United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Southern Nevada District Office
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Las Vegas, NV 89130
http://www.blm.gov/nv/st/en/fo/lvfo.1.html

JAN 13 2010

In Reply Refer to:
2710 (LLNVS00520)

Dear Reader:

Enclosed for your review is the Draft Supplemental Environmental Impact Statement (SEIS) for the Upper Las Vegas Wash Conservation Transfer Area which describes and analyzes the potential environmental impacts of six alternatives for the final boundary of the Upper Las Vegas Wash Conservation Transfer Area (CTA) managed by the Bureau of Land Management (BLM).

The BLM, Las Vegas Field Office is the lead agency for the SEIS with cooperation from the U.S. Fish and Wildlife Service, Federal Highway Administration, Las Vegas Paiute Tribe, City of Las Vegas, Clark County, Nevada Department of Transportation, and the City of North Las Vegas. The Draft SEIS describes and analyzes possible boundary adjustments to the CTA referenced in the 2004 Final Las Vegas Valley Disposal Boundary Environmental Impact Statement (FEIS) and Record of Decision. The SEIS is being prepared because of the significance of paleontological, botanical, hydrological, and cultural resources present within the CTA study area and the need for additional analysis and public input to establish a final boundary. The decision for a final CTA boundary was not made in the FEIS Record of Decision. Six alternatives for boundaries are analyzed, ranging from approximately 13,000 acres to less than 1,500 acres.

Comments regarding the Draft SEIS will be accepted for 60 days following the publication of the Notice of Availability (NOA) of this Draft SEIS in the Federal Register. You may submit comments by any of the following methods:

- BLM Web Site: http://www.blm.gov/nv/st/en/fo/lvfo.html
- Email: NV_SNDO_Planning@blm.gov
- Fax: 702-515-5023
- Mail: Bob Ross, Field Manager, BLM Las Vegas Field Office, 4701 North Torrey Pines Drive, Las Vegas, NV 89130-2301

Copies of the documents may be picked up at the BLM Southern Nevada District Office or downloaded from the BLM web site at the addresses above.

Three public meetings to accept comments will be conducted. Dates, times, and locations will be made public via news release, local media outlets, and on the BLM Southern Nevada District Office website (http://www.blm.gov/nv/st/en/fo/lvfo.html).

All comments received during the 60 day public comment period will be fully considered and evaluated for preparation of the Final SEIS. The BLM appreciates your interest in this project. If you have any questions on this matter, please contact Gayle Marrs-Smith, SEIS Project Manager (702) 515-5156.

Sincerely,

Mary Jo Rugwell
District Manager

Enclosure

EXECUTIVE SUMMARY

Executive Summary

The Bureau of Land Management Las Vegas Field Office (BLM) has prepared a Draft Supplemental Environmental Impact Statement (SEIS) for the Upper Las Vegas Wash Conservation Transfer Area (CTA). The Draft SEIS describes and analyzes possible boundary adjustments to the Upper Las Vegas Wash CTA referenced in the 2004 Final Las Vegas Valley Disposal Boundary Environmental Impact Statement and Record of Decision. The CTA Draft SEIS supplements the analysis contained in the Final Las Vegas Valley Disposal Boundary Environmental Impact Statement. Because of the significance of paleontological, botanical, hydrological, and cultural resources present within the CTA study area and the need for additional analysis and public input, the BLM is preparing this SEIS. The BLM proposes to establish a final boundary for the CTA. This decision was not made in the Final Las Vegas Valley Disposal Boundary Environmental Impact Statement Record of Decision. The CTA study area is located in the northern portion of the Las Vegas Valley. A defined final boundary is needed to ensure protection of sensitive resources, including fossils, cultural resources, the natural functioning of the wash, and endemic plants on public lands available for disposal within the CTA study area, in accordance with applicable laws.

This Draft SEIS has been prepared pursuant to the requirements of the National Environmental Policy Act of 1969 and its implementing regulations issued by the Council on Environmental Quality. The SEIS identifies the environmental consequences that may result from identifying different final boundaries for the Upper Las Vegas Wash CTA. This document also presents a record of consultation, coordination, and cooperation with other interested parties during the SEIS preparation. To assist the public and decision makers review, this SEIS is organized as follows:

- Chapter 1 discusses the purpose and need for action.
- Chapter 2 describes the alternative CTA boundaries including the BLM Preferred Alternative and No-Action Alternative. A discussion of the alternatives considered but eliminated is also provided in this chapter.
- Chapter 3 provides an overview of the existing environmental conditions within the CTA study area and the potentially affected environment.
- Chapter 4 addresses the potential environmental consequences of implementing the alternatives described in Chapter 2 when compared with the existing conditions presented in Chapter 3. Cumulative impacts and mitigation measures are also discussed in Chapter 4.
- Chapters 5, 6, 7, 8, 9, and 10 present Irreversible and Irretrievable Commitment of Resources, Consultation and Coordination, List of Preparers, Literature Cited, Glossary, and Index, respectively.
- Appendices provide additional technical support data.

Purpose and Need

BLM needs to determine a final boundary for the CTA that is based on best science to protect sensitive resources. The purpose of BLM's proposed action is to protect the natural functioning of the Upper Las Vegas Wash and the sensitive botanical, cultural, and paleontological resources. The ultimate boundary of the CTA is critically important to local municipalities that

must manage for the growth of their communities. Because the Upper Las Vegas Wash is an incised ephemeral wash, it intercepts runoff from adjacent lands. Thus, land uses could alter its natural hydrology and water quality. As a result, the Upper Las Vegas Wash and the resources it contains could be subject to impacts caused by land uses both inside and outside its immediate ordinary high-water mark.

Decisions to be Made

Selection of the final CTA boundary is the first step in a process for protection of sensitive resources in the CTA. Although stakeholders have provided input on a variety of planning and management actions that go beyond defining a final CTA boundary, the BLM is not making a decision on those planning and management actions through this SEIS. Additionally, although the Final Las Vegas Valley Disposal Boundary Environmental Impact Statement Record of Decision directed the BLM to transfer land in the CTA to another entity pursuant to an approved and signed conservation strategy agreement, the BLM is not making a decision on different managing entities though this process and would continue to manage resources within the final established boundary until such time as an outside entity meets the requirements of a BLM-approved conservation strategy agreement.

Description of Alternatives

From extensive public input, BLM identified six alternative CTA boundaries for analysis ranging from approximately 1,500 acres for the No-Action Alternative to almost 13,000 acres. These are each summarized below in Table ES-1, and described in detail in Chapter 2 of the Draft SEIS.

Table ES-1. Summary of Alternative Boundaries

Alternative	Alternative Boundary (acres)	Lands outside Alternative Boundary (acres)	Tule Springs (state lands)—outside Alternative Boundary (not available for disposal)	Eglington Preserve—outside Alternative Boundary (not available for disposal)	Lands Available for Disposal (acres)*
Alternative A	12,9523	670	299	0	370
Alternative B (Preferred Alternative)	11,008	2,615	299	0	2,315
Alternative C	6,362	7,260	299	0	6,961
Alternative D	5,301	8,321	0	298	8,022
Alternative E	3,314	10,308	0	298	10,010
No-Action Alternative	1,448	12,174	24	0	12,150

* Lands available for disposal = (Total acres outside alternative boundary) – (Eglington Preserve and Tule Springs State Lands if outside the alternative boundary).

Alternative A, at 12,953 acres, includes the fossil formation, sensitive cultural and plant resources, active wash and 100-year floodplain, the adjacent upper alluvial fan, and a one-mile resource protection zone around northern and eastern boundaries of the Las Vegas Paiute reservation. Alternative A includes the Eglington Preserve, but does not include the Tule Springs State Lands.

Alternative B, at 11,008 acres, includes the fossil formation, sensitive cultural and plant resources, active wash and 100-year floodplain, and the adjacent upper alluvial fan. Alternative B includes the Eglington Preserve, but does not include the Tule Springs State Lands. Alternative B is the BLM's Preferred Alternative.

Alternative C, at 6,362 acres, includes the fossil formation, sensitive cultural and plant resources, the active wash and 100-year floodplain, and a portion of the adjacent upper alluvial fan. Alternative C includes the Eglington Preserve, but does not include the Tule Springs State Lands.

Alternative D, at 5,301 acres, includes most of the fossil formation, the sensitive cultural and rare plant resources, and the active wash. Alternative D does not include the Eglington Preserve, but does include the Tule Springs State Lands.

Alternative E, at 3,314 acres, includes some of the fossil formation, the sensitive cultural and rare plant resources, and part of the active wash. Alternative E does not include the Eglington Preserve, but does include the Tule Springs State Lands.

The No Action Alternative is 1,448 acres and only includes the BLM portion of the Tule Springs National Register Site and the Eglington Preserve. Under the No-Action Alternative, the remaining lands in the CTA study area would be available for disposal in accordance with the Southern Nevada Public Land Management Act, Federal Land Policy Management Act, other applicable laws subject to valid existing rights, and stipulations established by the conservation strategy agreement.

Summary of Environmental Consequences

The environmental consequences the alternatives could have on the various natural, socioeconomic, and land use resources were identified. The analysis of the different alternatives focuses on identifying types of impacts and their potential significance. The BLM has received input on a variety of new facilities, utilities, roads, and recreation infrastructure by various stakeholders for lands within the study area. The BLM is not making decisions about these actions as part of this process; however, in order to determine the direct and indirect impacts, BLM has made several assumptions regarding the location and size of potential actions under each alternative. These assumptions are based on detailed information provided by the stakeholders and on different development scenarios that may occur under each alternative. A brief summary of the major conclusions of the analysis is presented in Table ES-1. A detailed analysis of the direct, indirect, and cumulative impacts on these resources from each alternative boundary is presented in Chapter 4 of the Draft SEIS.

Table ES-2. Summary of Environmental Impacts

Resource	Impacts	Mitigations
Earth Resources	The primary impact to earth resources would result from hydrologic changes in the Upper Las Vegas Wash. Increased erosion and sedimentation would occur as a result of increased land uses. Changes in surface erosion are comparative and are based on assumptions described in Chapter 4 of the Draft SEIS.	Implementation of standard engineering and construction practices would reduce impacts.
Alternative A	Private development would yield up to 1,340 tons of sediment loss annually as a result of surface erosion and up to 1,030 tons of total stream bank erosion.	Preparation of a Storm Water Pollution Protection Plan for construction projects that disturb more than one acre is required and would reduce impacts of construction-induced soil erosion and sedimentation.
Alternative B (BLM Preferred Alternative)	Private development would yield up to 1,440 tons of sediment loss annually as a result of surface erosion and up to 1,150 tons of total stream bank erosion.	See above mitigation.
Alternative C	Private development would yield up to 1,630 tons of sediment loss annually as a result of surface erosion and up to 1,380 tons of total stream bank erosion.	See above mitigation.
Alternative D	Private development would yield up to 1,700 tons of sediment loss annually as a result of surface erosion and up to 1,460 tons of total stream bank erosion.	See above mitigation.
Alternative E	Private development would yield up to 1,780 tons of sediment loss annually as a result of surface erosion and up to 1,550 tons of total stream bank erosion.	See above mitigation.
No-Action Alternative	Private development would yield up to 1,890 tons of sediment loss annually as a result of surface erosion and up to 1,680 tons of total stream bank erosion.	See above mitigation.

Resource	Impacts	Mitigations
Surface Water/Hydrology	The primary impact to surface water/hydrology would result from increased land uses. Increases in surface water flows and sedimentation would result in changes in the hydrologic and erosive processes in the Upper Las Vegas Wash and would occur as a result of increased land uses. These changes are described in comparison with a baseline condition described in section 4.3.1 of the Draft SEIS. Additionally, construction of additional flood control facilities, and the implementation of any Best Management Practices or mitigation measures for these impacts may conflict with the BLM goals and objectives to protect the natural wash system.	Implementation of standard engineering and construction practices would reduce impacts.
Alternative A	There would be 2% increase in annual sediment loss from the baseline condition. The hydrologic and erosive process in the CTA study area would behave in a manner that is similar to existing conditions.	No mitigation measures are identified.
Alternative B (BLM Preferred Alternative)	There would be 9% increase in annual sediment loss from the baseline condition. Over time, the changing hydrologic and erosive process in the CTA study area would alter aspects of the natural wash. New private development would be subject to engineering analysis to determine appropriate stability and setback distances from the Upper Las Vegas Wash.	Preparation of a Storm Water Pollution Protection Plan for construction projects that disturb more than one acre is required and would reduce impacts of construction-induced soil erosion and sedimentation.
Alternative C	There would be 23% increase in annual sediment loss from the baseline condition. Over time, the larger flows and greater stream bank erosion resulting from Alternative C would have a greater potential to alter the natural wash. There would be a greater need for additional erosion control measures and additional flood control facilities to protect sensitive areas.	Within their municipal boundaries, the cities of Las Vegas and North Las Vegas would coordinate with the Clark County Regional Flood Control District to implement flood control measures, as appropriate, to address higher peak flows and erosion within the Upper Las Vegas Wash. Best Management Practices identified in Appendix A of the Draft SEIS may be applied at the design stage for new flood control facilities.
Alternative D	There would be 29% increase in annual sediment loss from the baseline condition. Over time, the larger flows and greater stream bank erosion resulting from Alternative D would have a greater potential to alter the natural wash. There would be a greater need for additional erosion control measures and additional flood control facilities to protect sensitive areas.	See above mitigation.

Resource	Impacts	Mitigations
Alternative E	There would be 35% increase in annual sediment loss from the baseline condition. Over time, the larger flows and greater stream bank erosion resulting from Alternative E would have a greater potential to alter the natural wash. There would be a greater need for additional erosion control measures and additional flood control facilities to protect sensitive areas.	See above mitigation.
No-Action Alternative	There would be 43% increase in annual sediment loss from the baseline condition. Over time, the larger flows and greater stream bank erosion resulting from the No-Action alternative would have a greater potential to alter the natural wash. There would be a greater need for additional erosion control measures and additional flood control facilities to protect sensitive areas.	See above mitigation.

Special-Status Plant Species	Increased land uses including land disposal would result in loss of occupied, high-potential, and moderate-potential Las Vegas buckwheat and Las Vegas bearpoppy, and Merriam's bearpoppy habitat.	
Alternative A	Private development on lands outside the alternative A boundary would result in no loss of Las Vegas Buckwheat habitat. Additionally, there would be a removal of 10.2 acres of moderate potential bearpoppy habitat.	No mitigation measures are identified.
Alternative B (BLM Preferred Alternative)	Private development on lands outside the alternative B boundary would result in no loss of Las Vegas buckwheat habitat. Additionally, there would be a removal of 5.4 acres of occupied, 266.6 acres of high-potential, and 0.1 acre of moderate potential bearpoppy habitat.	Measures to reduce or eliminate impacts to special status plant species include relocating facilities outside of habitat, reducing the project footprint to the maximum extent possible, collecting seeds, salvaging topsoil, and propagating and planting native materials. Identify areas that should be avoided for activities or land uses to protect special state plant resources.
Alternative C	Private development on lands outside the alternative C boundary would result in the removal of 142.1 acres of moderate potential Las Vegas buckwheat habitat. Additionally, there would be a removal of 7.1 acres of high-potential, and 779.7 acres of moderate potential bearpoppy habitat.	See above mitigation.

Resource	Impacts	Mitigations
Alternative D	Private development on lands outside the alternative D boundary would result in the removal of 1.3 acres of moderate potential Las Vegas buckwheat habitat. Additionally, there would be a removal of 3.2 acres of high-potential, and 282.7 acres of moderate potential bearpoppy habitat.	See above mitigation.
Alternative E	Private development on lands outside the alternative E boundary would result in the removal of 3.1 acres of high-potential, and 32.7 acres of moderate potential Las Vegas buckwheat habitat. Additionally, there would be a removal of 3.2 acres of high-potential, and 282.7 acres of moderate potential bearpoppy habitat.	See above mitigation.
No-Action Alternative	Private development on lands outside the No-Action alternative boundary would result in the removal of 0.2 acres occupied, 4.1 acres of high-potential, and 1.6 acres of moderate potential Las Vegas buckwheat habitat. Additionally, there would be a removal of 39.8 acres of high-potential, and 684.9 acres of moderate potential bearpoppy habitat.	See above mitigation.

Cultural Resources	Increases in land uses would result in increased opportunities for discovery and direct loss of undocumented cultural resources.	Cultural resource mitigation and treatment. Development of public interpretive displays and educational materials would encourage public stewardship and protection of cultural resources.
Alternative A	There would a low probability of vandalism and destruction of undocumented cultural resources from people attracted to CTA as a result of private development on up to 370 acres. Indirect impacts from people attracted to the area would result from increased trail development and educational programs.	See above mitigation.
Alternative B (BLM Preferred Alternative)	There would a low to moderate probability of vandalism and destruction of undocumented cultural resources from people attracted to CTA as a result of private development on up to 2,315 acres. Indirect impacts from people attracted to the area would result from increased trail development and educational programs.	See above mitigation.

Resource	Impacts	Mitigations
Alternative C	There would a moderate probability of vandalism and destruction of undocumented cultural resources from people attracted to CTA as a result of private development on up to 6,961 acres. Indirect impacts from people attracted to the area would result from increased trail development and educational programs.	See above mitigation.
Alternative D	There would a moderate probability of vandalism and destruction of undocumented cultural resources from people attracted to CTA as a result of private development on up to 8,022 acres. Indirect impacts from people attracted to the area would result from increased trail development and educational programs.	See above mitigation.
Alternative E	There would a moderate probability of vandalism and destruction of undocumented cultural resources from people attracted to CTA as a result of private development on up to 10,010 acres. Indirect impacts from people attracted to the area would result from increased trail development and educational programs.	See above mitigation.
No-Action Alternative	The highest probability of the alternatives for vandalism and destruction of undocumented cultural resources from people attracted to CTA as a result of private development on up to 12,150 acres. Indirect impacts from people attracted to the area would result from increased trail development and educational programs.	See above mitigation.

Native American Religious Concerns	Increases in land uses surrounding the Upper Las Vegas Wash would affect resources of cultural and traditional importance to the Las Vegas Paiute Tribe.	Involving the tribe in planned developments early in the process could reduce impacts.
Alternative A	Alternative A would provide greatest protection of traditional use areas.	No mitigation measures are identified.
Alternative B (BLM Preferred Alternative)	Provides adequate protection of traditional use area. Development would result in alterations to cultural landscape.	No mitigation measures are identified.
Alternative C	Development would result in alterations to cultural landscape.	Involving the tribe in planned developments early in the process could reduce impacts.
Alternative D	Development would result in alterations to cultural landscape.	See above mitigation.

Resource	Impacts	Mitigations
Alternative E	Development would result in alterations to cultural landscape.	See above mitigation.
No-Action Alternative	Development would result in alterations to cultural landscape.	See above mitigation.

Paleontology	Increases in land uses within the Las Vegas Formation would result in destruction of surface and subsurface paleontological resources as a result of breakage and crushing from surface disturbing construction activities.	Impacts can be reduced through implementation of a paleontological survey and monitoring program and increasing public awareness.
Alternative A	Alternative A includes all 436 recorded fossil localities. There is the potential for exposure and destruction of undocumented fossil localities in the 370 acres of lands available for disposal.	Collection of all previously recorded scientifically significant surface fossils that will not be preserved or displayed in situ from within the boundaries of the CTA as soon as feasible in order to prevent loss from vandalism, theft, and natural weathering processes. Collection would be housed in a BLM-approved repository (i.e., museum). Mitigation monitoring of all surface-disturbing development activities in order to prevent destruction of scientifically significant subsurface fossils contained within strata of the Las Vegas Formation. Development of in situ paleontological interpretive displays, which may include fossil specimens, and in situ preservation of paleontologically sensitive areas and key fossil localities. Under the direction of the CTA management authority, establishment of an ongoing paleontological survey and monitoring program designed to periodically check for newly exposed fossil remains and monitor the status of in situ preserved localities.
Alternative B (BLM Preferred Alternative)	Alternative B includes all 436 recorded fossil localities. There is the potential for exposure and destruction of undocumented fossil localities in the 2,315 acres of lands available for disposal.	See above mitigation.
Alternative C	Alternative C includes 434 of the 436 recorded fossil localities. There is the potential for exposure and destruction of undocumented fossil localities in the 6,961 acres of lands available for disposal.	See above mitigation.

Resource	Impacts	Mitigations
Alternative D	Alternative D includes 422 of the 436 recorded fossil localities. There is the potential for exposure and destruction of undocumented fossil localities in the 8,022 acres of lands available for disposal.	See above mitigation.
Alternative E	Alternative E includes 318 of the 436 recorded fossil localities. There is the potential for exposure and destruction of undocumented fossil localities in the 10,010 acres of lands available for disposal.	See above mitigation.
No-Action Alternative	The No-Action alternative includes 82 of the 436 recorded fossil localities. There is the potential for exposure and destruction of undocumented fossil localities in the 12,174 acres of lands available for disposal.	See above mitigation.

Visual Resources	The transfer of land ownership would not affect visual resources, but the subsequent private development would result in clearly visible changes to the existing landscape.	Measures can be implemented during planning, design, and construction to reduce the presence of proposed facilities and make them more compatible with the natural elements of the landscape.
Alternative A	The level of change to the landscape was determined to be moderate, and proposed development was determined to be consistent with BLM Visual Resource Management objectives.	See above mitigation.
Alternative B (BLM Preferred Alternative)	Private development on 2,315 acres of lands available for disposal would convert predominantly undeveloped landscapes to high-density urban development. Although this is not consistent with Visual Resource Management Class III objectives, private land would not be subject to BLM Visual Resource Management objectives.	See above mitigation.
Alternative C	Private development on 6,961 acres of lands available for disposal would convert predominantly undeveloped landscapes to high-density urban development. Although this is not consistent with Visual Resource Management Class III objectives, private land would not be subject to BLM Visual Resource Management objectives.	See above mitigation.

Resource	Impacts	Mitigations
Alternative D	Private development on 8,022 acres of lands available for disposal would convert predominantly undeveloped landscapes to high-density urban development. Although this is not consistent with Visual Resource Management Class III objectives, private land would not be subject to BLM Visual Resource Management objectives.	See above mitigation.
Alternative E	Private development on 10,010 acres of lands available for disposal would convert predominantly undeveloped landscapes to high-density urban development. Although this is not consistent with Visual Resource Management Class III objectives, private land would not be subject to BLM Visual Resource Management objectives.	See above mitigation.
No-Action Alternative	Private development on 12,150 acres of lands available for disposal would convert predominantly undeveloped landscapes to high-density urban development. Although this is not consistent with Visual Resource Management Class III objectives, private land would not be subject to BLM Visual Resource Management objectives.	See above mitigation.

Land Uses	There would be no impact to current land uses within the CTA study area under any of the alternatives.	No mitigation measures are identified.

Recreation	The primary impact to recreation would result from a loss of open space that is currently available for passive recreation opportunities. Additionally, current access to the CTA study area would be limited as a result of private development on lands available for disposal.	No mitigation measures are identified.
Alternative A	Alternative A would preserve the open space available for non-motorized passive recreation opportunities.	No mitigation measures are identified.
Alternative B (BLM Preferred Alternative)	Alternative B would preserve open space and access available for non-motorized passive recreation opportunities.	No mitigation measures are identified.
Alternative C	Private development on 6,961 acres of lands available for disposal would reduce the available open space and access to passive recreation opportunities in the CTA study area	Incorporate plans to establish a non-motorized trail system, compatible with protection of sensitive resources, for the enjoyment of the public in association with private development.

Resource	Impacts	Mitigations
Alternative D	Private development on 8,022 acres of lands available for disposal would reduce the available open space and access to passive recreation opportunities in the CTA study area.	See above mitigation.
Alternative E	Private development on 10,010 acres of lands available for disposal would reduce the available open space and access to passive recreation opportunities in the CTA study area.	See above mitigation.
No-Action Alternative	Private development on 12,150 acres of lands available for disposal would reduce the available open space and access to passive recreation opportunities in the CTA study area	See above mitigation.

Transportation	The primary impact to transportation resources would be increased traffic resulting from limitations on roadways and population growth associated with the private development of disposal lands in the CTA study area.	
Alternative A	Minor increases in average daily traffic on roads surrounding alternative A would result from increased visitation for recreation and educational purposes.	No mitigation measures are identified.
Alternative B (BLM Preferred Alternative)	Minor increases in average daily traffic on roads surrounding alternative B would result from increased visitation for recreation and educational purposes. Additionally, population increases as a result of private development combined with only minor increases in road capacity assumed under alternative B would result in increased traffic volume.	Prior to any private development, builders would consult with the NDOT and RTC to develop traffic control plans.
Alternative C	Population increases as a result of private development would result in increased traffic volume. The additional road capacity assumed under alternative C would reduce the effects of increased population.	See above mitigation.
Alternative D	Population increases as a result of private development would result in increased traffic volume. The additional road capacity assumed under alternative D would reduce the effects of increased population.	See above mitigation.

Resource	Impacts	Mitigations
Alternative E	Population increases as a result of private development would result in increased traffic volume. The additional road capacity assumed under alternative E would reduce the effects of increased population.	See above mitigation.
No-Action Alternative	Population increases as a result of private development would result in increased traffic volume. The additional road capacity assumed under the No-Action alternative would reduce the effects of increased population on traffic volume.	See above mitigation.

Noise	There would be an increase in ambient noise levels associated with development and construction activities that would be associated with potential future development of disposal lands in the CTA study area.	The implementation of engineering and construction practices would reduce impacts to sensitive noise receptors.
Alternative A	There would be no changes in ambient noise levels as a result of alternative A.	No mitigation measures are identified.
Alternative B (BLM Preferred Alternative)	Private development on 2,315 acres would result in increased ambient noise levels.	Best Management Practices would be implemented to minimize potential impacts to sensitive noise receptors during design and construction of all new potential private development.
Alternative C	Private development on 6,961 acres would result in increased ambient noise levels.	See above mitigation.
Alternative D	Private development on 8,022 acres would result in increased ambient noise levels.	See above mitigation.
Alternative E	Private development on 10,010 acres would result in increased ambient noise levels.	See above mitigation.
No-Action Alternative	Private development on 12,174 acres would result in increased ambient noise levels.	See above mitigation.

Hazardous Materials	Based on the history of mining and unauthorized dumping throughout the CTA study area, there is the potential for discovery of previously unknown hazardous materials on lands available for disposal.	Characterization and appropriate remediation are required in order to ensure that any lands disposed of do not include hazardous materials.
Alternative A	There would be an increased risk of discovery on 370 acres as a result of alternative A.	See above mitigation.
Alternative B (BLM Preferred Alternative)	There would be an increased risk of discovery on 2,315 acres as a result of alternative B.	See above mitigation.

Resource	Impacts	Mitigations
Alternative C	There would be an increased risk of discovery on 6,961 acres as a result of alternative C.	See above mitigation.
Alternative D	There would be an increased risk of discovery on 8,022 acres as a result of alternative D.	See above mitigation.
Alternative E	There would be an increased risk of discovery on 10,010 acres as a result of alternative E.	See above mitigation.
No-Action Alternative	There would be an increased risk of discovery on 12,174 acres as a result of the No-Action alternative.	See above mitigation.

Socioeconomics	The preservation or development of currently undeveloped desert lands in the Las Vegas Valley would directly impact the social and economic resources of the area as a result of potential population increases, employment requirements, capital expenditures, loss or gain of open space as an amenity, and loss or gain of productive land value.	No mitigation measures are identified.
Alternative A	The cities of Las Vegas and North Las Vegas could experience loss of tax revenue, increased costs for transportation and infrastructure if development is further away; have reduced ability to grow in a more effective and orderly fashion. There would be direct, beneficial impacts to community resource groups who have an interest in the preservation of the entire CTA study area.	No mitigation measures are identified.
Alternative B (BLM Preferred Alternative)	Under Alternative B, 2,315 acres would be available for disposal and there would be a moderate increase in tax and revenue over Alternative A. There would be direct, beneficial impacts to community resource groups who have an interest in the preservation of the sensitive resources in the CTA study area.	No mitigation measures are identified.

Resource	Impacts	Mitigations
Alternative C	Under Alternative C, 6,961 acres would be available for disposal and private development and would result in a proportionally larger increase in tax and revenues to the cities. Groups who have an interest in preservation of the sensitive resources in the CTA study area would experience impacts to their community's values as a result of more limited protection of these sensitive resources.	No mitigation measures are identified.
Alternative D	Under Alternative D, 8,022 acres would be available for disposal and would result in a proportionally larger increase in tax and revenue to the cities. Groups who have an interest in preservation of the sensitive resources in the CTA study area would experience impacts to their community's values as a result of more limited protection of these sensitive resources.	No mitigation measures are identified.
Alternative E	Under Alternative E, 10,010 acres would be available for disposal and would result in a proportionally positive increase in tax and revenue to the cities. Groups who have an interest in preservation of the sensitive resources in the CTA study area would experience impacts to their community's values as a result of more limited protection of these sensitive resources.	No mitigation measures are identified.
No-Action Alternative	Under the No-Action Alternative, 12,150 acres would be available for disposal and would result in a proportionally larger increase in tax and revenue to the cities. Groups who have an interest in preservation of the sensitive resources in the CTA study area would experience impacts to their community's values as a result of more limited protection of these sensitive resources.	No mitigation measures are identified.

VOLUME 1 of 2

BLM

DRAFT
Supplemental Environmental Impact Statement
UPPER LAS VEGAS WASH CONSERVATION TRANSFER AREA, LAS VEGAS, NEVADA

January 2010

MISSION STATEMENT

"The Bureau of Land Management is responsible for stewardship of our public lands. The BLM is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people. Management is based upon the principles of multiple use and sustained yield of our Nation's resources within the framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife habitat, wilderness, air, and scenic quality, as well as scientific and cultural values."

BLM/NV/EL/ES-10/06+1793

Draft Supplemental Environmental Impact Statement

Upper Las Vegas Wash Conservation Transfer Area
Las Vegas, Nevada

Volume 1 of 2

U.S. Department of the Interior
Bureau of Land Management, Las Vegas Field Office

January 2010

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ACRONYMS AND ABBREVIATIONS

Document Abbreviations

Biological Opinion	*Biological and Conference Opinions for Reinitiation of Consultation on the Las Vegas Valley Programmatic Biological Opinion (File No. 1-5-96-F-023R, as amended) and Previously Reinitiated (File No. 1-5-96-F-023R.2), to Expand the Disposal Boundary (File No, 1-5-96-F-023R3)*
BLM NEPA Handbook	*National Environmental Policy Act Handbook* (H-1790-1)
Conservation Agreement	*Conservation Agreement for the Management of Special Resources on Bureau of Land Management Parcels Nominated for Disposal by the City of North Las Vegas*
Las Vegas RMP	*Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement*
CCRFCD Master Plan	*Clark County Regional Flood Control District 2002 Master Plan Update*
LVVDB FEIS	*Las Vegas Valley Disposal Boundary Final Environmental Impact Statement*
Mountain Edge Study	*Mountain Edge Parkway Feasibility Study*
MSHCP	*Clark County Multiple Species Habitat Conservation Plan*
Paleontology Plan	*Paleontological Resources Assessment and Treatment Plan—Las Vegas Valley Disposal Boundary EIS, Las Vegas, Nevada*
ROD	*Las Vegas Valley Disposal Boundary Final Environmental Impact Statement Record of Decision*
USU Report	*Upper Las Vegas Wash Conservation Transfer Area: A System to Develop Alternative Scenarios*

Other Abbreviations

ACEC	Area of Critical Environmental Concern
AFY	acre-feet per year
amsl	above mean sea level
AST	aboveground storage tanks
ASTM	American Society for Testing and Materials
BEA	Bureau of Economic Analysis
BIA	Bureau of Indian Affairs
BJS	Bureau of Justice Statistics
BLM	Bureau of Land Management
BMPs	best management practices

CAA	Clean Air Act
CCDCP	Clark County Department of Comprehensive Planning
CCP	Comprehensive Conservation Plan
CCRFCD	Clark County Regional Flood Control District
CCWRD	Clark County Water Reclamation District
CE	critically endangered
Census Bureau	U.S. Census Bureau
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cfs	cubic feet per second
Clark County Act	Clark County Conservation of Public Land and Natural Resources Act
CTA	Conservation Transfer Area
CWA	Clean Water Act
dB	decibel(s)
DNWR	Desert National Wildlife Refuge
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FINDS	Facility Index System
FLPMA	Federal Land Policy and Management Act
FY	fiscal year
GIS	geographic information system
GPS	global positioning system
Greenways	Greenways, Inc.
GDP	Gross Domestic Product
HEC-1	Hydrologic Engineering Center–1
HEC-RAS	Hydrologic Engineering Center River Analysis System
HMIRS	Hazardous Materials Incident Response System
HPTP	Historic Properties Treatment Plan
HRA	HRA, Inc.
I-CARE	Indian Crime Awareness Research and Evaluation
IC/EC	Federal Institutional and Engineering Controls
ID	identification
IM	instructional memo
KOP	key observation point

LD	land designation
LGN	large-quantity generator
LR2000 database	BLM Legacy Rehost System
LUST	leaking underground storage tank
LVF	Las Vegas Formation
LVFRD	Las Vegas Fire and Rescue Department
LVMPD	Las Vegas Metropolitan Police Department
LVV	Las Vegas Valley
LVVDB	Las Vegas Valley Disposal Boundary
LVVWD	Las Vegas Valley Water District
LVW	Las Vegas Wash
Mgal/day	million gallons per day
NAGPRA	Native American Graves Protection and Repatriation Act
NCA	National Conservation Area
NCDB	National Compliance Database System
NDEP	Nevada Division of Environmental Protection
NDF	Nevada Division of Forestry
NDOT	Nevada Department of Transportation
NEETF	National Environmental Education and Training Foundation
NEPA	National Environmental Policy Act
NFRAP	No Further Remedial Action Planned
NHPA	National Historic Preservation Act
NLVPD	North Las Vegas Police Department
NNHP	Nevada Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
NSD	Nevada State Demographer
NV Energy	Nevada Energy
NWR	National Wildlife Refuge
OHV	off-highway vehicle
OHWM	ordinary high-water mark
Paiute Reservation	Las Vegas Paiute Indian Reservation
PCB	PolyChlorinated BiPhenol
PFYC	Potential Fossil Yield Classification
PILT	payments in lieu of taxes
PL	Public Law
PZD	Planning and Zoning Department
R&PP Act	Recreation and Public Purposes Act
RCRA	Resource Conservation and Recovery Act
REC	recognized environmental condition
RMP	Resource Management Plan

ROD	Record of Decision
Roper	Roper Starch Worldwide
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
RTC	Regional Transportation Commission of Southern Nevada
SBCM	San Bernardino County Museum
SEIS	Supplemental Environmental Impact Statement
SGN	small-quantity generator
SHPO	State Historic Preservation Office
SNPLMA	Southern Nevada Public Land Management Act
SNWA	Southern Nevada Water Authority
SWCA	SWCA Environmental Consultants
SWL	Solid Waste Landfill
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Property
TTI	Texas Transportation Institute
TMDLs	Total Maximum Daily Loads
TRIS	Toxic Release Inventory System
Tule Springs	Tule Springs National Register of Historic Places Site
ULVW	Upper Las Vegas Wash
UNLV	University of Nevada–Las Vegas
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
USU	Utah State University
VCP	Voluntary Remediation or Clean-Up Programs
VGN	conditionally exempt generator
VRM	Visual Resource Management
WUS	waters of the United States
ybp	years before present

Chapter 1

PURPOSE AND NEED

1.1 BACKGROUND

Clark County, Nevada, which encompasses the greater Las Vegas metropolitan area, has been one of the fastest-growing regions in the United States. Between 1996 and 2006, the population increased by almost 800,000. This upward trend is anticipated to resume in the foreseeable future. According to the Nevada State Demographer (NSD 2006a), the population of Clark County is projected to increase from 1.89 million in 2006 to 2.79 million by 2016 (about 900,000 people over the 10-year period), and to 3.34 million by 2026 (an additional 550,000 people over the 10-year period).

To address issues associated with the need for developable lands and the management of public lands, Congress passed the Southern Nevada Public Land Management Act (SNPLMA) in 1998 [Public Law (PL) 105-263]. The SNPLMA authorized the United States (U.S.) Department of the Interior Bureau of Land Management (BLM) to dispose of federal lands in Clark County, Nevada, consistent with applicable law, population growth, and community land use plans and policies. In 2002, the Clark County Conservation of Public Land and Natural Resources Act (Clark County Act) [PL 107-282] amended the SNPLMA to expand the disposal boundary area to address the continuing increased growth rates in the Las Vegas region.

The disposal boundary established by the SNPLMA, as amended by the Clark County Act, encompasses much of the Las Vegas Valley (LVV) in southern Clark County, Nevada (Figure 1.1-1). The public lands that became available for auction were primarily located in the northern and southern portions of the disposal area. The northern area encompasses the Upper Las Vegas Wash (ULVW) and is bordered by Nellis Air Force Base to the east, the Desert National Wildlife Refuge (DNWR) to the north, and the Red Rock Canyon National Conservation Area (NCA) and the Las Vegas Paiute Indian Reservation (Paiute Reservation) to the west (Figure 1.1-2).

The BLM Las Vegas Field Office prepared the *Las Vegas Valley Disposal Boundary Final Environmental Impact Statement* (LVVDB FEIS) (BLM 2004a) to identify the environmental consequences that may result from the disposal and use of the remaining BLM-managed lands within the disposal boundary. During preparation of the LVVDB FEIS, sensitive biological, cultural, and paleontological resources were identified along the ULVW within the 5,000-acre Conservation Transfer Area (CTA) in the northern part of the LVV. The *Las Vegas Valley Disposal Boundary Final Environmental Impact Statement Record of Decision* (ROD) for the LVVDB FEIS (ROD No. FES 04-048) selected the Conservation Transfer Alternative, which was analyzed in the LVVDB FEIS as the agency's Preferred Alternative (BLM 2004b).

The Conservation Transfer Alternative allows the BLM to dispose of approximately 46,700 acres of lands in the LVV for future growth of the city and says that the BLM would conduct additional study, collaboration, and environmental analysis of approximately 5,000 acres that have been withheld from sale because of their high concentration of sensitive resources. The ROD indicates the CTA boundary should be adaptable. This Supplemental Environmental Impact Statement (SEIS) is a mandatory step in implementing the decision of the ROD for the LVVDB FEIS, which requires further study, collaboration, and analysis of the environmental effects of public land disposal within the CTA.

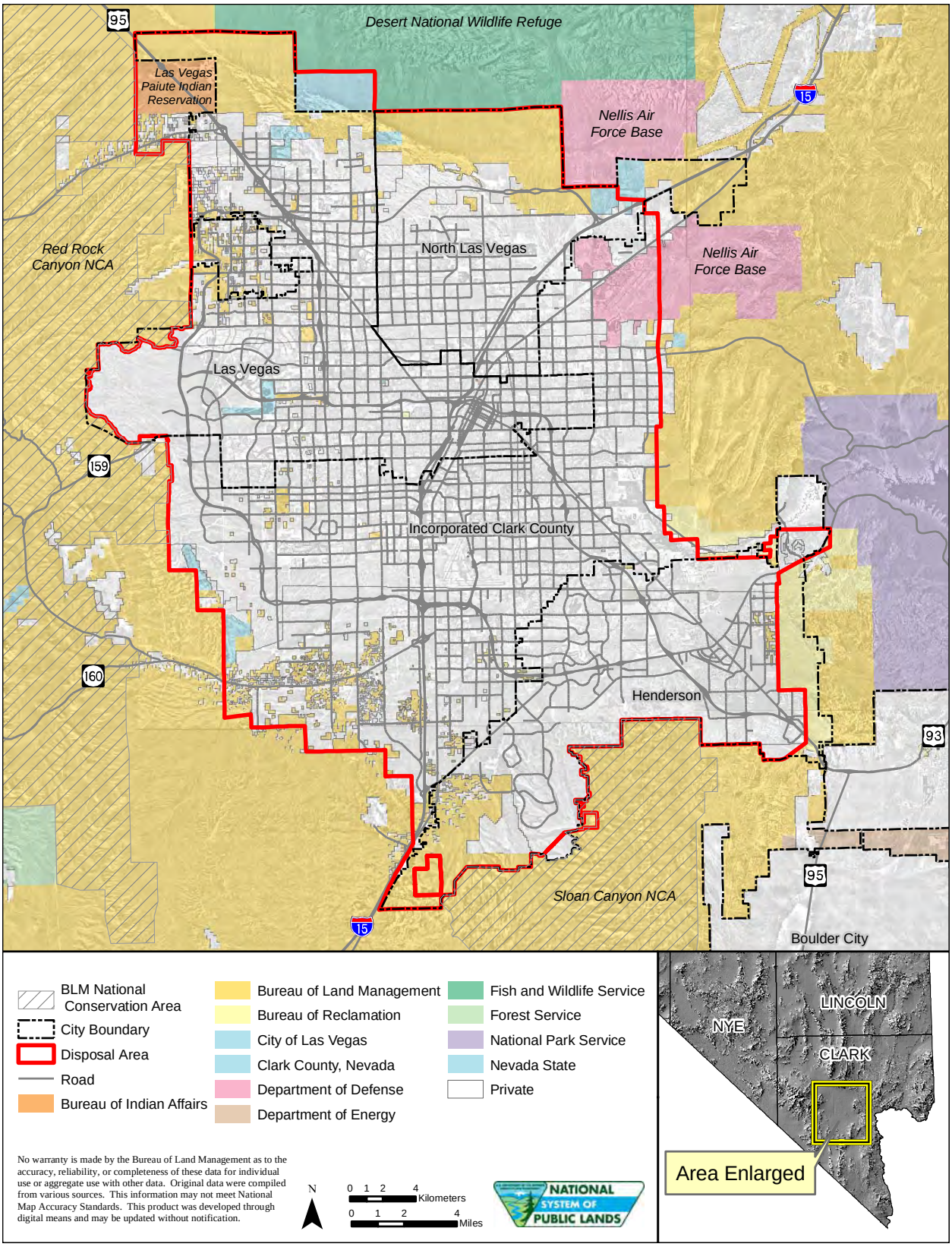

Figure 1.1-1. Bureau of Land Management Las Vegas Valley disposal boundary.

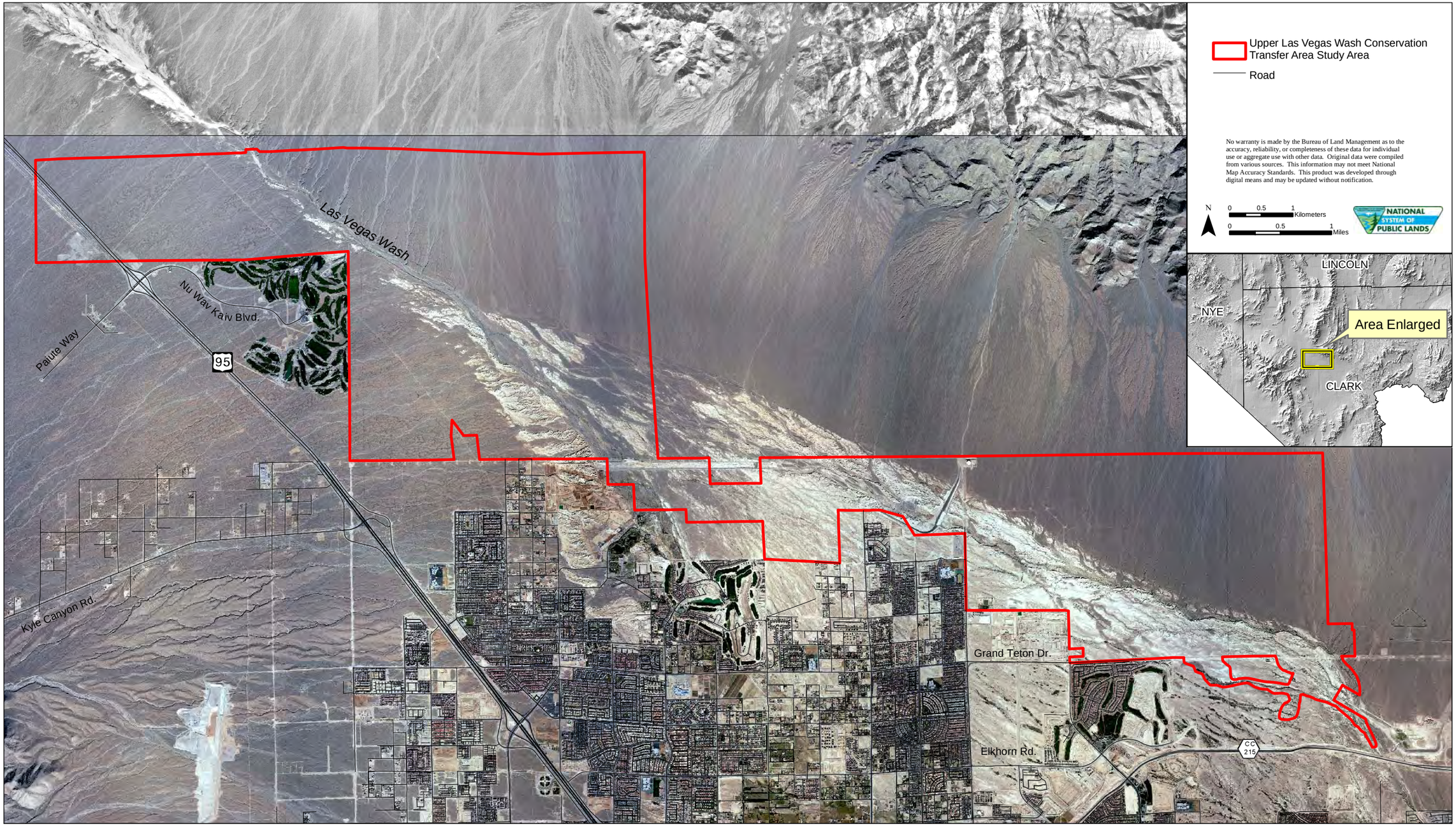

Figure 1.1-2. Upper Las Vegas Wash Conservation Transfer Area study area boundary.

Since issuing the ROD in December 2004, the BLM has hosted numerous meetings with stakeholders to gain input regarding the size of the CTA and potential allowable land uses within this area. Additionally, the BLM, with technical assistance from Utah State University (USU), has been conducting numerous studies that, among other things, are designed to specifically identify the locations within the CTA study area that possess the most sensitive resources. Based on preliminary study results, USU personnel prepared a report titled *Upper Las Vegas Wash Conservation Transfer Area: A System to Develop Alternative Scenarios* (USU Report) (USU 2007a).

This CTA SEIS supplements the analysis contained in the LVVDB FEIS. As a result of stakeholder input and internal BLM discussions, the CTA study area to be analyzed in this SEIS has been increased from approximately 5,000 to 13,622 acres.

This SEIS is being prepared by the BLM pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA) [42 United States Code (USC) 4321 *et seq*.], which requires federal agencies to consider environmental consequences in their decision-making process. BLM uses the NEPA process to ensure that its decisions are based on an understanding of potential environmental consequences and alternative courses of action.

To implement NEPA, the Council on Environmental Quality (CEQ) issued regulations [40 Code of Federal Regulations (CFR) 1500–1508] guiding the NEPA process and content of NEPA documents. BLM Handbook H-1790-1, *National Environmental Policy Act Handbook* (BLM NEPA Handbook) (BLM 1988), provides further instructions for compliance with the CEQ regulations, as well as U.S. Department of the Interior guidance (516 DM 1–7) on NEPA. This SEIS has been prepared in a manner that is consistent with the requirements of the CEQ NEPA regulations and the BLM NEPA Handbook.

The goals of this SEIS are to

- Assist BLM officials in making decisions that are based on an understanding of environmental consequences and in taking actions that protect, restore, and enhance the environment;
- Identify ways in which environmental effects can be avoided or reduced;
- Prevent significant avoidable effects on the environment by implementing alternatives or mitigation measures if feasible;
- Disclose to the public the environmental information and analyses on which the decisions will be based;
- Augment and update existing analyses in the LVVDB FEIS (BLM 2004b);
- Complete site-specific analysis of up to 13,622 acres to allow determination of a final boundary;
- As appropriate, ensure consistency between the SEIS and current and proposed municipal planning documents (e.g., Master Plans) for the area surrounding the CTA; and
- Obtain sufficient data to define a boundary that ensures that the natural functioning of the ULVW, including adjacent alluvial fans, is maintained while allowing for compatible development or uses. Natural functioning is defined as the ability of a system to function and support habitat with little to no anthropogenic alteration or change to that system. In the case of the ULVW, the natural functioning of the wash would include natural flows (both discharge and velocity), natural flood control, sediment transport, erosional processes (deposition and aggradation), and naturally occurring vegetation and habitat.

This SEIS identifies the environmental consequences that may result from the disposal and use of lands within the proposed CTA boundary under each alternative and also identifies methods to avoid, minimize, or mitigate potential impacts, as appropriate. In addition, this document presents a record of consultation, coordination, and cooperation with other interested parties during SEIS preparation.

While the BLM is authorized to dispose of lands within Clark County consistent with applicable laws, population growth, and community land use plans, the conditions of the ROD stipulate that the BLM carefully evaluate the resources within the CTA study area and collaborate with stakeholders to determine an appropriate CTA boundary that is adaptable to the needs and concerns of interested parties.

The LVVDB FEIS provided site-specific analysis for the indirect impacts of the community development scenarios and direct impacts of ROW alignments based on 10-acre parcels of BLM land. These impacts were quantified in the LVVDB FEIS to allow BLM to approve future land use authorizations. Within the final CTA boundary, a conservation strategy agreement will be developed to protect sensitive resources after the ROD is signed. For that reason, no further consideration of specific uses and projects within or adjacent to the CTA study area (e.g., roads, bridges, trails, utility lines, etc.) is being included in this SEIS.

1.2 DESCRIPTION OF THE UPPER LAS VEGAS WASH CONSERVATION TRANSFER AREA

The CTA study area, encompassing 13,622 acres, stretches east from U.S. Route 95 near the Paiute Reservation to approximately 4 miles west of Interstate 15. The DNWR is directly north of the CTA, and the southern boundary roughly approximates the southern edge of the ULVW. The maximum elevation within the CTA is 3,040 feet above mean sea level (amsl), and the minimum elevation is 2,113 feet amsl.

The CTA study area is located within a broad, northwest-southeast-trending alluvial basin characterized by interbedded alluvial fans originating in the Las Vegas and Sheep ranges and the Spring Mountains. Within the Las Vegas Wash Hydrologic Unit, the Las Vegas Wash (LVW) is a heavily incised natural flood channel that carries stormwater and runoff from Las Vegas to Lake Mead. The LVW not only provides an important floodway in the valley, it also contains unique riparian habitat that supports a large number of plant and animal species. Although sections of the ULVW have been modified through flood control structures (e.g., detention basins), a large portion of the wash provides for natural flood control. Approximately 13 linear miles of the ULVW traverse the CTA study area from the northwest to the southeast.

Three rare plant species occur within the CTA study area: golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont), commonly referred to as Las Vegas bearpoppy; Merriam's bearpoppy (*Arctomecon merriamii* Coville), also called white bearpoppy; and Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal), commonly referred to as Las Vegas buckwheat. All three plant species are listed as special-status species by the BLM. Las Vegas bearpoppy is classified as critically endangered by the State of Nevada, and Las Vegas buckwheat is a candidate for listing on the State of Nevada's critically endangered plant species list.

A number of wildlife species listed as sensitive by BLM, including western burrowing owl (*Athene cunicularia hypugea*) and phainopepla (*Phainopepla nitens*), are known to occur within or in the vicinity of the ULVW. Certain of these species are also protected by the State of Nevada. Of critical concern is the threatened Mojave Desert tortoise (*Gopherus agassizii*). Although the LVVDB FEIS indicates that there is no designated critical habitat within the disposal boundary, the habitat of the desert tortoise encompasses Mojave Desert creosote bush scrub, thorn scrub, and cacti, specifically in sandy or gravelly locations. Washes, canyon bottoms, and oases also serve as habitat for the desert tortoise (MacMahon 1985).

The CTA study area and adjacent lands have long been known to contain large numbers of paleontological sites. A 2003 review (conducted in preparation for the LVVDB FEIS) of the Regional

Paleontological Locality Inventory revealed 44 known paleontological resource localities. Field surveys of approximately 24,900 acres conducted specifically for the LVVDB FEIS located 438 previously unrecorded paleontological resources within the disposal boundary; the majority of these are located in specific horizons of fossiliferous Quaternary spring deposits in the ULVW (BLM 2004a).

The Tule Springs National Register of Historic Places (NRHP) archaeological site (Tule Springs), is a 1,125-acre designated archeological site[1] that has produced substantial important data relevant to the environmental history of the Great Basin. Approximately 660 acres of the site are located within the CTA study area.

The CTA study area also includes Eglington Preserve, a 300-acre protected area south of Grand Teton Drive between Clayton Street and North 5th Street within the city limits of North Las Vegas. Surrounded by private lands to the south, east, and west, Eglington Preserve is protected through the *Conservation Agreement for the Management of Special Resources on Bureau of Land Management Parcels Nominated for Disposal by the City of North Las Vegas* (Conservation Agreement) (BLM 2005), which obligates BLM, City of North Las Vegas, U.S. Fish and Wildlife Service (USFWS), and Nevada Division of Forestry (NDF). In addition to fossil and special-status plant resources, Eglington Preserve contains the active portion of the ULVW, which terminates into the North Las Vegas detention basin.

While the CTA study area contains ample reserves of potentially salable sand and gravel, under the Clark County Act all lands within the LVVDB have been withdrawn from mineral entry. In addition, no valid existing claims have been identified within the CTA study area boundary.

1.3 PURPOSE AND NEED

BLM's Proposed Action is to establish a final CTA boundary that is compatible with protecting natural, cultural, and biological resources and to facilitate orderly growth within the LVV that is consistent with the LVVDB ROD. The Proposed Action is intended to implement the Las Vegas RMP (BLM 1998a) decisions and management directions, as well as to preserve the intent of the SNPLMA and Clark County Act.

1.3.1 Need

BLM proposes to determine a final boundary for the CTA that meets the scientific requirements to protect sensitive resources. The final boundary for the CTA was not determined in the LVVDB ROD. BLM's Proposed Action is needed to comply with the LVVDB ROD, which provides for an adaptable final CTA boundary based on sound science.

Record of Decision and Adaptable Boundary

The ROD requires further study, collaboration, and analysis of the environmental effects of public land disposal within the CTA study area. Specifically, the ROD states,

> [A]pproximately 5,000 acres will be subject to a process of more study, collaboration, further NEPA analysis, as needed, and approval of a conservation agreement, if signed, prior to any transfer of title. Lands would be nominated under SNPLMA; however, any lands in the CTA would be disposed based on restrictions or mitigation measures determined necessary through the conservation agreement

[1] The NRHP lists the site as 980 acres. There has been no change to the boundary; rather, modern technology has allowed the acreage to be calculated with greater accuracy.

process. It is intended that the boundary of the CTA be adaptable to the needs and concerns of interested parties that participate in the development of the conservation agreement, including community land use planning.

1.3.2 Purpose

The purposes of BLM's proposed CTA action are to

- Protect the natural functioning of the ULVW; and
- Protect sensitive botanical, cultural, and paleontological resources in the CTA.

Natural Functioning of Las Vegas Wash

The ultimate boundary of the CTA is critically important to local municipalities that must manage for the growth of their communities. However, because the ULVW is an incised valley floor, it intercepts runoff from adjacent lands that can alter its natural hydrology and water quality. As a result, the ULVW and the resources it contains are subject to impacts caused by land uses both inside and outside its immediate ordinary high-water mark (OHWM). Establishing the CTA boundary is intended to preserve the ULVW's natural hydrologic functioning and water quality.

Botanical, Cultural, and Paleontological Resources

As part of the LVVDB FEIS, field surveys were conducted to identify the presence of sensitive botanical, cultural, and paleontological resources on BLM lands within the disposal boundary area. The survey results indicated that special-status species (including Las Vegas bearpoppy, Merriam's bearpoppy, and Las Vegas buckwheat), cultural resources, and unique paleontological resources within the disposal boundary are predominantly located near the ULVW. BLM's CTA actions are intended to implement BLM's resource protection mandates, derived from the LVVDB FEIS Conservation Transfer Alternative, Las Vegas RMP policies, SNPLMA, Clark County Act, and related federal environmental laws.

Resource Protection Mandate

BLM's mandate to protect sensitive resources in the CTA derives from several sources:

- The LVVDB FEIS Conservation Transfer Alternative, which was the alternative selected in the ROD. Under this alternative, land disposal can occur only with protection of sensitive environmental resources and mitigation of significant impacts to those resources.
- The Las Vegas RMP, which sets forth numerous policies to protect natural, cultural, and paleontological resources. The Las Vegas RMP requires BLM to protect habitat of Las Vegas bearpoppy (SS-2); protect cultural and paleontological resources in conformance with applicable legislation (CR-1); and limit future impacts to the visual and aesthetic character of public lands in the planning area (VS-1).
- The SNPLMA, which requires BLM to comply with other laws, including, but not limited to, the Federal Land Policy and Management Act of 1976 (FLPMA), as amended [PL 94-579, 43 USC 1701]; Endangered Species Act of 1973 (ESA), as amended [16 USC 1531–1543]; and National Historic Preservation Act of 1966 (NHPA), as amended [PL 89-665, 16 USC 470 *et seq.*], before any disposal action is approved.

1.3.3 Decision to Be Made

In accordance with the LVVDB ROD, the BLM will make a decision regarding the final boundary of the CTA. Additionally, recommendations regarding best management practices (BMPs) (Appendix A) and mitigations are provided to guide future management within the final CTA boundary.

Selection of the final CTA boundary is the first step in a process for protection of sensitive resources in the CTA. Stakeholders have had a key role in determining the alternative boundaries for analysis and in defining goals and objectives for the CTA (Appendix B). Stakeholders have also provided input on a variety of planning and management actions that go beyond defining a final CTA boundary. BLM is not making a decision on those planning and management actions through this SEIS. However, the information provided by stakeholders is still necessary to support future BLM decisions on specific management of the area. The public input will be used to develop a Conservation Strategy Agreement and associated planning documents, in particular revisions to the *Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement* (Las Vegas RMP) (BLM 1998a) that were initiated in October 2009. In the RMP revision, the BLM can examine resource allocation for rights-of–way (ROWs), trails, other infrastructure, and protection.

1.4 PRELIMINARY ISSUES, CONCERNS, AND OPPORTUNITIES

The following presents a list of public issues, agency management concerns, and opportunities that were identified prior to and during the public scoping process for this SEIS. Scoping meetings were held from August 14 through 16, 2007, at three different locations near the CTA. A comprehensive discussion of public involvement and the interagency consultation process for this SEIS is presented in Chapter 5, “Consultation and Coordination.”

1.4.1 Public Issues

This section summarizes the public issues that were identified through the public scoping process. For a detailed description of all the comments made during the public scoping process, please refer to the *Upper Las Vegas Wash Conservation Transfer Area Supplemental Environmental Impact Statement Scoping Report* (SWCA Environmental Consultants [SWCA] 2007). The issues identified during scoping largely focused on the NEPA process; the purpose of and need for the project; the proposed range of alternatives; specific natural and cultural resources within the CTA study area; and cumulative impacts. Some of the issues brought up during public scoping include the following:

- Protection of paleontological resources in the CTA study area;
- Providing open space and recreational trail connections through the CTA study area;
- Protection of endangered and rare plants, specifically, Las Vegas bearpoppy, Merriam’s bearpoppy, and Las Vegas buckwheat;
- Relationship between future development and infrastructure and the final CTA boundary; and
- Relationship between flood control associated with future development and infrastructure in the CTA study area and protection of the natural functioning of the wash.

1.4.2 Agency Management Concerns

The LVVDB FEIS analyzed all BLM-managed lands within the LVV for the resources described in Table 1.4-1. Agency management concerns that were sufficiently analyzed in the LVVDB FEIS and will not be further analyzed in this SEIS include air quality, minerals, wildlife, migratory birds, desert tortoise, environmental justice, public health and safety, water demand, and groundwater resources.

Table 1.4-1. Supplemental Analysis Required

Resource	Supplemental Analysis Required		Rationale
	Yes	No	
Air Quality		×	Adequate analysis was completed in the LVVDB FEIS.
Geology and Soil	×		The results of the USU Report are needed to provide necessary scientific information to contribute to the analysis and decision on the final CTA boundary.
Mineral Resources		×	Adequate analysis was completed in the LVVDB FEIS.
Surface Water/Hydrology	×		The results of a site-specific hydrology model are required to contribute to a decision on the final CTA boundary.
Groundwater Resources and Water Demand		×	Adequate analysis was completed in the LVVDB FEIS.
Vegetation	×		The results of the USU study are needed to provide necessary scientific information to contribute to the analysis and decision on the final CTA boundary.
Special-Status Plant Species	×		The results of the USU study are needed to consider the effects of different alternative CTA boundaries on populations and habitat of special-status plants, including Las Vegas bearpoppy, Merriam's bearpoppy, and Las Vegas buckwheat.
Wildlife		×	Adequate analysis was completed in the LVVDB FEIS.
Migratory Birds		×	Adequate analysis was completed in the LVVDB FEIS.
Threatened and Endangered Species, Desert Tortoise		×	Adequate analysis was completed in the LVVDB FEIS.
Cultural Resources	×		Additional studies of the cultural resources in the area are necessary in order to contribute to a decision on the final CTA boundary.
Native American Religious Concerns	×		Additional tribal coordination related specifically to the ULVW is necessary to complete adequate analysis before making a decision on the final CTA boundary.
Paleontology	×		The Las Vegas Formation within the CTA study area is considered to be the most significant assemblage of late Pleistocene invertebrate and vertebrate fossil remains known from the Mojave Desert and from the entire Great Basin. The results of the USU Report are needed to provide necessary scientific information to contribute to the analysis and decision on the final CTA boundary.
Visual Resources	×		Site-specific evaluation of the visual resources in the CTA study area is necessary to consider how each alternative CTA boundary would affect viewsheds within the CTA.
Land Uses	×		Site-specific analysis of how each alternative CTA boundary would affect future land uses in the CTA study area is necessary.
Recreation	×		Local communities have expressed a desire for open space and passive recreation access within the CTA study area. Site-specific consideration of existing recreation resources within and adjacent to the CTA study area is necessary.
Transportation	×		No analysis of transportation issues was completed in the LVVDB FEIS.

Table 1.4-1. Supplemental Analysis Required (Continued)

Resource	Supplemental Analysis Required		Rationale
	Yes	No	
Noise	×		No analysis of noise impacts was completed in the LVVDB FEIS.
Wastes, Hazardous or Solid	×		Site-specific analysis of hazardous and solid wastes within the CTA study area is necessary before determining the final CTA boundary.
Socioeconomics	×		Site-specific analysis of socioeconomic issues is necessary to contribute to a decision on the final CTA boundary.
Environmental Justice		×	Adequate analysis was completed in the LVVDB FEIS.
Public Health and Safety		×	Adequate analysis was completed in the LVVDB FEIS.

1.4.3 Opportunities

Certain issues raised by the public and agencies prior to and during the scoping process for this SEIS also present management opportunities that would assist BLM in defining alternative boundaries for the CTA. These opportunities include

- Increased scientific study and inventory of sensitive resources and other resources of interest in and around the CTA;
- Planning for recreational amenities in and around the CTA to serve a large nearby urban population (for example, Floyd Lamb Park and Recreation and Public Purposes Act [R&PP Act] leased lands); and
- Master plans from the cities that represent their vision for lands within the CTA study area.

1.5 RELEVANT STATUTES, REGULATIONS, AND GUIDELINES

The following subsections provide a brief description of the laws, regulations, executive orders (EOs), and other guidance that may apply to the establishment of the CTA.

1.5.1 Environmental Policy

NEPA establishes national environmental policy, provides an interdisciplinary framework for federal agency environmental assessment, and contains action-forcing procedures to ensure that federal agency decision-makers take environmental factors into account. NEPA requires preparation of an Environmental Impact Statement (EIS) for major federal actions that significantly affect environmental quality. The EIS discloses to decision-makers and the public the impacts of the Proposed Action and the alternatives to the Proposed Action.

The Executive Order on Protection and Enhancement of Environmental Quality [EO 11514, as amended by EO 11991] establishes the policy for federal agencies to provide leadership in environmental protection and enhancement, in particular implementing NEPA under the guidance of the CEQ.

1.5.2 Land Use and Natural Resources Management

Congress enacted the Southern Nevada Public Land Management Act of 1998, as amended [PL 105-263] to assist BLM management of lands in the rapidly urbanizing Las Vegas region. Specifically, the SNPLMA was intended to resolve issues related to numerous BLM landholdings interspersed among private properties in the Las Vegas metropolitan area, which were thus difficult for BLM to manage, and to allow BLM to dispose of lands for development consistent with community land use plans. The SNPLMA authorizes the BLM to dispose of approximately 52,000 acres of public land located within a specific boundary in the LVV.

Title IV of the Clark County Act [PL 107-282] amended the SNPLMA to increase the disposal boundary area and to include local and regional government entities in the process for receiving funds for the development of parks, trails, and natural areas in Clark County. The changes to the disposal boundary area increased the amount of land available for disposal by approximately 22,000 acres, including the lands in the CTA study area. Subject to valid existing rights, all land designated for disposal was withdrawn from entry and appropriation under the public land laws, location and entry under the mining laws, and operation under the mineral leasing and geothermal leasing laws.

The declaration policy for FLPMA, as amended [43 USC 1701 *et seq*.], requires the BLM to manage public lands to protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values that, where appropriate, will preserve and protect certain public lands in their natural condition, provide food and habitat for fish and wildlife and domestic animals, and provide for outdoor recreation and human occupancy and use.

1.5.3 Biological Resources

BLM Manual 6840, *Special Status Species Management* (BLM 2008), requires that actions authorized by the BLM further the conservation of federally listed and other special-status species and that the actions do not contribute to the listing of any special-status species.

1.5.4 Water Quality

The Clean Water Act (CWA) of 1972, as amended [33 USC 1251 *et seq*.], establishes a process for states to set water quality standards and develop plans for their achievement. National Pollutant Discharge Elimination System (NPDES) permits set limits on point source discharges to meet state water quality standards. Section 404 of the CWA regulates discharge of dredged or fill materials into waters of the United States (WUS) and adjacent wetlands.

Nevada Water Quality Regulations implement permitting and monitoring requirements for NPDES permits, operation of injection wells, groundwater protection requirements, prevention and response requirements for spills, and salinity standards and criteria for the Colorado River Basin.

The Executive Order on Floodplain Management [EO 11988] requires federal agencies to evaluate the potential effects of actions on floodplains and to consider alternatives to avoid adverse effects and incompatible development wherever possible.

1.5.5 Cultural Resources

The National Historic Preservation Act of 1966, as amended [16 USC 470 *et seq*.], requires federal agencies to determine the effects of their actions on cultural resources and to take certain steps to ensure these resources are located, identified, evaluated, and protected. Section 106 of the Act requires federal agencies to identify historic or archaeological properties near proposed project sites, including properties listed or eligible for listing in the NRHP. If the Proposed Action has an adverse effect on listed or eligible properties, the agency must consult with the State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation to develop alternatives or mitigation measures. This legislation protects Tule Springs, an archaeological site that has produced substantial important data relevant to the environmental history of the Great Basin.

The Archaeological Resources Protection Act of 1979, as amended [16 USC 470aa–mm], provides for protection of archaeological resources on federal lands. The Act requires permits for the excavation or removal of federally administered archaeological resources and encourages cooperation between federal agencies and private individuals in identifying and protecting important resources. In addition, the Act invokes penalties for excavating, removing, damaging, or defacing any archaeological resources that are more than 100 years old on public or Indian lands.

The American Antiquities Act of 1906 [16 USC 431–433] seeks to protect historic and prehistoric ruins, monuments, and objects of antiquity and scientific interest on lands owned or controlled by the federal government by imposing misdemeanor-level criminal penalties.

The American Indian Religious Freedom Act of 1978, as amended [42 USC 1996], protects and preserves the inherent right of Native Americans to believe, express, and exercise their traditional religions, including their unhindered access to religious sites.

The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) [25 USC 3001 *et seq*.] establishes the right of Indian tribes to claim ownership of certain cultural items, including human remains and funerary, sacred, and cultural patrimony objects and artifacts.

The Executive Order on Protection and Enhancement of the Cultural Environment [EO 11593] directs federal agencies to locate, inventory, nominate, and protect federally owned cultural resources eligible for the NRHP and to ensure that their plans and programs contribute to preservation and enhancement of non–federally owned resources.

The Executive Order on Indian Sacred Sites [EO 13007] directs federal agencies to accommodate access to and ceremonial use of Indian sacred sites and avoid adversely affecting the physical integrity of sacred sites.

The Executive Order on Consultation and Coordination with Indian Tribal Governments [EO 13175] directs federal agencies to establish regular and meaningful consultation and collaboration with tribal officials on federal actions that have tribal implications.

1.5.6 Hazardous Materials

The American Society for Testing and Materials (ASTM) Standard E 1527-05 and Section 120(h) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [42 USC 9601 *et seq*.] provide guidelines for conducting investigations and providing notice regarding the presence of hazardous substances on federal lands prior to the sale or transfer of such federal lands.

1.6 RELATIONSHIP TO BUREAU OF LAND MANAGEMENT POLICIES, PLANS, AND PROGRAMS

The Proposed Action in this SEIS is consistent with decisions in the LVVDB FEIS and the Conservation Transfer Alternative, which was identified as the Preferred Alternative in the ROD (BLM 2004b). In addition, the Proposed Action is in conformance with management objectives and directions of the Las Vegas RMP (BLM 1998a), SNPLMA, and the Clark County Act for land disposal, ROW management, and recreation management. Public lands within the disposal boundary area are available for disposal or authorized use through sale, exchange, R&PP Act lease, or permit in accordance with the FLPMA, as specified in the Las Vegas RMP under management objective Land Disposal-1 (LD). The Proposed Action will also conform to management direction LD-2-a: "Land use lease or permit applications, and airport lease applications will be addressed on a case-by-case basis, where consistent with other resource management objectives and local land uses. Special terms and conditions regarding use of the public lands involved will be developed as applicable" (BLM 1998a).

The Proposed Action will be consistent with the following Las Vegas RMP requirements. As specified in SS-2, BLM will manage habitat to sustain populations of federally listed species so that they no longer need protection under the ESA and will manage habitats to support non-listed species so that future listing is not necessary. As specified in SS-2-a, BLM will protect the habitat of Las Vegas bearpoppy. BLM will protect cultural and paleontological resources consistent with applicable legislation and policy as specified in objective CR-1.

BLM policy and the *Clark County Multiple Species Habitat Conservation Plan* (MSHCP) (Clark County Department of Comprehensive Planning [CCDCP] and USFWS 2000) require that BLM ensure no unmitigated net loss of Las Vegas bearpoppy habitat. BLM cannot undertake actions that will lead to the listing of a species under the ESA. In addition, the *Biological and Conference Opinions for Reinitiation of Consultation on the Las Vegas Valley Programmatic Biological Opinion (File No. 1-5-96-F-023R, as amended) and Previously Reinitiated (File No. 1-5-96-F-023R.2), to Expand the Disposal Boundary (File No. 1-5-96-F-023R3)* (Biological Opinion) (USFWS 2004) states that BLM must ensure that Las Vegas buckwheat within the LVV is managed in order to preclude protection under the ESA. The final CTA boundary will be consistent with these requirements by ensuring sustainable Las Vegas bearpoppy and buckwheat populations and habitat.

1.7 RELATIONSHIP TO NON-BLM POLICIES, PLANS, AND PROGRAMS

The proposed actions in this SEIS will be consistent with other officially approved federal, state, and local plans, policies, and programs to the extent that they are consistent with the goals and objectives of the SEIS and with applicable federal regulations, policies, and laws. The following documents as they relate to the CTA have been reviewed and considered as the SEIS has been developed.

- USFWS. 2008. *Draft Comprehensive Conservation Plan: Desert National Wildlife Refuge Complex*. USFWS Southern Nevada Field Office.
- City of Las Vegas. 2007. *Floyd Lamb Park Master Plan*.
- CCDCP and USFWS. 2000. *Clark County Multiple Species Habitat Conservation Plan*.
- Nevada Senate Bill 40. 1983. Nevada Statewide Policy Plan for Public Lands.

- Clark County Regional Flood Control District (CCRFCD). 2004. *Clark County Regional Flood Control District 2002 Master Plan Update*.
- City of Las Vegas. 2006. *City of Las Vegas Master Plan 2020*.
- City of North Las Vegas. 2006. *City of North Las Vegas Comprehensive Master Plan*.
- Clark County. 2001. *Clark County Comprehensive Master Plan*.

Chapter 2

ALTERNATIVES

2.1 INTRODUCTION

NEPA requires that an EIS consider a reasonable range of alternatives to the Proposed Action, including a No-Action Alternative. Reasonable alternatives are those that meet the purpose and need and are feasible to implement, given technical, economic, environmental, and other factors. NEPA also requires that the No-Action Alternative be evaluated to provide a baseline for comparison of the impacts of other alternatives, even if a No-Action Alternative may not be implemented as a result of legal, regulatory, or other considerations, including a legislative command to act.

NEPA requires that an EIS rigorously explore and objectively evaluate all reasonable alternatives. This comparative analysis of alternatives gives decision-makers and the public information that sharply defines the issues and provides a clear basis for choosing an alternative [40 CFR 1502.14].

This chapter contains descriptions of each of the alternatives for the CTA that are evaluated in this SEIS, as well as the process used to develop the alternatives. This chapter also contains summaries of the alternatives that were initially considered but subsequently eliminated from detailed analysis.

2.2 DEVELOPMENT OF ALTERNATIVES

The BLM Las Vegas Field Office hosted 10 public meetings during a 10-month period in 2005 to give the public opportunities to provide input for the CTA identified in the LVVDB FEIS (BLM 2004a). During those meetings, BLM received input on a variety of topics, including vision statements, goals and objectives, boundaries, infrastructure, recreation, education, and management options. Boundary recommendations for the CTA ranged from approximately 3,300 to almost 13,000 acres.

Potential alternatives, based on professional judgment of the investigators, were obtained from the USU Report (USU 2007a). Information from the USU Report and from other studies and documents was gathered to determine what components of the alternatives would be considered.

Based on the SNPLMA (as amended), LVVDB FEIS, USU Report, public input, and local BLM staff resource expertise, preliminary alternatives were developed for presentation at public scoping meetings held in Las Vegas on August 14 through 16, 2007. Comments received during those meetings and during the public scoping comment period (July 6, 2007–September 4, 2007) for the CTA SEIS were considered in formulating the alternatives presented in this SEIS. In addition, the resource knowledge of local BLM staff aided in further refining the alternatives.

2.2.1 Factors Considered in Developing the Alternatives

Reasonable alternatives must meet the purposes for action described in Chapter 1, which are to

- Protect the natural functioning of the ULVW; and
- Protect sensitive natural, cultural, and paleontological resources in the CTA.

Reasonable alternatives must also meet the needs for the project, which are to

- Comply with the LVVDB FEIS ROD, which provides for an adaptable final CTA boundary; and
- Respond to BLM's mandate to protect sensitive natural, cultural, and paleontological resources.

The following sections describe resource values and uses present in the CTA that may be affected by disposal and development as authorized by the SNPLMA and Clark County Act. These resource values and uses guided development of the alternatives described in Sections 2.3 through 2.5 below.

For detailed information on the resource values and current uses of the CTA, see Chapter 3, "Affected Environment." For a more thorough discussion of the nature of the issues, concerns, and opportunities identified for resolution through the SEIS process, see Chapter 1, "Purpose and Need."

Hydrology

BACKGROUND

The ULVW is the headwaters for the LVW, which serves as the main drainage channel for the LVV and its tributaries. The ULVW, located within the CTA boundary, drains approximately 500 square miles and conveys stormwater runoff from the mountains and alluvial fans generally north and northwest of the city of North Las Vegas, ultimately flowing into Lake Mead. The ULVW is a normally dry, very wide, sand-bed channel that is highly susceptible to erosion, headcutting, braiding, and lateral migration resulting from infrequent but intense cloudburst rainfall events, steep topography, and increased urbanization. The ULVW supports a variety of vegetation and provides access to outdoor activities. It has also been identified as important to Native American traditional uses. Erosional processes in the wash have exposed cultural and paleontological resources.

Land development in the watershed of the ULVW can alter the land surface and result in runoff and higher peak flows that affect the natural functioning of the wash. Urban runoff and higher sediment loads can result in higher levels of contaminants both in the watershed and downstream. Sensitive resource values associated with the ULVW can be affected, including riparian and other plant species such as catclaw acacia and mesquite, cultural resource sites, and fossil sites. Maintenance of adjacent open space, however, can help reduce these potential effects.

FACTOR

Consider how each alternative CTA boundary would affect the hydrologic functioning of the wash, the resource values found in proximity to the wash, and management of stormwater runoff.

Floyd Lamb Park at Tule Springs

BACKGROUND

Floyd Lamb Park, immediately southwest of the CTA, encompasses a total of 2,040 acres. The 680-acre park core (formerly known as Floyd Lamb State Park) is centered on Tule Springs, a series of small springs that historically formed an oasis in the middle of the Mojave Desert. The buildings of Tule Springs Ranch are listed in the NRHP, and the site is used by Las Vegas residents as an urban retreat. The remainder of the park includes 1,361 acres of lands leased from BLM under the R&PP Act. The park contains some of the best Pleistocene-era paleontological resources in western North America (San Bernardino County Museum [SBCM] 2004). In July 2007, the park, R&PP Act leases, and water rights were transferred from the Nevada Division of State Parks to the City of Las Vegas.

Proposed development of permanent recreation facilities (e.g., city park, trailheads, parking areas) within Floyd Lamb Park can result in the loss of the cultural and paleontological resources. While development can be mitigated by collecting physical remains and information from sites, surface disturbance can result in the permanent loss of the resources and their context with other elements of the site and surrounding environment. Active management of the park can provide protection of the cultural and paleontological resources present within the park.

FACTOR

Consider how each alternative CTA boundary would affect recreational opportunities, cultural resources, and paleontological resources at Floyd Lamb Park.

Paleontological Resources

BACKGROUND

The Pleistocene-age Las Vegas Formation (LVF) within the CTA is known to be highly fossiliferous and is considered to be the most significant assemblage of late Pleistocene invertebrate and vertebrate fossil remains known from the Mojave Desert and from the entire Great Basin (SBCM 2004). More than 430 fossil localities have been recorded within the CTA by paleontologists from the SBCM, and thousands of fossils have been excavated, prepared, curated, and interpreted. This work has contributed to a more complete, detailed understanding of the stratigraphy and paleoecology of the LVF. LVF fossils include a diverse assemblage of terrestrial and aquatic mollusks, amphibians, numerous species of birds, and small and large mammals. Representative fossils include ground sloth (*Nothrotheriops shastensis*), North American lion (*Panthera atrox*), camel (*Camelops* sp.), horse (*Equus* sp.), bison (*Bison* sp.), and mammoth (*Mammuthus columbi*). Many of these resources are found in Tule Springs, a 1,125-acre designated archeological site that has produced substantial important data relevant to the paleoenvironmental history of the Great Basin.

FACTOR

Consider how each alternative CTA boundary would affect paleontological resources in the CTA.

Eglington Preserve

BACKGROUND

Eglington Preserve is a 300-acre parcel of public land that is managed to protect two special-status plants—Las Vegas bearpoppy and Las Vegas buckwheat. Eglington Preserve is located south of Grand Teton Drive between Clayton Street and North 5th Street, within the city limits of North Las Vegas. Bordered by private lands to the west, south, and east, Eglington Preserve is protected through a Conservation Agreement between the BLM, USFWS, NDF, and City of North Las Vegas. The Conservation Agreement identifies allowable uses within and surrounding Eglington Preserve. In addition to special-status plants, Eglington Preserve contains fossils and the active portion of the ULVW, which terminates into the North Las Vegas detention basin.

Eglington Preserve is the site of a newly approved, fee-based compensatory mitigation bank, under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act regulatory programs. Under the restoration plan, titled *Protection, Restoration, and Enhancement Plan for the Project Area within Eglington Preserve* (BLM 2007b), as approved by the U.S. Army Corps of Engineers (USACE), 143

acres of ephemeral washes were identified for improvement and protection through Section 404 of the CWA permit fees.

Land development can result in fragmentation of habitat or disturbance and mortality of plants. Mitigation such as collection, transplanting, and/or seed bank salvage can reduce these impacts. Cooperative management of areas like Eglington Preserve can preserve viable populations of special-status plants, maintain the range of the species, protect sources of seed for expansion of the species to other areas of their range, and protect the functioning of wash systems.

FACTOR

Consider how each alternative CTA boundary and management of Eglington Preserve as part of the CTA would affect populations of Las Vegas bearpoppy and Las Vegas buckwheat, as well as the functioning of the wash system.

Special-Status Species

BACKGROUND

Special-status plants and wildlife are known to occur in the CTA, including one BLM sensitive plant species (Merriam's bearpoppy), one State of Nevada protected plant species (Las Vegas bearpoppy), and one candidate for federal listing and proposed for State of Nevada protection (Las Vegas buckwheat). The rare plant species are local endemics that are limited to specialized habitats in the northern Mojave Desert ecosystem. The LVV contains a substantial proportion of extant populations of Las Vegas bearpoppy and Las Vegas buckwheat, and it contains potentially genetically unique populations of all three special-status plant species.

Conversion and fragmentation of habitat resulting from land development in the LVV has led to rapid declines in the number and distribution of special-status species. USFWS and NDF have stated that further loss of individuals and populations would be detrimental to the long-term viability of Las Vegas bearpoppy and Las Vegas buckwheat and would potentially lead to emergency listing under the ESA (BLM 2004a). Preservation of occupied and suitable habitats within the CTA can serve to eliminate or minimize impacts to these plants and avoid their being listed by the USFWS (USFWS 2004), as well as protecting suitable habitat for other special-status species.

FACTOR

Consider how each alternative CTA boundary would affect populations and habitat of special-status plants, including Las Vegas bearpoppy, Merriam's bearpoppy, and Las Vegas buckwheat.

Recreation

BACKGROUND

Recreation opportunities in the CTA are casual and dispersed and include hiking, camping, picnicking, mountain biking, horseback riding, climbing, sightseeing, and off-highway vehicle (OHV) use. There are no developed recreation sites on public lands in the CTA. The Las Vegas RMP (BLM 1998a) limited OHV use in the CTA to existing roads, trails, and dry washes. In November 1998, BLM issued a valley-wide closure to off-highway travel, as the LVV did not meet air quality standards under the Clean Air Act (CAA). Thus, the Las Vegas RMP places recreation emphasis in the CTA on non-motorized forms of recreation.

The Floyd Lamb Park Core, adjacent to the CTA, is managed by the City of Las Vegas for picnicking, hiking, biking, horseback riding, and fishing. The park includes 1,361 acres of public land that overlaps the CTA under two R&PP Act leases. Portions of the Las Vegas Valley Trail System cross the CTA.

Local communities have expressed a desire for open space and passive recreation access (City of Las Vegas 2004). The City of Las Vegas is preparing an open space plan and has identified its two most critical concerns for open space: to preserve natural areas and viewsheds and to provide habitat for wildlife and plants. The community's desire for open space can be at least partly met in the CTA.

FACTOR

Consider how each alternative CTA boundary would affect recreation use of the CTA.

Visual Resources

BACKGROUND

The landscape of the CTA is characterized by the floodplain of the ULVW and the adjacent alluvium, deposited from the Spring Mountains to the west and the Sheep and Las Vegas ranges and Gass Peak to the north. Vegetation is typical of low elevations of the Mojave Desert and includes creosote bush shrub, desert saltbush shrub, and desert wash shrub vegetation communities. Whereas the landscape is largely unmodified by human development, roads, power lines, and flood control structures (wash channelization and retention basins) have altered parts of the CTA.

FACTOR

Consider how each alternative CTA boundary would affect viewsheds within the CTA and user experiences. Consider how visual resource management (VRM) objectives would complement and support the management objectives for other resources within the CTA.

Las Vegas and North Las Vegas Infrastructure and Growth

BACKGROUND

Lands west of Decatur Boulevard in the CTA are within the incorporated limits of the City of Las Vegas, and lands east of Decatur Boulevard in the CTA are within the incorporated limits of the City of North Las Vegas. As these cities continue to grow, their need for infrastructure continues to grow.

The cities have expressed concerns regarding how their needs for infrastructure and development will be met.

FACTOR

Consider how each alternative CTA boundary would affect the growth and economic prosperity of the Cities of Las Vegas and North Las Vegas.

Las Vegas Paiute Indian Reservation

BACKGROUND

The Paiute Reservation is adjacent to the CTA in the northwestern part of the disposal area. The Las Vegas Paiute Tribe has noted that the ULVW has been used for countless generations as a trade and

migration route as part of the larger Salt Song Trail system and is spiritually significant to the Tribe. The LVW represents an important traditional landscape and potential Traditional Cultural Property (TCP) for the Las Vegas Paiute Tribe and other tribal communities in the areas, including the Chemehuevi and Moapa Paiute.

The Las Vegas Paiute Tribe has requested a buffer on the north and east sides of their reservation from potential future urban development and that the reservation be provided protection from visual and social disturbances associated with adjacent residential areas and transportation networks. The Tribe has also expressed concern for protection of the economic benefits of its golf resort, which may be diminished by nearby development and the loss or obstruction of views of the native desert and the Spring Mountains.

FACTOR

Consider how each alternative CTA boundary would affect the Las Vegas Paiute Tribe and its reservation as well as tribal cultural resources within the CTA.

Recreation and Public Purposes Act Leased Lands and Rights-of-Way

BACKGROUND

The R&PP Act authorizes the sale and lease of public lands for recreational or public purposes to state and local governments, federal and state instrumentalities, and nonprofit organizations. Currently, three authorized leases, a pending lease, and a pending ROW overlap the CTA. Two of the authorized leases are to the City of Las Vegas for the development of recreation facilities. Lease N-62830 comprises 320 acres, and lease N-36876-01 encompasses 1,041 acres. Preliminary plans for these R&PP Act leases are addressed in *Floyd Lamb Park Master Plan* (City of Las Vegas 2007a) and include conceptual trails for hiking and equestrian use and other forms of passive recreation. These leased lands connect the northwestern and southeastern portions of the ULVW in the CTA and maintain continuity for ecological and recreational functions.

The City of North Las Vegas's McCool Regional Park, lease N-49747-01, comprises 160 acres of public lands within the CTA. A portion of the park includes 40 acres of Tule Springs. The park includes sports fields, picnic areas, trails, a model airplane flying area, and a xeriscape demonstration garden. The leased lands connect existing residential areas south of the CTA to Tule Springs within the CTA.

The two pending actions for a ROW and an R&PP Act lease within the CTA are proposed for a water detention basin and additional regional park developments. Pending ROW N-37233 comprises 640 acres west of the Clark County Shooting Park and includes plans for development of a water detention basin of up to 1,773 acre-feet. Pending lease N-78462-01 requests 80 acres west of Decatur Boulevard for a detention basin and development of park-related facilities, such as picnic shelters, restrooms, parking, and recreational trails.

FACTOR

Consider how each alternative CTA boundary would affect management of lands under R&PP Act leases and ROWs within the CTA, both currently authorized and pending.

Clark County Shooting Park

BACKGROUND

A shooting park was created by the Conveyance of Property to Clark County, Nevada Act of 2002 [(PL 107-350) 116 Statute 2975 *et seq*.], in response to the closure of recreational shooting in the LVV. The shooting park comprises approximately 2,800 acres north of Moccasin Road, adjacent to both the DNWR and CTA. A portion of the ULVW crosses the southwestern portion of the shooting park. Clark County has prepared a master plan for the shooting park that describes the type and location of the various facilities to be developed on 900 acres of the 2,800-acre conveyance. Construction of the public facilities began in May 2008. The shooting park will offer a safe place for citizens to participate in recreational shooting in a controlled environment. The first phase of development for the shooting park will include a day use range, hunter education area, trap and skeet field, archery range, and other support facilities. Clark County intends to focus intensive shooting park infrastructure development outside the ULVW.

The presence of the shooting park can affect the types of uses that would be allowed on lands adjacent to the park and the suitability of adjacent lands for disposal and future development.

FACTOR

Consider how each alternative CTA boundary would affect operation of the shooting range.

Desert National Wildlife Refuge

BACKGROUND

The DNWR encompasses 1.5 million acres north of the CTA and is managed by the USFWS. About one-half of the refuge is jointly managed with the U.S. Air Force as part of the Nevada Test and Training Range. The USFWS is in the process of preparing a Comprehensive Conservation Plan (CCP) and EIS for the entire Desert National Wildlife Refuge Complex (DNWR is one of four refuges in the complex) in compliance with the National Wildlife Refuge System Improvement Act of 1997 and NEPA. As part of the CCP/EIS effort, the USFWS is evaluating several alternatives for management of the DNWR. These alternatives consist of various objectives and strategies that are derived from the refuge's primary goals. Refuge goals address managing bighorn sheep populations, maintaining natural diversity, managing specially designated areas, improving visitor services, and managing cultural resources.

A key aspect of managing the DNWR is ensuring compatibility with surrounding land uses. Encroaching development from the Cities of Las Vegas and North Las Vegas creates potential conflicts with the resource values of the refuge and increases the potential for illegal activities, such as OHV use and vandalism.

FACTOR

Consider how each alternative CTA boundary would affect the ecological, wildlife, recreation, and cultural resource management objectives of the DNWR. Consider how management of the refuge would affect land uses in the adjacent CTA.

Southern Nevada Public Lands Management Act of 1998 and Clark County Conservation of Public Land and Natural Resources Act of 2002

BACKGROUND

Congress enacted the SNPLMA to address concerns over federal management of lands in the rapidly urbanizing Las Vegas metropolitan area. The purpose of the SNPLMA is to provide for the disposal of certain federal lands in Clark County, Nevada, and to provide for the acquisition of environmentally sensitive lands in the state of Nevada. The law authorized BLM to dispose of approximately 52,000 acres of public lands located within the disposal area of the LVV in accordance with other applicable laws. Title IV of the Clark County Act amended the SNPLMA to increase the disposal boundary area and to include regional governmental entities in the process for receiving funds for the development of parks, trails, and natural areas in Clark County. The Clark County Act increased the lands available for disposal by about 22,000 acres, including lands in the CTA.

Typically, local governments nominate parcels of federal land for disposal from within the disposal boundary. Generally, nominations are made in response to interest from potential buyers. Once an interest is expressed, the local government follows a joint selection process to ensure that the parcel is not needed for a public purpose. Nominations are then submitted to BLM one year in advance of the proposed sale date. BLM reviews each nominated parcel to verify ownership, existing rights, and pending applications or reservations and prepares an Environmental Site Assessment for each parcel before moving forward with the sale.

FACTOR

Consider how each alternative CTA boundary would meet the Congressional policies and the intent of the SNPLMA and Clark County Act.

2.2.2 Components of Each Alternative

Each alternative was developed to implement the requirements of the ROD for the LVVDB FEIS. This includes boundary definitions.

Boundary

The final boundary will be important for protection of sensitive resources, as well as for local governments that must plan for the growth of their communities. Although the ROD for the LVVDB FEIS identified approximately 5,000 acres of land to be withheld from disposal, it also stipulated that the boundaries were adaptable to the needs and concerns of interested parties participating in the development of the Conservation Agreement (BLM 2005). As the result of input during public meetings in 2005 and 2006 and its own internal analysis, BLM has expanded the CTA study area to 13,622 acres. Alternatives considered in this SEIS range in size from 1,448 to 12,952 acres. Each alternative described below is compared in size with the original CTA, defined as 5,000 acres, in the LVVDB FEIS and ROD (BLM 2004a).

Conservation Agreement

Based on the direction approved in the LVVDB FEIS ROD (BLM 2004b), BLM would dispose of lands within the CTA once all parties who are assuming management of the disposed lands sign a Conservation

Agreement. As noted above, this Conservation Agreement would stipulate mitigation measures and other restrictions to provide for long-term protection of sensitive resources within the disposed lands.

Specific conservation measures would be defined through a collaborative process involving BLM and members of the Mitigation Strategy Committee, which includes USFWS, NDF, Clark County Department of Air Quality and Environmental Management, Nevada Division of State Parks, and other federal, state, and regional agencies; the Las Vegas Paiute Indian Tribe; local governments; elected officials; environmental or other special interest organizations; and utility companies and other businesses (BLM 2004a).

2.3 ACTIONS COMMON TO ALL ACTION ALTERNATIVES

All the action alternatives include the following management actions:

- BLM has developed and would implement a treatment plan for eligible cultural sites within the CTA in compliance with the NHPA, except for Tule Springs, which is already protected.
- Conservation measures would be put in place for the protection of surface paleontological sites and sensitive plant habitats.
- BLM would inventory unauthorized surface disturbances in the CTA, including illegal dump sites, user-created trails and tracks, and other trespasses, and would seek to rehabilitate these disturbances to a more natural condition to improve management and protection of sensitive resources.
- Any future infrastructure would be authorized on a case-by-case basis, would incorporate BMPs identified by the BLM and the Nevada State Conservation Commission (1994), and would be subject to site-specific NEPA analysis.
- The authorized R&PP Act leases with the City of Las Vegas for Floyd Lamb Park (N-36876-01 and N-62830) would continue to be managed under a BLM-approved plan of development.

2.4 ALTERNATIVES CONSIDERED FOR DETAILED ANALYSIS

Six alternatives were considered in order to adequately analyze a range of boundaries while continuing to meet the purpose of and need for the CTA. These boundaries were identified through agency and public scoping.

Each of these alternatives considered the original CTA boundary of 5,000 acres and either added or subtracted acreage from that boundary to meet the objectives of the alternative as well as the overriding purpose of and need for the CTA (see Chapter 1, Section 1.3). The LVVDB EIS allowed for the final CTA boundary to be modified in size and shape from its original designation and stated that a separate NEPA analysis must be completed to determine the final CTA boundary. Table 2.4-1 provides a comparison of the original CTA boundary, as defined in the LVVDB EIS, with the SEIS alternatives outlined above, while Table 2.4-2 shows a detailed comparison of the alternatives with the 13,662.7-acre CTA study area.

Table 2.4-1. Comparison of Original CTA Boundary with SEIS Alternatives

Alternative	Alternative Boundary (acres)	Original CTA Boundary (acres)	Change in Acres between Original CTA and Alternative	% Change between Original CTA and Alternative
Alternative A	12,952.5	5,000.0	7,952.5	159% increase
Alternative B (Preferred Alternative)	11,007.6	5,000.0	6,007.6	120% increase
Alternative C	6,362.3	5,000.0	1,362.3	27% increase
Alternative D*	5,301.4	5,000.0	301.4	6% increase
Alternative E	3,313.8	5,000.0	−1,686.2	34% decrease
No-Action Alternative	1,448.2	5,000.0	−3,551.8	71% decrease

* Alternative D represents the original CTA boundary as subsequently adjusted to correct for acreage discrepancies in the LVVDB FEIS and reflect greater accuracy in acreage calculation.

Table 2.4-2. Comparison of SEIS Alternatives

Alternative	Alternative Boundary (acres)	Lands outside Alternative Boundary (acres)	Tule Springs (state lands)—outside Alternative Boundary (not available for disposal)	Eglington Preserve—outside Alternative Boundary (not available for disposal)	Lands Available for Disposal (acres)*
Alternative A	12,952.5	670.2	299.4	0.0	370.8
Alternative B (Preferred Alternative)	11,007.6	2,615.1	299.4	0.0	2,315.7
Alternative C	6,362.3	7,260.4	299.4	0.0	6,961.0
Alternative D	5,301.4	8,321.3	0.0	298.6	8,022.7
Alternative E	3,313.8	10,308.9	0.0	298.6	10,010.3
No-Action Alternative	1,448.2	12,174.5	24.5	0.0	12,150.0

* Lands available for disposal = (Total acres outside alternative boundary) – (Eglington Preserve and Tule Springs if outside the alternative boundary).

2.4.1 Alternative A

Alternative A (Figure 2.4-1) emphasizes preservation of the sensitive resources located within the CTA and ensures the natural functioning of the ULVW.

Alternative A is the alternative with the largest boundary and provides the greatest amount of protection for the functioning of the wash, habitat for special-status species, and paleontological resources. Alternative A provides the most protection to the DNWR and provides the Paiute Reservation with the most protection from encroachment. This alternative has the most connectivity to traditional and tribal resources within the wash.

Under Alternative A, the CTA would comprise 12,952.5 acres (see Figure 2.4-1); this alternative extends the boundary to the DNWR to the north and 1 mile north and east around the Paiute Reservation in order to maintain the natural character of the landscape and setting. The area designated as Eglington Preserve would be included in the CTA. Alternative A adds 7,952.5 acres to the original CTA boundary. Under this alternative, 370.8 acres within the CTA study area would remain available for private development purposes. Alternative A would include within the CTA 3,200 acres surrounding the Paiute Reservation that would not be available for private development.

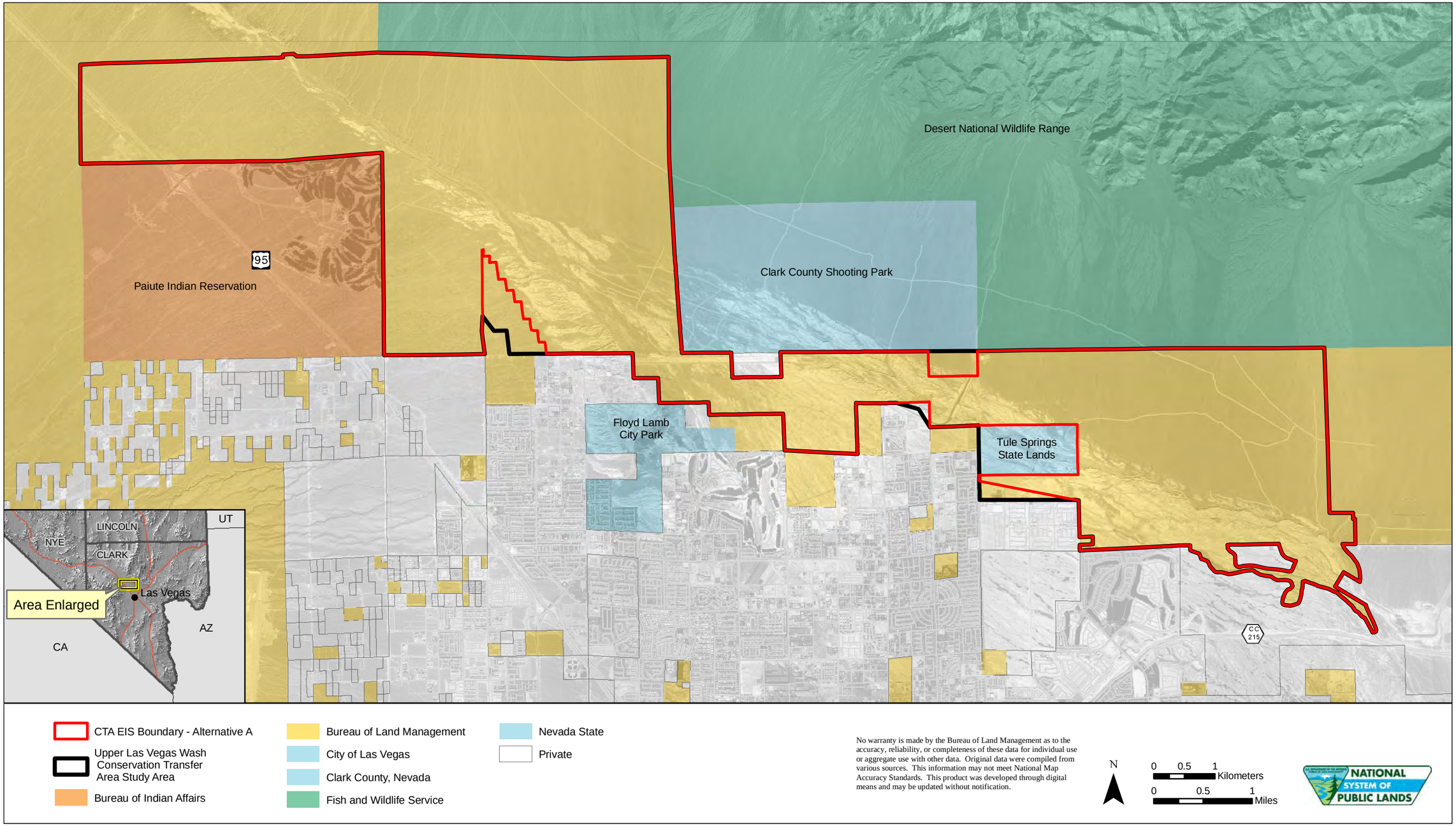

Figure 2.4-1. Conservation Transfer Area Alternative A boundary.

2.4.2 Alternative B (BLM Preferred Alternative)

Alternative B, which is the BLM Preferred Alternative (Figure 2.4-2), emphasizes the protection of the natural functioning of the ULVW and other sensitive resources while providing lands for disposal. Alternative B maintains existing stormwater volume, velocity, and depth, along with sediment load, flow location, and flow pattern of stormwater moving down the alluvial fans of the Sheep and Las Vegas ranges. Alternative B protects the LVF, ephemeral wash plant communities, and sensitive plant habitats. Alternative B includes lands to the north and east of the Paiute Reservation to protect traditional and tribal resources in the wash.

Alternative B would comprise 11,007.6 acres (see Figure 2.4-2). Alternative B encompasses most of the upper alluvial fans in the CTA study area and stretches north to the boundary of the DNWR. The eastern boundary would be offset 1,200 feet from the edge of the CTA study area, leaving approximately 373.1 acres available to the City of North Las Vegas for development. East of the Paiute Reservation, the southern boundary of Alternative B would be offset 700 feet from the LVF. Northwest of the Paiute Reservation, the northern boundary would start at the western edge of the golf course and run due north to the edge of the disposal boundary, leaving a total of 1,942.6 acres available to the City of Las Vegas for development. Within the CTA study area, a total of 2,315.7 acres would be available for disposal. The Alternative B boundary would protect the hydrologic functioning of the ULVW and allow waters flowing down the alluvial fans of the Sheep and Las Vegas ranges to continue in their current condition. Alternative B would protect Native American resources within the wash. Lands designated as Eglington Preserve would be included in Alternative B.

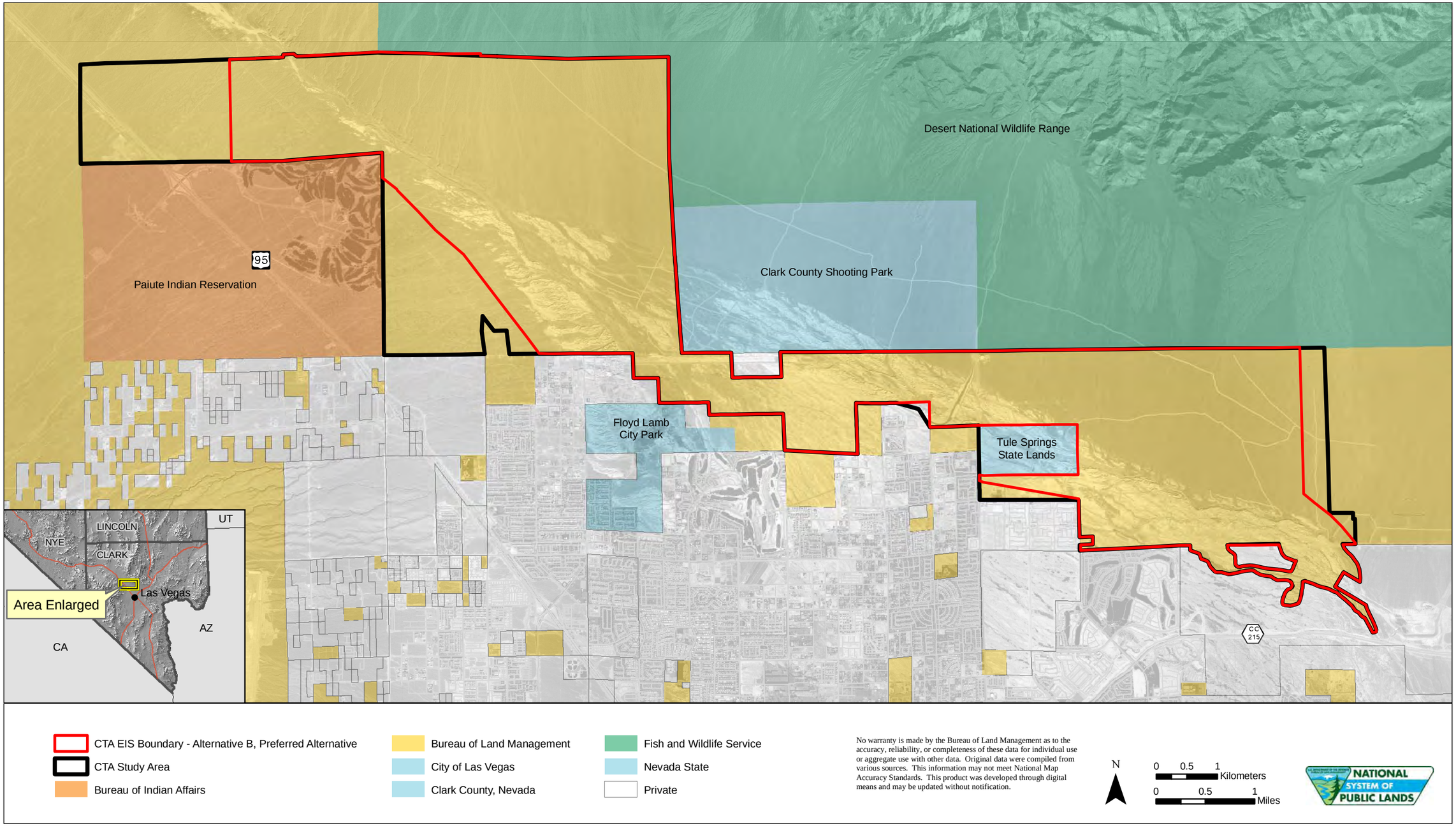

Figure 2.4-2. Conservation Transfer Area Alternative B, Preferred Alternative boundary.

2.4.3 Alternative C

Alternative C (Figure 2.4-3) continues to meet the resource conservation purposes for paleontological resources and special-status plants and incorporates the 100-year floodplain. Alternative C adds 1,362.3 acres to the original CTA boundary. Alternative C includes lands surrounding the northwest corner of the Paiute Reservation that would not be available for private development. Lands designated as Eglington Preserve would be included in the CTA.

Under Alternative C, the CTA would comprise 6,362.3 acres (see Figure 2.4-3); 6,961.0 acres within the CTA study area would remain available for disposal. Alternative C includes a portion of the upper alluvial fans in the CTA study area but does not extend to the boundary of the DNWR. The northeastern boundary would leave approximately 2,063 acres available to the City of North Las Vegas for development. East of the Paiute Reservation, the southern boundary of Alternative C, combined with the area north of the wash, would leave a total of 4,898 acres available to the City of Las Vegas for development. Within the CTA study area, a total of 6,961 acres would be available for disposal. The Alternative C boundary does not allow waters flowing down the alluvial fans of the Sheep and Las Vegas ranges to continue in their current condition.

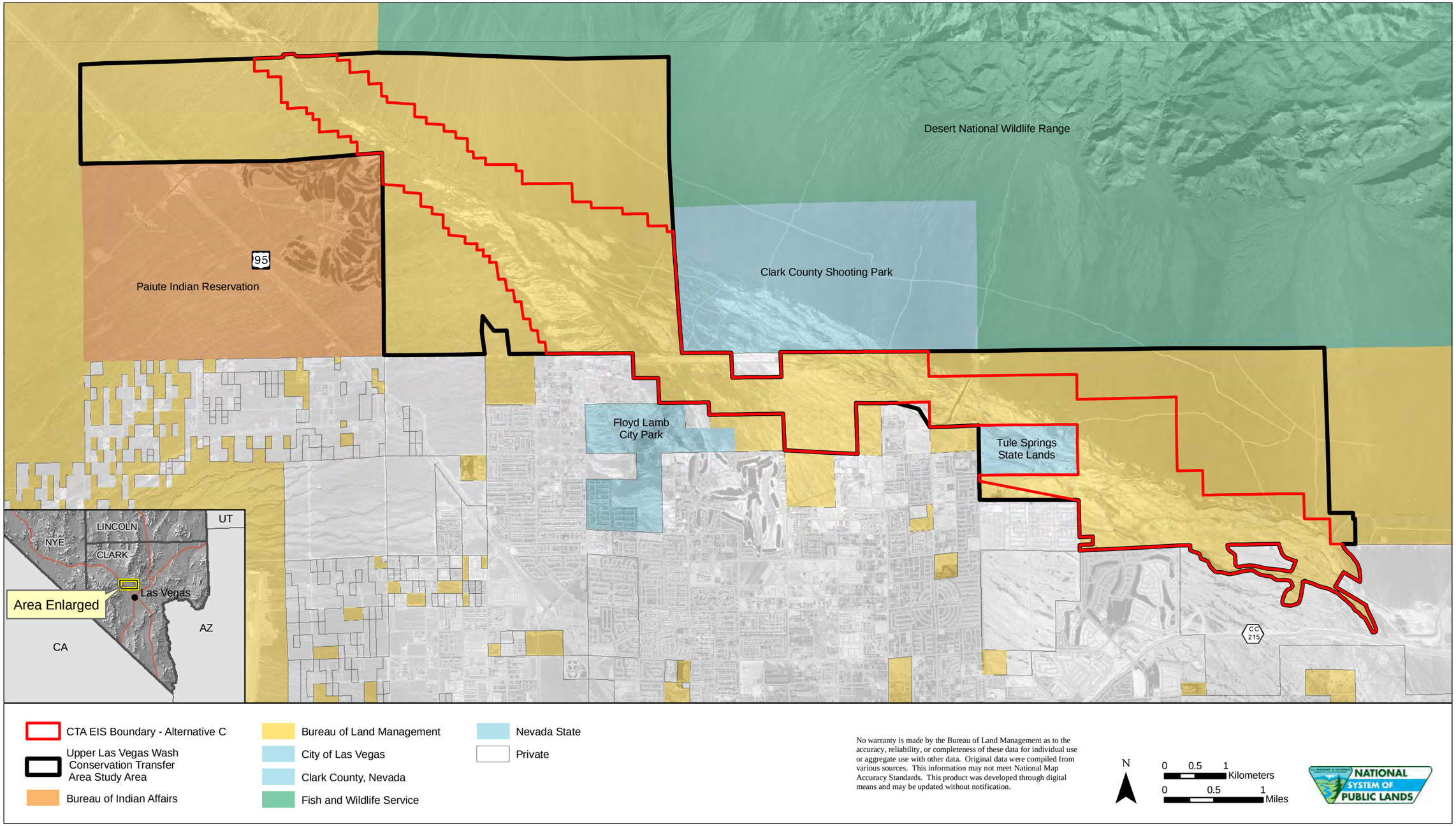

Figure 2.4-3. Conservation Transfer Area Alternative C boundary.

2.4.4 Alternative D

Alternative D (Figure 2.4-4) protects the surface paleontological localities identified in the LVVDB FEIS, special-status plant habitat outside Eglington Preserve, and the active wash channel. Alternative D adds 301.4 acres to the original CTA boundary. Lands around the Paiute Reservation would be available for private development.

Under Alternative D, the CTA would comprise 5,301.4 acres. Under this alternative, 8,022.7 acres of the CTA study area would remain available for disposal (see Figure 2.4-4); Alternative D includes active portions of the wash. The upper alluvial fans north of the wash would be available for disposal. The northeastern boundary would leave 1,980 acres available to the City of North Las Vegas for development. The southern boundary of Alternative D, combined with the area north of the Paiute Reservation and the wash, would leave a total of 6,043 acres available to the City of Las Vegas for development. Within the CTA study area, a total of 8,023 acres would be available for disposal. The Alternative D boundary does not allow waters flowing down the alluvial fans of the Sheep and Las Vegas ranges to continue in their current condition.

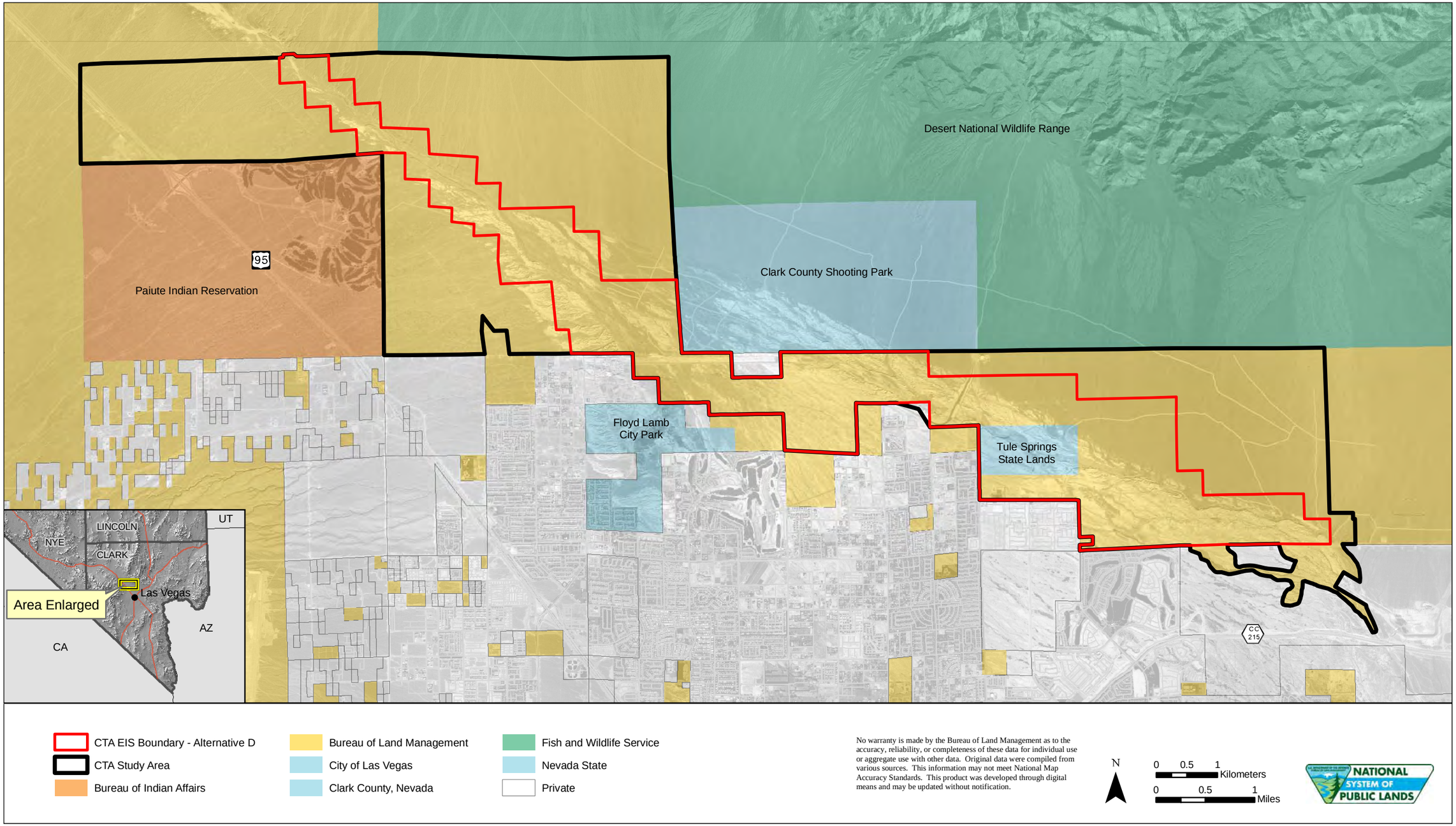

Figure 2.4-4. Conservation Transfer Area Alternative D boundary.

2.4.5 Alternative E

Alternative E (Figure 2.4-5) incorporates the occupied special-status plant habitat outside Eglington Preserve and a portion of the active wash outside the R&PP Act leases and Eglington Preserve. Alternative E reduces the original CTA boundary by 1,686.2 acres. Lands around the Paiute Reservation would be available for private development. Under Alternative E, lands within the CTA would comprise 3,313.8 acres (see Figure 2.4-5) and would continue to be managed for conservation of the sensitive resources and natural functioning of the wash. The 298 acres designated as Eglington Preserve would not be included in the Alternative E boundary.

The boundary would leave 2,402 acres available to the City of North Las Vegas for development and 7,609 acres available to the City of Las Vegas for development. Under this alternative, 10,010.3 acres within the CTA study area would be available for disposal. The Alternative E boundary does not allow waters flowing down the alluvial fans of the Sheep and Las Vegas ranges to continue in their current condition.

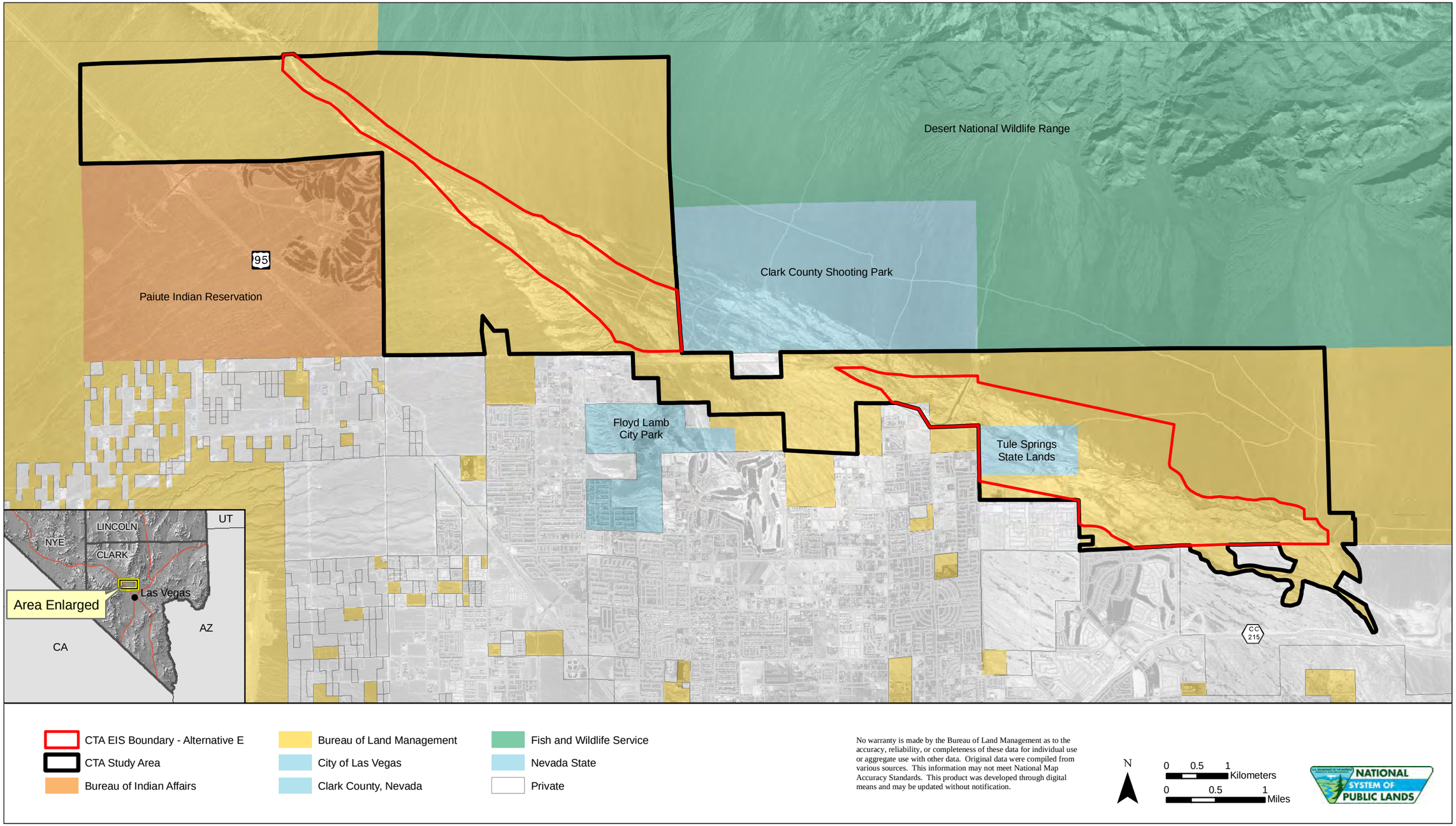

Figure 2.4-5. Conservation Transfer Area Alternative E boundary.

2.4.6 No-Action Alternative

The No-Action Alternative comprises 1,448.2 acres and includes the BLM portion of Tule Springs and Eglington Preserve.

Under the No-Action Alternative (Figure 2.4-6), the entire CTA, with the exception of 1,448.2 acres (Eglington Preserve and Tule Springs), would be available for disposal in accordance with the SNPLMA, FLPMA, other applicable laws subject to valid existing rights, and stipulations established by the Conservation Agreement. Under the No-Action Alternative, 12,174.5 acres would be available for disposal—3,111 within the City of North Las Vegas and 9,064 within the City of Las Vegas.

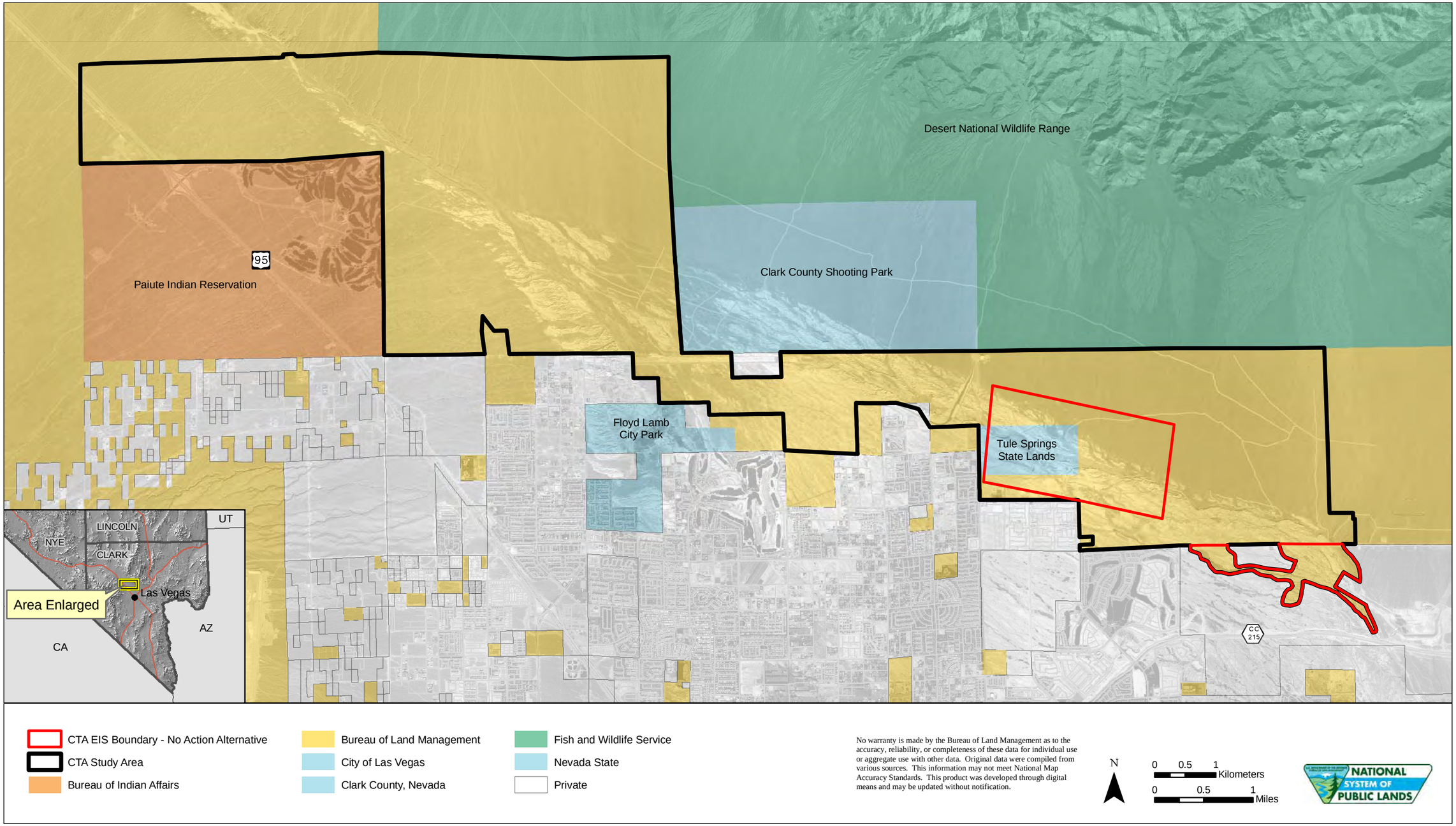

Figure 2.4-6. Conservation Transfer Area No-Action Alternative boundary.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

2.5.1 Expanded Wash Alternative—9,054 Acres

The BLM developed the expanded wash alternative during initial CTA stakeholder meetings. The expanded wash alternative would have added to the original 5,298-acre CTA No-Action Alternative an approximately 400-acre portion of the creosote bajada to the north as a buffer to future development, resulting from a 1-mile buffer north and 0.5 mile east of the Paiute Reservation plus the 300-acre Eglington Preserve.

Up to 4,568.7 acres would have been made available for disposal and private development. Future potential development north of the CTA would have required some supporting infrastructure consistent with protection of the resources. West of Decatur Boulevard, up to three 100-foot-wide ROWs for new roads and utilities would have been considered. East of Decatur Boulevard, only ROWs and land use authorizations that would facilitate the resource protection goals of the CTA would have been allowed. All ROWs and land use authorizations not consistent with the resource protection goals of the CTA would be located outside the CTA.

Although the expanded wash alternative would meet the project purpose and need, it was eliminated from further consideration because the boundary was not sufficiently different from the other alternatives to contribute to the analysis of a range of reasonable alternatives.

2.5.2 Protected Area Designation Alternative—13,622 Acres

During public scoping, BLM received a number of comments requesting that the entire 13,622-acre CTA study area be designated an NCA or National Monument and retained under BLM management. While BLM can have management responsibility for NCAs and National Monuments, BLM has no authority to make those designations. NCAs are established by Congress through enabling legislation. National Monuments are established through Presidential Proclamation under authority of the Antiquities Act of 1906. Congress can also designate National Monuments through monument-specific legislation. This alternative was eliminated from further consideration in the SEIS because these designations require Presidential and/or Congressional action.

2.5.3 Addition of 160 Acres of Lands East of Floyd Lamb Park

A number of comments focused on a request to include within the CTA the 160 acres located in the NW ¼ of Section 11, Township 19 South, Range 60 East. This parcel is part of an R&PP Act lease (N-62830) to the City of Las Vegas but was not previously identified in any of the public stakeholder meetings. Comments focused on the resources, such as fossils, plants, and wash function, as a reason to incorporate the land into the CTA alternatives. The site was evaluated by a BLM botanist, hydrologist, and paleontologist and by the SBCM during their 2003 fossil inventory. BLM concluded that although the parcel contains evidence of the LVF, the parcel does not contain habitat for any special-status species, does not contain surface fossil material, and does not contribute significantly to the function of the ULVW. BLM will provide direction to the City of Las Vegas to use a Discovery Plan for any excavations on the parcel in order to treat subsurface fossils that may be uncovered during future construction.

2.5.4 Consideration of Allowable Uses

Stakeholders suggested a number of specific allowable uses consisting of trails, roads, and utilities. The allowable uses identified by the stakeholders were considered to be allocative and would require a land use plan amendment in order to implement, which is beyond the scope of this SEIS process, which is to establish a CTA boundary. The BLM used the stakeholder suggestions to define future development scenarios. Based on these scenarios, disturbance footprint acreages were estimated and included in chapter 4 as an assumption for analysis in order to conduct alternative and cumulative impacts analysis.

2.5.5 Consideration of Alternative Managing Entities

Although the LVVDB ROD directed the BLM to transfer land in the CTA to another entity pursuant to an approved and signed conservation strategy agreement, stakeholders expressed a desire for the BLM to retain management of the CTA. The SNPLMA operates under other applicable laws, and BLM is not required to dispose of all lands within the disposal area as established by SNPLMA and amended by Title IV of the Clark County Act of 2002 (PL 107-282). BLM would continue to manage resources within the final established boundary until such time as an outside entity meets the requirements of a BLM-approved conservation management strategy.

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Chapter 3

AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter identifies the affected environment and focuses on the existing resources and uses that have the potential to be affected by changes to the CTA boundary. The affected environment is the baseline against which each project alternative is evaluated in terms of impacts to the human environment that would result from its implementation. We take a comprehensive approach to interpreting what makes up the human environment to potentially be affected by the project alternatives and include in our study both natural and physical resources and people's relationship to those resources [40 CFR 1508.14].

The affected environment discussed in this chapter includes earth resources, air quality, water resources, biological resources, cultural and historical resources, Native American resources, paleontological resources, visual resources, land uses, recreation, transportation and access, hazardous materials, social and economic conditions, environmental justice issues, and public health and safety. Relevant current environmental conditions and human uses within the CTA study area have been identified and described using geographic information system (GIS) data, literature searches, electronic searches, personal interviews, and detailed field surveys. Much of the information presented in this chapter is derived from the LVVDB FEIS (BLM 2004a) and other studies, site-specific field data collected by USU, and information provided by BLM resource specialists.

3.2 EARTH RESOURCES

The term *earth resources* encompasses the surface and subsurface characteristics of the landscape, including geology and soils. Following is a brief overview of the physical features of the CTA study area. Section 3.2, "Earth Resources," of the LVVDB FEIS (BLM 2004a) provides a detailed discussion of the entire disposal area.

3.2.1 Geological Setting

Located in the northern portion of the LVV, the CTA study area is situated within the Great Basin region of the Basin and Range physiographic province. The Spring Mountains border the CTA study area limits to the southwest, and the Sheep and Las Vegas ranges skirt the region to the north. The CTA study area encompasses a series of broad, alluvial fans bisected by the LVW and its tributaries. Extending northwest to southeast through the study area, the LVW is an active drainage system that serves as a conduit for emptying urban runoff and stormwater into Lake Mead.

The underlying geology within the CTA study area consists of the LVF, a series of light-colored clay and silt deposits exposed along the ULVW (Longwell et al. 1965). The LVF is divided into seven stratigraphic units, labeled A through G. Unit A is stratigraphically the lowest and temporally the oldest, whereas Unit G is the top layer of the formation and represents the most recent deposit. A detailed description of each stratigraphic unit can be found in Section 3.6, "Paleontological Resources."

The LVF is overlain by a complex blend of alluvial deposits that began accumulating during the late Pleistocene and continued accumulating throughout the Holocene (11,000 B.P.–present). The banks of the LVW predominantly comprise young and older young alluvium interspersed with fine-grained deposits

characteristic of previous groundwater discharge (Page et al. 2005). The LVW bed is a braid of youngest alluvium, young fan alluvium, and groundwater discharge deposits.

Although it is seismically active, the LVV has experienced very few earthquakes that measure greater than 5.0 on the Richter scale (Nevada Seismological Laboratory 2006). A series of smaller-scale earthquakes registering magnitudes up to 4.9 has been recorded, mostly in the vicinity of mountain ranges or near fault lines. No earthquakes have been recorded within the CTA study area. There are several inactive faults that extend through the CTA study area limits, most notably the Las Vegas Valley Shear Zone (Taylor 2007). The CTA study area is located within Seismic Zone 2B, which means that the area has the potential to sustain moderate damage during a seismic event.

In addition to earthquakes, subsidence and ground fissures also pose geological hazards within the LVV. Subsidence is the settling of the earth's surface. This effect can be caused by a variety of factors, including groundwater withdrawal, mineral extraction, and faulting. Fissures are cracks in the earth's surface that are caused by the collapse and compaction of subsurface sediments into residual gaps left by excessive groundwater pumping. Ground fissures and subsidence have been reported in the LVV but not specifically within the CTA study area.

3.2.2 Soils

A number of soil associations are present within the CTA study area, including a variety of gravelly and sandy loams formed in limestone, dolostone, and sandstone (Natural Resources Conservation Service [NRCS] 2007). Table 3.2-1 provides a summary of the soil associations identified within the CTA study area, along with the corresponding map unit identification (ID). USU refined the soil association map of the CTA study area using high-resolution aerial photography combined with field sampling and laboratory analysis. USU was able to better define soil associations in the southeastern part of the study area, particularly in areas in which special-status plants have been observed. Specifically, areas south of the ULVW channel that were originally mapped as 540-Weiser association were found to be more typical of 192–Dalian-McCullough complex (USU 2008a).

Table 3.2-1. Soil Associations within the CTA Study Area

Map Unit ID	Association	Description	Map Reference
192	Dalian-McCullough	Well-drained, very gravelly, fine, sandy loam derived from limestone and dolostone and found on fan skirts.	NV788
314	Weiser-Wechech	Well-drained, extremely gravelly, sandy loam derived from limestone and dolostone.	NV788
630	Badland	Stratified sand, silt, and clay with gypsum and calcium carbonate formed on the Muddy Creek Formation.	NV788
305	Las Vegas–DeStazo	Well-drained, gravelly, fine, sandy to clay loam derived from limestone and found on alluvial flats.	NV788
112	Arizo	Excessively drained, stratified, gravelly, loamy sand to cobbly, coarse sand formed in mixed alluvium and found along channels.	NV788
540	Weiser	Well-drained, stratified, extremely gravelly sandy loam to very gravelly, fine, sandy loam derived from limestone and dolostone found on fan remnants.	NV788
542	Weiser-Goodsprings	Well-drained, extremely gravelly, fine, sandy loam derived from limestone, dolomite, and gypsum and found on fan remnants.	NV788
300	Las Vegas	Well-drained, gravelly, fine, sandy to clay loam derived from limestone and found on basin-floor remnants.	NV788
240	Goodsprings	Well-drained, gravelly, fine, sandy loam to extremely gravelly, loamy, fine sand derived from limestone and sandstone and found on fan remnants.	NV788

According to the Clark County Department of Development Services Building Division and as further documented in the 2004 LVVDB FEIS, expansive soils are concentrated along the ULVW drainage. Expansive soils have a high concentration of clay, which can act like a sponge, shrinking and swelling with changing moisture conditions. Soils in the CTA study area may have other characteristics that could lead to problems for future construction projects. Specific soil properties would be evaluated prior to commencing any future construction activities.

3.3 WATER RESOURCES

The LVVDB FEIS (BLM 2004a) described the conditions of water resources in the LVV, provided descriptions of surface and groundwater resources, and also discussed water supply and demand in this region. This section describes the same resources but focuses on the CTA study area. Any changes in the condition of resources from the time of their description in the LVVDB FEIS are noted below.

3.3.1 Surface Water

The LVVDB FEIS provided a description of the network of ephemeral drainages that convey stormwater runoff from the LVV to the Colorado River. The majority of information presented in that document remains applicable to the current SEIS. The CTA study area is in the ULVW watershed and is drained by the ULVW and several tributaries. Because complete urbanization has not yet occurred within areas that drain to the ULVW, the majority of the ULVW length has not yet been significantly impacted by increased flow rates and channel erosion. The ULVW is an ephemeral wash that flows intermittently during and immediately after significant storm events. The upper subbasins flowing into the ULVW are classified geomorphologically as alluvial fans and consist of material ranging in size from boulders to silts. An alluvial fan is a fan-shaped collection of loose or unconsolidated sediments that have been deposited by stream flow or debris flows at the base of a mountain front or valley side (National Research Council 1996). A bajada is formed when neighboring fans converge into a single apron at the base of the slope. Flooding on alluvial fans can occur quickly. Flow paths on fans typically form a braided network of channels, both active and inactive. Near the mouth of the fan, where the slope is greater, channels tend to be more incised, with coarser-grained alluvium. Farther down the fan, as the slope decreases, flows spread out laterally into other channels and sheet flow with more fine-grained sediments. The ULVW can experience radical changes in shape, alignment, depth, and flood-carrying capacity during major storm events. As a result of these characteristics, specialized hydraulic analyses are usually required to adequately assess flooding impacts for both natural and altered conditions (CCRFCD 1999; House 2005). The Federal Emergency Management Agency (FEMA) has developed special guidelines for computing regulatory floodplains for alluvial fans (FEMA 2003). In addition, dramatic changes to the dry wash can occur with adjacent development and related infrastructure. Increased urban development, including channelization of stream courses, installation of storm drains, expanded areas of impervious land cover, and construction of stream crossings, has been occurring in the ULVW watershed and has gradually altered the hydrology of the ULVW in a manner similar to that of the Lower Las Vegas Wash.

There are a number of smaller, mostly unnamed ephemeral washes located throughout the ULVW watershed within the CTA study area. Along with the ULVW, smaller washes that naturally convey storm flows to the ULVW and ultimately into Lake Mead may be considered WUS, as defined under 33 CFR 328. The USACE regulates WUS pursuant to Section 404 of the CWA [33 USC 1251 *et seq.*]. The USACE has permitting authority for the placement of fill into WUS on federal, state, and private lands. The majority of the tributary ephemeral washes within the CTA study area have remained intact. However, the slope draining into the north side of the ULVW shows evidence of an active alluvial surface in several locations along the entire reach within the CTA. That conclusion is based on visual

interpretation of aerial images, available geological mapping (Bell et al. 1998), and criteria established for differentiating between active and inactive surfaces (House 2005).

Runoff from storm events in the ULVW watershed and surrounding mountains can result in flows ranging from a few dozen cubic feet per second (cfs) to several thousand cfs. Because of the lack of development in the upper basin, very few significant floods have been observed or recorded. Under future ultimate build-out conditions, however, 100-year flood flows are estimated to exceed 14,000 cfs upstream of the ULVW detention basin near Decatur Boulevard. That flow rate would cover a football field 1 foot deep in about 3.5 seconds. Peak flows of that magnitude (and even significantly smaller flows) would erode the banks and degrade the channel of the ULVW, which in turn would cause sedimentation in online detention facilities, Las Vegas Bay, and Lake Mead. In addition, development in the ULVW would impact the quantity of fine sediment that is conveyed during storm events via overland sheet flow into the ULVW and to those facilities. Specific flood flow information for the present-day 100-year scenario is not readily available and would require a more complete geomorphic study of the surfaces that drain into the ULVW.

The Regional Flood Control Master Plan map shows that any development that happens north of the wash on the fans would require flood control structures to move the waters. Without any further development, the wash has sufficient natural flood control capacity.

Floodplains

The LVVDB FEIS described the 100-year flood conditions within the LVV watershed. The majority of information presented in that document remains applicable to the current SEIS for the ULVW, with the exception that the upper range of 100-year flood flows would be around 14,000 cfs based on an ultimate projected build-out condition for all available land. FEMA and the CCRFCD have published maps that show the 100-year floodplain and floodway for the ULVW, based on computerized hydraulic models. The 100-year floodplain for the ULVW in the disposal boundary area is shown in Figure 3.3-1. The Flood Zone A and AE areas on the figure are used to designate the extent of the 100-year floodplain. Flood Zone A is an approximate extent for an area that has not been the subject of an accepted hydraulics study. Flood Zone AE is an area that has been the subject of an accepted hydraulics study; thus, base flood elevations have been developed for this zone.

While the CCRFCD and Cities of Las Vegas and North Las Vegas allow development within the floodplain fringe, it is generally discouraged. Proposed development adjacent to and within drainageways with established floodplains must be evaluated by a licensed engineer to confirm compliance with various criteria and to demonstrate that no adverse impacts to adjacent properties would result. Under no circumstances is proposed development permitted in the floodway. The CCRFCD and Cities of Las Vegas and North Las Vegas currently have no formal erosion setback criteria in place. Plans for development adjacent to the ULVW are reviewed by the appropriate jurisdiction on a case-by-case basis and are approved or rejected on the basis of supporting engineering analyses and compliance with appropriate regulations (CCRFCD 2007; personal communication, Raul Cruz, City of Las Vegas Flood Control Division 2008).

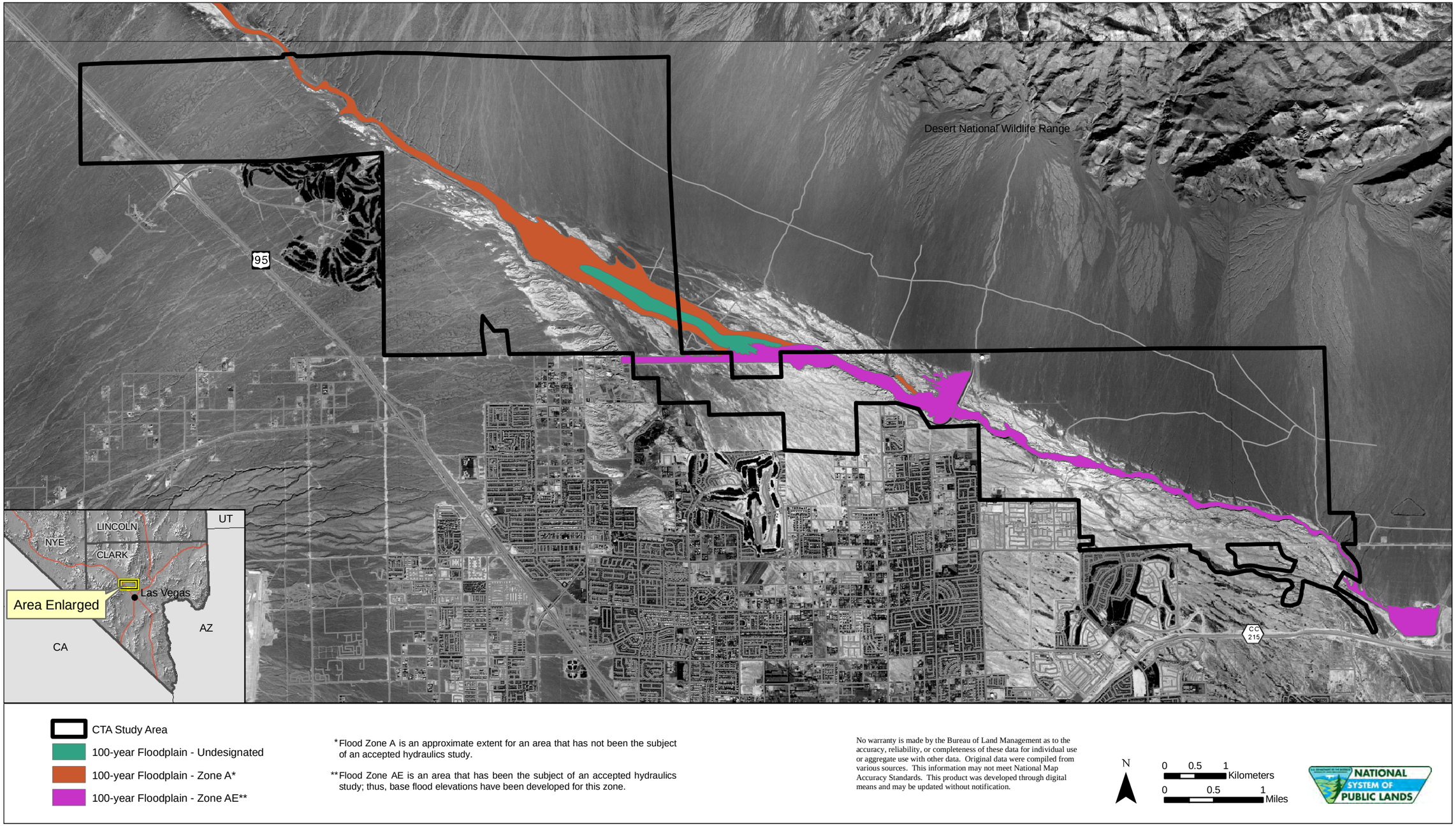

Figure 3.3-1. The 100-year Federal Emergency Management Agency floodplain for the Conservation Transfer Area study area.

Surface Water Quality

As described in the LVVDB FEIS, LVW drains the 1,600-square-mile LVV, of which more than 20% has been urbanized. Flow from the LVW enters Lake Mead and has a direct effect on the water quality of the lake, which is an important source of drinking water for portions of Nevada as well as for downstream users. Factors that contribute to poor water quality in flows from the LVW include high concentrations of soluble salts in the soils, urban stormwater, and intercepted, shallow, poor-quality groundwater. There are pending efforts by the Clark County Clean Water Coalition to reduce the volume of wastewater discharged directly to the Lower Wash. This effort, known as the Systems Conveyance and Operations Program, would discharge wastewater directly to Boulder Basin of Lake Mead through a new pipeline.

The LVVDB FEIS described issues relating to Section 303(d) of the CWA as they pertain to the LVW. The LVVDB FEIS also detailed the status of total maximum daily loads (TMDLs) for the LVW. As of November 2005, the portion of the LVW that is well downstream of the CTA study area was listed by Nevada Division of Environmental Protection (NDEP) as a 303(d) impaired water body (NDEP 2005). The pollutants or stressors of concern in this listing are total iron and selenium. The source of iron is believed to be associated with suspended sediment particulates, while the source of selenium has not been identified. For these reasons, LVW was identified as a water body warranting further investigation for selenium and total suspended solids. This designation pertains to the portion of LVW that runs between Telephone Line Road and Lake Mead, at the southeast end of the LVV.

In 1989, TMDLs for LVW were established for total phosphorus and ammonia. In 2003, compliance with the established TMDLs was assessed; no changes were recommended at that time. The TMDLs for total phosphorus and ammonia are currently being met by having the wastewater treatment plants use year-round tertiary treatment practices.

3.4 VEGETATION

This section describes the dominant vegetation communities and special-status plant species, including federally threatened, endangered, and candidate species, State of Nevada listed endangered and protected species, BLM special-status species, and other vegetation of interest that occurs in the CTA study area. All vegetation community descriptions are based on the results of the USU vegetation mapping study (USU 2007b), with certain common plant names changed to provide consistency with BLM. Nine vegetation communities have been identified in the CTA study area (see Section 3.4.1, “Vegetation Communities”). These nine vegetation communities (Figure 3.4-1) are distributed in association with the unique geological and hydrologic features of the ULVW, which occurs in the northern portion of the Mojave Desert. The Mojave Desert is a geographically distinct assemblage of natural communities that occurs across portions of southeastern California, northwestern Arizona, southern Nevada, and southwestern Utah. The Mojave Desert is marked by extreme environmental conditions, and the distribution, composition, and density of vegetation communities are strongly influenced by local variations in climate, elevation, and soil conditions.

The Mojave Desert climate is arid, with an average of 4 to 6 inches (10.1–15.2 cm) of precipitation per year and temperatures ranging from 20ºF to more than 100ºF (−6.7ºC to 37.8ºC). Rainfall is erratic and concentrated in late winter and early spring. The CTA study area consists predominantly of low desert, with elevations from 2,113 to 3,040 feet (644–927 m) and alkaline soils. The vegetation of the Mojave Desert is characterized by low-growing, widely spaced perennial shrubs, usually composed of only a few species, with cacti and yucca occurring locally; 25% of all plant species are endemic (MacMahon 2000). The vegetation communities that dominate the ULVW serve numerous important functions: vegetation slows and retains floodwaters, provides wildlife habitat, and provides recreational and aesthetic value.

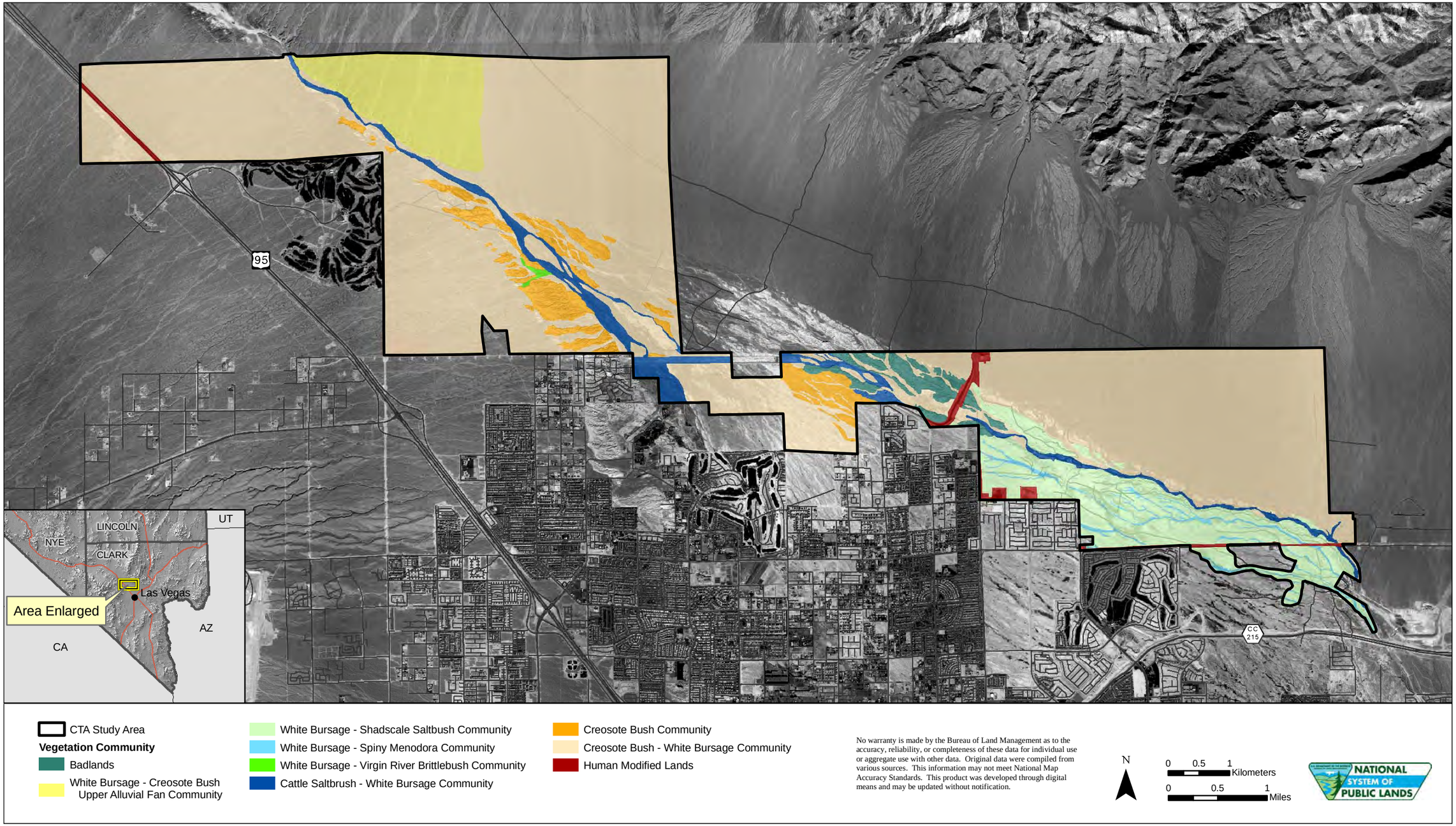

Figure 3.4-1. Vegetation communities according to the Utah State University (2007b) vegetation mapping study in the Conservation Transfer Area study area.

In addition, both vegetation and biological soil crusts stabilize the soil, control erosion, and retain moisture (Belnap et al. 2001). However, the distribution of vegetation in the CTA study area is largely determined by geological structure, with lower plant diversity on alluvial fans (71% of the CTA) and more diverse plant communities on more structurally complex spring deposits (29% of the CTA) (USU 2007b).

3.4.1 Vegetation Communities

All vegetation community descriptions are based on the results of the USU vegetation mapping study (USU 2007b), with certain common plant names changed to provide consistency with BLM. Nine vegetation communities have been identified in the CTA study area: White Bursage–Shadscale Saltbush (*Ambrosia dumosa–Atriplex confertifolia*); White Bursage–Creosote Bush (*Ambrosia dumosa–Larrea tridentata*) Upper Alluvial Fan; White Bursage–Virgin River Brittlebush (*Ambrosia dumosa–Encelia virginensis*); White Bursage–Spiny Menodora (*Ambrosia dumosa–Menodora spinescens*); Cattle Saltbush–White Bursage (*Atriplex polycarpa–Ambrosia dumosa*); Creosote Bush (*Larrea tridentata*); Creosote Bush–White Bursage (*Larrea tridentata–Ambrosia dumosa*); the Badlands; and human-modified lands (see Figure 3.4-1).

The acreage and proportion of each vegetation community in the CTA study area are listed in Table 3.4-1. In areas not covered by the USU study (USU 2007b), vegetation communities were developed by comparing aerial photography and adjacent data to extrapolate community designations.

Table 3.4-1. Vegetation Community Types and Acreages in the Conservation Transfer Area Study Area

Vegetation Community Type	Acres in the CTA	% of CTA
Creosote Bush–White Bursage (*Larrea tridentata–Ambrosia dumosa*)	9,684.1	71.1%
White Bursage–Shadscale Saltbush (*Ambrosia dumosa–Atriplex confertifolia*)	1,274.1	9.4%
White Bursage–Creosote Bush (*Ambrosia dumosa–Larrea tridentata*) Upper Alluvial Fan	905.8	6.6%
Creosote Bush (*Larrea tridentata*)	657.1	4.8%
Cattle Saltbush–White Bursage (*Atriplex polycarpa–Ambrosia dumosa*)	540.3	4.0%
Badlands	241.3	1.8%
Human-modified lands (no vegetation)	167.0	1.2%
White Bursage–Spiny Menodora (*Ambrosia dumosa–Menodora spinescens*)	139.8	1.0%
White Bursage–Virgin River Brittlebush (*Ambrosia dumosa–Encelia virginensis*)	13.2	0.1%
Total	**13,622.7**	**100%**

Creosote Bush–White Bursage Community

The Creosote Bush–White Bursage community is the dominant vegetation community and covers approximately 9,684 acres, or 71.1% of the CTA study area. The Creosote Bush–White Bursage vegetation community spans the entire width of the CTA study area at elevations between 2,163 and 3,047 feet (659 and 929 m). In this vegetation community, creosote bush and white bursage have a combined relative density greater than 70%. Littleleaf ratany (*Krameria erecta*) is an important subdominant species. The community also contains numerous woody species at low densities, including shadscale saltbush, cattle saltbush, Virgin River brittlebush, and jointfir (*Ephedra* spp.). This community also has a high density (207 plants per acre) and diversity of cactus and yucca (see Section 3.4.2, “Cactus and Yucca”).

White Bursage–Shadscale Saltbush Community

The White Bursage–Shadscale Saltbush community covers approximately 1,274 acres, or 9.4% of the CTA study area. It occurs primarily on spring deposits south of the wash environment at elevations between 2,163 and 2,375 feet (659 and 724 m) in the southeastern portion of the CTA study area. The vegetation is strongly dominated by shadscale saltbush, white bursage, and cheesebush (*Hymenoclea salsola*); creosote bush and wolfberry (*Lycium andersonii*) are important subdominant species. Additional species include jointfir, littleleaf ratany, and spiny menodora.

White Bursage–Creosote Bush Upper Alluvial Fan Community

The White Bursage–Creosote Bush Upper Alluvial Fan community covers approximately 905 acres, or 6.6% of the CTA study area. This vegetation community occurs at elevations between 2,647 and 2,873 feet (807 and 876 m) on upper alluvial fan geomorphology that is restricted to the north-central portion of the CTA study area. The vegetation is dominated by white bursage and creosote bush; the presence of shadscale saltbush may indicate higher soil alkalinity than adjacent habitats. Nevada jointfir (*Ephedra nevadensis*) is also a conspicuous component of this community type. Additional species include Virgin River brittlebush, spiny menodora, and Mojave woodyaster (*Xylorhiza tortifolia*). This community has a high density (157 plants per acre) of cactus and yucca (see Section 3.4.2).

Creosote Bush Community

The Creosote Bush community is widespread across the western and central portions of the wash on approximately 657 acres, or 4.8% of the CTA study area, at elevations between 2,390 and 2,716 feet (728 and 828 m). Creosote bush is the dominant shrub, with white bursage, littleleaf ratany, and Fremont's dalea (*Psorothamnus fremontii*) as important subdominant species. Shadscale saltbush, turpentinebroom (*Thamnosma montana*), and Mojave woodyaster occur patchily within this community.

Cattle Saltbush–White Bursage Community

The Cattle Saltbush–White Bursage community occurs on approximately 540 acres, or 4.0% of the CTA study area, at elevations between 2,160 and 2,725 feet (658 and 851 m). This community occurs predominantly in wet or active wash areas throughout the LVW and likely receives more water than the surrounding habitats. Cattle saltbush and white bursage are dominant, and creosote bush and cheesebush are important subdominant species. Virgin River brittlebush, Mojave rabbitbrush (*Ericameria paniculata*), and snakeweed (*Gutierrezia* spp.) are also important species. Minor species include fourwing saltbush (*Atriplex canescens*), shadscale saltbush, wolfberry, and brownplume wirelettuce (*Stephanomeria pauciflora*). This community had a low density (16 plants per acre) of cactus and yucca (see Section 3.4.2).

Badlands

The Badlands community is mostly barren ground covering approximately 241 acres, or 1.8% of the CTA study area, at elevations between 2,314 and 2,433 feet (705 and 742 m) in the north-central portion of the CTA study area. A small proportion of badlands was found to contain low densities of white bursage, littleleaf ratany, creosote bush, and brownplume wirelettuce.

Human-Modified Lands

Human-modified lands include areas of significant human disturbance or human-caused impacts that limit the growth of vegetation, such as paved or gravel surfaces, utility substations, water retention structures,

and other water structures, in the CTA study area. This classification only includes impacted areas greater than 2.47 acres and covers approximately 167 acres, or 1.2% of the CTA study area. This classification occurs primarily in the central portion of the CTA study area, near Decatur, where U.S. Highway 95 crosses through the west end of the CTA study area. Human-modified lands occur at elevations between 2,209 and 2,966 feet (673 and 904 m).

White Bursage–Spiny Menodora Community

The White Bursage–Spiny Menodora community occurs on approximately 139 acres, or 1.0% of the CTA study area, at elevations between 2,187 and 2,347 feet (667 and 715 m) in the southeastern portion of the CTA study area. This vegetation association includes desert wash habitats, which provide valuable habitat for a variety of common and special-status plant and wildlife species. White bursage dominates the community; creosote bush, spiny menodora, and littleleaf ratany are important subdominant species. Other conspicuous species include shadscale saltbush, Torrey's jointfir (*Ephedra torreyana*), and wolfberry. Minor species include fourwing saltbush, Nevada jointfir, snakeweed, winterfat (*Krascheninnikovia lanata*), wolfberry, and Mojave woodyaster.

This is the only vegetation association that was identified in the USU vegetation mapping study (USU 2007b) as containing catclaw acacia and mesquite (*Prosopis* sp.). Although these plant species are not federally or state listed for protection, catclaw acacia and mesquite habitat, especially when infected with fruiting mesquite mistletoe (*Phoradendron californicum*), supports populations of phainopepla, a BLM special-status bird species. Small, scattered stands or bosques grow in ephemeral drainages along the LVW. The ULVW contains a high density of these bosques, scattered throughout the southeastern portion of the CTA, which has high plant density. The USU (2007b) vegetation mapping study noted acacia occurring at medium density (78.6 plants per acre) within the White Bursage–Spiny Menodora association. Mesquite was not noted in the USU vegetation data but is suspected to occur in association with acacia in the lower portion of the wash (personal communication, Glen Busch, USU, January 22, 2008).

White Bursage–Virgin River Brittlebush Community

The White Bursage–Virgin River Brittlebush community occurs on approximately 13.2 acres, or 0.1% of the CTA study area, at elevations between 2,553 and 2,595 feet (778 and 791 m), limited to the west-central portion of the LVW. White Bursage, Virgin River brittlebush, and snakeweed dominate this community. Creosote bush and Fremont's dalea are also important species. Other species include cheesebush and rush skeletonplant (*Lygodesmia juncea*). Minor species include Shockley's goldenhead (*Acamptopappus shockleyi*), Nevada jointfir, Torrey's jointfir, wolfberry, and slender poreleaf (*Porophyllum gracile*). This community contains a high density of cactus and yucca (see Section 3.4.2).

3.4.2 Cactus and Yucca

All native cacti and yucca are protected and regulated by the State of Nevada under Nevada Revised Statutes (NRS) 527.060 and 527.120 (Appendix C). This provision regulates the removal and transportation of listed plant species on state lands, county lands, reserved or unreserved lands owned by the federal government, and privately owned lands without written permission, permit, and/or tag issued by the NDF.

Cacti species within the CTA study area include golden cholla (*Cylindropuntia echinocarpa*), branched pencil cholla (*Cylindropuntia ramosissima*), cottontop cactus (*Echinocactus polycephalus* var. *polycephalus*), Engelmann's hedgehog cactus (*Echinocereus engelmannii*), California barrel cactus

(*Ferocactus cylindraceus*), and beavertail pricklypear cactus (*Opuntia basilaris* var. *basilaris*). Yucca species within the CTA study area consist of Joshua tree (*Yucca brevifolia*) and Mojave yucca (*Yucca schidigera*). The USU vegetation data were used to determine the relative densities of cacti and yucca in each vegetation community (Table 3.4-2). The highest density and diversity of cacti and yucca were found in the Creosote Bush–White Bursage community. The White Bursage–Creosote Bush Upper Alluvial Fan and White Bursage–Virgin River Brittlebush communities contain high densities of yucca but few cacti. No areas were classified as medium-density cacti and yucca, but the Cattle Saltbush–White Bursage community had low densities of cacti.

Table 3.4-2. Cactus and Yucca Density Rankings and Vegetation Communities in the CTA Study Area

Vegetation Community	Plants/Acre
High Density	
Creosote Bush–White Bursage community	207.1
White Bursage–Creosote Bush Upper Alluvial Fan community	157.2
White Bursage–Virgin River Brittlebush community	104.8
Low Density	
Cattle Saltbush–White Bursage community	16.6

Source: USU (2007b).

3.4.3 Special-Status Plant Species

The unique geological and hydrologic features of the ULVW are host to a suite of plant species endemic to the northern Mojave Desert. The ULVW, including the southeastern portion of the CTA study area, contains a substantial proportion of extant populations of three special-status plant species: Las Vegas bearpoppy, Merriam's bearpoppy, and Las Vegas buckwheat (Table 3.4-3).

Table 3.4-3. Special-Status Plant Species Known to Occur in the CTA Study Area

Common Name	Scientific Name	Federal Status	BLM Sensitive List	State of Nevada*	MSHCP Covered[†]
Las Vegas buckwheat	*Eriogonum corymbosum* var. *nilesii*	Candidate	No[§]	No	No
Las Vegas bearpoppy	*Arctomecon californica*	None[‡]	No[§]	CE	Yes
Merriam's bearpoppy	*Arctomecon merriamii*	None[‡]	Yes	No	Yes

Sources: CCDCP and USFWS (2000); Nevada Natural Heritage Program (2003); USFWS (2003, 2007a, 2007b).

* CE = State of Nevada Critically Endangered (NRS 527.270; see Appendix C).

[†] *Clark County Multiple Species Habitat Conservation Plan* (CCDCP and USFWS 2000).

[‡] Although this species does not have official federal status, the USFWS considers it a "species of special concern."

[§] Species that have state or federal protection are not generally included on the BLM Sensitive list (see Appendix C).

Potentially genetically unique populations of these three plant species occur within the CTA study area (Ellis and Wolf 2006; Harper and Van Buren n.d. [1997]; Hickerson and Wolf 1998; Van Buren and Harper 1996). All three species are in rapid decline in the LVV as a result of urban development (CCDCP and USFWS 2000) (see Table 3.4-3). The USFWS and NDF have stated that further loss of individuals and populations would be detrimental to the long-term viability of Las Vegas bearpoppy and Las Vegas buckwheat and could lead to emergency listing under the ESA (BLM 2004a). The recent listing of Las Vegas buckwheat as a candidate for federal listing (72 *Federal Register* December 6, 2007) underlines this potential.

The preservation of occupied and potential habitats within the CTA study area will reduce impacts to these species and may prevent further listing actions by the USFWS (USFWS 2004).

The special-status plant species addressed here all occupy extreme soil environments in which other plants are unable to compete. All three species are thought to be associated with gypsum soils. Specific soil factors that limit the distributions of Las Vegas buckwheat or the bearpoppy species have yet to be determined, although USU researchers recently developed a predictive habitat model for these badland species (USU 2008a). For the purposes of this SEIS, occupied habitat includes each observed individual plant location plus a radius of 25 feet (7.6 m) from that point. Using that methodology, plants within 50 feet (15.2 m) of one another were considered part of the same occupied habitat population (PBS&J 2005). Potential habitat was determined by using GIS software to overlay vegetation and soil data to develop a habitat type (vegetation–soil community) data set. Occupied habitat was then overlaid on the habitat type data set and queried to determine potential habitat (e.g., habitat types that support the species). Any habitat type with less than 1% occupied habitat within it was considered an accidental occurrence resulting from GIS resolution or mapping errors and was eliminated as potential habitat. Additionally, any habitat type with the human-modified lands vegetation community was removed from potential habitat because it is highly unlikely that it would support viable plant populations. Potential habitat was then divided into high and moderate potential. Potential habitat adjacent to (within 100 feet [30.4 m] of) occupied habitat was determined to be the most likely to become occupied and was defined as high potential. The remaining potential habitat polygons were defined as moderate potential. All other areas within the CTA study area boundary are considered low-potential habitat that is unlikely to support buckwheat or bearpoppy because it contains the incorrect soil and/or vegetation communities.

Habitat loss and fragmentation form the primary threat to these plant species. Additional potential impacts include trampling by livestock or feral burros, mineral exploration and development, and alteration of hydrology within their habitats. Within the CTA study area, current direct impacts to these species include trampling, OHV use, illegal dumping, invasive plant species, and direct or indirect impacts to their pollinators and habitats (Nevada Natural Heritage Program [NNHP] 2007).

Federally Listed Plant Species

LAS VEGAS BUCKWHEAT

On December 6, 2007, the USFWS listed Las Vegas buckwheat, a long-lived perennial shrub, as a candidate species under the ESA because of threats to the remaining 892 acres of occupied habitat (USFWS 2007b). The primary threat to the species is loss or fragmentation of its habitats from urban development. Historically, 50% to 70% of the Las Vegas buckwheat population and habitat area occurred within the LVV (NNHP 2007), where populations have been evaluated (Ellis and Wolf 2006). Approximately 30% to 50% of these populations have been extirpated or are likely to be extirpated in the near future (NNHP 2007). In the LVV, the species is now concentrated in the southeastern portion of the CTA study area, with scattered remnant populations in the Las Vegas metropolitan area. Populations that occur to the north and east in Clark and Lincoln counties, Nevada, and in Kane County, Utah, are under less immediate threat (NNHP 2007; USFWS 2007a, 2007b). The total population is currently estimated at 25,214 individuals, with approximately 6,800 plants (27% of the total population) in the CTA study area, including Eglington Preserve (USFWS 2007a). The USU vegetation mapping study (USU 2007b) identified 125.17 acres of known occupied habitat in the CTA study area, or 0.9% of the CTA study area. However, this habitat represents 14% of the species' extant occupied habitat. An additional 815.46 acres of high-potential and 340.86 acres of moderate-potential Las Vegas buckwheat habitat (8.5% of the CTA study area) were also identified within the CTA study area (Figure 3.4-2, Table 3.4-4). The species occurs primarily within the White Bursage–Shadscale Saltbush Community but also occurs in adjacent communities in small percentages (see Table 3.4-4).

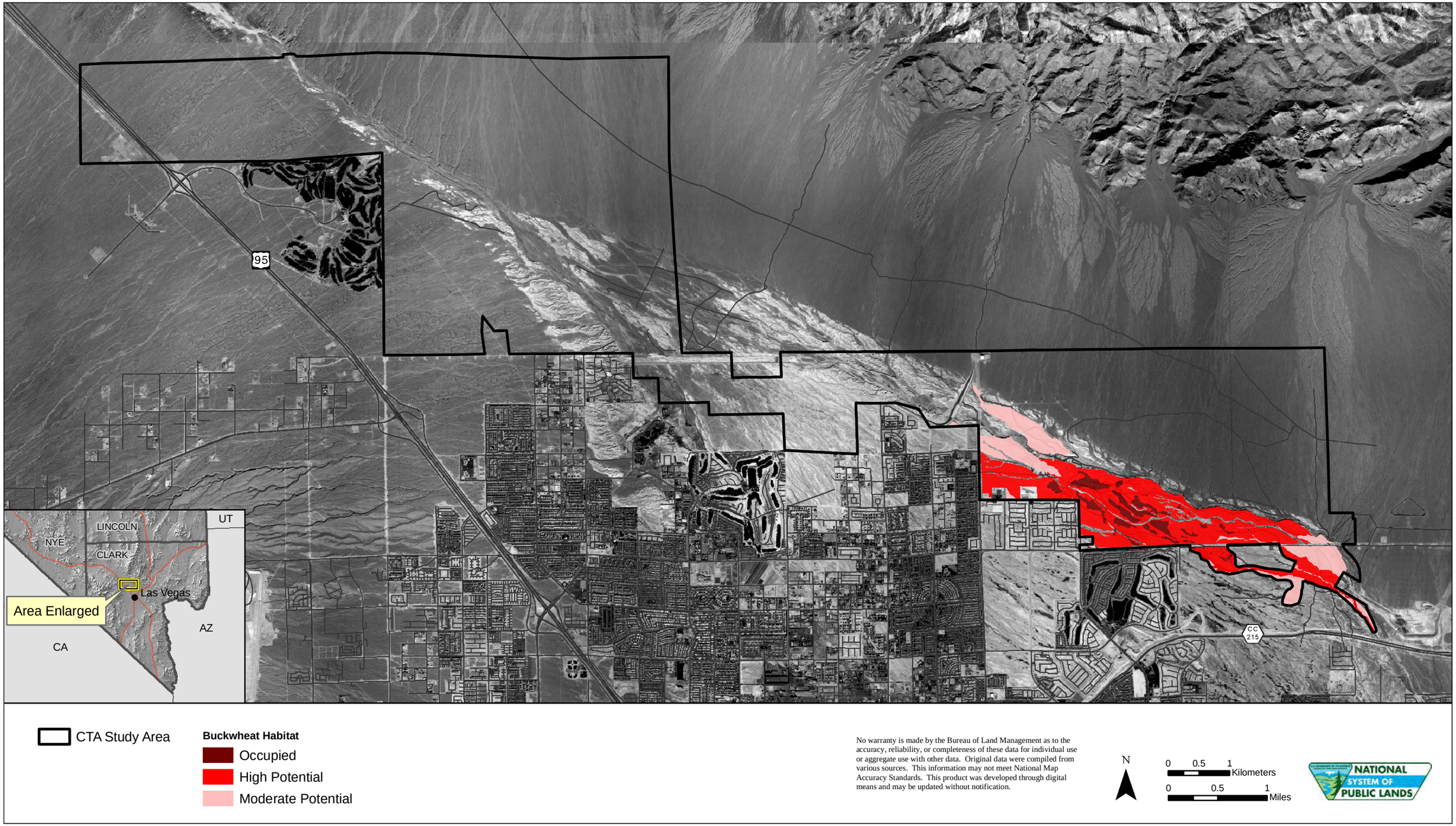

Figure 3.4-2. Known occupied and potential habitat for Las Vegas buckwheat in the Conservation Transfer Area study area.

Table 3.4-4. Occupied and Potential Habitat for Las Vegas Buckwheat

Habitat Type					
Soil Type	**Vegetation Community**	**Acres of Occupied Habitat per Soil-Vegetation Association**	**% Total Occupied Habitat**	**Acres of High-Potential Habitat per Soil-Vegetation Association* Soil Type**	**Acres of Moderate-Potential Habitat per Soil-Vegetation Association* Soil Type**
Las Vegas gravelly, fine, sandy loam, 0%–2% slopes	White Bursage–Shadscale Saltbush	43.84	35%	248.70	129.52
Las Vegas–DeStazo complex, 0%–2% slopes	White Bursage–Shadscale Saltbush	40.77	33%	215.28	59.44
Badland	White Bursage–Shadscale Saltbush	34.85	28%	254.41	113.32
Las Vegas gravelly, fine, sandy loam, 0%–2% slopes	White Bursage–Spiny Menodora	2.98	2%	28.92	21.04
Weiser extremely gravelly, fine, sandy loam, 2%–8% slopes	White Bursage–Shadscale Saltbush	1.69	1%	68.14	17.54
Badland	White Bursage–Spiny Menodora	0.67	<1%	0	0
Las Vegas–DeStazo complex, 0%–2% slopes	White Bursage–Spiny Menodora	0†	<1%	0	0
Weiser extremely gravelly, fine, sandy loam, 2%–8% slopes	White Bursage–Spiny Menodora	0.01	<1%	0	0
Las Vegas gravelly, fine, sandy loam, 0%–2% slopes	Human-modified lands	0.37	<1%	0	0
Las Vegas–DeStazo complex, 0%–2% slopes	Human-modified lands	0†	<1%	0	0
Total Habitat		**125.17**		**815.46**	**340.86**

Sources: NRCS (2007); USU (2007b).

* In accordance with the methodology, human-modified lands and habitat types <1% do not constitute potential habitat.

† The exact value is 0.001.

BLM Special-Status and State of Nevada Protected Plant Species

LAS VEGAS BEARPOPPY AND MERRIAM'S BEARPOPPY

Las Vegas bearpoppy is a State of Nevada Critically Endangered plant species (NRS 527.270); therefore, a permit from NDF is required for the take of any individual (see Appendix C). The USFWS considers both bearpoppy species "species of special concern," and both species are also covered under the MSHCP (CCDCP and USFWS 2000) (see Table 3.4-3). It is possible that LVV populations of both species could possess unique genetic traits that are not present elsewhere in their ranges (Harper and Van Buren n.d. [1997]; Hickerson and Wolf 1998; Van Buren and Harper 1996). Las Vegas bearpoppy and Merriam's bearpoppy have distinct distributions in the LVV, but their ranges overlap within the CTA study area; therefore, their distributions and habitats within the CTA study area are addressed jointly here.

Las Vegas bearpoppy is limited to the northeastern Mojave Desert, with 108 population locations in southeastern Nevada, predominantly in Clark County (CCDCP and USFWS 2000), and eight known locations in northwestern Arizona (Mistretta et al. 1996). The LVV contains more than one-third of the total acreage of known Las Vegas bearpoppy habitat (BLM 2004a); however, approximately 27% of the 108 known populations of Las Vegas bearpoppy are under threat of extirpation or are presumed extirpated as a result of urban development in the LVV (CCDCP and USFWS 2000; Mistretta et al. 1996).

Merriam's bearpoppy occurs from the Death Valley area in southeastern California to the Meadow Valley Wash of southeastern Nevada (Meyer 1997). In Nevada, the species is widely but sparsely distributed in approximately 70 to 129 occurrences, with a total estimated population of more than 20,000 individuals over 974 acres in Clark, Lincoln, and Nye counties (NNHP 2001). The overall Merriam's bearpoppy population is stable, except in the LVV, where populations may have been extirpated by development (CCDCP and USFWS 2000). In the CTA study area, Merriam's bearpoppy is known to occur from the Decatur Boulevard alignment east and in association with Las Vegas bearpoppy in the southeastern portion of the LVW (PBS&J 2005).

Las Vegas bearpoppy and Merriam's bearpoppy are both short-lived, evergreen perennial herbs that are distinguished by a branched stem with yellow flowers in Las Vegas bearpoppy and by an unbranched stem with white flowers in Merriam's bearpoppy. In 2005, a survey was conducted to assess 100% of the Las Vegas bearpoppy habitat in the CTA study area. Because the survey occurred during the latter portion of the species' flowering periods, surveyors could not identify non-flowering bearpoppies to species. The survey resulted in a total count of 131,939 plants distributed across 496.5 acres of habitat. Bearpoppy species are known to produce relatively large amounts of long-lived seed, and populations can fluctuate drastically from year to year in response to winter precipitation. Because the survey was performed during a year of above-average rainfall, the survey results are believed to represent the potential distribution of the species within the CTA study area. Surveys conducted in 2005 (PBS&J 2005) and 2007 (USU 2007b) identified a combined total of 509.71 acres of known occupied bearpoppy habitat, or 3.7% of the CTA study area, along with 1,082.95 acres of high-potential and 1,174.11 acres of moderate-potential habitat (17% of the CTA study area). Like the Las Vegas Buckwheat, this species occurs primarily within the White Bursage–Shadscale Saltbush community but also occurs in adjacent communities in small percentages (Table 3.4-5). The distribution of known occupied and potential bearpoppy habitats in the CTA study area is presented in Figure 3.4-3. It should be noted that although potential habitat for this species reaches all the way to the northwest end of the CTA study area, few individuals have been observed west of the Decatur Boulevard alignment. Conversely, Janis Boettinger of the Department of Pedology at USU speculated that surface characteristics of the soils west of Decatur may preclude bearpoppy occurrence, although the mechanism is not fully understood (personal communication, Janis Boettinger, USU 2008).

Table 3.4-5. Occupied and Potential Habitat for Bearpoppy

Habitat Type					
Soil Type	**Vegetation Community**	**Acres of Occupied Habitat per Soil-Vegetation Association**	**% Total Occupied Habitat**	**Acres of High-Potential Habitat per Soil-Vegetation Association* Soil Type**	**Acres of Moderate-Potential Habitat per Soil-Vegetation Association* Soil Type**
Badland	White Bursage–Shadscale Saltbush	200.47	39%	201.89	0.23
Las Vegas gravelly, fine, sandy loam, 0%–2% slopes	White Bursage–Shadscale Saltbush	145.80	29%	276.26	0
Las Vegas–DeStazo complex, 0%–2% slopes	White Bursage–Shadscale Saltbush	90.61	18%	220.35	4.51
Weiser extremely gravelly, fine, sandy loam, 2%–8% slopes	White Bursage–Shadscale Saltbush	29.53	6%	57.84	0
Badland	White Bursage–Spiny Menodora	9.15	2%	31.70	0
Dalian-McCullough complex, 0%–4% slopes	White Bursage–Shadscale Saltbush	6.90	1%	28.20	0

Table 3.4-5. Occupied and Potential Habitat for Bearpoppy (Continued)

Habitat Type					
Soil Type	**Vegetation Community**	**Acres of Occupied Habitat per Soil-Vegetation Association**	**% Total Occupied Habitat**	**Acres of High-Potential Habitat per Soil-Vegetation Association* Soil Type**	**Acres of Moderate-Potential Habitat per Soil-Vegetation Association* Soil Type**
Las Vegas gravelly, fine, sandy loam, 0%–2% slopes	White Bursage–Spiny Menodora	7.24	1%	45.70	0
Dalian-McCullough complex, 0%–4% slopes	Creosote Bush–White Bursage	7.53	1%	221.00	1,169.37
Las Vegas gravelly, fine, sandy loam, 0%–2% slopes	Human-modified lands	3.34	1%	0	0
Arizo very gravelly loamy sand, flooded, 0%–4% slopes	Badlands	0.50	<1%	0	0
Badland	Badlands	2.06	<1%	0	0
Las Vegas–DeStazo complex, 0%–2% slopes	Badlands	0.01	<1%	0	0
Arizo very gravelly loamy sand, flooded, 0%–4% slopes	White Bursage–Shadscale Saltbush	0.52	<1%	0	0
Las Vegas–DeStazo complex, 0%–2% slopes	White Bursage–Spiny Menodora	2.30	<1%	0	0
Weiser extremely gravelly, fine, sandy loam, 2%–8% slopes	White Bursage–Spiny Menodora	1.98	<1%	0	0
Badland	Cattle Saltbush–White Bursage	0.60	<1%	0	0
Dalian-McCullough complex, 0%–4% slopes	Cattle Saltbush–White Bursage	0.23	<1%	0	0
Las Vegas gravelly, fine, sandy loam, 0%–2% slopes	Cattle Saltbush–White Bursage	0.11	<1%	0	0
Arizo very gravelly loamy sand, flooded, 0%–4% slopes	Creosote Bush–White Bursage	0[†]	<1%	0	0
Badland	Creosote Bush–White Bursage	0.77	<1%	0	0
Las Vegas–DeStazo complex, 0%–2% slopes	Human-modified lands	0.06	<1%	0	0
Weiser extremely gravelly, fine, sandy loam, 2%–8% slopes	Human-modified lands	0.01	<1%	0	0
Total Habitat		**509.71**		**1,082.95**	**1,174.11**

Sources: NRCS (2007); USU (2007b).

* In accordance with the methodology, human-modified lands and habitat types <1% do not constitute potential habitat.

[†] The exact value is 0.001.

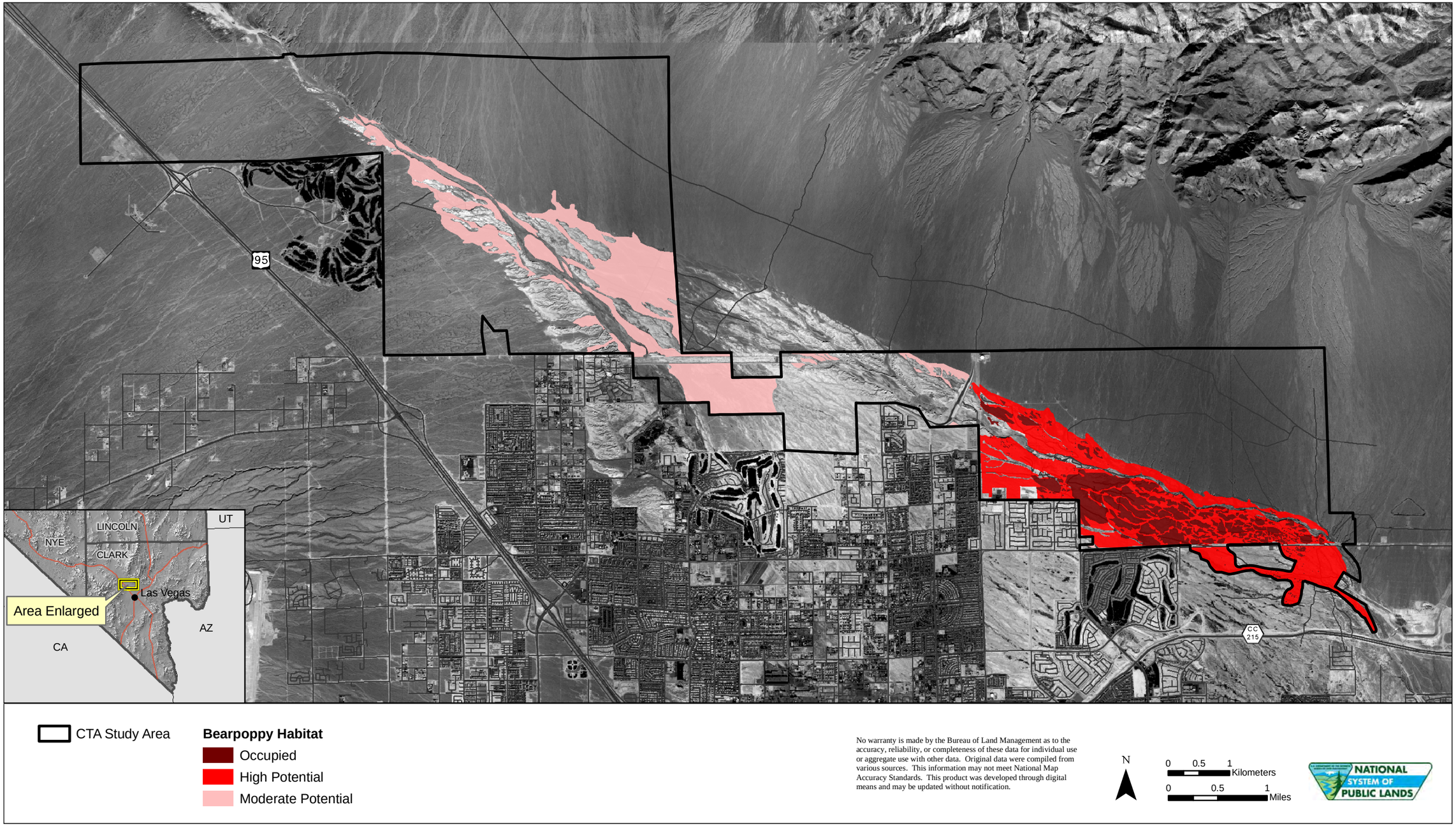

Figure 3.4-3. Known occupied and potential habitat for bearpoppy in the Conservation Transfer Area study area.

3.5 CULTURAL RESOURCES

3.5.1 Introduction

As part of the LVVDB FEIS, extensive work to identify and evaluate cultural resources was conducted by HRA, Inc. (HRA), for the BLM. The methods used during the identification efforts and the area of potential effect surveyed were established as the result of consultation between the BLM and the Nevada SHPO in accordance with the regulations set forth in 36 CFR 800. These regulations guide implementation of the National Historic Preservation Act of 1966, as amended. Identified cultural resources were then analyzed using the criteria in 36 CFR 60.4 to assess whether the cultural resources were eligible for the NRHP. BLM made determinations of eligibility for all identified cultural resources, and the Nevada SHPO concurred with all of the BLM's determinations. This documentation satisfied the identification phase of Section 106 of the NHPA and its implementing regulations at 36 CFR 800.

The Tule Springs archaeological site (26Ck247), which was listed in the NRHP in 1979, is located within the CTA study area on land owned by the BLM and the State of Nevada. Tule Springs will not change ownership or use as a result of this SEIS. Of the other properties located within the CTA study area, two have been determined eligible for the NRHP: Sites 26Ck6507 (the Tonopah Wagon Road) and 26Ck6910 (a prehistoric hearth and artifact scatter). Because these sites are located in an area of intense commercial and residential development, BLM has decided to mitigate impacts to both NRHP-eligible sites as an action independent of the purpose of and need for this SEIS. As part of the mitigation process, BLM contracted SWCA to prepare a Historic Properties Treatment Plan (HPTP) for mitigation of cultural resources in and adjacent to the CTA study area (Cannon et al. 2008). Mitigation efforts have been completed, and SWCA has prepared a draft report that details the results of the investigations. Ongoing tribal consultation is being conducted by BLM with support from SWCA.

3.5.2 Overview of the Prehistory and History of the Area

Land within the CTA study area has been used throughout prehistory and history. Prehistoric use of the area extends sporadically back to the Paleoindian period, but occupation evidence of the area is most commonly found to date to the past 1,500 years. Subsequent to Paleoindian occupation of the area, several cultural influences manifest themselves in the general region, including Anasazi, Patayan, and Numic traditions, among others. A substantial body of research has resulted in the production of a number of chronologies, many of which incorporate and summarize previous research (Blair and Wedding 2002; Blair et al. 1999; Ezzo 1995; Fowler and Madsen 1986; Lyneis 1982a, 1982b; Seddon and Ellis 2000; Seymour and Purcell 1995).

The Paleoindian period occupation of southeastern Nevada is not well defined because of the lack of substantial Paleoindian deposits; well-preserved, well-investigated occupations from this period are rare (Fowler and Madsen 1986:173). Indeed, some authors have posited a single Paleo-Archaic period that spans the years between 10,000 and 5500 B.C. (Roberts and Ahlstrom 2000; Woodman et al. 2001; Woodman et al. 2003). Paleoindian sites are generally surface finds of fluted points that suggest at least a short-lived Clovis-complex presence in some parts of southern Nevada. The association between artifacts and faunal remains at Tule Springs, located within the CTA study area, is unclear, and the Paleoindian age of this site has not been established beyond doubt (Fitzwater 1967; Harrington and Simpson 1961). To the east of the CTA study area, one fluted projectile point was identified in the LVW in Clark County Wetlands Park by Roberts and Ahlstrom (2000), but no additional cultural deposits were found in association with this artifact.

The earliest Archaic sites in the LVV date to the Pinto period, around 5000 B.C. However, few Pinto period sites or components have been identified, which may indicate decreased occupation of the area (Warren and Crabtree 1986). Several sites with Pinto components have been investigated in the LVV, including in the area of Tule Springs (Susia 1964). These sites are often limited to surface lithic scatters mixed with components of other periods. Excavated Middle Archaic sites have yielded few temporally diagnostic artifacts, but charcoal and ash deposits have provided radiocarbon dates for these deposits (Ahlstrom et al. 2004). Throughout the larger region, Late Archaic sites are more common than Middle Archaic sites, and a few are located within a few miles of the LVW.

Following the Archaic period is the Ceramic period, which spans the years from approximately A.D. 300 to 1500. In southeastern Nevada, three dominant agricultural groups are present: Anasazi (Ancestral Puebloan), Patayan, and Numic. It is difficult to discern the relationships and potential interactions between these groups, and such subjects have been a topic of recent research. Since ceramics are the only cultural indicator at many sites from this period in the area, it is uncertain whether they represent a Virgin Puebloan settlement or a trade network between the LVV inhabitants and established Puebloan settlements in the Moapa Valley. One of the sites in the CTA study area, 26Ck6910, has a ceramic assemblage, a scatter of fire-affected rock, and a single piece of lithic debitage; this site appears to have good potential to provide data on cultural affiliation and interaction (Ahlstrom et al. 2004:115).

Cultural features associated with the Patayan tradition include what have been called “intaglios,” “earth figures,” or “geoglyphs” (Seymour 1999:18). These consist of areas where removal of desert pavement creates shapes and figures (Ezzo 1995:64). One of the few known intaglios in Nevada is the LVW Intaglio Site, 26Ck4509, which is eligible for the NRHP under Criteria A, C, and D (Woodman and Valentine 1999). Stone alignments and rock rings may also be indicative of Patayan use of the region (Ezzo 1995:64–65). Patayan ceramics are often found mixed with Virgin Puebloan wares and increase in frequency near the end of the period as the Puebloan assemblage declines in frequency (Ahlstrom et al. 2004). This led Seymour (1997) to conclude that Patayan and Anasazi groups repeatedly used the same sites over long periods of time. Sites excavated as part of mitigation efforts for the Harry Allen to Mead Project include Early and Late Ceramic period sites, as well as a number of fragile pattern sites for which no definite dates could be determined (Gilreath et al. 2007).

For the LVV, the date of 1600 is considered the time when indirect influences from the Spanish of New Mexico began to reach the area. Direct contact between Southern Paiutes and Euro-Americans in southern Nevada did not occur until late in the eighteenth century. Prior to substantial permanent settlement by Euro-Americans in the LVV, parties traveled through the area en route to other places. The first travelers to traverse portions of what is now known as the old Spanish Trail were part of the Dominguez and Escalante party, although Francisco Garcés was the first to cover the Mojave segment (Myhrer et al. 1990:10). The two routes blazed by Dominguez and Escalante and by Garcés were later connected by Jedediah Smith in 1826 (Myhrer et al. 1990:10), and this route was reinforced by Antonio Armijo, who was the first to take a commercial caravan along the route (McBride and Rolf 2001:§8, p. 1). The route immediately became a major component of the trade network between the West Coast and the interior of the continent. A number of subsequent travelers followed these expeditions.

Captain John C. Frémont was one of the later travelers to cross southern Nevada, opening up the “Old Spanish Trail” in 1844, but he was one of the first to travel from west to east through the LVV (Myhrer et al. 1990:10), and his was the first expedition to give the name “Spanish Trail” to the route (McBride and Rolf 2001:§7, p. 1). With the publication of Frémont’s notes and maps in 1845, this route began being used by many travelers through the area (McBride and Rolf 2001:§7; Myhrer et al. 1990:69). This route was replaced in 1848 by routes to the north and south for travel between Santa Fe and San Gabriel (Myhrer et al. 1990). However, the Old Spanish Trail route was later merged into the Mormon Road for the portion between south-central Utah and San Bernardino, California, which facilitated migration to

California (Myhrer et al. 1990). Segments of this trail are listed in the NRHP, and it is significant under the Transportation Research Theme and the Exploration and Settlement Sub-theme in the Nevada state context (McBride and Rolf 2001:§8, p. 1).

Sustained contact between Native American groups and Euro-Americans did not occur until well into the nineteenth century. The first Euro-Americans to permanently settle in southern Nevada were members of the Church of Jesus Christ of Latter-Day Saints (Mormons), whose goal, in part, was the establishment of a route between Salt Lake City and southern California. Their initial settlement in the area was in Las Vegas, southeast of the CTA study area (Tingley 1992).

As the Mormon settlements grew, they developed irrigation networks for farming the land. They soon concluded, however, that the area was covered with alkaline soils and was not suitable for large-scale farming. By 1857, most of the Mormon settlers had headed back to Utah; by the end of that year, southeastern Nevada had become largely depopulated of Euro-Americans. This changed with the Homestead Act of 1862 and the formation of the Nevada Territory in 1864, which attracted new settlers to the territory with the promise of 160-acre allotments to settlers, with full ownership bestowed after five years' residency on the land (Milner 1994:153). The Homestead Act had far-reaching effects, since it allowed immigrants with even modest incomes to aspire to become part of the "American Dream," and it pushed the nation's frontier ever westward. Traces of this westward movement are still visible on the landscape today as wagon trails, such as Site 26Ck6507, a historic segment of road that extends north from the Paiute Reservation (Ahlstrom et al. 2004:170). This road carried people and materials to the gold fields north of Las Vegas until it was supplanted by the railroad (Ahlstrom et al. 2004:170).

With the Homestead Act, southeastern Nevada was once again populated, and agricultural activities soon became the main economic activity of the LVV. The community became a major supply stop on the now-well-traveled Mormon Trail. However, despite the community's new focus on agriculture and its recovered role as an important travelers' way station, Las Vegas remained a generally small and quiet settlement until the arrival of the railroad. By the beginning of the new century, the American West had become increasingly urbanized, including population expansion throughout the LVV. The advent of the railroad significantly shortened travel time between Las Vegas and Salt Lake City, Los Angeles, and San Diego (Ahlstrom et al. 2004:64). The Las Vegas and Tonopah Railroad (LV&TR) was built to connect Las Vegas with newly discovered gold sources in Bullfrog and Rhyolite and to extend rail service to Tonopah (Ahlstrom et al. 2004:64). Unfortunately, the line was in use for only a limited time, and the LV&TR line went out of business by 1918 (Ahlstrom et al. 2004:654). One of the sites near the CTA study area is related to the LV&TR—26Ck5596, the LV&TR camp and siding (Ahlstrom et al. 2004:150).

During World War I, southeastern Nevada remained primarily a central railroad stop and cargo depot on the way to and from the northern Nevada mining camps. The signing of the Colorado River Compact in 1922 resulted in an annual grant of 300,000 acre-feet per year (AFY) of previously untapped water to Nevada and set in motion the activities necessary to bring the water from the Colorado River to the southeastern part of the state (Hulse 1991:192–193). This, along with the federal government's proposal to construct the Boulder-Hoover Dam, led to a thriving Las Vegas during the 1920s, although this prosperity was diminished during the Great Depression. The dam began impounding water in 1935, and all the major transmission lines were completed by the end of the 1930s. People working to build the dam and at other industrial enterprises created squatter settlements throughout the LVW area, as well as in the surrounding mountains. Among the sites identified within the LVW are the remains of some of these squatter settlements.

During the World War II era, new developments came to the LVV. The Las Vegas Valley Army Gunnery School was one of the major new developments and was the first aerial gunnery school established in the

U.S. (Ahlstrom et al. 2004:123). This gunnery range was originally identified in 1991 as Site 26Ck4803 and was rerecorded by HRA during the survey for the LVVDB FEIS (Ahlstrom et al. 2004:123).
An additional historical site, 26Ck6351, is most likely the command and control facility for the Moving Target Range of the Las Vegas Valley Army Gunnery School; this site was also rerecorded by HRA during the LVVDB FEIS survey (Ahlstrom et al. 2004:154).

3.5.3 Identification of Cultural Resources

Identification of the cultural resources within the CTA study area was conducted in 2003 and 2004 by HRA for the area of the entire LVVDB, as initially defined (Ahlstrom et al. 2004). As a result of this documentation, three sites located within the CTA study area were determined by BLM to be NRHP eligible; SHPO has concurred with these determinations. Of these sites, one dates to the Historic period and one is prehistoric (Table 3.5-1). Because of development pressures in the surrounding areas, BLM has decided to mitigate two NRHP-eligible sites independent of the currently proposed action (Cannon et al. 2008). An HPTP (Cannon et al. 2008) has been prepared by SWCA in coordination with BLM and SHPO. BLM has approved the document, and it has been revised based on comments from SHPO; the HPTP is currently awaiting additional comments or approval from SHPO. One additional resource, Tule Springs (26Ck247), is also within the CTA study area. This site is on land owned by BLM and the State of Nevada and is listed in the NRHP. Tule Springs will not change ownership or use as a result of this SEIS.

Table 3.5-1. Sites Eligible for or Listed in the National Register of Historic Places

Site No.	Period	Site Type	NRHP Criterion
26Ck247	Prehistoric/ Paleontological	Prehistoric artifact scatter with features and paleontological locality.	Listed 1979
26Ck6507	Historic	Wagon Road from Tonopah to Las Vegas.	A
26Ck6910	Prehistoric	Hearth feature with ceramics and lithics.	D

Site 26Ck6507, the Tonopah Wagon Road, has been determined eligible for the NRHP under Criterion A. Specifically, as Ahlstrom et al. (2004:300) note, the site is associated with the expansion of Nevada's transportation system prior to the development of railways. The site also has the potential to provide information about road building, settlement expansion, early transportation routes, and early development in the LVV. Documentation and preservation of this historic site will involve addressing the following research questions related to these topics.

- For what length of time was the Tonopah Wagon Road used? Was this portion of the road used primarily for one purpose or several purposes?
- What role did the road play in regional development? What other types of roads were in operation at this time in southern Nevada?
- Can the Tonopah Wagon Road be interpreted in a meaningful way that can be used for educational materials?

Site 26Ck6910 is a prehistoric hearth and artifact scatter that has been determined eligible for the NRHP under Criterion D. This site has the potential to provide information about prehistoric chronology, cultural interaction, subsistence, environment, and use of wetlands in the LVV. Documentation of this site will involve addressing the following research questions related to these topics.

- What is the age of the hearth feature at this site, and was it used repeatedly?
- Were ceramics of the three different types present at the site manufactured locally, and what does this suggest about cultural interaction in the LVV?
- What kinds of resources were processed at the site, and what does this indicate about subsistence strategies and environmental conditions at the time of use?
- Were any of the resources that were processed at the site likely obtained at Tule Springs or other wetlands, and what does this suggest about the role of wetlands in ceramic period subsistence systems?

Site 26Ck247 is a prehistoric site with lithic artifacts and features and is also the location of significant paleontological deposits. The site has contributed substantially to our understanding of paleoenvironments. This site was listed in the NRHP in 1979 because of its importance in understanding paleoenvironments and because of its association with significant advances in archaeological methods and analysis. The Tule Springs site will not change ownership or use as a result of this SEIS.

3.5.4 Ethnographic Issues, Traditional Cultural Properties, and Native American Religious Concerns

The area in and around the CTA study area represents a cultural landscape of great significance to the Southern Paiute people (Stoffle et al. 2004). The concept of a cultural landscape encompasses the categories of ethnographic issues, TCPs, and Native American religious concerns, as the landscape is considered to be inextricably linked to the spirituality of the Paiute people. Representatives of the Las Vegas Paiute Tribe have described places such as the landscape in the area of the LVW as places of peace for connecting with the past. This view contrasts with Western cultural views of places such as the LVW as sites for urbanization and recreation.

As noted in Section 3.5.1, “Introduction,” tribal consultation regarding TCPs and related religious concerns is currently underway. Tribal representatives have shared their views with BLM and SWCA that the entire LVW in and of itself represents an important cultural landscape and potential TCP for the Las Vegas Paiute Tribe and other tribal communities in the area, such as the Chemehuevi and Moapa Paiute. They have stressed that the aboriginal homeland includes both the washes and the surrounding area: the whole of the landscape has cultural and religious importance to the Paiute people. Regional areas of significance also include the Ivanpah Valley, Gypsum Cave, and Middle Kyle Canyon. In the ongoing assessment of cultural and religious concerns, the Las Vegas Paiute Tribe noted that they do not want to identify locations of specific sites of importance, since they do not want them to be intentionally disturbed if the locations become known to the public. The entire landscape should be considered in the assessment of impacts.

In addition to landscape concerns, other TCPs and religious concerns identified in meetings with tribal members include migratory trails and washes because of the traditional practice of interring the dead in the washes. Disturbance to washes could result in the disturbance of the dead, which has both cultural and religious implications. The tribes are connected to the LVW both spiritually as well as physically. The LVW is part of the Salt Song Trail, which although it is not a physical trail does include geographical places. Salt Song singers “sing” the spirits of the dead home along the Salt Song Trail. The singers’ voices accompany the spirits on their journey. This is not a physical migration along the trail. The trail may vary according to singer, song, or band.

Numerous ethnographic studies and publications and ethnohistorical accounts attest to the cultural and religious significance of the regional landscape, landforms, and natural features, as well as archaeological

sites (e.g., Euler and Fowler 1966, 1973; Fowler 1989, 1992; Fowler and Fowler 1971; Stoffle and Arnold 2003; Stoffle and Zedeño 2001; Stoffle et al. 2002; Stoffle et al. 2004). Of particular relevance to the ethnographic concerns of the CTA study area is the recent study *Puha Flows from It: The Cultural Landscape Study of the Spring Mountains* (Stoffle et al. 2004). This study of Southern Paiute cultural landscapes provides a basis for evaluating alternatives and developing treatment plans. For example, the authors note,

> Landscapes are recognized as needing different types of management based on what they contain. So a mountain range may have hot springs, above-timberline vistas, obsidian outcrops, caves, and patches of medicine plants. Each has its own value and together they make up the cultural landscape for a traditional people. Each feature of this landscape can have different management responses based on the needs of the federal agency and the culture of the appropriate people. (Stoffle et al. 2004:179)

BLM is proceeding with tribal consultation with the Southern Paiute people regarding the CTA study area, focusing on the identified landscape-based cultural and religious concerns.

3.6 PALEONTOLOGICAL RESOURCES

Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms that have been preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced.

Paleontological resources represent a critical resource concern within the CTA study area. Researchers have recorded 436 paleontological localities within the CTA study area, and two localities occur just outside it. All these localities occur in sedimentary deposits of the late Pleistocene age LVF. BLM has identified four objectives for the management and conservation of paleontological resources within the CTA:

1. To maintain the integrity of the paleontological assemblages within the study area, including geological stratigraphy, by configuring the CTA boundary to include all major fossil localities, and to work within BLM's statutes to protect the LVF within all approved R&PP Act leases.
2. To establish in situ paleontological preservation areas that are kept undisturbed and unfragmented.
3. To maintain in situ key paleontological localities, including paleosols, that are essential to understanding the paleoecology of the LVF.
4. To provide for the mitigation and treatment of all paleontological localities, including those that can be preserved in situ.

The information presented here builds on the SBCM *Paleontological Resources Assessment and Treatment Plan—Las Vegas Valley Disposal Boundary EIS, Las Vegas, Nevada* (Paleontology Plan) (SBCM 2004), prepared as part of the LVVDB FEIS (BLM 2004a). The following section discusses the geological units within the CTA study area. The sensitivities of these geological units are ranked according to the BLM Conditions in the *Paleontology Resources Management Manual and Handbook* (H-8270-1) (BLM 1998b) and the Potential Fossil Yield Classification (PFYC) (U.S. Forest Service [USFS] 1996), which the BLM is currently considering adopting as policy (Appendices D and E).

3.6.1 Geology and Paleontology

The CTA study area is located within the LVV, which is a 600-square-mile basin bounded by Spring Mountains to the west, Sheep Mountains to the north, Muddy Mountains, Eldorado Range, and Lake Mead to the east, and Black Mountains to the south. The LVV is structurally characterized by a northwest-trending, down-dropped, wedge-shaped fracture zone that transects the folds and thrust faults of the mountains on either side (Longwell 1960). The floor of the LVV consists of the alluvial silt, sand, gravel, and lacustrine mudstone beds of the LVF interfingered with alluvial fan sediments derived from the Paleozoic limestone beds of the Spring Mountains to the southwest and the Las Vegas and Sheep ranges to the northeast (Haynes 1967). The north end of the valley is drained by the Corn Creek and Tule Springs washes, which eventually terminate in a distributary flat. At its south end, the valley is drained by LVW, which extends eastward between Frenchman and River mountains and drains into the Colorado River at Lake Mead.

According to the geological mapping of Longwell et al. (1965), and as supported by geological and paleontological data collected by the SBCM (2004), the CTA study area is almost entirely directly underlain by the highly paleontologically sensitive late Pleistocene age LVF. Portions of the study area may also be directly underlain by thin deposits of late Quaternary (latest Pleistocene to Holocene) younger alluvium with low paleontological sensitivity (Figure 3.6-1).

Las Vegas Formation

The LVF (Ql in Figure 3.6-1), which is exposed in several large areas along the length of the LVV, comprises a series of light-colored clay and silt deposits that often occur in thin, horizontal layers (Longwell 1946; Longwell et al. 1965). Exposures of the LVF have yielded numerous scientifically important fossil localities that have produced the most scientifically significant assemblages of late Pleistocene vertebrate fossils known from the Mojave Desert (SBCM 2004).

Based on stratigraphic study of the Tule Springs area, Haynes (1967) divided the LVF into seven units, A through G, which were then further subdivided; subscript numerals designate these subdivisions. A_1 is the oldest and stratigraphically lowest unit, and G_2 is the youngest and stratigraphically highest unit. Of the seven units, B_2, C, D, and E_1 have proven fossiliferous. Additionally, Haynes (1967) identified six interbedded soil horizons, S_1 through S_6. Although alternatives to these subdivisions of the LVF have been proposed (e.g., Donovan 1996), Haynes's stratigraphy has proven to be the most useful for describing temporally contemporaneous fossil assemblages and distinguishing between temporally discontinuous depositional episodes and has been adopted in recent paleontological research (SBCM 2004; Springer et al. 2006).

Units A and B consist mostly of light brown, fluvially deposited silt and gravel and are only sparsely fossiliferous, based on studies undertaken thus far. Unit B_2, however, contains pale green mudstone beds that have produced aquatic mollusks and large, vertebrate fossils, including mammoth, horse, and camel (Mawby 1967; Quade 1986; Springer et al. 2006). Although both Units A and B are too old to be dated using ^{14}C isotopic analysis, Quade et al. (2003) noted that Unit B_2 has been tentatively correlated with the 190,000 to 140,000 thousand years before present (ybp) deep lake episode in Death Valley and with the 186,000 to 130,000 ybp isotope Stage 6 at Devils Hole.

Unit C consists of light brown, calcareous silt and gravel with some localized bedded sand deposits. Unit C was likely fluvially deposited during a relatively dry period between the relatively wet periods of deposition represented by Units B and D. Fossils have recently been discovered within Unit C (personal communication, Kathleen Springer 2007). These have not been dated.

Of the seven LVF units (Haynes 1967), Unit D is generally the most widespread and best exposed in the CTA study area. It is highly fossiliferous and known to produce Pleistocene megafaunal and microfaunal vertebrates, in addition to abundant freshwater mollusks (Haynes 1967; Quade 1986; Quade and Pratt 1989; Reynolds et al. 1991; Springer et al. 2006). Toward the center of the LVV, Unit D comprises calcareous green mudstone with abundant secondary carbonate; it contains mollusk remains. Along the margins of the LVV, the fluvial bedforms of Unit D contain fossil cicada burrows but lack aquatic mollusks. Scattered vertebrate megafaunal remains have eroded from Unit D along the valley margins (Quade 1986).

Haynes (1967) dated the base of Unit D to 31,300 ± 2,500 ybp and the middle of the unit to 22,600 ± 550 ybp using ^{14}C from fossil gastropod shells collected from near Tule Springs. However, these dates may be too old because of isotopic fractionation and an initial ^{14}C deficiency in the water (Haynes 1967). Subsequently, carbonized wood collected from near the base of Unit D provided a radiocarbon date of 25,300 ± 2,500 ybp (SBCM 2006). Although the depositional environment of Unit D has been widely debated, Quade et al. (2003) hypothesized that the sediments of Unit D, as well as those of Units B_2 and E_1, were deposited as the result of spring discharge. Springer et al. (2006) suggested that the discharge features of these units can be correlated with late Quaternary climatic changes in the region.

At Tule Springs, Unit E is characterized by spring and channel deposits comprising cross-bedded alluvium, localized green clay, and organic horizons and tufa (Haynes 1967; Quade 1986). These channel deposits have produced locally abundant mammalian megafaunal remains, including mammoth, horse, and camel. Freshwater mollusks have also been recovered (Quade 1986; Springer et al. 2006). Carbonized wood fragments from near the base of Unit E have been radiocarbon dated at 14,040 ± 320 ybp. The youngest radiocarbon date obtained from Unit E is 9,370 ± 210 ybp (Quade 1986).

As stated earlier, the LVF contains locally abundant and highly diverse assemblages of fossil vertebrates, mollusks, and ichnofossils that represent both extinct and extant taxa. It is considered highly sensitive under BLM paleontological resource management guidelines (BLM Condition 1, PFYC Class 5) and as reported in the Paleontology Plan (SBCM 2004) and the LVVDB FEIS (BLM 2004a). Specifically, the LVF fauna includes remains of fossil amphibians, such as frogs and toads; reptiles, such as lizards, snakes, and tortoise; birds, including ducks, coots, owls, hawks, and teratorns (an extinct, giant condor–like bird); and a diverse assemblage of mammals. The fossil mammals include small-bodied forms, such as cottontail rabbit, jack rabbit, ground squirrel, marmot, pocket gopher, kangaroo rat, pocket mouse, deer mouse, wood rat, meadow vole, muskrat, badger, and coyote; and large-bodied forms, including possible mountain lion, possible lynx or jaguarundi, North American lion, two species of horse, camel, deer, pronghorn antelope, bison, two species of ground sloth, and Columbian mammoth. Additionally, mollusks, including 11 species of freshwater snails, nine species of land snails, and two species of freshwater clams; cicada burrows; and unidentifiable plant remains are locally preserved (Mawby 1967; Quade 1986; Reynolds et al. 1991; Scott and Cox 2002; Simpson 1933; Springer et al. 2006).

Ongoing paleontological work in the Tule Springs–LVW area by SBCM researchers is providing a picture of the fauna, taphonomy, paleoecology, and paleoenvironments of the Mojave Desert ecoregion during the late Pleistocene. Additionally, it is greatly increasing our understanding of the detailed stratigraphy and depositional environments of the LVF. In addition to the scientific significance of these paleontological resources, the long-term management and preservation of fossils within the CTA study area provide important opportunities for community involvement and education. Ongoing studies will refine the spatial distribution of fossil locations.

Younger Alluvium

Thin layers of late Quaternary younger alluvium (latest Pleistocene to Holocene in age) (Qal in Figure 3.6-1) overlie portions of the LVF within and around the CTA study area. While latest Pleistocene age alluvium has the potential to contain vertebrate fossils, Holocene age alluvium contains only the remains of modern species and is too young to contain fossils. Because no recorded fossil localities are documented within younger alluvium in or near the CTA study area, younger alluvium is considered to have low paleontological sensitivity (BLM Condition 3, PFYC Class 2) within the CTA. As shown in Figure 3.6-1, there are numerous fossil localities that appear in the younger alluvium. Because of the dynamic nature of the wash, the younger alluvium covering the LVF is inconsistent in thickness and varies throughout the area. The fossil localities recorded have all been documented as having been eroded from the LVF.

Ongoing geological mapping of Pleistocene sediments will refine spatial distribution.

3.6.2 Paleontological Records Search

In support of this analysis, paleontological locality and specimen data were obtained from the Regional Paleontological Locality Inventory at the SBCM. Researchers recorded 436 fossil localities within the current CTA study area during the field survey for the Paleontology Plan (SBCM 2004), prepared as part of the LVVDB FEIS. In order to illustrate their geographical distribution throughout the CTA study area, the approximate locations of the fossil localities are shown in Figure 3.6-1. Based on the large number of recorded fossil localities, locally abundant fossils, and highly diverse vertebrate fossil assemblages, the LVF is considered to have high paleontological sensitivity (Table 3.6-1). Because no fossils have been discovered in deposits of younger alluvium within or near the CTA study area, younger alluvium is considered to have low paleontological sensitivity.

Table 3.6-1. BLM and USFS Paleontological Sensitivity Classifications of Geological Units in the CTA Study Area*

Geological Unit	Age	Known Fossils	Sensitivity	BLM Condition	PFYC Class
Las Vegas Formation	Late Pleistocene	Diverse assemblages of amphibians, reptiles, birds, mammals; less diverse mollusks, plants, and ichnofossils.	High	1	5
Younger Alluvium	Latest Pleistocene to Holocene	None recorded in latest Pleistocene age alluvium in the CTA study area; Holocene age deposits are too young to contain fossil remains.	Low	3	2

* See Appendices D and E for details of the BLM Conditions (BLM 1998b) and USFS PFYC (USFS 1996), respectively.

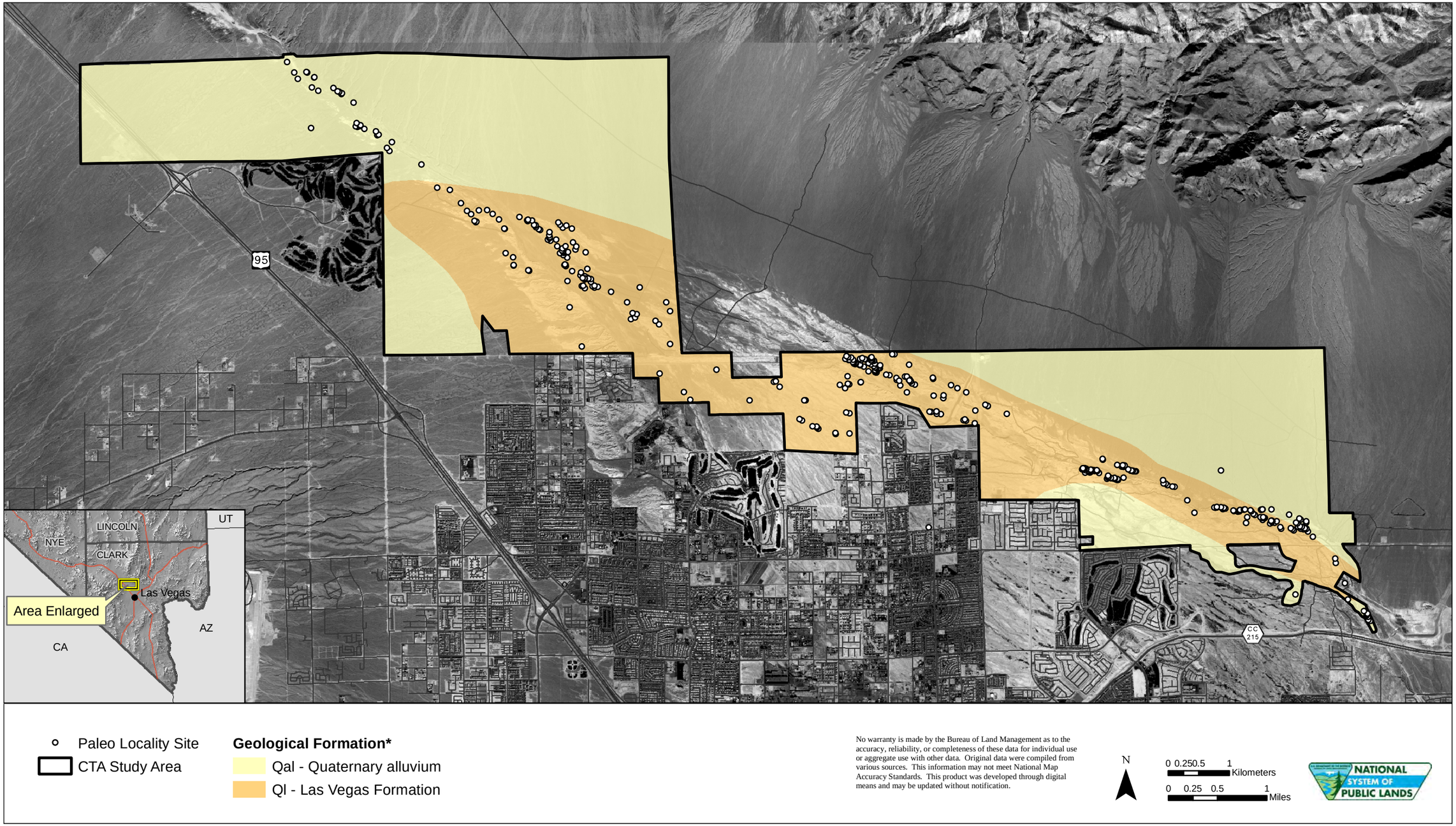

Figure 3.6-1. Geology of the Las Vegas Formation.

3.7 VISUAL RESOURCES

Visual resources (the landscape) consist of land forms (topography and soils), vegetation, bodies of water (lakes, streams, and rivers), and human-made structures (roads, buildings and other structures, and modifications of the land, vegetation, and water). These elements of the landscape can be described in terms of form, line, color, and texture. Usually, the more variety of these elements a landscape has, the more interesting or scenic the landscape becomes if the elements co-exist harmoniously. The BLM manages landscapes that require varying levels of protection and modification, giving consideration to the uses and values of other resources and the scenic quality of the landscape.

3.7.1 Existing Visual Conditions

Area of Influence

The CTA study area is located at the upper end of the LVV, which is in the Great Basin region of the Basin and Range Physiographic Province. The LVV is an intermountain valley, generally surrounded by north-south-trending mountain ranges. The LVV is bordered to the north by the Las Vegas and Sheep ranges, to the east by the Frenchman and River mountains, to the south by the McCullough and Bird Spring ranges, and to the west by the Spring Mountains. Generally, these mountain ranges rise between 1,500 and 7,000 feet above the valley floor, except for the portion of Spring Mountains that is at Mount Charleston, which rises to 12,000 feet.

The LVV is generally flat, sloping to the southeast at a grade of less than 1%. The valley floor is formed by a series of coalescing alluvial fans and drainages. The LVW and its tributaries form the active drainage system in the LVV, discharging into Lake Mead south of the Frenchman Mountains.

Much of the LVV has been modified by the growth and development of the Las Vegas metropolitan area, surrounding communities, and Nellis Air Force Base. Typical viewpoints of the valley are from U.S. Highways 93 and 95, Interstates 15, 215, and 515, and numerous state highways crossing the valley and adjacent mountain ranges and from adjacent recreation and natural areas, including Red Rock Canyon NCA, Sloan Canyon NCA, Toiyabe National Forest, DNWR, Lake Mead National Recreation Area (NRA), Sunrise Mountain Natural Area, and others.

Upper Las Vegas Wash Conservation Transfer Area

The CTA study area lies in the northern portion of the LVV. The CTA study area is characterized by the floodplain of the ULVW and the adjacent alluvial fans (bajadas), which slope gently from the nearby mountain ranges to the wash.

Vegetation in the CTA study area is typical of the lower elevations of the Mojave Desert and includes Mojave creosote bush scrub, desert saltbush scrub, and Mojave wash scrub vegetation communities. Common plants in the Mojave creosote bush scrub community include creosote bush, white bursage, and cactus and yucca species. Common plants in the desert saltbush scrub community include cattle saltbush and fourwing saltbush. The Mojave wash scrub community is found along washes and arroyos and commonly includes catclaw acacia and desert willow (*Chilopsis linearis*). This community is often mixed with the creosote bush scrub community. Generally, the vegetation is continuous across the CTA study area, widely spaced, and 2 to 8 feet tall.

Common riparian vegetation found along the ULVW includes desert willow, mesquite, cottonwood (*Populus fremontii*), and saltcedar. Because of the presence of water, vegetation along the wash is taller (2–30 feet tall) and more dense.

There are no permanent bodies of water present in the CTA study area. The CTA study area, however, is drained by the ULVW and Range Wash, two ephemeral washes that typically flow only after substantial rainfall events. Following these infrequent events, water may pool for short periods (from a few days to a couple of weeks) behind the Decatur detention basin, which is located within the ULVW in the CTA study area.

The landscape of the CTA study area has remained largely unmodified by human development; however, roads, power lines, and flood control structures have altered parts of the CTA study area. Most of the development is near the ULVW, particularly to the south of the wash. In the southeastern portion of the CTA study area, two power lines enter the property from the east, following the Grand Teton Road alignment. A 230-kV power line follows the Grand Teton Road alignment west to Decatur Boulevard. There, the line turns north, following Decatur Boulevard to the Moccasin Road alignment. At that intersection, the 230-kV line turns west and follows Moccasin Road until it leaves the CTA study area and crosses U.S. Highway 95. A 500-kV power line parallels the 230-kV line for a short distance along the Grand Teton Road alignment in the southeastern part of the CTA study area; it then branches northwest across the CTA study area, roughly following the ULVW to the Moccasin Road alignment. There, the 500-kV line also follows Moccasin Road west across the southern edge of the CTA study area, leaving the CTA study area just east of U.S. Highway 95.

The Grand Teton Road alignment (an east-west dirt road) crosses the southeastern portion of the CTA study area near the Eglington Preserve. Grand Teton Road is currently under construction to become a paved road. The Decatur Boulevard alignment (a north-south dirt road) crosses the central part of the CTA study area and intersects the Moccasin Road alignment. South of this intersection is the Decatur detention basin in the ULVW. Also in this location, the City of North Las Vegas has constructed a large water-storage tank (about 20 feet tall × 50 feet in diameter) surrounded by a brick wall. A second storage tank is under construction.

A concrete levy has been constructed in the wash upstream of the Decatur detention basin to protect residential areas south of the wash.

While some parts of the CTA study area have been modified by the above-described activities, the southeastern portion of the CTA study area—north of the ULVW and 500-kV power line—is undeveloped. The northwestern part of the CTA study area—west of the Clark County Shooting Park and north of Moccasin Road—is undeveloped. South and west of the LVW, a 7.2-kV transmission line crosses the CTA study area in a southeast-northwest direction. The lands to the northeast—between the 7.2-kV transmission line/LVW and DNWR—are undeveloped. In the background, the wildlife refuge enhances the sense of a large, natural, undeveloped landscape for visitors looking north into the CTA study area. As shown in Figure 3.8-1, U.S. Highway 95 crosses the extreme western portion of the CTA study area north of the Paiute Reservation.

3.7.2 Bureau of Land Management Direction

BLM sets objectives for management of landscape preservation and change through its land use planning process. All lands are placed into one of four classes, Classes I through IV. These classes identify the degree of acceptable landscape change, or alteration, giving consideration to the scenic value of the landscape and other resource values and uses of the land. Class I objectives are established in areas in which no landscape change is desired. Class IV objectives are set for landscapes that BLM manages for uses that will result in substantial landscape changes (e.g., mining, energy development, wind farms). Classes II and III allow for degrees of landscape preservation and change that are between those of Classes I and IV.

The VRM class objectives for the CTA study area were established in the Las Vegas RMP (BLM 1998a). All the lands in the CTA study area have been allocated to VRM Class III management objectives. The objective of Class III is to partially retain the existing character of the landscape. The level of change to the landscape can be moderate, and management activities may attract attention but should not dominate the view. Changes in the landscape should repeat the basic elements found in the predominant natural features of the characteristic landscape.

3.8 LAND USE

3.8.1 Land Ownership

Clark County covers 5.12 million acres of land, approximately 90% of which is under the administration and control of six federal agencies. BLM manages the majority (57%, or 2.9 million acres) of the federal land; National Park Service (NPS), USFWS, USFS, Bureau of Reclamation, and U.S. Air Force manage the other 33%. State and local governments and private and commercial owners hold the remaining 10%, or fewer than 500,000 acres, of land in Clark County. All lands within the CTA study area are BLM administered. Ownership and administration of the lands surrounding the CTA study area include federal (BLM and USFWS), state, and city governments, as well as private interests and tribal lands.

3.8.2 Land Use Planning

The LVV includes 13 community planning areas that have set goals and policies to guide future land use and development throughout the LVV. In the incorporated areas, land use planning decisions are created and approved by the Cities of North Las Vegas, Las Vegas, and Henderson. The town advisory boards of unincorporated areas of Clark County draft plans that are reviewed and approved by the Board of County Commissioners for incorporation into the *Clark County Comprehensive Master Plan* (Clark County 2001). CCRFCD guides planning in flood hazard areas throughout the LVV. The *Clark County Master Plan Update* (Clark County 2002) identifies the type and location of proposed flood control facilities.

The *City of Las Vegas Master Plan 2020* (City of Las Vegas 2006c) describes a vision of a recreation corridor and neighborhood park system along the LVW. Features such as paved walkways, play and picnic areas, landscaping, and restrooms are planned for the corridor. The Las Vegas Wash Trail would ultimately extend for approximately 20 miles and cross the CTA study area, stretching from Floyd Lamb Park to Lake Mead NRA.

Land use categories (or classifications) are generally determined by the local governments that have jurisdiction over the land. These categories are tools that provide a standard language in the community planning process to derive a land use plan. Clark County has 20 land use categories. The majority of the BLM-managed lands within the CTA study area fall within a community land use plan. For transportation planning, the Regional Transportation Commission of Southern Nevada (RTC) uses 27 planned development land use categories within these planning areas (RTC 2002). These land use categories were regrouped into nine land development or end-use groups, as follows:

- Single-family housing
- Multi-family housing
- Office buildings
- Retail space
- Hotels and casinos
- Light industry
- Religious facilities
- Public facilities
- Recreation and open space

3.8.3 Current Land Uses

The majority of BLM-administered lands in the CTA study area are vacant. Some of these lands are encumbered by ROWs, leases, permits, or mining claims. Other public lands in the CTA study area are leased for recreation and other public purposes under the R&PP Act.

A ROW allows the use of a specific piece of public land for specific facilities and for a specific period. The majority of the ROWs are authorized under Title V of the FLPMA, as amended, for structures, pipelines, and facilities to store and transport water, sewer, electrical, and communications systems; for flood control facilities; and for highways, roads, railroads, and other means of transportation. Other ROWs are also issued for natural gas pipelines under the MLA, as amended. BLM also grants ROWs to the Nevada Department of Transportation (NDOT) for mineral material sites that provide sand and gravel for road maintenance and construction. The BLM objective for ROW management is to meet public demand and reduce impacts to sensitive resources by providing an orderly system of development for linear projects and related facilities.

Recognizing the strong public need for a nationwide system of parks and other recreation and public purpose areas, in 1926 Congress enacted the R&PP Act, as amended [43 CFR 2740.03]. The R&PP Act authorizes the lease or conveyance of public lands (not including a $100 filing fee) for recreation uses by government entities or at reduced cost for public purposes to state and local governments and qualified non-profit organizations. Leases and patents granted under the R&PP Act require that the land continue to be used for the stated purpose. Counties, cities, and other political subdivisions of a state and nonprofit organizations may purchase up to 6,400 acres a year for recreation purposes and an additional 640 acres for other public purposes. Common R&PP Act leases include parks, community centers, schools, libraries, fire stations, public golf courses, law enforcement facilities, flood control detention basins, and sewage treatment facilities. The average lease size is 15 to 40 acres, with larger regional parks averaging 100 acres or more.

Government land records, such as master title plats, were reviewed to determine existing authorized uses of the public lands in the CTA study area. Table 3.8-1 provides a list of existing ROWs and R&PP Act leases, with a brief description of each authorization, while Figure 3.8-1 depicts these land uses. Table 3.8-2 provides a list of pending ROWs and leases for proposed uses of the CTA study area. A decision on these proposals will be made as a part of this SEIS process. There are no expired ROWs or leases that are planned for reauthorization. As part of the LVVDB, lands in the CTA study area have been withdrawn from entry under the public land and minerals laws. There is no livestock grazing in the CTA study area.

In addition to the authorized land uses identified in Table 3.8-1, lands in the CTA study area are popular with residents and visitors to the area for outdoor recreation uses, including hiking, horseback riding, back-country driving, mountain biking, natural history and cultural resource study, and sightseeing. Lands in Eglington Preserve (in the southeastern portion of the CTA) are managed for the protection of sensitive native plants.

Uses of notable lands adjacent to the CTA study area also influence how lands in the CTA study area are used. Floyd Lamb Park, on the southern boundary of the CTA study area, is a popular recreation destination for residents and visitors to the LVV. Adjacent public lands in the CTA study area are leased for recreation purposes to complement the purposes of Floyd Lamb Park. Thus, the residents and visitors use adjacent public lands in the CTA study area for similar recreation purposes. Tule Springs is listed in the NRHP for its role in the history of American archaeology and the study of early humans and Pleistocene fauna. Its cultural and paleontological resource values attract scientists and visitors to the CTA study area. The Las Vegas Paiute Tribe manages three golf courses on the Paiute Reservation, adjacent to the northwestern portion of the CTA study area.

Table 3.8-1. Existing Authorized Uses in the Upper Las Vegas Wash CTA Study Area

Serial No.	Description	Legal Description (Township, Range, Section)
Nev-043546	Transmission line ROW, 100 feet, Nevada Energy (NV Energy)	T18S, R59E, S22
CC-018191	U.S. Highway 95 ROW, 400 feet, NDOT	T18S, R59E, S22
N-54351	Fiber-optic line, 20 feet, U.S. Air Force	T18S, R59E, S22 T19S, R61E, S15, 16
N-73706	Fiber-optic facilities ROW, 20 feet, consolidates N-59276 and CC-021488, Nevada Bell	T18S, R59E, S22
Nev-055903	Transmission line ROW, 100 feet, NV Energy	T18S, R59E, S23, 24
Nev-055903	Transmission line ROW, 60 feet, NV Energy	T18S, R60E, S30–32
N-78142	Moccasin Road between Ft. Apache/Durango, sewer, and drainage ROW, varying width, City of Las Vegas	T18S, R60E, S31–33
N-83860	Road, drainage, sewage and streetscapes ROW, Kyle Canyon Gateway area	T18S, R60E, S31, 32
N-83860-01	Short-term construction area for road, drainage and sewage ROW, Kyle Canyon Gateway area	T18S, R60E, S31
N-53584	Decatur detention basin ROW, City of North Las Vegas	T19S, R60E, S1
N-76357	Decatur Boulevard and Aliante Parkway road, water, sewer, and drainage ROW, varying width, City of North Las Vegas	T19S, R60E, S1 T19S, R61E, S7, 8, 16
N-42592	230-kV power line ROW, varying width, NV Energy	T19S, R60E, S1–4 T19S, R61E, S6, 7, 15, 16
N-75025	500-kV power line ROW, 200 feet, NV Energy	T19S, R60E, S1–4 T19S, R61E, S6, 8, 9, 15, 16
N-75060	Fiber-optic line, 10 feet, NV Energy	T19S, R60E, S1–4 T19S, R61E, S6, 8, 9, 15, 16
N-76432	Fiber-optic line, varying width, NV Energy	T19S, R60E, S1–4 T19S, R61E, S15, 16
N-62830	R&PP Act lease, recreational park, 246.31 acres (in the CTA), City of Las Vegas	T19S, R60E, S2
N-76844	15-kV underground distribution line, varying width, NV Energy	T19S, R60E, S2
N-36876-01	R&PP Act lease, recreational park, 742.03 acres (in the CTA), assignment of lease from State of Nevada to City of Las Vegas	T19S, R60E, S2–4
N-29832	Road and sewer line ROW, varying width, City of Las Vegas	T19S, R60E, S3
N-77820	Two 7.5-million-gallon reservoirs, 10 acres; and pipeline ROW, 50 feet, Moccasin/Durango, City of North Las Vegas	T19S, R61E, S6
N-49747-01	R&PP Act lease, urban park facilities, 163.08 acres (in the CTA), City of North Las Vegas	T19S, R61E, S7
N-59611	Road ROW, varying width, City of North Las Vegas	T19S, R61E, S7
N-65720	Water pipeline ROW, 10 feet, Southern Nevada Water Authority (SNWA)	T19S, R61E, S7
N-80965	Pump station ROW, varying width, NV Energy	T19S, R61E, S7
N-82313	Fiber-optic line ROW, 10 feet, Central Telephone Company	T19S, R61E, S7
N-76304	Fiber-optic line ROW, 10 feet, NV Energy	T19S, R61E, S8
N-76305	Grand Teton substation, transmission line, and road ROW, varying width, NV Energy	T19S, R61E, S8
N-77675	Underground telephone facilities ROW, 10 feet, Central Telephone Company	T19S, R61E, S8
N-83310	Grand Teton Drive road, drainage and sewer utilities ROW, varying width, City of North Las Vegas	T19S, R61E, S10, 15, 16
N-66225	Water pipeline, varying width, SNWA	T19S, R61E, S8, 17

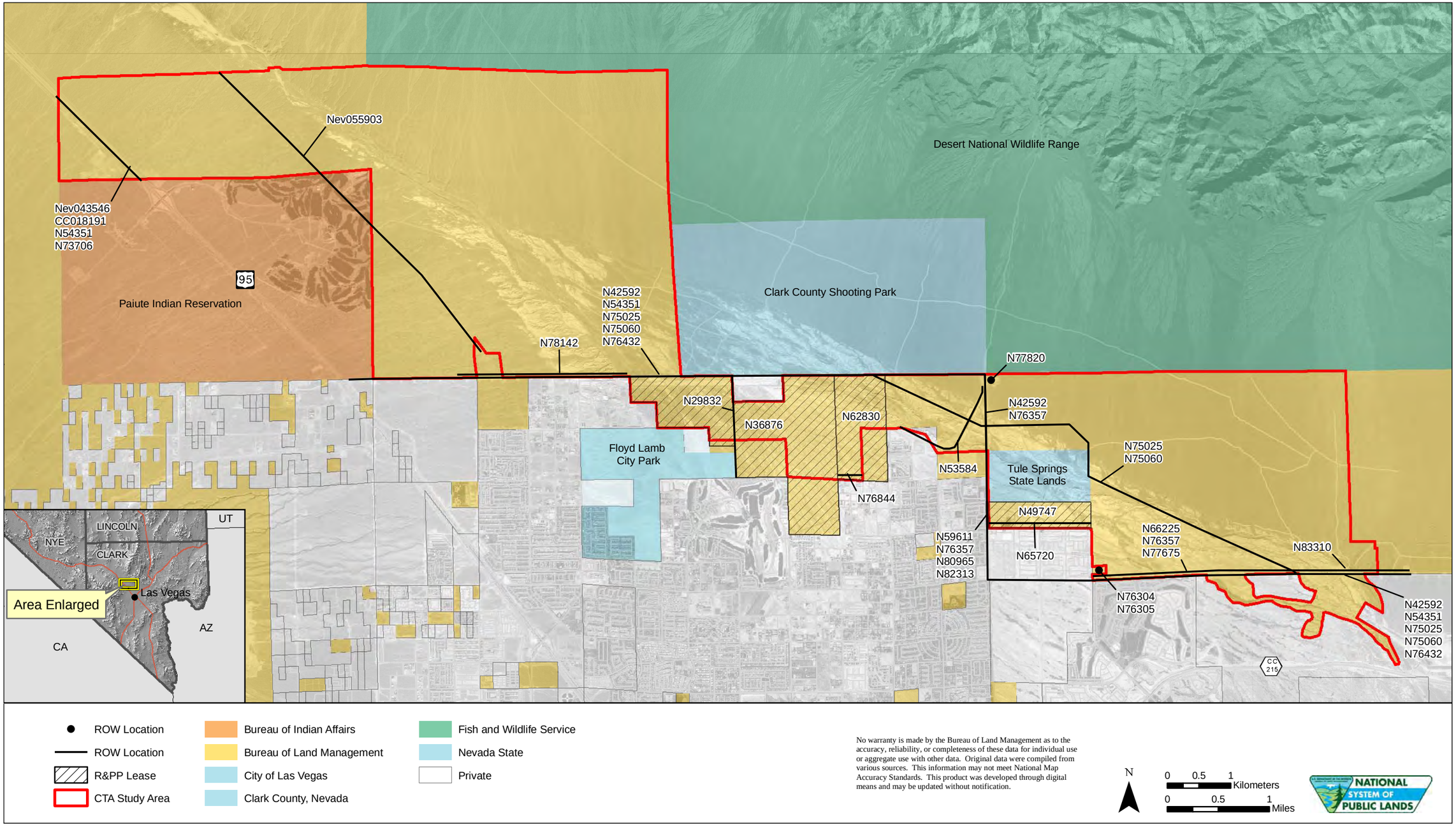

Figure 3.8-1. Existing rights-of-way and Recreation and Public Purposes Act leases in the Conservation Transfer Area study area.

Table 3.8-2. Pending Authorized Uses in the Upper Las Vegas Wash CTA Study Area

Serial No.	Description	Legal Description (Township, Range, Section)	Comments
N-58546	Perimeter fencing ROW, Las Vegas Paiute Tribe	T18S, R59E, S22–24 T18S, R60E, S19, 30, 31	
N78395-01	Three Lakes Project ROW temporary-use permit, SNWA	T18S, R59E, S22	
N-83498	Fiber-optic cable ROW, NV Energy	T18S, R59E, S22	
N-83499	230-/138-kV transmission line ROW, NV Energy	T18S, R59E, S22	
N-83499-01	Short-term workspace for electrical line ROW, NV Energy	T18S, R59E, S22	
N-37233	Water retention basin ROW, City of Las Vegas	T18S, R60E, S33	
N-77772	Sheep Mountain Parkway (formerly Mountain Edge Parkway) ROW, City of Las Vegas	T18S, R60E, S31–33 T19S, R60E, S1–4 T19S, R61E, S3–6, 8–10	
N-36876-01	Floyd Lamb, sale of 1,041 acres to the City of Las Vegas	T19S, R60E, S2–4	R&PP Act lease has been issued (see Table 3.8-1), but the patent to the City of Las Vegas is pending.
N-53584	Reservoir ROW and interception berm (diversion dike), City of North Las Vegas	T19S, R60E, S1, 3, 4	Partial ROW issued (see Table 3.8-1).
N-62830-01	Floyd Lamb Park, sale of 320 acres to the City of Las Vegas	T19S, R60E, S2	R&PP Act lease has been issued (see Table 3.8-1), but the patent to the City of Las Vegas is pending.
N-77820	Two 7.5-million-gallon reservoirs and pipeline ROW, City of North Las Vegas	T19S, R61E, S6	Original ROW issued (see Table 3.8-1). This is a request for additional lands to be added to the ROW for pipeline and road expansion.

3.9 RECREATION

A number of recreation opportunities are provided by local, state, and federal agencies on public lands within and adjacent to the CTA study area. These recreation activities include both casual, dispersed uses as well as organized events for which BLM issues use permits. Typical dispersed recreation in the CTA study area includes picnicking, biking, hiking, jogging, and horseback riding. There are several user-created routes but no formally established trails. BLM is interested in establishing designated non-motorized trails for hikers, equestrians, and bicyclists (personal communication, Mark Sanchez 2007).

BLM defines recreation value through the Recreation Opportunity Spectrum (ROS). The ROS represents a process in which 1) the recreation opportunities in an area are identified based on the area's setting and activities; and 2) the area is then assigned to one of five categories that define management objectives. In terms of recreation, BLM lands in the LVV are categorized as modern urban with rural; roaded natural; semi-primitive motorized; or semi-primitive non-motorized.

3.9.1 Recreation Areas

There are a number of local recreation and conservation areas under federal and state management adjacent to and near the CTA study area (Figure 3.9-1). In addition to BLM, managing agencies include USFWS, USFS, NPS, and Nevada Division of State Parks.

BLM records and tracks the visitor data through the Recreational Management Information System. Visitor use is based on actual numbers where available, such as traffic counts at Red Rock Canyon NCA or at OHV events at Nellis Dunes. Otherwise, visitor use is compiled on the basis of BLM's knowledge and professional estimates for specific activities and locations.

Recreation Sites within or adjacent to the Conservation Transfer Area Study Area

Las Vegas Special Recreation Management Area encompasses the CTA study area. The objective of the Las Vegas Valley Special Recreation Management Area is to coordinate with county and city governments to facilitate the provision of open space areas, recreational trails, and parks for LVV residents (BLM 1998b). Floyd Lamb Park, originally known as Tule Springs, is located in the south-central part of the CTA study area. Floyd Lamb is a natural park unique to the typical Las Vegas urban experience and provides opportunities for picnicking, hiking, biking, horseback riding, fishing, wildlife viewing, and historic sightseeing. The 680-acre Floyd Lamb Park has seen several owners and caretakers over the years and was most recently owned by Nevada Division of State Parks Department of Conservation and Natural Resources. In July 2007, the park and all leased lands and water rights were transferred to the City of Las Vegas. The transfer included preparation of a master plan for the park that ensures that Floyd Lamb Park and the adjoining 1,361 acres of BLM lands (R&PP Act lease land) are used only for recreation, conservation, and critical municipal infrastructure purposes. Nearly 200,000 people visit Floyd Lamb Park annually; most daily visitors are local residents who wish to retreat from the pace of urban life. There is a fee to enter the park, which includes a variety of recreation facilities, the historic Tule Springs Ranch, an equestrian park, the Las Vegas Gun Club shooting range, and a nursery run by the NDF (City of Las Vegas 2007a).

Managed by Clark County Parks and Recreation, Clark County Shooting Park began construction in October 2007, and Phase I is anticipated to be completed in fall 2009. Clark County Shooting Park is intended to provide venues for rifle, pistol, shotgun, and archery shooting, informal daily and event shooting opportunities, firearms safety training and skill development, hunter education, and conservation education programs. In addition, there will be a specialized "tourism range" for group shooting activities and classrooms for conferences (Clark County 2007).

Willie McCool Regional Park, leased from BLM, is a relatively remote site (Southern Nevada Regional Planning Coalition 2006). The 160-acre facility is surrounded by open desert to the north and east and is used as both a model airplane flying field and a trial nursery. Residents frequently use this park to fly model airplanes, and special meets and competitions are regularly sponsored by various clubs and organizations. Apart from the model airplanes, the University of Nevada–Reno and the Cooperative Extension Service have an experimental nursery to test water usage and the adaptability of non-native plants to the harsh desert climate. There is a significant amount of unused land in this park (City of North Las Vegas 2007a). Plans for the park detail a fully developed regional park with sports fields, picnic sites, playgrounds, park lighting, and other amenities. The total cost of these improvements is estimated at $25 million, paid through proceeds from the SNPLMA.

The DNWR is part of the National Wildlife Refuge (NWR) Complex, which includes Pahranagat NWR, Ash Meadows NWR, Moapa Valley NWR, and Amargosa Pupfish Station, and is located directly north

of the CTA study area. The largest NWR in the lower 48 states, DNWR includes the Sheep Mountain Range and supports habitat for desert bighorn sheep and other species. Recreation opportunities include camping, hiking, backpacking, bird watching, horseback riding, and OHV use on existing roads and trails for pleasure. Limited hunting for desert bighorn sheep is permitted once a year between November and January.

USFWS is in the compliance phase of a proposed new visitor center and administrative complex at the Corn Creek Field Station, which would accommodate more than 100,000 visitors annually. Corn Creek serves as the main entrance to DNWR and contains staff offices, a visitor contact station, and an information kiosk. Other facilities associated with the new building, such as parking areas, roads, utilities, and infrastructure, would also be improved or constructed. Additionally, USFWS would expand and improve some of the trails through the Corn Creek Springs area and provide new visitor opportunities. The new visitor center would be constructed at the field station in the same location as the existing visitor contact station, kiosk, and restrooms and would be designed to meet Leadership in Energy and Environmental Design standards. New parking areas and road improvements would be completed south of the existing facilities in desert upland habitat. Habitat rehabilitation would occur throughout the Corn Creek Springs area.

REGIONAL RECREATION SITES

Red Rock Canyon NCA is located along the west side of the CTA study area. Recreation activities include sightseeing, climbing, hiking, biking, and interpretive programs sponsored by BLM. Desert bighorn sheep hunting on a tag basis, managed by the Nevada Department of Wildlife, is allowed once a year between November and January above an elevation of 5,000 feet. Red Rock NCA contains the only developed campground managed by BLM in the LVV. The Spring Mountain Ranch State Park is located within Red Rock Canyon NCA. Recreation opportunities include picnicking, historic tours, living history programs, and summer theater programs.

The Sloan Canyon NCA is located south of Las Vegas and is managed by BLM. This area contains unique scenery, geological features, and cultural resource values. Recreation activities include hiking and viewing archeological, biological, and geological resources. Designated an NCA in 2002, the management of the area is in the planning process.

The 40,000-acre Sunrise Management Area is to the east of the CTA study area and includes the Frenchman-Sunrise Mountain Natural Area. This area was designated the Rainbow Garden Area of Critical Environmental Concern (ACEC) for its unique geological, biological, and scenic values. Recreation activities include backpacking, picnicking, hiking, biking, and rock hounding.

BLM-managed Nellis Dunes Recreation Area is to the northeast of the CTA study area. Nellis Dunes Recreation Area is a popular recreation site for casual use by OHV enthusiasts.

The Spring Mountain NRA is to the northwest of Las Vegas and is part of the Humboldt-Toiyabe National Forest. The area is locally referred to as Mt. Charleston. Recreation opportunities include hiking, camping, climbing, snow skiing, snowboarding, sightseeing, OHV use for pleasure, picnicking, and bird watching.

Lake Mead NRA is a popular visitor and water recreation destination. It is to the east of Las Vegas near Boulder City. The recreation area has 200,000 surface acres of water and 950 miles of shoreline on Lakes Mead and Mojave. Recreation opportunities include boating, fishing, water skiing, personal watercraft use, diving, parasailing, picnicking, camping, and isolated back-country use. Table 3.9-1 gives all regional recreation sites.

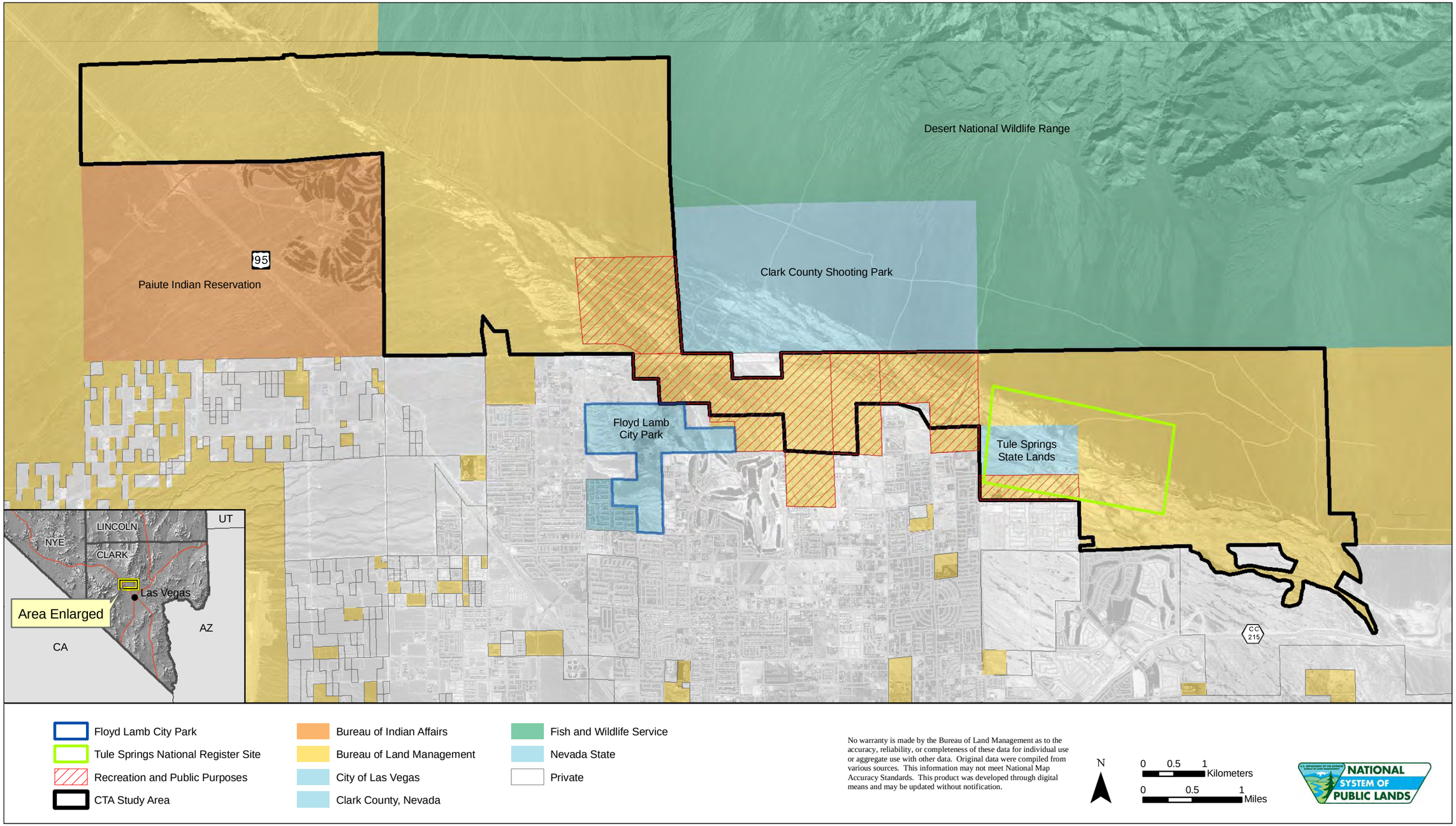

Figure 3.9-1. Regional recreation sites.

Table 3.9-1. Regional Recreation Sites

Name	Agency	Size
Red Rock Canyon National Conservation Area	BLM	195,819 acres
Sloan Canyon National Conservation Area	BLM	48,438 acres
Sunrise Management Area	BLM	40,000 acres
Nellis Dunes National Recreation Area	BLM	10,181 acres
Spring Mountain National Recreation Area	USFS	316,000 acres
Lake Mead National Recreation Area	NPS	1.5 million acres of land, 200,000 acres of surface water, and 950 miles of shoreline

OFF-HIGHWAY VEHICLE USE

Management of OHV activities by federal agencies on public lands is intended to conserve soil, wildlife, water quality, native vegetation, air quality, and cultural resources while providing appropriate recreational opportunities and promoting the safety of all users. The use of OHVs on BLM lands has increased in popularity in recent years and accounts for more than 4 million visitor-hours throughout the jurisdiction of the BLM Las Vegas Field Office (BLM 1998a). The term OHV refers to a motorized vehicle that is capable of off-highway travel and includes both street-legal, licensed vehicles (dual-sport motorcycles, 4×4 vehicles, sport-utility vehicles) and all-terrain vehicles and dirt motorcycles that are not street legal or licensed (BLM 2004a).

Off-highway access is designated in order to protect resources and the landscape from damage, ensure public safety, and minimize conflicts between users. The three main designations are “open,” “limited,” or “closed” to OHV use (Table 3.9-2). Designations are made through the land use planning process and are updated and revised as necessary to meet resource management objectives and to mitigate OHV-related impacts.

Table 3.9-2. Bureau of Land Management Off-Highway Vehicle Use Designations

Open	Area of intensive OHV use, with no resource, user, or public safety conflicts.
	Vehicle travel permitted both on and off roads.
	Vehicle must be operated responsibly and must not cause significant damage to resources or affect other authorized uses of public land.
	Restricted OHV use to meet specific resource management objectives.
	Vehicle travel permitted only on existing roads and trails in existence prior to the designation.
Limited	Vehicle travel permitted only on designated roads and trails that are identified, signed, and mapped by BLM.
	Vehicle travel limited by number and type of vehicle.
	Vehicle travel limited by time or season.
	Vehicle travel limited to licensed or permitted use.
	Prohibited OHV use to protect resources, ensure visitor safety, and reduce conflicts.
Closed	Vehicle travel not allowed either on or off roads or trails.
	Access by non-motorized vehicle is generally allowed.

Operators of OHVs must comply with Nevada laws and federal regulations when on public lands. Use is limited to existing or designated roads and trails on lands within and adjacent to the CTA study area. Illegal OHV traffic, particularly dirt-bike riding, in the CTA study area is common and is a legitimate concern for BLM land managers.

PUBLIC TRAILS SYSTEM

The Southern Nevada Regional Planning Coalition, represented by Clark County, the Clark County School District, and the Cities of Las Vegas, North Las Vegas, Henderson, and Boulder City, developed a plan for a system of interconnected trails throughout the LVV. The plan addresses 1) primary urban trail corridors that follow highways, utility ROWs, flood control facilities, and natural features, such as desert washes and ridge lines; and 2) secondary trails that are integrated into existing and planned public infrastructure and ROWs. The locations of primary and secondary trails were selected on the basis of the trails' ability to connect to federal lands.

The SNPLMA allocated funds for development of parks, trails, and natural areas in Clark County. Between 1999 and 2003, approximately $75 million was allocated to the trail system in Clark County. An additional $57 million was allocated to Clark County Wetlands Park, which includes an extensive public trails system.

The City of North Las Vegas has secured initial funds in the amount of $500,000 from Congress through SNPLMA for a multi-use pedestrian pathway along the ULVW as part of the regional and local trail system linking the residents of North Las Vegas and other jurisdictions to the DNWR, BLM Sunrise Management Area, Las Vegas Wetlands Park, Red Rock NCA, and Lake Mead NRA. The first linkage to this multi-use trail system consists of 8.5 miles of trails that follow the Western Tributary of the LVW from the intersection of the 215 Beltway and Lake Mead Boulevard. The second linkage in this trail system entails a 6-mile trail that runs north from Interstate 15 for approximately 6 miles to reach the North Las Vegas detention basin. From this detention basin, the trail continues east, providing a possible connection to DNWR. The initial funding was followed by a second set of funds from Congress through SNPLMA in the amount of $7.6 million for the second phase of the trail, which would provide trailheads and allow for the purchase of ROW and trail node areas, construction of pedestrian crossings and bridges, trail or park elements, and amenities, along with trail development and landscaping. It is anticipated that completion of the trail would occur during this phase, although a third phase may be required.

A portion of the ROW purchase was funded previously, and funding for construction in the ROW was approved. This funding is another significant step in the larger vision of a recreation corridor and neighborhood park system along the LVW, which are goals in the *City of Las Vegas Master Plan 2020* (City of Las Vegas 2006c). Features such as paved walkways, play and picnic areas, landscaping, and restrooms are planned for the corridor. The Las Vegas Wash Trail would ultimately extend for approximately 20 miles and cross the CTA study area, stretching from Floyd Lamb Park to Lake Mead NRA.

3.10 TRANSPORTATION

The Las Vegas metropolitan area has the fastest-growing population in the nation, with an increase of nearly 25% between 2000 and 2006. The current population is approximately 1.8 million (U.S. Census Bureau [Census Bureau] 2006). The metropolitan area consists of the Cities of Las Vegas, Henderson, North Las Vegas, Boulder City, and other unincorporated locales. A large network of roadways serves the transportation and travel needs within the LVV, which are coordinated by the RTC. As the LVV grows, transportation needs to be planned and managed.

3.10.1 Transportation Infrastructure

The CTA study area is at the north end of the LVV. U.S. Highway 95 passes through the northwest corner of the CTA study area. No other paved streets or roads occur within the CTA study area. The 215 Beltway (also known as Clark County Highway 215) is approximately 1.5 miles south of the CTA study area. Travel routes to and within the CTA study area consist primarily of graded dirt and include Moccasin Road, Decatur Boulevard, Aliante Parkway, Horse Drive, and Grand Teton Drive (Figure 3.10-1). Streets and roads in LVV are generally classified according to basic use, design, and function. Table 3.10-1 gives classifications for streets and roads that occur near the CTA study area.

There is a network of ways within the CTA study area that have been created by repeated casual vehicle use. These ways are not classified and do not access allowable uses or ROWs within the CTA study area.

The most significant travel corridor adjacent to the CTA study area is U.S. Highway 95. It is a four-lane, divided, limited-access freeway, and it is used as both a major interstate transportation route and a local and regional transportation route to access the communities of northwest LVV and in other parts of Nevada, such as Indian Springs. There are full-access interchanges at both Paiute Way and North Durango Drive. U.S. Highway 95 crosses approximately 1.2 miles of northwest corner of the CTA study area, but there is no direct access from U.S. Highway 95 to the CTA study area.

The 215 Beltway is a 53-mile-long roadway that encircles much of the western portion of the LVV. The beltway currently functions as three different road types: a four-lane divided freeway, a four-lane limited access expressway, and a four-lane frontage road. The beltway is an interstate highway that runs from the Interstate 515 interchange in Henderson to Charleston Boulevard in western Las Vegas. The 215 Beltway passes through the following cities and towns in the LVV:

- Las Vegas
- North Las Vegas
- Summerlin South
- Spring Valley
- Henderson

Vehicle Traffic

Traffic in the project area has become progressively more congested over time. Table 3.10-2 gives the average annual daily traffic (ADT) between 2004 and 2006. The growing population of the Las Vegas metropolitan area has led to an increase in the number of drivers using the roadways.

The Texas Transportation Institute (TTI), part of Texas A&M University, publishes the annual Urban Mobility Report. This report includes Las Vegas and shows how the city's growth trends compare with traffic congestion. The number of rush hours—times at which congestion is occurring—in Las Vegas increased from 7.4 to 7.8 hours between 2000 and 2005 (TTI 2005). Another measure calculated in the Urban Mobility Report is the Travel Time Index, which compares peak-period travel with free-flowing travel. It is a measure of congestion that focuses on each trip and each mile of travel. The Travel Time Index for Las Vegas in 2005 was 1.3, making it No. 18 out of the 68 urban areas measured (TTI 2005). A value of 1.3 means a 20-minute free-flowing trip would take 26 minutes during peak congestion times.

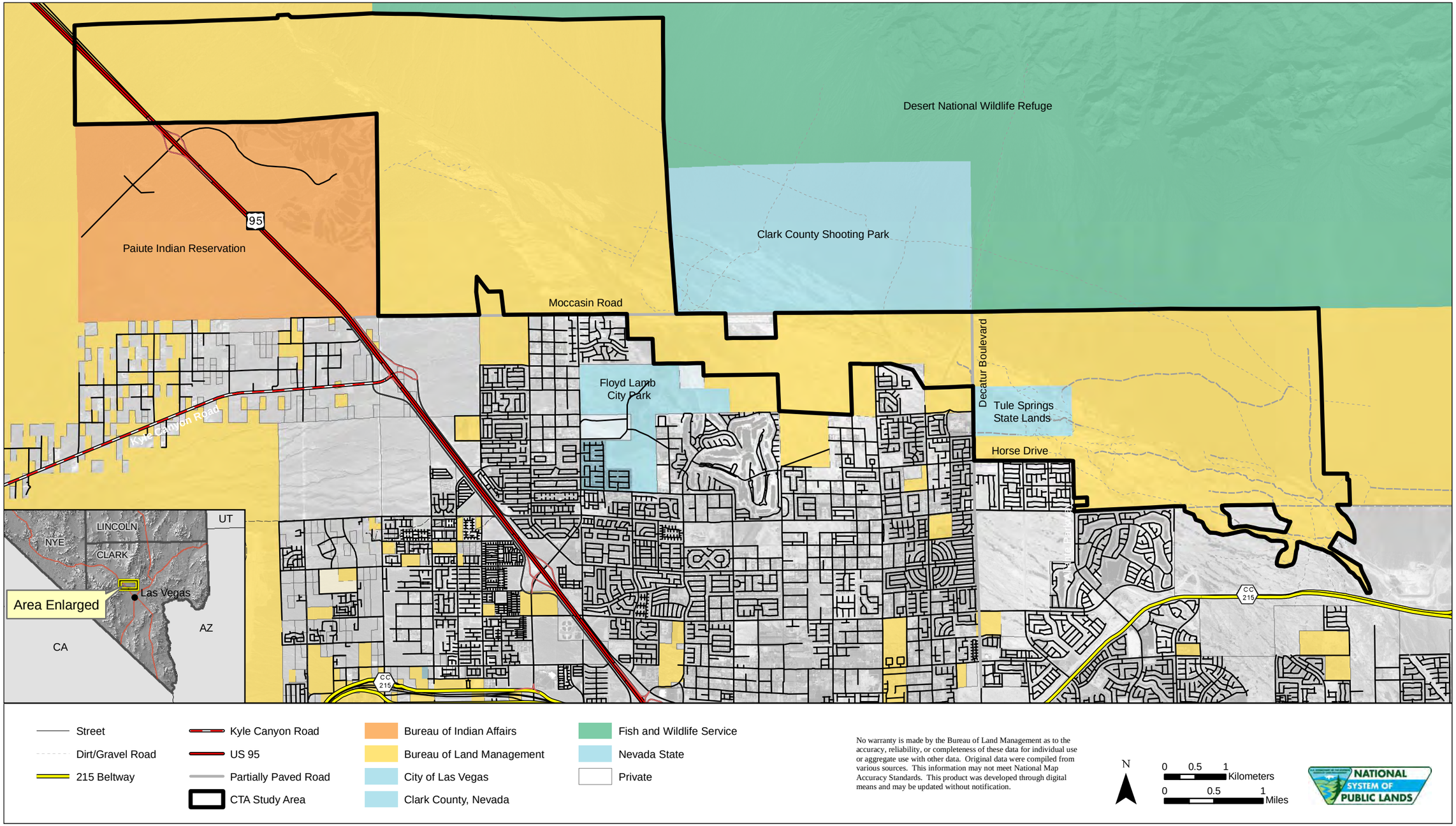

Figure 3.10-1. Transportation infrastructure in the Conservation Transfer Area study area.

Table 3.10-1. Roadway Type and Characteristics in the Conservation Transfer Area Study Area

Roadway Type		Characteristics	Name of Roadway in CTA
Local residential one-way		• Access to abutting single-family homes • Fewer than 200 vehicles per day total in both directions • Direction restriction access control • 40-foot ROW	• None
Local residential two-way collector*	Major	• Access to abutting single-family homes • Typically four lanes • More than 3,500 vehicles per day total in both directions • No access control • 80-foot ROW	• Log Cabin Way • Horse Drive • Farm Road • Deer Springs Way • Dayton Street • State Street • Walnut Road
Local residential two-way collector*	Minor	• Access to abutting single-family homes • Two travel lanes and a center turn lane and median • Contain more driveways, left turns, and intersections • 1,500 to 3,500 vehicles per day total in both directions • No access control • 60-foot ROW	• Rocky Avenue • Gilbert Lane • Brent Lane • Racel Street
Non-residential local		• Access to industrial and commercial lands • 1,500 to 3,500 vehicles per day total in both directions • No access control • 60-foot ROW	• None
Arterial roadways		• To convey traffic from local and collector streets • 3,500 or more vehicles per day total in both directions • Partial access control by means of limits on driveway locations and/or raised medians in the street • 80- to 120-foot ROW	• Moccasin Road • Iron Mountain Road • Grand Teton Drive • Centennial Parkway • North 5th Street • Pecos Road • Losee Road • Lamb Boulevard • Decatur Boulevard • Aliante Parkway • Jones Boulevard • Durango Drive
Freeway		• To convey traffic between regional activity centers • 3,500 or more vehicles per day total in both directions • Full access control; limited access at interchanges	• U.S. Highway 95 • 215 Beltway

* Streets that connect neighborhoods to the larger arterial streets are vital to overall circulation and make up a significant portion of the major street network.

Table 3.10-2. Nevada Department of Transportation Current Average Annual Daily Traffic, 2004–2006

Route Location	ADT		
	2004	2005	2006
Grand Teton Drive, 0.1 mile west of Decatur Boulevard	1,950	1,650	1,850
Grand Teton Drive, 0.1 mile east of U.S. Highway 95	430	840 *	890*
U.S. Highway 95 north, at State Route 157 (Charleston Park Road interchange)	10,500	10,500	11,100
Jones Boulevard, 0.3 mile north of Clark County 215	8,400*	16,200	16,000
U.S. Highway 95 north, 0.1 mile north of Milepost 129, 9.25 miles north of Indian Springs	3,900	3,900	3,650
Decatur Boulevard, 0.2 mile north of Centennial Parkway	12,500	18,600	20,100

* Data adjusted or estimated.

3.10.2 Access

Current travel within the CTA study area includes access to the Clark County Shooting Park along Decatur Boulevard and access to existing transmission lines, infrastructure, and private property adjacent to the CTA study area along Moccasin Road and Grand Teton Drive (see Figure 3.10-1). Travel across the CTA study also moves along existing unimproved dirt roads and ways. The majority of the CTA study area is not accessible from any existing transportation network.

3.11 NOISE

Noise is defined as any sound that is regarded as a nuisance. Exposure to prolonged, high levels of noise can result in temporary or permanent hearing loss or tinnitus (a ringing or roaring in the ears) and can also present safety issues. Noise can be perceived as a particular nuisance in rural or recreational settings because background noise levels in these settings are typically low and any disturbance to ambient conditions may be more pronounced. The most common problems with noise within the CTA study area are not health related but rather result from noise that is simply bothersome or annoying.

The impact of noise is variable, depending on such factors as distance from the sound source, air temperature and humidity, and frequency (hertz) of the sound. The atmosphere more readily absorbs sound produced at high frequencies. Other environmental factors that influence the propagation of sound are wind, terrain, and vegetation, which can either reflect or absorb sound.

3.11.1 Ambient Conditions

Sensitive noise receptors include residences, hospitals, libraries, recreation areas, churches, and similar venues. The CTA study area is bordered by both recreation and residential uses. Recreation facilities include Floyd Lamb Park to the southwest, Eglington Preserve to the east, Paiute Reservation Golf Course to the west, McCool Regional Park and DNWR to the northeast, the future Clark County Shooting Park to the north, and R&PP Act lands that are encompassed by the CTA study area. Residential uses are generally to the south of the project area and include the Aliante master-planned development and a limited number of residences on the Paiute Reservation to the west. The remaining land to the south of the CTA study area is largely privately owned.

3.11.2 Clark County

Clark County Zoning Development Code 30.68.020 establishes maximum allowable noise levels, measured in decibels (dB), for impulsive and persistent noise. Impulsive noise levels cannot exceed 56 dB during the daytime and 46 dB at night within residential districts. Within business and industrial districts, impulsive noise levels cannot exceed 65 dB during the daytime and 61 dB at night. Allowable persistent noise levels vary, depending on proximity to residential or business or industrial districts and the frequency of occurrence of the noise. Table 3.11-1 gives the maximum permitted sound levels in dB for Clark County (CCDCP 2007a).

Table 3.11-1. Clark County Maximum Permitted Sound Levels

Octave Band Center Frequency (hertz)	Residential Districts (dB)		Business and Industrial Districts (dB)	
	Daytime	Nighttime	Daytime	Nighttime
31.5	72	65	76	65
63	65	58	69	62
125	58	50	62	54
250	53	44	58	49
500	50	40	55	45
1,000	47	37	52	42
2,000	43	33	49	38
4,000	40	30	46	35
8,000	37	27	43	32

Source: CCDCP (2007b).

The CTA study area does not currently generate significant levels of unwanted noise. Recreation uses include hiking, camping, picnicking, mountain biking, climbing, sightseeing, and OHV use. OHV use is strictly limited to existing roads, trails, and dry washes, although some illegal OHV use does occur.

The planned Clark County Shooting Park has the potential to generate nuisance noise once it opens. The Clark County Shooting Park will cover more than 3,000 acres and will include buffers for wildlife study areas, for a paleontological protection area, and for safety and noise (Nevada Legislature 2007).

3.11.3 City of Las Vegas

City of Las Vegas Ordinance 9.16.005-050 prohibits excessive noise, particularly between the hours of 11 p.m. and 7 a.m. daily. Exceptions to this rule exist for emergency situations, public events such as carnivals and parades, and the necessary operations of public businesses. Construction noise must occur between 7:00 a.m. and 6:00 p.m. daily, with the exception of urgent instances in which public health and safety may otherwise be at risk. In those instances, the Director of the Department for Planning and Development must issue a permit, valid for a maximum of 30 days.

Floyd Lamb Park, on the northern boundary of Las Vegas, is used by Las Vegas residents as an urban retreat. The park does not currently generate unwanted noise, as its primary use is for passive recreation, such as hiking and picnicking. Limited residential housing is adjacent to a portion of the CTA study area to the south but is not considered a noise nuisance.

Transportation networks near the CTA study area include U.S. Highway 95, a northwest-southeast, four-lane divided highway in the western portion of the CTA study area.

3.11.4 City of North Las Vegas

The City of North Las Vegas, as part of City Ordinance 8.28.010–040, prohibits excessive, unreasonably loud, disturbing, or unnecessary noise, particularly between the hours of 11:00 p.m. and 7:00 a.m. daily. One noted exception to this rule includes non-amplified crowd noises at planned student, government, community, sporting, and entertainment events or gatherings (City of North Las Vegas 2007b).

McCool Regional Park is currently used as a model airplane–test demonstration garden and is operated by the City of North Las Vegas. The City of North Las Vegas is in the process of planning sports facilities, such as fields, courts, and sports lighting, to facilitate active recreation opportunities (BLM 2007a). The sports fields may or may not include amplified noise, such as loudspeakers during sporting events. Spectators may also contribute to an increase in ambient noise levels surrounding the park. If amplified noise is employed at McCool Park, the City Council must grant a variance that would allow "reasonable activities not deleterious to the public welfare to be conducted" (City of North Las Vegas 2007b). In order to approve the variance, a public hearing and notification process must take place prior to the City Council vote.

Vehicular traffic consisting of automobiles, buses, and trucks makes a significant contribution to noise levels in the City of North Las Vegas and surrounding areas. Grand Teton Drive and the 215 Beltway border the study area and may contribute to an increase in ambient noise levels within the CTA study area.

3.12 HAZARDOUS MATERIALS

Hazardous materials are defined as any item, agent, or substance that poses a serious threat to human health or the environment as a result of its quantity, concentration, physical, or chemical characteristics. Substances characterized as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (commonly referred to as the "Superfund" law) [42 USC 9601 *et seq*.], and hazardous waste classified under the Resource Conservation and Recovery Act of 1976, as amended (RCRA) [42 USC 6901 *et seq*.], are subsumed by this definition of hazardous materials.

In accordance with ASTM Standard E 1527-00 guidelines, a modified Phase I Environmental Site Assessment was conducted as part of the original LVVDB FEIS (BLM 2004a). The Phase I Environmental Site Assessment, which was adapted to account for the size of the LVVDB and the nature of the undertaking, included a records review and a limited site reconnaissance. The following section presents the results of a supplemental records review and site reconnaissance conducted within the limits of the CTA study area and is intended to update the 2004 LVVDB FEIS hazardous materials study.

3.12.1 Records Review

Using the minimum search distances outlined by ASTM, a review of federal, state, and local environmental databases was conducted to identify reported releases of hazardous materials within the CTA study area. The results of the federal, state, and tribal records review are presented in Tables 3.12-1 and 3.12-2 and are shown in Figure 3.12-1. Appendix F provides a detailed description of each environmental database.

Table 3.12-1. Federal Database Search Results for Reported Releases of Hazardous Materials in the CTA Study Area

Federal Regulatory Databases	Updated	Radius (miles)	Findings
National Priority List (NPL)	07-10-07	1.0	0
NPL (Delisted)	07-10-07	0.50	0
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	07-18-07	0.50	0
CERCLIS No Further Remedial Action Planned	07-18-07	0.50	0
RCRA Corrective Actions	06-06-06	1.0	0
RCRA Treatment, Storage, and Disposal	06-06-06	0.50	0
RCRA Generators	06-06-06	0.25	0
RCRA No Longer Regulated	06-06-06	0.12	0
Federal Institutional and Engineering Controls	07-17-07	0.25	0
Emergency Response Notification System	12-31-06	0.12	0
Federal Wells	12-28-06	0.50	11

Table 3.12-2. State and Tribal Database Search Results for Reported Releases of Hazardous Materials in the CTA Study Area

State and Tribal Regulatory Databases	Updated	Radius (miles)	Findings
Tribal Lands	12-01-05	1.0	1
State/Tribal Sites Corrective Action Cases	04-04-07	1.0	3
State/Tribal Solid Waste Landfills	06-27-02	0.50	0
State/Tribal Leaking Underground Storage Tanks	04-04-07	0.50	0
State/Tribal Underground Storage Tanks/Aboveground Storage Tanks	04-30-07	0.25	0
State/Tribal Engineering Controls	NA	0.25	0
State/Tribal Institutional Controls	NA	0.25	0
State/Tribal Voluntary Remediation Programs	NA	0.50	0
State/Tribal Brownfields	03-31-06	0.50	0

Fifteen sites were identified within or adjacent to the CTA study area boundary. Eleven of the sites represent federal wells located within 0.5 mile of the CTA study area limits. Of the 11 wells, only two have been identified within the CTA study area. The two well listings are FW-NV-1207/09419647 and FW-NV-1208/09419648; they appear to be used by USGS for groundwater investigations.

A search of the state and tribal databases yielded four additional sites. One of the four listings indicates that tribal lands are present within the subject property. A small overlap between the CTA study area and Paiute Reservation boundaries submitted in the database search explains why the tribal land listing was generated. There are, however, no tribal lands within the CTA study area limits.

The remaining three sites are NDEP Corrective Action listings for impacted soil. NDEP case files were reviewed for two of the listings; records for the third listing were not examined because the reported release occurred in 1992 and regulatory closure happened in the same year.

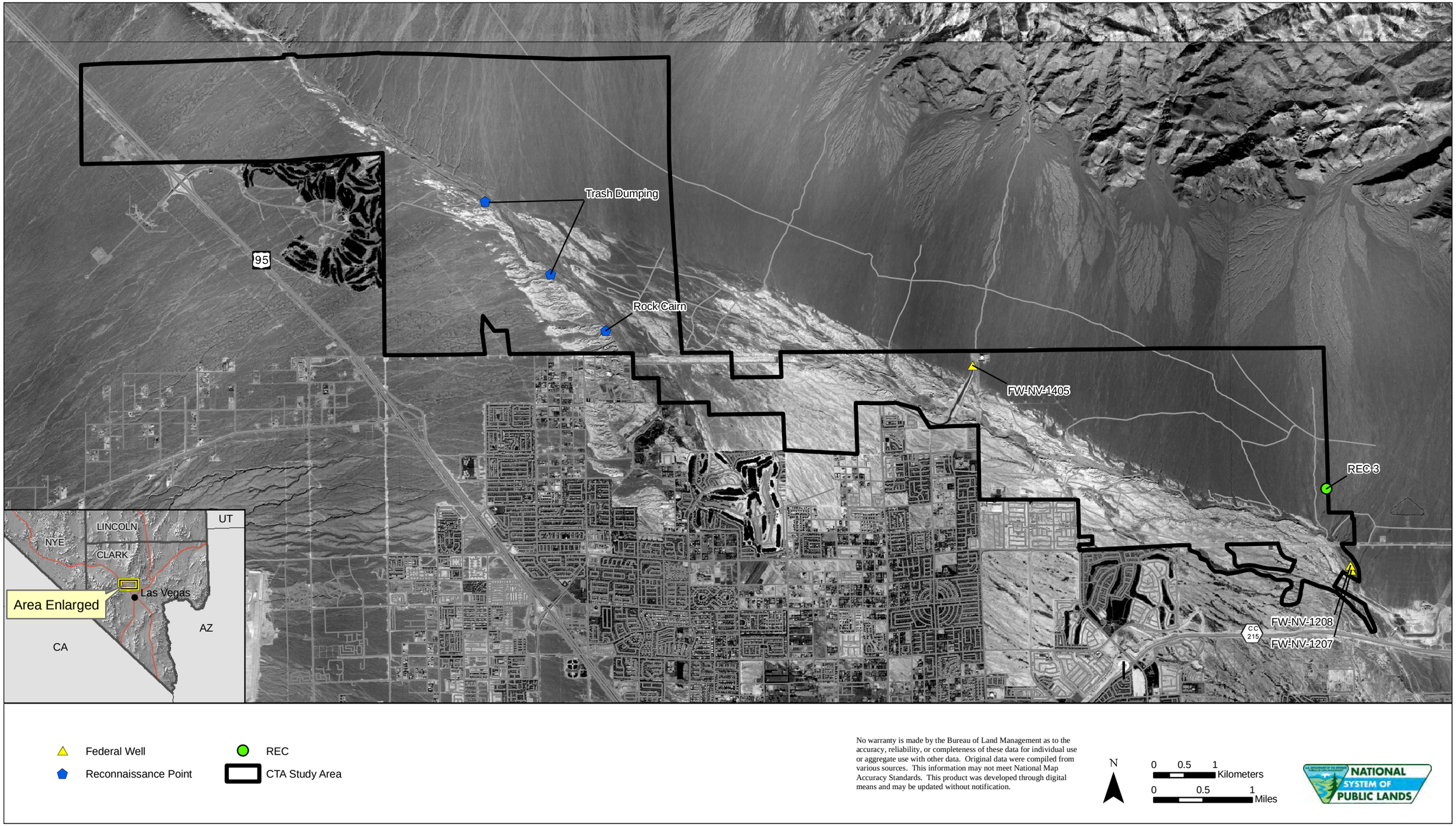

Figure 3.12-1. Federal, state, and tribal database search results for reported releases of hazardous materials in the Conservation Transfer Area study area.

The Southern Nevada Paving Mobile Source (NDEP Case File H-000275) was reported 0.1 mile south of the CTA study area limits. In 2004, a ruptured hydraulic line on construction equipment released approximately 10 gallons of hydraulic oil into surrounding soil. The impacted soil was excavated in 2005, and NDEP issued a finding of "No Further Corrective Action Required."

The second listing was reported approximately 0.88 mile southwest of the CTA study area. Centennial Pointe Property (NDEP Case File H-000318) was granted regulatory closure in May 2005 after 148 tons of impacted soil were excavated to mitigate a release of total petroleum hydrocarbons.

Supplemental information was obtained for the CTA study area beyond the standard ASTM searches. These resources, the respective search distances, and the findings are provided in Table 3.12-3.

In addition, the LR2000 database was consulted to identify mineral actions on which hazardous materials have been stored or released and closed mining claim records. According to the database, there have been no hazardous materials storage or releases associated with minerals actions within the CTA study area boundary. There are, however, more than 200 closed mining claims within the study area. The complete reports are provided in Appendices G through I.

Table 3.12-3. Results of ASTM Supplemental Records Review of Reported Releases of Hazardous Materials in the CTA Study Area

Regulatory Database	Updated	Radius (miles)	Findings
Receptors	01-01-05	0.50	0
Facility Index System	11-01-06	0.25	0
Toxic Release Inventory System	06-04-07	0.25	0
Hazardous Materials Incident Response System	07-03-07	0.25	0
National Compliance Database System	09-22-06	0.25	0
Polychlorinated Biphenyl Administrative Database System	04-12-07	0.25	0
Docket Integrated Compliance Information System	01-09-06	0.25	0
Nuclear Permits	04-30-99	0.50	0
Releases	12-31-06	0.25	0
Federal—Other	05-21-07	0.25	0
Site Enforcement Tracking System Potentially Responsible Parties	11-19-02	0.15	0
State—Other	01-01-07	0.25	0
Coal Gasification	12-31-05	0.50	0
Oil and Gas Wells	01-08-01	0.50	0
Fire Insurance Map Coverage	05-11-07	0.12	0

3.12.2 Site Reconnaissance

A general and cursory site reconnaissance of the CTA study area was conducted on August 30, 2007. The project limits were inspected through pedestrian and vehicular methods using existing roads. Occasional trash was observed along ULVW from the vicinity of Floyd Lamb Park eastward. Areas of urban dumping and evidence of target practice were noted primarily near the residential developments adjacent to the CTA study area. A single rock cairn, which may represent a mining claim, was identified in the northwestern portion of the CTA study area. A stormwater detention basin was noted within the CTA study area limits near North Decatur Boulevard. In addition, a Nevada Energy (NV Energy) substation that was observed off North Decatur Boulevard appears to adjoin the CTA study area. Portions of the southeastern extent of the CTA study area limits are fenced, and posted signage designates these as Eglington Preserve.

3.12.3 Recognized Environmental Conditions

ASTM defines a recognized environmental condition (REC) as "the presence or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property."

The site reconnaissance conducted as part of the original LVVDB FEIS (BLM 2004a) hazardous materials study identified five RECs. One of these RECs, identified in the LVVDB FEIS as REC 3, was reported along the eastern boundary of the CTA study area. Located on Assessor Parcel Number 124-10-000-001, REC 3 is described as consisting of steel pipes protruding from the ground. Although the function of the pipes is unknown, contaminants could be entering the soil or groundwater through these pipes. No additional information regarding the prior use of the pipes was provided in the original Phase I Environmental Site Assessment. The previously reported REC 3 was not observed during the site reconnaissance conducted for the current evaluation.

3.13 SOCIOECONOMICS

BLM is required to integrate social science information in the preparation of informed decisions. Section 102 of NEPA requires federal agencies to "insure the integrated use of natural and social sciences . . . in planning and decision making." BLM has recently developed an instructional memo (IM 2002-167) that contains guidance for social and economic analysis in land use planning.

The first section describes the existing population, economic, social and housing conditions, financial resources, and facilities and services in the socioeconomic study area to help analyze potential impacts from the proposed project to social and economic conditions. The second section discusses some of the social trends and changing attitudes that may have an impact to public land management, as well as some of the individuals and groups who could be affected by the different alternatives.

3.13.1 Study Area

The study area for this analysis includes the communities most likely to be affected by the proposed project. These include Clark County, City of Las Vegas, City of North Las Vegas, and Las Vegas Paiute Tribe, which has dual locations—the Paiute Reservation community, adjacent to the CTA study area, and the Las Vegas Colony, in downtown Las Vegas. Other towns or cities near the CTA study area were dismissed from analysis because of their size or distance from the CTA study area. The Las Vegas–Paradise metropolitan statistical area encompasses Clark County and is therefore represented in Clark County data.

Rapid growth in the LVV is a driving force in the social and economic setting. Increased growth in the LVV has also exerted environmental pressures on surrounding areas as development moves closer to the LVW. Development also creates an increased demand for open spaces, which will likely translate into more visitors to the LVW and surrounding areas. It also means that more rural and remote communities might experience other pressures, such as increased growth as people relocate from LVV to nearby communities, or possibly declining growth as people move away for increased economic opportunities.

This discussion describes the social and economic conditions of Clark County in southern Nevada and, when appropriate, communities near the LVW that may either have an impact to or be affected by the CTA study area. The discussion of Clark County is focused primarily on the LVV because it accounts for

97% of the county's population and households. Discussion of the Paiute Reservation and Las Vegas Colony are combined in this analysis because of the overlapping information from both areas.

Information for the socioeconomic conditions comes from a variety of sources. The Census Bureau and Bureau of Economic Analysis (BEA) identify major characteristics by county and some communities. Similarities and differences between Clark County, the communities, and the State of Nevada are discussed. Data from various agencies within the State of Nevada and Clark County are also used.

3.13.2 Community Perceptions

The most significant factors affecting the character and economy of the LVV are the tourism and gaming industries. Gaming has been an integral part of the development of Las Vegas; by the end of World War II, the area had become a desert oasis and gaming resort town. The LVV has become an entertainment, gaming, and recreation mecca, with 150 casinos and roughly 60 golf courses in Clark County, as well as access to thousands of acres of state and federal lands. There are numerous recreation opportunities, such as the nearby Hoover Dam, Lake Mead NRA, and Humboldt Toiyabe National Forest.

The moderate cost of living and lack of state income taxes have stimulated economic growth over the past decade. According to the Las Vegas Chamber of Commerce, more than 6,000 people per month relocate to the LVV, in large part because of substantial job growth in the area. Additionally, the cost of living is lower in the LVV than in comparable U.S. cities, such as Albuquerque, Houston, Phoenix, and San Jose (Applied Analysis 2007). Increased population growth and housing development have brought new challenges with respect to transportation and public services. For the most part, these challenges are being adequately addressed or planned for; there are many plans for new facilities, including medical facilities, public schools, and roads. Appendix J discusses housing, crime, and public service expenditures, including education, utilities, and health care.

Social Trends

Nevada has consistently been one of the fastest-growing states in the country, with Clark County being one of the fastest-growing counties in the U.S. In 2006, Clark County had a population density of 225.6 people per square mile (Census Bureau 2007b). Clark County is the thirty-fifth fastest-growing county in the U.S. in terms of housing (Census Bureau 2007a). Migration to Clark County continues to be the greatest contributor to population growth. According to CCDCP and the Nevada State Health Division, the net migration to Clark County in 2005 was 4,480 people per month. In contrast, the average monthly natural increase (births minus deaths) was 1,243 people (CCDCP 2005). Table J.1 in Appendix J gives information on population characteristics by age and education.

Common social trends in the western U.S. include rapidly growing urban populations, increased concern over loss of open space, increasingly transformed landscapes, continued and increased loss of biodiversity, increased pressures for uses of all types (particularly strong trends in recreational uses, such as hiking, biking, OHV, sport-utility vehicle use, camping, picnicking, etc.), and increased pressures for preservation and conservation. The trends also include increased feelings of loss associated with public and private lands, including 1) fees instead of free admission; 2) lost landscapes and loss of relatively uncongested use of special areas; 3) loss of favored species and sometimes biological diversity; and 4) lost access to special places.

Increased growth in the LVV exerts environmental pressures on surrounding areas as development moves closer to the LVW. As growth continues and development increases, the demand for open spaces will also increase, which will likely result in more visitors to the LVW and surrounding areas. A comprehensive report on recreation for the City of Las Vegas (2006b) indicates that parks were the second-most common

place respondents spent most of their free time (second only to home). The survey reported that walking, hiking, and biking were in the top 10 leisure activities that residents enjoy.

As the LVV continues to grow, rural and remote communities may also experience other pressures, such as increased growth as people relocate to some nearby communities, or possibly declining growth as people move away for increased economic opportunities.

Changing Attitudes

Nevada, once characterized by its mining, agriculture, and ranching culture, has in recent decades moved toward gaming, entertainment, tourism, construction, and recreation industries to accommodate its exponential growth. This is particularly true of Clark County, where the gaming-related industries and employment have continued to grow, while forestry, mining, and agricultural employment have declined in recent years. Table J.2 in Appendix J gives the major employers in Clark County. Table J.3 in Appendix J shows the breakdown by industry for Clark County and Nevada. More than 22,000 conventions were held in 2005, and tourism in Las Vegas resulted in an estimated $36.7 billion in economic impact. The gross gaming revenue in Clark County was $9.7 billion. The City of Las Vegas generated more than $7.6 billion of that revenue (City of Las Vegas 2006a).

In 2005, accommodation and food services accounted for 23.3% of total employment in Clark County, more than any other sector. Other prominent sectors included construction (10.7%), retail (10.4%), and administrative and waste services (7.1%). See Table J.3 for further information on employment by industry.

Some of the fastest-growing employment sectors in Clark County between 2001 and 2005 were health care and social assistance (208.8% growth), educational services (61.2%), management (55.9%), construction (46.4%), real estate (45.9%), and manufacturing (21.4%).

With rapid urbanization of the LVV, quality of life has now become a critical component of life for residents reflected by their desire for parks and open space. In January 2005, Greenways, Inc. (Greenways), prepared the *Northwest Open Space Plan* for the City of Las Vegas Comprehensive Planning Division (Greenways 2005). In support of the plan, the ETC Institute conducted a community attitude and interest survey in 2004 to establish priorities for the planning of parks, trails, open space areas, and outdoor recreation areas for northwestern Las Vegas (ETC Institute 2004). The ETC Institute study was designed specifically to assess priorities for Las Vegas residents for the planning of parks, trails, open space, and outdoor recreation. The study asked respondents to rank from a list of 12 specific goals the three most important goals for an open space plan. Forty-two percent of respondents rated providing habitat for wildlife, birds, and plant life in the top three, 36% rated preserving natural areas and viewsheds in the top three, and 32% rated providing cultural facilities in the top three. Large community parks and walking trails were ranked as the two categories of use Las Vegas residents were most likely to take advantage of in the next year (ETC Institute 2004).

Attitudes and perceptions regarding the LVW have also been documented. A study by USU (2009) included a comprehensive social survey that focused on the relationship between the residents' attitudes and degree of ecological disturbance in the LVW. The study found that residents living closer to the wash and residing longer in the area reported higher familiarity with the wash area and were considerably more likely to use the wash area. Types of activities reported were walking/hiking, exercising pets, bird/wildlife viewing, bicycling, and running/jogging. However, the residents' proximity to the wash did not prove to be important predictors that residents would report ecologically damaging activity in the wash.

Local attitudes and perceptions corroborate with national studies. For almost a decade, Roper Starch Worldwide (Roper), in conjunction with the National Environmental Education and Training Foundation (NEETF), has conducted an annual nationwide survey that offers insight into American perceptions of the environment. In 2001, NEETF and Roper published the *Ninth Annual Report on Environmental Attitudes, Knowledge, and Behavior*, which summarized their findings (NEETF and Roper 2001). More than 63% of Americans believe that environmental protection and economic development go hand in hand, whereas only 25% believe we must choose between the two. When forced to choose between the environment and the economy, 71% of Americans would choose the environment. In general, when support for the nationwide economy is strong, so is support for the environment. These data are relatively consistent over time (NEETF and Roper 2001).

Growing concern for the environment has sparked debate about placing a monetary value on preserving natural resources. Because many environmental values cannot be traded in the marketplace, quantifying the value of natural resources can be difficult. Several types of value can be attributed to natural resources (Ecosystem Valuation 2008). *Use value* is a person's willingness to pay for the direct use of an environmental resource. Direct use includes the active value of a resource, such as hiking, biking, wildlife observations, etc. Direct use can also mean the passive value of a resource, such as a television show about whales, which provides indirect value for whales. *Option value* is a person's willingness to pay for the future use of a natural resource; for example, although a person may not have visited Grand Canyon National Park, she may place value on the possibility of visiting it in the future. The final, most difficult value to quantify is *non-use value*, or existence value. Non-use value represents an individual's willingness to pay to preserve a resource he may never visit. Combined, use value, option value, and non-use value can represent the total willingness to pay for preservation of a natural resource (Price 2007).

Stakeholders and Affected Groups

Following is a discussion of the values and attitudes of various stakeholders who will be affected by the proposed project; the stakeholder groups include the Cities of Las Vegas and North Las Vegas, Clark County, CCRFCD, utility companies, developers, and environmental, neighborhood, and recreation groups. It should be noted that these discussions generalize from and simplify the members' actual values and attitudes. In addition, this format is not meant to imply that these groups are mutually exclusive, and examples of individuals fitting into all categories are likely to be present. For instance, recreationists may engage in motorized and non-motorized types of recreation and may have high levels of concern about the environment. In addition, people's attitudes and interests may change over time.

Clark County

Clark County's vision is for a dynamic, vibrant community that values diversity, opportunity, and partnerships, fostering a healthy environment where individuals and families choose to live, work, and play. Clark County recognizes the environmental sensitivity of the CTA study area and the valuable recreational opportunities the CTA study area provides for Clark County residents. Clark County is a cooperating agency on the SEIS. The various members of the Board of County Commissioners have expressed a range of positions relating to the CTA, from supporting conservation of the entire 13,622-acre CTA study area to maximum development.

In 2002, Clark County announced a partnership with Southern Nevada University that will use private funding to develop and implement programs to bring the benefits of natural world to disadvantaged youths in Clark County. Additionally, Clark County uses development fees to fund studies of the Las Vegas buckwheat and bearpoppy plants through the MSHCP.

Within Clark County, the Cities of Las Vegas and North Las Vegas will be most directly affected by the proposed project. Withdrawal of lands from potential development will change the pattern of development in both cities for generations to come.

City of Las Vegas

The City of Las Vegas is committed to providing residents, visitors, and the business community with the highest-quality municipal services in an efficient, courteous manner and to enhancing the quality of life through planning and visionary leadership. The City of Las Vegas is a cooperating agency on the SEIS.

The CTA study area is between the Cities of Las Vegas and North Las Vegas in the LVV; lands west of Decatur Boulevard in the CTA study area are within the incorporated limits of the City of Las Vegas. Increased development and population pressures in the LVV have led to concerns about limiting the availability of developable land while ensuring preservation of open spaces. The City of Las Vegas has identified the proposed Sheep Mountain Parkway, flood control detention basins, and utilities (electricity, water, and sewer) as uses desired on lands within and/or north of the CTA study area.

In 2005, the City of Las Vegas prepared the Northwest Open Space Plan (Greenways 2005). The primary goal of the plan is to "improve the quality of life and community character of northwest Las Vegas with a well planned system of interconnected open spaces, greenways, trails, parks, and protected landscapes" (Greenways 2005:EX-1).

The City of Las Vegas has expressed support for the protection of ecological, cultural, and paleontological resources in the CTA study area; however, the challenge will be to ensure that continued development opportunities and the associated economic benefits of development are not compromised while balancing growth with preservation of natural resources in the CTA study area.

Specifically, the City of Las Vegas is concerned about the impact that preserving the CTA study area would have to future development patterns; for instance, would non-availability of lands adjacent to existing developments result in leapfrog development? Other issues that involve the City of Las Vegas include concern for public health and safety, such as the ability of law enforcement and emergency response personnel to respond to recreationists, and meeting the transportation needs of an increasing population. The City is cooperating with NDOT and Federal Highway Administration on planning for the proposed Sheep Mountain Parkway to provide multi-modal transportation facilities to accommodate increased travel demands in LVV.

City of North Las Vegas

Like the City of Las Vegas, the City of North Las Vegas is responsible for its citizens and for providing development opportunities, transportation, public safety, and other city services, as well as open space and conservation. The City of North Las Vegas is committed to being a balanced, well-planned community that provides quality municipal services, education, housing, recreation, and leisure opportunities, economic vitality, security, public safety, strong community partnerships, and civic pride for a culturally rich, active, diverse population. Lands east of Decatur Boulevard in the CTA study area are within the incorporated limits of the City of North Las Vegas. Commensurate with the request of the City of Las Vegas, the City of North Las Vegas is a cooperating agency on the SEIS and has shown considerable interest in the process.

The City of North Las Vegas embraces the opportunity to establish the CTA; however, like the City of Las Vegas, the City of North Las Vegas is concerned about balancing conservation with development constraints, particularly with regard to city infrastructure (utilities, transportation, and public health and

safety). The City of North Las Vegas has identified the same infrastructure elements as the City of Las Vegas, such as Sheep Mountain Parkway and the need for flood control basins.

Other issues of concern to the City of North Las Vegas include what protection standards will be implemented for rare plants and cultural and paleontological resources and coordinated use of the CTA study area as a wildlife habitat with the nearby DNWR.

Las Vegas Paiute

The Paiute Reservation is adjacent to the northwestern part of the CTA study area. For the Las Vegas Paiute Tribe, the LVW is a highly significant area that is crucial to the spiritual, cultural, historical, anthropological, and ecological heritage of southern Nevada's ancestral and contemporary indigenous peoples, including the Anasazi, Chemehuevi, and various Paiute tribes. The Las Vegas Paiute Tribe is a cooperating agency on the SEIS. As part of the more expansive Salt Song Trail system, the LVW has been used for multiple generations as a migration and trade route, and along with the mountain ranges that border the LVW, is vital to tribal identity. The LVW represents an important traditional landscape and potential TCP for the Las Vegas Paiute Tribe and other tribal communities in the area, including the Chemehuevi and Moapa Paiute.

Preservation of the natural state of the LVW and the alluvial fans leading north and east up to the Sheep Mountain Range is crucial for the protection of ancient burial grounds and other sacred sites, for an understanding and appreciation of the Native American experience, for the preservation of the plant and animal life in environmentally sensitive lands, and for the visual landscape. For these reasons, the Las Vegas Paiute Tribe urges that the proposed CTA include the entire geological boundary of the LVW as well as the lands north of the LVW that lead up to the DNWR and the adjacent mountain range.

The Las Vegas Paiute Tribe has requested a buffer on the north and east sides of the Paiute Reservation from potential future urban development and to provide protection from visual and social disturbances associated with adjacent residential areas and transportation networks. The Las Vegas Paiute Tribe has also expressed concern for protection of the economic benefits of its golf resort, which may be diminished by nearby development and the loss or obstruction of views of the native desert and the Spring Mountains.

Resource Groups

A variety of individuals and organizations at the local, regional, and national levels have expressed interest in the SEIS and offered input during the scoping process. Many of their comments focused on endangered or rare fauna and flora, non-renewable resources, such as paleontological and archeological resources, and preservation of the hydrologic functioning of the LVW. Concerns regarding endangered flora and fauna include protection of the endangered Las Vegas bearpoppy, Merriam's bearpoppy, Las Vegas buckwheat, the remnant communities of catclaw acacia, honey mesquite, and desert willow that provide habitat for a diversity of bird, mammal, and reptile species, and the establishment of ecological preserves. Non-renewable resource concerns include protection of Pleistocene fossils, fossil spring formations, and archaeological resources.

The following groups have indicated that the condition of resources on public lands is important because they value these resources for a variety of reasons, including wildlife, recreation, education, scenic qualities, wilderness, and open space.

PROTECTORS OF TULE SPRINGS

Protectors of Tule Springs is a conservation group of concerned homeowners who aim to protect the 13,622-acre area in the ULVW from further development. Their vision is to protect the area through future designation of an NCA or National Monument so that people of all ages can study, learn about, and enjoy the non-renewable resources. They envision an Ice Age Park and Visitor Center focused on education, research, and tourism.

SIERRA CLUB

The Sierra Club is a national organization that aims to explore, enjoy, and protect the wild places of the earth and to practice and promote responsible use of the earth's ecosystems and resources. The Sierra Club is interested in protecting a variety of resources in the ULVW, including unique plants and animals, such as Las Vegas bearpoppy, Merriam's bearpoppy, endemic poppy bees, kit foxes, burrowing owls, Las Vegas buckwheat, mesquite and mistletoe stands that support phainopepla, and a variety of reptiles. Non-renewable resources include Pleistocene fossils and the fossil spring formations in which they are found. The Sierra Club also is interested in preserving the working of the LVW itself as a healthy desert wash, which means preserving the natural functioning of the wash to handle storm flows during rain events, as well as maintaining its banks and flow patterns. The organization also envisions a future ULVW Rare Plant Preserve, which would protect the ecosystems, provide a retreat from urban areas, provide hiking trails, bicycle paths, and foot bridges across the wash, and feature informational signs highlighting the rare and endemic resources.

THE NATURE CONSERVANCY

The Nature Conservancy is an international, non-profit organization dedicated to the conservation of biological diversity whose mission is to preserve the plants, animals, and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive. The Nature Conservancy's vision is for a carefully designed conservation strategy for the ULVW that would ensure the long-term survival of all viable native species, natural communities, ecological systems, and paleontological resources and provide public access and use for low-impact activities, such as hiking, picnicking, photography, and nature observation.

ARCHAEO-NEVADA SOCIETY

The Archaeo-Nevada Society is a local group of individuals interested in various aspects of archaeology, such as history, prehistory, and historic preservation. The purpose of the Archaeo-Nevada Society is to preserve Nevada's antiquities, encourage the study of archaeology, and educate the public on the aims of archaeological research. Archaeo-Nevada is an affiliate of the Nevada Archaeological Association and the Society for American Archaeology. Their vision is to protect the ULVW for educational, research, and tourism purposes.

NEVADA FRIENDS OF PALEONTOLOGY

The Nevada Friends of Paleontology is an organization that promotes the scientific and educational value of Nevada's fossil record by enhancing the knowledge of paleontology among amateur, student, and professional paleontologists, sharing new discoveries and knowledge with the scientific community and general public for the advancement of paleontology within the state, and promoting the protection and ethical study of Nevada's paleontological resources. They join Protectors of Tule Springs in their vision of protecting the ULVW and the future creation of a park that would focus on education, research, and tourism.

CITIZENS ACTION COMMITTEE FOR TULE SPRINGS

The Citizens Action Committee for Tule Springs consists of members of the Tule Springs Preservation Committee and local citizens. Their goals center on promoting and taking care of Floyd Lamb Park at Tule Springs. Citizens Action Committee for Tule Springs aims to develop small projects and expand services at the park and work with the City of North Las Vegas to manage the master plan.

Citizens Action Committee for Tule Springs envisions a new entranceway into the park and a paleontological and archaeological museum for the visitors' center. The majority of the structures within the park's historic area are listed in the NRHP and require cosmetic improvements. Thus, their plans also include historic building improvements.

State Parks

The Nevada Division of State Parks plans, develops, and maintains a system of parks and recreation areas for the use and enjoyment of residents and visitors. The Nevada Division of State Parks also preserves areas of scenic, historic, and scientific significance in Nevada. A portion of Tule Springs is state owned but is not designated a state park. The Nevada Division of State Parks would prefer that the state lands in Tule Springs be managed by the same entity that will manage the CTA under a cooperative agreement.

Nevada Division of Forestry

NDF is responsible for the protection and conservation of plant species determined by the State Forester to be threatened or endangered. Their goal regarding the disposal area is to maintain healthy, viable populations of all native flora determined to be endangered or in need of conservation, such as Las Vegas bearpoppy and Las Vegas buckwheat. They envision habitat protection for these plants in the LVW as well as in Eglington Preserve (in accordance with the 2006 Conservation Agreement, established to protect from disturbance nearly 300 acres of habitat of these species in the ULVW south of Grant Teton). NDF would be a cooperating agency in a conservation agreement that relegates management of the CTA in perpetuity either to the BLM, to an appropriate conservation organization, or to any capable conservation agency.

Nevada Department of Wildlife

The Nevada Department of Wildlife has a mission to protect, preserve, manage, and restore wildlife and its habitat for their aesthetic, scientific, educational, recreational, and economic benefits to citizens of Nevada and the U.S. and to promote the safety of persons using vessels on the waters of Nevada.

Nevada Department of Wildlife's interest in the management of the area primarily concerns urban wildlife interface, interpretation, and education opportunities, as well as the potential for the area to serve as a buffer for the DNWR and the impact to wildlife from management of the CTA as open space.

U.S. Fish and Wildlife Service

The vision of USFWS for the ULVW is to work with others to conserve, protect, and enhance wildlife, plants, and their habitats for the continuing benefit of the American people. USFWS is a cooperating agency on the SEIS. Additionally, USFWS would work with interested partners to accomplish the following for the ULVW:

- develop and implement a conservation strategy to protect and enhance the biological, paleontological, cultural, and other resources within the ecosystem;

- preserve known locations of sensitive plant species, particularly Las Vegas buckwheat and bearpoppy, and their suitable unoccupied habitat to maintain viable populations of these species in an unfragmented ecosystem;
- strive to maintain the integrity of the natural ephemeral wash and ecosystem, avoiding modifications and alterations of the wash to the extent possible; and
- provide a variety of educational and interpretive opportunities for the public to enjoy and appreciate the unique biological, paleontological, and cultural resources in and around the wash.

Educational Institutions

UNIVERSITY OF NEVADA–LAS VEGAS

The University of Nevada–Las Vegas (UNLV) Public Lands Institute facilitates and conducts high-quality research, education, and outreach that promote greater stewardship of natural and cultural resources. The Public Lands Institute is fully engaged in education to strengthen the national fabric that is essential for the protection, conservation, and management of public lands. The Public Lands Institute, together with its partners, creates new knowledge, advances technology, improves education, and engages the public. Their vision is the formation of Tule Springs Community Research Park, with a Visitor Center, which would protect the biodiversity and non-renewable resources and provide educational programs in geology, paleontology, and archaeology, as well as research and excavation opportunities for schools and other educational institutions.

DESERT RESEARCH INSTITUTE

The Desert Research Institute excels in environmental research and the application of technologies to improve people's lives by fostering scientific talent for the advancement and integration of terrestrial, hydrologic, atmospheric, and anthropological sciences. The Desert Research Institute applies scientific understanding to the effective management of all natural resources while meeting Nevada's needs for economic diversification and science-based educational opportunities. Their vision includes protecting the ULVW as an intact parcel, uncompromised by urban development, in order to preserve rare plants, animals, migratory birds, and non-renewable paleontological and archaeological resources.

Utilities

NV ENERGY

NV Energy serves more than 807,000 electric customers in Las Vegas, North Las Vegas, Henderson, other communities, and unincorporated areas of Clark County. NV Energy's service territory encompasses approximately 4,500 square miles. Because of the high in-migration rates of Clark County and the strong success of the gaming industry, NV Energy faces the challenge of one of the highest growth rates of any electric utility in the country. NV Energy envisions protection for existing and future corridor lines traversing the area and assurance that those rights will be maintained in BLM land transfer documents or acknowledged in future land use designations in order to serve the growing demand for power.

SOUTHERN NEVADA WATER AUTHORITY

The Southern Nevada Water Authority (SNWA) is responsible for management and delivery of water resources in southern Nevada and has existing and planned future water facility infrastructure in the area of the CTA study area. SNWA is currently planning a water transmission pipeline parallel to an existing

pipeline in Grand Teton Drive. This new pipeline is needed to meet the projected water demands of the purveyor members. Although design of this pipeline is not expected until 2016, SNWA envisions acquiring a ROW for the proposed pipeline corridor, as well as protection for existing and future corridor lines traversing the general area and assurance that those rights will be maintained in BLM land transfer documents or acknowledged in future land use designations in order to serve the growing demand for water.

SOUTHWEST GAS CORPORATION

Southwest Gas Corporation principally engages in the business of purchasing, transporting, and distributing natural gas to residential, commercial, and industrial customers in the southwestern U.S. Southwest Gas Corporation envisions that their existing ROWs will be maintained in BLM land transfer documents or acknowledged in future land use designations and that potential ROW utility corridors will be permitted to serve the growing population.

KERN RIVER GAS TRANSMISSION COMPANY

Kern River transports approximately 85% of the natural gas consumed in southern Nevada. Because Southwest Gas Corporation has a constrained southern system and because Kern River is connected to the abundant, growing Rocky Mountain natural gas supplies, Kern River anticipates serving all of southern Nevada's future growth requirements. Kern River intends to expand its main line, which will require the construction of a new pipeline around the LVV and filing a ROW grant application to construct new facilities. Kern River envisions protection for existing and future corridors that provide services to the many utility companies whose lines traverse the general area and assurance that those rights will be maintained in BLM land transfer documents or acknowledged in future land use designations.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

The mission of CCRFCD is to improve the protection of life and property for existing residents, future residents, and visitors from the impacts of flooding. CCRFCD aims to solve flooding problems and to regulate land use in flood hazard areas. CCRFCD envisions that the ULVW will have natural channeling of floodwaters in order to cost-effectively avoid water quality and flood control problems when future development occurs. CCRFCD proposes two potential flood control structures within the CTA study area in an effort to respond to flooding problems and to regulate land use in flood hazard areas.

Developers

Developers are concerned about potential limitations placed on the availability of public lands for residential and commercial use. Developers indicate that public land needs to be managed to be as productive as possible in order to meet the demand of the growing LVV population. Local governments and developers had contemplated that this land would be available for development and growth and generally feel that development can occur without destroying resources if appropriate mitigation measures are implemented.

One developer, Focus Property Group, owns land that is virtually surrounded by the CTA study area. Focus Property Group has not yet settled on detailed development plans.

Recreation Groups

Recreation is a component of most lifestyles in the study area. The substantial recreation opportunities for hiking, biking, horseback riding, OHV use, and sightseeing are an important element of the overall

quality of life for residents. Recreationists represent diverse groups of people, and changes in recreation management can affect recreationists quite differently. They tend to organize into interest groups; most recreation activities have at least one group that advocates for their activity. Comments received on recreation during the scoping period included the following concerns: maintaining or increasing access to BLM lands for hiking, biking, horseback riding, education, and research; and restricting or maintaining OHV use, minimizing the negative effects of OHV use and motorized travel on resources, and enforcing OHV regulations.

SOUTHERN NEVADA REGIONAL TRAILS PARTNERSHIP

The Southern Nevada Regional Trails Partnership's vision for the ULVW is that it be protected from development in perpetuity. They envision rare fauna and flora protection, a future visitor center for educational use, historic and archaeological research, and multi-use equestrian trails (excluding motorized recreation) with picnic benches that can be used for walking, jogging, and sightseeing. Trails would be marked and maps made available so that known sites of interest would be avoided. The Southern Nevada Regional Trails Partnership envisions that ownership would be retained by BLM, in cooperation with educational and environmental organizations, while maintaining recreation opportunities for the public.

SHADOW RIDGE CROSS COUNTRY COACHES

There are 41 schools in Clark County that field cross-country teams, and Shadow Ridge Cross Country Coaches envision developing running and jogging paths in the CTA study area to allow walking, jogging, and running while preserving the archaeological resources and biodiversity of the area. This would provide the public with minimal-impact recreation opportunities and would benefit school cross-country teams by providing an elite training and racing area.

NORTHWEST LAS VEGAS EQUESTRIAN SAFETY COALITION

The Northwest Las Vegas Equestrian Safety Coalition's vision of the ULVW CTA includes a well-planned system of interconnected open spaces, greenways, trails, parks, and protected landscapes. The CTA study area would be devoted to the preservation of natural resources and historic and cultural property, outdoor recreation, and protection of scenic landscapes. The Northwest Las Vegas Equestrian Safety Coalition envisions improvements to Floyd Lamb Park, such as a trailhead, model railroad society park, equestrian park, and archaeological park, possibly called the Northwest Cultural Park. The trail system would be a network of off-road and roadside multi-use trails serving bicyclists, joggers, hikers, and equestrians while protecting native landscapes and ecosystems, including wildlife habitat, arroyos, washes, viewsheds, and desert ecosystems.

OUTSIDE LAS VEGAS FOUNDATION

The Outside Las Vegas Foundation is dedicated to preserving federal public lands surrounding Las Vegas, enriching the experience of its visitors, enhancing the quality of life for local residents, and promoting community stewardship of these valuable resources.

The Outside Las Vegas Foundation envisions an LVW Heritage Corridor that would protect native desert ecology and paleontological resources, as well as creating opportunities for people to learn about, enjoy, and appreciate the place in which they live. The Heritage Corridor would preserve the integrity of the wash and serve as a natural laboratory for research and education. The Outside Las Vegas Foundation envisions a Visitor Center with extensive educational programming designed to meet diverse needs of the community, focusing on Mojave Desert ecology, archaeology, paleontology, and natural hydrology. It would remain undeveloped except for a network of multi-use trails that would allow access to key features and resources. The trails would serve as an interconnected system linking open spaces, such as

Floyd Lamb Park, Equestrian Park, and DNWR, that would be designed to help protect and minimize disturbance to sensitive resources. The Visitor Center would incorporate the needs of various partners through shared operation and management, such as USFWS, Cities of Las Vegas and North Las Vegas, Clark County, Tule Springs Preservation Association, and The Nature Conservancy.

3.13.3 Population and Demographics

Population data were obtained from the Census Bureau (1990, 2000a, 2006) and the Nevada State Demographer (NSD 2006b). Table 3.13-1 shows historical and projected population estimates for the socioeconomic study area, as well as state and national data.

Nevada

Nevada has experienced considerable growth over the past 15 years. In 2000, Nevada was the fastest-growing state in the nation, next to Arizona, Colorado, Utah, and Idaho. The population increased by 61.6% between 1990 and 2000, and then by another 31.1% between 2000 and 2006. Nevada is projected to grow by another 18% by 2010 and by another 17% by 2015. Nevada has a population density of 22.7 persons per square mile.

Clark County

The population of Clark County in 2000 was 1,375,365, up from 770,280 (78.6%) in 1990. According to Census Bureau estimates, the population of Clark County continued to increase between 2000 and 2006 (36.3%). According to NSD (2006b), Clark County is expected to have a population of 3,299,623 by 2025, which is a 75.9% increase from 2006 (see Table 3.13-1). Migration to Clark County continues to be the greatest contributor to population growth.

Table 3.13-1. Comparative Historical and Projected Populations for the CTA Study Area and the U.S.

Location	Population			% Change		Projected Population			
	1990	2000	2006	1990–2000	2000–2006	2010	2015	2020	2025
U.S.*	248,709,873	281,421,906	299,398,484	13.2	6.4	308,935	322,365	335,804	349,439
Nevada†	1,236,130	1,998,257	2,623,050	61.6	31.3	3,087,428	3,605,713	4,001,520	4,315,334
Clark County†	770,280	1,375,365	1,874,837	78.6	36.3	2,281,997	2,718,502	3,045,813	3,299,623
Las Vegas†	268,330	478,434	579,840	78.3	21.2	–	–	–	–
North Las Vegas†	50,030	115,488	198,516	130.8	71.9	–	–	–	–
Las Vegas Paiute Tribe*	86	108	–	25.6	–	–	–	–	–

* Census Bureau (1990, 2000a, 2006).

† NSD (2006b).

Growth in Clark County has created an LVV with an influence far beyond the jurisdiction of the City of Las Vegas. Communities in Clark County include larger, rapidly developing cities in the urbanized areas of LVV and Mesquite, as well as those in more rural areas, such as Indian Springs, Moapa, Overton, and Logandale. Clark County has a median age of 34.4 years, compared with a median age of 35.0 for the state.

The Cities of Las Vegas and North Las Vegas are likely to be most affected by the proposed project. Las Vegas has had population trends similar to those of Clark County, with an increase of 78.3% between 1990 and 2000 and of 21.2% between 2000 and 2005. The City of Las Vegas has a median age of 34.5 years. The population of Las Vegas has a distribution with varying densities; the highest density is in central downtown and along the U.S. Highway 95 corridor to the west and northwest. Las Vegas has an average density of 4,390 persons per square mile (City of Las Vegas 2006a).

The City of North Las Vegas, however, experienced an aggressive population increase during the same period, growing by 130.8% between 1990 and 2000 and by 71.9% between 2000 and 2006. North Las Vegas has a median age of 28.8, which is significantly lower than the state median age of 35.3. The availability of land for development in the city is attracting younger families to the area, as indicated by the relatively low median age.

Population data for the Las Vegas Paiute Tribe are limited to Las Vegas Colony in downtown Las Vegas. The population of Las Vegas Colony in 2000 was 108, up from 86 (25.6%) in 1990. No population estimates were available for 2006. Information on the Paiute Reservation community is limited or unavailable. Thus, Census Bureau data were used for this analysis.

Other selected age and education characteristics of the communities within the CTA study area are given in Table J.1 in Appendix J.

3.13.4 Economic Sectors and Employment

Income and earnings data were obtained from various sources, but principally from the Clark County government and BEA. This section describes employment by industry, per capita income, and labor force statistics.

Employment

The gaming and service sectors provide the greatest share of employment in Clark County. However, the largest single employer in Clark County is the Clark County School District, with 35,212 employees, followed by the Clark County government, Bellagio Hotel and Casino, and the State of Nevada. Table J.2 in Appendix J summarizes major employers in the study area, and Table J.3 summarizes employment by industry.

Tourism is the primary industry in the LVV. Population growth experienced in Clark County over the past decade has facilitated job growth as a result of increased demand for public infrastructure and housing. Per capita income for Clark County was $21,785 in 2000. In Las Vegas, per capita income was $22,060 in 2000. North Las Vegas per capita income was $16,023. The Paiute Reservation has a per capita income far below the federal poverty level, at $8,529 (Census Bureau 2000c).

Per capita income is often used as a measure of economic performance, but it should be combined with changes in earnings for a realistic picture of economic health. Since total personal income includes income from 401(k) plans, as well as other non-labor income sources like transfer payments, dividends, and rent, it is possible for per capita income to rise even if the average wage per job declines over time. In other words, non-labor sources of income can cause per capita income to rise, even if people are earning less at their jobs.

Income Characteristics

The median family income for Clark County, at $50,485, is essentially the same as the state's median family income, at $50,849. Las Vegas also had a median family income similar to the state and county averages, at $50,465, while North Las Vegas had a relatively lower median family income, at approximately $46,540. The median family income for communities in Clark County but outside the LVV is typically found to be lower than the county and state averages. The Las Vegas Paiute Tribe had the lowest median family income of the communities within the CTA study area, at $28,611. Table J.4 in Appendix J shows the breakdown of income characteristics.

Labor Force

Both labor force and employment have increased throughout the CTA study area. Labor force statistics reflect employment by residence, unlike employment by sector statistics, which reflect employment by work location. Nevada's labor force increased by 96.3% between 1990 and 2006; during the same period, Clark County's labor force increased by 126.8% and Las Vegas's labor force increased by 100.4%. The average annual unemployment rate in 2006 was 5.9%, compared with 6.6% in 1990 and 7.0% in 2000. North Las Vegas's labor force increased by 316.0% between 1990 and 2006. The average annual unemployment rate in 2006 was 5.0%, compared with 11.3% in 1990 and 7.9% in 2000. On the Paiute Reservation, the labor force decreased by 17.5% between 1990 and 2000, and the average annual unemployment rate in 2000 was 3.0%, compared with 20.0% in 1990. Table J.5 in Appendix J gives the details of the labor force and employment rates.

3.13.5 Community Resources

Housing

HOUSING INVENTORY

In response to rapid employment and population growth in Clark County, there has been a strong demand for housing over the past decade. According to CCDCP (2006), there were approximately 740,817 occupied housing units in Clark County in 2006; this number is almost 50,000 less than the 2005 numbers, which are given in Table J.6 in Appendix J. More than 58% of the occupied housing in Clark County in 2006 consisted of single-unit, detached homes. Of the 740,817 housing units in Clark County in 2006, more than 292,000 units were within the Cities of Las Vegas and North Las Vegas.

Table J.6 in Appendix J illustrates trends between 1996 and 2006 in the supply of single- and multi-family homes, including condominiums, duplexes, and mobile homes. Growth during the study period was healthy for Las Vegas, North Las Vegas, and Clark County (data were not available for the State of Nevada or Paiute populations). There was a significant spike in the number of occupied housing units, across all housing types, in 2005. In fact, the average annual growth rate in Clark County for the 10-year period between 1996 and 2005 was 13.52%, although the rate was only 4.78% over the 11-year period between 1996 and 2006. In other words, growth during 2005 was so significant that the average annual growth rate was much higher from 1996 through only 2005.

The most recent data for other aspects of housing are for the year 2000 (Census Bureau 2000b, 2000c). Median home value for Las Vegas was $137,300, with a vacancy rate of 7.3%, and the average household size was 2.7. Median home value for North Las Vegas was approximately $14,000 less, at $123,000. The vacancy rate in North Las Vegas was 7.1%, and the average household size was 3.4. Median home value in Clark County was similar to Las Vegas, at $139,500, compared with $142,000 for Nevada and

$119,600 in the U.S. (Table J.7 in Appendix J). Median home value for the Las Vegas Paiute Tribe was $48,000, the vacancy rate was 16.2%, and the average household size was 3.5. Occupancy rates for communities in the CTA study area were as follows: Las Vegas, 92.7%; North Las Vegas, 92.9%; Las Vegas Paiute Tribe, 83.8%; and Nevada, 90.8% (Las Vegas, North Las Vegas, Las Vegas Colony, and Nevada).

The average household size for North Las Vegas and the Paiute Tribe was similar (3.4 and 3.5, respectively); however, the number was lower for Las Vegas (2.7). The vacancy rate in Las Vegas and North Las Vegas was comparable (7.3% and 7.1%, respectively), although it was more than double that for the Las Vegas Paiute Tribe (16.2%). It should be noted that the housing stock for the Las Vegas Paiute Tribe was only 31 units in 2000.

The numbers discussed above were available through 2000; therefore, they do not completely reflect the pattern of explosive growth of 2005 or the recent downturn in residential development.

This information sheds light on the types of communities within the CTA study area with respect to housing occupancy. More recent information has not been developed for the study area; these occupancy rates are likely to have changed since 2000 as a result of the housing boom in subsequent years.

TRENDS IN HOUSING CONSTRUCTION

Over the past eight years, the new housing market has been healthy in Nevada in general and in Clark County in particular, although housing prices have already begun decreasing, or at least have stabilized, and will continue to do so for the foreseeable future as the market rebalances to more normal levels (UNLV 2006).

The construction industry is an important contributor to the Gross Domestic Product (GDP) and overall economic activity of the Las Vegas–Paradise metropolitan statistical area. Between 2001 and 2006, the construction industry GDP increased by an average of 12.99% each year, with a total percent change for the 6-year period of 82.26% (BEA 2008). For a fuller discussion of new housing construction growth, see the section on real estate and residential development below.

HOUSING AFFORDABILITY

Data were available for the Las Vegas metropolitan area in terms of historic sales data, but there is no breakdown by community for Las Vegas, North Las Vegas, Clark County, or the Las Vegas Paiute Tribe (Table J.8 in Appendix J). The number of home sales in the area has steadily increased over the past seven years—the average annual growth rate is 6.89%, while the increase in the number of sales totals 70.35%. Median new home price in the LVMA has also increased—the average annual growth rate was 10.57%, and the total growth in median home price between 1999 and 2006 was 123.41%.

Housing affordability in Las Vegas and North Las Vegas, as well as Clark County, was consistent, ranging between $632 and $699 per month for median rent and between $123,000 and $139,000 for median housing value. In 2000, housing for the Las Vegas Paiute Tribe was considerably less expensive, with $525 for median monthly rent and $48,000 for median housing value (see Table J.7 in Appendix J).

As a result of strong economic and population growth, as well as increased demand for housing, particularly in 2005, there was a significant amount of conversions of rental apartments to condominiums. This resulted in the loss of rental “supplies” and a 15-year low of the rental vacancy rate in 2005, at 5.1%, down from 10% in 2000 (HUD 2006). The rental vacancy rate is lowest in central Las Vegas as a result of a larger inventory of older and more affordable units (HUD 2006).

Crime

Data on various crime statistics were collected from the Bureau of Justice Statistics (BJS). BJS does not include information on the Las Vegas Paiute Tribe. Additionally, the Bureau of Indian Affairs (BIA) does not collect crime statistics. In early 2007, a proposal was put forward to create a national database called Indian Crime Awareness Research and Evaluation (or I-CARE); this database would be used to track crimes pertaining to tribes in the future.

Offenses reported in the data are categorized as violent crimes (murder, forcible rape, robbery, and aggravated assault) or as property crimes (burglary, larceny theft, and motor vehicle theft). Additionally, the data for this report were obtained from different reporting agencies, e.g., Las Vegas Metropolitan Police Department (LVMPD) and North Las Vegas Police Department (NLVPD). Between 1995 and 2005, there was a decrease in both violent and property crimes: −26.31% in Nevada, −26.41% in Las Vegas, and −43.81% in North Las Vegas (Tables J.9 and J.10 in Appendix J).

Public Facilities and Services

Information gathered by the State of Nevada, Clark County, and the Cities of Las Vegas and North Las Vegas was used to identify the availability of public services within the CTA study area. Public facilities and services vary considerably by community (Table J.11 in Appendix J). As would be expected, the greatest number of facilities and services for the CTA study area occur in Las Vegas.

Nevada has experienced considerable growth over the past 15 years; therefore, there has been an emphasis placed on new public facilities and services in communities to meet increased demand. There was a 78.6% increase in the population of Clark County between 1990 and 2000; there is a 75.9% increase projected by 2025. Much of the public service infrastructure and the number and capacity of public facilities will have to be expanded and upgraded to accommodate recent and expected growth. Each of the public service categories is explained in more detail below.

Public Service Expenditures

Annual capital expenditures for public services in Las Vegas totaled just over $492.6 million in fiscal year (FY) 2006 (City of Las Vegas 2007b) and just over $146.7 million in North Las Vegas. General funds for both cities are provided by property and other taxes, consolidated tax revenue, charges for government services, licenses and permits, intragovernment resources, and fines and forfeits. Clark County spent more than $519.9 million in public service expenditures for FY 2004 (Clark County Comptroller 2004).

Local Authority Development Oversight

Planning in the Cities of Las Vegas and North Las Vegas and in Clark County is conducted by local planning departments. Each entity has a zoning ordinance and master or comprehensive plan that is used to guide development within the respective planning areas. These three jurisdictions essentially operate in the same manner with regard to development oversight. Although not explicitly stated in the Las Vegas Paiute Tribe bylaws, tribal members collectively review planning proposals and vote on their preferred decision for the proposal (personal communication, Dave Brown 2007).

Development within unincorporated Clark County is coordinated by the CCDCP. Clark County has a Unified Development Code that dictates the type of development (commercial or residential) that can occur in the different areas of unincorporated Clark County. Any new subdivisions or site plans must be submitted to the Board of County Commissioners and Planning Commission, who approve, conditionally

approve, or deny land use applications. The *Clark County Comprehensive Master Plan* (Clark County 2002) is a policy document used by Clark County to guide long-term physical development in the unincorporated area. The fire and energy conservation elements are currently being updated.

The City of Las Vegas Planning and Development Department manages the zoning and subdivision zoning ordinances and the land use applications and project development requirements, staffs the planning commission and historic preservation commission, and prepares master and special area plans for the City. The Planning Commission makes recommendations to the City Council regarding the City's master plan, zoning requests, and other related issues. The Planning Commission is also the final decision-maker for subdivision maps. The Las Vegas Municipal Code is the City's zoning ordinance and, like Clark County and most cities, dictates the type of development (commercial or residential) that can occur in the planning area. The City of Las Vegas adopted a new master plan in 2006 (City of Las Vegas 2006c), which is a policy document that provides the framework for several individual element plans.

Development within the City of North Las Vegas is coordinated by the Planning and Zoning Department (PZD). The PZD is responsible for planning, coordinating, and promoting land development in the community; PZD also oversees three divisions, including administration and the Current and Advanced Planning Divisions. The Current Planning Division administers all development applications, while Advanced Planning develops land use ordinances, prepares special reports, and updates and implements the City's comprehensive plan. The City updated its comprehensive plan in 2006 (City of North Las Vegas 2006). The City's zoning is administered and enforced under the North Las Vegas Municipal Code.

Education

SCHOOLS

The Cities of Las Vegas and North Las Vegas and the Las Vegas Paiute Tribe are provided public education by the Clark County School District (State of Nevada 1991). As of 2007, there were 326 elementary, middle, and high schools in the county, 11 of which opened in 2007. In 2006, the Clark County School District employed 18,046 full-time teachers and 18,259 other district employees (Applied Analysis 2007).

The Las Vegas Paiute Tribe has an education office that provides tutoring and other educational services. There is also a tribal education committee that coordinates with the Clark County Indian Education program.

In 2006, there were 23,091 kindergarten students, 122,323 elementary school (Grades 1–5), 73,015 middle school (Grades 6–8), and 83,717 high school (Grades 9–12) in Clark County's public schools. In 2005, Clark County School District student enrollment was 291,510, and by 2006, it was 302,763 (a 3.9% increase). The rate of enrollment has increased by 3.9% to 5.9% annually since 2001 (Applied Analysis 2007). An additional 12,931 students were enrolled in private schools in 2006 (most private schools are K–8).

A total of 216 schools within Clark County School District passed the Adequate Yearly Progress Report in 2006, compared with 183 in 2005. The report is part of the accountability requirement of No Child Left Behind, enacted in 2001 (Nevada Department of Education 2006).

Libraries

In 2006, there were 12 libraries in the City of Las Vegas and Clark County and two libraries in the City of North Las Vegas. These libraries are operated by the Las Vegas–Clark County Library District and do not include university libraries, of which there are five in Clark County: University of Las Vegas, Nevada State College, and three community college libraries.

Utilities

WATER SUPPLY

The Colorado River supplies roughly 90% of Southern Nevada's water; Nevada is allocated 0.3 million AFY of water from the Colorado River, while Arizona and California receive 2.8 and 4.4 million AFY, respectively. The LVV treats and returns most of its wastewater back to the Colorado River at Lake Mead via the LVW; therefore, it receives a return flow credit for the returned water. This recharge allows southern Nevada to receive additional water from the Colorado River, depending on the amount that is recharged. The area's water supply is supplemented by pumped groundwater from wells throughout Clark County and the LVV. There are three major groundwater aquifer zones between 300 and 1,500 feet below the modern ground surface.

Las Vegas Valley Water District (LVVWD), a member of the SNWA, supplies water for the nearly 1 million residents in the LVV, including the City of Las Vegas and unincorporated portions of Clark County. LVVWD was established in 1954 and is not-for-profit. The board of directors consists of the Clark County Commissioners. The water rates for the district are regulated by law, and allowable expenditures include the cost of water delivery, as well as construction and maintenance of facilities for the district. The City of Las Vegas also provides direct reuse (reclaimed) water within its municipal boundaries and those of unincorporated Clark County. This water is provided to a power plant and four golf courses in the City of Las Vegas. Total reuse for the City of Las Vegas in 2003 was about 6,400 AFY (City of Las Vegas 2003).

The City of North Las Vegas provides water service to its own residents and adjacent portions of the City of Las Vegas and unincorporated Clark County; it is also a member of the SNWA. The water supplied to the City of North Las Vegas by SNWA is supplemented by six production wells owned and operated by the city.

The Paiute Reservation received 2,000 AFY from the LVVWD as a result of a 1996 lawsuit. This allocation sustains the Las Vegas Paiute Golf Resort and a residential area (Hopkins 1999).

The SNWA system diverts water from Lake Mead; the water is treated at the River Mountains and Aldred Merritt Smith water treatment facilities and then distributed via a looped regional system. The Aldred Merritt Smith water treatment facility, constructed in 1971, can treat up to 600 million gallons per day (Mgal/day), while the River Mountains facility can treat up to 300 Mgal/day. Most of the area's water is treated at Aldred Merritt Smith. The SNWA Water Resource Plan (SNWA 2004) calls for construction of a new treatment and transmission facility that would serve as backup in the event of catastrophic failures at existing facilities.

Peak demand for the system (both treatment plants) was 476 Mgal/day in 2005. Forecasts predict that the demand could either increase or decrease, although these amounts are variable, depending on the weather and to what extent conservation measures proposed by SNWA are implemented. During most of the year, water is drawn from the Colorado River via Lake Mead; however, during the summer, groundwater is pumped from the aquifer in the LVV. The area is under extreme pressure from years of drought that have

resulted in low water levels at Lake Mead, combined with the enormous population growth over the past 5 to 10 years.

SOLID WASTE

Solid Waste disposal for the area is provided by the privately owned Republic Services of Southern Nevada. The Southern Nevada Health District regulates and manages Clark County's solid waste program.

The state's largest landfill, and the repository for Clark County waste, is Apex, located at 13550 North Highway 93 (Exit 64 of Interstate 15). In 2005, Clark County generated an estimated 10 lb per capita per day; 8 lb is disposed of, and 2 lb is recycled (NDEP Bureau of Waste Management 2007); the total deposited at the Apex Landfill in 2005 was 11,653 tons per day. Municipal waste disposal in Clark County more than doubled between 1995 and 2003 (1,227,750 tons in 1995 vs. 2,680,172 in 2005). Given current and projected disposal rates, the Apex landfill is anticipated to close in 2150.

The Clark County Water Reclamation District (CCWRD), established under NRS in 1954, is the water treatment agency for Clark County. Like LVVWD, CCWRD is a member of the SNWA. CCWRD treats wastewater from unincorporated parts of Clark County in the LVV and most of the Las Vegas Strip. CCWRD currently collects and treats (reclaims) an estimated 96 Mgal/day at the central plant in Las Vegas; however, current plans to expand will allow treatment of up to 110 Mgal/day (CCWRD 2007). This expansion will be critical as demand increases; since 1996, the influent flows have increased from 63.4 to 101.5 Mgal/day (56%). Additionally, the number of customer accounts has increased from 85,756 accounts in 1996 to 186,689 in 2006. With the current population growth (2%–4%), there will be an estimated annual increase of 5 Mgal/Day that will require treatment. At this rate, the proposed 110 Mgal/day expansion activities at the central plant will have reached capacity by the end of 2008 (CCWRD 2007).

Neither the NDEP nor the health districts have the authority to regulate solid waste management on tribal lands. The Nevada Rural Water Association, under a contract with the U.S. Department of Agriculture, provides technical assistance to tribes on solid waste issues.

Public Safety

POLICE

The availability of full-time police protection varies throughout the CTA study area. LVMPD provides police protection for the City of Las Vegas and unincorporated parts of Clark County. LVMPD employs 2,635 officers and 1,649 other employees and has eight stations across the LVV. LVMPD has a service standard of one officer and two civilian personnel per 1,000 residents; as of 2001, LVMPD was on target to maintain this standard. Five new stations are in the planning phase to keep up with area growth; however, the location of these has not yet been determined (City of Las Vegas 2001). LVMPD also supports the 10-member Las Vegas Indian Colony Police Department, as needed.

NLVPD serves the City of North Las Vegas and employs 263 officers and 241 other employees. NLVPD operates out of two stations; however, it is anticipated that at least two more stations or command centers will be needed to maintain the target ratio of 1.82:1,000 residents. The location of future facilities has not yet been determined.

FIRE

The Las Vegas Fire and Rescue Department (LVFRD) serves the City of Las Vegas; LVFRD employs 672 employees and has 16 stations. Eleven new stations have been planned in compliance with Insurance Service Office standards for service radius areas. The City of Las Vegas employs approximately 0.80 fire personnel per 1,000 residents; however, the target ratio is 1:1,000. In order to meet this goal, LVFRD will have to hire at least 300 more personnel (City of Las Vegas 2001). LVFRD also supports the Las Vegas Colony.

The North Las Vegas Fire Department serves the City of North Las Vegas and has 175 employees and six stations. A seventh station is proposed for the additional call load of the growing area (City of North Las Vegas 2006). The location of future facilities has not yet been determined.

Health Care

Hospitals in the CTA study area include the North Vista Hospital in the City of North Las Vegas, which employs 800 doctors and 620 other staff. A Veterans Affairs Hospital is under construction in North Las Vegas and is anticipated to open in 2011. A third hospital is in the planning stages—the Meadows Hospital in North Las Vegas. No information about the hospital, including the location, was available; however, a zoning ordinance amendment (No. 2388) was passed for the proposed hospital in August 2007.

Hospitals in the City of Las Vegas include Desert Springs, Mountain View, Southern Hills, Spring Valley, St. Rose Dominican Hospital (San Martin Campus), Summerlin Medical Center, Sunrise Hospital and Medical Center (includes Sunrise Children's Hospital), University Medical Center, Centennial Hills, and Valley Hospital Medical Center. Summerlin Hospital has plans to expand their facilities, with completion expected in 2009; the expansion will double the hospital's capacity (City of Las Vegas 2002). More than 3,800 doctors and roughly 12,000 other staff are employed at these nine Las Vegas hospitals. The expansion of the Summerlin Hospital is expected to employ an additional 200 to 300 nurses and support personnel; physicians are also being recruited. There are also six additional specialty hospitals in Las Vegas that focus on long-term acute care, physical rehabilitation, etc. Physician and support staff figures were not available for these specialty hospitals.

Las Vegas established the Las Vegas Medical District, adopted by the City Council in 1997. The District encompasses approximately 214 acres and is generally bounded by Alta Drive to the north, Martin Luther King Boulevard to the east, Charleston Boulevard to the south, and Rancho Drive to the west (City of Las Vegas 2002). Facilities within the district include University Medical Center, Clark County Health Center, and Valley Hospital.

Las Vegas Paiute Tribe members, as well as other tribal members in Nevada, are eligible for health care through Indian Health Services by means of a contract administered by Equity Health Care (State of Nevada 1991). The tribe also constructed the Las Vegas Paiute Tribal Health Facility, which opened in 2005, to provide direct health services to any member of a federally recognized tribe. Currently, the clinic is available to any of the approximately 22,000 Native Americans who live in the LVV.

3.13.6 Taxes and Revenues

Nevada has a tax climate that encourages new business expansion and start-ups. The state does not have corporate or personal income tax, franchise tax on income, or inheritance gift, estate, admissions, or unitary taxes. Only those revenues that are clearly and concisely reported by the state or federal government (i.e., property taxes, sales tax, payments in lieu of taxes [PILT], etc.) were considered for the

analysis. Where available, revenue information was gathered for the county and city level; however, information of this type was limited.

Real Estate/Property Tax

According to the Nevada Department of Taxation, the combined countywide real estate tax rate for Clark County is 3.102% (FY 2006–2007), which is up by 0.80% from the previous FY. In 2006, the combined property tax rate in the City of Las Vegas was $3.282 per $100 assessed value (City of Las Vegas 2006c); the rate for the City of North Las Vegas was $3.385 per $100 assessed value. Statewide sales taxes generated an estimated $70 million to fund transportation projects in 1999. The statewide average ratio of assessed valuation to taxable value is 35%, as determined by state law. By way of comparison, the ratio of assessed valuation is 25% in Arizona and 100% in California.

North Las Vegas has four of Clark County's 92 tax districts, and Las Vegas has seven tax districts. North Las Vegas, unlike Las Vegas or Clark County, has approved a dedicated property tax levy for street and road maintenance at $23 per resident. Clark County has also adopted a development privilege tax under which revenues are used to fund beltway projects; the estimated revenue is $20 per capita (or approximately $500 per new home). The mean and median real estate taxes in Las Vegas are marginally higher than in North Las Vegas, Clark County, or Nevada (Table J.12 in Appendix J).

Payment in Lieu of Taxes

In 1976, Congress directed federal land management agencies to allocate income to states and counties with federal lands, to provide a PILT program to help offset lost tax revenues. Because BLM is the largest federal land owner and land manager, BLM was chosen by the Secretary of the Interior to administer the PILT program.

Since 1999, PILT payments received by the State of Nevada and Clark County have almost doubled. In Nevada, payments have increased in value by 96.86% since 1998, and in Clark County, payments have increased by 95.46% over the same period. Table J.13 in Appendix J gives the breakdown of the PILT program.

In 2006, the federal government owned and managed roughly 83% of the land in Nevada; as of 2006, Clark County has 56,772,898 acres of federal land within its limits. Federal lands are not subject to property taxes that support county governments and education, although local communities play an important role in supporting the management of federal lands. Congress appropriates PILT payments each year. The formula used to compute the payments is contained in the PILT Act and is based on population, receipt-sharing payments, and the amount of federal land within an affected county (U.S. Department of the Interior 2007).

Sales and Use Taxes

Sales taxes apply to the retail sale of personal property or services within the state; Nevada does not charge sales tax on food items for home use, medicine, or services. Use tax complements sales tax and is imposed on tangible personal property purchased for storage or use in Nevada on which Nevada sales tax was not paid at the time of purchase. Thus, use tax prevents sales tax avoidance or the payment of a lesser tax rate by making purchases outside the tax jurisdiction where first use, storage, or other consumption will occur. State use tax is shared between the state government and the county of origin (i.e., the county where the tax was imposed) on the same distribution basis as sales tax.

Sales tax is 6.5% across the state; however, Clark County currently assesses an option tax, making the county tax 7.75%. The option tax in Clark County is used to support public transit options and generated an estimated $41 per capita in 1999 (Institute of Transportation Studies 2007). Sales and use taxes for Nevada and Clark County are reported together by the NSD (Tables J.14 and J.15 in Appendix J). Table J.16 in Appendix J shows the breakdown of sales tax distribution in Clark County.

Overall, both state and county have seen a roughly 65% increase in sales tax revenue between 2000 and 2006. Growth was relatively healthy and increased in terms of revenue over the seven-year period; the only exception was 2002, when growth at the county level was marginal, at 1.12% (see Table J.14), and the state saw a decrease of −0.31% (see Table J.15).

Lodging Tax

Cities, towns, and counties, by voter approval, may impose a lodging excise tax on all sleeping accommodations for guests staying less than 31 days. This tax extends to mobile accommodations, such as tents, trailers, and campers. Clark County lodging tax revenue is used for street and road improvements in areas with high tourism, such as around Las Vegas Boulevard in Las Vegas. The lodging tax for Nevada is 1%. The estimated per capita revenue for Clark County is between $17 and $19. Between 2000 and 2006, there was a 32.40% increase in lodging tax revenue, which has steadily increased since FY 2002–2003 (Table J.17 in Appendix J). Like for sales and use tax, the 2001–2002 period saw a decrease in revenue, at −13.66% (see Table J.17).

3.13.7 Economic Environment

Rapid growth in the LVV has been a significant driving force in the social and economic setting of the area. Increased growth in the LVV has also exerted pressures on undeveloped federal lands, such as the ULVW area, as residential and commercial developments move closer to the fringe. The major economic stimuli come from tourism and gaming, along with real estate and residential development.

Tourism and Gaming Activity

TOURISM ACTIVITY

Nearly 21 million people visited LVV in 1990, compared with 38 million in 2006, an 80.95% increase over 16 years. The tourism industry is the primary industry in LVV, and the gaming and service sectors provide the greatest share of employment in Clark County. According to the *City of Las Vegas Master Plan 2020*, an estimated 2.5 jobs are created for each new hotel room; of these, one job is created within the hotel, 1.5 jobs outside the hotel (City of Las Vegas 2006c).

Tourism in the LVV is dominated by gaming; however, there is also substantial use of the nearly 3 million acres of federal land surrounding the Cities of Las Vegas and North Las Vegas. As a result, there are a host of year-round recreation opportunities for tourists, including hiking, camping, mountain biking, wildlife viewing, scenic viewing, education, and hunting. Section 3.9, “Recreation,” details the numerous opportunities that exist within the CTA study area. Recreation activities are an important contributor to the economic stability of the area.

GAMING

Gaming and tourism have been the principal components of the local economy in LVV for more than 50 years. As such, these provide the primary impetus for employment growth across all major industries in the area. The economic stability, growth, and development of City of North Las Vegas have also been tied

to the gaming and tourism industries; however, because it is located along two major transportation corridors, this has also promoted the development of a strong industrial base (City of North Las Vegas 2006).

There are 327 casinos in Nevada; of these, 10 are in North Las Vegas and 122 are in Las Vegas (World Casino Directory 2006). A summary of total gaming revenue in four geographic areas is presented in Table J.18. No data were available for gaming revenue in North Las Vegas, in Las Vegas as a whole, or for the Las Vegas Paiute Tribe. Nevertheless, these data present a summary of gaming activity in the region. In general, Clark County and Nevada have seen an increase in gaming revenue since 1999; 2002 was the exception, showing a −4.29% decrease in gaming revenue for the state. Downtown Las Vegas has had limited growth in terms of gaming revenue, while the Las Vegas Strip has had two years in which revenue has dropped (−1.45% in 2001 and −7.97% in 2002); in other years, Las Vegas has seen a 5% to 13.5% revenue increase.

Gaming in Nevada has generated enormous revenues for the state. In 2006, gaming revenue contributed $838,094,000 to the state general fund (Applied Analysis 2007). The state and LVV have also benefited in terms of employment opportunities that the casinos and associated hospitality, entertainment, and service industries have generated.

Real Estate and Residential Development

Using new building permits as a measure of growth, between 1996 and 2005, growth appeared to have been concentrated in the City of Las Vegas in terms of the actual number of permits issued, even though the percent growth was much higher in the City of North Las Vegas (Table J.19 in Appendix J). However, between 1996 and 2005 in North Las Vegas, there was a 169.12% increase in the number of permits issued and a 165.52% growth in the dollar value of those permits. Meanwhile, there was −8.09% growth in Las Vegas in terms of the number of building permits and −1.83% growth in the dollar value of those permits (Table J.20 in Appendix J). Data for Clark County between 2002 and 2005 also indicate that there was a 24.25% increase in the number of permits issued and a 100.09% increase in the dollar value of those permits.

Like other economic measures (sales tax, gaming revenue, etc.), growth in 2001–2002 in the LVV area was marginal. In fact, fewer new building permits were issued in 2001 than in 2000, and roughly the same number of permits was issued in 2002 as in 2000 (see Table J.19). Building permit dollar values for 2001 and 2002 did increase, unlike for the number of permits; however, the increase was not as substantial as in subsequent years (see Table J.20).

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Chapter 4

ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter analyzes the potential environmental consequences, or impacts, that could occur as a result of implementing any of the alternatives described in Chapter 2. Resource topics analyzed in this chapter are the same as those described in detail in Chapter 3, "Affected Environment." Direct, indirect, and cumulative impacts are analyzed for each resource topic. If applicable to a given resource topic, mitigation measures to alleviate potential impacts are identified. Impacts are described in terms of type, context, duration, and intensity. General definitions are defined as follows, while more specific impact thresholds are given for each resource at the beginning of each section.

- ***Type*** describes the classification of the impact as either beneficial or adverse, direct or indirect.
  - **Beneficial:** A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
  - **Adverse:** A change that moves the resource away from a desired condition or detracts from its appearance or condition.
  - **Direct:** An effect that is caused by an action and occurs at the same time and in the same place.
  - **Indirect:** An effect that is caused by an action but is later in time or farther removed in distance and is still reasonably foreseeable.
- ***Context*** describes the area or location in which the impact will occur. Are the effects site specific, local, regional, or even broader?
- ***Duration*** describes the length of time an impact is anticipated to last.
  - **Short-term** impacts generally last only as long as the construction period, and the resources generally resume their preconstruction conditions following construction.
  - **Long-term** impacts last beyond the construction period, and the resources may not resume their preconstruction conditions for a longer period following construction.
- ***Intensity*** describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this SEIS.

USU quantified impacts to various natural resources for their alternative futures model. Vegetation, soils, rare plants, and fossils were the focus of their investigation. Appendix K provides a comparison of the alternatives using their models.

For lands identified within the final CTA boundary, the management of proposed land actions would continue under current land use plan guidance.

A variety of new facilities, utilities, roads, and recreation infrastructure has been proposed by various stakeholders for lands within the study area. Although BLM is not making decisions about these actions as part of this process, in order to determine the direct and indirect impacts, BLM has made several assumptions regarding the location and size of potential actions under each alternative. These assumptions

are based on detailed information provided by the stakeholders and on different development scenarios that may occur under each alternative.

- Actions that have been considered consist of new utilities, flood control structures, transportation infrastructure, recreation infrastructure, and other public purposes.
- Development scenarios are based on anticipated infrastructure needs associated with the various acreages identified for disposal.
- The maximum extent in acres of these potential actions has been assumed for each alternative.
- Where appropriate, it is assumed that impacts would occur proportionate to the relative amount of a resource within a particular alternative boundary.
- Mitigation requirements identified in the SEIS to prevent or limit direct impacts associated with a proposed action would be applied within the CTA boundary.
- Site-specific analysis is necessary for any future proposed action.

4.2 EARTH RESOURCES

This section evaluates the potential direct and indirect impacts to earth resources associated with each of the alternatives. This analysis specifically addresses impacts related to geological hazards and soils. In 2008, Kleinfelder (2009) conducted a hydrologic and erosion study that presents a comparative analysis of the effects on water resources and ULVW under each of the alternatives (see Section 4.3, "Water Resources"). Portions of the study are also relevant to earth resources, in particular the quantification of sediment loss under each of the alternatives. A brief summary of the water resources study, as it pertains to earth resources, is presented in this section. The complete hydrologic and erosion analysis can be found in Appendix L. Table 4.2-1 presents the annual erosion impacts for each alternative.

Table 4.2-1. Comparison of Annual Erosion Impacts by Alternative

Water Resources	Baseline	A	B (Preferred)	C	D	E	No Action
Alternative Boundary (acres)	12,622.7	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
100-Year Peak Flow Upstream of Decatur Basin (cfs)	13,750	13,790	14,840	15,960	16,490	16,720	17,130
100-Year Peak Flow Downstream of Decatur Basin (cfs)	9,670	9,690	9,760	10,170	10,210	10,460	11,270
Stream Bank Erosion (tons)	1,000	1,030	1,150	1,380	1,460	1,550	1,680
Surface Erosion (tons)	320	310	290	250	240	230	210
Total Annual Sediment Loss (tons)*	1,320	1,340	1,440	1,630	1,700	1,780	1,890
% Increase from Baseline Conditions†	0	2	9	23	29	35	43

* Total annual sediment loss is calculated by summing stream bank erosion and surface erosion.

† Percentage represents the increase in total annual sediment loss from baseline conditions.

4.2.1 Analysis Approach and Assumptions

The hydrologic study analyzed surface erosion (from overland sheet flow) and stream bank erosion from the ULVW (from significant flood events). The methods and assumptions used to measure these mechanisms are briefly described below.

Surface Erosion

Using a strategy known as the Simple Method (Schueler 1987), surface erosion (or annual volume sediment loss) was calculated from annual rainfall and from the disposal area to derive the volume of annual runoff. A calibrated value, which had been previously developed for the LVV by Reginato and Piechota (2004), was applied to the volume of runoff. The calibrated values allow the analysis to account for how readily water flows over a given surface and the concentration of fine sediment contained in the runoff.

Assumptions for the surface erosion analyses include the following:

- All areas available for disposal under each of the alternatives assumed the same breakdown of future land uses, which included 65% residential, 20% streets and major roads, 10% commercial, and 5% parks and golf courses. This land use characterization is consistent with existing and future land uses in the vicinity of the CTA study area.
- The remaining lands (that is, those areas within the CTA study area that are not available for disposal) were assumed to be 97% undeveloped (desert) and 3% developed under each of the alternatives.

Stream Bank Erosion

Stream bank erosion occurs as a result of significant flood events. In order to calculate the extent of stream bank erosion under each of the alternatives, rainfall runoff models were created for 2-, 5-, 10-, 25-, 50-, and 100-year storm events using the Hydrologic Engineering Center–1 (HEC-1) software and the Soil Conservation Service's (1975) Curve Number Method. Curve numbers use soil and vegetation conditions to estimate runoff potential. Curve numbers for developed and undeveloped lands account for the type and amount of vegetation coverage and the average percentage of impervious surfaces.

The storm event models described above were then routed through a hydraulic model of the ULVW using the Hydrologic Engineering Center River Analysis System (HEC-RAS). Sediment transport was analyzed in the hydraulic model to estimate the accumulation and displacement of sediment in the ULVW. Sediment surpluses and deficits were tallied at multiple locations within the wash to determine the overall loss for the ULVW. These tallies were summed for each storm event under each alternative and statistically weighted to derive the average annual sediment loss from stream bank erosion.

Baseline Conditions

The rainfall runoff model for existing conditions within the CTA study area yields peak flows of 13,750 cfs for the 100-year flood. As a point of reference (refer to Section 3.3.1, "Surface Water"), a flow rate of 14,000 cfs would cover a football field 1 foot deep in approximately 3.5 seconds. Under baseline conditions, a peak flow of 13,750 cfs within the CTA study area would result in 1,000 tons[2] of total stream bank erosion. In addition, surface erosion causes approximately 320 tons of sediment loss. As a result, the total annual sediment loss from both erosion mechanisms amounts to 1,320 tons.

4.2.2 Impact Thresholds

The LVVDB FEIS defined thresholds for evaluating the significance of an impact to earth resources. These same thresholds are employed in the current CTA analysis, with one addition, which pertains to

[2] The technical study reports the modeling results using scientific notation. For clarity, the output has been converted to tons for the general reader.

modifications to ULVW resulting from efforts to mitigate soil loss. An impact to earth resources is considered significant if it would do the following:

- Substantially alter the topography or ground surface beyond that resulting from natural erosion and deposition;
- Result in substantial soil erosion or loss of topsoil;
- Be located on expansive soils, creating a risk to people or property;
- Expose people or property to hazards involving seismic events or subsidence; or
- Result in modifications to the ULVW as a result of efforts to mitigate soil loss.

4.2.3 Actions Proposed under All Alternatives that Would Cause Change to Earth Resources

The following would cause change to earth resources:

- Conservation measures would be put in place for the protection of surface paleontological sites and sensitive plant habitat.
- BLM would inventory unauthorized surface disturbances in the CTA, including illegal dump sites, user-created trails and tracks, and other trespasses, and would seek to rehabilitate these disturbances to a more natural condition to improve management and protection of sensitive resources.

Direct and Indirect Impacts

GEOLOGY

Situated within Seismic Zone 2B, the CTA study area has moderate potential to be subject to damage during a seismic event. Any construction activities within and adjacent to the CTA would not directly expose people to seismic events. Should an event occur, however, people and infrastructure would be more likely to sustain injuries or damages in developed areas that contain roads and utilities than in undeveloped desert currently within the CTA study area. Structural damage could be minimized by adhering to local design practices, which have stringent building requirements based on the seismic zone. No further mitigation would be required.

Although there is potential for subsidence within the LVV, there have not been any reports documenting subsidence within the CTA study limits. Factors that typically contribute to risk of subsidence include groundwater pumping and mineral extraction. Because neither activity is planned under any of the alternatives and there have been no subsidence incidents reported for the CTA study area or its vicinity, the potential for impacts to future infrastructure resulting from subsidence is considered minimal.

SOILS

Disturbance of native soils could impact the success of sensitive plant species within and adjacent to the ULVW. Disturbed soil also would be more susceptible to erosion during heavy winds and storm events, eventually reaching the Lower Las Vegas Wash and Lake Mead and degrading water quality. According to the USU (2008) soils study, special-status plant species occur primarily in the LVF.

Existing regulations require the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) for construction projects that disturb more than 1 acre. A SWPPP will include measures to

address water quality issues such as soil erosion and sedimentation on construction sites from storm runoff. As discussed in greater detail in Section 4.3, "Water Resources," measures associated with the SWPPP may conflict with BLM goals and objectives to preserve the natural functioning of the wash. The impacts associated with the short-term implementation of the SWPPP likely would be less detrimental to the natural ecosystem of the ULVW, compared with the impacts resulting from polluted runoff entering the wash. Implementation of the SWPPP is not expected to adversely affect the long-term natural functioning of the ULVW.

New development would result in more impervious surfaces within and adjacent to the CTA study limits. As a result, there would be an increase in surface water runoff, which would contribute to the amount of surface and stream bank erosion in the ULVW. The total annual sediment loss resulting only from new development common to all of the alternatives would be expected to be greater than the baseline conditions (1,320 tons) but less than that of Alternative A (1,340 tons).

According to the Clark County Department of Development Services Building Division and as further documented in the 2004 LVVDB FEIS, expansive soils may be present in various locations throughout the CTA study area but are concentrated along the ULVW drainage. Expansive soils have the potential for volume change under changing moisture conditions. As part of standard land development practices, geotechnical studies are typically conducted to characterize local conditions, and engineering solutions are developed to address soil limitations and concerns on a site-by-site basis. Standard geotechnical investigations will identify potential impacts such as expansive soils or concretion and recommend specific measures to address these issues during design and construction.

Mitigation Measures and Unavoidable Adverse Impacts

No mitigation beyond standard construction practices is required. No unavoidable adverse impacts to earth resources are anticipated with the implementation of the actions common to all alternatives.

4.2.4 Alternative A

Actions Proposed under Alternative A that Would Cause Change to Existing Earth Resources

In addition to the actions common to all alternatives, the following action is assumed under Alternative A and would affect earth resources:

- A total of 370.8 acres would be available for disposal and subsequent development.

Direct and Indirect Impacts

GEOLOGY

The CTA study area is in Seismic Zone 2B, which is defined as an area with moderate damage potential from seismic events. Although disposal of land would not directly increase potential exposure of people and property to seismic events, subsequent development activities on disposed lands would create the potential for new properties and people to become exposed to seismic activity and associated damages. However, local building practices for the Cities of Las Vegas and North Las Vegas require structures to be built to the 2006 International Building Code standards, which require more stringent seismic zone standards, thereby minimizing the potential for structural damage. No further mitigation would be needed.

Although the potential exists for subsidence to occur in the LVV, the potential for impacts to future infrastructure and structures within the CTA study area is considered minimal. There have been no previous reports of subsidence in the CTA study area, and factors that may contribute to subsidence (such as groundwater overpumping and mineral extraction) are not present.

SOILS

The primary impact to soils associated with implementation of this alternative would result from hydrologic changes in ULVW. The hydrologic changes and the resulting changes to erosion rates that would occur within the CTA study area have been described in detail in Section 4.3, “Water Resources.”

There are two factors that affect soil erosion under this alternative. As leased and disposed lands are developed, these areas—which would have more impermeable surfaces—would convey a greater amount of runoff, compared with their existing undeveloped state. The increase in runoff has the potential to increase the rate of erosion along natural drainages within the CTA study area and induce increased sedimentation downstream of the CTA study area. The other factor is construction activities, which disturb the surface soils, covering vegetation and causing the soils to be more susceptible to erosion from storm events.

For Alternative A, there is a relatively small amount of land that would be available for disposal and subsequent development. Development of the disposed parcels under this alternative would yield 310 tons of sediment loss annually as a result of surface erosion. Estimated rainfall runoff for Alternative A will generate peak flows of 13,790 cfs for the 100-year flood event, amounting to 1,030 tons of total stream bank erosion. The sediment loss from surface and stream bank erosion mechanisms represents a total annual sediment loss of 1,340 tons, which reflects a 2% increase in annual sediment loss, compared with baseline conditions. This is a relatively minor change in the erosion rate, and no mitigation is required.

Existing regulations require preparation and implementation of a SWPPP for construction projects that disturb more than 1 acre. A SWPPP will include BMPs to reduce issues such as soil erosion and sedimentation on construction sites from storm runoff. While BMPs are intended to reduce impacts of construction-induced soil erosion and sedimentation to ULVW, these same measures could impede the natural occurrences of soil erosion and sedimentation. This would conflict with BLM goals and objectives to protect the natural wash system. However, the effects of construction-induced soil erosion and sedimentation to the wash are expected to be more harmful to the natural ecosystem of the ULVW, compared with the impacts resulting from the short-term implementation of the BMPs. Accordingly, it is not anticipated that the BMPs would disrupt the long-term productivity of the natural system. With the exception of the preparation and implementation of a SWPPP, no mitigation measures would be required.

According to the Clark County Department of Development Services Building Division and as further documented in the 2004 LVVDB FEIS, expansive soils may be present in various locations throughout the CTA study area but are concentrated along the ULVW drainage. Geotechnical studies are typically conducted to characterize local conditions, and engineering solutions are developed to address soil limitations and concerns. Prior to development, standard geotechnical investigations, which will identify potential impacts from expansive soils and subsidence, would be conducted on a site-by-site basis to limit expansive soil impacts.

Mitigation Measures and Unavoidable Adverse Impacts

No mitigation beyond standard construction practices is required. No unavoidable adverse impacts to earth resources are anticipated under this alternative.

4.2.5 Alternative B (BLM Preferred Alternative)

Actions Proposed under Alternative B that Would Cause Change to Existing Earth Resources

Along with the actions common to all alternatives, the following action is assumed under Alternative B and would affect earth resources:

- A total of 2,315.7 acres would be available for disposal and development, including areas north and east of the Paiute Reservation and areas adjacent to DNWR at the northeastern extent of the CTA study area.

Direct and Indirect Impacts

GEOLOGY

Under Alternative B, 2,315.7 acres would be made available for disposal and potential development, compared with 370.8 acres under Alternative A. Although this alternative would result in additional structures and people relocating to an area classified as Seismic Zone 2B, as discussed under Alternative A, adherence to current building standards would minimize any potential effects from seismic events.

Potential impacts from subsidence would be similar to those discussed above under Alternative A.

SOILS

Erosion and sedimentation impacts would be similar to those described under Alternative A; however, because there would be 2,315.7 acres available for disposal, there would be a l% increase in the rate of erosion in ULVW and sedimentation of downstream reaches. Under this alternative, the rainfall runoff model indicates peak flows of 14,840 cfs for the 100-year flood event, which would yield 1,150 tons of total stream bank erosion. Surface erosion resulting from the limited development in the CTA study area and in the disposed parcels would cause 290 tons of sediment loss, for a total annual sediment loss of 1,440 tons. Compared with baseline conditions, this reflects a 9% increase in sediment loss. The sediment loss from surface and stream bank erosion could alter the natural wash, causing indirect impacts to possible cultural and/or paleontological resources within the ULVW active drainage corridor (see Section 4.5, “Cultural Resources,” and Section 4.6, “Paleontological Resources”).

Potential impacts involving expansive soils would be similar to those described under Alternative A.

Mitigation Measures and Unavoidable Adverse Impacts

Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas would coordinate with the CCRFCD to implement additional erosion and flood control measures necessary to address increased flood flows and erosion rates resulting from the development of lands disposed of by BLM. The disposal of portions of land upstream of the Decatur detention basin has the potential to increase the magnitude of major flood events in the ULVW, resulting in higher stream bank erosion rates. Development of additional erosion and flood control measures outside the CTA could affect the ecosystem of the ULVW by interfering with the surface water natural flow process. By capturing and/or diverting the surface water natural flow process into specific areas, the configuration and natural functioning of the wash would be changed. This is an unavoidable adverse impact.

4.2.6 Alternative C

Actions Proposed under Alternative C that Would Cause Change to Existing Earth Resources

In addition to the actions common to all alternatives, the following action is assumed under Alternative C and would affect earth resources:

- A total of 6,961.0 acres north and south of the CTA would be available for disposal and development, including areas north and east of the Paiute Reservation.

Direct and Indirect Impacts

GEOLOGY

Under Alternative C, 6,961.0 acres would be made available for disposal and potential development. Although this alternative would result in additional structures and people relocating to an area classified as Seismic Zone 2B, as discussed under Alternative A, adherence to current building standards would minimize any potential effects from seismic events.

Potential impacts from subsidence would be similar to those discussed above under Alternative A.

SOILS

Erosion and sedimentation impacts would be similar in nature to those described under Alternative B. There would be 6,961.0 acres available for disposal under this alternative, which would result in an increase in the rate of erosion in ULVW and sedimentation of downstream reaches. This alternative also allows for potential future development north of the ULVW, which would result in a large increase in sediment loss over Alternative B. Estimated rainfall runoff for this alternative would generate peak flows of 15,960 cfs for the 100-year flood event, amounting to 1,380 tons of total stream bank erosion. Land available for disposal and development under Alternative C would yield 250 tons of sediment loss from surface erosion. This equates to an annual sediment loss of 1,630 tons, which represents a 23% increase in sediment loss, compared with baseline conditions. The sediment loss from surface and stream bank erosion could alter the natural wash, causing indirect impacts to possible cultural and/or paleontological resources within the ULVW active drainage corridor (refer to Section 4.5, “Cultural Resources,” and Section 4.6, “Paleontological Resources”).

Potential impacts involving expansive soils would be similar to those described under Alternative A but would be potentially greater in magnitude.

Mitigation Measures and Unavoidable Adverse Impacts

Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas would coordinate with CCRFCD to implement additional erosion and flood control measures required to address increased flood flows and erosion rates resulting from the development of lands disposed of by BLM. The disposal of large portions of land upstream of the Decatur detention basin has the potential to increase the magnitude of major flood events in the ULVW, resulting in higher stream bank erosion rates. Additional flood control facilities constructed outside the CTA would affect the natural functioning of the wash by altering the natural migration of surface flows. As described above, anticipated impacts are likely to include alterations to the natural channelization of the ULVW, causing an unavoidable adverse impact.

4.2.7 Alternative D

Actions Proposed under Alternative D that Would Cause Change to Existing Earth Resources

Along with the actions common to all alternatives, the following action is assumed under Alternative D and would affect earth resources:

- A total of 8,022.7 acres would be available for disposal and future development, primarily north and east of the Paiute Reservation and along the northern extent of the CTA study area adjacent to DNWR.

Direct and Indirect Impacts

GEOLOGY

Under Alternative D, 8,022.7 acres would be made available for disposal and potential development. Although this alternative would result in additional structures and people locating to an area classified as Seismic Zone 2B, as discussed under Alternative A, adherence to current building standards would minimize any potential effects from seismic events.

Potential impacts from subsidence would be similar to those discussed above under Alternative A.

SOILS

Erosion and sedimentation impacts would be similar in nature to those described under Alternative B; however, because there would be 8,022.7 acres available for disposal under this alternative, this would result in an increase in the rate of erosion in ULVW and sedimentation of downstream reaches. This alternative also allows for potential future development north of the ULVW, which would result in a large increase in sediment loss, compared with that of Alternative B. Estimated rainfall runoff for this alternative will generate peak flows of 16,490 cfs for the 100-year flood event, amounting to 1,460 tons of total stream bank erosion. Development of the disposed parcels with implementation of this alternative would cause 240 tons of sediment loss, triggering an annual sediment loss of 1,700 tons. Compared with baseline conditions, this reflects a 29% increase in sediment loss. The sediment loss from surface and stream bank erosion could alter the natural wash, causing indirect impacts to possible cultural and/or paleontological resources within the ULVW active drainage corridor (see Section 4.5, “Cultural Resources,” and Section 4.6, “Paleontological Resources”).

Potential impacts involving expansive soils would be similar to those described under Alternative A but would be potentially greater in magnitude.

Mitigation Measures and Unavoidable Adverse Impacts

Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas would coordinate with the CCRFCD to implement additional erosion and flood control measures required to address increased flood flows and erosion rates resulting from the development of lands disposed of by BLM. The disposal of large portions of land upstream of the Decatur detention basin has the potential to increase the magnitude of major flood events in the ULVW, resulting in higher stream bank erosion rates. Land disposed of in and near the main channel of the ULVW will have the most significant impact to the hydraulic and erosion processes. The future construction of additional flood control facilities outside the CTA could affect the ecosystem of ULVW by disrupting the natural processes related to erosion and

deposition caused by surface water flows. This flow diversion could change the configuration of the natural wash by altering the sediment transport process and could cause an unavoidable adverse impact.

4.2.8 Alternative E

Actions Proposed under Alternative E that Would Cause Change to Existing Earth Resources

In addition to the actions common to all alternatives, the following action is assumed under Alternative E and would affect earth resources:

- A total of 10,010.3 acres would be available for disposal and future development.

Direct and Indirect Impacts

GEOLOGY

Under Alternative E, 10,010.3 acres would be made available for disposal and potential development. Although this alternative would result in additional structures and people locating to an area classified as Seismic Zone 2B, as discussed under Alternative A, adherence to current building standards would minimize any potential effects from seismic events.

Potential impacts from subsidence would be similar to those under Alternative A.

SOILS

Erosion and sedimentation impacts would be similar in nature to those described under Alternative B; however, there would be 10,010.3 acres available for disposal under this alternative, which would result in an increase in the rate of erosion in the ULVW and sedimentation of downstream reaches. This alternative also allows for potential future development north of the ULVW, which would result in a large increase in sediment loss, compared with Alternative B. Estimated rainfall runoff for this alternative will generate peak flows of 16,720 cfs for the 100-year flood event, amounting to 1,550 tons of total stream bank erosion. Land use and development under Alternative E would produce 230 tons of sediment loss from surface erosion. This loss equates to an annual sediment loss of 1,780 tons, which represents a 35% increase in sediment loss, compared with baseline conditions. The sediment loss from surface and stream bank erosion could alter the natural wash, causing indirect impacts to possible cultural and/or paleontological resources within the ULVW active drainage corridor (see Section 4.5, “Cultural Resources,” and Section 4.6, “Paleontological Resources”).

Potential impacts involving expansive soils would be similar to those described under Alternative A but would be potentially greater in magnitude.

Mitigation Measures and Unavoidable Adverse Impacts

Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas would coordinate with CCRFCD to implement additional erosion and flood control measures required to address increased flood flows and erosion rates resulting from the development of lands disposed of by BLM. The disposal of large portions of land upstream of the Decatur detention basin has the potential to increase the magnitude of major flood events in the ULVW, resulting in higher stream bank erosion rates. Land disposed of in and near the main channel of the ULVW will have the most significant impact to the hydraulic and erosion processes. The future construction of additional flood control facilities outside the CTA could

affect the ecosystem of the ULVW by disrupting the natural processes related to erosion and deposition caused by surface water flows. This flow diversion could change the configuration of the natural wash by altering the sediment transport process and could cause an unavoidable adverse impact.

4.2.9 No-Action Alternative

Actions Proposed under the No-Action Alternative that Would Cause Change to Existing Earth Resources

Along with the actions common to all alternatives, the following action is assumed under the No-Action Alternative and would affect earth resources:

- With the exception of Eglington Preserve and Tule Springs, the remainder of the CTA study area, which amounts to 12,150 acres, would be available for disposal and potential future development.

Direct and Indirect Impacts

GEOLOGY

Under the No-Action Alternative, 12,150 acres would be made available for disposal and potential development. Although this alternative would result in additional structures and people relocating to an area classified as Seismic Zone 2B, as discussed under Alternative A, adherence to current building standards would minimize any potential effects from seismic events.

Potential impacts from subsidence would be similar to those discussed above under Alternative A but would be potentially greater in magnitude.

SOILS

Erosion and sedimentation impacts would be similar in nature to those described under Alternative B; however, because there would be 12,150 acres available for disposal, there would be an increase in the rate of erosion in the ULVW and sedimentation of downstream reaches. This alternative also allows for potential future development north of the ULVW, which would result in a large increase in sediment loss, compared with Alternative B. Estimated rainfall runoff for this alternative will generate peak flows of 17,130 cfs for a 100-year flood event, amounting to 1,680 tons of total stream bank erosion. Development of the disposed parcels with implementation of this alternative would result in 210 tons of sediment loss, which amounts to an annual sediment loss of 1,890 tons. Compared with baseline conditions, this represents a 43% increase in sediment loss.

Potential impacts involving expansive soils would be similar to those described under Alternative A but would be greater in magnitude.

Mitigation Measures and Unavoidable Adverse Impacts

Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas would coordinate with CCRFCD to implement additional erosion and flood control measures required to address increased flood flows and erosion rates resulting from the development of lands disposed of by BLM. The disposal of large portions of land upstream of the Decatur detention basin has the potential to increase the magnitude of major flood events in the ULVW, resulting in higher stream bank erosion rates. Land disposed of in and near the main channel of the ULVW would have the most significant impact to the hydraulic and erosion processes. The future construction of additional flood control facilities outside the CTA could

affect the ecosystem of the ULVW by disrupting the natural processes related to erosion and deposition caused by surface water flows. This flow diversion could change the configuration of the natural wash by altering the sediment transport process and could cause an unavoidable adverse impact.

4.3 WATER RESOURCES

In general, the disposal or lease of BLM lands adjacent to the ULVW would not directly impact surface water, groundwater, or LVV water supply and demand. Indirect impacts to water resources would occur as a result of changes in land use following the disposal or lease and any subsequent development of adjacent lands. Land development on an active alluvial fan and wash system, such as the ULVW, can be problematic because smaller channels feeding into the main wash can behave in a very unpredictable manner with regard to flow direction and capacity during storm events. In addition, developed land can generate higher volumes of runoff as a result of increased impervious surfaces. The developed condition runoff is generally sediment free and discharges in a concentrated fashion at point locations, thus increasing the potential for channel scour in the main wash. Development on the north side of the ULVW on the Sheep Mountain and Las Vegas range fans would be particularly problematic because of the steepness of the alluvial fans. Development to date adjacent to the ULVW, coupled with online detention basins and diversion levees, has altered the stream geomorphology in sections of the ULVW. Because of the wide range of flood flows encountered and the unstable nature of the alluvial fan and wash hydrologic system, it is challenging to engineer land development and drainage improvements that function in a manner that is compatible with the natural wash system.

This section presents an analysis of the potential impacts to surface water with respect to each of the proposed CTA alternatives and the associated lands that would be available for disposal under each of the alternatives (refer to Table 2.4-1 in Chapter 2 for a comparison of the original CTA boundary proposed in the LVVDB FEIS with the SEIS alternatives). Table 4.3-1 provides the water resources impacts for each alternative.

Table 4.3-1. Comparison of Water Resources Impacts by Alternative

Water Resources	Baseline	A	B (Preferred)	C	D	E	No Action
Alternative Boundary (acres)	13,622.7	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
100-Year Peak Flow Upstream of Decatur Basin (cfs)	13,750	13,790	14,840	15,960	16,490	16,720	17,130
100-Year Peak Flow Downstream of Decatur Basin (cfs)	9,670	9,690	9,760	10,170	10,210	10,460	11,270
Annual Stream Bank Erosion (tons)	1,000	1,030	1,150	1,380	1,460	1,550	1,680
Annual Surface Erosion (tons)	320	310	290	250	240	230	210
Total Annual Sediment Loss (tons)*	1,320	1,340	1,440	1,630	1,700	1,780	1,890
% Increase from Baseline Conditions†	0	2	9	23	29	35	43
100-Year Floodplain (acres)	841	842	864	883	891	895	904

* Total Annual Sediment Loss is calculated by summing stream bank erosion and surface erosion.

† Percentage represents the increase in total annual sediment loss from baseline conditions.

4.3.1 Analysis Approach and Assumptions

To characterize the potential impacts to surface water, Kleinfelder (2009) prepared a study to develop a comparative analysis of the effects of each land disposal alternative on the ULVW (Appendix L).

The study identified three indicators for quantifying surface water impacts: surface erosion (from overland sheet flow), stream bank erosion from the ULVW (from significant flood events), and change in the area of the 100-year floodplain. The methods and assumptions used to measure each of the three indicators are briefly described below. Appendix L presents a more detailed discussion of each mechanism, along with supporting equations.

Surface Erosion

Surface erosion, which is measured by the annual volume of sediment loss, was calculated using the Simple Method (Schueler 1987). The Simple Method uses annual rainfall and the disposal area to measure the volume of annual runoff. Calibrated surface erosion values were then applied to the volume of annual runoff. The calibrated values account for how readily water flows over a given surface and the concentration of fine sediment contained in the runoff. Each land use was assigned a calibrated value that had been previously developed for the LVV (Reginato and Piechota 2004), and these values remained constant for all alternatives.

Assumptions for the surface erosion analyses include the following:

- The lands in each CTA alternative boundary were assumed to be 97% undeveloped (desert) and 3% developed.

Stream Bank Erosion

Stream bank erosion occurs as a result of significant flood events. Storm events for this modeling are described in terms of their frequency and probability of occurrence. For example, a 100-year storm event is one that would occur on average once every 100 years and has a 1% probability of occurring during any given year. In order to calculate the extent of stream bank erosion under each of the alternatives, rainfall runoff models were created for 2-, 5-, 10-, 25-, 50-, and 100-year storm events. The runoff models were developed in the HEC-1 software using the Soil Conservation Service's (1975) Curve Number Method, which is applicable to urbanizing watersheds. Curve numbers use soil and vegetation conditions to estimate runoff potential. Curve numbers for developed and undeveloped lands account for the type and amount of vegetation coverage and the average percentage of impervious surfaces. In general, the more impervious surface area, the higher the curve number. More impervious surfaces from future development will result in increased surface runoff and higher peak flows in the ULVW.

The storm event models described above were then routed through a hydraulic model of the ULVW using the HEC-RAS. The HEC-RAS hydraulic model includes two reaches previously modeled: one upstream and one downstream of the ULVW detention basin (also referred to as the Decatur detention basin). Sediment transport was analyzed in the hydraulic model to estimate the accumulation and displacement of sediment in the wash. Sediment surpluses and deficits were tallied at multiple locations within the wash to determine the overall loss for the upstream and downstream reaches. These tallies were summed for each storm event under each alternative. In order to present the results as an annual average, the totals were then statistically weighted to derive the average annual sediment loss from stream bank erosion. Excepting stream flow, all the calculations used variables consistent with each alternative to maintain a comparative approach. It should be noted that the 100-year peak flow, as opposed to the 2-, 5-, 10-, 25-, or 50-year flows, is presented in the following analyses because it represents the most extreme scenario modeled in this study.

100-Year Floodplain

To quantify the changes in the 100-year floodplain, wash geometry and elevation data were obtained from the USU mapping data to create a single continuous hydraulic model for the entire length of the ULVW

within the CTA boundary. The peak flows from the rainfall runoff models were used in conjunction with the hydraulic model to estimate the 100-year floodplain area within the CTA study area under each alternative. The peak flows and floodplain extent reflect the hydrologic modeling methods described above and only include existing flood control facilities. For this analysis, the water surface area for each alternative within the CTA boundary was calculated and tabulated in Table 4.3-1.

Baseline Conditions

The ULVW is an ephemeral wash that flows intermittently during and immediately after significant storm events. The upper subbasins flowing into the ULVW are classified geomorphologically as alluvial fans and consist of material ranging in size from boulders to silts. An alluvial fan is a fan-shaped collection of loose or unconsolidated sediments that have been deposited by stream flow or debris flows at the base of a mountain front or valley side (National Research Council 1996). A bajada is formed when multiple neighboring fans converge into a single apron at the base of the slope. Flooding on alluvial fans is typically shallow in depth and can occur quickly. Flow paths on fans typically form a braided network of stream channels, both active and inactive. These channels tend to be more incised with coarser-grained alluvium near the mouth of the fan where the slope is greater. As the slope on the fan decreases, typically due to a topographic break, the flow spreads out laterally into other channels and sheet flow with more fine-grained sediments. The ULVW can experience radical changes in shape, alignment, depth, and flood-carrying capacity during major storm events.

The rainfall runoff model for existing conditions within the study limits yields peak flows of 13,750 cfs for the 100-year flood. As a point of reference (refer to Section 3.3.1, “Surface Water”), a flow rate of 14,000 cfs would cover a football field 1 foot deep in approximately 3.5 seconds. Under baseline conditions, a peak flow of 13,750 cfs within the CTA study area would result in 1,000 tons[3] of total stream bank erosion. In addition, surface erosion causes approximately 320 tons of sediment loss. As a result, the total annual sediment loss from both erosion mechanisms amounts to 1,320 tons. A standard, tandem-axle dump truck has a capacity that approaches 20 tons. Currently, the CTA study area loses enough sediment each year to fill 66 of these dump trucks.

With a peak flow of 13,750 cfs, the 100-year floodplain within the CTA study area covers approximately 841 acres. This acreage encompasses the sum of the peak flows for the upstream and downstream reaches on either side of the Decatur detention basin. Currently, the ULVW is controlled by an east-west diversion berm upstream of the Decatur detention basin. Under all of the alternatives, a 100-year flood would not overtop the berm.

4.3.2 Impact Thresholds

The LVVDB FEIS previously defined significance thresholds for evaluating whether disposal of BLM lands would have a significant impact to water resources. These thresholds remain applicable for the current CTA analysis. The disposal and subsequent development of BLM lands would impact water resources if these actions would do the following:

- Substantially alter the existing drainage pattern of the area, including altering the course of a stream or wash in a manner that would result in accelerated erosion or siltation;
- Substantially alter the existing drainage pattern of the area, including increasing the rate or amount of surface runoff in a manner that would result in flooding;

[3] The technical study reports the modeling results using scientific notation. For clarity, the output has been converted to tons for the general reader.

- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Substantially degrade water quality; or
- Place structures that would impede or redirect flood flows within a 100-year flood hazard area.

In addition to the thresholds described above, BLM management objectives emphasize preserving the ecosystem of the ULVW and its natural processes. Accordingly, impacts to the natural functioning of the wash also will be considered significant if they are not compatible with BLM management goals and objectives.

4.3.3 Actions Proposed under All Alternatives that Would Cause Change to Water Resources

The following would cause change to water resources:

- BLM would inventory unauthorized surface disturbances in the CTA, including illegal dump sites, user-created trails and tracks, and other trespasses, and would seek to rehabilitate these disturbances to a more natural condition to improve management and protection of sensitive resources.

Direct and Indirect Impacts

SURFACE WATER

Ground-disturbing activities would result in loose, unstable soil. By way of wind and water erosion, these loose sediments would enter ULVW and degrade water quality. General restoration activities also could result in minor fuel and oil spills during the operation and maintenance of equipment and vehicles. Depending on the nature and extent of the spill, there is the potential for the releases to reach surface waters and groundwater, which could also degrade water quality.

Water quality is regulated by local, state, and federal regulations, which require construction projects that disturb more than 1 acre to develop and implement a SWPPP. The SWPPP identifies construction and postconstruction measures, known as BMPs, to reduce pollutants in construction runoff. Implementation of the BMPs would prevent stormwater pollution from degrading water quality.

BMPs implemented to prevent the degradation of water quality also could impede surface flows into the ULVW. These BMPs, however, would be a short-term, necessary measure for preventing additional sources of pollutant runoff into the wash. Stormwater pollution entering the ULVW would be expected to have more detrimental effects on the natural ecosystem of the wash, compared with impacts resulting from the short-term implementation of the BMPs. Accordingly, it is not anticipated that the BMPs would interrupt the long-term productivity of the natural system.

Potential flood control projects would affect ULVW by altering the velocity of the flow near the basin, which would, in turn, modify the way in which sediment is transported within the natural system. Over time, changes in sediment transport could affect characteristics of the wash, such as its shape, depth, and channelization. The extent of these effects cannot be determined at this time.

Flows originating from the DNWR that are not intercepted by engineered improvements (e.g., roads) will flow unimpeded and naturally toward the ULVW.

Mitigation Measures and Unavoidable Adverse Impacts

BMPs, such as SWPPPs and discharge permits, will be implemented for all alternatives prior to and during construction activities to minimize adverse environmental impacts.

4.3.4 Alternative A

Actions Proposed under Alternative A that Would Cause Change to Water Resources

In addition to the actions described above, the following action is assumed under Alternative A and would affect water resources:

- A total of 370.8 acres would be available for disposal and subsequent development.

Direct and Indirect Impacts

SURFACE WATER

The rainfall runoff model developed for Alternative A generates peak flows of 13,790 cfs for the 100-year flood event, which amounts to 1,030 tons of total stream bank erosion. Development of the disposed parcels under Alternative A would yield 310 tons of sediment loss as a result of surface erosion. The sediment loss from surface and stream bank erosion mechanisms represents a total annual sediment loss of 1,340 tons, which reflects a 2% increase in annual sediment loss, compared with baseline conditions. Because Alternative A generates a peak flow that is similar to existing conditions, the area of the 100-year floodplain would slightly increase to 842 acres.

Surface and stream bank erosion would alter the natural wash and also could have indirect impacts to cultural or paleontological resources within the ULVW active drainage corridor (refer to Section 4.5, “Cultural Resources and Traditional Cultural Properties,” and Section 4.6, “Paleontological Resources”). In addition, potential future actions within the active wash could be destroyed during flood events.

With this alternative, the hydrologic and erosive processes in the CTA study area would behave in a manner that is similar to existing conditions. Natural erosion and depositional processes would be maintained, and the ULVW ecosystem would continue to function largely as it does currently. There is no anticipated cut-off of flow from the Las Vegas and Sheep Mountain ranges under this alternative. Proposed development plans for areas near the ULVW banks would be subject to an engineering analysis to determine appropriate stability and erosion setback distances. Because there would not be a substantial change in sediment loss or the 100-year floodplain, the need for additional flood control facilities or erosion control measures would be minimized. No mitigation measures would be required.

Construction activities within the CTA and ground disturbance related to development of the disposed lands could result in loose, unstable soil. Without stabilization, loose sediments could be carried by wind or water into the ULVW (eventually reaching Lake Mead), thereby increasing turbidity and degrading water quality. Construction activities also could result in minor fuel and oil spills during the operation and maintenance of equipment and vehicles. Depending on the nature and extent of the spill, there is the potential for the releases to reach surface waters and groundwater, which could degrade water quality.

Local, state, and federal regulations dictate measures for protecting water quality, including the preparation and implementation of a SWPPP for construction projects that disturb more than 1 acre. The SWPPP would identify appropriate construction and postconstruction BMPs to reduce pollutants in

runoff from construction sites. Implementation of the BMPs would prevent stormwater pollution from impacting water quality. With the exception of the preparation and implementation of a SWPPP, which is a required component of the regulatory framework, no mitigation measures would be required.

BMPs implemented for future construction projects may temporarily conflict with BLM goals and objectives to protect the natural wash system. While the BMPs are intended to prevent the degradation of water quality, these same measures also could impede surface flows from entering the ULVW. The effects of pollutants reaching the wash, however, are expected to be more harmful to the natural ecosystem of ULVW, compared with the impacts resulting from the short-term implementation of the BMPs. Accordingly, it is not anticipated that the BMPs would disrupt the long-term productivity of the natural system.

Mitigation Measures and Unavoidable Adverse Impacts

In order to satisfy BLM management objectives and maintain a natural stormwater runoff volume, rate, or quality in the wash between pre- and postconstruction conditions under Alternative A, measures would have to be conducted to reduce increased flows from developed areas. This could be done through measures such as detention ponds, rain gardens, pervious pavement, and subsurface detention facilities. However, complete retention may have adverse impacts to vegetation and natural erosion processes in and near the wash as a result of the decreased amount of water. Some of the water from developed areas could be detained and directed to the wash in a manner that mitigates erosion and reduces the magnitude of this impact, such as through impact basins, outlet riprap, and numerous smaller outlet pipes (vs. a single large outlet). In addition, construction in utility and roadway ROWs could have an adverse impact to erosion processes on the bajada. Provided that mitigation measures are properly implemented, there would be no unavoidable adverse impacts to water resources under this alternative.

4.3.5 Alternative B (BLM Preferred Alternative)

Actions Proposed under the Preferred Alternative that Would Cause Change to Water Resources

Along with the actions common to all alternatives, the following action is assumed under the Preferred Alternative and would affect water resources:

- A total of 2,315.7 acres would be available for disposal and development, including areas north and east of the Paiute Reservation and areas adjacent to the DNWR at the northeastern extent of the CTA study area.

Direct and Indirect Impacts

SURFACE WATER

Under the Preferred Alternative, the rainfall runoff model indicates peak flows of 14,840 cfs for the 100-year flood event, which would yield 1,150 tons of total stream bank erosion. Surface erosion resulting from the limited development within the CTA study area and disposed land would cause 290 tons of sediment loss. East-west road alignments constructed on the bajada north of the ULVW will intercept sheet and shallow swale flows from the Las Vegas and Sheep Mountain range fan formations (both active and inactive surfaces) within the CTA study area and concentrate those at fewer discharge points unless special designs are undertaken to maintain the dispersed nature of the flow under baseline conditions. New development within the ULVW would adversely impact the natural processes if significant fill or

numerous obstructions (e.g., bridge piers) are placed within the wash. The total annual sediment loss from surface and stream bank erosion would be 1,440 tons. Compared with baseline conditions, this reflects a 9% increase in sediment loss. A higher peak flow associated with the Preferred Alternative would contribute to a larger 100-year floodplain. Under this alternative, the floodplain expands to 864 acres, which is a 3% increase, compared with baseline conditions. The hydrologic and erosive processes associated with the implementation of the Preferred Alternative would yield increases in sediment loss and the 100-year floodplain.

Over time, increases in surface and stream bank erosion would alter aspects of the natural wash, specifically its shape, direction, and depth, along with the carrying capacity of the flow (Kleinfelder 2009). The greater surface and stream bank erosion under the Preferred Alternative also would increase the potential for removing or burying cultural or paleontological deposits (refer to Section 4.5, “Cultural Resources and Traditional Cultural Properties,” and Section 4.6, “Paleontological Resources”). Proposed development plans for areas near the ULVW banks would be subject to an engineering analysis to determine appropriate stability and erosion setback distances. Other indirect impacts associated with the Preferred Alternative include the destruction or erosion of constructed recreational trails and minor fuel and oil spills during the operation and maintenance of construction equipment and vehicles. Oil and fuel releases could degrade water quality if they reach surface waters or groundwater. Ground-disturbing activities within the CTA study area or disposed parcels could result in loose, unstable soil. These loose sediments could enter surface waters and degrade water quality.

For construction projects that affect more than 1 acre, the preparation and implementation of a SWPPP would be required to prevent impacts to water quality. The SWPPP would identify appropriate construction and postconstruction BMPs to reduce pollutants in runoff from construction sites. Implementation of the BMPs would prevent stormwater pollution from impacting water quality. No additional mitigation measures would be required.

As described under Alternative A, some BMPs may conflict with BLM goals and objectives to protect the natural processes of the wash. Because these BMPs would be short term and are a necessary measure for preventing pollutant runoff into the wash, implementation of the SWPPP would not interrupt the long-term functioning of the natural wash system.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential water quality impacts associated with the Record of Environmental Consideration, BLM recommends that an assessment of the site be conducted to determine whether hazardous materials are present within the CTA study area. If hazardous materials are encountered, BLM recommends remediation of the materials prior to the disposal or leasing of the parcels.

Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas would coordinate with CCRFCD to implement additional erosion and flood control measures required to address increased cumulative flood flows and erosion rates resulting from the development of lands disposed of by BLM.

The future construction of additional flood control facilities outside the CTA could affect the ecosystem of the ULVW by disrupting the natural processes related to surface water flows. Although the extent of the impact cannot be determined at this time, flood control structures typically affect surface flows by capturing and/or diverting flows into specific areas. Over time, this diversion could change the configuration and natural functioning of the wash. This is an unavoidable adverse impact.

4.3.6 Alternative C

Actions Proposed under Alternative C that Would Cause Change to Water Resources

In addition to the actions common to all alternatives, the following action is assumed under Alternative C and would affect water resources:

- A total of 6,960.9 acres north and south of the CTA would be available for disposal, including areas north and east of the Paiute Reservation.

Direct and Indirect Impacts

SURFACE WATER

The rainfall runoff model developed for Alternative C produces peak flows of 15,960 cfs for the 100-year flood event. As a result, 1,380 tons of sediment will be lost as a result of stream bank erosion. Land use and development under Alternative C also would yield 250 tons of sediment from surface erosion. Therefore, the total annual sediment loss from surface and stream bank erosion is 1,630 tons, which represents a 23% increase in sediment loss, compared with baseline conditions. With a peak flow of 15,960 cfs, the 100-year floodplain under Alternative C would encompass 883 acres, which is a 5% increase from the existing floodplain configuration.

The hydrologic and erosive processes in the CTA study area would produce larger flows and greater stream bank erosion under Alternative C. These amplified erosion mechanisms have greater potential to reconfigure the natural wash and to bury or erode sensitive cultural or paleontological resources (refer to Section 4.5, “Cultural Resources and Traditional Cultural Properties,” and Section 4.6, “Paleontological Resources”). Under this alternative, there would be a greater need for erosion control measures in the wash to protect sensitive areas. Construction activities would also affect the natural functioning of the fan and wash systems by altering surface flows. Proposed development plans for areas near the ULVW banks would be subject to an engineering analysis to determine appropriate stability and erosion setback distances. In addition, the increase in the 100-year floodplain would require the construction of additional flood control structures to protect surrounding property and infrastructure. The introduction of flood control structures would affect the natural erosional processes within the wash.

Because there is more land available for disposal under this alternative, construction activities associated with the development of the disposed land would have greater potential to result in minor fuel and oil spills during construction activities. These spills have the potential to reach surface waters and groundwater, which could impact water quality. Ground-disturbing activities associated with allowable uses within the CTA study area or with development of the disposed parcels could loosen topsoil. These loose sediments could enter surface waters and degrade water quality.

The preparation and implementation of a SWPPP would be required for all projects that disturb more than 1 acre to prevent impacts to water quality. The SWPPP would identify appropriate BMPs to reduce pollutants in runoff from construction sites, thereby preventing stormwater pollution from impacting water quality.

BMPs implemented for future construction projects may be incompatible with the objectives pertaining to the protection of the natural processes of ULVW as outlined in the BLM managerial and environmental concerns. BMPs designed to prevent the degradation of water quality also could impede surface flow into the ULVW. Stormwater runoff entering ULVW would be more harmful to the ecosystem of the wash,

compared with impacts resulting from the short-term implementation of the BMPs. As a result, implementing the BMPs to prevent construction pollutants from entering the wash is not expected to disrupt the long-term productivity of the natural system.

Urban development, particularly on the bajada north of the ULVW, would require flood protection measures that have the potential to significantly alter the natural surface drainage processes in and near the ULVW. Likewise, land development would result in higher runoff peak flows and volumes because of impervious surfaces and would likely discharge into the ULVW in a concentrated manner at storm sewer outfalls.

Implementation of Alternative C would contribute to erosion and sedimentation processes within the CTA study area and in downstream reaches of the ULVW. Mitigation measures would be required to reduce the magnitude of cumulative erosion and sedimentation impacts.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential water quality impacts associated with the Record of Environmental Consideration, BLM recommends that an assessment of the site be conducted to determine whether hazardous materials are present within the CTA study area. If hazardous materials are encountered, BLM recommends remediation of the materials prior to the disposal or leasing of the parcels.

Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas would coordinate with CCRFCD to implement flood control measures, as appropriate, to address higher peak flows and erosion mechanisms within the ULVW. These measures could include modifications to the design of bridges, culverts, diversion berms, and other structures in the ULVW to accommodate larger flood events.

Additional flood control facilities constructed outside the CTA would affect the natural functioning of the wash by altering the velocity and natural migration of surface flows. The extent of the impact to the wash resulting from the construction of flood control structures outside the CTA cannot be determined at this time, but anticipated impacts are likely to include considerable alterations to the shape, depth, and channelization of the ULVW. This is an unavoidable adverse impact.

Construction activities would have a short-term impact to wash hydraulic and erosion/deposition processes. These would be considered unavoidable adverse impacts.

4.3.7 Alternative D

Actions Proposed under Alternative D that Would Cause Change to Water Resources

Along with the actions common to all alternatives, the following action is assumed under Alternative D and would affect water resources:

- A total of 8,022.7 acres would be available for disposal and future development, primarily north and east of the Paiute Reservation and along the northern extent of the CTA study area, adjacent to DNWR.

Direct and Indirect Impacts

SURFACE WATER

Under Alternative D, the rainfall runoff model generates peak flows of 16,490 cfs for the 100-year flood event, which would yield 1,460 tons of stream bank erosion. Development of the disposed parcels with implementation of this alternative would result in 240 tons of sediment loss from surface erosion, for a total annual sediment loss of 1,700 tons. Compared with baseline conditions, this reflects a 29% increase in sediment loss. A higher peak flow associated with Alternative D would contribute to a broader 100-year floodplain. Under this alternative, the floodplain would expand to 891 acres, which is a 6% increase, compared with existing conditions.

Under Alternative D, the hydrologic mechanisms in the CTA study area would produce larger flows, which would increase the amount of surface and stream bank erosion. Increased erosion would have a greater potential to affect the natural functioning of the wash and to impact cultural or paleontological resources (refer to Section 4.5, "Cultural Resources and Traditional Cultural Properties," and Section 4.6, "Paleontological Resources"). Compared with the other alternatives, there would be a greater need for erosion control measures in ULVW to protect sensitive areas. Although additional flood control facilities would accommodate larger flows and reduce erosion downstream by slowing the flow, these measures would also considerably alter the natural erosional and depositional processes within the wash.

Because there is more land available for disposal under this alternative, construction activities associated with the development of the disposed parcels would have greater potential to result in minor fuel and oil spills during the operation and maintenance of equipment and vehicles. Water quality could be degraded if the releases reach surface waters or groundwater. Other impacts to water quality could include sediment entering surface waters as a result of ground-disturbing activities.

To prevent impacts to water quality, the preparation and implementation of a SWPPP would be required for all construction projects that disturb more than 1 acre. The SWPPP would identify BMPs to prevent stormwater pollution by reducing pollutants in runoff from construction sites. As previously described, some of the BMPs implemented to address stormwater runoff from construction sites may conflict with BLM goals and objectives to protect the natural processes of the wash. Because these BMPs would be short term and are a necessary measure for preventing pollutant runoff into the wash, it is anticipated that the BMPs would not interrupt the long-term functioning of the natural wash system.

Urban development, particularly on the bajada north of the ULVW, would require flood protection measures that have the potential to significantly alter the natural surface drainage processes in and near the ULVW. Likewise, land development would result in higher runoff peak flows and volumes because of impervious surfaces and would likely discharge into the ULVW in a concentrated manner at storm sewer outfalls.

Mitigation Measures and Unavoidable Adverse Impacts

Prior to disposal, BLM recommends that a site assessment be conducted to determine whether hazardous materials are associated with the Record of Environmental Consideration. If hazardous materials are identified, BLM recommends that remediation activities be conducted to remove the materials from the site.

In cooperation with CCRFCD, the Cities of Las Vegas and North Las Vegas would implement erosion and flood control measures within the ULVW, as appropriate, to address increased cumulative flood flows and erosion rates resulting from the development of lands disposed of by BLM.

The future construction of additional flood control facilities outside the CTA could affect the ecosystem of the ULVW by disrupting the natural processes related to erosion and deposition caused by surface water flows. Although the extent of the impact cannot be determined at this time, flood control structures typically affect surface flows by capturing and/or diverting flows into specific areas. Over time, this flow diversion could change the configuration of the natural wash by altering the sediment transport process. This is an unavoidable adverse impact.

4.3.8 Alternative E

Actions Proposed under Alternative E that Would Cause Change to Water Resources

In addition to the actions common to all alternatives, the following action is assumed under Alternative E and would affect water resources:

- A total of 10,010.3 acres would be available for disposal and future development.

Direct and Indirect Impacts

SURFACE WATER

The rainfall runoff model developed for Alternative E produces peak flows of 16,720 cfs for the 100-year flood event. As a result, 1,550 tons of sediment will be lost as a result of stream bank erosion. Land use and development under Alternative E would generate 230 tons of sediment loss from surface erosion. Therefore, the total annual sediment loss from surface and stream bank erosion is 1,780 tons, which represents a 35% increase in sediment loss, compared with baseline conditions. With a peak flow of 16,720 cfs, the 100-year floodplain under Alternative E would encompass 895 acres, which is a 6% increase from the existing floodplain configuration.

Like the other alternatives, indirect impacts related to surface water under Alternative E could include impacts to cultural or paleontological resources, in particular erosion of the sensitive LVF (refer to Section 4.5, “Cultural Resources and Traditional Cultural Properties,” and Section 4.6, “Paleontological Resources”). More substantial surface and stream bank erosion under Alternative E also would involve considerable impacts to the natural functioning of the wash and would create a greater need for flood and erosion control measures in the ULVW to protect sensitive areas, including surrounding property and infrastructure. Pursuant to FEMA requirements, residential development could not occur within the expanded floodplain.

Because there would be more land available for disposal under this alternative, there would be a greater potential for minor fuel and oil spills during construction activities. Ground-disturbing activities also could result in loose, unstable soil, which could also contribute to water quality degradation.

For construction projects that affect more than 1 acre, the preparation and implementation of a SWPPP would be required to prevent impacts to water quality. The SWPPP would identify appropriate construction and postconstruction BMPs to reduce pollutants in runoff from construction sites. Implementation of the BMPs would prevent stormwater pollution from impacting water quality.

BMPs implemented for future construction projects may be incompatible with BLM’s priority to protect the natural processes of the ULVW as outlined in its managerial and environmental concerns. BMPs designed to prevent the degradation of water quality also could impede surface flow into the ULVW. Stormwater pollutants entering the ULVW would be more damaging to the ecosystem of the wash than

the impacts resulting from the short-term implementation of the BMPs. As a result, the prevention of stormwater runoff into the wash through the use of BMPs is not expected to disrupt the long-term productivity of the natural system.

Urban development, particularly on the bajada north of the ULVW, would require flood protection measures that have the potential to significantly alter the natural surface drainage processes in and near the ULVW. Likewise, land development would result in higher runoff peak flows and volumes because of impervious surfaces and would likely discharge into the ULVW in a concentrated manner at storm sewer outfalls.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential water quality impacts associated with the Record of Environmental Consideration, BLM recommends that an assessment of the site be conducted to determine whether hazardous materials are present within the CTA study area. If hazardous materials are encountered, BLM recommends remediation of the materials prior to disposal or leasing of the parcels.

Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas would coordinate with CCRFCD to implement flood control measures, as appropriate, to address higher peak flows and erosion mechanisms within the ULVW. These measures could include modifications to the design of bridges, culverts, diversion berms, and other structures in the ULVW.

Additional flood control facilities constructed outside the CTA study area would affect the natural functioning of the wash by altering the velocity and natural migration of surface flows. The extent of the impacts to the wash resulting from the construction of flood control structures outside the CTA study area cannot be determined at this time, but anticipated impacts likely would include considerable alterations to the shape, depth, and channelization of ULVW. This is an unavoidable adverse impact.

4.3.9 No-Action Alternative

Actions Proposed under the No-Action Alternative that Would Cause Change to Water Resources

Along with the actions common to all alternatives, the following actions are assumed under the No-Action Alternative and would affect water resources:

- Excepting Eglington Preserve and Tule Springs, the remainder of the CTA study area, which amounts to 12,150 acres, would be available for disposal.
- Additional flood control needs would be evaluated on a case-by-case basis.

Direct and Indirect Impacts

SURFACE WATER

Under the No-Action Alternative, the rainfall runoff model produces peak flows of 17,130 cfs for the 100-year flood event, which would yield 1,680 tons of total stream bank erosion. Development of the disposed parcels with implementation of this alternative would result in 210 tons of sediment loss from surface erosion, which amounts to an annual sediment loss of 1,890 tons. Compared with baseline conditions, this represents a 43% increase in sediment loss. Under the No-Action Alternative, the floodplain would expand to 904 acres, which is a 7% increase from existing conditions.

Like the other alternatives, indirect impacts related to surface water under the No-Action Alternative would include impacts to cultural and/or paleontological resources, including the highly sensitive LVF (refer to Section 4.5, "Cultural Resources and Traditional Cultural Properties," and Section 4.6, "Paleontological Resources"). Based on the surface water models, the No-Action Alternative would be subject to the most stream bank erosion, compared with the other alternatives. Consequently, the ULVW also would be subject to the most extreme changes in its natural functioning under this alternative. The No-Action Alternative would generate the largest flows and would therefore have the greatest need for flood control facilities and erosion control measures to accommodate the expanded 100-year floodplain and protect sensitive areas, surrounding property, and infrastructure. Under the No-Action Alternative, additional needs for flood control would be evaluated and allowed on a case-by-case basis. These facilities would affect natural erosion and depositional processes associated with surface water flows.

Compared with the other alternatives, the greatest amount of land would be available for disposal under the No-Action Alternative. As a result, construction activities associated with the development of the disposed parcels would have more potential to result in minor fuel and oil spills during the operation and maintenance of equipment and vehicles. These spills have the potential to reach surface waters and groundwater, which could impact water quality. Ground-disturbing activities associated with allowable uses within the CTA or with development of the disposed parcels could loosen topsoil. These loose sediments could enter surface waters, increasing turbidity and degrading water quality.

To prevent impacts to water quality, the preparation and implementation of a SWPPP would be required for all projects that disturb more than 1 acre. The SWPPP would identify appropriate BMPs to reduce pollutants in runoff from construction sites, thereby preventing stormwater pollution from impacting water quality.

As previously described, some of the BMPs implemented to address stormwater runoff from construction sites may conflict with BLM goals and objectives to protect the natural processes of the wash. Given the amount of land available for disposal under the No-Action Alternative, the BMPs would be a necessary measure for preventing pollutant runoff into the wash. Because the BMPs would be short term in nature, they are not expected to interrupt the long-term functioning of the natural wash system.

Urban development, particularly on the bajada north of the ULVW, would require flood protection measures that have the potential to significantly alter the natural surface drainage processes near and in the ULVW. Likewise, land development would result in higher runoff peak flows and volumes because of impervious surfaces and would likely discharge into the ULVW in a concentrated manner at storm sewer outfalls.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential water quality impacts associated with the Record of Environmental Consideration, BLM recommends that an assessment of the site be conducted to determine whether hazardous materials are present within the CTA study area. If hazardous materials are encountered, BLM recommends remediation of the materials prior to disposal or leasing of the parcels.

As described in Section 2.4.6, "No-Action Alternative," additional flood control needs would be evaluated on a case-by-case basis. Within their municipal boundaries, the Cities of Las Vegas and North Las Vegas, in coordination with CCRFCD, would implement erosion and flood control measures within the ULVW to address increased cumulative flood flows and erosion rates resulting from the development of lands disposed of by BLM.

The future construction of additional flood control facilities would affect the ecosystem of the ULVW by disrupting the natural processes related to surface water flows. Although the extent of the impacts cannot be determined at this time, flood control structures typically affect surface flows by capturing and/or diverting flows into specific areas. Over time, this diversion and slowing of the flow could change the configuration of the natural wash. This is an unavoidable adverse impact.

4.4 VEGETATION

This section analyzes the anticipated impacts to vegetation resources that would result from six alternatives. Each action alternative would result in different levels of both adverse and beneficial impacts as well as different levels of direct and indirect impacts. Each alternative considers different CTA boundaries, and each would result in habitat conservation. Table 4.4-1 provides a comparison of the habitat conservation acreage that would result under each alternative.

Table 4.4-1. Comparison of Total Acres of Conservation between Alternatives*

Resource	A (acres)	B (Preferred) (acres)	C (acres)	D (acres)	E (acres)	No Action (acres)
Alternative Boundary	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
General Vegetation Conserved†	12,818.8	10,686.4	5,789.3	4,668.5	2,978.8	1,437.2
Cacti/Yucca Habitat Conserved	10,701.2	8,603.1	3862.3	2911.8	1664.7	597.1
Buckwheat Habitat Conserved	1,044.5	1,040.7	987.8	902.8	899.7‡	729.0‡
Bearpoppy Habitat Conserved	2,462.9	2,458.6	2,314.0‡	1,661.1‡	1,665.2‡	910.2‡

* Total acres conserved = (Total acres available in alternative [plus Eglington Preserve or Tule Springs if outside boundary]) – (Total acres affected by alternative actions).

† Mesquite/acacia habitat occurs within the general vegetation category.

‡ Significant impacts occur because of loss of high-potential or occupied habitat.

4.4.1 Analysis Approach and Assumptions

While locations or alignments for new facilities, utilities, and roads have been proposed, the locations have not been determined. Although their exact locations are unknown, a maximum extent of development has been assumed for analysis. For the purposes of impacts analysis in this section, habitat impacts from assumed actions are measured by the acres of disturbance to different vegetation communities. Because exact location data are not available, it is impossible to determine exactly which vegetation community an action would impact. Therefore, it is assumed that impacts to vegetation communities will occur proportionate to the relative amount of each vegetation community within the alternative boundary.

4.4.2 Impact Thresholds

Through the evaluation of vegetation resources, it was concluded that general vegetation (including cacti/yucca habitat) and special-status plant resources have substantially different thresholds for impacts to become significant. Impacts to these resources are measured on a rangewide scale, resulting in far-reaching ranges for general vegetation communities and narrow ranges for special-status plants.
The presence of the available general vegetation communities within the CTA boundary represents an insignificant amount of those communities relative to their overall abundance. Using the rangewide concept, impacts to general vegetation communities would never reach a level of significance. In contrast,

thresholds for special-status plant species are much different because of their importance relative to the purpose and need for this project, as well as their limited distribution and potential for listing under the ESA. Sensitive plant species habitat designations in Section 3.4.3, "Special-Status Plant Species," are described as occupied, high potential, and low potential. Based on the best professional judgment, it was determined that any net unmitigated loss of high-potential and occupied habitat and any loss of known individuals would cause significant adverse impacts to these resources (known individuals are those plants that were identified and documented during preconstruction surveys). It was further determined that a net unmitigated loss of more than 10% of moderate-potential habitat would lead to significant impacts to these resources. The remaining acreage within the CTA boundary is considered low potential and is unlikely to support buckwheat or bearpoppy because it does not contain the correct soil and/or vegetation communities. Therefore, impacts to special-status plants would not occur from disturbance of low-potential special-status plant species habitat. In the "Cumulative Impacts" section, BLM estimates that past actions have removed up to 80% of known habitat for the Las Vegas buckwheat and the Las Vegas bearpoppy (BLM 2004a).

4.4.3 Actions Common to all Alternatives

The following actions are assumed under all alternatives and would result in impacts to vegetation resources. These actions include the following:

- Conservation measures would be put in place for the protection of surface paleontological sites and sensitive plant habitat.
- BLM would inventory unauthorized surface disturbances in the CTA, including illegal dump sites, user-created trails and tracks, and other trespasses, and would seek to rehabilitate these disturbances to a more natural condition to improve management and protection of sensitive resources.

4.4.4 Alternative A

Alternative A would encompass a total area of 12,952.5 acres (see Figure 2.4-1). An additional 299.4 acres of habitat within Tule Springs (state lands) that occur outside the Alternative A boundary would also be conserved. The 370.8 acres that are within the CTA study area but outside the alternative boundary would ultimately be developed. A total of 133.7 acres of general vegetation would be directly impacted from implementation of these actions (Table 4.4-2), resulting in 12,818.8 acres of total conservation. The acreages provided in Table 4.4-2 will be used to describe impacts to resources resulting from selection of Alternative A.

Direct and Indirect Impacts

VEGETATION COMMUNITIES

Direct, adverse impacts to vegetation communities would result from selection of Alternative A. The total amount of direct impacts from actions under this alternative would be only 1.0% of the total available habitat within Alternative A boundary, which would be a negligible direct impact to general vegetation communities.

Indirect, adverse impacts are anticipated to occur as a result of selecting Alternative A. Construction activities would cause fugitive dust, which would lead to an adverse impact because it lowers primary plant production by reducing photosynthesis (21%–58%), reducing leaf transpiration, reducing leaf area, lowering water use efficiency, and/or increasing leaf temperatures in Mojave Desert shrubs (Sarifi et al.

1997). Whereas development actions under this alternative would be short term, they would also be widespread and substantial. Therefore, for this alternative, fugitive dust from construction activities is expected to have moderate short-term impacts.

Table 4.4-2. Acres of Habitat Conserved under Alternative A

Resource	Alternative Boundary Habitat (acres)	Assumed Disturbance Areas Affecting Vegetation Communities (acres)	Acres Conserved*†
General Vegetation			
Creosote Bush–White Bursage‡	9,368.2	78.2	9,290.0
White Bursage–Shadscale Saltbush	1,038.1	5.6	1,032.5
White Bursage–Creosote Bush Upper Alluvial Fan‡	905.9	11.3	894.6
Creosote Bush	657.1	4.1	653.0
Cattle Saltbush–White Bursage‡	508.4	5.0	503.4
Badlands	218.7	2.6	216.1
Human-Modified Lands	124.1	25.5	98.6
White Bursage–Spiny Menodora	118.8	1.3	117.5
White Bursage–Virgin River Brittlebush‡	13.2	0.0	13.2
Total General Vegetation	**12,952.5**	**133.7**	**12,818.8**
Special-Status Plants			
Las Vegas Buckwheat–Occupied Habitat	125.2	0.2	125.0
Las Vegas Buckwheat–High-Potential Habitat	725.9	4.1	721.8
Las Vegas Buckwheat–Moderate-Potential Habitat	199.3	1.6	197.7
Total Las Vegas Buckwheat Habitat	**1,050.4**	**5.9**	**1,044.5**
Bearpoppy–Occupied Habitat	504.5	3.4	501.1
Bearpoppy–High-Potential Habitat	820.6	5.3	815.3
Bearpoppy–Moderate-Potential Habitat	1,155.3	8.8	1,146.5
Total Bearpoppy Habitat	**2,480.4**	**17.5**	**2,462.9**

* Acres conserved = (Acres available within alternative boundary) – (Acres affected by alternative actions).
† Conservation does not include the 299.4 acres of Tule Springs that would also be conserved.
‡ Vegetation community that includes cacti/yucca low- or high-density habitat.

Selection of Alternative A is anticipated to have substantial direct, long-term, beneficial impacts for the general vegetation communities. These benefits include rehabilitating existing surface disturbance sites by the BLM, conserving general vegetation communities, and providing access to habitat for education and scientific research purposes. It would also have an indirect, long-term, beneficial impact by increasing scientific research and education for desert ecosystems, leading to future conservation efforts.

In conclusion, as shown in Table 4.4-2 and discussed above, impacts to general vegetation communities resulting from selection of Alternative A are not anticipated to reach a level of significance. Removal of vegetation would be limited to a very small amount of the vegetation within the CTA study area, whereas conservation of vegetation would have a substantial beneficial impact to general vegetation communities. Selection of Alternative A is anticipated to provide the largest amount of direct, long-term, beneficial

impacts for the general vegetation communities out of the six alternatives because it protects the greatest amount of natural habitat (12,952.5 acres out of the 13,622.7-acre CTA study area = 95.1%) from direct and indirect impacts.

CACTUS AND YUCCA

Alternative A would result in direct, long-term impacts to cactus and yucca from the permanent removal of 89.5 acres (0.9%) of high-density and 5 acres (1%) of low-density habitat from the actions associated with this alternative. The total amount of direct impacts from actions under this alternative would be only 0.9% of the total available cactus and yucca habitat in Alternative A CTA boundary, which would be a negligible direct impact to cactus and yucca.

Indirect, adverse impacts would be similar to those described for general vegetation, i.e., adverse impacts from increased access, visitation, and fugitive dust. These activities are expected to be minimal and short term, and adverse impacts would be negligible.

Selection of Alternative A is anticipated to have substantial direct, long-term, beneficial impacts for cactus and yucca. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving cactus and yucca habitat, and providing access to habitat for scientific research and educational purposes. Direct, beneficial impacts to cactus and yucca are anticipated through the conservation of 10,701.2 acres of high- and low-density cactus and yucca habitat. It would also have an indirect, long-term, beneficial impact by increasing scientific research and education for cacti and yucca in desert ecosystems, leading to future conservation efforts.

In conclusion, adverse impacts to cactus and yucca resulting under Alternative A would be reduced. As discussed above, removal of cactus and yucca habitat would be negligible, as this is limited to a very small amount of the total cactus and yucca habitat within the CTA boundary. Conservation of 10,701.2 acres of habitat would have a substantial beneficial impact to cactus and yucca. Furthermore, cactus and yucca species are protected under NRS 527.060–527.120 and are therefore required for salvage at the discretion of BLM, which would further reduce the number of cactus and yucca individuals impacted.

SPECIAL-STATUS PLANT SPECIES

Federally Listed and Candidate Plant Species

Las Vegas Buckwheat

Direct, adverse impacts to Las Vegas buckwheat would result from the anticipated removal of 0.2 acre of occupied, 4.1 acres of high-potential, and 1.6 acres of moderate-potential habitat associated with this alternative. All buckwheat habitat would be within the CTA alternative boundary, and there would be no buckwheat habitat in lands available for disposal. The loss of both high-potential and occupied buckwheat habitat would occur, which would lead to a significant impact to buckwheat without implementation of specific mitigation measures. Impacts to moderate-potential habitat would be under the 10% threshold and would not reach a level of significance. Additionally, removal of habitat would result in fragmentation and increased edge effects for populations. Actions are assumed to be extremely limited for this alternative; therefore, habitat removal would be minimal. No other direct impacts to Las Vegas buckwheat are expected from selection of Alternative A.

Indirect, adverse impacts would be similar to those described for general vegetation. These activities are expected to be minimal and short term, and adverse impacts would be negligible.

Alternative A is anticipated to have substantial long-term, beneficial impacts for Las Vegas buckwheat. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving general vegetation communities, protecting sensitive plant habitat, and providing access to habitat for education and scientific research purposes. Additionally, the conservation of 1,044.5 acres of occupied, high-potential, and moderate-potential habitat would have a substantial long-term, beneficial impact to Las Vegas buckwheat by increasing the amount of land conserved and minimizing habitat fragmentation.

In conclusion, as shown in Table 4.4-2 and discussed above, a loss of both high-potential and occupied buckwheat habitat would occur, which would lead to a significant impact to buckwheat without implementation of specific mitigation measures. Less than 10% of moderate-potential habitat would be lost, and impacts to that habitat type would not reach a level of significance. All impacts to buckwheat habitat occur within the CTA boundary. Implementation of mitigation measures identified in Appendix A would lead to no net unmitigated loss of high-potential and occupied habitat and no loss of known individual plants. Therefore, significant adverse impacts are not anticipated following mitigation, whereas beneficial impacts are anticipated to be substantial.

BLM Special-Status and State of Nevada Protected Plant Species

Las Vegas Bearpoppy and Merriam's Bearpoppy

Direct, adverse impacts to bearpoppy would occur from the anticipated removal of 3.4 acres of occupied, 5.3 acres of high-potential, and 8.8 acres of moderate-potential habitat associated with this alternative. There would be up to 10.2 acres, or 1.0%, of moderate-potential bearpoppy habitat outside the alternative boundary in lands available for disposal. The loss of both high-potential and occupied bearpoppy habitat would occur within the alternative boundary, which would lead to a significant impact to bearpoppy without implementation of specific mitigation measures. Impacts to moderate-potential habitat would be under the 10% threshold and would not reach a level of significance. Impacts from habitat fragmentation would be similar to those discussed above for Las Vegas buckwheat. Fragmentation from actions under this alternative would constitute a minor impact to bearpoppy.

Indirect, adverse impacts would be similar to those described for general vegetation. These activities are expected to be minimal and short term, and adverse impacts would be negligible.

Alternative A is anticipated to have substantial long-term, beneficial impacts for bearpoppy. These benefits include rehabilitating existing surface disturbance sites by the BLM, conserving general vegetation communities, protecting sensitive plant habitat through the exclusion of roads north of Grand Teton Drive and east of Decatur Boulevard, and providing access to habitat for education and scientific research purposes. Additionally, conservation of 2,462.9 acres of occupied, high-potential, and moderate-potential habitat would have a substantial long-term, beneficial impact to bearpoppy by increasing the amount of land conserved and minimizing fragmentation of habitat.

In conclusion, as shown in Table 4.4-2 and discussed above, a loss of both high-potential and occupied bearpoppy habitat would occur, which would lead to a significant impact to bearpoppy without implementation of specific mitigation measures. Less than 10% of moderate-potential habitat would be lost, and impacts to that habitat type would not reach a level of significance. All impacts to bearpoppy high-potential and occupied habitat would occur within the alternative boundary and would be mitigated by measures identified in Appendix A. Therefore, significant adverse impacts are not anticipated following mitigation, whereas beneficial impacts are anticipated to be substantial.

Mitigation Measures and Unavoidable Adverse Impacts

It is assumed there would be loss of up to 133.7 acres of natural vegetation and individual plant species (general and special status) from ground-disturbing activities within the alternative boundary. The current measures listed in the Biological Opinion for the disposal boundary will be implemented. Additionally, a Biological Evaluation is being prepared to further evaluate potential impacts from future development. Following implementation of mitigation measures, no significant unavoidable adverse impacts to vegetation or special-status plants are expected from implementation of this alternative.

4.4.5 Alternative B (BLM Preferred Alternative)

Alternative B would encompass a total area of 11,007.6 acres (see Figure 2.4-2). The 2,315.7 acres that are within the CTA study area (adjacent to the Paiute Reservation and along the northeastern boundary of the CTA study area) but outside the Alternative B boundary would ultimately be developed. A total of 321.2 acres of vegetation would be impacted (Table 4.4-3) from actions assumed under Alternative B, resulting in 10,686.4 acres of total conservation. An additional 299.4 acres of habitat within Tule Springs (state lands) that occur outside the alternative boundary would also be conserved. The acreages provided in Table 4.4-3 will be used to describe impacts for resources resulting from selection of Alternative B.

Table 4.4-3. Acres of Habitat Conserved under Alternative B

Resource	Alternative Boundary Habitat (acres)	Assumed Disturbance Areas Affecting Vegetation Communities (acres)	Acres Conserved*†
General Vegetation			
Creosote Bush–White Bursage‡	7,444.1	239.8	7,204.3
White Bursage–Shadscale Saltbush	1,034.0	5.3	1,028.7
White Bursage–Creosote Bush Upper Alluvial Fan‡	905.9	19.9	886.0
Creosote Bush	657.1	11.5	645.6
Cattle Saltbush–White Bursage‡	508.1	8.5	499.6
Badlands	225.2	8.0	217.2
Human-Modified Lands	101.2	26.8	74.3
White Bursage–Spiny Menodora	118.8	1.3	117.5
White Bursage–Virgin River Brittlebush‡	13.2	0.0	13.2
Total General Vegetation	**11,007.6**	**32.1**	**10,686.4**
Special-Status Plants			
Las Vegas Buckwheat–Occupied Habitat	125.2	0.2	125.0
Las Vegas Buckwheat–High-Potential Habitat	722.2	3.9	718.3
Las Vegas Buckwheat–Moderate-Potential Habitat	199.0	1.6	197.4
Total Las Vegas Buckwheat Habitat	**1,046.4**	**5.7**	**1,040.7**
Bearpoppy–Occupied Habitat	504.3	3.4	500.9
Bearpoppy–High-Potential Habitat	816.6	5.2	811.4
Bearpoppy–Moderate-Potential Habitat	1,174.0	27.7	1,146.3
Total Bearpoppy Habitat	**2,494.9**	**36.3**	**2,458.6**

* Acres conserved = (Acres available within alternative boundary) – (Acres affected by alternative actions).
† Conservation does not include the 299.4 acres of Tule Springs that would also be conserved.
‡ Vegetation community that includes cacti/yucca low- or high-density habitat.

Direct and Indirect Impacts

VEGETATION COMMUNITIES

Direct, adverse impacts to vegetation communities would result from selection of Alternative B. The total amount of direct impacts from actions under this alternative would total only 2.9% of general vegetation communities within the Alternative B CTA boundary, which would be a negligible direct impact to general vegetation communities.

Indirect, adverse impacts would be similar to those described for Alternative A. Construction activities would cause fugitive dust, which would lead to an adverse impact because it lowers primary plant production by reducing photosynthesis (21%–58%), reducing leaf transpiration, reducing leaf area, lowering water use efficiency, and/or increasing leaf temperatures in Mojave Desert shrubs (Sarifi et al. 1997). Whereas impacts under this alternative would be short term, they would also be widespread and substantial. Therefore, for this alternative, fugitive dust from construction activities is expected to have moderate short-term impacts.

Alternative B is anticipated to have substantial direct, long-term, beneficial impacts for general vegetation communities. These benefits would be similar to those described for general vegetation under Alternative A, i.e., surface disturbance rehabilitation, conservation of habitat, and access to habitat for education and scientific research purposes, which could provide information to facilitate future conservation efforts. This alternative would conserve 10,686.4 acres of general vegetation communities.

In conclusion, as shown in Table 4.4-3 and discussed above, impacts to general vegetation communities resulting from selection of this alternative would not reach a level of significance. Removal of vegetation would be limited to a small amount of the vegetation within the CTA study area, whereas conservation of vegetation would have a substantial beneficial impact to general vegetation communities. Selection of Alternative B is anticipated to provide the second-highest amount of direct, long-term, beneficial impacts for the general vegetation communities out of the six alternatives because it protects the second-highest amount of natural habitat (11,007.5 acres out of the 13,622.7-acre CTA study area = 80.8%) from direct and indirect impacts.

CACTUS AND YUCCA

Alternative B would result in direct, long-term impacts to cactus and yucca from the permanent removal of up to 395.3 acres (4.7%) of high-density and 17.0 acres (3.2%) of low-density habitat from the actions associated with this alternative. The total amount of direct impact from actions under this alternative would be only 3% of the total available cactus and yucca habitat in Alternative B CTA boundary, which would be a negligible direct impact to cactus and yucca.

Indirect, adverse impacts from increased access, visitation, and fugitive dust would be similar to those described for general vegetation; these activities are expected to be minimal, and construction activities would be short term. Therefore, these impacts would be negligible.

Alternative B is anticipated to have direct, long-term, beneficial impacts to cactus and yucca. The benefits would be the same as those described for cactus and yucca under Alternative A, including surface disturbance rehabilitation, conservation of habitat, and access to habitat for education and scientific research purposes, which could indirectly facilitate future conservation efforts. This alternative would conserve 8,603.1 acres of high- and low-density cactus and yucca habitat.

In conclusion, adverse impacts to cactus and yucca resulting from selection of this alternative would not reach a level of significance. As shown in Table 4.4-3 and discussed above, removal of cactus and yucca

habitat would be negligible, as this is limited to a very small amount of the total cactus and yucca habitat within the CTA boundary. Conservation of vegetation would have a substantial beneficial impact to cactus and yucca. Furthermore, cactus and yucca species are protected under NRS 527.060–527.120 and are therefore required for salvage at the discretion of BLM, which would further reduce the number of cactus and yucca individuals impacted.

SPECIAL-STATUS PLANT SPECIES

Federally Listed and Candidate Plant Species

Las Vegas Buckwheat

Direct, adverse impacts to Las Vegas buckwheat would result from the anticipated removal of 0.2 acre of occupied, 3.9 acres of high-potential, and 1.6 acres of moderate-potential habitat associated with construction activities. All buckwheat habitat would be within the CTA boundary, and there would be no buckwheat habitat in lands available for disposal. The loss of high-potential, low-potential, and occupied buckwheat habitat would occur, which would lead to a significant impact to buckwheat without implementation of specific mitigation measures. Impacts to moderate-potential habitat would be under the 10% threshold and would not reach a level of significance. Additionally, removal of habitat would result in fragmentation and increased edge effects for populations. Development actions are assumed to be extremely limited for this alternative; therefore, habitat removal would be minimal.

Indirect, adverse impacts would be similar to those described for general vegetation. These activities are expected to be minimal, and adverse impacts would be negligible.

Alternative B would have direct, long-term, beneficial impacts for Las Vegas buckwheat. These benefits would be the same as those described for Alternative A. Overall, this alternative conserves 1,040.7 acres of occupied, high-potential, and moderate-potential habitat, resulting in long-term, beneficial impacts to Las Vegas buckwheat by increasing the amount of land conserved and minimizing fragmentation of habitat.

In conclusion, as shown in Table 4.4-3 and discussed above, a loss of occupied, high-potential, and moderate-potential buckwheat habitat would occur, which would lead to a significant impact to buckwheat without implementation of specific mitigation measures. Approximately 0.2% of occupied, 0.5% of high-potential, and 0.8% of moderate-potential habitat would be lost, and impacts to the latter habitat type would not reach a level of significance. All impacts to buckwheat habitat would occur within the CTA boundary. Implementation of mitigation measures identified in Appendix A would lead to no net unmitigated loss of occupied, high-potential, and moderate-potential habitat and no loss of known individual plants. Therefore, significant adverse impacts would not occur following mitigation, whereas beneficial impacts are anticipated to be substantial.

BLM Special-Status and State of Nevada Protected Plant Species

Las Vegas Bearpoppy and Merriam's Bearpoppy

There would be up to 5.4 acres of occupied, 266.6 acres of high-potential, and 0.1 acre of moderate-potential habitat in lands available for disposal. The loss of occupied, high-potential, and moderate-potential bearpoppy habitat would lead to a significant impact to bearpoppy without implementation of specific mitigation measures. Impacts to habitat would be under the 10% threshold and would not reach a level of significance. Additionally, removal of habitat would result in fragmentation and increased edge effects for populations. Development actions are assumed to be extremely limited for this alternative; therefore, habitat removal would be minimal.

Indirect, adverse impacts would be similar to those described for general vegetation. These activities are expected to be minimal and short term, and adverse impacts would be negligible.

Alternative B would have substantial long-term, beneficial impacts for bearpoppy. These benefits would be the same as those described for Alternative A. Additionally, the conservation of 2,458.6 acres of occupied, high-potential, and moderate-potential habitat would be substantial, resulting in long-term beneficial impacts to bearpoppy by increasing the amount of land conserved and minimizing fragmentation of habitat.

In conclusion, as shown in Table 4.4-3 and discussed above, a loss of occupied, moderate-potential, and high-potential bearpoppy habitat would occur, which would lead to a significant impact to bearpoppy without implementation of specific mitigation measures. Less than 0.7% of occupied, 0.7% of high-potential, and 2.5% of moderate-potential bearpoppy habitat would be impacted, although impacts to the latter habitat type would not reach a level of significance. All impacts to bearpoppy within the alternative boundary would be mitigated by measures identified in Appendix A. However, a loss of 3.7 acres of high-potential habitat would occur from development on lands outside the alternative boundary, which would lead to significant adverse impacts to bearpoppy because mitigation measures described in this document would not apply outside the alternative boundary once the land has been transferred.

Mitigation Measures and Unavoidable Adverse Impacts

There would be a significant impact to bearpoppy from the unmitigated impact of 3.7 acres of high-potential habitat resulting from land disposal outside the CTA boundary. No additional unavoidable adverse impacts would occur to vegetation, cactus/yucca, or sensitive plants from the completion of this alternative.

4.4.6 Alternative C

Alternative C would encompass a total of 6,362.3 acres (see Figure 2.4-3). The 7,260.4 acres that are within the CTA study area but outside the Alternative C boundary are assumed to be developed. A total of 573 acres of vegetation would be impacted (Table 4.4-4) from actions assumed under this alternative, resulting in 5,789.3 acres of total conservation within the alternative. An additional 299.4 acres of habitat within Tule Springs (state lands) that occur outside the alternative boundary would also be conserved. Impacts to vegetation resources are summarized in Table 4.4-4.

Direct and Indirect Impacts

VEGETATION COMMUNITIES

Direct, long-term, adverse impacts to vegetation communities would result from Alternative C, with the permanent removal of 573.1 acres of vegetation. The total amount of direct impact from actions under this alternative would be 9% of the total available habitat within the alternative boundary, which would be a moderate direct impact to general vegetation communities.

Indirect, adverse impacts would be similar to those described for Alternative A. However, these impacts would occur at a higher level as a result of private development on 6,960.9 acres that are within the CTA study area but outside the alternative boundary. Construction activities would cause fugitive dust, which would lead to an adverse impact because it lowers primary plant production by reducing photosynthesis (21%–58%), reducing leaf transpiration, reducing leaf area, lowering water use efficiency, and/or increasing leaf temperatures in Mojave Desert shrubs (Sarifi et al. 1997). Development actions under this

alternative would be short term but would also be widespread and substantial. Therefore, for this alternative, fugitive dust from construction activities is expected to have moderate short-term impacts.

Table 4.4-4. Acres of Habitat Conserved under Alternative C

Resource	Alternative Boundary Habitat (acres)	Assumed Disturbance Areas Affecting Vegetation Communities (acres)	Acres Conserved*†
General Vegetation			
Creosote Bush–White Bursage‡	3,337.8	247.7	3,090.1
White Bursage–Shadscale Saltbush	1,037.6	61.0	976.6
White Bursage–Creosote Bush Upper Alluvial Fan‡	394.9	78.3	316.6
Creosote Bush	657.1	58.1	599.0
Cattle Saltbush–White Bursage‡	504.3	59.4	444.9
Badlands	218.7	25.6	193.1
Human-Modified Lands	80.0	34.0	46.0
White Bursage–Spiny Menodora	118.8	6.5	112.3
White Bursage–Virgin River Brittlebush‡	13.2	2.4	10.7
Total General Vegetation	**6,362.3**	**573.0**	**5,789.3**
Special-Status Plants			
Las Vegas Buckwheat–Occupied Habitat	125.2	3.8	121.4
Las Vegas Buckwheat–High-Potential Habitat	725.9	49.6	676.3
Las Vegas Buckwheat–Moderate-Potential Habitat	199.0	8.9	190.1
Total Las Vegas Buckwheat Habitat	**1,050.1**	**62.3**	**987.8**
Bearpoppy–Occupied Habitat	504.5	32.4	472.1
Bearpoppy–High-Potential Habitat	818.3	34.8	783.5
Bearpoppy–Moderate-Potential Habitat	1,152.0	93.6	1,058.4
Total Bearpoppy Habitat	**2,474.8**	**160.8**	**2,314.0**

* Acres conserved = (Acres available within alternative boundary) – (Acres affected by alternative actions).
† Conservation does not include the 299.4 acres of Tule Springs that would also be conserved.
‡ Vegetation community that includes cacti/yucca low- or high-density habitat.

Alternative C is also anticipated to have moderate direct, long-term, beneficial impacts to general vegetation communities. Beneficial impacts would result from rehabilitating existing surface disturbance sites by BLM, conserving vegetation, and providing access to habitat for education and scientific research purposes. Additionally, conservation of 5,789.3 acres of vegetation would result under this alternative.

In conclusion, as shown in Table 4.4-4 and discussed above, direct and indirect adverse impacts to general vegetation communities resulting from selection of this alternative would not reach a level of significance. Effects of habitat fragmentation are anticipated to be moderate, as future development would result in the removal of 573.1 acres (9%) of the Alternative C CTA boundary. Selection of Alternative C would provide the third-highest amount of direct, long-term, beneficial impacts to the general vegetation communities out of the six alternatives because it protects the third-highest amount of natural habitat (5,789.3 acres out of the 13,622.7-acre CTA study area = 42.5%) from direct and indirect impacts.

CACTUS AND YUCCA

Direct, adverse impacts to cactus and yucca species would result from selection of Alternative C. This alternative would result in direct, adverse impacts to cactus and yucca from the anticipated removal of up

to 328.5 acres (8.8%) of high-density and 59.4 acres (11.8%) of low-density cactus and yucca habitat. Construction activities would result in the total removal of 9.1% of the total available cactus and yucca habitat in Alternative C boundary, which would be a moderate direct impact.

Indirect, adverse impacts would be similar to those described for general vegetation. These activities are expected to be both moderate and short term.

Alternative C would have moderate direct, long-term, beneficial impacts for cactus and yucca. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving cactus and yucca habitat, and providing access to habitat for education and scientific research purposes. Additionally, the conservation of 3,862.3 acres of high- and low-density cactus and yucca habitat would occur under this alternative.

As discussed above, adverse impacts to cactus and yucca are expected to be moderate. Effects of habitat removal and fragmentation would be moderate, as future development would result in the removal of 387.9 acres of high- and low-density cactus and yucca habitat, which is 9.1% of total cactus and yucca habitat available within Alternative C CTA boundary. Additionally, because most of these developments are linear in nature and are spread throughout the alternative boundary, the effects of habitat fragmentation would be accentuated further. Cactus and yucca species are protected under NRS 527.060–527.120 and are therefore required for salvage at the discretion of BLM, which would further reduce the number of cactus and yucca individuals impacted.

SPECIAL-STATUS PLANT SPECIES

Federally Listed and Candidate Plant Species

Las Vegas Buckwheat

Direct, adverse impacts to Las Vegas buckwheat would result from the anticipated removal of 3.8 acres of occupied, 49.6 acres of high-potential, and 8.9 acres of moderate-potential habitat from the actions associated with this alternative. There would be up to 142.1 acres of moderate-potential habitat in lands available for disposal. The loss of occupied, high-potential, and moderate-potential buckwheat habitat would occur. However, impacts to Las Vegas buckwheat habitat would be under the 10% threshold and therefore would not reach a level of significance. Indirect, adverse impacts would be similar to those described for general vegetation.

This alternative would have moderate long-term, beneficial impacts to this species. These benefits include rehabilitating existing surface disturbance sites by the BLM, conserving 5,789.3 acres of general vegetation communities, protecting sensitive plant habitat, and providing access to habitat for education and scientific research purposes. Additionally, conservation of 987.8 acres of occupied, high-potential, and moderate-potential habitat would reduce habitat fragmentation for Las Vegas buckwheat.

In conclusion, as shown in Table 4.4-4 and discussed above, a loss of both high-potential and occupied buckwheat habitat would occur. Less than 4.5% of moderate-potential buckwheat habitat would be impacted, and impacts to that habitat type would not reach a level of significance. All impacts to buckwheat habitat within the alternative boundary would be mitigated by measures identified in Appendix A. The loss of 2.0 acres of moderate-potential habitat would occur from development of lands outside the alternative boundary but would not reach a level of significance because it would represent less than 1% of all habitat. Therefore, adverse impacts would not reach a level of significance, whereas beneficial impacts are anticipated to be substantial.

BLM Special-Status and State of Nevada Protected Plant Species

Las Vegas Bearpoppy and Merriam's Bearpoppy

Direct, adverse impacts to bearpoppy would occur from the anticipated removal of 32.4 acres of occupied, 34.8 acres of high-potential, and 93.6 acres of moderate-potential habitat with the actions assumed under this alternative. There would be up to 7.1 acres of high-potential and 779.7 acres of moderate-potential habitat in lands available for disposal. Additionally, removal of habitat would result in moderate fragmentation and increased edge effects for populations. The loss of occupied, high-potential, and moderate-potential bearpoppy habitat would occur. Habitat removal and fragmentation from actions assumed under this alternative would be a moderate impact to bearpoppy. Indirect, adverse impacts would be similar to those described for general vegetation.

Alternative C would have moderate long-term, beneficial impacts for bearpoppy. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving general vegetation communities, protecting sensitive plant habitat, and providing access to habitat for education and scientific research purposes. Additionally, the conservation of 2,314.0 acres of occupied, high-potential, and moderate-potential habitat would reduce habitat fragmentation for bearpoppy.

As shown in Table 4.4-4 and discussed above, the loss of both high-potential and occupied bearpoppy habitat would occur, which would lead to a significant impact to bearpoppy without implementation of specific mitigation measures. There would be no net unmitigated loss of habitat and no loss of known individual plants. The loss of 160.8 acres (6.5%) of potential habitat would not reach a level of significance because it is less than 10% of total potential habitat. The loss of 7.1 acres of high-potential habitat would occur from development on lands that are outside the alternative boundary, which would lead to significant adverse impacts to bearpoppy because mitigation measures described in this document would not apply to areas outside the alternative boundary once the land has been transferred (areas transferred from BLM would fall under Clark County's master permit for allowable take).

Mitigation Measures and Unavoidable Adverse Impacts

There would be a significant impact to bearpoppy by the unmitigated impact of 7.1 acres of high-potential habitat as a result of land disposal outside the CTA boundary. No additional unavoidable adverse impacts would occur to vegetation, cactus/yucca, or sensitive plants from the completion of this alternative.

4.4.7 Alternative D

Alternative D would encompass 5,301.3 acres (see Figure 2.4-4). An additional 298.6 acres of habitat that occur outside the alternative boundary and that are within the Eglington Preserve would be conserved, as well. The 8,022.7 acres that are within the CTA study area but outside Alternative D boundary would ultimately be developed. A total of 632.8 acres of vegetation would be impacted from the actions assumed under this alternative and would result in the conservation of a total of 4,668.5 acres within the alternative. Impacts to vegetation resources are summarized in Table 4.4-5.

Direct and Indirect Impacts

VEGETATION COMMUNITIES

Long-term impacts to vegetation communities would result from the permanent removal of 632.8 acres (11.9%) of vegetation in the Alternative D CTA boundary. The total amount of direct impact from actions

under this alternative would be 11.9% of the total available habitat in the alternative boundary, which would be a moderate direct impact to general vegetation communities.

Table 4.4-5. Acres of Habitat Conserved under Alternative D

Resource	Alternative Boundary Habitat (acres)	Assumed Disturbance Areas Affecting Vegetation Communities (acres)	Acres Conserved*†
General Vegetation			
Creosote Bush–White Bursage‡	2,555.2	238.1	2,317.1
White Bursage–Shadscale Saltbush	1,040.6	67.7	972.9
White Bursage–Creosote Bush Upper Alluvial Fan‡	180.1	59.7	120.4
Creosote Bush	559.9	57.0	502.9
Cattle Saltbush–White Bursage‡	524.7	59.4	465.3
Badlands	227.9	77.9	150.0
Human-Modified Lands	99.5	64.8	34.8
White Bursage–Spiny Menodora	101.9	5.8	96.1
White Bursage–Virgin River Brittlebush‡	11.5	2.5	9.0
Total General Habitat	**5,301.4**	**632.9**	**4,668.5**
Special-Status Plants			
Las Vegas Buckwheat–Occupied Habitat	120.8	3.7	117.1
Las Vegas Buckwheat–High-Potential Habitat	632.7	40.5	592.2
Las Vegas Buckwheat–Moderate-Potential Habitat	201.7	8.2	193.5
Total Las Vegas Buckwheat Habitat	**955.2**	**52.4**	**902.8**
Bearpoppy–Occupied Habitat	499.2	31.8	467.4
Bearpoppy–High-Potential Habitat	762.9	25.7	737.2
Bearpoppy–Moderate-Potential Habitat	489.7	33.2	456.5
Total Bearpoppy Habitat	**1,751.8**	**90.7**	**1,661.1**

* Acres conserved = (Acres available within alternative boundary) – (Acres affected by alternative actions).
† Conservation does not include the 298.6-acre Eglington Preserve, which would also be conserved.
‡ Vegetation community that includes cacti/yucca low- or high-density habitat.

Under this alternative, the same types of indirect, adverse impacts would occur as under Alternative B. These impacts would occur at a higher level because the alternative boundary includes less land for conservation.

Alternative D is anticipated to have moderate direct, long-term, beneficial impacts to general vegetation communities. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving vegetation, and providing access to habitat for education and scientific research purposes. Additionally, 4,668.5 acres of vegetation communities would be conserved.

In conclusion, as shown in Table 4.4-5 and discussed above, direct and indirect adverse impacts to general vegetation communities resulting from selection of this alternative would not reach a level of significance. Effects of habitat fragmentation are anticipated to be moderate, as development actions associated with this alternative would occur on lands within and adjacent to the alternative boundary. Compared with the other alternatives, Alternative D has a moderate amount of direct, long-term, beneficial impacts for the general vegetation communities because it protects the fourth-lowest amount of

natural habitat (4,668.5 acres out of the 13,622.7-acre CTA study area = 34.3%) from direct and indirect adverse impacts.

CACTUS AND YUCCA

Adverse impacts to cactus and yucca species would result from selection of Alternative D. This alternative would result in adverse impacts to cactus and yucca from the anticipated removal of up to 300.3 acres (10.9%) of high-density and 59.4 acres (11.3%) of low-density cactus and yucca habitat. Construction activities would result in the removal of 11% of the total available cactus and yucca habitat in the Alternative D CTA boundary, which would be a moderate direct impact. Indirect, adverse impacts would be similar to those described for general vegetation.

Alternative D would have moderate direct, long-term, beneficial impacts for cactus and yucca. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving cactus and yucca habitat, and providing access to habitat for education and scientific research purposes. Additionally, the conservation of 2,911.8 acres of high- and low-density cactus and yucca habitat is anticipated through the selection of this alternative.

In conclusion, as shown in Table 4.4-5 and discussed above, adverse impacts to cactus and yucca would be moderate. Cactus and yucca species are protected under NRS 527.060–527.120 and are therefore required for salvage at the discretion of BLM, which would further reduce the number of cactus and yucca individuals impacted.

SPECIAL-STATUS PLANT SPECIES

Federally Listed and Candidate Plant Species

Las Vegas Buckwheat

Direct, adverse impacts to Las Vegas buckwheat would result from the anticipated removal of 3.7 acres of occupied, 40.5 acres of high-potential, and 8.2 acres of moderate-potential habitat and from the actions associated with this alternative. Unlike for Alternatives A and B, there would be up 1.3 acres of potential habitat in lands available for disposal. The loss of occupied, high-potential, and moderate-potential buckwheat habitat would occur. However, impacts to Las Vegas buckwheat habitat would be under the 10% threshold and therefore would not reach a level of significance. Fragmentation from actions under this alternative would be a moderate impact to buckwheat.

Indirect, adverse impacts would be similar to those described for general vegetation. These activities are expected to be both moderate and short term.

This alternative would have moderate long-term, beneficial impacts for this species. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving general vegetation communities, protecting sensitive plant habitat, and providing access to habitat for education and scientific research purposes. Additionally, the conservation of 902.8 acres of occupied and potential habitat would reduce habitat fragmentation for Las Vegas buckwheat.

In conclusion, as shown in Table 4.4-5 and discussed above, a loss of both occupied and high-potential buckwheat habitat would occur, which would lead to a significant impact to buckwheat without implementation of specific mitigation measures. Less than 4.1% of moderate-potential habitat would be impacted, and impacts would not reach a level of significance. All impacts within Alternative D boundary would be mitigated by measures identified in Appendix A. The loss of 1.3 acres of moderate-potential habitat would occur from development of lands that are within the CTA study area but outside the

alternative boundary. The loss of 1.3 acres represents less than 1% of all habitat and would therefore not reach a level of significance. Therefore, adverse impacts would not reach a level of significance.

BLM Special-Status and State of Nevada Protected Plant Species

Las Vegas Bearpoppy and Merriam's Bearpoppy

Direct, adverse impacts to bearpoppy would occur from the anticipated removal of 31.8 acres of occupied, 25.7 acres of high-potential, and 33.2 acres of moderate-potential habitat with the actions assumed with this alternative. There would be up to 282.7 acres of moderate-potential and 3.2 acres of high-potential habitat in lands available for disposal. The habitat removal and resulting fragmentation would be moderate. Loss of occupied, high-potential, and moderate-potential bearpoppy habitat would occur. However, impacts to bearpoppy habitat would be under the 10% threshold and therefore would not reach a level of significance. Habitat removal and fragmentation from actions under this alternative would be a significant impact to bearpoppy.

Indirect, adverse impacts would be similar to those described under general vegetation. These impacts are expected to be both moderate and short term.

Alternative D is anticipated to have some minimal long-term, beneficial impacts to bearpoppy. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving general vegetation communities, protecting sensitive plant habitat, and providing access to habitat for education and scientific research purposes. Additionally, the conservation of 1,661.1 acres of occupied, high-potential, and moderate-potential habitat would reduce habitat fragmentation for bearpoppy.

As shown in Table 4.4-5 and discussed above, the loss of both high-potential and occupied bearpoppy habitat would occur, which would lead to a significant impact to bearpoppy without implementation of specific mitigation measures. Less than 10% of moderate-potential habitat would be impacted, and impacts to moderate-potential habitat would not reach a level of significance. All impacts to occupied and high-potential bearpoppy habitat within the Alternative D boundary would be mitigated by measures identified in Appendix A. However, the loss of 3.2 acres of high-potential habitat would occur from development of land that is within the CTA study area but outside the alternative boundary, which would lead to significant adverse impacts because mitigation measures described in this document would not apply to areas outside the alternative boundary once the land has been transferred.

Mitigation Measures and Unavoidable Adverse Impacts

There would be a significant impact to bearpoppy because of the unmitigated impact of 3.2 acres of high-potential habitat as a result of land disposal outside the CTA boundary. No additional unavoidable adverse impacts would occur to vegetation, cactus/yucca, or sensitive plants from selection of this alternative.

4.4.8 Alternative E

Alternative E would encompass a total of 3,313.8 acres (see Figure 2.4-5). The 298.6 acres designated as Eglington Preserve would not be included in the Alternative E CTA boundary; however, Eglington Preserve would not be available for disposal. The 10,010.3 acres that are within the CTA study area but outside Alternative E boundary would ultimately be developed. A total of 335 acres of vegetation would be impacted from the implementation of actions assumed under this alternative and would result in the conservation of a total of 2,978.8 acres within the alternative. Impacts to vegetation resources resulting from Alternative E are summarized in Table 4.4-6.

Table 4.4-6. Acres of Habitat Conserved under Alternative E

Resource	Alternative Boundary Habitat (acres)	Assumed Disturbance Areas Affecting Vegetation Communities (acres)	Acres Conserved*†
General Vegetation			
Creosote Bush–White Bursage‡	1,414.7	113.1	1,301.6
White Bursage–Shadscale Saltbush	975.9	51.7	924.2
White Bursage–Creosote Bush Upper Alluvial Fan‡	61.1	23.5	37.6
Creosote Bush	222.5	3.5	219.0
Cattle Saltbush–White Bursage‡	345.8	24.4	321.4
Badlands	131.4	60.4	71.0
Human-Modified Lands	64.3	53.8	10.5
White Bursage–Spiny Menodora	92.8	3.4	89.4
White Bursage–Virgin River Brittlebush‡	5.3	1.2	4.1
Total General Vegetation	**3,313.8**	**335.0**	**2,978.8**
Special-Status Plants			
Las Vegas Buckwheat–Occupied Habitat	120.7	3.7	117.0
Las Vegas Buckwheat–High-Potential Habitat	628.5	39.2	589.3
Las Vegas Buckwheat–Moderate-Potential Habitat	200.5	7.1	193.4
Total Las Vegas Buckwheat Habitat	**949.7**	**50.0**	**899.7**
Bearpoppy–Occupied Habitat	496.3	29.0	467.3
Bearpoppy–High-Potential Habitat	756.7	23.3	733.4
Bearpoppy–Moderate-Potential Habitat	490.3	25.8	464.5
Total Bearpoppy Habitat	**1,743.3**	**78.1**	**1,665.2**

* Acres conserved = (Acres available within alternative boundary) – (Acres affected by alternative actions).
† Conservation does not include the 298.6-acre Eglington Preserve, which would also be conserved.
‡ Vegetation community that includes cacti/yucca low- or high-density habitat.

Direct and Indirect Impacts

VEGETATION COMMUNITIES

Long-term impacts to vegetation communities would result from the permanent removal of 335.0 acres of vegetation. The total amount of direct impacts from this alternative would be 10.1% of the total available habitat in the alternative boundary, which would be a moderate direct impact to general vegetation communities.

Under this alternative, the same types of indirect, adverse impacts are anticipated as for Alternative B, but these impacts would occur at a higher level. Construction activities would cause fugitive dust, which would lead to an adverse impact because it lowers primary plant production by reducing photosynthesis (21%–58%), reducing leaf transpiration, reducing leaf area, lowering water use efficiency, and/or increasing leaf temperatures in Mojave Desert shrubs (Sarifi et al. 1997). Whereas developments under this alternative would be short term, they would also be widespread and substantial. Therefore, for this alternative, fugitive dust from construction activities is expected to have moderate short-term impacts.

Alternative E is anticipated to have marginal direct, long-term, beneficial impacts to general vegetation communities. Selection of Alternative E would result in the conservation of 2,978.8 acres of vegetation communities.

In conclusion, as shown in Table 4.4-6 and discussed above, direct and indirect adverse impacts to general vegetation communities resulting from selection of this alternative would not reach a level of significance. Effects of habitat fragmentation are anticipated to be moderate, as development actions associated with this alternative would occur adjacent to and within the alternative boundary. Selection of Alternative E would provide the fifth-lowest amount of conservation for general vegetation communities out of the six alternatives because it protects the fifth-lowest amount of natural habitat (2,978.8 acres out of the 13,622.7-acre CTA study area = 22%) from direct and indirect impacts.

CACTUS AND YUCCA

Alternative E would result in long-term impacts to cactus and yucca from the permanent removal of up to 137.8 acres (9.3%) of high-density and 24.4 acres (7.0%) of low-density habitat for the actions associated with this alternative. These actions combined would result in the removal of 8.9% of the total available cactus and yucca habitat in the alternative boundary, which would be a moderate direct impact to cactus and yucca.

Indirect, adverse impacts would be similar to those described for general vegetation.

Alternative E is anticipated to have marginal long-term, beneficial impacts for cactus and yucca. These benefits are similar to those described for Alternative D. Alternative E would result in the conservation of 1,664.7 acres of high- and low-density cactus and yucca habitat.

As shown in Table 4.4-6 and discussed above, adverse impacts to cactus and yucca are expected to be moderate. Cactus and yucca species are protected under NRS 527.060–527.120 and are therefore required for salvage at the discretion of BLM, which would further reduce the number of cactus and yucca individuals impacted.

SPECIAL-STATUS PLANT SPECIES

Federally Listed and Candidate Plant Species

Las Vegas Buckwheat

Direct, adverse impacts to Las Vegas buckwheat would result from the anticipated removal of 3.7 acres of occupied, 39.2 acres of high-potential, and 7.1 acres of moderate-potential habitat from the actions associated with this alternative. There would be up 32.7 acres of moderate-potential and 3.1 acres of high-potential habitat in lands available for disposal. Loss of occupied, high-potential, and moderate-potential buckwheat habitat would occur. However, impacts to Las Vegas buckwheat habitat would be under the 10% threshold and therefore would not reach a level of significance. Fragmentation from actions under this alternative would be a moderate impact to buckwheat.

Indirect, adverse impacts would be similar to those described for general vegetation. These impacts are expected to be moderate.

This alternative would have marginal long-term, beneficial impacts for this species, similar to those described for Alternative D; however, for this alternative, less land would be conserved. Additionally, the conservation of 899.7 acres of occupied, high-potential, and moderate-potential habitat would reduce habitat fragmentation for Las Vegas buckwheat.

In conclusion, as shown in Table 4.4-6 and discussed above, the loss of both high-potential and occupied buckwheat habitat would occur, which would lead to a significant impact to buckwheat without implementation of specific mitigation measures. Less than 4% of moderate-potential habitat would be impacted, and impacts would not reach a level of significance. All impacts from Alternative E boundary would be mitigated by implementation of measures identified in Appendix A. The loss of 32.7 acres of moderate-potential habitat would occur from development of lands that are within the CTA study area but outside the alternative boundary; this represents less than 3% of all habitat and would not reach a level of significance. However, the loss of 3.1 acres of high-potential habitat would occur from development of land outside the CTA boundary, which would lead to significant adverse impacts to buckwheat because mitigation measures described in this document would not apply to areas outside the alternative boundary once the land has been transferred.

BLM Special-Status and State of Nevada Protected Plant Species

Las Vegas Bearpoppy and Merriam's Bearpoppy

Direct, adverse impacts to bearpoppy would occur from the anticipated removal of 29.0 acres of occupied, 23.3 acres of high-potential, and 25.8 acres of moderate-potential habitat with the actions associated with this alternative. There would be up 684.9 acres of moderate-potential and 39.8 acres of high-potential habitat in lands available for disposal. Additionally, actions assumed for analysis would result in moderate fragmentation and increased edge effects for populations. The habitat removal and resulting fragmentation would be moderate. The loss of both high- and moderate-potential, as well as occupied, bearpoppy habitat would occur. However, impacts to bearpoppy habitat would be under the 10% threshold and therefore would not reach a level of significance. Habitat removal and fragmentation from actions under this alternative would be a moderate impact to bearpoppy.

Indirect, adverse impacts would be similar to those described for general vegetation.

Alternative E is anticipated to have marginal long-term, beneficial impacts for bearpoppy. These benefits include rehabilitating existing surface disturbance sites by BLM, conserving general vegetation communities, protecting sensitive plant habitat, and providing access to habitat for education and scientific research purposes. Additionally, conservation of 1,665.1 acres of occupied and high-potential habitat would reduce habitat fragmentation for bearpoppy.

As shown in Table 4.4-6 and discussed above, loss of both high-potential and occupied bearpoppy habitat would occur, which would lead to a significant impact to bearpoppy without implementation of specific mitigation measures. Less than 6% of moderate-potential habitat would be impacted, and impacts to moderate-potential habitat would not reach a level of significance. All impacts from actions proposed in this alternative would be mitigated; there would be no net unmitigated loss of habitat and no loss of known individual plants. All impacts to bearpoppy would be within the CTA boundary. However, the loss of 684.9 acres of moderate-potential habitat would occur from development of land that is within the CTA study area but outside the Alternative E boundary, which represents 25% of all habitat and would lead to significant impacts. Additionally, the loss of 3.2 acres of high-potential habitat would occur from development of land outside the alternative boundary, which would lead to significant adverse impacts to bearpoppy because mitigation measures described in this document would not apply to areas outside the alternative boundary once the land has been transferred.

Mitigation Measures and Unavoidable Adverse Impacts

There would be a significant impact to bearpoppy as a result of the unmitigated impact of 3.2 acres of high-potential habitat from land disposal outside the CTA boundary. No additional unavoidable adverse impacts would occur to vegetation, cactus/yucca, or sensitive plants from selection of this alternative.

4.4.9 No-Action Alternative

Under the No-Action Alternative, the CTA boundary would encompass 1,448.2 acres and would include the BLM portion of Eglington Preserve and Tule Springs (see Figure 2.4-6). The 12,174.5 acres that are within the CTA study area but outside the No-Action Alternative boundary would ultimately be developed as necessary on a case-by-case basis. Impacts to vegetation resources resulting from the No-Action Alternative are summarized in Table 4.4-7.

Table 4.4-7. Acres of Habitat Conserved under the No-Action Alternative

Resource	Alternative Boundary Habitat (acres)	Actions Affecting Vegetation Communities (acres)	Acres Conserved*†
General Vegetation			
Creosote Bush–White Bursage‡	535.3	0.0	535.3
White Bursage–Shadscale Saltbush	743.4	4.4	739.0
White Bursage–Creosote Bush Upper Alluvial Fan‡	0.0	0.0	0.0
Creosote Bush	0.0	0.0	0.0
Cattle Saltbush–White Bursage‡	61.8	0.0	61.8
Badlands	9.4	0.0	9.4
Human-Modified Lands	16.5	5.9	10.6
White Bursage–Spiny Menodora	81.8	0.7	81.1
White Bursage–Virgin River Brittlebush‡	0.0	0.0	0.0
Total General Vegetation	**1,448.2**	**11.0**	**1,437.2**
Special-Status Plants			
Las Vegas Buckwheat–Occupied Habitat	57.7	0.7	57.0
Las Vegas Buckwheat–High-Potential Habitat	381.5	3.6	377.9
Las Vegas Buckwheat–Moderate-Potential Habitat	297.2	3.1	294.1
Total Las Vegas Buckwheat Habitat	**736.4**	**7.4**	**729.0**
Bearpoppy–Occupied Habitat	213.9	1.4	212.6
Bearpoppy–High-Potential Habitat	703.7	6.1	697.6
Bearpoppy–Moderate-Potential Habitat	0.1	0.0	0.0
Total Bearpoppy Habitat	**917.7**	**7.5**	**910.2**

* Acres conserved = (Acres available within CTA boundary) – (Acres affected by alternative actions).
† Conservation occurs within the previously designated Tule Springs and Eglington Preserve.
‡ Vegetation community that includes cacti/yucca low- or high-density habitat.

Direct and Indirect Impacts

VEGETATION COMMUNITIES

Long-term, adverse impacts to vegetation communities are anticipated through the selection of the No-Action Alternative. The potential land disposals under this alternative would allow for permanent removal of up to 12,174.5 acres of vegetation.

Indirect impacts to vegetation communities would include habitat fragmentation resulting from development surrounding the CTA boundary. Removal of habitat would result in fragmentation and increased edge effects for populations.

As shown in Table 4.4-7 and discussed above, direct and indirect adverse impacts are expected to be moderate from this alternative because these vegetation communities are relatively common throughout the LVV. Selection of the No-Action Alternative is anticipated to provide the least amount of direct, long-term, beneficial impacts to the general vegetation communities of the six alternatives because it protects the least amount of natural habitat (1,437.2 acres out of the 13,622.7-acre CTA study area = 10.6%) from direct and indirect impacts.

CACTUS AND YUCCA

Long-term impacts to cactus and yucca are anticipated through the selection of the No-Action Alternative. Under the No-Action Alternative, development of up to 12,174.5 acres of land would ultimately occur; 91.5% of this land is cactus and yucca habitat. This would be a moderate direct impact to cactus and yucca.

Indirect impacts to cactus and yucca habitat would include habitat fragmentation resulting from development surrounding the CTA. Removal of habitat would result in fragmentation and increased edge effects for populations.

As shown in Table 4.4-7 and discussed above, direct and indirect adverse impacts are expected to be moderate from this alternative because these cactus and yucca communities are relatively common throughout the LVV.

SPECIAL-STATUS PLANT SPECIES

Federally Listed Plant Species

Las Vegas Buckwheat

Direct, adverse impacts to Las Vegas buckwheat would result from the permanent removal of 0.7 acre of occupied, 3.6 acres of high-potential, and 3.1 acres of moderate-potential habitat within the CTA boundary under this alternative. Land disposal and subsequent development would result in the removal of approximately 220 acres of moderate-potential and 65 acres of occupied habitat outside Eglington Preserve and Tule Springs.

Indirect, adverse impacts to Las Vegas buckwheat would include habitat fragmentation resulting from development surrounding the population within the CTA boundary. Removal of habitat would result in fragmentation and increased edge effects for populations.

As shown in Table 4.4-7 and discussed above, direct and indirect adverse impacts to Las Vegas buckwheat are expected to be significant under the No-Action Alternative. This alternative does not meet the purpose of and need for the project, which includes protection of the natural resources in the area.

BLM Special-Status and State of Nevada Protected Plant Species

Las Vegas Bearpoppy and Merriam's Bearpoppy

Direct impacts to Las Vegas bearpoppy would result from permanent removal of 1.4 acres of occupied and 6.1 acres of high-potential habitat within the CTA boundary under this alternative. Land disposal and subsequent development would result in the removal of approximately 1,250 acres of moderate-potential and 285 acres of occupied habitat outside Eglington Preserve and Tule Springs.

Indirect impacts to bearpoppy would include habitat fragmentation resulting from development surrounding the population within the CTA. Removal of habitat would result in fragmentation and increased edge effects for populations.

As shown in Table 4.4-7 and discussed above, direct and indirect adverse impacts to bearpoppy are expected to be significant under the No-Action Alternative; it does not meet the purpose for action, which includes protecting the natural resources in the area.

Mitigation Measures and Unavoidable Adverse Impacts

There would be a significant impact to buckwheat populations by the unmitigated impact of 220 acres of moderate-potential and 65 acres of occupied habitat. Significant impacts to bearpoppy include 1,250 acres of moderate-potential and 285 acres of occupied habitat loss as a result of land disposal outside the CTA boundary. No additional unavoidable adverse impacts would occur to vegetation, cactus/yucca, or sensitive plants from the completion of this alternative.

4.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

4.5.1 Cultural Resources

As described in Chapter 3, identification of cultural resources within the CTA study area was conducted in 2003 and 2004 by HRA as part of the overall cultural resources study of the entire disposal area, as initially defined (Ahlstrom et al. 2004). Three historic properties and one TCP are within the study area: 26Ck247, 26Ck6507, and 26Ck6910.

Because of the intense residential and commercial development in the area surrounding two of these sites, BLM determined that mitigation of impacts to two of these sites (26Ck6507 and 26Ck6910) would be completed, regardless of whether any proposed action analyzed in this SEIS would directly affect them. Table 4.5-1 provides the impacts to cultural resources from each alternative. The following BLM management goals and objectives apply to cultural resources.

Analysis Approach and Assumptions

Impacts to cultural resources are analyzed by determining whether any NRHP-eligible site will be affected directly or indirectly by any of the actions included in each alternative.

Assumptions for analysis include

- BLM will complete the process of mitigating current impacts to Sites 26Ck6507 and 26Ck6910.
- Implementation of the mitigation measures prescribed in the HPTP for Sites 26Ck6507 and 26Ck6910 will result in the recovery of the sites' NRHP values.
- Tule Springs (26Ck247) is already protected by the BLM and state of Nevada. Ownership and use of the site will not change as a result of this SEIS.

Table 4.5-1. Comparison of Cultural Resource Impacts, by Alternative

Resource	A (acres/other factor)	B (Preferred) (acres/other factor)	C (acres/other factor)	D (acres)	E (acres)	No Action (acres)
Alternative Boundary	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
Site 26Ck247 (Tule Springs)*	Small possibility of direct impacts from people recreating near Tule Springs.	Slightly greater possibility of direct impacts from people recreating near Tule Springs.	Small possibility of direct impacts from people recreating near Tule Springs.	Small possibility of direct impacts from people recreating near Tule Springs.	Small possibility of direct impacts from people recreating near Tule Springs.	Small possibility of direct impacts from people recreating near Tule Springs.
	Low probability of indirect impacts from people brought to the site area as the result of residential and commercial development.	Low probability of indirect impacts from people brought to the site area as the result of residential and commercial development.	Slightly higher probability of indirect impacts from people brought to the site area as the result of residential and commercial development.	Higher probability of indirect impacts from people brought to the site area as the result of residential and commercial development.	Higher probability of indirect impacts from people brought to the site area as the result of residential and commercial development.	Higher probability of indirect impacts from people brought to the site area as the result of residential and commercial development.
Undocumented Historic Properties	Indirect impacts from people attracted to the area as the result of increased trail development and educational programs.	Indirect impacts from people attracted to the area as the result of increased trail development and educational programs.	Slightly higher probability of indirect impacts from people brought to the site area as the result of additional trail development and new residential and commercial development.	Higher probability of indirect impacts from people brought to the site area as the result of residential and commercial development.	Higher probability of indirect impacts from people brought to the area as the result of residential and commercial development.	Higher probability of indirect impacts from people brought to the area as the result of residential and commercial development surrounding Eglington Preserve and Tule Springs.

* Tule Springs will not change ownership or use as a result of this SEIS.

Based on these assumptions, no documented NRHP-eligible or NRHP-listed cultural resource will be directly affected by any of the alternatives analyzed in this SEIS. As previously stated, the Tule Springs site (26Ck247) is already listed as a National Register Site, and no development would be allowed to take place within its boundaries.

Given these assumptions, the analysis will focus on indirect impacts to Tule Springs and on direct and indirect impacts to undocumented historic properties both within and along the edge of the CTA alternative boundaries.

Impact Thresholds

The criteria used to assess adverse impacts to cultural resources are set forth in 36 CFR 800.5. An adverse impact includes any impacts that may alter directly or indirectly one or more of the characteristics of a historic property that qualify that property for eligibility for the NRHP. Characteristics that must be considered include the property's setting, feeling, location, design, materials, workmanship, and association. For all properties, direct impacts include any physical destruction or damage to all or part of the property. Direct impacts may also result from construction activities in areas adjacent to the resource. Any activity that causes physical destruction or damage to a significant cultural resource is defined as a direct impact to the resource.

Some of the more substantial indirect impacts result from increased human activity in the vicinity of a cultural resource; this heightens the threat of physical impacts to the resource. New developments can bring humans into proximity to significant cultural resources. Increasing the frequency of visits to the area surrounding a cultural resource augments the risk of vandalism, looting, or unintentional destruction of the resource. Some indirect impacts do not affect the physical integrity of the resource but rather affect the setting of the resource. The setting of a resource can be impacted by visual intrusions such as modern transmission lines, residential or commercial developments within a viewshed, or atmospheric intrusions such as smog. The setting can also be affected by substantial changes to the audible environment; such changes can result from increased vehicle or air traffic, heavy machinery operating in the vicinity of a site, or elimination of the natural sounds that would have created the historical audible environment.

Actions Proposed under all Alternatives that Would Cause Change to Existing Cultural Resources

The following action would be implemented under all alternatives and would cause change to existing cultural resources:

- BLM has developed and will implement a treatment plan for eligible cultural sites within the CTA in compliance with the NHPA, except for Tule Springs.

DIRECT AND INDIRECT IMPACTS

BLM has developed a treatment plan for eligible cultural sites within the CTA study area (Sites 26Ck6507 and 26Ck6910). This plan is currently under review by SHPO, and BLM expects to complete implementation of the plan before the end of 2008. Implementation of the treatment plan is expected to recover the characteristics of the sites that made them eligible for the NRHP. Since this mitigation will be completed prior to issuance of this SEIS, this is the only action that will affect these two sites.

None of the previously authorized ROWs or allowable new alignments would pass through or be adjacent to Tule Springs; therefore, they would have no impact to Tule Springs.

New development would be subject to site-specific NEPA analyses. Generally, the introduction of more people to an area of a significant site puts the site at risk. The CTA study area, including Tule Springs, has already been impacted by actions consisting of unauthorized collecting, digging, and trash dumping. During the most recent professional survey of Tule Springs in 2002, historic cans were present that have since been removed. Other factors contributing to the lack of surface material would be the result of extensive surface collection conducted by Susia in the 1960s and possibly action by natural forces, including erosion.

Construction activities would also result in indirect, adverse impacts to undocumented historic properties throughout the CTA study area and along the edge of the CTA boundaries. New development would attract increased public visitation to the area, which could result in a greater loss of undocumented resources as a result of trampling, unauthorized collection, and vandalism. The Conservation Agreement will provide ongoing protection for the site itself as well as areas adjacent to Tule Springs. This would be beneficial for the overall preservation of the site.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts to cultural resources include loss of undocumented cultural resources from development activities outside the alternative boundaries. No unavoidable adverse impacts would occur to cultural resources as a result of any of the actions common to all alternatives.

Alternative A

DIRECT AND INDIRECT IMPACTS

Independent of study efforts associated with this SEIS, BLM is mitigating impacts to two NRHP-eligible sites within the CTA study area following prescriptions in the HPTP (Cannon et al. 2008); mitigation has been completed. The mitigation measures are described below in “Mitigation Measures and Unavoidable Adverse Impacts.” Therefore, under Alternative A, impacts to the NRHP-eligible sites will be mitigated before the alternative can be implemented. BLM and the State of Nevada will retain ownership of Tule Springs. There is no intent to mitigate the site or dispose of the land on which Tule Springs is located, and the site is currently under BLM protection.

New development facilities will improve public access and attract increased visitation to the CTA, including Tule Springs. Additional access and visitation could result in an increased loss of undocumented cultural resources in the CTA from unauthorized collection, trampling of surface resources, and vandalism of sites. By controlling visitor access, some cultural resources could be better protected. Through the implementation of well-designed educational programs, visitors could learn to become stewards of cultural resources and assist in their future protection.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Independent of study efforts associated with this SEIS, mitigation measures for all sites are complete. Mitigation measures include the development of public interpretive and educational materials. Additionally, mitigation efforts at each site will follow a research design tailored to the specific characteristics that make each site eligible for the NRHP. The specific mitigation tasks planned for each NRHP-eligible site located in the CTA study area are briefly summarized below. More detail on research questions and mitigation measures is provided in the HPTP (Cannon et al. 2008).

Site 26Ck6507, the Tonopah Wagon Road, has been determined eligible for the NRHP under Criterion A. Mitigation measures for this site include historical survey, archival research, detailed recording of linear features and associated artifact concentrations, and site mapping. Detailed maps and drawings will be produced that identify site features, artifact concentrations, and topographic features. No surface artifacts will be collected.

Site 26Ck6910 is a prehistoric hearth and artifact scatter that has been determined eligible for the NRHP under Criterion D. Mitigation measures for this site include surface collection, excavation, and laboratory analysis. Excavation will include three contiguous, 1 × 1–m units placed to expose a profile of the hearth feature and develop a better understanding of the feature. Additional 1 × 1–m units will be excavated as

needed to complete excavation of the feature, supplemented by up to six additional 1 × 1–m units leading away from the feature to assess whether buried evidence of other activity is present. Radiocarbon and luminescence dating will be conducted if suitable material is recovered. Artifact analysis will use the methods set forth in the HPTP (Cannon et al. 2008).

For Tule Springs, new development should be planned to encourage resting or stopping in areas away from any sensitive parts of the site.

Alternative B (BLM Preferred Alternative)

DIRECT AND INDIRECT IMPACTS

New development will likely bring more people into the area of Tule Springs and throughout the CTA boundary. The increase in public visitation would lead to greater opportunities for adverse impacts to Tule Springs and to any undocumented cultural resources from vandalism, illegal OHV use, trampling, and illegal collection. By controlling visitor access, some cultural resources could be better protected. Through the implementation of well-designed educational programs, visitors could learn to become stewards of cultural resources and assist in their future protection. All new development should be planned to encourage resting or stopping in areas away from any sensitive parts of Tule Springs.

Additionally, up to 2,315.7 acres located outside the boundary of this alternative would be available for disposal and development. This increase in private development along the perimeter of the alternative boundary would result in increased opportunities for adverse impacts to undocumented cultural resources both in lands available for private development as well as from increased public proximity to the CTA. The proximity of new development to the CTA would result in increased accessibility to cultural resources present in the CTA.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Mitigation measures for Alternative B are identical to those under Alternative A.

Alternative C

DIRECT AND INDIRECT IMPACTS

New development would consist of a loss of undocumented resources resulting from construction activities associated with that development. Additionally, new development under this alternative would result in a loss of resource quality from increased public visitation, trampling, digging, dumping, and vandalism. The increase in public visitation would lead to greater opportunities for adverse impacts to Tule Springs and to any undocumented cultural resources from vandalism, illegal OHV use, trampling, and illegal collection. All new development should be planned to encourage resting or stopping in areas away from any sensitive parts of Tule Springs or any new sites identified during site-specific analysis.

Additionally, up to 7,260.4 acres located outside the boundary of this alternative would be available for disposal and development. This increase in private development along greater portions of the perimeter of the alternative boundary would result in increased opportunities for adverse impacts to undocumented cultural resources both in lands available for private development as well as from increased public proximity to the CTA.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Mitigation measures for Alternative C are identical to those for Alternative A.

Alternative D

DIRECT AND INDIRECT IMPACTS

Up to 8,321.3 acres outside this alternative boundary would be available for disposal and development. This increase in private development along the majority of the perimeter of the alternative boundary would result in greater opportunities for adverse impacts to undocumented cultural resources from construction activities for private development as well as from greater public proximity to the CTA. Indirect impacts from having private development surround the alternative boundary range from trampling of surface artifacts to illegal excavation and collection.

New development would result in a loss of undocumented resources from construction activities associated with that development.

New development within the CTA would result in an increase in public visitation, which would lead to greater risks for adverse impacts to Tule Springs and to any undocumented cultural resources from vandalism, illegal OHV use, trampling, and illegal collection. All new development should be planned to encourage resting or stopping in areas away from any sensitive parts of Tule Springs or any new sites identified during site-specific analysis.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Mitigation measures for Alternative D are identical to those under Alternative A. Unavoidable adverse impacts to cultural resources include loss of undocumented cultural resources from development activities outside the alternative boundary.

Alternative E

DIRECT AND INDIRECT IMPACTS

Up to 10,010.3 acres outside this alternative boundary would be available for disposal and development. This increase in private development along the perimeter of the alternative boundary would result in opportunities for adverse impacts to undocumented cultural resources in lands available for private development from surface-disturbing construction activities; these would be indirect, adverse impacts from the increased proximity of private development to the CTA alternative boundary. Additionally, new development within the CTA alternative boundary would result in the loss of undocumented cultural resources from construction activities associated with those developments. An increase in public visitation resulting from new development within the CTA boundaries and increased adjacent development would lead to greater opportunities for adverse impacts to Tule Springs and to any undocumented cultural resources from vandalism, illegal OHV use, trampling, and illegal collection. However, all new development should be planned to encourage resting or stopping in areas away from any sensitive parts of Tule Springs or any new sites identified during site-specific analysis.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Mitigation measures for Alternative E are identical to those under Alternative A. Unavoidable adverse impacts to cultural resources include the loss of undocumented cultural resources from development activities outside the alternative boundary.

No-Action Alternative

DIRECT AND INDIRECT IMPACTS

Up to 12,150.0 acres outside this alternative boundary would be available for disposal and development. This is the greatest amount of acreage available for private development of any of the alternatives. This increase in private development along the perimeter of the alternative boundary would result in the greatest opportunity for adverse impacts to both undocumented cultural resources in lands available for private development and to existing known resources within Tule Springs. The piecemeal development of commercial and residential property in the vicinity of Tule Springs would attract more people into the area of the site.

An increase in public visitation resulting from new development would lead to greater opportunities for adverse impacts to Tule Springs and to any undocumented cultural resources from vandalism, illegal OHV use, trampling, and illegal collection.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Mitigation measures for the No-Action Alternative are identical to those under Alternative A. Unavoidable adverse impacts to cultural resources include loss of undocumented cultural resources from development activities outside the alternative boundary.

4.5.2 Traditional Cultural Properties

As noted in Section 3.5.1, “Introduction,” tribal consultation regarding TCPs and related religious concerns has been conducted directly with the Las Vegas Paiute Tribe and will remain open to ensure adequate participation by interested Indian tribes. Las Vegas Paiute Tribal representatives shared their views with BLM and SWCA regarding the cultural significance of the LVW, and the Las Vegas Paiute Tribe has established that the LVW in and of itself represents an important cultural landscape and potential TCP to the Las Vegas Paiute Tribe, as well as to the Chemehuevi and Moapa Paiute tribes. The LVW and surrounding area are within the aboriginal homelands of these tribes. It was revealed through consultation that, according to Paiute belief, the entirety of the landscape has religious as well as cultural importance to the Paiute people. This belief is consistent with and supported by the previous identification of other regional landscapes/areas of cultural significance, such as the Ivanpah Valley, Gypsum Cave, and Middle Kyle Canyon. The Las Vegas Paiute Tribe has noted that they do not want to identify individual locations of specific sites of cultural importance; this is intended to protect such sites from any intentional disturbance that may occur if the location becomes known to the general public. Thus, it is the position of the Tribe that the entire landscape should be considered as a whole in the assessment of any projected impacts and in the consideration of project alternatives.

It is known and established that the Las Vegas Paiute Tribe considers the CTA and its surroundings to represent a cultural landscape of great significance to the Southern Paiute people (Stoffle et al. 2004). In general, the concept of a cultural landscape encompasses a variety of issues and resources, including ethnographic issues, TCPs, and tribal religious and spiritual access/use concerns, as the landscape is considered to be inextricably linked to the history, culture, and spirituality of the Paiute people. This concept is supported by numerous ethnographic studies and publications, and many ethno-historical accounts attest to the cultural and religious significance of regional landscape, landforms, and natural features, as well as archaeological sites (e.g., Euler and Fowler 1966, 1973; Fowler 1989, 1992; Fowler and Fowler 1971; Stoffle and Arnold 2003; Stoffle and Zedeño 2001; Stoffle et al. 2002; Stoffle et al. 2004). Of particular relevance to the ethnographic concerns of the CTA is the recent study *Puha Flows from It: The Cultural Landscape Study of the Spring Mountains* (Stoffle et al. 2004). This study of

Southern Paiute cultural landscapes provides a basis for evaluating alternatives and developing treatment plans. For example, the authors note,

> Landscapes are recognized as needing different types of management based on what they contain. So a mountain range may have hot springs, above-timberline vistas, obsidian outcrops, caves, and patches of medicine plants. Each has its own value and together they make up the cultural landscape for a traditional people. Each feature of this landscape can have different management responses based on the needs of the federal agency and the culture of the appropriate people. (Stoffle et al. 2004:179)

In past consultations, representatives of the Las Vegas Paiute Tribe have described places such as the landscapes in the area of the LVW as venues that offer their tribal members opportunities for experiencing spiritual peace, maintaining a connection with their past, and preserving their future. This view generally contrasts with present-day Western cultural views of places such as the LVW as sites for urbanization and recreation.

Table 4.5-2 provides a comparison of impacts to cultural resources and TCPs from each alternative.

Table 4.5-2. Comparison of Cultural Resource and Traditional Cultural Property Impacts, by Alternative

Resource	A (acres/other factor)	B (Preferred) (acres/other factor)	C (acres/other factor)	D (acres/other factor)	E (acres/other factor)	No Action (acres/other factor)
Alternative Boundary	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
Las Vegas Wash Traditional Cultural Property	Provides greatest protection of traditional use areas.	Provides adequate protection of traditional use area. Development would alter the cultural landscape.	Development would alter the cultural landscape.	Development would alter the cultural landscape.	Development would alter the cultural landscape.	Potential for significant adverse impacts over time.

Analysis Approach and Assumptions

The threshold for significant impacts to a TCP was developed through discussions in spring 2008 with the consulting tribal representatives. Because TCPs by their nature include information sensitive to tribes, concerned tribes are regarded as the sole authorities for establishing when an impact to a TCP is significant.

Impact Thresholds

Addressing adverse impacts to traditional cultural resources is complex. Although guidelines for evaluating such impacts are set forth in 36 CFR 800.5, considerations must also include protections, access, and use of such resources as described in the American Indian Religious Freedom Act of 1978 [42 USC 1996], which protects and preserves the inherent right of Native Americans to believe, express, and exercise their traditional religions, including their unhindered access to religious sites; the Native American Graves Protection and Repatriation Act of 1990 [25 USC 3001], which establishes the right of Indian tribes to claim ownership of certain cultural items, including human remains and funerary, sacred, and cultural patrimonial objects and artifacts; the Executive Order on Indian Sacred Sites [EO 13007], which directs federal agencies to accommodate access to, and ceremonial use of, Indian sacred sites and to avoid adversely affecting the physical integrity of such sacred sites; and other regulations that may mandate adequate coordination with Indian tribes regarding resources of importance to them.

In terms of the NHPA, a TCP may be subject to an adverse impact when an action may alter directly or indirectly one or more of the characteristics that may qualify that property for NRHP eligibility. In other instances, such as for EO 13007, evaluations of adverse impacts need to assess how such resources and places relate to the continuation of a tribe's culture and society and how an action may affect contemporary and future use and access. In general, direct impacts include any physical destruction, damage, or alterations to all or part of a property. Direct impacts may also result from construction activities in areas adjacent to the resource. For most TCP considerations within the LVW, an impact occurs when an agent (direct or indirect) could cause physical destruction or damage to a resource that is significant to the cultural landscape.

Discussions held on May 6, 2008, with the Las Vegas Paiute Tribe provided information to guide the assessment of impacts to TCPs in the project area. In general, the Tribe would prefer that no development take place in or around the LVW. They expressed concerns about direct and indirect impacts that may result from the development of roads across, or near, the LVW and the Paiute Reservation boundary.

Actions Proposed under all Alternatives that Would Cause Change to the Las Vegas Wash as a Traditional Cultural Property

The following actions assumed for analysis would cause change to the existing LVW and, as a result, could affect the cultural landscape of the LVW as a TCP. The changes described below include both beneficial and adverse impacts.

Possible beneficial impacts:

- Conservation measures would be put in place for the protection of surface paleontological sites and sensitive plant habitats.
- BLM would inventory unauthorized surface disturbances in the CTA, including illegal dump sites, user-created trails and tracks, and other trespasses, and would seek to rehabilitate these disturbances to a more natural condition to improve management and protection of sensitive resources.

DIRECT AND INDIRECT IMPACTS

Some of the common actions would have a beneficial impact to the LVW and may restore or improve some of the characteristics that define it as a TCP/cultural landscape. Conservation of sensitive plant habitat may protect and preserve species of special tribal interest. Rehabilitation of disturbed areas could help to restore the peaceful serenity of the LVW, which is tribally valued.

Creation of new development throughout the LVW area could result in an increase in human use of the area and therefore could lead to adverse impacts to unidentified traditional cultural resources.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

In order to mitigate damage to the resources of concern to the people of the Las Vegas Paiute Tribe, the consulting tribe could be involved as cooperators in the planning of any new developments to help find and plan the best possible routes, determine places to avoid or monitor for non-sanctioned use, and suggest other means of protecting resources of tribal importance. Continued involvement of the consulting tribe in planning such developments to minimize future impacts is the best mitigation measure to address impacts common to all alternatives and will provide the best process by which to achieve BLM Management Goal 4. Through ongoing consultation with the tribal government of the Las Vegas Paiute Tribe and its designated representatives—such as the Tribal Historic Preservation Offices and

Conservation Office—impacts could be tracked and analyzed and specific changes or measures implemented to mitigate adverse impacts as the project proceeds.

Alternative A

This alternative is not anticipated to result in impacts of concern to the consulting tribe. Discussions with the Las Vegas Paiute Tribe have determined that this alternative is the most acceptable alternative for meeting the goals of the tribe for the preservation of TCPs and cultural use of the landscape.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Because this alternative creates a buffer around the reservation lands of the Las Vegas Paiute Tribe, at least one of the tribal conservation goals would be met under this alternative. Under this alternative, tribal representatives could be involved in the planning of new development to find the best possible routes, determine places to avoid or monitor for non-sanctioned use, and suggest other means to protect resources of traditional cultural association. Continued involvement of the Las Vegas Paiute Tribe in planning such developments and minimizing future impacts is the best mitigation measure under this alternative. Through ongoing consultation with the government of the Las Vegas Paiute Tribe and the cooperation of designated tribal representatives (e.g., Tribal Historic Preservation Offices and Conservation Office, elders, or others), impacts can be tracked and analyzed, and specific changes or measures can be implemented to mitigate adverse impacts.

Alternative B (*BLM Preferred Alternative*)

This alternative is not anticipated to result in impacts of tribal concern based on the results of consultation. Discussions with the Las Vegas Paiute have determined that this alternative is the second-best alternative in terms of its acceptability for meeting the goals of the tribe for the preservation of TCPs and cultural use of the landscape. Alternative B, although similar to Alternative A, protects 1,944.9 fewer acres than Alternative A.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Because this alternative emphasizes the protection of sensitive resources, at least one tribal conservation goal would be met for the LVW. Under this alternative, the Las Vegas Paiute Tribe could be involved as a cooperator in the planning of new development in order to find the best possible routes, determine places to avoid or monitor for non-sanctioned use, and suggest other means to protect resources of traditional cultural association. Continued involvement of the tribe in planning such developments and minimizing future impacts is the best mitigation measure under this alternative. Through ongoing consultation with the government of the Las Vegas Paiute Tribe and the cooperation of its designated representatives (e.g., Tribal Historic Preservation Offices and Conservation Office, elders, and others), impacts can be tracked and analyzed, and specific changes or measures can be implemented to mitigate adverse impacts.

Alternative C

This alternative was determined through tribal consultation as having the potential to affect resources of cultural and traditional importance and to adversely affect the Las Vegas Paiute Tribe’s needs and goals for their own future development. Discussions with the Las Vegas Paiute Tribe have determined that this alternative is unacceptable to the tribe in terms of satisfying goals of the tribe for the preservation of TCPs and cultural uses of the landscape. The Las Vegas Paiute Tribe maintains that this alternative would increase recreational use to a level that could prove unmanageable, would result in new development that could affect the sanctity of the area and directly and indirectly affect traditional use areas, and has the

potential to lead to even more development in the upland bajada. Such development could result in more ROW permit applications across BLM land, which could lead to cumulative future impacts to the LVW and the reservation lands of the Las Vegas Paiute Tribe. Implementation of Alternative C would result in significant adverse impacts to TCPs and the traditional cultural landscape.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

The Las Vegas Paiute Tribe has determined that this alternative would change the cultural landscape to such a degree that the mitigation of TCPs and the surrounding cultural landscape appears impossible from the perspective of the tribe. This could change if the tribe is involved in planned development and consulted on an ongoing basis or is involved as a cooperating entity for present and future plans. Such an agreement would need to be negotiated with the government of the Las Vegas Paiute Tribe.

Alternative D

This alternative would have similar impact potential as Alternative C, although Alternative D would cover approximately 1,060.9 fewer acres than Alternative C. Tribal consultation determined that Alternative D has the potential to affect resources of cultural and traditional importance and to affect the Las Vegas Paiute Tribe's needs and goals for future development. Discussions with the Las Vegas Paiute Tribe have determined that this alternative would not satisfy tribal goals for preservation of TCPs and continued cultural use of the landscape. The Las Vegas Paiute Tribe maintains that this alternative would increase use to a level that could prove unmanageable, would result in new roads that could adversely affect the sanctity of the area and directly and indirectly affect traditional use areas, and has the potential to lead to even more development in the upland bajada. Implementation of Alternative D would result in significant adverse impacts to TCPs and the traditional cultural landscape.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Mitigation measures for this alternative are the same as those under Alternative C.

Alternative E

Because this alternative would remove lands from federal oversight, it has the greatest potential to affect resources of cultural and traditional importance, as well as the Las Vegas Paiute Tribe's needs and goals for future development. With the removal of CTA lands from federal oversight, the Las Vegas Paiute Tribe would be unable to participate in developing alternatives and mitigation measures for resources on removed lands, and cumulative impacts would result that would adversely affect tribal resources from direct use of those lands or indirectly on surrounding lands from use of removed lands.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

No mitigation measures have been identified regarding this alternative. The removal of official means for tribal involvement in development planning precludes the forms of mitigation suggested for other alternatives. Implementation of Alternative E would result in significant adverse impacts to TCPs and the traditional cultural landscape.

No-Action Alternative

This alternative assumes that development would continue according to present trends. In general, this alternative would have future impacts that would require tribal involvement on an ongoing, government-to-government basis but does not seek to programmatically minimize impacts to resources. Therefore,

there would be the potential for significant adverse impacts over time. Tribal involvement in future development would occur on a case-by-case basis. Case-by-case involvement would not be effective in mitigating impacts to TCPs and the cultural landscape. This alternative is thus contrary to the preservation and use goals of the Las Vegas Paiute Tribe and its people.

MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

Although this alternative would mean "business as usual" in terms of land use and management of resources, it could also result in significant damage and loss of resources of interest to the tribe, and tribal consultation has concluded that it is even less acceptable to the Las Vegas Paiute Tribe than the other alternatives with potentially significant adverse effects that might not be mitigated, such as Alternative E. Mitigation and avoidance of adverse impacts would need to take place on a case-by-case basis; therefore, the potential for loss of resources would be difficult to mitigate programmatically, which is possible under some of the other alternatives.

4.6 PALEONTOLOGICAL RESOURCES

Four hundred thirty-six paleontological localities have been recorded within the CTA study area. The fossils of the LVF, together with the relatively complete stratigraphic record exposed within the CTA study area, represent a critically important scientific and educational resource for understanding the late Pleistocene biota of the Mojave Desert and may represent a lagerstatte, as well as patterns of extinction and climate change. Lagerstatten are areas of preservation or varied diversity. These localities can represent a cross section of the local regional environment.

FLPMA mandates the treatment of paleontological resources that have scientific value [FLPMA 102(8)]. For the purposes of this analysis and in accordance with BLM policy, scientifically significant paleontological resources are defined as vertebrate fossils that are identifiable to taxon and/or element, noteworthy occurrences of invertebrate and plant fossils, and vertebrate trackways.

For this analysis, paleontological resources within the study area are classified in one of two categories: 1) those that have already eroded onto the ground surface and are thus visible (surface fossils); and 2) those that are still buried within rock strata and are thus not visible (subsurface fossils). Surface fossils may be located during a field survey, evaluated, and salvaged by paleontologists prior to a surface-disturbing action. Impacts to occurrences of previously documented surface fossils at individual fossil localities under each alternative represent the only paleontological resources that are quantifiable for this analysis. Because they are not visible, subsurface fossils cannot be located and evaluated prior to ground disturbance. Rather, the likelihood of adverse effects on subsurface fossils can only be estimated by determining the number and types of fossils that have been previously discovered within the CTA study area and elsewhere within the same fossil-bearing geological units (formations, members, submembers, and individual strata). The existence of subsurface fossils can only be ascertained by monitoring excavations during a surface-disturbing action. Thus, it is not possible to precisely quantify impacts to subsurface fossils prior to their discovery because their locations are unknown.

It is important to point out that subsequent to the location and removal of significant surface fossils during a paleontological field survey and issuance of a surface clearance recommendation, additional subsurface fossils will continue to erode onto the ground surface over time. This effect is particularly prevalent in areas that are prone to high rates of erosion, such as the active wash.

The potential for adverse impacts to both surface and subsurface paleontological resources is directly proportional to the amount of ground disturbance associated with a proposed action. Thus, the higher the amount of surface disturbance associated with development within the CTA, the greater the potential for

adverse impacts to paleontological resources within the LVF. Table 4.6-1 provides the impacts to paleontological resources from each alternative.

Table 4.6-1. Comparison of Paleontological Resource Impacts, by Alternative

Resource	A	B (Preferred)	C	D	E	No Action
CTA Alternative Boundary (acres)	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
Lands Available for Disposal (acres)	370.8	2,315.7	6,961.0	8,022.7	10,010.3	12,174.5
Fossil Localities within CTA (number)	436	436	434	422	318	82
Fossil Localities outside CTA (number)	0	0	2	14	118	354
Major Fossil Localities within CTA (number)*	181	181	180	175	139	33
Major Fossil Localities outside CTA (number)*	0	0	1	6	42	148

* See 4.6.1 for definition of major fossil localities.

4.6.1 Analysis Approach and Assumptions

This analysis is based on paleontological data for the CTA maintained by BLM. The data set was generated by the SBCM as part of the Paleontology Plan (SBCM 2004), which was prepared as part of the LVVDB FEIS (BLM 2004a). The data set includes, among other things, the geographic locations and stratigraphic provenance of fossil localities within the CTA and the types of fossils present at each locality. The data were analyzed in order to assess and quantify the impacts to paleontological resources under each alternative. As stated above, only surface fossils that have already been inventoried are available for this analysis. In addition, there are an unknown number of fossils buried within strata of the LVF within the ULVW that could be adversely impacted by surface disturbance in CTA lands that are made available for disposal.

The approach taken in this analysis is to determine 1) the acreage of LVF that would be preserved or made available for disposal under each alternative in order to estimate potential impacts to buried fossils that are still contained within sediments of the LVF and whose specific locations are unknown; 2) the total number of known fossil localities on lands that would be preserved or made available for disposal under each alternative; and 3) the number of known “major fossil localities,” as defined below, on lands that would be preserved or made available for disposal under each alternative.

Assumptions for the analysis include the following:

- The distribution of the LVF has not been geologically mapped in detail within the CTA study area, and it is known to underlie thin deposits of late Quaternary alluvium within the ULVW. Therefore, for the purpose of this analysis, it is assumed that surface disturbance anywhere within the CTA study area has the potential to disturb the LVF and its fossil assemblage, and the stratigraphic provenance of individual fossil localities (units defined by Haynes 1967) was not factored into this analysis.
- The majority of localities consist of isolated or only partially articulated skeletal elements representing individual animals, as opposed to larger accumulations with multiple individuals and more articulated skeletons. The localities are therefore assumed to be small in terms of geographic extent (size). This is consistent with the descriptions of fossils listed in the paleontological data set on which the analysis is based. The locality-size assumption for the purpose of this analysis is that the sizes of the fossil localities analyzed within the CTA study area

are relatively small and roughly similar. Locality size was not used as a variable in determining impacts to paleontological resources.

- "Major Fossil Surface Localities" are defined by the taxon types and quality of preservation of fossils at each locality. For the purpose of this analysis, and in accordance with BLM policy, major fossil surface localities are defined as those that contain vertebrate fossils that are identifiable to taxon and/or skeletal element and are thus scientifically significant. In terms of vertebrate fossils, with the exception of tortoise and bird, only mammalian fossils are listed in the data set. Those vertebrate fossils that are identified to below the taxonomic level of class (to order, family, or genus) and/or are identified to element type (tooth, tusk, vertebra, eggshell, etc.) constitute major fossil surface localities in this analysis. Major fossil surface localities as defined by taxon types are those that are listed in the data set as preserving the remains of tortoise, bird, rodent, lagomorph, bison, camel, unidentified artiodactyl, horse, and mammoth. It is important to recognize that in situ fossils as listed in the data set may be only partially exposed by erosion, and although the exposed portion may only be described as "mammal bone fragments" in the data set, the unweathered buried portion of the fossil may in fact be identifiable to both taxon and element once the fossil has been fully excavated and prepared in the laboratory.
- The preferred mitigation approach is to protect the paleontological resources of the LVF by configuring the boundaries of the CTA to include major fossil surface localities, establish in situ preservation areas that are kept undisturbed and unfragmented, and mitigate those paleontological localities than cannot be preserved in situ. The assumption in this analysis is therefore that wherever possible, the in situ preservation of paleontological resources is preferable over salvage and removal of fossils from the CTA.

4.6.2 Impact Thresholds

The threshold for significant adverse impacts to paleontological resources is reached with the damage or destruction of scientifically significant fossils and the consequent loss of associated scientific information. This includes destruction as the result of surface and subsurface disturbance as well as unlawful vandalism and unauthorized collection of scientifically significant fossil remains. Accomplishing the BLM objectives of configuring the CTA boundary to include all major fossil localities, establishing in situ preservation areas for paleontological areas that are kept undisturbed and unfragmented, maintaining in situ key paleontological localities, and providing mitigation for paleontological localities that cannot be preserved in situ would ensure that potential adverse impacts to paleontological resources within the CTA study area would be reduced to below the level of significance.

Direct and Indirect Impacts

The following are definitions of types of impacts and related effects on paleontological resources, followed by an analysis of impacts anticipated under each alternative. Direct impacts are expected under all alternatives to varying degrees and correlate directly with the amount (acreage and depth) of surface disturbance of the LVF within the CTA study area.

Direct, adverse impacts to surface or subsurface paleontological resources are the result of destruction by breakage and crushing by surface disturbing actions, including construction-related excavations. Direct impacts also occur as a result of the breakage, removal and burial of fossils by stream bank erosion, and erosion downstream. In areas that contain paleontologically sensitive geological units, hydrologically or construction-related surface disturbance has the potential to adversely impact surface fossils and an unknown quantity of subsurface fossils. Without mitigation, these fossils and the paleontological data

they could provide if properly salvaged and documented could be adversely impacted (damaged or destroyed), rendering them permanently lost.

Indirect impacts typically include those effects that result from the continuing implementation of management decisions and resulting activities, including normal ongoing operations of facilities constructed within a given project area. They also occur as the result of new development in areas that were previously less accessible. This increases the human presence and therefore increases the likelihood of the loss of paleontological resources through vandalism and unlawful collecting. Human activities that increase erosion as a result of stormwater runoff cause indirect impacts to surface and subsurface fossils with damage or destruction during hydrologic transport, weathering, and reburial.

Mitigation Measures and Unavoidable Adverse Impacts

Strategies for mitigating direct impacts to paleontological resources include avoidance of paleontologically sensitive areas and specific localities, in situ preservation of fossil localities, and monitoring of surface-disturbing actions to salvage fossils and associated data and permanently house them in a BLM-approved repository. While most fossils and associated data can be recovered if a paleontological monitoring program is successfully implemented, there is also the inevitable loss of fossils that are accidentally destroyed by excavation equipment before a monitor observes them.

Indirect impacts are difficult to mitigate to below the level of significance, but they can be greatly reduced by increasing public awareness about the scientific importance of paleontological resources through education, community partnerships, and interpretive displays, as well informing the public about penalties for vandalism and unlawful collecting of these resources from public lands.

4.6.3 Alternative A

Actions Proposed under Alternative A that Would Cause Change to Existing Paleontological Resources

Alternative A emphasizes preservation of sensitive paleontological resources within the CTA by preserving the largest acreage of any of the alternatives and by allowing only minimal new infrastructure. A limited amount of land (370.8 acres) would be available for disposal.

Direct and Indirect Impacts

Alternative A would preserve 12,952.5 acres of land and make 370.8 acres available for disposal (see Table 4.6-1). This alternative includes all 436 fossil localities that have been recorded from within the CTA study area, including the 181 major fossil localities. Direct impacts to paleontological resources would be anticipated with construction activities if these intersected the locations of previously unrecorded surface fossils and subsurface fossils. Indirect impacts would be anticipated to occur by facilitating access to parts of the CTA that were previously less accessible. Because it preserves the largest area of the LVF and encompasses all of the known paleontological localities, Alternative A would have the lowest potential for direct and indirect adverse impacts to paleontological resources out of all the alternatives.

Mitigation Measures and Unavoidable Adverse Impacts

There are four recommended components to mitigation under all CTA alternatives that are designed to achieve the BLM’s paleontological resource management goals and objectives. The locations and

amounts of mitigation needed will vary by alternative, and mitigation requirements will be consistent with resource management policies of the BLM or other current CTA management authority. Mitigation measures under Alternative A are summarized below and are provided in greater detail for all alternatives in Section 4.6.9, "Paleontological Mitigation Definitions and Procedures." The four interrelated paleontological mitigation components include the following:

1. Collection of all previously recorded scientifically significant surface fossils that will not be preserved or displayed in situ from within the boundaries of the CTA as soon as feasible in order to prevent loss from vandalism, theft, and natural weathering processes. Collection would be housed in a BLM-approved repository (i.e., museum).
2. Mitigation monitoring of all surface-disturbing development activities in order to prevent destruction of scientifically significant subsurface fossils contained within strata of the LVF.
3. Development of in situ paleontological interpretive displays, which may include fossil specimens, and in situ preservation of paleontologically sensitive areas and key fossil localities.
4. Under the direction of the CTA management authority, establishment of an ongoing paleontological survey and monitoring program designed to periodically check for newly exposed fossil remains and monitor the status of in situ preserved localities.

Mitigation of direct impacts under Alternative A will include monitoring of surface-disturbing activities, salvage of unearthed fossils, and transfer of these fossils to a BLM-approved repository, where they will be housed in perpetuity and available for scientific research, education, and display. Mitigation of indirect impacts will include the regulation of public access to the CTA by promoting the use of established roads and trails, providing educational interpretive displays highlighting the paleontological resources of the area, protecting in situ fossils associated with interpretive displays with protective barriers, and generally educating the community about the scientific importance of the paleontological resources of the LVF.

4.6.4 Alternative B (BLM Preferred Alternative)

Actions Proposed under the Preferred Alternative that Would Cause Change to Existing Paleontological Resources

Alternative B emphasizes protection of the hydrologic functioning of the ULVW and other sensitive resources. This alternative protects the LVF, ephemeral wash plant communities, and sensitive plant habitats.

Direct and Indirect Impacts

Alternative B would preserve 11,007.6 acres of land and make 2,315.7 acres available for disposal (see Table 4.6-1). Like Alternative A, this alternative includes all 436 fossil localities that have been recorded from within the CTA study area, including the 181 major fossil localities. The types and causes of direct and indirect impacts under this alternative would be similar to those for Alternative A. Direct impacts to paleontological resources would be anticipated with construction activities if these intersected the locations of previously unrecorded surface fossils and subsurface fossils. New development under the Alternative B would result in indirect impacts by facilitating access to fossil localities that were previously less accessible, potentially leading to increased unlawful fossil collection or vandalism.

Alternative B has the second-lowest potential for direct and indirect impacts to paleontological resources, after Alternative A. It has a higher potential for direct, adverse impacts than Alternative A only because it preserves less land and includes more new development that could disturb buried resources.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation components and unavoidable adverse impacts are described for Alternative A. Under the Preferred Alternative, any ground-disturbing activity in the LVF would require a qualified paleontologist on-site and would require a Discovery Plan in the event that fossils are found.

Because it has a higher potential for direct and indirect adverse impacts to paleontological resources than Alternative A, Alternative B could require a greater paleontological mitigation effort. Mitigation measures would be similar to those described for Alternative A. Increased public awareness of paleontological resources could lead to more fossil discoveries by visitors that will then be brought to the attention of the CTA managing authority and paleontologists so that these fossils can be preserved. Off-trail hiking opportunities should be restricted to those areas in which surface fossils have already been collected or are otherwise less sensitive.

4.6.5 Alternative C

Actions Proposed under Alternative C that Would Cause Change to Existing Paleontological Resources

Alternative C emphasizes opportunities for new development outside the CTA while continuing to meet the conservation purpose and need of the SEIS.

Direct and Indirect Impacts

Alternative C would preserve 6,362.3 acres of land and make 6,961.0 acres available for disposal (see Table 4.6-1). Unlike Alternatives A and B, this alternative includes 434 of the 436 known fossil localities within the CTA study area, including 180 of the 181 major fossil localities. Thus, a total of two fossil localities would be located outside the CTA.

The types and causes of direct and indirect impacts under this alternative would be similar to those for Alternative A. Alternative C has the third-lowest potential for direct and indirect impacts to paleontological resources, after Alternatives A and B. It has a higher potential for direct, adverse impacts than these alternatives because it preserves less land within the CTA and assumes the construction of additional infrastructure, which could destroy buried resources. It has a higher potential for indirect, adverse impacts because it provides greater access to paleontologically sensitive areas.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation components and unavoidable adverse impacts are described for Alternative A.

Because it has a higher potential for direct and indirect adverse impacts to paleontological resources than Alternatives A and B, Alternative C would require a greater paleontological mitigation effort because it allows for a greater amount of surface disturbance within the CTA. Direct impact mitigation measures would be identical to those under Alternative A. In addition, however, two fossil localities (one of which is major) would be located outside the CTA and would require mitigation. Mitigation measures for indirect impacts would also be identical to those under Alternative A, with the addition of allowing non-mechanized cross-country travel in areas in which surface fossils have already been collected or are otherwise less sensitive.

4.6.6 Alternative D

Actions Proposed under Alternative D that Would Cause Change to Existing Paleontological Resources

Alternative D emphasizes the protection of sensitive resources within the CTA while supporting private development, which could occur outside the CTA boundary. Under this alternative, there is a greater potential for urban runoff into the ULVW than under Alternatives A–C.

Direct and Indirect Impacts

Alternative D would preserve 5,301.4 acres of land and make 8,022.7 acres available for disposal (see Table 4.6-1). This alternative includes 422 of the 436 known fossil localities within the CTA study area, including 175 of the 181 major fossil localities. Thus, a total of 14 fossil localities would be excluded from the CTA.

The types and causes of direct and indirect impacts under this alternative would be similar to those under Alternative A. However, additional adverse impacts would potentially occur during construction excavations for new development.

Although Alternative D preserves more land within the CTA than Alternative E and the No-Action Alternative and less land than within the CTA than Alternatives A–C, it also assumes the greatest amount of acreage of infrastructure development within the CTA (633 acres). While Alternative D preserves less of the LVF than Alternatives A–C and excludes 14 fossil localities from the CTA, it preserves a net larger area than Alternative E and the No-Action Alternative. Therefore, it has the fourth-largest potential for direct and indirect impacts to paleontological resources, after Alternatives A–C.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation components and unavoidable adverse impacts are described for Alternative A.

Because it has a higher potential for direct and indirect adverse impacts to paleontological resources than Alternatives A–C, Alternative D would require a greater paleontological mitigation effort because it allows for a greater amount of surface disturbance within the CTA. Mitigation measures for direct impacts would be identical to those under Alternative A. In addition, however, 14 fossil localities (six of which are major) would be located outside the CTA and would require mitigation. Mitigation measures for indirect impacts would also be identical to those under Alternative A, with the addition of locating new development in areas in which surface fossils have already been collected or are otherwise less sensitive.

Unavoidable adverse impacts consist of the loss of 14 known fossil localities that would not be protected within the alternative boundary. Additionally, paleosols and stratigraphy within areas of the LVF not preserved within the alternative boundary would be lost and unavailable for future research and study.

4.6.7 Alternative E

Actions Proposed under Alternative E that Would Cause Change to Existing Paleontological Resources

Alternative E leaves 10,010 acres available for disposal while providing for the continued protection of Eglington Preserve and Tule Springs. Under this alternative, waters flowing down the alluvial fans of the Sheep and Las Vegas ranges would not continue in their current condition.

Direct and Indirect Impacts

Alternative E would preserve 3,313.8 acres of land and make 10,010.3 acres available for disposal (see Table 4.6-1). This alternative includes 318 of the 436 known fossil localities within the CTA study area, including 139 of the 181 major fossil localities. Thus, a total of 118 fossil localities would be excluded from the CTA.

The types and causes of indirect impacts under this alternative would be similar to those under Alternative A. However, additional adverse impacts would potentially occur during construction activities. Additional indirect impacts under this alternative would be possible as a result of the increased human presence within the CTA, the relatively smaller size of the CTA, and the resulting closer proximity of private development.

Alternative E has a greater potential for direct and indirect impacts to paleontological resources than Alternatives A–D. It has a greater potential for direct, adverse impacts because it preserves less land within the CTA and allows for disturbance of the LVF within the CTA resulting from new development. Alternative E has a greater potential for indirect, adverse impacts than the other action alternatives because it would provide less of an overall buffer to development and facilitate greater access to sensitive areas within the CTA by road.

Mitigation Measures and Unavoidable Adverse Impacts

Alternative E would require the greatest amount of paleontological mitigation of all the action alternatives, and assuming that mitigation would be required for the disposal of CTA lands under the No-Action Alternative, it would be second only to the No-Action Alternative in the mitigation effort needed to reduce adverse impacts to below the level of significance. Mitigation measures for direct impacts would be identical to those under Alternative A. Mitigation measures for indirect impacts would be identical to those under Alternative A, with the addition of new development in areas in which surface fossils have already been collected or are otherwise less sensitive.

Unavoidable adverse impacts consist of the loss of 118 known fossil localities, which would not be protected within the alternative boundary. Also, paleosols and stratigraphy within areas of the LVF not preserved within the alternative boundary would be lost and unavailable for future research and study.

4.6.8 No-Action Alternative

Actions Proposed under the No-Action Alternative that Would Cause Change to Existing Paleontological Resources

Under the No-Action Alternative, the entire CTA, with the exception of Eglington Preserve and Tule Springs, would be available for disposal in accordance with applicable laws and with the stipulations established by the Conservation Agreement.

Direct and Indirect Impacts

The No-Action Alternative would preserve 1,448.2 acres of land and make 12,174.5 acres available for disposal (see Table 4.6-1). This alternative includes 82 of the 436 known fossil localities within the CTA study area, including 22 of the 181 major fossil localities. Thus, a total of 354 fossil localities would be excluded from the CTA.

The types and causes of direct and indirect impacts under this alternative would be similar to those under Alternative A. However, additional direct and indirect impacts would be anticipated as a result of increased public access associated with greater development within the CTA, the relatively small geographic area encompassed by the CTA, compared with the action alternatives, and the resulting closer proximity of private development. Of all the alternatives, the No-Action Alternative has the highest potential for direct and indirect adverse impacts to paleontological resources because it has the greatest likelihood of cumulative surface disturbance to the LVF, includes the smallest geographic area (1,100 acres) within the CTA, and excludes the largest number of fossil localities.

Mitigation Measures and Unavoidable Adverse Impacts

Assuming that mitigation would be required for the disposal of CTA lands under the No-Action Alternative, this alternative would require the greatest amount of paleontological mitigation of all the alternatives in order to reduce adverse impacts to below the level of significance. This would include mitigation of 354 known fossil localities that would be excluded from the CTA. Mitigation measures for direct and indirect impacts would be identical to those under Alternative A.

Unavoidable adverse impacts consist of the loss of 354 known fossil localities that would not be protected within the alternative boundary. Additionally, paleosols and stratigraphy within areas of the LVF not preserved within the boundary would be lost and unavailable for future research and study.

4.6.9 Paleontological Mitigation Definitions and Procedures

As a nonrenewable resource, paleontological resources are unique. At the time fossils are discovered during paleontological surveys or mitigation-monitoring of ground-disturbing actions, many have already been subjected to a variety of destructive processes. These include predation, scavenging, disarticulation of skeletal remains, transport, primary weathering, diagenesis (physical changes in rock that occur over time, such as compaction, cementation, mineral replacement), erosion, secondary weathering, and if discovered during monitoring, additional damage that may have occurred during the surface-disturbing action that led to fossil discovery. Unlike other resources, it is difficult to develop measurable performance standards for paleontological mitigation because 1) fossils have been damaged by natural processes prior to their discovery during a paleontological survey or during paleontological monitoring; 2) subsurface fossils are often further damaged by construction activities that reveal their presence to paleontological monitors; and 3) there is no way to quantify how many fossils are preserved in the

sedimentary deposits underlying a given site but were not exposed during the ground-disturbing action. Therefore, the absence of fossils would not indicate failure of the mitigation measures. Paleontological mitigation seeks to discover, via survey or monitoring, as many significant fossils as possible prior to their destruction during human-caused surface disturbance. Measurable performance standards in paleontology apply to survey and mitigation-monitoring procedures, which ensures that fossil localities are documented thoroughly and accurately and that fossils are collected in accordance with professional paleontological standards and agency guidelines.

The need for and scope of all paleontological mitigation projects will be determined using the current version of the BLM *Paleontology Resources Management Manual and Handbook* (H-8270-1) (BLM 1998b), which is presently undergoing revision. Scopes of work for all paleontological mitigation projects will be developed by the BLM Authorized Officer or Paleontology Coordinator at the BLM Las Vegas Field Office in consultation with a BLM-permitted Paleontologist/Principal Investigator who is knowledgeable about the paleontology of the LVF. For larger or more complex mitigation projects, the BLM Regional Paleontologist responsible for Nevada will also be consulted.

As stated in Chapter 3, 436 fossil localities have been previously recorded within the CTA study area in sedimentary deposits of the late Pleistocene LVF. In this chapter, impacts to paleontological resources that are anticipated under each of the proposed alternatives have been evaluated, and general mitigation recommendations have been provided. As discussed in Section 4.6.3, “Actions Proposed under all Alternatives that Would Cause Change to the Existing Paleontological Resources,” there are four recommended components to paleontological mitigation under all CTA alternatives, and the locations and amounts of mitigation recommended vary by alternative. Following is a more detailed presentation of paleontological mitigation procedures for each of the four components to supplement the recommendations made for each CTA alternative.

Collection of Surface Fossils

As soon as allowable following the issuance of the ROD for this SEIS, it is recommended that all previously recorded *scientifically significant* surface fossils (and associated buried remains) that will not be preserved or displayed in situ within the CTA be salvaged, along with associated data, and transferred to an approved BLM repository for preparation, identification, curation, and storage. This will mitigate future losses resulting from vandalism, theft, and the natural processes of weathering and erosion. The determination of the scientific significance of fossils at each locality and the decision regarding which localities should be preserved in situ and considered for use in interpretive displays should be made by the BLM in consultation with a BLM-permitted Paleontologist/Principal Investigator who has specialized knowledge about and expertise in the paleontology of the LVF.

During fossil collection at either previously recorded or newly discovered fossil localities, if damage to a scientifically significant fossil or assemblage of fossils is determined to be unavoidable, it may be necessary to avoid the locality in order to prevent irreparable damage to the resource. Avoidance should also be considered if a known fossil locality contains critical scientific information and should be left undisturbed for later scientific evaluation.

Monitoring of Surface Disturbance

Paleontological monitoring includes inspection of exposed rock surfaces and microscopic examination of sedimentary matrix to determine whether fossils are present. This work occurs during surface-disturbing activities such as excavations for the construction of roads, trails, underground utility trenches, transmission lines poles, buildings, and other facilities. Monitoring is conducted by approved

paleontological monitors or field agents (supervisors) listed on Line 8 of a BLM Paleontological Resource Use Permit under the direction of a Principal Investigator.

Under the direction of a BLM-permitted Principal Investigator who has knowledge of the density of fossil occurrences within the different units and lithofacies of the LVF, monitoring may take place continuously, consist of spot-checks of construction excavations, or be temporarily suspended if appropriate (e.g., grading fill material), depending on the probability of locating significant fossils. Paleontological monitors follow earth-moving equipment and examine excavated sediments and excavation sidewalls for evidence of significant paleontological resources. Bulk matrix samples may be collected for screenwashing in order to collect microfossils. Monitoring staff has the authority to temporarily divert grading away from exposed fossils in order to professionally and efficiently salvage the fossil specimens and collect associated data. All efforts to avoid delays to project schedules are made.

If any subsurface bones or other potential fossils are found by construction personnel during construction when no paleontological monitor is present, work in the immediate area will cease, and the BLM Authorized Officer (or other CTA managing authority) and Principal Investigator will be notified to evaluate the significance of the find. Once salvage or other mitigation measures is complete, the BLM Authorized Officer will notify the construction supervisor that construction work at the discovery site can resume.

Under the supervision of the Field Agent, fossils are salvaged and associated resources are retrieved. The salvaged fossils are then transported to a secure and properly equipped paleontological laboratory for processing.

A final paleontological monitoring report will provide all information requested in the most current version of the BLM Paleontology Manual and Handbook (or as required by an alternative CTA managing authority). This includes, but is not limited to, a discussion of the results of the project with respect to the research design, an evaluation and analysis of all fossils collected (including an assessment of their significance, age, and geological context), an itemized inventory of fossils collected, a confidential appendix of locality and specimen data with locality maps and photographs, an appendix of curation agreements and other appropriate communications, and if applicable, a copy of the project-specific paleontological mitigation plan.

On-Site Fossil Preservation and Paleontological Displays

In order to be consistent with the paleontological resource management and conservation objectives that the BLM has identified for the CTA, in situ paleontological preservation areas should be established, and important paleontological localities that are essential to understanding the paleoecology of the LVF should be preserved in situ. This mitigation component may include the use of fossils in educational interpretive displays located within the CTA. The determination of scientific significance of fossils at each fossil locality, the delineation of paleontological preservation areas, the decision regarding which localities should be preserved in situ, and decisions regarding which fossils should be considered for use in interpretive displays (if any), should be made by the BLM (or other CTA managing authority) in consultation with a BLM-permitted Paleontologist/Principal Investigator who has specialized knowledge and expertise on the paleontology of the LVF.

Ongoing Survey and Resource Monitoring Program

Under the direction of the CTA management authority, an ongoing paleontological monitoring program designed to periodically survey for newly exposed fossil localities and monitor the status of in situ preserved localities within the CTA is critical.

Annual surveys conducted after the end of spring rains would locate newly eroded fossils and provide an opportunity to collect and document them prior to potential loss through unlawful collection or damage by weathering. Many such newly eroded fossil occurrences could be mapped and periodically monitored without collection until conditions warrant (i.e., identifiable remains are exposed). Inspections of paleontological preservation areas, preserved fossil localities, and fossils used in interpretive displays would be important in order to maintain proper conservation conditions for the paleontological resources involved. Paleontological surveys and monitoring of known sites would also provide educational opportunities for the community.

4.7 VISUAL RESOURCES

The analysis of impacts to visual resources is an assessment of changes to the landscape, not just the most scenic or striking landscapes, that would be caused by implementation of each of the alternatives. As discussed in Chapter 3, the landscape is composed of the landform and water bodies, the vegetation that grows on the land, and the presence of human modifications to the land. Those modifications include structures and changes to the land, water, and vegetation, such as development of an open-pit mine, impoundment of a river (creation of a reservoir), or clear-cutting of a forest. Table 4.7-1 provides a comparison of visual impacts between the alternatives.

Table 4.7-1. Comparison of Visual Impacts, by Visual Resource Management Objectives and Alternative

Resource	A (acres)	B (Preferred) (acres)	C (acres)	D (acres)	E (acres)	No Action (acres)
CTA Study Area	13,622.7	13,622.7	13,622.7	13,622.7	13,622.7	13,622.7
CTA Boundary	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
Consistent with VRM Objectives	13,251.9	11,307.0	6,661.8	5,600.0	3,612.4	1,448.2
Not Consistent with VRM Objectives	370.8*	2,315.7*	6,960.9*	8,022.7*	10,010.3*	12,174.5*

* Indicates significant impact.

4.7.1 Analysis Approach and Assumptions

For each alternative, the impact analysis is three-tiered. The first level of analysis is a discussion of changes to the landscape in the CTA study area as a whole, resulting from the actions prescribed under each alternative, both on lands inside and outside the CTA. The second level of analysis is an assessment of impacts resulting from those same actions as seen from five key observation points (KOPs) near and adjacent to the project area. The KOPs are critical viewpoints of typical landscapes in the project area that have been selected to represent the views encountered by a large number of people. The third level of analysis is an assessment of whether the proposed changes to the landscape would meet the BLM objectives for management of visual resources, as prescribed in the Las Vegas RMP and LVVDB FEIS (BLM 1998a, 2004a). The location and rationale for the selection of KOPs are identified below.

Key Observation Points

Five KOPs are identified to represent typical views of the project area to residents and visitors to Las Vegas. The selection of KOPs is consistent with BLM policy (BLM 1986b).The KOPs are selected to geographically represent views of the entire project area and to represent views from places where large

numbers of people reside and gather. They are also selected to represent people who desire to view the landscape in the project area (see Figure M.1-1 in Appendix M).

KOP 1 is located on the patio of the Paiute Reservation golf club house. This location represents panoramic views of the northwestern portion of the CTA study area as seen by a large number of year-round visitors to the golf course. In addition, this view was selected because the Las Vegas Paiute Tribe expressed concern about how the development of public lands adjacent to the Paiute Reservation would change the scene, as viewed from the Paiute Reservation, and what effect those changes would have on use of Paiute Reservation lands. This KOP also represents the views of travelers along U.S. Highway 95.

KOP 2 is located in the parking area at the fishing pond located next to the Tule Springs historic buildings in Floyd Lamb Park. From this location, the view is northward to the west-central portion of the CTA study area. This location represents views of visitors to the park and residents of adjacent neighborhoods. The views from this KOP are typically of the bajada across LVW in the CTA study area to the base of the Sheep Mountain and Las Vegas ranges and Gass Peak on the DNWR. Views are not wide open or panoramic but are somewhat obstructed by the vegetation in the park and adjacent housing development.

KOP 3 is located in the parking area at the model airplane park at McCool Regional Park. From this location, the view is northward to the east-central portion of the CTA study area. The rugged mountains of the DNWR are in the background, and the bajadas and LVW of the CTA study area are in the foreground and middle ground. Views are panoramic and unobstructed, and this location represents the views of visitors to McCool Regional Park and residents of adjacent neighborhoods.

KOP 4 is located along Grand Teton Drive near Eglington Preserve. The view is northward, looking into the southeastern portion of the CTA study area. Views are panoramic and unobstructed. The LVW and bajadas of the CTA study area are in the foreground, and the bajadas and mountains of the DNWR are in the middle ground and background. This location represents the views of future residents of urban development planned south of Grand Teton Drive and Eglington Preserve to the 215 Beltway.

KOP 5 is located at the intersection of the 215 Beltway and Lone Mountain Road. The view is to the northeast and panoramic and includes most of the CTA study area. The Cities of Las Vegas and North Las Vegas are in the foreground and middle ground, and the CTA study area and mountains of the DNWR are in the background. This location represents the views of residents who reside at slightly higher elevations around the perimeter of the LVV, as well as travelers along the beltway.

A visual contrast rating worksheet (BLM Form 8400-4) was prepared to analyzed the effects proposed development would have on the characteristic landscape, as viewed from each of the five KOPs. Not every action assumed for implementation under each alternative was analyzed. The analysis looked at the actions that would have the most potential to affect (change) the landscape, whether inside or outside the proposed CTA. In addition to the contrast rating analyses (worksheets), visual simulations were prepared for each KOP to depict how the landscape would change, as seen from that location. See Appendix M for visual contrast ratings and simulations.

Analysis Assumptions

Because every aspect of future use and development of lands in the CTA study area is not known at this time, it is necessary to make assumptions on which to base and guide the impact analysis. For the purpose of this analysis:

1. Public lands not included in the CTA under any alternative would be disposed of and potentially developed. Most of the lands would be developed residential, but other development would include commercial, light industrial, public facilities, school, parks, and open space.

2. BLM's VRM objectives apply only to public lands, although the effects of disposal and development will be disclosed for lands that leave public ownership for the purpose of this analysis.

4.7.2 Impact Thresholds

Changes to the characteristic landscape will be considered significant when those changes are not in conformance with BLM management objectives for visual resources. All lands in the CTA are managed as VRM Class III. The objective of Class III is to partially retain the existing character of the landscape. The level of change can be moderate, and management activities may attract attention but should not dominate the view (see Section 3.7.2, "Bureau of Land Management Direction"). When changes, or impacts, to the landscape do not meet this objective, they will be considered significant.

4.7.3 Actions Proposed under all Alternatives that Would Cause Change to the Existing Visual Resources

The following action would cause change to the existing visual resources:

- BLM would reclaim and rehabilitate unauthorized surface disturbances (e.g., dump sites, trails, and vehicle tracks) to a more natural condition.

4.7.4 Alternative A

Actions Proposed under Alternative A that Would Cause Change to Existing Visual Resources

In addition to the actions common to all alternatives, the following action would be implemented under this alternative and would affect the characteristic landscape:

- A total of 370.8 acres of the study area outside the proposed CTA would be available for disposal and potential private development. The lands outside the CTA available for disposal are located at McCool Park and the Grand Teton substation.

Direct and Indirect Impacts

CONSERVATION TRANSFER AREA

Under this alternative, 12,952.5 acres of the study area would be managed as the CTA, an increase of 7,952.5 acres (159%) over the original CTA boundary (see Table 2.4-1). Management emphasis would focus on preservation of sensitive resources values and the natural functioning of the ULVW. Generally, the CTA would remain undeveloped, although some development would be constructed that would be apparent on the landscape.

Lands in the CTA study area that were not included in the proposed CTA boundary under this alternative, 370.8 acres, would be available for disposal and potential development (see Table 2.4-2).

***KOP 1*—**From KOP 1, actions proposed in the CTA under this alternative that would be visible would have the same effect on the characteristic landscape as that described in "Conservation Transfer Area" above.

***KOP 2*—**From KOP 2, actions proposed in the CTA under this alternative that would be visible would have the same effect on the characteristic landscape as that described in "Conservation Transfer Area" above.

***KOP 3*—**From KOP 3, actions proposed in the CTA under this alternative that would be visible would have the same effect on the characteristic landscape as that described in "Conservation Transfer Area" above.

***KOP 4*—**From KOP 4, actions proposed in the CTA under this alternative that would be visible would have the same effect on the characteristic landscape as that described in "Conservation Transfer Area" above.

***KOP 5*—**From KOP 5, actions proposed in the CTA under this alternative that would be visible would have the same effect on the characteristic landscape as that described in "Conservation Transfer Area" above. The distance from the KOP to the CTA study area would reduce the visibility and thus the impact of new developments and reclamation projects, but they may still be visible to some degree.

BLM VISUAL RESOURCE MANAGEMENT OBJECTIVES

VRM objectives for public lands in the CTA are Class III. Under the BLM VRM program, the objective of Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape can be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape (BLM 1986a).

The level of change to the landscape was determined to be moderate, and proposed development was determined to be consistent with objectives. Any measure to restore the natural characteristics of the landscape would only support and enhance BLM objectives for management of the landscape. Since the level of landscape change resulting from development proposed under this alternative would be consistent with VRM Class III objectives, the impacts would not be significant. See Appendix M for visual contrast ratings.

Mitigation Measures and Unavoidable Adverse Impacts

The following measures would reduce but not eliminate the impacts of development to the characteristic landscape of the CTA:

1. Color the concrete of any development to match the predominant color in the surrounding landform.
2. Paint facilities a suitable color to reduce the contrast of the structures on the landscape.
3. Use the natural topography and vegetation on the landscape to screen the view of development in the CTA.

Even with implementation of mitigating measures, there would be impacts to the visual resources of the CTA. Under this alternative, measures are prescribed to reduce the evidence of human-made developments on the landscape of the CTA (see 1–3 above), and those project design techniques would reduce the presence of proposed facilities and make them more compatible with the natural elements of the landscape. In the end, however, proposed development would still be noticeable within the landscape. However, while these features may be seen, they would not predominate, and the natural landform and vegetation cover would still stand out in the view. Thus, the impacts to visual resources (the landscape) within the CTA following mitigation would not be significant.

4.7.5 Alternative B (BLM Preferred Alternative)

Actions Proposed under Alternative B that Would Cause Change to Existing Visual Resources

In addition to the actions common to all alternatives, the following action would be implemented under this alternative and would have an impact to the characteristic landscape:

- A total of 2,315.7 acres of the CTA study area outside the proposed CTA boundary would be available for disposal and potential private development. The lands outside the CTA available for disposal are north and east of the Paiute Reservation; a 1,200-foot strip of land on the eastern edge of the study area, adjacent to the southeastern boundary of the CTA; at McCool Regional Park; and at the Grand Teton substation.

Direct and Indirect Impacts

CONSERVATION TRANSFER AREA

Under this alternative, 11,007.6 acres of the study area would be managed as the CTA, an increase of 6,007.6 acres (120%) over the original CTA boundary (see Table 2.4-1). Management emphasis would focus on protecting the natural functioning of the LVW and other sensitive resources while providing for non-motorized recreation opportunities, environmental education, and interpretation. The effects of proposed development under Alternative B on the CTA as a whole would generally be the same as those described under Alternative A, with the following additional effects. Under Alternative B, construction activities would result in additional lines on the landscape as a result of vegetation removal and soil disturbance. Removal of vegetation and exposure of soils for construction activities would leave a noticeable line across the landscape at each location. In addition to vegetation removal and exposure of soils, leveling of the land to facilitate construction activities would leave an apparent bench across the gently sloping landform. This change in land form would further accentuate the visibility of new development.

This alternative would make 2,315.7 acres (see Table 2.4-2) of lands available for disposal and urban development. Most of this acreage would occur in three parcels. Two parcels would lie adjacent to the northern and eastern boundaries of the Paiute Reservation, and the third would lie on the eastern edge of the study area, adjacent to the southeastern boundary of the CTA. Given the current growth in the LVV, it is assumed these lands would be developed. The development, however, would convert predominantly undeveloped landscapes to high-density urban development consisting of buildings, roads, utility lines, and urban landscaping—a transformation of the landscape.

KOP 1—The changes to the landscape that would be viewed from this KOP under this alternative would be the same as those described for KOP 1 under Alternative A.

KOP 2—The changes to the landscape that would be viewed from this KOP under this alternative would be the same as those described for KOP 2 under Alternative A.

KOPs 3 and 4—The changes to the landscape that would be viewed from these KOPs under this alternative would be the same as those described for KOPs 3 and 4 under Alternative A. In addition, under this alternative, high-density urban development of lands outside the CTA on the southeastern boundary of the CTA would be visible from these KOPs, with the same effects as those described in “Conservation Transfer Area” above.

***KOP 5*—**The changes to the landscape that would be viewed from this KOP under this alternative would be the same as those described for KOP 5 under Alternative A. The distance from the KOP to the CTA study area would reduce the visibility, and thus impact, of these developments and reclamation projects, but they could still be visible to some degree. The effects on the landscape would be the same as those described in "Conservation Transfer Area" above, but to a reduced degree, given the distance of viewing and anticipated blending in with the existing adjacent city development.

BLM VISUAL RESOURCE MANAGEMENT OBJECTIVES

Under this alternative, within the CTA, consistency of the proposed development with the BLM VRM objectives would be the same as those described under Alternative A. On lands outside the CTA that would be available for disposal, high-density residential, commercial, and light industrial development would not be consistent with Class III VRM objectives. The lands, however, once transferred to private ownership would no longer be subject to those public land management objectives. See Appendix M for visual contrast ratings.

Mitigation Measures and Unavoidable Adverse Impacts

The following measures would reduce but not eliminate the impacts of development to the characteristic landscape of the CTA:

1. Color the concrete to match the predominant color in the surrounding landform.
2. Paint facilities a suitable color to reduce the contrast of the structures on the landscape.
3. Use the natural topography and vegetation on the landscape to screen the view of new development in the CTA.
4. Use design elements, such as colored concrete, to reduce the visibility of new development across the bajadas at the base of the DNWR.

Under this alternative, there would be more development proposed on lands in the CTA study area. Even with more development on lands within the CTA under this alternative, the unavoidable adverse impacts to the visual resources, or the landscape, would be the same as those described under Alternative A. The impacts to visual resources (the landscape) within the CTA following mitigation would not be significant.

4.7.6 Alternative C

Actions Proposed under Alternative C that Would Cause Change to Existing Visual Resources

In addition to the actions common to all alternatives, the following action would be implemented under this alternative and would have an effect on the characteristic landscape:

- A total of 6,961.0 acres of the study area outside the proposed CTA would be available for disposal and potential private development. The lands outside the CTA available for disposal are north and east of the Paiute Reservation, south of the CTA; north of the CTA, between the CTA and the DNWR north of Moccasin Road; north of the CTA, between the CTA and the DNWR north of Grand Teton Drive; at McCool Regional Park; and at the Grand Teton substation.

Direct and Indirect Impacts

CONSERVATION TRANSFER AREA

Under this alternative, 6,362.3 acres of the study area would be managed as the CTA, an increase of 1,362.3 acres (27%) over the original CTA boundary (see Table 2.4-1). The impacts of proposed development under Alternative C on the CTA as a whole would be the same as those described under Alternative B but would also include potential urban development on 6,961.0 acres of lands available for disposal.

Most of this 6,961.0 acres (see Table 2.4-2) would occur in four parcels. Two parcels would lie adjacent to the northern and eastern boundaries of the Paiute Reservation, south of the CTA. The third would lie north of the CTA between the CTA and DNWR, north of Moccasin Road. The fourth would lie north of the CTA between the CTA and DNWR, north of Grand Teton Drive. Given the current growth in the LVV, it is assumed these lands would be developed. The development, however, would convert predominantly undeveloped landscapes to high-density urban development consisting of buildings, streets, utility lines, and urban landscaping—a transformation of the landscape.

Construction activities would result in both short- and long-term changes to the wash landscape. In the short term, during construction, vegetation clearing would change the form and texture of vegetation cover. Clearing would introduce a large opening in a continuous pattern of the medium-textured element of the environment. Following construction, the opening would remain as smaller shrubs and grasses regrow. The texture would change from the medium texture of the native vegetation community to the smoother texture of shrubs and grasses. Over the long term, as larger shrubs and trees invade, the texture would return to its original condition, and the change in vegetation form (opening) would revert to its original condition—a continuous cover of riparian species.

***KOP 1*—**From KOP 1, substantial development proposed in the CTA under this alternative that would be visible includes construction of the detention basin at the upper end of the LVW. New development would have the same effect on the characteristic landscape as that described in “Conservation Transfer Area” above.

***KOP 2*—**From KOP 2, the primary view will be of the bajada across the LVW. This land would be outside the CTA and would be expected to be developed for residential, commercial, and light industrial uses. That development would be visible from KOP 2.

***KOPs 3 and 4*—**The changes to the landscape that would be viewed from these KOPs under this alternative would be the same as those described for KOPs 3 and 4 under Alternative B.

***KOP 5*—**From KOP 5, the most noticeable feature on the landscape would be the urban development adjacent to the northwestern and southeastern portions of the CTA. At the distance from the KOP to the CTA study area, a person might be able to pick out other developments; the predominant view on the landscape would be urban development. From KOP 5, urban development would appear as an extension of the existing Cities of Las Vegas and North Las Vegas. This development would have the same impact to the characteristic landscape as that described in “Conservation Transfer Area” above.

BLM VISUAL RESOURCE MANAGEMENT OBJECTIVES

Under this alternative, within the CTA, consistency of the proposed development with the BLM VRM objectives would be the same as that described under Alternative A, with the following addition. Construction activities would add noticeable features to the characteristic landscape of the northwestern portion of the CTA. While the development would be apparent from KOP 1, in the long term, following

reclamation, it would not dominate the scene within the CTA. Overall, the undisturbed character of the CTA would remain, especially in contrast to adjacent urban development outside the CTA, and impacts would not be considered significant.

Mitigation Measures and Unavoidable Adverse Impacts

The following measures would reduce but not eliminate the impacts of development to the characteristic landscape of the CTA:

1. Color the concrete to match the predominant color in the surrounding landform.
2. Paint facilities a suitable color to reduce the contrast of the structures on the landscape.
3. Use the natural topography and vegetation on the landscape to screen the view of new development in the CTA.
4. Reshape and recontour cut and fill slopes that cross the natural grade/slope of the bajada.
5. Replant vegetation to accelerate reclamation of disturbed surfaces resulting from construction of the basin.

Under this alternative, there would be substantially more development assumed on lands in the CTA. Even with more development on lands within the CTA under this alternative, the unavoidable adverse impacts to the visual resources, or the landscape, would be the same as those described under Alternative A. The impacts to visual resources (the landscape) within the CTA following mitigation would not be significant.

4.7.7 Alternative D

Actions Proposed under Alternative D that Would Cause Change to Existing Visual Resources

In addition to the actions common to all alternatives, the following action may be implemented under this alternative and may have an impact to the characteristic landscape:

- A total of 8,022.7 acres of the study area outside the proposed CTA would be available for disposal and potential private development. The lands outside the CTA available for disposal are north and east of the Paiute Indian Reservation, south of the CTA; north of the CTA between the CTA and DNWR, north of Moccasin Road; and north of the CTA between the CTA and DNWR, north of Grand Teton Drive.

Direct and Indirect Impacts

CONSERVATION TRANSFER AREA

Under this alternative, 5,301.4 acres of the study area would be managed as the CTA, an increase of 301.4 acres (6%) over the original CTA boundary (see Table 2.4-1). The impacts of proposed development under Alternative D to the CTA, as a whole, would be the same as those described under Alternative C but would also include potential urban development on 8,022.7 acres of lands available for disposal.

Under this alternative, 8,022.7 acres would not be included in the CTA and would be available for disposal and potential development (see Table 2.4-2). These lands would lie in the same locations as those

described under Alternative C. The impact of disposal and development to the landscape would be the same as that described under Alternative C, but applicable to a larger land area.

***KOP 1*—**From KOP 1, substantial development proposed in the CTA under this alternative would be visible. These developments would have the same effect on the characteristic landscape as those described in "Conservation Transfer Area" above.

***KOP 2*—**From KOP 2, the primary view would be the same as that described under Alternative C for KOP 2.

***KOPs 3 and 4*—**The view from KOPs 3 and 4 would be that same as that described under Alternative C. The impacts to the landscape would be the same as those described in "Conservation Transfer Area" above.

***KOP 5*—**From KOP 5, the primary view of landscape changes would be the same as that described under Alternative C.

BLM VISUAL RESOURCE MANAGEMENT OBJECTIVES

Under this alternative, within the CTA, the proposed development would be in compliance with the BLM VRM Class III objectives and would be the same as that described under Alternative C. Overall, the undisturbed character of the CTA would remain, especially in contrast to adjacent urban development outside the CTA, and impacts would not be significant.

On lands adjacent to the CTA that would be available for disposal, high-density residential, commercial, light industrial, and transportation, development would not be consistent with Class III VRM objectives. The lands, however, once transferred to private ownership, would no longer be subject to those public land management objectives. See Appendix M for visual contrast ratings.

Mitigation Measures and Unavoidable Adverse Impacts

The following measures would reduce but not eliminate the impacts of development to the characteristic landscape of the CTA:

1. Color the concrete to match the predominant color in the surrounding landform.
2. Paint facilities a suitable color to reduce the contrast of the structures on the landscape.
3. Use the natural topography and vegetation on the landscape to screen the view of new development in the CTA.
4. Reshape and recontour cut and fill slopes that cross the natural grade/slope of the bajada.
5. Replant vegetation to accelerate reclamation of disturbed surfaces resulting from construction of the two basins.

Under this alternative, there would be substantially more development proposed on lands in the CTA. Even with more development on lands within the CTA under this alternative, the unavoidable adverse impacts to the visual resources, or the landscape, would be the same as those described under Alternative A. The impacts to visual resources (the landscape) within the CTA following mitigation would not be significant.

4.7.8 Alternative E

Actions Proposed under Alternative E that Would Cause Change to Existing Visual Resources

In addition to the actions common to all alternatives, the following action would be implemented under this alternative and would have an impact to the characteristic landscape:

- A total of 10,010.3 acres of the study area outside the proposed CTA would be available for disposal and potential private development. The lands outside the CTA available for disposal are the same as those described under Alternative D but include more lands north of the CTA between the CTA and DNWR, north of Grand Teton Drive.

Direct and Indirect Impacts

CONSERVATION TRANSFER AREA

Under this alternative, 3,313.8 acres of the study area would be managed as the CTA, a decrease of 1,686.2 acres (34%) from the original CTA boundary (see Table 2.4-1). Management emphasis would focus on land disposal for private development, management of sensitive resources of the CTA, and natural functioning of the LVW. The impacts of proposed development under Alternative E to the CTA, as a whole, would be the same as those described under Alternative D but would also include potential urban development on 10,010.3 acres of lands available for disposal and construction activities.

Under this alternative, 10,010.3 acres would not be included in the CTA and would be available for disposal and potential development. These lands would lie in the same locations as described under Alternative D but would include more lands north of the CTA between the CTA and DNWR, north of Grand Teton Drive. The impact of disposal and development to the landscape, however, would be the same as that described for Alternative D but applicable to a larger area of land.

***KOPs 1 and 2*—**From these KOPs, the primary view would be the same as described under Alternative D. The impacts to the landscape would be the same as those described in “Conservation Transfer Area” above.

***KOPs 3 and 4*—**From these KOPs, the view would be the same as that described under Alternative D. While the development would still occur, with the impact described under Alternative D, the changes to the landscape would occur on lands adjacent to the CTA. The impacts to the landscape would be the same as those described in “Conservation Transfer Area” above.

***KOP 5*—**From KOP 5, the view of changes to the landscape would be the same as that described under Alternative C.

BLM VISUAL RESOURCE MANAGEMENT OBJECTIVES

Under this alternative, within the CTA, the proposed development would be in compliance with BLM VRM Class III objectives and would be the same as that described for Alternative D. Overall, the undisturbed character of the CTA would remain, especially in contrast to adjacent urban development outside the CTA, and impacts would not be considered significant.

On lands adjacent to the CTA that would be available for disposal, high-density residential, commercial, light industrial, and transportation development would not be consistent with Class III VRM objectives.

High-density urban development would dominate the landscape and the view of that landscape, which would be inconsistent with BLM VRM Class III objectives. The lands, however, once transferred to private ownership, would no longer be subject to those public land management objectives. See Appendix M for visual contrast ratings.

Mitigation Measures and Unavoidable Adverse Impacts

The following measures would reduce but not eliminate the impacts of development to the characteristic landscape of the CTA:

1. Color the concrete to match the predominant color in the surrounding landform.
2. Use the natural topography and vegetation on the landscape to screen the view of new development in the CTA.
3. Reshape and recontour cut and fill slopes that cross the natural grade/slope of the bajada.
4. Replant vegetation to accelerate reclamation of disturbed surfaces resulting from construction of the two basins.

Under this alternative, the unavoidable adverse impacts to the visual resources, or the landscape, would be the same as those described under Alternative D. The impacts to visual resources (the landscape) within the CTA following mitigation would not be significant.

4.7.9 No-Action Alternative

Actions Proposed under the No-Action Alternative that Would Cause Change to Existing Visual Resources

In addition to the actions common to all alternatives, the following actions would be implemented under this alternative and would have an impact to the characteristic landscape.

- A total of 12,174.5 acres of the study area outside the proposed CTA would be available for disposal and potential private development. All lands outside Tule Springs and Eglington Preserve would be available for disposal.
- Additional stormwater control facilities, both within and outside the CTA, on the LVW would be considered on a case-by-case basis.

Direct and Indirect Impacts

CONSERVATION TRANSFER AREA

Under this alternative, 1,448.2 acres of the study area would be managed as the CTA, a decrease of 3,551.8 acres (71%) from the original CTA boundary (see Table 2.4-1), including public lands in Tule Springs and Eglington Preserve. Generally, the CTA would remain undeveloped, although some development would be constructed on the boundary that would be apparent on the landscape.

Many other actions would be implemented under the No-Action Alternative that would alter the landscape scene, including disposal of 12,174.5 acres and potential urban development. All this development would occur outside the CTA, as established under this alternative, but it would transform a generally undeveloped landscape to an urban landscape of dense development.

***KOPs 1 and 2*—**Lands in the CTA would not be visible from these KOPs. However, much of the development planned and under consideration outside the CTA would be visible from these KOPs. The effects of these developments on the landscape are the same as those described in "Conservation Transfer Area" above.

***KOP 3*—**Tule Springs is visible from KOP 3. Developments planned adjacent to this part of the CTA would be visible from this KOP, with impacts as described in "Conservation Transfer Area" above. The impacts to the landscape would be the same as those described in "Conservation Transfer Area" above.

***KOP 4*—**The entire CTA would be visible from KOP 4. The impacts to the landscape, both within and outside the CTA, as seen from this KOP, would be the same as those described for KOP 3 above.

***KOP 5*—**From the distance of KOP 5 to the CTA study area, it would be difficult to see Tule Springs and Eglington Preserve. However, most of the urban development outside the CTA would be visible from this KOP, with the same effects as those described under Alternative C.

BLM VISUAL RESOURCE MANAGEMENT OBJECTIVES

Under this alternative, the only development that would occur in the CTA would be on the edges; no development would occur in the CTA. Thus, planned development would be in compliance with BLM VRM Class III objectives, and impacts would not be significant.

With the exception of Floyd Lamb Park R&PP Act leased lands, proposed development on lands outside the CTA that would be available for disposal and high-density residential, commercial, light industrial, and transportation uses would not be consistent with BLM Class III VRM objectives. High-density urban development would dominate the landscape and the view of that landscape and would be inconsistent with BLM VRM Class III objectives. The lands, however, once transferred to private ownership, would no longer be subject to those public land management objectives.

Mitigation Measures and Unavoidable Adverse Impacts

The following measure would reduce but not eliminate the impacts of development to the characteristic landscape of the CTA:

- Reshape and recontour cut and fill slopes that are disturbed during construction activities.

Under this alternative, the unavoidable adverse impacts to the visual resources, or the landscape, would be the same as those described under Alternative A, although most of the lands would be disposed of and developed for urban purposes. The impacts to visual resources (the landscape) within the CTA following mitigation would not be significant.

4.8 LAND USE

Under the Las Vegas RMP (BLM 1998a), BLM authorized the sale of 25,540 of 51,826 acres of public lands in the LVV. As a result of more rapid growth and development in the LVV than was anticipated in the Las Vegas RMP, this land was sold in just a few years. To respond to the continued demand for public lands for the growth of the valley, BLM prepared the LVVDB FEIS (BLM 2004a) to assess the impacts of selling the remaining 26,286 acres of public lands in the LVV and 22,000 acres authorized for disposal by the Clark County Act of 2002 (PL 107-282). The LVVDB FEIS (BLM 2004a) authorized the sale of 46,701 acres. Table 4.8-1 shows the impacts to land use from each alternative.

Table 4.8-1. Comparison of Land Use Impacts, by Alternative

Resource	A (acres)	B (Preferred) (acres)	C (acres)	D (acres)	E (acres)	No Action (acres)
CTA Study Area	13,622.7	13,622.7	13,622.7	13,622.7	13,622.7	13,622.7
CTA Boundary	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
Lands Available for Disposal	370.8	2,315.7	6,961.0	8,022.7	10,010.3	12,174.5
Consistent with the Las Vegas RMP, LVVDB FEIS, and legislation	13,323.3*	13,323.3*	13,323.3*	13,324.1†	13,324.1†	13,622.7

* Alternative includes Eglington Preserve but not Tule Springs.
† Alternative includes Tule Springs but not Eglington Preserve.

4.8.1 Analysis Approach and Assumptions

The decision of the LVVDB FEIS was to be consistent with the Las Vegas RMP for further land disposal, ROW development, and recreation management. The SEIS analyzes the effects of managing for conservation purposes, or disposing and developing, 13,622.7 acres of the remaining 46,701 acres analyzed in the LVVDB FEIS. Each alternative will disclose the acres managed as part of the CTA and acres of lands made available for disposal.

Under each alternative, different areas of land would be managed for conservation purposes as the CTA and, consequently, different areas of land would be available for disposal. For the purposes of this analysis, it is assumed that lands made available for disposal under each of the alternatives would transfer into private ownership and be developed as part of the continued growth of the LVV.

4.8.2 Impact Thresholds

For purposes of this SEIS, impact thresholds for land uses were not identified here because land disposals proposed under any of the alternatives would be in conformance with the Las Vegas RMP.

4.8.3 Actions Anticipated under Each Alternative that Would Cause Change to the Existing Land Uses

Different actions are assumed under each alternative in the CTA, and those actions are shown in Table 4.8-2. The table provides a comparison of the number of acres that would be managed as the CTA, the number of acres of land that would be made available for disposal by alternative. The impact analysis that follows summarizes the information in the table. The details are provided in the table and are extracted from the impact footprint described in Section 4.1. This impact analysis discloses the effects of the actions assumed under each alternative on lands in the CTA that would be made available for disposal and community growth.

4.8.4 Alternative A

Direct and Indirect Impacts

Under Alternative A, 12,952.5 acres of the study area would be managed as the CTA, an increase of 7,952.5 acres (159%) over the original CTA boundary (see Table 2.4-1). Management emphasis would focus on preservation of sensitive resources values and the functioning of the ULVW.

Under this alternative, 370.8 acres would be available for disposal. The lands that would be offered for disposal include lands at McCool Regional Park (N-49747-01) and the Grand Teton electrical substation (N-76305).

Management of 12,952.5 acres as the CTA would be consistent with uses prescribed in the Las Vegas RMP and the LVVDB FEIS. Further, disposal of public lands for community growth and development would be consistent with the SNPLMA, as amended by Clark County Act. Because management of lands for conservation purposes and disposal for community development would be consistent with BLM management plans and legislation, impacts to land uses would not be significant.

Mitigation Measures and Unavoidable Adverse Impacts

No specific mitigation measures have been identified at this time to reduce impacts to land uses under this alternative, either within or outside the CTA. Mitigation measures will be identified when site-specific environmental analyses are prepared prior to implementation of specific actions. With implementation of specific actions and application of mitigation, lands in the CTA would continue to be managed to preserve sensitive resource values, ensure the functioning of the ULVW, and provide opportunities for recreation, education, and research. Outside the CTA, lands made available for disposal would continue to be used for urban development and the growth of the Cities of Las Vegas and North Las Vegas.

4.8.5 Alternative B (BLM Preferred Alternative)

Direct and Indirect Impacts

Under this alternative, 11,007.6 acres of the study area would be managed as the CTA, an increase of 6,007.6 acres (120%) over the original CTA boundary (see Table 2.4-1).

Under Alternative B, 2,315.7 acres of the study area would be available for disposal and private development for the growth of the Cities of Las Vegas and North Las Vegas.

Management of 11,007.6 acres as the CTA would be consistent with the Las Vegas RMP and the LVVDB FEIS. Disposal of 2,315.7 acres of public lands for the growth of the adjacent communities would also be consistent with the BLM land use plan and the LVVDB FEIS. Disposal of public lands for community growth and development would also be consistent with the SNPLMA, as amended by the Clark County Act. Because management of lands for conservation purposes and disposal of lands for community growth and development would be consistent with BLM land use plans and legislation, impacts to land uses would not be significant.

Mitigation Measures and Unavoidable Adverse Impacts

No specific mitigation measures are proposed. The unavoidable adverse impacts of this alternative would be the same as those described under Alternative A.

4.8.6 Alternative C

Direct and Indirect Impacts

Under Alternative C, 6,362.3 acres of the study area would be managed as the CTA, an increase of 1,362.3 acres (27%) over the original CTA boundary (see Table 2.4-1).

Table 4.8-2. Land Uses by Alternative

Use	A	B (Preferred)	C	D	E	No Action
CTA Acres / Disposal Acres	CTA—12,952.5 acres Disposal—370.8 acres	CTA—11,007.6 acres Disposal—2,315.7 acres	CTA—6,362.3 acres Disposal—6,961.0 acres	CTA—5,301.4 acres Disposal—8,022.7 acres	CTA—3,313.8 acres Disposal—10,010.3 acres	CTA—1,448.2 acres Disposal—12,174.5 acres
Lands for Disposal	– McCool Regional Park (N-49747-01) – Grand Teton substation (N-76305)	– Lands north and east of Paiute Reservation – Lands on the eastern edge of the study area adjacent to southeastern boundary of the CTA – McCool Regional Park (N-49747-01) – Grand Teton substation (N-76305)	– Lands north and east of Paiute Reservation – Lands between the CTA and refuge north of Moccasin Road – Lands between the CTA and refuge north of Grand Teton Drive – McCool Regional Park (N-49747-01) – Grand Teton substation (N-76305)	– Lands north and east of Paiute Reservation – Lands between the CTA and refuge north of Moccasin Road – Lands between the CTA and refuge north of Grand Teton Drive	– Lands north and east of Paiute Reservation – Lands between the CTA and refuge north of Moccasin Road – Lands between the CTA and refuge north of Grand Teton Drive	– All lands in the CTA study area except Tule Springs and Eglington Preserve
Recreation Sites and Facilities	Consider recreation sites and facilities on a case-by-case basis	Case-by-case	Case-by-case	Case-by-case	In partnership with adjacent communities and recreation providers	Recreation development limited to R&PP Act leased lands (N-36876-01, N-62830).
Road Rights-of-Way	New road alignments: – Decatur Boulevard (N-76357) – Grand Teton Drive (N-83310) – Aliante Parkway (N-76357)	New road alignments: – Decatur Boulevard (N-76357) – Grand Teton Drive (N-83310) – Aliante Parkway (N-76357) Additional new road construction would be considered on a case-by-case basis	New road alignments: – Decatur Boulevard (N-76357) – Grand Teton Drive (N-83310) – Aliante Parkway (N-76357) Additional new road construction would be considered on a case-by-case basis; up to 6 ROW corridors across the northwestern portion of the CTA are assumed	New road alignments: – Decatur Boulevard (N-76357) – Grand Teton Drive (N-83310) – Aliante Parkway (N-76357) Additional new road construction would be considered on a case-by-case basis; up to 9 ROW corridors across the northwestern portion of the CTA are assumed	New road alignments: – Decatur Boulevard (N-76357) – Grand Teton Drive (N-83310) – Aliante Parkway (N-76357) Additional new road construction would be considered on a case-by-case basis; up to 5 ROW corridors across the northwestern portion of the CTA are assumed	New road alignments: – Decatur Boulevard (N-76357) – Grand Teton Drive (N-83310) – Aliante Parkway (N-76357) Consider additional corridor ROWs on a case-by-case basis
R&PP Act Leases	Floyd Lamb plan of development implemented, including trails and equestrian facilities (N-36876-01, N-62830)	Floyd Lamb plan of development implemented, including trails and equestrian facilities (N-36876-01, N-62830)	Floyd Lamb plan of development implemented, including trails and equestrian facilities (N-36876-01, N-62830)	Floyd Lamb plan of development implemented, including trails and equestrian facilities (N-36876-01, N-62830) McCool Regional Park in CTA and developed as a community park (N-49747-01)	Floyd Lamb and McCool Parks outside CTA, but lease lands developed as per plan of development (N-36876-01, N-62830)	Floyd Lamb plan of development implemented, including trails and equestrian facilities (N-36876-01, N-62830) McCool Regional Park in CTA and developed as a community park (N-49747-01)
Eglington Preserve (acres)	Within CTA; managed by Conservation Agreement	Within CTA; managed by Conservation Agreement	Within CTA; managed by Conservation Agreement	Outside CTA but managed by Conservation Agreement	Outside CTA but managed by Conservation Agreement	Within CTA; managed by Conservation Agreement
Tule Springs (acres)	Outside CTA: managed under the 1966 NHPA	Outside CTA: managed under the 1966 NHPA	Outside CTA: managed under the 1966 NHPA	Within CTA: managed under the 1966 NHPA	Within CTA: managed under the 1966 NHPA	Within CTA; managed under the 1966 NHPA

Under this alternative, 6,961.0 acres of land would be available for disposal and private development for the growth of the Cities of Las Vegas and North Las Vegas. The lands available for disposal would be the same as those described under Alternative B and would include lands between the CTA and DNWR north of Moccasin Road and lands between the CTA and DNWR north of Grand Teton Drive.

Management of 6,362.3 acres as the CTA would be consistent with uses prescribed in the Las Vegas RMP and the LVVDB FEIS. Disposal of 6,961.0 acres of public lands for the growth of the adjacent communities would also be consistent with the BLM land use plan and the LVVDB FEIS. Disposal of public lands for community growth and development would also be consistent with the SNPLMA, as amended by Clark County Act. Because management of lands for conservation purposes and disposal of lands for community development would be consistent with BLM land use plans and legislation, impacts to land uses would not be significant.

Mitigation Measures and Unavoidable Adverse Impacts

No specific mitigation measures are proposed. The unavoidable adverse impacts of this alternative would be the same as those described under Alternative A.

4.8.7 Alternative D

Direct and Indirect Impacts

Under this alternative, 5,301.4 acres of the CTA study area would be managed as the CTA, an increase of 301.4 acres (6%) over the original CTA boundary (see Table 2.4-1).

Under this alternative 8,022.7 acres of land would be available for disposal and private development for the growth of the Cities of Las Vegas and North Las Vegas. The lands available for disposal would be the same as those described under Alternative C, except that the lands at McCool Regional Park (N-49747-01) and the Grand Teton substation (N-76305) would remain in the CTA.

Management of 5,301.4 acres as the CTA would be consistent with the uses prescribed in the Las Vegas RMP and the LVVDB FEIS. Disposal of 8,022.7 acres of public lands for the growth of the adjacent communities would also be consistent with the BLM land use plan and the LVVDB FEIS. Disposal of public lands for community growth and development would also be consistent with the SNPLMA, as amended by the Clark County Act. Because management of lands for conservation purposes and disposal of lands for community development would be consistent with BLM management plans and legislation, impacts to land uses would not be significant.

Mitigation Measures and Unavoidable Adverse Impacts

No specific mitigation measures are proposed. The unavoidable adverse impacts of this alternative would be the same as those described under Alternative A.

4.8.8 Alternative E

Direct and Indirect Impacts

Under Alternative E, 3,313.8 acres of the study area would be managed as the CTA, a decrease of 1,686.2 acres (34%) from the original CTA boundary (see Table 2.4-1).

Under this alternative, 10,010.3 acres of land would be available for disposal and private development for the growth of the Cities of Las Vegas and North Las Vegas. The lands available for disposal would be the same as those described under Alternative D.

Management of 3,313.8 acres as the CTA would be consistent with the uses prescribed in the Las Vegas RMP and the LVVDB FEIS. Disposal of 10,010.3 acres of public lands for the growth of the adjacent communities would also be consistent with the BLM land use plan and the LVVDB FEIS. Disposal of public lands for community growth and development would also be consistent with the SNPLMA, as amended by the Clark County Act. Because management of lands for conservation purposes and disposal of lands for community development would be consistent with BLM land use plans and legislation, impacts to land uses would not be significant.

Mitigation Measures and Unavoidable Adverse Impacts

No specific mitigation measures are proposed. The unavoidable adverse impacts of this alternative would be the same as those described under Alternative A.

4.8.9 No-Action Alternative

Direct and Indirect Impacts

Under the No-Action Alternative, 1,448.2 acres of the study area would be managed as the CTA, a decrease of 3,551.8 acres (71%) from the original CTA boundary (see Table 2.4-1), including public lands in Tule Springs and Eglington Preserve. Generally, the CTA would remain undeveloped, although some development would be constructed on the boundary that would be apparent on the land.

Under this alternative, 12,174.5 acres of land would be available for disposal and private development for the growth of the Cities of Las Vegas and North Las Vegas. All lands in the study area would be available for disposal except lands in Tule Springs and Eglington Preserve.

Management of 1,448.2 acres as the CTA would be consistent with uses prescribed in the Las Vegas RMP and the LVVDB FEIS. Disposal of 12,174.5 acres of public lands for the growth of the adjacent communities would also be consistent with the BLM land use plan and the LVVDB FEIS. Disposal of public lands for community growth and development would also be consistent with the SNPLMA, as amended by the Clark County Act. Because management of lands for conservation purposes and disposal of lands for community development would be consistent with BLM land use plans and legislation, impacts to land uses would not be significant.

Mitigation Measures and Unavoidable Adverse Impacts

No specific mitigation measures are proposed. The unavoidable adverse impacts of this alternative would be the same as those described under Alternative A.

4.9 RECREATION

BLM lands within the CTA study area currently offer a wide variety of casual, dispersed recreation uses, including hiking, biking, horseback riding, wildlife viewing, and picnicking. Unauthorized OHV use and target shooting are also common, which contributes to the destruction of sensitive resources. For the purposes of this SEIS, impacts to recreation are considered significant if implementation of an action would substantially reduce or eliminate lands available for authorized recreation uses.

4.9.1 Alternative A

Under Alternative A, the CTA would encompass 12,952.5 acres. A total of 370.8 acres would be available for private development. Under this alternative, maximum protection of resources would take place.

Direct and Indirect Impacts

Public access to existing trails, washes, and roads for recreation use would be limited under this alternative. The loss of access may be perceived as negative to those users who access BLM parcels for entry into nearby recreation areas. Any future public trails within the CTA would provide a beneficial overall impact to recreationists, as better access to those areas would be provided for a variety of uses. The restriction of illegal OHV use would provide a safer, cleaner, and more welcoming environment for those who enjoy passive recreation uses, such as sightseeing and hiking.

Mitigation Measures and Unavoidable Adverse Impacts

Under Alternative A, no unavoidable adverse impact would occur to authorized recreation uses. No mitigation measures have been proposed to lessen impacts to recreation under this alternative.

4.9.2 Alternative B (BLM Preferred Alternative)

Under Alternative B, the CTA would comprise 11,007.6 acres. A total of 2,315.7 acres would be available for disposal.

Direct and Indirect Impacts

A direct, beneficial impact to recreationists would occur under this alternative as a result of the potential for increased access within the boundaries of the CTA.

Direct and indirect impacts of this alternative to recreation uses and users would be similar to those described under Alternative A.

Mitigation Measures and Unavoidable Adverse Impacts

Under Alternative B, no unavoidable adverse impacts would occur to authorized recreation uses. No mitigation measures have been proposed to lessen impacts to recreation under this alternative.

4.9.3 Alternative C

Under Alternative C, the CTA would encompass 6,362.3 acres. A total of 6,961.0 acres would be available for disposal.

Direct and Indirect Impacts

Direct, adverse impacts to passive recreation opportunities within the CTA would occur as a result of the sizable increase in development within its boundaries. Recreationists, such as mountain bikers, hikers, and equestrian users, may experience direct, adverse impacts under this alternative, as the availability of some existing routes would decline. A direct, beneficial impact to less active recreationists would occur under this alternative because of the potential for increased road access to future trailheads within the boundaries of the CTA. A wider range of visitors would be able to enjoy more recreation opportunities as a result of new development.

Mitigation Measures and Unavoidable Adverse Impacts

Under Alternative C, no unavoidable adverse impacts would occur to authorized recreation uses. No mitigation measures have been proposed to lessen impacts to recreation for this alternative.

4.9.4 Alternative D

Under Alternative D, the CTA would encompass 5,301.4 acres, with a total of 8,022.7 acres available for disposal.

Direct and Indirect Impacts

Direct and indirect impacts of this alternative to recreation uses and users would be similar to those described under Alternative C. Sufficient passive recreation opportunities might not be present under Alternative D, as access to existing resources would be hampered by development of those areas. Direct, adverse impacts to recreationists who enjoy passive recreation uses within the CTA, such as hiking, biking, and equestrian uses, would occur as more new development is permitted within the CTA boundaries, contributing to a sizable increase in both vehicular and foot traffic within its boundaries. A reduction in pristine viewsheds would contribute to a direct, adverse impact for recreationists who wish to enjoy a natural setting.

Mitigation Measures and Unavoidable Adverse Impacts

Under Alternative D, an unavoidable adverse impact to recreationists would occur as a result of a substantial decrease in available lands for both active and passive recreation uses. The reduction in pristine viewsheds as a result of new development within the CTA and substantial private development adjacent to the CTA would also contribute to unavoidable adverse impacts to recreation uses within the CTA. No mitigation measures have been proposed to lessen the adverse impacts to recreation associated with Alternative D.

4.9.5 Alternative E

Under Alternative E, the CTA would encompass 3,313.8 acres, with a total of 10,010.3 acres available for private development. An emphasis on private development with mitigated infrastructure development within the CTA boundaries would be the cities' primary objective.

Direct and Indirect Impacts

Direct and indirect impacts of this alternative to recreation uses and users would be similar to those described under Alternative D. Sufficient passive recreation opportunities might not be present under Alternative E, as access to existing resources would increasingly be hampered by development of those areas. The loss of the natural landscape would constitute a direct, adverse impact for recreationists wishing to enjoy a natural setting.

Mitigation Measures and Unavoidable Adverse Impacts

Unavoidable adverse impacts to recreation uses would be similar to those under Alternative D.
No mitigation measures have been proposed to lessen impacts to recreation under this alternative.

4.9.6 No-Action Alternative

Under the No-Action Alternative, the entire CTA, with the exception of the 1,448.2 acres that form Eglington Preserve and Tule Springs, would be available for disposal. The BLM would continue to manage the remaining 12,174.5 acres until disposal. Recreation would be limited to R&PP Act leased lands within the CTA.

Direct and Indirect Impacts

Under the No-Action Alternative, BLM lands within the CTA would remain open for dispersed recreation uses. However, more than 12,000 acres within the CTA study area boundaries would be eligible for disposal and, ultimately, development. This would result in an adverse impact to both passive and active recreation users, who would experience a decline in available recreation resources. The loss of the natural landscape would also contribute to a direct, adverse impact to recreationists who enjoy natural settings.

Mitigation Measures and Unavoidable Adverse Impacts

Under the No-Action Alternative, unavoidable adverse impacts to both passive and active recreation uses would occur as development encroaches on existing open recreation opportunities. A significant reduction in pristine viewsheds would also contribute to a direct, adverse impact to recreation users who wish to enjoy a more natural setting. No mitigation measures have been proposed to lessen impacts to recreation under this alternative.

4.10 TRANSPORTATION

Transportation and traffic continue to be issues across the LVV as new development occurs and the population continues to grow. This section discusses the potential impacts associated with the six different alternatives as they affect transportation and traffic in the LVV within and adjacent to the CTA study area. Each alternative considers different boundaries for the CTA. No management goals and

objectives were identified for transportation in the CTA study area. Table 4.10-1 provides transportation impacts from each alternative.

Table 4.10-1. Comparison of Transportation Impacts, by Alternative

Resource	A	B (Preferred)	C	D	E	No Action
Alternative Boundary (acres)	12,952.5	11,007.6	6,362.3	5,301.4	3,313.8	1,448.2
Potential Increase in Population (% of current)	0%	7%	22%	25%	31%*	38%*
Assumed Roads	3	5	10	13	9	TBD

Note: TBD = to be determined.

* Potentially significant increase in traffic volume.

4.10.1 Analysis Approach and Assumptions

Because no traffic models were prepared for this analysis, to the extent possible, impacts to transportation and traffic are quantified on the basis of potential development and population growth in the vicinity of the CTA study area. Different alternative boundaries would result in varying amounts of land available for private development. All potential actions considered in the CTA study area would be subject to further site-specific analysis, including an analysis of potential impacts to travel and transportation. Potential population increases in and around the CTA are based on density scenarios provided by the City of Las Vegas, as summarized in the socioeconomics section (see Section 4.13.1, “Analysis Approach and Assumptions”). The average projected number of persons per acre at build-out was estimated to be approximately 24.3 individuals.

4.10.2 Impact Thresholds

In a 2005 study, TTI concluded that significant changes in traffic resulted in 53 urban areas in which traffic growth was 30% greater or more than increases in road capacity (TTI 2005). Between 1982 and 2003, there was a consistent correlation across U.S. cities between population growth and increased traffic volume (TTI 2005). Therefore, a 30% increase in the population of the Cities of Las Vegas and North Las Vegas with no concurrent increases in road capacity would result in significant impacts to transportation and traffic.

4.10.3 Alternative A

Actions Proposed under Alternative A that Would Cause Change to Existing Transportation Resources

Alternative A would involve the preservation of 12,952.5 acres. Under this alternative, sensitive resources within the CTA would be preserved, and the natural ecology of the ULVW would be ensured. Improvements to existing roads within and adjacent to the area would occur.

Direct and Indirect Impacts

VEHICLE TRAFFIC

Adverse impacts to vehicle traffic would be minor and long term. Direct impacts would include minor increases in traffic on roadways within and near the CTA study area. Minor increases in average daily traffic may result from increased visitation. Additional increases in daily traffic volume resulting from population growth would be minor because only minimal lands in the CTA study area would be made available for disposal.

ACCESS

Impacts to access are based on the number of potential trails, streets, roads, and freeways that would intersect with the CTA study area. More road and trail construction within and adjacent to the CTA would lead to greater access. The majority of the CTA study area is currently not accessible by an existing transportation network. Improved access to the Clark County Shooting Park would result from construction activities. Under Alternative A, transportation access to the CTA study area would remain at current conditions.

Mitigation Measures and Unavoidable Adverse Impacts

Because of the nature of the actions considered and the description of potential impacts to transportation, no mitigation measures are recommended or required. Impacts include minor to moderate increases in traffic density as a result of projected population increases in the LVV. Unavoidable adverse impacts to transportation would result from traffic increases associated with potential increases in visitation to the CTA, as well as with population growth in the LVV.

4.10.4 Alternative B (BLM Preferred Alternative)

Actions Proposed under the Preferred Alternative that Would Cause Change to Existing Transportation Resources

The Preferred Alternative would involve the preservation of 11,007.6 acres as the CTA. Under this alternative, greater opportunities for primitive and non-motorized recreation opportunities, education, and research opportunities would be available, and the addition of any new infrastructure, including transportation development, would provide access for those additional opportunities.

Direct and Indirect Impacts

VEHICLE TRAFFIC

Population increases associated with private development that is assumed to occur under this alternative would result in long-term, adverse impacts to transportation as a result of moderate increases in the daily traffic on existing freeways. The level of private development that is assumed would occur would result in a potential population increase of up to 56,118 residents. This would be a 7% increase from the 2006 estimated population (778,356) of the Cities of Las Vegas and North Las Vegas, with a moderate increase in arterial roadway capacity. The impacts to transportation from an increase in traffic volume associated with a 7% increase in population would not, however, exceed the threshold of significance.

Construction activities associated with potential private development would include movement of personnel and materials on existing roadways. These activities have the potential to result in indirect, adverse impacts in the short term to current traffic levels in the CTA study area. These impacts would be minor because of the limited allowable development under this alternative.

ACCESS

Indirect, adverse impacts to access would be moderate and would result from the potential increased private development. Impacts would include a short-term disruption of access to businesses and residences adjacent to the CTA study area. Additionally, lands available for private development would be bounded by the CTA to the north and east and by the Paiute Reservation to the west. The only road access that would be available to the new potential private development would be Moccasin Road to the south and Fort Apache Road to the north. Impacts would be moderate because long-term access to the potential private development would be limited in time of emergencies.

Mitigation Measures and Unavoidable Adverse Impacts

BMPs for traffic control would be implemented to minimize the level of impacts from construction projects associated with private development. Prior to any construction taking place, builders should consult with the NDOT and RTC to develop traffic control plans. Unavoidable adverse impacts to transportation would result from a 7% increase in population and corresponding increase in traffic density. Additionally, short-term disruptions and delays in vehicle access would result from the potential for increased development on 2,315.7 acres in areas adjacent to the alternative boundary.

4.10.5 Alternative C

Actions Proposed under Alternative C that Would Cause Change to Existing Transportation Resources

Alternative C would involve the preservation of 6,362.3 acres. Under this alternative, emphasis would be placed on providing opportunities for recreation, infrastructure, and private development outside the CTA while continuing to meet the resource conservation purpose and need of the SEIS.

Direct and Indirect Impacts

VEHICLE TRAFFIC

The population increases associated with private development that is assumed to occur would result in long-term adverse impacts to transportation from moderate increases in the daily traffic on existing freeways. Under Alternative C, some private development is assumed to occur within the CTA study area on approximately 6,960.9 acres, resulting in a potential population increase of up to 169,150 residents. This would be a 22% increase from the 2006 estimated population (778,356) of the Cities of Las Vegas and North Las Vegas, with increases in freeway capacity and arterial roadway capacity. The impacts to transportation from an increase in traffic volume associated with a 22% increase in population would not reach a level of significance. The additional road capacity that is assumed in this alternative would further reduce impacts to transportation and traffic.

Impacts from construction activities associated with potential private development would include movement of personnel and materials on existing roadways. These activities have the potential to result in

indirect, adverse impacts in the short term to current traffic levels in the CTA study area. Impacts would be minor because individual projects would occur over the long term across different locations.

ACCESS

Indirect, adverse impacts to access would be moderate and short term and would result from construction activities associated with potential increased private development. Impacts would include a short-term disruption in access to existing businesses and residences adjacent to the CTA study area.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation measures would be the same as those under Alternative B. Unavoidable adverse impacts include increases in traffic density associated with a 22% increase in population and short-term disruptions and delays in vehicle access. Traffic disruptions and delays associated with potential private development could occur at various locations throughout the disposed 6,960.9 acres adjacent to the alternative boundary.

4.10.6 Alternative D

Actions Proposed under Alternative D that Would Cause Change to Existing Transportation Resources

Alternative D would involve the preservation of 5,301.4 acres. Under this alternative, up to 8,022.7 acres of private development would potentially occur outside the CTA boundary, and sensitive resources within the CTA would continue to be protected.

Direct and Indirect Impacts

VEHICLE TRAFFIC

There would be moderate adverse impacts to vehicle traffic under Alternative D. Under Alternative D, some private development is assumed to occur within the CTA study area on approximately 8,022.7 acres, resulting in a potential population increase of up to 194,952 residents. This would be a 25% increase from the 2006 estimated population (778,356) of the Cities of Las Vegas and North Las Vegas, with increases in freeway capacity and arterial roadway capacity. The impacts to transportation from increases in traffic volume associated with a 25% increase in population would not reach a level of significance. The additional road capacity assumed under this alternative would further reduce impacts to transportation and traffic.

Impacts from construction activities associated with potential private development would be the same as those under Alternative C.

ACCESS

Long-term, beneficial impacts would result from allowing new development to be constructed across the CTA. All potential private development under Alternative C would include multiple points of access across the CTA. Additionally, the public would have greater access to recreation opportunities within the CTA from the potential development.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation measures would be the same as those under Alternative B. Unavoidable adverse impacts would include increases in traffic density associated with a 25% increase in population and short-term disruptions and delays in vehicle access. Traffic disruptions and delays associated with potential private development could occur at various locations throughout the disposed 8,022.7 acres adjacent to the alternative boundary.

4.10.7 Alternative E

Actions Proposed under Alternative E that Would Cause Change to Existing Transportation Resources

Alternative E would involve the preservation of 3,313.8 acres. Under this alternative, emphasis would be placed on lands being made available for disposal for private development, allowing infrastructure with mitigation within the CTA in support of private development and management for sensitive resources within the CTA.

Direct and Indirect Impacts

VEHICLE TRAFFIC

There would be adverse impacts to vehicle traffic under Alternative E. Under Alternative E, private development is assumed to occur within the CTA study area on approximately 10,010.3 acres, resulting in a potential population increase of up to 243,250 residents. This would be a 31% increase from the 2006 estimated population (778,356) of the Cities of Las Vegas and North Las Vegas, with increases in freeway capacity and arterial roadway capacity. The impacts to transportation from increases in traffic volume associated with a 31% increase in population would reach a level of significance. However, the additional road capacity assumed under this alternative would reduce potential impacts to a level that is less than significant.

Impacts from construction activities associated with potential private development would be the same as those under Alternative C.

ACCESS

Impacts to access would be the same as those under Alternative D.

Mitigation Measures and Unavoidable Adverse Impacts

Unavoidable adverse impacts include significant increases in traffic volume as a result of population increases in the LVV. Additionally, traffic disruptions and delays associated with potential private development could occur at locations throughout the disposed 10,010.3 acres adjacent to the alternative boundary. These impacts would be mitigated in the long term through implementation of elements of the RTC transportation plan, including additional road capacity, roadway improvements, congestion management programs, expanded transit options, and alternative forms of transportation, including pedestrian and bicycle (RTC 2006).

4.10.8 No-Action Alternative

Actions Proposed under the No-Action Alternative that Would Cause Change to Existing Transportation Resources

Under the No-Action Alternative, the entire CTA, except approximately 1,448.2 acres (Eglington Preserve and Tule Springs), would be available for disposal in accordance with the SNPLMA, FLPMA, other applicable laws subject to valid existing rights, and stipulations established by the conservation agreement. All infrastructure, including roads and recreational trails, agreed to in the Conservation Agreement would continue to be allowed in the CTA.

Direct and Indirect Impacts

VEHICLE TRAFFIC

There would be adverse impacts to vehicle traffic under the No-Action Alternative. Under the No-Action Alternative, private development would be assumed to occur within the CTA study area on approximately 12,174.5 acres, resulting in a potential population increase of up to 295,245 residents. This would be a 38% increase from the 2006 estimated population (778,356) of the Cities of Las Vegas and North Las Vegas, with increases in freeway capacity and arterial roadway capacity. The impacts to transportation from increases in traffic volume associated with a 38% increase in population would potentially reach a level of significance.

ACCESS

Impacts to access would be the same as those under Alternative E.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation measures and unavoidable adverse impacts are the same as those under Alternative E.

4.11 NOISE

This section discusses the potential impacts to sensitive noise receptors in the vicinity of the CTA study area. Sensitive noise receptors include residences, hospitals, libraries, recreation areas, churches, and similar locations. Six different alternatives are analyzed in this section, and each alternative presents varying degrees of impacts to noise receptors within the vicinity of the CTA study area. Each alternative considers different CTA boundaries.

4.11.1 Analysis Approach and Assumptions

The criteria used to assess impacts to sensitive noise receptors are defined by the noise ordinances of the Cities of Las Vegas and North Las Vegas, as well as Clark County Zoning Development Code 30.68.020, which sets maximum allowable noise levels in dB. Because the potential impacts would be the same for the City of Las Vegas and the City of North Las Vegas, the impacts to the two cities are discussed collectively.

4.11.2 Impact Thresholds

Noise is regulated by the City of Las Vegas, City of North Las Vegas, and Clark County in the CTA study area. According to city noise ordinances, any excessive, unreasonably loud noise that occurs between the hours of 11:00 pm and 7:00 am is considered a significant impact. None of the alternatives would allow actions that would exceed this significance criterion.

According to county regulations, any long-term, sustained increase in ambient noise levels above the maximum permitted sound level as defined by Clark County is considered a significant impact to sensitive noise receptors. Impulsive noise levels within residential districts cannot exceed 56 dB during the daytime and 46 dB during the nighttime. Within business and industrial districts, impulsive noise levels cannot exceed 65 dB during the daytime and 61 dB during the nighttime. There is an exception for construction activities: county code permits construction activities to exceed these noise levels when conducted during the daytime. Any permitted construction activities that occur during the daytime would not result in a significant impact to sensitive noise receptors. Allowable persistent noise levels vary, depending on proximity to residential, business, or industrial districts and the frequency of occurrence of the noise (see Table 3.11-1). All potential allowable actions considered for the CTA would be subject to further site-specific analysis prior to final approval.

4.11.3 Actions Proposed under all Alternatives that Would Cause Change to Ambient Noise Levels

Direct and Indirect Impacts

Direct, adverse impacts from construction activities would occur under all alternatives in the short term. Noise from general construction equipment for new development would potentially exceed maximum dB levels to any sensitive noise receptor within 1,000 feet (Table 4.11-1). Table 4.11-2 shows typical noise levels of common sounds. This temporary increase in ambient noise levels would impact lands to the south and west of the CTA, where residential areas occur immediately adjacent to Alternative A boundary. However, it is anticipated that construction activities would require minimal equipment use, would be confined to narrow corridors, would occur during daytime hours, and would occur only in the short term.

Table 4.11-1. Typical Construction Equipment Noise

Equipment	Noise Level (dB)		
	50 feet	500 feet	1,000 feet
Bulldozer	89	69	63
Crane	88	68	62
Dump truck	88	68	62
Tractor	80	60	54
Backhoe	85	65	59

Source: Federal Transit Administration (2006).

Table 4.11-2. Common Sound Levels

Common Sounds	Noise Level (dB)
Thunderclap	180
Auto horn (3 feet)	120
Garbage truck	100
Heavy truck (50 feet)	90
Alarm clock (2 feet)	80
Freeway traffic	70
Conversational speech	60
Light auto traffic (100 feet)	50
Quiet office	40
Threshold of hearing	0

Source: No Noise (2008).

4.11.4 Alternative A

Actions Proposed under Alternative A that Would Cause Change to Existing Ambient Noise Levels

Alternative A preserves a total of 12,952.5 acres. There would be 370.8 acres available for private development, including recreation facilities at McCool Regional Park.

Direct and Indirect Impacts

There would be no additional direct or indirect adverse impacts to sensitive noise receptors under Alternative A. Under this alternative, there would be no further change in ambient noise levels within or around the CTA boundary. This would have an indirect, beneficial impact to sensitive noise receptors by limiting development that might otherwise occur in the area.

Mitigation Measures and Unavoidable Adverse Impacts

Based on the nature of the actions considered and the description of potential impacts to sensitive noise receptors, no mitigation measures are recommended or required. BMPs for construction would be implemented to minimize the level of impacts from potential construction noise associated with future development actions. Impacts include minor short-term increases in ambient noise levels as a result of construction activities.

4.11.5 Alternative B (BLM Preferred Alternative)

Actions Proposed under the Preferred Alternative that Would Cause Change to Existing Ambient Noise Levels

The Preferred Alternative conserves a total of 11,007.6 acres. There would be 2,315.7 acres of land within the CTA study area available for disposal.

Direct and Indirect Impacts

Under this alternative, approximately 11,007.6 acres of land would be conserved. This would generally have a beneficial impact to sensitive noise receptors, as it would limit development that might otherwise occur on these lands. Within the 2,315.7 acres available for private development, there would be the potential for minor increases in ambient noise levels in the CTA study area in both the short and long term.

Increases in ambient noise would result from increased construction activities in the short term. While these construction activities would exceed 85 dB, they would not occur at night or for sustained periods. Clark County code permits construction activities to exceed these noise standards when conducted during daytime hours. Therefore, the short-term, adverse impacts to sensitive noise receptors from construction activities would occur but would not reach a level of significance.

Increases in ambient noise would result from the potential development of new residential suburban areas and increased vehicle traffic on roadways in the long term. The increases in ambient noise levels associated with new residential developments and increased vehicle traffic would result in adverse impacts to sensitive noise receptors. It is assumed that increased ambient noise levels would be the same as those in similarly developed areas throughout the LVV and would not exceed maximum allowable noise levels set by Clark County. Therefore, long-term, adverse impacts to sensitive noise receptors from new private development and increased vehicle traffic would not reach a level of significance.

Mitigation Measures and Unavoidable Adverse Impacts

Based on the nature of the actions considered and the description of potential impacts to sensitive noise receptors, no mitigation measures are recommended or required. BMPs for construction would be implemented to minimize the level of impacts from potential construction noise associated with future development actions. Impacts include minor short-term increases in ambient noise levels as a result of construction activities.

4.11.6 Alternative C

Action Proposed under Alternative C that Would Cause Change to Existing Ambient Noise Levels

Alternative C conserves a total of 6,362.3 acres. There would be 6,961.0 acres of land within the CTA study area available for disposal and potential private development.

Direct and Indirect Impacts

Under this alternative, approximately 6,362.3 acres of land would be conserved. This would generally have a beneficial impact to sensitive noise receptors, as it would limit development that might otherwise occur on these lands. Within the 6,961.0 acres available for private development, there would be the potential for increases in ambient noise levels in the CTA study area in both the short and long term. Additionally, direct, adverse impacts from construction activities in the CTA would occur in the short term. Noise from general construction equipment would potentially exceed maximum dB levels to any sensitive noise receptor within 1,000 feet (see Table 4.11-1). This temporary increase in ambient noise levels would impact lands to the south and west of the CTA, where residential areas occur immediately adjacent to the CTA. Noise from allowable construction activities within and adjacent to the CTA would not occur at night or for sustained periods and would be consistent with the County Zoning Development

Code. The long-term increases in ambient noise levels associated with new private development would result in adverse impacts to sensitive noise receptors. It is assumed that ambient noise would be the same as that in similarly developed areas in LVV and would not exceed the county's maximum allowable noise levels. Therefore, adverse impacts to sensitive noise receptors from construction activities and private development would not reach a level of significance.

Adverse impacts would result from the potential new development. Construction activities would lead to short-term increases in the current ambient noise level in the CTA. Noise related to construction would not occur at night or for sustained periods.

Mitigation Measures and Unavoidable Adverse Impacts

BMPs would be implemented to minimize potential impacts to sensitive noise receptors during design and construction of all potential new development. Unavoidable adverse impacts include long-term, moderate increases in ambient noise levels as a result of new development.

4.11.7 Alternative D

Actions Proposed under Alternative D that Would Cause Change to Existing Ambient Noise Levels

Alternative D would cover a total of 5,301.4 acres. There would be 8,022.7 acres of land within the CTA study area available for disposal and potential private development.

Direct and Indirect Impacts

Under this alternative, approximately 5,301.4 acres of land would be conserved. This would generally have a beneficial impact to sensitive noise receptors as it would limit development that might otherwise occur on these lands. In the 8,022.1 acres available for private development, there would be the potential for increases in ambient noise levels in the CTA study area in both the short and long term. Impacts to sensitive noise receptors would be the same as described under Alternative C.

There would be no additional direct impacts to sensitive noise receptors under Alternative D. Indirect, adverse impacts from potential road development would be the same as those under Alternative C.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation measures would be the same as those under Alternative C. Unavoidable adverse impacts would be the same as those described under Alternative C and include long-term, moderate increases in ambient noise levels from a greater number of roads and greater traffic density and speed.

4.11.8 Alternative E

Actions Proposed under Alternative E that Would Cause Change the Existing Ambient Noise Levels

Alternative E would cover a total of 3,313.8 acres. There would be 10,010.3 acres of land within the CTA study area available for disposal and potential private development.

Direct and Indirect Impacts

Under this alternative, approximately 3,313.8 acres of land would be conserved. This would generally have a beneficial impact to sensitive noise receptors as it would limit development that might otherwise occur on these lands. In the 10,010.3 acres available for private development, there would be the potential for minor increases in ambient noise levels in the CTA study area in both the short and long term. Impacts to sensitive noise receptors would be the same as those described under Alternative C.

There would be no additional direct impacts to sensitive noise receptors under Alternative E. Indirect, adverse impacts from potential road development would be the same as those under Alternative C.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation measures would be the same as those under Alternative C. Unavoidable adverse impacts would be the same as those described under Alternative C and include long-term, moderate increases in ambient noise levels from new development.

4.11.9 No-Action Alternative

Actions Proposed under the No-Action Alternative that Would Cause Change the Existing Ambient Noise Levels

Under the No-Action Alternative, the entire CTA, except approximately 1,448.2 acres (Eglington Preserve and Tule Springs), would be available for disposal in accordance with the SNPLMA, FLPMA, other applicable laws subject to valid existing rights, and in accordance with stipulations established by the Conservation Agreement.

Direct and Indirect Impacts

Under this alternative, approximately 1,448.2 acres of land would be conserved. In the 12,174.5 acres available for private development, there would be the potential for minor increases in ambient noise levels in the CTA study area in both the short and long term. Impacts to sensitive noise receptors would be the same as those described under Alternative C.

There would be no additional direct impacts to sensitive noise receptors under the No-Action Alternative. Indirect, adverse impacts from new development would be the same as those under Alternative C.

Mitigation Measures and Unavoidable Adverse Impacts

Mitigation measures and unavoidable adverse impacts would be the same as those under Alternative C.

4.12 HAZARDOUS MATERIALS

This section analyzes the potential direct, indirect, and cumulative impacts associated with hazardous materials under each of the alternatives. Table 2.4-1 provides a comparison of the original CTA boundary proposed in the LVVDB FEIS and the acreage available for disposal under each of the SEIS alternatives.

4.12.1 Analysis Approach and Assumptions

To identify potential impacts associated with hazardous materials, a supplemental records review and site reconnaissance was conducted within the limits of the CTA study area for the current analysis. The supplemental data serve as an update to the modified Phase I Environmental Site Assessment conducted for the LVVDB FEIS (BLM 2004a).

Assumptions used in identifying hazardous materials within the CTA include the following:

- Federal, state, and local environmental databases were reviewed using the minimum search distances outlined in the American Society for Testing and Materials standards.
- The site reconnaissance conducted for the current analysis was a general and cursory one using existing roadways. It is assumed that BLM will conduct a complete Phase I Environmental Site Assessment on parcels available for disposal prior to lease or sale of the land.

4.12.2 Impact Thresholds

The LVVDB FEIS previously defined significance thresholds for evaluating impacts associated with the presence of hazardous materials on lands available for disposal and subsequent development. The thresholds remain applicable for the current CTA analysis. A hazardous materials impact would be considered significant if

- There is an increased potential for exposure to hazardous materials;
- The type and/or quantity of a hazardous material on a given parcel prevents the disposal of or requires remediation to those lands; or
- There is an environmental or health threat to human or animal populations.

4.12.3 Actions Proposed under All Alternatives that Would Cause Change Associated with Hazardous Materials

The following action would be implemented under all alternatives and would cause change associated with hazardous materials:

- BLM would inventory unauthorized surface disturbances in the CTA, including illegal dump sites, user-created trails and tracks, and other trespasses, and would seek to rehabilitate these disturbances to a more natural condition to improve management and protection of sensitive resources.

Direct and Indirect Impacts

The modified Phase I Environmental Site Assessment conducted for the LVVDB FEIS identified one REC along the eastern boundary of the CTA study area. The REC is described as two steel pipes protruding from the ground and could be associated with USTs or other historical uses involving hazardous materials. In addition, the CTA also has a history of mining and unauthorized dumping, which may have introduced hazardous materials into the study limits. The REC, mining locales, and dump sites could contain hazardous materials. This is a potentially adverse impact. Characterization and appropriate remediation of these areas are required in order to reduce the risk of exposure to hazardous materials. The REC, mining, and dump sites likely would be documented as part of BLM’s inventory of unauthorized surface disturbances.

Ground-disturbing activities associated with construction activities have the potential to introduce hazardous materials into the CTA. Maintenance and operation of construction equipment could result in spills or releases of hazardous materials (such as oils, fuels, and lubricants) onto the ground. Local codes and regulatory processes include provisions for construction site operations to limit the potential for exposure to hazardous materials, including requirements such as preparing hazardous materials management plans and spill containment plans.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential impacts associated with the REC and potential hazardous materials on lands slated for new development, BLM shall conduct an assessment of the areas to determine whether hazardous materials exist on the property. If such materials are found to be present, BLM shall conduct remediation activities prior to construction to remove the materials from the site.

Provided that the above mitigation measure is properly implemented, there would be no unavoidable adverse impacts involving hazardous materials under all alternatives.

4.12.4 Alternative A

Actions Proposed under Alternative A that Would Cause Change Associated with Hazardous Materials

In addition to those actions described above, the following action under Alternative A also would have impacts related to hazardous materials:

- A total of 370.8 acres would be available for disposal and subsequent development.

Direct and Indirect Impacts

One REC was identified along the eastern boundary of the CTA study area. Although no hazardous materials were identified at this location, the REC was identified as two steel pipes protruding from the ground. The nature of these pipes is unknown and could be associated with underground storage tanks or other historical uses that involve hazardous materials. The area that contains the steel pipes would not be developed under Alternative A. However, because the nature of this REC is currently unknown, additional investigation is required to assess the function of the steel pipes and any potential hazardous material impacts associated with the prior use of this area. Mitigation is required to address this potentially adverse impact.

Based on a history of mining and unauthorized dumping throughout the CTA study area, there is the potential for previously unknown hazardous materials to be located within the CTA boundaries. Mining and dump sites could contain hazardous materials. This is a potentially adverse impact. Characterization and appropriate remediation are required in order to ensure that any lands to be disposed of or leased by BLM do not include hazardous materials.

Construction activities have the potential to introduce hazardous materials into the CTA. Construction equipment and associated activities have the potential to spill or release hazardous materials (such as oils, fuels, and lubricants) onto the ground. Local codes and regulatory processes include provisions for construction site operations to limit the potential for exposure to hazardous materials, including requirements such as preparing hazardous materials management plans and spill containment plans. No further mitigation would be required.

Indirect impacts from hazardous materials may result from subsequent development of the disposed lands under Alternative A if that development involves the use of hazardous materials (for example, gasoline fueling stations or dry cleaners). The use of hazardous materials is locally regulated to prevent environmental impacts from hazardous materials that are stored or used as part of a business operation. Development activities conducted within the disposal boundary area would be required to comply with hazard mitigation requirements stated in the appropriate municipal development code. No additional mitigation is required.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential impacts associated with the REC and potential hazardous materials on disposal lands, BLM shall conduct an assessment of the site to determine whether hazardous materials exist on the property. If such materials are found to be present, BLM shall conduct remediation activities to remove the materials from the site. These actions shall occur prior to disposal or leasing of this property.

Provided that the above mitigation measure is properly implemented, there would be no unavoidable adverse impacts involving hazardous materials under this alternative.

4.12.5 Alternative B (BLM Preferred Alternative)

Actions Proposed under the Preferred Alternative that Would Cause Change Associated with Hazardous Materials

In addition to the actions common to all alternatives, the following action under the Preferred Alternative also would have impacts related to hazardous materials:

- A total of 2,315.7 acres would be available for disposal and development, including areas north and east of the Paiute Reservation and areas adjacent to DNWR at the northeastern extent of the CTA study area.

Direct and Indirect Impacts

With implementation of this alternative, the direct and indirect impacts associated with hazardous materials would be similar to those described under Alternative A. Under the Preferred Alternative, there would be approximately 2,315.7 acres of land made available for disposal by BLM; thus, there would also be an increased potential for encountering hazardous materials during construction activities on disposal and lease parcels.

Because there would be more land available for disposal (and subsequent development) under this alternative, there would also be a greater potential for the introduction of hazardous materials through spills or other chemical releases associated with construction activities.

As described under Alternative A, some future land uses (such as gas stations and dry cleaning businesses) may require the use of hazardous materials. However, existing regulations provide an adequate framework for minimizing potential impacts. No mitigation measures are needed.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential impacts associated with the REC and potential hazardous materials on disposal lands, BLM shall conduct an assessment of the site to determine whether hazardous materials exist on the

property. If such materials are found to be present, BLM shall conduct remediation activities to remove the materials from the site. These actions shall occur prior to disposal or leasing of this property.

Provided that the above mitigation measure is properly implemented, there would be no unavoidable adverse impacts involving hazardous materials under this alternative.

4.12.6 Alternative C

Actions Proposed under Alternative C that Would Cause Change Associated with Hazardous Materials

In addition to the actions common to all alternatives, the following action under Alternative C also would have impacts related to hazardous materials:

- A total of 6,960.9 acres north and south of the CTA would be available for disposal, including areas north and east of the Paiute Reservation.

Direct and Indirect Impacts

With implementation of this alternative, the direct and indirect impacts associated with hazardous materials would be similar to those described above for Alternative A. Under Alternative C, there would be approximately 6,960.9 acres of land made available for disposal by BLM; thus, there would also be an increased potential for encountering hazardous materials during construction activities on disposal and lease parcels.

Because there would be more land available for disposal (and subsequent development) under this alternative, there is also a greater potential for the introduction of hazardous materials through spills or other chemical releases associated with construction activities.

As described under Alternative A, some future land uses (such as gas stations and dry cleaning businesses) may require the use of hazardous materials. However, existing regulations provide an adequate framework for minimizing potential impacts. No mitigation measures are needed.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential impacts associated with the REC and potential hazardous materials on disposal lands, BLM shall conduct an assessment of the site to determine whether hazardous materials exist on the property. If such materials are found to be present, BLM shall conduct remediation activities to remove the materials from the site. These actions shall occur prior to disposal or leasing of this property.

Provided that the above mitigation measure is properly implemented, there would be no unavoidable adverse impacts involving hazardous materials under this alternative.

4.12.7 Alternative D

Actions Proposed under Alternative D that Would Cause Change Associated with Hazardous Materials

In addition to the actions common to all alternatives, the following action under Alternative D also would have impacts related to hazardous materials:

- A total of 8,022.7 acres would be available for disposal and future development, primarily north and east of the Paiute Reservation and along the northern extent of the CTA study area, adjacent to the DNWR.

Direct and Indirect Impacts

With implementation of this alternative, the direct and indirect impacts associated with hazardous materials would be similar to those described above under Alternative A. Under Alternative D, there would be approximately 8,022.7 acres of land made available for disposal by BLM; thus, there would also be an increased potential for encountering hazardous materials during construction activities on disposal and lease parcels.

Because there would be more land available for disposal (and subsequent development) under this alternative, there is also a greater potential for the introduction of hazardous materials through spills or other chemical releases associated with construction activities.

As described under Alternative A, some future land uses (such as gas stations and dry cleaning businesses) may require the use of hazardous materials. However, existing regulations provide an adequate framework for minimizing potential impacts. No mitigation measures are needed.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential impacts associated with the REC and potential hazardous materials on disposal lands, BLM shall conduct an assessment of the site to determine whether hazardous materials exist on the property. If such materials are found to be present, BLM shall conduct remediation activities to remove the materials from the site. These actions shall occur prior to disposal or leasing of this property.

Provided that the above mitigation measure is properly implemented, there would be no unavoidable adverse impacts involving hazardous materials under this alternative.

4.12.8 Alternative E

Actions Proposed under Alternative E that Would Cause Change Associated with Hazardous Materials

In addition to the actions common to all alternatives, the following action under Alternative E also would have impacts related to hazardous materials:

- A total of 10,010.3 acres would be available for disposal and future development.

Direct and Indirect Impacts

With implementation of this alternative, the direct and indirect impacts associated with hazardous materials would be similar to those described above under Alternative A. Under Alternative E, there would be approximately 10,010.3 acres of land made available for disposal by BLM; thus, there would also be an increased potential for encountering hazardous materials during construction activities on disposal and lease parcels.

Because there would be more land available for disposal (and subsequent development) under this alternative, there is also a greater potential for the introduction of hazardous materials through spills or other chemical releases associated with construction activities.

As described under Alternative A, some future land uses (such as gas stations and dry cleaning businesses) may require the use of hazardous materials. However, existing regulations provide an adequate framework for minimizing potential impacts. No mitigation measures are needed.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential impacts associated with the REC and potential hazardous materials on disposal lands, BLM shall conduct an assessment of the site to determine whether hazardous materials exist on the property. If such materials are found to be present, BLM shall conduct remediation activities to remove the materials from the site. These actions shall occur prior to disposal or leasing of this property.

Provided that the above mitigation measure is properly implemented, there would be no unavoidable adverse impacts involving hazardous materials under this alternative.

4.12.9 No-Action Alternative

Actions Proposed under the No-Action Alternative that Would Cause Change Associated with Hazardous Materials

In addition to the actions common to all alternatives, the following action under the No-Action Alternative also would have impacts related to hazardous materials:

- With the exception of Eglington Preserve and Tule Springs, the remainder of the CTA study area, which amounts to 12,150 acres, would be available for disposal.

Direct and Indirect Impacts

Under the No-Action Alternative, a substantial amount of land will be made available for disposal and potential development within the CTA study area. With implementation of this alternative, the direct and indirect impacts associated with hazardous materials would be similar to those described above under Alternative A. Under the No-Action Alternative, there would be approximately 12,150 acres of land made available for disposal by BLM; thus, there would also be an increased potential for encountering hazardous materials during construction activities on disposal and lease parcels.

Because there would be more land available for disposal (and subsequent development) under this alternative, there is also a greater potential for the introduction of hazardous materials through spills or other chemical releases associated with construction activities.

As described under Alternative A, some future land uses (such as gas stations and dry cleaning businesses) may require the use of hazardous materials. However, existing regulations provide an adequate framework for minimizing potential impacts. No mitigation measures are needed.

Mitigation Measures and Unavoidable Adverse Impacts

To address potential impacts associated with the REC and potential hazardous materials to disposal lands, BLM shall conduct an assessment of the site to determine whether hazardous materials exist on the property. If such materials are found to be present, BLM shall conduct remediation activities to remove the materials from the site. These actions shall occur prior to disposal or leasing of this property.

Provided that the above mitigation measure is properly implemented, there would be no unavoidable adverse impacts involving hazardous materials under this alternative.

4.13 SOCIOECONOMICS

The preservation or development of currently undeveloped desert lands in the LVV would directly impact the social and economic resources of the area as a result of potential population increases, employment requirements, capital expenditures, loss or gain of open space as an amenity, and loss or gain of productive land value. The analysis of socioeconomics in the following section focuses on impacts to the Cities of Las Vegas and North Las Vegas, residents in the CTA study area, and, to a lesser extent, on Clark County, where data are not available for the cities themselves. Social impacts are often discussed qualitatively when quantitative data are not available to address these impacts. To the extent possible, economic impacts are quantified based on assumptions and estimates of tax revenue and potential for development density under the different alternatives.

4.13.1 Analysis Approach and Assumptions

Community Perceptions

Analyzing community perceptions, including those of stakeholders and affected groups, is necessarily grounded primarily in the assumption that alternatives seeking additional protection of the CTA study area are based on the protection of a social amenity. A social amenity can be parks, open space, and other recreation resources. Social amenities are difficult to quantify, as they are intrinsic values not typically measured in dollar values. Alternatives that seek to provide more development acreage or additional ROW to accommodate development are based on realization of development goals and potential, which may vary, depending on the perception of various groups and stakeholders. Development potential can include employment opportunities, tax revenues, and housing construction, which is easier to quantify in dollar amounts.

The community perceptions analysis seeks to qualitatively analyze the value of preserving social amenities and/or development opportunities by alternative. A variety of stakeholders and affected groups have been considered in this analysis. Those include the Cities of Las Vegas and North Las Vegas, Las Vegas Paiute Tribe, community and resource groups, federal and state entities, educational institutions, utilities, developers, and recreation groups. Because community perceptions are difficult to evaluate, significance criteria for impacts to community perceptions and values must rely on values that each group places on preservation versus development of CTA study area resources and how each alternative accommodates those values (see Section 3.13.2, “Community Perceptions,” for more information on stated community perceptions and values, by stakeholder). The USU Community Interests Study (USU 2008b), when completed, will provide additional information that may add to this analysis.

Population and Demographics

Predictions in population impacts by alternative are based on past population trends and assumptions of the area’s past ability to absorb growth or recover from reduction in population numbers. Annual population in Clark County increased every year between 1985 and 2007; the average annual increase over this period was 5.8%. The lowest percentage of population increase occurred between 2006 and 2007 (4.2%), and the highest increase occurred between 1989 and 1990 (8.7%) (UNLV Center for Business and Economic Research 2007b).

Increases in population are projected to range from 1.4% to 5.3% annually over a 20-year period (Table 4.13-1). The change in rate of population growth is expected to remain consistent with local trends, with or without disposal acreage in the varying alternatives. It is assumed that under higher conservation alternatives, development will likely occur elsewhere. However, under the higher development

alternatives, development would occur within the disposal area, where land is better suited to accommodate growth, thus limiting the potential for leapfrog development on lands adjacent to the CTA study area.

Table 4.13-1. Clark County Population Projections, 2005–2025

Year	Total Population	Change Previous Year	% Change
2005	1,796,380	–	–
2006	1,892,391	69,012	5.3%
2007	1,981,798	89,407	4.7%
2008	2,079,802	98,003	4.9%
2009	2,180,041	100,239	4.8%
2010	2,281,997	101,957	4.7%
2011	2,379,242	97,244	4.3%
2012	2,471,684	92,442	3.9%
2013	2,558,907	87,224	3.5%
2014	2,641,169	82,261	3.2%
2015	2,718,502	77,333	2.9%
2016	2,791,542	73,040	2.7%
2017	2,860,466	68,924	2.5%
2018	2,925,580	65,114	2.3%
2019	2,987,252	61,672	2.1%
2020	3,045,813	58,560	2.0%
2021	3,101,389	55,576	1.8%
2022	3,154,272	52,883	1.7%
2023	3,204,766	50,493	1.6%
2024	3,253,151	48,385	1.5%
2025	3,299,623	44,767	1.4%

Source: Nevada Small Business Development Center (2008).

Population calculations for developable land within the CTA disposal area were determined using density scenarios provided by the City of Las Vegas. The average projected number of persons per acre at build-out was estimated to be approximately 24.3 individuals. Table 4.13-2 gives population estimates by alternative.

Employment

Significance criteria for socioeconomic impacts were determined by analyzing fluctuations in Las Vegas metropolitan area employment. This analysis allows specific determination of thresholds beyond which changes in employment would noticeably affect individuals and communities. Employment in the Las Vegas metropolitan area has increased every year between 1985 and 2007. The trend in employment shows that the average annual percent increase in labor force over this time period was 5.6%. The lowest

annual percent increase occurred between 2001 and 2002 (0.6%), and the highest increase occurred between 1993 and 1994 (12.4%).

Table 4.13-2. Projected Population at Build-Out for Each Alternative

Alternative	Total Developable Acreage	Projected Population
A	370.8	9,010
B (Preferred Alternative)	2,315.7	56,118
C	6,960.9	169,150
D	8,022.7	194,952
E	10,010.3	243,250
No Action	12,174.5	295,840

The annual deviations between actual change and average change form the basis for determining a threshold of significance. The deviations yield threshold values of −5.0% and 6.8%, wherein those values are the upper and lower limits of a range of change within which the LVV would have the capacity to absorb increases or decreases in employment. Thus, a significant impact would be an increase of more than 6.8% or a decline of more than 5.0% from the average projected level of employment of 5.6% (Figure 4.13-1).

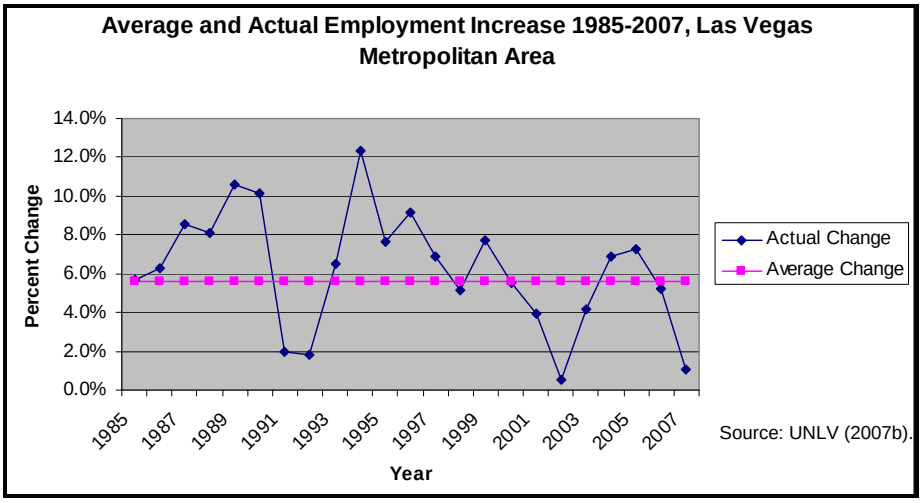

Figure 4.13-1. Average and actual employment increase between 1985 and 2007, Las Vegas metropolitan area.

In order to calculate projected employment under each alternative scenario, the *Mountain Edge Parkway Feasibility Study* (Mountain Edge Study) (City of Las Vegas 2007c), completed in cooperation with the Cities of Las Vegas and North Las Vegas, was consulted to determine possible employment projections for portions of the CTA study area. In the Mountain Edge Study, employment was determined using floor area ratios to estimate the amount of building space against total land area on which the building is located. As well, market-based estimates of employee per square foot averages were used to project jobs. Finally, the average commercial land use percentage (which includes office, industrial, and retail) was determined to be 22% of total land use in developable areas. Based on the Mountain Edge Study calculations, an estimate of potential employment was determined for three-year 2045 build-out scenarios—low, medium, and high (City of Las Vegas 2007c). Using the numbers derived from the

Mountain Edge Study, an estimate of 20.9 employees per acre under the low-density scenario, 26.4 under the medium-density scenario, and 31 under the high-density scenario was used to estimate a projected range of employment for each alternative. Table 4.13-3 provides estimates of potential employment on developable acreages by alternative and density scenario. These numbers do not take into account possible fluctuations in employment as construction-related jobs are generated during build-out.

Community Resources

Community resources that could be impacted by any of the given alternatives include housing, crime, public facilities and services, public service expenditures, public safety, education, and health care. In terms of significance criteria, impacts to these resources would be significant if the population increase under a given alternative is considered significant. Demands on community resources will be guided by the significance and impact of population increases to any of the given resources.

A joint study by the Cities of Las Vegas and North Las Vegas analyzes the potential costs of displaced development in Clark County (Entrix 2008). The study analyzes transportation impacts, such as energy costs and car maintenance, travel time, and transportation and obesity, as well as potential environmental and socioeconomic impacts related to displaced development and density-related effects. The study found that "the most significant expected economic impacts of the displaced development scenario are transportation-related" (Entrix 2008:10).

Table 4.13-3. Projected Employment by Alternative and Density Scenario

Alternative	Total Developable	Commercial Acreage (22%)	Projected Employment*	Projected Employment Growth within Disposal Area†
Low-Density Scenario (20.9 employees per acre)				
A	370.8	81.6	1,705	0.5%
B (Preferred)	2,315.7	508.1	10,619	3.0%
C	6,960.9	1531.4	32,006	9.1%
D	8,022.7	1765.0	36,888	10.5%
E	10,010.3	2202.3	46,027	13.1%
No Action	12,150.0	2673.0	55,866	15.9%
Medium-Density Scenario (26.4 employees per acre)				
A	370.8	81.6	2,154	0.6%
B (Preferred)	2,315.7	508.1	13,413	3.8%
C	6,960.9	1531.4	40,429	11.5%
D	8,022.7	1765.0	46,596	13.3%
E	10,010.3	2202.3	58,140	16.6%
No Action	12,150.0	2673.0	70,567	20.1%
High-Density Scenario (31 employees per acre)				
A	370.8	81.6	2,529	0.7%
B (Preferred)	2,315.7	508.1	15,750	4.5%
C	6,960.9	1531.4	47,473	13.5%
D	8,022.7	1765.0	54,715	15.6%
E	10,010.3	2202.3	68,270	19.4%
No Action	12,150.0	2673.0	82,863	23.6%

Source: City of Las Vegas (2007c).
* At 2045 build-out.
† Calculation generated using 2007 employment estimates from UNLV Center for Business and Economic Research (2007a, 2007b).

The Entrix study proposes that an average of 8 units per acre would be lost by lands added to the CTA. Using this estimate by Entrix (2008), under Alternatives A–D, between 2,411 and 63,260 units could be displaced (Table 4.13-4). No units would be displaced under Alternative E and the No-Action Alternative, as the CTA acreage would be reduced by 1,686 or 3,551 acres; in fact, more units could be built.

Table 4.13-4. Displaced Development Scenarios*

Alternative	Alternative Boundary (acres)	Original CTA Boundary (acres)	Change in Acreage between Original CTA and Alternative (acres)	Displaced Housing Units (8 units/acre) on Change in Acreage
A	12,952.50	5,000.00	7,952.50	63,620
B (Preferred)	11,007.6	5,000.00	6,007.6	48,146
C	6,362.30	5,000.00	1,362.30	10,898
D†	5,301.40	5,000.00	301.4	2,411
E	3,313.80	5,000.00	−1,686.20	NA‡
No Action	1,448.20	5,000.00	−3,551.80	NA‡

* Based on Entrix (2008) units per acre.

† Alternative D represents the original CTA boundary, which was subsequently adjusted to correct for acreage discrepancies in the LVVDB FEIS and reflect greater accuracy in acreage calculation.

‡ Both Alternative E and the No-Action Alternative would add developable acreage; therefore, there would be no displaced housing units under these alternatives.

The study estimates that $16,500 per household, per year, would be spent on increased transportation costs if these units are displaced. Using this annual household expenditure, up to $1.6 billion could be spent in Clark County per year for transportation costs resulting from displaced development (Entrix 2008). These costs could include gasoline and motor oil expenditures, vehicle maintenance, carbon emissions, medical expenditures attributable to obesity, and the value of lost time. No current, average household spending for Las Vegas is available. However, in 2005 the average annual household transportation expenditure in Phoenix, Arizona, was $8,659 and $7,781 in the U.S. (Surface Transportation Policy Partnership 2005). The Phoenix and U.S. average expenditures represent between 16% and 17.5% of the median income for Phoenix and the U.S., respectively, while the Entrix (2008) estimate for the Las Vegas area is substantially higher, at 32.7% of Clark County's median income.

The Entrix (2008) study also analyzes potential medical expenditures related to a correlated increase in obesity if development is displaced. A 2004 study (Frank et al. 2004) cited in the Entrix (2008) report analyzes the relationship between the likelihood of obesity as it relates to commute time. Frank et al. (2004) propose that the likelihood of obesity increases by 6% for every additional hour spent commuting. Using this model, Entrix (2008) estimates that annual medical expenditures within Clark County could increase from $21 million to $367 million, a 5.72% increase in obesity-related medical spending, if 8,000 acres are added to the CTA.

Entrix (2008) summarizes observed trends in quality of life and social and economic impacts related to urban sprawl. Sprawl can lead to low-income households being concentrated in inner city cores, inner city employment shortages, and more expensive housing in the suburban and exurban areas. These trends would be consistent with historic development trends in Clark County.

Population growth is a prime indicator of economic growth and the corresponding impacts to community resources. The Entrix (2008) study estimates monetary impacts related to displaced development by measuring several variables described above. Alternatively, this socioeconomic analysis measures impacts to community resources against population growth; the impact would be significant if the population increase under a given alternative is considered significant.

Taxes and Revenues

Impacts to taxes and revenues are considered in terms of the potential effects on the productive capacity of the land. Productive gains would include revenue generated from disposal (sale) of the land, as well as revenue from potential development (i.e., property taxes). It is important to note that under every alternative, there would be an increase in tax revenue for the Cities of Las Vegas and North Las Vegas, as well as Clark County, because some amount of land would be disposed of and potentially developed. Under all six alternatives, land development activities associated with the sale of BLM lands would be expected to generate positive economic benefits within Clark County. For the purpose of this analysis, all spending is assumed to occur in Clark County. The majority of the benefits would result from the construction of residential units; however, construction expenditures are based on the organization of three major land use categories (single-family, multi-family, and non-residential development). Construction of non-residential development would contribute directly and indirectly to economic benefits but to a lesser degree than residential development.

In support of the 2004 LVVDB FEIS (BLM 2004a), a comprehensive economic analysis was completed that examined the fiscal impacts of the initial land disposal proposals in the LVV area. For this SEIS, the dollar amounts in the 2004 analysis (BLM 2004a) have been adjusted for inflation and converted to 2008 dollars using a 1.06 inflator (National Aeronautics and Space Administration 2008).

The potential economic impacts in the 2004 LVVDB FEIS were estimated using the IMPLAN Pro I-O model. Input-output modeling is a mathematical accounting of the flow of dollars and commodities through an area's economy. The model provides an estimate of how a given amount of a particular economic activity translates to income in the area. It predicts how expenditures would affect specific industries within the area as dollars are spent and re-spent locally. The IMPLAN results are expressed as a culmination of construction and other commercial industries and are discussed in terms of local output. In general, economic impacts would result from development of disposed lands; thus, the results of the IMPLAN model reflect the indirect impacts of proposed BLM land disposal alternatives. Details of the initial assumptions made in the 2004 analysis can be found in the LVVDB FEIS (BLM 2004a:Appendix E).

Impacts to the local economy, government revenues, as well as property valuation and taxation based on the six alternatives have been considered in the analysis below. For this analysis, construction costs and spending resulting from the development of new residential and non-residential units within the project area are direct impacts. Indirect impacts are considered additional industry sectors that would be impacted as a result of the construction. These industries include wholesale trade, real estate, food and beverage stores and establishments, and offices of physicians, dentists, and other health care professionals. Indirect business taxes resulting from each alternative consist of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses. The average annual property tax was determined based on a range of LVV tax rates; in 2004 the average tax rate was $2.950 per $100 of assessed value. The 2004 IMPLAN analysis (BLM 2004a) uses this assumption to determine the number of homes that would be constructed, as well as the average value per acre ($94,000) based on BLM land sold in Clark County in 2004. Land values for the project area are anticipated to appreciate by 7% per year; as such, the annual property valuation and taxation amounts would increase in the years preceding build-out. The annual economic dollar impacts resulting from each of the alternatives (at full build-out) are shown in the tax and revenue analysis below (Table 4.13-5).

Table 4.13-5. Annual Construction, Commercial, and Taxation Revenue, by Alternative

	Lands Available for Disposal (acres)	% of Original Disposal Boundary Acreage (46,700)	2004 Dollars (BLM 2004a)	2008 Adjusted (1.06 inflator)
Annual, Construction Costs/Industry				
A	370	0.008	$6,804,399	$7,212,663
B (Preferred)	2,315	0.050	$42,573,471	$45,127,880
C	6,961	0.149	$128,014,658	$135,695,538
D	8,022	0.172	$147,526,733	$156,378,337
E	10,103	0.216	$185,796,882	$196,944,694
No Action	12,150	0.260	$223,441,761	$236,848,267
Annual, Other Commercial Costs/Industry (indirect)				
A	370	0.008	$4,267,383	$4,523,426
B (Preferred)	2,315	0.050	$26,699,980	$28,301,979
C	6,961	0.149	$80,284,476	$85,101,544
D	8,022	0.172	$92,521,486	$98,072,775
E	10,103	0.216	$116,522,635	$123,513,993
No Action	12,150	0.260	$140,131,645	$148,539,544
Annual, Government and Taxation Revenue				
A	370	0.008	$332,869	$352,841
B (Preferred)	2,315	0.050	$2,082,682	$2,207,642
C	6,961	0.149	$6,262,439	$6,638,185
D	8,022	0.172	$7,216,964	$7,649,982
E	10,103	0.216	$9,089,128	$9,634,476
No Action	12,150	0.260	$10,930,704	$11,586,547
Annual, Property Valuation and Taxation				
A	370	0.008	$2,400,169	$2,544,179
B (Preferred)	2,315	0.050	$15,017,272	$15,918,308
C	6,961	0.149	$45,155,606	$47,864,942
D	8,022	0.172	$52,038,252	$55,160,547
E	10,103	0.216	$65,537,579	$69,469,834
No Action	12,150	0.260	$78,816,350	$83,545,331
Total				
A	–	–	$13,804,821	$14,633,110
B (Preferred)	–	–	$86,373,405	$91,555,809
C	–	–	$259,717,179	$275,300,210
D	–	–	$299,303,435	$317,261,641
E	–	–	$376,946,223	$399,562,996
No Action	–	–	$453,320,460	$480,519,688

The economic impact of each alternative is extrapolated from the 2004 LVVDB FEIS impacts analysis (BLM 2004a); the results are based on lands available for disposal under the current alternatives (see Table 2.4-2) in relation to the original disposal acreage of 46,700 acres as a percentage of the following: 1) annual economic impact of residential construction spending; 2) commercial construction spending; and 3) business and property tax revenue from the proposed action in the LVVDB FEIS (BLM 2004a:Tables 4.12-2, 4.12-4, and 4.12-5). Unlike the economic analysis in the LVVDB FEIS, this analysis does not forecast a timeline for development. No timeline for development is included because development, by nature, is so speculative and uncertain; because there is no development timeline, no cumulative total of the economic impacts of a given alternative can be discussed. Rather, financial estimates are provided for annual impacts, at full build-out for each alternative.

4.13.2 Impact Thresholds

Socioeconomic significance thresholds discussed in Section 4.13.1, "Analysis Approach and Assumptions," are summarized below:

- Significance criteria for impacts to community perceptions and values must rely on values that each group places on preservation vs. development of CTA study area resources and how each alternative accommodates those values (see Section 3.13.2, "Community Perceptions," for more information on stated community perceptions and values, by stakeholder). The USU Community Interests Study (USU 2008b), when completed, will provide additional information that may add to this analysis.
- Significance criteria for population are based on whether implementation of an alternative would result in an exceedance of the lowest or highest population fluctuations experienced in Clark County between 1985 and 2007. The average annual increase over this period was 5.8%. The lowest percentage of population increase occurred between 2006 and 2007 (4.2%), and the highest increase occurred between 1989 and 1990 (8.7%) (UNLV Center for Business and Economic Research 2007b).
- Significant impacts to community resources are based on whether the population increase under a given alternative is considered significant, as defined above.
- Significance criteria for employment are based on whether implementation of an alternative would result in an exceedance of the lowest or highest fluctuations in labor force experienced in the Las Vegas metropolitan area between 1985 and 2007. The lowest annual percent increase occurred between 2001 and 2002 (0.6%), and the highest increase occurred between 1993 and 1994 (12.4%). The annual deviations between actual change and average change form the basis for determining a threshold of significance. The deviations yield threshold values of −5.0% and 6.8%, wherein those values are the upper and lower limits of a range of change within which the LVV would have the capacity to absorb increases or decreases in employment. Thus, a significant impact would be an increase of more than 6.8% or a decline of more than 5.0% from the average projected level of employment of 5.6% (see Figure 4.13-1).

4.13.3 Factors under all Alternatives that Would Cause Change to Existing Socioeconomic Conditions

The following factors would cause change to existing socioeconomic conditions:

- The change in rate of population growth across all alternatives is expected to remain consistent with local trends. It is assumed that in the alternatives with lower acreages of developable land, new development will likely occur elsewhere. However, under the higher development

alternatives, development would occur within the LVVDB, where land is better suited to accommodate growth.

- The population of Clark County is expected to increase by 1.4% to 5.3% annually over the next 20 years.
- Housing requirements for projected population increases within CTA boundaries are expected to result in a relatively low demand for additional housing. Most of the workers (primarily temporary workers in the construction industry) are already located within the LVV and Clark County area.
- Long-term rate of population growth is expected to occur under any of the action alternatives. Therefore, the action alternatives are not expected to directly contribute to population increases that would have a substantial adverse effect on public facilities and services.
- Implementation of any of the alternatives would result in an increase in property taxes and economic activity because some amount of land will be disposed of, and potentially developed, under any scenario. Details of potential economic gains from development of disposed lands are presented below.
- None of the alternatives would result in adverse health effects that would be significant, unacceptable, or above generally accepted norms, as no alternative includes the construction or operation of facilities that may pose an undue health risk to minority or low-income populations.
- No risk or rate of hazard exposure by a minority or low-income population to an environmental hazard would appreciably exceed, or be likely to appreciably exceed, the risk or rate to the general population or other appropriate comparison group. No health effects would occur in a minority population as a result of exposure to environmental hazards related to the proposed alternatives.

4.13.4 Alternative A

Actions Proposed under Alternative A that Would Cause Change to Existing Socioeconomic Conditions

Under Alternative A, 12,952.5 acres would be preserved as the CTA and would be unavailable for private development. The total developable acreage available to the Cities of Las Vegas and North Las Vegas would be 370.8 acres, representing the lowest available acreage for development offered under any of the other alternatives.

Direct and Indirect Impacts

COMMUNITY PERCEPTIONS

Cities of Las Vegas and North Las Vegas

The primary goal of the Cities of Las Vegas and North Las Vegas is to balance the preservation of natural resources with the need to accommodate additional development in the growing LVV. Under Alternative A, the cities may experience added pressure to develop in less desirable areas in order to accommodate the need for development as population continues to rise. The result, according to the cities, is that leapfrog development would occur and there would be more inefficient placement related to utility construction and transportation infrastructure. If this were to occur, there would be a significant, direct, adverse impact to both cities as a result of Alternative A.

Las Vegas Paiute Tribe

The LVW is a highly significant spiritual, cultural, historical, anthropological, and ecological part of Paiute heritage. Preservation of both the LVW and surrounding areas would help to maintain ancient burial grounds and other sacred sites to the maximum extent possible. By limiting development in areas surrounding the Paiute Reservation, it is likely that resort amenities, both current and planned, for the tribe would have value added by maintaining undeveloped surroundings. Therefore, under Alternative A, the Las Vegas Paiute would experience a direct, positive impact as perceived by the Tribe.

Community Resource Groups

Alternative A would provide a direct, beneficial impact, as far as community perception, to community resource groups who have expressed interest in preservation of the entire CTA study area boundary.

Federal and State Entities

Of primary concern to federal and state entities is the desire to maintain natural resources to the extent possible while also allowing for competent management of the future CTA boundaries and associated Tule Springs and Eglington Preserve sites. Alternative A would therefore provide a direct, positive benefit to federal and state entities.

Educational Institutions

Alternative A would provide a direct, beneficial impact to educational institutions that have expressed interest in preservation of the entire CTA boundary for the purposes of educating the public about existing natural resources. Additionally, a reduction in BLM land sales would result in less money going into the State of Nevada General Education Fund. Under the SNPLMA, 5% of the revenue generated from BLM land sales goes into that fund.

Utilities

The general consensus among interested utility groups is to maintain existing ROWs within the CTA boundaries while also allowing for the protection of potential future ROWs necessary to accommodate current and future demand.

Developers

Alternative A could result in a direct, adverse impact to the development community, which hopes to use public land as productively as possible in order to meet the demands of the growing LVV population. However, availability of developable land outside the CTA could offset this adverse impact.

Recreation Groups

Recreation groups would experience negligible social impacts under Alternative A. Recreation opportunities and activity would likely remain as it presently exists; the only exception would be among OHV users who currently use the CTA for off-road vehicle use and other motorized off-trail activities.

POPULATION AND DEMOGRAPHICS

Under Alternative A, it is expected that approximately 9,010 individuals will occupy developable disposal lands at build-out (see Table 4.13-2). The change in rate of population growth is expected to occur

independent of any changes in the disposal boundaries. Therefore, Alternative A is not expected to contribute to population increases that would have a substantial adverse effect on the community.

EMPLOYMENT

Under Alternative A, it is expected that between 1,705 and 2,529 new employment opportunities would result at total build-out in 2045. This would represent a 0.5% to 0.7% increase in overall employment by 2045 (see Table 4.13-3). Based on the significance criteria discussed above, this would result in a direct, adverse impact to employment in the area, as the projected growth rate is more than 5% lower than the expected growth rate.

Indirect, adverse impacts may occur as a result of the loss of potential workers who could benefit from disposal of developable land within the CTA study area. It is expected that a portion of potential jobs that would be unavailable under this alternative would shift to other areas in the LVV where economic opportunities still exist, but not enough to compensate for current and future city needs.

COMMUNITY RESOURCES

Based on the significance criteria for employment, and by extension, community resources, implementation of Alternative A could directly and indirectly adversely impact the location and costs of providing public facilities and services in the community. This would be because of a decrease in the housing inventory that would thereby affect public service expenditures. A study sponsored by the Cities of Las Vegas and North Las Vegas estimates that transportation costs could increase by as much as $1.06 billion annually at full build-out as a result of displaced development and the costs associated with longer commute times between work and home, entertainment, and retail centers (Entrix 2008). However, because implementation of Alternative A is not expected to contribute to population increases that would have a substantial adverse effect on community resources or services, there are not likely to be any significant impacts to the provision of police, fire, hospitals, or libraries.

Overall population is expected to increase annually by 1.4% to 5.3% through 2025. The rate of enrollment in the Clark County School District has increased by 3.9% to 5.9% annually since 2001 (see “Educational Institutions”). Increases in school enrollment that result from population migration and an increase in housing in the LVV would have to be incorporated into the school district’s projected growth plans. However, implementation of Alternative A will not likely increase the demand for additional educational facilities in the district because the Clark County School District has plans to accommodate a 5% increase in enrollment. Additionally, because implementation of Alternative A is not expected to contribute to population increases that would have a substantial adverse effect on community resources or services, impacts to education are not expected to be significant.

Implementation of Alternative A would not be expected to have direct or indirect impacts to the supply of water or solid waste disposal in the LVV area. Implementation of Alternative A is not expected to contribute to population increases that would have a substantial adverse effect on community resources or services; impacts to the provision of utilities are not expected to be significant.

Based on 2006 population and crime reports (see Chapter 3, “Affected Environment”), the per capita crime rate for the City of Las Vegas is 0.96%, and the rate for the City of North Las Vegas is 2.74%. Minor population increases as a result of an increased housing inventory and other land uses could have a direct, adverse impact to crime and the attendant need for public safety resources and facilities (police, fire, etc.) under Alternative A; however, the population is expected to increase with or without the disposal of land within the CTA study area, so this impact is not expected to be significant. While illegal activity (dumping, etc.) could continue and the remoteness of portions of the CTA could impact the ability of public safety officials to respond to recreationists in the CTA, no direct or indirect adverse

impacts are anticipated because the area already consists of vacant, undeveloped desert with the same risks.

There are plans for increasing the capacity of the health care system in the Cities of Las Vegas and North Las Vegas, as well as the LVV. Implementation of Alternative A is not expected to contribute to population increases that would have a substantial adverse effect on the demand for additional health care facilities in the area. Therefore, no direct or indirect impacts are anticipated.

TAXES AND REVENUES

Taxes and other sources of revenue provide the state, counties, and communities with discretionary dollars to develop infrastructure and support the population. Nevada does not have corporate or personal income tax; therefore, property taxes and PILT are important sources of revenue for the state, counties, and communities. Median and mean property taxes are detailed by city in Appendix J (see Table J-12).

Under Alternative A, only 370.8 acres would be made available for development. Implementation of Alternative A would result in a reduced amount of land available for development, which would provide some increased tax revenues to the cities and other governmental jurisdictions when the land is developed. However, municipalities would receive the least amount of tax revenue to fund infrastructure projects under Alternative A. An estimated $2.9 million in annual tax revenue would be generated if Alternative A is implemented and the full 370.8 acres are developed (see Table 4.13-5). While implementation of this alternative is expected to result in an increase in taxes and revenues, of the six alternatives presented for analysis, Alternative A would result in the least amount of tax revenue for Clark County and the Cities of Las Vegas and North Las Vegas.

Additionally, the potential for leapfrog development is higher under Alternative A, as the likelihood of development along non-contiguous parcels of land is greater when more land is conserved in a rapidly urbanizing area. Leapfrog development could place additional demands on new public infrastructure, resulting in a higher cost of supplying infrastructure than other alternatives. The estimated annual tax revenue may not be enough to offset these costs. Therefore, implementation of this alternative could result in a negative impact to taxes and revenues, relative to the other project alternatives.

ECONOMIC ENVIRONMENT

Implementation of Alternative A will not likely increase or alter the demand for gaming opportunities in the area. However, implementation of Alternative A could have a direct, beneficial impact to tourism. The CTA and other federal lands in the LVV could be used for hiking, camping, mountain biking, scenic and wildlife viewing, etc. This increase in recreation could result in an indirect, beneficial impact to the economic environment as a result of increases in economic activity in the local economy, including increased jobs, tax revenue, etc.

Development of the 370.8 acres also has the potential to generate an additional $7.2 million annually in construction spending (see Table 4.13-5) and an additional $4.5 million annually in other commercial expenditures (BLM 2004a). The annual $7.2 million in construction spending would be an increase of 0.08% over the 2006 GDP for the construction industry in the Las Vegas–Paradise metropolitan statistical area (BEA 2008). As previously noted (see Section 3.13.5, “Community Resources”), the average percent change for GDP contribution by the construction industry was 12.99% between 2001 and 2006.

Mitigation Measures and Unavoidable Adverse Impacts

Based on the significance criteria identified for employment, Alternative A could result in a direct, adverse impact to employment in the area, as the projected growth rate is more than 5% lower than the expected growth rate. No mitigation measures have been proposed to lessen the impacts expected under this alternative.

A significant, direct, adverse impact to the Cities of Las Vegas and North Las Vegas, as well as utility groups, would likely occur, as less land would be made available for development and more restrictions on utility infrastructure would be in place. A significant loss in community values for the cities could occur, as the desire to balance the need for development and more recreation opportunities for residents would not be realized. Utility groups would similarly be affected, as the need to accommodate current and future growth would come at greater economic costs, since redundant utility infrastructure would be required to sufficiently service residents of the Cities of Las Vegas and North Las Vegas.

No mitigation measures have been proposed to offset adverse impacts to socioeconomics under this alternative.

4.13.5 Alternative B (BLM Preferred Alternative)

Actions Proposed under Alternative B that Would Cause Change to Existing Socioeconomic Conditions

Under Alternative B, 2,315.7 acres of land would be available for development for the Cities of Las Vegas and North Las Vegas. Under this alternative, 11,007.6 acres would be preserved as the CTA and would be unavailable for private development.

Direct and Indirect Impacts

COMMUNITY PERCEPTIONS

Under Alternative B, impacts to stakeholders and affected groups would largely reflect those discussed under Alternative A. Groups that would experience additional impacts under this alternative would include the Las Vegas Paiute and community resource groups.

The Las Vegas Paiute would experience minor adverse impacts under this alternative, as the northeast corner of the Paiute Reservation would not be buffered from adjacent development. The impact is considered minor, as preservation of the LVV and surrounding areas would largely remain intact. As well, adjacent development would occur in areas at a distance from the existing resort.

Resource groups who have expressed the desire for maximum protection of CTA boundaries will experience direct, adverse impacts from a community perception standpoint. However, this impact is not considered significant, as the majority of lands within the CTA study area would be preserved.

POPULATION AND DEMOGRAPHICS

Under Alternative B, it is expected that approximately 56,118 individuals will occupy developable disposal lands at build-out (see Table 4.13-2). Impacts to population will remain consistent with those discussed in Alternative A, as the change in rate of population growth is expected to occur independent of any changes in the disposal boundaries.

EMPLOYMENT

Under Alternative B, it is expected that between 10,619 and 15,750 new employment opportunities would result at total build-out in 2045. This would represent an overall employment growth rate between 3% and 4.5% (see Table 4.13-3). Based on the significance criteria, this would represent an overall decline in projected employment during the period, although not to a significant degree. Impacts to employment under this alternative would therefore be considered direct and adverse.

Indirect impacts may occur as a result of fewer potential workers because of less developable land, compared with the other, more heavily developed, alternatives. It is expected that those potential jobs would shift to other areas in the LVV where economic opportunities still exist.

COMMUNITY RESOURCES

The direct and indirect impacts of disposal and development, as well as conservation of public lands, under Alternative B would generally reflect the impacts to community resources described under Alternative A but on 2,315.7 rather than 370.8 acres of land. Substantially more land would be potentially developable under this alternative, although population and employment impacts are not expected to increase significantly; therefore, impacts to community resources would be expected to increase proportionate to additional acreage. Therefore, because implementation of Alternative B is not expected to contribute to population increases that would have a substantial adverse effect on community resources or services, there are not likely to be any significant impacts to the provision of police, fire, hospitals, or libraries.

TAXES AND REVENUES

Under Alternative B, 2,315.7 acres would be available for disposal and potential development. Potential tax and revenue impacts under this alternative would include a proportional increase over Alternative A in property tax revenue generated because more acreage would be disposed of and potentially developable. An estimated $18.1 million in annual tax revenue could result if Alternative B is implemented and the 2,315.7 acres are developed (see Table 4.13-5). Therefore, implementation of Alternative B is expected to result in a direct, beneficial impact to taxes and revenues in Clark County; this revenue could be used to support and fund new area infrastructure.

ECONOMIC ENVIRONMENT

Impacts to gaming and tourism under Alternative B would be similar to those described under Alternative A. Although there would be less acreage preserved for the CTA under this alternative, additional opportunities for non-motorized recreation would be emphasized.

Land development activities associated with disposal of BLM land are expected to generate positive economic benefits in the area. Benefits would result from increased residential development from construction spending in the county. At full build-out, development of the 2,315.7 acres has the potential to generate an additional $45.12 million annually in construction spending (see Table 4.13-5) and an additional $28.31 million annually in other commercial expenditures (BLM 2004a). This would be an increase of 0.51% over the 2006 GDP for the construction industry in the Las Vegas–Paradise metropolitan statistical area (BEA 2008).

Mitigation Measures and Unavoidable Adverse Impacts

Significant impacts to the Cities of Las Vegas and North Las Vegas, as well as utility groups, would be similar to those discussed under Alternative A. No additional unavoidable adverse impacts would occur

under Alternative B. In addition, no mitigation measures have been proposed to minimize any adverse impacts experienced under this alternative.

4.13.6 Alternative C

Actions Proposed under Alternative C that Would Cause Change to Existing Socioeconomic Resources

Under Alternative C, 6,960.9 acres of land would be available for development by the Cities of Las Vegas and North Las Vegas, and 6,362.3 acres would be preserved as the CTA and would be unavailable for development.

Direct and Indirect Impacts

COMMUNITY PERCEPTIONS

Under Alternative C, development along both the northern and southern boundaries of the LVV would be permitted. Under this alternative, the disposal of more acreage for potential development is likely to result in a direct, positive impact to the cities, utilities, and developers.

Direct, adverse impacts to the Paiute Tribe, educational institutions, and community resource groups would occur, as the protection of natural resources is less under this alternative than under Alternatives A or B. Impacts are expected to be minor, as there would still be an emphasis on protection of natural resources, but there would be added deference to accommodating needed development and recreation infrastructure.

POPULATION AND DEMOGRAPHICS

Under Alternative C, it is expected that approximately 169,150 individuals will occupy developable disposal lands at build-out (see Table 4.13-2). Impacts from an increase in population will remain consistent with those discussed under Alternative A.

EMPLOYMENT

Under Alternative C, it is expected that between 32,006 and 47,473 new employment opportunities would result at total build-out in 2045. This would result in an overall employment increase of 9.1% to 13.5% (see Table 4.13-3). Based on the significance criteria, this alternative would result in an overall increase in employment within the disposal boundaries. A negligible, indirect impact may occur as a result of fewer potential workers because of more limited developable land. It is expected that those potential jobs would shift to other areas in the LVV where economic opportunities still exist.

COMMUNITY RESOURCES

The direct and indirect impacts of disposal and development, as well as conservation of public lands under Alternative C, would have similar effects on community resources as those described under Alternative A, but with proportional differences as a result of different acreages in the developed and undeveloped areas. Therefore, as with Alternatives A and B, implementation of Alternative C is not expected to contribute to population increases that would have a substantial adverse effect on community resources or services. Therefore, there are not likely to be any significant impacts to the provision of police, fire, hospitals, or libraries.

TAXES AND REVENUES

Under Alternative C, 6,960.9 acres would be available for disposal and potential development. Implementation of this alternative would result in an increase in potential taxes and revenues, compared with current conditions. More land would be disposed of and potentially developed, so impacts to taxes and revenues under this alternative would include a proportional increase over Alternative A. An estimated $54.5 million in annual tax revenue could result if Alternative C is implemented and the 6,961.9 acres are developed (see Table 4.13-5). Therefore, implementation of Alternative C is expected to result in a direct, beneficial impact to taxes and revenues in Clark County; this revenue could be used to support and fund new area infrastructure.

ECONOMIC ENVIRONMENT

Impacts to gaming and tourism under Alternative C would be similar to those described under Alternatives A and B; however, there would be fewer opportunities for recreation under this alternative because more land would be disposed of and potentially developed.

Land development activities associated with disposal of BLM land are expected to generate positive economic benefits in the area. Benefits would result from increased residential development from construction spending in the county. At full build-out, development of the 6,960.9 acres has the potential to generate an additional $135.6 million annually in construction spending (see Table 4.13-5) and an additional $85.1 million annually in other commercial expenditures (BLM 2004a). This would be an increase of 1.53% over the 2006 GDP for the construction industry in the Las Vegas–Paradise metropolitan statistical area (BEA 2008).

Mitigation Measures and Unavoidable Adverse Impacts

Under Alternative C, no unavoidable adverse impacts to economic sectors and employment would occur. In addition, no mitigation measures have been proposed to offset impacts associated with this alternative.

4.13.7 Alternative D

Actions Proposed under Alternative D that Would Cause Change to Existing Socioeconomic Resources

Under Alternative D, 8,022.7 acres of land would be available for development by the Cities of Las Vegas and North Las Vegas, and 5,301.4 acres would be preserved as the CTA.

Direct and Indirect Impacts

COMMUNITY PERCEPTIONS

Under Alternative D, impacts would be similar to those under Alternative C but to a greater degree. Developers, cities, and utilities would obtain the most direct benefit under this alternative, while the Paiute Tribe, educational institutions, preferred groups, and resource groups would experience an overall increase in direct, adverse impacts to their community's values.

POPULATION AND DEMOGRAPHICS

Under Alternative D, it is expected that approximately 194,952 individuals will occupy developable disposal lands at build-out (see Table 4.13-2). Impacts as a result of population changes would remain consistent with those discussed in Alternative A.

EMPLOYMENT

Under Alternative D, it is expected that between 36,888 and 54,715 new employment opportunities would result at total build-out in 2045. This would result in an overall employment increase of 10.5% to 15.6% (see Table 4.13-3). Based on the significance criteria, this alternative would result in an overall increase in employment within the disposal area. Therefore, no adverse impacts to employment are expected to occur under this alternative. Impacts are likely to be beneficial for cities and future residents who move to the area.

COMMUNITY RESOURCES

The direct and indirect impacts of disposal and development, as well as conservation of public lands under Alternative D, would have similar effects on the crime rate as those described for Alternatives A–C but with proportional differences in crime as a result of different acreages in the developed and undeveloped areas.

Direct and indirect impacts to public facilities and services, educational and health care facilities, and public safety under Alternative D would be similar to those described under the other action alternatives. However, these impacts would be expected to proportionately increase as developable area increases and preservation areas decrease.

Direct and indirect impacts to utilities under Alternative D would be similar to those described for Alternatives A–C. Impacts to utilities would increase as development density increases. Alternative D would result in the disposal and potential development of 8,022.70 acres, in contrast to the 370.80 acres available for disposal under Alternative A.

TAXES AND REVENUES

Under Alternative D, approximately 8,022.7 acres would be available for disposal and potential development. Implementation of this alternative would result in an increase in potential taxes and revenues over current conditions. Additionally, because more land would be disposed of and potentially developed, impacts to taxes and revenues under this alternative would include a proportional increase over Alternatives A and C. At full build-out, an estimated $62.8 million in annual tax revenue could result if Alternative D is implemented and the 8,022.7 acres are developed (see Table 4.13-5). Therefore, implementation of Alternative D is expected to result in a direct, beneficial impact to taxes and revenues in Clark County; this revenue could be used to support and fund new area infrastructure.

ECONOMIC ENVIRONMENT

Impacts to gaming and tourism under Alternative D would be similar to those described under the other action alternatives; however, there would be fewer opportunities for recreation under this alternative because more land would be disposed of and potentially developed.

Land development activities associated with disposal of BLM land are expected to generate positive economic benefits in the area. Benefits would result from increased residential development from construction spending in the county. At full build-out, development of the 8,022.7 acres has the potential

to generate an additional $156.3 million annually in construction spending (see Table 4.13-5) and an additional $98 million annually in other commercial expenditures (BLM 2004a). This would be an increase of 1.77% over the 2006 GDP for the construction industry in the Las Vegas–Paradise metropolitan statistical area (BEA 2008).

Mitigation Measures and Unavoidable Adverse Impacts

Under Alternative D, no unavoidable adverse impacts to socioeconomics are expected to occur. In addition, no specific mitigation measures are proposed to offset any adverse impacts associated with this alternative.

4.13.8 Alternative E

Actions Proposed under Alternative E that Would Cause Change to Existing Socioeconomic Resources

Under Alternative E, 10,010.3 acres of land would be available for development by the Cities of Las Vegas and North Las Vegas, and 3,313.8 acres would be preserved as the CTA. Development of disposed acreage could include construction of homes, commercial development, open space, roads and utilities, and other city infrastructure.

Direct and Indirect Impacts

COMMUNITY PERCEPTIONS

Under Alternative E, community perceptions would be similar to those for Alternative D, but to a greater degree. It is expected that resource groups would experience direct, adverse impacts to their community's values, as there would be limitations placed on the protection of natural resources.

POPULATION AND DEMOGRAPHICS

Under Alternative E, it is expected that approximately 243,250 individuals will occupy developable disposal lands at build-out (see Table 4.13-2). Impacts resulting from the population increase will remain consistent with those discussed under Alternative A.

EMPLOYMENT

Under Alternative E, it is expected that between 46,027 and 68,270 new employment opportunities would result at total build-out in 2045. This would result in an overall employment increase of 13.1% to 19.4% (see Table 4.13-3). Based on the significance criteria, this alternative would result in an overall increase in employment within the disposal area. Therefore, no adverse impacts to employment are expected to occur under this alternative. This would be a direct, positive impact for the cities and future residents of the area.

COMMUNITY RESOURCES

The direct and indirect impacts of disposal and development, as well as conservation of public lands under Alternative E, would have similar effects on the crime rate as those described under Alternatives A–D, but with proportional differences in crime as a result of different acreages in the developed and undeveloped areas.

Direct and indirect impacts to public facilities and services, educational and health care facilities, and public safety under Alternative E would be similar to those described under the other action alternatives. However, these impacts would be expected to proportionately increase as developable area increases and preservation areas decrease.

Direct and indirect impacts to utilities under Alternative E would be similar to those described under the other action alternatives. Impacts to utilities would increase as development density increases; Alternative E would result in an increase in developable land (10,010.30 acres), compared with Alternative A (370.80 acres).

TAXES AND REVENUES

Under Alternative E, approximately 10,010.3 acres would be available for disposal and potential development. Implementation of this alternative would result in an increase in potential taxes and revenues over current conditions. Additionally, because more land would be disposed of and potentially developed, impacts to taxes and revenues under this alternative would include a proportional increase over Alternatives A–D. At full build-out, an estimated $79.1 million in annual tax revenue could result if Alternative E is implemented and the 10,010.3 acres are developed (see Table 4.13-5). Therefore, implementation of Alternative E could result in a direct, beneficial impact to taxes and revenues in Clark County.

ECONOMIC ENVIRONMENT

Impacts to gaming and tourism under Alternative E would be similar to those described under Alternatives A and C; however, there would be fewer opportunities for recreation under this alternative because more land would be disposed of and potentially developed.

Land development activities associated with disposal of BLM land are expected to generate positive economic benefits in the area. The benefits of increased construction spending would result from increased residential development in the county. At full build-out, development of the 10,010.3 acres has the potential to generate an additional $196.9 million annually in construction spending (see Table 4.13-5) and an additional $123.5 million annually in other commercial expenditures (BLM 2004a). This would be an increase of 2.22% over the 2006 GDP for the construction industry in the Las Vegas–Paradise metropolitan statistical area (BEA 2008).

Mitigation Measures and Unavoidable Adverse Impacts

Under Alternative E, it is likely that resource groups and other stakeholders intent on maximum protection of resource would consider Alternative E an unavoidable adverse impact, given the community perceptions related to resource preservation and protection. No mitigation measures have been proposed to lessen the effect of the impacts associated with this alternative. Thus, impacts are considered significant.

4.13.9 No-Action Alternative

Actions Proposed under the No-Action Alternative that Would Cause Change to Existing Socioeconomic Resources

Under the No-Action Alternative, 12,174.5 acres of land would be available for development by the Cities of Las Vegas and North Las Vegas, representing the highest developable acreage that would be made

available, compared with the other alternatives. A total of 1,448.2 acres would be preserved and would be unavailable for development. Development of disposed acreage could include construction of homes, commercial development, open space, roads and utilities, and other city infrastructure.

Direct and Indirect Impacts

COMMUNITY PERCEPTIONS

Impacts under the No-Action Alternative would be similar to those under Alternative E but to a greater degree. Groups who have expressed interest in maximum protection would experience an overall direct, adverse impact, given their community perceptions and values as a result of the No-Action Alternative.

POPULATION AND DEMOGRAPHICS

Under the No-Action Alternative, it is expected that approximately 295,840 individuals would occupy developable disposal lands at build-out (see Table 4.13-2). Impacts resulting from the increase in population would remain consistent with those discussed in Alternative A, as the change in rate of population growth is expected to occur independent of any changes in the disposal boundaries.

EMPLOYMENT

Under the No-Action Alternative, it is expected that between 55,866 and 82,863 new employment opportunities would result at total build-out in 2045; this would result in an overall employment increase of 15.9% to 23.6% (see Table 4.13-3). Based on the significance criteria, this alternative would result in an overall increase in employment within the disposal boundary. Therefore, no adverse impacts to employment are expected to occur under this alternative. This would be a direct, beneficial impact for the cities and future residents to the area.

COMMUNITY RESOURCES

The No-Action Alternative would provide the most acreage available for disposal, and ultimately development, allowing for the disposal of 12,174.5 acres. Direct impacts would include an increase in dwelling units in both cities. Indirect impacts could occur as a result of the loss of potential housing on the acres of undevelopable land.

Additionally, the conversion of large tracts of land to private development is seen by some as industrialization and a diminishment of the characteristics they value in the LVV: natural beauty, quiet, vast reaches of unpopulated and undeveloped open space, fresh air, and wildlife. Therefore, the loss of open space as an amenity could be a direct impact resulting from implementation of the No-Action Alternative.

Direct and indirect impacts to the crime rate, public facilities and services, educational and health care facilities, and public safety under Alternative D would be similar to those described under the other alternatives. However, these impacts would be expected to proportionately increase as the developable area increases and the preservation area decreases.

Direct and indirect impacts to utilities under the No-Action Alternative would be similar in scale to those described under the other action alternatives. Impacts to utilities would increase as development density increases; the No-Action Alternative would result in an increase in developable land (12,174.5 acres), compared with Alternative A (370.8 acres).

TAXES AND REVENUES

Under the No-Action Alternative, approximately 12,174.5 acres would be available for disposal and potential development. Implementation of this alternative would result in the largest increase in potential taxes and revenues over current conditions because the No-Action Alternative includes disposal of the largest amount of acreage of the six alternatives. At full build-out, an estimated $95.1 million in annual tax revenue could result if the No-Action Alternative is implemented and the 12,174.5 acres are developed (see Table 4.13-5). Therefore, implementation of the No-Action Alternative is expected to result in a direct, beneficial impact to taxes and revenues in Clark County; this revenue could be used to support and fund new area infrastructure.

ECONOMIC ENVIRONMENT

Impacts to gaming and tourism under the No-Action Alternative would be similar to those under the other alternatives. However, there would be fewer opportunities for recreation under this alternative because more land would be disposed of and potentially developed, and less land than under the other action alternatives would be available for conservation and recreation.

Land development activities associated with disposal of BLM land are expected to generate positive economic benefits in the area. Benefits would result from increased residential development from construction spending in Clark County. At full build-out, development of the 12,174.5 acres has the potential to generate an additional $236.8 million annually in construction spending (see Table 4.13-5) and an additional $148.5 million annually in other commercial expenditures (BLM 2004a). This would be an increase of 2.67% over the 2006 GDP for the construction industry in the Las Vegas–Paradise metropolitan statistical area (BEA 2008).

Mitigation Measures and Unavoidable Adverse Impacts

Under the No-Action Alternative, it is likely that resource groups and other stakeholders intent on maximum protection of natural resource would consider the No-Action Alternative an unavoidable adverse impact to community perceptions related to resource preservation and protection. No mitigation measures have been proposed to lessen the effect of the impacts associated with this alternative. Thus, the impact is considered significant.

4.14 CUMULATIVE IMPACTS

The CEQ regulations that implement NEPA [42 USC 4321 *et seq.*] require an assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” [40 CFR 1508.7]. Cumulative impacts are considered for both the No-Action and action alternatives.

Cumulative impacts were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions in the vicinity of the CTA study area and, if applicable, the surrounding region. The projects and/or uses listed in Table 4.14-1 were identified for the purpose of conducting the cumulative effects analysis.

Table 4.14-1. Actions Considered for Cumulative Impacts Analysis

Action	Description	Area of Impact	Resources Impacted	Status
Land Development	The LVVDB FEIS assumed approximately 5,000 acres (private and lands sold by BLM) a year would continue to be developed in the LVV through 2018. This was based on development trends throughout Clark County from 1970–2003.	Clark County	All (indirect)	Past, present, and future
Flood Control Channels and Detention Basins	CCRFCD is working to construct and operate additional flood control facilities throughout the LVV.	LVV	Hydrology Earth resources Biological resources Socioeconomics Public safety Visual resources	Past, present, and future
Kern River Pipeline	The Kern River Gas Transmission Company proposes to continue to expand its pipeline system to meet increasing demand.	Utah Nevada California	All	Present and future
SNWA Water Conservation Measures	SNWA is working with local municipalities to achieve more rigorous conservation goals and to implement its *Drought Plan* (SNWA 2007).	Southern Nevada	Hydrology Socioeconomics Recreation	Present and future
Development of Clark County Shooting Park	Clark County is preparing to develop facilities on approximately 900 acres (of the 2,900-acre area) for a recreational shooting park.	LVV	Socioeconomics Recreation Hydrology Hazardous materials	Present
Development of McCool Park	The City of North Las Vegas plans to further develop 80 acres of the 160-acre R&PP Act regional park to include sports fields, picnic sites, playgrounds, lighting, and other amenities.	LVV	Socioeconomics Recreation Hydrology Hazardous materials Cultural resources Paleontological Resources	Present
Protection, Restoration, and Enhancement Projects in the Eglington Preserve	BLM is working cooperatively with the City of North Las Vegas and The Nature Conservancy to protect, restore, and enhance important wash/aquatic systems in Eglington Preserve.	LVV	Hydrology Biological resources Earth resources Recreation	Present
Sheep Mountain Parkway	NDOT, the Federal Highway Association, Clark County, the Nevada RTC, and the Cities of Las Vegas and North Las Vegas have proposed a 550-foot-wide multimodal transportation corridor that provides a link from the Las Vegas Beltway (Interstate 215) to U.S. Highway 95, continuing eastward to link with Interstate 15.	Clark County	All	Future
NV Energy ROW	NV Energy proposes to develop various ROWs throughout the LVV.	LVV	All	Future
West Wide Corridor Designations	Energy corridors are to be designated on federal lands across 11 western states (including Nevada) for the purpose of oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities.	Western U.S.	All (indirect)	Future
Comprehensive Conservation Plan for Desert National Wildlife Refuge	A Comprehensive Conservation Plan is currently being developed for the Desert National Wildlife Complex, which includes the 1.5-million-acre DNWR to the north of the CTA study area.	North Las Vegas Valley	Biological resources Recreation Visual resources	Future
SNWA Pipeline	SNWA proposes to develop a pipeline system for the purpose of transporting groundwater from eastern Nevada to meet growing water demands in the LVV.	Eastern and southern Nevada	All	Future
Open Space and Recreational Trail Development	A variety of recreational trails and open space parks are under development or proposed for development throughout the LVV.	LVV	All	Past, present, and future

Table 4.14-1. Actions Considered for Cumulative Impacts Analysis (Continued)

Action	Description	Area of Impact	Resources Impacted	Status
Floyd Lamb Park Improvements	The City of Las Vegas plans to improve core park facilities, construct a new visitor center and museum, develop facilities for passive recreation activities, and provide for land conservation, historic preservation, and environmental education within the park and adjacent R&PP Act leased lands in the CTA study area.	LVV	All	Future
Solar Energy Development	There are currently as many as 60 proposals for development of solar energy generation facilities in southern Nevada.	Nevada Southwest	All	Future
Expansion of the disposal boundary	Expansion of the LVVDB north along U.S. Highway 95 but south of the ULVW, as suggested by the City of Las Vegas. This type of expansion would require Congressional action.*	Northwest of current disposal boundary	All	Future

* City of Las Vegas (2007d).

4.14.1 Earth Resources

In consideration of past, present, and reasonably foreseeable projects, the actions common to all the alternatives would not have cumulatively considerable impacts related to geological hazards, mineral resources, or soils. Existing regulations and building practices would minimize potential adverse effects involving potential geological hazards on both an individual project basis and a cumulative basis. Implementation of the common actions would contribute to erosion and sedimentation rates in the CTA study area and in downstream reaches of the ULVW; however, as indicated in the hydrologic modeling discussed in Section 4.3, “Water Resources,” which considers future conditions in the watershed, the cumulative effect is not expected to be significant. According to the USU (2008a) soils study, the plants of interest occur primarily in spring and basin floor deposits; therefore, cumulative impacts that could degrade these habitats must be mitigated.

Existing regulations pertaining to water quality would minimize any individually or cumulatively significant adverse effects resulting from the construction of new road alignments and utilities.

Alternative A

Cumulative impacts involving geological hazards would not be significant under Alternative A. In combination with other past, present, and reasonably foreseeable projects, implementation of this alternative would have minor impacts related to geological hazards, mineral resources, and soils. Existing regulations and building practices would minimize potential adverse effects involving potential geological hazards on both an individual project basis and a cumulative basis.

Implementation of this alternative would contribute to increased erosion and sedimentation rates in the CTA study area and in downstream reaches of the ULVW; however, as indicated in the hydrologic modeling discussed in Section 4.3, “Water Resources,” which looks at future conditions in the watershed, the cumulative effect is not expected to be significant.

Alternative B

As discussed under Alternative A, cumulative impacts involving geological hazards and mineral resources would not be significant under this alternative. Existing regulations and building practices

would minimize potential adverse effects involving potential geological hazards on both an individual project basis and a cumulative basis.

Implementation of this alternative would contribute to increased erosion and sedimentation rates in the CTA study area and in downstream reaches of the ULVW. Mitigation described below would address project-specific impacts, as well as cumulative erosion and sedimentation issues.

Alternative C

As discussed under Alternative A, cumulative impacts involving geological hazards would not be significant under this alternative. Existing regulations and building practices would minimize potential adverse effects involving potential geological hazards on both an individual project basis and a cumulative basis.

Implementation of this alternative would contribute to increased erosion and sedimentation rates in the CTA study area and in downstream reaches of the ULVW. Mitigation below would address project-specific impacts, as well as cumulative erosion and sedimentation issues.

Alternative D

As discussed under Alternative A, cumulative impacts involving geological hazards would not be significant under this alternative. Existing regulations and building practices would minimize potential adverse effects involving potential geological hazards both on an individual project basis and on a cumulative basis.

Implementation of this alternative would contribute to increased erosion and sedimentation rates in the CTA study area and in downstream reaches of the ULVW. Mitigation described below would address project-specific impacts, as well as cumulative erosion and sedimentation issues.

Alternative E

As discussed under Alternative A, cumulative impacts involving geological hazards would not be significant under this alternative. Existing regulations and building practices would minimize potential adverse effects involving potential geological hazards on both an individual project basis and a cumulative basis.

Implementation of this alternative would contribute to increased erosion and sedimentation rates in the CTA study area and in downstream reaches of the ULVW. Mitigation described below would address project-specific impacts, as well as cumulative erosion and sedimentation issues.

No Action

As discussed under Alternative A, cumulative impacts involving geological hazards would not be significant under this alternative. Existing regulations and building practices would minimize potential adverse effects involving potential geological hazards on both an individual project basis and a cumulative basis.

Implementation of this alternative would have the greatest contribution to increased erosion and sedimentation rates in the CTA study area and in downstream reaches of the ULVW. Mitigation described below would address project-specific impacts, as well as cumulative erosion and sedimentation issues.

4.14.2 Water Resources

In consideration of past, present, and reasonably foreseeable projects, the actions common to all of the alternatives would not have cumulatively significant impacts to surface water, groundwater, or water supply and demand. Surface and stream bank erosion and the 100-year floodplain are expected to remain similar to baseline conditions of the CTA.

Existing regulations pertaining to hazardous materials and water quality would minimize any individually or cumulatively significant adverse impacts resulting from the presence of an REC and the construction of new road alignments and utilities. Because no wells are proposed under any of the alternatives and there is little potential to encounter groundwater during construction activities within the disposed parcels, impacts to groundwater levels would not be cumulatively significant.

Alternative A

In consideration of past, present, and reasonably foreseeable projects, Alternative A would not have cumulatively significant impacts to surface water or groundwater. The amount of sediment loss resulting from surface and stream bank erosion is expected to mirror current conditions within the CTA study limits, and the 100-year floodplain and existing drainage would not be altered with the implementation of this alternative. As a result, no new flood control facilities or erosion control measures would be required under this alternative.

Existing regulations pertaining to hazardous materials and water quality would minimize any individually or cumulatively significant adverse impacts resulting from development within the disposed parcels. Because no wells are proposed under Alternative A and there is little potential to encounter groundwater during construction activities within the disposed parcels, impacts to groundwater levels would not be cumulatively significant.

Implementation of Alternative A would result in an incremental increase in water demand to accommodate development within the disposed parcels. Because the demand for water in the LVV continues to grow and supplies are uncertain, this increase, despite being minimal, could represent a cumulatively significant impact if SNWA cannot meet future projected water demands. SNWA, in cooperation with local municipalities, will continue its effort to achieve more rigorous conservation goals, will implement its *Drought Plan* (SNWA 2007), and will explore additional supply opportunities to help meet long-term demand within this region.

Alternative B

Cumulative impacts related to groundwater would not be significant for the same reasons as described under Alternative A. Implementation of the Preferred Alternative would result in an incremental increase in water demand to accommodate development of the disposed parcels. If the forecasted water shortfall cannot be met by the SNWA water portfolio (refer to Figure 3.3-2), the additional water requirements under the Preferred Alternative could contribute to a cumulative impact to water supply and demand. SNWA, in cooperation with local municipalities, will continue its effort to achieve more rigorous conservation goals, will implement its *Drought Plan* (SNWA 2007), and will explore additional supply opportunities to help meet long-term demands within this region.

Under the Preferred Alternative, stream bank erosion processes would increase incrementally within the CTA study area and in downstream reaches of the ULVW. The additional impervious surfaces and increased runoff from development would lead to a slightly larger floodplain, assuming no enlargement to

the existing flood control facilities or construction of new facilities. Mitigation measures would be required to reduce the cumulative erosion and hydrologic impacts.

Alternative C

Implementation of Alternative C would not have cumulatively significant impacts to groundwater for the same reasons as those described under Alternative A. In addition, the construction of a new detention basin within the CTA to address flood control needs would promote groundwater recharge. However, a new detention basin would alter existing flows and sediment transport within the wash, disrupting the natural flows and erosion processes. Existing regulations pertaining to hazardous materials and water quality would minimize any individually or cumulatively significant adverse impacts resulting from development within the disposed parcels.

Alternative C would result in an incremental increase in water demand to accommodate development within the disposed parcels. The increase represents a small percentage of future projected demands over the presumed 20-year build-out period. Because future water sources are undetermined, any increase in water requirements in the LVV could represent a cumulatively significant impact if SNWA cannot meet its projected demands. SNWA will continue its effort to achieve more rigorous conservation goals, will implement its *Drought Plan* (SNWA 2007), and will explore additional supply opportunities to help meet long-term demands within this region.

Alternative D

Because no wells are proposed under Alternative D and there is little potential to encounter groundwater during construction activities within the disposed parcels, cumulative impacts to groundwater levels would not be significant under Alternative D. In addition, the construction of a detention basin within the CTA to address flood control needs would promote groundwater recharge.

Existing regulations pertaining to hazardous materials and water quality would minimize any individually or cumulatively significant adverse impacts resulting from development within the disposal parcels.

Under Alternative D, there would be an incremental increase in water demand to accommodate development of the disposed parcels. If the forecasted shortfall cannot be met by the SNWA water portfolio, the additional water demand required under Alternative D could represent a cumulatively significant impact to water supply and demand. SNWA, in cooperation with local municipalities, will continue its effort to achieve more rigorous conservation goals, will implement its *Drought Plan* (SNWA 2007), and will explore additional supply opportunities to help meet long-term demands within this region.

Implementation of Alternative D would contribute to cumulative erosion and sedimentation processes within the CTA study area and in downstream reaches of the ULVW. Mitigation measures would be required to reduce the magnitude of cumulative erosion and sedimentation impacts.

Alternative E

Implementation of Alternative E would not have cumulatively significant impacts to groundwater for the same reasons as those described under Alternative A. In addition, the construction of a detention basin within the CTA to address flood control needs would promote groundwater recharge. Existing regulations pertaining to hazardous materials and water quality would minimize any individually or cumulatively significant adverse impacts resulting from development within the disposal parcels.

Implementation of Alternative E would contribute to cumulative erosion and sedimentation processes within the CTA study area and in downstream reaches of the ULVW. Mitigation measures would be required in order to reduce the magnitude of cumulative erosion and sedimentation impacts.

Alternative E would result in an increase in water demand to accommodate development within the disposed parcels. The incremental increase represents a small percentage of future projected demands over the presumed 20-year build-out period. Because future water sources are undetermined, however, any increase in water requirements in the LVV could represent a cumulatively significant impact if SNWA cannot meet projected demands. SNWA, in cooperation with local municipalities, will continue its effort to achieve more rigorous conservation goals, will implement its *Drought Plan* (SNWA 2007), and will explore additional supply opportunities to help meet long-term demands within this region.

No Action

Because no wells are proposed under the No-Action Alternative and there is little potential to encounter groundwater during construction activities within the disposed parcels, impacts to groundwater levels would not be cumulatively significant. Existing regulations pertaining to hazardous materials and water quality would minimize any individually or cumulatively significant adverse impacts resulting from development within the disposal parcels.

The No-Action Alternative would result in an increase in water demand to accommodate development within the disposed parcels. If the forecasted shortfall cannot be met by the SNWA water portfolio, the additional water demand required under the No-Action Alternative could represent a cumulatively significant impact to water supply and demand. SNWA, in cooperation with local municipalities, will continue its effort to achieve more rigorous conservation goals, will implement its *Drought Plan* (SNWA 2007), and will explore additional supply opportunities to help meet long-term demands within this region.

Implementation of the No-Action Alternative would have a cumulatively significant impact to erosion and sedimentation within the CTA study area and in downstream reaches of the ULVW. Mitigation measures would be required in order to reduce the magnitude of cumulative erosion and sedimentation impacts.

4.14.3 Vegetation

Alternative A

The cumulative impact assessment area considered for general vegetation resources includes the CTA study area and adjacent northern LVV vegetation communities. The cumulative impact assessment area considered for sensitive plants includes all available species' habitat in the LVV. This section describes impacts to vegetation resources within their cumulative impact assessment area resulting from the combination of this project and unrelated past, present, and reasonably foreseeable future projects in the area. These past, present, and future actions were or will be analyzed on a site-specific basis to determine their impact to vegetation resources (see Table 4.14-1).

Past actions that have directly impacted vegetation resources in the cumulative impact assessment area boundary include housing and industrial development, the construction of flood control facilities and detention basins, and the development of transmission lines, which have resulted in vegetation removal and habitat fragmentation. Approximately 5,000 acres a year has been developed in the LVV from 1970 to 2003 (165,000 acres). The BLM estimates that past actions have removed up to 80% of known habitat for Las Vegas buckwheat and Las Vegas bearpoppy in the LVV (BLM 2004a). Designation of the 1.5-

million-acre DNWR adjacent to the CTA study area has resulted in the preservation of a large tract of vegetation resources.

Present actions that have resulted in adverse impacts from the direct removal and fragmentation of vegetation resources consist of private development on up to 1,200 acres in the vicinity of the CTA study area, development of up to 900 acres for the Clark County Shooting Park, and development of the 5-acre Grand Teton power substation. Beneficial impacts from restoration and enhancement activities on up to 300 acres are occurring from current projects in Eglington Preserve. Projects leading to these beneficial impacts have included fencing, signing, increased monitoring, weed removal, trash removal, and site-specific revegetation.

Future actions that may result in direct, adverse impacts to general vegetation from vegetation loss and habitat fragmentation are related primarily to private development and growth in the LVV. These actions include development of gas pipelines, water pipelines, solar power plants, and master-planned communities, including development on the Paiute Reservation. Based on the 5,000-acre-per-year historic development estimate, approximately 50,000 acres would be developed through 2018. Development of individual solar energy projects would result in the loss of large tracts of undeveloped land in southern Nevada outside the disposal boundary. Other actions consist of park improvements within the 680 acres of Floyd Lamb Park (City of Las Vegas 2007a). Park improvements are anticipated to have a beneficial impact by improving visitor and educational facilities.

New development under Alternative A, when added to past, present, and reasonably foreseeable future actions, consists of both temporary and permanent removal of vegetation and habitat fragmentation. Under this alternative, actions would contribute up to 133.7 acres of general vegetation removal, or less than 1% of the cumulative vegetation removed from past, present, and reasonably foreseeable future actions (up to 217,000 acres). Under this alternative, construction activities would not contribute to a cumulative loss of buckwheat and bearpoppy habitat. Additionally, the preservation of 12,952.5 acres under this alternative, when added to approximately 1,000 acres of other beneficial projects as well as the adjacent 1.5-million-acre DNWR, would contribute to maintaining a large, continuous tract of vegetation, including buckwheat and bearpoppy habitat, along the ULVW. This ensures that adequate habitat for these species would be preserved in the study area.

Alternative B

The impacts to vegetation and BLM special-status and State of Nevada protected plant species from past, present, and reasonably foreseeable future actions would be the same as those described under Alternative A. Cumulative impacts to vegetation under this alternative would be similar to those identified for Alternative A but would differ in terms of the amount of vegetation removed and the amount of land preserved.

The impacts of construction activities under Alternative B, when added to past, present, and reasonably foreseeable future actions, consist of both temporary and permanent removal of vegetation and habitat fragmentation. Under this alternative, impacts to buckwheat habitat would be mitigated and would not contribute to any cumulative loss of habitat; 3.7 acres of high potential bearpoppy habitat would be lost to development actions outside the alternative boundary. Additionally, the preservation of 10,686.4 acres, including buckwheat and bearpoppy habitat, under this alternative, when added to 1,000 acres of other beneficial projects as well as the 1.5-million-acre DNWR, would contribute to maintaining a continuous tract of vegetation along the ULVW and adjacent uplands. This large tract would contribute toward maintaining adequate habitat for these species in the study area.

Alternative C

The impacts to vegetation and BLM special-status and State of Nevada protected plant species from past, present, and reasonably foreseeable future actions would be the same as those described under Alternative A. Under this alternative, construction activities would contribute up to 573.0 acres of permanent general vegetation removal to cumulative impacts. Additionally, private development on lands outside the alternative boundary would contribute up to 7,260.4 acres of permanent general vegetation removal to cumulative impacts. This loss of vegetation and fragmentation of habitat would be an adverse impact and would contribute 4% to a cumulative loss of up to 224,800 acres of vegetation habitat. The preservation of 5,789.3 acres under this alternative, when added to 1,000 acres of other beneficial projects, would contribute toward maintaining a continuous tract of vegetation along the ULVW but not adjacent uplands. The Alternative C boundary would not be directly adjacent to the 1.5-million-acre DNWR.

Under this alternative, 2.0 acres of moderate potential buckwheat habitat would be removed as a result of development actions outside the alternative boundary and 7.1 acres of high potential bearpoppy habitat would be lost to development actions outside the alternative boundary. This loss of habitat would be an adverse impact and would contribute to a cumulative loss of more than 80% of known buckwheat and bearpoppy habitat.

Alternative D

The impacts to vegetation and BLM special-status and State of Nevada protected plant species from past, present, and reasonably foreseeable future actions would be the same as those described under Alternative A. The loss of vegetation and fragmentation of habitat would be an adverse impact and would contribute more than 4% to a cumulative loss of more than 225,755 acres of vegetation habitat. The preservation of 4,668.5 acres under this alternative, when added to the 1,000 acres of other beneficial projects, would contribute to the preservation and enhancement of tracts of vegetation along the ULVW but not to adjacent uplands. The Alternative D boundary would not be adjacent to the 1.5-million-acre DNWR.

Under this alternative, 1.3 acres of moderate-potential buckwheat habitat would be removed as a result of development actions outside the alternative boundary, and 3.2 acres of high-potential bearpoppy habitat would be lost to development actions outside the alternative boundary. This loss of habitat would be an adverse impact and would contribute to a cumulative loss of more than 80% of known buckwheat and bearpoppy habitat.

Alternative E

The impacts to vegetation and BLM special-status and State of Nevada protected plant species from past, present, and reasonably foreseeable future actions would be the same as those described under Alternative A. The impacts of new development under Alternative E, when added to past, present, and reasonably foreseeable future actions, would be similar to those described under Alternative C and would consist of both temporary and permanent removal of vegetation and habitat fragmentation. This loss of vegetation and fragmentation of habitat would be an adverse impact and would contribute 5% to a cumulative loss of 227,445 acres of vegetation habitat. The preservation of 2,978.8 acres under this alternative, when added to other beneficial projects, would be a minor contribution to the preservation of vegetation within the active portions of the ULVW but not to adjacent uplands. Because the alternative boundary is not continuous, acres preserved would contribute to the fragmentation of vegetation communities along the ULVW.

Under this alternative, 32.7 acres of moderate-potential and 3.1 acres of high-potential buckwheat habitat would be removed as a result of development actions outside the alternative boundary, and 684.9 acres of

moderate-potential and 3.2 acres of high-potential bearpoppy habitat would be lost to development actions outside the alternative boundary. This loss of habitat would be an adverse impact and would be a significant contribution to cumulative losses of more than 85% of known buckwheat and bearpoppy habitat.

No Action

The impacts to vegetation and BLM special-status and State of Nevada protected plant species from past, present, and reasonably foreseeable future actions would be the same as those described under Alternative A. The impacts of private development to lands outside the No-Action boundary, when added to past, present, and reasonably foreseeable future actions, would consist of the permanent removal of vegetation and habitat fragmentation. Under the No-Action Alternative, private development on lands outside the alternative boundary would contribute up to 12,174.5 acres of general vegetation removal to cumulative impacts. This loss of vegetation and fragmentation of habitat would be an adverse impact and would contribute 5% to cumulative losses of more than 229,275 acres of vegetation habitat. The preservation of 1,448.2 acres under this alternative, when added to the 1,000 acres of other beneficial projects, would not contribute to the preservation of vegetation within the active portions of the ULVW, nor to adjacent uplands.

Under this alternative, 0.7 acre of occupied, 3.1 acres of moderate-potential, and 3.6 acres of high-potential buckwheat habitat would be removed as a result of development actions outside the alternative boundary, and 1,250.0 acres of potential and 285 acres of occupied bearpoppy habitat would be lost to development actions outside Eglington Preserve and Tule Springs. This loss of habitat would be an adverse impact and would be a significant contribution to cumulative losses of approximately 90% of known habitat for both species.

4.14.4 Cultural Resources

The cumulative impact assessment area considered for cultural resources includes the CTA study area and areas immediately adjacent to the study area boundary. This section describes impacts to cultural resources within the cumulative impact assessment area resulting from the combination of this project with unrelated past, present, and reasonably foreseeable future projects in the area. These past, present, and future actions were or will be analyzed on a site-specific basis to determine their impact to cultural resources (see Table 4.14-1).

Past actions that have had direct and indirect adverse impacts to cultural resources in the cumulative impact assessment area boundary include housing and industrial development, the construction of flood control facilities and detention basins, and the development of transmission lines, which have resulted in direct surface and subsurface disturbances. There were 117 previously recorded sites on BLM land within the disposal boundary prior to a 2004 field survey. Additionally, undocumented cultural resources likely occur on both private lands within the disposal boundary and around the perimeter of the disposal boundary. Approximately 5,000 acres a year have been developed in LVV from 1970 to 2003 (165,000 acres).

Present actions that have resulted in the loss of documented and undocumented cultural resources consist of private development on up to 1,200 acres in the vicinity of the CTA study area and development of up to 900 acres for the Clark County Shooting Park.

Future actions that may result in direct, adverse impacts to cultural resources are related primarily to private development and growth in the LVV. These actions include development of gas pipelines, water pipelines, solar power plants, and master-planned communities, including development on the Paiute

Reservation. Based on the 5,000-acre-per-year historic development estimate, approximately 50,000 acres would be developed through 2018. Development of individual solar energy projects would result in the loss of large tracts of undeveloped land in southern Nevada outside the disposal boundary (the acreage of these areas is unknown at this time).

The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, consist of both direct and indirect adverse impacts to cultural resources. Construction activities that would occur under all alternatives would contribute to increased public visitation and use, which may result in trampling, illegal collection, trash dumping, vandalism, and digging at undocumented sites.

Alternative A

The impacts to cultural resources from past, present, and reasonably foreseeable future actions would be the same as those described under "Actions Common to all Alternatives." The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would consist of the loss of undocumented resources as a result of development and the loss of resource quality from increased public visitation, trampling, digging, dumping, and vandalism. The direct loss of cultural resources and resource quality would be an adverse impact and would contribute to the cumulative loss of cultural resources on up to 217,100 acres.

The preservation of 12,952.5 acres under this alternative, when added to the 300 acres preserved at Eglington Preserve and the 1.5 million acres of the DNWR, would contribute to the protection of undocumented cultural resources in a large block extending north of the LVV.

Alternative B

The impacts to cultural resources from past, present, and reasonably foreseeable future actions would be the same as those described under "Actions Common to all Alternatives." The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would consist of the loss of undocumented resources as a result of development and the loss of resource quality from increased public visitation, trampling, digging, dumping, and vandalism. The direct loss of cultural resources and resource quality would be an adverse impact and would contribute to the cumulative loss of cultural resources on up to 219,400 acres.

The preservation of 11,007.6 acres under this alternative, when added to the 300-acre Eglington Preserve and 1.5-million-acre DNWR, would contribute to the preservation of undocumented cultural resources in a large block extending north of the LVV.

Alternative C

The impacts to cultural resources from past, present, and reasonably foreseeable future actions would be the same as those described under "Actions Common to all Alternatives." The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would consist of the loss of undocumented resources as a result of construction activities associated with private development and the loss of resource quality from increased public visitation, trampling, digging, dumping, and vandalism. The direct loss of cultural resources and resource quality would be an adverse impact and would contribute to the cumulative loss of cultural resources on up to 224,360 acres.

The preservation of 6,362.3 acres under this alternative would contribute to the preservation of undocumented cultural resources along the ULVW but would not decrease the cumulative adverse impacts of increased private development surrounding the alternative boundary.

Alternative D

The impacts to cultural resources from past, present, and reasonably foreseeable future actions would be the same as those described under "Actions Common to all Alternatives." The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would consist of the loss of undocumented resources as a result of construction activities associated with private development and the loss of resource quality from increased public visitation, trampling, digging, dumping, and vandalism. The direct loss of cultural resources and resource quality would be an adverse impact and would contribute to the cumulative loss of cultural resources on up to 225,421 acres.

The preservation of 5,301.4 acres under this alternative would contribute to the protection of undocumented cultural resources along the ULVW but would not decrease the cumulative adverse impacts of increased private development surrounding the alternative boundary.

Alternative E

The impacts to cultural resources from past, present, and reasonably foreseeable future actions would be the same as those described under "Actions Common to all Alternatives." The adverse impacts of increased private development surrounding the alternative boundary, when added to past, present, and reasonably foreseeable future actions, would consist of the loss of undocumented cultural resources as a result of construction activities associated with private development and the loss of resource quality from increased public visitation, trampling, digging, dumping, and vandalism. The direct loss of cultural resources and resource quality would be an adverse impact and would contribute to the cumulative loss of cultural resources on up to 227,110 acres.

The preservation of 3,313.8 acres under this alternative would contribute to the preservation of undocumented cultural resources along the ULVW but would not decrease the cumulative adverse impacts of increased private development surrounding the alternative boundary.

No Action

The impacts to cultural resources from past, present, and reasonably foreseeable future actions would be the same as those described under the actions common to all alternatives. The adverse impacts of increased private development surrounding the alternative boundary, when added to past, present, and reasonably foreseeable future actions, would consist of the loss of undocumented cultural resources as a result of construction activities associated with private development and the loss of resource quality from increased public visitation, trampling, digging, dumping, and vandalism. The direct loss of cultural resources and resource quality would be an adverse impact and would contribute to the cumulative loss of cultural resources on up to 229,250 acres.

The preservation of 1,448.2 acres under this alternative would not contribute to the cumulative preservation of known or undocumented cultural resources along the ULVW.

4.14.5 Traditional Cultural Properties

Cumulative impacts may include increases in pollution resulting from additional vehicle traffic in the vicinity of the LVW or from an increase in litter from additional visitors (e.g., objects thrown from vehicle windows), which may subsequently impact the resources of the LVW. Easier access to the ULVW could result in unintended increases in OHV use, which could affect other resources, such as sensitive plants or sacred places, thus adversely affecting the serenity and cultural experience that is so important for tribal members who use the area.

4.14.6 Paleontology

Cumulative impacts can result from incrementally minor but collectively significant actions taking place over a period of time. The incremental loss of paleontological resources over time as a result of hydrologically or construction-related surface disturbance, vandalism, and unlawful collection would represent a significant cumulative adverse impact because it would result in the destruction of non-renewable paleontological resources and the associated irretrievable loss of scientific information regarding the paleoecology and paleoenvironments of the ULVW during the Pleistocene. The size of the CTA correlates directly with cumulative impacts to paleontological resources. The greater the area of the LVF and number of known fossil localities that are preserved within the CTA, the lower the amount of cumulative impacts in terms of the loss to science and society of the fossils and associated information.

Alternative A

The cumulative impact assessment area considered for paleontological resources includes the LVF. This section describes impacts to paleontological resources within the cumulative impact assessment area resulting from the combination of this project with unrelated past, present, and reasonably foreseeable future projects in the area. Although it is unknown how many paleontological sites have been impacted by past development in the LVV, future actions will be analyzed on a site-specific basis to determine their impact to resources (see Table 4.14-1).

Past actions that have directly impacted paleontological resources in the LVF include housing and industrial development, the construction of flood control facilities and detention basins, and development of transmission lines and roads, which have resulted in surface and subsurface disturbances.

Present actions that have resulted in adverse impacts from the direct disturbance of acreage in the LVF consist of development of access and infrastructure for the Clark County Shooting Park. Future actions that may result in direct, adverse impacts to paleontological resources are related primarily to private development and growth in the LVV. These actions include development of gas pipelines, water pipelines, and master-planned communities, including development on the Paiute Reservation. Other actions consist of park improvements within the 680 acres of Floyd Lamb Park (City of Las Vegas 2007a). Park improvements are anticipated to have a beneficial impact by improving visitor and educational facilities related to the fossil resources present in the area.

The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would result in a minor contribution to cumulative impacts to undocumented paleontological resources. Impacts from construction activities would be mitigated. Additionally, the preservation of 12,952.5 acres under this alternative would contribute to the overall preservation of all 436 known and undocumented paleontological resources throughout the LVF.

Alternative B

Impacts to paleontological resources from past, present, and reasonably foreseeable future actions would be the same as those under Alternative A. Cumulative impacts to impacts to paleontological resources under this alternative would be greater than under Alternative A yet would not be as severe as under the other alternatives, which preserve less land and provide less of a buffer for the LVF within the CTA.

The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would contribute to a greater loss of undocumented fossil localities as a result of surface-disturbing construction activities. Additionally, new recreation use and greater private development density surrounding the LVF would contribute to cumulative indirect impacts to fossils in the form of illegal collection, vandalism, and trampling.

The preservation of 10,686.4 acres, including all known fossil localities, under this alternative would contribute to the preservation of paleontological resources in the LVF. This would result in the long-term protection and interpretation of fossil resources present in the LVF.

Alternative C

Impacts to paleontological resources from past, present, and reasonably foreseeable future actions would be the same as those under Alternative A. The preservation of 6,362.3 acres does not include all known fossil localities under this alternative. Cumulative impacts to impacts to paleontological resources under this alternative would be greater than under Alternative A yet would not be as severe as under the other alternatives, which preserve less land and provide less of a buffer for the LVF within the CTA.

The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would contribute to the loss of undocumented fossil localities as a result of subsurface-disturbing construction activities.

Alternative D

Impacts to paleontological resources from past, present, and reasonably foreseeable future actions would be the same as those under Alternative A. The preservation of 5,301.4 acres does not include all known fossil localities under this alternative. Cumulative impacts to paleontological resources under this alternative would be greater than under Alternative A yet would not be as severe as under the other alternatives, which preserve less land and provide less of a buffer for the LVF within the CTA.

The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, consist of the loss of known and undocumented fossil localities as a result of surface-disturbing construction activities. Additionally, the increase in allowable private development surrounding the LVF would contribute to greater adverse indirect impacts to fossils in the form of illegal collection, vandalism, and trampling. New development would contribute cumulatively to significant adverse impacts from the loss of paleontological resources in the LVF.

Alternative E

Impacts to paleontological resources from past, present, and reasonably foreseeable future actions would be the same as those under Alternative A. The preservation of 3,313.8 acres does not include all known fossil localities under this alternative. Up to 118 known fossil localities would be lost under this alternative. Cumulative impacts to paleontological resources under this alternative would be greater than

under Alternative A yet would not be as severe as under the No-Action Alternative, which preserves less land and provides less of a buffer for the LVF within the CTA.

The impacts of private development under this alternative, when added to past, present, and reasonably foreseeable future actions, would contribute to the loss of 118 known fossil localities and the loss of undocumented fossil localities as a result of surface-disturbing construction activities. Additionally, the increase in private development surrounding the LVF would contribute to greater indirect, adverse impacts to fossils in the form of illegal collection, vandalism, and trampling. New development would contribute cumulatively to significant adverse impacts from the loss of paleontological resources in the LVF.

No Action

The impacts to paleontological resources from past, present, and reasonably foreseeable future actions would be the same as those under Alternative A. Cumulative impacts to paleontological resources under this alternative would be the greatest of all the alternatives because it would preserve the smallest acreage of LVF and smallest number of known fossil localities within the CTA. The preservation of 1,448.2 acres does not include all known fossil localities under this alternative. Under this alternative, there would be no contribution to the long-term protection and interpretation of fossil resources present in the LVF.

The impacts of private development under this alternative, when added to past, present, and reasonably foreseeable future actions, consist of the loss of 354 known fossil localities and the loss of undocumented fossil localities as a result of surface-disturbing construction activities. The largest increase in private development surrounding and overlapping the LVF and Tule Springs would contribute to greater indirect, adverse impacts to fossils in the form of illegal collection, vandalism, and trampling. These actions would contribute cumulatively to significant adverse impacts from the loss of paleontological resources in the LVF.

4.14.7 Visual Resources

Alternative A

To determine the cumulative effect of the alternatives of this SEIS on the visual resources, or landscapes, of public lands in the CTA, the analysis assumes that lands made available for disposal under each alternative would go into private ownership and potentially be developed as part of the growth of the Cities of Las Vegas and North Las Vegas. As disclosed above, lands that transfer into private ownership would be expected to be developed to a degree that will transform a predominantly natural or undeveloped setting into an urban setting composed of residential areas, commercial business, light industrial development, public facilities, and parks. Other development in and adjacent to the LVV would also contribute to the urban development of lands in and adjacent to the valley.

The LVVDB FEIS (BLM 2004a) assumed that about 5,000 acres of public lands would be sold by BLM for the growth of the valley and would be developed per year through 2018. Thus by 2018, an additional 50,000 acres would have been sold and developed. Following that assumption, this alternative would contribute cumulatively 370.8 acres (or < 1%) to that ultimate disposal and anticipated development of public lands in and adjacent to the valley and the conversion of a mostly undeveloped landscape to an urban landscape.

Alternative B

The disposal and potential development of public lands outside the CTA under Alternative B would have cumulative effects on the landscape that are similar to those described under Alternative A but on 2,315.7 acres, or about 5% of public lands in and adjacent to the LVV.

Alternative C

The disposal and potential development of public lands outside the CTA under Alternative C would have cumulative effects on the landscape that are similar to those described under Alternative A but on 6,960.9 acres, or about 14% of public lands in and adjacent to the entire LVV.

Alternative D

The disposal and potential development of public lands outside the CTA under Alternative D would have cumulative effects on the landscape that are similar to those described under Alternative A but on 8,022.7 acres, or about 16% of public lands in and adjacent to the entire LVV.

Alternative E

The disposal and potential development of public lands outside the CTA under Alternative E would have cumulative effects on the landscape that are similar to those described under Alternative A, but on 10,010.3 acres, or about 20% of public lands in and adjacent to the entire LVV.

No Action

The disposal and potential development of public lands outside the CTA under the No-Action Alternative would have cumulative effects on the landscape that are similar to those described under Alternative A but on 12,174.5 acres, or about 24% of public lands in and adjacent to the entire LVV.

4.14.8 Land Uses

Alternative A

The SNPLMA, as amended by the Clark County Act, authorized BLM to dispose of about 74,000 acres of public land in the LVV for the growth of communities in the valley (BLM 2004a). Many lands have already been sold or made available for public purposes through the R&PP Act, and the LVVDB FEIS (BLM 2004a) authorized the sale of the remaining 46,701 acres. Other development in and adjacent to the LVV would also contribute to the use and development of lands in and adjacent to the LVV. The development includes stormwater runoff control structures, water pipelines, gas pipelines, electric transmission lines, parks, roads and parkways, utility corridors, solar energy development, and development on the Paiute Reservation (see Table 4.14-1). The LVVDB FEIS (BLM 2004a) assumed about 5,000 acres of public lands would be sold by BLM for the growth of the valley and would be developed per year through 2018. Thus, by 2018, an additional 50,000 acres would have been sold and developed. Following that assumption, this alternative would contribute cumulatively 370.8 acres (or < 1%) to that ultimate disposal and anticipated use of public lands in and adjacent to the LVV.

Local outdoor recreation areas in proximity to the LVV offer about 1,495,664 acres for a variety of recreation opportunities (BLM 1998a). These recreation areas include Red Rock Canyon NCA, Sloan Canyon NCA, Frenchman/Sunrise Mountain Natural Area, Nellis Dunes Recreation Area, DNWR, Spring

Mountain NRA, Floyd Lamb Park, Spring Mountain Ranch State Park, and Lake Mead NRA. Development of the Clark County Shooting Park would add another 2,880 acres of outdoor recreation opportunities.

Alternative B

The cumulative impacts of disposal of public lands under Alternative B would have effects on development and land uses that are similar to those under Alternative A, but for 2,315.7 acres, or about 5% of public lands available for disposal in the LVV.

The cumulative effect of management of the CTA for recreation, education, and research would be similar to that described under Alternative A but for 11,007.6 acres, or 0.7% of the lands available for these uses in proximity to the LVV.

Alternative C

The cumulative impact of disposal of public lands under Alternative C would have effects on development and land uses that are similar to those under Alternative A but for 6,961.0 acres, or about 14% of public lands available for disposal in the LVV.

The cumulative effect of management of the CTA for recreation, education, and research would be similar to that under Alternative A but for 6,362.3 acres, or 0.4% of the lands available for these uses in proximity to the LVV.

Alternative D

The cumulative impact of disposal of public lands under Alternative D would have effects on development and land uses that are similar to those under Alternative A but for 8,022.7 acres, or about 16% of public lands available for disposal in the LVV.

The cumulative effect of management of the CTA for recreation, education, and research would be similar to that under Alternative A, but for 5,301.4 acres, or 0.4% of the lands available for these uses in proximity to the LVV.

Alternative E

The cumulative impact of disposal of public lands under Alternative E would have effects on development and land uses that are similar to those under Alternative A but for 10,010.3 acres, or about 20% of public lands available for disposal in the LVV.

The cumulative effect of management of the CTA for recreation, education, and research would similar to that under Alternative A, but for 3,313.8 acres, or 0.2% of the lands available for these uses in proximity to the LVV.

No Action

The cumulative impact of disposal of public lands under the No-Action Alternative would have effects on development and land uses that are similar to those under Alternative A but for 12,174.5 acres, or about 24% of public lands available for disposal in the LVV.

The cumulative effect of management of the CTA for recreation, education, and research would similar to that under Alternative A but for 1,448.2 acres, or 0.1% of the lands available for these uses in proximity to the LVV.

4.14.9 Recreation

Alternative A

The cumulative impact assessment area considered for recreation includes the CTA study area, LVV, and areas surrounding the LVV. This section describes impacts to recreation resources within the cumulative impact assessment area resulting from the combination of this project with unrelated past, present, and reasonably foreseeable future projects in the area. These past, present, and future actions were or will be analyzed on a site-specific basis to determine their impact to vegetation resources (see Table 4.14-1).

Past actions that have directly impacted recreation resources in the cumulative impact assessment area boundary include housing and industrial development, the construction of flood control facilities and detention basins, and the development of transmission lines, which have resulted in a loss of access and changes to recreational opportunities. Approximately 5,000 acres per year were developed in the LVV between 1970 and 2003 (165,000 acres). The designation of the 1.5-million-acre DNWR adjacent to the study area, Red Rock Canyon NCA, Lake Mead NRA, and state and local parks has, at the same time, resulted in greater urban recreation opportunities within the LVV and the availability of large areas of land surrounding the LVV that provide diverse recreation opportunities.

Present actions that have resulted in adverse impacts from the direct removal of lands available for recreation consist of private development on up to 1,200 acres in the vicinity of the CTA study area. Increased, diverse recreation opportunities would result from the development of the Clark County Shooting Park. The Clark County Shooting Park, to be located north of the Urban Interface Zone, would contribute to indirect, beneficial cumulative impacts to recreation by adding to the diverse range of recreation opportunities for residents and visitors to the LVV. In addition, the development of Floyd Lamb State Park as a regional park with sports fields, playgrounds, visitors' centers, and other amenities would add cumulatively to the diversity of recreation opportunities available in the LVV.

Future actions that may result in direct, adverse impacts from the loss of recreation resources and opportunities are related primarily to private development and growth in the LVV. These actions include development of gas pipelines, water pipelines, solar power plants, and master-planned communities, including development on the Paiute Reservation. Based on the 5,000-acre-per-year historic development estimate, approximately 50,000 acres would be developed through 2018. Development of individual solar energy projects would result in the loss of large tracts of undeveloped land in southern Nevada outside the disposal boundary. Beneficial impacts from other future actions consist of park improvements within the 680 acres of Floyd Lamb Park (City of Las Vegas 2007a). Park improvements are anticipated to have a beneficial impact by adding to and improving existing recreational facilities.

The impacts of land preservation and new development under Alternative A, when added to past, present, and reasonably foreseeable future actions, would contribute to new recreation opportunities within the LVV. The preservation of 12,952.5 acres under this alternative and the new development, when added to the lands managed as the DNWR, Red Rock Canyon, Lake Mead, and state and local parks throughout the LVV, would contribute to the diverse amount of recreation opportunities provided in the study area.

Alternative B

The impacts to recreation from past, present, and reasonably foreseeable future actions would be the same as those described under Alternative A. Cumulative impacts to recreation under this alternative would be similar to those under Alternative A but would differ in terms of the amount of new trails provided and the amount of land preserved.

The impacts of land preservation and new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would contribute to new recreation opportunities within the LVV. The preservation of up to 11,007.6 acres under this alternative and the new development, when added to the lands managed as the DNWR, Red Rock Canyon, Lake Mead, and state and local parks throughout the LVV, would contribute to the diverse amount of recreation opportunities provided in the study area.

Alternative C

The impacts to recreation from past, present, and reasonably foreseeable future actions would be the same as those under Alternative A. Cumulative impacts to recreation under this alternative would be similar to those under Alternative A but would differ in terms of the amount of new development and the amount of land preserved.

The increase in intensity of adjacent land uses, along with increased access to the CTA, could contribute cumulatively to a decrease in the perceived value of the resources within the area. The loss of natural landscapes as a result of the increased development within and adjacent to CTA boundaries could lead to a decrease in recreation opportunities for enjoying natural settings.

Alternative D

The impacts to recreation from past, present, and reasonably foreseeable future actions would be the same as those under Alternative A. Cumulative impacts to recreation under this alternative would be similar to those under Alternative A but would differ in terms of the amount of new development and the amount of land preserved. Only 5,301 acres would be preserved under this alternative, and the total amount of trails would be reduced to approximately 5 miles.

The increase in development and intensity of adjacent land uses, along with greater access to a smaller CTA, could contribute cumulatively to a decrease in the perceived value of the resources within the area. The loss of the natural landscape as a result of the increased development within and adjacent to CTA boundaries could lead to a decrease in the perceived value of important resources.

Alternative E

Under Alternative E, cumulative impacts would be similar to those under Alternative D. An overall increase in adverse cumulative impacts would result from the reduction in protected acreage within the CTA as well as the change in focus from protection of natural resources to assurance that private development opportunities would be made available with the implementation of established mitigation measures.

No Action

As populations within the Cities of Las Vegas and North Las Vegas continue to increase, the demand for a wide variety of active and passive recreation opportunities within the LVV may also increase. A

significant adverse cumulative impact to existing and potential future recreation areas adjacent to and within the CTA boundaries may result from an incremental increase in visitorship to those areas over time and a lack of available resources to accommodate growing numbers. A subsequent overuse of existing amenities and natural resources may occur, leading to a reduction in the value of resources and less appreciation and enjoyment of the area by potential visitors.

4.14.10 Transportation

Alternative A

The area considered for cumulative impacts to transportation includes the CTA study area and adjacent lands in the northern LVV. This cumulative impacts section describes impacts to transportation within that area that would result from the combination of this alternative with past, present, and reasonably foreseeable future projects in the area.

Past actions include private development and expansion of transportation infrastructure, including the 215 Beltway, throughout the northern LVV. Beneficial impacts to transportation infrastructure from present actions include widening and paving existing roads in areas adjacent to the CTA study area. Adverse impacts to transportation from present actions include increasing daily traffic and a reduction in access to public lands resulting from land disposal and private development adjacent to the CTA study area.

Direct, adverse impacts to transportation are anticipated to continue from population growth throughout the LVV, additional land disposals, private development, and development of the Clark County Shooting Park. For the purposes of this study, increases in population are projected to range from 1.4% to 5.3% annually over a 20-year period (see Section 4.13.1, “Analysis Approach and Assumptions”). Population and traffic volume in the LVV will increase in the long term by over 30%. The potential planned developments within the Paiute Reservation and Kyle Canyon Gateway would result in increased populations and traffic volume on U.S. Highway 95 in areas adjacent to the CTA study area. The Kyle Canyon Gateway project has been projected to include up to 16,000 residential units. Clark County has estimated 225,000 annual visits to the County Shooting Park (Clark County 2007). These actions would result in cumulative adverse impacts to transportation and traffic from increases in traffic volume relative to road capacity. The RTC of southern Nevada has developed a transportation plan to address an area that roughly coincides with the BLM disposal boundary through the year 2030. Components of the plan consider population growth projections, upgrades to major travel corridors, as well as providing access and connectivity to developing areas in the LVV (RTC 2006). Cumulative adverse impacts would be mitigated in the long term through implementation of elements of the RTC transportation plan, including additional road capacity, roadway improvements, congestion management programs, expanded transit options, and alternative forms of transportation, including pedestrian and bicycle (RTC 2006).

Alternative B

The impacts to transportation from past, present, and reasonably foreseeable future actions would be the same as those under “Actions Common to all Alternatives.” The impacts of private development on 2,315.7 acres outside the alternative boundary, when added to past, present, and reasonably foreseeable future actions, would consist of adverse impacts to transportation and traffic from increases in traffic volume relative to road capacity.

Alternative C

The impacts to transportation from past, present, and reasonably foreseeable future actions would be the same as those under "Actions Common to all Alternatives." The impacts of private development to 6,960.9 acres outside the alternative boundary, when added to past, present, and reasonably foreseeable future actions, would consist of adverse impacts to transportation and traffic from increases in traffic volume relative to road capacity. Future direct, adverse impacts to transportation and traffic are anticipated to occur from additional acreage available for disposal and private development. Population growth in the vicinity of the CTA would potentially be greater under this alternative. These actions would result in a cumulative increase in average annual daily traffic.

Alternative D

The impacts to transportation from past, present, and reasonably foreseeable future actions would be the same as those under "Actions Common to all Alternatives." The impacts of private development to 8,022.7 acres outside the alternative boundary, when added to past, present, and reasonably foreseeable future actions, would consist of adverse impacts to transportation and traffic from increases in traffic volume relative to road capacity. Population growth in the vicinity of the CTA would potentially be greater under this alternative. This would result in a cumulative increase in average annual daily traffic.

Alternative E

The impacts to transportation from past, present, and reasonably foreseeable future actions would be the same as those under "Actions Common to all Alternatives." The impacts of private development to 10,010.3 acres outside the alternative boundary, when added to past, present, and reasonably foreseeable future actions, would consist of adverse impacts to transportation and traffic from increases in traffic volume relative to road capacity. Population growth and density in the vicinity of the CTA would be greater under this alternative. This would result in a cumulative increase in average annual daily traffic.

No Action

The impacts to transportation from past, present, and reasonably foreseeable future actions would be the same as those under "Actions Common to all Alternatives." The impacts of private development to 12,174.5 acres outside the alternative boundary, when added to past, present, and reasonably foreseeable future actions, would consist of adverse impacts to transportation and traffic from increases in traffic volume relative to road capacity. Population growth and density in the vicinity of the CTA would be the greatest under this alternative. This would result in a cumulative increase in average annual daily traffic.

4.14.11 Noise

Alternative A

The area considered for cumulative impacts to sensitive noise receptors includes the CTA study area and adjacent lands in the northern LVV. Under Alternative A, there would be no direct or indirect adverse impacts to sensitive noise receptors; thus, Alternative A would not contribute to cumulative impacts.

Alternative B

The area considered for cumulative impacts to sensitive noise receptors includes the CTA study area and adjacent lands in the northern LVV. This cumulative impacts section describes impacts to sensitive noise

receptors within that area that would result from the combination of this alternative with past, present, and reasonably foreseeable future projects in the area. Past actions that have directly impacted sensitive noise receptors in the cumulative impact assessment area include housing and industrial development, the construction of flood control facilities and detention basins, and the development of transmission lines, which have resulted in short-term increases in ambient noise levels throughout the LVV. Adverse impacts to sensitive noise receptors from present actions include increased construction activities resulting from potential land disposal and private development adjacent to the CTA study area, as well as increased traffic.

Direct, adverse impacts to sensitive noise receptors are anticipated to continue from private development, population growth, and operation of the Clark County Shooting Park. Facilities in the shooting park would be located a minimum of 1 mile from sensitive noise receptors, including existing residential development adjacent to the CTA, and would result in a minor increase in ambient noise levels in the area immediately surrounding the shooting park. The potential planned developments within the Paiute Reservation and Kyle Canyon Gateway would result in increased ambient noise from residential development and motor vehicle traffic. Actions assumed for analysis would result in cumulative increases in ambient noise levels in the vicinity of construction areas.

All construction activities would occur in the short term and during daytime hours and would not exceed maximum allowable noise levels. The increases in ambient noise levels associated with new residential developments and traffic on existing roadways would not exceed the city noise ordinances or the county's maximum allowable noise levels. Cumulative impacts to sensitive noise receptors would not reach a level of significance.

Alternative C

The impacts to sensitive noise receptors from past, present, and reasonably foreseeable future actions would be the same as those under Alternative B. The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, consist of increased construction activities resulting from potential land disposal and private development adjacent to the CTA study area, as well as increased traffic.

Under this alternative, noise would occur in the short term from construction activities. Noise would also occur associated with the increased private development surrounding the alternative boundary. The cumulative increases in ambient noise levels associated with new development would not exceed the city noise ordinances or the county's maximum allowable noise levels.

Alternative D

The impacts to sensitive noise receptors from past, present, and reasonably foreseeable future actions would be the same as those under Alternative B. The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, consist of increased construction activities resulting from potential land disposal and private development adjacent to the CTA study area, as well as increased traffic.

Under this alternative, noise would occur in the short term from construction activities. Noise would also occur associated with the increased private development on up to 8,022.1 acres surrounding the alternative boundary. The cumulative increases in ambient noise levels associated with new development would not exceed the city noise ordinances or the county's maximum allowable noise levels.

Alternative E

The impacts to sensitive noise receptors from past, present, and reasonably foreseeable future actions would be the same as those under Alternative B. The impacts of greater private development, when added to past, present, and reasonably foreseeable future actions, would consist of increased construction activities resulting from potential land disposal and private development adjacent to the CTA study area.

Under this alternative, noise would occur in the short term from construction. Noise would also occur associated with the increased private development on up to 10,010.3 acres surrounding the alternative boundary. The cumulative increases in ambient noise levels associated with new development would not exceed the city noise ordinances or the county's maximum allowable noise levels.

No Action

The impacts to sensitive noise receptors from past, present, and reasonably foreseeable future actions would be the same as those under Alternative B. The impacts of new development under this alternative, when added to past, present, and reasonably foreseeable future actions, would consist of increased construction activities resulting from potential land disposal and private development adjacent to the CTA study area, as well as increased traffic.

Under this alternative, noise would occur in the short term from construction activities. Noise would also occur associated with the increased private development on 12,174.5 acres surrounding the alternative boundary. The cumulative increases in ambient noise levels associated with new development would not exceed the city noise ordinances or the county's maximum allowable noise levels.

4.14.12 Hazardous Materials

The actions common to all alternatives would not result in cumulatively significant impacts from hazardous materials. Because hazardous materials encountered from these actions would be mitigated on a case-by-case basis, cumulative impacts are not anticipated. Should hazardous materials be identified during implementation of any of the actions common to all alternatives, mitigation on a case-by-case basis would be considered to have a beneficial impact to the study area and its surroundings by eliminating the potential for the hazardous materials to adversely affect other resources.

Alternative A

In consideration of past, present, and reasonably foreseeable projects, Alternative A would not have cumulatively significant impacts from hazardous materials. Because hazardous materials encountered under this alternative and potential impacts from other projects would be mitigated on a case-by-case basis, cumulative hazardous impacts would not be considered significant. Should hazardous materials be identified during implementation of any of the actions described above, mitigation on a case-by-case basis would be considered to have a beneficial impact to the study area and its surroundings by eliminating the potential for the hazardous materials to adversely affect other resources. Although minor amounts of hazardous materials may be located at facilities within these developed areas in the future, new facilities, including those within the CTA and others in the region, would be required to comply with hazardous material regulations to minimize potential impacts.

Alternative B

Cumulative impacts involving hazardous materials would not be significant for the same reasons as those described for Alternative A.

Alternative C

Cumulative impacts involving hazardous materials would not be significant for the same reasons as those described for Alternative A.

Alternative D

Cumulative impacts involving hazardous materials would not be significant for the same reasons as those described for Alternative A.

Alternative E

Cumulative impacts involving hazardous materials would not be significant for the same reasons as those described for Alternative A.

No Action

Cumulative impacts involving hazardous materials would not be significant for the same reasons as those described for Alternative A.

4.14.13 Socioeconomics

Alternative A

At present, Clark County and the Cities of Las Vegas and North Las Vegas are experiencing substantial population growth, which is expected to continue through 2025 (see Table 4.13-1). The nation, and certainly Nevada, is currently experiencing a downturn in the housing market. A lagging housing market can impact many aspects of the local economy by affecting the willingness of consumers to spend on discretionary purchases, such as automobiles and dining out. It is outside the scope of this project to forecast the expected trends of the local and national housing market based on anything other than historic data.

As developable land in the LVV diminishes, 370.8 acres of developable land from the CTA study area would not likely be sufficient to accommodate the needs of the Cities of Las Vegas and North Las Vegas for accommodating projected population growth and the subsequent need for public infrastructure, housing, and employment. Cumulatively, combined with the need for diversity of economic sectors and job availability for current and potential future residents, Alternative A could result in an adverse impact to economic sectors and employment for the Cities of Las Vegas and North Las Vegas.

The disposal and development of lands in and adjacent to the CTA is itself considered cumulative. Between 1970 and 2003, an average of 5,000 acres per year has been developed in Clark County (BLM 2004a). Development of disposed lands within the CTA could add to cumulative impacts of lands outside but adjacent to the CTA. Cumulative impacts could include additional demands on public facilities and services, as well as utilities and infrastructure. Additional beneficial impacts could also include increased construction spending, increased tax revenue, and employment opportunities in Clark County as those

lands are developed in concert with the disposed lands within the CTA. Developed acreage could also contribute to a positive cumulative impact from increased revenues for adjacent facilities such as the future Clark County Shooting Park, Las Vegas Paiute developments, and other private entities within the area. Preservation of the 12,952.5 acres could add to the existing outdoor recreation opportunities in the LVV (see Section 4.8, "Land Use") and increase the amount of social amenities to residents of the area.

Alternative B

Cumulative impacts under Alternative B would be similar to those under Alternative A. Development of disposed lands within the CTA could add to cumulative impacts of lands outside but adjacent to the CTA. Cumulative impacts could include additional demands on public facilities and services, as well as utilities and infrastructure. Additional beneficial impacts could also include increased construction spending, increased tax revenue, and employment opportunities in Clark County as those lands are developed in concert with the 2,315.7 acres of disposed lands within the CTA. Developed acreage could also contribute to a positive cumulative impact from increased revenues for adjacent facilities such as the future Clark County Shooting Park, Las Vegas Paiute developments, and other private entities within the area. Preservation of the 11,007.60 acres could add to the existing outdoor recreation opportunities in the LVV (see Section 4.8, "Land Use") and increase the amount of social amenities to residents of the area; however, less land for recreation opportunities would be available than under Alternative A.

Alternative C

Under Alternative C, the increased availability of disposed acreage for development could contribute to a positive cumulative impact from increased revenues for adjacent facilities, such as the future Clark County Shooting Range, Las Vegas Paiute developments, and other private entities in the vicinity. Development of disposed lands within the CTA could add to cumulative impacts of developed lands outside but adjacent to the CTA. Cumulative impacts could include additional demands on public facilities and services, as well as utilities and infrastructure that must be accommodated by the Cities of Las Vegas and North Las Vegas. Additional beneficial impacts could also include increased construction spending, increased tax revenue, and employment opportunities in Clark County as those lands are developed in concert with the 6,960.9 acres of disposed lands within the CTA. Preservation of the 6,362.30 acres could add to the existing outdoor recreation opportunities in the LVV (see Section 4.8, "Land Use") and increase the amount of social amenities to residents of the area; however, less land for recreation opportunities would be available than under Alternatives A or B.

Alternative D

Development of disposed lands within the CTA could add to the cumulative impact of developed lands outside but adjacent to the CTA. Cumulative impacts could include additional demands on public facilities and services, as well as utilities and infrastructure that must be accommodated by the Cities of Las Vegas and North Las Vegas as the housing inventory and population increase in the region. As a result of increased development, additional beneficial impacts could also include increased construction spending, increased tax revenues, and employment opportunities in Clark County as land is developed in concert with the 8,022.7 acres of disposed lands within the CTA. Under Alternative D, more construction spending, tax revenue, and employment opportunities would result than if Alternatives A–C were implemented. Preservation of the 5,301.40 acres could add to the existing outdoor recreation opportunities in the LVV (see Section 4.8, "Land Use") and increase the amount of social amenities to residents of the area; however, less land for recreation opportunities would be available than under Alternatives A–C.

Alternative E

Under Alternative E, the increased availability of disposed acreage for development could contribute to a positive cumulative impact from increased revenues for adjacent facilities and other private entities in the vicinity. Development of disposed lands within the CTA could add to cumulative impacts of lands outside but adjacent to the CTA, such as additional demands on public facilities and services, as well as utilities and infrastructure. Additional beneficial impacts could cumulatively include increased construction spending, tax revenue, and employment opportunities in Clark County as lands are developed in concert with the 10,010.3 acres of disposed lands within the CTA; implementation of Alternative E would result in more cumulative economic impacts than Alternatives A–D. Preservation of the 3,313.80 acres could add to the existing outdoor recreation opportunities in the LVV (see Section 4.8, "Land Use") and increase the amount of social amenities to residents of the area; however, less land for recreation opportunities would be available than under Alternatives A–C.

No Action

Under the No-Action Alternative, cumulative impacts are expected to be similar to those under Alternative E, although to a greater degree, as there would be more land available for development and subsequent demands for infrastructure and employment to accommodate population growth in the area.

Of the six alternatives analyzed in this document, the No-Action Alternative provides for the most acreage (12,174.5 acres) to be disposed of and developed within the CTA. The cumulative development of these disposed lands, along with lands outside the CTA and within Clark County, could contribute to a positive cumulative impact from increased construction spending, tax revenue, and employment opportunities in the region. Development of disposed lands within the CTA, in addition to other private parcels, could also add to the potential for cumulative impacts, such as additional demands on public facilities and services, as well as utilities and infrastructure that must be accommodated by the Cities of Las Vegas and North Las Vegas. Municipalities would receive the most amount of tax revenue to fund infrastructure projects under the No-Action Alternative because implementation of this alternative would result in more cumulative economic impacts than under the five action alternatives. Preservation of the 1,448.20 acres could add to the existing outdoor recreation opportunities in the LVV (see Section 4.8, "Land Use") and increase the amount of social amenities to residents of the area; however, there would be fewer opportunities for recreation than under the five action alternatives.

Tables 4.14-2 and 4.14-3 present a summary of impacts and mitigation measures, respectively.

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Table 4.14-2. Identified Significant Impacts that Cannot Be Mitigated below the Threshold of Significance, by Alternative

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	No-Action Alternative
Earth Resources	None	None	None	None	None	None
Water Resources	One REC was identified along the eastern boundary of the CTA study area. Because the nature of this REC is currently unknown, additional investigation is required to assess the function of the steel pipes and the presence of any potential hazardous materials. This could potentially be a significant adverse impact. Demand for water in the LVV continues to grow and supplies are uncertain; increased demand under this alternative, despite being minimal, could represent a cumulatively significant impact if SNWA cannot meet future projected water demands.	Same as Alternative A.	Same as Alternative A. Urban development, particularly on the bajada north of the ULVW, would require flood protection measures that have the potential to significantly alter the natural surface drainage processes within or near the ULVW. Likewise, land development would result in higher runoff peak flows and volumes as a result of impervious surfaces and would likely discharge into the ULVW in a concentrated manner at storm sewer outfalls.	Same as Alternative C.	Same as Alternative C.	Same as Alternative C.
Vegetation	None	A loss of 3.7 acres of high-potential bearpoppy habitat would occur from land disposal outside the alternative boundary, which would lead to significant adverse impacts to bearpoppy.	A loss of 7.1 acres of high-potential bearpoppy habitat would occur from land disposal outside the alternative boundary, which would lead to significant adverse impacts to bearpoppy.	A loss of 3.2 acres of high-potential bearpoppy habitat would occur from land disposal outside the CTA boundary, which would lead to significant adverse impacts to bearpoppy.	A loss of 684.9 acres of moderate-potential bearpoppy habitat and 3.2 acres of high-potential bearpoppy habitat would occur from land disposal outside the alternative boundary, which would lead to significant adverse impacts to bearpoppy.	Direct and indirect adverse impacts to Las Vegas buckwheat and bearpoppy would be significant. A loss of up to 220 acres of potential and 65 acres of occupied Las Vegas buckwheat habitat and 1,250 acres of potential and 285 acres of occupied bearpoppy habitat would occur from land disposal outside the alternative boundary.
Cultural Resources and Traditional Cultural Properties	None	None	Significant adverse impacts to TCPs and the traditional cultural landscape.	Significant adverse impacts to TCPs and the traditional cultural landscape.	Significant adverse impacts to TCPs and the traditional cultural landscape.	Significant adverse impacts to TCPs and the traditional cultural landscape.
Paleontological	None	None	None	The incremental loss of paleontological resources over time as a result of construction-related or hydrologic surface disturbance, vandalism, or unlawful collection would represent a significant cumulative adverse impact.	Same as Alternative D.	Same as Alternative D.
Visual	None	None	None	None	None	None
Land Use	None	None	None	None	None	None
Recreation	None	None	None	None	None	None
Transportation	None	None	None	None	None	None
Noise	None	None	None	None	None	None
Socioeconomics	A significant, direct, adverse impact to the Cities of Las Vegas and North Las Vegas, as well as utility groups, would likely occur, as less land would be made available for development and more restrictions on utility infrastructure would be put in place. A significant loss in community values for the cities could occur, as the desire to balance the need for development and more recreation opportunities for residents would not be realized. Utility groups would similarly be affected, as the need to accommodate current and future growth would come at greater economic cost, since redundant utility infrastructure would be required in order to sufficiently service residents of the Cities of Las Vegas and North Las Vegas.	Same as Alternative A.	None	None	Resource conservation groups and other stakeholders intent on maximum protection of the CTA study area would consider implementation of either Alternative E or the No-Action Alternative a significant adverse impact, given their community perceptions related to resource preservation and protection.	Same as Alternative E.
Hazardous Materials	None	None	None	None	None	None

Table 4.14-3. Identified Mitigation Measures by Alternative

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	No-Action Alternative
Earth Resources	No mitigation beyond standard construction practices is required.	The Cities of Las Vegas and North Las Vegas shall coordinate with CCRFCD to implement additional erosion and flood control measures required to address increased cumulative flood flows and erosion rates resulting from the development of lands disposed of by BLM.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.
Water Resources	To address potential groundwater quality impacts associated with the REC described in Section 3.12, BLM will conduct an assessment of the site to determine whether hazardous materials exist within the study limits. If such materials are found to be present, BLM shall conduct remediation activities to remove the materials from the site. These actions shall occur prior to the disposal or leasing of the parcels.	Same as Alternative A. The Cities of Las Vegas and North Las Vegas shall coordinate with CCRFCD to implement additional erosion and flood control measures required to address increased cumulative flood flows and erosion rates resulting from the development of lands disposed of by BLM.	Same as Alternative A. The Cities of Las Vegas and North Las Vegas shall coordinate with CCRFCD to implement additional measures, as appropriate, to address higher peak flows and erosion mechanisms within ULVW.	Same as Alternative C.	Same as Alternative C.	Same as Alternative C.
Vegetation	**Significant Impacts Mitigation (see Appendix A)** **Prior to Project Construction** A. Mitigation banks or habitat conservation areas that contain both occupied and potential habitat for bearpoppy and Las Vegas buckwheat will be set up prior to construction actions. The mitigation bank should conserve habitat as well as fund transplant studies and other research. All moderate-potential habitat lost as a result of proposed actions greater than 10% would be mitigated by buying into the mitigation bank at a ratio of 1 acre:1 acre. All high-potential and occupied special-status plant habitat lost as a result of the proposed actions will be mitigated by buying into the mitigation bank at a ratio of 2 acres:1 acre, resulting in no unmitigated loss of potential sensitive plant habitat. B. Comprehensive plant surveys shall be conducted in potential and occupied habitat for all special-status plants during the blooming period immediately prior to construction activities. If individual(s) or areas with multiple individuals are observed, they will be documented (using a handheld global positioning system [GPS] unit) in accordance with BLM protocol, and an avoidance and impact minimization plan will be developed and implemented in coordination with BLM, NDF, and USFWS. Maps that depict the results of these surveys will be prepared that will include other recently mapped special-status plant occurrences in the area to ensure that the full scope of rare plant habitat associated with all the proposed construction is delineated. C. All individuals and populations of Las Vegas buckwheat and Merriam and Las Vegas bearpoppy within a construction area will be protected by being flagged with a buffer of 3 m (approximately 10 feet) by a BLM resource specialist or approved botanical contractor prior to surface-disturbing activities. This will protect root systems and seed banks and prevent plant damage. **During Construction** D. All individual special-status plants must be avoided by keeping construction activities outside flagged areas per Measure C. However, take of Merriam (white) bearpoppy may be allowed if it is necessary, but the species must be identified and a Take Permit must be obtained through NDF. If bearpoppies have not flowered and cannot be identified to species, no impacts will be allowed within any bearpoppy flagged areas. **Postconstruction** E. The amount of potential or occupied habitat of Las Vegas buckwheat, Las Vegas bearpoppy, and Merriam's bearpoppy will be monitored as part of the mitigation bank in Measure A. The total habitat removed for actions associated with a specific alternative cannot exceed the amount of loss analyzed for that alternative, which is reflected in the table of acres of habitat conserved that is established for each alternative. If an amount greater than the acres presented is affected, mitigation requirements should be re-evaluated.	Same as Alternative A.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.

Table 4.14-3. Identified Mitigation Measures by Alternative (Continued)

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	No-Action Alternative
Vegetation, continued	**General Impacts Mitigation** **Prior to Project Construction** A. A construction zone will be designated for vehicle and equipment travel, turnaround areas, stockpile areas, and vehicle service areas that use existing roads and disturbed areas, such as parking lots, as much as possible. Where construction needs to go into undisturbed areas, all areas to be disturbed will have boundaries flagged to minimize impacts to sensitive species and habitats, and all disturbances will be confined to the flagged areas. All employees will be instructed that their activities must be confined to locations within the flagged areas. B. A weed plan following BLM management practices will be developed for ground-disturbing activities. C. Equipment will be free of caked mud or debris and will be washed prior to entering and exiting the project site to avoid the introduction of noxious weeds. Weed monitoring shall occur for species identified by the State of Nevada as well as for additional species specified by Clark County during a given year. Such species constitute the official list of weeds for which a county may apply for cost-share funding for control and removal efforts. If such species are found during monitoring, control and eradication efforts shall be implemented following county control procedures. D. All topsoil in occupied habitat is potentially seed bearing. Topsoil in potential habitat will be evaluated by BLM resource specialists or contractors to determine its seed-bearing potential, and soils determined to be seed bearing will be flagged. During construction, topsoil in flagged areas will be removed to a depth of 2–4 inches (5–10 cm), stockpiled, and used for topsoil restoration following construction activities. **During Construction** E. Removal of desert wash habitat should be avoided and minimized to the greatest extent practicable. Where avoidance is not practicable, consultation with USACE, potentially leading to the issuance of a Section 404 CWA permit, should occur and mitigation strategies should be developed. F. Cacti and yucca species are protected by NDF under NRS 527.060–527.120 and are required to be salvaged based on requirements stipulated by the local BLM office. Salvaged plants will be used for revegetation of the project area or other disturbed areas or sent to a BLM stockpiling facility as directed by BLM. G. BLM-approved soil stabilization/dust control methods will be implemented. H. Oil, fuel, and other equipment fluid leaks will be cleaned up and properly disposed of in accordance with regulations. **Postconstruction** I. Disturbed areas will be stabilized with appropriate treatments immediately following project facility construction until the areas can be seeded with site-specific mix(es) during the next appropriate planting period (i.e., spring or fall). J. Disturbed natural vegetation communities will be seeded with BLM-approved seed mixes during the appropriate planting period (i.e., spring or fall).					Same as Alternative B.
Cultural Resources	Mitigation measures for all sites are being completed independent of any proposed action and will be completed by the end of 2008. All mitigation measures include the development of public interpretive and educational material. Mitigation measures for Sites 26Ck4803 and 26Ck6351 include historical survey and archival research, detailed recording of linear features and associated artifact concentrations, site mapping, surface recording, and creation of interpretive material that can later be used to produce an interpretive sign for the location. Detailed maps and drawings will be produced that identify site features, artifact concentrations, and topographic features. No surface artifacts will be collected. Mitigation measures for Site 26Ck5596 include historical and archival research, detailed recording of surface artifact concentrations, site mapping, and phased excavation of cultural features believed to be associated with the construction camp. A detailed map will be produced that identifies site features, artifact concentrations, and topographic features. No surface artifacts will be collected unless the artifact has additional data potential or intrinsic value. Artifacts recovered from excavation units with the potential to be ethnically or temporally diagnostic will be collected for further analysis.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Table 4.14-3. Identified Mitigation Measures by Alternative (Continued)

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	No-Action Alternative
Cultural Resources, continued	Mitigation measures for Site 26Ck6507 include historical survey, archival research, detailed recording of linear features and associated artifact concentrations, and site mapping. Detailed maps and drawings will be produced that identify site features, artifact concentrations, and topographic features. No surface artifacts will be collected. Mitigation measures for Site 26Ck6910 include surface collection, excavation, and laboratory analysis. Excavation will include three contiguous 1 × 1–m units placed to expose a profile of the hearth feature and develop a better understanding of the feature. Additional 1 × 1–m units will be excavated as needed to complete excavation of the feature, supplemented by up to six additional 1 × 1–m units leading away from the feature to assess whether buried evidence of other activity is present. Radiocarbon and luminescence dating will be conducted if suitable material is recovered. Artifact analysis will use the methods set forth in the HPTP (Cannon et al. 2008).					
Traditional Cultural Properties	Tribal representatives could be involved in the planning of recreational trails and infrastructure development to find the best possible routes, determine places to avoid or monitor for non-sanctioned use, and suggest other means to protect resources of traditional cultural association. Continued involvement of the Las Vegas Paiute Tribe in planning such developments and minimizing future impacts is the best mitigation measure under this alternative. Through ongoing consultation with the government of the Las Vegas Paiute Tribe and the cooperation of designated tribal representatives (e.g., Tribal Historic Preservation Offices and Conservation Office, elders, or others), impacts can be tracked and analyzed, and specific changes or measures can be implemented to mitigate adverse impacts.	The Las Vegas Paiute Tribe could be involved as a cooperator in the planning of recreational trails, flood control measures, and infrastructure development in order to find the best possible routes, determine places to avoid or monitor for non-sanctioned use, and suggest other means to protect resources of traditional cultural association. Continued involvement of the tribe in planning such developments and minimizing future impacts is the best mitigation measure under this alternative. Through ongoing consultation with the government of the Las Vegas Paiute Tribe and the cooperation of its designated representatives (e.g., Tribal Historic Preservation Offices and Conservation Office, elders, and others), impacts can be tracked and analyzed, and specific changes or measures can be implemented to mitigate adverse impacts.	Because the Las Vegas Paiute Tribe has determined that this alternative is unacceptable, mitigation of TCPs and the surrounding cultural landscape appears impossible from the perspective of the tribe. This could change if the tribe is involved in planned development and consulted on an ongoing basis or is involved as a cooperating entity for present and future plans. Such an agreement would need to be negotiated with the government of the Las Vegas Paiute Tribe.	Same as Alternative C.	No mitigation measures have been identified that would be acceptable to the consulting tribes regarding this alternative. The removal of the means for tribal involvement in development planning precludes the forms of mitigation suggested for other alternatives. Implementation of Alternative E would result in significant adverse impacts to TCPs and the traditional cultural landscape.	This alternative could result in significant damage and loss of resources of interest to the tribe, and tribal consultation has concluded that it is even less acceptable to the Las Vegas Paiute Tribe than the other alternatives that have potentially significant adverse effects that might not be mitigated, such as Alternative E. Mitigation and avoidance of adverse impacts would need to take place on a case-by-case basis; therefore, the potential for the loss of resources would be difficult to mitigate programmatically, which is possible under some of the other alternatives.
Paleontological Resources	See Section 4.6.9 for additional details. The four interrelated paleontological mitigation components include 1. Collection of all previously recorded scientifically significant surface fossils that will not be preserved or displayed in situ from within the boundaries of the CTA as soon as feasible in order to prevent loss from vandalism, theft, and natural weathering processes. 2. Mitigation monitoring of all surface-disturbing development activities in order to prevent destruction of scientifically significant subsurface fossils contained within strata of the LVF. 3. Development of in situ paleontological interpretive displays that may include fossil specimens and implementation of in situ preservation of important fossil localities as appropriate. 4. Under the direction of the BLM or other CTA management authority, establishment of an ongoing paleontological survey and monitoring program designed to periodically check for newly exposed fossil remains and monitor the status of in situ preserved localities. Mitigation of direct impacts under Alternative A will include paleontological monitoring of surface-disturbing activities, salvage of unearthed fossils, and transfer of these fossils to a public museum, where they will be housed in perpetuity and available for scientific research, education, and display. Mitigation of indirect impacts will include the regulation of public access to the CTA by promoting the use of established roads and trails, providing educational interpretive displays highlighting the paleontological resources of the area, protecting in situ fossils associated with interpretive displays with protective barriers, and generally educating the community about the scientific importance of the paleontological resources of the LVF.	Same as Alternative A. Indirect impacts mitigation measures would be identical to those for Alternative A, but with the addition of locating off-trail hiking opportunities to areas in which surface fossils have already been collected or are otherwise less sensitive.	Same as Alternative B.	Same as Alternative A. Additional mitigation of direct impacts would include paleontological monitoring of surface-disturbing activities, salvage of unearthed fossils, and transfer of these fossils to a public museum where they would be housed in perpetuity and available for scientific research, education, and display. Additional mitigation of indirect impacts would include the regulation of public access to the CTA by promoting the use of established roads and trails, locating non-mechanized cross-country travel in areas where surface fossils have already been collected or are otherwise less sensitive, providing educational interpretive displays highlighting the paleontological resources of the area, protecting in situ fossils associated with interpretive displays with protective barriers, and generally educating the community about the scientific importance of the paleontological resources of the LVF.	Same as Alternative B.	Same as Alternative B.

Table 4.14-3. Identified Mitigation Measures by Alternative (Continued)

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	No-Action Alternative
Visual Resources	Color the concrete in the ULVW interception berm (diversion dike) to match the predominant color in the surrounding landform. Paint the equestrian boarding facilities a suitable color to reduce the contrast of the structures on the landscape. Use the natural topography and vegetation on the landscape to screen the view of multi-use trails in the CTA. Use shields to direct nighttime lighting along Decatur Boulevard, Grand Teton Drive, and Aliante Parkway downward to reduce the glare on night skies.	Color the concrete in the ULVW interception berm (diversion dike) to match the predominant color in the surrounding landform. Paint the equestrian boarding facilities a suitable color to reduce the contrast of the structures on the landscape. Use the natural topography and vegetation on the landscape to screen the view of trails in the CTA. Use shields to direct nighttime lighting along new roads downward to reduce the glare on night skies. Use design elements such as colored concrete across the bajadas at the base of the DNWR.	Color the concrete in the ULVW interception berm (diversion dike) to match the predominant color in the surrounding landform. Paint the equestrian boarding facilities a suitable color to reduce the contrast of the structures on the landscape. Use the natural topography and vegetation on the landscape to screen the view of trails in the CTA. Use shields to direct nighttime lighting along new roads downward to reduce the glare on night skies. Reshape and recontour cut and fill slopes (for road construction) that cross the natural grade/slope of the bajada. Replant vegetation on the detention structure, in the basin, and in the wash below the structure to accelerate reclamation of disturbed surfaces resulting from construction of the basin. Paint transmission line poles a color that blends in with the background landscape.	Color the concrete in detention structure interception berms (diversion dikes) to match the predominant color in the surrounding landform. Paint the equestrian boarding facilities a suitable color to reduce the contrast of the structures on the landscape. Use the natural topography and vegetation on the landscape to screen the view of multi-use trails in the CTA. Use shields to direct nighttime lighting along roads downward to reduce the glare on night skies. Reshape and recontour cut and fill slopes (for road and utility construction) that cross the natural grade/slope of the bajada. Replant vegetation on the detention structures, in the basins, and in the wash below the structures to accelerate reclamation of disturbed surfaces resulting from construction of the two basins. Paint transmission line poles a color that blends in with the background landscape.	Color the concrete in the interception berms (diversion dikes) of the two detention structures in the northwestern part of the CTA to match the predominant color in the surrounding landform. Use the natural topography and vegetation on the landscape to screen the view of multi-use trails in the CTA. Use shields to direct nighttime lighting along roads downward to reduce the glare on night skies. Reshape and recontour cut and fill slopes (for road and utility construction) that cross the natural grade/slope of the bajada. Replant vegetation on the detention structures, in the basins, and in the wash below the structures to accelerate reclamation of disturbed surfaces resulting from construction of the two basins. Paint transmission line poles a color that blends in with the background landscape.	Reshape and recontour cut and fill slopes that are disturbed during road and utility construction. Paint transmission line poles a color that blends in with the background landscape.
Land Use	No specific mitigation measures have been identified at this time to reduce impacts to land uses under this alternative, either within or outside the CTA. Mitigation measures will be identified when site-specific environmental analyses are prepared prior to implementation of specific actions.	None	None	None	None	None
Recreation	None	None	None	None	None	None
Transportation	None	BMPs for traffic control would be implemented to minimize the level of impacts from construction projects associated with private development. Prior to any construction taking place, builders should consult with NDOT and RTC to develop traffic control plans.	Same as Alternative B.	Same as Alternative B.	Impacts would be mitigated in the long term through implementation of elements of the RTC transportation plan, including additional road capacity, roadway improvements, congestion management programs, expanded transit options, and alternative forms of transportation, including pedestrian and bicycle (RTC 2006).	Same as Alternative E.
Noise	BMPs for construction would be implemented to minimize the level of impacts from potential construction noise associated with future development actions.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Socioeconomics	None	None	None	None	None	None
Hazardous Materials	BLM shall conduct an assessment of the site to determine whether hazardous materials exist on the property. If such materials are found to be present, BLM shall conduct remediation activities to remove the materials from the site. These actions shall occur prior to disposal or leasing of this property.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

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Chapter 5

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

A commitment of resources is irreversible when its primary or secondary impacts limit the future option for a resource. An irretrievable commitment refers to the use or consumption of resources that is neither renewable nor recoverable for later use by future generations. The commitment of resources refers primarily to the use of nonrenewable resources such as fossil fuels, water, labor, and electricity. Expected changes resulting from alternative CTA boundaries could include the commitment of land, physical changes in the environment, effects on human populations, and fiscal changes.

The disposal of land from the CTA study area, under the alternatives, would result in direct impacts to the environment. Each alternative, with the exception of Alternative A, involves the transfer of title of BLM lands to public or private entities. As such, there would be no direct commitment of resources. However, once the transfer of title is complete, it is expected that the disposed lands would be developed. Construction and operation associated with private development would result in an irretrievable and irreversible commitment of natural, physical, and cultural resources.

Construction activities would require the use of fossil fuels for electricity and for the operation of vehicles and equipment. Use of raw building materials for construction would be an irretrievable commitment of resources from which these materials are produced. The use of water for dust abatement during construction activities would be irreversible. Development of lands would also require labor that would otherwise be available for other projects. Commitment of labor and fiscal resources to develop the land is considered irretrievable.

An irreversible and irretrievable loss of existing resources within the CTA study area would also occur as a result of Alternatives B–E and the No-Action Alternative. Resources lost would include permanent loss of varying amounts of soils, vegetation, cultural and Native American sites, fossils, and wildlife. The visual quality of the area would also diminish, as disposal alternatives would result in increased development on a natural landscape.

Irreversible loss of biological resources would occur under disposal alternatives. These losses would include individual plants, animals, and habitat. Specifically, the individuals of bearpoppy, buckwheat, and desert tortoise that inhabit the existing BLM lands would be destroyed or displaced as incrementally more development occurs and subsequent loss of habitat takes place.

Under the NHPA, cultural resources eligible for listing in the NRHP would be protected from development. Development of disposal lands would result in the irretrievable loss of unidentified cultural resources. In addition, Native American resources, once destroyed or altered, cannot be replaced. Any loss of TCPs would be considered irreversible and irretrievable.

Both known and unknown paleontological resources located within the disposal boundaries would be irretrievably lost during development of the lands. Although some protection has been afforded under the varying alternatives, this protection cannot be guaranteed once the BLM performs title transfers to public or private entities. As such, the scientific and educational information these resources may provide would be irreversibly lost.

5.1 UNAVOIDABLE ADVERSE IMPACTS

Certain adverse impacts cannot be avoided with the application of mitigation measures. Additionally, implementation of any land disposal action would have unavoidable direct, adverse impacts to the continued availability of BLM-managed lands within the LVV.

Unavoidable indirect impacts resulting from disposal alternatives include fugitive dust and exhaust emissions from construction activities, soil and wind erosion, water quality impacts from stormwater runoff, displacement of vegetation and wildlife species, disturbance of cultural and paleontological resources, loss of natural viewsheds, decreased opportunities for dispersed recreation, and increased dumping of household waste or debris in open lands as a result of encroaching development.

5.2 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Pursuant to NEPA regulations [40 CFR 1502.16], an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Management of BLM land is primarily for the long-term productivity of sensitive plant and animal species, paleontological resources, cultural resources, and certain dispersed recreation opportunities. For the purposes of this SEIS, short term is defined as the remainder of the planning period through 2018, and long term is defined as the disposal and full build-out of all remaining BLM lands within the disposal boundary, whenever that may be.

The process of land disposal under the alternatives would result in the short-term uses of physical, natural, and cultural resources. The short-term effects of land disposal under the alternatives would consist of a temporary loss of access to some recreational opportunities, potential loss of undocumented cultural and paleontological resources, and construction-related impacts consisting of increases in localized noise, dust, traffic, and vehicular emissions. Long-term environmental impacts include increased noise, air emissions, and loss of open space as population locates to disposal areas.

Short-term use of the labor force would result in long-term productivity of the economic environment, including employment, personal income, and tax revenue. Long-term benefits include the provision of new local housing and employment opportunities. Disposal may also serve as a catalyst for other economic growth in the area. The disposal alternatives would also provide short- and long-term employment opportunities. Short-term employment would be related to construction activities. Long-term employment would relate to the addition of commercial and economic development opportunities realized under varying disposal alternatives.

Chapter 6

CONSULTATION AND COORDINATION

This chapter describes public participation opportunities made available by the BLM prior to and during preparation of the SEIS. Consultation and coordination help determine whether BLM actions are consistent with other agencies' land use and development plans. As part of the NEPA process, coordination with federal, state, and local agencies, Native American tribes, and the general public took place to ensure informed decision-making.

6.1 PUBLIC PARTICIPATION PROCESS

6.1.1 Pre-scoping

Between the publication of the ROD for the LVVDB EIS and the initiation of the scoping period for this SEIS, the BLM Las Vegas Field Office engaged in a pre-scoping process relating to the CTA. The process included meetings from November 2004 through June 2007, each composed of varying stakeholders and interested members of the public. The meetings primarily dealt with concerns of stakeholder groups, including state, federal, and local government, non-profit organizations, and utility groups on how to manage the CTA and mitigate potential impacts to the area.

More than 160 individuals participated in the pre-scoping process. From this larger group, Task Groups were formed to provide input on behalf of 1) the City of Las Vegas; 2) the City of North Las Vegas; 3) Conservation; 4) Recreation; 5) Regional Entities (flood, water, transportation); 6) State of Nevada; 7) USFWS (both Ecological Services and Refuge); 8) Clark County; 9) Education/Research; 10) Utilities; 11) Builders/Developers; 12) Native American; and 13) BLM (*ex officio*). The monthly meetings were all open to the public.

Over a 10-month period in 2005, BLM received preliminary input on a variety of topics, including vision statements, goals and objectives, boundaries, infrastructure, recreation, education, and management options. After the final Task Group Meeting in August 2005, BLM used this input to develop an initial set of five alternatives for a NEPA document. These Draft Alternatives were sent out to the broader public for review in early October 2005. BLM received 21 responses, half of them from individuals. Two comments were out of state. Other than the cities, the overwhelming response was to save the largest area of the CTA. Originally, this document was planned as an Environmental Assessment. However, because of the high degree of complexity, level of controversy, levels of uncertainty, and the results of pre-scoping activities, the BLM decided to move forward with an SEIS process. The stakeholder and working group processes helped to provide a basis for discussions that lead to the draft SEIS process. The task group meetings continued until June 2007, when the BLM began plans for an official public scoping period for the SEIS. During this time, the BLM has continued to provide quarterly progress reports to task group members.

6.1.2 Scoping

The purpose of scoping is to provide an opportunity for members of the public to learn about the proposed project and to share any concerns or comments they may have. Input from the public scoping process is used to help the BLM identify a range of alternatives as well as to identify issues and concerns to be considered in the SEIS. In addition, the scoping process helps identify any issues that are not

considered significant and can therefore be eliminated from detailed analysis in the SEIS. The list of stakeholders and other interested parties is also updated and generally expanded during the scoping process.

The BLM Las Vegas Field Office hosted three scoping meetings throughout the LVV on August 14, 15, and 16, 2007, to provide the public an opportunity to learn about the project and provide comments. One meeting was held at the BLM offices on Torrey Pines Drive. The two other meetings were held in the West Charleston Library and North Las Vegas Library to ensure convenient access to interested parties. An open-house format was used to encourage two-way dialogue and to encourage discussions about issues to be addressed in the CTA SEIS; concerns with the process; and development of the range of alternatives to be analyzed in the draft CTA SEIS. Several informational posters were on display that described potential alternative boundaries and allowable uses for the CTA. A 45-day scoping comment period was provided to submit written comments related to CTA SEIS issues.

The scoping meetings were advertised in the *Federal Register* and the *Las Vegas Review Journal*, in an email to the BLM CTA stakeholder mailing list, and on the BLM Las Vegas Field Office website at <http://www.nv.blm.gov> two weeks prior to their scheduled dates. The BLM Las Vegas Field Office has maintained a link on the website for the CTA SEIS to provide information to the public regarding the NEPA process, CTA SEIS schedule, public scoping, and other information pertinent to the project.

Members of the public were afforded several methods for providing comments during the scoping period. Those included multiple comment stations with comment forms, flip charts for meeting personnel to write down comments submitted verbally as requested by meeting attendees, and emails or letters sent to BLM personnel. A total of 1,183 individuals submitted comments.

The scoping period for the SEIS was initially July 6, 2007, through August 20, 2007. An announcement was made at the August 14, 2007, scoping meeting that the comment period would be extended until September 4, 2007. The scoping process and public comments summary and analysis are documented in the *Upper Las Vegas Wash Conservation Transfer Area Supplemental Environmental Impact Statement Scoping Report*, dated November 2007 (SWCA 2007).

6.2 AGENCY CONSULTATION AND COORDINATION

Early and frequent coordination with affected agencies is emphasized in CEQ regulations and is directed by BLM guidance. The BLM is also required by law and regulation to consult with specific agencies and entities because of jurisdictional responsibilities.

6.2.1 Cooperating Agencies

As defined by CEQ regulations, a cooperating agency is one that has special expertise with respect to an environmental issue and/or has jurisdiction by law. The BLM invited 10 federal, state, and local governments to be cooperating agencies for the preparation of the CTA SEIS. The following agencies have accepted the invitation and signed a Memorandum of Understanding with the BLM:

- U.S. Fish and Wildlife Service
- Federal Highway Administration
- Las Vegas Paiute Tribe
- Clark County

- City of Las Vegas
- City of North Las Vegas

The BLM met with each of the cooperating agencies on an individual basis between October and December 2008. The purpose of these meetings was to present the alternatives analyzed in the draft SEIS, including the BLM Preferred Alternative, and describe the approach to the environmental impacts analysis. Throughout the process, the BLM has also had regular meetings with the Cities of Las Vegas and North Las Vegas that included updates on the CTA SEIS.

6.2.2 State Historic Preservation Office

BLM consults with the SHPO in accordance with Section 106 of the NHPA when BLM actions may affect cultural properties. The entire area of the CTA SEIS has been inventoried for cultural resources, and BLM has completed consultation with the Nevada SHPO on determinations of eligibilities for cultural resources located within the CTA SEIS project area. BLM has prepared an HPTP for those eligible cultural sites for review by the SHPO. Since this consultation process involves sensitive data, such as the location of sites, this process is not generally open to the public.

6.2.3 Native American Tribes

BLM consults with Native American Tribes to identify cultural values, religious beliefs, and cultural values that may be affected by BLM actions. The NHPA is the basis for tribal consultation provisions. BLM used a two-phased approach to fulfill the objective of consultation with Native American tribes and identification of any TCPs within the project area. First, BLM completed an intensive review of ethnographic literature relevant to the geographic region that encompasses the project area to identify previously documented TCPs and Native American tribes with traditional concerns in the area. Second, consultation letters were submitted to the Southern Paiute. Follow-up calls were made to discuss initial reactions and concerns. BLM met with representatives of the Las Vegas Paiute tribe on May 6, 2008, to get their views on the alternatives being analyzed in the SEIS. Tribal consultation has occurred throughout the CTA SEIS process. Additionally, tribal members and the general public had the opportunity to comment during the public meetings held during the scoping period.

6.2.4 U.S. Fish and Wildlife Service

The ESA requires all federal agencies to participate in the conservation of endangered species. Specifically, Section 7 of the ESA charges federal agencies to aid in the conservation of listed species and ensure that their activities are not likely to jeopardize the continued existence of listed species or adversely modify designated Critical Habitats. In addition, BLM cannot undertake actions that will lead to the listing of a species under the ESA.

Formal Section 7 Consultation with USFWS was initiated in October 2003 for potential effects from expansion of the disposal boundary, including the Conservation Transfer Alternative, on the desert tortoise. USFWS issued a programmatic Biological Opinion in December 2004. At the request of BLM, USFWS included recommendations for conservation of the Las Vegas buckwheat as well. The development of trails in the CTA study area was not specifically addressed in the 2004 Biological Opinion. To supplement the 2004 Biological Opinion, the BLM has prepared a Biological Evaluation for the future development of trails that could potentially be developed under the CTA SEIS Preferred Alternative.

6.3 DISTRIBUTION LIST

U.S. Congress

Federal Agencies

Nevada State Agencies

6.3.1 Local Governments

Clark County

City of Las Vegas

City of North Las Vegas

6.3.2 Native American Tribes

Las Vegas Paiute Tribe

Chapter 7

LIST OF PREPARERS

This document was prepared and reviewed by a team from the BLM Las Vegas District Office and a team associated with SWCA. Team members are identified with their titles, roles, experience, and education in Table 7-1.

Table 7-1. List of Preparers

Organization	Name	Project Role	Years of Experience	Education
BLM	Gayle Marrs-Smith	Project Manager, Botany	15	MS Botany
BLM	Sarah Peterson	Hydrology	10	MS Hydrology
BLM	Jeff Steinmetz	Lead Planning and Environmental Coordinator	31	BS Range Management
BLM	Susanne Rowe	Archaeology, Paleontology	9	MA Anthropology
BLM	George Varhalmi	Minerals	10	MS Geology
BLM	Mark Slaughter	Biological Resources	6	BS Biology
BLM	Cheryl Cote	Realty Specialist	17	BLM Lands Academy
BLM	Lew Brownfield	GIS Specialist	10	BS Geography
SWCA	Charles Coyle	Project Manager	10	BA English, MA English
SWCA	Al Herson	NEPA Quality Assurance Review	30	JD, MA Urban Planning
SWCA	Jeff Connell	Principal in Charge, Public Involvement, Socioeconomics	30	AICP, MA
SWCA	David Brown	Planning Coordinator, Public Involvement	7	MLA
SWCA	Eric Koster	Assistant Project Manager, Biological Resources	8	BA Biology
SWCA	Steve Leslie	Assistant Project Manager, Transportation and Noise	11	BS Natural Resource Management
SWCA	Justin Streit	Biological Resources	6	BS Natural Resources
SWCA	Matt Villaneva	Botany, Biological Resources	5	BS Environmental Biology, Minor in Botany
SWCA	Heather Stettler	Cultural Resources	15	BA, MA, and PhD Anthropology
SWCA	Elizabeth Perry	Tribal Coordination	13	BA, MA, and PhD Anthropology
SWCA	Steve Knox	Visual Resources, Land Use	34	BS Watershed Management
SWCA	David Reinhart	Lead GIS Specialist	9	BS Anthropology, GIS certificate
SWCA	Barbara Stone	GIS	3	BS Fisheries and Wildlife
SWCA	Allen Stutz	GIS Specialist, Geospatial Analysis	1 year	BS Conservation, Ecology and Evolution, BS Zoology, Certificate of Advanced Study in GIS

Table 7-1. List of Preparers (Continued)

Organization	Name	Project Role	Years of Experience	Education
SWCA	Paul Murphy	Principal Investigator, Paleontology	26	BS Anthropology/Biology, MS and PhD Geological Sciences (Paleontology Emphasis)
SWCA	Jessica DeBusk	Paleontology	6	BS Geology (Emphasis in Paleobiology)
SWCA	Camille Ensle	Publication Specialist		
SWCA	Heidi Orcutt-Gachiri	Editor	8	PhD Linguistics and Anthropology, MA Linguistics, MA Philosophy
SWCA	Benjamin Gaddis	Public Scoping and Comment Analysis Scoping report primary author	8	BS Environmental Science, MEM Water Resources
SWCA	Elisha Hornung	Public Scoping and Comment Analysis	8	BS Environmental Studies
SWCA	Megan Nelson	Public Scoping and Comment Analysis, Comment Analyst	2	BA English
SWCA	Janet Guinn	Public Scoping and Comment Analysis, Scoping Report	9	BS Psychology and Anthropology
SWCA	Lesley Hanson	Biological Resources	4	BS Biology
SWCA	Harmony Hall	Recreation	8	BS Natural Resources
SWCA	Claire Bingaman	Recreation, Socioeconomics, Environmental Justice	2	BS Environmental Science, MA Urban and Environmental Planning
SWCA	Cara Bellavia	Socioeconomics	8	MUEP
SWCA	Kelli Nagamine	Administrative Record	5	BA
Zeus Environmental, LLC	Carrie Stewart	NEPA Quality Assurance	20	BS Geology, MA Computer and Information Systems, MA Human Resources and Development
Kleinfelder	Darcy Anderson	Project Manager, Air Quality QA/QC	25	MS Meteorology, MS Hydrology
Kleinfelder	Michael Langley	Senior NEPA Specialist	25	BS Meteorology
Kleinfelder	Charles Larson	Hydrology/Erosion	25	MS Engineering
Kleinfelder	Travis Kluthe	Surface Water Modeling	2	BS Geological Engineering
Kleinfelder	Dan Burns	Hazardous Materials	23	BS Geology, BS Civil Engineering
Kleinfelder	Doug Davis	Geology and Soils	18	MS Geology
Kleinfelder	Karin Hagan	Earth Resources	10	MS Geology, MS GIS
Kleinfelder	Ryan Eberle	Air Quality	10	BS Environmental Engineering
Kleinfelder	Sarah Walters	Air Quality	5	MS Hydrology
Kleinfelder	Jodi Strohmayer	Environmental Planner, Archaeologist	6	MS GIS, Archaeology

Chapter 8

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Chapter 9

GLOSSARY

100-year flood. A flood event of such magnitude that it occurs, on average, every 100 years. This equates to a 1% probability of its occurring in any given year.

Acre-foot. A measure of volume of water. The amount of water it would take to cover 1 acre of land to a depth of 1 foot; equal to 325,851 gallons or 43,560 cubic feet.

Affected environment. Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air quality. The cleanliness of the air as measured by the levels of pollutants relative to standards or guideline levels established to protect human health and welfare.

Alluvial fan. A broad, conical deposit of sediment typically found at the edge of mountain ranges, dissected by channels and composed of coarse-grained material, including sand, gravel, cobbles, and boulders.

Alluvium. Any stream-laid sediment deposit.

Ambient. Surrounding or background conditions in the absence of an identifiable source.

Ambient air. That portion of the atmosphere, outside buildings, to which the general public has access.

Ambient Air Quality Standards. Standards established on a state or federal level that define the limits for airborne concentrations of designated criteria pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter with aerodynamic diameters less than 10 microns [PM10), ozone, and lead) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Aquifer. A body of rock that contains enough saturated, permeable material to transmit groundwater and to yield significant quantities of groundwater to wells and springs.

Area of Critical Environmental Concern. A Bureau of Land Management designation for an area within public lands in which special management is required in order to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life from natural hazards.

Artesian. Refers to groundwater under sufficient hydrostatic head to rise above the aquifer that contains it.

Assessment (Environmental). An evaluation of existing resources and potential impacts to them from a proposed act or change to the environment.

Attainment area. A region that meets the National Ambient Air Quality Standards for a criteria pollutant under the Clean Air Act.

Baseline. The initial environmental conditions against which the environmental consequences of the alternatives are evaluated.

Candidate species. Species for which the U.S. Fish and Wildlife Service has sufficient information on file regarding biological vulnerability and threat(s) to support the issuance of a proposed rule to list but issuance of the proposed rule is precluded.

Criteria pollutant. Common air pollutant for which the U.S. Environmental Protection Agency has established a maximum exposure standard based on scientific knowledge regarding the pollutant's health effects. Criteria pollutants include sulfur dioxide, carbon monoxide, particulate matter less than 10 microns in diameter, particulate matter less than 2.5 microns in diameter, nitrogen dioxide, ozone, and lead.

Cumulative impact. A cumulative impact is the environmental impact resulting from the incremental impacts of a particular activity when added to other past, present, or future activities. Cumulative impacts may be individually insignificant, but collectively, the individually insignificant activities may become significant.

Detention basin. A basin designed to hold floodwaters.

Diagnostic remains. "Diagnostic" refers to the usefulness of the fossil with respect to obtaining information of scientific worth.

Direct effect. Beneficial or adverse impact that is caused by an action and occurs at the same time and place.

Disposal boundary area. The land area within the boundary established by the Southern Nevada Public Land Management Act of 1998 and as expanded by the Clark County Conservation of Public Land and Natural Resources Act of 2002.

Distance zones. A subdivision of the landscape as viewed from an observer position. The subdivision (zones) includes foreground–middle ground, background, and seldom seen.

Endangered species. A plant or animal species that is threatened with extinction or serious depletion in its range and is formally listed as such by the U.S. Fish and Wildlife Service.

Endemic environment. Plants or animals that are native to a particular region; the surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.

Environmental Impact Statement. A detailed written statement that helps public officials to make decisions based on an understanding of the environmental consequences and to take actions that protect, restore, and enhance the environment.

Ephemeral. Lasting only a brief period of time.

Ephemeral stream. A stream or portion of a stream that flows only in direct response to precipitation.

Evapotranspiration. The loss of water from the soil both by evaporation and by transpiration from the plants growing there.

Fault. A fracture or fracture zone in the earth's surface along which there has been displacement of the sides relative to one another parallel to the fracture.

Floodplain. That portion of a river or stream valley, adjacent to the river channel, which is built of sediments and is inundated with water when the stream overflows its banks.

Form. The mass or shape of an object or objects, which appears unified.

Fossil. The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust, excluding organisms that have been buried since the beginning of historical time.

Fossiliferous. Containing fossils.

Fugitive dust. Particulate matter composed of soil. Fugitive dust may include emissions from haul roads, wind erosion of exposed soil surfaces, and other activities in which soil is either removed or redistributed.

Geological. Any natural process acting as a dynamic physical force on the earth, e.g., faulting, erosion, and mountain-building resulting in rock formations.

Groundwater recharge. Water that infiltrates the land surface and is not lost to evaporation or consumed by plants can percolate downward and replenish the groundwater aquifers. This deep percolation is called recharge.

Habitat. The region in which a plant or animal natural grows or lives. A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and home range.

Hazardous waste. Waste that is designated hazardous by the U.S. Environmental Protection Agency or state regulations. As defined under the Resource Conservation and Recovery Act, hazardous waste is waste from production or operation activities that pose a potential hazard to human health or the environment when improperly treated, stored, or disposed of. Hazardous waste that appears on special Environmental Protection Agency lists or possesses at least one of the four following characteristics: ignitability, corrosivity, reactivity, or toxicity.

Human environment. The natural and physical environment and the relationship between people and the environment.

Hydrology. A science that studies the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere.

Impact. The terms "impacts" and "effects" are synonymous as used in the National Environmental Policy Act. Impacts may be beneficial or adverse and may apply to the natural, aesthetic, historic, cultural, and socioeconomic resources of the installation and the surrounding communities. Where applicable, impacts may be classified as direct or indirect.

Indirect impact. An indirect impact is caused by a proposed activity but is later in time or farther removed in distance while still being reasonably foreseeable. Indirect impacts may include land use changes or population density changes and the related effects these changes will have on air, water, and other natural or social systems.

Infiltration. Water that falls on the land surface and does not run off, instead percolating into the ground. Some of this water evaporates, some is used by plants, and some percolates downward to the groundwater.

Intermittent stream. A stream that flows only at certain times when it receives water from springs or from a surface source.

Landform. A term used to describe the many types of land surfaces that exist as a result of geological activity and weathering (e.g., plateaus, mountains, plains, and valleys).

Line. The path, real or imagined, that the eye follows when perceiving abrupt differences in form, color, or texture or when objects are aligned in a one-dimensional sequence. Usually evident in the edge of shapes or as masses in the landscape.

Lithic. Pertaining to stone or a stone tool (e.g., lithic artifact).

Locatable materials. Traditional "hard rock" minerals such as gold, silver, lead, copper, zinc, and industrial minerals such as fluorspar, barite, and high-calcium limestone that occur in lode or placer deposits.

Long-term impacts. Long-term impacts are neither temporary nor reversible. They may occur either during the construction or operational phases of an activity. For example, the construction of a new building may create long-term impacts during both the construction and operational phases. Draining of a wetland for the construction of a new building will create long-term and permanent impacts to biological resources. Likewise, once operation, the new building may create additional long-term impacts such as increased population density, waste generation, etc.

Master Plan. A document (or a set of document) that sets forth goals and policies for guiding future land use and development in a community. Also known as a Comprehensive Plan.

Migratory. Birds, animals, or people that migrate (move) from one region or country to another.

Mineral resource. Any inorganic or organic substance that occurs naturally in the earth and that has a consistent and distinctive set of physical properties. Examples of mineral resources include coal, nickel, gold, silver, and copper.

Mitigation. Mitigation generally includes the following: avoiding the impact altogether by stopping or modifying the proposed action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; compensating for the impact by replacing or providing substitute resources or environments.

National Ambient Air Quality Standards. Section 109 of the Clean Air Act requires the U.S. Environmental Protection Agency to set nationwide standards for widespread air pollutants. Currently, six pollutants are regulated: sulfur dioxide, carbon monoxide, PM10, nitrogen dioxide, ozone, and lead.

National Register of Historic Places. A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance established by the Historic Preservation Act of 1966 and maintained by the National Park Service.

Native vegetation. Vegetation originating in a certain region or country.

Nitrates. A water-soluble molecule made up of nitrogen and oxygen. It is formed when nitrogen from ammonia or other sources combines with oxygenated water.

No impact. "No impact" implies that a particular activity creates neither a direct nor indirect impact, does not have long- or short-term implications, and is neither beneficial nor negative.

Nonattainment area. An area that has been designated by the U.S. Environmental Protection Agency or the appropriate state air quality agency as exceeding one or more national or state Ambient Air Quality Standards.

Nonpoint source. Source of pollution generally attributed to urban runoff from irrigating landscapes and golf courses, draining pools to streets, washing vehicles in streets, and hosing down driveways.

Off-highway vehicle. Any motorized vehicle designated for cross-country travel over any type of natural terrain.

Ozone (ground level). A major ingredient in smog. Ozone is produced from reactions of hydrocarbons and nitrogen oxides in the presence of sunlight and heat.

Paleontology. The science that deals with the life of past geological ages through the study of the fossil remains of organisms.

Particulate. Fine liquid or solid particles, such as dust, smoke, mist, fumes, or smog, found in air or emissions.

Patent. A government deed; a document that conveys legal title of public lands to whom the patent is issued.

Perennial. Lasting or active through the year. May refer to rivers, streams, or plants.

Permeability. The measure of the ease with which a fluid can diffuse through a particular porous material.

Physiographic province. An area characterized by distinctive topography, geological structure, climate, drainage patterns, and other features and phenomena of nature.

Pleistocene. The first geological epoch during the Quaternary period, spanning from 1.8 million years ago to about 9000 B.C., characterized by extensive continental glaciation in the Northern Hemisphere.

Point source. Any discernible, confined, and discrete conveyance, including any pipe, ditch, channel, tunnel, or conduit from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

Quaternary. The geological period following the Tertiary in the Cenozoic Era, beginning about 1.8 million years ago, composed of the Pleistocene and Holocene epochs, characterized by the evolution of hominids into modern humans.

Range. A large, open area of land over which livestock can wander and graze.

Rare. A plant or animal restricted in distribution. May be locally abundant in a limited area or few in number over a wide area.

Record of Decision. A public document that explains which alternative will be selected for the area of concern.

Region. A large tract of land generally recognized as having similar character types and physiographic types.

Region of Influence. The geographical area to be addressed as the baseline from which to identify and evaluate environmental changes resulting from the proposed alternatives. The region of influence may vary for each resource area.

Right-of-way. Strip of land acquired by legal means, over which the power line and access roads would pass.

Riparian. The banks of a body of water.

Salable minerals. Common variety mineral materials such as sand, gravel, cinders, and building stone that are sold on a permit basis. Also referred to as mineral materials.

Scope. The range of actions, alternatives, and impacts to be considered in an Environmental Impact Statement.

Sediment. Solid fragmented material, either mineral and organic, that is transported or deposited by air, water, gravity, or ice.

Sensitive species. Species whose populations are small and widely dispersed or restricted to a few localities; species that are listed or candidates for listing by the state or federal government.

Sensitivity level. A measure of public concern for scenic quality based on various indicators of public concern.

Short-term impacts. Short-term impacts are temporary and either direct or indirect. Short-term impacts usually occur during the construction phase of the activity.

Significance. Significance requires consideration of the context and intensity of the impact or effect under consideration. Significance can vary in relation to the context of the proposed action. Both short- and long-term effects may be relevant. Impacts may also be evaluated in terms of their intensity or severity.

Socioeconomic. Have or involving both social and economic factors. A given geographical area delineated for specific research.

Species. A group of individuals of common ancestry that closely resemble each other structurally and physiologically, and in nature interbreed, producing fertile offspring.

Stratigraphic. Division of geology dealing with the definition and description of rocks and soils, especially sedimentary rocks.

Subsidence. The gradual settling or sinking of an area, usually due to the withdrawal of large amounts of groundwater.

Subsurface. A zone below the surface of the earth whose geological features are principally layers of rock that have been tilted or faulted and are interpreted on the basis of drill hole records and geophysical (seismic or rock vibration) evidence. Generally, it is all rock and solid materials lying beneath the earth's surface.

Texture. The aggregation of small forms or color mixtures into a continuous surface pattern; the aggregated parts are enough that they do not appear as discrete objects in the composition of the scene.

Threatened species. A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Traditional cultural property. A location that is valued by some group, such as an ethnic group, because it is a place of cultural patrimony and an important place in the traditional cultural landscape.

Tributary. Any stream or wash that contributes water to another stream or wash.

Unemployment rate. The unemployment rate represents the number unemployed as a percent of the labor force.

Viewshed. Visible portion of the specific landscape seen from a specific viewpoint, normally limited landform, vegetation, distance, and existing cultural modifications.

Waters of the U.S. Water such as intrastate lakes, rivers, streams (including intermitted streams).

Watershed. A region or area bounded peripherally by a water parting and draining ultimately to a particular body of water.

Wetlands. An area that is regularly saturated by surface water or groundwater and subsequently supports vegetation that is adopted for life in saturated soil conditions. To qualify as a U.S. Army Corps of Engineers jurisdictional wetland, it must have hydric soil, be saturated to the surface sometime during the growing season, and contain wetland plant species.

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Chapter 10

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BLM

DRAFT
Supplemental Environmental Impact Statement
UPPER LAS VEGAS WASH CONSERVATION TRANSFER AREA, LAS VEGAS, NEVADA

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

January 2010

Appendix A

BEST MANAGEMENT PRACTICES

BEST MANAGEMENT PRACTICES

BMPs are management actions that have been developed by an agency, industry, and/or scientific community as methods for reducing environmental impacts to certain resources associated with certain kinds of activities. They have been developed by the Southern Nevada District Office specifically to guide future management of the CTA. Additionally, the revised 1994 edition of the *Handbook of Best Management Practices,* adopted by the Nevada State Environmental Commission, can be used as applicable.

BMPs typically are implemented at the discretion of the BLM Authorized Officer at the activity plan or project-specific level. Depending on the specific project and types of anticipated disturbances, BMPs may not be appropriate to apply in all cases. The BMPs identified here will be used to guide the development of the Conservation Strategy Agreement, revisions to the Las Vegas RMP, and individual land use authorizations to provide for long-term protection of sensitive resources within the CTA.

Soil Resources

- Use specialized low-surface impact equipment (e.g., vehicles with balloon tires) for off-road access, where travel on foot is not feasible, in order to protect fragile soils and other resource values.
- Salvage and reapply topsoil from construction activities as appropriate during reclamation.
- Comply with county, state, and federal standards for implementation of erosion controls. Apply appropriate erosion control practices, such as silt fences and check dams, near disturbed areas where appropriate.
- Identify areas that need to be avoided in the CTA to protect the LVF, sensitive plant habitat, and wash resources.
- Restore human-caused disturbances to soils in order to prevent habitat fragmentation, soil erosion, and loss of nutrients.
- Use native species in restoration to stabilize surfaces.
- Avoid soil disturbance in Las Vegas buckwheat, Las Vegas bearpoppy, and Merriam's bearpoppy habitat in order to manage for sustainable natural populations.

Water Resources

- Design land uses to minimize disturbance to the ULVW.
- Design approved roadways to allow natural floodwaters from the alluvial fan between the Sheep Mountain and Las Vegas ranges and the ULVW to flow in a natural fashion; this could include elevating roads, creating appropriate dissipation structures with outflow phalanges, and installing porous pavement.
- Avoid modifying the ULVW, such as armoring (e.g., riprap), channeling, diversion structures, detention basins, etc., in the design and construction of new projects and land uses.
- Maintain natural ecosystem processes, including surface flows, wind/water erosion and deposition, and nutrient cycling, when designing projects.
- Protect natural drainages when considering land use authorizations. Land use authorizations, including recreational permits, should be designed to minimize impacts to wash resources.

- Develop an In Lieu Fee Mitigation Program under the CWA that defines protection, enhancement, restoration, and monitoring actions for identified jurisdictional waters. Work with non-government groups and the USACE to establish the program.

- Engineer land use authorizations to protect the washes that provide for hydrologic and biological functioning of the system.
    - Design roads to span washes and/or leave wash bottoms undisturbed.
    - Construct gabions, water bars, and other low-impact flood control structures outside the ULVW, or in less sensitive areas within the CTA only if necessary, to reduce human-caused impacts to sensitive resources.
    - Coordinate with CCRFCD to establish an erosion monitoring program in key areas to track changes in erosion patterns that could negatively impact plant and paleontological resources as part of the Conservation Strategy Agreement.

Vegetation

- Develop procedures to reduce or eliminate impacts to special-status plant species. Measures could include relocating project facilities outside plant habitat, collecting seeds, salvaging topsoil, and propagating and planting native material.
- Identify areas that should be avoided for activities or land uses to protect sensitive plant resources.
- Land uses should be designed to the smallest footprint necessary.

- Restore disturbed habitat. Develop and implement habitat restoration protocols to restore and minimize negative impacts of authorized projects to sensitive plant species. Include actions that will identify revegetation, soil stabilization, and erosion reduction measures to ensure successful restoration of temporary construction areas. Require that restoration occur as soon as possible after completion of activities to speed up recovery of natural habitats.
- Control noxious weeds and invasive species. Develop actions that address weed inventory and monitoring, as well as education of personnel on weed identification, the manner in which weeds spread, and methods for treating infestations. Establish and implement weed protocols for reducing weed introductions from construction vehicles and equipment that are arriving from locations with known invasive vegetation problems. Protocols include establishing a controlled inspection and cleaning area, visually inspecting construction equipment arriving at the construction area, and ensuring that invasive propagules and seeds are removed from tires and other equipment surfaces.
- Protect natural ecological processes, such as pollinator movement, natural wind flow patterns, surface water flows, etc., that maintain sustainable populations by providing connectivity between populations in evaluating land uses.
- Maintain open spaces and corridors between populations when considering land uses.
- Establish long-term monitoring studies for the Las Vegas bearpoppy, Merriam's bearpoppy, and Las Vegas buckwheat to track recruitment, population viability, and life history. Establish thresholds to detect declining populations and trigger additional conservation actions to be

implemented when these ecological thresholds are hit as part of the Conservation Strategy Agreement.

- Ensure that developments and land uses are compatible with the long-term protection of the sensitive plant species, including avoidance of habitat or application of meaningful mitigation.
- Restore existing and new land disturbances in sensitive plant habitat.
    - Use stockpiled native soils and salvaged native plant material.
    - Use native species in approved developments within the CTA.
- Provide protection to sensitive plant habitat from activities such as illegal motorized use, dumping, trespassing, and other invasive uses through fencing, cleanups, or education.
- Provide ecological connectivity between Eglington Preserve and the CTA to the extent possible.

Educational and Recreational Opportunities

- Provide compatible educational, recreational, and interpretive opportunities in order for the public to enjoy and appreciate the unique resources of the CTA.
- Design uses, including recreational permits, to minimize impacts to sensitive resources.
- Appropriately interpret the Tule Springs site while protecting the historical and paleontological resources.
- Support studies and interpretation of the fossil resources in the CTA.
- Develop environmental education and interpretive programs for paleontological, cultural, and rare plant resources when such actions are consistent with the protection of the ULVW.
    - Locate uses in areas that reduce impacts to sensitive resources.
    - Develop ongoing public information and interpretation of the Las Vegas bearpoppy, Las Vegas buckwheat, cultural, and paleontological resources.
- Establish a non-motorized trail system, compatible with the protection of sensitive resources, for the enjoyment of the public. Provide interpretation to recreational users.
    - Locate trails and structures (kiosks, staging areas, restrooms, parking facilities, etc.) such that they do not conflict with the management of sensitive resources.
    - Uses, including recreational permits that are compatible with sensitive resource management goals, should be designed to minimize impacts.

Cultural Resources

- Consult with Indian Tribal Governments early in the process to identify issues regarding any proposed developments, including issues related to the presence of cultural properties, access rights, disruption to traditional cultural practices, and impacts to visual resources important to the tribe.
- Address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land.
- Protect the LVF, including the paleontological, geological, and cultural resources.
- Protect cultural resource sites and paleontological areas so that they are kept undisturbed and unfragmented.

- Provide mitigation and treatment for all paleontological and cultural resource sites that cannot be preserved in situ.
- Protect the 1,125-acre Tule Springs site as defined in the NRHP nomination form.[1] The Tule Springs site has national significance in our country's history and should be protected from destruction or impairment. Ensure that actions on BLM land do not conflict with the preservation of historic resources within Tule Springs.
- Cooperate with the Nevada Division of State Parks on the Tule Springs State lands, an inholding within the 1,125-acre Tule Springs site, to ensure consistency with management actions on BLM lands through a cooperative management agreement.
- Provide mitigation and treatment for all paleontological sites, cultural resource sites, and rare plants that cannot be preserved in situ.
- Protect Native American traditional use areas.
- Evaluate and, if significant, nominate a TCP for the ULVW, working closely with the tribes.
- Appropriately manage areas that have been identified as being sensitive to the Southern Paiute tribes, including the Las Vegas Paiute Tribe.
- If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a cultural resources management plan shall be developed. The plan shall
    - Establish a cultural resources monitoring program; and
    - Identify measures to prevent potential looting/vandalism or erosion impacts.

Paleontological Resources

- Require a Discovery Plan for any authorized action that would cause disturbance in the LVF; a qualified paleontologist would be on-site during construction activities in case fossils are found.
- Protect the LVF, including the paleontological and geological resources.
- Manage the paleontological assemblages within the LVF.
    - Protect the CTA boundary and in situ fossil localities.
    - Work within BLM's statutes to protect the LVF within all approved R&PP Act leases.
- Establish appropriate in situ preservation areas for paleontological areas that are kept undisturbed and unfragmented for future research and interpretation.
- Maintain appropriate in situ key paleontological localities that are essential to understanding paleoecology within the LVF.
- Provide mitigation and treatment for all paleontological localities sites that cannot be preserved in situ.
- Conduct regular paleontological prospecting to ensure that new surface fossil sites eroding from the LVF are identified and protected.
- Establish a paleontological stewardship program to educate and train volunteers to monitor and assist in protecting the CTA.

[1] The NRHP lists the site as 980 acres. There has been no change to the boundary; rather, modern technology has allowed the acreage to be calculated with greater accuracy.

Appendix B

CONSERVATION GOALS AND OBJECTIVES—UPPER LAS VEGAS WASH CONSERVATION TRANSFER AREA

CONSERVATION GOALS AND OBJECTIVES—UPPER LAS VEGAS WASH CONSERVATION TRANSFER AREA

Many of the goals and objectives listed below were developed through numerous CTA public meetings between 2004 and 2006 that led up to the SEIS process. The public meetings helped BLM to achieve the following vision: *The CTA preserves the natural function of the Upper Las Vegas Wash, protects the sensitive resources within, and supports education, research, and low-impact recreational use. The CTA is ecologically functional to the maximum extent possible and managed to insure the long-term integrity of the Las Vegas Formation and associated fossil beds, the rare plant habitat for the Las Vegas bearpoppy, Merriam's bearpoppy, and Las Vegas buckwheat, as well as natural flood water capacity for present and future generations.*

In order to guide development of the conservation agreement and future management decisions within the final CTA boundary, the goals and objectives are listed below by the resource to which they apply. Goals and objectives may be listed under more than one resource.

EARTH RESOURCES

Ensure the long-term viability of Las Vegas buckwheat, Las Vegas bearpoppy, and Merriam's bearpoppy in sustainable natural populations within the boundaries of the ULVW CTA.

- Maintain rare plant habitat by preventing fragmentation of that habitat.
    - Protect the boundary of the CTA from the impacts of urbanization.
- Restore existing and new land disturbances in sensitive plant habitat.
    - Use stockpiled native soils and salvaged native plant materials.
    - Use native species in approved developments within the CTA.

WATER RESOURCES

Preserve the ecosystem of the ULVW in a natural state.

- Protect the CTA boundary from the impacts of urbanization.
- Maintain natural ecosystem processes, including surface flows, wind and water erosion and deposition, and nutrient cycling.
    - Protect natural drainages when considering land use authorizations.

Land use authorizations, including recreational permits that are compatible with sensitive resource management goals, should be designed to minimize impacts.

- Land use authorizations should be engineered to protect the washes that provide for the hydrologic and biological functioning of the system.
    - Engineering design may include spanning washes and/or leaving wash bottoms undisturbed.
    - Construct gabions, water bars, and other low-impact flood control structures outside the ULVW, or in less sensitive areas within the CTA only if necessary, to reduce human-caused impacts to sensitive resources.

  - Coordinate with the Regional Flood Control District to establish an erosion monitoring program in key areas to track changes in erosion patterns that could negatively impact plant and paleontological resources as part of the Conservation Agreement.
  - Develop an In Lieu Fee Mitigation Program that identifies protection, enhancement, restoration, and monitoring actions for jurisdictional WUS identified under the CWA. Work with non-governmental groups and the USACE to establish the program.

VEGETATION

Ensure long-term viability of the Las Vegas buckwheat, Las Vegas bearpoppy, and Merriam's bearpoppy in sustainable natural populations within the boundaries of the ULVW CTA.

- Maintain rare plant habitat by preventing fragmentation of that habitat by development or use.
  - Protect the boundary of the CTA from the impacts of urbanization.
  - Land uses should avoid rare plant habitat.
- Protect natural ecological processes, such as pollinator movement, natural wind flow patterns, surface water flows, etc., that maintain sustainable populations by providing connectivity between populations.
  - Maintain open spaces and corridors between populations.
- Establish long-term monitoring studies for the Las Vegas bearpoppy and Las Vegas buckwheat to track recruitment, population viability, and life history. Establish thresholds to detect declining populations and trigger additional conservation actions to be implemented when these ecological thresholds are hit as part of the Conservation Agreement.
- Developments and land uses should be compatible with the long-term protection of the sensitive plant species, including avoidance of habitat or meaningful mitigation.
- Restore existing and new land disturbances in sensitive plant habitat.
  - Use stockpiled native soils and salvaged native plant material.
  - Use native species in approved developments within the CTA.
- Provide protection to sensitive plant habitat from activities such as illegal motorized use, dumping, trespass, and other invasive uses.

Preserve the ecosystem of the ULVW in a functional state.

- Protect the CTA boundary from the impacts of urbanization.
- Maintain natural ecosystem processes, including surface flows, wind and water erosion and deposition, and nutrient cycling.
- Provide ecological connectivity between Eglington Preserve and the CTA to the extent possible.

Provide compatible educational, recreational, and interpretive opportunities in order for the public to enjoy and appreciate the unique resources of the CTA.

- Develop environmental education and interpretive programs for key paleontological and cultural sites when such actions are consistent with the protection of the ULVW.
  - Locate uses in areas that reduce impacts to sensitive resources.
  - Develop ongoing public information and interpretation of the Las Vegas bearpoppy, Las Vegas buckwheat, cultural, and paleontological resources.

- Establish a non-motorized trail system, compatible with the protection of sensitive resources, for the enjoyment of the public.
    - Locate trails and structures (staging areas, restrooms, parking facilities, etc.) such that they do not conflict with the management of sensitive resources.

Uses, including recreational permits that are compatible with sensitive resource management goals, should be designed to minimize impacts.

- Land uses should avoid plant habitat that has been identified to be preserved intact.
- Land uses should be designed to the smallest area necessary.
- Land uses should be engineered to protect the washes that provide for the hydrologic and biological functioning of the system.

CULTURAL RESOURCES

Protect the LVF, including the paleontological, geological, and cultural resources.

- Establish in situ preservation areas for cultural resource sites and paleontological areas that are kept undisturbed and unfragmented.
- Provide mitigation and treatment for all paleontological sites, cultural resource sites, and rare plants that cannot be preserved in situ.
- Preserve the 1,125-acre Tule Springs site as defined in the NRHP nomination form.[1] The Tule Springs site is nationally significant in our nation's history and should be protected from destruction or impairment.
    - Cooperate with the Nevada Division of State Parks on the Tule Springs state lands, an inholding within the 1,125-acre Tule Springs site, to ensure consistency with management actions on BLM land through cooperative management agreements.
    - Ensure that actions on BLM land do not conflict with the preservation of the cultural resources and lands within the defined boundary.
- Provide mitigation and treatment for all paleontological sites, cultural resource sites, and rare plants that cannot be preserved in situ.

Protect Native American traditional use areas.

- Evaluate and, if significant, nominate a TCP for the ULVW, working closely with the tribes.
- Protect areas that have been identified as being sensitive to the Southern Paiute tribes, including the Las Vegas Paiutes.

PALEONTOLOGICAL RESOURCES

Protect the LVF, including the paleontological, geological, and cultural resources.

- Manage the paleontological assemblages within the LVF.
    - Protect the boundary and all major fossil surface localities.

[1] The NRHP lists the site as 980 acres. There has been no change to the boundary; rather, modern technology has allowed the acreage to be calculated with greater accuracy.

    - Work within BLM's statutes to protect the LVF within all approved R&PP Act leases.
- Establish in situ preservation areas for cultural resource sites and paleontological areas that are kept undisturbed and unfragmented.
- Maintain in situ key paleontological localities that are essential to understand paleoecology within the LVF.
- Provide mitigation and treatment for all paleontological localities, cultural resource sites, and rare plants that cannot be preserved in situ.
- Conduct regular paleontological inventories to ensure that new surface fossil sites eroding from the LVF are identified and protected.
- Support studies and interpretation of the fossil resources in the CTA.
- Establish a paleontological stewardship program to educate and train volunteers to monitor and assist in protecting the CTA.

VISUAL RESOURCES

Preserve the ecosystem of the ULVW in a functional state.

- Protect the CTA boundary from the impacts of urbanization.
- Maintain natural ecosystem processes, including surface flows, wind and water erosion and deposition, and nutrient cycling.

LAND USE

Preserve the ecosystem of the ULVW in a functional state.

- Protect the CTA boundary from the impacts of urbanization.
- Maintain natural ecosystem processes, including surface flows, wind and water erosion and deposition, and nutrient cycling.

Uses, including recreational permits that are compatible with sensitive resource management goals, should be designed to minimize impacts.

- Land uses should avoid plant habitat that has been identified to be preserved intact.
- Land uses should avoid fragmentation of the LVF to the extent possible.
- Land uses should be designed to the smallest area necessary.
- Land uses should be engineered to protect the washes that provide for the hydrologic and biological functioning of the system.

RECREATION

Uses, including recreational permits that are compatible with sensitive resource management goals, should be designed to minimize impacts. Provide compatible educational, recreational, and interpretive opportunities in order for the public to enjoy and appreciate the unique resources of the CTA.

- Develop environmental education and interpretive programs for key paleontological and cultural sites when such actions are consistent with the protection of the ULVW.
    - Locate uses in areas that reduce impacts to sensitive resources.
    - Develop ongoing public information and interpretation of the Las Vegas bearpoppy, Las Vegas buckwheat, cultural, and paleontological resources.
- Establish a non-motorized trail system, compatible with the protection of sensitive resources, for the enjoyment of the public.
    - Locate trails and structures (staging areas, restrooms, parking facilities, etc.) such that they do not conflict with the management of sensitive resources.

HAZARDOUS MATERIALS

Ensure long-term viability of the Las Vegas buckwheat, Las Vegas bearpoppy, and Merriam's bearpoppy in sustainable natural populations within the boundaries of the CTA.

- Restore existing and new land disturbances that result in soil contamination in sensitive plant habitat.
- Provide protection to sensitive plant habitat from activities such as illegal motorized use, dumping, trespass, and other invasive use.
- Protect the CTA boundary from the impacts of urbanization.

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Appendix C

NATIVE PLANT PROTECTIONS UNDER NEVADA STATE LAW

BLM MANUAL 6840.06

Sensitive species are taxa that are not already included as BLM special-status species under 1) federally listed, proposed, or candidate species; or 2) State of Nevada listed species. BLM policy is to provide these species with same level of protection as is provided for candidate species in BLM Manual 6840.06, that is, to "ensure that actions authorized, funded, or carried out do not contribute to the need for the species to become listed." The Sensitive Species designation is normally used for species that occur on BLM-administered lands for which BLM has the capability to significantly affect the conservation status of the species through management. BLM Manual 6840.06 provides factors by which a native species may be listed as "sensitive" if it:

1. Could become endangered or extirpated from a state, or within a significant portion of its range in the foreseeable future;
2. Is under status review by the USFWS and/or National Marine Fisheries Service;
3. Is undergoing significant current or predicted downward trends in a) habitat capability that would reduce a species' existing distribution; and/or b) population or density such that federally listed, proposed, candidate, or state-listed status may become necessary;
4. Typically consists of a small, widely dispersed population;
5. Inhabits ecological refugia or specialized or unique habitats;
6. Is state listed but may be better conserved through application of BLM sensitive species status.

Many of the plant species on Nevada's critically endangered species list are not federally listed by the USFWS because of the protection afforded them under Nevada State law (BLM 2004a; NRS 527.260–527.300).

PROTECTION AND PROPAGATION OF SELECTED SPECIES OF NATIVE FLORA

Under the NRS 527.260 legislative finding:

1. The Legislature finds that:
    a) The economic growth of the State of Nevada has been attended with some serious and unfortunate consequences. Nevada has experienced the extermination or extirpation of some of its native species of flora. Serious losses have occurred and are occurring in other species of flora with important economic, educational, historical, political, recreational, scientific, and aesthetic values.
    b) The people of the State of Nevada have an obligation to conserve and protect the various species of flora that are threatened with extinction.
2. The purpose of NRS 527.260–527.300, inclusive, is to provide a program for the conservation, protection, restoration, and propagation of selected species of flora and for the perpetuation of the habitats of such species.

(Added to NRS by 1969, 775.)

NRS 527.270

List of species declared to be threatened with extinction; special permit required for removal or destruction. A species or subspecies of native flora shall be regarded as threatened with extinction when the State Forester Firewarden, after consultation with competent authorities, determines that its existence is endangered and its survival requires assistance because of overexploitation, disease, or other factors or because its habitat is threatened with destruction, drastic modification or severe curtailment. Any species declared to be threatened with extinction shall be placed on the list of fully protected species, and no member of its kind may be removed or destroyed at any time by any means except under special permit issued by the State Forester Firewarden.

(Added to NRS by 1969, 775.)

NRS 527.280

Destruction or removal of dangerous species by State Forester Firewarden. Where any species of flora which is declared to be in danger of extinction pursuant to NRS 527.270 is found to be dangerous to domestic animals or fowl or a menace to health, the State Forester Firewarden may provide for its destruction or its removal, alive, for translocating.

(Added to NRS by 1969, 775.)

NRS 527.290

Duties of Governor. The Governor shall review the programs which he administers and, to the extent practicable, use such programs in furtherance of the purpose of NRS 527.260–527.300, inclusive, and shall encourage other state and federal agencies to use their authorities in such a manner.

(Added to NRS by 1969, 775.)

NRS 527.300

Powers and duties of State Forester Firewarden. In carrying out the program authorized by NRS 527.260–527.300, inclusive, the State Forester Firewarden, subject to the approval of the Director of the State Department of Conservation and Natural Resources, shall cooperate, to the maximum extent practicable, with other states and with the counties in the State of Nevada, and may enter into agreements with such other states and counties and with other legal entities for the administration and management of any area established pursuant to NRS 527.260–527.300, inclusive, for the conservation, protection, restoration, and propagation of species of native flora which are threatened with extinction.

(Added to NRS by 1969, 775; A 1977, 1168.)

Appendix D

BLM PALEONTOLOGICAL CLASSIFICATION

BLM: CONDITIONS 1–3

Paleontological resource classification is a ranking of areas according to their potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. These rankings are used in land use planning, as well as to identify areas that may warrant special management or special designation, such as ACECs. BLM (1998b) classifies public lands on the basis of the potential for paleontological "areas" to contain noteworthy occurrences of fossils by using the following criteria:

- **Condition 1.** Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Consideration of paleontological resources will be necessary if the field office review of available information indicates that such fossils are present in the area.
- **Condition 2.** Areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. The presence of geologic units from which such fossils have been recovered elsewhere may require further assessment of these same units where they are exposed in the area of consideration.
- **Condition 3.** Areas that are very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils on the basis of their surficial geology, igneous or metamorphic rocks, extremely young alluvium, colluvium, or eolian deposits or the presence of deep soils. However, if possible, it should be noted at what depth bedrock may be expected in order to determine whether fossiliferous deposits may be uncovered during surface-disturbing activities.

Either Condition 1 or 2 may trigger the initiation of a formal analysis of existing data prior to the authorization of land use actions involving surface disturbance or transfer of title. Condition 3 suggests that further paleontological consideration is generally unnecessary.

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Appendix E

USFS PALEONTOLOGICAL CLASSIFICATION

USFS: POTENTIAL FOSSIL YIELD CLASSIFICATION

Occurrences of paleontological resources are closely related to the geological units that contain them. The potential for finding important paleontological resources can, therefore, be broadly predicted by the presence of the pertinent geological units at or near the surface. Therefore, geological mapping can be used as a proxy for assessing the potential for the occurrence of important paleontological resources. The PFYC system was originally developed by the USFS Paleontology Center of Excellence and the Region 2 Paleo Initiative (USFS 1996). It is in the process of being formally adopted by the BLM to promote consistency between agencies and throughout the BLM. The PFYC should be used for land use planning efforts and for the preliminary assessment of potential impacts and mitigation needs for specific projects.

Under the PFYC system, geological units are classified on the basis of the relative abundance of vertebrate fossils or uncommon invertebrate or plant fossils and their sensitivity to adverse impacts; a higher class number indicates a higher potential. This classification should be applied at the geological formation or member level. It is not intended to be an assessment of whether important fossils are known to occur occasionally in these units (i.e., a few important fossils or localities widely scattered throughout a formation do not necessarily indicate a higher class), nor is it intended to be applied to specific sites or areas. The classification system is intended to provide baseline guidance for assessing and mitigating impacts to paleontological resources. In many situations, the classification should be an intermediate step in the analysis and should be used to assess additional mitigation needs. For the purposes of this overview study, Class 4/5 was added to the PFYC to replace Classes 4 and 5, which are described below (see Chapter 3, Section 3.6, "Paleontological Resources," for an explanation).

- **Class 1.** Class 1 units are geological units that are not likely to contain recognizable fossil remains. This includes units that are igneous or metamorphic in origin (but excludes tuffs), as well as units that are Precambrian in age or older. Management concern for paleontological resources in Class 1 units is negligible or not applicable. No assessment or mitigation is needed, except in very rare circumstances. The occurrence of significant fossils in Class 1 units is nonexistent or extremely rare.
- **Class 2.** Class 2 units are sedimentary geological units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.[1] This includes units in which vertebrate or significant nonvertebrate fossils are unknown or very rare, units that are younger than 10,000 years B.P., units that are eolian in origin, and units that exhibit significant diagenetic alteration. The potential for impacting vertebrate fossils or uncommon invertebrate or plant fossils is low. Management concern for paleontological resources is low, and management actions are not likely to be needed. Localities containing important resources may exist but would be rare and would not influence the classification.
- **Class 3.** Class 3 units are fossiliferous sedimentary geological units where fossil content varies in significance, abundance, and predictable occurrence, or sedimentary units of unknown fossil potential. These units are often marine in origin, with sporadic known occurrences of vertebrate fossils. Vertebrate fossils and uncommon nonvertebrate fossils are known to occur inconsistently, and predictability is known to be low. Class 3 includes units that are poorly studied or poorly documented, so that the potential yield cannot be assigned without ground reconnaissance. Management concern for paleontological resources in these units is moderate or cannot be determined from existing data. Surface-disturbing activities may require field assessment to determine a further course of action. The Class 3 category includes a broad range of potential impacts. Geological units of unknown potential, as well as units of moderate or infrequent fossil occurrence are included. Assessment and mitigation efforts also include a broad range of options. Surface-disturbing activities will require sufficient assessment to determine whether significant

[1] In the USFS PFYC system, nonvertebrates refers to fossil invertebrates and plants.

fossil resources occur in the area of a proposed action and whether the action could affect the paleontological resources. Authorizations for any surface-disturbing activities should include the following statement, or one similar in nature:

> The operator shall immediately bring any paleontological resources discovered as a result of operations under this authorization to the attention of the BLM-authorized officer. The operator shall suspend all activities in the vicinity of such discovery until notified to proceed by the authorized officer and shall protect the site from damage or looting. The authorized officer will evaluate, or will have evaluated, such discoveries as soon as possible, but not later than five working days after being notified. Appropriate measures to mitigate adverse effects to significant paleontological resources will be determined by the authorized officer after consulting with the operator. The operator is responsible for the cost of any investigation necessary for the evaluation and for any mitigation measures. There is no need to suspend operations if the operator can avoid further impacts to a discovered site; however, the discovery shall be brought to the attention of the authorized officer as soon as possible and protected from damage or looting.

- **Class 4.** Class 4 units are Class 5 geological units (see below) that have lowered risks of human-caused adverse impacts or lowered risk of natural degradation. They include bedrock units with extensive soil or vegetative cover, bedrock exposures that are limited or not expected to be impacted, units with areas of exposed outcrop smaller than 2 contiguous acres, units in which outcrops form cliffs of sufficient height and slope that impacts are minimized by topographic effects, and units where other characteristics are present that lower the vulnerability of both known and unidentified fossil localities. The potential for impacting significant fossils is moderate to high and is dependent on the proposed action. The bedrock unit is Class 5, but a protective layer of soil, thin, alluvial material, or other mitigating circumstances may lessen or prevent potential impacts to the bedrock that could result from the activity. Mitigation efforts must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access that could result in greater looting potential. If impacts to significant fossils are anticipated, on-the-ground surveys before authorization of the surface-disturbing action will usually be necessary. On-site monitoring may also be necessary during construction activities. Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered. Class 4 and 5 units are often combined as Class 5 for general application, such as planning efforts or preliminary assessments, because Class 4 is determined from local mitigating conditions and the impacts of the planned action.
- **Class 5.** Class 5 units are highly fossiliferous geological units that regularly and predictably produce vertebrate fossils or uncommon invertebrate or plant fossils and that are at risk of human-caused adverse impacts or natural degradation. These include units in which vertebrate fossils or uncommon invertebrate or plant fossils are known and documented to occur consistently, predictably, or abundantly. Class 5 pertains to highly sensitive units that are well exposed, with little or no soil or vegetative cover, units in which outcrop areas are extensive, and exposed bedrock areas larger than 2 contiguous acres. Management concern for paleontological resources in Class 5 units or areas is high because the potential for impacting significant fossils is high. Vertebrate fossils or uncommon nonvertebrate fossils are known from the impacted area or can reasonably be expected to occur in the impacted area. Assessment by a qualified paleontologist is required in advance of surface-disturbing activities or land-tenure adjustments, and mitigation will often be necessary before or during surface-disturbing actions, or both. Field surveys before authorization of any surface-disturbing activities will usually be necessary. On-site monitoring may also be necessary during construction activities. Designation of areas of special interest and concern may be appropriate.

Appendix F

ENVIRONMENTAL DATABASES

Table F-1. Environmental Database Descriptions*

Federal Database	Database Description
National Priority List (NPL)	NPL is a list of Superfund sites maintained by the U.S. Environmental Protection Agency (EPA). Sites listed on the NPL reflect significant risk to public health and the environment and indicate a federal priority to remediate the site.
NPL (Delisted)	Achievement of NPL-delisted status indicates that an uncontrolled hazardous waste site (Superfund site) has been remediated or that it has been determined that no further response is appropriate and that the site therefore is no longer considered a federal priority.
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	CERCLIS is the EPA's list of potential Superfund sites currently or previously under investigation.
CERCLIS No Further Remedial Action Planned (NFRAP)	CERCLIS NFRAP status indicates that a site has been evaluated and that EPA has determined that it not be included on the NPL.
Resource Conservation and Recovery Act (RCRA) Corrective Actions	This is EPA's list of RCRA facilities that have reported violations and that are subject to corrective actions.
RCRA Treatment, Storage, and Disposal	This is EPA's list of RCRA facilities licensed to store, treat, and dispose of hazardous waste materials.
RCRA Generators	This is EPA's list of facilities that generate or transport hazardous waste. EPA categorizes the facilities as large-quantity generators (LGNs), small-quantity generators (SGNs), or conditionally exempt generators (VGNs).
RCRA No Longer Regulated	This is a list of facilities that are not currently classified by EPA because 1) failure to report in a timely manner; 2) no longer in business; 3) no longer in business at the listed address; or 4) no longer generating hazardous waste materials in quantities that require reporting.
Federal Institutional and Engineering Controls (IC/EC)	IC/EC is a list of Superfund sites that have either engineering or institutional controls. Engineering controls include caps, building foundations, liners, and treatment methods to eliminate the means by which regulated substances can enter into the environment or affect human health. Institutional controls seek to prevent exposure to contaminants remaining on-site. Common institutional controls include groundwater-use restrictions, construction restrictions, property-use restrictions, deed restrictions, and post-remediation care requirements.
Emergency Response Notification System (ERNS)	ERNS database maintains information about emergency response actions to reported releases of hazardous materials or unidentified substances.
Federal Wells	U.S. Geological Survey maintains a list of wells, springs, test holes, tunnels, drains, and excavations throughout the U.S.
Tribal Lands	These are areas with boundaries established by treaty, statute, and/or executive or court order that are recognized by the federal government as territory in which American Indian tribes have primary governmental authority.
State/Tribal Sites Corrective Action Cases	Bureau of Corrective Actions maintains a list of clean-up evaluations and actions regarding sites with actual or potential contamination that could affect groundwater.
State/Tribal Solid Waste Landfills (SWL)	SWL maintains an inventory of various solid waste facilities, including open, closed, and permitted landfills, dumps, pesticide sites, and transfer stations. The inventory specifies the landfill class type and whether the site is a private or governmental facility.
State/Tribal Leaking Underground Storage Tanks (LUSTs)	This division maintains an inventory of sites with LUSTs, and includes sites with tanks under investigation for potential leaks or confirmed leaks, and those to be closed.
State/Tribal Underground Storage Tanks (USTs)/ Aboveground Storage Tanks (ASTs)	This division maintains an inventory of USTs, a list of sites with ASTs, and a list of USTs currently on tribal lands under federal jurisdiction. Nevada tribal land USTs are administered by EPA Region 9.
State/Tribal Engineering Controls/Institutional Controls	A Nevada state list of Superfund sites that have engineering or institutional controls (as noted under Federal IC/EC).

Table F-1. Environmental Database Descriptions* (Continued)

Federal Database	Database Description
State/Tribal Brownfields	NDEP defines a Brownfield as an abandoned, idled, or underused industrial or commercial property that has been taken out of productive use because of real or perceived risks from environmental contamination. The Bureau of Corrective Actions maintains a list of Brownfield sites as part of its listing of clean-up evaluations and actions regarding sites with actual or potential contamination that could affect groundwater.
State/Tribal Voluntary Remediation or Clean-Up Programs (VCPs)	VCPs are the state-level authority for addressing the clean-up of Brownfields.
Receptors	This is the 2002 Census Bureau's database of schools and hospitals that may house individuals deemed sensitive to environmental discharges as a result of their fragile immune systems.
Facility Index System (FINDS)	FINDS is an index of identification numbers associated with a property or facility that EPA has investigated or has been made aware of in conjunction with various regulatory programs.
Toxic Release Inventory System (TRIS)	TRIS is a database of all facilities that have had or may be prone to toxic material releases.
Hazardous Materials Incident Response System (HMIRS)	HMIRS is a database of information on materials and packaging, and a description of events for tracked incidents.
National Compliance Database System (NCDB)	NCDB is EPA's tracking system for regional compliance and enforcement and a national repository for the Pesticides and Toxic Substances Compliance and Enforcement program.
PolyChlorinated BiPhenol (PCB) Administrative Database System	This is EPA's register of facilities that generate, transport, store, or dispose of PCB.
Docket Integrated Compliance Information System	This is a federal database of administrative and judicial cases under the following environmental statutes: Clean Air Act; Clean Water Act; RCRA; the Emergency Planning and Community Right-to-Know Act Section 313; the Toxic Substances Control Act; the Federal Insecticide, Fungicide, and Rodenticide Act; the Comprehensive Environmental Response, Compensation, and Liability Act; the Safe Drinking Water Act; and the Marine Protection, Research, and Sanctuaries Act.
Nuclear Permits	This is a database of facilities that are permitted and regulated for their use and handling of radioactive materials.
Releases	This is a list of hazardous materials releases.
Federal—Other	This is EPA's database of registration and production data for facilities that manufacture pesticides.
Site Enforcement Tracking System Potentially Responsible Parties	This is EPA's database of parties identified by EPA as being potentially responsible for contamination at a CERCLIS or NPL site.
Coal Gasification	This is a database of sites that have been involved in coal gasification.
Oil and Gas Wells	This is a list of completions, pluggings, and permits obtained from digital data provided by the regulatory agency.
Fire Insurance Map Coverage	This is a database of historical fire insurance maps.

* In most cases, the database descriptions closely follow those provided by Environmental FirstSearch.

Appendix G

BLM LAND AND MINERAL RESOURCES LR2000 PUBLIC RECORDS DATABASE SEARCH RESULTS:

MATERIAL SITE RIGHTS-OF-WAY AND GRAVEL PIT SEARCHES

Run Date: 10/31/2007

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
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Admin State: NV
Geo State: NV

Mer/Twp/Rng: 21 0180S 0590E

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVCC 0018191	282105	AUTHORIZED	304	AUTH AMENDED/MODIFIED	08/21/1970	/B/		Total Acres = 629.16
NV DEPT OF TRANS		1263 S STEWART ST		CARSON CITY	NV	89712	100.00000	HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ		01	W2NW,SENW,E2SW,NWSW,NWSE;
022	ALIQ		02	S2SE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVCC 0021488	286203	CLOSED	970	CASE CLOSED	10/30/2007			Total Acres = 1654.855
NEVADA BELL		PO BOX 11010 RM C259		RENO	NV	89502	100.00000	HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			W2NW,N2SW,SESW,SWSE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 020856	311111	CLOSED	970	CASE CLOSED	07/14/1983			Total Acres = 1920
MORMAC OIL & GAS CO		321 TEXAN TRAIL #100		CORPUS CHRISTI	TX	78411	50.00000	LESSEE
TIPPERARY OG CORP		BOX 3179		MIDLAND	TX	79702	50.00000	LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			ALL;
023	ALIQ			ALL;
024	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 041567	240006	CLOSED	967	CLOSED WITHOUT ACTION	05/20/1991			Total Acres = 255
CLARK CNTY SCHOOL DIST		2832 E FLAMINGO RD		LAS VEGAS	NV	89121	100.00000	APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
023	ALIQ			SENWNW;

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Mer/Twp/Rng: 21 0180S 0590E

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 04156712	240006	CLOSED	970	CASE CLOSED	05/18/2004		Total Acres = 10
CLARK CNTY SCHOOL DIST		2832 E FLAMINGO RD		LAS VEGAS	NV	89121	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
023	RSDL			SENWNW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 04156732	291200	CLOSED	970	CASE CLOSED	05/18/2004		Total Acres = 10
CLARK CNTY SCHOOL DIST		2832 E FLAMINGO RD		LAS VEGAS	NV	89121	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
023	RSDL			SENWNW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 048989	361113	CLOSED	970	CASE CLOSED	04/13/1995		Total Acres = 640
MEURER JOHN W		3713 SAN ANGELO AVE		LAS VEGAS	NV	89102	100.00000 PERMITTEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
023	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 052308	287001	CLOSED	970	CASE CLOSED	11/24/2003		Total Acres = 4960
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
024	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 054017	286203	CLOSED	970	CASE CLOSED	06/21/2002		Total Acres = 1
CENTRAL TELEPHONE CO		330 S VALLEY VIEW BLVD		LAS VEGAS	NV	89152	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			SWSWNWNW,SWNW,NESW,SWSE;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 054351	286207	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	503-2.980;	Total Acres = 72.734
AF		5870 DEVLIN DR BLDG 595		NELLIS AFB	NV	89191	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			NWSW,S2SW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 058546	289001	PENDING	124	APLN RECD	03/02/1994		Total Acres = 3.636
LAS VEGAS PAIUTE TRIBE		#1 PAIUTE DR		LAS VEGAS	NV	89106	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	RSDL			S2SESE;
023	RSDL			S2S2S2;
024	RSDL			S2S2S2;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 073706	286203	AUTHORIZED	307	ROW GRANTED-ISSUED	11/20/2006		Total Acres = 797.74
NEVADA BELL		PO BOX 11010 RM C259		RENO	NV	89502	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			SWNW,N2SW,SESW,SWSE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076432	286203	PENDING	153	POST AUTH APLN RECD	05/01/2007	/C/	Total Acres = 39.704
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			NWSW,S2SW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076653	231145	AUTHORIZED	868	EFFECTIVE DATE	11/06/2002		Total Acres = 23334.16
BLM		4701 N TORREY PINES DR		LAS VEGAS	NV	891302301	100.00000 ADMIN MGT ENTITY

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Mer/Twp/Rng: **21 0180S 0590E**

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALL			ENTIRE SECTION
023	ALL			ENTIRE SECTION
024	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 077149	280004	CLOSED	970	CASE CLOSED	03/31/2005	Total Acres = 0.83
UNIVERSITY OF NV RENO		4505 MARYLAND PKY		LAS VEGAS	NV 891544004	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	RSDL			NESWSE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 07839501	280004	PENDING	124	APLN RECD	04/08/2004	Total Acres = 3.5
SOUTHERN NV WATER AUTHORITY		1900 E FLAMINGO #170		LAS VEGAS	NV 89119	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			W2SW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 083498	285003	PENDING	124	APLN RECD	05/03/2007	Total Acres = 12.4
NV POWER CO		PO BOX 98910		LAS VEGAS	NV 89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			W2W2;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 083499	285003	PENDING	124	APLN RECD	05/03/2007	Total Acres = 12.4
NV POWER CO		PO BOX 98910		LAS VEGAS	NV 89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			W2W2;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 08349901	285003	PENDING	124	APLN RECD	05/03/2007		Total Acres = 12.4
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			SWSW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 0043546	285003	AUTHORIZED	304	AUTH AMENDED/MODIFIED	04/04/2007	/H1/	Total Acres = 546.77
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
022	ALIQ			W2SW,SESW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 0055903	285002	AUTHORIZED	307	ROW GRANTED-ISSUED	10/14/1960		Total Acres = 68.56
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
023	ALIQ			N2NE,SENE,NENW;
024	ALIQ			SWNW,SW;

Mer/Twp/Rng: 21 0180S 0600E

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 020286	311111	CLOSED	970	CASE CLOSED	09/01/1993		Total Acres = 1600
NUGGET OIL CORP		BOX 27156		SALT LAKE CITY	UT	84127	50.00000 LESSEE
STANDARD ENERGY CORP		BOX 27156		SALT LAKE CITY	UT	84127	50.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
028	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 020287	311111	CLOSED	970	CASE CLOSED	09/01/1993		Total Acres = 2543.88
NUGGET OIL CORP		BOX 27156		SALT LAKE CITY	UT	84127	50.00000 LESSEE
STANDARD ENERGY CORP		BOX 27156		SALT LAKE CITY	UT	84127	50.00000 LESSEE

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
029	ALIQ			ALL;
030	ALIQ			E2W2,E2;
030	LOTS			1-4;
031	ALIQ			E2W2,E2;
031	LOTS			1-4;
032	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 020288	311111	CLOSED	970	CASE CLOSED	09/01/1993		Total Acres = 2560
NUGGET OIL CORP		BOX 27156		SALT LAKE CITY	UT	84127	50.00000 LESSEE
STANDARD ENERGY CORP		BOX 27156		SALT LAKE CITY	UT	84127	50.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
033	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 020858	311111	CLOSED	970	CASE CLOSED	09/01/1991		Total Acres = 1280
MORMAC OIL & GAS CO		321 TEXAN TRAIL #100		CORPUS CHRISTI	TX	78411	100.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
020	ALIQ			ALL;
021	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 021996	311111	CLOSED	970	CASE CLOSED	09/01/1991		Total Acres = 160
SOCO 1978 AC PROG		1800 GLENARM PL #700		DENVER	CO	80202	100.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
019	ALIQ			NE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 021996A	311111	CLOSED	970	CASE CLOSED	09/01/1991		Total Acres = 470.32
BLM		PO BOX 12000		RENO	NV	89520	100.00000 HOLDING AGENCY

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
019	ALIQ			E2W2,SE,
019	LOTS			1-4;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark			
NVN 037233	287001	PENDING	124	APLN RECD	10/07/1982				Total Acres = 1280
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000	APPLICANT	

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
033	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark			
NVN 039819	291100	CLOSED	970	CASE CLOSED	11/05/1987				Total Acres = 1912.67
GUSAKOV M A		6147 O'BANNON DR		LAS VEGAS	NV	89102	100.00000	APPLICANT	

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
031	ALIQ			E2,E2W2;
031	LOTS			1-4;
032	ALIQ			ALL;
033	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark			
NVN 042793	181050	CLOSED	967	CLOSED WITHOUT ACTION	10/07/1991				Total Acres = 235
HOPKINS AMOS ABE		RT 1 BOX 128 A		ELGIN	OK	73538	100.00000	PLAINTIFF	

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
032	ALIQ			SE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark			
NVN 045207	286001	CLOSED	970	CASE CLOSED	04/30/1988				Total Acres = 40
WAYNE NEWTON COMM		1120 CONNECTICUT		WASHINGTON	DC	20036	100.00000	APPLICANT	

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
030	ALIQ			SENE;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 052308	287001	CLOSED	970	CASE CLOSED	11/24/2003		Total Acres = 4960
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
019	ALIQ			E2W2,SE;
019	LOTS			1-4;
028	ALIQ			S2;
029	ALL			ENTIRE SECTION
030	ALIQ			E2,E2W2;
030	LOTS			1-4;
032	ALL			ENTIRE SECTION
033	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 055757	240006	CLOSED	970	CASE CLOSED	11/20/2003		Total Acres = 3840
BIG HORN RIFLE		15 DIAMOND CIR		LAS VEGAS	NV	89106	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
021	ALIQ			E2;
028	ALIQ			E2;
033	ALIQ			E2;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 05575701	291200	CLOSED	970	CASE CLOSED	11/20/2003		Total Acres = 3840
BIG HORN RIFLE		15 DIAMOND CIR		LAS VEGAS	NV	89106	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
021	ALIQ			E2;
028	ALIQ			E2;
033	ALIQ			E2;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 058546	289001	PENDING	124	APLN RECD	03/02/1994		Total Acres = 3.636
LAS VEGAS PAIUTE TRIBE		#1 PAIUTE DR		LAS VEGAS	NV	89106	100.00000 APPLICANT

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
019	LOTS			1-4;
030	LOTS			1-4;
031	LOTS			1-4;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 06644701	280004	AUTHORIZED	304	AUTH AMENDED/MODIFIED	08/01/2005		Total Acres = 6.56
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
031	RSDL			SESE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076653	231145	AUTHORIZED	868	EFFECTIVE DATE	11/06/2002		Total Acres = 23334.16
BLM		4701 N TORREY PINES DR		LAS VEGAS	NV	891302301	100.00000 ADMIN MGT ENTITY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
019	ALL			ENTIRE SECTION
020	ALL			ENTIRE SECTION
021	ALL			ENTIRE SECTION
028	ALL			ENTIRE SECTION
029	ALL			ENTIRE SECTION
030	ALL			ENTIRE SECTION
031	ALL			ENTIRE SECTION
032	ALL			ENTIRE SECTION
033	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077772	281001	PENDING	153	POST AUTH APLN RECD	12/08/2006	/B/	Total Acres = 2454.68
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 HOLDER

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
031	RSDL		01	SENESESE,SESWSESE;
031	RSDL		02	N2SESESE,S2SESESE;
032	RSDL		01	SENESESE;
032	RSDL		02	S2S2S2,SWNWSWSW;
033	RSDL		01	S2S2S2,SWNWSWSW;
033	RSDL		02	SENESESE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 078142	281001	AUTHORIZED	307	ROW GRANTED-ISSUED	08/25/2004		Total Acres = 12.11
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
031	RSDL			SESESESE;
032	RSDL			S2S2S2S2S2;
033	RSDL			S2S2S2SW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 083860	281001	PENDING	124	APLN RECD	07/11/2007		Total Acres = 35.68
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
031	ALIQ			S2,S2SE;
032	ALIQ			NENW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 08386001	281001	PENDING	124	APLN RECD	07/11/2007		Total Acres = 5.53
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
031	ALIQ			SE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 0055903	285002	AUTHORIZED	307	ROW GRANTED-ISSUED	10/14/1960		Total Acres = 68.56
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
030	ALIQ			SESW;
030	LOTS			3,4;
031	ALIQ		01	SWNE,NENW,NESE;
031	ALIQ		02	SENE;
031	MNR		01	NWNWNE;
031	MNR		02	SWNWNE;
032	ALIQ			SWSW;

Mer/Twp/Rng: 21 0190S 0600E

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 029832	281001	AUTHORIZED	304	AUTH AMENDED/MODIFIED	06/01/1988	DATE CORRECTED	Total Acres = 27.5
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
003	LOTS			5,8,11,12,14,15;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 036876	240006	AUTHORIZED	868	EFFECTIVE DATE	10/23/1985	CLASSIFIED;	Total Acres = 1041.33
NV STATE		333 W NYE LN RM #118		CARSON CITY	NV	89710	100.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			5-20;
003	LOTS			5-15;
004	LOTS			5-7;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 03687601	291200	PENDING	153	POST AUTH APLN RECD	02/26/2004	/C/	Total Acres = 1041.33
NV STATE		333 W NYE LN RM #118		CARSON CITY	NV	89710	100.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			7-10,15-18;
003	LOTS			5-15;
004	LOTS			5-7;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 036968	291200	CLOSED	970	CASE CLOSED	05/02/1983		Total Acres = 10
CLARK CNTY SCHOOL DIST		2832 E FLAMINGO RD		LAS VEGAS	NV	89121	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	ALIQ			NWSWSE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 037206	287001	CLOSED	967	CLOSED WITHOUT ACTION	08/23/2000		Total Acres = 159.29
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			5,6,11,12;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 037207	287001	CLOSED	970	CASE CLOSED	04/26/2004		Total Acres = 40
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
003	LOTS			10;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 037307	311111	CLOSED	970	CASE CLOSED	01/31/1983		Total Acres = 3451.56
DOLLY EDWARD D		1700 BROADWAY #2216		DENVER	CO	80290	33.33333 APPLICANT
FOSTER NORMAN H		1700 BROADWAY #2216		DENVER	CO	80290	33.33333 APPLICANT
OOMRIGAR J J		410 17TH ST #1720		DENVER	CO	80202	33.33333 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			5-16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 037363	311111	CLOSED	970	CASE CLOSED	11/15/1982		Total Acres = 6200
EMERY ENERGY INC		225 N STATE ST		SALT LAKE CITY	UT	84103	0.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			7,10;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 039863	291100	CLOSED	970	CASE CLOSED	11/05/1987		Total Acres = 2579.51
GENERAL REC PROD		5695 GILBERT LN		LAS VEGAS	NV	89130	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			5-20;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 042592	285003	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	503-1.989,	Total Acres = 121.627
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			5-8,12,13,16;
002	LOTS			5-8;
003	LOTS			5-6;
004	LOTS			3,4;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 053584	287001	PENDING	153	POST AUTH APLN RECD	01/16/2003	/B/	Total Acres = 480.01
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			5-16;
003	LOTS			5,6;
004	LOTS			5,6;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 054351	286207	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	503-2.980,	Total Acres = 72.734
AF		5870 DEVLIN DR BLDG 595		NELLIS AFB	NV	89191	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			5-8;
002	LOTS			5-8;
003	LOTS			5,6;
004	LOTS			5,6;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 060412	285003	AUTHORIZED	037	POST AUTH APLN WITHDRAWN	06/07/2004	/A/	Total Acres = 20
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 060475	285003	CLOSED	970	CASE CLOSED	08/11/1997		Total Acres = 5
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			17;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 061188	270030	CLOSED	967	CLOSED WITHOUT ACTION	03/01/2004		Total Acres = 5
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 PROPONENT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			17;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 062830	291200	PENDING	153	POST AUTH APLN RECD	03/15/2007	/C/	Total Acres = 317.5
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			5,6,11,12,13,14,19,20;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 06283001	274000	PENDING	387	CASE ESTABLISHED	06/03/1998		Total Acres = 320
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			5,6,11,12,13,14,19,20;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 062944	285001	CLOSED	970	CASE CLOSED	06/29/2004		Total Acres = 20
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 066143	361113	CLOSED	970	CASE CLOSED	09/16/2000		Total Acres = 5
CONTRI CONSTRUCTION		BOX 12100		RENO	NV	89510	100.00000 CORPORATION

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	ALIQ			SESE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 074201	361113	CLOSED	970	CASE CLOSED	12/12/2002		Total Acres = 5
CONTRI CONSTRUCTION		BOX 12100		RENO	NV	89510	100.00000 CORPORATION

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	ALIQ			SESE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 075025	285003	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	502-7178.545;	Total Acres = 730.14
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			7,8,10-13;
002	LOTS			5-8;
003	LOTS			5,6;
004	LOTS			3-6;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07502501	280004	CLOSED	970	CASE CLOSED	01/29/2004		Total Acres = 59.01
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	RSDL			N2NESE,SWSENE,NWNWNW;
002	RSDL			N2NENE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 075060	286203	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	503-0.973,(MILES)	Total Acres = 35.74
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			7,8,10-13;
002	LOTS			5-8;
003	LOTS			5,6;
004	LOTS			3-6;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 075426	280004	CLOSED	967	CLOSED WITHOUT ACTION	04/12/2004		Total Acres = 0.15
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			5,8;
003	LOTS			6;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 075621	362113	CLOSED	970	CASE CLOSED	07/10/2003		Total Acres = 5
CLARK CNTY SCHOOL DIST		4828 S PEARL ST		LAS VEGAS	NV	89121	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076357	281001	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/01/2006	503 -0.375; /C/	Total Acres = 34.665
NVN 076357	281001	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/01/2006	503-31514.680;	Total Acres = 34.665
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 HOLDER

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			5,12,13,16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07635701	280004	CLOSED	970	CASE CLOSED	05/30/2007		Total Acres = 6.97
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			5,12,13,16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076432	286203	PENDING	153	POST AUTH APLN RECD	05/01/2007	/C/	Total Acres = 39.704
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			5-8;
002	LOTS			5-8;
003	LOTS			5,6;
004	LOTS			5,6;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076844	285003	AUTHORIZED	307	ROW GRANTED-ISSUED	11/17/2003		Total Acres = 1.9
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			15,16;
002	LOTS			19,20;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07684401	280004	CLOSED	970	CASE CLOSED	07/08/2004		Total Acres = 4
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			15,16;
002	LOTS			19,20;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076980	281001	PENDING	124	APLN RECD	04/07/2003		Total Acres = 2.52
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077492	281001	AUTHORIZED	307	ROW GRANTED-ISSUED	01/16/2004		Total Acres = 1.6
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			20;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077519	281001	PENDING	124	APLN RECD	08/19/2003		Total Acres = 3.787
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			15-16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077772	281001	PENDING	153	POST AUTH APLN RECD	12/08/2006	/B/	Total Acres = 2454.68
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	RSDL			N2NENENE,NWNWNWNW;
002	RSDL			NENENENE;
003	RSDL			NWNWNWNW;
004	RSDL			NENENENE,NWNWNWNW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 078438	286203	AUTHORIZED	307	ROW GRANTED-ISSUED	01/30/2007		Total Acres = 1.1
COX COMMUNICATIONS		121 MARTIN LUTHER KING BLVD		LAS VEGAS	NV	89106	100.00000 HOLDER/BILLEE

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			15,16;
002	LOTS			20;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 07843801	280004	AUTHORIZED	307	ROW GRANTED-ISSUED	01/30/2007	Total Acres = 2.75
COX COMMUNICATIONS		121 MARTIN LUTHER KING BLVD		LAS VEGAS	NV 89106	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			15,16;
002	LOTS			20;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 078462	240006	PENDING	124	APLN RECD	04/21/2004	Total Acres = 80
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV 89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			15,16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 07846201	291200	PENDING	124	APLN RECD	04/21/2004	Total Acres = 80
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV 89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			15,16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 078969	288001	CLOSED	967	CLOSED WITHOUT ACTION	01/13/2005	Total Acres = 5.44
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV 89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	LOTS			9;
002	LOTS			9-12;
003	LOTS			7-10;
004	LOTS			4;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 079490	292006	CLOSED	970	CASE CLOSED	03/30/2005		Total Acres = 80
VEGAS BABY PRODUCTIONS		116 S 1ST ST		LAS VEGAS	NV	89101	100.00000 PERMITTEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	ALIQ		01	S2,NW;
002	ALIQ		02	S2,NE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 082655	281001	AUTHORIZED	307	ROW GRANTED-ISSUED	01/18/2007		Total Acres = 1.15
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	LOTS			20;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 083258	285003	PENDING	124	APLN RECD	04/10/2007		Total Acres = 2.03
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
001	ALIQ			NWNW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 083281	291200	PENDING	387	CASE ESTABLISHED	03/15/2007		Total Acres = 2.5
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	RSDL			SWSWSESE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 08328101	274000	PENDING	387	CASE ESTABLISHED	03/15/2007		Total Acres = 2.5
LAS VEGAS CITY OF		400 STEWART AVE		LAS VEGAS	NV	89101	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
002	RSDL			SWSWSESE;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark			
NVN 019804	311111	CLOSED	970	CASE CLOSED	01/02/1997				Total Acres = 1590.97
TEXACO INC		PO BOX 2100		DENVER	CO	80201	100.00000	LESSEE	

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
004	ALIQ			S2N2,S2;
004	LOTS			1-4;
005	ALIQ			S2N2,S2;
005	LOTS			1-4;
006	LOTS			8-15;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark			
NVN 019806	311111	CLOSED	970	CASE CLOSED	01/02/1997				Total Acres = 320
TEXACO INC		PO BOX 2100		DENVER	CO	80201	100.00000	LESSEE	

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
009	ALIQ			N2;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark			
NVN 019807	311111	CLOSED	970	CASE CLOSED	01/02/1997				Total Acres = 2560
TEXACO INC		PO BOX 2100		DENVER	CO	80201	0.00000	LESSEE	

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
010	ALIQ			ALL;
015	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark			
NVN 019819	311111	CLOSED	970	CASE CLOSED	09/01/1991				Total Acres = 757.8
LOUISIANA LAND & EXPL		1560 BROADWAY #1200		DENVER	CO	80202	100.00000	LESSEE	

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
003	ALIQ			S2N2,S2;
003	LOTS			1-4;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 036864	287001	CLOSED	970	CASE CLOSED	05/08/2006			Total Acres = 368
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000	HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			7-10;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 037307	311111	CLOSED	970	CASE CLOSED	01/31/1983			Total Acres = 3451.56
DOLLY EDWARD D		1700 BROADWAY #2216		DENVER	CO	80290	33.33333	APPLICANT
FOSTER NORMAN H		1700 BROADWAY #2216		DENVER	CO	80290	33.33333	APPLICANT
OOMRIGAR J J		410 17TH ST #1720		DENVER	CO	80202	33.33333	APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
006	ALIQ			SESW,S2SE;
006	LOTS			7,16-19;
007	ALIQ			N2NE,NENW;
007	LOTS			1,5-8;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 037308	311111	CLOSED	970	CASE CLOSED	01/31/1983			Total Acres = 4280
DOLLY EDWARD D		1700 BROADWAY #2216		DENVER	CO	80290	33.33333	APPLICANT
FOSTER NORMAN H		1700 BROADWAY #2216		DENVER	CO	80290	33.33333	APPLICANT
OOMRIGAR J J		410 17TH ST #1720		DENVER	CO	80202	33.33333	APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	ALIQ			ALL;
009	ALIQ			S2;
016	ALIQ			ALL;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 037363	311111	CLOSED	970	CASE CLOSED	11/15/1982			Total Acres = 6200
EMERY ENERGY INC		225 N STATE ST		SALT LAKE CITY	UT	84103	0.00000	APPLICANT

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
006	ALIQ			SESW,S2SE;
006	LOTS			7,16-19;
007	ALIQ			N2NE,NENW;
007	LOTS			1,5-8;
008	ALL			ENTIRE SECTION
009	ALIQ			S2;
016	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 042592	285003	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	503-1.989;	Total Acres = 121.627
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			3,22,23;
016	LOTS			30,32;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 042793	181050	CLOSED	967	CLOSED WITHOUT ACTION	10/07/1991		Total Acres = 235
HOPKINS AMOS ABE		RT 1 BOX 128 A		ELGIN	OK	73538	100.00000 PLAINTIFF

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
004	ALIQ			SE;
009	ALIQ			NE;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 048649	281001	CLOSED	970	CASE CLOSED	02/09/1990		Total Acres = 268.6
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALIQ			S2;
016	ALIQ			S2;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 049747	240006	AUTHORIZED	868	EFFECTIVE DATE	05/30/1989	CLASSIFIED;	Total Acres = 163.08

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N LAS VEGAS CITY 2200 CIVIC CTR DR N LAS VEGAS NV 89030 100.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5-8;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 04974701	291200	AUTHORIZED	242	LEASE RENEWED	08/01/2007	/G/	Total Acres = 163.08

N LAS VEGAS CITY 2200 CIVIC CTR DR N LAS VEGAS NV 89030 100.00000 LESSEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5-8;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 050469	271000	CLOSED	967	CLOSED WITHOUT ACTION	05/10/1990	/A/;	Total Acres = 7488.53

BLM 4701 N TORREY PINES DR LAS VEGAS NV 891302301 100.00000 ADMIN MGT ENTITY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALL			ENTIRE SECTION
016	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 053110	271000	CLOSED	967	CLOSED WITHOUT ACTION	03/05/1991	/A/;	Total Acres = 7488.53

BLM 4701 N TORREY PINES DR LAS VEGAS NV 891302301 100.00000 AGENCY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALL			ENTIRE SECTION
016	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 053347	393001	CLOSED	970	CASE CLOSED	05/14/1991		Total Acres = 80

INGALLS RONALD G 801 CALLE DE JULIO GREEN VALLEY AZ 85614 100.00000 CONTESTEE
N LAS VEGAS CITY 2200 CIVIC CTR DR N LAS VEGAS NV 89030 100.00000 CONTESTANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
016	RSDL			S2NWSW,S2SWSE;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 053348	393001	CLOSED	970	CASE CLOSED	05/14/1991	KMW	Total Acres = 160

COLUMBUS MINERALS	BOX 308	PHOENIX	AZ	85001	100.00000	CONTESTEE
HUCZEL MARK D	BOX 308	PHOENIX	AZ	85001	100.00000	CONTESTEE
N LAS VEGAS CITY	2200 CIVIC CTR DR	N LAS VEGAS	NV	89030	100.00000	CONTESTANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
016	MNR			S2SESE,N2SESE,
016	MNR		01	S2NESE,N2NESE,

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 054229	272000	CLOSED	967	CLOSED WITHOUT ACTION	12/16/1992	/D/;	Total Acres = 7534.27

BLM	4701 N TORREY PINES DR	LAS VEGAS	NV	891302301	100.00000	AGENCY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALL			ENTIRE SECTION
016	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 055291	271000	CLOSED	967	CLOSED WITHOUT ACTION	09/26/1992	/A/;	Total Acres = 7534.27

BLM	4701 N TORREY PINES DR	LAS VEGAS	NV	891302301	100.00000	AGENCY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALL			ENTIRE SECTION
016	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 056356	271000	CLOSED	970	CASE CLOSED	12/16/1992		Total Acres = 7534.27

BLM	4701 N TORREY PINES DR	LAS VEGAS	NV	891302301	100.00000	AGENCY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALL			ENTIRE SECTION
016	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 057477	271000	CLOSED	970	CASE CLOSED	12/16/1992		Total Acres = 7534.27

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BLM 4701 N TORREY PINES DR LAS VEGAS NV 891302301 100.00000 AGENCY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALL			ENTIRE SECTION
016	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 057877FD	220100	CLOSED	970	CASE CLOSED	05/09/2006	Total Acres = 11621.23

BLM 4701 N TORREY PINES DR LAS VEGAS NV 891302301 100.00000 ADMIN MGT ENTITY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			1-16;
016	LOTS			1-16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 057887FD	220100	CLOSED	970	CASE CLOSED	10/15/1996	Total Acres = 7534.27

BLM 5100 E WINNEMUCCA BLVD WINNEMUCCA NV 89445 100.00000 ADMIN MGT ENTITY
CASEY JOHN J 2905 S VIRGINIA ST RENO NV 89502 100.00000 PATENTEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALL			ENTIRE SECTION
016	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 058873	240006	CLOSED	970	CASE CLOSED	02/23/2006	Total Acres = 15

CLARK CNTY SCHOOL DIST 2832 E FLAMINGO RD LAS VEGAS NV 89121 100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
016	LOTS			7;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 05887301	291200	CLOSED	970	CASE CLOSED	05/18/2004	Total Acres = 15

CLARK CNTY SCHOOL DIST 2832 E FLAMINGO RD LAS VEGAS NV 89121 100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
016	LOTS			7;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 058874	240006	CLOSED	970	CASE CLOSED	02/23/2006		Total Acres = 20
CLARK CNTY SCHOOL DIST		2832 E FLAMINGO RD		LAS VEGAS	NV	89121	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			11;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 05887401	291200	CLOSED	970	CASE CLOSED	05/18/2004		Total Acres = 20
CLARK CNTY SCHOOL DIST		2832 E FLAMINGO RD		LAS VEGAS	NV	89121	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			11;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 059611	281001	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	502-5353.00;	Total Acres = 14.556
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 060073FD	220100	PENDING	387	CASE ESTABLISHED	08/21/1995		Total Acres = 9971.51
BLM		4701 N TORREY PINES DR		LAS VEGAS	NV	891302301	100.00000 ADMIN MGT ENTITY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			1-16;
016	LOTS			1-16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 061323	281001	AUTHORIZED	304	AUTH AMENDED/MODIFIED	02/01/2007	502-660.00;	Total Acres = 2428.529
CLARK CNTY		PO BOX 554000		LAS VEGAS	NV	89155	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
016	LOTS			23;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 062372	285003	CLOSED	970	CASE CLOSED	06/30/2004		Total Acres = 103.03
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
006	LOTS			16,17,18,19;
008	LOTS			4,5,12,13;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 065720	287001	AUTHORIZED	307	ROW GRANTED-ISSUED	11/30/1999		Total Acres = 0.337
SOUTHERN NV WATER AUTHORITY		1900 E FLAMINGO #170		LAS VEGAS	NV	89119	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	RSDL			S2S2S2N2;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 065969	240006	CLOSED	967	CLOSED WITHOUT ACTION	06/01/2005		Total Acres = 810
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			1-3,6-10;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 066216	292006	CLOSED	970	CASE CLOSED	07/15/2000		Total Acres = 1
SOUTHERN NV WATER AUTHORITY		1900 E FLAMINGO #170		LAS VEGAS	NV	89119	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13-16;
009	LOTS			13-16;
010	LOTS			13-16;
015	LOTS			1-4;
016	LOTS			1-4;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 066225	287001	AUTHORIZED	304	AUTH AMENDED/MODIFIED	03/05/2002		Total Acres = 35.57

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SOUTHERN NV WATER AUTHORITY 1900 E FLAMINGO #170 LAS VEGAS NV 89119 100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	FF			PORTION OF LOT 13;
008	LOTS			14-16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 073752	270030	AUTHORIZED	271	PATENT ISSUED	01/07/2002	27-2002-0015;	Total Acres = 1905.08

NORTH VALLEY ENTERPRISES LLC 901 N GREEN VALLEY PKWY #200 HENDERSON NV 89014 100.00000 PATENTEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
016	LOTS			23;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07457701	280004	CLOSED	970	CASE CLOSED	08/11/2005		Total Acres = 16.62

SOUTHERN NV WATER AUTHORITY 1900 E FLAMINGO #170 LAS VEGAS NV 89119 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 075025	285003	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	502-7178.545;	Total Acres = 730.14

NV POWER CO PO BOX 98910 LAS VEGAS NV 89151 100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
006	LOTS			16-19;
008	LOTS			3,4,6-9;
009	LOTS			11,12,14-16;
015	LOTS			3,22,23;
016	LOTS			1;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07502501	280004	CLOSED	970	CASE CLOSED	01/29/2004		Total Acres = 59.01

NV POWER CO PO BOX 98910 LAS VEGAS NV 89151 100.00000 HOLDER/BILLEE

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
006	RSDL			NWNWSW;
009	ALIQ			SESE;
010	RSDL			SWSWSW;
015	RSDL			W2NWNW;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 075060	286203	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	503-0.973;(MILES)		Total Acres = 35.74
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000	HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
006	LOTS			16-19;
008	LOTS			3,4,6-9;
009	LOTS			11,12,14-16;
015	LOTS			1-4;
016	LOTS			1;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 075413	287001	CLOSED	970	CASE CLOSED	12/10/2002			Total Acres = 0.46
MMC INC		408 E GOWAN RD		LAS VEGAS	NV	89030	100.00000	HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			15;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 075426	280004	CLOSED	967	CLOSED WITHOUT ACTION	04/12/2004			Total Acres = 0.15
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000	APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			1,4;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 076304	286203	AUTHORIZED	307	ROW GRANTED-ISSUED	03/18/2004			Total Acres = 0.07
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000	HOLDER/BILLEE

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Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076305	285001	AUTHORIZED	307	ROW GRANTED-ISSUED	03/18/2004		Total Acres = 6.05
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07630501	280004	AUTHORIZED	242	LEASE RENEWED	03/15/2006		Total Acres = 1.82
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07630502	270037	CLOSED	967	CLOSED WITHOUT ACTION	08/24/2007		Total Acres = 6.05
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076357	281001	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/01/2006	503 -0.375; /C/	Total Acres = 34.665
NVN 076357	281001	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/01/2006	503-31514.680;	Total Acres = 34.665
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5;
008	LOTS			13-16;
016	LOTS			4;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07635701	280004	CLOSED	970	CASE CLOSED	05/30/2007		Total Acres = 6.97
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076432	286203	PENDING	153	POST AUTH APLN RECD	05/01/2007	/C/	Total Acres = 39.704
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			3,22,23;
016	LOTS			30,32;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 076653	231145	AUTHORIZED	868	EFFECTIVE DATE	11/06/2002		Total Acres = 23334.16
BLM		4701 N TORREY PINES DR		LAS VEGAS	NV	891302301	100.00000 ADMIN MGT ENTITY

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
003	LOTS			5-20;
004	LOTS			5-20;
005	LOTS			5-20;
006	LOTS			8-19;
008	LOTS			1-16;
009	LOTS			1-16;
010	LOTS			1-16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077547	285003	CLOSED	970	CASE CLOSED	05/08/2006		Total Acres = 1.763
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
016	LOTS			12,22;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077675	286203	AUTHORIZED	304	AUTH AMENDED/MODIFIED	05/08/2006	502-26077.070;	Total Acres = 1.114
CENTRAL TELEPHONE CO		330 S VALLEY VIEW BLVD		LAS VEGAS	NV	89152	100.00000 HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13,14,15,16;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077736	362113	AUTHORIZED	276	PMT-LIC ISSUED	04/05/2004		Total Acres = 80
N LAS VEGAS CITY OF		2266 CIVIC CTR DR		LAS VEGAS	NV	89030	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	ALL			ENTIRE SECTION

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077772	281001	PENDING	153	POST AUTH APLN RECD	12/08/2006	/B/	Total Acres = 2454.68
LAS VEGAS CITY OF		731 S 4TH ST		LAS VEGAS	NV	89101	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
003	LOTS			17-20;
004	LOTS			17-20;
005	LOTS			9,14-20;
006	LOTS			8-11,13-16;
008	LOTS			1,2;
009	LOTS			1-4;
010	LOTS			1-4;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077820	287001	PENDING	153	POST AUTH APLN RECD	12/20/2006	/A/	Total Acres = 15.19
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
006	LOTS			11,12,19;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 077938	281001	CLOSED	970	CASE CLOSED	05/22/2007		Total Acres = 5.578
N LAS VEGAS CITY		2200 CIVIC CTR DR		N LAS VEGAS	NV	89030	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			7,8;
008	LOTS			12,13;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 078217	270030	AUTHORIZED	271	PATENT ISSUED	05/08/2006	27-2006-0097;	Total Acres = 2675.3
NOV 2005 LAND INVSTR LLC		11411 STHRN HIGHLANDS PKWY		ENCINO	CA	91436	100.00000 PATENTEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			28,30,31,33,35,36,38,39;
015	LOTS			13-15,17-19,21,24,25,26;
015	LOTS			41,43,45;
016	LOTS			29,31,33,34,37,39,41,42;
016	LOTS			5,9-12,14-16,19,21,22,25;
016	LOTS			27,44;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 078787	285001	CLOSED	970	CASE CLOSED	10/25/2005		Total Acres = 5.19
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			1;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07878701	280004	CLOSED	970	CASE CLOSED	10/25/2005		Total Acres = 5.19
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			1;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 078789	286203	CLOSED	970	CASE CLOSED	10/25/2005		Total Acres = 5.19
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			11;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07878901	280004	CLOSED	967	CLOSED WITHOUT ACTION	07/07/2004		Total Acres = 5.19
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			11;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 078790	285003	CLOSED	970	CASE CLOSED	10/25/2005		Total Acres = 7.27
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			3,6;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 07879001	280004	CLOSED	967	CLOSED WITHOUT ACTION	07/09/2004		Total Acres = 7.27
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			3,6;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 078848	288100	CLOSED	967	CLOSED WITHOUT ACTION	05/04/2005		Total Acres = 0.02
SOUTHWEST GAS CORP		PO BOX 98510		LAS VEGAS	NV	891938510	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 07884801	280004	CLOSED	967	CLOSED WITHOUT ACTION	05/04/2005			Total Acres = 0.01
SOUTHWEST GAS CORP		PO BOX 98510		LAS VEGAS	NV	891938510	100.00000	APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 080965	285003	AUTHORIZED	307	ROW GRANTED-ISSUED	12/16/2005			Total Acres = 0.25
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000	HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 082313	286203	AUTHORIZED	307	ROW GRANTED-ISSUED	08/30/2006			Total Acres = 0.147
CENTRAL TELEPHONE CO		6391 SPRINT PKWY		OVERLAND PARK	KS	66251	100.00000	HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 08231301	280004	EXPIRED	234	EXPIRED	09/30/2007			Total Acres = 0.147
CENTRAL TELEPHONE CO		6391 SPRINT PKWY		OVERLAND PARK	KS	66251	100.00000	HOLDER/BILLEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
007	LOTS			5;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark		
NVN 082428	270037	CLOSED	967	CLOSED WITHOUT ACTION	07/17/2007			Total Acres = 6.05
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000	PATENTEE

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13;

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Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 083272	285003	CLOSED	970	CASE CLOSED	05/03/2007		Total Acres = 10
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			3,22,23;
016	LOTS			24,30,32;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 08327201	285003	CLOSED	970	CASE CLOSED	05/03/2007		Total Acres = 10
NV POWER CO		PO BOX 98910		LAS VEGAS	NV	89151	100.00000 APPLICANT

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
015	LOTS			3,22,23;
016	LOTS			24,30,32;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 083310	281001	AUTHORIZED	307	ROW GRANTED-ISSUED	05/21/2007		Total Acres = 31.08
N LAS VEGAS CITY OF		2266 CIVIC CTR DR		LAS VEGAS	NV	89030	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
009	LOTS			13,14,15,16;
010	LOTS			15,16;
015	LOTS			3,22,23;
016	LOTS			24,30,32;

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark	
NVN 08331001	281001	AUTHORIZED	307	ROW GRANTED-ISSUED	05/21/2007		Total Acres = 4.99
N LAS VEGAS CITY OF		2266 CIVIC CTR DR		LAS VEGAS	NV	89030	100.00000 HOLDER

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
009	LOTS			13,14,15,16;
010	LOTS			15,16;
015	LOTS			3,22,23;
016	LOTS			24,30,32;

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UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Geographic Report with Customer
Sorted by Meridian Township Range

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Mer/Twp/Rng: **21 0190S 0610E**

Serial Number	Casetype	Disposition	Actn Code	Actn Txt	Date	Actn Remark
NVN 083621	271000	PENDING	124	APLN RECD	12/11/2006	
NV POWER CO		PO BOX 98910		LAS VEGAS	NV 89151	100.00000 APPLICANT

Total Acres = 5

Section	TYP	Sur Nr	Sur Suffix	Aliquot Part
008	LOTS			13;

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Appendix H

BLM LAND AND MINERAL RESOURCES LR2000 PUBLIC RECORDS DATABASE SEARCH RESULTS:
ALL MINING CLAIM RECORDS

Run Time: 11:00 AM

UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
MINING CLAIM GEOGRAPHIC INDEX REPORT

ACTIVE, CLOSED, PENDING, VOID CL

Run Date: 10/31/2007
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Geo State: NV County: CLARK

BLM Resource Area: LAS VEGAS FIELD OFFICE

Meridian Township Range: 21 0180S 0590E

SEC	SUB DV	Ser No	Case Type	Claim Name/Number	Claimant	Lead File	County Book:Page	Loc Dt	Latest Assmt-Yr	Closed Date
022	NE	NMC93821	PLACER	VEGA 222	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	NW	NMC93820	PLACER	VEGA 221	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SE	NMC93822	PLACER	VEGA 2234	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SW	NMC93823	PLACER	VEGA 233	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
023	SE	NMC93824	PLACER	VEGA 2314	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
024	NE	NMC93826	PLACER	VEGA 2412	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	NE	NMC93827	PLACER	VEGA 2421	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	NW	NMC93825	PLACER	VEGA 2321	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SE	NMC93829	PLACER	VEGA 244	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SW	NMC93828	PLACER	VEGA 243	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994

Meridian Township Range: 21 0180S 0600E

SEC	SUB DV	Ser No	Case Type	Claim Name/Number	Claimant	Lead File	County Book:Page	Loc Dt	Latest Assmt-Yr	Closed Date
030	NE	NMC93837	PLACER	VEGA 302	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	NW	NMC93836	PLACER	VEGA 301	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SE	NMC93839	PLACER	VEGA 304	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SW	NMC93838	PLACER	VEGA 303	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
031	NE	NMC93841	PLACER	VEGA 312	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	NW	NMC93840	PLACER	VEGA 311	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SE	NMC93843	PLACER	VEGA 314	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SW	NMC93842	PLACER	VEGA 313	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
032	NW	NMC93844	PLACER	VEGA 321	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SE	NMC93846	PLACER	VEGA 324	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994
	SW	NMC93845	PLACER	VEGA 323	VEGA INC	NMC93820		05/21/1971	1992	09/01/1994

Meridian Township Range: 21 0190S 0610E

SEC	SUB DV	Ser No	Case Type	Claim Name/Number	Claimant	Lead File	County Book:Page	Loc Dt	Latest Assmt-Yr	Closed Date
016	SE	NMC562827	PLACER	ORO #13	CITY OF N LAS VEGAS	NMC552815	890717;00709	07/14/1989	0000	01/22/1991
	SE	NMC562828	PLACER	ORO #14	CITY OF N LAS VEGAS	NMC552815	890717;00711	07/14/1989	0000	01/22/1991
	SE	NMC562829	PLACER	ORO #15	CITY OF N LAS VEGAS	NMC552815	890717;00713	07/14/1989	0000	01/22/1991

* DISCLOSURE * ALL INFORMATION RECEIVED IN THIS OFFICE MAY NOT YET BE LISTED ON THIS REPORT. NAMES AND ADDRESSES ARE ENTERED AS THEY APPEAR ON THE LOCATION NOTICE C THEY MAY NOT APPEAR IN THE EXPECTED SEQUENCE. A BLANK LATEST ASSESSMENT YEAR IN THIS REPORT DOES NOT CONSTITUTE AN ABANDONED CLAIM.

Run Time: 11:00 AM

UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
MINING CLAIM GEOGRAPHIC INDEX REPORT

ACTIVE, CLOSED, PENDING, VOID CL

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Meridian Township Range: 21 0190S 0610E

SEC	SUB DV	Ser No	Case Type	Claim Name/Number	Claimant	Lead File	County Book:Page	Loc Dt	Latest Assmt-Yr	Closed Date
	SE	NMC562830	PLACER	ORO #16	CITY OF N LAS VEGAS	NMC552815	890717;00715	07/14/1989	0000	01/22/1991
	SE	NMC575137	PLACER	PLACER # 16	CITY OF N LAS VEGAS	NMC575132		08/10/1989	0000	08/14/1991
	SW	NMC575136	PLACER	PLACER # 15	CITY OF N LAS VEGAS	NMC575132		08/10/1989	0000	08/14/1991

* DISCLOSURE * ALL INFORMATION RECEIVED IN THIS OFFICE MAY NOT YET BE LISTED ON THIS REPORT. NAMES AND ADDRESSES ARE ENTERED AS THEY APPEAR ON THE LOCATION NOTICE C THEY MAY NOT APPEAR IN THE EXPECTED SEQUENCE. A BLANK LATEST ASSESSMENT YEAR IN THIS REPORT DOES NOT CONSTITUTE AN ABANDONED CLAIM.

Appendix I

BLM LAND AND MINERAL RESOURCES LR2000 PUBLIC RECORDS DATABASE SEARCH RESULTS:
CLOSED MINING CLAIM RECORDS

Run Time: 11:06 AM

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MINING CLAIM GEOGRAPHIC REPORT
LIST OF MINING CLAIMS BY SECTION

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MER TWP RNG SEC
21 0180S 0590E 022

Serial Num	Quad	Claim Name/Number	Claimant(s)	Lead File	Case Type	Status	Loc Dt	Last Assessment
NMC93820	NW	VEGA 221	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93821	NE	VEGA 222	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93822	SE	VEGA 2234	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93823	SW	VEGA 233	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992

MER TWP RNG SEC
21 0180S 0590E 023

Serial Num	Quad	Claim Name/Number	Claimant(s)	Lead File	Case Type	Status	Loc Dt	Last Assessment
NMC93824	SE	VEGA 2314	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992

MER TWP RNG SEC
21 0180S 0590E 024

Serial Num	Quad	Claim Name/Number	Claimant(s)	Lead File	Case Type	Status	Loc Dt	Last Assessment
NMC93825	NW	VEGA 2321	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93826	NE	VEGA 2412	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93827	NE	VEGA 2421	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93828	SW	VEGA 243	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93829	SE	VEGA 244	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992

MER TWP RNG SEC
21 0180S 0600E 030

Serial Num	Quad	Claim Name/Number	Claimant(s)	Lead File	Case Type	Status	Loc Dt	Last Assessment
NMC93836	NW	VEGA 301	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93837	NE	VEGA 302	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93838	SW	VEGA 303	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93839	SE	VEGA 304	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992

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Run Time: 11:06 AM

UNITED STATES DEPARTMENT OF THE INTERIOR
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LIST OF MINING CLAIMS BY SECTION

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MER TWP RNG SEC
21 0180S 0600E 031

Serial Num	Quad	Claim Name/Number	Claimant(s)	Lead File	Case Type	Status	Loc Dt	Last Assessment
NMC93840	NW	VEGA 311	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93841	NE	VEGA 312	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93842	SW	VEGA 313	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93843	SE	VEGA 314	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992

MER TWP RNG SEC
21 0180S 0600E 032

Serial Num	Quad	Claim Name/Number	Claimant(s)	Lead File	Case Type	Status	Loc Dt	Last Assessment
NMC93844	NW	VEGA 321	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93845	SW	VEGA 323	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992
NMC93846	SE	VEGA 324	VEGA INC	NMC93820	384201	CLOSED	05/21/1971	1992

MER TWP RNG SEC
21 0190S 0610E 016

Serial Num	Quad	Claim Name/Number	Claimant(s)	Lead File	Case Type	Status	Loc Dt	Last Assessment
NMC562827	SE	ORO #13	CITY OF N LAS VEGAS	NMC552815	384201	CLOSED	07/14/1989	0000
NMC562828	SE	ORO #14	CITY OF N LAS VEGAS	NMC552815	384201	CLOSED	07/14/1989	0000
NMC562829	SE	ORO #15	CITY OF N LAS VEGAS	NMC552815	384201	CLOSED	07/14/1989	0000
NMC562830	SE	ORO #16	CITY OF N LAS VEGAS	NMC552815	384201	CLOSED	07/14/1989	0000
NMC575136	SW	PLACER # 15	CITY OF N LAS VEGAS	NMC575132	384201	CLOSED	08/10/1989	0000
NMC575137	SE	PLACER # 16	CITY OF N LAS VEGAS	NMC575132	384201	CLOSED	08/10/1989	0000

NO WARRANTY IS MADE BY BLM
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Appendix J

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Table J.1. Selected Age and Education Characteristics, 2000

	Nevada	Clark County	Las Vegas	North Las Vegas	Las Vegas Paiute Tribe
Various Statistics					
Median Age	35.0	34.4	34.5	28.8	30.5
Male	1,018,051 (50.9%)	699,728 (50.9%)	243,077 (50.5%)	58,947 (51%)	52 (48.1%)
Female	980,206 (49.1%)	676037 (49.1%)	235,357 (49.2%)	56,541 (49%)	56 (51.9%)
Number of households	751,165	512,253	176,750	34,018	31
Average household size	2.62	2.65	2.66	3.36	3.48
Education Statistics					
School Enrollment					
Elementary school	47.1%	47.9%	49.0%	53.4%	77.8%
High school	21.2%	20.7%	20.8%	19.9%	3.7%
College	20%	19.5%	17.7%	12.6%	0.0%
Education of Population over 25 Years					
Less than high school	19.3%	20.5%	20.6%	33.5%	22.7%
High school graduate	29.3%	29.9%	28.9%	27.8%	59.5%
Some college	27%	26.4%	25.7%	22.9%	14.9%
College or graduate degree*	18.2%	17.4%	18.2%	10.1%	0.0%

Source: Census Bureau (2000b, 2000c).

* Does not include Associate's degrees awarded.

Table J.2. Major Employers in Clark County, Last Quarter 2006

Company	No. Full-Time Employees
Clark County School District	35,212
Clark County	10,107
Bellagio Hotel and Casino	9,812
MGM Grand Hotel, Inc.	9,289
Wynn Las Vegas	9,072
Mandalay Bay Resort and Casino	8,193
Caesars Palace Hotel and Casino	7,748
Mirage Hotel and Casino	5,710
Las Vegas Metropolitan Police	5,018
Rio Hotel and Casino	4,556
UNLV	3,244

Source: CCDCP (2006).

Table J.3. Employment by Industry, 2000 and 2005

Total Employment by Industry	Clark County				Nevada			
	2001	2005	% Change	% of 2005 Total	2001	2005	% Change	% of 2005 Total
Farm Employment	361	339	−6.1%	0.0%	5,501	5,156	−6.3%	0.3%
Non-farm Employment	884,221	1,073,443	21.4%	100.0%	1,262,498	1,522,275	20.6%	99.7%
Private Employment	801,510	975,039	21.7%	90.8%	1,131,913	1,366,333	20.7%	89.5%
Forestry, fishing	333	325	−2.4%	0.0%	1,983	1,762	−11.1%	0.1%
Mining	1,357	1,250	−7.9%	0.1%	12,917	12,817	−0.8%	0.8%
Utilities	2,733	3,413	24.9%	0.3%	4,795	5,324	11.0%	0.3%
Construction	78,289	114,588	46.4%	10.7%	107,302	154,978	44.4%	10.1%
Manufacturing	22,260	27,019	21.4%	2.5%	45,746	51,662	12.9%	3.4%
Wholesale trade	22,862	26,374	15.4%	2.5%	38,165	41,970	10.0%	2.7%
Retail trade	94,077	111,541	18.6%	10.4%	133,350	159,527	19.6%	10.4%
Transportation and warehousing	29,319	33,661	14.8%	3.1%	40,783	48,115	18.0%	3.2%
Information	16,212	13,356	−17.6%	1.2%	21,909	18,760	−14.4%	1.2%
Finance and insurance	45,074	52,792	17.1%	4.9%	62,657	71,946	14.8%	4.7%
Real estate and rental and leasing	41,731	60,886	45.9%	5.7%	58,556	86,177	47.2%	5.6%
Professional and technical services	42,440	54,168	27.6%	5.0%	62,571	80,268	28.3%	5.3%
Management of companies and enterprises	6,545	10,203	55.9%	1.0%	9,680	13,956	44.2%	0.9%
Administrative and waste services	59,800	75,941	27.0%	7.1%	78,841	102,890	30.5%	6.7%
Educational services	3,870	6,240	61.2%	0.6%	4,942	9,070	83.5%	0.6%
Health care and social assistance	20,286	62,636	208.8%	5.8%	72,949	93,763	28.5%	6.1%
Arts, entertainment, and recreation	27,427	30,612	11.6%	2.9%	42,627	47,047	10.4%	3.1%
Accommodation and food services	223,647	250,426	12.0%	23.3%	283,926	307,328	8.2%	20.1%
Other services	33,248	39,608	19.1%	3.7%	48,214	58,937	22.2%	3.9%
Government	82,711	98,404	19.0%	9.2%	130,585	155,942	19.4%	10.2%
Federal, civilian	8,966	11,080	23.6%	1.0%	15,140	17,019	12.4%	1.1%
Military	9,870	11,377	15.3%	1.1%	11,615	13,860	19.3%	0.9%
State government	11,690	14,294	22.3%	1.3%	25,841	31,565	22.2%	2.1%
Local government	52,185	61,653	18.1%	5.7%	77,989	93,498	19.9%	6.1%
Total Employment	**884,582**	**1,073,782**	**21.4%**		**1,267,999**	**1,527,431**	**20.5%**	

Source: BEA (2007).

Table J.4. Income Characteristics, 2000

Location	Per Capita Personal Income ($)	Median Household Income ($)	Median Family Income ($)
Nevada	21,989	44,581	50,849
Clark County	21,785	44,616	50,485
Las Vegas	22,060	44,069	50,465
North Las Vegas	16,023	46,057	46,540
Las Vegas Paiute Tribe	8,529	29,861	28,611

Source: Census Bureau (2000c).

Table J.5. Labor Force Summary, 1990–2004

Location	Labor Force			Employed			Unemployed			Unemployment Rate (%)		
	1990	2000	2006	1990	2000	2006	1990	2000	2006	1990	2000	2006
Nevada	657,878	1,003,293	1,291,287	607,437	933,280	1,224,523	40,083	61,920	66,764	6.1	6.2	5.2
Clark County	405,957	688,917	920,842	370,583	937,073	872,024	26,633	44,734	48,643	6.6	6.5	5.3
Las Vegas	141,467	231,388	283,504	131,001	214,301	265,916	9,297	16,176	16,829	6.6	7.0	5.9
North Las Vegas	22,257	50,594	92,073	19,510	45,740	85,157	2,507	3,980	4,572	11.3	7.9	5.0
Paiute Reservation	40	33	NA	32	32	NA	8	1	NA	20.0	3.0	NA

Source: Census Bureau (1990, 2000c, 2006).

Table J.6. Total Estimated Occupied Housing Units in the CTA Study Area, 1996–2006

	Single Family	Duplex or ¾Plex	Mobile Home	Apartment	Townhome	Condo	Total Housing Unit	AAGR* 1996–2006 (%)	Growth 1996–2006 (%)
Las Vegas									
1996	89,181	7,586	3,295	44,030	5,053	10,430	159,575		
1997	91,219	7,163	3,179	41,575	5,182	10,457	158,775		
1998	98,240	7,790	3,282	48,628	7,406	9,094	174,440		
1999	101,783	7,238	3,143	46,478	7,351	9,247	175,240		
2000	110,497	7,598	3,420	48,927	5,790	16,447	192,679		
2001	114,490	7,540	3,344	48,769	5,767	16,331	196,241		
2002	119,001	7,513	3,333	49,671	5,807	16,722	202,047		
2003	122,754	7,523	3,370	49,950	6,271	17,418	207,286		
2004	127,980	7,386	3,315	50,755	8,021	17,833	215,290		
2005	382,217	17,611	6,735	108,510	15,782	38,368	569,223		
2006	138,172	7,376	3,160	51,284	9,721	18,149	227,862	3.29	42.79
North Las Vegas									
1996	19,764	3,664	993	1,586	428	368	26,803		
1997	20,901	3,502	958	1,874	397	352	27,984		

Table J.6. Total Estimated Occupied Housing Units in the CTA Study Area, 1996–2006 (Continued)

	Single Family	Duplex or ¾Plex	Mobile Home	Apartment	Townhome	Condo	Total Housing Unit	AAGR* 1996–2006 (%)	Growth 1996–2006 (%)
North Las Vegas, continued									
1998	23,392	3,663	994	3,132	535	324	32,040		
1999	25,203	3,476	817	3,076	497	683	33,752		
2000	28,357	3,764	1,166	4,389	484	1,092	39,252		
2001	29,379	3,695	838	4,967	555	796	40,230		
2002	31,555	3,695	838	5,234	627	846	42,795		
2003	35,138	3,695	838	5,677	725	886	46,959		
2004	40,851	3,695	838	5,949	1,025	1,364	53,722		
2005	140,910	13,948	2,297	16,886	3,044	3,449	180,534		
2006	51,300	3,695	893	5,446	1,494	1,861	64,689	8.33	141.34
Clark County									
1996	225,203	19,367	29,313	115,866	16,489	37,153	443,391		
1997	232,536	18,288	28,522	118,251	16,280	32,988	446,865		
1998	256,249	19,404	29,782	140,652	21,830	28,144	496,061		
1999	268,149	18,118	27,932	138,566	21,956	27,367	502,088		
2000	296,570	19,791	30,610	150,878	21,697	39,836	559,382		
2001	314,001	19,328	30,233	154,002	24,006	39,649	581,219		
2002	333,111	19,385	31,350	161,289	24,792	41,234	611,161		
2003	356,188	19,197	28,870	164,645	25,779	43,673	638,352		
2004	381,275	19,168	29,305	168,076	28,684	49,050	675,558		
2005	1,157,447	52,915	61,668	345,078	58,781	112,816	788,705		
2006	433,317	19,101	30,460	159,803	35,158	62,978	740,817	4.78	67.07

Source: CCDCP (2006).

* Average annual growth rate.

Table J.7. Average Median Gross Rents and Housing Costs in the CTA Study Area in 2000*

	Average Median Gross Rent ($)	Average Median Housing Value* ($)
Las Vegas	699	137,300
North Las Vegas	644	123,000
Las Vegas Paiute Tribe	525	48,000
Clark County	632	139,500
State of Nevada	699	142,000
United States	602	119,600

Source: Census Bureau (2000c).

* Inflation adjusted for 2000$; specified owner-occupied housing units.

Table J.8. Real Estate Sales for Las Vegas Metro Area, 1999–2006

	1999	2000	2001	2002	2003	2004	2005	2006	AAGR (%)	Growth 1999–2005 (%)
Closed home sales	21,162	20,520	22,940	22,502	25,230	29,248	30,750	36,051	6.89	70.35
Median new home price	147,750	161,893	178,920	186,827	209,611	290,287	309,990	330,094	10.57	123.41

Source: Southern Nevada Home Builders Association (2007).

Table J.9. Reported Crimes for LVMPD and NLVPD, 1995 and 2005

Crimes	Nevada*		LVMPD†		NLVPD	
	1995	2005	1995	2005	1995	2005
Murder	155	194	118	145	11	20
Rape	880	923	571	616	66	56
Robbery	4,89	4,617	3,712	3,494	464	408
Aggravated assault	7,670	8,098	5,122	5,275	1,077	872
Burglary	18,362	21,821	12,219	14,368	1,300	1,866
Larceny—theft	49,903	47,234	30,445	27,695	2,727	3,249
Motor vehicle thefts	11,043	2,636	7,991	19,950	920	2,466
Total	**92,902**	**109,250**	**60,178**	**71,543**	**6,565**	**8,937**

Source: BJS (2007).

* Counts based on sum of all reporting agencies in Nevada.

† LVMPD serves the City of Las Vegas and unincorporated Clark County.

Table J.10. Crime Rates for LVMPD, NLVPD, and Nevada, 1995 and 2005

Location	Crimes Committed		
	1995	2005	% Change in Crime Rate
Nevada	6,579	4,848	−26.31
LVMPD	7,584	5,581	−26.41
NLVPD	9,687	5,443	−43.81

Source: BJS (2007).

Table J.11. Public Services Available within the CTA Study Area

Subarea	Schools*	Library†	Solid Waste‡ (System Type)	Police§	Fire§	Hospitals¶
Las Vegas	Joint with Clark County	24	Both	8	16	23
North Las Vegas	Joint with Clark County	2	Both	2	6	1
Las Vegas Paiute Tribe	None	None	Municipal (City of Las Vegas)	1	Joint with Las Vegas	0
Clark County	326	Joint with Las Vegas	Both	Joint with Las Vegas	25	25
State of Nevada	538	108	Both	–	–	30

* Elementary and secondary public schools, 2006–2007 school year (Applied Analysis 2007).

† Public libraries only as of FY 2006–2007 (Nevada State Library and Archives 2007).

‡ Solid waste systems include private or municipal; ~~b~~both" means both methods were used (Applied Analysis 2007).

§ Number of stations (not employees) (Applied Analysis 2007).

¶ Source: American Hospital Directory (2007).

Table J.12. Average Gross Mean and Median Real Estate Tax, CTA Study Area, 2000*

	Average Median Real Estate Tax ($)	Average Mean Real Estate Tax ($)
Las Vegas	1,200	1,400
North Las Vegas	1,165	1,210
Paiute	–	–
Clark County	1,174	1,342
State of Nevada	1,187	1,371

Source: Census Bureau (2000c).

* Inflation adjusted for 2000$; specified owner-occupied housing units.

Table J.13. PILT, Clark County and Nevada, 1999–2006

Year	Clark County	Nevada
1999	$991,677	7,180,805
2000	$1,048,261	7,604,840
2001	$1,505,243	10,956,327
2002	$1,579,548	11,506,400
2003	$1,811,804	13,132,942
2004	$1,862,174	13,495,376
2005	$1,900,732	13,732,723
2006	$1,938,337	14,135,972
% Growth 1999–2006	**95.46**	**96.86**

Source: U.S. Department of the Interior (2007).

Table J.14. Clark County Sales and Use Tax Revenue, 2000–2006

2000	2001	2002	2003	2004	2005	2006
$1,940,227,309	$2,004,152,187	$2,026,522,333	$2,214,389,999	$2,604,929,990	$2,984,462,586	$3,243,187,831
% Change Year to Year						
	3.29	1.12	9.27	17.64	14.57	8.67
% Change Trend 2000–2006						
67.15						

Source: NSD (2006).

Table J.15. Nevada Sales and Use Tax Revenue, 2000–2006

2000	2001	2002	2003	2004	2005	2006
$2,750,071,695	$2,832,345,655	$2,823,533,894	$3,087,848,866	$3,579,833,092	$4,150,906,098	$4,486,362,249
% Change Year to Year						
	2.99	−0.31	9.36	15.93	15.95	8.08
% Change Trend 2000–2006						
63.13						

Source: NSD (2006).

Table J.16. Clark County Sales Tax Breakdown, 2006

Minimum Tax Rate %	
Sales tax	2.00
Local school support tax	2.25
Basic city-county relief tax	0.50
Supplemental city-county relief tax	1.75
Option tax	
Police protection	0.25
Public mass transportation and road construction	0.50
Flood control	0.25
Infrastructure	0.25
Total	**7.75**

Source: NSD (2006).

Table J.17. Nevada Lodging Tax Revenue, Fiscal Years 2000–2006

2000–2001	2001–2002	2002–2003	2003–2004	2004–2005	2005–2006
$13,050,670	$11,268,582	$11,875,153	$13,305,505	$15,134,104	$17,279,556
% Change Year to Year					
	−13.66	5.38	12.04	13.74	14.18
% Change Trend 2000–2006					
32.40					

Source: Nevada Department of Taxation (2007).

Table J.18. Gaming Revenue, 1999–2005

	1999 ($)	2000 ($)	2001 ($)	2002 ($)	2003 ($)	2004 ($)	2005 ($)
Downtown Las Vegas	667,172,173	670,245,345	671,942,657	661,435,043	655,186,940	653,438,887	658,620,516
% Change Year to Year	−2.34	0.46	0.25	−1.56	−0.94	−0.27	0.79
% Change Trend 1999–2005	−1.28						
Las Vegas Strip	4,128,143,954	4,683,729,471	4,615,644,944	4,247,749,172	4,490,623,007	4,909,991,047	5,283,122,106
% Change Year to Year	11.04	13.46	−1.45	−7.97	5.72	9.34	7.60
% Change Trend 1999–2005	27.98						
Clark County	6,783,980,118	7,272,083,749	7,355,623,122	7,377,726,505	7,638,930,066	8,456,485,865	9,242,973,632
% Change Year to Year	11.44	7.19	1.15	0.30	3.54	10.70	9.30
%t Change Trend 1999–2005	36.25						
Nevada	8,426,224,115	9,305,916,419	9,310,594,712	8,911,540,280	9,250,496,837	9,83,510,737	10,662,454,467
% Change Year to Year	8.81	10.48	0.02	−4.29	3.80	6.84	7.88
% Change Trend 1999–2005	26.54						

Source: University of North Las Vegas, Center for Gaming Research (2007).

Table J.19. Total New Building Permits, 1996–2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	% Growth 1996–2005
Las Vegas*	16,611	16,110	15,809	16,612	14,913	14,477	14,916	18,193	19,147	15,267	−8.09
North Las Vegas†	4,233	4,122	4,391	4,175	4,626	5,961	6,489	9,759	10,185	11,392	169.12
Clark County‡	–	–	–	–	–	–	46,627	53,499	61,742	57,935	24.25§

* Source: City of Las Vegas (2006a).
† Source: City of North Las Vegas (2007c).
‡ Source: Applied Analysis (2007).
§ Percent growth for Clark County is only available from 2002 to 2005.

Table J.20. Total Dollar Value for New Building Permits (New, Privately Owned Residential), 1995–2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	% Growth 1996–2005
Las Vegas	726,573,159	692,606,873	601,007,492	599,645,960	513,443,785	544,980,266	703,152,829	1,060,388,643	1,023,998,094	930,990,766	–1.83
North Las Vegas	209,888,549	160,759,511	238,615,441	181,547,891	259,128,988	298,578,724	335,750,266	567,399,334	795,082,404	1,056,490,699	165.52
Clark County	2,265,682,398	2,248,410,974	2,186,603,261	2,351,029,824	2,666,696,445	2,999,763,863	3,209,523,879	3,888,553,535	4,193,823,122	5,203,972,340	100.09

Source: Census Bureau (2000b, 2000c).

Appendix K

UTAH STATE UNIVERSITY LAS VEGAS FUTURES PROJECT

UPPER LAS VEGAS WASH CONSERVATION TRANSFER AREA:

A SYSTEM TO DEVELOP ALTERNATIVE SCENARIOS

UtahState UNIVERSITY

UPPER LAS VEGAS WASH CONSERVATION TRANSFER AREA:

A SYSTEM TO DEVELOP ALTERNATIVE SCENARIOS

PREPARED FOR THE LAS VEGAS
BUREAU OF LAND MANAGEMENT

FEBRUARY 2007

UtahState
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PREFACE

The Las Vegas Valley is located in southern Clark County, Nevada within the Mojave Desert Ecoregion of the Basin and Range Province. The Mojave Desert is an expansive region in the arid western United States spanning southeastern California and southern Nevada (Figure 1). The low elevations of the Mojave Desert create warm year-round temperatures with the number of frost-free days greater than 200. Rainfall in the Mojave Desert is scarce and averages less than six inches (15.24 cm) per year. The average precipitation in Las Vegas, Nevada is 4.13 inches (10.49 cm). The limited precipitation in the Mojave Desert promotes unique vegetation communities characterized by low, widely spaced shrubs with numerous species of cacti, yucca, and flowering annuals. The creosote bush-dominated communities of southern Nevada provide habitat for several species of reptiles, birds, and mammals (MacMahon, 1985; Rundel and Gibson, 1996).

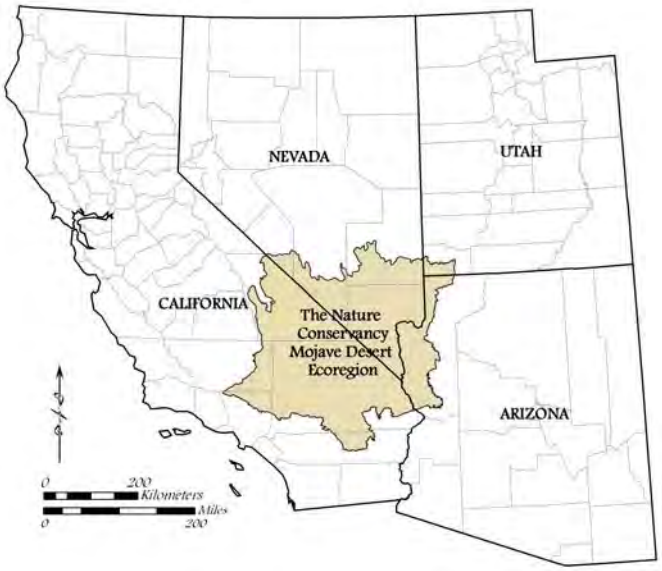


Figure 1. The Nature Conservancy Mojave Desert Ecoregion.

The Las Vegas Valley is one of the fastest growing regions in the United States and is continuing to grow at unprecedented rates with the remaining parcels of private land being converted to urban land uses to accommodate the growing population. The combined population of the North Las Vegas and Las Vegas municipalities more than doubled from 306,003 in 1990 to 721,822 in 2005. The population of Clark County increased from 741,459 in 1990 to 1,710,551 in 2005 (Figure 2) (United States Census Bureau).

As a result of rapid urbanization and previous legislation mandating the disposal of Federal lands in the Las Vegas Valley, BLM managed lands have become widely separated and surrounded by more urbanized land uses. To address issues associated with the need for developable lands and the management of public lands, Congress passed the Southern Nevada Public Land Management Act (SNPLMA) in 1998 (Public Law 105-263). The SNPLMA authorized the Bureau of Land Management to dispose of federal lands in

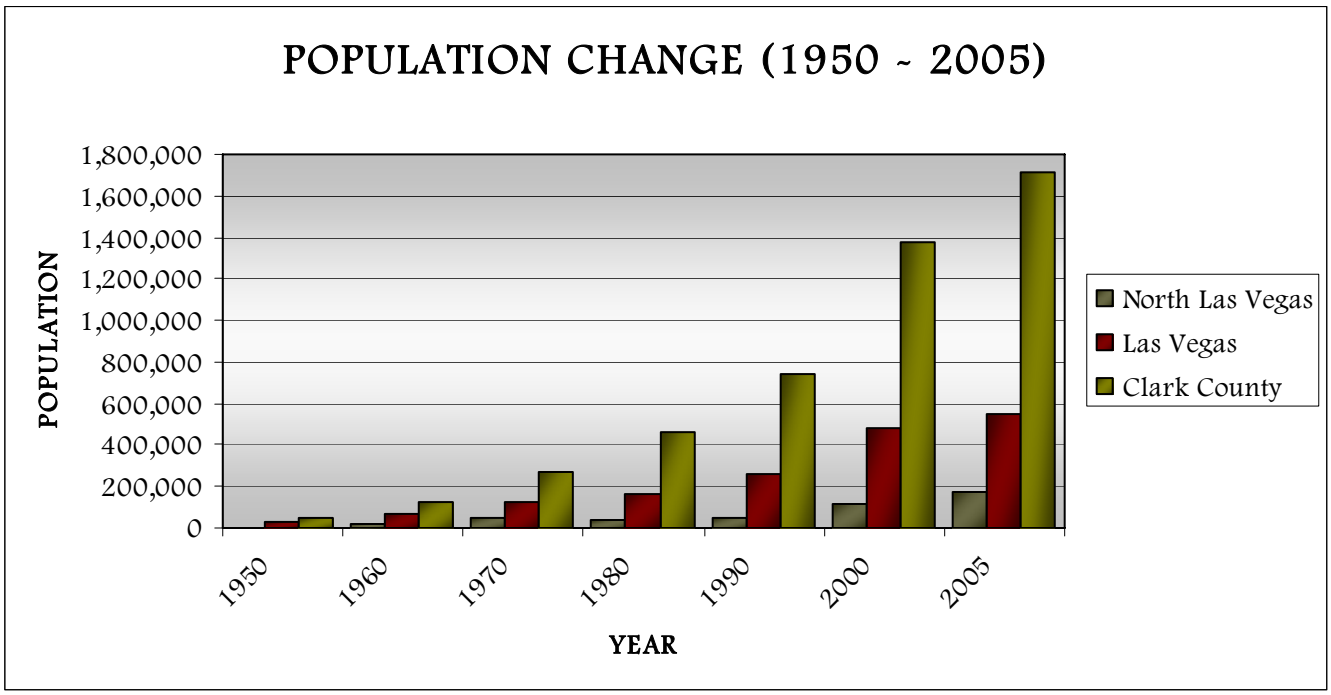


Figure 2. Population Change in North Las Vegas City, Las Vegas City, and Clark County, Nevada (U.S. Census Bureau).

Clark County, Nevada consistent with population growth and community land-use plans and policies. In 2002, the Clark County Conservation of Public Land and Natural Resources Act (Public Law 107-282) amended the SNPLMA to expand the disposal boundary area to address the continuing increase in growth in the Las Vegas region.

The disposal boundary established by the Southern Nevada Public Land Management Act of 1998 as amended by the Clark County Conservation of Public Land and Natural Resources Act of 2002 encompasses the Las Vegas Valley in southern Clark County, Nevada. The public lands that became available for auction were predominantly located in the northern and southern portions of the disposal area. This project and preliminary alternative future analyses focus on the lands available for disposal in the north (Figure 3). The northern area encompasses the Upper Las Vegas Wash and is bordered by Nellis Air Force Base to the east, the Desert National Wildlife Refuge to the north, and Red Rock Canyon National Conservation Area and the Las Vegas Paiute Indian Reservation to the west (Figure 4).

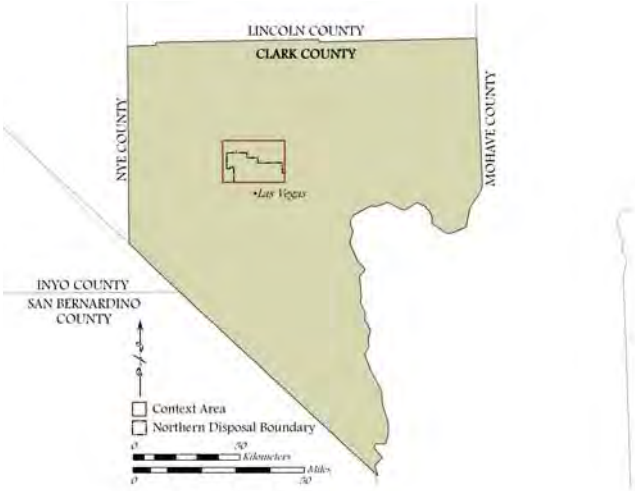


Figure 3. Disposal Boundary, Clark County, Nevada.

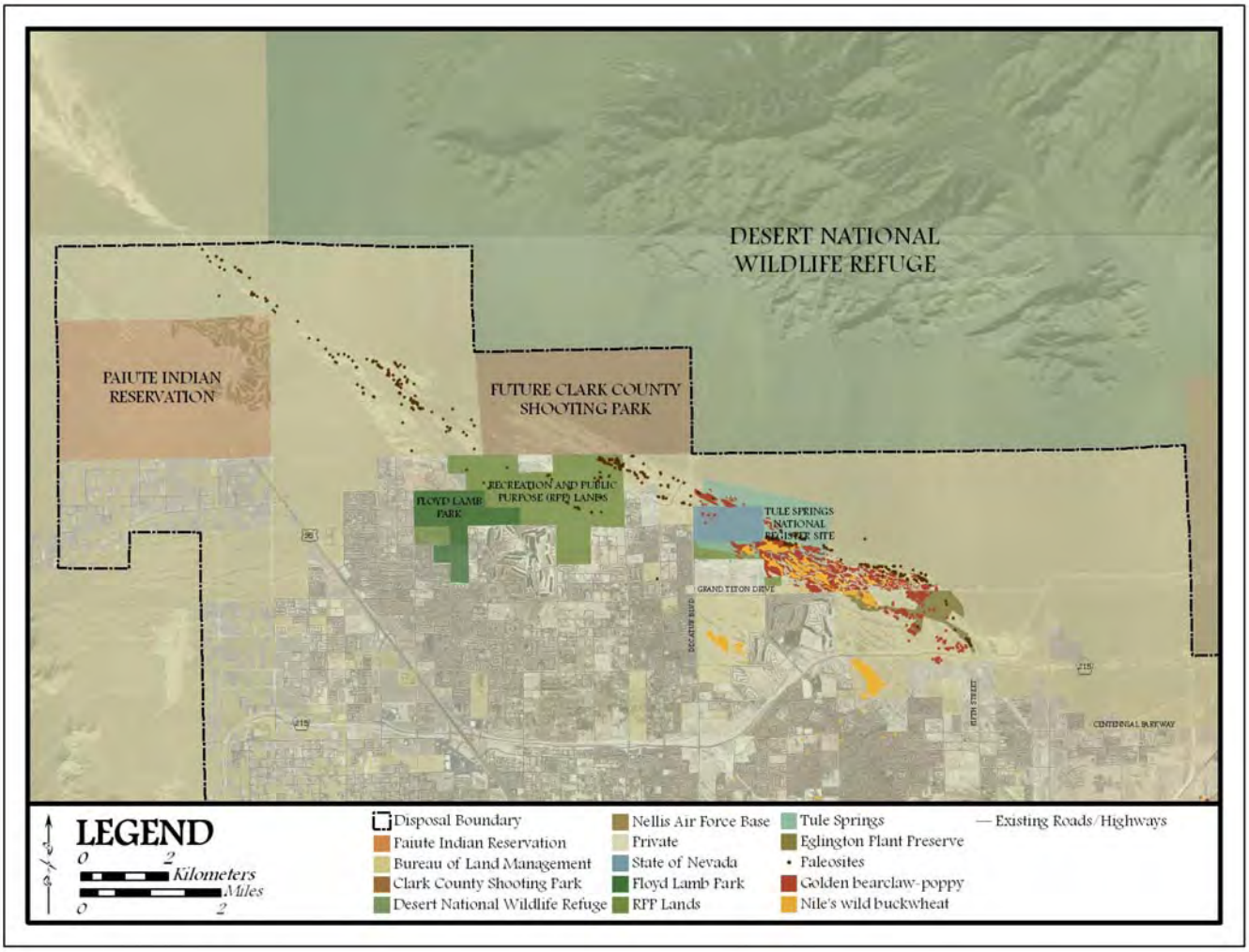


Figure 4. Upper Las Vegas Wash Conservation Transfer Area.

While the Bureau of Land Management has been authorized to dispose of lands within Clark County consistent with population growth and community land-use plans, they are bound by other Federal legislation which has prevented the immediate auction of lands within the Upper Las Vegas Wash.

The Endangered Species Act of 1973 (16 USC 1531-1543) provides for the conservation of critical habitat and ecosystems upon which threatened and endangered species depend on for survival and continued existence. The Bureau of Land Management is also required to protect candidate, proposed, and sensitive plant species. Within the Upper Las Vegas Wash, there are two rare plant species, the Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont) and Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal), both of which are listed as sensitive species by the BLM. The Golden bearclaw-poppy is classified as critically endangered by the State of Nevada and Nile's wild buckwheat is a candidate for listing on the State of Nevada's critically endangered plant species list. Declines in the population of these two species is largely attributed to the conversion of habitat for urban land uses, off-road vehicle use, flood control infrastructure, road and utility corridors, trash dumping, and gypsum mining (Morefield, 2001).

There are several animal wildlife species which are listed as sensitive by the BLM, some of which are protected by the State of Nevada. Of critical concern is the threatened desert tortoise (*Gopherus agassizii*). The desert tortoise inhabits a range of desert environments in the southwestern United States, including southeastern California and southern Nevada. Although the BLM (*Las Vegas Valley Disposal Boundary EIS*) indicates that there is no designated critical habitat within the disposal boundary, the habitat of the desert tortoise encompasses Mojave Desert creosote bush scrub, thorn scrub, and cacti, specifically in sandy or gravelly locations. Washes, canyon bottoms, and oases also serve as habitat for the desert tortoise (MacMahon, 1985).

Cultural resources within the disposal boundary are protected by the American Antiquities Act of 1906, the National Historic Preservation Act of 1966, and the Archaeological Resources Protection Act of 1979. Review of the *Las Vegas Disposal Boundary EIS* (Affected Environment) indicates that during a Class III field inventory, archeologists identified 100 sites, both prehistoric and historic, within the disposal area, 69 of which were not previously recorded.

The American Antiquities Act of 1906 (16 USC 431-433) seeks to protect historic and prehistoric ruins, monuments, objects of antiquity and scientific interest on lands owned or controlled by the Government of the United States by imposing misdemeanor-level criminal penalties. The National Historic Preservation Act of 1966 (16 USC 470) created the National Register of Historic Places which extends protection to historic places of State, local, and national significance. This legislation protects Tule Springs National Register Site, an archeological site which has produced substantial data relevant to the environmental history of the Great Basin. The Archaeological Resources Protection Act of 1979 (16 USC 470a-11) provides for the protection of archaeological resources on federal lands by invoking felony-level penalties for excavating, removing, damaging, or defacing any archeological resources older than 100 years on public or Indian lands.

Paleontological resources are fossilized evidence of past life on Earth. Review of the *Las Vegas Disposal Boundary EIS* (Affected Environment) indicates that 438 previously unrecorded paleontological resources were identified within the disposal boundary, the majority of which reside in fossiliferous Quaternary spring deposits in the Upper Las Vegas Wash. Although there is not a great deal of specific legislation protecting fossils other than what has been previously discussed, the Fossil Preservation Act of 1996 (HR 2943) provides for the protection, including the collection and preservation, of fossils that are on Federal lands for the present and future benefit of the people of the United States. This legislation is controversial because it encourages preservation through collection in order to reduce the loss of fossils resulting from erosion and theft.

The Las Vegas Paiute Tribe Reservation is located within the disposal area; therefore, other legislation that is relevant is the American Indian Religious Freedom Act of 1978 and the Native American Graves Protection and Repatriation Act. The American Indian Religious Freedom Act of 1978 (42 USC 1996) protects and preserves the inherent right of Native

Americans to believe, express, and exercise their traditional religions, including access to religious sites. The Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) establishes the right of Indian tribes to claim ownership of certain cultural items, including human remains and funerary, sacred, and cultural patrimony objects and artifacts.

INTRODUCTION

The primary objective of this deliverable was to develop a range of reasonable alternative scenarios using the best professional judgment of our team prior to the completion of the field work and the acquisition of the social and demographic survey results. There are challenges with generating solid conclusions without the evaluation of field data and social survey results; therefore, the team developed a modular approach for developing alternative scenarios. The components within each module were delineated based on the available data and some preliminary field work, and they were constructed in such a way that they can be modified based on the analyses of field, social, and demographic data.

The modules encompass five categories of change in which alternatives can be efficiently constructed based on the selection of components within the categories. The categories of change focus on variations of the Las Vegas Paiute Indian Reservation buffer, the northwest portion of the Upper Las Vegas Wash, the Recreation and Public Purpose lands adjacent to Floyd Lamb Park, the southeast portion of the Upper Las Vegas Wash, and the proposed Mountain Edge Beltway. Each category presents a series of components that represent the various objectives of stakeholders, ranging from maximum development to maximum conservation.

Each component within each category is accompanied with a series of assessment metrics. The assessment metrics will assist in evaluating the impacts of the various alternative scenarios. The primary assessment metrics which the team has been asked to evaluate are (1) populations of rare plant species, (2) paleontological resources, and (3) a landscape representative of the Mojave Desert. However, there are several other assessment metrics included which will aid in making an informed and reasoned decision regarding lands available for disposal in the Upper Las Vegas Wash.

Although this modular process presents hundreds of possible combinations, it provides a systematic framework that allows the components of alternative scenarios to be evaluated independently or collectively utilizing the provided assessment metrics.

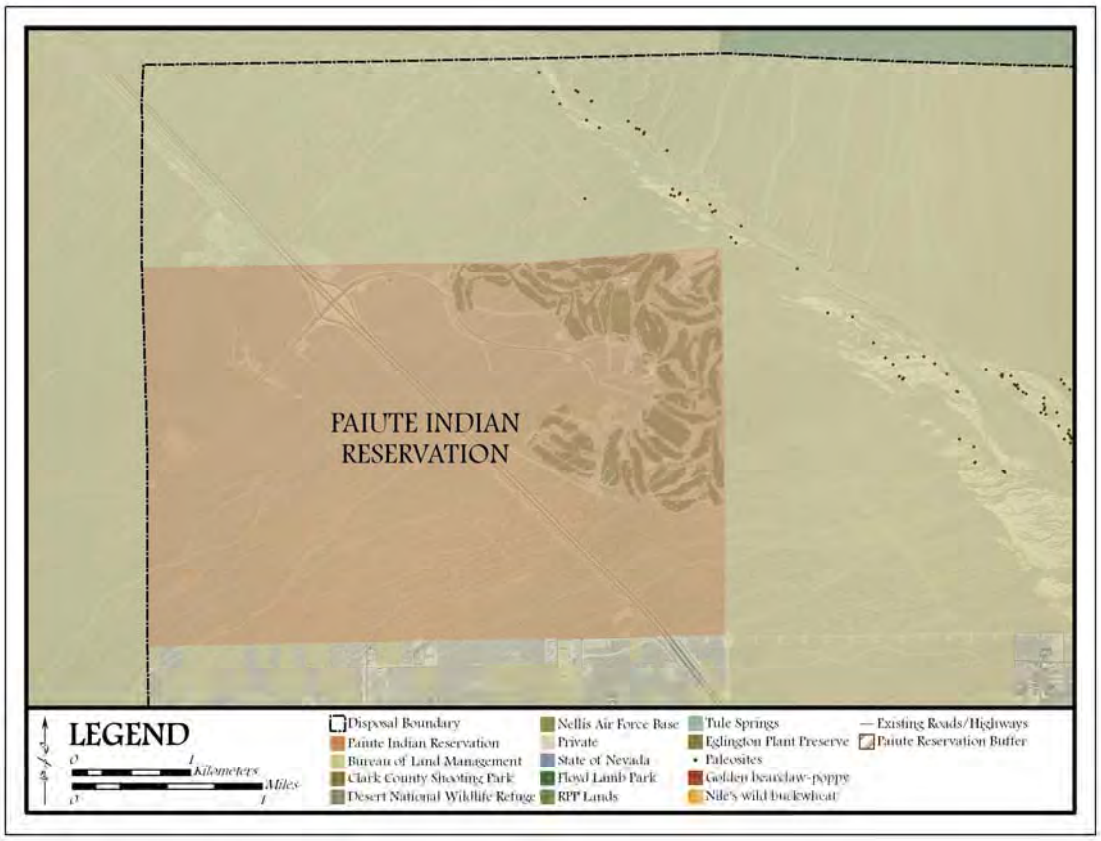
A DVD containing an ArcGIS map document and the GIS shapefiles of the components is provided so alternatives can be composed by the Bureau of Land Management and stakeholders within the Las Vegas Valley.

The GIS data used to create the base layers on the maps was provided by the Las Vegas Bureau of Land Management. Aero-Graphics provided the 2-foot resolution 2005 aerial photography.

ALTERNATIVE COMPONENTS

COMPONENT A PAIUTE INDIAN RESERVATION	COMPONENT B NORTHWEST UPPER LAS VEGAS WASH	COMPONENT C RECREATION & PUBLIC PURPOSE LANDS	COMPONENT D SOUTHEAST UPPER LAS VEGAS WASH	COMPONENT E MOUNTAIN EDGE BELTWAY
~A1~ NO BUFFER	~B1~ ACTIVE WASH	~C1~ NO RPP LANDS	~D1~ RARE PLANT SPECIES	~E1~ NO MOUNTAIN EDGE BELTWAY
~A2~ ONE~EIGHTH MILE BUFFER	~B2~ PALEO RESOURCES	~C2~ RPP LANDS WITH NO DESIGNATED USE	~D2~ PALEO RESOURCES & RARE PLANTS	~E2~ PROPOSED ALIGNMENT
~A3~ ONE~QUARTER MILE BUFFER	~B3~ WASH ECOSYSTEM	~C3~ RPP LANDS AND PRIVATE PARCEL	~D3~ WASH ECOSYSTEM I	~E3~ ALTERNATE ALIGNMENT
~A4~ ONE~HALF MILE BUFFER	~B4~ MOJAVE DESERT ECOSYSTEM		~D4~ WASH ECOSYSTEM II	
~A5~ ONE MILE BUFFER			~D5~ MOJAVE DESERT ECOSYSTEM I	
			~D6~ MOJAVE DESERT ECOSYSTEM II	

PAIUTE INDIAN RESERVATION (A1)



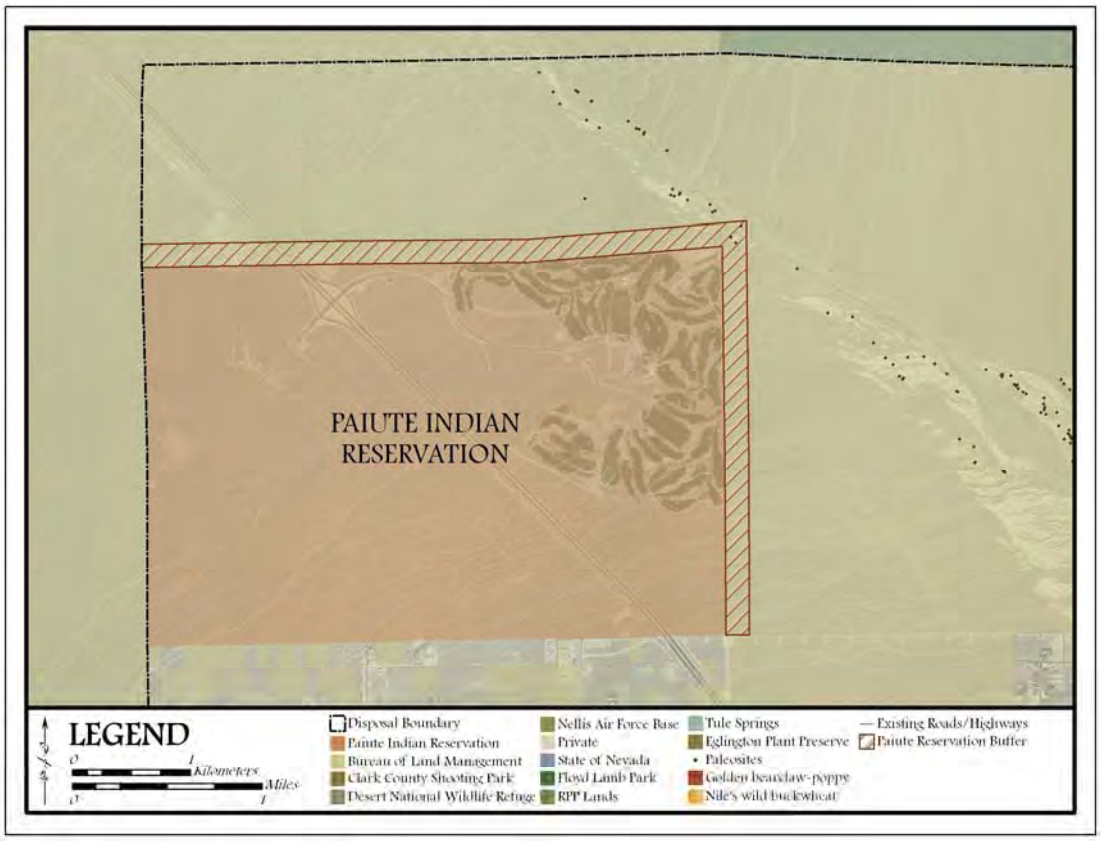
NO BUFFER (A1)

This alternative component represents the exclusion of a buffer on the north and east sides of the Paiute Indian Reservation. The absence of a buffer would not fulfill the request of the Paiute Tribe of Las Vegas, Nevada, but it would provide the greatest amount of urban development adjacent to the reservation in the northwest corner of the disposal area. The exclusion of a buffer would not provide protection from visual and social nuisances associated with the construction and existence of adjacent residential subdivisions and the associated transportation networks, and it would offer no protection of any potential Native American artifacts or burial sites within the North Las Vegas Wash. If Native American cultural sites are discovered, the Native American Graves Protection and Repatriation Act of 1990 mandates that they be protected or returned to lineal descendents or culturally affiliated Indian tribes (http://www.cr.nps.gov/nagpra/). Additionally, the exclusion of a buffer may impact the economic benefits of the Las Vegas Paiute Golf Resort, as the primary attraction and selling point of the resort is that it resides in the "undisturbed beauty of the Southern Nevada desert at the base of the picturesque Spring Mountains" (http://www.lvpaiutegolf.com/).

ASSESSMENT METRICS

- Cultural resources (Native American artifacts and burial sites)
- Visual quality (distance to residential development; vistas of wash and wildlife refuge)
- Road traffic noise (distance to roadway; speed of roadway; average vehicles per hour)
- Air quality (dust from construction sites, roads, and recreation)
- Social impacts (littering; vandalism; unregulated motorized vehicle use)

PAIUTE INDIAN RESERVATION (A2)



ONE-EIGHTH MILE BUFFER (A2)

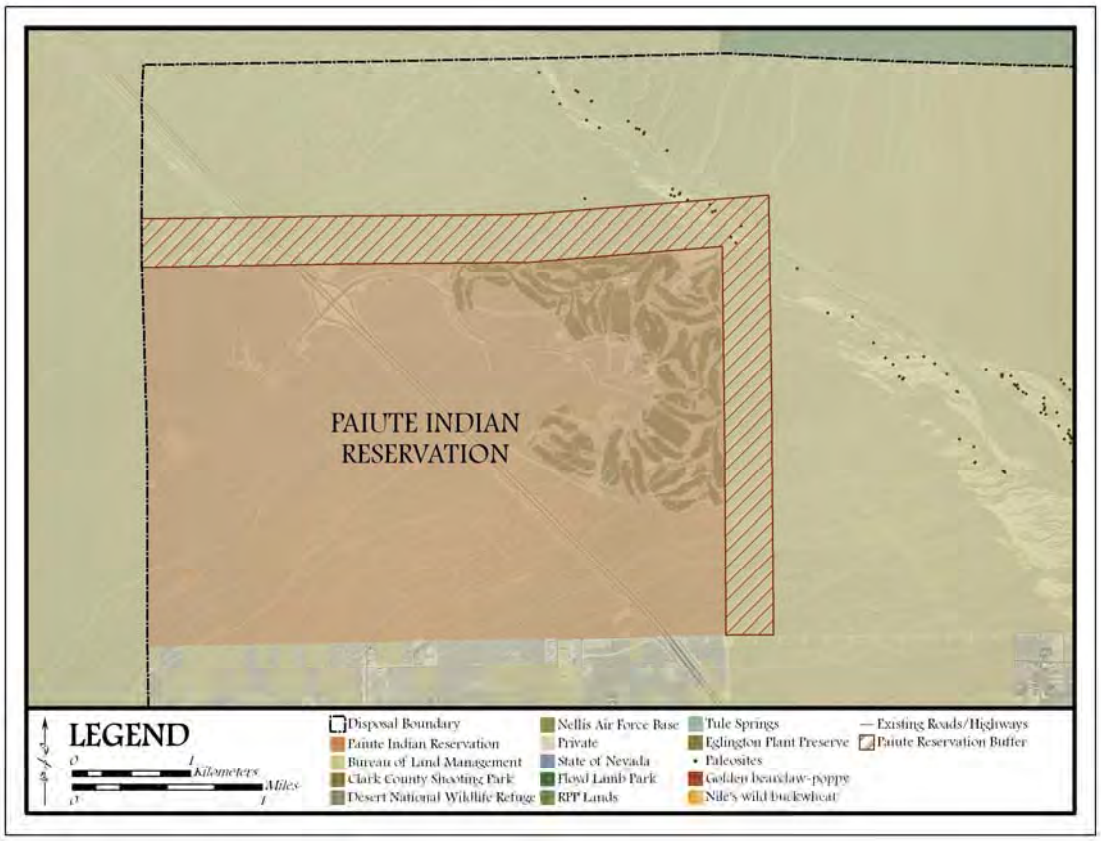
This alternative component represents a one-eighth mile (0.2 km) buffer on the north and east sides of the Paiute Indian Reservation. The existence of a one-eighth mile buffer may not fulfill the request of the Paiute Tribe of Las Vegas, Nevada, but it would provide the greatest amount of urban development adjacent to the reservation in the northwest portion of the disposal area while offering minimal protection from visual and social nuisances associated with the construction and existence of adjacent residential subdivisions and associated transportation networks. The buffer provides a moderately low amount of protection for any potential Native American artifacts or burial sites within the North Las Vegas Wash. However, a one-eighth mile buffer may not be adequate to prevent adverse social impacts within the buffer and sustain the economic benefits of the Las Vegas Paiute Golf Resort.

AREA: 415 acres (168 hectares)

ASSESSMENT METRICS

- Cultural resources (Native American artifacts and burial sites)
- Visual quality (distance to residential development; vistas of wash and wildlife refuge)
- Road traffic noise (distance to roadway; speed of roadway; average vehicles per hour)
- Air quality (dust from construction sites, roads, and recreation)
- Social impacts (littering; vandalism; unregulated motorized vehicle use)

PAIUTE INDIAN RESERVATION (A3)



ONE-QUARTER MILE BUFFER (A3)

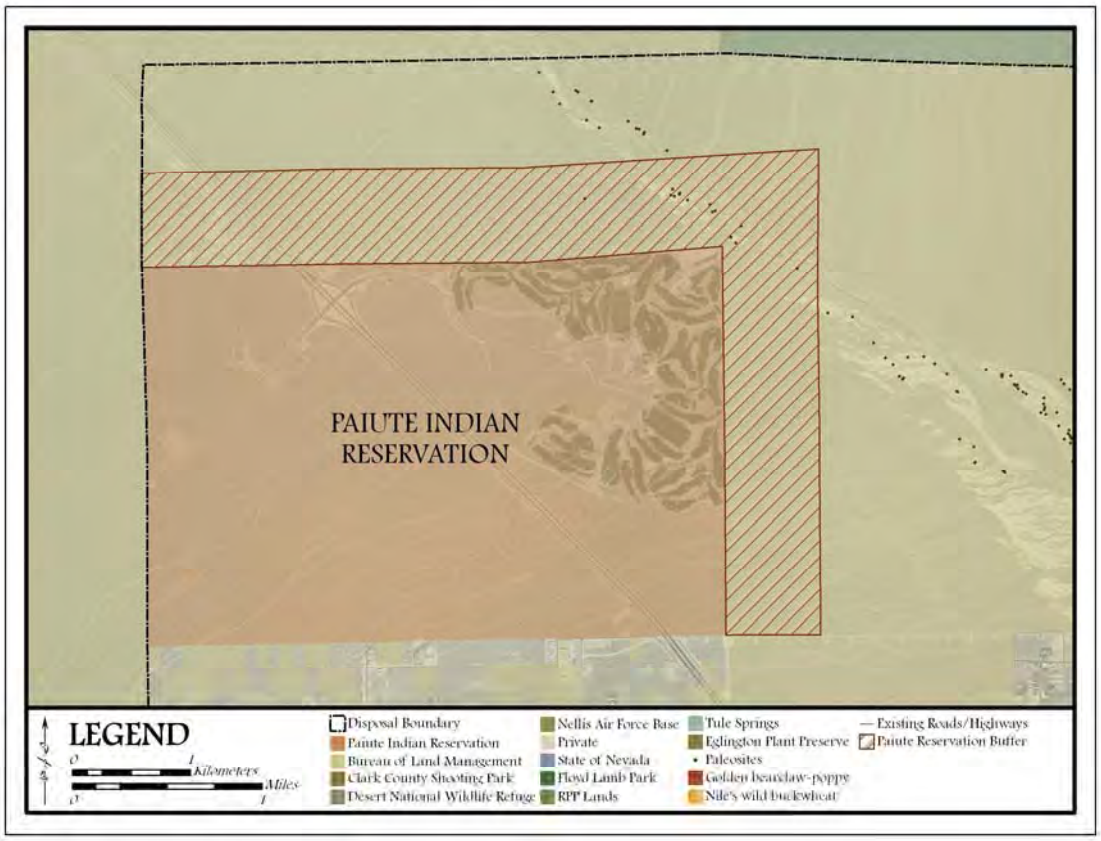
This alternative component represents a one-quarter mile (0.4 km) buffer on the north and east sides of the Paiute Indian Reservation. The existence of a one-quarter mile buffer may not fulfill the request of the Paiute Tribe of Las Vegas, Nevada, but it would provide for a moderate amount of urban development adjacent to the reservation in the northwest portion of the disposal area while providing the Paiute Tribe of Las Vegas, Nevada with a reasonable amount of protection from visual and social nuisances associated with the construction and existence of adjacent residential subdivisions and associated transportation networks. A one-quarter mile buffer may provide a moderate amount of protection for any potential Native American artifacts or burial sites within the North Las Vegas Wash and should be adequate to prevent any adverse social impacts and to maintain the economic benefits of the Las Vegas Paiute Golf Resort.

AREA: 860 acres (348 hectares)

ASSESSMENT METRICS

- Cultural resources (Native American artifacts and burial sites)
- Visual quality (distance to residential development; vistas of wash and wildlife refuge)
- Road traffic noise (distance to roadway; speed of roadway; average vehicles per hour)
- Air quality (dust from construction sites, roads, and recreation)
- Social impacts (littering; vandalism; unregulated motorized vehicle use)

PAIUTE INDIAN RESERVATION (A4)



ONE-HALF MILE BUFFER (A4)

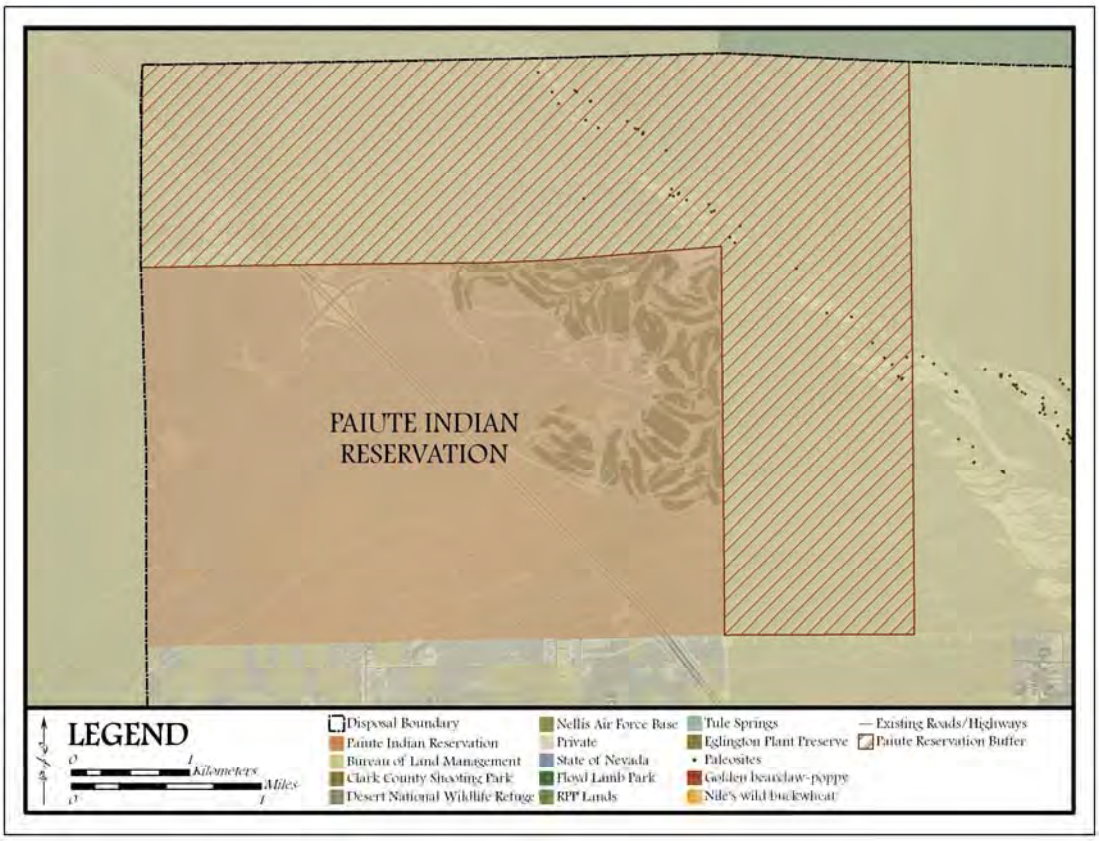
This alternative component represents a one-half mile (0.8 km) buffer on the north and east sides of the Paiute Indian Reservation. The existence of a one-half mile buffer may fulfill the request of the Paiute Tribe of Las Vegas, Nevada; however, it would provide a minimal to moderate amount of urban development adjacent to the reservation in the northwest portion of the disposal area. The existence of a one-half mile buffer should provide protection from visual and social nuisances associated with the construction and existence of adjacent residential subdivisions and associated transportation networks. The width of the buffer provides a moderately high amount of protection for any potential Native American artifacts or burial sites within the North Las Vegas Wash and may be more than adequate to prevent any adverse social impacts and to maintain the economic benefits of the Las Vegas Paiute Golf Resort.

AREA: 1,790 acres (724 hectares)

ASSESSMENT METRICS

- Cultural resources (Native American artifacts and burial sites)
- Visual quality (distance to residential development; vistas of wash and wildlife refuge)
- Road traffic noise (distance to roadway; speed of roadway; average vehicles per hour)
- Air quality (dust from construction sites, roads, and recreation)
- Social impacts (littering; vandalism; unregulated motorized vehicle use)

PAIUTE INDIAN RESERVATION (A5)



ONE MILE BUFFER (A5)

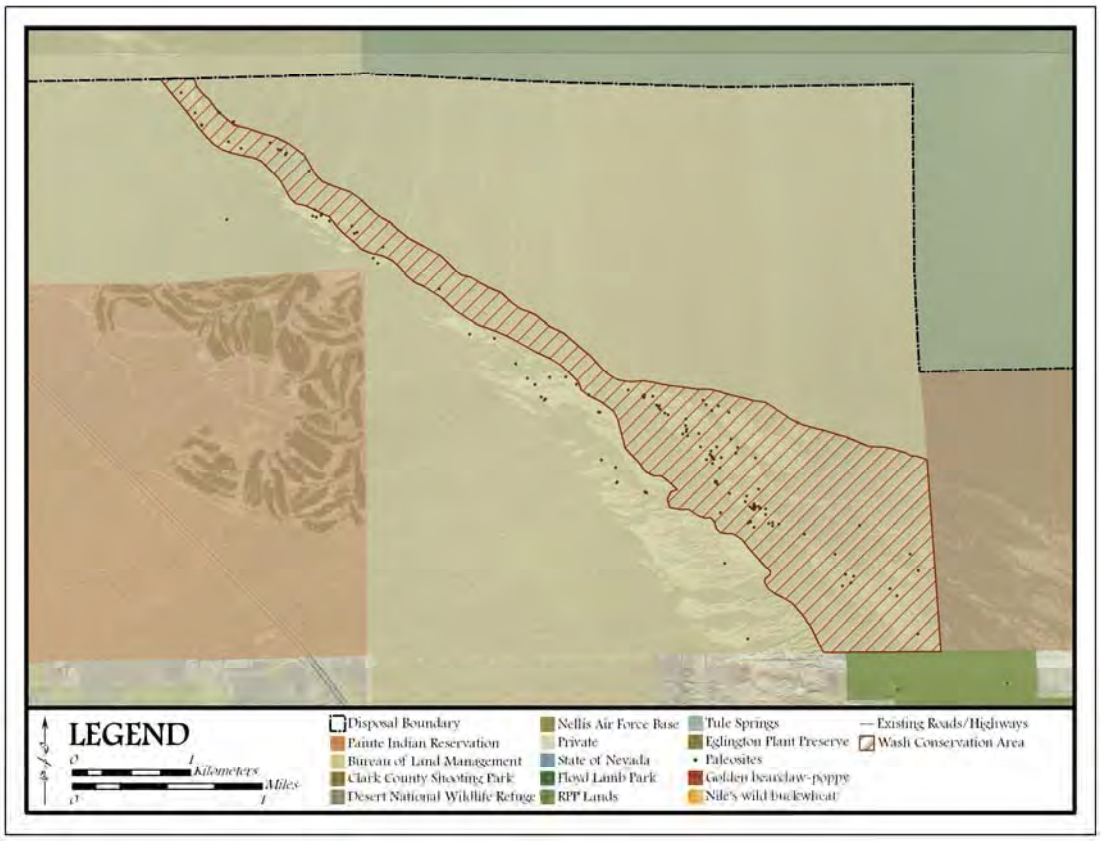
This alternative component represents a one mile buffer (1.6 km) on the north and east sides of the Paiute Indian Reservation. The existence of a one mile buffer would fulfill the request of the Paiute Tribe of Las Vegas, Nevada; however, it would provide only a minimal amount of urban development adjacent to the reservation in the northwest portion of the disposal area. Because a one mile buffer would prevent any development to the north of the reservation, it may also preserve intact plant communities representative of the Mojave Desert. The existence of a one mile buffer should provide protection from visual and social nuisances associated with the construction and existence of adjacent residential subdivisions and associated transportation networks. The width of the buffer provides the maximum amount of protection for any potential Native American artifacts or burial sites within the North Las Vegas Wash and it may be more than adequate to prevent any adverse social impacts and to maintain the economic benefits of the Las Vegas Paiute Golf Resort.

AREA: 4,026 acres (1,629 hectares)

ASSESSMENT METRICS

- Cultural resources (Native American artifacts and burial sites)
- Visual quality (distance to residential development; vistas of wash and wildlife refuge)
- Road traffic noise (distance to roadway; speed of roadway; average vehicles per hour)
- Air quality (dust from construction sites, roads, and recreation)
- Social impacts (littering; vandalism; unregulated motorized vehicle use)

NORTHWEST UPPER LAS VEGAS WASH (B1)



ACTIVE WASH (B1)

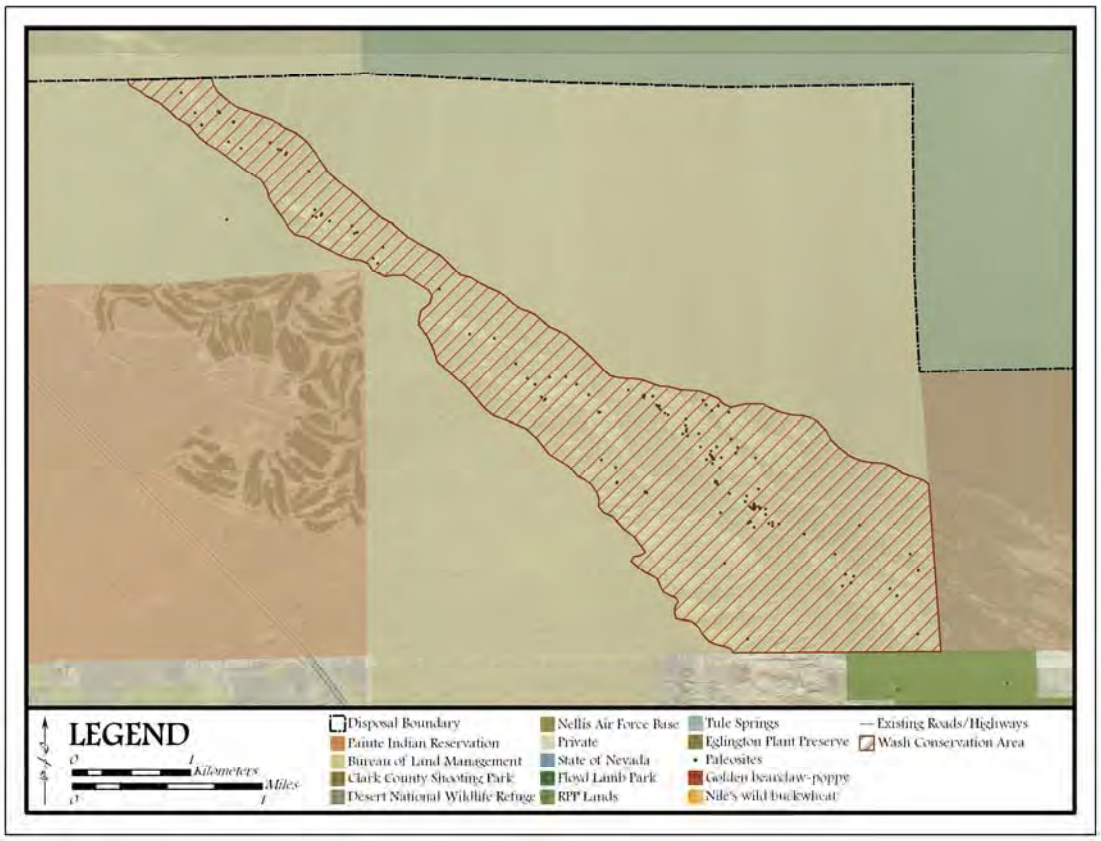
This alternative component represents the preservation of the active wash (Quaternary active wash deposits) and the adjacent floodplains. This configuration would allow the greatest amount of urban development adjacent to the northwest portion of the Upper Las Vegas Wash while preserving the minimum land necessary for natural water flow. The active wash boundary was delineated using photo interpretation methods and data derived from the United States Geological Survey (USGS) geologic and geophysical data of the Las Vegas quadrangle.

AREA: 1,211 acres (490 hectares)

ASSESSMENT METRICS

- Quaternary active wash deposits
  - Qayy [Youngest alluvium (Holocene)] - Noncemented alluvial-fan gravel and sand of intermittently active wash complexes.
- 100-year floodplain

NORTHWEST UPPER LAS VEGAS WASH (B2)



PALEONTOLOGICAL RESOURCES (B2)

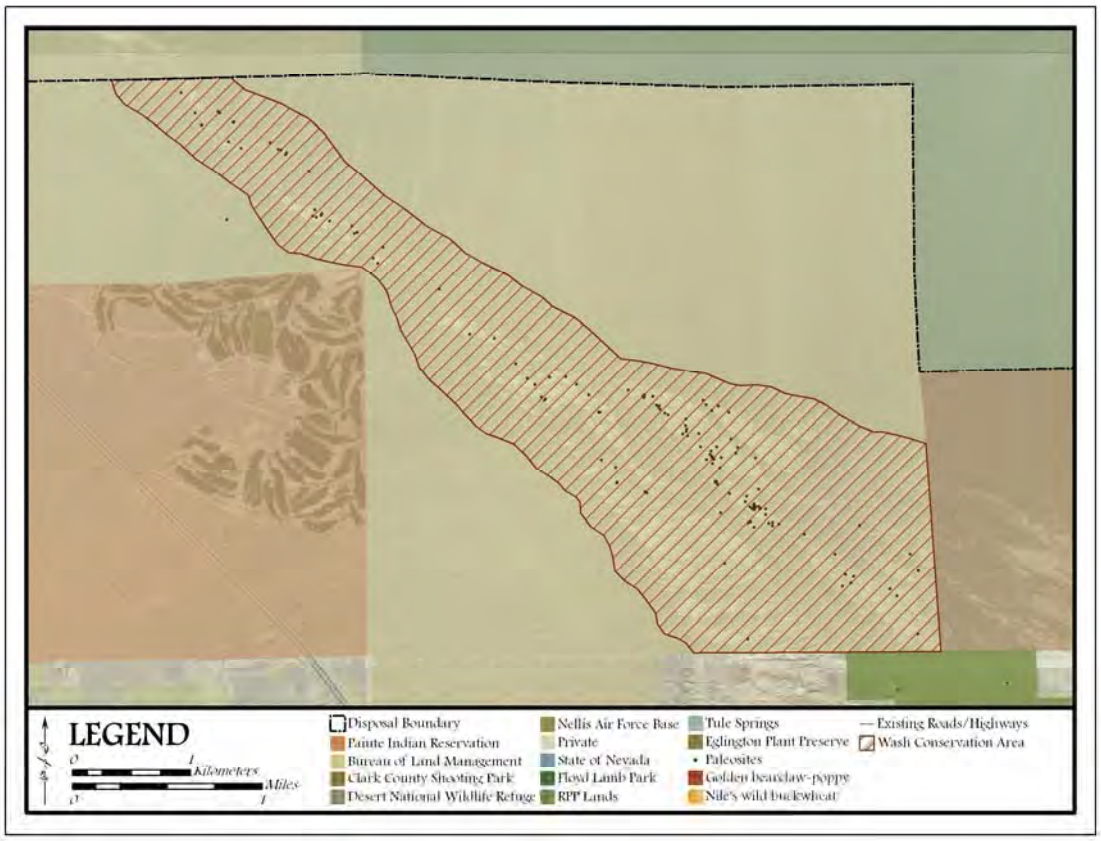
This alternative component represents the preservation of paleontological resources and the fossiliferous Quaternary spring deposits associated with fossils of late Pleistocene megafauna. This configuration would provide a moderate amount of urban development adjacent to the northwest portion of the Upper Las Vegas Wash while preserving valuable fossils that may increase the understanding of the history of life on Earth. The paleontological resources boundary was delineated using photo interpretation methods and data derived from the United States Geological Survey (USGS) geologic and geophysical data of the Las Vegas quadrangle.

AREA: 1,919 acres (776 hectares)

ASSESSMENT METRICS

- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge (late Pleistocene)] - Top 1 to 2 meters is characteristically resistant light-gray calcareous mud that is particularly cemented with calcite.
    - Qse [Young fine-grained deposits associated with past groundwater discharge (early Holocene to latest Pleistocene)] - Light-gray to light-brown unconsolidated silt, sandy silt, and mud. Locally contains aquatic and terrestrial mollusk shells and fossils of late Pleistocene megafauna, including mammoth, bison, horse, and camel.
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge (early Holocene and late Pleistocene) - Includes units Qse and Qscd.

NORTHWEST UPPER LAS VEGAS WASH (B3)



WASH ECOSYSTEM (B3)

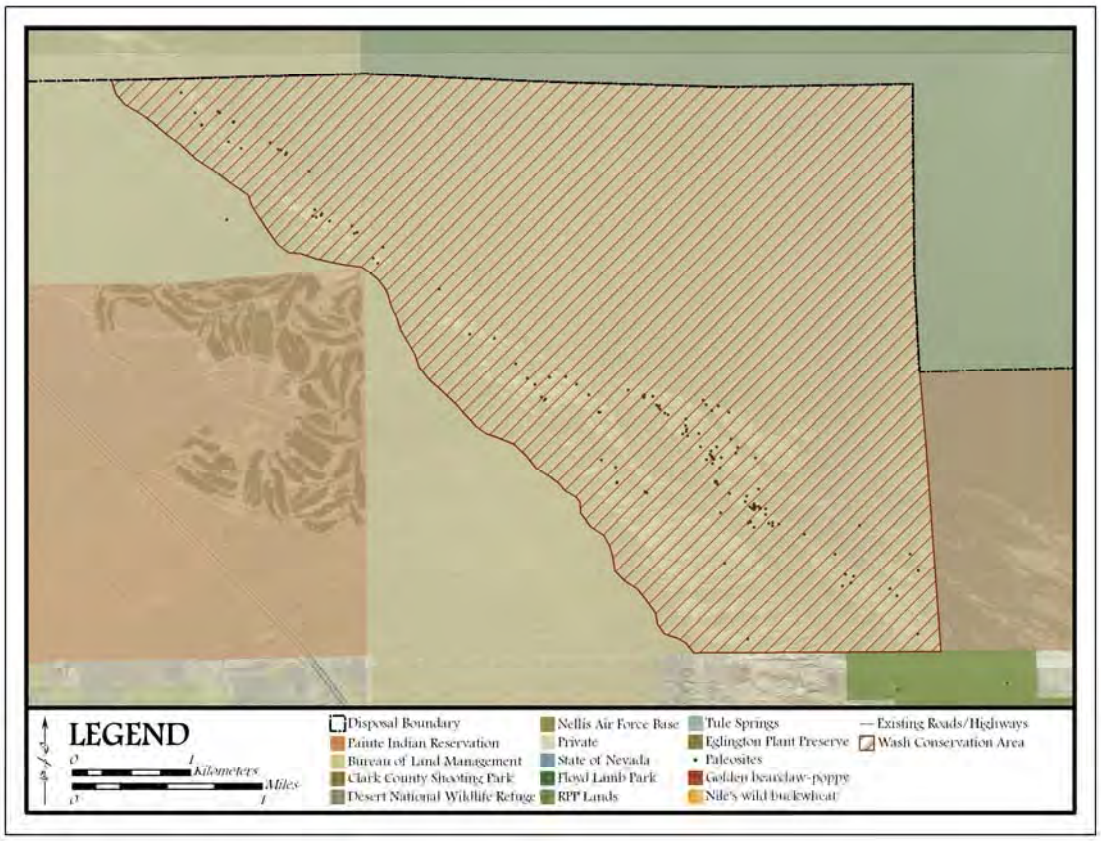
This alternative component represents the preservation of the northwest portion of the Upper Las Vegas Wash ecosystem. This includes the conservation of plant and animal communities representative of an arid wash ecosystem as well as the conservation of paleontological resources and fossiliferous Quaternary spring deposits within the wash environment. This configuration would provide a minimum to moderate amount of urban development adjacent to the northwest portion of the Upper Las Vegas Wash while preserving the ecological functioning of the wash. The wash ecosystem boundary was delineated using a combination of the active wash and paleontological resources boundaries in addition to including an ecological buffer, approximately one-tenth of a mile (0.16 km) wide.

AREA: 2,517 acres (1,019 hectares)

ASSESSMENT METRICS

- Ecological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]

NORTHWEST UPPER LAS VEGAS WASH (B4)



MOJAVE DESERT ECOSYSTEM (B4)

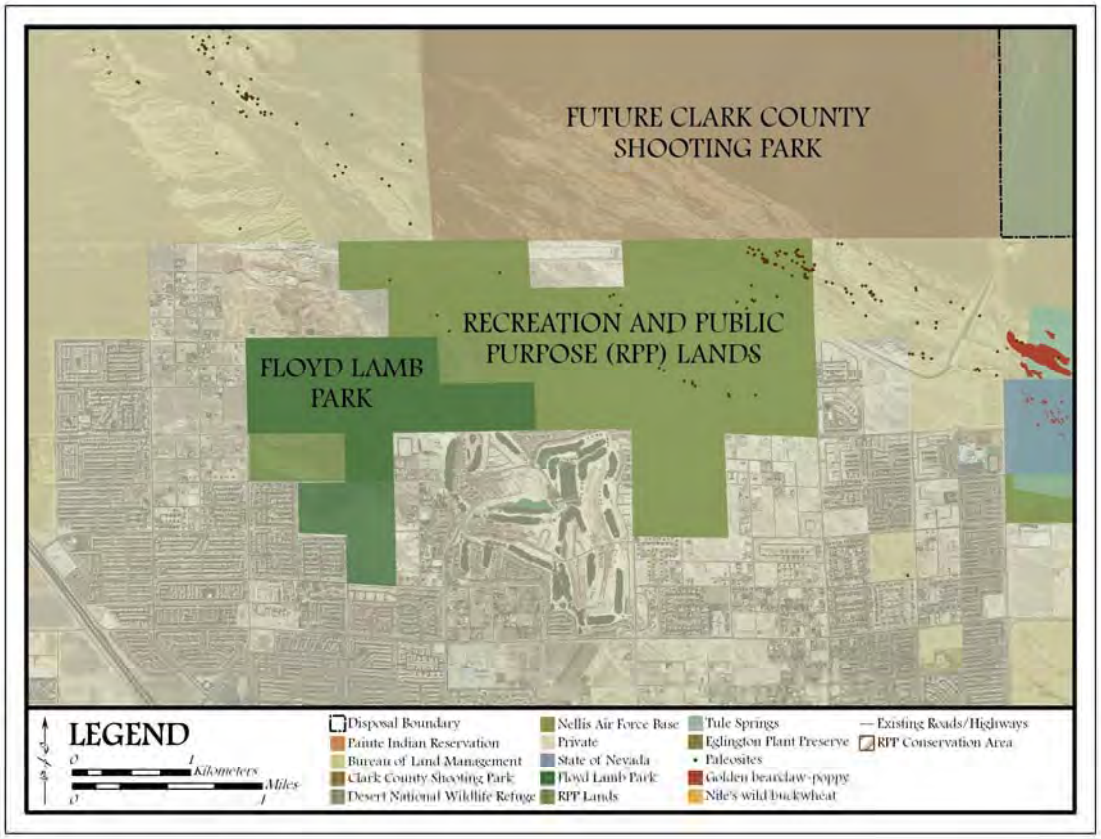
This alternative component represents the preservation of an intact portion of the Mojave Desert ecosystem that would neighbor the Desert National Wildlife Refuge. This includes the conservation of plant and animal communities representative of the Mojave Desert as well as the conservation of paleontological resources and fossiliferous Quaternary spring deposits within the Mojave Desert environment. This configuration would provide the least amount of urban development adjacent to the northwest portion of the Upper Las Vegas Wash, but it would sustain the ecological functioning of the northwest portion of the Upper Las Vegas Wash, the bajada of the Sheep Range, and a community representative of the Mojave Desert.

AREA: 5,105 acres (2,066 hectares)

ASSESSMENT METRICS

- Representative plant communities of the Mojave Desert
- Ecological and hydrological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]

RECREATION AND PUBLIC PURPOSE LANDS (C1)



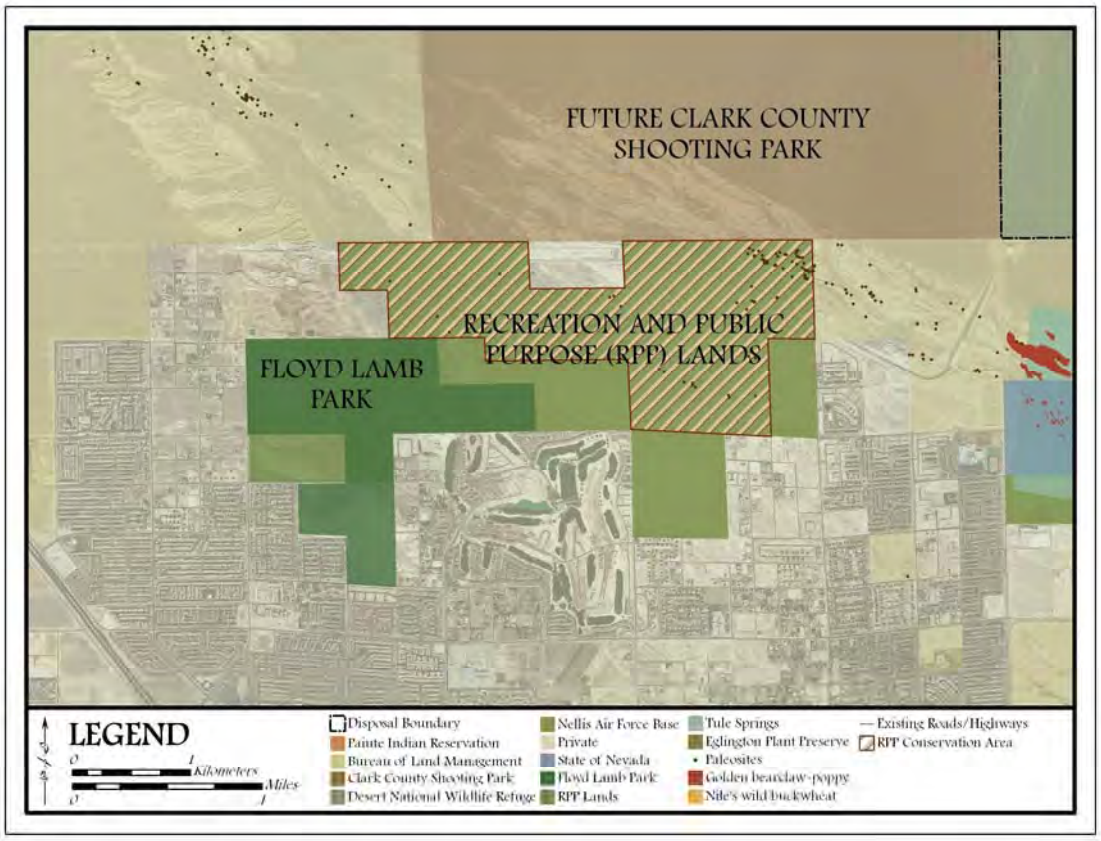
NO RECREATION AND PUBLIC PURPOSE LANDS (C1)

This alternative component represents the exclusion of Recreation and Public Purpose lands (lands leased from the Bureau of Land Management) from the designated conservation transfer area. No recommendations will be made regarding the future uses of the area. The Recreation and Public Purpose lands may indirectly serve as areas of access into the authorized wash conservation areas, but will be utilized and maintained as specified in the Floyd Lamb Park Master Plan and consistent with the plan of development amendment as approved by the Bureau of Land Management.

ASSESSMENT METRICS

- Connectivity of the Upper Las Vegas Wash
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
- Cultural resources
- Non-motorized recreation (hiking, biking, and equestrian trails)
- Social impacts (littering; vandalism; unregulated motorized vehicle use)

RECREATION AND PUBLIC PURPOSE LANDS (C2)



RECREATION AND PUBLIC PURPOSE LANDS WITH NO DESIGNATED USE (C2)

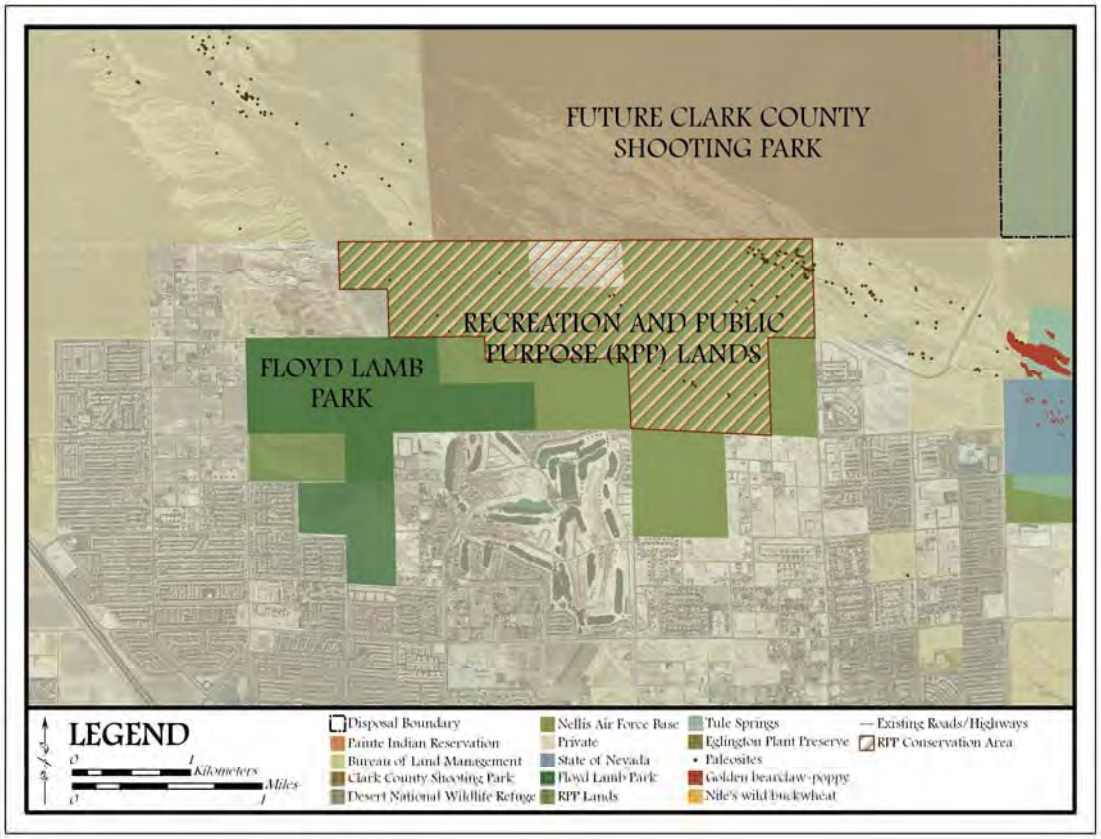
This alternative component represents the inclusion of Recreation and Public Purpose lands (lands leased from the Bureau of Land Management) which currently have no designated use or plan into the conservation transfer area. This indicates that recommendations will be made by the Las Vegas Bureau of Land Management based on the field data and social survey results regarding the future uses of the lands. The inclusion of these lands will connect the northwest and southeast wash conservation transfer areas to maintain continuity within the Upper Las Vegas Wash for ecological and recreational functions.

AREA: 988 acres (400 hectares)

ASSESSMENT METRICS

- Connectivity of the Upper Las Vegas Wash
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
- Cultural resources
- Non-motorized recreation (hiking, biking, and equestrian trails)
- Social impacts (littering; vandalism; unregulated motorized vehicle use)

RECREATION AND PUBLIC PURPOSE LANDS (C3)



RECREATION AND PUBLIC PURPOSE LANDS WITH NO DESIGNATED USE AND PRIVATELY-OWNED PARCEL (C3)

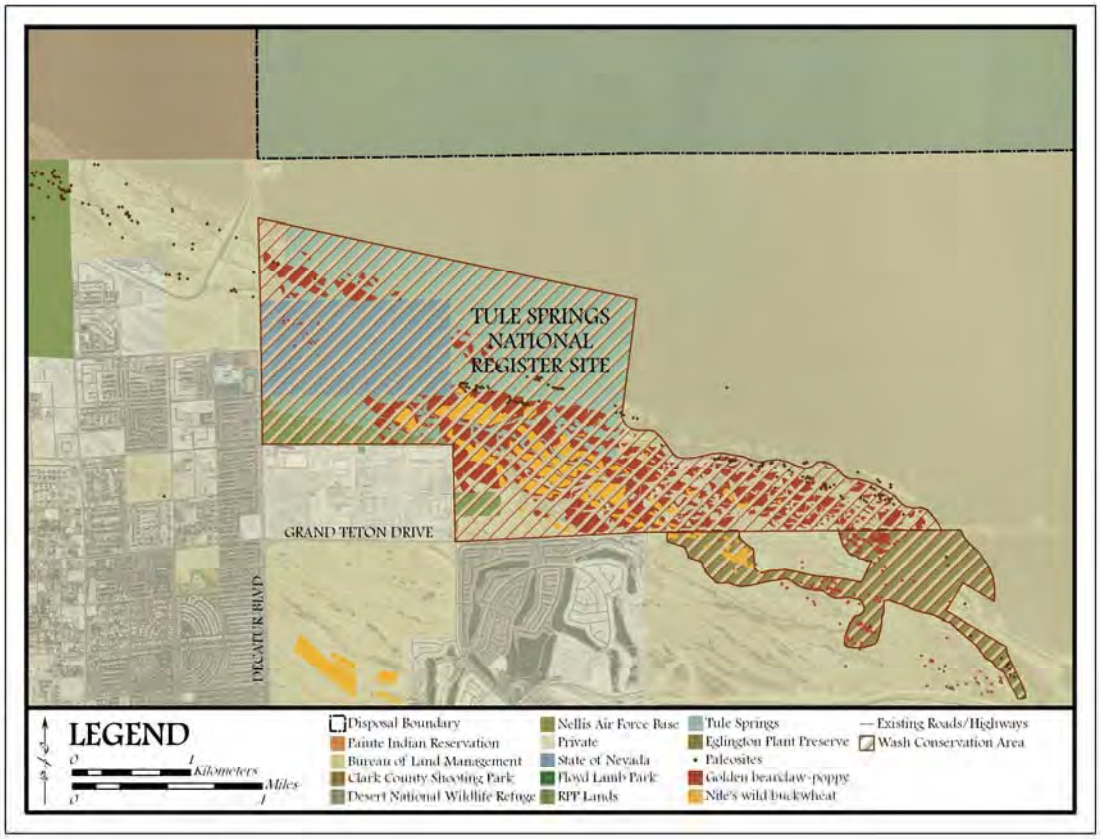
This alternative component represents the inclusion of Recreation and Public Purpose lands (lands leased from the Bureau of Land Management) which currently have no designated use or plan and the 81 acre (33 hectare) privately-owned parcel into the conservation transfer area. Although the privately-owned parcel appears land-locked by the Recreation and Public Purpose lands and the future Clark County Shooting Park, the proposed Mountain Edge Beltway may provide future access for development if constructed. Therefore, the parcel should be acquired, either purchased or exchanged for another parcel outside of the North Las Vegas Wash, to provide and potentially enhance the connectivity within the Upper Las Vegas Wash for ecological and recreational functions.

AREA: 1,069 acres (433 hectares)

ASSESSMENT METRICS

- Connectivity of the Upper Las Vegas Wash
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
- Cultural resources
- Non-motorized recreation (hiking, biking, and equestrian trails)
- Social impacts (littering; vandalism; unregulated motorized vehicle use)

SOUTHEAST UPPER NORTH LAS VEGAS WASH (D1)



RARE PLANT SPECIES (D1)

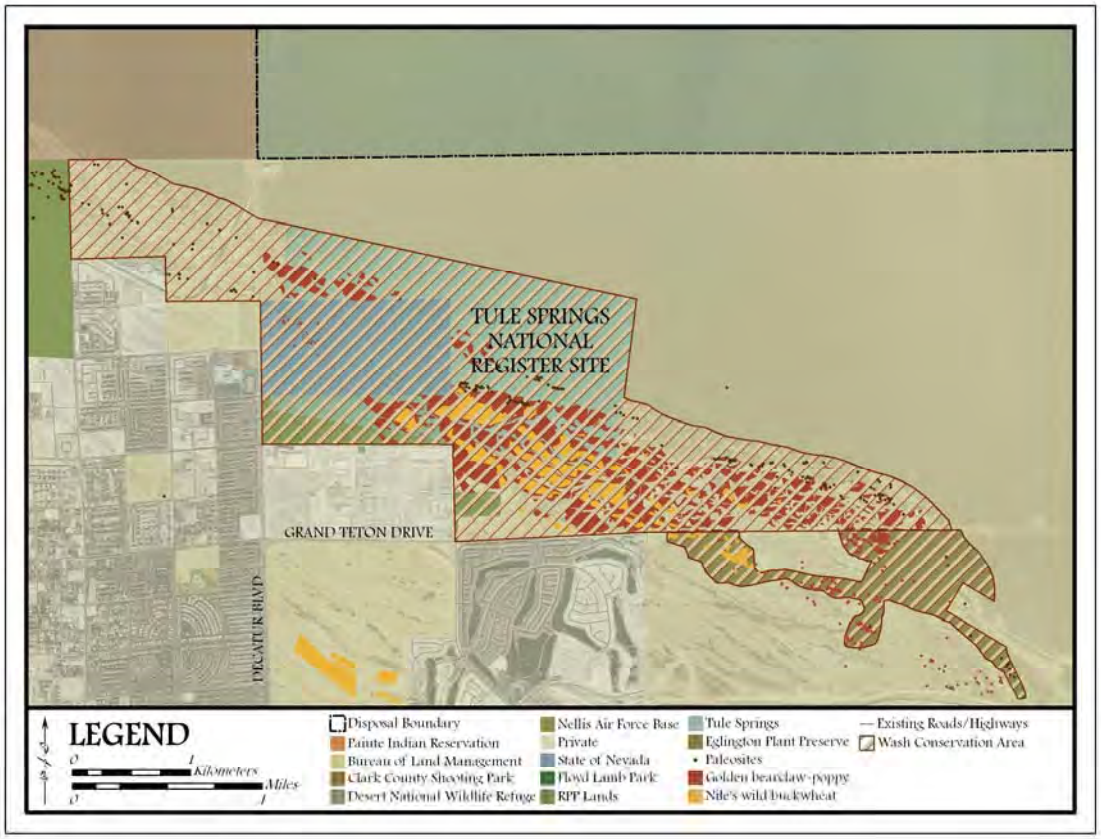
This alternative component represents the preservation of rare, sensitive, and endemic plant species with an emphasis on preserving the Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont) and Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal) within the Upper Las Vegas Wash. This configuration would provide the greatest amount of urban development adjacent to the southeast portion of the Upper Las Vegas Wash while maintaining the habitat required for viable populations of rare plant species. The rare plant species boundary was delineated based on previously surveyed populations of the Golden bearclaw-poppy and Nile's wild buckwheat.

AREA: 622 acres (251 hectares); **TOTAL AREA:** 2,157 acres (873 hectares) [includes Tule Springs National Register Site, State Land, Recreation and Public Purpose Lands, and Eglington Plant Preserve]

ASSESSMENT METRICS

- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)

SOUTHEAST UPPER NORTH LAS VEGAS WASH (D2)



PALEONTOLOGICAL RESOURCES AND RARE PLANT SPECIES (D2)

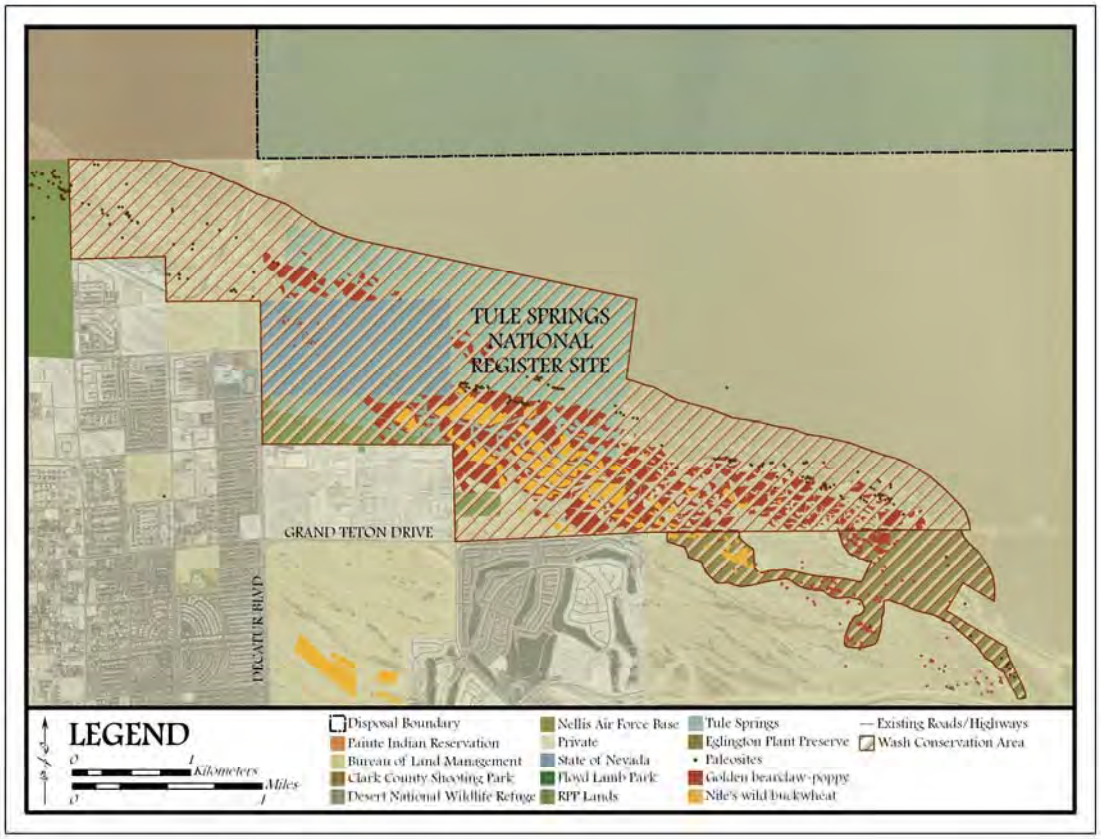
This alternative component represents the preservation of paleontological resources and the fossiliferous Quaternary spring deposits associated with fossils of late Pleistocene megafauna and the preservation of rare, sensitive, and endemic plant species with an emphasis on preserving the Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont) and Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal) within the Upper Las Vegas Wash. This configuration would provide the greatest amount of urban development adjacent to the southeast portion of the Upper Las Vegas Wash while maintaining the habitat required for viable populations of rare plant species and preserving valuable fossils that may increase the understanding of the history of life on Earth. The paleontological resources and rare plant species boundary was delineated based on previously surveyed paleosites and populations of the Golden bearclaw-poppy and Nile's wild buckwheat, as well as photo-interpretation methods based on data derived from the United States Geological Survey (USGS) geologic and geophysical data of the Las Vegas quadrangle.

AREA: 1,067 acres (431 hectares); **TOTAL AREA:** 2,602 acres (1,053 hectares) [includes Tule Springs National Register Site, State Land, Recreation and Public Purpose Lands, and Eglington Plant Preserve]

ASSESSMENT METRICS

- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
  - Maintenance of Tule Springs National Register Site
- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)

SOUTHEAST UPPER NORTH LAS VEGAS WASH (D3)



WASH ECOSYSTEM I (D3)

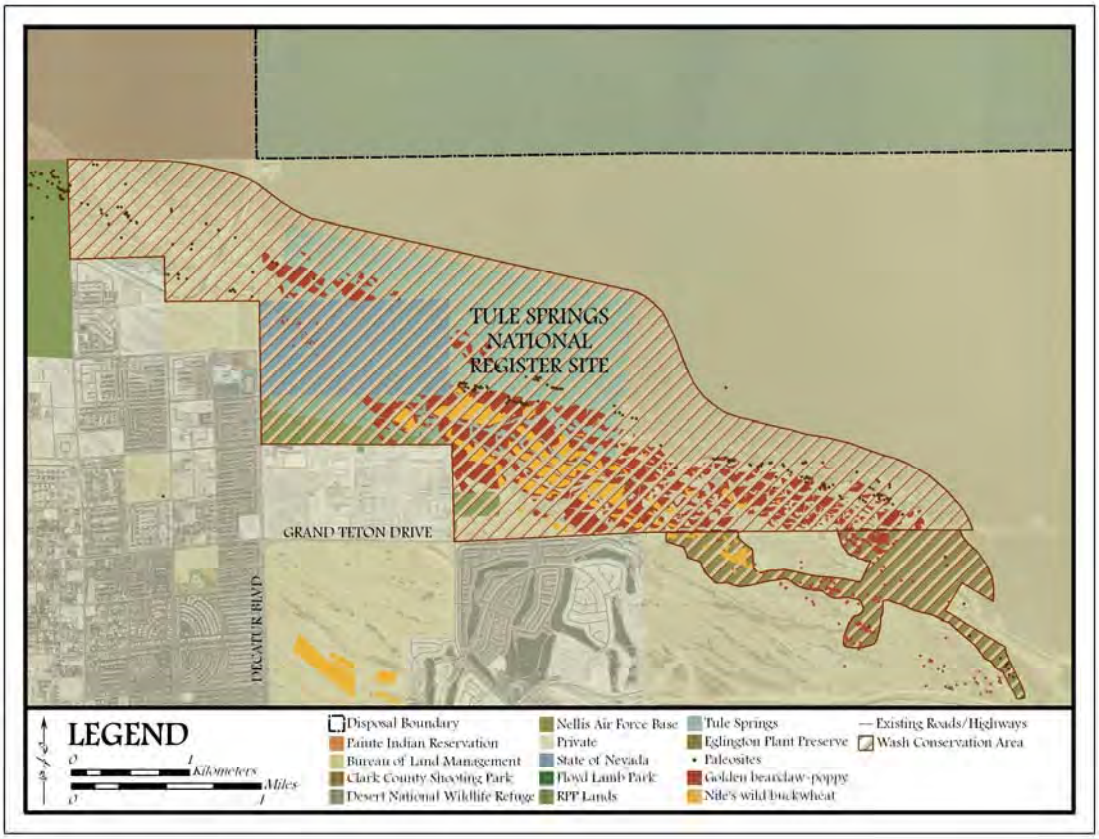
This alternative component represents the preservation of the southwest portion of the Upper Las Vegas Wash ecosystem. In addition to the elements preserved in component D2, this component incorporates the conservation of the ecological functioning of the wash ecosystem and conservation of plant and animal communities representative of an arid wash ecosystem. This is displayed by including an ecological buffer, approximately one-tenth of a mile (0.16 km) wide. This configuration would provide a moderate amount of urban development adjacent to the southeast portion of the Upper Las Vegas Wash while preserving sustained populations of rare plants, conserving valuable fossils that may increase the understanding of the history of life on Earth, and maintaining the ecological functioning of the wash.

AREA: 1,255 acres (508 hectares); **TOTAL AREA:** 2,790 acres (1,130 hectares) [includes Tule Springs National Register Site, State Land, Recreation and Public Purpose Lands, and Eglington Plant Preserve]

ASSESSMENT METRICS

- Ecological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
  - Maintenance of Tule Springs National Register Site
- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]

SOUTHEAST UPPER NORTH LAS VEGAS WASH (D4)



WASH ECOSYSTEM II (D4)

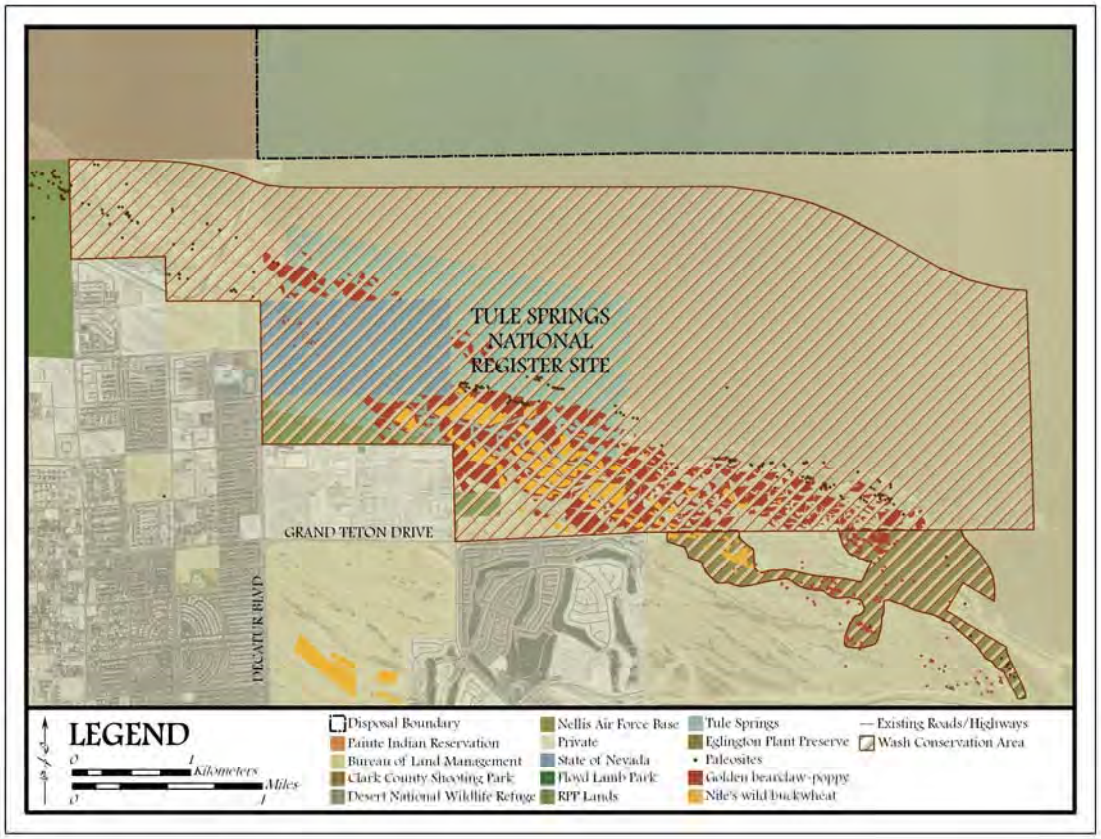
This alternative component represents the preservation of the southwest portion of the Upper Las Vegas Wash ecosystem. This component incorporates an enlarged wash conservation area which encompasses a portion of the lower bajada in order to preserve the plant and animal communities of the wash ecosystem, populations of rare plant species, and paleontological resources and fossiliferous Quaternary spring deposits within the wash environment. This configuration would provide a minimum to moderate amount of urban development adjacent to the southeast portion of the Upper Las Vegas Wash, but would sustain populations of rare plants, conserve valuable fossils that may increase the understanding of the history of life on Earth, and maintain the ecological functioning of the wash (see component E3).

AREA: 1,405 acres (569 hectares); **TOTAL AREA:** 2,940 acres (1,190 hectares) [includes Tule Springs National Register Site, State Land, Recreation and Public Purpose Lands, and Eglington Plant Preserve]

ASSESSMENT METRICS

- Ecological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
  - Maintenance of Tule Springs National Register Site
- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]

SOUTHEAST UPPER NORTH LAS VEGAS WASH (D5)



MOJAVE DESERT ECOSYSTEM I (D5)

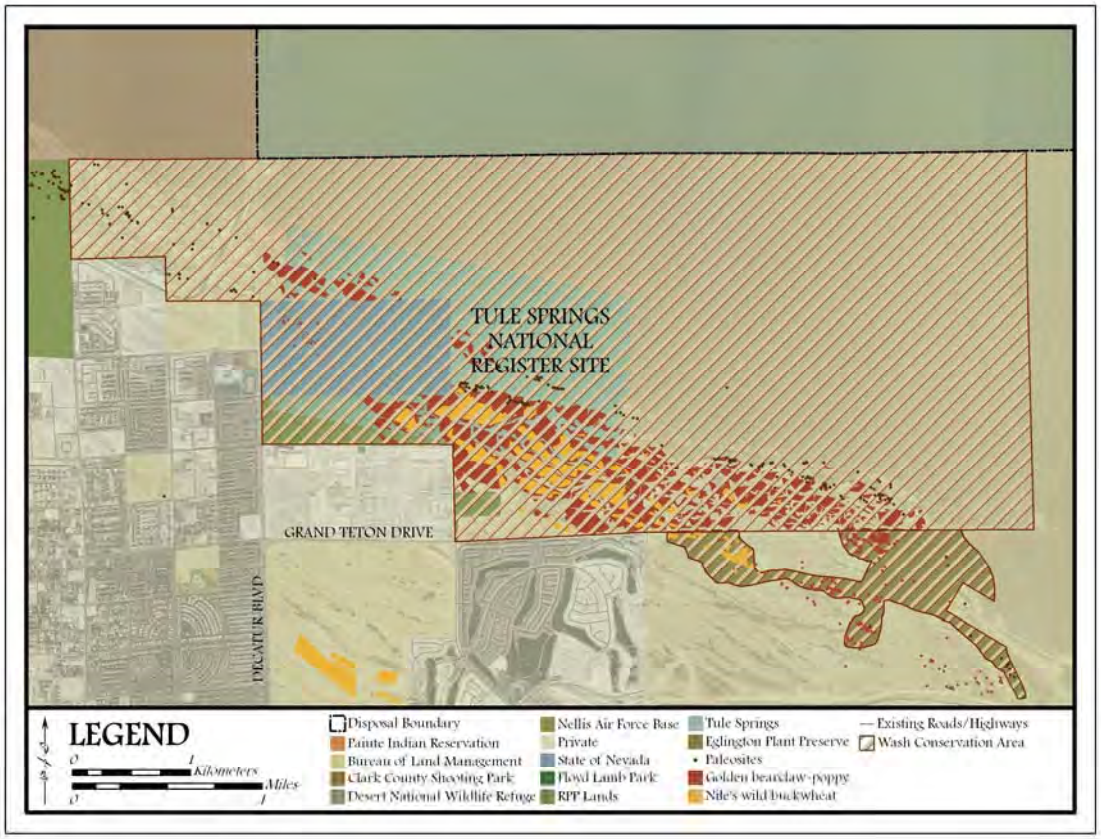
This alternative component represents the preservation of an intact portion of the Mojave Desert ecosystem which would be bound by the proposed Mountain Edge Beltway (see component E2). This component includes the conservation of plant and animal communities representative of the Mojave Desert, as well as the conservation of rare plant species, paleontological resources and fossiliferous Quaternary spring deposits within the southeast portion of the Upper Las Vegas Wash. This configuration would allow a minimal amount of urban development, but it would sustain the ecological functioning of the southeast portion of the wash and a community representative of the Mojave Desert.

AREA: 3,309 acres (1,339 hectares); **TOTAL AREA:** 4,844 acres (1,961 hectares) [includes Tule Springs National Register Site, State Land, Recreation and Public Purpose Lands, and Eglington Plant Preserve]

ASSESSMENT METRICS

- Representative plant communities of the Mojave Desert
- Ecological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - · Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - · Qse [Young fine-grained deposits associated with past groundwater discharge
    - · Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
  - Maintenance of Tule Springs National Register Site
- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]

SOUTHEAST UPPER NORTH LAS VEGAS WASH (D6)



MOJAVE DESERT ECOSYSTEM II (D6)

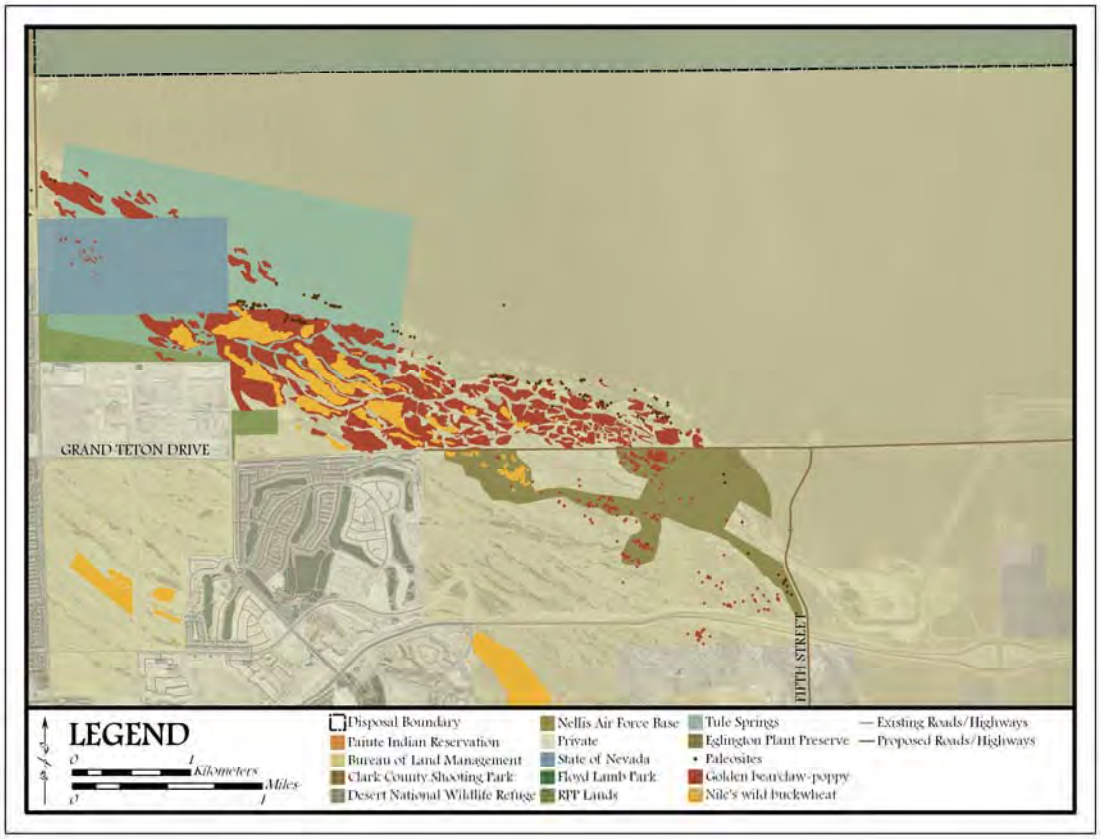
This alternative component represents the preservation of an intact portion of the Mojave Desert ecosystem which would be connected to the wildlife refuge (see component E1). This component includes the conservation of plant and animal communities representative of the Mojave Desert, as well as the conservation of rare plant species, paleontological resources and fossiliferous Quaternary spring deposits within the southeast portion of the Upper Las Vegas Wash. This configuration would provide the least amount of urban development, but it would sustain the ecological and hydrological functioning of the southeast portion of the wash and the bajada of the Sheep Range and a community representative of the Mojave Desert.

AREA: 4,047 acres (1,637 hectares); **TOTAL AREA:** 5,582 acres (2,259 hectares) [includes Tule Springs National Register Site, State Land, Recreation and Public Purpose Lands, and Eglington Plant Preserve]

ASSESSMENT METRICS

- Representative plant communities of the Mojave Desert
- Ecological and hydrological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - · Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - · Qse [Young fine-grained deposits associated with past groundwater discharge
    - · Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
  - Maintenance of Tule Springs National Register Site
- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]

MOUNTAIN EDGE BELTWAY (E1)



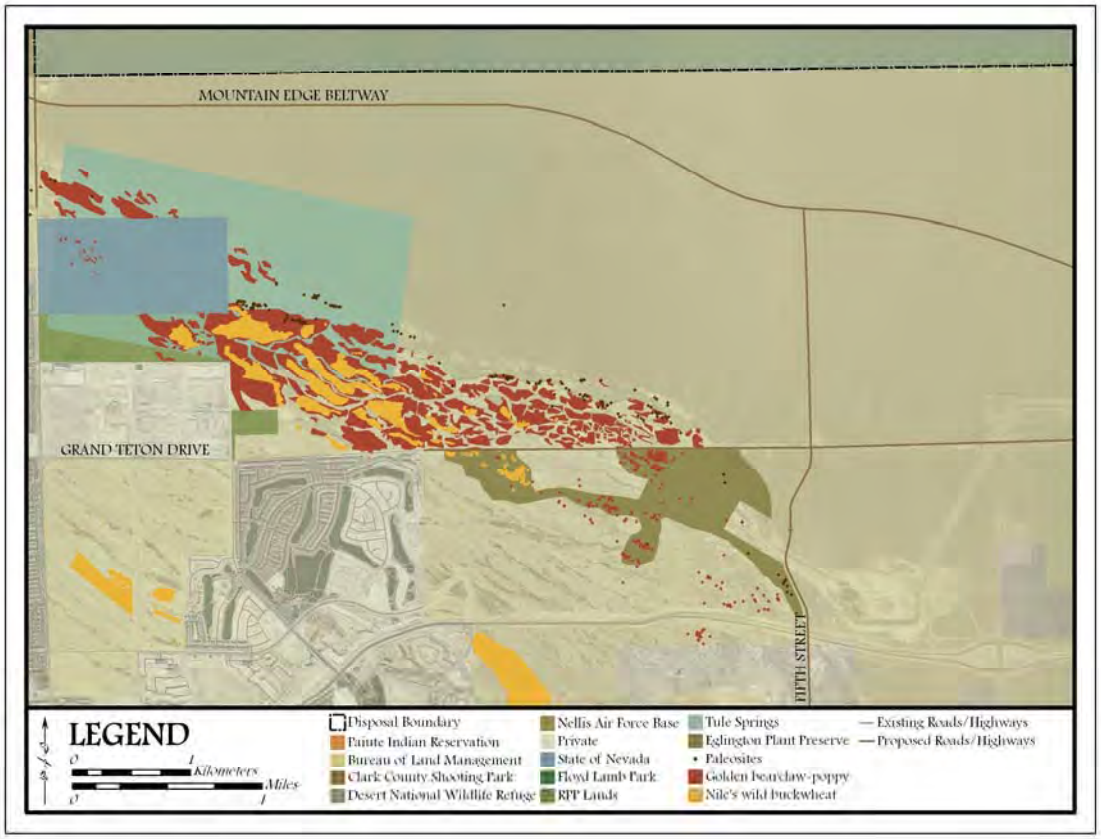
NO MOUNTAIN EDGE BELTWAY (E1)

This alternative component represents the exclusion of future roads and highways (i.e. Mountain Edge Beltway) north of Grand Teton Drive in the area adjacent to the southeast portion of the North Las Vegas Wash. This component may be paired with Mojave Desert Ecosystem II (D6).

ASSESSMENT METRICS

- Representative plant communities of the Mojave Desert
- Ecological and hydrological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
  - Maintenance of Tule Springs National Register Site
- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]

MOUNTAIN EDGE BELTWAY (E2)



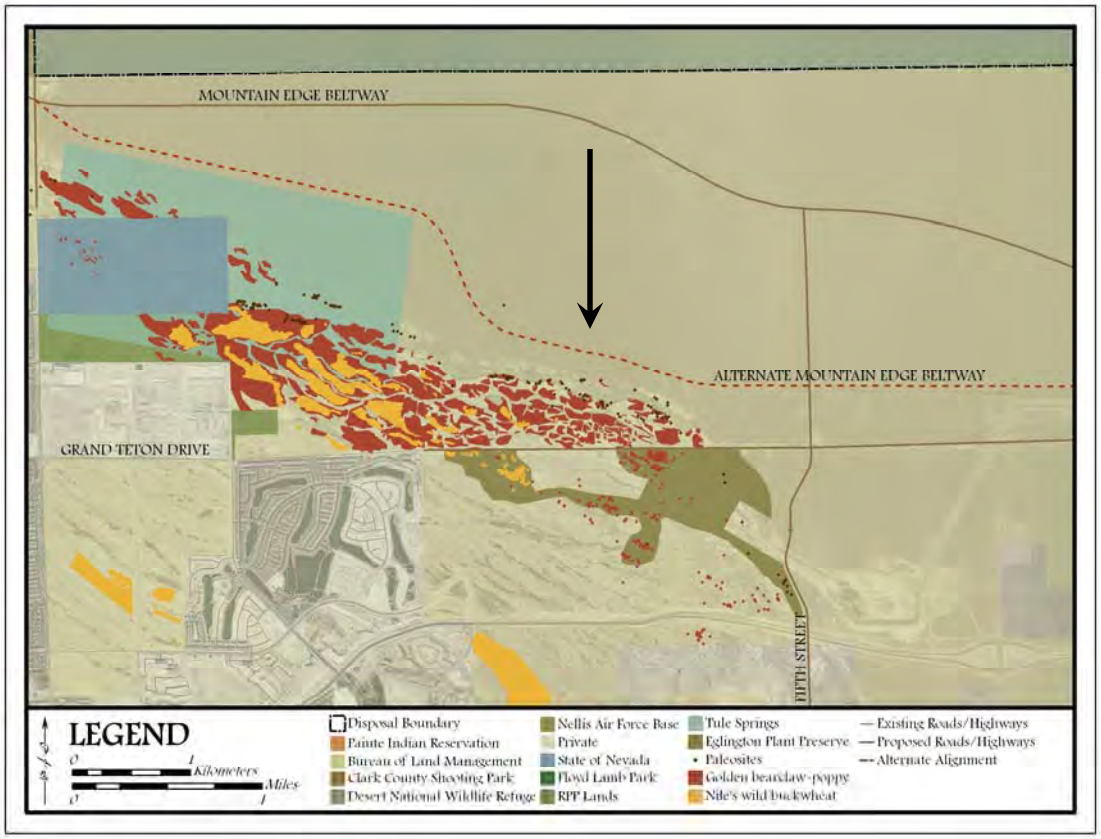
PROPOSED ALIGNMENT (E2)

This alternative component represents the proposed alignment of Mountain Edge Beltway and the extension of Fifth Street. This component was considered by the Utah State University team because a major transportation artery is necessary for public safety if development is to occur in the area. However, roads bisecting the wash or areas of concern may cause irreparable harm. This component may be paired with components Rare Plant Species (D1), Paleontological Resources and Rare Plant Species (D2), Wash Ecosystem I (D3), Wash Ecosystem II (D4), or Mojave Desert Ecosystem I (D5).

ASSESSMENT METRICS

- Ecological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
  - Maintenance of Tule Springs National Register Site
- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]

MOUNTAIN EDGE BELTWAY (E3)



ALTERNATE ALIGNMENT (E3)

This alternative component represents an alternate alignment of Mountain Edge Beltway. The realignment of this proposed beltway was considered for the purpose of preserving the southeast portion of the Upper Las Vegas Wash while providing public safety. The alternate alignment can serve two scenarios to ensure the wash will be protected from encroachment of future urban land uses. The beltway may be utilized as an access barrier or it may be used as a limited access road with high-end, low-density housing in the developable parcels south of the beltway. As an access barrier, the beltway may not only protect the wash, but it may provide scenic views of the Las Vegas Valley over the wash. This component may be paired with the Wash Ecosystem II (D4). As a limited access road, it can protect the wash with high-end, low-density housing serving as a social barrier. This scenario may be paired with the Rare Plant Species (D1), Paleontological Resources and Rare Plant Species (D2), or Wash Ecosystem I (D3). Other alignments may be considered by stakeholders to achieve similar objectives.

ASSESSMENT METRICS

- Ecological functioning of the wash ecosystem
- Paleontological resources
  - Fossiliferous Quaternary spring deposits
    - Qscd [Intermediate fine-grained deposits associated with past groundwater discharge]
    - Qse [Young fine-grained deposits associated with past groundwater discharge
    - Qsu [Undivided young and intermediate fine-grained deposits associated with past groundwater discharge]
  - Maintenance of Tule Springs National Register Site
- Golden bearclaw-poppy (*Arctomecon californica* Torrey and Frémont)
- Nile's wild buckwheat (*Eriogonum corymbosum* Bentham var. *nilesii* Reveal)
- Quaternary active wash deposits
  - Qayy [Youngest alluvium]
- Visual quality (views of the Upper Las Vegas Wash and the Las Vegas Valley from the beltway)

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http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500118 (*Arctomecon californica)*
http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250060238 (*Eriogonum corymbosum*)

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Appendix L

HYDROLOGY AND EROSION ANALYSIS

BUREAU OF LAND MANAGEMENT
SEIS TECHNICAL SUPPORT
HYDROLOGY AND EROSION ANALYSIS
UPPER LAS VEGAS WASH
CLARK COUNTY, NEVADA

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January 2009
Project No. 85153

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1.0 INTRODUCTION

The Upper Las Vegas Wash (ULVW) is an ephemeral stream draining northern Las Vegas Valley. The ULVW flows through an alluvial fan and during significant flood events is subject to radical changes in shape, direction, depth, and flow carrying capacity (CCRFCD, 1999). In the process of completing a Supplemental Environmental Impact Statement (SEIS), the Bureau of Land Management (BLM) is required to investigate the impact several land disposal alternatives will have on the hydrology and erosion in the Conservation Transfer Area (CTA)—a 21 square mile tract of land in north Las Vegas Valley. The land disposal alternatives for the SEIS are presented in Table 1.1, including a baseline (existing) condition for this study.

TABLE 1.1
LAND DISPOSAL ALTERNATIVES INFORMATION

Land Disposal Alternative	Land Available for Disposal (ac)	Percent of CTA Area Available for Disposal[1]
Baseline	0	0
Alternative A	371	3
Alternative B	2,316	18
Alternative C	6,961	55
Alternative D	8,023	64
Alternative E	10,010	79
No-Action Alternative	12,150	96

[1]Total land area in CTA study boundary is 12,623 ac.

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2.0 METHODS AND APPROACH

Future development will have both a direct and indirect impact on the hydrologic and erosive processes occurring in and near the Upper Las Vegas Wash (ULVW). More impervious surfaces from future development will cause increased surface runoff and higher peak flows in the ULVW. The frequency and volume of significant flood events will also be affected by the land disposal alternatives. More specifically, the 100-yr floodplain inundation area will be increased due to higher flows in the wash, assuming no change to existing flood control infrastructure.

The most important erosion mechanisms occurring in the area are surface erosion from overland and sheet flow and streambank erosion from significant flood events. The Simple Method (Schueler, 1987) was used to analyze surface erosion and the Hydrologic Engineering Center's River Analysis System (HEC-RAS) sediment transport routines were used in analyzing streambank erosion. A comparative analysis approach was taken to estimate the effect different land disposal alternatives will have on both erosion mechanisms.

The two mechanisms are indirectly related and both operate primarily during large storm events, and would therefore be considered a cumulative process. Development that would occur as a result of land disposal may ultimately cause less surface erosion as large areas are covered with impervious surfaces such as streets, parking lots, and buildings (Wolman, 1967), as well as increased landscaping that is less susceptible to surface erosion. At the same time, more impervious surfaces can indirectly increase streambank erosion by increasing the frequency and magnitude of significant flood events (Leopold, 1968; Hammer, 1972).

2.1 SURFACE EROSION

The Simple Method is a method for estimating stormwater runoff pollutant loads for urban areas. The method uses annual rainfall depths, a runoff coefficient, and Total Suspended Solids (TSS) concentrations as a sediment surrogate to determine the annual stormwater sediment load. Equation 2-1 below shows the adapted version of the Simple Method for this study.

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$$L = R_i \times C_i \times A_i \times 1.23 \qquad (2\text{-}1)$$
$$R_i = R_{vi} \times P \times P_j$$

Where:

L = Annual sediment load (kg)
R_i = Annual runoff (ac-ft)
C_i = TSS concentration (mg/l)
A_i = Area (ac)
R_{vi} = Runoff coefficient
P = Annual rainfall (in)
P_j = Fraction of rainfall events that produce runoff (usually 0.9)

Calibrated runoff coefficients and TSS concentrations for the Las Vegas Valley were taken from Reginato and Piechota (2004). The future land uses were assumed to be 65 percent residential, 20 percent streets and roads, 10 percent commercial, and 5 percent parks and golf courses for all disposal areas. While there may be some uncertainty on how the land available for disposal will develop, land use percentages represent a general trend in local development and were determined by studying several urban areas near the CTA study area. These future land use allocations are reasonable approximations for a comparative analysis among alternatives. Non-disposal areas and the adjacent properties were assumed to remain in their baseline (existing) conditions.

A spreadsheet program was developed to calculate the average annual sediment loss from surface erosion for each alternative and the baseline condition. The fraction of land uses could be easily changed if needed to reflect different development conditions (e.g. 85 percent commercial, 15 percent streets and roads).

2.2 HYDROLOGY

The Hydrologic Engineering Center's Flood Hydrograph Package (HEC-1) was developed in the late 1960's and adopted by the Clark County Regional Flood Control District (CCRFCD) in 1999 for rainfall-runoff analyses. The hydrology of the CTA study area indirectly impacts the rate of streambank erosion and is the only variable in the sediment transport comparative analysis. The other key parameters in the sediment transport analysis (e.g. channel geometry, grain size distribution) remained the same among alternatives.

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Kleinfelder was unable to locate a complete existing conditions hydrologic model for the CTA study area. However, a future conditions HEC-1 rainfall-runoff model of the CTA study area and surrounding area was prepared by VTN Nevada (VTN, 2004) and obtained from the BLM and CCRFCD. Many of the parameters used in the rainfall-runoff models—such as basin area, slope, and routing methods—were taken from the original VTN report. The subbasin routing network was partially modified to reflect existing flow directions and was used in all of the land disposal alternative analyses. Given the unpredictable nature of future development and the comparative emphasis of the analysis, it was judged appropriate to use the same routing network for all analyses.

To maximize sensitivity in the comparative analysis, the contributing watershed (Figure 1) was re-defined to focus primarily on the CTA area. As such, the rainfall-runoff model was truncated to include only the CTA study area and selected contributing subbasins. Normally a rainfall-runoff model would include all contributing subbasins appropriate for a specific storm event, including those upstream of the area of interest. This rainfall-runoff model is “cut-down” to focus specifically on the CTA study area and the effects land disposal will have on the hydrology. Because some of the disposal alternatives are very similar, it was important not to include many subbasins outside of the CTA area that would dampen the changes in hydrology due to an increase in land area outside the CTA boundary being included in the hydrology model.

The rainfall-runoff model uses the Soils Conservation Service’s curve number method (SCS, 1975) and simulates a specific storm event for an 88 square mile area, incorporating the entire CTA study area and several contributing subbasins outside the CTA boundary. As recommended in CCRFCD’s Hydrologic Criteria and Drainage Design Manual (HCDDM), the model uses a 6-hr SDN5 storm distribution with the rainfall depths provided in Table 2.1.

TABLE 2.1
NORTH LAS VEGAS RAINFALL DEPTHS FOR DIFFERENT FREQUENCY STORM EVENTS

Storm Event Return Period	6-hr Rainfall Depth (in)
100-yr	2.77
50-yr	2.41
25-yr	2.05
10-yr	1.58
5-yr	1.22
2-yr	0.72

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The rainfall-runoff model includes all existing flood control facilities, including the ULVW Detention Basin. The model does not reflect planned or proposed flood control facilities because it is currently beyond the scope of this comparative analysis to investigate the effects of additional infrastructure.

2.2.1 CURVE NUMBERS AND ROUTING

The Natural Resources Conservation Service (formerly Soil Conservation Service) Technical Release 55 (TR-55) was developed in 1975 and provides procedures to calculate storm runoff volume, peak discharge, hydrographs, and storage volumes required for floodwater reservoirs. The method is applicable to urbanizing watersheds and is appropriate for the CTA study area and adjacent subbasins.

Curve numbers (CNs) were developed for each subbasin according to the land disposal criteria outlined for each alternative. The CNs for subbasins not included in the land disposal area were not adjusted, thus reflecting no land use change. All subbasins included in the land disposal were adjusted using the same land development criteria to maintain a consistent comparative analysis.

Most subbasin runoff hydrographs were routed using the Muskingum-Cunge method requiring channel length, slope, roughness, and geometry. The remaining subbasin hydrographs were routed using the Muskingum method requiring a number of integer steps, Muskingum K coefficient and a Muskingum X coefficient. Where appropriate, these variables were adjusted to reflect future development within the disposal areas. A representative conveyance element for developed subbasins was defined as a V-channel with 50H:1V side slopes and a Manning's roughness value of 0.016.

2.2.2 SOIL TYPES AND LAND USES

Existing condition CNs were calculated using Utah State University (USU) soils data (Figure 2) and observed vegetation information. Soil types in the CTA study area are shown in Table 2.2 below and vegetation was considered to be a "fair desert shrub" throughout the entire CTA study area based on visual observation during site visits. Soils were assigned a hydrologic soil type (i.e. A, B, C, or D) according to Soils Survey of Clark County Area, Nevada (NRCS, 2006). In general, soil type A has a much lower runoff potential than soil types C or D.

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TABLE 2.2
HYDROLOGIC SOIL CLASSIFICATION FOR SOILS FOUND NEAR CTA, BASED ON USU 2007 INVENTORY

Soil Map Unit	Soil Name	Hydrologic Soil Group
112	Arizo	A
140	Casaga	C
192	Dalian-McCullough Complex	B
240	Goodsprings	D
300	Las Vegas	D
305	Las Vegas-DeStazo	D
314	Weiser-Wechech	B
540	Weiser	B
630	Badland	C
340	Zeheme-Rock	D
360	Rock Outcrop-St. Thomas	D
400	Tencee	D
155	Cave	D
840	Potosi-Zeheme-Rock	D

For undeveloped conditions, CNs were assigned to each soil type according to Table 2-2d in TR-55 (SCS, 1975). For developed conditions, CNs were reassigned to subbasins in the disposal area according to Table 2-2a in TR-55 (SCS, 1975). All soils outside the CTA boundary retained the same CN, reflecting no future land use changes. As previously mentioned, it was assumed that all development areas would be 65 percent residential, 20 percent streets and major roads, 10 percent commercial, and 5 percent parks and golf courses. Land use percentages represent a general trend in local development and were determined by studying several urban areas near the CTA study area.

2.2.3 LAG TIMES

Lag times were calculated for all basins according to methods outlined in CCRFCD's HCDDM. For basins less than one square mile in area, equation 2-2 was used.

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$$\textbf{Lag Time} = 0.6T_c \qquad (2\text{-}2)$$

$$T_c = T_i + T_t$$

$$T_i = \frac{1.8(1.1-K)L^{1/2}}{S^{1/3}}$$

$$K = 0.0132CN - 0.39$$

$$T_t = \frac{500}{60V_1} + \frac{(L-500)}{60V_2}$$

$$V_i = CS^{1/2}$$

Where:

T_c = Time of concentration (min)
T_i = Initial or overland flow time (min)
T_t = Travel time in ditch, channel, gutter, etc. (min)
K = Flow resistance coefficient
L = Length of overland flow, (ft, 500-ft maximum)
S = Average basin slope (%)

V_1 = Velocity for first 500 ft of channel (ft/s)
C = 20.2 for developed and 14.8 for undeveloped

V_2 = velocity for remaining section of channel (ft/s)
C = 30.6 for developed and 29.4 for undeveloped

For basin areas greater than one square mile, equation 2-3 was used according to the United States Bureau of Reclamation Method (USBR, 1989).

$$T_{Lag} = 20K_n\left[\frac{(L \times L_c)}{\sqrt{S}}\right]^{1/3} \qquad (2\text{-}3)$$

Where:

K_n = Manning's roughness factor for the basin channels
L = Length of longest watercourse (mi)
L_c = Length along longest watercourse measured upstream to a point opposite the centroid of the basin (mi)
S = Representative (average) slope of the longest watercourse (ft/ mi)

2.3 STREAMBANK EROSION

Several studies indicate streambank erosion is an important source of sediment in an urbanizing watershed like the ULVW watershed. In a similar sized watershed in southern California, two-thirds of the suspended sediment yield and

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downstream sedimentation was attributed to streambank (channelbank) erosion (Trimble, 1997). Also, in a rapidly urbanizing watershed in Washington state, Nelson and Booth (2002) concluded 20 percent of total watershed sediment yield was from streambank erosion with nearly 45 percent of course sediment in the watershed attributable to streambank erosion alone. Similarly, streambank erosion in the ULVW will be exacerbated by the higher frequency and volume of flood events resulting from increased imperviousness under the CTA alternatives with larger areas of land available for disposal.

HEC-RAS was first developed in 1995 to perform one-dimensional steady and unsteady flow river hydraulics and was recently expanded to include sediment transport mobile bed analysis. HEC-RAS is used primarily to quantify the change different land disposal alternatives would have on streambank erosion rates in the wash. To quantify changes in annual streambank erosion rates, the Meyer-Peter Müller (MPM) sediment transport routine was used in a HEC-RAS computational analysis of the ULVW. To simplify the analysis and focus on the sensitivity of the different land disposal alternatives, a representative cross-section was used for both the upstream and downstream reaches of the ULVW to provide numerical stability in the quasi-unsteady routing of the flood hydrograph. The 2-, 5-, 10-, 25-, 50-, and 100-yr hydrographs for each alternative were routed through both reaches to determine the amount of sediment loss occurring during specific events.

2.3.1 BASIS FOR COMPUTATIONAL ANALYSIS

Urbanization resulting from land disposal alternatives can indirectly increase channel erosion by increasing the frequency and volume of channel-altering storm flows (Leopold, 1968; Hammer, 1972). A literature review found no simple and accurate method of estimating streambank erosion in ephemeral washes. Therefore, to estimate the change in streambank erosion between the different land disposal alternatives, the sediment transport routines in HEC-RAS were employed to use sediment transport rates as a surrogate for streambank erosion. This method is adapted from CCRFCD's HCDDM for open channel flow and sediment loss analysis (1999). This method assumes the bed load transport rate will be equal to the transport capacity, indirectly accounting for streambank erosion.

The ephemeral nature and geologic conditions of the ULVW cause it to bifurcate and fan out into several divided flow channels, avoiding any single, well-defined

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channel in many areas. The wash is also subject to radical changes in shape, direction, depth, and flow carrying capacity during large storm events (CCRFCD, 1999). This makes it difficult to accurately analyze streambank erosion rates and it is important to understand a comparative analysis approach is thus appropriate.

Based on cross-section geometry data from VTN Nevada and CCRFCD, a representative wash cross-section with an approximate bottom width of 300 ft, a depth of 12 ft, and side slope of 4.5H:1V was judged to be appropriate. This cross-section was used along the entire length of the wash under analysis with the elevations and slopes from the VTN Nevada and CCRFCD data. The slope of the channel has a major influence on sediment transport rates and areas of aggradation and degradation and was therefore accurately represented.

For each land disposal alternative, the hydrographs for the 2-, 5-, 10-, 25-, 50-, and 100-yr storms from the HEC-1 rainfall-runoff models were routed through the channel using the MPM sediment transport routine. The MPM transport routine was selected based on physical and hydraulic characteristics of the ULVW including channel slope, flow velocity, and channel bed material grain size. The MPM routine is a bedload-only equation and does not account for suspended load. The MPM routine was therefore judged to be the most appropriate routine capable of producing a consistent analysis and meaningful results.

The sediment transport analysis determined general trends of aggradation and degradation in the wash and the sediment mass surplus or deficit at each cross-section. The surpluses and deficits were summed for each storm event, for each alternative and then statistically weighted to determine the average annual sediment loss from streambank erosion. For example, the average annual loss assumes 1/100th of the 100-yr loss, 1/50th of the 50-yr loss, 1/25th of the 25-yr loss, etc. All variables, except the flood hydrographs for the various events and alternatives, were kept constant throughout the analyses to maintain a consistent comparative approach.

2.3.2 SEDIMENT TRANSPORT

Several factors important in the sediment transport computational analysis include the sediment gradation, flow duration, computational time step, transport equation, boundary conditions, and movable bed station locations. These

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parameters were used to reflect actual physical processes in the wash while maintaining a large-scale, comparative approach.

Sediment gradations were taken from a geotechnical investigation (Kleinfelder, 1991) performed for the Upper Las Vegas Wash Detention Basin (Decatur Detention Basin). An average gradation was chosen from numerous boring and trench samples and was applied to the entire wash. Considering the comparative nature of this analysis and a lack of available channel bed gradation data along the study reach, it was considered appropriate to apply a single gradation to the entire length of the wash.

A five-minute time step with approximately one-minute computational intervals was used for all analyses. Because single storm events (hydrographs) were used in the analyses, it was important to keep short time steps to accurately represent changes in the flow. The computational interval was chosen to allow enough bed adjustments according to transport rates while maintaining an acceptable overall computation duration.

A 2,000-foot-long upstream and downstream buffer was included in all analyses to account for sediment and flow boundary aberrations. An equilibrium condition was used for upstream cross-sections so no initial aggradation or degradation could occur. A pass-through boundary was used for the downstream-most cross-section to restrict any aggradation or degradation. Moveable bed stations define the part of the streambed that can transport sediment during a flood event. The moveable bed stations are set at the overbank stations to allow sediment transport to occur under all wetted areas.

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3.0 ANALYSIS AND RESULTS

The following section further describes the methods outlined in Section 2 and summarizes the results of the analyses.

3.1 SURFACE EROSION

The runoff coefficients and TSS values outlined in Table 3.1 below were used in the surface erosion analysis.

TABLE 3.1
RUNOFF COEFFICIENTS AND TSS VALUES CALIBRATED FOR THE LAS VEGAS VALLEY[1]

Land Use	Runoff Coefficient	TSS (mg/l)
Residential	0.05	120
Streets and Major Roads	0.11	1,200
Commercial	0.11	80
Parks and Golf Courses	0.01	130
Undeveloped/Desert	0.01	4,800

[1]Runoff Coefficients and TSS values taken from Reginato and Piechota (2004).

All disposal land under each alternative assumes future development being 65 percent residential, 20 percent streets and major roads, 10 percent commercial, and 5 percent parks and golf courses. All non-disposal land assumes no future development and is considered 97 percent desert/undeveloped and 3 percent streets and major roads. Average monthly rainfall depths as of December 31st, 2007 from CCRFCD's website were used in the analysis and are provided in Table 3.2 below.

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TABLE 3.2
AVERAGE MONTHLY RAINFALL DEPTHS FOR CLARK COUNTY, NV[2]

Month	Rainfall Depth (in)
January	0.59
February	0.69
March	0.59
April	0.15
May	0.24
June	0.08
July	0.44
August	0.45
September	0.31
October	0.24
November	0.31
December	0.40
Annual	4.49

[2]Rainfall depths take from: http://www.ccrfcd.org/raingauges.htm

Table 3.3 shows, by land disposal alternative, the amount of land disposal and the resulting sediment loss rate. Full calculations for monthly sediment loads by land use for each alternative are provided in Appendix A.

TABLE 3.3
LAND DISPOSAL ALTERNATIVE AREAS AND ANNUAL SURFACE EROSION RATES

Land Disp. Alternative	Disposal Yield (kg/yr)	Non-Disp. Yield (kg/yr)	Total Yield (kg/yr)	Percent Decrease from Baseline
Baseline	0.00E+00	2.88E+05	2.88E+05	0
Alternative A	1.07E+04	2.71E+05	2.81E+05	2
Alternative B	3.50E+04	2.31E+05	2.66E+05	8
Alternative C	9.57E+04	1.33E+05	2.28E+05	21
Alternative D	1.09E+05	1.11E+05	2.20E+05	24
Alternative E	1.35E+05	6.94E+04	2.04E+05	29
No-Action Alternative	1.59E+05	2.93E+04	1.88E+05	35

3.2 HYDROLOGY

The CN and lag time calculations are included in Appendix B. Abbreviated HEC-1 output is included in Appendix C.

The peak flows for the 100-yr flood event of each alternative are provided in Table 3.4 below. The peak flows for the entire subbasin network upstream and

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downstream of the ULVW Detention Basin were used in the analyses to reflect the most extreme flow conditions in the wash.

TABLE 3.4
100-YR STORM AND ALTERNATIVE SPECIFIC PEAK FLOWS FOR REACHES UPSTREAM (U/S) AND DOWNSTREAM (D/S) OF THE DECATUR DETENTION BASIN

Land Disposal Alternative	U/S (cfs)	D/S (cfs)	Percent Increase from Baseline	
			U/S	D/S
Baseline	13,750	9,670	0	0
Alternative A	13,790	9,690	0	0
Alternative B	14,840	9,760	8	1
Alternative C	15,960	10,170	16	5
Alternative D	16,490	10,210	20	6
Alternative E	16,720	10,460	22	8
No-Action Alternative	17,130	11,270	25	17

3.3 STREAMBANK EROSION

Streambank erosion rates were determined by summing all cross-sectional sediment deficits or surpluses and then statistically weighting the event to determine an annual average sediment loss. Table 3.5 shows the average annual sediment loss from streambank erosion for the upstream and downstream reaches of the ULVW. A complete table of streambank erosion loss rates according to specific storm events is included in Appendix D.

TABLE 3.5
AVERAGE ANNUAL SEDIMENT LOSSES FROM STREAMBANK EROSION IN THE ULVW

Land Disposal Alternative	Average Annual Sediment Loss (kg/yr)			Percent Increase from Baseline
	U/S Reach	D/S Reach	Total	
Baseline	6.07E+05	3.01E+05	9.08E+05	0
Alternative A	6.20E+05	3.11E+05	9.31E+05	3
Alternative B	6.93E+05	3.49E+05	1.04E+06	15
Alternative C	8.08E+05	4.47E+05	1.25E+06	38
Alternative D	8.54E+05	4.73E+05	1.33E+06	46
Alternative E	8.97E+05	5.13E+05	1.41E+06	55
No-Action Alternative	9.73E+05	5.49E+05	1.52E+06	68

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4.0 SUMMARY AND CONCLUSIONS

Urbanization as a result of land disposal will indirectly cause more sediment loss in the CTA study area. The results from the Simple Method show residential and commercial land development will decrease surface erosion because more impervious surfaces, such as parking lots and rooftops, will cover previously exposed soil. Landscaping practices associated with urbanization would also reduce surface erosion. However, assuming no change to the existing flood control infrastructure, more impervious surfaces will also increase flows in the ULVW resulting in higher streambank erosion rates. Ultimately, increased land development will cause more sediment loss in the CTA study area. Table 4.1 below shows the total sediment loss in the CTA study area for each land disposal alternative.

TABLE 4.1
TOTAL SEDIMENT LOSS IN THE CTA STUDY AREA FOR EACH LAND DISPOSAL ALTERNATIVE

Land Disposal Alternative	Streambank Erosion Loss (kg/yr)	Surface Erosion Loss (kg/yr)	Total Loss (kg/yr)	Percent Increase from Baseline
Baseline	9.08E+05	2.88E+05	1.20E+06	0
Alternative A	9.31E+05	2.81E+05	1.21E+06	1
Alternative B	1.04E+06	2.66E+05	1.31E+06	9
Alternative C	1.25E+06	2.28E+05	1.48E+06	24
Alternative D	1.33E+06	2.20E+05	1.55E+06	29
Alternative E	1.41E+06	2.04E+05	1.61E+06	35
No-Action Alternative	1.52E+06	1.88E+05	1.71E+06	43

Given the complexity of the hydrologic and erosive mechanisms at work in the CTA study area and the simplifying assumptions made in the analyses, the results presented are comparative and should be considered qualitatively. Perhaps the most useful estimates of land disposal alternative impacts on hydrology and erosion are shown by the increases from baseline (existing) conditions. Alternative A disposes of the least amount of land and has the smallest sediment loss increase at 1 percent. The No-Action Alternative disposes of the largest amount of land and has the largest sediment loss increase at 43 percent.

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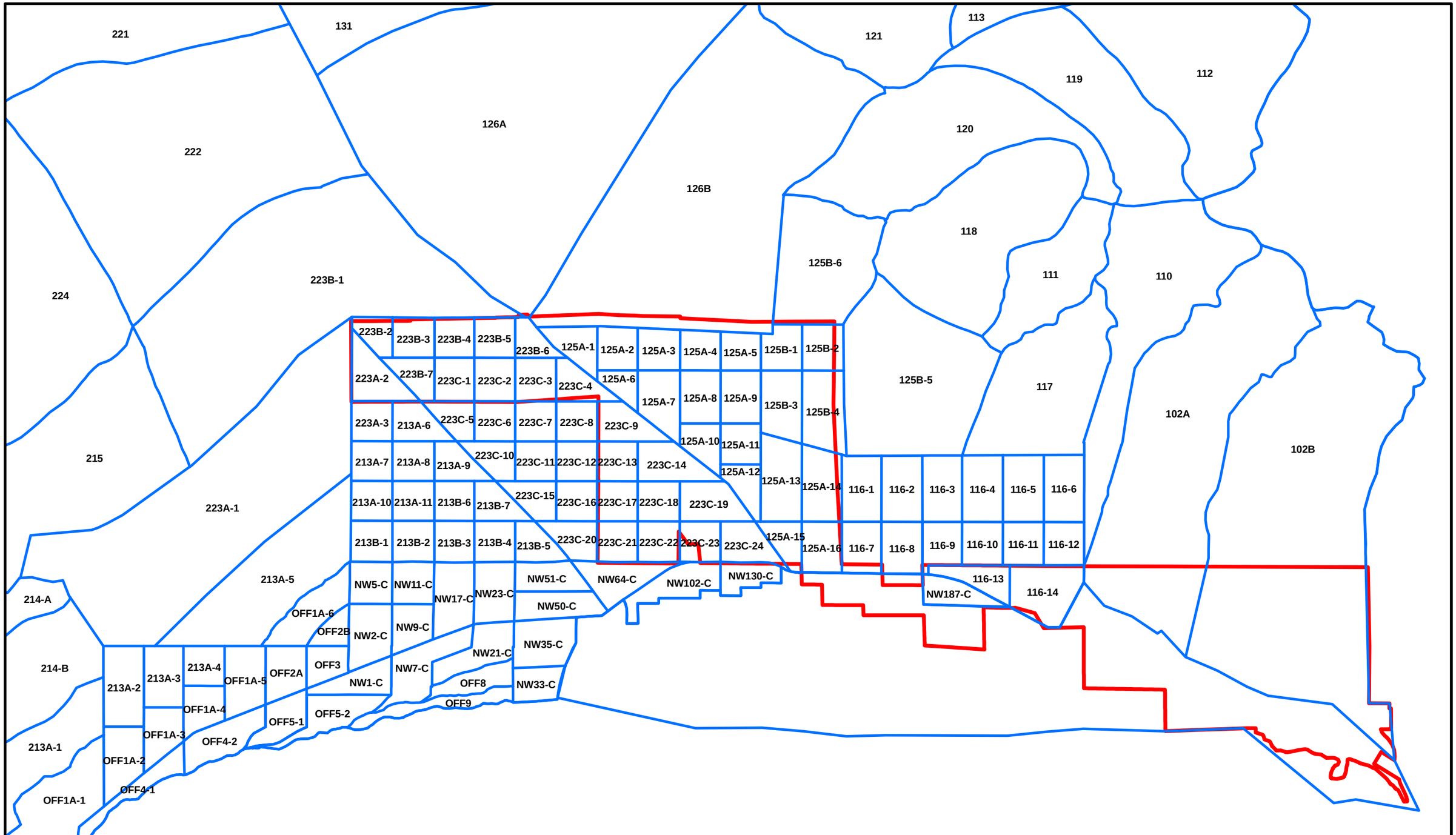
Figure 1

ULVW WATERSHED WITH CONTRIBUTING SUBBASINS



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Legend

- CTA Study Area
- Basins

0 6,000 12,000 Feet

1 inch equals 6,000 feet

N

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DRAWN:	01/05/09
DRAWN BY:	TAK
CHECKED BY:	CEL
FILE NAME:	ULVW Hydro.mxd

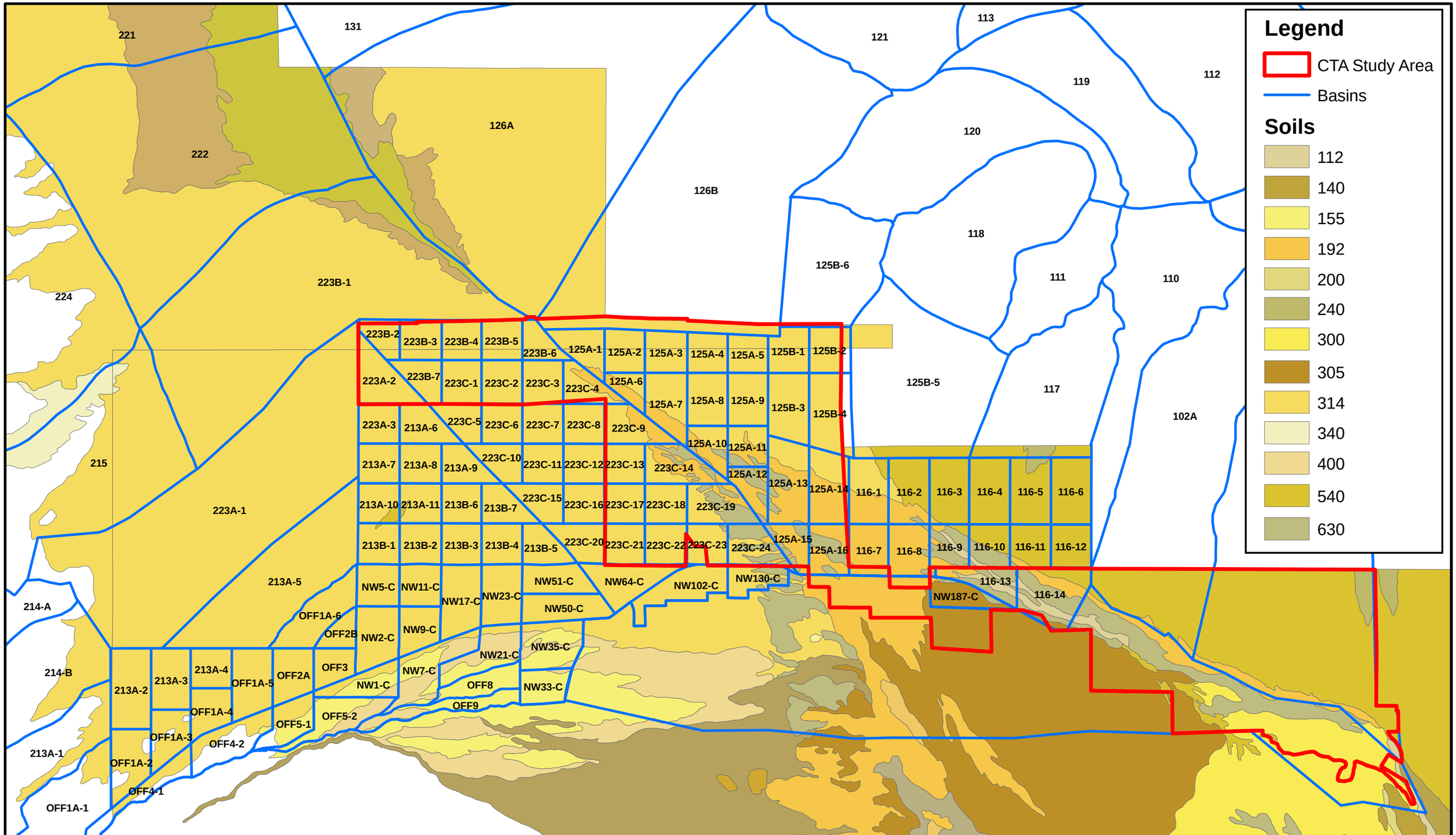
UPPER LAS VEGAS WASH
CTA STUDY AREA SUBBASIN MAP

UPPER LAS VEGAS WASH SEIS
CLARK COUNTY, NV

FIGURE
1

Figure 2

SOIL TYPE MAP FOR ULVW WATERSHED



0 6,200 12,400 Feet

1 inch equals 6,000 feet

N

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UPPER LAS VEGAS WASH
CTA STUDY AREA SOIL AND SUBBASIN MAP

UPPER LAS VEGAS WASH SEIS
CLARK COUNTY, NV
SOURCE: UTAH STATE SOIL SURVEY, 2008

FIGURE
2

APPENDIX A
DELTAILED SURFACE EROSION CALCULATION SHEETS AND CHARTS

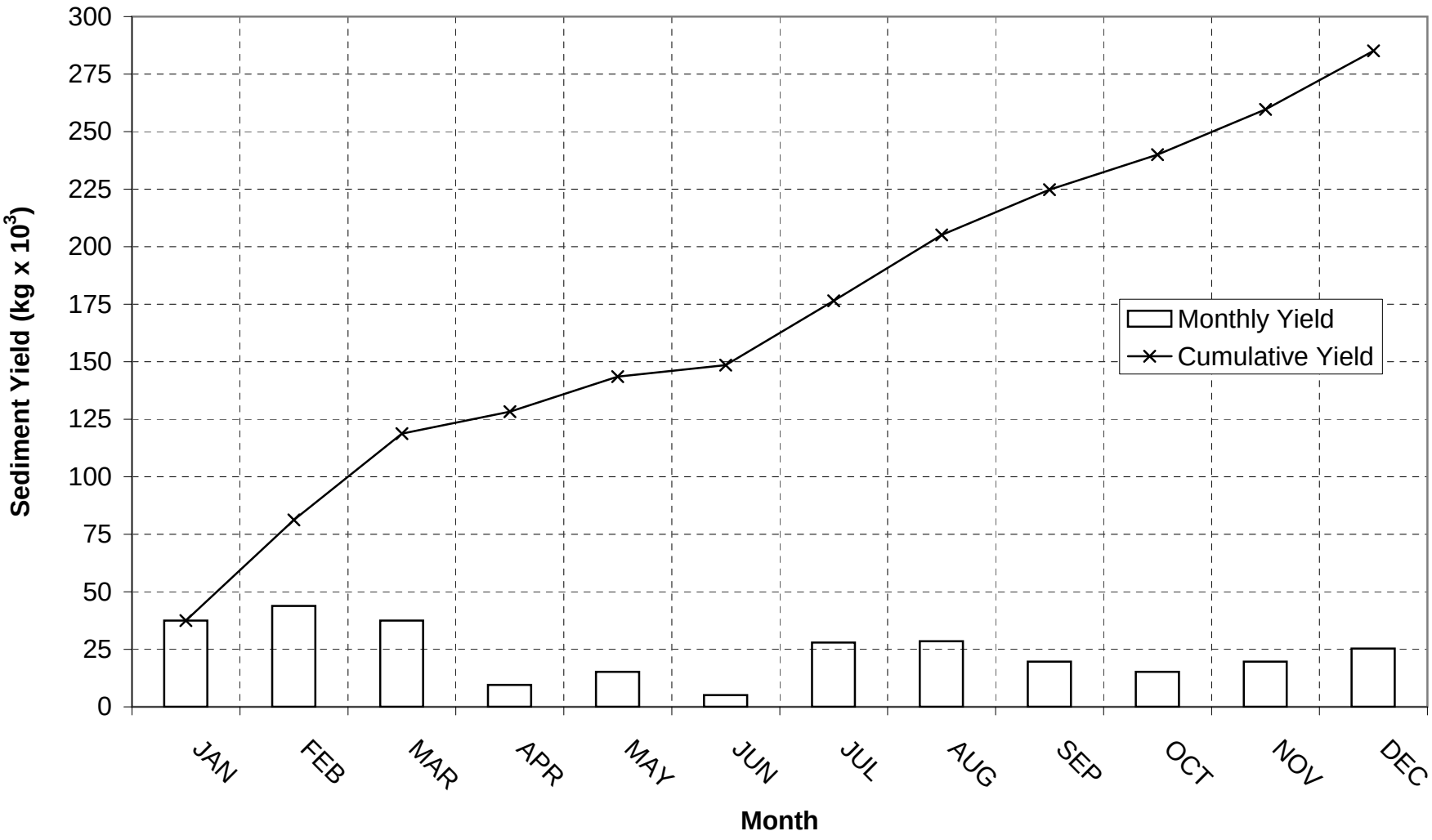
Baseline Alternative

CTA Study Area =	13623	ac
Non Disp. Area =	13623	ac
Disposal Area =	0	ac
Sediment Load =	2.86E+05	kg/yr

Month	Annual Rainfall	COM Area (%) = 10		IND Area (%) = 0		PAR Area (%) = 5		PUB Area (%) = 0		RES Area (%) = 65		ROA Area (%) = 20		UND Area (%) = 0		Disposal Yield	Non-Disposal[1] Yield	Monthly Yield x 10^3	Cumulative Yield x 10^3
	P_{MON} (in)	R_{COM} (ac-ft)	Y_{COM} (kg/mo)	R_{IND} (ac-ft)	Y_{IND} (kg/mo)	R_{PAR} (ac-ft)	Y_{PAR} (kg/mo)	R_{PUB} (ac-ft)	Y_{PUB} (kg/mo)	R_{RES} (ac-ft)	Y_{RES} (kg/mo)	R_{ROA} (ac-ft)	Y_{ROA} (kg/mo)	R_{UND} (ac-ft)	Y_{UND} (kg/mo)	Y_{DIS} (kg/mo)	Y_{NDIS} (kg/mo)	Y_{MON} (kg/mo)	Y_{CUMM} (kg/mo)
JAN	0.59	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	3.75E+04	37	37
FEB	0.69	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	4.38E+04	44	81
MAR	0.59	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	3.75E+04	37	119
APR	0.15	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	9.52E+03	10	128
MAY	0.24	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	1.52E+04	15	143
JUN	0.08	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	5.08E+03	5	149
JUL	0.44	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	2.79E+04	28	177
AUG	0.45	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	2.86E+04	29	205
SEP	0.31	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	1.97E+04	20	225
OCT	0.24	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	1.52E+04	15	240
NOV	0.31	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	1.97E+04	20	260
DEC	0.40	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	2.54E+04	25	285
Total =	4.49	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.0	0.00E+00	0.00E+00	2.86E+05		

[1]Non-Disposal areas considered 97% undeveloped and 3% roads

Definitions and Notes
COM = Commercial
IND = Industrial
PAR = Parks & Golf Courses
RES = Residential
ROA = Roads
UND = Undeveloped
R = Runoff
Y = Sediment Yield



Monthly and cumulative surface erosion sediment yields from Baseline Alternative. Average monthly rainfall depths and predicted land use types were used in the Simple Method for average monthly yield calculations.

Alternative A

CTA Study Area =	13623	ac
Non Disp. Area =	13252	ac
Disposal Area =	371	ac
Sediment Load =	2.83E+05	kg/yr

Month	Annual Rainfall	COM Area (%) = 10		IND Area (%) = 0		PAR Area (%) = 5		PUB Area (%) = 0		RES Area (%) = 65		ROA Area (%) = 20		UND Area (%) = 0		Disposal Yield	Non-Disposal[1] Yield	Monthly Yield x 10^3	Cumulative Yield x 10^3
	P_{MON} (in)	R_{COM} (ac-ft)	Y_{COM} (kg/mo)	R_{IND} (ac-ft)	Y_{IND} (kg/mo)	R_{PAR} (ac-ft)	Y_{PAR} (kg/mo)	R_{PUB} (ac-ft)	Y_{PUB} (kg/mo)	R_{RES} (ac-ft)	Y_{RES} (kg/mo)	R_{ROA} (ac-ft)	Y_{ROA} (kg/mo)	R_{UND} (ac-ft)	Y_{UND} (kg/mo)	Y_{DIS} (kg/mo)	Y_{NDIS} (kg/mo)	Y_{MON} (kg/mo)	Y_{CUMM} (kg/mo)
JAN	0.59	0.2	1.78E+01	0.0	0.00E+00	0.0	1.31E+00	0.0	0.00E+00	0.5	7.88E+01	0.4	5.33E+02	0.0	0.00E+00	6.31E+02	3.64E+04	37	37
FEB	0.69	0.2	2.08E+01	0.0	0.00E+00	0.0	1.53E+00	0.0	0.00E+00	0.6	9.21E+01	0.4	6.23E+02	0.0	0.00E+00	7.38E+02	4.26E+04	43	80
MAR	0.59	0.2	1.78E+01	0.0	0.00E+00	0.0	1.31E+00	0.0	0.00E+00	0.5	7.88E+01	0.4	5.33E+02	0.0	0.00E+00	6.31E+02	3.64E+04	37	117
APR	0.15	0.0	4.52E+00	0.0	0.00E+00	0.0	3.34E-01	0.0	0.00E+00	0.1	2.00E+01	0.1	1.36E+02	0.0	0.00E+00	1.60E+02	9.26E+03	9	127
MAY	0.24	0.1	7.23E+00	0.0	0.00E+00	0.0	5.34E-01	0.0	0.00E+00	0.2	3.20E+01	0.1	2.17E+02	0.0	0.00E+00	2.57E+02	1.48E+04	15	142
JUN	0.08	0.0	2.41E+00	0.0	0.00E+00	0.0	1.78E-01	0.0	0.00E+00	0.1	1.07E+01	0.0	7.23E+01	0.0	0.00E+00	8.55E+01	4.94E+03	5	147
JUL	0.44	0.1	1.33E+01	0.0	0.00E+00	0.0	9.79E-01	0.0	0.00E+00	0.4	5.87E+01	0.3	3.98E+02	0.0	0.00E+00	4.71E+02	2.72E+04	28	175
AUG	0.45	0.1	1.36E+01	0.0	0.00E+00	0.0	1.00E+00	0.0	0.00E+00	0.4	6.01E+01	0.3	4.07E+02	0.0	0.00E+00	4.81E+02	2.78E+04	28	203
SEP	0.31	0.1	9.34E+00	0.0	0.00E+00	0.0	6.90E-01	0.0	0.00E+00	0.3	4.14E+01	0.2	2.80E+02	0.0	0.00E+00	3.31E+02	1.91E+04	19	222
OCT	0.24	0.1	7.23E+00	0.0	0.00E+00	0.0	5.34E-01	0.0	0.00E+00	0.2	3.20E+01	0.1	2.17E+02	0.0	0.00E+00	2.57E+02	1.48E+04	15	237
NOV	0.31	0.1	9.34E+00	0.0	0.00E+00	0.0	6.90E-01	0.0	0.00E+00	0.3	4.14E+01	0.2	2.80E+02	0.0	0.00E+00	3.31E+02	1.91E+04	19	257
DEC	0.40	0.1	1.20E+01	0.0	0.00E+00	0.0	8.90E-01	0.0	0.00E+00	0.4	5.34E+01	0.2	3.61E+02	0.0	0.00E+00	4.28E+02	2.47E+04	25	282
Total =	4.49	1.4	1.35E+02	0.0	0.00E+00	0.1	9.99E+00	0.0	0.00E+00	4.1	5.99E+02	2.7	4.06E+03	0.0	0.00E+00	4.80E+03	2.78E+05		

[1]Non-Disposal areas considered 97% undeveloped and 3% roads

Definitions and Notes
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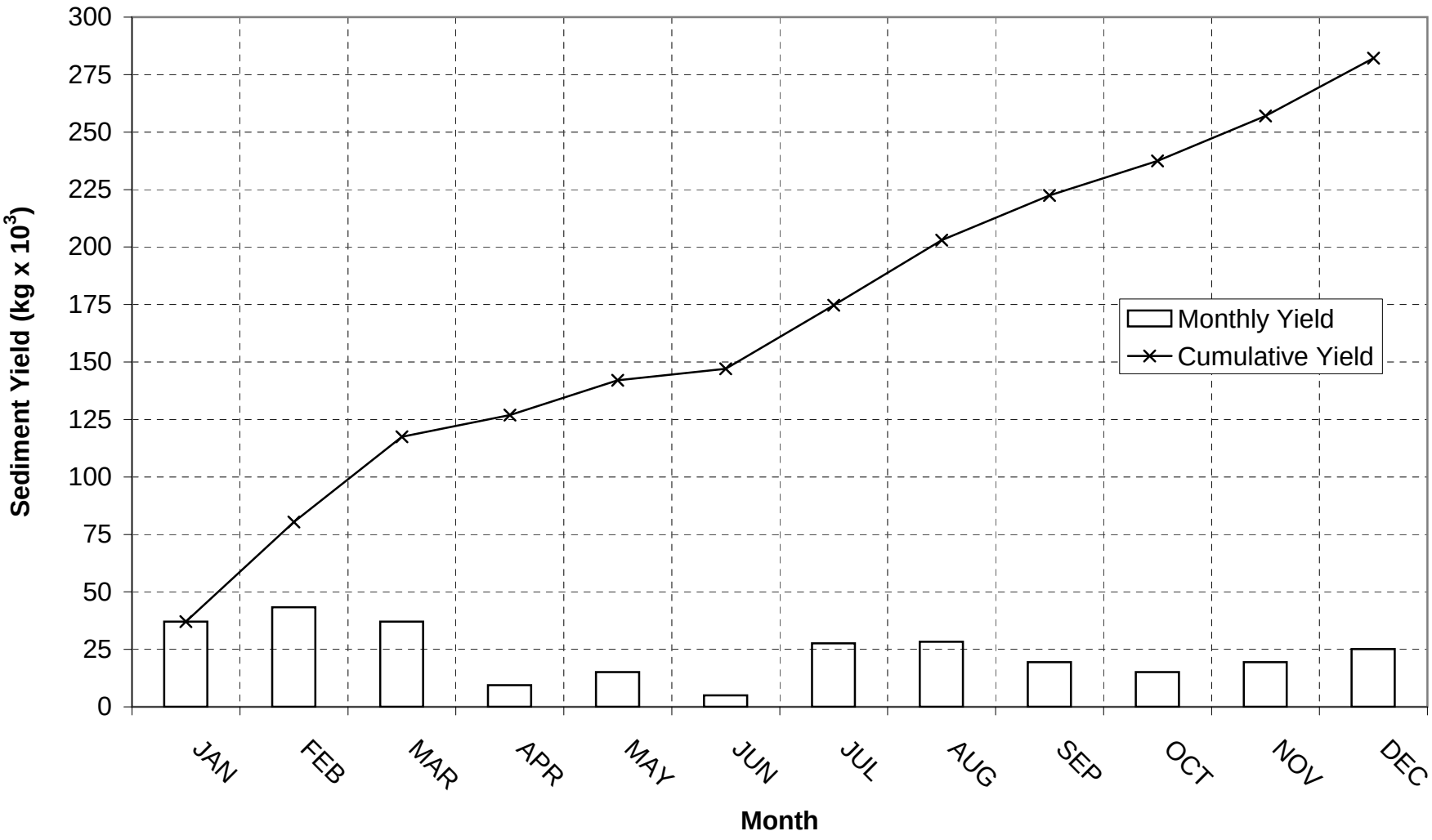

Monthly and cumulative surface erosion sediment yields from Alternative A. Average monthly rainfall depths and predicted land use types were used in the Simple Method for average monthly yield calculations.

Alternative B

CTA Study Area =	13623 ac
Non Disp. Area =	11307 ac
Disposal Area =	2316 ac
Sediment Load =	2.67E+05 kg/yr

Month	Annual Rainfall	COM Area (%) = 10		IND Area (%) = 0		PAR Area (%) = 5		PUB Area (%) = 0		RES Area (%) = 65		ROA Area (%) = 20		UND Area (%) = 0		Disposal Yield	Non-Disposal[1] Yield	Monthly Yield x 10^3	Cumulative Yield x 10^3
	P_{MON} (in)	R_{COM} (ac-ft)	Y_{COM} (kg/mo)	R_{IND} (ac-ft)	Y_{IND} (kg/mo)	R_{PAR} (ac-ft)	Y_{PAR} (kg/mo)	R_{PUB} (ac-ft)	Y_{PUB} (kg/mo)	R_{RES} (ac-ft)	Y_{RES} (kg/mo)	R_{ROA} (ac-ft)	Y_{ROA} (kg/mo)	R_{UND} (ac-ft)	Y_{UND} (kg/mo)	Y_{DIS} (kg/mo)	Y_{NDIS} (kg/mo)	Y_{MON} (kg/mo)	Y_{CUMM} (kg/mo)
JAN	0.59	1.1	1.11E+02	0.0	0.00E+00	0.1	8.19E+00	0.0	0.00E+00	3.3	4.92E+02	2.3	3.33E+03	0.0	0.00E+00	3.94E+03	3.11E+04	35	35
FEB	0.69	1.3	1.30E+02	0.0	0.00E+00	0.1	9.58E+00	0.0	0.00E+00	3.9	5.75E+02	2.6	3.89E+03	0.0	0.00E+00	4.61E+03	3.64E+04	41	76
MAR	0.59	1.1	1.11E+02	0.0	0.00E+00	0.1	8.19E+00	0.0	0.00E+00	3.3	4.92E+02	2.3	3.33E+03	0.0	0.00E+00	3.94E+03	3.11E+04	35	111
APR	0.15	0.3	2.82E+01	0.0	0.00E+00	0.0	2.08E+00	0.0	0.00E+00	0.8	1.25E+02	0.6	8.46E+02	0.0	0.00E+00	1.00E+03	7.90E+03	9	120
MAY	0.24	0.5	4.51E+01	0.0	0.00E+00	0.0	3.33E+00	0.0	0.00E+00	1.4	2.00E+02	0.9	1.35E+03	0.0	0.00E+00	1.60E+03	1.26E+04	14	134
JUN	0.08	0.2	1.50E+01	0.0	0.00E+00	0.0	1.11E+00	0.0	0.00E+00	0.5	6.67E+01	0.3	4.51E+02	0.0	0.00E+00	5.34E+02	4.22E+03	5	139
JUL	0.44	0.8	8.27E+01	0.0	0.00E+00	0.0	6.11E+00	0.0	0.00E+00	2.5	3.67E+02	1.7	2.48E+03	0.0	0.00E+00	2.94E+03	2.32E+04	26	165
AUG	0.45	0.9	8.46E+01	0.0	0.00E+00	0.0	6.25E+00	0.0	0.00E+00	2.5	3.75E+02	1.7	2.54E+03	0.0	0.00E+00	3.00E+03	2.37E+04	27	192
SEP	0.31	0.6	5.83E+01	0.0	0.00E+00	0.0	4.31E+00	0.0	0.00E+00	1.8	2.58E+02	1.2	1.75E+03	0.0	0.00E+00	2.07E+03	1.63E+04	18	210
OCT	0.24	0.5	4.51E+01	0.0	0.00E+00	0.0	3.33E+00	0.0	0.00E+00	1.4	2.00E+02	0.9	1.35E+03	0.0	0.00E+00	1.60E+03	1.26E+04	14	224
NOV	0.31	0.6	5.83E+01	0.0	0.00E+00	0.0	4.31E+00	0.0	0.00E+00	1.8	2.58E+02	1.2	1.75E+03	0.0	0.00E+00	2.07E+03	1.63E+04	18	243
DEC	0.40	0.8	7.52E+01	0.0	0.00E+00	0.0	5.55E+00	0.0	0.00E+00	2.3	3.33E+02	1.5	2.26E+03	0.0	0.00E+00	2.67E+03	2.11E+04	24	267
Total =	4.49	8.6	8.44E+02	0.0	0.00E+00	0.4	6.24E+01	0.0	0.00E+00	25.3	3.74E+03	17.2	2.53E+04	0.0	0.00E+00	3.00E+04	2.37E+05		

[1]Non-Disposal areas considered 97% undeveloped and 3% roads

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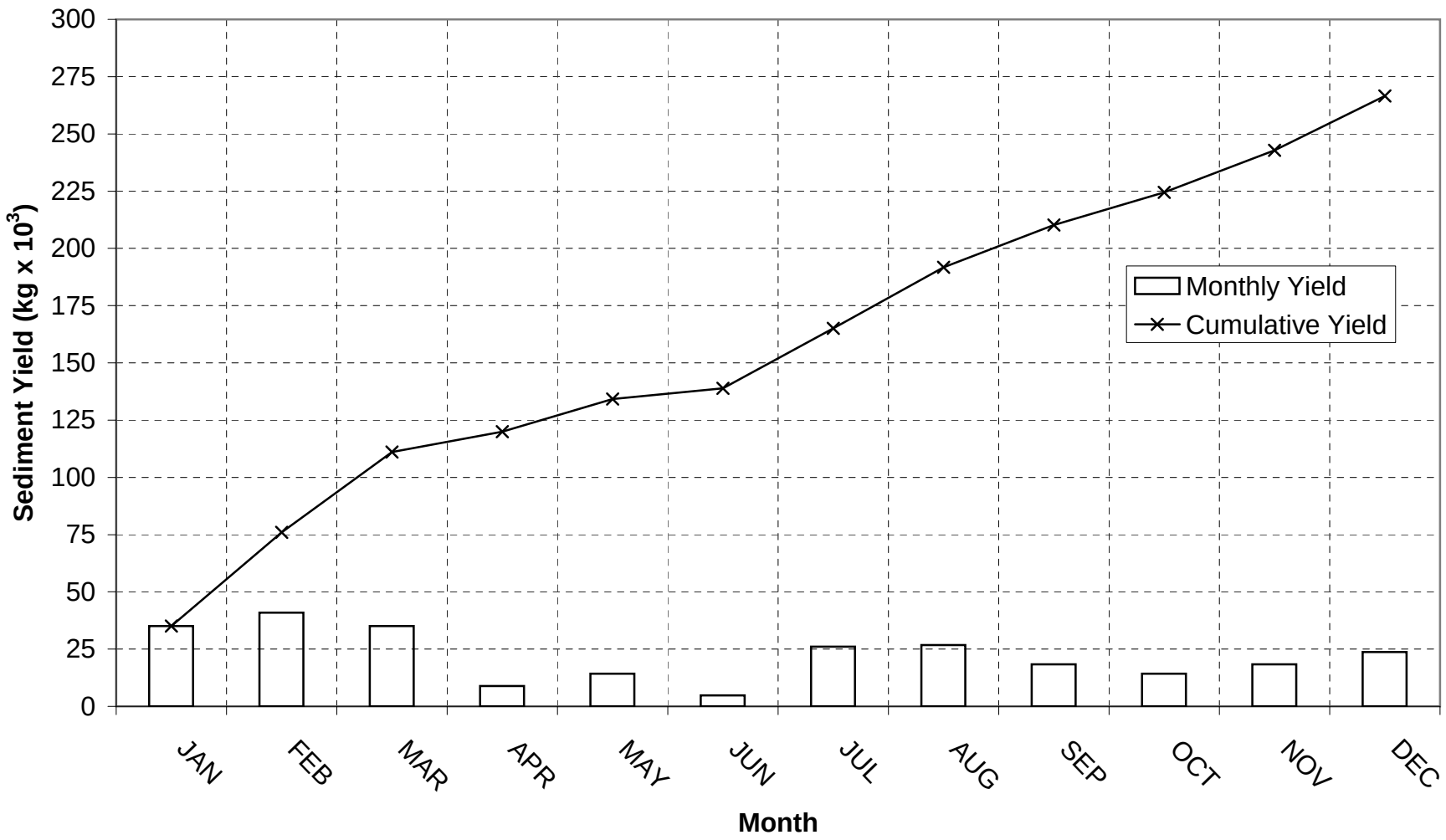
ROA = Roads
UND = Undeveloped
R = Runoff
Y = Sediment Yield



Monthly and cumulative surface erosion sediment yields from Alternative B. Average monthly rainfall depths and predicted land use types were used in the Simple Method for average monthly yield calculations.

Alternative C

CTA Study Area =	13623 ac
Non Disp. Area =	6662 ac
Disposal Area =	6961 ac
Sediment Load =	2.30E+05 kg/yr

Month	Annual Rainfall	COM Area (%) = 10		IND Area (%) = 0		PAR Area (%) = 5		PUB Area (%) = 0		RES Area (%) = 65		ROA Area (%) = 20		UND Area (%) = 0		Disposal Yield	Non-Disposal[1] Yield	Monthly Yield x 10^3	Cumulative Yield x 10^3
	P_{MON} (in)	R_{COM} (ac-ft)	Y_{COM} (kg/mo)	R_{IND} (ac-ft)	Y_{IND} (kg/mo)	R_{PAR} (ac-ft)	Y_{PAR} (kg/mo)	R_{PUB} (ac-ft)	Y_{PUB} (kg/mo)	R_{RES} (ac-ft)	Y_{RES} (kg/mo)	R_{ROA} (ac-ft)	Y_{ROA} (kg/mo)	R_{UND} (ac-ft)	Y_{UND} (kg/mo)	Y_{DIS} (kg/mo)	Y_{NDIS} (kg/mo)	Y_{MON} (kg/mo)	Y_{CUMM} (kg/mo)
JAN	0.59	3.4	3.33E+02	0.0	0.00E+00	0.2	2.46E+01	0.0	0.00E+00	10.0	1.48E+03	6.8	1.00E+04	0.0	0.00E+00	1.18E+04	1.83E+04	30	30
FEB	0.69	4.0	3.90E+02	0.0	0.00E+00	0.2	2.88E+01	0.0	0.00E+00	11.7	1.73E+03	7.9	1.17E+04	0.0	0.00E+00	1.38E+04	2.14E+04	35	65
MAR	0.59	3.4	3.33E+02	0.0	0.00E+00	0.2	2.46E+01	0.0	0.00E+00	10.0	1.48E+03	6.8	1.00E+04	0.0	0.00E+00	1.18E+04	1.83E+04	30	96
APR	0.15	0.9	8.48E+01	0.0	0.00E+00	0.0	6.26E+00	0.0	0.00E+00	2.5	3.76E+02	1.7	2.54E+03	0.0	0.00E+00	3.01E+03	4.66E+03	8	103
MAY	0.24	1.4	1.36E+02	0.0	0.00E+00	0.1	1.00E+01	0.0	0.00E+00	4.1	6.01E+02	2.8	4.07E+03	0.0	0.00E+00	4.82E+03	7.45E+03	12	116
JUN	0.08	0.5	4.52E+01	0.0	0.00E+00	0.0	3.34E+00	0.0	0.00E+00	1.4	2.00E+02	0.9	1.36E+03	0.0	0.00E+00	1.61E+03	2.48E+03	4	120
JUL	0.44	2.5	2.49E+02	0.0	0.00E+00	0.1	1.84E+01	0.0	0.00E+00	7.5	1.10E+03	5.1	7.46E+03	0.0	0.00E+00	8.83E+03	1.37E+04	22	142
AUG	0.45	2.6	2.54E+02	0.0	0.00E+00	0.1	1.88E+01	0.0	0.00E+00	7.6	1.13E+03	5.2	7.63E+03	0.0	0.00E+00	9.03E+03	1.40E+04	23	165
SEP	0.31	1.8	1.75E+02	0.0	0.00E+00	0.1	1.29E+01	0.0	0.00E+00	5.3	7.76E+02	3.6	5.26E+03	0.0	0.00E+00	6.22E+03	9.62E+03	16	181
OCT	0.24	1.4	1.36E+02	0.0	0.00E+00	0.1	1.00E+01	0.0	0.00E+00	4.1	6.01E+02	2.8	4.07E+03	0.0	0.00E+00	4.82E+03	7.45E+03	12	193
NOV	0.31	1.8	1.75E+02	0.0	0.00E+00	0.1	1.29E+01	0.0	0.00E+00	5.3	7.76E+02	3.6	5.26E+03	0.0	0.00E+00	6.22E+03	9.62E+03	16	209
DEC	0.40	2.3	2.26E+02	0.0	0.00E+00	0.1	1.67E+01	0.0	0.00E+00	6.8	1.00E+03	4.6	6.78E+03	0.0	0.00E+00	8.03E+03	1.24E+04	20	229
Total =	4.49	25.8	2.54E+03	0.0	0.00E+00	1.2	1.87E+02	0.0	0.00E+00	76.2	1.12E+04	51.6	7.61E+04	0.0	0.00E+00	9.01E+04	1.40E+05		

[1]Non-Disposal areas considered 97% undeveloped and 3% roads

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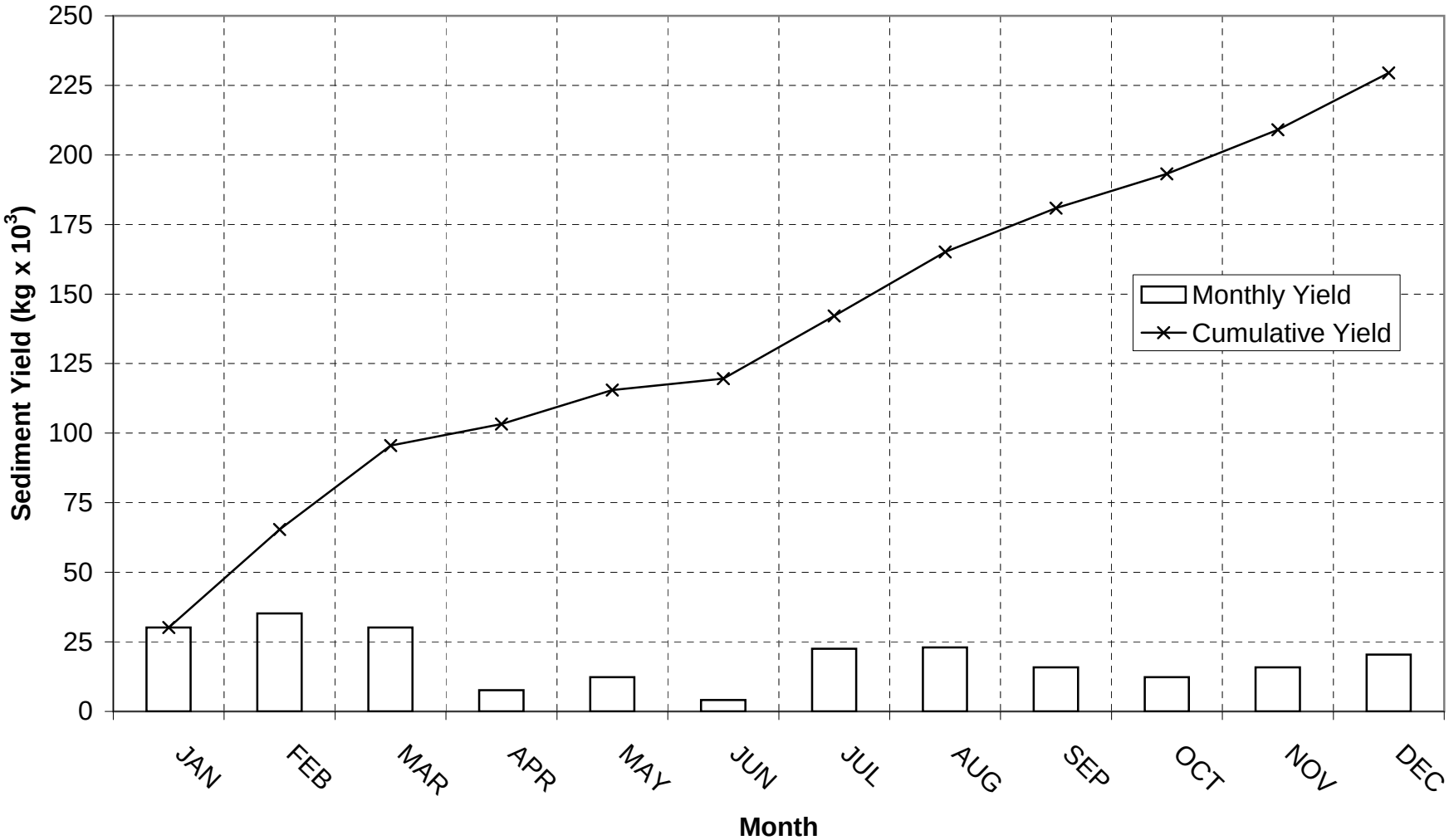

Monthly and cumulative surface erosion sediment yields from Alternative C. Average monthly rainfall depths and predicted land use types were used in the Simple Method for average monthly yield calculations.

Alternative D

CTA Study Area =	13623	ac
Non Disp. Area =	5600	ac
Disposal Area =	8023	ac
Sediment Load =	2.21E+05	kg/yr

Month	Annual Rainfall	COM Area (%) = 10		IND Area (%) = 0		PAR Area (%) = 5		PUB Area (%) = 0		RES Area (%) = 65		ROA Area (%) = 20		UND Area (%) = 0		Disposal Yield	Non-Disposal[1] Yield	Monthly Yield x 10^3	Cumulative Yield x 10^3
	P_{MON} (in)	R_{COM} (ac-ft)	Y_{COM} (kg/mo)	R_{IND} (ac-ft)	Y_{IND} (kg/mo)	R_{PAR} (ac-ft)	Y_{PAR} (kg/mo)	R_{PUB} (ac-ft)	Y_{PUB} (kg/mo)	R_{RES} (ac-ft)	Y_{RES} (kg/mo)	R_{ROA} (ac-ft)	Y_{ROA} (kg/mo)	R_{UND} (ac-ft)	Y_{UND} (kg/mo)	Y_{DIS} (kg/mo)	Y_{NDIS} (kg/mo)	Y_{MON} (kg/mo)	Y_{CUMM} (kg/mo)
JAN	0.59	3.9	3.84E+02	0.0	0.00E+00	0.2	2.84E+01	0.0	0.00E+00	11.5	1.70E+03	7.8	1.15E+04	0.0	0.00E+00	1.36E+04	1.54E+04	29	29
FEB	0.69	4.6	4.49E+02	0.0	0.00E+00	0.2	3.32E+01	0.0	0.00E+00	13.5	1.99E+03	9.1	1.35E+04	0.0	0.00E+00	1.60E+04	1.80E+04	34	63
MAR	0.59	3.9	3.84E+02	0.0	0.00E+00	0.2	2.84E+01	0.0	0.00E+00	11.5	1.70E+03	7.8	1.15E+04	0.0	0.00E+00	1.36E+04	1.54E+04	29	92
APR	0.15	1.0	9.77E+01	0.0	0.00E+00	0.0	7.22E+00	0.0	0.00E+00	2.9	4.33E+02	2.0	2.93E+03	0.0	0.00E+00	3.47E+03	3.91E+03	7	99
MAY	0.24	1.6	1.56E+02	0.0	0.00E+00	0.1	1.15E+01	0.0	0.00E+00	4.7	6.93E+02	3.2	4.69E+03	0.0	0.00E+00	5.55E+03	6.26E+03	12	111
JUN	0.08	0.5	5.21E+01	0.0	0.00E+00	0.0	3.85E+00	0.0	0.00E+00	1.6	2.31E+02	1.1	1.56E+03	0.0	0.00E+00	1.85E+03	2.09E+03	4	115
JUL	0.44	2.9	2.87E+02	0.0	0.00E+00	0.1	2.12E+01	0.0	0.00E+00	8.6	1.27E+03	5.8	8.60E+03	0.0	0.00E+00	1.02E+04	1.15E+04	22	137
AUG	0.45	3.0	2.93E+02	0.0	0.00E+00	0.1	2.16E+01	0.0	0.00E+00	8.8	1.30E+03	6.0	8.79E+03	0.0	0.00E+00	1.04E+04	1.17E+04	22	159
SEP	0.31	2.1	2.02E+02	0.0	0.00E+00	0.1	1.49E+01	0.0	0.00E+00	6.1	8.95E+02	4.1	6.06E+03	0.0	0.00E+00	7.17E+03	8.09E+03	15	174
OCT	0.24	1.6	1.56E+02	0.0	0.00E+00	0.1	1.15E+01	0.0	0.00E+00	4.7	6.93E+02	3.2	4.69E+03	0.0	0.00E+00	5.55E+03	6.26E+03	12	186
NOV	0.31	2.1	2.02E+02	0.0	0.00E+00	0.1	1.49E+01	0.0	0.00E+00	6.1	8.95E+02	4.1	6.06E+03	0.0	0.00E+00	7.17E+03	8.09E+03	15	201
DEC	0.40	2.6	2.61E+02	0.0	0.00E+00	0.1	1.92E+01	0.0	0.00E+00	7.8	1.15E+03	5.3	7.82E+03	0.0	0.00E+00	9.25E+03	1.04E+04	20	221
Total =	4.49	29.7	2.92E+03	0.0	0.00E+00	1.4	2.16E+02	0.0	0.00E+00	87.8	1.30E+04	59.4	8.77E+04	0.0	0.00E+00	1.04E+05	1.18E+05		

[1]Non-Disposal areas considered 97% undeveloped and 3% roads

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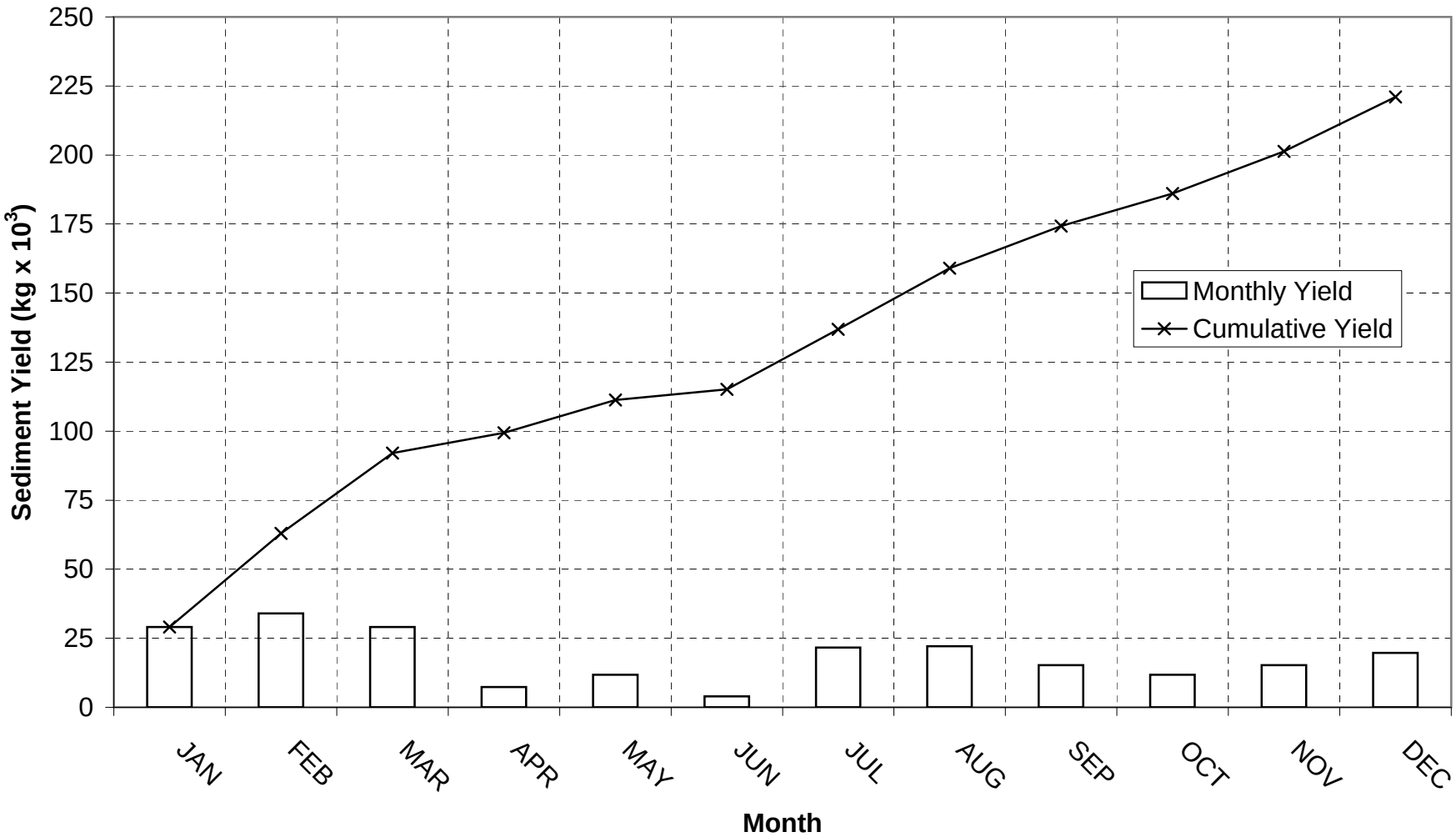

Monthly and cumulative surface erosion sediment yields from Alternative D. Average monthly rainfall depths and predicted land use types were used in the Simple Method for average monthly yield calculations.

Alternative E

CTA Study Area =	13623	ac
Non Disp. Area =	3613	ac
Disposal Area =	10010	ac
Sediment Load =	2.05E+05	kg/yr

Month	Annual Rainfall	COM Area (%) = 10		IND Area (%) = 0		PAR Area (%) = 5		PUB Area (%) = 0		RES Area (%) = 65		ROA Area (%) = 20		UND Area (%) = 0		Disposal Yield	Non-Disposal[1] Yield	Monthly Yield x 10^3	Cumulative Yield x 10^3
	P_{MON} (in)	R_{COM} (ac-ft)	Y_{COM} (kg/mo)	R_{IND} (ac-ft)	Y_{IND} (kg/mo)	R_{PAR} (ac-ft)	Y_{PAR} (kg/mo)	R_{PUB} (ac-ft)	Y_{PUB} (kg/mo)	R_{RES} (ac-ft)	Y_{RES} (kg/mo)	R_{ROA} (ac-ft)	Y_{ROA} (kg/mo)	R_{UND} (ac-ft)	Y_{UND} (kg/mo)	Y_{DIS} (kg/mo)	Y_{NDIS} (kg/mo)	Y_{MON} (kg/mo)	Y_{CUMM} (kg/mo)
JAN	0.59	4.9	4.79E+02	0.0	0.00E+00	0.2	3.54E+01	0.0	0.00E+00	14.4	2.12E+03	9.7	1.44E+04	0.0	0.00E+00	1.70E+04	9.93E+03	27	27
FEB	0.69	5.7	5.61E+02	0.0	0.00E+00	0.3	4.14E+01	0.0	0.00E+00	16.8	2.48E+03	11.4	1.68E+04	0.0	0.00E+00	1.99E+04	1.16E+04	32	58
MAR	0.59	4.9	4.79E+02	0.0	0.00E+00	0.2	3.54E+01	0.0	0.00E+00	14.4	2.12E+03	9.7	1.44E+04	0.0	0.00E+00	1.70E+04	9.93E+03	27	85
APR	0.15	1.2	1.22E+02	0.0	0.00E+00	0.1	9.00E+00	0.0	0.00E+00	3.7	5.40E+02	2.5	3.66E+03	0.0	0.00E+00	4.33E+03	2.53E+03	7	92
MAY	0.24	2.0	1.95E+02	0.0	0.00E+00	0.1	1.44E+01	0.0	0.00E+00	5.9	8.64E+02	4.0	5.85E+03	0.0	0.00E+00	6.92E+03	4.04E+03	11	103
JUN	0.08	0.7	6.50E+01	0.0	0.00E+00	0.0	4.80E+00	0.0	0.00E+00	2.0	2.88E+02	1.3	1.95E+03	0.0	0.00E+00	2.31E+03	1.35E+03	4	107
JUL	0.44	3.6	3.58E+02	0.0	0.00E+00	0.2	2.64E+01	0.0	0.00E+00	10.7	1.58E+03	7.3	1.07E+04	0.0	0.00E+00	1.27E+04	7.41E+03	20	127
AUG	0.45	3.7	3.66E+02	0.0	0.00E+00	0.2	2.70E+01	0.0	0.00E+00	11.0	1.62E+03	7.4	1.10E+04	0.0	0.00E+00	1.30E+04	7.58E+03	21	148
SEP	0.31	2.6	2.52E+02	0.0	0.00E+00	0.1	1.86E+01	0.0	0.00E+00	7.6	1.12E+03	5.1	7.56E+03	0.0	0.00E+00	8.94E+03	5.22E+03	14	162
OCT	0.24	2.0	1.95E+02	0.0	0.00E+00	0.1	1.44E+01	0.0	0.00E+00	5.9	8.64E+02	4.0	5.85E+03	0.0	0.00E+00	6.92E+03	4.04E+03	11	173
NOV	0.31	2.6	2.52E+02	0.0	0.00E+00	0.1	1.86E+01	0.0	0.00E+00	7.6	1.12E+03	5.1	7.56E+03	0.0	0.00E+00	8.94E+03	5.22E+03	14	187
DEC	0.40	3.3	3.25E+02	0.0	0.00E+00	0.2	2.40E+01	0.0	0.00E+00	9.8	1.44E+03	6.6	9.75E+03	0.0	0.00E+00	1.15E+04	6.74E+03	18	205
Total =	4.49	37.1	3.65E+03	0.0	0.00E+00	1.7	2.70E+02	0.0	0.00E+00	109.6	1.62E+04	74.2	1.09E+05	0.0	0.00E+00	1.30E+05	7.59E+04		

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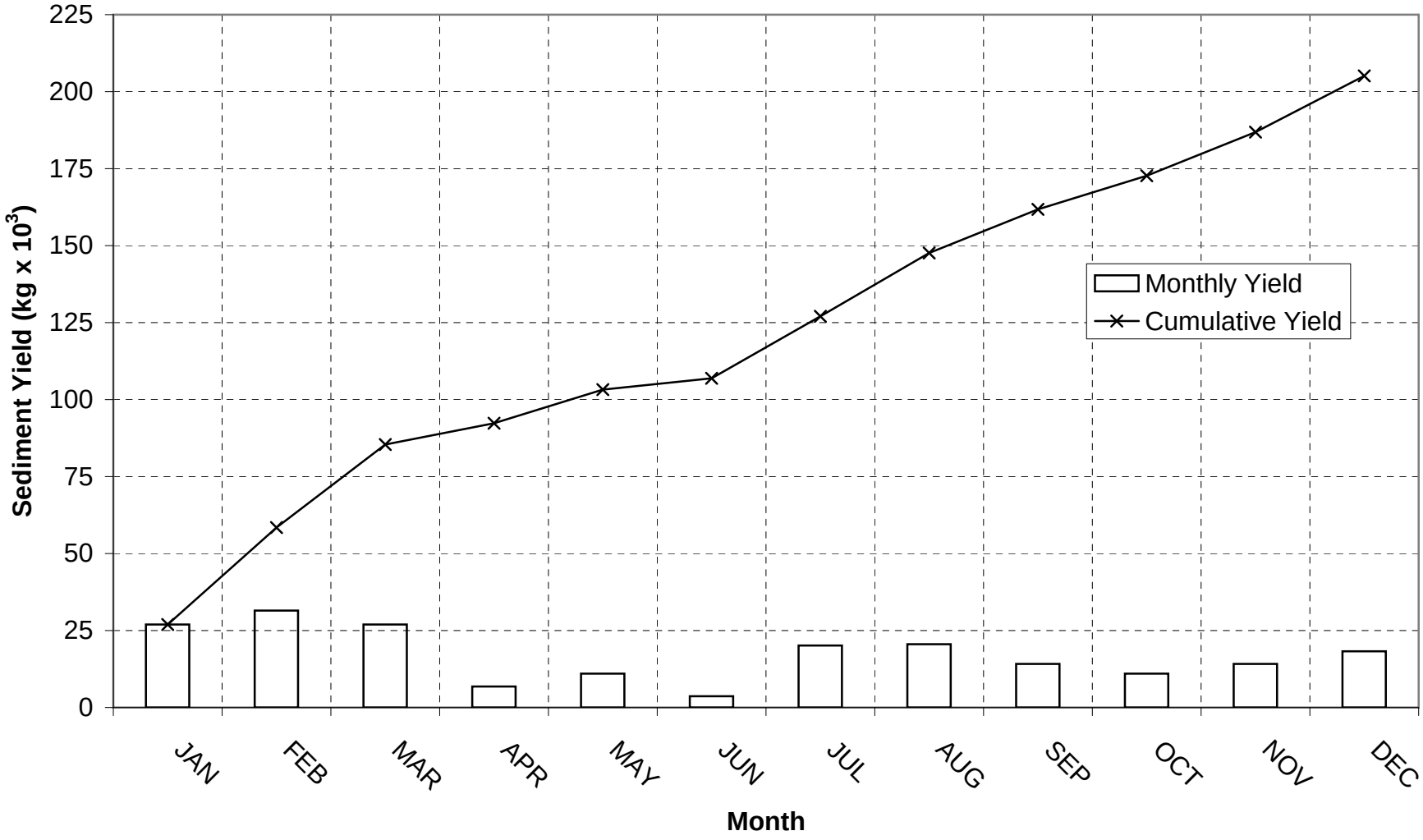

Monthly and cumulative surface erosion sediment yields from Alternative E. Average monthly rainfall depths and predicted land use types were used in the Simple Method for average monthly yield calculations.

No-Action Alternative

CTA Study Area =	13623 ac
Non Disp. Area =	1473 ac
Disposal Area =	12150 ac
Sediment Load =	1.88E+05 kg/yr

Month	Annual Rainfall	COM		IND		PAR		PUB		RES		ROA		UND		Disposal Yield	Non-Disposal[1] Yield	Monthly Yield x 10^3	Cumulative Yield x 10^3
		Area (%) = 10		Area (%) = 0		Area (%) = 5		Area (%) = 0		Area (%) = 65		Area (%) = 20		Area (%) = 0					
	P_{MON} (in)	R_{COM} (ac-ft)	Y_{COM} (kg/mo)	R_{IND} (ac-ft)	Y_{IND} (kg/mo)	R_{PAR} (ac-ft)	Y_{PAR} (kg/mo)	R_{PUB} (ac-ft)	Y_{PUB} (kg/mo)	R_{RES} (ac-ft)	Y_{RES} (kg/mo)	R_{ROA} (ac-ft)	Y_{ROA} (kg/mo)	R_{UND} (ac-ft)	Y_{UND} (kg/mo)	Y_{DIS} (kg/mo)	Y_{NDIS} (kg/mo)	Y_{MON} (kg/mo)	Y_{CUMM} (kg/mo)
JAN	0.59	5.9	5.82E+02	0.0	0.00E+00	0.3	4.30E+01	0.0	0.00E+00	17.5	2.58E+03	11.8	1.75E+04	0.0	0.00E+00	2.07E+04	3.97E+03	25	25
FEB	0.69	6.9	6.81E+02	0.0	0.00E+00	0.3	5.03E+01	0.0	0.00E+00	20.4	3.02E+03	13.8	2.04E+04	0.0	0.00E+00	2.42E+04	4.65E+03	29	53
MAR	0.59	5.9	5.82E+02	0.0	0.00E+00	0.3	4.30E+01	0.0	0.00E+00	17.5	2.58E+03	11.8	1.75E+04	0.0	0.00E+00	2.07E+04	3.97E+03	25	78
APR	0.15	1.5	1.48E+02	0.0	0.00E+00	0.1	1.09E+01	0.0	0.00E+00	4.4	6.56E+02	3.0	4.44E+03	0.0	0.00E+00	5.25E+03	1.01E+03	6	84
MAY	0.24	2.4	2.37E+02	0.0	0.00E+00	0.1	1.75E+01	0.0	0.00E+00	7.1	1.05E+03	4.8	7.10E+03	0.0	0.00E+00	8.40E+03	1.62E+03	10	94
JUN	0.08	0.8	7.89E+01	0.0	0.00E+00	0.0	5.83E+00	0.0	0.00E+00	2.4	3.50E+02	1.6	2.37E+03	0.0	0.00E+00	2.80E+03	5.39E+02	3	98
JUL	0.44	4.4	4.34E+02	0.0	0.00E+00	0.2	3.21E+01	0.0	0.00E+00	13.0	1.92E+03	8.8	1.30E+04	0.0	0.00E+00	1.54E+04	2.96E+03	18	116
AUG	0.45	4.5	4.44E+02	0.0	0.00E+00	0.2	3.28E+01	0.0	0.00E+00	13.3	1.97E+03	9.0	1.33E+04	0.0	0.00E+00	1.58E+04	3.03E+03	19	135
SEP	0.31	3.1	3.06E+02	0.0	0.00E+00	0.1	2.26E+01	0.0	0.00E+00	9.2	1.36E+03	6.2	9.17E+03	0.0	0.00E+00	1.09E+04	2.09E+03	13	148
OCT	0.24	2.4	2.37E+02	0.0	0.00E+00	0.1	1.75E+01	0.0	0.00E+00	7.1	1.05E+03	4.8	7.10E+03	0.0	0.00E+00	8.40E+03	1.62E+03	10	158
NOV	0.31	3.1	3.06E+02	0.0	0.00E+00	0.1	2.26E+01	0.0	0.00E+00	9.2	1.36E+03	6.2	9.17E+03	0.0	0.00E+00	1.09E+04	2.09E+03	13	171
DEC	0.40	4.0	3.95E+02	0.0	0.00E+00	0.2	2.91E+01	0.0	0.00E+00	11.8	1.75E+03	8.0	1.18E+04	0.0	0.00E+00	1.40E+04	2.69E+03	17	187
Total =	4.49	45.0	4.43E+03	0.0	0.00E+00	2.0	3.27E+02	0.0	0.00E+00	133.0	1.96E+04	90.0	1.33E+05	0.0	0.00E+00	1.57E+05	3.03E+04		

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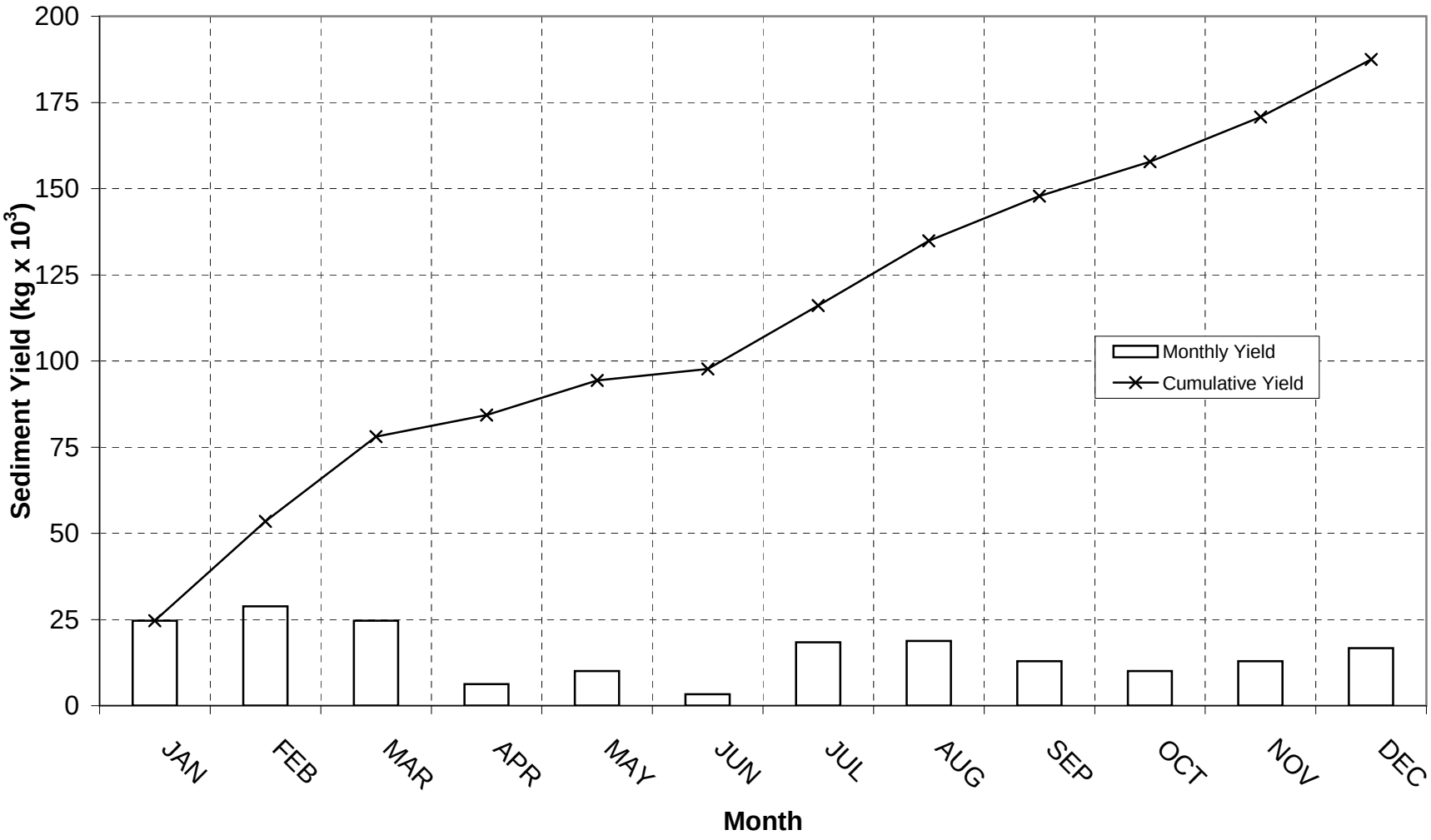

Monthly and cumulative surface erosion sediment yields from No-Action Alternative. Average monthly rainfall depths and predicted land use types were used in the Simple Method for average monthly yield calculations.

APPENDIX B
CURVE NUMBER, SOIL, AND LAG TIME CALCULATIONS

Baseline

Subbasin ID	Within CTA (ac)	Out of CTA (ac)	CN_{NONDIS}	CN_{BAS}
NW187-C	161	4	80	80
116-13	174	1	72	72
116-14	322	13	73	73
223C-21	159	2	73	73
223C-22	164	3	73	73
223C-23	123	38	73	73
223C-24	197	5	77	77
125A-15	131	11	75	75
125A-16	194	6	76	76
116-7	34	165	73	73
223C-17	155	4	73	73
223C-18	165	0	73	73
223C-19	239	0	76	76
125A-12	145	0	76	76
223C-13	154	4	73	73
125A-14	255	29	73	73
223C-14	241	0	75	75
125A-13	337	0	74	74
125A-10	153	0	74	74
125A-11	161	0	74	74
223C-9	196	5	73	73
125A-6	106	0	73	73
125A-7	245	0	73	73
125A-8	210	0	73	73
125A-9	208	1	73	73
125B-3	273	0	73	73
125B-4	245	86	73	73
223B-7	147	0	73	73
223C-1	170	0	73	73
223C-2	175	0	73	73
223C-3	172	3	73	73
223C-4	153	15	73	73
223A-2	246	0	73	73
125A-5	195	0	73	73
125A-4	203	0	73	73
125A-3	224	0	73	73
125A-1	249	0	73	73
125A-2	217	0	73	73
125B-1	197	0	73	73
125B-2	154	52	73	73
223B-2	107	15	73	73
223B-3	155	10	73	73
223B-4	152	4	73	73
223B-5	160	2	73	73
223B-6	123	0	73	73
102B	2067	3623	83	83
102A	625	3390	83	83
SOUTH	2620	6899	80	80

Upper Las Vegas Wash
SCS Lag Time Calculations for Baseline Alternative

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
116-2	U	0.415	73	0.567	100	1	9.6	8150	1.3	1.7	3.4	43.0	52.6	0.53
116-3	U	0.403	72	0.561	100	1	9.7	7000	2.6	2.4	4.7	26.3	36.1	0.36
116-4	U	0.417	72	0.560	100	1	9.7	7100	3.5	2.8	5.5	23.0	32.7	0.33
116-5	U	0.418	73	0.576	100	1	9.4	7100	3.9	2.9	5.8	21.8	31.2	0.31
116-6	U	0.413	72	0.560	100	1	9.7	7150	4.7	3.2	6.4	20.0	29.7	0.30
116-9	U	0.271	75	0.605	100	1	8.9	5400	0.3	0.8	1.6	61.0	69.9	0.70
116-10	U	0.271	75	0.597	100	1	9.1	5000	1.7	1.9	3.8	23.9	32.9	0.33
116-11	U	0.270	72	0.563	100	1	9.7	5600	2	2.1	4.2	24.4	34.1	0.34
116-12	U	0.265	72	0.560	100	1	9.7	5550	2.6	2.4	4.7	21.2	31.0	0.31
116-13	U	0.273	72	0.559	100	1	9.7	5700	0.5	1.0	2.1	49.7	59.4	0.59
116-14	U	0.293	73	0.573	100	1	9.5	5100	1	1.5	2.9	31.7	41.2	0.41
NW187-C	U	0.259	80	0.665	100	1	7.8	7150	0.6	1.1	2.3	55.9	63.8	0.64
116-1	U	0.402	73	0.573	100	1	9.5	7100	1.1	1.6	3.1	41.0	50.5	0.51
116-7	U	0.311	73	0.575	100	1	9.5	6000	0.7	1.2	2.5	44.0	53.5	0.53
116-8	U	0.328	74	0.580	100	1	9.4	6150	0.6	1.1	2.3	48.6	58.0	0.58
125A-5	U	0.234	73	0.574	100	1	9.5	5200	2.5	2.3	4.6	20.4	29.9	0.30
125A-8	U	0.328	73	0.574	100	1	9.5	3500	3.1	2.6	5.2	12.9	22.3	0.22
125A-9	U	0.326	73	0.574	100	1	9.5	3500	3.9	2.9	5.8	11.5	20.9	0.21
125A-10	U	0.239	74	0.587	100	1	9.2	5000	1.1	1.6	3.1	29.7	38.9	0.39
125A-11	U	0.253	74	0.591	100	1	9.2	5450	1.2	1.6	3.2	30.8	39.9	0.40
125A-12	U	0.225	76	0.619	100	1	8.7	4900	0.9	1.4	2.8	32.2	40.9	0.41
125A-13	U	0.519	74	0.588	100	1	9.2	8000	0.9	1.4	2.8	50.8	60.0	0.60
125A-14	U	0.443	73	0.574	100	1	9.5	6700	1.2	1.6	3.2	37.2	46.7	0.47
125A-15	U	0.219	75	0.606	100	1	8.9	4800	1	1.5	2.9	30.0	38.9	0.39
125A-16	U	0.312	76	0.611	100	1	8.8	6650	0.7	1.2	2.5	48.4	57.2	0.57
125B-1	U	0.274	73	0.574	100	1	9.5	5100	2.9	2.5	5.0	18.6	28.1	0.28
125B-2	U	0.293	73	0.574	100	1	9.5	5100	2.8	2.5	4.9	18.9	28.4	0.28
125B-3	U	0.425	73	0.574	100	1	9.5	6950	2.6	2.4	4.7	26.2	35.6	0.36
125B-4	U	0.517	73	0.574	100	1	9.5	7950	2.6	2.4	4.7	29.7	39.2	0.39
125A-1	U	0.278	73	0.574	100	1	9.5	5200	1.8	2.0	3.9	24.1	33.5	0.34

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
125A-2	U	0.269	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
125A-3	U	0.270	73	0.574	100	1	9.5	5550	2.3	2.2	4.5	22.6	32.1	0.32
125A-4	U	0.246	73	0.574	100	1	9.5	5050	2.3	2.2	4.5	20.7	30.2	0.30
125A-6	U	0.165	73	0.574	100	1	9.5	3800	2.1	2.1	4.3	16.8	26.3	0.26
125A-7	U	0.382	73	0.574	100	1	9.5	5000	2.7	2.4	4.8	19.0	28.4	0.28
213A-2	U	0.500	73	0.574	500	10	9.8	8100	3	2.6	5.1	28.1	38.0	0.38
213A-3	U	0.371	73	0.574	100	1	9.5	6850	2.6	2.4	4.7	25.8	35.3	0.35
213A-4	U	0.251	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
OFF1A-2	U	0.378	75	0.600	100	1	9.0	6500	3.4	2.7	5.4	21.5	30.5	0.31
OFF1A-3	U	0.302	74	0.581	100	1	9.3	7150	2.7	2.4	4.8	26.4	35.7	0.36
OFF1A-4	U	0.274	73	0.575	100	1	9.5	6400	2.8	2.5	4.9	23.4	32.8	0.33
213A-6	U	0.279	73	0.574	100	1	9.5	5550	1.3	1.7	3.4	30.0	39.5	0.40
213A-7	U	0.251	73	0.574	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213A-8	U	0.255	73	0.574	100	1	9.5	5450	2.2	2.2	4.4	22.7	32.2	0.32
213A-9	U	0.252	73	0.574	100	1	9.5	5300	1	1.5	2.9	32.8	42.3	0.42
213A-10	U	0.252	73	0.572	100	1	9.5	5500	2.2	2.2	4.4	22.9	32.4	0.32
213A-11	U	0.256	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-1	U	0.261	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-2	U	0.262	73	0.574	100	1	9.5	5600	2.4	2.3	4.6	22.3	31.8	0.32
213B-3	U	0.253	73	0.574	100	1	9.5	5400	2.3	2.2	4.5	22.0	31.5	0.32
213B-4	U	0.255	73	0.574	100	1	9.5	5500	2.1	2.1	4.3	23.4	32.9	0.33
213B-5	U	0.240	73	0.574	100	1	9.5	4900	1.3	1.7	3.4	26.8	36.3	0.36
213B-6	U	0.244	73	0.574	100	1	9.5	5350	2.1	2.1	4.3	22.9	32.3	0.32
213B-7	U	0.249	73	0.574	100	1	9.5	5200	1.2	1.6	3.2	29.5	38.9	0.39
223A-2	U	0.384	73	0.574	100	1	9.5	4750	2.2	2.2	4.4	20.0	29.5	0.30
223A-3	U	0.250	73	0.574	100	1	9.5	5400	2	2.1	4.2	23.6	33.1	0.33
223B-2	U	0.191	73	0.574	100	1	9.5	3450	1.7	1.9	3.8	17.1	26.6	0.27
223B-3	U	0.257	73	0.574	100	1	9.5	5500	1.6	1.9	3.7	26.9	36.3	0.36
223B-4	U	0.244	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223B-5	U	0.252	73	0.574	100	1	9.5	5450	1.5	1.8	3.6	27.5	37.0	0.37
223B-6	U	0.192	73	0.574	100	1	9.5	4600	0.9	1.4	2.8	30.4	39.9	0.40
223B-7	U	0.230	73	0.574	100	1	9.5	3800	2	2.1	4.2	17.2	26.7	0.27
223C-1	U	0.266	73	0.574	100	1	9.5	5600	1.7	1.9	3.8	26.5	36.0	0.36
223C-2	U	0.273	73	0.574	100	1	9.5	5650	1.8	2.0	3.9	26.0	35.4	0.35

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
223C-3	U	0.273	73	0.574	100	1	9.5	5650	1.8	2.0	3.9	26.0	35.4	0.35
223C-4	U	0.262	73	0.574	100	1	9.5	5600	0.9	1.4	2.8	36.4	45.9	0.46
223C-5	U	0.219	73	0.574	100	1	9.5	3100	2.5	2.3	4.6	12.9	22.4	0.22
223C-6	U	0.249	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223C-7	U	0.250	73	0.574	100	1	9.5	5350	1.7	1.9	3.8	25.4	34.9	0.35
223C-8	U	0.251	73	0.574	100	1	9.5	5450	1.7	1.9	3.8	25.8	35.3	0.35
223C-9	U	0.313	73	0.574	100	1	9.5	6000	1.3	1.7	3.4	32.3	41.8	0.42
223C-10	U	0.241	73	0.574	100	1	9.5	3900	2.4	2.3	4.6	16.1	25.6	0.26
223C-11	U	0.250	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-12	U	0.251	73	0.574	100	1	9.5	5500	2	2.1	4.2	24.0	33.5	0.33
223C-13	U	0.247	73	0.574	100	1	9.5	5350	1.9	2.0	4.1	24.0	33.5	0.34
223C-14	U	0.375	75	0.598	100	1	9.0	6700	1.3	1.7	3.4	35.8	44.8	0.45
223C-15	U	0.251	73	0.574	100	1	9.5	4100	2.4	2.3	4.6	16.8	26.3	0.26
223C-16	U	0.251	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-17	U	0.248	73	0.574	100	1	9.5	5400	1.7	1.9	3.8	25.6	35.1	0.35
223C-18	U	0.258	73	0.574	100	1	9.5	5500	1.7	1.9	3.8	26.1	35.5	0.36
223C-19	U	0.373	76	0.619	100	1	8.7	6400	1.2	1.6	3.2	35.7	44.3	0.44
223C-20	U	0.265	73	0.574	100	1	9.5	4150	2.5	2.3	4.6	16.6	26.1	0.26
223C-21	U	0.252	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223C-22	U	0.262	73	0.574	100	1	9.5	5500	1.5	1.8	3.6	27.7	37.2	0.37
223C-23	U	0.253	73	0.576	100	1	9.4	5400	1.5	1.8	3.6	27.3	36.7	0.37
223C-24	U	0.315	77	0.632	100	1	8.4	6850	1.2	1.6	3.2	38.0	46.4	0.46
NW1-C	U	0.293	81	0.676	100	1	7.6	6400	3.4	2.7	5.4	21.2	28.8	0.29
NW2-C	U	0.395	73	0.574	100	1	9.5	7300	2.2	2.2	4.4	29.8	39.3	0.39
NW5-C	U	0.275	73	0.574	100	1	9.5	5650	2.1	2.1	4.3	24.0	33.5	0.34
NW7-C	U	0.488	84	0.720	100	1	6.8	9700	3.2	2.6	5.3	32.3	39.1	0.39
NW9-C	U	0.273	73	0.574	100	1	9.5	6200	2.3	2.2	4.5	25.0	34.5	0.34
NW11-C	U	0.270	73	0.574	100	1	9.5	5600	2.6	2.4	4.7	21.4	30.9	0.31
NW17-C	U	0.430	73	0.574	100	1	9.5	7750	2.2	2.2	4.4	31.5	41.0	0.41
NW21-C	U	0.403	84	0.723	100	1	6.8	7850	3.1	2.6	5.2	26.9	33.6	0.34
NW23-C	U	0.376	73	0.574	100	1	9.5	6900	2.1	2.1	4.3	28.9	38.4	0.38
NW33-C	U	0.248	86	0.745	100	1	6.4	5400	2.8	2.5	4.9	20.0	26.4	0.26
NW35-C	U	0.434	83	0.710	100	1	7.0	5100	3.5	2.8	5.5	16.9	24.0	0.24
NW50-C	U	0.358	73	0.574	100	1	9.5	6300	3.3	2.7	5.3	21.2	30.7	0.31

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
NW51-C	U	0.306	73	0.574	100	1	9.5	5100	3.2	2.6	5.3	17.7	27.2	0.27
NW64-C	U	0.407	73	0.574	100	1	9.5	7500	2.8	2.5	4.9	27.1	36.6	0.37
NW102-C	U	0.412	73	0.574	100	1	9.5	8600	2.2	2.2	4.4	34.8	44.2	0.44
NW130-C	U	0.241	75	0.606	100	1	8.9	6550	1.5	1.8	3.6	32.6	41.5	0.42
OFF1A-5	U	0.418	73	0.574	100	1	9.5	7650	2.5	2.3	4.6	29.2	38.7	0.39
OFF1A-6	U	0.473	73	0.574	500	10	9.8	8300	3.5	2.8	5.5	26.6	36.5	0.36
OFF2A	U	0.318	73	0.574	100	1	9.5	6200	2.5	2.3	4.6	24.0	33.5	0.33
OFF2B	U	0.160	73	0.574	500	10	9.8	3700	3.5	2.8	5.5	12.7	22.5	0.23
OFF3	U	0.222	73	0.574	100	1	9.5	5200	2.4	2.3	4.6	20.8	30.3	0.30
OFF4-1	U	0.301	77	0.628	100	1	8.5	10400	6.2	3.7	7.3	24.8	33.3	0.33
OFF4-2	U	0.420	79	0.659	100	1	7.9	4600	12.7	5.3	10.5	8.1	16.0	0.16
OFF5-1	U	0.297	80	0.672	100	1	7.7	6700	6	3.6	7.2	16.6	24.4	0.24
OFF5-2	U	0.395	86	0.742	100	1	6.4	10000	4.8	3.2	6.4	27.2	33.6	0.34
OFF8	U	0.272	86	0.745	500	10	6.6	6500	3.9	2.9	5.8	20.1	26.7	0.27
OFF9	U	0.303	86	0.745	500	10	6.6	11100	4	3.0	5.9	32.9	39.5	0.39

Alternative A

Subbasin ID	Non-Disposal (ac)	Disposal (ac)	Out of CTA (ac)	CN_{NONDIS}	CN_{DIS}	CN_A
NW187-C	161	0	4	80	91	80
116-13	174	0	1	72	88	72
116-14	228	93	13	73	88	77
223C-21	159	1	2	73	88	73
223C-22	163	1	3	73	88	73
223C-23	14	109	38	73	88	83
223C-24	186	11	5	77	90	78
125A-15	131	0	11	75	90	75
125A-16	194	0	6	76	90	76
116-7	34	0	165	73	89	73
223C-17	155	0	4	73	88	73
223C-18	162	3	0	73	88	73
223C-19	177	62	0	76	89	80
125A-12	145	1	0	76	90	77
223C-13	153	1	4	73	88	73
125A-14	254	0	29	73	89	73
223C-14	241	1	0	75	89	75
125A-13	336	0	0	74	89	74
125A-10	153	0	0	74	89	74
125A-11	161	0	0	74	89	74
223C-9	196	1	5	73	88	73
125A-6	106	0	0	73	89	73
125A-7	245	1	0	73	88	73
125A-8	210	1	0	73	88	73
125A-9	209	0	1	73	88	73
125B-3	272	0	0	73	88	73
125B-4	241	5	86	73	88	73
223B-7	147	0	0	73	88	73
223C-1	170	0	0	73	88	73
223C-2	175	1	0	73	88	73
223C-3	172	1	3	73	88	73
223C-4	153	0	15	73	88	73
223A-2	246	1	0	73	88	73
125A-5	195	0	0	73	88	73
125A-4	203	0	0	73	88	73
125A-3	224	0	0	73	88	73
125A-1	249	0	0	73	88	73
125A-2	217	0	0	73	88	73
125B-1	197	0	0	73	88	73
125B-2	154	0	52	73	88	73
223B-2	107	1	15	73	88	73
223B-3	151	4	10	73	88	73
223B-4	144	8	4	73	88	74
223B-5	154	6	2	73	88	74
223B-6	123	0	0	73	88	73
102B	2061	6	3623	83	92	83
102A	620	5	3390	83	92	83
SOUTH	2114	506	6899	80	91	80

Upper Las Vegas Wash
SCS Lag Time Calculations for Alternative A

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
116-2	U	0.415	73	0.567	100	1	9.6	8150	1.3	1.7	3.4	43.0	52.6	0.53
116-3	U	0.403	72	0.561	100	1	9.7	7000	2.6	2.4	4.7	26.3	36.1	0.36
116-4	U	0.417	72	0.560	100	1	9.7	7100	3.5	2.8	5.5	23.0	32.7	0.33
116-5	U	0.418	73	0.576	100	1	9.4	7100	3.9	2.9	5.8	21.8	31.2	0.31
116-6	U	0.413	72	0.560	100	1	9.7	7150	4.7	3.2	6.4	20.0	29.7	0.30
116-9	U	0.271	75	0.605	100	1	8.9	5400	0.3	0.8	1.6	61.0	69.9	0.70
116-10	U	0.271	75	0.597	100	1	9.1	5000	1.7	1.9	3.8	23.9	32.9	0.33
116-11	U	0.270	72	0.563	100	1	9.7	5600	2	2.1	4.2	24.4	34.1	0.34
116-12	U	0.265	72	0.560	100	1	9.7	5550	2.6	2.4	4.7	21.2	31.0	0.31
116-13	U	0.273	72	0.559	100	1	9.7	5700	0.5	1.0	2.1	49.7	59.4	0.59
116-14	U	0.293	77	0.626	100	1	8.5	5100	1	1.5	2.9	31.7	40.2	0.40
NW187-C	U	0.259	80	0.665	100	1	7.8	7150	0.6	1.1	2.3	55.9	63.8	0.64
116-1	U	0.402	73	0.573	100	1	9.5	7100	1.1	1.6	3.1	41.0	50.5	0.51
116-7	U	0.311	73	0.575	100	1	9.5	6000	0.7	1.2	2.5	44.0	53.5	0.53
116-8	U	0.328	74	0.580	100	1	9.4	6150	0.6	1.1	2.3	48.6	58.0	0.58
125A-5	U	0.234	73	0.574	100	1	9.5	5200	2.5	2.3	4.6	20.4	29.9	0.30
125A-8	U	0.328	73	0.574	100	1	9.5	3500	3.1	2.6	5.2	12.9	22.3	0.22
125A-9	U	0.326	73	0.574	100	1	9.5	3500	3.9	2.9	5.8	11.5	20.9	0.21
125A-10	U	0.239	74	0.587	100	1	9.2	5000	1.1	1.6	3.1	29.7	38.9	0.39
125A-11	U	0.253	74	0.591	100	1	9.2	5450	1.2	1.6	3.2	30.8	39.9	0.40
125A-12	U	0.225	76	0.619	100	1	8.7	4900	0.9	1.4	2.8	32.2	40.9	0.41
125A-13	U	0.519	74	0.588	100	1	9.2	8000	0.9	1.4	2.8	50.8	60.0	0.60
125A-14	U	0.443	73	0.574	100	1	9.5	6700	1.2	1.6	3.2	37.2	46.7	0.47
125A-15	U	0.219	75	0.606	100	1	8.9	4800	1	1.5	2.9	30.0	38.9	0.39
125A-16	U	0.312	76	0.611	100	1	8.8	6650	0.7	1.2	2.5	48.4	57.2	0.57
125B-1	U	0.274	73	0.574	100	1	9.5	5100	2.9	2.5	5.0	18.6	28.1	0.28
125B-2	U	0.293	73	0.574	100	1	9.5	5100	2.8	2.5	4.9	18.9	28.4	0.28
125B-3	U	0.425	73	0.574	100	1	9.5	6950	2.6	2.4	4.7	26.2	35.6	0.36
125B-4	U	0.517	73	0.574	100	1	9.5	7950	2.6	2.4	4.7	29.7	39.2	0.39
125A-1	U	0.278	73	0.574	100	1	9.5	5200	1.8	2.0	3.9	24.1	33.5	0.34

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
125A-2	U	0.269	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
125A-3	U	0.270	73	0.574	100	1	9.5	5550	2.3	2.2	4.5	22.6	32.1	0.32
125A-4	U	0.246	73	0.574	100	1	9.5	5050	2.3	2.2	4.5	20.7	30.2	0.30
125A-6	U	0.165	73	0.574	100	1	9.5	3800	2.1	2.1	4.3	16.8	26.3	0.26
125A-7	U	0.382	73	0.574	100	1	9.5	5000	2.7	2.4	4.8	19.0	28.4	0.28
213A-2	U	0.500	73	0.574	500	10	9.8	8100	3	2.6	5.1	28.1	38.0	0.38
213A-3	U	0.371	73	0.574	100	1	9.5	6850	2.6	2.4	4.7	25.8	35.3	0.35
213A-4	U	0.251	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
OFF1A-2	U	0.378	74	0.591	100	1	9.2	6500	3.4	2.7	5.4	21.5	30.7	0.31
OFF1A-3	U	0.302	74	0.581	100	1	9.3	7150	2.7	2.4	4.8	26.4	35.7	0.36
OFF1A-4	U	0.274	73	0.575	100	1	9.5	6400	2.8	2.5	4.9	23.4	32.8	0.33
213A-6	U	0.279	73	0.574	100	1	9.5	5550	1.3	1.7	3.4	30.0	39.5	0.40
213A-7	U	0.251	73	0.574	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213A-8	U	0.255	73	0.574	100	1	9.5	5450	2.2	2.2	4.4	22.7	32.2	0.32
213A-9	U	0.252	73	0.574	100	1	9.5	5300	1	1.5	2.9	32.8	42.3	0.42
213A-10	U	0.252	73	0.572	100	1	9.5	5500	2.2	2.2	4.4	22.9	32.4	0.32
213A-11	U	0.256	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-1	U	0.261	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-2	U	0.262	73	0.574	100	1	9.5	5600	2.4	2.3	4.6	22.3	31.8	0.32
213B-3	U	0.253	73	0.574	100	1	9.5	5400	2.3	2.2	4.5	22.0	31.5	0.32
213B-4	U	0.255	73	0.574	100	1	9.5	5500	2.1	2.1	4.3	23.4	32.9	0.33
213B-5	U	0.240	73	0.574	100	1	9.5	4900	1.3	1.7	3.4	26.8	36.3	0.36
213B-6	U	0.244	73	0.574	100	1	9.5	5350	2.1	2.1	4.3	22.9	32.3	0.32
213B-7	U	0.249	73	0.574	100	1	9.5	5200	1.2	1.6	3.2	29.5	38.9	0.39
223A-2	U	0.384	73	0.574	100	1	9.5	4750	2.2	2.2	4.4	20.0	29.5	0.30
223A-3	U	0.250	73	0.574	100	1	9.5	5400	2	2.1	4.2	23.6	33.1	0.33
223B-2	U	0.191	73	0.574	100	1	9.5	3450	1.7	1.9	3.8	17.1	26.6	0.27
223B-3	U	0.257	73	0.574	100	1	9.5	5500	1.6	1.9	3.7	26.9	36.3	0.36
223B-4	U	0.244	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223B-5	U	0.252	73	0.574	100	1	9.5	5450	1.5	1.8	3.6	27.5	37.0	0.37
223B-6	U	0.192	73	0.574	100	1	9.5	4600	0.9	1.4	2.8	30.4	39.9	0.40
223B-7	U	0.230	73	0.574	100	1	9.5	3800	2	2.1	4.2	17.2	26.7	0.27
223C-1	U	0.266	73	0.574	100	1	9.5	5600	1.7	1.9	3.8	26.5	36.0	0.36
223C-2	U	0.273	73	0.574	100	1	9.5	5650	1.8	2.0	3.9	26.0	35.4	0.35

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
223C-3	U	0.273	73	0.574	100	1	9.5	5650	1.8	2.0	3.9	26.0	35.4	0.35
223C-4	U	0.262	73	0.574	100	1	9.5	5600	0.9	1.4	2.8	36.4	45.9	0.46
223C-5	U	0.219	73	0.574	100	1	9.5	3100	2.5	2.3	4.6	12.9	22.4	0.22
223C-6	U	0.249	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223C-7	U	0.250	73	0.574	100	1	9.5	5350	1.7	1.9	3.8	25.4	34.9	0.35
223C-8	U	0.251	73	0.574	100	1	9.5	5450	1.7	1.9	3.8	25.8	35.3	0.35
223C-9	U	0.313	73	0.574	100	1	9.5	6000	1.3	1.7	3.4	32.3	41.8	0.42
223C-10	U	0.241	73	0.574	100	1	9.5	3900	2.4	2.3	4.6	16.1	25.6	0.26
223C-11	U	0.250	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-12	U	0.251	73	0.574	100	1	9.5	5500	2	2.1	4.2	24.0	33.5	0.33
223C-13	U	0.247	73	0.574	100	1	9.5	5350	1.9	2.0	4.1	24.0	33.5	0.34
223C-14	U	0.375	75	0.598	100	1	9.0	6700	1.3	1.7	3.4	35.8	44.8	0.45
223C-15	U	0.251	73	0.574	100	1	9.5	4100	2.4	2.3	4.6	16.8	26.3	0.26
223C-16	U	0.251	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-17	U	0.248	73	0.574	100	1	9.5	5400	1.7	1.9	3.8	25.6	35.1	0.35
223C-18	U	0.258	73	0.574	100	1	9.5	5500	1.7	1.9	3.8	26.1	35.5	0.36
223C-19	U	0.373	80	0.666	100	1	7.8	6400	1.2	1.6	3.2	35.7	43.5	0.43
223C-20	U	0.265	73	0.574	100	1	9.5	4150	2.5	2.3	4.6	16.6	26.1	0.26
223C-21	U	0.252	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223C-22	U	0.262	73	0.574	100	1	9.5	5500	1.5	1.8	3.6	27.7	37.2	0.37
223C-23	U	0.253	83	0.706	100	1	7.1	5400	1.5	1.8	3.6	27.3	34.4	0.34
223C-24	U	0.315	78	0.640	100	1	8.3	6850	1.2	1.6	3.2	38.0	46.3	0.46
NW1-C	U	0.293	81	0.676	100	1	7.6	6400	3.4	2.7	5.4	21.2	28.8	0.29
NW2-C	U	0.395	73	0.574	100	1	9.5	7300	2.2	2.2	4.4	29.8	39.3	0.39
NW5-C	U	0.275	73	0.574	100	1	9.5	5650	2.1	2.1	4.3	24.0	33.5	0.34
NW7-C	U	0.488	84	0.720	100	1	6.8	9700	3.2	2.6	5.3	32.3	39.1	0.39
NW9-C	U	0.273	73	0.574	100	1	9.5	6200	2.3	2.2	4.5	25.0	34.5	0.34
NW11-C	U	0.270	73	0.574	100	1	9.5	5600	2.6	2.4	4.7	21.4	30.9	0.31
NW17-C	U	0.430	73	0.574	100	1	9.5	7750	2.2	2.2	4.4	31.5	41.0	0.41
NW21-C	U	0.403	84	0.723	100	1	6.8	7850	3.1	2.6	5.2	26.9	33.6	0.34
NW23-C	U	0.376	73	0.574	100	1	9.5	6900	2.1	2.1	4.3	28.9	38.4	0.38
NW33-C	U	0.248	86	0.745	100	1	6.4	5400	2.8	2.5	4.9	20.0	26.4	0.26
NW35-C	U	0.434	83	0.710	100	1	7.0	5100	3.5	2.8	5.5	16.9	24.0	0.24
NW50-C	U	0.358	73	0.574	100	1	9.5	6300	3.3	2.7	5.3	21.2	30.7	0.31

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	**Developed/**	**Area**	**CN**	**K**	**Length**	**Slope**	**t_i**	**Length**	**Slope**	**Velocity (fps)**		**t_t**	**t_c**	**Lag Time**
	Undeveloped	**(mi^2)**			**(ft)**	**(%)**	**(min)**	**(ft)**	**(%)**	**V_1**	**V_2**	**(min)**	**(min)**	**(hours)**
NW51-C	U	0.306	73	0.574	100	1	9.5	5100	3.2	2.6	5.3	17.7	27.2	0.27
NW64-C	U	0.407	73	0.574	100	1	9.5	7500	2.8	2.5	4.9	27.1	36.6	0.37
NW102-C	U	0.412	73	0.574	100	1	9.5	8600	2.2	2.2	4.4	34.8	44.2	0.44
NW130-C	U	0.241	75	0.606	100	1	8.9	6550	1.5	1.8	3.6	32.6	41.5	0.42
OFF1A-5	U	0.418	73	0.574	100	1	9.5	7650	2.5	2.3	4.6	29.2	38.7	0.39
OFF1A-6	U	0.473	73	0.574	500	10	9.8	8300	3.5	2.8	5.5	26.6	36.5	0.36
OFF2A	U	0.318	73	0.574	100	1	9.5	6200	2.5	2.3	4.6	24.0	33.5	0.33
OFF2B	U	0.160	73	0.574	500	10	9.8	3700	3.5	2.8	5.5	12.7	22.5	0.23
OFF3	U	0.222	73	0.574	100	1	9.5	5200	2.4	2.3	4.6	20.8	30.3	0.30
OFF4-1	U	0.301	77	0.628	100	1	8.5	10400	6.2	3.7	7.3	24.8	33.3	0.33
OFF4-2	U	0.420	79	0.659	100	1	7.9	4600	12.7	5.3	10.5	8.1	16.0	0.16
OFF5-1	U	0.297	80	0.672	100	1	7.7	6700	6	3.6	7.2	16.6	24.4	0.24
OFF5-2	U	0.395	86	0.742	100	1	6.4	10000	4.8	3.2	6.4	27.2	33.6	0.34
OFF8	U	0.272	86	0.745	500	10	6.6	6500	3.9	2.9	5.8	20.1	26.7	0.27
OFF9	U	0.303	86	0.745	500	10	6.6	11100	4	3.0	5.9	32.9	39.5	0.39

Alternative B

Subbasin ID	Non-Disposal (ac)	Disposal (ac)	Out of CTA (ac)	CN_{NONDIS}	CN_{DIS}	CN_B
NW187-C	161	1	4	80	91	80
116-13	174	0	1	72	88	72
116-14	306	16	13	73	88	74
223C-21	0	159	2	73	88	88
223C-22	0	164	3	73	88	88
223C-23	46	77	38	73	88	80
223C-24	197	0	5	77	90	77
125A-15	131	0	11	75	90	75
125A-16	194	1	6	76	90	76
116-7	34	0	165	73	89	73
223C-17	0	155	4	73	88	88
223C-18	16	149	0	73	88	87
223C-19	226	13	0	76	89	77
125A-12	144	1	0	76	90	77
223C-13	10	144	4	73	88	87
125A-14	254	1	29	73	89	73
223C-14	210	31	0	75	89	77
125A-13	336	1	0	74	89	74
125A-10	153	0	0	74	89	74
125A-11	161	0	0	74	89	74
223C-9	164	32	5	73	88	75
125A-6	106	1	0	73	89	73
125A-7	245	1	0	73	88	73
125A-8	209	1	0	73	88	73
125A-9	208	0	1	73	88	73
125B-3	272	1	0	73	88	73
125B-4	244	1	86	73	88	73
223B-7	0	147	0	73	88	88
223C-1	0	170	0	73	88	88
223C-2	175	0	0	73	88	73
223C-3	172	1	3	73	88	73
223C-4	153	0	15	73	88	73
223A-2	0	246	0	73	88	88
125A-5	195	1	0	73	88	73
125A-4	203	1	0	73	88	73
125A-3	224	1	0	73	88	73
125A-1	249	1	0	73	88	73
125A-2	216	2	0	73	88	73
125B-1	197	1	0	73	88	73
125B-2	154	0	52	73	88	73
223B-2	0	107	15	73	88	86
223B-3	0	155	10	73	88	87
223B-4	0	152	4	73	88	88
223B-5	160	0	2	73	88	73
223B-6	123	0	0	73	88	73
102B	1803	264	3623	83	92	83
102A	625	0	3390	83	92	83
SOUTH	2135	485	6899	80	91	80

Upper Las Vegas Wash
SCS Lag Time Calculations for Alternative B

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
116-2	U	0.415	73	0.567	100	1	9.6	8150	1.3	1.7	3.4	43.0	52.6	0.53
116-3	U	0.403	72	0.561	100	1	9.7	7000	2.6	2.4	4.7	26.3	36.1	0.36
116-4	U	0.417	72	0.560	100	1	9.7	7100	3.5	2.8	5.5	23.0	32.7	0.33
116-5	U	0.418	73	0.576	100	1	9.4	7100	3.9	2.9	5.8	21.8	31.2	0.31
116-6	U	0.413	72	0.560	100	1	9.7	7150	4.7	3.2	6.4	20.0	29.7	0.30
116-9	U	0.271	75	0.605	100	1	8.9	5400	0.3	0.8	1.6	61.0	69.9	0.70
116-10	U	0.271	75	0.597	100	1	9.1	5000	1.7	1.9	3.8	23.9	32.9	0.33
116-11	U	0.270	72	0.563	100	1	9.7	5600	2	2.1	4.2	24.4	34.1	0.34
116-12	U	0.265	72	0.560	100	1	9.7	5550	2.6	2.4	4.7	21.2	31.0	0.31
116-13	U	0.273	72	0.559	100	1	9.7	5700	0.5	1.0	2.1	49.7	59.4	0.59
116-14	U	0.293	74	0.587	100	1	9.2	5100	1	1.5	2.9	31.7	40.9	0.41
NW187-C	U	0.259	80	0.665	100	1	7.8	7150	0.6	1.1	2.3	55.9	63.8	0.64
116-1	U	0.402	73	0.573	100	1	9.5	7100	1.1	1.6	3.1	41.0	50.5	0.51
116-7	U	0.311	73	0.575	100	1	9.5	6000	0.7	1.2	2.5	44.0	53.5	0.53
116-8	U	0.328	74	0.580	100	1	9.4	6150	0.6	1.1	2.3	48.6	58.0	0.58
125A-5	U	0.234	73	0.574	100	1	9.5	5200	2.5	2.3	4.6	20.4	29.9	0.30
125A-8	U	0.328	73	0.574	100	1	9.5	3500	3.1	2.6	5.2	12.9	22.3	0.22
125A-9	U	0.326	73	0.574	100	1	9.5	3500	3.9	2.9	5.8	11.5	20.9	0.21
125A-10	U	0.239	74	0.587	100	1	9.2	5000	1.1	1.6	3.1	29.7	38.9	0.39
125A-11	U	0.253	74	0.591	100	1	9.2	5450	1.2	1.6	3.2	30.8	39.9	0.40
125A-12	U	0.225	76	0.619	100	1	8.7	4900	0.9	1.4	2.8	32.2	40.9	0.41
125A-13	U	0.519	74	0.588	100	1	9.2	8000	0.9	1.4	2.8	50.8	60.0	0.60
125A-14	U	0.443	73	0.574	100	1	9.5	6700	1.2	1.6	3.2	37.2	46.7	0.47
125A-15	U	0.219	75	0.606	100	1	8.9	4800	1	1.5	2.9	30.0	38.9	0.39
125A-16	U	0.312	76	0.611	100	1	8.8	6650	0.7	1.2	2.5	48.4	57.2	0.57
125B-1	U	0.274	73	0.574	100	1	9.5	5100	2.9	2.5	5.0	18.6	28.1	0.28
125B-2	U	0.293	73	0.574	100	1	9.5	5100	2.8	2.5	4.9	18.9	28.4	0.28
125B-3	U	0.425	73	0.574	100	1	9.5	6950	2.6	2.4	4.7	26.2	35.6	0.36
125B-4	U	0.517	73	0.574	100	1	9.5	7950	2.6	2.4	4.7	29.7	39.2	0.39
125A-1	U	0.278	73	0.574	100	1	9.5	5200	1.8	2.0	3.9	24.1	33.5	0.34

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
125A-2	U	0.269	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
125A-3	U	0.270	73	0.574	100	1	9.5	5550	2.3	2.2	4.5	22.6	32.1	0.32
125A-4	U	0.246	73	0.574	100	1	9.5	5050	2.3	2.2	4.5	20.7	30.2	0.30
125A-6	U	0.165	73	0.574	100	1	9.5	3800	2.1	2.1	4.3	16.8	26.3	0.26
125A-7	U	0.382	73	0.574	100	1	9.5	5000	2.7	2.4	4.8	19.0	28.4	0.28
213A-2	U	0.500	73	0.574	500	10	9.8	8100	3	2.6	5.1	28.1	38.0	0.38
213A-3	U	0.371	73	0.574	100	1	9.5	6850	2.6	2.4	4.7	25.8	35.3	0.35
213A-4	U	0.251	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
OFF1A-2	U	0.378	74	0.591	100	1	9.2	6500	3.4	2.7	5.4	21.5	30.7	0.31
OFF1A-3	U	0.302	74	0.581	100	1	9.3	7150	2.7	2.4	4.8	26.4	35.7	0.36
OFF1A-4	U	0.274	73	0.575	100	1	9.5	6400	2.8	2.5	4.9	23.4	32.8	0.33
213A-6	U	0.279	73	0.574	100	1	9.5	5550	1.3	1.7	3.4	30.0	39.5	0.40
213A-7	U	0.251	73	0.574	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213A-8	U	0.255	73	0.574	100	1	9.5	5450	2.2	2.2	4.4	22.7	32.2	0.32
213A-9	U	0.252	73	0.574	100	1	9.5	5300	1	1.5	2.9	32.8	42.3	0.42
213A-10	U	0.252	73	0.572	100	1	9.5	5500	2.2	2.2	4.4	22.9	32.4	0.32
213A-11	U	0.256	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-1	U	0.261	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-2	U	0.262	73	0.574	100	1	9.5	5600	2.4	2.3	4.6	22.3	31.8	0.32
213B-3	U	0.253	73	0.574	100	1	9.5	5400	2.3	2.2	4.5	22.0	31.5	0.32
213B-4	U	0.255	73	0.574	100	1	9.5	5500	2.1	2.1	4.3	23.4	32.9	0.33
213B-5	U	0.240	73	0.574	100	1	9.5	4900	1.3	1.7	3.4	26.8	36.3	0.36
213B-6	U	0.244	73	0.574	100	1	9.5	5350	2.1	2.1	4.3	22.9	32.3	0.32
213B-7	U	0.249	73	0.574	100	1	9.5	5200	1.2	1.6	3.2	29.5	38.9	0.39
223A-2	D	0.384	88	0.772	100	1	5.9	4750	2.2	3.0	4.5	18.4	24.3	0.24
223A-3	U	0.250	73	0.574	100	1	9.5	5400	2	2.1	4.2	23.6	33.1	0.33
223B-2	U	0.191	86	0.745	100	1	6.4	3450	1.7	1.9	3.8	17.1	23.5	0.24
223B-3	D	0.257	87	0.758	100	1	6.1	5500	1.6	2.6	3.9	24.8	30.9	0.31
223B-4	D	0.244	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.29
223B-5	U	0.252	73	0.574	100	1	9.5	5450	1.5	1.8	3.6	27.5	37.0	0.37
223B-6	U	0.192	73	0.574	100	1	9.5	4600	0.9	1.4	2.8	30.4	39.9	0.40
223B-7	D	0.230	88	0.772	100	1	5.9	3800	2	2.9	4.3	15.6	21.5	0.22
223C-1	D	0.266	88	0.772	100	1	5.9	5600	1.7	2.6	4.0	24.5	30.4	0.30
223C-2	U	0.273	73	0.574	100	1	9.5	5650	1.8	2.0	3.9	26.0	35.4	0.35

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
223C-3	U	0.273	73	0.574	100	1	9.5	5650	1.8	2.0	3.9	26.0	35.4	0.35
223C-4	U	0.262	73	0.574	100	1	9.5	5600	0.9	1.4	2.8	36.4	45.9	0.46
223C-5	U	0.219	73	0.574	100	1	9.5	3100	2.5	2.3	4.6	12.9	22.4	0.22
223C-6	U	0.249	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223C-7	U	0.250	73	0.574	100	1	9.5	5350	1.7	1.9	3.8	25.4	34.9	0.35
223C-8	U	0.251	73	0.574	100	1	9.5	5450	1.7	1.9	3.8	25.8	35.3	0.35
223C-9	U	0.313	73	0.574	100	1	9.5	6000	1.3	1.7	3.4	32.3	41.8	0.42
223C-10	U	0.241	73	0.574	100	1	9.5	3900	2.4	2.3	4.6	16.1	25.6	0.26
223C-11	U	0.250	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-12	U	0.251	73	0.574	100	1	9.5	5500	2	2.1	4.2	24.0	33.5	0.33
223C-13	D	0.247	87	0.758	100	1	6.1	5350	1.9	2.8	4.2	22.2	28.3	0.28
223C-14	U	0.375	77	0.626	100	1	8.5	6700	1.3	1.7	3.4	35.8	44.3	0.44
223C-15	U	0.251	73	0.574	100	1	9.5	4100	2.4	2.3	4.6	16.8	26.3	0.26
223C-16	U	0.251	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-17	D	0.248	88	0.772	100	1	5.9	5400	1.7	2.6	4.0	23.6	29.5	0.30
223C-18	D	0.258	87	0.758	100	1	6.1	5500	1.7	2.6	4.0	24.1	30.2	0.30
223C-19	U	0.373	77	0.626	100	1	8.5	6400	1.2	1.6	3.2	35.7	44.2	0.44
223C-20	U	0.265	73	0.574	100	1	9.5	4150	2.5	2.3	4.6	16.6	26.1	0.26
223C-21	D	0.252	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.29
223C-22	D	0.262	88	0.772	100	1	5.9	5500	1.5	2.5	3.7	25.6	31.5	0.32
223C-23	U	0.253	80	0.666	100	1	7.8	5400	1.5	1.8	3.6	27.3	35.1	0.35
223C-24	U	0.315	77	0.632	100	1	8.4	6850	1.2	1.6	3.2	38.0	46.4	0.46
NW1-C	U	0.293	81	0.676	100	1	7.6	6400	3.4	2.7	5.4	21.2	28.8	0.29
NW2-C	U	0.395	73	0.574	100	1	9.5	7300	2.2	2.2	4.4	29.8	39.3	0.39
NW5-C	U	0.275	73	0.574	100	1	9.5	5650	2.1	2.1	4.3	24.0	33.5	0.34
NW7-C	U	0.488	84	0.720	100	1	6.8	9700	3.2	2.6	5.3	32.3	39.1	0.39
NW9-C	U	0.273	73	0.574	100	1	9.5	6200	2.3	2.2	4.5	25.0	34.5	0.34
NW11-C	U	0.270	73	0.574	100	1	9.5	5600	2.6	2.4	4.7	21.4	30.9	0.31
NW17-C	U	0.430	73	0.574	100	1	9.5	7750	2.2	2.2	4.4	31.5	41.0	0.41
NW21-C	U	0.403	84	0.723	100	1	6.8	7850	3.1	2.6	5.2	26.9	33.6	0.34
NW23-C	U	0.376	73	0.574	100	1	9.5	6900	2.1	2.1	4.3	28.9	38.4	0.38
NW33-C	U	0.248	86	0.745	100	1	6.4	5400	2.8	2.5	4.9	20.0	26.4	0.26
NW35-C	U	0.434	83	0.710	100	1	7.0	5100	3.5	2.8	5.5	16.9	24.0	0.24
NW50-C	U	0.358	73	0.574	100	1	9.5	6300	3.3	2.7	5.3	21.2	30.7	0.31

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	**Developed/**	**Area**	**CN**	**K**	**Length**	**Slope**	**t_i**	**Length**	**Slope**	**Velocity (fps)**		**t_t**	**t_c**	**Lag Time**
	Undeveloped	**(mi^2)**			**(ft)**	**(%)**	**(min)**	**(ft)**	**(%)**	**V_1**	**V_2**	**(min)**	**(min)**	**(hours)**
NW51-C	U	0.306	73	0.574	100	1	9.5	5100	3.2	2.6	5.3	17.7	27.2	0.27
NW64-C	U	0.407	73	0.574	100	1	9.5	7500	2.8	2.5	4.9	27.1	36.6	0.37
NW102-C	U	0.412	73	0.574	100	1	9.5	8600	2.2	2.2	4.4	34.8	44.2	0.44
NW130-C	U	0.241	75	0.606	100	1	8.9	6550	1.5	1.8	3.6	32.6	41.5	0.42
OFF1A-5	U	0.418	73	0.574	100	1	9.5	7650	2.5	2.3	4.6	29.2	38.7	0.39
OFF1A-6	U	0.473	73	0.574	500	10	9.8	8300	3.5	2.8	5.5	26.6	36.5	0.36
OFF2A	U	0.318	73	0.574	100	1	9.5	6200	2.5	2.3	4.6	24.0	33.5	0.33
OFF2B	U	0.160	73	0.574	500	10	9.8	3700	3.5	2.8	5.5	12.7	22.5	0.23
OFF3	U	0.222	73	0.574	100	1	9.5	5200	2.4	2.3	4.6	20.8	30.3	0.30
OFF4-1	U	0.301	77	0.628	100	1	8.5	10400	6.2	3.7	7.3	24.8	33.3	0.33
OFF4-2	U	0.420	79	0.659	100	1	7.9	4600	12.7	5.3	10.5	8.1	16.0	0.16
OFF5-1	U	0.297	80	0.672	100	1	7.7	6700	6	3.6	7.2	16.6	24.4	0.24
OFF5-2	U	0.395	86	0.742	100	1	6.4	10000	4.8	3.2	6.4	27.2	33.6	0.34
OFF8	U	0.272	86	0.745	500	10	6.6	6500	3.9	2.9	5.8	20.1	26.7	0.27
OFF9	U	0.303	86	0.745	500	10	6.6	11100	4	3.0	5.9	32.9	39.5	0.39

Alternative C

Subbasin ID	Non-Disposal (ac)	Disposal (ac)	Out of CTA (ac)	CN_{NONDIS}	CN_{DIS}	CN_C
NW187-C	161	0	4	80	91	80
116-13	174	0	1	72	88	72
116-14	228	93	13	73	88	77
223C-21	0	159	2	73	88	88
223C-22	0	164	3	73	88	88
223C-23	14	109	38	73	88	83
223C-24	186	11	5	77	90	78
125A-15	132	0	11	75	90	75
125A-16	194	0	6	76	90	76
116-7	34	0	165	73	89	73
223C-17	0	155	4	73	88	88
223C-18	0	165	0	73	88	88
223C-19	178	62	0	76	89	80
125A-12	145	1	0	76	90	77
223C-13	0	154	4	73	88	88
125A-14	227	27	29	73	89	75
223C-14	168	74	0	75	89	79
125A-13	311	25	0	74	89	75
125A-10	153	0	0	74	89	74
125A-11	149	12	0	74	89	75
223C-9	149	47	5	73	88	77
125A-6	105	1	0	73	89	73
125A-7	185	61	0	73	88	77
125A-8	50	161	0	73	88	84
125A-9	0	208	1	73	88	88
125B-3	0	273	0	73	88	88
125B-4	0	245	86	73	88	84
223B-7	0	147	0	73	88	88
223C-1	0	170	0	73	88	88
223C-2	0	175	0	73	88	88
223C-3	28	144	3	73	88	85
223C-4	119	34	15	73	88	76
223A-2	0	246	0	73	88	88
125A-5	0	195	0	73	88	88
125A-4	0	203	0	73	88	88
125A-3	0	224	0	73	88	88
125A-1	199	50	0	73	88	76
125A-2	46	171	0	73	88	85
125B-1	0	197	0	73	88	88
125B-2	0	154	52	73	88	84
223B-2	0	107	15	73	88	86
223B-3	0	155	10	73	88	87
223B-4	0	152	4	73	88	88
223B-5	25	136	2	73	88	86
223B-6	118	5	0	73	88	74
102B	414	1653	3623	83	92	86
102A	307	318	3390	83	92	84
SOUTH	2111	509	6899	80	91	80

Upper Las Vegas Wash
SCS Lag Time Calculations for Alternative C

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
116-2	U	0.415	73	0.567	100	1	9.6	8150	1.3	1.7	3.4	43.0	52.6	0.526
116-3	U	0.403	72	0.561	100	1	9.7	7000	2.6	2.4	4.7	26.3	36.1	0.361
116-4	U	0.417	72	0.560	100	1	9.7	7100	3.5	2.8	5.5	23.0	32.7	0.327
116-5	U	0.418	73	0.576	100	1	9.4	7100	3.9	2.9	5.8	21.8	31.2	0.312
116-6	U	0.413	72	0.560	100	1	9.7	7150	4.7	3.2	6.4	20.0	29.7	0.297
116-9	U	0.271	75	0.605	100	1	8.9	5400	0.3	0.8	1.6	61.0	69.9	0.699
116-10	U	0.271	75	0.597	100	1	9.1	5000	1.7	1.9	3.8	23.9	32.9	0.329
116-11	U	0.270	72	0.563	100	1	9.7	5600	2	2.1	4.2	24.4	34.1	0.341
116-12	U	0.265	72	0.560	100	1	9.7	5550	2.6	2.4	4.7	21.2	31.0	0.310
116-13	U	0.273	72	0.559	100	1	9.7	5700	0.5	1.0	2.1	49.7	59.4	0.594
116-14	U	0.293	77	0.626	100	1	8.5	5100	1	1.5	2.9	31.7	40.2	0.402
NW187-C	U	0.259	80	0.665	100	1	7.8	7150	0.6	1.1	2.3	55.9	63.8	0.638
116-1	U	0.402	73	0.573	100	1	9.5	7100	1.1	1.6	3.1	41.0	50.5	0.505
116-7	U	0.311	73	0.575	100	1	9.5	6000	0.7	1.2	2.5	44.0	53.5	0.535
116-8	U	0.328	74	0.580	100	1	9.4	6150	0.6	1.1	2.3	48.6	58.0	0.580
125A-5	D	0.234	88	0.772	100	1	5.9	5200	2.5	3.2	4.8	18.8	24.7	0.247
125A-8	D	0.328	84	0.719	100	1	6.9	3500	3.1	3.6	5.4	11.6	18.5	0.185
125A-9	D	0.326	88	0.772	100	1	5.9	3500	3.9	4.0	6.0	10.4	16.3	0.163
125A-10	U	0.239	74	0.587	100	1	9.2	5000	1.1	1.6	3.1	29.7	38.9	0.389
125A-11	U	0.253	75	0.600	100	1	9.0	5450	1.2	1.6	3.2	30.8	39.8	0.398
125A-12	U	0.225	76	0.619	100	1	8.7	4900	0.9	1.4	2.8	32.2	40.9	0.409
125A-13	U	0.519	75	0.600	100	1	9.0	8000	0.9	1.4	2.8	50.8	59.8	0.598
125A-14	U	0.443	75	0.600	100	1	9.0	6700	1.2	1.6	3.2	37.2	46.2	0.462
125A-15	U	0.219	75	0.606	100	1	8.9	4800	1	1.5	2.9	30.0	38.9	0.389
125A-16	U	0.312	76	0.611	100	1	8.8	6650	0.7	1.2	2.5	48.4	57.2	0.572
125B-1	D	0.274	88	0.772	100	1	5.9	5100	2.9	3.4	5.2	17.1	23.0	0.230
125B-2	D	0.293	84	0.719	100	1	6.9	5100	2.8	3.4	5.1	17.4	24.3	0.243
125B-3	D	0.425	88	0.772	100	1	5.9	6950	2.6	3.3	4.9	24.3	30.3	0.303
125B-4	D	0.517	84	0.719	100	1	6.9	7950	2.6	3.3	4.9	27.7	34.6	0.346
125A-1	U	0.278	76	0.613	100	1	8.8	5200	1.8	2.0	3.9	24.1	32.8	0.328

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
125A-2	D	0.269	85	0.732	100	1	6.6	5550	2.5	3.2	4.8	20.0	26.6	0.266
125A-3	D	0.270	88	0.772	100	1	5.9	5550	2.3	3.1	4.6	20.9	26.8	0.268
125A-4	D	0.246	88	0.772	100	1	5.9	5050	2.3	3.1	4.6	19.1	25.0	0.250
125A-6	U	0.165	73	0.574	100	1	9.5	3800	2.1	2.1	4.3	16.8	26.3	0.263
125A-7	U	0.382	77	0.626	100	1	8.5	5000	2.7	2.4	4.8	19.0	27.5	0.275
213A-2	U	0.500	73	0.574	500	10	9.8	8100	3	2.6	5.1	28.1	38.0	0.380
213A-3	U	0.371	73	0.574	100	1	9.5	6850	2.6	2.4	4.7	25.8	35.3	0.353
213A-4	U	0.251	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.311
OFF1A-2	U	0.378	74	0.591	100	1	9.2	6500	3.4	2.7	5.4	21.5	30.7	0.307
OFF1A-3	U	0.302	74	0.581	100	1	9.3	7150	2.7	2.4	4.8	26.4	35.7	0.357
OFF1A-4	U	0.274	73	0.575	100	1	9.5	6400	2.8	2.5	4.9	23.4	32.8	0.328
213A-6	U	0.279	73	0.574	100	1	9.5	5550	1.3	1.7	3.4	30.0	39.5	0.395
213A-7	U	0.251	73	0.574	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.319
213A-8	U	0.255	73	0.574	100	1	9.5	5450	2.2	2.2	4.4	22.7	32.2	0.322
213A-9	U	0.252	73	0.574	100	1	9.5	5300	1	1.5	2.9	32.8	42.3	0.423
213A-10	U	0.252	73	0.572	100	1	9.5	5500	2.2	2.2	4.4	22.9	32.4	0.324
213A-11	U	0.256	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.319
213B-1	U	0.261	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.319
213B-2	U	0.262	73	0.574	100	1	9.5	5600	2.4	2.3	4.6	22.3	31.8	0.318
213B-3	U	0.253	73	0.574	100	1	9.5	5400	2.3	2.2	4.5	22.0	31.5	0.315
213B-4	U	0.255	73	0.574	100	1	9.5	5500	2.1	2.1	4.3	23.4	32.9	0.329
213B-5	U	0.240	73	0.574	100	1	9.5	4900	1.3	1.7	3.4	26.8	36.3	0.363
213B-6	U	0.244	73	0.574	100	1	9.5	5350	2.1	2.1	4.3	22.9	32.3	0.323
213B-7	U	0.249	73	0.574	100	1	9.5	5200	1.2	1.6	3.2	29.5	38.9	0.389
223A-2	D	0.384	88	0.772	100	1	5.9	4750	2.2	3.0	4.5	18.4	24.3	0.243
223A-3	U	0.250	73	0.574	100	1	9.5	5400	2	2.1	4.2	23.6	33.1	0.331
223B-2	D	0.191	86	0.745	100	1	6.4	3450	1.7	2.6	4.0	15.5	21.9	0.219
223B-3	D	0.257	87	0.758	100	1	6.1	5500	1.6	2.6	3.9	24.8	30.9	0.309
223B-4	D	0.244	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.289
223B-5	D	0.252	86	0.745	100	1	6.4	5450	1.5	2.5	3.7	25.4	31.8	0.318
223B-6	U	0.192	74	0.587	100	1	9.2	4600	0.9	1.4	2.8	30.4	39.7	0.397
223B-7	D	0.230	88	0.772	100	1	5.9	3800	2	2.9	4.3	15.6	21.5	0.215
223C-1	D	0.266	88	0.772	100	1	5.9	5600	1.7	2.6	4.0	24.5	30.4	0.304
223C-2	D	0.273	88	0.772	100	1	5.9	5650	1.8	2.7	4.1	24.0	29.9	0.299

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
223C-3	D	0.273	85	0.732	100	1	6.6	5650	1.8	2.7	4.1	24.0	30.6	0.306
223C-4	D	0.262	76	0.613	100	1	8.8	5600	0.9	1.9	2.9	33.6	42.4	0.424
223C-5	U	0.219	73	0.574	100	1	9.5	3100	2.5	2.3	4.6	12.9	22.4	0.224
223C-6	U	0.249	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.344
223C-7	U	0.250	73	0.574	100	1	9.5	5350	1.7	1.9	3.8	25.4	34.9	0.349
223C-8	U	0.251	73	0.574	100	1	9.5	5450	1.7	1.9	3.8	25.8	35.3	0.353
223C-9	U	0.313	77	0.626	100	1	8.5	6000	1.3	1.7	3.4	32.3	40.8	0.408
223C-10	U	0.241	73	0.574	100	1	9.5	3900	2.4	2.3	4.6	16.1	25.6	0.256
223C-11	U	0.250	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.337
223C-12	U	0.251	73	0.574	100	1	9.5	5500	2	2.1	4.2	24.0	33.5	0.335
223C-13	D	0.247	88	0.772	100	1	5.9	5350	1.9	2.8	4.2	22.2	28.1	0.281
223C-14	U	0.375	79	0.653	100	1	8.0	6700	1.3	1.7	3.4	35.8	43.8	0.438
223C-15	U	0.251	73	0.574	100	1	9.5	4100	2.4	2.3	4.6	16.8	26.3	0.263
223C-16	U	0.251	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.337
223C-17	D	0.248	88	0.772	100	1	5.9	5400	1.7	2.6	4.0	23.6	29.5	0.295
223C-18	D	0.258	88	0.772	100	1	5.9	5500	1.7	2.6	4.0	24.1	30.0	0.300
223C-19	D	0.373	80	0.666	100	1	7.8	6400	1.2	2.2	3.4	33.1	40.9	0.409
223C-20	U	0.265	73	0.574	100	1	9.5	4150	2.5	2.3	4.6	16.6	26.1	0.261
223C-21	D	0.252	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.289
223C-22	D	0.262	88	0.772	100	1	5.9	5500	1.5	2.5	3.7	25.6	31.5	0.315
223C-23	D	0.253	83	0.706	100	1	7.1	5400	1.5	2.5	3.7	25.2	32.3	0.323
223C-24	U	0.315	78	0.640	100	1	8.3	6850	1.2	1.6	3.2	38.0	46.3	0.463
NW1-C	U	0.293	81	0.676	100	1	7.6	6400	3.4	2.7	5.4	21.2	28.8	0.288
NW2-C	U	0.395	73	0.574	100	1	9.5	7300	2.2	2.2	4.4	29.8	39.3	0.393
NW5-C	U	0.275	73	0.574	100	1	9.5	5650	2.1	2.1	4.3	24.0	33.5	0.335
NW7-C	U	0.488	84	0.720	100	1	6.8	9700	3.2	2.6	5.3	32.3	39.1	0.391
NW9-C	U	0.273	73	0.574	100	1	9.5	6200	2.3	2.2	4.5	25.0	34.5	0.345
NW11-C	U	0.270	73	0.574	100	1	9.5	5600	2.6	2.4	4.7	21.4	30.9	0.309
NW17-C	U	0.430	73	0.574	100	1	9.5	7750	2.2	2.2	4.4	31.5	41.0	0.410
NW21-C	U	0.403	84	0.723	100	1	6.8	7850	3.1	2.6	5.2	26.9	33.6	0.336
NW23-C	U	0.376	73	0.574	100	1	9.5	6900	2.1	2.1	4.3	28.9	38.4	0.384
NW33-C	U	0.248	86	0.745	100	1	6.4	5400	2.8	2.5	4.9	20.0	26.4	0.264
NW35-C	U	0.434	83	0.710	100	1	7.0	5100	3.5	2.8	5.5	16.9	24.0	0.240
NW50-C	U	0.358	73	0.574	100	1	9.5	6300	3.3	2.7	5.3	21.2	30.7	0.307

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	**Developed/**	**Area**	**CN**	**K**	**Length**	**Slope**	**t_i**	**Length**	**Slope**	**Velocity (fps)**		**t_t**	**t_c**	**Lag Time**
	Undeveloped	**(mi^2)**			**(ft)**	**(%)**	**(min)**	**(ft)**	**(%)**	**V_1**	**V_2**	**(min)**	**(min)**	**(hours)**
NW51-C	U	0.306	73	0.574	100	1	9.5	5100	3.2	2.6	5.3	17.7	27.2	0.272
NW64-C	U	0.407	73	0.574	100	1	9.5	7500	2.8	2.5	4.9	27.1	36.6	0.366
NW102-C	U	0.412	73	0.574	100	1	9.5	8600	2.2	2.2	4.4	34.8	44.2	0.442
NW130-C	U	0.241	75	0.606	100	1	8.9	6550	1.5	1.8	3.6	32.6	41.5	0.415
OFF1A-5	U	0.418	73	0.574	100	1	9.5	7650	2.5	2.3	4.6	29.2	38.7	0.387
OFF1A-6	U	0.473	73	0.574	500	10	9.8	8300	3.5	2.8	5.5	26.6	36.5	0.365
OFF2A	U	0.318	73	0.574	100	1	9.5	6200	2.5	2.3	4.6	24.0	33.5	0.335
OFF2B	U	0.160	73	0.574	500	10	9.8	3700	3.5	2.8	5.5	12.7	22.5	0.225
OFF3	U	0.222	73	0.574	100	1	9.5	5200	2.4	2.3	4.6	20.8	30.3	0.303
OFF4-1	U	0.301	77	0.628	100	1	8.5	10400	6.2	3.7	7.3	24.8	33.3	0.333
OFF4-2	U	0.420	79	0.659	100	1	7.9	4600	12.7	5.3	10.5	8.1	16.0	0.160
OFF5-1	U	0.297	80	0.672	100	1	7.7	6700	6	3.6	7.2	16.6	24.4	0.244
OFF5-2	U	0.395	86	0.742	100	1	6.4	10000	4.8	3.2	6.4	27.2	33.6	0.336
OFF8	U	0.272	86	0.745	500	10	6.6	6500	3.9	2.9	5.8	20.1	26.7	0.267
OFF9	U	0.303	86	0.745	500	10	6.6	11100	4	3.0	5.9	32.9	39.5	0.395

Alternative D

Subbasin ID	Non-Disposal (ac)	Disposal (ac)	Out of CTA (ac)	CN_{NONDIS}	CN_{DIS}	CN_D
NW187-C	161	0	4	80	91	80
116-13	174	0	1	72	88	72
116-14	228	93	13	73	88	77
223C-21	0	159	2	73	88	88
223C-22	0	164	3	73	88	88
223C-23	0	123	38	73	88	85
223C-24	106	91	5	77	90	83
125A-15	132	0	11	75	90	75
125A-16	194	0	6	76	90	76
116-7	34	0	165	73	89	73
223C-17	0	155	4	73	88	88
223C-18	0	165	0	73	88	88
223C-19	125	114	0	76	89	83
125A-12	145	1	0	76	90	77
223C-13	0	154	4	73	88	88
125A-14	62	193	29	73	89	84
223C-14	110	132	0	75	89	83
125A-13	127	209	0	74	89	83
125A-10	94	60	0	74	89	80
125A-11	66	95	0	74	89	83
223C-9	89	108	5	73	88	81
125A-6	73	33	0	73	89	78
125A-7	102	143	0	73	88	82
125A-8	0	210	0	73	88	88
125A-9	0	208	1	73	88	88
125B-3	0	273	0	73	88	88
125B-4	0	245	86	73	88	84
223B-7	0	147	0	73	88	88
223C-1	0	170	0	73	88	88
223C-2	0	175	0	73	88	88
223C-3	0	172	3	73	88	88
223C-4	98	55	15	73	88	78
223A-2	0	246	0	73	88	88
125A-5	0	195	0	73	88	88
125A-4	0	203	0	73	88	88
125A-3	0	224	0	73	88	88
125A-1	130	119	0	73	88	80
125A-2	0	217	0	73	88	88
125B-1	0	197	0	73	88	88
125B-2	0	154	52	73	88	84
223B-2	0	107	15	73	88	86
223B-3	0	155	10	73	88	87
223B-4	0	152	4	73	88	88
223B-5	0	160	2	73	88	88
223B-6	78	45	0	73	88	79
102B	381	1687	3623	83	92	86
102A	312	313	3390	83	92	84
SOUTH	2266	354	6899	80	91	80

Upper Las Vegas Wash
SCS Lag Time Calculations for Alternative D

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
116-2	U	0.415	73	0.567	100	1	9.6	8150	1.3	1.7	3.4	43.0	52.6	0.53
116-3	U	0.403	72	0.561	100	1	9.7	7000	2.6	2.4	4.7	26.3	36.1	0.36
116-4	U	0.417	72	0.560	100	1	9.7	7100	3.5	2.8	5.5	23.0	32.7	0.33
116-5	U	0.418	73	0.576	100	1	9.4	7100	3.9	2.9	5.8	21.8	31.2	0.31
116-6	U	0.413	72	0.560	100	1	9.7	7150	4.7	3.2	6.4	20.0	29.7	0.30
116-9	U	0.271	75	0.605	100	1	8.9	5400	0.3	0.8	1.6	61.0	69.9	0.70
116-10	U	0.271	75	0.597	100	1	9.1	5000	1.7	1.9	3.8	23.9	32.9	0.33
116-11	U	0.270	72	0.563	100	1	9.7	5600	2	2.1	4.2	24.4	34.1	0.34
116-12	U	0.265	72	0.560	100	1	9.7	5550	2.6	2.4	4.7	21.2	31.0	0.31
116-13	U	0.273	72	0.559	100	1	9.7	5700	0.5	1.0	2.1	49.7	59.4	0.59
116-14	U	0.293	77	0.626	100	1	8.5	5100	1	1.5	2.9	31.7	40.2	0.40
NW187-C	U	0.259	80	0.665	100	1	7.8	7150	0.6	1.1	2.3	55.9	63.8	0.64
116-1	U	0.402	73	0.573	100	1	9.5	7100	1.1	1.6	3.1	41.0	50.5	0.51
116-7	U	0.311	73	0.575	100	1	9.5	6000	0.7	1.2	2.5	44.0	53.5	0.53
116-8	U	0.328	74	0.580	100	1	9.4	6150	0.6	1.1	2.3	48.6	58.0	0.58
125A-5	D	0.234	88	0.772	100	1	5.9	5200	2.5	3.2	4.8	18.8	24.7	0.25
125A-8	D	0.328	88	0.772	100	1	5.9	3500	3.1	3.6	5.4	11.6	17.5	0.18
125A-9	D	0.326	88	0.772	100	1	5.9	3500	3.9	4.0	6.0	10.4	16.3	0.16
125A-10	U	0.239	80	0.666	100	1	7.8	5000	1.1	1.6	3.1	29.7	37.5	0.38
125A-11	D	0.253	83	0.706	100	1	7.1	5450	1.2	2.2	3.4	28.4	35.5	0.35
125A-12	U	0.225	76	0.619	100	1	8.7	4900	0.9	1.4	2.8	32.2	40.9	0.41
125A-13	D	0.519	83	0.706	100	1	7.1	8000	0.9	1.9	2.9	47.4	54.5	0.55
125A-14	D	0.443	84	0.719	100	1	6.9	6700	1.2	2.2	3.4	34.6	41.5	0.41
125A-15	U	0.219	75	0.606	100	1	8.9	4800	1	1.5	2.9	30.0	38.9	0.39
125A-16	U	0.312	76	0.611	100	1	8.8	6650	0.7	1.2	2.5	48.4	57.2	0.57
125B-1	D	0.274	88	0.772	100	1	5.9	5100	2.9	3.4	5.2	17.1	23.0	0.23
125B-2	D	0.293	84	0.719	100	1	6.9	5100	2.8	3.4	5.1	17.4	24.3	0.24
125B-3	D	0.425	88	0.772	100	1	5.9	6950	2.6	3.3	4.9	24.3	30.3	0.30
125B-4	D	0.517	84	0.719	100	1	6.9	7950	2.6	3.3	4.9	27.7	34.6	0.35
125A-1	D	0.278	80	0.666	100	1	7.8	5200	1.8	2.7	4.1	22.2	30.0	0.30

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
125A-2	D	0.269	88	0.772	100	1	5.9	5550	2.5	3.2	4.8	20.0	25.9	0.26
125A-3	D	0.270	88	0.772	100	1	5.9	5550	2.3	3.1	4.6	20.9	26.8	0.27
125A-4	D	0.246	88	0.772	100	1	5.9	5050	2.3	3.1	4.6	19.1	25.0	0.25
125A-6	U	0.165	78	0.640	100	1	8.3	3800	2.1	2.1	4.3	16.8	25.1	0.25
125A-7	D	0.382	82	0.692	100	1	7.3	5000	2.7	3.3	5.0	17.4	24.8	0.25
213A-2	U	0.500	73	0.574	500	10	9.8	8100	3	2.6	5.1	28.1	38.0	0.38
213A-3	U	0.371	73	0.574	100	1	9.5	6850	2.6	2.4	4.7	25.8	35.3	0.35
213A-4	U	0.251	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
OFF1A-2	U	0.378	74	0.591	100	1	9.2	6500	3.4	2.7	5.4	21.5	30.7	0.31
OFF1A-3	U	0.302	74	0.581	100	1	9.3	7150	2.7	2.4	4.8	26.4	35.7	0.36
OFF1A-4	U	0.274	73	0.575	100	1	9.5	6400	2.8	2.5	4.9	23.4	32.8	0.33
213A-6	U	0.279	73	0.574	100	1	9.5	5550	1.3	1.7	3.4	30.0	39.5	0.40
213A-7	U	0.251	73	0.574	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213A-8	U	0.255	73	0.574	100	1	9.5	5450	2.2	2.2	4.4	22.7	32.2	0.32
213A-9	U	0.252	73	0.574	100	1	9.5	5300	1	1.5	2.9	32.8	42.3	0.42
213A-10	U	0.252	73	0.572	100	1	9.5	5500	2.2	2.2	4.4	22.9	32.4	0.32
213A-11	U	0.256	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-1	U	0.261	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-2	U	0.262	73	0.574	100	1	9.5	5600	2.4	2.3	4.6	22.3	31.8	0.32
213B-3	U	0.253	73	0.574	100	1	9.5	5400	2.3	2.2	4.5	22.0	31.5	0.32
213B-4	U	0.255	73	0.574	100	1	9.5	5500	2.1	2.1	4.3	23.4	32.9	0.33
213B-5	U	0.240	73	0.574	100	1	9.5	4900	1.3	1.7	3.4	26.8	36.3	0.36
213B-6	U	0.244	73	0.574	100	1	9.5	5350	2.1	2.1	4.3	22.9	32.3	0.32
213B-7	U	0.249	73	0.574	100	1	9.5	5200	1.2	1.6	3.2	29.5	38.9	0.39
223A-2	D	0.384	88	0.772	100	1	5.9	4750	2.2	3.0	4.5	18.4	24.3	0.24
223A-3	U	0.250	73	0.574	100	1	9.5	5400	2	2.1	4.2	23.6	33.1	0.33
223B-2	D	0.191	86	0.745	100	1	6.4	3450	1.7	2.6	4.0	15.5	21.9	0.22
223B-3	D	0.257	87	0.758	100	1	6.1	5500	1.6	2.6	3.9	24.8	30.9	0.31
223B-4	D	0.244	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.29
223B-5	D	0.252	88	0.772	100	1	5.9	5450	1.5	2.5	3.7	25.4	31.3	0.31
223B-6	U	0.192	79	0.653	100	1	8.0	4600	0.9	1.4	2.8	30.4	38.5	0.38
223B-7	D	0.230	88	0.772	100	1	5.9	3800	2	2.9	4.3	15.6	21.5	0.22
223C-1	D	0.266	88	0.772	100	1	5.9	5600	1.7	2.6	4.0	24.5	30.4	0.30
223C-2	D	0.273	88	0.772	100	1	5.9	5650	1.8	2.7	4.1	24.0	29.9	0.30

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
223C-3	D	0.273	88	0.772	100	1	5.9	5650	1.8	2.7	4.1	24.0	29.9	0.30
223C-4	D	0.262	78	0.640	100	1	8.3	5600	0.9	1.9	2.9	33.6	41.9	0.42
223C-5	U	0.219	73	0.574	100	1	9.5	3100	2.5	2.3	4.6	12.9	22.4	0.22
223C-6	U	0.249	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223C-7	U	0.250	73	0.574	100	1	9.5	5350	1.7	1.9	3.8	25.4	34.9	0.35
223C-8	U	0.251	73	0.574	100	1	9.5	5450	1.7	1.9	3.8	25.8	35.3	0.35
223C-9	D	0.313	81	0.679	100	1	7.6	6000	1.3	2.3	3.5	29.9	37.5	0.37
223C-10	U	0.241	73	0.574	100	1	9.5	3900	2.4	2.3	4.6	16.1	25.6	0.26
223C-11	U	0.250	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-12	U	0.251	73	0.574	100	1	9.5	5500	2	2.1	4.2	24.0	33.5	0.33
223C-13	D	0.247	88	0.772	100	1	5.9	5350	1.9	2.8	4.2	22.2	28.1	0.28
223C-14	D	0.375	83	0.706	100	1	7.1	6700	1.3	2.3	3.5	33.2	40.3	0.40
223C-15	U	0.251	73	0.574	100	1	9.5	4100	2.4	2.3	4.6	16.8	26.3	0.26
223C-16	U	0.251	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-17	D	0.248	88	0.772	100	1	5.9	5400	1.7	2.6	4.0	23.6	29.5	0.30
223C-18	D	0.258	88	0.772	100	1	5.9	5500	1.7	2.6	4.0	24.1	30.0	0.30
223C-19	D	0.373	83	0.706	100	1	7.1	6400	1.2	2.2	3.4	33.1	40.2	0.40
223C-20	U	0.265	73	0.574	100	1	9.5	4150	2.5	2.3	4.6	16.6	26.1	0.26
223C-21	D	0.252	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.29
223C-22	D	0.262	88	0.772	100	1	5.9	5500	1.5	2.5	3.7	25.6	31.5	0.32
223C-23	D	0.253	85	0.732	100	1	6.6	5400	1.5	2.5	3.7	25.2	31.8	0.32
223C-24	D	0.315	83	0.706	100	1	7.1	6850	1.2	2.2	3.4	35.3	42.4	0.42
NW1-C	U	0.293	81	0.676	100	1	7.6	6400	3.4	2.7	5.4	21.2	28.8	0.29
NW2-C	U	0.395	73	0.574	100	1	9.5	7300	2.2	2.2	4.4	29.8	39.3	0.39
NW5-C	U	0.275	73	0.574	100	1	9.5	5650	2.1	2.1	4.3	24.0	33.5	0.34
NW7-C	U	0.488	84	0.720	100	1	6.8	9700	3.2	2.6	5.3	32.3	39.1	0.39
NW9-C	U	0.273	73	0.574	100	1	9.5	6200	2.3	2.2	4.5	25.0	34.5	0.34
NW11-C	U	0.270	73	0.574	100	1	9.5	5600	2.6	2.4	4.7	21.4	30.9	0.31
NW17-C	U	0.430	73	0.574	100	1	9.5	7750	2.2	2.2	4.4	31.5	41.0	0.41
NW21-C	U	0.403	84	0.723	100	1	6.8	7850	3.1	2.6	5.2	26.9	33.6	0.34
NW23-C	U	0.376	73	0.574	100	1	9.5	6900	2.1	2.1	4.3	28.9	38.4	0.38
NW33-C	U	0.248	86	0.745	100	1	6.4	5400	2.8	2.5	4.9	20.0	26.4	0.26
NW35-C	U	0.434	83	0.710	100	1	7.0	5100	3.5	2.8	5.5	16.9	24.0	0.24
NW50-C	U	0.358	73	0.574	100	1	9.5	6300	3.3	2.7	5.3	21.2	30.7	0.31

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
NW51-C	U	0.306	73	0.574	100	1	9.5	5100	3.2	2.6	5.3	17.7	27.2	0.27
NW64-C	U	0.407	73	0.574	100	1	9.5	7500	2.8	2.5	4.9	27.1	36.6	0.37
NW102-C	U	0.412	73	0.574	100	1	9.5	8600	2.2	2.2	4.4	34.8	44.2	0.44
NW130-C	U	0.241	75	0.606	100	1	8.9	6550	1.5	1.8	3.6	32.6	41.5	0.42
OFF1A-5	U	0.418	73	0.574	100	1	9.5	7650	2.5	2.3	4.6	29.2	38.7	0.39
OFF1A-6	U	0.473	73	0.574	500	10	9.8	8300	3.5	2.8	5.5	26.6	36.5	0.36
OFF2A	U	0.318	73	0.574	100	1	9.5	6200	2.5	2.3	4.6	24.0	33.5	0.33
OFF2B	U	0.160	73	0.574	500	10	9.8	3700	3.5	2.8	5.5	12.7	22.5	0.23
OFF3	U	0.222	73	0.574	100	1	9.5	5200	2.4	2.3	4.6	20.8	30.3	0.30
OFF4-1	U	0.301	77	0.628	100	1	8.5	10400	6.2	3.7	7.3	24.8	33.3	0.33
OFF4-2	U	0.420	79	0.659	100	1	7.9	4600	12.7	5.3	10.5	8.1	16.0	0.16
OFF5-1	U	0.297	80	0.672	100	1	7.7	6700	6	3.6	7.2	16.6	24.4	0.24
OFF5-2	U	0.395	86	0.742	100	1	6.4	10000	4.8	3.2	6.4	27.2	33.6	0.34
OFF8	U	0.272	86	0.745	500	10	6.6	6500	3.9	2.9	5.8	20.1	26.7	0.27
OFF9	U	0.303	86	0.745	500	10	6.6	11100	4	3.0	5.9	32.9	39.5	0.39

Alternative E

Subbasin ID	Non-Disposal (ac)	Disposal (ac)	Out of CTA (ac)	CN_{NONDIS}	CN_{DIS}	CN_E
NW187-C	0	161	4	80	91	91
116-13	42	133	1	72	88	84
116-14	176	145	13	73	88	80
223C-21	0	159	2	73	88	88
223C-22	0	164	3	73	88	88
223C-23	0	123	38	73	88	85
223C-24	0	197	5	77	90	89
125A-15	88	43	11	75	90	80
125A-16	154	40	6	76	90	79
116-7	0	34	165	73	89	76
223C-17	0	155	4	73	88	88
223C-18	0	165	0	73	88	88
223C-19	34	205	0	76	89	88
125A-12	142	4	0	76	90	77
223C-13	0	154	4	73	88	88
125A-14	59	195	29	73	89	84
223C-14	75	166	0	75	89	85
125A-13	155	182	0	74	89	82
125A-10	101	52	0	74	89	79
125A-11	25	136	0	74	89	87
223C-9	36	160	5	73	88	85
125A-6	49	58	0	73	89	81
125A-7	75	171	0	73	88	84
125A-8	0	210	0	73	88	88
125A-9	0	208	1	73	88	88
125B-3	0	273	0	73	88	88
125B-4	0	245	86	73	88	84
223B-7	0	147	0	73	88	88
223C-1	0	170	0	73	88	88
223C-2	0	175	0	73	88	88
223C-3	0	172	3	73	88	88
223C-4	42	111	15	73	88	83
223A-2	0	246	0	73	88	88
125A-5	0	195	0	73	88	88
125A-4	0	203	0	73	88	88
125A-3	0	224	0	73	88	88
125A-1	66	183	0	73	88	84
125A-2	0	217	0	73	88	88
125B-1	0	197	0	73	88	88
125B-2	0	154	52	73	88	84
223B-2	0	107	15	73	88	86
223B-3	0	155	10	73	88	87
223B-4	0	152	4	73	88	88
223B-5	0	160	2	73	88	88
223B-6	60	64	0	73	88	81
102B	230	1837	3623	83	92	86
102A	174	451	3390	83	92	84
SOUTH	1523	1097	6899	80	91	81

Upper Las Vegas Wash
SCS Lag Time Calculations for Alternative E

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
116-2	U	0.415	73	0.567	100	1	9.6	8150	1.3	1.7	3.4	43.0	52.6	0.53
116-3	U	0.403	72	0.561	100	1	9.7	7000	2.6	2.4	4.7	26.3	36.1	0.36
116-4	U	0.417	72	0.560	100	1	9.7	7100	3.5	2.8	5.5	23.0	32.7	0.33
116-5	U	0.418	73	0.576	100	1	9.4	7100	3.9	2.9	5.8	21.8	31.2	0.31
116-6	U	0.413	72	0.560	100	1	9.7	7150	4.7	3.2	6.4	20.0	29.7	0.30
116-9	U	0.271	75	0.605	100	1	8.9	5400	0.3	0.8	1.6	61.0	69.9	0.70
116-10	U	0.271	75	0.597	100	1	9.1	5000	1.7	1.9	3.8	23.9	32.9	0.33
116-11	U	0.270	72	0.563	100	1	9.7	5600	2	2.1	4.2	24.4	34.1	0.34
116-12	U	0.265	72	0.560	100	1	9.7	5550	2.6	2.4	4.7	21.2	31.0	0.31
116-13	D	0.273	84	0.719	100	1	6.9	5700	0.5	1.4	2.2	45.9	52.7	0.53
116-14	D	0.293	80	0.666	100	1	7.8	5100	1	2.0	3.1	29.2	37.0	0.37
NW187-C	D	0.259	91	0.811	100	1	5.2	7150	0.6	1.6	2.4	52.1	57.3	0.57
116-1	U	0.402	73	0.573	100	1	9.5	7100	1.1	1.6	3.1	41.0	50.5	0.51
116-7	U	0.311	76	0.613	100	1	8.8	6000	0.7	1.2	2.5	44.0	52.8	0.53
116-8	U	0.328	74	0.580	100	1	9.4	6150	0.6	1.1	2.3	48.6	58.0	0.58
125A-5	D	0.234	88	0.772	100	1	5.9	5200	2.5	3.2	4.8	18.8	24.7	0.25
125A-8	D	0.328	88	0.772	100	1	5.9	3500	3.1	3.6	5.4	11.6	17.5	0.18
125A-9	D	0.326	88	0.772	100	1	5.9	3500	3.9	4.0	6.0	10.4	16.3	0.16
125A-10	D	0.239	79	0.653	100	1	8.0	5000	1.1	2.1	3.2	27.3	35.4	0.35
125A-11	D	0.253	87	0.758	100	1	6.1	5450	1.2	2.2	3.4	28.4	34.5	0.35
125A-12	D	0.225	77	0.626	100	1	8.5	4900	0.9	1.9	2.9	29.6	38.1	0.38
125A-13	D	0.519	82	0.692	100	1	7.3	8000	0.9	1.9	2.9	47.4	54.7	0.55
125A-14	D	0.443	84	0.719	100	1	6.9	6700	1.2	2.2	3.4	34.6	41.5	0.41
125A-15	U	0.219	80	0.666	100	1	7.8	4800	1	1.5	2.9	30.0	37.8	0.38
125A-16	U	0.312	79	0.653	100	1	8.0	6650	0.7	1.2	2.5	48.4	56.4	0.56
125B-1	D	0.274	88	0.772	100	1	5.9	5100	2.9	3.4	5.2	17.1	23.0	0.23
125B-2	D	0.293	84	0.719	100	1	6.9	5100	2.8	3.4	5.1	17.4	24.3	0.24
125B-3	D	0.425	88	0.772	100	1	5.9	6950	2.6	3.3	4.9	24.3	30.3	0.30
125B-4	D	0.517	84	0.719	100	1	6.9	7950	2.6	3.3	4.9	27.7	34.6	0.35
125A-1	D	0.278	84	0.719	100	1	6.9	5200	1.8	2.7	4.1	22.2	29.0	0.29

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
125A-2	D	0.269	88	0.772	100	1	5.9	5550	2.5	3.2	4.8	20.0	25.9	0.26
125A-3	D	0.270	88	0.772	100	1	5.9	5550	2.3	3.1	4.6	20.9	26.8	0.27
125A-4	D	0.246	88	0.772	100	1	5.9	5050	2.3	3.1	4.6	19.1	25.0	0.25
125A-6	D	0.165	81	0.679	100	1	7.6	3800	2.1	2.9	4.4	15.2	22.8	0.23
125A-7	D	0.382	84	0.719	100	1	6.9	5000	2.7	3.3	5.0	17.4	24.3	0.24
213A-2	U	0.500	73	0.574	500	10	9.8	8100	3	2.6	5.1	28.1	38.0	0.38
213A-3	U	0.371	73	0.574	100	1	9.5	6850	2.6	2.4	4.7	25.8	35.3	0.35
213A-4	U	0.251	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
OFF1A-2	U	0.378	74	0.591	100	1	9.2	6500	3.4	2.7	5.4	21.5	30.7	0.31
OFF1A-3	U	0.302	74	0.581	100	1	9.3	7150	2.7	2.4	4.8	26.4	35.7	0.36
OFF1A-4	U	0.274	73	0.575	100	1	9.5	6400	2.8	2.5	4.9	23.4	32.8	0.33
213A-6	U	0.279	73	0.574	100	1	9.5	5550	1.3	1.7	3.4	30.0	39.5	0.40
213A-7	U	0.251	73	0.574	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213A-8	U	0.255	88	0.772	100	1	5.9	5450	2.2	2.2	4.4	22.7	28.6	0.29
213A-9	U	0.252	88	0.772	100	1	5.9	5300	1	1.5	2.9	32.8	38.8	0.39
213A-10	U	0.252	73	0.572	100	1	9.5	5500	2.2	2.2	4.4	22.9	32.4	0.32
213A-11	U	0.256	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-1	U	0.261	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-2	U	0.262	73	0.574	100	1	9.5	5600	2.4	2.3	4.6	22.3	31.8	0.32
213B-3	U	0.253	73	0.574	100	1	9.5	5400	2.3	2.2	4.5	22.0	31.5	0.32
213B-4	U	0.255	73	0.574	100	1	9.5	5500	2.1	2.1	4.3	23.4	32.9	0.33
213B-5	U	0.240	73	0.574	100	1	9.5	4900	1.3	1.7	3.4	26.8	36.3	0.36
213B-6	U	0.244	73	0.574	100	1	9.5	5350	2.1	2.1	4.3	22.9	32.3	0.32
213B-7	U	0.249	73	0.574	100	1	9.5	5200	1.2	1.6	3.2	29.5	38.9	0.39
223A-2	D	0.384	88	0.772	100	1	5.9	4750	2.2	3.0	4.5	18.4	24.3	0.24
223A-3	U	0.250	73	0.574	100	1	9.5	5400	2	2.1	4.2	23.6	33.1	0.33
223B-2	D	0.191	86	0.745	100	1	6.4	3450	1.7	2.6	4.0	15.5	21.9	0.22
223B-3	D	0.257	87	0.758	100	1	6.1	5500	1.6	2.6	3.9	24.8	30.9	0.31
223B-4	D	0.244	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.29
223B-5	D	0.252	88	0.772	100	1	5.9	5450	1.5	2.5	3.7	25.4	31.3	0.31
223B-6	D	0.192	81	0.679	100	1	7.6	4600	0.9	1.9	2.9	27.9	35.5	0.35
223B-7	D	0.230	88	0.772	100	1	5.9	3800	2	2.9	4.3	15.6	21.5	0.22
223C-1	D	0.266	88	0.772	100	1	5.9	5600	1.7	2.6	4.0	24.5	30.4	0.30
223C-2	D	0.273	88	0.772	100	1	5.9	5650	1.8	2.7	4.1	24.0	29.9	0.30

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
223C-3	D	0.273	88	0.772	100	1	5.9	5650	1.8	2.7	4.1	24.0	29.9	0.30
223C-4	D	0.262	83	0.706	100	1	7.1	5600	0.9	1.9	2.9	33.6	40.7	0.41
223C-5	U	0.219	73	0.574	100	1	9.5	3100	2.5	2.3	4.6	12.9	22.4	0.22
223C-6	U	0.249	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223C-7	U	0.250	73	0.574	100	1	9.5	5350	1.7	1.9	3.8	25.4	34.9	0.35
223C-8	U	0.251	73	0.574	100	1	9.5	5450	1.7	1.9	3.8	25.8	35.3	0.35
223C-9	D	0.313	85	0.732	100	1	6.6	6000	1.3	2.3	3.5	29.9	36.5	0.37
223C-10	U	0.241	73	0.574	100	1	9.5	3900	2.4	2.3	4.6	16.1	25.6	0.26
223C-11	U	0.250	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-12	U	0.251	73	0.574	100	1	9.5	5500	2	2.1	4.2	24.0	33.5	0.33
223C-13	D	0.247	88	0.772	100	1	5.9	5350	1.9	2.8	4.2	22.2	28.1	0.28
223C-14	D	0.375	85	0.732	100	1	6.6	6700	1.3	2.3	3.5	33.2	39.9	0.40
223C-15	U	0.251	73	0.574	100	1	9.5	4100	2.4	2.3	4.6	16.8	26.3	0.26
223C-16	U	0.251	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-17	D	0.248	88	0.772	100	1	5.9	5400	1.7	2.6	4.0	23.6	29.5	0.30
223C-18	D	0.258	88	0.772	100	1	5.9	5500	1.7	2.6	4.0	24.1	30.0	0.30
223C-19	D	0.373	88	0.772	100	1	5.9	6400	1.2	2.2	3.4	33.1	39.0	0.39
223C-20	U	0.265	73	0.574	100	1	9.5	4150	2.5	2.3	4.6	16.6	26.1	0.26
223C-21	D	0.252	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.29
223C-22	D	0.262	88	0.772	100	1	5.9	5500	1.5	2.5	3.7	25.6	31.5	0.32
223C-23	D	0.253	85	0.732	100	1	6.6	5400	1.5	2.5	3.7	25.2	31.8	0.32
223C-24	D	0.315	89	0.785	100	1	5.7	6850	1.2	2.2	3.4	35.3	41.0	0.41
NW1-C	U	0.293	81	0.676	100	1	7.6	6400	3.4	2.7	5.4	21.2	28.8	0.29
NW2-C	U	0.395	73	0.574	100	1	9.5	7300	2.2	2.2	4.4	29.8	39.3	0.39
NW5-C	U	0.275	73	0.574	100	1	9.5	5650	2.1	2.1	4.3	24.0	33.5	0.34
NW7-C	U	0.488	84	0.720	100	1	6.8	9700	3.2	2.6	5.3	32.3	39.1	0.39
NW9-C	U	0.273	73	0.574	100	1	9.5	6200	2.3	2.2	4.5	25.0	34.5	0.34
NW11-C	U	0.270	73	0.574	100	1	9.5	5600	2.6	2.4	4.7	21.4	30.9	0.31
NW17-C	U	0.430	73	0.574	100	1	9.5	7750	2.2	2.2	4.4	31.5	41.0	0.41
NW21-C	U	0.403	84	0.723	100	1	6.8	7850	3.1	2.6	5.2	26.9	33.6	0.34
NW23-C	U	0.376	73	0.574	100	1	9.5	6900	2.1	2.1	4.3	28.9	38.4	0.38
NW33-C	U	0.248	86	0.745	100	1	6.4	5400	2.8	2.5	4.9	20.0	26.4	0.26
NW35-C	U	0.434	83	0.710	100	1	7.0	5100	3.5	2.8	5.5	16.9	24.0	0.24
NW50-C	U	0.358	73	0.574	100	1	9.5	6300	3.3	2.7	5.3	21.2	30.7	0.31

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	**Developed/**	**Area**	**CN**	**K**	**Length**	**Slope**	**t_i**	**Length**	**Slope**	**Velocity (fps)**		**t_t**	**t_c**	**Lag Time**
	Undeveloped	**(mi^2)**			**(ft)**	**(%)**	**(min)**	**(ft)**	**(%)**	**V_1**	**V_2**	**(min)**	**(min)**	**(hours)**
NW51-C	U	0.306	73	0.574	100	1	9.5	5100	3.2	2.6	5.3	17.7	27.2	0.27
NW64-C	U	0.407	73	0.574	100	1	9.5	7500	2.8	2.5	4.9	27.1	36.6	0.37
NW102-C	U	0.412	73	0.574	100	1	9.5	8600	2.2	2.2	4.4	34.8	44.2	0.44
NW130-C	U	0.241	75	0.606	100	1	8.9	6550	1.5	1.8	3.6	32.6	41.5	0.42
OFF1A-5	U	0.418	73	0.574	100	1	9.5	7650	2.5	2.3	4.6	29.2	38.7	0.39
OFF1A-6	U	0.473	73	0.574	500	10	9.8	8300	3.5	2.8	5.5	26.6	36.5	0.36
OFF2A	U	0.318	73	0.574	100	1	9.5	6200	2.5	2.3	4.6	24.0	33.5	0.33
OFF2B	U	0.160	73	0.574	500	10	9.8	3700	3.5	2.8	5.5	12.7	22.5	0.23
OFF3	U	0.222	73	0.574	100	1	9.5	5200	2.4	2.3	4.6	20.8	30.3	0.30
OFF4-1	U	0.301	77	0.628	100	1	8.5	10400	6.2	3.7	7.3	24.8	33.3	0.33
OFF4-2	U	0.420	79	0.659	100	1	7.9	4600	12.7	5.3	10.5	8.1	16.0	0.16
OFF5-1	U	0.297	80	0.672	100	1	7.7	6700	6	3.6	7.2	16.6	24.4	0.24
OFF5-2	U	0.395	86	0.742	100	1	6.4	10000	4.8	3.2	6.4	27.2	33.6	0.34
OFF8	U	0.272	86	0.745	500	10	6.6	6500	3.9	2.9	5.8	20.1	26.7	0.27
OFF9	U	0.303	86	0.745	500	10	6.6	11100	4	3.0	5.9	32.9	39.5	0.39

No-Action Alternative

Subbasin ID	Non-Disposal (ac)	Disposal (ac)	Out of CTA (ac)	CN_{NONDIS}	CN_{DIS}	CN_{NOA}
NW187-C	0	161	4	80	91	91
116-13	0	174	1	72	88	88
116-14	0	322	13	73	88	88
223C-21	0	159	2	73	88	88
223C-22	0	164	3	73	88	88
223C-23	0	123	38	73	88	85
223C-24	0	197	5	77	90	89
125A-15	0	131	11	75	90	88
125A-16	0	194	6	76	90	89
116-7	0	34	165	73	89	76
223C-17	0	155	4	73	88	88
223C-18	0	165	0	73	88	88
223C-19	0	239	0	76	89	89
125A-12	0	145	0	76	90	90
223C-13	0	154	4	73	88	88
125A-14	0	255	29	73	89	87
223C-14	0	241	0	75	89	89
125A-13	0	337	0	74	89	89
125A-10	0	153	0	74	89	89
125A-11	0	161	0	74	89	89
223C-9	0	196	5	73	88	88
125A-6	0	106	0	73	89	89
125A-7	0	245	0	73	88	88
125A-8	0	210	0	73	88	88
125A-9	0	208	1	73	88	88
125B-3	0	273	0	73	88	88
125B-4	0	245	86	73	88	84
223B-7	0	147	0	73	88	88
223C-1	0	170	0	73	88	88
223C-2	0	175	0	73	88	88
223C-3	0	172	3	73	88	88
223C-4	0	153	15	73	88	87
223A-2	0	246	0	73	88	88
125A-5	0	195	0	73	88	88
125A-4	0	203	0	73	88	88
125A-3	0	224	0	73	88	88
125A-1	0	249	0	73	88	88
125A-2	0	217	0	73	88	88
125B-1	0	197	0	73	88	88
125B-2	0	154	52	73	88	84
223B-2	0	107	15	73	88	86
223B-3	0	155	10	73	88	87
223B-4	0	152	4	73	88	88
223B-5	0	160	2	73	88	88
223B-6	0	123	0	73	88	88
102B	192	1875	3623	83	92	86
102A	174	451	3390	83	92	84
SOUTH	1057	1564	6899	80	91	82

Upper Las Vegas Wash
SCS Lag Time Calculations for No-Action Alternative

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
116-2	U	0.415	73	0.567	100	1	9.6	8150	1.3	1.7	3.4	43.0	52.6	0.53
116-3	U	0.403	72	0.561	100	1	9.7	7000	2.6	2.4	4.7	26.3	36.1	0.36
116-4	U	0.417	72	0.560	100	1	9.7	7100	3.5	2.8	5.5	23.0	32.7	0.33
116-5	U	0.418	73	0.576	100	1	9.4	7100	3.9	2.9	5.8	21.8	31.2	0.31
116-6	U	0.413	72	0.560	100	1	9.7	7150	4.7	3.2	6.4	20.0	29.7	0.30
116-9	U	0.271	75	0.605	100	1	8.9	5400	0.3	0.8	1.6	61.0	69.9	0.70
116-10	U	0.271	75	0.597	100	1	9.1	5000	1.7	1.9	3.8	23.9	32.9	0.33
116-11	U	0.270	72	0.563	100	1	9.7	5600	2	2.1	4.2	24.4	34.1	0.34
116-12	U	0.265	72	0.560	100	1	9.7	5550	2.6	2.4	4.7	21.2	31.0	0.31
116-13	D	0.273	88	0.772	100	1	5.9	5700	0.5	1.4	2.2	45.9	51.8	0.52
116-14	U	0.293	88	0.772	100	1	5.9	5100	1	1.5	2.9	31.7	37.6	0.38
NW187-C	D	0.259	91	0.811	100	1	5.2	7150	0.6	1.6	2.4	52.1	57.3	0.57
116-1	U	0.402	73	0.573	100	1	9.5	7100	1.1	1.6	3.1	41.0	50.5	0.51
116-7	U	0.311	76	0.613	100	1	8.8	6000	0.7	1.2	2.5	44.0	52.8	0.53
116-8	U	0.328	74	0.580	100	1	9.4	6150	0.6	1.1	2.3	48.6	58.0	0.58
125A-5	D	0.234	88	0.772	100	1	5.9	5200	2.5	3.2	4.8	18.8	24.7	0.25
125A-8	D	0.328	88	0.772	100	1	5.9	3500	3.1	3.6	5.4	11.6	17.5	0.18
125A-9	D	0.326	88	0.772	100	1	5.9	3500	3.9	4.0	6.0	10.4	16.3	0.16
125A-10	D	0.239	89	0.785	100	1	5.7	5000	1.1	2.1	3.2	27.3	33.0	0.33
125A-11	D	0.253	89	0.785	100	1	5.7	5450	1.2	2.2	3.4	28.4	34.1	0.34
125A-12	D	0.225	90	0.798	100	1	5.4	4900	0.9	1.9	2.9	29.6	35.0	0.35
125A-13	D	0.519	89	0.785	100	1	5.7	8000	0.9	1.9	2.9	47.4	53.1	0.53
125A-14	D	0.443	87	0.758	100	1	6.1	6700	1.2	2.2	3.4	34.6	40.7	0.41
125A-15	D	0.219	88	0.772	100	1	5.9	4800	1	2.0	3.1	27.5	33.5	0.33
125A-16	D	0.312	89	0.785	100	1	5.7	6650	0.7	1.7	2.6	45.0	50.6	0.51
125B-1	D	0.274	88	0.772	100	1	5.9	5100	2.9	3.4	5.2	17.1	23.0	0.23
125B-2	D	0.293	84	0.719	100	1	6.9	5100	2.8	3.4	5.1	17.4	24.3	0.24
125B-3	D	0.425	88	0.772	100	1	5.9	6950	2.6	3.3	4.9	24.3	30.3	0.30
125B-4	D	0.517	84	0.719	100	1	6.9	7950	2.6	3.3	4.9	27.7	34.6	0.35
125A-1	D	0.278	88	0.772	100	1	5.9	5200	1.8	2.7	4.1	22.2	28.1	0.28

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
125A-2	D	0.269	88	0.772	100	1	5.9	5550	2.5	3.2	4.8	20.0	25.9	0.26
125A-3	D	0.270	88	0.772	100	1	5.9	5550	2.3	3.1	4.6	20.9	26.8	0.27
125A-4	D	0.246	88	0.772	100	1	5.9	5050	2.3	3.1	4.6	19.1	25.0	0.25
125A-6	D	0.165	89	0.785	100	1	5.7	3800	2.1	2.9	4.4	15.2	20.9	0.21
125A-7	D	0.382	88	0.772	100	1	5.9	5000	2.7	3.3	5.0	17.4	23.3	0.23
213A-2	U	0.500	73	0.574	500	10	9.8	8100	3	2.6	5.1	28.1	38.0	0.38
213A-3	U	0.371	73	0.574	100	1	9.5	6850	2.6	2.4	4.7	25.8	35.3	0.35
213A-4	U	0.251	73	0.574	100	1	9.5	5550	2.5	2.3	4.6	21.7	31.1	0.31
OFF1A-2	U	0.378	74	0.591	100	1	9.2	6500	3.4	2.7	5.4	21.5	30.7	0.31
OFF1A-3	U	0.302	74	0.581	100	1	9.3	7150	2.7	2.4	4.8	26.4	35.7	0.36
OFF1A-4	U	0.274	73	0.575	100	1	9.5	6400	2.8	2.5	4.9	23.4	32.8	0.33
213A-6	U	0.279	73	0.574	100	1	9.5	5550	1.3	1.7	3.4	30.0	39.5	0.40
213A-7	U	0.251	73	0.574	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213A-8	U	0.255	73	0.574	100	1	9.5	5450	2.2	2.2	4.4	22.7	32.2	0.32
213A-9	U	0.252	73	0.574	100	1	9.5	5300	1	1.5	2.9	32.8	42.3	0.42
213A-10	U	0.252	73	0.572	100	1	9.5	5500	2.2	2.2	4.4	22.9	32.4	0.32
213A-11	U	0.256	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-1	U	0.261	73	0.573	100	1	9.5	5500	2.3	2.2	4.5	22.4	31.9	0.32
213B-2	U	0.262	73	0.574	100	1	9.5	5600	2.4	2.3	4.6	22.3	31.8	0.32
213B-3	U	0.253	73	0.574	100	1	9.5	5400	2.3	2.2	4.5	22.0	31.5	0.32
213B-4	U	0.255	73	0.574	100	1	9.5	5500	2.1	2.1	4.3	23.4	32.9	0.33
213B-5	U	0.240	73	0.574	100	1	9.5	4900	1.3	1.7	3.4	26.8	36.3	0.36
213B-6	U	0.244	73	0.574	100	1	9.5	5350	2.1	2.1	4.3	22.9	32.3	0.32
213B-7	U	0.249	73	0.574	100	1	9.5	5200	1.2	1.6	3.2	29.5	38.9	0.39
223A-2	D	0.384	88	0.772	100	1	5.9	4750	2.2	3.0	4.5	18.4	24.3	0.24
223A-3	U	0.250	73	0.574	100	1	9.5	5400	2	2.1	4.2	23.6	33.1	0.33
223B-2	D	0.191	86	0.745	100	1	6.4	3450	1.7	2.6	4.0	15.5	21.9	0.22
223B-3	D	0.257	87	0.758	100	1	6.1	5500	1.6	2.6	3.9	24.8	30.9	0.31
223B-4	D	0.244	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.29
223B-5	D	0.252	88	0.772	100	1	5.9	5450	1.5	2.5	3.7	25.4	31.3	0.31
223B-6	D	0.192	88	0.772	100	1	5.9	4600	0.9	1.9	2.9	27.9	33.8	0.34
223B-7	D	0.230	88	0.772	100	1	5.9	3800	2	2.9	4.3	15.6	21.5	0.22
223C-1	D	0.266	88	0.772	100	1	5.9	5600	1.7	2.6	4.0	24.5	30.4	0.30
223C-2	D	0.273	88	0.772	100	1	5.9	5650	1.8	2.7	4.1	24.0	29.9	0.30

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
223C-3	D	0.273	88	0.772	100	1	5.9	5650	1.8	2.7	4.1	24.0	29.9	0.30
223C-4	D	0.262	83	0.706	100	1	7.1	5600	0.9	1.9	2.9	33.6	40.7	0.41
223C-5	U	0.219	73	0.574	100	1	9.5	3100	2.5	2.3	4.6	12.9	22.4	0.22
223C-6	U	0.249	73	0.574	100	1	9.5	5400	1.8	2.0	3.9	24.9	34.4	0.34
223C-7	U	0.250	73	0.574	100	1	9.5	5350	1.7	1.9	3.8	25.4	34.9	0.35
223C-8	U	0.251	73	0.574	100	1	9.5	5450	1.7	1.9	3.8	25.8	35.3	0.35
223C-9	D	0.313	88	0.772	100	1	5.9	6000	1.3	2.3	3.5	29.9	35.8	0.36
223C-10	U	0.241	73	0.574	100	1	9.5	3900	2.4	2.3	4.6	16.1	25.6	0.26
223C-11	U	0.250	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-12	U	0.251	73	0.574	100	1	9.5	5500	2	2.1	4.2	24.0	33.5	0.33
223C-13	D	0.247	88	0.772	100	1	5.9	5350	1.9	2.8	4.2	22.2	28.1	0.28
223C-14	D	0.375	89	0.785	100	1	5.7	6700	1.3	2.3	3.5	33.2	38.9	0.39
223C-15	U	0.251	73	0.574	100	1	9.5	4100	2.4	2.3	4.6	16.8	26.3	0.26
223C-16	U	0.251	73	0.574	100	1	9.5	5400	1.9	2.0	4.1	24.2	33.7	0.34
223C-17	D	0.248	88	0.772	100	1	5.9	5400	1.7	2.6	4.0	23.6	29.5	0.30
223C-18	D	0.258	88	0.772	100	1	5.9	5500	1.7	2.6	4.0	24.1	30.0	0.30
223C-19	D	0.373	89	0.785	100	1	5.7	6400	1.2	2.2	3.4	33.1	38.8	0.39
223C-20	U	0.265	73	0.574	100	1	9.5	4150	2.5	2.3	4.6	16.6	26.1	0.26
223C-21	D	0.252	88	0.772	100	1	5.9	5400	1.8	2.7	4.1	23.0	28.9	0.29
223C-22	D	0.262	88	0.772	100	1	5.9	5500	1.5	2.5	3.7	25.6	31.5	0.32
223C-23	D	0.253	85	0.732	100	1	6.6	5400	1.5	2.5	3.7	25.2	31.8	0.32
223C-24	D	0.315	89	0.785	100	1	5.7	6850	1.2	2.2	3.4	35.3	41.0	0.41
NW1-C	U	0.293	81	0.676	100	1	7.6	6400	3.4	2.7	5.4	21.2	28.8	0.29
NW2-C	U	0.395	73	0.574	100	1	9.5	7300	2.2	2.2	4.4	29.8	39.3	0.39
NW5-C	U	0.275	73	0.574	100	1	9.5	5650	2.1	2.1	4.3	24.0	33.5	0.34
NW7-C	U	0.488	84	0.720	100	1	6.8	9700	3.2	2.6	5.3	32.3	39.1	0.39
NW9-C	U	0.273	73	0.574	100	1	9.5	6200	2.3	2.2	4.5	25.0	34.5	0.34
NW11-C	U	0.270	73	0.574	100	1	9.5	5600	2.6	2.4	4.7	21.4	30.9	0.31
NW17-C	U	0.430	73	0.574	100	1	9.5	7750	2.2	2.2	4.4	31.5	41.0	0.41
NW21-C	U	0.403	84	0.723	100	1	6.8	7850	3.1	2.6	5.2	26.9	33.6	0.34
NW23-C	U	0.376	73	0.574	100	1	9.5	6900	2.1	2.1	4.3	28.9	38.4	0.38
NW33-C	U	0.248	86	0.745	100	1	6.4	5400	2.8	2.5	4.9	20.0	26.4	0.26
NW35-C	U	0.434	83	0.710	100	1	7.0	5100	3.5	2.8	5.5	16.9	24.0	0.24
NW50-C	U	0.358	73	0.574	100	1	9.5	6300	3.3	2.7	5.3	21.2	30.7	0.31

Subbasin Data					Overland Time (t_i)			Travel Time (t_t)					Totals	
Subbasin ID	Developed/	Area	CN	K	Length	Slope	t_i	Length	Slope	Velocity (fps)		t_t	t_c	Lag Time
	Undeveloped	(mi^2)			(ft)	(%)	(min)	(ft)	(%)	V_1	V_2	(min)	(min)	(hours)
NW51-C	U	0.306	73	0.574	100	1	9.5	5100	3.2	2.6	5.3	17.7	27.2	0.27
NW64-C	U	0.407	73	0.574	100	1	9.5	7500	2.8	2.5	4.9	27.1	36.6	0.37
NW102-C	U	0.412	73	0.574	100	1	9.5	8600	2.2	2.2	4.4	34.8	44.2	0.44
NW130-C	U	0.241	75	0.606	100	1	8.9	6550	1.5	1.8	3.6	32.6	41.5	0.42
OFF1A-5	U	0.418	73	0.574	100	1	9.5	7650	2.5	2.3	4.6	29.2	38.7	0.39
OFF1A-6	U	0.473	73	0.574	500	10	9.8	8300	3.5	2.8	5.5	26.6	36.5	0.36
OFF2A	U	0.318	73	0.574	100	1	9.5	6200	2.5	2.3	4.6	24.0	33.5	0.33
OFF2B	U	0.160	73	0.574	500	10	9.8	3700	3.5	2.8	5.5	12.7	22.5	0.23
OFF3	U	0.222	73	0.574	100	1	9.5	5200	2.4	2.3	4.6	20.8	30.3	0.30
OFF4-1	U	0.301	77	0.628	100	1	8.5	10400	6.2	3.7	7.3	24.8	33.3	0.33
OFF4-2	U	0.420	79	0.659	100	1	7.9	4600	12.7	5.3	10.5	8.1	16.0	0.16
OFF5-1	U	0.297	80	0.672	100	1	7.7	6700	6	3.6	7.2	16.6	24.4	0.24
OFF5-2	U	0.395	86	0.742	100	1	6.4	10000	4.8	3.2	6.4	27.2	33.6	0.34
OFF8	U	0.272	86	0.745	500	10	6.6	6500	3.9	2.9	5.8	20.1	26.7	0.27
OFF9	U	0.303	86	0.745	500	10	6.6	11100	4	3.0	5.9	32.9	39.5	0.39

CN and Lag Time Summary for Land Disposal Alternatives

Subbasin ID	CN_{BAS}	LAG_{BAS}	CN_A	LAG_A	CN_B	LAG_B	CN_C	LAG_C	CN_D	LAG_D	CN_E	LAG_E	CN_{NOA}	LAG_{NOA}
		(hr)		(hr)		(hr)		(hr)		(hr)		(hr)		(hr)
116-2	73	0.53	73	0.53	73	0.53	73	0.53	73	0.53	73	0.53	73	0.53
116-3	72	0.36	72	0.36	72	0.36	72	0.36	72	0.36	72	0.36	72	0.36
116-4	72	0.33	72	0.33	72	0.33	72	0.33	72	0.33	72	0.33	72	0.33
116-5	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31
116-6	72	0.30	72	0.30	72	0.30	72	0.30	72	0.30	72	0.30	72	0.30
116-9	75	0.70	75	0.70	75	0.70	75	0.70	75	0.70	75	0.70	75	0.70
116-10	75	0.33	75	0.33	75	0.33	75	0.33	75	0.33	75	0.33	75	0.33
116-11	72	0.34	72	0.34	72	0.34	72	0.34	72	0.34	72	0.34	72	0.34
116-12	72	0.31	72	0.31	72	0.31	72	0.31	72	0.31	72	0.31	72	0.31
116-13	72	0.59	72	0.59	72	0.59	72	0.59	72	0.59	84	0.53	88	0.52
116-14	73	0.41	77	0.40	74	0.41	77	0.40	77	0.40	80	0.37	88	0.38
NW187-C	80	0.64	80	0.64	80	0.64	80	0.64	80	0.64	91	0.57	91	0.57
116-1	73	0.51	73	0.51	73	0.51	73	0.51	73	0.51	73	0.51	73	0.51
116-7	73	0.53	73	0.53	73	0.53	73	0.53	73	0.53	76	0.53	76	0.53
116-8	74	0.58	74	0.58	74	0.58	74	0.58	74	0.58	74	0.58	74	0.58
125A-5	73	0.30	73	0.30	73	0.30	88	0.25	88	0.25	88	0.25	88	0.25
125A-8	73	0.22	73	0.22	73	0.22	84	0.18	88	0.18	88	0.18	88	0.18
125A-9	73	0.21	73	0.21	73	0.21	88	0.16	88	0.16	88	0.16	88	0.16
125A-10	74	0.39	74	0.39	74	0.39	74	0.39	80	0.38	79	0.35	89	0.33
125A-11	74	0.40	74	0.40	74	0.40	75	0.40	83	0.35	87	0.35	89	0.34
125A-12	76	0.41	76	0.41	76	0.41	76	0.41	76	0.41	77	0.38	90	0.35
125A-13	74	0.60	74	0.60	74	0.60	75	0.60	83	0.55	82	0.55	89	0.53
125A-14	73	0.47	73	0.47	73	0.47	75	0.46	84	0.41	84	0.41	87	0.41
125A-15	75	0.39	75	0.39	75	0.39	75	0.39	75	0.39	80	0.38	88	0.33
125A-16	76	0.57	76	0.57	76	0.57	76	0.57	76	0.57	79	0.56	89	0.51
125B-1	73	0.28	73	0.28	73	0.28	88	0.23	88	0.23	88	0.23	88	0.23
125B-2	73	0.28	73	0.28	73	0.28	84	0.24	84	0.24	84	0.24	84	0.24
125B-3	73	0.36	73	0.36	73	0.36	88	0.30	88	0.30	88	0.30	88	0.30
125B-4	73	0.39	73	0.39	73	0.39	84	0.35	84	0.35	84	0.35	84	0.35
125A-1	73	0.34	73	0.34	73	0.34	76	0.33	80	0.30	84	0.29	88	0.28
125A-2	73	0.31	73	0.31	73	0.31	85	0.27	88	0.26	88	0.26	88	0.26
125A-3	73	0.32	73	0.32	73	0.32	88	0.27	88	0.27	88	0.27	88	0.27
125A-4	73	0.30	73	0.30	73	0.30	88	0.25	88	0.25	88	0.25	88	0.25
125A-6	73	0.26	73	0.26	73	0.26	73	0.26	78	0.25	81	0.23	89	0.21
125A-7	73	0.28	73	0.28	73	0.28	77	0.27	82	0.25	84	0.24	88	0.23
213A-2	73	0.38	73	0.38	73	0.38	73	0.38	73	0.38	73	0.38	73	0.38
213A-3	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35
213A-4	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31
OFF1A-2	75	0.31	74	0.31	74	0.31	74	0.31	74	0.31	74	0.31	74	0.31
OFF1A-3	74	0.36	74	0.36	74	0.36	74	0.36	74	0.36	74	0.36	74	0.36
OFF1A-4	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33
213A-6	73	0.40	73	0.40	73	0.40	73	0.40	73	0.40	73	0.40	73	0.40
213A-7	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32
213A-8	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	88	0.29	73	0.32
213A-9	73	0.42	73	0.42	73	0.42	73	0.42	73	0.42	88	0.39	73	0.42
213A-10	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32
213A-11	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32
213B-1	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32
213B-2	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32
213B-3	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32
213B-4	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33
213B-5	73	0.36	73	0.36	73	0.36	73	0.36	73	0.36	73	0.36	73	0.36
213B-6	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32	73	0.32
213B-7	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39
223A-2	73	0.30	73	0.30	88	0.24	88	0.24	88	0.24	88	0.24	88	0.24
223A-3	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33
223B-2	73	0.27	73	0.27	86	0.24	86	0.22	86	0.22	86	0.22	86	0.22
223B-3	73	0.36	73	0.36	87	0.31	87	0.31	87	0.31	87	0.31	87	0.31
223B-4	73	0.34	73	0.34	88	0.29	88	0.29	88	0.29	88	0.29	88	0.29
223B-5	73	0.37	73	0.37	73	0.37	86	0.32	88	0.31	88	0.31	88	0.31
223B-6	73	0.40	73	0.40	73	0.40	74	0.40	79	0.38	81	0.35	88	0.34
223B-7	73	0.27	73	0.27	88	0.22	88	0.22	88	0.22	88	0.22	88	0.22
223C-1	73	0.36	73	0.36	88	0.30	88	0.30	88	0.30	88	0.30	88	0.30
223C-2	73	0.35	73	0.35	73	0.35	88	0.30	88	0.30	88	0.30	88	0.30
223C-3	73	0.35	73	0.35	73	0.35	85	0.31	88	0.30	88	0.30	88	0.30
223C-4	73	0.46	73	0.46	73	0.46	76	0.42	78	0.42	83	0.41	83	0.41
223C-5	73	0.22	73	0.22	73	0.22	73	0.22	73	0.22	73	0.22	73	0.22
223C-6	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34
223C-7	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35
223C-8	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35	73	0.35
223C-9	73	0.42	73	0.42	73	0.42	77	0.41	81	0.37	85	0.37	88	0.36
223C-10	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26
223C-11	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34
223C-12	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33
223C-13	73	0.34	73	0.34	87	0.28	88	0.28	88	0.28	88	0.28	88	0.28
223C-14	75	0.45	75	0.45	77	0.44	79	0.44	83	0.40	85	0.40	89	0.39
223C-15	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26
223C-16	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34
223C-17	73	0.35	73	0.35	88	0.30	88	0.30	88	0.30	88	0.30	88	0.30
223C-18	73	0.36	73	0.36	87	0.30	88	0.30	88	0.30	88	0.30	88	0.30
223C-19	76	0.44	80	0.43	77	0.44	80	0.41	83	0.40	88	0.39	89	0.39
223C-20	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26	73	0.26
223C-21	73	0.34	73	0.34	88	0.29	88	0.29	88	0.29	88	0.29	88	0.29

223C-22	73	0.37	73	0.37	88	0.32	88	0.32	88	0.32	88	0.32	88	0.32
223C-23	73	0.37	83	0.34	80	0.35	83	0.32	85	0.32	85	0.32	85	0.32
223C-24	77	0.46	78	0.46	77	0.46	78	0.46	83	0.42	89	0.41	89	0.41
NW1-C	81	0.29	81	0.29	81	0.29	81	0.29	81	0.29	81	0.29	81	0.29
NW2-C	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39
NW5-C	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34
NW7-C	84	0.39	84	0.39	84	0.39	84	0.39	84	0.39	84	0.39	84	0.39
NW9-C	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34	73	0.34
NW11-C	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31
NW17-C	73	0.41	73	0.41	73	0.41	73	0.41	73	0.41	73	0.41	73	0.41
NW21-C	84	0.34	84	0.34	84	0.34	84	0.34	84	0.34	84	0.34	84	0.34
NW23-C	73	0.38	73	0.38	73	0.38	73	0.38	73	0.38	73	0.38	73	0.38
NW33-C	86	0.26	86	0.26	86	0.26	86	0.26	86	0.26	86	0.26	86	0.26
NW35-C	83	0.24	83	0.24	83	0.24	83	0.24	83	0.24	83	0.24	83	0.24
NW50-C	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31	73	0.31
NW51-C	73	0.27	73	0.27	73	0.27	73	0.27	73	0.27	73	0.27	73	0.27
NW64-C	73	0.37	73	0.37	73	0.37	73	0.37	73	0.37	73	0.37	73	0.37
NW102-C	73	0.44	73	0.44	73	0.44	73	0.44	73	0.44	73	0.44	73	0.44
NW130-C	75	0.42	75	0.42	75	0.42	75	0.42	75	0.42	75	0.42	75	0.42
OFF1A-5	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39	73	0.39
OFF1A-6	73	0.36	73	0.36	73	0.36	73	0.36	73	0.36	73	0.36	73	0.36
OFF2A	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33	73	0.33
OFF2B	73	0.23	73	0.23	73	0.23	73	0.23	73	0.23	73	0.23	73	0.23
OFF3	73	0.30	73	0.30	73	0.30	73	0.30	73	0.30	73	0.30	73	0.30
OFF4-1	77	0.33	77	0.33	77	0.33	77	0.33	77	0.33	77	0.33	77	0.33
OFF4-2	79	0.16	79	0.16	79	0.16	79	0.16	79	0.16	79	0.16	79	0.16
OFF5-1	80	0.24	80	0.24	80	0.24	80	0.24	80	0.24	80	0.24	80	0.24
OFF5-2	86	0.34	86	0.34	86	0.34	86	0.34	86	0.34	86	0.34	86	0.34
OFF8	86	0.27	86	0.27	86	0.27	86	0.27	86	0.27	86	0.27	86	0.27
OFF9	86	0.39	86	0.39	86	0.39	86	0.39	86	0.39	86	0.39	86	0.39

APPENDIX C
HEC-1 OUTPUT SUMMARY

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1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   09JAN09  TIME  11:08:05  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                   HEC-1 INPUT                                                   PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                        *DIAGRAM
 *** FREE ***
             1          ID    KLEINFELDER
             2          ID    FEBRUARY 2008
             3          ID
             4          ID    THIS MODEL OUTPUT PRESENTS THE BASIN CHARACTERISTICS, ROUTING ELEMENTS,
             5          ID    AND ROUTING NETWORK FOR THE BASELINE ALTERNATIVE. HOWEVER, THE OUTPUT
             6          ID    IS ALSO AN EXAMPLE OF THE ROUTING NETWORK USED IN ALL ALTERNATIVES. ONLY
             7          ID    THE LS AND UD CARDS WERE CHANGED IN OTHER MODELS TO REFELCT CHANGES AMONG
             8          ID    ALTERNATIVES.
             9          ID
            10          ID
            11          ID    DESIGN STORM = 100-YEAR 6-HOUR STORM
            12          ID    STORM DISTRIBUTION = SDN5
            13          ID
            14          ID
            15          IT       5       0       0     300
            16          IO       5       0       0
            17          IN       5       0       0
            18          JR    PREC   1.000   0.870   0.740   0.570   0.440   0.260
                        *
                        * SDN5

            19          KK  223B-2
            20          BA   0.191
            21          PB    2.77
            22          PC   0.000   0.020   0.059   0.080   0.110   0.144   0.150   0.160   0.168   0.171
            23          PC   0.180   0.182   0.187   0.190   0.197   0.202   0.210   0.220   0.230   0.241
            24          PC   0.250   0.259   0.265   0.280   0.290   0.300   0.305   0.309   0.310   0.317
            25          PC   0.321   0.327   0.333   0.346   0.361   0.381   0.408   0.430   0.477   0.514
            26          PC   0.561   0.630   0.710   0.720   0.731   0.752   0.779   0.790   0.795   0.804
            27          PC   0.810   0.820   0.826   0.840   0.859   0.889   0.910   0.938   0.966   0.970
            28          PC   0.974   0.979   0.981   0.983   0.985   0.989   0.990   0.992   0.993   0.996
            29          PC   0.997   0.999   1.000
            30          LS       0      73
            31          UD   0.266
                        *

            32          KK R223B-2
            33          KM   ROUTE 223B-2 TO 223B-3
            34          RD    2600  0.0204    0.05       0    TRAP      10      15
                        *
```

```
  35          KK  223B-3
  36          BA   0.257
  37          LS       0      73
  38          UD   0.363
              *

  39          KK C223B-3
  40          KM   COMBINE R223B-2 AND 223B-3
  41          HC       2
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  42          KKRC223B-3
  43          KM   ROUTE C223B-3 TO 223B-4
  44          RD    2600  0.0181    0.05       0    TRAP      10      15
              *

  45          KK  223B-4
  46          BA   0.244
  47          LS       0      73
  48          UD   0.344
              *

  49          KK C223B-4
  50          KM   COMBINE RC223B-3 AND 223B-4
  51          HC       2
              *

  52          KKRC223B-4
  53          KM   ROUTE C223B-4 TO 223B-5
  54          RD    2600  0.0192    0.05       0    TRAP      10      15
              *

  55          KK  223B-5
  56          BA   0.252
  57          LS       0      73
  58          UD   0.370
              *

  59          KK C223B-5
  60          KM   COMBINE RC223B-4 AND 223B-5
  61          HC       2
              *

  62          KKRC223B-5
  63          KM   ROUTE C223B-5 TO 223B-6
  64          RD    2600  0.0075    0.05       0    TRAP      10      15
              *

  65          KK  223B-6
  66          BA   0.192
  67          LS       0      73
  68          UD   0.399
              *

  69          KK C223B-6
  70          KM   COMBINE RC223B-5 AND 223B-6
  71          HC       2
              *

  72          KK  223B-7
  73          BA   0.230
  74          LS       0      73
  75          UD   0.267
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  76          KK R223B-7
  77          KM   ROUTE 223B-7 TO 223C-1
  78          RD    2600  0.0211    0.05       0    TRAP      10      15
              *

  79          KK  223C-1
  80          BA   0.266
  81          LS       0      73
```

```
 82          UD   0.360
             *

 83          KK C223C-1
 84          KM   COMBINE R223B-7 AND 223C-1
 85          HC       2
             *

 86          KKRC223C-1
 87          KM   ROUTE C223C-1 TO 223C-2
 88          RD    2600  0.0212    0.05       0    TRAP      10      15
             *

 89          KK  223C-2
 90          BA   0.273
 91          LS       0      73
 92          UD   0.354
             *

 93          KK C223C-2
 94          KM   COMBINE RC223C-1 AND 223C-2
 95          HC       2
             *

 96          KKRC223C-2
 97          KM   ROUTE C223C-2 TO 223C-3
 98          RD    2600  0.0211    0.05       0    TRAP      10      15
             *

 99          KK  223C-3
100          BA   0.273
101          LS       0      73
102          UD   0.354
             *

103          KK C223C-3
104          KM   COMBINE RC223C-2 AND 223C-3
105          HC       2
             *

106          KK2C223C-3
107          KM   COMBINE C223C-3 AND C223B-6
108          HC       2
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

109          KKRC223C-3
110          KM   ROUTE C223C-3 TO 223C-4
111          KM   FACILITY = UPPER LAS VEGAS WASH WEST
112          KM   FACILITY ID-MILE = UPWE 0000
113          KM   LINING = CONCRETE
114          RD    2500  0.0115   0.015       0    DEEP      30       0
             *

115          KK  125A-1
116          BA   0.393
117          LS       0      73
118          UD   0.335
             *

119          KK     DP1
120          KM   COMBINE 125A-1 AND RC223C-3
121          HC       2
             *

122          KKRC125A-1
123          KM   ROUTE C223C-3 TO 223C-4
124          RD    2300  0.0115    0.05       0    TRAP      10      15
             *

125          KK  223C-4
126          BA   0.262
127          LS       0      73
128          UD   0.459
             *

129          KK C223C-4
130          KM   COMBINE RC223C-3 AND 223C-4
```

```
 131          HC       2
              *

 132          KK  223C-5
 133          BA   0.219
 134          LS       0      73
 135          UD   0.224
              *

 136          KK R223C-5
 137          KM   ROUTE 223C-5 TO 223C-6
 138          RD    2600  0.0231    0.05       0    TRAP      10      15
              *

 139          KK  223C-6
 140          BA   0.249
 141          LS       0      73
 142          UD   0.344
              *
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 143          KK C223C-6
 144          KM   COMBINE R223C-5 AND 223C-6
 145          HC       2
              *

 146          KKRC223C-6
 147          KM   ROUTE C223C-6 TO 223C-7
 148          RD    2600  0.0212    0.05       0    TRAP      10      15
              *

 149          KK  223C-7
 150          BA   0.250
 151          LS       0      73
 152          UD   0.349
              *

 153          KK C223C-7
 154          KM   COMBINE RC223C-6 AND 223C-7
 155          HC       2
              *

 156          KKRC223C-7
 157          KM   ROUTE C223C-7 TO 223C-8
 158          RD    2600  0.0231    0.05       0    TRAP      10      15
              *

 159          KK  223C-8
 160          BA   0.251
 161          LS       0      73
 162          UD   0.353
              *

 163          KK C223C-8
 164          KM   COMBINE RC223C-7 AND 223C-8
 165          HC       2
              *

 166          KK1RC23C-8
 167          KM   ROUTE C223C-8 TO UPWE 0000
 168          RD    1600  0.0231    0.05       0    TRAP      10      15
              *

 169          KK2C223C-8
 170          KM   COMBINE 1RC23C-8 AND C223C-4
 171          HC       2
              *

 172          KK2RC23C-8
 173          KM   ROUTE 2C223C-8 TO 223C-9
 174          RD    1400  0.0197    0.05       0    TRAP      20      10
              *
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 175          KK  125A-2
```

```
 176          BA   0.339
 177          LS       0      73
 178          UD   0.311
              *

 179          KK R125A-2
 180          KM   ROUTE 125A-2 TO 125A-6
 181          KM   STREET NAME = HUALAPAI
 182          RD    2400  0.0317    0.05       0    TRAP      10      15
              *

 183          KK  125A-6
 184          BA   0.165
 185          LS       0      73
 186          UD   0.263
              *

 187          KK C125A-6
 188          KM   COMBINE 125A-6, R125A-2 AND RC125A-1
 189          KM   COMBINATION @ HUALAPAI AND US95
 190          HC       3
              *

 191          KKRC125A-6
 192          KM   ROUTE 2C223C-8 TO 223C-9
 193          RD    2300  0.0197    0.05       0    TRAP      20      10
              *

 194          KK  223C-9
 195          BA   0.313
 196          LS       0      73
 197          UD   0.418
              *

 198          KK C223C-9
 199          KM   COMBINE RC223C-8 AND 223C-9
 200          HC       2
              *

 201          KK  125A-3
 202          BA   0.357
 203          LS       0      73
 204          UD   0.321
              *

 205          KK R125A-3
 206          KM   ROUTE 125A-3 TO 125A-7
 207          KM   STREET NAME = GRAND CANYON
 208          RD    4900  0.0265    0.05       0    TRAP      10      15
              *
1                                          HEC-1 INPUT                                                    PAGE  7

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 209          KK  125A-7
 210          BA   0.382
 211          LS       0      73
 212          UD   0.284
              *

 213          KK C125A-7
 214          KM   COMBINE 125A-7, R125A-3 AND RC125A-6
 215          KM   COMBINATION @ GRAND CANYON AND US95
 216          HC       3
              *

 217          KK 223C-10
 218          BA   0.241
 219          LS       0      73
 220          UD   0.256
              *

 221          KKR223C-10
 222          KM   ROUTE 223C-10 TO 223C-11
 223          RD    2600  0.0212    0.05       0    TRAP      10      15
              *

 224          KK 223C-11
 225          BA   0.250
 226          LS       0      73
```

```
 227          UD   0.337
              *

 228          KKC223C-11
 229          KM   COMBINE R223C-10 AND 223C-11
 230          HC       2
              *

 231          KKRC23C-11
 232          KM   ROUTE C223C-11 TO 223C-12
 233          RD    2600   0.025    0.05       0    TRAP      10      15
              *

 234          KK 223C-12
 235          BA   0.251
 236          LS       0      73
 237          UD   0.335
              *

 238          KKC223C-12
 239          KM   COMBINE RC23C-11 AND 223C-12
 240          HC       2
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 241          KKRC23C-12
 242          KM   ROUTE C223C-12 TO 223C-13
 243          RD    2600   0.025    0.05       0    TRAP      10      15
              *

 244          KK 223C-13
 245          BA   0.247
 246          LS       0      73
 247          UD   0.335
              *

 248          KKC223C-13
 249          KM   COMBINE RC23C-12 AND 223C-13
 250          HC       2
              *

 251          KK1RC3C-13
 252          KM   ROUTE C223C-13 TO UPWE 0000
 253          RD    2200  0.0218    0.05       0    TRAP      10      15
              *

 254          KK2C23C-13
 255          KM   COMBINE 1RC3C-13 AND C223C-9
 256          HC       2
              *

 257          KK2RC3C-13
 258          KM   ROUTE 2C23C-13 TO 223C-14
 259          RD    4000  0.0105    0.05       0    TRAP      10      15
              *

 260          KK 223C-14
 261          BA   0.375
 262          LS       0      75
 263          UD   0.448
              *

 264          KKC223C-14
 265          KM   COMBINE 2RC3C-13 AND 223C-14
 266          HC       2
              *

 267          KK  125A-4
 268          BA   0.317
 269          LS       0      73
 270          UD   0.302
              *

 271          KK R125A-4
 272          KM   ROUTE 125A-4 TO 125A-8
 273          KM   STREET NAME = FORT APACHE
 274          RD    3400  0.0324    0.05       0    TRAP      10      15
              *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 275          KK  125A-8
 276          BA   0.328
 277          LS       0      73
 278          UD   0.223
              *

 279          KK C125A-8
 280          KM   COMBINE 125A-8 AND R125A-4
 281          KM   COMBINATION @ FORT APACHE AND US95
 282          HC       2
              *

 283          KKRC125A-8
 284          KM   ROUTE C125A-8 TO 125A-10
 285          KM   STREET NAME = FORT APACHE
 286          RD    3400  0.0162    0.05       0    TRAP      10      15
              *

 287          KK 125A-10
 288          BA   0.239
 289          LS       0      74
 290          UD   0.389
              *

 291          KKC125A-10
 292          KM   COMBINE 125A-10, RC125A-8 AND RC125A-7
 293          KM   COMBINATION @ FORT APACHE AND US95
 294          HC       3
              *

 295          KK 223C-15
 296          BA   0.251
 297          LS       0      73
 298          UD   0.263
              *

 299          KKR223C-15
 300          KM   ROUTE 223C-15 TO 223C-16
 301          RD    2600   0.025    0.05       0    TRAP      10      15
              *

 302          KK 223C-16
 303          BA   0.251
 304          LS       0      73
 305          UD   0.337
              *

 306          KKC223C-16
 307          KM   COMBINE R223C-15 AND 223C-16
 308          HC       2
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 309          KKRC23C-16
 310          KM   ROUTE C223C-16 TO 223C-17
 311          RD    2600   0.025    0.05       0    TRAP      10      15
              *

 312          KK 223C-17
 313          BA   0.248
 314          LS       0      73
 315          UD   0.351
              *

 316          KKC223C-17
 317          KM   COMBINE RC23C-16 AND 223C-17
 318          HC       2
              *

 319          KKRC23C-17
 320          KM   ROUTE C223C-17 TO 223C-18
 321          RD    2600  0.0269    0.05       0    TRAP      10      15
              *
```

```
 322          KK 223C-18
 323          BA   0.258
 324          LS       0      73
 325          UD   0.355
              *

 326          KKC223C-18
 327          KM   COMBINE RC23C-17 AND 223C-18
 328          HC       2
              *

 329          KK1RC3C-18
 330          KM   ROUTE C223C-18 TO UPWE 0000
 331          RD    3000    0.02    0.05       0    TRAP      10      15
              *

 332          KK2C23C-18
 333          KM   COMBINE 1RC3C-18 AND C223C-14
 334          HC       2
              *

 335          KK2RC3C-18
 336          KM   ROUTE 2C23C-18 TO 223C-19
 337          RD    2800  0.0714    0.05       0    TRAP      20      10
              *

 338          KK 223C-19
 339          BA   0.373
 340          LS       0      76
 341          UD   0.443
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 342          KKC223C-19
 343          KM   COMBINE RC23C-18 AND 223C-19
 344          HC       2
              *

 345          KK  125A-5
 346          BA   0.305
 347          LS       0      73
 348          UD   0.299
              *

 349          KK R125A-5
 350          KM   ROUTE 125A-5 TO 125A-9
 351          KM   STREET NAME = EL CAPITAN
 352          RD    3400  0.0324    0.05       0    TRAP      10      15
              *

 353          KK  125A-9
 354          BA   0.326
 355          LS       0      73
 356          UD   0.209
              *

 357          KK C125A-9
 358          KM   COMBINE 125A-9 AND R125A-5
 359          HC       2
              *

 360          KKRC125A-9
 361          KM   ROUTE C125A-9 TO 125A-11
 362          KM   STREET NAME = EL CAPITAN
 363          RD    2500   0.022    0.05       0    TRAP      10      15
              *

 364          KK 125A-11
 365          BA   0.253
 366          LS       0      74
 367          UD   0.399
              *

 368          KKC125A-11
 369          KM   COMBINE 125A-11 AND RC125A-9
 370          HC       2
              *
```

```
 371          KKRC25A-11
 372          KM   ROUTE C125A-11 TO 125A-12
 373          KM   STREET NAME = EL CAPITAN TO US 95
 374          RD    3700  0.0081    0.05       0    TRAP      10      15
              *
1                                   HEC-1 INPUT                                                PAGE 12

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 375          KK 125A-12
 376          BA   0.225
 377          LS       0      76
 378          UD   0.409
              *

 379          KKC125A-12
 380          KM   COMBINE 125A-12, RC25A-11 AND RC25A-10
 381          KM   COMBINATION @ DURANGO AND US95
 382          HC       3
              *

 383          KK 223C-20
 384          BA   0.265
 385          LS       0      73
 386          UD   0.261
              *

 387          KKR223C-20
 388          KM   ROUTE 223C-20 TO 223C-21
 389          RD    2600   0.025    0.05       0    TRAP      10      15
              *

 390          KK 223C-21
 391          BA   0.252
 392          LS       0      73
 393          UD   0.344
              *

 394          KKC223C-21
 395          KM   COMBINE R223C-20 AND 223C-21
 396          HC       2
              *

 397          KKRC23C-21
 398          KM   ROUTE C223C-21 TO 223C-22
 399          RD    2600  0.0288    0.05       0    TRAP      10      15
              *

 400          KK 223C-22
 401          BA   0.262
 402          LS       0      73
 403          UD   0.372
              *

 404          KKC223C-22
 405          KM   COMBINE RC23C-21 AND 223C-22
 406          HC       2
              *
1                                   HEC-1 INPUT                                                PAGE 13

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 407          KKRC23C-22
 408          KM   ROUTE C223C-22 TO 223C-23
 409          RD    2600   0.025    0.05       0    TRAP      10      15
              *

 410          KK 223C-23
 411          BA   0.253
 412          LS       0      73
 413          UD   0.367
              *

 414          KKC223C-23
 415          KM   COMBINE RC23C-22 AND 223C-23
 416          HC       2
              *
```

```
 417          KK1RC3C-23
 418          KM   ROUTE C223C-23 TO UPWE 000
 419          RD    2100   0.019    0.05       0    TRAP      10      15
              *

 420          KK2C23C-23
 421          KM   COMBINE 1RC3C-23 AND C223C-19
 422          HC       2
              *

 423          KK2RC3C-23
 424          KM   ROUTE 2C23C-23 TO 223C-24
 425          RD    3200  0.0125    0.05       0    TRAP      10      15
              *

 426          KK 223C-24
 427          BA   0.315
 428          LS       0      77
 429          UD   0.464
              *

 430          KKC223C-24
 431          KM   COMBINE RC23C-23 AND 223C-24
 432          HC       2
              *

 433          KK 125A-13
 434          BA   0.519
 435          LS       0      74
 436          UD   0.600
              *

 437          KKR125A-13
 438          KM   ROUTE 125A-13 TO 125A-15
 439          KM   STREET NAME = CIMARRON
 440          RD    3200  0.0094    0.05       0    TRAP      10      15
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 441          KK 125A-15
 442          BA   0.219
 443          LS       0      75
 444          UD   0.389
              *

 445          KK DP2WASH
 446          KM   COMBINE 125A-15, R125A-13 AND RC25A-12
 447          KM   CIMARRON AND MOCCASIN
 448          HC       3
              *

 449          KK  223A-1
 450          BA   6.378
 451          LS       0      74
 452          UD   0.972
              *

 453          KK  223A-2
 454          BA   0.384
 455          LS       0      73
 456          UD   0.295
              *

 457          KK C223A-2
 458          KM   COMBINE C223A-1 AND 223A-2
 459          HC       2
              *

 460          KK  223A-3
 461          BA   0.250
 462          LS       0      73
 463          UD   0.331
              *

 464          KK R223A-3
 465          KM   ROUTE 223A-2 TO C223A-2
 466          RD    1300  0.0308    0.05       0    TRAP      10      15
              *
```

```
 467          KK C223A-3
 468          KM   COMBINE R223A-3 AND C223A-2
 469          HC       2
              *

 470          KKRC223A-3
 471          RD    3500  0.0057    0.05       0    TRAP      10       5
              *
1                                        HEC-1 INPUT                                                PAGE 15

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 472          KK  213A-6
 473          BA   0.279
 474          LS       0      73
 475          UD   0.395
              *

 476          KK C213A-6
 477          KM   COMBINE RC223A-3 AND 213A-6
 478          HC       2
              *

 479          KK  213A-7
 480          BA   0.251
 481          LS       0      73
 482          UD   0.319
              *

 483          KK R213A-7
 484          KM   ROUTE 213A-7 TO 213A-8
 485          RD    2600  0.0288    0.05       0    TRAP      10      15
              *

 486          KK  213A-8
 487          BA   0.255
 488          LS       0      73
 489          UD   0.322
              *

 490          KK C213A-8
 491          KM   COMBINE R213A-7 AND 213A-8
 492          HC       2
              *

 493          KKRC213A-8
 494          KM   ROUTE C213A-8 TO 213A-6
 495          RD    1500    0.02    0.05       0    TRAP      10      15
              *

 496          KK2C213A-6
 497          KM   COMBINE C213A-6 AND RC213A-8
 498          HC       2
              *

 499          KKRC213A-6
 500          KM   ROUTE C213A-6 TO 213A-9
 501          RD    3200  0.0063    0.05       0    TRAP      10       5
              *

 502          KK  213A-9
 503          BA   0.252
 504          LS       0      73
 505          UD   0.423
              *
1                                        HEC-1 INPUT                                                PAGE 16

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 506          KK C213A-9
 507          KM   COMBINE RC213A-6 AND 213A-9
 508          HC       2
              *

 509          KK  213A-2
 510          BA   0.500
 511          LS       0      73
 512          UD   0.380
```

```
                 *

513              KKRC213A-2
514              KM   ROUTE C213A-2 TO 213A-3
515              KM   IRON MOUNTAIN
516              RD    2600  0.0269    0.05       0    TRAP      10      15
                 *

517              KK  213A-3
518              BA   0.371
519              LS       0      73
520              UD   0.353
                 *

521              KK C213A-3
522              KM   COMBINE RC213A-2 AND 213A-3
523              KM   IRON MOUNTAIN AND HURTADO
524              HC       2
                 *

525              KKRC213A-3
526              KM   ROUTE C213A-3 TO 213A-4
527              KM   IRON MOUNTAIN
528              RD    2600  0.0346    0.05       0    TRAP      10      15
                 *

529              KK  213A-4
530              BA   0.251
531              LS       0      73
532              UD   0.311
                 *

533              KK C213A-4
534              KM   COMBINE RC213A-3 AND 213A-4
535              KM   IRON MOUNTAIN AND WOOLBRIGHT
536              HC       2
                 *

537              KKRC213A-4
538              KM   ROUTE C213A-4 TO 213A-5
539              KM   NATURAL WASH
540              KM   TRAVEL LENGTH = 13,000
541              KM   SLOPE = 3.5%
542              KM   N = 0.040
543              KM   HYDRAULIC RADIUS = 1.5
```



```
            LINE ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

544              KM   VELOCITY =
545              RM       3   0.247    0.15
                 *

546              KK  213A-5
547              BA   2.059
548              LS       0      73
549              UD   0.701
                 *

550              KK C213A-5
551              KM   COMBINE RC213A-4 AND 213A-5
552              HC       2
                 *

553              KKRC213A-5
554              KM   ROUTE C213A-5 TO 213A-10
555              RD    2600  0.0288    0.05       0    TRAP      10      15
                 *

556              KK 213A-10
557              BA   0.252
558              LS       0      73
559              UD   0.324
                 *

560              KKC213A-10
561              KM   COMBINE RC213A-5 AND 213A-10
562              HC       2
                 *

563              KKRC13A-10
```

```
 564          KM   ROUTE C213A-10 TO 213A-11
 565          RD    2600  0.0288    0.05       0    TRAP      10      15
              *

 566          KK 213A-11
 567          BA   0.256
 568          LS       0      73
 569          UD   0.319
              *

 570          KKC213A-11
 571          KM   COMBINE RC13A-10 AND 213A-11
 572          HC       2
              *

 573          KKRC13A-11
 574          KM   ROUTE C213A-11 TO 213B-6
 575          RD    2600  0.0231    0.05       0    TRAP      10      15
              *
1                                          HEC-1 INPUT                                                    PAGE 18

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 576          KK  213B-6
 577          BA   0.244
 578          LS       0      73
 579          UD   0.323
              *

 580          KK C213B-6
 581          KM   COMBINE RC13A-11 AND 213B-6
 582          HC       2
              *

 583          KKRC213B-6
 584          KM   ROUTE C213B-6 TO 213A-9
 585          RD    1100  0.0318    0.05       0    TRAP      10      15
              *

 586          KK2C213A-9
 587          KM   COMBINE RC213B-6 AND C213A-9
 588          HC       2
              *

 589          KKRC213A-9
 590          KM   ROUTE C213A-9 TO 213B-7
 591          RD    3200  0.0078    0.05       0    TRAP      10       5
              *

 592          KK  213B-7
 593          BA   0.249
 594          LS       0      73
 595          UD   0.389
              *

 596          KK C213B-7
 597          KM   COMBINE RC13A-11 AND 213B-6
 598          HC       2
              *

 599          KK  213B-1
 600          BA   0.261
 601          LS       0      73
 602          UD   0.319
              *

 603          KK R213B-1
 604          KM   ROUTE 213B-1 TO 213B-2
 605          RD    2600  0.0288    0.05       0    TRAP      10      15
              *

 606          KK  213B-2
 607          BA   0.262
 608          LS       0      73
 609          UD   0.318
              *
1                                          HEC-1 INPUT                                                    PAGE 19

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
610          KK C213B-2
611          KM   COMBINE R213B-1 AND 213B-2
612          HC       2
             *

613          KKRC213B-2
614          KM   ROUTE C213B-2 TO 213B-3
615          RD    2600  0.0269    0.05       0    TRAP      10      15
             *

616          KK  213B-3
617          BA   0.253
618          LS       0      73
619          UD   0.315
             *

620          KK C213B-3
621          KM   COMBINE RC213B-2 AND 213B-3
622          HC       2
             *

623          KKRC213B-3
624          KM   ROUTE C213B-3 TO 213B-4
625          RD    2600  0.0269    0.05       0    TRAP      10      15
             *

626          KK  213B-4
627          BA   0.255
628          LS       0      73
629          UD   0.329
             *

630          KK C213B-4
631          KM   COMBINE RC213B-3 AND 213B-4
632          HC       2
             *

633          KKRC213B-4
634          KM   ROUTE C213B-4 TO 213B-7
635          RD    1100  0.0318    0.05       0    TRAP      10      15
             *

636          KK2C213B-7
637          KM   COMBINE C213B-7 AND RC213B-4
638          HC       2
             *

639          KKRC213B-7
640          KM   ROUTE C213B-7 TO 213B-5
641          RD    3200  0.0109    0.05       0    TRAP      10       5
             *
```



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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

642          KK  213B-5
643          BA   0.240
644          LS       0      73
645          UD   0.363
             *

646          KK C213B-5
647          KM   COMBINE RC213B-7 AND 213B-5
648          HC       2
             *

649          KK OFF1A-2
650          BA   0.378
651          LS       0      75
652          UD   0.305
             *

653          KKRCFF1A-2
654          KM   ROUTE COFF1A-2 TO OFF1A-3
655          KM   SCOTTIE AND RACEL
656          RD    3600  0.0333    0.05       0    TRAP      10      15
             *

657          KK OFF1A-3
```

```
 658          BA   0.302
 659          LS       0      74
 660          UD   0.357
              *

 661          KKCOFF1A-3
 662          KM   COMBINE RCFF1A-2 AND OFF1A-3
 663          KM   RACEL AND HURTADO
 664          HC       2
              *

 665          KKRCFF1A-3
 666          KM   ROUTE COFF1A-3 TO OFF1A-4
 667          KM   HURTADO AND HORSE
 668          RD    3900  0.0308    0.05       0    TRAP      10      15
              *

 669          KK OFF1A-4
 670          BA   0.274
 671          LS       0      73
 672          UD   0.328
              *

 673          KKCOFF1A-4
 674          KM   COMBINE RCFF1A-3 AND OFF1A-4
 675          KM   HORSE AND WOOLBRIGHT
 676          HC       2
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 677          KKRCFF1A-4
 678          KM   ROUTE COFF1A-4 TO OFF1A-5
 679          KM   HORSE AND UNKNOWN STREET
 680          RD    5100  0.0333    0.05       0    TRAP      10      15
              *

 681          KK OFF1A-5
 682          BA   0.418
 683          LS       0      73
 684          UD   0.387
              *

 685          KKCOFF1A-5
 686          KM   COMBINE RCFF1A-4 AND OFF1A-5
 687          HC       2
              *

 688          KKRCFF1A-5
 689          KM   ROUTE COFF1A-5 TO OFF2A
 690          KM   IRON MOUNTAIN
 691          RD    2600  0.0288    0.05       0    TRAP      10      15
              *

 692          KK   OFF2A
 693          BA   0.318
 694          LS       0      73
 695          UD   0.335
              *

 696          KK  COFF2A
 697          KM   COMBINE RCFF1A-5 AND OFF2A
 698          HC       2
              *

 699          KK RCOFF2A
 700          KM   ROUTE COFF2A TO OFF3
 701          KM   IRON MOUNTAIN
 702          RD    2600  0.0333    0.05       0    TRAP      10      15
              *

 703          KK    OFF3
 704          BA   0.222
 705          LS       0      73
 706          UD   0.303
              *

 707          KK   COFF3
 708          KM   COMBINE RC0FF2A AND OFF3
```

```
          709          HC       2
                       *
1                                                HEC-1 INPUT                                                PAGE 22

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          710          KK  RCOFF3
          711          KM   ROUTE COFF3 TO OFF2B
          712          RD    2600  0.0212    0.05       0    TRAP      10       5
                       *

          713          KK   OFF2B
          714          BA   0.160
          715          LS       0      73
          716          UD   0.225
                       *

          717          KK  COFF2B
          718          KM   COMBINE RCOFF3 AND OFF2B
          719          HC       2
                       *

          720          KK RCOFF2B
          721          KM   ROUTE COFF2B TO OFF1A-6
          722          RD    2600  0.0296    0.05       0    TRAP      10       5
                       *

          723          KK OFF1A-6
          724          BA   0.473
          725          LS       0      73
          726          UD   0.365
                       *

          727          KKCOFF1A-6
          728          KM   COMBINE RCOFF2B AND OFF1A-6
          729          HC       2
                       *

          730          KKRCFF1A-6
          731          KM   ROUTE COFF1A-6 TO NW5-C
          732          RD    2600  0.0288    0.05       0    TRAP      10       5
                       *

          733          KK   NW2-C
          734          BA   0.395
          735          LS       0      73
          736          UD   0.393
                       *

          737          KK  RNW2-C
          738          KM   ROUTE NW2-C TO NW5-C
          739          RD    2600   0.025    0.05       0    TRAP      10      15
                       *

          740          KK   NW5-C
          741          BA   0.275
          742          LS       0      73
          743          UD   0.335
                       *
1                                                HEC-1 INPUT                                                PAGE 23

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          744          KK  CNW5-C
          745          KM   COMBINE RNW2-C AND NW5-C
          746          HC       2
                       *

          747          KK 2CNW5-C
          748          KM   COMBINE RCFF1A-6 AND CNW5-C
          749          HC       2
                       *

          750          KK RCNW5-C
          751          KM   ROUTE 2CNW5-C TO NW11-C
          752          RD    2600  0.0288    0.05       0    TRAP      10       5
                       *

          753          KK   NW9-C
```

```
754          BA   0.273
755          LS       0      73
756          UD   0.345
             *

757          KK  RNW9-C
758          KM   ROUTE NW9-C TO NW11-C
759          KM   WITCH MOUNTAIN
760          RD    2600  0.0192    0.05       0    TRAP      10      15
             *

761          KK  NW11-C
762          BA   0.270
763          LS       0      73
764          UD   0.309
             *

765          KK CNW11-C
766          KM   COMBINE RNW9-C AND NW11-C
767          KM   WITCH MOUNTAIN AND MOCCASIN
768          HC       2
             *

769          KK2CNW11-C
770          KM   COMBINE RCNW5-C AND CNW11-C
771          KM   WITCH MOUNTAIN AND MOCCASIN
772          HC       2
             *

773          KKRCNW11-C
774          KM   ROUTE 2CNW11-C TO NW17-C
775          RD    2600  0.0327    0.05       0    TRAP      10       5
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

776          KK  NW17-C
777          BA   0.430
778          LS       0      73
779          UD   0.410
             *

780          KK CNW17-C
781          KM   COMBINE RCNW11-C AND NW17-C
782          KM   NICKELSON AND MOCCASIN
783          HC       2
             *

784          KKRCNW17-C
785          KM   ROUTE CNW17-C TO NW23-C
786          RD    2600  0.0288    0.05       0    TRAP      10       5
             *

787          KK  NW23-C
788          BA   0.376
789          LS       0      73
790          UD   0.384
             *

791          KK CNW23-C
792          KM   COMBINE RCNW17-C AND NW23-C
793          KM   MAINWAL AND MOCCASIN
794          HC       2
             *

795          KKRCNW23-C
796          KM   ROUTE CNW23-C TO 213B-5
797          RD    3500  0.0286    0.05       0    TRAP      10       5
             *

798          KK2C213B-5
799          KM   COMBINE C213B-5 AND RCNW23-C
800          HC       2
             *

801          KKRC213B-5
802          KM   ROUTE 2C213B-5 TO NW64-C
803          RD    7000  0.0293    0.05       0    TRAP      10       5
             *
```

```
          804          KK  NW51-C
          805          BA   0.306
          806          LS       0      73
          807          UD   0.272
                       *
1                                                HEC-1 INPUT                                                PAGE 25

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          808          KK RNW51-C
          809          KM   ROUTE NW51-C TO NW64-C
          810          RD    5900  0.0305    0.05       0    TRAP      10      15
                       *

          811          KK CNW64-C
          812          KM   COMBINE RC213B-5 AND RNW51-C
          813          HC       2
                       *

          814          KK  OFF4-1
          815          BA   0.301
          816          LS       0      77
          817          UD   0.333
                       *

          818          KK ROFF4-1
          819          KM   ROUTE OFF4-1 TO OFF4-2
          820          KM   KYLE CANYON ROAD
          821          RD    5800  0.0414    0.05       0    TRAP      10      15
                       *

          822          KK  OFF4-2
          823          BA   0.420
          824          LS       0      79
          825          UD   0.160
                       *

          826          KK COFF4-2
          827          KM   COMBINE ROFF4-1 AND OFF4-2
          828          HC       2
                       *

          829          KKRCOFF4-2
          830          KM   ROUTE COFF4-2 TO OFF5-1
          831          KM   KYLE CANYON ROAD
          832          RD    2800  0.0429   0.016       0    TRAP       0      50
                       *

          833          KK  OFF5-1
          834          BA   0.297
          835          LS       0      80
          836          UD   0.244
                       *

          837          KK COFF5-1
          838          KM   COMBINE RCOFF4-2 AND OFF5-1
          839          HC       2
                       *
1                                                HEC-1 INPUT                                                PAGE 26

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          840          KKRCOFF5-1
          841          KM   ROUTE COFF5-1 TO NW1-C
          842          RD    5800  0.0362    0.05       0    TRAP      10       3
                       *

          843          KK  OFF5-2
          844          BA   0.395
          845          LS       0      86
          846          UD   0.336
                       *

          847          KK ROFF5-2
          848          KM   ROUTE OFF5-2 TO NW1-C
          849          RD    2300  0.0239    0.05       0    TRAP      10       3
                       *
```

```
 850          KK   NW1-C
 851          BA   0.293
 852          LS       0      81
 853          UD   0.288
              *

 854          KK  CNW1-C
 855          KM   COMBINE ROFF5-2 AND NW1-C
 856          HC       2
              *

 857          KK 2CNW1-C
 858          KM   COMBINE RCOFF5-1 AND CNW1-C
 859          HC       2
              *

 860          KKR2CNW1-C
 861          KM   ROUTE 2CNW1-C TO NW7-C
 862          RD    5500  0.0373    0.05       0    TRAP      10       5
              *

 863          KK   NW7-C
 864          BA   0.488
 865          LS       0      84
 866          UD   0.391
              *

 867          KK  CNW7-C
 868          KM   COMBINE NW7-C AND R2CNW1-C
 869          HC       2
              *

 870          KK RCNW7-C
 871          KM   ROUTE CNW7-C TO NW21-C
 872          RD    2600  0.0365    0.05       0    TRAP      10       5
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 873          KK  NW21-C
 874          BA   0.403
 875          LS       0      84
 876          UD   0.336
              *

 877          KK CNW21-C
 878          KM   COMBINE RCNW7-C AND NW21-C
 879          KM   MAINWAL AND KYLE CANYON
 880          HC       2
              *

 881          KKRCNW21-C
 882          KM   ROUTE CNW21-C TO NW35-C
 883          RD    4000  0.0063    0.05       0    TRAP      10       5
              *

 884          KK    OFF9
 885          BA   0.303
 886          LS       0      86
 887          UD   0.395
              *

 888          KK   ROFF9
 889          KM   ROUTE OFF9 TO NW33-C
 890          KM   HORSE HUALAPAI WEST
 891          RD    4200  0.0321    0.05       0    TRAP      10      15
              *

 892          KK  NW33-C
 893          BA   0.248
 894          LS       0      86
 895          UD   0.264
              *

 896          KK CNW33-C
 897          KM   COMBINE ROFF9 AND NW33-C
 898          KM   BRENT AND HUALAPAI WEST
 899          HC       2
              *
```

```
 900          KK    OFF8
 901          BA   0.272
 902          LS       0      86
 903          UD   0.267
              *

 904          KK   ROFF8
 905          KM   ROUTE OFF8 TO NW33-C
 906          KM   BRENT
 907          RD    3100  0.0387    0.05       0    TRAP      10      15
              *
1                                        HEC-1 INPUT                                                    PAGE 28

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 908          KK2CNW33-C
 909          KM   COMBINE ROFF8 AND CNW33-C
 910          KM   BRENT AND HUALAPAI WEST
 911          HC       2
              *

 912          KKRCNW33-C
 913          KM   ROUTE 2CNW33-C TO NW35-C
 914          RD    3000  0.0321    0.05       0    TRAP      10      15
              *

 915          KK  NW35-C
 916          BA   0.434
 917          LS       0      83
 918          UD   0.240
              *

 919          KK CNW35-C
 920          KM   COMBINE RNW33-C AND NW35-C
 921          KM   KYLE CANYON ROAD AND HUALAPAI WEST
 922          HC       2
              *

 923          KK2CNW35-C
 924          KM   COMBINE CNW35-C AND RCNW21-C
 925          KM   KYLE CANYON ROAD AND HUALAPAI WEST
 926          HC       2
              *

 927          KKRCNW35-C
 928          KM   ROUTE 2CNW35-C TO NW50-C
 929          RD    1900  0.0342    0.05       0    TRAP      10       5
              *

 930          KK  NW50-C
 931          BA   0.358
 932          LS       0      73
 933          UD   0.307
              *

 934          KK CNW50-C
 935          KM   COMBINE RCNW35-C AND NW50-C
 936          KM   KYLE CANYON ROAD AND U.S. 95
 937          HC       2
              *

 938          KKRCNW50-C
 939          KM   ROUTE CNW50-C TO NW64-C
 940          RD    6000  0.0275    0.05       0    TRAP      10       5
              *
1                                        HEC-1 INPUT                                                    PAGE 29

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 941          KK  NW64-C
 942          BA   0.407
 943          LS       0      73
 944          UD   0.366
              *

 945          KK2CNW64-C
 946          KM   COMBINE RCNW50-C AND NW64-C
 947          KM   KYLE CANYON ROAD AND MOCCASIN
```

```
 948          HC       2
              *

 949          KK3CNW64-C
 950          KM   COMBINE 2CNW64-C AND CNW64-C
 951          KM   KYLE CANYON ROAD AND MOCCASIN
 952          HC       2
              *

 953          KKRCNW64-C
 954          KM   ROUTE CNW64-C TO NW102-C
 955          RD    2600  0.0269    0.05       0    TRAP      10       5
              *

 956          KK NW102-C
 957          BA   0.412
 958          LS       0      73
 959          UD   0.442
              *

 960          KKCNW102-C
 961          KM   COMBINE RCNW64-C AND NW102-C
 962          KM   EL CAPITAN AND MOCCASIN
 963          HC       2
              *

 964          KK RC102-C
 965          KM   ROUTE CNW102-C TO NW130-C
 966          RD    4000  0.0225    0.05       0    TRAP      10       5
              *

 967          KK NW130-C
 968          BA   0.241
 969          LS       0      75
 970          UD   0.415
              *

 971          KK DP2WEST
 972          KM   COMBINE RC102-C AND NW130-C
 973          KM   AL CARRISON AND MOCCASIN
 974          HC       2
              *
1                                   HEC-1 INPUT                                          PAGE 30

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 975          KK2CNW130-C
 976          KM   COMBINE C223C-24 AND CNW130-C
 977          HC       2
              *

 978          KKRC25A-15
 979          KM   ROUTE C125A-15 TO 125A-16
 980          KM   FACILITY = UPPER LAS VEGAS WASH
 981          KM   FACILITY ID-MILE = LVUP 0976
 982          KM   LINING = UNLINED
 983          RD    2600  0.0065    0.02       0    TRAP     300       3
              *

 984          KK  125B-1
 985          BA   0.308
 986          LS       0      73
 987          UD   0.281
              *

 988          KK R125B-1
 989          KM   ROUTE 125B-1 TO 125B-3
 990          KM   STREET NAME = CIMARRON
 991          RD    4600  0.0391    0.05       0    TRAP      10      15
              *

 992          KK  125B-3
 993          BA   0.425
 994          LS       0      73
 995          UD   0.356
              *

 996          KK C125B-3
 997          KM   COMBINE 125B-3 AND R125B-1
 998          KM   UPPER LAS VEGAS WASH EAST @ CIMARRON
```

```
 999          HC       2
              *

1000          KKRC125B-3
1001          KM   ROUTE C125B-3 TO 125B-4
1002          RD    3000  0.0083    0.05       0    TRAP      10      15
              *

1003          KK  125B-6
1004          BA   1.693
1005          LS       0      78
1006          UD   0.329
              *

1007          KK R125B-6
1008          KM   ROUTE 125B-6 TO 125B-2
1009          KM   STREET NAME = BUFFALO
1010          RD    3000  0.0433    0.05       0    TRAP      10      15
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1011          KK  125B-2
1012          BA   0.313
1013          LS       0      73
1014          UD   0.284
              *

1015          KK C125B-2
1016          KM   COMBINE 125B-2 AND R125B-6
1017          HC       2
              *

1018          KKRC125B-2
1019          KM   ROUTE C125B-2 TO 125B-4
1020          KM   STREET NAME = BUFFALO
1021          RD    5300  0.0377    0.05       0    TRAP      10      15
              *

1022          KK  125B-4
1023          BA   0.517
1024          LS       0      73
1025          UD   0.392
              *

1026          KK C125B-4
1027          KM   COMBINE 125B-4, RC125B-2 AND RC125B-3
1028          KM   STREET FLOW IN BUFFALO @ UPPER LAS VEGAS WASH EAST
1029          HC       3
              *

1030          KKRC125B-4
1031          KM   ROUTE C125B-4 TO 125A-14
1032          RD    4100  0.0146    0.05       0    TRAP      10      15
              *

1033          KK 125A-14
1034          BA   0.443
1035          LS       0      73
1036          UD   0.467
              *

1037          KKC125A-14
1038          KM   COMBINE 125A-14 AND RC125B-4
1039          HC       2
              *

1040          KKRC25A-14
1041          KM   ROUTE C125A-14 TO 125A-16
1042          RD    3200  0.0038    0.05       0    TRAP      10      15
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1043          KK 125A-16
1044          BA   0.312
1045          LS       0      76
```

```
1046          UD   0.572
              *

1047          KKC125A-16
1048          KM   COMBINE 125A-16 AND RC25A-14
1049          KM   UPPER LV WASH EAST FLOW @ UPPER LAS VEGAS WASH
1050          HC       2
              *

1051          KK     DP2
1052          KM   COMBINE C125A-16 AND RC25A-15
1053          KM   UPPER LAS VEGAS WASH @ BUFFALO
1054          HC       2
              *

1055          KKRC25A-16
1056          KM   ROUTE 2C25A-16 TO 116-7
1057          KM   FACILITY = UPPER LAS VEGAS WASH
1058          KM   FACILITY ID-MILE = LVUP 0976
1059          KM   LINING = UNLINED
1060          RD    2600  0.0077    0.02       0    TRAP     300       3
              *

1061          KK   116-1
1062          BA   0.402
1063          LS       0      73
1064          UD   0.505
              *

1065          KK  R116-1
1066          KM   ROUTE 116-1 TO 116-7
1067          KM   STREET NAME = TENAYA
1068          RD    3200  0.0078    0.02       0    TRAP      10      15
              *

1069          KK   116-7
1070          BA   0.311
1071          LS       0      73
1072          UD   0.535
              *

1073          KK  C116-7
1074          KM   COMBINE 116-7, R116-1 AND RC25A-16
1075          KM   UPPER LAS VEGAS WASH @ TENAYA
1076          HC       3
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1077          KK RC116-7
1078          KM   ROUTE C116-7 TO 116-8
1079          KM   FACILITY = UPPER LAS VEGAS WASH
1080          KM   FACILITY ID-MILE = LVUP 0976
1081          KM   LINING = UNLINED
1082          RD    2600  0.0077    0.02       0    TRAP     300       3
              *

1083          KK     118
1084          BA   3.549
1085          LS       0      84
1086          UD   0.520
              *

1087          KK    R118
1088          KM   ROUTE 118 TO 125B-5
1089          KM   NATURAL WASH
1090          KM   TRAVEL LENGTH = 10,500
1091          KM   SLOPE = 5.8%
1092          KM   N = 0.040
1093          KM   HYDRAULIC RADIUS = 1.5
1094          KM   VELOCITY = 13.43
1095          RM       2   0.155    0.15
              *

1096          KK  125B-5
1097          BA   3.120
1098          LS       0      78
1099          UD   0.625
              *
```

```
1100          KK C125B-5
1101          KM   COMBINE 125B-5, R118
1102          HC       2
              *

1103          KKRC125B-5
1104          RD    3200  0.0063    0.05       0    TRAP      10      15
              *

1105          KK   116-2
1106          BA   0.415
1107          LS       0      73
1108          UD   0.526
              *

1109          KK  C116-2
1110          HC       2
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1111          KK  R116-2
1112          KM   ROUTE 116-2 TO 116-8
1113          KM   STREET NAME = RAINBOW
1114          RD    3200  0.0063    0.05       0    TRAP      10      15
              *

1115          KK   116-8
1116          BA   0.328
1117          LS       0      74
1118          UD   0.580
              *

1119          KK  C116-8
1120          KM   COMBINE 116-8, R116-2 AND RC116-7
1121          KM   UPPER LAS VEGAS WASH @ RAINBOW
1122          HC       3
              *

1123          KK RC116-8
1124          KM   ROUTE C116-8 TO 116-9
1125          KM   FACILITY = UPPER LAS VEGAS WASH
1126          KM   FACILITY ID-MILE = LVUP 0976
1127          KM   LINING = NATURAL WASH
1128          RD    2600  0.0078    0.04       0    TRAP     300       3
              *

1129          KK   116-3
1130          BA   0.403
1131          LS       0      72
1132          UD   0.361
              *

1133          KK  R116-3
1134          KM   ROUTE 116-3 TO 116-9
1135          KM   STREET NAME = TORREY PINES
1136          RD    2600  0.0185    0.05       0    TRAP      10      15
              *

1137          KK   116-9
1138          BA   0.271
1139          LS       0      75
1140          UD   0.699
              *

1141          KK  C116-9
1142          KM   COMBINE 116-9, R116-3 AND RC116-8
1143          KM   UPPER LAS VEGAS WASH @ TORREY PINES
1144          HC       3
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1145          KK RC116-9
1146          KM   ROUTE C116-9 TO 116-13
1147          KM   FACILITY = UPPER LAS VEGAS WASH
```

```
1148          KM   FACILITY ID-MILE = LVUP 0976
1149          KM   LINING = NATURAL WASH
1150          RD    3400  0.0088    0.04       0    TRAP     300       3
              *

1151          KK   116-4
1152          BA   0.417
1153          LS       0      72
1154          UD   0.327
              *

1155          KK  R116-4
1156          KM   ROUTE 116-4 TO 116-10
1157          KM   STREET NAME = TORREY PINES
1158          RD    2700  0.0296    0.05       0    TRAP      10      15
              *

1159          KK  116-10
1160          BA   0.271
1161          LS       0      75
1162          UD   0.329
              *

1163          KK C116-10
1164          KM   COMBINE 116-10 AND R116-4
1165          HC       2
              *

1166          KK  116-13
1167          BA   0.273
1168          LS       0      72
1169          UD   0.594
              *

1170          KK C116-13
1171          KM   COMBINE 116-13, C116-10 AND RC116-9
1172          HC       3
              *

1173          KKRC116-13
1174          KM   ROUTE C116-13 TO 116-14
1175          KM   FACILITY = UPPER LAS VEGAS WASH
1176          KM   FACILITY ID-MILE = LVUP 0976
1177          KM   LINING = NATURAL WASH
1178          RD    3500  0.0086    0.04       0    TRAP     300       3
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1179          KK NW187-C
1180          BA   0.259
1181          LS       0      80
1182          UD   0.638
              *

1183          KK     DP3
1184          KM   COMBINE RC116-13, AND NW187-C
1185          HC       2
              *

1186          KK     111
1187          BA   1.479
1188          LS       0      84
1189          UD   0.453
              *

1190          KK    R111
1191          KM   ROUTE 111 TO 117
1192          KM   NATURAL WASH
1193          KM   TRAVEL LENGTH = 8,000
1194          KM   SLOPE = 7.1%
1195          KM   N = 0.040
1196          KM   HYDRAULIC RADIUS = 1.5
1197          KM   VELOCITY = 14.86
1198          RM       1   0.107    0.15
              *

1199          KK     117
1200          BA   2.334
```

```
1201          LS       0      78
1202          UD   0.554
              *

1203          KK    C117
1204          KM   COMBINE R111 AND 117
1205          HC       2
              *

1206          KK
1207          RD    2700  0.0389    0.05       0    TRAP      10      15
              *

1208          KK   116-5
1209          BA   0.418
1210          LS       0      73
1211          UD   0.312
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1212          KK  C116-5
1213          HC       2
              *

1214          KK  R116-5
1215          KM   ROUTE 116-5 TO 116-11
1216          KM   STREET NAME = JONES
1217          RD    2700  0.0389    0.05       0    TRAP      10      15
              *

1218          KK  116-11
1219          BA   0.270
1220          LS       0      72
1221          UD   0.341
              *

1222          KK C116-11
1223          KM   COMBINE 116-11 AND R116-5
1224          HC       2
              *

1225          KKRC116-11
1226          KM   ROUTE C116-11 TO 116-14
1227          KM   STREET NAME = JONES
1228          RD    3000    0.01    0.05       0    TRAP      10      15
              *

1229          KK   116-6
1230          BA   0.413
1231          LS       0      72
1232          UD   0.297
              *

1233          KK  R116-6
1234          KM   ROUTE 116-6 TO 116-12
1235          KM   STREET NAME = BRADLEY
1236          RD    2700  0.0389    0.05       0    TRAP      10      15
              *

1237          KK     110
1238          BA   3.260
1239          LS       0      85
1240          UD   0.821
              *

1241          KK  116-12
1242          BA   0.265
1243          LS       0      72
1244          UD   0.310
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1245          KK C116-12
1246          KM   COMBINE 116-12, 110 AND R116-6
1247          HC       3
```

```
                 *

1248             KKRC116-12
1249             KM   ROUTE C116-12 TO 116-14
1250             KM   STREET NAME = BRADLEY
1251             RD    2800  0.0214    0.05       0    TRAP      10      15
                 *

1252             KK  116-14
1253             BA   0.543
1254             LS       0      73
1255             UD   0.412
                 *

1256             KK   ULWIN
1257             KM   COMBINE 116-14, RC116-12, RC116-11 AND RC116-13
1258             KM   TOTAL INFLOW TO THE UPPER LAS VEGAS WASH DETETENTION BASIN
1259             HC       4
1260             KO       1
                 *

1261             KK ULWDBEX
1262             KM   FACILITY ID-MILE = LVUP 0910
1263             KM   STORAGE VOLUME = 1836 ACRE-FEET
1264             KM   OUTLET = 2, 8'X8' RCB
1265             KM   100-YEAR DISCHARGE = 4,260 CFS
1266             KM   SPILLWAY LENGTH = 750'
1267             KM   SPILLWAY HEIGHT = 18'
1268             KM   SPILLWAY CREST ELEVATION = 2374.6'
1269             KM   SPILLWAY TYPE = RCC BROAD CRESTED WEIR
1270             KM   PMF DISCHARGE = 182,000 CFS
1271             KM   TOP OF EMBANKMENT ELEVATION = 2393'
1272             RS    1.00    STOR      -1
                 * NEW SV, SE, & SQ CARDS FROM VTN FINDINGS
                 * OUTLET = 2: 8'X8' RCB
1273             SV     0.0     3.9    18.3    45.2    82.5   128.8   184.3   248.9   322.9   411.7
1274             SV   517.5   637.9   773.1   924.2  1092.8  1282.8  1500.1  1750.0  1836.0  2036.6
1275             SE    2340    2342    2344    2346    2348    2350    2352    2354    2356    2358
1276             SE    2360    2362    2364    2366    2368    2370    2372    2374  2374.6    2376
1277             SQ     0.0   197.1   471.5   735.7   989.7  1233.5  1467.1  1690.5  1903.7  2106.7
1278             SQ  2299.5  2482.1  2654.5  2816.7  2968.6  3110.4  3242.0  3363.4  3397.8  7201.7
                 * ORIGINAL SV CARDS "STARRED" OUT
                 * SV 0      40      75      110     250     500     920     1550    1700    1860
                 * SV 2060   2200    2380    2530    2750    3000    3450    4880    6680
                 * SV 0      47      89      130     295     590     1086    1829    2006    2195
                 * SV 2431   2596    2808    2985    3245    3540    4071    5758    7882
                 * SE 2335   2340    2345    2350    2355    2360    2365    2370    2371    2372
                 * SE 2373   2374    2375    2376    2377    2378    2380    2385    2390
                 * SQ 0      720     1690    2300    2800    3290    3730    4120    4190    4260
                 * SQ 6840   10100   15490   20040   26090   34160   53290   106990  182210
                 * KO 3
                 *
```



```
LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1279             KK  RULWDB
1280             KM   ROUTE ULWDB TO CCNW206
1281             KM   FACILITY = UPPER LAS VEGAS WASH
1282             KM   FACILITY ID-MILE = LVUP 0446
1283             KM   LINING = NATURAL WASH
1284             RD    1500   0.009    0.05       0    TRAP     250       3
                 *

1285             KK   SOUTH
1286             BA  14.867
1287             LS       0      80
1288             UD   1.856
                 *

1289             KKS0_RULWDB
1290             HC       2
                 *

1291             KK   R102A
1292             KM   ROUTE NBRULWDB TO 102A
1293             RD    1500   0.009    0.05       0    TRAP     250       3
                 *

1294             KK    102A
```

```
1295          BA   6.273
1296          LS       0      83
1297          UD   0.775
              *

1298          KK  CR102A
1299          KM   COMBINE R102A AND NBRULWDB
1300          HC       2
              *

1301          KK   R102B
1302          KM   ROUTE CR102A TO 102B
1303          RD    1500   0.009    0.05       0    TRAP     250       3
              *

1304          KK    102B
1305          BA   8.885
1306          LS       0      83
1307          UD   0.834
              *

1308          KK  RC102B
1309          KM   COMBINE 102B AND CR102A
1310          HC       2
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1311          KK  FINISH
1312          RD    1500   0.009    0.05       0    TRAP     250       3
1313          KO       1
              *
1314          ZZ
```

1

```
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:27:12  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                   HEC-1 INPUT                                                PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
 *** NOLIST ***
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:27:12  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************


                              KLEINFELDER
                              FEBRUARY 2008
                              BASELINE MODEL

                              DESIGN STORM = 100-YEAR 6-HOUR STORM
                              STORM DISTRIBUTION = SDN5


   10 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           5  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      2    0  ENDING DATE
                       NDTIME        0055  ENDING TIME
                       ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
```

```
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                   1.00       .87       .74       .57       .44       .26


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
1250 KK     *     ULWIN  *
            *            *
            **************

1254 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

1253 HC          HYDROGRAPH COMBINATION
                       ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***

*****************************************************************************************************************************************

                                                   HYDROGRAPH AT STATION    ULWIN
                                                        SUM OF  4 HYDROGRAPHS
                                                       PLAN 1,   RATIO =  1.00

*****************************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	8101.	1		1230	151	5.	1		1845	226	0.
1		0005	2	0.	1		0620	77	7445.	1		1235	152	4.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6836.	1		1240	153	4.	1		1855	228	0.
1		0015	4	0.	1		0630	79	6276.	1		1245	154	3.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5763.	1		1250	155	3.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5298.	1		1255	156	2.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4876.	1		1300	157	2.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4491.	1		1305	158	2.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4136.	1		1310	159	2.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3806.	1		1315	160	1.	1		1930	235	0.
1		0050	11	1.	1		0705	86	3502.	1		1320	161	1.	1		1935	236	0.
1		0055	12	2.	1		0710	87	3222.	1		1325	162	1.	1		1940	237	0.
1		0100	13	4.	1		0715	88	2961.	1		1330	163	1.	1		1945	238	0.
1		0105	14	6.	1		0720	89	2719.	1		1335	164	1.	1		1950	239	0.
1		0110	15	9.	1		0725	90	2495.	1		1340	165	1.	1		1955	240	0.
1		0115	16	12.	1		0730	91	2289.	1		1345	166	1.	1		2000	241	0.
1		0120	17	16.	1		0735	92	2100.	1		1350	167	0.	1		2005	242	0.
1		0125	18	20.	1		0740	93	1928.	1		1355	168	0.	1		2010	243	0.
1		0130	19	25.	1		0745	94	1770.	1		1400	169	0.	1		2015	244	0.
1		0135	20	31.	1		0750	95	1624.	1		1405	170	0.	1		2020	245	0.
1		0140	21	38.	1		0755	96	1490.	1		1410	171	0.	1		2025	246	0.
1		0145	22	46.	1		0800	97	1370.	1		1415	172	0.	1		2030	247	0.
1		0150	23	55.	1		0805	98	1260.	1		1420	173	0.	1		2035	248	0.
1		0155	24	65.	1		0810	99	1161.	1		1425	174	0.	1		2040	249	0.
1		0200	25	77.	1		0815	100	1070.	1		1430	175	0.	1		2045	250	0.
1		0205	26	91.	1		0820	101	983.	1		1435	176	0.	1		2050	251	0.
1		0210	27	109.	1		0825	102	901.	1		1440	177	0.	1		2055	252	0.
1		0215	28	131.	1		0830	103	825.	1		1445	178	0.	1		2100	253	0.
1		0220	29	156.	1		0835	104	754.	1		1450	179	0.	1		2105	254	0.
1		0225	30	184.	1		0840	105	688.	1		1455	180	0.	1		2110	255	0.
1		0230	31	215.	1		0845	106	626.	1		1500	181	0.	1		2115	256	0.
1		0235	32	247.	1		0850	107	569.	1		1505	182	0.	1		2120	257	0.
1		0240	33	280.	1		0855	108	516.	1		1510	183	0.	1		2125	258	0.
1		0245	34	312.	1		0900	109	469.	1		1515	184	0.	1		2130	259	0.
1		0250	35	344.	1		0905	110	425.	1		1520	185	0.	1		2135	260	0.

1	0255	36	375.	*	1	0910	111	387.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	410.	*	1	0915	112	352.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	453.	*	1	0920	113	320.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	510.	*	1	0925	114	292.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	588.	*	1	0930	115	266.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	696.	*	1	0935	116	242.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	850.	*	1	0940	117	220.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1069.	*	1	0945	118	200.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1378.	*	1	0950	119	181.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1791.	*	1	0955	120	164.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	2290.	*	1	1000	121	148.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	2833.	*	1	1005	122	134.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	3365.	*	1	1010	123	121.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	3846.	*	1	1015	124	109.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	4350.	*	1	1020	125	98.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	5234.	*	1	1025	126	88.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	6747.	*	1	1030	127	79.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	8887.	*	1	1035	128	71.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	11092.	*	1	1040	129	64.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	12656.	*	1	1045	130	57.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	13496.	*	1	1050	131	51.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	13752.	*	1	1055	132	46.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	13580.	*	1	1100	133	41.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	13224.	*	1	1105	134	37.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	12817.	*	1	1110	135	33.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	12422.	*	1	1115	136	29.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	12106.	*	1	1120	137	26.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	11869.	*	1	1125	138	23.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	11701.	*	1	1130	139	21.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	11582.	*	1	1135	140	19.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	11513.	*	1	1140	141	17.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	11494.	*	1	1145	142	15.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	11496.	*	1	1150	143	13.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	11461.	*	1	1155	144	12.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	11346.	*	1	1200	145	10.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	11094.	*	1	1205	146	9.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	10672.	*	1	1210	147	8.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	10109.	*	1	1215	148	7.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	9466.	*	1	1220	149	6.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	8785.	*	1	1225	150	6.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 13752.	4.67		5513.	1405.	1353.	1353.
		(INCHES)	.871	.888	.888	.888
		(AC-FT)	2734.	2787.	2787.	2787.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .87

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	6688.	*	1		1230	151	7.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	6187.	*	1		1235	152	6.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	5707.	*	1		1240	153	6.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	5259.	*	1		1245	154	5.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	4844.	*	1		1250	155	4.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	4463.	*	1		1255	156	4.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	4116.	*	1		1300	157	3.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	3796.	*	1		1305	158	3.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	3504.	*	1		1310	159	3.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	3235.	*	1		1315	160	2.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	2987.	*	1		1320	161	2.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	2758.	*	1		1325	162	2.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	2545.	*	1		1330	163	2.	*	1		1945	238	0.
1		0105	14	1.	*	1		0720	89	2348.	*	1		1335	164	1.	*	1		1950	239	0.
1		0110	15	1.	*	1		0725	90	2165.	*	1		1340	165	1.	*	1		1955	240	0.
1		0115	16	2.	*	1		0730	91	1996.	*	1		1345	166	1.	*	1		2000	241	0.
1		0120	17	3.	*	1		0735	92	1839.	*	1		1350	167	1.	*	1		2005	242	0.

1	0125	18	4.	*	1	0740	93	1695.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	6.	*	1	0745	94	1563.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	8.	*	1	0750	95	1441.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	11.	*	1	0755	96	1330.	*	1	1410	171	1.	*	1	2025	246	0.
1	0145	22	15.	*	1	0800	97	1228.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	19.	*	1	0805	98	1135.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	25.	*	1	0810	99	1050.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	32.	*	1	0815	100	968.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	41.	*	1	0820	101	890.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	52.	*	1	0825	102	819.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	65.	*	1	0830	103	754.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	79.	*	1	0835	104	694.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	94.	*	1	0840	105	640.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	110.	*	1	0845	106	588.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	126.	*	1	0850	107	540.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	142.	*	1	0855	108	495.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	159.	*	1	0900	109	452.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	175.	*	1	0905	110	411.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	190.	*	1	0910	111	375.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	206.	*	1	0915	112	342.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	224.	*	1	0920	113	312.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	249.	*	1	0925	114	285.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	288.	*	1	0930	115	260.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	349.	*	1	0935	116	238.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	442.	*	1	0940	117	218.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	580.	*	1	0945	118	200.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	785.	*	1	0950	119	183.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1077.	*	1	0955	120	167.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1446.	*	1	1000	121	153.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1860.	*	1	1005	122	140.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	2280.	*	1	1010	123	129.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	2653.	*	1	1015	124	118.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	2960.	*	1	1020	125	108.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	3224.	*	1	1025	126	99.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	3555.	*	1	1030	127	90.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	4472.	*	1	1035	128	82.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	5809.	*	1	1040	129	75.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	7246.	*	1	1045	130	68.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	8454.	*	1	1050	131	62.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	9227.	*	1	1055	132	56.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	9582.	*	1	1100	133	51.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	9666.	*	1	1105	134	46.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	9589.	*	1	1110	135	41.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	9422.	*	1	1115	136	37.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	9236.	*	1	1120	137	34.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	9081.	*	1	1125	138	30.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	8972.	*	1	1130	139	27.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	8902.	*	1	1135	140	24.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	8856.	*	1	1140	141	22.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	8837.	*	1	1145	142	19.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	8837.	*	1	1150	143	17.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	8827.	*	1	1155	144	16.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	8780.	*	1	1200	145	14.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	8651.	*	1	1205	146	13.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	8421.	*	1	1210	147	11.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	8089.	*	1	1215	148	10.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	7670.	*	1	1220	149	9.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7192.	*	1	1225	150	8.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS)	6-HR	24-HR	72-HR	24.92-HR
+ 9666.	4.83		4123.	1051.	1012.	1012.
		(INCHES)	.652	.664	.664	.664
		(AC-FT)	2044.	2085.	2085.	2085.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .74

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DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW

1	0000	1	0.	*	1	0615	76	5213.	*	1	1230	151	11.	*	1	1845	226	0.
1	0005	2	0.	*	1	0620	77	4870.	*	1	1235	152	10.	*	1	1850	227	0.
1	0010	3	0.	*	1	0625	78	4527.	*	1	1240	153	9.	*	1	1855	228	0.
1	0015	4	0.	*	1	0630	79	4196.	*	1	1245	154	8.	*	1	1900	229	0.
1	0020	5	0.	*	1	0635	80	3882.	*	1	1250	155	7.	*	1	1905	230	0.
1	0025	6	0.	*	1	0640	81	3591.	*	1	1255	156	6.	*	1	1910	231	0.
1	0030	7	0.	*	1	0645	82	3323.	*	1	1300	157	6.	*	1	1915	232	0.
1	0035	8	0.	*	1	0650	83	3076.	*	1	1305	158	5.	*	1	1920	233	0.
1	0040	9	0.	*	1	0655	84	2849.	*	1	1310	159	5.	*	1	1925	234	0.
1	0045	10	0.	*	1	0700	85	2638.	*	1	1315	160	4.	*	1	1930	235	0.
1	0050	11	0.	*	1	0705	86	2445.	*	1	1320	161	4.	*	1	1935	236	0.
1	0055	12	0.	*	1	0710	87	2265.	*	1	1325	162	3.	*	1	1940	237	0.
1	0100	13	0.	*	1	0715	88	2100.	*	1	1330	163	3.	*	1	1945	238	0.
1	0105	14	0.	*	1	0720	89	1948.	*	1	1335	164	3.	*	1	1950	239	0.
1	0110	15	0.	*	1	0725	90	1805.	*	1	1340	165	2.	*	1	1955	240	0.
1	0115	16	0.	*	1	0730	91	1673.	*	1	1345	166	2.	*	1	2000	241	0.
1	0120	17	0.	*	1	0735	92	1549.	*	1	1350	167	2.	*	1	2005	242	0.
1	0125	18	0.	*	1	0740	93	1436.	*	1	1355	168	2.	*	1	2010	243	0.
1	0130	19	0.	*	1	0745	94	1330.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	1.	*	1	0750	95	1232.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	1.	*	1	0755	96	1141.	*	1	1410	171	1.	*	1	2025	246	0.
1	0145	22	2.	*	1	0800	97	1058.	*	1	1415	172	1.	*	1	2030	247	0.
1	0150	23	4.	*	1	0805	98	981.	*	1	1420	173	1.	*	1	2035	248	0.
1	0155	24	6.	*	1	0810	99	910.	*	1	1425	174	1.	*	1	2040	249	0.
1	0200	25	9.	*	1	0815	100	844.	*	1	1430	175	1.	*	1	2045	250	0.
1	0205	26	12.	*	1	0820	101	784.	*	1	1435	176	1.	*	1	2050	251	0.
1	0210	27	17.	*	1	0825	102	728.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	22.	*	1	0830	103	677.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	29.	*	1	0835	104	630.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	38.	*	1	0840	105	587.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	47.	*	1	0845	106	547.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	56.	*	1	0850	107	509.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	66.	*	1	0855	108	474.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	74.	*	1	0900	109	441.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	82.	*	1	0905	110	410.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	89.	*	1	0910	111	382.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	97.	*	1	0915	112	355.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	105.	*	1	0920	113	328.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	114.	*	1	0925	114	301.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	129.	*	1	0930	115	277.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	151.	*	1	0935	116	254.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	189.	*	1	0940	117	234.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	251.	*	1	0945	118	215.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	346.	*	1	0950	119	198.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	501.	*	1	0955	120	182.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	730.	*	1	1000	121	168.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1015.	*	1	1005	122	155.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	1326.	*	1	1010	123	143.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	1617.	*	1	1015	124	132.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	1844.	*	1	1020	125	122.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	1994.	*	1	1025	126	112.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	2079.	*	1	1030	127	103.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	2123.	*	1	1035	128	95.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	2348.	*	1	1040	129	87.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	3171.	*	1	1045	130	80.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	3990.	*	1	1050	131	74.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	4678.	*	1	1055	132	67.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	5425.	*	1	1100	133	62.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	5907.	*	1	1105	134	56.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	6157.	*	1	1110	135	51.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	6238.	*	1	1115	136	47.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	6262.	*	1	1120	137	43.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	6284.	*	1	1125	138	39.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	6280.	*	1	1130	139	35.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6273.	*	1	1135	140	32.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6262.	*	1	1140	141	29.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6249.	*	1	1145	142	26.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	6249.	*	1	1150	143	24.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	6252.	*	1	1155	144	22.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	6248.	*	1	1200	145	20.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	6228.	*	1	1205	146	18.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6160.	*	1	1210	147	16.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6023.	*	1	1215	148	14.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5812.	*	1	1220	149	13.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5536.	*	1	1225	150	12.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR

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+   (CFS)       (HR)
                          (CFS)
+    6284.      5.17                2860.        731.        704.         704.
                         (INCHES)     .452        .462        .462         .462
                          (AC-FT)    1418.       1450.       1450.        1450.

                          CUMULATIVE AREA =   58.84 SQ MI
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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3039.	1		1230	151	18.	1		1845	226	0.
1		0005	2	0.	1		0620	77	2944.	1		1235	152	16.	1		1850	227	0.
1		0010	3	0.	1		0625	78	2825.	1		1240	153	15.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2696.	1		1245	154	14.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2548.	1		1250	155	13.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2390.	1		1255	156	12.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2235.	1		1300	157	11.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2083.	1		1305	158	10.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1940.	1		1310	159	9.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1807.	1		1315	160	8.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1685.	1		1320	161	8.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1572.	1		1325	162	7.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1468.	1		1330	163	6.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1372.	1		1335	164	6.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1281.	1		1340	165	5.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1194.	1		1345	166	5.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1113.	1		1350	167	5.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1038.	1		1355	168	4.	1		2010	243	0.
1		0130	19	0.	1		0745	94	968.	1		1400	169	4.	1		2015	244	0.
1		0135	20	0.	1		0750	95	906.	1		1405	170	3.	1		2020	245	0.
1		0140	21	0.	1		0755	96	847.	1		1410	171	3.	1		2025	246	0.
1		0145	22	0.	1		0800	97	792.	1		1415	172	3.	1		2030	247	0.
1		0150	23	0.	1		0805	98	740.	1		1420	173	3.	1		2035	248	0.
1		0155	24	0.	1		0810	99	693.	1		1425	174	2.	1		2040	249	0.
1		0200	25	0.	1		0815	100	649.	1		1430	175	2.	1		2045	250	0.
1		0205	26	0.	1		0820	101	608.	1		1435	176	2.	1		2050	251	0.
1		0210	27	1.	1		0825	102	570.	1		1440	177	2.	1		2055	252	0.
1		0215	28	2.	1		0830	103	534.	1		1445	178	2.	1		2100	253	0.
1		0220	29	3.	1		0835	104	500.	1		1450	179	1.	1		2105	254	0.
1		0225	30	4.	1		0840	105	469.	1		1455	180	1.	1		2110	255	0.
1		0230	31	6.	1		0845	106	440.	1		1500	181	1.	1		2115	256	0.
1		0235	32	8.	1		0850	107	412.	1		1505	182	1.	1		2120	257	0.
1		0240	33	11.	1		0855	108	387.	1		1510	183	1.	1		2125	258	0.
1		0245	34	13.	1		0900	109	363.	1		1515	184	1.	1		2130	259	0.
1		0250	35	15.	1		0905	110	340.	1		1520	185	1.	1		2135	260	0.
1		0255	36	18.	1		0910	111	319.	1		1525	186	1.	1		2140	261	0.
1		0300	37	20.	1		0915	112	300.	1		1530	187	1.	1		2145	262	0.
1		0305	38	23.	1		0920	113	281.	1		1535	188	1.	1		2150	263	0.
1		0310	39	28.	1		0925	114	264.	1		1540	189	0.	1		2155	264	0.
1		0315	40	34.	1		0930	115	248.	1		1545	190	0.	1		2200	265	0.
1		0320	41	43.	1		0935	116	233.	1		1550	191	0.	1		2205	266	0.
1		0325	42	57.	1		0940	117	219.	1		1555	192	0.	1		2210	267	0.
1		0330	43	79.	1		0945	118	205.	1		1600	193	0.	1		2215	268	0.
1		0335	44	113.	1		0950	119	192.	1		1605	194	0.	1		2220	269	0.
1		0340	45	161.	1		0955	120	179.	1		1610	195	0.	1		2225	270	0.
1		0345	46	223.	1		1000	121	165.	1		1615	196	0.	1		2230	271	0.
1		0350	47	299.	1		1005	122	153.	1		1620	197	0.	1		2235	272	0.
1		0355	48	442.	1		1010	123	142.	1		1625	198	0.	1		2240	273	0.
1		0400	49	633.	1		1015	124	131.	1		1630	199	0.	1		2245	274	0.
1		0405	50	805.	1		1020	125	122.	1		1635	200	0.	1		2250	275	0.
1		0410	51	928.	1		1025	126	113.	1		1640	201	0.	1		2255	276	0.
1		0415	52	1012.	1		1030	127	105.	1		1645	202	0.	1		2300	277	0.
1		0420	53	1049.	1		1035	128	97.	1		1650	203	0.	1		2305	278	0.
1		0425	54	1051.	1		1040	129	91.	1		1655	204	0.	1		2310	279	0.
1		0430	55	1030.	1		1045	130	85.	1		1700	205	0.	1		2315	280	0.
1		0435	56	999.	1		1050	131	79.	1		1705	206	0.	1		2320	281	0.
1		0440	57	961.	1		1055	132	74.	1		1710	207	0.	1		2325	282	0.
1		0445	58	1051.	1		1100	133	69.	1		1715	208	0.	1		2330	283	0.
1		0450	59	1839.	1		1105	134	64.	1		1720	209	0.	1		2335	284	0.
1		0455	60	1978.	1		1110	135	60.	1		1725	210	0.	1		2340	285	0.
1		0500	61	2005.	1		1115	136	56.	1		1730	211	0.	1		2345	286	0.
1		0505	62	2421.	1		1120	137	52.	1		1735	212	0.	1		2350	287	0.

1	0510	63	2587.	*	1	1125	138	49.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	2823.	*	1	1130	139	46.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	2933.	*	1	1135	140	42.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	2987.	*	1	1140	141	40.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2942.	*	1	1145	142	37.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	2986.	*	1	1150	143	34.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	3035.	*	1	1155	144	31.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	3063.	*	1	1200	145	29.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	3155.	*	1	1205	146	27.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	3209.	*	1	1210	147	25.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3184.	*	1	1215	148	23.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3146.	*	1	1220	149	21.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3100.	*	1	1225	150	19.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 3209.	5.92	(CFS)	1461.	377.	363.	363.
		(INCHES)	.231	.239	.239	.239
		(AC-FT)	724.	749.	749.	749.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	1173.	*	1		1230	151	27.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	1183.	*	1		1235	152	25.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	1150.	*	1		1240	153	24.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	1135.	*	1		1245	154	22.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	1159.	*	1		1250	155	21.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	1161.	*	1		1255	156	20.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	1170.	*	1		1300	157	19.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	1150.	*	1		1305	158	17.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	1102.	*	1		1310	159	16.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	1051.	*	1		1315	160	15.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	995.	*	1		1320	161	14.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	958.	*	1		1325	162	13.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	903.	*	1		1330	163	12.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	846.	*	1		1335	164	12.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	799.	*	1		1340	165	11.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	752.	*	1		1345	166	10.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	719.	*	1		1350	167	9.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	674.	*	1		1355	168	9.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	639.	*	1		1400	169	8.	*	1		2015	244	0.
1		0135	20	0.	*	1		0750	95	604.	*	1		1405	170	8.	*	1		2020	245	0.
1		0140	21	0.	*	1		0755	96	574.	*	1		1410	171	7.	*	1		2025	246	0.
1		0145	22	0.	*	1		0800	97	541.	*	1		1415	172	7.	*	1		2030	247	0.
1		0150	23	0.	*	1		0805	98	509.	*	1		1420	173	6.	*	1		2035	248	0.
1		0155	24	0.	*	1		0810	99	482.	*	1		1425	174	6.	*	1		2040	249	0.
1		0200	25	0.	*	1		0815	100	456.	*	1		1430	175	6.	*	1		2045	250	0.
1		0205	26	0.	*	1		0820	101	429.	*	1		1435	176	5.	*	1		2050	251	0.
1		0210	27	0.	*	1		0825	102	404.	*	1		1440	177	5.	*	1		2055	252	0.
1		0215	28	0.	*	1		0830	103	382.	*	1		1445	178	5.	*	1		2100	253	0.
1		0220	29	0.	*	1		0835	104	360.	*	1		1450	179	4.	*	1		2105	254	0.
1		0225	30	0.	*	1		0840	105	340.	*	1		1455	180	4.	*	1		2110	255	0.
1		0230	31	0.	*	1		0845	106	322.	*	1		1500	181	4.	*	1		2115	256	0.
1		0235	32	0.	*	1		0850	107	305.	*	1		1505	182	3.	*	1		2120	257	0.
1		0240	33	0.	*	1		0855	108	289.	*	1		1510	183	3.	*	1		2125	258	0.
1		0245	34	0.	*	1		0900	109	274.	*	1		1515	184	3.	*	1		2130	259	0.
1		0250	35	0.	*	1		0905	110	260.	*	1		1520	185	3.	*	1		2135	260	0.
1		0255	36	0.	*	1		0910	111	246.	*	1		1525	186	3.	*	1		2140	261	0.
1		0300	37	1.	*	1		0915	112	233.	*	1		1530	187	2.	*	1		2145	262	0.
1		0305	38	1.	*	1		0920	113	221.	*	1		1535	188	2.	*	1		2150	263	0.
1		0310	39	1.	*	1		0925	114	210.	*	1		1540	189	2.	*	1		2155	264	0.
1		0315	40	2.	*	1		0930	115	199.	*	1		1545	190	2.	*	1		2200	265	0.
1		0320	41	4.	*	1		0935	116	189.	*	1		1550	191	2.	*	1		2205	266	0.
1		0325	42	6.	*	1		0940	117	181.	*	1		1555	192	2.	*	1		2210	267	0.
1		0330	43	12.	*	1		0945	118	172.	*	1		1600	193	2.	*	1		2215	268	0.
1		0335	44	24.	*	1		0950	119	164.	*	1		1605	194	2.	*	1		2220	269	0.

1	0340	45	43.	*	1	0955	120	156.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	69.	*	1	1000	121	148.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	102.	*	1	1005	122	141.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	137.	*	1	1010	123	134.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	174.	*	1	1015	124	127.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	215.	*	1	1020	125	121.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	320.	*	1	1025	126	115.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	425.	*	1	1030	127	110.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	468.	*	1	1035	128	105.	*	1	1650	203	1.	*	1	2305	278	0.
1	0425	54	494.	*	1	1040	129	100.	*	1	1655	204	1.	*	1	2310	279	0.
1	0430	55	498.	*	1	1045	130	95.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	491.	*	1	1050	131	90.	*	1	1705	206	1.	*	1	2320	281	0.
1	0440	57	477.	*	1	1055	132	85.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	459.	*	1	1100	133	80.	*	1	1715	208	1.	*	1	2330	283	0.
1	0450	59	442.	*	1	1105	134	75.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	430.	*	1	1110	135	71.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	425.	*	1	1115	136	67.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	430.	*	1	1120	137	63.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	444.	*	1	1125	138	59.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	810.	*	1	1130	139	55.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	1148.	*	1	1135	140	52.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	780.	*	1	1140	141	49.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	1010.	*	1	1145	142	46.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	1000.	*	1	1150	143	43.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	989.	*	1	1155	144	41.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	1219.	*	1	1200	145	38.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	1172.	*	1	1205	146	36.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	1218.	*	1	1210	147	34.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	1199.	*	1	1215	148	32.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	1278.	*	1	1220	149	30.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	1199.	*	1	1225	150	29.	*	1	1840	225	0.	*	2	0055	300	0.

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 1278.	6.08	(CFS)	645.	172.	166.	166.
		(INCHES)	.102	.109	.109	.109
		(AC-FT)	320.	341.	341.	341.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	71.	1		1230	151	14.	1		1845	226	1.
1		0005	2	0.	1		0620	77	63.	1		1235	152	13.	1		1850	227	1.
1		0010	3	0.	1		0625	78	57.	1		1240	153	12.	1		1855	228	1.
1		0015	4	0.	1		0630	79	51.	1		1245	154	12.	1		1900	229	1.
1		0020	5	0.	1		0635	80	46.	1		1250	155	12.	1		1905	230	1.
1		0025	6	0.	1		0640	81	41.	1		1255	156	11.	1		1910	231	1.
1		0030	7	0.	1		0645	82	37.	1		1300	157	11.	1		1915	232	1.
1		0035	8	0.	1		0650	83	33.	1		1305	158	11.	1		1920	233	0.
1		0040	9	0.	1		0655	84	30.	1		1310	159	10.	1		1925	234	0.
1		0045	10	0.	1		0700	85	27.	1		1315	160	10.	1		1930	235	0.
1		0050	11	0.	1		0705	86	24.	1		1320	161	10.	1		1935	236	0.
1		0055	12	0.	1		0710	87	76.	1		1325	162	10.	1		1940	237	0.
1		0100	13	0.	1		0715	88	123.	1		1330	163	9.	1		1945	238	0.
1		0105	14	0.	1		0720	89	80.	1		1335	164	9.	1		1950	239	0.
1		0110	15	0.	1		0725	90	123.	1		1340	165	9.	1		1955	240	0.
1		0115	16	0.	1		0730	91	84.	1		1345	166	8.	1		2000	241	0.
1		0120	17	0.	1		0735	92	65.	1		1350	167	8.	1		2005	242	0.
1		0125	18	0.	1		0740	93	104.	1		1355	168	8.	1		2010	243	0.
1		0130	19	0.	1		0745	94	60.	1		1400	169	8.	1		2015	244	0.
1		0135	20	0.	1		0750	95	67.	1		1405	170	7.	1		2020	245	0.
1		0140	21	0.	1		0755	96	79.	1		1410	171	7.	1		2025	246	0.
1		0145	22	0.	1		0800	97	46.	1		1415	172	7.	1		2030	247	0.
1		0150	23	0.	1		0805	98	65.	1		1420	173	6.	1		2035	248	0.
1		0155	24	0.	1		0810	99	69.	1		1425	174	6.	1		2040	249	0.
1		0200	25	0.	1		0815	100	66.	1		1430	175	6.	1		2045	250	0.
1		0205	26	0.	1		0820	101	101.	1		1435	176	6.	1		2050	251	0.

1	0210	27	0.	*	1	0825	102	87.	*	1	1440	177	6.	*	1	2055	252	0.
1	0215	28	0.	*	1	0830	103	73.	*	1	1445	178	5.	*	1	2100	253	0.
1	0220	29	0.	*	1	0835	104	72.	*	1	1450	179	5.	*	1	2105	254	0.
1	0225	30	0.	*	1	0840	105	65.	*	1	1455	180	5.	*	1	2110	255	0.
1	0230	31	0.	*	1	0845	106	79.	*	1	1500	181	5.	*	1	2115	256	0.
1	0235	32	0.	*	1	0850	107	69.	*	1	1505	182	4.	*	1	2120	257	0.
1	0240	33	0.	*	1	0855	108	55.	*	1	1510	183	4.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	59.	*	1	1515	184	4.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	58.	*	1	1520	185	4.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	63.	*	1	1525	186	4.	*	1	2140	261	0.
1	0300	37	0.	*	1	0915	112	53.	*	1	1530	187	4.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	44.	*	1	1535	188	3.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	51.	*	1	1540	189	3.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	54.	*	1	1545	190	3.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	51.	*	1	1550	191	3.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	45.	*	1	1555	192	3.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	46.	*	1	1600	193	3.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	51.	*	1	1605	194	3.	*	1	2220	269	0.
1	0340	45	0.	*	1	0955	120	42.	*	1	1610	195	2.	*	1	2225	270	0.
1	0345	46	0.	*	1	1000	121	36.	*	1	1615	196	2.	*	1	2230	271	0.
1	0350	47	0.	*	1	1005	122	39.	*	1	1620	197	2.	*	1	2235	272	0.
1	0355	48	1.	*	1	1010	123	40.	*	1	1625	198	2.	*	1	2240	273	0.
1	0400	49	5.	*	1	1015	124	35.	*	1	1630	199	2.	*	1	2245	274	0.
1	0405	50	11.	*	1	1020	125	32.	*	1	1635	200	2.	*	1	2250	275	0.
1	0410	51	19.	*	1	1025	126	36.	*	1	1640	201	2.	*	1	2255	276	0.
1	0415	52	26.	*	1	1030	127	34.	*	1	1645	202	2.	*	1	2300	277	0.
1	0420	53	32.	*	1	1035	128	28.	*	1	1650	203	2.	*	1	2305	278	0.
1	0425	54	36.	*	1	1040	129	28.	*	1	1655	204	2.	*	1	2310	279	0.
1	0430	55	40.	*	1	1045	130	31.	*	1	1700	205	2.	*	1	2315	280	0.
1	0435	56	43.	*	1	1050	131	27.	*	1	1705	206	2.	*	1	2320	281	0.
1	0440	57	44.	*	1	1055	132	24.	*	1	1710	207	2.	*	1	2325	282	0.
1	0445	58	45.	*	1	1100	133	26.	*	1	1715	208	2.	*	1	2330	283	0.
1	0450	59	53.	*	1	1105	134	26.	*	1	1720	209	1.	*	1	2335	284	0.
1	0455	60	71.	*	1	1110	135	22.	*	1	1725	210	1.	*	1	2340	285	0.
1	0500	61	67.	*	1	1115	136	21.	*	1	1730	211	1.	*	1	2345	286	0.
1	0505	62	68.	*	1	1120	137	22.	*	1	1735	212	1.	*	1	2350	287	0.
1	0510	63	75.	*	1	1125	138	21.	*	1	1740	213	1.	*	1	2355	288	0.
1	0515	64	75.	*	1	1130	139	19.	*	1	1745	214	1.	*	2	0000	289	0.
1	0520	65	80.	*	1	1135	140	19.	*	1	1750	215	1.	*	2	0005	290	0.
1	0525	66	83.	*	1	1140	141	20.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	87.	*	1	1145	142	18.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	92.	*	1	1150	143	16.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	98.	*	1	1155	144	17.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	104.	*	1	1200	145	17.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	104.	*	1	1205	146	15.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	100.	*	1	1210	147	15.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	94.	*	1	1215	148	15.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	87.	*	1	1220	149	14.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	79.	*	1	1225	150	13.	*	1	1840	225	1.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 123.	7.25	64.	19.	19.	19.
		(INCHES) .010	.012	.012	.012
		(AC-FT) 32.	39.	39.	39.

CUMULATIVE AREA = 58.84 SQ MI

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              *            *
1305 KK       *    FINISH  *
              *            *
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1307 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

1306 RD MUSKINGUM-CUNGE CHANNEL ROUTING

L	1500.	CHANNEL LENGTH
S	.0090	SLOPE
N	.050	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	250.00	BOTTOM WIDTH OR DIAMETER
Z	3.00	SIDE SLOPE

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COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.60	750.00	9675.12	325.30	.98	9.61
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		9672.78	325.00	.98	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4665E+04 EXCESS= .0000E+00 OUTFLOW= .4665E+04 BASIN STORAGE= .9672E-02 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = 1.00

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	7829.	1		1230	151	2593.	1		1845	226	73.
1		0005	2	0.	1		0620	77	7608.	1		1235	152	2569.	1		1850	227	55.
1		0010	3	0.	1		0625	78	7394.	1		1240	153	2545.	1		1855	228	41.
1		0015	4	0.	1		0630	79	7185.	1		1245	154	2521.	1		1900	229	31.
1		0020	5	0.	1		0635	80	6982.	1		1250	155	2497.	1		1905	230	23.
1		0025	6	0.	1		0640	81	6783.	1		1255	156	2471.	1		1910	231	18.
1		0030	7	0.	1		0645	82	6590.	1		1300	157	2445.	1		1915	232	13.
1		0035	8	0.	1		0650	83	6405.	1		1305	158	2419.	1		1920	233	10.
1		0040	9	0.	1		0655	84	6227.	1		1310	159	2393.	1		1925	234	8.
1		0045	10	0.	1		0700	85	6055.	1		1315	160	2368.	1		1930	235	6.
1		0050	11	1.	1		0705	86	5890.	1		1320	161	2342.	1		1935	236	4.
1		0055	12	2.	1		0710	87	5733.	1		1325	162	2317.	1		1940	237	3.
1		0100	13	3.	1		0715	88	5584.	1		1330	163	2290.	1		1945	238	2.
1		0105	14	6.	1		0720	89	5441.	1		1335	164	2262.	1		1950	239	2.
1		0110	15	10.	1		0725	90	5305.	1		1340	165	2234.	1		1955	240	1.
1		0115	16	16.	1		0730	91	5174.	1		1345	166	2206.	1		2000	241	1.
1		0120	17	24.	1		0735	92	5047.	1		1350	167	2178.	1		2005	242	1.
1		0125	18	33.	1		0740	93	4925.	1		1355	168	2150.	1		2010	243	1.
1		0130	19	44.	1		0745	94	4808.	1		1400	169	2122.	1		2015	244	0.
1		0135	20	58.	1		0750	95	4698.	1		1405	170	2093.	1		2020	245	0.
1		0140	21	75.	1		0755	96	4594.	1		1410	171	2061.	1		2025	246	0.
1		0145	22	97.	1		0800	97	4498.	1		1415	172	2030.	1		2030	247	0.
1		0150	23	124.	1		0805	98	4409.	1		1420	173	1998.	1		2035	248	0.
1		0155	24	158.	1		0810	99	4326.	1		1425	174	1967.	1		2040	249	0.
1		0200	25	197.	1		0815	100	4249.	1		1430	175	1936.	1		2045	250	0.
1		0205	26	243.	1		0820	101	4177.	1		1435	176	1905.	1		2050	251	0.
1		0210	27	294.	1		0825	102	4108.	1		1440	177	1871.	1		2055	252	0.
1		0215	28	351.	1		0830	103	4044.	1		1445	178	1835.	1		2100	253	0.
1		0220	29	411.	1		0835	104	3984.	1		1450	179	1800.	1		2105	254	0.
1		0225	30	473.	1		0840	105	3927.	1		1455	180	1765.	1		2110	255	0.
1		0230	31	535.	1		0845	106	3873.	1		1500	181	1731.	1		2115	256	0.
1		0235	32	594.	1		0850	107	3822.	1		1505	182	1697.	1		2120	257	0.
1		0240	33	649.	1		0855	108	3773.	1		1510	183	1660.	1		2125	258	0.
1		0245	34	700.	1		0900	109	3728.	1		1515	184	1623.	1		2130	259	0.
1		0250	35	747.	1		0905	110	3684.	1		1520	185	1586.	1		2135	260	0.
1		0255	36	795.	1		0910	111	3641.	1		1525	186	1550.	1		2140	261	0.
1		0300	37	850.	1		0915	112	3601.	1		1530	187	1514.	1		2145	262	0.
1		0305	38	918.	1		0920	113	3562.	1		1535	188	1478.	1		2150	263	0.
1		0310	39	1004.	1		0925	114	3526.	1		1540	189	1440.	1		2155	264	0.
1		0315	40	1124.	1		0930	115	3491.	1		1545	190	1402.	1		2200	265	0.
1		0320	41	1302.	1		0935	116	3458.	1		1550	191	1363.	1		2205	266	0.
1		0325	42	1558.	1		0940	117	3427.	1		1555	192	1326.	1		2210	267	0.
1		0330	43	1914.	1		0945	118	3396.	1		1600	193	1289.	1		2215	268	0.

1	0335	44	2400.	*	1	0950	119	3367.	*	1	1605	194	1252.	*	1	2220	269	0.
1	0340	45	3008.	*	1	0955	120	3339.	*	1	1610	195	1214.	*	1	2225	270	0.
1	0345	46	3702.	*	1	1000	121	3311.	*	1	1615	196	1175.	*	1	2230	271	0.
1	0350	47	4450.	*	1	1005	122	3283.	*	1	1620	197	1135.	*	1	2235	272	0.
1	0355	48	5220.	*	1	1010	123	3255.	*	1	1625	198	1096.	*	1	2240	273	0.
1	0400	49	5952.	*	1	1015	124	3228.	*	1	1630	199	1059.	*	1	2245	274	0.
1	0405	50	6582.	*	1	1020	125	3202.	*	1	1635	200	1022.	*	1	2250	275	0.
1	0410	51	7088.	*	1	1025	126	3176.	*	1	1640	201	985.	*	1	2255	276	0.
1	0415	52	7478.	*	1	1030	127	3152.	*	1	1645	202	946.	*	1	2300	277	0.
1	0420	53	7763.	*	1	1035	128	3128.	*	1	1650	203	906.	*	1	2305	278	0.
1	0425	54	7959.	*	1	1040	129	3105.	*	1	1655	204	867.	*	1	2310	279	0.
1	0430	55	8092.	*	1	1045	130	3082.	*	1	1700	205	830.	*	1	2315	280	0.
1	0435	56	8197.	*	1	1050	131	3058.	*	1	1705	206	794.	*	1	2320	281	0.
1	0440	57	8292.	*	1	1055	132	3034.	*	1	1710	207	759.	*	1	2325	282	0.
1	0445	58	8378.	*	1	1100	133	3010.	*	1	1715	208	721.	*	1	2330	283	0.
1	0450	59	8482.	*	1	1105	134	2987.	*	1	1720	209	682.	*	1	2335	284	0.
1	0455	60	8637.	*	1	1110	135	2964.	*	1	1725	210	643.	*	1	2340	285	0.
1	0500	61	8842.	*	1	1115	136	2942.	*	1	1730	211	605.	*	1	2345	286	0.
1	0505	62	9065.	*	1	1120	137	2920.	*	1	1735	212	569.	*	1	2350	287	0.
1	0510	63	9282.	*	1	1125	138	2898.	*	1	1740	213	535.	*	1	2355	288	0.
1	0515	64	9474.	*	1	1130	139	2875.	*	1	1745	214	501.	*	2	0000	289	0.
1	0520	65	9612.	*	1	1135	140	2853.	*	1	1750	215	463.	*	2	0005	290	0.
1	0525	66	9673.	*	1	1140	141	2829.	*	1	1755	216	420.	*	2	0010	291	0.
1	0530	67	9658.	*	1	1145	142	2805.	*	1	1800	217	375.	*	2	0015	292	0.
1	0535	68	9577.	*	1	1150	143	2782.	*	1	1805	218	334.	*	2	0020	293	0.
1	0540	69	9441.	*	1	1155	144	2759.	*	1	1810	219	297.	*	2	0025	294	0.
1	0545	70	9258.	*	1	1200	145	2736.	*	1	1815	220	264.	*	2	0030	295	0.
1	0550	71	9041.	*	1	1205	146	2714.	*	1	1820	221	232.	*	2	0035	296	0.
1	0555	72	8804.	*	1	1210	147	2691.	*	1	1825	222	198.	*	2	0040	297	0.
1	0600	73	8557.	*	1	1215	148	2667.	*	1	1830	223	162.	*	2	0045	298	0.
1	0605	74	8306.	*	1	1220	149	2643.	*	1	1835	224	127.	*	2	0050	299	0.
1	0610	75	8061.	*	1	1225	150	2618.	*	1	1840	225	97.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS)	6-HR	24-HR	72-HR	24.92-HR
+ 9673.	5.42		6255.	2352.	2266.	2266.
		(INCHES)	.654	.984	.984	.984
		(AC-FT)	3101.	4665.	4665.	4665.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.82	750.00	7845.69	330.39	.75	8.85

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		7845.68	330.00	.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3540E+04 EXCESS= .0000E+00 OUTFLOW= .3540E+04 BASIN STORAGE= .1124E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .87

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6549.	1		1230	151	1920.	1		1845	226	0.
1		0005	2	0.	1		0620	77	6386.	1		1235	152	1885.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6228.	1		1240	153	1848.	1		1855	228	0.
1		0015	4	0.	1		0630	79	6070.	1		1245	154	1812.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5915.	1		1250	155	1776.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5762.	1		1255	156	1741.	1		1910	231	0.
1		0030	7	0.	1		0645	82	5612.	1		1300	157	1705.	1		1915	232	0.
1		0035	8	0.	1		0650	83	5467.	1		1305	158	1668.	1		1920	233	0.

1	0040	9	0.	*	1	0655	84	5327.	*	1	1310	159	1630.	*	1	1925	234	0.
1	0045	10	0.	*	1	0700	85	5192.	*	1	1315	160	1592.	*	1	1930	235	0.
1	0050	11	0.	*	1	0705	86	5062.	*	1	1320	161	1555.	*	1	1935	236	0.
1	0055	12	0.	*	1	0710	87	4937.	*	1	1325	162	1519.	*	1	1940	237	0.
1	0100	13	0.	*	1	0715	88	4817.	*	1	1330	163	1482.	*	1	1945	238	0.
1	0105	14	0.	*	1	0720	89	4703.	*	1	1335	164	1444.	*	1	1950	239	0.
1	0110	15	0.	*	1	0725	90	4593.	*	1	1340	165	1405.	*	1	1955	240	0.
1	0115	16	1.	*	1	0730	91	4487.	*	1	1345	166	1366.	*	1	2000	241	0.
1	0120	17	2.	*	1	0735	92	4384.	*	1	1350	167	1328.	*	1	2005	242	0.
1	0125	18	4.	*	1	0740	93	4284.	*	1	1355	168	1291.	*	1	2010	243	0.
1	0130	19	6.	*	1	0745	94	4189.	*	1	1400	169	1254.	*	1	2015	244	0.
1	0135	20	11.	*	1	0750	95	4098.	*	1	1405	170	1215.	*	1	2020	245	0.
1	0140	21	17.	*	1	0755	96	4012.	*	1	1410	171	1176.	*	1	2025	246	0.
1	0145	22	26.	*	1	0800	97	3932.	*	1	1415	172	1136.	*	1	2030	247	0.
1	0150	23	39.	*	1	0805	98	3857.	*	1	1420	173	1097.	*	1	2035	248	0.
1	0155	24	55.	*	1	0810	99	3787.	*	1	1425	174	1060.	*	1	2040	249	0.
1	0200	25	77.	*	1	0815	100	3722.	*	1	1430	175	1023.	*	1	2045	250	0.
1	0205	26	103.	*	1	0820	101	3660.	*	1	1435	176	985.	*	1	2050	251	0.
1	0210	27	133.	*	1	0825	102	3600.	*	1	1440	177	946.	*	1	2055	252	0.
1	0215	28	168.	*	1	0830	103	3542.	*	1	1445	178	906.	*	1	2100	253	0.
1	0220	29	206.	*	1	0835	104	3488.	*	1	1450	179	867.	*	1	2105	254	0.
1	0225	30	246.	*	1	0840	105	3436.	*	1	1455	180	830.	*	1	2110	255	0.
1	0230	31	287.	*	1	0845	106	3386.	*	1	1500	181	794.	*	1	2115	256	0.
1	0235	32	327.	*	1	0850	107	3338.	*	1	1505	182	759.	*	1	2120	257	0.
1	0240	33	365.	*	1	0855	108	3293.	*	1	1510	183	721.	*	1	2125	258	0.
1	0245	34	399.	*	1	0900	109	3249.	*	1	1515	184	682.	*	1	2130	259	0.
1	0250	35	430.	*	1	0905	110	3208.	*	1	1520	185	643.	*	1	2135	260	0.
1	0255	36	461.	*	1	0910	111	3168.	*	1	1525	186	606.	*	1	2140	261	0.
1	0300	37	496.	*	1	0915	112	3129.	*	1	1530	187	570.	*	1	2145	262	0.
1	0305	38	540.	*	1	0920	113	3092.	*	1	1535	188	537.	*	1	2150	263	0.
1	0310	39	601.	*	1	0925	114	3055.	*	1	1540	189	503.	*	1	2155	264	0.
1	0315	40	686.	*	1	0930	115	3019.	*	1	1545	190	467.	*	1	2200	265	0.
1	0320	41	811.	*	1	0935	116	2984.	*	1	1550	191	427.	*	1	2205	266	0.
1	0325	42	996.	*	1	0940	117	2950.	*	1	1555	192	384.	*	1	2210	267	0.
1	0330	43	1254.	*	1	0945	118	2917.	*	1	1600	193	342.	*	1	2215	268	0.
1	0335	44	1603.	*	1	0950	119	2886.	*	1	1605	194	305.	*	1	2220	269	0.
1	0340	45	2041.	*	1	0955	120	2855.	*	1	1610	195	271.	*	1	2225	270	0.
1	0345	46	2561.	*	1	1000	121	2824.	*	1	1615	196	240.	*	1	2230	271	0.
1	0350	47	3146.	*	1	1005	122	2793.	*	1	1620	197	208.	*	1	2235	272	0.
1	0355	48	3769.	*	1	1010	123	2762.	*	1	1625	198	172.	*	1	2240	273	0.
1	0400	49	4383.	*	1	1015	124	2731.	*	1	1630	199	137.	*	1	2245	274	0.
1	0405	50	4915.	*	1	1020	125	2701.	*	1	1635	200	105.	*	1	2250	275	0.
1	0410	51	5341.	*	1	1025	126	2671.	*	1	1640	201	80.	*	1	2255	276	0.
1	0415	52	5678.	*	1	1030	127	2642.	*	1	1645	202	60.	*	1	2300	277	0.
1	0420	53	5931.	*	1	1035	128	2614.	*	1	1650	203	46.	*	1	2305	278	0.
1	0425	54	6097.	*	1	1040	129	2586.	*	1	1655	204	34.	*	1	2310	279	0.
1	0430	55	6196.	*	1	1045	130	2557.	*	1	1700	205	26.	*	1	2315	280	0.
1	0435	56	6267.	*	1	1050	131	2528.	*	1	1705	206	20.	*	1	2320	281	0.
1	0440	57	6342.	*	1	1055	132	2498.	*	1	1710	207	15.	*	1	2325	282	0.
1	0445	58	6433.	*	1	1100	133	2469.	*	1	1715	208	11.	*	1	2330	283	0.
1	0450	59	6560.	*	1	1105	134	2441.	*	1	1720	209	9.	*	1	2335	284	0.
1	0455	60	6739.	*	1	1110	135	2413.	*	1	1725	210	7.	*	1	2340	285	0.
1	0500	61	6957.	*	1	1115	136	2385.	*	1	1730	211	5.	*	1	2345	286	0.
1	0505	62	7185.	*	1	1120	137	2356.	*	1	1735	212	4.	*	1	2350	287	0.
1	0510	63	7404.	*	1	1125	138	2327.	*	1	1740	213	3.	*	1	2355	288	0.
1	0515	64	7597.	*	1	1130	139	2297.	*	1	1745	214	2.	*	2	0000	289	0.
1	0520	65	7743.	*	1	1135	140	2267.	*	1	1750	215	2.	*	2	0005	290	0.
1	0525	66	7826.	*	1	1140	141	2237.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	7846.	*	1	1145	142	2207.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	7807.	*	1	1150	143	2178.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	7721.	*	1	1155	144	2148.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	7597.	*	1	1200	145	2117.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	7443.	*	1	1205	146	2084.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	7271.	*	1	1210	147	2051.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	7089.	*	1	1215	148	2018.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	6904.	*	1	1220	149	1986.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	6721.	*	1	1225	150	1954.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 7846.	5.50		5148.	1785.	1719.	1719.
		(INCHES)	.539	.747	.747	.747
		(AC-FT)	2553.	3540.	3540.	3540.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	COMPUTATION TIME STEP M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.14	750.00	5974.39	332.80	.53	7.96
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		5968.10	335.00	.53	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2510E+04 EXCESS= .0000E+00 OUTFLOW= .2510E+04 BASIN STORAGE= .1100E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .74

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	5169.	1		1230	151	1067.	1		1845	226	0.
1		0005	2	0.	1		0620	77	5060.	1		1235	152	1029.	1		1850	227	0.
1		0010	3	0.	1		0625	78	4953.	1		1240	153	991.	1		1855	228	0.
1		0015	4	0.	1		0630	79	4844.	1		1245	154	951.	1		1900	229	0.
1		0020	5	0.	1		0635	80	4736.	1		1250	155	911.	1		1905	230	0.
1		0025	6	0.	1		0640	81	4629.	1		1255	156	872.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4522.	1		1300	157	835.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4417.	1		1305	158	798.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4315.	1		1310	159	762.	1		1925	234	0.
1		0045	10	0.	1		0700	85	4216.	1		1315	160	724.	1		1930	235	0.
1		0050	11	0.	1		0705	86	4119.	1		1320	161	685.	1		1935	236	0.
1		0055	12	0.	1		0710	87	4025.	1		1325	162	646.	1		1940	237	0.
1		0100	13	0.	1		0715	88	3935.	1		1330	163	608.	1		1945	238	0.
1		0105	14	0.	1		0720	89	3848.	1		1335	164	573.	1		1950	239	0.
1		0110	15	0.	1		0725	90	3763.	1		1340	165	539.	1		1955	240	0.
1		0115	16	0.	1		0730	91	3681.	1		1345	166	506.	1		2000	241	0.
1		0120	17	0.	1		0735	92	3600.	1		1350	167	471.	1		2005	242	0.
1		0125	18	0.	1		0740	93	3522.	1		1355	168	433.	1		2010	243	0.
1		0130	19	0.	1		0745	94	3446.	1		1400	169	392.	1		2015	244	0.
1		0135	20	0.	1		0750	95	3373.	1		1405	170	353.	1		2020	245	0.
1		0140	21	1.	1		0755	96	3303.	1		1410	171	316.	1		2025	246	0.
1		0145	22	2.	1		0800	97	3238.	1		1415	172	283.	1		2030	247	0.
1		0150	23	4.	1		0805	98	3176.	1		1420	173	251.	1		2035	248	0.
1		0155	24	8.	1		0810	99	3117.	1		1425	174	221.	1		2040	249	0.
1		0200	25	14.	1		0815	100	3062.	1		1430	175	187.	1		2045	250	0.
1		0205	26	23.	1		0820	101	3009.	1		1435	176	152.	1		2050	251	0.
1		0210	27	35.	1		0825	102	2957.	1		1440	177	119.	1		2055	252	0.
1		0215	28	49.	1		0830	103	2906.	1		1445	178	91.	1		2100	253	0.
1		0220	29	68.	1		0835	104	2857.	1		1450	179	70.	1		2105	254	0.
1		0225	30	88.	1		0840	105	2810.	1		1455	180	53.	1		2110	255	0.
1		0230	31	110.	1		0845	106	2765.	1		1500	181	40.	1		2115	256	0.
1		0235	32	133.	1		0850	107	2721.	1		1505	182	31.	1		2120	257	0.
1		0240	33	155.	1		0855	108	2679.	1		1510	183	24.	1		2125	258	0.
1		0245	34	176.	1		0900	109	2638.	1		1515	184	18.	1		2130	259	0.
1		0250	35	195.	1		0905	110	2598.	1		1520	185	14.	1		2135	260	0.
1		0255	36	214.	1		0910	111	2559.	1		1525	186	11.	1		2140	261	0.
1		0300	37	235.	1		0915	112	2521.	1		1530	187	8.	1		2145	262	0.
1		0305	38	261.	1		0920	113	2482.	1		1535	188	6.	1		2150	263	0.
1		0310	39	297.	1		0925	114	2444.	1		1540	189	5.	1		2155	264	0.
1		0315	40	347.	1		0930	115	2407.	1		1545	190	4.	1		2200	265	0.
1		0320	41	418.	1		0935	116	2371.	1		1550	191	3.	1		2205	266	0.
1		0325	42	530.	1		0940	117	2336.	1		1555	192	2.	1		2210	267	0.
1		0330	43	688.	1		0945	118	2302.	1		1600	193	2.	1		2215	268	0.
1		0335	44	923.	1		0950	119	2268.	1		1605	194	1.	1		2220	269	0.
1		0340	45	1235.	1		0955	120	2233.	1		1610	195	1.	1		2225	270	0.
1		0345	46	1608.	1		1000	121	2197.	1		1615	196	1.	1		2230	271	0.
1		0350	47	2032.	1		1005	122	2160.	1		1620	197	1.	1		2235	272	0.
1		0355	48	2485.	1		1010	123	2124.	1		1625	198	1.	1		2240	273	0.
1		0400	49	2932.	1		1015	124	2088.	1		1630	199	0.	1		2245	274	0.
1		0405	50	3338.	1		1020	125	2053.	1		1635	200	0.	1		2250	275	0.
1		0410	51	3689.	1		1025	126	2019.	1		1640	201	0.	1		2255	276	0.
1		0415	52	3981.	1		1030	127	1983.	1		1645	202	0.	1		2300	277	0.
1		0420	53	4204.	1		1035	128	1946.	1		1650	203	0.	1		2305	278	0.
1		0425	54	4354.	1		1040	129	1908.	1		1655	204	0.	1		2310	279	0.

1	0430	55	4442.	*	1	1045	130	1870.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	4491.	*	1	1050	131	1833.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	4525.	*	1	1055	132	1797.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	4574.	*	1	1100	133	1760.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	4661.	*	1	1105	134	1722.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	4803.	*	1	1110	135	1684.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	4999.	*	1	1115	136	1645.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	5221.	*	1	1120	137	1607.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	5439.	*	1	1125	138	1570.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	5639.	*	1	1130	139	1533.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	5801.	*	1	1135	140	1495.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	5908.	*	1	1140	141	1456.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	5962.	*	1	1145	142	1416.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	5968.	*	1	1150	143	1377.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	5933.	*	1	1155	144	1339.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	5861.	*	1	1200	145	1301.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	5765.	*	1	1205	146	1263.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	5652.	*	1	1210	147	1224.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	5532.	*	1	1215	148	1184.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5408.	*	1	1220	149	1144.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5285.	*	1	1225	150	1105.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS)	6-HR	24-HR	72-HR	24.92-HR
+ 5968.	5.58		3978.	1266.	1219.	1219.
		(INCHES)	.416	.530	.530	.530
		(AC-FT)	1973.	2510.	2510.	2510.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.88	750.00	3458.31	341.73	.28	6.44
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		3457.73	340.00	.28	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1350E+04 EXCESS= .0000E+00 OUTFLOW= .1350E+04 BASIN STORAGE= .1100E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3178.	1		1230	151	182.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3133.	1		1235	152	152.	1		1850	227	0.
1		0010	3	0.	1		0625	78	3089.	1		1240	153	125.	1		1855	228	0.
1		0015	4	0.	1		0630	79	3044.	1		1245	154	102.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2999.	1		1250	155	85.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2951.	1		1255	156	71.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2900.	1		1300	157	60.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2848.	1		1305	158	51.	1		1920	233	0.
1		0040	9	0.	1		0655	84	2796.	1		1310	159	44.	1		1925	234	0.
1		0045	10	0.	1		0700	85	2742.	1		1315	160	38.	1		1930	235	0.
1		0050	11	0.	1		0705	86	2688.	1		1320	161	33.	1		1935	236	0.
1		0055	12	0.	1		0710	87	2634.	1		1325	162	29.	1		1940	237	0.
1		0100	13	0.	1		0715	88	2581.	1		1330	163	26.	1		1945	238	0.
1		0105	14	0.	1		0720	89	2529.	1		1335	164	23.	1		1950	239	0.
1		0110	15	0.	1		0725	90	2477.	1		1340	165	21.	1		1955	240	0.
1		0115	16	0.	1		0730	91	2425.	1		1345	166	19.	1		2000	241	0.
1		0120	17	0.	1		0735	92	2373.	1		1350	167	17.	1		2005	242	0.
1		0125	18	0.	1		0740	93	2321.	1		1355	168	16.	1		2010	243	0.
1		0130	19	0.	1		0745	94	2270.	1		1400	169	14.	1		2015	244	0.

1	0135	20	0.	*	1	0750	95	2220.	*	1	1405	170	13.	*	1	2020	245	0.
1	0140	21	0.	*	1	0755	96	2170.	*	1	1410	171	12.	*	1	2025	246	0.
1	0145	22	0.	*	1	0800	97	2122.	*	1	1415	172	11.	*	1	2030	247	0.
1	0150	23	0.	*	1	0805	98	2075.	*	1	1420	173	10.	*	1	2035	248	0.
1	0155	24	0.	*	1	0810	99	2029.	*	1	1425	174	9.	*	1	2040	249	0.
1	0200	25	0.	*	1	0815	100	1983.	*	1	1430	175	8.	*	1	2045	250	0.
1	0205	26	0.	*	1	0820	101	1939.	*	1	1435	176	7.	*	1	2050	251	0.
1	0210	27	0.	*	1	0825	102	1896.	*	1	1440	177	7.	*	1	2055	252	0.
1	0215	28	1.	*	1	0830	103	1854.	*	1	1445	178	6.	*	1	2100	253	0.
1	0220	29	2.	*	1	0835	104	1813.	*	1	1450	179	6.	*	1	2105	254	0.
1	0225	30	3.	*	1	0840	105	1772.	*	1	1455	180	5.	*	1	2110	255	0.
1	0230	31	5.	*	1	0845	106	1733.	*	1	1500	181	5.	*	1	2115	256	0.
1	0235	32	8.	*	1	0850	107	1694.	*	1	1505	182	4.	*	1	2120	257	0.
1	0240	33	12.	*	1	0855	108	1655.	*	1	1510	183	4.	*	1	2125	258	0.
1	0245	34	17.	*	1	0900	109	1615.	*	1	1515	184	4.	*	1	2130	259	0.
1	0250	35	21.	*	1	0905	110	1575.	*	1	1520	185	3.	*	1	2135	260	0.
1	0255	36	27.	*	1	0910	111	1536.	*	1	1525	186	3.	*	1	2140	261	0.
1	0300	37	34.	*	1	0915	112	1497.	*	1	1530	187	3.	*	1	2145	262	0.
1	0305	38	42.	*	1	0920	113	1460.	*	1	1535	188	2.	*	1	2150	263	0.
1	0310	39	54.	*	1	0925	114	1423.	*	1	1540	189	2.	*	1	2155	264	0.
1	0315	40	72.	*	1	0930	115	1387.	*	1	1545	190	2.	*	1	2200	265	0.
1	0320	41	98.	*	1	0935	116	1352.	*	1	1550	191	2.	*	1	2205	266	0.
1	0325	42	138.	*	1	0940	117	1315.	*	1	1555	192	2.	*	1	2210	267	0.
1	0330	43	196.	*	1	0945	118	1277.	*	1	1600	193	2.	*	1	2215	268	0.
1	0335	44	289.	*	1	0950	119	1238.	*	1	1605	194	1.	*	1	2220	269	0.
1	0340	45	436.	*	1	0955	120	1201.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	627.	*	1	1000	121	1165.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	860.	*	1	1005	122	1130.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	1122.	*	1	1010	123	1095.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	1384.	*	1	1015	124	1060.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	1626.	*	1	1020	125	1024.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	1836.	*	1	1025	126	987.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	2021.	*	1	1030	127	949.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	2184.	*	1	1035	128	913.	*	1	1650	203	1.	*	1	2305	278	0.
1	0425	54	2311.	*	1	1040	129	878.	*	1	1655	204	1.	*	1	2310	279	0.
1	0430	55	2406.	*	1	1045	130	844.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	2479.	*	1	1050	131	811.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	2527.	*	1	1055	132	777.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	2552.	*	1	1100	133	742.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	2578.	*	1	1105	134	705.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	2626.	*	1	1110	135	667.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	2708.	*	1	1115	136	632.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	2822.	*	1	1120	137	599.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	2955.	*	1	1125	138	568.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3096.	*	1	1130	139	537.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	3222.	*	1	1135	140	506.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	3323.	*	1	1140	141	473.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	3400.	*	1	1145	142	436.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	3444.	*	1	1150	143	399.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	3458.	*	1	1155	144	365.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	3450.	*	1	1200	145	334.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	3421.	*	1	1205	146	305.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	3377.	*	1	1210	147	280.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3328.	*	1	1215	148	257.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3277.	*	1	1220	149	234.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3227.	*	1	1225	150	210.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR (CFS)	24-HR	72-HR	24.92-HR
+ 3458.	5.67	2372.	681.	656.	656.
		(INCHES) .248	.285	.285	.285
		(AC-FT) 1176.	1350.	1350.	1350.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	750.00	1750.86	345.00	.14	4.94

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN .08 1.64 5.00 1750.86 345.00 .14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6538E+03 EXCESS= .0000E+00 OUTFLOW= .6539E+03 BASIN STORAGE= .1003E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	1634.	1		1230	151	63.	1		1845	226	0.
1		0005	2	0.	1		0620	77	1620.	1		1235	152	59.	1		1850	227	0.
1		0010	3	0.	1		0625	78	1600.	1		1240	153	56.	1		1855	228	0.
1		0015	4	0.	1		0630	79	1580.	1		1245	154	52.	1		1900	229	0.
1		0020	5	0.	1		0635	80	1555.	1		1250	155	49.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1533.	1		1255	156	46.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1508.	1		1300	157	44.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1484.	1		1305	158	41.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1461.	1		1310	159	39.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1438.	1		1315	160	37.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1418.	1		1320	161	35.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1397.	1		1325	162	33.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1375.	1		1330	163	31.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1352.	1		1335	164	29.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1329.	1		1340	165	27.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1304.	1		1345	166	26.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1279.	1		1350	167	24.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1252.	1		1355	168	23.	1		2010	243	0.
1		0130	19	0.	1		0745	94	1223.	1		1400	169	21.	1		2015	244	0.
1		0135	20	0.	1		0750	95	1194.	1		1405	170	20.	1		2020	245	0.
1		0140	21	0.	1		0755	96	1165.	1		1410	171	19.	1		2025	246	0.
1		0145	22	0.	1		0800	97	1136.	1		1415	172	18.	1		2030	247	0.
1		0150	23	0.	1		0805	98	1108.	1		1420	173	16.	1		2035	248	0.
1		0155	24	0.	1		0810	99	1080.	1		1425	174	15.	1		2040	249	0.
1		0200	25	0.	1		0815	100	1052.	1		1430	175	14.	1		2045	250	0.
1		0205	26	0.	1		0820	101	1025.	1		1435	176	13.	1		2050	251	0.
1		0210	27	0.	1		0825	102	998.	1		1440	177	13.	1		2055	252	0.
1		0215	28	0.	1		0830	103	971.	1		1445	178	12.	1		2100	253	0.
1		0220	29	0.	1		0835	104	945.	1		1450	179	11.	1		2105	254	0.
1		0225	30	0.	1		0840	105	919.	1		1455	180	10.	1		2110	255	0.
1		0230	31	0.	1		0845	106	894.	1		1500	181	10.	1		2115	256	0.
1		0235	32	0.	1		0850	107	868.	1		1505	182	9.	1		2120	257	0.
1		0240	33	0.	1		0855	108	841.	1		1510	183	8.	1		2125	258	0.
1		0245	34	0.	1		0900	109	813.	1		1515	184	8.	1		2130	259	0.
1		0250	35	0.	1		0905	110	783.	1		1520	185	7.	1		2135	260	0.
1		0255	36	0.	1		0910	111	752.	1		1525	186	7.	1		2140	261	0.
1		0300	37	0.	1		0915	112	724.	1		1530	187	7.	1		2145	262	0.
1		0305	38	0.	1		0920	113	697.	1		1535	188	6.	1		2150	263	0.
1		0310	39	1.	1		0925	114	671.	1		1540	189	6.	1		2155	264	0.
1		0315	40	2.	1		0930	115	645.	1		1545	190	5.	1		2200	265	0.
1		0320	41	5.	1		0935	116	621.	1		1550	191	5.	1		2205	266	0.
1		0325	42	11.	1		0940	117	597.	1		1555	192	5.	1		2210	267	0.
1		0330	43	22.	1		0945	118	574.	1		1600	193	4.	1		2215	268	0.
1		0335	44	44.	1		0950	119	551.	1		1605	194	4.	1		2220	269	0.
1		0340	45	82.	1		0955	120	529.	1		1610	195	4.	1		2225	270	0.
1		0345	46	141.	1		1000	121	504.	1		1615	196	4.	1		2230	271	0.
1		0350	47	244.	1		1005	122	475.	1		1620	197	3.	1		2235	272	0.
1		0355	48	368.	1		1010	123	444.	1		1625	198	3.	1		2240	273	0.
1		0400	49	508.	1		1015	124	415.	1		1630	199	3.	1		2245	274	0.
1		0405	50	655.	1		1020	125	390.	1		1635	200	3.	1		2250	275	0.
1		0410	51	779.	1		1025	126	367.	1		1640	201	3.	1		2255	276	0.
1		0415	52	879.	1		1030	127	345.	1		1645	202	3.	1		2300	277	0.
1		0420	53	960.	1		1035	128	325.	1		1650	203	2.	1		2305	278	0.
1		0425	54	1028.	1		1040	129	306.	1		1655	204	2.	1		2310	279	0.
1		0430	55	1086.	1		1045	130	289.	1		1700	205	2.	1		2315	280	0.
1		0435	56	1140.	1		1050	131	272.	1		1705	206	2.	1		2320	281	0.
1		0440	57	1197.	1		1055	132	257.	1		1710	207	2.	1		2325	282	0.
1		0445	58	1248.	1		1100	133	243.	1		1715	208	2.	1		2330	283	0.
1		0450	59	1283.	1		1105	134	230.	1		1720	209	2.	1		2335	284	0.
1		0455	60	1320.	1		1110	135	216.	1		1725	210	2.	1		2340	285	0.
1		0500	61	1381.	1		1115	136	200.	1		1730	211	1.	1		2345	286	0.
1		0505	62	1449.	1		1120	137	180.	1		1735	212	1.	1		2350	287	0.
1		0510	63	1516.	1		1125	138	164.	1		1740	213	1.	1		2355	288	0.
1		0515	64	1580.	1		1130	139	150.	1		1745	214	1.	2		0000	289	0.
1		0520	65	1633.	1		1135	140	138.	1		1750	215	1.	2		0005	290	0.

1	0525	66	1671.	*	1	1140	141	126.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	1693.	*	1	1145	142	116.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	1711.	*	1	1150	143	107.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	1734.	*	1	1155	144	100.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	1751.	*	1	1200	145	93.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	1738.	*	1	1205	146	87.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	1706.	*	1	1210	147	81.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	1685.	*	1	1215	148	76.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	1669.	*	1	1220	149	71.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	1648.	*	1	1225	150	67.	*	1	1840	225	1.	*	2	0055	300	0.
				*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)	(CFS)				
+ 1751.	5.75		1196.	330.	318.	318.
		(INCHES)	.125	.138	.138	.138
		(AC-FT)	593.	654.	654.	654.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS
COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	375.00	284.95	355.00	.02	2.44

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00	284.95	355.00	.02	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8591E+02 EXCESS= .0000E+00 OUTFLOW= .8593E+02 BASIN STORAGE= .4489E-01 PERCENT ERROR= -.1

****

HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .26

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	252.	*	1		1230	151	27.	*	1		1845	226	2.
1		0005	2	0.	*	1		0620	77	248.	*	1		1235	152	26.	*	1		1850	227	2.
1		0010	3	0.	*	1		0625	78	242.	*	1		1240	153	25.	*	1		1855	228	2.
1		0015	4	0.	*	1		0630	79	239.	*	1		1245	154	24.	*	1		1900	229	2.
1		0020	5	0.	*	1		0635	80	236.	*	1		1250	155	24.	*	1		1905	230	2.
1		0025	6	0.	*	1		0640	81	228.	*	1		1255	156	23.	*	1		1910	231	2.
1		0030	7	0.	*	1		0645	82	221.	*	1		1300	157	22.	*	1		1915	232	2.
1		0035	8	0.	*	1		0650	83	210.	*	1		1305	158	21.	*	1		1920	233	2.
1		0040	9	0.	*	1		0655	84	201.	*	1		1310	159	21.	*	1		1925	234	2.
1		0045	10	0.	*	1		0700	85	189.	*	1		1315	160	20.	*	1		1930	235	2.
1		0050	11	0.	*	1		0705	86	179.	*	1		1320	161	20.	*	1		1935	236	2.
1		0055	12	0.	*	1		0710	87	168.	*	1		1325	162	19.	*	1		1940	237	1.
1		0100	13	0.	*	1		0715	88	158.	*	1		1330	163	18.	*	1		1945	238	1.
1		0105	14	0.	*	1		0720	89	148.	*	1		1335	164	18.	*	1		1950	239	1.
1		0110	15	0.	*	1		0725	90	139.	*	1		1340	165	17.	*	1		1955	240	1.
1		0115	16	0.	*	1		0730	91	130.	*	1		1345	166	17.	*	1		2000	241	1.
1		0120	17	0.	*	1		0735	92	122.	*	1		1350	167	16.	*	1		2005	242	1.
1		0125	18	0.	*	1		0740	93	115.	*	1		1355	168	16.	*	1		2010	243	1.
1		0130	19	0.	*	1		0745	94	108.	*	1		1400	169	16.	*	1		2015	244	1.
1		0135	20	0.	*	1		0750	95	102.	*	1		1405	170	15.	*	1		2020	245	1.
1		0140	21	0.	*	1		0755	96	97.	*	1		1410	171	15.	*	1		2025	246	1.
1		0145	22	0.	*	1		0800	97	95.	*	1		1415	172	14.	*	1		2030	247	1.
1		0150	23	0.	*	1		0805	98	99.	*	1		1420	173	14.	*	1		2035	248	1.
1		0155	24	0.	*	1		0810	99	113.	*	1		1425	174	14.	*	1		2040	249	1.
1		0200	25	0.	*	1		0815	100	128.	*	1		1430	175	13.	*	1		2045	250	1.
1		0205	26	0.	*	1		0820	101	129.	*	1		1435	176	13.	*	1		2050	251	1.
1		0210	27	0.	*	1		0825	102	119.	*	1		1440	177	12.	*	1		2055	252	1.
1		0215	28	0.	*	1		0830	103	112.	*	1		1445	178	12.	*	1		2100	253	1.
1		0220	29	0.	*	1		0835	104	111.	*	1		1450	179	12.	*	1		2105	254	1.
1		0225	30	0.	*	1		0840	105	107.	*	1		1455	180	11.	*	1		2110	255	1.

1	0230	31	0.	*	1	0845	106	100.	*	1	1500	181	11.	*	1	2115	256	1.
1	0235	32	0.	*	1	0850	107	96.	*	1	1505	182	11.	*	1	2120	257	1.
1	0240	33	0.	*	1	0855	108	93.	*	1	1510	183	10.	*	1	2125	258	1.
1	0245	34	0.	*	1	0900	109	89.	*	1	1515	184	10.	*	1	2130	259	1.
1	0250	35	0.	*	1	0905	110	88.	*	1	1520	185	10.	*	1	2135	260	1.
1	0255	36	0.	*	1	0910	111	90.	*	1	1525	186	10.	*	1	2140	261	1.
1	0300	37	0.	*	1	0915	112	92.	*	1	1530	187	9.	*	1	2145	262	1.
1	0305	38	0.	*	1	0920	113	95.	*	1	1535	188	9.	*	1	2150	263	1.
1	0310	39	0.	*	1	0925	114	94.	*	1	1540	189	9.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	89.	*	1	1545	190	9.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	86.	*	1	1550	191	8.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	84.	*	1	1555	192	8.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	82.	*	1	1600	193	8.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	81.	*	1	1605	194	7.	*	1	2220	269	0.
1	0340	45	0.	*	1	0955	120	76.	*	1	1610	195	7.	*	1	2225	270	0.
1	0345	46	0.	*	1	1000	121	72.	*	1	1615	196	7.	*	1	2230	271	0.
1	0350	47	0.	*	1	1005	122	71.	*	1	1620	197	7.	*	1	2235	272	0.
1	0355	48	1.	*	1	1010	123	69.	*	1	1625	198	6.	*	1	2240	273	0.
1	0400	49	3.	*	1	1015	124	67.	*	1	1630	199	6.	*	1	2245	274	0.
1	0405	50	7.	*	1	1020	125	64.	*	1	1635	200	6.	*	1	2250	275	0.
1	0410	51	12.	*	1	1025	126	61.	*	1	1640	201	6.	*	1	2255	276	0.
1	0415	52	19.	*	1	1030	127	59.	*	1	1645	202	6.	*	1	2300	277	0.
1	0420	53	31.	*	1	1035	128	58.	*	1	1650	203	5.	*	1	2305	278	0.
1	0425	54	45.	*	1	1040	129	57.	*	1	1655	204	5.	*	1	2310	279	0.
1	0430	55	61.	*	1	1045	130	56.	*	1	1700	205	5.	*	1	2315	280	0.
1	0435	56	79.	*	1	1050	131	54.	*	1	1705	206	5.	*	1	2320	281	0.
1	0440	57	95.	*	1	1055	132	52.	*	1	1710	207	5.	*	1	2325	282	0.
1	0445	58	103.	*	1	1100	133	51.	*	1	1715	208	4.	*	1	2330	283	0.
1	0450	59	112.	*	1	1105	134	50.	*	1	1720	209	4.	*	1	2335	284	0.
1	0455	60	119.	*	1	1110	135	47.	*	1	1725	210	4.	*	1	2340	285	0.
1	0500	61	126.	*	1	1115	136	45.	*	1	1730	211	4.	*	1	2345	286	0.
1	0505	62	136.	*	1	1120	137	44.	*	1	1735	212	4.	*	1	2350	287	0.
1	0510	63	149.	*	1	1125	138	43.	*	1	1740	213	4.	*	1	2355	288	0.
1	0515	64	165.	*	1	1130	139	41.	*	1	1745	214	3.	*	2	0000	289	0.
1	0520	65	184.	*	1	1135	140	40.	*	1	1750	215	3.	*	2	0005	290	0.
1	0525	66	210.	*	1	1140	141	38.	*	1	1755	216	3.	*	2	0010	291	0.
1	0530	67	244.	*	1	1145	142	37.	*	1	1800	217	3.	*	2	0015	292	0.
1	0535	68	274.	*	1	1150	143	36.	*	1	1805	218	3.	*	2	0020	293	0.
1	0540	69	281.	*	1	1155	144	35.	*	1	1810	219	3.	*	2	0025	294	0.
1	0545	70	278.	*	1	1200	145	33.	*	1	1815	220	3.	*	2	0030	295	0.
1	0550	71	284.	*	1	1205	146	32.	*	1	1820	221	3.	*	2	0035	296	0.
1	0555	72	285.	*	1	1210	147	31.	*	1	1825	222	3.	*	2	0040	297	0.
1	0600	73	273.	*	1	1215	148	30.	*	1	1830	223	2.	*	2	0045	298	0.
1	0605	74	268.	*	1	1220	149	29.	*	1	1835	224	2.	*	2	0050	299	0.
1	0610	75	261.	*	1	1225	150	28.	*	1	1840	225	2.	*	2	0055	300	0.
				*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 285.	5.92		145.	43.	42.	42.
		(INCHES)	.015	.018	.018	.018
		(AC-FT)	72.	86.	86.	86.

CUMULATIVE AREA = 88.86 SQ MI

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1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:38:08  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************


                                                X     X  XXXXXXX   XXXXX           X
                                                X     X  X        X     X         XX
                                                X     X  X        X                X
                                                XXXXXXX  XXXX     X        XXXXX   X
                                                X     X  X        X                X
                                                X     X  X        X     X          X
                                                X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                   HEC-1 INPUT                                                PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
 *** NOLIST ***
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:38:08  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************


                              KLEINFELDER
                              FEBRUARY 2008
                              ALTERNATIVE A

                              DESIGN STORM = 100-YEAR 6-HOUR STORM
                              STORM DISTRIBUTION = SDN5


   10 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           5  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      2    0  ENDING DATE
                       NDTIME        0055  ENDING TIME
                       ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
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```
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                   1.00       .87       .74       .57       .44       .26


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
1250 KK     *     ULWIN  *
            *            *
            **************

1254 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

1253 HC          HYDROGRAPH COMBINATION
                       ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***
*****************************************************************************************************************************************

                                                   HYDROGRAPH AT STATION    ULWIN
                                                        SUM OF  4 HYDROGRAPHS
                                                       PLAN 1,   RATIO =  1.00
*****************************************************************************************************************************************
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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	8105.	1		1230	151	5.	1		1845	226	0.
1		0005	2	0.	1		0620	77	7451.	1		1235	152	4.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6842.	1		1240	153	4.	1		1855	228	0.
1		0015	4	0.	1		0630	79	6278.	1		1245	154	3.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5765.	1		1250	155	3.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5302.	1		1255	156	2.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4882.	1		1300	157	2.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4494.	1		1305	158	2.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4136.	1		1310	159	2.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3807.	1		1315	160	1.	1		1930	235	0.
1		0050	11	1.	1		0705	86	3504.	1		1320	161	1.	1		1935	236	0.
1		0055	12	2.	1		0710	87	3223.	1		1325	162	1.	1		1940	237	0.
1		0100	13	4.	1		0715	88	2962.	1		1330	163	1.	1		1945	238	0.
1		0105	14	6.	1		0720	89	2719.	1		1335	164	1.	1		1950	239	0.
1		0110	15	9.	1		0725	90	2494.	1		1340	165	1.	1		1955	240	0.
1		0115	16	12.	1		0730	91	2289.	1		1345	166	1.	1		2000	241	0.
1		0120	17	16.	1		0735	92	2101.	1		1350	167	0.	1		2005	242	0.
1		0125	18	20.	1		0740	93	1929.	1		1355	168	0.	1		2010	243	0.
1		0130	19	25.	1		0745	94	1769.	1		1400	169	0.	1		2015	244	0.
1		0135	20	31.	1		0750	95	1623.	1		1405	170	0.	1		2020	245	0.
1		0140	21	38.	1		0755	96	1490.	1		1410	171	0.	1		2025	246	0.
1		0145	22	47.	1		0800	97	1370.	1		1415	172	0.	1		2030	247	0.
1		0150	23	56.	1		0805	98	1261.	1		1420	173	0.	1		2035	248	0.
1		0155	24	68.	1		0810	99	1161.	1		1425	174	0.	1		2040	249	0.
1		0200	25	81.	1		0815	100	1069.	1		1430	175	0.	1		2045	250	0.
1		0205	26	96.	1		0820	101	983.	1		1435	176	0.	1		2050	251	0.
1		0210	27	115.	1		0825	102	901.	1		1440	177	0.	1		2055	252	0.
1		0215	28	138.	1		0830	103	825.	1		1445	178	0.	1		2100	253	0.
1		0220	29	163.	1		0835	104	754.	1		1450	179	0.	1		2105	254	0.
1		0225	30	192.	1		0840	105	688.	1		1455	180	0.	1		2110	255	0.
1		0230	31	222.	1		0845	106	626.	1		1500	181	0.	1		2115	256	0.
1		0235	32	254.	1		0850	107	569.	1		1505	182	0.	1		2120	257	0.
1		0240	33	287.	1		0855	108	516.	1		1510	183	0.	1		2125	258	0.
1		0245	34	321.	1		0900	109	468.	1		1515	184	0.	1		2130	259	0.
1		0250	35	354.	1		0905	110	425.	1		1520	185	0.	1		2135	260	0.

1	0255	36	388.	*	1	0910	111	386.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	428.	*	1	0915	112	352.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	476.	*	1	0920	113	320.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	539.	*	1	0925	114	292.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	623.	*	1	0930	115	266.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	739.	*	1	0935	116	242.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	900.	*	1	0940	117	220.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1127.	*	1	0945	118	200.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1443.	*	1	0950	119	181.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1861.	*	1	0955	120	164.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	2360.	*	1	1000	121	148.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	2899.	*	1	1005	122	134.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	3425.	*	1	1010	123	120.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	3902.	*	1	1015	124	109.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	4430.	*	1	1020	125	98.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	5376.	*	1	1025	126	88.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	7000.	*	1	1030	127	79.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	9168.	*	1	1035	128	71.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	11274.	*	1	1040	129	64.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	12794.	*	1	1045	130	57.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	13579.	*	1	1050	131	51.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	13785.	*	1	1055	132	46.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	13632.	*	1	1100	133	41.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	13291.	*	1	1105	134	37.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	12864.	*	1	1110	135	33.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	12466.	*	1	1115	136	29.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	12153.	*	1	1120	137	26.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	11916.	*	1	1125	138	23.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	11741.	*	1	1130	139	21.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	11624.	*	1	1135	140	18.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	11564.	*	1	1140	141	17.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	11547.	*	1	1145	142	15.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	11541.	*	1	1150	143	13.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	11500.	*	1	1155	144	12.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	11377.	*	1	1200	145	10.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	11108.	*	1	1205	146	9.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	10678.	*	1	1210	147	8.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	10124.	*	1	1215	148	7.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	9484.	*	1	1220	149	6.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	8795.	*	1	1225	150	6.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 13785.	4.67		5548.	1414.	1362.	1362.
		(INCHES)	.877	.894	.894	.894
		(AC-FT)	2751.	2805.	2805.	2805.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .87

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	6696.	*	1		1230	151	7.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	6193.	*	1		1235	152	6.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	5711.	*	1		1240	153	6.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	5261.	*	1		1245	154	5.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	4845.	*	1		1250	155	4.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	4464.	*	1		1255	156	4.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	4116.	*	1		1300	157	3.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	3797.	*	1		1305	158	3.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	3506.	*	1		1310	159	3.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	3237.	*	1		1315	160	2.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	2990.	*	1		1320	161	2.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	2761.	*	1		1325	162	2.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	2548.	*	1		1330	163	2.	*	1		1945	238	0.
1		0105	14	1.	*	1		0720	89	2350.	*	1		1335	164	1.	*	1		1950	239	0.
1		0110	15	1.	*	1		0725	90	2167.	*	1		1340	165	1.	*	1		1955	240	0.
1		0115	16	2.	*	1		0730	91	1997.	*	1		1345	166	1.	*	1		2000	241	0.
1		0120	17	3.	*	1		0735	92	1840.	*	1		1350	167	1.	*	1		2005	242	0.

1	0125	18	4.	*	1	0740	93	1696.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	6.	*	1	0745	94	1563.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	8.	*	1	0750	95	1442.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	11.	*	1	0755	96	1330.	*	1	1410	171	1.	*	1	2025	246	0.
1	0145	22	15.	*	1	0800	97	1228.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	19.	*	1	0805	98	1135.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	25.	*	1	0810	99	1050.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	33.	*	1	0815	100	968.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	42.	*	1	0820	101	890.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	54.	*	1	0825	102	818.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	68.	*	1	0830	103	753.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	82.	*	1	0835	104	694.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	98.	*	1	0840	105	639.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	114.	*	1	0845	106	588.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	130.	*	1	0850	107	540.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	146.	*	1	0855	108	495.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	163.	*	1	0900	109	452.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	180.	*	1	0905	110	412.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	197.	*	1	0910	111	375.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	214.	*	1	0915	112	342.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	235.	*	1	0920	113	312.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	264.	*	1	0925	114	285.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	309.	*	1	0930	115	260.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	376.	*	1	0935	116	238.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	477.	*	1	0940	117	218.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	623.	*	1	0945	118	199.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	836.	*	1	0950	119	183.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1134.	*	1	0955	120	167.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1505.	*	1	1000	121	153.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1917.	*	1	1005	122	140.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	2333.	*	1	1010	123	128.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	2702.	*	1	1015	124	117.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	3007.	*	1	1020	125	107.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	3272.	*	1	1025	126	98.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	3652.	*	1	1030	127	90.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	4678.	*	1	1035	128	82.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	6077.	*	1	1040	129	75.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	7455.	*	1	1045	130	68.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	8585.	*	1	1050	131	62.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	9320.	*	1	1055	132	56.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	9657.	*	1	1100	133	51.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	9730.	*	1	1105	134	46.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	9644.	*	1	1110	135	41.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	9468.	*	1	1115	136	37.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	9274.	*	1	1120	137	34.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	9118.	*	1	1125	138	30.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	9014.	*	1	1130	139	27.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	8949.	*	1	1135	140	24.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	8906.	*	1	1140	141	22.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	8885.	*	1	1145	142	19.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	8882.	*	1	1150	143	17.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	8865.	*	1	1155	144	16.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	8809.	*	1	1200	145	14.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	8673.	*	1	1205	146	12.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	8438.	*	1	1210	147	11.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	8104.	*	1	1215	148	10.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	7683.	*	1	1220	149	9.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7203.	*	1	1225	150	8.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS)	6-HR	24-HR	72-HR	24.92-HR
+ 9730.	4.83		4154.	1059.	1020.	1020.
		(INCHES)	.656	.670	.670	.670
		(AC-FT)	2060.	2101.	2101.	2101.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .74

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DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW

1	0000	1	0.	*	1	0615	76	5221.	*	1	1230	151	11.	*	1	1845	226	0.
1	0005	2	0.	*	1	0620	77	4877.	*	1	1235	152	10.	*	1	1850	227	0.
1	0010	3	0.	*	1	0625	78	4533.	*	1	1240	153	9.	*	1	1855	228	0.
1	0015	4	0.	*	1	0630	79	4200.	*	1	1245	154	8.	*	1	1900	229	0.
1	0020	5	0.	*	1	0635	80	3886.	*	1	1250	155	7.	*	1	1905	230	0.
1	0025	6	0.	*	1	0640	81	3595.	*	1	1255	156	6.	*	1	1910	231	0.
1	0030	7	0.	*	1	0645	82	3326.	*	1	1300	157	6.	*	1	1915	232	0.
1	0035	8	0.	*	1	0650	83	3078.	*	1	1305	158	5.	*	1	1920	233	0.
1	0040	9	0.	*	1	0655	84	2851.	*	1	1310	159	5.	*	1	1925	234	0.
1	0045	10	0.	*	1	0700	85	2640.	*	1	1315	160	4.	*	1	1930	235	0.
1	0050	11	0.	*	1	0705	86	2446.	*	1	1320	161	4.	*	1	1935	236	0.
1	0055	12	0.	*	1	0710	87	2267.	*	1	1325	162	3.	*	1	1940	237	0.
1	0100	13	0.	*	1	0715	88	2102.	*	1	1330	163	3.	*	1	1945	238	0.
1	0105	14	0.	*	1	0720	89	1949.	*	1	1335	164	3.	*	1	1950	239	0.
1	0110	15	0.	*	1	0725	90	1806.	*	1	1340	165	2.	*	1	1955	240	0.
1	0115	16	0.	*	1	0730	91	1673.	*	1	1345	166	2.	*	1	2000	241	0.
1	0120	17	0.	*	1	0735	92	1550.	*	1	1350	167	2.	*	1	2005	242	0.
1	0125	18	0.	*	1	0740	93	1436.	*	1	1355	168	2.	*	1	2010	243	0.
1	0130	19	0.	*	1	0745	94	1330.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	1.	*	1	0750	95	1232.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	1.	*	1	0755	96	1141.	*	1	1410	171	1.	*	1	2025	246	0.
1	0145	22	2.	*	1	0800	97	1058.	*	1	1415	172	1.	*	1	2030	247	0.
1	0150	23	4.	*	1	0805	98	981.	*	1	1420	173	1.	*	1	2035	248	0.
1	0155	24	6.	*	1	0810	99	910.	*	1	1425	174	1.	*	1	2040	249	0.
1	0200	25	9.	*	1	0815	100	844.	*	1	1430	175	1.	*	1	2045	250	0.
1	0205	26	12.	*	1	0820	101	784.	*	1	1435	176	1.	*	1	2050	251	0.
1	0210	27	17.	*	1	0825	102	728.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	22.	*	1	0830	103	677.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	30.	*	1	0835	104	630.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	38.	*	1	0840	105	587.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	47.	*	1	0845	106	547.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	57.	*	1	0850	107	509.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	66.	*	1	0855	108	474.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	75.	*	1	0900	109	441.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	83.	*	1	0905	110	410.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	92.	*	1	0910	111	382.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	100.	*	1	0915	112	355.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	110.	*	1	0920	113	328.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	122.	*	1	0925	114	301.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	140.	*	1	0930	115	276.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	166.	*	1	0935	116	254.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	209.	*	1	0940	117	234.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	275.	*	1	0945	118	215.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	377.	*	1	0950	119	198.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	536.	*	1	0955	120	182.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	767.	*	1	1000	121	168.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1052.	*	1	1005	122	155.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	1362.	*	1	1010	123	143.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	1652.	*	1	1015	124	132.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	1876.	*	1	1020	125	121.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	2023.	*	1	1025	126	112.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	2106.	*	1	1030	127	103.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	2149.	*	1	1035	128	95.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	2426.	*	1	1040	129	87.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	3347.	*	1	1045	130	80.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	4228.	*	1	1050	131	74.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	4878.	*	1	1055	132	67.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	5527.	*	1	1100	133	62.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	5970.	*	1	1105	134	56.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	6218.	*	1	1110	135	51.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	6282.	*	1	1115	136	47.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	6304.	*	1	1120	137	42.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	6316.	*	1	1125	138	39.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	6311.	*	1	1130	139	35.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6307.	*	1	1135	140	32.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6296.	*	1	1140	141	29.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6286.	*	1	1145	142	26.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	6288.	*	1	1150	143	24.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	6290.	*	1	1155	144	22.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	6284.	*	1	1200	145	19.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	6258.	*	1	1205	146	18.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6184.	*	1	1210	147	16.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6043.	*	1	1215	148	14.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5829.	*	1	1220	149	13.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5548.	*	1	1225	150	12.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR

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+   (CFS)       (HR)
                          (CFS)
+    6316.      5.17                2884.        738.        711.         711.
                         (INCHES)      .456        .466        .466         .466
                          (AC-FT)     1430.       1463.       1463.        1463.

                          CUMULATIVE AREA =   58.84 SQ MI
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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3050.	1		1230	151	18.	1		1845	226	0.
1		0005	2	0.	1		0620	77	2952.	1		1235	152	16.	1		1850	227	0.
1		0010	3	0.	1		0625	78	2831.	1		1240	153	15.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2701.	1		1245	154	14.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2552.	1		1250	155	13.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2394.	1		1255	156	12.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2238.	1		1300	157	11.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2086.	1		1305	158	10.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1943.	1		1310	159	9.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1809.	1		1315	160	8.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1687.	1		1320	161	8.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1574.	1		1325	162	7.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1470.	1		1330	163	6.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1373.	1		1335	164	6.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1282.	1		1340	165	5.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1195.	1		1345	166	5.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1113.	1		1350	167	5.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1038.	1		1355	168	4.	1		2010	243	0.
1		0130	19	0.	1		0745	94	968.	1		1400	169	4.	1		2015	244	0.
1		0135	20	0.	1		0750	95	906.	1		1405	170	3.	1		2020	245	0.
1		0140	21	0.	1		0755	96	847.	1		1410	171	3.	1		2025	246	0.
1		0145	22	0.	1		0800	97	792.	1		1415	172	3.	1		2030	247	0.
1		0150	23	0.	1		0805	98	740.	1		1420	173	3.	1		2035	248	0.
1		0155	24	0.	1		0810	99	693.	1		1425	174	2.	1		2040	249	0.
1		0200	25	0.	1		0815	100	649.	1		1430	175	2.	1		2045	250	0.
1		0205	26	0.	1		0820	101	608.	1		1435	176	2.	1		2050	251	0.
1		0210	27	1.	1		0825	102	570.	1		1440	177	2.	1		2055	252	0.
1		0215	28	2.	1		0830	103	534.	1		1445	178	2.	1		2100	253	0.
1		0220	29	3.	1		0835	104	500.	1		1450	179	1.	1		2105	254	0.
1		0225	30	4.	1		0840	105	469.	1		1455	180	1.	1		2110	255	0.
1		0230	31	6.	1		0845	106	440.	1		1500	181	1.	1		2115	256	0.
1		0235	32	8.	1		0850	107	412.	1		1505	182	1.	1		2120	257	0.
1		0240	33	11.	1		0855	108	387.	1		1510	183	1.	1		2125	258	0.
1		0245	34	13.	1		0900	109	363.	1		1515	184	1.	1		2130	259	0.
1		0250	35	15.	1		0905	110	340.	1		1520	185	1.	1		2135	260	0.
1		0255	36	18.	1		0910	111	319.	1		1525	186	1.	1		2140	261	0.
1		0300	37	20.	1		0915	112	300.	1		1530	187	1.	1		2145	262	0.
1		0305	38	24.	1		0920	113	281.	1		1535	188	1.	1		2150	263	0.
1		0310	39	29.	1		0925	114	264.	1		1540	189	0.	1		2155	264	0.
1		0315	40	36.	1		0930	115	248.	1		1545	190	0.	1		2200	265	0.
1		0320	41	47.	1		0935	116	233.	1		1550	191	0.	1		2205	266	0.
1		0325	42	65.	1		0940	117	219.	1		1555	192	0.	1		2210	267	0.
1		0330	43	91.	1		0945	118	205.	1		1600	193	0.	1		2215	268	0.
1		0335	44	130.	1		0950	119	192.	1		1605	194	0.	1		2220	269	0.
1		0340	45	182.	1		0955	120	179.	1		1610	195	0.	1		2225	270	0.
1		0345	46	246.	1		1000	121	165.	1		1615	196	0.	1		2230	271	0.
1		0350	47	322.	1		1005	122	153.	1		1620	197	0.	1		2235	272	0.
1		0355	48	464.	1		1010	123	142.	1		1625	198	0.	1		2240	273	0.
1		0400	49	653.	1		1015	124	131.	1		1630	199	0.	1		2245	274	0.
1		0405	50	822.	1		1020	125	122.	1		1635	200	0.	1		2250	275	0.
1		0410	51	942.	1		1025	126	113.	1		1640	201	0.	1		2255	276	0.
1		0415	52	1025.	1		1030	127	105.	1		1645	202	0.	1		2300	277	0.
1		0420	53	1060.	1		1035	128	97.	1		1650	203	0.	1		2305	278	0.
1		0425	54	1060.	1		1040	129	91.	1		1655	204	0.	1		2310	279	0.
1		0430	55	1039.	1		1045	130	85.	1		1700	205	0.	1		2315	280	0.
1		0435	56	1007.	1		1050	131	79.	1		1705	206	0.	1		2320	281	0.
1		0440	57	971.	1		1055	132	74.	1		1710	207	0.	1		2325	282	0.
1		0445	58	1099.	1		1100	133	69.	1		1715	208	0.	1		2330	283	0.
1		0450	59	1951.	1		1105	134	64.	1		1720	209	0.	1		2335	284	0.
1		0455	60	2095.	1		1110	135	60.	1		1725	210	0.	1		2340	285	0.
1		0500	61	2184.	1		1115	136	56.	1		1730	211	0.	1		2345	286	0.
1		0505	62	2544.	1		1120	137	52.	1		1735	212	0.	1		2350	287	0.

1	0510	63	2620.	*	1	1125	138	49.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	2867.	*	1	1130	139	46.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	2977.	*	1	1135	140	42.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	3001.	*	1	1140	141	40.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2967.	*	1	1145	142	37.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	3021.	*	1	1150	143	34.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	3057.	*	1	1155	144	31.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	3102.	*	1	1200	145	29.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	3191.	*	1	1205	146	27.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	3239.	*	1	1210	147	25.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3212.	*	1	1215	148	23.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3165.	*	1	1220	149	21.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3117.	*	1	1225	150	19.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 3239.	5.92		1477.	382.	368.	368.
		(INCHES)	.233	.241	.241	.241
		(AC-FT)	733.	757.	757.	757.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	1218.	1		1230	151	27.	1		1845	226	0.
1		0005	2	0.	1		0620	77	1194.	1		1235	152	25.	1		1850	227	0.
1		0010	3	0.	1		0625	78	1168.	1		1240	153	24.	1		1855	228	0.
1		0015	4	0.	1		0630	79	1158.	1		1245	154	22.	1		1900	229	0.
1		0020	5	0.	1		0635	80	1161.	1		1250	155	21.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1174.	1		1255	156	20.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1175.	1		1300	157	19.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1151.	1		1305	158	17.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1110.	1		1310	159	16.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1048.	1		1315	160	15.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1001.	1		1320	161	14.	1		1935	236	0.
1		0055	12	0.	1		0710	87	960.	1		1325	162	13.	1		1940	237	0.
1		0100	13	0.	1		0715	88	903.	1		1330	163	12.	1		1945	238	0.
1		0105	14	0.	1		0720	89	851.	1		1335	164	12.	1		1950	239	0.
1		0110	15	0.	1		0725	90	798.	1		1340	165	11.	1		1955	240	0.
1		0115	16	0.	1		0730	91	755.	1		1345	166	10.	1		2000	241	0.
1		0120	17	0.	1		0735	92	718.	1		1350	167	9.	1		2005	242	0.
1		0125	18	0.	1		0740	93	676.	1		1355	168	9.	1		2010	243	0.
1		0130	19	0.	1		0745	94	639.	1		1400	169	8.	1		2015	244	0.
1		0135	20	0.	1		0750	95	605.	1		1405	170	8.	1		2020	245	0.
1		0140	21	0.	1		0755	96	574.	1		1410	171	7.	1		2025	246	0.
1		0145	22	0.	1		0800	97	542.	1		1415	172	7.	1		2030	247	0.
1		0150	23	0.	1		0805	98	510.	1		1420	173	6.	1		2035	248	0.
1		0155	24	0.	1		0810	99	482.	1		1425	174	6.	1		2040	249	0.
1		0200	25	0.	1		0815	100	456.	1		1430	175	6.	1		2045	250	0.
1		0205	26	0.	1		0820	101	429.	1		1435	176	5.	1		2050	251	0.
1		0210	27	0.	1		0825	102	404.	1		1440	177	5.	1		2055	252	0.
1		0215	28	0.	1		0830	103	382.	1		1445	178	5.	1		2100	253	0.
1		0220	29	0.	1		0835	104	361.	1		1450	179	4.	1		2105	254	0.
1		0225	30	0.	1		0840	105	340.	1		1455	180	4.	1		2110	255	0.
1		0230	31	0.	1		0845	106	322.	1		1500	181	4.	1		2115	256	0.
1		0235	32	0.	1		0850	107	305.	1		1505	182	3.	1		2120	257	0.
1		0240	33	0.	1		0855	108	289.	1		1510	183	3.	1		2125	258	0.
1		0245	34	0.	1		0900	109	274.	1		1515	184	3.	1		2130	259	0.
1		0250	35	0.	1		0905	110	260.	1		1520	185	3.	1		2135	260	0.
1		0255	36	0.	1		0910	111	246.	1		1525	186	3.	1		2140	261	0.
1		0300	37	1.	1		0915	112	233.	1		1530	187	2.	1		2145	262	0.
1		0305	38	1.	1		0920	113	221.	1		1535	188	2.	1		2150	263	0.
1		0310	39	1.	1		0925	114	210.	1		1540	189	2.	1		2155	264	0.
1		0315	40	2.	1		0930	115	199.	1		1545	190	2.	1		2200	265	0.
1		0320	41	4.	1		0935	116	189.	1		1550	191	2.	1		2205	266	0.
1		0325	42	7.	1		0940	117	181.	1		1555	192	2.	1		2210	267	0.
1		0330	43	15.	1		0945	118	172.	1		1600	193	2.	1		2215	268	0.
1		0335	44	29.	1		0950	119	164.	1		1605	194	2.	1		2220	269	0.

1	0340	45	51.	*	1	0955	120	156.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	80.	*	1	1000	121	148.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	114.	*	1	1005	122	141.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	149.	*	1	1010	123	134.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	186.	*	1	1015	124	127.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	226.	*	1	1020	125	121.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	330.	*	1	1025	126	115.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	433.	*	1	1030	127	110.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	475.	*	1	1035	128	105.	*	1	1650	203	1.	*	1	2305	278	0.
1	0425	54	501.	*	1	1040	129	100.	*	1	1655	204	1.	*	1	2310	279	0.
1	0430	55	504.	*	1	1045	130	95.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	497.	*	1	1050	131	90.	*	1	1705	206	1.	*	1	2320	281	0.
1	0440	57	484.	*	1	1055	132	85.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	467.	*	1	1100	133	80.	*	1	1715	208	1.	*	1	2330	283	0.
1	0450	59	451.	*	1	1105	134	75.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	439.	*	1	1110	135	71.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	435.	*	1	1115	136	67.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	439.	*	1	1120	137	63.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	452.	*	1	1125	138	59.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	829.	*	1	1130	139	55.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	1162.	*	1	1135	140	52.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	804.	*	1	1140	141	49.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	1077.	*	1	1145	142	46.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	1095.	*	1	1150	143	43.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	1116.	*	1	1155	144	41.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	1262.	*	1	1200	145	38.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	1147.	*	1	1205	146	36.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	1252.	*	1	1210	147	34.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	1251.	*	1	1215	148	32.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	1285.	*	1	1220	149	30.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	1216.	*	1	1225	150	29.	*	1	1840	225	0.	*	2	0055	300	0.

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)				
+ 1285.	6.08		655.	175.	168.	168.
		(INCHES)	.104	.110	.110	.110
		(AC-FT)	325.	347.	347.	347.

CUMULATIVE AREA = 58.84 SQ MI

****

HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .26

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	71.	1		1230	151	13.	1		1845	226	1.
1		0005	2	0.	1		0620	77	64.	1		1235	152	13.	1		1850	227	1.
1		0010	3	0.	1		0625	78	57.	1		1240	153	13.	1		1855	228	1.
1		0015	4	0.	1		0630	79	51.	1		1245	154	12.	1		1900	229	1.
1		0020	5	0.	1		0635	80	46.	1		1250	155	12.	1		1905	230	1.
1		0025	6	0.	1		0640	81	41.	1		1255	156	12.	1		1910	231	0.
1		0030	7	0.	1		0645	82	37.	1		1300	157	11.	1		1915	232	0.
1		0035	8	0.	1		0650	83	33.	1		1305	158	11.	1		1920	233	0.
1		0040	9	0.	1		0655	84	30.	1		1310	159	10.	1		1925	234	0.
1		0045	10	0.	1		0700	85	27.	1		1315	160	10.	1		1930	235	0.
1		0050	11	0.	1		0705	86	24.	1		1320	161	10.	1		1935	236	0.
1		0055	12	0.	1		0710	87	90.	1		1325	162	9.	1		1940	237	0.
1		0100	13	0.	1		0715	88	113.	1		1330	163	9.	1		1945	238	0.
1		0105	14	0.	1		0720	89	83.	1		1335	164	9.	1		1950	239	0.
1		0110	15	0.	1		0725	90	127.	1		1340	165	8.	1		1955	240	0.
1		0115	16	0.	1		0730	91	74.	1		1345	166	8.	1		2000	241	0.
1		0120	17	0.	1		0735	92	74.	1		1350	167	8.	1		2005	242	0.
1		0125	18	0.	1		0740	93	100.	1		1355	168	7.	1		2010	243	0.
1		0130	19	0.	1		0745	94	56.	1		1400	169	7.	1		2015	244	0.
1		0135	20	0.	1		0750	95	78.	1		1405	170	7.	1		2020	245	0.
1		0140	21	0.	1		0755	96	75.	1		1410	171	7.	1		2025	246	0.
1		0145	22	0.	1		0800	97	64.	1		1415	172	6.	1		2030	247	0.
1		0150	23	0.	1		0805	98	107.	1		1420	173	6.	1		2035	248	0.
1		0155	24	0.	1		0810	99	98.	1		1425	174	6.	1		2040	249	0.
1		0200	25	0.	1		0815	100	96.	1		1430	175	6.	1		2045	250	0.
1		0205	26	0.	1		0820	101	83.	1		1435	176	5.	1		2050	251	0.

```
    1   0210   27       0.   *    1    0825  102      65.   *    1    1440  177       5.   *    1    2055  252        0.
    1   0215   28       0.   *    1    0830  103      89.   *    1    1445  178       5.   *    1    2100  253        0.
    1   0220   29       0.   *    1    0835  104      83.   *    1    1450  179       5.   *    1    2105  254        0.
    1   0225   30       0.   *    1    0840  105      76.   *    1    1455  180       5.   *    1    2110  255        0.
    1   0230   31       0.   *    1    0845  106      65.   *    1    1500  181       4.   *    1    2115  256        0.
    1   0235   32       0.   *    1    0850  107      57.   *    1    1505  182       4.   *    1    2120  257        0.
    1   0240   33       0.   *    1    0855  108      73.   *    1    1510  183       4.   *    1    2125  258        0.
    1   0245   34       0.   *    1    0900  109      67.   *    1    1515  184       4.   *    1    2130  259        0.
    1   0250   35       0.   *    1    0905  110      57.   *    1    1520  185       4.   *    1    2135  260        0.
    1   0255   36       0.   *    1    0910  111      52.   *    1    1525  186       3.   *    1    2140  261        0.
    1   0300   37       0.   *    1    0915  112      53.   *    1    1530  187       3.   *    1    2145  262        0.
    1   0305   38       0.   *    1    0920  113      60.   *    1    1535  188       3.   *    1    2150  263        0.
    1   0310   39       0.   *    1    0925  114      50.   *    1    1540  189       3.   *    1    2155  264        0.
    1   0315   40       0.   *    1    0930  115      46.   *    1    1545  190       3.   *    1    2200  265        0.
    1   0320   41       0.   *    1    0935  116      52.   *    1    1550  191       3.   *    1    2205  266        0.
    1   0325   42       0.   *    1    0940  117      54.   *    1    1555  192       3.   *    1    2210  267        0.
    1   0330   43       0.   *    1    0945  118      48.   *    1    1600  193       3.   *    1    2215  268        0.
    1   0335   44       0.   *    1    0950  119      42.   *    1    1605  194       2.   *    1    2220  269        0.
    1   0340   45       0.   *    1    0955  120      46.   *    1    1610  195       2.   *    1    2225  270        0.
    1   0345   46       0.   *    1    1000  121      42.   *    1    1615  196       2.   *    1    2230  271        0.
    1   0350   47       0.   *    1    1005  122      36.   *    1    1620  197       2.   *    1    2235  272        0.
    1   0355   48       1.   *    1    1010  123      36.   *    1    1625  198       2.   *    1    2240  273        0.
    1   0400   49       5.   *    1    1015  124      40.   *    1    1630  199       2.   *    1    2245  274        0.
    1   0405   50      11.   *    1    1020  125      35.   *    1    1635  200       2.   *    1    2250  275        0.
    1   0410   51      19.   *    1    1025  126      31.   *    1    1640  201       2.   *    1    2255  276        0.
    1   0415   52      26.   *    1    1030  127      33.   *    1    1645  202       2.   *    1    2300  277        0.
    1   0420   53      32.   *    1    1035  128      33.   *    1    1650  203       2.   *    1    2305  278        0.
    1   0425   54      36.   *    1    1040  129      28.   *    1    1655  204       2.   *    1    2310  279        0.
    1   0430   55      40.   *    1    1045  130      27.   *    1    1700  205       2.   *    1    2315  280        0.
    1   0435   56      43.   *    1    1050  131      29.   *    1    1705  206       2.   *    1    2320  281        0.
    1   0440   57      44.   *    1    1055  132      27.   *    1    1710  207       1.   *    1    2325  282        0.
    1   0445   58      46.   *    1    1100  133      24.   *    1    1715  208       1.   *    1    2330  283        0.
    1   0450   59      53.   *    1    1105  134      24.   *    1    1720  209       1.   *    1    2335  284        0.
    1   0455   60      72.   *    1    1110  135      24.   *    1    1725  210       1.   *    1    2340  285        0.
    1   0500   61      68.   *    1    1115  136      22.   *    1    1730  211       1.   *    1    2345  286        0.
    1   0505   62      70.   *    1    1120  137      21.   *    1    1735  212       1.   *    1    2350  287        0.
    1   0510   63      77.   *    1    1125  138      20.   *    1    1740  213       1.   *    1    2355  288        0.
    1   0515   64      77.   *    1    1130  139      20.   *    1    1745  214       1.   *    2    0000  289        0.
    1   0520   65      81.   *    1    1135  140      20.   *    1    1750  215       1.   *    2    0005  290        0.
    1   0525   66      84.   *    1    1140  141      18.   *    1    1755  216       1.   *    2    0010  291        0.
    1   0530   67      88.   *    1    1145  142      18.   *    1    1800  217       1.   *    2    0015  292        0.
    1   0535   68      93.   *    1    1150  143      18.   *    1    1805  218       1.   *    2    0020  293        0.
    1   0540   69      99.   *    1    1155  144      17.   *    1    1810  219       1.   *    2    0025  294        0.
    1   0545   70     105.   *    1    1200  145      16.   *    1    1815  220       1.   *    2    0030  295        0.
    1   0550   71     105.   *    1    1205  146      16.   *    1    1820  221       1.   *    2    0035  296        0.
    1   0555   72     101.   *    1    1210  147      15.   *    1    1825  222       1.   *    2    0040  297        0.
    1   0600   73      95.   *    1    1215  148      14.   *    1    1830  223       1.   *    2    0045  298        0.
    1   0605   74      87.   *    1    1220  149      14.   *    1    1835  224       1.   *    2    0050  299        0.
    1   0610   75      79.   *    1    1225  150      14.   *    1    1840  225       1.   *    2    0055  300        0.
                             *                                *                                *
*************************************************************************************************************************************

  PEAK FLOW     TIME                         MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                             (CFS)
+     127.      7.42                  66.         20.         19.          19.
                          (INCHES)    .010        .013        .013         .013
                           (AC-FT)     33.         40.         40.          40.

                           CUMULATIVE AREA =   58.84 SQ MI




*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


             **************
             *            *
 1305 KK     *    FINISH  *
             *            *
             **************

 1307 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           1  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA
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1306 RD MUSKINGUM-CUNGE CHANNEL ROUTING

L	1500.	CHANNEL LENGTH
S	.0090	SLOPE
N	.050	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	250.00	BOTTOM WIDTH OR DIAMETER
Z	3.00	SIDE SLOPE

***

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.60	750.00	9685.89	325.15	.99	9.61

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		9684.64	325.00	.99	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4684E+04 EXCESS= .0000E+00 OUTFLOW= .4684E+04 BASIN STORAGE= .1032E-01 PERCENT ERROR= .0

****

HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = 1.00

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	7836.	1		1230	151	2606.	1		1845	226	86.
1		0005	2	0.	1		0620	77	7615.	1		1235	152	2582.	1		1850	227	65.
1		0010	3	0.	1		0625	78	7400.	1		1240	153	2558.	1		1855	228	49.
1		0015	4	0.	1		0630	79	7191.	1		1245	154	2534.	1		1900	229	37.
1		0020	5	0.	1		0635	80	6988.	1		1250	155	2510.	1		1905	230	28.
1		0025	6	0.	1		0640	81	6790.	1		1255	156	2485.	1		1910	231	21.
1		0030	7	0.	1		0645	82	6597.	1		1300	157	2459.	1		1915	232	16.
1		0035	8	0.	1		0650	83	6411.	1		1305	158	2433.	1		1920	233	12.
1		0040	9	0.	1		0655	84	6233.	1		1310	159	2407.	1		1925	234	9.
1		0045	10	0.	1		0700	85	6061.	1		1315	160	2381.	1		1930	235	7.
1		0050	11	1.	1		0705	86	5896.	1		1320	161	2356.	1		1935	236	5.
1		0055	12	2.	1		0710	87	5739.	1		1325	162	2331.	1		1940	237	4.
1		0100	13	3.	1		0715	88	5589.	1		1330	163	2305.	1		1945	238	3.
1		0105	14	6.	1		0720	89	5447.	1		1335	164	2277.	1		1950	239	2.
1		0110	15	10.	1		0725	90	5311.	1		1340	165	2249.	1		1955	240	2.
1		0115	16	16.	1		0730	91	5180.	1		1345	166	2221.	1		2000	241	1.
1		0120	17	24.	1		0735	92	5053.	1		1350	167	2193.	1		2005	242	1.
1		0125	18	33.	1		0740	93	4931.	1		1355	168	2165.	1		2010	243	1.
1		0130	19	44.	1		0745	94	4814.	1		1400	169	2138.	1		2015	244	1.
1		0135	20	58.	1		0750	95	4704.	1		1405	170	2109.	1		2020	245	0.
1		0140	21	75.	1		0755	96	4601.	1		1410	171	2079.	1		2025	246	0.
1		0145	22	97.	1		0800	97	4504.	1		1415	172	2047.	1		2030	247	0.
1		0150	23	124.	1		0805	98	4415.	1		1420	173	2016.	1		2035	248	0.
1		0155	24	158.	1		0810	99	4333.	1		1425	174	1984.	1		2040	249	0.
1		0200	25	197.	1		0815	100	4256.	1		1430	175	1954.	1		2045	250	0.
1		0205	26	243.	1		0820	101	4183.	1		1435	176	1922.	1		2050	251	0.
1		0210	27	295.	1		0825	102	4115.	1		1440	177	1890.	1		2055	252	0.
1		0215	28	352.	1		0830	103	4050.	1		1445	178	1855.	1		2100	253	0.
1		0220	29	412.	1		0835	104	3990.	1		1450	179	1820.	1		2105	254	0.
1		0225	30	474.	1		0840	105	3933.	1		1455	180	1785.	1		2110	255	0.
1		0230	31	537.	1		0845	106	3879.	1		1500	181	1750.	1		2115	256	0.
1		0235	32	597.	1		0850	107	3828.	1		1505	182	1716.	1		2120	257	0.
1		0240	33	654.	1		0855	108	3780.	1		1510	183	1681.	1		2125	258	0.
1		0245	34	705.	1		0900	109	3734.	1		1515	184	1644.	1		2130	259	0.
1		0250	35	753.	1		0905	110	3690.	1		1520	185	1607.	1		2135	260	0.
1		0255	36	802.	1		0910	111	3648.	1		1525	186	1570.	1		2140	261	0.
1		0300	37	856.	1		0915	112	3608.	1		1530	187	1534.	1		2145	262	0.
1		0305	38	923.	1		0920	113	3570.	1		1535	188	1498.	1		2150	263	0.
1		0310	39	1009.	1		0925	114	3533.	1		1540	189	1461.	1		2155	264	0.
1		0315	40	1128.	1		0930	115	3499.	1		1545	190	1423.	1		2200	265	0.
1		0320	41	1307.	1		0935	116	3466.	1		1550	191	1385.	1		2205	266	0.
1		0325	42	1566.	1		0940	117	3434.	1		1555	192	1347.	1		2210	267	0.
1		0330	43	1926.	1		0945	118	3404.	1		1600	193	1309.	1		2215	268	0.

1	0335	44	2415.	*	1	0950	119	3374.	*	1	1605	194	1273.	*	1	2220	269	0.
1	0340	45	3027.	*	1	0955	120	3346.	*	1	1610	195	1235.	*	1	2225	270	0.
1	0345	46	3722.	*	1	1000	121	3319.	*	1	1615	196	1197.	*	1	2230	271	0.
1	0350	47	4470.	*	1	1005	122	3291.	*	1	1620	197	1157.	*	1	2235	272	0.
1	0355	48	5241.	*	1	1010	123	3264.	*	1	1625	198	1118.	*	1	2240	273	0.
1	0400	49	5975.	*	1	1015	124	3237.	*	1	1630	199	1080.	*	1	2245	274	0.
1	0405	50	6603.	*	1	1020	125	3211.	*	1	1635	200	1043.	*	1	2250	275	0.
1	0410	51	7108.	*	1	1025	126	3185.	*	1	1640	201	1006.	*	1	2255	276	0.
1	0415	52	7497.	*	1	1030	127	3161.	*	1	1645	202	968.	*	1	2300	277	0.
1	0420	53	7784.	*	1	1035	128	3137.	*	1	1650	203	928.	*	1	2305	278	0.
1	0425	54	7982.	*	1	1040	129	3113.	*	1	1655	204	889.	*	1	2310	279	0.
1	0430	55	8117.	*	1	1045	130	3090.	*	1	1700	205	851.	*	1	2315	280	0.
1	0435	56	8222.	*	1	1050	131	3068.	*	1	1705	206	814.	*	1	2320	281	0.
1	0440	57	8315.	*	1	1055	132	3044.	*	1	1710	207	779.	*	1	2325	282	0.
1	0445	58	8399.	*	1	1100	133	3020.	*	1	1715	208	744.	*	1	2330	283	0.
1	0450	59	8500.	*	1	1105	134	2997.	*	1	1720	209	705.	*	1	2335	284	0.
1	0455	60	8654.	*	1	1110	135	2974.	*	1	1725	210	665.	*	1	2340	285	0.
1	0500	61	8858.	*	1	1115	136	2952.	*	1	1730	211	626.	*	1	2345	286	0.
1	0505	62	9079.	*	1	1120	137	2929.	*	1	1735	212	589.	*	1	2350	287	0.
1	0510	63	9295.	*	1	1125	138	2908.	*	1	1740	213	554.	*	1	2355	288	0.
1	0515	64	9486.	*	1	1130	139	2886.	*	1	1745	214	520.	*	2	0000	289	0.
1	0520	65	9623.	*	1	1135	140	2863.	*	1	1750	215	484.	*	2	0005	290	0.
1	0525	66	9685.	*	1	1140	141	2840.	*	1	1755	216	444.	*	2	0010	291	0.
1	0530	67	9670.	*	1	1145	142	2817.	*	1	1800	217	400.	*	2	0015	292	0.
1	0535	68	9588.	*	1	1150	143	2793.	*	1	1805	218	357.	*	2	0020	293	0.
1	0540	69	9451.	*	1	1155	144	2770.	*	1	1810	219	317.	*	2	0025	294	0.
1	0545	70	9268.	*	1	1200	145	2748.	*	1	1815	220	282.	*	2	0030	295	0.
1	0550	71	9051.	*	1	1205	146	2725.	*	1	1820	221	250.	*	2	0035	296	0.
1	0555	72	8813.	*	1	1210	147	2702.	*	1	1825	222	218.	*	2	0040	297	0.
1	0600	73	8565.	*	1	1215	148	2679.	*	1	1830	223	183.	*	2	0045	298	0.
1	0605	74	8314.	*	1	1220	149	2655.	*	1	1835	224	146.	*	2	0050	299	0.
1	0610	75	8069.	*	1	1225	150	2631.	*	1	1840	225	113.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)				
+ 9685.	5.42		6265.	2361.	2274.	2274.
		(INCHES)	.655	.988	.988	.988
		(AC-FT)	3107.	4684.	4684.	4684.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.82	750.00	7860.77	330.15	.75	8.86

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		7860.68	330.00	.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3556E+04 EXCESS= .0000E+00 OUTFLOW= .3556E+04 BASIN STORAGE= .9648E-02 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .87

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6559.	1		1230	151	1936.	1		1845	226	0.
1		0005	2	0.	1		0620	77	6397.	1		1235	152	1902.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6238.	1		1240	153	1866.	1		1855	228	0.
1		0015	4	0.	1		0630	79	6079.	1		1245	154	1830.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5923.	1		1250	155	1793.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5770.	1		1255	156	1758.	1		1910	231	0.
1		0030	7	0.	1		0645	82	5621.	1		1300	157	1723.	1		1915	232	0.
1		0035	8	0.	1		0650	83	5476.	1		1305	158	1686.	1		1920	233	0.

1	0040	9	0.	*	1	0655	84	5336.	*	1	1310	159	1649.	*	1	1925	234	0.
1	0045	10	0.	*	1	0700	85	5200.	*	1	1315	160	1611.	*	1	1930	235	0.
1	0050	11	0.	*	1	0705	86	5070.	*	1	1320	161	1573.	*	1	1935	236	0.
1	0055	12	0.	*	1	0710	87	4945.	*	1	1325	162	1537.	*	1	1940	237	0.
1	0100	13	0.	*	1	0715	88	4826.	*	1	1330	163	1500.	*	1	1945	238	0.
1	0105	14	0.	*	1	0720	89	4711.	*	1	1335	164	1463.	*	1	1950	239	0.
1	0110	15	0.	*	1	0725	90	4602.	*	1	1340	165	1425.	*	1	1955	240	0.
1	0115	16	1.	*	1	0730	91	4496.	*	1	1345	166	1386.	*	1	2000	241	0.
1	0120	17	2.	*	1	0735	92	4393.	*	1	1350	167	1347.	*	1	2005	242	0.
1	0125	18	4.	*	1	0740	93	4293.	*	1	1355	168	1309.	*	1	2010	243	0.
1	0130	19	6.	*	1	0745	94	4197.	*	1	1400	169	1272.	*	1	2015	244	0.
1	0135	20	11.	*	1	0750	95	4106.	*	1	1405	170	1234.	*	1	2020	245	0.
1	0140	21	17.	*	1	0755	96	4020.	*	1	1410	171	1195.	*	1	2025	246	0.
1	0145	22	26.	*	1	0800	97	3940.	*	1	1415	172	1155.	*	1	2030	247	0.
1	0150	23	39.	*	1	0805	98	3865.	*	1	1420	173	1116.	*	1	2035	248	0.
1	0155	24	55.	*	1	0810	99	3795.	*	1	1425	174	1078.	*	1	2040	249	0.
1	0200	25	77.	*	1	0815	100	3730.	*	1	1430	175	1041.	*	1	2045	250	0.
1	0205	26	103.	*	1	0820	101	3668.	*	1	1435	176	1004.	*	1	2050	251	0.
1	0210	27	133.	*	1	0825	102	3608.	*	1	1440	177	966.	*	1	2055	252	0.
1	0215	28	168.	*	1	0830	103	3552.	*	1	1445	178	926.	*	1	2100	253	0.
1	0220	29	206.	*	1	0835	104	3497.	*	1	1450	179	887.	*	1	2105	254	0.
1	0225	30	246.	*	1	0840	105	3445.	*	1	1455	180	849.	*	1	2110	255	0.
1	0230	31	287.	*	1	0845	106	3395.	*	1	1500	181	812.	*	1	2115	256	0.
1	0235	32	328.	*	1	0850	107	3347.	*	1	1505	182	777.	*	1	2120	257	0.
1	0240	33	366.	*	1	0855	108	3302.	*	1	1510	183	741.	*	1	2125	258	0.
1	0245	34	400.	*	1	0900	109	3258.	*	1	1515	184	702.	*	1	2130	259	0.
1	0250	35	432.	*	1	0905	110	3217.	*	1	1520	185	663.	*	1	2135	260	0.
1	0255	36	463.	*	1	0910	111	3177.	*	1	1525	186	624.	*	1	2140	261	0.
1	0300	37	498.	*	1	0915	112	3138.	*	1	1530	187	588.	*	1	2145	262	0.
1	0305	38	543.	*	1	0920	113	3101.	*	1	1535	188	553.	*	1	2150	263	0.
1	0310	39	605.	*	1	0925	114	3065.	*	1	1540	189	520.	*	1	2155	264	0.
1	0315	40	691.	*	1	0930	115	3029.	*	1	1545	190	485.	*	1	2200	265	0.
1	0320	41	816.	*	1	0935	116	2994.	*	1	1550	191	447.	*	1	2205	266	0.
1	0325	42	1001.	*	1	0940	117	2960.	*	1	1555	192	405.	*	1	2210	267	0.
1	0330	43	1261.	*	1	0945	118	2928.	*	1	1600	193	363.	*	1	2215	268	0.
1	0335	44	1610.	*	1	0950	119	2896.	*	1	1605	194	323.	*	1	2220	269	0.
1	0340	45	2049.	*	1	0955	120	2865.	*	1	1610	195	288.	*	1	2225	270	0.
1	0345	46	2573.	*	1	1000	121	2834.	*	1	1615	196	256.	*	1	2230	271	0.
1	0350	47	3163.	*	1	1005	122	2804.	*	1	1620	197	224.	*	1	2235	272	0.
1	0355	48	3791.	*	1	1010	123	2773.	*	1	1625	198	190.	*	1	2240	273	0.
1	0400	49	4405.	*	1	1015	124	2743.	*	1	1630	199	154.	*	1	2245	274	0.
1	0405	50	4936.	*	1	1020	125	2712.	*	1	1635	200	120.	*	1	2250	275	0.
1	0410	51	5362.	*	1	1025	126	2683.	*	1	1640	201	91.	*	1	2255	276	0.
1	0415	52	5697.	*	1	1030	127	2654.	*	1	1645	202	69.	*	1	2300	277	0.
1	0420	53	5949.	*	1	1035	128	2625.	*	1	1650	203	52.	*	1	2305	278	0.
1	0425	54	6116.	*	1	1040	129	2597.	*	1	1655	204	39.	*	1	2310	279	0.
1	0430	55	6216.	*	1	1045	130	2569.	*	1	1700	205	30.	*	1	2315	280	0.
1	0435	56	6290.	*	1	1050	131	2540.	*	1	1705	206	23.	*	1	2320	281	0.
1	0440	57	6369.	*	1	1055	132	2511.	*	1	1710	207	17.	*	1	2325	282	0.
1	0445	58	6461.	*	1	1100	133	2482.	*	1	1715	208	13.	*	1	2330	283	0.
1	0450	59	6586.	*	1	1105	134	2453.	*	1	1720	209	10.	*	1	2335	284	0.
1	0455	60	6763.	*	1	1110	135	2425.	*	1	1725	210	7.	*	1	2340	285	0.
1	0500	61	6979.	*	1	1115	136	2397.	*	1	1730	211	6.	*	1	2345	286	0.
1	0505	62	7205.	*	1	1120	137	2369.	*	1	1735	212	4.	*	1	2350	287	0.
1	0510	63	7422.	*	1	1125	138	2341.	*	1	1740	213	3.	*	1	2355	288	0.
1	0515	64	7614.	*	1	1130	139	2311.	*	1	1745	214	2.	*	2	0000	289	0.
1	0520	65	7758.	*	1	1135	140	2281.	*	1	1750	215	2.	*	2	0005	290	0.
1	0525	66	7840.	*	1	1140	141	2251.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	7861.	*	1	1145	142	2221.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	7822.	*	1	1150	143	2192.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	7735.	*	1	1155	144	2162.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	7609.	*	1	1200	145	2132.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	7455.	*	1	1205	146	2100.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	7283.	*	1	1210	147	2067.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	7101.	*	1	1215	148	2034.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	6915.	*	1	1220	149	2001.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	6732.	*	1	1225	150	1969.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 7861.	5.50		5161.	1793.	1727.	1727.
		(INCHES)	.540	.750	.750	.750
		(AC-FT)	2559.	3556.	3556.	3556.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	COMPUTATION TIME STEP M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.14	750.00	5990.66	332.43	.53	7.97
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		5984.42	335.00	.53	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2523E+04 EXCESS= .0000E+00 OUTFLOW= .2523E+04 BASIN STORAGE= .9971E-02 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .74

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	5182.	1		1230	151	1081.	1		1845	226	0.
1		0005	2	0.	1		0620	77	5072.	1		1235	152	1044.	1		1850	227	0.
1		0010	3	0.	1		0625	78	4964.	1		1240	153	1006.	1		1855	228	0.
1		0015	4	0.	1		0630	79	4856.	1		1245	154	967.	1		1900	229	0.
1		0020	5	0.	1		0635	80	4747.	1		1250	155	926.	1		1905	230	0.
1		0025	6	0.	1		0640	81	4640.	1		1255	156	887.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4533.	1		1300	157	849.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4428.	1		1305	158	812.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4326.	1		1310	159	776.	1		1925	234	0.
1		0045	10	0.	1		0700	85	4226.	1		1315	160	740.	1		1930	235	0.
1		0050	11	0.	1		0705	86	4129.	1		1320	161	701.	1		1935	236	0.
1		0055	12	0.	1		0710	87	4035.	1		1325	162	661.	1		1940	237	0.
1		0100	13	0.	1		0715	88	3945.	1		1330	163	623.	1		1945	238	0.
1		0105	14	0.	1		0720	89	3858.	1		1335	164	586.	1		1950	239	0.
1		0110	15	0.	1		0725	90	3773.	1		1340	165	552.	1		1955	240	0.
1		0115	16	0.	1		0730	91	3691.	1		1345	166	519.	1		2000	241	0.
1		0120	17	0.	1		0735	92	3610.	1		1350	167	485.	1		2005	242	0.
1		0125	18	0.	1		0740	93	3532.	1		1355	168	447.	1		2010	243	0.
1		0130	19	0.	1		0745	94	3456.	1		1400	169	408.	1		2015	244	0.
1		0135	20	0.	1		0750	95	3383.	1		1405	170	368.	1		2020	245	0.
1		0140	21	1.	1		0755	96	3313.	1		1410	171	330.	1		2025	246	0.
1		0145	22	2.	1		0800	97	3247.	1		1415	172	296.	1		2030	247	0.
1		0150	23	4.	1		0805	98	3185.	1		1420	173	264.	1		2035	248	0.
1		0155	24	8.	1		0810	99	3127.	1		1425	174	234.	1		2040	249	0.
1		0200	25	14.	1		0815	100	3071.	1		1430	175	202.	1		2045	250	0.
1		0205	26	23.	1		0820	101	3018.	1		1435	176	167.	1		2050	251	0.
1		0210	27	35.	1		0825	102	2967.	1		1440	177	131.	1		2055	252	0.
1		0215	28	50.	1		0830	103	2917.	1		1445	178	101.	1		2100	253	0.
1		0220	29	68.	1		0835	104	2868.	1		1450	179	77.	1		2105	254	0.
1		0225	30	88.	1		0840	105	2821.	1		1455	180	59.	1		2110	255	0.
1		0230	31	110.	1		0845	106	2775.	1		1500	181	45.	1		2115	256	0.
1		0235	32	133.	1		0850	107	2731.	1		1505	182	34.	1		2120	257	0.
1		0240	33	155.	1		0855	108	2689.	1		1510	183	26.	1		2125	258	0.
1		0245	34	176.	1		0900	109	2648.	1		1515	184	20.	1		2130	259	0.
1		0250	35	195.	1		0905	110	2608.	1		1520	185	15.	1		2135	260	0.
1		0255	36	214.	1		0910	111	2569.	1		1525	186	12.	1		2140	261	0.
1		0300	37	235.	1		0915	112	2531.	1		1530	187	9.	1		2145	262	0.
1		0305	38	261.	1		0920	113	2493.	1		1535	188	7.	1		2150	263	0.
1		0310	39	297.	1		0925	114	2456.	1		1540	189	5.	1		2155	264	0.
1		0315	40	348.	1		0930	115	2419.	1		1545	190	4.	1		2200	265	0.
1		0320	41	419.	1		0935	116	2383.	1		1550	191	3.	1		2205	266	0.
1		0325	42	531.	1		0940	117	2347.	1		1555	192	3.	1		2210	267	0.
1		0330	43	690.	1		0945	118	2313.	1		1600	193	2.	1		2215	268	0.
1		0335	44	925.	1		0950	119	2279.	1		1605	194	2.	1		2220	269	0.
1		0340	45	1242.	1		0955	120	2245.	1		1610	195	1.	1		2225	270	0.
1		0345	46	1618.	1		1000	121	2209.	1		1615	196	1.	1		2230	271	0.
1		0350	47	2044.	1		1005	122	2173.	1		1620	197	1.	1		2235	272	0.
1		0355	48	2499.	1		1010	123	2137.	1		1625	198	1.	1		2240	273	0.
1		0400	49	2947.	1		1015	124	2101.	1		1630	199	0.	1		2245	274	0.
1		0405	50	3354.	1		1020	125	2066.	1		1635	200	0.	1		2250	275	0.
1		0410	51	3709.	1		1025	126	2031.	1		1640	201	0.	1		2255	276	0.
1		0415	52	4000.	1		1030	127	1996.	1		1645	202	0.	1		2300	277	0.
1		0420	53	4220.	1		1035	128	1960.	1		1650	203	0.	1		2305	278	0.
1		0425	54	4369.	1		1040	129	1922.	1		1655	204	0.	1		2310	279	0.

1	0430	55	4455.	*	1	1045	130	1884.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	4504.	*	1	1050	131	1847.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	4542.	*	1	1055	132	1810.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	4594.	*	1	1100	133	1774.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	4685.	*	1	1105	134	1737.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	4831.	*	1	1110	135	1699.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	5028.	*	1	1115	136	1660.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	5247.	*	1	1120	137	1622.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	5464.	*	1	1125	138	1584.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	5661.	*	1	1130	139	1547.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	5822.	*	1	1135	140	1510.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	5928.	*	1	1140	141	1471.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	5980.	*	1	1145	142	1432.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	5984.	*	1	1150	143	1392.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	5948.	*	1	1155	144	1354.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	5876.	*	1	1200	145	1316.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	5780.	*	1	1205	146	1278.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	5667.	*	1	1210	147	1239.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	5546.	*	1	1215	148	1199.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5421.	*	1	1220	149	1159.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5297.	*	1	1225	150	1120.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)	(CFS)				
+ 5984.	5.58		3992.	1272.	1225.	1225.
		(INCHES)	.418	.532	.532	.532
		(AC-FT)	1979.	2523.	2523.	2523.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.87	750.00	3481.46	340.90	.29	6.45
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		3480.15	340.00	.29	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1359E+04 EXCESS= .0000E+00 OUTFLOW= .1359E+04 BASIN STORAGE= .9865E-02 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	3196.	*	1		1230	151	189.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	3150.	*	1		1235	152	159.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	3106.	*	1		1240	153	131.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	3061.	*	1		1245	154	107.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	3015.	*	1		1250	155	88.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	2966.	*	1		1255	156	73.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	2915.	*	1		1300	157	61.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	2862.	*	1		1305	158	52.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	2809.	*	1		1310	159	45.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	2755.	*	1		1315	160	39.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	2701.	*	1		1320	161	34.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	2647.	*	1		1325	162	30.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	2594.	*	1		1330	163	26.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	2541.	*	1		1335	164	24.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	2489.	*	1		1340	165	21.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	2437.	*	1		1345	166	19.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	2385.	*	1		1350	167	17.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	2333.	*	1		1355	168	16.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	2281.	*	1		1400	169	14.	*	1		2015	244	0.

1	0135	20	0.	*	1	0750	95	2231.	*	1	1405	170	13.	*	1	2020	245	0.
1	0140	21	0.	*	1	0755	96	2182.	*	1	1410	171	12.	*	1	2025	246	0.
1	0145	22	0.	*	1	0800	97	2134.	*	1	1415	172	11.	*	1	2030	247	0.
1	0150	23	0.	*	1	0805	98	2087.	*	1	1420	173	10.	*	1	2035	248	0.
1	0155	24	0.	*	1	0810	99	2041.	*	1	1425	174	9.	*	1	2040	249	0.
1	0200	25	0.	*	1	0815	100	1995.	*	1	1430	175	8.	*	1	2045	250	0.
1	0205	26	0.	*	1	0820	101	1951.	*	1	1435	176	7.	*	1	2050	251	0.
1	0210	27	0.	*	1	0825	102	1907.	*	1	1440	177	7.	*	1	2055	252	0.
1	0215	28	1.	*	1	0830	103	1865.	*	1	1445	178	6.	*	1	2100	253	0.
1	0220	29	2.	*	1	0835	104	1823.	*	1	1450	179	6.	*	1	2105	254	0.
1	0225	30	3.	*	1	0840	105	1783.	*	1	1455	180	5.	*	1	2110	255	0.
1	0230	31	5.	*	1	0845	106	1743.	*	1	1500	181	5.	*	1	2115	256	0.
1	0235	32	8.	*	1	0850	107	1705.	*	1	1505	182	4.	*	1	2120	257	0.
1	0240	33	12.	*	1	0855	108	1666.	*	1	1510	183	4.	*	1	2125	258	0.
1	0245	34	17.	*	1	0900	109	1627.	*	1	1515	184	4.	*	1	2130	259	0.
1	0250	35	21.	*	1	0905	110	1587.	*	1	1520	185	3.	*	1	2135	260	0.
1	0255	36	27.	*	1	0910	111	1547.	*	1	1525	186	3.	*	1	2140	261	0.
1	0300	37	34.	*	1	0915	112	1508.	*	1	1530	187	3.	*	1	2145	262	0.
1	0305	38	42.	*	1	0920	113	1470.	*	1	1535	188	2.	*	1	2150	263	0.
1	0310	39	54.	*	1	0925	114	1434.	*	1	1540	189	2.	*	1	2155	264	0.
1	0315	40	72.	*	1	0930	115	1397.	*	1	1545	190	2.	*	1	2200	265	0.
1	0320	41	98.	*	1	0935	116	1362.	*	1	1550	191	2.	*	1	2205	266	0.
1	0325	42	138.	*	1	0940	117	1325.	*	1	1555	192	2.	*	1	2210	267	0.
1	0330	43	197.	*	1	0945	118	1288.	*	1	1600	193	2.	*	1	2215	268	0.
1	0335	44	290.	*	1	0950	119	1249.	*	1	1605	194	1.	*	1	2220	269	0.
1	0340	45	436.	*	1	0955	120	1212.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	626.	*	1	1000	121	1175.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	862.	*	1	1005	122	1139.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	1126.	*	1	1010	123	1104.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	1391.	*	1	1015	124	1070.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	1637.	*	1	1020	125	1034.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	1852.	*	1	1025	126	997.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	2041.	*	1	1030	127	959.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	2200.	*	1	1035	128	922.	*	1	1650	203	1.	*	1	2305	278	0.
1	0425	54	2323.	*	1	1040	129	887.	*	1	1655	204	1.	*	1	2310	279	0.
1	0430	55	2420.	*	1	1045	130	853.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	2494.	*	1	1050	131	819.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	2537.	*	1	1055	132	786.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	2558.	*	1	1100	133	751.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	2584.	*	1	1105	134	714.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	2633.	*	1	1110	135	677.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	2717.	*	1	1115	136	641.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	2832.	*	1	1120	137	607.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	2969.	*	1	1125	138	575.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3116.	*	1	1130	139	544.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	3246.	*	1	1135	140	514.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	3352.	*	1	1140	141	481.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	3427.	*	1	1145	142	445.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	3466.	*	1	1150	143	408.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	3480.	*	1	1155	144	372.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	3472.	*	1	1200	145	340.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	3441.	*	1	1205	146	312.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	3396.	*	1	1210	147	286.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3348.	*	1	1215	148	262.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3297.	*	1	1220	149	239.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3245.	*	1	1225	150	216.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 3480.	5.67	2386.	685.	660.	660.
		(INCHES) .250	.287	.287	.287
		(AC-FT) 1183.	1359.	1359.	1359.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	750.00	1757.50	345.00	.14	4.95

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN .08 1.64 5.00 1757.50 345.00 .14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6593E+03 EXCESS= .0000E+00 OUTFLOW= .6594E+03 BASIN STORAGE= .1003E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	1655.	1		1230	151	63.	1		1845	226	0.
1		0005	2	0.	1		0620	77	1638.	1		1235	152	59.	1		1850	227	0.
1		0010	3	0.	1		0625	78	1616.	1		1240	153	56.	1		1855	228	0.
1		0015	4	0.	1		0630	79	1596.	1		1245	154	52.	1		1900	229	0.
1		0020	5	0.	1		0635	80	1573.	1		1250	155	49.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1551.	1		1255	156	46.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1526.	1		1300	157	44.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1502.	1		1305	158	41.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1478.	1		1310	159	39.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1455.	1		1315	160	37.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1434.	1		1320	161	35.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1412.	1		1325	162	33.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1390.	1		1330	163	31.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1367.	1		1335	164	29.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1343.	1		1340	165	27.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1317.	1		1345	166	26.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1291.	1		1350	167	24.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1264.	1		1355	168	23.	1		2010	243	0.
1		0130	19	0.	1		0745	94	1235.	1		1400	169	21.	1		2015	244	0.
1		0135	20	0.	1		0750	95	1205.	1		1405	170	20.	1		2020	245	0.
1		0140	21	0.	1		0755	96	1176.	1		1410	171	19.	1		2025	246	0.
1		0145	22	0.	1		0800	97	1147.	1		1415	172	18.	1		2030	247	0.
1		0150	23	0.	1		0805	98	1118.	1		1420	173	16.	1		2035	248	0.
1		0155	24	0.	1		0810	99	1089.	1		1425	174	15.	1		2040	249	0.
1		0200	25	0.	1		0815	100	1061.	1		1430	175	14.	1		2045	250	0.
1		0205	26	0.	1		0820	101	1034.	1		1435	176	13.	1		2050	251	0.
1		0210	27	0.	1		0825	102	1006.	1		1440	177	13.	1		2055	252	0.
1		0215	28	0.	1		0830	103	979.	1		1445	178	12.	1		2100	253	0.
1		0220	29	0.	1		0835	104	953.	1		1450	179	11.	1		2105	254	0.
1		0225	30	0.	1		0840	105	926.	1		1455	180	10.	1		2110	255	0.
1		0230	31	0.	1		0845	106	901.	1		1500	181	10.	1		2115	256	0.
1		0235	32	0.	1		0850	107	875.	1		1505	182	9.	1		2120	257	0.
1		0240	33	0.	1		0855	108	849.	1		1510	183	8.	1		2125	258	0.
1		0245	34	0.	1		0900	109	821.	1		1515	184	8.	1		2130	259	0.
1		0250	35	0.	1		0905	110	791.	1		1520	185	7.	1		2135	260	0.
1		0255	36	0.	1		0910	111	760.	1		1525	186	7.	1		2140	261	0.
1		0300	37	0.	1		0915	112	731.	1		1530	187	7.	1		2145	262	0.
1		0305	38	0.	1		0920	113	704.	1		1535	188	6.	1		2150	263	0.
1		0310	39	1.	1		0925	114	677.	1		1540	189	6.	1		2155	264	0.
1		0315	40	2.	1		0930	115	651.	1		1545	190	5.	1		2200	265	0.
1		0320	41	5.	1		0935	116	626.	1		1550	191	5.	1		2205	266	0.
1		0325	42	11.	1		0940	117	602.	1		1555	192	5.	1		2210	267	0.
1		0330	43	22.	1		0945	118	579.	1		1600	193	4.	1		2215	268	0.
1		0335	44	44.	1		0950	119	556.	1		1605	194	4.	1		2220	269	0.
1		0340	45	82.	1		0955	120	533.	1		1610	195	4.	1		2225	270	0.
1		0345	46	141.	1		1000	121	509.	1		1615	196	4.	1		2230	271	0.
1		0350	47	244.	1		1005	122	481.	1		1620	197	3.	1		2235	272	0.
1		0355	48	368.	1		1010	123	450.	1		1625	198	3.	1		2240	273	0.
1		0400	49	509.	1		1015	124	420.	1		1630	199	3.	1		2245	274	0.
1		0405	50	656.	1		1020	125	394.	1		1635	200	3.	1		2250	275	0.
1		0410	51	780.	1		1025	126	371.	1		1640	201	3.	1		2255	276	0.
1		0415	52	883.	1		1030	127	348.	1		1645	202	3.	1		2300	277	0.
1		0420	53	967.	1		1035	128	328.	1		1650	203	2.	1		2305	278	0.
1		0425	54	1038.	1		1040	129	309.	1		1655	204	2.	1		2310	279	0.
1		0430	55	1098.	1		1045	130	291.	1		1700	205	2.	1		2315	280	0.
1		0435	56	1154.	1		1050	131	275.	1		1705	206	2.	1		2320	281	0.
1		0440	57	1208.	1		1055	132	259.	1		1710	207	2.	1		2325	282	0.
1		0445	58	1254.	1		1100	133	245.	1		1715	208	2.	1		2330	283	0.
1		0450	59	1287.	1		1105	134	232.	1		1720	209	2.	1		2335	284	0.
1		0455	60	1326.	1		1110	135	218.	1		1725	210	2.	1		2340	285	0.
1		0500	61	1388.	1		1115	136	202.	1		1730	211	1.	1		2345	286	0.
1		0505	62	1454.	1		1120	137	183.	1		1735	212	1.	1		2350	287	0.
1		0510	63	1522.	1		1125	138	166.	1		1740	213	1.	1		2355	288	0.
1		0515	64	1586.	1		1130	139	152.	1		1745	214	1.	2		0000	289	0.
1		0520	65	1640.	1		1135	140	139.	1		1750	215	1.	2		0005	290	0.

1	0525	66	1678.	*	1	1140	141	127.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	1700.	*	1	1145	142	117.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	1718.	*	1	1150	143	108.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	1741.	*	1	1155	144	100.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	1757.	*	1	1200	145	93.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	1747.	*	1	1205	146	87.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	1721.	*	1	1210	147	81.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	1706.	*	1	1215	148	76.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	1693.	*	1	1220	149	71.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	1672.	*	1	1225	150	67.	*	1	1840	225	1.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1757.	5.75		1207.	332.	320.	320.
		(INCHES)	.126	.139	.139	.139
		(AC-FT)	598.	659.	659.	659.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS
COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	375.00	286.45	355.00	.02	2.45

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00	286.45	355.00	.02	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8690E+02 EXCESS= .0000E+00 OUTFLOW= .8692E+02 BASIN STORAGE= .4200E-01 PERCENT ERROR= -.1

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	253.	*	1		1230	151	27.	*	1		1845	226	2.
1		0005	2	0.	*	1		0620	77	250.	*	1		1235	152	26.	*	1		1850	227	2.
1		0010	3	0.	*	1		0625	78	243.	*	1		1240	153	26.	*	1		1855	228	2.
1		0015	4	0.	*	1		0630	79	240.	*	1		1245	154	25.	*	1		1900	229	2.
1		0020	5	0.	*	1		0635	80	237.	*	1		1250	155	24.	*	1		1905	230	2.
1		0025	6	0.	*	1		0640	81	229.	*	1		1255	156	23.	*	1		1910	231	2.
1		0030	7	0.	*	1		0645	82	222.	*	1		1300	157	22.	*	1		1915	232	2.
1		0035	8	0.	*	1		0650	83	211.	*	1		1305	158	22.	*	1		1920	233	2.
1		0040	9	0.	*	1		0655	84	201.	*	1		1310	159	21.	*	1		1925	234	2.
1		0045	10	0.	*	1		0700	85	190.	*	1		1315	160	20.	*	1		1930	235	1.
1		0050	11	0.	*	1		0705	86	179.	*	1		1320	161	20.	*	1		1935	236	1.
1		0055	12	0.	*	1		0710	87	168.	*	1		1325	162	19.	*	1		1940	237	1.
1		0100	13	0.	*	1		0715	88	158.	*	1		1330	163	19.	*	1		1945	238	1.
1		0105	14	0.	*	1		0720	89	148.	*	1		1335	164	18.	*	1		1950	239	1.
1		0110	15	0.	*	1		0725	90	139.	*	1		1340	165	17.	*	1		1955	240	1.
1		0115	16	0.	*	1		0730	91	131.	*	1		1345	166	17.	*	1		2000	241	1.
1		0120	17	0.	*	1		0735	92	122.	*	1		1350	167	17.	*	1		2005	242	1.
1		0125	18	0.	*	1		0740	93	115.	*	1		1355	168	16.	*	1		2010	243	1.
1		0130	19	0.	*	1		0745	94	108.	*	1		1400	169	16.	*	1		2015	244	1.
1		0135	20	0.	*	1		0750	95	102.	*	1		1405	170	15.	*	1		2020	245	1.
1		0140	21	0.	*	1		0755	96	97.	*	1		1410	171	15.	*	1		2025	246	1.
1		0145	22	0.	*	1		0800	97	96.	*	1		1415	172	14.	*	1		2030	247	1.
1		0150	23	0.	*	1		0805	98	101.	*	1		1420	173	14.	*	1		2035	248	1.
1		0155	24	0.	*	1		0810	99	115.	*	1		1425	174	14.	*	1		2040	249	1.
1		0200	25	0.	*	1		0815	100	130.	*	1		1430	175	13.	*	1		2045	250	1.
1		0205	26	0.	*	1		0820	101	129.	*	1		1435	176	13.	*	1		2050	251	1.
1		0210	27	0.	*	1		0825	102	118.	*	1		1440	177	12.	*	1		2055	252	1.
1		0215	28	0.	*	1		0830	103	113.	*	1		1445	178	12.	*	1		2100	253	1.
1		0220	29	0.	*	1		0835	104	112.	*	1		1450	179	12.	*	1		2105	254	1.
1		0225	30	0.	*	1		0840	105	108.	*	1		1455	180	11.	*	1		2110	255	1.

1	0230	31	0.	*	1	0845	106	103.	*	1	1500	181	11.	*	1	2115	256	1.
1	0235	32	0.	*	1	0850	107	103.	*	1	1505	182	11.	*	1	2120	257	1.
1	0240	33	0.	*	1	0855	108	103.	*	1	1510	183	10.	*	1	2125	258	1.
1	0245	34	0.	*	1	0900	109	105.	*	1	1515	184	10.	*	1	2130	259	1.
1	0250	35	0.	*	1	0905	110	109.	*	1	1520	185	10.	*	1	2135	260	1.
1	0255	36	0.	*	1	0910	111	108.	*	1	1525	186	9.	*	1	2140	261	1.
1	0300	37	0.	*	1	0915	112	102.	*	1	1530	187	9.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	98.	*	1	1535	188	9.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	95.	*	1	1540	189	8.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	94.	*	1	1545	190	8.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	93.	*	1	1550	191	8.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	88.	*	1	1555	192	8.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	83.	*	1	1600	193	7.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	80.	*	1	1605	194	7.	*	1	2220	269	0.
1	0340	45	0.	*	1	0955	120	78.	*	1	1610	195	7.	*	1	2225	270	0.
1	0345	46	0.	*	1	1000	121	76.	*	1	1615	196	7.	*	1	2230	271	0.
1	0350	47	0.	*	1	1005	122	73.	*	1	1620	197	6.	*	1	2235	272	0.
1	0355	48	1.	*	1	1010	123	69.	*	1	1625	198	6.	*	1	2240	273	0.
1	0400	49	3.	*	1	1015	124	66.	*	1	1630	199	6.	*	1	2245	274	0.
1	0405	50	7.	*	1	1020	125	64.	*	1	1635	200	6.	*	1	2250	275	0.
1	0410	51	12.	*	1	1025	126	63.	*	1	1640	201	5.	*	1	2255	276	0.
1	0415	52	19.	*	1	1030	127	62.	*	1	1645	202	5.	*	1	2300	277	0.
1	0420	53	31.	*	1	1035	128	59.	*	1	1650	203	5.	*	1	2305	278	0.
1	0425	54	45.	*	1	1040	129	57.	*	1	1655	204	5.	*	1	2310	279	0.
1	0430	55	61.	*	1	1045	130	57.	*	1	1700	205	5.	*	1	2315	280	0.
1	0435	56	79.	*	1	1050	131	56.	*	1	1705	206	4.	*	1	2320	281	0.
1	0440	57	95.	*	1	1055	132	54.	*	1	1710	207	4.	*	1	2325	282	0.
1	0445	58	103.	*	1	1100	133	51.	*	1	1715	208	4.	*	1	2330	283	0.
1	0450	59	112.	*	1	1105	134	49.	*	1	1720	209	4.	*	1	2335	284	0.
1	0455	60	119.	*	1	1110	135	48.	*	1	1725	210	4.	*	1	2340	285	0.
1	0500	61	126.	*	1	1115	136	46.	*	1	1730	211	4.	*	1	2345	286	0.
1	0505	62	136.	*	1	1120	137	44.	*	1	1735	212	4.	*	1	2350	287	0.
1	0510	63	149.	*	1	1125	138	43.	*	1	1740	213	3.	*	1	2355	288	0.
1	0515	64	165.	*	1	1130	139	42.	*	1	1745	214	3.	*	2	0000	289	0.
1	0520	65	184.	*	1	1135	140	40.	*	1	1750	215	3.	*	2	0005	290	0.
1	0525	66	210.	*	1	1140	141	39.	*	1	1755	216	3.	*	2	0010	291	0.
1	0530	67	244.	*	1	1145	142	37.	*	1	1800	217	3.	*	2	0015	292	0.
1	0535	68	274.	*	1	1150	143	36.	*	1	1805	218	3.	*	2	0020	293	0.
1	0540	69	282.	*	1	1155	144	35.	*	1	1810	219	3.	*	2	0025	294	0.
1	0545	70	279.	*	1	1200	145	34.	*	1	1815	220	3.	*	2	0030	295	0.
1	0550	71	285.	*	1	1205	146	32.	*	1	1820	221	2.	*	2	0035	296	0.
1	0555	72	286.	*	1	1210	147	31.	*	1	1825	222	2.	*	2	0040	297	0.
1	0600	73	275.	*	1	1215	148	30.	*	1	1830	223	2.	*	2	0045	298	0.
1	0605	74	269.	*	1	1220	149	29.	*	1	1835	224	2.	*	2	0050	299	0.
1	0610	75	262.	*	1	1225	150	28.	*	1	1840	225	2.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 286.	5.92		148.	44.	42.	42.
		(INCHES)	.015	.018	.018	.018
		(AC-FT)	73.	87.	87.	87.

CUMULATIVE AREA = 88.86 SQ MI

```
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05JAN09  TIME  14:28:18  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                                   HEC-1 INPUT                                                PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
 *** NOLIST ***
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05JAN09  TIME  14:28:18  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

KLEINFELDER
FEBRUARY 2008
ALTERNATIVE B

DESIGN STORM = 100-YEAR 6-HOUR STORM
STORM DISTRIBUTION = SDN5

```
  10 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0055  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
```

```
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00       .87       .74       .57       .44       .26


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
1250 KK     *     ULWIN  *
            *            *
            **************

1254 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

1253 HC          HYDROGRAPH COMBINATION
                       ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***
*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    ULWIN
                                                     SUM OF  4 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00
*****************************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	8250.	1		1230	151	5.	1		1845	226	0.
1		0005	2	0.	1		0620	77	7575.	1		1235	152	4.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6943.	1		1240	153	4.	1		1855	228	0.
1		0015	4	0.	1		0630	79	6357.	1		1245	154	3.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5826.	1		1250	155	3.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5346.	1		1255	156	2.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4909.	1		1300	157	2.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4510.	1		1305	158	2.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4147.	1		1310	159	1.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3815.	1		1315	160	1.	1		1930	235	0.
1		0050	11	1.	1		0705	86	3507.	1		1320	161	1.	1		1935	236	0.
1		0055	12	2.	1		0710	87	3223.	1		1325	162	1.	1		1940	237	0.
1		0100	13	4.	1		0715	88	2959.	1		1330	163	1.	1		1945	238	0.
1		0105	14	6.	1		0720	89	2716.	1		1335	164	1.	1		1950	239	0.
1		0110	15	9.	1		0725	90	2491.	1		1340	165	1.	1		1955	240	0.
1		0115	16	12.	1		0730	91	2285.	1		1345	166	1.	1		2000	241	0.
1		0120	17	16.	1		0735	92	2095.	1		1350	167	0.	1		2005	242	0.
1		0125	18	20.	1		0740	93	1922.	1		1355	168	0.	1		2010	243	0.
1		0130	19	25.	1		0745	94	1763.	1		1400	169	0.	1		2015	244	0.
1		0135	20	31.	1		0750	95	1618.	1		1405	170	0.	1		2020	245	0.
1		0140	21	38.	1		0755	96	1485.	1		1410	171	0.	1		2025	246	0.
1		0145	22	46.	1		0800	97	1364.	1		1415	172	0.	1		2030	247	0.
1		0150	23	55.	1		0805	98	1255.	1		1420	173	0.	1		2035	248	0.
1		0155	24	65.	1		0810	99	1156.	1		1425	174	0.	1		2040	249	0.
1		0200	25	77.	1		0815	100	1065.	1		1430	175	0.	1		2045	250	0.
1		0205	26	93.	1		0820	101	979.	1		1435	176	0.	1		2050	251	0.
1		0210	27	112.	1		0825	102	896.	1		1440	177	0.	1		2055	252	0.
1		0215	28	137.	1		0830	103	818.	1		1445	178	0.	1		2100	253	0.
1		0220	29	166.	1		0835	104	746.	1		1450	179	0.	1		2105	254	0.
1		0225	30	200.	1		0840	105	678.	1		1455	180	0.	1		2110	255	0.
1		0230	31	237.	1		0845	106	615.	1		1500	181	0.	1		2115	256	0.
1		0235	32	275.	1		0850	107	558.	1		1505	182	0.	1		2120	257	0.
1		0240	33	313.	1		0855	108	505.	1		1510	183	0.	1		2125	258	0.
1		0245	34	351.	1		0900	109	457.	1		1515	184	0.	1		2130	259	0.
1		0250	35	387.	1		0905	110	414.	1		1520	185	0.	1		2135	260	0.

1	0255	36	426.	*	1	0910	111	375.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	470.	*	1	0915	112	341.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	525.	*	1	0920	113	309.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	599.	*	1	0925	114	281.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	696.	*	1	0930	115	255.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	826.	*	1	0935	116	231.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	1000.	*	1	0940	117	210.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1235.	*	1	0945	118	190.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1555.	*	1	0950	119	172.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1975.	*	1	0955	120	155.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	2477.	*	1	1000	121	140.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	3021.	*	1	1005	122	126.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	3559.	*	1	1010	123	114.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	4096.	*	1	1015	124	103.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	4917.	*	1	1020	125	92.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	6451.	*	1	1025	126	83.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	8595.	*	1	1030	127	75.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	10813.	*	1	1035	128	67.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	12706.	*	1	1040	129	60.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	14049.	*	1	1045	130	54.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	14729.	*	1	1050	131	49.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	14835.	*	1	1055	132	43.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	14555.	*	1	1100	133	39.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	14028.	*	1	1105	134	35.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	13424.	*	1	1110	135	31.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	12906.	*	1	1115	136	28.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	12498.	*	1	1120	137	25.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	12193.	*	1	1125	138	22.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	12003.	*	1	1130	139	20.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	11901.	*	1	1135	140	18.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	11858.	*	1	1140	141	16.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	11864.	*	1	1145	142	14.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	11877.	*	1	1150	143	12.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	11826.	*	1	1155	144	11.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	11664.	*	1	1200	145	10.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	11358.	*	1	1205	146	9.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	10891.	*	1	1210	147	8.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	10305.	*	1	1215	148	7.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	9650.	*	1	1220	149	6.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	8953.	*	1	1225	150	5.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 14835.	4.67		5795.	1476.	1422.	1422.
		(INCHES)	.916	.933	.933	.933
		(AC-FT)	2874.	2928.	2928.	2928.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .87

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6853.	1		1230	151	7.	1		1845	226	0.
1		0005	2	0.	1		0620	77	6339.	1		1235	152	6.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5841.	1		1240	153	5.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5373.	1		1245	154	5.	1		1900	229	0.
1		0020	5	0.	1		0635	80	4938.	1		1250	155	4.	1		1905	230	0.
1		0025	6	0.	1		0640	81	4537.	1		1255	156	4.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4171.	1		1300	157	3.	1		1915	232	0.
1		0035	8	0.	1		0650	83	3837.	1		1305	158	3.	1		1920	233	0.
1		0040	9	0.	1		0655	84	3534.	1		1310	159	2.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3258.	1		1315	160	2.	1		1930	235	0.
1		0050	11	0.	1		0705	86	3006.	1		1320	161	2.	1		1935	236	0.
1		0055	12	0.	1		0710	87	2771.	1		1325	162	2.	1		1940	237	0.
1		0100	13	0.	1		0715	88	2554.	1		1330	163	1.	1		1945	238	0.
1		0105	14	1.	1		0720	89	2354.	1		1335	164	1.	1		1950	239	0.
1		0110	15	1.	1		0725	90	2169.	1		1340	165	1.	1		1955	240	0.
1		0115	16	2.	1		0730	91	1997.	1		1345	166	1.	1		2000	241	0.
1		0120	17	3.	1		0735	92	1838.	1		1350	167	1.	1		2005	242	0.

1	0125	18	4.	*	1	0740	93	1693.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	6.	*	1	0745	94	1559.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	8.	*	1	0750	95	1437.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	11.	*	1	0755	96	1326.	*	1	1410	171	0.	*	1	2025	246	0.
1	0145	22	15.	*	1	0800	97	1225.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	19.	*	1	0805	98	1132.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	25.	*	1	0810	99	1046.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	32.	*	1	0815	100	965.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	41.	*	1	0820	101	887.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	52.	*	1	0825	102	816.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	65.	*	1	0830	103	751.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	79.	*	1	0835	104	692.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	95.	*	1	0840	105	636.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	113.	*	1	0845	106	583.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	131.	*	1	0850	107	532.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	150.	*	1	0855	108	484.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	170.	*	1	0900	109	440.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	190.	*	1	0905	110	399.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	209.	*	1	0910	111	362.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	228.	*	1	0915	112	328.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	251.	*	1	0920	113	298.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	284.	*	1	0925	114	271.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	333.	*	1	0930	115	246.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	407.	*	1	0935	116	225.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	514.	*	1	0940	117	205.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	667.	*	1	0945	118	188.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	887.	*	1	0950	119	171.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1192.	*	1	0955	120	157.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1570.	*	1	1000	121	144.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1989.	*	1	1005	122	131.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	2412.	*	1	1010	123	120.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	2789.	*	1	1015	124	110.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	3107.	*	1	1020	125	101.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	3407.	*	1	1025	126	92.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	4246.	*	1	1030	127	84.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	5902.	*	1	1035	128	77.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	7511.	*	1	1040	129	70.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	8747.	*	1	1045	130	64.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	9727.	*	1	1050	131	58.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	10371.	*	1	1055	132	53.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	10656.	*	1	1100	133	48.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	10629.	*	1	1105	134	43.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	10384.	*	1	1110	135	39.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	10056.	*	1	1115	136	35.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	9742.	*	1	1120	137	31.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	9499.	*	1	1125	138	28.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	9334.	*	1	1130	139	25.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	9239.	*	1	1135	140	23.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	9196.	*	1	1140	141	20.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	9187.	*	1	1145	142	18.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	9194.	*	1	1150	143	16.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	9182.	*	1	1155	144	15.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	9110.	*	1	1200	145	13.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	8950.	*	1	1205	146	12.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	8684.	*	1	1210	147	10.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	8319.	*	1	1215	148	9.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	7869.	*	1	1220	149	8.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7370.	*	1	1225	150	7.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS) 6-HR	24-HR	72-HR	24.92-HR
+ 10656.	4.75	4371.	1113.	1072.	1072.
		(INCHES) .691	.704	.704	.704
		(AC-FT) 2167.	2208.	2208.	2208.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .74

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DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW

				*					*					*					
1	0000	1	0.	*	1	0615	76	5375.	*	1	1230	151	10.	*	1	1845	226	0.
1	0005	2	0.	*	1	0620	77	5022.	*	1	1235	152	9.	*	1	1850	227	0.
1	0010	3	0.	*	1	0625	78	4672.	*	1	1240	153	8.	*	1	1855	228	0.
1	0015	4	0.	*	1	0630	79	4330.	*	1	1245	154	7.	*	1	1900	229	0.
1	0020	5	0.	*	1	0635	80	4003.	*	1	1250	155	7.	*	1	1905	230	0.
1	0025	6	0.	*	1	0640	81	3695.	*	1	1255	156	6.	*	1	1910	231	0.
1	0030	7	0.	*	1	0645	82	3409.	*	1	1300	157	5.	*	1	1915	232	0.
1	0035	8	0.	*	1	0650	83	3146.	*	1	1305	158	5.	*	1	1920	233	0.
1	0040	9	0.	*	1	0655	84	2904.	*	1	1310	159	4.	*	1	1925	234	0.
1	0045	10	0.	*	1	0700	85	2683.	*	1	1315	160	4.	*	1	1930	235	0.
1	0050	11	0.	*	1	0705	86	2479.	*	1	1320	161	3.	*	1	1935	236	0.
1	0055	12	0.	*	1	0710	87	2293.	*	1	1325	162	3.	*	1	1940	237	0.
1	0100	13	0.	*	1	0715	88	2121.	*	1	1330	163	3.	*	1	1945	238	0.
1	0105	14	0.	*	1	0720	89	1962.	*	1	1335	164	2.	*	1	1950	239	0.
1	0110	15	0.	*	1	0725	90	1815.	*	1	1340	165	2.	*	1	1955	240	0.
1	0115	16	0.	*	1	0730	91	1679.	*	1	1345	166	2.	*	1	2000	241	0.
1	0120	17	0.	*	1	0735	92	1554.	*	1	1350	167	2.	*	1	2005	242	0.
1	0125	18	0.	*	1	0740	93	1439.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	0.	*	1	0745	94	1333.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	1.	*	1	0750	95	1233.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	1.	*	1	0755	96	1142.	*	1	1410	171	1.	*	1	2025	246	0.
1	0145	22	2.	*	1	0800	97	1057.	*	1	1415	172	1.	*	1	2030	247	0.
1	0150	23	4.	*	1	0805	98	979.	*	1	1420	173	1.	*	1	2035	248	0.
1	0155	24	6.	*	1	0810	99	908.	*	1	1425	174	1.	*	1	2040	249	0.
1	0200	25	9.	*	1	0815	100	842.	*	1	1430	175	1.	*	1	2045	250	0.
1	0205	26	12.	*	1	0820	101	782.	*	1	1435	176	1.	*	1	2050	251	0.
1	0210	27	17.	*	1	0825	102	726.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	22.	*	1	0830	103	675.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	29.	*	1	0835	104	629.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	38.	*	1	0840	105	586.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	47.	*	1	0845	106	546.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	56.	*	1	0850	107	508.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	66.	*	1	0855	108	472.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	74.	*	1	0900	109	439.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	82.	*	1	0905	110	409.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	90.	*	1	0910	111	381.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	98.	*	1	0915	112	352.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	107.	*	1	0920	113	323.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	118.	*	1	0925	114	296.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	135.	*	1	0930	115	271.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	160.	*	1	0935	116	248.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	203.	*	1	0940	117	227.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	269.	*	1	0945	118	208.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	371.	*	1	0950	119	191.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	534.	*	1	0955	120	175.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	771.	*	1	1000	121	160.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1065.	*	1	1005	122	147.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	1384.	*	1	1010	123	135.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	1682.	*	1	1015	124	124.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	1913.	*	1	1020	125	114.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	2066.	*	1	1025	126	105.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	2154.	*	1	1030	127	97.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	2252.	*	1	1035	128	89.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	2913.	*	1	1040	129	82.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	4425.	*	1	1045	130	75.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	5389.	*	1	1050	131	69.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	5835.	*	1	1055	132	63.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	6383.	*	1	1100	133	57.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	6807.	*	1	1105	134	52.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	7050.	*	1	1110	135	48.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	7115.	*	1	1115	136	43.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	7054.	*	1	1120	137	40.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	6917.	*	1	1125	138	36.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	6780.	*	1	1130	139	33.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6683.	*	1	1135	140	30.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6628.	*	1	1140	141	27.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6600.	*	1	1145	142	24.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	6594.	*	1	1150	143	22.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	6592.	*	1	1155	144	20.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	6588.	*	1	1200	145	18.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	6545.	*	1	1205	146	17.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6436.	*	1	1210	147	15.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6258.	*	1	1215	148	14.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	6011.	*	1	1220	149	12.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5711.	*	1	1225	150	11.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR

```
+   (CFS)       (HR)
                          (CFS)
+    7115.      5.00                 3069.        783.        754.         754.
                         (INCHES)      .485        .495        .495         .495
                          (AC-FT)     1522.       1553.       1553.        1553.

                         CUMULATIVE AREA =   58.84 SQ MI
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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3219.	1		1230	151	15.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3097.	1		1235	152	14.	1		1850	227	0.
1		0010	3	0.	1		0625	78	2965.	1		1240	153	13.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2826.	1		1245	154	12.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2674.	1		1250	155	11.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2516.	1		1255	156	10.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2354.	1		1300	157	9.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2193.	1		1305	158	8.	1		1920	233	0.
1		0040	9	0.	1		0655	84	2038.	1		1310	159	8.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1892.	1		1315	160	7.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1756.	1		1320	161	7.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1633.	1		1325	162	6.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1519.	1		1330	163	6.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1413.	1		1335	164	5.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1315.	1		1340	165	5.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1221.	1		1345	166	4.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1135.	1		1350	167	4.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1055.	1		1355	168	4.	1		2010	243	0.
1		0130	19	0.	1		0745	94	983.	1		1400	169	3.	1		2015	244	0.
1		0135	20	0.	1		0750	95	917.	1		1405	170	3.	1		2020	245	0.
1		0140	21	0.	1		0755	96	856.	1		1410	171	3.	1		2025	246	0.
1		0145	22	0.	1		0800	97	798.	1		1415	172	2.	1		2030	247	0.
1		0150	23	0.	1		0805	98	745.	1		1420	173	2.	1		2035	248	0.
1		0155	24	0.	1		0810	99	697.	1		1425	174	2.	1		2040	249	0.
1		0200	25	0.	1		0815	100	652.	1		1430	175	2.	1		2045	250	0.
1		0205	26	0.	1		0820	101	610.	1		1435	176	2.	1		2050	251	0.
1		0210	27	1.	1		0825	102	572.	1		1440	177	1.	1		2055	252	0.
1		0215	28	2.	1		0830	103	536.	1		1445	178	1.	1		2100	253	0.
1		0220	29	3.	1		0835	104	501.	1		1450	179	1.	1		2105	254	0.
1		0225	30	4.	1		0840	105	470.	1		1455	180	1.	1		2110	255	0.
1		0230	31	6.	1		0845	106	440.	1		1500	181	1.	1		2115	256	0.
1		0235	32	8.	1		0850	107	413.	1		1505	182	1.	1		2120	257	0.
1		0240	33	11.	1		0855	108	387.	1		1510	183	1.	1		2125	258	0.
1		0245	34	13.	1		0900	109	362.	1		1515	184	1.	1		2130	259	0.
1		0250	35	15.	1		0905	110	339.	1		1520	185	1.	1		2135	260	0.
1		0255	36	18.	1		0910	111	317.	1		1525	186	1.	1		2140	261	0.
1		0300	37	20.	1		0915	112	296.	1		1530	187	0.	1		2145	262	0.
1		0305	38	23.	1		0920	113	277.	1		1535	188	0.	1		2150	263	0.
1		0310	39	28.	1		0925	114	258.	1		1540	189	0.	1		2155	264	0.
1		0315	40	34.	1		0930	115	242.	1		1545	190	0.	1		2200	265	0.
1		0320	41	43.	1		0935	116	226.	1		1550	191	0.	1		2205	266	0.
1		0325	42	58.	1		0940	117	211.	1		1555	192	0.	1		2210	267	0.
1		0330	43	82.	1		0945	118	196.	1		1600	193	0.	1		2215	268	0.
1		0335	44	116.	1		0950	119	182.	1		1605	194	0.	1		2220	269	0.
1		0340	45	166.	1		0955	120	169.	1		1610	195	0.	1		2225	270	0.
1		0345	46	230.	1		1000	121	156.	1		1615	196	0.	1		2230	271	0.
1		0350	47	309.	1		1005	122	144.	1		1620	197	0.	1		2235	272	0.
1		0355	48	454.	1		1010	123	133.	1		1625	198	0.	1		2240	273	0.
1		0400	49	645.	1		1015	124	123.	1		1630	199	0.	1		2245	274	0.
1		0405	50	818.	1		1020	125	114.	1		1635	200	0.	1		2250	275	0.
1		0410	51	947.	1		1025	126	105.	1		1640	201	0.	1		2255	276	0.
1		0415	52	1032.	1		1030	127	97.	1		1645	202	0.	1		2300	277	0.
1		0420	53	1069.	1		1035	128	90.	1		1650	203	0.	1		2305	278	0.
1		0425	54	1075.	1		1040	129	83.	1		1655	204	0.	1		2310	279	0.
1		0430	55	1061.	1		1045	130	77.	1		1700	205	0.	1		2315	280	0.
1		0435	56	1035.	1		1050	131	71.	1		1705	206	0.	1		2320	281	0.
1		0440	57	1022.	1		1055	132	66.	1		1710	207	0.	1		2325	282	0.
1		0445	58	1570.	1		1100	133	62.	1		1715	208	0.	1		2330	283	0.
1		0450	59	2548.	1		1105	134	57.	1		1720	209	0.	1		2335	284	0.
1		0455	60	2685.	1		1110	135	53.	1		1725	210	0.	1		2340	285	0.
1		0500	61	2825.	1		1115	136	50.	1		1730	211	0.	1		2345	286	0.
1		0505	62	2870.	1		1120	137	46.	1		1735	212	0.	1		2350	287	0.

1	0510	63	3139.	*	1	1125	138	43.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3367.	*	1	1130	139	40.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	3538.	*	1	1135	140	37.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	3609.	*	1	1140	141	35.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	3607.	*	1	1145	142	32.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	3577.	*	1	1150	143	30.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	3513.	*	1	1155	144	27.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	3511.	*	1	1200	145	25.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	3545.	*	1	1205	146	23.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	3538.	*	1	1210	147	21.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3493.	*	1	1215	148	20.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3417.	*	1	1220	149	18.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3322.	*	1	1225	150	17.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)			
+ 3609.	5.42	1615.	415.	400.	400.
		(INCHES) .255	.262	.262	.262
		(AC-FT) 801.	824.	824.	824.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .44

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	1585.	*	1		1230	151	25.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	1523.	*	1		1235	152	23.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	1476.	*	1		1240	153	22.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	1406.	*	1		1245	154	21.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	1400.	*	1		1250	155	19.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	1344.	*	1		1255	156	18.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	1297.	*	1		1300	157	17.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	1267.	*	1		1305	158	16.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	1225.	*	1		1310	159	15.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	1178.	*	1		1315	160	14.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	1110.	*	1		1320	161	13.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	1061.	*	1		1325	162	12.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	1004.	*	1		1330	163	11.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	931.	*	1		1335	164	10.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	874.	*	1		1340	165	10.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	824.	*	1		1345	166	9.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	770.	*	1		1350	167	8.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	719.	*	1		1355	168	8.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	682.	*	1		1400	169	7.	*	1		2015	244	0.
1		0135	20	0.	*	1		0750	95	641.	*	1		1405	170	7.	*	1		2020	245	0.
1		0140	21	0.	*	1		0755	96	600.	*	1		1410	171	6.	*	1		2025	246	0.
1		0145	22	0.	*	1		0800	97	565.	*	1		1415	172	6.	*	1		2030	247	0.
1		0150	23	0.	*	1		0805	98	533.	*	1		1420	173	6.	*	1		2035	248	0.
1		0155	24	0.	*	1		0810	99	499.	*	1		1425	174	5.	*	1		2040	249	0.
1		0200	25	0.	*	1		0815	100	470.	*	1		1430	175	5.	*	1		2045	250	0.
1		0205	26	0.	*	1		0820	101	443.	*	1		1435	176	5.	*	1		2050	251	0.
1		0210	27	0.	*	1		0825	102	415.	*	1		1440	177	4.	*	1		2055	252	0.
1		0215	28	0.	*	1		0830	103	391.	*	1		1445	178	4.	*	1		2100	253	0.
1		0220	29	0.	*	1		0835	104	369.	*	1		1450	179	4.	*	1		2105	254	0.
1		0225	30	0.	*	1		0840	105	347.	*	1		1455	180	4.	*	1		2110	255	0.
1		0230	31	0.	*	1		0845	106	327.	*	1		1500	181	3.	*	1		2115	256	0.
1		0235	32	0.	*	1		0850	107	310.	*	1		1505	182	3.	*	1		2120	257	0.
1		0240	33	0.	*	1		0855	108	293.	*	1		1510	183	3.	*	1		2125	258	0.
1		0245	34	0.	*	1		0900	109	277.	*	1		1515	184	3.	*	1		2130	259	0.
1		0250	35	0.	*	1		0905	110	263.	*	1		1520	185	3.	*	1		2135	260	0.
1		0255	36	0.	*	1		0910	111	249.	*	1		1525	186	2.	*	1		2140	261	0.
1		0300	37	1.	*	1		0915	112	236.	*	1		1530	187	2.	*	1		2145	262	0.
1		0305	38	1.	*	1		0920	113	223.	*	1		1535	188	2.	*	1		2150	263	0.
1		0310	39	1.	*	1		0925	114	211.	*	1		1540	189	2.	*	1		2155	264	0.
1		0315	40	2.	*	1		0930	115	201.	*	1		1545	190	2.	*	1		2200	265	0.
1		0320	41	4.	*	1		0935	116	191.	*	1		1550	191	2.	*	1		2205	266	0.
1		0325	42	6.	*	1		0940	117	182.	*	1		1555	192	2.	*	1		2210	267	0.
1		0330	43	12.	*	1		0945	118	174.	*	1		1600	193	1.	*	1		2215	268	0.
1		0335	44	25.	*	1		0950	119	165.	*	1		1605	194	1.	*	1		2220	269	0.

1	0340	45	44.	*	1	0955	120	157.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	71.	*	1	1000	121	149.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	104.	*	1	1005	122	142.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	139.	*	1	1010	123	135.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	177.	*	1	1015	124	129.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	217.	*	1	1020	125	122.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	322.	*	1	1025	126	117.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	427.	*	1	1030	127	111.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	469.	*	1	1035	128	106.	*	1	1650	203	1.	*	1	2305	278	0.
1	0425	54	496.	*	1	1040	129	101.	*	1	1655	204	1.	*	1	2310	279	0.
1	0430	55	499.	*	1	1045	130	96.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	493.	*	1	1050	131	91.	*	1	1705	206	1.	*	1	2320	281	0.
1	0440	57	479.	*	1	1055	132	86.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	461.	*	1	1100	133	81.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	444.	*	1	1105	134	76.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	432.	*	1	1110	135	72.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	427.	*	1	1115	136	68.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	432.	*	1	1120	137	63.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	451.	*	1	1125	138	59.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	1085.	*	1	1130	139	55.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	1369.	*	1	1135	140	52.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	1165.	*	1	1140	141	48.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	1462.	*	1	1145	142	45.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	1234.	*	1	1150	143	42.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	1382.	*	1	1155	144	39.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	1432.	*	1	1200	145	37.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	1449.	*	1	1205	146	34.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	1715.	*	1	1210	147	32.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	1689.	*	1	1215	148	30.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	1672.	*	1	1220	149	28.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	1582.	*	1	1225	150	27.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 1715.	5.92	748.	198.	190.	190.
		(INCHES) .118	.125	.125	.125
		(AC-FT) 371.	392.	392.	392.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .26

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	71.	1		1230	151	20.	1		1845	226	1.
1		0005	2	0.	1		0620	77	63.	1		1235	152	19.	1		1850	227	1.
1		0010	3	0.	1		0625	78	57.	1		1240	153	19.	1		1855	228	0.
1		0015	4	0.	1		0630	79	51.	1		1245	154	18.	1		1900	229	0.
1		0020	5	0.	1		0635	80	46.	1		1250	155	17.	1		1905	230	0.
1		0025	6	0.	1		0640	81	41.	1		1255	156	17.	1		1910	231	0.
1		0030	7	0.	1		0645	82	37.	1		1300	157	16.	1		1915	232	0.
1		0035	8	0.	1		0650	83	33.	1		1305	158	16.	1		1920	233	0.
1		0040	9	0.	1		0655	84	30.	1		1310	159	15.	1		1925	234	0.
1		0045	10	0.	1		0700	85	29.	1		1315	160	15.	1		1930	235	0.
1		0050	11	0.	1		0705	86	137.	1		1320	161	14.	1		1935	236	0.
1		0055	12	0.	1		0710	87	177.	1		1325	162	14.	1		1940	237	0.
1		0100	13	0.	1		0715	88	130.	1		1330	163	13.	1		1945	238	0.
1		0105	14	0.	1		0720	89	147.	1		1335	164	13.	1		1950	239	0.
1		0110	15	0.	1		0725	90	132.	1		1340	165	12.	1		1955	240	0.
1		0115	16	0.	1		0730	91	210.	1		1345	166	12.	1		2000	241	0.
1		0120	17	0.	1		0735	92	160.	1		1350	167	11.	1		2005	242	0.
1		0125	18	0.	1		0740	93	165.	1		1355	168	11.	1		2010	243	0.
1		0130	19	0.	1		0745	94	180.	1		1400	169	10.	1		2015	244	0.
1		0135	20	0.	1		0750	95	156.	1		1405	170	10.	1		2020	245	0.
1		0140	21	0.	1		0755	96	165.	1		1410	171	9.	1		2025	246	0.
1		0145	22	0.	1		0800	97	137.	1		1415	172	9.	1		2030	247	0.
1		0150	23	0.	1		0805	98	145.	1		1420	173	9.	1		2035	248	0.
1		0155	24	0.	1		0810	99	108.	1		1425	174	8.	1		2040	249	0.
1		0200	25	0.	1		0815	100	126.	1		1430	175	8.	1		2045	250	0.
1		0205	26	0.	1		0820	101	128.	1		1435	176	8.	1		2050	251	0.

1	0210	27	0.	*	1	0825	102	119.	*	1	1440	177	7.	*	1	2055	252	0.
1	0215	28	0.	*	1	0830	103	118.	*	1	1445	178	7.	*	1	2100	253	0.
1	0220	29	0.	*	1	0835	104	110.	*	1	1450	179	7.	*	1	2105	254	0.
1	0225	30	0.	*	1	0840	105	110.	*	1	1455	180	6.	*	1	2110	255	0.
1	0230	31	0.	*	1	0845	106	97.	*	1	1500	181	6.	*	1	2115	256	0.
1	0235	32	0.	*	1	0850	107	112.	*	1	1505	182	6.	*	1	2120	257	0.
1	0240	33	0.	*	1	0855	108	103.	*	1	1510	183	6.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	105.	*	1	1515	184	5.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	107.	*	1	1520	185	5.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	105.	*	1	1525	186	5.	*	1	2140	261	0.
1	0300	37	0.	*	1	0915	112	94.	*	1	1530	187	5.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	88.	*	1	1535	188	4.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	80.	*	1	1540	189	4.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	78.	*	1	1545	190	4.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	83.	*	1	1550	191	4.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	82.	*	1	1555	192	4.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	77.	*	1	1600	193	3.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	70.	*	1	1605	194	3.	*	1	2220	269	0.
1	0340	45	0.	*	1	0955	120	63.	*	1	1610	195	3.	*	1	2225	270	0.
1	0345	46	0.	*	1	1000	121	63.	*	1	1615	196	3.	*	1	2230	271	0.
1	0350	47	0.	*	1	1005	122	61.	*	1	1620	197	3.	*	1	2235	272	0.
1	0355	48	1.	*	1	1010	123	58.	*	1	1625	198	2.	*	1	2240	273	0.
1	0400	49	5.	*	1	1015	124	56.	*	1	1630	199	2.	*	1	2245	274	0.
1	0405	50	11.	*	1	1020	125	51.	*	1	1635	200	2.	*	1	2250	275	0.
1	0410	51	19.	*	1	1025	126	48.	*	1	1640	201	2.	*	1	2255	276	0.
1	0415	52	26.	*	1	1030	127	47.	*	1	1645	202	2.	*	1	2300	277	0.
1	0420	53	32.	*	1	1035	128	46.	*	1	1650	203	2.	*	1	2305	278	0.
1	0425	54	36.	*	1	1040	129	44.	*	1	1655	204	2.	*	1	2310	279	0.
1	0430	55	40.	*	1	1045	130	42.	*	1	1700	205	2.	*	1	2315	280	0.
1	0435	56	43.	*	1	1050	131	41.	*	1	1705	206	2.	*	1	2320	281	0.
1	0440	57	44.	*	1	1055	132	39.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	45.	*	1	1100	133	36.	*	1	1715	208	1.	*	1	2330	283	0.
1	0450	59	53.	*	1	1105	134	36.	*	1	1720	209	1.	*	1	2335	284	0.
1	0455	60	71.	*	1	1110	135	34.	*	1	1725	210	1.	*	1	2340	285	0.
1	0500	61	67.	*	1	1115	136	33.	*	1	1730	211	1.	*	1	2345	286	0.
1	0505	62	68.	*	1	1120	137	32.	*	1	1735	212	1.	*	1	2350	287	0.
1	0510	63	75.	*	1	1125	138	31.	*	1	1740	213	1.	*	1	2355	288	0.
1	0515	64	75.	*	1	1130	139	30.	*	1	1745	214	1.	*	2	0000	289	0.
1	0520	65	80.	*	1	1135	140	29.	*	1	1750	215	1.	*	2	0005	290	0.
1	0525	66	83.	*	1	1140	141	27.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	87.	*	1	1145	142	27.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	92.	*	1	1150	143	26.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	98.	*	1	1155	144	25.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	104.	*	1	1200	145	24.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	104.	*	1	1205	146	23.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	100.	*	1	1210	147	22.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	94.	*	1	1215	148	22.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	87.	*	1	1220	149	21.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	79.	*	1	1225	150	20.	*	1	1840	225	1.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 210.	7.50		92.	28.	27.	27.
		(INCHES)	.014	.017	.017	.017
		(AC-FT)	45.	55.	55.	55.

CUMULATIVE AREA = 58.84 SQ MI

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            *            *
1306 KK     *    FINISH  *
            *            *
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1308 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

1307 RD          MUSKINGUM-CUNGE CHANNEL ROUTING
                          L       1500.  CHANNEL LENGTH
                          S       .0090  SLOPE
                          N        .050  CHANNEL ROUGHNESS COEFFICIENT
                         CA         .00  CONTRIBUTING AREA
                      SHAPE        TRAP  CHANNEL SHAPE
                         WD      250.00  BOTTOM WIDTH OR DIAMETER
                          Z        3.00  SIDE SLOPE
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COMPUTED MUSKINGUM-CUNGE PARAMETERS
COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.59	750.00	9761.97	326.77	1.01	9.64
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		9757.71	325.00	1.01	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4806E+04 EXCESS= .0000E+00 OUTFLOW= .4806E+04 BASIN STORAGE= .1190E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = 1.00

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	7886.	1		1230	151	2681.	1		1845	226	194.
1		0005	2	0.	1		0620	77	7665.	1		1235	152	2658.	1		1850	227	157.
1		0010	3	0.	1		0625	78	7451.	1		1240	153	2634.	1		1855	228	123.
1		0015	4	0.	1		0630	79	7241.	1		1245	154	2609.	1		1900	229	93.
1		0020	5	0.	1		0635	80	7037.	1		1250	155	2585.	1		1905	230	71.
1		0025	6	0.	1		0640	81	6841.	1		1255	156	2562.	1		1910	231	53.
1		0030	7	0.	1		0645	82	6669.	1		1300	157	2538.	1		1915	232	40.
1		0035	8	0.	1		0650	83	6548.	1		1305	158	2515.	1		1920	233	30.
1		0040	9	0.	1		0655	84	6485.	1		1310	159	2491.	1		1925	234	23.
1		0045	10	0.	1		0700	85	6433.	1		1315	160	2466.	1		1930	235	17.
1		0050	11	1.	1		0705	86	6339.	1		1320	161	2440.	1		1935	236	13.
1		0055	12	2.	1		0710	87	6201.	1		1325	162	2414.	1		1940	237	10.
1		0100	13	3.	1		0715	88	6031.	1		1330	163	2389.	1		1945	238	7.
1		0105	14	6.	1		0720	89	5837.	1		1335	164	2363.	1		1950	239	5.
1		0110	15	10.	1		0725	90	5625.	1		1340	165	2338.	1		1955	240	4.
1		0115	16	16.	1		0730	91	5404.	1		1345	166	2313.	1		2000	241	3.
1		0120	17	24.	1		0735	92	5188.	1		1350	167	2286.	1		2005	242	2.
1		0125	18	33.	1		0740	93	4999.	1		1355	168	2258.	1		2010	243	2.
1		0130	19	44.	1		0745	94	4853.	1		1400	169	2230.	1		2015	244	1.
1		0135	20	58.	1		0750	95	4738.	1		1405	170	2202.	1		2020	245	1.
1		0140	21	75.	1		0755	96	4636.	1		1410	171	2175.	1		2025	246	1.
1		0145	22	97.	1		0800	97	4540.	1		1415	172	2147.	1		2030	247	1.
1		0150	23	125.	1		0805	98	4451.	1		1420	173	2119.	1		2035	248	0.
1		0155	24	158.	1		0810	99	4370.	1		1425	174	2090.	1		2040	249	0.
1		0200	25	198.	1		0815	100	4294.	1		1430	175	2059.	1		2045	250	0.
1		0205	26	243.	1		0820	101	4222.	1		1435	176	2027.	1		2050	251	0.
1		0210	27	295.	1		0825	102	4153.	1		1440	177	1996.	1		2055	252	0.

1	0215	28	352.	*	1	0830	103	4089.	*	1	1445	178	1965.	*	1	2100	253	0.
1	0220	29	412.	*	1	0835	104	4029.	*	1	1450	179	1935.	*	1	2105	254	0.
1	0225	30	474.	*	1	0840	105	3972.	*	1	1455	180	1903.	*	1	2110	255	0.
1	0230	31	536.	*	1	0845	106	3918.	*	1	1500	181	1869.	*	1	2115	256	0.
1	0235	32	597.	*	1	0850	107	3866.	*	1	1505	182	1833.	*	1	2120	257	0.
1	0240	33	653.	*	1	0855	108	3818.	*	1	1510	183	1798.	*	1	2125	258	0.
1	0245	34	705.	*	1	0900	109	3772.	*	1	1515	184	1764.	*	1	2130	259	0.
1	0250	35	755.	*	1	0905	110	3728.	*	1	1520	185	1729.	*	1	2135	260	0.
1	0255	36	807.	*	1	0910	111	3687.	*	1	1525	186	1695.	*	1	2140	261	0.
1	0300	37	864.	*	1	0915	112	3649.	*	1	1530	187	1658.	*	1	2145	262	0.
1	0305	38	932.	*	1	0920	113	3613.	*	1	1535	188	1621.	*	1	2150	263	0.
1	0310	39	1021.	*	1	0925	114	3578.	*	1	1540	189	1584.	*	1	2155	264	0.
1	0315	40	1146.	*	1	0930	115	3544.	*	1	1545	190	1548.	*	1	2200	265	0.
1	0320	41	1326.	*	1	0935	116	3511.	*	1	1550	191	1512.	*	1	2205	266	0.
1	0325	42	1586.	*	1	0940	117	3480.	*	1	1555	192	1476.	*	1	2210	267	0.
1	0330	43	1950.	*	1	0945	118	3449.	*	1	1600	193	1439.	*	1	2215	268	0.
1	0335	44	2447.	*	1	0950	119	3420.	*	1	1605	194	1400.	*	1	2220	269	0.
1	0340	45	3064.	*	1	0955	120	3391.	*	1	1610	195	1361.	*	1	2225	270	0.
1	0345	46	3761.	*	1	1000	121	3364.	*	1	1615	196	1324.	*	1	2230	271	0.
1	0350	47	4510.	*	1	1005	122	3338.	*	1	1620	197	1287.	*	1	2235	272	0.
1	0355	48	5284.	*	1	1010	123	3312.	*	1	1625	198	1250.	*	1	2240	273	0.
1	0400	49	6016.	*	1	1015	124	3287.	*	1	1630	199	1212.	*	1	2245	274	0.
1	0405	50	6641.	*	1	1020	125	3263.	*	1	1635	200	1173.	*	1	2250	275	0.
1	0410	51	7144.	*	1	1025	126	3239.	*	1	1640	201	1133.	*	1	2255	276	0.
1	0415	52	7539.	*	1	1030	127	3214.	*	1	1645	202	1095.	*	1	2300	277	0.
1	0420	53	7840.	*	1	1035	128	3190.	*	1	1650	203	1057.	*	1	2305	278	0.
1	0425	54	8062.	*	1	1040	129	3166.	*	1	1655	204	1021.	*	1	2310	279	0.
1	0430	55	8223.	*	1	1045	130	3143.	*	1	1700	205	983.	*	1	2315	280	0.
1	0435	56	8344.	*	1	1050	131	3121.	*	1	1705	206	944.	*	1	2320	281	0.
1	0440	57	8438.	*	1	1055	132	3099.	*	1	1710	207	904.	*	1	2325	282	0.
1	0445	58	8514.	*	1	1100	133	3078.	*	1	1715	208	865.	*	1	2330	283	0.
1	0450	59	8609.	*	1	1105	134	3057.	*	1	1720	209	828.	*	1	2335	284	0.
1	0455	60	8759.	*	1	1110	135	3035.	*	1	1725	210	793.	*	1	2340	285	0.
1	0500	61	8959.	*	1	1115	136	3013.	*	1	1730	211	757.	*	1	2345	286	0.
1	0505	62	9176.	*	1	1120	137	2990.	*	1	1735	212	720.	*	1	2350	287	0.
1	0510	63	9387.	*	1	1125	138	2968.	*	1	1740	213	681.	*	1	2355	288	0.
1	0515	64	9572.	*	1	1130	139	2946.	*	1	1745	214	641.	*	2	0000	289	0.
1	0520	65	9702.	*	1	1135	140	2925.	*	1	1750	215	603.	*	2	0005	290	0.
1	0525	66	9758.	*	1	1140	141	2904.	*	1	1755	216	567.	*	2	0010	291	0.
1	0530	67	9742.	*	1	1145	142	2882.	*	1	1800	217	533.	*	2	0015	292	0.
1	0535	68	9659.	*	1	1150	143	2861.	*	1	1805	218	499.	*	2	0020	293	0.
1	0540	69	9519.	*	1	1155	144	2839.	*	1	1810	219	461.	*	2	0025	294	0.
1	0545	70	9333.	*	1	1200	145	2816.	*	1	1815	220	417.	*	2	0030	295	0.
1	0550	71	9113.	*	1	1205	146	2793.	*	1	1820	221	373.	*	2	0035	296	0.
1	0555	72	8873.	*	1	1210	147	2770.	*	1	1825	222	332.	*	2	0040	297	0.
1	0600	73	8623.	*	1	1215	148	2748.	*	1	1830	223	295.	*	2	0045	298	0.
1	0605	74	8369.	*	1	1220	149	2726.	*	1	1835	224	261.	*	2	0050	299	0.
1	0610	75	8120.	*	1	1225	150	2704.	*	1	1840	225	229.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 9758.	5.42		6359.	2423.	2334.	2334.
		(INCHES)	.665	1.014	1.014	1.014
		(AC-FT)	3153.	4806.	4806.	4806.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.81	750.00	7955.75	328.58	.77	8.90
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		7952.47	330.00	.77	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3663E+04 EXCESS= .0000E+00 OUTFLOW= .3663E+04 BASIN STORAGE= .1060E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .87

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6631.	1		1230	151	2052.	1		1845	226	0.
1		0005	2	0.	1		0620	77	6465.	1		1235	152	2020.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6303.	1		1240	153	1987.	1		1855	228	0.
1		0015	4	0.	1		0630	79	6144.	1		1245	154	1955.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5988.	1		1250	155	1923.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5835.	1		1255	156	1888.	1		1910	231	0.
1		0030	7	0.	1		0645	82	5686.	1		1300	157	1852.	1		1915	232	0.
1		0035	8	0.	1		0650	83	5540.	1		1305	158	1816.	1		1920	233	0.
1		0040	9	0.	1		0655	84	5401.	1		1310	159	1780.	1		1925	234	0.
1		0045	10	0.	1		0700	85	5265.	1		1315	160	1745.	1		1930	235	0.
1		0050	11	0.	1		0705	86	5134.	1		1320	161	1710.	1		1935	236	0.
1		0055	12	0.	1		0710	87	5008.	1		1325	162	1674.	1		1940	237	0.
1		0100	13	0.	1		0715	88	4889.	1		1330	163	1636.	1		1945	238	0.
1		0105	14	0.	1		0720	89	4774.	1		1335	164	1598.	1		1950	239	0.
1		0110	15	1.	1		0725	90	4665.	1		1340	165	1561.	1		1955	240	0.
1		0115	16	1.	1		0730	91	4559.	1		1345	166	1525.	1		2000	241	0.
1		0120	17	2.	1		0735	92	4456.	1		1350	167	1489.	1		2005	242	0.
1		0125	18	4.	1		0740	93	4356.	1		1355	168	1451.	1		2010	243	0.
1		0130	19	6.	1		0745	94	4260.	1		1400	169	1412.	1		2015	244	0.
1		0135	20	11.	1		0750	95	4168.	1		1405	170	1373.	1		2020	245	0.
1		0140	21	17.	1		0755	96	4082.	1		1410	171	1335.	1		2025	246	0.
1		0145	22	26.	1		0800	97	4001.	1		1415	172	1298.	1		2030	247	0.
1		0150	23	39.	1		0805	98	3926.	1		1420	173	1261.	1		2035	248	0.
1		0155	24	56.	1		0810	99	3856.	1		1425	174	1223.	1		2040	249	0.
1		0200	25	77.	1		0815	100	3791.	1		1430	175	1184.	1		2045	250	0.
1		0205	26	103.	1		0820	101	3729.	1		1435	176	1144.	1		2050	251	0.
1		0210	27	134.	1		0825	102	3670.	1		1440	177	1105.	1		2055	252	0.
1		0215	28	168.	1		0830	103	3614.	1		1445	178	1068.	1		2100	253	0.
1		0220	29	206.	1		0835	104	3561.	1		1450	179	1031.	1		2105	254	0.
1		0225	30	246.	1		0840	105	3511.	1		1455	180	993.	1		2110	255	0.
1		0230	31	287.	1		0845	106	3463.	1		1500	181	955.	1		2115	256	0.
1		0235	32	327.	1		0850	107	3416.	1		1505	182	915.	1		2120	257	0.
1		0240	33	366.	1		0855	108	3372.	1		1510	183	876.	1		2125	258	0.
1		0245	34	400.	1		0900	109	3328.	1		1515	184	839.	1		2130	259	0.
1		0250	35	431.	1		0905	110	3286.	1		1520	185	803.	1		2135	260	0.
1		0255	36	462.	1		0910	111	3245.	1		1525	186	767.	1		2140	261	0.
1		0300	37	498.	1		0915	112	3207.	1		1530	187	730.	1		2145	262	0.
1		0305	38	542.	1		0920	113	3170.	1		1535	188	692.	1		2150	263	0.
1		0310	39	605.	1		0925	114	3135.	1		1540	189	652.	1		2155	264	0.
1		0315	40	696.	1		0930	115	3101.	1		1545	190	614.	1		2200	265	0.
1		0320	41	824.	1		0935	116	3069.	1		1550	191	578.	1		2205	266	0.
1		0325	42	1007.	1		0940	117	3037.	1		1555	192	544.	1		2210	267	0.
1		0330	43	1266.	1		0945	118	3005.	1		1600	193	511.	1		2215	268	0.
1		0335	44	1620.	1		0950	119	2973.	1		1605	194	475.	1		2220	269	0.
1		0340	45	2066.	1		0955	120	2941.	1		1610	195	436.	1		2225	270	0.
1		0345	46	2589.	1		1000	121	2910.	1		1615	196	393.	1		2230	271	0.
1		0350	47	3180.	1		1005	122	2880.	1		1620	197	351.	1		2235	272	0.
1		0355	48	3816.	1		1010	123	2851.	1		1625	198	313.	1		2240	273	0.
1		0400	49	4426.	1		1015	124	2823.	1		1630	199	278.	1		2245	274	0.
1		0405	50	4954.	1		1020	125	2795.	1		1635	200	247.	1		2250	275	0.
1		0410	51	5388.	1		1025	126	2767.	1		1640	201	215.	1		2255	276	0.
1		0415	52	5725.	1		1030	127	2738.	1		1645	202	180.	1		2300	277	0.
1		0420	53	5973.	1		1035	128	2710.	1		1650	203	144.	1		2305	278	0.
1		0425	54	6147.	1		1040	129	2681.	1		1655	204	111.	1		2310	279	0.
1		0430	55	6267.	1		1045	130	2653.	1		1700	205	84.	1		2315	280	0.
1		0435	56	6367.	1		1050	131	2626.	1		1705	206	63.	1		2320	281	0.
1		0440	57	6469.	1		1055	132	2599.	1		1710	207	48.	1		2325	282	0.
1		0445	58	6579.	1		1100	133	2573.	1		1715	208	36.	1		2330	283	0.
1		0450	59	6711.	1		1105	134	2546.	1		1720	209	27.	1		2335	284	0.
1		0455	60	6885.	1		1110	135	2518.	1		1725	210	21.	1		2340	285	0.
1		0500	61	7097.	1		1115	136	2490.	1		1730	211	16.	1		2345	286	0.
1		0505	62	7320.	1		1120	137	2461.	1		1735	212	12.	1		2350	287	0.
1		0510	63	7533.	1		1125	138	2434.	1		1740	213	9.	1		2355	288	0.
1		0515	64	7721.	1		1130	139	2406.	1		1745	214	7.	2		0000	289	0.
1		0520	65	7863.	1		1135	140	2379.	1		1750	215	5.	2		0005	290	0.
1		0525	66	7939.	1		1140	141	2352.	1		1755	216	4.	2		0010	291	0.
1		0530	67	7952.	1		1145	142	2323.	1		1800	217	3.	2		0015	292	0.
1		0535	68	7911.	1		1150	143	2294.	1		1805	218	2.	2		0020	293	0.
1		0540	69	7823.	1		1155	144	2264.	1		1810	219	2.	2		0025	294	0.
1		0545	70	7695.	1		1200	145	2235.	1		1815	220	1.	2		0030	295	0.
1		0550	71	7537.	1		1205	146	2205.	1		1820	221	1.	2		0035	296	0.
1		0555	72	7362.	1		1210	147	2177.	1		1825	222	1.	2		0040	297	0.
1		0600	73	7177.	1		1215	148	2147.	1		1830	223	1.	2		0045	298	0.

1	0605	74	6989.	*	1	1220	149	2117.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	6806.	*	1	1225	150	2085.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)			
+ 7952.	5.50	5231.	1847.	1779.	1779.
		(INCHES) .547	.773	.773	.773
		(AC-FT) 2594.	3663.	3663.	3663.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS
COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.11	750.00	6111.55	332.97	.55	8.03
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		6103.91	330.00	.55	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2613E+04 EXCESS= .0000E+00 OUTFLOW= .2613E+04 BASIN STORAGE= .1096E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .74

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	5275.	*	1		1230	151	1208.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	5162.	*	1		1235	152	1168.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	5052.	*	1		1240	153	1128.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	4943.	*	1		1245	154	1089.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	4835.	*	1		1250	155	1052.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	4727.	*	1		1255	156	1014.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	4619.	*	1		1300	157	975.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	4513.	*	1		1305	158	935.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	4410.	*	1		1310	159	896.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	4309.	*	1		1315	160	857.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	4212.	*	1		1320	161	820.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	4117.	*	1		1325	162	785.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	4026.	*	1		1330	163	748.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	3939.	*	1		1335	164	710.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	3854.	*	1		1340	165	670.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	3772.	*	1		1345	166	631.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	3692.	*	1		1350	167	594.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	3614.	*	1		1355	168	560.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	3538.	*	1		1400	169	526.	*	1		2015	244	0.
1		0135	20	0.	*	1		0750	95	3465.	*	1		1405	170	492.	*	1		2020	245	0.
1		0140	21	1.	*	1		0755	96	3395.	*	1		1410	171	456.	*	1		2025	246	0.
1		0145	22	2.	*	1		0800	97	3329.	*	1		1415	172	417.	*	1		2030	247	0.
1		0150	23	4.	*	1		0805	98	3266.	*	1		1420	173	376.	*	1		2035	248	0.
1		0155	24	8.	*	1		0810	99	3207.	*	1		1425	174	338.	*	1		2040	249	0.
1		0200	25	14.	*	1		0815	100	3151.	*	1		1430	175	302.	*	1		2045	250	0.
1		0205	26	23.	*	1		0820	101	3098.	*	1		1435	176	270.	*	1		2050	251	0.
1		0210	27	35.	*	1		0825	102	3046.	*	1		1440	177	239.	*	1		2055	252	0.
1		0215	28	50.	*	1		0830	103	2997.	*	1		1445	178	207.	*	1		2100	253	0.
1		0220	29	68.	*	1		0835	104	2950.	*	1		1450	179	172.	*	1		2105	254	0.
1		0225	30	88.	*	1		0840	105	2905.	*	1		1455	180	137.	*	1		2110	255	0.
1		0230	31	110.	*	1		0845	106	2861.	*	1		1500	181	106.	*	1		2115	256	0.
1		0235	32	133.	*	1		0850	107	2818.	*	1		1505	182	81.	*	1		2120	257	0.
1		0240	33	155.	*	1		0855	108	2776.	*	1		1510	183	62.	*	1		2125	258	0.
1		0245	34	176.	*	1		0900	109	2735.	*	1		1515	184	47.	*	1		2130	259	0.
1		0250	35	195.	*	1		0905	110	2694.	*	1		1520	185	36.	*	1		2135	260	0.
1		0255	36	214.	*	1		0910	111	2655.	*	1		1525	186	27.	*	1		2140	261	0.
1		0300	37	235.	*	1		0915	112	2617.	*	1		1530	187	21.	*	1		2145	262	0.
1		0305	38	262.	*	1		0920	113	2581.	*	1		1535	188	16.	*	1		2150	263	0.

1	0310	39	298.	*	1	0925	114	2546.	*	1	1540	189	12.	*	1	2155	264	0.
1	0315	40	348.	*	1	0930	115	2511.	*	1	1545	190	9.	*	1	2200	265	0.
1	0320	41	421.	*	1	0935	116	2477.	*	1	1550	191	7.	*	1	2205	266	0.
1	0325	42	529.	*	1	0940	117	2442.	*	1	1555	192	6.	*	1	2210	267	0.
1	0330	43	691.	*	1	0945	118	2407.	*	1	1600	193	4.	*	1	2215	268	0.
1	0335	44	924.	*	1	0950	119	2372.	*	1	1605	194	3.	*	1	2220	269	0.
1	0340	45	1236.	*	1	0955	120	2338.	*	1	1610	195	3.	*	1	2225	270	0.
1	0345	46	1616.	*	1	1000	121	2304.	*	1	1615	196	2.	*	1	2230	271	0.
1	0350	47	2039.	*	1	1005	122	2271.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	2494.	*	1	1010	123	2239.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	2946.	*	1	1015	124	2206.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	3354.	*	1	1020	125	2171.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	3709.	*	1	1025	126	2136.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	4005.	*	1	1030	127	2100.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	4224.	*	1	1035	128	2066.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	4373.	*	1	1040	129	2032.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	4465.	*	1	1045	130	1998.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	4519.	*	1	1050	131	1963.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	4573.	*	1	1055	132	1927.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	4650.	*	1	1100	133	1890.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	4770.	*	1	1105	134	1852.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	4940.	*	1	1110	135	1816.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	5150.	*	1	1115	136	1780.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	5377.	*	1	1120	137	1743.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	5597.	*	1	1125	138	1706.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	5796.	*	1	1130	139	1668.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	5954.	*	1	1135	140	1629.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6055.	*	1	1140	141	1591.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6104.	*	1	1145	142	1554.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	6102.	*	1	1150	143	1517.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	6060.	*	1	1155	144	1479.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	5985.	*	1	1200	145	1440.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	5885.	*	1	1205	146	1400.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	5769.	*	1	1210	147	1361.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	5645.	*	1	1215	148	1323.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5519.	*	1	1220	149	1286.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5394.	*	1	1225	150	1247.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 6104.	5.50		4073.	1318.	1269.	1269.
		(INCHES)	.426	.551	.551	.551
		(AC-FT)	2020.	2613.	2613.	2613.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.82	750.00	3612.02	343.61	.30	6.55

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00	3611.84	340.00	.30	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1425E+04 EXCESS= .0000E+00 OUTFLOW= .1425E+04 BASIN STORAGE= .1110E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3337.	1		1230	151	240.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3290.	1		1235	152	215.	1		1850	227	0.
1		0010	3	0.	1		0625	78	3243.	1		1240	153	186.	1		1855	228	0.

1	0015	4	0.	*	1	0630	79	3194.	*	1	1245	154	155.	*	1	1900	229	0.
1	0020	5	0.	*	1	0635	80	3144.	*	1	1250	155	126.	*	1	1905	230	0.
1	0025	6	0.	*	1	0640	81	3092.	*	1	1255	156	101.	*	1	1910	231	0.
1	0030	7	0.	*	1	0645	82	3039.	*	1	1300	157	82.	*	1	1915	232	0.
1	0035	8	0.	*	1	0650	83	2987.	*	1	1305	158	67.	*	1	1920	233	0.
1	0040	9	0.	*	1	0655	84	2934.	*	1	1310	159	55.	*	1	1925	234	0.
1	0045	10	0.	*	1	0700	85	2880.	*	1	1315	160	46.	*	1	1930	235	0.
1	0050	11	0.	*	1	0705	86	2825.	*	1	1320	161	39.	*	1	1935	236	0.
1	0055	12	0.	*	1	0710	87	2770.	*	1	1325	162	33.	*	1	1940	237	0.
1	0100	13	0.	*	1	0715	88	2716.	*	1	1330	163	28.	*	1	1945	238	0.
1	0105	14	0.	*	1	0720	89	2662.	*	1	1335	164	24.	*	1	1950	239	0.
1	0110	15	0.	*	1	0725	90	2609.	*	1	1340	165	21.	*	1	1955	240	0.
1	0115	16	0.	*	1	0730	91	2555.	*	1	1345	166	19.	*	1	2000	241	0.
1	0120	17	0.	*	1	0735	92	2502.	*	1	1350	167	17.	*	1	2005	242	0.
1	0125	18	0.	*	1	0740	93	2448.	*	1	1355	168	15.	*	1	2010	243	0.
1	0130	19	0.	*	1	0745	94	2395.	*	1	1400	169	13.	*	1	2015	244	0.
1	0135	20	0.	*	1	0750	95	2343.	*	1	1405	170	12.	*	1	2020	245	0.
1	0140	21	0.	*	1	0755	96	2292.	*	1	1410	171	11.	*	1	2025	246	0.
1	0145	22	0.	*	1	0800	97	2242.	*	1	1415	172	10.	*	1	2030	247	0.
1	0150	23	0.	*	1	0805	98	2194.	*	1	1420	173	9.	*	1	2035	248	0.
1	0155	24	0.	*	1	0810	99	2148.	*	1	1425	174	8.	*	1	2040	249	0.
1	0200	25	0.	*	1	0815	100	2104.	*	1	1430	175	7.	*	1	2045	250	0.
1	0205	26	0.	*	1	0820	101	2061.	*	1	1435	176	7.	*	1	2050	251	0.
1	0210	27	0.	*	1	0825	102	2018.	*	1	1440	177	6.	*	1	2055	252	0.
1	0215	28	1.	*	1	0830	103	1977.	*	1	1445	178	5.	*	1	2100	253	0.
1	0220	29	2.	*	1	0835	104	1935.	*	1	1450	179	5.	*	1	2105	254	0.
1	0225	30	3.	*	1	0840	105	1893.	*	1	1455	180	4.	*	1	2110	255	0.
1	0230	31	5.	*	1	0845	106	1851.	*	1	1500	181	4.	*	1	2115	256	0.
1	0235	32	8.	*	1	0850	107	1810.	*	1	1505	182	4.	*	1	2120	257	0.
1	0240	33	12.	*	1	0855	108	1770.	*	1	1510	183	3.	*	1	2125	258	0.
1	0245	34	17.	*	1	0900	109	1731.	*	1	1515	184	3.	*	1	2130	259	0.
1	0250	35	22.	*	1	0905	110	1692.	*	1	1520	185	3.	*	1	2135	260	0.
1	0255	36	27.	*	1	0910	111	1655.	*	1	1525	186	2.	*	1	2140	261	0.
1	0300	37	34.	*	1	0915	112	1617.	*	1	1530	187	2.	*	1	2145	262	0.
1	0305	38	43.	*	1	0920	113	1579.	*	1	1535	188	2.	*	1	2150	263	0.
1	0310	39	55.	*	1	0925	114	1540.	*	1	1540	189	2.	*	1	2155	264	0.
1	0315	40	73.	*	1	0930	115	1501.	*	1	1545	190	2.	*	1	2200	265	0.
1	0320	41	100.	*	1	0935	116	1463.	*	1	1550	191	2.	*	1	2205	266	0.
1	0325	42	140.	*	1	0940	117	1426.	*	1	1555	192	1.	*	1	2210	267	0.
1	0330	43	198.	*	1	0945	118	1389.	*	1	1600	193	1.	*	1	2215	268	0.
1	0335	44	290.	*	1	0950	119	1353.	*	1	1605	194	1.	*	1	2220	269	0.
1	0340	45	437.	*	1	0955	120	1317.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	628.	*	1	1000	121	1279.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	862.	*	1	1005	122	1241.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	1124.	*	1	1010	123	1203.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	1388.	*	1	1015	124	1165.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	1631.	*	1	1020	125	1129.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	1843.	*	1	1025	126	1093.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	2029.	*	1	1030	127	1057.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	2190.	*	1	1035	128	1020.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	2316.	*	1	1040	129	983.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	2414.	*	1	1045	130	945.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	2488.	*	1	1050	131	907.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	2531.	*	1	1055	132	871.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	2556.	*	1	1100	133	837.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	2585.	*	1	1105	134	802.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	2640.	*	1	1110	135	768.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	2740.	*	1	1115	136	731.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	2876.	*	1	1120	137	694.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	3037.	*	1	1125	138	656.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3202.	*	1	1130	139	621.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	3348.	*	1	1135	140	587.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	3463.	*	1	1140	141	555.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	3539.	*	1	1145	142	524.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	3588.	*	1	1150	143	491.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	3612.	*	1	1155	144	456.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	3606.	*	1	1200	145	418.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	3580.	*	1	1205	146	381.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	3542.	*	1	1210	147	347.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3494.	*	1	1215	148	317.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3440.	*	1	1220	149	289.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3387.	*	1	1225	150	264.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 3612.	5.67		2480.	718.	692.	692.
		(INCHES)	.259	.301	.301	.301

(AC-FT) 1230. 1425. 1425. 1425.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	750.00	1809.41	349.86	.15	5.00
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		1809.17	350.00	.15	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7048E+03 EXCESS= .0000E+00 OUTFLOW= .7049E+03 BASIN STORAGE= .1024E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	1751.	1		1230	151	63.	1		1845	226	0.
1		0005	2	0.	1		0620	77	1744.	1		1235	152	59.	1		1850	227	0.
1		0010	3	0.	1		0625	78	1740.	1		1240	153	55.	1		1855	228	0.
1		0015	4	0.	1		0630	79	1731.	1		1245	154	52.	1		1900	229	0.
1		0020	5	0.	1		0635	80	1716.	1		1250	155	48.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1701.	1		1255	156	45.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1679.	1		1300	157	42.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1655.	1		1305	158	40.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1630.	1		1310	159	37.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1605.	1		1315	160	35.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1581.	1		1320	161	33.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1555.	1		1325	162	31.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1529.	1		1330	163	29.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1504.	1		1335	164	27.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1478.	1		1340	165	25.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1451.	1		1345	166	24.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1424.	1		1350	167	22.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1395.	1		1355	168	21.	1		2010	243	0.
1		0130	19	0.	1		0745	94	1365.	1		1400	169	20.	1		2015	244	0.
1		0135	20	0.	1		0750	95	1335.	1		1405	170	18.	1		2020	245	0.
1		0140	21	0.	1		0755	96	1304.	1		1410	171	17.	1		2025	246	0.
1		0145	22	0.	1		0800	97	1274.	1		1415	172	16.	1		2030	247	0.
1		0150	23	0.	1		0805	98	1244.	1		1420	173	15.	1		2035	248	0.
1		0155	24	0.	1		0810	99	1215.	1		1425	174	14.	1		2040	249	0.
1		0200	25	0.	1		0815	100	1186.	1		1430	175	13.	1		2045	250	0.
1		0205	26	0.	1		0820	101	1155.	1		1435	176	12.	1		2050	251	0.
1		0210	27	0.	1		0825	102	1124.	1		1440	177	11.	1		2055	252	0.
1		0215	28	0.	1		0830	103	1092.	1		1445	178	11.	1		2100	253	0.
1		0220	29	0.	1		0835	104	1061.	1		1450	179	10.	1		2105	254	0.
1		0225	30	0.	1		0840	105	1030.	1		1455	180	9.	1		2110	255	0.
1		0230	31	0.	1		0845	106	1000.	1		1500	181	9.	1		2115	256	0.
1		0235	32	0.	1		0850	107	971.	1		1505	182	8.	1		2120	257	0.
1		0240	33	0.	1		0855	108	942.	1		1510	183	7.	1		2125	258	0.
1		0245	34	0.	1		0900	109	913.	1		1515	184	7.	1		2130	259	0.
1		0250	35	0.	1		0905	110	885.	1		1520	185	7.	1		2135	260	0.
1		0255	36	0.	1		0910	111	858.	1		1525	186	6.	1		2140	261	0.
1		0300	37	0.	1		0915	112	831.	1		1530	187	6.	1		2145	262	0.
1		0305	38	0.	1		0920	113	803.	1		1535	188	5.	1		2150	263	0.
1		0310	39	1.	1		0925	114	772.	1		1540	189	5.	1		2155	264	0.
1		0315	40	2.	1		0930	115	740.	1		1545	190	5.	1		2200	265	0.
1		0320	41	5.	1		0935	116	709.	1		1550	191	5.	1		2205	266	0.
1		0325	42	11.	1		0940	117	680.	1		1555	192	4.	1		2210	267	0.
1		0330	43	23.	1		0945	118	652.	1		1600	193	4.	1		2215	268	0.
1		0335	44	44.	1		0950	119	625.	1		1605	194	4.	1		2220	269	0.
1		0340	45	82.	1		0955	120	599.	1		1610	195	4.	1		2225	270	0.
1		0345	46	142.	1		1000	121	575.	1		1615	196	3.	1		2230	271	0.
1		0350	47	244.	1		1005	122	551.	1		1620	197	3.	1		2235	272	0.
1		0355	48	368.	1		1010	123	527.	1		1625	198	3.	1		2240	273	0.
1		0400	49	509.	1		1015	124	502.	1		1630	199	3.	1		2245	274	0.

1	0405	50	655.	*	1	1020	125	473.	*	1	1635	200	3.	*	1	2250	275	0.
1	0410	51	778.	*	1	1025	126	440.	*	1	1640	201	2.	*	1	2255	276	0.
1	0415	52	879.	*	1	1030	127	408.	*	1	1645	202	2.	*	1	2300	277	0.
1	0420	53	961.	*	1	1035	128	382.	*	1	1650	203	2.	*	1	2305	278	0.
1	0425	54	1030.	*	1	1040	129	358.	*	1	1655	204	2.	*	1	2310	279	0.
1	0430	55	1088.	*	1	1045	130	334.	*	1	1700	205	2.	*	1	2315	280	0.
1	0435	56	1143.	*	1	1050	131	314.	*	1	1705	206	2.	*	1	2320	281	0.
1	0440	57	1199.	*	1	1055	132	294.	*	1	1710	207	2.	*	1	2325	282	0.
1	0445	58	1249.	*	1	1100	133	276.	*	1	1715	208	2.	*	1	2330	283	0.
1	0450	59	1284.	*	1	1105	134	260.	*	1	1720	209	1.	*	1	2335	284	0.
1	0455	60	1322.	*	1	1110	135	245.	*	1	1725	210	1.	*	1	2340	285	0.
1	0500	61	1383.	*	1	1115	136	230.	*	1	1730	211	1.	*	1	2345	286	0.
1	0505	62	1450.	*	1	1120	137	216.	*	1	1735	212	1.	*	1	2350	287	0.
1	0510	63	1517.	*	1	1125	138	199.	*	1	1740	213	1.	*	1	2355	288	0.
1	0515	64	1581.	*	1	1130	139	179.	*	1	1745	214	1.	*	2	0000	289	0.
1	0520	65	1634.	*	1	1135	140	161.	*	1	1750	215	1.	*	2	0005	290	0.
1	0525	66	1673.	*	1	1140	141	146.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	1698.	*	1	1145	142	132.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	1726.	*	1	1150	143	119.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	1766.	*	1	1155	144	108.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	1802.	*	1	1200	145	99.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	1809.	*	1	1205	146	91.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	1801.	*	1	1210	147	85.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	1795.	*	1	1215	148	78.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	1782.	*	1	1220	149	73.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	1763.	*	1	1225	150	68.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)			
+ 1809.	5.83	1285.	355.	342.	342.
		(INCHES) .134	.149	.149	.149
		(AC-FT) 637.	705.	705.	705.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	375.00	284.79	350.00	.02	2.44

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		284.79	350.00	.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1021E+03 EXCESS= .0000E+00 OUTFLOW= .1021E+03 BASIN STORAGE= .2644E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	253.	1		1230	151	37.	1		1845	226	2.
1		0005	2	0.	1		0620	77	248.	1		1235	152	36.	1		1850	227	2.
1		0010	3	0.	1		0625	78	242.	1		1240	153	35.	1		1855	228	2.
1		0015	4	0.	1		0630	79	240.	1		1245	154	34.	1		1900	229	2.
1		0020	5	0.	1		0635	80	235.	1		1250	155	33.	1		1905	230	2.
1		0025	6	0.	1		0640	81	229.	1		1255	156	32.	1		1910	231	2.
1		0030	7	0.	1		0645	82	221.	1		1300	157	31.	1		1915	232	2.
1		0035	8	0.	1		0650	83	211.	1		1305	158	30.	1		1920	233	2.
1		0040	9	0.	1		0655	84	200.	1		1310	159	29.	1		1925	234	2.
1		0045	10	0.	1		0700	85	190.	1		1315	160	28.	1		1930	235	1.
1		0050	11	0.	1		0705	86	179.	1		1320	161	27.	1		1935	236	1.
1		0055	12	0.	1		0710	87	168.	1		1325	162	26.	1		1940	237	1.
1		0100	13	0.	1		0715	88	158.	1		1330	163	26.	1		1945	238	1.
1		0105	14	0.	1		0720	89	148.	1		1335	164	25.	1		1950	239	1.

1	0110	15	0.	*	1	0725	90	139.	*	1	1340	165	24.	*	1	1955	240	1.
1	0115	16	0.	*	1	0730	91	130.	*	1	1345	166	23.	*	1	2000	241	1.
1	0120	17	0.	*	1	0735	92	122.	*	1	1350	167	23.	*	1	2005	242	1.
1	0125	18	0.	*	1	0740	93	115.	*	1	1355	168	22.	*	1	2010	243	1.
1	0130	19	0.	*	1	0745	94	110.	*	1	1400	169	22.	*	1	2015	244	1.
1	0135	20	0.	*	1	0750	95	109.	*	1	1405	170	21.	*	1	2020	245	1.
1	0140	21	0.	*	1	0755	96	120.	*	1	1410	171	20.	*	1	2025	246	1.
1	0145	22	0.	*	1	0800	97	151.	*	1	1415	172	20.	*	1	2030	247	1.
1	0150	23	0.	*	1	0805	98	183.	*	1	1420	173	19.	*	1	2035	248	1.
1	0155	24	0.	*	1	0810	99	186.	*	1	1425	174	19.	*	1	2040	249	1.
1	0200	25	0.	*	1	0815	100	180.	*	1	1430	175	18.	*	1	2045	250	1.
1	0205	26	0.	*	1	0820	101	193.	*	1	1435	176	18.	*	1	2050	251	1.
1	0210	27	0.	*	1	0825	102	200.	*	1	1440	177	17.	*	1	2055	252	1.
1	0215	28	0.	*	1	0830	103	189.	*	1	1445	178	17.	*	1	2100	253	1.
1	0220	29	0.	*	1	0835	104	185.	*	1	1450	179	16.	*	1	2105	254	1.
1	0225	30	0.	*	1	0840	105	186.	*	1	1455	180	16.	*	1	2110	255	1.
1	0230	31	0.	*	1	0845	106	176.	*	1	1500	181	15.	*	1	2115	256	1.
1	0235	32	0.	*	1	0850	107	166.	*	1	1505	182	15.	*	1	2120	257	1.
1	0240	33	0.	*	1	0855	108	161.	*	1	1510	183	14.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	154.	*	1	1515	184	14.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	148.	*	1	1520	185	14.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	145.	*	1	1525	186	13.	*	1	2140	261	0.
1	0300	37	0.	*	1	0915	112	141.	*	1	1530	187	13.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	137.	*	1	1535	188	12.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	131.	*	1	1540	189	12.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	127.	*	1	1545	190	11.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	124.	*	1	1550	191	11.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	121.	*	1	1555	192	10.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	119.	*	1	1600	193	10.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	117.	*	1	1605	194	10.	*	1	2220	269	0.
1	0340	45	0.	*	1	0955	120	115.	*	1	1610	195	9.	*	1	2225	270	0.
1	0345	46	0.	*	1	1000	121	113.	*	1	1615	196	9.	*	1	2230	271	0.
1	0350	47	0.	*	1	1005	122	109.	*	1	1620	197	8.	*	1	2235	272	0.
1	0355	48	1.	*	1	1010	123	106.	*	1	1625	198	8.	*	1	2240	273	0.
1	0400	49	3.	*	1	1015	124	101.	*	1	1630	199	8.	*	1	2245	274	0.
1	0405	50	7.	*	1	1020	125	96.	*	1	1635	200	8.	*	1	2250	275	0.
1	0410	51	12.	*	1	1025	126	93.	*	1	1640	201	7.	*	1	2255	276	0.
1	0415	52	19.	*	1	1030	127	91.	*	1	1645	202	7.	*	1	2300	277	0.
1	0420	53	31.	*	1	1035	128	89.	*	1	1650	203	7.	*	1	2305	278	0.
1	0425	54	45.	*	1	1040	129	86.	*	1	1655	204	6.	*	1	2310	279	0.
1	0430	55	61.	*	1	1045	130	83.	*	1	1700	205	6.	*	1	2315	280	0.
1	0435	56	79.	*	1	1050	131	79.	*	1	1705	206	6.	*	1	2320	281	0.
1	0440	57	95.	*	1	1055	132	75.	*	1	1710	207	6.	*	1	2325	282	0.
1	0445	58	103.	*	1	1100	133	72.	*	1	1715	208	5.	*	1	2330	283	0.
1	0450	59	112.	*	1	1105	134	70.	*	1	1720	209	5.	*	1	2335	284	0.
1	0455	60	119.	*	1	1110	135	67.	*	1	1725	210	5.	*	1	2340	285	0.
1	0500	61	126.	*	1	1115	136	65.	*	1	1730	211	5.	*	1	2345	286	0.
1	0505	62	136.	*	1	1120	137	62.	*	1	1735	212	5.	*	1	2350	287	0.
1	0510	63	149.	*	1	1125	138	59.	*	1	1740	213	4.	*	1	2355	288	0.
1	0515	64	166.	*	1	1130	139	57.	*	1	1745	214	4.	*	2	0000	289	0.
1	0520	65	187.	*	1	1135	140	55.	*	1	1750	215	4.	*	2	0005	290	0.
1	0525	66	215.	*	1	1140	141	53.	*	1	1755	216	4.	*	2	0010	291	0.
1	0530	67	248.	*	1	1145	142	51.	*	1	1800	217	4.	*	2	0015	292	0.
1	0535	68	273.	*	1	1150	143	49.	*	1	1805	218	3.	*	2	0020	293	0.
1	0540	69	279.	*	1	1155	144	47.	*	1	1810	219	3.	*	2	0025	294	0.
1	0545	70	280.	*	1	1200	145	46.	*	1	1815	220	3.	*	2	0030	295	0.
1	0550	71	285.	*	1	1205	146	44.	*	1	1820	221	3.	*	2	0035	296	0.
1	0555	72	283.	*	1	1210	147	43.	*	1	1825	222	3.	*	2	0040	297	0.
1	0600	73	275.	*	1	1215	148	41.	*	1	1830	223	3.	*	2	0045	298	0.
1	0605	74	268.	*	1	1220	149	40.	*	1	1835	224	3.	*	2	0050	299	0.
1	0610	75	260.	*	1	1225	150	38.	*	1	1840	225	2.	*	2	0055	300	0.
				*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 285.	5.83		169.	51.	50.	50.
		(INCHES)	.018	.022	.022	.022
		(AC-FT)	84.	102.	102.	102.

CUMULATIVE AREA = 88.86 SQ MI

```
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:48:35  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                                   HEC-1 INPUT                                                PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
 *** NOLIST ***
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:48:35  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

KLEINFELDER
FEBRUARY 2008
ALTERNATIVE C

DESIGN STORM = 100-YEAR 6-HOUR STORM
STORM DISTRIBUTION = SDN5

```
  10 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0055  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
```

```
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00       .87       .74       .57       .44       .26


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
1250 KK     *     ULWIN  *
            *            *
            **************

1254 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

1253 HC          HYDROGRAPH COMBINATION
                       ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***
*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    ULWIN
                                                     SUM OF  4 HYDROGRAPHS
                                                    PLAN 1,   RATIO =  1.00
*****************************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	8098.	1		1230	151	4.	1		1845	226	0.
1		0005	2	0.	1		0620	77	7401.	1		1235	152	4.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6763.	1		1240	153	3.	1		1855	228	0.
1		0015	4	0.	1		0630	79	6185.	1		1245	154	3.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5663.	1		1250	155	3.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5198.	1		1255	156	2.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4780.	1		1300	157	2.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4397.	1		1305	158	2.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4045.	1		1310	159	1.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3724.	1		1315	160	1.	1		1930	235	0.
1		0050	11	1.	1		0705	86	3428.	1		1320	161	1.	1		1935	236	0.
1		0055	12	2.	1		0710	87	3153.	1		1325	162	1.	1		1940	237	0.
1		0100	13	4.	1		0715	88	2896.	1		1330	163	1.	1		1945	238	0.
1		0105	14	6.	1		0720	89	2659.	1		1335	164	1.	1		1950	239	0.
1		0110	15	9.	1		0725	90	2437.	1		1340	165	1.	1		1955	240	0.
1		0115	16	12.	1		0730	91	2232.	1		1345	166	0.	1		2000	241	0.
1		0120	17	16.	1		0735	92	2043.	1		1350	167	0.	1		2005	242	0.
1		0125	18	20.	1		0740	93	1869.	1		1355	168	0.	1		2010	243	0.
1		0130	19	25.	1		0745	94	1709.	1		1400	169	0.	1		2015	244	0.
1		0135	20	31.	1		0750	95	1562.	1		1405	170	0.	1		2020	245	0.
1		0140	21	38.	1		0755	96	1428.	1		1410	171	0.	1		2025	246	0.
1		0145	22	47.	1		0800	97	1308.	1		1415	172	0.	1		2030	247	0.
1		0150	23	57.	1		0805	98	1200.	1		1420	173	0.	1		2035	248	0.
1		0155	24	69.	1		0810	99	1102.	1		1425	174	0.	1		2040	249	0.
1		0200	25	86.	1		0815	100	1010.	1		1430	175	0.	1		2045	250	0.
1		0205	26	109.	1		0820	101	920.	1		1435	176	0.	1		2050	251	0.
1		0210	27	141.	1		0825	102	837.	1		1440	177	0.	1		2055	252	0.
1		0215	28	181.	1		0830	103	760.	1		1445	178	0.	1		2100	253	0.
1		0220	29	227.	1		0835	104	689.	1		1450	179	0.	1		2105	254	0.
1		0225	30	276.	1		0840	105	624.	1		1455	180	0.	1		2110	255	0.
1		0230	31	324.	1		0845	106	564.	1		1500	181	0.	1		2115	256	0.
1		0235	32	372.	1		0850	107	511.	1		1505	182	0.	1		2120	257	0.
1		0240	33	422.	1		0855	108	462.	1		1510	183	0.	1		2125	258	0.
1		0245	34	476.	1		0900	109	419.	1		1515	184	0.	1		2130	259	0.
1		0250	35	536.	1		0905	110	381.	1		1520	185	0.	1		2135	260	0.

1	0255	36	606.	*	1	0910	111	346.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	690.	*	1	0915	112	315.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	788.	*	1	0920	113	287.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	903.	*	1	0925	114	262.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	1038.	*	1	0930	115	239.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	1198.	*	1	0935	116	218.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	1394.	*	1	0940	117	198.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1646.	*	1	0945	118	180.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1978.	*	1	0950	119	163.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	2407.	*	1	0955	120	148.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	2918.	*	1	1000	121	134.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	3491.	*	1	1005	122	121.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	4159.	*	1	1010	123	109.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	5233.	*	1	1015	124	99.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	7375.	*	1	1020	125	89.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	10320.	*	1	1025	126	80.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	12806.	*	1	1030	127	72.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	14518.	*	1	1035	128	65.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	15537.	*	1	1040	129	58.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	15961.	*	1	1045	130	52.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	15919.	*	1	1050	131	47.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	15522.	*	1	1055	132	42.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	14925.	*	1	1100	133	38.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	14233.	*	1	1105	134	34.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	13555.	*	1	1110	135	30.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	12996.	*	1	1115	136	27.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	12592.	*	1	1120	137	24.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	12348.	*	1	1125	138	21.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	12257.	*	1	1130	139	19.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	12293.	*	1	1135	140	17.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	12426.	*	1	1140	141	15.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	12593.	*	1	1145	142	14.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	12683.	*	1	1150	143	12.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	12592.	*	1	1155	144	11.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	12284.	*	1	1200	145	10.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	11777.	*	1	1205	146	8.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	11130.	*	1	1210	147	7.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	10396.	*	1	1215	148	7.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	9618.	*	1	1220	149	6.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	8842.	*	1	1225	150	5.	*	1	1840	225	0.	*	2	0055	300	0.

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 15961.	4.50		6210.	1582.	1524.	1524.
		(INCHES)	.981	1.000	1.000	1.000
		(AC-FT)	3080.	3137.	3137.	3137.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .87

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6787.	1		1230	151	6.	1		1845	226	0.
1		0005	2	0.	1		0620	77	6228.	1		1235	152	6.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5707.	1		1240	153	5.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5234.	1		1245	154	4.	1		1900	229	0.
1		0020	5	0.	1		0635	80	4804.	1		1250	155	4.	1		1905	230	0.
1		0025	6	0.	1		0640	81	4414.	1		1255	156	3.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4059.	1		1300	157	3.	1		1915	232	0.
1		0035	8	0.	1		0650	83	3737.	1		1305	158	3.	1		1920	233	0.
1		0040	9	0.	1		0655	84	3444.	1		1310	159	2.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3178.	1		1315	160	2.	1		1930	235	0.
1		0050	11	0.	1		0705	86	2934.	1		1320	161	2.	1		1935	236	0.
1		0055	12	0.	1		0710	87	2708.	1		1325	162	2.	1		1940	237	0.
1		0100	13	0.	1		0715	88	2497.	1		1330	163	1.	1		1945	238	0.
1		0105	14	1.	1		0720	89	2302.	1		1335	164	1.	1		1950	239	0.
1		0110	15	1.	1		0725	90	2120.	1		1340	165	1.	1		1955	240	0.
1		0115	16	2.	1		0730	91	1951.	1		1345	166	1.	1		2000	241	0.
1		0120	17	3.	1		0735	92	1795.	1		1350	167	1.	1		2005	242	0.

1	0125	18	4.	*	1	0740	93	1650.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	6.	*	1	0745	94	1518.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	8.	*	1	0750	95	1396.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	11.	*	1	0755	96	1284.	*	1	1410	171	0.	*	1	2025	246	0.
1	0145	22	15.	*	1	0800	97	1182.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	19.	*	1	0805	98	1089.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	25.	*	1	0810	99	1002.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	33.	*	1	0815	100	919.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	43.	*	1	0820	101	843.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	55.	*	1	0825	102	774.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	70.	*	1	0830	103	710.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	87.	*	1	0835	104	650.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	108.	*	1	0840	105	594.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	133.	*	1	0845	106	541.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	159.	*	1	0850	107	491.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	186.	*	1	0855	108	446.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	214.	*	1	0900	109	405.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	242.	*	1	0905	110	368.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	272.	*	1	0910	111	334.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	307.	*	1	0915	112	304.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	352.	*	1	0920	113	277.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	415.	*	1	0925	114	253.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	500.	*	1	0930	115	231.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	611.	*	1	0935	116	212.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	750.	*	1	0940	117	194.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	928.	*	1	0945	118	178.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1165.	*	1	0950	119	163.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1480.	*	1	0955	120	150.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1865.	*	1	1000	121	137.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	2288.	*	1	1005	122	126.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	2718.	*	1	1010	123	116.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	3113.	*	1	1015	124	106.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	3644.	*	1	1020	125	97.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	5292.	*	1	1025	126	89.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	7899.	*	1	1030	127	82.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	9808.	*	1	1035	128	75.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	10925.	*	1	1040	129	68.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	11492.	*	1	1045	130	62.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	11648.	*	1	1050	131	56.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	11629.	*	1	1055	132	51.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	11439.	*	1	1100	133	46.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	11083.	*	1	1105	134	42.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	10643.	*	1	1110	135	38.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	10205.	*	1	1115	136	34.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	9848.	*	1	1120	137	31.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	9614.	*	1	1125	138	27.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	9506.	*	1	1130	139	25.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	9508.	*	1	1135	140	22.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	9596.	*	1	1140	141	20.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	9743.	*	1	1145	142	18.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	9893.	*	1	1150	143	16.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	9944.	*	1	1155	144	14.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	9816.	*	1	1200	145	13.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	9503.	*	1	1205	146	11.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	9057.	*	1	1210	147	10.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	8534.	*	1	1215	148	9.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	7963.	*	1	1220	149	8.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7373.	*	1	1225	150	7.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 11648.	4.58	(CFS)	4739.	1206.	1162.	1162.
		(INCHES)	.749	.762	.762	.762
		(AC-FT)	2350.	2392.	2392.	2392.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .74

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DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW

1	0000	1	0.	*	1	0615	76	5429.	*	1	1230	151	9.	*	1	1845	226	0.
1	0005	2	0.	*	1	0620	77	5020.	*	1	1235	152	8.	*	1	1850	227	0.
1	0010	3	0.	*	1	0625	78	4624.	*	1	1240	153	7.	*	1	1855	228	0.
1	0015	4	0.	*	1	0630	79	4253.	*	1	1245	154	6.	*	1	1900	229	0.
1	0020	5	0.	*	1	0635	80	3912.	*	1	1250	155	6.	*	1	1905	230	0.
1	0025	6	0.	*	1	0640	81	3599.	*	1	1255	156	5.	*	1	1910	231	0.
1	0030	7	0.	*	1	0645	82	3317.	*	1	1300	157	5.	*	1	1915	232	0.
1	0035	8	0.	*	1	0650	83	3060.	*	1	1305	158	4.	*	1	1920	233	0.
1	0040	9	0.	*	1	0655	84	2826.	*	1	1310	159	4.	*	1	1925	234	0.
1	0045	10	0.	*	1	0700	85	2612.	*	1	1315	160	3.	*	1	1930	235	0.
1	0050	11	0.	*	1	0705	86	2415.	*	1	1320	161	3.	*	1	1935	236	0.
1	0055	12	0.	*	1	0710	87	2235.	*	1	1325	162	2.	*	1	1940	237	0.
1	0100	13	0.	*	1	0715	88	2070.	*	1	1330	163	2.	*	1	1945	238	0.
1	0105	14	0.	*	1	0720	89	1917.	*	1	1335	164	2.	*	1	1950	239	0.
1	0110	15	0.	*	1	0725	90	1773.	*	1	1340	165	2.	*	1	1955	240	0.
1	0115	16	0.	*	1	0730	91	1641.	*	1	1345	166	2.	*	1	2000	241	0.
1	0120	17	0.	*	1	0735	92	1519.	*	1	1350	167	1.	*	1	2005	242	0.
1	0125	18	0.	*	1	0740	93	1404.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	0.	*	1	0745	94	1298.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	1.	*	1	0750	95	1200.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	1.	*	1	0755	96	1108.	*	1	1410	171	1.	*	1	2025	246	0.
1	0145	22	2.	*	1	0800	97	1024.	*	1	1415	172	1.	*	1	2030	247	0.
1	0150	23	4.	*	1	0805	98	945.	*	1	1420	173	1.	*	1	2035	248	0.
1	0155	24	6.	*	1	0810	99	871.	*	1	1425	174	1.	*	1	2040	249	0.
1	0200	25	9.	*	1	0815	100	803.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	12.	*	1	0820	101	741.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	17.	*	1	0825	102	684.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	22.	*	1	0830	103	632.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	30.	*	1	0835	104	585.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	38.	*	1	0840	105	542.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	47.	*	1	0845	106	501.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	57.	*	1	0850	107	463.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	67.	*	1	0855	108	428.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	77.	*	1	0900	109	395.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	87.	*	1	0905	110	363.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	99.	*	1	0910	111	332.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	112.	*	1	0915	112	303.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	128.	*	1	0920	113	277.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	148.	*	1	0925	114	253.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	176.	*	1	0930	115	231.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	219.	*	1	0935	116	212.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	282.	*	1	0940	117	194.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	375.	*	1	0945	118	179.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	507.	*	1	0950	119	164.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	699.	*	1	0955	120	151.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	959.	*	1	1000	121	139.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1265.	*	1	1005	122	128.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	1589.	*	1	1010	123	118.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	1889.	*	1	1015	124	109.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	2130.	*	1	1020	125	101.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	2323.	*	1	1025	126	93.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	2713.	*	1	1030	127	85.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	4510.	*	1	1035	128	79.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	6868.	*	1	1040	129	72.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	7439.	*	1	1045	130	66.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	7803.	*	1	1050	131	61.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	7919.	*	1	1055	132	56.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	7852.	*	1	1100	133	51.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	7791.	*	1	1105	134	46.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	7639.	*	1	1110	135	42.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	7474.	*	1	1115	136	38.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	7265.	*	1	1120	137	35.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	7067.	*	1	1125	138	32.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	6920.	*	1	1130	139	29.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6863.	*	1	1135	140	26.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6883.	*	1	1140	141	24.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6969.	*	1	1145	142	21.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	7092.	*	1	1150	143	19.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	7207.	*	1	1155	144	18.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	7241.	*	1	1200	145	16.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	7149.	*	1	1205	146	14.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6932.	*	1	1210	147	13.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6623.	*	1	1215	148	12.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	6252.	*	1	1220	149	11.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5846.	*	1	1225	150	10.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR

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+   (CFS)       (HR)
                          (CFS)
+    7919.      4.67                 3381.        861.        829.         829.
                         (INCHES)      .534        .544        .544         .544
                          (AC-FT)     1677.       1707.       1707.        1707.

                         CUMULATIVE AREA =   58.84 SQ MI
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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3453.	1		1230	151	15.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3264.	1		1235	152	14.	1		1850	227	0.
1		0010	3	0.	1		0625	78	3076.	1		1240	153	12.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2887.	1		1245	154	11.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2696.	1		1250	155	11.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2505.	1		1255	156	10.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2322.	1		1300	157	9.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2149.	1		1305	158	8.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1991.	1		1310	159	8.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1845.	1		1315	160	7.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1712.	1		1320	161	6.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1591.	1		1325	162	6.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1480.	1		1330	163	5.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1377.	1		1335	164	5.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1282.	1		1340	165	5.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1194.	1		1345	166	4.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1111.	1		1350	167	4.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1034.	1		1355	168	4.	1		2010	243	0.
1		0130	19	0.	1		0745	94	962.	1		1400	169	3.	1		2015	244	0.
1		0135	20	0.	1		0750	95	897.	1		1405	170	3.	1		2020	245	0.
1		0140	21	0.	1		0755	96	836.	1		1410	171	3.	1		2025	246	0.
1		0145	22	0.	1		0800	97	780.	1		1415	172	2.	1		2030	247	0.
1		0150	23	0.	1		0805	98	727.	1		1420	173	2.	1		2035	248	0.
1		0155	24	0.	1		0810	99	678.	1		1425	174	2.	1		2040	249	0.
1		0200	25	0.	1		0815	100	633.	1		1430	175	2.	1		2045	250	0.
1		0205	26	0.	1		0820	101	591.	1		1435	176	2.	1		2050	251	0.
1		0210	27	1.	1		0825	102	552.	1		1440	177	1.	1		2055	252	0.
1		0215	28	2.	1		0830	103	516.	1		1445	178	1.	1		2100	253	0.
1		0220	29	3.	1		0835	104	482.	1		1450	179	1.	1		2105	254	0.
1		0225	30	4.	1		0840	105	451.	1		1455	180	1.	1		2110	255	0.
1		0230	31	6.	1		0845	106	421.	1		1500	181	1.	1		2115	256	0.
1		0235	32	8.	1		0850	107	394.	1		1505	182	1.	1		2120	257	0.
1		0240	33	11.	1		0855	108	368.	1		1510	183	1.	1		2125	258	0.
1		0245	34	13.	1		0900	109	343.	1		1515	184	1.	1		2130	259	0.
1		0250	35	15.	1		0905	110	319.	1		1520	185	1.	1		2135	260	0.
1		0255	36	18.	1		0910	111	297.	1		1525	186	1.	1		2140	261	0.
1		0300	37	20.	1		0915	112	277.	1		1530	187	1.	1		2145	262	0.
1		0305	38	24.	1		0920	113	258.	1		1535	188	0.	1		2150	263	0.
1		0310	39	29.	1		0925	114	241.	1		1540	189	0.	1		2155	264	0.
1		0315	40	36.	1		0930	115	224.	1		1545	190	0.	1		2200	265	0.
1		0320	41	47.	1		0935	116	208.	1		1550	191	0.	1		2205	266	0.
1		0325	42	65.	1		0940	117	193.	1		1555	192	0.	1		2210	267	0.
1		0330	43	92.	1		0945	118	178.	1		1600	193	0.	1		2215	268	0.
1		0335	44	130.	1		0950	119	164.	1		1605	194	0.	1		2220	269	0.
1		0340	45	184.	1		0955	120	151.	1		1610	195	0.	1		2225	270	0.
1		0345	46	251.	1		1000	121	139.	1		1615	196	0.	1		2230	271	0.
1		0350	47	332.	1		1005	122	129.	1		1620	197	0.	1		2235	272	0.
1		0355	48	480.	1		1010	123	119.	1		1625	198	0.	1		2240	273	0.
1		0400	49	677.	1		1015	124	110.	1		1630	199	0.	1		2245	274	0.
1		0405	50	859.	1		1020	125	102.	1		1635	200	0.	1		2250	275	0.
1		0410	51	997.	1		1025	126	94.	1		1640	201	0.	1		2255	276	0.
1		0415	52	1090.	1		1030	127	88.	1		1645	202	0.	1		2300	277	0.
1		0420	53	1133.	1		1035	128	81.	1		1650	203	0.	1		2305	278	0.
1		0425	54	1142.	1		1040	129	76.	1		1655	204	0.	1		2310	279	0.
1		0430	55	1133.	1		1045	130	71.	1		1700	205	0.	1		2315	280	0.
1		0435	56	1630.	1		1050	131	66.	1		1705	206	0.	1		2320	281	0.
1		0440	57	4133.	1		1055	132	61.	1		1710	207	0.	1		2325	282	0.
1		0445	58	4035.	1		1100	133	57.	1		1715	208	0.	1		2330	283	0.
1		0450	59	3845.	1		1105	134	54.	1		1720	209	0.	1		2335	284	0.
1		0455	60	4187.	1		1110	135	50.	1		1725	210	0.	1		2340	285	0.
1		0500	61	3909.	1		1115	136	47.	1		1730	211	0.	1		2345	286	0.
1		0505	62	3987.	1		1120	137	44.	1		1735	212	0.	1		2350	287	0.

1	0510	63	3878.	*	1	1125	138	41.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3836.	*	1	1130	139	38.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	3807.	*	1	1135	140	36.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	3796.	*	1	1140	141	33.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	3801.	*	1	1145	142	31.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	3811.	*	1	1150	143	28.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	3853.	*	1	1155	144	26.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	3932.	*	1	1200	145	24.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	4011.	*	1	1205	146	22.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	4023.	*	1	1210	147	21.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3946.	*	1	1215	148	19.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3807.	*	1	1220	149	17.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3638.	*	1	1225	150	16.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)			
+ 4187.	4.92	1841.	471.	454.	454.
		(INCHES) .291	.298	.298	.298
		(AC-FT) 913.	935.	935.	935.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	1882.	1		1230	151	18.	1		1845	226	0.
1		0005	2	0.	1		0620	77	1812.	1		1235	152	17.	1		1850	227	0.
1		0010	3	0.	1		0625	78	1729.	1		1240	153	16.	1		1855	228	0.
1		0015	4	0.	1		0630	79	1646.	1		1245	154	15.	1		1900	229	0.
1		0020	5	0.	1		0635	80	1550.	1		1250	155	14.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1477.	1		1255	156	13.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1421.	1		1300	157	12.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1357.	1		1305	158	11.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1275.	1		1310	159	10.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1199.	1		1315	160	9.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1128.	1		1320	161	9.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1052.	1		1325	162	8.	1		1940	237	0.
1		0100	13	0.	1		0715	88	976.	1		1330	163	8.	1		1945	238	0.
1		0105	14	0.	1		0720	89	912.	1		1335	164	7.	1		1950	239	0.
1		0110	15	0.	1		0725	90	855.	1		1340	165	7.	1		1955	240	0.
1		0115	16	0.	1		0730	91	798.	1		1345	166	6.	1		2000	241	0.
1		0120	17	0.	1		0735	92	749.	1		1350	167	6.	1		2005	242	0.
1		0125	18	0.	1		0740	93	705.	1		1355	168	5.	1		2010	243	0.
1		0130	19	0.	1		0745	94	662.	1		1400	169	5.	1		2015	244	0.
1		0135	20	0.	1		0750	95	622.	1		1405	170	5.	1		2020	245	0.
1		0140	21	0.	1		0755	96	586.	1		1410	171	4.	1		2025	246	0.
1		0145	22	0.	1		0800	97	549.	1		1415	172	4.	1		2030	247	0.
1		0150	23	0.	1		0805	98	517.	1		1420	173	4.	1		2035	248	0.
1		0155	24	0.	1		0810	99	487.	1		1425	174	4.	1		2040	249	0.
1		0200	25	0.	1		0815	100	457.	1		1430	175	3.	1		2045	250	0.
1		0205	26	0.	1		0820	101	430.	1		1435	176	3.	1		2050	251	0.
1		0210	27	0.	1		0825	102	405.	1		1440	177	3.	1		2055	252	0.
1		0215	28	0.	1		0830	103	381.	1		1445	178	3.	1		2100	253	0.
1		0220	29	0.	1		0835	104	359.	1		1450	179	3.	1		2105	254	0.
1		0225	30	0.	1		0840	105	338.	1		1455	180	2.	1		2110	255	0.
1		0230	31	0.	1		0845	106	318.	1		1500	181	2.	1		2115	256	0.
1		0235	32	0.	1		0850	107	300.	1		1505	182	2.	1		2120	257	0.
1		0240	33	0.	1		0855	108	283.	1		1510	183	2.	1		2125	258	0.
1		0245	34	0.	1		0900	109	267.	1		1515	184	2.	1		2130	259	0.
1		0250	35	0.	1		0905	110	252.	1		1520	185	2.	1		2135	260	0.
1		0255	36	0.	1		0910	111	238.	1		1525	186	2.	1		2140	261	0.
1		0300	37	1.	1		0915	112	225.	1		1530	187	1.	1		2145	262	0.
1		0305	38	1.	1		0920	113	213.	1		1535	188	1.	1		2150	263	0.
1		0310	39	1.	1		0925	114	202.	1		1540	189	1.	1		2155	264	0.
1		0315	40	2.	1		0930	115	191.	1		1545	190	1.	1		2200	265	0.
1		0320	41	4.	1		0935	116	180.	1		1550	191	1.	1		2205	266	0.
1		0325	42	7.	1		0940	117	170.	1		1555	192	1.	1		2210	267	0.
1		0330	43	15.	1		0945	118	159.	1		1600	193	1.	1		2215	268	0.
1		0335	44	29.	1		0950	119	148.	1		1605	194	1.	1		2220	269	0.

1	0340	45	51.	*	1	0955	120	139.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	80.	*	1	1000	121	130.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	114.	*	1	1005	122	121.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	150.	*	1	1010	123	113.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	187.	*	1	1015	124	105.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	227.	*	1	1020	125	98.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	331.	*	1	1025	126	92.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	435.	*	1	1030	127	86.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	476.	*	1	1035	128	80.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	502.	*	1	1040	129	75.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	505.	*	1	1045	130	70.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	499.	*	1	1050	131	65.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	486.	*	1	1055	132	61.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	470.	*	1	1100	133	57.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	457.	*	1	1105	134	53.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	449.	*	1	1110	135	50.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	1403.	*	1	1115	136	46.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	2477.	*	1	1120	137	43.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	1533.	*	1	1125	138	41.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	1925.	*	1	1130	139	38.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	2145.	*	1	1135	140	36.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	1823.	*	1	1140	141	33.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2030.	*	1	1145	142	31.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	1894.	*	1	1150	143	30.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	1853.	*	1	1155	144	28.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	1868.	*	1	1200	145	26.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	1873.	*	1	1205	146	25.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	1932.	*	1	1210	147	23.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	2004.	*	1	1215	148	22.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	2021.	*	1	1220	149	20.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	1992.	*	1	1225	150	19.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)			
+ 2477.	5.08	908.	236.	227.	227.
		(INCHES) .144	.149	.149	.149
		(AC-FT) 450.	467.	467.	467.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	71.	1		1230	151	15.	1		1845	226	0.
1		0005	2	0.	1		0620	77	64.	1		1235	152	14.	1		1850	227	0.
1		0010	3	0.	1		0625	78	60.	1		1240	153	13.	1		1855	228	0.
1		0015	4	0.	1		0630	79	280.	1		1245	154	12.	1		1900	229	0.
1		0020	5	0.	1		0635	80	303.	1		1250	155	12.	1		1905	230	0.
1		0025	6	0.	1		0640	81	134.	1		1255	156	11.	1		1910	231	0.
1		0030	7	0.	1		0645	82	376.	1		1300	157	11.	1		1915	232	0.
1		0035	8	0.	1		0650	83	427.	1		1305	158	10.	1		1920	233	0.
1		0040	9	0.	1		0655	84	325.	1		1310	159	10.	1		1925	234	0.
1		0045	10	0.	1		0700	85	401.	1		1315	160	9.	1		1930	235	0.
1		0050	11	0.	1		0705	86	289.	1		1320	161	9.	1		1935	236	0.
1		0055	12	0.	1		0710	87	309.	1		1325	162	8.	1		1940	237	0.
1		0100	13	0.	1		0715	88	343.	1		1330	163	8.	1		1945	238	0.
1		0105	14	0.	1		0720	89	261.	1		1335	164	7.	1		1950	239	0.
1		0110	15	0.	1		0725	90	261.	1		1340	165	7.	1		1955	240	0.
1		0115	16	0.	1		0730	91	261.	1		1345	166	6.	1		2000	241	0.
1		0120	17	0.	1		0735	92	243.	1		1350	167	6.	1		2005	242	0.
1		0125	18	0.	1		0740	93	233.	1		1355	168	6.	1		2010	243	0.
1		0130	19	0.	1		0745	94	229.	1		1400	169	6.	1		2015	244	0.
1		0135	20	0.	1		0750	95	202.	1		1405	170	5.	1		2020	245	0.
1		0140	21	0.	1		0755	96	205.	1		1410	171	5.	1		2025	246	0.
1		0145	22	0.	1		0800	97	212.	1		1415	172	5.	1		2030	247	0.
1		0150	23	0.	1		0805	98	184.	1		1420	173	5.	1		2035	248	0.
1		0155	24	0.	1		0810	99	190.	1		1425	174	4.	1		2040	249	0.
1		0200	25	0.	1		0815	100	177.	1		1430	175	4.	1		2045	250	0.
1		0205	26	0.	1		0820	101	164.	1		1435	176	4.	1		2050	251	0.

1	0210	27	0.	*	1	0825	102	161.	*	1	1440	177	4.	*	1	2055	252	0.
1	0215	28	0.	*	1	0830	103	144.	*	1	1445	178	4.	*	1	2100	253	0.
1	0220	29	0.	*	1	0835	104	134.	*	1	1450	179	4.	*	1	2105	254	0.
1	0225	30	0.	*	1	0840	105	133.	*	1	1455	180	3.	*	1	2110	255	0.
1	0230	31	0.	*	1	0845	106	122.	*	1	1500	181	3.	*	1	2115	256	0.
1	0235	32	0.	*	1	0850	107	120.	*	1	1505	182	3.	*	1	2120	257	0.
1	0240	33	0.	*	1	0855	108	118.	*	1	1510	183	3.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	109.	*	1	1515	184	3.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	104.	*	1	1520	185	3.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	98.	*	1	1525	186	2.	*	1	2140	261	0.
1	0300	37	0.	*	1	0915	112	91.	*	1	1530	187	2.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	87.	*	1	1535	188	2.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	84.	*	1	1540	189	2.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	85.	*	1	1545	190	2.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	83.	*	1	1550	191	2.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	78.	*	1	1555	192	2.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	73.	*	1	1600	193	2.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	69.	*	1	1605	194	2.	*	1	2220	269	0.
1	0340	45	0.	*	1	0955	120	66.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	0.	*	1	1000	121	64.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	0.	*	1	1005	122	61.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	1.	*	1	1010	123	57.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	5.	*	1	1015	124	53.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	11.	*	1	1020	125	50.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	19.	*	1	1025	126	48.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	26.	*	1	1030	127	47.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	32.	*	1	1035	128	45.	*	1	1650	203	1.	*	1	2305	278	0.
1	0425	54	36.	*	1	1040	129	44.	*	1	1655	204	1.	*	1	2310	279	0.
1	0430	55	40.	*	1	1045	130	42.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	43.	*	1	1050	131	40.	*	1	1705	206	1.	*	1	2320	281	0.
1	0440	57	44.	*	1	1055	132	38.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	46.	*	1	1100	133	36.	*	1	1715	208	1.	*	1	2330	283	0.
1	0450	59	53.	*	1	1105	134	35.	*	1	1720	209	1.	*	1	2335	284	0.
1	0455	60	72.	*	1	1110	135	34.	*	1	1725	210	1.	*	1	2340	285	0.
1	0500	61	68.	*	1	1115	136	32.	*	1	1730	211	1.	*	1	2345	286	0.
1	0505	62	70.	*	1	1120	137	31.	*	1	1735	212	1.	*	1	2350	287	0.
1	0510	63	77.	*	1	1125	138	29.	*	1	1740	213	1.	*	1	2355	288	0.
1	0515	64	77.	*	1	1130	139	28.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	81.	*	1	1135	140	26.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	84.	*	1	1140	141	25.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	88.	*	1	1145	142	24.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	93.	*	1	1150	143	23.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	99.	*	1	1155	144	21.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	105.	*	1	1200	145	20.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	105.	*	1	1205	146	19.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	101.	*	1	1210	147	18.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	95.	*	1	1215	148	17.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	87.	*	1	1220	149	16.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	79.	*	1	1225	150	16.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)	(CFS)				
+ 427.	6.83		140.	39.	38.	38.
		(INCHES)	.022	.025	.025	.025
		(AC-FT)	70.	77.	77.	77.

CUMULATIVE AREA = 58.84 SQ MI

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            **************
            *            *
1305 KK     *    FINISH  *
            *            *
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1307 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

1306 RD MUSKINGUM-CUNGE CHANNEL ROUTING

L	1500.	CHANNEL LENGTH
S	.0090	SLOPE
N	.050	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	250.00	BOTTOM WIDTH OR DIAMETER
Z	3.00	SIDE SLOPE

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COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.55	750.00	10167.45	324.28	1.08	9.79
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		10165.62	325.00	1.08	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5134E+04 EXCESS= .0000E+00 OUTFLOW= .5134E+04 BASIN STORAGE= .1018E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = 1.00

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	8337.	1		1230	151	2694.	1		1845	226	206.
1		0005	2	0.	1		0620	77	8531.	1		1235	152	2671.	1		1850	227	169.
1		0010	3	0.	1		0625	78	8797.	1		1240	153	2647.	1		1855	228	133.
1		0015	4	0.	1		0630	79	8947.	1		1245	154	2623.	1		1900	229	101.
1		0020	5	0.	1		0635	80	8964.	1		1250	155	2599.	1		1905	230	76.
1		0025	6	0.	1		0640	81	8883.	1		1255	156	2575.	1		1910	231	57.
1		0030	7	0.	1		0645	82	8726.	1		1300	157	2551.	1		1915	232	43.
1		0035	8	1.	1		0650	83	8513.	1		1305	158	2528.	1		1920	233	32.
1		0040	9	3.	1		0655	84	8261.	1		1310	159	2505.	1		1925	234	24.
1		0045	10	6.	1		0700	85	7980.	1		1315	160	2480.	1		1930	235	18.
1		0050	11	11.	1		0705	86	7678.	1		1320	161	2455.	1		1935	236	14.
1		0055	12	19.	1		0710	87	7362.	1		1325	162	2429.	1		1940	237	10.
1		0100	13	29.	1		0715	88	7038.	1		1330	163	2403.	1		1945	238	8.
1		0105	14	42.	1		0720	89	6711.	1		1335	164	2378.	1		1950	239	6.
1		0110	15	58.	1		0725	90	6384.	1		1340	165	2353.	1		1955	240	4.
1		0115	16	74.	1		0730	91	6057.	1		1345	166	2328.	1		2000	241	3.
1		0120	17	92.	1		0735	92	5734.	1		1350	167	2302.	1		2005	242	2.
1		0125	18	111.	1		0740	93	5417.	1		1355	168	2275.	1		2010	243	2.
1		0130	19	130.	1		0745	94	5117.	1		1400	169	2247.	1		2015	244	1.
1		0135	20	152.	1		0750	95	4859.	1		1405	170	2219.	1		2020	245	1.
1		0140	21	177.	1		0755	96	4672.	1		1410	171	2191.	1		2025	246	1.
1		0145	22	207.	1		0800	97	4552.	1		1415	172	2163.	1		2030	247	1.
1		0150	23	243.	1		0805	98	4463.	1		1420	173	2136.	1		2035	248	0.
1		0155	24	285.	1		0810	99	4381.	1		1425	174	2108.	1		2040	249	0.
1		0200	25	334.	1		0815	100	4305.	1		1430	175	2078.	1		2045	250	0.
1		0205	26	390.	1		0820	101	4233.	1		1435	176	2046.	1		2050	251	0.
1		0210	27	453.	1		0825	102	4164.	1		1440	177	2015.	1		2055	252	0.
1		0215	28	520.	1		0830	103	4100.	1		1445	178	1984.	1		2100	253	0.
1		0220	29	591.	1		0835	104	4039.	1		1450	179	1953.	1		2105	254	0.
1		0225	30	663.	1		0840	105	3981.	1		1455	180	1922.	1		2110	255	0.
1		0230	31	737.	1		0845	106	3927.	1		1500	181	1889.	1		2115	256	0.
1		0235	32	809.	1		0850	107	3875.	1		1505	182	1855.	1		2120	257	0.
1		0240	33	877.	1		0855	108	3826.	1		1510	183	1819.	1		2125	258	0.
1		0245	34	938.	1		0900	109	3780.	1		1515	184	1784.	1		2130	259	0.
1		0250	35	994.	1		0905	110	3737.	1		1520	185	1750.	1		2135	260	0.
1		0255	36	1046.	1		0910	111	3695.	1		1525	186	1716.	1		2140	261	0.
1		0300	37	1100.	1		0915	112	3657.	1		1530	187	1680.	1		2145	262	0.
1		0305	38	1171.	1		0920	113	3620.	1		1535	188	1644.	1		2150	263	0.
1		0310	39	1275.	1		0925	114	3586.	1		1540	189	1606.	1		2155	264	0.
1		0315	40	1428.	1		0930	115	3552.	1		1545	190	1570.	1		2200	265	0.
1		0320	41	1653.	1		0935	116	3520.	1		1550	191	1534.	1		2205	266	0.
1		0325	42	1968.	1		0940	117	3488.	1		1555	192	1498.	1		2210	267	0.
1		0330	43	2392.	1		0945	118	3457.	1		1600	193	1461.	1		2215	268	0.

1	0335	44	2939.	*	1	0950	119	3428.	*	1	1605	194	1423.	*	1	2220	269	0.
1	0340	45	3603.	*	1	0955	120	3399.	*	1	1610	195	1384.	*	1	2225	270	0.
1	0345	46	4358.	*	1	1000	121	3372.	*	1	1615	196	1346.	*	1	2230	271	0.
1	0350	47	5169.	*	1	1005	122	3346.	*	1	1620	197	1309.	*	1	2235	272	0.
1	0355	48	5994.	*	1	1010	123	3320.	*	1	1625	198	1273.	*	1	2240	273	0.
1	0400	49	6760.	*	1	1015	124	3296.	*	1	1630	199	1235.	*	1	2245	274	0.
1	0405	50	7406.	*	1	1020	125	3272.	*	1	1635	200	1197.	*	1	2250	275	0.
1	0410	51	7918.	*	1	1025	126	3248.	*	1	1640	201	1157.	*	1	2255	276	0.
1	0415	52	8322.	*	1	1030	127	3223.	*	1	1645	202	1118.	*	1	2300	277	0.
1	0420	53	8644.	*	1	1035	128	3199.	*	1	1650	203	1080.	*	1	2305	278	0.
1	0425	54	8884.	*	1	1040	129	3176.	*	1	1655	204	1043.	*	1	2310	279	0.
1	0430	55	9037.	*	1	1045	130	3153.	*	1	1700	205	1006.	*	1	2315	280	0.
1	0435	56	9120.	*	1	1050	131	3130.	*	1	1705	206	968.	*	1	2320	281	0.
1	0440	57	9158.	*	1	1055	132	3108.	*	1	1710	207	928.	*	1	2325	282	0.
1	0445	58	9175.	*	1	1100	133	3087.	*	1	1715	208	889.	*	1	2330	283	0.
1	0450	59	9216.	*	1	1105	134	3066.	*	1	1720	209	851.	*	1	2335	284	0.
1	0455	60	9319.	*	1	1110	135	3045.	*	1	1725	210	814.	*	1	2340	285	0.
1	0500	61	9482.	*	1	1115	136	3023.	*	1	1730	211	779.	*	1	2345	286	0.
1	0505	62	9670.	*	1	1120	137	3001.	*	1	1735	212	743.	*	1	2350	287	0.
1	0510	63	9856.	*	1	1125	138	2979.	*	1	1740	213	705.	*	1	2355	288	0.
1	0515	64	10020.	*	1	1130	139	2957.	*	1	1745	214	665.	*	2	0000	289	0.
1	0520	65	10130.	*	1	1135	140	2935.	*	1	1750	215	625.	*	2	0005	290	0.
1	0525	66	10166.	*	1	1140	141	2914.	*	1	1755	216	588.	*	2	0010	291	0.
1	0530	67	10126.	*	1	1145	142	2893.	*	1	1800	217	552.	*	2	0015	292	0.
1	0535	68	10018.	*	1	1150	143	2872.	*	1	1805	218	517.	*	2	0020	293	0.
1	0540	69	9855.	*	1	1155	144	2851.	*	1	1810	219	480.	*	2	0025	294	0.
1	0545	70	9647.	*	1	1200	145	2828.	*	1	1815	220	438.	*	2	0030	295	0.
1	0550	71	9403.	*	1	1205	146	2805.	*	1	1820	221	393.	*	2	0035	296	0.
1	0555	72	9139.	*	1	1210	147	2782.	*	1	1825	222	349.	*	2	0040	297	0.
1	0600	73	8866.	*	1	1215	148	2760.	*	1	1830	223	308.	*	2	0045	298	0.
1	0605	74	8596.	*	1	1220	149	2738.	*	1	1835	224	272.	*	2	0050	299	0.
1	0610	75	8380.	*	1	1225	150	2716.	*	1	1840	225	239.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 10166.	5.42		6908.	2588.	2493.	2493.
		(INCHES)	.723	1.083	1.083	1.083
		(AC-FT)	3425.	5134.	5134.	5134.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.75	750.00	8379.41	327.51	.83	9.08
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		8374.66	325.00	.83	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3953E+04 EXCESS= .0000E+00 OUTFLOW= .3953E+04 BASIN STORAGE= .1047E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .87

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6849.	1		1230	151	2222.	1		1845	226	1.
1		0005	2	0.	1		0620	77	6667.	1		1235	152	2193.	1		1850	227	1.
1		0010	3	0.	1		0625	78	6491.	1		1240	153	2165.	1		1855	228	1.
1		0015	4	0.	1		0630	79	6319.	1		1245	154	2136.	1		1900	229	1.
1		0020	5	0.	1		0635	80	6151.	1		1250	155	2106.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5988.	1		1255	156	2074.	1		1910	231	0.
1		0030	7	0.	1		0645	82	5828.	1		1300	157	2042.	1		1915	232	0.
1		0035	8	0.	1		0650	83	5674.	1		1305	158	2009.	1		1920	233	0.

1	0040	9	0.	*	1	0655	84	5527.	*	1	1310	159	1978.	*	1	1925	234	0.
1	0045	10	1.	*	1	0700	85	5385.	*	1	1315	160	1946.	*	1	1930	235	0.
1	0050	11	2.	*	1	0705	86	5249.	*	1	1320	161	1914.	*	1	1935	236	0.
1	0055	12	4.	*	1	0710	87	5119.	*	1	1325	162	1880.	*	1	1940	237	0.
1	0100	13	7.	*	1	0715	88	4995.	*	1	1330	163	1844.	*	1	1945	238	0.
1	0105	14	11.	*	1	0720	89	4877.	*	1	1335	164	1808.	*	1	1950	239	0.
1	0110	15	17.	*	1	0725	90	4764.	*	1	1340	165	1773.	*	1	1955	240	0.
1	0115	16	23.	*	1	0730	91	4656.	*	1	1345	166	1739.	*	1	2000	241	0.
1	0120	17	31.	*	1	0735	92	4551.	*	1	1350	167	1703.	*	1	2005	242	0.
1	0125	18	40.	*	1	0740	93	4449.	*	1	1355	168	1667.	*	1	2010	243	0.
1	0130	19	50.	*	1	0745	94	4352.	*	1	1400	169	1629.	*	1	2015	244	0.
1	0135	20	62.	*	1	0750	95	4261.	*	1	1405	170	1592.	*	1	2020	245	0.
1	0140	21	77.	*	1	0755	96	4175.	*	1	1410	171	1555.	*	1	2025	246	0.
1	0145	22	95.	*	1	0800	97	4094.	*	1	1415	172	1519.	*	1	2030	247	0.
1	0150	23	117.	*	1	0805	98	4020.	*	1	1420	173	1483.	*	1	2035	248	0.
1	0155	24	144.	*	1	0810	99	3950.	*	1	1425	174	1445.	*	1	2040	249	0.
1	0200	25	176.	*	1	0815	100	3885.	*	1	1430	175	1407.	*	1	2045	250	0.
1	0205	26	213.	*	1	0820	101	3824.	*	1	1435	176	1368.	*	1	2050	251	0.
1	0210	27	254.	*	1	0825	102	3766.	*	1	1440	177	1330.	*	1	2055	252	0.
1	0215	28	299.	*	1	0830	103	3711.	*	1	1445	178	1294.	*	1	2100	253	0.
1	0220	29	347.	*	1	0835	104	3658.	*	1	1450	179	1257.	*	1	2105	254	0.
1	0225	30	395.	*	1	0840	105	3607.	*	1	1455	180	1219.	*	1	2110	255	0.
1	0230	31	443.	*	1	0845	106	3559.	*	1	1500	181	1179.	*	1	2115	256	0.
1	0235	32	488.	*	1	0850	107	3512.	*	1	1505	182	1140.	*	1	2120	257	0.
1	0240	33	529.	*	1	0855	108	3468.	*	1	1510	183	1101.	*	1	2125	258	0.
1	0245	34	565.	*	1	0900	109	3425.	*	1	1515	184	1064.	*	1	2130	259	0.
1	0250	35	596.	*	1	0905	110	3385.	*	1	1520	185	1027.	*	1	2135	260	0.
1	0255	36	629.	*	1	0910	111	3346.	*	1	1525	186	989.	*	1	2140	261	0.
1	0300	37	668.	*	1	0915	112	3310.	*	1	1530	187	950.	*	1	2145	262	0.
1	0305	38	721.	*	1	0920	113	3275.	*	1	1535	188	911.	*	1	2150	263	0.
1	0310	39	794.	*	1	0925	114	3241.	*	1	1540	189	872.	*	1	2155	264	0.
1	0315	40	901.	*	1	0930	115	3208.	*	1	1545	190	835.	*	1	2200	265	0.
1	0320	41	1059.	*	1	0935	116	3175.	*	1	1550	191	799.	*	1	2205	266	0.
1	0325	42	1274.	*	1	0940	117	3143.	*	1	1555	192	763.	*	1	2210	267	0.
1	0330	43	1569.	*	1	0945	118	3112.	*	1	1600	193	727.	*	1	2215	268	0.
1	0335	44	1973.	*	1	0950	119	3082.	*	1	1605	194	688.	*	1	2220	269	0.
1	0340	45	2491.	*	1	0955	120	3052.	*	1	1610	195	648.	*	1	2225	270	0.
1	0345	46	3098.	*	1	1000	121	3024.	*	1	1615	196	610.	*	1	2230	271	0.
1	0350	47	3765.	*	1	1005	122	2996.	*	1	1620	197	575.	*	1	2235	272	0.
1	0355	48	4443.	*	1	1010	123	2969.	*	1	1625	198	540.	*	1	2240	273	0.
1	0400	49	5076.	*	1	1015	124	2942.	*	1	1630	199	507.	*	1	2245	274	0.
1	0405	50	5622.	*	1	1020	125	2914.	*	1	1635	200	471.	*	1	2250	275	0.
1	0410	51	6055.	*	1	1025	126	2886.	*	1	1640	201	430.	*	1	2255	276	0.
1	0415	52	6385.	*	1	1030	127	2859.	*	1	1645	202	387.	*	1	2300	277	0.
1	0420	53	6639.	*	1	1035	128	2833.	*	1	1650	203	345.	*	1	2305	278	0.
1	0425	54	6834.	*	1	1040	129	2807.	*	1	1655	204	307.	*	1	2310	279	0.
1	0430	55	6988.	*	1	1045	130	2781.	*	1	1700	205	273.	*	1	2315	280	0.
1	0435	56	7114.	*	1	1050	131	2756.	*	1	1705	206	242.	*	1	2320	281	0.
1	0440	57	7212.	*	1	1055	132	2731.	*	1	1710	207	209.	*	1	2325	282	0.
1	0445	58	7286.	*	1	1100	133	2705.	*	1	1715	208	174.	*	1	2330	283	0.
1	0450	59	7369.	*	1	1105	134	2678.	*	1	1720	209	137.	*	1	2335	284	0.
1	0455	60	7494.	*	1	1110	135	2652.	*	1	1725	210	106.	*	1	2340	285	0.
1	0500	61	7664.	*	1	1115	136	2626.	*	1	1730	211	80.	*	1	2345	286	0.
1	0505	62	7853.	*	1	1120	137	2600.	*	1	1735	212	61.	*	1	2350	287	0.
1	0510	63	8038.	*	1	1125	138	2575.	*	1	1740	213	46.	*	1	2355	288	0.
1	0515	64	8201.	*	1	1130	139	2550.	*	1	1745	214	35.	*	2	0000	289	0.
1	0520	65	8319.	*	1	1135	140	2524.	*	1	1750	215	26.	*	2	0005	290	0.
1	0525	66	8375.	*	1	1140	141	2498.	*	1	1755	216	20.	*	2	0010	291	0.
1	0530	67	8367.	*	1	1145	142	2470.	*	1	1800	217	15.	*	2	0015	292	0.
1	0535	68	8301.	*	1	1150	143	2443.	*	1	1805	218	11.	*	2	0020	293	0.
1	0540	69	8187.	*	1	1155	144	2416.	*	1	1810	219	9.	*	2	0025	294	0.
1	0545	70	8036.	*	1	1200	145	2389.	*	1	1815	220	7.	*	2	0030	295	0.
1	0550	71	7856.	*	1	1205	146	2363.	*	1	1820	221	5.	*	2	0035	296	0.
1	0555	72	7659.	*	1	1210	147	2336.	*	1	1825	222	4.	*	2	0040	297	0.
1	0600	73	7453.	*	1	1215	148	2309.	*	1	1830	223	3.	*	2	0045	298	0.
1	0605	74	7244.	*	1	1220	149	2280.	*	1	1835	224	2.	*	2	0050	299	0.
1	0610	75	7041.	*	1	1225	150	2251.	*	1	1840	225	2.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 8375.	5.42		5512.	1993.	1920.	1920.
		(INCHES)	.577	.834	.834	.834
		(AC-FT)	2733.	3953.	3953.	3953.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	COMPUTATION TIME STEP M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.03	750.00	6550.66	330.18	.60	8.25

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		6550.51	330.00	.60	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2858E+04 EXCESS= .0000E+00 OUTFLOW= .2858E+04 BASIN STORAGE= .1127E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .74

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	5527.	1		1230	151	1389.	1		1845	226	0.
1		0005	2	0.	1		0620	77	5399.	1		1235	152	1350.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5275.	1		1240	153	1313.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5152.	1		1245	154	1275.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5032.	1		1250	155	1237.	1		1905	230	0.
1		0025	6	0.	1		0640	81	4914.	1		1255	156	1197.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4797.	1		1300	157	1157.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4683.	1		1305	158	1117.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4573.	1		1310	159	1079.	1		1925	234	0.
1		0045	10	0.	1		0700	85	4466.	1		1315	160	1042.	1		1930	235	0.
1		0050	11	0.	1		0705	86	4362.	1		1320	161	1004.	1		1935	236	0.
1		0055	12	0.	1		0710	87	4262.	1		1325	162	965.	1		1940	237	0.
1		0100	13	0.	1		0715	88	4167.	1		1330	163	925.	1		1945	238	0.
1		0105	14	1.	1		0720	89	4075.	1		1335	164	886.	1		1950	239	0.
1		0110	15	2.	1		0725	90	3987.	1		1340	165	848.	1		1955	240	0.
1		0115	16	3.	1		0730	91	3902.	1		1345	166	812.	1		2000	241	0.
1		0120	17	4.	1		0735	92	3819.	1		1350	167	776.	1		2005	242	0.
1		0125	18	7.	1		0740	93	3738.	1		1355	168	739.	1		2010	243	0.
1		0130	19	10.	1		0745	94	3660.	1		1400	169	701.	1		2015	244	0.
1		0135	20	14.	1		0750	95	3586.	1		1405	170	661.	1		2020	245	0.
1		0140	21	20.	1		0755	96	3515.	1		1410	171	622.	1		2025	246	0.
1		0145	22	28.	1		0800	97	3449.	1		1415	172	586.	1		2030	247	0.
1		0150	23	38.	1		0805	98	3386.	1		1420	173	551.	1		2035	248	0.
1		0155	24	51.	1		0810	99	3327.	1		1425	174	518.	1		2040	249	0.
1		0200	25	68.	1		0815	100	3272.	1		1430	175	484.	1		2045	250	0.
1		0205	26	88.	1		0820	101	3219.	1		1435	176	447.	1		2050	251	0.
1		0210	27	112.	1		0825	102	3169.	1		1440	177	407.	1		2055	252	0.
1		0215	28	138.	1		0830	103	3120.	1		1445	178	366.	1		2100	253	0.
1		0220	29	167.	1		0835	104	3073.	1		1450	179	328.	1		2105	254	0.
1		0225	30	197.	1		0840	105	3028.	1		1455	180	293.	1		2110	255	0.
1		0230	31	227.	1		0845	106	2983.	1		1500	181	261.	1		2115	256	0.
1		0235	32	256.	1		0850	107	2939.	1		1505	182	231.	1		2120	257	0.
1		0240	33	282.	1		0855	108	2897.	1		1510	183	198.	1		2125	258	0.
1		0245	34	305.	1		0900	109	2857.	1		1515	184	162.	1		2130	259	0.
1		0250	35	324.	1		0905	110	2818.	1		1520	185	127.	1		2135	260	0.
1		0255	36	342.	1		0910	111	2781.	1		1525	186	97.	1		2140	261	0.
1		0300	37	363.	1		0915	112	2744.	1		1530	187	74.	1		2145	262	0.
1		0305	38	391.	1		0920	113	2709.	1		1535	188	56.	1		2150	263	0.
1		0310	39	430.	1		0925	114	2674.	1		1540	189	42.	1		2155	264	0.
1		0315	40	491.	1		0930	115	2639.	1		1545	190	32.	1		2200	265	0.
1		0320	41	582.	1		0935	116	2604.	1		1550	191	25.	1		2205	266	0.
1		0325	42	718.	1		0940	117	2570.	1		1555	192	19.	1		2210	267	0.
1		0330	43	917.	1		0945	118	2536.	1		1600	193	14.	1		2215	268	0.
1		0335	44	1196.	1		0950	119	2504.	1		1605	194	11.	1		2220	269	0.
1		0340	45	1565.	1		0955	120	2472.	1		1610	195	8.	1		2225	270	0.
1		0345	46	2003.	1		1000	121	2440.	1		1615	196	6.	1		2230	271	0.
1		0350	47	2482.	1		1005	122	2408.	1		1620	197	5.	1		2235	272	0.
1		0355	48	2987.	1		1010	123	2375.	1		1625	198	4.	1		2240	273	0.
1		0400	49	3480.	1		1015	124	2342.	1		1630	199	3.	1		2245	274	0.
1		0405	50	3924.	1		1020	125	2310.	1		1635	200	2.	1		2250	275	0.
1		0410	51	4291.	1		1025	126	2278.	1		1640	201	2.	1		2255	276	0.
1		0415	52	4573.	1		1030	127	2246.	1		1645	202	1.	1		2300	277	0.
1		0420	53	4781.	1		1035	128	2215.	1		1650	203	1.	1		2305	278	0.
1		0425	54	4919.	1		1040	129	2183.	1		1655	204	1.	1		2310	279	0.

1	0430	55	5009.	*	1	1045	130	2151.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	5095.	*	1	1050	131	2117.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	5200.	*	1	1055	132	2082.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	5318.	*	1	1100	133	2049.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	5447.	*	1	1105	134	2015.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	5604.	*	1	1110	135	1982.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	5791.	*	1	1115	136	1949.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	5984.	*	1	1120	137	1913.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	6169.	*	1	1125	138	1876.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	6335.	*	1	1130	139	1839.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6459.	*	1	1135	140	1803.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6530.	*	1	1140	141	1767.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6551.	*	1	1145	142	1731.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	6522.	*	1	1150	143	1694.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	6453.	*	1	1155	144	1656.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	6355.	*	1	1200	145	1617.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	6232.	*	1	1205	146	1580.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6094.	*	1	1210	147	1543.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	5950.	*	1	1215	148	1506.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5805.	*	1	1220	149	1468.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5662.	*	1	1225	150	1429.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS) 6-HR	24-HR	72-HR	24.92-HR
+ 6551.	5.50	4357.	1441.	1388.	1388.
		(INCHES) .456	.603	.603	.603
		(AC-FT) 2160.	2858.	2858.	2858.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.64	750.00	4087.82	334.85	.34	6.87
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		4087.61	335.00	.34	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1606E+04 EXCESS= .0000E+00 OUTFLOW= .1606E+04 BASIN STORAGE= .1077E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3647.	1		1230	151	321.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3584.	1		1235	152	292.	1		1850	227	0.
1		0010	3	0.	1		0625	78	3521.	1		1240	153	265.	1		1855	228	0.
1		0015	4	0.	1		0630	79	3459.	1		1245	154	240.	1		1900	229	0.
1		0020	5	0.	1		0635	80	3396.	1		1250	155	213.	1		1905	230	0.
1		0025	6	0.	1		0640	81	3332.	1		1255	156	183.	1		1910	231	0.
1		0030	7	0.	1		0645	82	3267.	1		1300	157	150.	1		1915	232	0.
1		0035	8	0.	1		0650	83	3203.	1		1305	158	120.	1		1920	233	0.
1		0040	9	0.	1		0655	84	3139.	1		1310	159	96.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3076.	1		1315	160	76.	1		1930	235	0.
1		0050	11	0.	1		0705	86	3013.	1		1320	161	61.	1		1935	236	0.
1		0055	12	0.	1		0710	87	2951.	1		1325	162	50.	1		1940	237	0.
1		0100	13	0.	1		0715	88	2891.	1		1330	163	41.	1		1945	238	0.
1		0105	14	0.	1		0720	89	2831.	1		1335	164	34.	1		1950	239	0.
1		0110	15	0.	1		0725	90	2773.	1		1340	165	28.	1		1955	240	0.
1		0115	16	0.	1		0730	91	2717.	1		1345	166	24.	1		2000	241	0.
1		0120	17	0.	1		0735	92	2660.	1		1350	167	20.	1		2005	242	0.
1		0125	18	0.	1		0740	93	2604.	1		1355	168	18.	1		2010	243	0.
1		0130	19	0.	1		0745	94	2550.	1		1400	169	15.	1		2015	244	0.

1	0135	20	0.	*	1	0750	95	2496.	*	1	1405	170	13.	*	1	2020	245	0.
1	0140	21	0.	*	1	0755	96	2445.	*	1	1410	171	12.	*	1	2025	246	0.
1	0145	22	1.	*	1	0800	97	2395.	*	1	1415	172	10.	*	1	2030	247	0.
1	0150	23	1.	*	1	0805	98	2348.	*	1	1420	173	9.	*	1	2035	248	0.
1	0155	24	3.	*	1	0810	99	2302.	*	1	1425	174	8.	*	1	2040	249	0.
1	0200	25	5.	*	1	0815	100	2257.	*	1	1430	175	7.	*	1	2045	250	0.
1	0205	26	8.	*	1	0820	101	2213.	*	1	1435	176	7.	*	1	2050	251	0.
1	0210	27	13.	*	1	0825	102	2169.	*	1	1440	177	6.	*	1	2055	252	0.
1	0215	28	19.	*	1	0830	103	2124.	*	1	1445	178	5.	*	1	2100	253	0.
1	0220	29	27.	*	1	0835	104	2081.	*	1	1450	179	5.	*	1	2105	254	0.
1	0225	30	36.	*	1	0840	105	2039.	*	1	1455	180	4.	*	1	2110	255	0.
1	0230	31	46.	*	1	0845	106	1997.	*	1	1500	181	4.	*	1	2115	256	0.
1	0235	32	57.	*	1	0850	107	1957.	*	1	1505	182	4.	*	1	2120	257	0.
1	0240	33	68.	*	1	0855	108	1917.	*	1	1510	183	3.	*	1	2125	258	0.
1	0245	34	78.	*	1	0900	109	1878.	*	1	1515	184	3.	*	1	2130	259	0.
1	0250	35	88.	*	1	0905	110	1838.	*	1	1520	185	3.	*	1	2135	260	0.
1	0255	36	97.	*	1	0910	111	1798.	*	1	1525	186	2.	*	1	2140	261	0.
1	0300	37	107.	*	1	0915	112	1758.	*	1	1530	187	2.	*	1	2145	262	0.
1	0305	38	119.	*	1	0920	113	1719.	*	1	1535	188	2.	*	1	2150	263	0.
1	0310	39	137.	*	1	0925	114	1680.	*	1	1540	189	2.	*	1	2155	264	0.
1	0315	40	162.	*	1	0930	115	1643.	*	1	1545	190	2.	*	1	2200	265	0.
1	0320	41	200.	*	1	0935	116	1606.	*	1	1550	191	2.	*	1	2205	266	0.
1	0325	42	255.	*	1	0940	117	1568.	*	1	1555	192	1.	*	1	2210	267	0.
1	0330	43	342.	*	1	0945	118	1530.	*	1	1600	193	1.	*	1	2215	268	0.
1	0335	44	477.	*	1	0950	119	1491.	*	1	1605	194	1.	*	1	2220	269	0.
1	0340	45	663.	*	1	0955	120	1452.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	900.	*	1	1000	121	1414.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	1175.	*	1	1005	122	1377.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	1474.	*	1	1010	123	1340.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	1772.	*	1	1015	124	1303.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	2039.	*	1	1020	125	1265.	*	1	1635	200	1.	*	1	2250	275	0.
1	0410	51	2263.	*	1	1025	126	1226.	*	1	1640	201	1.	*	1	2255	276	0.
1	0415	52	2453.	*	1	1030	127	1186.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	2602.	*	1	1035	128	1148.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	2715.	*	1	1040	129	1111.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	2798.	*	1	1045	130	1074.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	2844.	*	1	1050	131	1038.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	2865.	*	1	1055	132	1000.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	2879.	*	1	1100	133	961.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	2920.	*	1	1105	134	923.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	3023.	*	1	1110	135	885.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	3207.	*	1	1115	136	849.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	3418.	*	1	1120	137	814.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	3610.	*	1	1125	138	780.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3776.	*	1	1130	139	744.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	3914.	*	1	1135	140	706.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	4012.	*	1	1140	141	668.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	4066.	*	1	1145	142	631.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	4088.	*	1	1150	143	596.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	4075.	*	1	1155	144	563.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	4039.	*	1	1200	145	531.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	3988.	*	1	1205	146	498.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	3922.	*	1	1210	147	463.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3851.	*	1	1215	148	425.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3780.	*	1	1220	149	388.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3712.	*	1	1225	150	353.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 4088.	5.58	2749.	810.	780.	780.
		(INCHES) .288	.339	.339	.339
		(AC-FT) 1363.	1606.	1606.	1606.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	4.59	750.00	2246.39	344.44	.18	5.44

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN .08 1.64 5.00 2245.91 345.00 .18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8302E+03 EXCESS= .0000E+00 OUTFLOW= .8303E+03 BASIN STORAGE= .1093E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	2093.	1		1230	151	48.	1		1845	226	0.
1		0005	2	0.	1		0620	77	2070.	1		1235	152	45.	1		1850	227	0.
1		0010	3	0.	1		0625	78	2051.	1		1240	153	42.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2030.	1		1245	154	39.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2007.	1		1250	155	36.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1980.	1		1255	156	34.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1950.	1		1300	157	32.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1917.	1		1305	158	30.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1884.	1		1310	159	28.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1850.	1		1315	160	26.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1817.	1		1320	161	25.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1783.	1		1325	162	23.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1749.	1		1330	163	22.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1715.	1		1335	164	20.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1681.	1		1340	165	19.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1647.	1		1345	166	18.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1613.	1		1350	167	16.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1577.	1		1355	168	15.	1		2010	243	0.
1		0130	19	0.	1		0745	94	1541.	1		1400	169	14.	1		2015	244	0.
1		0135	20	0.	1		0750	95	1504.	1		1405	170	13.	1		2020	245	0.
1		0140	21	0.	1		0755	96	1467.	1		1410	171	12.	1		2025	246	0.
1		0145	22	0.	1		0800	97	1430.	1		1415	172	12.	1		2030	247	0.
1		0150	23	0.	1		0805	98	1394.	1		1420	173	11.	1		2035	248	0.
1		0155	24	0.	1		0810	99	1358.	1		1425	174	10.	1		2040	249	0.
1		0200	25	0.	1		0815	100	1324.	1		1430	175	9.	1		2045	250	0.
1		0205	26	0.	1		0820	101	1290.	1		1435	176	9.	1		2050	251	0.
1		0210	27	0.	1		0825	102	1257.	1		1440	177	8.	1		2055	252	0.
1		0215	28	0.	1		0830	103	1224.	1		1445	178	7.	1		2100	253	0.
1		0220	29	0.	1		0835	104	1192.	1		1450	179	7.	1		2105	254	0.
1		0225	30	1.	1		0840	105	1161.	1		1455	180	6.	1		2110	255	0.
1		0230	31	2.	1		0845	106	1130.	1		1500	181	6.	1		2115	256	0.
1		0235	32	3.	1		0850	107	1097.	1		1505	182	6.	1		2120	257	0.
1		0240	33	4.	1		0855	108	1064.	1		1510	183	5.	1		2125	258	0.
1		0245	34	5.	1		0900	109	1029.	1		1515	184	5.	1		2130	259	0.
1		0250	35	7.	1		0905	110	996.	1		1520	185	5.	1		2135	260	0.
1		0255	36	9.	1		0910	111	963.	1		1525	186	4.	1		2140	261	0.
1		0300	37	12.	1		0915	112	932.	1		1530	187	4.	1		2145	262	0.
1		0305	38	15.	1		0920	113	901.	1		1535	188	4.	1		2150	263	0.
1		0310	39	20.	1		0925	114	871.	1		1540	189	4.	1		2155	264	0.
1		0315	40	28.	1		0930	115	842.	1		1545	190	3.	1		2200	265	0.
1		0320	41	41.	1		0935	116	813.	1		1550	191	3.	1		2205	266	0.
1		0325	42	61.	1		0940	117	783.	1		1555	192	3.	1		2210	267	0.
1		0330	43	91.	1		0945	118	751.	1		1600	193	3.	1		2215	268	0.
1		0335	44	136.	1		0950	119	717.	1		1605	194	3.	1		2220	269	0.
1		0340	45	212.	1		0955	120	685.	1		1610	195	2.	1		2225	270	0.
1		0345	46	323.	1		1000	121	654.	1		1615	196	2.	1		2230	271	0.
1		0350	47	460.	1		1005	122	625.	1		1620	197	2.	1		2235	272	0.
1		0355	48	621.	1		1010	123	597.	1		1625	198	2.	1		2240	273	0.
1		0400	49	794.	1		1015	124	569.	1		1630	199	2.	1		2245	274	0.
1		0405	50	952.	1		1020	125	543.	1		1635	200	2.	1		2250	275	0.
1		0410	51	1085.	1		1025	126	517.	1		1640	201	2.	1		2255	276	0.
1		0415	52	1190.	1		1030	127	488.	1		1645	202	2.	1		2300	277	0.
1		0420	53	1272.	1		1035	128	456.	1		1650	203	1.	1		2305	278	0.
1		0425	54	1336.	1		1040	129	421.	1		1655	204	1.	1		2310	279	0.
1		0430	55	1385.	1		1045	130	389.	1		1700	205	1.	1		2315	280	0.
1		0435	56	1426.	1		1050	131	360.	1		1705	206	1.	1		2320	281	0.
1		0440	57	1462.	1		1055	132	334.	1		1710	207	1.	1		2325	282	0.
1		0445	58	1489.	1		1100	133	310.	1		1715	208	1.	1		2330	283	0.
1		0450	59	1508.	1		1105	134	287.	1		1720	209	1.	1		2335	284	0.
1		0455	60	1539.	1		1110	135	267.	1		1725	210	1.	1		2340	285	0.
1		0500	61	1592.	1		1115	136	248.	1		1730	211	1.	1		2345	286	0.
1		0505	62	1653.	1		1120	137	230.	1		1735	212	1.	1		2350	287	0.
1		0510	63	1722.	1		1125	138	212.	1		1740	213	1.	1		2355	288	0.
1		0515	64	1801.	1		1130	139	191.	1		1745	214	1.	2		0000	289	0.
1		0520	65	1903.	1		1135	140	168.	1		1750	215	1.	2		0005	290	0.

1	0525	66	2028.	*	1	1140	141	147.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	2146.	*	1	1145	142	127.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	2214.	*	1	1150	143	110.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	2237.	*	1	1155	144	97.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	2246.	*	1	1200	145	85.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	2239.	*	1	1205	146	76.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	2217.	*	1	1210	147	68.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	2190.	*	1	1215	148	62.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	2156.	*	1	1220	149	57.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	2122.	*	1	1225	150	52.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2246.	5.75		1514.	419.	403.	403.
		(INCHES)	.158	.175	.175	.175
		(AC-FT)	751.	830.	830.	830.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	375.00	374.06	340.00	.03	2.71

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		374.06	340.00	.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1451E+03 EXCESS= .0000E+00 OUTFLOW= .1452E+03 BASIN STORAGE= .1247E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	303.	*	1		1230	151	36.	*	1		1845	226	1.
1		0005	2	0.	*	1		0620	77	292.	*	1		1235	152	35.	*	1		1850	227	1.
1		0010	3	0.	*	1		0625	78	283.	*	1		1240	153	34.	*	1		1855	228	1.
1		0015	4	0.	*	1		0630	79	275.	*	1		1245	154	32.	*	1		1900	229	1.
1		0020	5	0.	*	1		0635	80	267.	*	1		1250	155	31.	*	1		1905	230	1.
1		0025	6	0.	*	1		0640	81	257.	*	1		1255	156	30.	*	1		1910	231	1.
1		0030	7	0.	*	1		0645	82	245.	*	1		1300	157	29.	*	1		1915	232	1.
1		0035	8	0.	*	1		0650	83	232.	*	1		1305	158	28.	*	1		1920	233	1.
1		0040	9	0.	*	1		0655	84	220.	*	1		1310	159	27.	*	1		1925	234	1.
1		0045	10	0.	*	1		0700	85	209.	*	1		1315	160	26.	*	1		1930	235	1.
1		0050	11	0.	*	1		0705	86	205.	*	1		1320	161	25.	*	1		1935	236	1.
1		0055	12	0.	*	1		0710	87	221.	*	1		1325	162	24.	*	1		1940	237	1.
1		0100	13	0.	*	1		0715	88	266.	*	1		1330	163	23.	*	1		1945	238	1.
1		0105	14	0.	*	1		0720	89	314.	*	1		1335	164	22.	*	1		1950	239	1.
1		0110	15	0.	*	1		0725	90	323.	*	1		1340	165	21.	*	1		1955	240	1.
1		0115	16	0.	*	1		0730	91	320.	*	1		1345	166	20.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	339.	*	1		1350	167	19.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	345.	*	1		1355	168	18.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	333.	*	1		1400	169	17.	*	1		2015	244	0.
1		0135	20	0.	*	1		0750	95	335.	*	1		1405	170	16.	*	1		2020	245	0.
1		0140	21	0.	*	1		0755	96	335.	*	1		1410	171	15.	*	1		2025	246	0.
1		0145	22	0.	*	1		0800	97	322.	*	1		1415	172	15.	*	1		2030	247	0.
1		0150	23	0.	*	1		0805	98	318.	*	1		1420	173	14.	*	1		2035	248	0.
1		0155	24	0.	*	1		0810	99	311.	*	1		1425	174	13.	*	1		2040	249	0.
1		0200	25	0.	*	1		0815	100	301.	*	1		1430	175	12.	*	1		2045	250	0.
1		0205	26	0.	*	1		0820	101	297.	*	1		1435	176	12.	*	1		2050	251	0.
1		0210	27	0.	*	1		0825	102	287.	*	1		1440	177	11.	*	1		2055	252	0.
1		0215	28	0.	*	1		0830	103	277.	*	1		1445	178	11.	*	1		2100	253	0.
1		0220	29	0.	*	1		0835	104	272.	*	1		1450	179	10.	*	1		2105	254	0.
1		0225	30	0.	*	1		0840	105	262.	*	1		1455	180	10.	*	1		2110	255	0.

1	0230	31	0.	*	1	0845	106	255.	*	1	1500	181	9.	*	1	2115	256	0.
1	0235	32	0.	*	1	0850	107	248.	*	1	1505	182	9.	*	1	2120	257	0.
1	0240	33	0.	*	1	0855	108	239.	*	1	1510	183	8.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	231.	*	1	1515	184	8.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	222.	*	1	1520	185	7.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	213.	*	1	1525	186	7.	*	1	2140	261	0.
1	0300	37	0.	*	1	0915	112	201.	*	1	1530	187	7.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	188.	*	1	1535	188	6.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	174.	*	1	1540	189	6.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	162.	*	1	1545	190	6.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	153.	*	1	1550	191	6.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	146.	*	1	1555	192	5.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	139.	*	1	1600	193	5.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	131.	*	1	1605	194	5.	*	1	2220	269	0.
1	0340	45	0.	*	1	0955	120	125.	*	1	1610	195	5.	*	1	2225	270	0.
1	0345	46	1.	*	1	1000	121	119.	*	1	1615	196	5.	*	1	2230	271	0.
1	0350	47	5.	*	1	1005	122	113.	*	1	1620	197	4.	*	1	2235	272	0.
1	0355	48	14.	*	1	1010	123	108.	*	1	1625	198	4.	*	1	2240	273	0.
1	0400	49	29.	*	1	1015	124	103.	*	1	1630	199	4.	*	1	2245	274	0.
1	0405	50	61.	*	1	1020	125	99.	*	1	1635	200	4.	*	1	2250	275	0.
1	0410	51	92.	*	1	1025	126	96.	*	1	1640	201	4.	*	1	2255	276	0.
1	0415	52	120.	*	1	1030	127	93.	*	1	1645	202	3.	*	1	2300	277	0.
1	0420	53	145.	*	1	1035	128	90.	*	1	1650	203	3.	*	1	2305	278	0.
1	0425	54	170.	*	1	1040	129	86.	*	1	1655	204	3.	*	1	2310	279	0.
1	0430	55	191.	*	1	1045	130	82.	*	1	1700	205	3.	*	1	2315	280	0.
1	0435	56	205.	*	1	1050	131	79.	*	1	1705	206	3.	*	1	2320	281	0.
1	0440	57	213.	*	1	1055	132	76.	*	1	1710	207	3.	*	1	2325	282	0.
1	0445	58	219.	*	1	1100	133	73.	*	1	1715	208	3.	*	1	2330	283	0.
1	0450	59	222.	*	1	1105	134	70.	*	1	1720	209	2.	*	1	2335	284	0.
1	0455	60	225.	*	1	1110	135	67.	*	1	1725	210	2.	*	1	2340	285	0.
1	0500	61	231.	*	1	1115	136	64.	*	1	1730	211	2.	*	1	2345	286	0.
1	0505	62	241.	*	1	1120	137	61.	*	1	1735	212	2.	*	1	2350	287	0.
1	0510	63	258.	*	1	1125	138	59.	*	1	1740	213	2.	*	1	2355	288	0.
1	0515	64	281.	*	1	1130	139	56.	*	1	1745	214	2.	*	2	0000	289	0.
1	0520	65	309.	*	1	1135	140	54.	*	1	1750	215	2.	*	2	0005	290	0.
1	0525	66	337.	*	1	1140	141	52.	*	1	1755	216	2.	*	2	0010	291	0.
1	0530	67	358.	*	1	1145	142	50.	*	1	1800	217	2.	*	2	0015	292	0.
1	0535	68	370.	*	1	1150	143	49.	*	1	1805	218	2.	*	2	0020	293	0.
1	0540	69	374.	*	1	1155	144	47.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	373.	*	1	1200	145	45.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	370.	*	1	1205	146	43.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	360.	*	1	1210	147	42.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	345.	*	1	1215	148	40.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	330.	*	1	1220	149	39.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	317.	*	1	1225	150	38.	*	1	1840	225	1.	*	2	0055	300	0.
				*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 374.	5.67		254.	73.	71.	71.
		(INCHES)	.027	.031	.031	.031
		(AC-FT)	126.	145.	145.	145.

CUMULATIVE AREA = 88.86 SQ MI

```
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:51:55  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                                   HEC-1 INPUT                                                PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
 *** NOLIST ***
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:51:55  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

KLEINFELDER
FEBRUARY 2008
ALTERNATIVE D

DESIGN STORM = 100-YEAR 6-HOUR STORM
STORM DISTRIBUTION = SDN5

```
  10 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME       0055  ENDING TIME
                      ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
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              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                   1.00       .87       .74       .57       .44       .26


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
1250 KK     *     ULWIN  *
            *            *
            **************

1254 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

1253 HC          HYDROGRAPH COMBINATION
                       ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***
*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    ULWIN
                                                     SUM OF  4 HYDROGRAPHS
                                                   PLAN 1,   RATIO =  1.00
*****************************************************************************************************************************************
                                  *                                 *                                 *
   DA MON HRMN  ORD      FLOW     *   DA MON HRMN  ORD      FLOW    *   DA MON HRMN  ORD      FLOW    *   DA MON HRMN  ORD      FLOW
                                  *                                 *                                 *
    1     0000    1        0.     *    1     0615   76     8025.    *    1     1230  151        4.     *    1     1845  226        0.
    1     0005    2        0.     *    1     0620   77     7327.    *    1     1235  152        4.     *    1     1850  227        0.
    1     0010    3        0.     *    1     0625   78     6692.    *    1     1240  153        3.     *    1     1855  228        0.
    1     0015    4        0.     *    1     0630   79     6118.    *    1     1245  154        3.     *    1     1900  229        0.
    1     0020    5        0.     *    1     0635   80     5601.    *    1     1250  155        2.     *    1     1905  230        0.
    1     0025    6        0.     *    1     0640   81     5138.    *    1     1255  156        2.     *    1     1910  231        0.
    1     0030    7        0.     *    1     0645   82     4718.    *    1     1300  157        2.     *    1     1915  232        0.
    1     0035    8        0.     *    1     0650   83     4335.    *    1     1305  158        2.     *    1     1920  233        0.
    1     0040    9        0.     *    1     0655   84     3986.    *    1     1310  159        1.     *    1     1925  234        0.
    1     0045   10        0.     *    1     0700   85     3665.    *    1     1315  160        1.     *    1     1930  235        0.
    1     0050   11        1.     *    1     0705   86     3369.    *    1     1320  161        1.     *    1     1935  236        0.
    1     0055   12        2.     *    1     0710   87     3095.    *    1     1325  162        1.     *    1     1940  237        0.
    1     0100   13        4.     *    1     0715   88     2840.    *    1     1330  163        1.     *    1     1945  238        0.
    1     0105   14        6.     *    1     0720   89     2604.    *    1     1335  164        1.     *    1     1950  239        0.
    1     0110   15        9.     *    1     0725   90     2386.    *    1     1340  165        1.     *    1     1955  240        0.
    1     0115   16       12.     *    1     0730   91     2185.    *    1     1345  166        0.     *    1     2000  241        0.
    1     0120   17       16.     *    1     0735   92     2000.    *    1     1350  167        0.     *    1     2005  242        0.
    1     0125   18       20.     *    1     0740   93     1829.    *    1     1355  168        0.     *    1     2010  243        0.
    1     0130   19       25.     *    1     0745   94     1673.    *    1     1400  169        0.     *    1     2015  244        0.
    1     0135   20       31.     *    1     0750   95     1530.    *    1     1405  170        0.     *    1     2020  245        0.
    1     0140   21       39.     *    1     0755   96     1400.    *    1     1410  171        0.     *    1     2025  246        0.
    1     0145   22       47.     *    1     0800   97     1282.    *    1     1415  172        0.     *    1     2030  247        0.
    1     0150   23       59.     *    1     0805   98     1175.    *    1     1420  173        0.     *    1     2035  248        0.
    1     0155   24       73.     *    1     0810   99     1076.    *    1     1425  174        0.     *    1     2040  249        0.
    1     0200   25       94.     *    1     0815  100      982.    *    1     1430  175        0.     *    1     2045  250        0.
    1     0205   26      123.     *    1     0820  101      893.    *    1     1435  176        0.     *    1     2050  251        0.
    1     0210   27      160.     *    1     0825  102      810.    *    1     1440  177        0.     *    1     2055  252        0.
    1     0215   28      206.     *    1     0830  103      733.    *    1     1445  178        0.     *    1     2100  253        0.
    1     0220   29      257.     *    1     0835  104      663.    *    1     1450  179        0.     *    1     2105  254        0.
    1     0225   30      312.     *    1     0840  105      600.    *    1     1455  180        0.     *    1     2110  255        0.
    1     0230   31      368.     *    1     0845  106      542.    *    1     1500  181        0.     *    1     2115  256        0.
    1     0235   32      427.     *    1     0850  107      491.    *    1     1505  182        0.     *    1     2120  257        0.
    1     0240   33      489.     *    1     0855  108      444.    *    1     1510  183        0.     *    1     2125  258        0.
    1     0245   34      558.     *    1     0900  109      403.    *    1     1515  184        0.     *    1     2130  259        0.
    1     0250   35      635.     *    1     0905  110      366.    *    1     1520  185        0.     *    1     2135  260        0.
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1	0255	36	722.	*	1	0910	111	332.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	820.	*	1	0915	112	302.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	932.	*	1	0920	113	276.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	1058.	*	1	0925	114	251.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	1201.	*	1	0930	115	229.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	1364.	*	1	0935	116	208.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	1561.	*	1	0940	117	189.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1813.	*	1	0945	118	171.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	2146.	*	1	0950	119	155.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	2579.	*	1	0955	120	140.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	3110.	*	1	1000	121	127.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	3762.	*	1	1005	122	114.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	4685.	*	1	1010	123	103.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	6275.	*	1	1015	124	93.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	8792.	*	1	1020	125	84.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	11642.	*	1	1025	126	75.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	13970.	*	1	1030	127	68.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	15495.	*	1	1035	128	61.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	16279.	*	1	1040	129	55.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	16488.	*	1	1045	130	49.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	16294.	*	1	1050	131	44.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	15790.	*	1	1055	132	39.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	15093.	*	1	1100	133	35.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	14348.	*	1	1105	134	31.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	13647.	*	1	1110	135	28.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	13076.	*	1	1115	136	25.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	12676.	*	1	1120	137	22.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	12444.	*	1	1125	138	20.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	12373.	*	1	1130	139	18.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	12437.	*	1	1135	140	16.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	12586.	*	1	1140	141	14.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	12746.	*	1	1145	142	13.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	12817.	*	1	1150	143	11.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	12697.	*	1	1155	144	10.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	12353.	*	1	1200	145	9.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	11808.	*	1	1205	146	8.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	11124.	*	1	1210	147	7.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	10360.	*	1	1215	148	6.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	9564.	*	1	1220	149	5.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	8775.	*	1	1225	150	5.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 16488.	4.50		6356.	1619.	1559.	1559.
		(INCHES)	1.004	1.023	1.023	1.023
		(AC-FT)	3152.	3210.	3210.	3210.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .87

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6737.	1		1230	151	6.	1		1845	226	0.
1		0005	2	0.	1		0620	77	6169.	1		1235	152	6.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5647.	1		1240	153	5.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5174.	1		1245	154	4.	1		1900	229	0.
1		0020	5	0.	1		0635	80	4744.	1		1250	155	4.	1		1905	230	0.
1		0025	6	0.	1		0640	81	4357.	1		1255	156	3.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4007.	1		1300	157	3.	1		1915	232	0.
1		0035	8	0.	1		0650	83	3688.	1		1305	158	3.	1		1920	233	0.
1		0040	9	0.	1		0655	84	3399.	1		1310	159	2.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3134.	1		1315	160	2.	1		1930	235	0.
1		0050	11	0.	1		0705	86	2889.	1		1320	161	2.	1		1935	236	0.
1		0055	12	0.	1		0710	87	2662.	1		1325	162	2.	1		1940	237	0.
1		0100	13	0.	1		0715	88	2451.	1		1330	163	1.	1		1945	238	0.
1		0105	14	1.	1		0720	89	2255.	1		1335	164	1.	1		1950	239	0.
1		0110	15	1.	1		0725	90	2074.	1		1340	165	1.	1		1955	240	0.
1		0115	16	2.	1		0730	91	1908.	1		1345	166	1.	1		2000	241	0.
1		0120	17	3.	1		0735	92	1755.	1		1350	167	1.	1		2005	242	0.

1	0125	18	4.	*	1	0740	93	1614.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	6.	*	1	0745	94	1484.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	8.	*	1	0750	95	1365.	*	1	1405	170	0.	*	1	2020	245	0.
1	0140	21	11.	*	1	0755	96	1256.	*	1	1410	171	0.	*	1	2025	246	0.
1	0145	22	15.	*	1	0800	97	1155.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	19.	*	1	0805	98	1064.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	25.	*	1	0810	99	978.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	33.	*	1	0815	100	897.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	43.	*	1	0820	101	822.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	56.	*	1	0825	102	753.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	72.	*	1	0830	103	688.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	92.	*	1	0835	104	628.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	116.	*	1	0840	105	571.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	143.	*	1	0845	106	519.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	173.	*	1	0850	107	471.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	205.	*	1	0855	108	427.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	239.	*	1	0900	109	387.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	277.	*	1	0905	110	351.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	320.	*	1	0910	111	319.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	370.	*	1	0915	112	290.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	430.	*	1	0920	113	265.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	508.	*	1	0925	114	242.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	605.	*	1	0930	115	221.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	725.	*	1	0935	116	202.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	870.	*	1	0940	117	185.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1051.	*	1	0945	118	170.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1290.	*	1	0950	119	156.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1608.	*	1	0955	120	143.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1994.	*	1	1000	121	131.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	2420.	*	1	1005	122	120.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	2864.	*	1	1010	123	110.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	3352.	*	1	1015	124	100.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	4353.	*	1	1020	125	92.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	6609.	*	1	1025	126	84.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	9227.	*	1	1030	127	77.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	10826.	*	1	1035	128	70.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	11711.	*	1	1040	129	64.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	12106.	*	1	1045	130	58.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	12126.	*	1	1050	131	53.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	11967.	*	1	1055	132	48.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	11670.	*	1	1100	133	43.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	11245.	*	1	1105	134	39.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	10755.	*	1	1110	135	35.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	10295.	*	1	1115	136	32.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	9932.	*	1	1120	137	29.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	9705.	*	1	1125	138	26.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	9616.	*	1	1130	139	23.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	9645.	*	1	1135	140	21.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	9760.	*	1	1140	141	19.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	9927.	*	1	1145	142	17.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	10079.	*	1	1150	143	15.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	10116.	*	1	1155	144	13.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	9954.	*	1	1200	145	12.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	9596.	*	1	1205	146	11.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	9111.	*	1	1210	147	10.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	8556.	*	1	1215	148	9.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	7953.	*	1	1220	149	8.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7339.	*	1	1225	150	7.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS)	6-HR	24-HR	72-HR	24.92-HR
+ 12126.	4.58		4861.	1237.	1191.	1191.
		(INCHES)	.768	.782	.782	.782
		(AC-FT)	2411.	2453.	2453.	2453.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .74

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DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW

1	0000	1	0.	*	1	0615	76	5408.	*	1	1230	151	7.	*	1	1845	226	0.
1	0005	2	0.	*	1	0620	77	4987.	*	1	1235	152	6.	*	1	1850	227	0.
1	0010	3	0.	*	1	0625	78	4587.	*	1	1240	153	6.	*	1	1855	228	0.
1	0015	4	0.	*	1	0630	79	4210.	*	1	1245	154	5.	*	1	1900	229	0.
1	0020	5	0.	*	1	0635	80	3868.	*	1	1250	155	4.	*	1	1905	230	0.
1	0025	6	0.	*	1	0640	81	3558.	*	1	1255	156	4.	*	1	1910	231	0.
1	0030	7	0.	*	1	0645	82	3278.	*	1	1300	157	4.	*	1	1915	232	0.
1	0035	8	0.	*	1	0650	83	3023.	*	1	1305	158	3.	*	1	1920	233	0.
1	0040	9	0.	*	1	0655	84	2791.	*	1	1310	159	3.	*	1	1925	234	0.
1	0045	10	0.	*	1	0700	85	2580.	*	1	1315	160	2.	*	1	1930	235	0.
1	0050	11	0.	*	1	0705	86	2386.	*	1	1320	161	2.	*	1	1935	236	0.
1	0055	12	0.	*	1	0710	87	2205.	*	1	1325	162	2.	*	1	1940	237	0.
1	0100	13	0.	*	1	0715	88	2040.	*	1	1330	163	2.	*	1	1945	238	0.
1	0105	14	0.	*	1	0720	89	1886.	*	1	1335	164	1.	*	1	1950	239	0.
1	0110	15	0.	*	1	0725	90	1743.	*	1	1340	165	1.	*	1	1955	240	0.
1	0115	16	0.	*	1	0730	91	1611.	*	1	1345	166	1.	*	1	2000	241	0.
1	0120	17	0.	*	1	0735	92	1489.	*	1	1350	167	1.	*	1	2005	242	0.
1	0125	18	0.	*	1	0740	93	1375.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	0.	*	1	0745	94	1271.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	1.	*	1	0750	95	1174.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	1.	*	1	0755	96	1084.	*	1	1410	171	1.	*	1	2025	246	0.
1	0145	22	2.	*	1	0800	97	998.	*	1	1415	172	1.	*	1	2030	247	0.
1	0150	23	4.	*	1	0805	98	916.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	6.	*	1	0810	99	841.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	9.	*	1	0815	100	771.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	12.	*	1	0820	101	707.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	17.	*	1	0825	102	650.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	22.	*	1	0830	103	597.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	30.	*	1	0835	104	550.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	39.	*	1	0840	105	505.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	48.	*	1	0845	106	463.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	59.	*	1	0850	107	424.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	71.	*	1	0855	108	388.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	83.	*	1	0900	109	354.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	96.	*	1	0905	110	323.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	111.	*	1	0910	111	294.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	130.	*	1	0915	112	268.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	154.	*	1	0920	113	245.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	186.	*	1	0925	114	224.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	228.	*	1	0930	115	205.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	287.	*	1	0935	116	188.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	368.	*	1	0940	117	172.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	476.	*	1	0945	118	158.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	619.	*	1	0950	119	146.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	816.	*	1	0955	120	134.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1076.	*	1	1000	121	123.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1388.	*	1	1005	122	113.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	1713.	*	1	1010	123	105.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	2018.	*	1	1015	124	96.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	2277.	*	1	1020	125	89.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	2547.	*	1	1025	126	81.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	3868.	*	1	1030	127	75.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	6357.	*	1	1035	128	69.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	7685.	*	1	1040	129	63.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	8223.	*	1	1045	130	57.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	8388.	*	1	1050	131	52.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	8311.	*	1	1055	132	48.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	8170.	*	1	1100	133	43.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	7990.	*	1	1105	134	39.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	7796.	*	1	1110	135	36.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	7586.	*	1	1115	136	32.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	7358.	*	1	1120	137	29.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	7156.	*	1	1125	138	26.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	7027.	*	1	1130	139	24.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6990.	*	1	1135	140	22.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	7041.	*	1	1140	141	19.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	7155.	*	1	1145	142	18.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	7302.	*	1	1150	143	16.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	7417.	*	1	1155	144	14.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	7434.	*	1	1200	145	13.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	7306.	*	1	1205	146	12.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	7041.	*	1	1210	147	11.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6685.	*	1	1215	148	10.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	6277.	*	1	1220	149	9.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5844.	*	1	1225	150	8.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR

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+   (CFS)       (HR)
                          (CFS)
+    8388.      4.58                 3494.        888.        855.         855.
                         (INCHES)      .552        .561        .561         .561
                          (AC-FT)     1733.       1762.       1762.        1762.

                         CUMULATIVE AREA =   58.84 SQ MI
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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3520.	1		1230	151	12.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3307.	1		1235	152	11.	1		1850	227	0.
1		0010	3	0.	1		0625	78	3097.	1		1240	153	10.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2889.	1		1245	154	9.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2685.	1		1250	155	8.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2487.	1		1255	156	8.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2299.	1		1300	157	7.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2126.	1		1305	158	6.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1968.	1		1310	159	6.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1825.	1		1315	160	5.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1694.	1		1320	161	5.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1573.	1		1325	162	4.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1463.	1		1330	163	4.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1360.	1		1335	164	4.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1266.	1		1340	165	3.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1177.	1		1345	166	3.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1095.	1		1350	167	3.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1019.	1		1355	168	2.	1		2010	243	0.
1		0130	19	0.	1		0745	94	948.	1		1400	169	2.	1		2015	244	0.
1		0135	20	0.	1		0750	95	883.	1		1405	170	2.	1		2020	245	0.
1		0140	21	0.	1		0755	96	822.	1		1410	171	2.	1		2025	246	0.
1		0145	22	0.	1		0800	97	766.	1		1415	172	2.	1		2030	247	0.
1		0150	23	0.	1		0805	98	714.	1		1420	173	1.	1		2035	248	0.
1		0155	24	0.	1		0810	99	665.	1		1425	174	1.	1		2040	249	0.
1		0200	25	0.	1		0815	100	619.	1		1430	175	1.	1		2045	250	0.
1		0205	26	0.	1		0820	101	577.	1		1435	176	1.	1		2050	251	0.
1		0210	27	1.	1		0825	102	539.	1		1440	177	1.	1		2055	252	0.
1		0215	28	2.	1		0830	103	502.	1		1445	178	1.	1		2100	253	0.
1		0220	29	3.	1		0835	104	468.	1		1450	179	1.	1		2105	254	0.
1		0225	30	4.	1		0840	105	435.	1		1455	180	1.	1		2110	255	0.
1		0230	31	6.	1		0845	106	405.	1		1500	181	1.	1		2115	256	0.
1		0235	32	8.	1		0850	107	377.	1		1505	182	1.	1		2120	257	0.
1		0240	33	11.	1		0855	108	350.	1		1510	183	0.	1		2125	258	0.
1		0245	34	13.	1		0900	109	324.	1		1515	184	0.	1		2130	259	0.
1		0250	35	15.	1		0905	110	300.	1		1520	185	0.	1		2135	260	0.
1		0255	36	18.	1		0910	111	278.	1		1525	186	0.	1		2140	261	0.
1		0300	37	20.	1		0915	112	257.	1		1530	187	0.	1		2145	262	0.
1		0305	38	24.	1		0920	113	238.	1		1535	188	0.	1		2150	263	0.
1		0310	39	29.	1		0925	114	220.	1		1540	189	0.	1		2155	264	0.
1		0315	40	36.	1		0930	115	203.	1		1545	190	0.	1		2200	265	0.
1		0320	41	47.	1		0935	116	187.	1		1550	191	0.	1		2205	266	0.
1		0325	42	65.	1		0940	117	172.	1		1555	192	0.	1		2210	267	0.
1		0330	43	92.	1		0945	118	158.	1		1600	193	0.	1		2215	268	0.
1		0335	44	132.	1		0950	119	146.	1		1605	194	0.	1		2220	269	0.
1		0340	45	188.	1		0955	120	134.	1		1610	195	0.	1		2225	270	0.
1		0345	46	259.	1		1000	121	124.	1		1615	196	0.	1		2230	271	0.
1		0350	47	346.	1		1005	122	114.	1		1620	197	0.	1		2235	272	0.
1		0355	48	502.	1		1010	123	106.	1		1625	198	0.	1		2240	273	0.
1		0400	49	705.	1		1015	124	98.	1		1630	199	0.	1		2245	274	0.
1		0405	50	892.	1		1020	125	91.	1		1635	200	0.	1		2250	275	0.
1		0410	51	1033.	1		1025	126	84.	1		1640	201	0.	1		2255	276	0.
1		0415	52	1129.	1		1030	127	78.	1		1645	202	0.	1		2300	277	0.
1		0420	53	1176.	1		1035	128	73.	1		1650	203	0.	1		2305	278	0.
1		0425	54	1196.	1		1040	129	68.	1		1655	204	0.	1		2310	279	0.
1		0430	55	1651.	1		1045	130	63.	1		1700	205	0.	1		2315	280	0.
1		0435	56	4113.	1		1050	131	59.	1		1705	206	0.	1		2320	281	0.
1		0440	57	4559.	1		1055	132	55.	1		1710	207	0.	1		2325	282	0.
1		0445	58	4267.	1		1100	133	51.	1		1715	208	0.	1		2330	283	0.
1		0450	59	4534.	1		1105	134	48.	1		1720	209	0.	1		2335	284	0.
1		0455	60	4244.	1		1110	135	45.	1		1725	210	0.	1		2340	285	0.
1		0500	61	4215.	1		1115	136	42.	1		1730	211	0.	1		2345	286	0.
1		0505	62	4092.	1		1120	137	39.	1		1735	212	0.	1		2350	287	0.

1	0510	63	4001.	*	1	1125	138	36.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3941.	*	1	1130	139	34.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	3906.	*	1	1135	140	31.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	3912.	*	1	1140	141	29.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	3923.	*	1	1145	142	26.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	3952.	*	1	1150	143	24.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	4012.	*	1	1155	144	22.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	4110.	*	1	1200	145	21.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	4196.	*	1	1205	146	19.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	4195.	*	1	1210	147	17.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	4091.	*	1	1215	148	16.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3925.	*	1	1220	149	14.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3730.	*	1	1225	150	13.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 4559.	4.67	(CFS) 1929.	492.	474.	474.
		(INCHES) .305	.311	.311	.311
		(AC-FT) 957.	976.	976.	976.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	1981.	1		1230	151	17.	1		1845	226	0.
1		0005	2	0.	1		0620	77	1891.	1		1235	152	16.	1		1850	227	0.
1		0010	3	0.	1		0625	78	1807.	1		1240	153	15.	1		1855	228	0.
1		0015	4	0.	1		0630	79	1702.	1		1245	154	14.	1		1900	229	0.
1		0020	5	0.	1		0635	80	1600.	1		1250	155	13.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1514.	1		1255	156	12.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1445.	1		1300	157	11.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1367.	1		1305	158	10.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1280.	1		1310	159	9.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1202.	1		1315	160	9.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1128.	1		1320	161	8.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1049.	1		1325	162	7.	1		1940	237	0.
1		0100	13	0.	1		0715	88	973.	1		1330	163	7.	1		1945	238	0.
1		0105	14	0.	1		0720	89	910.	1		1335	164	6.	1		1950	239	0.
1		0110	15	0.	1		0725	90	851.	1		1340	165	6.	1		1955	240	0.
1		0115	16	0.	1		0730	91	794.	1		1345	166	5.	1		2000	241	0.
1		0120	17	0.	1		0735	92	745.	1		1350	167	5.	1		2005	242	0.
1		0125	18	0.	1		0740	93	701.	1		1355	168	5.	1		2010	243	0.
1		0130	19	0.	1		0745	94	657.	1		1400	169	4.	1		2015	244	0.
1		0135	20	0.	1		0750	95	617.	1		1405	170	4.	1		2020	245	0.
1		0140	21	0.	1		0755	96	581.	1		1410	171	4.	1		2025	246	0.
1		0145	22	0.	1		0800	97	544.	1		1415	172	3.	1		2030	247	0.
1		0150	23	0.	1		0805	98	511.	1		1420	173	3.	1		2035	248	0.
1		0155	24	0.	1		0810	99	481.	1		1425	174	3.	1		2040	249	0.
1		0200	25	0.	1		0815	100	451.	1		1430	175	3.	1		2045	250	0.
1		0205	26	0.	1		0820	101	424.	1		1435	176	3.	1		2050	251	0.
1		0210	27	0.	1		0825	102	399.	1		1440	177	2.	1		2055	252	0.
1		0215	28	0.	1		0830	103	375.	1		1445	178	2.	1		2100	253	0.
1		0220	29	0.	1		0835	104	353.	1		1450	179	2.	1		2105	254	0.
1		0225	30	0.	1		0840	105	332.	1		1455	180	2.	1		2110	255	0.
1		0230	31	0.	1		0845	106	313.	1		1500	181	2.	1		2115	256	0.
1		0235	32	0.	1		0850	107	295.	1		1505	182	2.	1		2120	257	0.
1		0240	33	0.	1		0855	108	277.	1		1510	183	2.	1		2125	258	0.
1		0245	34	0.	1		0900	109	261.	1		1515	184	1.	1		2130	259	0.
1		0250	35	0.	1		0905	110	246.	1		1520	185	1.	1		2135	260	0.
1		0255	36	0.	1		0910	111	233.	1		1525	186	1.	1		2140	261	0.
1		0300	37	1.	1		0915	112	220.	1		1530	187	1.	1		2145	262	0.
1		0305	38	1.	1		0920	113	207.	1		1535	188	1.	1		2150	263	0.
1		0310	39	1.	1		0925	114	196.	1		1540	189	1.	1		2155	264	0.
1		0315	40	2.	1		0930	115	184.	1		1545	190	1.	1		2200	265	0.
1		0320	41	4.	1		0935	116	172.	1		1550	191	1.	1		2205	266	0.
1		0325	42	7.	1		0940	117	161.	1		1555	192	1.	1		2210	267	0.
1		0330	43	15.	1		0945	118	151.	1		1600	193	1.	1		2215	268	0.
1		0335	44	29.	1		0950	119	141.	1		1605	194	1.	1		2220	269	0.

1	0340	45	51.	*	1	0955	120	131.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	80.	*	1	1000	121	123.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	114.	*	1	1005	122	114.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	150.	*	1	1010	123	107.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	187.	*	1	1015	124	100.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	227.	*	1	1020	125	93.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	331.	*	1	1025	126	87.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	435.	*	1	1030	127	81.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	476.	*	1	1035	128	76.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	502.	*	1	1040	129	70.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	505.	*	1	1045	130	66.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	499.	*	1	1050	131	61.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	487.	*	1	1055	132	57.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	473.	*	1	1100	133	53.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	463.	*	1	1105	134	50.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	1854.	*	1	1110	135	47.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	2764.	*	1	1115	136	44.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	1699.	*	1	1120	137	41.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	2251.	*	1	1125	138	38.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	2295.	*	1	1130	139	36.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	1929.	*	1	1135	140	34.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	2191.	*	1	1140	141	32.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2000.	*	1	1145	142	30.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	1974.	*	1	1150	143	28.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	1998.	*	1	1155	144	26.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	1935.	*	1	1200	145	25.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	2039.	*	1	1205	146	23.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	2068.	*	1	1210	147	22.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	2145.	*	1	1215	148	20.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	2151.	*	1	1220	149	19.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	2080.	*	1	1225	150	18.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2764.	5.00		970.	250.	241.	241.
		(INCHES)	.153	.158	.158	.158
		(AC-FT)	481.	497.	497.	497.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	125.	1		1230	151	12.	1		1845	226	0.
1		0005	2	0.	1		0620	77	446.	1		1235	152	12.	1		1850	227	0.
1		0010	3	0.	1		0625	78	315.	1		1240	153	11.	1		1855	228	0.
1		0015	4	0.	1		0630	79	243.	1		1245	154	10.	1		1900	229	0.
1		0020	5	0.	1		0635	80	500.	1		1250	155	10.	1		1905	230	0.
1		0025	6	0.	1		0640	81	373.	1		1255	156	9.	1		1910	231	0.
1		0030	7	0.	1		0645	82	393.	1		1300	157	9.	1		1915	232	0.
1		0035	8	0.	1		0650	83	479.	1		1305	158	8.	1		1920	233	0.
1		0040	9	0.	1		0655	84	344.	1		1310	159	8.	1		1925	234	0.
1		0045	10	0.	1		0700	85	412.	1		1315	160	7.	1		1930	235	0.
1		0050	11	0.	1		0705	86	370.	1		1320	161	7.	1		1935	236	0.
1		0055	12	0.	1		0710	87	308.	1		1325	162	7.	1		1940	237	0.
1		0100	13	0.	1		0715	88	362.	1		1330	163	6.	1		1945	238	0.
1		0105	14	0.	1		0720	89	295.	1		1335	164	6.	1		1950	239	0.
1		0110	15	0.	1		0725	90	294.	1		1340	165	6.	1		1955	240	0.
1		0115	16	0.	1		0730	91	293.	1		1345	166	5.	1		2000	241	0.
1		0120	17	0.	1		0735	92	258.	1		1350	167	5.	1		2005	242	0.
1		0125	18	0.	1		0740	93	259.	1		1355	168	5.	1		2010	243	0.
1		0130	19	0.	1		0745	94	239.	1		1400	169	5.	1		2015	244	0.
1		0135	20	0.	1		0750	95	226.	1		1405	170	4.	1		2020	245	0.
1		0140	21	0.	1		0755	96	220.	1		1410	171	4.	1		2025	246	0.
1		0145	22	0.	1		0800	97	209.	1		1415	172	4.	1		2030	247	0.
1		0150	23	0.	1		0805	98	192.	1		1420	173	4.	1		2035	248	0.
1		0155	24	0.	1		0810	99	193.	1		1425	174	4.	1		2040	249	0.
1		0200	25	0.	1		0815	100	178.	1		1430	175	4.	1		2045	250	0.
1		0205	26	0.	1		0820	101	165.	1		1435	176	3.	1		2050	251	0.

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   1     0210   27        0.    *    1     0825  102      161.   *    1     1440  177        3.    *    1     2055  252        0.
   1     0215   28        0.    *    1     0830  103      144.   *    1     1445  178        3.    *    1     2100  253        0.
   1     0220   29        0.    *    1     0835  104      139.   *    1     1450  179        3.    *    1     2105  254        0.
   1     0225   30        0.    *    1     0840  105      129.   *    1     1455  180        3.    *    1     2110  255        0.
   1     0230   31        0.    *    1     0845  106      124.   *    1     1500  181        3.    *    1     2115  256        0.
   1     0235   32        0.    *    1     0850  107      121.   *    1     1505  182        3.    *    1     2120  257        0.
   1     0240   33        0.    *    1     0855  108      114.   *    1     1510  183        2.    *    1     2125  258        0.
   1     0245   34        0.    *    1     0900  109      111.   *    1     1515  184        2.    *    1     2130  259        0.
   1     0250   35        0.    *    1     0905  110      104.   *    1     1520  185        2.    *    1     2135  260        0.
   1     0255   36        0.    *    1     0910  111       96.   *    1     1525  186        2.    *    1     2140  261        0.
   1     0300   37        0.    *    1     0915  112       90.   *    1     1530  187        2.    *    1     2145  262        0.
   1     0305   38        0.    *    1     0920  113       86.   *    1     1535  188        2.    *    1     2150  263        0.
   1     0310   39        0.    *    1     0925  114       85.   *    1     1540  189        2.    *    1     2155  264        0.
   1     0315   40        0.    *    1     0930  115       84.   *    1     1545  190        2.    *    1     2200  265        0.
   1     0320   41        0.    *    1     0935  116       82.   *    1     1550  191        1.    *    1     2205  266        0.
   1     0325   42        0.    *    1     0940  117       77.   *    1     1555  192        1.    *    1     2210  267        0.
   1     0330   43        0.    *    1     0945  118       72.   *    1     1600  193        1.    *    1     2215  268        0.
   1     0335   44        0.    *    1     0950  119       69.   *    1     1605  194        1.    *    1     2220  269        0.
   1     0340   45        0.    *    1     0955  120       66.   *    1     1610  195        1.    *    1     2225  270        0.
   1     0345   46        0.    *    1     1000  121       63.   *    1     1615  196        1.    *    1     2230  271        0.
   1     0350   47        0.    *    1     1005  122       60.   *    1     1620  197        1.    *    1     2235  272        0.
   1     0355   48        1.    *    1     1010  123       56.   *    1     1625  198        1.    *    1     2240  273        0.
   1     0400   49        5.    *    1     1015  124       53.   *    1     1630  199        1.    *    1     2245  274        0.
   1     0405   50       11.    *    1     1020  125       50.   *    1     1635  200        1.    *    1     2250  275        0.
   1     0410   51       19.    *    1     1025  126       48.   *    1     1640  201        1.    *    1     2255  276        0.
   1     0415   52       26.    *    1     1030  127       47.   *    1     1645  202        1.    *    1     2300  277        0.
   1     0420   53       32.    *    1     1035  128       45.   *    1     1650  203        1.    *    1     2305  278        0.
   1     0425   54       36.    *    1     1040  129       43.   *    1     1655  204        1.    *    1     2310  279        0.
   1     0430   55       40.    *    1     1045  130       41.   *    1     1700  205        1.    *    1     2315  280        0.
   1     0435   56       43.    *    1     1050  131       39.   *    1     1705  206        1.    *    1     2320  281        0.
   1     0440   57       44.    *    1     1055  132       37.   *    1     1710  207        1.    *    1     2325  282        0.
   1     0445   58       46.    *    1     1100  133       36.   *    1     1715  208        1.    *    1     2330  283        0.
   1     0450   59       53.    *    1     1105  134       34.   *    1     1720  209        1.    *    1     2335  284        0.
   1     0455   60       72.    *    1     1110  135       32.   *    1     1725  210        1.    *    1     2340  285        0.
   1     0500   61       68.    *    1     1115  136       30.   *    1     1730  211        0.    *    1     2345  286        0.
   1     0505   62       70.    *    1     1120  137       29.   *    1     1735  212        0.    *    1     2350  287        0.
   1     0510   63       77.    *    1     1125  138       27.   *    1     1740  213        0.    *    1     2355  288        0.
   1     0515   64       77.    *    1     1130  139       25.   *    1     1745  214        0.    *    2     0000  289        0.
   1     0520   65       81.    *    1     1135  140       24.   *    1     1750  215        0.    *    2     0005  290        0.
   1     0525   66       84.    *    1     1140  141       23.   *    1     1755  216        0.    *    2     0010  291        0.
   1     0530   67       88.    *    1     1145  142       21.   *    1     1800  217        0.    *    2     0015  292        0.
   1     0535   68       93.    *    1     1150  143       20.   *    1     1805  218        0.    *    2     0020  293        0.
   1     0540   69       99.    *    1     1155  144       19.   *    1     1810  219        0.    *    2     0025  294        0.
   1     0545   70      105.    *    1     1200  145       18.   *    1     1815  220        0.    *    2     0030  295        0.
   1     0550   71      105.    *    1     1205  146       17.   *    1     1820  221        0.    *    2     0035  296        0.
   1     0555   72      101.    *    1     1210  147       16.   *    1     1825  222        0.    *    2     0040  297        0.
   1     0600   73       95.    *    1     1215  148       15.   *    1     1830  223        0.    *    2     0045  298        0.
   1     0605   74       87.    *    1     1220  149       14.   *    1     1835  224        0.    *    2     0050  299        0.
   1     0610   75       79.    *    1     1225  150       13.   *    1     1840  225        0.    *    2     0055  300        0.
                                *                                  *                                  *
*******************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                            (CFS)
+     500.      6.58                 161.         44.         42.          42.
                         (INCHES)    .025        .028        .028         .028
                          (AC-FT)     80.         87.         87.          87.

                          CUMULATIVE AREA =   58.84 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
1305 KK     *    FINISH  *
            *            *
            **************

1307 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA
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1306 RD MUSKINGUM-CUNGE CHANNEL ROUTING

L	1500.	CHANNEL LENGTH
S	.0090	SLOPE
N	.050	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	250.00	BOTTOM WIDTH OR DIAMETER
Z	3.00	SIDE SLOPE

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COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.55	750.00	10209.02	323.76	1.10	9.81

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		10207.58	325.00	1.10	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5207E+04 EXCESS= .0000E+00 OUTFLOW= .5207E+04 BASIN STORAGE= .1055E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = 1.00

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	9253.	1		1230	151	2692.	1		1845	226	200.
1		0005	2	0.	1		0620	77	9553.	1		1235	152	2669.	1		1850	227	162.
1		0010	3	0.	1		0625	78	9698.	1		1240	153	2645.	1		1855	228	126.
1		0015	4	0.	1		0630	79	9707.	1		1245	154	2621.	1		1900	229	96.
1		0020	5	0.	1		0635	80	9614.	1		1250	155	2597.	1		1905	230	72.
1		0025	6	0.	1		0640	81	9438.	1		1255	156	2573.	1		1910	231	54.
1		0030	7	0.	1		0645	82	9202.	1		1300	157	2549.	1		1915	232	40.
1		0035	8	1.	1		0650	83	8924.	1		1305	158	2526.	1		1920	233	30.
1		0040	9	3.	1		0655	84	8614.	1		1310	159	2503.	1		1925	234	22.
1		0045	10	6.	1		0700	85	8282.	1		1315	160	2478.	1		1930	235	17.
1		0050	11	11.	1		0705	86	7935.	1		1320	161	2453.	1		1935	236	13.
1		0055	12	19.	1		0710	87	7580.	1		1325	162	2427.	1		1940	237	9.
1		0100	13	29.	1		0715	88	7223.	1		1330	163	2401.	1		1945	238	7.
1		0105	14	42.	1		0720	89	6867.	1		1335	164	2376.	1		1950	239	5.
1		0110	15	58.	1		0725	90	6514.	1		1340	165	2351.	1		1955	240	4.
1		0115	16	74.	1		0730	91	6166.	1		1345	166	2326.	1		2000	241	3.
1		0120	17	92.	1		0735	92	5823.	1		1350	167	2300.	1		2005	242	2.
1		0125	18	111.	1		0740	93	5491.	1		1355	168	2272.	1		2010	243	2.
1		0130	19	131.	1		0745	94	5176.	1		1400	169	2244.	1		2015	244	1.
1		0135	20	153.	1		0750	95	4903.	1		1405	170	2216.	1		2020	245	1.
1		0140	21	178.	1		0755	96	4697.	1		1410	171	2188.	1		2025	246	1.
1		0145	22	208.	1		0800	97	4560.	1		1415	172	2161.	1		2030	247	0.
1		0150	23	244.	1		0805	98	4464.	1		1420	173	2134.	1		2035	248	0.
1		0155	24	286.	1		0810	99	4381.	1		1425	174	2105.	1		2040	249	0.
1		0200	25	335.	1		0815	100	4305.	1		1430	175	2075.	1		2045	250	0.
1		0205	26	391.	1		0820	101	4233.	1		1435	176	2043.	1		2050	251	0.
1		0210	27	454.	1		0825	102	4165.	1		1440	177	2012.	1		2055	252	0.
1		0215	28	522.	1		0830	103	4100.	1		1445	178	1981.	1		2100	253	0.
1		0220	29	594.	1		0835	104	4039.	1		1450	179	1950.	1		2105	254	0.
1		0225	30	668.	1		0840	105	3981.	1		1455	180	1919.	1		2110	255	0.
1		0230	31	745.	1		0845	106	3927.	1		1500	181	1886.	1		2115	256	0.
1		0235	32	821.	1		0850	107	3875.	1		1505	182	1852.	1		2120	257	0.
1		0240	33	894.	1		0855	108	3826.	1		1510	183	1816.	1		2125	258	0.
1		0245	34	960.	1		0900	109	3780.	1		1515	184	1781.	1		2130	259	0.
1		0250	35	1015.	1		0905	110	3736.	1		1520	185	1747.	1		2135	260	0.
1		0255	36	1065.	1		0910	111	3695.	1		1525	186	1712.	1		2140	261	0.
1		0300	37	1122.	1		0915	112	3656.	1		1530	187	1677.	1		2145	262	0.
1		0305	38	1200.	1		0920	113	3620.	1		1535	188	1640.	1		2150	263	0.
1		0310	39	1312.	1		0925	114	3585.	1		1540	189	1603.	1		2155	264	0.
1		0315	40	1477.	1		0930	115	3552.	1		1545	190	1566.	1		2200	265	0.
1		0320	41	1713.	1		0935	116	3519.	1		1550	191	1530.	1		2205	266	0.
1		0325	42	2033.	1		0940	117	3487.	1		1555	192	1494.	1		2210	267	0.
1		0330	43	2456.	1		0945	118	3457.	1		1600	193	1458.	1		2215	268	0.

1	0335	44	3006.	*	1	0950	119	3427.	*	1	1605	194	1419.	*	1	2220	269	0.
1	0340	45	3677.	*	1	0955	120	3399.	*	1	1610	195	1381.	*	1	2225	270	0.
1	0345	46	4432.	*	1	1000	121	3371.	*	1	1615	196	1343.	*	1	2230	271	0.
1	0350	47	5240.	*	1	1005	122	3345.	*	1	1620	197	1306.	*	1	2235	272	0.
1	0355	48	6061.	*	1	1010	123	3319.	*	1	1625	198	1269.	*	1	2240	273	0.
1	0400	49	6824.	*	1	1015	124	3295.	*	1	1630	199	1232.	*	1	2245	274	0.
1	0405	50	7472.	*	1	1020	125	3271.	*	1	1635	200	1193.	*	1	2250	275	0.
1	0410	51	7998.	*	1	1025	126	3247.	*	1	1640	201	1153.	*	1	2255	276	0.
1	0415	52	8426.	*	1	1030	127	3222.	*	1	1645	202	1114.	*	1	2300	277	0.
1	0420	53	8768.	*	1	1035	128	3198.	*	1	1650	203	1076.	*	1	2305	278	0.
1	0425	54	9014.	*	1	1040	129	3174.	*	1	1655	204	1039.	*	1	2310	279	0.
1	0430	55	9160.	*	1	1045	130	3151.	*	1	1700	205	1002.	*	1	2315	280	0.
1	0435	56	9229.	*	1	1050	131	3129.	*	1	1705	206	964.	*	1	2320	281	0.
1	0440	57	9252.	*	1	1055	132	3107.	*	1	1710	207	924.	*	1	2325	282	0.
1	0445	58	9258.	*	1	1100	133	3086.	*	1	1715	208	885.	*	1	2330	283	0.
1	0450	59	9291.	*	1	1105	134	3065.	*	1	1720	209	847.	*	1	2335	284	0.
1	0455	60	9389.	*	1	1110	135	3044.	*	1	1725	210	811.	*	1	2340	285	0.
1	0500	61	9546.	*	1	1115	136	3022.	*	1	1730	211	776.	*	1	2345	286	0.
1	0505	62	9730.	*	1	1120	137	3000.	*	1	1735	212	740.	*	1	2350	287	0.
1	0510	63	9912.	*	1	1125	138	2977.	*	1	1740	213	701.	*	1	2355	288	0.
1	0515	64	10070.	*	1	1130	139	2955.	*	1	1745	214	661.	*	2	0000	289	0.
1	0520	65	10175.	*	1	1135	140	2934.	*	1	1750	215	622.	*	2	0005	290	0.
1	0525	66	10208.	*	1	1140	141	2913.	*	1	1755	216	584.	*	2	0010	291	0.
1	0530	67	10166.	*	1	1145	142	2892.	*	1	1800	217	548.	*	2	0015	292	0.
1	0535	68	10059.	*	1	1150	143	2871.	*	1	1805	218	512.	*	2	0020	293	0.
1	0540	69	9894.	*	1	1155	144	2849.	*	1	1810	219	475.	*	2	0025	294	0.
1	0545	70	9681.	*	1	1200	145	2826.	*	1	1815	220	431.	*	2	0030	295	0.
1	0550	71	9435.	*	1	1205	146	2803.	*	1	1820	221	385.	*	2	0035	296	0.
1	0555	72	9174.	*	1	1210	147	2781.	*	1	1825	222	342.	*	2	0040	297	0.
1	0600	73	8935.	*	1	1215	148	2758.	*	1	1830	223	302.	*	2	0045	298	0.
1	0605	74	8814.	*	1	1220	149	2736.	*	1	1835	224	266.	*	2	0050	299	0.
1	0610	75	8933.	*	1	1225	150	2714.	*	1	1840	225	234.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 10208.	5.42	7053.	2625.	2529.	2529.
		(INCHES) .738	1.099	1.099	1.099
		(AC-FT) 3497.	5207.	5207.	5207.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.75	750.00	8433.52	326.69	.85	9.11
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		8427.54	325.00	.85	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4014E+04 EXCESS= .0000E+00 OUTFLOW= .4014E+04 BASIN STORAGE= .1199E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .87

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6884.	1		1230	151	2272.	1		1845	226	2.
1		0005	2	0.	1		0620	77	6701.	1		1235	152	2243.	1		1850	227	2.
1		0010	3	0.	1		0625	78	6524.	1		1240	153	2214.	1		1855	228	1.
1		0015	4	0.	1		0630	79	6351.	1		1245	154	2186.	1		1900	229	1.
1		0020	5	0.	1		0635	80	6184.	1		1250	155	2157.	1		1905	230	1.
1		0025	6	0.	1		0640	81	6019.	1		1255	156	2129.	1		1910	231	0.
1		0030	7	0.	1		0645	82	5860.	1		1300	157	2098.	1		1915	232	0.
1		0035	8	0.	1		0650	83	5706.	1		1305	158	2067.	1		1920	233	0.

1	0040	9	0.	*	1	0655	84	5558.	*	1	1310	159	2034.	*	1	1925	234	0.
1	0045	10	1.	*	1	0700	85	5415.	*	1	1315	160	2003.	*	1	1930	235	0.
1	0050	11	2.	*	1	0705	86	5279.	*	1	1320	161	1971.	*	1	1935	236	0.
1	0055	12	4.	*	1	0710	87	5148.	*	1	1325	162	1940.	*	1	1940	237	0.
1	0100	13	7.	*	1	0715	88	5024.	*	1	1330	163	1907.	*	1	1945	238	0.
1	0105	14	11.	*	1	0720	89	4906.	*	1	1335	164	1873.	*	1	1950	239	0.
1	0110	15	17.	*	1	0725	90	4793.	*	1	1340	165	1837.	*	1	1955	240	0.
1	0115	16	24.	*	1	0730	91	4684.	*	1	1345	166	1801.	*	1	2000	241	0.
1	0120	17	31.	*	1	0735	92	4579.	*	1	1350	167	1766.	*	1	2005	242	0.
1	0125	18	40.	*	1	0740	93	4477.	*	1	1355	168	1732.	*	1	2010	243	0.
1	0130	19	50.	*	1	0745	94	4380.	*	1	1400	169	1697.	*	1	2015	244	0.
1	0135	20	62.	*	1	0750	95	4288.	*	1	1405	170	1660.	*	1	2020	245	0.
1	0140	21	77.	*	1	0755	96	4202.	*	1	1410	171	1622.	*	1	2025	246	0.
1	0145	22	95.	*	1	0800	97	4121.	*	1	1415	172	1585.	*	1	2030	247	0.
1	0150	23	117.	*	1	0805	98	4046.	*	1	1420	173	1548.	*	1	2035	248	0.
1	0155	24	144.	*	1	0810	99	3977.	*	1	1425	174	1512.	*	1	2040	249	0.
1	0200	25	176.	*	1	0815	100	3912.	*	1	1430	175	1476.	*	1	2045	250	0.
1	0205	26	213.	*	1	0820	101	3850.	*	1	1435	176	1439.	*	1	2050	251	0.
1	0210	27	254.	*	1	0825	102	3792.	*	1	1440	177	1400.	*	1	2055	252	0.
1	0215	28	299.	*	1	0830	103	3737.	*	1	1445	178	1361.	*	1	2100	253	0.
1	0220	29	347.	*	1	0835	104	3685.	*	1	1450	179	1324.	*	1	2105	254	0.
1	0225	30	395.	*	1	0840	105	3636.	*	1	1455	180	1287.	*	1	2110	255	0.
1	0230	31	443.	*	1	0845	106	3588.	*	1	1500	181	1250.	*	1	2115	256	0.
1	0235	32	489.	*	1	0850	107	3542.	*	1	1505	182	1212.	*	1	2120	257	0.
1	0240	33	530.	*	1	0855	108	3498.	*	1	1510	183	1173.	*	1	2125	258	0.
1	0245	34	566.	*	1	0900	109	3455.	*	1	1515	184	1133.	*	1	2130	259	0.
1	0250	35	599.	*	1	0905	110	3415.	*	1	1520	185	1094.	*	1	2135	260	0.
1	0255	36	633.	*	1	0910	111	3376.	*	1	1525	186	1057.	*	1	2140	261	0.
1	0300	37	674.	*	1	0915	112	3339.	*	1	1530	187	1021.	*	1	2145	262	0.
1	0305	38	730.	*	1	0920	113	3304.	*	1	1535	188	983.	*	1	2150	263	0.
1	0310	39	808.	*	1	0925	114	3271.	*	1	1540	189	944.	*	1	2155	264	0.
1	0315	40	918.	*	1	0930	115	3239.	*	1	1545	190	904.	*	1	2200	265	0.
1	0320	41	1074.	*	1	0935	116	3207.	*	1	1550	191	865.	*	1	2205	266	0.
1	0325	42	1293.	*	1	0940	117	3177.	*	1	1555	192	828.	*	1	2210	267	0.
1	0330	43	1600.	*	1	0945	118	3146.	*	1	1600	193	793.	*	1	2215	268	0.
1	0335	44	2020.	*	1	0950	119	3116.	*	1	1605	194	757.	*	1	2220	269	0.
1	0340	45	2554.	*	1	0955	120	3086.	*	1	1610	195	719.	*	1	2225	270	0.
1	0345	46	3166.	*	1	1000	121	3057.	*	1	1615	196	680.	*	1	2230	271	0.
1	0350	47	3828.	*	1	1005	122	3029.	*	1	1620	197	641.	*	1	2235	272	0.
1	0355	48	4500.	*	1	1010	123	3002.	*	1	1625	198	604.	*	1	2240	273	0.
1	0400	49	5130.	*	1	1015	124	2976.	*	1	1630	199	568.	*	1	2245	274	0.
1	0405	50	5671.	*	1	1020	125	2950.	*	1	1635	200	534.	*	1	2250	275	0.
1	0410	51	6107.	*	1	1025	126	2923.	*	1	1640	201	501.	*	1	2255	276	0.
1	0415	52	6448.	*	1	1030	127	2897.	*	1	1645	202	465.	*	1	2300	277	0.
1	0420	53	6717.	*	1	1035	128	2870.	*	1	1650	203	423.	*	1	2305	278	0.
1	0425	54	6931.	*	1	1040	129	2844.	*	1	1655	204	380.	*	1	2310	279	0.
1	0430	55	7099.	*	1	1045	130	2818.	*	1	1700	205	338.	*	1	2315	280	0.
1	0435	56	7228.	*	1	1050	131	2793.	*	1	1705	206	301.	*	1	2320	281	0.
1	0440	57	7322.	*	1	1055	132	2768.	*	1	1710	207	268.	*	1	2325	282	0.
1	0445	58	7386.	*	1	1100	133	2744.	*	1	1715	208	236.	*	1	2330	283	0.
1	0450	59	7459.	*	1	1105	134	2719.	*	1	1720	209	203.	*	1	2335	284	0.
1	0455	60	7576.	*	1	1110	135	2693.	*	1	1725	210	167.	*	1	2340	285	0.
1	0500	61	7740.	*	1	1115	136	2667.	*	1	1730	211	131.	*	1	2345	286	0.
1	0505	62	7923.	*	1	1120	137	2642.	*	1	1735	212	101.	*	1	2350	287	0.
1	0510	63	8103.	*	1	1125	138	2616.	*	1	1740	213	76.	*	1	2355	288	0.
1	0515	64	8262.	*	1	1130	139	2591.	*	1	1745	214	57.	*	2	0000	289	0.
1	0520	65	8376.	*	1	1135	140	2566.	*	1	1750	215	43.	*	2	0005	290	0.
1	0525	66	8428.	*	1	1140	141	2541.	*	1	1755	216	33.	*	2	0010	291	0.
1	0530	67	8417.	*	1	1145	142	2515.	*	1	1800	217	25.	*	2	0015	292	0.
1	0535	68	8352.	*	1	1150	143	2489.	*	1	1805	218	19.	*	2	0020	293	0.
1	0540	69	8237.	*	1	1155	144	2462.	*	1	1810	219	14.	*	2	0025	294	0.
1	0545	70	8083.	*	1	1200	145	2435.	*	1	1815	220	11.	*	2	0030	295	0.
1	0550	71	7901.	*	1	1205	146	2408.	*	1	1820	221	8.	*	2	0035	296	0.
1	0555	72	7701.	*	1	1210	147	2381.	*	1	1825	222	6.	*	2	0040	297	0.
1	0600	73	7494.	*	1	1215	148	2355.	*	1	1830	223	5.	*	2	0045	298	0.
1	0605	74	7284.	*	1	1220	149	2328.	*	1	1835	224	4.	*	2	0050	299	0.
1	0610	75	7078.	*	1	1225	150	2301.	*	1	1840	225	3.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 8428.	5.42		5557.	2024.	1949.	1949.
		(INCHES)	.581	.847	.847	.847
		(AC-FT)	2755.	4014.	4014.	4014.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	COMPUTATION TIME STEP M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.02	750.00	6621.68	328.78	.61	8.29

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		6619.14	330.00	.61	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2913E+04 EXCESS= .0000E+00 OUTFLOW= .2913E+04 BASIN STORAGE= .1112E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .74

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	5580.	1		1230	151	1448.	1		1845	226	0.
1		0005	2	0.	1		0620	77	5451.	1		1235	152	1408.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5326.	1		1240	153	1369.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5203.	1		1245	154	1331.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5082.	1		1250	155	1293.	1		1905	230	0.
1		0025	6	0.	1		0640	81	4961.	1		1255	156	1256.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4842.	1		1300	157	1217.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4726.	1		1305	158	1177.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4615.	1		1310	159	1137.	1		1925	234	0.
1		0045	10	0.	1		0700	85	4507.	1		1315	160	1098.	1		1930	235	0.
1		0050	11	0.	1		0705	86	4402.	1		1320	161	1060.	1		1935	236	0.
1		0055	12	0.	1		0710	87	4302.	1		1325	162	1023.	1		1940	237	0.
1		0100	13	0.	1		0715	88	4207.	1		1330	163	985.	1		1945	238	0.
1		0105	14	1.	1		0720	89	4115.	1		1335	164	946.	1		1950	239	0.
1		0110	15	2.	1		0725	90	4027.	1		1340	165	905.	1		1955	240	0.
1		0115	16	3.	1		0730	91	3942.	1		1345	166	867.	1		2000	241	0.
1		0120	17	5.	1		0735	92	3860.	1		1350	167	829.	1		2005	242	0.
1		0125	18	7.	1		0740	93	3779.	1		1355	168	793.	1		2010	243	0.
1		0130	19	10.	1		0745	94	3702.	1		1400	169	757.	1		2015	244	0.
1		0135	20	14.	1		0750	95	3627.	1		1405	170	720.	1		2020	245	0.
1		0140	21	20.	1		0755	96	3557.	1		1410	171	681.	1		2025	246	0.
1		0145	22	28.	1		0800	97	3490.	1		1415	172	641.	1		2030	247	0.
1		0150	23	38.	1		0805	98	3427.	1		1420	173	604.	1		2035	248	0.
1		0155	24	51.	1		0810	99	3367.	1		1425	174	568.	1		2040	249	0.
1		0200	25	68.	1		0815	100	3312.	1		1430	175	535.	1		2045	250	0.
1		0205	26	88.	1		0820	101	3258.	1		1435	176	501.	1		2050	251	0.
1		0210	27	112.	1		0825	102	3207.	1		1440	177	466.	1		2055	252	0.
1		0215	28	138.	1		0830	103	3159.	1		1445	178	427.	1		2100	253	0.
1		0220	29	167.	1		0835	104	3112.	1		1450	179	386.	1		2105	254	0.
1		0225	30	197.	1		0840	105	3067.	1		1455	180	346.	1		2110	255	0.
1		0230	31	228.	1		0845	106	3024.	1		1500	181	309.	1		2115	256	0.
1		0235	32	256.	1		0850	107	2981.	1		1505	182	275.	1		2120	257	0.
1		0240	33	283.	1		0855	108	2939.	1		1510	183	244.	1		2125	258	0.
1		0245	34	305.	1		0900	109	2898.	1		1515	184	213.	1		2130	259	0.
1		0250	35	324.	1		0905	110	2859.	1		1520	185	178.	1		2135	260	0.
1		0255	36	343.	1		0910	111	2821.	1		1525	186	142.	1		2140	261	0.
1		0300	37	363.	1		0915	112	2784.	1		1530	187	110.	1		2145	262	0.
1		0305	38	392.	1		0920	113	2748.	1		1535	188	84.	1		2150	263	0.
1		0310	39	432.	1		0925	114	2714.	1		1540	189	64.	1		2155	264	0.
1		0315	40	493.	1		0930	115	2680.	1		1545	190	48.	1		2200	265	0.
1		0320	41	589.	1		0935	116	2647.	1		1550	191	37.	1		2205	266	0.
1		0325	42	725.	1		0940	117	2613.	1		1555	192	28.	1		2210	267	0.
1		0330	43	928.	1		0945	118	2579.	1		1600	193	21.	1		2215	268	0.
1		0335	44	1222.	1		0950	119	2545.	1		1605	194	16.	1		2220	269	0.
1		0340	45	1598.	1		0955	120	2513.	1		1610	195	12.	1		2225	270	0.
1		0345	46	2040.	1		1000	121	2481.	1		1615	196	9.	1		2230	271	0.
1		0350	47	2526.	1		1005	122	2450.	1		1620	197	7.	1		2235	272	0.
1		0355	48	3037.	1		1010	123	2419.	1		1625	198	5.	1		2240	273	0.
1		0400	49	3538.	1		1015	124	2387.	1		1630	199	4.	1		2245	274	0.
1		0405	50	3983.	1		1020	125	2355.	1		1635	200	3.	1		2250	275	0.
1		0410	51	4348.	1		1025	126	2322.	1		1640	201	2.	1		2255	276	0.
1		0415	52	4626.	1		1030	127	2290.	1		1645	202	2.	1		2300	277	0.
1		0420	53	4833.	1		1035	128	2259.	1		1650	203	1.	1		2305	278	0.
1		0425	54	4982.	1		1040	129	2228.	1		1655	204	1.	1		2310	279	0.

1	0430	55	5096.	*	1	1045	130	2197.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	5212.	*	1	1050	131	2165.	*	1	1705	206	1.	*	1	2320	281	0.
1	0440	57	5340.	*	1	1055	132	2132.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	5461.	*	1	1100	133	2098.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	5581.	*	1	1105	134	2064.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	5727.	*	1	1110	135	2031.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	5902.	*	1	1115	136	1998.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	6084.	*	1	1120	137	1965.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	6261.	*	1	1125	138	1930.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	6418.	*	1	1130	139	1894.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6539.	*	1	1135	140	1857.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6605.	*	1	1140	141	1821.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6619.	*	1	1145	142	1784.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	6589.	*	1	1150	143	1749.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	6520.	*	1	1155	144	1712.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	6418.	*	1	1200	145	1675.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	6293.	*	1	1205	146	1636.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6155.	*	1	1210	147	1598.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6010.	*	1	1215	148	1561.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5862.	*	1	1220	149	1524.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5717.	*	1	1225	150	1486.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)				
+ 6619.	5.50		4414.	1469.	1415.	1415.
		(INCHES)	.462	.615	.615	.615
		(AC-FT)	2189.	2913.	2913.	2913.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.61	750.00	4186.98	335.27	.35	6.93
			INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL					
MAIN	.08	1.64	5.00		4186.51	335.00	.35	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1647E+04 EXCESS= .0000E+00 OUTFLOW= .1647E+04 BASIN STORAGE= .1210E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3721.	1		1230	151	352.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3657.	1		1235	152	320.	1		1850	227	0.
1		0010	3	0.	1		0625	78	3595.	1		1240	153	290.	1		1855	228	0.
1		0015	4	0.	1		0630	79	3532.	1		1245	154	263.	1		1900	229	0.
1		0020	5	0.	1		0635	80	3469.	1		1250	155	236.	1		1905	230	0.
1		0025	6	0.	1		0640	81	3404.	1		1255	156	208.	1		1910	231	0.
1		0030	7	0.	1		0645	82	3337.	1		1300	157	176.	1		1915	232	0.
1		0035	8	0.	1		0650	83	3270.	1		1305	158	143.	1		1920	233	0.
1		0040	9	0.	1		0655	84	3203.	1		1310	159	114.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3138.	1		1315	160	90.	1		1930	235	0.
1		0050	11	0.	1		0705	86	3074.	1		1320	161	71.	1		1935	236	0.
1		0055	12	0.	1		0710	87	3011.	1		1325	162	57.	1		1940	237	0.
1		0100	13	0.	1		0715	88	2950.	1		1330	163	46.	1		1945	238	0.
1		0105	14	0.	1		0720	89	2891.	1		1335	164	37.	1		1950	239	0.
1		0110	15	0.	1		0725	90	2833.	1		1340	165	30.	1		1955	240	0.
1		0115	16	0.	1		0730	91	2776.	1		1345	166	25.	1		2000	241	0.
1		0120	17	0.	1		0735	92	2718.	1		1350	167	21.	1		2005	242	0.
1		0125	18	0.	1		0740	93	2661.	1		1355	168	17.	1		2010	243	0.
1		0130	19	0.	1		0745	94	2606.	1		1400	169	15.	1		2015	244	0.

1	0135	20	0.	*	1	0750	95	2551.	*	1	1405	170	13.	*	1	2020	245	0.
1	0140	21	0.	*	1	0755	96	2499.	*	1	1410	171	11.	*	1	2025	246	0.
1	0145	22	1.	*	1	0800	97	2448.	*	1	1415	172	9.	*	1	2030	247	0.
1	0150	23	1.	*	1	0805	98	2399.	*	1	1420	173	8.	*	1	2035	248	0.
1	0155	24	3.	*	1	0810	99	2353.	*	1	1425	174	7.	*	1	2040	249	0.
1	0200	25	5.	*	1	0815	100	2308.	*	1	1430	175	6.	*	1	2045	250	0.
1	0205	26	8.	*	1	0820	101	2265.	*	1	1435	176	5.	*	1	2050	251	0.
1	0210	27	13.	*	1	0825	102	2222.	*	1	1440	177	5.	*	1	2055	252	0.
1	0215	28	19.	*	1	0830	103	2180.	*	1	1445	178	4.	*	1	2100	253	0.
1	0220	29	27.	*	1	0835	104	2137.	*	1	1450	179	4.	*	1	2105	254	0.
1	0225	30	36.	*	1	0840	105	2094.	*	1	1455	180	3.	*	1	2110	255	0.
1	0230	31	47.	*	1	0845	106	2052.	*	1	1500	181	3.	*	1	2115	256	0.
1	0235	32	57.	*	1	0850	107	2010.	*	1	1505	182	3.	*	1	2120	257	0.
1	0240	33	68.	*	1	0855	108	1969.	*	1	1510	183	2.	*	1	2125	258	0.
1	0245	34	79.	*	1	0900	109	1930.	*	1	1515	184	2.	*	1	2130	259	0.
1	0250	35	88.	*	1	0905	110	1891.	*	1	1520	185	2.	*	1	2135	260	0.
1	0255	36	97.	*	1	0910	111	1852.	*	1	1525	186	2.	*	1	2140	261	0.
1	0300	37	107.	*	1	0915	112	1812.	*	1	1530	187	2.	*	1	2145	262	0.
1	0305	38	120.	*	1	0920	113	1772.	*	1	1535	188	1.	*	1	2150	263	0.
1	0310	39	137.	*	1	0925	114	1733.	*	1	1540	189	1.	*	1	2155	264	0.
1	0315	40	162.	*	1	0930	115	1693.	*	1	1545	190	1.	*	1	2200	265	0.
1	0320	41	200.	*	1	0935	116	1655.	*	1	1550	191	1.	*	1	2205	266	0.
1	0325	42	256.	*	1	0940	117	1618.	*	1	1555	192	1.	*	1	2210	267	0.
1	0330	43	343.	*	1	0945	118	1580.	*	1	1600	193	1.	*	1	2215	268	0.
1	0335	44	479.	*	1	0950	119	1542.	*	1	1605	194	1.	*	1	2220	269	0.
1	0340	45	664.	*	1	0955	120	1503.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	898.	*	1	1000	121	1463.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	1178.	*	1	1005	122	1424.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	1475.	*	1	1010	123	1386.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	1771.	*	1	1015	124	1349.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	2040.	*	1	1020	125	1311.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	2269.	*	1	1025	126	1273.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	2457.	*	1	1030	127	1234.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	2611.	*	1	1035	128	1194.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	2724.	*	1	1040	129	1155.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	2806.	*	1	1045	130	1117.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	2857.	*	1	1050	131	1080.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	2887.	*	1	1055	132	1043.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	2925.	*	1	1100	133	1006.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	3011.	*	1	1105	134	967.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	3166.	*	1	1110	135	928.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	3363.	*	1	1115	136	890.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	3565.	*	1	1120	137	853.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	3749.	*	1	1125	138	818.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3909.	*	1	1130	139	783.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	4034.	*	1	1135	140	746.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	4123.	*	1	1140	141	709.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	4171.	*	1	1145	142	670.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	4187.	*	1	1150	143	633.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	4171.	*	1	1155	144	597.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	4130.	*	1	1200	145	564.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	4075.	*	1	1205	146	531.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	4008.	*	1	1210	147	498.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	3937.	*	1	1215	148	463.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3863.	*	1	1220	149	425.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3790.	*	1	1225	150	387.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS)	6-HR	24-HR	72-HR	24.92-HR
+ 4187.	5.58		2812.	831.	800.	800.
		(INCHES)	.294	.348	.348	.348
		(AC-FT)	1395.	1647.	1647.	1647.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	4.51	750.00	2354.68	342.66	.18	5.54

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN .08 1.64 5.00 2351.49 345.00 .18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8597E+03 EXCESS= .0000E+00 OUTFLOW= .8597E+03 BASIN STORAGE= .1104E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	2182.	1		1230	151	47.	1		1845	226	0.
1		0005	2	0.	1		0620	77	2160.	1		1235	152	43.	1		1850	227	0.
1		0010	3	0.	1		0625	78	2137.	1		1240	153	40.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2112.	1		1245	154	37.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2084.	1		1250	155	35.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2054.	1		1255	156	32.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2022.	1		1300	157	30.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1989.	1		1305	158	28.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1955.	1		1310	159	27.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1921.	1		1315	160	25.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1885.	1		1320	161	23.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1850.	1		1325	162	22.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1814.	1		1330	163	20.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1778.	1		1335	164	19.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1743.	1		1340	165	18.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1707.	1		1345	166	17.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1670.	1		1350	167	15.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1633.	1		1355	168	14.	1		2010	243	0.
1		0130	19	0.	1		0745	94	1597.	1		1400	169	13.	1		2015	244	0.
1		0135	20	0.	1		0750	95	1560.	1		1405	170	12.	1		2020	245	0.
1		0140	21	0.	1		0755	96	1524.	1		1410	171	12.	1		2025	246	0.
1		0145	22	0.	1		0800	97	1488.	1		1415	172	11.	1		2030	247	0.
1		0150	23	0.	1		0805	98	1452.	1		1420	173	10.	1		2035	248	0.
1		0155	24	0.	1		0810	99	1415.	1		1425	174	9.	1		2040	249	0.
1		0200	25	0.	1		0815	100	1379.	1		1430	175	8.	1		2045	250	0.
1		0205	26	0.	1		0820	101	1343.	1		1435	176	8.	1		2050	251	0.
1		0210	27	0.	1		0825	102	1307.	1		1440	177	7.	1		2055	252	0.
1		0215	28	0.	1		0830	103	1273.	1		1445	178	7.	1		2100	253	0.
1		0220	29	0.	1		0835	104	1239.	1		1450	179	6.	1		2105	254	0.
1		0225	30	1.	1		0840	105	1206.	1		1455	180	6.	1		2110	255	0.
1		0230	31	2.	1		0845	106	1173.	1		1500	181	5.	1		2115	256	0.
1		0235	32	3.	1		0850	107	1141.	1		1505	182	5.	1		2120	257	0.
1		0240	33	4.	1		0855	108	1109.	1		1510	183	5.	1		2125	258	0.
1		0245	34	5.	1		0900	109	1076.	1		1515	184	4.	1		2130	259	0.
1		0250	35	7.	1		0905	110	1042.	1		1520	185	4.	1		2135	260	0.
1		0255	36	9.	1		0910	111	1007.	1		1525	186	4.	1		2140	261	0.
1		0300	37	12.	1		0915	112	972.	1		1530	187	3.	1		2145	262	0.
1		0305	38	15.	1		0920	113	940.	1		1535	188	3.	1		2150	263	0.
1		0310	39	20.	1		0925	114	909.	1		1540	189	3.	1		2155	264	0.
1		0315	40	28.	1		0930	115	878.	1		1545	190	3.	1		2200	265	0.
1		0320	41	41.	1		0935	116	848.	1		1550	191	3.	1		2205	266	0.
1		0325	42	61.	1		0940	117	818.	1		1555	192	2.	1		2210	267	0.
1		0330	43	92.	1		0945	118	788.	1		1600	193	2.	1		2215	268	0.
1		0335	44	139.	1		0950	119	756.	1		1605	194	2.	1		2220	269	0.
1		0340	45	216.	1		0955	120	722.	1		1610	195	2.	1		2225	270	0.
1		0345	46	327.	1		1000	121	688.	1		1615	196	2.	1		2230	271	0.
1		0350	47	463.	1		1005	122	656.	1		1620	197	2.	1		2235	272	0.
1		0355	48	623.	1		1010	123	626.	1		1625	198	2.	1		2240	273	0.
1		0400	49	794.	1		1015	124	596.	1		1630	199	1.	1		2245	274	0.
1		0405	50	953.	1		1020	125	568.	1		1635	200	1.	1		2250	275	0.
1		0410	51	1084.	1		1025	126	541.	1		1640	201	1.	1		2255	276	0.
1		0415	52	1190.	1		1030	127	513.	1		1645	202	1.	1		2300	277	0.
1		0420	53	1272.	1		1035	128	483.	1		1650	203	1.	1		2305	278	0.
1		0425	54	1336.	1		1040	129	450.	1		1655	204	1.	1		2310	279	0.
1		0430	55	1386.	1		1045	130	415.	1		1700	205	1.	1		2315	280	0.
1		0435	56	1426.	1		1050	131	382.	1		1705	206	1.	1		2320	281	0.
1		0440	57	1462.	1		1055	132	353.	1		1710	207	1.	1		2325	282	0.
1		0445	58	1489.	1		1100	133	327.	1		1715	208	1.	1		2330	283	0.
1		0450	59	1509.	1		1105	134	303.	1		1720	209	1.	1		2335	284	0.
1		0455	60	1541.	1		1110	135	280.	1		1725	210	1.	1		2340	285	0.
1		0500	61	1593.	1		1115	136	260.	1		1730	211	1.	1		2345	286	0.
1		0505	62	1660.	1		1120	137	240.	1		1735	212	1.	1		2350	287	0.
1		0510	63	1749.	1		1125	138	221.	1		1740	213	0.	1		2355	288	0.
1		0515	64	1875.	1		1130	139	201.	1		1745	214	0.	2		0000	289	0.
1		0520	65	2043.	1		1135	140	179.	1		1750	215	0.	2		0005	290	0.

1	0525	66	2198.	*	1	1140	141	156.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2281.	*	1	1145	142	135.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	2322.	*	1	1150	143	116.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	2348.	*	1	1155	144	100.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	2351.	*	1	1200	145	87.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	2337.	*	1	1205	146	77.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	2310.	*	1	1210	147	68.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	2276.	*	1	1215	148	61.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	2241.	*	1	1220	149	56.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	2209.	*	1	1225	150	51.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)	(CFS)				
+ 2351.	5.75		1567.	433.	418.	418.
		(INCHES)	.164	.181	.181	.181
		(AC-FT)	777.	860.	860.	860.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	500.00	400.53	445.00	.03	2.78

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		400.53	445.00	.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1547E+03 EXCESS= .0000E+00 OUTFLOW= .1548E+03 BASIN STORAGE= .1129E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW		DA	MON	HRMN	ORD	FLOW		DA	MON	HRMN	ORD	FLOW		DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	303.	*	1		1230	151	35.	*	1		1845	226	1.
1		0005	2	0.	*	1		0620	77	292.	*	1		1235	152	33.	*	1		1850	227	1.
1		0010	3	0.	*	1		0625	78	283.	*	1		1240	153	32.	*	1		1855	228	1.
1		0015	4	0.	*	1		0630	79	275.	*	1		1245	154	31.	*	1		1900	229	1.
1		0020	5	0.	*	1		0635	80	267.	*	1		1250	155	29.	*	1		1905	230	1.
1		0025	6	0.	*	1		0640	81	257.	*	1		1255	156	28.	*	1		1910	231	1.
1		0030	7	0.	*	1		0645	82	248.	*	1		1300	157	27.	*	1		1915	232	1.
1		0035	8	0.	*	1		0650	83	244.	*	1		1305	158	25.	*	1		1920	233	1.
1		0040	9	0.	*	1		0655	84	260.	*	1		1310	159	24.	*	1		1925	234	1.
1		0045	10	0.	*	1		0700	85	309.	*	1		1315	160	23.	*	1		1930	235	1.
1		0050	11	0.	*	1		0705	86	362.	*	1		1320	161	22.	*	1		1935	236	1.
1		0055	12	0.	*	1		0710	87	368.	*	1		1325	162	21.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	358.	*	1		1330	163	20.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	382.	*	1		1335	164	18.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	401.	*	1		1340	165	18.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	391.	*	1		1345	166	17.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	394.	*	1		1350	167	16.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	398.	*	1		1355	168	15.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	385.	*	1		1400	169	14.	*	1		2015	244	0.
1		0135	20	0.	*	1		0750	95	382.	*	1		1405	170	13.	*	1		2020	245	0.
1		0140	21	0.	*	1		0755	96	377.	*	1		1410	171	13.	*	1		2025	246	0.
1		0145	22	0.	*	1		0800	97	364.	*	1		1415	172	12.	*	1		2030	247	0.
1		0150	23	0.	*	1		0805	98	358.	*	1		1420	173	11.	*	1		2035	248	0.
1		0155	24	0.	*	1		0810	99	348.	*	1		1425	174	11.	*	1		2040	249	0.
1		0200	25	0.	*	1		0815	100	336.	*	1		1430	175	10.	*	1		2045	250	0.
1		0205	26	0.	*	1		0820	101	328.	*	1		1435	176	10.	*	1		2050	251	0.
1		0210	27	0.	*	1		0825	102	316.	*	1		1440	177	9.	*	1		2055	252	0.
1		0215	28	0.	*	1		0830	103	306.	*	1		1445	178	9.	*	1		2100	253	0.
1		0220	29	0.	*	1		0835	104	296.	*	1		1450	179	8.	*	1		2105	254	0.
1		0225	30	0.	*	1		0840	105	285.	*	1		1455	180	8.	*	1		2110	255	0.

1	0230	31	0.	*	1	0845	106	276.	*	1	1500	181	7.	*	1	2115	256	0.
1	0235	32	0.	*	1	0850	107	265.	*	1	1505	182	7.	*	1	2120	257	0.
1	0240	33	0.	*	1	0855	108	255.	*	1	1510	183	7.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	245.	*	1	1515	184	6.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	235.	*	1	1520	185	6.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	225.	*	1	1525	186	6.	*	1	2140	261	0.
1	0300	37	0.	*	1	0915	112	214.	*	1	1530	187	6.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	202.	*	1	1535	188	5.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	189.	*	1	1540	189	5.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	175.	*	1	1545	190	5.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	161.	*	1	1550	191	5.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	151.	*	1	1555	192	4.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	143.	*	1	1600	193	4.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	135.	*	1	1605	194	4.	*	1	2220	269	0.
1	0340	45	2.	*	1	0955	120	127.	*	1	1610	195	4.	*	1	2225	270	0.
1	0345	46	5.	*	1	1000	121	120.	*	1	1615	196	4.	*	1	2230	271	0.
1	0350	47	12.	*	1	1005	122	114.	*	1	1620	197	4.	*	1	2235	272	0.
1	0355	48	23.	*	1	1010	123	108.	*	1	1625	198	3.	*	1	2240	273	0.
1	0400	49	38.	*	1	1015	124	104.	*	1	1630	199	3.	*	1	2245	274	0.
1	0405	50	61.	*	1	1020	125	100.	*	1	1635	200	3.	*	1	2250	275	0.
1	0410	51	92.	*	1	1025	126	96.	*	1	1640	201	3.	*	1	2255	276	0.
1	0415	52	119.	*	1	1030	127	93.	*	1	1645	202	3.	*	1	2300	277	0.
1	0420	53	145.	*	1	1035	128	89.	*	1	1650	203	3.	*	1	2305	278	0.
1	0425	54	170.	*	1	1040	129	86.	*	1	1655	204	3.	*	1	2310	279	0.
1	0430	55	192.	*	1	1045	130	82.	*	1	1700	205	2.	*	1	2315	280	0.
1	0435	56	205.	*	1	1050	131	79.	*	1	1705	206	2.	*	1	2320	281	0.
1	0440	57	213.	*	1	1055	132	76.	*	1	1710	207	2.	*	1	2325	282	0.
1	0445	58	219.	*	1	1100	133	73.	*	1	1715	208	2.	*	1	2330	283	0.
1	0450	59	222.	*	1	1105	134	70.	*	1	1720	209	2.	*	1	2335	284	0.
1	0455	60	225.	*	1	1110	135	67.	*	1	1725	210	2.	*	1	2340	285	0.
1	0500	61	231.	*	1	1115	136	64.	*	1	1730	211	2.	*	1	2345	286	0.
1	0505	62	241.	*	1	1120	137	61.	*	1	1735	212	2.	*	1	2350	287	0.
1	0510	63	258.	*	1	1125	138	58.	*	1	1740	213	2.	*	1	2355	288	0.
1	0515	64	281.	*	1	1130	139	56.	*	1	1745	214	2.	*	2	0000	289	0.
1	0520	65	309.	*	1	1135	140	54.	*	1	1750	215	1.	*	2	0005	290	0.
1	0525	66	337.	*	1	1140	141	52.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	358.	*	1	1145	142	50.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	370.	*	1	1150	143	48.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	374.	*	1	1155	144	46.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	373.	*	1	1200	145	45.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	370.	*	1	1205	146	43.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	360.	*	1	1210	147	41.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	345.	*	1	1215	148	40.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	330.	*	1	1220	149	38.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	317.	*	1	1225	150	36.	*	1	1840	225	1.	*	2	0055	300	0.

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 401.	7.42		275.	78.	75.	75.
		(INCHES)	.029	.033	.033	.033
		(AC-FT)	136.	155.	155.	155.

CUMULATIVE AREA = 88.86 SQ MI

```
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:56:20  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
 *** NOLIST ***
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  14:56:20  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

KLEINFELDER
FEBRUARY 2008
ALTERNATIVE E

DESIGN STORM = 100-YEAR 6-HOUR STORM
STORM DISTRIBUTION = SDN5

```
  10 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0055  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
```

```
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00       .87       .74       .57       .44       .26


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
1250 KK     *     ULWIN  *
            *            *
            **************

1254 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

1253 HC          HYDROGRAPH COMBINATION
                       ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***
*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    ULWIN
                                                     SUM OF  4 HYDROGRAPHS
                                                   PLAN 1,   RATIO =  1.00
*****************************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	7801.	1		1230	151	3.	1		1845	226	0.
1		0005	2	0.	1		0620	77	7104.	1		1235	152	3.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6480.	1		1240	153	3.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5917.	1		1245	154	2.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5417.	1		1250	155	2.	1		1905	230	0.
1		0025	6	1.	1		0640	81	4964.	1		1255	156	2.	1		1910	231	0.
1		0030	7	2.	1		0645	82	4554.	1		1300	157	1.	1		1915	232	0.
1		0035	8	3.	1		0650	83	4183.	1		1305	158	1.	1		1920	233	0.
1		0040	9	5.	1		0655	84	3838.	1		1310	159	1.	1		1925	234	0.
1		0045	10	8.	1		0700	85	3522.	1		1315	160	1.	1		1930	235	0.
1		0050	11	10.	1		0705	86	3229.	1		1320	161	1.	1		1935	236	0.
1		0055	12	13.	1		0710	87	2958.	1		1325	162	1.	1		1940	237	0.
1		0100	13	16.	1		0715	88	2706.	1		1330	163	1.	1		1945	238	0.
1		0105	14	19.	1		0720	89	2472.	1		1335	164	0.	1		1950	239	0.
1		0110	15	23.	1		0725	90	2257.	1		1340	165	0.	1		1955	240	0.
1		0115	16	27.	1		0730	91	2058.	1		1345	166	0.	1		2000	241	0.
1		0120	17	31.	1		0735	92	1876.	1		1350	167	0.	1		2005	242	0.
1		0125	18	37.	1		0740	93	1710.	1		1355	168	0.	1		2010	243	0.
1		0130	19	45.	1		0745	94	1558.	1		1400	169	0.	1		2015	244	0.
1		0135	20	55.	1		0750	95	1419.	1		1405	170	0.	1		2020	245	0.
1		0140	21	69.	1		0755	96	1293.	1		1410	171	0.	1		2025	246	0.
1		0145	22	87.	1		0800	97	1180.	1		1415	172	0.	1		2030	247	0.
1		0150	23	111.	1		0805	98	1077.	1		1420	173	0.	1		2035	248	0.
1		0155	24	141.	1		0810	99	981.	1		1425	174	0.	1		2040	249	0.
1		0200	25	177.	1		0815	100	891.	1		1430	175	0.	1		2045	250	0.
1		0205	26	219.	1		0820	101	809.	1		1435	176	0.	1		2050	251	0.
1		0210	27	267.	1		0825	102	733.	1		1440	177	0.	1		2055	252	0.
1		0215	28	320.	1		0830	103	663.	1		1445	178	0.	1		2100	253	0.
1		0220	29	375.	1		0835	104	600.	1		1450	179	0.	1		2105	254	0.
1		0225	30	432.	1		0840	105	544.	1		1455	180	0.	1		2110	255	0.
1		0230	31	491.	1		0845	106	493.	1		1500	181	0.	1		2115	256	0.
1		0235	32	557.	1		0850	107	447.	1		1505	182	0.	1		2120	257	0.
1		0240	33	632.	1		0855	108	406.	1		1510	183	0.	1		2125	258	0.
1		0245	34	720.	1		0900	109	369.	1		1515	184	0.	1		2130	259	0.
1		0250	35	820.	1		0905	110	335.	1		1520	185	0.	1		2135	260	0.

1	0255	36	931.	*	1	0910	111	305.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	1053.	*	1	0915	112	277.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	1185.	*	1	0920	113	252.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	1326.	*	1	0925	114	230.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	1475.	*	1	0930	115	209.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	1639.	*	1	0935	116	189.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	1836.	*	1	0940	117	171.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	2093.	*	1	0945	118	155.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	2447.	*	1	0950	119	140.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	2924.	*	1	0955	120	126.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	3540.	*	1	1000	121	114.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	4404.	*	1	1005	122	102.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	5788.	*	1	1010	123	92.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	7898.	*	1	1015	124	83.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	10616.	*	1	1020	125	74.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	13208.	*	1	1025	126	67.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	15089.	*	1	1030	127	60.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	16172.	*	1	1035	128	53.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	16720.	*	1	1040	129	48.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	16717.	*	1	1045	130	43.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	16373.	*	1	1050	131	38.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	15786.	*	1	1055	132	34.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	15050.	*	1	1100	133	30.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	14295.	*	1	1105	134	27.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	13601.	*	1	1110	135	24.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	13059.	*	1	1115	136	21.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	12705.	*	1	1120	137	19.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	12543.	*	1	1125	138	17.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	12520.	*	1	1130	139	15.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	12649.	*	1	1135	140	14.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	12842.	*	1	1140	141	12.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	13000.	*	1	1145	142	11.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	13012.	*	1	1150	143	10.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	12814.	*	1	1155	144	8.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	12374.	*	1	1200	145	7.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	11762.	*	1	1205	146	7.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	11016.	*	1	1210	147	6.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	10194.	*	1	1215	148	5.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	9371.	*	1	1220	149	4.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	8562.	*	1	1225	150	4.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 16720.	4.42		6486.	1654.	1593.	1593.
		(INCHES)	1.025	1.045	1.045	1.045
		(AC-FT)	3216.	3280.	3280.	3280.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .87

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6553.	1		1230	151	5.	1		1845	226	0.
1		0005	2	0.	1		0620	77	5987.	1		1235	152	5.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5468.	1		1240	153	4.	1		1855	228	0.
1		0015	4	0.	1		0630	79	4994.	1		1245	154	4.	1		1900	229	0.
1		0020	5	0.	1		0635	80	4574.	1		1250	155	3.	1		1905	230	0.
1		0025	6	0.	1		0640	81	4202.	1		1255	156	3.	1		1910	231	0.
1		0030	7	1.	1		0645	82	3862.	1		1300	157	2.	1		1915	232	0.
1		0035	8	2.	1		0650	83	3551.	1		1305	158	2.	1		1920	233	0.
1		0040	9	3.	1		0655	84	3266.	1		1310	159	2.	1		1925	234	0.
1		0045	10	4.	1		0700	85	3004.	1		1315	160	2.	1		1930	235	0.
1		0050	11	6.	1		0705	86	2761.	1		1320	161	1.	1		1935	236	0.
1		0055	12	7.	1		0710	87	2537.	1		1325	162	1.	1		1940	237	0.
1		0100	13	8.	1		0715	88	2331.	1		1330	163	1.	1		1945	238	0.
1		0105	14	9.	1		0720	89	2139.	1		1335	164	1.	1		1950	239	0.
1		0110	15	10.	1		0725	90	1961.	1		1340	165	1.	1		1955	240	0.
1		0115	16	11.	1		0730	91	1798.	1		1345	166	1.	1		2000	241	0.
1		0120	17	12.	1		0735	92	1647.	1		1350	167	1.	1		2005	242	0.

1	0125	18	14.	*	1	0740	93	1508.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	17.	*	1	0745	94	1382.	*	1	1400	169	0.	*	1	2015	244	0.
1	0135	20	20.	*	1	0750	95	1267.	*	1	1405	170	0.	*	1	2020	245	0.
1	0140	21	25.	*	1	0755	96	1162.	*	1	1410	171	0.	*	1	2025	246	0.
1	0145	22	32.	*	1	0800	97	1066.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	41.	*	1	0805	98	979.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	51.	*	1	0810	99	897.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	65.	*	1	0815	100	822.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	83.	*	1	0820	101	753.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	104.	*	1	0825	102	689.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	129.	*	1	0830	103	629.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	157.	*	1	0835	104	572.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	188.	*	1	0840	105	520.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	220.	*	1	0845	106	472.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	254.	*	1	0850	107	429.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	291.	*	1	0855	108	390.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	334.	*	1	0900	109	355.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	384.	*	1	0905	110	323.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	442.	*	1	0910	111	294.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	512.	*	1	0915	112	268.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	598.	*	1	0920	113	244.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	702.	*	1	0925	114	223.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	824.	*	1	0930	115	204.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	960.	*	1	0935	116	187.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	1116.	*	1	0940	117	171.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1309.	*	1	0945	118	157.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1564.	*	1	0950	119	143.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1900.	*	1	0955	120	131.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	2307.	*	1	1000	121	120.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	2783.	*	1	1005	122	110.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	3397.	*	1	1010	123	101.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	4450.	*	1	1015	124	92.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	6352.	*	1	1020	125	84.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	8616.	*	1	1025	126	77.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	10466.	*	1	1030	127	70.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	11645.	*	1	1035	128	64.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	12205.	*	1	1040	129	58.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	12399.	*	1	1045	130	53.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	12298.	*	1	1050	131	48.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	12046.	*	1	1055	132	43.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	11685.	*	1	1100	133	39.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	11231.	*	1	1105	134	35.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	10731.	*	1	1110	135	31.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	10294.	*	1	1115	136	28.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	9968.	*	1	1120	137	25.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	9796.	*	1	1125	138	23.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	9769.	*	1	1130	139	20.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	9834.	*	1	1135	140	18.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	9987.	*	1	1140	141	16.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	10169.	*	1	1145	142	15.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	10271.	*	1	1150	143	13.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	10221.	*	1	1155	144	12.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	9970.	*	1	1200	145	11.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	9552.	*	1	1205	146	9.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	9033.	*	1	1210	147	8.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	8432.	*	1	1215	148	8.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	7794.	*	1	1220	149	7.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7161.	*	1	1225	150	6.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 12399.	4.50		4980.	1269.	1222.	1222.
		(INCHES)	.787	.802	.802	.802
		(AC-FT)	2469.	2517.	2517.	2517.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .74

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DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW

1	0000	1	0.	*	1	0615	76	5256.	*	1	1230	151	6.	*	1	1845	226	0.
1	0005	2	0.	*	1	0620	77	4829.	*	1	1235	152	5.	*	1	1850	227	0.
1	0010	3	0.	*	1	0625	78	4425.	*	1	1240	153	5.	*	1	1855	228	0.
1	0015	4	0.	*	1	0630	79	4053.	*	1	1245	154	4.	*	1	1900	229	0.
1	0020	5	0.	*	1	0635	80	3719.	*	1	1250	155	4.	*	1	1905	230	0.
1	0025	6	0.	*	1	0640	81	3418.	*	1	1255	156	3.	*	1	1910	231	0.
1	0030	7	0.	*	1	0645	82	3147.	*	1	1300	157	3.	*	1	1915	232	0.
1	0035	8	1.	*	1	0650	83	2899.	*	1	1305	158	3.	*	1	1920	233	0.
1	0040	9	1.	*	1	0655	84	2672.	*	1	1310	159	2.	*	1	1925	234	0.
1	0045	10	2.	*	1	0700	85	2464.	*	1	1315	160	2.	*	1	1930	235	0.
1	0050	11	3.	*	1	0705	86	2274.	*	1	1320	161	2.	*	1	1935	236	0.
1	0055	12	4.	*	1	0710	87	2099.	*	1	1325	162	2.	*	1	1940	237	0.
1	0100	13	4.	*	1	0715	88	1936.	*	1	1330	163	1.	*	1	1945	238	0.
1	0105	14	5.	*	1	0720	89	1785.	*	1	1335	164	1.	*	1	1950	239	0.
1	0110	15	5.	*	1	0725	90	1644.	*	1	1340	165	1.	*	1	1955	240	0.
1	0115	16	5.	*	1	0730	91	1514.	*	1	1345	166	1.	*	1	2000	241	0.
1	0120	17	5.	*	1	0735	92	1395.	*	1	1350	167	1.	*	1	2005	242	0.
1	0125	18	6.	*	1	0740	93	1285.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	6.	*	1	0745	94	1183.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	7.	*	1	0750	95	1088.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	9.	*	1	0755	96	1001.	*	1	1410	171	0.	*	1	2025	246	0.
1	0145	22	11.	*	1	0800	97	919.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	14.	*	1	0805	98	844.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	18.	*	1	0810	99	774.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	23.	*	1	0815	100	710.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	29.	*	1	0820	101	652.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	37.	*	1	0825	102	599.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	46.	*	1	0830	103	551.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	56.	*	1	0835	104	507.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	68.	*	1	0840	105	465.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	80.	*	1	0845	106	426.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	94.	*	1	0850	107	389.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	109.	*	1	0855	108	356.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	125.	*	1	0900	109	325.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	144.	*	1	0905	110	297.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	167.	*	1	0910	111	271.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	198.	*	1	0915	112	248.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	237.	*	1	0920	113	227.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	287.	*	1	0925	114	208.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	350.	*	1	0930	115	191.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	433.	*	1	0935	116	175.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	539.	*	1	0940	117	160.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	672.	*	1	0945	118	147.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	835.	*	1	0950	119	135.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1049.	*	1	0955	120	124.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1323.	*	1	1000	121	114.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1642.	*	1	1005	122	105.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	1977.	*	1	1010	123	97.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	2341.	*	1	1015	124	89.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	2907.	*	1	1020	125	82.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	4176.	*	1	1025	126	75.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	6120.	*	1	1030	127	69.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	7540.	*	1	1035	128	63.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	8274.	*	1	1040	129	58.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	8595.	*	1	1045	130	52.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	8612.	*	1	1050	131	48.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	8464.	*	1	1055	132	43.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	8257.	*	1	1100	133	39.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	8041.	*	1	1105	134	36.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	7823.	*	1	1110	135	32.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	7599.	*	1	1115	136	29.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	7373.	*	1	1120	137	26.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	7193.	*	1	1125	138	24.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	7115.	*	1	1130	139	21.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	7141.	*	1	1135	140	19.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	7244.	*	1	1140	141	17.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	7395.	*	1	1145	142	16.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	7542.	*	1	1150	143	14.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	7606.	*	1	1155	144	13.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	7533.	*	1	1200	145	12.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	7317.	*	1	1205	146	10.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6991.	*	1	1210	147	9.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6597.	*	1	1215	148	8.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	6161.	*	1	1220	149	8.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5705.	*	1	1225	150	7.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR

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+   (CFS)       (HR)
                          (CFS)
+    8612.      4.58                 3593.        914.        881.         881.
                         (INCHES)      .568        .578        .578         .578
                          (AC-FT)     1781.       1814.       1814.        1814.

                         CUMULATIVE AREA =   58.84 SQ MI
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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3442.	1		1230	151	10.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3216.	1		1235	152	9.	1		1850	227	0.
1		0010	3	0.	1		0625	78	2994.	1		1240	153	8.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2779.	1		1245	154	8.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2571.	1		1250	155	7.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2373.	1		1255	156	6.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2189.	1		1300	157	6.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2020.	1		1305	158	5.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1868.	1		1310	159	5.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1729.	1		1315	160	4.	1		1930	235	0.
1		0050	11	1.	1		0705	86	1603.	1		1320	161	4.	1		1935	236	0.
1		0055	12	1.	1		0710	87	1487.	1		1325	162	4.	1		1940	237	0.
1		0100	13	1.	1		0715	88	1380.	1		1330	163	3.	1		1945	238	0.
1		0105	14	1.	1		0720	89	1280.	1		1335	164	3.	1		1950	239	0.
1		0110	15	1.	1		0725	90	1187.	1		1340	165	3.	1		1955	240	0.
1		0115	16	2.	1		0730	91	1101.	1		1345	166	2.	1		2000	241	0.
1		0120	17	2.	1		0735	92	1021.	1		1350	167	2.	1		2005	242	0.
1		0125	18	2.	1		0740	93	946.	1		1355	168	2.	1		2010	243	0.
1		0130	19	2.	1		0745	94	878.	1		1400	169	2.	1		2015	244	0.
1		0135	20	3.	1		0750	95	815.	1		1405	170	2.	1		2020	245	0.
1		0140	21	3.	1		0755	96	757.	1		1410	171	1.	1		2025	246	0.
1		0145	22	4.	1		0800	97	702.	1		1415	172	1.	1		2030	247	0.
1		0150	23	4.	1		0805	98	652.	1		1420	173	1.	1		2035	248	0.
1		0155	24	5.	1		0810	99	605.	1		1425	174	1.	1		2040	249	0.
1		0200	25	6.	1		0815	100	561.	1		1430	175	1.	1		2045	250	0.
1		0205	26	7.	1		0820	101	521.	1		1435	176	1.	1		2050	251	0.
1		0210	27	8.	1		0825	102	484.	1		1440	177	1.	1		2055	252	0.
1		0215	28	9.	1		0830	103	448.	1		1445	178	1.	1		2100	253	0.
1		0220	29	11.	1		0835	104	415.	1		1450	179	1.	1		2105	254	0.
1		0225	30	13.	1		0840	105	385.	1		1455	180	0.	1		2110	255	0.
1		0230	31	15.	1		0845	106	357.	1		1500	181	0.	1		2115	256	0.
1		0235	32	18.	1		0850	107	331.	1		1505	182	0.	1		2120	257	0.
1		0240	33	20.	1		0855	108	307.	1		1510	183	0.	1		2125	258	0.
1		0245	34	23.	1		0900	109	284.	1		1515	184	0.	1		2130	259	0.
1		0250	35	26.	1		0905	110	263.	1		1520	185	0.	1		2135	260	0.
1		0255	36	29.	1		0910	111	244.	1		1525	186	0.	1		2140	261	0.
1		0300	37	34.	1		0915	112	225.	1		1530	187	0.	1		2145	262	0.
1		0305	38	41.	1		0920	113	208.	1		1535	188	0.	1		2150	263	0.
1		0310	39	52.	1		0925	114	191.	1		1540	189	0.	1		2155	264	0.
1		0315	40	68.	1		0930	115	176.	1		1545	190	0.	1		2200	265	0.
1		0320	41	90.	1		0935	116	163.	1		1550	191	0.	1		2205	266	0.
1		0325	42	122.	1		0940	117	150.	1		1555	192	0.	1		2210	267	0.
1		0330	43	169.	1		0945	118	138.	1		1600	193	0.	1		2215	268	0.
1		0335	44	232.	1		0950	119	128.	1		1605	194	0.	1		2220	269	0.
1		0340	45	313.	1		0955	120	118.	1		1610	195	0.	1		2225	270	0.
1		0345	46	405.	1		1000	121	109.	1		1615	196	0.	1		2230	271	0.
1		0350	47	506.	1		1005	122	101.	1		1620	197	0.	1		2235	272	0.
1		0355	48	670.	1		1010	123	93.	1		1625	198	0.	1		2240	273	0.
1		0400	49	877.	1		1015	124	86.	1		1630	199	0.	1		2245	274	0.
1		0405	50	1064.	1		1020	125	80.	1		1635	200	0.	1		2250	275	0.
1		0410	51	1199.	1		1025	126	74.	1		1640	201	0.	1		2255	276	0.
1		0415	52	1320.	1		1030	127	69.	1		1645	202	0.	1		2300	277	0.
1		0420	53	1699.	1		1035	128	64.	1		1650	203	0.	1		2305	278	0.
1		0425	54	2819.	1		1040	129	60.	1		1655	204	0.	1		2310	279	0.
1		0430	55	4056.	1		1045	130	56.	1		1700	205	0.	1		2315	280	0.
1		0435	56	4526.	1		1050	131	52.	1		1705	206	0.	1		2320	281	0.
1		0440	57	4609.	1		1055	132	49.	1		1710	207	0.	1		2325	282	0.
1		0445	58	4614.	1		1100	133	45.	1		1715	208	0.	1		2330	283	0.
1		0450	59	4500.	1		1105	134	42.	1		1720	209	0.	1		2335	284	0.
1		0455	60	4362.	1		1110	135	39.	1		1725	210	0.	1		2340	285	0.
1		0500	61	4228.	1		1115	136	37.	1		1730	211	0.	1		2345	286	0.
1		0505	62	4112.	1		1120	137	34.	1		1735	212	0.	1		2350	287	0.

1	0510	63	4030.	*	1	1125	138	32.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	3988.	*	1	1130	139	29.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	3990.	*	1	1135	140	27.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	4021.	*	1	1140	141	25.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	4070.	*	1	1145	142	23.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	4140.	*	1	1150	143	21.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	4229.	*	1	1155	144	19.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	4306.	*	1	1200	145	17.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	4324.	*	1	1205	146	16.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	4251.	*	1	1210	147	14.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	4096.	*	1	1215	148	13.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3893.	*	1	1220	149	12.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3670.	*	1	1225	150	11.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)			
+ 4614.	4.75	2002.	511.	492.	492.
		(INCHES) .316	.323	.323	.323
		(AC-FT) 992.	1013.	1013.	1013.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	1973.	1		1230	151	13.	1		1845	226	0.
1		0005	2	0.	1		0620	77	1872.	1		1235	152	12.	1		1850	227	0.
1		0010	3	0.	1		0625	78	1757.	1		1240	153	12.	1		1855	228	0.
1		0015	4	0.	1		0630	79	1638.	1		1245	154	11.	1		1900	229	0.
1		0020	5	0.	1		0635	80	1542.	1		1250	155	10.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1465.	1		1255	156	9.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1379.	1		1300	157	8.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1290.	1		1305	158	8.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1211.	1		1310	159	7.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1134.	1		1315	160	7.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1050.	1		1320	161	6.	1		1935	236	0.
1		0055	12	0.	1		0710	87	973.	1		1325	162	6.	1		1940	237	0.
1		0100	13	0.	1		0715	88	909.	1		1330	163	5.	1		1945	238	0.
1		0105	14	0.	1		0720	89	846.	1		1335	164	5.	1		1950	239	0.
1		0110	15	0.	1		0725	90	788.	1		1340	165	5.	1		1955	240	0.
1		0115	16	0.	1		0730	91	739.	1		1345	166	4.	1		2000	241	0.
1		0120	17	0.	1		0735	92	691.	1		1350	167	4.	1		2005	242	0.
1		0125	18	0.	1		0740	93	645.	1		1355	168	4.	1		2010	243	0.
1		0130	19	1.	1		0745	94	606.	1		1400	169	3.	1		2015	244	0.
1		0135	20	1.	1		0750	95	567.	1		1405	170	3.	1		2020	245	0.
1		0140	21	1.	1		0755	96	529.	1		1410	171	3.	1		2025	246	0.
1		0145	22	1.	1		0800	97	497.	1		1415	172	3.	1		2030	247	0.
1		0150	23	2.	1		0805	98	464.	1		1420	173	2.	1		2035	248	0.
1		0155	24	2.	1		0810	99	435.	1		1425	174	2.	1		2040	249	0.
1		0200	25	2.	1		0815	100	408.	1		1430	175	2.	1		2045	250	0.
1		0205	26	3.	1		0820	101	381.	1		1435	176	2.	1		2050	251	0.
1		0210	27	3.	1		0825	102	358.	1		1440	177	2.	1		2055	252	0.
1		0215	28	3.	1		0830	103	336.	1		1445	178	2.	1		2100	253	0.
1		0220	29	4.	1		0835	104	315.	1		1450	179	2.	1		2105	254	0.
1		0225	30	4.	1		0840	105	295.	1		1455	180	1.	1		2110	255	0.
1		0230	31	4.	1		0845	106	277.	1		1500	181	1.	1		2115	256	0.
1		0235	32	4.	1		0850	107	259.	1		1505	182	1.	1		2120	257	0.
1		0240	33	4.	1		0855	108	244.	1		1510	183	1.	1		2125	258	0.
1		0245	34	4.	1		0900	109	229.	1		1515	184	1.	1		2130	259	0.
1		0250	35	4.	1		0905	110	215.	1		1520	185	1.	1		2135	260	0.
1		0255	36	5.	1		0910	111	203.	1		1525	186	1.	1		2140	261	0.
1		0300	37	5.	1		0915	112	190.	1		1530	187	1.	1		2145	262	0.
1		0305	38	7.	1		0920	113	177.	1		1535	188	1.	1		2150	263	0.
1		0310	39	9.	1		0925	114	166.	1		1540	189	1.	1		2155	264	0.
1		0315	40	13.	1		0930	115	155.	1		1545	190	1.	1		2200	265	0.
1		0320	41	19.	1		0935	116	145.	1		1550	191	1.	1		2205	266	0.
1		0325	42	28.	1		0940	117	135.	1		1555	192	1.	1		2210	267	0.
1		0330	43	45.	1		0945	118	126.	1		1600	193	0.	1		2215	268	0.
1		0335	44	70.	1		0950	119	118.	1		1605	194	0.	1		2220	269	0.

1	0340	45	103.	*	1	0955	120	110.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	142.	*	1	1000	121	102.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	183.	*	1	1005	122	96.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	223.	*	1	1010	123	89.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	261.	*	1	1015	124	83.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	300.	*	1	1020	125	77.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	400.	*	1	1025	126	72.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	499.	*	1	1030	127	67.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	537.	*	1	1035	128	63.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	561.	*	1	1040	129	58.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	564.	*	1	1045	130	55.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	562.	*	1	1050	131	51.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	683.	*	1	1055	132	48.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	1983.	*	1	1100	133	44.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	2809.	*	1	1105	134	42.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	1949.	*	1	1110	135	39.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	2373.	*	1	1115	136	36.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	2370.	*	1	1120	137	34.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	2112.	*	1	1125	138	32.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	2252.	*	1	1130	139	30.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	2081.	*	1	1135	140	28.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	2116.	*	1	1140	141	26.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2065.	*	1	1145	142	25.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	2036.	*	1	1150	143	23.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	2068.	*	1	1155	144	22.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	2117.	*	1	1200	145	20.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	2198.	*	1	1205	146	19.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	2258.	*	1	1210	147	18.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	2271.	*	1	1215	148	17.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	2188.	*	1	1220	149	16.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	2074.	*	1	1225	150	14.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2809.	4.83		1024.	264.	254.	254.
		(INCHES)	.162	.167	.167	.167
		(AC-FT)	508.	523.	523.	523.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW		DA	MON	HRMN	ORD	FLOW		DA	MON	HRMN	ORD	FLOW		DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	364.	*	1		1230	151	8.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	385.	*	1		1235	152	8.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	499.	*	1		1240	153	7.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	406.	*	1		1245	154	7.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	494.	*	1		1250	155	6.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	464.	*	1		1255	156	6.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	404.	*	1		1300	157	6.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	436.	*	1		1305	158	5.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	378.	*	1		1310	159	5.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	367.	*	1		1315	160	5.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	350.	*	1		1320	161	5.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	317.	*	1		1325	162	4.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	319.	*	1		1330	163	4.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	288.	*	1		1335	164	4.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	269.	*	1		1340	165	4.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	260.	*	1		1345	166	4.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	238.	*	1		1350	167	4.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	229.	*	1		1355	168	3.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	215.	*	1		1400	169	3.	*	1		2015	244	0.
1		0135	20	0.	*	1		0750	95	202.	*	1		1405	170	3.	*	1		2020	245	0.
1		0140	21	0.	*	1		0755	96	196.	*	1		1410	171	3.	*	1		2025	246	0.
1		0145	22	0.	*	1		0800	97	184.	*	1		1415	172	3.	*	1		2030	247	0.
1		0150	23	0.	*	1		0805	98	173.	*	1		1420	173	3.	*	1		2035	248	0.
1		0155	24	0.	*	1		0810	99	161.	*	1		1425	174	3.	*	1		2040	249	0.
1		0200	25	0.	*	1		0815	100	150.	*	1		1430	175	2.	*	1		2045	250	0.
1		0205	26	0.	*	1		0820	101	138.	*	1		1435	176	2.	*	1		2050	251	0.

1	0210	27	0.	1	0825	102	129.	1	1440	177	2.	1	2055	252	0.
1	0215	28	0.	1	0830	103	124.	1	1445	178	2.	1	2100	253	0.
1	0220	29	0.	1	0835	104	119.	1	1450	179	2.	1	2105	254	0.
1	0225	30	0.	1	0840	105	114.	1	1455	180	2.	1	2110	255	0.
1	0230	31	0.	1	0845	106	109.	1	1500	181	2.	1	2115	256	0.
1	0235	32	0.	1	0850	107	102.	1	1505	182	2.	1	2120	257	0.
1	0240	33	0.	1	0855	108	93.	1	1510	183	2.	1	2125	258	0.
1	0245	34	0.	1	0900	109	86.	1	1515	184	1.	1	2130	259	0.
1	0250	35	0.	1	0905	110	84.	1	1520	185	1.	1	2135	260	0.
1	0255	36	0.	1	0910	111	83.	1	1525	186	1.	1	2140	261	0.
1	0300	37	1.	1	0915	112	82.	1	1530	187	1.	1	2145	262	0.
1	0305	38	1.	1	0920	113	78.	1	1535	188	1.	1	2150	263	0.
1	0310	39	1.	1	0925	114	73.	1	1540	189	1.	1	2155	264	0.
1	0315	40	2.	1	0930	115	69.	1	1545	190	1.	1	2200	265	0.
1	0320	41	3.	1	0935	116	65.	1	1550	191	1.	1	2205	266	0.
1	0325	42	4.	1	0940	117	63.	1	1555	192	1.	1	2210	267	0.
1	0330	43	5.	1	0945	118	59.	1	1600	193	1.	1	2215	268	0.
1	0335	44	7.	1	0950	119	55.	1	1605	194	1.	1	2220	269	0.
1	0340	45	10.	1	0955	120	51.	1	1610	195	1.	1	2225	270	0.
1	0345	46	12.	1	1000	121	48.	1	1615	196	1.	1	2230	271	0.
1	0350	47	15.	1	1005	122	46.	1	1620	197	1.	1	2235	272	0.
1	0355	48	18.	1	1010	123	45.	1	1625	198	1.	1	2240	273	0.
1	0400	49	22.	1	1015	124	43.	1	1630	199	1.	1	2245	274	0.
1	0405	50	30.	1	1020	125	41.	1	1635	200	1.	1	2250	275	0.
1	0410	51	37.	1	1025	126	38.	1	1640	201	1.	1	2255	276	0.
1	0415	52	44.	1	1030	127	36.	1	1645	202	0.	1	2300	277	0.
1	0420	53	49.	1	1035	128	34.	1	1650	203	0.	1	2305	278	0.
1	0425	54	52.	1	1040	129	33.	1	1655	204	0.	1	2310	279	0.
1	0430	55	55.	1	1045	130	31.	1	1700	205	0.	1	2315	280	0.
1	0435	56	57.	1	1050	131	28.	1	1705	206	0.	1	2320	281	0.
1	0440	57	59.	1	1055	132	27.	1	1710	207	0.	1	2325	282	0.
1	0445	58	61.	1	1100	133	25.	1	1715	208	0.	1	2330	283	0.
1	0450	59	69.	1	1105	134	24.	1	1720	209	0.	1	2335	284	0.
1	0455	60	90.	1	1110	135	22.	1	1725	210	0.	1	2340	285	0.
1	0500	61	87.	1	1115	136	21.	1	1730	211	0.	1	2345	286	0.
1	0505	62	89.	1	1120	137	19.	1	1735	212	0.	1	2350	287	0.
1	0510	63	96.	1	1125	138	18.	1	1740	213	0.	1	2355	288	0.
1	0515	64	95.	1	1130	139	17.	1	1745	214	0.	2	0000	289	0.
1	0520	65	99.	1	1135	140	16.	1	1750	215	0.	2	0005	290	0.
1	0525	66	101.	1	1140	141	15.	1	1755	216	0.	2	0010	291	0.
1	0530	67	103.	1	1145	142	14.	1	1800	217	0.	2	0015	292	0.
1	0535	68	107.	1	1150	143	13.	1	1805	218	0.	2	0020	293	0.
1	0540	69	111.	1	1155	144	12.	1	1810	219	0.	2	0025	294	0.
1	0545	70	114.	1	1200	145	11.	1	1815	220	0.	2	0030	295	0.
1	0550	71	244.	1	1205	146	11.	1	1820	221	0.	2	0035	296	0.
1	0555	72	538.	1	1210	147	10.	1	1825	222	0.	2	0040	297	0.
1	0600	73	368.	1	1215	148	10.	1	1830	223	0.	2	0045	298	0.
1	0605	74	257.	1	1220	149	9.	1	1835	224	0.	2	0050	299	0.
1	0610	75	494.	1	1225	150	8.	1	1840	225	0.	2	0055	300	0.

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*************************************************************************************************************************************

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                         6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                              (CFS)
+     538.      5.92                     182.         49.         47.          47.
                           (INCHES)      .029        .031        .031         .031
                            (AC-FT)       90.         96.         96.          96.

                            CUMULATIVE AREA =   58.84 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


               **************
               *            *
 1305 KK       *   FINISH   *
               *            *
               **************

 1307 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          1  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

                  HYDROGRAPH ROUTING DATA
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1306 RD MUSKINGUM-CUNGE CHANNEL ROUTING

L	1500.	CHANNEL LENGTH
S	.0090	SLOPE
N	.050	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	250.00	BOTTOM WIDTH OR DIAMETER
Z	3.00	SIDE SLOPE

***

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.52	750.00	10469.42	380.98	1.11	9.91
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		10457.09	380.00	1.11	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5277E+04 EXCESS= .0000E+00 OUTFLOW= .5277E+04 BASIN STORAGE= .1001E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = 1.00

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	10332.	1		1230	151	2680.	1		1845	226	174.
1		0005	2	0.	1		0620	77	10457.	1		1235	152	2656.	1		1850	227	137.
1		0010	3	0.	1		0625	78	10447.	1		1240	153	2632.	1		1855	228	105.
1		0015	4	0.	1		0630	79	10328.	1		1245	154	2608.	1		1900	229	79.
1		0020	5	0.	1		0635	80	10127.	1		1250	155	2584.	1		1905	230	59.
1		0025	6	0.	1		0640	81	9863.	1		1255	156	2560.	1		1910	231	44.
1		0030	7	0.	1		0645	82	9553.	1		1300	157	2536.	1		1915	232	33.
1		0035	8	1.	1		0650	83	9210.	1		1305	158	2513.	1		1920	233	25.
1		0040	9	3.	1		0655	84	8846.	1		1310	159	2489.	1		1925	234	18.
1		0045	10	6.	1		0700	85	8468.	1		1315	160	2464.	1		1930	235	14.
1		0050	11	11.	1		0705	86	8081.	1		1320	161	2438.	1		1935	236	10.
1		0055	12	19.	1		0710	87	7692.	1		1325	162	2412.	1		1940	237	8.
1		0100	13	30.	1		0715	88	7305.	1		1330	163	2387.	1		1945	238	6.
1		0105	14	43.	1		0720	89	6923.	1		1335	164	2361.	1		1950	239	4.
1		0110	15	60.	1		0725	90	6548.	1		1340	165	2336.	1		1955	240	3.
1		0115	16	78.	1		0730	91	6180.	1		1345	166	2311.	1		2000	241	2.
1		0120	17	97.	1		0735	92	5822.	1		1350	167	2284.	1		2005	242	2.
1		0125	18	118.	1		0740	93	5474.	1		1355	168	2256.	1		2010	243	1.
1		0130	19	139.	1		0745	94	5148.	1		1400	169	2228.	1		2015	244	1.
1		0135	20	163.	1		0750	95	4871.	1		1405	170	2200.	1		2020	245	1.
1		0140	21	190.	1		0755	96	4675.	1		1410	171	2172.	1		2025	246	1.
1		0145	22	222.	1		0800	97	4553.	1		1415	172	2145.	1		2030	247	0.
1		0150	23	259.	1		0805	98	4463.	1		1420	173	2117.	1		2035	248	0.
1		0155	24	303.	1		0810	99	4380.	1		1425	174	2088.	1		2040	249	0.
1		0200	25	355.	1		0815	100	4303.	1		1430	175	2056.	1		2045	250	0.
1		0205	26	414.	1		0820	101	4230.	1		1435	176	2025.	1		2050	251	0.
1		0210	27	482.	1		0825	102	4161.	1		1440	177	1994.	1		2055	252	0.
1		0215	28	557.	1		0830	103	4096.	1		1445	178	1963.	1		2100	253	0.
1		0220	29	637.	1		0835	104	4035.	1		1450	179	1932.	1		2105	254	0.
1		0225	30	724.	1		0840	105	3977.	1		1455	180	1900.	1		2110	255	0.
1		0230	31	815.	1		0845	106	3922.	1		1500	181	1866.	1		2115	256	0.
1		0235	32	900.	1		0850	107	3871.	1		1505	182	1831.	1		2120	257	0.
1		0240	33	972.	1		0855	108	3821.	1		1510	183	1795.	1		2125	258	0.
1		0245	34	1029.	1		0900	109	3775.	1		1515	184	1761.	1		2130	259	0.
1		0250	35	1079.	1		0905	110	3731.	1		1520	185	1727.	1		2135	260	0.
1		0255	36	1131.	1		0910	111	3690.	1		1525	186	1692.	1		2140	261	0.
1		0300	37	1196.	1		0915	112	3651.	1		1530	187	1656.	1		2145	262	0.
1		0305	38	1285.	1		0920	113	3614.	1		1535	188	1618.	1		2150	263	0.
1		0310	39	1411.	1		0925	114	3580.	1		1540	189	1581.	1		2155	264	0.
1		0315	40	1584.	1		0930	115	3546.	1		1545	190	1545.	1		2200	265	0.
1		0320	41	1817.	1		0935	116	3513.	1		1550	191	1509.	1		2205	266	0.
1		0325	42	2133.	1		0940	117	3481.	1		1555	192	1473.	1		2210	267	0.
1		0330	43	2561.	1		0945	118	3450.	1		1600	193	1435.	1		2215	268	0.

1	0335	44	3124.	*	1	0950	119	3420.	*	1	1605	194	1397.	*	1	2220	269	0.
1	0340	45	3801.	*	1	0955	120	3392.	*	1	1610	195	1358.	*	1	2225	270	0.
1	0345	46	4553.	*	1	1000	121	3364.	*	1	1615	196	1321.	*	1	2230	271	0.
1	0350	47	5360.	*	1	1005	122	3338.	*	1	1620	197	1284.	*	1	2235	272	0.
1	0355	48	6184.	*	1	1010	123	3312.	*	1	1625	198	1247.	*	1	2240	273	0.
1	0400	49	6952.	*	1	1015	124	3287.	*	1	1630	199	1209.	*	1	2245	274	0.
1	0405	50	7609.	*	1	1020	125	3263.	*	1	1635	200	1169.	*	1	2250	275	0.
1	0410	51	8148.	*	1	1025	126	3238.	*	1	1640	201	1130.	*	1	2255	276	0.
1	0415	52	8589.	*	1	1030	127	3214.	*	1	1645	202	1092.	*	1	2300	277	0.
1	0420	53	8935.	*	1	1035	128	3189.	*	1	1650	203	1054.	*	1	2305	278	0.
1	0425	54	9172.	*	1	1040	129	3166.	*	1	1655	204	1018.	*	1	2310	279	0.
1	0430	55	9300.	*	1	1045	130	3143.	*	1	1700	205	980.	*	1	2315	280	0.
1	0435	56	9351.	*	1	1050	131	3120.	*	1	1705	206	941.	*	1	2320	281	0.
1	0440	57	9361.	*	1	1055	132	3098.	*	1	1710	207	901.	*	1	2325	282	0.
1	0445	58	9355.	*	1	1100	133	3077.	*	1	1715	208	862.	*	1	2330	283	0.
1	0450	59	9376.	*	1	1105	134	3056.	*	1	1720	209	825.	*	1	2335	284	0.
1	0455	60	9464.	*	1	1110	135	3034.	*	1	1725	210	790.	*	1	2340	285	0.
1	0500	61	9614.	*	1	1115	136	3012.	*	1	1730	211	755.	*	1	2345	286	0.
1	0505	62	9791.	*	1	1120	137	2989.	*	1	1735	212	717.	*	1	2350	287	0.
1	0510	63	9969.	*	1	1125	138	2967.	*	1	1740	213	677.	*	1	2355	288	0.
1	0515	64	10125.	*	1	1130	139	2945.	*	1	1745	214	637.	*	2	0000	289	0.
1	0520	65	10228.	*	1	1135	140	2924.	*	1	1750	215	598.	*	2	0005	290	0.
1	0525	66	10256.	*	1	1140	141	2902.	*	1	1755	216	560.	*	2	0010	291	0.
1	0530	67	10211.	*	1	1145	142	2881.	*	1	1800	217	525.	*	2	0015	292	0.
1	0535	68	10100.	*	1	1150	143	2860.	*	1	1805	218	489.	*	2	0020	293	0.
1	0540	69	9933.	*	1	1155	144	2837.	*	1	1810	219	448.	*	2	0025	294	0.
1	0545	70	9719.	*	1	1200	145	2814.	*	1	1815	220	400.	*	2	0030	295	0.
1	0550	71	9479.	*	1	1205	146	2791.	*	1	1820	221	354.	*	2	0035	296	0.
1	0555	72	9282.	*	1	1210	147	2769.	*	1	1825	222	313.	*	2	0040	297	0.
1	0600	73	9291.	*	1	1215	148	2746.	*	1	1830	223	277.	*	2	0045	298	0.
1	0605	74	9603.	*	1	1220	149	2724.	*	1	1835	224	244.	*	2	0050	299	0.
1	0610	75	10033.	*	1	1225	150	2702.	*	1	1840	225	210.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 10457.	6.33	7198.	2660.	2563.	2563.
		(INCHES) .753	1.113	1.113	1.113
		(AC-FT) 3569.	5277.	5277.	5277.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.74	750.00	8495.68	325.77	.86	9.13

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		8491.82	325.00	.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4077E+04 EXCESS= .0000E+00 OUTFLOW= .4077E+04 BASIN STORAGE= .1037E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .87

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6922.	1		1230	151	2309.	1		1845	226	3.
1		0005	2	0.	1		0620	77	6739.	1		1235	152	2280.	1		1850	227	2.
1		0010	3	0.	1		0625	78	6561.	1		1240	153	2251.	1		1855	228	2.
1		0015	4	0.	1		0630	79	6387.	1		1245	154	2222.	1		1900	229	1.
1		0020	5	0.	1		0635	80	6218.	1		1250	155	2194.	1		1905	230	1.
1		0025	6	0.	1		0640	81	6052.	1		1255	156	2166.	1		1910	231	1.
1		0030	7	0.	1		0645	82	5890.	1		1300	157	2137.	1		1915	232	1.
1		0035	8	0.	1		0650	83	5734.	1		1305	158	2108.	1		1920	233	0.

1	0040	9	0.	*	1	0655	84	5585.	*	1	1310	159	2077.	*	1	1925	234	0.
1	0045	10	1.	*	1	0700	85	5442.	*	1	1315	160	2044.	*	1	1930	235	0.
1	0050	11	2.	*	1	0705	86	5304.	*	1	1320	161	2012.	*	1	1935	236	0.
1	0055	12	4.	*	1	0710	87	5173.	*	1	1325	162	1981.	*	1	1940	237	0.
1	0100	13	7.	*	1	0715	88	5049.	*	1	1330	163	1950.	*	1	1945	238	0.
1	0105	14	12.	*	1	0720	89	4930.	*	1	1335	164	1918.	*	1	1950	239	0.
1	0110	15	17.	*	1	0725	90	4818.	*	1	1340	165	1884.	*	1	1955	240	0.
1	0115	16	24.	*	1	0730	91	4709.	*	1	1345	166	1849.	*	1	2000	241	0.
1	0120	17	33.	*	1	0735	92	4604.	*	1	1350	167	1813.	*	1	2005	242	0.
1	0125	18	42.	*	1	0740	93	4502.	*	1	1355	168	1778.	*	1	2010	243	0.
1	0130	19	54.	*	1	0745	94	4405.	*	1	1400	169	1743.	*	1	2015	244	0.
1	0135	20	67.	*	1	0750	95	4313.	*	1	1405	170	1708.	*	1	2020	245	0.
1	0140	21	83.	*	1	0755	96	4226.	*	1	1410	171	1672.	*	1	2025	246	0.
1	0145	22	102.	*	1	0800	97	4145.	*	1	1415	172	1635.	*	1	2030	247	0.
1	0150	23	125.	*	1	0805	98	4070.	*	1	1420	173	1597.	*	1	2035	248	0.
1	0155	24	153.	*	1	0810	99	3999.	*	1	1425	174	1560.	*	1	2040	249	0.
1	0200	25	185.	*	1	0815	100	3934.	*	1	1430	175	1524.	*	1	2045	250	0.
1	0205	26	223.	*	1	0820	101	3872.	*	1	1435	176	1488.	*	1	2050	251	0.
1	0210	27	266.	*	1	0825	102	3814.	*	1	1440	177	1451.	*	1	2055	252	0.
1	0215	28	312.	*	1	0830	103	3758.	*	1	1445	178	1413.	*	1	2100	253	0.
1	0220	29	362.	*	1	0835	104	3706.	*	1	1450	179	1374.	*	1	2105	254	0.
1	0225	30	414.	*	1	0840	105	3657.	*	1	1455	180	1337.	*	1	2110	255	0.
1	0230	31	466.	*	1	0845	106	3609.	*	1	1500	181	1300.	*	1	2115	256	0.
1	0235	32	517.	*	1	0850	107	3564.	*	1	1505	182	1263.	*	1	2120	257	0.
1	0240	33	564.	*	1	0855	108	3521.	*	1	1510	183	1225.	*	1	2125	258	0.
1	0245	34	608.	*	1	0900	109	3479.	*	1	1515	184	1186.	*	1	2130	259	0.
1	0250	35	649.	*	1	0905	110	3438.	*	1	1520	185	1146.	*	1	2135	260	0.
1	0255	36	691.	*	1	0910	111	3399.	*	1	1525	186	1107.	*	1	2140	261	0.
1	0300	37	739.	*	1	0915	112	3362.	*	1	1530	187	1070.	*	1	2145	262	0.
1	0305	38	798.	*	1	0920	113	3327.	*	1	1535	188	1033.	*	1	2150	263	0.
1	0310	39	873.	*	1	0925	114	3293.	*	1	1540	189	996.	*	1	2155	264	0.
1	0315	40	980.	*	1	0930	115	3261.	*	1	1545	190	957.	*	1	2200	265	0.
1	0320	41	1135.	*	1	0935	116	3230.	*	1	1550	191	917.	*	1	2205	266	0.
1	0325	42	1362.	*	1	0940	117	3200.	*	1	1555	192	878.	*	1	2210	267	0.
1	0330	43	1693.	*	1	0945	118	3170.	*	1	1600	193	841.	*	1	2215	268	0.
1	0335	44	2140.	*	1	0950	119	3141.	*	1	1605	194	805.	*	1	2220	269	0.
1	0340	45	2685.	*	1	0955	120	3111.	*	1	1610	195	769.	*	1	2225	270	0.
1	0345	46	3290.	*	1	1000	121	3082.	*	1	1615	196	733.	*	1	2230	271	0.
1	0350	47	3939.	*	1	1005	122	3054.	*	1	1620	197	694.	*	1	2235	272	0.
1	0355	48	4614.	*	1	1010	123	3027.	*	1	1625	198	655.	*	1	2240	273	0.
1	0400	49	5249.	*	1	1015	124	3000.	*	1	1630	199	616.	*	1	2245	274	0.
1	0405	50	5789.	*	1	1020	125	2974.	*	1	1635	200	580.	*	1	2250	275	0.
1	0410	51	6232.	*	1	1025	126	2949.	*	1	1640	201	546.	*	1	2255	276	0.
1	0415	52	6597.	*	1	1030	127	2924.	*	1	1645	202	512.	*	1	2300	277	0.
1	0420	53	6899.	*	1	1035	128	2898.	*	1	1650	203	477.	*	1	2305	278	0.
1	0425	54	7132.	*	1	1040	129	2872.	*	1	1655	204	437.	*	1	2310	279	0.
1	0430	55	7297.	*	1	1045	130	2846.	*	1	1700	205	394.	*	1	2315	280	0.
1	0435	56	7405.	*	1	1050	131	2820.	*	1	1705	206	352.	*	1	2320	281	0.
1	0440	57	7473.	*	1	1055	132	2795.	*	1	1710	207	313.	*	1	2325	282	0.
1	0445	58	7516.	*	1	1100	133	2771.	*	1	1715	208	278.	*	1	2330	283	0.
1	0450	59	7570.	*	1	1105	134	2747.	*	1	1720	209	247.	*	1	2335	284	0.
1	0455	60	7676.	*	1	1110	135	2723.	*	1	1725	210	215.	*	1	2340	285	0.
1	0500	61	7831.	*	1	1115	136	2698.	*	1	1730	211	180.	*	1	2345	286	0.
1	0505	62	8005.	*	1	1120	137	2672.	*	1	1735	212	143.	*	1	2350	287	0.
1	0510	63	8178.	*	1	1125	138	2647.	*	1	1740	213	110.	*	1	2355	288	0.
1	0515	64	8334.	*	1	1130	139	2621.	*	1	1745	214	83.	*	2	0000	289	0.
1	0520	65	8445.	*	1	1135	140	2596.	*	1	1750	215	63.	*	2	0005	290	0.
1	0525	66	8492.	*	1	1140	141	2571.	*	1	1755	216	47.	*	2	0010	291	0.
1	0530	67	8477.	*	1	1145	142	2546.	*	1	1800	217	36.	*	2	0015	292	0.
1	0535	68	8407.	*	1	1150	143	2521.	*	1	1805	218	27.	*	2	0020	293	0.
1	0540	69	8292.	*	1	1155	144	2495.	*	1	1810	219	20.	*	2	0025	294	0.
1	0545	70	8137.	*	1	1200	145	2468.	*	1	1815	220	15.	*	2	0030	295	0.
1	0550	71	7953.	*	1	1205	146	2441.	*	1	1820	221	12.	*	2	0035	296	0.
1	0555	72	7751.	*	1	1210	147	2415.	*	1	1825	222	9.	*	2	0040	297	0.
1	0600	73	7541.	*	1	1215	148	2388.	*	1	1830	223	7.	*	2	0045	298	0.
1	0605	74	7327.	*	1	1220	149	2362.	*	1	1835	224	5.	*	2	0050	299	0.
1	0610	75	7119.	*	1	1225	150	2336.	*	1	1840	225	4.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 8492.	5.42		5613.	2056.	1980.	1980.
		(INCHES)	.587	.860	.860	.860
		(AC-FT)	2783.	4077.	4077.	4077.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	COMPUTATION TIME STEP M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.00	750.00	6695.21	327.36	.63	8.32

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		6693.29	330.00	.63	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2965E+04 EXCESS= .0000E+00 OUTFLOW= .2965E+04 BASIN STORAGE= .1030E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .74

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	5633.	1		1230	151	1485.	1		1845	226	0.
1		0005	2	0.	1		0620	77	5502.	1		1235	152	1447.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5375.	1		1240	153	1407.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5248.	1		1245	154	1368.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5123.	1		1250	155	1330.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5000.	1		1255	156	1292.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4880.	1		1300	157	1255.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4763.	1		1305	158	1216.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4651.	1		1310	159	1176.	1		1925	234	0.
1		0045	10	0.	1		0700	85	4542.	1		1315	160	1136.	1		1930	235	0.
1		0050	11	0.	1		0705	86	4436.	1		1320	161	1097.	1		1935	236	0.
1		0055	12	0.	1		0710	87	4335.	1		1325	162	1059.	1		1940	237	0.
1		0100	13	0.	1		0715	88	4239.	1		1330	163	1022.	1		1945	238	0.
1		0105	14	1.	1		0720	89	4146.	1		1335	164	984.	1		1950	239	0.
1		0110	15	2.	1		0725	90	4058.	1		1340	165	945.	1		1955	240	0.
1		0115	16	3.	1		0730	91	3972.	1		1345	166	904.	1		2000	241	0.
1		0120	17	5.	1		0735	92	3889.	1		1350	167	866.	1		2005	242	0.
1		0125	18	7.	1		0740	93	3808.	1		1355	168	828.	1		2010	243	0.
1		0130	19	11.	1		0745	94	3730.	1		1400	169	792.	1		2015	244	0.
1		0135	20	16.	1		0750	95	3656.	1		1405	170	756.	1		2020	245	0.
1		0140	21	22.	1		0755	96	3585.	1		1410	171	719.	1		2025	246	0.
1		0145	22	30.	1		0800	97	3519.	1		1415	172	679.	1		2030	247	0.
1		0150	23	42.	1		0805	98	3456.	1		1420	173	640.	1		2035	248	0.
1		0155	24	56.	1		0810	99	3396.	1		1425	174	603.	1		2040	249	0.
1		0200	25	73.	1		0815	100	3339.	1		1430	175	567.	1		2045	250	0.
1		0205	26	93.	1		0820	101	3285.	1		1435	176	534.	1		2050	251	0.
1		0210	27	118.	1		0825	102	3234.	1		1440	177	501.	1		2055	252	0.
1		0215	28	145.	1		0830	103	3184.	1		1445	178	465.	1		2100	253	0.
1		0220	29	174.	1		0835	104	3137.	1		1450	179	426.	1		2105	254	0.
1		0225	30	206.	1		0840	105	3092.	1		1455	180	384.	1		2110	255	0.
1		0230	31	237.	1		0845	106	3048.	1		1500	181	345.	1		2115	256	0.
1		0235	32	268.	1		0850	107	3006.	1		1505	182	308.	1		2120	257	0.
1		0240	33	296.	1		0855	108	2965.	1		1510	183	274.	1		2125	258	0.
1		0245	34	321.	1		0900	109	2925.	1		1515	184	243.	1		2130	259	0.
1		0250	35	343.	1		0905	110	2885.	1		1520	185	211.	1		2135	260	0.
1		0255	36	364.	1		0910	111	2846.	1		1525	186	177.	1		2140	261	0.
1		0300	37	388.	1		0915	112	2809.	1		1530	187	141.	1		2145	262	0.
1		0305	38	420.	1		0920	113	2773.	1		1535	188	109.	1		2150	263	0.
1		0310	39	464.	1		0925	114	2739.	1		1540	189	83.	1		2155	264	0.
1		0315	40	530.	1		0930	115	2705.	1		1545	190	63.	1		2200	265	0.
1		0320	41	631.	1		0935	116	2672.	1		1550	191	48.	1		2205	266	0.
1		0325	42	780.	1		0940	117	2639.	1		1555	192	36.	1		2210	267	0.
1		0330	43	991.	1		0945	118	2606.	1		1600	193	27.	1		2215	268	0.
1		0335	44	1294.	1		0950	119	2572.	1		1605	194	21.	1		2220	269	0.
1		0340	45	1676.	1		0955	120	2539.	1		1610	195	16.	1		2225	270	0.
1		0345	46	2116.	1		1000	121	2507.	1		1615	196	12.	1		2230	271	0.
1		0350	47	2614.	1		1005	122	2476.	1		1620	197	9.	1		2235	272	0.
1		0355	48	3146.	1		1010	123	2445.	1		1625	198	7.	1		2240	273	0.
1		0400	49	3658.	1		1015	124	2414.	1		1630	199	5.	1		2245	274	0.
1		0405	50	4097.	1		1020	125	2383.	1		1635	200	4.	1		2250	275	0.
1		0410	51	4450.	1		1025	126	2351.	1		1640	201	3.	1		2255	276	0.
1		0415	52	4735.	1		1030	127	2319.	1		1645	202	2.	1		2300	277	0.
1		0420	53	4958.	1		1035	128	2287.	1		1650	203	2.	1		2305	278	0.
1		0425	54	5136.	1		1040	129	2256.	1		1655	204	1.	1		2310	279	0.

1	0430	55	5290.	*	1	1045	130	2225.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	5426.	*	1	1050	131	2194.	*	1	1705	206	1.	*	1	2320	281	0.
1	0440	57	5542.	*	1	1055	132	2163.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	5639.	*	1	1100	133	2130.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	5737.	*	1	1105	134	2096.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	5862.	*	1	1110	135	2062.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	6020.	*	1	1115	136	2029.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	6190.	*	1	1120	137	1996.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	6356.	*	1	1125	138	1963.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	6506.	*	1	1130	139	1929.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6618.	*	1	1135	140	1893.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6680.	*	1	1140	141	1856.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6693.	*	1	1145	142	1819.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	6660.	*	1	1150	143	1783.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	6587.	*	1	1155	144	1747.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	6484.	*	1	1200	145	1711.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	6358.	*	1	1205	146	1673.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6218.	*	1	1210	147	1635.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6070.	*	1	1215	148	1597.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5919.	*	1	1220	149	1559.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5772.	*	1	1225	150	1523.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS)	6-HR	24-HR	72-HR	24.92-HR
+ 6693.	5.50		4476.	1495.	1440.	1440.
		(INCHES)	.468	.626	.626	.626
		(AC-FT)	2219.	2965.	2965.	2965.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS
COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.57	750.00	4288.43	332.07	.36	7.00
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		4287.86	335.00	.36	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1684E+04 EXCESS= .0000E+00 OUTFLOW= .1684E+04 BASIN STORAGE= .1117E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .57

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3798.	1		1230	151	356.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3732.	1		1235	152	323.	1		1850	227	0.
1		0010	3	0.	1		0625	78	3666.	1		1240	153	293.	1		1855	228	0.
1		0015	4	0.	1		0630	79	3597.	1		1245	154	265.	1		1900	229	0.
1		0020	5	0.	1		0635	80	3528.	1		1250	155	238.	1		1905	230	0.
1		0025	6	0.	1		0640	81	3458.	1		1255	156	209.	1		1910	231	0.
1		0030	7	0.	1		0645	82	3389.	1		1300	157	177.	1		1915	232	0.
1		0035	8	0.	1		0650	83	3319.	1		1305	158	144.	1		1920	233	0.
1		0040	9	0.	1		0655	84	3251.	1		1310	159	114.	1		1925	234	0.
1		0045	10	0.	1		0700	85	3184.	1		1315	160	90.	1		1930	235	0.
1		0050	11	0.	1		0705	86	3117.	1		1320	161	71.	1		1935	236	0.
1		0055	12	0.	1		0710	87	3053.	1		1325	162	56.	1		1940	237	0.
1		0100	13	0.	1		0715	88	2990.	1		1330	163	45.	1		1945	238	0.
1		0105	14	0.	1		0720	89	2929.	1		1335	164	36.	1		1950	239	0.
1		0110	15	0.	1		0725	90	2870.	1		1340	165	29.	1		1955	240	0.
1		0115	16	0.	1		0730	91	2812.	1		1345	166	24.	1		2000	241	0.
1		0120	17	0.	1		0735	92	2755.	1		1350	167	20.	1		2005	242	0.
1		0125	18	0.	1		0740	93	2699.	1		1355	168	16.	1		2010	243	0.
1		0130	19	0.	1		0745	94	2643.	1		1400	169	14.	1		2015	244	0.

1	0135	20	0.	*	1	0750	95	2588.	*	1	1405	170	12.	*	1	2020	245	0.
1	0140	21	0.	*	1	0755	96	2534.	*	1	1410	171	10.	*	1	2025	246	0.
1	0145	22	1.	*	1	0800	97	2481.	*	1	1415	172	8.	*	1	2030	247	0.
1	0150	23	2.	*	1	0805	98	2431.	*	1	1420	173	7.	*	1	2035	248	0.
1	0155	24	3.	*	1	0810	99	2383.	*	1	1425	174	6.	*	1	2040	249	0.
1	0200	25	6.	*	1	0815	100	2337.	*	1	1430	175	5.	*	1	2045	250	0.
1	0205	26	9.	*	1	0820	101	2292.	*	1	1435	176	5.	*	1	2050	251	0.
1	0210	27	15.	*	1	0825	102	2249.	*	1	1440	177	4.	*	1	2055	252	0.
1	0215	28	21.	*	1	0830	103	2206.	*	1	1445	178	4.	*	1	2100	253	0.
1	0220	29	29.	*	1	0835	104	2164.	*	1	1450	179	3.	*	1	2105	254	0.
1	0225	30	39.	*	1	0840	105	2121.	*	1	1455	180	3.	*	1	2110	255	0.
1	0230	31	49.	*	1	0845	106	2078.	*	1	1500	181	2.	*	1	2115	256	0.
1	0235	32	61.	*	1	0850	107	2035.	*	1	1505	182	2.	*	1	2120	257	0.
1	0240	33	72.	*	1	0855	108	1993.	*	1	1510	183	2.	*	1	2125	258	0.
1	0245	34	83.	*	1	0900	109	1952.	*	1	1515	184	2.	*	1	2130	259	0.
1	0250	35	93.	*	1	0905	110	1912.	*	1	1520	185	2.	*	1	2135	260	0.
1	0255	36	103.	*	1	0910	111	1872.	*	1	1525	186	1.	*	1	2140	261	0.
1	0300	37	114.	*	1	0915	112	1833.	*	1	1530	187	1.	*	1	2145	262	0.
1	0305	38	127.	*	1	0920	113	1793.	*	1	1535	188	1.	*	1	2150	263	0.
1	0310	39	146.	*	1	0925	114	1752.	*	1	1540	189	1.	*	1	2155	264	0.
1	0315	40	172.	*	1	0930	115	1712.	*	1	1545	190	1.	*	1	2200	265	0.
1	0320	41	211.	*	1	0935	116	1672.	*	1	1550	191	1.	*	1	2205	266	0.
1	0325	42	268.	*	1	0940	117	1634.	*	1	1555	192	1.	*	1	2210	267	0.
1	0330	43	356.	*	1	0945	118	1596.	*	1	1600	193	1.	*	1	2215	268	0.
1	0335	44	493.	*	1	0950	119	1557.	*	1	1605	194	1.	*	1	2220	269	0.
1	0340	45	682.	*	1	0955	120	1518.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	923.	*	1	1000	121	1478.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1208.	*	1	1005	122	1438.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	1521.	*	1	1010	123	1399.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	1834.	*	1	1015	124	1361.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	2119.	*	1	1020	125	1323.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	2360.	*	1	1025	126	1285.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	2550.	*	1	1030	127	1246.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	2701.	*	1	1035	128	1206.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	2822.	*	1	1040	129	1166.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	2901.	*	1	1045	130	1128.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	2955.	*	1	1050	131	1090.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	3018.	*	1	1055	132	1053.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	3115.	*	1	1100	133	1015.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	3243.	*	1	1105	134	976.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	3401.	*	1	1110	135	937.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	3570.	*	1	1115	136	898.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	3738.	*	1	1120	137	861.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	3898.	*	1	1125	138	826.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	4044.	*	1	1130	139	790.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	4159.	*	1	1135	140	754.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	4239.	*	1	1140	141	717.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	4280.	*	1	1145	142	678.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	4288.	*	1	1150	143	640.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	4269.	*	1	1155	144	604.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	4226.	*	1	1200	145	569.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	4169.	*	1	1205	146	536.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	4100.	*	1	1210	147	503.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	4023.	*	1	1215	148	468.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3945.	*	1	1220	149	430.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3869.	*	1	1225	150	392.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 4288.	5.58	2880.	849.	818.	818.
		(INCHES) .301	.355	.355	.355
		(AC-FT) 1428.	1684.	1684.	1684.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	4.42	750.00	2481.76	340.21	.19	5.66

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN .08 1.64 5.00 2481.49 340.00 .19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8861E+03 EXCESS= .0000E+00 OUTFLOW= .8862E+03 BASIN STORAGE= .1055E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	2281.	1		1230	151	40.	1		1845	226	0.
1		0005	2	0.	1		0620	77	2253.	1		1235	152	37.	1		1850	227	0.
1		0010	3	0.	1		0625	78	2226.	1		1240	153	34.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2197.	1		1245	154	32.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2166.	1		1250	155	30.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2133.	1		1255	156	28.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2097.	1		1300	157	26.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2060.	1		1305	158	24.	1		1920	233	0.
1		0040	9	0.	1		0655	84	2023.	1		1310	159	23.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1984.	1		1315	160	21.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1946.	1		1320	161	20.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1906.	1		1325	162	18.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1867.	1		1330	163	17.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1828.	1		1335	164	16.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1788.	1		1340	165	15.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1749.	1		1345	166	14.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1709.	1		1350	167	13.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1670.	1		1355	168	12.	1		2010	243	0.
1		0130	19	0.	1		0745	94	1630.	1		1400	169	11.	1		2015	244	0.
1		0135	20	0.	1		0750	95	1591.	1		1405	170	10.	1		2020	245	0.
1		0140	21	0.	1		0755	96	1552.	1		1410	171	9.	1		2025	246	0.
1		0145	22	0.	1		0800	97	1515.	1		1415	172	9.	1		2030	247	0.
1		0150	23	0.	1		0805	98	1478.	1		1420	173	8.	1		2035	248	0.
1		0155	24	0.	1		0810	99	1441.	1		1425	174	7.	1		2040	249	0.
1		0200	25	0.	1		0815	100	1403.	1		1430	175	7.	1		2045	250	0.
1		0205	26	0.	1		0820	101	1365.	1		1435	176	6.	1		2050	251	0.
1		0210	27	0.	1		0825	102	1328.	1		1440	177	6.	1		2055	252	0.
1		0215	28	0.	1		0830	103	1291.	1		1445	178	5.	1		2100	253	0.
1		0220	29	1.	1		0835	104	1255.	1		1450	179	5.	1		2105	254	0.
1		0225	30	1.	1		0840	105	1220.	1		1455	180	5.	1		2110	255	0.
1		0230	31	2.	1		0845	106	1185.	1		1500	181	4.	1		2115	256	0.
1		0235	32	3.	1		0850	107	1152.	1		1505	182	4.	1		2120	257	0.
1		0240	33	5.	1		0855	108	1118.	1		1510	183	4.	1		2125	258	0.
1		0245	34	6.	1		0900	109	1084.	1		1515	184	3.	1		2130	259	0.
1		0250	35	8.	1		0905	110	1049.	1		1520	185	3.	1		2135	260	0.
1		0255	36	11.	1		0910	111	1012.	1		1525	186	3.	1		2140	261	0.
1		0300	37	14.	1		0915	112	977.	1		1530	187	3.	1		2145	262	0.
1		0305	38	18.	1		0920	113	942.	1		1535	188	3.	1		2150	263	0.
1		0310	39	23.	1		0925	114	909.	1		1540	189	2.	1		2155	264	0.
1		0315	40	32.	1		0930	115	877.	1		1545	190	2.	1		2200	265	0.
1		0320	41	45.	1		0935	116	846.	1		1550	191	2.	1		2205	266	0.
1		0325	42	66.	1		0940	117	815.	1		1555	192	2.	1		2210	267	0.
1		0330	43	98.	1		0945	118	783.	1		1600	193	2.	1		2215	268	0.
1		0335	44	146.	1		0950	119	749.	1		1605	194	2.	1		2220	269	0.
1		0340	45	223.	1		0955	120	714.	1		1610	195	1.	1		2225	270	0.
1		0345	46	335.	1		1000	121	679.	1		1615	196	1.	1		2230	271	0.
1		0350	47	473.	1		1005	122	646.	1		1620	197	1.	1		2235	272	0.
1		0355	48	635.	1		1010	123	615.	1		1625	198	1.	1		2240	273	0.
1		0400	49	811.	1		1015	124	585.	1		1630	199	1.	1		2245	274	0.
1		0405	50	975.	1		1020	125	557.	1		1635	200	1.	1		2250	275	0.
1		0410	51	1116.	1		1025	126	528.	1		1640	201	1.	1		2255	276	0.
1		0415	52	1234.	1		1030	127	497.	1		1645	202	1.	1		2300	277	0.
1		0420	53	1331.	1		1035	128	465.	1		1650	203	1.	1		2305	278	0.
1		0425	54	1409.	1		1040	129	430.	1		1655	204	1.	1		2310	279	0.
1		0430	55	1463.	1		1045	130	395.	1		1700	205	1.	1		2315	280	0.
1		0435	56	1493.	1		1050	131	364.	1		1705	206	1.	1		2320	281	0.
1		0440	57	1510.	1		1055	132	335.	1		1710	207	1.	1		2325	282	0.
1		0445	58	1529.	1		1100	133	310.	1		1715	208	1.	1		2330	283	0.
1		0450	59	1554.	1		1105	134	286.	1		1720	209	0.	1		2335	284	0.
1		0455	60	1599.	1		1110	135	264.	1		1725	210	0.	1		2340	285	0.
1		0500	61	1677.	1		1115	136	244.	1		1730	211	0.	1		2345	286	0.
1		0505	62	1807.	1		1120	137	223.	1		1735	212	0.	1		2350	287	0.
1		0510	63	1982.	1		1125	138	203.	1		1740	213	0.	1		2355	288	0.
1		0515	64	2153.	1		1130	139	180.	1		1745	214	0.	2		0000	289	0.
1		0520	65	2282.	1		1135	140	156.	1		1750	215	0.	2		0005	290	0.

1	0525	66	2374.	*	1	1140	141	133.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2436.	*	1	1145	142	113.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	2471.	*	1	1150	143	97.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	2481.	*	1	1155	144	84.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	2471.	*	1	1200	145	73.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	2448.	*	1	1205	146	65.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	2417.	*	1	1210	147	58.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	2382.	*	1	1215	148	53.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	2347.	*	1	1220	149	48.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	2313.	*	1	1225	150	44.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 2481.	5.67	1628.	447.	430.	430.
		(INCHES) .170	.187	.187	.187
		(AC-FT) 807.	886.	886.	886.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	500.00	469.02	430.00	.03	2.95

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		469.02	430.00	.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1643E+03 EXCESS= .0000E+00 OUTFLOW= .1644E+03 BASIN STORAGE= .1007E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	322.	*	1		1230	151	25.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	316.	*	1		1235	152	24.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	328.	*	1		1240	153	22.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	372.	*	1		1245	154	21.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	425.	*	1		1250	155	20.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	433.	*	1		1255	156	19.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	414.	*	1		1300	157	17.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	428.	*	1		1305	158	16.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	450.	*	1		1310	159	16.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	447.	*	1		1315	160	15.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	456.	*	1		1320	161	14.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	469.	*	1		1325	162	13.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	463.	*	1		1330	163	12.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	463.	*	1		1335	164	12.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	459.	*	1		1340	165	11.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	449.	*	1		1345	166	10.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	443.	*	1		1350	167	10.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	431.	*	1		1355	168	9.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	419.	*	1		1400	169	9.	*	1		2015	244	0.
1		0135	20	0.	*	1		0750	95	408.	*	1		1405	170	8.	*	1		2020	245	0.
1		0140	21	0.	*	1		0755	96	394.	*	1		1410	171	8.	*	1		2025	246	0.
1		0145	22	0.	*	1		0800	97	380.	*	1		1415	172	7.	*	1		2030	247	0.
1		0150	23	0.	*	1		0805	98	366.	*	1		1420	173	7.	*	1		2035	248	0.
1		0155	24	0.	*	1		0810	99	353.	*	1		1425	174	7.	*	1		2040	249	0.
1		0200	25	0.	*	1		0815	100	339.	*	1		1430	175	6.	*	1		2045	250	0.
1		0205	26	0.	*	1		0820	101	327.	*	1		1435	176	6.	*	1		2050	251	0.
1		0210	27	0.	*	1		0825	102	313.	*	1		1440	177	6.	*	1		2055	252	0.
1		0215	28	0.	*	1		0830	103	301.	*	1		1445	178	5.	*	1		2100	253	0.
1		0220	29	0.	*	1		0835	104	289.	*	1		1450	179	5.	*	1		2105	254	0.
1		0225	30	0.	*	1		0840	105	277.	*	1		1455	180	5.	*	1		2110	255	0.

1	0230	31	0.	*	1	0845	106	265.	*	1	1500	181	5.	*	1	2115	256	0.
1	0235	32	0.	*	1	0850	107	253.	*	1	1505	182	4.	*	1	2120	257	0.
1	0240	33	0.	*	1	0855	108	242.	*	1	1510	183	4.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	230.	*	1	1515	184	4.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	218.	*	1	1520	185	4.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	205.	*	1	1525	186	4.	*	1	2140	261	0.
1	0300	37	0.	*	1	0915	112	191.	*	1	1530	187	4.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	175.	*	1	1535	188	3.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	161.	*	1	1540	189	3.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	149.	*	1	1545	190	3.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	140.	*	1	1550	191	3.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	132.	*	1	1555	192	3.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	123.	*	1	1600	193	3.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	115.	*	1	1605	194	3.	*	1	2220	269	0.
1	0340	45	2.	*	1	0955	120	109.	*	1	1610	195	3.	*	1	2225	270	0.
1	0345	46	5.	*	1	1000	121	104.	*	1	1615	196	2.	*	1	2230	271	0.
1	0350	47	12.	*	1	1005	122	100.	*	1	1620	197	2.	*	1	2235	272	0.
1	0355	48	23.	*	1	1010	123	96.	*	1	1625	198	2.	*	1	2240	273	0.
1	0400	49	39.	*	1	1015	124	92.	*	1	1630	199	2.	*	1	2245	274	0.
1	0405	50	64.	*	1	1020	125	88.	*	1	1635	200	2.	*	1	2250	275	0.
1	0410	51	97.	*	1	1025	126	84.	*	1	1640	201	2.	*	1	2255	276	0.
1	0415	52	127.	*	1	1030	127	80.	*	1	1645	202	2.	*	1	2300	277	0.
1	0420	53	153.	*	1	1035	128	77.	*	1	1650	203	2.	*	1	2305	278	0.
1	0425	54	176.	*	1	1040	129	74.	*	1	1655	204	2.	*	1	2310	279	0.
1	0430	55	194.	*	1	1045	130	70.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	208.	*	1	1050	131	67.	*	1	1705	206	1.	*	1	2320	281	0.
1	0440	57	218.	*	1	1055	132	64.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	225.	*	1	1100	133	61.	*	1	1715	208	1.	*	1	2330	283	0.
1	0450	59	231.	*	1	1105	134	58.	*	1	1720	209	1.	*	1	2335	284	0.
1	0455	60	237.	*	1	1110	135	56.	*	1	1725	210	1.	*	1	2340	285	0.
1	0500	61	247.	*	1	1115	136	53.	*	1	1730	211	1.	*	1	2345	286	0.
1	0505	62	263.	*	1	1120	137	51.	*	1	1735	212	1.	*	1	2350	287	0.
1	0510	63	286.	*	1	1125	138	49.	*	1	1740	213	1.	*	1	2355	288	0.
1	0515	64	314.	*	1	1130	139	47.	*	1	1745	214	1.	*	2	0000	289	0.
1	0520	65	342.	*	1	1135	140	45.	*	1	1750	215	1.	*	2	0005	290	0.
1	0525	66	364.	*	1	1140	141	43.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	380.	*	1	1145	142	40.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	390.	*	1	1150	143	39.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	395.	*	1	1155	144	37.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	396.	*	1	1200	145	35.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	390.	*	1	1205	146	33.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	379.	*	1	1210	147	31.	*	1	1825	222	1.	*	2	0040	297	0.
1	0600	73	364.	*	1	1215	148	29.	*	1	1830	223	1.	*	2	0045	298	0.
1	0605	74	350.	*	1	1220	149	28.	*	1	1835	224	1.	*	2	0050	299	0.
1	0610	75	335.	*	1	1225	150	26.	*	1	1840	225	1.	*	2	0055	300	0.
				*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 469.	7.17		301.	83.	80.	80.
		(INCHES)	.032	.035	.035	.035
		(AC-FT)	149.	164.	164.	164.

CUMULATIVE AREA = 88.86 SQ MI

```
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  15:00:52  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                                   HEC-1 INPUT                                                PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
 *** NOLIST ***
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET           *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   18MAR08  TIME  15:00:52  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************
```

KLEINFELDER
FEBRUARY 2008
NO-ACTION ALTERNATIVE

DESIGN STORM = 100-YEAR 6-HOUR STORM
STORM DISTRIBUTION = SDN5

```
  10 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0055  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
```

```
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                   1.00       .87       .74       .57       .44       .26


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
1250 KK     *     ULWIN  *
            *            *
            **************

1254 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           1  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

1253 HC          HYDROGRAPH COMBINATION
                       ICOMP           4  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***
*****************************************************************************************************************************************

                                                HYDROGRAPH AT STATION    ULWIN
                                                     SUM OF  4 HYDROGRAPHS
                                                   PLAN 1,   RATIO =  1.00
*****************************************************************************************************************************************
```

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	7837.	1		1230	151	3.	1		1845	226	0.
1		0005	2	0.	1		0620	77	7134.	1		1235	152	3.	1		1850	227	0.
1		0010	3	0.	1		0625	78	6500.	1		1240	153	3.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5937.	1		1245	154	2.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5427.	1		1250	155	2.	1		1905	230	0.
1		0025	6	1.	1		0640	81	4973.	1		1255	156	2.	1		1910	231	0.
1		0030	7	4.	1		0645	82	4562.	1		1300	157	1.	1		1915	232	0.
1		0035	8	9.	1		0650	83	4188.	1		1305	158	1.	1		1920	233	0.
1		0040	9	15.	1		0655	84	3845.	1		1310	159	1.	1		1925	234	0.
1		0045	10	21.	1		0700	85	3526.	1		1315	160	1.	1		1930	235	0.
1		0050	11	27.	1		0705	86	3233.	1		1320	161	1.	1		1935	236	0.
1		0055	12	32.	1		0710	87	2961.	1		1325	162	1.	1		1940	237	0.
1		0100	13	36.	1		0715	88	2708.	1		1330	163	1.	1		1945	238	0.
1		0105	14	40.	1		0720	89	2474.	1		1335	164	0.	1		1950	239	0.
1		0110	15	43.	1		0725	90	2258.	1		1340	165	0.	1		1955	240	0.
1		0115	16	48.	1		0730	91	2059.	1		1345	166	0.	1		2000	241	0.
1		0120	17	54.	1		0735	92	1877.	1		1350	167	0.	1		2005	242	0.
1		0125	18	63.	1		0740	93	1710.	1		1355	168	0.	1		2010	243	0.
1		0130	19	78.	1		0745	94	1557.	1		1400	169	0.	1		2015	244	0.
1		0135	20	100.	1		0750	95	1418.	1		1405	170	0.	1		2020	245	0.
1		0140	21	130.	1		0755	96	1293.	1		1410	171	0.	1		2025	246	0.
1		0145	22	168.	1		0800	97	1179.	1		1415	172	0.	1		2030	247	0.
1		0150	23	212.	1		0805	98	1075.	1		1420	173	0.	1		2035	248	0.
1		0155	24	260.	1		0810	99	978.	1		1425	174	0.	1		2040	249	0.
1		0200	25	309.	1		0815	100	887.	1		1430	175	0.	1		2045	250	0.
1		0205	26	362.	1		0820	101	804.	1		1435	176	0.	1		2050	251	0.
1		0210	27	418.	1		0825	102	728.	1		1440	177	0.	1		2055	252	0.
1		0215	28	477.	1		0830	103	659.	1		1445	178	0.	1		2100	253	0.
1		0220	29	536.	1		0835	104	597.	1		1450	179	0.	1		2105	254	0.
1		0225	30	596.	1		0840	105	541.	1		1455	180	0.	1		2110	255	0.
1		0230	31	661.	1		0845	106	490.	1		1500	181	0.	1		2115	256	0.
1		0235	32	736.	1		0850	107	445.	1		1505	182	0.	1		2120	257	0.
1		0240	33	824.	1		0855	108	404.	1		1510	183	0.	1		2125	258	0.
1		0245	34	926.	1		0900	109	367.	1		1515	184	0.	1		2130	259	0.
1		0250	35	1039.	1		0905	110	333.	1		1520	185	0.	1		2135	260	0.

1	0255	36	1163.	*	1	0910	111	303.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	1295.	*	1	0915	112	275.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	1435.	*	1	0920	113	251.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	1583.	*	1	0925	114	228.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	1732.	*	1	0930	115	207.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	1891.	*	1	0935	116	188.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	2083.	*	1	0940	117	170.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	2344.	*	1	0945	118	154.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	2714.	*	1	0950	119	139.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	3232.	*	1	0955	120	125.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	3950.	*	1	1000	121	113.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	5031.	*	1	1005	122	101.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	6700.	*	1	1010	123	91.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	9058.	*	1	1015	124	82.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	11694.	*	1	1020	125	74.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	14021.	*	1	1025	126	66.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	15706.	*	1	1030	127	59.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	16749.	*	1	1035	128	53.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	17126.	*	1	1040	129	47.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	17097.	*	1	1045	130	42.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	16688.	*	1	1050	131	38.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	16030.	*	1	1055	132	34.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	15275.	*	1	1100	133	30.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	14484.	*	1	1105	134	27.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	13770.	*	1	1110	135	24.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	13221.	*	1	1115	136	21.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	12873.	*	1	1120	137	19.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	12715.	*	1	1125	138	17.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	12748.	*	1	1130	139	15.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	12874.	*	1	1135	140	13.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	13072.	*	1	1140	141	12.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	13226.	*	1	1145	142	11.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	13211.	*	1	1150	143	9.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	12951.	*	1	1155	144	8.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	12489.	*	1	1200	145	7.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	11836.	*	1	1205	146	7.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	11073.	*	1	1210	147	6.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	10249.	*	1	1215	148	5.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	9410.	*	1	1220	149	4.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	8600.	*	1	1225	150	4.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 17126.	4.42		6677.	1707.	1644.	1644.
		(INCHES)	1.055	1.079	1.079	1.079
		(AC-FT)	3311.	3386.	3386.	3386.

CUMULATIVE AREA = 58.84 SQ MI

****

HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .87

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6586.	1		1230	151	5.	1		1845	226	0.
1		0005	2	0.	1		0620	77	6013.	1		1235	152	5.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5491.	1		1240	153	4.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5016.	1		1245	154	4.	1		1900	229	0.
1		0020	5	0.	1		0635	80	4592.	1		1250	155	3.	1		1905	230	0.
1		0025	6	1.	1		0640	81	4217.	1		1255	156	3.	1		1910	231	0.
1		0030	7	2.	1		0645	82	3876.	1		1300	157	2.	1		1915	232	0.
1		0035	8	4.	1		0650	83	3562.	1		1305	158	2.	1		1920	233	0.
1		0040	9	7.	1		0655	84	3275.	1		1310	159	2.	1		1925	234	0.
1		0045	10	10.	1		0700	85	3012.	1		1315	160	2.	1		1930	235	0.
1		0050	11	13.	1		0705	86	2767.	1		1320	161	1.	1		1935	236	0.
1		0055	12	16.	1		0710	87	2542.	1		1325	162	1.	1		1940	237	0.
1		0100	13	19.	1		0715	88	2334.	1		1330	163	1.	1		1945	238	0.
1		0105	14	20.	1		0720	89	2140.	1		1335	164	1.	1		1950	239	0.
1		0110	15	22.	1		0725	90	1960.	1		1340	165	1.	1		1955	240	0.
1		0115	16	24.	1		0730	91	1795.	1		1345	166	1.	1		2000	241	0.
1		0120	17	26.	1		0735	92	1643.	1		1350	167	1.	1		2005	242	0.

1	0125	18	29.	*	1	0740	93	1503.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	35.	*	1	0745	94	1377.	*	1	1400	169	0.	*	1	2015	244	0.
1	0135	20	43.	*	1	0750	95	1261.	*	1	1405	170	0.	*	1	2020	245	0.
1	0140	21	55.	*	1	0755	96	1155.	*	1	1410	171	0.	*	1	2025	246	0.
1	0145	22	70.	*	1	0800	97	1059.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	90.	*	1	0805	98	971.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	113.	*	1	0810	99	889.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	140.	*	1	0815	100	814.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	171.	*	1	0820	101	745.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	204.	*	1	0825	102	679.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	238.	*	1	0830	103	618.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	273.	*	1	0835	104	562.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	310.	*	1	0840	105	511.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	348.	*	1	0845	106	465.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	389.	*	1	0850	107	422.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	436.	*	1	0855	108	384.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	490.	*	1	0900	109	349.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	555.	*	1	0905	110	318.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	631.	*	1	0910	111	290.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	719.	*	1	0915	112	264.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	818.	*	1	0920	113	241.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	932.	*	1	0925	114	220.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	1060.	*	1	0930	115	201.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	1198.	*	1	0935	116	184.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	1354.	*	1	0940	117	169.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	1549.	*	1	0945	118	155.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1811.	*	1	0950	119	142.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	2160.	*	1	0955	120	130.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	2592.	*	1	1000	121	119.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	3138.	*	1	1005	122	109.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	3982.	*	1	1010	123	100.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	5434.	*	1	1015	124	91.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	7455.	*	1	1020	125	83.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	9612.	*	1	1025	126	76.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	11234.	*	1	1030	127	70.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	12255.	*	1	1035	128	63.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	12725.	*	1	1040	129	57.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	12797.	*	1	1045	130	52.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	12649.	*	1	1050	131	47.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	12343.	*	1	1055	132	43.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	11918.	*	1	1100	133	38.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	11422.	*	1	1105	134	34.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	10916.	*	1	1110	135	31.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	10471.	*	1	1115	136	28.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	10162.	*	1	1120	137	25.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	9988.	*	1	1125	138	22.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	9977.	*	1	1130	139	20.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	10081.	*	1	1135	140	18.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	10233.	*	1	1140	141	16.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	10401.	*	1	1145	142	14.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	10479.	*	1	1150	143	13.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	10382.	*	1	1155	144	12.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	10106.	*	1	1200	145	10.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	9658.	*	1	1205	146	9.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	9104.	*	1	1210	147	8.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	8493.	*	1	1215	148	7.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	7844.	*	1	1220	149	7.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	7201.	*	1	1225	150	6.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS) 6-HR	24-HR	72-HR	24.92-HR
+ 12797.	4.50	5157.	1318.	1270.	1270.
	(INCHES)	.815	.833	.833	.833
	(AC-FT)	2557.	2614.	2614.	2614.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .74

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DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW	*	DA MON HRMN	ORD	FLOW

1	0000	1	0.	*	1	0615	76	5297.	*	1	1230	151	6.	*	1	1845	226	0.
1	0005	2	0.	*	1	0620	77	4864.	*	1	1235	152	5.	*	1	1850	227	0.
1	0010	3	0.	*	1	0625	78	4457.	*	1	1240	153	5.	*	1	1855	228	0.
1	0015	4	0.	*	1	0630	79	4083.	*	1	1245	154	4.	*	1	1900	229	0.
1	0020	5	0.	*	1	0635	80	3746.	*	1	1250	155	4.	*	1	1905	230	0.
1	0025	6	0.	*	1	0640	81	3443.	*	1	1255	156	3.	*	1	1910	231	0.
1	0030	7	0.	*	1	0645	82	3167.	*	1	1300	157	3.	*	1	1915	232	0.
1	0035	8	1.	*	1	0650	83	2915.	*	1	1305	158	3.	*	1	1920	233	0.
1	0040	9	2.	*	1	0655	84	2686.	*	1	1310	159	2.	*	1	1925	234	0.
1	0045	10	4.	*	1	0700	85	2478.	*	1	1315	160	2.	*	1	1930	235	0.
1	0050	11	5.	*	1	0705	86	2286.	*	1	1320	161	2.	*	1	1935	236	0.
1	0055	12	7.	*	1	0710	87	2109.	*	1	1325	162	2.	*	1	1940	237	0.
1	0100	13	8.	*	1	0715	88	1944.	*	1	1330	163	1.	*	1	1945	238	0.
1	0105	14	9.	*	1	0720	89	1790.	*	1	1335	164	1.	*	1	1950	239	0.
1	0110	15	10.	*	1	0725	90	1649.	*	1	1340	165	1.	*	1	1955	240	0.
1	0115	16	11.	*	1	0730	91	1520.	*	1	1345	166	1.	*	1	2000	241	0.
1	0120	17	12.	*	1	0735	92	1399.	*	1	1350	167	1.	*	1	2005	242	0.
1	0125	18	14.	*	1	0740	93	1288.	*	1	1355	168	1.	*	1	2010	243	0.
1	0130	19	16.	*	1	0745	94	1185.	*	1	1400	169	1.	*	1	2015	244	0.
1	0135	20	19.	*	1	0750	95	1091.	*	1	1405	170	1.	*	1	2020	245	0.
1	0140	21	23.	*	1	0755	96	1004.	*	1	1410	171	0.	*	1	2025	246	0.
1	0145	22	29.	*	1	0800	97	922.	*	1	1415	172	0.	*	1	2030	247	0.
1	0150	23	35.	*	1	0805	98	846.	*	1	1420	173	0.	*	1	2035	248	0.
1	0155	24	43.	*	1	0810	99	775.	*	1	1425	174	0.	*	1	2040	249	0.
1	0200	25	52.	*	1	0815	100	711.	*	1	1430	175	0.	*	1	2045	250	0.
1	0205	26	63.	*	1	0820	101	653.	*	1	1435	176	0.	*	1	2050	251	0.
1	0210	27	76.	*	1	0825	102	600.	*	1	1440	177	0.	*	1	2055	252	0.
1	0215	28	90.	*	1	0830	103	551.	*	1	1445	178	0.	*	1	2100	253	0.
1	0220	29	106.	*	1	0835	104	506.	*	1	1450	179	0.	*	1	2105	254	0.
1	0225	30	123.	*	1	0840	105	463.	*	1	1455	180	0.	*	1	2110	255	0.
1	0230	31	140.	*	1	0845	106	424.	*	1	1500	181	0.	*	1	2115	256	0.
1	0235	32	160.	*	1	0850	107	387.	*	1	1505	182	0.	*	1	2120	257	0.
1	0240	33	181.	*	1	0855	108	353.	*	1	1510	183	0.	*	1	2125	258	0.
1	0245	34	207.	*	1	0900	109	322.	*	1	1515	184	0.	*	1	2130	259	0.
1	0250	35	238.	*	1	0905	110	294.	*	1	1520	185	0.	*	1	2135	260	0.
1	0255	36	277.	*	1	0910	111	269.	*	1	1525	186	0.	*	1	2140	261	0.
1	0300	37	325.	*	1	0915	112	246.	*	1	1530	187	0.	*	1	2145	262	0.
1	0305	38	384.	*	1	0920	113	225.	*	1	1535	188	0.	*	1	2150	263	0.
1	0310	39	456.	*	1	0925	114	206.	*	1	1540	189	0.	*	1	2155	264	0.
1	0315	40	541.	*	1	0930	115	189.	*	1	1545	190	0.	*	1	2200	265	0.
1	0320	41	639.	*	1	0935	116	173.	*	1	1550	191	0.	*	1	2205	266	0.
1	0325	42	756.	*	1	0940	117	159.	*	1	1555	192	0.	*	1	2210	267	0.
1	0330	43	896.	*	1	0945	118	146.	*	1	1600	193	0.	*	1	2215	268	0.
1	0335	44	1066.	*	1	0950	119	134.	*	1	1605	194	0.	*	1	2220	269	0.
1	0340	45	1285.	*	1	0955	120	123.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	1564.	*	1	1000	121	113.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1890.	*	1	1005	122	104.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	2262.	*	1	1010	123	96.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	2792.	*	1	1015	124	88.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	3841.	*	1	1020	125	81.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	5466.	*	1	1025	126	74.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	7104.	*	1	1030	127	68.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	8281.	*	1	1035	128	62.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	8856.	*	1	1040	129	57.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	9022.	*	1	1045	130	52.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	8951.	*	1	1050	131	47.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	8750.	*	1	1055	132	43.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	8509.	*	1	1100	133	39.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	8263.	*	1	1105	134	35.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	8021.	*	1	1110	135	32.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	7784.	*	1	1115	136	29.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	7560.	*	1	1120	137	26.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	7384.	*	1	1125	138	23.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	7317.	*	1	1130	139	21.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	7360.	*	1	1135	140	19.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	7473.	*	1	1140	141	17.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	7616.	*	1	1145	142	15.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	7741.	*	1	1150	143	14.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	7772.	*	1	1155	144	13.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	7660.	*	1	1200	145	11.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	7416.	*	1	1205	146	10.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	7071.	*	1	1210	147	9.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6661.	*	1	1215	148	8.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	6211.	*	1	1220	149	7.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5750.	*	1	1225	150	7.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR

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+   (CFS)       (HR)
                          (CFS)
+    9022.      4.50                 3754.        958.        923.         923.
                         (INCHES)     .593        .606        .606         .606
                          (AC-FT)    1861.       1901.       1901.        1901.

                         CUMULATIVE AREA =   58.84 SQ MI
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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	3490.	1		1230	151	10.	1		1845	226	0.
1		0005	2	0.	1		0620	77	3256.	1		1235	152	9.	1		1850	227	0.
1		0010	3	0.	1		0625	78	3027.	1		1240	153	8.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2806.	1		1245	154	7.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2594.	1		1250	155	7.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2394.	1		1255	156	6.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2208.	1		1300	157	6.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2038.	1		1305	158	5.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1883.	1		1310	159	5.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1742.	1		1315	160	4.	1		1930	235	0.
1		0050	11	1.	1		0705	86	1614.	1		1320	161	4.	1		1935	236	0.
1		0055	12	1.	1		0710	87	1496.	1		1325	162	4.	1		1940	237	0.
1		0100	13	1.	1		0715	88	1387.	1		1330	163	3.	1		1945	238	0.
1		0105	14	1.	1		0720	89	1286.	1		1335	164	3.	1		1950	239	0.
1		0110	15	2.	1		0725	90	1193.	1		1340	165	3.	1		1955	240	0.
1		0115	16	2.	1		0730	91	1105.	1		1345	166	2.	1		2000	241	0.
1		0120	17	3.	1		0735	92	1024.	1		1350	167	2.	1		2005	242	0.
1		0125	18	3.	1		0740	93	950.	1		1355	168	2.	1		2010	243	0.
1		0130	19	4.	1		0745	94	881.	1		1400	169	2.	1		2015	244	0.
1		0135	20	5.	1		0750	95	817.	1		1405	170	2.	1		2020	245	0.
1		0140	21	7.	1		0755	96	758.	1		1410	171	1.	1		2025	246	0.
1		0145	22	9.	1		0800	97	704.	1		1415	172	1.	1		2030	247	0.
1		0150	23	11.	1		0805	98	653.	1		1420	173	1.	1		2035	248	0.
1		0155	24	13.	1		0810	99	606.	1		1425	174	1.	1		2040	249	0.
1		0200	25	15.	1		0815	100	562.	1		1430	175	1.	1		2045	250	0.
1		0205	26	18.	1		0820	101	522.	1		1435	176	1.	1		2050	251	0.
1		0210	27	21.	1		0825	102	484.	1		1440	177	1.	1		2055	252	0.
1		0215	28	24.	1		0830	103	448.	1		1445	178	1.	1		2100	253	0.
1		0220	29	26.	1		0835	104	415.	1		1450	179	1.	1		2105	254	0.
1		0225	30	28.	1		0840	105	385.	1		1455	180	0.	1		2110	255	0.
1		0230	31	30.	1		0845	106	357.	1		1500	181	0.	1		2115	256	0.
1		0235	32	32.	1		0850	107	331.	1		1505	182	0.	1		2120	257	0.
1		0240	33	35.	1		0855	108	306.	1		1510	183	0.	1		2125	258	0.
1		0245	34	39.	1		0900	109	284.	1		1515	184	0.	1		2130	259	0.
1		0250	35	44.	1		0905	110	262.	1		1520	185	0.	1		2135	260	0.
1		0255	36	52.	1		0910	111	242.	1		1525	186	0.	1		2140	261	0.
1		0300	37	63.	1		0915	112	224.	1		1530	187	0.	1		2145	262	0.
1		0305	38	80.	1		0920	113	206.	1		1535	188	0.	1		2150	263	0.
1		0310	39	102.	1		0925	114	190.	1		1540	189	0.	1		2155	264	0.
1		0315	40	133.	1		0930	115	175.	1		1545	190	0.	1		2200	265	0.
1		0320	41	172.	1		0935	116	161.	1		1550	191	0.	1		2205	266	0.
1		0325	42	223.	1		0940	117	149.	1		1555	192	0.	1		2210	267	0.
1		0330	43	290.	1		0945	118	137.	1		1600	193	0.	1		2215	268	0.
1		0335	44	374.	1		0950	119	127.	1		1605	194	0.	1		2220	269	0.
1		0340	45	474.	1		0955	120	117.	1		1610	195	0.	1		2225	270	0.
1		0345	46	578.	1		1000	121	108.	1		1615	196	0.	1		2230	271	0.
1		0350	47	681.	1		1005	122	100.	1		1620	197	0.	1		2235	272	0.
1		0355	48	841.	1		1010	123	92.	1		1625	198	0.	1		2240	273	0.
1		0400	49	1045.	1		1015	124	86.	1		1630	199	0.	1		2245	274	0.
1		0405	50	1232.	1		1020	125	79.	1		1635	200	0.	1		2250	275	0.
1		0410	51	1415.	1		1025	126	74.	1		1640	201	0.	1		2255	276	0.
1		0415	52	1856.	1		1030	127	69.	1		1645	202	0.	1		2300	277	0.
1		0420	53	2878.	1		1035	128	64.	1		1650	203	0.	1		2305	278	0.
1		0425	54	4051.	1		1040	129	59.	1		1655	204	0.	1		2310	279	0.
1		0430	55	4712.	1		1045	130	55.	1		1700	205	0.	1		2315	280	0.
1		0435	56	4943.	1		1050	131	52.	1		1705	206	0.	1		2320	281	0.
1		0440	57	4976.	1		1055	132	48.	1		1710	207	0.	1		2325	282	0.
1		0445	58	4886.	1		1100	133	45.	1		1715	208	0.	1		2330	283	0.
1		0450	59	4736.	1		1105	134	42.	1		1720	209	0.	1		2335	284	0.
1		0455	60	4568.	1		1110	135	39.	1		1725	210	0.	1		2340	285	0.
1		0500	61	4412.	1		1115	136	36.	1		1730	211	0.	1		2345	286	0.
1		0505	62	4282.	1		1120	137	34.	1		1735	212	0.	1		2350	287	0.

1	0510	63	4190.	*	1	1125	138	31.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	4149.	*	1	1130	139	29.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	4156.	*	1	1135	140	26.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	4193.	*	1	1140	141	24.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	4246.	*	1	1145	142	22.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	4321.	*	1	1150	143	20.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	4418.	*	1	1155	144	19.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	4498.	*	1	1200	145	17.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	4492.	*	1	1205	146	15.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	4373.	*	1	1210	147	14.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	4184.	*	1	1215	148	13.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	3965.	*	1	1220	149	12.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3730.	*	1	1225	150	11.	*	1	1840	225	0.	*	2	0055	300	0.

****

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 4976.	4.67	(CFS) 2129.	544.	524.	524.
		(INCHES) .336	.344	.344	.344
		(AC-FT) 1056.	1080.	1080.	1080.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	2038.	1		1230	151	13.	1		1845	226	0.
1		0005	2	0.	1		0620	77	1924.	1		1235	152	12.	1		1850	227	0.
1		0010	3	0.	1		0625	78	1797.	1		1240	153	12.	1		1855	228	0.
1		0015	4	0.	1		0630	79	1673.	1		1245	154	11.	1		1900	229	0.
1		0020	5	0.	1		0635	80	1574.	1		1250	155	10.	1		1905	230	0.
1		0025	6	0.	1		0640	81	1490.	1		1255	156	9.	1		1910	231	0.
1		0030	7	0.	1		0645	82	1400.	1		1300	157	8.	1		1915	232	0.
1		0035	8	0.	1		0650	83	1308.	1		1305	158	8.	1		1920	233	0.
1		0040	9	0.	1		0655	84	1227.	1		1310	159	7.	1		1925	234	0.
1		0045	10	0.	1		0700	85	1147.	1		1315	160	7.	1		1930	235	0.
1		0050	11	0.	1		0705	86	1061.	1		1320	161	6.	1		1935	236	0.
1		0055	12	0.	1		0710	87	983.	1		1325	162	6.	1		1940	237	0.
1		0100	13	0.	1		0715	88	918.	1		1330	163	5.	1		1945	238	0.
1		0105	14	0.	1		0720	89	854.	1		1335	164	5.	1		1950	239	0.
1		0110	15	0.	1		0725	90	794.	1		1340	165	5.	1		1955	240	0.
1		0115	16	0.	1		0730	91	744.	1		1345	166	4.	1		2000	241	0.
1		0120	17	0.	1		0735	92	695.	1		1350	167	4.	1		2005	242	0.
1		0125	18	0.	1		0740	93	649.	1		1355	168	4.	1		2010	243	0.
1		0130	19	1.	1		0745	94	609.	1		1400	169	3.	1		2015	244	0.
1		0135	20	1.	1		0750	95	569.	1		1405	170	3.	1		2020	245	0.
1		0140	21	1.	1		0755	96	531.	1		1410	171	3.	1		2025	246	0.
1		0145	22	1.	1		0800	97	499.	1		1415	172	3.	1		2030	247	0.
1		0150	23	2.	1		0805	98	466.	1		1420	173	2.	1		2035	248	0.
1		0155	24	3.	1		0810	99	436.	1		1425	174	2.	1		2040	249	0.
1		0200	25	4.	1		0815	100	409.	1		1430	175	2.	1		2045	250	0.
1		0205	26	5.	1		0820	101	382.	1		1435	176	2.	1		2050	251	0.
1		0210	27	6.	1		0825	102	359.	1		1440	177	2.	1		2055	252	0.
1		0215	28	7.	1		0830	103	336.	1		1445	178	2.	1		2100	253	0.
1		0220	29	8.	1		0835	104	315.	1		1450	179	2.	1		2105	254	0.
1		0225	30	9.	1		0840	105	296.	1		1455	180	1.	1		2110	255	0.
1		0230	31	9.	1		0845	106	277.	1		1500	181	1.	1		2115	256	0.
1		0235	32	9.	1		0850	107	260.	1		1505	182	1.	1		2120	257	0.
1		0240	33	9.	1		0855	108	244.	1		1510	183	1.	1		2125	258	0.
1		0245	34	9.	1		0900	109	229.	1		1515	184	1.	1		2130	259	0.
1		0250	35	10.	1		0905	110	215.	1		1520	185	1.	1		2135	260	0.
1		0255	36	12.	1		0910	111	202.	1		1525	186	1.	1		2140	261	0.
1		0300	37	15.	1		0915	112	189.	1		1530	187	1.	1		2145	262	0.
1		0305	38	19.	1		0920	113	177.	1		1535	188	1.	1		2150	263	0.
1		0310	39	26.	1		0925	114	165.	1		1540	189	1.	1		2155	264	0.
1		0315	40	35.	1		0930	115	154.	1		1545	190	1.	1		2200	265	0.
1		0320	41	48.	1		0935	116	144.	1		1550	191	1.	1		2205	266	0.
1		0325	42	66.	1		0940	117	134.	1		1555	192	1.	1		2210	267	0.
1		0330	43	93.	1		0945	118	125.	1		1600	193	0.	1		2215	268	0.
1		0335	44	128.	1		0950	119	116.	1		1605	194	0.	1		2220	269	0.

1	0340	45	171.	*	1	0955	120	109.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	216.	*	1	1000	121	101.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	258.	*	1	1005	122	95.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	297.	*	1	1010	123	88.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	334.	*	1	1015	124	82.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	369.	*	1	1020	125	77.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	468.	*	1	1025	126	72.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	566.	*	1	1030	127	67.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	605.	*	1	1035	128	62.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	632.	*	1	1040	129	58.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	653.	*	1	1045	130	54.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	1178.	*	1	1050	131	51.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	2618.	*	1	1055	132	47.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	2656.	*	1	1100	133	44.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	2405.	*	1	1105	134	41.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	2645.	*	1	1110	135	39.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	2446.	*	1	1115	136	36.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	2483.	*	1	1120	137	34.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	2358.	*	1	1125	138	32.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	2303.	*	1	1130	139	30.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	2261.	*	1	1135	140	28.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	2215.	*	1	1140	141	26.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2197.	*	1	1145	142	25.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	2179.	*	1	1150	143	23.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	2227.	*	1	1155	144	22.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	2293.	*	1	1200	145	20.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	2362.	*	1	1205	146	19.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	2407.	*	1	1210	147	18.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	2383.	*	1	1215	148	17.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	2276.	*	1	1220	149	16.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	2150.	*	1	1225	150	14.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 2656.	4.75	1116.	288.	277.	277.
		(INCHES) .176	.182	.182	.182
		(AC-FT) 553.	571.	571.	571.

CUMULATIVE AREA = 58.84 SQ MI

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HYDROGRAPH AT STATION ULWIN
SUM OF 4 HYDROGRAPHS
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	496.	1		1230	151	7.	1		1845	226	0.
1		0005	2	0.	1		0620	77	543.	1		1235	152	7.	1		1850	227	0.
1		0010	3	0.	1		0625	78	515.	1		1240	153	6.	1		1855	228	0.
1		0015	4	0.	1		0630	79	551.	1		1245	154	6.	1		1900	229	0.
1		0020	5	0.	1		0635	80	512.	1		1250	155	6.	1		1905	230	0.
1		0025	6	0.	1		0640	81	500.	1		1255	156	5.	1		1910	231	0.
1		0030	7	0.	1		0645	82	469.	1		1300	157	5.	1		1915	232	0.
1		0035	8	0.	1		0650	83	443.	1		1305	158	5.	1		1920	233	0.
1		0040	9	0.	1		0655	84	419.	1		1310	159	5.	1		1925	234	0.
1		0045	10	0.	1		0700	85	384.	1		1315	160	4.	1		1930	235	0.
1		0050	11	0.	1		0705	86	367.	1		1320	161	4.	1		1935	236	0.
1		0055	12	0.	1		0710	87	346.	1		1325	162	4.	1		1940	237	0.
1		0100	13	0.	1		0715	88	326.	1		1330	163	4.	1		1945	238	0.
1		0105	14	0.	1		0720	89	301.	1		1335	164	4.	1		1950	239	0.
1		0110	15	0.	1		0725	90	283.	1		1340	165	4.	1		1955	240	0.
1		0115	16	0.	1		0730	91	265.	1		1345	166	3.	1		2000	241	0.
1		0120	17	0.	1		0735	92	251.	1		1350	167	3.	1		2005	242	0.
1		0125	18	0.	1		0740	93	234.	1		1355	168	3.	1		2010	243	0.
1		0130	19	0.	1		0745	94	221.	1		1400	169	3.	1		2015	244	0.
1		0135	20	0.	1		0750	95	211.	1		1405	170	3.	1		2020	245	0.
1		0140	21	0.	1		0755	96	200.	1		1410	171	3.	1		2025	246	0.
1		0145	22	0.	1		0800	97	188.	1		1415	172	3.	1		2030	247	0.
1		0150	23	0.	1		0805	98	177.	1		1420	173	2.	1		2035	248	0.
1		0155	24	0.	1		0810	99	165.	1		1425	174	2.	1		2040	249	0.
1		0200	25	0.	1		0815	100	151.	1		1430	175	2.	1		2045	250	0.
1		0205	26	0.	1		0820	101	141.	1		1435	176	2.	1		2050	251	0.

1	0210	27	0.	*	1	0825	102	133.	*	1	1440	177	2.	*	1	2055	252	0.
1	0215	28	0.	*	1	0830	103	126.	*	1	1445	178	2.	*	1	2100	253	0.
1	0220	29	0.	*	1	0835	104	121.	*	1	1450	179	2.	*	1	2105	254	0.
1	0225	30	0.	*	1	0840	105	117.	*	1	1455	180	2.	*	1	2110	255	0.
1	0230	31	0.	*	1	0845	106	110.	*	1	1500	181	1.	*	1	2115	256	0.
1	0235	32	0.	*	1	0850	107	101.	*	1	1505	182	1.	*	1	2120	257	0.
1	0240	33	0.	*	1	0855	108	93.	*	1	1510	183	1.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	88.	*	1	1515	184	1.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	86.	*	1	1520	185	1.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	85.	*	1	1525	186	1.	*	1	2140	261	0.
1	0300	37	1.	*	1	0915	112	82.	*	1	1530	187	1.	*	1	2145	262	0.
1	0305	38	1.	*	1	0920	113	78.	*	1	1535	188	1.	*	1	2150	263	0.
1	0310	39	2.	*	1	0925	114	73.	*	1	1540	189	1.	*	1	2155	264	0.
1	0315	40	3.	*	1	0930	115	69.	*	1	1545	190	1.	*	1	2200	265	0.
1	0320	41	5.	*	1	0935	116	67.	*	1	1550	191	1.	*	1	2205	266	0.
1	0325	42	9.	*	1	0940	117	63.	*	1	1555	192	1.	*	1	2210	267	0.
1	0330	43	14.	*	1	0945	118	58.	*	1	1600	193	1.	*	1	2215	268	0.
1	0335	44	21.	*	1	0950	119	54.	*	1	1605	194	1.	*	1	2220	269	0.
1	0340	45	29.	*	1	0955	120	51.	*	1	1610	195	1.	*	1	2225	270	0.
1	0345	46	35.	*	1	1000	121	49.	*	1	1615	196	1.	*	1	2230	271	0.
1	0350	47	40.	*	1	1005	122	47.	*	1	1620	197	1.	*	1	2235	272	0.
1	0355	48	43.	*	1	1010	123	45.	*	1	1625	198	1.	*	1	2240	273	0.
1	0400	49	48.	*	1	1015	124	42.	*	1	1630	199	1.	*	1	2245	274	0.
1	0405	50	54.	*	1	1020	125	40.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	60.	*	1	1025	126	37.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	65.	*	1	1030	127	35.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	67.	*	1	1035	128	33.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	69.	*	1	1040	129	30.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	70.	*	1	1045	130	28.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	72.	*	1	1050	131	26.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	74.	*	1	1055	132	25.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	77.	*	1	1100	133	23.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	87.	*	1	1105	134	22.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	108.	*	1	1110	135	20.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	106.	*	1	1115	136	19.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	108.	*	1	1120	137	18.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	114.	*	1	1125	138	16.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	112.	*	1	1130	139	15.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	113.	*	1	1135	140	14.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	113.	*	1	1140	141	13.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	196.	*	1	1145	142	13.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	576.	*	1	1150	143	12.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	577.	*	1	1155	144	11.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	368.	*	1	1200	145	10.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	564.	*	1	1205	146	10.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	462.	*	1	1210	147	9.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	417.	*	1	1215	148	9.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	554.	*	1	1220	149	8.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	445.	*	1	1225	150	8.	*	1	1840	225	0.	*	2	0055	300	0.

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+		(CFS)				
+ 577.	5.67		222.	59.	57.	57.
		(INCHES)	.035	.037	.037	.037
		(AC-FT)	110.	117.	117.	117.

CUMULATIVE AREA = 58.84 SQ MI

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            **************
            *            *
1305 KK     *    FINISH  *
            *            *
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1307 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

1306 RD MUSKINGUM-CUNGE CHANNEL ROUTING

L	1500.	CHANNEL LENGTH
S	.0090	SLOPE
N	.050	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	250.00	BOTTOM WIDTH OR DIAMETER
Z	3.00	SIDE SLOPE

***

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.45	750.00	11279.67	377.53	1.14	10.20
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		11268.66	380.00	1.14	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5383E+04 EXCESS= .0000E+00 OUTFLOW= .5383E+04 BASIN STORAGE= .1063E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = 1.00

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	11262.	1		1230	151	2683.	1		1845	226	176.
1		0005	2	0.	1		0620	77	11269.	1		1235	152	2660.	1		1850	227	138.
1		0010	3	0.	1		0625	78	11154.	1		1240	153	2636.	1		1855	228	105.
1		0015	4	0.	1		0630	79	10948.	1		1245	154	2611.	1		1900	229	79.
1		0020	5	0.	1		0635	80	10670.	1		1250	155	2587.	1		1905	230	59.
1		0025	6	0.	1		0640	81	10339.	1		1255	156	2563.	1		1910	231	44.
1		0030	7	0.	1		0645	82	9970.	1		1300	157	2540.	1		1915	232	33.
1		0035	8	1.	1		0650	83	9577.	1		1305	158	2516.	1		1920	233	25.
1		0040	9	3.	1		0655	84	9168.	1		1310	159	2492.	1		1925	234	18.
1		0045	10	6.	1		0700	85	8750.	1		1315	160	2467.	1		1930	235	14.
1		0050	11	11.	1		0705	86	8329.	1		1320	161	2442.	1		1935	236	10.
1		0055	12	20.	1		0710	87	7911.	1		1325	162	2416.	1		1940	237	8.
1		0100	13	31.	1		0715	88	7498.	1		1330	163	2390.	1		1945	238	6.
1		0105	14	46.	1		0720	89	7094.	1		1335	164	2365.	1		1950	239	4.
1		0110	15	64.	1		0725	90	6698.	1		1340	165	2340.	1		1955	240	3.
1		0115	16	85.	1		0730	91	6313.	1		1345	166	2315.	1		2000	241	2.
1		0120	17	107.	1		0735	92	5938.	1		1350	167	2288.	1		2005	242	2.
1		0125	18	131.	1		0740	93	5577.	1		1355	168	2260.	1		2010	243	1.
1		0130	19	155.	1		0745	94	5237.	1		1400	169	2232.	1		2015	244	1.
1		0135	20	181.	1		0750	95	4938.	1		1405	170	2204.	1		2020	245	1.
1		0140	21	210.	1		0755	96	4710.	1		1410	171	2176.	1		2025	246	1.
1		0145	22	243.	1		0800	97	4562.	1		1415	172	2149.	1		2030	247	0.
1		0150	23	283.	1		0805	98	4464.	1		1420	173	2121.	1		2035	248	0.
1		0155	24	330.	1		0810	99	4382.	1		1425	174	2092.	1		2040	249	0.
1		0200	25	387.	1		0815	100	4304.	1		1430	175	2061.	1		2045	250	0.
1		0205	26	456.	1		0820	101	4232.	1		1435	176	2030.	1		2050	251	0.
1		0210	27	536.	1		0825	102	4163.	1		1440	177	1998.	1		2055	252	0.
1		0215	28	625.	1		0830	103	4098.	1		1445	178	1968.	1		2100	253	0.
1		0220	29	721.	1		0835	104	4037.	1		1450	179	1937.	1		2105	254	0.
1		0225	30	816.	1		0840	105	3979.	1		1455	180	1906.	1		2110	255	0.
1		0230	31	902.	1		0845	106	3924.	1		1500	181	1872.	1		2115	256	0.
1		0235	32	980.	1		0850	107	3872.	1		1505	182	1836.	1		2120	257	0.
1		0240	33	1051.	1		0855	108	3823.	1		1510	183	1801.	1		2125	258	0.
1		0245	34	1115.	1		0900	109	3777.	1		1515	184	1766.	1		2130	259	0.
1		0250	35	1175.	1		0905	110	3733.	1		1520	185	1732.	1		2135	260	0.
1		0255	36	1240.	1		0910	111	3692.	1		1525	186	1697.	1		2140	261	0.
1		0300	37	1315.	1		0915	112	3653.	1		1530	187	1661.	1		2145	262	0.
1		0305	38	1405.	1		0920	113	3616.	1		1535	188	1624.	1		2150	263	0.
1		0310	39	1523.	1		0925	114	3581.	1		1540	189	1587.	1		2155	264	0.
1		0315	40	1690.	1		0930	115	3548.	1		1545	190	1550.	1		2200	265	0.
1		0320	41	1927.	1		0935	116	3515.	1		1550	191	1515.	1		2205	266	0.
1		0325	42	2253.	1		0940	117	3483.	1		1555	192	1479.	1		2210	267	0.
1		0330	43	2688.	1		0945	118	3452.	1		1600	193	1441.	1		2215	268	0.

1	0335	44	3248.	*	1	0950	119	3422.	*	1	1605	194	1402.	*	1	2220	269	0.
1	0340	45	3920.	*	1	0955	120	3394.	*	1	1610	195	1364.	*	1	2225	270	0.
1	0345	46	4672.	*	1	1000	121	3366.	*	1	1615	196	1326.	*	1	2230	271	0.
1	0350	47	5478.	*	1	1005	122	3340.	*	1	1620	197	1290.	*	1	2235	272	0.
1	0355	48	6299.	*	1	1010	123	3314.	*	1	1625	198	1253.	*	1	2240	273	0.
1	0400	49	7068.	*	1	1015	124	3290.	*	1	1630	199	1215.	*	1	2245	274	0.
1	0405	50	7730.	*	1	1020	125	3265.	*	1	1635	200	1175.	*	1	2250	275	0.
1	0410	51	8277.	*	1	1025	126	3241.	*	1	1640	201	1136.	*	1	2255	276	0.
1	0415	52	8722.	*	1	1030	127	3216.	*	1	1645	202	1097.	*	1	2300	277	0.
1	0420	53	9062.	*	1	1035	128	3192.	*	1	1650	203	1060.	*	1	2305	278	0.
1	0425	54	9284.	*	1	1040	129	3168.	*	1	1655	204	1023.	*	1	2310	279	0.
1	0430	55	9398.	*	1	1045	130	3145.	*	1	1700	205	986.	*	1	2315	280	0.
1	0435	56	9438.	*	1	1050	131	3123.	*	1	1705	206	947.	*	1	2320	281	0.
1	0440	57	9439.	*	1	1055	132	3101.	*	1	1710	207	907.	*	1	2325	282	0.
1	0445	58	9426.	*	1	1100	133	3079.	*	1	1715	208	868.	*	1	2330	283	0.
1	0450	59	9443.	*	1	1105	134	3058.	*	1	1720	209	831.	*	1	2335	284	0.
1	0455	60	9527.	*	1	1110	135	3037.	*	1	1725	210	795.	*	1	2340	285	0.
1	0500	61	9672.	*	1	1115	136	3014.	*	1	1730	211	760.	*	1	2345	286	0.
1	0505	62	9844.	*	1	1120	137	2992.	*	1	1735	212	722.	*	1	2350	287	0.
1	0510	63	10017.	*	1	1125	138	2970.	*	1	1740	213	682.	*	1	2355	288	0.
1	0515	64	10170.	*	1	1130	139	2948.	*	1	1745	214	641.	*	2	0000	289	0.
1	0520	65	10269.	*	1	1135	140	2926.	*	1	1750	215	601.	*	2	0005	290	0.
1	0525	66	10296.	*	1	1140	141	2905.	*	1	1755	216	563.	*	2	0010	291	0.
1	0530	67	10250.	*	1	1145	142	2884.	*	1	1800	217	528.	*	2	0015	292	0.
1	0535	68	10137.	*	1	1150	143	2863.	*	1	1805	218	493.	*	2	0020	293	0.
1	0540	69	9970.	*	1	1155	144	2840.	*	1	1810	219	450.	*	2	0025	294	0.
1	0545	70	9775.	*	1	1200	145	2818.	*	1	1815	220	403.	*	2	0030	295	0.
1	0550	71	9648.	*	1	1205	146	2795.	*	1	1820	221	357.	*	2	0035	296	0.
1	0555	72	9780.	*	1	1210	147	2772.	*	1	1825	222	316.	*	2	0040	297	0.
1	0600	73	10239.	*	1	1215	148	2749.	*	1	1830	223	279.	*	2	0045	298	0.
1	0605	74	10767.	*	1	1220	149	2727.	*	1	1835	224	245.	*	2	0050	299	0.
1	0610	75	11111.	*	1	1225	150	2705.	*	1	1840	225	212.	*	2	0055	300	0.

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 11269.	6.33	7379.	2714.	2614.	2614.
		(INCHES) .772	1.136	1.136	1.136
		(AC-FT) 3659.	5383.	5383.	5383.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.73	750.00	8549.73	324.96	.88	9.16

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		8549.72	325.00	.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4175E+04 EXCESS= .0000E+00 OUTFLOW= .4175E+04 BASIN STORAGE= .1056E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .87

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	6964.	*	1		1230	151	2378.	*	1		1845	226	6.
1		0005	2	0.	*	1		0620	77	6778.	*	1		1235	152	2352.	*	1		1850	227	5.
1		0010	3	0.	*	1		0625	78	6598.	*	1		1240	153	2326.	*	1		1855	228	4.
1		0015	4	0.	*	1		0630	79	6422.	*	1		1245	154	2299.	*	1		1900	229	3.
1		0020	5	0.	*	1		0635	80	6252.	*	1		1250	155	2270.	*	1		1905	230	2.
1		0025	6	0.	*	1		0640	81	6085.	*	1		1255	156	2241.	*	1		1910	231	2.
1		0030	7	0.	*	1		0645	82	5923.	*	1		1300	157	2213.	*	1		1915	232	1.
1		0035	8	0.	*	1		0650	83	5767.	*	1		1305	158	2185.	*	1		1920	233	1.

1	0040	9	0.	*	1	0655	84	5617.	*	1	1310	159	2157.	*	1	1925	234	1.
1	0045	10	1.	*	1	0700	85	5474.	*	1	1315	160	2129.	*	1	1930	235	0.
1	0050	11	2.	*	1	0705	86	5337.	*	1	1320	161	2099.	*	1	1935	236	0.
1	0055	12	4.	*	1	0710	87	5206.	*	1	1325	162	2068.	*	1	1940	237	0.
1	0100	13	7.	*	1	0715	88	5081.	*	1	1330	163	2036.	*	1	1945	238	0.
1	0105	14	12.	*	1	0720	89	4962.	*	1	1335	164	2004.	*	1	1950	239	0.
1	0110	15	18.	*	1	0725	90	4849.	*	1	1340	165	1973.	*	1	1955	240	0.
1	0115	16	26.	*	1	0730	91	4741.	*	1	1345	166	1942.	*	1	2000	241	0.
1	0120	17	35.	*	1	0735	92	4636.	*	1	1350	167	1910.	*	1	2005	242	0.
1	0125	18	46.	*	1	0740	93	4534.	*	1	1355	168	1876.	*	1	2010	243	0.
1	0130	19	59.	*	1	0745	94	4438.	*	1	1400	169	1840.	*	1	2015	244	0.
1	0135	20	74.	*	1	0750	95	4346.	*	1	1405	170	1804.	*	1	2020	245	0.
1	0140	21	91.	*	1	0755	96	4260.	*	1	1410	171	1769.	*	1	2025	246	0.
1	0145	22	112.	*	1	0800	97	4181.	*	1	1415	172	1735.	*	1	2030	247	0.
1	0150	23	136.	*	1	0805	98	4107.	*	1	1420	173	1700.	*	1	2035	248	0.
1	0155	24	165.	*	1	0810	99	4037.	*	1	1425	174	1664.	*	1	2040	249	0.
1	0200	25	199.	*	1	0815	100	3972.	*	1	1430	175	1626.	*	1	2045	250	0.
1	0205	26	239.	*	1	0820	101	3910.	*	1	1435	176	1589.	*	1	2050	251	0.
1	0210	27	286.	*	1	0825	102	3851.	*	1	1440	177	1553.	*	1	2055	252	0.
1	0215	28	338.	*	1	0830	103	3796.	*	1	1445	178	1517.	*	1	2100	253	0.
1	0220	29	395.	*	1	0835	104	3744.	*	1	1450	179	1481.	*	1	2105	254	0.
1	0225	30	455.	*	1	0840	105	3694.	*	1	1455	180	1444.	*	1	2110	255	0.
1	0230	31	518.	*	1	0845	106	3647.	*	1	1500	181	1405.	*	1	2115	256	0.
1	0235	32	581.	*	1	0850	107	3602.	*	1	1505	182	1366.	*	1	2120	257	0.
1	0240	33	641.	*	1	0855	108	3559.	*	1	1510	183	1329.	*	1	2125	258	0.
1	0245	34	695.	*	1	0900	109	3518.	*	1	1515	184	1292.	*	1	2130	259	0.
1	0250	35	738.	*	1	0905	110	3479.	*	1	1520	185	1255.	*	1	2135	260	0.
1	0255	36	776.	*	1	0910	111	3442.	*	1	1525	186	1217.	*	1	2140	261	0.
1	0300	37	817.	*	1	0915	112	3406.	*	1	1530	187	1178.	*	1	2145	262	0.
1	0305	38	873.	*	1	0920	113	3371.	*	1	1535	188	1138.	*	1	2150	263	0.
1	0310	39	956.	*	1	0925	114	3337.	*	1	1540	189	1100.	*	1	2155	264	0.
1	0315	40	1079.	*	1	0930	115	3305.	*	1	1545	190	1062.	*	1	2200	265	0.
1	0320	41	1258.	*	1	0935	116	3273.	*	1	1550	191	1025.	*	1	2205	266	0.
1	0325	42	1505.	*	1	0940	117	3243.	*	1	1555	192	988.	*	1	2210	267	0.
1	0330	43	1839.	*	1	0945	118	3214.	*	1	1600	193	949.	*	1	2215	268	0.
1	0335	44	2277.	*	1	0950	119	3186.	*	1	1605	194	909.	*	1	2220	269	0.
1	0340	45	2808.	*	1	0955	120	3159.	*	1	1610	195	870.	*	1	2225	270	0.
1	0345	46	3413.	*	1	1000	121	3132.	*	1	1615	196	833.	*	1	2230	271	0.
1	0350	47	4067.	*	1	1005	122	3105.	*	1	1620	197	797.	*	1	2235	272	0.
1	0355	48	4738.	*	1	1010	123	3077.	*	1	1625	198	762.	*	1	2240	273	0.
1	0400	49	5368.	*	1	1015	124	3050.	*	1	1630	199	725.	*	1	2245	274	0.
1	0405	50	5909.	*	1	1020	125	3024.	*	1	1635	200	686.	*	1	2250	275	0.
1	0410	51	6356.	*	1	1025	126	2999.	*	1	1640	201	647.	*	1	2255	276	0.
1	0415	52	6728.	*	1	1030	127	2974.	*	1	1645	202	609.	*	1	2300	277	0.
1	0420	53	7036.	*	1	1035	128	2949.	*	1	1650	203	573.	*	1	2305	278	0.
1	0425	54	7273.	*	1	1040	129	2925.	*	1	1655	204	539.	*	1	2310	279	0.
1	0430	55	7432.	*	1	1045	130	2901.	*	1	1700	205	505.	*	1	2315	280	0.
1	0435	56	7526.	*	1	1050	131	2877.	*	1	1705	206	469.	*	1	2320	281	0.
1	0440	57	7576.	*	1	1055	132	2852.	*	1	1710	207	428.	*	1	2325	282	0.
1	0445	58	7606.	*	1	1100	133	2827.	*	1	1715	208	384.	*	1	2330	283	0.
1	0450	59	7654.	*	1	1105	134	2803.	*	1	1720	209	343.	*	1	2335	284	0.
1	0455	60	7753.	*	1	1110	135	2779.	*	1	1725	210	305.	*	1	2340	285	0.
1	0500	61	7902.	*	1	1115	136	2755.	*	1	1730	211	271.	*	1	2345	286	0.
1	0505	62	8072.	*	1	1120	137	2732.	*	1	1735	212	239.	*	1	2350	287	0.
1	0510	63	8243.	*	1	1125	138	2708.	*	1	1740	213	207.	*	1	2355	288	0.
1	0515	64	8395.	*	1	1130	139	2684.	*	1	1745	214	171.	*	2	0000	289	0.
1	0520	65	8503.	*	1	1135	140	2659.	*	1	1750	215	135.	*	2	0005	290	0.
1	0525	66	8550.	*	1	1140	141	2633.	*	1	1755	216	103.	*	2	0010	291	0.
1	0530	67	8533.	*	1	1145	142	2608.	*	1	1800	217	78.	*	2	0015	292	0.
1	0535	68	8461.	*	1	1150	143	2584.	*	1	1805	218	59.	*	2	0020	293	0.
1	0540	69	8342.	*	1	1155	144	2559.	*	1	1810	219	45.	*	2	0025	294	0.
1	0545	70	8184.	*	1	1200	145	2535.	*	1	1815	220	34.	*	2	0030	295	0.
1	0550	71	7999.	*	1	1205	146	2510.	*	1	1820	221	25.	*	2	0035	296	0.
1	0555	72	7796.	*	1	1210	147	2484.	*	1	1825	222	19.	*	2	0040	297	0.
1	0600	73	7584.	*	1	1215	148	2457.	*	1	1830	223	15.	*	2	0045	298	0.
1	0605	74	7369.	*	1	1220	149	2431.	*	1	1835	224	11.	*	2	0050	299	0.
1	0610	75	7160.	*	1	1225	150	2404.	*	1	1840	225	8.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 8550.	5.42		5669.	2105.	2027.	2027.
		(INCHES)	.593	.881	.881	.881
		(AC-FT)	2811.	4175.	4175.	4175.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	COMPUTATION TIME STEP M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	2.99	750.00	6767.18	328.96	.64	8.36

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		6763.94	330.00	.64	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3052E+04 EXCESS= .0000E+00 OUTFLOW= .3052E+04 BASIN STORAGE= .1017E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .74

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	5688.	1		1230	151	1578.	1		1845	226	0.
1		0005	2	0.	1		0620	77	5555.	1		1235	152	1541.	1		1850	227	0.
1		0010	3	0.	1		0625	78	5425.	1		1240	153	1504.	1		1855	228	0.
1		0015	4	0.	1		0630	79	5298.	1		1245	154	1466.	1		1900	229	0.
1		0020	5	0.	1		0635	80	5174.	1		1250	155	1427.	1		1905	230	0.
1		0025	6	0.	1		0640	81	5051.	1		1255	156	1388.	1		1910	231	0.
1		0030	7	0.	1		0645	82	4930.	1		1300	157	1349.	1		1915	232	0.
1		0035	8	0.	1		0650	83	4813.	1		1305	158	1311.	1		1920	233	0.
1		0040	9	0.	1		0655	84	4701.	1		1310	159	1274.	1		1925	234	0.
1		0045	10	0.	1		0700	85	4592.	1		1315	160	1236.	1		1930	235	0.
1		0050	11	0.	1		0705	86	4486.	1		1320	161	1197.	1		1935	236	0.
1		0055	12	0.	1		0710	87	4385.	1		1325	162	1157.	1		1940	237	0.
1		0100	13	0.	1		0715	88	4288.	1		1330	163	1117.	1		1945	238	0.
1		0105	14	1.	1		0720	89	4195.	1		1335	164	1079.	1		1950	239	0.
1		0110	15	2.	1		0725	90	4106.	1		1340	165	1042.	1		1955	240	0.
1		0115	16	3.	1		0730	91	4020.	1		1345	166	1004.	1		2000	241	0.
1		0120	17	5.	1		0735	92	3937.	1		1350	167	966.	1		2005	242	0.
1		0125	18	8.	1		0740	93	3855.	1		1355	168	926.	1		2010	243	0.
1		0130	19	12.	1		0745	94	3777.	1		1400	169	886.	1		2015	244	0.
1		0135	20	17.	1		0750	95	3703.	1		1405	170	848.	1		2020	245	0.
1		0140	21	24.	1		0755	96	3633.	1		1410	171	812.	1		2025	246	0.
1		0145	22	34.	1		0800	97	3567.	1		1415	172	776.	1		2030	247	0.
1		0150	23	45.	1		0805	98	3504.	1		1420	173	740.	1		2035	248	0.
1		0155	24	60.	1		0810	99	3446.	1		1425	174	701.	1		2040	249	0.
1		0200	25	78.	1		0815	100	3391.	1		1430	175	662.	1		2045	250	0.
1		0205	26	100.	1		0820	101	3338.	1		1435	176	623.	1		2050	251	0.
1		0210	27	126.	1		0825	102	3287.	1		1440	177	587.	1		2055	252	0.
1		0215	28	155.	1		0830	103	3238.	1		1445	178	552.	1		2100	253	0.
1		0220	29	187.	1		0835	104	3190.	1		1450	179	519.	1		2105	254	0.
1		0225	30	221.	1		0840	105	3145.	1		1455	180	485.	1		2110	255	0.
1		0230	31	256.	1		0845	106	3101.	1		1500	181	447.	1		2115	256	0.
1		0235	32	291.	1		0850	107	3059.	1		1505	182	407.	1		2120	257	0.
1		0240	33	323.	1		0855	108	3018.	1		1510	183	367.	1		2125	258	0.
1		0245	34	352.	1		0900	109	2979.	1		1515	184	328.	1		2130	259	0.
1		0250	35	379.	1		0905	110	2941.	1		1520	185	292.	1		2135	260	0.
1		0255	36	406.	1		0910	111	2904.	1		1525	186	260.	1		2140	261	0.
1		0300	37	436.	1		0915	112	2868.	1		1530	187	230.	1		2145	262	0.
1		0305	38	473.	1		0920	113	2832.	1		1535	188	197.	1		2150	263	0.
1		0310	39	527.	1		0925	114	2797.	1		1540	189	161.	1		2155	264	0.
1		0315	40	603.	1		0930	115	2763.	1		1545	190	125.	1		2200	265	0.
1		0320	41	711.	1		0935	116	2730.	1		1550	191	96.	1		2205	266	0.
1		0325	42	866.	1		0940	117	2698.	1		1555	192	73.	1		2210	267	0.
1		0330	43	1083.	1		0945	118	2666.	1		1600	193	55.	1		2215	268	0.
1		0335	44	1381.	1		0950	119	2635.	1		1605	194	42.	1		2220	269	0.
1		0340	45	1776.	1		0955	120	2604.	1		1610	195	32.	1		2225	270	0.
1		0345	46	2244.	1		1000	121	2572.	1		1615	196	24.	1		2230	271	0.
1		0350	47	2756.	1		1005	122	2540.	1		1620	197	18.	1		2235	272	0.
1		0355	48	3284.	1		1010	123	2508.	1		1625	198	14.	1		2240	273	0.
1		0400	49	3780.	1		1015	124	2478.	1		1630	199	11.	1		2245	274	0.
1		0405	50	4211.	1		1020	125	2448.	1		1635	200	8.	1		2250	275	0.
1		0410	51	4565.	1		1025	126	2418.	1		1640	201	6.	1		2255	276	0.
1		0415	52	4850.	1		1030	127	2388.	1		1645	202	5.	1		2300	277	0.
1		0420	53	5089.	1		1035	128	2358.	1		1650	203	4.	1		2305	278	0.
1		0425	54	5289.	1		1040	129	2326.	1		1655	204	3.	1		2310	279	0.

1	0430	55	5452.	*	1	1045	130	2295.	*	1	1700	205	2.	*	1	2315	280	0.
1	0435	56	5583.	*	1	1050	131	2264.	*	1	1705	206	2.	*	1	2320	281	0.
1	0440	57	5686.	*	1	1055	132	2234.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	5768.	*	1	1100	133	2204.	*	1	1715	208	1.	*	1	2330	283	0.
1	0450	59	5852.	*	1	1105	134	2173.	*	1	1720	209	1.	*	1	2335	284	0.
1	0455	60	5968.	*	1	1110	135	2142.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	6118.	*	1	1115	136	2109.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	6280.	*	1	1120	137	2076.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	6440.	*	1	1125	138	2042.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	6585.	*	1	1130	139	2010.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	6697.	*	1	1135	140	1977.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	6756.	*	1	1140	141	1944.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	6764.	*	1	1145	142	1909.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	6729.	*	1	1150	143	1873.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	6656.	*	1	1155	144	1836.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	6551.	*	1	1200	145	1800.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	6423.	*	1	1205	146	1764.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	6280.	*	1	1210	147	1728.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	6131.	*	1	1215	148	1692.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	5979.	*	1	1220	149	1654.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	5830.	*	1	1225	150	1615.	*	1	1840	225	0.	*	2	0055	300	0.

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PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW (CFS) 6-HR	24-HR	72-HR	24.92-HR
+ 6764.	5.50	4547.	1539.	1482.	1482.
		(INCHES) .476	.644	.644	.644
		(AC-FT) 2255.	3052.	3052.	3052.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	3.54	750.00	4393.92	332.55	.37	7.07
INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL								
MAIN	.08	1.64	5.00		4390.90	335.00	.37	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1751E+04 EXCESS= .0000E+00 OUTFLOW= .1751E+04 BASIN STORAGE= .1218E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .57

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	3879.	*	1		1230	151	429.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	3808.	*	1		1235	152	390.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	3738.	*	1		1240	153	354.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	3669.	*	1		1245	154	321.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	3599.	*	1		1250	155	290.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	3528.	*	1		1255	156	262.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	3458.	*	1		1300	157	235.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	3388.	*	1		1305	158	205.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	3319.	*	1		1310	159	172.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	3251.	*	1		1315	160	139.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	3184.	*	1		1320	161	110.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	3119.	*	1		1325	162	86.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	3055.	*	1		1330	163	67.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	2994.	*	1		1335	164	53.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	2934.	*	1		1340	165	42.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	2875.	*	1		1345	166	33.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	2818.	*	1		1350	167	27.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	2761.	*	1		1355	168	22.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	2706.	*	1		1400	169	18.	*	1		2015	244	0.

1	0135	20	0.	*	1	0750	95	2652.	*	1	1405	170	15.	*	1	2020	245	0.
1	0140	21	0.	*	1	0755	96	2600.	*	1	1410	171	12.	*	1	2025	246	0.
1	0145	22	1.	*	1	0800	97	2550.	*	1	1415	172	10.	*	1	2030	247	0.
1	0150	23	2.	*	1	0805	98	2502.	*	1	1420	173	8.	*	1	2035	248	0.
1	0155	24	4.	*	1	0810	99	2454.	*	1	1425	174	7.	*	1	2040	249	0.
1	0200	25	6.	*	1	0815	100	2407.	*	1	1430	175	6.	*	1	2045	250	0.
1	0205	26	10.	*	1	0820	101	2362.	*	1	1435	176	5.	*	1	2050	251	0.
1	0210	27	15.	*	1	0825	102	2317.	*	1	1440	177	4.	*	1	2055	252	0.
1	0215	28	22.	*	1	0830	103	2274.	*	1	1445	178	4.	*	1	2100	253	0.
1	0220	29	31.	*	1	0835	104	2232.	*	1	1450	179	3.	*	1	2105	254	0.
1	0225	30	41.	*	1	0840	105	2191.	*	1	1455	180	3.	*	1	2110	255	0.
1	0230	31	53.	*	1	0845	106	2151.	*	1	1500	181	3.	*	1	2115	256	0.
1	0235	32	66.	*	1	0850	107	2111.	*	1	1505	182	2.	*	1	2120	257	0.
1	0240	33	78.	*	1	0855	108	2070.	*	1	1510	183	2.	*	1	2125	258	0.
1	0245	34	91.	*	1	0900	109	2028.	*	1	1515	184	2.	*	1	2130	259	0.
1	0250	35	102.	*	1	0905	110	1986.	*	1	1520	185	2.	*	1	2135	260	0.
1	0255	36	114.	*	1	0910	111	1946.	*	1	1525	186	1.	*	1	2140	261	0.
1	0300	37	126.	*	1	0915	112	1906.	*	1	1530	187	1.	*	1	2145	262	0.
1	0305	38	141.	*	1	0920	113	1868.	*	1	1535	188	1.	*	1	2150	263	0.
1	0310	39	160.	*	1	0925	114	1829.	*	1	1540	189	1.	*	1	2155	264	0.
1	0315	40	187.	*	1	0930	115	1790.	*	1	1545	190	1.	*	1	2200	265	0.
1	0320	41	227.	*	1	0935	116	1750.	*	1	1550	191	1.	*	1	2205	266	0.
1	0325	42	285.	*	1	0940	117	1710.	*	1	1555	192	1.	*	1	2210	267	0.
1	0330	43	378.	*	1	0945	118	1671.	*	1	1600	193	1.	*	1	2215	268	0.
1	0335	44	520.	*	1	0950	119	1633.	*	1	1605	194	1.	*	1	2220	269	0.
1	0340	45	719.	*	1	0955	120	1595.	*	1	1610	195	0.	*	1	2225	270	0.
1	0345	46	976.	*	1	1000	121	1557.	*	1	1615	196	0.	*	1	2230	271	0.
1	0350	47	1279.	*	1	1005	122	1518.	*	1	1620	197	0.	*	1	2235	272	0.
1	0355	48	1605.	*	1	1010	123	1478.	*	1	1625	198	0.	*	1	2240	273	0.
1	0400	49	1929.	*	1	1015	124	1438.	*	1	1630	199	0.	*	1	2245	274	0.
1	0405	50	2215.	*	1	1020	125	1399.	*	1	1635	200	0.	*	1	2250	275	0.
1	0410	51	2452.	*	1	1025	126	1361.	*	1	1640	201	0.	*	1	2255	276	0.
1	0415	52	2650.	*	1	1030	127	1323.	*	1	1645	202	0.	*	1	2300	277	0.
1	0420	53	2805.	*	1	1035	128	1285.	*	1	1650	203	0.	*	1	2305	278	0.
1	0425	54	2921.	*	1	1040	129	1247.	*	1	1655	204	0.	*	1	2310	279	0.
1	0430	55	3006.	*	1	1045	130	1207.	*	1	1700	205	0.	*	1	2315	280	0.
1	0435	56	3084.	*	1	1050	131	1167.	*	1	1705	206	0.	*	1	2320	281	0.
1	0440	57	3180.	*	1	1055	132	1128.	*	1	1710	207	0.	*	1	2325	282	0.
1	0445	58	3293.	*	1	1100	133	1090.	*	1	1715	208	0.	*	1	2330	283	0.
1	0450	59	3420.	*	1	1105	134	1053.	*	1	1720	209	0.	*	1	2335	284	0.
1	0455	60	3562.	*	1	1110	135	1016.	*	1	1725	210	0.	*	1	2340	285	0.
1	0500	61	3721.	*	1	1115	136	977.	*	1	1730	211	0.	*	1	2345	286	0.
1	0505	62	3880.	*	1	1120	137	938.	*	1	1735	212	0.	*	1	2350	287	0.
1	0510	63	4029.	*	1	1125	138	899.	*	1	1740	213	0.	*	1	2355	288	0.
1	0515	64	4167.	*	1	1130	139	862.	*	1	1745	214	0.	*	2	0000	289	0.
1	0520	65	4277.	*	1	1135	140	826.	*	1	1750	215	0.	*	2	0005	290	0.
1	0525	66	4350.	*	1	1140	141	790.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	4387.	*	1	1145	142	754.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	4391.	*	1	1150	143	717.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	4371.	*	1	1155	144	678.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	4324.	*	1	1200	145	639.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	4260.	*	1	1205	146	603.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	4188.	*	1	1210	147	569.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	4111.	*	1	1215	148	535.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	4033.	*	1	1220	149	502.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	3955.	*	1	1225	150	467.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)				
		(CFS)			
+ 4391.	5.58	2967.	883.	850.	850.
		(INCHES) .310	.369	.369	.369
		(AC-FT) 1471.	1751.	1751.	1751.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	4.34	750.00	2600.14	338.39	.20	5.76

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN .08 1.64 5.00 2598.41 340.00 .20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9339E+03 EXCESS= .0000E+00 OUTFLOW= .9339E+03 BASIN STORAGE= .9589E-02 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .44

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	2382.	1		1230	151	41.	1		1845	226	0.
1		0005	2	0.	1		0620	77	2354.	1		1235	152	38.	1		1850	227	0.
1		0010	3	0.	1		0625	78	2325.	1		1240	153	35.	1		1855	228	0.
1		0015	4	0.	1		0630	79	2294.	1		1245	154	32.	1		1900	229	0.
1		0020	5	0.	1		0635	80	2261.	1		1250	155	30.	1		1905	230	0.
1		0025	6	0.	1		0640	81	2225.	1		1255	156	28.	1		1910	231	0.
1		0030	7	0.	1		0645	82	2186.	1		1300	157	26.	1		1915	232	0.
1		0035	8	0.	1		0650	83	2146.	1		1305	158	24.	1		1920	233	0.
1		0040	9	0.	1		0655	84	2107.	1		1310	159	23.	1		1925	234	0.
1		0045	10	0.	1		0700	85	2067.	1		1315	160	21.	1		1930	235	0.
1		0050	11	0.	1		0705	86	2027.	1		1320	161	20.	1		1935	236	0.
1		0055	12	0.	1		0710	87	1987.	1		1325	162	18.	1		1940	237	0.
1		0100	13	0.	1		0715	88	1947.	1		1330	163	17.	1		1945	238	0.
1		0105	14	0.	1		0720	89	1907.	1		1335	164	16.	1		1950	239	0.
1		0110	15	0.	1		0725	90	1867.	1		1340	165	15.	1		1955	240	0.
1		0115	16	0.	1		0730	91	1826.	1		1345	166	14.	1		2000	241	0.
1		0120	17	0.	1		0735	92	1784.	1		1350	167	13.	1		2005	242	0.
1		0125	18	0.	1		0740	93	1742.	1		1355	168	12.	1		2010	243	0.
1		0130	19	0.	1		0745	94	1701.	1		1400	169	11.	1		2015	244	0.
1		0135	20	0.	1		0750	95	1660.	1		1405	170	10.	1		2020	245	0.
1		0140	21	0.	1		0755	96	1620.	1		1410	171	9.	1		2025	246	0.
1		0145	22	0.	1		0800	97	1580.	1		1415	172	9.	1		2030	247	0.
1		0150	23	0.	1		0805	98	1542.	1		1420	173	8.	1		2035	248	0.
1		0155	24	0.	1		0810	99	1504.	1		1425	174	7.	1		2040	249	0.
1		0200	25	0.	1		0815	100	1468.	1		1430	175	7.	1		2045	250	0.
1		0205	26	0.	1		0820	101	1432.	1		1435	176	6.	1		2050	251	0.
1		0210	27	0.	1		0825	102	1396.	1		1440	177	6.	1		2055	252	0.
1		0215	28	0.	1		0830	103	1358.	1		1445	178	5.	1		2100	253	0.
1		0220	29	1.	1		0835	104	1320.	1		1450	179	5.	1		2105	254	0.
1		0225	30	1.	1		0840	105	1283.	1		1455	180	5.	1		2110	255	0.
1		0230	31	2.	1		0845	106	1246.	1		1500	181	4.	1		2115	256	0.
1		0235	32	3.	1		0850	107	1211.	1		1505	182	4.	1		2120	257	0.
1		0240	33	5.	1		0855	108	1176.	1		1510	183	4.	1		2125	258	0.
1		0245	34	7.	1		0900	109	1142.	1		1515	184	3.	1		2130	259	0.
1		0250	35	9.	1		0905	110	1108.	1		1520	185	3.	1		2135	260	0.
1		0255	36	12.	1		0910	111	1074.	1		1525	186	3.	1		2140	261	0.
1		0300	37	15.	1		0915	112	1038.	1		1530	187	3.	1		2145	262	0.
1		0305	38	20.	1		0920	113	1002.	1		1535	188	2.	1		2150	263	0.
1		0310	39	26.	1		0925	114	966.	1		1540	189	2.	1		2155	264	0.
1		0315	40	35.	1		0930	115	932.	1		1545	190	2.	1		2200	265	0.
1		0320	41	49.	1		0935	116	898.	1		1550	191	2.	1		2205	266	0.
1		0325	42	70.	1		0940	117	866.	1		1555	192	2.	1		2210	267	0.
1		0330	43	103.	1		0945	118	834.	1		1600	193	2.	1		2215	268	0.
1		0335	44	152.	1		0950	119	802.	1		1605	194	2.	1		2220	269	0.
1		0340	45	232.	1		0955	120	769.	1		1610	195	1.	1		2225	270	0.
1		0345	46	347.	1		1000	121	734.	1		1615	196	1.	1		2230	271	0.
1		0350	47	489.	1		1005	122	699.	1		1620	197	1.	1		2235	272	0.
1		0355	48	658.	1		1010	123	664.	1		1625	198	1.	1		2240	273	0.
1		0400	49	842.	1		1015	124	631.	1		1630	199	1.	1		2245	274	0.
1		0405	50	1016.	1		1020	125	600.	1		1635	200	1.	1		2250	275	0.
1		0410	51	1169.	1		1025	126	570.	1		1640	201	1.	1		2255	276	0.
1		0415	52	1298.	1		1030	127	541.	1		1645	202	1.	1		2300	277	0.
1		0420	53	1405.	1		1035	128	511.	1		1650	203	1.	1		2305	278	0.
1		0425	54	1480.	1		1040	129	479.	1		1655	204	1.	1		2310	279	0.
1		0430	55	1518.	1		1045	130	445.	1		1700	205	1.	1		2315	280	0.
1		0435	56	1537.	1		1050	131	409.	1		1705	206	1.	1		2320	281	0.
1		0440	57	1557.	1		1055	132	375.	1		1710	207	1.	1		2325	282	0.
1		0445	58	1584.	1		1100	133	345.	1		1715	208	1.	1		2330	283	0.
1		0450	59	1625.	1		1105	134	317.	1		1720	209	0.	1		2335	284	0.
1		0455	60	1701.	1		1110	135	293.	1		1725	210	0.	1		2340	285	0.
1		0500	61	1838.	1		1115	136	270.	1		1730	211	0.	1		2345	286	0.
1		0505	62	2014.	1		1120	137	249.	1		1735	212	0.	1		2350	287	0.
1		0510	63	2181.	1		1125	138	229.	1		1740	213	0.	1		2355	288	0.
1		0515	64	2319.	1		1130	139	208.	1		1745	214	0.	2		0000	289	0.
1		0520	65	2432.	1		1135	140	185.	1		1750	215	0.	2		0005	290	0.

1	0525	66	2517.	*	1	1140	141	159.	*	1	1755	216	0.	*	2	0010	291	0.
1	0530	67	2570.	*	1	1145	142	134.	*	1	1800	217	0.	*	2	0015	292	0.
1	0535	68	2594.	*	1	1150	143	113.	*	1	1805	218	0.	*	2	0020	293	0.
1	0540	69	2598.	*	1	1155	144	96.	*	1	1810	219	0.	*	2	0025	294	0.
1	0545	70	2587.	*	1	1200	145	82.	*	1	1815	220	0.	*	2	0030	295	0.
1	0550	71	2561.	*	1	1205	146	71.	*	1	1820	221	0.	*	2	0035	296	0.
1	0555	72	2526.	*	1	1210	147	63.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	2487.	*	1	1215	148	56.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	2449.	*	1	1220	149	50.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	2413.	*	1	1225	150	45.	*	1	1840	225	0.	*	2	0055	300	0.
				*					*					*				

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2598.	5.67		1710.	471.	454.	454.
		(INCHES)	.179	.197	.197	.197
		(AC-FT)	848.	934.	934.	934.

CUMULATIVE AREA = 88.86 SQ MI

COMPUTED MUSKINGUM-CUNGE PARAMETERS

ELEMENT	ALPHA	M	COMPUTATION TIME STEP DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.08	1.64	5.00	500.00	560.76	420.00	.04	3.17

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.08	1.64	5.00		560.76	420.00	.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1851E+03 EXCESS= .0000E+00 OUTFLOW= .1851E+03 BASIN STORAGE= .1121E-01 PERCENT ERROR= .0

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HYDROGRAPH AT STATION FINISH
PLAN 1, RATIO = .26

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	510.	*	1		1230	151	22.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	526.	*	1		1235	152	21.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	509.	*	1		1240	153	20.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	525.	*	1		1245	154	18.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	540.	*	1		1250	155	17.	*	1		1905	230	0.
1		0025	6	0.	*	1		0640	81	533.	*	1		1255	156	16.	*	1		1910	231	0.
1		0030	7	0.	*	1		0645	82	544.	*	1		1300	157	15.	*	1		1915	232	0.
1		0035	8	0.	*	1		0650	83	552.	*	1		1305	158	14.	*	1		1920	233	0.
1		0040	9	0.	*	1		0655	84	551.	*	1		1310	159	14.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	561.	*	1		1315	160	13.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	558.	*	1		1320	161	12.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	554.	*	1		1325	162	11.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	549.	*	1		1330	163	11.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	537.	*	1		1335	164	10.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	526.	*	1		1340	165	10.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	512.	*	1		1345	166	9.	*	1		2000	241	0.
1		0120	17	0.	*	1		0735	92	498.	*	1		1350	167	9.	*	1		2005	242	0.
1		0125	18	0.	*	1		0740	93	481.	*	1		1355	168	8.	*	1		2010	243	0.
1		0130	19	0.	*	1		0745	94	466.	*	1		1400	169	8.	*	1		2015	244	0.
1		0135	20	0.	*	1		0750	95	449.	*	1		1405	170	7.	*	1		2020	245	0.
1		0140	21	0.	*	1		0755	96	432.	*	1		1410	171	7.	*	1		2025	246	0.
1		0145	22	0.	*	1		0800	97	415.	*	1		1415	172	6.	*	1		2030	247	0.
1		0150	23	0.	*	1		0805	98	398.	*	1		1420	173	6.	*	1		2035	248	0.
1		0155	24	0.	*	1		0810	99	381.	*	1		1425	174	6.	*	1		2040	249	0.
1		0200	25	0.	*	1		0815	100	365.	*	1		1430	175	6.	*	1		2045	250	0.
1		0205	26	0.	*	1		0820	101	350.	*	1		1435	176	5.	*	1		2050	251	0.
1		0210	27	0.	*	1		0825	102	335.	*	1		1440	177	5.	*	1		2055	252	0.
1		0215	28	0.	*	1		0830	103	320.	*	1		1445	178	5.	*	1		2100	253	0.
1		0220	29	0.	*	1		0835	104	306.	*	1		1450	179	5.	*	1		2105	254	0.
1		0225	30	0.	*	1		0840	105	293.	*	1		1455	180	4.	*	1		2110	255	0.

1	0230	31	0.	*	1	0845	106	279.	*	1	1500	181	4.	*	1	2115	256	0.
1	0235	32	0.	*	1	0850	107	266.	*	1	1505	182	4.	*	1	2120	257	0.
1	0240	33	0.	*	1	0855	108	253.	*	1	1510	183	4.	*	1	2125	258	0.
1	0245	34	0.	*	1	0900	109	241.	*	1	1515	184	4.	*	1	2130	259	0.
1	0250	35	0.	*	1	0905	110	229.	*	1	1520	185	4.	*	1	2135	260	0.
1	0255	36	0.	*	1	0910	111	217.	*	1	1525	186	3.	*	1	2140	261	0.
1	0300	37	0.	*	1	0915	112	204.	*	1	1530	187	3.	*	1	2145	262	0.
1	0305	38	0.	*	1	0920	113	189.	*	1	1535	188	3.	*	1	2150	263	0.
1	0310	39	0.	*	1	0925	114	173.	*	1	1540	189	3.	*	1	2155	264	0.
1	0315	40	0.	*	1	0930	115	158.	*	1	1545	190	3.	*	1	2200	265	0.
1	0320	41	0.	*	1	0935	116	146.	*	1	1550	191	3.	*	1	2205	266	0.
1	0325	42	0.	*	1	0940	117	136.	*	1	1555	192	3.	*	1	2210	267	0.
1	0330	43	0.	*	1	0945	118	127.	*	1	1600	193	2.	*	1	2215	268	0.
1	0335	44	0.	*	1	0950	119	119.	*	1	1605	194	2.	*	1	2220	269	0.
1	0340	45	2.	*	1	0955	120	112.	*	1	1610	195	2.	*	1	2225	270	0.
1	0345	46	5.	*	1	1000	121	107.	*	1	1615	196	2.	*	1	2230	271	0.
1	0350	47	12.	*	1	1005	122	102.	*	1	1620	197	2.	*	1	2235	272	0.
1	0355	48	23.	*	1	1010	123	98.	*	1	1625	198	2.	*	1	2240	273	0.
1	0400	49	39.	*	1	1015	124	93.	*	1	1630	199	2.	*	1	2245	274	0.
1	0405	50	64.	*	1	1020	125	89.	*	1	1635	200	2.	*	1	2250	275	0.
1	0410	51	97.	*	1	1025	126	85.	*	1	1640	201	2.	*	1	2255	276	0.
1	0415	52	127.	*	1	1030	127	81.	*	1	1645	202	1.	*	1	2300	277	0.
1	0420	53	154.	*	1	1035	128	78.	*	1	1650	203	1.	*	1	2305	278	0.
1	0425	54	179.	*	1	1040	129	74.	*	1	1655	204	1.	*	1	2310	279	0.
1	0430	55	200.	*	1	1045	130	71.	*	1	1700	205	1.	*	1	2315	280	0.
1	0435	56	219.	*	1	1050	131	67.	*	1	1705	206	1.	*	1	2320	281	0.
1	0440	57	235.	*	1	1055	132	64.	*	1	1710	207	1.	*	1	2325	282	0.
1	0445	58	247.	*	1	1100	133	61.	*	1	1715	208	1.	*	1	2330	283	0.
1	0450	59	256.	*	1	1105	134	58.	*	1	1720	209	1.	*	1	2335	284	0.
1	0455	60	265.	*	1	1110	135	56.	*	1	1725	210	1.	*	1	2340	285	0.
1	0500	61	278.	*	1	1115	136	53.	*	1	1730	211	1.	*	1	2345	286	0.
1	0505	62	296.	*	1	1120	137	51.	*	1	1735	212	1.	*	1	2350	287	0.
1	0510	63	319.	*	1	1125	138	49.	*	1	1740	213	1.	*	1	2355	288	0.
1	0515	64	343.	*	1	1130	139	46.	*	1	1745	214	1.	*	2	0000	289	0.
1	0520	65	366.	*	1	1135	140	43.	*	1	1750	215	1.	*	2	0005	290	0.
1	0525	66	385.	*	1	1140	141	41.	*	1	1755	216	1.	*	2	0010	291	0.
1	0530	67	401.	*	1	1145	142	39.	*	1	1800	217	1.	*	2	0015	292	0.
1	0535	68	411.	*	1	1150	143	36.	*	1	1805	218	1.	*	2	0020	293	0.
1	0540	69	418.	*	1	1155	144	34.	*	1	1810	219	1.	*	2	0025	294	0.
1	0545	70	418.	*	1	1200	145	32.	*	1	1815	220	1.	*	2	0030	295	0.
1	0550	71	410.	*	1	1205	146	30.	*	1	1820	221	1.	*	2	0035	296	0.
1	0555	72	399.	*	1	1210	147	28.	*	1	1825	222	0.	*	2	0040	297	0.
1	0600	73	391.	*	1	1215	148	27.	*	1	1830	223	0.	*	2	0045	298	0.
1	0605	74	401.	*	1	1220	149	25.	*	1	1835	224	0.	*	2	0050	299	0.
1	0610	75	447.	*	1	1225	150	24.	*	1	1840	225	0.	*	2	0055	300	0.

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 561.	7.00		344.	93.	90.	90.
		(INCHES)	.036	.039	.039	.039
		(AC-FT)	171.	185.	185.	185.

CUMULATIVE AREA = 88.86 SQ MI

APPENDIX D
STREAMBANK EROSION FOR SPECIFIC STORM EVENTS

Upstream Reach

Event Frequency

Alternative	100 Yr	50 Yr	25 Yr	10 Yr	5 Yr	2 Yr	Annual
	(kg/yr)						
Baseline	6.23E+04	1.02E+05	1.36E+05	1.56E+05	1.21E+05	2.88E+04	6.07E+05
Alternative A	6.97E+04	1.03E+05	1.37E+05	1.58E+05	1.23E+05	2.86E+04	6.20E+05
Alternative B	7.29E+04	1.09E+05	1.47E+05	1.76E+05	1.44E+05	4.47E+04	6.93E+05
Alternative C	7.80E+04	1.19E+05	1.64E+05	2.06E+05	1.80E+05	6.09E+04	8.08E+05
Alternative D	7.99E+04	1.22E+05	1.71E+05	2.18E+05	1.95E+05	6.98E+04	8.54E+05
Alternative E	8.16E+04	1.25E+05	1.76E+05	2.28E+05	2.08E+05	7.92E+04	8.97E+05
No-Action	8.41E+04	1.30E+05	1.85E+05	2.45E+05	2.29E+05	1.00E+05	9.73E+05

Downstream Reach

Event Frequency

Alternative	100 Yr	50 Yr	25 Yr	10 Yr	5 Yr	2 Yr	Annual
	(kg/yr)						
Baseline	4.16E+04	6.69E+04	9.79E+04	1.31E+05	9.08E+04	1.27E+05	3.01E+05
Alternative A	4.19E+04	6.69E+04	9.94E+04	1.33E+05	8.82E+04	1.19E+05	3.11E+05
Alternative B	4.37E+04	7.04E+04	1.04E+05	1.45E+05	1.08E+05	1.22E+05	3.49E+05
Alternative C	4.39E+04	7.35E+04	1.10E+05	1.56E+05	1.38E+05	7.36E+04	4.47E+05
Alternative D	4.41E+04	7.43E+04	1.12E+05	1.63E+05	1.46E+05	6.55E+04	4.73E+05
Alternative E	4.43E+04	7.51E+04	1.14E+05	1.67E+05	1.51E+05	3.73E+04	5.13E+05
No-Action	4.44E+04	7.68E+04	1.17E+05	1.72E+05	1.62E+05	2.25E+04	5.49E+05

Appendix M

VISUAL RESOURCES

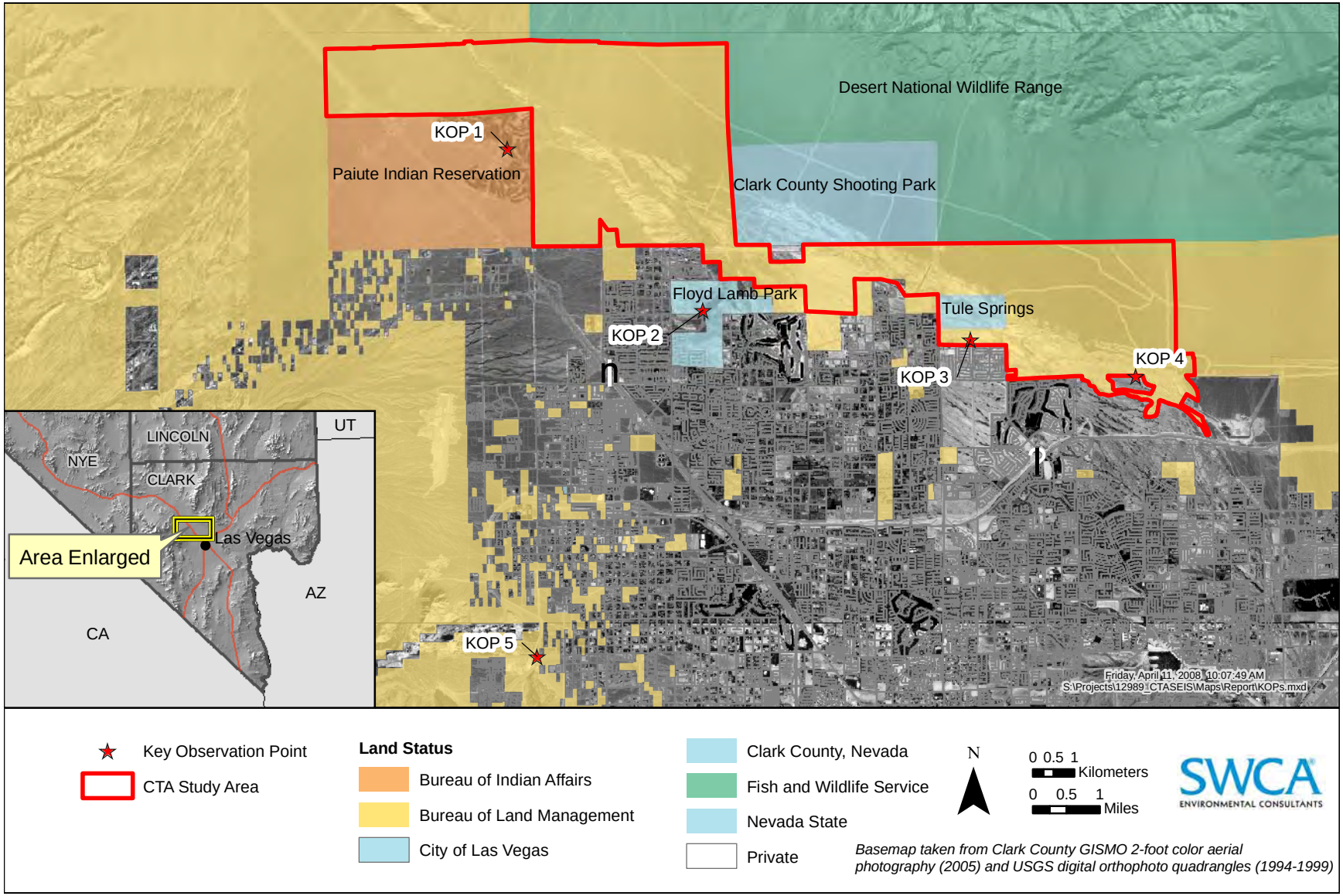


Figure M.1-1. Visual Resources—Key Observation Points (KOPs).

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date (of fieldwork): February 27, 2008
District: Las Vegas Field Office
Resource Area:
Activity (program): Lands and Realty, 1430

SECTION A. PROJECT INFORMATION

1. Project Name Upper Las Vegas Wash CTA SEIS
Urban development; Thunderbird electric trans. line

2. Key Observation Point (KOP)
Paiute Reservation Golf Club House – KOP 1

3. VRM Class
Class III

4. Location
Township(s) 18 S
Range(s) 60 E
Section(s) 19–21; 28–30

5. Location Sketch
See the attached map for location of the KOP (Figure L.1-1). The attached photo is a simulation of the proposed development, as seen from the KOP.

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Gently sloping bajada in MG. Rugged mountains in BG. Golf course in FG (not in CTA).	Bajada – continuous carpet of vegetation; few clumpy joshua trees. Vegetation cover on mountains not distinguishable. Golf course fairways – continuous carpet.	Electric power poles in MG.
LINE	Undulating horizontal line on horizon of mountain range. Horizontal layers in mountain range. Diagonal lines of side washes. Rolling fairways.	Joshua trees in FG – vertical. No characteristic lines in vegetation cover on the bajada.	Power poles – vertical.
COLOR	Bajadas – tans and buff colors. Mountains – tan with black layers. LV Wash – tan. Lake – very blue.	Bajada – olive green shrubs, gray grasses. Golf course fairways – lawn green.	Power poles – black.
TEX-TURE	Bajada – smooth; mountains – rough. LV Wash – moderate. Golf course – smooth. Lake – smooth.	Bajada – moderately dense, continuous; almost smooth. Golf course fairways – smooth.	Power poles – smooth.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Leveling, terracing of bajadas; stair-stepping of bajada.	Patchy urban landscaping between residential and commercial buildings.	Blocky square and rectangular buildings. Vertical electrical power poles, street lights, etc.
LINE	Multiple horizontal lines created by leveling of the land form.	Vertical lines of landscaping trees.	Vertical and horizontal lines of buildings. Curvilinear and straight lines of roads. Vertical lines of electrical poles.
COLOR	Black asphalt and gray concrete of roads. Natural buffs, tans, and gray of undisturbed land form. Urban landscaping.	Various greens of urban landscaping.	Various colors of buildings. Gray and dark colors for power poles. Black asphalt; gray concrete.
TEX-TURE	Smooth to medium.	Smooth lawns to medium shrubs and trees.	Mostly smooth.

SECTION D. CONTRAST RATING ☐ **SHORT TERM** ☒ **LONG TERM**

1. DEGREE OF CONTRAST

ELEMENTS	FEATURES: LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form		X			X				X			
Line		X				X			X			
Color		X			X				X			
Texture			X			X					X	

2. Does project design meet visual resource management objectives? ☒ Yes ☒ No (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☒ No (Explain on reverse side)

Evaluators Name(s) Steve Knox– SWCA, Inc.
Date March 19, 2008

SECTION D. (Continued)

Comments from Item 2.

CTA – The roads crossing the CTA would introduce curvilinear lines into the landscape that would be visible. While visible to the average visitor, these roads across the Upper Las Vegas Wash would not dominate the landscape of the CTA. The wash zone landscape and lower slopes of the adjacent bajadas would generally still remain in an undeveloped condition and the natural landform and vegetation community would still predominate in the setting.

Outside the CTA – Lands on the bajadas above the wash zone would be made available for disposal and developed for urban uses, including residential neighborhoods, commercial businesses, light industrial uses, schools and other public buildings, and parks. This development would include roads, utilities, and landscaping. Further, the Thunderbird powerline would traverse the perimeter of the urban development. This degree of development on the slopes adjacent to the wash zone would transform the natural landscape to an urban landscape. This transformation would dominate the scene, and would not be consistent with BLM objectives for VRM Class III management objectives. However, when the lands are transferred out of public ownership, these public land objectives will no longer apply to those lands.

Additional Mitigation Measures (See Item 3)

No additional mitigating measures are proposed for the lands that would be developed for the growth of Las Vegas.

U. S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date (of fieldwork): February 27, 2008
District: Las Vegas Field Office
Resource Area:
Activity (program): Lands and Realty–1430

SECTION A. PROJECT INFORMATION

1. Project Name Upper Las Vegas Wash CTA SEIS
Urban development; Thunderbird electric trans. line

2. Key Observation Point (KOP)
Floyd Lamb Park – KOP 2

3. VRM Class
Class III

4. Location
Township(s) 18 S
Range(s) 60 E
Section(s) 19–21, 28–29

5. Location Sketch
See the attached map for location of the KOP (Figure L.1-1). The attached photo is a simulation of the proposed development, as seen from the KOP.

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Gently sloping bajada in MG; rugged mountains in BG; small hills and mesas in FG. Road and parking area in FG.	Bajada – continuous carpet of vegetation in MG. Urban landscaping trees, shrubs, and grasses in FG. BG vegetation not distinguishable.	Vertical power poles; blocky houses; rectangular fence.
LINE	Undulating horizontal line on horizon of mountain range. Horizontal layers in mountain range. Diagonal and horizontal lines in mesa of FG.	No distinct line in MG vegetation. FG vegetation vertical.	Vertical and horizontal lines of power poles and fence. Horizontal and vertical lines of houses, with some diagonal roof lines.
COLOR	Bajada – tans and buff colors. Mountains – tans with black layers. FG hills and mesa – tans. Black road and parking area.	Bajada – olive green shrubs, gray grasses. FG – dark green trees, yellow grasses, yellow/green shrubs (winter time colors).	Gray power poles; white fence; white and tan houses.
TEX-TURE	Bajada – smooth; mountains – rough; FG hills and mesa – smooth. FG road and parking area – smooth.	Bajada – moderately dense, continuous, almost smooth. FG park vegetation – rough.	Power poles and fence – smooth. Houses – medium.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Leveling, terracing of bajadas; stair-stepping of bajada.	Patchy urban landscaping between residential and commercial buildings.	Blocky square and rectangular buildings. Vertical electrical power poles, street lights, etc.
LINE	Multiple horizontal lines created by leveling of the land form.	Vertical lines of landscaping trees.	Vertical and horizontal lines of buildings. Curvilinear and straight lines of roads. Vertical lines of electrical poles.
COLOR	Black asphalts, gray concretes of roads. Natural buffs, tans, and grays of undisturbed lands. Urban landscaping.	Various greens of urban landscaping.	Various colors of buildings. Gray and dark colors of power poles. Black asphalt; gray concrete.
TEX-TURE	Smooth to medium.	Smooth lawns to medium shrubs and trees.	Mostly smooth.

SECTION D. CONTRAST RATING ☐ **SHORT TERM** ☒ **LONG TERM**

1. DEGREE OF CONTRAST

ELEMENTS	FEATURES: LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form		X			X						X	
Line		X				X					X	
Color		X			X						X	
Texture			X			X					X	

2. Does project design meet visual resource management objectives? ☐ Yes ☒ No (Explain on reverse side)

3. Additional mitigating measures recommended? ☐ Yes ☒ No (Explain on reverse side)

Evaluators Name(s) Steve Knox–SWCA, Inc.
Date March 19, 2008

SECTION D. (Continued)

Comments from Item 2.

Outside the CTA – Development of the bajada across Las Vegas Wash as seen from this KOP would transform the landscape from an undeveloped and natural middle ground landscape to an urban setting composed of residential areas, businesses, and light industrial development. This transformation would dominate the view and would not be consistent with BLM's VRM Class III objectives. However, when the lands are transferred out of public ownership, these public land objectives will no longer apply to those lands. Further, from this KOP, the view of urban growth would be seen as an extension of identical development that currently exists in the foreground of the landscape, repeating the form, line, color, and texture of that development. The Thunderbird electric transmission line would repeat the line and texture of the existing power poles that rise above the urban development in the foreground. Urban (residential and park) landscaping would repeat the form, line, color, and texture of the exiting urban vegetation at Floyd Lamb Park.

Additional Mitigation Measures (See Item 3)

No additional mitigating measures are proposed for the lands that would be developed for the growth of Las Vegas.

U. S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date (of fieldwork): February 27, 2008
District: Las Vegas Field Office
Resource Area:
Activity (program): Lands and Realty–1430

SECTION A. PROJECT INFORMATION

1. Project Name Upper Las Vegas Wash CTA SEIS
Urban development; Sheep Mountain Parkway

2. Key Observation Point (KOP)
McCool Regional Park – KOP 3

3. VRM Class
Class III

4. Location
Township(s) 19 S
Range(s) 61 E
Section(s) 2–6, 9–11

5. Location Sketch
See the attached map for location of the KOP (Figure L.1-1). The attached photo is a simulation of the proposed development, as seen from the KOP.

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Gently sloping bajada in MG; rugged mountains in BG; flat airport runway in FG.	Bajada – continuous carpet of vegetation. Vegetation on mountains not distinguishable. Scattered, clumpy shrubs in FG.	Power poles.
LINE	Undulating horizontal line on horizon of mountain range. Horizontal layers in mountains.	No characteristic line in the vegetation.	Vertical power poles.
COLOR	Bajada – tans and buff colors. Mountains – tan with black layers. Light tan/white soils and black asphalt in FG.	Bajada – olive green shrubs, gray grasses. FG shrubs – gray and olive green.	Light gray power poles.
TEX-TURE	Bajada – smooth; mountains – rough; FG – smooth to medium.	Bajada – moderately dense, continuous, almost smooth. FG medium.	Smooth power poles.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Leveling, terracing of bajadas; stair-stepping of bajada.	Patchy urban landscaping between residential and commercial buildings, and of public use area of Sheep Mtn. Parkway.	Blocky square and rectangular buildings. Vertical electrical power poles, street lights, etc.
LINE	Multiple horizontal lines created by leveling of the land form.	Vertical lines of landscaping trees.	Vertical and horizontal lines of buildings. Curvilinear and straight lines of roads. Vertical lines of electrical poles. Horizontal line of cut slope of Sheep Mountain Parkway.
COLOR	Black asphalts, gray concretes of roads. Natural buffs, tans, and grays of undisturbed lands. Urban landscaping.	Various greens of urban landscaping.	Various colors of buildings. Gray and dark colors of power poles. Black asphalt, gray concrete of roads.
TEX-TURE	Smooth to medium.	Smooth lawns to medium shrubs and trees.	Power poles – smooth. Buildings – medium.

SECTION D. CONTRAST RATING ☐ **SHORT TERM** ☒ **LONG TERM**

1. DEGREE OF CONTRAST

ELEMENTS	FEATURES: LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form		X			X				X			
Line		X				X			X			
Color		X			X				X			
Texture			X			X					X	

2. Does project design meet visual resource management objectives? ☐ Yes ☒ No (Explain on reverse side)

3. Additional mitigating measures recommended? ☒ Yes ☐ No (Explain on reverse side)

Evaluators Name(s) Steve Knox–SWCA, Inc.
Date March 19, 2008

SECTION D. (Continued)

Comments from Item 2.

Outside the CTA – Lands on the bajadas beyond Las Vegas Wash would be made available for disposal and developed for urban uses, including residential neighborhoods, commercial businesses, light industrial uses, schools and other public buildings, and parks. This development would include roads, utilities, and landscaping. Further, the Thunderbird powerline would traverse the perimeter of the urban development. And, the Sheep Mountain Parkway would be constructed around most of the future urban development. The proposed degree of development would transform a natural, and mostly undeveloped, landscape to an urban landscape. While mitigation would help reduce some of the contrast to the landscape, this transformation would dominate the scene and would not be consistent with BLM objectives for VRM Class III management objectives. However, when the lands are transferred out of public ownership, these public land objectives will no longer apply to those lands.

Additional Mitigation Measures (See Item 3)

1. Reshape and re-contour the cut slope (up slope side) of the excavation for the Sheep Mountain Parkway and re-vegetate by planting to reduce the visual impact of the horizontal line on the landscape.

2. Paint power poles a color that blends with the background landform and vegetation colors to reduce the visual impact of the vertical poles on the landscape.

U. S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date (of fieldwork): February 27, 2008
District: Las Vegas Field Office
Resource Area:
Activity (program): Lands and Realty–1430

SECTION A. PROJECT INFORMATION

1. Project Name Upper Las Vegas Wash CTA SEIS
Urban development; Sheep Mountain Parkway

2. Key Observation Point (KOP)
Grand Teton Drive at Eglington Preserve – KOP 4

3. VRM Class
Class III

4. Location
Township(s) 19 S
Range(s) 61 E
Section(s) 2–6, 9–11

5. Location Sketch
See the attached map for location of the KOP (Figure L.1-1). The attached photo is a simulation of the proposed development, as seen from the KOP.

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Gently sloping bajada in MG; rugged mountains in BG. Flat dirt road in FG.	Bajada – continuous carpet of vegetation. Vegetation on mountains not distinguishable. Scattered, clumpy shrubs in FG.	Power poles. Rectangular, blocky wall.
LINE	Undulating horizontal line on horizon of mountain range. Horizontal layers in mountains.	No characteristic lines in the vegetation.	Vertical power poles. Horizontal line of brick wall.
COLOR	Bajada – tans and buff colors. Mountains – tan with black layers. FG – light tans and white soils.	Bajada – olive green shrubs, gray grasses. FG shrubs – gray and olive green.	Light gray power poles. Tan brick wall.
TEX-TURE	Bajada – smooth; mountains – rough. FG cobbly – medium.	Bajada – moderately dense, continuous, almost smooth. FG medium.	Smooth

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Leveling, terracing of bajadas; stair-stepping of bajada.	Patchy urban landscaping between residential and commercial buildings, and of public use area of Sheep Mtn. Parkway.	Blocky square and rectangular buildings. Vertical electrical power poles, street lights, etc.
LINE	Multiple horizontal lines created by leveling of the landform.	Vertical lines of landscaping trees.	Vertical and horizontal lines of buildings. Curvilinear and straight lines of roads. Vertical lines of electrical poles. Horizontal line of cut slope of the Sheep Mountain Parkway.
COLOR	Black asphalts, gray concretes of roads. Natural buffs, tans, and grays of undisturbed or undeveloped lands.	Various greens of urban landscaping.	Various colors of buildings. Gray and dark colors of power poles. Black asphalt, gray concrete of roads.
TEX-TURE	Smooth to medium.	Smooth lawns to medium shrubs and trees.	Power poles – smooth; buildings – medium.

SECTION D. CONTRAST RATING ☐ **SHORT TERM** ☒ **LONG TERM**

1. DEGREE OF CONTRAST

ELEMENTS	FEATURES: LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form		X			X				X			
Line		X				X			X			
Color		X			X				X			
Texture			X			X				X		

2. Does project design meet visual resource management objectives? ☐ Yes ☒ No (Explain on reverse side)

3. Additional mitigating measures recommended? ☒ Yes ☐ No (Explain on reverse side)

Evaluators Name(s) Steve Knox–SWCA, Inc.
Date March 19, 2008

SECTION D. (Continued)

Comments from Item 2.

Outside the CTA – Lands on the bajadas beyond Las Vegas Wash would be made available for disposal and developed for urban uses, including residential neighborhoods, commercial businesses, light industrial uses, schools and other public buildings, and parks. This development would include roads, utilities, and landscaping. Further, the Thunderbird transmission line would traverse the perimeter of the urban development. And, the Sheep Mountain Parkway would be constructed around most of the future urban development. This proposed degree of development would transform a natural, and mostly undeveloped, landscape to an urban landscape. While mitigation would help reduce some of the contrast to the landscape, this transformation would dominate the scene and would not be consistent with BLM objectives for VRM Class III management objectives. However, when the lands are transferred out of public ownership, these public land objectives will no longer apply to those lands.

Additional Mitigation Measures (See Item 3)

1. Reshape and re-contour the cut slope (up slope side) of the excavation for the Sheep Mountain Parkway and re-vegetate by planting to reduce the visual impact of the horizontal line on the landscape.

2. Paint power poles a color that blends with the background landform and vegetation colors to reduce the visual contrast of the vertical poles on the landscape.

U. S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date (of fieldwork): March 31, 2008
District: Las Vegas Field Office
Resource Area:
Activity (program): Lands and Realty–1430

SECTION A. PROJECT INFORMATION

1. Project Name Upper Las Vegas Wash CTA SEIS
Urban development, Sheep Mtn. Parkway, trans. line

2. Key Observation Point (KOP)
215 and Lone Mountain Road – KOP 5

3. VRM Class
Class III

4. Location
Township(s) 18 S
Range(s) 60 E
Section(s) 19–21, 28–33

5. Location Sketch
See the attached map for location of the KOP (Figure L.1-1). The attached photo is a simulation of the proposed development, as seen from the KOP.

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Gently sloping bajadas and rugged mountains in BG. Cities of Las Vegas and North Las Vegas in FG.	Vegetation cover of mountains and bajadas not distinguishable. Clumpy trees of urban landscaping in MG. Native shrubs and yuccas in FG.	Blocky square and rectangular buildings, rectangular signs, and electrical power poles in FG.
LINE	Undulating line of mountain range. Horizontal layers in mountain range. Horizontal line of LV Wash. Diagonal line of Decatur Rd. to shooting park.	Joshua trees in FG – vertical. No characteristic lines in vegetation cover in the city.	Electrical power poles – vertical. Signs and some buildings – vertical. Most building – horizontal, with some diagonal roof lines.
COLOR	Bajadas – tans and buff colors. Mountains – tan with black layers. LV Wash – light tans and white.	Bajada – olive green tint. Urban landscaping – dark greens. Native vegetation grays and light greens.	Power poles – gray and white. Buildings – earth tones. Signs – red, white, and black.
TEX-TURE	Bajada – smooth; mountains – moderate; City development – moderate to rough.	Bajada – moderately dense, continuous; almost smooth. Urban landscaping and native vegetation – rough.	All structures – mostly moderate texture. Rougher in FG.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Leveling, terracing of bajadas; stair-stepping of bajada.	Patchy urban landscaping – mostly trees - between and rising above residential and commercial buildings	Blocky square and rectangular buildings. Vertical electrical power poles.
LINE	Multiple horizontal lines created by leveling of the land form.	No apparent line.	Multiple horizontal lines of continuous buildings. Horizontal line of Sheep Mountain Parkway. Vertical lines of electrical poles.
COLOR	Black asphalt and gray concrete of roads. Natural buffs, tans, and gray of undisturbed land form. Light colored road cuts and power line ROWs.	Various greens of urban landscaping. Darker greens most noticeable.	Various colors of buildings. Gray and light colors for power poles.
TEX-TURE	Smooth.	Moderate.	Smooth to moderate.

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST

ELEMENTS	LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form		X				X					X	
Line			X				X				X	
Color		X				X					X	
Texture			X			X				X		

2. Does project design meet visual resource management objectives? ☐ Yes ☒ No
(Explain on reverse side)

3. Additional mitigating measures recommended?
☐ Yes ☒ No (Explain on reverse side)

Evaluators Name(s) Steve Knox–SWCA, Inc.
Date April 1, 2008

SECTION D. (Continued)

Comments from Item 2.

CTA – Given the distance from the KOP to the CTA and adjacent lands and given the degree of urban development of lands outside but immediately adjacent to the CTA, it will be difficult to distinguish the lands within the CTA. Thus, it will be difficult to distinguish the developments that do occur in the CTA. The development of lands within the CTA will blend with adjacent urban development outside the CTA.

Outside the CTA – Distance will diminish the effect (view) of the anticipated urban development on the lands adjacent to the CTA, and it will be difficult to determine where the existing city development ends and the future development begins (following disposal of lands outside the CTA). Distance will soften the effect of development on the form, line, color, and texture of the land, vegetation, and structures. While it will be difficult to distinguish the effects of the new development and distance will reduce the effects of that development to moderate and weak ratings (see contrast rating above), the existing undeveloped landscape will still transform to dense urban development. That degree of development, even when viewed at a greater distance, is not consistent with BLM's VRM Class III objectives.

Additional Mitigation Measures (See Item 3)

No additional mitigating measures are proposed for the lands that would be developed for the growth of Las Vegas.

U. S. GOVERNMENT PRINTING OFFICE: 1985-461-988/33094

Existing Landscape

Simulated Landscape

Figure M.1-2. Visual Simulation KOP 1.

Existing Landscape

Simulated Landscape

Figure M.1-3. Visual Simulation KOP 2.

Existing Landscape

Simulated Landscape

Figure M.1-4. Visual Simulation KOP 3.

Existing Landscape

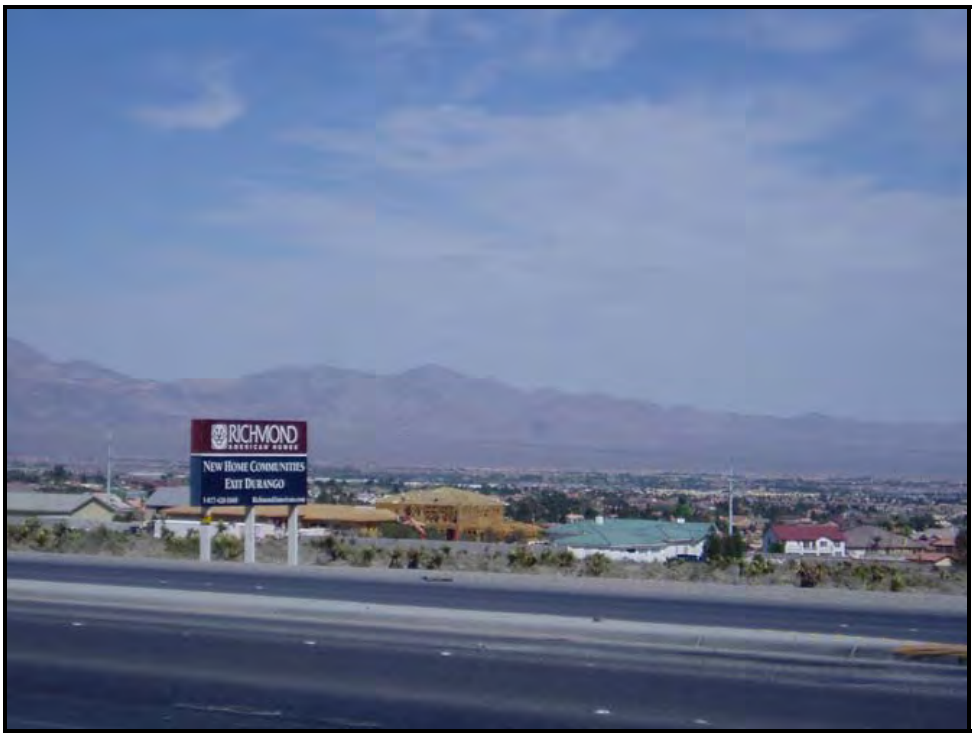
Simulated Landscape

Figure M.1-5. Visual Simulation KOP 4.

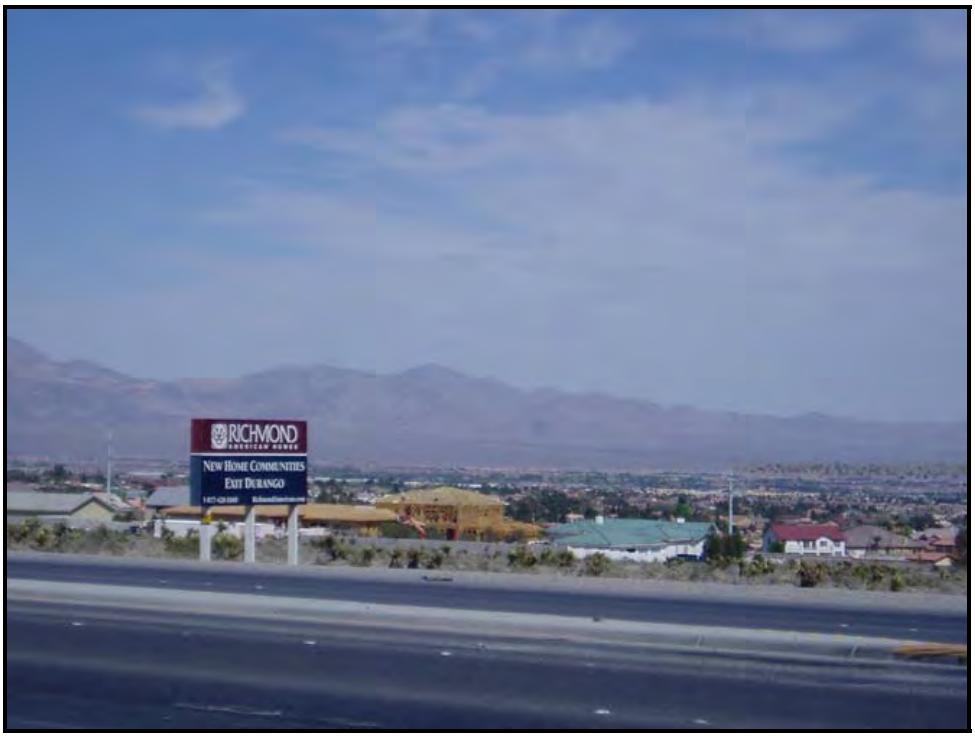
Existing Landscape

Simulated Landscape

Figure M.1-6a. Visual Simulation KOP 5.



Existing Landscape



Simulated Landscape

Figure M.1-6b. Visual Simulation KOP 5.

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