APPENDIX C

REDDING RANCHERIA CASINO MASTER PLAN DRAFT GRADING AND DRAINAGE STUDY

REDDING RANCHERIA CASINO MASTER PLAN

DRAFT GRADING AND DRAINAGE STUDY

PREPARATION DATE:
FEBRUARY 9, 2018

PREPARED FOR:
REDDING RANCHERIA
2000 REDDING RANCHERIA ROAD
REDDING, CA 96001

PREPARED BY:
SHARRAH DUNLAP SAWYER, INC.
6590 LOCKHEED DRIVE
REDDING, CA 96002

Contents

List of Figures

List of Figures (continued)

List of Appendices

Section 1 – Project Description

1.1 Purpose

The purpose of this analysis is to assess the development potential of the undeveloped property described in Section 1.2 as the Proposed Project. This analysis will address project grading, drainage, and stormwater management for the Proposed Project and the project alternatives.

1.2 Project Description

The Redding Rancheria has submitted an application to the Department of the Interior requesting the placement of approximately 232 acres of fee land in trust by the United States upon which the Tribe would construct a casino resort (Proposed Project). The facility would include an approximately 70,000 square foot casino, an approximately 250-room hotel, an event/convention center, a retail center, and associated parking and infrastructure and would be located at the south end of Bechelli Lane in Redding, CA (see Figure 1). The new facility would replace the Tribe's existing casino located at 2100 Redding Rancheria Road in Redding, CA (near the intersection of State Highway 273 and Canyon Road).

This analysis will address the Proposed Project as well as five alternatives, including one off-site alternative, on an equal level basis in both the build out year and cumulative year (likely 2035). Alternatives to be addressed within this report will include the following:

- Alternative A - Proposed Project
- Alternative B – No Big Box Retail
- Alternative C - Reduced Intensity Alternative – smaller casino and hotel
- Alternative D - Non-Gaming Alternative –Convention Center and Hotel
- Alternative E - Alternative Site (in the City of Anderson)

1.3 Project Alternatives

1.3.1. Alternative A - Proposed Project

Alternative A includes the construction of an approximately 70,000 square foot casino, an approximately 250-room hotel, an event/convention center, a retail center, associated parking and infrastructure, and 130,000 square feet of big box retail. Alternative A will be constructed at the Proposed Project Site located at the south end of Bechelli Lane in Redding, CA (see Figure 1). Access to the Project Site from the north will include a road connection to the southern end of Bechelli Lane (see Figure 5), and a potential access from the south will include a road connection to Smith Road south of the Project Site (see Figure 6).

1.3.2. Alternative B – No Big Box Retail

Alternative B is identical to Alternative A with the exception that Alternative B does not include the 130,000 square feet of big box retail. Alternative B includes the construction of an approximately 70,000 square foot casino, an approximately 250-room hotel, an event/convention center, and associated parking and infrastructure. Alternative B will be constructed at the Proposed Project Site located at the south end of Bechelli Lane in Redding, CA (see Figure 1). Access to the Project Site from the north will include a road connection to the southern end of Bechelli Lane (see Figure 5), and a potential access from the south will include a road connection to Smith Road south of the Project Site (see Figure 6).

1.3.3. Alternative C – Reduced Intensity Alternative

Alternative C includes the construction of an approximately 57,000 square foot casino, an approximately 250-room hotel, an event/convention center, a retail center, and associated parking and infrastructure, as well as 130,000 square feet of big box retail. The limits of disturbance and project footprint for Alternative C are approximately the same as that of Alternative A. Alternative C will be constructed at the Proposed Project Site located at the south end of Bechelli Lane in Redding, CA (see Figure 1). Access to the Project Site from the north will include a road connection to the southern end of Bechelli Lane (see Figure 5), and a potential access from the south will include a road connection to Smith Road south of the Project Site (see Figure 6).

1.3.4. Alternative D – Non-Gaming Alternative

Alternative D includes the construction of an approximately 128-room hotel, a retail center, and associated parking and infrastructure, as well as 120,000 square feet of big box retail. Alternative D will be constructed at the Proposed Project Site located at the south end of Bechelli Lane in Redding, CA (see Figure 1). Access to the Project Site from the north will include a road connection to the southern end of Bechelli Lane (see Figure 5), and a potential access from the south will include a road connection to Smith Road south of the Project Site (see Figure 6).

1.3.5. Alternative E – Alternative Site

Alternative E includes the construction of an approximately 70,000 square foot casino, an approximately 250-room hotel, an event/convention center, a retail center, and associated parking and infrastructure, as well as 120,000 square feet of big box retail. Alternative E will be constructed at an Alternate Project Site located north of North Street and west of Interstate 5 in Anderson California (see Figure 7). Access to the Alternate Project Site will include a road connection to Oak Street as shown on Figure E1.

Section 2 – Existing Site Conditions

2.1 Proposed Project Site – Alternatives A thru D

The Proposed Project site topography is relatively flat with the site sloping from north to south in the uplands portion adjacent to Interstate 5, and the remaining portions of the site sloping from northeast to southwest toward the river. The elevation (NAVD 88) varies on site from a high of roughly 455 feet above mean sea level on the north east corner of the project to a low point of roughly 430 feet above mean sea level near the Sacramento River on the south west corner of the project. In the uplands portion of the site adjacent to Interstate 5, the site slopes from north to south at less than 0.5%. Surface drainage from Interstate 5 is collected in the median and east side of the roadway, then conveyed through a series of pipes across the traveled way to a roadside earth ditch that runs from north to south along the project's eastern boundary. Toward the southern portion of the project site, a natural swale conveys the storm water runoff from the project site as well as the Interstate 5 storm water runoff in a south westerly direction toward the Sacramento River. See Figure 3 for existing topography and existing drainage.

A majority of the uplands portion (eastern portion of the site near Interstate 5) of the Site are either a sandy loam, or loamy sand. The soils found in these uplands portions of the project are excessively drained to well drained soils with rapid to moderately rapid permeability. The majority of the soil located in the lower areas near the river in the southwest portion of the project is riverwash or cobbly alluvium that is subjected to frequent flooding. These soils have highly variable characteristics, and typically are excessively drained with very rapid permeability. The potential for subsurface or surface stormwater infiltration for both the uplands and the lower areas of the Proposed Project site is excellent.

According to the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map #06089C1561G and #06089C1563G, a majority of the Proposed Project site is located within one of two different flood zones from the Sacramento River to the west. A majority of the lowlands portion of the site is located in a special flood hazard area within the 100 year flood plain which means that these areas are subject to inundation during the 100-year event. The uplands portion of the site adjacent to Interstate 5 is located within Zone X. Zone X is defined as an area that lies within the 500 year (0.2% annual chance of flood) flood zone, and may have less than 1' of flooding during a 100-year event. The FEMA 100 year flood plain from the Sacramento River is shown on Figure 3.

FEMA Flood Insurance Rate Map #06089C1561G and #06089C1563G, shows that there is potential overflow from Churn Creek to the Sacramento River. This flow may come from Churn Creek, may spill over Interstate 5 and then would be conveyed overland to the Sacramento River. This potential is discussed in detail in Section 4.1. The FEMA 100 year flood plain from Churn Creek is shown on Figure 3.

Several regulatory agencies have jurisdiction of portions of the Sacramento River, but their jurisdiction falls west of the FEMA 100 year flood plain line. The Agencies and their jurisdictional lines are as follows:

- The Central Valley Flood Protection Board – The Designated Floodway Line refers to the channel of the stream and that portion of the adjoining floodplain reasonably required providing for the passage of a design flood; it is also the floodway between existing levees as adopted by the Central Valley Flood Protection Board (formerly the Reclamation Board) or the Legislature. The Designated Floodway Line follows the FEMA 100 year flood plain line, or is located west of the FEMA 100 year flood plain line adjacent to the Proposed Project site.
- The California State Lands Commission (CSLC) – The CSLC has jurisdiction and management authority over all un-granted tidelands, submerged lands and the beds of navigable lakes and waterways. The CSLC jurisdictional line lies west of the FEMA 100 year flood plain line adjacent to the Proposed Project site.

The eastern bank of the Sacramento River is actively eroding in areas adjacent to the proposed development during exceptionally high river flows. See Section 6.2 streambank erosion details and streambank stabilization recommendations.

2.2 Alternative Project Site – Alternative E

The Alternative Project site topography is relatively flat with the site generally sloping easterly towards the Tormey Drain and Interstate 5. The Tormey Drain bisects the site and runs from southwest to northeast to a box culvert under Interstate 5. The portion of the site located north of the Tormey Drain generally flows from north to south with a high elevation (NAVD 88) at the northwest corner of roughly 420 feet above mean sea level to a low point the easterly project boundary of 413 feet above mean sea level. The portion of the site located south of the Tormey Drain generally flows from south to north with a high elevation along the southerly site boundary of roughly 420 feet above mean sea level to a low point the easterly project boundary of 413 feet above mean sea level. The site generally has slopes less than 0.5%. Surface drainage from surrounding areas west of the project are collected and conveyed via the Tormey Drain through the site eastward under Interstate 5. The site is also bisected by Oak Street running north and south. The portion of the site located west of Oak Street will remain undeveloped and be used for a material borrow area and stormwater infiltration and storage.

Soils types were determined using the *Web Soil Survey* provided by the United States Department of Agriculture Soil Conservation Service and Forest Service. It was determined from the Web Soil Survey that the site consists of Hydrologic Soil Group A and D.

According to the FEMA Flood Insurance Rate Map #06089C1935G, a majority of the Alternative Project site is located within the special flood hazard area within the 100 year flood plain which means that these areas are subject to inundation during the 100-year event. The FEMA 100 year flood plain from the Tormey Drain is shown on Figure E4.

Section 3 – Grading and Drainage

3.1 Proposed Project Access

The proposed project will be accessed from the north by extending Bechelli Lane and from the south by a new road connection to Smith Road as described in the Access Alternative Concepts Memorandum prepared by Kimley-Horn dated July 7, 2017.

3.1.1 Proposed Project Access from the North

As described in the Access Alternative Concepts Memorandum the Proposed Project Site will require significant improvements to the intersection of South Bonneyview Road and Bechelli Lane including road widening and construction of a three lane roundabout at the intersection. The intersection will require numerous retaining walls to accommodate the roundabout footprint and sidewalk extension.

Widening Bechilli Lane to access the Proposed Project Site as described in the Access Alternative Concepts Memorandum would require significant grading, retaining walls, and relocation/extension of existing facilities to avoid impacting the City of Redding's Sunnyhill Wastewater Pump Station infrastructure and the Anderson Cottonwood Irrigation District's (ACID) canal. Significant grading will be required to maintain access to the adjacent residential properties, Sunnyhill Wastewater Pump Station and the ACID canal. Additional grading may be required to mitigate the 28 lost parking spaces eliminated by the Bechelli Lane widening as described in the Access Alternatives Concepts Memorandum.

3.1.2 Proposed Project Access from the South

As described in the Access Alternative Concepts Memorandum, a Shasta County Standard "Major Local Rural" road will be constructed south to Smith Road. At the intersection of Smith Road, a Shasta County Standard Road Connection will be constructed. These improvements will require minimal grading beyond the typical roadway infrastructure (street improvements, pedestrian facilities, drainage and other utility infrastructure, etc.). The road will be designed to follow the existing terrain where possible, and minimize the roadway grading footprint and impact. It is anticipated that the access road will extend approximately 3,500 feet south to Smith Road and the grading footprint will be approximately 5 acres.

3.2 Alternative A – Proposed Project Grading

The grading for Alternative A has been designed to be a balanced earthwork operation, meaning the cut and fill quantities will be the same and there is no import or export of material required. The finished floor elevations (including basements) for each of the buildings were established based upon the adjacent top of bank elevation of the Sacramento River west of the development. The finished floor elevations (including basements) are approximately 3 feet above the adjacent top of bank elevation and the FEMA 100-year water surface elevation.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure A3. For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure A1. The profile of the access road has been designed to match the existing grade to minimize earthwork from Bechelli Lane at the north to Smith Road at the south.

A 40-feet wide, 5-foot deep vegetated swale has been designed to run north to south between the access road and Interstate 5 approximately 1,000 feet south of the project's northerly line. This vegetated swale will convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow that potentially could come westerly from Churn Creek during extreme rain events as described in Sections 2.1 and 4.1. The vegetated swale then passes through a large box culvert under the access road and to a 650,000 cubic foot wet pond as shown on Figure A4.

The wet pond is sized per the California Stormwater Quality Association (CASQA) California Stormwater BMP Handbook for New Development and Redevelopment, see calculations in Appendix C. The wet pond will store water and allow for infiltration into the native soil.

Table 3.1 - Grading Quantities – Alternative A

DISTURBANCE AREA	57 ACRES	SEE FIGURE A1 & A2
VOLUME OF CUT	94,000 CUBIC YARDS	SEE FIGURE A5
VOLUME OF FILL (ADJUSTED FOR MATERIAL SHRINK)	94,000 CUBIC YARDS	SEE FIGURE A5
INFILTRATION / WET POND SIZE	650,000 CUBIC FEET	SEE FIGURE A4 & A6

See Figures A1-A6 for Alternative A grading and drainage Exhibits.

3.3 Alternative B – No Big Box Retail Grading

The grading for Alternative B has been designed to be a balanced earthwork operation. The finished floor elevations for each of the buildings were established based upon the adjacent top of bank elevation of the Sacramento River west of the development. The finished floor elevations (including basements) are approximately 2 to 3 feet above the adjacent top of bank elevation and the FEMA 100-year water surface elevation.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure B3. For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure B1. The profile of the access road has been designed to match the existing grade to minimize earthwork from Bechelli Lane at the north to Smith Road at the south.

A 40-feet wide, 5-foot deep vegetated swale has been designed to run north to south between the access road and Interstate 5 approximately 1,000 feet south of the project's northerly line. This vegetated swale will convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow that potentially could come westerly from Churn Creek during extreme rain events as described in Sections 2.1 and 4.1. The vegetated swale then passes through a large box culvert under the access road and to a 510,000 cubic foot wet pond as shown on Figure B4.

The wet pond is sized per the CASQA California Stormwater BMP Handbook for New Development and Redevelopment, see calculations in Appendix C. The wet pond will store water and allow for infiltration into the native soil.

Table 3.2 - Grading Quantities – Alternative B

Disturbance Area	48 acres	See Figure B1 & B2
Volume of Cut	80,000 cubic yards	See Figure B5
Volume of Fill (Adjusted for Material shrink)	80,000 cubic yards	See Figure B5
Infiltration / Wet Pond size	510,000 cubic feet	See Figure B4 & B6

See Figures B1-B6 for Alternative B grading and drainage Exhibits.

3.4 Alternative C – Reduced Intensity Alternative

The grading for Alternative C has been designed to be a balanced earthwork operation. The finished floor elevations for each of the buildings were established based upon the adjacent top of bank elevation of the Sacramento River west of the development. The finished floor elevations (including basements) are approximately 3 feet above the adjacent top of bank elevation and the FEMA 100-year water surface elevation.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure C3. For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure C1. The profile of the access road has been designed to match the existing grade to minimize earthwork from Bechelli Lane at the north to Smith Road at the south.

A 40-feet wide, 5-foot deep vegetated swale has been designed to run north to south between the access road and Interstate 5 approximately 1,000 feet south of the project's northerly line. This vegetated swale will convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow that potentially could come westerly from Churn Creek during extreme rain events as described in Sections 2.1 and 4.1. The vegetated swale then passes through a large box culvert under the access road and to a 650,000 cubic foot wet pond as shown on Figure C4.

The wet pond is sized per the CASQA California Stormwater BMP Handbook for New Development and Redevelopment, see calculations in Appendix C. The wet pond will store water and allow for infiltration into the native soil.

Table 3.3 - Grading Quantities – Alternative C

Disturbance Area	57 acres	See Figure C1 & C2
Volume of Cut	94,000 cubic yards	See Figure C5
Volume of Fill (Adjusted for Material shrink)	94,000 cubic yards	See Figure C5
Infiltration / Wet Pond size	650,000 cubic feet	See Figure C4 & C6

See Figures C1-C6 for Alternative C grading and drainage Exhibits.

3.5 Alternative D – Non-Gaming Alternative

The grading for Alternative D has been designed to be a balanced earthwork operation. The finished floor elevations for each of the buildings were established based upon the adjacent top of bank elevation of the Sacramento River west of the development. The finished floor elevations are approximately 3 feet above the adjacent top of bank elevation and the FEMA 100-year water surface elevation.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure D3. For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure D1. The profile of the access road has been designed to match the existing grade to minimize earthwork from Bechelli Lane at the north to Smith Road at the south.

A 40-feet wide, 5-foot deep vegetated swale has been designed to run north to south between the access road and Interstate 5 approximately 1,000 feet south of the project's northerly line. This vegetated swale will convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow that potentially could come westerly from Churn Creek during extreme rain events as described in Sections 2.1 and 4.1. The vegetated swale then passes through a large box culvert under the access road and to a 450,000 cubic foot wet pond as shown on Figure D4.

The wet pond is sized per the CASQA California Stormwater BMP Handbook for New Development and Redevelopment, see calculations in Appendix C. The wet pond will store water and allow for infiltration into the native soil.

Table 3.4 - Grading Quantities – Alternative D

Disturbance Area	39 acres	See Figure D1 & D2
Volume of Cut	75,000 cubic yards	See Figure D5
Volume of Fill (Adjusted for Material shrink)	75,000 cubic yards	See Figure D5
Infiltration / Wet Pond size	450,000 cubic feet	See Figure D4 & D6

See Figures D1-D6 for Alternative D grading and drainage Exhibits.

3.6 Alternative E – Alternative Site

The grading for Alternative E has been designed to be a balanced earthwork operation. The finished floor elevations for each of the buildings were established based upon the FEMA 100-year water surface elevation of the Tormey Drain that runs southwest to north east through the middle of the project. The finished floor elevations (including basements) are approximately 2 to 3 feet above the FEMA 100-year water surface elevation of the Tormey Drain.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure E2.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure E1. Since the project proposes a large amount of fill within the 100-year flood plain, an excavation equal to that fill volume must be constructed in order to prevent additional flooding and mitigate for the proposed fill within the flood plain. Two large retention ponds will be constructed along the southern portion of the project, a large pond on the west side of Oak Street, and a smaller one on the east side of Oak Street.

Table 3.5 - Grading Quantities – Alternative E

Disturbance Area	52 acres	See Figure E1
Volume of Cut	138,000 cubic yards	See Figure E2
Volume of Fill (Adjusted for Material shrink)	138,000 cubic yards	See Figure E2
Retention Pond Size	99,000 cubic feet	See Figure E4

See Figures E1-E4 for Alternative E grading and drainage Exhibits.

3.7 Cumulative Project Grading Impacts

The proposed project and all the alternatives will be designed in such a way that the grading will be a balanced earthwork operation, meaning the cut and fill quantities will be the same and there is no import or export of material required. There will be no fill placed in the FEMA 100-year floodplain. There will be no adverse impacts on the existing FEMA 100-year floodplain as a result of the project grading.

Additionally, hazardous materials that FEMA has identified as being "extremely hazardous or vulnerable to flood conditions" will not be stored within the 500-year floodplain of the proposed development.

For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

Section 4 – Hydrology and Hydraulics – Proposed Site

4.1 Description of Existing Watershed Characteristics

The site for Alternatives A, B, C, and D is relatively flat and generally drains southwesterly from Interstate 5 towards the Sacramento River. The 232 -acre site is a part of the Sacramento River Basin and consists of pastureland and scattered oak trees. Soils types were determined using the *Web Soil Survey* provided by the United States Department of Agriculture Soil Conservation Service and Forest Service. It was determined from the Web Soil Survey that the site consists of Hydrologic Soil Group A.

The current FEMA Flood Insurance Rate Map (FIRM) identifies that the developed area of the proposed project is outside of the 100-year floodplain but within the 500-year floodplain. The State Central Valley Flood Protection Board Floodway Map shows that the proposed project is outside of the designated floodway. Figures A7, B7, C7, and D7 show both the FEMA 100-year floodplain and the designated floodway as compared to the project.

In this area an estimated flow of 600 to 700 cubic feet per second at a depth of approximately 9 inches, as identified by a State of California Department of Water Resources work map, could cross Interstate 5 from the east (Churn Creek). This hydrologic and hydraulic model of Churn Creek shows that Churn Creek could overtop Interstate 5, and that could cause shallow overflow across the project site. In discussions with Brett Ditzler with Caltrans, there are no historical records of this section of Interstate 5 ever overtopping. Caltrans found a note in their files stating that not even in the large rainfall event of 1964, did Churn Creek overtop I-5. However, in the event that this might happen all the alternatives have been designed to convey possible floodwaters from Churn Creek that may overtop Interstate 5 via a large newly constructed vegetated swale that parallels Interstate 5 and discharges into the proposed infiltration wet pond south of the proposed development. The vegetated swale has been sized to convey the possible overflow from Churn Creek. The proposed channel has been oversized by 35% to accommodate increases in peak runoff that might occur in the future.

4.2 Methodology

Hydrology Calculations were prepared using engineering industry standard methodology and the on-site storm drain conveyance system will be designed using local jurisdiction requirements regarding storm event. Peak flows for the 2-, 10-, and 100-year storm events for a 24-hour period were estimated using the United States Army Corp of Engineers flood hydrograph package HEC-1 to model rainfall runoff. Rainfall estimates are discussed in detail within the *City of Redding Department of Public Works Hydrology Manual*. An excerpt from the manual discussing the calculation of Redding Area design storms can be found in Appendix A. Existing peak flows can be in found in Table 4.1. The Rational Method was used to estimate the proposed size of the on-site storm drain conveyance system. The Darcy Equation was used to estimate the amount of infiltration that will be achieved in the proposed storm drain conveyance and infiltration system.

4.2.1 Alternative Studies

There are two hydrologic studies that encompass the project area; The Army Corps of Engineers Comprehensive Study (Sacramento and San Joaquin River Basins Comprehensive Study – 2002) and the current FEMA 100-year floodplain (2011). The intent of the Army Corps of Engineers Comprehensive Study was to inventory resource conditions within the Sacramento and San Joaquin River Basins and to analyze problems and opportunities for flood management and ecosystem restoration. The flood delineation for the Army Corps of Engineers Comprehensive Study (Sacramento and San Joaquin River Basins Comprehensive Study – 2002) used a “composite floodplain” concept, which considers a combination of several flood events, each shaping the floodplain at different locations at different times. The flood events considered ranged from the from the 2-year to the 500-year storm event. However, the 10- and 500-year events were not computed or mapped between Redding and Deer Creek (which is located just upstream of Woodson Bridge in Corning, California approximately 70 river miles downstream of the proposed development). Each flood event was combined for the maximum extent of the composite floodplain for a conservative approach. The composite floodplain, ACOE Comprehensive Study Line, shown (the pink area shown in the California Department of Water Resources Best Available Maps) does not include the operational effects of headwaters reservoirs. The ACOE study recognizes that Shasta Reservoir has 1.3 million acre-feet of flood control space and operates for the Sacramento River at Keswick (upstream of the proposed development) and Bend Bridge (30 miles downstream of the project in Red Bluff, California). Between Keswick and Bend there are several unregulated tributaries that generate significant inflows to the Sacramento River. There are no significant unregulated tributaries between the project and Shasta Dam, so Shasta Reservoir completely regulates the river flow at the project location.

The ACOE floodplain composite line in the area of the proposed development has no elevation associated with it as the river profiles end at Woodson Bridge. Extensive topographic data was collected south of the Woodson Bridge, producing 2-foot contour mapping whereas the study north of Woodson Bridge is much less detailed. The study north of Woodson Bridge used topography in the overbank areas that was derived from USGS 30-meter (roughly 98-feet) digital elevation models with 10-foot contour intervals. The detail of the floodplain model is dependent on the detail of the overbank topography. In the development area the existing topography varies a few feet; therefore, using USGS 30-meter topography with 10-foot contour intervals would not pick up the existing detailed terrain. The ACOE Comprehensive Study Line is not consistent with the known existing topography of the proposed development and was not studied in detail in the region of the proposed project.

The current FEMA 100-year floodplain, effective March 17, 2011, is based on a detailed study with detailed cross sections for the Sacramento River throughout the Redding Area. These cross sections show flood elevations for the 100-year storm event. The current FEMA 100-year floodplain follows the existing topography in the project development area. In discussions with Raul Barba of the California Department of Water resources regarding the ACOE Comprehensive Study Line, it was stated that the FEMA 100-year Floodplain shown on the Flood Insurance Maps is the regulatory line regarding flood elevations and special building requirements. Additionally, as stated on the FEMA website, FEMA does not have setback guidelines from river channels. If no part of the structure falls within the FEMA 100-year floodplain, there are no special building requirements. If there is an encroachment, then FEMA has very specific requirements that must be followed. Since the proposed development does not encroach into the FEMA 100-year floodplain, there are no special requirements.

For all these reasons and consistent with our telephone conversations with Raul Barba of the California Department of Water resources we are using the well-studied and documented FEMA 100-year floodplain as the best available and regulatory 100-year floodplain for this project. All hydrology exhibits clearly show that no part of the proposed development falls within the FEMA 100-year floodplain.

4.3 Results of Analysis

The existing condition peak flows for Alternatives A through D were calculated and are summarized in Table 4.1. These flows were calculated for the overall developable project area (66.2-acres) which is shown in Figure A6. The HEC-1 input parameters and hydrologic calculations can be found in Appendix A.

Table 4.1: Estimated Existing Condition Peak Flows

Storm Event	Existing Condition Peak Flow, cfs
2-YEAR	3
10-YEAR	7
100-YEAR	19

With development the post-developed runoff will be captured by onsite inlets and conveyed by a series of perforated storm drain pipe and drain rock infiltration trenches to the sandy loam or gravel layer below or to the proposed vegetated swale along the frontage road.

In order to convey the potential overflow from Churn Creek, a vegetated swale will be constructed between the proposed frontage road and Interstate 5. This proposed vegetated swale will be approximately 40-feet wide and 5-feet deep and is shown in Appendix D. It will have a longitudinal slope of 0.4 percent to encourage infiltration to the sandy gravelly layer below. The vegetated swale will convey the onsite runoff, and when necessary the potential overflow from Churn Creek, from the project to a proposed water quality retention facility and ultimately to the Sacramento River. The proposed swale along with the water quality retention facility will act as an infiltration trench and infiltration basin and wet pond. Preliminary calculations can be found in Appendix D.

6.2.1 Alternative A – Proposed Project

With development of the proposed project, the site will develop into 18% rooftop, sidewalks, and parking lot. Table 4.2 summarizes the peak flows from the post-development condition. The HEC-1 input parameters and hydrologic calculations can be found in Appendix A.

Table 4.2: Estimated Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
2-YEAR	87
10-YEAR	118
100-YEAR	174

In the post-development condition the on-site drainage basin will be broken into four separate drainage areas, Drainage Area #1, Drainage Area #2, Drainage Area #3, and Drainage Area #4. These drainage areas are shown in Figure A7. Each drainage area is less than 25 acres so a design storm of 10 years was used to estimate the size of the storm drain pipe.

Drainage Area #1 is approximately 16 acres in size and will drain the runoff from the proposed north parking lot, entry, and Big Box Retail. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will range from 15 to 36 inches in size.

Drainage Area #2 is approximately 4 acres in size and will drain the runoff from approximately half of the east side of the proposed casino. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will be a maximum of 24 inches in size.

Drainage Area #3 is approximately 6 acres in size and will drain the runoff from the remainder of the east side of the casino. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will range from 15 to 30 inches in size.

Drainage Area #4 is approximately 4 acres in size and will drain the runoff from the proposed south parking lot. A series of inlets and perforated storm drain pipe will collect and convey the runoff to the Sacramento River. The perforated storm drain pipe will be a maximum of 24 inches in size and will be placed within a drain rock infiltration trench three feet wide. This infiltration trench will infiltrate 1.3 cubic feet per second of the peak flow.

Table 4.3 summarizes the post-development peak flows for each drainage area for the 2- and 10- year events.

Table 4.3: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs			
	Drainage Area #1	Drainage Area #2	Drainage Area #3	Drainage Area #4
2-YEAR	36	10	14	11
10-YEAR	47	14	19	14

The proposed infiltration channel will be sized to convey the overflow from Churn Creek to the Sacramento River. The channel has a 20-foot bottom, 2:1 side slopes, with a longitudinal slope of 0.4 percent. This large flat channel will also convey the on-site stormwater that does not infiltrate to the proposed water quality detention pond. Using Darcy's Law the maximum flow that the proposed channel can infiltrate was calculated to be approximately 182 cubic feet per second as shown in Appendix A, which is larger than the calculated 100-year peak flow of 174 cubic feet per second. Comparing this calculated flow to the peak flows shown in Table 4.2 the proposed channel has the ability to infiltrate the 2-, 10-, and 100-year events.

Peak flow and infiltration calculations can be found in Appendix D. Pipe and infiltration trench sizing calculations can be found in Appendix D.

6.2.2 Alternative B – No Big Box Retail

With development of the proposed project, the site will develop into 13% rooftop, sidewalks, and parking lot. Table 4.4 summarizes the peak flows from the post-development condition. The HEC-1 input parameters and hydrologic calculations can be found in Appendix A.

Table 4.4: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
2-YEAR	64
10-YEAR	90
100-YEAR	139

In the post-development condition the on-site drainage basin will be broken into four separate drainage areas, Drainage Area #1, Drainage Area #2, Drainage Area #3, and Drainage Area #4. These drainage areas are shown in Figure B7. Each drainage area is less than 25 acres so a design storm of 10 years was used to estimate the storm drain pipe diameter.

Drainage Area #1 is approximately 6.5 acres in size and will drain the runoff from the proposed north parking lot and entry. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will range from 15 to 30 inches in size.

Drainage Areas #2, #3, and #4 are the same as Alternative A.

Table 4.5 summarizes the post-development peak flows for each drainage area for the 2- and 10- year events.

Table 4.5: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs			
	Drainage Area #1	Drainage Area #2	Drainage Area #3	Drainage Area #4
2-YEAR	15	10	14	11
10-YEAR	20	14	19	14

The maximum flow that the proposed channel can infiltrate was calculated to be approximately 182 cubic feet per second as shown in Appendix A, which is much larger than the calculated peak flows shown in Tables 4.4 and 4.5. Therefore the proposed channel has the ability to infiltrate the 2-, 10-, and 100-year events.

Peak flow and infiltration calculations can be found in Appendix D. Pipe and infiltration trench sizing calculations can be found in Appendix D.

6.2.3 Alternative C – Reduced Intensity Alternative

Hydrologically and hydraulically speaking, Alternative C is the same as Alternative A.

6.2.4 Alternative D – Non-Gaming Alternative

With development of the proposed project, the site will develop into 10% rooftop, sidewalks, and parking lot. Table 4.6 summarizes the peak flows from the post-development condition. The HEC-1 input parameters and hydrologic calculations can be found in Appendix A.

Table 4.6: Estimated Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
2-YEAR	52
10-YEAR	73
100-YEAR	117

In the post-development condition, the on-site drainage basin will be broken into two separate drainage areas, Drainage Area #1 and Drainage Area #2. These drainage areas are shown on Figure D7. Each drainage area is less than 25 acres, so a design storm of 10 years was used to estimate the storm drain pipe diameter.

Drainage Area #1 is approximately 10 acres in size and will drain the runoff from the proposed north parking lot and Big Box Retail. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will range from 15 to 30 inches in size.

Drainage Area #2 is approximately 6 acres in size and will drain the runoff from the proposed hotel and south parking lot. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will be a maximum of 30 inches in size.

Table 4.7 summarizes the post-development peak flows for each drainage area for the 2- and 10- year events.

Table 4.7: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs	
	Drainage Area #1	Drainage Area #2
2-YEAR	23	15
10-YEAR	32	20

The maximum flow that the proposed channel can infiltrate was calculated to be approximately 182 cubic feet per second as shown in Appendix A, which is much larger than the calculated peak flows shown in Tables 4.6 and 4.7. Therefore, the proposed channel has the ability to infiltrate the 2-, 10-, and 100-year events.

Peak flow and infiltration calculations can be found in Appendix D. Pipe and infiltration trench sizing calculations can be found in Appendix D.

6.3 Cumulative Project Drainage Impacts

As seasonal precipitation patterns may be changing, and rainfall may become more concentrated and intense the following has been considered in the hydraulic design of the storm drain conveyance system to accommodate future peak flows:

- The on-site storm drain system will be oversized by at least 25%, leaving additional capacity for future conditions.
- The design of the storm drain pipe system provides infiltration into the loam soil, however the calculations neglect the infiltration into the ground by the proposed LID features; vegetated swales, retention pond, and infiltration trenches which is a conservative approach and adds additional capacity to the system.

The flow in the Sacramento River adjacent to the project is almost entirely regulated by the upstream releases from Shasta Dam and Keswick Dam. The project drainage system has been designed in such a way that there will be no increase in flows downstream. This will be accomplished using infiltrations trenches, an infiltration wet pond, and numerous other stormwater quality BMPs that encourage groundwater infiltration as described in Section 6.1.

Surrounding development will be subject to the City of Redding's City Council Policy 1806, the City of Redding Storm Water Quality Improvement Plan, and the City of Redding Phase II NPDES Permit in regard to both stormwater quality and quantity. The City of Redding's City Council Policy 1806 requires that proposed development address peak flows to maintain pre-development levels at all locations downstream of the project. Both the City of Redding Storm Water Quality Improvement Plan and the City of Redding Phase II NPDES Permit require proposed development to incorporate Low Impact Development (LID) Best Management Practices (BMPs) to improve stormwater quality in the runoff to mitigate for the increased impervious area. Development surrounding the proposed project will not negatively impact Stormwater quality or quantity.

All of the proposed project alternatives have been designed to convey the estimated 600-700 cubic feet per second that might overtop Interstate 5 from Churn Creek (east of Interstate 5), as described in Section 4.1. This flow will be conveyed by constructing a large vegetated swale along the project's easterly boundary that will allow the estimated 600-700 cfs to bypass the proposed development and be conveyed to the Sacramento River. The development will have no negative impact on the flooding that occurs in the neighborhoods of the Churn Creek area as it is not tributary to the Churn Creek Watershed and will not impede the potential Interstate 5 overflow. Any future watershed development upstream of the proposed development will be required to mitigate for any future increases in impervious area to maintain pre-development conditions per local jurisdiction and state standards and regulations.

No levees will be constructed as part of this project and ground elevations will not be increased within the FEMA 100-year floodplain. Therefore there will be no loss of existing floodplain storage volume.

There will be no adverse impacts to stormwater quality or stormwater quantity to locations downstream as a result of the proposed project development and drainage system.

Section 5 – Hydrology and Hydraulics – Alternative Site

5.1 Description of Existing Watershed Characteristics

The Alternative E site is relatively flat and generally drains easterly towards the Tormey Drain and Interstate 5. The 40.5-acre site is a part of the Tormey Drain Basin and consists of pastureland and scattered oak trees. Soils types were determined using the *Web Soil Survey* provided by the United States Department of Agriculture Soil Conservation Service and Forest Service. It was determined from the Web Soil Survey that the site consists of Hydrologic Soil Group A and D.

The current FEMA FIRM identifies that the proposed project is within the Tormey Drain 100-year floodplain. The Flood Insurance Study provided by FEMA shows that the 100-year peak flow at Oak Street is 744 cubic feet per second and at Interstate 5 is 788 cubic feet per second. Figure E4 shows FEMA 100-year floodplain.

5.2 Methodology

Peak flows for the 2-, 10-, and 100-year storm events for a 24-hour period were estimated using the United States Army Corp of Engineers flood hydrograph package HEC-1 to model rainfall runoff. Existing peak flows can be in Table 5.1. The Rational Method was used to estimate the proposed size of the on-site storm drain conveyance system. The Darcy Equation was used to estimate the amount of infiltration that will be utilized in the proposed storm drain conveyance system.

5.3 Results of Analysis

The existing condition peak flows for Alternative E were calculated and are summarized in Table 5.1.

Table 5.1: Estimated Existing Condition Peak Flows

Storm Event	Existing Condition Peak Flow, cfs
2-YEAR	4
10-YEAR	8
100-YEAR	21

With development of the proposed project, the site will develop into 84% rooftop, sidewalks, and parking lot. Table 5.2 summarizes the peak flows from the post-development condition.

Table 5.2: Estimated Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
2-YEAR	55
10-YEAR	76
100-YEAR	115

Post-developed runoff will be captured by onsite inlets and conveyed by a series of perforated storm drain pipe and drain rock infiltration trenches to the proposed retention pond located in the southeast of the project site. Approximately 24 acres of the site (Drainage Area #1) will be conveyed by the proposed on-site system. A series of inlets and perforated storm drain pipe will collect and convey the runoff to the proposed retention pond. The perforated storm drain pipe will be a maximum of 36 inches in size and will be placed within a drain rock infiltration trench five feet wide. This infiltration trench will infiltrate 38 cubic feet per second of the peak flow. Table 5.3 summarizes the post-development peak flows for Drainage Area #1 for the 2- and 10- year events.

Table 5.3: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
	Drainage Area #1
2-YEAR	35
10-YEAR	49

This site has approximately 58 acre-feet of storage within the 100-year floodplain. With development of the project it is estimated that 36 acre-feet of the floodplain will be filled. This will require filing a Letter of Map Revision - Fill with FEMA. This storage will be relocated to the southeast portion of the site on both sides of Oak Street. The bottom of the proposed retention pond will be set at the flowline of the Tormey Drain (elevation 410) and the top of the pond will be at the ground elevation of 416 feet. The proposed pond depicted will have a volume of 62 acre-feet. Figure E4 shows the location of the proposed retention pond.

5.4 Cumulative Impact of Alternative Site Grading & Drainage

The proposed alternative site will be designed in such a way that the grading will be a balanced earthwork operation, meaning the cut and fill quantities will be the same and there is no import or export of material required. The grading design of the alternative site will require fill to be placed in the FEMA 100-year floodplain in order to get the building finished floors a minimum of one foot above the 100-year flood elevation of the Tormey Drain. The project has been designed in such a way that the volume of fill placed within the FEMA 100-year floodplain will be mitigated by an equal volume of cut (detention/ infiltration basins) within the FEMA 100-year floodplain. This will maintain pre-development flood levels at all locations upstream and downstream of the project.

The project drainage system has been designed in such a way that there will be no increase in flows downstream. This will be accomplished using infiltrations trenches, infiltration/detention basins, and numerous other stormwater quality BMPs that encourage groundwater infiltration as described in Section 6.1.

Surrounding development will be subject to the City of Anderson's policy to demonstrate "No Net" offsite downstream drainage effects as a result of any proposed development. The City of Anderson is a Phase II NPDES community and any proposed development will be required to incorporate Low Impact Development (LID) Best Management Practices (BMPs) to improve stormwater quality in the runoff to mitigate for the increased impervious area. Development surrounding the proposed project will not negatively impact Stormwater quality or quantity.

There will be no adverse impacts to stormwater quality or stormwater quantity to locations downstream as a result of the alternative site development and drainage system.

Section 6 – Stormwater Quality

6.1 Stormwater Quality Best Management Practices

During urban development two important changes occur, first a portion of the vegetated, pervious ground cover is converted to impervious surfaces. Vegetated soil both absorbs rain water, and helps to remove pollutants, providing a natural purification system. This natural absorption purification system is blocked by the newly developed impervious surface. The second important change of urban development is the addition of new pollutants, such as vehicle emissions, pesticides, trash, and other contaminants that come along with development. Because of these changes, storm water runoff leaving a site in a newly developed or redeveloped area may be considerably greater in volume, velocity and level of pollutants. The proposed project will incorporate numerous stormwater quality and quantity BMPs into the project design and landscaping to reduce pollutants and leaving the site, including but not limited to the following:

- Catch Basin Filters
- Infiltration Trenches (Perforated storm drain pipe with drain rock)
- Vegetated Swales
- Bio-filtration Swales
- Natural Water Quality Retention Basins
- Wet Ponds
- Pervious Pavements

6.1.1 Catch Basin Filters

Catch Basin insert filters will be installed at select area drains and catch basins on-site. These inlet filters are designed to capture sediment, debris, trash, oil and grease from storm water. These filters clean the storm water during low flows, and have no standing water which minimizes any bacteria and odor problems. The system consists of a fabric filter that is placed inside the area drain or catch basin. This fabric is permeable so that the water may pass through leaving the pollutants & debris behind. The filters require regular maintenance, and must be checked regularly. The debris and contaminants can be removed and disposed of properly, the filter can be then be reused.

All of the alternatives will utilize catch basin inlet filters where feasible in the parking and landscape areas to improve the water quality of the runoff prior to entering the underground storm drain system.

6.1.2 Infiltration Trenches

Where feasible, Infiltration Trenches will be built as opposed to solid wall underground storm drain systems. Perforated pipe will be installed in a drain rock backfilled trench which will allow the low storm water flows to flow through the drain rock. The drain rock acts as a filter removing sediment and other contaminants. Most of the storm water will absorb into the ground which simulates the pre-development natural absorption and purification condition that existed prior to development. These infiltration trenches will be constructed in areas that have favorable soil conditions to promote stormwater infiltration. The entire site consists of Hydrologic Soil Group A soils, which provides excellent infiltration and absorption.

6.1.3 Vegetated Swales

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems. The 40 foot wide vegetated swale provides filtration through proposed vegetation and infiltration for stormwater runoff.

6.1.4 Wet Ponds

Wet ponds (a.k.a. stormwater ponds, retention ponds, wet extended detention ponds) are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season) and differ from constructed wetlands primarily in having a greater average depth. Ponds treat incoming stormwater runoff by settling and biological uptake. The primary removal mechanism is settling as stormwater runoff resides in this pool, but pollutant uptake, particularly of nutrients, also occurs to some degree through biological activity in the pond. Wet ponds are among the most widely used stormwater practices. While there are several different versions of the wet pond design, the most common modification is the extended detention wet pond, where storage is provided above the permanent pool in order to detain stormwater runoff and promote settling.

The wet pond will be located at the southern portion of the Proposed Project site and runoff will be conveyed to the wet pond via the vegetated swale (40' vegetated swale) described in Section 6.1.3. The wet pond will retain water and allow infiltration into the native alluvial soil during a typical rain event. During rare extreme runoff events, the wet pond will spill and runoff will make its way south to the Sacramento River. The wet pond will be submerged when the Sacramento River is flooding.

6.1.5 Pervious Pavements

Pervious paving is used for light vehicle loading in parking areas and in outdoor pedestrian areas. The term describes a system comprising a load-bearing, durable surface together with an underlying layered structure that temporarily stores water prior to infiltration or drainage to a controlled outlet. The surface can itself be porous such that water infiltrates across the entire surface of the material (e.g., grass and gravel surfaces, porous concrete and porous asphalt), or can be built up of impermeable blocks separated by spaces and joints, through which the water can drain. This latter system is termed 'permeable' paving.

Advantages of pervious pavements are that they reduce runoff volume while providing treatment and are unobtrusive resulting in a high level of acceptability.

Pervious pavement was not used in the stormwater quality or stormwater quantity mitigation calculations. However pervious pavement could be implemented on the proposed project to further improve the stormwater quality. Pervious pavements could be used in parking areas, courtyard areas, pedestrian areas or any other areas where feasible. Pervious pavements may be any of the following:

- Porous Concrete
- Porous Asphalt
- Pavers
- Gravel Surfaces

6.1.6 Green Roofs

When used in appropriate climates, green roofs can significantly reduce the amount of rain water that would otherwise run off an impervious roof surface. However, green roofs are not a viable option due to Redding's climate. Redding experiences cold, wet winters with dry, hot summers. Green roofs have been attempted in some projects around the Redding area but have fallen into disrepair as the amount of water to keep plants thriving in the harsh summer is counterproductive to the intent of the LID.

6.2 Sacramento River Streambank Stabilization

The eastern streambank of the Sacramento River (westerly project boundary) has a layer of loam that easily erodes with high river flows, see the photos below. As shown in the photos, there is an approximate 2:1 slope that contains cobble and established vegetation. This slope extends to the bottom of the riverbed and appears stable. As shown in the photos, the top 4 feet to 8 feet of the streambank contains a layer of loam that shows evidence of erosion and instability when it is exposed to high river flows as it was in early 2017.

Sacramento River eastern bank (Facing north)

Sacramento River eastern bank (Facing north)

Sacramento River eastern bank (Facing north)

6.2.1 Streambank Stabilization Recommendations

The upper loam portion of the riverbank should be stabilized using the 'Windrow Rock Slope Protection' method as described on page 16 of "California Bank and Shore Rock Slope Protection Design" Third Edition – Internet October 2000. This involves removal of existing stream bank material above the ordinary high-water mark and placement of a wide row of appropriately sized rock (boulders) over the existing cobbly alluvium up to at least the flood water surface elevation of the river. The river-side and top surface of the boulders is then covered with native cobbly alluvium, and the top surface is further covered with a minimum of 18 inches of native loam up to the desired finished surface elevation. This "hardened" bank will reduce erosion but will not increase the flow energy because the channel roughness coefficient and geometry will remain relatively the same. The ACOE Comprehensive Study stated that the HEC-RAS model in the upper Sacramento River "was not highly sensitive to changes in channel roughness". The roughness coefficient used by both the ACOE study and FEMA in the channel was 0.035. The roughness coefficient values for boulders range from 0.035-0.05. See Figure 6.1 below.

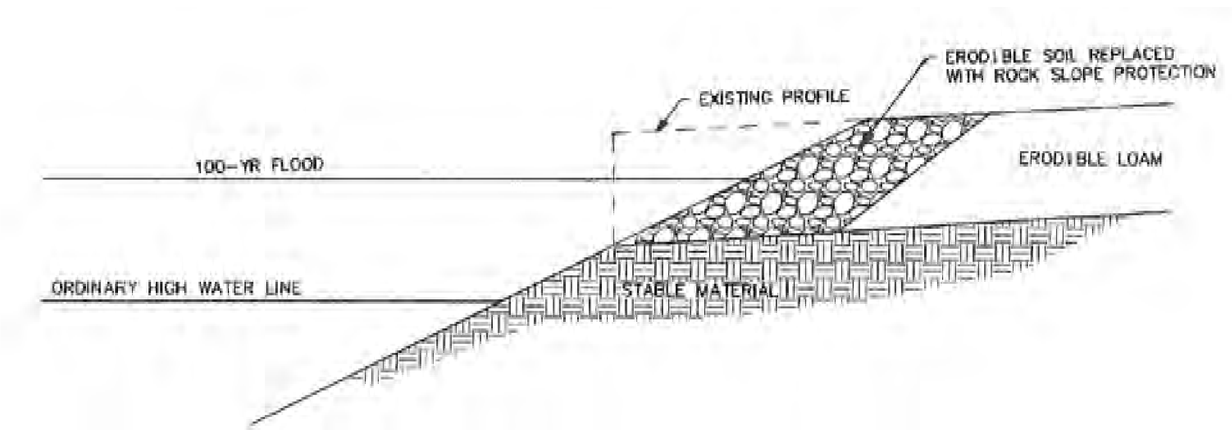

Figure 6.1: Streambank Stabilization

Figures

REDDING RANCHERIA CASINO MASTER PLAN

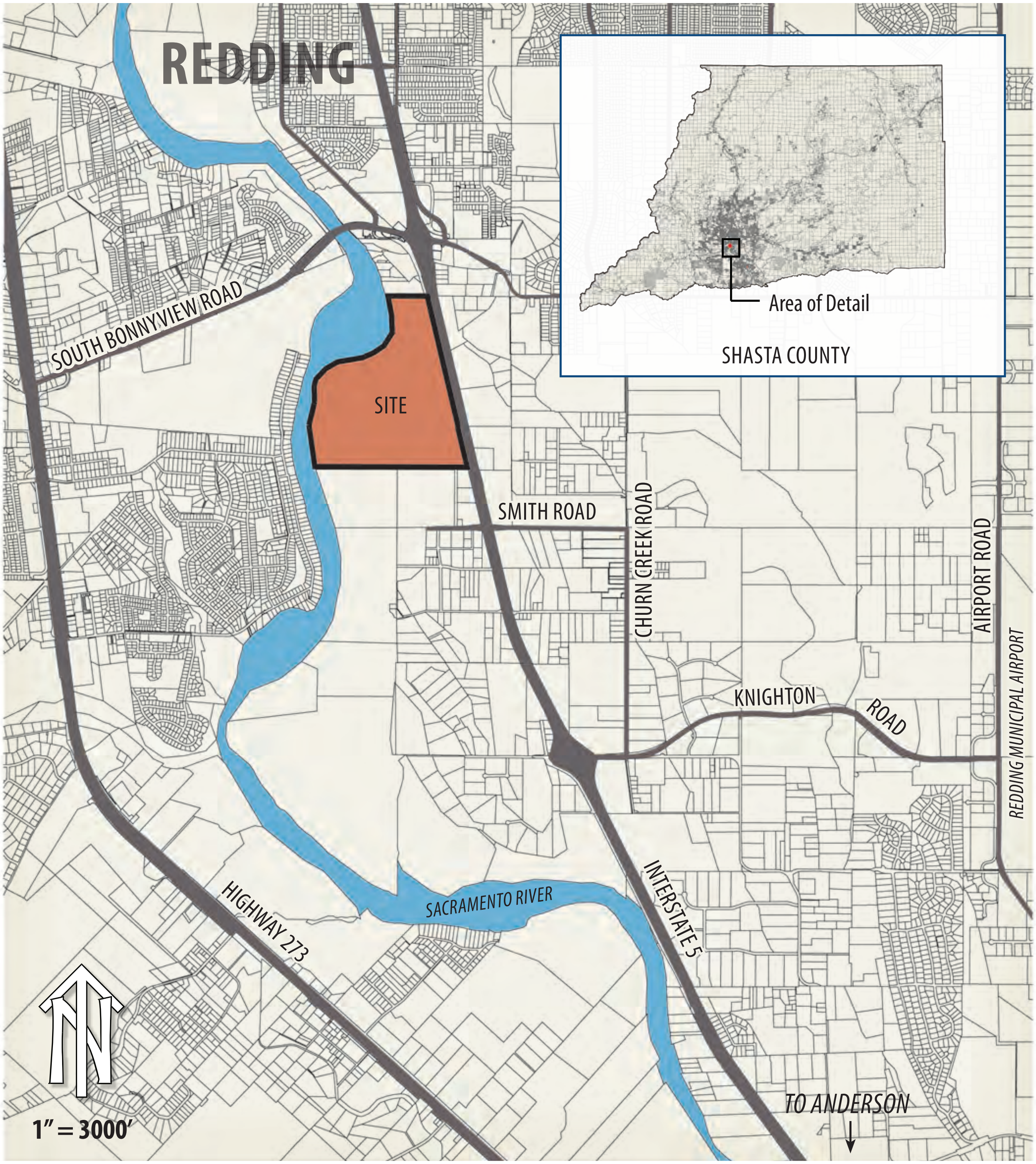

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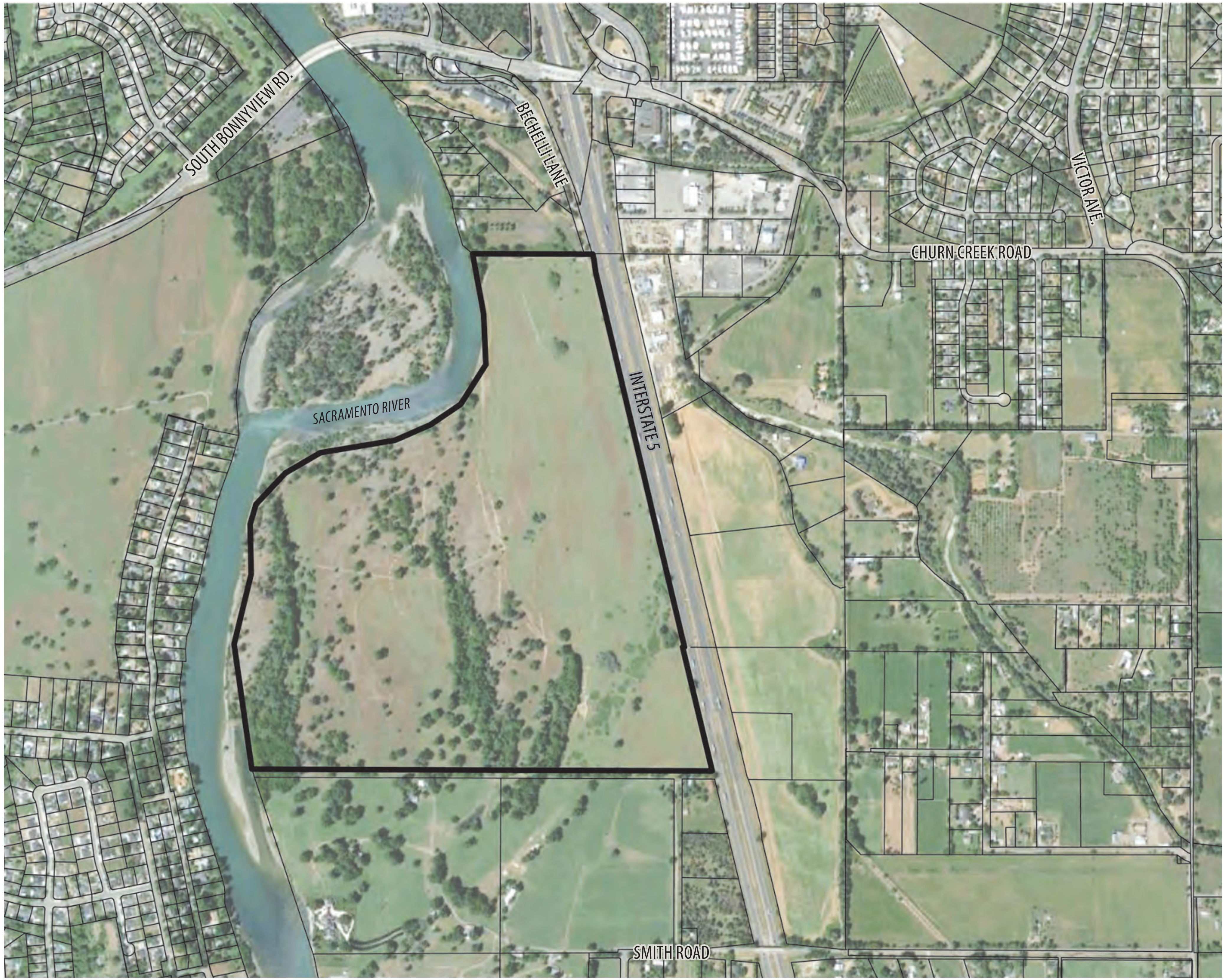
FIGURE 1
PROPOSED PROJECT - ALT 'A', 'B', 'C', & 'D'
LOCATION MAP



N

1" = 800'

FIGURE 2
PROPOSED PROJECT
ENLARGED LOCATION MAP WITH AERIAL

REDDING RANCHERIA
CASINO MASTER PLAN

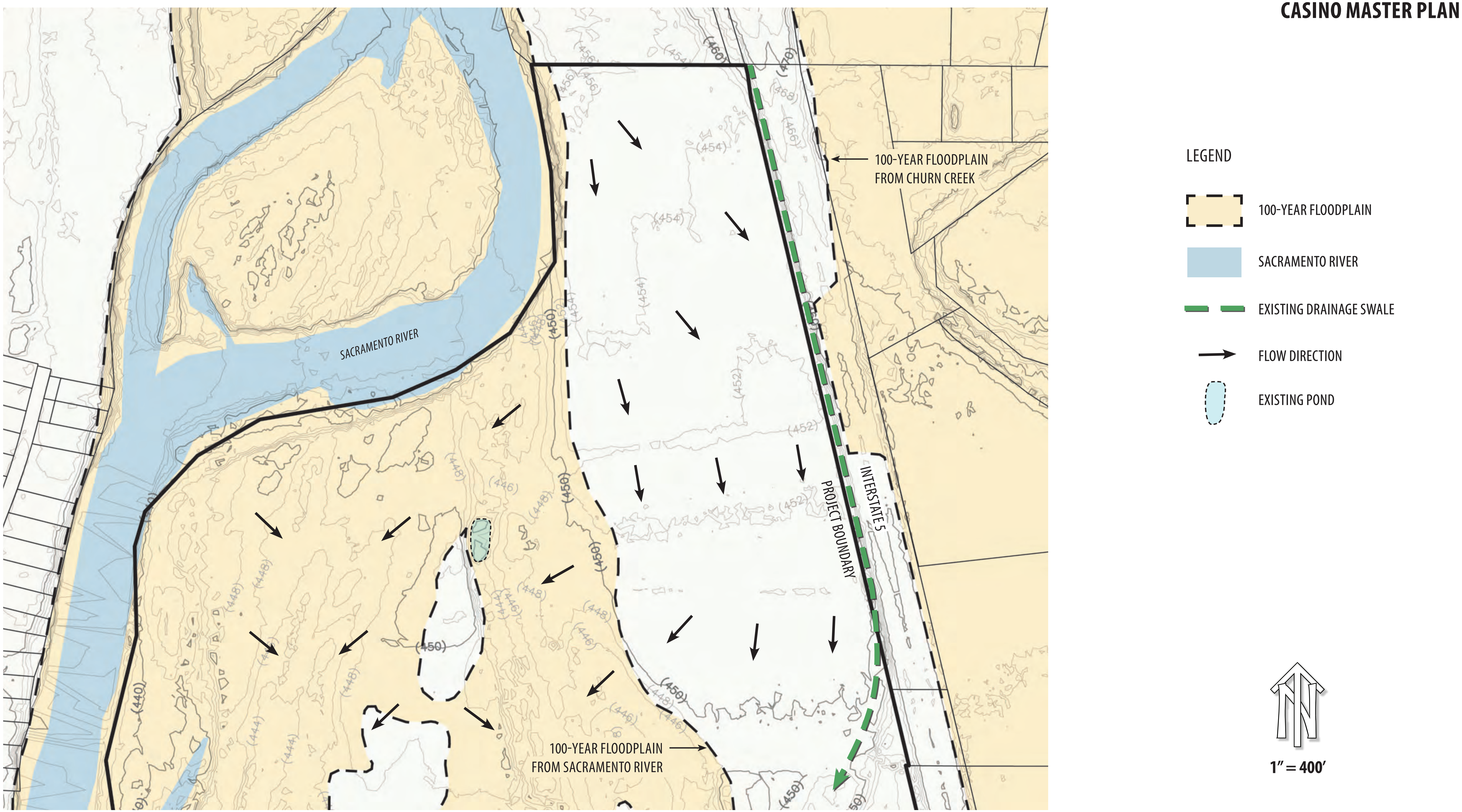


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FIGURE 3
PROPOSED PROJECT EXISTING TOPOGRAPHY

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FIGURE 4
PROPOSED PROJECT AERIAL AND TOPOGRAPHY

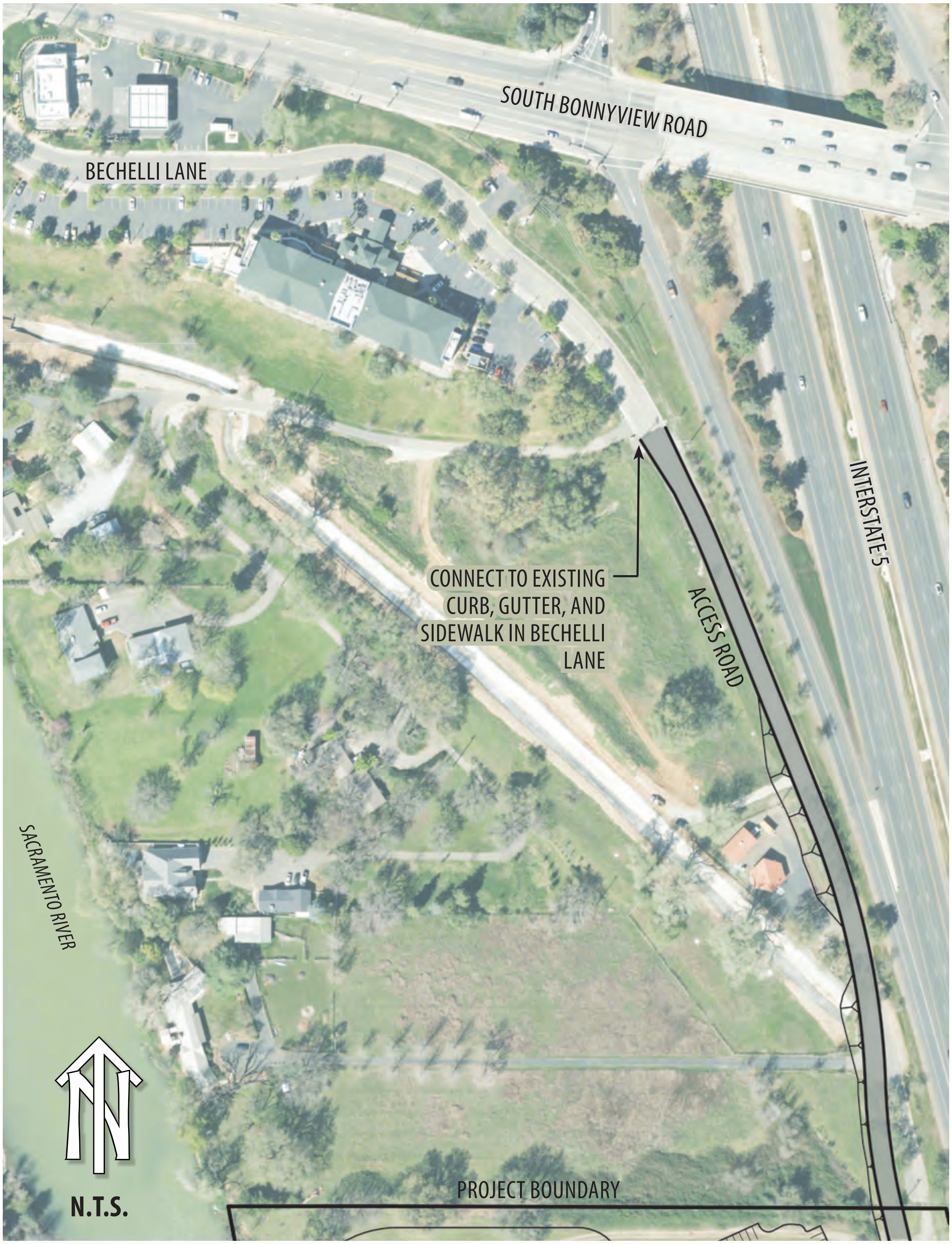

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FIGURE 5
PROPOSED PROJECT NORTH ROAD CONNECTION

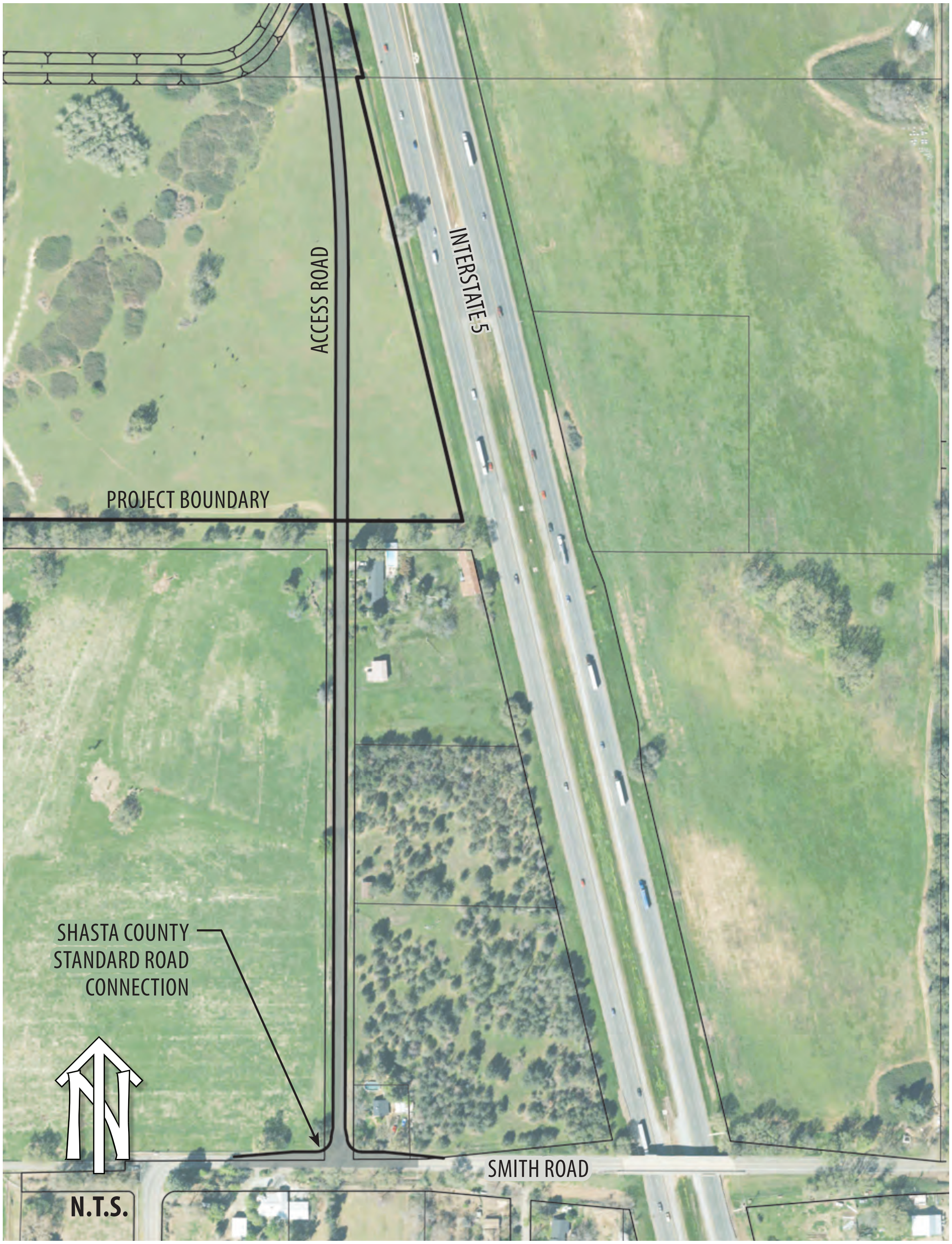

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FIGURE 6
PROPOSED PROJECT
SOUTH ROAD CONNECTION

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FIGURE 7
PROPOSED PROJECT - ALT 'E'
LOCATION MAP

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FIGURE 8
ALT SITE
EXISTING TOPOGRAPHY

FIGURE 9
ALT SITE
AERIAL AND TOPOGRAPHY

Figures – Alternative A

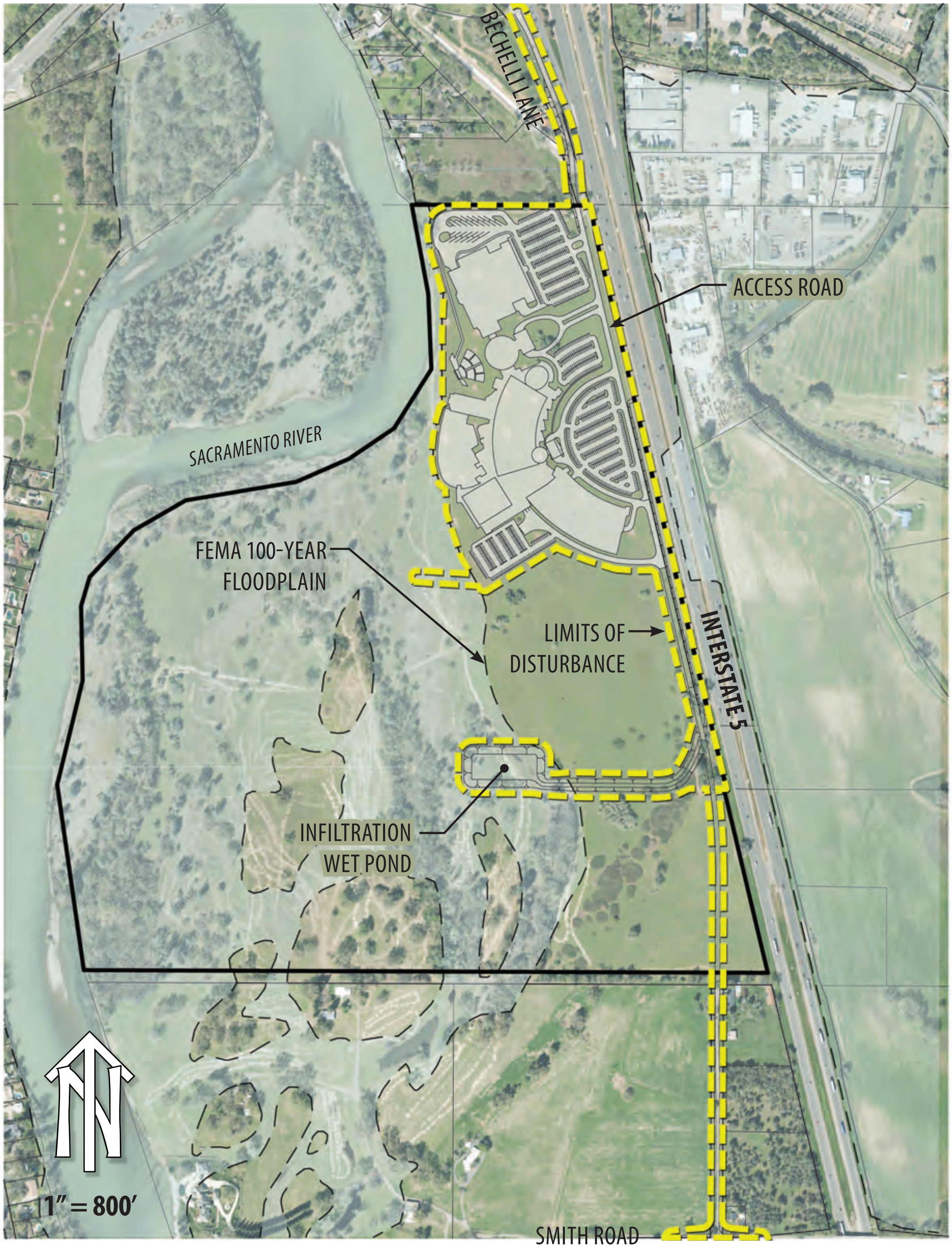

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FIGURE A1
PROPOSED PROJECT - ALT 'A'
OVERALL DISTURBANCE LIMITS

REDDING RANCHERIA CASINO MASTER PLAN

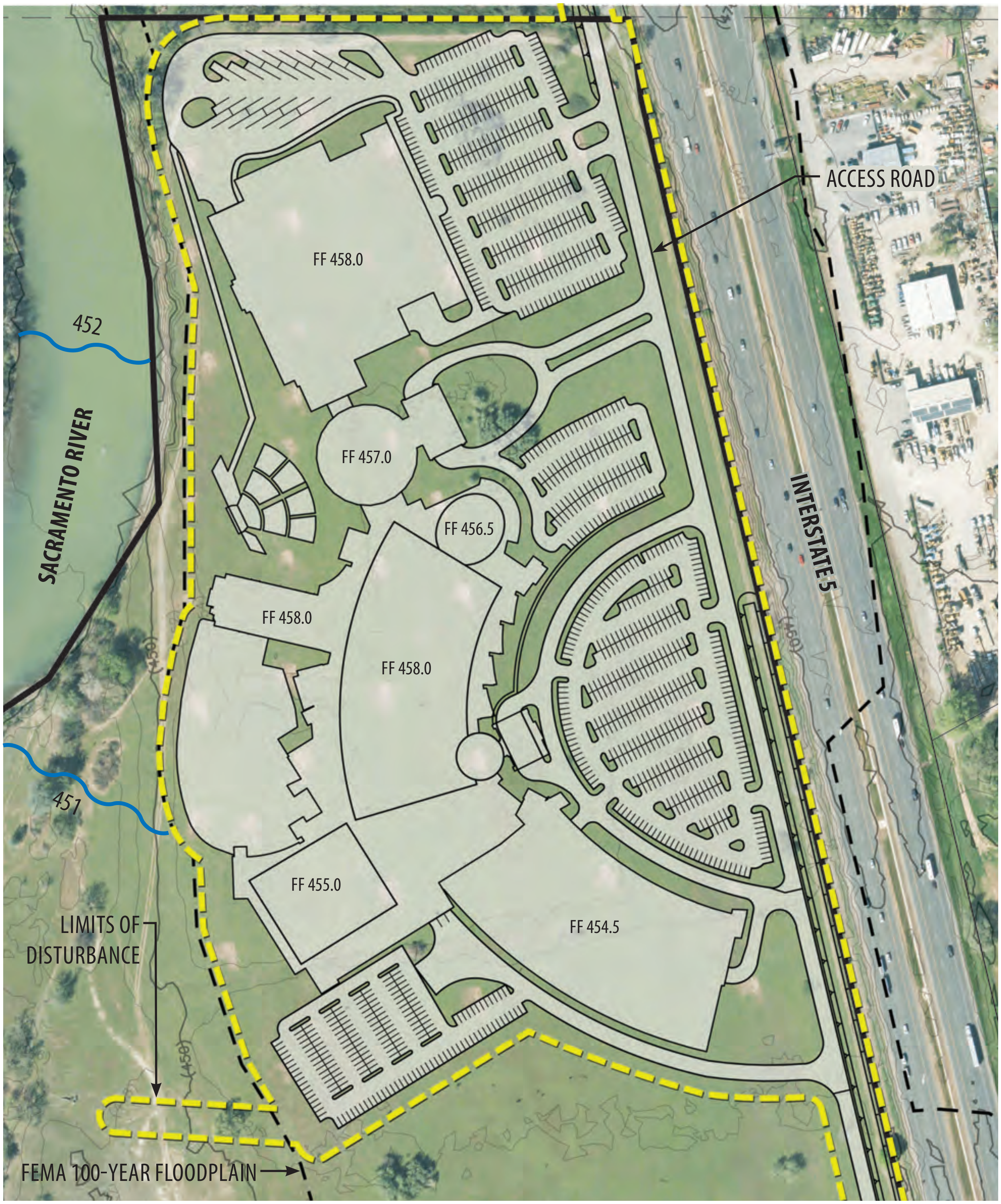

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FIGURE A2

PROPOSED PROJECT - ALT 'A'

ONSITE DISTURBANCE LIMITS

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FIGURE A3
PROPOSED PROJECT - ALT 'A'
ONSITE GRADING

REDDING RANCHERIA CASINO MASTER PLAN

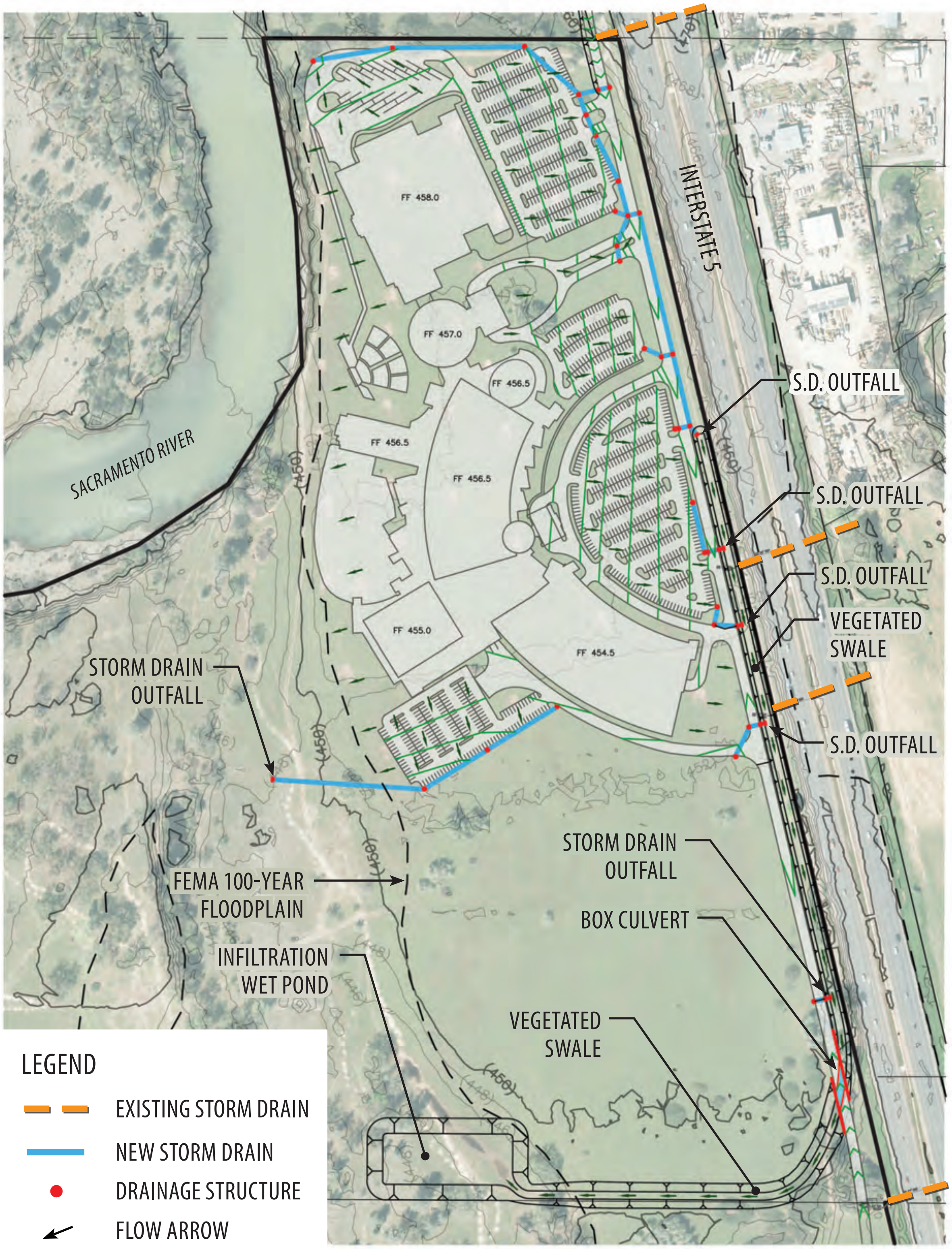

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FIGURE A4
PROPOSED PROJECT - ALT 'A'
OVERALL GRADING

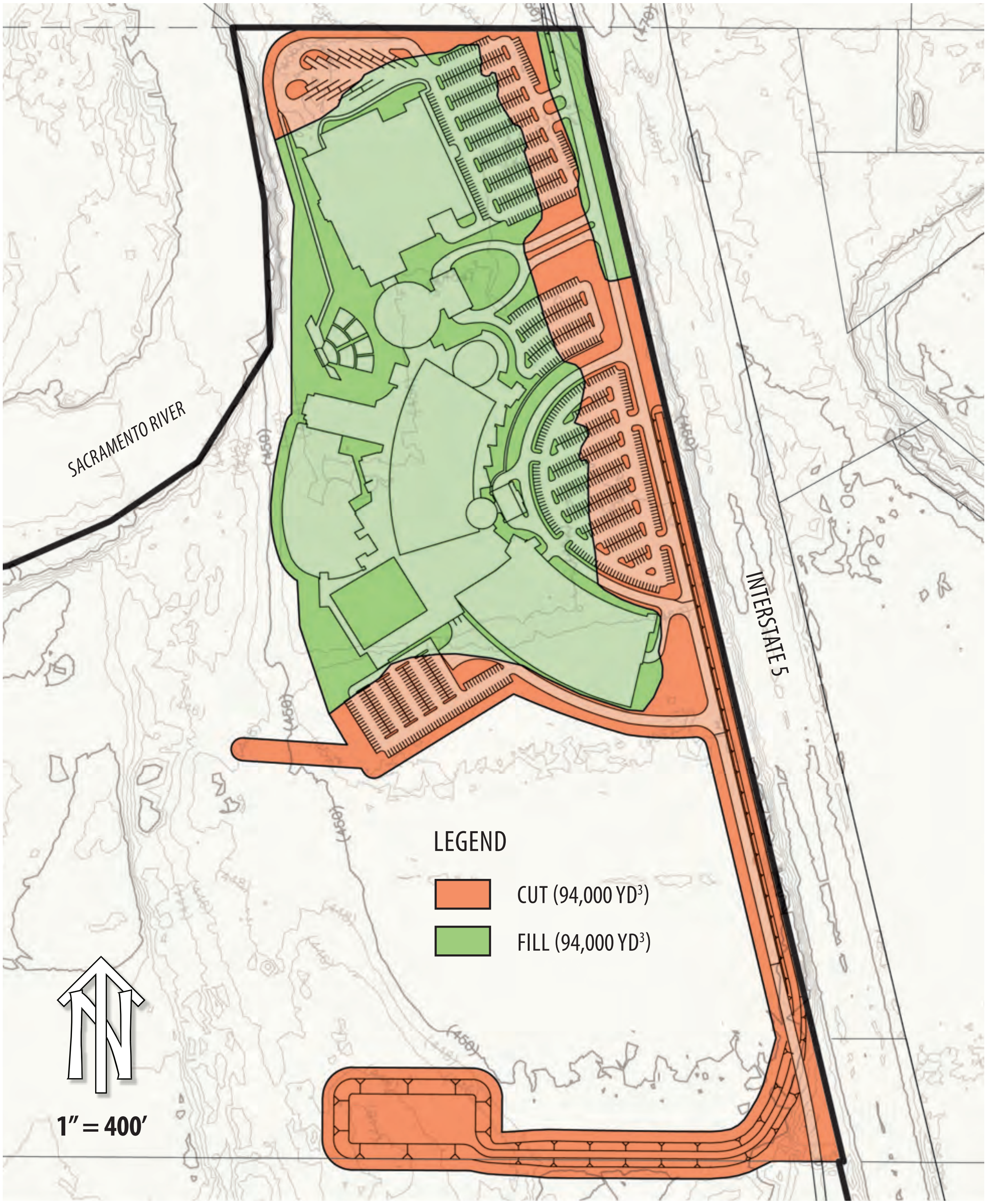

FIGURE A5
PROPOSED PROJECT - ALT 'A'
CUT FILL DIAGRAM

REDDING RANCHERIA CASINO MASTER PLAN

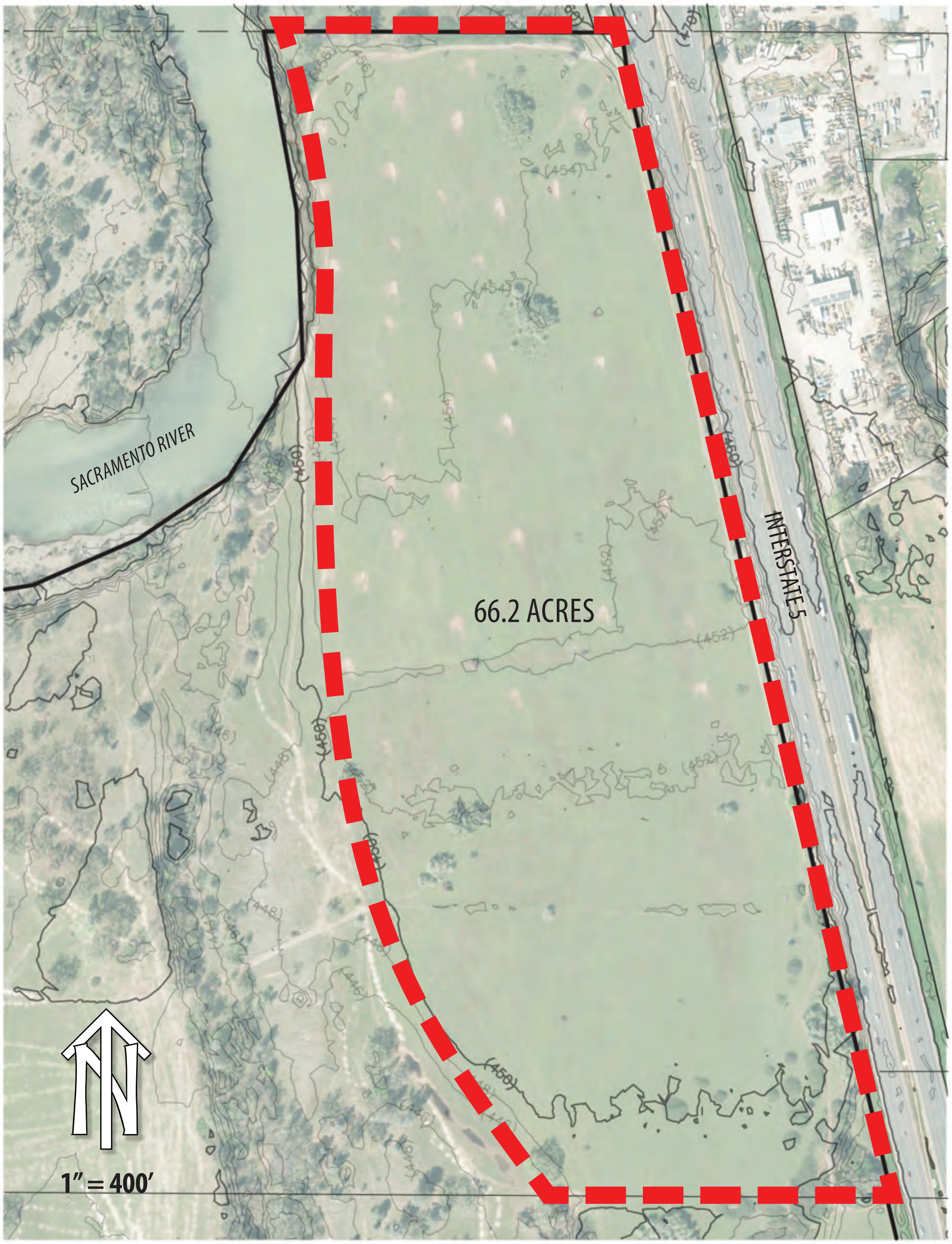

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FIGURE A6
OVERALL DEVELOPABLE SITE DRAINAGE AREA- ALT 'A'
EXISTING CONDITION

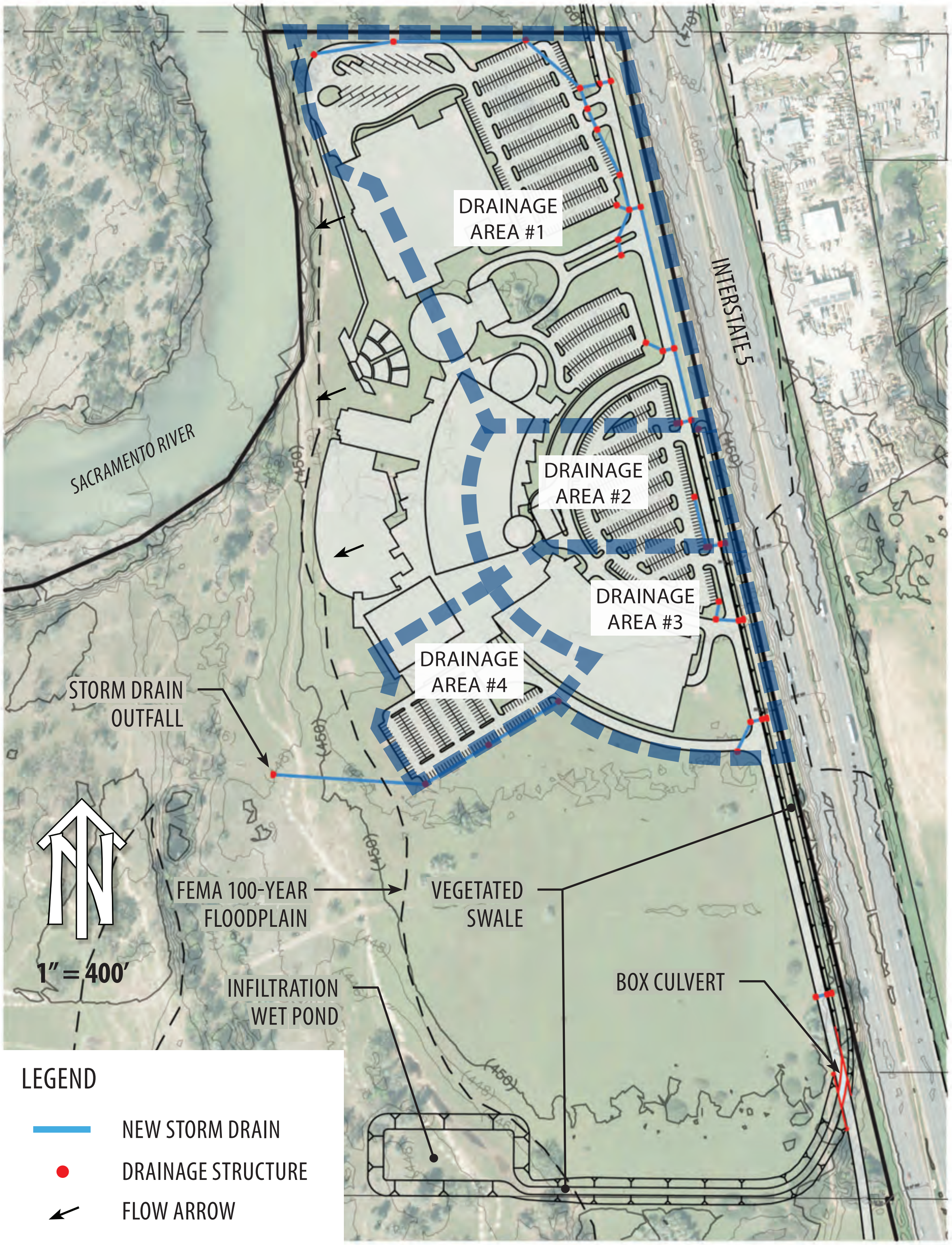

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FIGURE A7
PROPOSED PROJECT - ALT 'A'
STORMWATER MANAGEMENT

Figures – Alternative B

REDDING RANCHERIA
CASINO MASTER PLAN

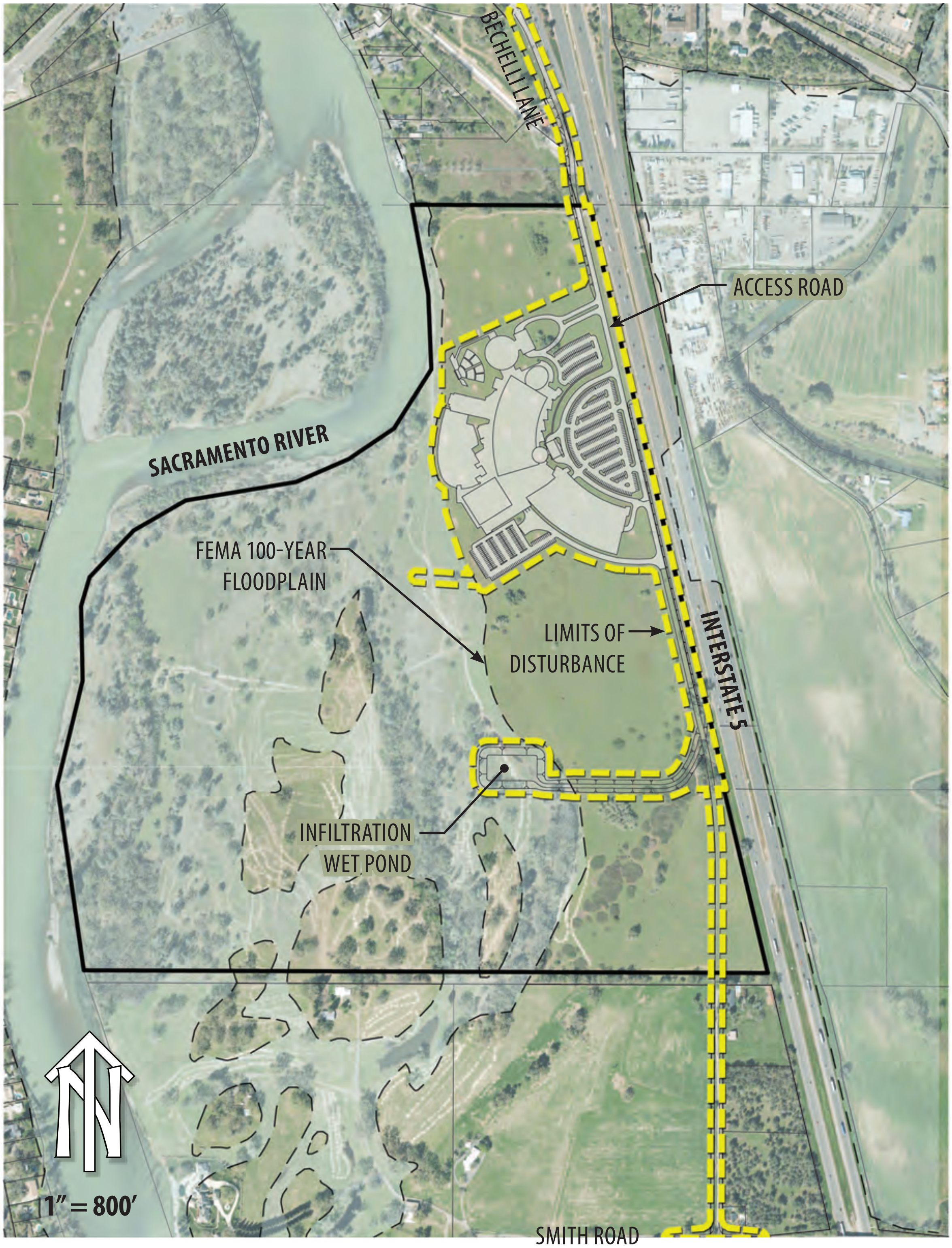

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FIGURE B1
PROPOSED PROJECT - ALT 'B'
OVERALL DISTURBANCE LIMITS

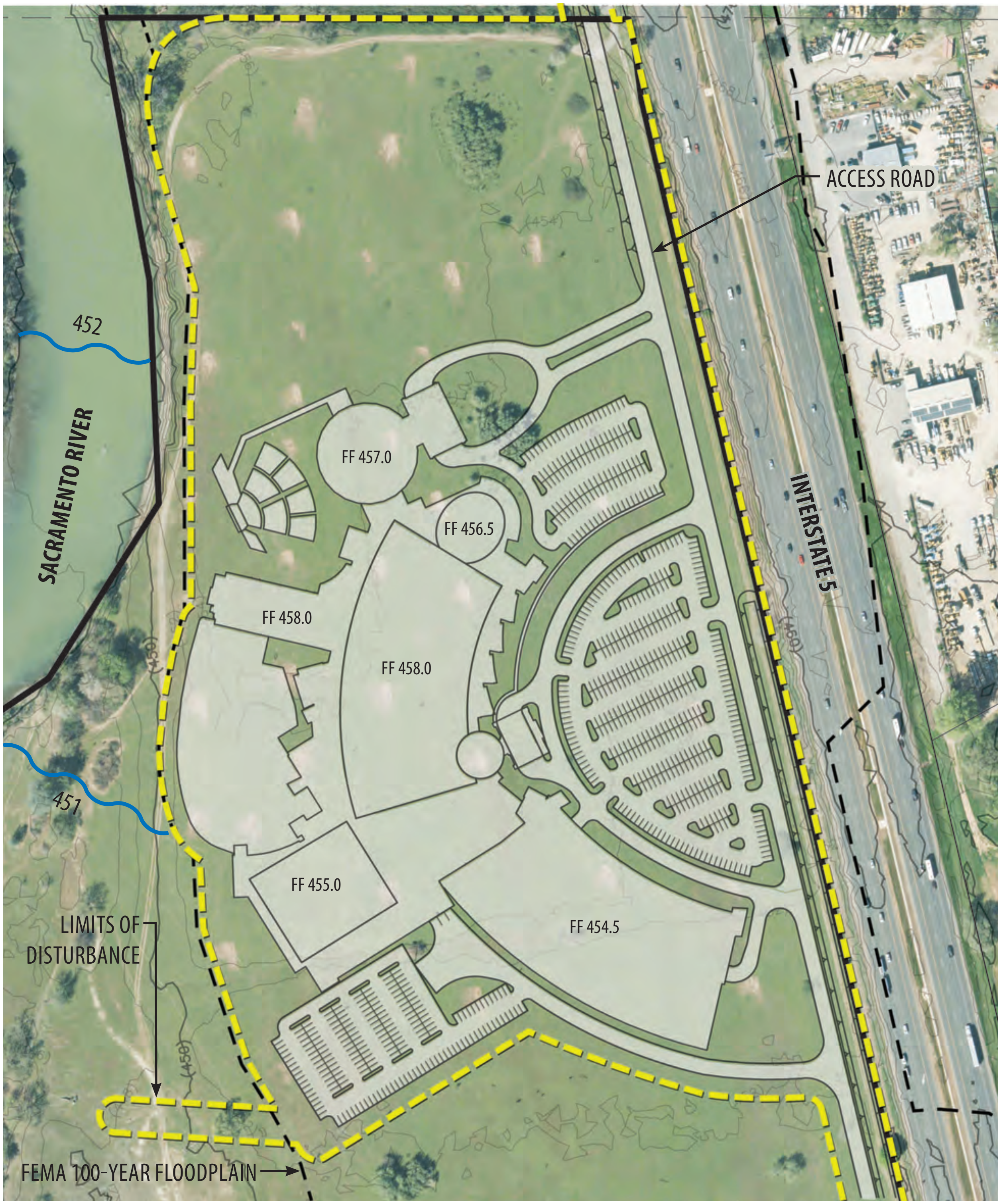

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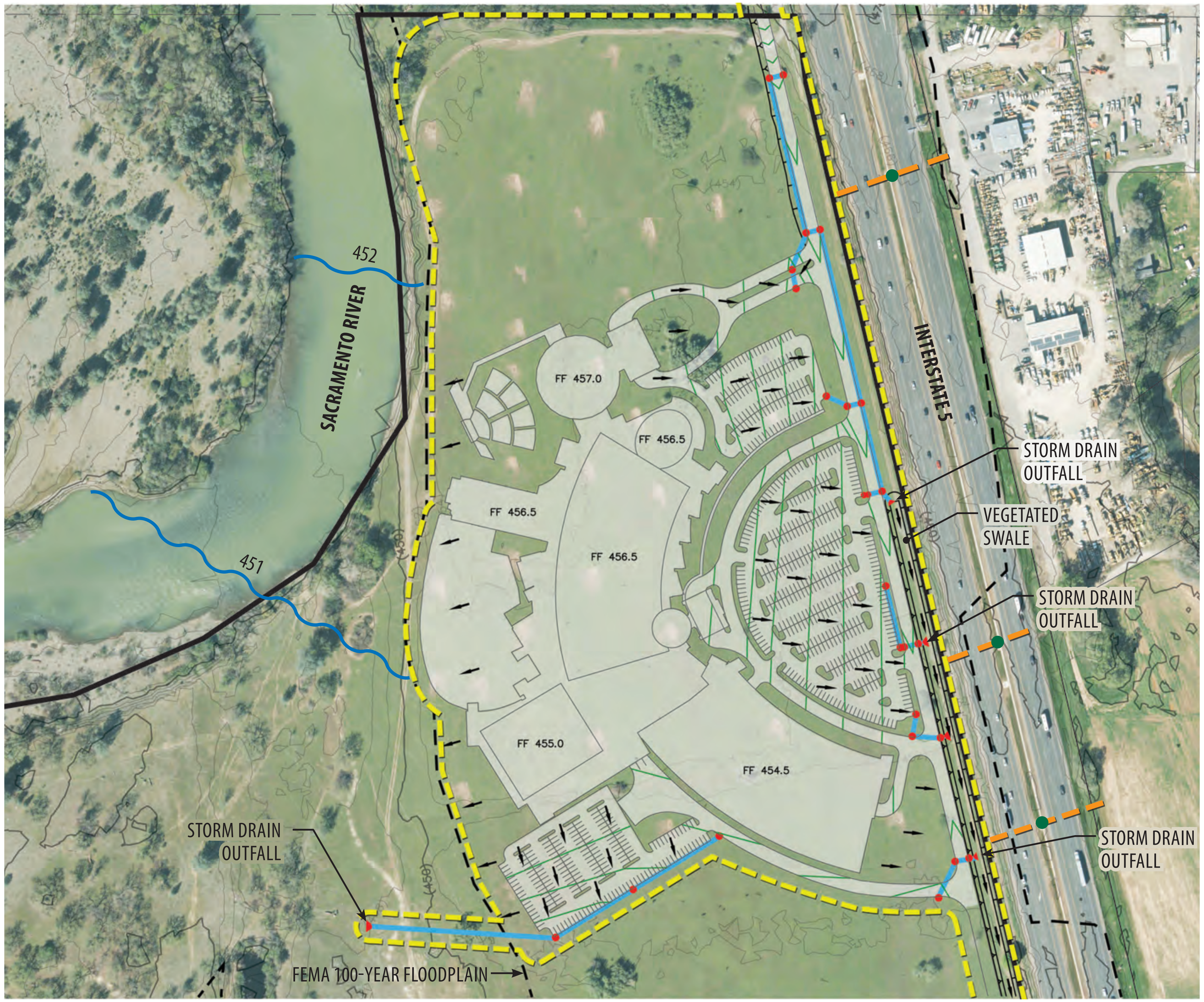
FIGURE B2
PROPOSED PROJECT - ALT 'B'
ONSITE DISTURBANCE LIMITS

REDDING RANCHERIA
CASINO MASTER PLAN



LEGEND

- FINISH GRADE CONTOUR
- NEW STORM DRAIN
- EXISTING STORM DRAIN
- DRAINAGE STRUCTURE
- EXISTING DRAINAGE STRUCTURE
- 452 FEMA 100 YEAR FLOOD ELEVATION
- FLOW DIRECTION

N

NOT TO SCALE

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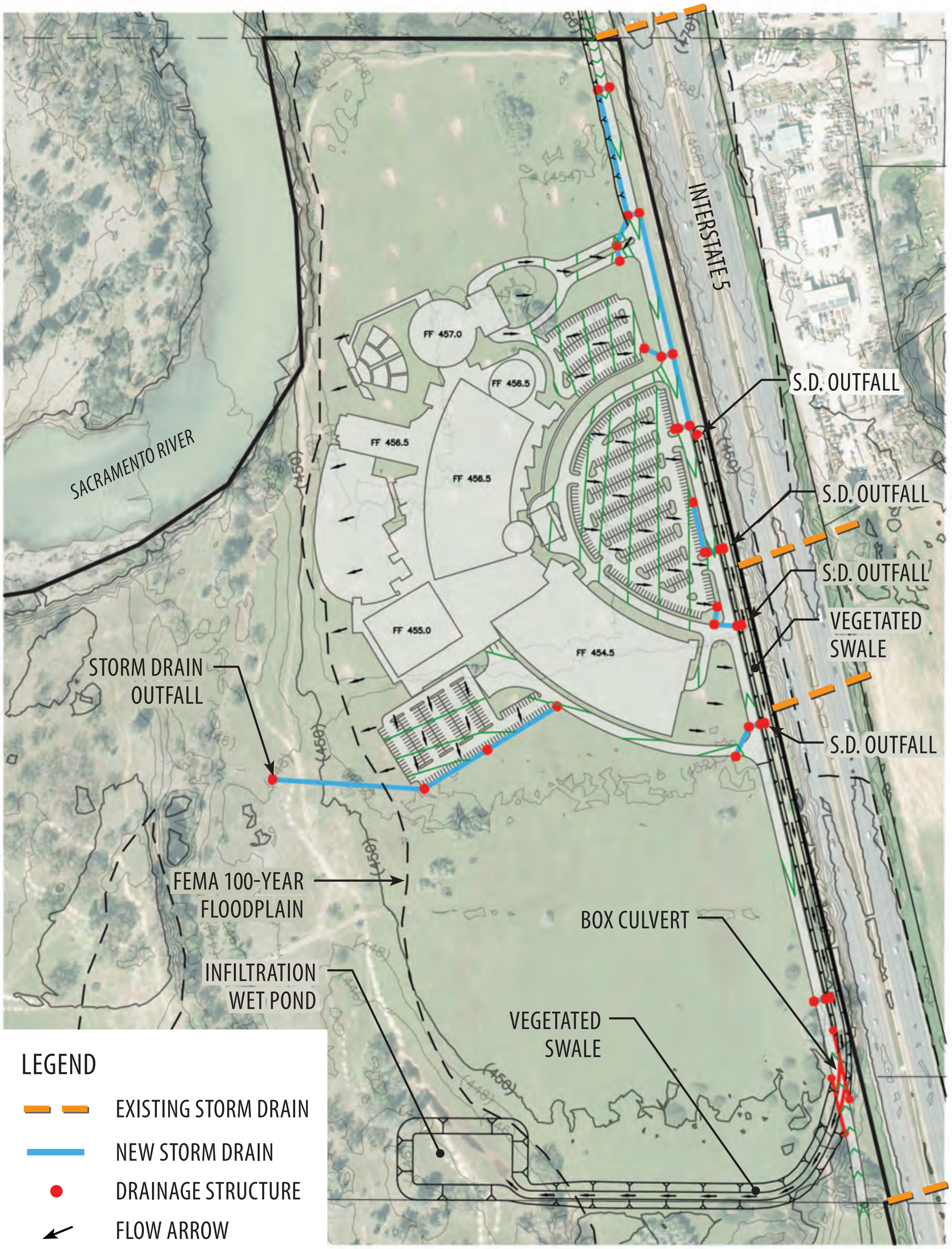
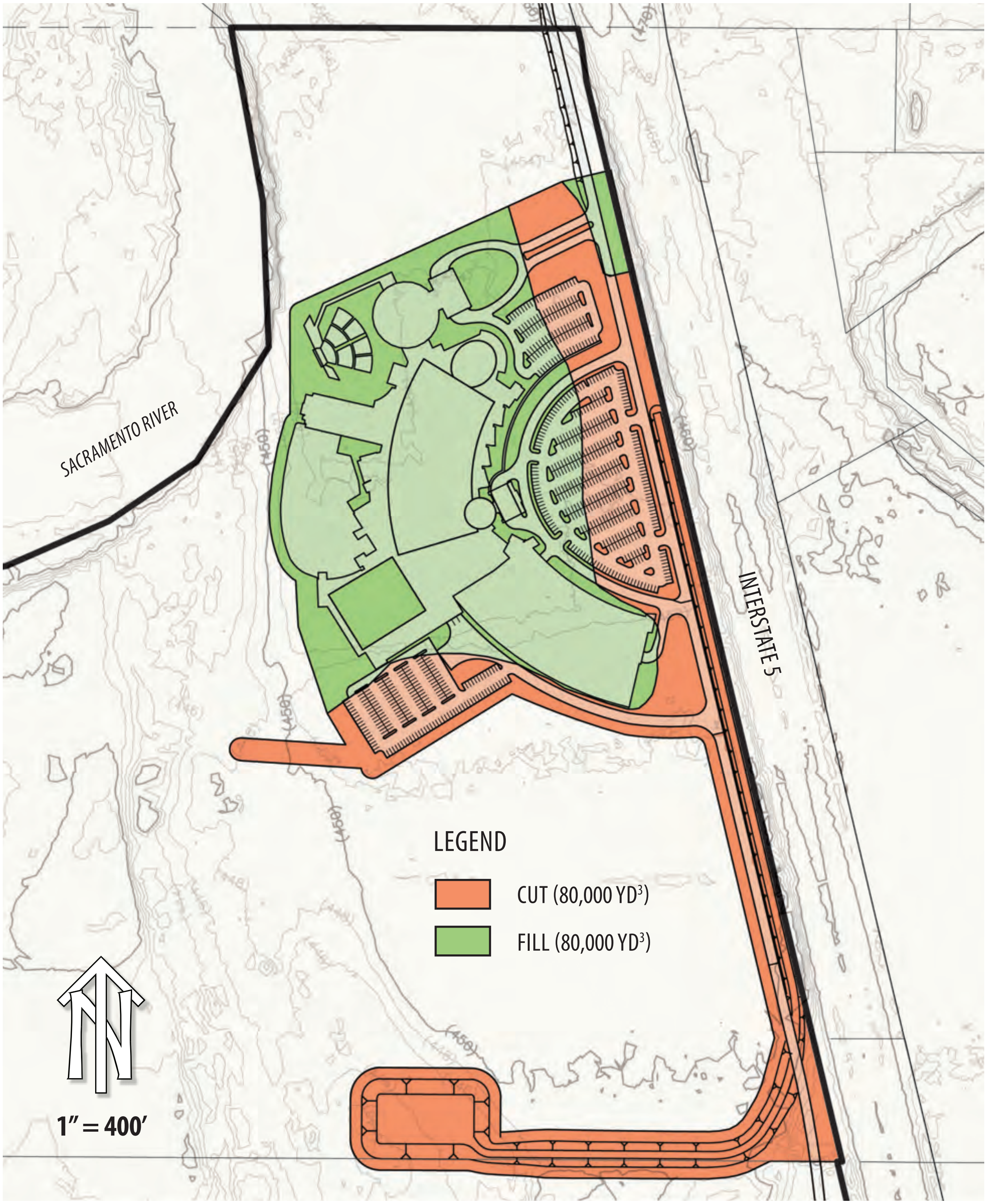
FIGURE B3
PROPOSED PROJECT - ALT 'B'
ONSITE GRADING



SHARRAH DUNLAP SAWYER INCORPORATED

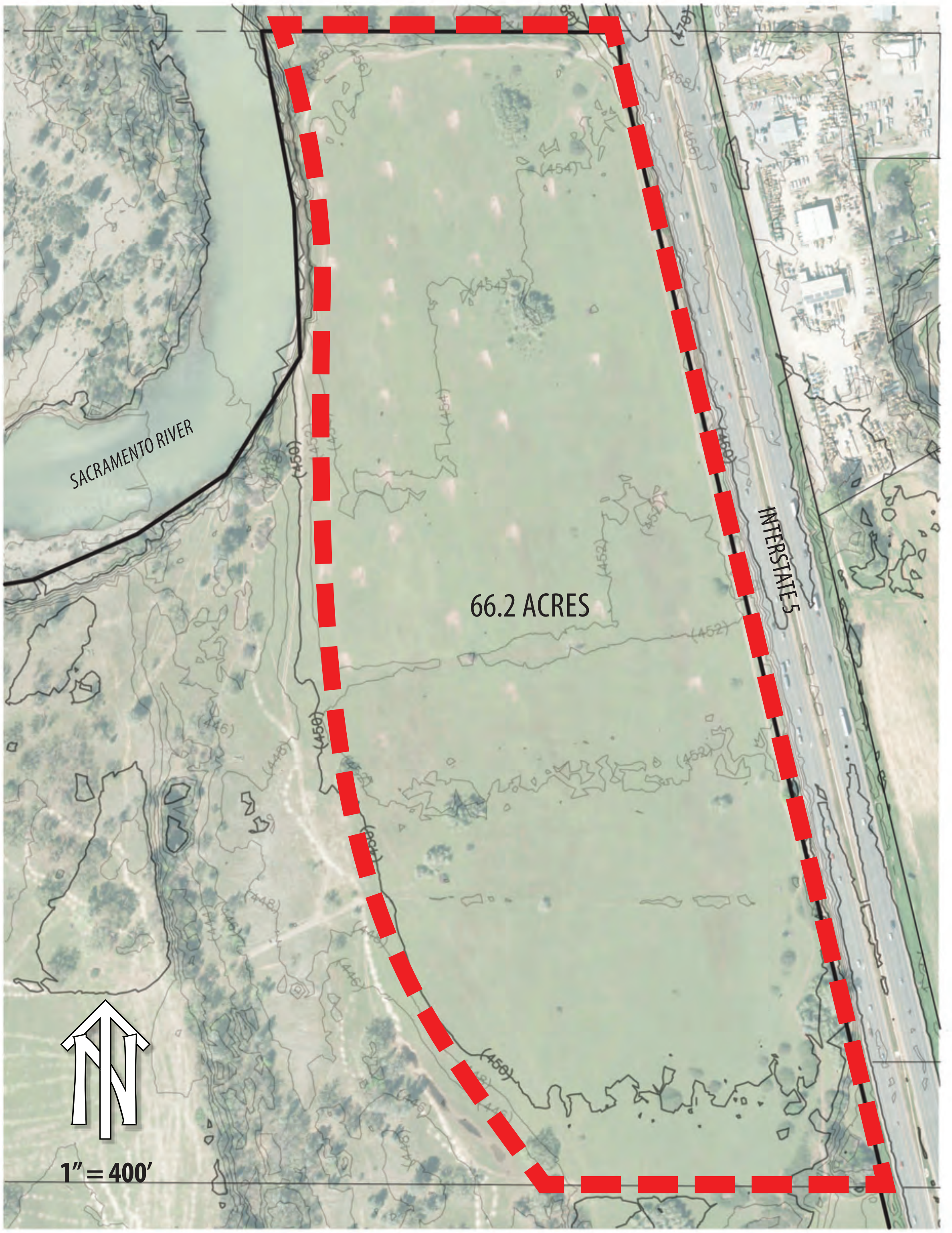
FIGURE B4
PROPOSED PROJECT - ALT 'B'
OVERALL GRADING



SHARRAH DUNLAP SAWYER INCORPORATED

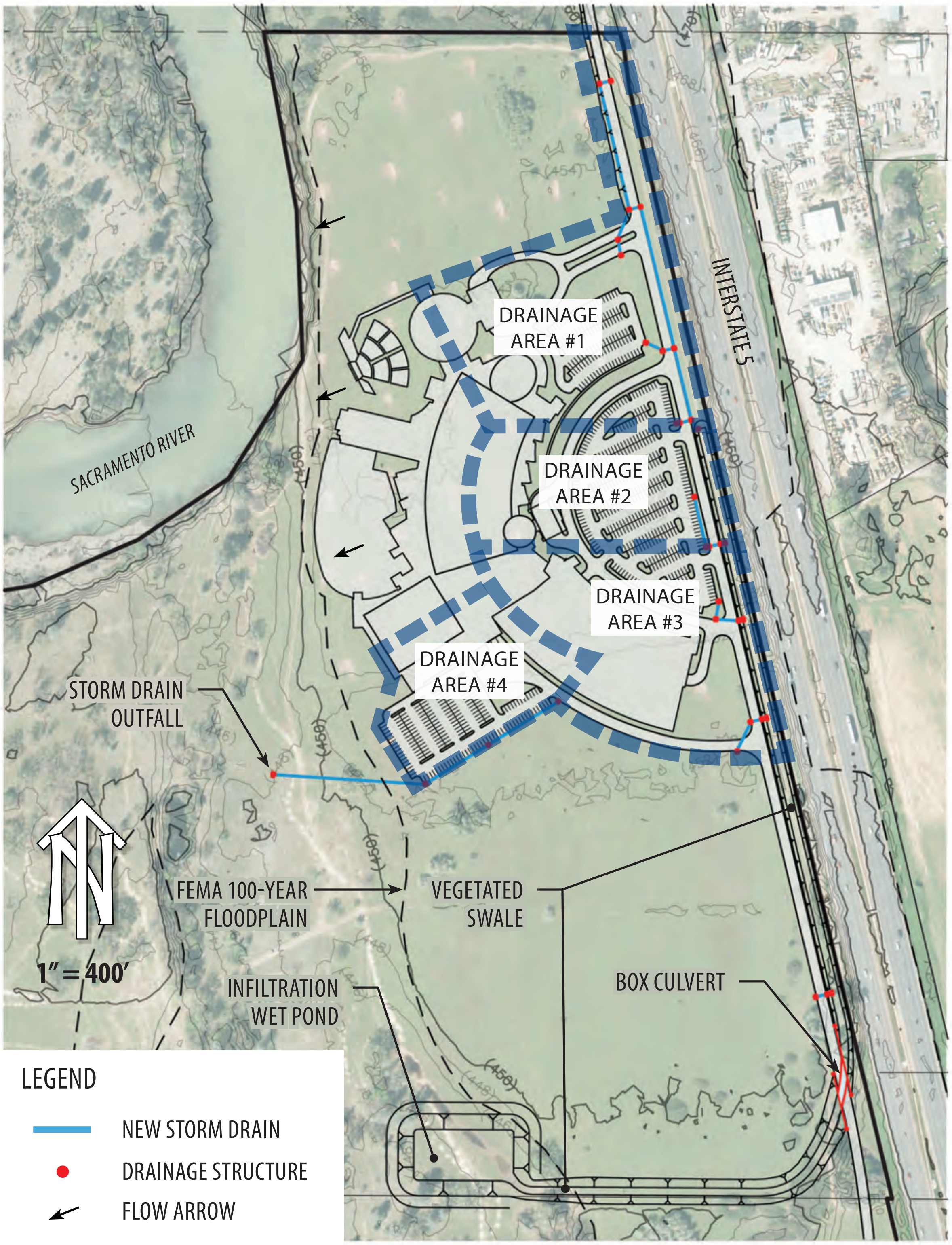
FIGURE B5
PROPOSED PROJECT - ALT 'B'
CUT FILL DIAGRAM

REDDING RANCHERIA CASINO MASTER PLAN



SHARRAH DUNLAP SAWYER INCORPORATED

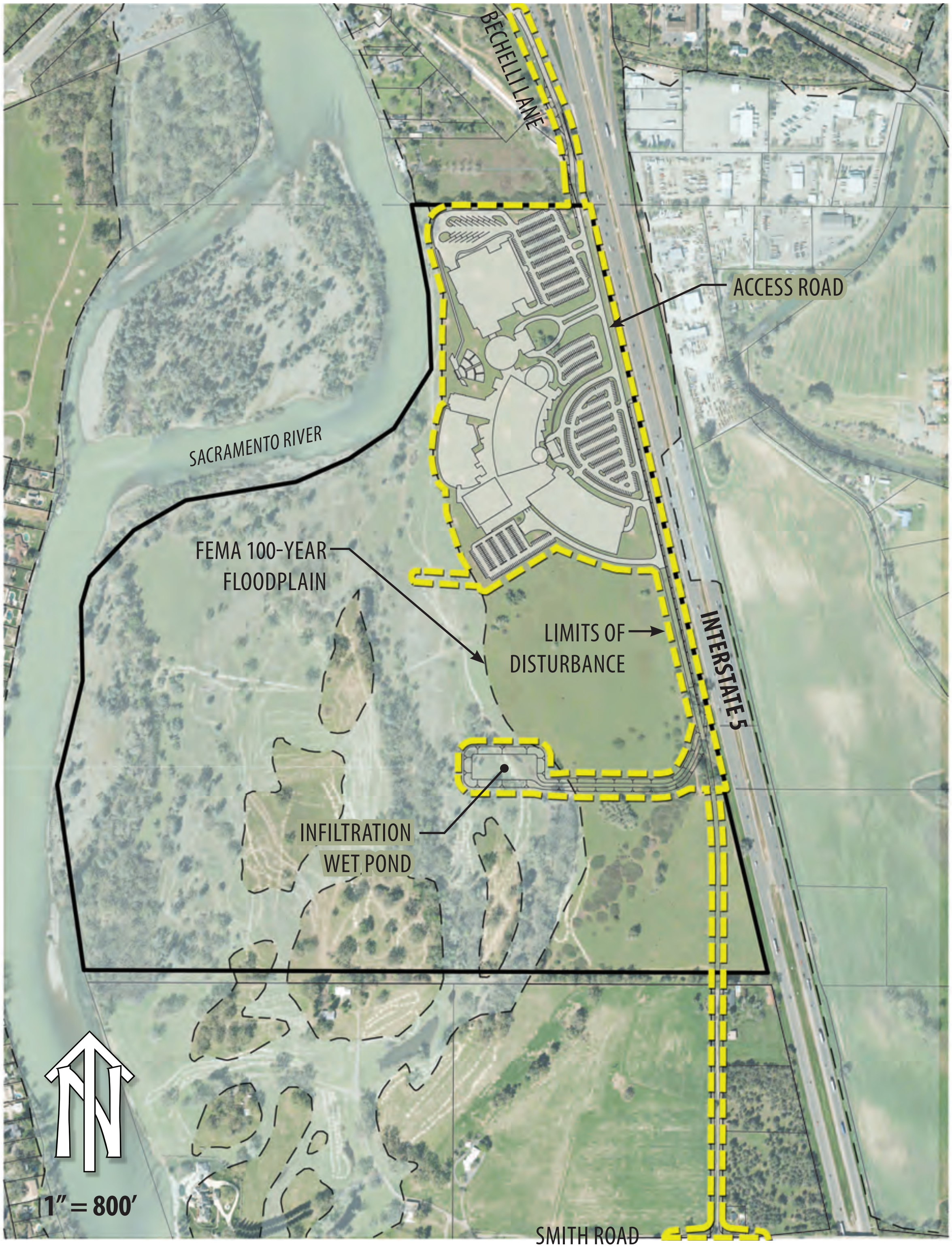
FIGURE B6
OVERALL DEVELOPABLE SITE DRAINAGE AREA- ALT 'B'
EXISTING CONDITION



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE B7
PROPOSED PROJECT - ALT 'B'
STORMWATER MANAGEMENT

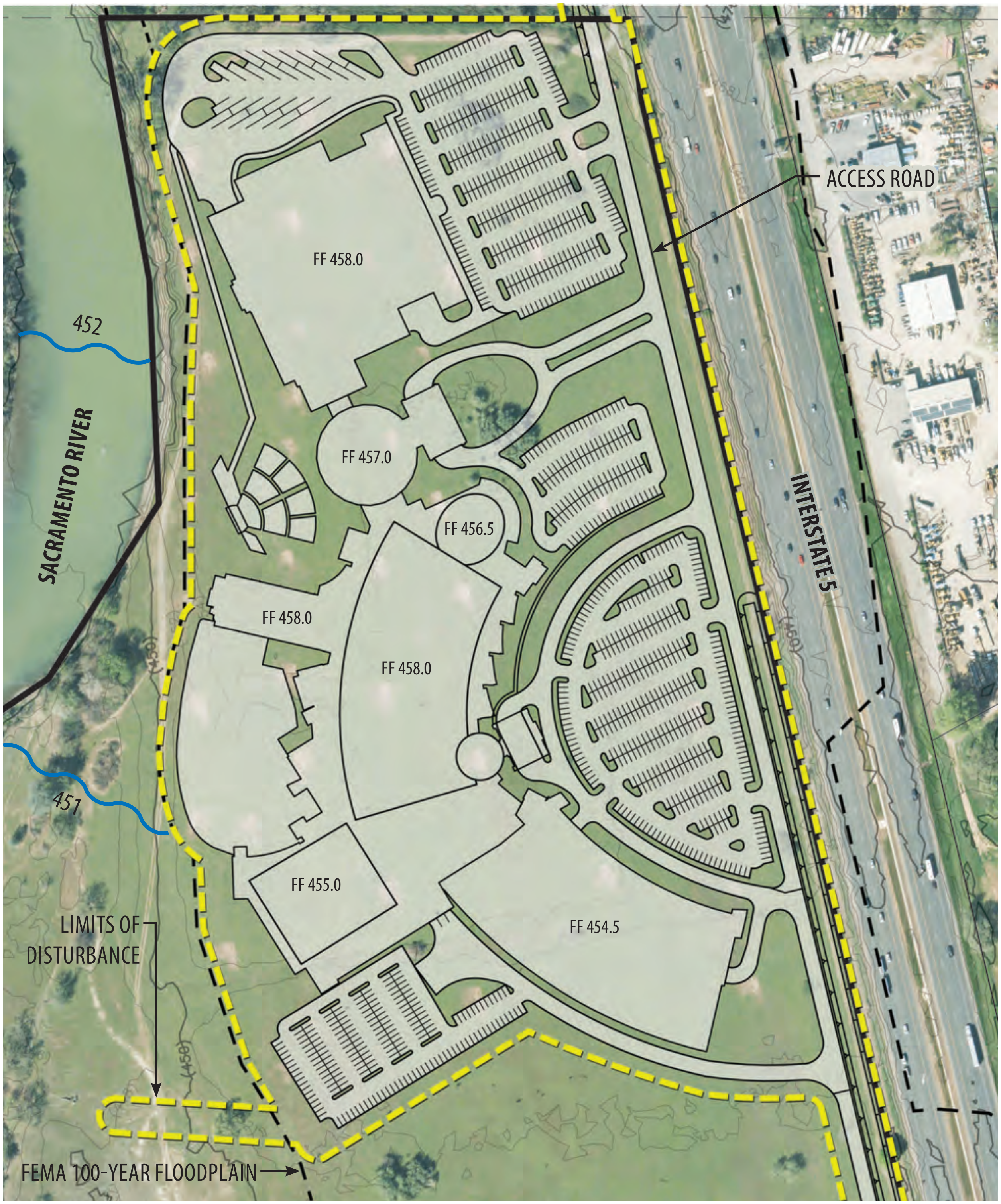
Figures – Alternative C



SHARRAH
DUNLAP
SAWYER
INCORPORATED

FIGURE C1
PROPOSED PROJECT - ALT 'C'
OVERALL DISTURBANCE LIMITS

REDDING RANCHERIA
CASINO MASTER PLAN

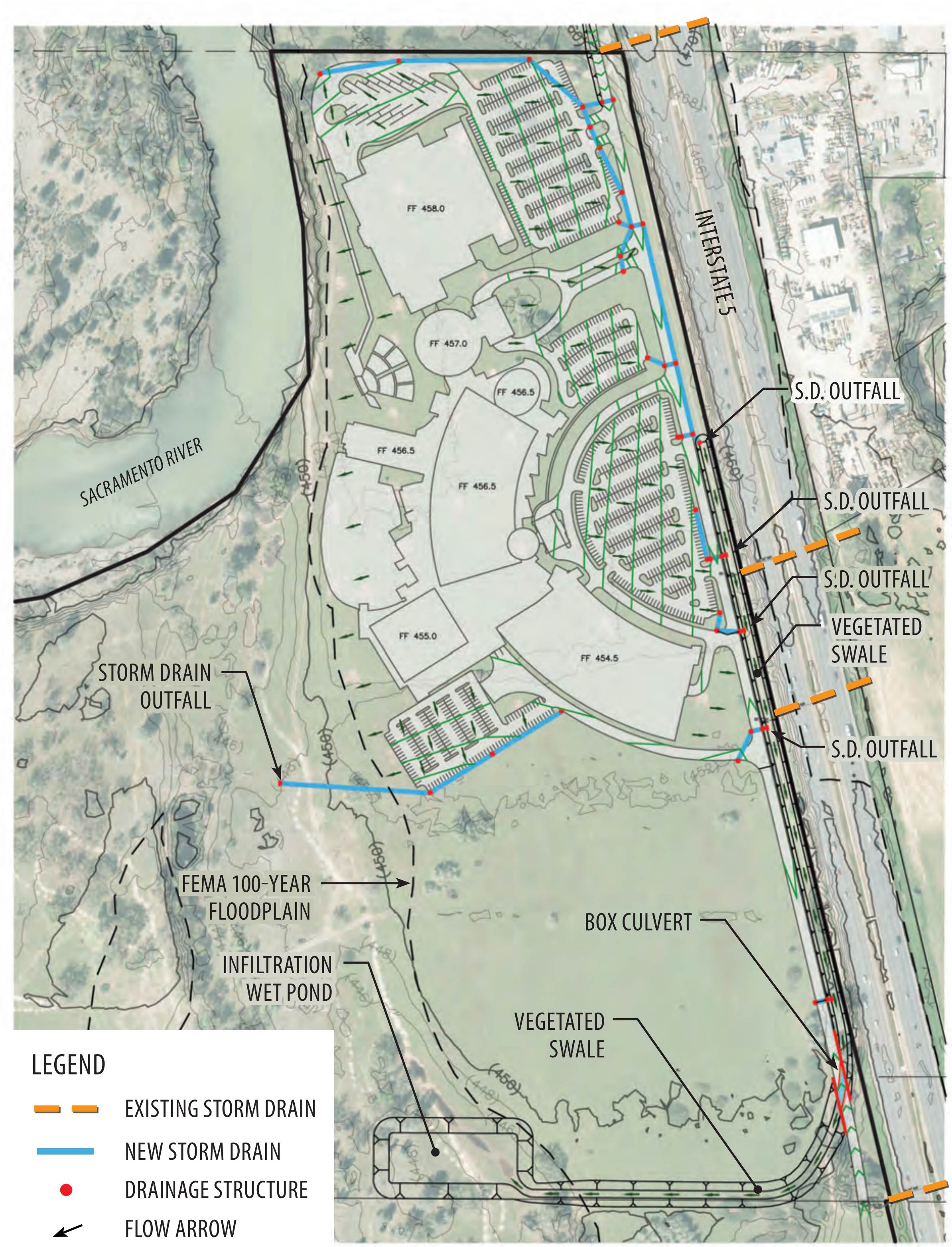


SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE C2
PROPOSED PROJECT - ALT 'C'
ONSITE DISTURBANCE LIMITS

SHARRAH DUNLAP SAWYER INCORPORATED

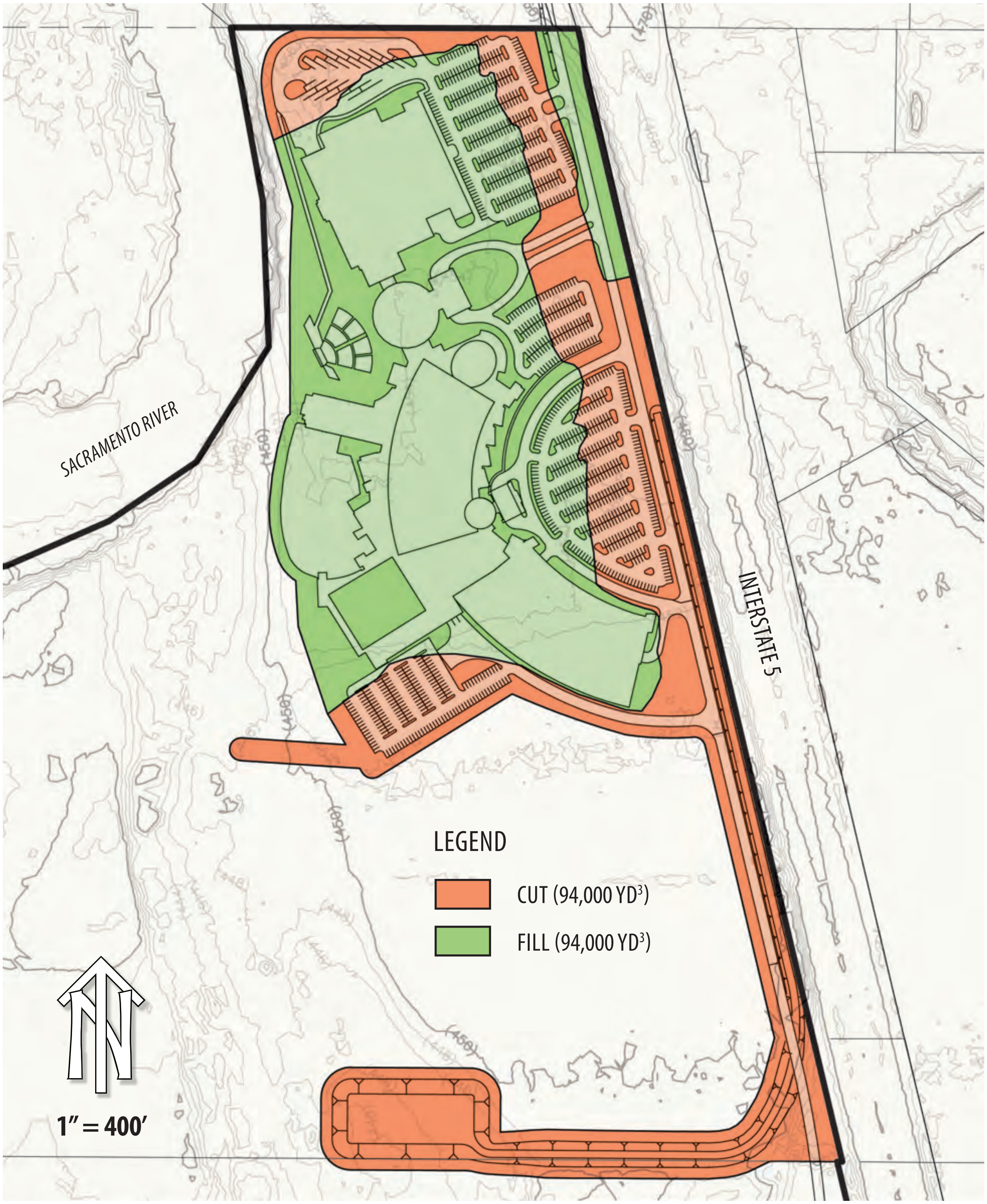
FIGURE C3
PROPOSED PROJECT - ALT 'C'
ONSITE GRADING



SHARRAH DUNLAP SAWYER INCORPORATED

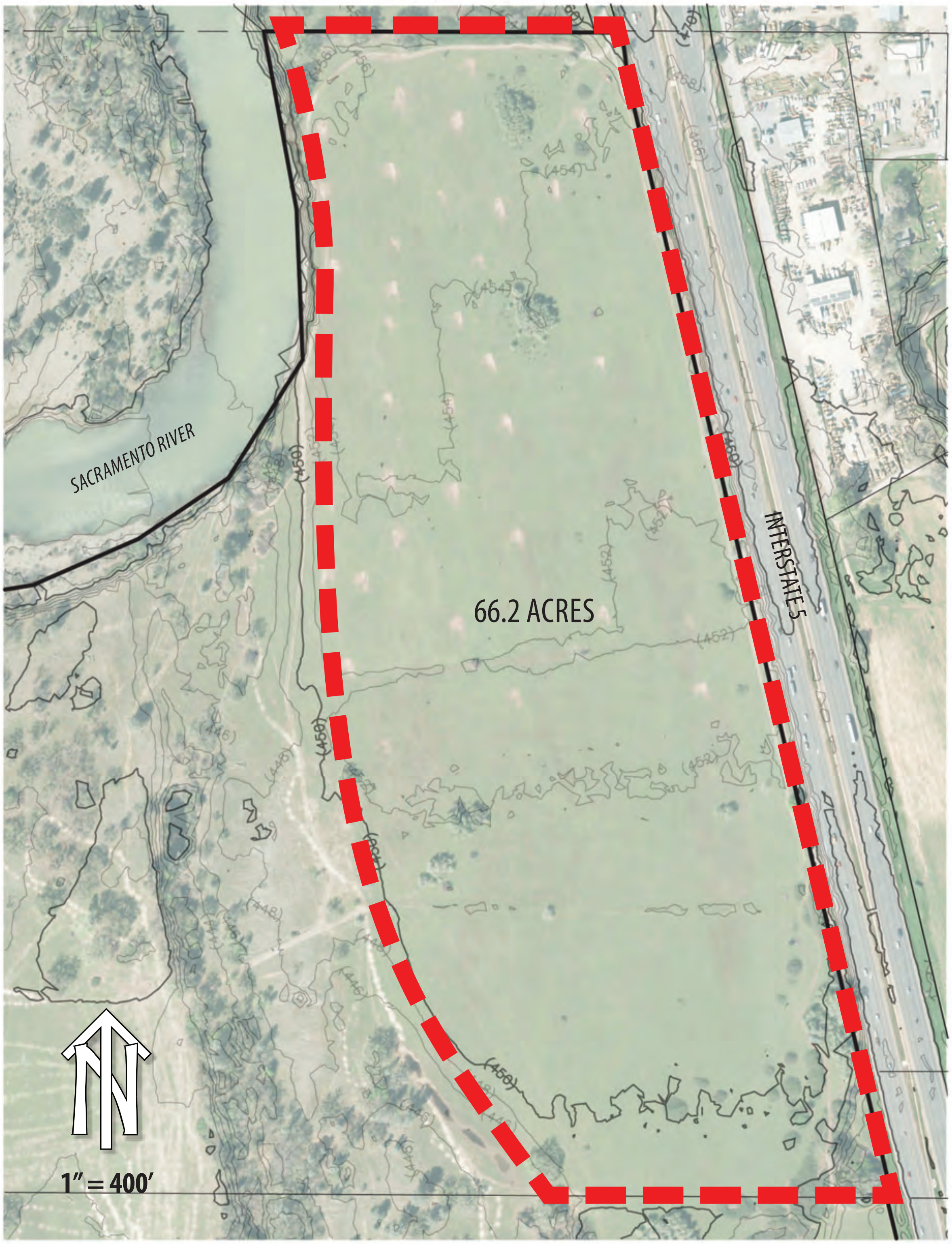
FIGURE C4
PROPOSED PROJECT - ALT 'C'
OVERALL GRADING

REDDING RANCHERIA
CASINO MASTER PLAN



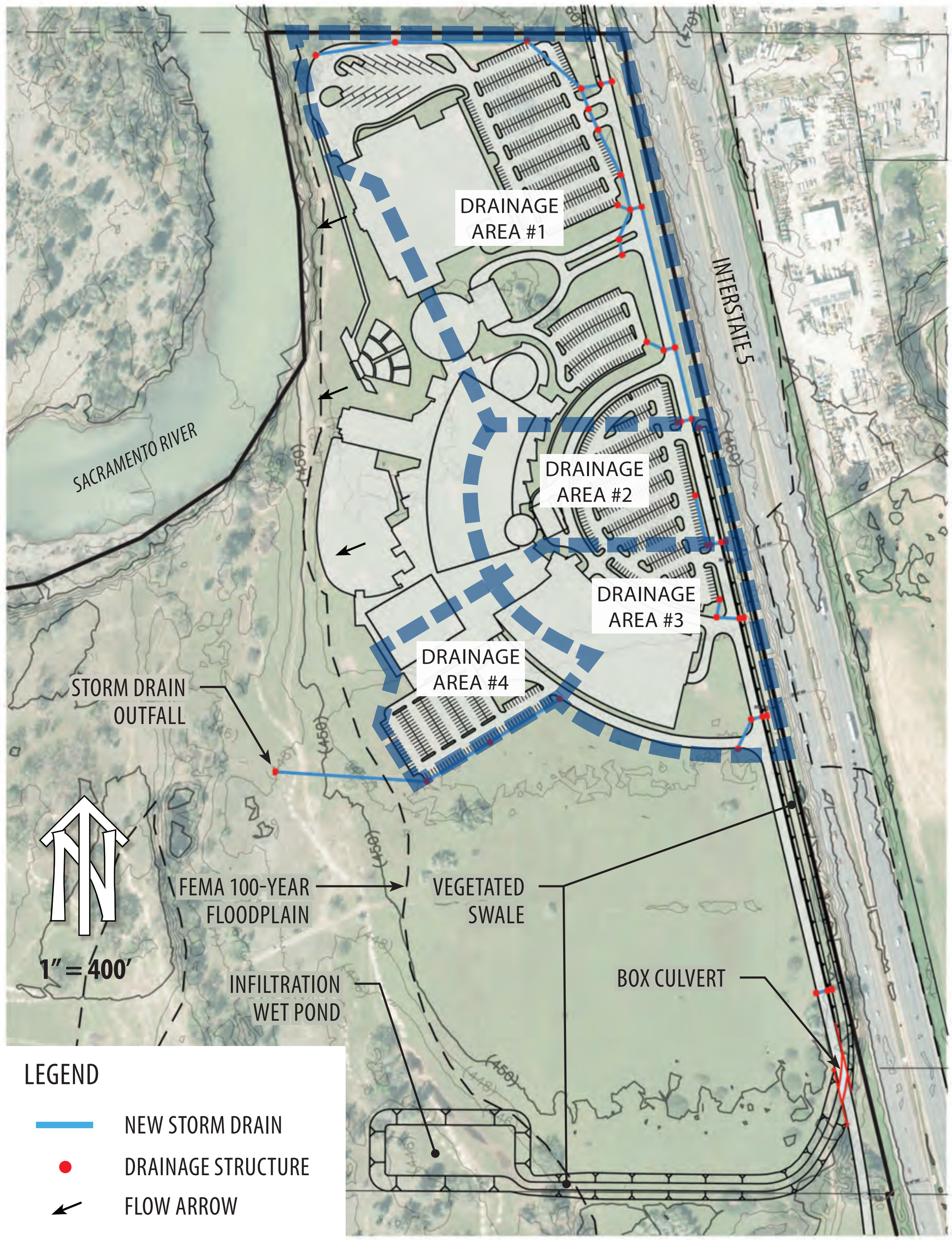
SHARRAH
DUNLAP
SAWYER
INCORPORATED

FIGURE C5
PROPOSED PROJECT - ALT 'C'
CUT FILL DIAGRAM



SHARRAH
DUNLAP
SAWYER
INCORPORATED

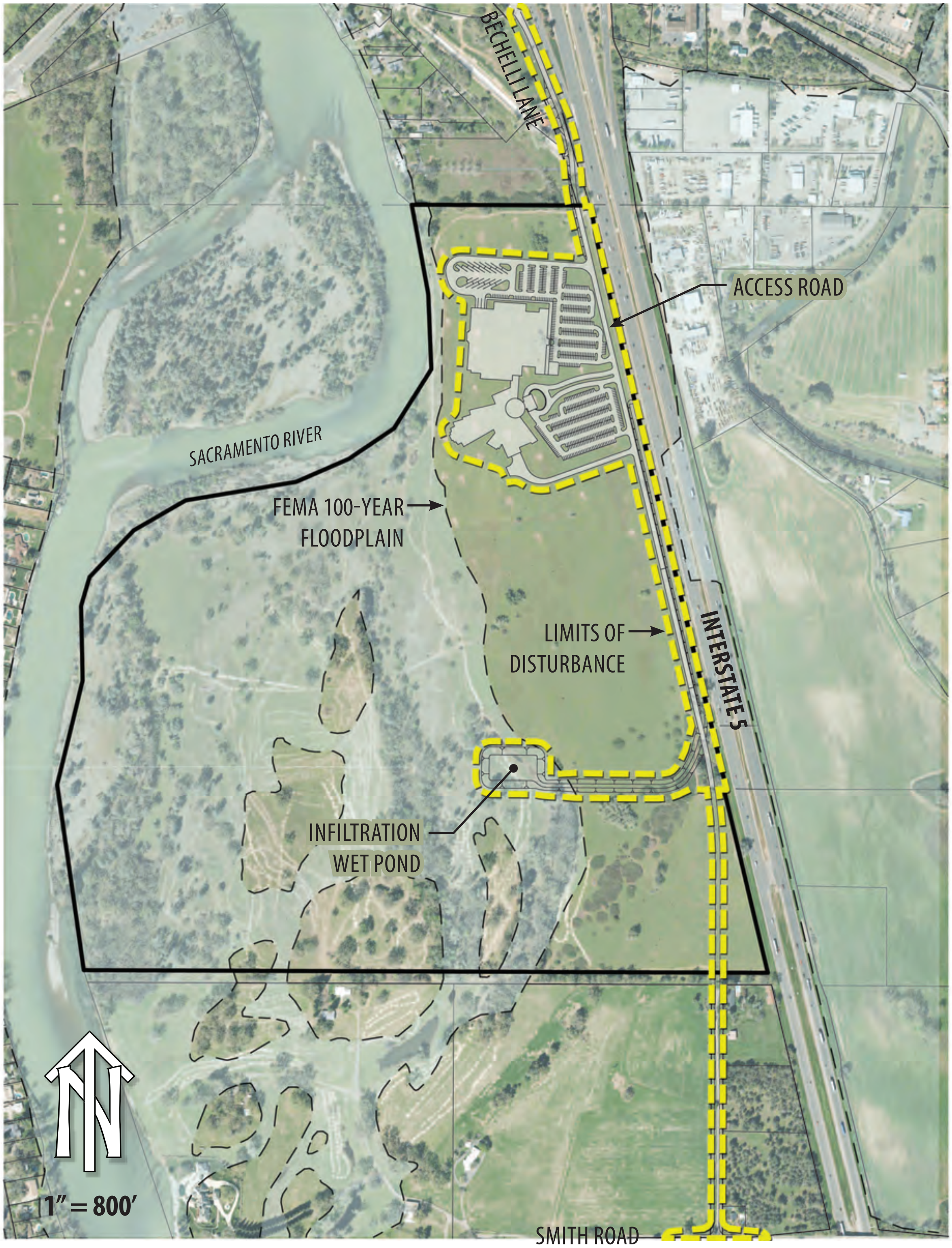
FIGURE C6
OVERALL DEVELOPABLE SITE DRAINAGE AREA- ALT 'C'
EXISTING CONDITION



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE C7
PROPOSED PROJECT - ALT 'C'
STORMWATER MANAGEMENT

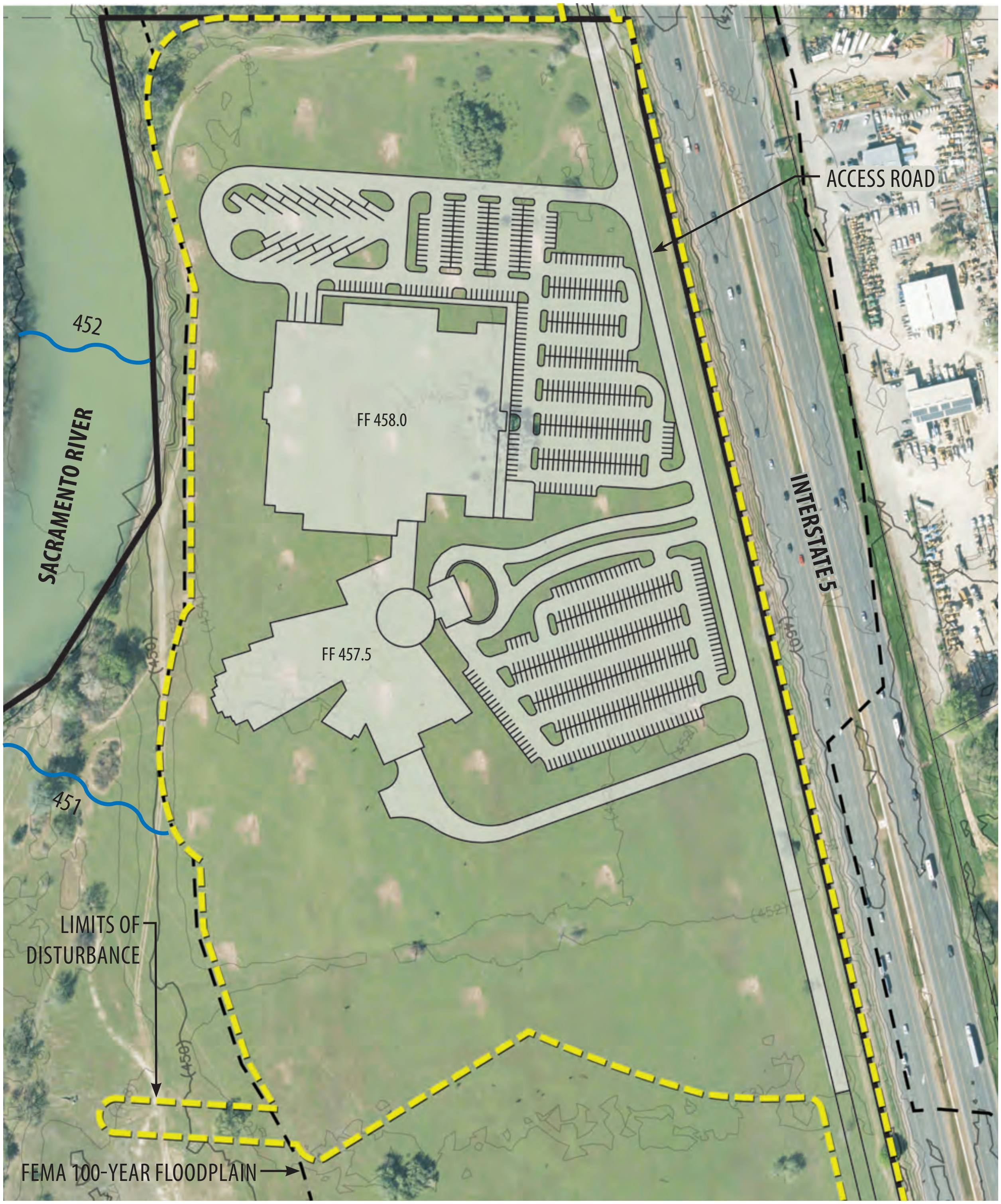
Figures – Alternative D



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D1
PROPOSED PROJECT - ALT 'D'
OVERALL DISTURBANCE LIMITS

REDDING RANCHERIA CASINO MASTER PLAN

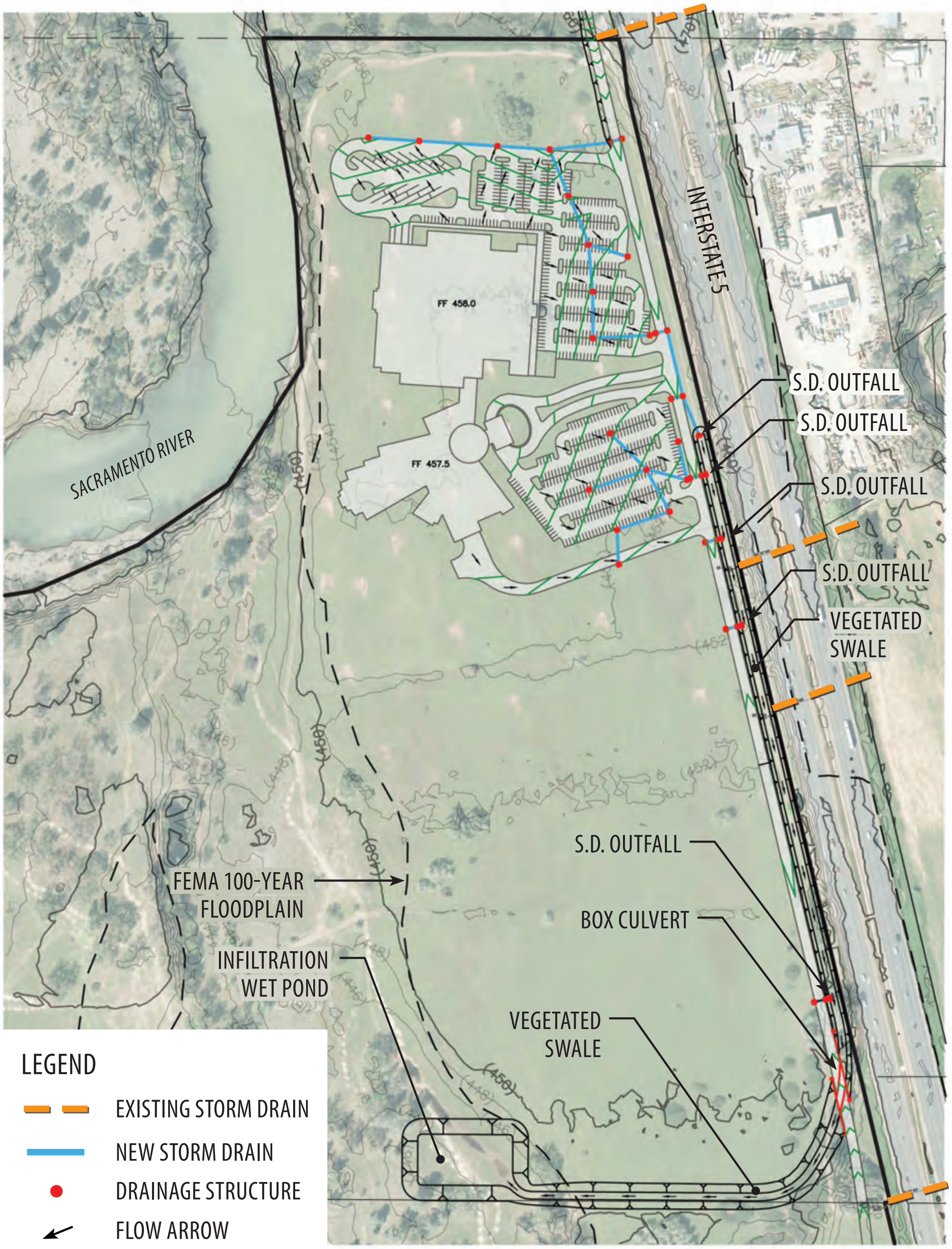


SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D2
PROPOSED PROJECT - ALT 'D'
ONSITE DISTURBANCE LIMITS

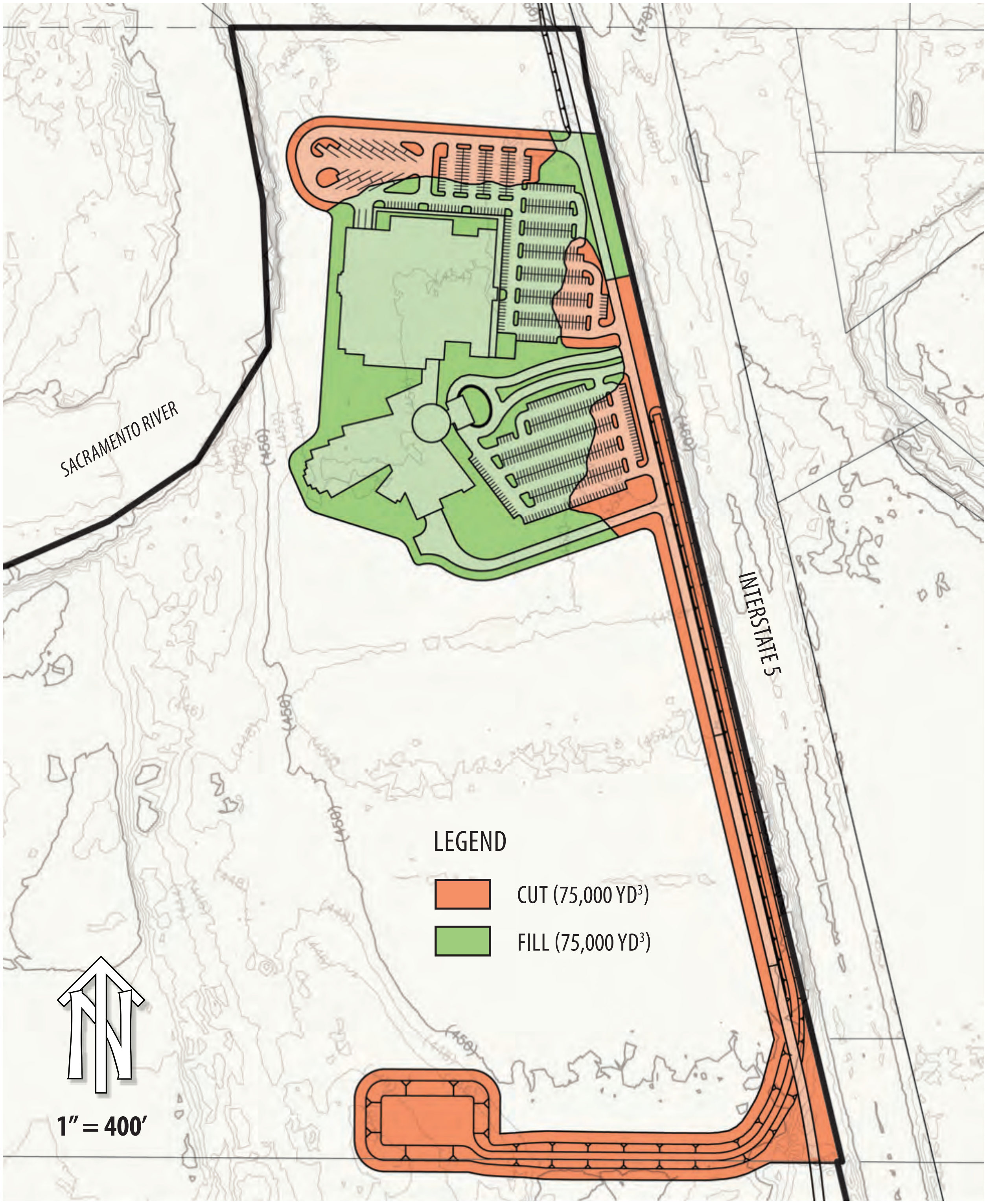
SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D3
PROPOSED PROJECT - ALT 'D'
ONSITE GRADING



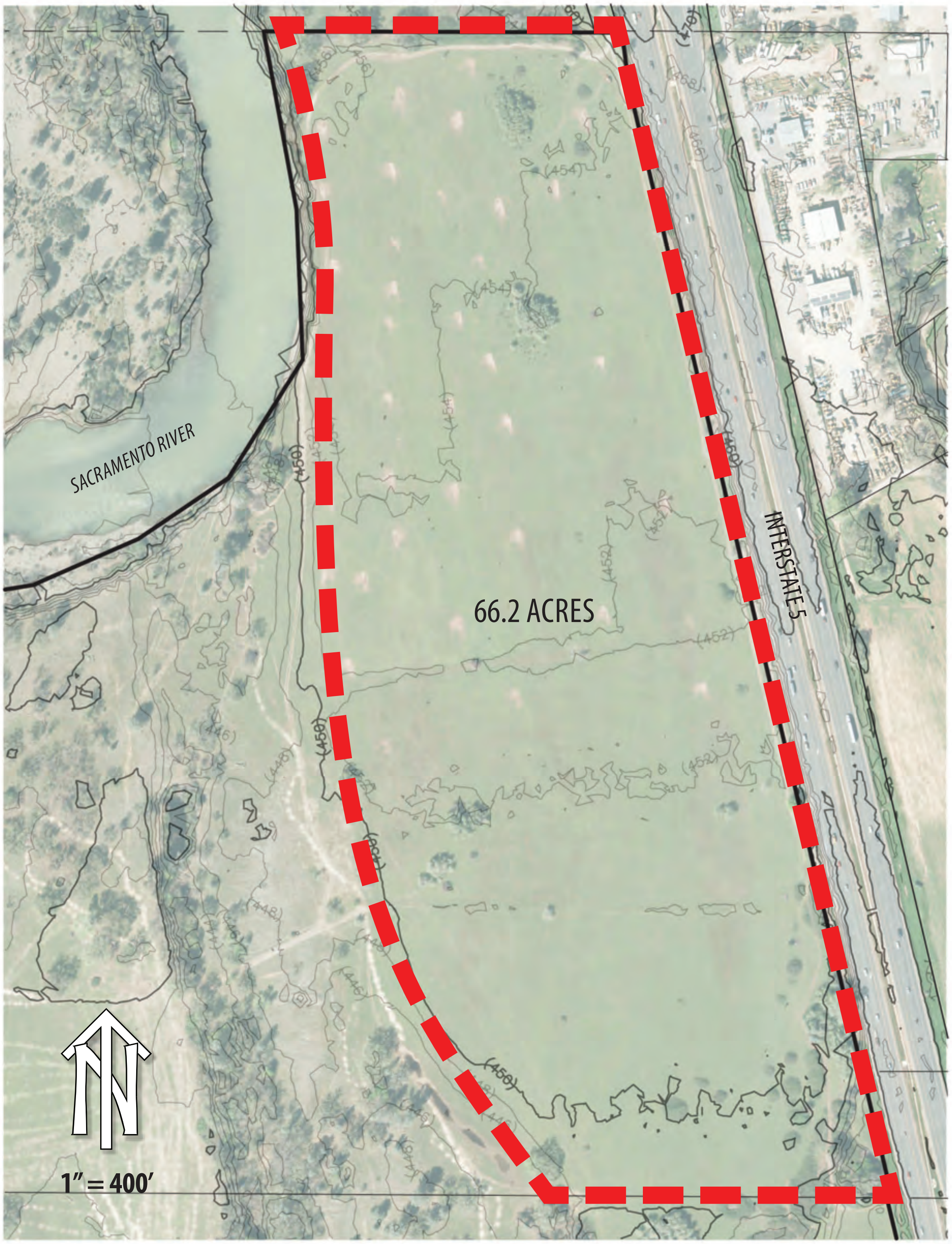
SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D4
PROPOSED PROJECT - ALT 'D'
OVERALL GRADING



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D5
PROPOSED PROJECT - ALT 'D'
CUT FILL DIAGRAM



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D6
OVERALL DEVELOPABLE SITE DRAINAGE AREA- ALT 'D'
EXISTING CONDITION

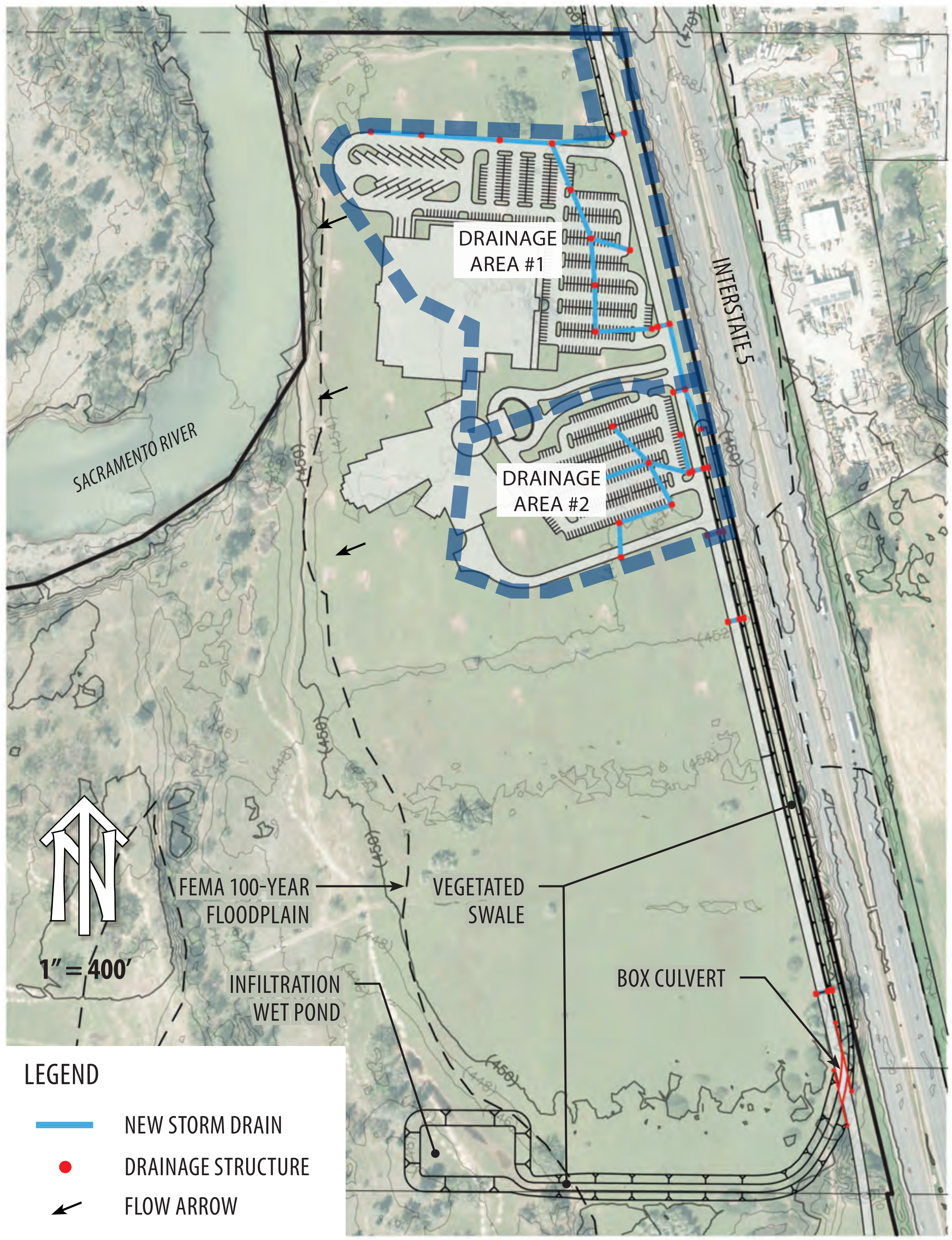
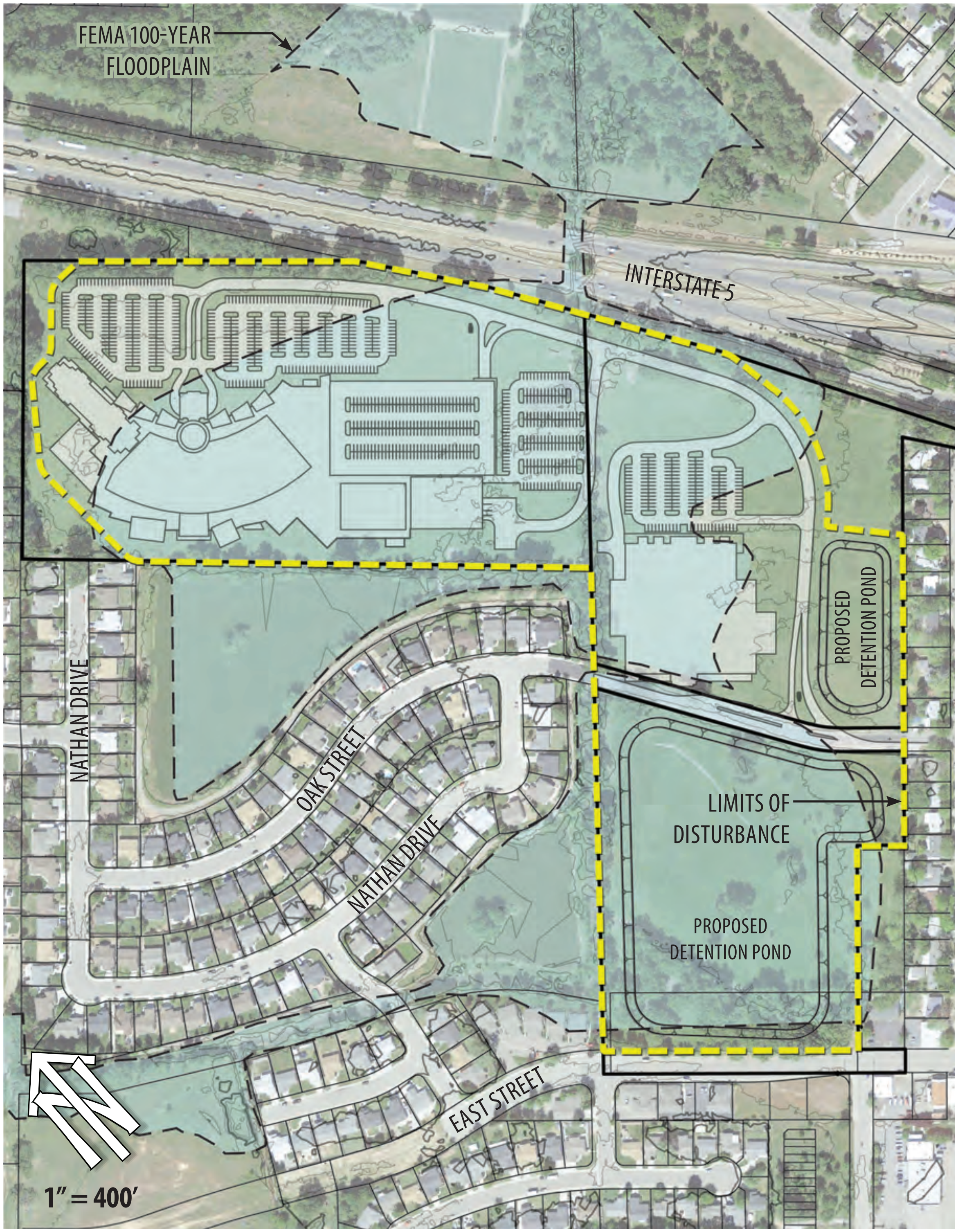


FIGURE D7
PROPOSED PROJECT - ALT 'D'
STORMWATER MANAGEMENT

Figures – Alternative E



SHARRAH DUNLAP SAWYER INCORPORATED

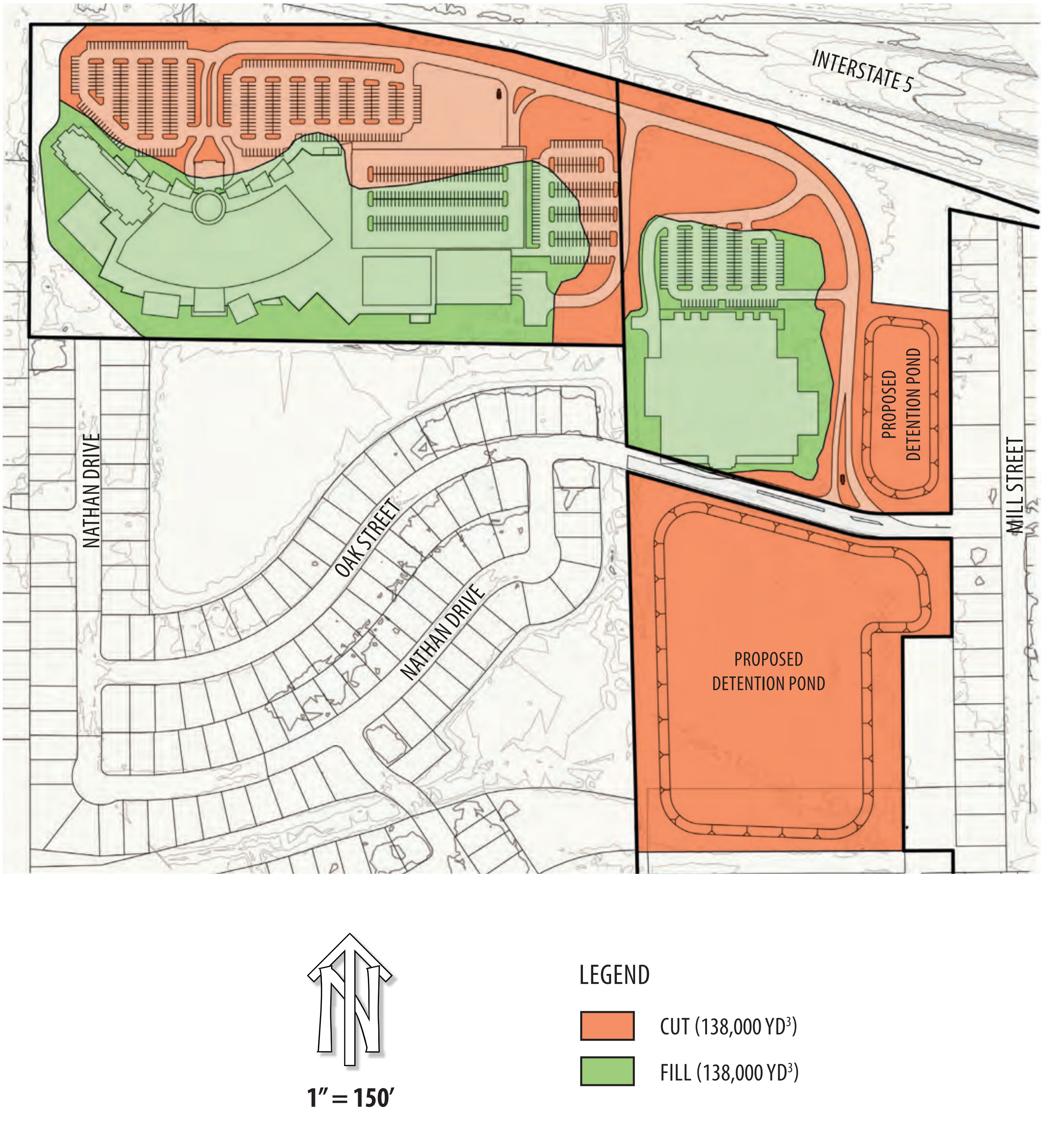
FIGURE E1
PROPOSED PROJECT - ALT 'E'
OVERALL DISTURBANCE LIMITS

REDDING RANCHERIA
CASINO MASTER PLAN

SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE E2
PROPOSED PROJECT - ALT 'E'
ONSITE GRADING

REDDING RANCHERIA
CASINO MASTER PLAN



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE E3
PROPOSED PROJECT - ALT 'E'
CUT FILL DIAGRAM

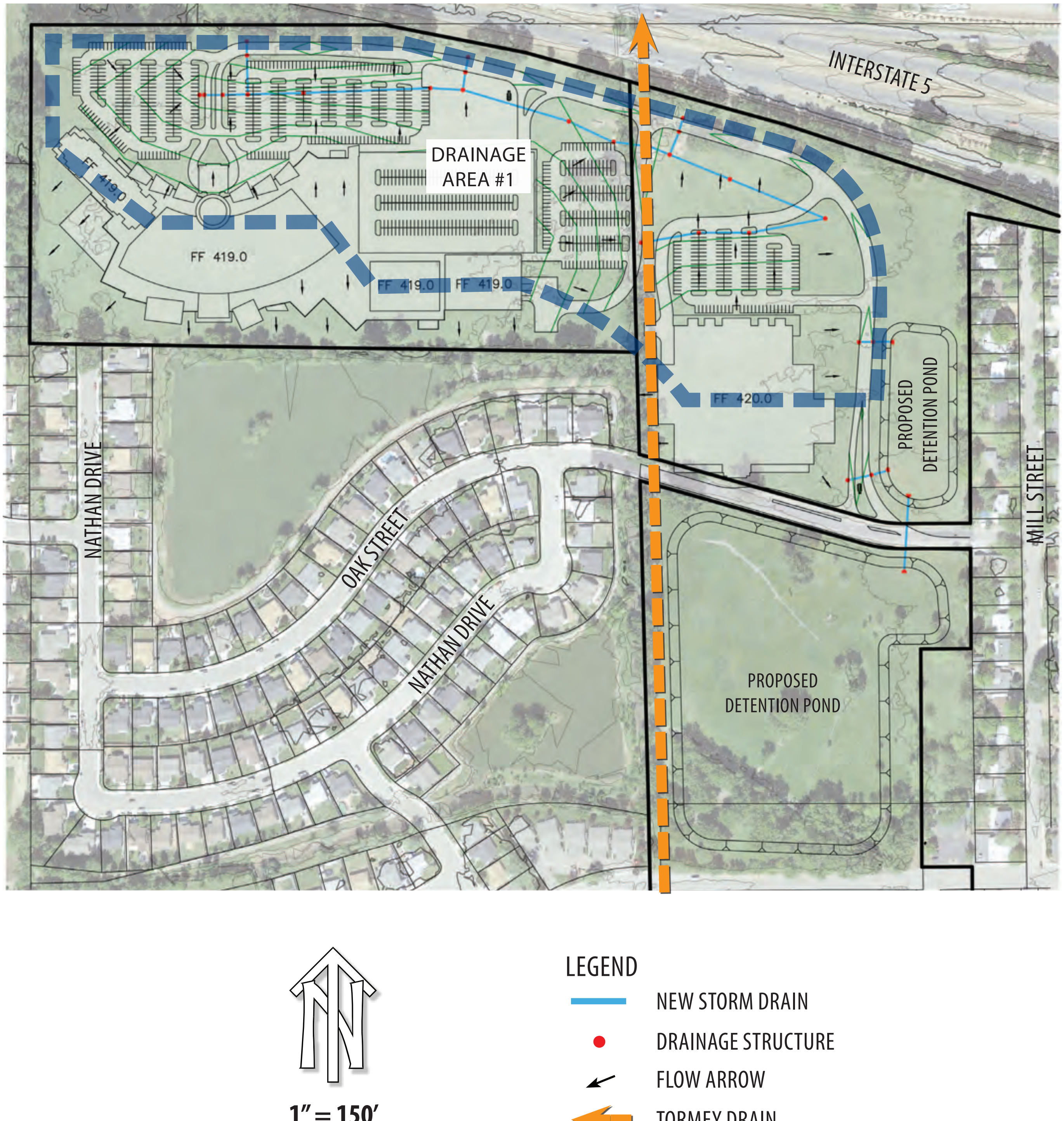


FIGURE E4
PROPOSED PROJECT - ALT 'E'
STORMWATER MANAGEMENT

Appendix A

Hydrology and Hydraulic Calculations

Existing Condition Subbasin Parameters

Subbasin:	BA
Mean Subbasin Elevation (ft):	450
Subbasin Area (Sq. Mi.):	0.1034375
Subbasin Area (acres):	66.2
Land Use:	Soil A:61% 14-Pasture/Parkland/Mowed Grass Soil A:39% 17- Open Oak/Pine Woodland/Grassland
Pervious Curve Number:	66
Pervious Overland Length (ft):	300
Pervious Overland Slope (ft/ft):	0.003
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	98
Impervious Overland Length (ft):	300
Impervious Overland Slope (ft/ft):	0.003
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	700
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.040
Representative Area (acres):	10.30
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	20.0
Collector #2 (pipe or channel):	street
Length (ft):	995
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.040
Representative Area (acres):	33.10
Width (ft)/Diameter (in) :	3.0
Sideslopes (ft/ft-H/V):	20.0
Collector #3 (pipe or channel):	street
Length (ft):	995
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.040
Representative Area (acres):	66.20
Width (ft)/Diameter (in) :	4.0
Sideslopes (ft/ft-H/V):	20.0

```
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 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN  1998                *
 *             VERSION 4.1               *
 *                                       *
 * RUN DATE  23MAR17  TIME  10:47:16     *
 *                                       *
 *****************************************
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```
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*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*        609 SECOND STREET              *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
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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
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```
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
```

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   3         ID   Recurrence Interval:  2 year
   4         ID   Storm Duration:       24 hours
   5         ID   Date Compiled:        03/23/2017
   6         ID   Total Area at Point of Interest: 66.2
             *
             *
             *
             *
   7         IT       1 23Mar17    0000    1800
   8         IO       5       0       0
```

```
  9         IN      5
            *
            * BA
            * Casino Master Plan Alternates A-D

 10         KK     BA
 11         KO      0
 12         PB  2.762
 13         PI  0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
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 26         PI  0.016    0.017    0.017    0.018    0.019    0.021    0.022    0.024    0.027    0.030
 27         PI  0.035    0.042    0.055    0.094    0.286    0.068    0.047    0.038    0.032    0.028
 28         PI  0.025    0.023    0.022    0.020    0.019    0.018    0.017    0.016    0.015    0.015
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 41         PI  0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
 42         BA 0.1034
 43         BF     -1    -0.01      1.1
 44         LS      0       66        0      .05       99        0
 45         UK    300    0.003    0.600       98
 46         UK    300    0.003    0.050        2
 47         RD    700   0.0030    0.040    0.016     TRAP      2.0     20.0
1                                       HEC-1 INPUT                                                     PAGE  2

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 49         RD    995   0.0030    0.040    0.103     TRAP      4.0     20.0
 50         ZZ
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*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*           JUN   1998                  *
*          VERSION 4.1                  *
*                                       *
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*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
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```
                    HEC-1 Input Filename: 16196pre2
                    Description:          Casino Master Plan Pre-development Flow
                    Recurrence Interval:  2 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/23/2017
                    Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    23Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     24  17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 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

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
            **************
            *            *
  10 KK     *      BA    *
            *            *
            **************

  11 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


     *** ROFGRD - MAXIMUM NUMBER OF DX INTERVALS REACHED. MDX=201
      THIS MAY AFFECT ACCURACY OF KW SOLUTION TO REDUCE ERRORS SHORTEN OVERLANDFLOW LENGTH PLANE 1
1
                                                 RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                 PEAK    TIME OF      AVERAGE FLOW FOR MAXIMUM PERIOD       BASIN   + MAXIMUM     TIME OF
      OPERATION        STATION   FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                      6-HOUR     24-HOUR     72-HOUR

      HYDROGRAPH AT
+                         BA        3.   18.27           2.          1.          1.          .10
1
                                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                     INTERPOLATED TO
                                                                   COMPUTATION INTERVAL
       ISTAQ    ELEMENT      DT        PEAK     TIME TO      VOLUME        DT        PEAK     TIME TO      VOLUME
                                                  PEAK                                          PEAK

                            (MIN)      (CFS)     (MIN)        (IN)       (MIN)      (CFS)     (MIN)        (IN)

          BA    MANE         1.00       2.66    1096.00        .42        1.00       2.66    1096.00        .42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2643E+01 OUTFLOW= .2305E+01 BASIN STORAGE= .8765E-01 PERCENT ERROR=   9.5


*** NORMAL END OF HEC-1 ***
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*            VERSION 4.1                *
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*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
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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
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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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

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   4           ID   Storm Duration:       24 hours
   5           ID   Date Compiled:        03/23/2017
   6           ID   Total Area at Point of Interest: 66.2
               *
               *
               *
               *
   7           IT       1 23Mar17    0000    1800
```

```
  8         IO      5       0       0
  9         IN      5
            *
            * BA
            * Casino Master Plan Alternates A-D

 10         KK     BA
 11         KO      0
 12         PB  3.599
 13         PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 14         PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 15         PI  0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
 16         PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 17         PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 18         PI  0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 19         PI  0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 20         PI  0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 21         PI  0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
 22         PI  0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
 23         PI  0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
 24         PI  0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
 25         PI  0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
 26         PI  0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
 27         PI  0.045   0.055   0.072   0.122   0.372   0.088   0.062   0.049   0.042   0.037
 28         PI  0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
 29         PI  0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
 30         PI  0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
 31         PI  0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
 32         PI  0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 33         PI  0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 34         PI  0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
 35         PI  0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 36         PI  0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
 37         PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 38         PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 39         PI  0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
 40         PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 41         PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 42         BA 0.1034
 43         BF     -1   -0.01     1.1
 44         LS      0      66       0     .05      99       0
 45         UK    300   0.003   0.600      98
 46         UK    300   0.003   0.050       2
 47         RD    700  0.0030   0.040   0.016    TRAP     2.0    20.0
1                                     HEC-1 INPUT                                          PAGE  2

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48         RD    995  0.0030   0.040   0.052    TRAP     3.0    20.0
```

```
          49            RD      995  0.0030    0.040    0.103     TRAP      4.0      20.0
          50            ZZ
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   23MAR17  TIME  10:55:33   *                                                            *          (916) 756-1104              *
 *                                       *                                                            *                                      *
*****************************************                                                            ****************************************



                                          HEC-1 Input Filename: 16196pre10
                                          Description:          Casino Master Plan Pre-development Flow
                                          Recurrence Interval:  10 year
                                          Storm Duration:       24 hours
                                          Date Compiled:        03/23/2017
                                          Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     23Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     24   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                       ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
  10 KK   *     BA     *
          *            *
          **************

  11 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                    RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                    PEAK   TIME OF    AVERAGE FLOW FOR MAXIMUM PERIOD     BASIN    MAXIMUM    TIME OF
        OPERATION      STATION      FLOW    PEAK                                          AREA     STAGE    MAX STAGE
+                                                     6-HOUR    24-HOUR    72-HOUR

        HYDROGRAPH AT
+                          BA         7.   16.03         5.        2.         2.          .10
1
                                     SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                         (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                      INTERPOLATED TO
                                                                   COMPUTATION INTERVAL
          ISTAQ    ELEMENT      DT        PEAK    TIME TO    VOLUME      DT        PEAK   TIME TO     VOLUME
                                                    PEAK                                    PEAK

                              (MIN)      (CFS)     (MIN)      (IN)     (MIN)      (CFS)    (MIN)       (IN)

              BA   MANE        1.00       6.55    962.00       .82      1.00       6.55   962.00        .82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4999E+01 OUTFLOW= .4546E+01 BASIN STORAGE= .9902E-01 PERCENT ERROR=   7.1


*** NORMAL END OF HEC-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   23MAR17  TIME  10:56:13  *               *          (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

             1         ID   HEC-1 Input Filename: 16196pre100
             2         ID   Description:          Casino Master Plan Pre-development Flow
             3         ID   Recurrence Interval:  100 year
             4         ID   Storm Duration:       24 hours
             5         ID   Date Compiled:        03/23/2017
             6         ID   Total Area at Point of Interest: 66.2
                       *
                       *
                       *
                       *
             7         IT       1 23Mar17    0000    1800
```

```
   8        IO      5       0       0
   9        IN      5
            *
            * BA
            * Casino Master Plan Alternates A-D

  10        KK     BA
  11        KO      0
  12        PB  5.069
  13        PI  0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  14        PI  0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008
  15        PI  0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  16        PI  0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  17        PI  0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  18        PI  0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.010   0.010
  19        PI  0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  20        PI  0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
  21        PI  0.011   0.011   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.012
  22        PI  0.013   0.013   0.013   0.013   0.013   0.013   0.014   0.014   0.014   0.014
  23        PI  0.014   0.015   0.015   0.015   0.015   0.015   0.016   0.016   0.016   0.016
  24        PI  0.017   0.017   0.017   0.018   0.018   0.019   0.019   0.019   0.020   0.020
  25        PI  0.021   0.021   0.022   0.023   0.023   0.024   0.025   0.026   0.027   0.028
  26        PI  0.029   0.030   0.032   0.034   0.036   0.038   0.041   0.045   0.049   0.055
  27        PI  0.064   0.077   0.101   0.172   0.526   0.125   0.087   0.070   0.059   0.052
  28        PI  0.047   0.043   0.040   0.037   0.035   0.033   0.031   0.030   0.028   0.027
  29        PI  0.026   0.025   0.024   0.024   0.023   0.022   0.022   0.021   0.021   0.020
  30        PI  0.020   0.019   0.019   0.018   0.018   0.018   0.017   0.017   0.017   0.016
  31        PI  0.016   0.016   0.016   0.015   0.015   0.015   0.015   0.014   0.014   0.014
  32        PI  0.014   0.014   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.012
  33        PI  0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011   0.011   0.011
  34        PI  0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
  35        PI  0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  36        PI  0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  37        PI  0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008
  38        PI  0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  39        PI  0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  40        PI  0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  41        PI  0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  42        BA 0.1034
  43        BF     -1   -0.01     1.1
  44        LS      0      66       0     .05      99       0
  45        UK    300   0.003   0.600      98
  46        UK    300   0.003   0.050       2
  47        RD    700  0.0030   0.040   0.016    TRAP     2.0    20.0
1                                      HEC-1 INPUT                                        PAGE  2

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48        RD    995  0.0030   0.040   0.052    TRAP     3.0    20.0
```

```
        49          RD     995  0.0030   0.040   0.103    TRAP     4.0     20.0
        50          ZZ
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   23MAR17  TIME  10:56:13    *                                             *         (916) 756-1104                *
*                                        *                                             *                                       *
*****************************************                                             *****************************************



                     HEC-1 Input Filename: 16196pre100
                     Description:          Casino Master Plan Pre-development Flow
                     Recurrence Interval:  100 year
                     Storm Duration:       24 hours
                     Date Compiled:        03/23/2017
                     Total Area at Point of Interest: 66.2

   8 IO           OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT           HYDROGRAPH TIME DATA
                         NMIN          1  MINUTES IN COMPUTATION INTERVAL
                        IDATE    23Mar17  STARTING DATE
                        ITIME       0000  STARTING TIME
                           NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE    24   17  ENDING DATE
                       NDTIME       0559  ENDING TIME
                        ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
  10 KK      *        BA  *
             *            *
             **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                   RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN    MAXIMUM    TIME OF
         OPERATION        STATION     FLOW    PEAK                                             AREA     STAGE    MAX STAGE
+                                                       6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                            BA        19.   14.35        12.          5.          4.          .10
1
                                     SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                         (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                         INTERPOLATED TO
                                                                      COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                      PEAK

                                (MIN)     (CFS)     (MIN)       (IN)      (MIN)     (CFS)     (MIN)       (IN)

                BA  MANE         1.00     18.61    861.00       1.69       1.00     18.61    861.00       1.69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1013E+02 OUTFLOW= .9309E+01 BASIN STORAGE= .1035E+00 PERCENT ERROR=   7.1


*** NORMAL END OF HEC-1 ***
```

Existing Condition Subbasin Parameters

Subbasin:	Basin E
Mean Subbasin Elevation (ft):	414
Subbasin Area (Sq. Mi.):	0.06328125
Subbasin Area (acres):	40.5
Land Use:	Soil A:75% Soil D:25% 14-Pasture/Parkland/Mowed Grass
Pervious Curve Number:	73
Pervious Overland Length (ft):	200
Pervious Overland Slope (ft/ft):	0.005
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	98
Impervious Overland Length (ft):	200
Impervious Overland Slope (ft/ft):	0.005
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	672
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.040
Representative Area (acres):	3.00
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	20.0
Collector #2 (pipe or channel):	street
Length (ft):	672
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.040
Representative Area (acres):	20.25
Width (ft)/Diameter (in) :	3.0
Sideslopes (ft/ft-H/V):	20.0
Collector #3 (pipe or channel):	street
Length (ft):	672
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.040
Representative Area (acres):	40.50
Width (ft)/Diameter (in) :	4.0
Sideslopes (ft/ft-H/V):	20.0

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*           JUN   1998                  *
*         VERSION 4.1                   *
*                                       *
*  RUN DATE  27MAR17  TIME  10:57:25    *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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

        1         ID   HEC-1 Input Filename: 16196preE
        2         ID   Description:          Casino Master Plan Alternative E Pre-development Flow
        3         ID   Recurrence Interval:  2 year
        4         ID   Storm Duration:       24 hours
        5         ID   Date Compiled:        03/27/2017
        6         ID   Total Area at Point of Interest: 40.5
                  *
                  *
                  *
                  *
        7         IT        1 27Mar17    0000    1800
```

```
  8          IO      5       0       0
  9          IN      5
             *
             * Basin E
             * Alternative E - Anderson, Ca

 10          KK  Basin
 11          KO      0
 12          PB  2.580
 13          PI  0.003   0.003   0.003   0.003   0.004   0.004   0.004   0.004   0.004   0.004
 14          PI  0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 15          PI  0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 16          PI  0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 17          PI  0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 18          PI  0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 19          PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 20          PI  0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
 21          PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 22          PI  0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 23          PI  0.007   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 24          PI  0.008   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010
 25          PI  0.011   0.011   0.011   0.011   0.012   0.012   0.013   0.013   0.014   0.014
 26          PI  0.015   0.015   0.016   0.017   0.018   0.020   0.021   0.023   0.025   0.028
 27          PI  0.033   0.040   0.052   0.089   0.278   0.065   0.045   0.036   0.030   0.027
 28          PI  0.024   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.014   0.014
 29          PI  0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011   0.010   0.010
 30          PI  0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008
 31          PI  0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007   0.007
 32          PI  0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
 33          PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 34          PI  0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 35          PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 36          PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.004   0.004
 37          PI  0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 38          PI  0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 39          PI  0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 40          PI  0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 41          PI  0.004   0.004   0.004   0.004   0.003   0.003   0.003   0.003
 42          BA 0.0632
 43          BF     -1   -0.01     1.1
 44          LS      0      73       0     .05      99       0
 45          UK    200   0.005   0.600      98
 46          UK    200   0.005   0.050       2
 47          RD    672  0.0050   0.040   0.005    TRAP     2.0    20.0
1                                                HEC-1 INPUT                                        PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48          RD    672  0.0050   0.040   0.032    TRAP     3.0    20.0
```

```
        49          RD     672  0.0050   0.040   0.063    TRAP     4.0     20.0
        50          ZZ
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   27MAR17  TIME  10:57:25    *                                      *           (916) 756-1104              *
*                                        *                                      *                                       *
*****************************************                                       *****************************************


                       HEC-1 Input Filename: 16196postE
                       Description:          Casino Master Plan Alternative E Pre-development Flow
                       Recurrence Interval:  2 year
                       Storm Duration:       24 hours
                       Date Compiled:        03/27/2017
                       Total Area at Point of Interest: 40.5

  8 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          1  MINUTES IN COMPUTATION INTERVAL
                      IDATE    27Mar17  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE    28   17  ENDING DATE
                     NDTIME       0559  ENDING TIME
                      ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .02 HOURS
                     TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
  10 KK   *   Basin    *
          *            *
          **************

  11 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL          0. HYDROGRAPH PLOT SCALE
1
                                                   RUNOFF SUMMARY
                                           FLOW IN CUBIC FEET PER SECOND
                                        TIME IN HOURS,  AREA IN SQUARE MILES

                                          PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD     BASIN    MAXIMUM     TIME OF
         OPERATION        STATION         FLOW     PEAK                                            AREA     STAGE     MAX STAGE
+                                                             6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                          Basin            4.    14.82          2.          1.          1.          .06
1
                                       SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                           (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                              INTERPOLATED TO
                                                                           COMPUTATION INTERVAL
          ISTAQ    ELEMENT      DT        PEAK    TIME TO    VOLUME      DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                     PEAK

                               (MIN)     (CFS)     (MIN)      (IN)      (MIN)    (CFS)     (MIN)       (IN)

           Basin   MANE         1.00      3.54     889.00      .62       1.00     3.54    889.00        .62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2184E+01 OUTFLOW= .2074E+01 BASIN STORAGE= .2573E-01 PERCENT ERROR=   3.8


*** NORMAL END OF HEC-1 ***
```

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*             VERSION 4.1               *
*                                       *
* RUN DATE   27MAR17  TIME  10:58:10    *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (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

       1        ID   HEC-1 Input Filename: 16196preE
       2        ID   Description:          Casino Master Plan Alternative E Pre-development Flow
       3        ID   Recurrence Interval:  10 year
       4        ID   Storm Duration:       24 hours
       5        ID   Date Compiled:        03/27/2017
       6        ID   Total Area at Point of Interest: 40.5
                *
                *
                *
                *
       7        IT       1 27Mar17    0000     1800
```

```
  8      IO      5       0       0
  9      IN      5
         *
         * Basin E
         * Alternative E - Anderson, Ca

 10      KK  Basin
 11      KO      0
 12      PB  3.362
 13      PI  0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 14      PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 15      PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 16      PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 17      PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 18      PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 19      PI  0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
 20      PI  0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 21      PI  0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 22      PI  0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 23      PI  0.009   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.011   0.011
 24      PI  0.011   0.011   0.011   0.012   0.012   0.012   0.012   0.013   0.013   0.013
 25      PI  0.014   0.014   0.015   0.015   0.015   0.016   0.016   0.017   0.018   0.018
 26      PI  0.019   0.020   0.021   0.022   0.024   0.025   0.027   0.030   0.033   0.037
 27      PI  0.043   0.052   0.068   0.116   0.362   0.084   0.059   0.047   0.040   0.035
 28      PI  0.031   0.029   0.026   0.025   0.023   0.022   0.021   0.020   0.019   0.018
 29      PI  0.017   0.017   0.016   0.016   0.015   0.015   0.014   0.014   0.014   0.013
 30      PI  0.013   0.013   0.012   0.012   0.012   0.012   0.011   0.011   0.011   0.011
 31      PI  0.011   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009
 32      PI  0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008   0.008
 33      PI  0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007
 34      PI  0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 35      PI  0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006
 36      PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 37      PI  0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.005   0.005
 38      PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 39      PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 40      PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 41      PI  0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 42      BA 0.0632
 43      BF     -1   -0.01     1.1
 44      LS      0      73       0     .05      99       0
 45      UK    200   0.005   0.600      98
 46      UK    200   0.005   0.050       2
 47      RD    672  0.0050   0.040   0.005    TRAP     2.0    20.0
1                                      HEC-1 INPUT                                        PAGE  2

LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48      RD    672  0.0050   0.040   0.032    TRAP     3.0    20.0
```

```
         49            RD     672  0.0050    0.040    0.063     TRAP      4.0      20.0
         50            ZZ
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   27MAR17  TIME  10:58:10   *                                                         *            (916) 756-1104            *
 *                                       *                                                         *                                      *
 *****************************************                                                         ****************************************


                           HEC-1 Input Filename: 16196postE
                           Description:          Casino Master Plan Alternative E Pre-development Flow
                           Recurrence Interval:  10 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/27/2017
                           Total Area at Point of Interest: 40.5

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT            5  PRINT CONTROL
                        IPLOT            0  PLOT CONTROL
                        QSCAL           0.  HYDROGRAPH PLOT SCALE

     IT           HYDROGRAPH TIME DATA
                         NMIN            1  MINUTES IN COMPUTATION INTERVAL
                        IDATE      27Mar17  STARTING DATE
                        ITIME         0000  STARTING TIME
                           NQ         1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE       28  17  ENDING DATE
                       NDTIME         0559  ENDING TIME
                        ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
   10 KK      *   Basin    *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                        RUNOFF SUMMARY
                                               FLOW IN CUBIC FEET PER SECOND
                                            TIME IN HOURS,  AREA IN SQUARE MILES

                                         PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM      TIME OF
        OPERATION         STATION        FLOW     PEAK                                             AREA      STAGE      MAX STAGE
+                                                              6-HOUR      24-HOUR     72-HOUR

        HYDROGRAPH AT
+                          Basin           8.    13.80            5.           2.          1.        .06
1
                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                             COMPUTATION INTERVAL
         ISTAQ    ELEMENT       DT         PEAK    TIME TO      VOLUME       DT        PEAK    TIME TO      VOLUME
                                                     PEAK                                        PEAK

                               (MIN)       (CFS)     (MIN)       (IN)       (MIN)      (CFS)    (MIN)        (IN)

          Basin   MANE          1.00        8.28    828.00       1.08        1.00       8.28    828.00        1.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3810E+01 OUTFLOW= .3642E+01 BASIN STORAGE= .2725E-01 PERCENT ERROR=   3.7


*** NORMAL END OF HEC-1 ***
```

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN   1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   27MAR17  TIME  10:58:57   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*     U.S. ARMY CORPS OF ENGINEERS      *
*     HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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

        1           ID   HEC-1 Input Filename: 16196preE
        2           ID   Description:          Casino Master Plan Alternative E Pre-development Flow
        3           ID   Recurrence Interval:  100 year
        4           ID   Storm Duration:       24 hours
        5           ID   Date Compiled:        03/27/2017
        6           ID   Total Area at Point of Interest: 40.5
                    *
                    *
                    *
                    *
        7           IT       1 27Mar17     0000     1800
```

```
   8         IO       5       0       0
   9         IN       5
             *
             * Basin E
             * Alternative E - Anderson, Ca

  10         KK  Basin
  11         KO       0
  12         PB   4.702
  13         PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.007
  14         PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  15         PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  16         PI   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008   0.008
  17         PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  18         PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  19         PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  20         PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  21         PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
  22         PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.013   0.013   0.013
  23         PI   0.013   0.013   0.014   0.014   0.014   0.014   0.014   0.015   0.015   0.015
  24         PI   0.015   0.016   0.016   0.016   0.017   0.017   0.017   0.018   0.018   0.019
  25         PI   0.019   0.020   0.020   0.021   0.022   0.022   0.023   0.024   0.025   0.026
  26         PI   0.027   0.028   0.030   0.031   0.033   0.036   0.038   0.042   0.046   0.052
  27         PI   0.060   0.073   0.096   0.163   0.509   0.118   0.082   0.065   0.055   0.049
  28         PI   0.044   0.040   0.037   0.034   0.032   0.030   0.029   0.028   0.026   0.025
  29         PI   0.024   0.023   0.023   0.022   0.021   0.021   0.020   0.019   0.019   0.018
  30         PI   0.018   0.018   0.017   0.017   0.017   0.016   0.016   0.016   0.015   0.015
  31         PI   0.015   0.015   0.014   0.014   0.014   0.014   0.013   0.013   0.013   0.013
  32         PI   0.013   0.013   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011
  33         PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
  34         PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009
  35         PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  36         PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  37         PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  38         PI   0.008   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  39         PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  40         PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  41         PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  42         BA  0.0632
  43         BF      -1   -0.01     1.1
  44         LS       0      73       0     .05      99       0
  45         UK     200   0.005   0.600      98
  46         UK     200   0.005   0.050       2
  47         RD     672  0.0050   0.040   0.005    TRAP     2.0    20.0
1                                      HEC-1 INPUT                                       PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48         RD     672  0.0050   0.040   0.032    TRAP     3.0    20.0
```

```
          49           RD    672  0.0050   0.040   0.063    TRAP    4.0   20.0
          50           ZZ
1*****************************************
*                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*             JUN   1998                *
*           VERSION 4.1                 *
*                                       *
* RUN DATE   27MAR17  TIME  10:58:57    *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

```
                    HEC-1 Input Filename: 16196postE
                    Description:          Casino Master Plan Alternative E Pre-development Flow
                    Recurrence Interval:  100 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/27/2017
                    Total Area at Point of Interest: 40.5

  8 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          1  MINUTES IN COMPUTATION INTERVAL
                      IDATE    27Mar17  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     28   17  ENDING DATE
                     NDTIME       0559  ENDING TIME
                      ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 10 KK    *   Basin    *
          *            *
          **************

 11 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                    RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                            PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD     BASIN    MAXIMUM     TIME OF
        OPERATION        STATION            FLOW      PEAK                                          AREA     STAGE     MAX STAGE
+                                                                 6-HOUR     24-HOUR     72-HOUR

        HYDROGRAPH AT
+                         Basin              21.    13.03           9.          3.          3.        .06
1
                                       SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                           (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                              INTERPOLATED TO
                                                                           COMPUTATION INTERVAL
          ISTAQ    ELEMENT       DT        PEAK     TIME TO     VOLUME      DT       PEAK     TIME TO      VOLUME
                                                     PEAK                                      PEAK

                                (MIN)      (CFS)     (MIN)       (IN)      (MIN)     (CFS)     (MIN)        (IN)

          Basin    MANE          1.00      20.79    782.00       1.98      1.00      20.79    782.00        1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7076E+01 OUTFLOW= .6662E+01 BASIN STORAGE= .2647E-01 PERCENT ERROR=   5.5


*** NORMAL END OF HEC-1 ***
```

Existing Condition 100-year Storm Event
Alternative E

Post-development Subbasin Parameters

Subbasin:	BA
Mean Subbasin Elevation (ft):	450
Subbasin Area (Sq. Mi.):	0.1034375
Subbasin Area (acres):	66.2
Land Use:	Soil A:62% 1-Commercial/Highways/Parking Soil A:36% 14-Pasture/Parkland/Mowed Grass Soil A:2% 17- Open Oak/Pine Woodland/Grassland
Pervious Curve Number:	76
Pervious Overland Length (ft):	100
Pervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	40
Impervious Overland Length (ft):	100
Impervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	200
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.030
Representative Area (acres):	10.30
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	15.0
Collector #2 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	33.10
Width (ft)/Diameter (in) :	24.0
Sideslopes (ft/ft-H/V):	0
Collector #3 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	66.20
Width (ft)/Diameter (in) :	36.0
Sideslopes (ft/ft-H/V):	0

```
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   07APR17  TIME  11:24:36   *                        *           (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

               1          ID   HEC-1 Input Filename: 16196post2
               2          ID   Description:          Casino Master Plan Post-development Flow
               3          ID   Recurrence Interval:  2 year
               4          ID   Storm Duration:       24 hours
               5          ID   Date Compiled:        04/07/2017
               6          ID   Total Area at Point of Interest: 66.2
                          *
                          *
                          *
                          *
               7          IT       1 07Apr17    0000    1800
               8          IO       5       0       0
```

```
   9            IN       5
                *
                * BA
                * Casino Master Plan

  10            KK      BA
  11            KO       0
  12            PB   2.762
  13            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20            PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21            PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22            PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23            PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24            PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25            PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26            PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27            PI   0.035   0.042   0.055   0.094   0.286   0.068   0.047   0.038   0.032   0.028
  28            PI   0.025   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29            PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30            PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31            PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32            PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33            PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34            PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35            PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38            PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42            BA  0.1034
  43            BF      -3    -0.1    1.05
  44            LS       0      76       0     .05      99       0
  45            UK     100   0.010   0.600      40
  46            UK     100   0.010   0.050      60
  47            RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                          HEC-1 INPUT                                                PAGE  2

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48            RD     900  0.0030   0.020   0.052    CIRC       2       0
  49            RD     900  0.0030   0.020   0.103    CIRC       3       0
  50            ZZ
```

```
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   07APR17  TIME  11:24:36    *                                                                   *           (916) 756-1104             *
 *                                        *                                                                   *                                      *
 *****************************************                                                                   ****************************************



                           HEC-1 Input Filename: 16196post2
                           Description:          Casino Master Plan Post-development Flow
                           Recurrence Interval:  2 year
                           Storm Duration:       24 hours
                           Date Compiled:        04/07/2017
                           Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE      7Apr17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      8   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
             **************
             *            *
   10 KK     *        BA  *
             *            *
             **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                                            RUNOFF SUMMARY
                                                                    FLOW IN CUBIC FEET PER SECOND
                                                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                    AREA      STAGE     MAX STAGE
+                                                                    6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA        87.   12.15          13.          7.          6.        .10
1
                                                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                    INTERPOLATED TO
                                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                       PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00     86.72    729.00      1.42      1.00     86.72    729.00        1.42

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1054E+02 OUTFLOW= .7838E+01 BASIN STORAGE= .4305E-02 PERCENT ERROR=  25.6



 *** NORMAL END OF HEC-1 ***



                                                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                    INTERPOLATED TO
                                                                                                 COMPUTATION INTERVAL
```

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
BA	MANE	1.00	86.23	729.00	1.43	1.00	86.23	729.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1037E+02 OUTFLOW= .7681E+01 BASIN STORAGE= .4190E-02 PERCENT ERROR= 25.9

*** NORMAL END OF HEC-1 ***

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   23MAR17  TIME  11:00:15   *
 *                                       *
 *****************************************

 ***************************************
 *                                     *
 *    U.S. ARMY CORPS OF ENGINEERS     *
 *    HYDROLOGIC ENGINEERING CENTER    *
 *          609 SECOND STREET          *
 *       DAVIS, CALIFORNIA 95616       *
 *           (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

            1           ID   HEC-1 Input Filename: 16196post10
            2           ID   Description:          Casino Master Plan Post-development Flow
            3           ID   Recurrence Interval:  10 year
            4           ID   Storm Duration:       24 hours
            5           ID   Date Compiled:        03/23/2017
            6           ID   Total Area at Point of Interest: 66.2
                        *
                        *
                        *
                        *
            7           IT       1 23Mar17    0000    1800
            8           IO       5       0       0
```

```
  9           IN       5
              *
              * BA
              * Casino Master Plan

 10           KK      BA
 11           KO       0
 12           PB   3.599
 13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
 16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
 22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
 23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
 24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
 25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
 26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
 27           PI   0.045   0.055   0.072   0.122   0.372   0.088   0.062   0.049   0.042   0.037
 28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
 29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
 30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
 31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
 32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
 35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
 37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
 40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 42           BA  0.1034
 43           BF      -5    -0.1    1.05
 44           LS       0      76       0     .05      99       0
 45           UK     100   0.010   0.600      40
 46           UK     100   0.010   0.050      60
 47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                HEC-1 INPUT                                              PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     900  0.0030   0.020   0.052    CIRC       2       0
 49           RD     900  0.0030   0.020   0.103    CIRC       3       0
 50           ZZ
```

```
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   23MAR17  TIME  11:00:15   *                        *           (916) 756-1104            *
 *                                       *                        *                                     *
 *****************************************                        ***************************************
```

```
                       HEC-1 Input Filename: 16196post10
                       Description:          Casino Master Plan Post-development Flow
                       Recurrence Interval:  10 year
                       Storm Duration:       24 hours
                       Date Compiled:        03/23/2017
                       Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     23Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     24   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
           **************
           *            *
   10 KK   *        BA  *
           *            *
           **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                     RUNOFF SUMMARY
                                             FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                           PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION          FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                               6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA           118.   12.15          18.          9.          8.        .10
1
                                                 SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                     (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                     INTERPOLATED TO
                                                                                  COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00    117.46    729.00      1.92      1.00    117.46    729.00        1.92

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1459E+02 OUTFLOW= .1059E+02 BASIN STORAGE= .4445E-02 PERCENT ERROR=  27.4



 *** NORMAL END OF HEC-1 ***
```


```
                                                     (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                     INTERPOLATED TO
                                                                                  COMPUTATION INTERVAL
```

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
BA	MANE	1.00	86.23	729.00	1.43	1.00	86.23	729.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1037E+02 OUTFLOW= .7681E+01 BASIN STORAGE= .4190E-02 PERCENT ERROR= 25.9

*** NORMAL END OF HEC-1 ***

```
1***************************************
 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *              JUN   1998             *
 *           VERSION 4.1               *
 *                                     *
 *  RUN DATE   23MAR17  TIME  11:01:41  *
 *                                     *
 ***************************************
```

```
***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (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

             1            ID   HEC-1 Input Filename: 16196post100
             2            ID   Description:          Casino Master Plan Post-development Flow
             3            ID   Recurrence Interval:  100 year
             4            ID   Storm Duration:       24 hours
             5            ID   Date Compiled:        03/23/2017
             6            ID   Total Area at Point of Interest: 66.2
                          *
                          *
                          *
                          *
             7            IT       1 23Mar17    0000    1800
```

```
  8           IO       5       0       0
  9           IN       5
              *
              * BA
              * Casino Master Plan

 10           KK      BA
 11           KO       0
 12           PB   5.069
 13           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 14           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008
 15           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 16           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 17           PI   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 18           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.010   0.010
 19           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
 20           PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
 21           PI   0.011   0.011   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.012
 22           PI   0.013   0.013   0.013   0.013   0.013   0.013   0.014   0.014   0.014   0.014
 23           PI   0.014   0.015   0.015   0.015   0.015   0.015   0.016   0.016   0.016   0.016
 24           PI   0.017   0.017   0.017   0.018   0.018   0.019   0.019   0.019   0.020   0.020
 25           PI   0.021   0.021   0.022   0.023   0.023   0.024   0.025   0.026   0.027   0.028
 26           PI   0.029   0.030   0.032   0.034   0.036   0.038   0.041   0.045   0.049   0.055
 27           PI   0.064   0.077   0.101   0.172   0.526   0.125   0.087   0.070   0.059   0.052
 28           PI   0.047   0.043   0.040   0.037   0.035   0.033   0.031   0.030   0.028   0.027
 29           PI   0.026   0.025   0.024   0.024   0.023   0.022   0.022   0.021   0.021   0.020
 30           PI   0.020   0.019   0.019   0.018   0.018   0.018   0.017   0.017   0.017   0.016
 31           PI   0.016   0.016   0.016   0.015   0.015   0.015   0.015   0.014   0.014   0.014
 32           PI   0.014   0.014   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.012
 33           PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011   0.011   0.011
 34           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
 35           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
 36           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 37           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008
 38           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 39           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 40           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 41           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 42           BA  0.1034
 43           BF     -10    -0.1    1.05
 44           LS       0      76       0     .05      99       0
 45           UK     100   0.010   0.600      40
 46           UK     100   0.010   0.050      60
 47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                       HEC-1 INPUT                                          PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     900  0.0030   0.020   0.052    CIRC       2       0
```

```
          49          RD     900  0.0030   0.020   0.103    CIRC       3       0
          50          ZZ
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   23MAR17  TIME  11:01:41   *                                               *           (916) 756-1104            *
 *                                       *                                               *                                     *
*****************************************                                                ***************************************



                          HEC-1 Input Filename: 16196post100
                          Description:          Casino Master Plan Post-development Flow
                          Recurrence Interval:  100 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/23/2017
                          Total Area at Point of Interest: 66.2

   8 IO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT         HYDROGRAPH TIME DATA
                       NMIN          1  MINUTES IN COMPUTATION INTERVAL
                      IDATE    23Mar17  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE    24   17  ENDING DATE
                     NDTIME       0559  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *        BA  *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                    RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                       PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION       FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                             BA       174.   12.15          28.         14.         12.        .10
1
                                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                              INTERPOLATED TO
                                                                           COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                BA  MANE         1.00    173.82    729.00      3.20      1.00    173.82    729.00       3.20

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2200E+02 OUTFLOW= .1764E+02 BASIN STORAGE= .4494E-02 PERCENT ERROR=  19.8



 *** NORMAL END OF HEC-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   23MAR17  TIME  11:47:01   *                          *           (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

              1           ID   HEC-1 Input Filename: 16196post2
              2           ID   Description:          Drainage Area #1 Post-development Flow
              3           ID   Recurrence Interval:  2 year
              4           ID   Storm Duration:       24 hours
              5           ID   Date Compiled:        03/23/2017
              6           ID   Total Area at Point of Interest: 15.7
                          *
                          *
                          *
                          *
              7           IT       1 23Mar17    0000    1800
              8           IO       5       0       0
```

```
   9           IN       5
               *
               * BA
               * Casino Master Plan

  10           KK      BA
  11           KO       0
  12           PB   2.767
  13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27           PI   0.035   0.042   0.055   0.094   0.290   0.068   0.047   0.038   0.032   0.028
  28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42           BA  0.0245
  43           BF      -3    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                          HEC-1 INPUT                                                   PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     582  0.0030   0.020   0.012    CIRC       2       0
  49           RD     582  0.0030   0.020   0.025    CIRC     2.5       0
  50           ZZ
```

```
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   23MAR17  TIME  11:47:01  *                                                    *           (916) 756-1104             *
 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************



                           HEC-1 Input Filename: 16196post2
                           Description:          Drainage Area #1 Post-development Flow
                           Recurrence Interval:  2 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/23/2017
                           Total Area at Point of Interest: 15.7

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     23Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     24   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                              RUNOFF SUMMARY
                                                      FLOW IN CUBIC FEET PER SECOND
                                                   TIME IN HOURS,  AREA IN SQUARE MILES

                                              PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                                AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                             BA        36.   12.13           5.          2.          2.        .02
1
                                                 SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                     (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                   INTERPOLATED TO
                                                                                COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                   PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                BA  MANE         1.00     35.91    728.00      1.68      1.00     35.91    728.00       1.68

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3322E+01 OUTFLOW= .2190E+01 BASIN STORAGE= .1182E-02 PERCENT ERROR=  34.1



 *** NORMAL END OF HEC-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   23MAR17  TIME  11:45:37  *                                      *         (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

             1           ID   HEC-1 Input Filename: 16196post10
             2           ID   Description:          Drainage Area #1 Post-development Flow
             3           ID   Recurrence Interval:  10 year
             4           ID   Storm Duration:       24 hours
             5           ID   Date Compiled:        03/23/2017
             6           ID   Total Area at Point of Interest: 15.7
                         *
                         *
                         *
                         *
             7           IT       1 23Mar17    0000    1800
```

```
   8          IO      5      0      0
   9          IN      5
              *
              * BA
              * Casino Master Plan

  10          KK     BA
  11          KO      0
  12          PB  3.605
  13          PI  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005
  14          PI  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005
  15          PI  0.005  0.005  0.005  0.005  0.006  0.006  0.006  0.006  0.006  0.006
  16          PI  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006
  17          PI  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006
  18          PI  0.006  0.006  0.006  0.007  0.007  0.007  0.007  0.007  0.007  0.007
  19          PI  0.007  0.007  0.007  0.007  0.007  0.007  0.007  0.007  0.007  0.007
  20          PI  0.007  0.007  0.008  0.008  0.008  0.008  0.008  0.008  0.008  0.008
  21          PI  0.008  0.008  0.008  0.008  0.008  0.009  0.009  0.009  0.009  0.009
  22          PI  0.009  0.009  0.009  0.009  0.009  0.010  0.010  0.010  0.010  0.010
  23          PI  0.010  0.010  0.010  0.011  0.011  0.011  0.011  0.011  0.012  0.012
  24          PI  0.012  0.012  0.012  0.013  0.013  0.013  0.013  0.014  0.014  0.014
  25          PI  0.015  0.015  0.016  0.016  0.017  0.017  0.018  0.018  0.019  0.020
  26          PI  0.021  0.022  0.023  0.024  0.025  0.027  0.029  0.032  0.035  0.039
  27          PI  0.045  0.055  0.072  0.122  0.378  0.089  0.062  0.049  0.042  0.037
  28          PI  0.033  0.030  0.028  0.026  0.025  0.023  0.022  0.021  0.020  0.019
  29          PI  0.019  0.018  0.017  0.017  0.016  0.016  0.015  0.015  0.015  0.014
  30          PI  0.014  0.014  0.013  0.013  0.013  0.012  0.012  0.012  0.012  0.012
  31          PI  0.011  0.011  0.011  0.011  0.011  0.011  0.010  0.010  0.010  0.010
  32          PI  0.010  0.010  0.010  0.009  0.009  0.009  0.009  0.009  0.009  0.009
  33          PI  0.009  0.009  0.009  0.008  0.008  0.008  0.008  0.008  0.008  0.008
  34          PI  0.008  0.008  0.008  0.008  0.008  0.008  0.007  0.007  0.007  0.007
  35          PI  0.007  0.007  0.007  0.007  0.007  0.007  0.007  0.007  0.007  0.007
  36          PI  0.007  0.007  0.007  0.007  0.007  0.007  0.006  0.006  0.006  0.006
  37          PI  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006
  38          PI  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006  0.006
  39          PI  0.006  0.006  0.006  0.006  0.005  0.005  0.005  0.005  0.005  0.005
  40          PI  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005
  41          PI  0.005  0.005  0.005  0.005  0.005  0.005  0.005  0.005
  42          BA 0.0245
  43          BF     -5   -0.1   1.05
  44          LS      0     80      0    .05     99      0
  45          UK    100  0.010  0.600      5
  46          UK    100  0.010  0.050     95
  47          RD    200 0.0030  0.030  0.016   TRAP    2.0   15.0
1                                        HEC-1 INPUT                                        PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD    582 0.0030  0.020  0.012   CIRC      2      0
```

```
           49           RD     582  0.0030   0.020   0.025    CIRC     2.5       0
           50           ZZ
1***************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   23MAR17  TIME  11:45:37   *
 *                                       *
 ***************************************
```

```
***************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
***************************************
```

```
                         HEC-1 Input Filename: 16196post10
                         Description:          Drainage Area #1 Post-development Flow
                         Recurrence Interval:  10 year
                         Storm Duration:       24 hours
                         Date Compiled:        03/23/2017
                         Total Area at Point of Interest: 15.7

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     23Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     24   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   29.98 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
```

```
 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
   10 KK    *        BA  *
            *            *
            **************

   11 KO         OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                   RUNOFF SUMMARY
                                           FLOW IN CUBIC FEET PER SECOND
                                        TIME IN HOURS,  AREA IN SQUARE MILES

                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                             BA        47.   12.12           6.          3.          3.        .02
1
                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                    PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                BA  MANE         1.00     46.58    727.00      2.35      1.00     46.58    727.00       2.35

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4403E+01 OUTFLOW= .3076E+01 BASIN STORAGE= .1184E-02 PERCENT ERROR=  30.1



 *** NORMAL END OF HEC-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   24MAR17  TIME  10:22:48   *                                                     *           (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

             1            ID   HEC-1 Input Filename: 16196post2
             2            ID   Description:          Casino Master Plan Post-development Flow
             3            ID   Recurrence Interval:  2 year
             4            ID   Storm Duration:       24 hours
             5            ID   Date Compiled:        03/24/2017
             6            ID   Total Area at Point of Interest: 4.3
                          *
                          *
                          *
                          *
             7            IT       1 24Mar17    0000    1800
```

```
   8           IO       5       0       0
   9           IN       5
               *
               * DA2
               * Casino Master Plan

  10           KK     DA2
  11           KO       0
  12           PB   2.769
  13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27           PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
  28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42           BA  0.0067
  43           BF      -3    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                   HEC-1 INPUT                                                   PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     250  0.0030   0.020   0.007    CIRC       2       0
          50           ZZ
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   24MAR17  TIME  10:22:48   *                                                 *           (916) 756-1104            *
 *                                       *                                                 *                                     *
 ****************************************                                                 ***************************************



                            HEC-1 Input Filename: 16196post2
                            Description:          Casino Master Plan Post-development Flow
                            Recurrence Interval:  2 year
                            Storm Duration:       24 hours
                            Date Compiled:        03/24/2017
                            Total Area at Point of Interest: 4.3

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    24Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                       ICENT         19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *       DA2  *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                             RUNOFF SUMMARY
                                                     FLOW IN CUBIC FEET PER SECOND
                                                  TIME IN HOURS,  AREA IN SQUARE MILES

                                            PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION       FLOW     PEAK                                                AREA      STAGE     MAX STAGE
+                                                            6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA2        10.   12.12          1.          1.          1.        .01
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                        INTERPOLATED TO
                                                                                     COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                      PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA2  MANE         1.00     10.37    727.00      1.90      1.00     10.37    727.00       1.90

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9092E+00 OUTFLOW= .6794E+00 BASIN STORAGE= .7719E-03 PERCENT ERROR=  25.2



 *** NORMAL END OF HEC-1 ***
```

Post-development 2-year Storm Event
Alternative A Drainage Area #2

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   24MAR17  TIME  10:21:43   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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

            1            ID   HEC-1 Input Filename: 16196post10
            2            ID   Description:          Casino Master Plan Post-development Flow
            3            ID   Recurrence Interval:  10 year
            4            ID   Storm Duration:       24 hours
            5            ID   Date Compiled:        03/24/2017
            6            ID   Total Area at Point of Interest: 4.3
                         *
                         *
                         *
                         *
            7            IT       1 24Mar17    0000    1800
```

```
     8           IO       5       0       0
     9           IN       5
                 *
                 * DA2
                 * Casino Master Plan

    10           KK     DA2
    11           KO       0
    12           PB   3.608
    13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
    16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
    22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
    23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
    24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
    25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
    26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
    27           PI   0.045   0.055   0.072   0.122   0.381   0.089   0.062   0.049   0.042   0.037
    28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
    29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
    30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
    31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
    32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
    33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
    35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
    37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
    40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    42           BA  0.0067
    43           BF      -5    -0.1    1.05
    44           LS       0      80       0     .05      99       0
    45           UK     100   0.010   0.600       5
    46           UK     100   0.010   0.050      95
    47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                            HEC-1 INPUT                                          PAGE  2

 LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    48           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     250  0.0030   0.020   0.007    CIRC       2       0
          50           ZZ
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   24MAR17  TIME  10:21:43   *                                                   *           (916) 756-1104            *
 *                                       *                                                   *                                     *
 ****************************************                                                   ***************************************



                           HEC-1 Input Filename: 16196post10
                           Description:          Casino Master Plan Post-development Flow
                           Recurrence Interval:  10 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/24/2017
                           Total Area at Point of Interest: 4.3

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     24Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
  10 KK   *       DA2  *
          *            *
          **************

  11 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                  RUNOFF SUMMARY
                                          FLOW IN CUBIC FEET PER SECOND
                                       TIME IN HOURS,  AREA IN SQUARE MILES

                                  PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                          AREA      STAGE     MAX STAGE
+                                                       6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                            DA2        14.   12.12          2.          1.          1.        .01
1
                                       SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                           (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                              INTERPOLATED TO
                                                                           COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                      PEAK

                              (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

               DA2  MANE         1.00     14.01    727.00      2.64      1.00     14.01    727.00       2.64

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1205E+01 OUTFLOW= .9442E+00 BASIN STORAGE= .7690E-03 PERCENT ERROR=  21.6



 *** NORMAL END OF HEC-1 ***
```

Post-development 10-year Storm Event
Alternative A Drainage Area #2

```
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   24MAR17  TIME  11:26:21   *                                         *          (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

             1            ID   HEC-1 Input Filename: 16196post2
             2            ID   Description:          Casino Master Plan Post-development Flow
             3            ID   Recurrence Interval:  2 year
             4            ID   Storm Duration:       24 hours
             5            ID   Date Compiled:        03/24/2017
             6            ID   Total Area at Point of Interest: 5.8
                          *
                          *
                          *
                          *
             7            IT       1 24Mar17    0000    1800
```

```
   8           IO       5       0       0
   9           IN       5
               *
               * DA3
               * Casino Master Plan

  10           KK     DA3
  11           KO       0
  12           PB   2.769
  13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27           PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
  28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42           BA  0.0090
  43           BF      -3    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                  HEC-1 INPUT                                               PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
           49           RD     250  0.0030   0.020   0.009    CIRC       2       0
           50           ZZ
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   24MAR17  TIME  11:26:21   *                                                  *           (916) 756-1104             *
 *                                       *                                                  *                                      *
 ****************************************                                                  ****************************************


                       HEC-1 Input Filename: 16196post2
                       Description:          Casino Master Plan Post-development Flow
                       Recurrence Interval:  2 year
                       Storm Duration:       24 hours
                       Date Compiled:        03/24/2017
                       Total Area at Point of Interest: 5.8

  8 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN           1  MINUTES IN COMPUTATION INTERVAL
                      IDATE     24Mar17  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     25   17  ENDING DATE
                     NDTIME        0559  ENDING TIME
                     ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
   10 KK    *       DA3  *
            *            *
            **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                            RUNOFF SUMMARY
                                                    FLOW IN CUBIC FEET PER SECOND
                                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                         PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                             AREA      STAGE     MAX STAGE
+                                                           6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA3        14.   12.12          2.          1.          1.        .01
1
                                             SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                      PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA3  MANE         1.00     13.85    727.00      1.93      1.00     13.85    727.00       1.93

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1221E+01 OUTFLOW= .9284E+00 BASIN STORAGE= .9693E-03 PERCENT ERROR=  23.9



 *** NORMAL END OF HEC-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   24MAR17  TIME  11:30:15  *                    *           (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

            1           ID   HEC-1 Input Filename: 16196post10
            2           ID   Description:          Casino Master Plan Post-development Flow
            3           ID   Recurrence Interval:  10 year
            4           ID   Storm Duration:       24 hours
            5           ID   Date Compiled:        03/24/2017
            6           ID   Total Area at Point of Interest: 5.8
                        *
                        *
                        *
                        *
            7           IT       1 24Mar17    0000    1800
```

```
     8           IO       5       0       0
     9           IN       5
                 *
                 * DA3
                 * Casino Master Plan

    10           KK     DA3
    11           KO       0
    12           PB   3.608
    13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
    16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
    22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
    23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
    24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
    25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
    26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
    27           PI   0.045   0.055   0.072   0.122   0.380   0.089   0.062   0.049   0.042   0.037
    28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
    29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
    30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
    31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
    32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
    33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
    35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
    37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
    40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    42           BA  0.0090
    43           BF      -5    -0.1    1.05
    44           LS       0      80       0     .05      99       0
    45           UK     100   0.010   0.600       5
    46           UK     100   0.010   0.050      95
    47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                             HEC-1 INPUT                                              PAGE  2

  LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    48           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
            49           RD     250  0.0030   0.020   0.009    CIRC       2       0
            50           ZZ
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   24MAR17  TIME  11:30:15   *                                              *           (916) 756-1104             *
 *                                       *                                              *                                      *
 *****************************************                                              ****************************************



                          HEC-1 Input Filename: 16196post10
                          Description:          Casino Master Plan Post-development Flow
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/24/2017
                          Total Area at Point of Interest: 5.8

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     24Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *      DA3   *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                            RUNOFF SUMMARY
                                                    FLOW IN CUBIC FEET PER SECOND
                                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                          PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                               AREA      STAGE     MAX STAGE
+                                                            6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                            DA3        19.   12.12          2.          1.          1.        .01
1
                                              SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                  (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                             COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                   PEAK                                     PEAK

                               (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

               DA3  MANE         1.00     18.58    727.00      2.70      1.00     18.58    727.00       2.70

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1619E+01 OUTFLOW= .1294E+01 BASIN STORAGE= .9663E-03 PERCENT ERROR=  20.0



 *** NORMAL END OF HEC-1 ***
```

Post-development 10-year Storm Event
Alternative A Drainage Area #3

```
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   24MAR17  TIME  12:00:46  *                                                          *           (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

                   1           ID   HEC-1 Input Filename: 16196post2
                   2           ID   Description:          Casino Master Plan Post-development Flow
                   3           ID   Recurrence Interval:  2 year
                   4           ID   Storm Duration:       24 hours
                   5           ID   Date Compiled:        03/24/2017
                   6           ID   Total Area at Point of Interest: 4
                               *
                               *
                               *
                               *
                   7           IT       1 24Mar17    0000    1800
```

```
   8           IO       5       0       0
   9           IN       5
               *
               * DA4
               * Casino Master Plan

  10           KK     DA4
  11           KO       0
  12           PB   2.770
  13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27           PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
  28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42           BA  0.0062
  43           BF      -3    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     100  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                   HEC-1 INPUT                                                PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     100  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     100  0.0030   0.030   0.006    TRAP     2.0     0.0
          50           ZZ
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   24MAR17  TIME  12:00:46   *                                                   *           (916) 756-1104             *
 *                                       *                                                   *                                      *
 *****************************************                                                   ****************************************



                          HEC-1 Input Filename: 16196post2
                          Description:          Casino Master Plan Post-development Flow
                          Recurrence Interval:  2 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/24/2017
                          Total Area at Point of Interest: 4

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     24Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
  10 KK    *       DA4  *
           *            *
           **************

  11 KO         OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                            RUNOFF SUMMARY
                                                    FLOW IN CUBIC FEET PER SECOND
                                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                        PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION       FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                              6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA4        11.   12.10          1.          1.          1.        .01
1
                                                  SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                      (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                      PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA4  MANE          .37     10.62    725.99      1.43      1.00     10.61    726.00       1.43

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8417E+00 OUTFLOW= .4712E+00 BASIN STORAGE= .4740E-03 PERCENT ERROR=  44.0



 *** NORMAL END OF HEC-1 ***
```

Post-development 2-year Storm Event
Alternative A Drainage Area #4

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *             JUN   1998               *
 *           VERSION 4.1                *
 *                                      *
 *  RUN DATE   24MAR17  TIME  11:59:45  *
 *                                      *
 ****************************************
```

```
***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (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

              1           ID   HEC-1 Input Filename: 16196post10
              2           ID   Description:          Casino Master Plan Post-development Flow
              3           ID   Recurrence Interval:  10 year
              4           ID   Storm Duration:       24 hours
              5           ID   Date Compiled:        03/24/2017
              6           ID   Total Area at Point of Interest: 4
                          *
                          *
                          *
                          *
              7           IT       1 24Mar17    0000    1800
```

```
   8          IO       5       0       0
   9          IN       5
              *
              * DA4
              * Casino Master Plan

  10          KK     DA4
  11          KO       0
  12          PB   3.608
  13          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15          PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18          PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20          PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21          PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22          PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23          PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24          PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25          PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26          PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27          PI   0.045   0.055   0.072   0.122   0.381   0.089   0.062   0.049   0.042   0.037
  28          PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29          PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30          PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31          PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32          PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33          PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39          PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42          BA  0.0062
  43          BF      -5    -0.1    1.05
  44          LS       0      80       0     .05      99       0
  45          UK     100   0.010   0.600       5
  46          UK     100   0.010   0.050      95
  47          RD     100  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                 HEC-1 INPUT                                          PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     100  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     100  0.0030   0.030   0.006    TRAP     2.0     0.0
          50           ZZ
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   24MAR17  TIME  11:59:45   *                                                   *           (916) 756-1104             *
 *                                       *                                                   *                                       *
 *****************************************                                                   *****************************************


                          HEC-1 Input Filename: 16196post10
                          Description:          Casino Master Plan Post-development Flow
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/24/2017
                          Total Area at Point of Interest: 4

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     24Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
  10 KK       *       DA4  *
              *            *
              **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                         RUNOFF SUMMARY
                                                 FLOW IN CUBIC FEET PER SECOND
                                              TIME IN HOURS,  AREA IN SQUARE MILES

                                       PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION       FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                            DA4        14.   12.10          2.          1.          1.        .01
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                    PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

               DA4  MANE          .33     14.33    725.87      1.86      1.00     14.26    726.00       1.86

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1115E+01 OUTFLOW= .6166E+00 BASIN STORAGE= .4673E-03 PERCENT ERROR=  44.7



 *** NORMAL END OF HEC-1 ***
```

Post-development 10-year Storm Event
Alternative A Drainage Area #4

Post-development Subbasin Parameters

Subbasin:	BA
Mean Subbasin Elevation (ft):	450
Subbasin Area (Sq. Mi.):	0.1034375
Subbasin Area (acres):	66.2
Land Use:	Soil A:44% 1-Commercial/Highways/Parking
	Soil A:54% 14-Pasture/Parkland/Mowed Grass
	Soil A:2% 17- Open Oak/Pine Woodland/Grassland
Pervious Curve Number:	74
Pervious Overland Length (ft):	100
Pervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	57
Impervious Overland Length (ft):	100
Impervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	200
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.030
Representative Area (acres):	10.30
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	15.0
Collector #2 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	33.10
Width (ft)/Diameter (in) :	24.0
Sideslopes (ft/ft-H/V):	0
Collector #3 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	66.20
Width (ft)/Diameter (in) :	36.0
Sideslopes (ft/ft-H/V):	0

```
1***************************************
 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998              *
 *           VERSION 4.1               *
 *                                     *
 *  RUN DATE   27MAR17  TIME  14:10:18   *
 *                                     *
 ***************************************
```

```
***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (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

            1           ID   HEC-1 Input Filename: 16196post2-B
            2           ID   Description:          Casino Master Plan Post-development Flow – Alternative B
            3           ID   Recurrence Interval:  2 year
            4           ID   Storm Duration:       24 hours
            5           ID   Date Compiled:        03/27/2017
            6           ID   Total Area at Point of Interest: 66.2
                        *
                        *
                        *
                        *
            7           IT       1 27Mar17    0000    1800
```

```
   8          IO       5       0       0
   9          IN       5
              *
              * BA
              * Casino Master Plan

  10          KK      BA
  11          KO       0
  12          PB   2.762
  13          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21          PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24          PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25          PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26          PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27          PI   0.035   0.042   0.055   0.094   0.286   0.068   0.047   0.038   0.032   0.028
  28          PI   0.025   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29          PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30          PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31          PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32          PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33          PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35          PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38          PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42          BA  0.1034
  43          BF      -3    -0.1    1.05
  44          LS       0      74       0     .05      99       0
  45          UK     100   0.010   0.600      57
  46          UK     100   0.010   0.050      43
  47          RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                        HEC-1 INPUT                                         PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     900  0.0030   0.020   0.052    CIRC       2       0
```

```
          49          RD     900  0.0030   0.020   0.103    CIRC       3       0
          50          ZZ
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *          VERSION 4.1                  *
 *                                       *
 *  RUN DATE   27MAR17  TIME  14:10:18   *
 *                                       *
 *****************************************

 ***************************************
 *                                     *
 *    U.S. ARMY CORPS OF ENGINEERS     *
 *    HYDROLOGIC ENGINEERING CENTER    *
 *          609 SECOND STREET          *
 *       DAVIS, CALIFORNIA 95616       *
 *           (916) 756-1104            *
 *                                     *
 ***************************************


                            HEC-1 Input Filename: 16196post2-B
                            Description:          Casino Master Plan Post-development Flow - Alternative
                            Recurrence Interval:  2 year
                            Storm Duration:       24 hours
                            Date Compiled:        03/27/2017
                            Total Area at Point of Interest: 66.2

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN          1  MINUTES IN COMPUTATION INTERVAL
                        IDATE    27Mar17  STARTING DATE
                        ITIME       0000  STARTING TIME
                           NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     28   17  ENDING DATE
                       NDTIME       0559  ENDING TIME
                       ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   29.98 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
```

```
 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *        BA  *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                RUNOFF SUMMARY
                                                        FLOW IN CUBIC FEET PER SECOND
                                                     TIME IN HOURS,  AREA IN SQUARE MILES

                                             PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                                 AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                             BA        64.   12.15          10.          5.          4.        .10
1
                                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                       INTERPOLATED TO
                                                                                    COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                BA  MANE         1.00     63.42    729.00      1.10      1.00     63.42    729.00       1.10

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8592E+01 OUTFLOW= .6067E+01 BASIN STORAGE= .5096E-02 PERCENT ERROR=  29.3



 *** NORMAL END OF HEC-1 ***
```

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   27MAR17  TIME  14:09:41   *
 *                                       *
 *****************************************
```

```
***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (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

             1          ID   HEC-1 Input Filename: 16196post10-B
             2          ID   Description:          Casino Master Plan Post-development Flow – Alternative B
             3          ID   Recurrence Interval:  10 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/27/2017
             6          ID   Total Area at Point of Interest: 66.2
                        *
                        *
                        *
                        *
             7          IT       1 27Mar17    0000    1800
             8          IO       5       0       0
```

```
   9            IN       5
                *
                * BA
                * Casino Master Plan

  10            KK      BA
  11            KO       0
  12            PB   3.599
  13            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15            PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16            PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17            PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18            PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19            PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20            PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21            PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22            PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23            PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24            PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25            PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26            PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27            PI   0.045   0.055   0.072   0.122   0.372   0.088   0.062   0.049   0.042   0.037
  28            PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29            PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30            PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31            PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32            PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33            PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34            PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35            PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36            PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37            PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38            PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39            PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42            BA  0.1034
  43            BF      -5    -0.1    1.05
  44            LS       0      74       0     .05      99       0
  45            UK     100   0.010   0.600      57
  46            UK     100   0.010   0.050      43
  47            RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                   HEC-1 INPUT                                         PAGE  2

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48            RD     900  0.0030   0.020   0.052    CIRC       2       0
  49            RD     900  0.0030   0.020   0.103    CIRC       3       0
  50            ZZ
```

```
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   27MAR17  TIME  14:09:41   *                           *           (916) 756-1104            *
 *                                       *                           *                                     *
 ****************************************                            ***************************************


                           HEC-1 Input Filename: 16196post10-B
                           Description:          Casino Master Plan Post-development Flow - Alternative
                           Recurrence Interval:  10 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/27/2017
                           Total Area at Point of Interest: 66.2

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     27Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     28   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                     PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                        AREA      STAGE     MAX STAGE
+                                                                          6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA        90.   12.15          15.          7.          6.        .10
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                 INTERPOLATED TO
                                                                                              COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                      PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00     89.54    729.00      1.72      1.00     89.54    729.00       1.72

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1230E+02 OUTFLOW= .9460E+01 BASIN STORAGE= .5123E-02 PERCENT ERROR=  23.0



 *** NORMAL END OF HEC-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   27MAR17  TIME  14:08:44   *                            *          (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

              1          ID   HEC-1 Input Filename: 16196post100
              2          ID   Description:          Casino Master Plan Post-development Flow – Alternative B
              3          ID   Recurrence Interval:  100 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/27/2017
              6          ID   Total Area at Point of Interest: 66.2
                         *
                         *
                         *
                         *
              7          IT       1 27Mar17    0000    1800
              8          IO       5       0       0
```

```
  9           IN       5
              *
              * BA
              * Casino Master Plan

 10           KK      BA
 11           KO       0
 12           PB   5.069
 13           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 14           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008
 15           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 16           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 17           PI   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 18           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.010   0.010
 19           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
 20           PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
 21           PI   0.011   0.011   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.012
 22           PI   0.013   0.013   0.013   0.013   0.013   0.013   0.014   0.014   0.014   0.014
 23           PI   0.014   0.015   0.015   0.015   0.015   0.015   0.016   0.016   0.016   0.016
 24           PI   0.017   0.017   0.017   0.018   0.018   0.019   0.019   0.019   0.020   0.020
 25           PI   0.021   0.021   0.022   0.023   0.023   0.024   0.025   0.026   0.027   0.028
 26           PI   0.029   0.030   0.032   0.034   0.036   0.038   0.041   0.045   0.049   0.055
 27           PI   0.064   0.077   0.101   0.172   0.526   0.125   0.087   0.070   0.059   0.052
 28           PI   0.047   0.043   0.040   0.037   0.035   0.033   0.031   0.030   0.028   0.027
 29           PI   0.026   0.025   0.024   0.024   0.023   0.022   0.022   0.021   0.021   0.020
 30           PI   0.020   0.019   0.019   0.018   0.018   0.018   0.017   0.017   0.017   0.016
 31           PI   0.016   0.016   0.016   0.015   0.015   0.015   0.015   0.014   0.014   0.014
 32           PI   0.014   0.014   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.012
 33           PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011   0.011   0.011
 34           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
 35           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
 36           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 37           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008
 38           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 39           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 40           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 41           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 42           BA  0.1034
 43           BF     -10    -0.1    1.05
 44           LS       0      74       0     .05      99       0
 45           UK     100   0.010   0.600      57
 46           UK     100   0.010   0.050      43
 47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                    HEC-1 INPUT                                         PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     900  0.0030   0.020   0.052    CIRC       2       0
 49           RD     900  0.0030   0.020   0.103    CIRC       3       0
 50           ZZ
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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   27MAR17  TIME  14:08:44   *                     *          (916) 756-1104             *
 *                                       *                     *                                     *
 *****************************************                     ***************************************



                           HEC-1 Input Filename: 16196post100
                           Description:          Casino Master Plan Post-development Flow - Alternative
                           Recurrence Interval:  100 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/27/2017
                           Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    27Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                      ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                   PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                   AREA      STAGE     MAX STAGE
+                                                                          6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                                  BA       139.   12.15          24.         12.         10.        .10
1
                                                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                INTERPOLATED TO
                                                                                             COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                      PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00    138.71    729.00      2.74      1.00    138.71    729.00       2.74

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1927E+02 OUTFLOW= .1510E+02 BASIN STORAGE= .5304E-02 PERCENT ERROR=  21.6



 *** NORMAL END OF HEC-1 ***
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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   07APR17  TIME  12:09:00   *                                    *          (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

              1           ID   HEC-1 Input Filename: 16196post2-DA1 B
              2           ID   Description:          Casino Master Plan Alternate B Post-development Flow DA
              3           ID   Recurrence Interval:  2 year
              4           ID   Storm Duration:       24 hours
              5           ID   Date Compiled:        03/28/2017
              6           ID   Total Area at Point of Interest: 6.4
                          *
                          *
                          *
                          *
              7           IT       1 28Mar17    0000    1800
              8           IO       5       0       0
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```
  9           IN       5
              *
              * DA1
              * Casino Master Plan

 10           KK     DA1
 11           KO       0
 12           PB   2.769
 13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
 17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
 20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
 22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
 23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
 24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
 25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
 26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
 27           PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
 28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
 29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
 30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
 31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 42           BA    0.01
 43           BF      -3    -0.1    1.05
 44           LS       0      80       0     .05      99       0
 45           UK     100   0.010   0.600       5
 46           UK     100   0.010   0.050      95
 47           RD     200  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                  HEC-1 INPUT                                         PAGE  2

     LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     500  0.0030   0.020   0.005    CIRC       2       0
 49           RD     500  0.0030   0.020   0.010    CIRC       3       0
 50           ZZ
```

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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   07APR17  TIME  12:09:00    *                                                     *           (916) 756-1104            *
 *                                        *                                                     *                                     *
 ****************************************                                                      ***************************************



                    HEC-1 Input Filename: 16196post2-DA1 B
                    Description:          Casino Master Plan Alternate B Post-development Flow DA
                    Recurrence Interval:  2 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/28/2017
                    Total Area at Point of Interest: 6.4

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
            **************
            *            *
   10 KK    *       DA1  *
            *            *
            **************

   11 KO         OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                       RUNOFF SUMMARY
                                               FLOW IN CUBIC FEET PER SECOND
                                            TIME IN HOURS,  AREA IN SQUARE MILES

                                            PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION           FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                              6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA1             15.   12.13          2.          1.          1.         .01
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                             COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                 (MIN)     (CFS)     (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA1  MANE         1.00     15.26    728.00      1.78      1.00     15.26    728.00        1.78


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1357E+01 OUTFLOW= .9475E+00 BASIN STORAGE= .9248E-03 PERCENT ERROR=  30.1



 *** NORMAL END OF HEC-1 ***
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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   28MAR17  TIME  10:02:09  *                                         *          (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

   1            ID   HEC-1 Input Filename: 16196post10-DA1 B
   2            ID   Description:          Casino Master Plan Alternate B Post-development Flow DA
   3            ID   Recurrence Interval:  10 year
   4            ID   Storm Duration:       24 hours
   5            ID   Date Compiled:        03/28/2017
   6            ID   Total Area at Point of Interest: 6.4
                *
                *
                *
                *
   7            IT       1 28Mar17    0000    1800
```

```
   8           IO       5       0       0
   9           IN       5
               *
               * DA1
               * Casino Master Plan

  10           KK     DA1
  11           KO       0
  12           PB   3.608
  13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27           PI   0.045   0.055   0.072   0.122   0.380   0.089   0.062   0.049   0.042   0.037
  28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42           BA    0.01
  43           BF      -5    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     200  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                         HEC-1 INPUT                                            PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     500  0.0030   0.020   0.005    CIRC       2       0
```

```
          49           RD     500  0.0030   0.020   0.010    CIRC       3       0
          50           ZZ
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   28MAR17  TIME  10:02:09   *                                                      *           (916) 756-1104            *
 *                                       *                                                      *                                     *
 *****************************************                                                      ***************************************


                         HEC-1 Input Filename: 16196post10-DA1 B
                         Description:          Casino Master Plan Alternate B Post-development Flow DA
                         Recurrence Interval:  10 year
                         Storm Duration:       24 hours
                         Date Compiled:        03/28/2017
                         Total Area at Point of Interest: 6.4

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     28Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     29   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *       DA1  *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                               RUNOFF SUMMARY
                                                       FLOW IN CUBIC FEET PER SECOND
                                                    TIME IN HOURS,  AREA IN SQUARE MILES

                                            PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                               AREA      STAGE     MAX STAGE
+                                                              6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                            DA1        20.   12.12           2.          1.          1.        .01
1
                                               SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                   (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

               DA1  MANE         1.00     20.33    727.00      2.18      1.00     20.33    727.00       2.18

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1799E+01 OUTFLOW= .1164E+01 BASIN STORAGE= .9239E-03 PERCENT ERROR=  35.3



 *** NORMAL END OF HEC-1 ***
```

Post-development Subbasin Parameters

Subbasin:	BA
Mean Subbasin Elevation (ft):	450
Subbasin Area (Sq. Mi.):	0.1034375
Subbasin Area (acres):	66.2
Land Use:	Soil A:33% 1-Commercial/Highways/Parking
	Soil A:65% 14-Pasture/Parkland/Mowed Grass
	Soil A:2% 17- Open Oak/Pine Woodland/Grassland
Pervious Curve Number:	72
Pervious Overland Length (ft):	100
Pervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	67
Impervious Overland Length (ft):	100
Impervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	200
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.030
Representative Area (acres):	10.30
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	15.0
Collector #2 (pipe or channel):	pipe
Length (ft):	300
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	33.10
Width (ft)/Diameter (in) :	18.0
Sideslopes (ft/ft-H/V):	0
Collector #3 (pipe or channel):	pipe
Length (ft):	300
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	66.20
Width (ft)/Diameter (in) :	24.0
Sideslopes (ft/ft-H/V):	0

```
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   27MAR17  TIME  14:45:33  *                      *          (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

             1           ID   HEC-1 Input Filename: 16196post2-D
             2           ID   Description:          Casino Master Plan Post-development Flow - Alternative D
             3           ID   Recurrence Interval:  2 year
             4           ID   Storm Duration:       24 hours
             5           ID   Date Compiled:        03/27/2017
             6           ID   Total Area at Point of Interest: 66.2
                         *
                         *
                         *
                         *
             7           IT       1 27Mar17    0000    1800
             8           IO       5       0       0
```

```
   9           IN       5
               *
               * BA
               * Casino Master Plan

  10           KK      BA
  11           KO       0
  12           PB   2.762
  13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27           PI   0.035   0.042   0.055   0.094   0.286   0.068   0.047   0.038   0.032   0.028
  28           PI   0.025   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42           BA  0.1034
  43           BF      -3    -0.1    1.05
  44           LS       0      72       0     .05      99       0
  45           UK     100   0.010   0.600      67
  46           UK     100   0.010   0.050      33
  47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                             HEC-1 INPUT                                      PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     300  0.0030   0.020   0.052    CIRC     1.5       0
  49           RD     300  0.0030   0.020   0.103    CIRC       2       0
  50           ZZ
```

```
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   27MAR17  TIME  14:45:33   *                                               *          (916) 756-1104             *
 *                                     *                                                 *                                     *
 ***************************************                                                 ***************************************


                            HEC-1 Input Filename: 16196post2-D
                            Description:          Casino Master Plan Post-development Flow - Alternative
                            Recurrence Interval:  2 year
                            Storm Duration:       24 hours
                            Date Compiled:        03/27/2017
                            Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                     PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                 AREA      STAGE     MAX STAGE
+                                                                         6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA        52.   12.13          8.          4.          3.        .10
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                  INTERPOLATED TO
                                                                                               COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE          .99     52.03    727.49       .95      1.00     51.99    728.00        .95

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7235E+01 OUTFLOW= .5228E+01 BASIN STORAGE= .5102E-02 PERCENT ERROR=  27.7



 *** NORMAL END OF HEC-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   27MAR17  TIME  14:47:10   *                   *           (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

            1           ID   HEC-1 Input Filename: 16196post10-D
            2           ID   Description:          Casino Master Plan Post-development Flow - Alternative
            3           ID   Recurrence Interval:  10 year
            4           ID   Storm Duration:       24 hours
            5           ID   Date Compiled:        03/27/2017
            6           ID   Total Area at Point of Interest: 66.2
                        *
                        *
                        *
                        *
            7           IT       1 27Mar17    0000    1800
            8           IO       5       0       0
```

```
          9           IN       5
                      *
                      * BA
                      * Casino Master Plan

         10           KK      BA
         11           KO       0
         12           PB   3.599
         13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
         14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
         15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
         16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
         17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
         18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
         19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
         20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
         21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
         22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
         23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
         24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
         25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
         26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
         27           PI   0.045   0.055   0.072   0.122   0.372   0.088   0.062   0.049   0.042   0.037
         28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
         29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
         30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
         31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
         32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
         33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
         34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
         35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
         36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
         37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
         38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
         39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
         40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
         41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
         42           BA  0.1034
         43           BF      -5    -0.1    1.05
         44           LS       0      72       0     .05      99       0
         45           UK     100   0.010   0.600      67
         46           UK     100   0.010   0.050      33
         47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                 HEC-1 INPUT                                            PAGE  2

       LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

         48           RD     300  0.0030   0.020   0.052    CIRC     1.5       0
         49           RD     300  0.0030   0.020   0.103    CIRC       2       0
         50           ZZ
```

```
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   27MAR17  TIME  14:47:10   *                        *           (916) 756-1104            *
 *                                       *                        *                                     *
 *****************************************                        ***************************************



                       HEC-1 Input Filename: 16196post10-D
                       Description:          Casino Master Plan Post-development Flow - Alternative
                       Recurrence Interval:  10 year
                       Storm Duration:       24 hours
                       Date Compiled:        03/27/2017
                       Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
           **************
           *            *
   10 KK   *        BA  *
           *            *
           **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                                RUNOFF SUMMARY
                                                        FLOW IN CUBIC FEET PER SECOND
                                                     TIME IN HOURS,  AREA IN SQUARE MILES

                                                   PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                                   6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA        73.   12.13          13.          6.          5.        .10
1
                                                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                              INTERPOLATED TO
                                                                                           COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                        PEAK                                          PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE          .93     73.34    728.29      1.53      1.00     73.09    728.00       1.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1066E+02 OUTFLOW= .8415E+01 BASIN STORAGE= .5143E-02 PERCENT ERROR=  21.0



 *** NORMAL END OF HEC-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   27MAR17  TIME  14:48:26 *                    *          (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

             1           ID   HEC-1 Input Filename: 16196post100-D
             2           ID   Description:          Casino Master Plan Post-development Flow - Alternative D
             3           ID   Recurrence Interval:  100 year
             4           ID   Storm Duration:       24 hours
             5           ID   Date Compiled:        03/27/2017
             6           ID   Total Area at Point of Interest: 66.2
                         *
                         *
                         *
                         *
             7           IT       1 27Mar17    0000    1800
             8           IO       5       0       0
```

```
   9           IN       5
               *
               * BA
               * Casino Master Plan

  10           KK      BA
  11           KO       0
  12           PB   5.069
  13           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  14           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008
  15           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  16           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  17           PI   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  18           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.010   0.010
  19           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  20           PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
  21           PI   0.011   0.011   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.012
  22           PI   0.013   0.013   0.013   0.013   0.013   0.013   0.014   0.014   0.014   0.014
  23           PI   0.014   0.015   0.015   0.015   0.015   0.015   0.016   0.016   0.016   0.016
  24           PI   0.017   0.017   0.017   0.018   0.018   0.019   0.019   0.019   0.020   0.020
  25           PI   0.021   0.021   0.022   0.023   0.023   0.024   0.025   0.026   0.027   0.028
  26           PI   0.029   0.030   0.032   0.034   0.036   0.038   0.041   0.045   0.049   0.055
  27           PI   0.064   0.077   0.101   0.172   0.526   0.125   0.087   0.070   0.059   0.052
  28           PI   0.047   0.043   0.040   0.037   0.035   0.033   0.031   0.030   0.028   0.027
  29           PI   0.026   0.025   0.024   0.024   0.023   0.022   0.022   0.021   0.021   0.020
  30           PI   0.020   0.019   0.019   0.018   0.018   0.018   0.017   0.017   0.017   0.016
  31           PI   0.016   0.016   0.016   0.015   0.015   0.015   0.015   0.014   0.014   0.014
  32           PI   0.014   0.014   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.012
  33           PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011   0.011   0.011
  34           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
  35           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  36           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  37           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008
  38           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  39           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  40           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  41           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  42           BA  0.1034
  43           BF     -10    -0.1    1.05
  44           LS       0      72       0     .05      99       0
  45           UK     100   0.010   0.600      67
  46           UK     100   0.010   0.050      33
  47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                HEC-1 INPUT                                           PAGE  2

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     300  0.0030   0.020   0.052    CIRC     1.5       0
  49           RD     300  0.0030   0.020   0.103    CIRC       2       0
  50           ZZ
```

```
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   27MAR17  TIME  14:48:26   *                                        *           (916) 756-1104            *
 *                                     *                                        *                                     *
 ***************************************                                        ***************************************


                          HEC-1 Input Filename: 16196post100-D
                          Description:          Casino Master Plan Post-development Flow - Alternative
                          Recurrence Interval:  100 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/27/2017
                          Total Area at Point of Interest: 66.2

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     27Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     28   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                RUNOFF SUMMARY
                                                        FLOW IN CUBIC FEET PER SECOND
                                                     TIME IN HOURS,  AREA IN SQUARE MILES

                                              PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION         FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA       117.   12.15          22.         11.          9.        .10
1
                                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                         INTERPOLATED TO
                                                                                      COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                       PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE          .84    116.44    729.00      2.72      1.00    116.44    729.00        2.72

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1727E+02 OUTFLOW= .1501E+02 BASIN STORAGE= .5301E-02 PERCENT ERROR=  13.1



 *** NORMAL END OF HEC-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   28MAR17  TIME  11:35:13   *                   *          (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

             1          ID   HEC-1 Input Filename: 16196post2-DA1 D
             2          ID   Description:          Casino Master Plan Alternate D Post-development Flow DA1
             3          ID   Recurrence Interval:  2 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/28/2017
             6          ID   Total Area at Point of Interest: 9.9
                        *
                        *
                        *
                        *
             7          IT       1 28Mar17    0000    1800
             8          IO       5       0       0
```

```
     9           IN       5
                 *
                 * DA1
                 * Casino Master Plan

    10           KK     DA1
    11           KO       0
    12           PB   2.768
    13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
    17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
    20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
    22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
    23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
    24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
    25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
    26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
    27           PI   0.035   0.042   0.055   0.094   0.291   0.068   0.047   0.038   0.032   0.028
    28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
    29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
    30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
    31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    42           BA  0.0154
    43           BF      -3    -0.1    1.05
    44           LS       0      80       0     .05      99       0
    45           UK     100   0.010   0.600       5
    46           UK     100   0.010   0.050      95
    47           RD     200  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                  HEC-1 INPUT                                       PAGE  2

  LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    48           RD     500  0.0030   0.020   0.005    CIRC       2       0
    49           RD     500  0.0030   0.020   0.010    CIRC       3       0
    50           ZZ
```

```
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   28MAR17  TIME  11:35:13   *                                                                        *           (916) 756-1104            *
 *                                       *                                                                        *                                     *
 ****************************************                                                                        ***************************************



                            HEC-1 Input Filename: 16196post2-DA1 D
                            Description:          Casino Master Plan Alternate D Post-development Flow DA
                            Recurrence Interval:  2 year
                            Storm Duration:       24 hours
                            Date Compiled:        03/28/2017
                            Total Area at Point of Interest: 9.9

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
             **************
             *            *
   10 KK     *       DA1  *
             *            *
             **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                              RUNOFF SUMMARY
                                                      FLOW IN CUBIC FEET PER SECOND
                                                   TIME IN HOURS,  AREA IN SQUARE MILES

                                            PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION           FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA1            23.   12.13          3.          2.          1.        .02
1
                                                 SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                     (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA1  MANE         1.00      23.41    728.00      1.82      1.00     23.41    728.00       1.82


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2089E+01 OUTFLOW= .1491E+01 BASIN STORAGE= .1286E-02 PERCENT ERROR=  28.6



 *** NORMAL END OF HEC-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   28MAR17  TIME  11:35:45   *                                                          *          (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

             1            ID   HEC-1 Input Filename: 16196post10-DA1 D
             2            ID   Description:          Casino Master Plan Alternate D Post-development Flow DA1
             3            ID   Recurrence Interval:  10 year
             4            ID   Storm Duration:       24 hours
             5            ID   Date Compiled:        03/28/2017
             6            ID   Total Area at Point of Interest: 9.9
                          *
                          *
                          *
                          *
             7            IT       1 28Mar17    0000    1800
             8            IO       5       0       0
```

```
  9           IN       5
              *
              * DA1
              * Casino Master Plan

 10           KK     DA1
 11           KO       0
 12           PB   3.607
 13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
 16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
 22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
 23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
 24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
 25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
 26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
 27           PI   0.045   0.055   0.072   0.122   0.379   0.089   0.062   0.049   0.042   0.037
 28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
 29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
 30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
 31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
 32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
 35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
 37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
 40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 42           BA  0.0154
 43           BF      -5    -0.1    1.05
 44           LS       0      80       0     .05      99       0
 45           UK     100   0.010   0.600       5
 46           UK     100   0.010   0.050      95
 47           RD     200  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                         HEC-1 INPUT                                          PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     500  0.0030   0.020   0.005    CIRC       2       0
 49           RD     500  0.0030   0.020   0.010    CIRC       3       0
 50           ZZ
```

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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   28MAR17  TIME  11:35:45  *                    *           (916) 756-1104             *
 *                                      *                    *                                      *
 ****************************************                    ****************************************


                      HEC-1 Input Filename: 16196post10-DA1 D
                      Description:          Casino Master Plan Alternate D Post-development Flow DA
                      Recurrence Interval:  10 year
                      Storm Duration:       24 hours
                      Date Compiled:        03/28/2017
                      Total Area at Point of Interest: 9.9

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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```
              **************
              *            *
   10 KK      *       DA1  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                           RUNOFF SUMMARY
                                                   FLOW IN CUBIC FEET PER SECOND
                                                TIME IN HOURS,  AREA IN SQUARE MILES

                                          PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION         FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA1          32.   12.12          4.          2.          2.        .02
1
                                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                       INTERPOLATED TO
                                                                                    COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA1  MANE         1.00     31.48    727.00      2.23      1.00     31.48    727.00        2.23


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2769E+01 OUTFLOW= .1828E+01 BASIN STORAGE= .1290E-02 PERCENT ERROR=  33.9



 *** NORMAL END OF HEC-1 ***
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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   28MAR17  TIME  11:47:23   *                       *           (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

              1          ID   HEC-1 Input Filename: 16196post2-D-DA2
              2          ID   Description:          Casino Master Plan Alternative D Post-development Flow
              3          ID   Recurrence Interval:  2 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/28/2017
              6          ID   Total Area at Point of Interest: 6.1
                         *
                         *
                         *
                         *
              7          IT       1 28Mar17    0000    1800
              8          IO       5       0       0
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```
     9          IN       5
                *
                * DA2
                * Casino Master Plan

    10          KK     DA2
    11          KO       0
    12          PB   2.769
    13          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    14          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    15          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    16          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
    17          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    18          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    19          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
    20          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    21          PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
    22          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
    23          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
    24          PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
    25          PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
    26          PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
    27          PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
    28          PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
    29          PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
    30          PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
    31          PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    32          PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    33          PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    34          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    35          PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    36          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    37          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    38          PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    39          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    40          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    41          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    42          BA  0.0095
    43          BF      -3    -0.1    1.05
    44          LS       0      80       0     .05      99       0
    45          UK     100   0.010   0.600       5
    46          UK     100   0.010   0.050      95
    47          RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                            HEC-1 INPUT                                    PAGE  2

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    48          RD     222  0.0030   0.030   0.008    TRAP     2.0    15.0
    49          RD     250  0.0030   0.020   0.015    CIRC       2       0
    50          ZZ
```

```
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   28MAR17  TIME  11:47:23  *                           *           (916) 756-1104            *
 *                                     *                            *                                     *
***************************************                             ***************************************


                    HEC-1 Input Filename: 16196post2-D-DA2
                    Description:          Casino Master Plan Alternative D Post-development Flow
                    Recurrence Interval:  2 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/28/2017
                    Total Area at Point of Interest: 6.1

   8 IO         OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT         HYDROGRAPH TIME DATA
                       NMIN           1  MINUTES IN COMPUTATION INTERVAL
                      IDATE     28Mar17  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     29   17  ENDING DATE
                     NDTIME        0559  ENDING TIME
                     ICENT           19  CENTURY MARK

                COMPUTATION INTERVAL     .02 HOURS
                     TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *       DA2  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                              RUNOFF SUMMARY
                                                      FLOW IN CUBIC FEET PER SECOND
                                                   TIME IN HOURS,  AREA IN SQUARE MILES

                                               PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                   AREA      STAGE     MAX STAGE
+                                                                 6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA2        15.   12.12          2.          1.          1.        .01
1
                                                 SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                     (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA2  MANE         1.00     14.75    727.00      1.99      1.00     14.75    727.00       1.99


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1289E+01 OUTFLOW= .1010E+01 BASIN STORAGE= .8558E-03 PERCENT ERROR=  21.6



 *** NORMAL END OF HEC-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   28MAR17  TIME  11:47:59  *                              *          (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

             1          ID   HEC-1 Input Filename: 16196post10-D-DA2
             2          ID   Description:          Casino Master Plan Alternative D Post-development Flow
             3          ID   Recurrence Interval:  10 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/28/2017
             6          ID   Total Area at Point of Interest: 6.1
                        *
                        *
                        *
                        *
             7          IT       1 28Mar17    0000    1800
             8          IO       5       0       0
```

```
    9           IN       5
                *
                * DA2
                * Casino Master Plan

   10           KK     DA2
   11           KO       0
   12           PB   3.608
   13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
   16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
   19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
   20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
   21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
   22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
   23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
   24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
   25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
   26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
   27           PI   0.045   0.055   0.072   0.122   0.380   0.089   0.062   0.049   0.042   0.037
   28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
   29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
   30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
   31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
   32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
   33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
   34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
   35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
   36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
   37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
   40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   42           BA  0.0095
   43           BF      -5    -0.1    1.05
   44           LS       0      80       0     .05      99       0
   45           UK     100   0.010   0.600       5
   46           UK     100   0.010   0.050      95
   47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                  HEC-1 INPUT                                        PAGE  2

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   48           RD     222  0.0030   0.030   0.008    TRAP     2.0    15.0
   49           RD     250  0.0030   0.020   0.015    CIRC       2       0
   50           ZZ
```

```
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   28MAR17  TIME  11:47:59   *                              *           (916) 756-1104             *
 *                                       *                              *                                      *
 *****************************************                              ****************************************



                          HEC-1 Input Filename: 16196post10-D-DA2
                          Description:          Casino Master Plan Alternative D Post-development Flow
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/28/2017
                          Total Area at Point of Interest: 6.1

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *       DA2  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                           RUNOFF SUMMARY
                                                                   FLOW IN CUBIC FEET PER SECOND
                                                                TIME IN HOURS,  AREA IN SQUARE MILES

                                                      PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                 AREA      STAGE     MAX STAGE
+                                                                      6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA2        20.   12.12          2.          1.          1.        .01
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                  INTERPOLATED TO
                                                                                               COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                         PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA2  MANE         1.00     19.66    727.00      2.41      1.00     19.66    727.00       2.41

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1709E+01 OUTFLOW= .1223E+01 BASIN STORAGE= .8608E-03 PERCENT ERROR=  28.4

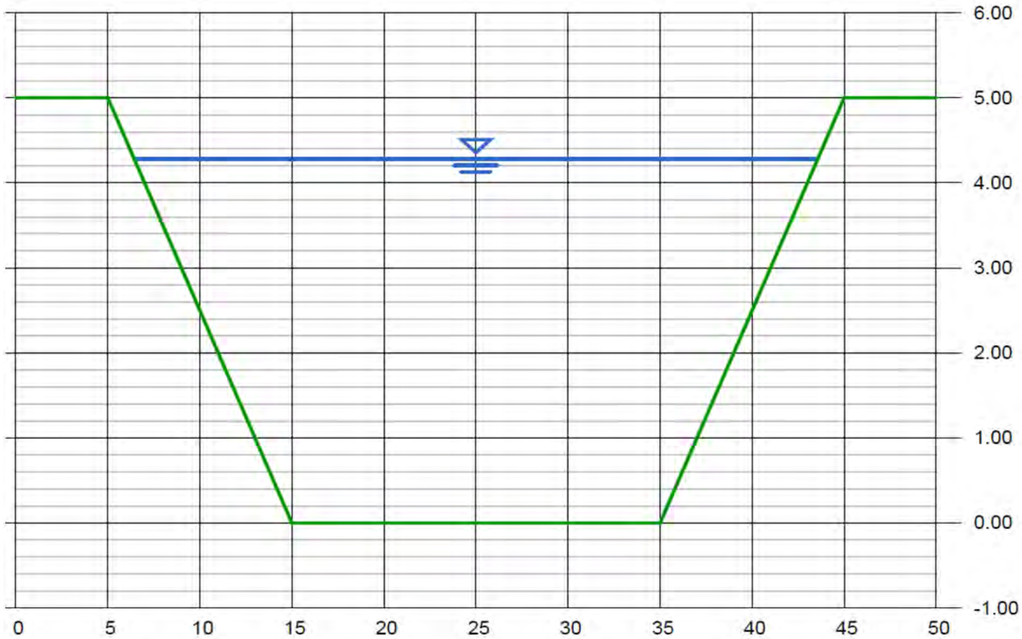


 *** NORMAL END OF HEC-1 ***
```

INFILTRATION TRENCH CALCULATIONS

Proposed Earthen Infiltration Channel

Determine the capacity of the proposed channel toconvey flow to the existing sandy gravel layer below the surface.



Using Darcy's Law: Q = A*k*i where: A = cross-sectional area, including space occupied by porous material
k = hydraulic conductivity
i = hydraulic gradient = h/d = drop in head / distance drop occurs
assume: minimum h = d; therefore, i = 1.0

Table 11.1 (Soil Engineering, 4th Edition): k = 0.1 cm/s

k = (0.1 cm/s)*(0.03281 ft/cm) = 0.0033 ft/s

Calculate Q diverted to existing sandy gravel layer (Q_D)

A = 55360 sf
width of trench = 20 ft
length of trench = 2768 ft

Q = 181.6 cfs

Alternative	2-year Peak Flow	10-year Peak Flow
A	60	80
B	39	53
C	60	80
D	38	52

As shown is the above table the proposed infiltration trench will be more than adequate to infiltrate the 2- and 10-year storms for Altrenatives A, B, C, and D.

Post-development Subbasin Parameters

Subbasin:	Basin E
Mean Subbasin Elevation (ft):	414
Subbasin Area (Sq. Mi.):	0.06328125
Subbasin Area (acres):	40.5
Land Use:	Soil A:42% Soil D:42% 1-Commercial/Highways/Parking
	Soil A:8% Soil D:8% 14-Pasture/Parkland/Mowed Grass
Pervious Curve Number:	84
Pervious Overland Length (ft):	200
Pervious Overland Slope (ft/ft):	0.005
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	20
Impervious Overland Length (ft):	200
Impervious Overland Slope (ft/ft):	0.005
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	285
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.030
Representative Area (acres):	3.00
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	15.0
Collector #2 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.020
Representative Area (acres):	20.25
Width (ft)/Diameter (in) :	18.0
Sideslopes (ft/ft-H/V):	0
Collector #3 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.020
Representative Area (acres):	40.50
Width (ft)/Diameter (in) :	24.0
Sideslopes (ft/ft-H/V):	0

```
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   27MAR17  TIME  11:09:29   *                          *          (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

              1           ID   HEC-1 Input Filename: 16196postE
              2           ID   Description:          Casino Master Plan Alternative E Post-development Flow
              3           ID   Recurrence Interval:  2 year
              4           ID   Storm Duration:       24 hours
              5           ID   Date Compiled:        03/27/2017
              6           ID   Total Area at Point of Interest: 40.5
                          *
                          *
                          *
                          *
              7           IT       1 27Mar17    0000    1800
              8           IO       5       0       0
```

```
  9           IN       5
              *
              * Basin E
              * Alternative E - Anderson, Ca

 10           KK  Basin
 11           KO       0
 12           PB   2.580
 13           PI   0.003   0.003   0.003   0.003   0.004   0.004   0.004   0.004   0.004   0.004
 14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 17           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 18           PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 20           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
 21           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 22           PI   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 23           PI   0.007   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 24           PI   0.008   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010
 25           PI   0.011   0.011   0.011   0.011   0.012   0.012   0.013   0.013   0.014   0.014
 26           PI   0.015   0.015   0.016   0.017   0.018   0.020   0.021   0.023   0.025   0.028
 27           PI   0.033   0.040   0.052   0.089   0.278   0.065   0.045   0.036   0.030   0.027
 28           PI   0.024   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.014   0.014
 29           PI   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011   0.010   0.010
 30           PI   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008
 31           PI   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007   0.007
 32           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
 33           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 34           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 35           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.004   0.004
 37           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 38           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 41           PI   0.004   0.004   0.004   0.004   0.003   0.003   0.003   0.003
 42           BA  0.0632
 43           BF      -3    -0.1    1.05
 44           LS       0      84       0     .05      99       0
 45           UK     200   0.005   0.600      27
 46           UK     200   0.005   0.050      73
 47           RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                                HEC-1 INPUT                                              PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     900  0.0050   0.020   0.031    CIRC     1.5       0
 49           RD     900  0.0050   0.020   0.063    CIRC       2       0
 50           ZZ
```

```
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   27MAR17  TIME  11:09:29   *                                                   *           (916) 756-1104            *
 *                                     *                                                     *                                     *
 ***************************************                                                     ***************************************



                    HEC-1 Input Filename: 16196postE
                    Description:          Casino Master Plan Alternative E Post-development Flow
                    Recurrence Interval:  2 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/27/2017
                    Total Area at Point of Interest: 40.5

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *    Basin   *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                     PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                  AREA      STAGE     MAX STAGE
+                                                                         6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                          Basin         55.   12.18          8.          4.          4.        .06
1
                                                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                      INTERPOLATED TO
                                                                                                   COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                    PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00     54.50    731.00      1.52      1.00     54.50    731.00       1.52

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7058E+01 OUTFLOW= .5118E+01 BASIN STORAGE= .5799E-02 PERCENT ERROR=  27.4



 *** NORMAL END OF HEC-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   27MAR17  TIME  11:08:51  *                          *          (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

             1          ID   HEC-1 Input Filename: 16196postE
             2          ID   Description:          Casino Master Plan Alternative E Post-development Flow
             3          ID   Recurrence Interval:  10 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/27/2017
             6          ID   Total Area at Point of Interest: 40.5
                        *
                        *
                        *
                        *
             7          IT       1 27Mar17    0000    1800
             8          IO       5       0       0
```

```
    9           IN       5
                *
                * Basin E
                * Alternative E - Anderson, Ca

   10           KK  Basin
   11           KO       0
   12           PB   3.362
   13           PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   15           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   16           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   18           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   19           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
   20           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
   21           PI   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
   22           PI   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009
   23           PI   0.009   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.011   0.011
   24           PI   0.011   0.011   0.011   0.012   0.012   0.012   0.012   0.013   0.013   0.013
   25           PI   0.014   0.014   0.015   0.015   0.015   0.016   0.016   0.017   0.018   0.018
   26           PI   0.019   0.020   0.021   0.022   0.024   0.025   0.027   0.030   0.033   0.037
   27           PI   0.043   0.052   0.068   0.116   0.362   0.084   0.059   0.047   0.040   0.035
   28           PI   0.031   0.029   0.026   0.025   0.023   0.022   0.021   0.020   0.019   0.018
   29           PI   0.017   0.017   0.016   0.016   0.015   0.015   0.014   0.014   0.014   0.013
   30           PI   0.013   0.013   0.012   0.012   0.012   0.012   0.011   0.011   0.011   0.011
   31           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009
   32           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008   0.008
   33           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007
   34           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
   35           PI   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006
   36           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
   37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.005   0.005
   38           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   39           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
   42           BA  0.0632
   43           BF      -5    -0.1    1.05
   44           LS       0      84       0     .05      99       0
   45           UK     200   0.005   0.600      27
   46           UK     200   0.005   0.050      73
   47           RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                                  HEC-1 INPUT                                          PAGE  2

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   48           RD     900  0.0050   0.020   0.031    CIRC     1.5       0
   49           RD     900  0.0050   0.020   0.063    CIRC       2       0
   50           ZZ
```

```
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   27MAR17  TIME  11:08:51 *                   *           (916) 756-1104            *
 *                                     *                   *                                     *
 ***************************************                   ***************************************


                       HEC-1 Input Filename: 16196postE
                       Description:          Casino Master Plan Alternative E Post-development Flow
                       Recurrence Interval:  10 year
                       Storm Duration:       24 hours
                       Date Compiled:        03/27/2017
                       Total Area at Point of Interest: 40.5

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *    Basin   *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                RUNOFF SUMMARY
                                                        FLOW IN CUBIC FEET PER SECOND
                                                     TIME IN HOURS,  AREA IN SQUARE MILES

                                                PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                                 6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                          Basin          76.   12.17          12.          6.          5.        .06
1
                                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                      INTERPOLATED TO
                                                                                   COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                      PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00     75.67    730.00      2.12      1.00     75.67    730.00        2.12

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9563E+01 OUTFLOW= .7140E+01 BASIN STORAGE= .5988E-02 PERCENT ERROR=  25.3



 *** NORMAL END OF HEC-1 ***
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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   27MAR17  TIME  11:07:57  *                    *           (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

              1          ID   HEC-1 Input Filename: 16196postE
              2          ID   Description:          Casino Master Plan Alternative E Post-development Flow
              3          ID   Recurrence Interval:  100 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/27/2017
              6          ID   Total Area at Point of Interest: 40.5
                         *
                         *
                         *
                         *
              7          IT       1 27Mar17    0000    1800
              8          IO       5       0       0
```

```
  9           IN       5
              *
              * Basin E
              * Alternative E - Anderson, Ca

 10           KK  Basin
 11           KO       0
 12           PB   4.702
 13           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.007
 14           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 15           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 16           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008   0.008
 17           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 18           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
 19           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 20           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
 21           PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
 22           PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.013   0.013   0.013
 23           PI   0.013   0.013   0.014   0.014   0.014   0.014   0.014   0.015   0.015   0.015
 24           PI   0.015   0.016   0.016   0.016   0.017   0.017   0.017   0.018   0.018   0.019
 25           PI   0.019   0.020   0.020   0.021   0.022   0.022   0.023   0.024   0.025   0.026
 26           PI   0.027   0.028   0.030   0.031   0.033   0.036   0.038   0.042   0.046   0.052
 27           PI   0.060   0.073   0.096   0.163   0.509   0.118   0.082   0.065   0.055   0.049
 28           PI   0.044   0.040   0.037   0.034   0.032   0.030   0.029   0.028   0.026   0.025
 29           PI   0.024   0.023   0.023   0.022   0.021   0.021   0.020   0.019   0.019   0.018
 30           PI   0.018   0.018   0.017   0.017   0.017   0.016   0.016   0.016   0.015   0.015
 31           PI   0.015   0.015   0.014   0.014   0.014   0.014   0.013   0.013   0.013   0.013
 32           PI   0.013   0.013   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011
 33           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
 34           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009
 35           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 36           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 37           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 38           PI   0.008   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 39           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 40           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 41           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 42           BA  0.0632
 43           BF     -10    -0.1    1.05
 44           LS       0      84       0     .05      99       0
 45           UK     200   0.005   0.600      27
 46           UK     200   0.005   0.050      73
 47           RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                          HEC-1 INPUT                                          PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     900  0.0050   0.020   0.031    CIRC     1.5       0
 49           RD     900  0.0050   0.020   0.063    CIRC       2       0
 50           ZZ
```

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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   27MAR17  TIME  11:07:57   *                     *           (916) 756-1104            *
 *                                       *                     *                                     *
 *****************************************                     ***************************************


                            HEC-1 Input Filename: 16196postE
                            Description:          Casino Master Plan Alternative E Post-development Flow
                            Recurrence Interval:  100 year
                            Storm Duration:       24 hours
                            Date Compiled:        03/27/2017
                            Total Area at Point of Interest: 40.5

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *   Basin    *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                              RUNOFF SUMMARY
                                                      FLOW IN CUBIC FEET PER SECOND
                                                   TIME IN HOURS,  AREA IN SQUARE MILES

                                              PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION       FLOW     PEAK                                                 AREA      STAGE     MAX STAGE
+                                                                  6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                          Basin        115.   12.17          17.          9.          7.        .06
1
                                             SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                      INTERPOLATED TO
                                                                                   COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00    114.16    730.00      2.95      1.00    114.16    730.00        2.95

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1393E+02 OUTFLOW= .9953E+01 BASIN STORAGE= .6113E-02 PERCENT ERROR=  28.5


 *** NORMAL END OF HEC-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   27MAR17  TIME  11:52:33   *                         *          (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

             1          ID   HEC-1 Input Filename: 16196post-DE1
             2          ID   Description:          Casino Master Plan Alternative E Post-development Flow
             3          ID   Recurrence Interval:  2 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/27/2017
             6          ID   Total Area at Point of Interest: 23.9
                        *
                        *
                        *
                        *
```

```
     7           IT       1 27Mar17    0000    1800
     8           IO       5       0       0
     9           IN       5
                 *
                 * Basin E
                 * Alternative E - Anderson, Ca

    10           KK  Basin
    11           KO       0
    12           PB   2.581
    13           PI   0.003   0.003   0.003   0.003   0.004   0.004   0.004   0.004   0.004   0.004
    14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    17           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    18           PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    20           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
    21           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    22           PI   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    23           PI   0.007   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    24           PI   0.008   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010
    25           PI   0.011   0.011   0.011   0.011   0.012   0.012   0.013   0.013   0.014   0.014
    26           PI   0.015   0.015   0.016   0.017   0.018   0.020   0.021   0.023   0.025   0.028
    27           PI   0.033   0.040   0.052   0.089   0.280   0.065   0.045   0.036   0.030   0.027
    28           PI   0.024   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.014   0.014
    29           PI   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011   0.010   0.010
    30           PI   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008
    31           PI   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007   0.007
    32           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
    33           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    34           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    35           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.004   0.004
    37           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    38           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    41           PI   0.004   0.004   0.004   0.004   0.003   0.003   0.003   0.003
    42           BA  0.0373
    43           BF      -3    -0.1    1.05
    44           LS       0      84       0     .05      99       0
    45           UK     200   0.005   0.600      20
    46           UK     200   0.005   0.050      80
    47           RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                                      HEC-1 INPUT                                          PAGE  2

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
          48           RD     900  0.0050   0.020   0.025    CIRC     1.5       0
          49           RD     900  0.0050   0.020   0.037    CIRC       2       0
          50           ZZ
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   27MAR17  TIME  11:52:33   *                                                  *           (916) 756-1104            *
 *                                       *                                                  *                                     *
 *****************************************                                                  ***************************************


                     HEC-1 Input Filename: 16196post-DE1
                     Description:          Casino Master Plan Alternative E Post-development Flow
                     Recurrence Interval:  2 year
                     Storm Duration:       24 hours
                     Date Compiled:        03/27/2017
                     Total Area at Point of Interest: 23.9

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     27Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     28   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


              **************
              *            *
   10 KK      *    Basin   *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                                      RUNOFF SUMMARY
                                                              FLOW IN CUBIC FEET PER SECOND
                                                           TIME IN HOURS,  AREA IN SQUARE MILES

                                             PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION            FLOW     PEAK                                             AREA      STAGE     MAX STAGE
+                                                                 6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                          Basin               35.   12.18          5.          3.          2.        .04
1
                                                     SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                         (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                         INTERPOLATED TO
                                                                                      COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO      VOLUME       DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                       PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00     35.24    731.00      1.71      1.00     35.24    731.00       1.71

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4342E+01 OUTFLOW= .3406E+01 BASIN STORAGE= .3888E-02 PERCENT ERROR=  21.5
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*** NORMAL END OF HEC-1 ***
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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   27MAR17  TIME  11:53:26   *                     *           (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

              1          ID   HEC-1 Input Filename: 16196post-DE1
              2          ID   Description:          Casino Master Plan Alternative E Post-development Flow
              3          ID   Recurrence Interval:  10 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/27/2017
              6          ID   Total Area at Point of Interest: 23.9
                         *
                         *
                         *
                         *
              7          IT       1 27Mar17    0000    1800
              8          IO       5       0       0
```

```
   9          IN       5
              *
              * Basin E
              * Alternative E - Anderson, Ca

  10          KK  Basin
  11          KO       0
  12          PB   3.364
  13          PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  16          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  17          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  19          PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
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  21          PI   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  22          PI   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  23          PI   0.009   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.011   0.011
  24          PI   0.011   0.011   0.011   0.012   0.012   0.012   0.012   0.013   0.013   0.013
  25          PI   0.014   0.014   0.015   0.015   0.015   0.016   0.016   0.017   0.018   0.018
  26          PI   0.019   0.020   0.021   0.022   0.024   0.025   0.027   0.030   0.033   0.037
  27          PI   0.043   0.052   0.068   0.116   0.364   0.084   0.059   0.047   0.040   0.035
  28          PI   0.031   0.029   0.026   0.025   0.023   0.022   0.021   0.020   0.019   0.018
  29          PI   0.017   0.017   0.016   0.016   0.015   0.015   0.014   0.014   0.014   0.013
  30          PI   0.013   0.013   0.012   0.012   0.012   0.012   0.011   0.011   0.011   0.011
  31          PI   0.011   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009
  32          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008   0.008
  33          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007
  34          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  35          PI   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006
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  38          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
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  40          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42          BA  0.0373
  43          BF      -5    -0.1    1.05
  44          LS       0      84       0     .05      99       0
  45          UK     200   0.005   0.600      20
  46          UK     200   0.005   0.050      80
  47          RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                                HEC-1 INPUT                                     PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     900  0.0050   0.020   0.025    CIRC     1.5       0
  49          RD     900  0.0050   0.020   0.037    CIRC       2       0
  50          ZZ
```

```
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   27MAR17  TIME  11:53:26    *                  *           (916) 756-1104            *
 *                                        *                  *                                     *
 *****************************************                   ***************************************


                    HEC-1 Input Filename: 16196post-DE1
                    Description:          Casino Master Plan Alternative E Post-development Flow
                    Recurrence Interval:  10 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/27/2017
                    Total Area at Point of Interest: 23.9

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 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


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *    Basin   *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                        RUNOFF SUMMARY
                                                FLOW IN CUBIC FEET PER SECOND
                                             TIME IN HOURS,  AREA IN SQUARE MILES

                                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION       FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                                  6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                          Basin         49.   12.17          7.          4.          3.        .04
1
                                                 SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                     (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                      INTERPOLATED TO
                                                                                   COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00     48.79    730.00      2.07      1.00     48.79    730.00        2.07

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5842E+01 OUTFLOW= .4122E+01 BASIN STORAGE= .3957E-02 PERCENT ERROR=  29.4



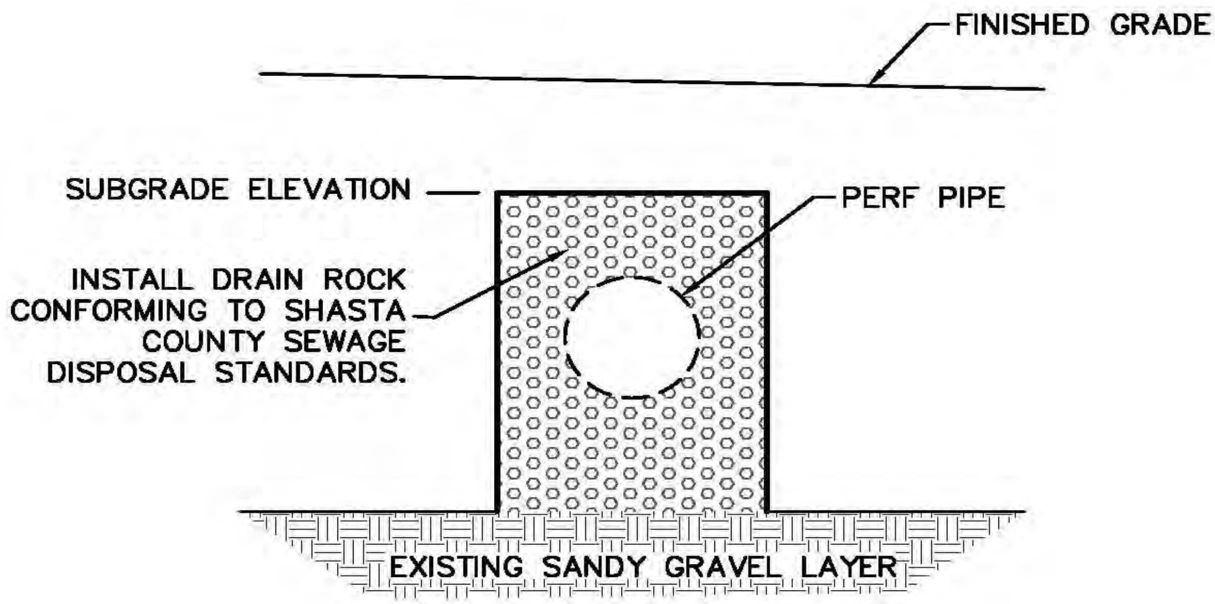
 *** NORMAL END OF HEC-1 ***
```

Casino Master Plan
Job#16.0196.000
Calc'd By: K. Reagan, P.E.
Sharrah Dunlap Sawyer, Inc.
Date:March 2017

INFILTRATION TRENCH CALCULATIONS

DE#1

Determine the capacity of the proposed rock trench to convey flow to the existing sandy gravel layer below the surface.



Using Darcy's Law: Q = A*k*i where: A = cross-sectional area, including space occupied by porous material
k = hydraulic conductivity
i = hydraulic gradient = h/d = drop in head / distance drop occurs

assume: minimum h = d; therefore, i = 1.0

Table 11.1 (Soil Engineering, 4th Edition): k = 0.1 cm/s

k = (0.1 cm/s)*(0.03281 ft/cm) = 0.0033 ft/s

Calculate Q diverted to existing sandy gravel layer (Q_D)

		A =	11700 sf
		width of trench =	5 ft
Q =	38.4 cfs	length of trench =	2340 ft

The calculated 2-year peak flow for Alternative E is 35 cubic feet per second and the 10-year peak flow is 49 cubic feet per second. As shown in the above calculation the proposed infiltration trench is adequately sized to infiltrate the 2-year peak storm.

Appendix B

Grading and Earthwork Calculations

SHARRAH
DUNLAP
SAWYER
INCORPORATED

Page	1	Of	1		
Job No.	16.0196.000				
Calc	IS	Checked		Date	04/13/17
Job Name	Casino Alternative A				

Alternative 'A' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	56,000	82,000	94,300	38,300	FILL
Offsite Drainage	38,000	0	0	38,000	CUT
Total	94,000	82,000	94,300	**300**	**Short Material**

***Notes:**
1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

SHARRAH DUNLAP SAWYER INCORPORATED

Page	1	Of	1
Job No.	16.0196.000		
Calc	IS	Checked	Date 04/13/17
Job Name	Casino Alternative B		

Alternative 'B' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	46,000	70,000	80,500	34,500	FILL
Offsite Drainage	34,000	0	0	34,000	CUT
Total	80,000	70,000	80,500	**500**	**Short Material**

***Notes:**

1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

SHARRAH DUNLAP SAWYER INCORPORATED

Job No. 16.0196.000
Calc IS Checked Date 04/13/17
Job Name Casino Alternative C

Alternative 'C' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	56,000	82,000	94,300	38,300	FILL
Offsite Drainage	38,000	0	0	38,000	CUT
Total	94,000	82,000	94,300	**300**	**Short Material**

***Notes:**
1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

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SAWYER
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Job No. 16.0196.000
Calc IS Checked ______ Date 04/13/17
Job Name Casino Alternative D

Alternative 'D' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	42,000	65,000	74,750	32,750	FILL
Offsite Drainage	33,000	0	0	33,000	CUT
Total	75,000	65,000	74,750	**250**	**Excess Material**

***Notes:**
1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

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SAWYER
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Job No. 16.0196.000
Calc IS Checked ______ Date 04/13/17
Job Name Casino Alternative E

Alternative 'E' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	18,000	120,000	138,000	120,000	FILL
Detention/Infiltration	120,000	0	0	120,000	CUT
Total	138,000	120,000	138,000	**0**	**Short Material**

***Notes:**

1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

Appendix C

Retention / Infiltration Pond Sizing Calculations

Alternative A Pond Sizing

1-year runoff: 1.24 inches
2-year runoff: 1.43 inches
85 percentile storm: 1.34 inches

85% Volume = 320809 cubic feet
Pond Volume = 641617 cubic feet

Note: The pool volume of the Wet Pond shall be twice the volume of the 85 percentile storm (Per CASQA California Stormwater BMP Handbook)

Project Area: 66.2 acres

Alternative B Pond Sizing

1-year runoff: 1.00 inches
2-year runoff: 1.10 inches
85 percentile storm: 1.05 inches

85% Volume = 252321 cubic feet
Pond Volume = 504643 cubic feet

Note: The pool volume of the Wet Pond shall be twice the volume of the 85 percentile storm (Per CASQA California Stormwater BMP Handbook)

Project Area: 66.2 acres

Alternative C Pond Sizing

1-year runoff: 1.24 inches
2-year runoff: 1.43 inches
85 percentile storm: 1.34 inches

85% Volume = 320809 cubic feet
Pond Volume = 641617 cubic feet

Note: The pool volume of the Wet Pond shall be twice the volume of the 85 percentile storm (Per CASQA California Stormwater BMP Handbook)

Project Area: 66.2 acres

Alternative D Pond Sizing

1-year runoff: 0.92 inches
2-year runoff: 0.95 inches
85 percentile storm: 0.94 inches

85% Volume = 224686 cubic feet
Pond Volume = 449372 cubic feet

Note: The pool volume of the Wet Pond shall be twice the volume of the 85 percentile storm (Per CASQA California Stormwater BMP Handbook)

Project Area: 66.2 acres

Design Considerations

- Area Required
- Slope
- Water Availability
- Aesthetics
- Environmental Side-effects

Targeted Constituents

☑	Sediment	■
☑	Nutrients	▲
☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

Description

Wet ponds (a.k.a. stormwater ponds, retention ponds, wet extended detention ponds) are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season) and differ from constructed wetlands primarily in having a greater average depth. Ponds treat incoming stormwater runoff by settling and biological uptake. The primary removal mechanism is settling as stormwater runoff resides in this pool, but pollutant uptake, particularly of nutrients, also occurs to some degree through biological activity in the pond. Wet ponds are among the most widely used stormwater practices. While there are several different versions of the wet pond design, the most common modification is the extended detention wet pond, where storage is provided above the permanent pool in order to detain stormwater runoff and promote settling. The schematic diagram is of an on-line pond that includes detention for larger events, but this is not required in all areas of the state.

California Experience

Caltrans constructed a wet pond in northern San Diego County (I-5 and La Costa Blvd.). Largest issues at this site were related to vector control, vegetation management, and concern that endangered species would become resident and hinder maintenance activities.

Advantages

- If properly designed, constructed and maintained, wet basins can provide substantial aesthetic/recreational value and wildlife and wetlands habitat.

- Ponds are often viewed as a public amenity when integrated into a park setting.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Due to the presence of the permanent wet pool, properly designed and maintained wet basins can provide significant water quality improvement across a relatively broad spectrum of constituents including dissolved nutrients.

- Widespread application with sufficient capture volume can provide significant control of channel erosion and enlargement caused by changes to flow frequency relationships resulting from the increase of impervious cover in a watershed.

Limitations

- Some concern about safety when constructed where there is public access.

- Mosquito and midge breeding is likely to occur in ponds.

- Cannot be placed on steep unstable slopes.

- Need for base flow or supplemental water if water level is to be maintained.

- Require a relatively large footprint

- Depending on volume and depth, pond designs may require approval from the State Division of Safety of Dams

Design and Sizing Guidelines

- Capture volume determined by local requirements or sized to treat 85% of the annual runoff volume.

- Use a draw down time of 48 hours in most areas of California. Draw down times in excess of 48 hours may result in vector breeding, and should be used only after coordination with local vector control authorities. Draw down times of less than 48 hours should be limited to BMP drainage areas with coarse soils that readily settle and to watersheds where warming may be detrimental to downstream fisheries.

- Permanent pool volume equal to twice the water quality volume.

- Water depth not to exceed about 8 feet.

- Wetland vegetation occupying no more than 25% of surface area.

- Include energy dissipation in the inlet design and a sediment forebay to reduce resuspension of accumulated sediment and facilitate maintenance.

- A maintenance ramp should be included in the design to facilitate access to the forebay for maintenance activities and for vector surveillance and control.

- To facilitate vector surveillance and control activities, road access should be provided along at least one side of BMPs that are seven meters or less in width. Those BMPs that have shoreline-to-shoreline distances in excess of seven meters should have perimeter road access on both sides or be designed such that no parcel of water is greater than seven meters from the road.

Construction/Inspection Considerations

- In areas with porous soils an impermeable liner may be required to maintain an adequate permanent pool level.
- Outlet structures and piping should be installed with collars to prevent water from seeping through the fill and causing structural failure.
- Inspect facility after first large storm to determine whether the desired residence time has been achieved.

Performance

The observed pollutant removal of a wet pond is highly dependent on two factors: the volume of the permanent pool relative to the amount of runoff from the typical event in the area and the quality of the base flow that sustains the permanent pool. A recent study (Caltrans, 2002) has documented that if the permanent pool is much larger than the volume of runoff from an average event, then displacement of the permanent pool by the wet weather flow is the primary process. A statistical comparison of the wet pond discharge quality during dry and wet weather shows that they are not significantly different. Consequently, there is a relatively constant discharge quality during storms that is the same as the concentrations observed in the pond during ambient (dry weather) conditions. Consequently, for most constituents the performance of the pond is better characterized by the average effluent concentration, rather than the "percent reduction," which has been the conventional measure of performance. Since the effluent quality is essentially constant, the percent reduction observed is mainly a function of the influent concentrations observed at a particular site.

The dry and wet weather discharge quality is, therefore, related to the quality of the base flow that sustains the permanent pool and of the transformations that occur to those constituents during their residence in the basin. One could potentially expect a wide range of effluent concentrations at different locations even if the wet ponds were designed according to the same guidelines, if the quality of the base flow differed significantly. This may explain the wide range of concentration reductions reported in various studies.

Concentrations of nutrients in base flow may be substantially higher than in urban stormwater runoff. Even though these concentrations may be substantially reduced during the residence time of the base flow in the pond, when this water is displaced by wet weather flows, concentrations may still be quite elevated compared to the levels that promote eutrophication in surface water systems. Consequently comparing influent and effluent nutrient concentrations during wet weather can make the performance seem highly variable.

Relatively small perennial flows may often substantially exceed the wet weather flow treated. Consequently, one should also consider the load reduction observed under ambient conditions when assessing the potential benefit to the receiving water.

Siting Criteria

Wet ponds are a widely applicable stormwater management practice and can be used over a broad range of storm frequencies and sizes, drainage areas and land use types. Although they have limited applicability in highly urbanized settings and in arid climates, they have few other restrictions. Wet basins may be constructed on- or off-line and can be sited at feasible locations along established drainage ways with consistent base flow. An off-line design is preferred. Wet basins are often utilized in smaller sub-watersheds and are particularly appropriate in areas with residential land uses or other areas where high nutrient loads are considered to be potential problems (e.g., golf courses).

Ponds do not consume a large area (typically 2–3 percent of the contributing drainage area); however, these facilities are generally large. Other practices, such as filters or swales, may be "squeezed" into relatively unusable land, but ponds need a relatively large continuous area. Wet basins are typically used in drainage basins of more than ten acres and less than one square mile (Schueler et al., 1992). Emphasis can be placed in siting wet basins in areas where the pond can also function as an aesthetic amenity or in conjunction with other stormwater management functions.

Wet basin application is appropriate in the following settings: (1) where there is a need to achieve a reasonably high level of dissolved contaminant removal and/or sediment capture; (2) in small to medium-sized regional tributary areas with available open space and drainage areas greater than about 10 ha (25 ac.); (3) where base flow rates or other channel flow sources are relatively consistent year-round; (4) in residential settings where aesthetic and wildlife habitat benefits can be appreciated and maintenance activities are likely to be consistently undertaken.

Traditional wet extended detention ponds can be applied in most regions of the United States, with the exception of arid climates. In arid regions, it is difficult to justify the supplemental water needed to maintain a permanent pool because of the scarcity of water. Even in semi-arid Austin, Texas, one study found that 2.6 acre-feet per year of supplemental water was needed to maintain a permanent pool of only 0.29 acre-feet (Saunders and Gilroy, 1997). Seasonal wet ponds (i.e., ponds that maintain a permanent pool only during the wet season) may prove effective in areas with distinct wet and dry seasons; however, this configuration has not been extensively evaluated.

Wet ponds may pose a risk to cold water systems because of their potential for stream warming. When water remains in the permanent pool, it is heated by the sun. A study in Prince George's County, Maryland, found that stormwater wet ponds heat stormwater by about 9°F from the inlet to the outlet (Galli, 1990).

Additional Design Guidelines

Specific designs may vary considerably, depending on site constraints or preferences of the designer or community. There are several variations of the wet pond design, including constructed wetlands, and wet extended detention ponds. Some of these design alternatives are intended to make the practice adaptable to various sites and to account for regional constraints and opportunities. In conventional wet ponds, the open water area comprises 50% or more of the total surface area of the pond. The permanent pool should be no deeper than 2.5 m (8 feet) and should average 1.2 – 2 m (4-6 feet) deep. The greater depth of this configuration helps limit the extent of the vegetation to an aquatic bench around the perimeter of the pond with a nominal depth of about 1 foot and variable width. This shallow bench also protects the banks from erosion, enhances habitat and aesthetic values, and reduces the drowning hazard.

The wet extended detention pond combines the treatment concepts of the dry extended detention pond and the wet pond. In this design, the water quality volume is detained above the permanent pool and released over 24 hours. In addition to increasing the residence time, which improves pollutant removal, this design also attenuates peak runoff rates. Consequently, this design alternative is recommended.

Pretreatment incorporates design features that help to settle out coarse sediment particles. By removing these particles from runoff before they reach the large permanent pool, the maintenance burden of the pond is reduced. In ponds, pretreatment is achieved with a sediment forebay. A sediment forebay is a small pool (typically about 10 percent of the volume of the permanent pool). Coarse particles remain trapped in the forebay, and maintenance is performed on this smaller pool, eliminating the need to dredge the entire pond.

There are a variety of sizing criteria for determining the volume of the permanent pool, mostly related to the water quality volume (i.e., the volume of water treated for pollutant removal) or the average storm size in a particular area. In addition, several theoretical approaches to determination of permanent pool volume have been developed. However, there is little empirical evidence to support these designs. Consequently, a simplified method (i.e., permanent pool volume equal to twice the water quality volume) is recommended.

Other design features do not increase the volume of a pond, but can increase the amount of time stormwater remains in the device and eliminate short-circuiting. Ponds should always be designed with a length-to-width ratio of at least 1.5:1, where feasible. In addition, the design should incorporate features to lengthen the flow path through the pond, such as underwater berms designed to create a longer route through the pond. Combining these two measures helps ensure that the entire pond volume is used to treat stormwater. Wet ponds with greater amounts of vegetation often have channels through the vegetated areas and contain dead areas where stormwater is restricted from mixing with the entire permanent pool, which can lead to less pollutant removal. Consequently, a pond with open water comprising about 75% of the surface area is preferred.

Design features are also incorporated to ease maintenance of both the forebay and the main pool of ponds. Ponds should be designed with a maintenance access to the forebay to ease this relatively routine (every 5–7 year) maintenance activity. In addition, ponds should generally have a drain to draw down the pond for vegetation harvesting or the more infrequent dredging of the main cell of the pond.

Cold climates present many challenges to designers of wet ponds. The spring snowmelt may have a high pollutant load and a large volume to be treated. In addition, cold winters may cause freezing of the permanent pool or freezing at inlets and outlets. Finally, high salt concentrations in runoff resulting from road salting, and sediment loads from road sanding, may impact pond vegetation as well as reduce the storage and treatment capacity of the pond.

One option to deal with high pollutant loads and runoff volumes during the spring snowmelt is the use of a seasonally operated pond to capture snowmelt during the winter and retain the permanent pool during warmer seasons. In this option, proposed by Oberts (1994), the pond has two water quality outlets, both equipped with gate valves. In the summer, the lower outlet is closed. During the fall and throughout the winter, the lower outlet is opened to draw down the permanent pool. As the spring melt begins, the lower outlet is closed to provide detention for the melt event. The manipulation of this system requires some labor and vigilance; a careful maintenance agreement should be confirmed.

Several other modifications may help to improve the performance of ponds in cold climates. Designers should consider planting the pond with salt-tolerant vegetation if the facility receives road runoff. In order to counteract the effects of freezing on inlet and outlet structures, the use of inlet and outlet structures that are resistant to frost, including weirs and larger diameter pipes, may be useful. Designing structures on-line, with a continuous flow of water through the pond, will also help prevent freezing of these structures. Finally, since freezing of the permanent pool can reduce the effectiveness of pond systems, it is important to incorporate extended detention into the design to retain usable treatment area above the permanent pool when it is frozen.

Summary of Design Recommendations

(1) Facility Sizing – The basin should be sized to hold the permanent pool as well as the required water quality volume. The volume of the permanent pool should equal twice the water quality volume.

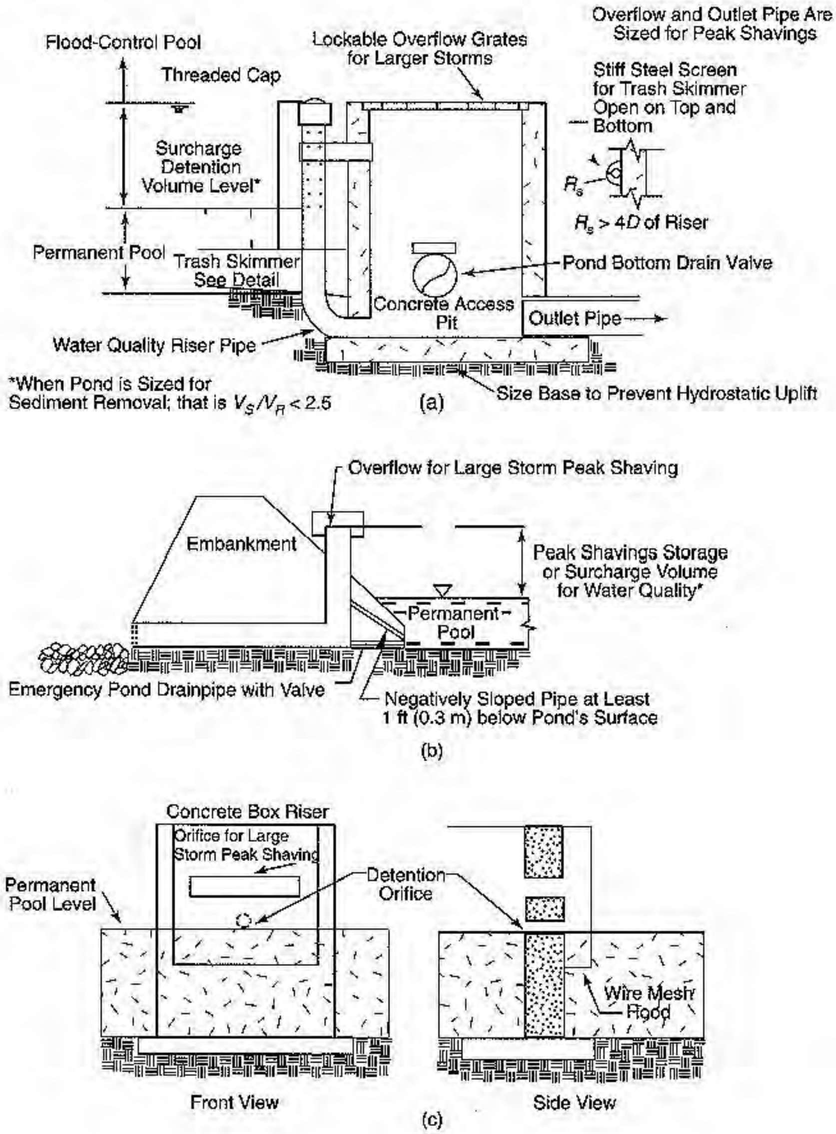
(2) Pond Configuration - The wet basin should be configured as a two stage facility with a sediment forebay and a main pool. The basins should be wedge-shaped, narrowest at the inlet and widest at the outlet. The minimum length to width ratio should be 1.5 where feasible. The perimeter of all permanent pool areas with depths of 4.0 feet or greater should be surrounded by an aquatic bench. This bench should extend inward 5-10 feet from the perimeter of the permanent pool and should be no more than 18 inches below normal depth. The area of the bench should not exceed about 25% of pond surface. The depth in the center of the basin should be 4 – 8 feet deep to prevent vegetation from encroaching on the pond open water surface.

(3) Pond Side Slopes - Side slopes of the basin should be 3:1 (H:V) or flatter for grass stabilized slopes. Slopes steeper than 3:1 should be stabilized with an appropriate slope stabilization practice.

(4) Sediment Forebay - A sediment forebay should be used to isolate gross sediments as they enter the facility and to simplify sediment removal. The sediment forebay should consist of a separate cell formed by an earthen berm, gabion, or loose riprap wall. The forebay should be sized to contain 15 to 25% of the permanent pool volume and should be at least 3 feet deep. Exit velocities from the forebay should not be erosive. Direct maintenance access should be provided to the forebay. The bottom of the forebay may be hardened (concrete) to make sediment removal easier. A fixed vertical sediment depth marker should be installed in the forebay to measure sediment accumulation.

(5) Outflow Structure - Figure 2 presents a schematic representation of suggested outflow structures. The outlet structure should be designed to drain the water quality volume over 24 hours with the orifice sized according to the equation presented in the Extended Detention Basin fact sheet. The facility should have a separate drain pipe with a manual valve that can completely or partially drain the pond for maintenance purposes. To allow for possible sediment accumulation, the submerged end of the pipe should be protected, and the drain pipe should be sized to drain the pond within 24 hours. The valve should be located at a point where it can be operated in a safe and convenient manner.

For on-line facilities, the principal and emergency spillways must be sized to provide 1.0 foot of freeboard during the 25-year event and to safely pass the 100-year flood. The embankment should be designed in accordance with all relevant specifications for small dams.



(6) Splitter Box - When the pond is designed as an off-line facility, a splitter structure is used to isolate the water quality volume. The splitter box, or other flow diverting approach, should be designed to convey the 25-year event while providing at least 1.0 foot of freeboard along pond side slopes.

(7) Vegetation - A plan should be prepared that indicates how aquatic and terrestrial areas will be vegetatively stabilized. Wetland vegetation elements should be placed along the aquatic bench or in the shallow portions of the permanent pool. The optimal elevation for planting of wetland vegetation is within 6 inches vertically of the normal pool elevation. A list of some wetland vegetation native to California is presented in Table 1.

Table 1 California Wetland Vegetation

Botanical Name	Common Name
BACCHARIS SALICIFOLIA	MULE FAT
FRANKENIA GRANDIFOLIA	HEATH
SALIX GOODINGII	BLACK WILLOW
SALIX LASIOLEPIS	ARROYO WILLOW
SAMUCUS MEXICANUS	MEXICAN ELDERBERRY
HAPLOPAPPUS VENETUS	COAST GOLDENBRUSH
DISTICHIS SPICATA	SALT GRASS
LIMONIUM CALIFORNICUM	COASTAL STATICE
ATRIPLEX LENTIFORMIS	COASTAL QUAIL BUSH
BACCHARIS PILULARIS	CHAPARRAL BROOM
MIMULUS LONGIFLORUS	MONKEY FLOWER
SCIRPUS CALIFORNICUS	BULRUSH
SCIRPUS ROBUSTUS	BULRUSH
TYPHA LATIFOLIA	BROADLEAF CATTAIL
JUNCUS ACUTUS	RUSH

Maintenance

The amount of maintenance required for a wet pond is highly dependent on local regulatory agencies, particular health and vector control agencies. These agencies are often extremely concerned about the potential for mosquito breeding that may occur in the permanent pool. Even though mosquito fish (*Gambusia affinis*) were introduced into a wet pond constructed by Caltrans in the San Diego area, mosquito breeding was routinely observed during inspections. In addition, the vegetation at this site became sufficiently dense on the bench around the edge of the pool that mosquito fish were unable to enter this area to feed upon the mosquito larvae. The vegetation at this site was particularly vigorous because of the high nutrient concentrations in the perennial base flow (15.5 mg/L NO_3-N) and the mild climate, which permitted growth year round. Consequently, the vector control agency required an annual harvest of vegetation to address this situation. This harvest can be very expensive.

On the other hand, routine harvesting may increase nutrient removal and prevent the export of these constituents from dead and dying plants falling in the water. A previous study (Faulkner and Richardson, 1991) documented dramatic reductions in nutrient removal after the first several years of operation and related it to the vegetation achieving a maximum density. That content then decreases through the growth season, as the total biomass increases. In effect, the total amount of nutrients/m2 of wetland remains essentially the same from June through September, when the plants start to put the P back into the rhizomes. Therefore harvesting should occur between June and September. Research also suggests that harvesting only the foliage is less effective, since a very small percentage of the removed nutrients is taken out with harvesting.

Since wet ponds are often selected for their aesthetic considerations as well as pollutant removal, they are often sited in areas of high visibility. Consequently, floating litter and debris are removed more frequently than would be required simply to support proper functioning of the pond and outlet. This is one of the primary maintenance activities performed at the Central Market Pond located in Austin, Texas. In this type of setting, vegetation management in the area surrounding the pond can also contribute substantially to the overall maintenance requirements.

One normally thinks of sediment removal as one of the typical activities performed at stormwater BMPs. This activity does not normally constitute one of the major activities on an annual basis. At the concentrations of TSS observed in urban runoff from stable watersheds, sediment removal may only be required every 20 years or so. Because this activity is performed so infrequently, accurate costs for this activity are lacking.

In addition to regular maintenance activities needed to maintain the function of wet ponds, some design features can be incorporated to ease the maintenance burden. In wet ponds, maintenance reduction features include techniques to reduce the amount of maintenance needed, as well as techniques to make regular maintenance activities easier.

One potential maintenance concern in wet ponds is clogging of the outlet. Ponds should be designed with a non-clogging outlet such as a reverse-slope pipe, or a weir outlet with a trash rack. A reverse-slope pipe draws from below the permanent pool extending in a reverse angle up to the riser and establishes the water elevation of the permanent pool. Because these outlets draw water from below the level of the permanent pool, they are less likely to be clogged by floating debris.

Typical maintenance activities and frequencies include:

- Schedule semiannual inspections for burrows, sediment accumulation, structural integrity of the outlet, and litter accumulation.

- Remove accumulated trash and debris in the basin at the middle and end of the wet season. The frequency of this activity may be altered to meet specific site conditions and aesthetic considerations.

- Where permitted by the Department of Fish and Game or other agency regulations, stock wet ponds/constructed wetlands regularly with mosquito fish (*Gambusia spp.*) to enhance natural mosquito and midge control.

- Introduce mosquito fish and maintain vegetation to assist their movements to control mosquitoes, as well as to provide access for vector inspectors. An annual vegetation harvest in summer appears to be optimum, in that it is after the bird breeding season, mosquito fish can provide the needed control until vegetation reaches late summer density, and there is time for re-growth for runoff treatment purposes before the wet season. In certain cases, more frequent plant harvesting may be required by local vector control agencies.

- Maintain emergent and perimeter shoreline vegetation as well as site and road access to facilitate vector surveillance and control activities.

- Remove accumulated sediment in the forebay and regrade about every 5-7 years or when the accumulated sediment volume exceeds 10 percent of the basin volume. Sediment removal may not be required in the main pool area for as long as 20 years.

Cost

Construction Cost

Wet ponds can be relatively inexpensive stormwater practices; however, the construction costs associated with these facilities vary considerably. Much of this variability can be attributed to the degree to which the existing topography will support a wet pond, the complexity and amount of concrete required for the outlet structure, and whether it is installed as part of new construction or implemented as a retrofit of existing storm drain system.

A recent study (Brown and Schueler, 1997) estimated the cost of a variety of stormwater management practices. The study resulted in the following cost equation, adjusting for inflation:

$$C = 24.5^{V0.705}$$

where:

C = Construction, design and permitting cost;

V = Volume in the pond to include the 10-year storm (ft^3).

Using this equation, typical construction costs are:

$45,700 for a 1 acre-foot facility

$232,000 for a 10 acre-foot facility

$1,170,000 for a 100 acre-foot facility

In contrast, Caltrans (2002) reported spending over $448,000 for a pond with a total permanent pool plus water quality volume of only 1036 m^3 (0.8 ac.-ft.), while the City of Austin spent $584,000 (including design) for a pond with a permanent pool volume of 3,100 m^3 (2.5 ac.-ft.). The large discrepancies between the costs of these actual facilities and the model developed by Brown and Schueler indicate that construction costs are highly site specific, depending on topography, soils, subsurface conditions, the local labor, rate and other considerations.

Maintenance Cost

For ponds, the annual cost of routine maintenance has typically been estimated at about 3 to 5 percent of the construction cost; however, the published literature is almost totally devoid of actual maintenance costs. Since ponds are long-lived facilities (typically longer than 20 years), major maintenance activities are unlikely to occur during a relatively short study.

Caltrans (2002) estimated annual maintenance costs of $17,000 based on three years of monitoring of a pond treating runoff from 1.7 ha. Almost all the activities are associated with the annual vegetation harvest for vector control. Total cost at this site falls within the 3-5% range reported above; however, the construction costs were much higher than those estimated by Brown and Schueler (1997). The City of Austin has been reimbursing a developer about $25,000/yr for wet pond maintenance at a site located at a very visible location. Maintenance costs are mainly the result of vegetation management and litter removal. On the other hand, King County estimates annual maintenance costs at about $3,000 per pond; however, this cost likely does not include annual extensive vegetation removal. Consequently, maintenance costs may vary considerably at sites in California depending on the aggressiveness of the vegetation management in that area and the frequency of litter removal.

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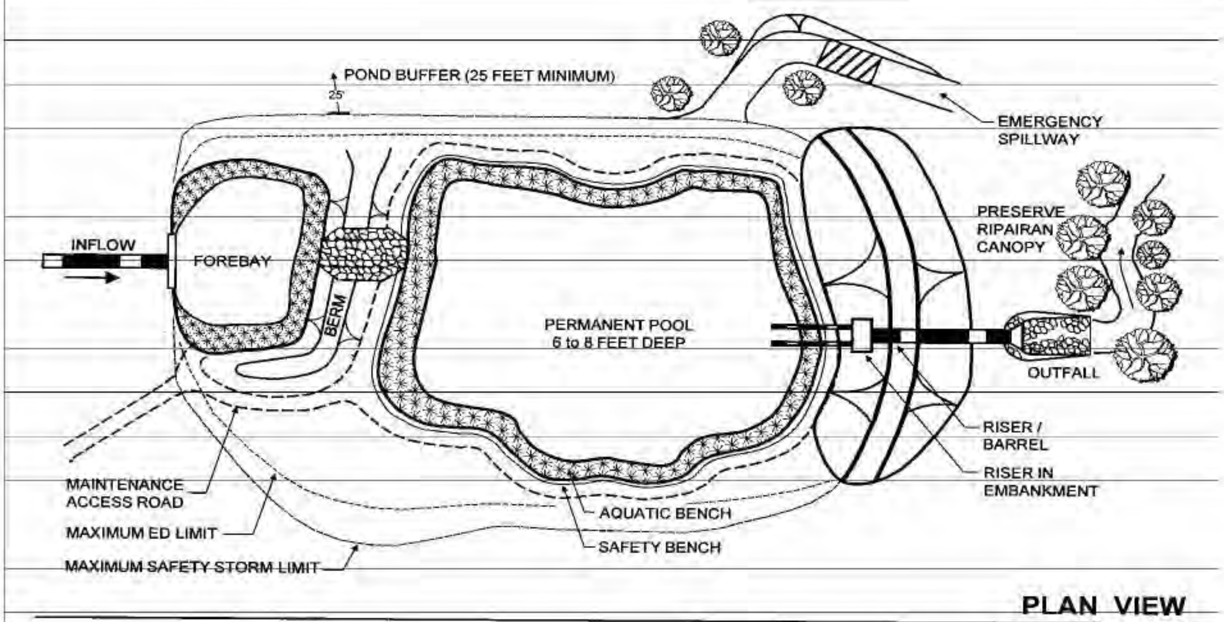
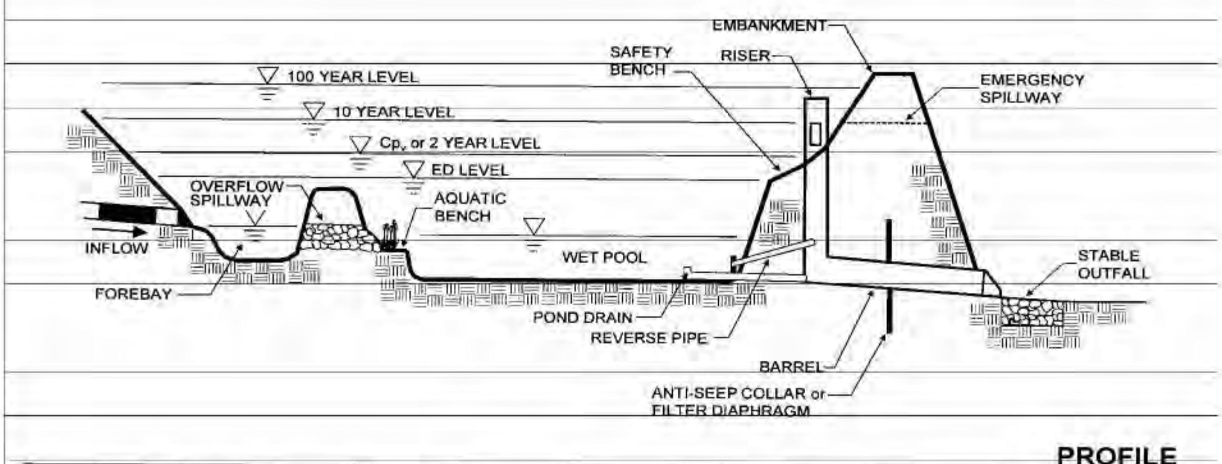


POND BUFFER (25 FEET MINIMUM)
25'
EMERGENCY SPILLWAY
INFLOW
FOREBAY
BERM
PRESERVE RIPAIRAN CANOPY
PERMANENT POOL 6 to 8 FEET DEEP
OUTFALL
RISER / BARREL
RISER IN EMBANKMENT
MAINTENANCE ACCESS ROAD
MAXIMUM ED LIMIT
MAXIMUM SAFETY STORM LIMIT
AQUATIC BENCH
SAFETY BENCH
PLAN VIEW



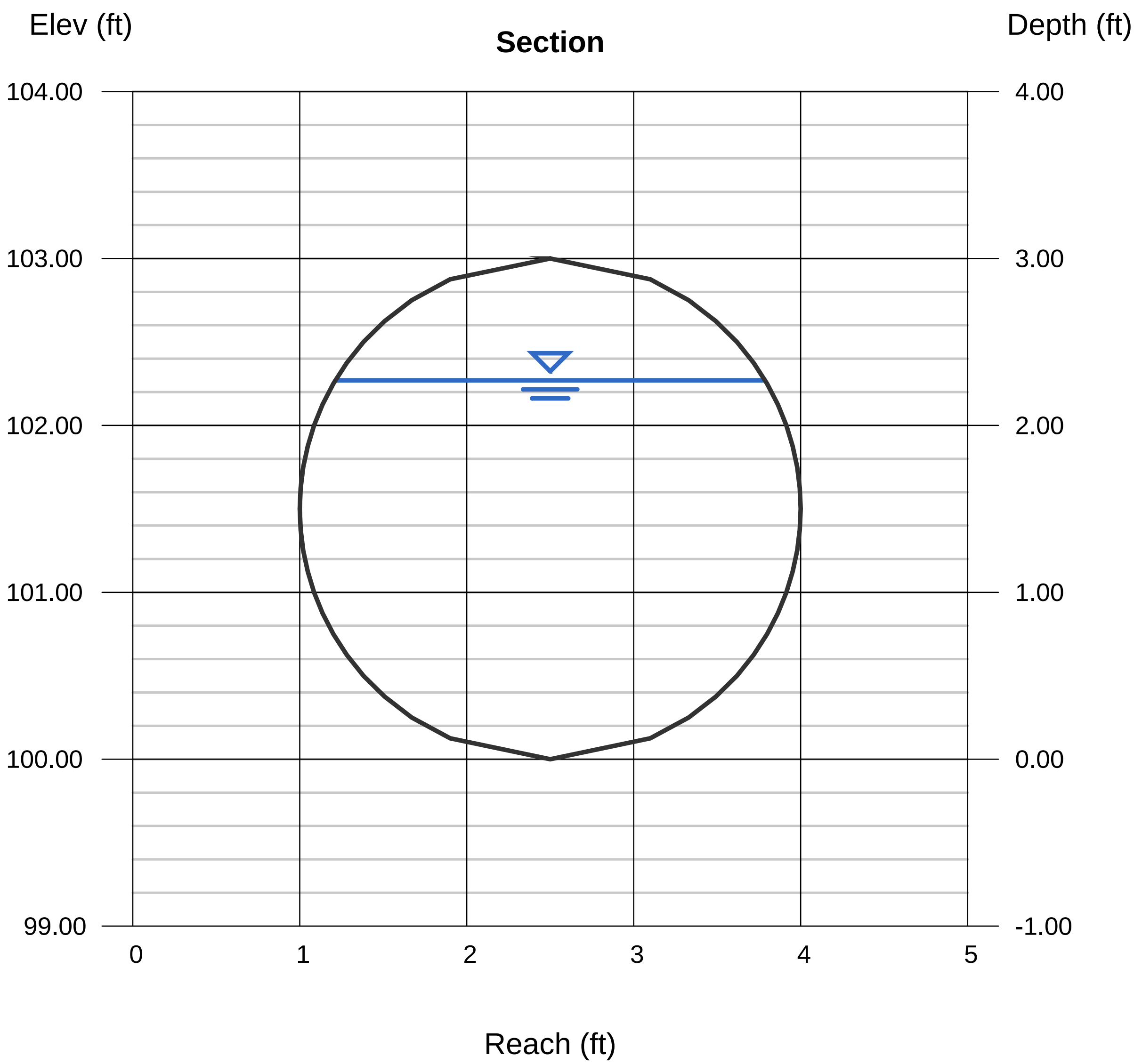
EMBANKMENT
SAFETY BENCH
RISER
100 YEAR LEVEL
10 YEAR LEVEL
Cp, or 2 YEAR LEVEL
ED LEVEL
EMERGENCY SPILLWAY
OVERFLOW SPILLWAY
AQUATIC BENCH
INFLOW
WET POOL
STABLE OUTFALL
FOREBAY
POND DRAIN
REVERSE PIPE
BARREL
ANTI-SEEP COLLAR or FILTER DIAPHRAGM
PROFILE

Appendix D
Drainage Structure Sizing

Channel Report

Alternative A: Drainage Area #1

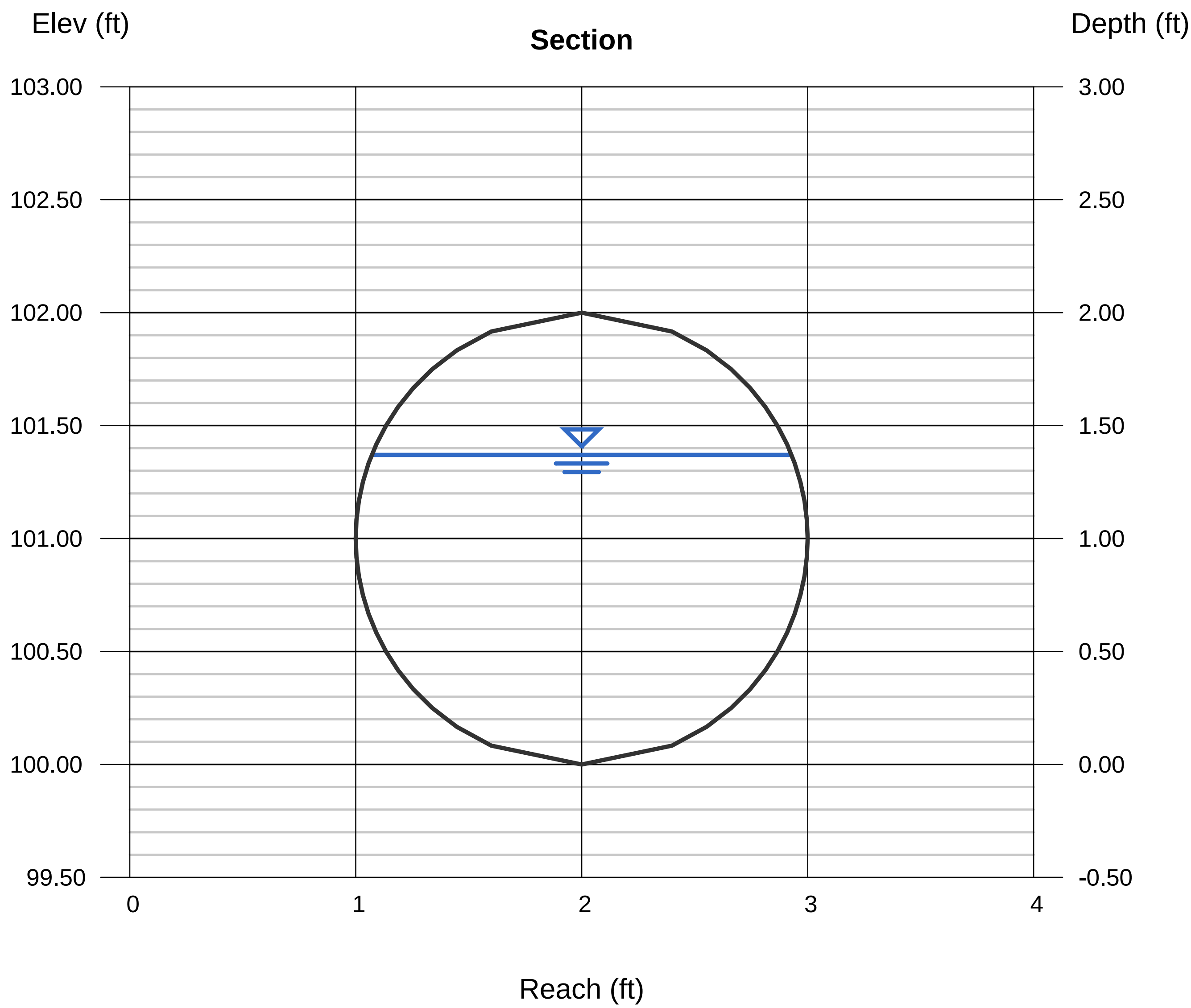
Circular		**Highlighted**	
Diameter (ft)	= 3.00	Depth (ft)	= 2.27
		Q (cfs)	= 47.00
		Area (sqft)	= 5.74
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 8.19
Slope (%)	= 0.50	Wetted Perim (ft)	= 6.33
N-Value	= 0.012	Crit Depth, Yc (ft)	= 2.24
		Top Width (ft)	= 2.57
Calculations		EGL (ft)	= 3.31
Compute by:	Known Q		
Known Q (cfs)	= 47.00		



Channel Report

Alternative A: Drainage Areas #2 and #4

Circular		**Highlighted**	
Diameter (ft)	= 2.00	Depth (ft)	= 1.37
		Q (cfs)	= 14.00
		Area (sqft)	= 2.29
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 6.10
Slope (%)	= 0.50	Wetted Perim (ft)	= 3.90
N-Value	= 0.012	Crit Depth, Yc (ft)	= 1.35
		Top Width (ft)	= 1.86
Calculations		EGL (ft)	= 1.95
Compute by:	Known Q		
Known Q (cfs)	= 14.00		



Channel Report

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Alternative A: Drainage Area #3

Circular

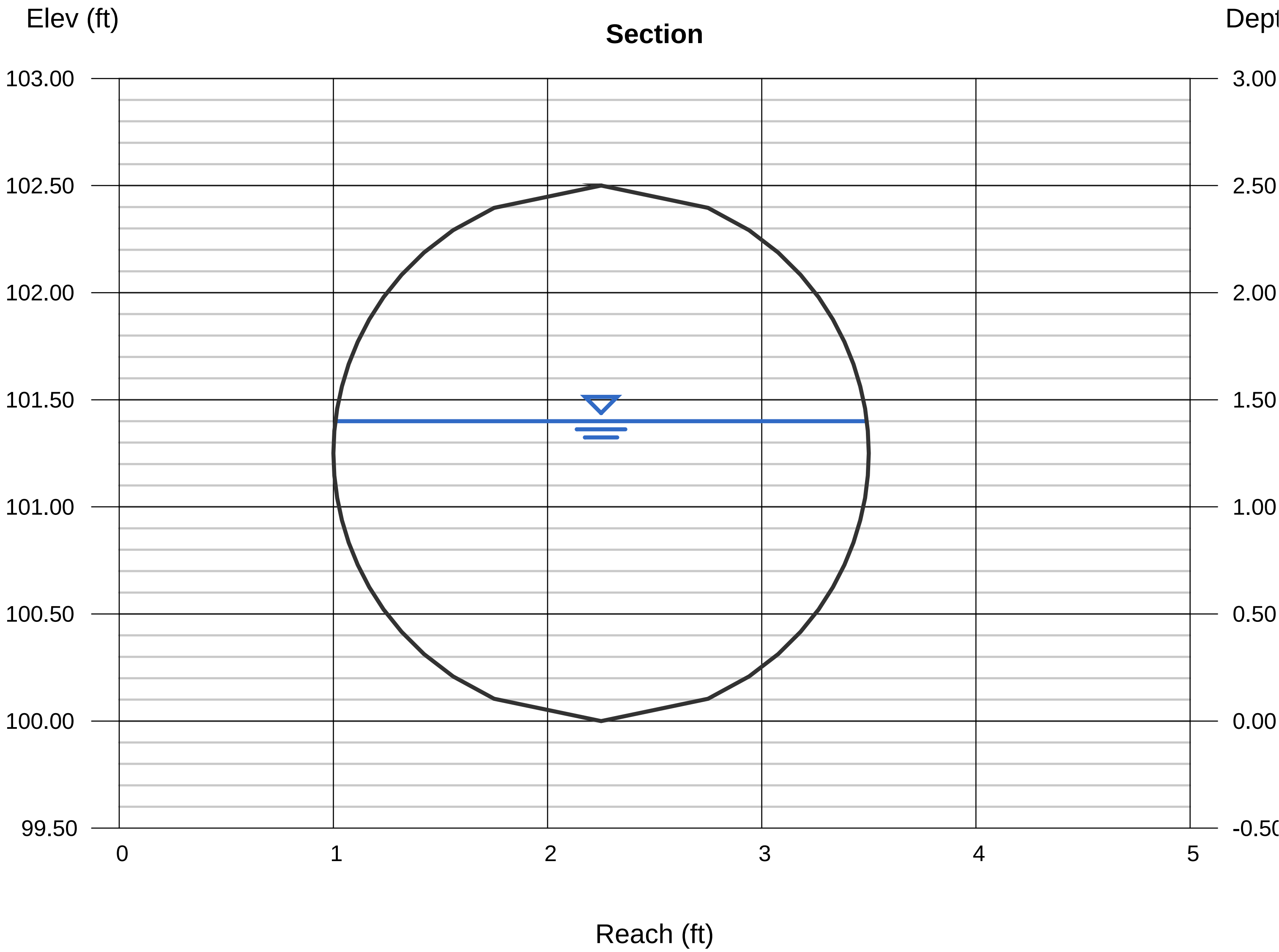
Diameter (ft)	= 2.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 19.00

Highlighted

Depth (ft)	= 1.40
Q (cfs)	= 19.00
Area (sqft)	= 2.84
Velocity (ft/s)	= 6.69
Wetted Perim (ft)	= 4.24
Crit Depth, Yc (ft)	= 1.48
Top Width (ft)	= 2.48
EGL (ft)	= 2.10



Channel Report

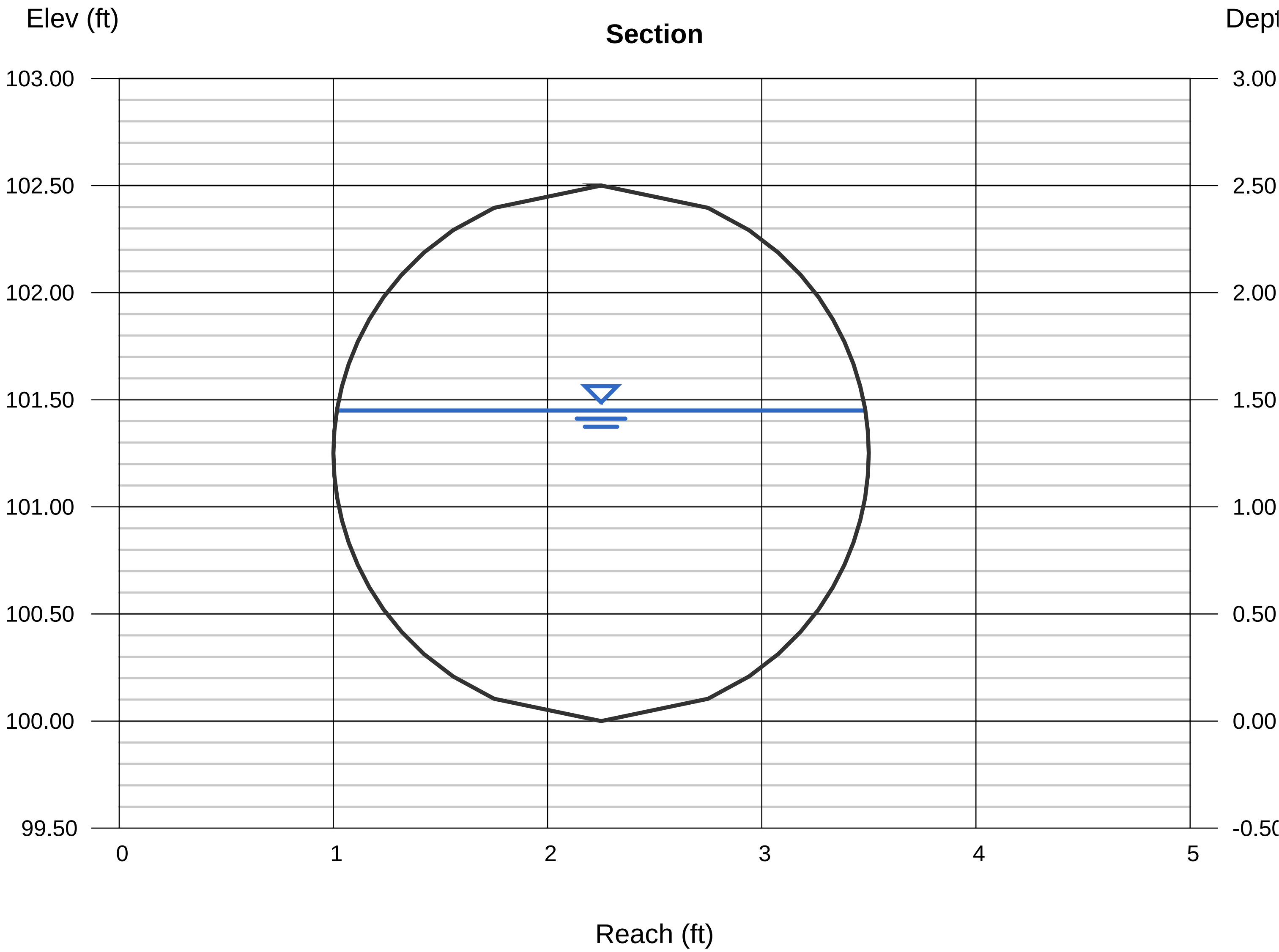
Alternative B: Drainage Area #1

Circular
Diameter (ft) = 2.50

Invert Elev (ft) = 100.00
Slope (%) = 0.50
N-Value = 0.012

Calculations
Compute by: Known Q
Known Q (cfs) = 20.00

Highlighted
Depth (ft) = 1.45
Q (cfs) = 20.00
Area (sqft) = 2.96
Velocity (ft/s) = 6.75
Wetted Perim (ft) = 4.34
Crit Depth, Yc (ft) = 1.52
Top Width (ft) = 2.47
EGL (ft) = 2.16



Channel Report

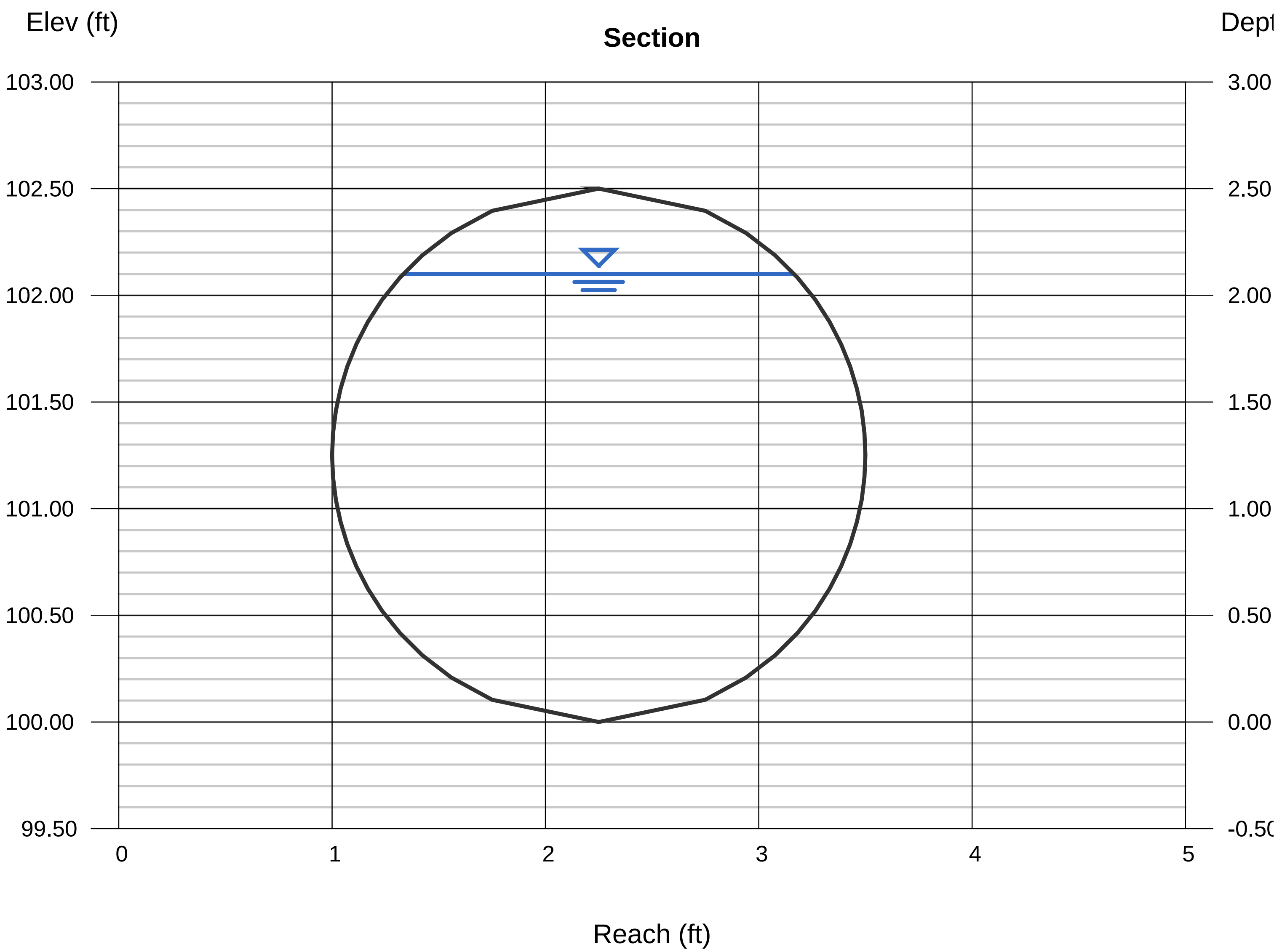
Alternative D: Drainage Area #1

Circular
Diameter (ft) = 2.50

Invert Elev (ft) = 100.00
Slope (%) = 0.50
N-Value = 0.012

Calculations
Compute by: Known Q
Known Q (cfs) = 32.00

Highlighted
Depth (ft) = 2.10
Q (cfs) = 32.00
Area (sqft) = 4.40
Velocity (ft/s) = 7.27
Wetted Perim (ft) = 5.80
Crit Depth, Yc (ft) = 1.93
Top Width (ft) = 1.83
EGL (ft) = 2.92



Channel Report

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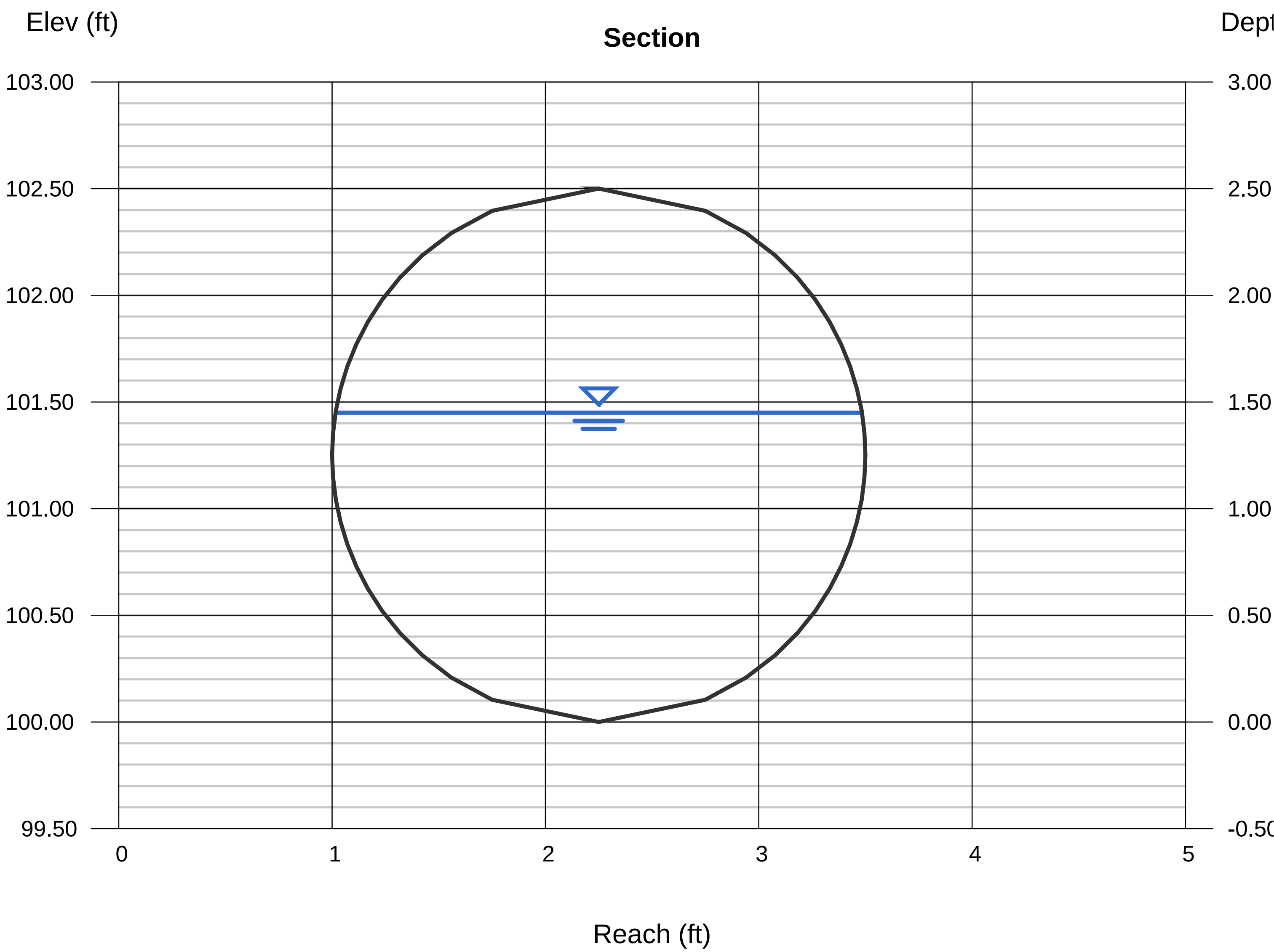
Alternative D: Drainage Area #2

Circular		**Highlighted**	
Diameter (ft)	= 2.50	Depth (ft)	= 1.45
		Q (cfs)	= 20.00
		Area (sqft)	= 2.96
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 6.75
Slope (%)	= 0.50	Wetted Perim (ft)	= 4.34
N-Value	= 0.012	Crit Depth, Yc (ft)	= 1.52
		Top Width (ft)	= 2.47
Calculations		EGL (ft)	= 2.16
Compute by:	Known Q		
Known Q (cfs)	= 20.00		



Channel Report

Alternative E: Drainage Area #1

Circular

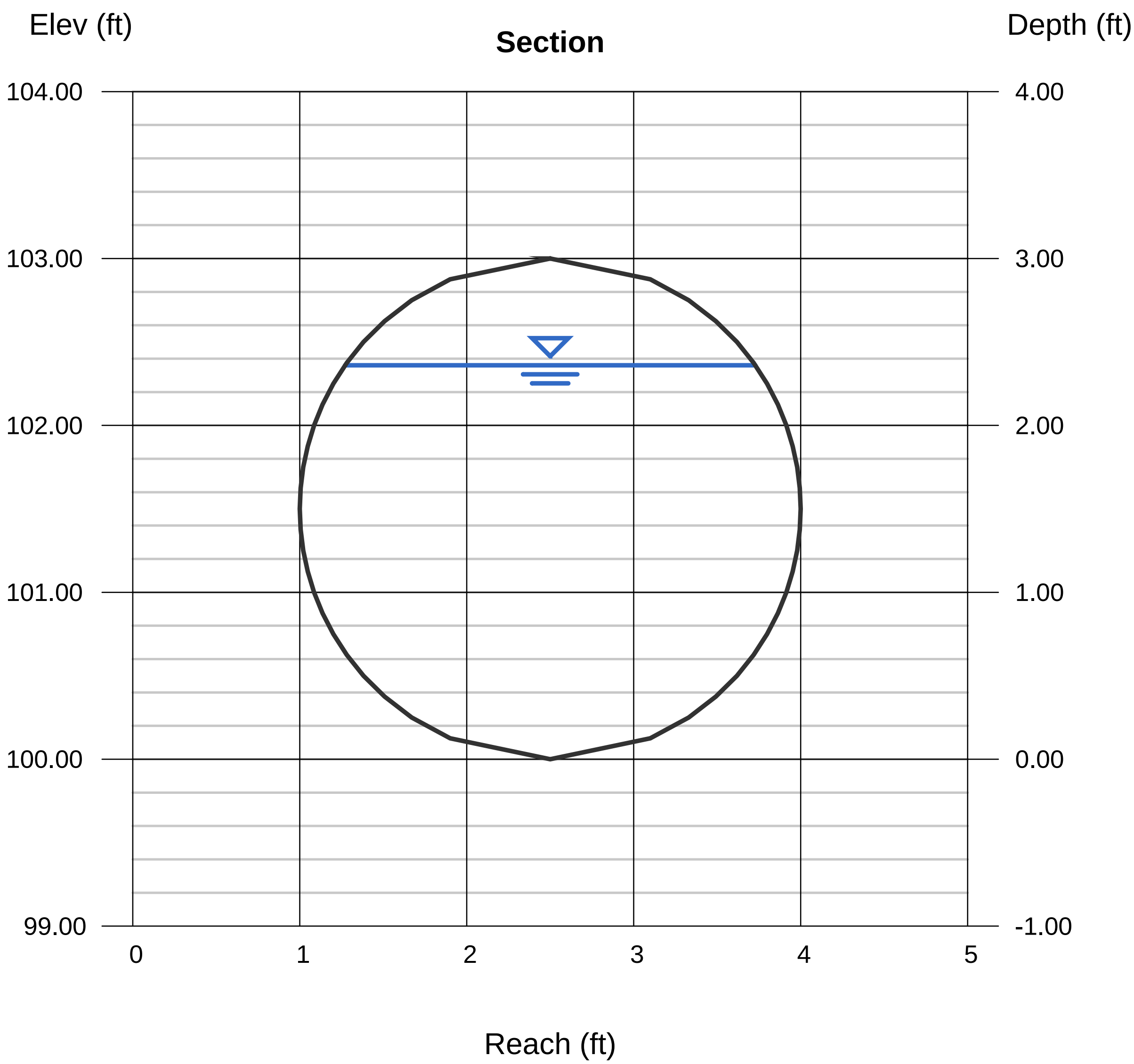
Diameter (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 49.00

Highlighted

Depth (ft)	= 2.36
Q (cfs)	= 49.00
Area (sqft)	= 5.98
Velocity (ft/s)	= 8.20
Wetted Perim (ft)	= 6.56
Crit Depth, Yc (ft)	= 2.28
Top Width (ft)	= 2.45
EGL (ft)	= 3.41

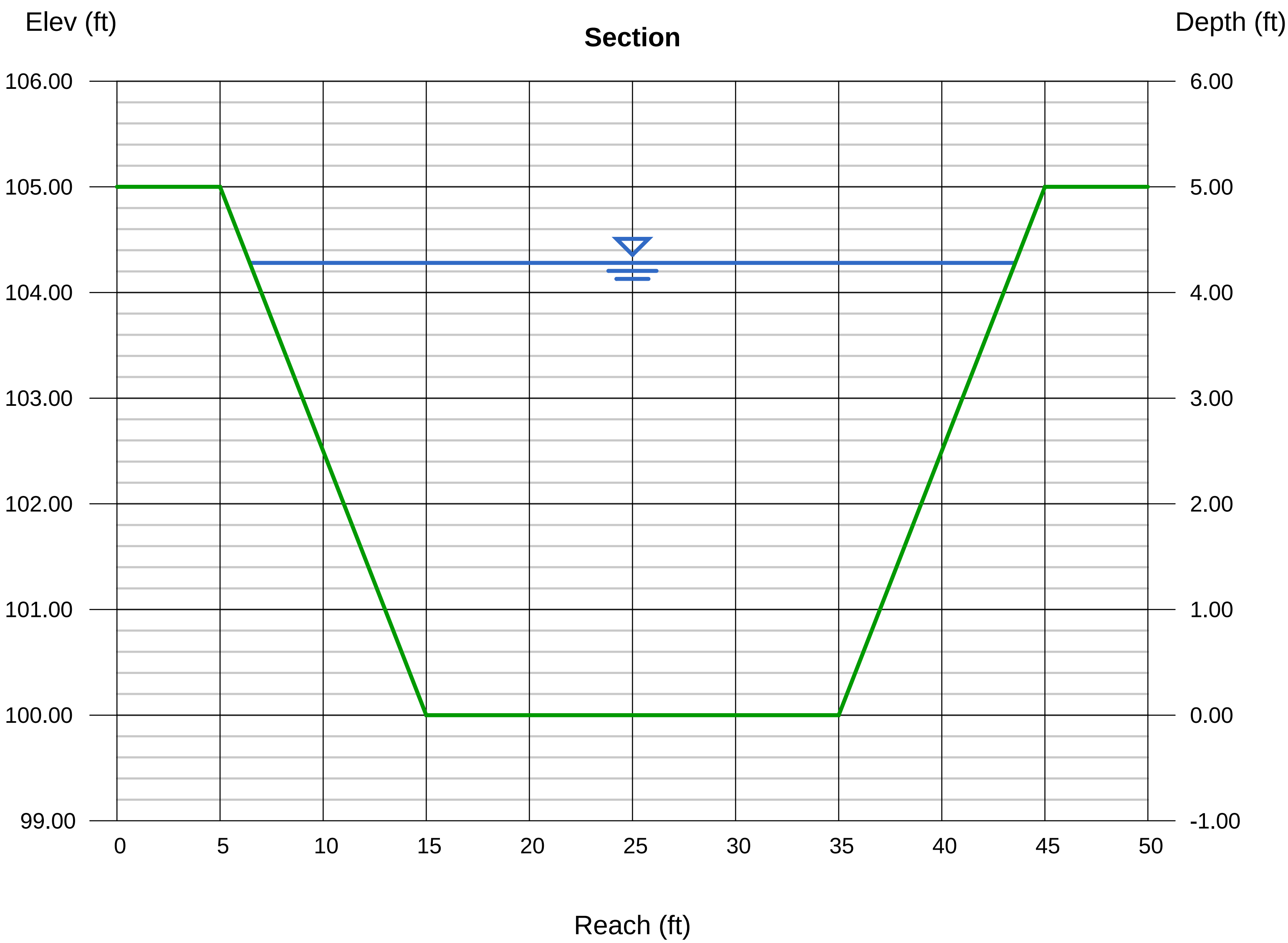


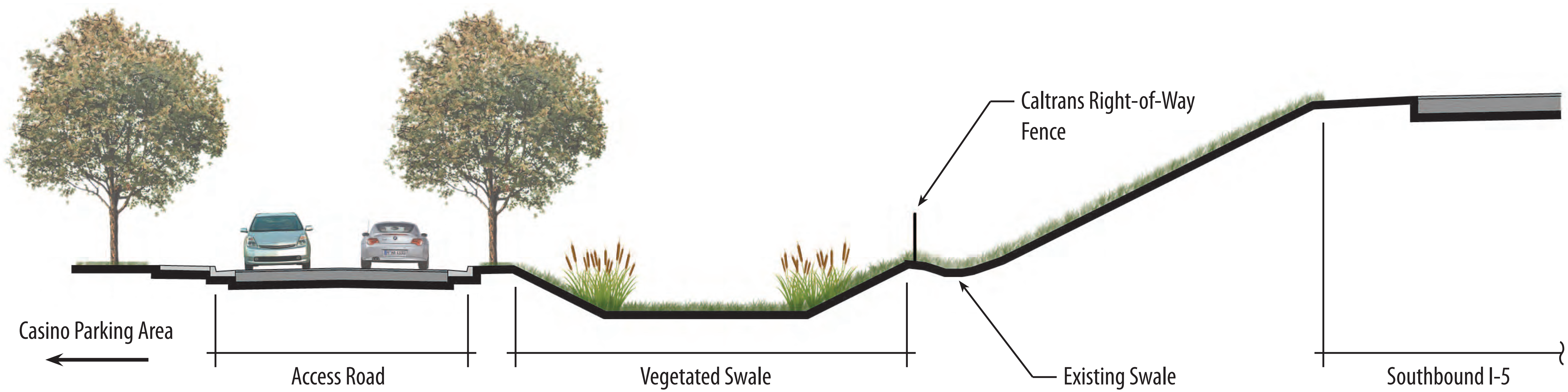
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 7 2017

Proposed Earthen Infiltration Channel

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 20.00	Depth (ft)	= 4.28
Side Slopes (z:1)	= 2.00, 2.00	Q (cfs)	= 700.00
Total Depth (ft)	= 5.00	Area (sqft)	= 122.24
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 5.73
Slope (%)	= 0.40	Wetted Perim (ft)	= 39.14
N-Value	= 0.035	Crit Depth, Yc (ft)	= 3.03
		Top Width (ft)	= 37.12
Calculations		EGL (ft)	= 4.79
Compute by:	Known Q		
Known Q (cfs)	= 700.00		




Caltrans Right-of-Way
Fence
Casino Parking Area
Access Road
Vegetated Swale
Existing Swale
Southbound I-5

NOT TO SCALE

Vegetated Swale

Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	●
☑	Metals	▲
☑	Bacteria	●
☑	Oil and Grease	▲
☑	Organics	▲

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

CASQA

CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are mores susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, which ever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data

Study	TSS	TP	TN	NO_3	Metals	Bacteria	Type
	Removal Efficiencies (% Removal)						
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42–62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2–16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46–73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70–80	-	dry swale
Dorman et al., 1989	98	18	-	45	37–81	-	dry swale
Harper, 1988	87	83	84	80	88–90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37–69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.

2) A design grass height of 6 inches is recommended.

3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.

4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.

5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).

6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.

7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.

- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.

- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.

- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.

- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately \$0.25 per ft^2. This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately \$0.50 per ft^2, which compares favorably with other stormwater management practices.

Table 2 Swale Cost Estimate (SEWRPC, 1991)

Component	Unit	Extent	Unit Cost Low	Unit Cost Moderate	Unit Cost High	Total Cost Low	Total Cost Moderate	Total Cost High
Mobilization / Demobilization-Light	Swale	1	$107	$274	$441	$107	$274	$441
Site Preparation								
Clearing[b]...............	Acre	0.5	$2,200	$3,800	$5,400	$1,100	$1,900	$2,700
Grubbing[c].............	Acre	0.25	$3,800	$5,200	$6,600	$950	$1,300	$1,650
General Excavation[d]...........	Yd^3	372	$2.10	$3.70	$5.30	$781	$1,376	$1,972
Level and Till[e]........	Yd^2	1,210	$0.20	$0.35	$0.50	$242	$424	$605
Sites Development								
Salvaged Topsoil Seed, and Mulch[f]..	Yd^2	1,210	$0.40	$1.00	$1.60	$484	$1,210	$1,936
Sod[g].....................	Yd^2	1,210	$1.20	$2.40	$3.60	$1,452	$2,904	$4,356
Subtotal	--	--	--	--	--	$5,116	$9,388	$13,660
Contingencies	Swale	1	25%	25%	25%	$1,279	$2,347	$3,415
Total	--	--	--	--	--	$6,395	$11,735	$17,075

Source: (SEWRPC, 1991)

Note: Mobilization/demobilization refers to the organization and planning involved in establishing a vegetative swale.

[a] Swale has a bottom width of 1.0 foot, a top width of 10 feet with 1:3 side slopes, and a 1,000-foot length.

[b] Area cleared = (top width + 10 feet) x swale length.

[c] Area grubbed = (top width x swale length).

[d] Volume excavated = (0.67 x top width x swale depth) x swale length (parabolic cross-section).

[e] Area tilled = $\left(\text{top width} + \dfrac{8(\text{swale depth}^2)}{3(\text{top width})}\right)$ x swale length (parabolic cross-section).

[f] Area seeded = area cleared x 0.5.

[g] Area sodded = area cleared x 0.5.

Table 3 Estimated Maintenance Costs (SEWRPC. 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	$0.85 / 1,000 ft²/ mowing	$0.14 / linear foot	$0.21 / linear foot	Lawn maintenance area=(top width + 10 feet) x length. Mow eight times per year
General Lawn Care	$9.00 / 1,000 ft²/ year	$0.18 / linear foot	$0.28 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	$0.10 / linear foot / year	$0.10 / linear foot	$0.10 / linear foot	–
Grass Reseeding with Mulch and Fertilizer	$0.30 / yd²	$0.01 / linear foot	$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	$0.15 / linear foot / year, plus $25 / inspection	$0.15 / linear foot	$0.15 / linear foot	Inspect four times per year
Total	--	**$0.58 / linear foot**	**$ 0.75 / linear foot**	–

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately $2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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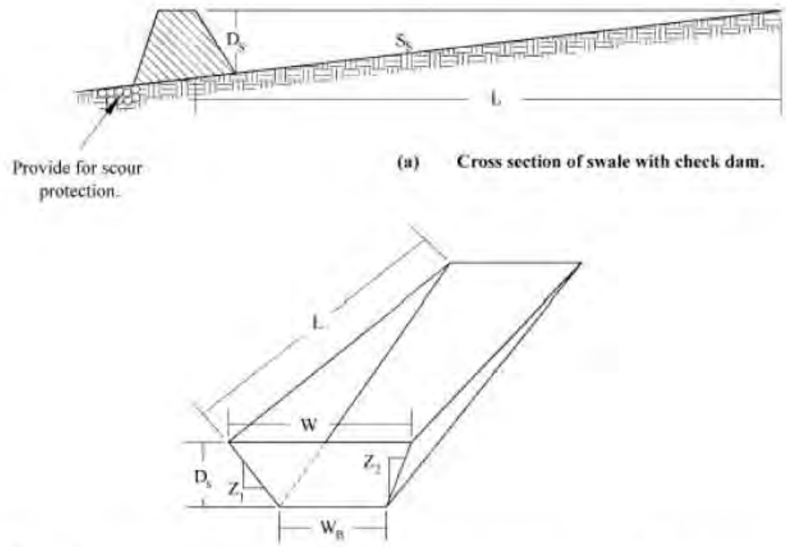

(a) Cross section of swale with check dam.

(b) Dimensional view of swale impoundment area.

Notation:

- L = Length of swale impoundment area per check dam (ft)
- D_S = Depth of check dam (ft)
- S_S = Bottom slpe of swale (ft/ft)
- W = Top width of check dam (ft)
- W_B = Bottom width of check dam (ft)
- $Z_{1\&2}$ = Ratio of horizontal to vertical change in swale side slope (ft/ft)

Appendix E – References

The following documents were utilized as primary reference documents in developing the Redding Rancheria Casino Master Plan, Grading and Drainage Study

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