DRAFT DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN (DESCP)

HYDROGEN ENERGY CALIFORNIA

PREPARED FOR

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HYDROGEN ENERGY CALIFORNIA DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

INTRODUCTION

Hydrogen Energy International LLC (HEI) is planning to develop and construct the Hydrogen Energy California (HECA) project. The HECA project will gasify petroleum coke (petcoke or blends of petcoke and coal, as needed) to produce hydrogen to fuel a combustion turbine operating in combined cycle mode. The net electrical generation output from the Project will provide California with approximately 250 MW of low-carbon baseload power to the grid. The Gasification Block will also capture approximately 90 percent of the carbon from the raw syngas at steady-state operations, which will be transported to the Elk Hills Field for CO_2 enhanced oil recovery (EOR) and Sequestration.

In addition to the new HECA facility, the project will construct the linear facilities shown on Figure 2 – Location Map, which includes: an electrical transmission line, a natural gas supply pipeline, a potable water pipeline, a raw water pipeline and a carbon dioxide pipeline.

Hydrogen Energy International has prepared this Drainage, Erosion and Sedimentation Control Plan (DESCP) for the HECA project to demonstrate that construction activities associated with the project will not result in an increase in off-site flooding potential or sedimentation and that the project will meet all local, state, and federal regulatory requirements associated with the protection of water quality and soil resources. The DESCP includes the following elements:

A. **Vicinity Map:** A site vicinity map (Figure 1) and a location map (Figure 2) showing the location of all project elements with depictions of all significant geographic features including swales, creeks, and sensitive areas (Note: more detailed maps for linear features will be prepared for the final DESCP once design has been advanced).

B. **Site Delineation**: A site delineation (Figures 4, 5, 6, 7, and 8) that includes the boundary lines of all construction areas and the location of existing and proposed structures, pipelines, temporary construction facilities, roads, and drainage facilities.

C. **Watercourses and Critical Areas**: Figures 2 and 3 show the location of all nearby watercourses including swales, creeks, drainage ditches and other important surface water bodies.

D. **Drainage Map**: Figures 4, 5, 6 and 7 show water courses, critical areas, and existing and proposed drainage systems.

E. **Drainage Narrative**: A description of the drainage measures to be taken to protect the site and downstream facilities, including site-specific Best Management Practices (BMPs) to be implemented during construction, as well as a schedule of the timing and implementation of erosion and sediment control measures. This will include a preliminary erosion control plan (Figure 8) and erosion and sedimentation control notes.

F. **Clearing and Grading Plans**: A delineation of areas to be cleared and areas to be preserved (Figure 6). Specific details of vegetation clearance and soil excavation and grading associated with the water supply and discharge pipelines will be developed as project design is advanced prior to construction.

G. **Clearing and Grading Narrative**: Identification of the quantities of material excavated or filled for the site and all project elements, including those materials removed from the site.

H. **Best Management Practices (BMP) Plan**: A figure showing the location of the BMPs to be implemented during project construction (Figure 8).

I. **Best Management Practices Narrative**: A description of the location, timing, and maintenance schedule for the proposed BMPs.

PROJECT LOCATION

The Project Site consists of approximately 473 acres located near a petroleum-producing area in Kern County, California, as shown in Figure 1, Vicinity Map. The Project Site is located in a predominantly agricultural area of the county, 1.5 miles northwest of the unincorporated community of Tupman. The Project Site is located within Section 10 of Township 30 South, Range 24 East in Kern County. The Project Site Assessor's Parcel Numbers (APN) are as follows:

- Part of 159-040-16
- Part of 159-040-18

The Project Site and Controlled Area is shown on Figure 3, Site Delineation Map. The APNs associated with the
Controlled Area are as follows:

- 159-040-02
- 159-040-04
- 159-040-11
- Remnant part of 159-040-16
- Remnant part of 159-040-18
- 159-190-09

The Project Site is predominantly used for agricultural purposes, including cultivation of cotton, alfalfa and onions. The Project Site vicinity consists primarily of agricultural uses. Adjacent land uses include Adohr Road and agricultural uses to the north; Tupman Road and agricultural uses to the east, agricultural uses and an irrigation canal to the south; and a residence, structures (used for grain storage and organic fertilizer production), agricultural uses, and Dairy Road right of way to the west. The West Side/Outlet Canal, Kern River Flood Control Channel, and the California Aqueduct (State Water Project) are approximately 500, 700, and 1,900 feet south of the Project Site, respectively.

SITE DELINEATION

Construction activities for the Project will occur throughout the 37-month construction period and include on-site and off-site facilities. Figures 2, 3 and 4, Location Map, Site Delineation Map and Preliminary Temporary Construction Facilities Plan, show the proposed route of the Project Linears and details of the Project Site temporary construction facilities. Detailed maps indicating the location of all project elements at a 1”=100’ scale or other appropriate scales will be provided in the final DESCP.

Project Site

Construction areas, including lay down and parking. Construction laydown and parking areas will be located entirely within the 473-acre Project Site. Construction site access will be via Dairy Road for truck deliveries and via Tupman Road for construction craft cars arriving and departing the site. Initial site preparation operations will include on-site construction of temporary access roads, craft parking, laydown areas, office and warehouse facilities, installation of erosion control measures and other improvements necessary for construction.

Project Linear Facilities

The Project Linear Facilities are depicted on Figures 2 and 3, Location Map and Site Delineation Map.

Electrical Transmission Line – A 230-kV transmission line will interconnect the Project to Pacific Gas & Electric's (PG&E’s) Midway Substation. The transmission line will be constructed and owned by HEI up to the point of interconnect (Midway Substation).

The transmission route extends from the west portion of the Project Site and continues along the West Side Canal and then north on the Dunford Road. The transmission route then continues northwest to Freeborn Road, and then turns northwest along one of two routes (1A or 1B) to the substation. The transmission routeis approximately 7.5 miles in length. Construction of the new 230-kV transmission line interconnection will require approximately 6 months

Raw Water Supply - The Project will use brackish groundwater supplied from BVWSD's main trunk line as raw feed water. The brackish water will be treated on site to meet all process and utility water requirements.

The raw water pipeline route will run from Seventh Standard Road to the Project Site, along the existing BVWSD road on the north side of the West Side Canal. The raw water pipeline will be approximately 15 miles in length. Construction of the raw water pipeline is expected to take approximately 6 months to complete.

Potable Water Supply - For drinking and sanitary use, the Project will use potable water supplied by West Kern Water District. The potable water line will be constructed and owned by WKWD. The potable water supply pipeline route begins near the intersection of State Route (SR) 119 and Tupman Road and then continues northwest to the Project Site. The potable water line is approximately 7 miles in length. This pipeline will be placed in a parallel alignment with the natural gas pipeline over most of its route.

Horizontal Directional Drilling (HDD) will be used to install the pipeline under the Outlet Canal, the Kern River Flood Control Channel, and the California Aqueduct. Construction of the water pipeline is expected to take approximately 6 months to complete.

Natural Gas Supply **-** A natural gas interconnection will be made with PG&E or Southern California Gas Company (SoCal Gas) natural gas pipelines, each of which are located southeast of the Project Site. The selected gas company will construct and own the natural gas pipeline. The natural gas supply pipeline route will continue west along SR 119, tum north at Tupman Road, and then continue northwest to the Project Site. Horizontal Directional Drilling (HDD) will be used to install the pipeline under the Kern River, the Kern River Flood Control Channel, and the California Aqueduct. The natural gas line is approximately 8 miles in length. This pipeline will be placed in the same trench as the potable water pipeline for most of its alignment.

Carbon Dioxide Pipeline **-** The Project will include construction of a carbon dioxide (CO_2) pipeline to transfer the carbon dioxide captured during gasification from the Project Site to the custody transfer point. Carbon dioxide produced by the Project will be routed via this pipeline to the custody transfer point for injection into deep underground hydrocarbon reservoirs for CO_2 EOR and Sequestration. HEI will own and construct the pipeline between the Project Site and the custody transfer point. Oxy Elk Hills will construct and own the pipeline and transfer facilities downstream of the custody transfer point.

The Project's selected carbon dioxide pipeline route extends from the southwestern comer of the Project Siteand is approximately 4 miles in length.

HDD will be used to install the pipeline under the West Side Canal, the Kern River Flood ControlChannel, and the California Aqueduct. Construction of the carbon dioxide pipeline will take approximately 6 months.

SOIL CHARACTERIZATION

A description of the project site was developed using the Soil Survey of Kern County, California, Northwestern Part prepared and maintained by the U.S. Department of Agriculture (USDA) natural Resources Conservation Services (NRCS) (USDA SCS 1988). Additionally, information for the Soil Survey of Kern County, California, Northwestern Part was obtained through review of the NRCS Web Soil Survey (WSS) - Soil Survey Geographic (SSURGO) database (NRCS 2009). The WSS database contains official USDA soil survey information as viewable maps and tables for more than 2,300 soil surveys in the United States and its territories.

Project Site

The predominant soils at the Project Site and along the associated linears consist of clays, loamy sands, gravely sandy loams, silt loams, fine sandy loams, and sandy loams. The soil mapping units at the Project Site include the Buttonwillow Clay, 0 to 2 percent slopes and the Lokern Clay, 0 to 2 percent slopes.

Project Linear Facilities

Electrical Transmission Line **-** The soil mapping units along the transmission linears include Lokern Clay - Saline-Alkali, 0 to 2 percent slopes, Milham Sandy Sandy Loam, 0 to 2 percent slopes, Kimberlina Fine Sandy Loam, 0 to 2 percent slopes, Garces Silt Loam, 0 to 2 percent slopes, Buttonwillow Clay, 0 to 2 percent slopes, and Lokem Clay, 0 to 2 percent slopes. The soil mapping units along the carbon dioxide linears include Torriorthents Stratified, Eroded Elkhills Complex, 9 to 50 percent slopes, Elkhills Sandy Loam, 9 to 50 percent slopes, Cajon Loamy

Sand, 2 to 5 percent slopes, Buttonwillow Clay, 0 to 2 percent slopes, Garces Silt Loam, 0 to 2 percent slopes, and Lokern Clay, 0 to 2 percent slopes.

Raw Water Supply - The soil mapping units along the process water linear includes the Lokern Clay, 0 to 2 percent slopes, Lokern Clay - Saline-Alkali, 0 to 2 percent slopes, and Buttonwillow Clay, 0 to 2 percent slopes.

Natural Gas Supply - The soil mapping units along the natural gas linear include the Granoso Loamy Sand, 2 to 5 percent slopes, Kimberlina Fine Sandy Loam, Saline-Sodic 0 to 2 percent slopes, and Kimberlina Fine Sandy Loam - Saline-Alkali, 0 to 2 percent slopes.

Potable Water Supply - The soil mapping units along the potable water/natural gas linear include Torriorthents Stratified, Eroded Elkhills Complex, 9 to 50 percent slopes, Lokern Clay, 0 to 2 percent slopes, Cajon Loamy Sand, 0 to 2 percent slopes, Cajon Loamy Sand, 2 to 5 percent slopes, Elkhills Sandy Loam, 9 to 50 percent slopes, and Granoso Loamy Sand, 2 to 5 percent slopes.

Carbon Dioxide Pipeline - The soil mapping units along the carbon dioxide linear include Torriorthents Stratified, Eroded Elkhills Complex, 9 to 50 percent slopes, Elkhills Sandy Loam, 9 to 50 percent slopes, Cajon Loamy Sand, 2 to 5 percent slopes, Buttonwillow Clay, 0 to 2 percent slopes, Garces Silt Loam, 0 to 2 percent slopes, and Lokern Clay, 0 to 2 percent slopes.

Table A-1 – Soils Mapping Units included in Appendix A presents characteristics of the soils survey described within the project site and along the project linear facilities.

WATERCOURSES AND CRITICAL AREAS

The Project Site is located in the Central Valley as shown on Figure 2. Figures 2 and 3 show the Project Site on USGS topographic mapping. The Project is located in the southern end of the Central Valley region of California. The topography at the Project Site is characterized by relatively flat, low-lying terrain that slopes very gently from southeast to northwest. Average annual precipitation is approximately 6.23 inches, with more than 75 percent occurring between November and March. The average annual precipitation is based on rainfall records for the Bakersfield WSO Airport, Station no. 040442, from October 1, 1937 to December 31, 2006. The 50-year, 24-hour, and the 10-year, 24-hour rainfall amounts for the project site are approximately 1.8 inches and 1.4 inches, respectively, based on the National Oceanic and Atmospheric Administration Atlas 2 (NOAA 1973).

Several regional irrigation and water supply canals are located in the vicinity of the Project Site (Figure 3). The Outlet and West Side Canals are located approximately 0.1 mile and 0.2 mile south of the Project Site, respectively. The East Side Canal is located approximately 0.25 mile east of the Project Site boundary. The California Aqueduct, which was constructed in the 1970s and supplies agricultural and municipal areas in Southern California, is located parallel to, and west of the West Side and Outlet Canals, approximately 0.5 mile south of the Project Site. The California Aqueduct generally runs north-south and is the major conveyance feature for the California State Water Project that brings water from Northern to Southern California. The aqueduct is 444 miles long and is mostly an open concrete-lined canal. The canal width and depth vary along the length of the aqueduct, but it is generally approximately 50 feet wide and approximately 30 feet deep. An irrigation canal extends generally from the east to the west from

Tupman Road along the southern border of the Project Site. This irrigation canal connects the East Side Canal with the West Side and Outlet Canals.

An irrigation ditch crosses approximately ¾ of the Project Site from south to north and then runs diagonally northwest through the natural fertilizer manufacturing plant area and ends just south of Adohr Road. This ditch is approximately 7 feet deep and feeds the smaller irrigation ditches that traverse the Project Site from north to south and east to west around the crop fields. These irrigation ditches are fed by the West Side Canal and the East Side Canal.

The Kern River Flood Control Channel is located approximately 0.5 mile south of the Project Site. This channel conveys overflows from the Kern River during flood events. The floodplain associated with this channel does not extend onto the Project Site. According to the Federal Emergency Management Agency (FEMA), Flood Insurance Rate Maps (FIRM), the Project Site is not located within an area identified as having flood hazards or shallow groundwater (FEMA 2008).

The Kern River is located approximately 5 miles southeast of the Project Site and is a regionally large and biologically important jurisdictional Water. It flows west-southwest through the city of Bakersfield, under SR 119 east of Tupman Road. The river changes course and then flows southeastward into Lake Webb.

Project Site

The Project Site is within agricultural fields that have a generally flat topography. The only drainage features within the Project Site are irrigation ditches. These irrigation ditches, the West Side Canal and the Outlet Canal, are excavated on dry land and are not considered Waters. These features do not have a direct hydrological connection to the Kern River or Kern River Flood Control Channel.

Construction, operation, or maintenance of the Project could affect surface water quality of nearby canals through inadvertent spills or discharges. Surface water impacts, if any, are anticipated to be a by-product of short-term construction activity and consist of increased turbidity due to erosion of newly excavated or placed soils. Activities such as grading can potentially increase rates of erosion during construction. In addition, construction materials could contaminate runoff or groundwater if not properly stored and used. Compliance with engineering and construction specifications, following approved grading and drainage plans, and adhering to proper material handling procedures will ensure effective mitigation of these short-term impacts.

Implementing these best management practices (BMPs) and retaining surface runoff onsite during construction will minimize the potential impact on adjacent water bodies. A construction SWPPP will be prepared and implemented in accordance with the General Permit for Construction Activities.

For the post-developed condition, the HECA Project Site will be graded and drained such that all runoff will be retained onsite. The increase in runoff caused by the impermeable surface proposed will be mitigated by retention basins strategically located around the Project Site (Figures 6 and 7) that will retain surface runoff from process and open areas. All temporary laydown areas will be restored to pre-construction conditions after construction.

Project Linear Facilities

Potential Jurisdictional Waters and Wetlands of the United States and the State of California would not be affected by project construction and operation activities. Any potential waters or wetlands along the linear facilities determined to be Jurisdictional Waters will be avoided by horizontal directional (HDD) drilling underneath the feature. No impacts to Jurisdictional Waters or Wetlands of the United States and the State of California are anticipated.

Formal wetland delineations were not conducted for the Project Site and linear facilities, though an informal examination was conducted during site assessment surveys. During the site assessment surveys, the Kern River showed a well-defined "bed and bank" and woody hydrophytic vegetation. Portions of the Coles Levee Preserve north of SR 119 showed indications of ponded water and potentially hydrophytic herbaceous vegetation; these areas would be avoided by HDD. These areas likely meet both state and federal criteria for wetlands.

Electrical Transmission Line - The electrical transmission line extends west from the Project Site and then northward to the PG&E Midway Substation. The majority of the approximately 8-mile route is adjacent to road shoulders and within areas of active agriculture. Near the PG&E Midway Substation, undeveloped parcels with small wetland features may fall under California Department of Fish and Game (CDFG) jurisdiction as state wetlands and USACE as federal Waters.

Raw Water Supply - Land in the vicinity of the process water pipeline is primarily used for farming (mainly alfalfa, cotton, and wheat cultivation), and orchards (pistachio). Much of the land between the West Side Canal and the Kern River Flood Control Channel is undeveloped.

Natural Gas and Potable Water Supply - Land uses in the vicinity of the 8-mile natural gas pipeline and the 7-mile potable water supply pipeline primarily include farmland (mainly cotton cultivation), resource extraction (oil production), undeveloped areas, and public utilities. The pipelines would be constructed through undeveloped areas and land used for resource extraction (oil production) south of the unincorporated community of Tupman. The natural gas pipeline and potable water supply pipeline would also cross under Tupman Road, Outlet Canal, Kern River, Kern River Flood Control Channel, and California Aqueduct.

Carbon Dioxide Pipeline - The *NG/PW* line and carbon dioxide line crosses multiple dry swales. Although the vigor of the plants suggests that water flows through the swales during wet periods, the dominance of upland species and lack of hydrophytic species indicate that these swales are not federal jurisdictional wetlands. Additionally, the drainage features on the south side of the California Aqueduct are now isolated and no longer connect to the Kern River or other significant drainage feature due to the construction of the aqueduct.

Existing land uses in the vicinity of the 4-mile carbon dioxide pipeline primarily include farming (mainly alfalfa cultivation), undeveloped areas, and resource extraction (oil production). The carbon dioxide pipeline would also cross under the West Side Canal, Kern River Flood Control Channel, and the California Aqueduct.

DRAINAGE MAP

Figure 5 is the Existing Drainage Plan of the existing site. Figure 6 shows the proposed preliminary drainage and grading concept and Figure 7 illustrates the delineation between the potentially contaminated runoff and non-contact runoff for the HECA project.

DRAINAGE NARRATIVE

Storm water management for the Project is designed to avoid direct discharge to surface waters. The site drainage system will be separated in two distinct systems (Figure 7): 1) Potentially contaminated storm water runoff from the process, power block and administration building areas, and 2) Non-contact storm water runoff from the undeveloped open areas.

Storm water runoff from process areas will be routed to lined on-site storm water retention basins. Clean storm water will be used as makeup water to the cooling towers. Potentially contaminated water will be tested to determine an appropriate destination for re-use. Depending on the water quality, it may be used for cooling tower makeup, used for gasifier slurry water makeup, or disposed in one of the ZLD (zero liquid discharge) systems. Storm water runoff from non-process areas but within the main plant area will be routed to lined retention basins. Retention basins and storm water collection/conveyance systems will be designed in accordance with the Kern County Development Standards. A preliminary site drainage plan is presented in Figure 6, Preliminary Grading and Drainage Plan.

Storm water runoff from non-process areas outside the main plant process areas but within the Project Site should be relatively clean. Runoff from these areas will be separately collected in retention basins located throughout the Project Site. The retention basin locations are also shown in Figure 6, Preliminary Grading and Drainage Plan. Storm water generated at the Project Site will be managed as follows:

- Non-contact storm water runoff outside the power block and process areas will be routed to storm water retention basins. After solids have settled and water is determined to be suitable for reuse, storm water will be filtered for suspended solids removal before being used as cooling tower makeup water. If this collected storm water is determined to be unsuitable for cooling tower use, then it will be reused in the slurry preparation area or disposed of in one of the ZLD systems.
- Storm water that may be contaminated with oil will be separately collected and routed to an oil/water separator. Recovered waste oil from the separator will be disposed off site in accordance with applicable LORS. The separated water will be reused or disposed as described above.
- Runoff in the AGR Unit will be collected in a separate lined, dedicated AGR storm water retention basin. The AGR unit collection system is isolated to contain any potentially contaminated water that could result in the unlikely event of a methanol spill.
- Storm water runoff from chemical and oil storage areas will be held within the associated secondary containment. Storm water held in these areas will first be tested. If it is acceptable for cooling water makeup, then it will be routed to the retention pond. Oily storm water will be routed through an oil/water separator.

The storm water management system will be designed in accordance with the EPA's guidance document entitled "Storm Water Management for Construction Activities - Developing Pollution Prevention Plans And Best Management Practices" (EPA 832-R-92-005, September 1992), the California Storm Water Best Management Practices Handbook, the National Pollution Discharge Elimination System Industrial General Permit Requirements and 2003 Construction General Permit requirements.

Preliminary Drainage Calculations have been prepared and are included as Appendix B. These preliminary calculations consider a tributary drainage area of 473 acres of which most of it will be disturbed during project construction. A summary of the preliminary drainage calculations is presented in Table 1. Figure 7 identifies the drainage subareas used in the preliminary drainage calculations.

TABLE 1 - Summary of Preliminary Drainage Calculations

Total tributary area:	473 ac
Peak total flow for 50-year, 24-hour storm:	109 cfs
Construction site area:	473 ac
Percentage impervious area before construction:	3%
Percentage impervious area after construction:	56%

Source: HECA – Preliminary Hydrology Study, Dated: May, 2009, Appendix B

CLEARING AND GRADING PLANS

Figure 6 shows the Preliminary Grading and Drainage Plan for the HECA site. The Plan depicts the preliminary grading concept developed for the HECA Project Site. Grading associated with the Project Linear facilities will be developed as project design is advanced prior to construction; however as noted below, construction of the linear facilities will not result in a change in surface elevations.

CLEARING AND GRADING NARRATIVE

The information provided in this section is preliminary and will be updated and expanded as the project design is advanced prior to the start of construction for the HECA project. The project site will require earthwork to construct the HECA and associated facilities. On-site construction activities include clearing and grubbing, grading, layout of equipment, delivery and handling of materials and supplies, and project construction and testing operations.

For areas where earthwork will be executed, materials suitable for compaction will be stockpiled in designated onsite locations. Materials not suitable for compaction will be stored in separate stockpiles and reused on the site, as appropriate.

If any contaminated materials is encountered during excavation it will be disposed of in accordance with applicable laws, ordinances, regulations, and standards. Only licensed, commercial fill or inspected and approved on-site soil suitable for fill will be used for the project.

Construction of the Project Linear facilities will not result in a change in surface elevations and disturbed areas will be returned to pre-construction conditions.

Project Site

The Project Site occurs in an area of relatively flat topography. Site grading will occur as necessary to form level building pads for major process units as shown on the Grading Plan. All existing irrigation ditches within the Project Site will be abandoned and filled in to meet grade. The irrigation ditches serve the current agricultural uses on the property and will no longer be needed once the Project Site is developed. The smaller irrigation ditches on the Project Site that

serve the individual crop fields will also be abandoned and filled where not required for crop irrigation.

Land disturbances related to development activities are expected to be conducted on the 473-acre Project Site, which includes all temporary construction facilities. Excavation work will consist of the removal, storage, and/or disposal of earth, sand, gravel, vegetation, organic matter, loose rock, boulders, and debris as necessary for construction. Materials suitable for backfill will be stockpiled at designated locations using proper erosion protection methods.

Areas to be backfilled will be prepared by removing unsuitable material and rocks. The bottom of an excavation will be examined for loose or soft areas. If observed, these areas will be excavated fully and backfilled with suitable material and compacted.

Project Linear Facilities

Electrical Transmission Line – Construction and installation of aboveground linear facilities (the 230-kV electrical transmission line) will follow a sequence similar to that of underground facilities, with trench excavation being replaced by augering of holes to facilitate placement of the utility poles, followed by backfilling and compaction. Grade cuts will be restored to their original contours and affected areas will be restored to their original state to minimize the potential for erosion. To the extent possible, the material excavated from trenches and auger holes will be used to backfill around the poles and in the trenches. Additional excess material that cannot be reused along the easement corridor because it will be susceptible to increased erosion, will be transported to another reuse area or disposed of at an off-site landfill facility. During construction and installation, the soil within the alignment for the linear facilities may become more susceptible to erosion. The extent of this construction related impact on soils and agricultural lands, however, will be temporary and appropriate BMPs will be implemented to minimize potential impacts. With the implementation of mitigation measures no significant impacts to native soil, receiving water bodies, or area agricultural lands are anticipated at or near linear facilities.

Raw Water, Potable Water, Natural Gas and Carbon Dioxide Pipelines - Construction of the interconnection pipelines will consist of primarily of crews performing the following typical pipeline construction activities: hauling and stringing of the pipe along the route; welding; radiographic inspection; coating of the pipe welds; trenching; lowering of the pipe into the trench; backfill of the trench; hydrostatic testing of the pipeline; purging the pipeline; and cleanup and restoration of construction areas. Grade cuts will be restored to their original contours and affected areas will be restored to their original state so as to minimize erosion.

Pipelines installation will require a construction right-of-way of 50-feet. Temporary ground disturbance within the right-of-way could be as much as about 175acres At the end of the construction the total disturbance will be less than 1 acre.

When the proposed routes (Figure 2 - Location Map) crosses county roads, the California Aqueduct, Kern River, the Kern River Flood Control Channel, and/or West Side/Outlet Canal, the pipelines will all be installed under the facility using Horizontal Directional Drilling (HDD), which minimizes direct impacts to the water courses and sensitive areas. The depth of HDD under the water bodies will comply with all applicable federal and state regulations.

The California Department of Water Resources (DWR) "Encroachment Permit Guidelines June 2005" spells out specific requirements regarding the use HDD. The principal requirements include but are not limited to the following:

- A site-specific geotechnical report must be submitted to the DWR with the Encroachment Permit application
- Pipe sleeves are required with any pipeline carrying hazardous materials or pollutants
- The minimum separation between the bottom of the Aqueduct channel and the top of pipe is 25 feet.; further separation may be required depending on the actual pipe diameter
- Drawings submitted with the Encroachment Permit Application must include the following for buried pipelines (as a minimum):

  - Aqueduct mileposts at each crossing, pipe size, location, and type of material transported
  - Maximum operating pressure, type of pipe and pipe joints, pipe wall thickness, maximum test pressure, and description of test procedures
  - Type of sleeve/casing including diameter, joints, and wall thickness
  - Protection coatings and a description of control measures
  - Method employed to accommodate pipeline expansion and contraction
  - Thrust block location and details
  - Pipe line coatings and corrosion control measures
  - Location of shutoff valves on each side of the crossing
  - List of applicable design codes
  - Location, including depth of the buried aqueduct communication and control cables
  - Identification of existing utility easements or encroachments in the immediate vicinity of the proposed crossing

The HDD method includes a drilling rig that will bore a horizontal hole under the water crossings. The HDD could extend up to 1 mile, but much shorter distances are anticipated. At each of these crossings, a 100-foot by 150-foot laydown area (or entry/exit pit) has been identified on either side of the water course to accommodate the HDD installation.

Best management practices for HDD will include silt fencing around the drill sites, energy dissipation devices for discharging water from hydrostatic testing of the pipeline, selecting drilling fluids for environmental compatibility, and removing spent fluids from the areas immediately adjacent to the water bodies for safe disposal and to prevent contamination. In addition, soil erosion control measures will be implemented to prevent runoff and impacts to water quality.

Construction Laydown/Parking Areas

Construction laydown and parking areas will be graded (as necessary) to support the storage of equipment and materials and craft parking. Soil stabilization measures will be implemented as appropriate for dust and erosion control purposes. Laydown areas will be fenced around their perimeter. Gates will be provided for access control. At the end of construction, these areas will be cleaned up and restored to their pre-construction conditions.

BEST MANAGEMENT PRACTICES

The California Stormwater Quality Association's Construction Handbook will used for selecting and implementing appropriate erosion control measures that will eliminate or reduce the discharge of pollutants from the site. The Construction Handbook contains Best Management Practice (BMP) fact sheets describing erosion, sediment, wind and vehicle tracking control practices that protect the soil surface, and trap soil particles that have been detached by rainfall, flowing water, wind or construction operations. Figure 8 shows the placement of the BMPs that will be utilized during Project Site construction.

Discussed below in the narrative is a list and description of potential BMPs to be used during construction of the Project Site, Project Linear Facilities and associated project components. Prior to construction, a construction Stormwater Pollution Prevention Plan (SWPPP) will be prepared. The SWPPP will include details for all BMPs. Updated BMP maps will be included in the SWPPP. As part of the SWPPP, a current set of the BMP drawings will be maintained in the project construction trailer and updated as needed to reflect modified or new BMPs that are being implemented on site. Plans depicting specific details of BMPs to be utilized during construction will be developed and provided as the project design is advanced prior to construction.

BEST MANAGEMENT PRACTICES NARRATIVE

The project Key BMP Implementation dates is provided in Table 2. An implementation and maintenance schedule for the drainage, erosion, and sediment control methods and practices that will be utilized at the Project Site and Project Linear Facilities are described in the following section. Specific schedule details will be developed and provided as project design is advanced prior to construction.

TABLE 2 - Key BMP Implementation Dates

Start of Rainy Season	October 15
End of Rainy Season	April 15

Source: Caltrans Storm Water Quality Handbooks

BMP Implementation and Maintenance Schedule

Soil Stabilization (Erosion Control)

Soil stabilization, also referred to as erosion control, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in storm water runoff. This project will implement the following practices for effective temporary and final soil stabilization:

<u>BMP Fact Sheet</u>

EC-1 Scheduling

EC-2 Preservation of Existing Vegetation

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-9 Earth Dikes and Drainage Swales

Implementation of Soil Stabilization BMPs

- The project will monitor weather using National Weather Service reports to track conditions and alert crews to the onset of rainfall events.

- Disturbed soil areas will be stabilized with temporary soil stabilization or with permanent erosion control as soon as possible after grading or construction is complete.

- During the rainy season, disturbed areas will be stabilized with temporary or permanent soil stabilization (erosion control) before rain events.

- During the rainy season, disturbed areas that are substantially complete will be stabilized with permanent soil stabilization (erosion control) and vegetation (if within seeding window for seed establishment).

- During the rainy season, prior to forecasted storm events, temporary soil stabilization BMPs will be deployed and inspected.

- During the non-rainy season, the project schedule will sequence construction activities with the installation of both soil stabilization and sediment control measures. The construction schedule will be arranged as much as practicable to leave existing vegetation undisturbed until immediately prior to grading.

Sediment Control

Sediment controls are structural measures that are intended to complement and enhance the selected soil stabilization (erosion control) measures and reduce sediment discharges from construction areas. This project will implement the following practices for effective sediment control:

<u>BMP Fact Sheet</u>

SE-1 Silt fence

SE-4 Check dams

SE-5 Fiber rolls

SE-7 Street Sweeping and Vacuuming

SE-8 Sandbag barrier

Implementation of Sediment Controls

- During the rainy season, temporary sediment controls will be implemented at the draining perimeter of disturbed soil areas, at the toe of slopes at all times.

- During the non-rainy season, temporary sediment controls will be implemented at the draining perimeter of disturbed soil areas before rain events.

- During the non-rainy season, in the event of a predicted storm, the following temporary sediment control materials will be maintained on-site: silt fence materials, sandbags and, fiber rolls.

Tracking Control

The following BMPs have been selected to reduce sediment tracking from the construction site onto private or public roads:

BMP Fact Sheet

SE-7 Street Sweeping and Vacuuming

TR-1 Stabilized Construction Entrance/Exit

TR-2 Stabilized Construction Roadway

TR-3 Entrance/Outlet Tire Wash

Wind Erosion Control

The following BMP has been selected to control dust from the construction site:

BMP Fact Sheet

WE-1 Wind Erosion Control

Project Linear Facilities

The following BMPs have been selected for construction of the Project Linear Facilities:

- Avoid sensitive habitats and species during construction by developing construction exclusion zones and silt fencing in sensitive areas.

  - In general, disturbance to existing grades and vegetation will be limited to the actual site of the linear alignments, which will be generally 15-foot construction corridor. Where appropriate, this corridor may be reduced to 5 feet to avoid environmental resources and/or minimize traffic disruption. Information about environmentally sensitive areas will be shown on contract plans and discussed in the Special Provisions.

  - Environmentally sensitive area provisions could include, but are not limited to, the use of temporary orange fencing to delineate the proposed limit of work in areas adjacent to sensitive resources, or to delineate and exclude sensitive resources from potential construction impacts.

  - Contractor encroachment into environmentally sensitive areas will be restricted (including the staging/operation of heavy equipment or casting of excavation materials). Provisions for environmentally sensitive areas will be implemented as a first order of work, and will remain in place until all construction activities are complete; this includes any nest sites identified during preconstruction surveys.

- Placement of all roads, staging areas, and other facilities will avoid disturbance to wetlands and other sensitive areas of habitat, except where unavoidable impacts have been identified and mitigation has been proposed.

- Existing ingress or egress points will be used. Equipment parking, project access, supply logistics, equipment maintenance, and other project-related activities will occur at a designated staging area.

- Following completion of the work, the contours of the area will be returned to preconstruction conditions or better.

- Provide worker environmental awareness training for all construction personnel.

  - Training will include the identification of any special-status biological resources and measures required to minimize project impacts during construction and operation.

- General avoidance of wetland/stream impacts

  - The launching and receiving pits for stream and drainage channel crossings will be located at least 10 feet back from the stream/drainage channel. No work will be conducted within the California Aqueduct, the Kern River Flood Control Channel, and/or the West Side/Outlet Canal right-of-ways without prior approval.

  - Regional Water Quality Control Board (RWQCB) approved physical barriers adequate to prevent the flow or discharge of sediment into water systems will be constructed and maintained between working areas and streams, lakes, and wetlands. Erosion control and sediment retention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the project design and implemented at the time of construction. These devices will be in place during construction activities, and afterwards if necessary, to minimize sediment impacts to the wetlands. These devices will be placed at all locations where sediment input is likely.

  - An emergency response plan will be prepared and submitted to appropriate agencies prior to the start of construction. The plan will identify actions that will be taken in the event of a spill of petroleum products or other material harmful to aquatic or plant life, and the emergency response materials that will be kept at the site to allow the rapid containment and cleanup of any spilled material.

- Revegetation and restoration of disturbed areas

  - Vegetation disturbed during the installation of the Project Linear Facilities will be replanted with appropriate native species.

  - The topography will be restored after proposed construction activities have been completed.

- Measures to avoid and minimize potential for frac-outs (only possible with the HDD pipeline installation method) will include:

  - All tunneling activities will be conducted outside of wetland and riparian areas.

- All work will be performed during dry months.
- Certified weed-free straw barriers and silt fences will be installed between the work area and any potential jurisdictional wetlands, if topography is such that runoff from the work area could enter any nearby potential jurisdictional wetlands.
- A Frac-Out Contingency Plan will be prepared and implemented to minimize potential for frac-out during HDD. This plan will describe BMPs for dealing with a frac-out should one occur.
- An on-call vacuum truck will be maintained in case a spill, seep, or frac-out occurs.
- The HDD operation will be designed, pre-planned, and directed in such a way as to minimize the risk of spills of all types. Appropriate controls will be established to quickly seal any leakage that may occur and prevent spills from traveling outside the work area.
- Biological monitor(s) will continuously monitor the HDD operation to ensure adequate protection controls have been installed. All field personnel will be briefed in their responsibility for timely reporting of frac-out releases to the monitor on site.
- If a frac-out or spill into the drainage channel occurs, California Department of Fish and Game (CDFG), West Kern Water District (WKWD) will be contacted immediately. Work activities will cease immediately, and will not resume until the jurisdictional agency as determines that no facilities or biological resources are at risk.
- Any sediment, including natural substrate, that enters the channel in a frac-out situation will be contained and removed from the channel as part of the cleanup procedure.

- Capping all open pipes
  - Capping open pipes at the end of each day during construction will reduce the potential for wildlife to enter a pipe and become trapped.

Non-Storm Water Control

The following BMPs have been selected as non-storm water controls:

<u>BMP Fact Sheet</u>

NS-1 Water Conservation Practices

NS-3 Paving and Grinding Operations

NS-6 Illicit Connection/Illegal Discharge Detection and Reporting

NS-8 Vehicle and Equipment Cleaning

NS-9 Vehicle and Equipment Fueling

NS-10 Vehicle and Equipment Maintenance

NS-11 Pile Driving Operations

NS-12 Concrete Curing

NS-13 Concrete Finishing

NS-14 Material Over Water

NS-15 Demolition Adjacent to Water

WM-8 Concrete Waste Management

Waste Management and Materials Pollution Control

The following BMPs have been selected as waste management and material pollution control:

BMP Fact Sheet

WM-1 Material Delivery and Storage

WM-2 Material Use

WM-3 Stockpile Management

WM-4 Spill Prevention and Control

WM-5 Solid Waste Management

WM-6 Hazardous Waste Management

WM-8 Concrete Waste Management

Petroleum Products - Construction equipment will require use of diesel fuel and oil on a regular basis. While a potential exists for spills or leaks, all onsite vehicles will be monitored for leaks and receive regular preventive maintenance to ensure proper operation and reduce the chance of leakage. No "topping off' of fuel tanks will be allowed to further reduce the possibility of spills. Petroleum products will be stored in clearly labeled and tightly sealed containers or tanks. Any asphalt used onsite will be applied according to the manufacturer's recommendations. Any soil impacted by fuel or oil spills will be removed and disposed of by the Contractor at an approved disposal site. It will be the Contractor's responsibility to ensure that secondary containment around fuel/oil tanks (stationary or mobile) will meet the minimum requirements of the U.S. Environment Protection Agency (EPA) 40 CFR Part 112 with regard to secondary containment or more stringent state requirements, if applicable. Any spills will be contained and cleaned up immediately.

Sanitary Wastes - A licensed sanitary waste management contractor will collect all construction or temporary sanitary wastes from the portable units. The units will be maintained on a regular basis. Portable units will be placed on a flat area at least 50 feet from streets or drain inlets. Portable units will be anchored to prevent blowing or tipping over and all leaks or spills will be reported immediately (sampling may be required).

Hazardous Wastes **-** Potentially hazardous waste associated with construction of the project will be limited to small quantities of liquids and solids such as lubricating oils, acids for equipment cleanup, concrete curing compounds, and waste paint. These wastes are typical of industrial construction activities and will be placed in containers onsite and disposed in accordance with applicable LORS and with the manufacturer's recommendations.

Hazardous wastes will be either recycled or disposed of in a licensed Class I disposal facility, as appropriate. Waste oil and used oil filters will be recycled if the maintenance activities will take

place onsite. Waste generated during each chemical cleaning operation will be temporarily stored onsite in portable tanks and disposed offsite by the chemical cleaning contractor at an appropriate disposal facility. Site personnel will be instructed of these procedures and the Contractor's Site Manager will be responsible for implementing these practices.

To prevent contact of hazardous wastes with stormwater runoff, secondary containment will be provided such as curbs and berms. As much as possible, all materials will be kept in a dry covered area.

Paints - All containers will be tightly sealed and properly stored to prevent leaks or spills. Excess paint will not be discharged to the stormwater system. Unused paints will be disposed in labeled original containers according to applicable local, state, and federal laws and regulations. Spray painting will not occur on windy or rainy days, and a drop cloth will be used to collect and dispose of drips associated with painting activities. All paints will be mixed indoors, in a containment area. If using water based paints, equipment will be cleaned in a sink that is connected to the sanitary sewer.

Concrete Trucks – *C*oncrete trucks will not be allowed to discharge surplus concrete and drum wash at the site, unless these materials are fully contained in an engineered structure that can contain all free liquid until dry. Dried concrete shall then be removed and disposed of at an off site location. Alternatively, concrete washout will be taken off-site for disposal by the concrete contractor. No surplus concrete or drum wash water will be disposed of onto the ground surface.

Waste Materials - All construction waste material, trash, and construction debris will be collected and stored in a metal dumpster, leased from a licensed solid waste management contractor. The dumpster will meet all local and state solid waste management regulations. The dumpster will be emptied a minimum of twice per week or more often if necessary, and the trash will be hauled to the local dump. No construction waste will be buried onsite. All site personnel will be instructed regarding the correct procedure for waste disposal. The Site Manager will be responsible for seeing that these procedures are followed. All dumpsters will be covered, where possible.

Allowable Non-Stormwater Discharges - The following sources of non-stormwater discharges may be combined with stormwater discharges from project construction activities:

- Pavement wash waters and dust control water not containing toxic or hazardous substances.
- Uncontaminated dewatering discharges.
- Firefighting waters.
- Vegetation watering.
- Potable or spring water discharges.

Good Housekeeping - Good housekeeping practices are designed to maintain a clean and orderly work environment. The good housekeeping practices listed below will be followed to reduce the risk of potential pollutants entering stormwater discharges. All construction personnel will be responsible for monitoring and maintaining housekeeping tasks and reporting potential problems to the Contractor's Site Manager:

- Store only enough products required for doing the job.

- Store all materials in a neat and orderly manner in the appropriate containers. Materials that may adversely impact stormwater, such as: paint, oils, greases, sealers, etc., will be stored in covered areas such as temporary/permanent buildings or trailers, in accordance with the SWPPP.
- Keep products in the original container with the original manufacturer's label.
- Do not mix products unless recommended by the manufacturer.
- Use all of a product before disposing of the container.
- Use and dispose of products according to the Contractor's Site Manager's direction or manufacturer's recommendations.
- Perform regular inspections of the stormwater system and the material storage areas.
- When and where appropriate, use posters, bulletin boards, or meetings to remind and inform construction personnel of required procedures.
- Preventive maintenance includes regular inspection and maintenance of structural stormwater controls (catch basins, oil water separators, etc.) as well as other facility equipment and systems.

Storage areas for hazardous materials such as oils, greases, paints, fuels, and chemicals will be provided with secondary containment to ensure that spills in these areas do not reach stormwater. All hazardous chemical storage areas will be surrounded by curbs or dikes to contain the chemicals in the event of leaks or spills. The Contractor will establish contingencies for the proper disposal of contaminated soils (use of licensed hauler, approved landfill) early in the construction period. Secondary containment will be designed to hold the entire contents of the largest single storage container plus rainfall from a 50-year, 24-hour storm for all outdoor storage areas. Curbs and dikes will be provided around all chemical storage areas, hazardous waste products, areas with possibility of oil spill, and washout areas.

Spills and leaks are one of the largest potential sources of stormwater pollutants at industrial facilities. Chemicals will be stored in chemical storage facilities appropriately designed for their individual characteristics. Bulk chemicals will be stored outdoors in aboveground storage tanks. Other chemicals will be stored and used in their delivery containers. All hazardous chemical storage areas will be surrounded by curbs or dikes to contain the chemicals in the event of leaks or spills. Secondary containment will be sized to hold the entire contents of the largest single storage tank. All drains and vent piping for volatile chemicals will be trapped and isolated from other drains. Containment areas for bulk storage tanks will not be drained. Any chemical spills in these areas will be removed with portable equipment and reused or properly disposed. It is anticipated that all substances will be applied/dispensed at manufacturer's recommendations.
In addition to the housekeeping and hazardous materials storage procedures described above, spill prevention and cleanup practices will be as follows:

- The Hydrogen Energy Site Manager or appointee is responsible for informing construction personnel of the manufacturer's recommended spill cleanup methods, and the location of that information and cleanup supplies.
- Materials and equipment for the cleanup of a relatively small spill will be kept in the materials storage area. These facilities may include brooms, rags, gloves, shovels, goggles, sand, sawdust, absorbent, plastic or metal trash containers, and protective clothing.
- All containers will be labeled, tightly sealed, and stacked or stored neatly and securely.

Spill response procedures will be as follows:

Step 1: Upon discovery of a spill, stop the source of the spill.

Step 2: Cease all spill material transfer until the release is stopped and waste removed from the spill site.

Step 3: Initiate containment to prevent spill from reaching State waters.

Step 4: Notify Supervisor and the Hydrogen Energy Site Manager of the spill.

Step 5: The Hydrogen Energy Site Manager will immediately notify the HECA emergency coordinator, and coordinate further cleanup activities

Step 6: Any significant spill of hazardous material will be reported to the appropriate state and/or local agencies by Hydrogen Energy personnel or qualified contractors. See Table 4 for emergency response contact list.

TABLE 3 - Emergency Response Contact List

Company/Organization Telephone Numbers	
Hydrogen Energy International, LLC	
Primary Facility Emergency Coordinator:	Manager
24-Hour Telephone Number: Hydrogen Energy Dispatch	
Alternate Facility Emergency Coordinator:	Principal Engineer
Hydrogen Energy Environmental Specialist:	TBD
Hydrogen Energy Media Representative:	TBD
Hydrogen Energy Headquarters Telephone Operator:	TBD
Other Resources	
3E Company (MSDS by FAX):	(800) 451-8346
Chemtrec (emergency chemical information):	(800) 424-9300
Poison Control Center:	(800) 662-9886
Federal Agency	
U.S. Coast Guard/National Response Center:	(800) 424-8802
State Agencies	
California Office of Emergency Services (OES):	(800) 852-7550
California Department of Toxic Substances Control (DTSC)*:	(800) 852-7550
California Department of Fish and Game (CDFG)*:	(800) 852-7550
California State Lands Commission (CSLC):	(562) 590-5201
Regional Water Quality Control Board (RWQCB)*:	(800) 852-7550
West Kern Water District (WKWD):	(661) 763-3151
Kern County Water Agency (KCWA):	(661) 634-1400
Local Contacts	
Kern County Environmental Health Department:	(661) 862-8700
Fire – Kern County Fire Department:	911 or (661) 324-6551
Sheriff – Kern County Sheriff Office:	911 or (661) 861-3110
Hospital – Kern Medical Center:	911 or (661) 326-2000
Ambulance/Paramedics:	911

*Note:** DTSC, RWQCB and CDFG have requested that emergency notifications to these offices be made through the OES 800 number.

Step 7: Submit a Notice of Discharge Form within 7 days of the discharge event.

Step 8: Review the construction stormwater pollution prevention plan and amend, if needed. Record a description of the spill, cause, and cleanup measures taken.

Inspection, Maintenance, and Recordkeeping Procedures.

Site inspection and facility maintenance are important features of an effective stormwater management system. The Contractor's qualified personnel will inspect disturbed areas of the site that have not been stabilized, storage areas exposed to precipitation, all control measures, and site access areas to determine if the control measures and stormwater management system are effective in preventing significant impacts to receiving waters.

Inspections will be performed during the non-rainy season once every 2 weeks. Maintenance shall be performed as necessary. Inspections will be performed before and after storm events and once each 24-hour period during extended storm events to identify BMP effectiveness and implement repairs or design changes as soon as feasible depending on field conditions. The discharger will complete an inspection checklist, which will include the following information:

- Inspection date
- Weather conditions
- A description of any inadequate BMPs
- List of observations of all BMPs
- Corrective actions required, including any changes to DESCP
- Inspector name, title, and signature

Erosion and Sediment Controls.

The following procedures will be used to maintain erosion and sedimentation controls:

- All control measures will be inspected before and after storm events and once each 24-hour period during extended storm events.
- All measures will be maintained in good working order; if a repair is necessary, that repair will be initiated within 24 hours of the report.
- Sediment will be removed from the silt barriers when it has reached one-third of the height of the barrier.
- Silt barriers will be inspected for depth of accumulated sediment, tears, attachment to posts, and stability on a weekly basis.
- Aggregate-covered areas will be inspected for bare spots and washouts.
- The Hydrogen Energy Site Manager will select individuals to be responsible for inspections, maintenance, repairs, and reporting. The designated inspectors will receive the necessary

training from the Hydrogen Energy Site Manager to properly inspect and maintain the controls in good working order.

- An Inspection Form will be completed after each inspection.
- The completed Inspection Forms will be retained onsite.

Non-Stormwater Controls

The following procedures will be used to maintain the non-stormwater controls:

- All control measures will be inspected before and after storm events and once each 24-hour period during extended storm events.
- All measures will be maintained in good working order; if a repair is necessary, that repair will be initiated within 24 hours of the report.
- The designated inspector will visually observe all drainage areas for the presence of unauthorized non-stormwater discharges and their sources.
- If a spill occurs that cannot be cleaned up before the next rain event, or under other circumstances warranting sample collection, the designated inspector will collect stormwater samples during the first two hours (even including weekends or holidays) of discharge. Similarly, if it appears that BMPs have failed or been damaged to the extent that they could result in discharge of pollutants in stormwater; and are discharging potentially impacted water, samples should be collected. Another instance that requires sampling is where stormwater comes in contact with exposed materials that could potentially contaminate stormwater runoff. The samples should be analyzed for visible and non-visible compounds with the analytical testing suite determined from the specific materials spilled or not contained properly, and for any constituents in the spill that occur in high enough concentrations to cause an impact to water quality.
- The Hydrogen Energy Site Manager will select individuals to be responsible for inspections, maintenance, repairs, and reporting. The designated inspectors will receive the necessary training from the Willow Pass Site Manager to properly inspect and maintain the controls in good working order.
- An Inspection Form will be completed after each inspection.
- The completed Inspection Forms will be retained onsite.

Recordkeeping

Two inspection forms will be completed demonstrating that inspections and maintenance of the control measures are implemented: Erosion and Sedimentation Controls, and Non-stormwater Source Controls. All disturbed areas and materials storage areas require inspection at least every 1 day before and after storm events and once each 24-hour period during extended storm events. After each inspection, the inspector completes an inspection report and retains a copy of the report. Any maintenance required is initiated within 24 hours of the inspection.

A copy of this DESCP and any supporting materials must be maintained at the construction site from the date of CEC approval to the date of final stabilization. All records and supporting documents will be compiled in an orderly manner, and maintained onsite until final site stabilization is completed.

The generation of reports, as part of the construction process and inspection or amendment procedures, provides accurate records, which can be used to evaluate the effectiveness of this DESCP and document compliance. Changes in design or construction of the stormwater management system are documented and included with the DESCP to facilitate review or evaluation.

Post-construction Stormwater Management.

Final erosion and sediment control measures for final stabilization or exposed soil will be in place prior to final sign off of improvements Post-construction erosion and sediment control measures to be used at this construction site once all construction is complete may include:

- Seeding
- Hydroseeding
- Mulching
- Removal of debris from drain inlet bags
- Removal of temporary erosion sediment control measures
- Removal of temporary erosion and sediment control measures (if necessary)

REFERENCES

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California Stormwater Quality Association (CASQA), “California Stormwater BMP Handbook Construction”, www.cabmphandbooks.com, Dated January 2003.

FIGURES

Source:
URS Hydrogen Engery California (HECA), Kern County, California;
Project Vicinity Map; Figure 1-1; Dated May 2009

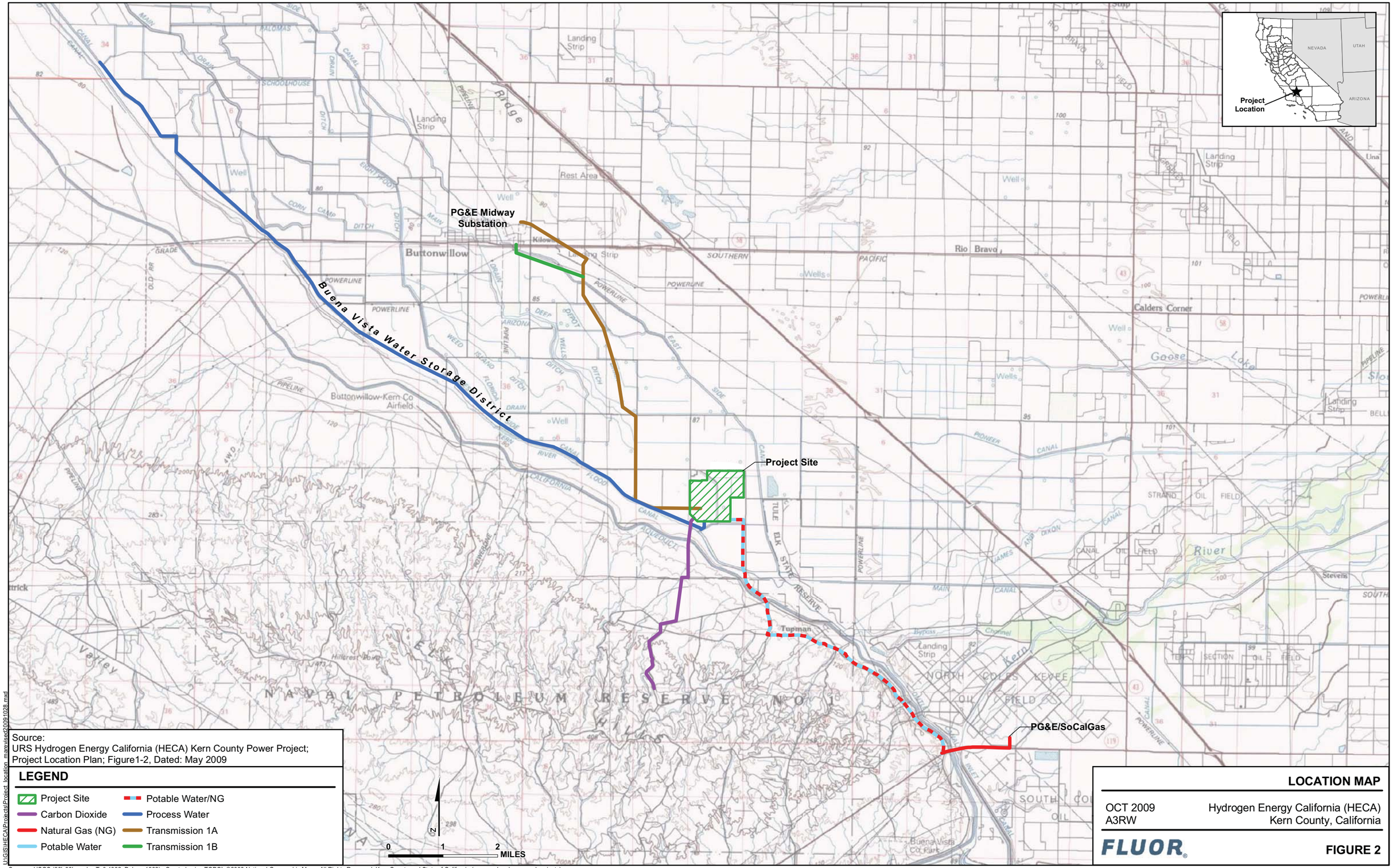
VICINITY MAP

OCT 2009
A3RW

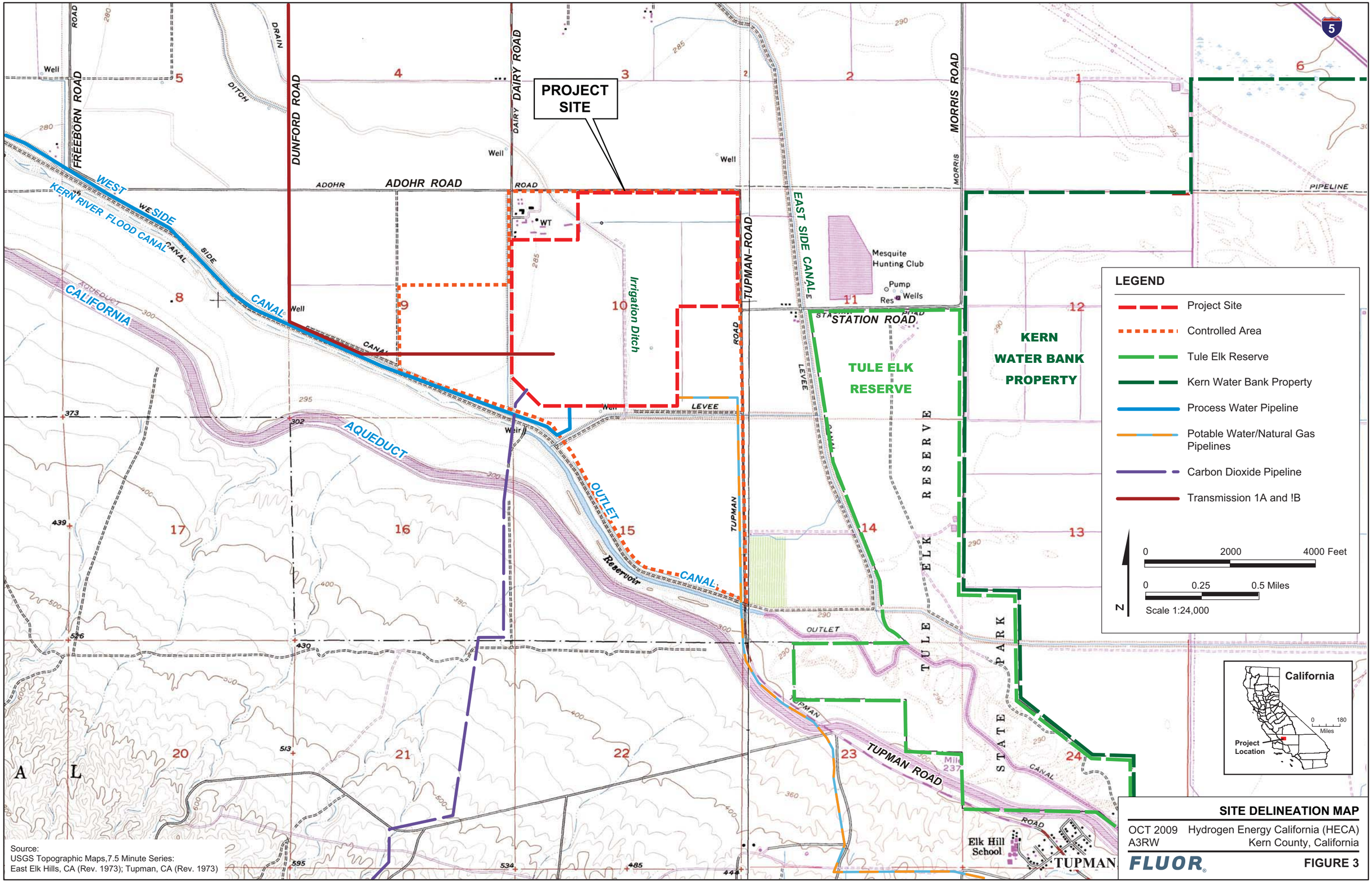
Hydrogen Energy California (HECA)
Kern County, California

FLUOR

FIGURE 1



Sources: USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved. Kern County and State of California (proposed and approved projects).



SITE DELINEATION MAP

OCT 2009 Hydrogen Energy California (HECA)
A3RW Kern County, California

FLUOR

FIGURE 3

10/28/09 vsa..T:\HECA\GRAPHICS\Data Requests\DR 95 DESCP\Fig 1_site location.ai

TEMPORARY CONSTRUCTION FENCE
ADOHR ROAD
SECURITY FENCE
DAIRY ROAD
STORM WATER RETENTION
SECURITY FENCE
PLANT EMERGENCY EXIT GATE
STORM WATER RETENTION
STORM WATER RETENTION
TUPMAN ROAD
SECURITY FENCE
REMOTE LAYDOWN YARD 56 ACRES
LAYDOWN YARD AREA #1 12 ACRES
LAYDOWN YARD AREA #2 36 ACRES
CONSTRUCTION WAREHOUSE
LAYDOWN YARD AREA #3 28 ACRES
STATION ROAD
STORM WATER RETENTION
CONSTRUCTION ENTRANCE
STAFF PARKING 2 ACRES
TEMPORARY GUARD HOUSE
CONSTRUCTION TRAILER AREA
CONSTRUCTION OFFICE
TEMPORARY POWER SUBSTATION
BRASS ALLEY
CHANGE ROOMS
CONSTRUCTION TRAILERS
CRAFT PARKING ENTRANCE
TEMPORARY GUARD HOUSE
CONSTRUCTION CRAFT ENTRANCE
CRAFT PARKING 12 ACRES
ASU OFFICE/ TRAILER
STORM WATER RETENTION
ASU TEMPORARY CONSTRUCTION FENCE
SECURITY FENCE
ASU CONSTRUCTION ACCESS (SECURED)
ASU LAYDOWN YARD 7.10 ACRES
ASU CONSTRUCTION WAREHOUSE
CRAFT PARKING EXIT
CHANGE ROOMS
BRASS ALLEY
PLANT EMERGENCY EXIT GATE
SECURITY FENCE
ASU TEMPORARY SECURITY STATION
ASU CRAFT PARKING 2 ACRES
ASU CONSTRUCTION CRAFT ENTRANCE

(STATE PLANE)
PLANT
N

STATE PLANE COORDINATES
NAD83 ZONE V (U.S. FEET)

LEGEND

- TEMPORARY FACILITIES AREA
- SECURITY FENCE
- TEMPORARY FENCE
- TEMPORARY CONSTRUCTION ROAD

FIGURE 4

1"=300'
0 150' 300' 600' 900' 1200'
GRAPHIC SCALE

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS
A	19OCT09	ISSUED FOR CEC AFC	DRM	PMF	BRE							SK-250-1001	PRELIMINARY PLOT PLAN

FLUOR

NOTICE: THIS DRAWING HAS NOT BEEN PUBLISHED AND IS THE SOLE PROPERTY OF FLUOR AND IS LENT TO THE BORROWER FOR THEIR CONFIDENTIAL USE ONLY, AND IN CONSIDERATION OF THE LOAN OF THIS DRAWING, THE BORROWER PROMISES AND AGREES TO RETURN IT UPON REQUEST AND AGREES THAT IT WILL NOT BE REPRODUCED, COPIED, LENT OR OTHERWISE DISPOSED OF DIRECTLY OR INDIRECTLY, NOR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS FURNISHED.

CONTRACT	A3RW		
DESIGNED BY	D. MARTINEZ		
CHECKED BY	P. FORTIER		
SUPERVISOR	B. EISENBISE	APP DATE	19OCT09
LEAD ENGR/SPEC.	P. FORTIER	APP DATE	19OCT09
FLUOR	.	APP DATE	.
CLIENT	.	APP DATE	.

HYDROGEN ENERGY CALIFORNIA(HECA)
KERN COUNTY, CALIFORNIA

PRELIMINARY TEMPORARY CONSTRUCTION FACILITIES PLAN

SCALE	DRAWING NUMBER	REV
1:300'	A3RW-SK-210-1010	A

CAD FILE NAME A3RW-SK-210-1010.DWG

PLOT DATE:

XREF ATTACHED – YES ☐ NO ☐ MANUAL CHANGES MADE – YES ☐ NO ☐ DWG FILE UPDATED – YES ☐ NO ☐ MODEL UPDATED – YES ☐ NO ☐

LEGEND

FLOW	FLOW DIRECTION
SLOPE	SURFCE SLOPE DIRECTION
(287)	EXISTING CONTOUR ELEVTION

FIGURE 5

1"=400'

0 200' 400' 800' 1200' 1600'

GRAPHIC SCALE

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS
A	19OCT09	ISSUED FOR CEC AFC	DRM	PMF	BRE							SK-250-1001	PRELIMINARY PLOT PLAN

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CONTRACT A3RW		
DESIGNED BY D. MARTINEZ		
CHECKED BY P.FORTIER		
SUPERVISOR B.EISENBISE	APP DATE 19OCT09	
LEAD ENGR/SPEC. P. FORTIER	APP DATE 19OCT09	
FLUOR .	APP DATE .	
CLIENT .	APP DATE .	

HYDROGEN ENERGY CALIFORNIA(HECA)
KERN COUNTY, CALIFORNIA

CIVIL
EXISTING DRAINAGE PLAN

SCALE	DRAWING NUMBER	REV
1:300'	A3RW-SK-210-1011	A

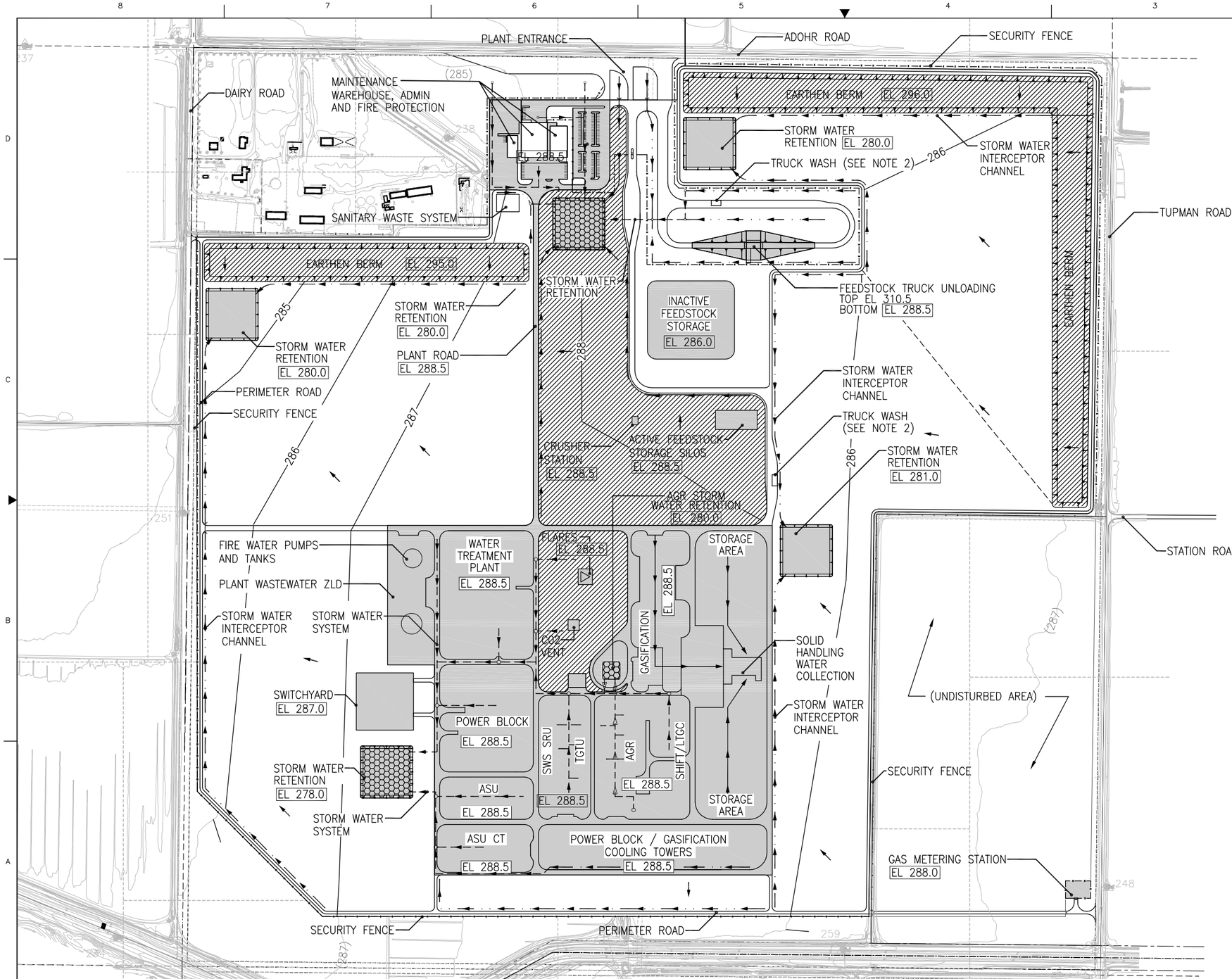
CAD FILE NAME A3RW-SK-210-1011.DWG

SAP NWA

DIST CODE

PLOT DATE:

XREF ATTACHED – YES ☐ NO ☐ MANUAL CHANGES MADE – YES ☐ NO ☐ DWG FILE UPDATED – YES ☐ NO ☐ MODEL UPDATED – YES ☐ NO ☐



(STATE PLANE) PLANT N

NAD83 ZONE V (U.S. FEET)

LEGEND

- EL 288.5 — H.P. GRADE ELEVATION
- PAD AREA
- EXCAVATED FILL MATERIAL (SEE NOTE 3)
- STORM WATER DRAINAGE SWALES AND DITCHES FROM NON-PROCESS AREAS
- STORM WATER SYSTEM FROM PROCESS AREAS WHERE SOLIDS ARE NOT PRESENT
- STORM WATER SYSTEM FROM SOLIDS HANDLING AREAS
- STORM WATER SYSTEM FROM AGR PROCESS AREA
- SURFACE RUNOFF
- CULVERT

ABBREVIATIONS:

ASU = AIR SEPARATION UNIT
AGR = ACID GAS REMOVAL
SWS = SOUR WATER STRIPPING
SRU = SULFUR RECOVERY UNIT
TGTU = TAIL GAS TREATING UNIT
ZLD = ZERO LIQUID DISCHARGE

NOTE:

1. WHERE DISTANCES ARE PROHIBITIVE FOR GRAVITY FLOW, SUMPS AND PUMPS WILL BE USED TO CONVEY RUNOFF TO THE APPROPRIATE DRAINAGE FACILITY FOR WATER TREATMENT OR RETENTION.
2. COLLECTION SUMPS FOR SETTLEMENT OF SOLIDS AND REUSE OF CLARIFIED WATER WILL BE PROVIDED AT SOLIDS HANDLING FACILITIES AT VARIOUS LOCATIONS.
3. UNSUITABLE SOIL MATERIAL WILL BE EXCAVATED, AND USED TO CONSTRUCT THE EARTHEN BERMS AND TO LEVEL THE OPEN AREAS AS SHOWN ON THE PLAN.

FIGURE 6

1"=300' 0 150' 300' 600' 900' 1200'
GRAPHIC SCALE

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS
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KERN COUNTY, CALIFORNIA

CIVIL
PRELIMINARY
GRADING AND DRAINAGE PLAN

SCALE 1:300' | DRAWING NUMBER A3RW-SK-210-1012 | REV A

CAD FILE NAME A3RW-SK-210-1012.DWG

PLOT DATE:

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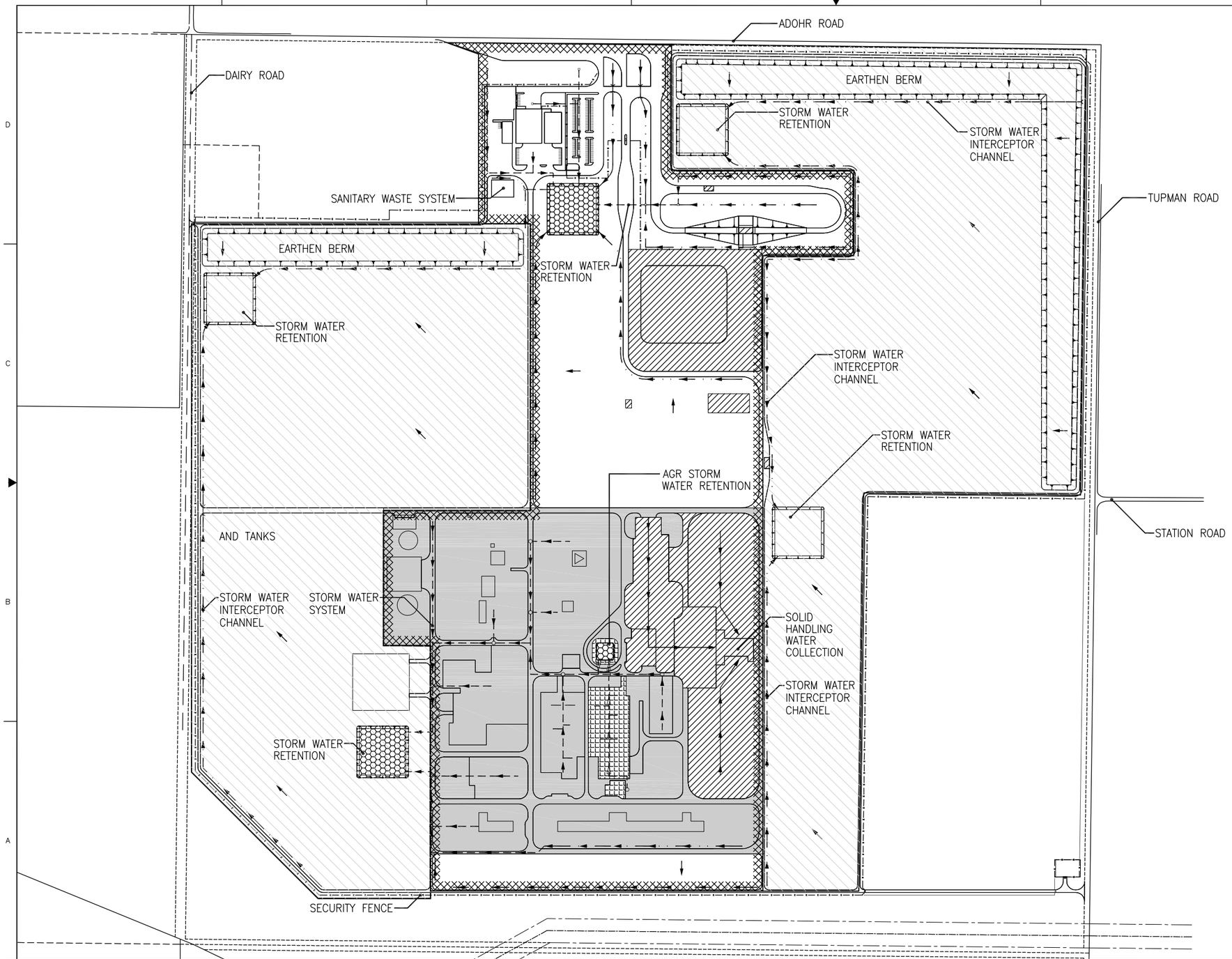

PLANT (STATE PLANE) N

LEGEND

- NON-CONTACT RUN-OFF
- POTENTIALLY CONTAMINATED RUN-OFF
- MAIN PLANT PROCESS AREAS
- SOLIDS HANDLING AREAS
- IMPERMEABLE LINER
- ACID GAS REMOVAL (AGR) AREA
- STORM WATER DRAINAGE SWALES AND DITCHES FROM NON-PROCESS AREAS
- STORM WATER SYSTEM FROM PROCESS AREAS WHERE SOLIDS ARE NOT PRESENT
- STORM WATER SYSTEM FROM SOLIDS HANDLING AREAS
- STORM WATER SYSTEM FROM AGR PROCESS AREA
- SURFACE RUNOFF
- CULVERT

NOTE:

1. WHERE DISTANCES ARE PROHIBITIVE FOR GRAVITY FLOW, SUMPS AND PUMPS WILL BE USED TO CONVEY RUNOFF TO THE APPROPRIATE DRAINAGE FACILITY FOR WATER TREATMENT OR RETENTION.
2. COLLECTION SUMPS FOR SETTLEMENT OF SOLIDS AND REUSE OF CLARIFIED WATER WILL BE PROVIDED AT SOLIDS HANDLING FACILITIES AT VARIOUS LOCATIONS.

FIGURE 7

1"=300' 0 150' 300' 600' 900' 1200'
GRAPHIC SCALE

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS
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HYDROGEN ENERGY CALIFORNIA(HECA)
KERN COUNTY, CALIFORNIA

CIVIL
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SITE DRAINAGE PATTERNS

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CAD FILE NAME A3RW-SK-210-1013.DWG

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TEMPORARY CONSTRUCTION FENCE
ADOHR ROAD
SECURITY FENCE
DAIRY ROAD
SNADBAG (TYP)
SILT FENCE (TYP)
PLANT EMERGENCY EXIT GATE
SEDIMENTATION/ RETENTION
SECURITY FENCE
SEDIMENTATION/ RETENTION
SEDIMENTATION/ RETENTION
SECURITY FENCE
LAYDOWN YARD AREA #1 12 ACRES
LAYDOWN YARD AREA #2 36 ACRES
LAYDOWN YARD AREA #3 28 ACRES
REMOTE LAYDOWN YARD 56 ACRES
TUPMAN ROAD
STATION ROAD
SEDIMENTATION/ RETENTION
CONSTRUCTION ENTRANCE/EXIT
STAFF PARKING 2 ACRES
CONSTRUCTION CRAFT ENTRANCE
CHECKDAM (TYP)
CRAFT PARKING 12 ACRES
SEDIMENTATION/ RETENTION
ASU TEMPORARY CONSTRUCTION FENCE
SECURITY FENCE
ASU CONSTRUCTION ACCESS (SECURED)
ASU LAYDOWN YARD 7.10 ACRES
PLANT EMERGENCY EXIT GATE
SECURITY FENCE
ASU CRAFT PARKING 2 ACRES
ASU CONSTRUCTION CRAFT ENTRANCE

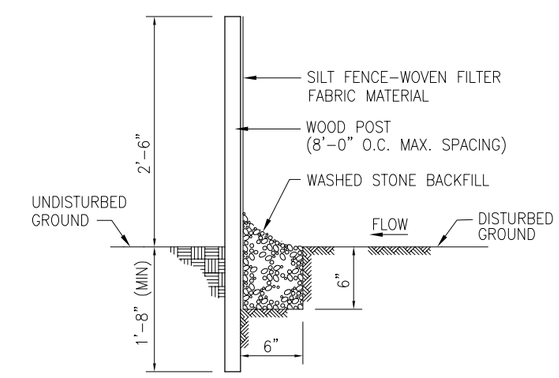
LEGEND

- TEMPORARY FACILITIES AREA
- SECURITY FENCE
- TEMPORARY FENCE
- TEMPORARY CONSTRUCTION ROAD
- SILTFENCE (BMP SE-1)
- SANDBAG BARRIER (BMP SE-8)
- CHECK DAM (BMP SE-4)
- STABILIZED CONSTRUCTION ENTRANCE/EXIT (BMP TR-1) ENTRANCE/OUTLET TIRE WASH (BMP TR-3)
- SEDIMENTATION/RETENTION
- CULVERT
- STORM WATER DRAINAGE & SWALE DITCHES

(STATE PLANE) PLANT N

TYPICAL SANDBAGS (2 HIGH)

TYPICAL SANDBAG BARRIER DETAIL (BMP SE-8)
NTS



TYPICAL SILT FENCE DETAIL (BMP SE-1)
NTS

FIGURE 8

1"=300' 0 150' 300' 600' 900' 1200'
GRAPHIC SCALE

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS
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HYDROGEN ENERGY CALIFORNIA(HECA)
KERN COUNTY, CALIFORNIA

CIVIL CONCEPTURAL EROSION CONTROL PLAN

SCALE 1:300'
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REV A
CAD FILE NAME A3RW-SK-5210-1014.DWG

SAP NMA
DST CODE

PLOT DATE:
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APPENDIX A: SOIL MAPPING UNITS

Table A-1
Soil Mapping Units – Descriptions and Properties

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Kern County Northwestern Part											
Buttonwillow clay, drained, 0 to 2% slopes (123)	Clay	No restrictive feature within 200 cm	Somewhat Poorly Drained	High	C	7s	5	0.24	7.9-8.4	High	Prime Farmland if Irrigated
Cajon loamy sand, 0 to 2% slopes (125)	Loamy sand	No restrictive feature within 200 cm	Somewhat Excessively Drained	Negligible	A	7s	5	0.15	7.4-8.4	Moderate	Prime Farmland if Irrigated
Cajon loamy sand, 2 to 5% slopes (126)	Loamy sand	No restrictive feature within 200 cm	Somewhat Excessively Drained	Negligible	A	7e	5	0.15	7.4-8.4	Moderate	Prime Farmland if Irrigated
Elkhills sandy loam, 9 to 50% slopes, eroded (146)	Gravely sandy loam	No restrictive feature within 200 cm	Well Drained	Medium	B	7e	5	0.20	7.4-8.4	High	Not Prime Farmland
Garces silt loam (156)	Silt loam	No restrictive feature within 200 cm	Well Drained	Very High	D	7s	5	0.49	7.9-9.0	High	Farmland of State-Wide Importance
Kimberlina fine sandy loam, 0 to 2% slopes (174)	Fine sandy loam	No restrictive feature within 200 cm	Well Drained	Very Low	B	7c	5	0.24	6.6-8.4	High	Prime Farmland if Irrigated
Kimberlina fine sandy loam, saline-alkali, 0 to 2% slopes (179)	Fine sandy loam	No restrictive feature within 200 cm	Well Drained	Medium	B	7s	5	0.24	7.9-8.4	High	Farmland of State-Wide Importance

Table A-1
Soil Mapping Units – Descriptions and Properties

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Lokern clay, drained, 0 to 2% slopes (187)	Clay	No restrictive feature within 200 cm	Moderately Well Drained	High C		7s	5	0.28	7.9-8.4	High	Prime Farmland if Irrigated
Lokern clay, saline-alkali, drained, 0 to 2% slopes (188)	Clay	No restrictive feature within 200 cm	Moderately Well Drained	Very High	D 7s		5	0.28	7.9-8.4	High	Not Prime Farmland
Milham sandy loam, 0 to 2% slopes (196)	Sandy loam	No restrictive feature within 200 cm	Well Drained	Medium B		7c	5	0.32	7.4-8.4	High	Prime Farmland if Irrigated
Panoche clay loam, 0 to 2% slopes (211)	Clay loam	No restrictive feature within 200 cm	Well Drained	Low B		7c	5	0.43	7.4-8.4	High	Prime Farmland if Irrigated
Panoche clay loam, saline-alkali, 0 to 2% slopes (214)	Clay loam	No restrictive feature within 200 cm	Well Drained	Medium B		7s	5	0.43	7.4-8.4	High	Farmland of State-Wide Importance
Torriorthents stratified, eroded-Elkhills complex, 9 to 50% slopes (232)	Sandy loam, gravelly sandy loam	No restrictive feature within 200 cm	Well Drained	Medium to High	C 7e		5	0.20	7.4-8.4	High	Not Prime Farmland
Kern County, Southwestern Part											
Granoso loamy sand, 2 to 5% slopes (121)	Loamy Sand	No restrictive feature within 200 cm	Somewhat Excessively Drained	Very Low	A	7e	5	0.17	7.4-8.4	Low	Farmland of State-Wide Importance

Table A-1
Soil Mapping Units – Descriptions and Properties

Soil Series	Surface Texture	Depth to Bedrock or Restrictive Feature[1]	Drainage	Runoff	Hydrologic Soil Group[2]	Land Capability Class (Non-Irrigated)[3]	Erosion Factor T[4]	Erosion Factor K[5]	Surface pH	Risk of Corrosive Action on Steel[6]	Farmland Category
Kimberlina fine sandy loam, saline-sodic, 0 to 2% slopes (212)	Fine Sandy Loam	No restrictive feature within 200 cm	Well Drained	Low B		7s	3	0.24	7.9-8.4	High	Farmland of State-Wide Importance

Source: USDA SCS 1988, NRCS 2009.

Notes:

[1]*Depth to Bedrock or Restrictive Feature:* Represents a restrictive layer that is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

[2]*Hydrologic Soil Groups:* Are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms. The four hydrologic soil groups are:

Group A - Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B - Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C - Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D - Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

[3]*Land Capability Classes:* ***Class 7*** soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forest land, or wildlife. ***Subclass s*** indicates that the soil is limited mainly because it is shallow, droughty, or stony; ***Subclass c*** indicates that the soil is limited by climates that are very cold or very dry; and ***Subclass e*** indicates susceptibility to erosion is the dominant problem or hazard affecting use with erosion susceptibility and past erosion damage comprising the major soil factors that affect soils in this subclass; Subclass s indicates that the soil is limited mainly because it is shallow, droughty, or stony.

[4]*T Factor:* is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

[5]*Erosion Factor K:* indicates the susceptibility of a soil to sheet and rill erosion by water. *Factor K* is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of *K* range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

[6]*Risk of Corrosion:* pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer. For uncoated steel, the risk of corrosion, expressed as "low," "moderate," or "high," is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

cm = centimeter
% = percent

APPENDIX B: PRELIMINARY HYDROLOGY STUDY

HYDROGEN ENERGY CALIFORNIA (HECA)

KERN COUNTY POWER PROJECT

PRELIMINARY HYDROLOGY STUDY

Rev. No.	Date	By	Checked	Approved
0	05/19/09	P. Fortier	B. Eisenbise	W. Becktel

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APPENDIX C - POST-DEVELOPMENT ANALYSES 11

Analysis Parameters

Existing Site Parameters

Area:	473 ac
Stream Length:	5,176 ft
High Point Elevation	288 ft
Low Point Elevation	285 ft
Delta Elevation:	3 ft
Slope:	0.0006 ft/ft

Soil Characteristic

Soil Type:	Clay and Silty-Clay
Soil Group:	D

Reference: *Prelimnary Geotechnical Investigations*
Kern County Hydrology Manual - Section C.3 - Hydrologic Soil Group

Rainfall Event

Storm Duration:	24 h
Storm Distribution:	Type 1
Rainfall Depth:	

Storm Frequencies	***Rainfall*** (in)
2-yr	0.9
5-yr	1.2
10-yr	1.4
25-yr	1.6
50-yr	1.8
100-Yr	2.0

Reference: *NOAA Atlas 2 - Volume 11 California*

Ground Cover

Existing:

Drainage Area	***Surface***	***Condition***	***Area***	***Impervious [1]***	***CN***	***CNw [2]***
DE	Agricultural Close Seeded	Good	473 ac	3%	85	85

Proposed:

Drainage Area	***Surface***	***Condition***	***Area***	***Impervious [1]***	***CN***	***CNw [2]***
DA 1	Grass, Meadow	Good	110 ac	10%	78	80
DA 2	Grass, Meadow	Good	31 ac	10%	78	80
DA 3	Grass, Meadow	Good	144 ac	10%	78	80
DA 4	Process Area, Gravel	Good	76 ac	85%	91	97
DA 5	Grass Meadow	Good	70 ac	40%	78	86
DA 6	Paved, Grass Meadow	Good	13 ac	60%	78	90
DA 7	Process Area, Gravel	Good	11 ac	95%	91	98
DA 8	Process Area, Gravel	Good	15 ac	95%	91	98
DA 9	Process Area, Gravel	Good	3 ac	95%	91	98
Total			**473 ac**			

Reference: *Kern County Hydrology Manual - Figure C-2*

Notes: *1) Impervious surfaces have a CN value of 98*
2) CNw is the weighted CN value of the impervious and pervious surfaces

Analysis Summary Table

Duration: 24-Hour

Existing:

	10-Year		50-Year		100-Year	
Drainage Area	***Peak Flow*** (cfs)	***Hydrograph Vol.*** (ac/ft)	***Peak Flow*** (cfs)	***Hydrograph Vol.*** (ac/ft)	***Peak Flow*** (cfs)	***Hydrograph Vol.*** (ac/ft)
DE	15.4	15.4	27.1	25.7	33.7	31.3

Proposed:

Drainage Area	***Peak Flow*** (cfs)	***Hydrograph Vol.*** (ac/ft)	***Peak Flow*** (cfs)	***Hydrograph Vol.*** (ac/ft)	***Peak Flow*** (cfs)	***Hydrograph Vol.*** (ac/ft)
DA 1	2.9	2.2	6.5	4.1	8.8	5.2
DA 2	0.9	0.6	1.8	1.1	2.9	1.5
DA 3	3.5	2.9	6.7	4.9	10.2	6.7
DA 4	37.0	6.9	49.9	9.3	56.3	10.6
DA 5	6.8	2.5	12.6	4.1	15.8	5.0
DA 6	3.5	0.7	5.5	1.0	6.7	1.2
DA 7	7.9	1.1	10.5	1.4	11.7	1.6
DA 8	9.1	1.5	12.0	2.0	13.5	2.2
DA 9	2.4	0.3	3.1	0.4	3.5	0.4
Total		**18.5**		**28.3**		**34.4**

Storm Water Retention Volume Kern County

Drainage Area	***Rainfall*** D_{10}	***% Impervious*** a_i	***Area*** (ac)	***Kern Co. Ret. Volume***[1] (ac/ft)	**Ret. Basin**[2] ID
DA 1	1.4	10%	110	1.8	Ret #1
DA 2	1.4	10%	31	0.5	Ret #2
DA 3	1.4	10%	144	2.4	Ret #3
DA 4	1.4	85%	76	10.9	Ret #4
DA 5	1.4	40%	70	4.7	Ret #5
DA 6	1.4	60%	13	N/A[3]	Sump #1
DA 7	1.4	95%	15	N/A[3]	Sump #2
DA 8	1.4	95%	11	N/A[3]	Sump #3
DA 9	1.4	95%	3	0.5	Ret #6
Total			**473**	**20.8**	

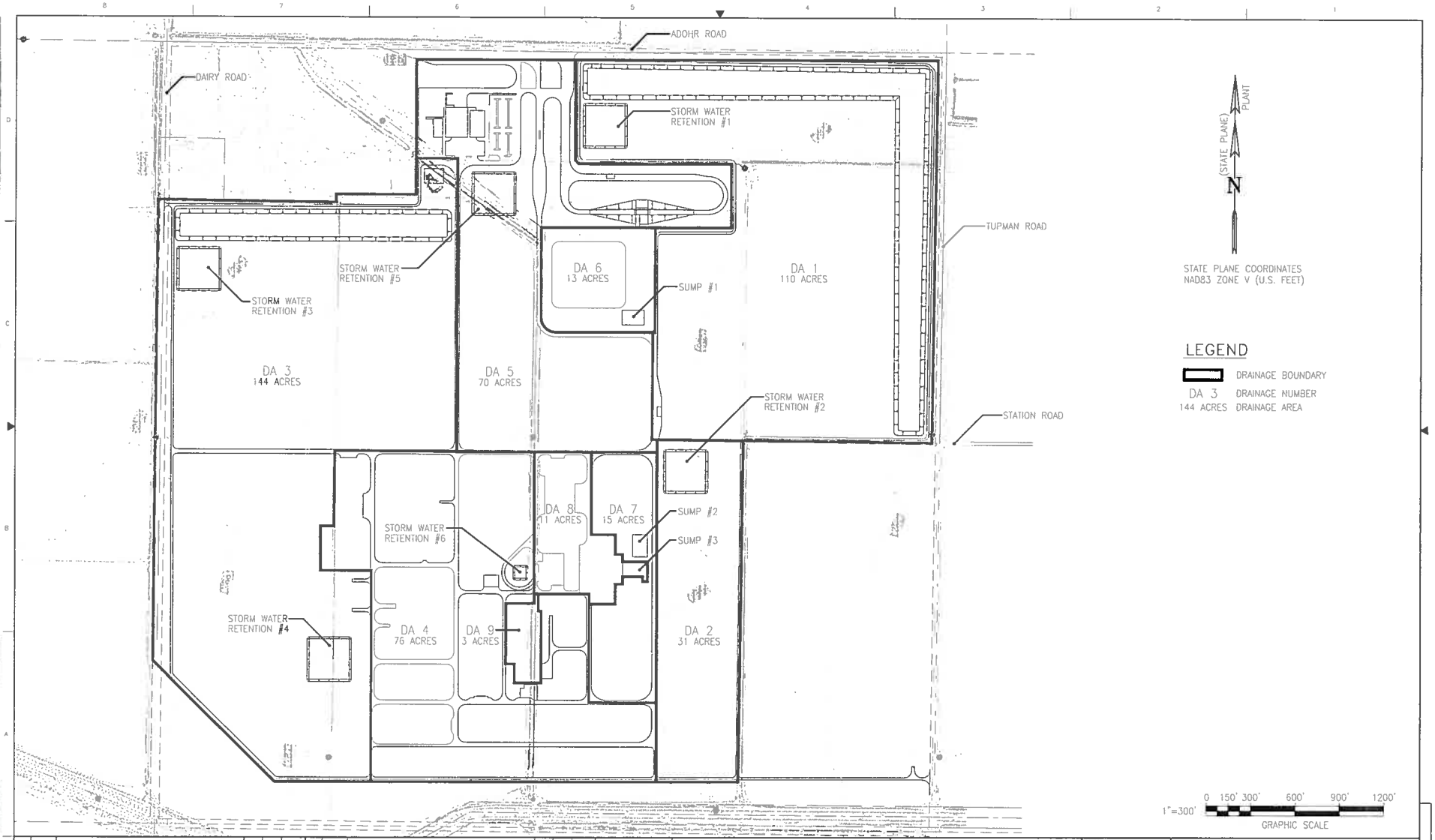
Note:

1) Kern County Hydrology Manual - Section VIII - Retention Basin Design
Section 408.1 -Design Volume:
Runoff Volume from the ISDD five day storm event = 0.12 (D_{10}) (a_i) (Area)
D_{10} = 10 year 24 hour depth of rainfall
a_i = average percentages of impervious
Area = Drainage Area
2) Refer to Civil Hydrology Map, DWG No. SK-HYDRO-01 in Appendix A
3) Runoff draining to sumps will be retained within process units and solid handling areas for reuse.

Key Design Assumptions and Methodologies

The application HydroFlow Storm Sewer 2005 by Inteli Solve has been used for calculations.
Preliminary Geotechnical Investigation, Proposed Hydrogen Energy California Project, Dated March 2009
Kern County Hydrology Manual
NOAA Atlas 2 - Precipitation Frequency Atlas Western United States - Volume 11 California

APPENDIX A – HYDROLOGY MAP



REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS
A	19 MAY	INITIAL ISSUE	DD	PMF	BRE							SK-250-1001	PRELIMINARY PLOT PLAN
												SK-210-1001	PRELIMINARY GRADING PLAN
												SK-210-1002	PRELIMINARY DRAINAGE PLAN
												SK-210-1003	PRELIMINARY PAVING PLAN

PLOT DATE.

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CONTRACT A3RW
DESIGNED BY G.DIAZ
CHECKED BY P.FORTIER
SUPERVISOR B.CISCNBISE
LEAD ENGR/SPEC.
FLUOR
CLIENT
APP DATE

HYDROGEN ENERGY CALIFORNIA
KERN COUNTY POWER PROJECT

CIVIL
PRELIMINARY
HYDROLOGY MAP

SCALE 1:300'
DRAWING NUMBER SK-HYDRO-01
REV A
CAD FILE NAME A3RW-SK-HYDRO-01.DWG

XREF ATTACHED – YES ☐ NO ☐ MANUAL CHANGES MADE – YES ☐ NO ☐ DWG FILE UPDATED – YES ☐ NO ☐ MODEL UPDATED – YES ☐ NO ☐

6/38

APPENDIX B - PRE-DEVELOPMENT ANALYSES

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

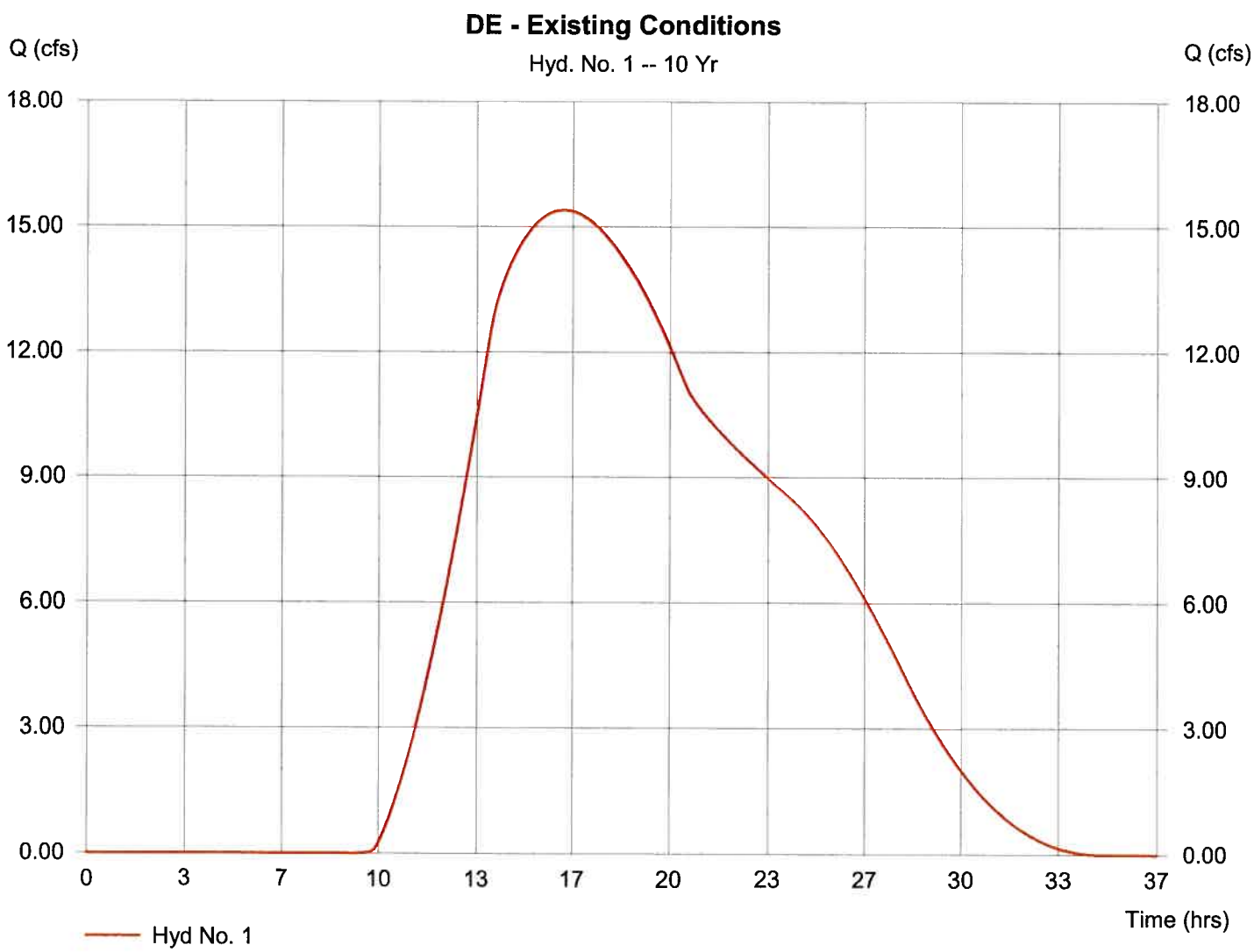
Tuesday, May 19 2009, 7:29 AM

Hyd. No. 1

DE - Existing Conditions

Hydrograph type	= SCS Runoff	Peak discharge	= 15.41 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 473.000 ac	Curve number	= 85
Basin Slope	= 0.1 %	Hydraulic length	= 5175 ft
Tc method	= LAG	Time of conc. (Tc)	= 410.51 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 669,121 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

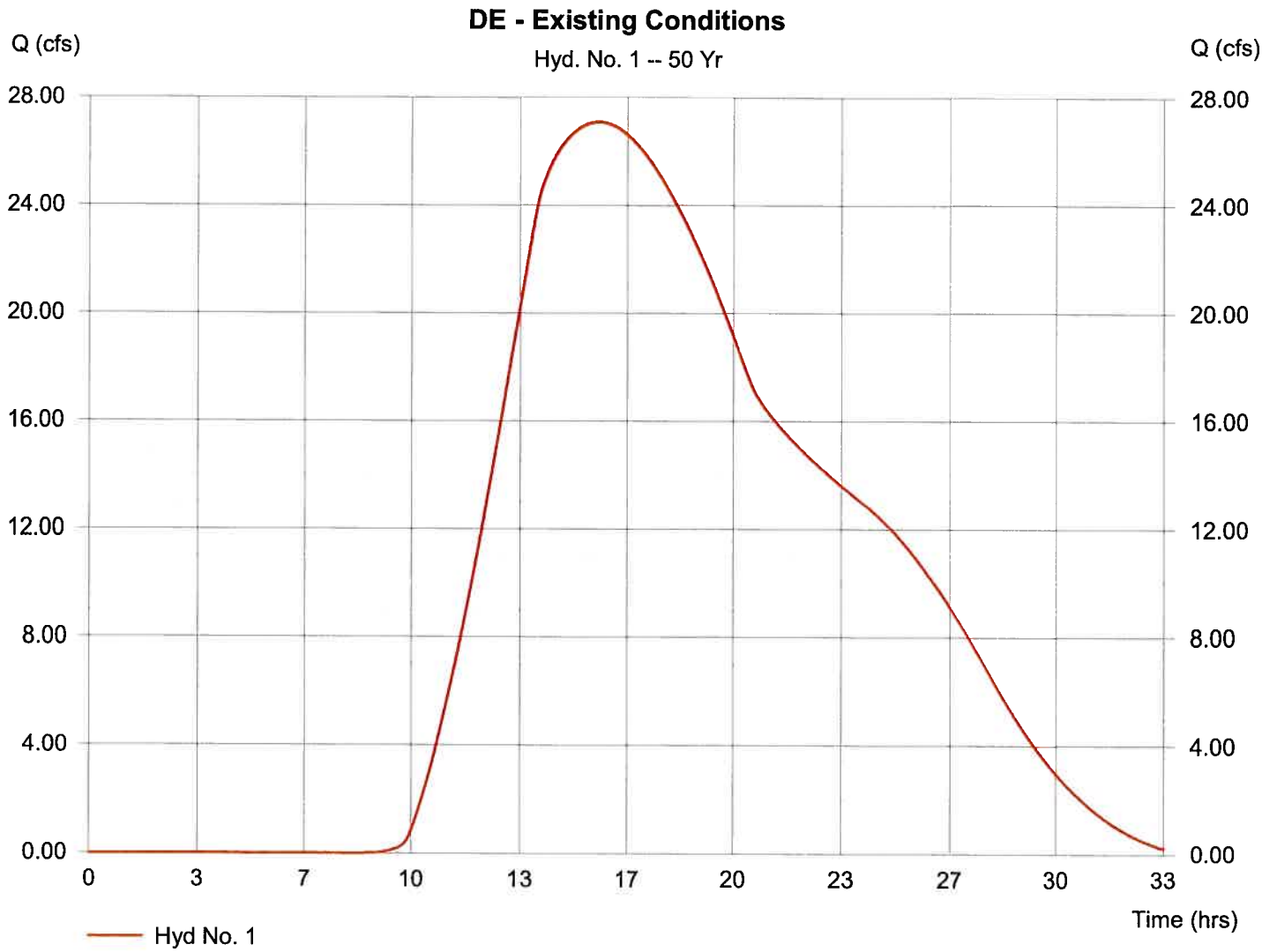
Tuesday, May 19 2009, 7:40 AM

Hyd. No. 1

DE - Existing Conditions

Hydrograph type	= SCS Runoff	Peak discharge	= 27.10 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 473.000 ac	Curve number	= 85
Basin Slope	= 0.1 %	Hydraulic length	= 5175 ft
Tc method	= LAG	Time of conc. (Tc)	= 410.51 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,118,846 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

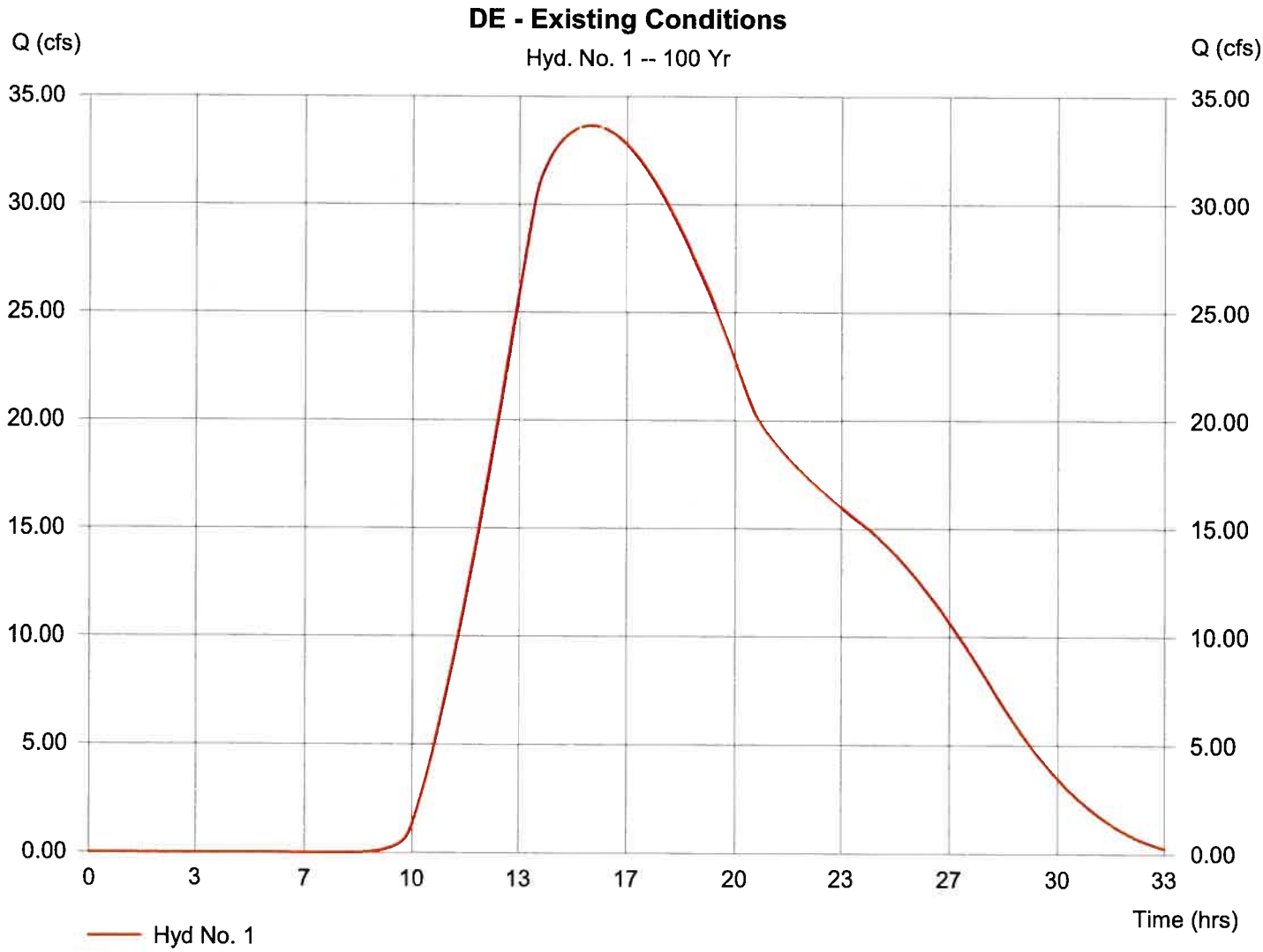
Tuesday, May 19 2009, 7:39 AM

Hyd. No. 1

DE - Existing Conditions

Hydrograph type	= SCS Runoff	Peak discharge	= 33.67 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 473.000 ac	Curve number	= 85
Basin Slope	= 0.1 %	Hydraulic length	= 5175 ft
Tc method	= LAG	Time of conc. (Tc)	= 410.51 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,364,523 cuft



APPENDIX C - POST-DEVELOPMENT ANALYSES

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

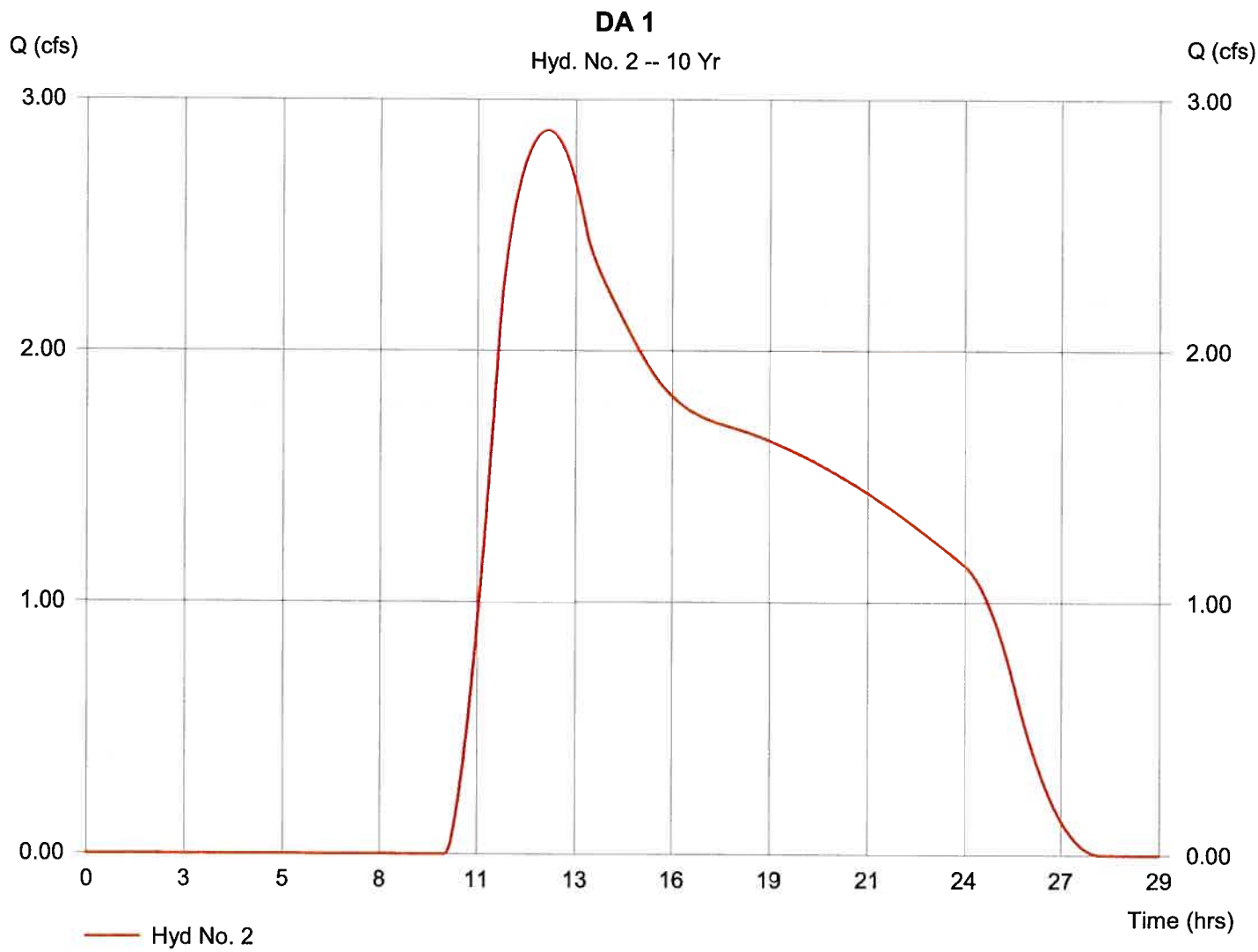
Tuesday, May 19 2009, 4:33 PM

Hyd. No. 2

DA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.88 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 110.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 3100 ft
Tc method	= LAG	Time of conc. (Tc)	= 143.71 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 95,267 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

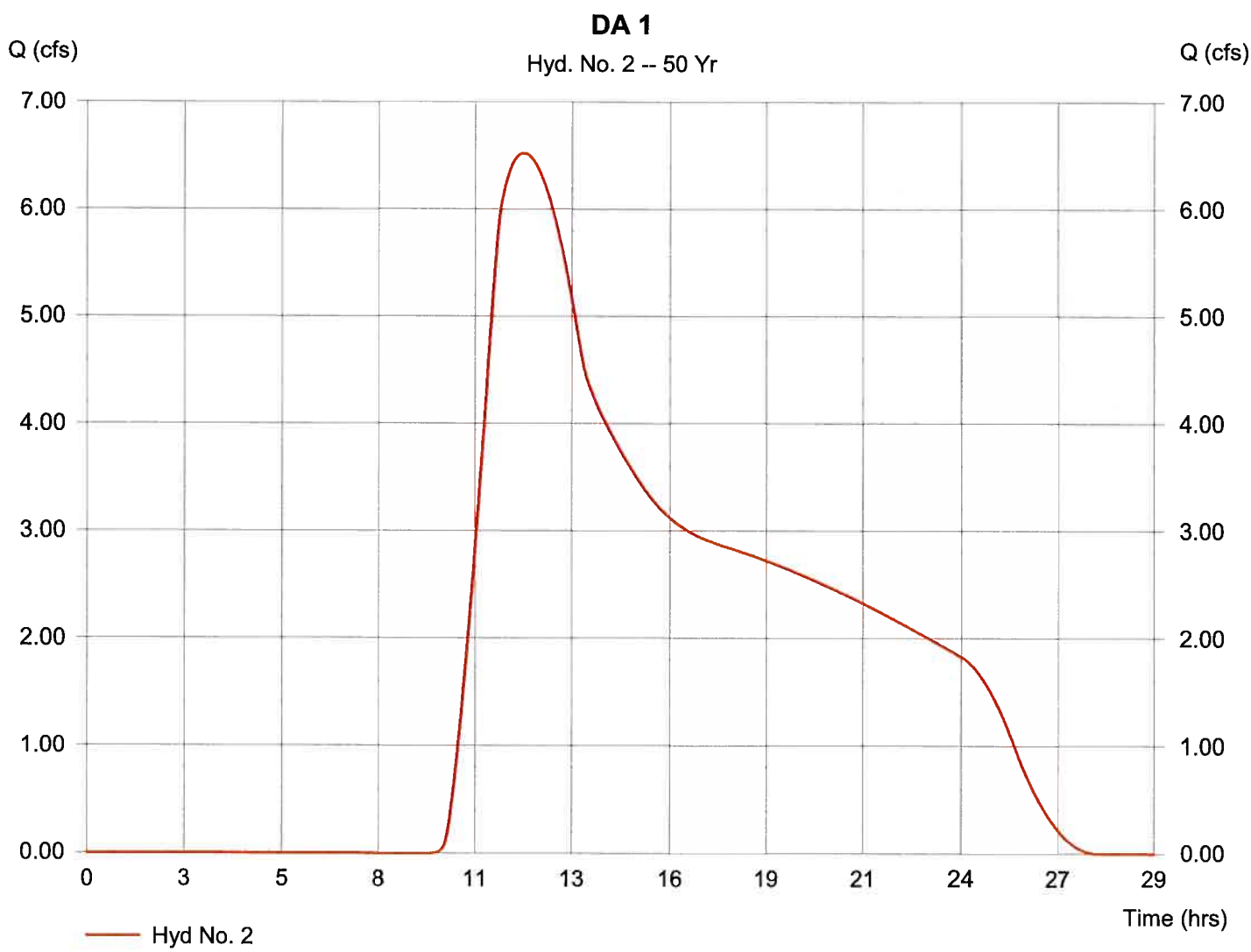
Tuesday, May 19 2009, 4:43 PM

Hyd. No. 2

DA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 6.52 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 110.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 3100 ft
Tc method	= LAG	Time of conc. (Tc)	= 143.71 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 177,845 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

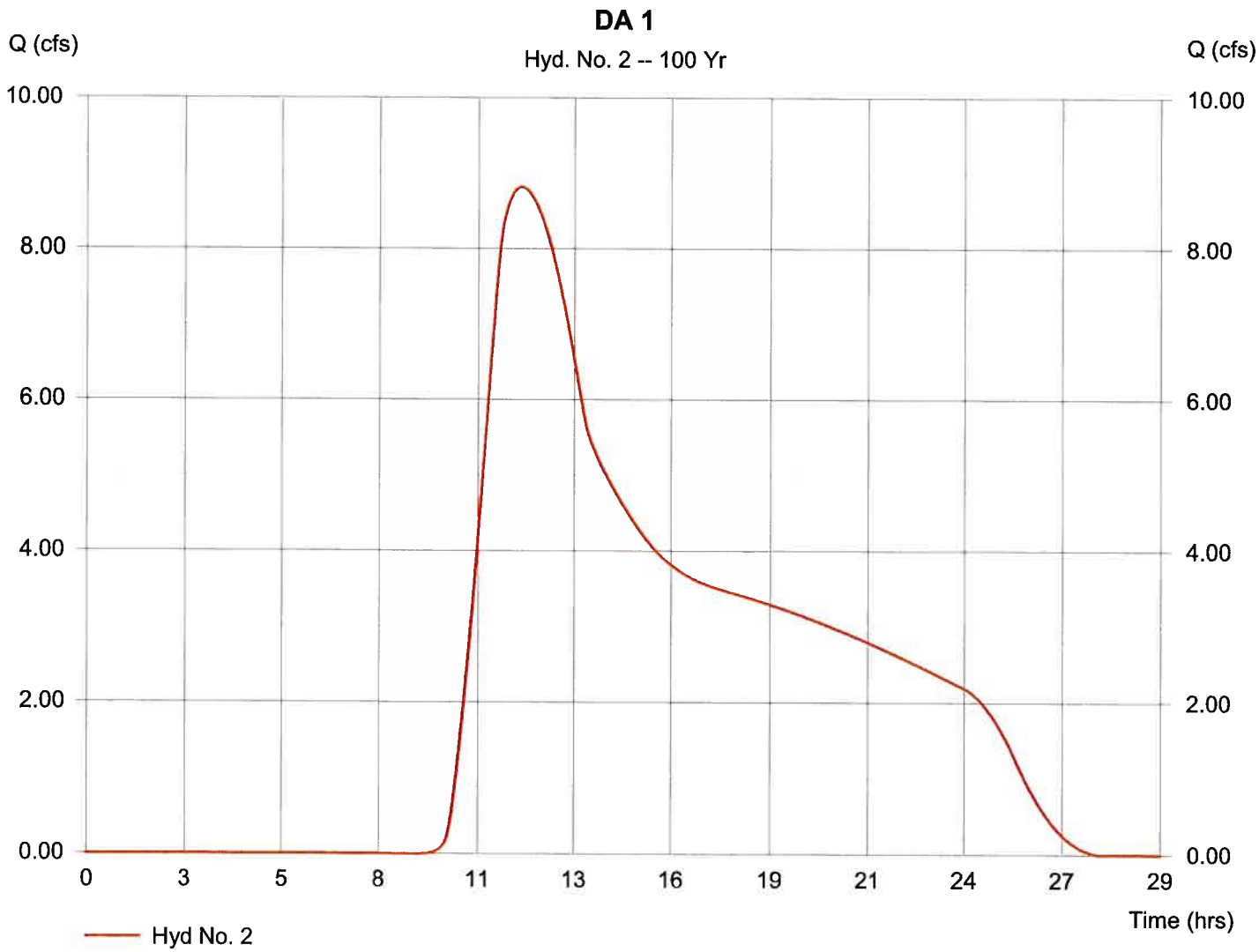
Tuesday, May 19 2009, 4:44 PM

Hyd. No. 2

DA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 8.82 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 110.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 3100 ft
Tc method	= LAG	Time of conc. (Tc)	= 143.71 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 224,937 cuft



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Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

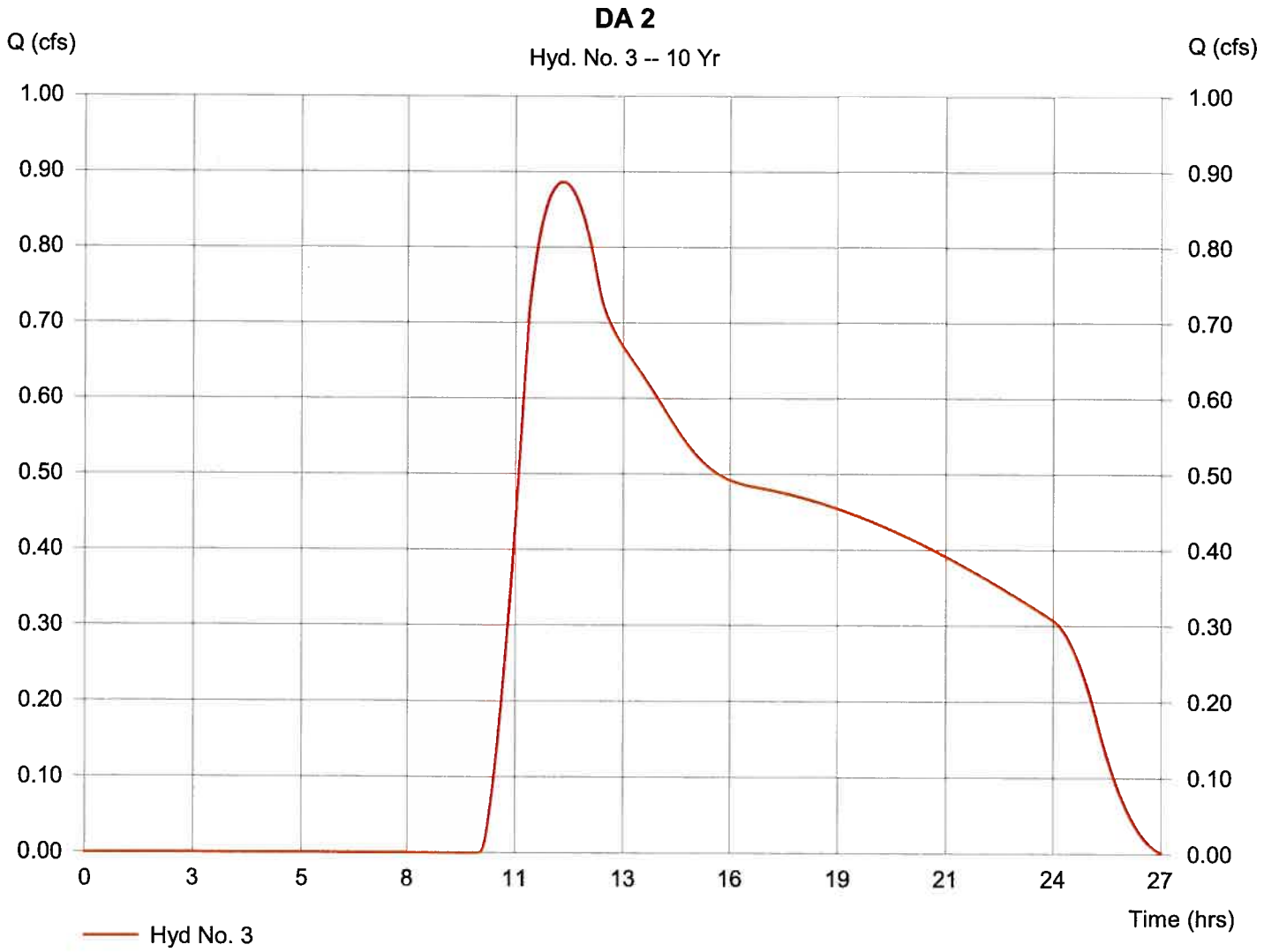
Tuesday, May 19 2009, 10:33 AM

Hyd. No. 3

DA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.89 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 31.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 2200 ft
Tc method	= LAG	Time of conc. (Tc)	= 109.23 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 26,757 cuft



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Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

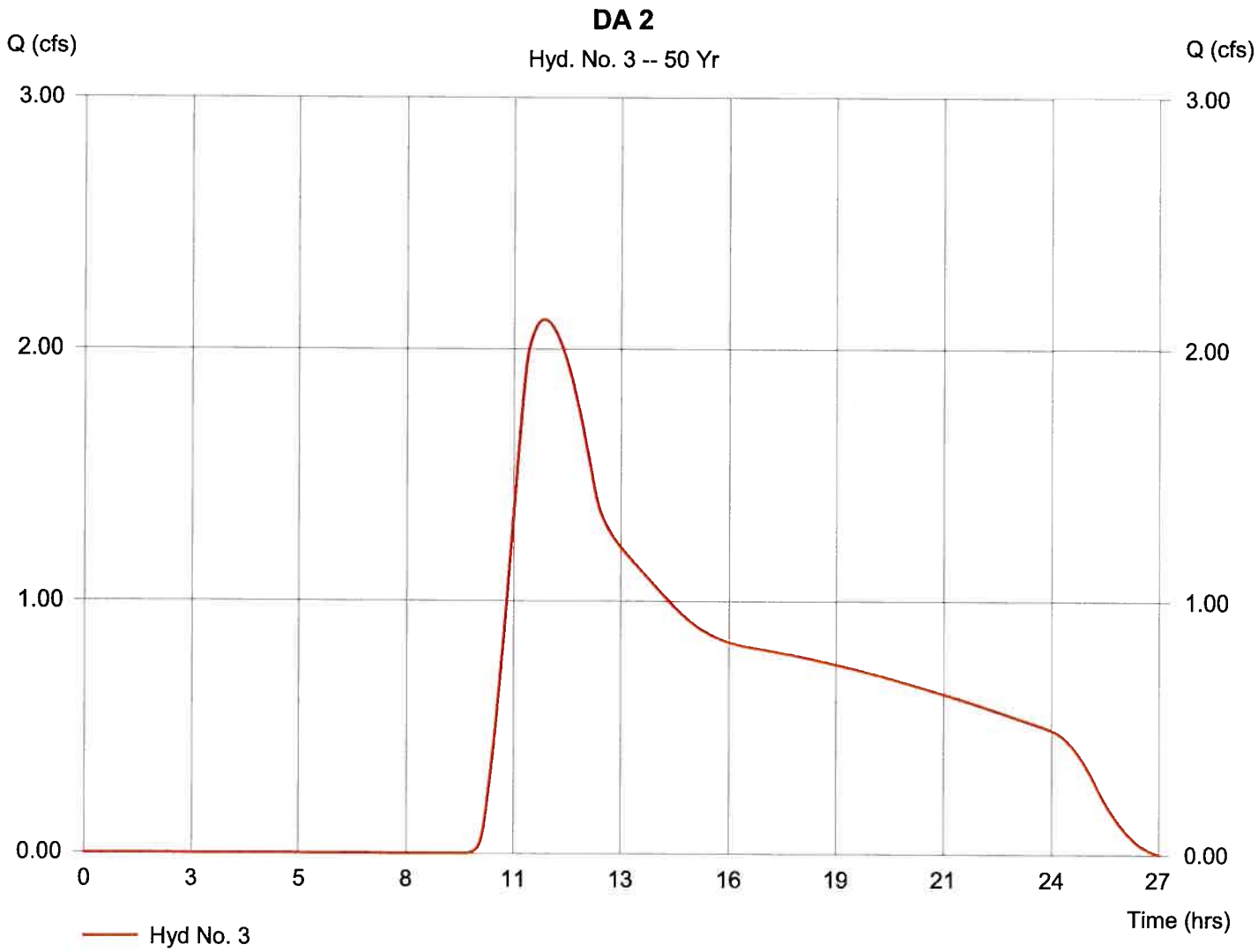
Tuesday, May 19 2009, 10:34 AM

Hyd. No. 3

DA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.12 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 31.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 2200 ft
Tc method	= LAG	Time of conc. (Tc)	= 109.23 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 49,950 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

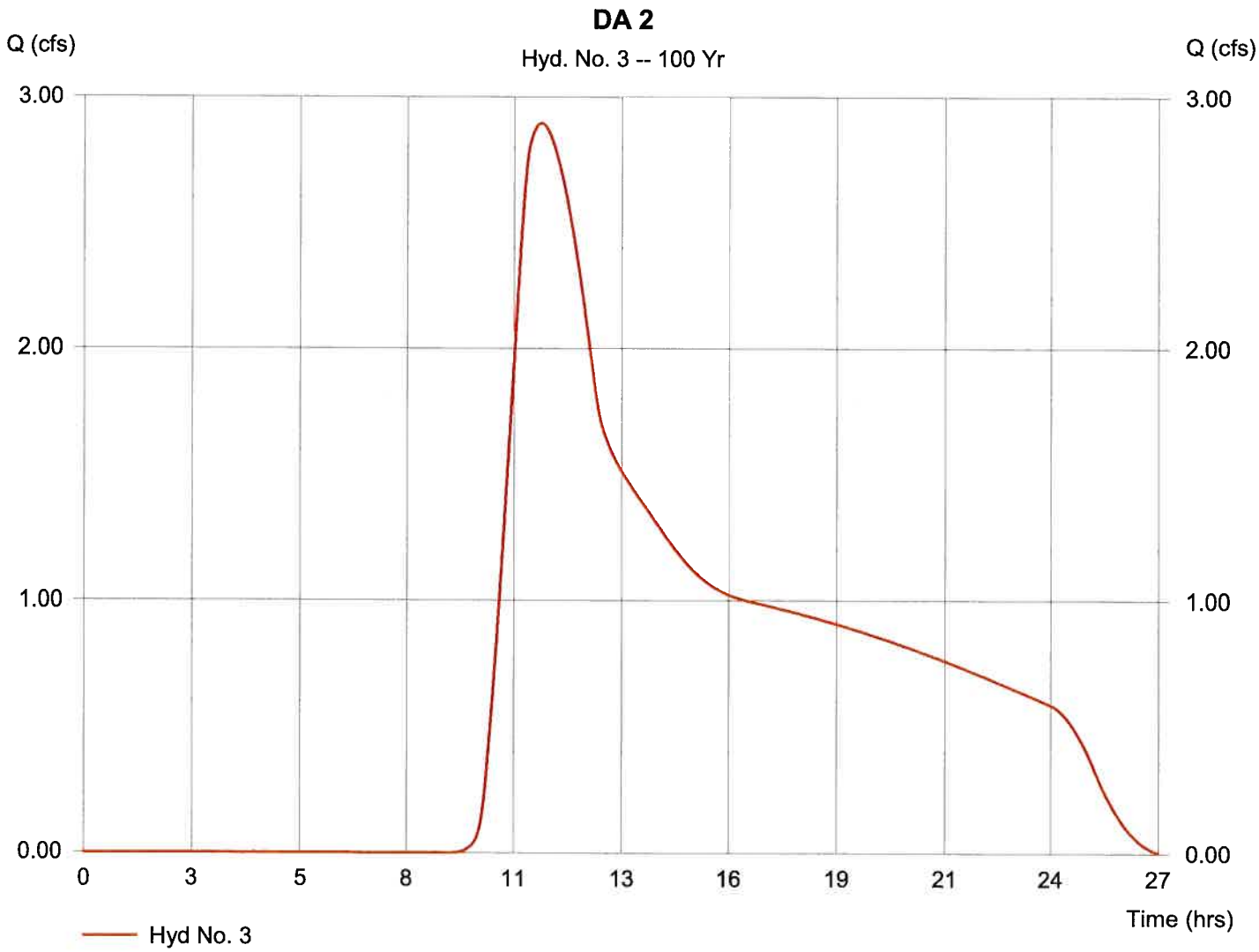
Tuesday, May 19 2009, 4:47 PM

Hyd. No. 3

DA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.90 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 31.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 2200 ft
Tc method	= LAG	Time of conc. (Tc)	= 109.23 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 63,176 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, May 19 2009, 10:34 AM

Hyd. No. 4

DA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.50 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 144.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 4130 ft
Tc method	= LAG	Time of conc. (Tc)	= 180.78 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 124,385 cuft

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

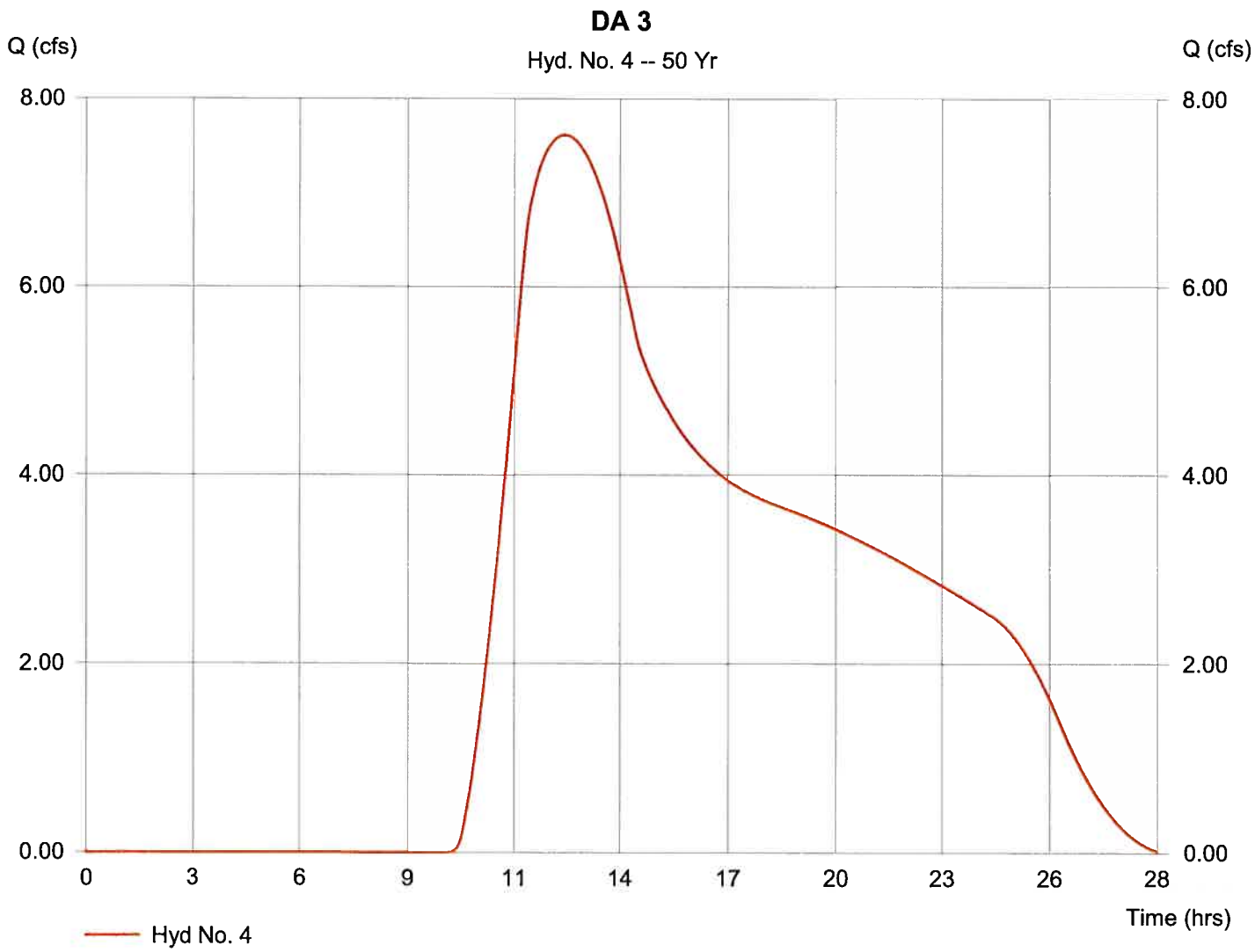
Tuesday, May 19 2009, 10:35 AM

Hyd. No. 4

DA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 7.62 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 144.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 4130 ft
Tc method	= LAG	Time of conc. (Tc)	= 180.78 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 232,202 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

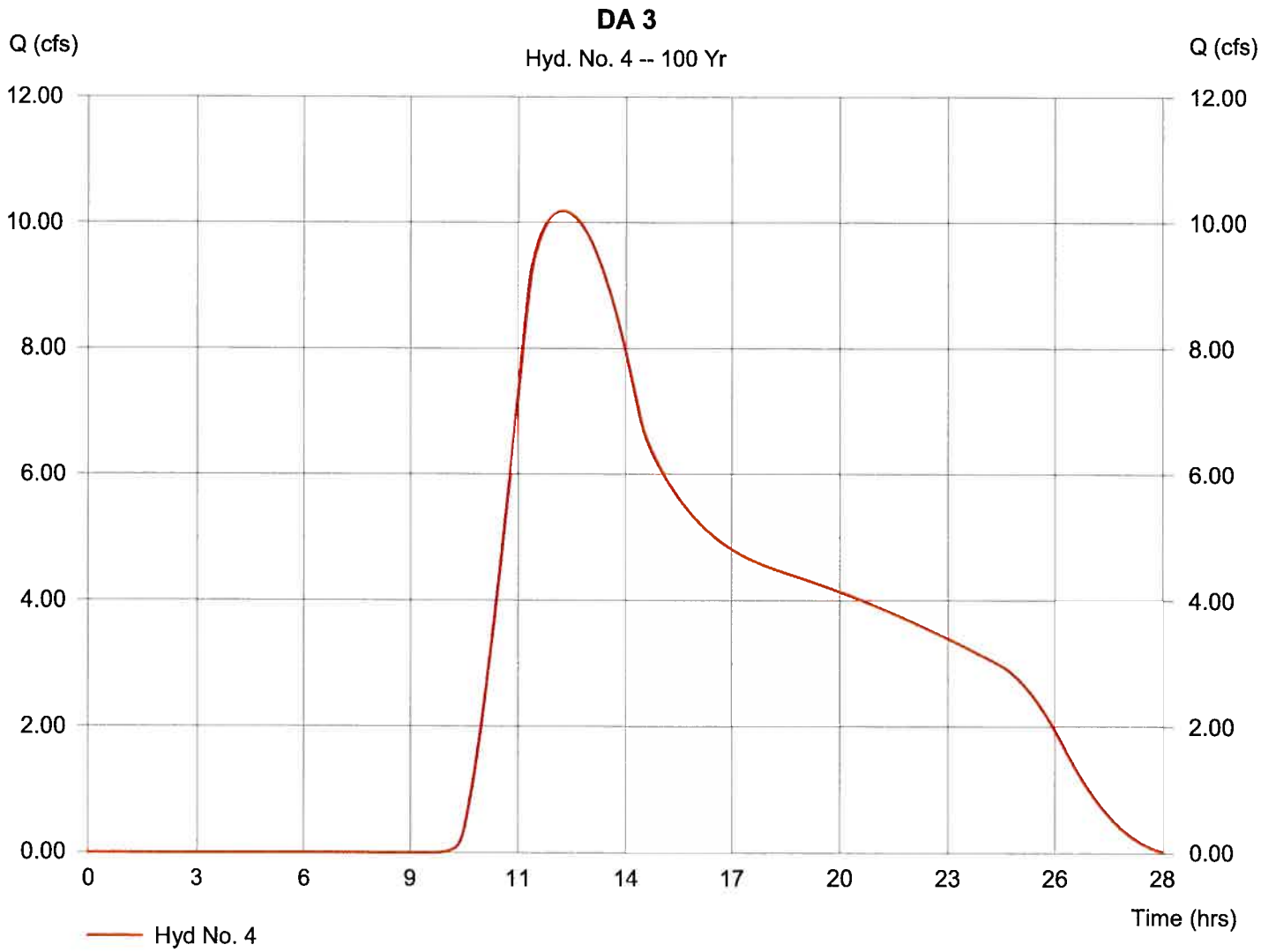
Tuesday, May 19 2009, 4:54 PM

Hyd. No. 4

DA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 10.19 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 144.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 4130 ft
Tc method	= LAG	Time of conc. (Tc)	= 180.78 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 293,687 cuft



20/38

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

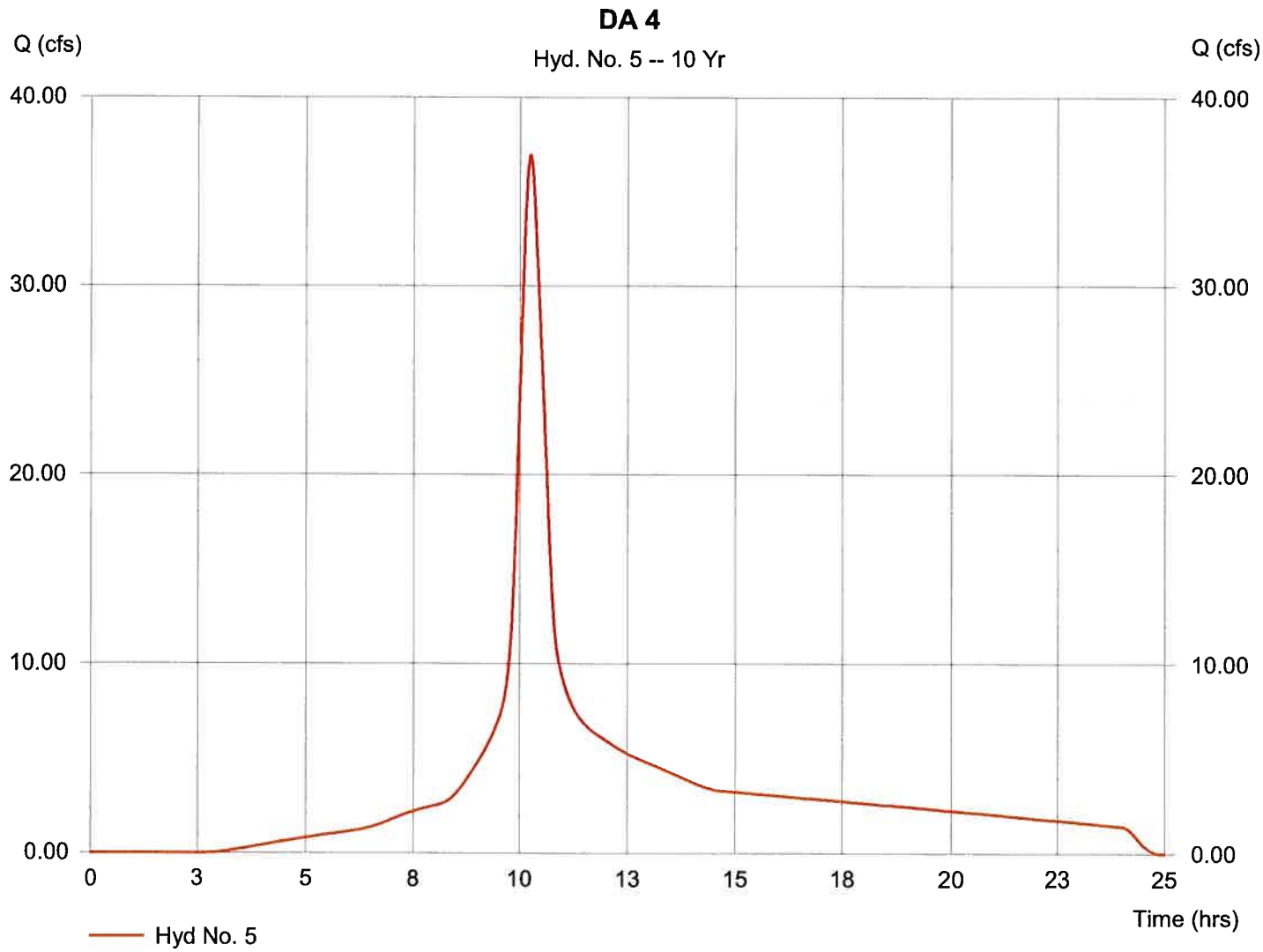
Tuesday, May 19 2009, 9:7 AM

Hyd. No. 5

DA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 36.95 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 76.000 ac	Curve number	= 97
Basin Slope	= 0.5 %	Hydraulic length	= 1750 ft
Tc method	= LAG	Time of conc. (Tc)	= 35.40 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 299,862 cuft



21/38

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

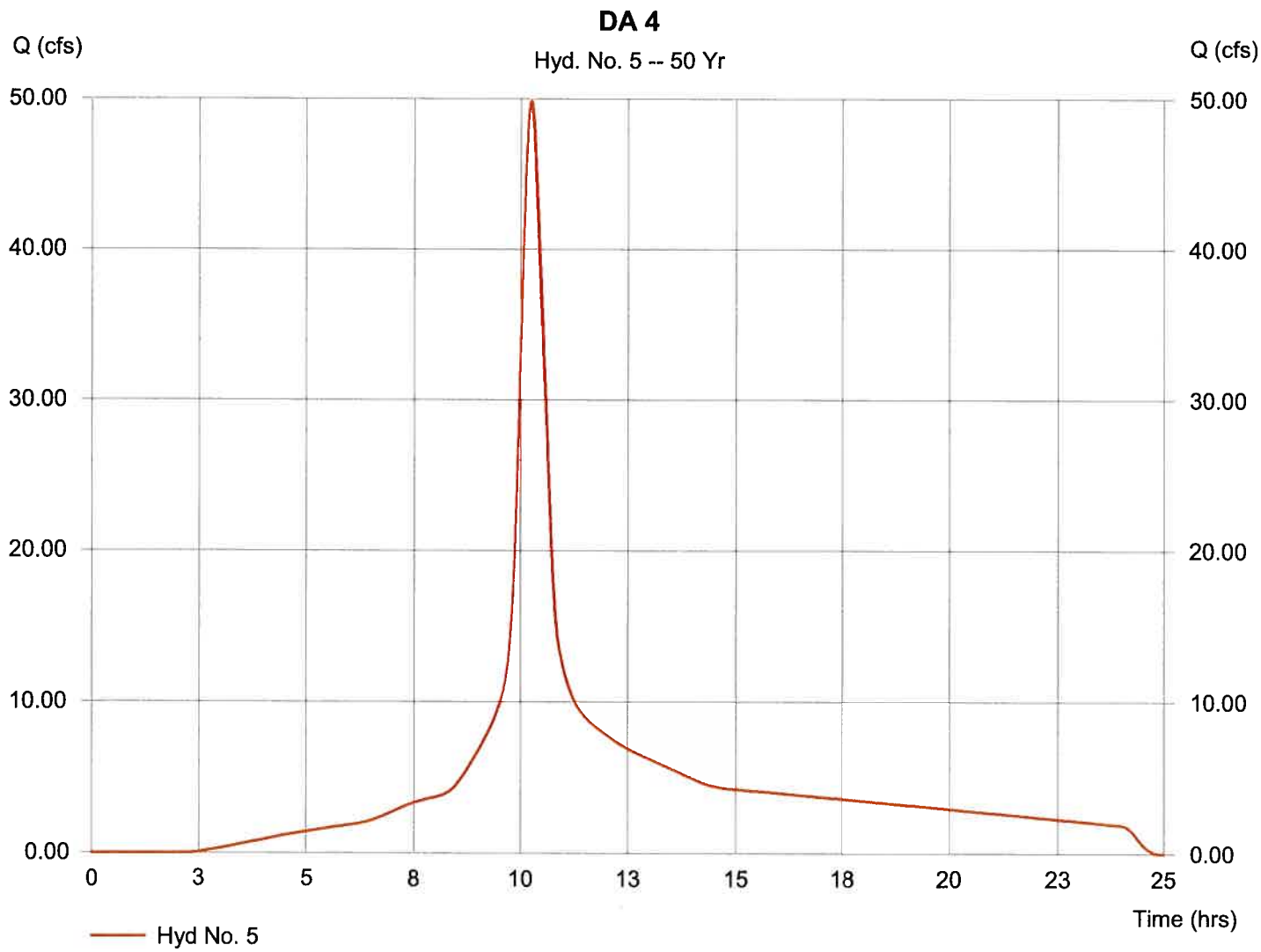
Tuesday, May 19 2009, 9:6 AM

Hyd. No. 5

DA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 49.86 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 76.000 ac	Curve number	= 97
Basin Slope	= 0.5 %	Hydraulic length	= 1750 ft
Tc method	= LAG	Time of conc. (Tc)	= 35.40 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 407,084 cuft



22/38

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

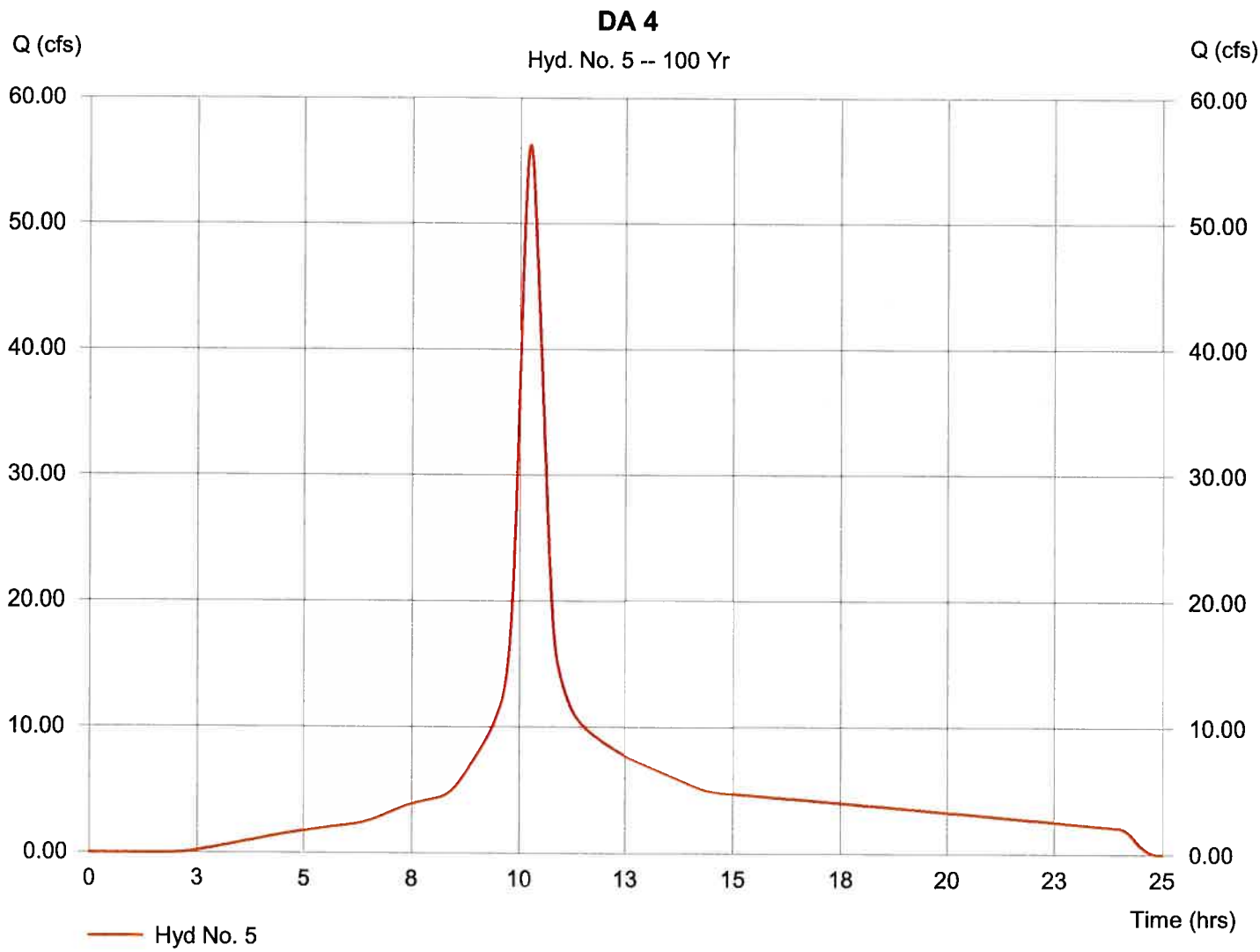
Tuesday, May 19 2009, 5:0 PM

Hyd. No. 5

DA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 56.28 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 76.000 ac	Curve number	= 97
Basin Slope	= 0.5 %	Hydraulic length	= 1750 ft
Tc method	= LAG	Time of conc. (Tc)	= 35.40 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 461,114 cuft



23/38

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

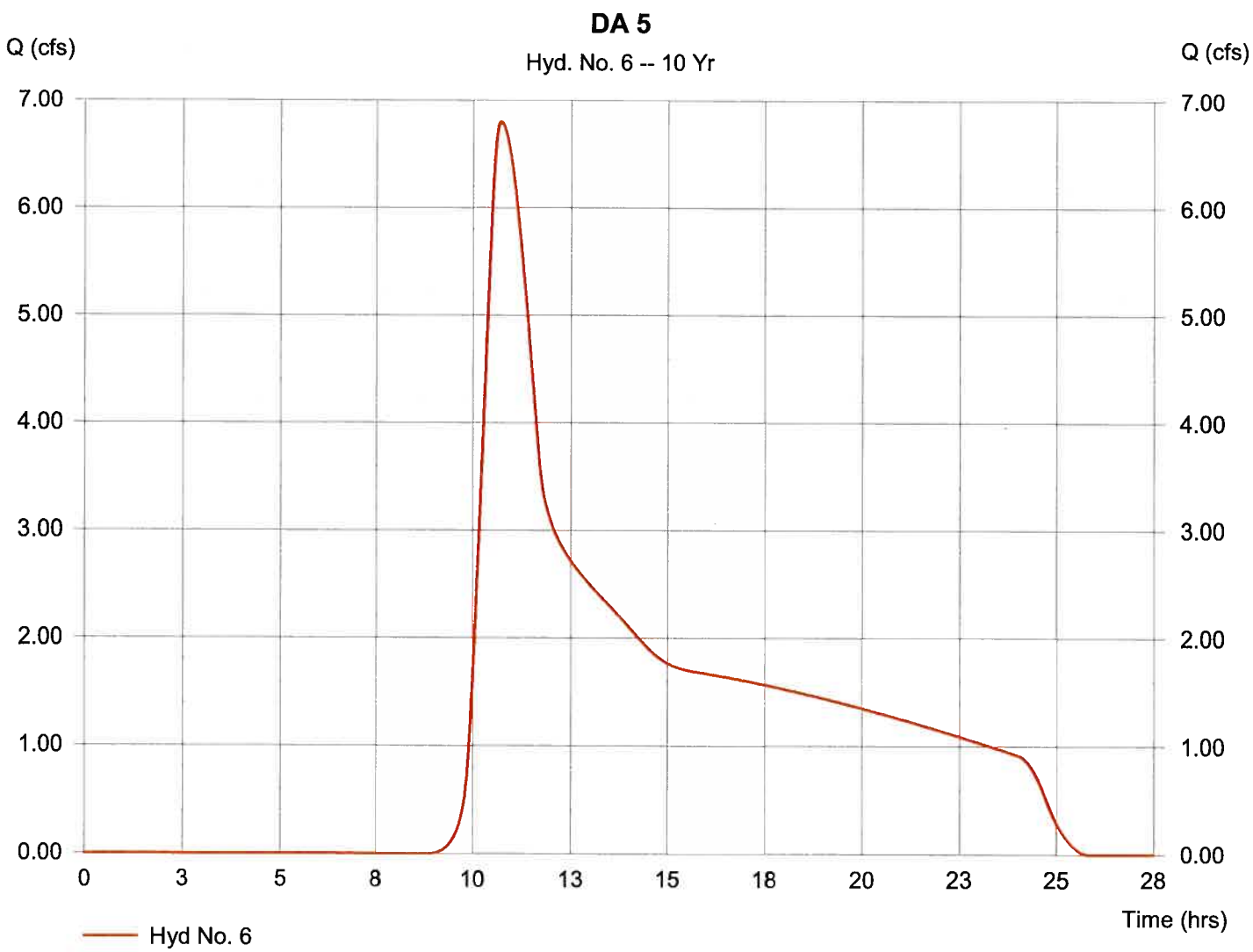
Tuesday, May 19 2009, 8:58 AM

Hyd. No. 6

DA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 6.80 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 70.000 ac	Curve number	= 86
Basin Slope	= 0.3 %	Hydraulic length	= 1650 ft
Tc method	= LAG	Time of conc. (Tc)	= 71.00 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 108,546 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

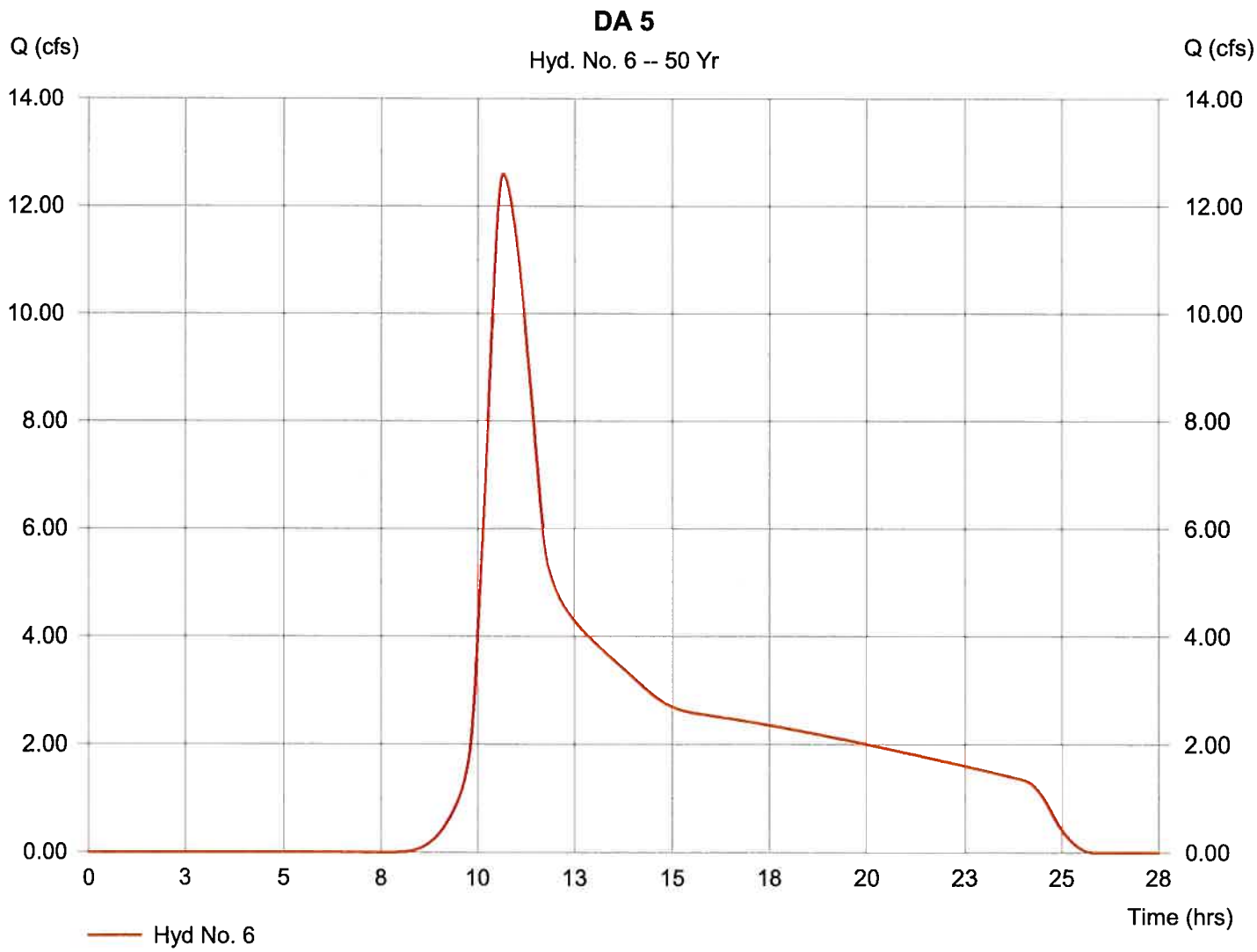
Tuesday, May 19 2009, 8:58 AM

Hyd. No. 6

DA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 12.60 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 70.000 ac	Curve number	= 86
Basin Slope	= 0.3 %	Hydraulic length	= 1650 ft
Tc method	= LAG	Time of conc. (Tc)	= 71.00 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 178,057 cuft



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Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

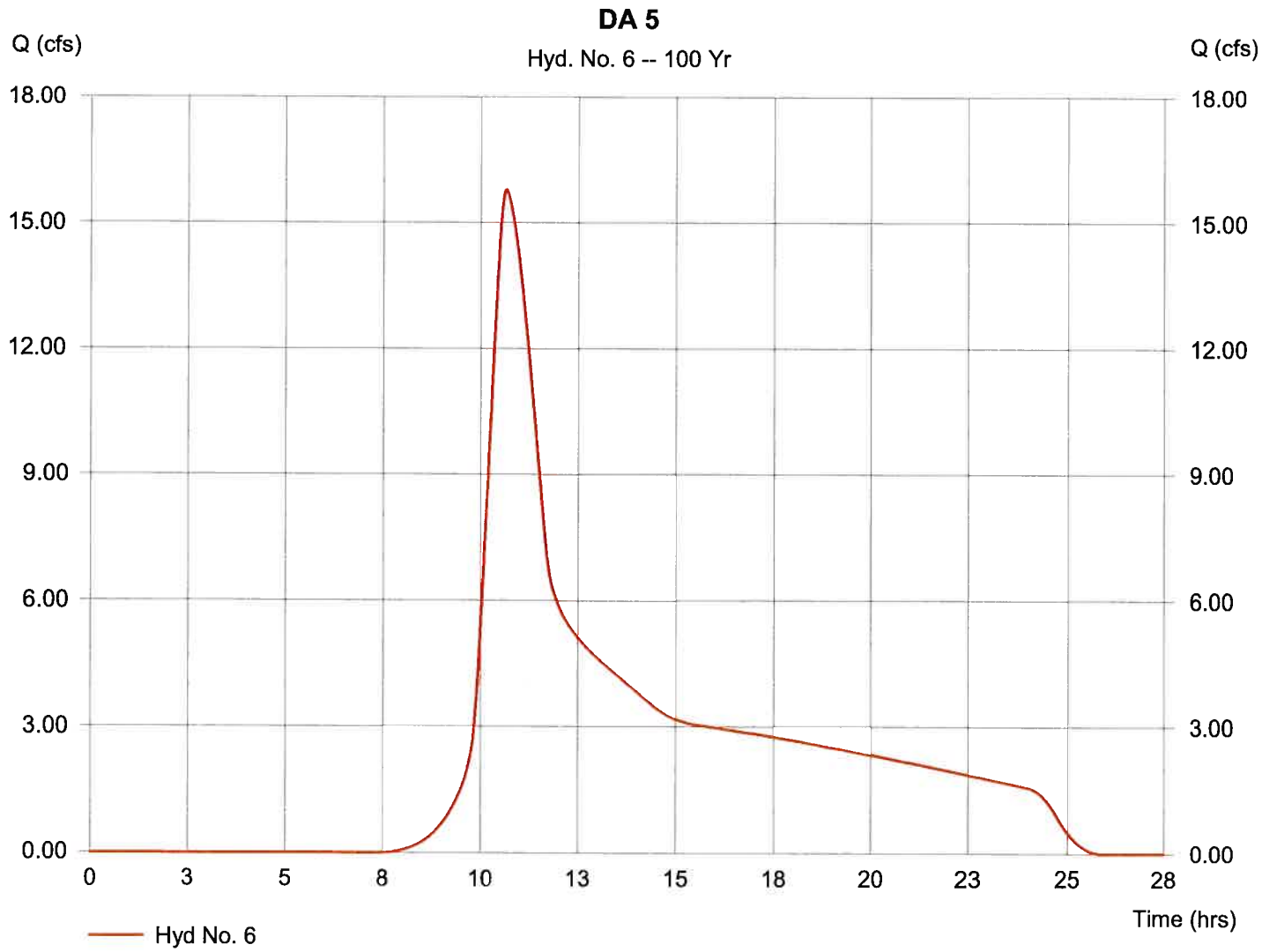
Tuesday, May 19 2009, 5:2 PM

Hyd. No. 6

DA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 15.79 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 70.000 ac	Curve number	= 86
Basin Slope	= 0.3 %	Hydraulic length	= 1650 ft
Tc method	= LAG	Time of conc. (Tc)	= 71.00 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 215,731 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

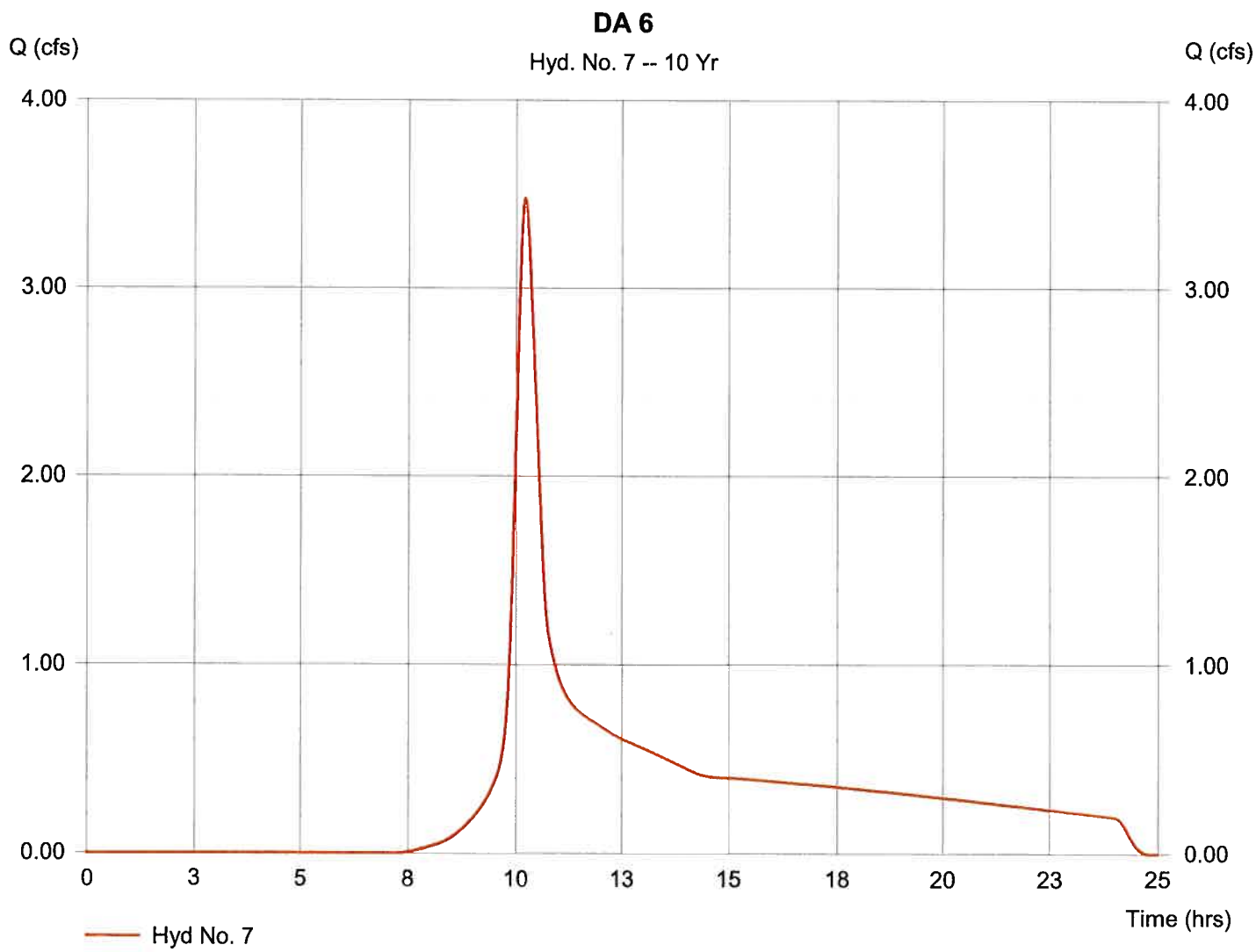
Tuesday, May 19 2009, 9:0 AM

Hyd. No. 7

DA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 3.48 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 13.000 ac	Curve number	= 90
Basin Slope	= 0.5 %	Hydraulic length	= 950 ft
Tc method	= LAG	Time of conc. (Tc)	= 30.34 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 28,599 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

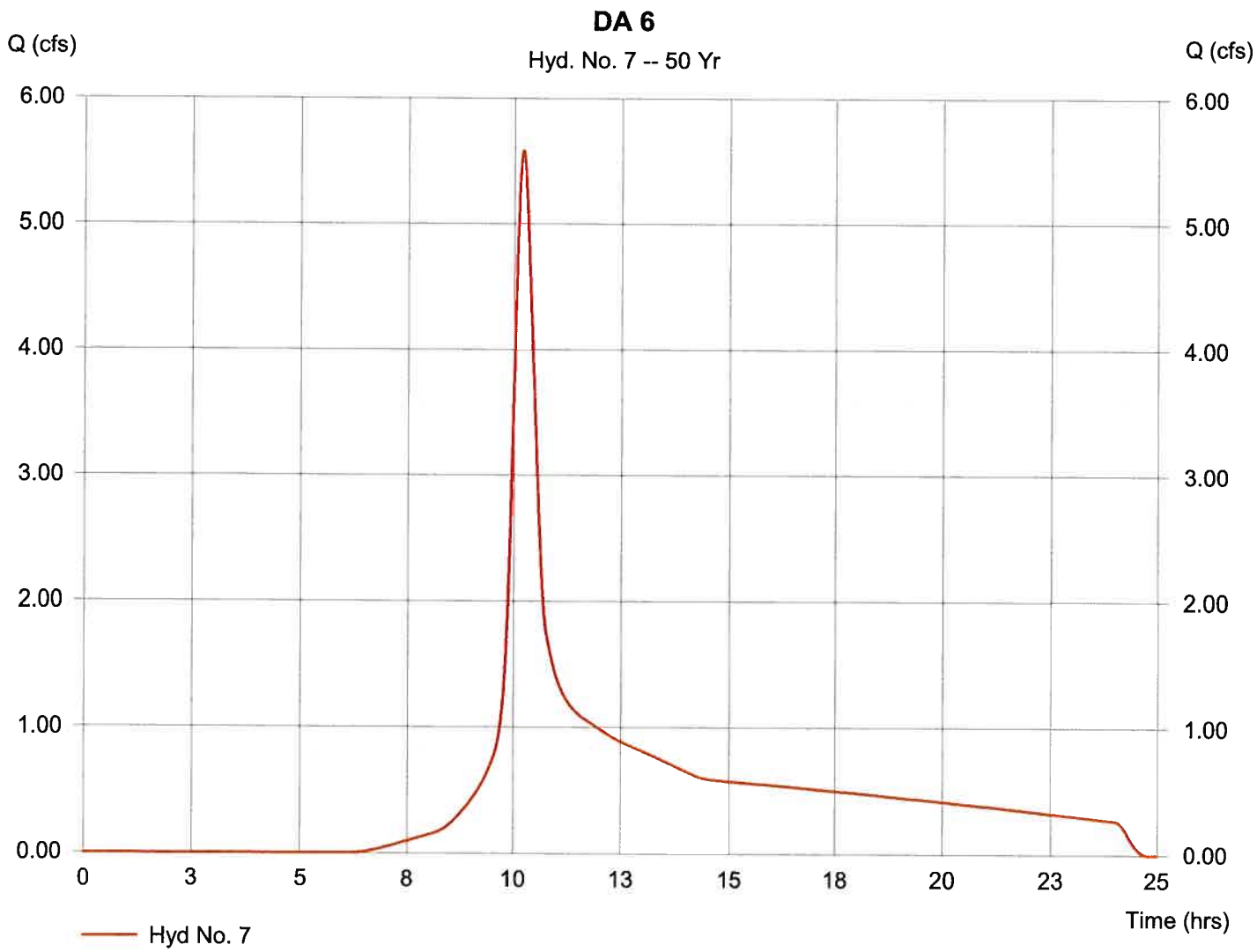
Tuesday, May 19 2009, 9:1 AM

Hyd. No. 7

DA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 5.58 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 13.000 ac	Curve number	= 90
Basin Slope	= 0.5 %	Hydraulic length	= 950 ft
Tc method	= LAG	Time of conc. (Tc)	= 30.34 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 43,689 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

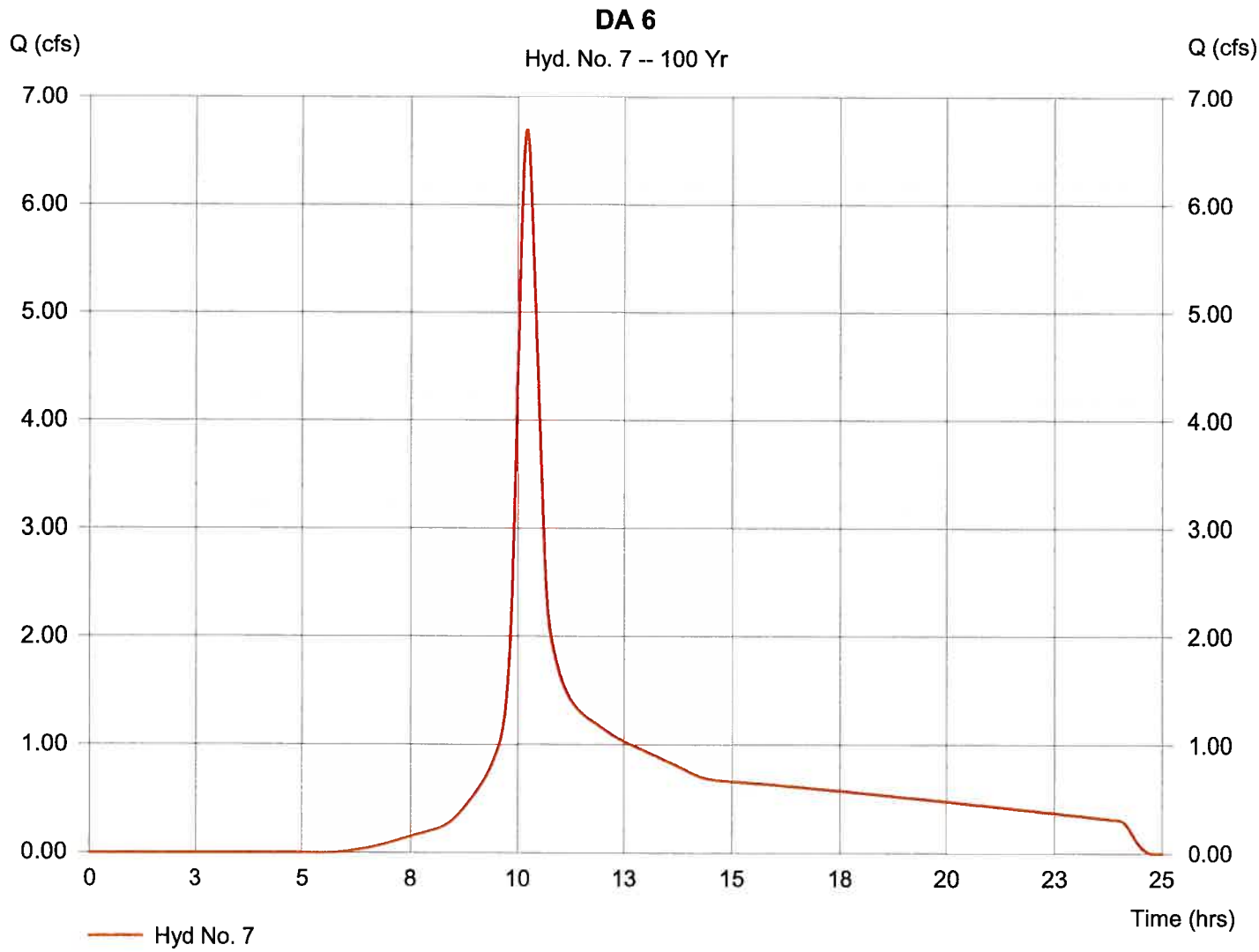
Tuesday, May 19 2009, 5:3 PM

Hyd. No. 7

DA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 6.69 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 13.000 ac	Curve number	= 90
Basin Slope	= 0.5 %	Hydraulic length	= 950 ft
Tc method	= LAG	Time of conc. (Tc)	= 30.34 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 51,627 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

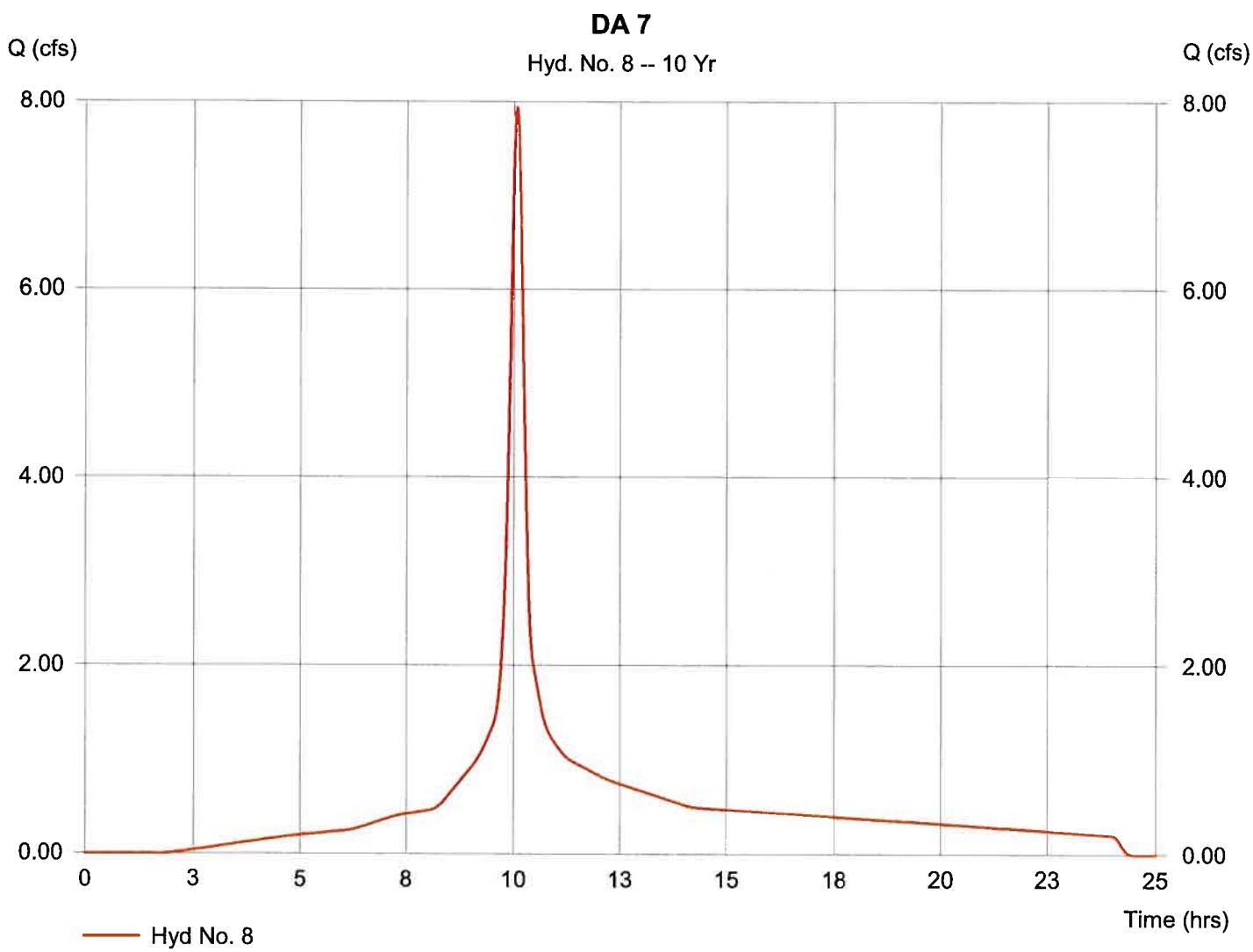
Tuesday, May 19 2009, 9:2 AM

Hyd. No. 8

DA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 7.94 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 11.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 750 ft
Tc method	= LAG	Time of conc. (Tc)	= 16.95 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 46,651 cuft



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Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

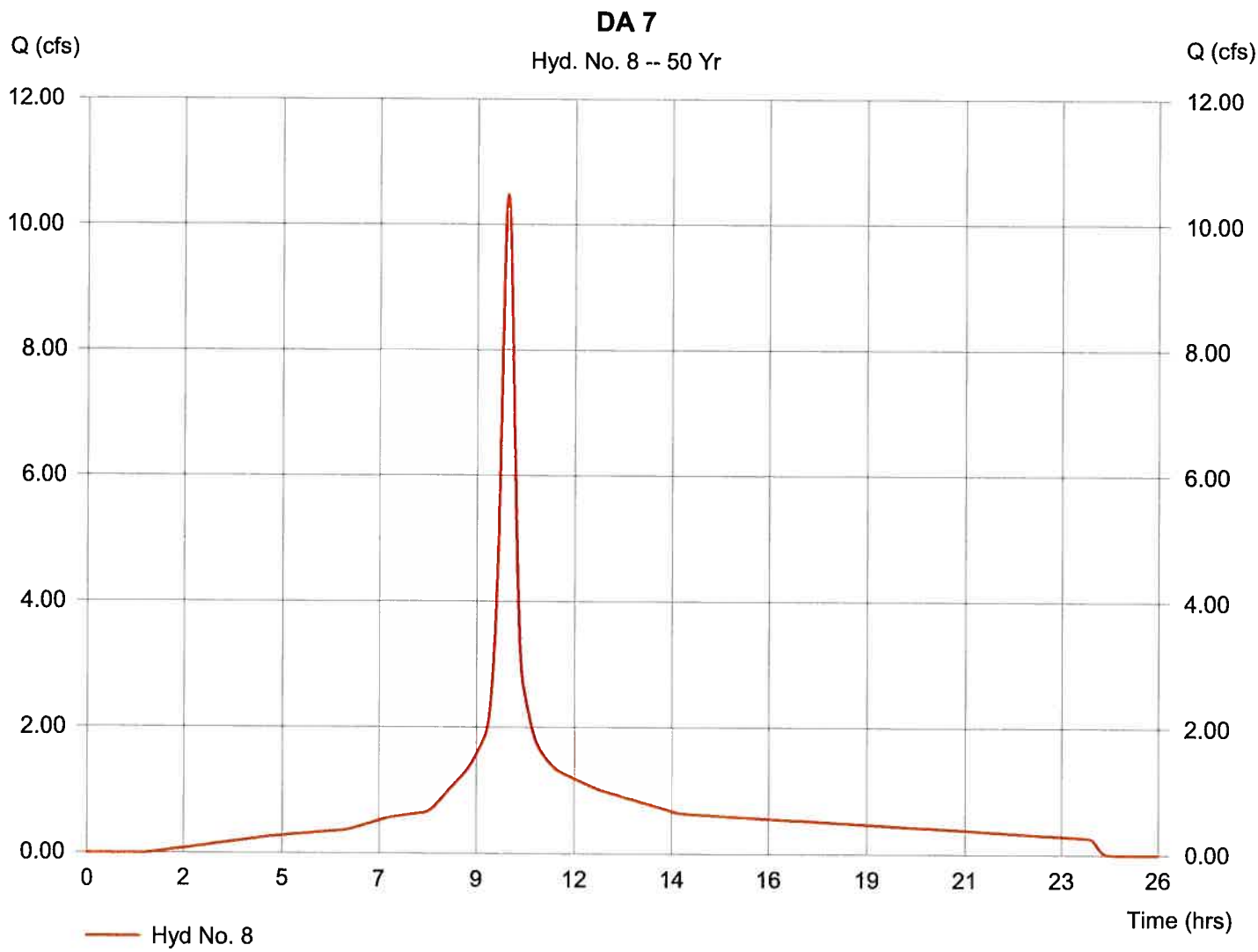
Tuesday, May 19 2009, 9:2 AM

Hyd. No. 8

DA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 10.48 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 11.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 750 ft
Tc method	= LAG	Time of conc. (Tc)	= 16.95 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 62,227 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

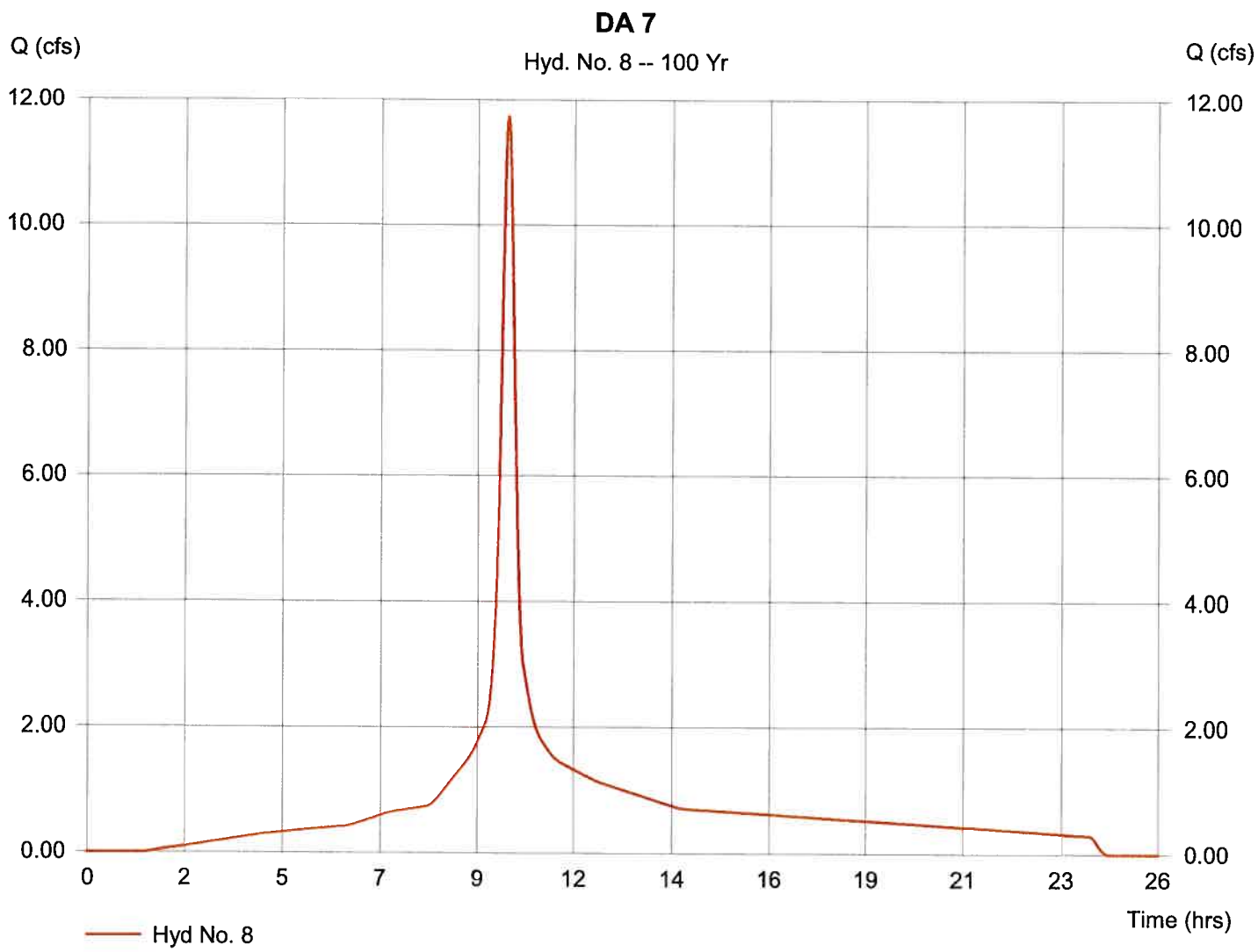
Tuesday, May 19 2009, 5:4 PM

Hyd. No. 8

DA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 11.74 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 11.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 750 ft
Tc method	= LAG	Time of conc. (Tc)	= 16.95 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 70,045 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

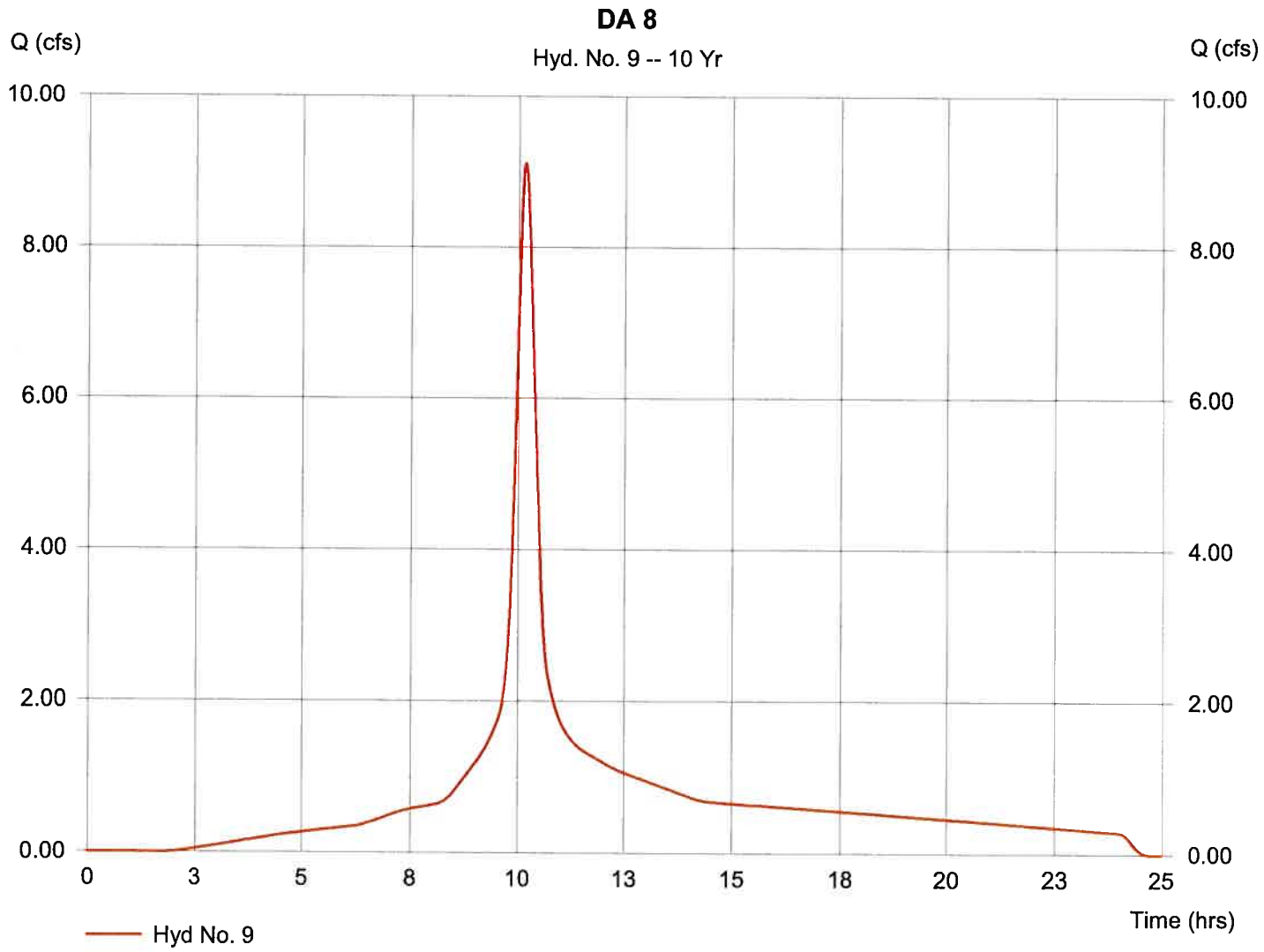
Tuesday, May 19 2009, 9:3 AM

Hyd. No. 9

DA 8

Hydrograph type	= SCS Runoff	Peak discharge	= 9.11 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 15.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 1250 ft
Tc method	= LAG	Time of conc. (Tc)	= 25.50 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 64,849 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

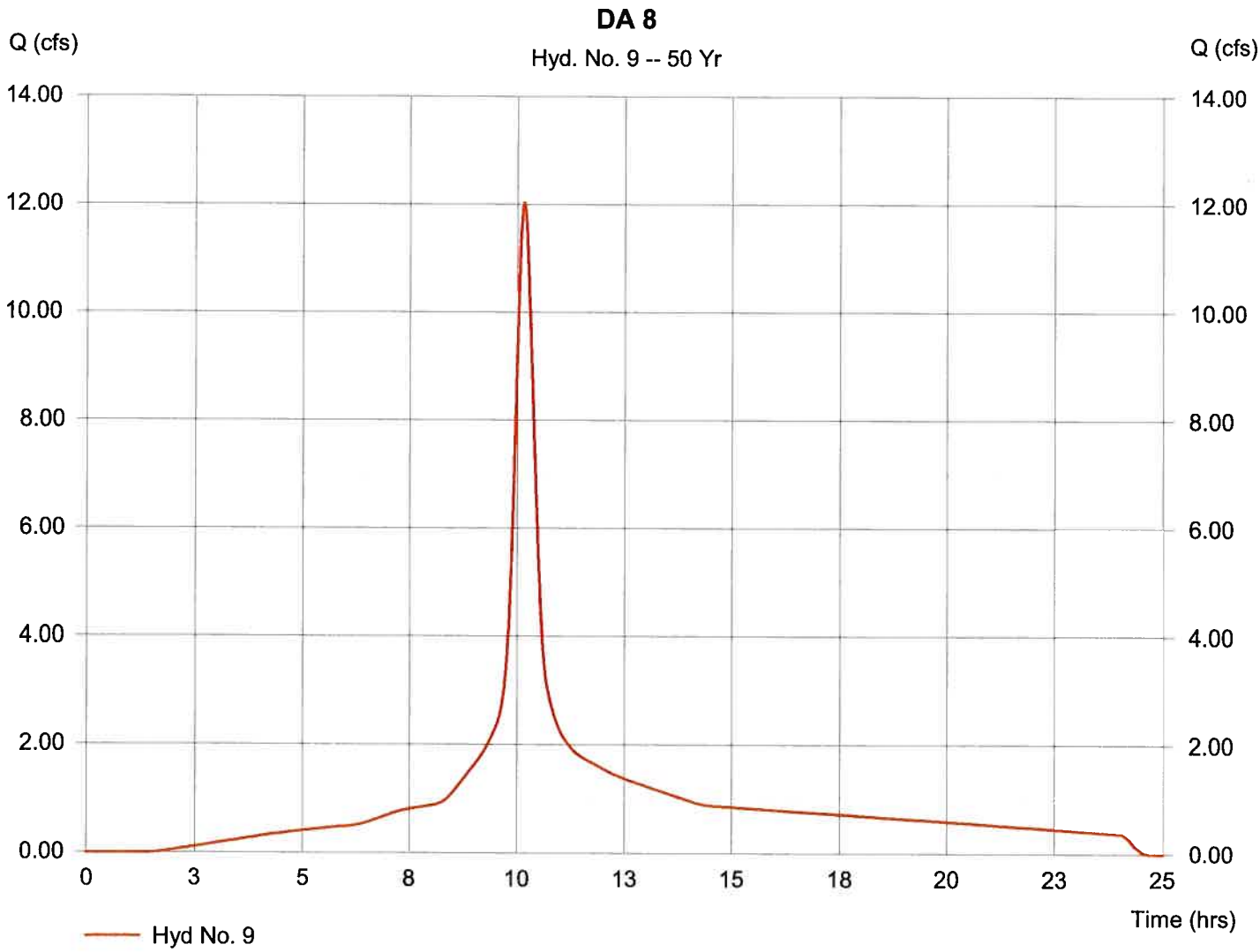
Tuesday, May 19 2009, 9:3 AM

Hyd. No. 9

DA 8

Hydrograph type	= SCS Runoff	Peak discharge	= 12.03 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 15.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 1250 ft
Tc method	= LAG	Time of conc. (Tc)	= 25.50 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 86,501 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

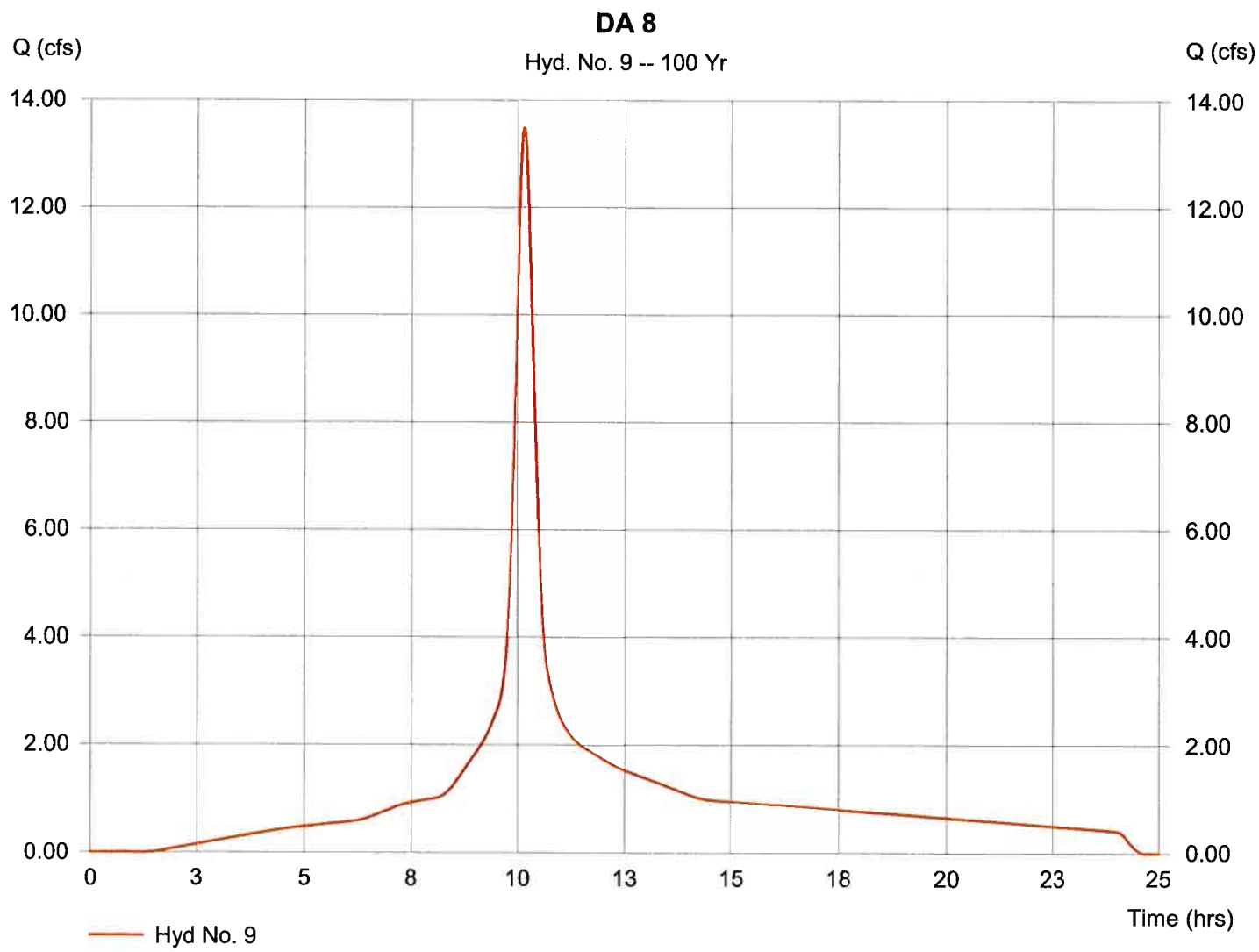
Tuesday, May 19 2009, 5:6 PM

Hyd. No. 9

DA 8

Hydrograph type	= SCS Runoff	Peak discharge	= 13.48 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 15.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 1250 ft
Tc method	= LAG	Time of conc. (Tc)	= 25.50 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 97,368 cuft



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Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

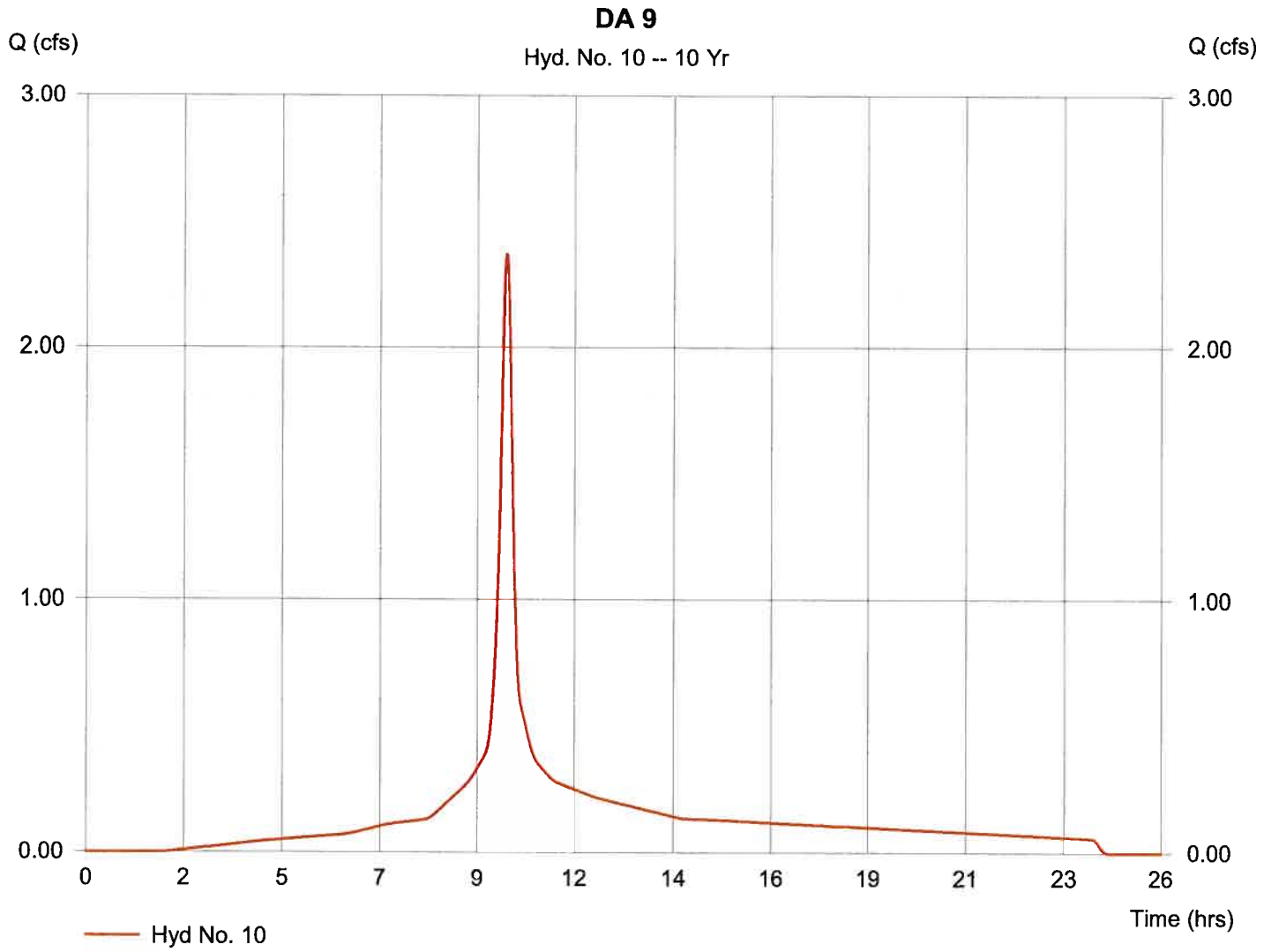
Tuesday, May 19 2009, 9:4 AM

Hyd. No. 10

DA 9

Hydrograph type	= SCS Runoff	Peak discharge	= 2.37 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 3.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 600 ft
Tc method	= LAG	Time of conc. (Tc)	= 14.18 min
Total precip.	= 1.40 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 12,869 cuft



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Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

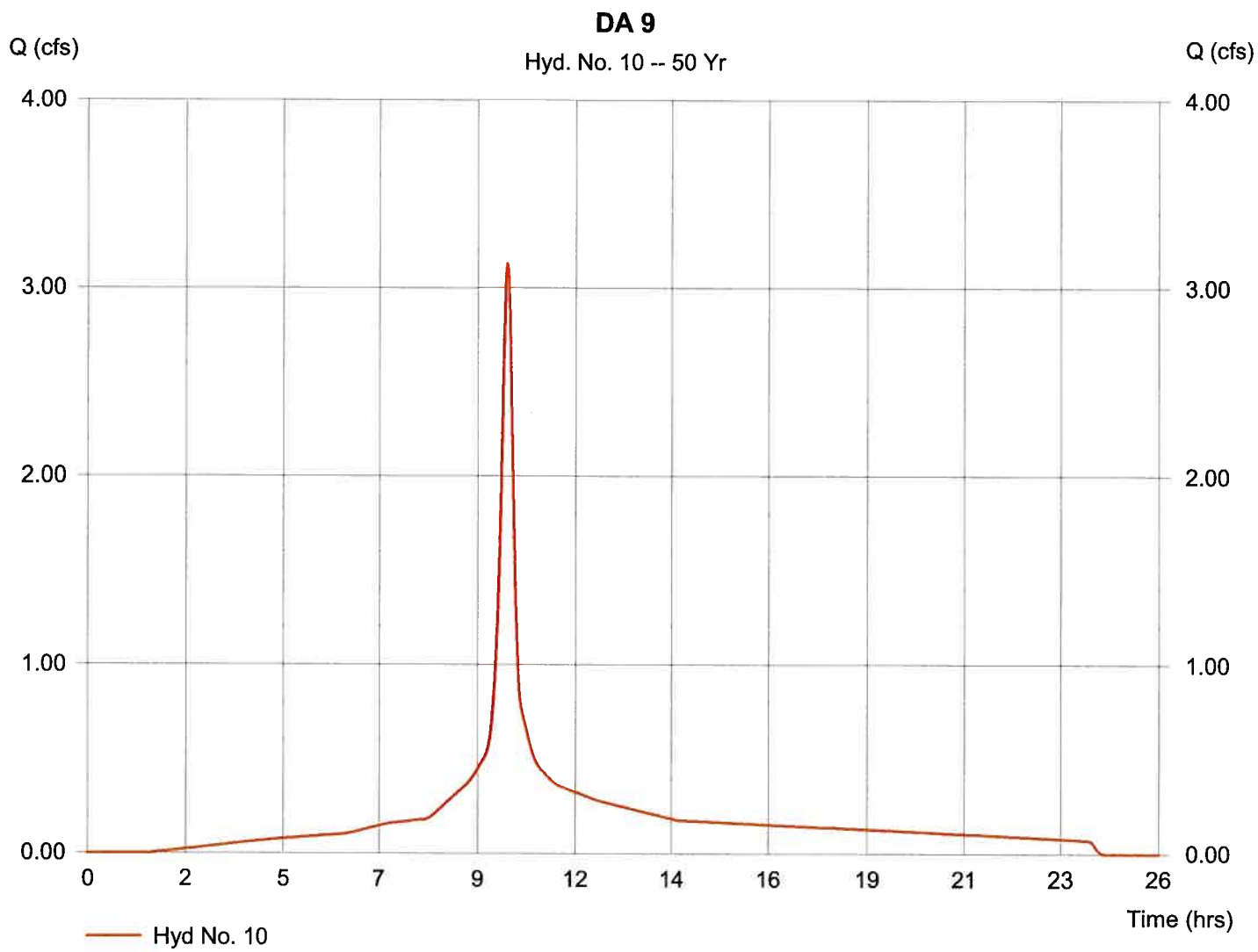
Tuesday, May 19 2009, 9:6 AM

Hyd. No. 10

DA 9

Hydrograph type	= SCS Runoff	Peak discharge	= 3.13 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 3.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 600 ft
Tc method	= LAG	Time of conc. (Tc)	= 14.18 min
Total precip.	= 1.80 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 17,166 cuft



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Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

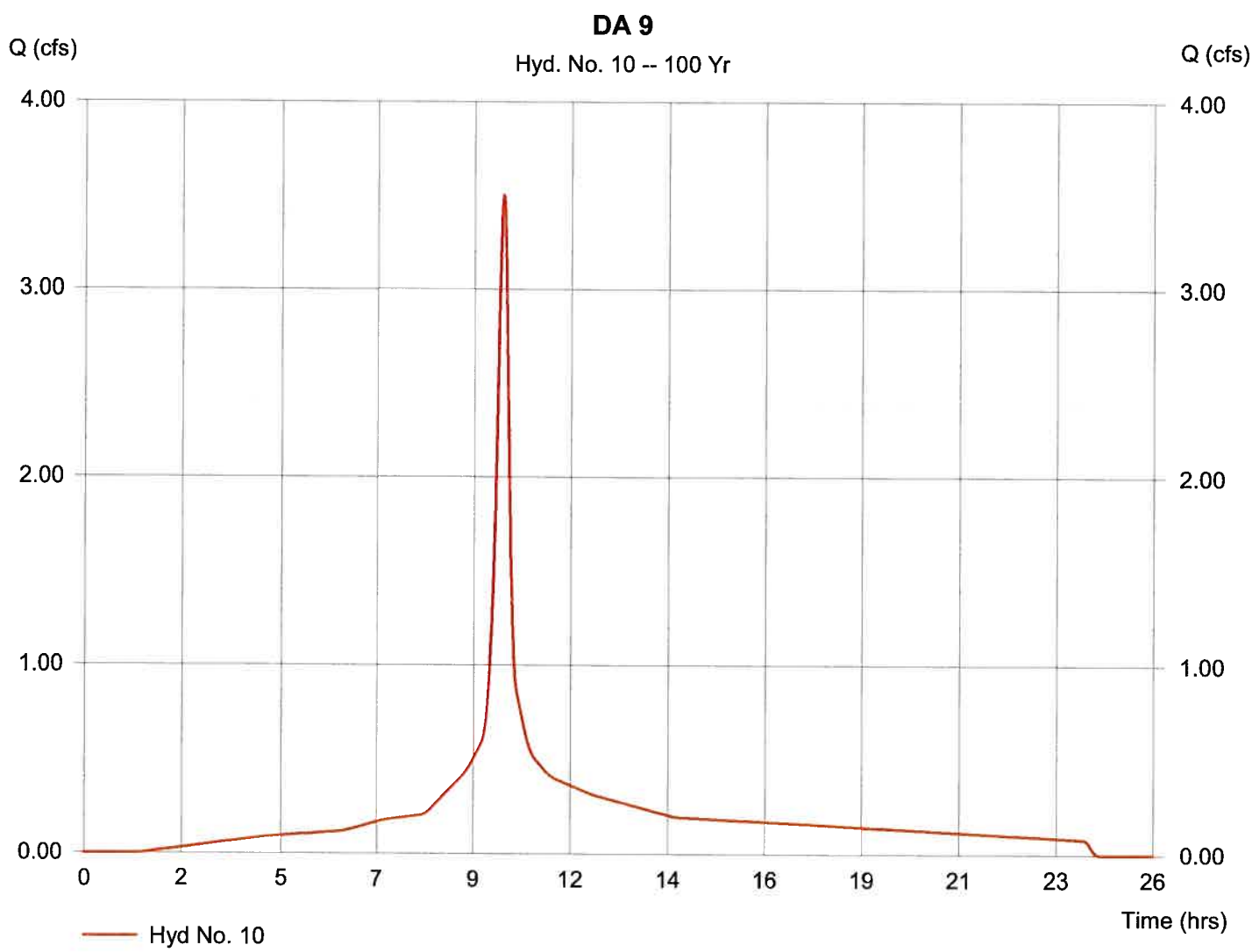
Tuesday, May 19 2009, 5:7 PM

Hyd. No. 10

DA 9

Hydrograph type	= SCS Runoff	Peak discharge	= 3.50 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 3.000 ac	Curve number	= 98
Basin Slope	= 0.5 %	Hydraulic length	= 600 ft
Tc method	= LAG	Time of conc. (Tc)	= 14.18 min
Total precip.	= 2.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 19,323 cuft



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