APPENDIX J

Preliminary Drainage Study and Preliminary Water Quality Technical Report

Kaiser Permanente San Diego Central Hospital Medical Center

Preliminary Drainage Study

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Section 1. Project Location and Scope

1.1. Project Location

The 20-acre Kaiser Central San Diego project is located at the southeasterly corner of Ruffin Road and Clairemont Mesa Boulevard, in the City of San Diego, California. The site is bound by Clairemont Mesa Boulevard to the north, Ruffin Court to the south, Ruffin Road to the west, and the Polinsky Children's Center to the east. Access to the project site is provided off of Ruffin Road and Clairemont Mesa Boulevard. A vicinity map is found in Figure 1-1 below:

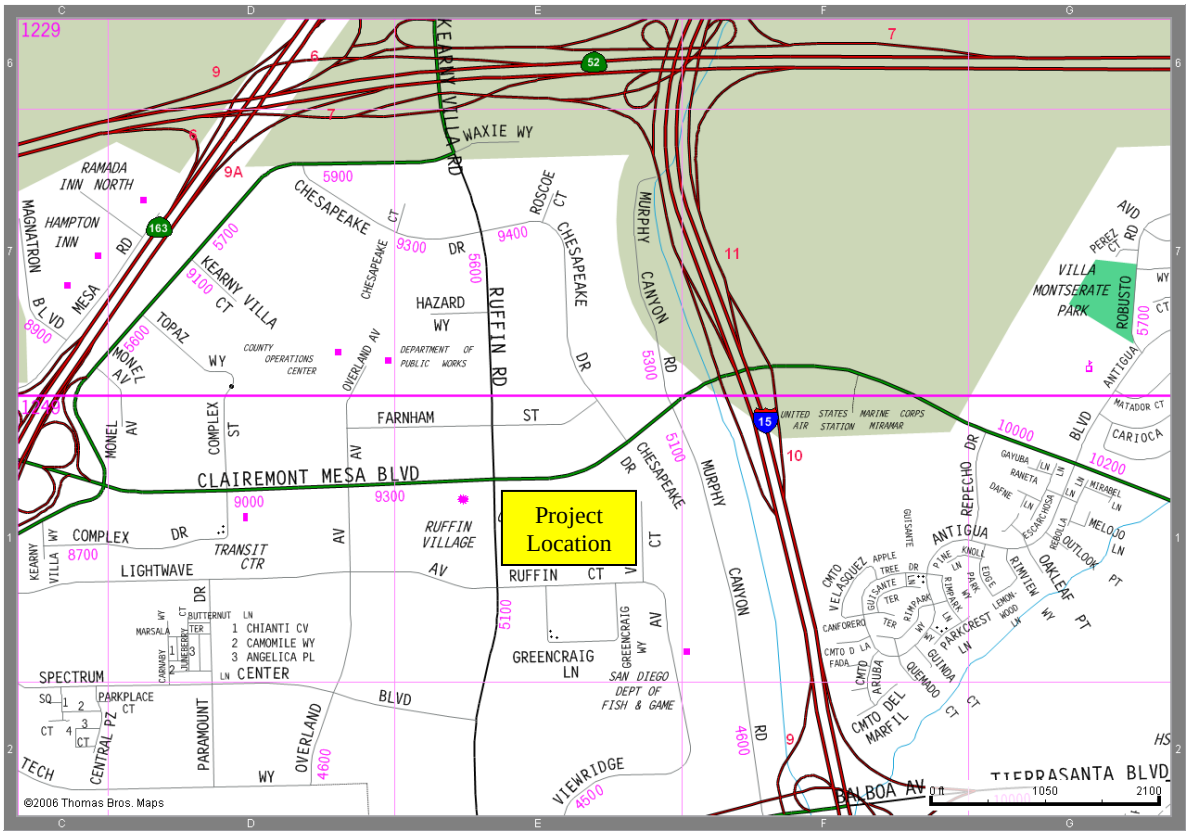


Figure 1-1 Vicinity Map: Thomas Brothers 1249 E1

1.2. Scope of Report

This report will deal specifically with proposed improvements associated with the Kaiser Central San Diego development project. This study develops 2, 10, and 100-year flow rates for both pre and post development conditions to identify the hydrologic and hydraulic affect of the proposed project.

This report does not discuss required water quality measures to be taken on an interim level during construction, or those necessary to be implemented on a permanent basis. That discussion can be found under separate cover in the project "Water Quality Technical Report." Additionally, this report does not discuss hydromodification mitigation requirements and/or exemptions. That discussion can be found in the WQTR as well.

Section 2. Study Objectives

The specific objectives of this study are as follows:

- Quantify pre and post development peak flow rates for the 2, 10 and 100-year storm events,
- Document the nature of storm water runoff under pre-development conditions, including the capacity of the existing on-site and off-site storm drain infrastructure,
- Design an on-site and off-site storm drain system to convey the 100-year storm event,
- Design an on-site storm water vault and pump (with overflow release) such that surrounding finished floor elevations are not flooded (maintenance bay, southwest corner of the project site),
- Document capacity of the proposed off-site storm drain infrastructure under post development conditions,
- Identify pre and post development erosion, areas of concern, and qualitatively discuss mitigation measures associated with proposed improvements.

Section 3. Project Description

3.1. Project Site Information

Elevations on site range from approximately 425 feet above mean sea level (MSL) along the southerly boundary (Ruffin Court) to 400 feel MSL along the northeasterly boundary (Clairemont Mesa Boulevard). Under pre development conditions, the site is terraced, creating two relatively flat pads with stairs and a sloped drive aisle providing pedestrian and vehicular access.

Based on the Natural Resources Conservation Service's (NRCS) Websoil Survey, the project site is comprised almost entirely of Redding gravelly loam, with slopes ranging from two to nine percent (hydrologic soil type D).

There are no significant sources of project site storm water run-on. As described in further detail below, project site runoff is conveyed northerly towards Clairemont Mesa Boulevard via overland flow.

The Federal Emergency Management Agency (FEMA) has not mapped any Special Flood Hazard Areas (SFHAs) for the project site. The easterly half of the project site lies within un-shaded Zone X, which correlates with areas determined to be outside the 500-year floodplain. The westerly half of the project site lies within an area not mapped by FEMA. An exhibit is provided in Appendix A of this report.

3.2. Pre Development Conditions

The project site currently consists of asphalt paved parking lots and buildings associated with the County of San Diego Public Works. Approximately 19 acres of the 20-acre project site (95 percent) are comprised of impervious surfaces. All storm water runoff is conveyed overland, via either sheet flow or shallow concentrated flow (brow ditch).

Runoff is ultimately discharged from the site along the northerly project boundary (Clairemont Mesa Boulevard). An existing concrete brow ditch (top width of five feet, depth of roughly 1.25 feet – per site visit conducted by RBF) conveys project site runoff easterly towards an off-site F-Type inlet. Pictures of the existing concrete brow ditch and F-Type inlet are shown on the following pages.

Upstream Portion of Existing Concrete Brow Ditch

Downstream Portion of Existing Concrete Brow Ditch

Existing F-Type Inlet (open on one side only)

Based on the brow ditch dimensions and a longitudinal slope of four percent (off-site portion of the ditch), the full flow capacity of the existing concrete ditch is 42 cfs. Per City Plan Set Drawing 18569-9, the off-site F-Type inlet is open on one side. The capture capacity of the existing F-Type inlet has been calculated as five cubic feet per second (cfs). Runoff not captured by the existing F-Type inlet drains northerly towards Clairemont Mesa Boulevard.

An existing 24-inch reinforced concrete pipe (RCP) conveys runoff captured by the F-Type inlet across Clairemont Mesa Boulevard to Chesapeake Drive, where it is ultimately discharged to Murphy Canyon.

Given the terraced aspect of the project site under pre development conditions, there is some potential for erosion to occur. Multiple concrete brow ditches are provided along each slope throughout the project site to prevent concentrated flow from eroding the slopes located between the two terraced pads. The photo below shows two concrete brow ditches along the northerly slope, just south of Clairemont Mesa Boulevard.

Picture taken from Clairemont Mesa Boulevard, looking southerly at the project site

3.3. Post Development Conditions

Initial project activities will involve demolition of all existing buildings and paved areas. Proposed improvements include the construction of new buildings, re-alignment of parking lots and drive aisles, as compared to pre development conditions, and the installation of new landscaped areas. Access to the site will continue to be provided off of Ruffin Road and Clairemont Mesa Boulevard; however, access from Clairemont Mesa Boulevard will be shifted easterly, as compared to pre development conditions.

The proposed landscaped areas (medians and flow through planter areas) will effectively reduce the project site runoff coefficient, as compared to pre development conditions. Approximately 17-acres of the 20-acre project site (85 percent) are comprised of impervious surfaces under post development conditions; a reduction of 10-percent, as compared to pre development conditions.

Based on the proposed site plan, a pump and storm water storage vault will be required for flood control purposes in the southwesterly corner of the project site. The storage vault will include an overflow discharge pipe, operating under gravity flow, in the event the pump fails or inflow into the storage tank exceeds the pump rate or the tank capacity. The overflow discharge pipe connects to additional proposed storm drain along the northerly project boundary and remains tight-lined. The pump will discharge storm water runoff to a proposed flow through planter area located along the northerly project boundary (Clairemont Mesa Boulevard).

Additional storm drain infrastructure will be installed, including perforated sub drains for flow through planter areas, a proposed storm drain system, grate drains, curb inlets, headwalls; and off-site storm drains, inlets and cleanouts. Under the ultimate project condition, proposed off-site improvements (storm drain and clean out) will replace the existing concrete ditch and F-Type inlet.

All of the flow through planter areas will be fitted with an impermeable liner and perforated sub-drains. The perforated sub-drains will connect to hard-lined pipes prior to discharging from the site.

Each flow through planter area will be designed with a secondary, or emergency, discharge mechanism. In most cases, the secondary release mechanism is a riser and grate inlet elevated such that the WQ event drains through the flow through planter area. Additional containment is provided, via proposed grading, such that hydraulic head is available for discharge through the riser. Three of the four flow through planter areas located near Clairemont Mesa Boulevard (north side of the project site) will be designed with an engineered emergency spillway for secondary discharge. The spillway will be fitted with appropriate riprap to prevent erosion. The fourth flow through planter area (northern most area in the adjacent to Clairemont Mesa Boulevard) will include a riser and grate inlet similar to the previously described flow through planter areas.

The on-site portion of the existing concrete brow ditch along the northerly project boundary, parallel to Clairemont Mesa Boulevard, will be removed; however, a berm will

be created through grading to prevent localized runoff from draining onto Clairemont Mesa Boulevard. The new ditch created by the berm will continue to drain easterly

Under the ultimate condition, runoff discharged from the project site will be conveyed within a proposed off-site storm drain, which will replace the existing off-site concrete brow ditch. The existing off-site F-Type inlet will be removed and replaced with a proposed clean out. As such, the proposed project will improve an existing downstream capacity deficiency (concrete ditch and F-Type inlet). Refer to the Proposed Hydrologic Work Map, found in Appendix D of this report, for a graphical representation.

Section 4. Methodology

4.1. Hydrology

Design peak flow rates were developed based upon the Rational Method methodologies outline in the City of San Diego Drainage Design Manual (DDM, April 1984). The Rational Method is a physically-based model that calculates peak flow rates (Q) as a function of runoff coefficients (c), rainfall intensities (I), and drainage areas (A):

$$Q = c * I * A$$

Runoff coefficients (c) where established based on the guidelines provided on page 82 of the City DDM. The project site is entirely comprised of hydrologic soil type D; therefore, adjustments to the runoff coefficients outlined on page 82 are not warranted. Under pre and post development conditions, the actual project site impervious (percent) is divided by 85 percent (consistent with 'Commercial') and multiplied by 0.85. Calculations are provided in Appendices B and C, pre-development and post development respectively.

Intensities were derived from the Rainfall Intensity-Duration-Frequency Curve found on page 83 of the City DDM. The time of concentration, or duration, to each node is a function of the initial time (Ti) associated with the most upstream sub-basin, and the travel time (Tt) to each respective downstream node. The initial time, Ti, was calculated using the City of San Diego's Urban Areas Overland Time of Flow Curves, found on page 86 of the City DDM. Travel times were based on velocities and travel lengths.

Drainage areas were delineated using one-foot contour interval aerial topography obtained from Commercial Due Diligence Services. Proposed improvements will not result in the diversion of any area. As such, the drainage area (A) will remain unchanged between pre and post development conditions.

4.2. Hydraulics

To determine the flow capacity of the existing concrete brow ditch, normal depth calculations were developed. Normal depth calculations involve an iterative solution of Manning's equation in order to develop normal depth, which is the depth of flow attained in an infinitely long channel of constant cross section and slope where uniform flow occurs.

Normal depth computations were performed using Bentley's Flow Master software and are based upon a given channel geometry (cross section and slope), channel roughness, and flow rate. The channel roughness was chosen as 0.015, which is typical for exposed concrete. The cross section geometry was based upon City Plan Set Drawing 18569-9, as well as a field visit performed by RBF Consulting on March 28th, 2012.

The proposed storm drain system has been sized based on normal depth using Bentley's Flow Master software. A roughness coefficient of 0.013 has been used for the proposed RCP, which is typical for concrete pipes. Proposed storm drain inlets have been sized following the guidelines outlined in the City of San Diego Drainage Design Manual (April 1984).

To determine the optimal storm water storage tank and pump size, a routing analysis was performed using Hydraflow Hydrographs (Version 2007). An optimal storage tank and pump size were determined such that the normal operational pump discharge to the proposed flow through planter area coincides with the water quality (85th percentile) volume from the area draining to the storage tank. The Hydraflow model depicts the hydraulics of the entire site, including the tank,pump, and multiple flow through planter areas. Two storm events were analyzed, the water quality event for treatment purposes and the 100-year event, for flood control purposes. Refer to Appendix D of this report for output from the mode.

Section 5. Results and Conclusions

5.1. Results

Table 5-1 summarizes the pre and post development hydrologic properties of the site. The proposed project will increase the amount of pervious area, as compared to pre development conditions, and thus reduce the project site runoff coefficient. Rainfall runoff intensities for the project site are not anticipated to change significantly between pre and post development conditions. The project site drainage area will not be impacted by the proposed development. Based on a reduction in the project site runoff coefficient the proposed project will result in a decreased 100-year peak flow runoff. As such, the proposed flow through planter areas are not required to attenuate peak flow increases, however, some incidental attenuation will occur.

Table 5-1 Hydrologic Summary of Pre vs. Post Development

Discharge Location	Pre Development Runoff Coefficient	Post Development Runoff Coefficient	Pre Development Rainfall Runoff Intensity (in/hr)	Post Development Rainfall Runoff Intensity (in/hr)	Drainage Area (ac)	Pre Development Q_{100} (cfs)	Post Development Q_{100} (cfs)	**ΔQ_{100} (cfs)**
Node 100	0.95	0.90	3.5	3.5	20.0	66.5	63.0	**-3.5**
Node 100 represents the ultimate project site discharge location under pre and post development conditions. Results from Nodes 20, 40 and 60 (tabulated below) are not meant to be added or confluenced in order to achieve a comparison between pre and post development conditions. Results for Node 100 (pre and post) serve as the comparison for hydrologic purposes.								

Table 5-2 summarizes the post development drainage management areas. Discussion pertaining to treatment can be found in the project specific WQTR, found under separate cover. The drainage management areas are included within this study to address the 100-year, 6-hour storm peak flow and volume draining to the proposed flow through planter areas.

Table 5-2 Post Development Drainage Management Areas

Discharge Location	Post Development Runoff Coefficient	Post Development Rainfall Intensity (in/hr)	Drainage Area (ac)	Post Development Q_{100} (cfs)	Post Development 100-year, 6-hour Volume (ft^3)
Node 20	0.90	4.4	3.1	12.3	25,319
Node 40	0.90	4.4	8.8	34.8	71,874
Node 60	0.90	4.4	8.1	32.1	66,157

Based on the hydrologic and hydraulic analyses described in Section 4, the existing off-site storm drain infrastructure is severely under sized for the 100-year storm event. The capacity of the off-site brow ditch is calculated as 42 cfs, however, the 100-year peak flow discharge from the project site under pre development conditions is 66.5 cfs. Proposed improvements will result in a reduced 100-year peak flow discharge from the site. Additionally, proposed improvements will replace the undersized concrete ditch with storm drain, both on-site and off-site.

The existing undersized F-Type inlet will be removed and replaced with a clean out. As such, runoff will no longer be conveyed via surface flow.

All proposed storm drain infrastructure will be sized for the 100-year, 6-hour storm event (with the exception of the storm water vault, see below). Storm drains will be sized to prevent pressure flow, with the exception of the pipe associated with the proposed pump located in the southwesterly corner of the site. Grate inlets will be located in sump conditions and sized such that ponding depths do not exceed six inches. Curb inlets will be sized to prevent flow by conditions.

A 2.4-acre portion of the project site drains to a low point located in the southwesterly corner of the project site (maintenance bay). A storm water storage tank is proposed along with a pump. Runoff from the 2.4-acre drainage area will be pumped to the flow through planter area located near the northerly project boundary of the site for treatment.

A 13,000 gallon tank is proposed within the southwesterly corner of the site. A 25-gallon per minute (0.06 cfs) pump is proposed to divert the water quality volume to a proposed flow through planter area. Although the tank is not sized to store the 100-year volume, a secondary overflow pipe is proposed and will operate under gravity flow.

A hydraulic exhibit and calculations are provided in Appendix D of this report.

5.2. Conclusions

Proposed improvements will not negatively impact the project site in terms of hydrology or hydraulics. Through the installation of landscaped areas and multiple flow through planter areas, the proposed project will result in a decreased runoff coefficient. Combined with a slight decrease in rainfall runoff intensity, a function of reduced impervious cover, the post development 100-year peak flow rate will be reduced, as compared to pre development conditions.

Based on the inclusion of a proposed pump, the post development hydrologic condition has been modeled within Hydraflow Hydrographs. A routing analysis has been performed, accounting for the increase in travel time associated with the tank and flow through planter areas.

Off-site, undersized storm drain infrastructure (concrete ditch and F-Type inlet) will be replaced as a result of the ultimate proposed project. Runoff will discharge from the site via proposed storm drain, and continue easterly towards Murphy canyon via proposed storm drain. A clean will replace the existing F-Type inlet, whereby proposed storm drain will connect to existing storm drain.

Section 6. References

City of San Diego, 1984. City of San Diego. (April 1984). Drainage Design Manual.

FEMA, 1997. FEMA. (June 17, 1997). Flood Insurance Study, San Diego County.

Appendix A
Project Site Information

Aerial Exhibit

Rainfall Isopluvials

NRCS Soils Information

FEMA Information

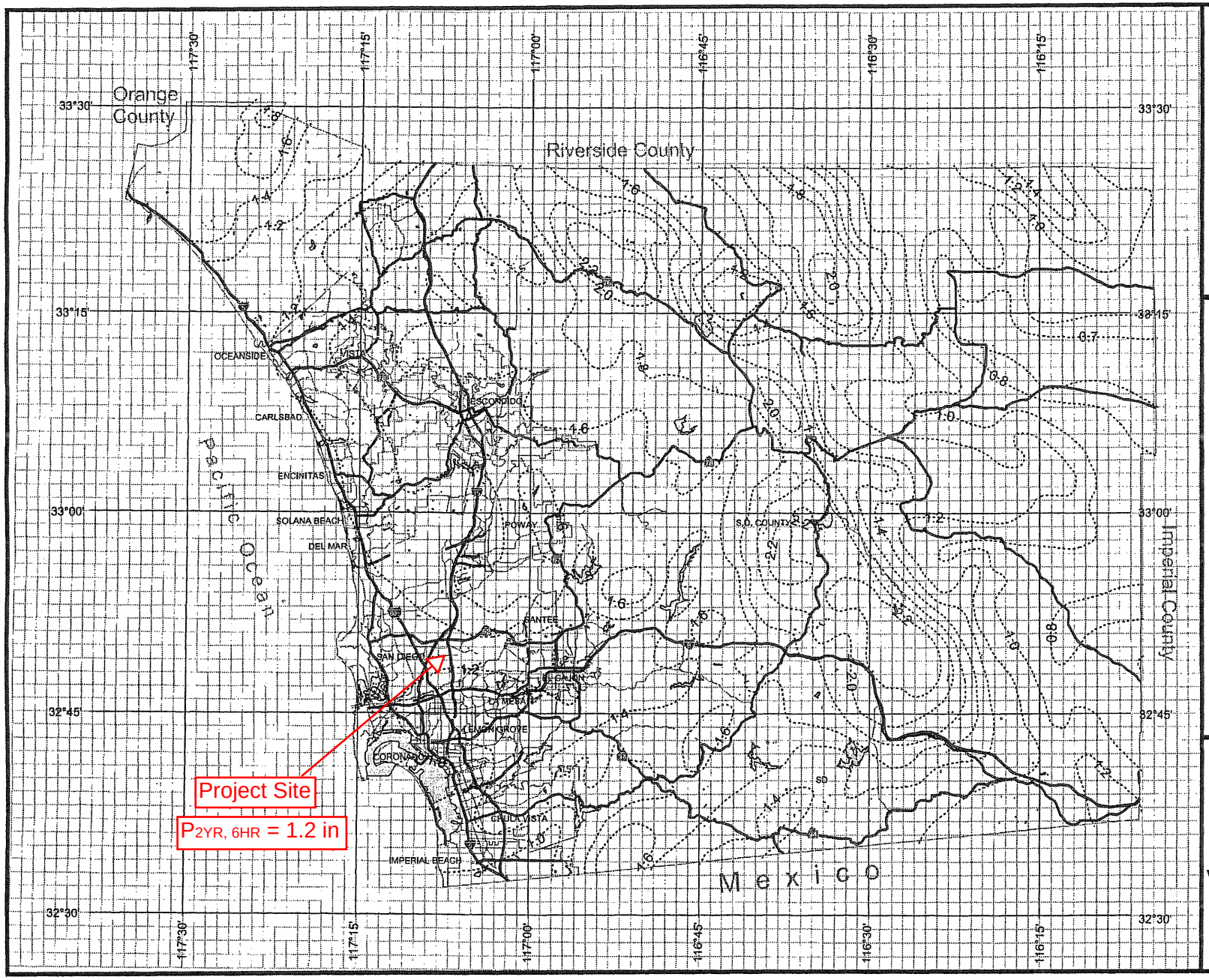
Excerpts from the City of San Diego Hydrology Manual (April 1984)

4/2/2012 JN M:\Mdata\25105430\GIS\5430_Kaiser_Aerial_Exhibit.mxd

0 250 500 1,000 Feet

KAISER CENTRAL SAN DIEGO

Aerial Exhibit



County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Services

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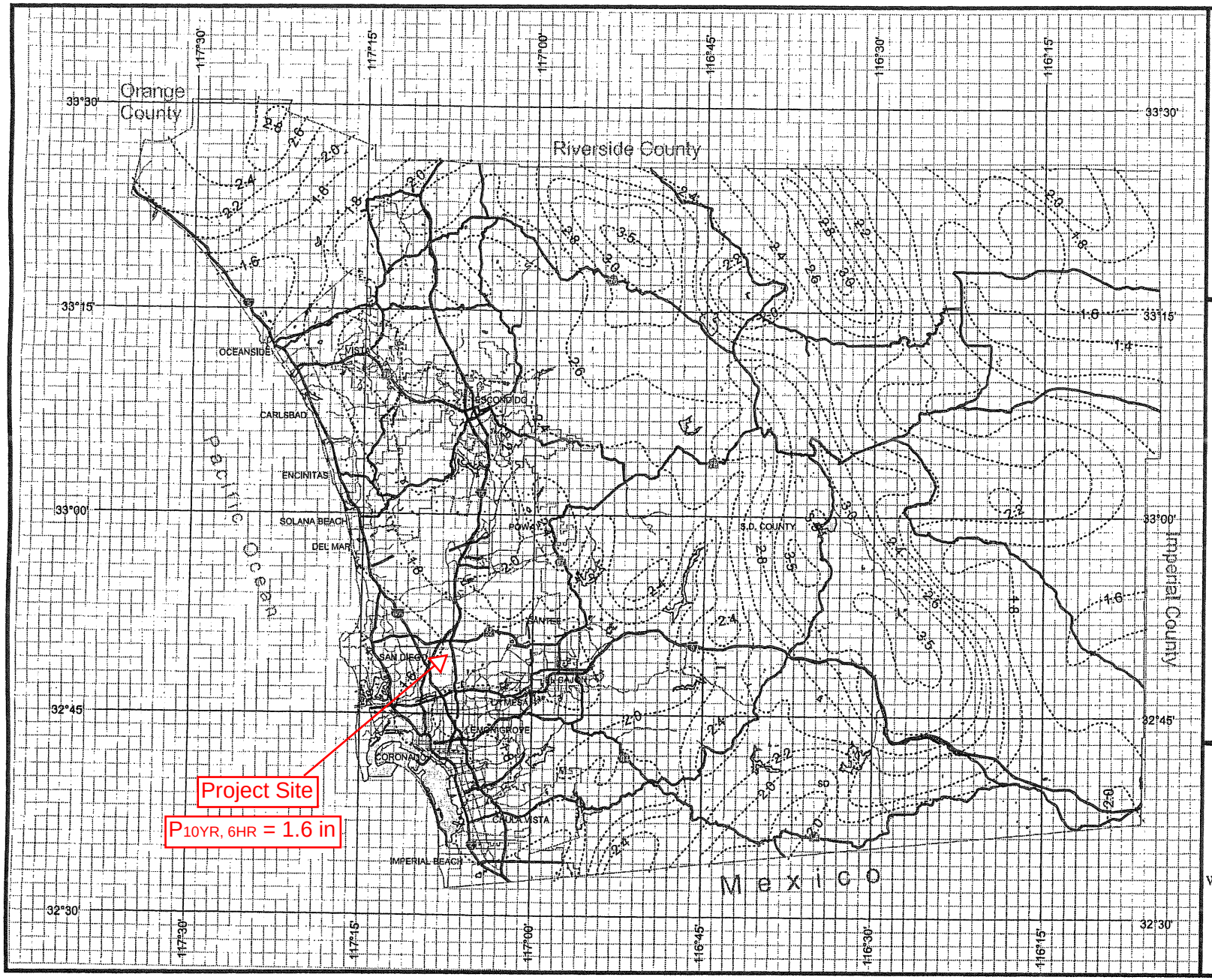

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS
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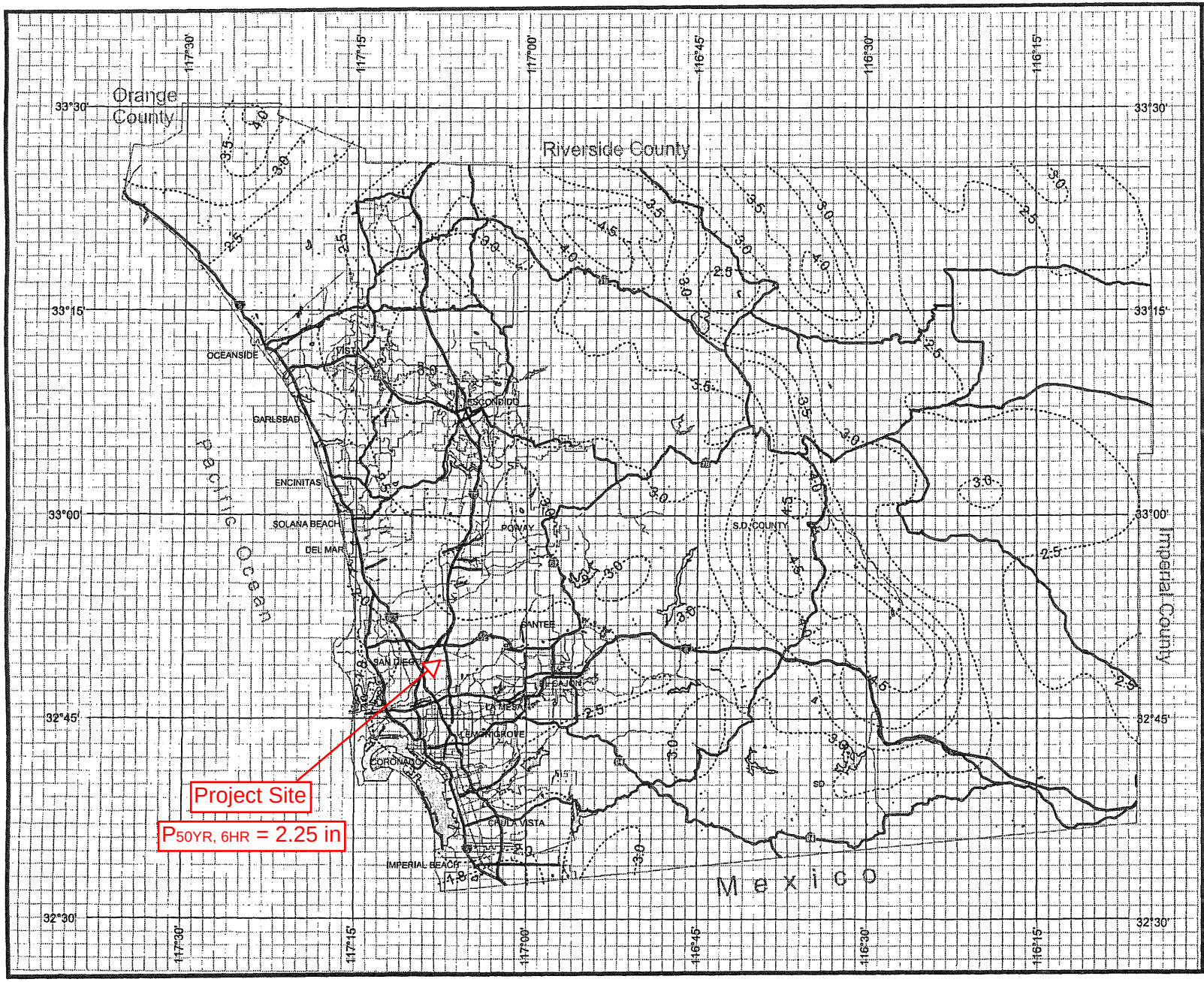

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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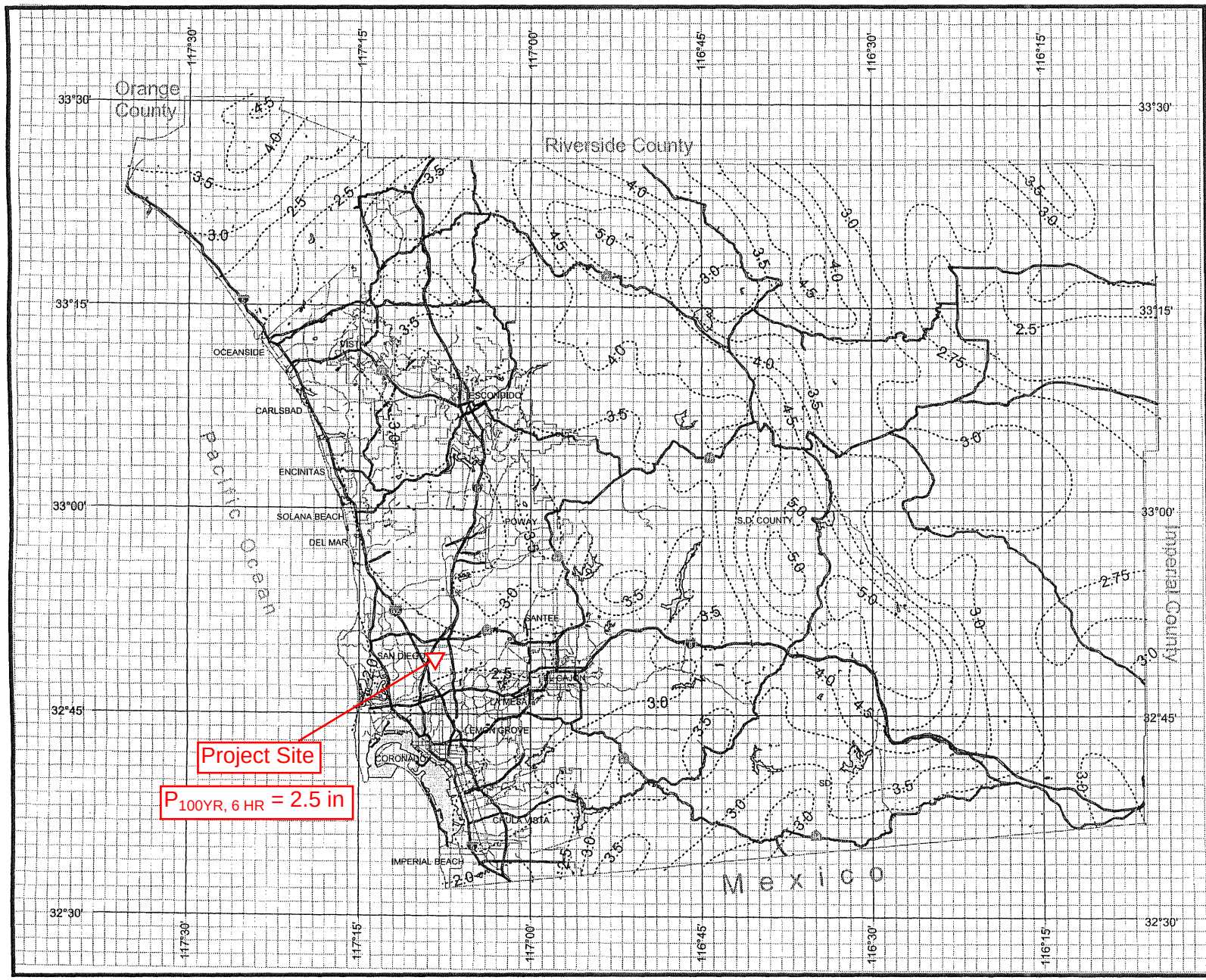

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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N W E S

3 0 3 Miles

Map Scale: 1:2,690 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:2,690 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
RdC	Redding gravelly loam, 2 to 9 percent slopes	D	21.6	99.1%
ReE	Redding cobbly loam, 9 to 30 percent slopes	D	0.2	0.9%
Totals for Area of Interest			**21.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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.

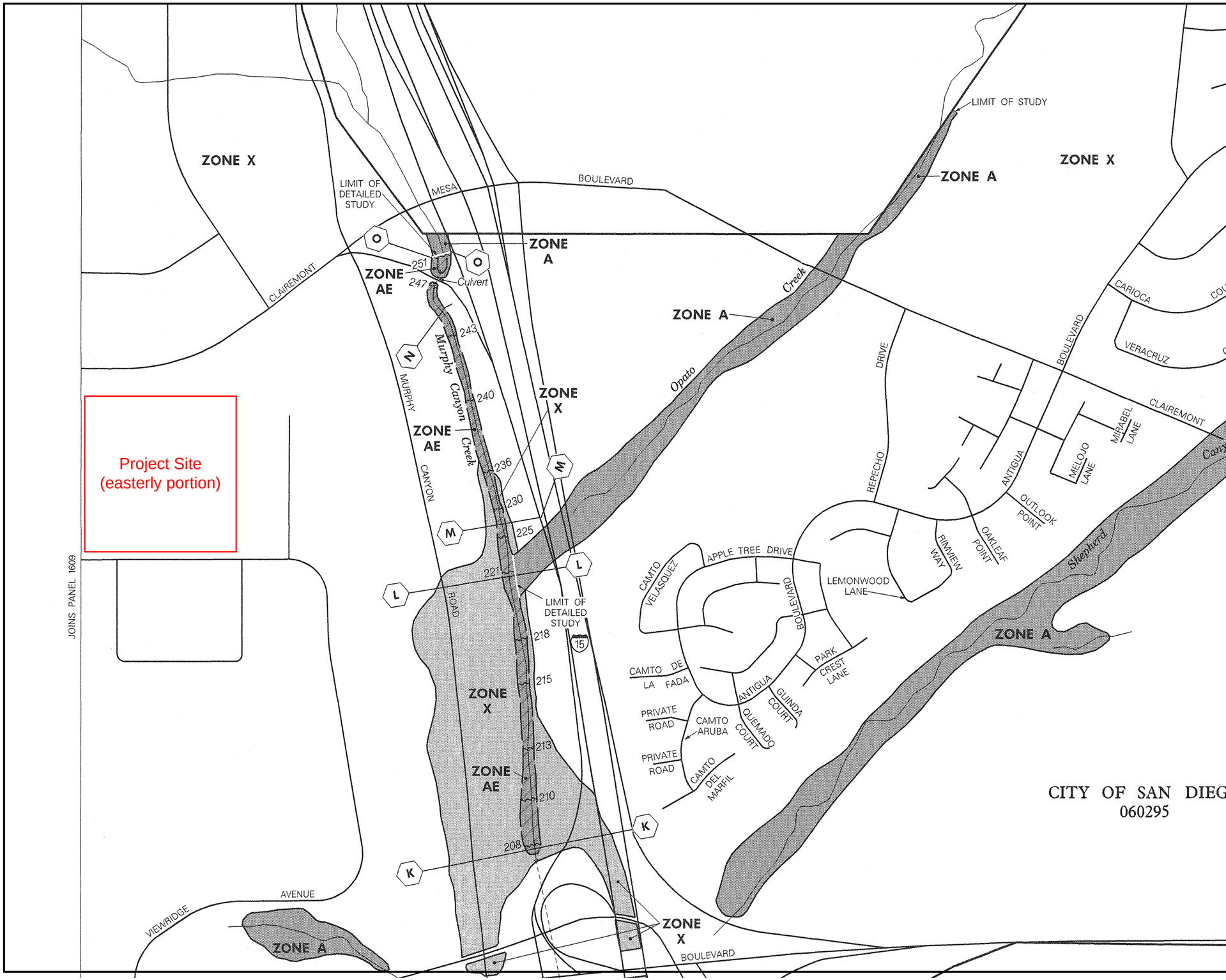
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a 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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition



APPROXIMATE SCALE IN FEET

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1628 OF 2375

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO CITY OF	060295	1628	G
SAN DIEGO COUNTY, UNINCORPORATED AREAS	060284	1628	G

MAP NUMBER 06073C1628 G

MAP REVISED: JUNE 16, 1999

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

Land Use	Coefficient, C Soil Type (1)
Residential:	D
Single Family	.55
Multi-Units	.70
Mobile Homes	.65
Rural (lots greater than 1/2 acre)	.45
Commercial (2) 80% Impervious	.85
Industrial (2) 90% Impervious	.95

Existing Condition (Node 100)

Industrial:
Actual imperviousness = 85%
Tabulated imperviousness = 90%
Revised C = (85/90) x 0.95 = 0.90

Proposed Condition (Node 100)

NOTES:

(1) Type D soil to be used for all areas.

(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in no case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%

Tabulated imperviousness = 80%

$$\text{Revised C} = \frac{50}{80} \times 0.85 = 0.53$$

ELEV.	FACTOR
0–1500	1.00
1500–3000	1.25
3000–4000	1.42
4000–5000	1.60
5000–6000	1.70
DESERT	1.25

To obtain correct intensity, multiply intensity on chart by factor for design elevation.

RAINFALL

INTENSITY – DURATION – FREQUENCY

CURVES

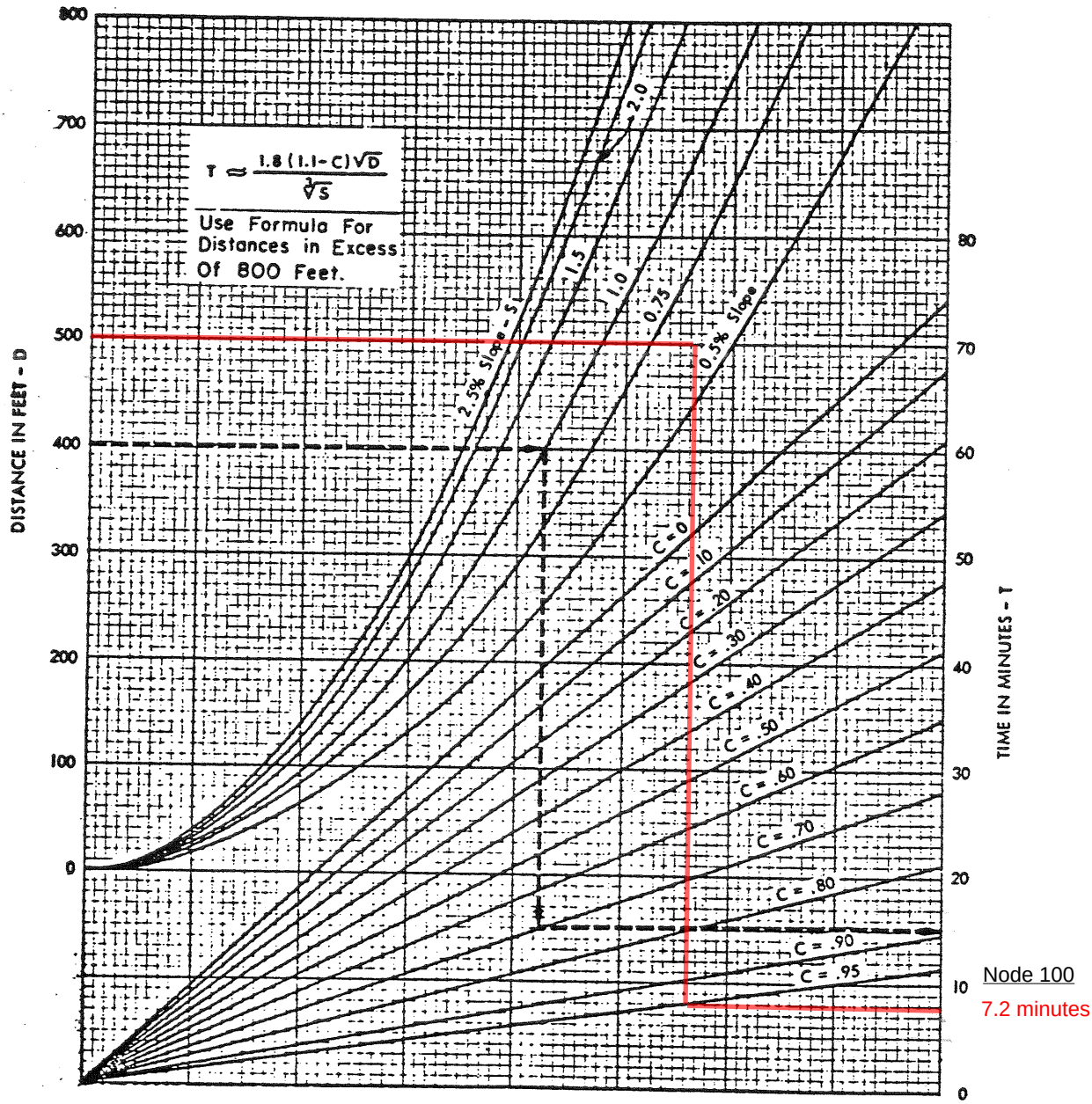
for

COUNTY OF SAN DIEGO

APPENDIX I-

I-B

URBAN AREAS OVERLAND TIME OF FLOW CURVES



Surface Flow Time Curves

EXAMPLE:

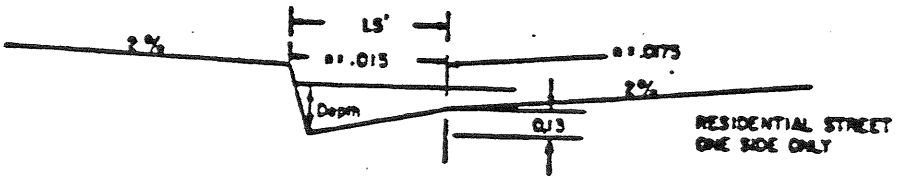
GIVEN: LENGTH OF FLOW = 400 FT.

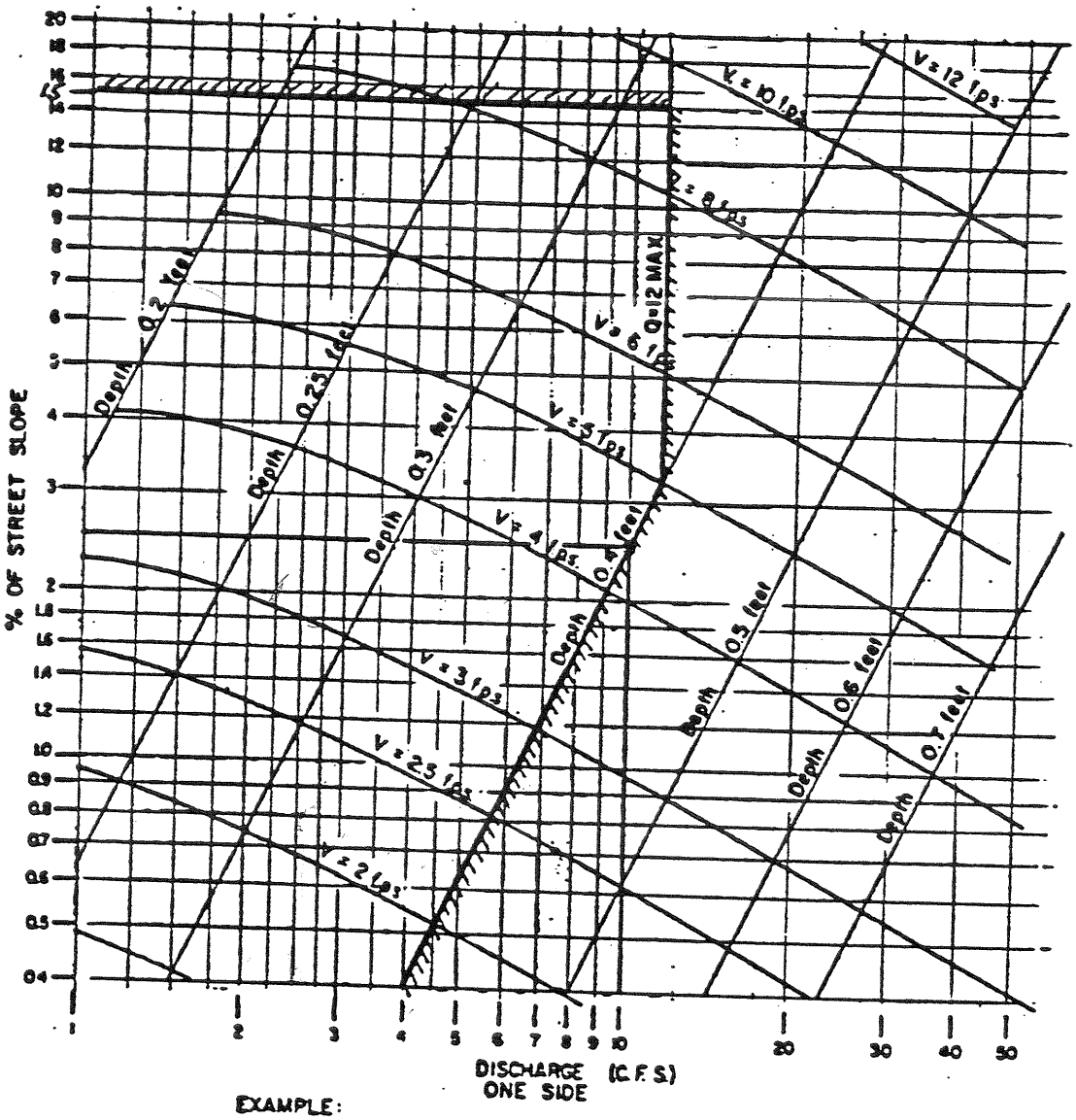
SLOPE = 1.0 %

COEFFICIENT OF RUNOFF C = .70

READ: OVERLAND FLOWTIME = 15 MINUTES

CHART I-104.12





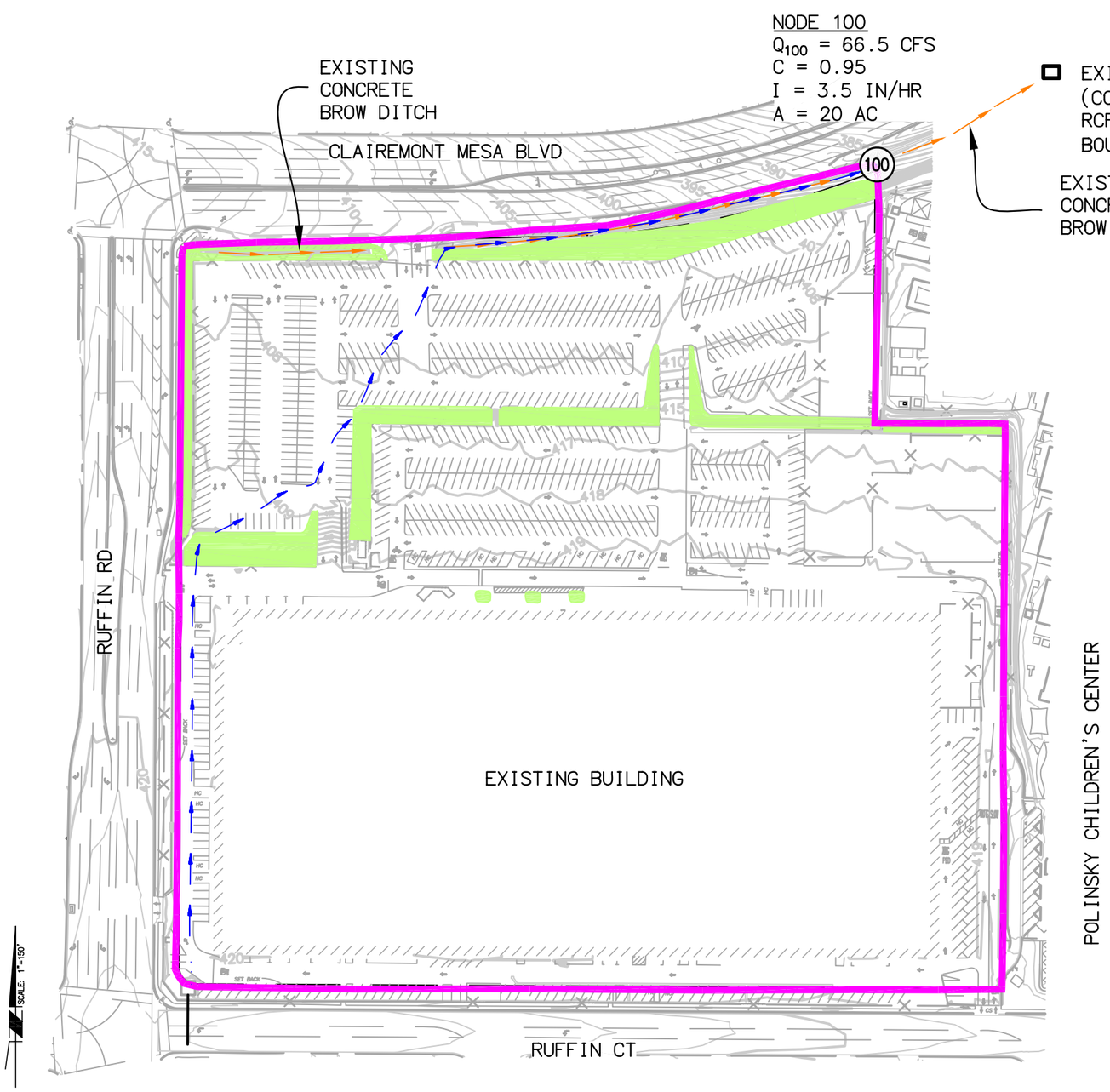
EXAMPLE:

Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 fps

REV.		CITY OF SAN DIEGO - DESIGN GUIDE	SHT. NO.
		GUTTER AND ROADWAY DISCHARGE-VELOCITY CHART	

Appendix B

Pre-Development Hydrologic Work Map & Calculations



LEGEND

- EXISTING PERVIOUS AREA
- (100) NODE
- DRAINAGE AREA
- FLOWPATH

150 75 0 150 300 450

SCALE: 1"=150'

KAISER CENTRAL SAN DIEGO
PRE DEVELOPMENT
HYDROLOGIC WORK MAP

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SAN DIEGO, CALIFORNIA 92124-1324
858.614.5000 ▪ FAX 858.614.5001 ▪ www.RBF.com

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100-YEAR

Pre Development															
Node	Total Area (ac)	Runoff Coefficient	Initial Time of Concentration (Ti)					Travel Time (Tt)					Tc (min)	i (in/hr)	Q_{100} (cfs)
			US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Ti (min)	US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Tt (min)			
100	20.00	0.95	423.00	420.00	500	0.60	7.2	420.0	400.0	970	2.06	2.8	10.0	3.5	66.5

10-YEAR

Pre Development															
Node	Total Area (ac)	Runoff Coefficient	Initial Time of Concentration (Ti)					Travel Time (Tt)					Tc (min)	i (in/hr)	Q_{100} (cfs)
			US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Ti (min)	US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Tt (min)			
100	20.00	0.95	423.00	420.00	500	0.60	7.2	420.0	400.0	970	2.06	2.8	10.0	2.6	49.4

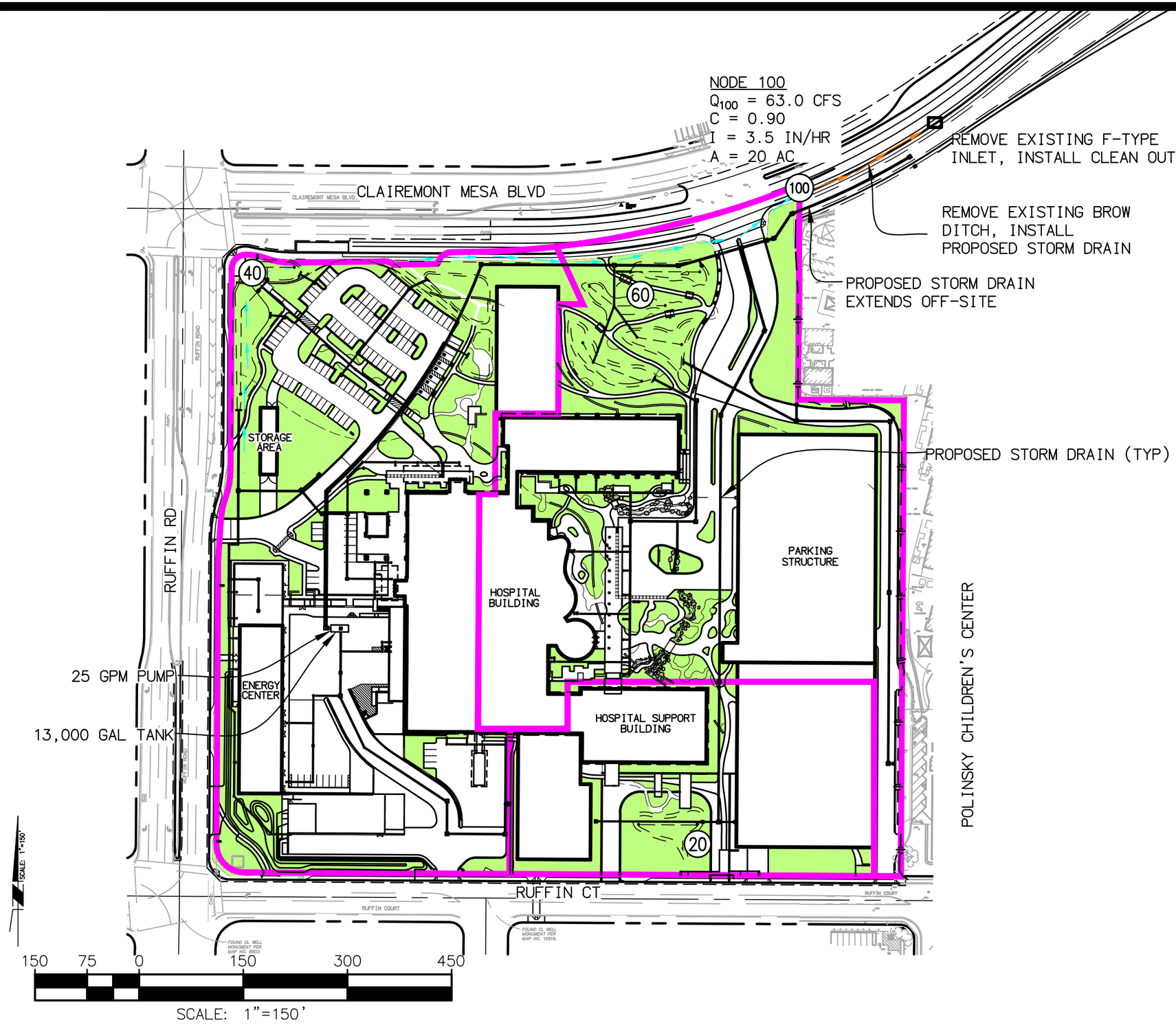
2-YEAR

Pre Development															
Node	Total Area (ac)	Runoff Coefficient	Initial Time of Concentration (Ti)					Travel Time (Tt)					Tc (min)	i (in/hr)	Q_{100} (cfs)
			US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Ti (min)	US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Tt (min)			
100	20.00	0.95	423.00	420.00	500	0.60	7.2	420.0	400.0	970	2.06	2.8	10.0	1.8	34.2

Notes:

1. Existing Rainfall intensity (i) derived from City of San Diego Drainage Design Manual Appendix I-B using a 10 minute duration (Tc)
2. Initial travel time (Ti) calculated per Urban Areas Overland Time of Flow, page 86 of the City Manual
3. Travel time based on flow velocities (5 ft/sec) and remaining travel length

Appendix C
Post-Development Hydrologic Work Map & Calculations



LEGEND

PROPOSED LANDSCAPING

NODE

FLOWPATH

DRAINAGE MANAGEMENT AREAS

NOTE:
NODES 20, 40, & 60 ARE INCLUDED AS PART OF THE POST DEVELOPMENT HYDROLOGIC ANALYSIS TO DETERMINE THE 100-YR VOLUME TO EACH BIO FILTRATION AREA. THESE NODES ARE NOT 'CONFLUENCED' TO DETERMINE THE ULTIMATE PROJECT SITE DISCHARGE.

USE RESULTS FOR NODE 100 FOR COMPARISON OF PEAK FLOW DISCHARGE BETWEEN THE PRE AND UNMITIGATED POST DEVELOPMENT CONDITIONS.

KAISER CENTRAL SAN DIEGO POST DEVELOPMENT HYDROLOGIC WORK MAP

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100-YEAR

Post Development															
Node	Total Area (ac)	Runoff Coefficient	Initial Time of Concentration (Ti)					Travel Time (Tt)					Tc (min)	i (in/hr)	Q_{100} (cfs)
			US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Ti (min)	US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Tt (min)			
20	3.1	0.90	420	418	910	0.22	5	-	-	-	-	-	5	4.4	12.3
40	8.8	0.90	420	408	1075	1.12	5	-	-	-	-	-	5	4.4	34.8
60	8.1	0.90	408	386	790	2.78	5	-	-	-	-	-	5	4.4	32.1
100	20.0	0.90	423.00	420.00	500	0.60	7.2	420.0	400.0	970	2.06	2.8	10.0	3.5	63.0

10-YEAR

Post Development															
Node	Total Area (ac)	Runoff Coefficient	Initial Time of Concentration (Ti)					Travel Time (Tt)					Tc (min)	i (in/hr)	Q_{100} (cfs)
			US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Ti (min)	US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Tt (min)			
20	3.1	0.90	420	418	910	0.22	5	-	-	-	-	-	5	3.4	9.5
40	8.8	0.90	420	408	1075	1.12	5	-	-	-	-	-	5	3.4	26.9
60	8.1	0.90	408	386	790	2.78	5	-	-	-	-	-	5	3.4	24.8
100	20.0	0.90	423.00	420.00	500	0.60	7.2	420.0	400.0	970	2.06	2.8	10.0	2.6	46.8

2-YEAR

Post Development															
Node	Total Area (ac)	Runoff Coefficient	Initial Time of Concentration (Ti)					Travel Time (Tt)					Tc (min)	i (in/hr)	Q_{100} (cfs)
			US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Ti (min)	US Elev (ft)	DS Elev (ft)	Length (ft)	Slope (%)	Tt (min)			
20	3.1	0.90	420	418	910	0.22	5	-	-	-	-	-	5	2.4	6.7
40	8.8	0.90	420	408	1075	1.12	5	-	-	-	-	-	5	2.4	19.0
60	8.1	0.90	408	386	790	2.78	5	-	-	-	-	-	5	2.4	17.5
100	20.0	0.90	423.00	420.00	500	0.60	7.2	420.0	400.0	970	2.06	2.8	10.0	1.8	32.4

Notes:

1. Proposed Rainfall intensity for Node 100 (i) assumed equal to pre development conditions, despite the reduction in overall project site impervious cover
2. Proposed Rainfall intensity for Nodes 20, 40, & 60 (i) based off an assumed Tc of 5 minutes
3. Proposed runoff coefficient (C) calculated as 0.9 based on 85% impervious and page 82 of the City Manual
4. Initial travel time (Ti) calculated per Urban Areas Overland Time of Flow, page 86 of the City Manual
5. Travel time based on flow velocities (5 ft/sec) and remaining travel length
6. Nodes 20, 40, & 60 correlate with the proposed flow through planter areas, and thus are intentionally not included as part of the pre development analysis
7. Use results for Node 100 for comparison of peak flow discharge between pre and unmitigated post development conditions

Node 20

$$VOL_{100\,YR} = C * P_{100\,YR} * A$$

Where:

VOL_{100YR} = 100 YR Volume Requirement (ac*in)
C = Node Runoff Coefficient
P_{100YR} = 100YR 6 HR Rainfall Depth (in)
A = Node Area (ac)

C =	0.9	Per page 82 of the City of San Diego DDM, April 1984 **(Assumes 85% impervious)**
P_{100YR} =	2.5	(in)
A =	3.1	(ac)
VOL_{100YR} =	7.0	ac-in
VOL_{100YR} =	0.6	ac-ft
VOL_{100YR} =	25,319	ft^3

Node 40

$$VOL_{100\,YR} = C * P_{100\,YR} * A$$

Where:

VOL_{100YR} = 100 YR Volume Requirement (ac*in)
C = Node Runoff Coefficient
P_{100YR} = 100YR 6 HR Rainfall Depth (in)
A = Node Area (ac)

C =	0.9	Per page 82 of the City of San Diego DDM, April 1984 **(Assumes 85% impervious)**
P_{100YR} =	2.5	(in)
A =	8.8	(ac)
VOL_{100YR} =	19.8	ac-in
VOL_{100YR} =	1.7	ac-ft
VOL_{100YR} =	71,874	ft^3

Node 60

$$VOL_{100\,YR} = C * P_{100\,YR} * A$$

Where:

VOL_{100YR} = 100 YR Volume Requirement (ac*in)
C = Node Runoff Coefficient
P_{100YR} = 100YR 6 HR Rainfall Depth (in)
A = Node Area (ac)

C =	0.9	Per page 82 of the City of San Diego DDM, April 1984 **(Assumes 85% impervious)**
P_{100YR} =	2.5	(in)
A =	8.1	(ac)
VOL_{100YR} =	18.2	ac-in
VOL_{100YR} =	1.5	ac-ft
VOL_{100YR} =	66,157	ft^3

Appendix D
Hydraulic Exhibit & Calculations

Existing Channel & Off-Site F-Type Inlet

Existing Off-Site Concrete Brow Ditch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.04000	ft/ft
Normal Depth	1.25	ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)

Results

Discharge	42.01	ft^3/s
Flow Area	3.13	ft^2
Wetted Perimeter	5.59	ft
Top Width	5.00	ft
Critical Depth	1.94	ft
Critical Slope	0.00384	ft/ft
Velocity	13.44	ft/s
Velocity Head	2.81	ft
Specific Energy	4.06	ft
Froude Number	3.00	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.25	ft
Critical Depth	1.94	ft
Channel Slope	0.04000	ft/ft
Critical Slope	0.00384	ft/ft

Existing Off-Site Concrete Brow Ditch

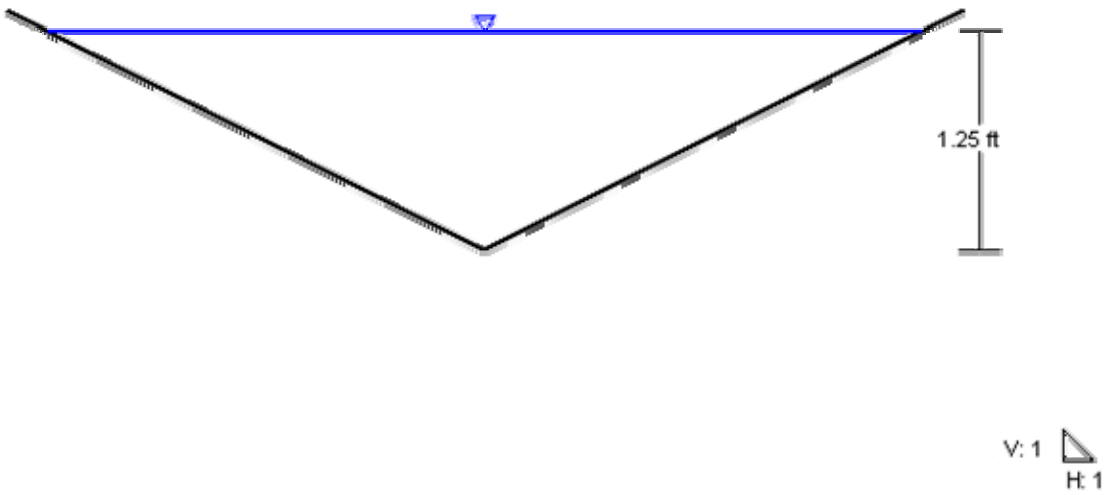
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

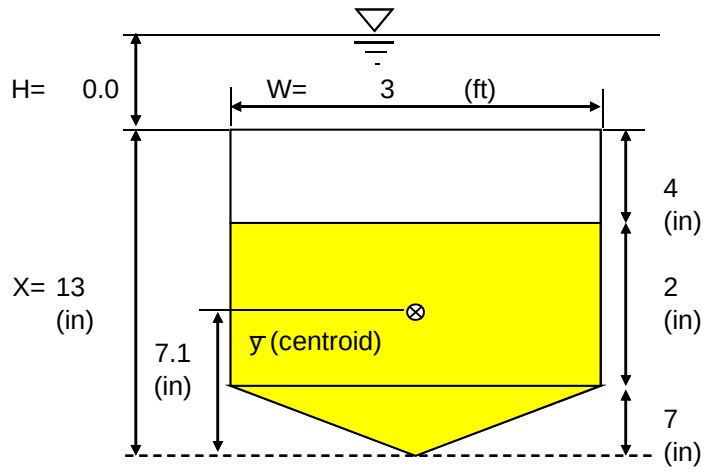
Roughness Coefficient	0.015	
Channel Slope	0.04000	ft/ft
Normal Depth	1.25	ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Discharge	42.01	ft^3/s

Cross Section Image



Kaiser Central San Diego (25-105430)
Catch Basin Type F Capacity

Dimensions obtained from City of San Diego Standard Drawings (Drawing D-7):

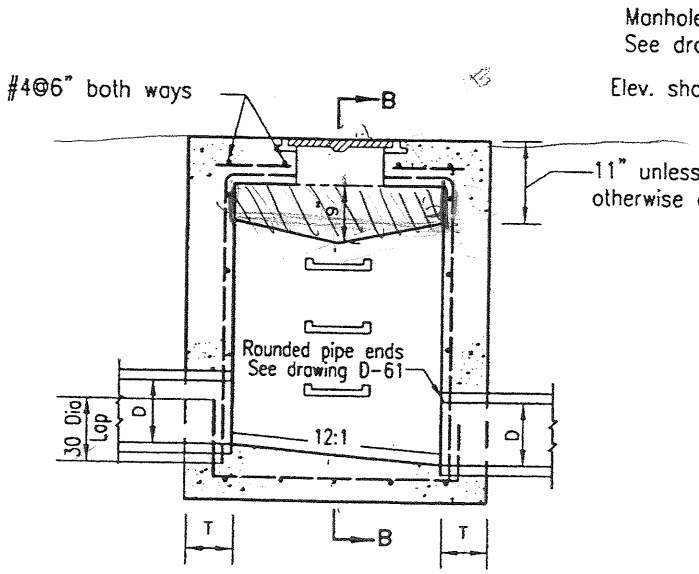


W=	3.0	(ft)	Input width of opening
X=	13	(in)	Input depth from top of box to flowline
X-6"=	2	(in)	Height of rectangular opening
$\Sigma A\bar{y}$=	0.67	(ft^3)	Sum of each area times each centroid
ΣA=	1.38	(ft^2)	Sum of areas
$\bar{y}=\Sigma Ay/\Sigma A$=	0.49	(ft)	Height of effective centroid
h=	0.59	(ft)	Computed head to top of box ($X - \bar{y}$)
H=	0.00	(ft)	Additional ponding height allowable
H+h=	0.59	(ft)	Total height above centroid

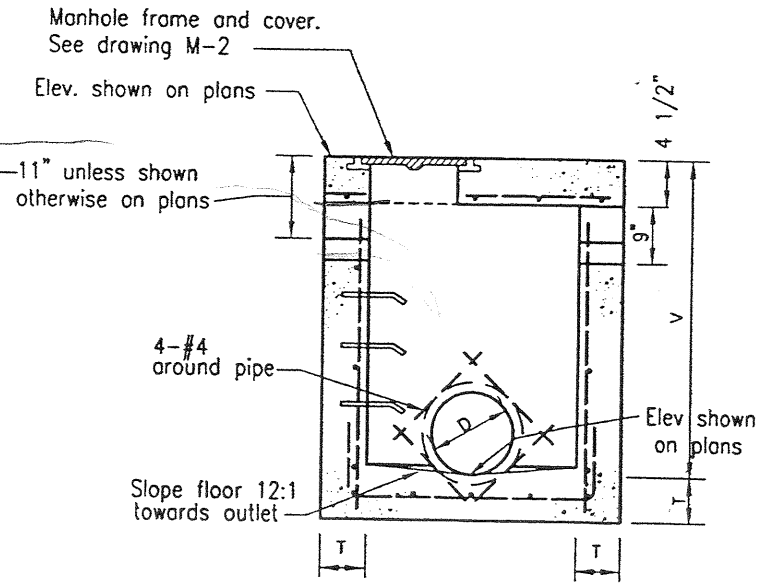
$Q_{max} = 0.6A\sqrt{(2gh)}$

Qmax = 5.10 cfs per opening

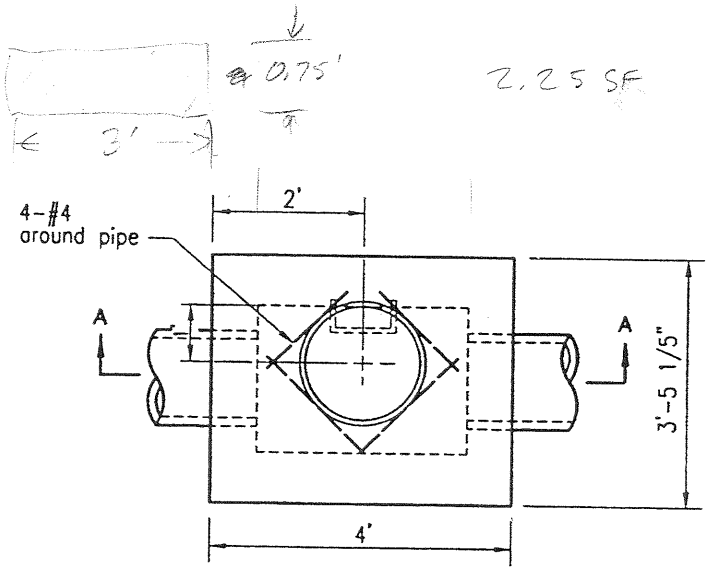
*Assumes no clogging of opening



SECTION A–A



SECTION B–B

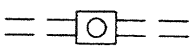


PLAN

NOTE

1. See Standard Drawing D–11 for additional notes and details.
2. When V exceeds 4' steps shall be installed. See Standard Drawing D–11 for details.
3. Exposed edges of concrete shall be rounded with a radius of 1/2".
4. Construct openings on both sides unless otherwise shown on plans.
5. Maintain 1 1/2" clear spacing between reinforcing and surface.

LEGEND ON PLANS



Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75

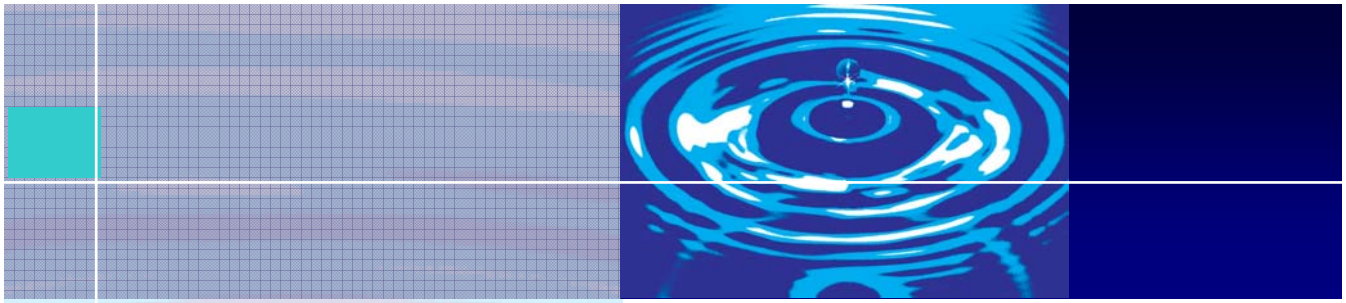
SAN DIEGO REGIONAL STANDARD DRAWING

CATCH BASIN - TYPE F

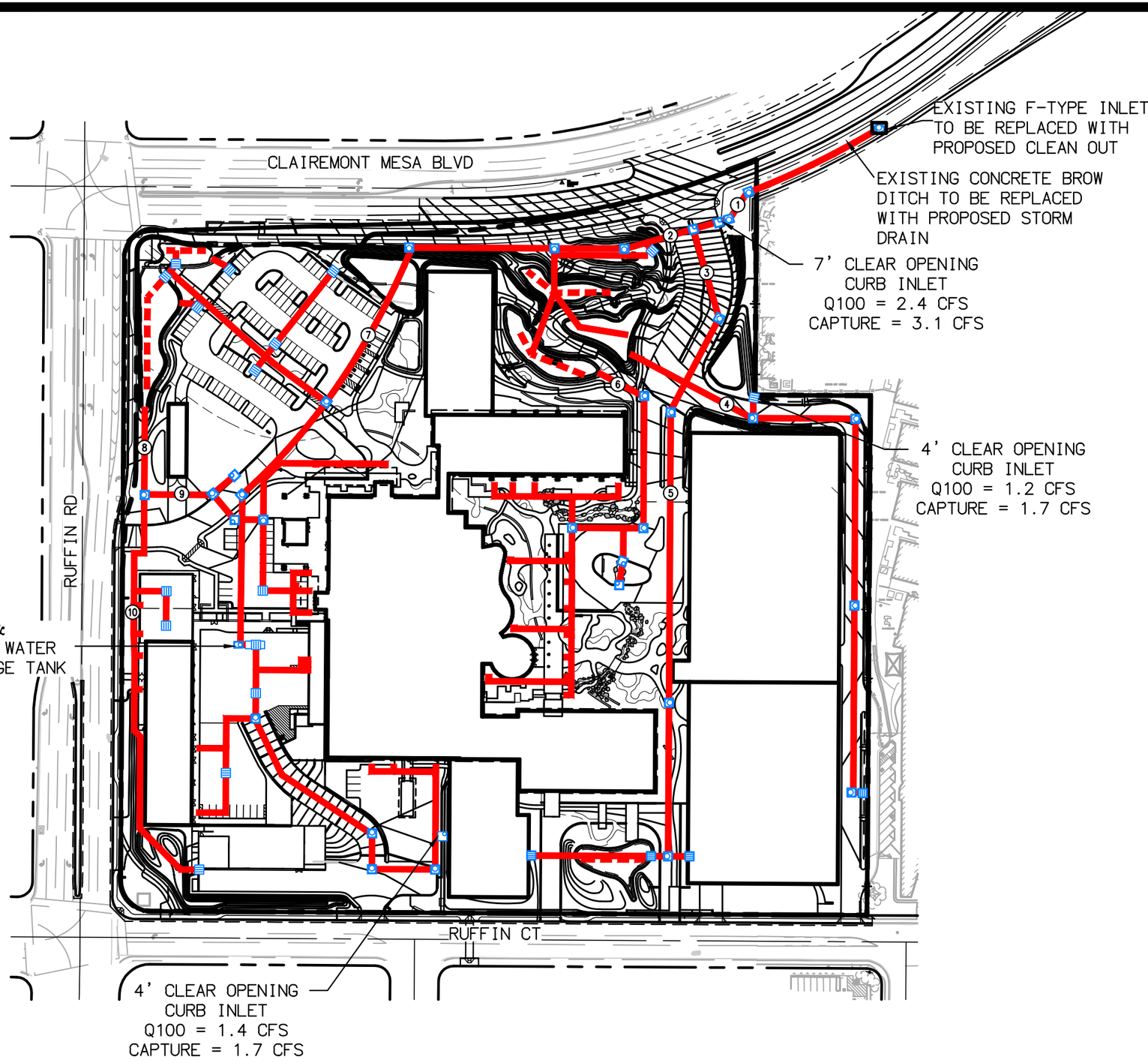
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Chairperson R.C.E. 19246 Date 3/23/00

DRAWING NUMBER D-7



Post Development Storm Drain



LEGEND

- PROJECT BOUNDARY
- PROPOSED STORM DRAIN
- PERFORATED PIPE
- GRATE INLETS
- CURB INLETS
- CLEAN OUTS
- (#) PIPE SEGMENT SEE FLOWMASTER CALCULATIONS

SCALE: 1"=150'

150 75 0 150 300 450

SCALE: 1"=150'

KAISER CENTRAL SAN DIEGO POST DEVELOPMENT HYDRAULIC EXHIBIT

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Pipe Segment 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.06400	ft/ft
Diameter	2.00	ft
Discharge	47.10	ft^3/s

Results

Normal Depth	1.38	ft
Flow Area	2.32	ft^2
Wetted Perimeter	3.93	ft
Top Width	1.85	ft
Critical Depth	1.97	ft
Percent Full	69.1	%
Critical Slope	0.03958	ft/ft
Velocity	20.34	ft/s
Velocity Head	6.43	ft
Specific Energy	7.81	ft
Froude Number	3.20	
Maximum Discharge	61.56	ft^3/s
Discharge Full	57.23	ft^3/s
Slope Full	0.04335	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	69.10	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 1

GVF Output Data

Normal Depth	1.38	ft
Critical Depth	1.97	ft
Channel Slope	0.06400	ft/ft
Critical Slope	0.03958	ft/ft

Cross Section for Pipe Segment 1

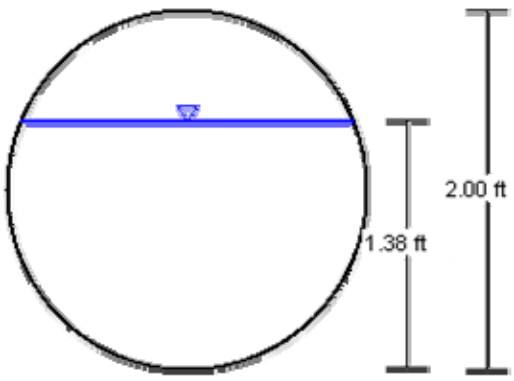
Project Description

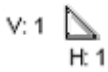
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.06400	ft/ft
Normal Depth	1.38	ft
Diameter	2.00	ft
Discharge	47.10	ft^3/s

Cross Section Image





Pipe Segment 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00600	ft/ft
Diameter	2.00	ft
Discharge	17.40	ft^3/s

Results

Normal Depth	1.63	ft
Flow Area	2.74	ft^2
Wetted Perimeter	4.50	ft
Top Width	1.56	ft
Critical Depth	1.50	ft
Percent Full	81.3	%
Critical Slope	0.00708	ft/ft
Velocity	6.36	ft/s
Velocity Head	0.63	ft
Specific Energy	2.26	ft
Froude Number	0.85	
Maximum Discharge	18.85	ft^3/s
Discharge Full	17.52	ft^3/s
Slope Full	0.00592	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	81.34	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 2

GVF Output Data

Normal Depth	1.63	ft
Critical Depth	1.50	ft
Channel Slope	0.00600	ft/ft
Critical Slope	0.00708	ft/ft

Cross Section for Pipe Segment 2

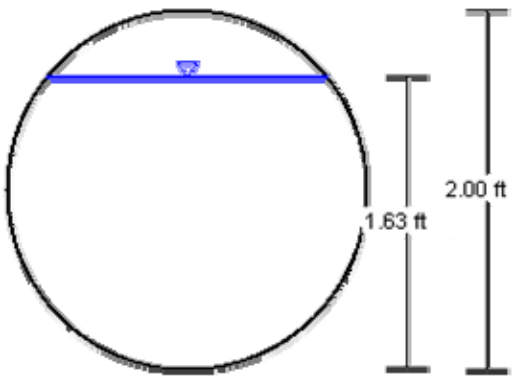
Project Description

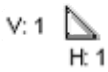
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00600	ft/ft
Normal Depth	1.63	ft
Diameter	2.00	ft
Discharge	17.40	ft^3/s

Cross Section Image





Pipe Segment 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.17420	ft/ft
Diameter	2.00	ft
Discharge	12.30	ft^3/s

Results

Normal Depth	0.49	ft
Flow Area	0.59	ft^2
Wetted Perimeter	2.07	ft
Top Width	1.72	ft
Critical Depth	1.26	ft
Percent Full	24.4	%
Critical Slope	0.00565	ft/ft
Velocity	20.75	ft/s
Velocity Head	6.69	ft
Specific Energy	7.18	ft
Froude Number	6.23	
Maximum Discharge	101.56	ft^3/s
Discharge Full	94.41	ft^3/s
Slope Full	0.00296	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	24.38	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 3

GVF Output Data

Normal Depth	0.49	ft
Critical Depth	1.26	ft
Channel Slope	0.17420	ft/ft
Critical Slope	0.00565	ft/ft

Cross Section for Pipe Segment 3

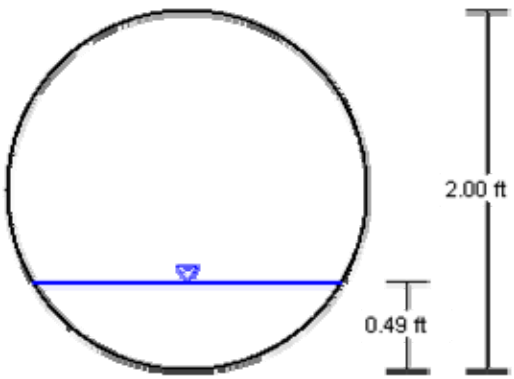
Project Description

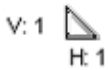
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.17420	ft/ft
Normal Depth	0.49	ft
Diameter	2.00	ft
Discharge	12.30	ft^3/s

Cross Section Image





Pipe Segment 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.03040	ft/ft
Diameter	1.50	ft
Discharge	7.20	ft^3/s

Results

Normal Depth	0.65	ft
Flow Area	0.74	ft^2
Wetted Perimeter	2.16	ft
Top Width	1.49	ft
Critical Depth	1.04	ft
Percent Full	43.6	%
Critical Slope	0.00689	ft/ft
Velocity	9.74	ft/s
Velocity Head	1.47	ft
Specific Energy	2.13	ft
Froude Number	2.44	
Maximum Discharge	19.70	ft^3/s
Discharge Full	18.31	ft^3/s
Slope Full	0.00470	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	43.57	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 4

GVF Output Data

Normal Depth	0.65	ft
Critical Depth	1.04	ft
Channel Slope	0.03040	ft/ft
Critical Slope	0.00689	ft/ft

Cross Section for Pipe Segment 4

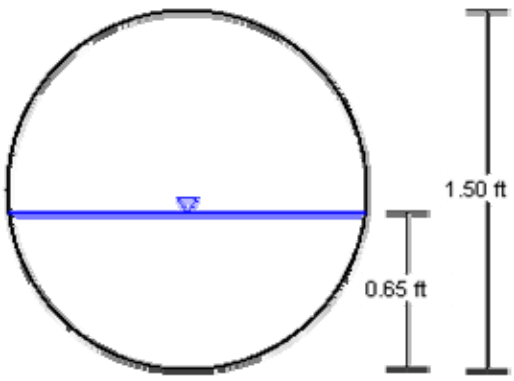
Project Description

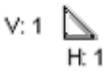
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.03040	ft/ft
Normal Depth	0.65	ft
Diameter	1.50	ft
Discharge	7.20	ft^3/s

Cross Section Image





Pipe Segment 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01200	ft/ft
Diameter	1.50	ft
Discharge	12.30	ft^3/s

Results

Normal Depth	1.36	ft
Flow Area	1.68	ft^2
Wetted Perimeter	3.78	ft
Top Width	0.87	ft
Critical Depth	1.33	ft
Percent Full	90.7	%
Critical Slope	0.01228	ft/ft
Velocity	7.30	ft/s
Velocity Head	0.83	ft
Specific Energy	2.19	ft
Froude Number	0.93	
Maximum Discharge	12.38	ft^3/s
Discharge Full	11.51	ft^3/s
Slope Full	0.01371	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	90.72	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 5

GVF Output Data

Normal Depth	1.36	ft
Critical Depth	1.33	ft
Channel Slope	0.01200	ft/ft
Critical Slope	0.01228	ft/ft

Cross Section for Pipe Segment 5

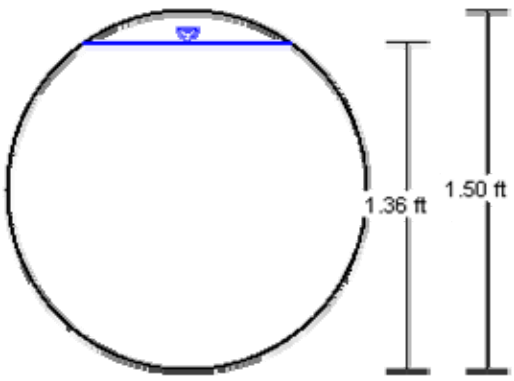
Project Description

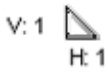
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01200	ft/ft
Normal Depth	1.36	ft
Diameter	1.50	ft
Discharge	12.30	ft^3/s

Cross Section Image





Pipe Segment 6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00520	ft/ft
Diameter	2.00	ft
Discharge	13.10	ft^3/s

Results

Normal Depth	1.36	ft
Flow Area	2.27	ft^2
Wetted Perimeter	3.87	ft
Top Width	1.87	ft
Critical Depth	1.30	ft
Percent Full	67.8	%
Critical Slope	0.00583	ft/ft
Velocity	5.77	ft/s
Velocity Head	0.52	ft
Specific Energy	1.87	ft
Froude Number	0.92	
Maximum Discharge	17.55	ft^3/s
Discharge Full	16.31	ft^3/s
Slope Full	0.00335	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	67.85	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 6

GVF Output Data

Normal Depth	1.36	ft
Critical Depth	1.30	ft
Channel Slope	0.00520	ft/ft
Critical Slope	0.00583	ft/ft

Cross Section for Pipe Segment 6

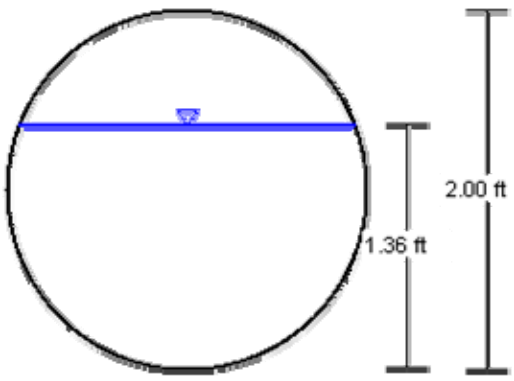
Project Description

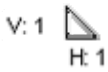
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00520	ft/ft
Normal Depth	1.36	ft
Diameter	2.00	ft
Discharge	13.10	ft^3/s

Cross Section Image





Pipe Segment 7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Diameter	2.00	ft
Discharge	8.70	ft^3/s

Results

Normal Depth	1.05	ft
Flow Area	1.67	ft^2
Wetted Perimeter	3.24	ft
Top Width	2.00	ft
Critical Depth	1.05	ft
Percent Full	52.6	%
Critical Slope	0.00499	ft/ft
Velocity	5.20	ft/s
Velocity Head	0.42	ft
Specific Energy	1.47	ft
Froude Number	1.00	
Maximum Discharge	17.21	ft^3/s
Discharge Full	16.00	ft^3/s
Slope Full	0.00148	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	52.57	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 7

GVF Output Data

Normal Depth	1.05	ft
Critical Depth	1.05	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00499	ft/ft

Cross Section for Pipe Segment 7

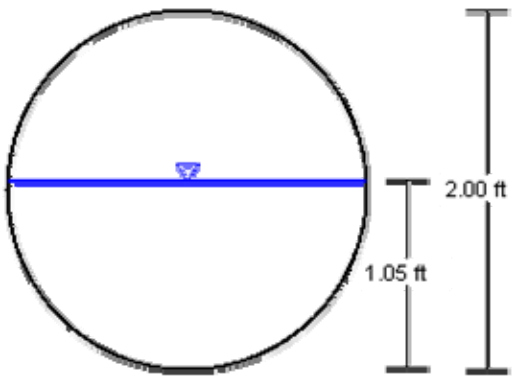
Project Description

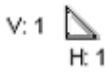
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	1.05	ft
Diameter	2.00	ft
Discharge	8.70	ft^3/s

Cross Section Image





Pipe Segment 8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00770	ft/ft
Diameter	2.00	ft
Discharge	21.30	ft^3/s

Results

Normal Depth	1.84	ft
Flow Area	3.02	ft^2
Wetted Perimeter	5.13	ft
Top Width	1.09	ft
Critical Depth	1.65	ft
Percent Full	91.9	%
Critical Slope	0.00874	ft/ft
Velocity	7.05	ft/s
Velocity Head	0.77	ft
Specific Energy	2.61	ft
Froude Number	0.75	
Maximum Discharge	21.35	ft^3/s
Discharge Full	19.85	ft^3/s
Slope Full	0.00887	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	91.91	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 8

GVF Output Data

Normal Depth	1.84	ft
Critical Depth	1.65	ft
Channel Slope	0.00770	ft/ft
Critical Slope	0.00874	ft/ft

Cross Section for Pipe Segment 8

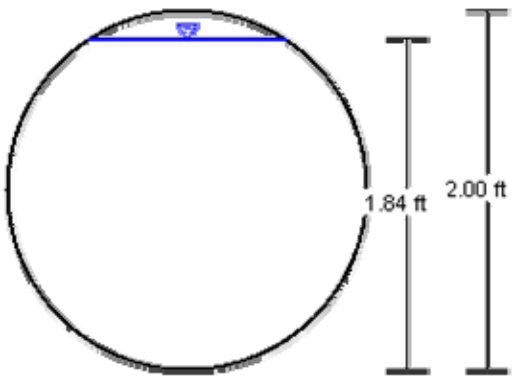
Project Description

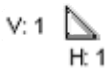
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00770	ft/ft
Normal Depth	1.84	ft
Diameter	2.00	ft
Discharge	21.30	ft^3/s

Cross Section Image





Pipe Segment 9

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00560	ft/ft
Diameter	2.00	ft
Discharge	14.80	ft^3/s

Results

Normal Depth	1.45	ft
Flow Area	2.44	ft^2
Wetted Perimeter	4.07	ft
Top Width	1.79	ft
Critical Depth	1.39	ft
Percent Full	72.4	%
Critical Slope	0.00626	ft/ft
Velocity	6.07	ft/s
Velocity Head	0.57	ft
Specific Energy	2.02	ft
Froude Number	0.92	
Maximum Discharge	18.21	ft^3/s
Discharge Full	16.93	ft^3/s
Slope Full	0.00428	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	72.42	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 9

GVF Output Data

Normal Depth	1.45	ft
Critical Depth	1.39	ft
Channel Slope	0.00560	ft/ft
Critical Slope	0.00626	ft/ft

Cross Section for Pipe Segment 9

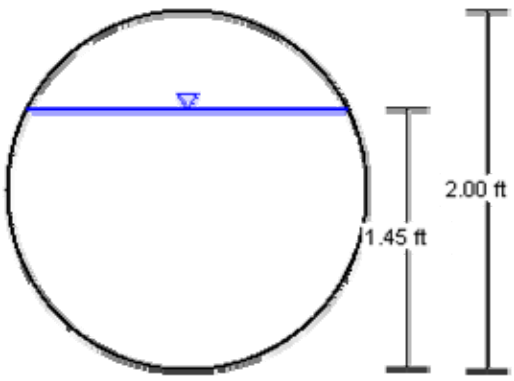
Project Description

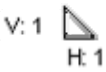
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00560	ft/ft
Normal Depth	1.45	ft
Diameter	2.00	ft
Discharge	14.80	ft^3/s

Cross Section Image





Pipe Segment 10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00650	ft/ft
Diameter	1.50	ft
Discharge	5.14	ft^3/s

Results

Normal Depth	0.84	ft
Flow Area	1.02	ft^2
Wetted Perimeter	2.54	ft
Top Width	1.49	ft
Critical Depth	0.87	ft
Percent Full	56.2	%
Critical Slope	0.00583	ft/ft
Velocity	5.02	ft/s
Velocity Head	0.39	ft
Specific Energy	1.24	ft
Froude Number	1.07	
Maximum Discharge	9.11	ft^3/s
Discharge Full	8.47	ft^3/s
Slope Full	0.00239	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	56.23	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

Pipe Segment 10

GVF Output Data

Normal Depth	0.84	ft
Critical Depth	0.87	ft
Channel Slope	0.00650	ft/ft
Critical Slope	0.00583	ft/ft

Cross Section for Pipe Segment 10

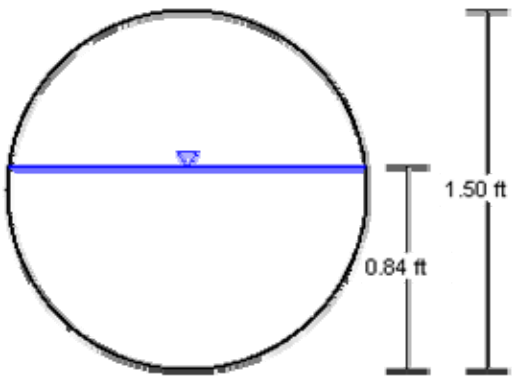
Project Description

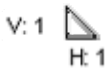
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00650	ft/ft
Normal Depth	0.84	ft
Diameter	1.50	ft
Discharge	5.14	ft^3/s

Cross Section Image





Post Development Inlets

Kaiser San Diego: Proposed Curb Inlets In Sag
RBF Consulting
JN: 25-105430
August 2012

City of San Diego - Design Guide
Chart 1-103.6A
Capacity of Curb Opening Inlets:

$$Q = 0.7L(A+Y)^{\frac{3}{2}}$$

Where:

A = 0.33 ft
Y = Height of Water at Curb Face = 0.4 ft Maximum
L = Length of Clear Opening of Inlet (ft)

L (ft)	Capture (cfs)
4	1.7
5	2.2
6	2.6
7	3.1
8	3.5
9	3.9
10	4.4

Kaiser San Diego: Proposed Grate Inlet (18"x18")
RBF Consulting
JN: 25-105430
August 2012

Weir and Orifice flow equations have been calculated below to determine the grate inlet capacity:

WEIR FLOW

Grate Inlet in Sag

$$Q = C_W * P_e * d^{\frac{3}{2}}$$

Where:

Q = inlet capacity of grated inlet (cfs)
C_W = weir coefficient (3.0 for U.S. Traditional Units)
P_e = effective grate perimeter length (ft)
d = flow depth approaching inlet (ft)

$$P_e = (1 - C_L) * P$$

Where:

P_e = effective grate perimeter (ft)
C_L = clogging factor (0.5)
P = actual grate perimeter (ft)
P = 1.5' x 4

C_W =	3	
P_e =	3	ft
d =	0.5	ft
Q =	3.2	cfs

ORIFICE FLOW

Grate Inlet in Sag

$$Q = C_O * A_e * \sqrt{2 * g * d}$$

Where:

Q = inlet capacity of grated inlet (cfs)
C_O = orifice coefficient (0.67)
A_e = effective grate area (ft^2)
g = gravitational acceleration (ft/s^2)
d = flow depth above inlet (ft)

$$A_e = (1 - C_A) * A$$

Where:

A_e = effective grate area (ft^2)
C_A = area clogging factor (0.5)
A = actual opening of grate inlet
A = 1.5' x 1.5' x 0.85 (15% less to account for area of bars)

C_O =	0.67	
A_e =	0.96	ft^2
g =	32.2	ft/s^2
d =	0.5	ft
Q =	3.6	cfs

Weir flow equation governs.
A 18" x 18" grate inlet in sag will capture approximately 3.2 cfs.

Kaiser San Diego: Proposed Grate Inlet (24"x24")
RBF Consulting
JN: 25-105430
August 2012

Weir and Orifice flow equations have been calculated below to determine the grate inlet capacity:

WEIR FLOW

Grate Inlet in Sag

$$Q = C_W * P_e * d^{\frac{3}{2}}$$

Where:

Q = inlet capacity of grated inlet (cfs)
C_W = weir coefficient (3.0 for U.S. Traditional Units)
P_e = effective grate perimeter length (ft)
d = flow depth approaching inlet (ft)

$$P_e = (1 - C_L) * P$$

Where:

P_e = effective grate perimeter (ft)
C_L = clogging factor (0.5)
P = actual grate perimeter (ft)
P = 2' x 4

C_W =	3	
P_e =	4	ft
d =	0.5	ft
Q =	4.2	cfs

ORIFICE FLOW

Grate Inlet in Sag

$$Q = C_O * A_e * \sqrt{2 * g * d}$$

Where:

Q = inlet capacity of grated inlet (cfs)
C_O = orifice coefficient (0.67)
A_e = effective grate area (ft^2)
g = gravitational acceleration (ft/s^2)
d = flow depth above inlet (ft)

$$A_e = (1 - C_A) * A$$

Where:

A_e = effective grate area (ft^2)
C_A = area clogging factor (0.5)
A = actual opening of grate inlet
A = 2' x 2' x 0.85 (15% less to account for area of bars)

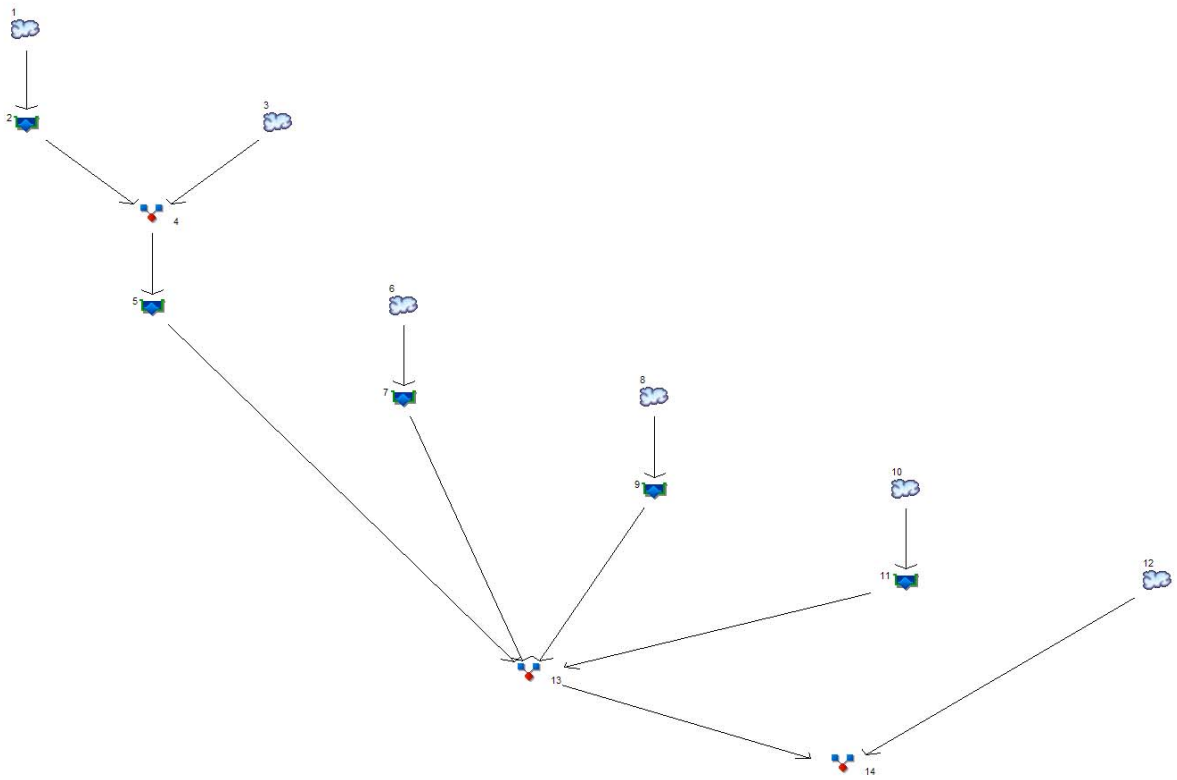
C_O =	0.67	
A_e =	1.7	ft^2
g =	32.2	ft/s^2
d =	0.5	ft
Q =	6.5	cfs

Weir flow equation governs.
A 24" x 24" grate inlet in sag will capture approximately 4.2 cfs.

Hydraflow Hydrographs Output

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.1



Legend

Hyd.	Origin	Description
1	SCS Runoff	Tank Inflow
2	Reservoir	Pump Outflow from tank
3	SCS Runoff	Overland to FTP Node 40 B
4	Combine	Total FTP B Inflow (Includes Pump)
5	Reservoir	FTP Out N40 B
6	SCS Runoff	Overland to FTP Node 40 A
7	Reservoir	FTP Out N40 A
8	SCS Runoff	Overland to FTP Node 20
9	Reservoir	FTP Out Node 20
10	SCS Runoff	Overland to FTP Node 60
11	Reservoir	FTP Out Node 60
12	SCS Runoff	Driveway Bypass to Node 100
13	Combine	Flow to Node 100 (less bypass)
14	Combine	Total Flow to Node 100

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	1.608	1	961	4,884	----	------	------	Tank Inflow
2	Reservoir	0.753	1	966	4,881	1	104.84	1,393	Pump Outflow from tank
3	SCS Runoff	1.250	1	961	3,649	----	------	------	Overland to FTP Node 40 B
4	Combine	1.360	1	966	8,530	2, 3	------	------	Total FTP B Inflow (Includes Pump)
5	Reservoir	0.009	1	1704	228	4	102.53	8,461	FTP Out N40 B
6	SCS Runoff	2.915	1	961	8,318	----	------	------	Overland to FTP Node 40 A
7	Reservoir	0.030	1	1439	637	6	102.06	8,152	FTP Out N40 A
8	SCS Runoff	2.008	1	961	5,730	----	------	------	Overland to FTP Node 20
9	Reservoir	0.005	1	1450	59	8	102.52	5,723	FTP Out Node 20
10	SCS Runoff	5.091	1	961	16,513	----	------	------	Overland to FTP Node 60
11	Reservoir	0.000	1	n/a	0	10	102.31	16,513	FTP Out Node 60
12	SCS Runoff	0.408	1	961	1,348	----	------	------	Driveway Bypass to Node 100
13	Combine	0.034	1	1447	924	5, 7, 9, 11,	------	------	Flow to Node 100 (less bypass)
14	Combine	0.408	1	961	2,272	12, 13	------	------	Total Flow to Node 100

Hydraflow Table of Contents

Kaiser 2007 Bioretention with media v3.gpw

Hydraflow Hydrographs by Intelisolve v9.1

Thursday, Jan 10, 2013

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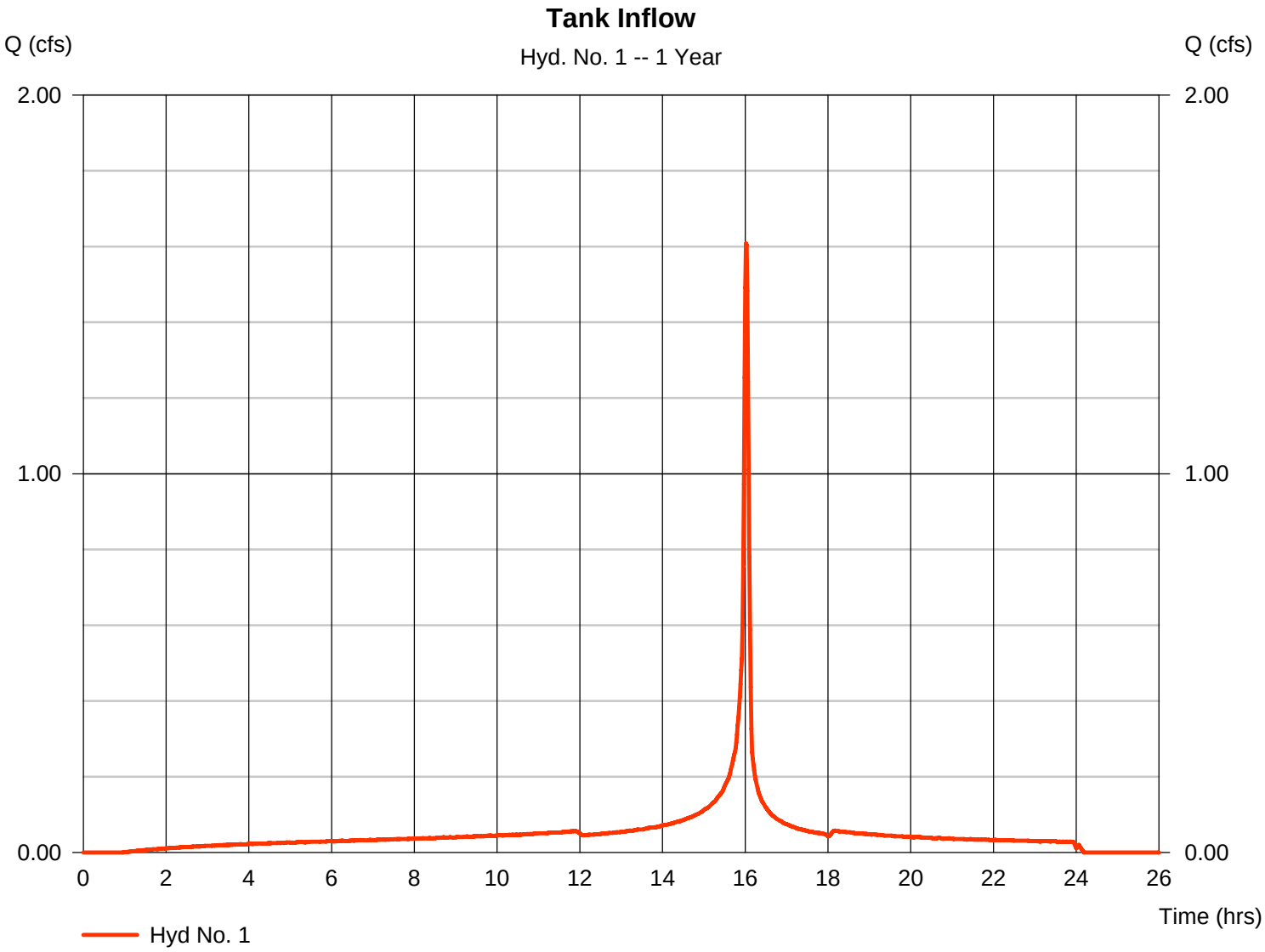
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Jan 10, 2013

Hyd. No. 1

Tank Inflow

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.608 cfs
Storm frequency	=	1 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	4,884 cuft
Drainage area	=	2.400 ac	Curve number	=	99.5
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.60 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



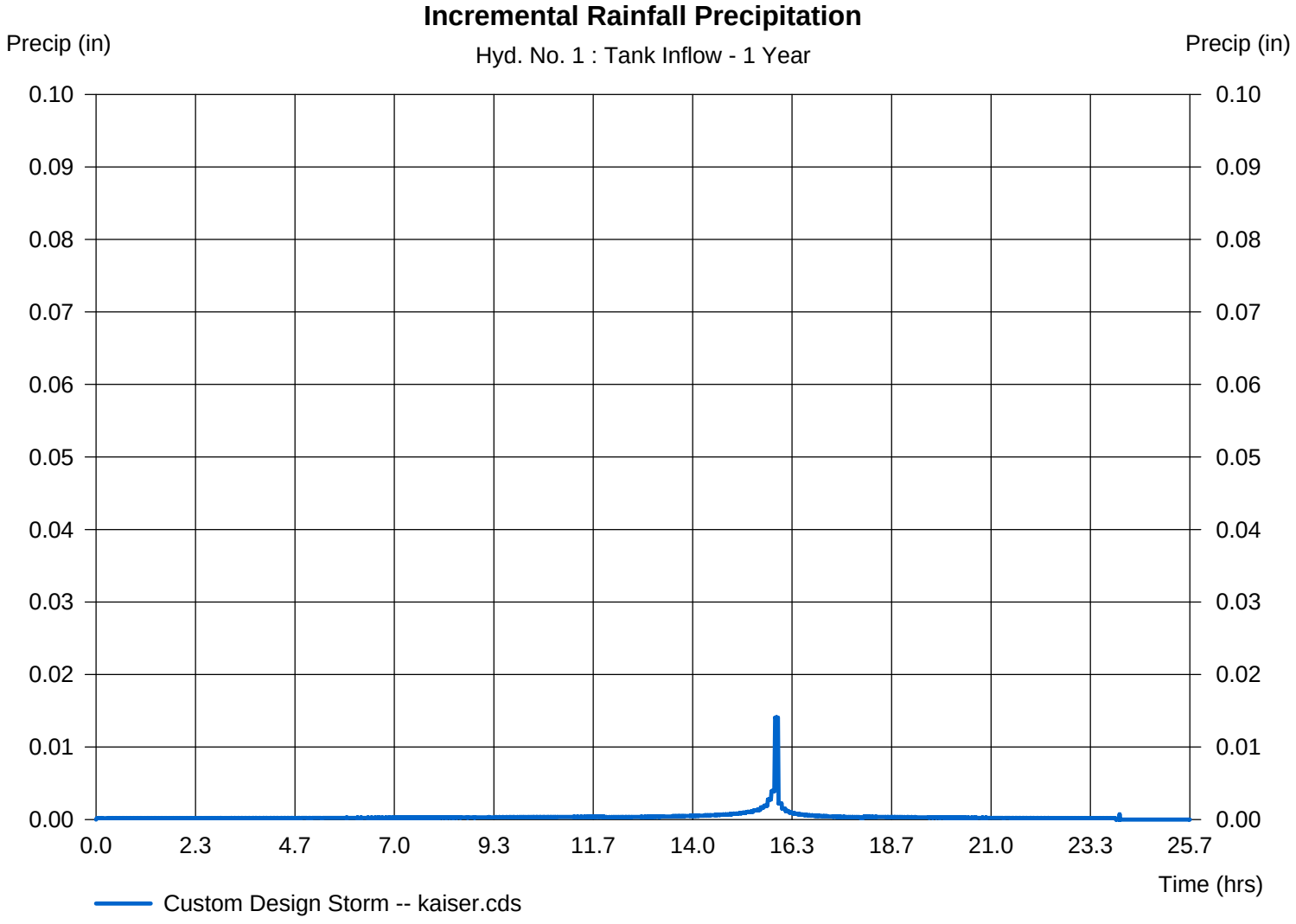
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 1

Tank Inflow

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 0.6000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



Hydrograph Report

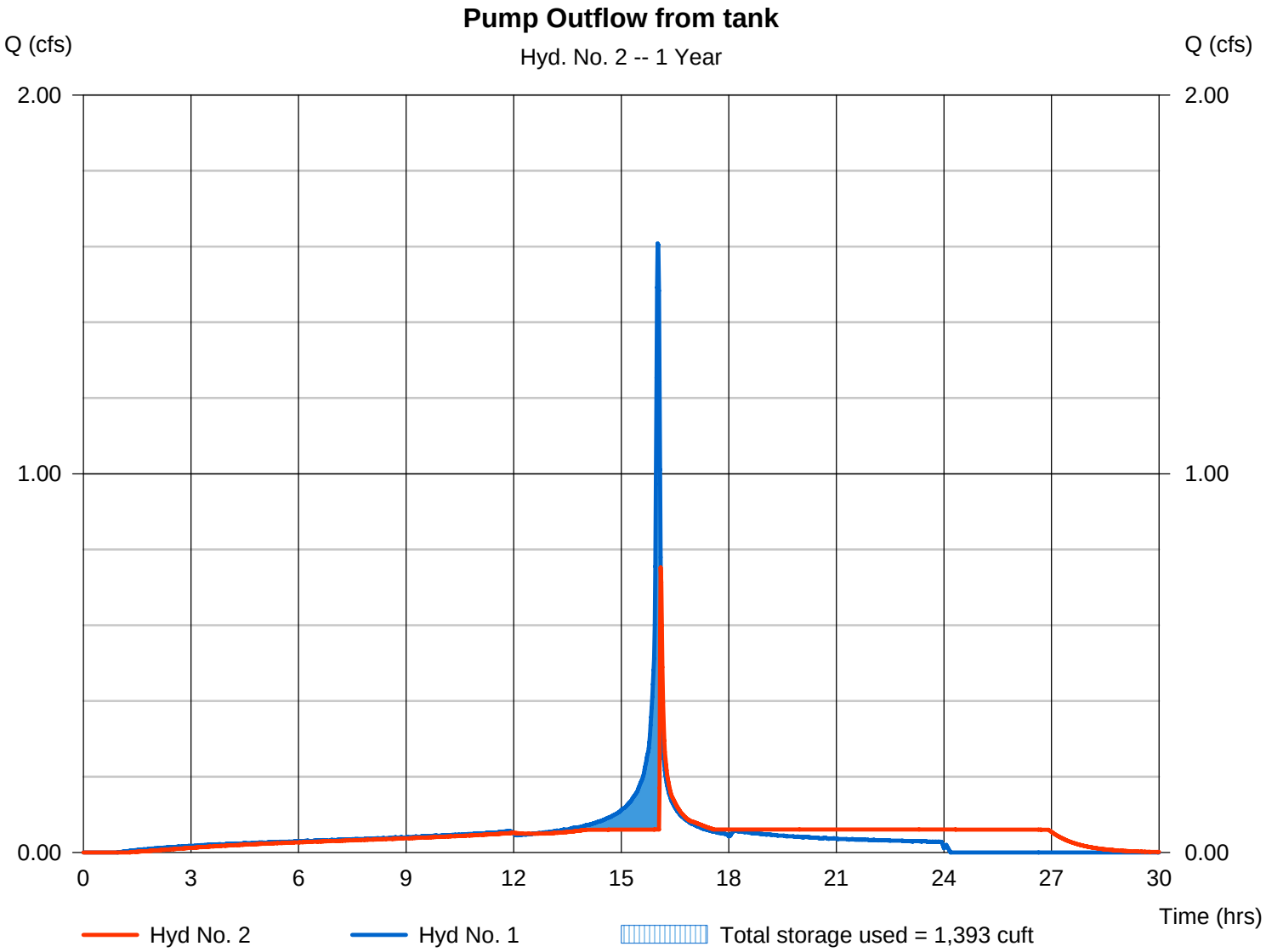
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 2

Pump Outflow from tank

Hydrograph type	=	Reservoir	Peak discharge	=	0.753 cfs
Storm frequency	=	1 yrs	Time to peak	=	16.10 hrs
Time interval	=	1 min	Hyd. volume	=	4,881 cuft
Inflow hyd. No.	=	1 - Tank Inflow	Max. Elevation	=	104.84 ft
Reservoir name	=	Storage Tank	Max. Storage	=	1,393 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Jan 10, 2013

Pond No. 1 - Storage Tank

Pond Data

Trapezoid - Bottom L x W = 24.0 x 12.0 ft, Side slope = 0.0:1, Bottom elev. = 100.00 ft, Depth = 6.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	288	0	0
0.60	100.60	288	173	173
1.20	101.20	288	173	346
1.80	101.80	288	173	518
2.40	102.40	288	173	691
3.00	103.00	288	173	864
3.60	103.60	288	173	1,037
4.20	104.20	288	173	1,210
4.80	104.80	288	173	1,382
5.40	105.40	288	173	1,555
6.00	106.00	288	173	1,728

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 104.50	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

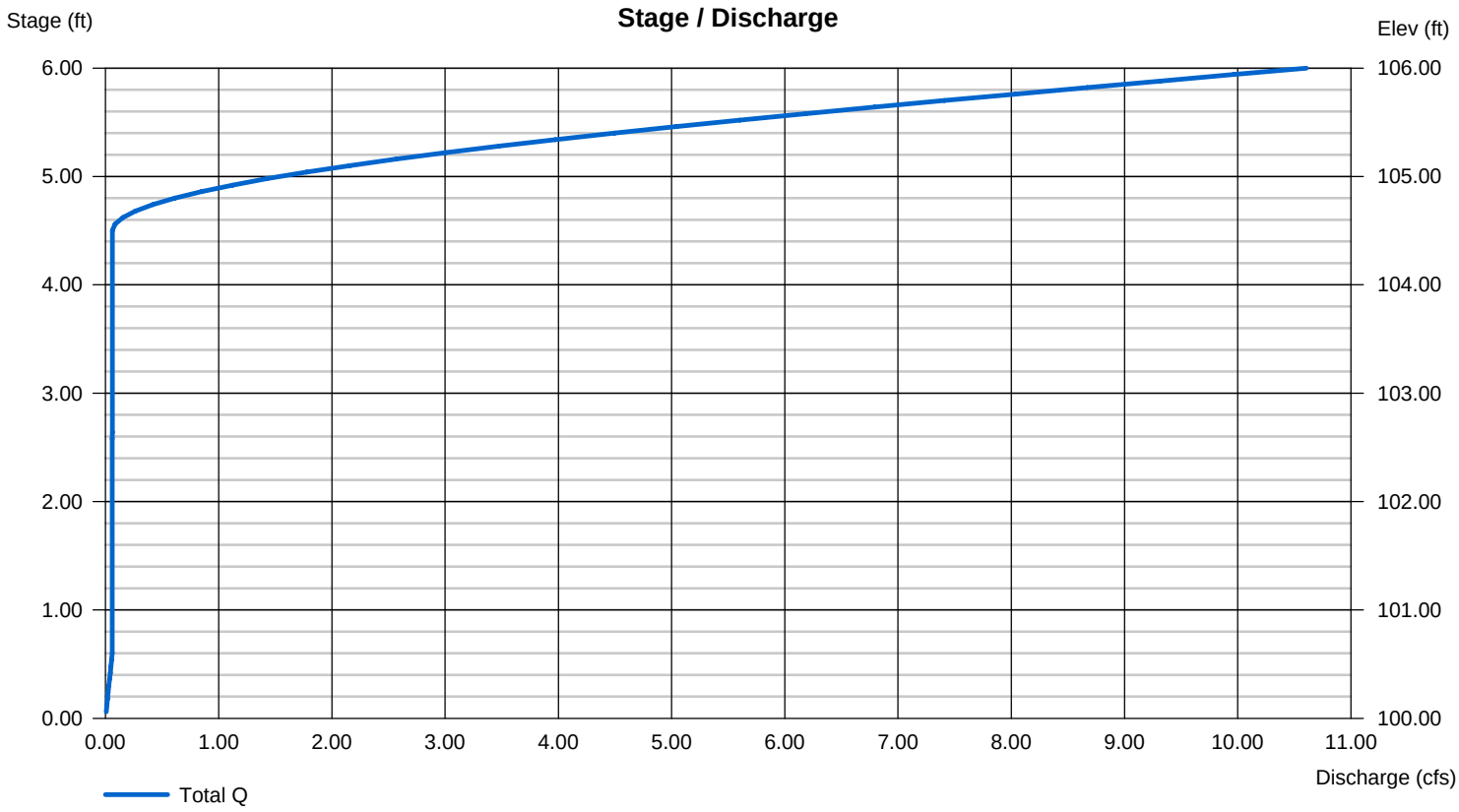
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



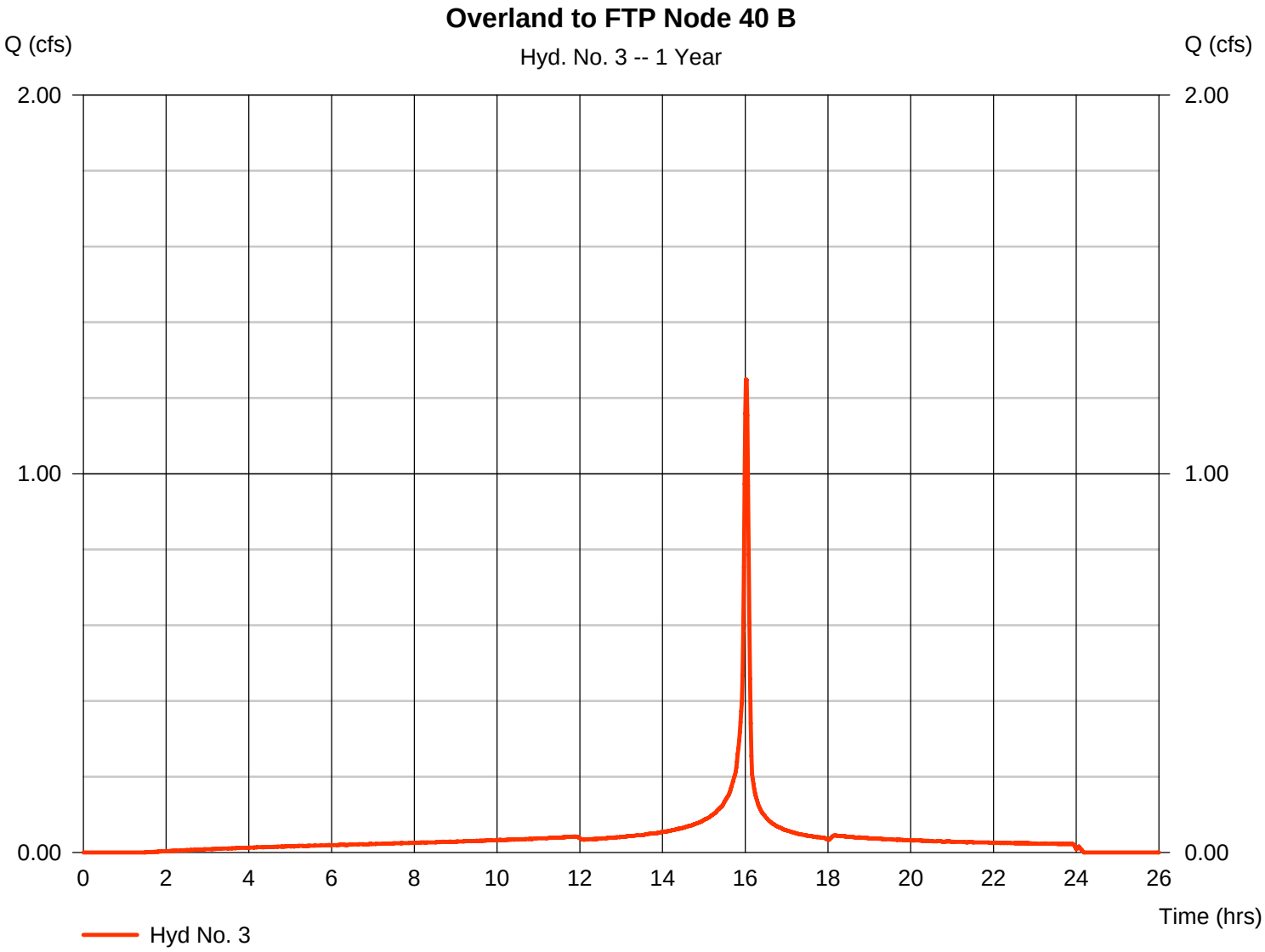
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Jan 10, 2013

Hyd. No. 3

Overland to FTP Node 40 B

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.250 cfs
Storm frequency	=	1 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	3,649 cuft
Drainage area	=	1.900 ac	Curve number	=	99.2
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.60 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



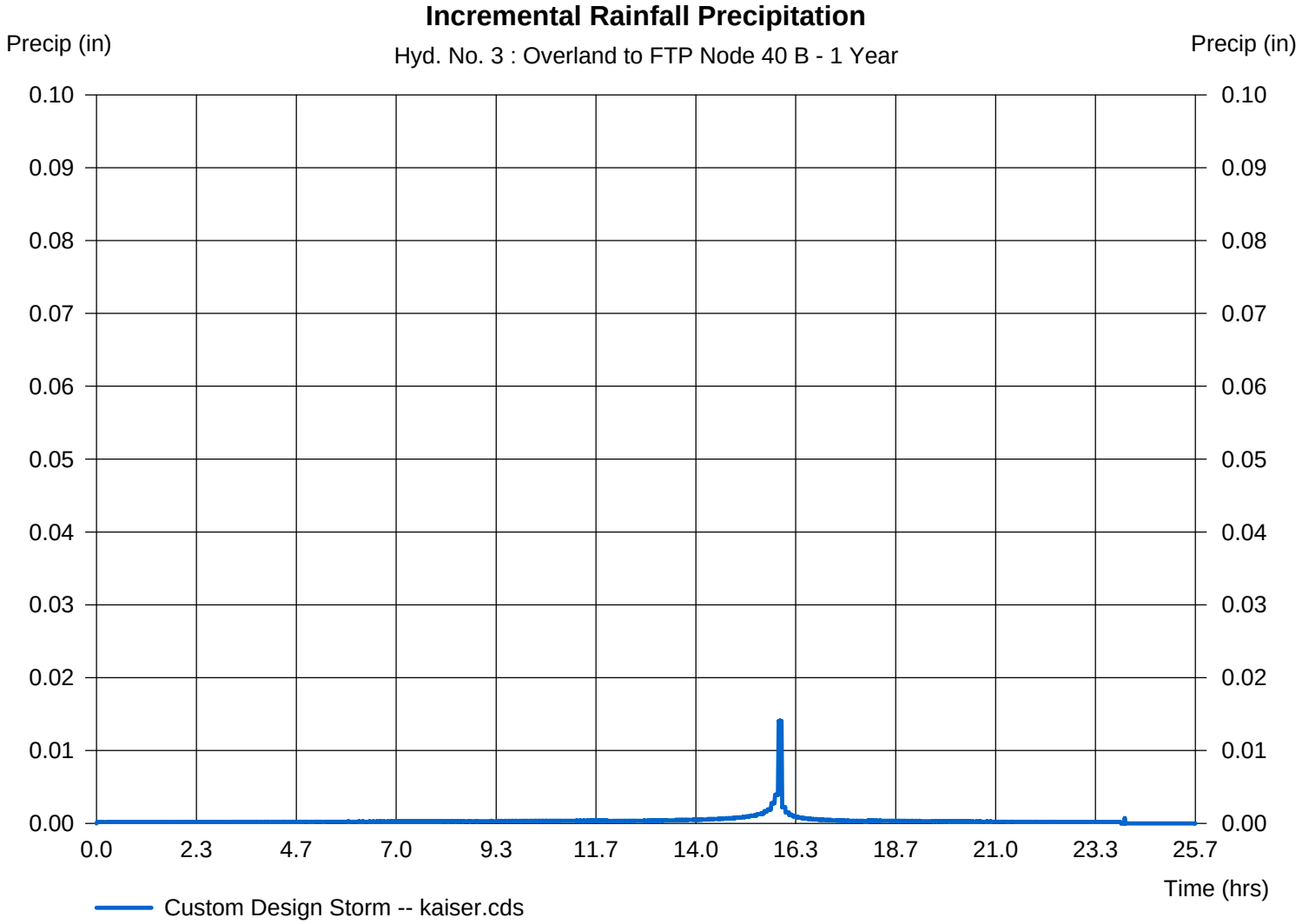
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 3

Overland to FTP Node 40 B

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 0.6000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



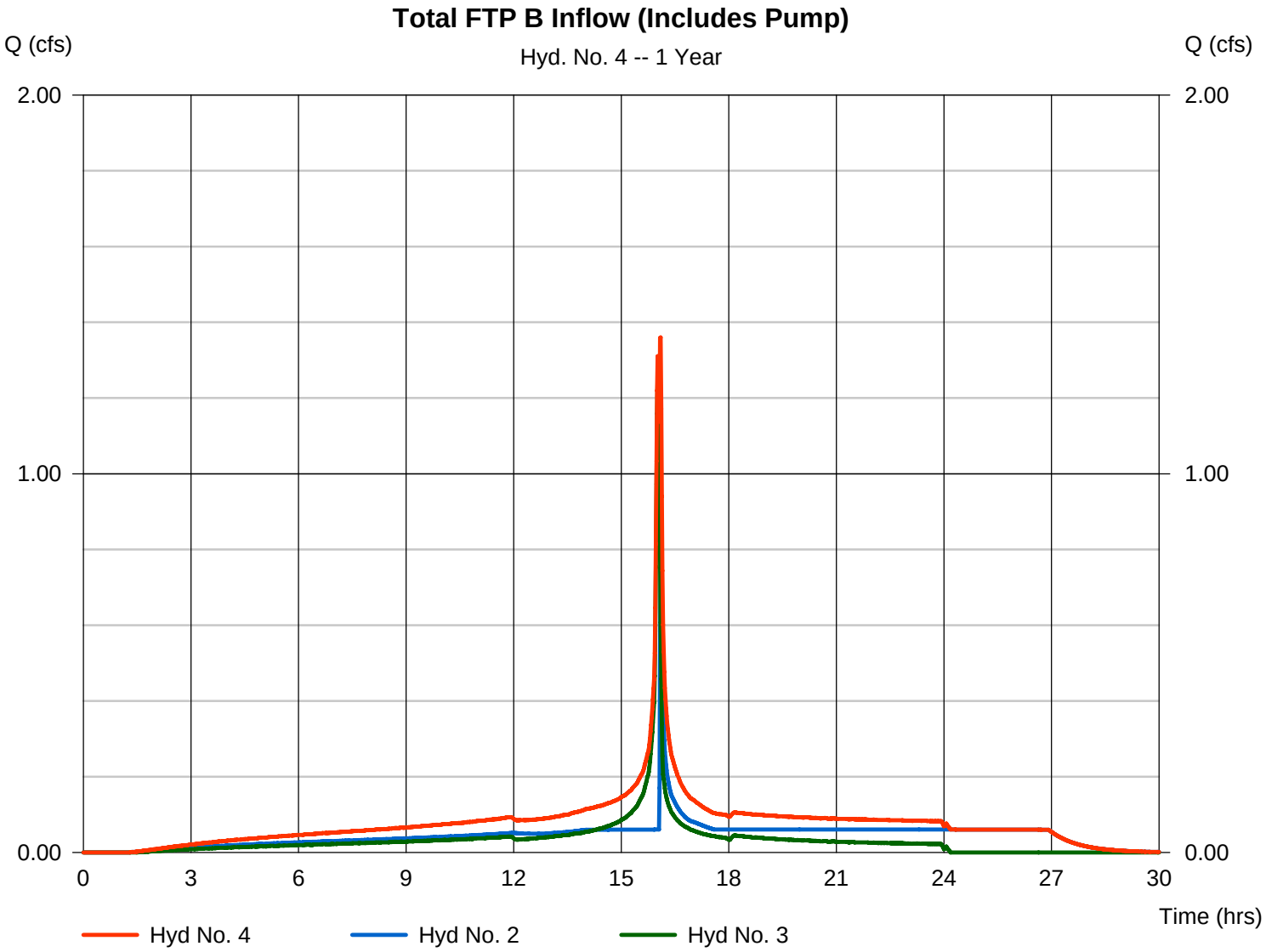
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 4

Total FTP B Inflow (Includes Pump)

Hydrograph type	= Combine	Peak discharge	= 1.360 cfs
Storm frequency	= 1 yrs	Time to peak	= 16.10 hrs
Time interval	= 1 min	Hyd. volume	= 8,530 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 1.900 ac



Hydrograph Report

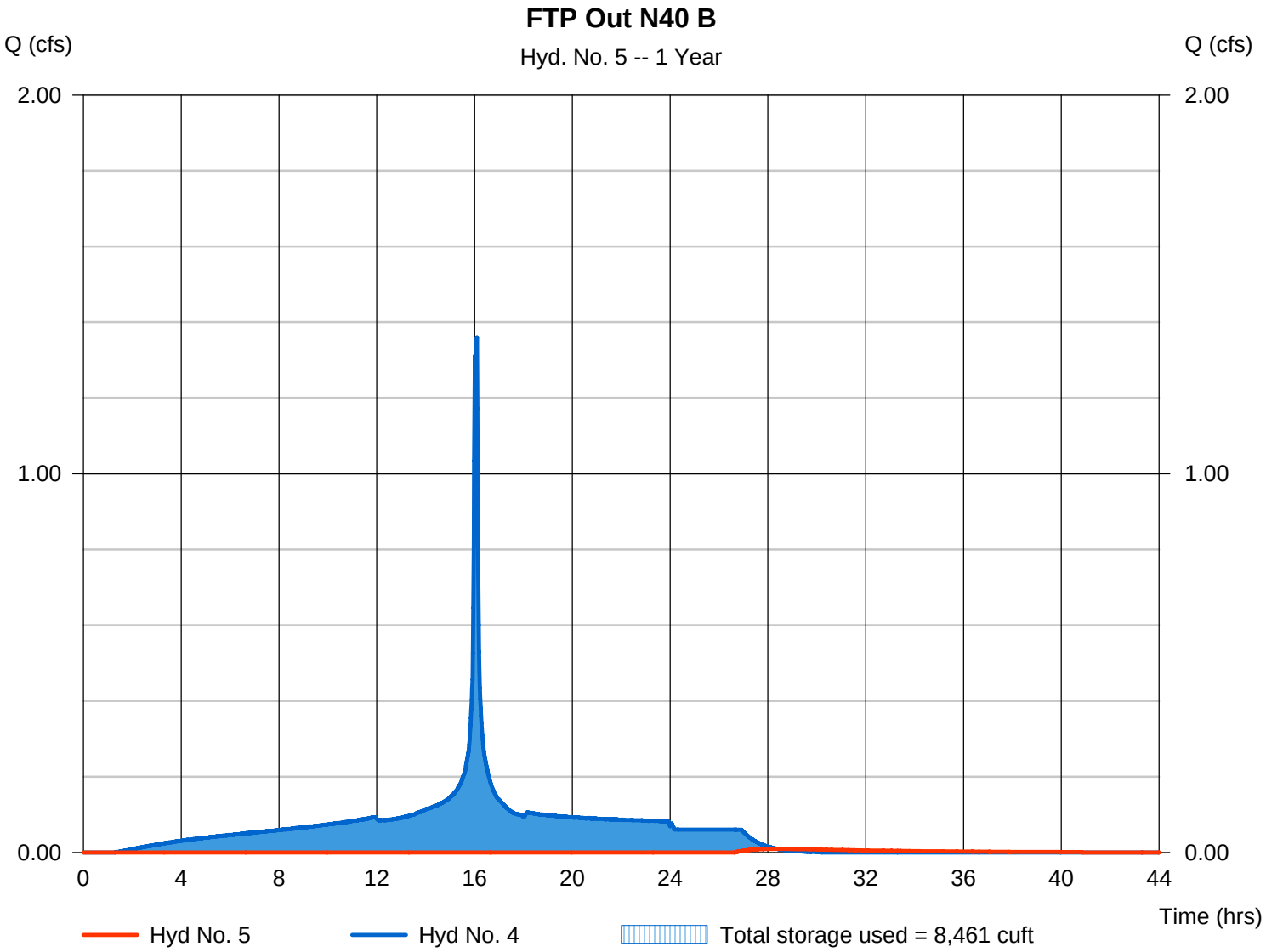
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 5

FTP Out N40 B

Hydrograph type	=	Reservoir	Peak discharge	=	0.009 cfs
Storm frequency	=	1 yrs	Time to peak	=	28.40 hrs
Time interval	=	1 min	Hyd. volume	=	228 cuft
Inflow hyd. No.	=	4 - Total FTP B Inflow (Includes Pump)	Max. Elevation	=	102.53 ft
Reservoir name	=	FTP at Node 40 B	Max. Storage	=	8,461 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Jan 10, 2013

Pond No. 5 - FTP at Node 40 B

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	1,500	0	0
0.50	100.50	1,500	750	750
1.00	101.00	1,500	750	1,500
1.50	101.50	4,792	1,495	2,995
2.00	102.00	5,289	2,519	5,514
2.50	102.50	5,792	2,769	8,283
3.00	103.00	6,303	3,023	11,306
3.50	103.50	6,820	3,280	14,585
4.00	104.00	30,000	8,520	23,105
4.50	104.50	50,000	19,786	42,891

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 102.50	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

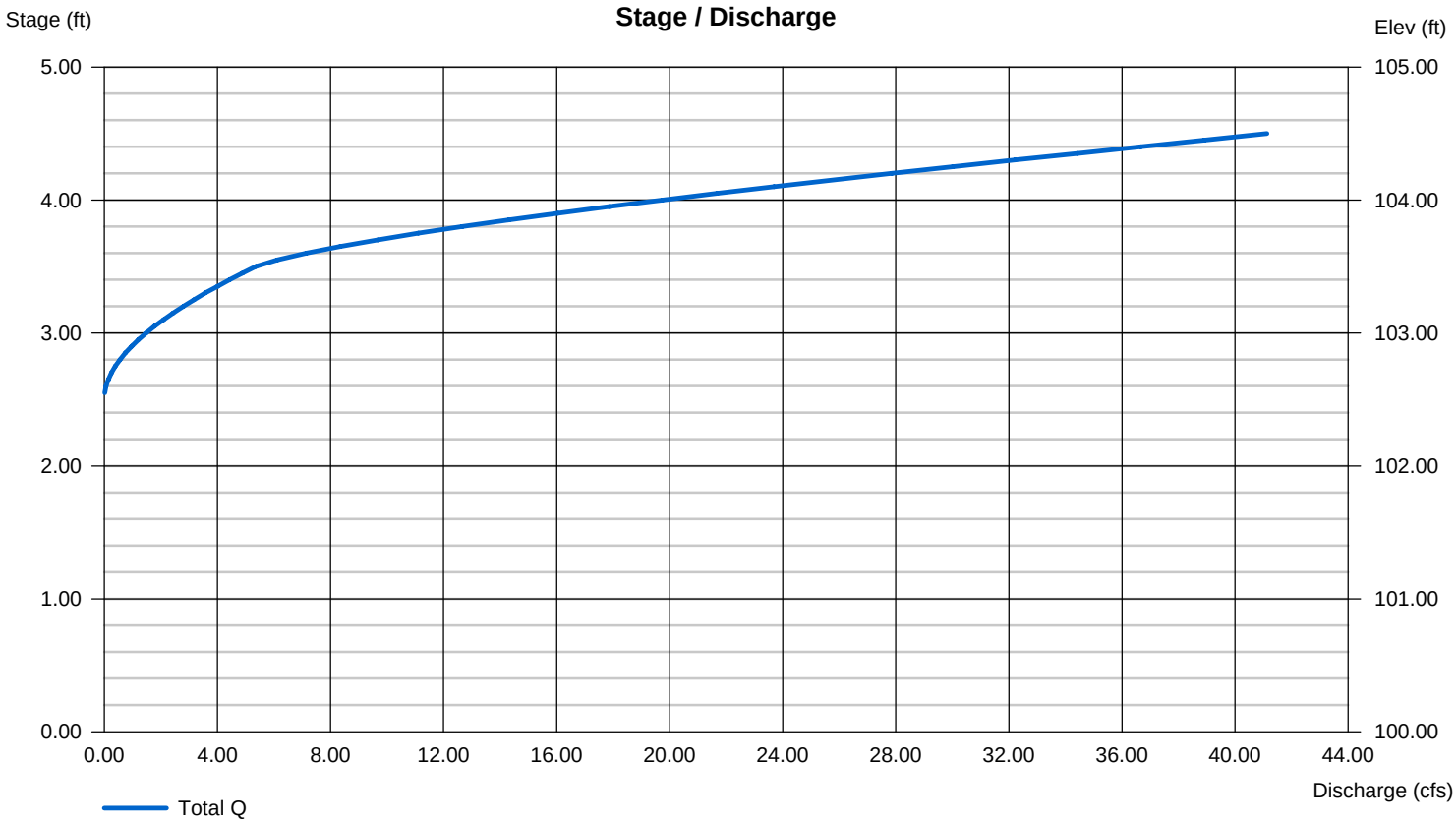
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 103.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



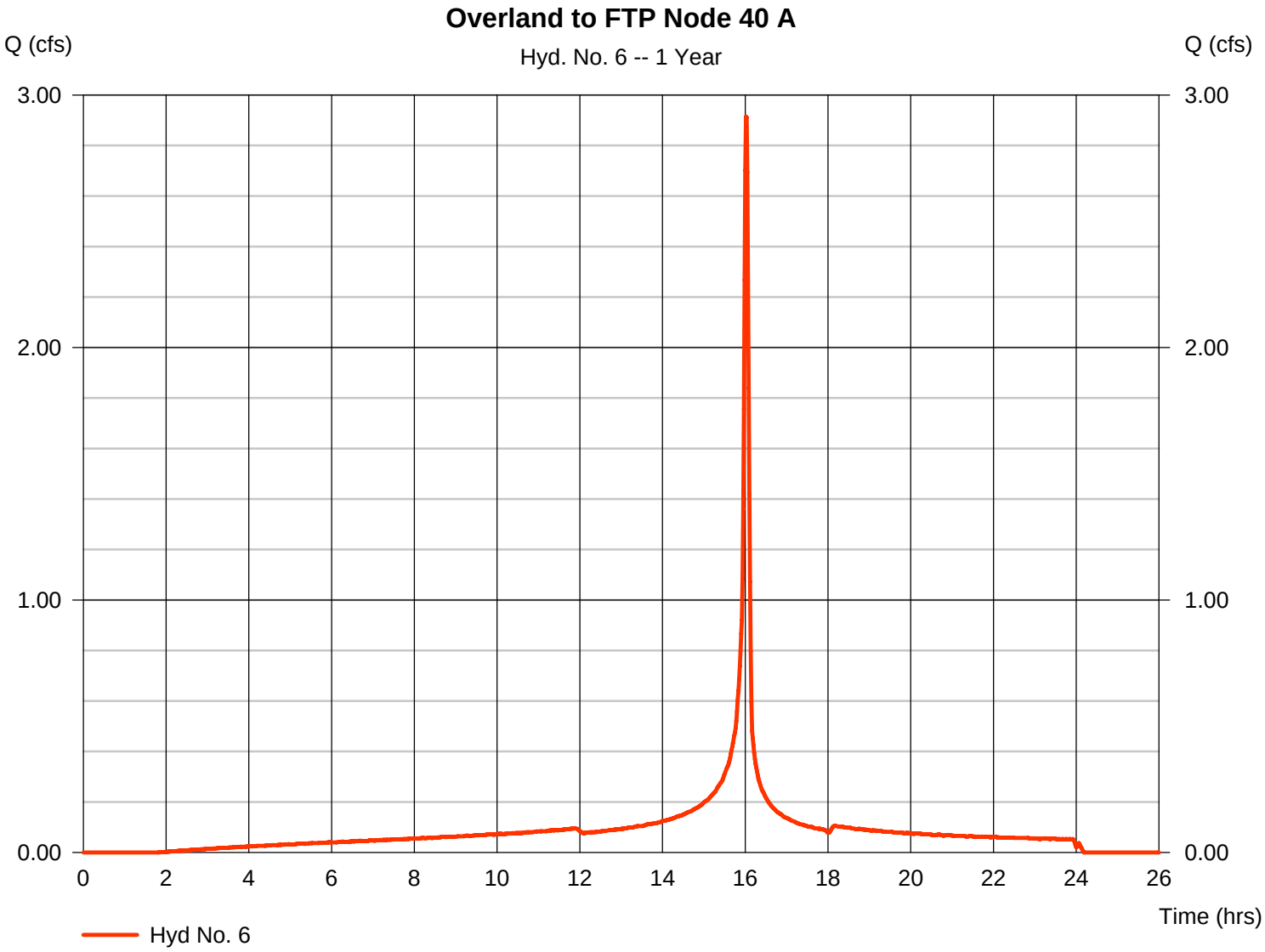
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 6

Overland to FTP Node 40 A

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.915 cfs
Storm frequency	=	1 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	8,318 cuft
Drainage area	=	4.500 ac	Curve number	=	99
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.60 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



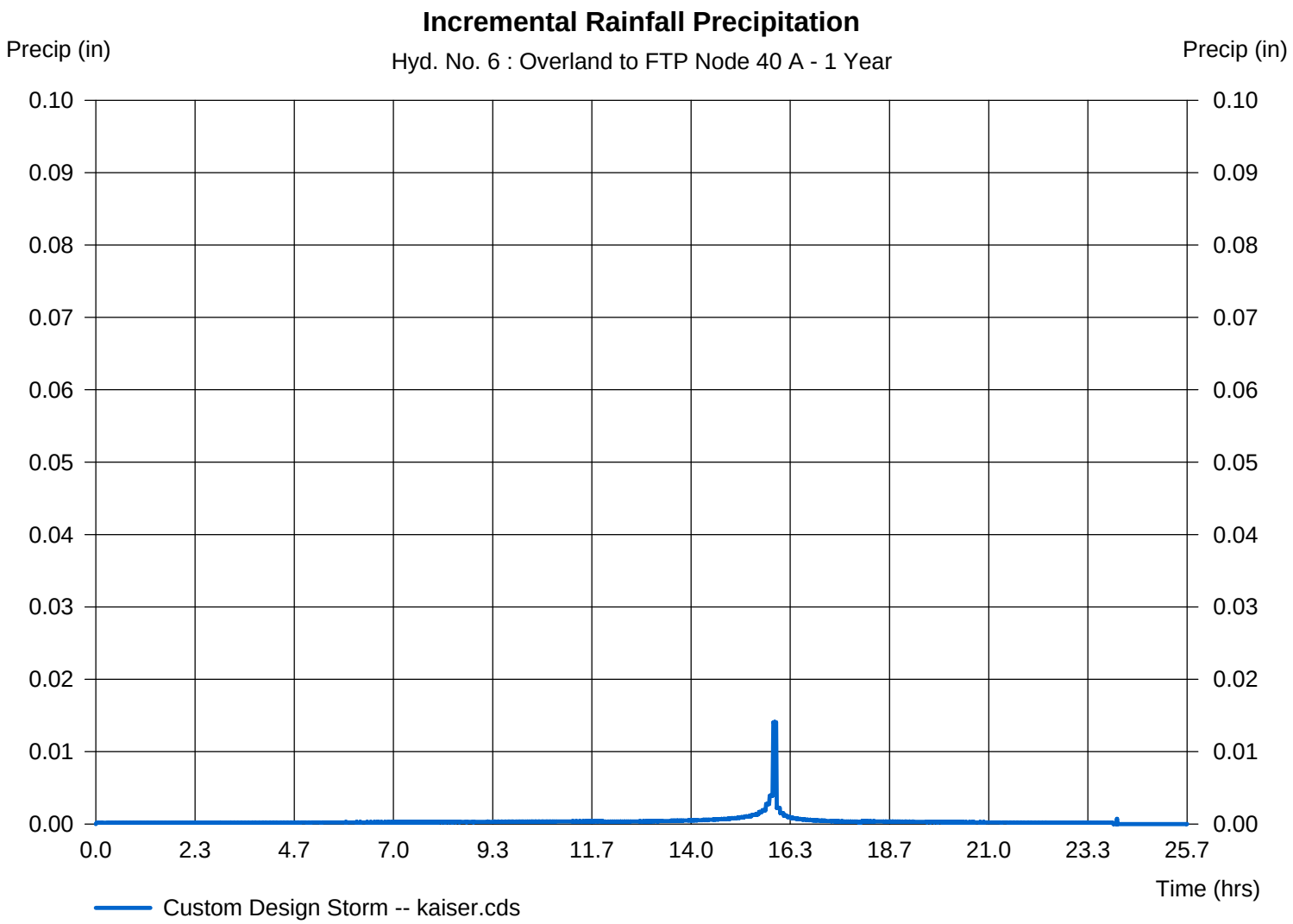
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 6

Overland to FTP Node 40 A

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 0.6000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



Hydrograph Report

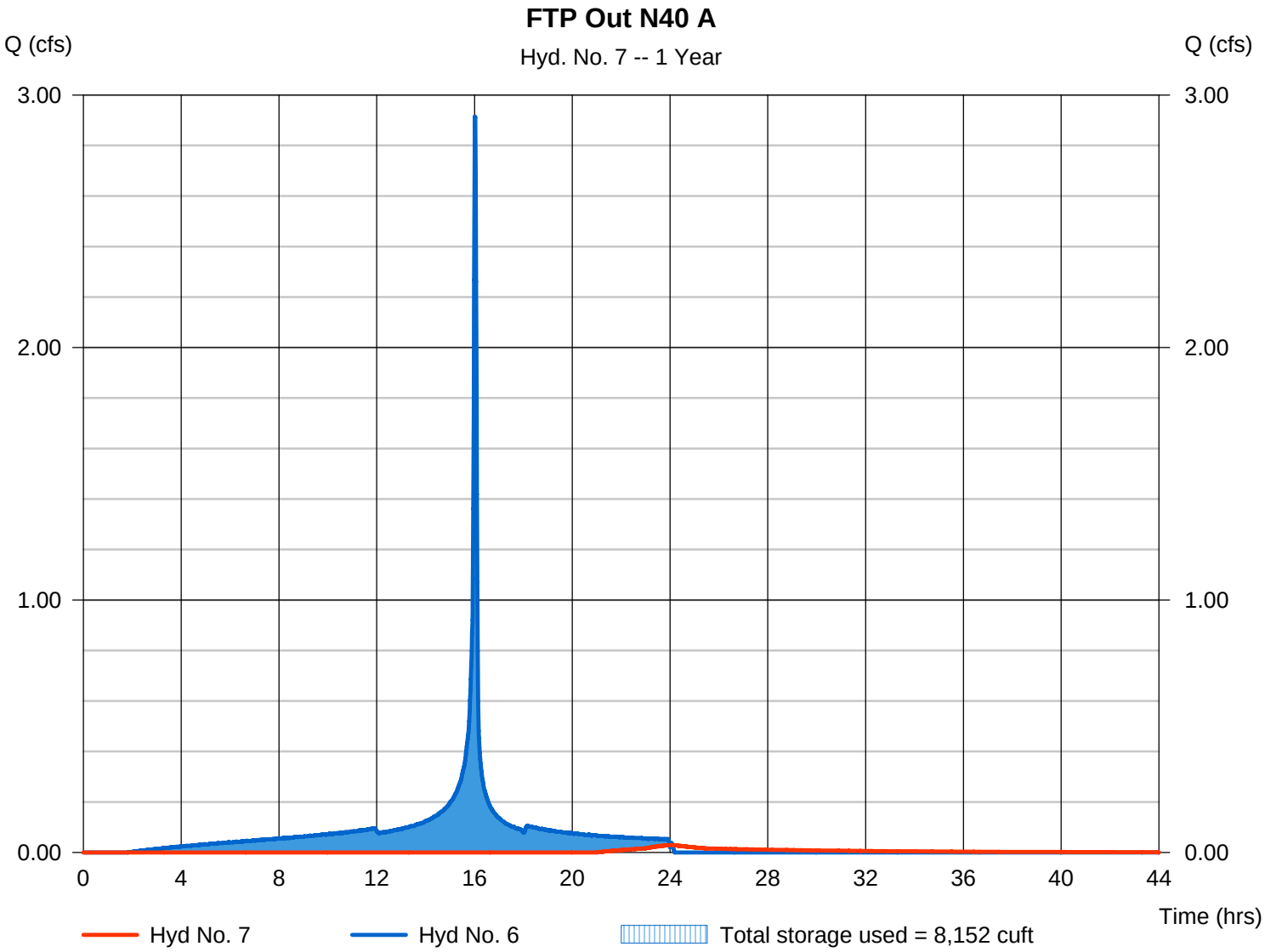
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 7

FTP Out N40 A

Hydrograph type	=	Reservoir	Peak discharge	=	0.030 cfs
Storm frequency	=	1 yrs	Time to peak	=	23.98 hrs
Time interval	=	1 min	Hyd. volume	=	637 cuft
Inflow hyd. No.	=	6 - Overland to FTP Node 40 A	Max. Elevation	=	102.06 ft
Reservoir name	=	Flow Through Planter at Node 40 A	Max. Storage	=	8,152 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Pond No. 2 - Flow Through Planter at Node 40 A

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	2,000	0	0
0.50	100.50	2,000	1,000	1,000
1.00	101.00	2,000	1,000	2,000
1.50	101.50	6,846	2,091	4,091
2.00	102.00	7,426	3,567	7,657
2.50	102.50	8,011	3,858	11,515
3.00	103.00	8,603	4,152	15,667
3.50	103.50	9,201	4,450	20,117
4.00	104.00	30,000	9,302	29,419
4.50	104.50	50,000	19,786	49,205

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 102.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

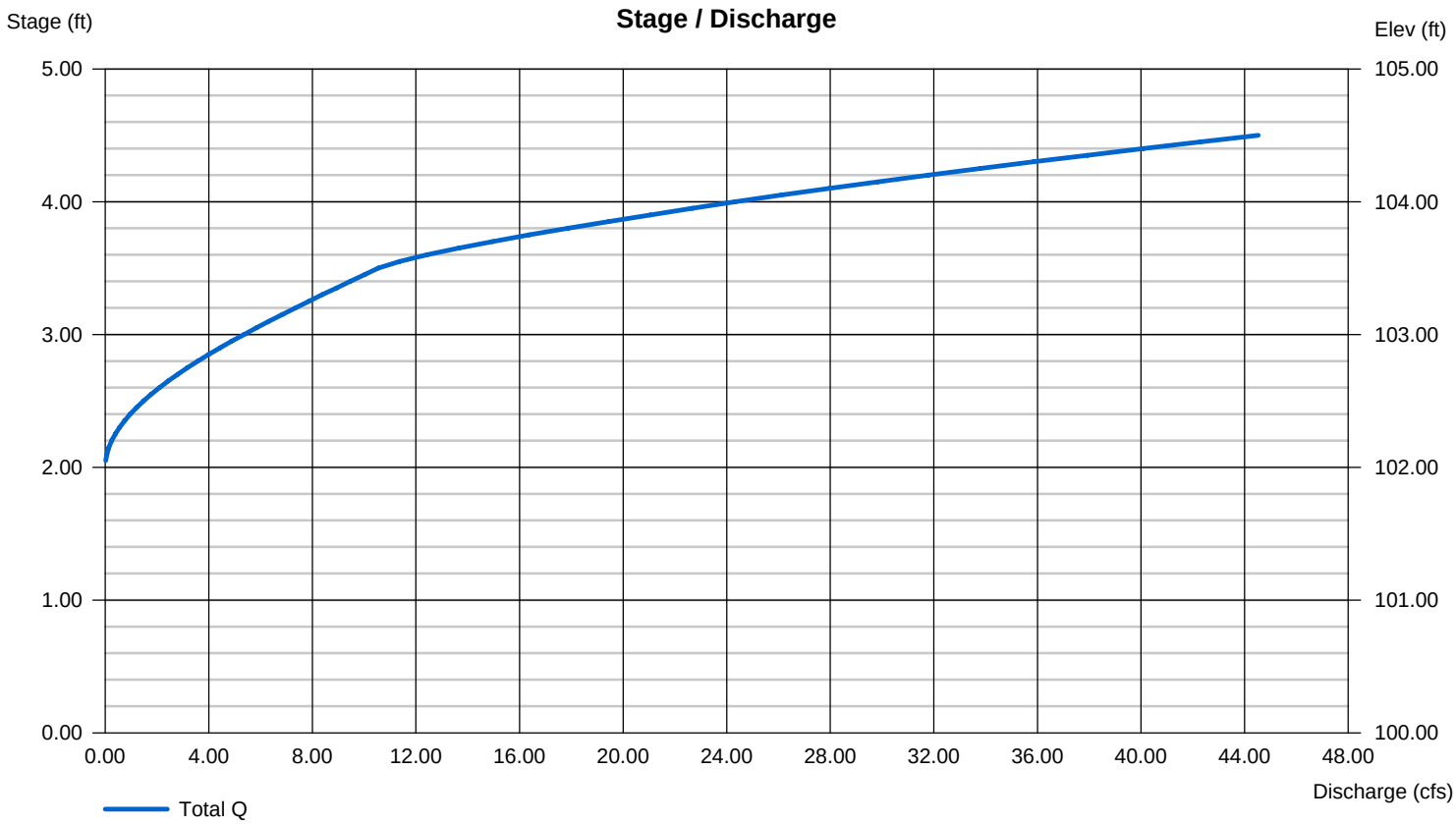
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 103.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



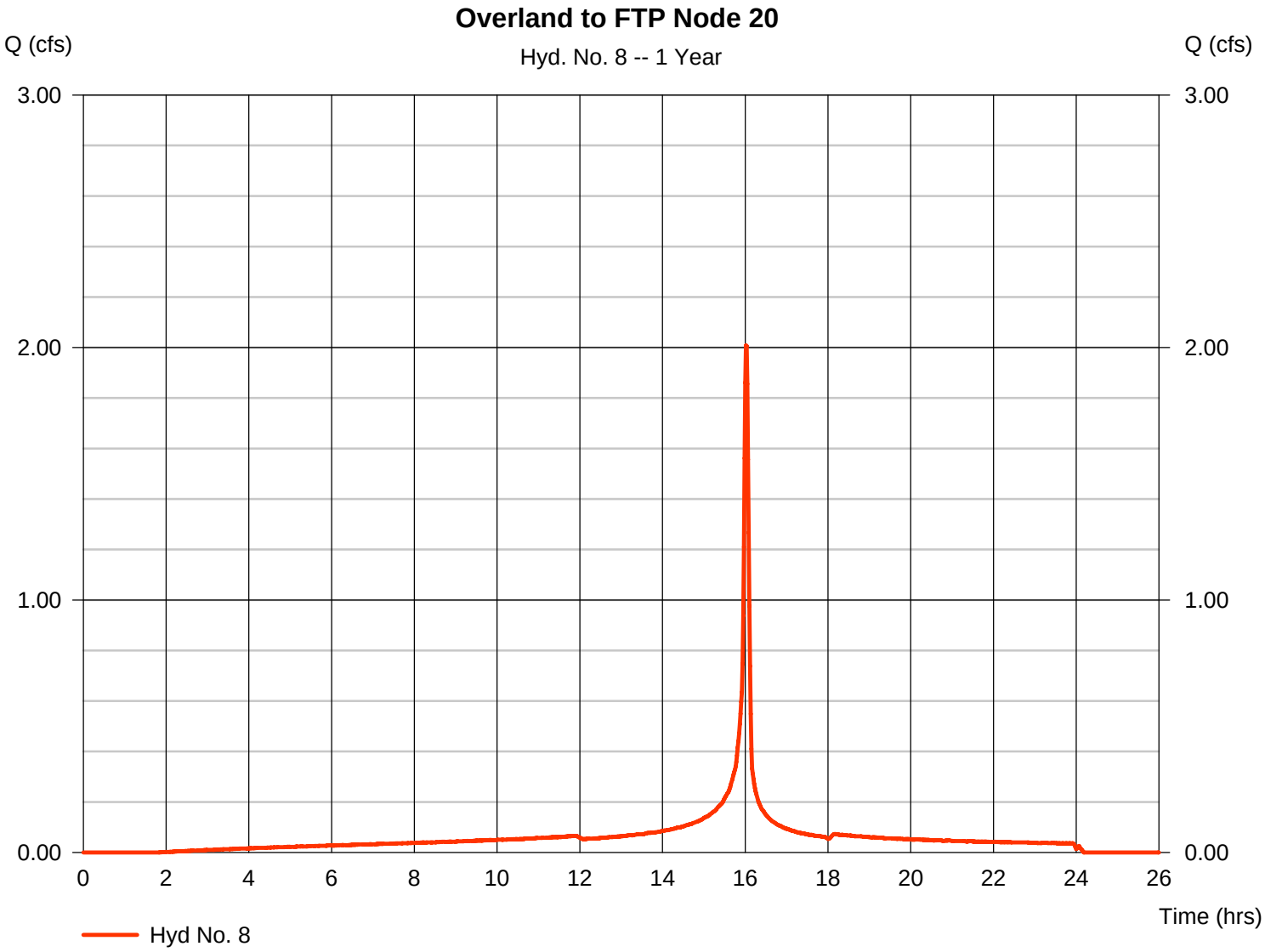
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 8

Overland to FTP Node 20

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.008 cfs
Storm frequency	=	1 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	5,730 cuft
Drainage area	=	3.100 ac	Curve number	=	99
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.60 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



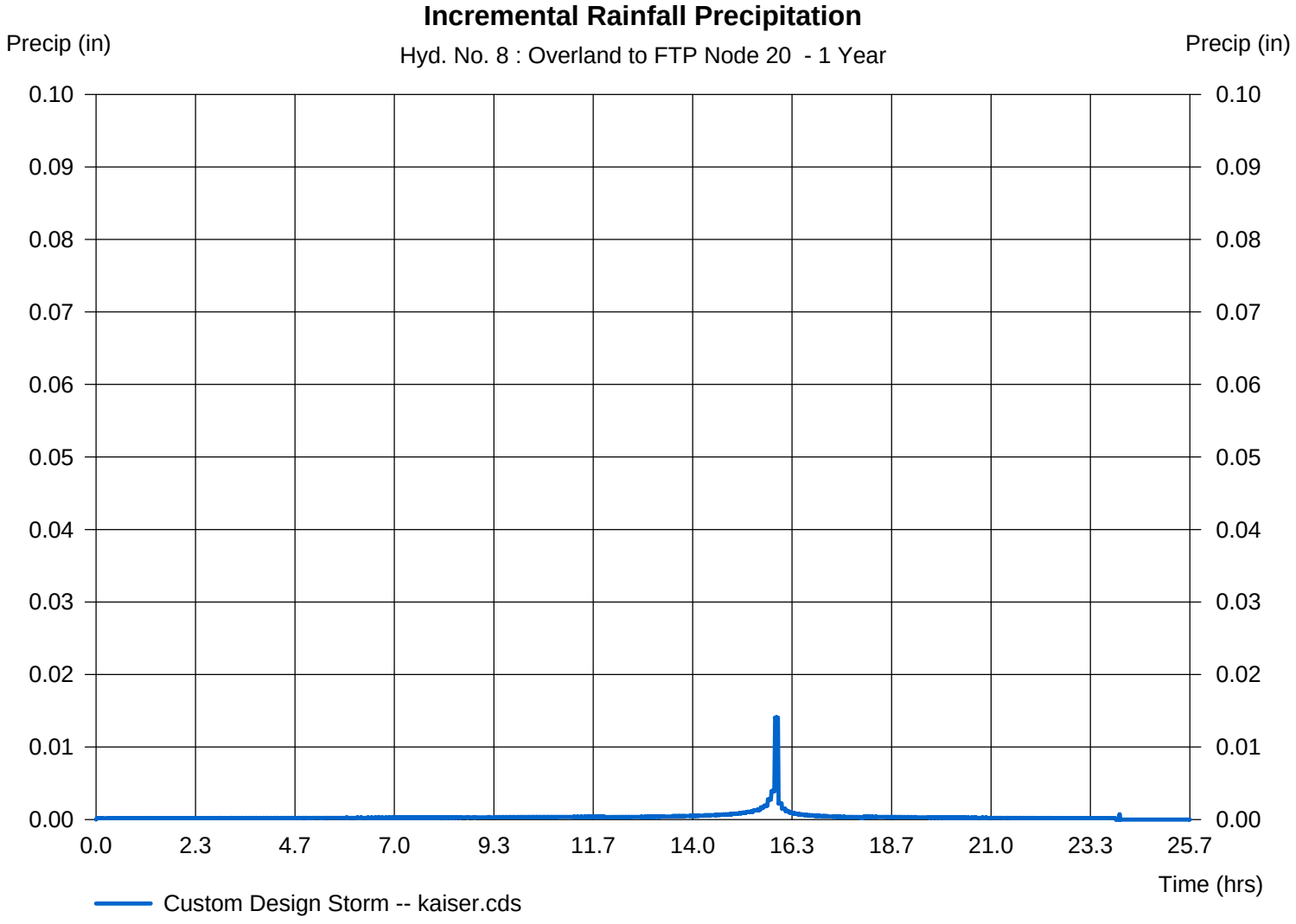
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 8

Overland to FTP Node 20

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 0.6000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



Hydrograph Report

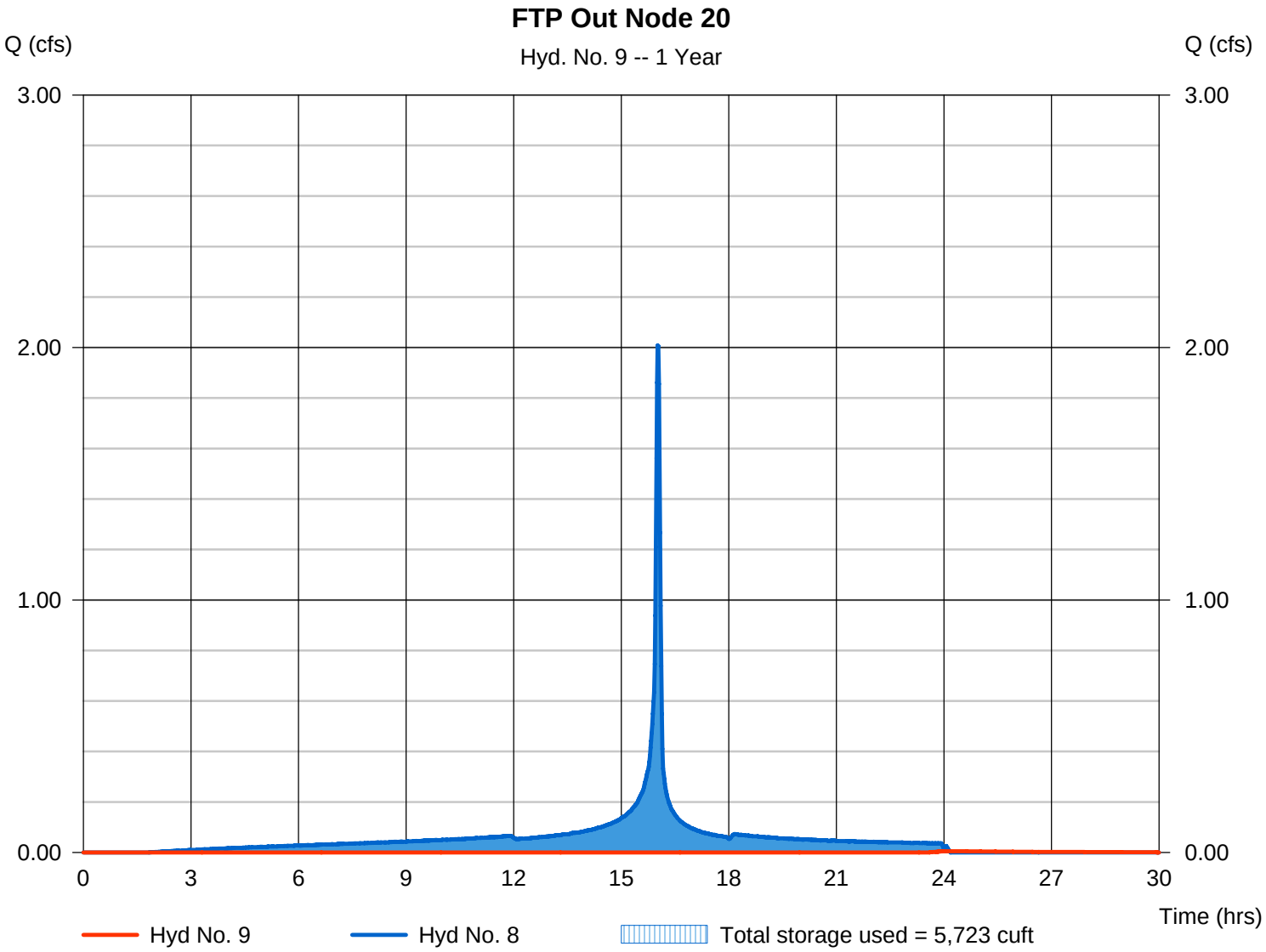
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 9

FTP Out Node 20

Hydrograph type	=	Reservoir	Peak discharge	=	0.005 cfs
Storm frequency	=	1 yrs	Time to peak	=	24.17 hrs
Time interval	=	1 min	Hyd. volume	=	59 cuft
Inflow hyd. No.	=	8 - Overland to FTP Node 20	Max. Elevation	=	102.52 ft
Reservoir name	=	FTP at Node 20	Max. Storage	=	5,723 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Jan 10, 2013

Pond No. 6 - FTP at Node 20

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	1,000	0	0
0.50	100.50	1,000	500	500
1.00	101.00	1,000	500	1,000
1.50	101.50	3,327	1,025	2,025
2.00	102.00	3,633	1,739	3,764
2.50	102.50	3,945	1,894	5,658
3.00	103.00	4,264	2,052	7,710
3.50	103.50	4,589	2,213	9,922
4.00	104.00	10,000	3,560	13,482
4.50	104.50	10,000	5,000	18,482

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 102.50	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 2.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

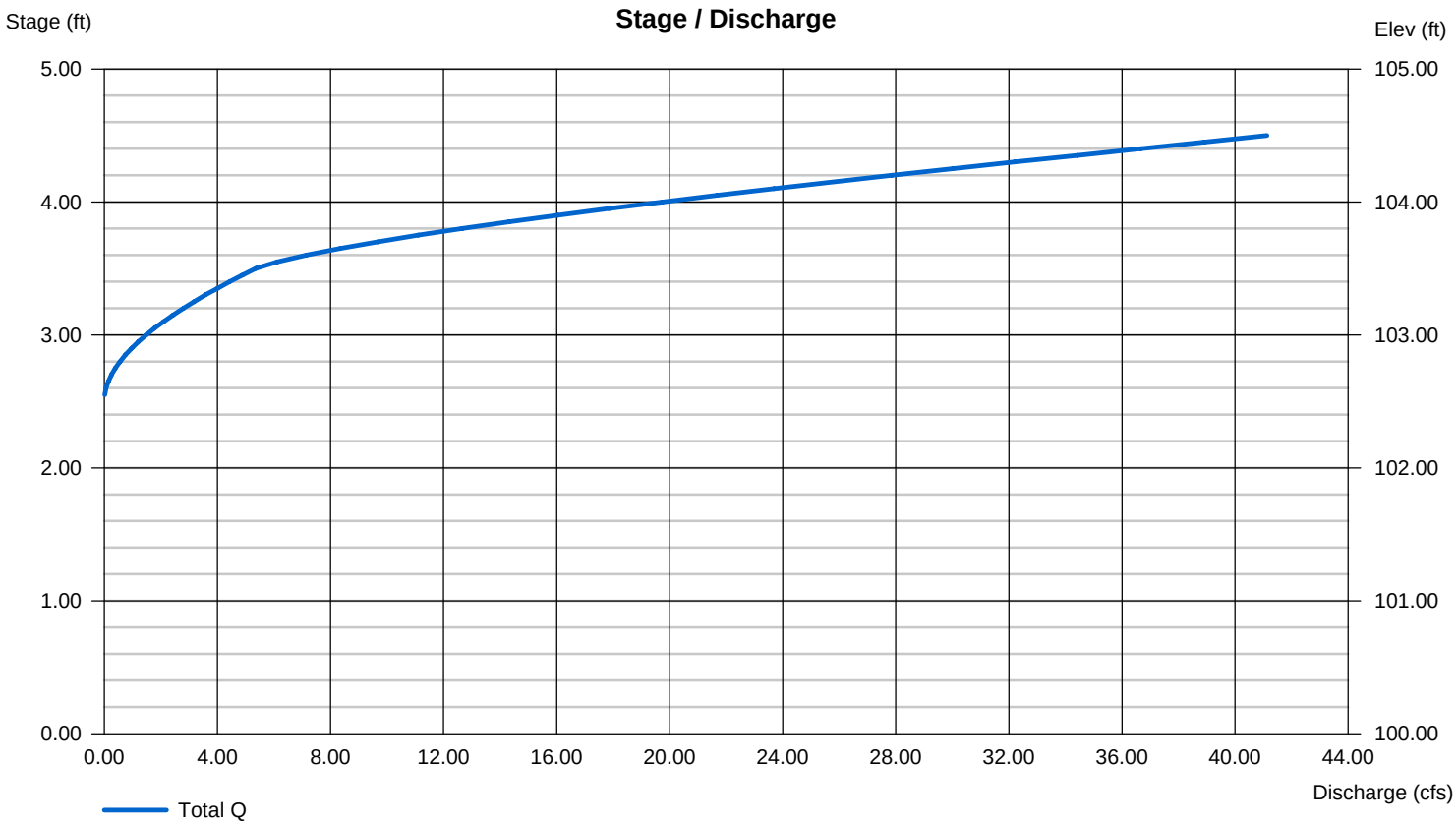
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 103.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



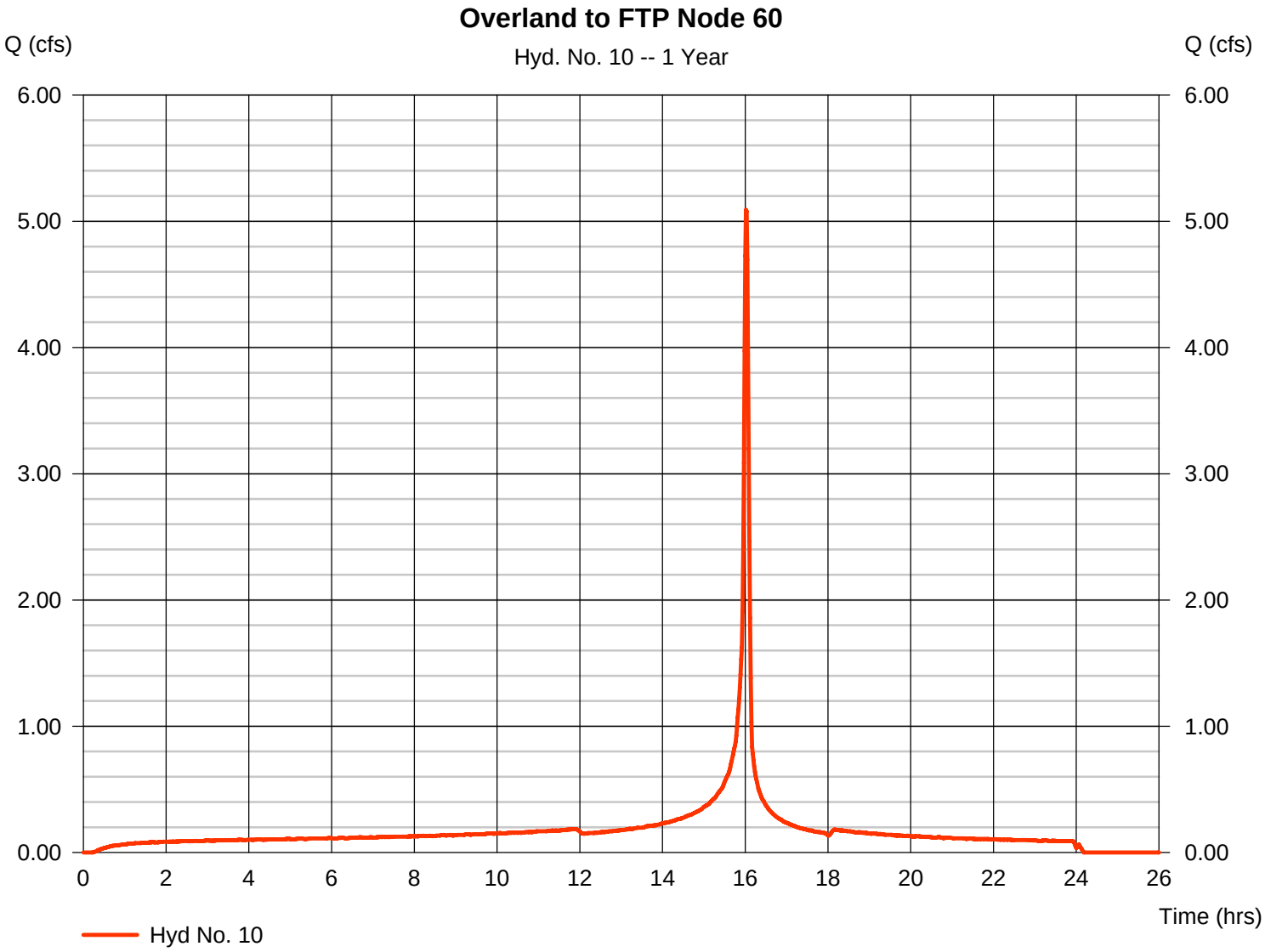
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 10

Overland to FTP Node 60

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.091 cfs
Storm frequency	=	1 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	16,513 cuft
Drainage area	=	7.500 ac	Curve number	=	99.9
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.60 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



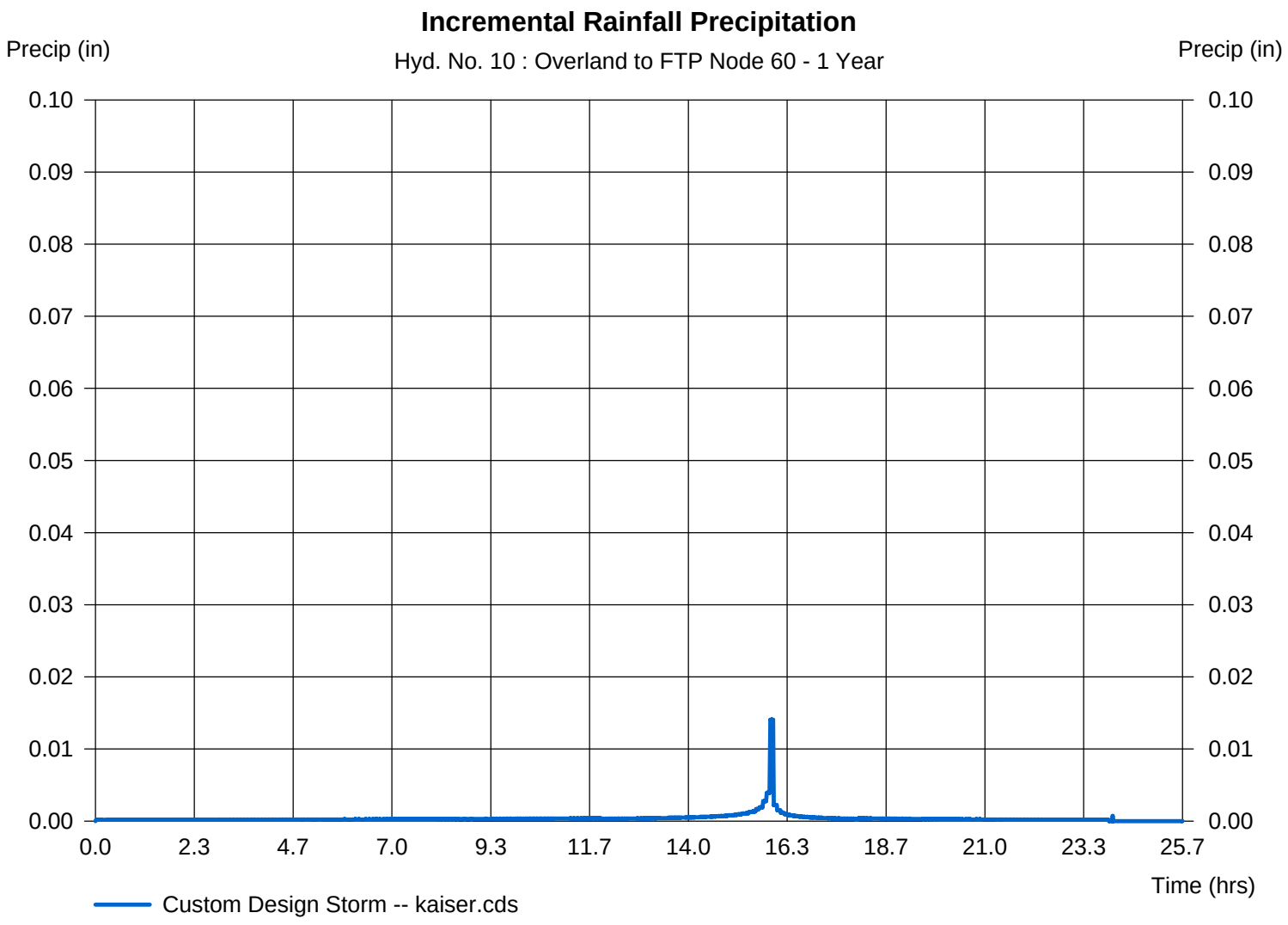
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 10

Overland to FTP Node 60

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 0.6000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



Hydrograph Report

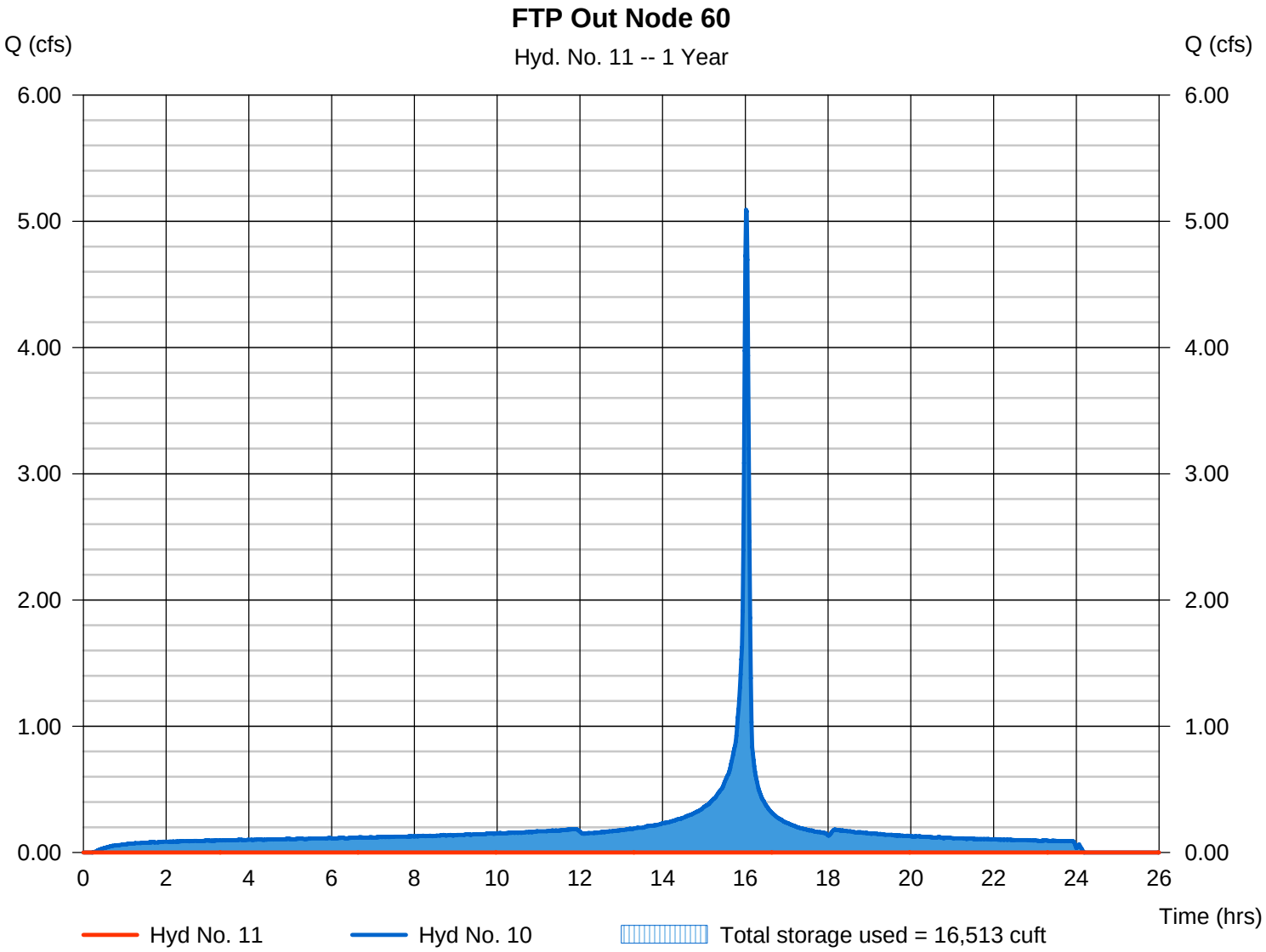
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 11

FTP Out Node 60

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	1 yrs	Time to peak	=	n/a
Time interval	=	1 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	10 - Overland to FTP Node 60	Max. Elevation	=	102.31 ft
Reservoir name	=	FTP at Node 60	Max. Storage	=	16,513 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.1 — Thursday, Jan 10, 2013

Pond No. 7 - FTP at Node 60

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	3,500	0	0
0.50	100.50	3,500	1,750	1,750
1.00	101.00	3,500	1,750	3,500
1.50	101.50	10,792	3,406	6,906
2.00	102.00	12,056	5,709	12,614
2.50	102.50	13,345	6,347	18,961
3.00	103.00	14,660	6,998	25,959
3.50	103.50	16,001	7,662	33,621
4.00	104.00	10,000	6,441	40,062
4.50	104.50	20,000	7,356	47,418

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 102.50	0.00	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 6.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

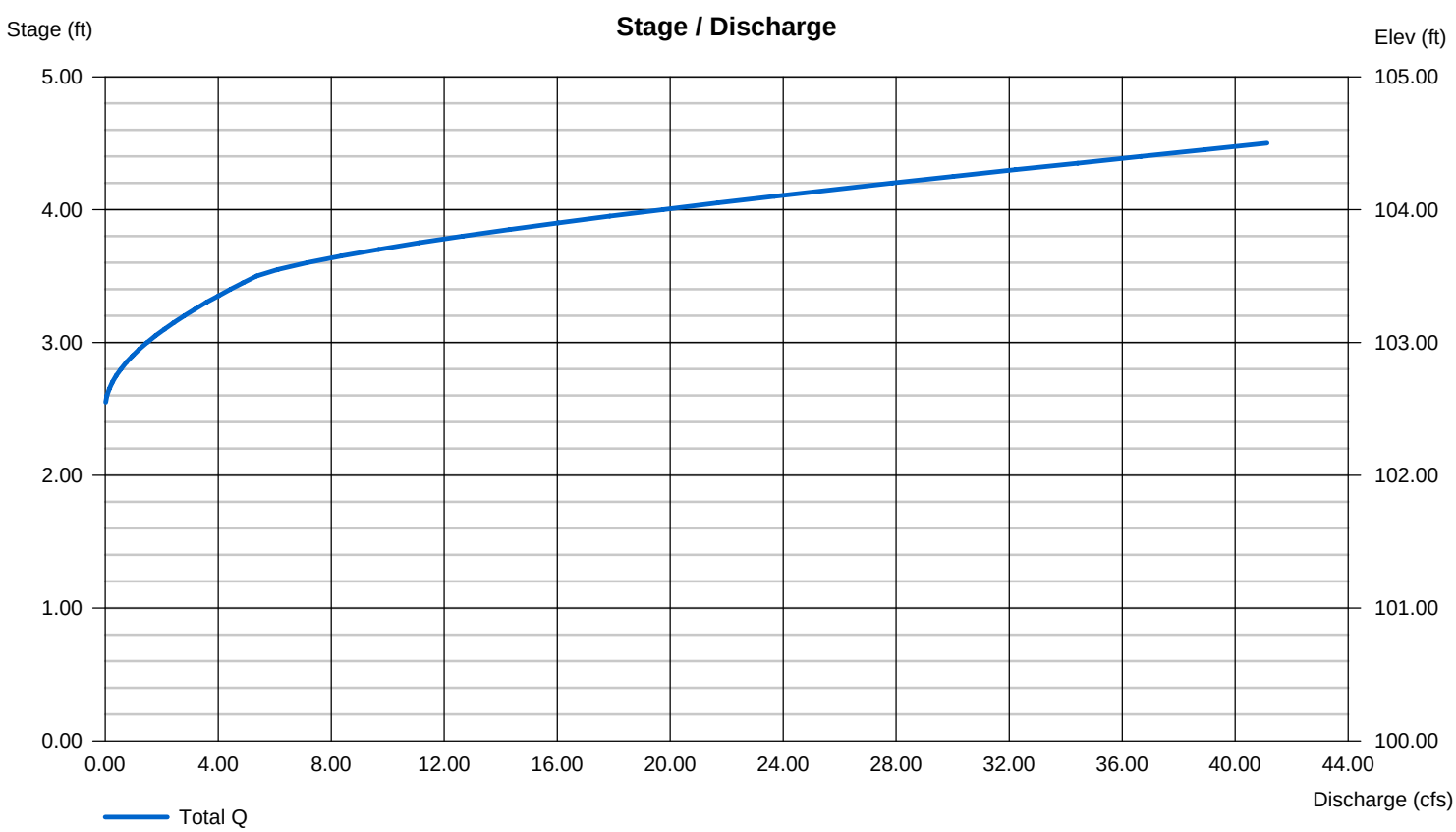
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 103.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



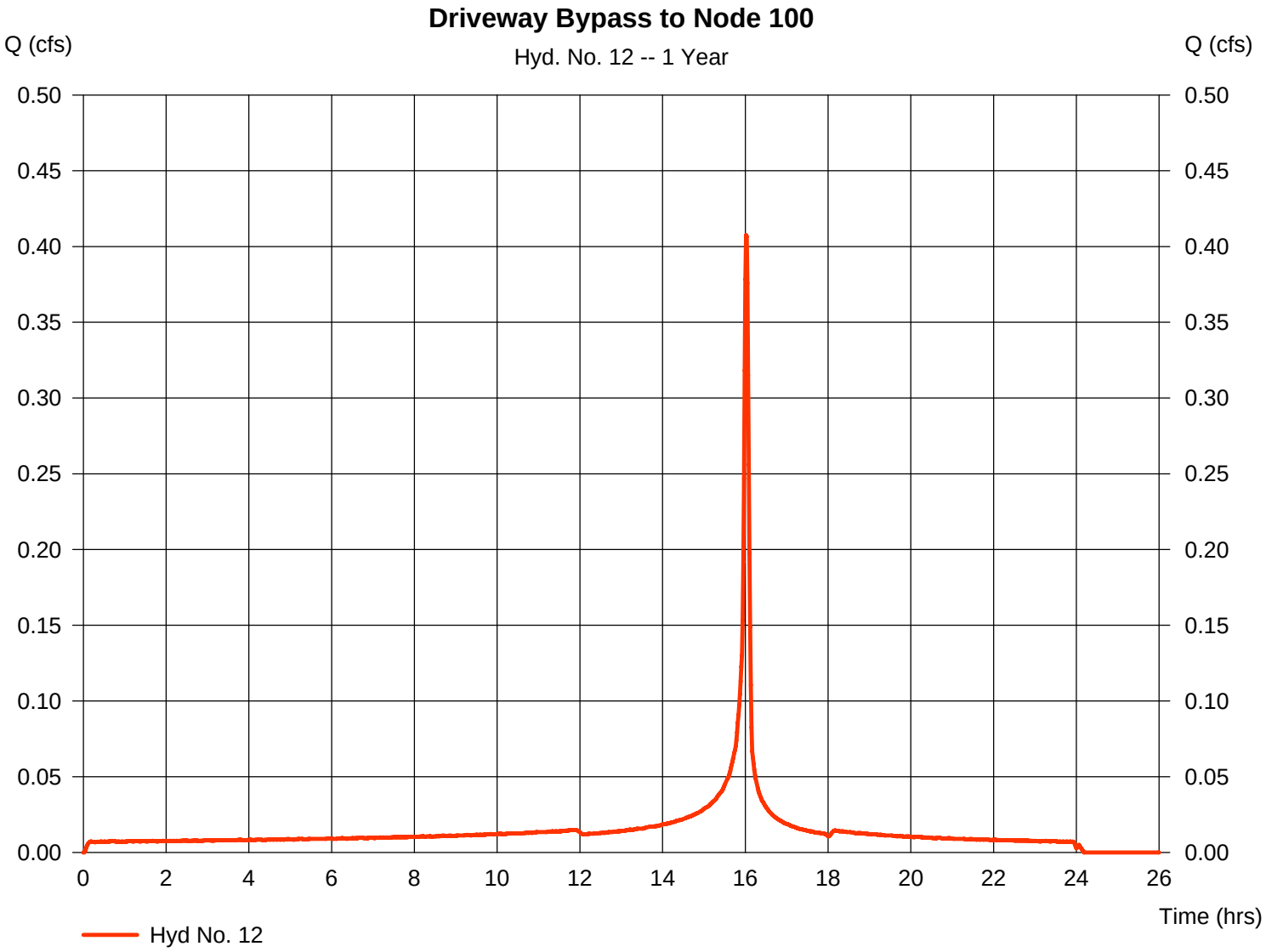
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 12

Driveway Bypass to Node 100

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.408 cfs
Storm frequency	=	1 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	1,348 cuft
Drainage area	=	0.600 ac	Curve number	=	100
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.60 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



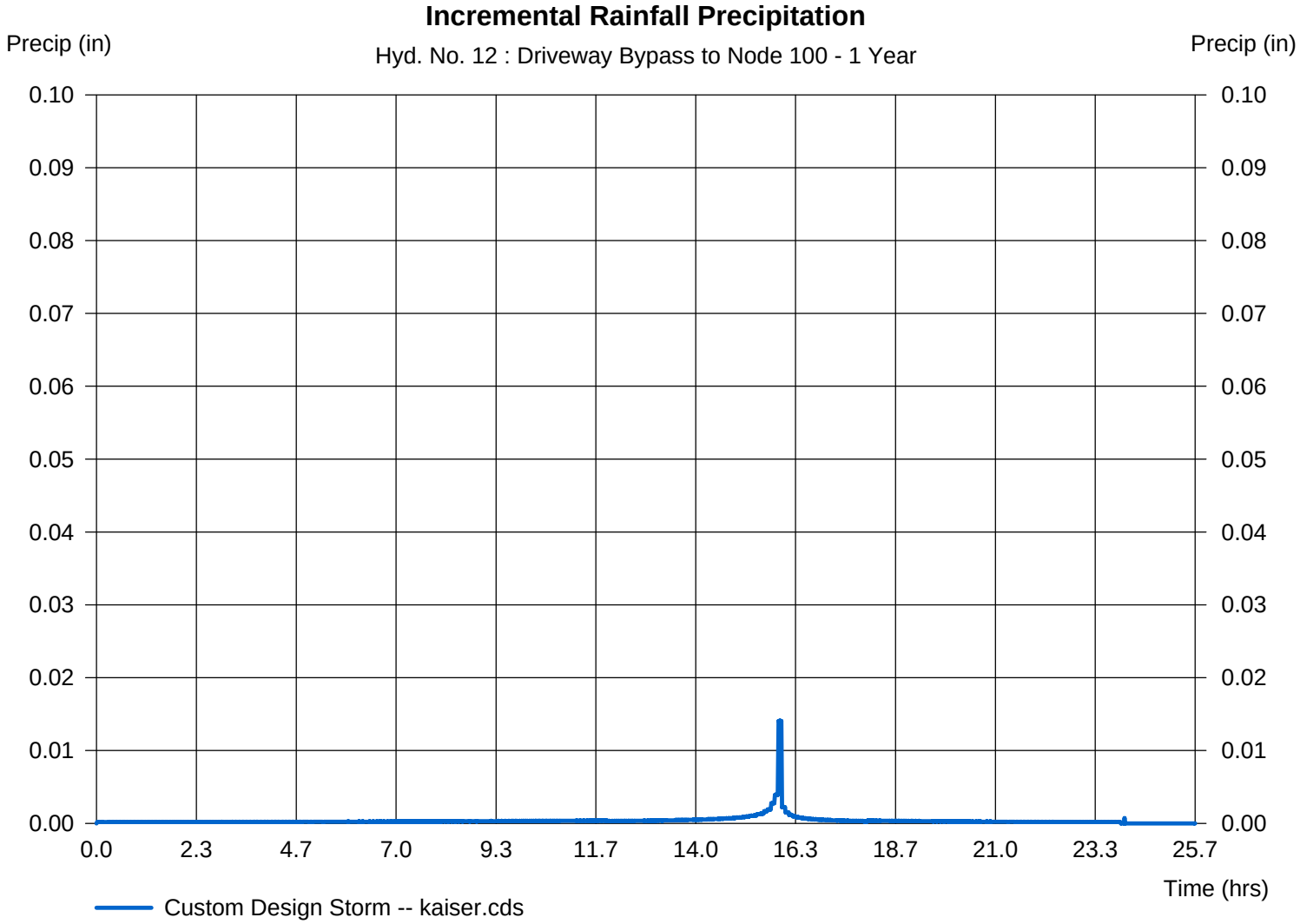
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 12

Driveway Bypass to Node 100

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 0.6000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



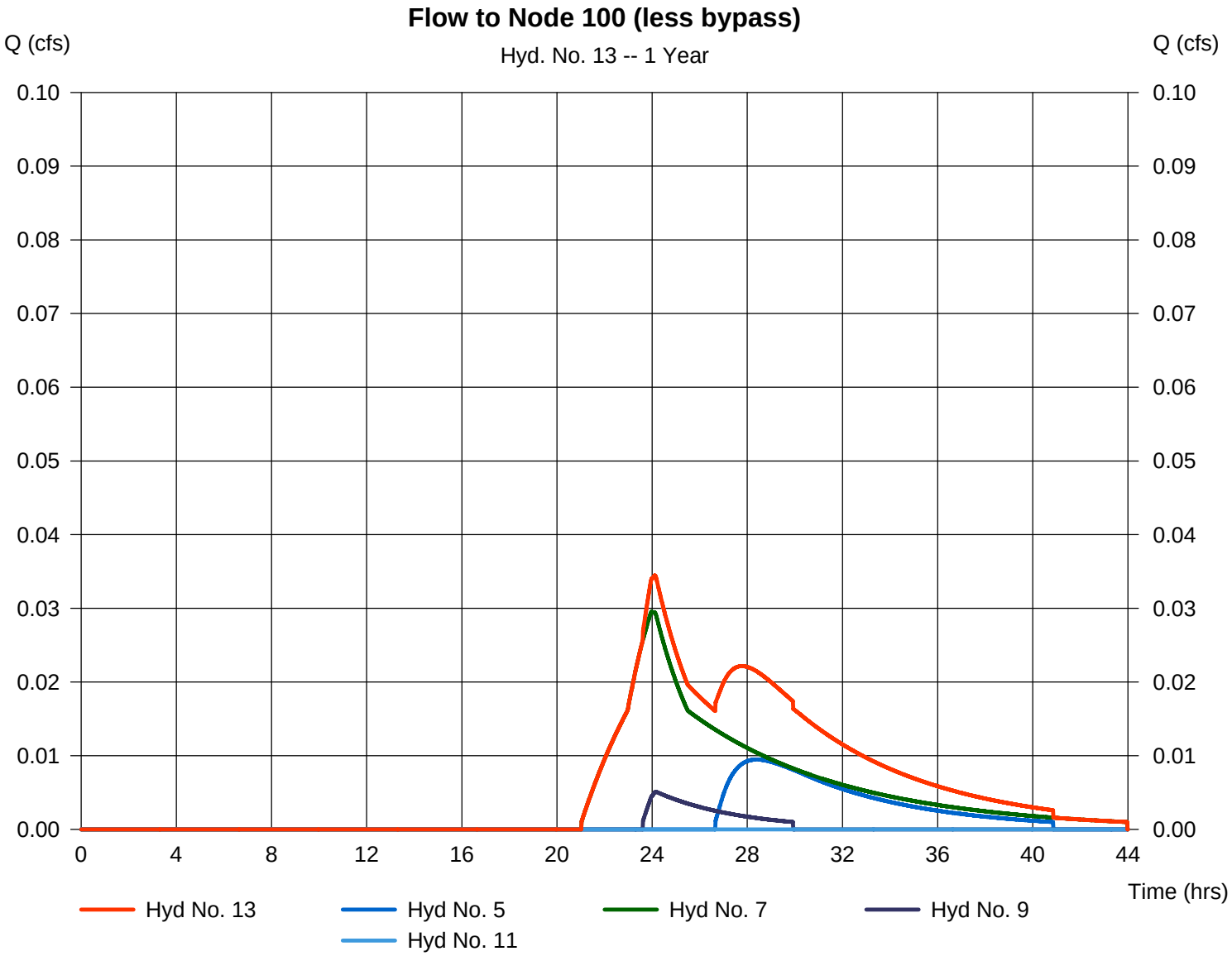
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 13

Flow to Node 100 (less bypass)

Hydrograph type	= Combine	Peak discharge	= 0.034 cfs
Storm frequency	= 1 yrs	Time to peak	= 24.12 hrs
Time interval	= 1 min	Hyd. volume	= 924 cuft
Inflow hyds.	= 5, 7, 9, 11	Contrib. drain. area	= 0.000 ac



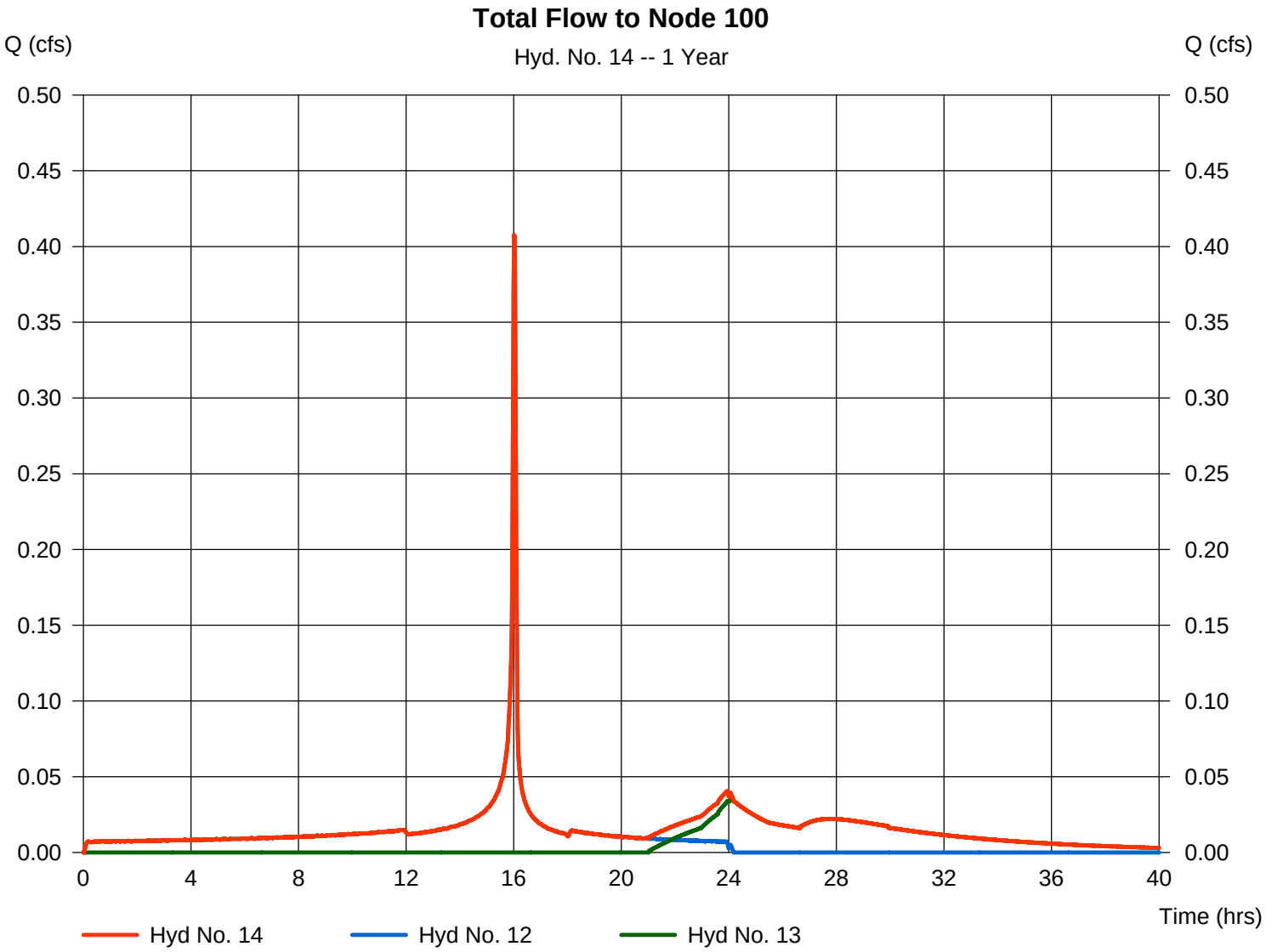
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 14

Total Flow to Node 100

Hydrograph type	= Combine	Peak discharge	= 0.408 cfs
Storm frequency	= 1 yrs	Time to peak	= 16.02 hrs
Time interval	= 1 min	Hyd. volume	= 2,272 cuft
Inflow hyds.	= 12, 13	Contrib. drain. area	= 0.600 ac



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	8.145	1	961	26,418	----	------	------	Tank Inflow
2	Reservoir	8.147	1	962	26,416	1	105.77	1,662	Pump Outflow from tank
3	SCS Runoff	6.442	1	961	20,664	----	------	------	Overland to FTP Node 40 B
4	Combine	14.57	1	962	47,080	2, 3	------	------	Total FTP B Inflow (Includes Pump)
5	Reservoir	6.878	1	966	38,778	4	103.59	16,066	FTP Out N40 B
6	SCS Runoff	15.24	1	961	48,550	----	------	------	Overland to FTP Node 40 A
7	Reservoir	6.748	1	966	40,869	6	103.14	16,931	FTP Out N40 A
8	SCS Runoff	10.50	1	961	33,446	----	------	------	Overland to FTP Node 20
9	Reservoir	6.275	1	965	27,775	8	103.56	10,331	FTP Out Node 20
10	SCS Runoff	25.47	1	961	83,890	----	------	------	Overland to FTP Node 60
11	Reservoir	12.46	1	966	64,719	10	103.79	37,402	FTP Out Node 60
12	SCS Runoff	2.038	1	961	6,738	----	------	------	Driveway Bypass to Node 100
13	Combine	32.29	1	966	172,141	5, 7, 9, 11,	------	------	Flow to Node 100 (less bypass)
14	Combine	33.28	1	966	178,879	12, 13	------	------	Total Flow to Node 100

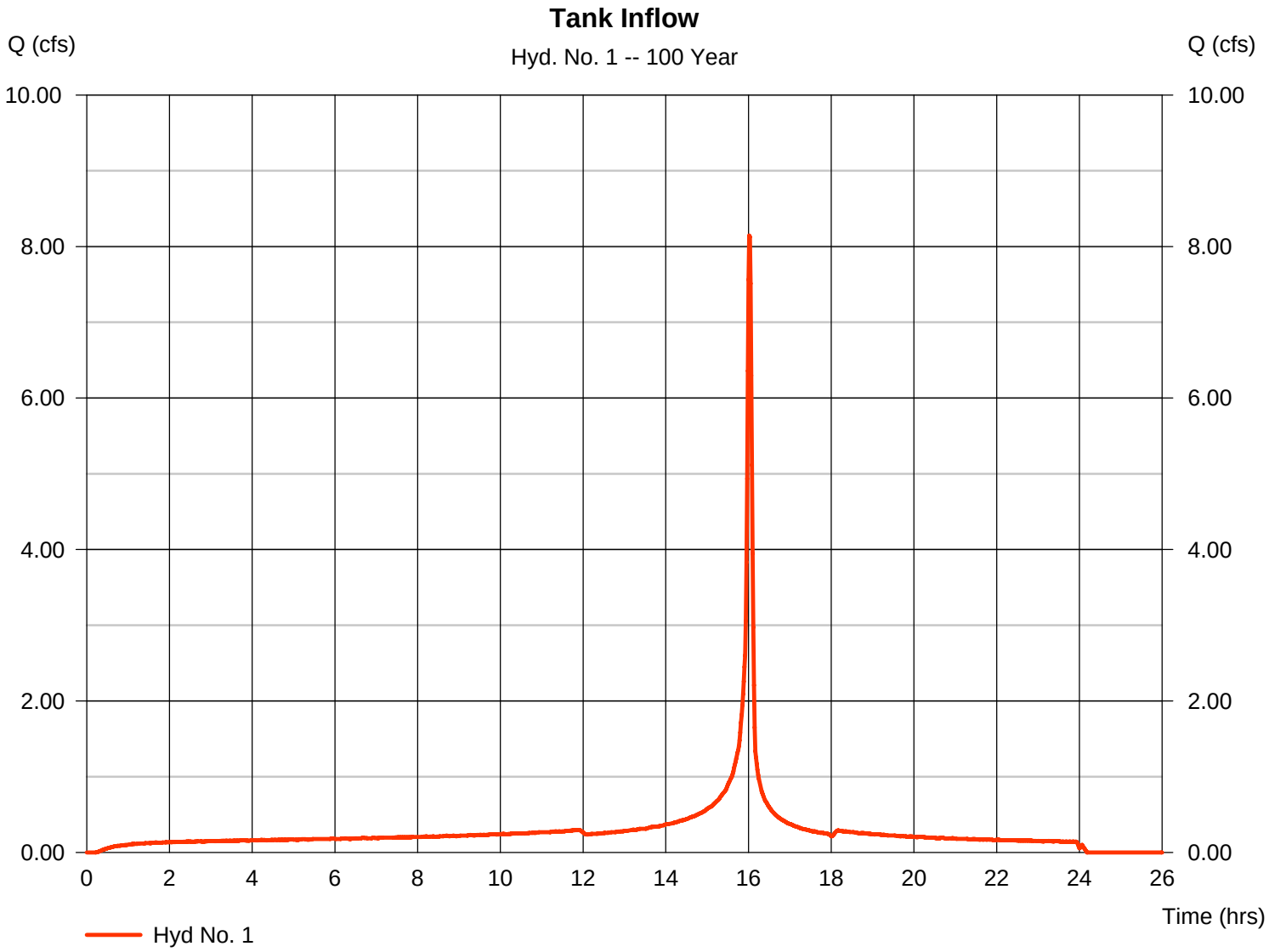
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 1

Tank Inflow

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.145 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	26,418 cuft
Drainage area	=	2.400 ac	Curve number	=	99.5
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



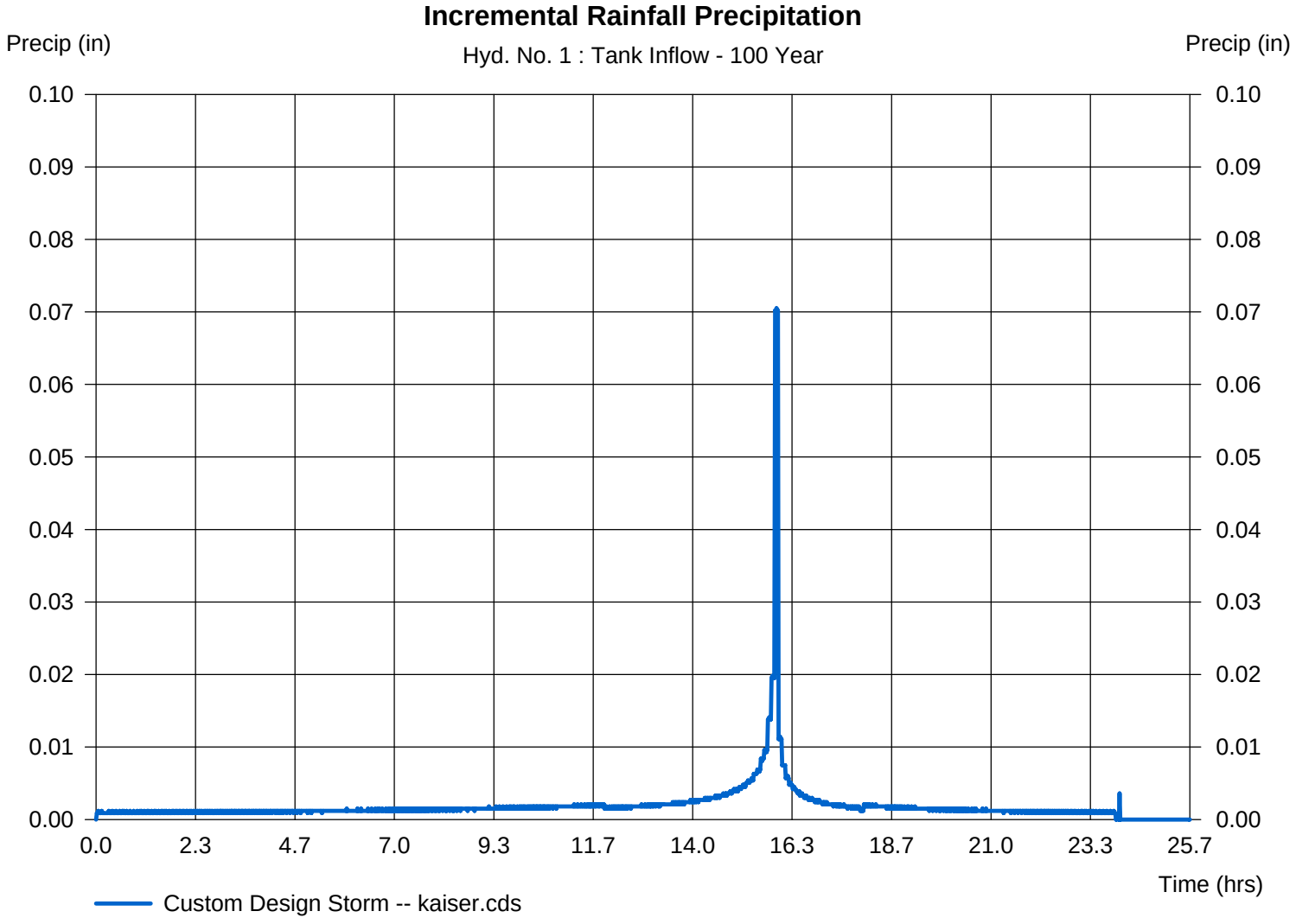
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 1

Tank Inflow

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 3.0000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



Hydrograph Report

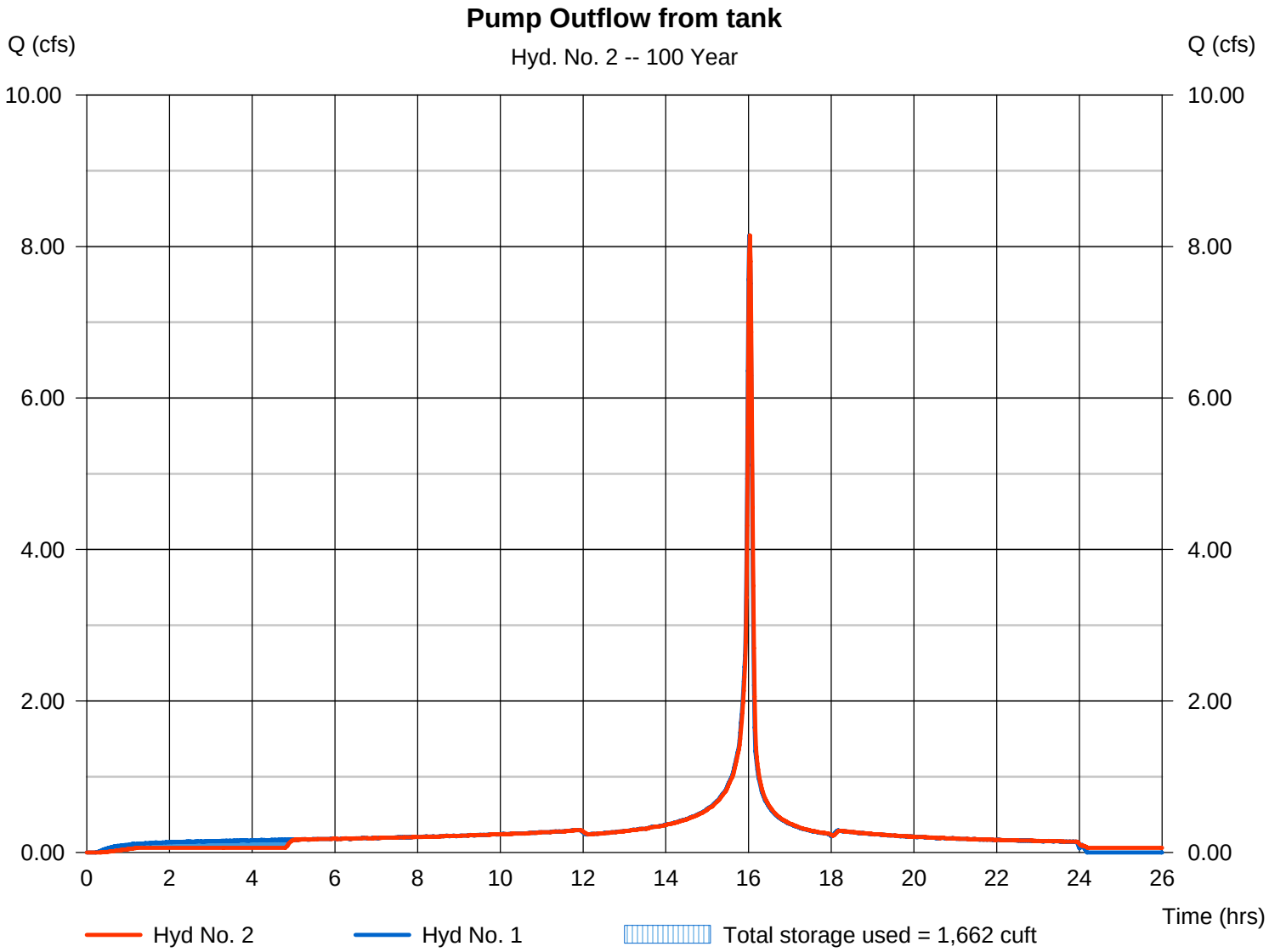
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 2

Pump Outflow from tank

Hydrograph type	=	Reservoir	Peak discharge	=	8.147 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.03 hrs
Time interval	=	1 min	Hyd. volume	=	26,416 cuft
Inflow hyd. No.	=	1 - Tank Inflow	Max. Elevation	=	105.77 ft
Reservoir name	=	Storage Tank	Max. Storage	=	1,662 cuft

Storage Indication method used.



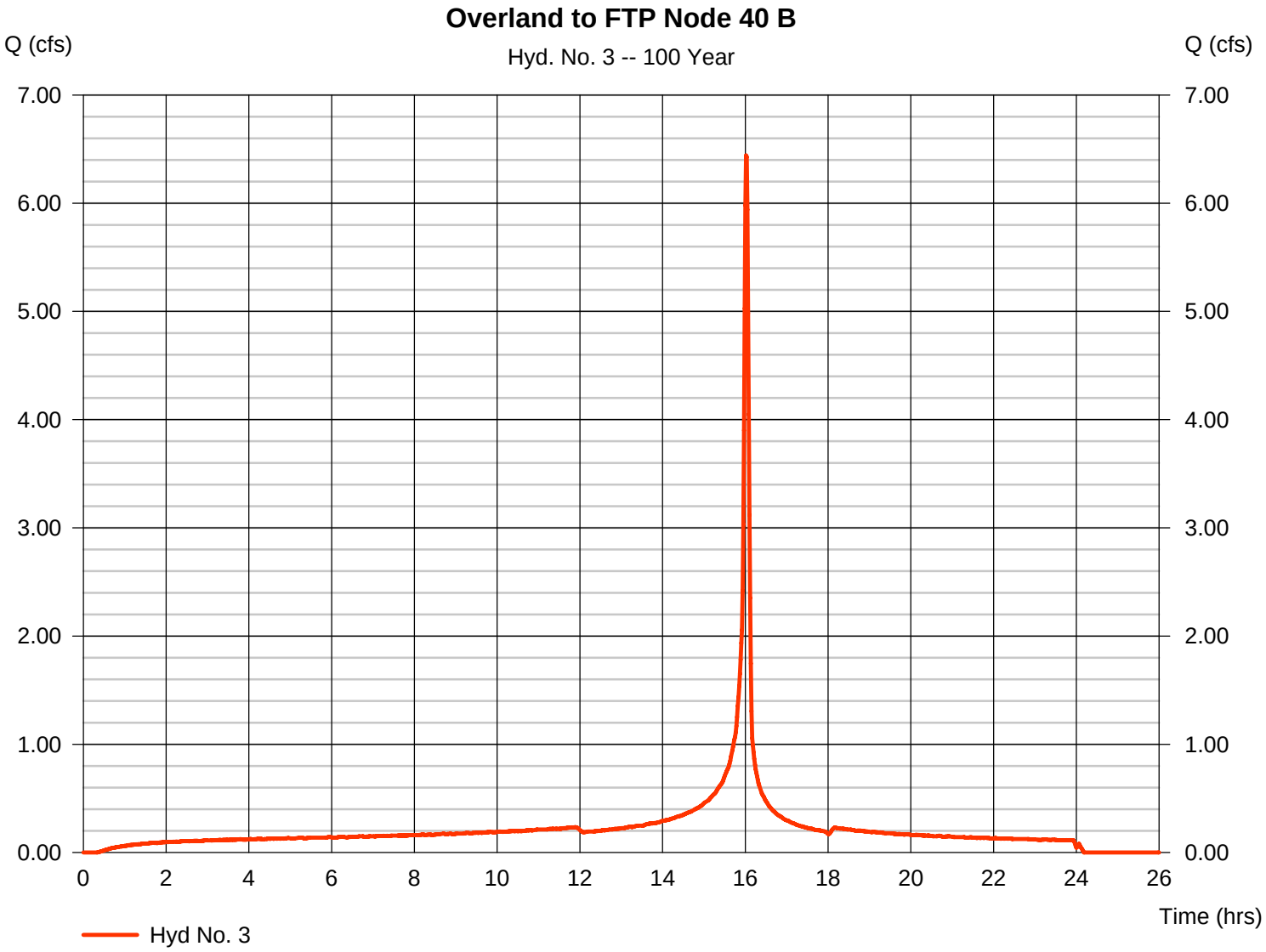
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 3

Overland to FTP Node 40 B

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.442 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	20,664 cuft
Drainage area	=	1.900 ac	Curve number	=	99.2
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



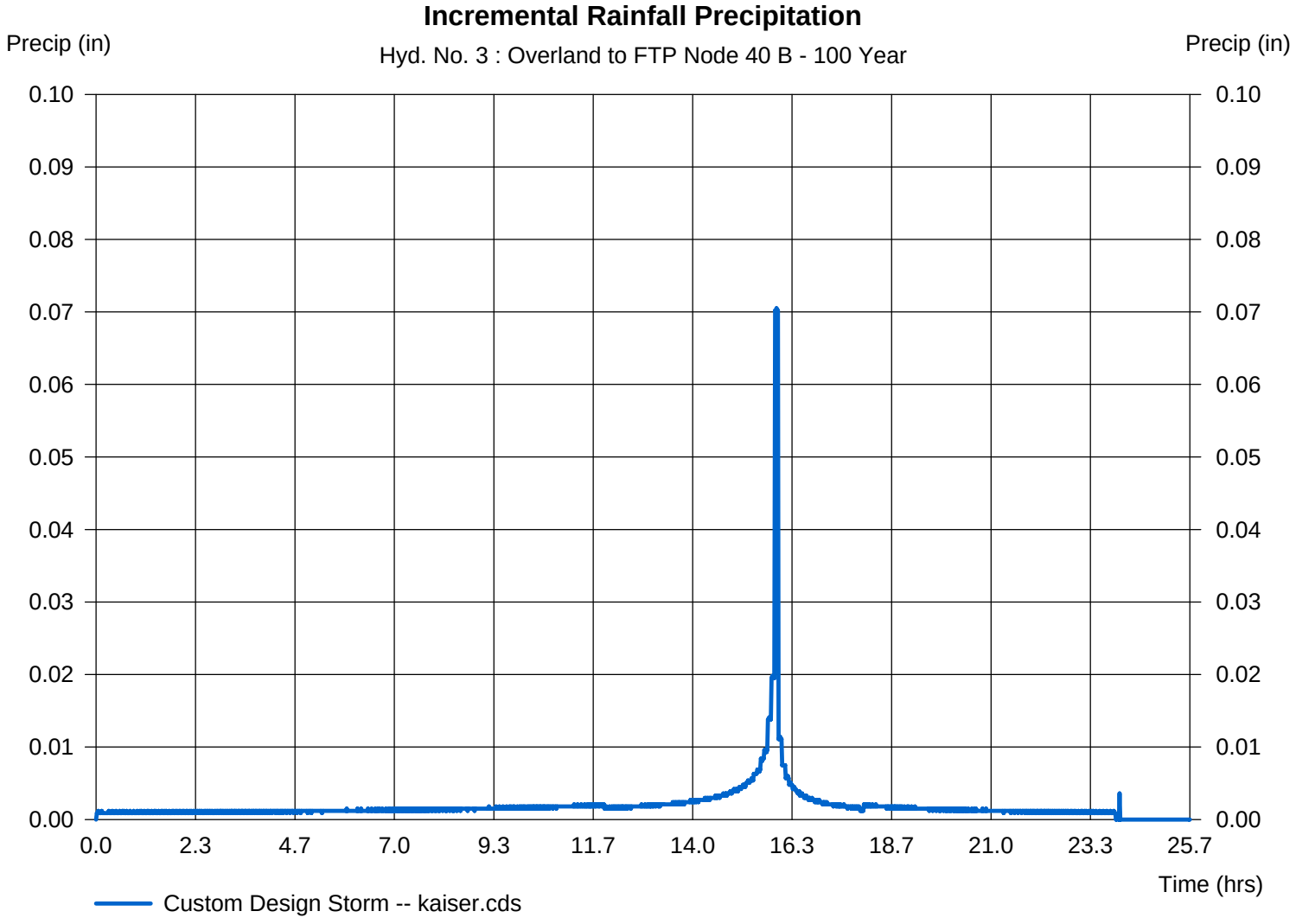
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 3

Overland to FTP Node 40 B

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 3.0000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



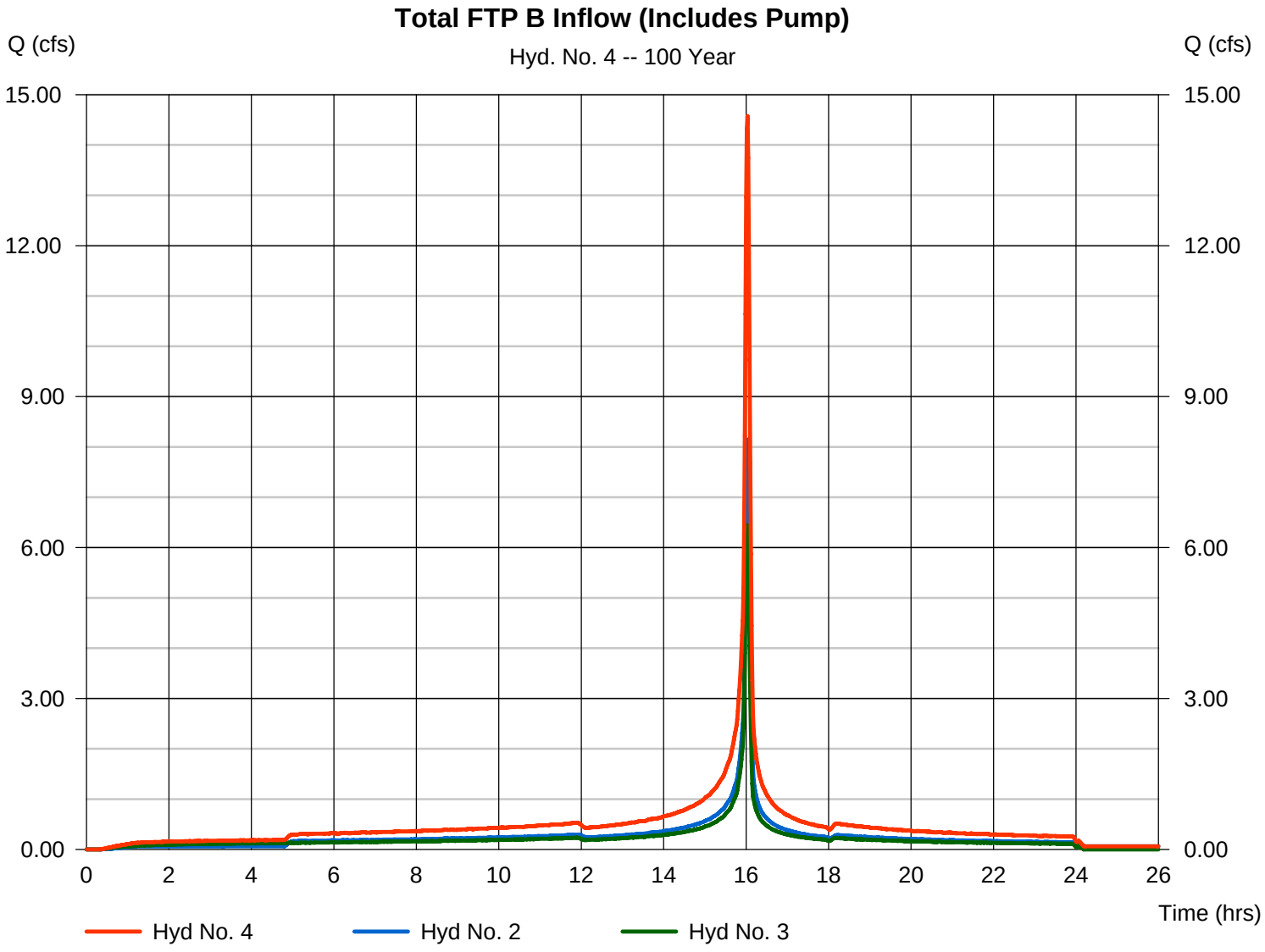
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 4

Total FTP B Inflow (Includes Pump)

Hydrograph type	= Combine	Peak discharge	= 14.57 cfs
Storm frequency	= 100 yrs	Time to peak	= 16.03 hrs
Time interval	= 1 min	Hyd. volume	= 47,080 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 1.900 ac



Hydrograph Report

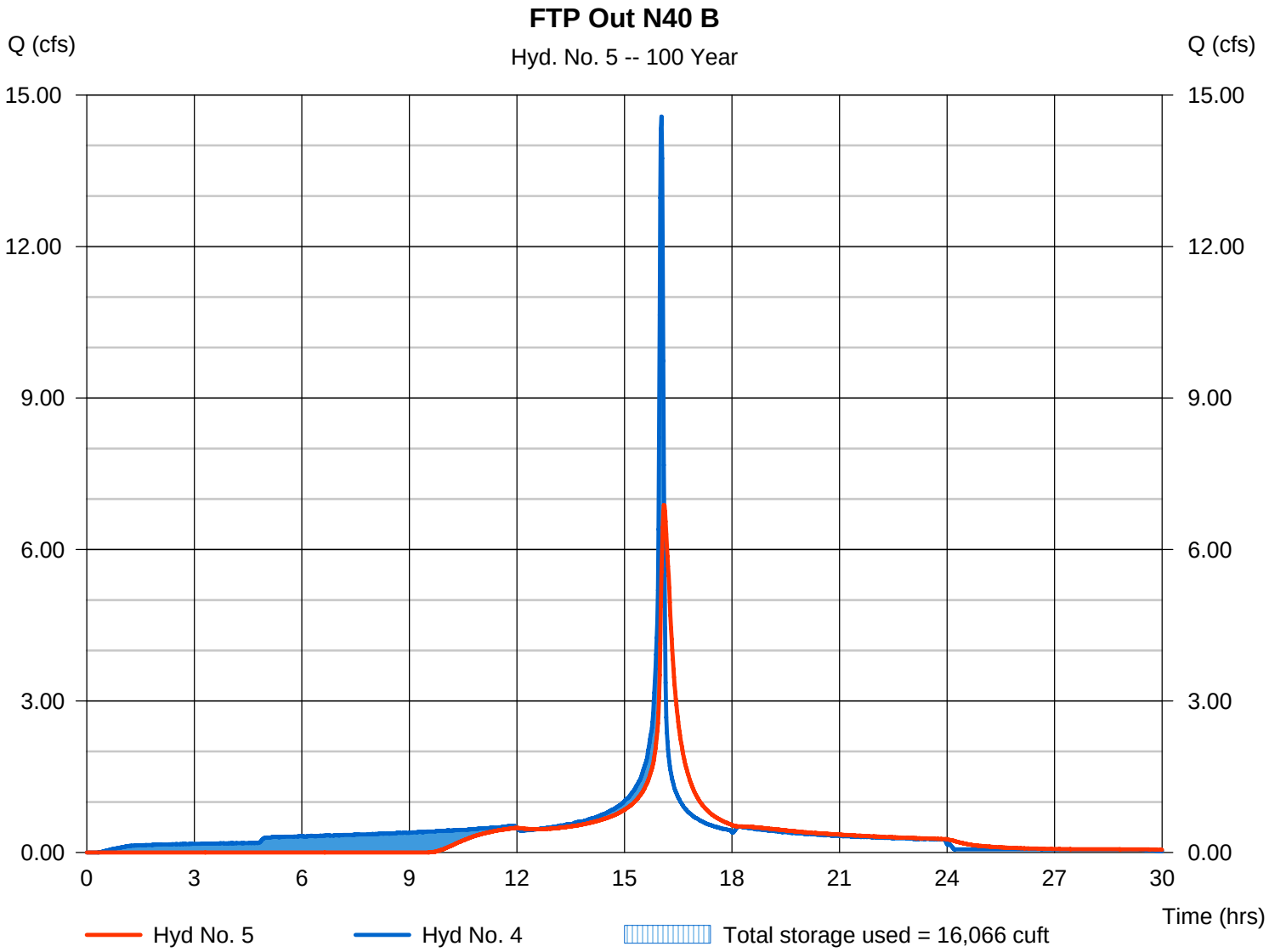
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 5

FTP Out N40 B

Hydrograph type	=	Reservoir	Peak discharge	=	6.878 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.10 hrs
Time interval	=	1 min	Hyd. volume	=	38,778 cuft
Inflow hyd. No.	=	4 - Total FTP B Inflow (Includes Pump)	Max. Elevation	=	103.59 ft
Reservoir name	=	FTP at Node 40 B	Max. Storage	=	16,066 cuft

Storage Indication method used.



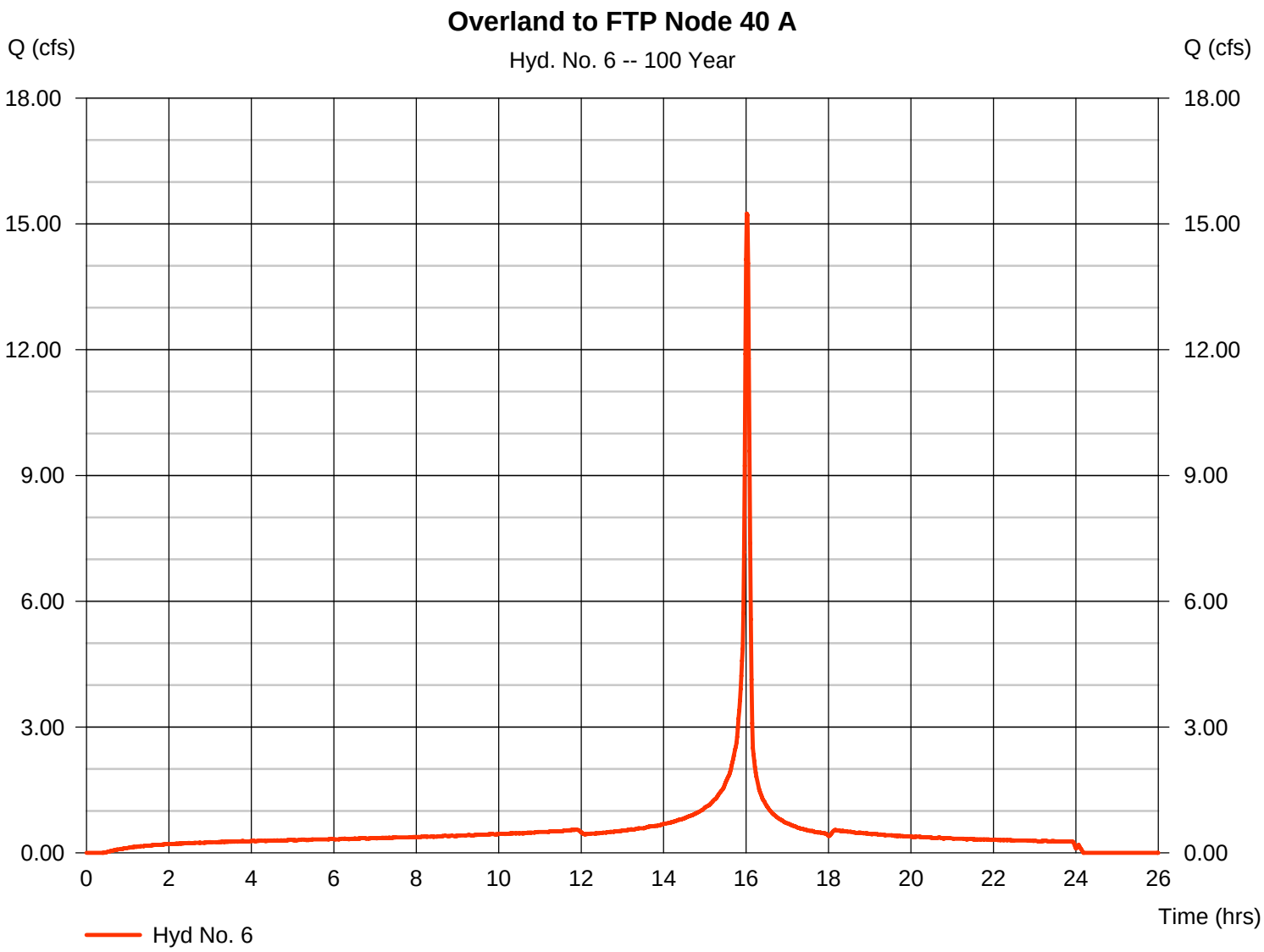
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 6

Overland to FTP Node 40 A

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.24 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	48,550 cuft
Drainage area	=	4.500 ac	Curve number	=	99
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



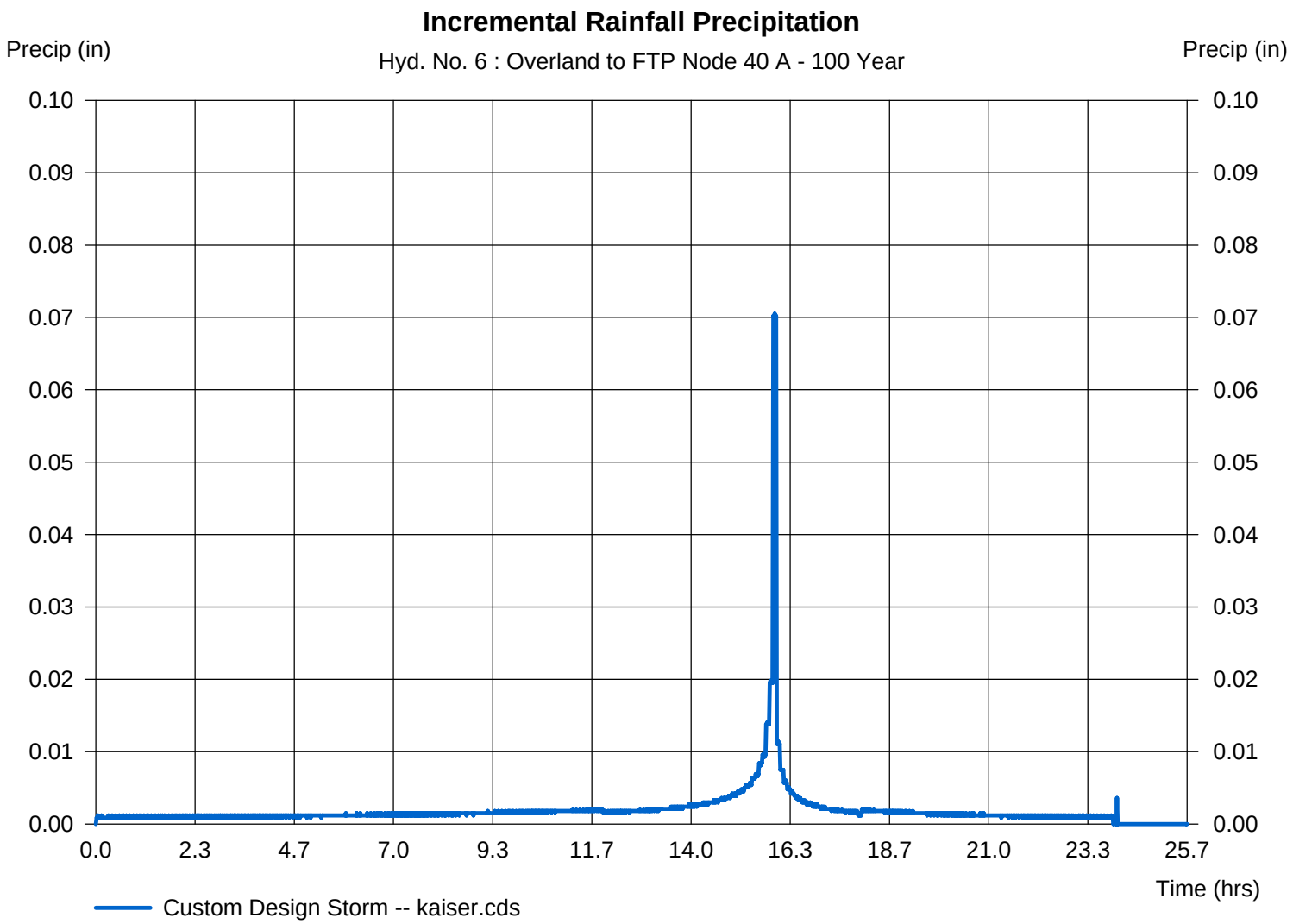
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 6

Overland to FTP Node 40 A

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 3.0000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



Hydrograph Report

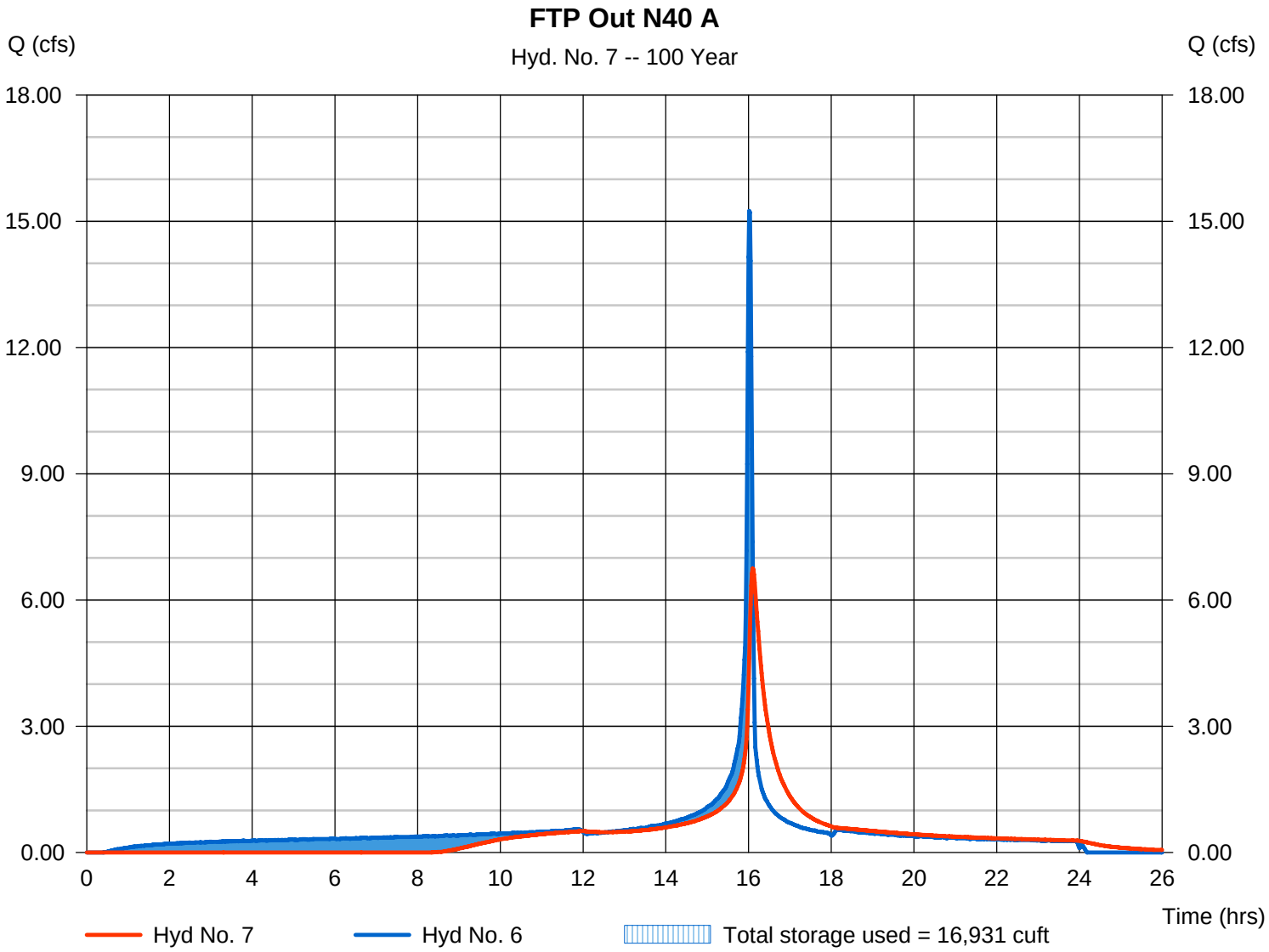
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 7

FTP Out N40 A

Hydrograph type	=	Reservoir	Peak discharge	=	6.748 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.10 hrs
Time interval	=	1 min	Hyd. volume	=	40,869 cuft
Inflow hyd. No.	=	6 - Overland to FTP Node 40 A	Max. Elevation	=	103.14 ft
Reservoir name	=	Flow Through Planter at Node 40 A	Max. Storage	=	16,931 cuft

Storage Indication method used.



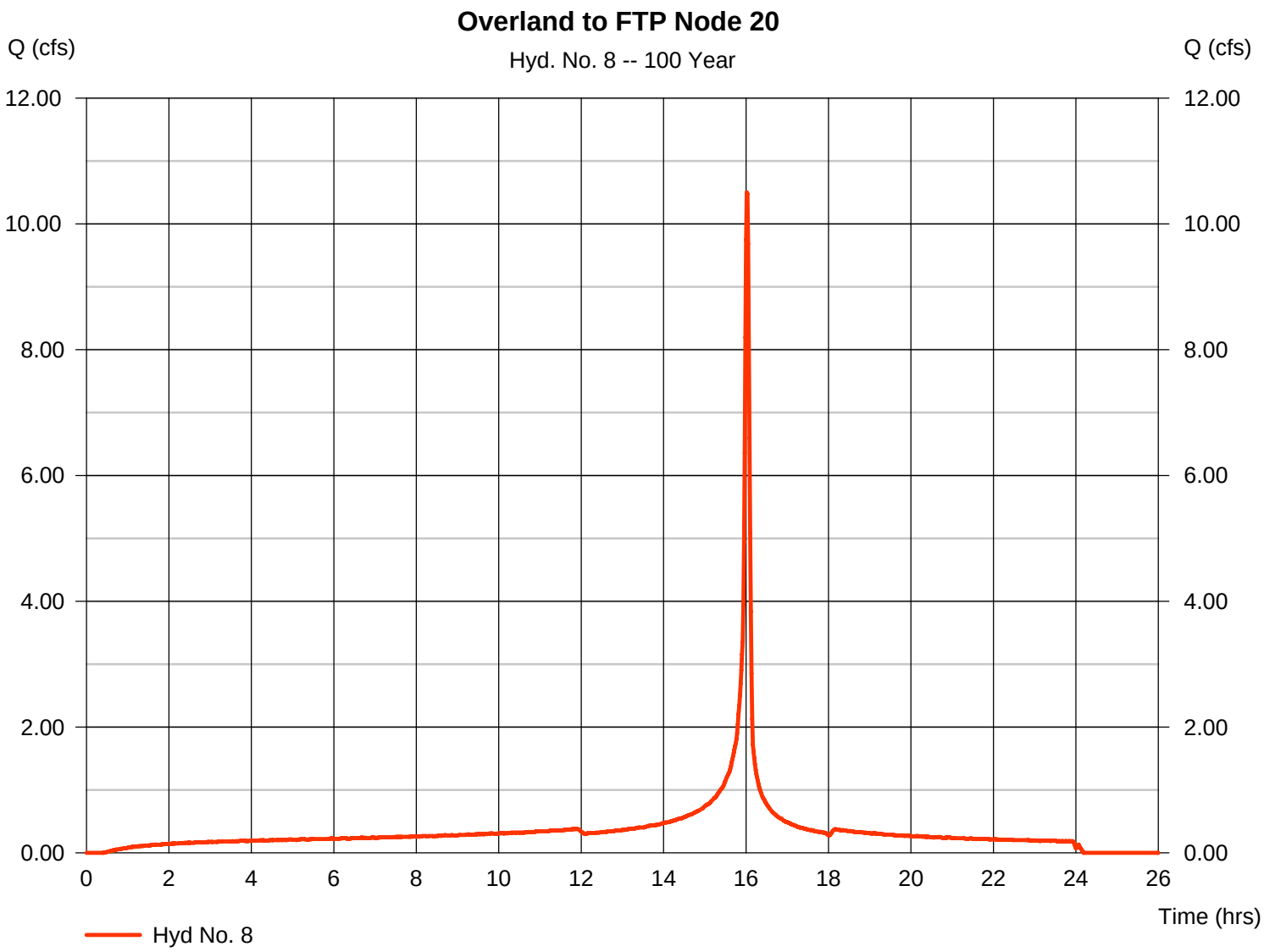
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 8

Overland to FTP Node 20

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.50 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	33,446 cuft
Drainage area	=	3.100 ac	Curve number	=	99
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



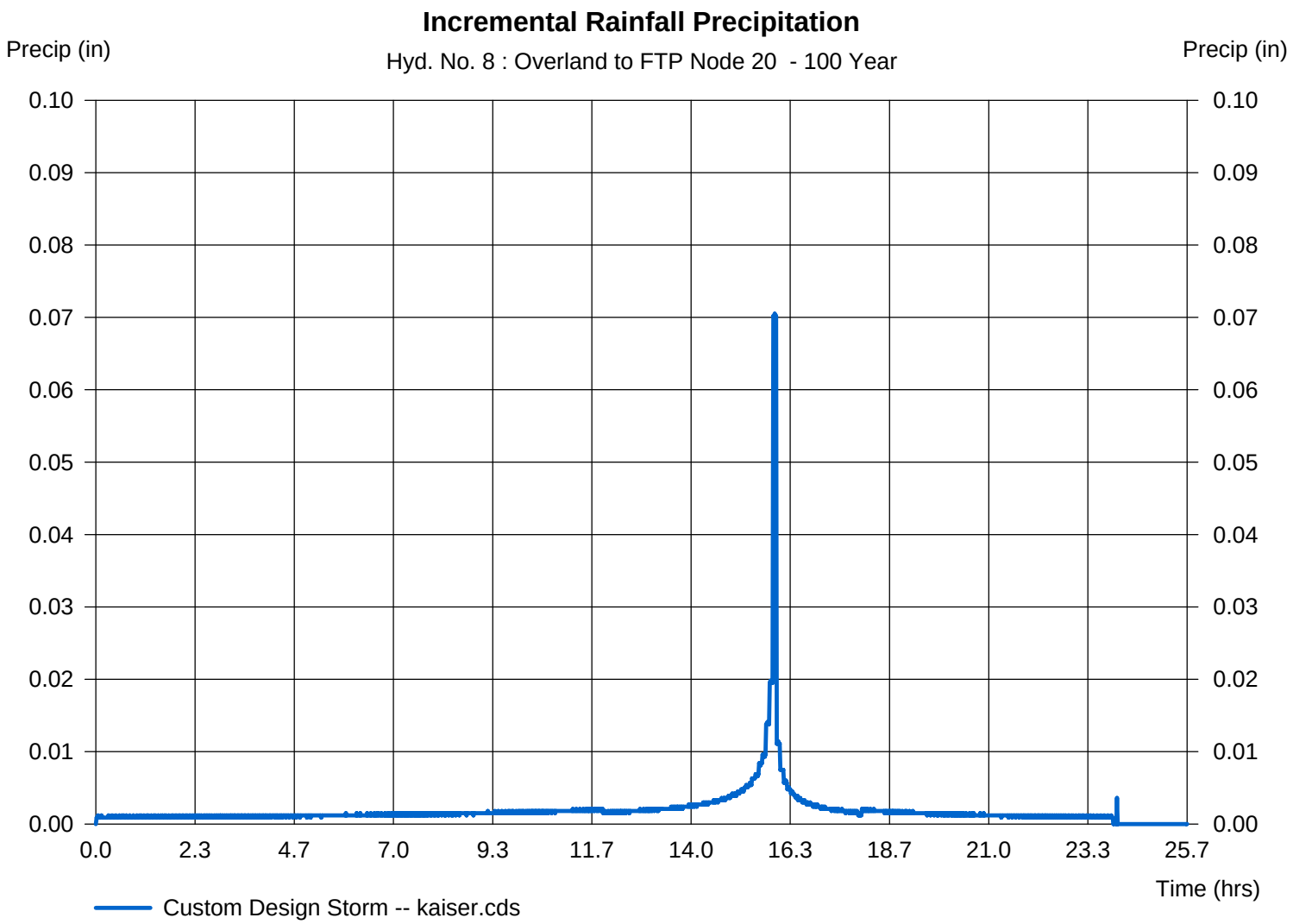
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 8

Overland to FTP Node 20

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 3.0000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



Hydrograph Report

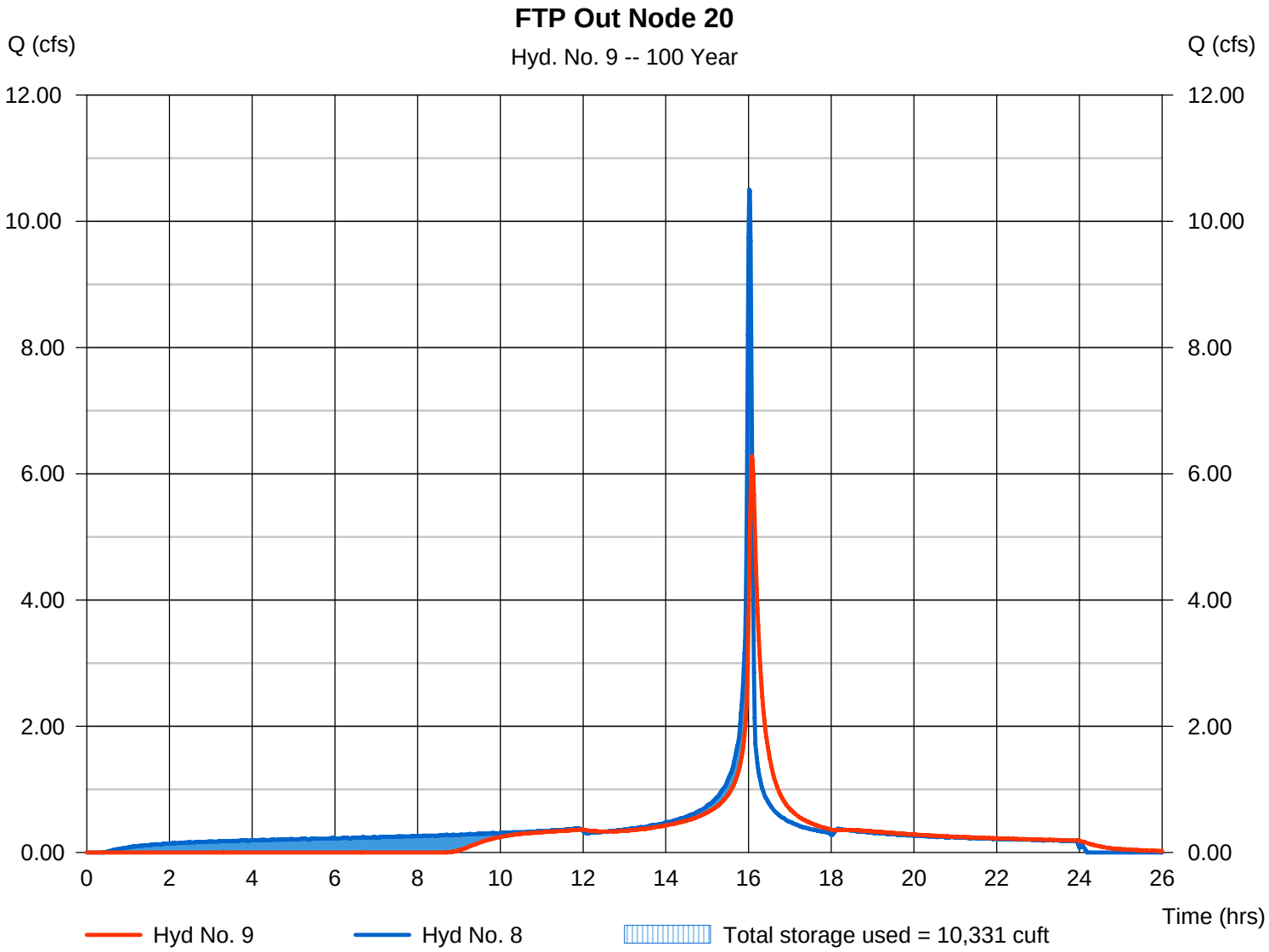
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 9

FTP Out Node 20

Hydrograph type	=	Reservoir	Peak discharge	=	6.275 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.08 hrs
Time interval	=	1 min	Hyd. volume	=	27,775 cuft
Inflow hyd. No.	=	8 - Overland to FTP Node 20	Max. Elevation	=	103.56 ft
Reservoir name	=	FTP at Node 20	Max. Storage	=	10,331 cuft

Storage Indication method used.



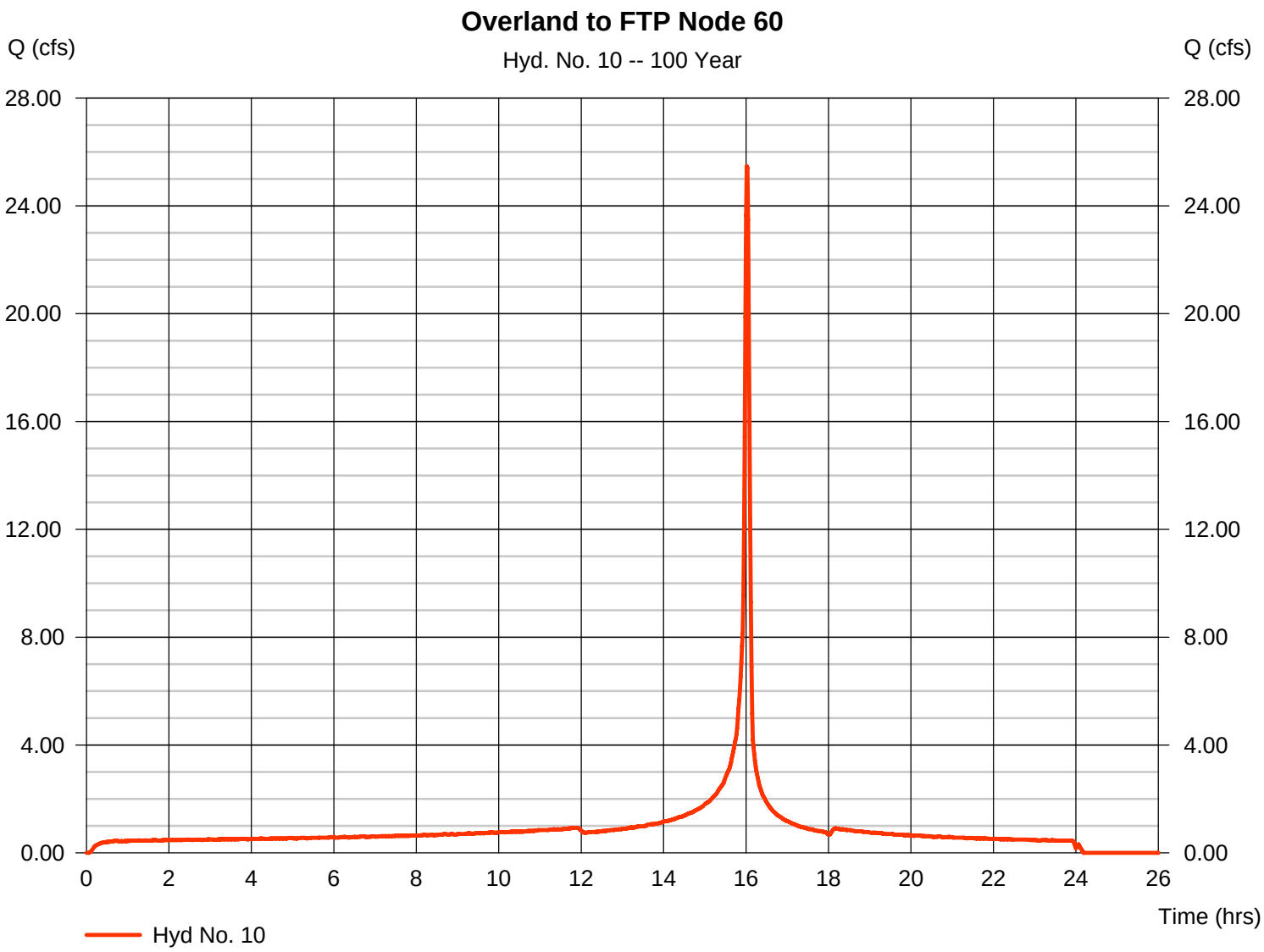
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 10

Overland to FTP Node 60

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.47 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	83,890 cuft
Drainage area	=	7.500 ac	Curve number	=	99.9
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



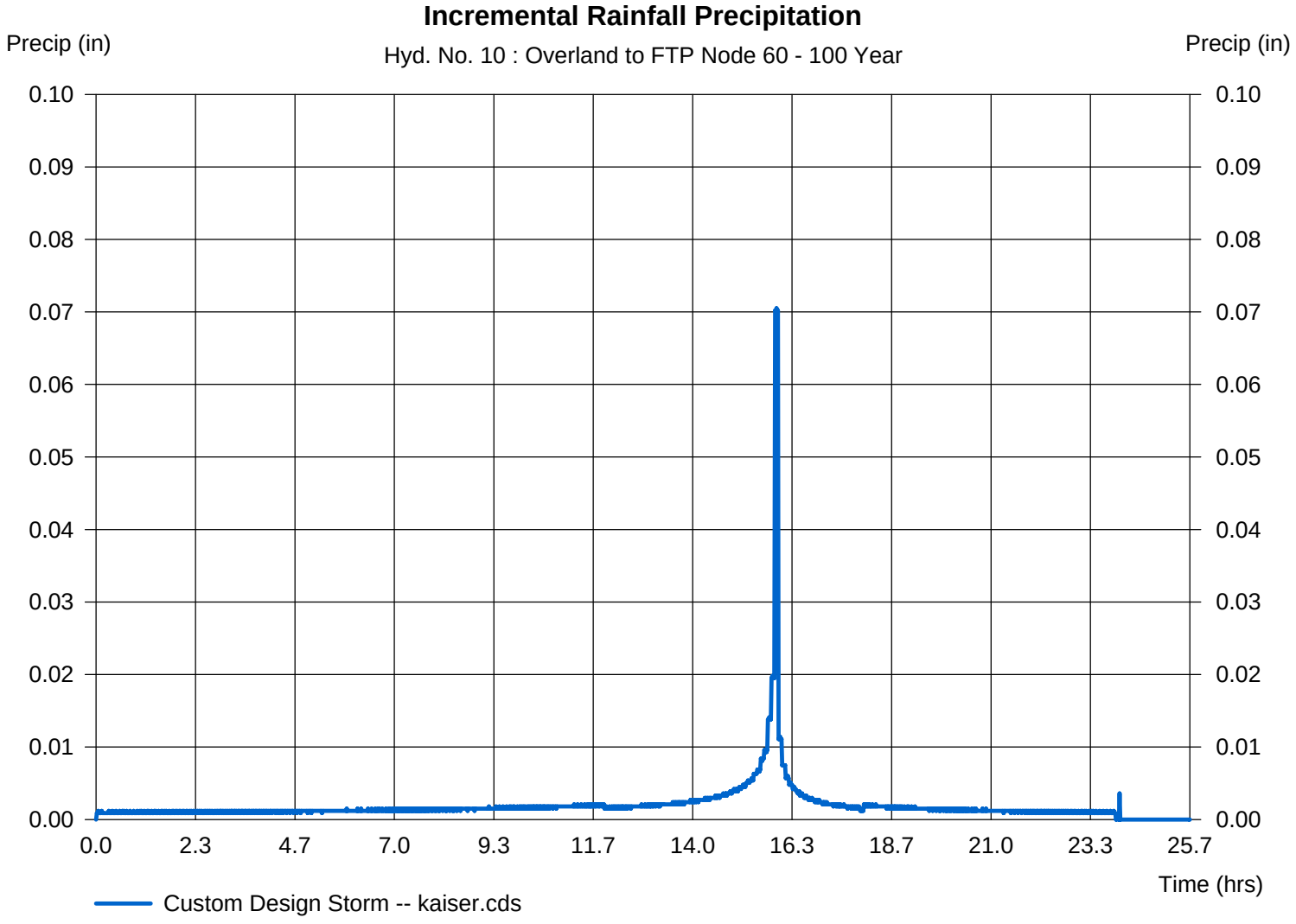
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 10

Overland to FTP Node 60

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 3.0000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



Hydrograph Report

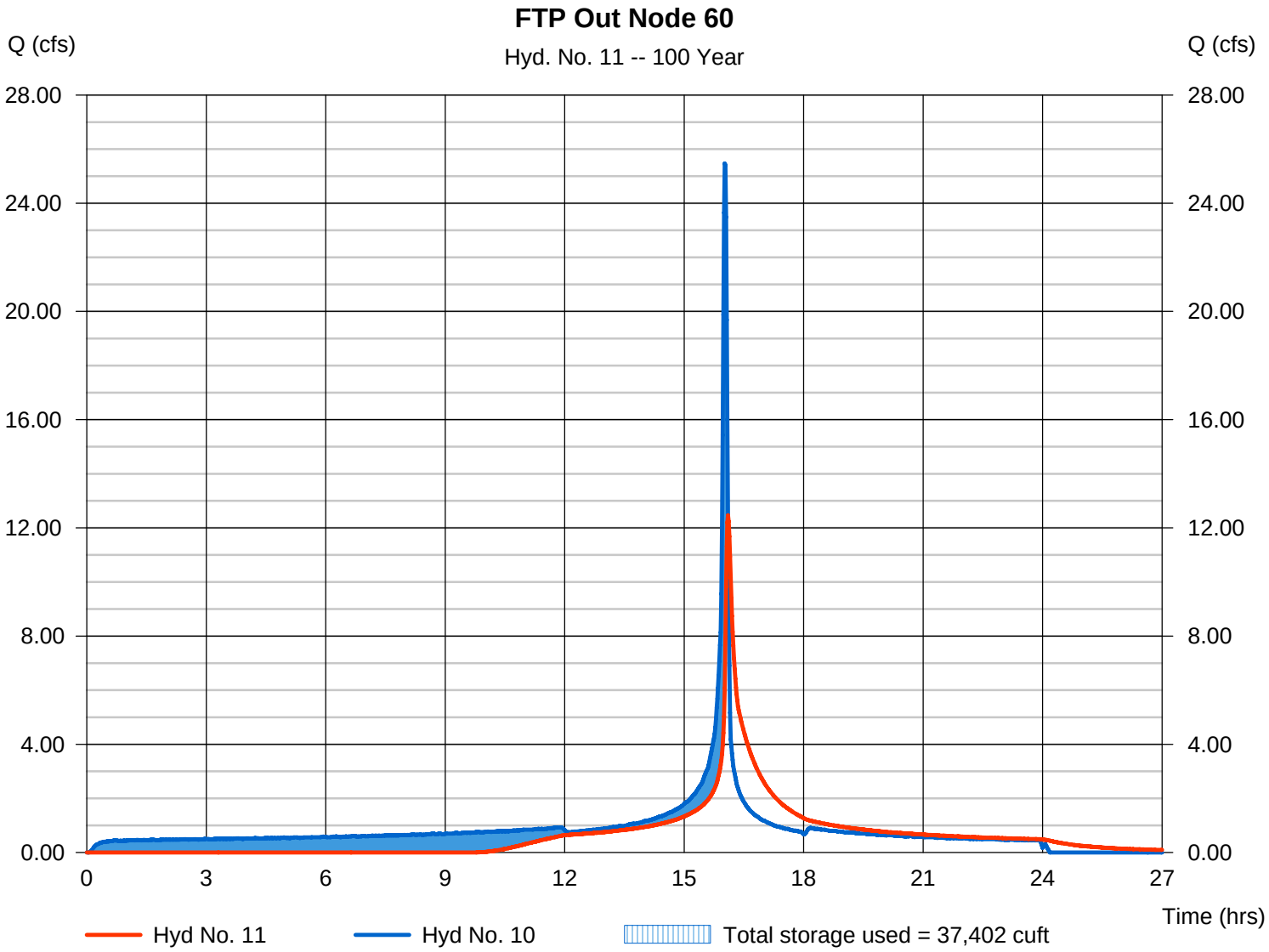
Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 11

FTP Out Node 60

Hydrograph type	=	Reservoir	Peak discharge	=	12.46 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.10 hrs
Time interval	=	1 min	Hyd. volume	=	64,719 cuft
Inflow hyd. No.	=	10 - Overland to FTP Node 60	Max. Elevation	=	103.79 ft
Reservoir name	=	FTP at Node 60	Max. Storage	=	37,402 cuft

Storage Indication method used.



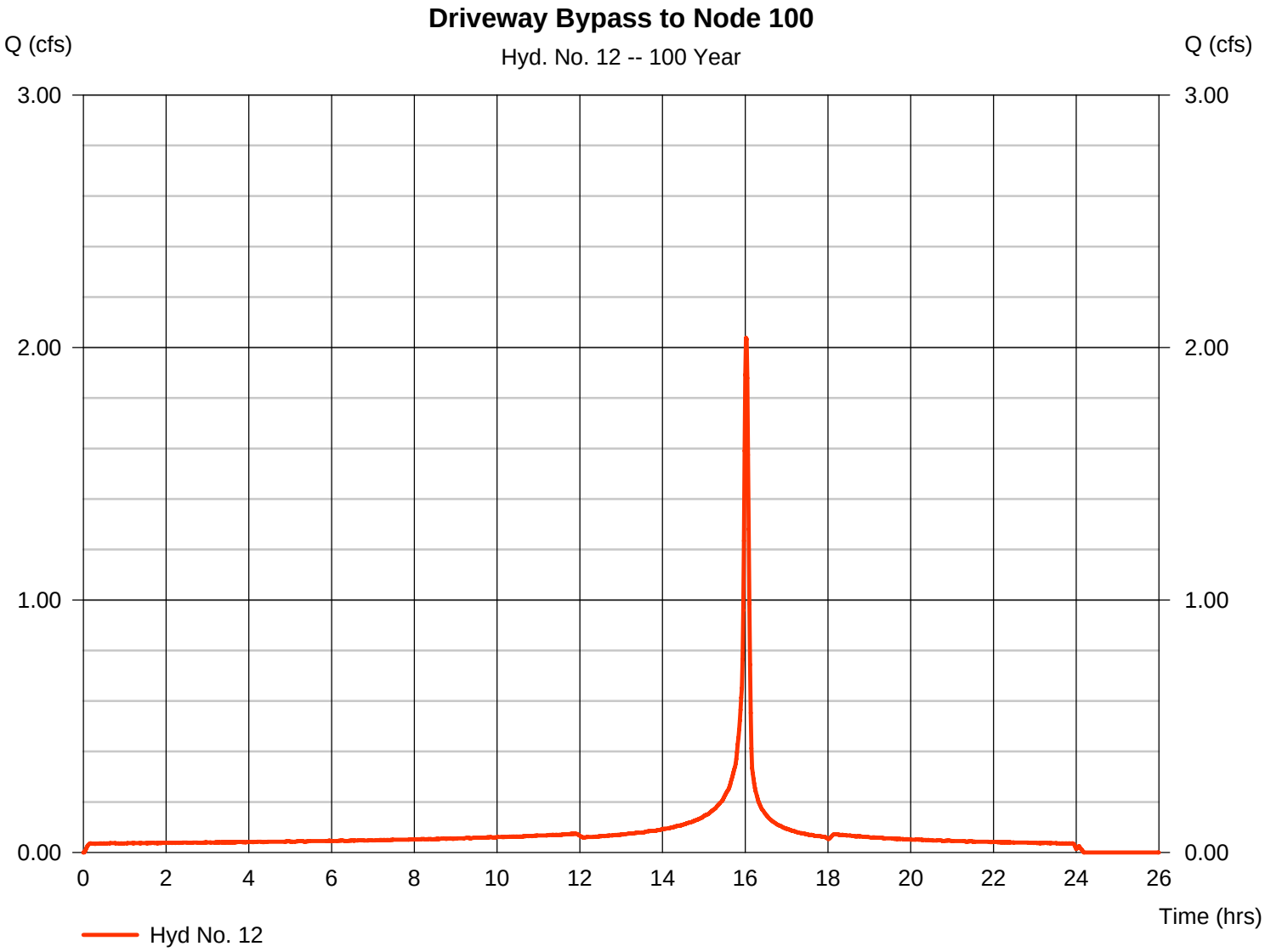
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 12

Driveway Bypass to Node 100

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.038 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.02 hrs
Time interval	=	1 min	Hyd. volume	=	6,738 cuft
Drainage area	=	0.600 ac	Curve number	=	100
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Custom
Storm duration	=	kaiser.cds	Shape factor	=	484



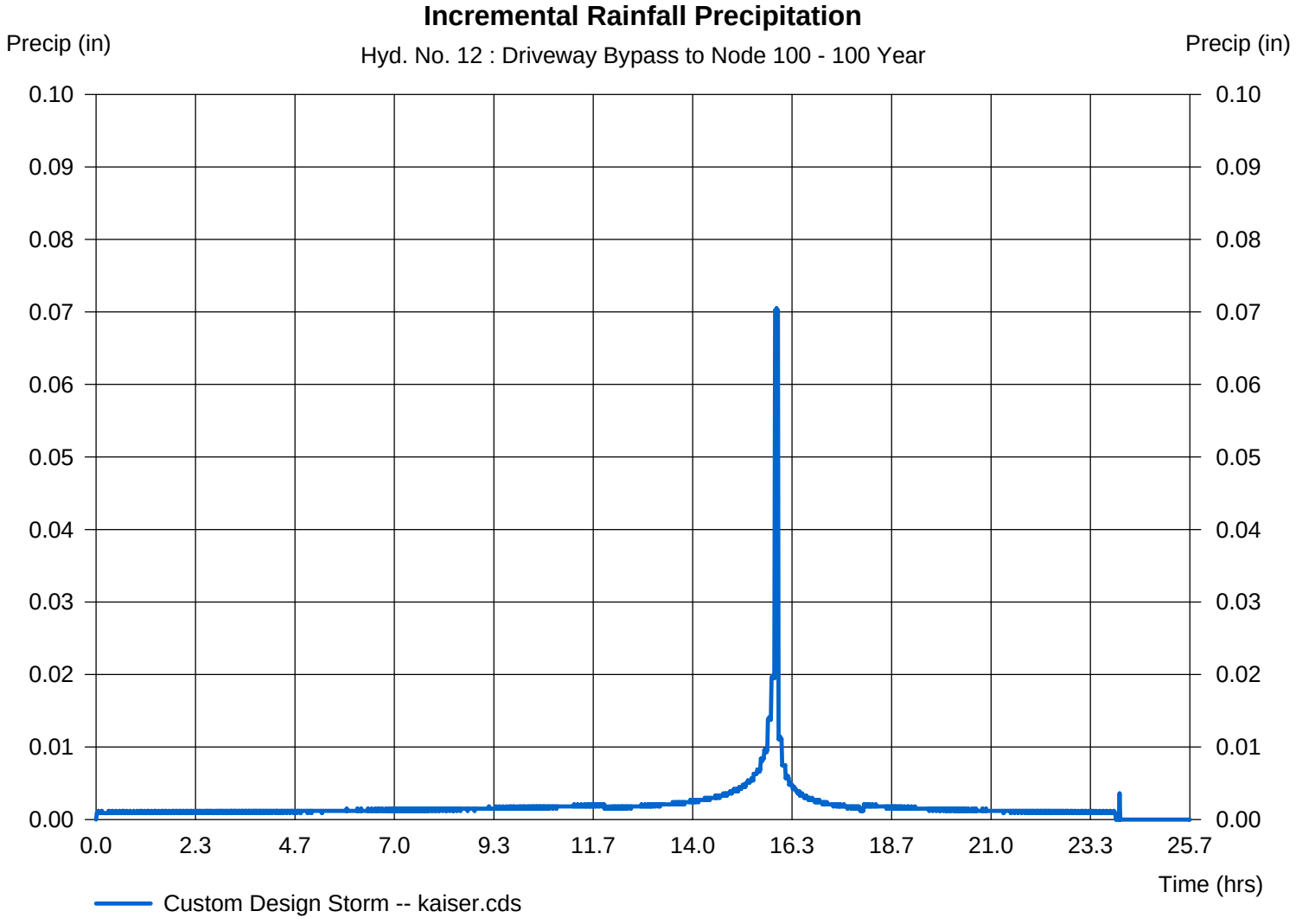
Precipitation Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 12

Driveway Bypass to Node 100

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 3.0000 in	Distribution	= Custom
Storm duration	= kaiser.cds		



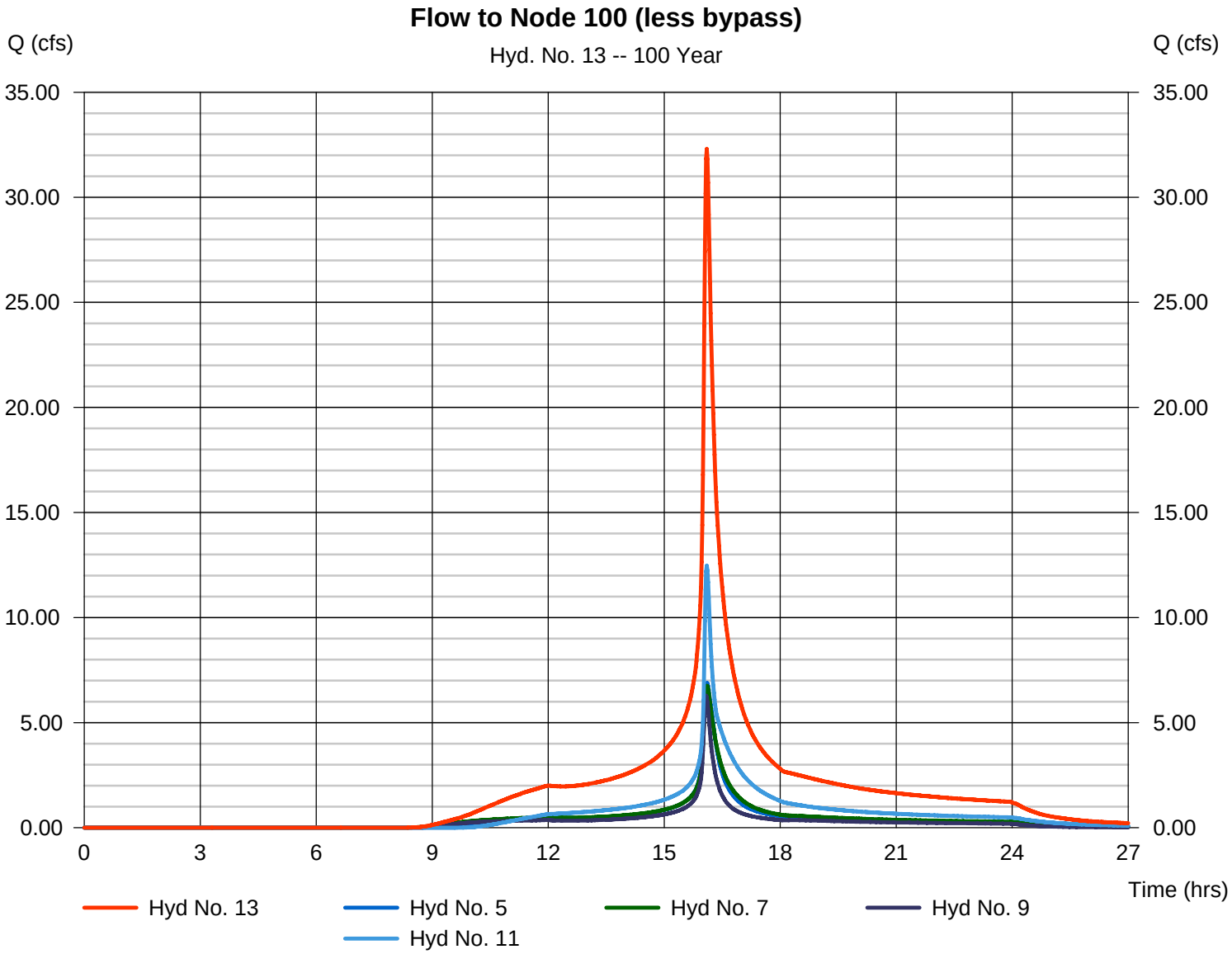
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 13

Flow to Node 100 (less bypass)

Hydrograph type	=	Combine	Peak discharge	=	32.29 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.10 hrs
Time interval	=	1 min	Hyd. volume	=	172,141 cuft
Inflow hyds.	=	5, 7, 9, 11	Contrib. drain. area	=	0.000 ac



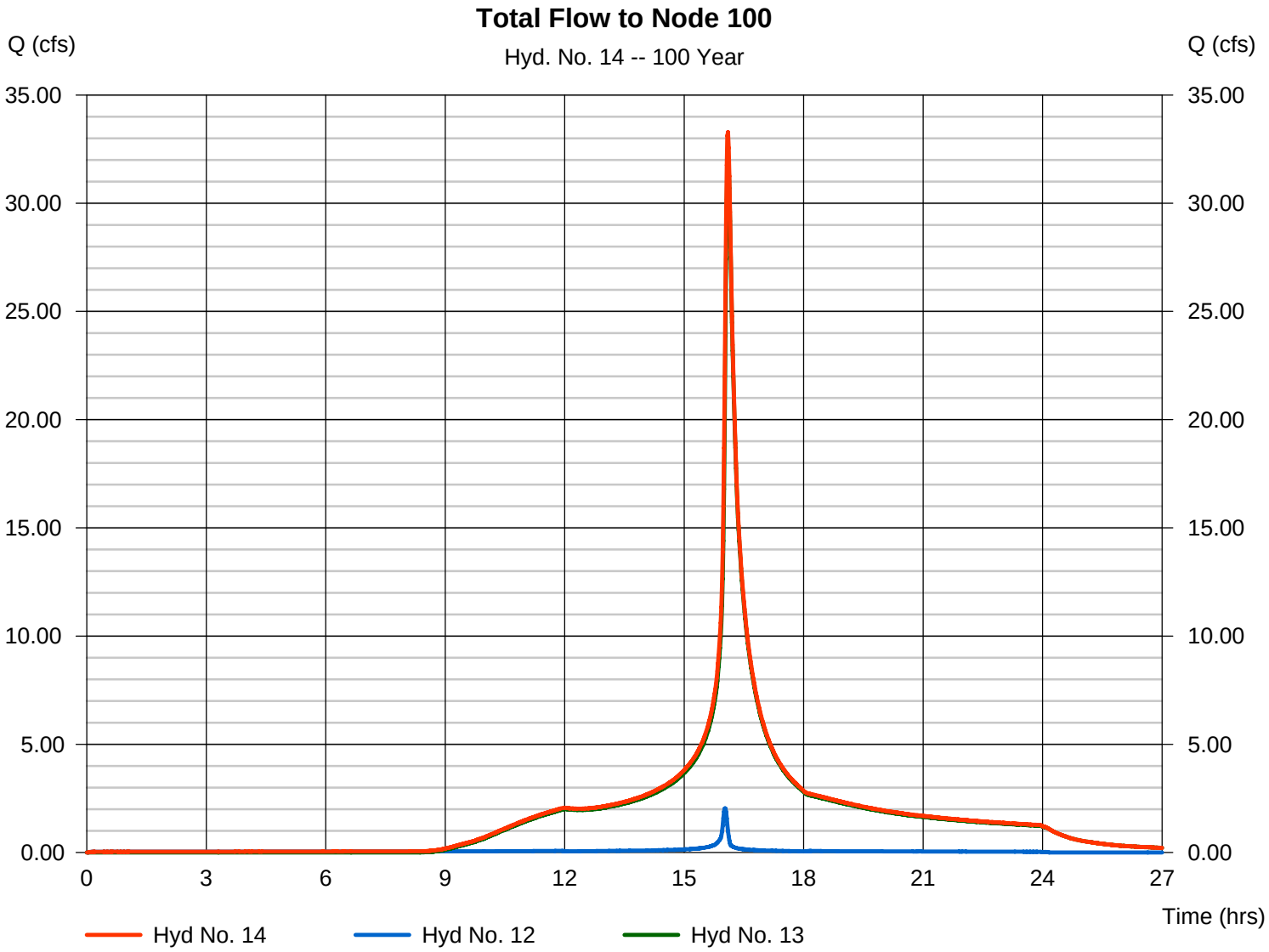
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.1 Thursday, Jan 10, 2013

Hyd. No. 14

Total Flow to Node 100

Hydrograph type	=	Combine	Peak discharge	=	33.28 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.10 hrs
Time interval	=	1 min	Hyd. volume	=	178,879 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	0.600 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	2.20	0.00	3.30	4.25	5.77	6.80	3.00
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	0.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	1.55	0.00	2.75	4.00	5.38	6.50	0.00
Custom	0.60	0.60	0.00	2.80	3.90	5.25	6.00	3.00

Kaiser Permanente San Diego Central Hospital Medical Center

Preliminary Water Quality Technical Report

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RBF CONSULTING

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RBF Job Number 25105430.001

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INTRODUCTION

City of San Diego's Standard Urban Stormwater Mitigation Plan (SUSMP) states a Water Quality Technical Report (WQTR) must accompany all applications for a permit or approval associated with a Land Disturbance Activity. The purpose of this WQTR is to describe how the project will minimize the short and long-term impacts on receiving water quality.

The plans and specifications found in this WQTR are not for construction purposes; the contractor shall refer to the final approved construction documents of plans and specifications.

1 Project Description

This section describes the project with respect to its location, the planned improvements, and places it within the context of the larger watershed.

1.1 PROJECT LOCATION

The 20-acre Kaiser San Diego project is located at the southeasterly corner of Ruffin Road and Clairemont Mesa Boulevard, in the City of San Diego, California. The site is bound by Clairemont Mesa Boulevard to the north, Ruffin Court to the south, Ruffin Road to the west, and the Polinsky Children's Center to the east. Access to the project site is provided off of Ruffin Road and Clairemont Mesa Boulevard. A vicinity map is located within Attachment A of this report (Thomas Brothers 1249 E1).

1.2 PROJECT DESCRIPTION AND PURPOSE

1.2.1 Project Description

The proposed project will construct Kaiser medical facilities on an existing developed site. The County of San Diego Public Works buildings currently located at the site will be removed. Existing parking lots and drive aisles will be re-aligned to fit the proposed site plan. Proposed improvements will incorporate landscape at all feasible locations, effectively reducing the amount of impervious cover, as compared to pre development conditions.

1.2.2 Project Activities

Project activities will include demolition of existing buildings, asphalt parking lots and drive aisles. Additionally, project activities include rough and precise grading and construction activities associated with new buildings, parking lots and drive aisles.

1.3 EXISTING IMPROVEMENTS AND DRAINAGE PATTERNS

1.3.1 Existing Drainage Improvements

All storm water runoff is conveyed overland as either sheet flow or shallow concentrated flow (brow ditch) under pre development conditions. Runoff is ultimately discharged from the site along the northerly boundary, Clairemont Mesa Boulevard. An existing concrete brow ditch parallels Clairemont Mesa Boulevard, conveying storm water runoff easterly.

1.3.2 Floodplain Mapping

The Federal Emergency Management Agency (FEMA) has not mapped any Special Flood Hazard Areas (SFHAs) for the project site. The easterly half of the project site lies within un-shaded Zone X, which correlates with areas determined to be outside the 500-year floodplain. The westerly half of the project site lies within an area not mapped by FEMA.

1.3.3 Downstream Conditions

Runoff within the existing concrete brow ditch, parallel to Clairemont Mesa Boulevard, continues easterly towards Murphy Canyon and Interstate 15 (I-15). Prior to reaching I-15, runoff is conveyed southerly, via Murphy Canyon, towards the San Diego River.

1.4 PROPOSED IMPROVEMENTS AND DRAINAGE PATTERNS

Existing drainage patterns and discharge locations will not be significantly altered by the proposed project.

Proposed improvements will include the installation of multiple flow through planter areas. As such, drainage patterns across the site will change slightly, as compared to pre development conditions; however the ultimate discharge point (northerly project boundary) will not be altered.

In all cases, flow through planter areas will be lined and fitted with perforated sub drains which will connect to the proposed on-site reinforced concrete pipes (RCPs). All flow through planter areas will contain a riser outlet or spillway for secondary discharge.

The ultimate project site discharge point, northeasterly corner, will consist of a proposed on-site storm drain connecting to a proposed off-site storm drain. The proposed off-site storm drain will connect to existing storm drain within the Clairemont Mesa Boulevard right of way. Refer to the project specific Drainage Study for specific details pertaining to the drainage patterns across the site. All on-site pipe outfalls, including discharge from the proposed storm drain pipes to the flow through planter areas, will be fitted with appropriate energy dissipaters.

A pump and storm water storage vault will be installed within the maintenance bay area located in the southwesterly corner of the project site. The storage vault will include an overflow discharge pipe operating under gravity flow. The pump will direct runoff to a proposed flow through planter area located along the northerly portion of the site (Drainage Management Area 40, Flow Through Planter Area B on the BMP location map found in Attachment D of this report). The proposed storage tank and pump are designed to discharge, at a minimum, the 85th percentile volume to the flow through planter area, prior to overflow. Refer to the project specific Drainage Report, found under separate cover, for further details.

1.5 HYDROLOGIC EFFECT OF PROJECT

The proposed project will not adversely impact the hydrologic and hydraulic properties of the project site. Through a reduction in impervious area the proposed project will reduce

the peak flow rate of runoff discharging from the site, as compared to pre-development conditions.

1.6 85TH PERCENTILE TREATMENT FLOW VOLUME ANALYSIS

The 85th percentile treatment volume analysis was performed based upon the impervious areas tributary to proposed water quality treatment locations. Table 1-1 summarizes the results of the water quality treatment flow rate analysis. Refer to Attachment D for the BMP location map.

Table 1-1 Water Quality (85th Percentile) Treatment Volume

Node/DMA	Drainage Area	Runoff Coefficient	Water Quality Depth	Treatment Volume Required
	(ac)	-	(in)	(ft^3)
20	3.1	0.9	0.6	6,077
40	8.8	0.9	0.6	17,250
60	8.1	0.9	0.6	15,878

Table 1-2 summarizes the impervious cover under existing and proposed condition. The proposed project will decrease the overall impervious area by approximately 2 acres.

Table 1-2 Summary of Impervious Cover Analysis

Coverage	**Existing Condition**		**Proposed Condition**		**Change**	
	acres	**%**	**acres**	**%**	**acres**	**%**
Buildings	8.0	40	10.0	50	+2.0	+10
Paved	11.0	55	7.0	35	-4.0	-20
Sub-Total	**19.0**	**95**	**17.0**	**85**	**2.0**	**-10**
Vegetated	0.1	0.5	3.0	15	+2.9	+14.5
Unimproved	0.9	4.5	0	0	-0.9	-4.5
Sub-Total	**1.0**	**5.0**	**3.0**	**15**	**+2.0**	**+10**
Total	**20.0**	**100**	**20.0**	**100**	**0.0**	**0**

1.7 HYDROLOGIC CONTEXT (WATERSHED CONTRIBUTION)

The project site is located on the 37,224-acre (58.2 square-mile) Mission San Diego Hydrologic Area (HA 907.11), which is part of the San Diego Hydrologic Unit (HU 907.00). The 20-acre property accounts for less than 0.06 percent of the local watershed area. **Attachment B** illustrates the project site in the context of the watershed. Table 1-3 summarizes the property in context of the watershed.

Table 1-3 Comparison of Watershed Areas

	Area (ac)	**37,224**	**20**	**18.7**
Mission San Diego HA 907.11	37,224	100%	-	-
Project Site	20	< 0.06%	100%	-
Post Development Impervious Area	17	< 0.05 %	85%	100%

2 Priority Project Determination

The following table determines whether the project is priority according to guidelines laid out in the Municipal Permit. There is a limited exclusion for trenching and re-surfacing work associated with utility projects, which are not considered priority projects. Parking lots, buildings, and other structures associated with utility projects are subject to SUSMP requirements if one or more of the criteria described in the table are met. Answering 'No' to all the projects indicates that the project is not a priority project and it is not necessary to complete a Major WQTR. Rather, a WQTR for Minor Activities must be completed.

PRIORITY PROJECT	YES	NO
1. Does the project disturb one acre or more and not meet one of the exclusions listed below?	✓	
Exclusions: Projects creating less than 5,000 sf of impervious surface; projects that add landscaping that does not require regular use of pesticides and fertilizers such as a slope stabilization project using native plants; linear pathway projects that are for infrequent vehicle use, such as for emergency or maintenance access or for bicycle or pedestrian use, if they are built with impervious surfaces or if they sheet flow to surrounding pervious surfaces; and, projects that do not meet the definition of New Development or Significant Redevelopment in the Storm Water Standards.		
2. New detached or attached residential development of 10 or more units		✓
3. New developments of heavy industry greater than 1 acre		✓
4. New commercial development greater than 1 acre	✓	
5. New automotive repair shop		✓
6. New restaurant		✓
7. New hillside development greater than 5,000 square feet		✓
8. New project within, directly adjacent to or discharging to receiving waters within the Water Quality Sensitive Areas		✓
9. New parking lots greater than or equal to 5,000 square feet or with at least 15 parking spaces	✓	
10. New streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater		✓
11. New retail gasoline outlets		✓
12. Redevelopment that installs and/or replaces 5,000 square feet or more of impervious surface and the existing site meets at least one of the categories 2-11 above	✓	

3 Summary of Water Quality Issues

This section provides a summary of relevant storm water quality issues pertaining to the project site.

QUESTIONS	Section	Completed	N/A
Describe the topography of the project area.	3.1	✓	
Describe the local land use within the project area and adjacent areas.	3.2	✓	
Evaluate the presence of dry weather flow.	3.3	✓	
Determine the receiving waters that may be affected by the project throughout the project life cycle (i.e., construction, maintenance and operation).	3.4	✓	
For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	3.5	✓	
Determine if there are any High Risk Areas (municipal or domestic water supply reservoirs or groundwater percolation facilities) within the project limits.	3.6	✓	
Determine the Regional Board special requirements, including TMDLs, effluent limits, etc.	3.7	✓	
Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	3.8	✓	
If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and depth to groundwater.	3.9	✓	
Determine contaminated or hazardous soils within the project area.	3.1	✓	

3.1 TOPOGRAPHY

The project site slopes south to north, with slopes ranging from two to nine percent. Natural bluffs, ranging from five to 30 feet high, form the northerly perimeter along Clairemont Mesa Boulevard. Elevations range from 425 feet above mean sea level (MSL) along the southerly boundary to 400 feet MSL along the northerly boundary. One-foot contour topography, obtained from Commercial Due Diligence, was used for the hydrologic analysis, which can be found in the Hydrology and Hydraulics report, under separate cover.

3.2 LAND USE AND VEGETATION

A majority of the existing project site consists of impervious surfaces with little to no vegetated cover. There are scattered trees around the perimeter as well as a few trees near the existing building. The remaining portion of the site that is not paved consists of dirt slopes located between the two terraced parking lots.

3.3 DRY WEATHER FLOW

No dry weather flow was observed during a field visit performed by RBF Consulting on March 23, 2012.

3.4 RECEIVING WATERS

Construction, operation, and maintenance of the project will affect receiving waters throughout the project lifetime. The most immediate receiving water for the project site is Murphy Canyon. According to the California 2010 303(d) list published by the San Diego Regional Water Quality Control Board (RWQCB Region 9), Murphy Canyon is not listed; however, the lower San Diego River contains several impairments. Table 3-1 summarizes the receiving waters and their classification by the RWQCB Region 9.

Table 3-1 Summary of Receiving Waters

Receiving Water	Hydrologic Unit	Approximate Distance from Site	303(d) Impairment(s)
San Diego Hydrologic Unit (907.00)			
Mission San Diego Hydrologic Area (907.11)			
Murphy Canyon	907.11	< 1 miles	Not Listed
San Diego River (Lower)	907.11	< 3.5 miles	Enterococcus, Fecal Coliform, Low Dissolved Oxygen, Manganese, Nitrogen, Phosphorus, Total Dissolved Solids, Toxicity
Pacific Ocean at the San Diego River Outlet (Dog Beach)	907.11	< 13 miles	Enterococcus, Total Coliform

3.5 303(D) IMPAIRMENTS

The Environmental Protection Agency (EPA) is the primary federal agency responsible for management of water quality in the United States. The Clean Water Act (CWA) is the federal law that governs water quality control activities initiated by the EPA and others. Section 303 of the CWA requires the adoption of water quality standards for all

surface water in the United States. Under Section 303(d), individual states are required to develop lists of water bodies that do not meet water quality objectives after required levels of treatment by point source dischargers. Total maximum daily loads (TMDLs) for all pollutants for which these water bodies are listed must be developed in order to bring them into compliance with water quality objectives.

3.6 RISK ASSESSMENT

There are no high-risk drinking water supply or other sensitive resources within the project limits. Due to the small size of the project in the context of the watershed and the lack of downstream reservoirs, the project is unlikely to have any effect on drinking water supply. Therefore, the project presents negligible risk to drinking water supply or other sensitive resources.

3.7 TOTAL MAXIMUM DAILY LOAD (TMDL)

There are currently no Total Maximum Daily Load (TMDL) restrictions for the project receiving waters.

3.8 GENERAL CLIMATE

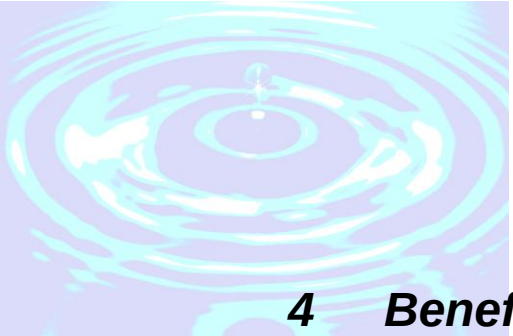
San Diego climate is classified as Mediterranean, with warm, dry summers and mild, wet winters. Annual precipitation averages range from 10 inches along the coast to 18 inches the eastern mountains, with low to high intensity storms occurring mostly in the winter and spring.

3.9 SOIL CHARACTERISTICS

No soils report was available at the time of initial report preparation. Based on the Natural Resources Conservation Service's (NRCS) Websoil Survey, the project site is comprised almost entirely of Redding gravelly loam, with slopes ranging from two to nine percent (hydrologic soil type D).

3.10 CONTAMINATED SOIL AND HAZARDOUS WASTE ASSESSMENT

There are no known contaminated soils, fills, or hazardous wastes at the project site.



4 Beneficial Uses

This section summarizes the beneficial uses of surface water and ground water resources downstream of the project.

4.1 DEFINITIONS

The Porter-Cologne Act establishes a comprehensive program for the protection of beneficial uses of the waters of the state. California Water Code Section 13050(f) describes the beneficial uses of surface and ground waters that may be designated by the State or Regional Board for protection as follows:

"Beneficial uses of the waters of the state that may be protected against quality degradation include, but are not necessarily limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves."

Beneficial uses for surface waters are designated under the Clean Water Act Section 303 in accordance with regulations contained in 40 CFR 131. The State is required to specify appropriate water uses to be achieved and protected. The beneficial use designation of surface waters of the state must take into consideration the use and value of water for public water supplies, protection and propagation of fish, shellfish and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation.

In 1972, the State Board adopted a uniform list and description of beneficial uses to be applied throughout all basins of the State. During the 1994 Basin Plan update, beneficial use definitions were revised and some new beneficial uses were added. The following beneficial uses are defined statewide and are designated within the San Diego Region:

Municipal and Domestic Supply. Includes uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.

Agricultural Supply. Includes uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Industrial Process Supply. Includes uses of water for industrial activities that depend primarily on water quality.

Industrial Service Supply. Includes uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

Ground Water Recharge. Includes uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

Freshwater Replenishment. Includes uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).

Navigation. Includes uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

Hydropower Generation. Includes uses of water for hydropower generation.

Contact Water Recreation. Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation. Includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Commercial and Sport Fishing. Includes the uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Aquaculture. Includes the uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.

Warm Freshwater Habitat. Includes uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

Cold Freshwater Habitat. Includes uses of water that support cold-water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

Inland Saline Water Habitat. Includes uses of water that support inland saline water ecosystems including, but not limited to, preservation or enhancement of aquatic saline habitats, vegetation, fish, or wildlife, including invertebrates.

Estuarine Habitat. Includes uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).
Marine Habitat. Includes uses of water that support marine ecosystems including, but not

limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

Wildlife Habitat. Includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Preservation of Biological Habitats of Special Significance. Includes uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

4.1.1 Beneficial Uses: Inland Surface Waters

The RWQCB San Diego Basin Plan identifies several beneficial uses of receiving inland surface waters. For the Mission San Diego Hydrologic Area (907.11), the Basin Plan lists "San Diego Rover Murphy Canyon." Table 4-1 summarizes the beneficial uses identified for downstream inland surface waters.

4.1.2 Beneficial Uses: Coastal Waters

The Pacific Ocean is approximately 13 miles downstream of the project site. Table 4-2 summarizes the beneficial uses identified for downstream coastal waters.

4.1.3 Beneficial Uses: Lake and Reservoirs

The RWQCB San Diego Basin Plan identifies several beneficial uses of receiving lakes and reservoirs. In this particular case, there are no lakes or reservoirs located downstream of the project site.

4.1.4 Beneficial Uses: Groundwater Resources

The RWQCB Basin Plan identifies the beneficial uses of groundwater resources. Table 4-4 summarizes the beneficial uses of downstream groundwater resources.

Table 4-1 Beneficial Uses of Downstream Inland Surface Waters (RWQCB, 1998).

● Existing Beneficial Use ○ Potential Beneficial Use **+** Exempt from Municipal Use	**Beneficial Use**														
Receiving Water (Hydrologic Unit Code)	Municipal/Domestic Supply	Agricultural Supply	Industrial Service Supply	Industrial Process Supply	Groundwater Recharge	Freshwater Replenishment	Hydropower Generation	Contact Water Recreation	Non-Contact Water Recreation	Significant Biological Habitats	Warm Freshwater Habitat	Cold Freshwater Habitat	Wildlife Habitat	Rare Species	Fish Spawning and Development
San Diego River Murphy Canyon	+	●	●					●	●		●		●	●	
Pacific Ocean Shoreline (906.30)	See Coastal Waters (Table 4-2)														

Table 4-2 Beneficial Uses of Downstream Coastal Waters (RWQCB, 1998).

● Existing Beneficial Use ○ Potential Beneficial Use	**Beneficial Use**														
Receiving Water (Hydrologic Unit Code)	Industrial	Navigation	Contact Water Recreation	Non-Contact Water Recreation	Commercial/Sport Fishing	Significant Biological Habitats	Estuarine Habitat	Wildlife Habitat	Rare Species	Marine Habitat	Aquaculture	Aquatic Organism Migration	Spawning	Warm Freshwater Habitat	Shellfish
Pacific Ocean	●	●	●	●	●	●		●	●	●	●	●	●		●

Table 4-3 Beneficial Uses of Downstream Lakes and Reservoirs (RWQCB, 1998).

● Existing Beneficial Use ○ Potential Beneficial Use	**Beneficial Use**												
Receiving Water (Hydrologic Unit Code)	Municipal/Domestic Supply	Agricultural Supply	Industrial Process Supply	Industrial Service Supply	Groundwater Recharge	Freshwater Replenishment	Contact Water Recreation(1)	Non-Contact Water Recreation	Warm Freshwater Habitat	Cold Freshwater Habitat	Wildlife Habitat	Rare Species	Hydropower Generation
N/A													

(1) Fishing from shore or boat is permitted, but other water contact recreation uses are prohibited.

Table 4-4 Beneficial Use of Downstream Ground Waters (RWQCB, 1998).

● Existing Beneficial Use ○ Potential Beneficial Use **+** Exempt from Municipal Use	**Beneficial Use**					
Receiving Water (Hydrologic Unit Code)	Municipal/Domestic Supply	Agricultural Supply	Industrial Service Supply	Industrial Process Supply	Freshwater Replenishment	Groundwater Recharge
Mission San Diego (907.11)	○	●	●	●		

5 Pollutants of Concern

5.1 POTENTIAL POLLUTANTS

The proposed project is not expected to generate significant amounts of pollutants, but many constituents are generally anticipated for projects in this category. Table 5-1 identifies anticipated pollutants that might be generated from priority project categories.

Table 5-1 Anticipated and Potential Pollutants Generated by Land Use Type (City of San Diego Storm Water Standards, January 2012)

General Project Categories	General Pollutant Categories								
	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Housing Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development	P(1)	P(1)	X	P(2)	X	P(5)	X	P(3)	P(5)
Industrial Development	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	P(1)
Steep Hillside Developments	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X	X	P(1)
Retail Gasoline Outlets (RGO)			X	X	X	X	X		

X = anticipated
P = potential
(1) A potential pollutant is landscaping exists on-site
(2) A potential pollutant is the project includes uncovered parking areas
(3) A potential pollutant if land use involves food or animal waste products
(4) Including petroleum hydrocarbons
(5) Including solvents

5.2 POLLUTANTS

The following discussion briefly describes the pollutants listed in Table 5-1:

5.2.1 Sediment

Sediments are soils or other surface materials eroded and then transported or deposited by the action of wind, water, ice, or gravity. Sediments can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth.

5.2.2 Nutrients

Nutrients are inorganic substances, such as nitrogen and phosphorus. They commonly exist in the form of mineral salts that are either dissolved or suspended in water. Primary sources of nutrients in urban runoff are fertilizers and eroded soils. Excessive discharge of nutrients to water bodies and streams can cause excessive aquatic algae and plant growth. Such excessive production, referred to as cultural eutrophication, may lead to excessive decay of organic matter in the water body, loss of oxygen in the water, release of toxins in sediment, and the eventual death of aquatic organisms.

5.2.3 Heavy Metals

Metals are raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. The primary sources of metal pollution in storm water are typically commercially available metals and metal products. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and cooling tower systems. At low concentrations naturally occurring in soil, metals are not toxic. However, at higher concentrations, certain metals can be toxic to aquatic life. Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns, regarding the potential for release of metals to the environment, have already led to restricted metal usage in certain applications.

5.2.4 Organic Compounds

Organic compounds are carbon-based (commercially available or naturally occurring) substances found in pesticides, solvents, and hydrocarbons. Organic compounds can, at certain concentrations, indirectly or directly constitute a hazard to life or health. When rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to storm drains. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life.

5.2.5 Trash and Debris

Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic matter (such as leaves, grass cuttings, and food waste) are general waste products on the landscape. The presence of trash and debris may have a significant impact on the recreational value of a water body and aquatic habitat. Excess organic matter can create a high biochemical oxygen demand in a stream and thereby lower its water quality. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide.

5.2.6 Oxygen-Demanding Substances

This category includes biodegradable organic material as well as chemicals that react with dissolved oxygen in water to form other compounds. Proteins, carbohydrates, and fats are examples of biodegradable organic compounds. Compounds such as ammonia and hydrogen sulfide are examples of oxygen-demanding compounds. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions.

5.2.7 Oil and Grease

Oil and grease are characterized as high-molecular weight organic compounds. The primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids. Introduction of these pollutants to the water bodies are very possible due to the wide uses and applications of some of these products in municipal, residential, commercial, industrial, and construction areas. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality.

5.2.8 Bacteria and Viruses

Bacteria and viruses are ubiquitous microorganisms that thrive under certain environmental conditions. Their proliferation is typically caused by the transport of animal or human fecal wastes from the watershed. Water containing excessive bacteria and viruses can alter the aquatic habitat and create a harmful environment for humans and aquatic life. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in the water.

5.2.9 Pesticides

Pesticides (including herbicides) are chemical compounds commonly used to control nuisance growth of organisms. Excessive application of a pesticide may result in runoff containing toxic levels of its active component.

5.3 PRIMARY POLLUTANTS OF CONCERN

Primary pollutants of concern are pollutants that correspond to Clean Water Act section 303(d) impairment of the receiving waters of the project and may aggravate the identified impairment(s). Table 5-2 summarizes these primary pollutants of concern and the treatment control BMPs applied to the project site that target them (see Section 9 for more information).

Table 5-2 Primary Pollutants of Concern versus BMP Matrix

Condition of Concern (Impairments)	Potential Aggravating Pollutant Source(s)	Best Management Practice
Low Dissolved Oxygen	Nutrients from Fertilizers	Flow Through Planters
Nitrogen	Nutrients from Fertilizers	Flow Through Planters
Phosphorus	Nutrients from Fertilizers	Flow Through Planters
Manganese	Heavy Metals from Cars	Flow Through Planters
Bacteria	Food and Animal Waste	Flow Through Planters

5.4 SECONDARY POLLUTANTS OF CONCERN

Pollutants that are anticipated from the project, but are not correlated to receiving water impairments are considered secondary pollutants of concern. Table 5-3 summarizes the secondary pollutants of concern and the treatment control BMPs applied to the project site that target them (see Section 9 for more information).

Table 5-3 Secondary Pollutants of Concern versus BMP Matrix

Anticipated Pollutants	Potential Aggravating Pollutant Source(s)	Best Management Practice
Oils and Grease	Designated Drive Aisles and Parking Areas	Flow Through Planters
Trash and Debris	General Public Use	Flow Through Planters
Pesticides	Landscaped Areas	Flow Through Planters
Sediment	Landscaped Areas	Flow Through Planters
Organic Substances	Uncovered Parking	Flow Through Planters
Oxygen Demanding Substances	Landscaped Areas	Flow Through Planters

Sediment discharge and eroded soil are of most concern during construction phase of the project. A complete program of construction Best Management Practices (BMPs) will be developed for the project site, and will be described in a Storm Water Pollution Prevention Program (SWPPP) for Construction Activities as part of the approval of the final grading plans. The construction BMPs will address this condition of concern during the construction phase.

6 Construction BMPs

Best management practices to prevent, reduce, or treat storm water pollution will be implemented during the construction phase of the project. Table 6-1 and Table 6-2 (on the following two pages) summarize the Construction BMPs that will potentially be used for the project.

Because the project site is larger than one acre in size, a full Storm Water Pollution Prevention Plan for Construction Activities (SWPPP) will be developed for the project under separate cover from this WQTR. Please reference the SWPPP and erosion control plans for additional construction-phase BMP information.

Table 6-1 Minimum Required Construction BMPs

Minimum Required Best Management Practices (BMPs)	Caltrans Stormwater Handbook Reference Detail	BMP Selected	Explanation (If No BMP Selected)
Step 1 Select Erosion Control method for graded Slopes (choose at least one)			
Vegetation Stabilization Planting (see note 1)	SS-2 SS-4	☒	
Hydraulic Stabilization Hydroseeding (see note 1)	SS-3 SS-4	☒	
Bonded Fiber Matrix (see note 2)	SS-4	☐	
Physical Stabilization / Erosion Control Blanket (see note 2)	SS-7	☒	
Step 2 Select Erosion Control Method for Graded Flat Areas (Slope < 5%) (Choose at Least One)			
Will use above Slope Control measures on flat areas also	SS-2,3,4,7	☒	
Mulch, straw, wood chips, soil application	SS-6 SS-8	☐	
De-silting Basin (must treat all site runoff)	SC-2	☐	
Step 3 If runoff is concentrated, velocity must be controlled using energy dissipater			
Energy Dissipater Outlet Protection (see note 3)	SS-10	☐	
Step 4 Select Sediment Control method for all disturbed areas (choose at least one)			
Silt Fence	SC-1	☒	
Straw Wattles	SC-5	☒	
Gravel Bags	SC-6 & 8	☒	
Storm Drain Inlet Protection	SC-10	☐	
De-silting Basin (sized for 10-year flow)	SC-2	☐	
Step 5 Select method for preventing offsite tracking of sediment (choose at least one)			
Stabilized Construction Entrance	TC-1	☒	
Construction Road Stabilization	TC-2	☒	
Entrance/Exit Tire Wash	TC-3	☒	
Entrance/Exit Inspection & Cleaning Facility	-	☐	
Step 6 Select the General Site Management BMPs for each waste that will be on site			
Materials Management / Material Delivery & Storage	WM-1	☒	
Waste Management / Concrete Waste Management	WM-8	☒	
Solid Waste Management	WM-5	☒	
Sanitary Waste Management	WM-9	☒	
Hazardous Waste Management	WM-6	☐	

Notes:

1. When Planting or Hydroseeding are selected for erosion control, the vegetative cover must be planted by August 15th and established by October 1st. If in the opinion of the City Official the vegetative cover is not established by October 1st, additional hydraulic or physical erosion control BMPs will be required.

2. These BMPs are temporary measures only when used without planting or hydroseeding. All slopes must have established vegetative cover prior to final grading approval.

3. Regional Standard Drawing D-40 - Rip Rap Energy Dissipater is also acceptable for velocity reduction.

4. Not all grading projects will have every waste identified. The applicant is responsible for identifying wastes that will be on-site and applying the appropriate BMP. For example, if concrete will be used, BMP WM-8 should be selected.

Table 6-2 Additional Construction BMPs

Best Management Practices (BMPs)	**CASQA Stormwater Handbook Detail**	**BMP Selected**
EROSION CONTROL		
Site Development Considerations		
Scheduling	SS-1	☒
Preservation of Existing Vegetation	SS-2	☒
Other (submit description for approval)		☐
Vegetation Stabilization		
Vegetation Buffer Strips	SS-2	☐
Physical Stabilization		
Dust Control	WE-1	☒
Soil Stabilizers	SS-5	☒
DIVERSION OF RUNOFF		
Earthen Dikes	SS-9	☐
Ditches and Berms	SS-9	☐
Slope Drains	SS-11	☐
Temporary Drains & Swales	SS-9	☒
VELOCITY REDUCTION		
Check Dams	SS-4	☒
Slope Terracing	-	☐
SEDIMENT CONTROL		
Brush or Rock Filter	-	☐
Sediment Trap	SC-3	☐
Sediment Basin	SC-2	☐
GENERAL SITE MANAGEMENT		
Employee & Subcontractor Training	-	☒
Materials Management		
Spill Prevention & Control	WM-4	☒
Waste Management		
Contaminated Soil Management	WM-7	☐
Vehicle and Equipment Management		
Vehicle & Equipment Cleaning	NS-8	☒
Vehicle & Equipment Fueling	NS-9	☐
Vehicle & Equipment Maintenance	NS-10	☐
Construction Practices		
Water Conservation	NS-1	☒
Structure Construction & Painting	-	☒
Paving Operations	NS-3	☒
Dewatering Operations	NS-2	☐

7 Priority Project Site Development LID Requirements

Priority Development Projects are to include Low Impact Development, which will include features that attempt to mimic natural hydrologic conditions for the water quality design storm. Although this development is not a Priority Project, Low Impact Development measures such as retention will be implemented on the site.

7.1 PRIORITY DEVELOPMENT PROJECT LID BMP SELECTION MATRIX

(Per Section 3.2 of the City of San Diego Stormwater Standards Manual dated January 20, 2012)

	LID BMP OPTION	YES	NO	N/A	EXPLANATION
1.	**Optimize Site Layout.** To minimize storm water related impacts, apply the following design principles to the layout of newly developed and redeveloped sites.				
	Utilize topography to optimize the site layout and reduce the need for grading. Development envelopes should be focused in the upper elevations of a site to promote sheet flow and natural surface drainage to BMPs or Integrated Management Practices (IMPs) located at lower elevations of the site (IMPs are discussed in detail in Appendix I of this manual).	✓			The proposed project focuses development within the upper elevations to promote sheet flow and natural surface drainage (where feasible) to BMPs. The proposed BMPs are generally located at the lower elevations across the site.
	Where possible, conform the site layout along natural landforms, avoid excessive grading and disturbance of vegetation and soils, and replicate the site's natural drainage patterns. Set development sufficiently away from creeks, wetlands, and riparian habitats.	✓			Excessive grading has been avoided. The project will increase landscaped areas, as compared to pre development conditions. The natural discharge location will not be changed, as compared to pre development conditions. There are no creeks or wetlands in the project vicinity.
	Hillside areas should be considered more sensitive to development practices than flatter areas.	✓			Development is primary proposed along the flatter portions of the site. The only exception being the main entrance off Clairemont Mesa Boulevard.

	LID BMP OPTION	YES	NO	N/A	EXPLANATION
	Identify soils with high infiltration capacity and, if possible, locate storm water treatment facilities in these locations. Concentrate development on portions of the site with less permeable soils.			✓	Infiltration is not proposed due to poor infiltration rates associated with project site soils and adjacent public roads that could potentially be damages as a result of project site infiltration
	Areas of the site where the erosive potential of the soil is high should be considered more sensitive to development and areas that should be left undisturbed. Areas devoid of vegetation, including previously graded areas and agricultural fields, and areas of non-native vegetation where receiving waters are not present are typically suitable for development. Conversely, areas of occupied habitat of sensitive species and wetlands areas are typically unsuitable for development.			✓	There are no areas where the erosive potential of the soil is significantly higher than other areas throughout the site. The steep access (main entrance) road off Clairemont Mesa Blvd. Will be paved.
	Preserve significant trees, especially native trees and shrubs, and identify locations for planting additional native or drought tolerant and large shrubs.		✓		Existing site is 95% impervious (i.e. not much to preserve). The proposed project will increase pervious land
2.	**Minimize Impervious Footprint**. For all types of development, limit the overall coverage of paving and roofs. Examine the site layout and circulation patterns to identify areas where landscaping areas can replace areas of proposed pavement.				
	Increase building density (number of stories above or below ground) through design of compact and taller structures.	✓			The building footprint has been reduced to the maximum extent practicable. A parking garage will be installed as part of Phase 2, thus reducing the amount of surface parking across the 20-acre site.
	Construct walkways, trails, patios, overflow parking lots, alleys and other low-traffic areas with permeable surfaces. Such permeable surfaces could include pervious concrete, porous asphalt, unit pavers, etc.		✓		Permeable pavement is not proposed due to poor on-site soil conditions (low infiltration) and the presence of other LID and treatment control BMPs throughout the site
	Construct streets, sidewalks and parking lot aisles to the minimum widths necessary, provided that public safety and a walkable environment for pedestrians are not compromised.	✓			Sidewalks, parking stalls, and drive aisles have been reduced to the maximum extent practicable.
	Promote the implementation of shared driveways where possible.			✓	Shared driveways are not applicable to this type of development (hospital)
	Design of smaller parking lots with fewer stalls, smaller stalls, more efficient lanes.	✓			The proposed parking has been reduced to the maximum extent practicable, and accounts for the future development of a parking garage (Phase 2).
	Design of indoor or underground parking.	✓			A parking garage is proposed as part of Phase 2.

	LID BMP OPTION	YES	NO	N/A	EXPLANATION
	Minimize the use of impervious surfaces in the landscape design.	✓			The use of impervious surfaces has been reduced throughout the site. The proposed project will reduce impervious cover, as compared to pre development conditions.
3.	**Disperse Runoff to Adjacent Landscaping.** Project designs should direct runoff from impervious areas to adjacent landscaping areas. The design, including consideration of slopes and soils, must reflect a reasonable expectation that an inch of rainfall will soak into the soil and produce no runoff. Minimize directly connected impervious areas as follows:				
	Drain rooftops into adjacent landscaping areas.	✓			A majority of the roof top drains will discharge to landscaped areas. Those roof drains that are connected to the proposed storm drain system will discharge to proposed flow through planter areas for treatment.
	Drain impervious parking lots, sidewalks, walkways, trails, and patios into adjacent landscaping areas.	✓			All impervious surfaces drain to landscaped areas (where feasible). Areas that drain directly to the proposed storm drain system will discharge to proposed, on-site flow through planter areas for treatment.
	Reduce or eliminate curb and gutters from roadway sections, thus allowing roadway runoff to drain to adjacent pervious areas.		✓		Curb and gutter are proposed for a majority of the roads associated with this proposed hospital. All impervious areas that drain directly to the proposed storm drain system will discharge into proposed, on-site flow through planter areas for treatment.
	Detain and retain runoff through the site. On flatter sites, landscaped areas and IMPs can be interspersed among the buildings and pavement areas. On hillside sites, drainage from upper areas may be collected in conventional catch basins and conveyed to landscaped areas and IMPs in lower areas of the site.	✓			Detention will occur within all of the proposed flow through planter areas. Retention is not proposed due to poor soil conditions (low infiltration rates) and potential adverse impacts to adjacent property associated with infiltration.
	Use depressed landscaping areas (also known as Self-Retaining Areas—see Appendix I), vegetated buffers, and bioretention areas as amenities and focal points within the site and landscaping design.	✓			Multiple flow through planter areas are proposed throughout the site.

	LID BMP OPTION	YES	NO	N/A	EXPLANATION
4.	**Design and Implementation of Impervious Surfaces**				
	Consider the implementation of permeable pavements into the site design. Identify locations where permeable pavements, such as turf block, unit pavers, pervious concrete, or pervious asphalt could be substituted for impervious concrete or asphalt paving. The Operations and Maintenance Plan of the site must ensure that permeable pavements will not be sealed in the future.	✓			The use of permeable pavement has been considered; however, based on poor soil conditions (low infiltration rates) and other LID and treatment control BMPs throughout the site, permeable pavement is not proposed.
	Potential benefits of vegetated or green roofs include lower heating and cooling costs and better sound insulation, in addition to air quality and water quality benefits. For SUSMP compliance purposes, runoff from vegetated roofs requires no further treatment or detention. For more information on vegetated roofs, see www.greenroofs.org.		✓		Green roofs are not proposed for this project based on initial costs and building type (i.e. roof top equipment associated with hospitals).
5.	**Construction Considerations:**				
	Minimize soil compaction (see discussion in Countywide Model SUSMP) for landscaped areas of the project site designated for storm water treatment.	✓			Soil compaction will be minimized within the areas designated for as flow through planters.
	Implement soil amendments. Landscape topsoil improvements play a significant role in maintaining plant and lawn health. Such soil amendments also improve the soil's capacity to retain moisture, which will reduce runoff from the water quality design storm and improve water quality.	✓			Soil amendments (import of top soil) will be included as part of the flow through planter area design. Each flow through planter area will have a minimum of 18-inches of top soil over the entire surface area.
6.	**Additional Considerations**				
	Stabilize the site. Vegetate disturbed soils and slopes with drought tolerant vegetation and stabilize permanent channel crossings.	✓			All areas of the site will be stabilized. Areas which are not impervious will consist of traditional landscape or flow through planters.
	Convey runoff safely away from the tops of slopes (to prevent slope instability caused by infiltrated runoff)	✓			Slopes have been minimized throughout the site. Runoff will be conveyed away from tops of slopes.
	Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, or channels that discharge to unlined channels in accordance with applicable specifications to reduce the potential for erosion and minimize impacts to receiving waters.	✓			All surface discharge locations will contain riprap

7.2 PROJECTS WITHIN CHANNELS

The following decision matrix must be completed for projects that include work within channels. The information is obtained from the project drainage report.

ITEM	CRITERIA	YES	NO	N/A	INSTRUCTIONS	EXPLANATION
	The project includes work within drainage channels.		✓		If YES, START at 1.	The project does not propose any development within drainage channels
1.	Will the project increase velocity or volume of downstream flow?			✓	If YES go to 5.	
2.	Will the project discharge to unlined channels?			✓	If YES go to 5.	
3.	Will the project increase potential sediment load of downstream flow?			✓	If YES go to 5.	
4.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect upstream and/or downstream channel stability?			✓	If YES go to 7.	
5.	Review channel lining materials and design for stream bank erosion.			✓	Continue to 6.	
6.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.			✓	Continue to 7.	
7.	Include, where appropriate, energy dissipation devices at culverts.			✓	Continue to 8.	
8.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.			✓	Continue to 9.	
9.	Include, if appropriate, detention facilities to reduce peak discharges.			✓		
10.	“Hardening“ natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.			✓	Continue to 11.	
11.	Provide other design principles that are comparable and equally effective.			✓	Continue to 12.	
12.	End					

8 Source Control BMPs

Source-control BMPs are activities, practices, and procedures (primarily non-structural) that are designed to prevent urban runoff pollution. These measures either reduce the amount of runoff from the site or prevent contact between potential pollutants and storm water. Also, source-control BMPs are often the best method to address non-storm (dry-weather) flows. The following table lists source-control BMP alternatives and indicates the practices that will be applied at the project site.

8.1.1 Source Control BMP Selection Matrix

	SOURCE CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION[1]
1.	**Maintenance Bays:** Shall include one of the following				
	1. a. Repairs/maintenance bays shall be indoors	✓			The proposed delivery bay will be covered to prevent contact with precipitation.
	1. b. Drainage system shall be designed to preclude urban run-on and run-off.		✓		Runoff from the surrounding area will drain to a proposed underground storage tank and be pumped to a proposed flow through planter area.
2.	**Vehicle and Equipment Wash Areas:** Areas for washing/steam cleaning of vehicles and areas for outdoor equipment/accessory washing and steam cleaning shall be:				
	2. a. Self-contained to preclude run-on and run-off, covered with a roof or overhang, and equipped with a clarifier or other pretreatment facility; and			✓	No vehicle or equipment wash areas.
	2. b. Properly connected to sanitary sewer.			✓	No vehicle or equipment wash areas.

[1] *Explanation is only required if "NO" or "N/A" is indicated; if YES is checked, it is assumed that the measure was used for this project.*

	SOURCE CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION[1]
3.	**Outdoor Processing Areas:** **Shall be**				
	3.a Cover or enclose areas that would be the most significant source of pollutants;			✓	No outdoor processing areas.
	3. b. Slope the area towards a dead end sump;			✓	No outdoor processing areas.
	3.c. Discharge to the sanitary sewer system.			✓	No outdoor processing areas.
4.	**Retail and Non-retail Fueling Areas** Retail and non-retail fueling areas shall be:				
	4. a Paved with Portland cement concrete or equivalent smooth impervious surface (asphalt concrete is prohibited.)			✓	No fueling areas.
	4. b. Designed to extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less;			✓	No fueling areas.
	4. c. Sloped to prevent ponding;			✓	No fueling areas.
	4. d. Separated from the rest of the site by a grade break that prevents run-on of adjacent urban runoff;			✓	No fueling areas.
	4. e. Designed to drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.			✓	No fueling areas.
	4.f. The overhanging roof structure or canopy shall be equal to or greater than the area within the fuel dispensing area's grade break;			✓	No fueling areas.
	4.g. The overhanging roof structure or canopy shall be: Designed to drain away form the fuel dispensing area.			✓	No fueling areas.
5.	**Steep Hillside Landscaping**				
	5. a. Steep hillside areas disturbed by project development shall be landscaped with deep-rooted, drought tolerant and/or native plant species selected for erosion control, in accordance with the Landscape Technical Manual.			✓	Site is flat, no slopes exist on site.

	SOURCE CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION[1]
6.	**Efficient Irrigation Systems & Landscaping Design**				
	6. a. Implement rain shutoff devices to prevent irrigation during and after precipitation events in accordance with Section 2.3-4 of the City of San Diego's Landscape Standards	✓			An efficient irrigation system is proposed.
	6. b. Reduce irrigation contribution to dry-weather runoff by avoiding spray irrigation patterns where overspray to paved surfaces or drain inlets will occur.	✓			The efficient irrigation system will be aligned such that impervious areas are not sprayed.
	6. c. To avoid over watering and potential irrigation runoff, design irrigation systems to each landscape area's specific water requirement..	✓			The proposed efficient irrigation system will be designed based on the needs of the specific landscape installed.
	6.d. Implement flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.	✓			Flow reducers or shutoff valves will be included as part of the efficient irrigation system.
	6.e. Avoid locating drain inlets in lawn areas, since such inlets tend to be sources or irrigation runoff and the transport mechanism for lawn care products. Design the grading and drainage systems such that drain inlets can be located outside of the lawn area, or include a non-turf buffer around the inlet.	✓			Area drains within the proposed landscaped areas will be elevated such that runoff is not immediately captured.
7.	**Trash Storage Areas** Design trash storage areas to reduce pollution contribution, trash storage areas shall:				
	7. a. Be paved with an impervious surface designed to prevent run on from adjoining areas and screened or walled to prevent off-site transport of trash.	✓			The proposed trash enclosures will be located on an impervious surface designed to prevent run on from adjoining areas. Dumpsters will contain lids to prevent off-site transport of trash.
	7. b. Contain attached lids on all trash containers to prevent rainfall intrusion.	✓			Dumpsters will contain lids to prevent rainfall intrusion.
	7. c. Contain a roof or awning, at the discretion of the City, for high usage trash areas such as those for fast food establishments, convenience stores, and high-density residential developments..			✓	A roof or awning is not proposed for the trash enclosures.

	SOURCE CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION[1]
8.	**Outdoor Material Storage Areas** Materials with the potential to contaminate urban runoff shall be:				
	8. a Placed in an enclosure such as a cabinet, shed, or other structure that prevents contact with rainfall or runoff and prevents spillage to the storm water conveyance system.	✓			All materials stored outside will be located within either a shed or other structure such that contact with rainfall is prevented.
	8. b. Protected by secondary containment structures such as berms, dikes, or curbs when the material storage area includes hazardous materials. The storage area shall be paved and sufficiently impervious to contain leaks and spills and be covered by a roof or awning to minimize direct precipitation within the secondary containment area..	✓			A secondary containment structure (curb) will be included for hazardous material storage areas.
9.	**Loading docks** Loading dock areas shall be:				
	9. a. Provide overhead cover where appropriate to prevent precipitation contact with debris and potential spills.	✓			The loading docks will include overhead protection where appropriate to prevent contact with precipitation.
	9. b. Isolate drainage in the loading dock area through the use of paved berms and/or grade breaks to prevent adjacent runoff from entering the loading area and to prevent liquid spills from discharging from the loading area.	✓			Runoff from the 24-hour water quality event within the loading area will be pumped to the flow through planter area located along the northerly boundary of the site.
	9. c. Include an acceptable method of spill containment such as a shut-off valve and containment areas.	✓			A natural containment area will be included as part of the design.
10.	**Employ Integrated Pest Management Principles** Integrated pest management (IPM) is an ecosystem-based pollution prevention strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as:				
	10.a. Biological Control	✓			
	10.b. Habitat manipulation	✓			Drawdown times within the proposed flow through planter areas will be limited to a maximum of 96 hours to prevent vector breeding.

	SOURCE CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION[1]
	10.c. Use of resistant plant varieties	✓			
	10.d Pesticides shall be used only after monitoring indicates they are needed according to established guidelines. Pest control materials shall be selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the surrounding environment.	✓			Proper pesticide application will be employed as necessary.
	10.e. To eliminate or reduce the need for pesticide use, the following strategies can be used: Plant pest-resistant or well-adapted plant varieties Discourage pests by modifying the site and landscaping design	✓			The need for pesticide use will be reduced to the maximum extent practicable.
	10.f. IPM educational materials should be distributed to future site residents and tenants. These educational materials should address the following: Use of barriers, screens, and caulking to keep pests out of buildings and landscaping Physical pest elimination techniques, such as weeding, washing , or trapping pests Relying on natural enemies to eliminate pests Proper use of pesticides as a last line of defense	✓			Proper IMP educational materials will be distributed to future owners.
11.	**Storm Water Conveyance System Stamping and Signage** Provide storm water conveyance system stamping and signage.				
	11. a. Concrete stamping, or approved equivalent method, shall be provided for all storm water conveyance system inlets and catch basins within the project area.	✓			Proposed curb inlets will contain concrete stamping or signage to prohibit illicit dumping to storm drains.
	11. b. Language associated with the stamping (e.g., “No Dumping – I Live in San Diego Bay”) must be satisfactory to the City Engineer. Stamping may also be required in Spanish.	✓			See 11a. above
	11. c. Post signs and prohibitive language (with graphical icons) which prohibit illegal dumping at trailheads, parks, building entrances and public access points along channels and creeks within the project area.			✓	See 11a. above

	SOURCE CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION[1]
12.	**Manage Fire Sprinkler Discharges** For new buildings with fire sprinkler systems, design fire sprinkler systems as follows".				
	12. a. Contain discharges from sprinkler systems' operational maintenance and testing and convey discharges to the sanitary sewer system.	✓			Sprinkler systems will discharge to the sanitary sewer system.
13.	**Manage Air Conditioning Condensate** Air conditioning condensate is a source of dry-weather runoff and elevated copper levels. Include design features to manage this pollutant source, such as the following:.				
	13. a. Direct air conditioning condensate to the sanitary sewer system	✓			Air condensation will either be directed to the sanitary sewer system or to proposed landscaped areas
	13. b. Direct air conditioning condensate to landscaping areas.	✓			See 13a. above.
14.	**Use Non-Toxic Roofing Materials Where Feasible:**				
	14 a. Avoid the use of galvanized steel or copper for roofs, gutters, and downspouts.	✓			Galvanized steel and/or copper roofs, gutters, and downspouts are not proposed.
	14.b. If using such materials, reduce the potential for leaching of metals by applying a coating or patina		✓		Such materials are not proposed.
	14.c. Avoid composite roofing materials that contain copper	✓			Copper will not be used in the design or construction of the proposed roofs.
15.	**Other Source Control Requirements**				
	15 a. Require implementation of post-construction soil stabilization practices, such as the re-vegetation of construction sites, in conformance with the approved Landscaping Plan and Grading Plans.	✓			Proposed improvements will increase landscaped areas throughout the site, as compared to predevelopment conditions.
	15.b. Provide for pet waste collection dispensers where applicable.		✓		Low potential for pets to be in the area.
	15.c. Provide trash receptacles in areas of high pedestrian traffic and in front of retail convenience stores	✓			Trash receptacles will be placed in areas with high pedestrian traffic.

9 LID and Treatment Control BMPs

Post-construction "treatment control" storm water management BMPs provide treatment for storm water emanating from the project site. Implementation of Regional MS4 Permit requirements entail the use of post-construction BMPs that will remain in service to protect water quality throughout the life of the project. Structural BMPs are an integral element of post-construction storm water management and include storage, filtration, and infiltration practices. BMPs have varying degrees of effectiveness versus different pollutants of concern as identified in Table 9-1.

9.1 SELECTION OF TREATMENT CONTROL BMPS

The selection, design and siting of structural BMPs within a project depend largely on the project-wide drainage plan. BMP alternatives were evaluated for their relative effectiveness for treating potential pollutants from the project site; technical feasibility; relative costs and benefits; and applicable legal, institutional, and other constraints. Table 9-1 lists treatment-control BMP alternatives and identifies the BMPs selected for the project site.

The Treatment Control BMPs have been chosen based on this Selection Matrix, comparing the list of pollutants for which the downstream receiving waters are impaired with the pollutants anticipated to be generated by the project.

Any potential pollutants that correspond to a Clean Water Act section 303(d) impairment of the receiving waters of the project, are considered primary pollutants of concern. Table 5-2 summarizes these primary pollutants of concern.

9.1.1 When There are Primary Pollutants of Concern

Priority projects that are anticipated to generate primary pollutants of concern shall select a single or combination of stormwater BMPs from Table 9-1, which **maximizes pollutant removal** for the particular primary pollutant(s) of concern. Maximizing pollutant removal generally implies the selection of a BMP with a high removal efficiency for the pollutant(s) of concern, or a "treatment train" of BMPs with low or medium removal efficiencies for the pollutant(s) of concern that will maximize the removal of primary pollutant(s) of concern.

9.1.2 When There are No Primary Pollutants of Concern

Priority projects that are **not** anticipated to generate a pollutant for which the receiving water is Clean Water Act Section 303(d) impaired (i.e., with no primary pollutants of concern, see Section 5.4) shall select a single or combination of stormwater BMPs from

Table 9-1, which are effective for pollutant removal of the identified secondary pollutants of concern, consistent with the "maximum extent practicable" standard.

Table 9-1 Structural BMP Treatment Control Selection Matrix

BMP	LID	HMP Control	Sediment	Nutrients	Trash	Metals	Bacteria	Oils and Grease	Organics
Infiltration Basin	Y	Y	H	H	H	H	H	H	H
Bioretention Basin	Y	Y	H	M	H	H	H	H	H
Cistern Plus Bioretention	Y	Y	H	M	H	H	H	H	H
Vault plus Bioretention	Y	Y	H	M	H	H	H	H	H
Self-retaining Area	Y	Y	H	H	H	H	H	H	H
Dry Wells	Y	Y	H	H	H	H	H	H	H
Constructed Wetlands	Y	Y	H	M	H	H	H	H	H
Extended Detention Basin	Y	Y	M	L	H	M	M	M	M
Vegetated Swale	Y	N	M	L	L	M	L	M	M
Vegetated Buffer Strips	Y	N	H	L	M	H	L	H	M
Flo-Through Planter Boxes	Y	Y	H	M	H	H	H	H	H
Vortex Separator or Wet Vault	N	N	M	L	M	L	L	L	L
Media Filter	N	N	H	L	H	N	M	H	H
H = High removal efficiency M = Medium removal efficiency L = Low removal efficiency									

9.2 TREATMENT CONTROL BMP PROGRAM

Treatment control BMPs address runoff from all developed areas on the project site. Section 10 describes the treatment control BMPs for the project, where they are located, and the water quality volume (V_{WQ}) treated by each. The treatment control BMP program consists of: multiple flow through planter areas. Attachment D illustrates the location of the BMPs.

Table 9-2 Summary of Treatment Control BMP's and Numeric Sizing

Drainage Management Area	BMP Type	Drainage Area (ac)	Required Treatment Volume (ft^3)	Provided Treatment Volume (ft^3)	Required Surface Area (ft^2)	Provided Surface Area (ft^2)
20	Flow Through Planter Area	3.1	6,077	6,436	4,672	4,700
40	Flow Through Planter Areas	8.8	17,250	20,724	11,134	15,636
60	Flow Through Planters and a Bio-Clean inlet	8.1	15,878	18,210	9,537	14,561
Totals		20	39,205	45,537	25,343	34,897
Surface area 'required' and 'provided' columns pertain to flow through planters only						

Drainage Management Area (DMA) 20:

This 3.1 acre sub-basin contains a 4,700 square foot flow through planter area. The riser outlet is set 1.5 feet above the bottom of the flow through planter area such that 6,436 cubic feet of storage is provided (prior to runoff flowing through the riser). Under Phase 1 conditions, three area drains will be provided to drain Self Treating Areas adjacent to the flow through planter area.

These three area drains will connect to the proposed storm drain system and bypass the flow through planter area under Phase 1 only. Under ultimate conditions, these area drains will be removed due to construction of a proposed building and parking garage. At that time, all runoff within the 3.1-acre sub basin will be directed to the flow through planter area.

Drainage Management Area (DMA) 40:

This 8.8-acre sub-basin contains two flow through planter areas.

Flow through planter area A, northwesterly corner, is 8,469 square feet with a riser set 1.0 feet off the bottom. Approximately 11,247 cubic feet of storage is provided prior to runoff overtopping the riser. Approximately 4.5 acres of the 8.8-acre sub-basin drain to flow through planter area A.

Flow through planter area B, northerly boundary, is 7,167 square feet with a riser set 1.0 feet off the bottom. Approximately 9,477 cubic feet of storage is provided prior to runoff overtopping the riser. Approximately 4.3 acres of the 8.8-acre sub-basin drain to flow through planter B. Included within this 4.3 acre area are the 2.4 acres that drain to the proposed storage tank & pump and 1.9 acres of overland flow.

Drainage Management Area (DMA) 60:

This 8.1-acre sub-basin contains four connected flow through planter areas and a Bio Clean Unit.

DMA 60 contains 14,561 square feet of total flow through planter area, split up amongst four separate areas. All four areas are interconnected via overland spillways, fitted with riprap to prevent erosion. The downstream flow through planter area, nearest to Clairemont Mesa Boulevard, contains a riser set 1.0-feet off the bottom. The total storage provided by the four connected areas is approximately 18,210 cubic feet. Approximately 7.5 acres drain to these four flow through planter areas via proposed storm drain and overland flow.

The main entrance to the project will be treated through the installation of a proposed Bio Clean Curb Inlet Basket system. Approximately 0.6 acres within DMA 60 will bypass the flow through planter areas due to site constraints associated with topography. Bio-Clean Curb Inlet Basket with shelf system (or similar means) will be installed in the northeasterly corner of the project site to treat runoff from the entrance driveway. Technical information, including sizing and design guides, is included within Attachment E of this report.

9.3 TREATMENT CONTROL BMP SELECTION

Table 9-3 describes the treatment control BMPs for the project and explains why they were (or were not) selected. A detailed explanation and justification is provided if a low performing BMP was selected.

Table 9-3 Treatment Control BMP Selection Summary

	TREATMENT CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION
1.	**Biofilters**				
	1.a. Grass Swale(s)		✓		The project site layout does not lend itself to the construction of vegetated swales
	1.b. Grass Strip(s)		✓		Grass strips are not proposed
	1.c. Wetland Vegetation Swale(s)		✓		Wetland vegetated swales are not proposed
	1.d. Bio-retention Area(s)	✓			Flow through planter areas will be included throughout the project site. These areas have high removal efficiency for the primary pollutants of concern.
2.	**Detention Basins**				
	2.a. Extended Dry Detention w/ Grass Lining		✓		Not practical due to nature of topography and proposed improvements.
	2.b. Extended Dry Detention Basin(s) w/ Impervious Lining		✓		See above (2a)
3.	**Infiltration Measures**				
	3.a Infiltration Basin(s)		✓		Infiltration is not proposed based on poor soil conditions on-site (low infiltration rates) and subsequent adverse impacts to adjacent public streets potentially associated with infiltration.
	3.b. Infiltration Trench(es)		✓		See above (3a)
	3.c Porous Asphalt		✓		See above (3a)
	3.d. Porous Concrete		✓		See above (3a)

	TREATMENT CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION
	3.e Porous Modular Concrete Block		✓		See above (3a)
4.	**Wet Ponds or Wetlands**				
	4.a Wet Detention Pond or Basin w/ Permanent Pool		✓		Not practical due to nature of topography and proposed improvements.
	4.b. Constructed Wetland		✓		See above (4a)
5.	**Drainage Inserts***				
	5.a. Oil/Water Separator(s)		✓		See below (5.b)
	5.b Catch Basin Insert(s)	✓			A Bio-Clean Curb Inlet Basket with Shelf System is proposed for the main entrance drive aisle. This area cannot be directed to flow through planter areas based on site topography.
	5.c. Storm Drain Inserts		✓		See above (5b)
	5.d. Catch Basin Screens		✓		See above (5b)
6.	**Filtration Practices**				
	6.a. Media Filtration		✓		Flow through planter areas chosen in favor of media filtration
	6.b. Sand Filtration		✓		See above (6a)
7.	**Hydrodynamic Separator(s)**				
	7.a. Swirl Concentrator(s)		✓		See above (6a)
	7.b. Cyclone Separator(s)		✓		See above (6a)
	7.c. Baffle Separators		✓		See above (6a)
	7.d. Gross Solids Removal Devices (GSRDs)		✓		See above (6a))

	TREATMENT CONTROL BMP OPTION	YES	NO	N/A	EXPLANATION
	7.e. Linear Radial Device		✓		See above (1d)

9.4 TREATMENT CONTROL BMP DESIGN

Multiple flow through planter areas are proposed throughout the project site to treat the 85th percentile runoff volume. Each of the flow through planter areas will be fitted with a perforated sub drain and an impermeable liner to prevent infiltration. The perforated sub-drains will connect to hard-lined proposed storm drains and ultimately discharge from the site as pipe flow. Refer to the project specific Drainage Study, found under separate cover, for further information pertaining to the proposed storm drain and discharge location.

Based on proposed grading, the project site has been broken up into three water quality basins or Drainage Management Areas (DMAs), Nodes 20, 40 and 60. The flow through planter areas within each DMA have been designed based on the impervious quantities within each respective DMA (20, 40, or 60). A Treatment BMP Location Map is included in Attachment D of this WQTR.

Within DMA 40, a pump and storm water storage vault are proposed. The pump will route flow from a 2.4 acre portion of the DMA to Flow Through Planter Area B for treatment purposes (refer to the BMP location map found in Attached D). The storage tank and pump are designed to discharge, at a minimum, the 85th percentile volume to Flow Through Planter Area B.

All flow through planter areas (DMAs 20, 40, and 60) will be fitted with either a riser outlet pipe that will connect to the on-site proposed storm drain or an engineered spillway for secondary discharge.

Each area will consist of an 18-inch deep section of engineered media, essentially 33 percent void space. Per guidelines outlined in the California Stormwater Quality Association (CASQA) BMP fact sheet (TC-32), the engineered media should consist of sandy loam, loamy sand, or loam texture with a clay content ranging from 10 to 25 percent. In addition to the 18 inches of engineered media, each flow through planter area will contain a foot and a half depressed area consisting of plants, essentially 100 percent void space.

A proposed Bio-Clean Curb Inlet Basket with Shelf System is proposed to treat runoff from the 0.56-acre main entrance drive aisle. Runoff from this portion of the site cannot be directed to flow through planter areas based on site topography.

10 Maintenance

Maintenance for all BMPs is required in order to ensure that BMPs continually operate at maximum efficiency for water quality purposes. Proposed BMPs that require maintenance include flow through planter areas, Bio-Clean Curb Inlet Basket, riprap, storm drain stenciling and signage, outdoor material storage areas, trash storage areas, dock areas, maintenance bays, and landscaping within parking areas.

Flow through planter areas must be maintained to avoid overgrown vegetation and excessive sediment/trash accumulation, which would reduce the pollutant removal efficiency of this BMP.

A standard vacuum truck will be necessary for cleaning maintenance associated with the Bio Clean Curb Inlet Basket. Further information provided by the manufacture is included in Attachment F.

Riprap must be maintained to ensure that energy dissipation continues to operate effectively.

Storm drain stenciling and signage must be maintained for fading/damage in order to provide continual signage throughout seasons. Trash storage areas, dock areas, and maintenance bays should all be continually maintained to be free of trash and spills in order to avoid discharge that would hinder water quality. Landscaping within parking areas should be continually maintained to avoid overgrown vegetation, standing water, and trash accumulation.

Refer to Attachment F for a schedule and list of maintenance activities associated with flow through planter areas, riprap, and storm drain stenciling and signage.

11 Design Criteria

This section summarizes the design criteria and methodology applied during drainage analysis of the project site.

11.1 VOLUME-BASED WATER QUALITY NUMERIC SIZING CRITERIA

Volume-based BMPs are designed to capture and treat the most frequent storm events. Volume-based BMPs include flow through planter areas.

The water quality capture volume may be included as part of the configuration of the detention basins (for example, in a forebay or as initial storage in the basin), or as a stand-alone water quality basin. The water quality volumes should be provided in addition to the flood-control detention volume and debris volumes allocated for each basin.

The San Diego Regional Water Quality Control Board (RWQCB Region 9) has defined the sizing criteria for volume-based Best Management Practices as:

> *The volume of runoff produced from each and every storm event up to and including a historical record-based reference 24-hour rainfall criterion for treatment (0.6 inch approximate average for the City of San Diego area) that achieves approximately the same reduction in pollutant loads achieved by the 85th percentile 24-hour event.*

A 24-hour, 0.6-inch rainfall has a return frequency of less than one year. The 85th percentile 24-hour event criterion was used for sizing the volume-based water quality treatment controls within the project site.

11.2 FLOW-BASED WATER QUALITY NUMERIC SIZING CRITERIA

Flow-based BMPs are sized to filter or otherwise treat the peak flow of runoff from a stormwater quality storm event.

The San Diego RWQCB has defined the design discharge for flow-based BMPs as the runoff generated from a storm with a rainfall intensity of 0.2 inch/hour. Flow-based water quality BMPs on the project site have been designed based upon a Rational Method analysis of this design storm, which is slightly larger than the 85th percentile event (0.1 inch/hour).

The proposed Bio Clean curb inlet cleansing system represents the only flow based BMP.

12 Hydromodification Mitigation

Per the Hydromodification Management Plan (HMP), Brown and Caldwell, March 2011, the project meets hydromodification mitigation without the need for further analysis. As such, a San Diego Hydrology Model (SDHM) or similar analysis is not warranted. The following items pertain to the HMP Decision Matrix. A copy of the Decision Matrix is included on the following page.

- The project is a Priority Development,
- Proper energy dissipaters have been provided at all appropriate locations (anywhere concentrated flow is discharged to a non hard-lined conveyance mechanism),
- The project does not increase impervious area, as compared to pre development conditions. The proposed project actually reduces the impervious cover, as compared to pre development conditions,
- The project does not increase unmitigated peak flows for the 2, 10 and 100-year storm events to any outlet location. There is only one project site discharge location and the proposed improvements will reduce the unmitigated peak flow, as compared to pre development conditions (refer to the project specific Drainage Study, found under separate cover, for hydrologic calculations)
- Per matrix shown on the next page, the project is exempt from Hydromodification Mitigation

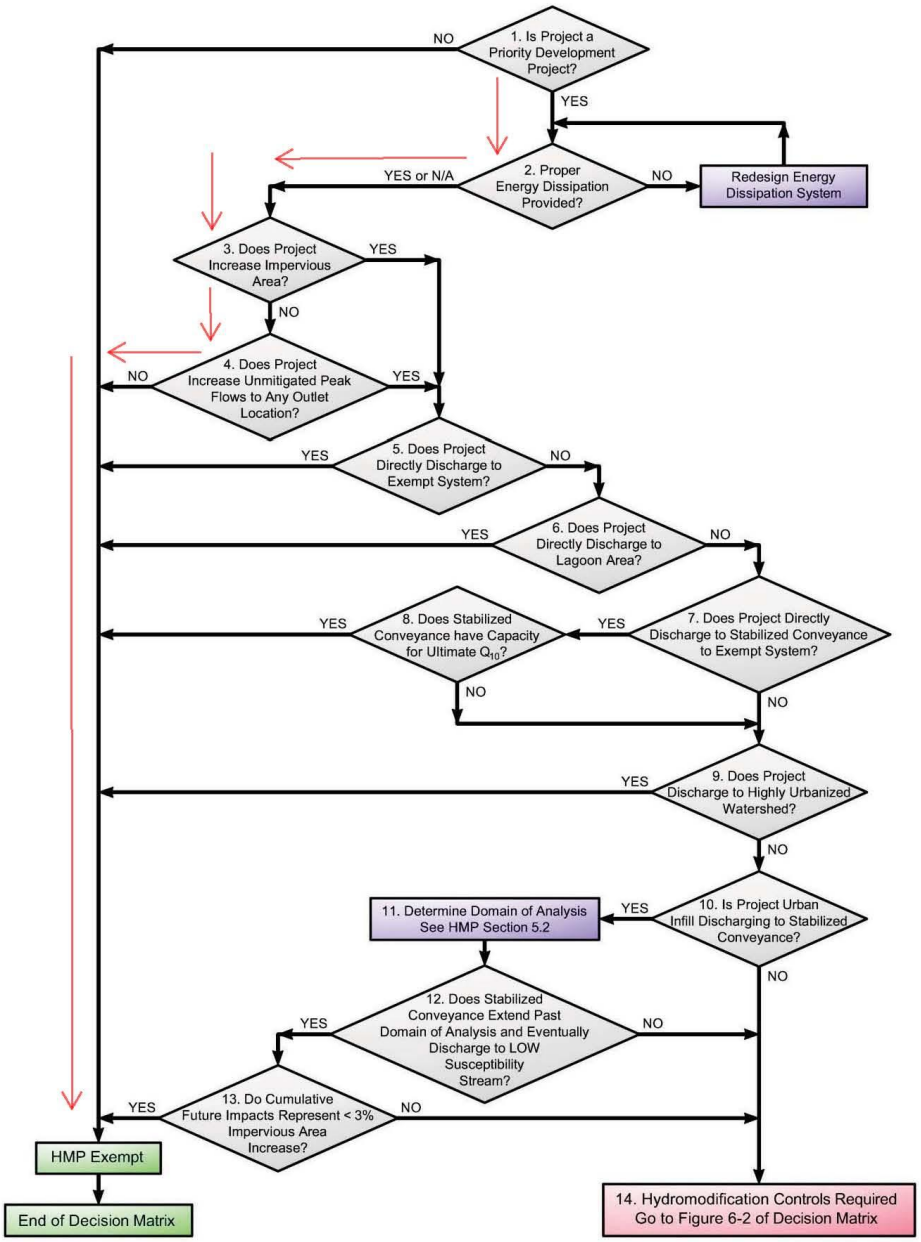


Figure 6-1. HMP Applicability Determination

Use of contents on this sheet is subject to the limitations specified at the end of this document.
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13 Summary

The project is not anticipated to violate any waste discharge requirements. During construction of the project, a Storm Water Pollution Prevention Plan for Construction Activities (SWPPP) will ensure proper storm water control, minimizing or eliminating storm water contact with potential pollutants and the discharge of polluted storm water from the site. The SWPPP will be in compliance with the requirements of the State Water Resources Control Board (SWRCB) General Permit for Construction Activities (Construction Permit). The project applicant will file a Notice of Intent that demonstrates their intent to comply with all requirements of the Construction Permit.

After construction, activities on the project site will not involve the discharge of municipal or sanitary waste to surface waters, and the project does not propose non-storm water discharges that might require authorization by the Regional Water Quality Control Board (RWQCB).

Storm water management on the site will comply with RWQCB Municipal NPDES Permit requirements, including the incorporation of site design, source control, and treatment control Best Management Practices (BMPs); and Low Impact Development (LID) strategies.

The project does not represent a substantial additional source of polluted runoff. The project represents less than one percent of the local hydrologic unit. The project includes site design and source control BMPs to prevent the generation of potential pollutants and to prevent exposure of storm water to pollutants. In addition, the project includes LID strategies and treatment control BMPs to treat polluted storm water runoff to the maximum extent practicable before it exits the site.

The project is not anticipated to cause or contribute to an exceedance of applicable surface or groundwater receiving water quality objectives or degradation of beneficial uses. The project includes LID strategies, site design and source control BMPs to prevent the generation of potential pollutants and to prevent exposure of storm water to pollutants. The project also includes treatment control BMPs to treat polluted storm water runoff to the maximum extent practicable before it exits the site.

14 References

14.1 GENERAL REFERENCES

CASQA, 2003a. California Stormwater Quality Association (CASQA). (2004a). Stormwater Best Management Practice Handbook, Volume 1. New Development and Redevelopment.

CASQA, 2003b. California Stormwater Quality Association (CASQA). (2004b). Stormwater Best Management Practice Handbook, Volume 2. Construction.

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SCS, 1973. Soil Conservation Service. (December, 1973). Soil Survey, San Diego Area, California.

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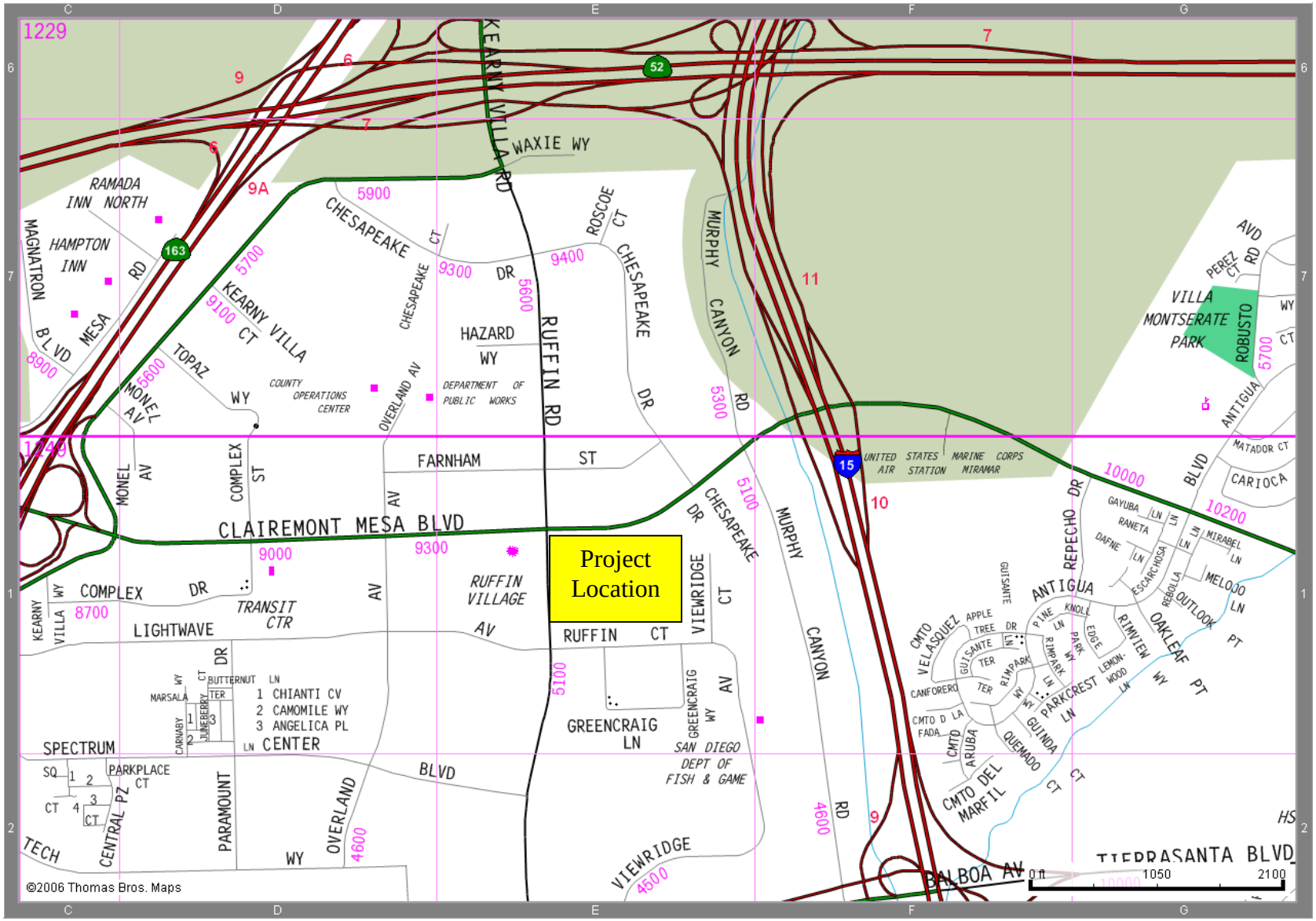
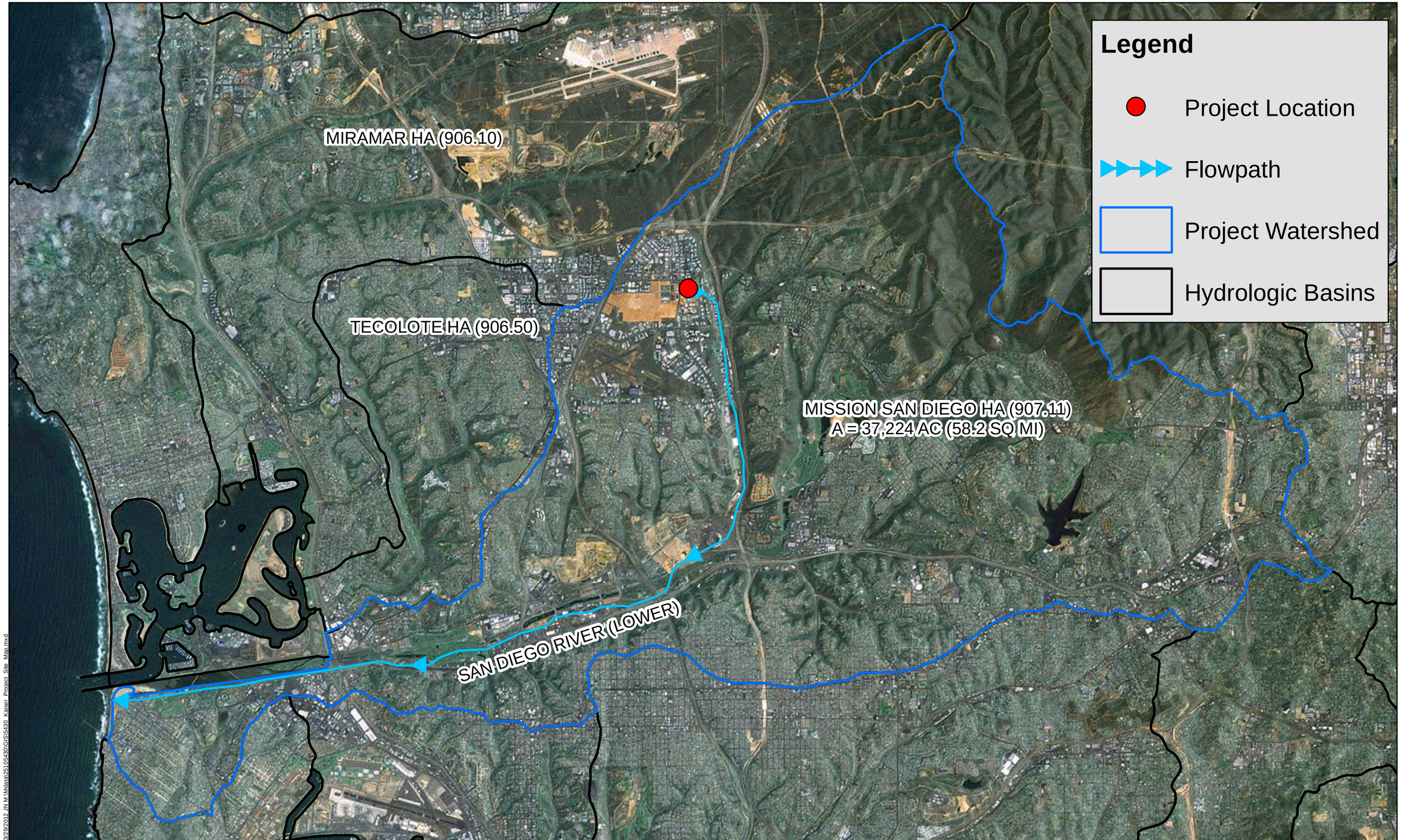
ATTACHMENT A

Location Map

RBF CONSULTING



Location Map (Reference Thomas Bros. 1249 E1)



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0 7,500 15,000 30,000 Feet

Source: SANDAG

KAISER CENTRAL SAN DIEGO

Project Site Map

ATTACHMENT B

Aerial Exhibit

RBF CONSULTING

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0 250 500 1,000 Feet

KAISER CENTRAL SAN DIEGO

Aerial Exhibit

ATTACHMENT C

Water Quality Monitoring Data

RBF CONSULTING

Table D.7-1. Analytes Measured at the San Diego River Mass Loading Station.

Analyte	Units	Water Quality Benchmarks	Source	2001-2002			2002-2003			2003-2004			2004-2005			2005-2006		
				11/29/01	2/17/02	3/17/02	11/8/02	12/16/02	2/11/03	11/12/03	2/3/04	3/2/04	10/27/04	2/11/05	2/18/05	10/18/05	2/19/06	3/11/06
General / Physical / Organic																		
Electrical Conductivity	umhos/cm	NA	2. CCR, 5. Goldbook	1680	2230	2270	1568	811	1550	2470	1546	995	560	1260	747	2870	2490	1262
Oil and Grease	mg/L	10	1 Basin Plan, 3. Anacostia River TMDL, 4. MSGP 2000	<1	4	<1	10.70	<1.00	2.39	4.83	<1	<1	<1	<1	<1	<1	<1	<1
pH	pH Units	6.5-9.0	1. Basin Plan	7.3	7.6	7.5	7.68	7.64	7.61	7.48	7.70	7.26	7.16	7.63	7.20	7.79	8.07	7.74
Water Temperature	Celcius						17.40	15.00	15.00	17.40	14.20	13.70	15.40	14.40	16.00	19.00	14.60	13.40
Bacteriological																		
Enterococci	MPN/100 mL	NA	1. Basin Plan	80	2,200	170	17,000	13,000	7,000	11,000	23,000	358	22,000	2,300	22,000	50,000	3,000	5,000
Fecal Coliform	MPN/100 mL	400	1.Basin Plan REC-1/REC-2	130	30,000	170	110,000	17,000	5,000	13,000	2,300	500	5,000	800	1,300	70,000	3,000	800
Total Coliform	MPN/100 mL	NA	1. Basin Plan	2,300	80,000	3,000	220,000	50,000	23,000	50,000	28,000	11,000	300,000	30,000	50,000	1,100,000	50,000	30,000
Wet Chemistry																		
Ammonia As N	mg/L	(a)	6. U.S. EPA Water Quality Criteria (Freshwater)	0.9	0.7	0.2	0.34	0.13	0.19	<0.1	<0.1	1.8	0.38	0.28	0.95	0.19	0.31	<0.1
Biochemical Oxygen Demand	mg/L	30	4. MSGP 2000, 8. McNeeley (1979)	12	58.8	3.4	4.73	<2.0	20.7	8.44	45.2	2.94	4.22	3.68	3.39	8.24	2.21	5.17
Chemical Oxygen Demand	mg/L	120	4. MSGP 2000	28	154	54	71	48	63	83	67	52	98	283	56	62	65	74
Dissolved Organic Carbon	mg/L						6.80	8.68	10.70	16.6	4.26	5.57	33.2	2.94	5.62	9.41	12.8	5.59
Dissolved Phosphorus	mg/L	2	4. MSGP 2000	0.3	0.03	0.12	0.19	0.24	0.19	0.41	0.13	0.15	0.44	<0.05	0.32	0.24	0.37	0.11
Nitrate As N	mg/L	10	1. Basin Plan	0.9	0.8	0.3	0.67	0.56	0.57	0.5	0.2	0.63	0.37	0.66	1.01	0.63	0.25	0.29
Nitrite As N	mg/L	1	1. Basin Plan	0.12	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Surfactants (MBAS)	mg/L	0.5	1. Basin Plan	<0.5	0.6	<0.5	<0.1	<0.1	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Solids	mg/L	1000 (b)	1. Basin Plan	869	691	796	1260	676	896	1540	1120	491	594	756	490	1490	1370	655
Total Kjeldahl Nitrogen	mg/L	NA		2.7	2.9	1.7	1.6	1.2	1.5	1.4	2.8	2	2.3	<0.5	23.3	1.6	4.3	1.5
Total Organic Carbon	mg/L						18.3	39.8	12.4	16.7	11.7	11.5	62	9.61	9.6	22.4	14.1	8.57
Total Phosphorus	mg/L	2	4. MSGP 2000	1.21	0.4	0.28	0.57	1.01	0.33	0.34	0.23	0.35	0.85	0.28	0.44	0.5	0.45	0.52
Total Suspended Solids	mg/L	100	4. MSGP 2000, 1. Basin Plan	<20	24	20	43	212	66	34	<20	21	477	50	61	31	42	48
Turbidity	NTU	20	1. Basin Plan	8.6	15.3	13.1	40.7	104	34.5	19.9	31.2	22.4	234	14.5	30.9	27.3	34.8	32.3
Pesticides																		
Chlorpyrifos	µg/L	0.02	12. CA Dept. of Fish & Game, 2000	<0.03*	<0.03*	0.03	0.043	0.051	0.048	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
Diazinon	µg/L	0.08	12. CA Dept. of Fish & Game, 2000, 11. Chollas Creek TMDL for Diazinon, 10. U.S. EPA, Aquatic Life Ambient Water Quality Criteria Diazinon	0.21	0.10	0.08	0.051	0.051	0.038	<0.01	<0.01	<0.01	<0.01	0.038	<0.01	<0.01	<0.02	<0.02
Malathion	µg/L	0.43	13. CA Dept. of Fish & Game, 1998, 5. Goldbook				<0.10	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
Hardness																		
Total Hardness	mg CaCO3/L			429	399	490	545	331	483	759	476	206	201	364	251	706	751	366
Total Metals																		
Antimony	mg/L	NA	1. Basin Plan	<0.002	0.003	<0.002	<0.002	0.006	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	NA	1. Basin Plan	0.003	0.002	0.005	0.005	0.008	0.004	0.005	0.006	0.003	0.006	0.006	<0.002	0.008	0.005	0.006
Cadmium	mg/L	NA	1. Basin Plan	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.012
Chromium	mg/L	NA	1. Basin Plan	0.005	<0.005	0.007	<0.005	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	mg/L	NA	1. Basin Plan	0.007	0.028	0.011	0.009	0.021	0.017	0.008	0.013	0.006	0.025	0.006	0.006	0.01	0.008	0.008
Lead	mg/L	NA		0.003	0.004	0.009	0.007	0.035	0.011	0.004	0.006	0.005	0.060	0.005	0.004	0.004	0.006	0.007
Nickel	mg/L	NA	1. Basin Plan	0.004	0.005	0.004	0.007	0.005	0.005	0.005	0.003	<0.002	0.006	0.003	0.002	0.007	0.005	0.003
Selenium	mg/L	NA	16. 40 CFR 131.38	<0.002	0.002	<0.002	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	NA	1. Basin Plan	0.029	0.112	0.067	0.031	0.118	0.077	0.046	0.053	0.026	0.213	0.033	0.032	0.075	0.045	0.068
Dissolved Metals																		
Antimony	mg/L	0.006	1. Basin Plan	<0.002	<0.002	<0.002	0.002	0.007	0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.34 (c)	16. 40 CFR 131.38	0.002	<0.001	0.002	0.004	0.003	0.003	0.004	0.003	0.002	<0.002	<0.002	<0.002	0.003	<0.001	<0.001
Cadmium	mg/L	(d)	16. 40 CFR 131.38	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	(d)	16. 40 CFR 131.38	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	mg/L	(d)	16. 40 CFR 131.38	0.006	0.015	<0.005	0.005	0.006	0.015	<0.005	0.005	<0.005	<0.005	<0.005	0.005	0.005	<0.005	<0.005
Lead	mg/L	(d)	16. 40 CFR 131.38	0.002	<0.002	<0.002	0.006	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L	(d)	16. 40 CFR 131.38	0.003	0.005	0.002	0.006	<0.002	0.003	0.003	0.003	<0.002	0.003	0.002	0.002	0.003	0.004	0.002
Selenium	mg/L	NA	16. 40 CFR 131.38	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/L	(d)	16. 40 CFR 131.38	0.022	0.084	<0.020	0.026	0.037	0.070	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.053	0.026	0.035
Toxicity																		
Ceriodaphnia 96-hr	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ceriodaphnia 7-day survival	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ceriodaphnia 7-day reproduction	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	50	100	100
Hyalella 96-hr	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Selenastrum 96-hr	NOEC (%)	100		100	25	100	100	100	100	100	100	100	100	100	100	100	100	100

See last page for footnotes and source references.

Table D.7-1. Analytes Measured at the San Diego River Mass Loading Station.

Analyte	Units	Water Quality Benchmarks	Source	2006-2007			Frequency Above Benchmarks	Mean Ratio to Benchmarks
				10/14/06	1/30/07	2/19/07		
General / Physical / Organic								
Electrical Conductivity	umhos/cm	NA	2. CCR, 5. Goldbook	1499	2830	994		
Oil and Grease	mg/L	10	1 Basin Plan, 3. Anacostia River TMDL, 4. MSGP 2000	<5	<5	<5	6%	0.19
pH	pH Units	6.5-9.0	1. Basin Plan	8.32	7.67	6.95	0%	0.00
Water Temperature	Celcius			18.80	11.20	14.10		
Bacteriological								
Enterococci	MPN/100 mL	NA	1. Basin Plan	17,000	2,300	9,000		
Fecal Coliform	MPN/100 mL	400	1.Basin Plan REC-1/REC-2	5,000	8,000	5,000	89%	38.47
Total Coliform	MPN/100 mL	NA	1. Basin Plan	30,000	14,000	23,000		
Wet Chemistry								
Ammonia As N	mg/L	(a)	6. U.S. EPA Water Quality Criteria (Freshwater)	0.54	0.51	1.04	0%	0.03
Biochemical Oxygen Demand	mg/L	30	4. MSGP 2000, 8. McNeeley (1979)	15.6	14.8	5.51	11%	0.41
Chemical Oxygen Demand	mg/L	120	4. MSGP 2000	112	59	52	11%	0.69
Dissolved Organic Carbon	mg/L			66	13	9.03		
Dissolved Phosphorus	mg/L	2	4. MSGP 2000	0.29	0.07	0.1	0%	0.10
Nitrate As N	mg/L	10	1. Basin Plan	0.9	<0.05	0.1	0%	0.05
Nitrite As N	mg/L	1	1. Basin Plan	<0.05	<0.05	<0.05	0%	0.03
Surfactants (MBAS)	mg/L	0.5	1. Basin Plan	<0.5	<0.5	<0.5	6%	0.49
Total Dissolved Solids	mg/L	1000 (b)	1. Basin Plan	1200	1350	642	39%	0.94
Total Kjeldahl Nitrogen	mg/L	NA		2.2	1.7	3.1		
Total Organic Carbon	mg/L			69.4	16	9.85		
Total Phosphorus	mg/L	2	4. MSGP 2000	0.51	0.09	0.33	0%	0.24
Total Suspended Solids	mg/L	100	4. MSGP 2000, 1. Basin Plan	111	34	124	22%	0.79
Turbidity	NTU	20	1. Basin Plan	58.1	24.5	59.6	72%	2.24
Pesticides								
Chlorpyrifos	µg/L	0.02	12. CA Dept. of Fish & Game, 2000	<0.002	<0.002	<0.002	25%	0.71
Diazinon	µg/L	0.08	12. CA Dept. of Fish & Game, 2000, 11. Chollas Creek TMDL for Diazinon, 10. U.S. EPA, Aquatic Life Ambient Water Quality Criteria Diazinon	<0.004	<0.004	<0.004	11%	0.43
Malathion	µg/L	0.43	13. CA Dept. of Fish & Game, 1998, 5. Goldbook	0.095	<0.006	<0.006	0%	0.05
Hardness								
Total Hardness	mg CaCO3/L			657	713	305		
Total Metals								
Antimony	mg/L	NA	1. Basin Plan	0.003	0.003	0.004		
Arsenic	mg/L	NA	1. Basin Plan	0.015	<0.001	0.004		
Cadmium	mg/L	NA	1. Basin Plan	0.003	<0.001	<0.001		
Chromium	mg/L	NA	1. Basin Plan	<0.005	<0.005	0.006		
Copper	mg/L	NA	1. Basin Plan	0.02	0.009	0.029		
Lead	mg/L	NA		0.016	0.004	0.024		
Nickel	mg/L	NA	1. Basin Plan	0.006	0.003	0.007		
Selenium	mg/L	NA	16. 40 CFR 131.38	<0.004	0.004	<0.004		
Zinc	mg/L	NA	1. Basin Plan	0.113	0.045	0.149		
Dissolved Metals								
Antimony	mg/L	0.006	1. Basin Plan	<0.002	<0.002	0.002		
Arsenic	mg/L	0.34 (c)	16. 40 CFR 131.38	0.003	<0.001	<0.001	0%	0.01
Cadmium	mg/L	(d)	16. 40 CFR 131.38	<0.001	<0.001	<0.001	0%	0.09
Chromium	mg/L	(d)	16. 40 CFR 131.38	<0.005	<0.005	<0.005	0%	0.01
Copper	mg/L	(d)	16. 40 CFR 131.38	0.003	0.005	0.003	0%	0.19
Lead	mg/L	(d)	16. 40 CFR 131.38	<0.001	<0.001	<0.001	0%	0.14
Nickel	mg/L	(d)	16. 40 CFR 131.38	0.004	<0.002	0.002	0%	0.02
Selenium	mg/L	NA	16. 40 CFR 131.38	<0.004	<0.004	<0.004	0%	0.01
Zinc	mg/L	(d)	16. 40 CFR 131.38	<0.02	<0.02	<0.02	0%	0.07
Toxicity								
Ceriodaphnia 96-hr	NOEC (%)	100		100	100	100	0%	0.00
Ceriodaphnia 7-day survival	NOEC (%)	100		100	100	100	0%	0.00
Ceriodaphnia 7-day reproduction	NOEC (%)	100		100	100	100	6%	0.11
Hyalella 96-hr	NOEC (%)	100		25	100	100	6%	0.22
Selenastrum 96-hr	NOEC (%)	100		100	100	100	6%	0.22

See last page for footnotes and source references.

Table D.7-1. Analytes Measured at the San Diego River Mass Loading Station.

Blank spaces have been verified and no data is available due to changes in the monitoring program.

(a) Water Quality Benchmark is based on CMC (salmonids absent) using pH described in the U.S. EPA, 1999 Update of Ambient Water Quality Criteria for Ammonia, EPA-822-R-99-014, December 1999.
(b) Water Quality Benchmark for total dissolved solids is based on the San Diego Regional Water Quality Control Plan by watershed for the San Diego Region (Basin Plan), 1994 (with amendments effective prior to April 25, 2007).
(c) Water Quality Benchmark for dissolved metal fractions are based on a default water effects ratios (WER) value of 1 and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
(d) Water Quality Benchmark for dissolved metal fractions are based on total hardness and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000. The Criteria Maximum Concentration (CMC) was used.
NA indicate no criteria or published value was available or applicable to the matrix or program.

Shaded text – exceeds water quality benchmark. Underlined results are above the **CMC** water quality benchmark.

* Indicates detection limit above water quality benchmark.

Sources
Please refer to the San Diego County Copermittee Regional Monitoring Program Benchmark Sources for benchmark source citations.

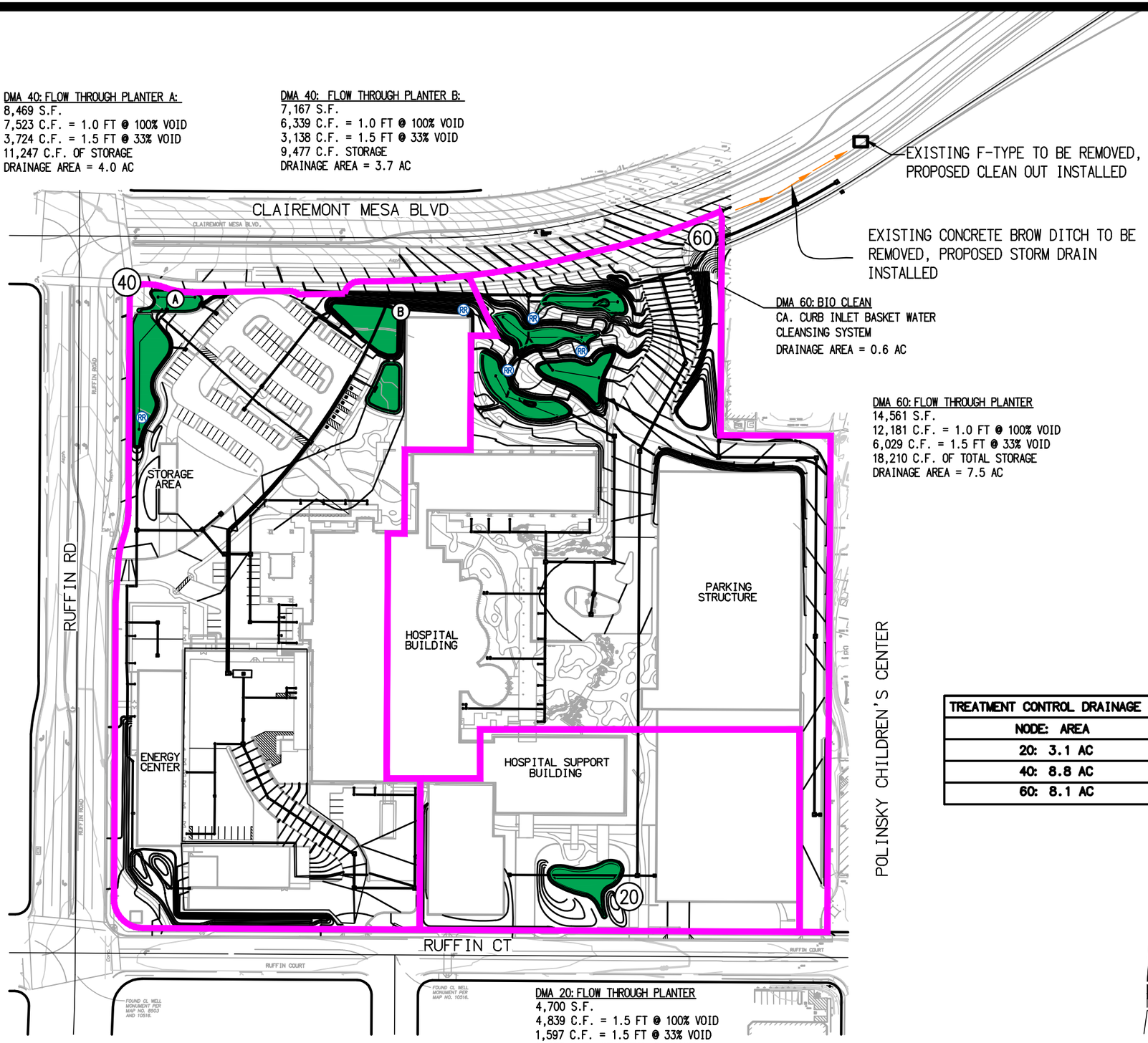
ATTACHMENT D

Treatment BMP Location Map

RBF CONSULTING

DMA 40: FLOW THROUGH PLANTER A:
8,469 S.F.
7,523 C.F. = 1.0 FT @ 100% VOID
3,724 C.F. = 1.5 FT @ 33% VOID
11,247 C.F. OF STORAGE
DRAINAGE AREA = 4.0 AC

DMA 40: FLOW THROUGH PLANTER B:
7,167 S.F.
6,339 C.F. = 1.0 FT @ 100% VOID
3,138 C.F. = 1.5 FT @ 33% VOID
9,477 C.F. STORAGE
DRAINAGE AREA = 3.7 AC



EXISTING F-TYPE TO BE REMOVED, PROPOSED CLEAN OUT INSTALLED

EXISTING CONCRETE BROW DITCH TO BE REMOVED, PROPOSED STORM DRAIN INSTALLED

DMA 60: BIO CLEAN
CA. CURB INLET BASKET WATER CLEANSING SYSTEM
DRAINAGE AREA = 0.6 AC

DMA 60: FLOW THROUGH PLANTER
14,561 S.F.
12,181 C.F. = 1.0 FT @ 100% VOID
6,029 C.F. = 1.5 FT @ 33% VOID
18,210 C.F. OF TOTAL STORAGE
DRAINAGE AREA = 7.5 AC

DMA 20: FLOW THROUGH PLANTER
4,700 S.F.
4,839 C.F. = 1.5 FT @ 100% VOID
1,597 C.F. = 1.5 FT @ 33% VOID
6,436 C.F. OF TOTAL STORAGE
DRAINAGE AREA = 3.1 AC

LEGEND

(20) DRAINAGE MANAGEMENT AREAS

LID & SITE DESIGN BMPS:

1. MINIMIZE IMPERVIOUS FOOTPRINT
2. DISCONNECT IMPERVIOUS
3. (RR) RIPRAP ENERGY DISSIPATERS

SOURCE CONTROL BMPS:

1. PROPERLY DESIGNED TRASH STORAGE AREAS
2. STENCILING

TREATMENT CONTROL BMPs/IMPs:

1. FLOW THROUGH PLANTER AREAS

TREATMENT CONTROL DRAINAGE AREA	TREATMENT VOLUME REQUIRED	TREATMENT VOLUME PROVIDED
NODE: AREA	FT^3	FT^3
20: 3.1 AC	6,077	6,436
40: 8.8 AC	17,250	20,724
60: 8.1 AC	15,878	18,210

150 75 0 150 300 450

SCALE: 1"=150'

KAISER CENTRAL SAN DIEGO POST DEVELOPMENT BMP LOCATION MAP

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
9755 CLAIREMONT MESA BOULEVARD, SUITE 100
SAN DIEGO, CALIFORNIA 92124-1324
858.614.5000 ▪FAX 858.614.5001 ▪www.RBF.com

H:\PDATA\25105430\CADD\SURFACE WATER\C3D\5430_BMP_LOCATION_MAP V3.DWG ARIAS, PEDRO 1/8/2013 11:44 AM

ATTACHMENT E

Treatment BMP Data and Sizing Calculations

RBF CONSULTING

Node 20: Volume Base BMP (Flow Through Planter)

$$VOL_{WQ} = C * P_{WQ} * A$$

Where:

VOL_{WQ} = Water Quality Volume Requirement (ac*in)
C = Node Runoff Coefficient
P_{WQ} = WQ Rainfall Depth (in)
A = Node Area (ac)

C =	0.9	Per page 82 of the City of San Diego DDM, April 1984 **(Assumes 85% impervious)**
P_{WQ} =	0.6	(in)
A =	3.1	(ac)
VOL_{WQ} =	1.7	ac-in
VOL_{WQ} =	0.1	ac-ft
VOL_{WQ} =	6,077	ft^3

Node 40: Volume Based BMP (2 - Flow Through Planters)

$$VOL_{WQ} = C * P_{WQ} * A$$

Where:

VOL_{WQ} = Water Quality Volume Requirement (ac*in)
C = Node Runoff Coefficient
P_{WQ} = WQ Rainfall Depth (in)
A = Node Area (ac)

C =	0.9	Per page 82 of the City of San Diego DDM, April 1984 **(Assumes 85% impervious)**
P_{WQ} =	0.6	(in)
A =	8.8	(ac)
VOL_{WQ} =	4.8	ac-in
VOL_{WQ} =	0.4	ac-ft
VOL_{WQ} =	17,250	ft^3

Node 60: Volume Based BMP (Flow Through Planter and Bio-Clean Inlet Filter)

$$VOL_{WQ} = C * P_{WQ} * A$$

Where:

VOL_{WQ} = Water Quality Volume Requirement (ac*in)
C = Node Runoff Coefficient
P_{WQ} = WQ Rainfall Depth (in)
A = Node Area (ac)

C =	0.9	Per page 82 of the City of San Diego DDM, April 1984 **(Assumes 85% impervious)**
P_{WQ} =	0.6	(in)
A =	8.1	(ac)
VOL_{WQ} =	4.4	ac-in
VOL_{WQ} =	0.4	ac-ft
VOL_{WQ} =	15,878	ft^3

Project Name: Kaiser Central San Diego
Project Location: San Diego, CA
Total Project Area: 20 AC

I. Self-treating areas: (Landscape)

DMA Name	Area (square feet)
N/A	

II. Self-retaining areas: (Bioretention)

DMA Name	Area (square feet)
N/A	

III. Areas draining to self-retaining areas:

DMA Name	Post-Project Surface Type	Runoff Factor	Area (square feet)	Receiving Self-Retaining DMA	Receiving Self-Retaining DMA Area (square feet)
N/A					

IV. Areas draining to IMPs (repeat for each IMP):

DMA 20

DMA Name	DMA Area (square feet)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	Soil Type: D	IMP Name: Flow Through Planter		
20.1	75,880	Roofs	1.0	75,880				
20.2	38,901	Concrete	1.0	38,901				
20.3	20,255	Landscape	0.1	2,026	IMP Sizing Factor (WQ Only)	Flow Through Planter	Minimum Area	Proposed Area
			Total	116,807	0.04		4,672	4,700

DMA 40

DMA Name	DMA Area (square feet)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	Soil Type: D	IMP Name: Flow Through Planter		
40.1	128,070	Roofs	1.0	128,070				
40.2	138,605	Concrete	1.0	138,605				
40.3	116,653	Landscape	0.1	11,665	IMP Sizing Factor (WQ Only)	Flow Through Planter	Minimum Area	Proposed Area
			Total	278,340	0.04		11,134	15,636

DMA 60

DMA Name	DMA Area (square feet)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	Soil Type: D	IMP Name: Flow Through Planter		
60.1	131,525	Roofs	1.0	131,525				
60.2	94,178	Concrete	1.0	94,178				
60.3	127,133	Landscape	0.1	12,713	IMP Sizing Factor (WQ Only)	Flow Through Planter	Minimum Area	Proposed Area
			Total	238,416	0.04		9,537	14,561

BIO CLEAN

ENVIRONMENTAL SERVICES, INC.

PRODUCT CATALOG

STORMWATER FILTRATION

"The Stormwater Standard"

P O Box 869, Oceanside, CA 92049
(760) 433-7640 • Fax (760) 433-3176
www.biocleanenvironmental.net

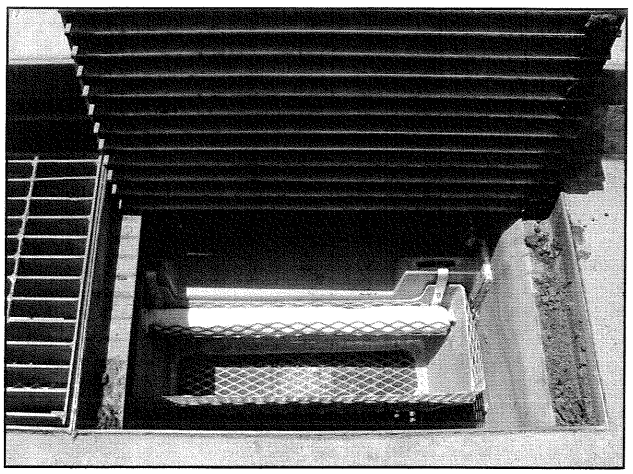
CURB INLET BASKET
WITH SHELF SYSTEM

Lifts Out Through Manhole

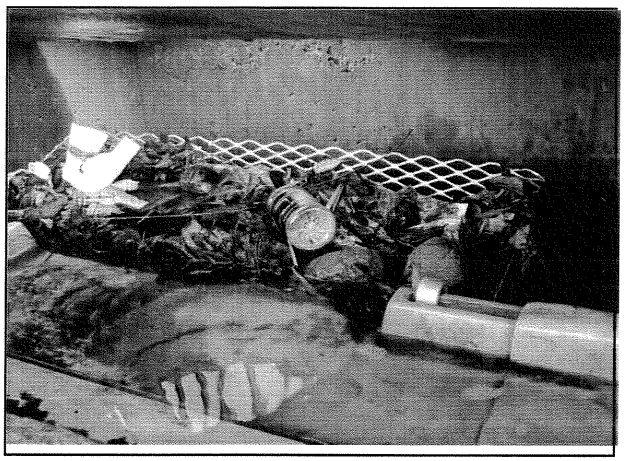
High Capacity
Patented

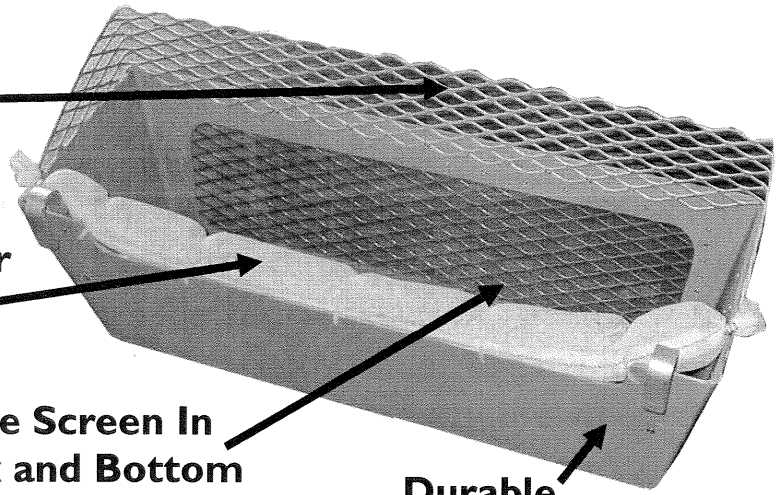
5 Year Warranty

For Grated Curb Inlet



Shelf Basket Assembly
Basket Located Under Manhole





Built Strong To Last!

BIO CLEAN
ENVIRONMENTAL SERVICES, INC.™
Manufactured by Suntree Technologies

CALIFORNIA CURB SHELF BASKET WATER CLEANSING SYSTEM
SAN DIEGO REGIONAL STANDARD CURB INLET

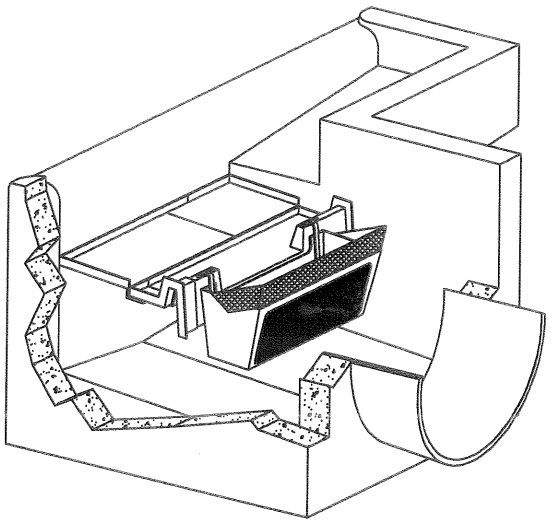


FIGURE 1
DETAIL OF PARTS

WIDTH OF INLET WILL VARY

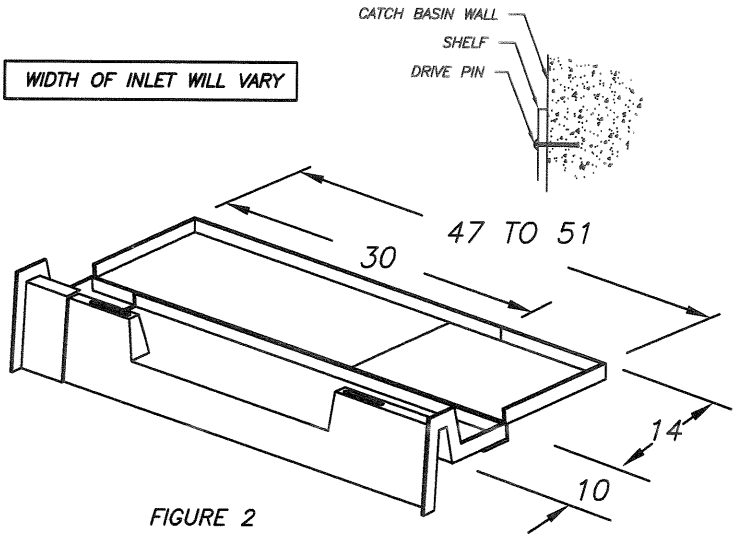


FIGURE 2
DETAIL OF INSTALLATION

FLOW RATES per 3 FT. Basket				
$Q=SO*c_d*A\sqrt{2*g*h}$		c_d = Coefficient of Discharge = .67		
	SO	$A(ft^2)$	h (ft)	Q $(\frac{h^3}{s})$
Coarse Screen	.62	.84	0.146	1.06
Med Screen	.56	1.36	0.75	3.53
Fine Screen	.68	1.02	1.167	4.01
TOTAL				8.6

The above flow rates are based on unobstructed screens.

REMOVABLE BASKET CATCHES EVERYTHING AND MAY BE REMOVED THROUGH MANHOLE WITHOUT ENTRY.

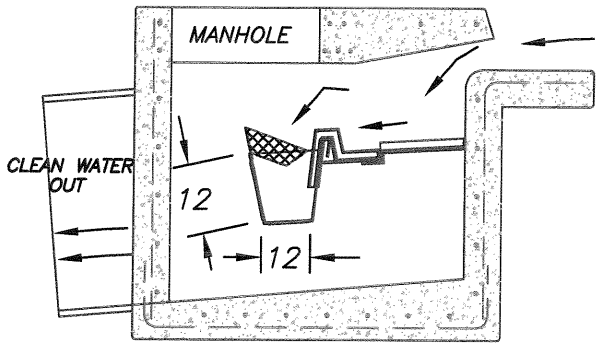


FIGURE 3
DETAIL OF PROCESS

NOTES:

1. SHELF SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO BASKET.
2. SHELF SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS,GEL COATED FOR UV PROTECTION.
3. SHELF SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTRATION BASKET STRUCTURE MANUFACTURED OF MARINE GRADE FIBERGLASS,GEL COATED FOR UV PROTECTION.
5. FILTRATION BASKET FINE SCREEN AND COARSE CONTAINMENT SCREEN MANUFACTURED FROM STAINLESS STEEL.
6. FILTRATION BASKET HOLDS BOOM OF ABSORBENT MEDIA TO CAPTURE HYDROCARBONS. BOOM IS EASILY REPLACED WITHOUT REMOVING MOUNTING HARDWARE.
7. FILTRATION BASKET LOCATION IS DIRECTLY UNDER MANHOLE FOR EASY MAINTENANCE.

BOX MANUFACTURED FROM MARINE GRADE FIBERGLASS & GEL COATED FOR UV PROTECTION

5 YEAR MANUFACTURERS WARRANTY

PATENTED

ALL FILTER SCREENS ARE STAINLESS STEEL

EXCLUSIVE CALIFORNIA DISTRIBUTOR:
BIO CLEAN ENVIRONMENTAL SERVICE
P.O. BOX 869, OCEANSIDE, CA. 92049
TEL. 760-433-7640 FAX:760-433-3176
Email: info@biocleanenvironmental.net

SUNTREE QUALITY PRODUCTS ARE BUILT FOR EASY CLEANING AND ARE DESIGNED TO BE PERMANENT INFRASTRUCTURE AND SHOULD LAST FOR DECADES.

SUNTREE TECHNOLOGIES
798 CLEARLAKE RD. SUITE #2
COCOA FL. 32922
TEL. 321-637-7552 FAX 321-637-7554

CURB INLET BASKET SYSTEM

DATE: 04/12/04 | SCALE:SF = 15

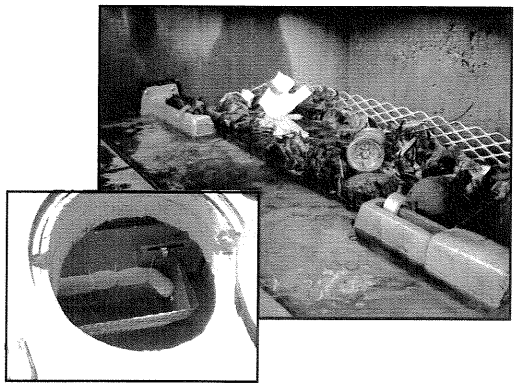
DRAFTER: N.R.B. | UNITS =INCHES

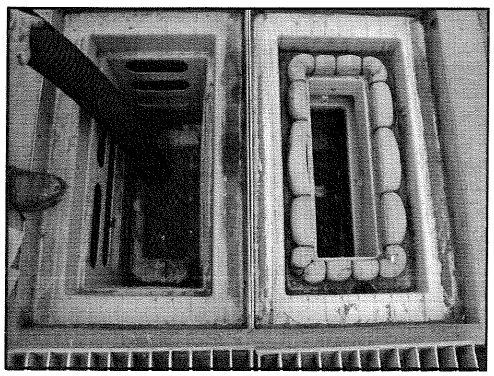
PROJECT:
REVISIONS: DATE:
REVISIONS: DATE:
REVISIONS: DATE:
REVISIONS: DATE:
REVISIONS: DATE:

CLEANING & MAINTENANCE

Curb Inlet Basket

The CIB shelf system locates debris basket under the manhole for easy access to clean. Strong fiber-glass and stainless steel makes cleaning with any standard vacuum truck quick and easy. The basket under the manhole makes for easy hydrocarbon boom replacement.



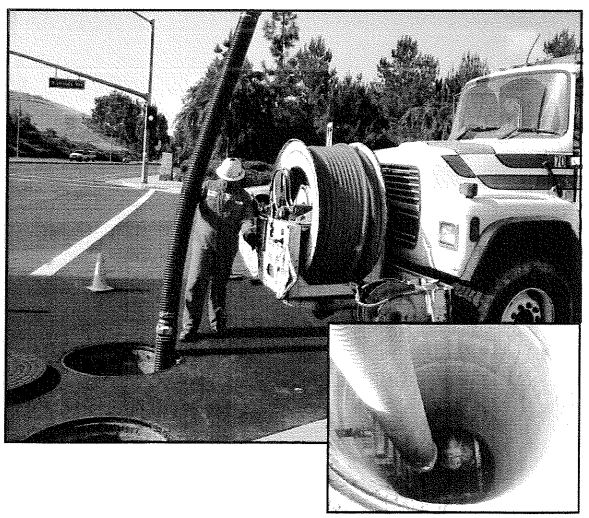


Grate Inlet Skimmer Box

The GISB has easy access to filter below the grate for easy and quick cleaning. Strong fiberglass and stainless steel makes cleaning with any standard vacuum truck quick and easy. The hydrocarbon replacement boom made easy to replace.

Nutrient Separating Baffle Box

The Baffle Box is fast and easily cleaned with any standard vacuum truck. Easy access to debris through manholes. Screen can be cleaned separately without entire system being cleaned. The screen lifts up on hinges to clean sediments collected in baffles. No need to enter box for cleaning in most cases.



ATTACHMENT F

Treatment BMP Maintenance Program

Note: *The maintenance program found in Attachment F has been designed to be compatible with the City of San Diego's standard Stormwater Management and Discharge Control Maintenance Agreement (SMDCMA).*

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EXHIBIT C
BMP Maintenance Program

The following inspection and maintenance activities shall be performed and completed as indicated.

Maintenance Program for Inlet Stenciling

Inspection Frequency/Indications:	Regular Maintenance Inspections ❑ Before wet season begins (September); ❑ After wet season (April).
Maintenance Indications	**Maintenance Activities**
❑ Inlet stenciling/signage begins to weather or fade	❑ Re-stamp signage
❑ Broken or damaged structure	❑ Repair or replace signage structure

Maintenance Program for Flow Through Planter Areas

Inspection Frequency/Indications:	Regular Inspections ❑ Before wet season begins (September); ❑ Every 60 days during wet season (September-April); ❑ After wet season (April). Performance Inspections ❑ After rainfall events greater than 0.5 inch
Maintenance Indications Connections	**Maintenance Activities Connections**
❑ Damage to inlet/outlet, sideslopes, headwall, or other structures	❑ Repair inlet/outlet structures, side slopes, fences, or other structural elements as needed to maintain performance of the facility.
❑ Over-grown vegetation, emergent woody vegetation and/or weeds	❑ Trim vegetation to average height of 12 inches and remove trimmings. ❑ Remove emergent trees and other vegetation that are not part of flow through planter area plan and weeds ❑ Re-seed and re-plan barren areas prior to rainy season ❑ Install erosion blanket on barrent spots if re-vegetation is not successful
❑ Sediment accumulation over 3 inches	❑ Remove sediment accumulation at or near plant height
❑ Trash, debris, and vegetative litter	❑ Remove trash, debris, and vegetative litter
❑ Rodents or other vectors	❑ Abate and control rodents as necessary to maintain performance of the facility ❑ Drain standing water
Waste Disposal	Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations.

Maintenance Program for Riprap Energy Dissipaters

Inspection Frequency/Indications:	Regular Inspection - First Year ❑ Before wet season begins (September); ❑ After wet season (April). Regular Inspection - Subsequent Years ❑ After wet season begins (April). Performance Inspection ❑ After rainfall events greater than 0.5 inches.
Maintenance Indications	**Maintenance Activities**
❑ Damage to sill, headwall, or other structures	❑ Repair sill, headwall, or other structures
❑ Riprap displaced or washed away	❑ Replace riprap
❑ Erosion (ruts, rills, or gullies) found downstream of dissipater structure (riprap apron).	❑ Extend riprap apron, reposition, increase riprap coverage to fully cover eroded area.
❑ Over-grown vegetation, emergent woody vegetation and/or weeds	❑ Trim vegetation to 6 inches, remove emergent woody vegetation and weeds
❑ Sediment accumulation over 3 inches	❑ Remove sediment accumulation
❑ Trash and litter present in riprap	❑ Remove trash and debris
Waste Disposal	Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations.

ATTACHMENT G

Engineer's Certification

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Certification

This Water Quality Technical Report (WQTR) has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based. The plans and specifications in this WQTR are not for construction purposes; the contractor shall refer to final approved construction documents for plans and specifications.

Jay Sullivan RCE 77445	January 10, 2013

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RBF JN 25-105430.001 (January 2013)