# ATTACHMENT “D”
# (As referenced in Attachment “B”)
# (Hydrology and Hydraulics Study)

**Southern California Edison**

# So Cal Gas Sub-transmission Project

# Hydrology and Hydraulics Study

January 2014

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# PROJECT AND SITE INFORMATION

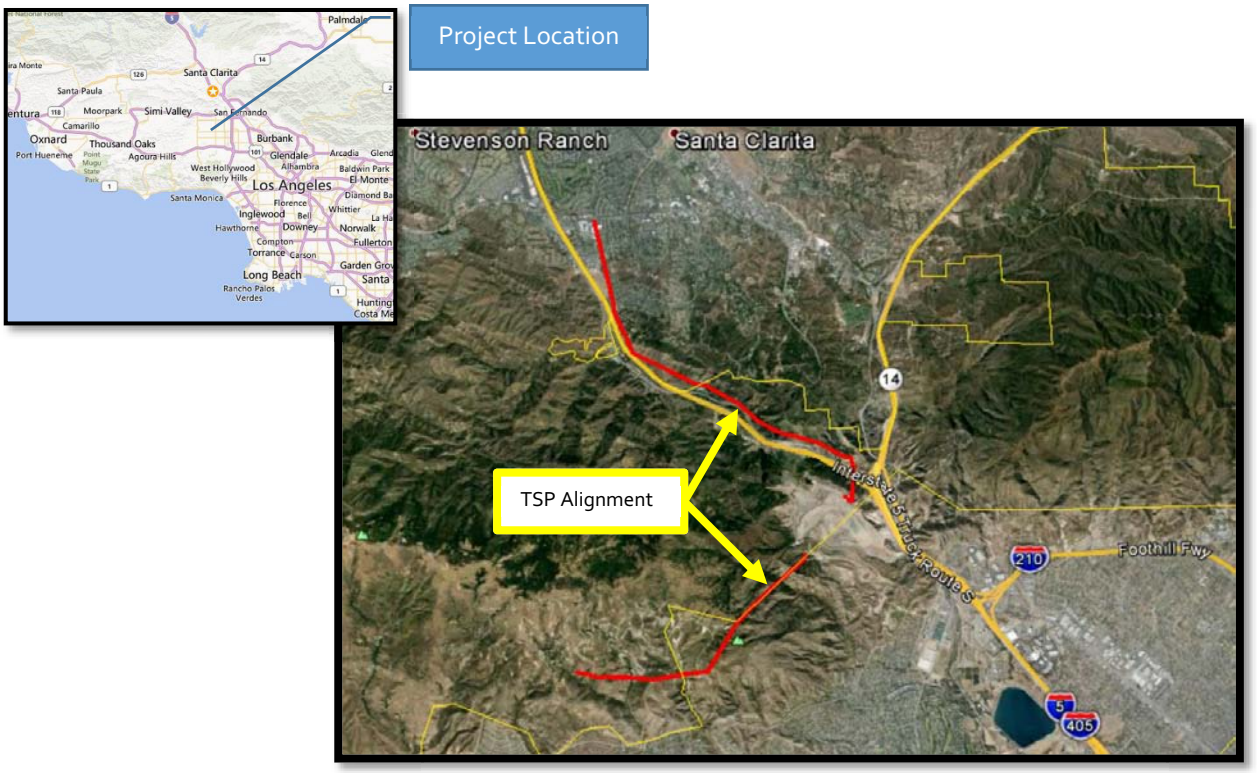
## PROJECT DESCRIPTION

Southern California Edison (SCE) has an existing transmission lines that are being upgraded to support increased load demand. Existing transmission towers are being replaced with Tubular Steel Poles (TSP) to support additional load due to upgrade of exiting conductors. As part of this project, SCE is reviewing, and identifying where improvements to the existing maintenance access roads may be necessary to ensure reliable access to the TSP locations. In addition at various locations anew maintenance access roads are proposed.

## PROJECT LOCATION

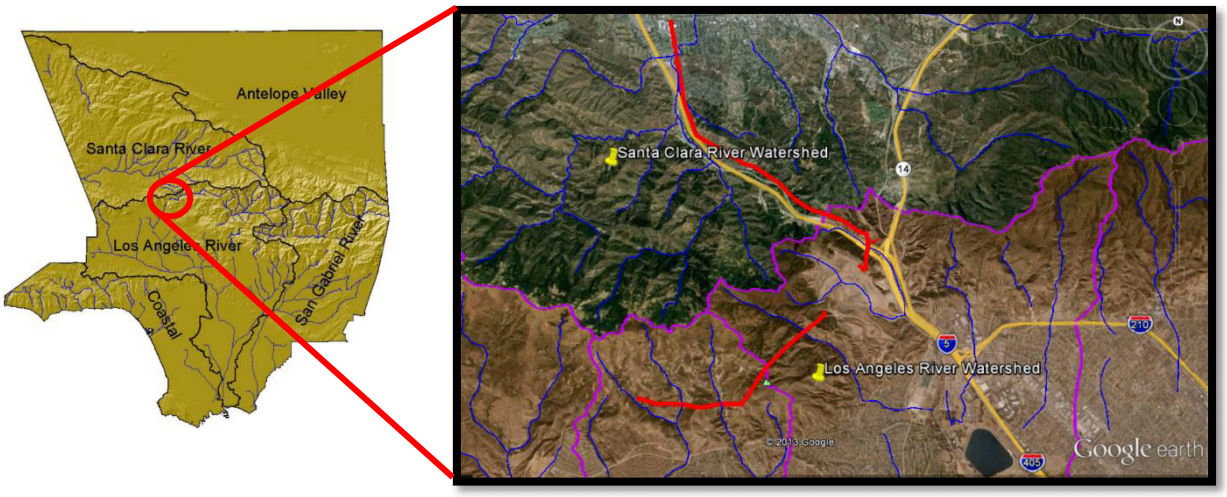
The SoCal Gas project is located within Los Angeles County, beginning at the intersection of Lyons Ave and Wiley Canyon Road in the City of Santa Clarita, then following Interstate 5 southeast through Newhall Pass to the Interstate 5 / Highway 14 interchange. The project then crosses Interstate 5 and follows southwest through the Santa Susana Mountains past Limekiln Canyon Trail.

For the purposes of this report, the portion of the project on the north east side of Interstate 5, will be referred to as the **'East' Alignment**, and those on the southwest side of Interstate 5 will be referred to as the **'West' Alignment**

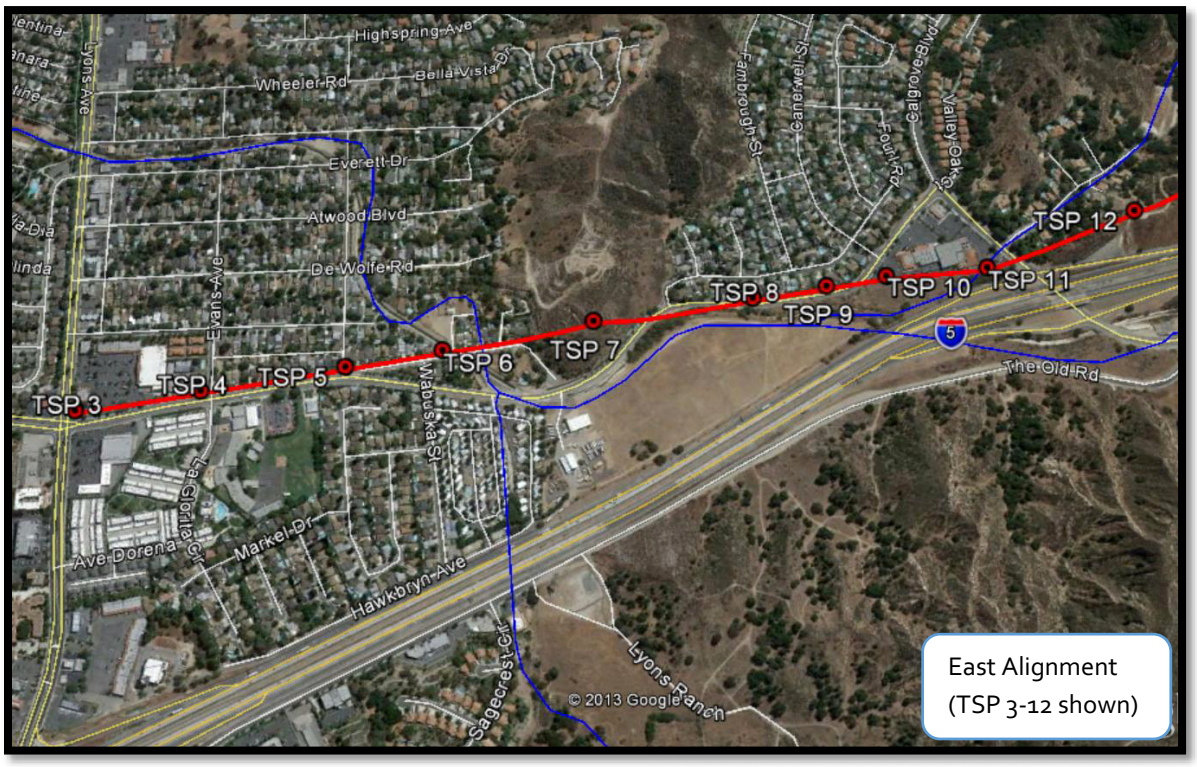


## TOPOGRAPHY:

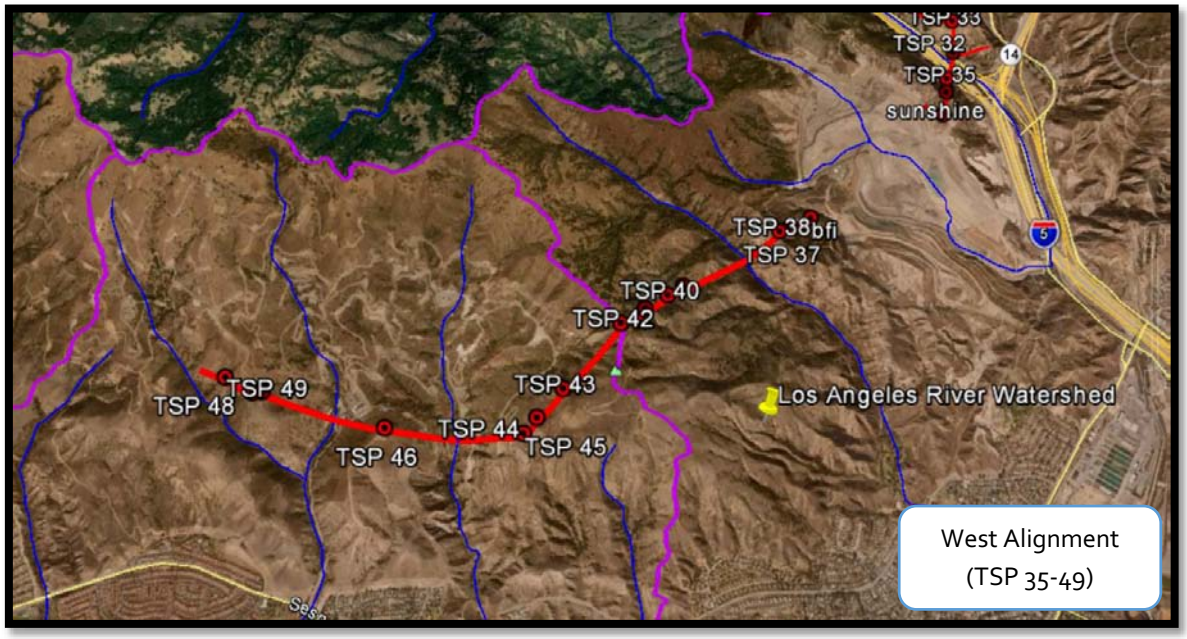
The project is located within both the Santa Clara River and the Los Angeles River Watersheds.




TSP 1 through 6 and 8 through 11 are located within a relatively flat urbanized portion of the City of Santa Clarita along Wiley Canyon Road.



The remainder of the TSPs and associated maintenance access roads are located in portions of the San Gabriel (East Alignment) and Santa Susana Mountain range (West Alignment). The topography in these mountainous areas of the project is characterized by steep slopes and often narrow canyons.



## STUDY SCOPE

This report has been developed to support the Southern California Edison "SoCal Gas" project by providing the following information:

1. Identify 'Points of Concentration' for any locations that may be subject to flood and erosion hazards, and to delineate tributary drainage boundaries to each.
2. Determine the 50-year and 100-peak flow rates to each Point of Concentration.
3. Estimate the flood and erosion hazards (flood depth and velocity) resulting from the calculated flow rates.
4. Identify and quantify any scour and lateral hydraulic loading will occur at the proposed TSP locations, caused by flood and debris flows.
5. Assess the capacity of selected existing culverts and provide design parameters for new culverts as needed.

## FINDINGS AND RECOMMENDATIONS

The following sections summarize the findings of this study as they apply to the five scope items listed above.

## #1: POINTS OF CONCENTRATION AND DRAINAGE AREAS

The first task for this study was to analyze the project area to *identify 'Points of Concentration' for any locations that may be subject to flood and erosion hazards, and to delineate tributary drainage boundaries to each*. Specifically, this study assessed locations where there may be concentrations of runoff that could pose hazards to:

1) The proposed TSP locations, and/or
2) Key maintenance roads that will provide access to the TSP locations.

The following resources were reviewed and used to identify areas that may be subject to flood or erosion hazards, and to delineate tributary drainage areas:

- *FEMA Flood Insurance Rate Maps (FIRM):* These maps show areas where FEMA has already identified and mapped an area known to be subject to flooding hazards. While these maps are helpful for identifying areas of major flooding such as major rivers and tributaries, they do not identify all areas where a localized flood hazard may exist.
- *National Hydrography Dataset (NHD):* The NHD is a dataset developed and maintained by United States Geological Survey (USGS) which contains features such as lakes, ponds, streams, rivers, canals, dams and stream gages. This information can be used to help identify water features that cross the subject project area.
- *Watershed Boundary Dataset (WBD):* This dataset is also developed and maintained by USGS and it identifies major watershed drainage boundaries.
- *National Elevation Dataset (NED) / USGS Topographic Maps:* This information provides contour maps that can be used to delineate smaller drainage boundaries than those shown in the WBD, and is used to determine relative elevations and slopes of land for where more detailed topographic mapping is not available.
- *Aerial Photography and Google Earth:* These tools were used to refine drainage boundaries and drainage paths, as well as to look for areas of historic erosion.
- *On-Site field visit:* An on-site review of the proposed TSP locations and access roads was performed to verify areas that may be subject to flood and erosion hazards and refine points of concentration.

Each location of potential flood or erosion hazard that was assigned a 'Point of Concentration' number for further analysis, and drainage areas were developed for each.

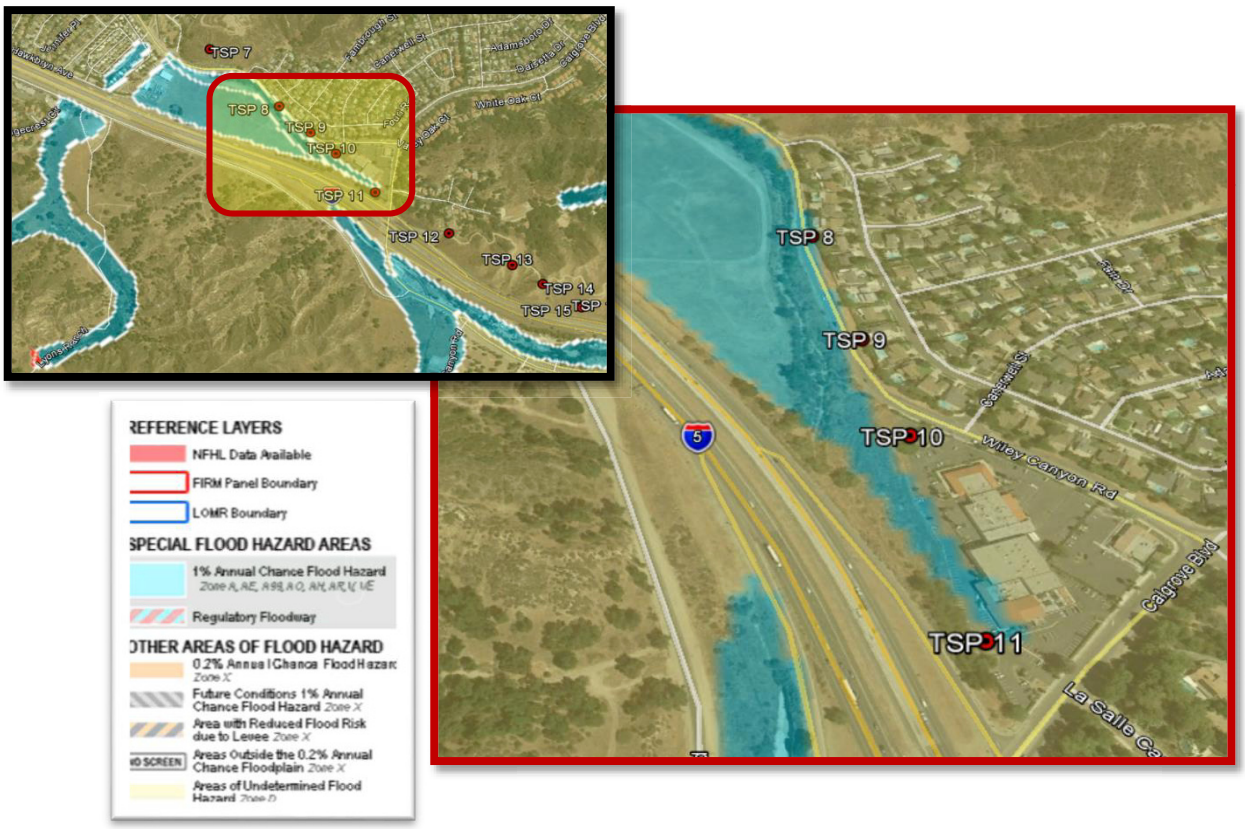
The following sections document the findings for hazards to the **TSP locations** and the **maintenance access roads**, respectively.

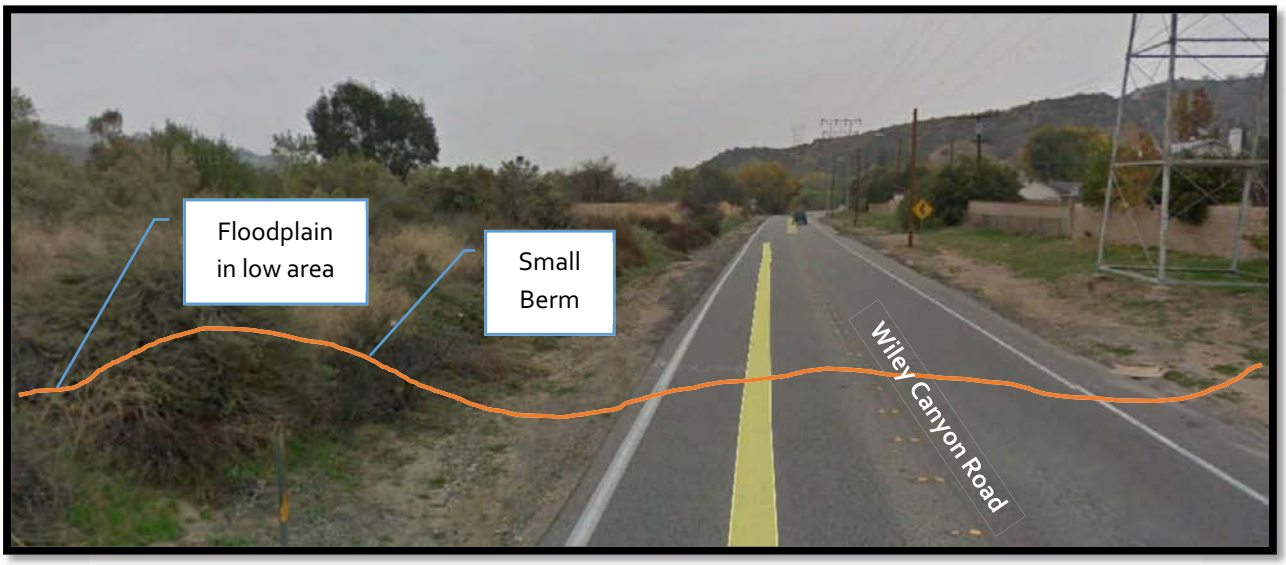
## POINTS OF CONCENTRATON AT TSP LOCATIONS

A majority of the proposed TSP locations are on ridgelines or otherwise on high ground away from any low areas that could be subject to flooding. There are however a few TSP locations that are ***close*** to areas prone to flooding or erosion; these are discussed in the following sub-sections.

### TSP 8 Through 11

TSP 8 through 11 are located along the east side of Wiley Canyon Road. A 100-year (1% Annual Chance) FEMA floodplain occupies a low area on the west side of Wiley Canyon Roads shown in the figures below.

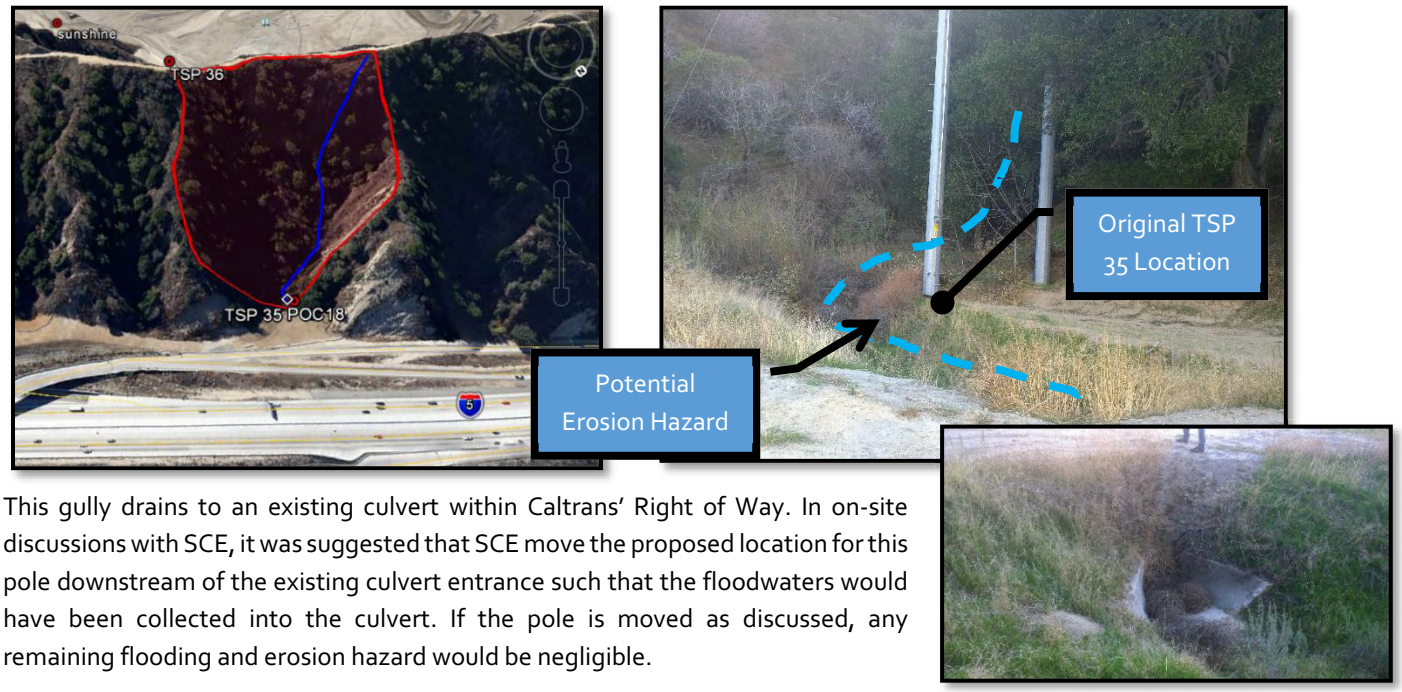





- **FINDING:** TSP 8 through 11 are on the opposite side of Wiley Canyon Road and are ***not*** located within the 100-year FEMA floodplain. Since these poles are located outside of those floodplain limits; and since the pole locations are not otherwise near or in an identifiable low area where runoff would concentrate, *no potential flood or erosion hazards, and thus no Points of Concentration have identified for these poles*.

## TSP 35

The location for TSP 35 is adjacent to Interstate 5 at the beginning of the West Alignment. It was originally proposed to be located along the bank of an earthen gully at the bottom of a steep 6-acre drainage area. This originally proposed location would be subject to flood and erosion hazards.




This gully drains to an existing culvert within Caltrans' Right of Way. In on-site discussions with SCE, it was suggested that SCE move the proposed location for this pole downstream of the existing culvert entrance such that the floodwaters would have been collected into the culvert. If the pole is moved as discussed, any remaining flooding and erosion hazard would be negligible.

- **FINDING: Point of Concentration (POC) # 18 has been identified** for the originally proposed location for TSP 35. Findings related to this point of concentration are identified in this report. If however TSP 35 is relocated as discussed in the field with SCE, then any hazards identified in this report for POC 18 would no longer apply.

### All Other TSP Locations

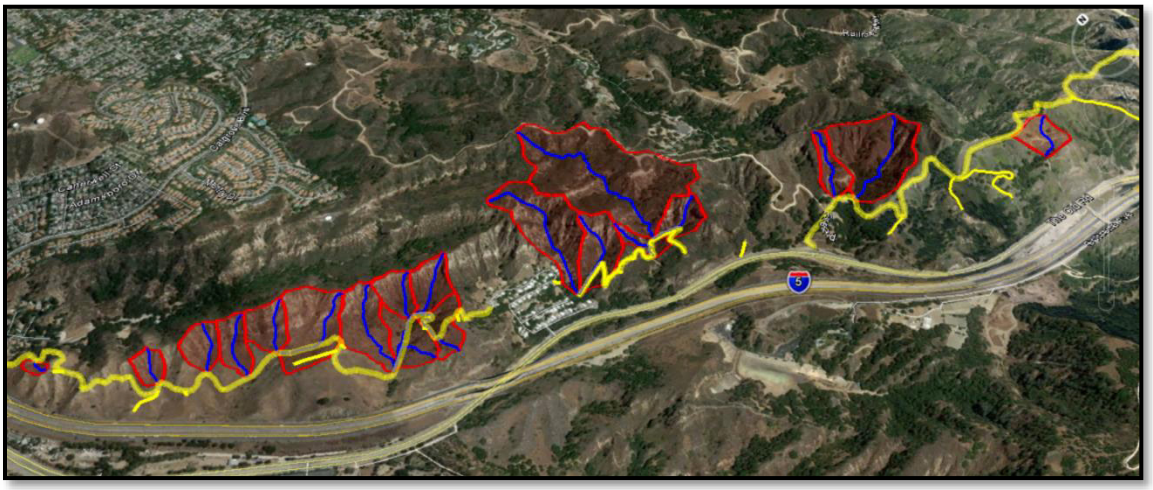
- **FINDING:** All other TSP locations are on ridgelines or otherwise on high ground away from areas where runoff would concentrate and cause hazards. Thus no Points of Concentration have been identified to any of the other TSP locations.

## POINTS OF CONCENTRATON AT MAINTENANCE ACCESS ROADS

The dirt roads that provide maintenance access to each of the TSP locations have been reviewed to identify any low points where runoff would concentrate and cross the road, potentially subjecting the road to flood or erosion hazards.

### East Alignment

- **FINDING:** Seventeen (17) low crossings that have a tributary drainage area greater than 1 acre have been identified along the maintenance access roads serving the East Alignment. **POCs 1 through 17 have been identified for each of these locations,** and tributary drainage areas delineated to each. Findings related to each of these points of concentration are identified in this report, and the detailed studies are provided in Appendix A and B.



### West Alignment

- **FINDING:** The maintenance access roads serving the West Alignment are located on or near ridgeline, or otherwise away from and identifiable points of flow concentration. **No points of concentration were identified for the maintenance access roads serving the West Alignment.**

## #2: PEAK FLOW RATES

The second task for this study was to *determine the 50-year and 100-peak flow rates to each Point of Concentration.*

The methods and requirements described in the Los Angeles County Hydrology Manual (2006) and the Los Angeles County Sedimentation Manual (2006) were followed for this study. The Hydrology Manual identifies the 50-year storm as the Capital Flood. This Hydrology Study was developed to determine both the 50-year Capital Flood flow rates, and at the Client's request the 100-year flow rates at each identified Point of Concentration.

- **RESULTS:** The table below identifies the peak 50-year and 100-year flow rates for each of the 18 points of concentration.

| POC | Location Description | Latitude (approx.) | Longitude (approx.) | Area (acres) | $Q_{50}$ (cfs) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|
| 1 | End of De Wolfe Road | 34°22'18.41"N | 118°33'16.18"W | 4 | 26 | 35 |
| 2 | Proposed water bar at approx. Sta 4+50, on preliminary sheet 4.2. | 34°22'15.79"N | 118°33'19.50"W | 2.5 | 16 | 18 |
| 3 | Proposed Swale at approx. Sta 9+28 on preliminary sheet 4.2 | 34°22'12.47"N | 118°33'21.59"W | 1 | 7.8 | 8.8 |
| 4 | Access Road between TSP 12 and 13 | 34°21'36.59"N | 118°33'9.75"W | 1 | 8.7 | 9.9 |
| 5 | Access Road between TSP 15 and 16 | 34°21'25.37"N | 118°33'1.06"W | 2 | 17 | 22 |
| 6 | Access Road between TSP 16 and 17 | 34°21'23.13"N | 118°32'56.22"W | 3.4 | 29 | 33 |
| 7 | Access Road approx. 217 ft east of TSP 17 | 34°21'19.88"N | 118°32'53.22"W | 3.7 | 27 | 31 |
| 8 | Access Road approx. 600 ft east of TSP 17 (flow from the north) | 34°21'19.87"N | 118°32'48.62"W | 4.1 | 35 | 40 |
| 9 | Access Road approx. 600 ft east of TSP 17 (flow from the east) | 34°21'19.39"N | 118°32'48.47"W | 11.5 | 74 | 84 |
| 10 | Low area adjacent to access road, approx. 250 feet north of TSP 20 | 34°21'13.02"N | 118°32'34.34"W | 13 | 91 | 110 |
| 11 | Existing Culvert @ Access Road, 545 feet south east of TSP 19, includes flow from TSP 10. | 34°21'9.53"N | 118°32'40.63"W | 14.1 | 170 | 200 |
| 12.1 | North Creek at Mobile Home entrance to access road to TSP 24 | 34°21'2.83"N | 118°32'17.02"W | 15 | 78 | 93 |
| 12.2 | East Creek at Mobile Home entrance to access road to TSP 24 | 34°21'2.68"N | 118°32'16.73"W | 7.4 | 47 | 54 |
| 13 | Confluence adjacent to new Access Road that will be constructed to TSP 25. Approx. 255 ft. north of low crossing at POC 14. | 34°21'1.66"N | 118°32'3.92"W | 50.2 | 240 | 280 |
| 14 | Proposed Culvert crossing on new Access Road to TSP 25. Includes flow from POC 13. | 34°21'0.14"N | 118°32'6.32"W | 53 | 260 | 300 |
| 15 | Existing culvert along the road to TSP 27. Approx. 760 feet east of the 'Old Road'. | 34°20'50.14"N | 118°31'42.48"W | 4.4 | 28 | 36 |
| 16 | Existing culvert along access road, approximately 200 feet southeast from POC 15 | 34°20'48.71"N | 118°31'40.91"W | 17.5 | 100 | 130 |
| 17 | Existing culvert along proposed redesigned access road to TSP 30, approximately 250 feet northwest from TSP 30 | 34°20'35.70"N | 118°31'20.60"W | 4.6 | 33 | 44 |
| 18 | Existing gulley adjacent to original location for TSP 35 | 34°20'7.48"N | 118°30'43.88"W | 6.2 | 40 | 54 |

The detailed hydrologic studies including key parameters, hydrographs, and the resulting flow rates for each of the POCs are provided in Appendix A and B.

## #3: FLOOD AND EROSION HAZARDS

The third task for this study was to *estimate the flood and erosion hazards (flood depth and velocity) resulting from the calculated flow rates*.

Estimating the risk of flood and erosion for this report included determination of the velocity, depth of flow, and a rough estimation of the ability of the soil to resist the shear stresses caused by those flows. Velocities and Depths at each Point of Concentration have been estimated to help indicate whether the identified flow rates are *likely to be erosive*, which can be used by SCE to decide if and where improved / engineered crossings may be desired.

For this preliminary assessment, the needed parameters have been approximated using the following methods:

1) Flow Velocities and Depths: The upstream approach velocity was estimated by assuming uniform flow depth (normal depth). This approach to determining the velocity is considered an approximation, however it can give reasonable 'order of magnitude' estimate of the velocity.
2) Resistance to Shear Stresses: USGS soils information was obtained for each point of concentration and was then combined with the information in Table 8-4 of the NRCS Threshold Channel Design handbook (August 2007) to estimate allowable (non-erosive) velocities at each Point of Concentration.

- **RESULTS:** The results of the study for flood and erosion hazards is summarized in the table below.

| POC | $D_{100\ yr\text{-}peak}$ (ft) | $V_{100\ yr\text{-}peak}$ (ft/s) | USGS Soil Type | Soil Character | $V_{Allowable}$ (ft/s) |
|---|---|---|---|---|---|
| 1 | 0.4* | 8.3 | ScF | Sandy Loam | 2 |
| 2 | 0.9* | 4.3 | ScF | Sandy Loam | 2 |
| 3 | 0.4* | 10.7 | ScF | Sandy Loam | 2 |
| 4 | 0.7* | 11.9 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 5 | 0.5* | 7.3 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 6 | 0.8* | 7.0 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 7 | 1.2 | 9.5 | CmF | Silty Clay | 3.5 |
| 8 | 1.2 | 14.2 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 9 | 0.8* | 7.1 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 10 | 3.3 | 12.5 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 11 | 2.1 | 11.4 | CmF | Silty Clay | 3.5 |
| 12.1 | 2.4 | 12.2 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 12.2 | 2.2 | 11.3 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 13 | 1.4 | 6.7 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 14 | 2.8 | 10.7 | CnG3 | 45% Silty Clay, 35% Sandy Loam | 3 |
| 15 | 1.5 | 11.0 | MhF2 | Clay Loam | 6 |
| 16 | 2.1 | 22.1 | MhF2 | Clay Loam | 6 |
| 17 | 1.6 | 17.9 | MhF2 | Clay Loam | 6 |
| 18 | 1.6 | 11.1 | MhF2 | Clay Loam | 6 |

- **FINDINGS:** As can be seen from the table above, the velocity associated with the 'peak' flow for all of the Points of Concentration will greatly exceed the likely threshold 'allowable' velocity, which could result in

erosion that could affect the maintenance roads. There are however a few points that should be kept in mind for interpreting this information:

- Many of the depths shown in the table above (based on the peak flow rate) are only estimated to be in the 1-2 range of depth, with some (denoted with*) not exceeding one-foot in depth. *When the depth is below about one foot, the velocities will likely be less than can be predicted with the Manning's equation* because the effects of local obstructions of brush, rocks, debris, etc in the channel become more pronounced than can be reflected with use of normal depth calculations and N values.
- The velocities in the above table are at the 'peak' flow rate. For much of the duration of the 100-year, 24-hour storm, flow rates will be significantly less. For example POC 14, which has the largest 'peak' flow rate of 300 cfs, only has flow rates above 200 cfs for about 8 minutes; most of the duration of the storm will have significantly lower flow rates. *As the flow rate subsides from the peak, the depth will also quickly subside, and actual flow velocities will also reduce*.

## #4: SCOUR AND LATERAL LOADING ON POLES

The third goal of this study was to *identify and quantify any scour and lateral hydraulic loading will occur at the proposed TSP locations, caused by flood and debris flows*.

As previously discussed, none of the proposed TSPs will be subject to flood or erosion hazards, and accordingly will not be subject to scour or lateral hydraulic loading. Individual discussions are provided below.

### TSPS 8 THROUGH 11:

These proposed locations, while adjacent to a floodplain, are located outside the floodplain. Furthermore, the pole locations are not near or in any identifiable low that might cause any risk of scour or lateral hydraulic loading.

- **FINDING:** No Scour or Lateral hydraulic loading is expected for these poles.

### TSP 35:

The location initially provided for TSP 35 would be subject to scour hazards, however SCE has identified that they plan to move the proposed location for that pole to downstream of where the flood flows are collected into an existing culvert, such that any remaining surface flows would pose a negligible risk to the pole.

- **FINDING:** No scour or lateral hydraulic loading is anticipated for this pole, provided that it is relocated as discussed.

### ALL OTHER TSP LOCATIONS:

The remaining proposed TSP locations are either on a ridge line or otherwise on high ground away from any flood or erosion hazards.

- **FINDING:** No scour or lateral hydraulic loading is anticipated for these poles.

## #5: CULVERT HYDRAULICS

The fifth goal of this study was to *assess the capacity of selected existing culverts and provide design parameters for new culverts as needed.* Based on the field review and discussions with SCE and CGR Engineering, it was determined that three existing culverts needed to be analyzed (at POC 7, 11 and 17). A new culvert is also needed at POC 14.

For the existing culverts, field visits were performed to assess the existing condition of the culvert, measure the diameter, and the amount of cover on the upstream and downstream ends of the culvert. For each culvert, rating curves were developed following the methodologies described in the US Department of Transportation's Hydraulic Design Series 5: "Hydraulic Design of Highway Culverts", Third Edition (April 2012).

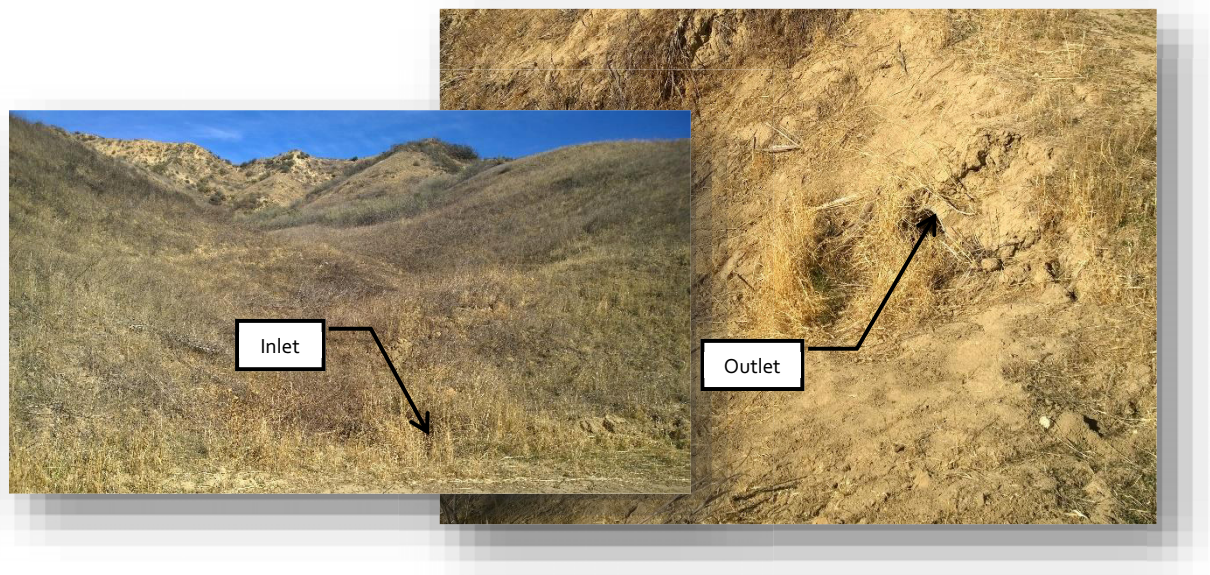
Three enveloping scenarios were analyzed for each culvert:

- Inlet Control: Inlet operates as a weir, crossing through critical depth at inlet.
- Inlet Control: Inlet is submerged and operates as an orifice.
- Outlet Control: Assuming the pipe is flowing full for its entire length and that the headwater is determined primarily by friction losses in the culvert barrel, as well as entrance and exit losses.

Due to the minimal cover each culvert has, potential headwater depths are minimal and *all culverts were found to operate under Inlet Control.*

### POC 7: EXISTING 36" CMP CULVERT

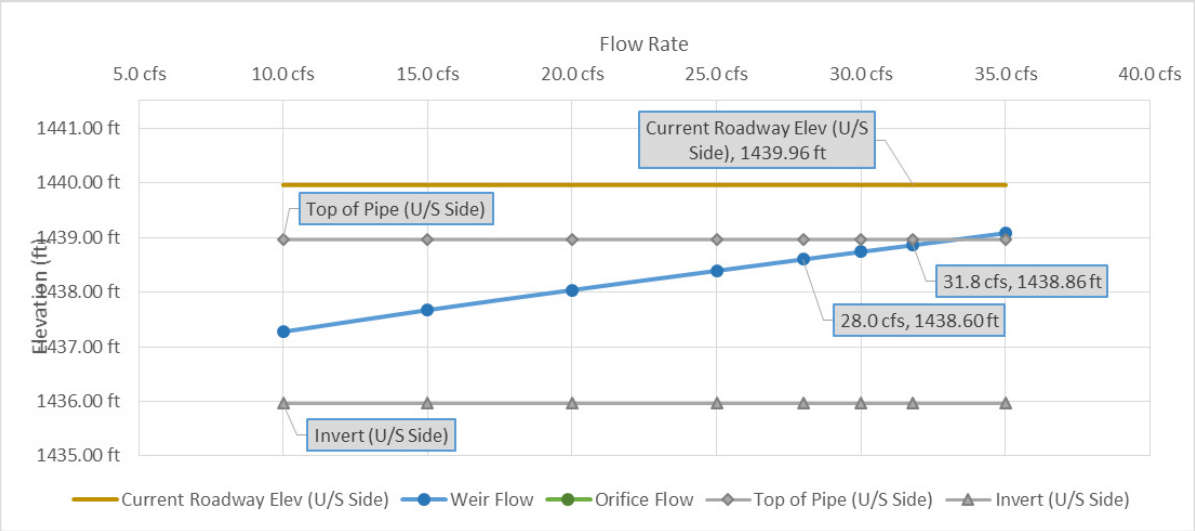
There is an existing 36" Corrugated Metal Pipe (CMP) draining the runoff reaching POC 7. The culvert overall is clean and in serviceable condition[1]. Since precise surveyed invert elevations were not available for this culvert, the approximate slope and maximum upstream ponding elevations were estimated from a combination of topographic maps provided by SCE and hand measured depths provided by CGR Engineering on January 7, 2014.




[1] Per CGR Engineering January 7, 2014

## RESULTS:

| Parameter | Value |
|---|---|
| **Type of Control** | Inlet (weir) |
| **Capacity without overtopping road** | Approx. 47 cfs |
| **$Q_{50}$** | 28 cfs |
| **$Q_{100}$** | 32 cfs |

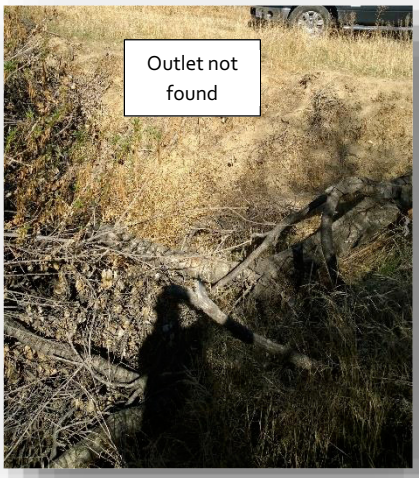



## FINDINGS:

- The existing culvert has capacity to safely pass the 100-year peak flow rate without overtopping the road.
- The existing culvert has no upstream or downstream erosion protections. Without such features it is possible that over time the culvert could fail due to erosion at the upstream or downstream ends of the culvert. It is recommended that periodic inspections of the culvert be performed and any observed erosion remedied.

## POC 11: EXISTING 42" CMP CULVERT BETWEEN TSP 19 AND 20

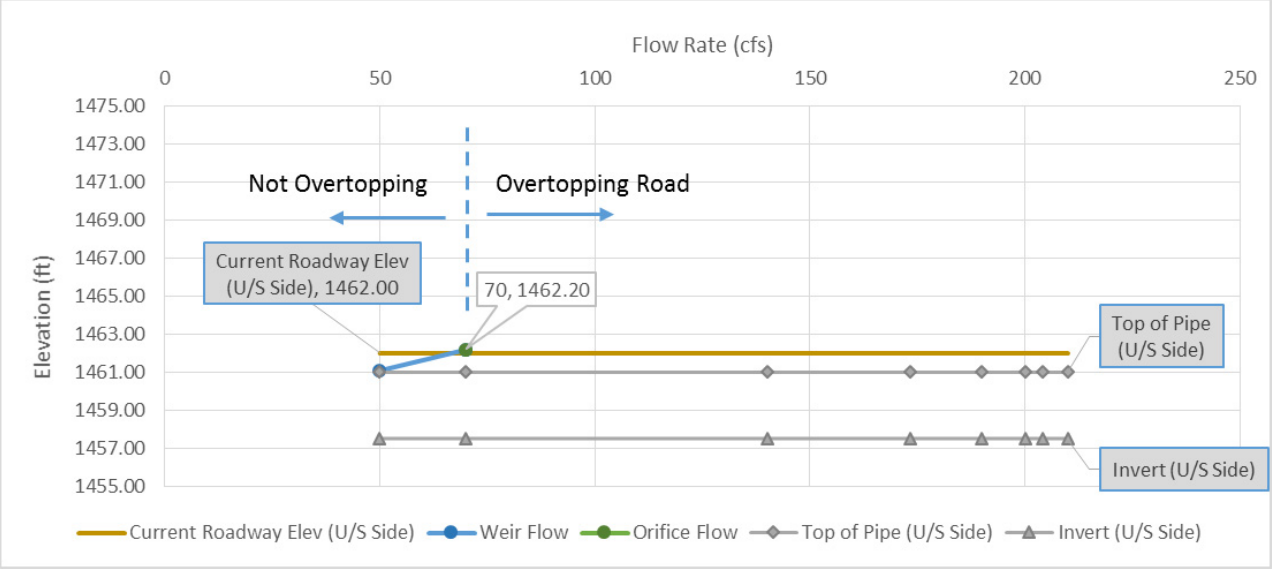
There is an existing 42" Corrugated Metal Pipe (CMP) crossing under the existing access road at POC 11, between TSP 19 and TSP 20. The downstream end of the culvert was not visible during field visits and may have been destroyed or buried by past maintenance activities on the road, or may have been obstructed by brush. To determine whether a 42-inch CMP culvert is adequate for the flood flows, an approximate culvert slope and maximum upstream ponding elevation were estimated from a combination of topographic maps provided by SCE and hand measured depths provided by CGR Engineering on January 7, 2014. Below are the findings, assuming the optimal scenario of a clean undamaged culvert. If the existing culvert is indeed damaged, or the outlet is obstructed, the performance of the existing culvert could be significantly less than shown below.




➢ **RESULTS:**

| Parameter | Value |
|---|---|
| **Type of Control** | Inlet (Orifice) |
| **Capacity without overtopping road** | About 70 cfs |
| **$Q_{50}$** | 170 cfs |
| **$Q_{100}$** | 200 cfs |

### ANALYSIS OF EXISTING 42" CMP CULVERT (ASSUMING CLEAN CONDITION)



## FINDINGS:

- A 42 inch CMP culvert in clean condition at this location would only be able to pass approximately 70 cfs before flows would overtop the existing access road, which is significantly less than the flow rates to this location in the 50-year or 100-year events.
- Flows would exceed the 70 cfs capacity for approximately 12 minutes, and the high velocities that overtopping flows could reach on the downstream slope of the road embankment, could cause erosion potentially rendering the road impassible.

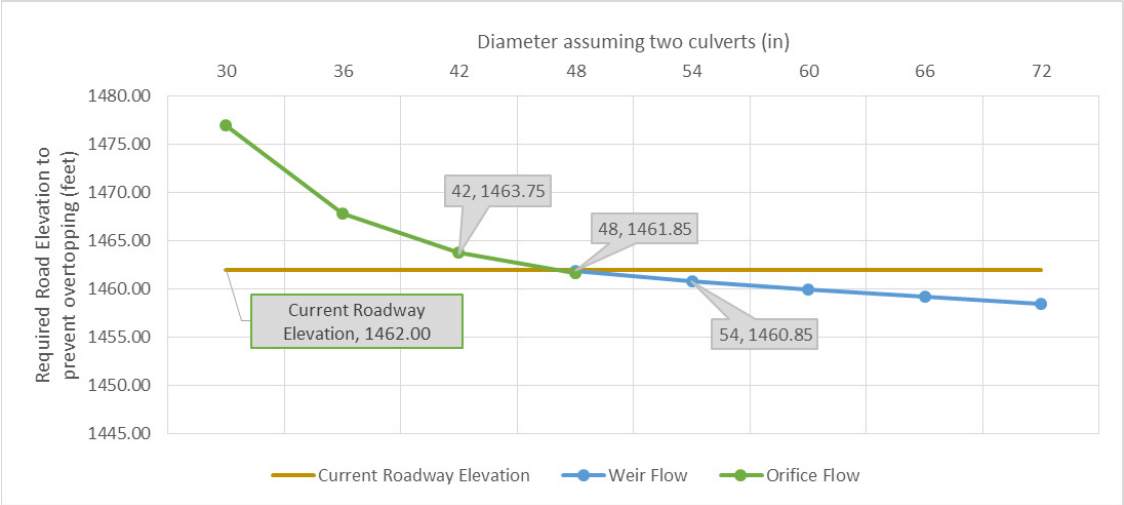
## RECOMMENDATIONS FOR POC 11:

Options for providing various levels of additional culvert capacity were analyzed, and three potential options that could be pursued for POC 11 are discussed below. Options 2 and 3 below assume that two parallel culverts could be installed at this location. Additional options can be considered using the charts below. ***The information provided in Options 2 and 3, and the charts below should be considered preliminary until an actual embankment / culvert design can be reviewed to verify modeling assumptions.***

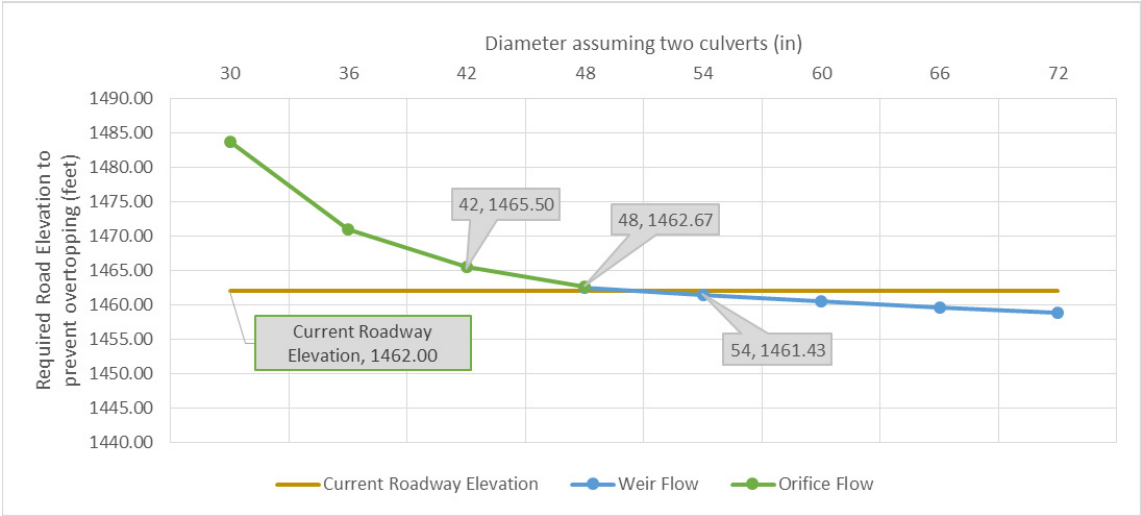
1. Option 1: Maintain use of a single *clean* 42-inch CMP culvert, either via rehabilitation of the existing culvert or replacement of the existing culvert with one of the same size. Since erosion damage would be likely any time a storm yields more than 70 cfs, this alternative would require more frequent restorative maintenance of the roadway embankment, and there may be periods where access across this point of concentration is not feasible until restoration is performed. In the 50-year flood, the flow rate will exceed the 70 cfs culvert capacity for approximately 10 minutes, and in the 100-year flood for approximately 12 minutes.
2. Option 2: Install a second 42-inch CMP culvert, parallel to the existing culvert (along with any restoration necessary for the existing culvert). This would increase the overall capacity to approximately 140 cfs before the existing roadway elevation would be overtopped. While this option still provides less than the 50-year capacity and leaves the access road at risk to overstepping erosion damage in such events, it would reduce the duration of overtopping flows, potentially reducing the extent and/or frequency of any needed restorative maintenance. In the 50-year flood, the flow rate will exceed the 140 cfs capacity for approximately 3 minutes, and in the 100-year flood for approximately 5 minutes.
3. Option 3: To prevent overtopping of the existing access road in the 50-year flood, two 48” culverts would be required, or for the 100-year flood, two 54” culverts would be required. This presumes that the roadway and top of pipe elevations would be maintained at the existing elevations to avoid significant re-profiling of the existing maintenance access road, and that the additional culvert size would be accommodated by excavating a culvert flow line that is deeper than the current invert elevation. The chart provided below can also be used to identify other culvert sizes that could be used if elevating the existing road is an option.

For options 1 and 2 above, the risk of erosion due to overtopping flows could be partially mitigated through the implementation of erosion controls on the roadway embankment, such as by following the methodologies described in FHWA HEC 23.

***SIZING OPTIONS FOR NEW DOUBLE CMP CULVERTS AT POC 11, (Q50)***




***SIZING OPTIONS FOR NEW DOUBLE CMP CULVERTS AT POC 11, (Q100)***



## POC 14: NEW CULVERT AT POC 14, NEAR TSP 25

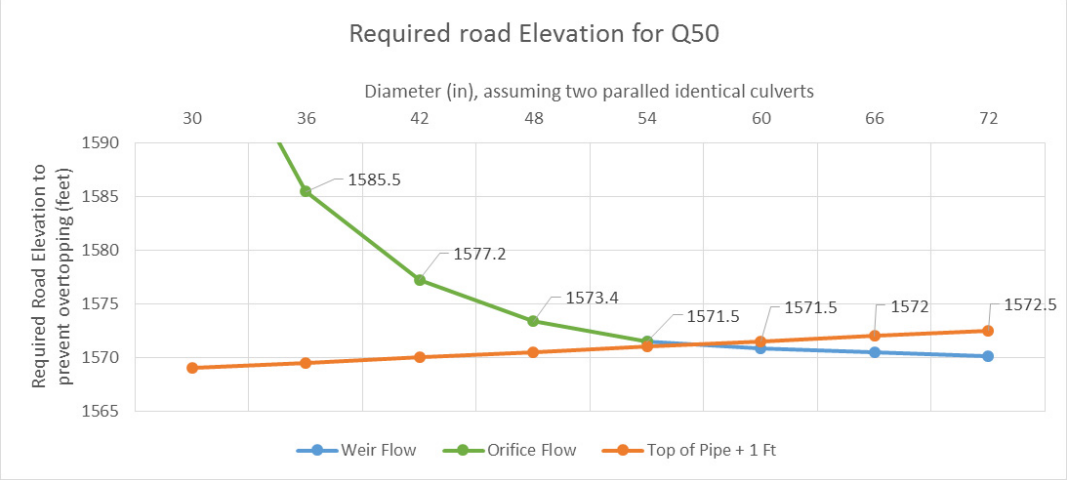
A new stream crossing and culvert will be constructed at POC 14, to provide access to TSP 25.

### ➢ FINDINGS AND RECOMMENDATIONS:

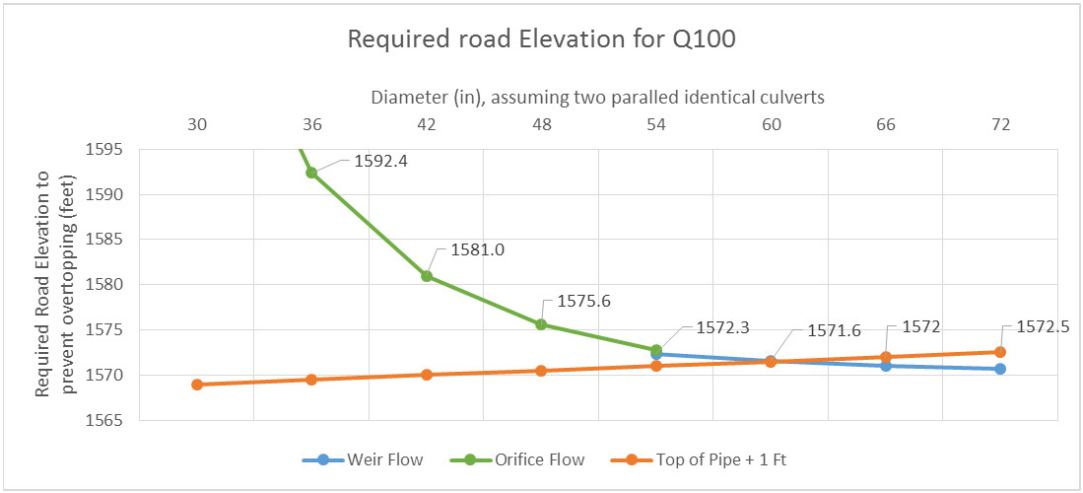
The charts below identify the minimum roadway embankment elevation* that would allow passage of the 50-year ($Q_{50}$) and 100-year ($Q_{100}$) flow rates through CMP culverts of various sizes, without overtopping of the new roadway. The charts can be used to assist in designing the roadway vertical alignment and to identify the culvert diameters required. ***The information provided below should be considered preliminary until an actual embankment / culvert design can be reviewed to verify modeling assumptions.***

*The charts below assume that TWO parallel CMP culverts of the designated size are installed. The elevation values assume that the invert of the new culvert will be designed to match the existing streambed grade, which based on SCE topography is approximately 1565.50 ft. The orange line represents an approximate minimum road elevation, simply accounting for the pipe diameter and one foot of cover. The green and blue lines represent the minimum road elevation to prevent overtopping of the road.

### DESIGN FOR Q50 = 258 CFS, ASSUMING TWO PARALLEL CMP CULVERTS




### DESIGN FOR Q100 = 303 CFS, ASSUMING TWO PARALLEL CMP CULVERTS



## POC 17: EXISTING 36" CMP CULVERT NEAR TSP 30

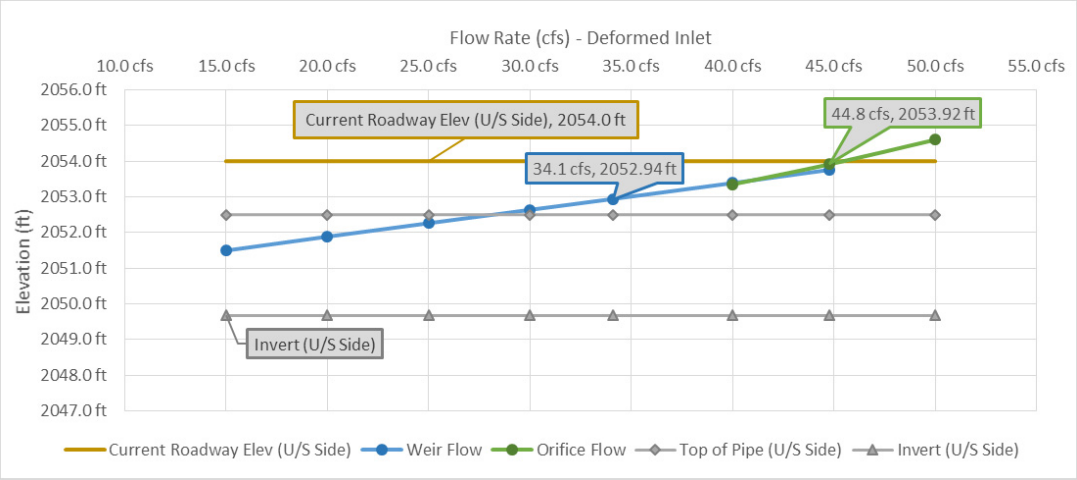
There is an existing 36" Corrugated Metal Pipe (CMP) draining the runoff reaching POC 17 underneath the existing maintenance access road serving TSP 30. The interior barrel of the culvert is clean and in serviceable condition, however the entrance to the culvert has a slight deformation impinging upon the flow area. The stream just upstream of the culvert inlet also has a deposition of sediment that, while not entirely blocking the inlet, will make the inlet more prone to clogging. Since precise surveyed invert elevations were not available for this culvert, the approximate slope and maximum upstream ponding elevations were estimated from a combination of topographic maps provided by SCE and hand measured depths provided by CGR Engineering on January 7, 2014.

➢ **RESULTS:**

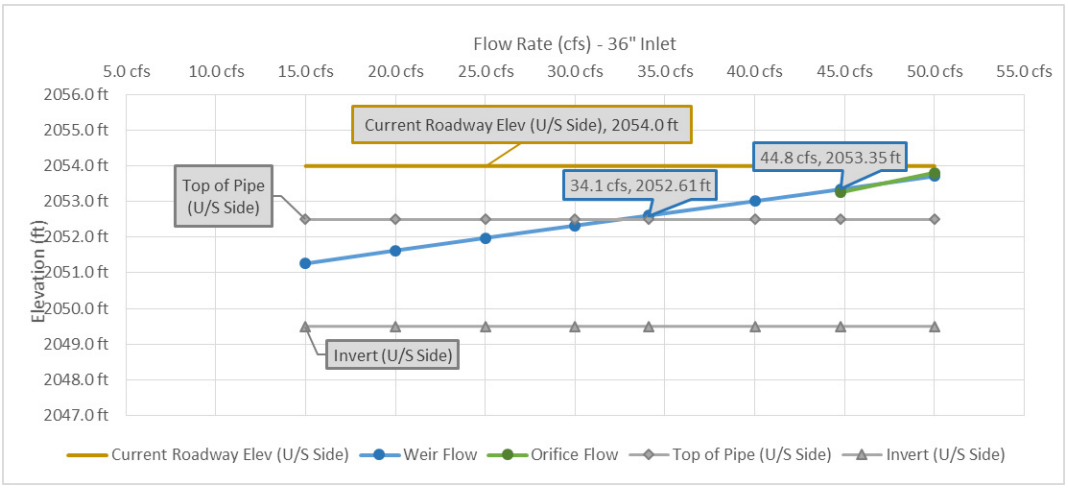
This culvert operates under inlet control, so the deformation at the inlet will affect the capacity of the culvert. While a non-deformed 36" culvert would have capacity of approximately 52 cfs without overtopping the road, this deformation reduces the area of the opening of the culvert. The exact measurements of the deformation are not known, however assuming the deformation is approximately six-inches, the area of the culvert opening is approximately equal to that of a 34-inch diameter CMP. The table below shows the capacity of the existing culvert both with and without a six-inch deformation at the inlet.

| Parameter | Non-Deformed | Deformed |
|---|---|---|
| **Effective Diameter** | 36 inches | 34 inches |
| **Type of Control** | Inlet (Orifice) | |
| **$Q_{50}$** | 34 cfs | |
| **$Q_{100}$** | 45 cfs | |
| **Capacity without overtopping road** | ~52 cfs | ~45 cfs |

***ANALYSIS OF EXISTING CMP CULVERT (MODELED DEFORMED INLET AS 34" CMP)***




***ANALYSIS OF CLEAN 36" CMP CULVERT***




## FINDINGS:

- The existing culvert (including the deformed inlet) likely has just enough capacity to pass the 100-year flow rate without overtopping the road.

## RECOMMENDATIONS:

- If the existing culvert is protected during any construction or grading activities, and otherwise maintained in its current condition, it should have just enough capacity to pass the 100-year flood without overtopping the existing road elevation.
- The area upstream of the culvert should be re-graded and cleared to reduce the risk of the inlet becoming clogged.
- The existing culvert has no upstream or downstream erosion protections. Without such features it is possible that over time the culvert and roadway embankment could fail due to erosion at the upstream or downstream ends of the culvert. It is recommended that periodic inspections of the culvert be performed and any observed erosion remedied.

# APPENDIX A

## POC SUMMARIES

# POINT OF CONCENTRATION #1

## LOCATION

POC #1 is located at the end of De Wolfe Road, in the City of Santa Clarita, CA. It is at the north entrance to the maintenance access road leading to TSP 7.

*Approximate Latitude:* 34°22'18.41"N

*Approximate Longitude:* *118°33'16.18"W*

## DRAINAGE AREA INFORMATION

*Area:* 4 acres

*Flow Length:* 631 feet

*Effective Slope:* 19.6%

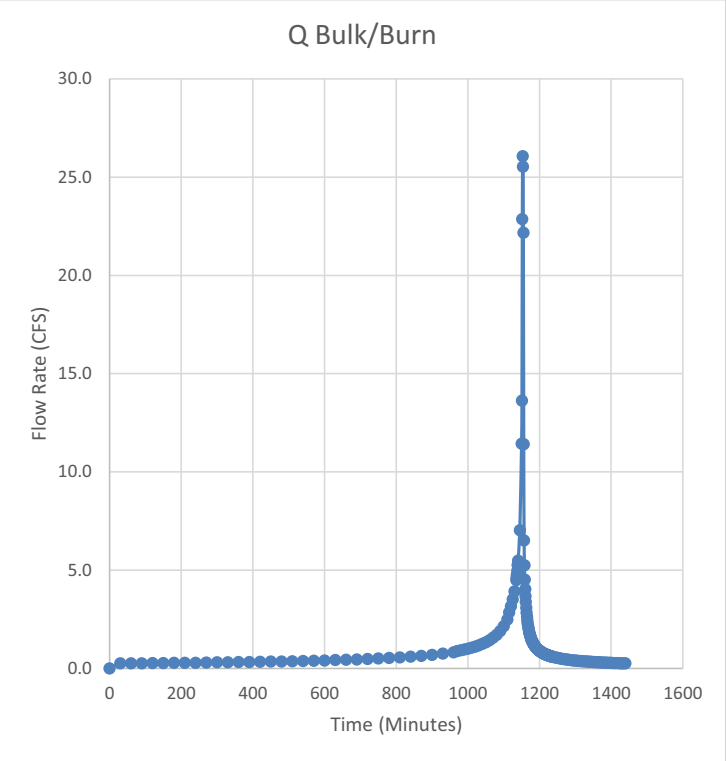
*Soil Type No:* 097

*Debris Production Area:* 5

# 50-Year Summary for POC: 1

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

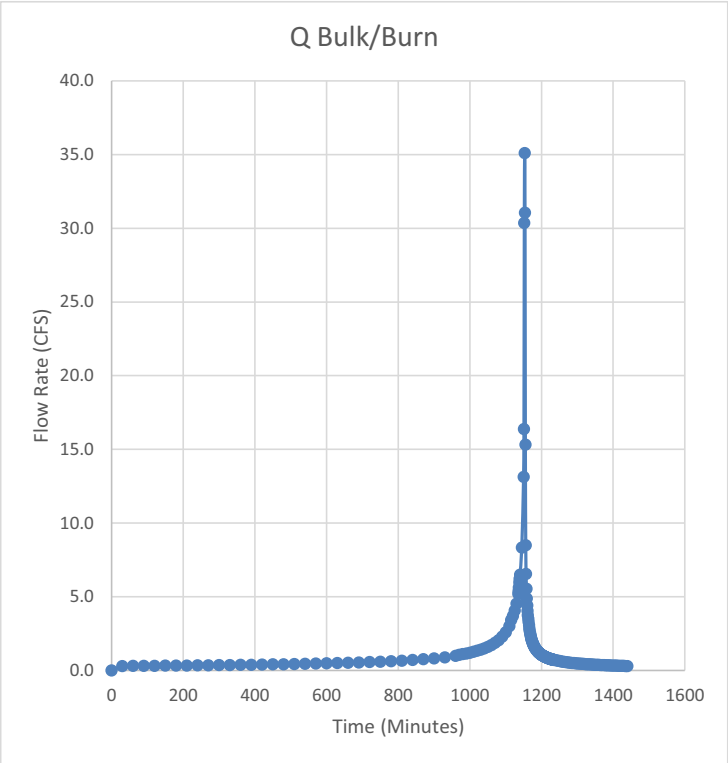
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 2.5 | 1185 | 1.2 | 1232 | 0.6 |
| 30 | 0.3 | 1115 | 2.8 | 1186 | 1.2 | 1233 | 0.6 |
| 60 | 0.3 | 1120 | 3.2 | 1187 | 1.1 | 1234 | 0.6 |
| 90 | 0.3 | 1125 | 3.5 | 1188 | 1.1 | 1235 | 0.6 |
| 120 | 0.3 | 1130 | 3.9 | 1189 | 1.1 | 1240 | 0.6 |
| 150 | 0.3 | 1135 | 4.5 | 1190 | 1.1 | 1245 | 0.6 |
| 180 | 0.3 | 1136 | 4.6 | 1191 | 1.1 | 1250 | 0.5 |
| 210 | 0.3 | 1137 | 4.8 | 1192 | 1.0 | 1255 | 0.5 |
| 240 | 0.3 | 1138 | 5.0 | 1193 | 1.0 | 1260 | 0.5 |
| 270 | 0.3 | 1139 | 5.3 | 1194 | 1.0 | 1265 | 0.5 |
| 300 | 0.3 | 1140 | 5.5 | 1195 | 1.0 | 1270 | 0.5 |
| 330 | 0.3 | 1145 | 7.0 | 1196 | 1.0 | 1275 | 0.5 |
| 360 | 0.3 | 1150 | 11.4 | 1197 | 0.9 | 1280 | 0.4 |
| 390 | 0.3 | 1151 | 13.6 | 1198 | 0.9 | 1285 | 0.4 |
| 420 | 0.3 | 1152 | 22.9 | 1199 | 0.9 | 1290 | 0.4 |
| 450 | 0.3 | 1153 | 26.1 | 1200 | 0.9 | 1295 | 0.4 |
| 480 | 0.4 | 1154 | 25.5 | 1201 | 0.9 | 1300 | 0.4 |
| 510 | 0.4 | 1155 | 22.2 | 1202 | 0.9 | 1305 | 0.4 |
| 540 | 0.4 | 1156 | 11.4 | 1203 | 0.9 | 1310 | 0.4 |
| 570 | 0.4 | 1157 | 6.5 | 1204 | 0.8 | 1315 | 0.4 |
| 600 | 0.4 | 1158 | 5.3 | 1205 | 0.8 | 1320 | 0.4 |
| 630 | 0.4 | 1159 | 4.5 | 1206 | 0.8 | 1325 | 0.4 |
| 660 | 0.4 | 1160 | 4.0 | 1207 | 0.8 | 1330 | 0.4 |
| 690 | 0.5 | 1161 | 3.7 | 1208 | 0.8 | 1335 | 0.3 |
| 720 | 0.5 | 1162 | 3.4 | 1209 | 0.8 | 1340 | 0.3 |
| 750 | 0.5 | 1163 | 3.1 | 1210 | 0.8 | 1345 | 0.3 |
| 780 | 0.5 | 1164 | 2.8 | 1211 | 0.8 | 1350 | 0.3 |
| 810 | 0.6 | 1165 | 2.6 | 1212 | 0.8 | 1355 | 0.3 |
| 840 | 0.6 | 1166 | 2.5 | 1213 | 0.8 | 1360 | 0.3 |
| 870 | 0.6 | 1167 | 2.3 | 1214 | 0.7 | 1365 | 0.3 |
| 900 | 0.7 | 1168 | 2.2 | 1215 | 0.7 | 1370 | 0.3 |
| 930 | 0.7 | 1169 | 2.1 | 1216 | 0.7 | 1375 | 0.3 |
| 960 | 0.8 | 1170 | 2.0 | 1217 | 0.7 | 1380 | 0.3 |
| 970 | 0.9 | 1171 | 1.9 | 1218 | 0.7 | 1385 | 0.3 |
| 980 | 0.9 | 1172 | 1.8 | 1219 | 0.7 | 1390 | 0.3 |
| 990 | 1.0 | 1173 | 1.7 | 1220 | 0.7 | 1395 | 0.3 |
| 1000 | 1.0 | 1174 | 1.7 | 1221 | 0.7 | 1400 | 0.3 |
| 1010 | 1.1 | 1175 | 1.6 | 1222 | 0.7 | 1405 | 0.3 |
| 1020 | 1.1 | 1176 | 1.5 | 1223 | 0.7 | 1410 | 0.3 |
| 1030 | 1.2 | 1177 | 1.5 | 1224 | 0.7 | 1415 | 0.3 |
| 1040 | 1.2 | 1178 | 1.4 | 1225 | 0.7 | 1420 | 0.3 |
| 1050 | 1.3 | 1179 | 1.4 | 1226 | 0.7 | 1425 | 0.3 |
| 1060 | 1.4 | 1180 | 1.4 | 1227 | 0.6 | 1430 | 0.3 |
| 1070 | 1.6 | 1181 | 1.3 | 1228 | 0.6 | 1435 | 0.3 |
| 1080 | 1.7 | 1182 | 1.3 | 1229 | 0.6 | 1440 | 0.3 |
| 1090 | 1.9 | 1183 | 1.3 | 1230 | 0.6 | | |
| 1100 | 2.1 | 1184 | 1.2 | 1231 | 0.6 | | |



# 100-Year Summary for POC: 1

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| (min) | (CFS) | (min) | (CFS) | (min) | (CFS) | (min) | (CFS) |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 3.0 | 1185 | 1.4 | 1232 | 0.7 |
| 30 | 0.3 | 1115 | 3.4 | 1186 | 1.4 | 1233 | 0.7 |
| 60 | 0.3 | 1120 | 3.7 | 1187 | 1.4 | 1234 | 0.7 |
| 90 | 0.3 | 1125 | 4.1 | 1188 | 1.3 | 1235 | 0.7 |
| 120 | 0.3 | 1130 | 4.5 | 1189 | 1.3 | 1240 | 0.7 |
| 150 | 0.3 | 1135 | 5.2 | 1190 | 1.3 | 1245 | 0.7 |
| 180 | 0.3 | 1136 | 5.4 | 1191 | 1.2 | 1250 | 0.6 |
| 210 | 0.3 | 1137 | 5.6 | 1192 | 1.2 | 1255 | 0.6 |
| 240 | 0.3 | 1138 | 6.0 | 1193 | 1.2 | 1260 | 0.6 |
| 270 | 0.4 | 1139 | 6.2 | 1194 | 1.2 | 1265 | 0.6 |
| 300 | 0.4 | 1140 | 6.5 | 1195 | 1.2 | 1270 | 0.6 |
| 330 | 0.4 | 1145 | 8.3 | 1196 | 1.1 | 1275 | 0.5 |
| 360 | 0.4 | 1150 | 13.1 | 1197 | 1.1 | 1280 | 0.5 |
| 390 | 0.4 | 1151 | 16.4 | 1198 | 1.1 | 1285 | 0.5 |
| 420 | 0.4 | 1152 | 30.4 | 1199 | 1.1 | 1290 | 0.5 |
| 450 | 0.4 | 1153 | 35.1 | 1200 | 1.1 | 1295 | 0.5 |
| 480 | 0.4 | 1154 | 31.1 | 1201 | 1.0 | 1300 | 0.5 |
| 510 | 0.4 | 1155 | 15.3 | 1202 | 1.0 | 1305 | 0.5 |
| 540 | 0.4 | 1156 | 8.5 | 1203 | 1.0 | 1310 | 0.5 |
| 570 | 0.5 | 1157 | 6.5 | 1204 | 1.0 | 1315 | 0.4 |
| 600 | 0.5 | 1158 | 5.5 | 1205 | 1.0 | 1320 | 0.4 |
| 630 | 0.5 | 1159 | 4.9 | 1206 | 1.0 | 1325 | 0.4 |
| 660 | 0.5 | 1160 | 4.4 | 1207 | 1.0 | 1330 | 0.4 |
| 690 | 0.5 | 1161 | 4.0 | 1208 | 0.9 | 1335 | 0.4 |
| 720 | 0.6 | 1162 | 3.7 | 1209 | 0.9 | 1340 | 0.4 |
| 750 | 0.6 | 1163 | 3.5 | 1210 | 0.9 | 1345 | 0.4 |
| 780 | 0.6 | 1164 | 3.3 | 1211 | 0.9 | 1350 | 0.4 |
| 810 | 0.7 | 1165 | 3.1 | 1212 | 0.9 | 1355 | 0.4 |
| 840 | 0.7 | 1166 | 2.9 | 1213 | 0.9 | 1360 | 0.4 |
| 870 | 0.8 | 1167 | 2.7 | 1214 | 0.9 | 1365 | 0.4 |
| 900 | 0.8 | 1168 | 2.6 | 1215 | 0.9 | 1370 | 0.4 |
| 930 | 0.9 | 1169 | 2.4 | 1216 | 0.9 | 1375 | 0.4 |
| 960 | 1.0 | 1170 | 2.3 | 1217 | 0.8 | 1380 | 0.4 |
| 970 | 1.1 | 1171 | 2.2 | 1218 | 0.8 | 1385 | 0.3 |
| 980 | 1.1 | 1172 | 2.1 | 1219 | 0.8 | 1390 | 0.3 |
| 990 | 1.2 | 1173 | 2.0 | 1220 | 0.8 | 1395 | 0.3 |
| 1000 | 1.2 | 1174 | 2.0 | 1221 | 0.8 | 1400 | 0.3 |
| 1010 | 1.3 | 1175 | 1.9 | 1222 | 0.8 | 1405 | 0.3 |
| 1020 | 1.3 | 1176 | 1.8 | 1223 | 0.8 | 1410 | 0.3 |
| 1030 | 1.4 | 1177 | 1.8 | 1224 | 0.8 | 1415 | 0.3 |
| 1040 | 1.5 | 1178 | 1.7 | 1225 | 0.8 | 1420 | 0.3 |
| 1050 | 1.6 | 1179 | 1.7 | 1226 | 0.8 | 1425 | 0.3 |
| 1060 | 1.7 | 1180 | 1.6 | 1227 | 0.8 | 1430 | 0.3 |
| 1070 | 1.9 | 1181 | 1.6 | 1228 | 0.8 | 1435 | 0.3 |
| 1080 | 2.1 | 1182 | 1.5 | 1229 | 0.7 | 1440 | 0.3 |
| 1090 | 2.3 | 1183 | 1.5 | 1230 | 0.7 | | |
| 1100 | 2.6 | 1184 | 1.5 | 1231 | 0.7 | | |



# SoCal Gas Project

## POC 1

### Stream Station = 10+00

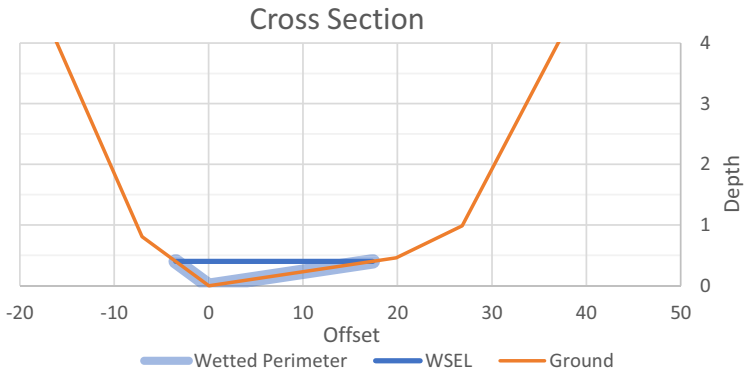
## INPUT

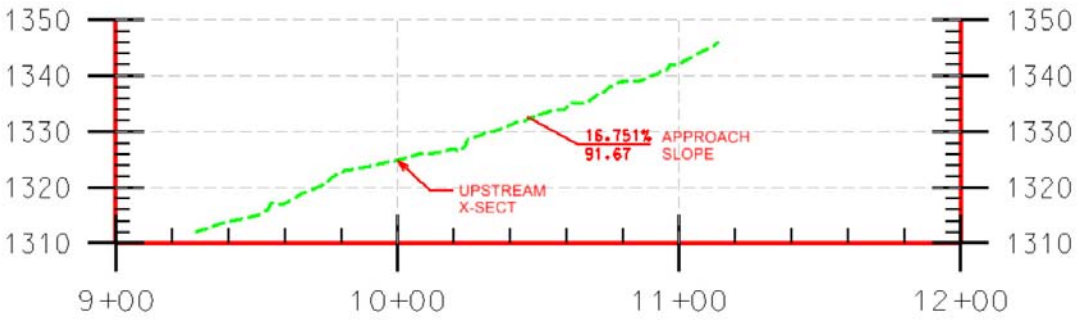
| | | |
|---|---|---|
| $Q_{50}$ | 26.0 | cfs |
| $Q_{100}$ | 35.0 | cfs |
| **$Q_{DESIGN}$** | **35.0** | **cfs** |
| | | |
| N | 0.025 | |
| So | 0.168 | ft/ft |

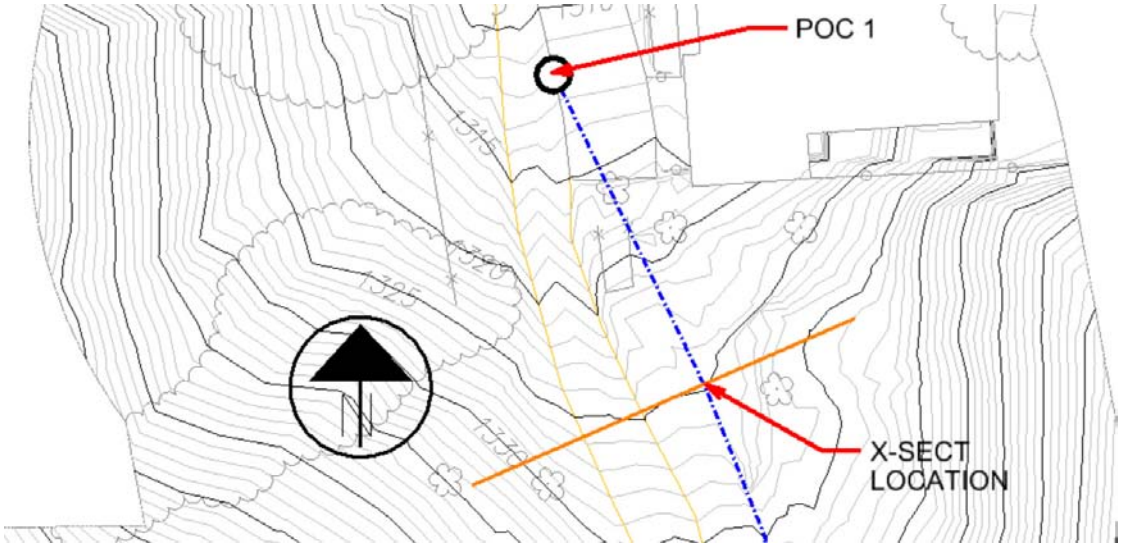
| Point | Station | Ground |
|---|---|---|
| 1 | -16.16 | 1328.90 |
| 2 | -7.06 | 1325.68 |
| 3 | 0.03 | 1324.87 |
| 4 | 19.88 | 1325.33 |
| 5 | 26.85 | 1325.86 |
| 6 | 37.46 | 1329.00 |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **0.4** | **ft** | *(NORMAL DEPTH)* |
| Area= | 4.2 | $ft^2$ | |
| $P_W$ | 20.9 | ft | |
| R | 0.201 | ft | |
| **Velocity=** | **8.3** | **ft/s** | |
| $S_F$ | 0.168 | ft/ft | |



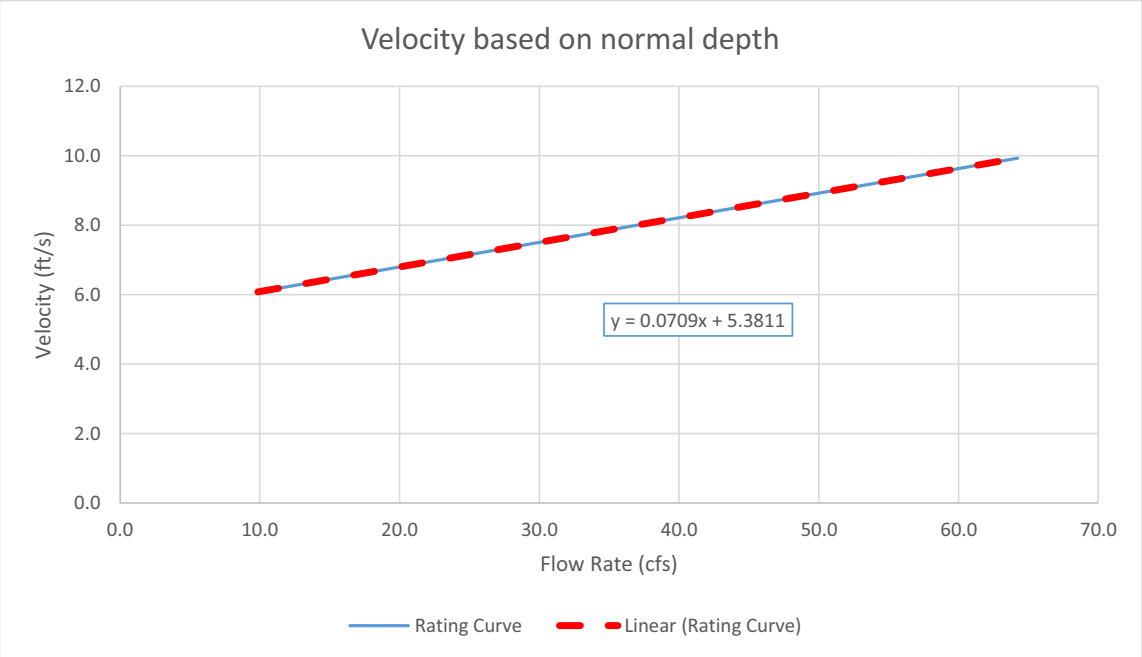



# SoCal Gas Project

## POC 1

### Stream Station = 10+00



# POC #2

## LOCATION

POC #2 is located in the City of Santa Clarita, CA, along the maintenance access road leading to TSP 7.

*Approximate Latitude:* 34°22'15.79"N

*Approximate Longitude:* *118°33'19.50"W*

## DRAINAGE AREA INFORMATION

*Area:* 2.5 acres

*Flow Length:* 700 feet

*Effective Slope:* 12.8%

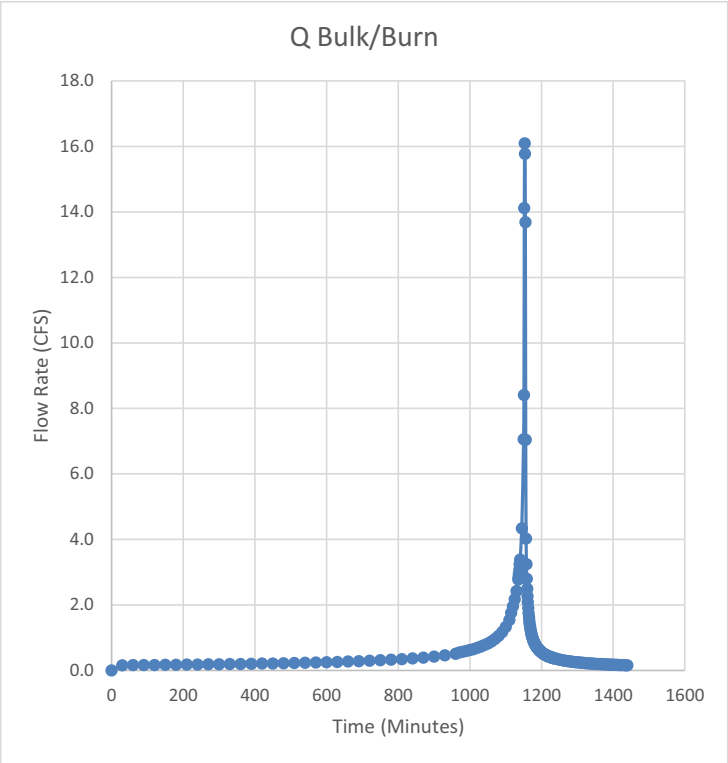
*Soil Type No:* 097

*Debris Production Area:* 5

# 50-Year Summary for POC: 2

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

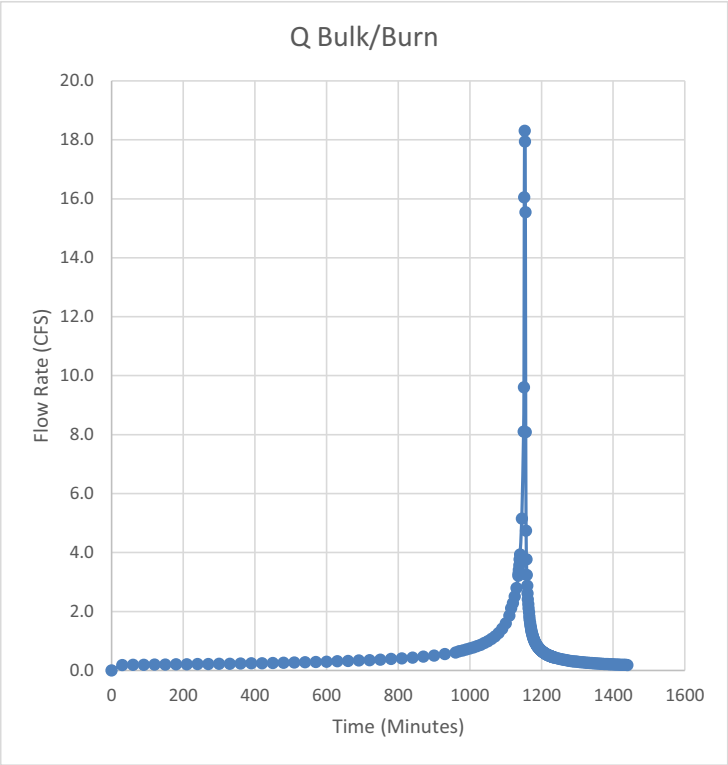
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 1.5 | 1185 | 0.7 | 1232 | 0.4 |
| 30 | 0.2 | 1115 | 1.8 | 1186 | 0.7 | 1233 | 0.4 |
| 60 | 0.2 | 1120 | 2.0 | 1187 | 0.7 | 1234 | 0.4 |
| 90 | 0.2 | 1125 | 2.2 | 1188 | 0.7 | 1235 | 0.4 |
| 120 | 0.2 | 1130 | 2.4 | 1189 | 0.7 | 1240 | 0.4 |
| 150 | 0.2 | 1135 | 2.8 | 1190 | 0.7 | 1245 | 0.3 |
| 180 | 0.2 | 1136 | 2.8 | 1191 | 0.6 | 1250 | 0.3 |
| 210 | 0.2 | 1137 | 2.9 | 1192 | 0.6 | 1255 | 0.3 |
| 240 | 0.2 | 1138 | 3.1 | 1193 | 0.6 | 1260 | 0.3 |
| 270 | 0.2 | 1139 | 3.2 | 1194 | 0.6 | 1265 | 0.3 |
| 300 | 0.2 | 1140 | 3.4 | 1195 | 0.6 | 1270 | 0.3 |
| 330 | 0.2 | 1145 | 4.3 | 1196 | 0.6 | 1275 | 0.3 |
| 360 | 0.2 | 1150 | 7.1 | 1197 | 0.6 | 1280 | 0.3 |
| 390 | 0.2 | 1151 | 8.4 | 1198 | 0.6 | 1285 | 0.3 |
| 420 | 0.2 | 1152 | 14.1 | 1199 | 0.6 | 1290 | 0.3 |
| 450 | 0.2 | 1153 | 16.1 | 1200 | 0.6 | 1295 | 0.3 |
| 480 | 0.2 | 1154 | 15.8 | 1201 | 0.5 | 1300 | 0.2 |
| 510 | 0.2 | 1155 | 13.7 | 1202 | 0.5 | 1305 | 0.2 |
| 540 | 0.2 | 1156 | 7.0 | 1203 | 0.5 | 1310 | 0.2 |
| 570 | 0.2 | 1157 | 4.0 | 1204 | 0.5 | 1315 | 0.2 |
| 600 | 0.3 | 1158 | 3.2 | 1205 | 0.5 | 1320 | 0.2 |
| 630 | 0.3 | 1159 | 2.8 | 1206 | 0.5 | 1325 | 0.2 |
| 660 | 0.3 | 1160 | 2.5 | 1207 | 0.5 | 1330 | 0.2 |
| 690 | 0.3 | 1161 | 2.3 | 1208 | 0.5 | 1335 | 0.2 |
| 720 | 0.3 | 1162 | 2.1 | 1209 | 0.5 | 1340 | 0.2 |
| 750 | 0.3 | 1163 | 1.9 | 1210 | 0.5 | 1345 | 0.2 |
| 780 | 0.3 | 1164 | 1.8 | 1211 | 0.5 | 1350 | 0.2 |
| 810 | 0.3 | 1165 | 1.6 | 1212 | 0.5 | 1355 | 0.2 |
| 840 | 0.4 | 1166 | 1.5 | 1213 | 0.5 | 1360 | 0.2 |
| 870 | 0.4 | 1167 | 1.4 | 1214 | 0.5 | 1365 | 0.2 |
| 900 | 0.4 | 1168 | 1.3 | 1215 | 0.5 | 1370 | 0.2 |
| 930 | 0.5 | 1169 | 1.3 | 1216 | 0.4 | 1375 | 0.2 |
| 960 | 0.5 | 1170 | 1.2 | 1217 | 0.4 | 1380 | 0.2 |
| 970 | 0.5 | 1171 | 1.2 | 1218 | 0.4 | 1385 | 0.2 |
| 980 | 0.6 | 1172 | 1.1 | 1219 | 0.4 | 1390 | 0.2 |
| 990 | 0.6 | 1173 | 1.1 | 1220 | 0.4 | 1395 | 0.2 |
| 1000 | 0.6 | 1174 | 1.0 | 1221 | 0.4 | 1400 | 0.2 |
| 1010 | 0.7 | 1175 | 1.0 | 1222 | 0.4 | 1405 | 0.2 |
| 1020 | 0.7 | 1176 | 1.0 | 1223 | 0.4 | 1410 | 0.2 |
| 1030 | 0.7 | 1177 | 0.9 | 1224 | 0.4 | 1415 | 0.2 |
| 1040 | 0.8 | 1178 | 0.9 | 1225 | 0.4 | 1420 | 0.2 |
| 1050 | 0.8 | 1179 | 0.9 | 1226 | 0.4 | 1425 | 0.2 |
| 1060 | 0.9 | 1180 | 0.8 | 1227 | 0.4 | 1430 | 0.2 |
| 1070 | 1.0 | 1181 | 0.8 | 1228 | 0.4 | 1435 | 0.2 |
| 1080 | 1.1 | 1182 | 0.8 | 1229 | 0.4 | 1440 | 0.2 |
| 1090 | 1.2 | 1183 | 0.8 | 1230 | 0.4 | | |
| 1100 | 1.3 | 1184 | 0.8 | 1231 | 0.4 | | |

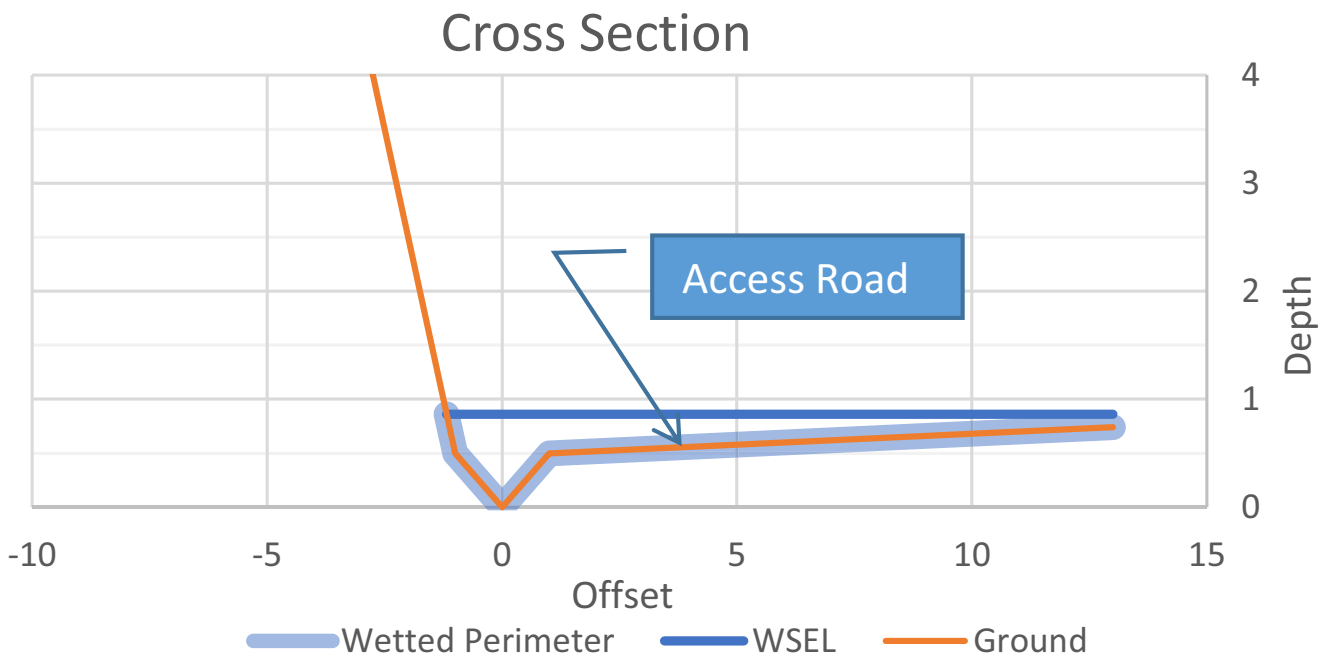


# 100-Year Summary for POC: 2

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 1.9 | 1185 | 0.9 | 1232 | 0.5 |
| 30 | 0.2 | 1115 | 2.1 | 1186 | 0.9 | 1233 | 0.4 |
| 60 | 0.2 | 1120 | 2.3 | 1187 | 0.8 | 1234 | 0.4 |
| 90 | 0.2 | 1125 | 2.5 | 1188 | 0.8 | 1235 | 0.4 |
| 120 | 0.2 | 1130 | 2.8 | 1189 | 0.8 | 1240 | 0.4 |
| 150 | 0.2 | 1135 | 3.2 | 1190 | 0.8 | 1245 | 0.4 |
| 180 | 0.2 | 1136 | 3.3 | 1191 | 0.8 | 1250 | 0.4 |
| 210 | 0.2 | 1137 | 3.4 | 1192 | 0.8 | 1255 | 0.4 |
| 240 | 0.2 | 1138 | 3.6 | 1193 | 0.7 | 1260 | 0.4 |
| 270 | 0.2 | 1139 | 3.8 | 1194 | 0.7 | 1265 | 0.4 |
| 300 | 0.2 | 1140 | 3.9 | 1195 | 0.7 | 1270 | 0.3 |
| 330 | 0.2 | 1145 | 5.2 | 1196 | 0.7 | 1275 | 0.3 |
| 360 | 0.2 | 1150 | 8.1 | 1197 | 0.7 | 1280 | 0.3 |
| 390 | 0.2 | 1151 | 9.6 | 1198 | 0.7 | 1285 | 0.3 |
| 420 | 0.2 | 1152 | 16.0 | 1199 | 0.7 | 1290 | 0.3 |
| 450 | 0.3 | 1153 | 18.3 | 1200 | 0.7 | 1295 | 0.3 |
| 480 | 0.3 | 1154 | 17.9 | 1201 | 0.7 | 1300 | 0.3 |
| 510 | 0.3 | 1155 | 15.5 | 1202 | 0.6 | 1305 | 0.3 |
| 540 | 0.3 | 1156 | 8.1 | 1203 | 0.6 | 1310 | 0.3 |
| 570 | 0.3 | 1157 | 4.7 | 1204 | 0.6 | 1315 | 0.3 |
| 600 | 0.3 | 1158 | 3.8 | 1205 | 0.6 | 1320 | 0.3 |
| 630 | 0.3 | 1159 | 3.2 | 1206 | 0.6 | 1325 | 0.3 |
| 660 | 0.3 | 1160 | 2.9 | 1207 | 0.6 | 1330 | 0.3 |
| 690 | 0.3 | 1161 | 2.6 | 1208 | 0.6 | 1335 | 0.3 |
| 720 | 0.4 | 1162 | 2.4 | 1209 | 0.6 | 1340 | 0.2 |
| 750 | 0.4 | 1163 | 2.2 | 1210 | 0.6 | 1345 | 0.2 |
| 780 | 0.4 | 1164 | 2.1 | 1211 | 0.6 | 1350 | 0.2 |
| 810 | 0.4 | 1165 | 2.0 | 1212 | 0.6 | 1355 | 0.2 |
| 840 | 0.4 | 1166 | 1.8 | 1213 | 0.6 | 1360 | 0.2 |
| 870 | 0.5 | 1167 | 1.7 | 1214 | 0.5 | 1365 | 0.2 |
| 900 | 0.5 | 1168 | 1.6 | 1215 | 0.5 | 1370 | 0.2 |
| 930 | 0.6 | 1169 | 1.5 | 1216 | 0.5 | 1375 | 0.2 |
| 960 | 0.6 | 1170 | 1.5 | 1217 | 0.5 | 1380 | 0.2 |
| 970 | 0.7 | 1171 | 1.4 | 1218 | 0.5 | 1385 | 0.2 |
| 980 | 0.7 | 1172 | 1.3 | 1219 | 0.5 | 1390 | 0.2 |
| 990 | 0.7 | 1173 | 1.3 | 1220 | 0.5 | 1395 | 0.2 |
| 1000 | 0.7 | 1174 | 1.2 | 1221 | 0.5 | 1400 | 0.2 |
| 1010 | 0.8 | 1175 | 1.2 | 1222 | 0.5 | 1405 | 0.2 |
| 1020 | 0.8 | 1176 | 1.1 | 1223 | 0.5 | 1410 | 0.2 |
| 1030 | 0.9 | 1177 | 1.1 | 1224 | 0.5 | 1415 | 0.2 |
| 1040 | 0.9 | 1178 | 1.1 | 1225 | 0.5 | 1420 | 0.2 |
| 1050 | 1.0 | 1179 | 1.0 | 1226 | 0.5 | 1425 | 0.2 |
| 1060 | 1.1 | 1180 | 1.0 | 1227 | 0.5 | 1430 | 0.2 |
| 1070 | 1.2 | 1181 | 1.0 | 1228 | 0.5 | 1435 | 0.2 |
| 1080 | 1.3 | 1182 | 1.0 | 1229 | 0.5 | 1440 | 0.2 |
| 1090 | 1.4 | 1183 | 0.9 | 1230 | 0.5 | | |
| 1100 | 1.6 | 1184 | 0.9 | 1231 | 0.5 | | |




Cross Section
Access Road
4
3
2
1
0
Depth
-10
-5
0
5
10
15
Offset
Wetted Perimeter
WSEL
Ground

# POC #3

## LOCATION

POC #3 is located in the City of Santa Clarita, CA, along the maintenance access road leading to TSP 7. It represents the flows in the existing concrete v-ditch that will be re the new access road being constructed to TSP 7.

*Approximate Latitude:* 34°22'12.47"N

*Approximate Longitude:* *118°33'21.59"W*

## DRAINAGE AREA INFORMATION

*Area:* 1.0 acre

*Flow Length:* 380 feet

*Effective Slope:* 10.5%

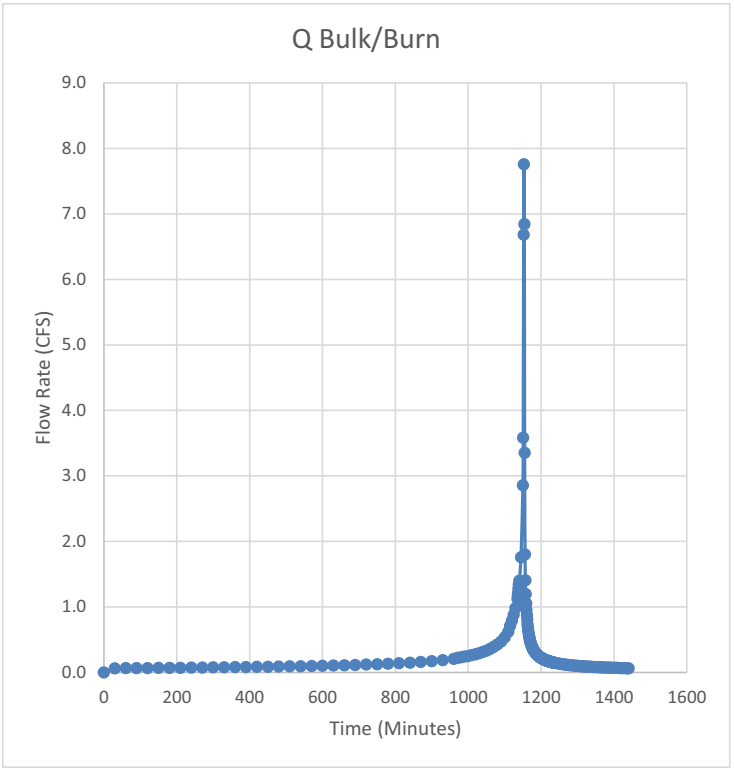
*Soil Type No:* 097

*Debris Production Area:* 5

# 50-Year Summary for POC: 3

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

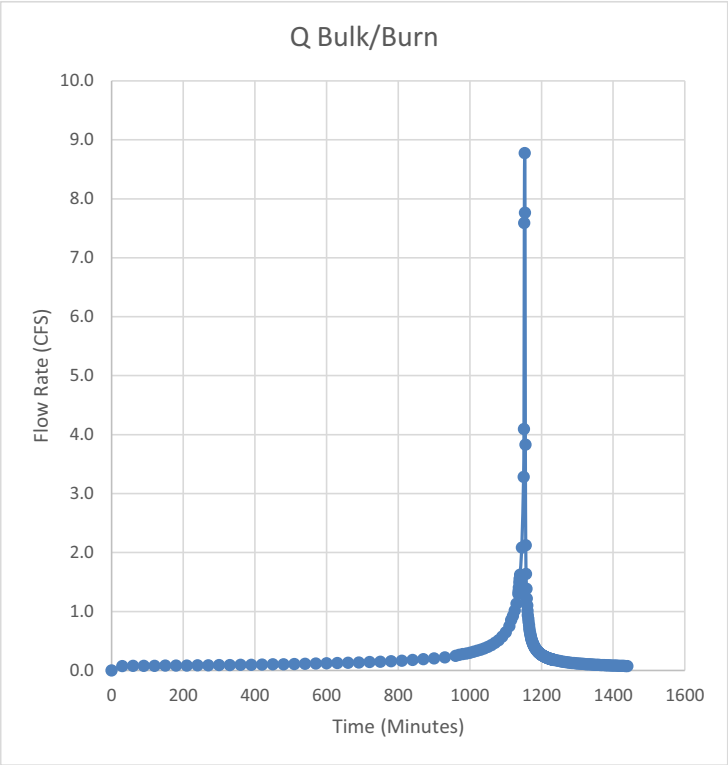
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 0.6 | 1185 | 0.3 | 1232 | 0.2 |
| 30 | 0.1 | 1115 | 0.7 | 1186 | 0.3 | 1233 | 0.2 |
| 60 | 0.1 | 1120 | 0.8 | 1187 | 0.3 | 1234 | 0.2 |
| 90 | 0.1 | 1125 | 0.9 | 1188 | 0.3 | 1235 | 0.1 |
| 120 | 0.1 | 1130 | 1.0 | 1189 | 0.3 | 1240 | 0.1 |
| 150 | 0.1 | 1135 | 1.1 | 1190 | 0.3 | 1245 | 0.1 |
| 180 | 0.1 | 1136 | 1.2 | 1191 | 0.3 | 1250 | 0.1 |
| 210 | 0.1 | 1137 | 1.2 | 1192 | 0.3 | 1255 | 0.1 |
| 240 | 0.1 | 1138 | 1.3 | 1193 | 0.3 | 1260 | 0.1 |
| 270 | 0.1 | 1139 | 1.3 | 1194 | 0.2 | 1265 | 0.1 |
| 300 | 0.1 | 1140 | 1.4 | 1195 | 0.2 | 1270 | 0.1 |
| 330 | 0.1 | 1145 | 1.8 | 1196 | 0.2 | 1275 | 0.1 |
| 360 | 0.1 | 1150 | 2.9 | 1197 | 0.2 | 1280 | 0.1 |
| 390 | 0.1 | 1151 | 3.6 | 1198 | 0.2 | 1285 | 0.1 |
| 420 | 0.1 | 1152 | 6.7 | 1199 | 0.2 | 1290 | 0.1 |
| 450 | 0.1 | 1153 | 7.8 | 1200 | 0.2 | 1295 | 0.1 |
| 480 | 0.1 | 1154 | 6.8 | 1201 | 0.2 | 1300 | 0.1 |
| 510 | 0.1 | 1155 | 3.4 | 1202 | 0.2 | 1305 | 0.1 |
| 540 | 0.1 | 1156 | 1.8 | 1203 | 0.2 | 1310 | 0.1 |
| 570 | 0.1 | 1157 | 1.4 | 1204 | 0.2 | 1315 | 0.1 |
| 600 | 0.1 | 1158 | 1.2 | 1205 | 0.2 | 1320 | 0.1 |
| 630 | 0.1 | 1159 | 1.1 | 1206 | 0.2 | 1325 | 0.1 |
| 660 | 0.1 | 1160 | 1.0 | 1207 | 0.2 | 1330 | 0.1 |
| 690 | 0.1 | 1161 | 0.9 | 1208 | 0.2 | 1335 | 0.1 |
| 720 | 0.1 | 1162 | 0.8 | 1209 | 0.2 | 1340 | 0.1 |
| 750 | 0.1 | 1163 | 0.7 | 1210 | 0.2 | 1345 | 0.1 |
| 780 | 0.1 | 1164 | 0.7 | 1211 | 0.2 | 1350 | 0.1 |
| 810 | 0.1 | 1165 | 0.6 | 1212 | 0.2 | 1355 | 0.1 |
| 840 | 0.1 | 1166 | 0.6 | 1213 | 0.2 | 1360 | 0.1 |
| 870 | 0.2 | 1167 | 0.6 | 1214 | 0.2 | 1365 | 0.1 |
| 900 | 0.2 | 1168 | 0.5 | 1215 | 0.2 | 1370 | 0.1 |
| 930 | 0.2 | 1169 | 0.5 | 1216 | 0.2 | 1375 | 0.1 |
| 960 | 0.2 | 1170 | 0.5 | 1217 | 0.2 | 1380 | 0.1 |
| 970 | 0.2 | 1171 | 0.5 | 1218 | 0.2 | 1385 | 0.1 |
| 980 | 0.2 | 1172 | 0.4 | 1219 | 0.2 | 1390 | 0.1 |
| 990 | 0.2 | 1173 | 0.4 | 1220 | 0.2 | 1395 | 0.1 |
| 1000 | 0.3 | 1174 | 0.4 | 1221 | 0.2 | 1400 | 0.1 |
| 1010 | 0.3 | 1175 | 0.4 | 1222 | 0.2 | 1405 | 0.1 |
| 1020 | 0.3 | 1176 | 0.4 | 1223 | 0.2 | 1410 | 0.1 |
| 1030 | 0.3 | 1177 | 0.4 | 1224 | 0.2 | 1415 | 0.1 |
| 1040 | 0.3 | 1178 | 0.4 | 1225 | 0.2 | 1420 | 0.1 |
| 1050 | 0.3 | 1179 | 0.3 | 1226 | 0.2 | 1425 | 0.1 |
| 1060 | 0.4 | 1180 | 0.3 | 1227 | 0.2 | 1430 | 0.1 |
| 1070 | 0.4 | 1181 | 0.3 | 1228 | 0.2 | 1435 | 0.1 |
| 1080 | 0.4 | 1182 | 0.3 | 1229 | 0.2 | 1440 | 0.1 |
| 1090 | 0.5 | 1183 | 0.3 | 1230 | 0.2 | | |
| 1100 | 0.5 | 1184 | 0.3 | 1231 | 0.2 | | |



# 100-Year Summary for POC: 3

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| (min) | (CFS) | (min) | (CFS) | (min) | (CFS) | (min) | (CFS) |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 0.8 | 1185 | 0.4 | 1232 | 0.2 |
| 30 | 0.1 | 1115 | 0.9 | 1186 | 0.3 | 1233 | 0.2 |
| 60 | 0.1 | 1120 | 0.9 | 1187 | 0.3 | 1234 | 0.2 |
| 90 | 0.1 | 1125 | 1.0 | 1188 | 0.3 | 1235 | 0.2 |
| 120 | 0.1 | 1130 | 1.1 | 1189 | 0.3 | 1240 | 0.2 |
| 150 | 0.1 | 1135 | 1.3 | 1190 | 0.3 | 1245 | 0.2 |
| 180 | 0.1 | 1136 | 1.3 | 1191 | 0.3 | 1250 | 0.2 |
| 210 | 0.1 | 1137 | 1.4 | 1192 | 0.3 | 1255 | 0.2 |
| 240 | 0.1 | 1138 | 1.5 | 1193 | 0.3 | 1260 | 0.1 |
| 270 | 0.1 | 1139 | 1.6 | 1194 | 0.3 | 1265 | 0.1 |
| 300 | 0.1 | 1140 | 1.6 | 1195 | 0.3 | 1270 | 0.1 |
| 330 | 0.1 | 1145 | 2.1 | 1196 | 0.3 | 1275 | 0.1 |
| 360 | 0.1 | 1150 | 3.3 | 1197 | 0.3 | 1280 | 0.1 |
| 390 | 0.1 | 1151 | 4.1 | 1198 | 0.3 | 1285 | 0.1 |
| 420 | 0.1 | 1152 | 7.6 | 1199 | 0.3 | 1290 | 0.1 |
| 450 | 0.1 | 1153 | 8.8 | 1200 | 0.3 | 1295 | 0.1 |
| 480 | 0.1 | 1154 | 7.8 | 1201 | 0.3 | 1300 | 0.1 |
| 510 | 0.1 | 1155 | 3.8 | 1202 | 0.3 | 1305 | 0.1 |
| 540 | 0.1 | 1156 | 2.1 | 1203 | 0.3 | 1310 | 0.1 |
| 570 | 0.1 | 1157 | 1.6 | 1204 | 0.3 | 1315 | 0.1 |
| 600 | 0.1 | 1158 | 1.4 | 1205 | 0.2 | 1320 | 0.1 |
| 630 | 0.1 | 1159 | 1.2 | 1206 | 0.2 | 1325 | 0.1 |
| 660 | 0.1 | 1160 | 1.1 | 1207 | 0.2 | 1330 | 0.1 |
| 690 | 0.1 | 1161 | 1.0 | 1208 | 0.2 | 1335 | 0.1 |
| 720 | 0.1 | 1162 | 0.9 | 1209 | 0.2 | 1340 | 0.1 |
| 750 | 0.1 | 1163 | 0.9 | 1210 | 0.2 | 1345 | 0.1 |
| 780 | 0.2 | 1164 | 0.8 | 1211 | 0.2 | 1350 | 0.1 |
| 810 | 0.2 | 1165 | 0.8 | 1212 | 0.2 | 1355 | 0.1 |
| 840 | 0.2 | 1166 | 0.7 | 1213 | 0.2 | 1360 | 0.1 |
| 870 | 0.2 | 1167 | 0.7 | 1214 | 0.2 | 1365 | 0.1 |
| 900 | 0.2 | 1168 | 0.6 | 1215 | 0.2 | 1370 | 0.1 |
| 930 | 0.2 | 1169 | 0.6 | 1216 | 0.2 | 1375 | 0.1 |
| 960 | 0.2 | 1170 | 0.6 | 1217 | 0.2 | 1380 | 0.1 |
| 970 | 0.3 | 1171 | 0.6 | 1218 | 0.2 | 1385 | 0.1 |
| 980 | 0.3 | 1172 | 0.5 | 1219 | 0.2 | 1390 | 0.1 |
| 990 | 0.3 | 1173 | 0.5 | 1220 | 0.2 | 1395 | 0.1 |
| 1000 | 0.3 | 1174 | 0.5 | 1221 | 0.2 | 1400 | 0.1 |
| 1010 | 0.3 | 1175 | 0.5 | 1222 | 0.2 | 1405 | 0.1 |
| 1020 | 0.3 | 1176 | 0.5 | 1223 | 0.2 | 1410 | 0.1 |
| 1030 | 0.4 | 1177 | 0.4 | 1224 | 0.2 | 1415 | 0.1 |
| 1040 | 0.4 | 1178 | 0.4 | 1225 | 0.2 | 1420 | 0.1 |
| 1050 | 0.4 | 1179 | 0.4 | 1226 | 0.2 | 1425 | 0.1 |
| 1060 | 0.4 | 1180 | 0.4 | 1227 | 0.2 | 1430 | 0.1 |
| 1070 | 0.5 | 1181 | 0.4 | 1228 | 0.2 | 1435 | 0.1 |
| 1080 | 0.5 | 1182 | 0.4 | 1229 | 0.2 | 1440 | 0.1 |
| 1090 | 0.6 | 1183 | 0.4 | 1230 | 0.2 | | |
| 1100 | 0.6 | 1184 | 0.4 | 1231 | 0.2 | | |



# SoCal Gas Project

## POC 3

### Stream Station = 10+00

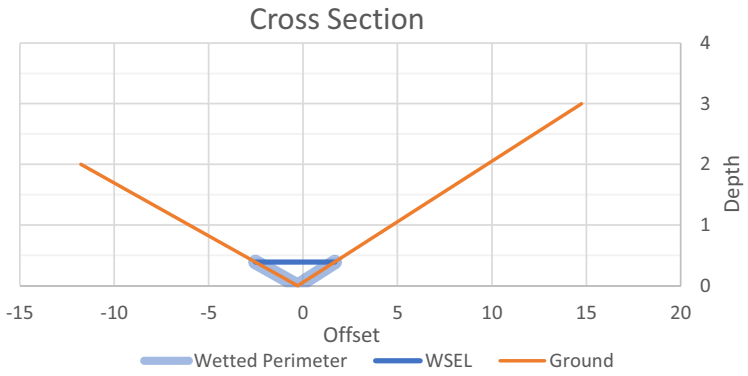
## INPUT

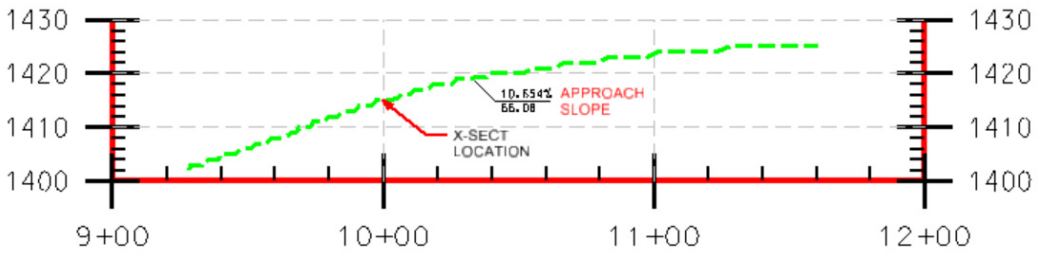
| | | |
|---|---|---|
| $Q_{50}$ | 7.8 | cfs |
| $Q_{100}$ | 8.8 | cfs |
| **$Q_{DESIGN}$** | **8.8** | **cfs** |
| | | |
| N | 0.015 | |
| So | 0.107 | ft/ft |

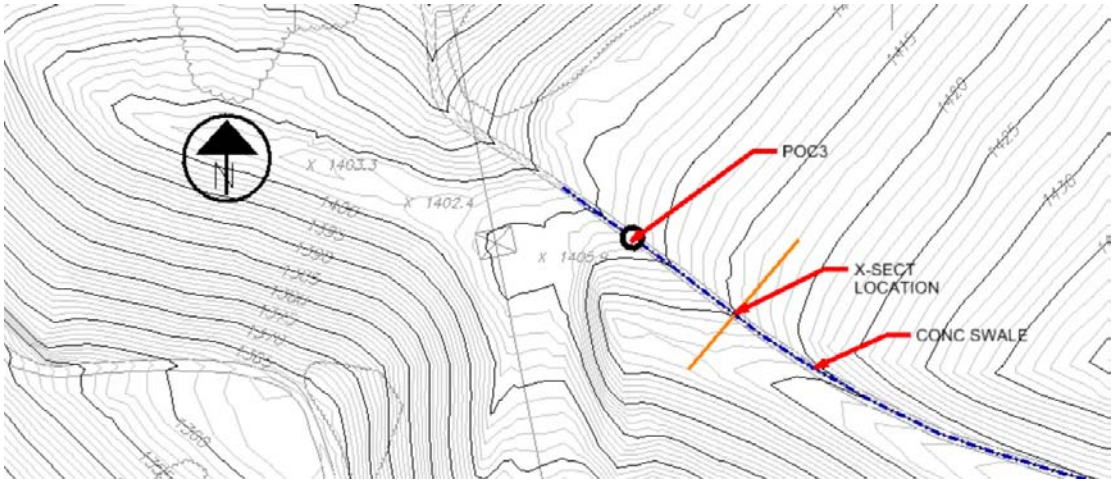
| Point | Station | Ground |
|---|---|---|
| 1 | -11.77 | 1417 |
| 2 | -0.28 | 1415 |
| 3 | 14.75 | 1418 |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **0.4** | **ft** | *(NORMAL DEPTH)* |
| Area= | 0.8 | $ft^2$ | |
| $P_W$ | 4.3 | ft | |
| R | 0.192 | ft | |
| **Velocity=** | **10.7** | **ft/s** | |
| $S_F$ | 0.106 | ft/ft | |



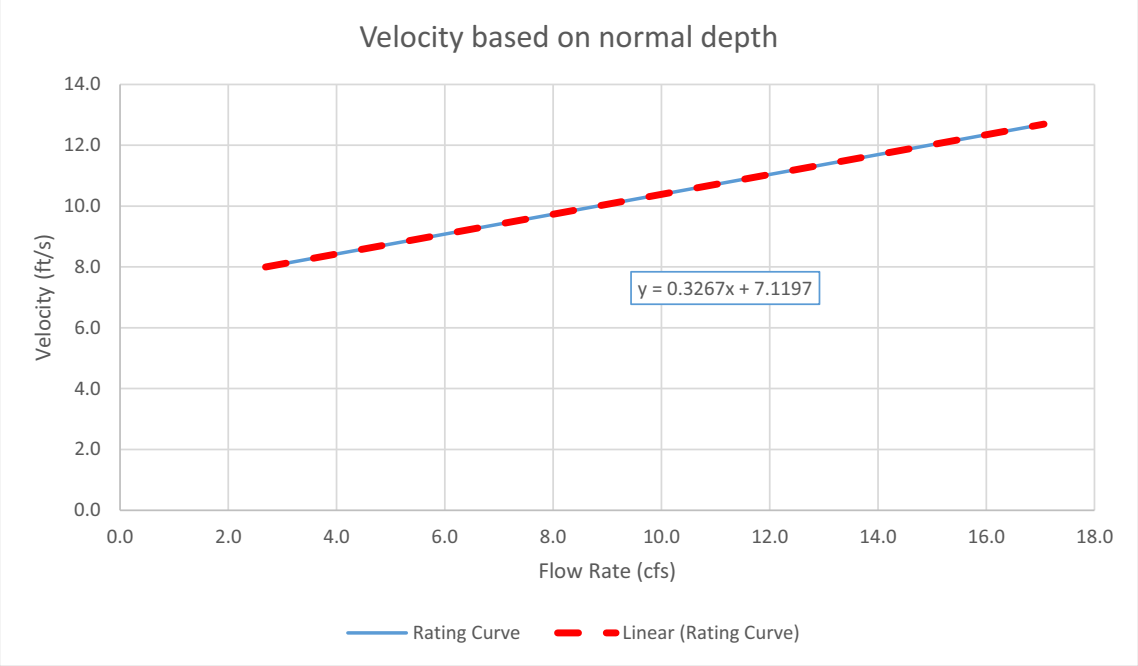



# SoCal Gas Project

## POC 3

### Stream Station = 10+00



# POC #4

## LOCATION

POC #4 is located along the maintenance access road between TSP 12 and TSP 13.

*Approximate Latitude:* 34°21'36.59"N

*Approximate Longitude:* *118°33'9.75"W*

## DRAINAGE AREA INFORMATION

*Area:* 1.0 acre

*Flow Length:* 280 feet

*Effective Slope:* 21.7%

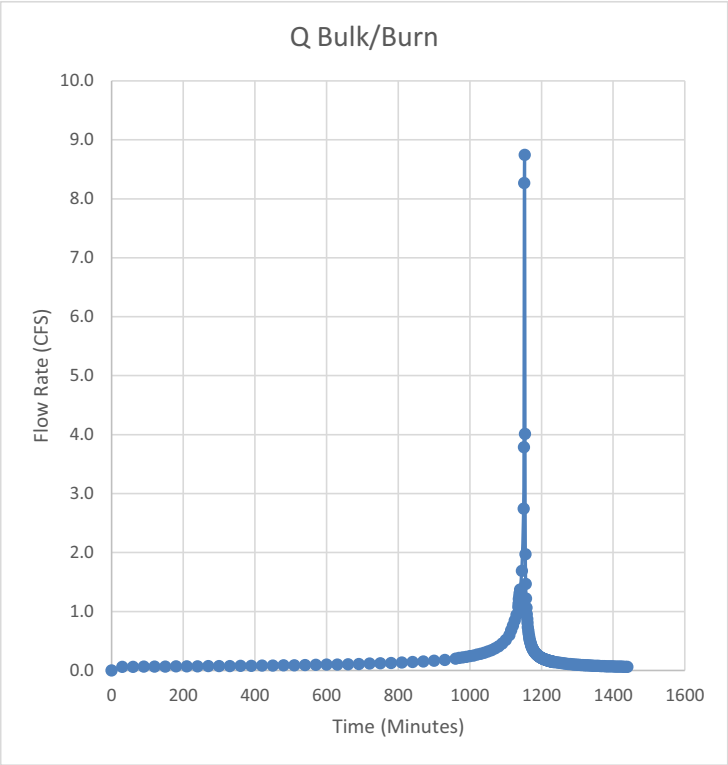
*Soil Type No:* 097

*Debris Production Area:* 5

# 50-Year Summary for POC: 4

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

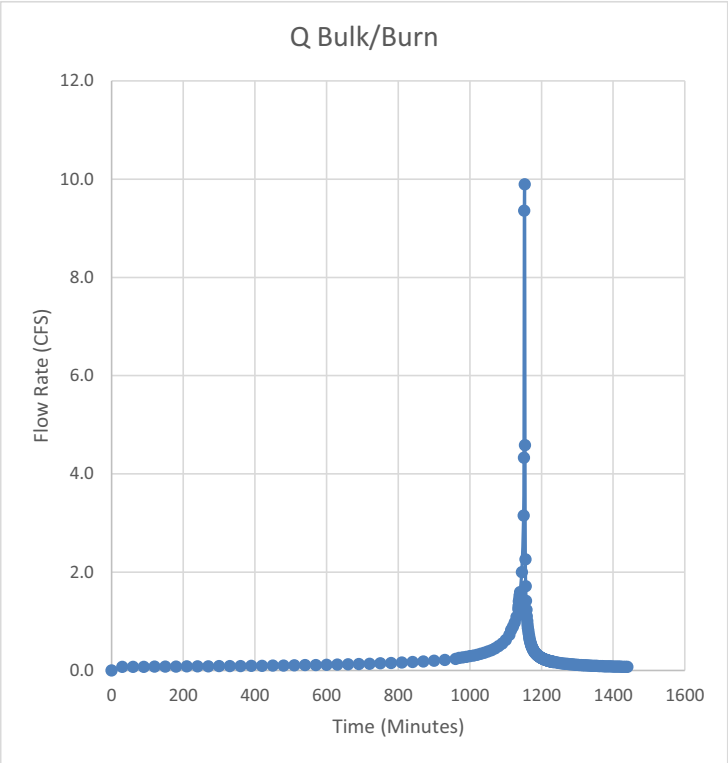
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 0.6 | 1185 | 0.3 | 1232 | 0.1 |
| 30 | 0.1 | 1115 | 0.7 | 1186 | 0.3 | 1233 | 0.1 |
| 60 | 0.1 | 1120 | 0.8 | 1187 | 0.3 | 1234 | 0.1 |
| 90 | 0.1 | 1125 | 0.8 | 1188 | 0.3 | 1235 | 0.1 |
| 120 | 0.1 | 1130 | 0.9 | 1189 | 0.3 | 1240 | 0.1 |
| 150 | 0.1 | 1135 | 1.1 | 1190 | 0.3 | 1245 | 0.1 |
| 180 | 0.1 | 1136 | 1.1 | 1191 | 0.2 | 1250 | 0.1 |
| 210 | 0.1 | 1137 | 1.2 | 1192 | 0.2 | 1255 | 0.1 |
| 240 | 0.1 | 1138 | 1.3 | 1193 | 0.2 | 1260 | 0.1 |
| 270 | 0.1 | 1139 | 1.3 | 1194 | 0.2 | 1265 | 0.1 |
| 300 | 0.1 | 1140 | 1.4 | 1195 | 0.2 | 1270 | 0.1 |
| 330 | 0.1 | 1145 | 1.7 | 1196 | 0.2 | 1275 | 0.1 |
| 360 | 0.1 | 1150 | 2.7 | 1197 | 0.2 | 1280 | 0.1 |
| 390 | 0.1 | 1151 | 3.8 | 1198 | 0.2 | 1285 | 0.1 |
| 420 | 0.1 | 1152 | 8.3 | 1199 | 0.2 | 1290 | 0.1 |
| 450 | 0.1 | 1153 | 8.7 | 1200 | 0.2 | 1295 | 0.1 |
| 480 | 0.1 | 1154 | 4.0 | 1201 | 0.2 | 1300 | 0.1 |
| 510 | 0.1 | 1155 | 2.0 | 1202 | 0.2 | 1305 | 0.1 |
| 540 | 0.1 | 1156 | 1.5 | 1203 | 0.2 | 1310 | 0.1 |
| 570 | 0.1 | 1157 | 1.2 | 1204 | 0.2 | 1315 | 0.1 |
| 600 | 0.1 | 1158 | 1.1 | 1205 | 0.2 | 1320 | 0.1 |
| 630 | 0.1 | 1159 | 1.0 | 1206 | 0.2 | 1325 | 0.1 |
| 660 | 0.1 | 1160 | 0.9 | 1207 | 0.2 | 1330 | 0.1 |
| 690 | 0.1 | 1161 | 0.8 | 1208 | 0.2 | 1335 | 0.1 |
| 720 | 0.1 | 1162 | 0.7 | 1209 | 0.2 | 1340 | 0.1 |
| 750 | 0.1 | 1163 | 0.7 | 1210 | 0.2 | 1345 | 0.1 |
| 780 | 0.1 | 1164 | 0.6 | 1211 | 0.2 | 1350 | 0.1 |
| 810 | 0.1 | 1165 | 0.6 | 1212 | 0.2 | 1355 | 0.1 |
| 840 | 0.1 | 1166 | 0.6 | 1213 | 0.2 | 1360 | 0.1 |
| 870 | 0.2 | 1167 | 0.5 | 1214 | 0.2 | 1365 | 0.1 |
| 900 | 0.2 | 1168 | 0.5 | 1215 | 0.2 | 1370 | 0.1 |
| 930 | 0.2 | 1169 | 0.5 | 1216 | 0.2 | 1375 | 0.1 |
| 960 | 0.2 | 1170 | 0.4 | 1217 | 0.2 | 1380 | 0.1 |
| 970 | 0.2 | 1171 | 0.4 | 1218 | 0.2 | 1385 | 0.1 |
| 980 | 0.2 | 1172 | 0.4 | 1219 | 0.2 | 1390 | 0.1 |
| 990 | 0.2 | 1173 | 0.4 | 1220 | 0.2 | 1395 | 0.1 |
| 1000 | 0.2 | 1174 | 0.4 | 1221 | 0.2 | 1400 | 0.1 |
| 1010 | 0.3 | 1175 | 0.4 | 1222 | 0.2 | 1405 | 0.1 |
| 1020 | 0.3 | 1176 | 0.4 | 1223 | 0.2 | 1410 | 0.1 |
| 1030 | 0.3 | 1177 | 0.3 | 1224 | 0.2 | 1415 | 0.1 |
| 1040 | 0.3 | 1178 | 0.3 | 1225 | 0.2 | 1420 | 0.1 |
| 1050 | 0.3 | 1179 | 0.3 | 1226 | 0.2 | 1425 | 0.1 |
| 1060 | 0.3 | 1180 | 0.3 | 1227 | 0.2 | 1430 | 0.1 |
| 1070 | 0.4 | 1181 | 0.3 | 1228 | 0.2 | 1435 | 0.1 |
| 1080 | 0.4 | 1182 | 0.3 | 1229 | 0.2 | 1440 | 0.1 |
| 1090 | 0.5 | 1183 | 0.3 | 1230 | 0.1 | | |
| 1100 | 0.5 | 1184 | 0.3 | 1231 | 0.1 | | |



# 100-Year Summary for POC: 4

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 0.7 | 1185 | 0.3 | 1232 | 0.2 |
| 30 | 0.1 | 1115 | 0.8 | 1186 | 0.3 | 1233 | 0.2 |
| 60 | 0.1 | 1120 | 0.9 | 1187 | 0.3 | 1234 | 0.2 |
| 90 | 0.1 | 1125 | 1.0 | 1188 | 0.3 | 1235 | 0.2 |
| 120 | 0.1 | 1130 | 1.1 | 1189 | 0.3 | 1240 | 0.2 |
| 150 | 0.1 | 1135 | 1.2 | 1190 | 0.3 | 1245 | 0.2 |
| 180 | 0.1 | 1136 | 1.3 | 1191 | 0.3 | 1250 | 0.2 |
| 210 | 0.1 | 1137 | 1.4 | 1192 | 0.3 | 1255 | 0.1 |
| 240 | 0.1 | 1138 | 1.5 | 1193 | 0.3 | 1260 | 0.1 |
| 270 | 0.1 | 1139 | 1.5 | 1194 | 0.3 | 1265 | 0.1 |
| 300 | 0.1 | 1140 | 1.6 | 1195 | 0.3 | 1270 | 0.1 |
| 330 | 0.1 | 1145 | 2.0 | 1196 | 0.3 | 1275 | 0.1 |
| 360 | 0.1 | 1150 | 3.2 | 1197 | 0.3 | 1280 | 0.1 |
| 390 | 0.1 | 1151 | 4.3 | 1198 | 0.3 | 1285 | 0.1 |
| 420 | 0.1 | 1152 | 9.4 | 1199 | 0.3 | 1290 | 0.1 |
| 450 | 0.1 | 1153 | 9.9 | 1200 | 0.3 | 1295 | 0.1 |
| 480 | 0.1 | 1154 | 4.6 | 1201 | 0.2 | 1300 | 0.1 |
| 510 | 0.1 | 1155 | 2.3 | 1202 | 0.2 | 1305 | 0.1 |
| 540 | 0.1 | 1156 | 1.7 | 1203 | 0.2 | 1310 | 0.1 |
| 570 | 0.1 | 1157 | 1.4 | 1204 | 0.2 | 1315 | 0.1 |
| 600 | 0.1 | 1158 | 1.2 | 1205 | 0.2 | 1320 | 0.1 |
| 630 | 0.1 | 1159 | 1.1 | 1206 | 0.2 | 1325 | 0.1 |
| 660 | 0.1 | 1160 | 1.0 | 1207 | 0.2 | 1330 | 0.1 |
| 690 | 0.1 | 1161 | 0.9 | 1208 | 0.2 | 1335 | 0.1 |
| 720 | 0.1 | 1162 | 0.9 | 1209 | 0.2 | 1340 | 0.1 |
| 750 | 0.1 | 1163 | 0.8 | 1210 | 0.2 | 1345 | 0.1 |
| 780 | 0.2 | 1164 | 0.8 | 1211 | 0.2 | 1350 | 0.1 |
| 810 | 0.2 | 1165 | 0.7 | 1212 | 0.2 | 1355 | 0.1 |
| 840 | 0.2 | 1166 | 0.7 | 1213 | 0.2 | 1360 | 0.1 |
| 870 | 0.2 | 1167 | 0.6 | 1214 | 0.2 | 1365 | 0.1 |
| 900 | 0.2 | 1168 | 0.6 | 1215 | 0.2 | 1370 | 0.1 |
| 930 | 0.2 | 1169 | 0.6 | 1216 | 0.2 | 1375 | 0.1 |
| 960 | 0.2 | 1170 | 0.5 | 1217 | 0.2 | 1380 | 0.1 |
| 970 | 0.3 | 1171 | 0.5 | 1218 | 0.2 | 1385 | 0.1 |
| 980 | 0.3 | 1172 | 0.5 | 1219 | 0.2 | 1390 | 0.1 |
| 990 | 0.3 | 1173 | 0.5 | 1220 | 0.2 | 1395 | 0.1 |
| 1000 | 0.3 | 1174 | 0.5 | 1221 | 0.2 | 1400 | 0.1 |
| 1010 | 0.3 | 1175 | 0.4 | 1222 | 0.2 | 1405 | 0.1 |
| 1020 | 0.3 | 1176 | 0.4 | 1223 | 0.2 | 1410 | 0.1 |
| 1030 | 0.3 | 1177 | 0.4 | 1224 | 0.2 | 1415 | 0.1 |
| 1040 | 0.4 | 1178 | 0.4 | 1225 | 0.2 | 1420 | 0.1 |
| 1050 | 0.4 | 1179 | 0.4 | 1226 | 0.2 | 1425 | 0.1 |
| 1060 | 0.4 | 1180 | 0.4 | 1227 | 0.2 | 1430 | 0.1 |
| 1070 | 0.4 | 1181 | 0.4 | 1228 | 0.2 | 1435 | 0.1 |
| 1080 | 0.5 | 1182 | 0.4 | 1229 | 0.2 | 1440 | 0.1 |
| 1090 | 0.5 | 1183 | 0.4 | 1230 | 0.2 | | |
| 1100 | 0.6 | 1184 | 0.3 | 1231 | 0.2 | | |



# SoCal Gas Project

## POC 4

### Stream Station = 10+00

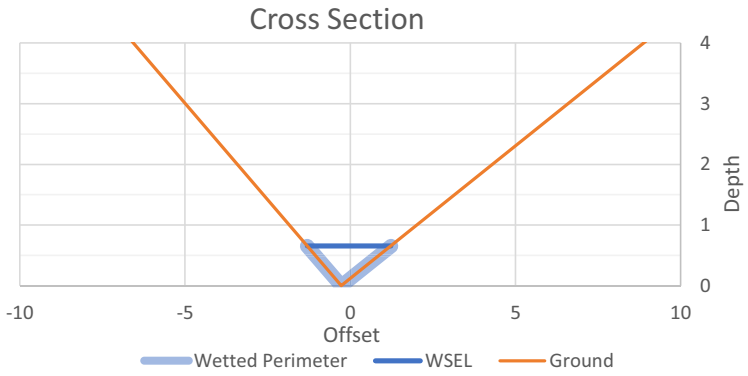
## INPUT

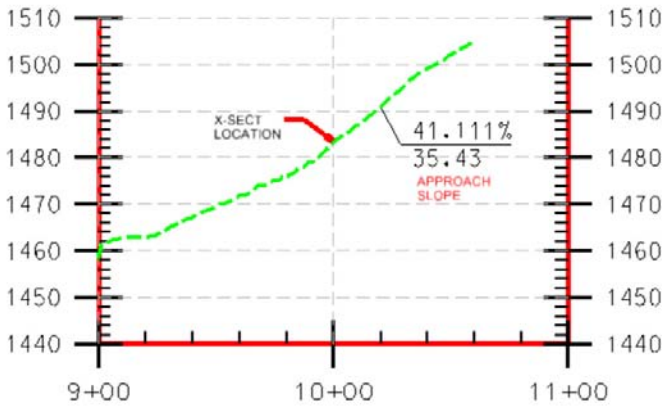
| | | |
|---|---|---|
| $Q_{50}$ | 8.7 | cfs |
| $Q_{100}$ | 9.9 | cfs |
| **$Q_{DESIGN}$** | **9.9** | **cfs** |
| | | |
| N | 0.035 | |
| So | 0.411 | ft/ft |

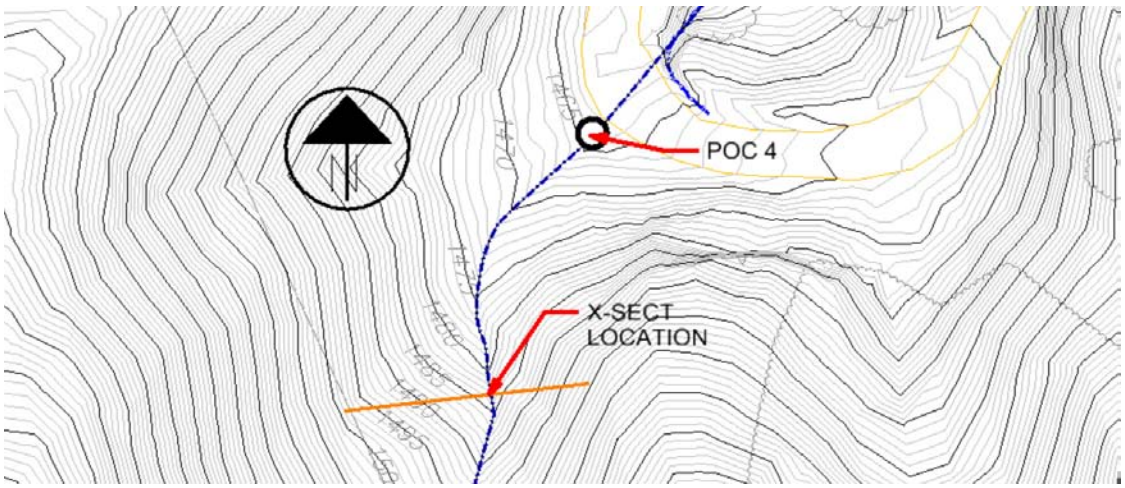
| Point | Station | Ground |
|---|---|---|
| 1 | -12.6 | 1491 |
| 2 | -0.27 | 1483.16 |
| 3 | 17.66 | 1491 |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **0.7** | **ft** | *(NORMAL DEPTH)* |
| Area= | 0.8 | $ft^2$ | |
| $P_W$ | 2.9 | ft | |
| R | 0.290 | ft | |
| **Velocity=** | **11.9** | **ft/s** | |
| $S_F$ | 0.411 | ft/ft | |



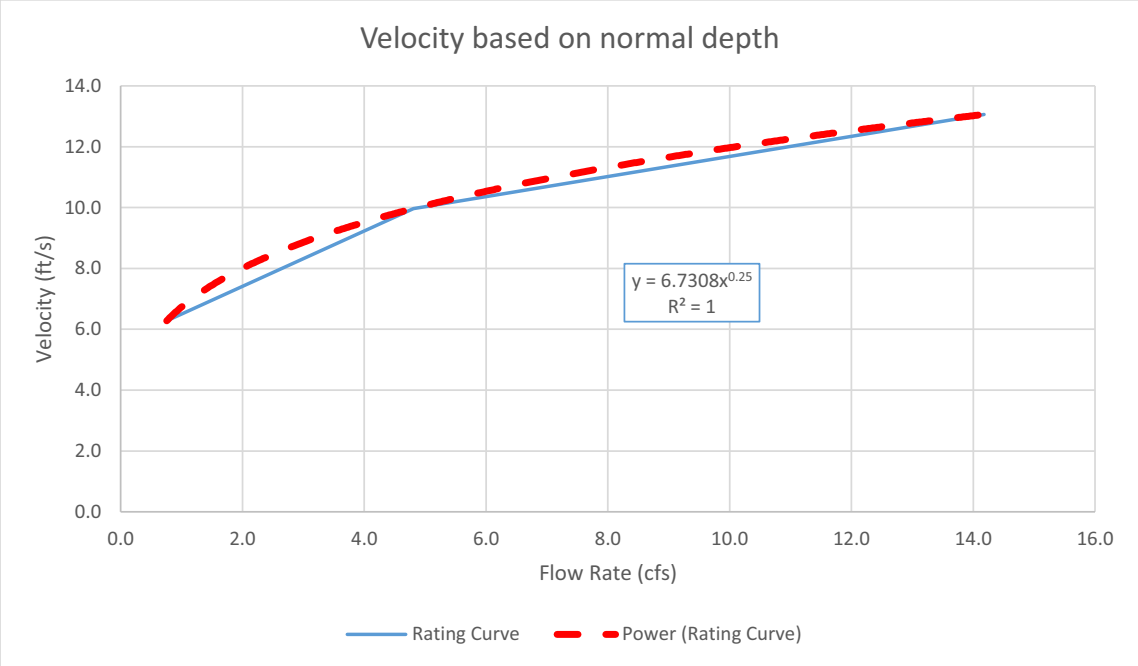



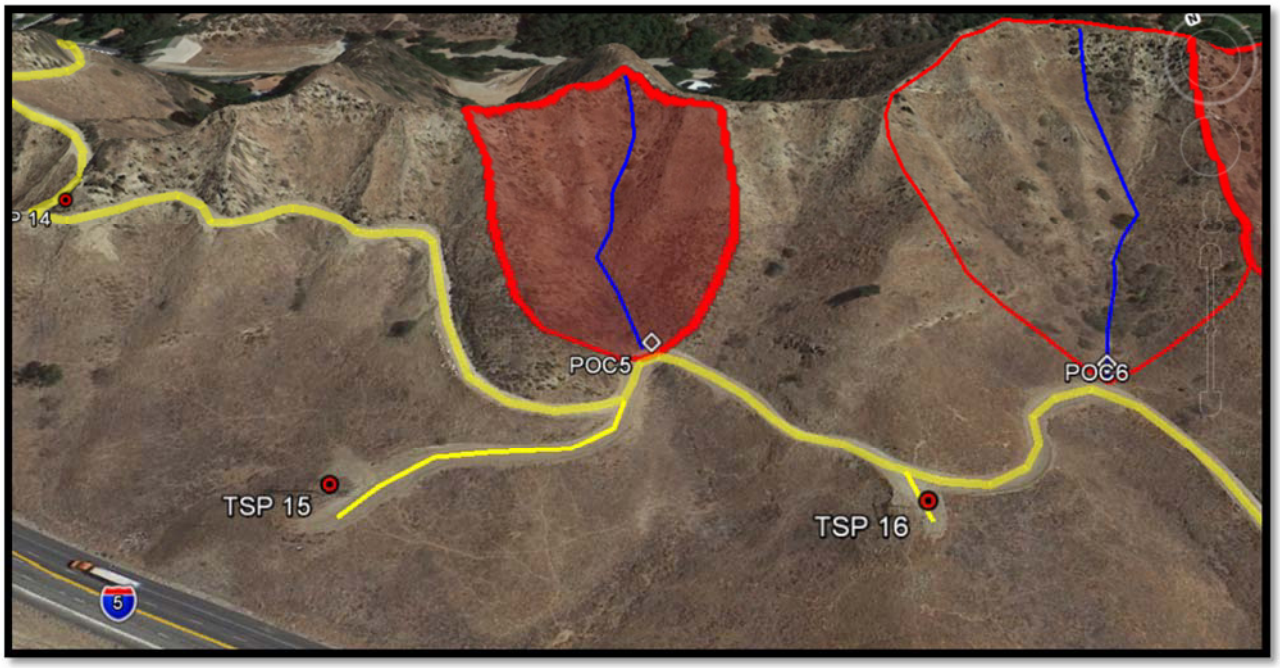
# SoCal Gas Project

## POC 4

### Stream Station = 10+00



# POC #5




## LOCATION

POC #5 is located along the maintenance access road between TSP 15 and TSP 16.

*Approximate Latitude:* 34°21'25.37"N

*Approximate Longitude:* *118°33'1.06"W*

## DRAINAGE AREA INFORMATION

*Area:* 2.0 acre

*Flow Length:* 372 feet

*Effective Slope:* 22.1%

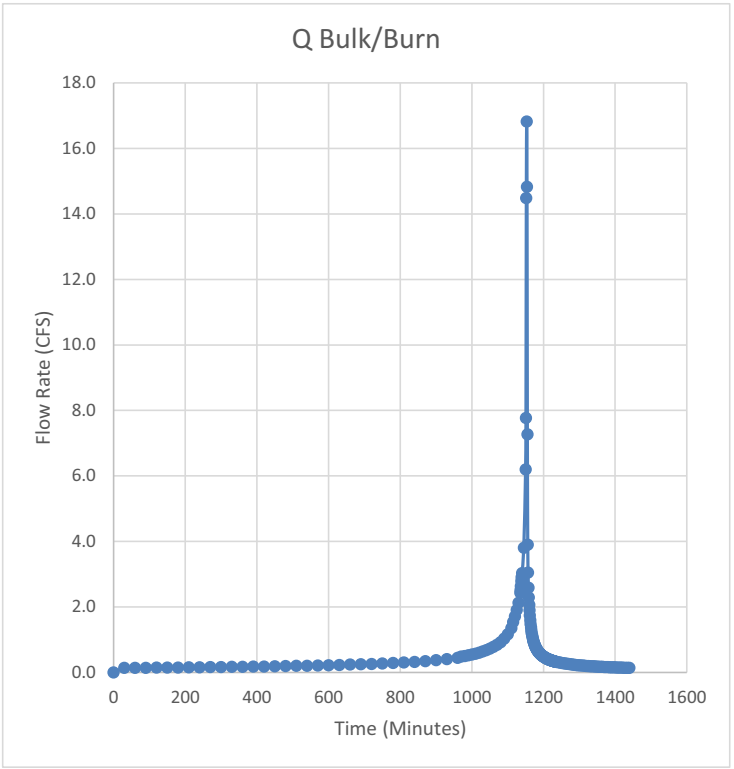
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 5

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

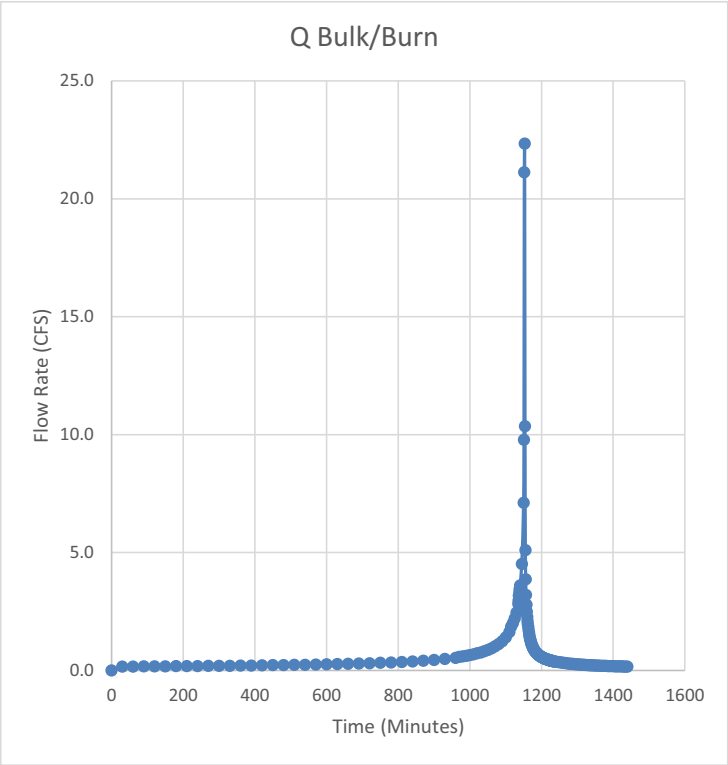
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 1.3 | 1185 | 0.6 | 1232 | 0.3 |
| 30 | 0.1 | 1115 | 1.5 | 1186 | 0.6 | 1233 | 0.3 |
| 60 | 0.1 | 1120 | 1.7 | 1187 | 0.6 | 1234 | 0.3 |
| 90 | 0.1 | 1125 | 1.9 | 1188 | 0.6 | 1235 | 0.3 |
| 120 | 0.1 | 1130 | 2.1 | 1189 | 0.6 | 1240 | 0.3 |
| 150 | 0.1 | 1135 | 2.4 | 1190 | 0.6 | 1245 | 0.3 |
| 180 | 0.2 | 1136 | 2.5 | 1191 | 0.6 | 1250 | 0.3 |
| 210 | 0.2 | 1137 | 2.6 | 1192 | 0.6 | 1255 | 0.3 |
| 240 | 0.2 | 1138 | 2.8 | 1193 | 0.5 | 1260 | 0.3 |
| 270 | 0.2 | 1139 | 2.9 | 1194 | 0.5 | 1265 | 0.3 |
| 300 | 0.2 | 1140 | 3.0 | 1195 | 0.5 | 1270 | 0.3 |
| 330 | 0.2 | 1145 | 3.8 | 1196 | 0.5 | 1275 | 0.2 |
| 360 | 0.2 | 1150 | 6.2 | 1197 | 0.5 | 1280 | 0.2 |
| 390 | 0.2 | 1151 | 7.8 | 1198 | 0.5 | 1285 | 0.2 |
| 420 | 0.2 | 1152 | 14.5 | 1199 | 0.5 | 1290 | 0.2 |
| 450 | 0.2 | 1153 | 16.8 | 1200 | 0.5 | 1295 | 0.2 |
| 480 | 0.2 | 1154 | 14.8 | 1201 | 0.5 | 1300 | 0.2 |
| 510 | 0.2 | 1155 | 7.3 | 1202 | 0.5 | 1305 | 0.2 |
| 540 | 0.2 | 1156 | 3.9 | 1203 | 0.5 | 1310 | 0.2 |
| 570 | 0.2 | 1157 | 3.0 | 1204 | 0.5 | 1315 | 0.2 |
| 600 | 0.2 | 1158 | 2.6 | 1205 | 0.4 | 1320 | 0.2 |
| 630 | 0.2 | 1159 | 2.3 | 1206 | 0.4 | 1325 | 0.2 |
| 660 | 0.2 | 1160 | 2.1 | 1207 | 0.4 | 1330 | 0.2 |
| 690 | 0.2 | 1161 | 1.9 | 1208 | 0.4 | 1335 | 0.2 |
| 720 | 0.3 | 1162 | 1.7 | 1209 | 0.4 | 1340 | 0.2 |
| 750 | 0.3 | 1163 | 1.6 | 1210 | 0.4 | 1345 | 0.2 |
| 780 | 0.3 | 1164 | 1.5 | 1211 | 0.4 | 1350 | 0.2 |
| 810 | 0.3 | 1165 | 1.4 | 1212 | 0.4 | 1355 | 0.2 |
| 840 | 0.3 | 1166 | 1.3 | 1213 | 0.4 | 1360 | 0.2 |
| 870 | 0.3 | 1167 | 1.2 | 1214 | 0.4 | 1365 | 0.2 |
| 900 | 0.4 | 1168 | 1.1 | 1215 | 0.4 | 1370 | 0.2 |
| 930 | 0.4 | 1169 | 1.1 | 1216 | 0.4 | 1375 | 0.2 |
| 960 | 0.4 | 1170 | 1.0 | 1217 | 0.4 | 1380 | 0.2 |
| 970 | 0.5 | 1171 | 1.0 | 1218 | 0.4 | 1385 | 0.2 |
| 980 | 0.5 | 1172 | 1.0 | 1219 | 0.4 | 1390 | 0.2 |
| 990 | 0.5 | 1173 | 0.9 | 1220 | 0.4 | 1395 | 0.2 |
| 1000 | 0.5 | 1174 | 0.9 | 1221 | 0.4 | 1400 | 0.2 |
| 1010 | 0.6 | 1175 | 0.9 | 1222 | 0.4 | 1405 | 0.2 |
| 1020 | 0.6 | 1176 | 0.8 | 1223 | 0.4 | 1410 | 0.1 |
| 1030 | 0.6 | 1177 | 0.8 | 1224 | 0.4 | 1415 | 0.1 |
| 1040 | 0.7 | 1178 | 0.8 | 1225 | 0.4 | 1420 | 0.1 |
| 1050 | 0.7 | 1179 | 0.7 | 1226 | 0.4 | 1425 | 0.1 |
| 1060 | 0.8 | 1180 | 0.7 | 1227 | 0.3 | 1430 | 0.1 |
| 1070 | 0.8 | 1181 | 0.7 | 1228 | 0.3 | 1435 | 0.1 |
| 1080 | 0.9 | 1182 | 0.7 | 1229 | 0.3 | 1440 | 0.1 |
| 1090 | 1.0 | 1183 | 0.7 | 1230 | 0.3 | | |
| 1100 | 1.2 | 1184 | 0.7 | 1231 | 0.3 | | |



# 100-Year Summary for POC: 5

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 1.6 | 1185 | 0.8 | 1232 | 0.4 |
| 30 | 0.2 | 1115 | 1.9 | 1186 | 0.7 | 1233 | 0.4 |
| 60 | 0.2 | 1120 | 2.0 | 1187 | 0.7 | 1234 | 0.4 |
| 90 | 0.2 | 1125 | 2.2 | 1188 | 0.7 | 1235 | 0.4 |
| 120 | 0.2 | 1130 | 2.5 | 1189 | 0.7 | 1240 | 0.4 |
| 150 | 0.2 | 1135 | 2.8 | 1190 | 0.7 | 1245 | 0.4 |
| 180 | 0.2 | 1136 | 3.0 | 1191 | 0.7 | 1250 | 0.3 |
| 210 | 0.2 | 1137 | 3.2 | 1192 | 0.7 | 1255 | 0.3 |
| 240 | 0.2 | 1138 | 3.3 | 1193 | 0.6 | 1260 | 0.3 |
| 270 | 0.2 | 1139 | 3.4 | 1194 | 0.6 | 1265 | 0.3 |
| 300 | 0.2 | 1140 | 3.6 | 1195 | 0.6 | 1270 | 0.3 |
| 330 | 0.2 | 1145 | 4.5 | 1196 | 0.6 | 1275 | 0.3 |
| 360 | 0.2 | 1150 | 7.1 | 1197 | 0.6 | 1280 | 0.3 |
| 390 | 0.2 | 1151 | 9.8 | 1198 | 0.6 | 1285 | 0.3 |
| 420 | 0.2 | 1152 | 21.1 | 1199 | 0.6 | 1290 | 0.3 |
| 450 | 0.2 | 1153 | 22.3 | 1200 | 0.6 | 1295 | 0.3 |
| 480 | 0.2 | 1154 | 10.4 | 1201 | 0.6 | 1300 | 0.3 |
| 510 | 0.2 | 1155 | 5.1 | 1202 | 0.6 | 1305 | 0.3 |
| 540 | 0.2 | 1156 | 3.9 | 1203 | 0.5 | 1310 | 0.2 |
| 570 | 0.3 | 1157 | 3.2 | 1204 | 0.5 | 1315 | 0.2 |
| 600 | 0.3 | 1158 | 2.8 | 1205 | 0.5 | 1320 | 0.2 |
| 630 | 0.3 | 1159 | 2.5 | 1206 | 0.5 | 1325 | 0.2 |
| 660 | 0.3 | 1160 | 2.3 | 1207 | 0.5 | 1330 | 0.2 |
| 690 | 0.3 | 1161 | 2.1 | 1208 | 0.5 | 1335 | 0.2 |
| 720 | 0.3 | 1162 | 2.0 | 1209 | 0.5 | 1340 | 0.2 |
| 750 | 0.3 | 1163 | 1.8 | 1210 | 0.5 | 1345 | 0.2 |
| 780 | 0.3 | 1164 | 1.7 | 1211 | 0.5 | 1350 | 0.2 |
| 810 | 0.4 | 1165 | 1.6 | 1212 | 0.5 | 1355 | 0.2 |
| 840 | 0.4 | 1166 | 1.5 | 1213 | 0.5 | 1360 | 0.2 |
| 870 | 0.4 | 1167 | 1.4 | 1214 | 0.5 | 1365 | 0.2 |
| 900 | 0.4 | 1168 | 1.3 | 1215 | 0.5 | 1370 | 0.2 |
| 930 | 0.5 | 1169 | 1.3 | 1216 | 0.5 | 1375 | 0.2 |
| 960 | 0.5 | 1170 | 1.2 | 1217 | 0.5 | 1380 | 0.2 |
| 970 | 0.6 | 1171 | 1.2 | 1218 | 0.5 | 1385 | 0.2 |
| 980 | 0.6 | 1172 | 1.1 | 1219 | 0.4 | 1390 | 0.2 |
| 990 | 0.6 | 1173 | 1.1 | 1220 | 0.4 | 1395 | 0.2 |
| 1000 | 0.7 | 1174 | 1.0 | 1221 | 0.4 | 1400 | 0.2 |
| 1010 | 0.7 | 1175 | 1.0 | 1222 | 0.4 | 1405 | 0.2 |
| 1020 | 0.7 | 1176 | 1.0 | 1223 | 0.4 | 1410 | 0.2 |
| 1030 | 0.8 | 1177 | 0.9 | 1224 | 0.4 | 1415 | 0.2 |
| 1040 | 0.8 | 1178 | 0.9 | 1225 | 0.4 | 1420 | 0.2 |
| 1050 | 0.9 | 1179 | 0.9 | 1226 | 0.4 | 1425 | 0.2 |
| 1060 | 0.9 | 1180 | 0.9 | 1227 | 0.4 | 1430 | 0.2 |
| 1070 | 1.0 | 1181 | 0.8 | 1228 | 0.4 | 1435 | 0.2 |
| 1080 | 1.1 | 1182 | 0.8 | 1229 | 0.4 | 1440 | 0.2 |
| 1090 | 1.2 | 1183 | 0.8 | 1230 | 0.4 | | |
| 1100 | 1.4 | 1184 | 0.8 | 1231 | 0.4 | | |



# SoCal Gas Project

## POC 5

### Stream Station = 10+00

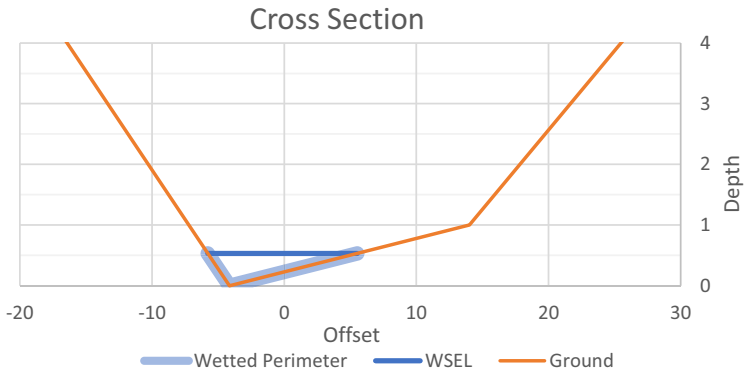
## INPUT

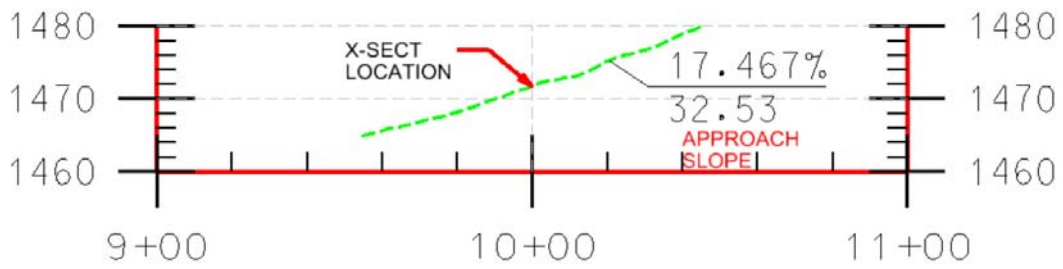
| | | |
|---|---|---|
| $Q_{50}$ | 17.0 | cfs |
| $Q_{100}$ | 22.0 | cfs |
| **$Q_{DESIGN}$** | **22.0** | **cfs** |
| | | |
| N | 0.035 | |
| So | 0.175 | ft/ft |

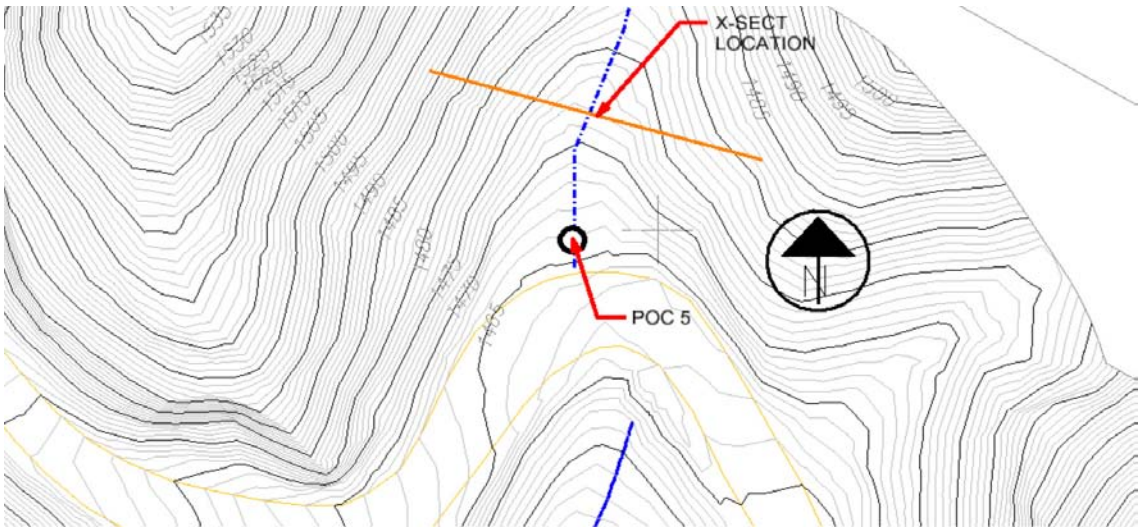
## Results

| | | | |
|---|---|---|---|
| **Depth=** | **0.5** | **ft** | *(NORMAL DEPTH)* |
| Area= | 3.0 | $ft^2$ | |
| $P_W$ | 11.4 | ft | |
| R | 0.264 | ft | |
| **Velocity=** | **7.3** | **ft/s** | |
| $S_F$ | 0.175 | ft/ft | |

| Point | Station | Ground |
|---|---|---|
| 1 | -22.75 | 1477.84 |
| 2 | -4.15 | 1471.78 |
| 3 | 14.01 | 1472.78 |
| 4 | 26.93 | 1476.16 |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |



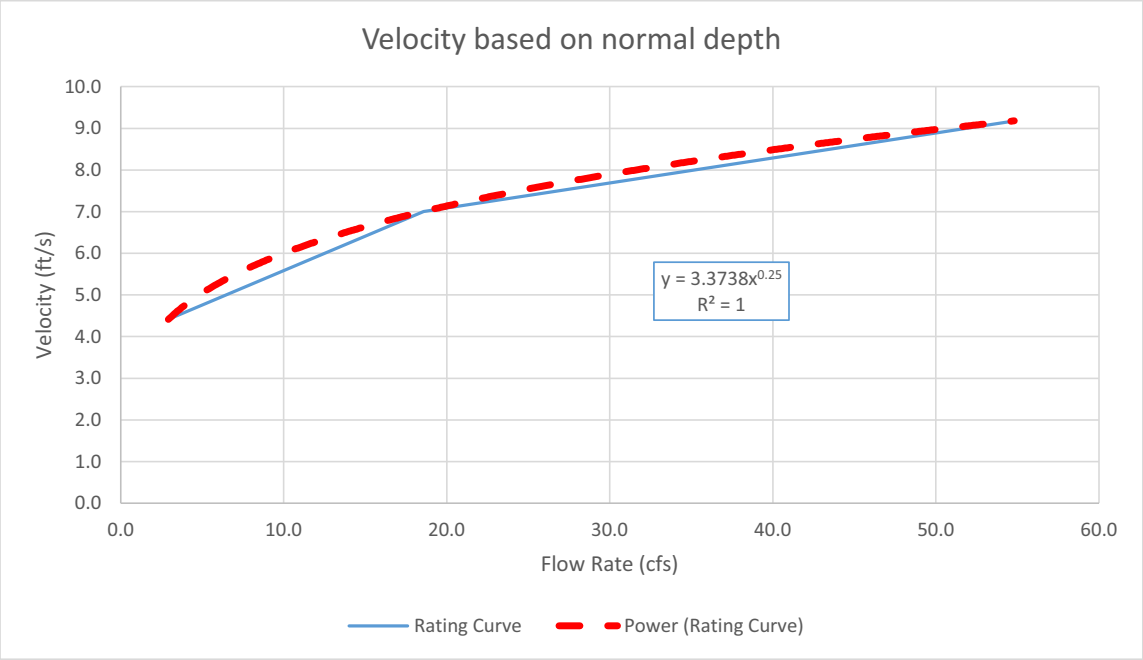



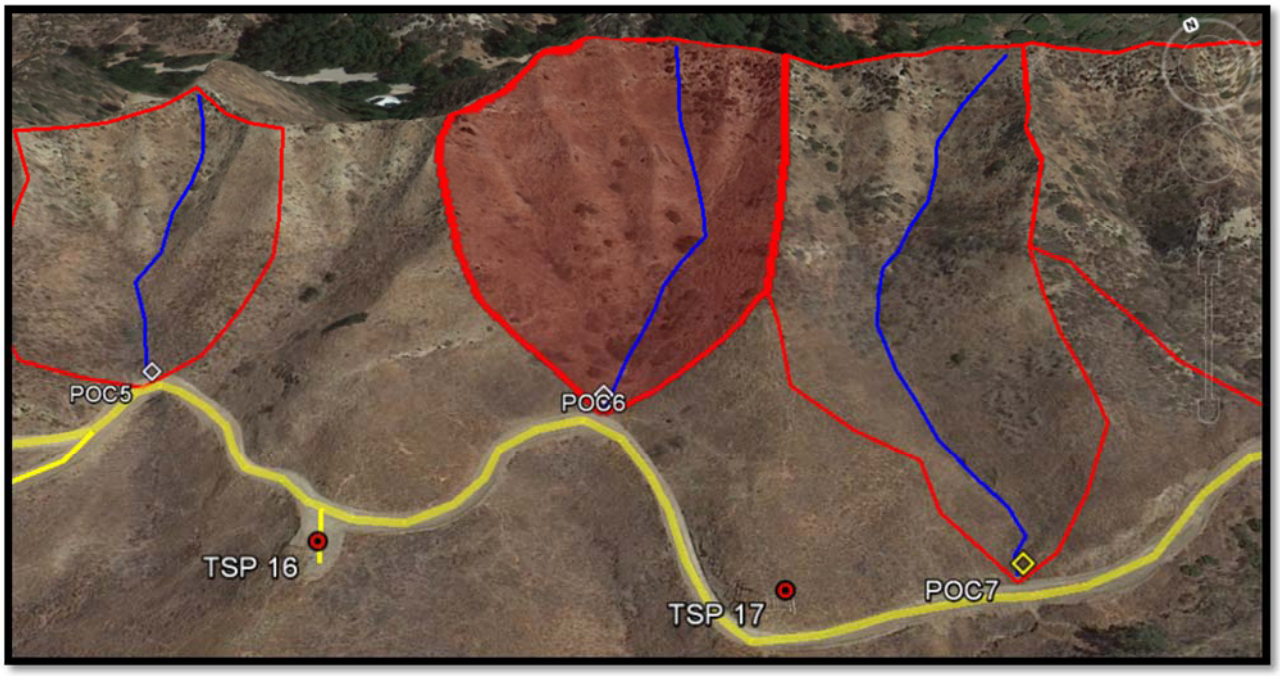
# SoCal Gas Project

## POC 5

### Stream Station = 10+00



# POC #6




## LOCATION

POC #6 is located along the maintenance access road between TSP 16 and TSP 17.

*Approximate Latitude:* 34°21'23.13"N

*Approximate Longitude:* *118°32'56.22"W*

## DRAINAGE AREA INFORMATION

*Area:* 3.4 acre

*Flow Length:* 507 feet

*Effective Slope:* 21.0%

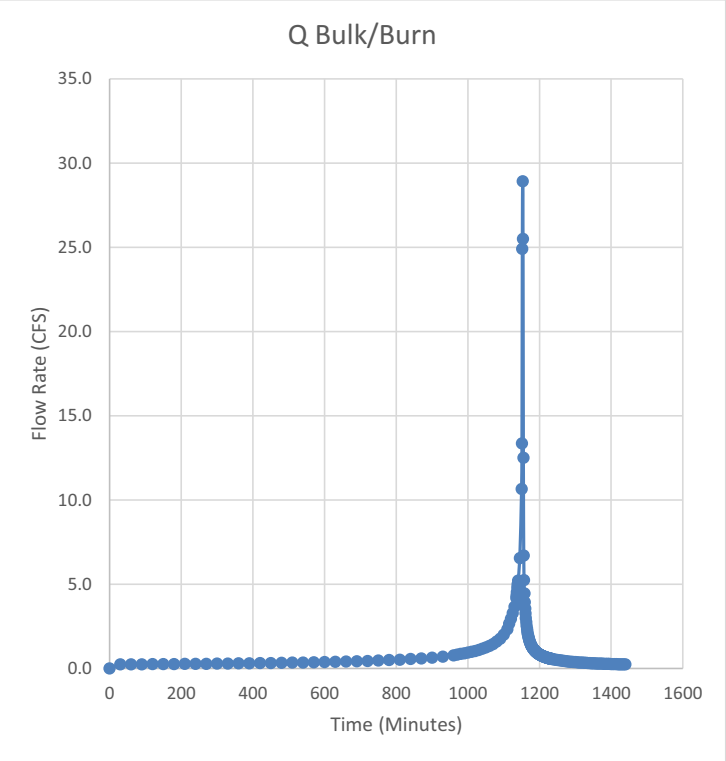
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 6

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

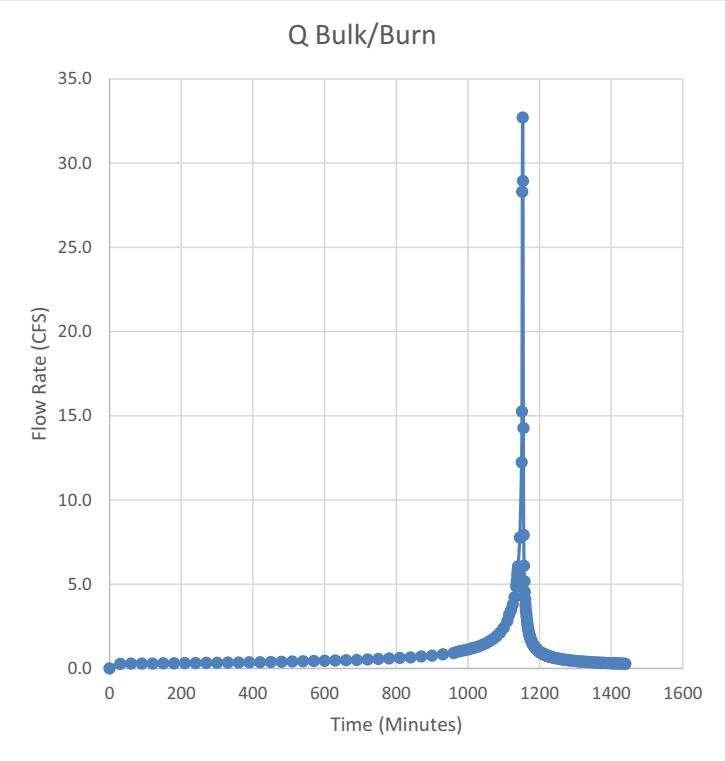
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 2.3 | 1185 | 1.1 | 1232 | 0.6 |
| 30 | 0.2 | 1115 | 2.7 | 1186 | 1.1 | 1233 | 0.6 |
| 60 | 0.2 | 1120 | 2.9 | 1187 | 1.1 | 1234 | 0.6 |
| 90 | 0.2 | 1125 | 3.3 | 1188 | 1.0 | 1235 | 0.6 |
| 120 | 0.3 | 1130 | 3.7 | 1189 | 1.0 | 1240 | 0.5 |
| 150 | 0.3 | 1135 | 4.2 | 1190 | 1.0 | 1245 | 0.5 |
| 180 | 0.3 | 1136 | 4.3 | 1191 | 1.0 | 1250 | 0.5 |
| 210 | 0.3 | 1137 | 4.5 | 1192 | 1.0 | 1255 | 0.5 |
| 240 | 0.3 | 1138 | 4.8 | 1193 | 0.9 | 1260 | 0.5 |
| 270 | 0.3 | 1139 | 5.0 | 1194 | 0.9 | 1265 | 0.5 |
| 300 | 0.3 | 1140 | 5.2 | 1195 | 0.9 | 1270 | 0.4 |
| 330 | 0.3 | 1145 | 6.5 | 1196 | 0.9 | 1275 | 0.4 |
| 360 | 0.3 | 1150 | 10.7 | 1197 | 0.9 | 1280 | 0.4 |
| 390 | 0.3 | 1151 | 13.4 | 1198 | 0.9 | 1285 | 0.4 |
| 420 | 0.3 | 1152 | 24.9 | 1199 | 0.8 | 1290 | 0.4 |
| 450 | 0.3 | 1153 | 28.9 | 1200 | 0.8 | 1295 | 0.4 |
| 480 | 0.3 | 1154 | 25.5 | 1201 | 0.8 | 1300 | 0.4 |
| 510 | 0.3 | 1155 | 12.5 | 1202 | 0.8 | 1305 | 0.4 |
| 540 | 0.4 | 1156 | 6.7 | 1203 | 0.8 | 1310 | 0.4 |
| 570 | 0.4 | 1157 | 5.2 | 1204 | 0.8 | 1315 | 0.3 |
| 600 | 0.4 | 1158 | 4.5 | 1205 | 0.8 | 1320 | 0.3 |
| 630 | 0.4 | 1159 | 3.9 | 1206 | 0.8 | 1325 | 0.3 |
| 660 | 0.4 | 1160 | 3.6 | 1207 | 0.8 | 1330 | 0.3 |
| 690 | 0.4 | 1161 | 3.3 | 1208 | 0.7 | 1335 | 0.3 |
| 720 | 0.4 | 1162 | 3.0 | 1209 | 0.7 | 1340 | 0.3 |
| 750 | 0.5 | 1163 | 2.7 | 1210 | 0.7 | 1345 | 0.3 |
| 780 | 0.5 | 1164 | 2.5 | 1211 | 0.7 | 1350 | 0.3 |
| 810 | 0.5 | 1165 | 2.4 | 1212 | 0.7 | 1355 | 0.3 |
| 840 | 0.6 | 1166 | 2.2 | 1213 | 0.7 | 1360 | 0.3 |
| 870 | 0.6 | 1167 | 2.1 | 1214 | 0.7 | 1365 | 0.3 |
| 900 | 0.6 | 1168 | 2.0 | 1215 | 0.7 | 1370 | 0.3 |
| 930 | 0.7 | 1169 | 1.9 | 1216 | 0.7 | 1375 | 0.3 |
| 960 | 0.8 | 1170 | 1.8 | 1217 | 0.7 | 1380 | 0.3 |
| 970 | 0.8 | 1171 | 1.7 | 1218 | 0.7 | 1385 | 0.3 |
| 980 | 0.9 | 1172 | 1.6 | 1219 | 0.6 | 1390 | 0.3 |
| 990 | 0.9 | 1173 | 1.6 | 1220 | 0.6 | 1395 | 0.3 |
| 1000 | 0.9 | 1174 | 1.5 | 1221 | 0.6 | 1400 | 0.3 |
| 1010 | 1.0 | 1175 | 1.5 | 1222 | 0.6 | 1405 | 0.3 |
| 1020 | 1.0 | 1176 | 1.4 | 1223 | 0.6 | 1410 | 0.3 |
| 1030 | 1.1 | 1177 | 1.4 | 1224 | 0.6 | 1415 | 0.3 |
| 1040 | 1.2 | 1178 | 1.3 | 1225 | 0.6 | 1420 | 0.2 |
| 1050 | 1.2 | 1179 | 1.3 | 1226 | 0.6 | 1425 | 0.2 |
| 1060 | 1.3 | 1180 | 1.3 | 1227 | 0.6 | 1430 | 0.2 |
| 1070 | 1.5 | 1181 | 1.2 | 1228 | 0.6 | 1435 | 0.2 |
| 1080 | 1.6 | 1182 | 1.2 | 1229 | 0.6 | 1440 | 0.2 |
| 1090 | 1.8 | 1183 | 1.2 | 1230 | 0.6 | | |
| 1100 | 2.0 | 1184 | 1.1 | 1231 | 0.6 | | |



# 100-Year Summary for POC: 6

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 2.8 | 1185 | 1.3 | 1232 | 0.7 |
| 30 | 0.3 | 1115 | 3.2 | 1186 | 1.3 | 1233 | 0.7 |
| 60 | 0.3 | 1120 | 3.5 | 1187 | 1.3 | 1234 | 0.7 |
| 90 | 0.3 | 1125 | 3.8 | 1188 | 1.2 | 1235 | 0.7 |
| 120 | 0.3 | 1130 | 4.2 | 1189 | 1.2 | 1240 | 0.6 |
| 150 | 0.3 | 1135 | 4.8 | 1190 | 1.2 | 1245 | 0.6 |
| 180 | 0.3 | 1136 | 5.0 | 1191 | 1.2 | 1250 | 0.6 |
| 210 | 0.3 | 1137 | 5.2 | 1192 | 1.1 | 1255 | 0.6 |
| 240 | 0.3 | 1138 | 5.6 | 1193 | 1.1 | 1260 | 0.6 |
| 270 | 0.3 | 1139 | 5.8 | 1194 | 1.1 | 1265 | 0.5 |
| 300 | 0.3 | 1140 | 6.1 | 1195 | 1.1 | 1270 | 0.5 |
| 330 | 0.3 | 1145 | 7.8 | 1196 | 1.1 | 1275 | 0.5 |
| 360 | 0.4 | 1150 | 12.2 | 1197 | 1.0 | 1280 | 0.5 |
| 390 | 0.4 | 1151 | 15.3 | 1198 | 1.0 | 1285 | 0.5 |
| 420 | 0.4 | 1152 | 28.3 | 1199 | 1.0 | 1290 | 0.5 |
| 450 | 0.4 | 1153 | 32.7 | 1200 | 1.0 | 1295 | 0.5 |
| 480 | 0.4 | 1154 | 28.9 | 1201 | 1.0 | 1300 | 0.4 |
| 510 | 0.4 | 1155 | 14.3 | 1202 | 1.0 | 1305 | 0.4 |
| 540 | 0.4 | 1156 | 7.9 | 1203 | 0.9 | 1310 | 0.4 |
| 570 | 0.4 | 1157 | 6.1 | 1204 | 0.9 | 1315 | 0.4 |
| 600 | 0.4 | 1158 | 5.2 | 1205 | 0.9 | 1320 | 0.4 |
| 630 | 0.5 | 1159 | 4.5 | 1206 | 0.9 | 1325 | 0.4 |
| 660 | 0.5 | 1160 | 4.1 | 1207 | 0.9 | 1330 | 0.4 |
| 690 | 0.5 | 1161 | 3.8 | 1208 | 0.9 | 1335 | 0.4 |
| 720 | 0.5 | 1162 | 3.5 | 1209 | 0.9 | 1340 | 0.4 |
| 750 | 0.6 | 1163 | 3.3 | 1210 | 0.9 | 1345 | 0.4 |
| 780 | 0.6 | 1164 | 3.1 | 1211 | 0.8 | 1350 | 0.4 |
| 810 | 0.6 | 1165 | 2.9 | 1212 | 0.8 | 1355 | 0.4 |
| 840 | 0.7 | 1166 | 2.7 | 1213 | 0.8 | 1360 | 0.3 |
| 870 | 0.7 | 1167 | 2.5 | 1214 | 0.8 | 1365 | 0.3 |
| 900 | 0.8 | 1168 | 2.4 | 1215 | 0.8 | 1370 | 0.3 |
| 930 | 0.8 | 1169 | 2.3 | 1216 | 0.8 | 1375 | 0.3 |
| 960 | 0.9 | 1170 | 2.2 | 1217 | 0.8 | 1380 | 0.3 |
| 970 | 1.0 | 1171 | 2.1 | 1218 | 0.8 | 1385 | 0.3 |
| 980 | 1.0 | 1172 | 2.0 | 1219 | 0.8 | 1390 | 0.3 |
| 990 | 1.1 | 1173 | 1.9 | 1220 | 0.8 | 1395 | 0.3 |
| 1000 | 1.1 | 1174 | 1.8 | 1221 | 0.8 | 1400 | 0.3 |
| 1010 | 1.2 | 1175 | 1.8 | 1222 | 0.7 | 1405 | 0.3 |
| 1020 | 1.2 | 1176 | 1.7 | 1223 | 0.7 | 1410 | 0.3 |
| 1030 | 1.3 | 1177 | 1.6 | 1224 | 0.7 | 1415 | 0.3 |
| 1040 | 1.4 | 1178 | 1.6 | 1225 | 0.7 | 1420 | 0.3 |
| 1050 | 1.5 | 1179 | 1.5 | 1226 | 0.7 | 1425 | 0.3 |
| 1060 | 1.6 | 1180 | 1.5 | 1227 | 0.7 | 1430 | 0.3 |
| 1070 | 1.7 | 1181 | 1.5 | 1228 | 0.7 | 1435 | 0.3 |
| 1080 | 1.9 | 1182 | 1.4 | 1229 | 0.7 | 1440 | 0.3 |
| 1090 | 2.1 | 1183 | 1.4 | 1230 | 0.7 | | |
| 1100 | 2.4 | 1184 | 1.4 | 1231 | 0.7 | | |



# SoCal Gas Project

## POC 6

### Stream Station = 10+00

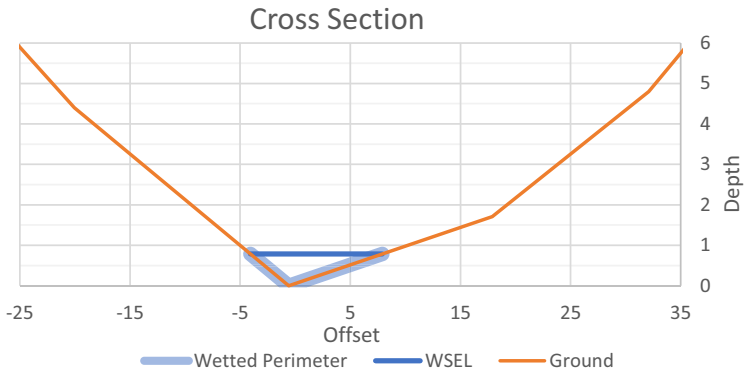
## INPUT

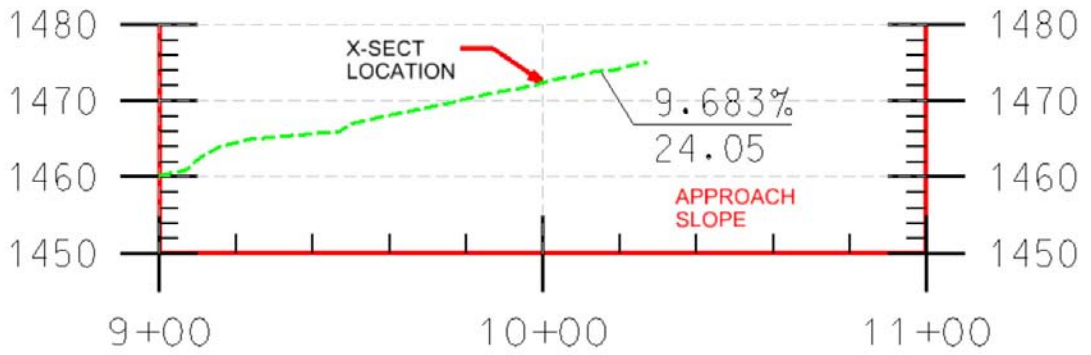
| | | |
|---|---|---|
| $Q_{50}$ | 29.0 | cfs |
| $Q_{100}$ | 33.0 | cfs |
| **$Q_{DESIGN}$** | **33.0** | **cfs** |
| | | |
| N | 0.035 | |
| So | 0.097 | ft/ft |

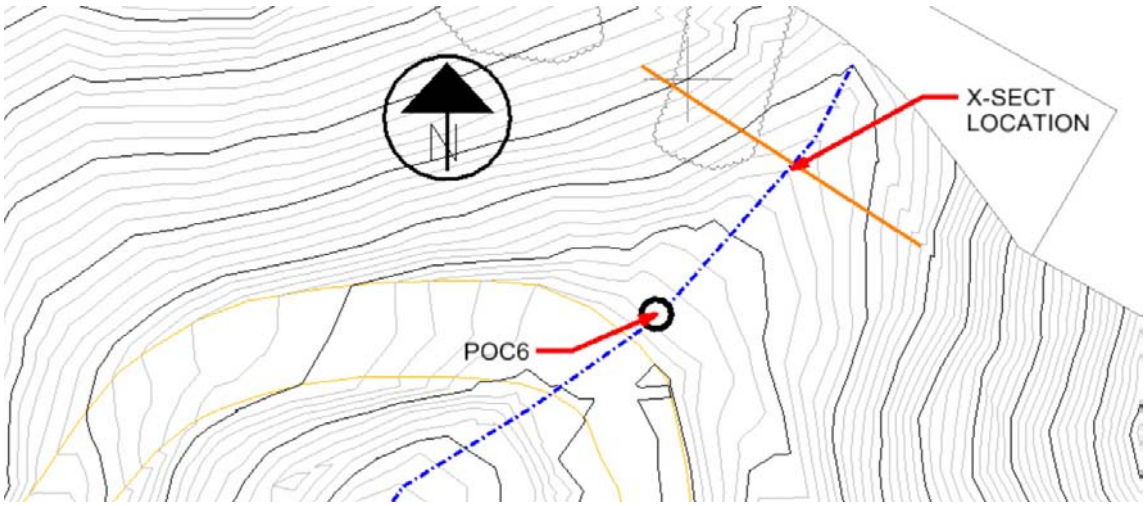
| Point | Station | Ground |
|---|---|---|
| 1 | -31.43 | 1480.13 |
| 2 | -20.04 | 1476.69 |
| 3 | -0.59 | 1472.29 |
| 4 | 17.89 | 1474 |
| 5 | 32.11 | 1477.09 |
| 6 | 40.99 | 1480 |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **0.8** | **ft** | *(NORMAL DEPTH)* |
| Area= | 4.7 | $ft^2$ | |
| $P_W$ | 12.1 | ft | |
| R | 0.389 | ft | |
| **Velocity=** | **7.0** | **ft/s** | |
| $S_F$ | 0.096 | ft/ft | |



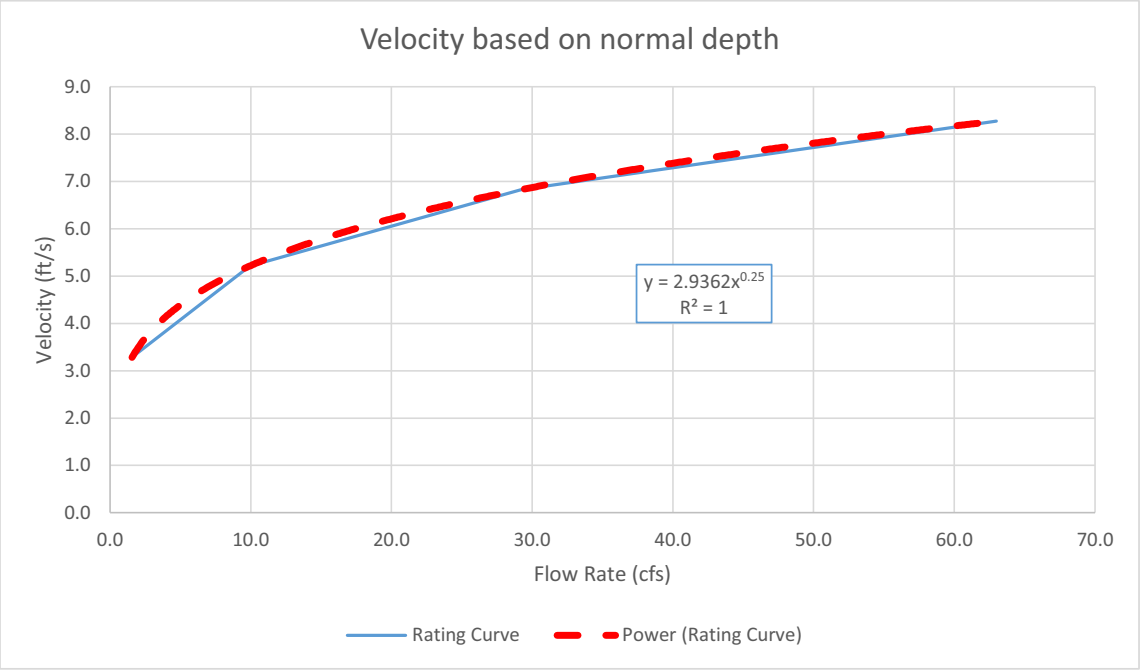



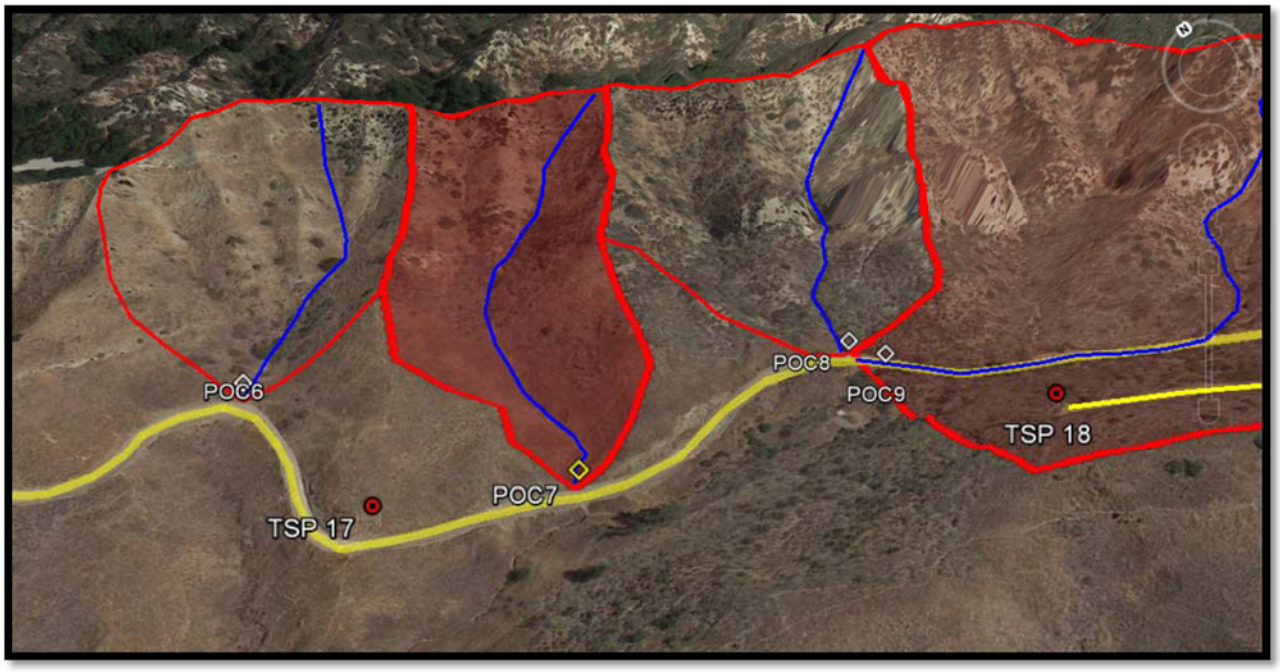
# SoCal Gas Project

## POC 6

### Stream Station = 10+00



# POC #7




## LOCATION

POC #7 is located along the maintenance access road east of TSP 17. There is an existing culvert at this location.

*Approximate Latitude:* 34°21'19.88"N

*Approximate Longitude:* *118°32'53.22"W*

## DRAINAGE AREA INFORMATION

*Area:* 3.7 acre

*Flow Length:* 731 feet

*Effective Slope:* 19.7%

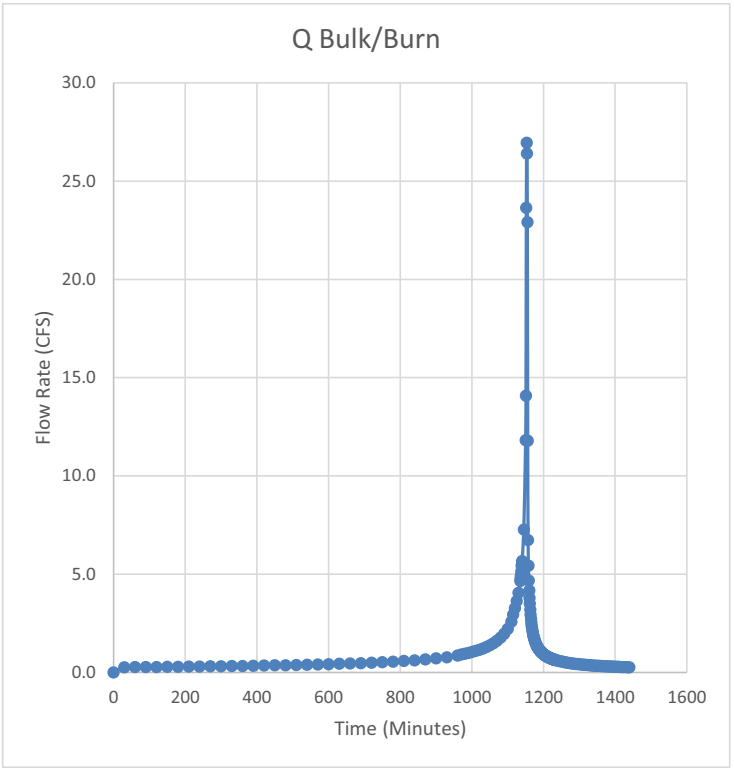
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 7

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

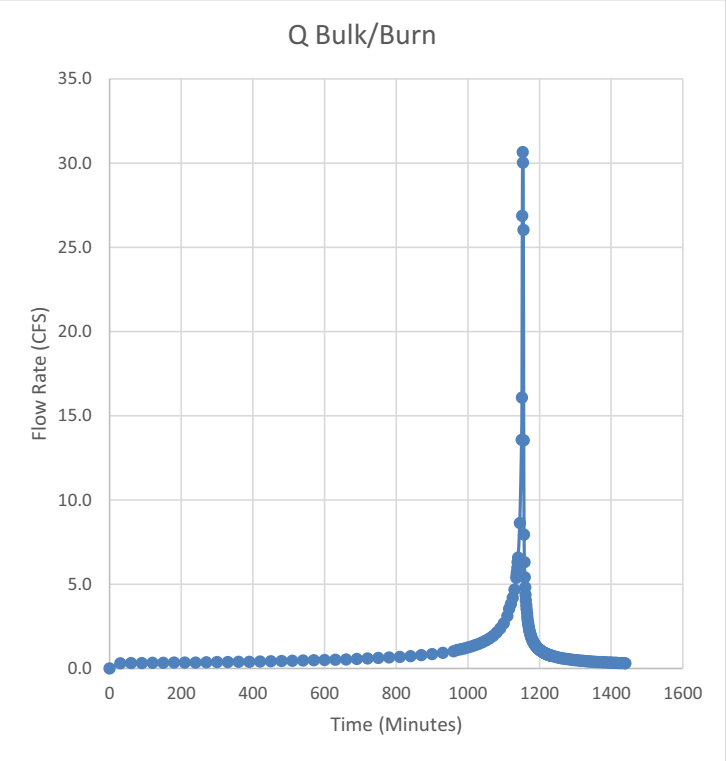
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 2.6 | 1185 | 1.2 | 1232 | 0.6 |
| 30 | 0.3 | 1115 | 2.9 | 1186 | 1.2 | 1233 | 0.6 |
| 60 | 0.3 | 1120 | 3.3 | 1187 | 1.2 | 1234 | 0.6 |
| 90 | 0.3 | 1125 | 3.6 | 1188 | 1.2 | 1235 | 0.6 |
| 120 | 0.3 | 1130 | 4.1 | 1189 | 1.1 | 1240 | 0.6 |
| 150 | 0.3 | 1135 | 4.6 | 1190 | 1.1 | 1245 | 0.6 |
| 180 | 0.3 | 1136 | 4.8 | 1191 | 1.1 | 1250 | 0.6 |
| 210 | 0.3 | 1137 | 4.9 | 1192 | 1.1 | 1255 | 0.5 |
| 240 | 0.3 | 1138 | 5.1 | 1193 | 1.0 | 1260 | 0.5 |
| 270 | 0.3 | 1139 | 5.4 | 1194 | 1.0 | 1265 | 0.5 |
| 300 | 0.3 | 1140 | 5.7 | 1195 | 1.0 | 1270 | 0.5 |
| 330 | 0.3 | 1145 | 7.3 | 1196 | 1.0 | 1275 | 0.5 |
| 360 | 0.3 | 1150 | 11.8 | 1197 | 1.0 | 1280 | 0.5 |
| 390 | 0.3 | 1151 | 14.1 | 1198 | 1.0 | 1285 | 0.4 |
| 420 | 0.3 | 1152 | 23.6 | 1199 | 0.9 | 1290 | 0.4 |
| 450 | 0.4 | 1153 | 27.0 | 1200 | 0.9 | 1295 | 0.4 |
| 480 | 0.4 | 1154 | 26.4 | 1201 | 0.9 | 1300 | 0.4 |
| 510 | 0.4 | 1155 | 22.9 | 1202 | 0.9 | 1305 | 0.4 |
| 540 | 0.4 | 1156 | 11.8 | 1203 | 0.9 | 1310 | 0.4 |
| 570 | 0.4 | 1157 | 6.7 | 1204 | 0.9 | 1315 | 0.4 |
| 600 | 0.4 | 1158 | 5.4 | 1205 | 0.9 | 1320 | 0.4 |
| 630 | 0.4 | 1159 | 4.7 | 1206 | 0.9 | 1325 | 0.4 |
| 660 | 0.5 | 1160 | 4.2 | 1207 | 0.8 | 1330 | 0.4 |
| 690 | 0.5 | 1161 | 3.8 | 1208 | 0.8 | 1335 | 0.4 |
| 720 | 0.5 | 1162 | 3.5 | 1209 | 0.8 | 1340 | 0.4 |
| 750 | 0.5 | 1163 | 3.2 | 1210 | 0.8 | 1345 | 0.3 |
| 780 | 0.5 | 1164 | 2.9 | 1211 | 0.8 | 1350 | 0.3 |
| 810 | 0.6 | 1165 | 2.7 | 1212 | 0.8 | 1355 | 0.3 |
| 840 | 0.6 | 1166 | 2.5 | 1213 | 0.8 | 1360 | 0.3 |
| 870 | 0.7 | 1167 | 2.4 | 1214 | 0.8 | 1365 | 0.3 |
| 900 | 0.7 | 1168 | 2.3 | 1215 | 0.8 | 1370 | 0.3 |
| 930 | 0.8 | 1169 | 2.1 | 1216 | 0.7 | 1375 | 0.3 |
| 960 | 0.9 | 1170 | 2.0 | 1217 | 0.7 | 1380 | 0.3 |
| 970 | 0.9 | 1171 | 1.9 | 1218 | 0.7 | 1385 | 0.3 |
| 980 | 1.0 | 1172 | 1.9 | 1219 | 0.7 | 1390 | 0.3 |
| 990 | 1.0 | 1173 | 1.8 | 1220 | 0.7 | 1395 | 0.3 |
| 1000 | 1.0 | 1174 | 1.7 | 1221 | 0.7 | 1400 | 0.3 |
| 1010 | 1.1 | 1175 | 1.7 | 1222 | 0.7 | 1405 | 0.3 |
| 1020 | 1.2 | 1176 | 1.6 | 1223 | 0.7 | 1410 | 0.3 |
| 1030 | 1.2 | 1177 | 1.5 | 1224 | 0.7 | 1415 | 0.3 |
| 1040 | 1.3 | 1178 | 1.5 | 1225 | 0.7 | 1420 | 0.3 |
| 1050 | 1.4 | 1179 | 1.5 | 1226 | 0.7 | 1425 | 0.3 |
| 1060 | 1.5 | 1180 | 1.4 | 1227 | 0.7 | 1430 | 0.3 |
| 1070 | 1.6 | 1181 | 1.4 | 1228 | 0.7 | 1435 | 0.3 |
| 1080 | 1.8 | 1182 | 1.3 | 1229 | 0.7 | 1440 | 0.3 |
| 1090 | 2.0 | 1183 | 1.3 | 1230 | 0.6 | | |
| 1100 | 2.2 | 1184 | 1.3 | 1231 | 0.6 | | |



# 100-Year Summary for POC: 7

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 3.1 | 1185 | 1.5 | 1232 | 0.8 |
| 30 | 0.3 | 1115 | 3.5 | 1186 | 1.4 | 1233 | 0.8 |
| 60 | 0.3 | 1120 | 3.8 | 1187 | 1.4 | 1234 | 0.7 |
| 90 | 0.3 | 1125 | 4.2 | 1188 | 1.4 | 1235 | 0.7 |
| 120 | 0.3 | 1130 | 4.7 | 1189 | 1.4 | 1240 | 0.7 |
| 150 | 0.3 | 1135 | 5.4 | 1190 | 1.3 | 1245 | 0.7 |
| 180 | 0.3 | 1136 | 5.5 | 1191 | 1.3 | 1250 | 0.7 |
| 210 | 0.3 | 1137 | 5.7 | 1192 | 1.3 | 1255 | 0.6 |
| 240 | 0.4 | 1138 | 6.0 | 1193 | 1.3 | 1260 | 0.6 |
| 270 | 0.4 | 1139 | 6.3 | 1194 | 1.2 | 1265 | 0.6 |
| 300 | 0.4 | 1140 | 6.6 | 1195 | 1.2 | 1270 | 0.6 |
| 330 | 0.4 | 1145 | 8.6 | 1196 | 1.2 | 1275 | 0.6 |
| 360 | 0.4 | 1150 | 13.6 | 1197 | 1.2 | 1280 | 0.5 |
| 390 | 0.4 | 1151 | 16.1 | 1198 | 1.1 | 1285 | 0.5 |
| 420 | 0.4 | 1152 | 26.9 | 1199 | 1.1 | 1290 | 0.5 |
| 450 | 0.4 | 1153 | 30.7 | 1200 | 1.1 | 1295 | 0.5 |
| 480 | 0.4 | 1154 | 30.0 | 1201 | 1.1 | 1300 | 0.5 |
| 510 | 0.5 | 1155 | 26.0 | 1202 | 1.1 | 1305 | 0.5 |
| 540 | 0.5 | 1156 | 13.5 | 1203 | 1.1 | 1310 | 0.5 |
| 570 | 0.5 | 1157 | 7.9 | 1204 | 1.0 | 1315 | 0.5 |
| 600 | 0.5 | 1158 | 6.3 | 1205 | 1.0 | 1320 | 0.4 |
| 630 | 0.5 | 1159 | 5.4 | 1206 | 1.0 | 1325 | 0.4 |
| 660 | 0.5 | 1160 | 4.8 | 1207 | 1.0 | 1330 | 0.4 |
| 690 | 0.6 | 1161 | 4.4 | 1208 | 1.0 | 1335 | 0.4 |
| 720 | 0.6 | 1162 | 4.0 | 1209 | 1.0 | 1340 | 0.4 |
| 750 | 0.6 | 1163 | 3.8 | 1210 | 1.0 | 1345 | 0.4 |
| 780 | 0.7 | 1164 | 3.5 | 1211 | 0.9 | 1350 | 0.4 |
| 810 | 0.7 | 1165 | 3.3 | 1212 | 0.9 | 1355 | 0.4 |
| 840 | 0.7 | 1166 | 3.1 | 1213 | 0.9 | 1360 | 0.4 |
| 870 | 0.8 | 1167 | 2.9 | 1214 | 0.9 | 1365 | 0.4 |
| 900 | 0.8 | 1168 | 2.7 | 1215 | 0.9 | 1370 | 0.4 |
| 930 | 0.9 | 1169 | 2.6 | 1216 | 0.9 | 1375 | 0.4 |
| 960 | 1.0 | 1170 | 2.5 | 1217 | 0.9 | 1380 | 0.4 |
| 970 | 1.1 | 1171 | 2.3 | 1218 | 0.9 | 1385 | 0.4 |
| 980 | 1.1 | 1172 | 2.2 | 1219 | 0.9 | 1390 | 0.4 |
| 990 | 1.2 | 1173 | 2.1 | 1220 | 0.9 | 1395 | 0.3 |
| 1000 | 1.2 | 1174 | 2.1 | 1221 | 0.8 | 1400 | 0.3 |
| 1010 | 1.3 | 1175 | 2.0 | 1222 | 0.8 | 1405 | 0.3 |
| 1020 | 1.4 | 1176 | 1.9 | 1223 | 0.8 | 1410 | 0.3 |
| 1030 | 1.5 | 1177 | 1.9 | 1224 | 0.8 | 1415 | 0.3 |
| 1040 | 1.5 | 1178 | 1.8 | 1225 | 0.8 | 1420 | 0.3 |
| 1050 | 1.7 | 1179 | 1.7 | 1226 | 0.8 | 1425 | 0.3 |
| 1060 | 1.8 | 1180 | 1.7 | 1227 | 0.8 | 1430 | 0.3 |
| 1070 | 1.9 | 1181 | 1.6 | 1228 | 0.8 | 1435 | 0.3 |
| 1080 | 2.1 | 1182 | 1.6 | 1229 | 0.8 | 1440 | 0.3 |
| 1090 | 2.4 | 1183 | 1.6 | 1230 | 0.8 | | |
| 1100 | 2.7 | 1184 | 1.5 | 1231 | 0.8 | | |



# SoCal Gas Project

## POC 7

**Stream Station = 10+50.30**

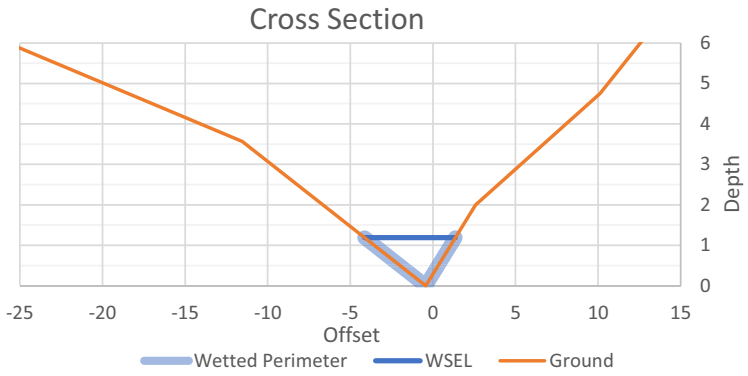
## INPUT

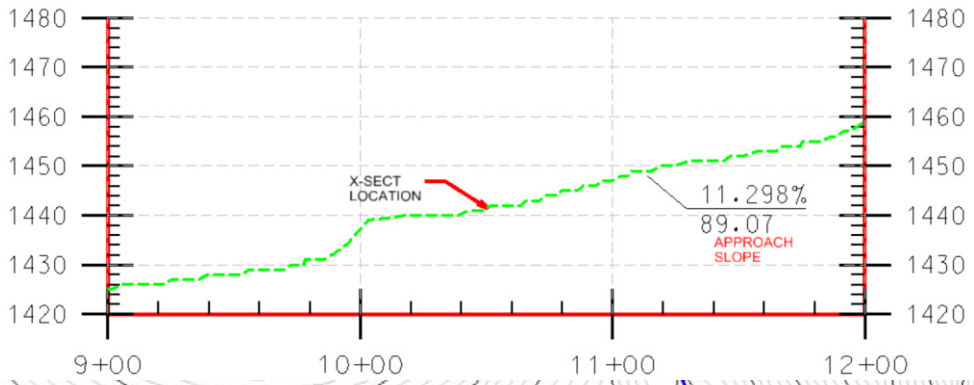
| | | |
|---|---|---|
| $Q_{50}$ | 27.0 | cfs |
| $Q_{100}$ | 31.0 | cfs |
| **$Q_{DESIGN}$** | **31.0** | **cfs** |
| | | |
| N | 0.035 | |
| So | 0.113 | ft/ft |

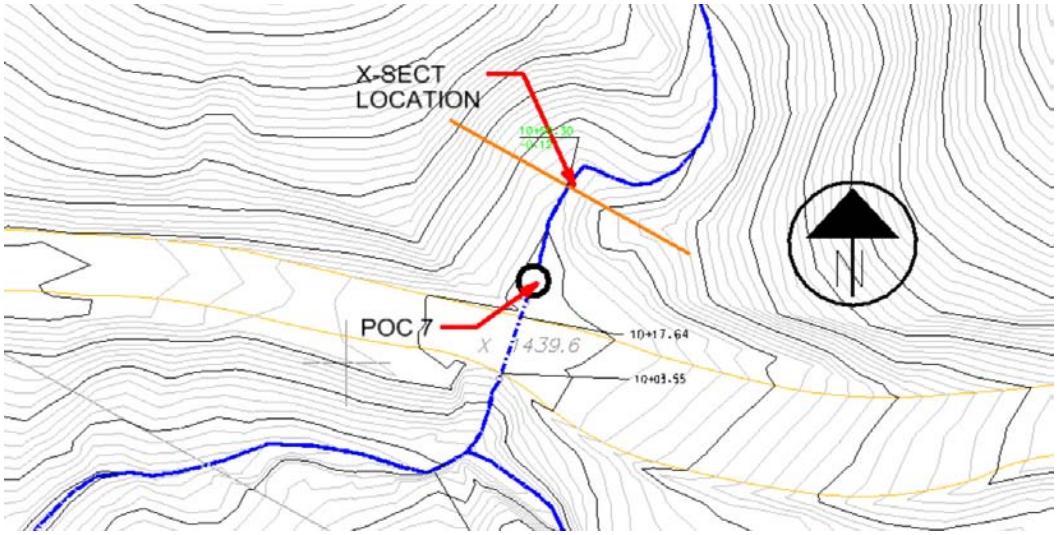
## Results

| | | | |
|---|---|---|---|
| **Depth=** | **1.2** | **ft** | *(NORMAL DEPTH)* |
| Area= | 3.3 | $ft^2$ | |
| $P_W$ | 6.0 | ft | |
| R | 0.541 | ft | |
| **Velocity=** | **9.5** | **ft/s** | |
| $S_F$ | 0.113 | ft/ft | |

| Point | Station | Ground |
|---|---|---|
| 1 | -37.15 | 1429.96 |
| 2 | -11.53 | 1425.57 |
| 3 | -0.44 | 1422 |
| 4 | 2.58 | 1424 |
| 5 | 10.12 | 1426.75 |
| 6 | 19.89 | 1431.75 |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |



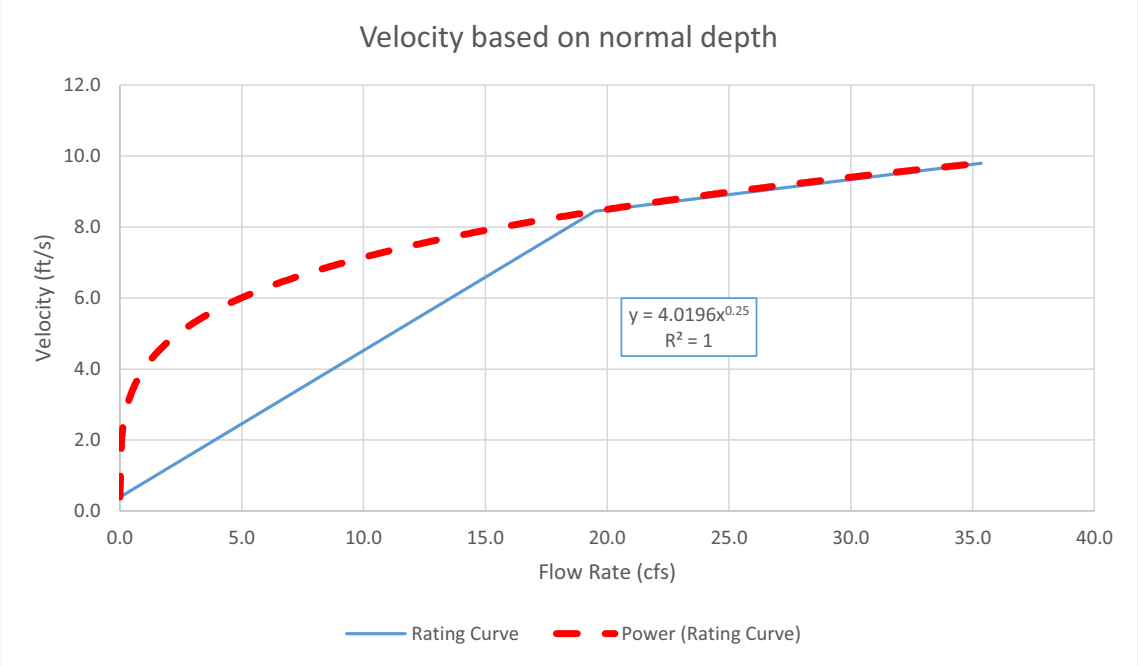



# SoCal Gas Project

## POC 7

### Stream Station = 10+50.30



# Culvert @ POC7

## Physical Data

| | | |
|---|---|---|
| Q50 | 28 | cfs |
| Q100 | 31.8 | cfs |
| Length | 35 | feet |
| Diameter | 36 | inches |
| Cover over Top of Pipe (U/S Side) | 1 | feet |
| Cover over Top of Pipe (D/S Side) | 3 | feet |
| Road Elev (U/S Side) | 1439.96 | feet |
| Road Elev (D/S Side) | 1439.00 | feet |
| Slope | 0.08 | ft/ft |
| N-value | 0.023 | (per LAFCD) |

## Modeling Parameters (PER FHWA HDS-5 Methods)

| | | |
|---|---|---|
| Type | CMP, Projecting Thin Wall | |
| K | 0.034 | |
| $K_S$ | -0.5 | |
| M | 1.5 | |
| c | 0.0553 | |
| Y | 0.54 | |
| Ke | 0.9 | FHWA Table C.2 |

Orifice Formula

$$\frac{HW_i}{D} = c\left[\frac{K_u Q}{AD^{0.5}}\right]^2 + Y + K_s S$$

Weir Formula

$$\frac{HW_i}{D} = \frac{H_c}{D} + K\left[\frac{K_u Q}{AD^{0.5}}\right]^M + K_s S$$

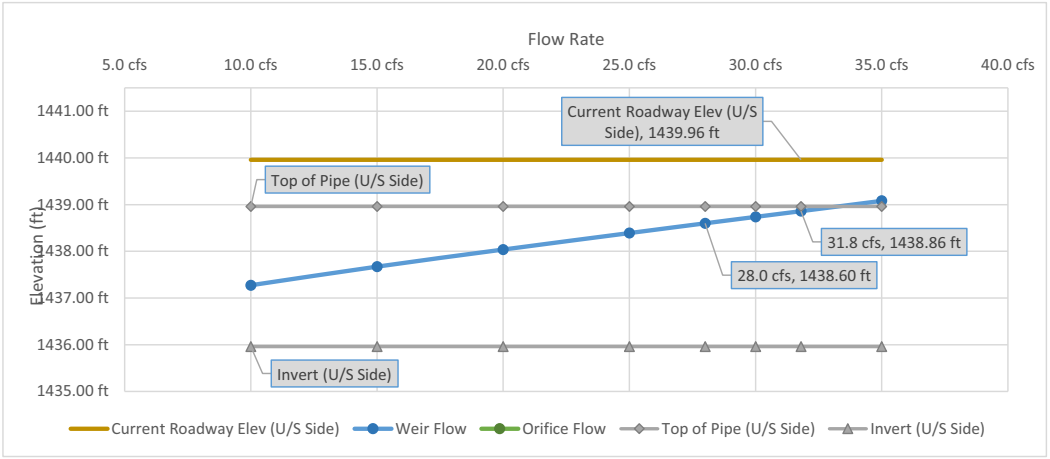
## Results

Findings

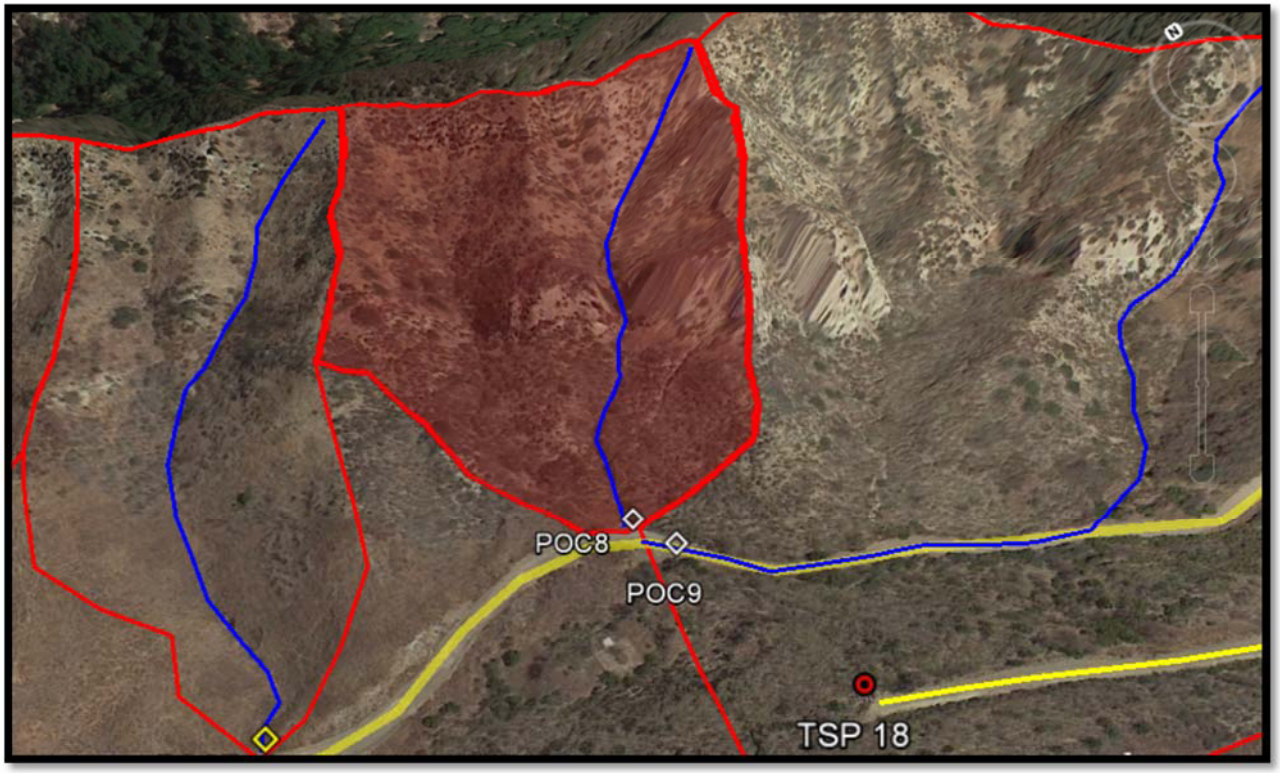
The existing 36" CMP Culvert is sufficient to pass the 100-year flow rate of 31.8 cfs without overtopping of the road. This culvert's performance is highly dependant on the conditions at the inlet, so care should be made to ensure that the inlet remains clear and undamaged.

**Flow rates and corresponding WSEL (Upstream side of road)**

| | 10.0 cfs | 15.0 cfs | 20.0 cfs | 25.0 cfs | 28.0 cfs | 30.0 cfs | 31.8 cfs | 35.0 cfs |
|---|---|---|---|---|---|---|---|---|
| **d/D (Normal Depth)** | 0.2 | 0.24 | 0.28 | 0.32 | 0.34 | 0.35 | 0.36 | 0.38 |
| **Area** | 1.01 | 1.30 | 1.62 | 1.95 | 2.12 | 2.20 | 2.29 | 2.46 |
| **Hyd Radius** | 0.36 | 0.42 | 0.48 | 0.54 | 0.57 | 0.58 | 0.59 | 0.62 |
| **Velocity** | 9.9 | 11.5 | 12.3 | 12.8 | 13.2 | 13.6 | 13.9 | 14.2 |
| **Weir Flow** | 1437.27 ft | 1437.67 ft | 1438.04 ft | 1438.39 ft | 1438.60 ft | 1438.74 ft | 1438.86 ft | 1439.08 ft |
| **Orifice Flow** | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| **Friction Control** | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |



# POC #8




## LOCATION

POC #8 is located along the maintenance access road north and downslope from TSP 18. There is an existing culvert crossing at POC #8. POC #8 is adjacent to POC #9.

*Approximate Latitude:* 34°21'19.87"N

*Approximate Longitude:* *118°32'48.62"W*

## DRAINAGE AREA INFORMATION

*Area:* 4.1 acre

*Flow Length:* 547 feet

*Effective Slope:* 21.7%

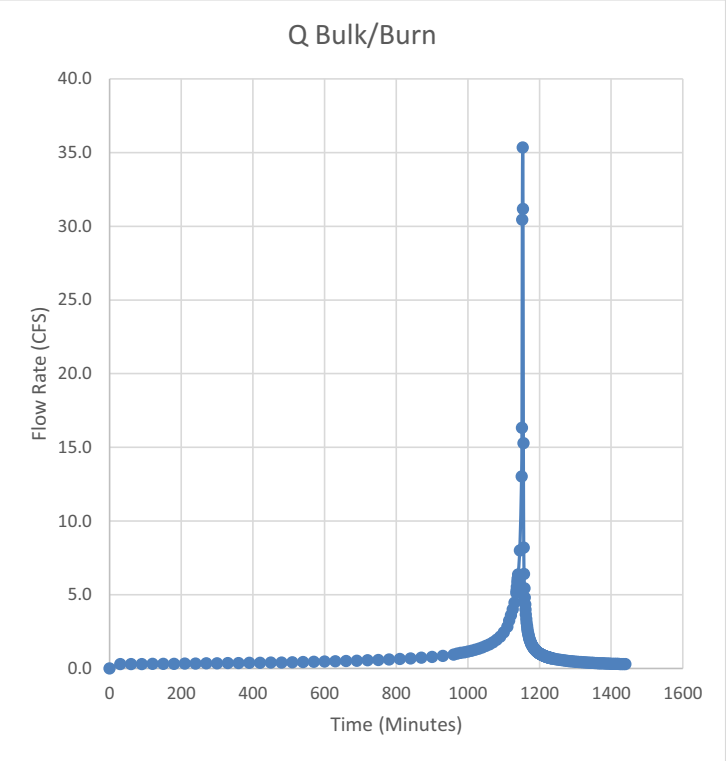
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 8

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

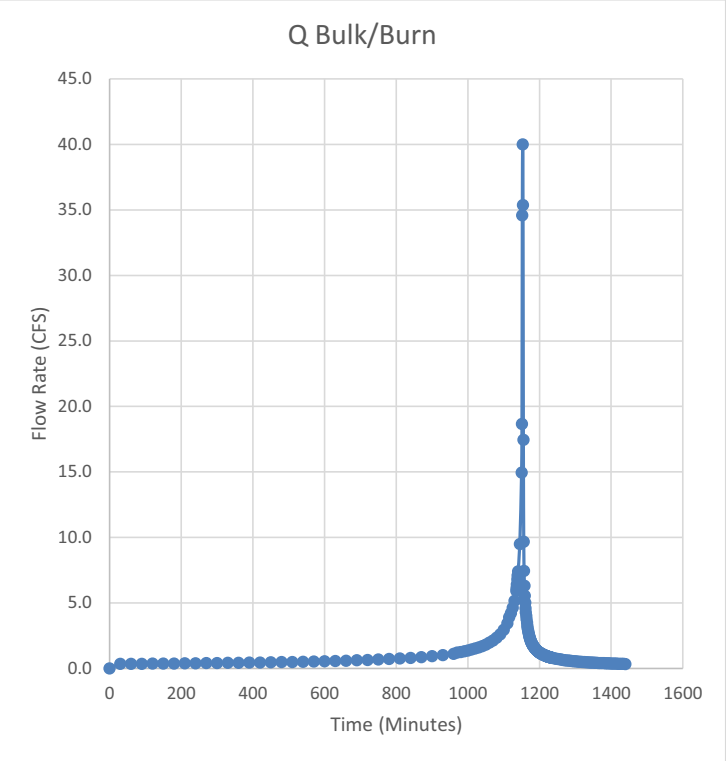
| (min) | (CFS) | (min) | (CFS) | (min) | (CFS) | (min) | (CFS) |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 2.8 | 1185 | 1.3 | 1232 | 0.7 |
| 30 | 0.3 | 1115 | 3.2 | 1186 | 1.3 | 1233 | 0.7 |
| 60 | 0.3 | 1120 | 3.6 | 1187 | 1.3 | 1234 | 0.7 |
| 90 | 0.3 | 1125 | 4.0 | 1188 | 1.3 | 1235 | 0.7 |
| 120 | 0.3 | 1130 | 4.5 | 1189 | 1.2 | 1240 | 0.7 |
| 150 | 0.3 | 1135 | 5.1 | 1190 | 1.2 | 1245 | 0.6 |
| 180 | 0.3 | 1136 | 5.3 | 1191 | 1.2 | 1250 | 0.6 |
| 210 | 0.3 | 1137 | 5.5 | 1192 | 1.2 | 1255 | 0.6 |
| 240 | 0.3 | 1138 | 5.9 | 1193 | 1.1 | 1260 | 0.6 |
| 270 | 0.3 | 1139 | 6.1 | 1194 | 1.1 | 1265 | 0.6 |
| 300 | 0.3 | 1140 | 6.4 | 1195 | 1.1 | 1270 | 0.5 |
| 330 | 0.4 | 1145 | 8.0 | 1196 | 1.1 | 1275 | 0.5 |
| 360 | 0.4 | 1150 | 13.0 | 1197 | 1.1 | 1280 | 0.5 |
| 390 | 0.4 | 1151 | 16.3 | 1198 | 1.0 | 1285 | 0.5 |
| 420 | 0.4 | 1152 | 30.4 | 1199 | 1.0 | 1290 | 0.5 |
| 450 | 0.4 | 1153 | 35.3 | 1200 | 1.0 | 1295 | 0.5 |
| 480 | 0.4 | 1154 | 31.2 | 1201 | 1.0 | 1300 | 0.5 |
| 510 | 0.4 | 1155 | 15.3 | 1202 | 1.0 | 1305 | 0.4 |
| 540 | 0.4 | 1156 | 8.2 | 1203 | 1.0 | 1310 | 0.4 |
| 570 | 0.4 | 1157 | 6.4 | 1204 | 1.0 | 1315 | 0.4 |
| 600 | 0.5 | 1158 | 5.4 | 1205 | 0.9 | 1320 | 0.4 |
| 630 | 0.5 | 1159 | 4.8 | 1206 | 0.9 | 1325 | 0.4 |
| 660 | 0.5 | 1160 | 4.3 | 1207 | 0.9 | 1330 | 0.4 |
| 690 | 0.5 | 1161 | 4.0 | 1208 | 0.9 | 1335 | 0.4 |
| 720 | 0.5 | 1162 | 3.7 | 1209 | 0.9 | 1340 | 0.4 |
| 750 | 0.6 | 1163 | 3.4 | 1210 | 0.9 | 1345 | 0.4 |
| 780 | 0.6 | 1164 | 3.1 | 1211 | 0.9 | 1350 | 0.4 |
| 810 | 0.6 | 1165 | 2.9 | 1212 | 0.9 | 1355 | 0.4 |
| 840 | 0.7 | 1166 | 2.7 | 1213 | 0.9 | 1360 | 0.4 |
| 870 | 0.7 | 1167 | 2.6 | 1214 | 0.8 | 1365 | 0.4 |
| 900 | 0.8 | 1168 | 2.4 | 1215 | 0.8 | 1370 | 0.3 |
| 930 | 0.9 | 1169 | 2.3 | 1216 | 0.8 | 1375 | 0.3 |
| 960 | 0.9 | 1170 | 2.2 | 1217 | 0.8 | 1380 | 0.3 |
| 970 | 1.0 | 1171 | 2.1 | 1218 | 0.8 | 1385 | 0.3 |
| 980 | 1.1 | 1172 | 2.0 | 1219 | 0.8 | 1390 | 0.3 |
| 990 | 1.1 | 1173 | 1.9 | 1220 | 0.8 | 1395 | 0.3 |
| 1000 | 1.1 | 1174 | 1.9 | 1221 | 0.8 | 1400 | 0.3 |
| 1010 | 1.2 | 1175 | 1.8 | 1222 | 0.8 | 1405 | 0.3 |
| 1020 | 1.3 | 1176 | 1.7 | 1223 | 0.8 | 1410 | 0.3 |
| 1030 | 1.3 | 1177 | 1.7 | 1224 | 0.8 | 1415 | 0.3 |
| 1040 | 1.4 | 1178 | 1.6 | 1225 | 0.7 | 1420 | 0.3 |
| 1050 | 1.5 | 1179 | 1.6 | 1226 | 0.7 | 1425 | 0.3 |
| 1060 | 1.6 | 1180 | 1.5 | 1227 | 0.7 | 1430 | 0.3 |
| 1070 | 1.8 | 1181 | 1.5 | 1228 | 0.7 | 1435 | 0.3 |
| 1080 | 1.9 | 1182 | 1.5 | 1229 | 0.7 | 1440 | 0.3 |
| 1090 | 2.2 | 1183 | 1.4 | 1230 | 0.7 | | |
| 1100 | 2.4 | 1184 | 1.4 | 1231 | 0.7 | | |



# 100-Year Summary for POC: 8

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 3.4 | 1185 | 1.6 | 1232 | 0.8 |
| 30 | 0.3 | 1115 | 3.9 | 1186 | 1.6 | 1233 | 0.8 |
| 60 | 0.3 | 1120 | 4.2 | 1187 | 1.5 | 1234 | 0.8 |
| 90 | 0.4 | 1125 | 4.6 | 1188 | 1.5 | 1235 | 0.8 |
| 120 | 0.4 | 1130 | 5.2 | 1189 | 1.5 | 1240 | 0.8 |
| 150 | 0.4 | 1135 | 5.9 | 1190 | 1.4 | 1245 | 0.8 |
| 180 | 0.4 | 1136 | 6.1 | 1191 | 1.4 | 1250 | 0.7 |
| 210 | 0.4 | 1137 | 6.4 | 1192 | 1.4 | 1255 | 0.7 |
| 240 | 0.4 | 1138 | 6.8 | 1193 | 1.4 | 1260 | 0.7 |
| 270 | 0.4 | 1139 | 7.1 | 1194 | 1.3 | 1265 | 0.7 |
| 300 | 0.4 | 1140 | 7.4 | 1195 | 1.3 | 1270 | 0.6 |
| 330 | 0.4 | 1145 | 9.5 | 1196 | 1.3 | 1275 | 0.6 |
| 360 | 0.4 | 1150 | 14.9 | 1197 | 1.3 | 1280 | 0.6 |
| 390 | 0.4 | 1151 | 18.7 | 1198 | 1.3 | 1285 | 0.6 |
| 420 | 0.5 | 1152 | 34.6 | 1199 | 1.2 | 1290 | 0.6 |
| 450 | 0.5 | 1153 | 40.0 | 1200 | 1.2 | 1295 | 0.6 |
| 480 | 0.5 | 1154 | 35.4 | 1201 | 1.2 | 1300 | 0.5 |
| 510 | 0.5 | 1155 | 17.4 | 1202 | 1.2 | 1305 | 0.5 |
| 540 | 0.5 | 1156 | 9.7 | 1203 | 1.2 | 1310 | 0.5 |
| 570 | 0.5 | 1157 | 7.4 | 1204 | 1.1 | 1315 | 0.5 |
| 600 | 0.5 | 1158 | 6.3 | 1205 | 1.1 | 1320 | 0.5 |
| 630 | 0.6 | 1159 | 5.6 | 1206 | 1.1 | 1325 | 0.5 |
| 660 | 0.6 | 1160 | 5.0 | 1207 | 1.1 | 1330 | 0.5 |
| 690 | 0.6 | 1161 | 4.6 | 1208 | 1.1 | 1335 | 0.5 |
| 720 | 0.6 | 1162 | 4.3 | 1209 | 1.1 | 1340 | 0.5 |
| 750 | 0.7 | 1163 | 4.0 | 1210 | 1.1 | 1345 | 0.4 |
| 780 | 0.7 | 1164 | 3.8 | 1211 | 1.0 | 1350 | 0.4 |
| 810 | 0.8 | 1165 | 3.5 | 1212 | 1.0 | 1355 | 0.4 |
| 840 | 0.8 | 1166 | 3.3 | 1213 | 1.0 | 1360 | 0.4 |
| 870 | 0.9 | 1167 | 3.1 | 1214 | 1.0 | 1365 | 0.4 |
| 900 | 0.9 | 1168 | 2.9 | 1215 | 1.0 | 1370 | 0.4 |
| 930 | 1.0 | 1169 | 2.8 | 1216 | 1.0 | 1375 | 0.4 |
| 960 | 1.1 | 1170 | 2.6 | 1217 | 1.0 | 1380 | 0.4 |
| 970 | 1.2 | 1171 | 2.5 | 1218 | 1.0 | 1385 | 0.4 |
| 980 | 1.3 | 1172 | 2.4 | 1219 | 0.9 | 1390 | 0.4 |
| 990 | 1.3 | 1173 | 2.3 | 1220 | 0.9 | 1395 | 0.4 |
| 1000 | 1.4 | 1174 | 2.2 | 1221 | 0.9 | 1400 | 0.4 |
| 1010 | 1.4 | 1175 | 2.2 | 1222 | 0.9 | 1405 | 0.4 |
| 1020 | 1.5 | 1176 | 2.1 | 1223 | 0.9 | 1410 | 0.4 |
| 1030 | 1.6 | 1177 | 2.0 | 1224 | 0.9 | 1415 | 0.4 |
| 1040 | 1.7 | 1178 | 2.0 | 1225 | 0.9 | 1420 | 0.4 |
| 1050 | 1.8 | 1179 | 1.9 | 1226 | 0.9 | 1425 | 0.4 |
| 1060 | 2.0 | 1180 | 1.8 | 1227 | 0.9 | 1430 | 0.3 |
| 1070 | 2.1 | 1181 | 1.8 | 1228 | 0.9 | 1435 | 0.3 |
| 1080 | 2.3 | 1182 | 1.7 | 1229 | 0.9 | 1440 | 0.3 |
| 1090 | 2.6 | 1183 | 1.7 | 1230 | 0.8 | | |
| 1100 | 3.0 | 1184 | 1.7 | 1231 | 0.8 | | |



# SoCal Gas Project

## POC 8

### Stream Station = 10+00

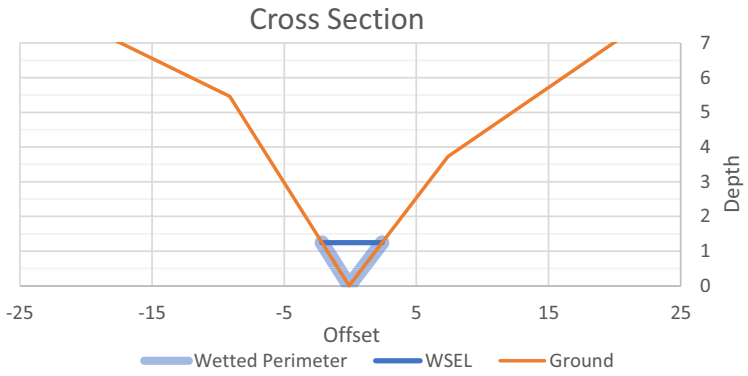
## INPUT

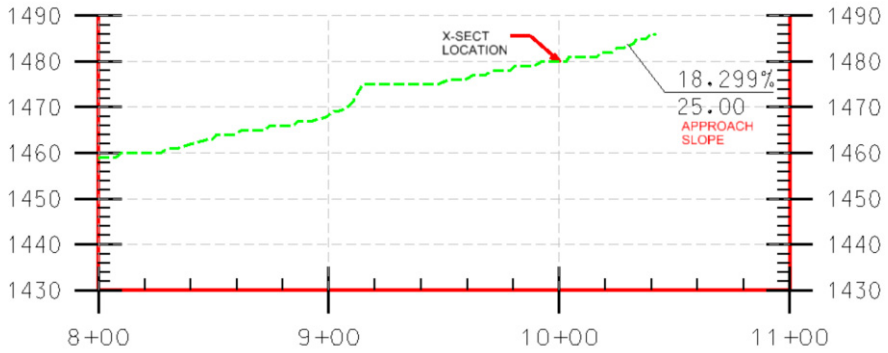
| | | |
|---|---|---|
| $Q_{50}$ | 35.0 | cfs |
| $Q_{100}$ | 40.0 | cfs |
| **$Q_{DESIGN}$** | **40.0** | **cfs** |
| | | |
| N | 0.030 | |
| So | 0.183 | ft/ft |

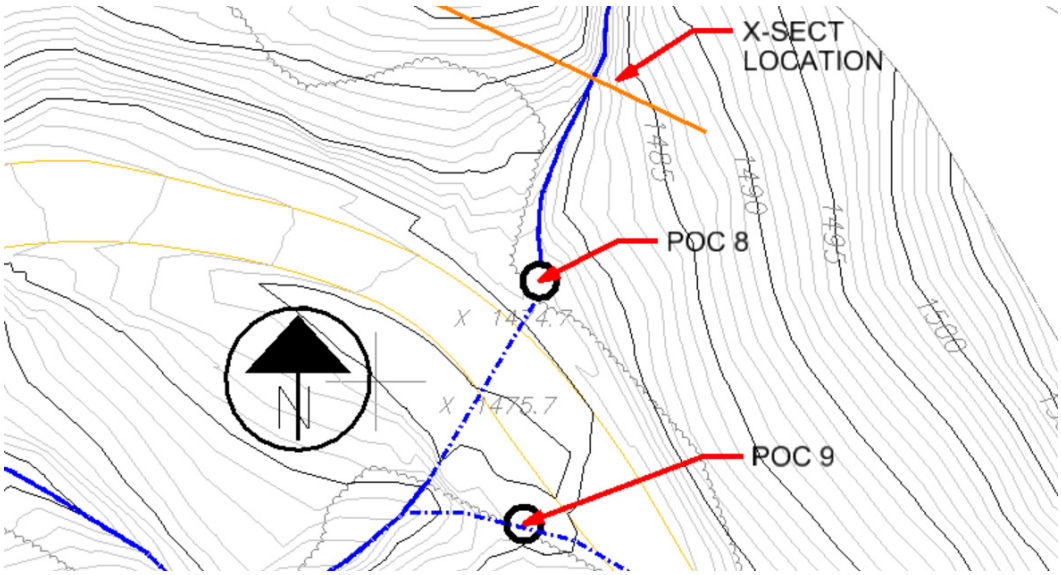
## Results

| | | | |
|---|---|---|---|
| **Depth=** | **1.2** | **ft** | *(NORMAL DEPTH)* |
| Area= | 2.8 | $ft^2$ | |
| $P_W$ | 5.2 | ft | |
| R | 0.545 | ft | |
| **Velocity=** | **14.2** | **ft/s** | |
| $S_F$ | 0.183 | ft/ft | |

| Point | Station | Ground |
|---|---|---|
| 1 | -34.17 | 1490.13 |
| 2 | -9.12 | 1485.46 |
| 3 | -0.09 | 1480 |
| 4 | 7.4 | 1483.73 |
| 5 | 22.78 | 1487.75 |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |



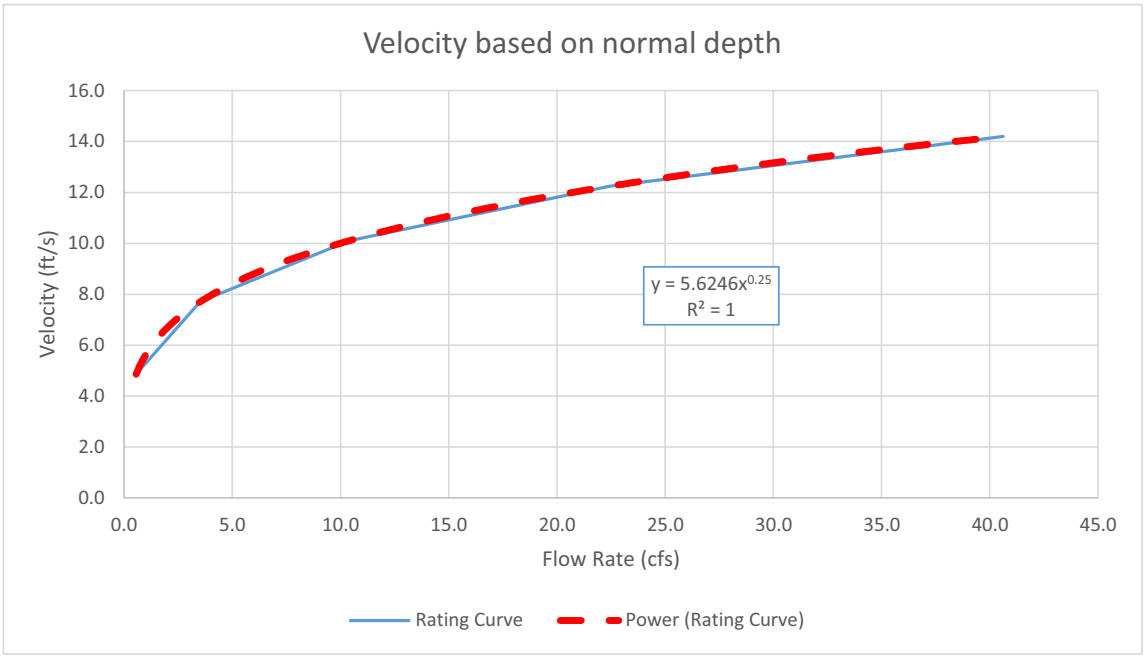



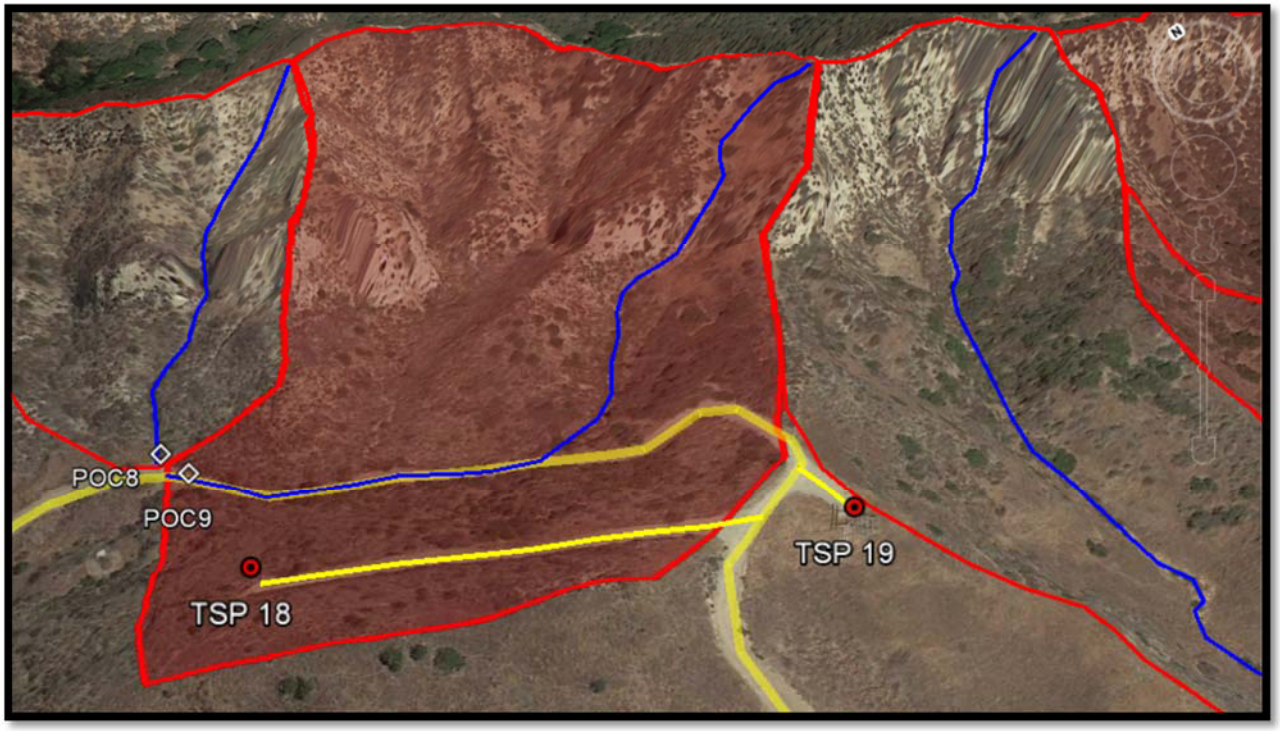
# SoCal Gas Project

## POC 8

### Stream Station = 10+00



# POC #9




## LOCATION

POC #9 is located along the maintenance access road between TSP 11 and TSPs 18/19. The maintenance access road is in the low, such that runoff will concentrate on the maintenance access road, and travel for a couple hundred feet before reaching POC #9, where it then flows over the edge of the road and to the west.

*Approximate Latitude:* 34°21'19.39"N

*Approximate Longitude:* *118°32'48.47"W*

## DRAINAGE AREA INFORMATION

*Area:* 11.5 acre

*Flow Length:* 1033 feet

*Effective Slope:* 18.3%

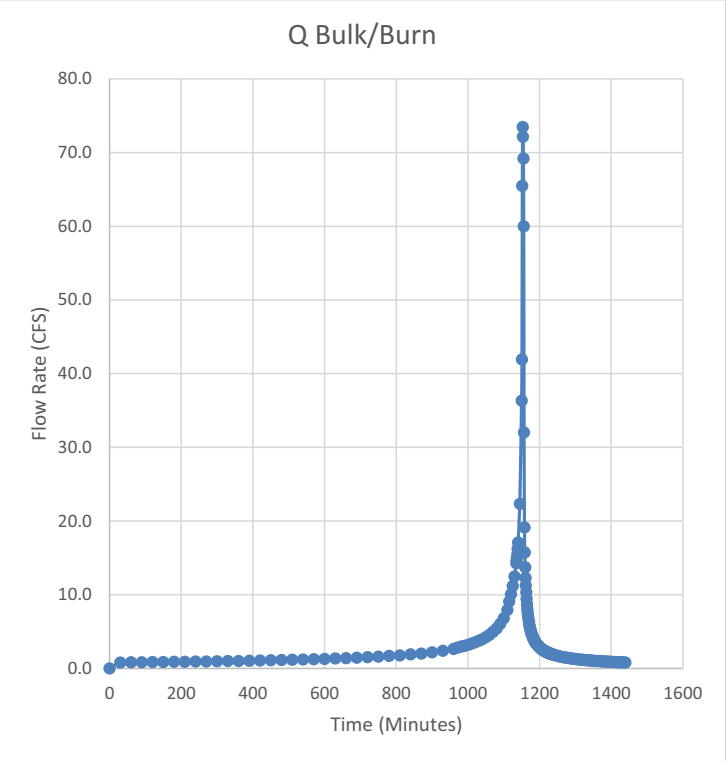
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 9

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

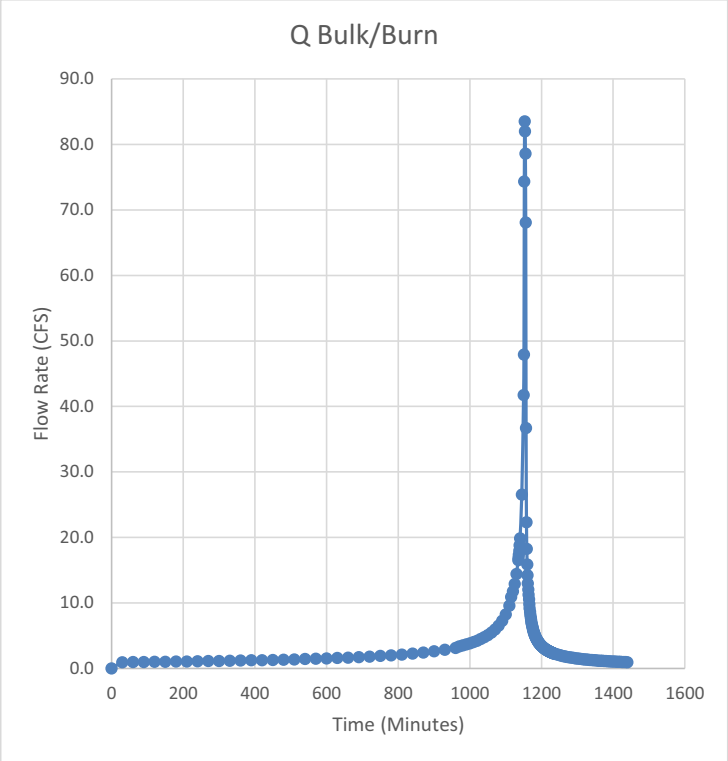
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 7.9 | 1185 | 3.9 | 1232 | 2.0 |
| 30 | 0.8 | 1115 | 9.0 | 1186 | 3.8 | 1233 | 2.0 |
| 60 | 0.8 | 1120 | 10.1 | 1187 | 3.7 | 1234 | 1.9 |
| 90 | 0.8 | 1125 | 11.2 | 1188 | 3.6 | 1235 | 1.9 |
| 120 | 0.9 | 1130 | 12.5 | 1189 | 3.5 | 1240 | 1.8 |
| 150 | 0.9 | 1135 | 14.3 | 1190 | 3.4 | 1245 | 1.8 |
| 180 | 0.9 | 1136 | 14.6 | 1191 | 3.4 | 1250 | 1.7 |
| 210 | 0.9 | 1137 | 15.0 | 1192 | 3.3 | 1255 | 1.6 |
| 240 | 0.9 | 1138 | 15.5 | 1193 | 3.2 | 1260 | 1.6 |
| 270 | 1.0 | 1139 | 16.2 | 1194 | 3.2 | 1265 | 1.5 |
| 300 | 1.0 | 1140 | 17.1 | 1195 | 3.1 | 1270 | 1.5 |
| 330 | 1.0 | 1145 | 22.3 | 1196 | 3.1 | 1275 | 1.4 |
| 360 | 1.0 | 1150 | 36.3 | 1197 | 3.0 | 1280 | 1.4 |
| 390 | 1.0 | 1151 | 41.9 | 1198 | 3.0 | 1285 | 1.4 |
| 420 | 1.1 | 1152 | 65.5 | 1199 | 2.9 | 1290 | 1.3 |
| 450 | 1.1 | 1153 | 73.5 | 1200 | 2.9 | 1295 | 1.3 |
| 480 | 1.1 | 1154 | 72.2 | 1201 | 2.8 | 1300 | 1.3 |
| 510 | 1.2 | 1155 | 69.2 | 1202 | 2.8 | 1305 | 1.2 |
| 540 | 1.2 | 1156 | 60.0 | 1203 | 2.7 | 1310 | 1.2 |
| 570 | 1.3 | 1157 | 32.0 | 1204 | 2.7 | 1315 | 1.2 |
| 600 | 1.3 | 1158 | 19.1 | 1205 | 2.7 | 1320 | 1.2 |
| 630 | 1.3 | 1159 | 15.7 | 1206 | 2.6 | 1325 | 1.1 |
| 660 | 1.4 | 1160 | 13.7 | 1207 | 2.6 | 1330 | 1.1 |
| 690 | 1.5 | 1161 | 12.3 | 1208 | 2.6 | 1335 | 1.1 |
| 720 | 1.5 | 1162 | 11.3 | 1209 | 2.5 | 1340 | 1.1 |
| 750 | 1.6 | 1163 | 10.3 | 1210 | 2.5 | 1345 | 1.1 |
| 780 | 1.7 | 1164 | 9.4 | 1211 | 2.5 | 1350 | 1.0 |
| 810 | 1.8 | 1165 | 8.7 | 1212 | 2.4 | 1355 | 1.0 |
| 840 | 1.9 | 1166 | 8.1 | 1213 | 2.4 | 1360 | 1.0 |
| 870 | 2.0 | 1167 | 7.6 | 1214 | 2.4 | 1365 | 1.0 |
| 900 | 2.2 | 1168 | 7.1 | 1215 | 2.3 | 1370 | 1.0 |
| 930 | 2.4 | 1169 | 6.8 | 1216 | 2.3 | 1375 | 1.0 |
| 960 | 2.6 | 1170 | 6.4 | 1217 | 2.3 | 1380 | 0.9 |
| 970 | 2.8 | 1171 | 6.1 | 1218 | 2.3 | 1385 | 0.9 |
| 980 | 2.9 | 1172 | 5.9 | 1219 | 2.2 | 1390 | 0.9 |
| 990 | 3.1 | 1173 | 5.6 | 1220 | 2.2 | 1395 | 0.9 |
| 1000 | 3.2 | 1174 | 5.4 | 1221 | 2.2 | 1400 | 0.9 |
| 1010 | 3.4 | 1175 | 5.2 | 1222 | 2.2 | 1405 | 0.9 |
| 1020 | 3.5 | 1176 | 5.0 | 1223 | 2.1 | 1410 | 0.9 |
| 1030 | 3.7 | 1177 | 4.8 | 1224 | 2.1 | 1415 | 0.9 |
| 1040 | 4.0 | 1178 | 4.7 | 1225 | 2.1 | 1420 | 0.8 |
| 1050 | 4.2 | 1179 | 4.5 | 1226 | 2.1 | 1425 | 0.8 |
| 1060 | 4.6 | 1180 | 4.4 | 1227 | 2.1 | 1430 | 0.8 |
| 1070 | 5.0 | 1181 | 4.3 | 1228 | 2.0 | 1435 | 0.8 |
| 1080 | 5.4 | 1182 | 4.2 | 1229 | 2.0 | 1440 | 0.8 |
| 1090 | 6.0 | 1183 | 4.1 | 1230 | 2.0 | | |
| 1100 | 6.8 | 1184 | 4.0 | 1231 | 2.0 | | |



# 100-Year Summary for POC: 9

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 9.6 | 1185 | 4.6 | 1232 | 2.3 |
| 30 | 1.0 | 1115 | 10.9 | 1186 | 4.5 | 1233 | 2.3 |
| 60 | 1.0 | 1120 | 11.8 | 1187 | 4.4 | 1234 | 2.3 |
| 90 | 1.0 | 1125 | 12.9 | 1188 | 4.3 | 1235 | 2.3 |
| 120 | 1.0 | 1130 | 14.4 | 1189 | 4.2 | 1240 | 2.2 |
| 150 | 1.0 | 1135 | 16.5 | 1190 | 4.1 | 1245 | 2.1 |
| 180 | 1.1 | 1136 | 16.9 | 1191 | 4.0 | 1250 | 2.0 |
| 210 | 1.1 | 1137 | 17.4 | 1192 | 4.0 | 1255 | 1.9 |
| 240 | 1.1 | 1138 | 18.0 | 1193 | 3.9 | 1260 | 1.9 |
| 270 | 1.1 | 1139 | 18.8 | 1194 | 3.8 | 1265 | 1.8 |
| 300 | 1.1 | 1140 | 19.8 | 1195 | 3.7 | 1270 | 1.8 |
| 330 | 1.2 | 1145 | 26.5 | 1196 | 3.7 | 1275 | 1.7 |
| 360 | 1.2 | 1150 | 41.7 | 1197 | 3.6 | 1280 | 1.7 |
| 390 | 1.2 | 1151 | 47.9 | 1198 | 3.6 | 1285 | 1.6 |
| 420 | 1.3 | 1152 | 74.3 | 1199 | 3.5 | 1290 | 1.6 |
| 450 | 1.3 | 1153 | 83.5 | 1200 | 3.4 | 1295 | 1.5 |
| 480 | 1.3 | 1154 | 82.0 | 1201 | 3.4 | 1300 | 1.5 |
| 510 | 1.4 | 1155 | 78.6 | 1202 | 3.3 | 1305 | 1.5 |
| 540 | 1.4 | 1156 | 68.1 | 1203 | 3.3 | 1310 | 1.4 |
| 570 | 1.5 | 1157 | 36.7 | 1204 | 3.2 | 1315 | 1.4 |
| 600 | 1.5 | 1158 | 22.3 | 1205 | 3.2 | 1320 | 1.4 |
| 630 | 1.6 | 1159 | 18.2 | 1206 | 3.1 | 1325 | 1.4 |
| 660 | 1.7 | 1160 | 15.9 | 1207 | 3.1 | 1330 | 1.3 |
| 690 | 1.7 | 1161 | 14.2 | 1208 | 3.1 | 1335 | 1.3 |
| 720 | 1.8 | 1162 | 13.0 | 1209 | 3.0 | 1340 | 1.3 |
| 750 | 1.9 | 1163 | 12.0 | 1210 | 3.0 | 1345 | 1.3 |
| 780 | 2.0 | 1164 | 11.2 | 1211 | 2.9 | 1350 | 1.2 |
| 810 | 2.1 | 1165 | 10.6 | 1212 | 2.9 | 1355 | 1.2 |
| 840 | 2.3 | 1166 | 9.8 | 1213 | 2.9 | 1360 | 1.2 |
| 870 | 2.4 | 1167 | 9.2 | 1214 | 2.8 | 1365 | 1.2 |
| 900 | 2.6 | 1168 | 8.6 | 1215 | 2.8 | 1370 | 1.2 |
| 930 | 2.8 | 1169 | 8.2 | 1216 | 2.8 | 1375 | 1.1 |
| 960 | 3.1 | 1170 | 7.7 | 1217 | 2.7 | 1380 | 1.1 |
| 970 | 3.4 | 1171 | 7.4 | 1218 | 2.7 | 1385 | 1.1 |
| 980 | 3.5 | 1172 | 7.1 | 1219 | 2.7 | 1390 | 1.1 |
| 990 | 3.7 | 1173 | 6.8 | 1220 | 2.6 | 1395 | 1.1 |
| 1000 | 3.8 | 1174 | 6.5 | 1221 | 2.6 | 1400 | 1.1 |
| 1010 | 4.0 | 1175 | 6.2 | 1222 | 2.6 | 1405 | 1.0 |
| 1020 | 4.2 | 1176 | 6.0 | 1223 | 2.6 | 1410 | 1.0 |
| 1030 | 4.5 | 1177 | 5.8 | 1224 | 2.5 | 1415 | 1.0 |
| 1040 | 4.8 | 1178 | 5.6 | 1225 | 2.5 | 1420 | 1.0 |
| 1050 | 5.1 | 1179 | 5.4 | 1226 | 2.5 | 1425 | 1.0 |
| 1060 | 5.5 | 1180 | 5.3 | 1227 | 2.5 | 1430 | 1.0 |
| 1070 | 6.0 | 1181 | 5.1 | 1228 | 2.4 | 1435 | 1.0 |
| 1080 | 6.5 | 1182 | 5.0 | 1229 | 2.4 | 1440 | 1.0 |
| 1090 | 7.3 | 1183 | 4.9 | 1230 | 2.4 | | |
| 1100 | 8.2 | 1184 | 4.7 | 1231 | 2.4 | | |



# SoCal Gas Project

## POC 9

### Stream Station = 10+00

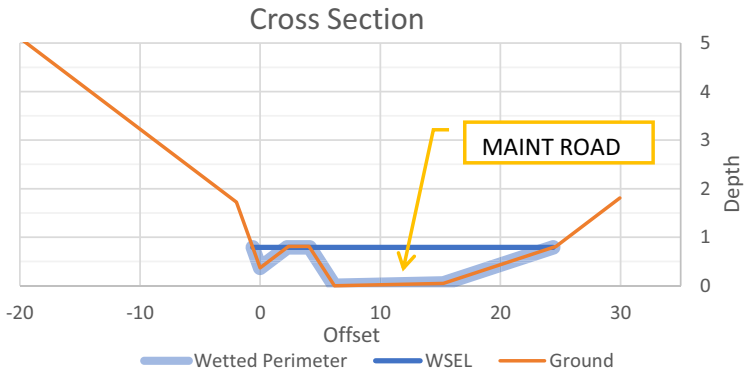
## INPUT

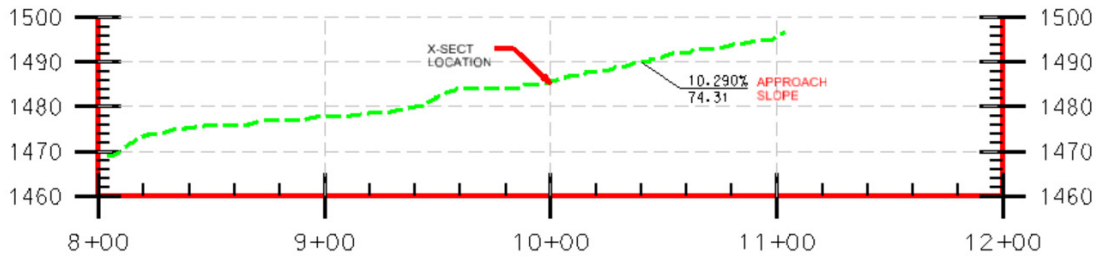
| | | |
|---|---|---|
| $Q_{50}$ | 74.0 | cfs |
| $Q_{100}$ | 84.0 | cfs |
| **$Q_{DESIGN}$** | **84.0** | **cfs** |
| | | |
| N | 0.040 | |
| So | 0.103 | ft/ft |

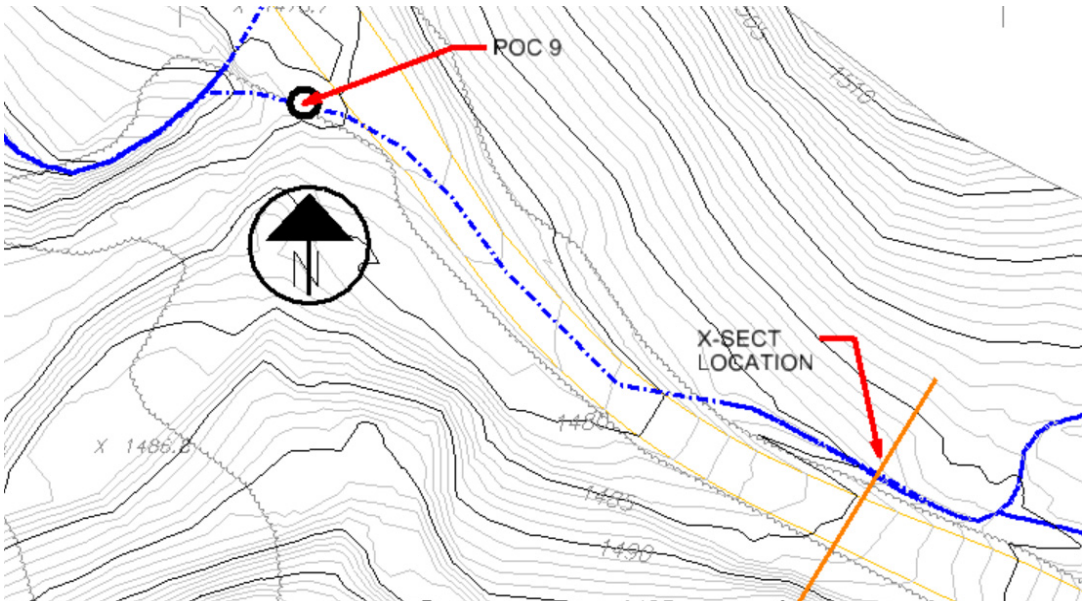
| Point | Station | Ground |
|---|---|---|
| 1 | -21.43 | 1490.56 |
| 2 | -1.97 | 1486.91 |
| 3 | 0 | 1485.56 |
| 4 | 2.35 | 1486 |
| 5 | 4.07 | 1486 |
| 6 | 6.18 | 1485.19 |
| 7 | 15.25 | 1485.24 |
| 8 | 24.63 | 1486 |
| 9 | 29.94 | 1487 |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **0.8** | **ft** | *(NORMAL DEPTH)* |
| Area= | 11.7 | $ft^2$ | |
| $P_W$ | 25.4 | ft | |
| R | 0.463 | ft | |
| **Velocity=** | **7.1** | **ft/s** | |
| $S_F$ | 0.103 | ft/ft | |



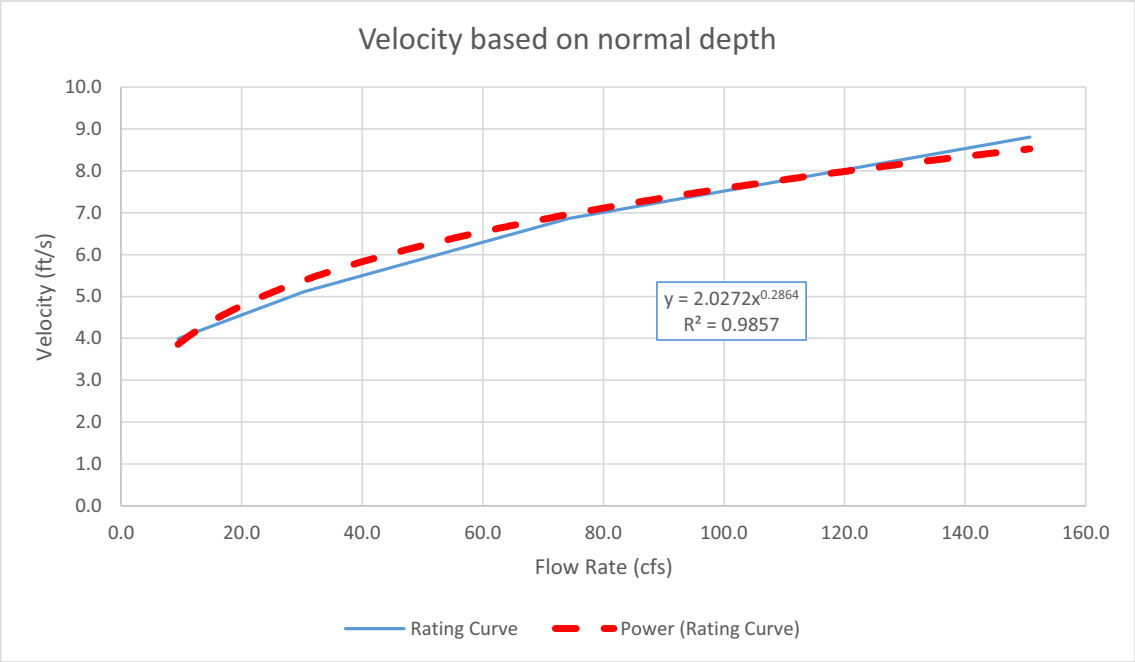



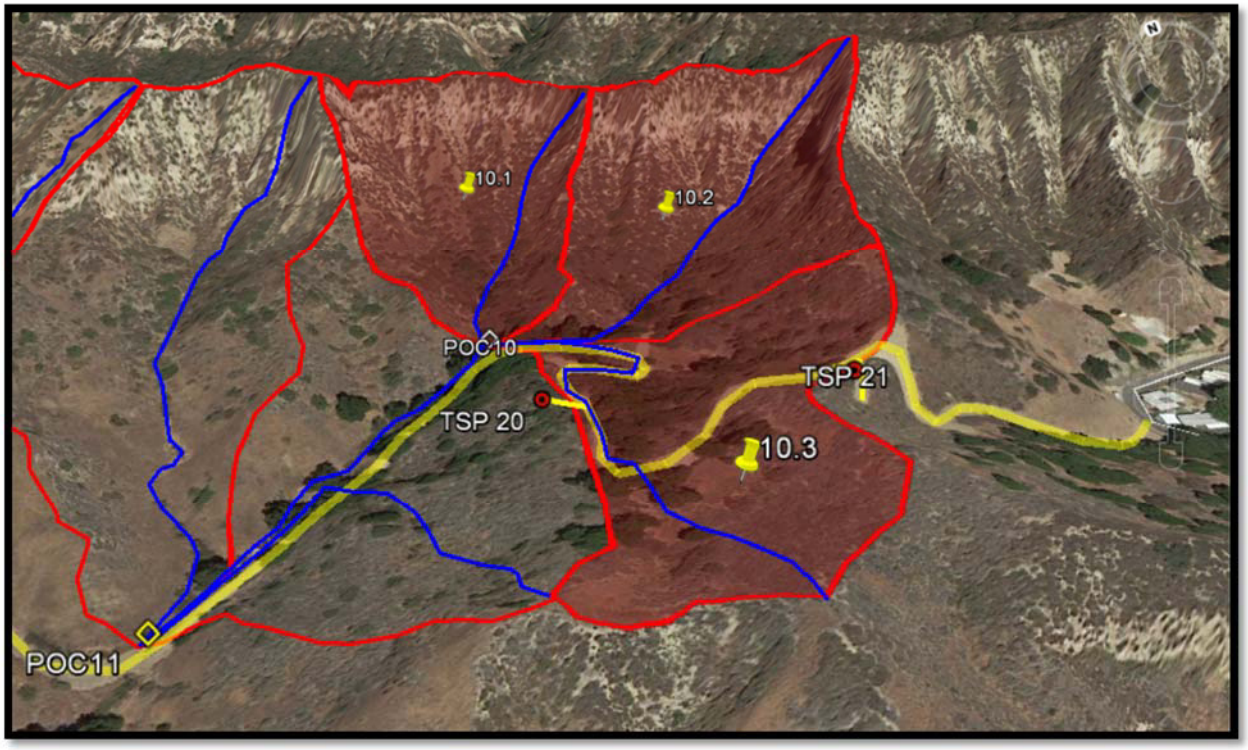
# SoCal Gas Project

## POC 9

### Stream Station = 10+00



# POC #10




## LOCATION

POC #10 is located north of TSP 20, and is comprised of the confluence of three smaller drainage areas, named 10.1, 10.2 and 10.3 in this study. The confluence at POC 10 is in a dry creek that is about 10-feet below the maintenance road grade. Flood flows in the creek should not pose any significant risk to the access road. The runoff leaving POC #10 flows westerly alongside the road to POC #11.

*Approximate Latitude:* 34°21'13.02"N

*Approximate Longitude:* *118°32'34.34"W*

## DRAINAGE AREA INFORMATION

| Sub-drainage | Area (acres) | Length (ft) | Effective Slope (%) |
|---|---|---|---|
| **10.1** | 3.4 | 478 | 22.4% |
| **10.2** | 4.3 | 780 | 21.3% |
| **10.3** | 5.3 | 1020 | 14.3% |
| **Total** | **13** | **-** | **-** |

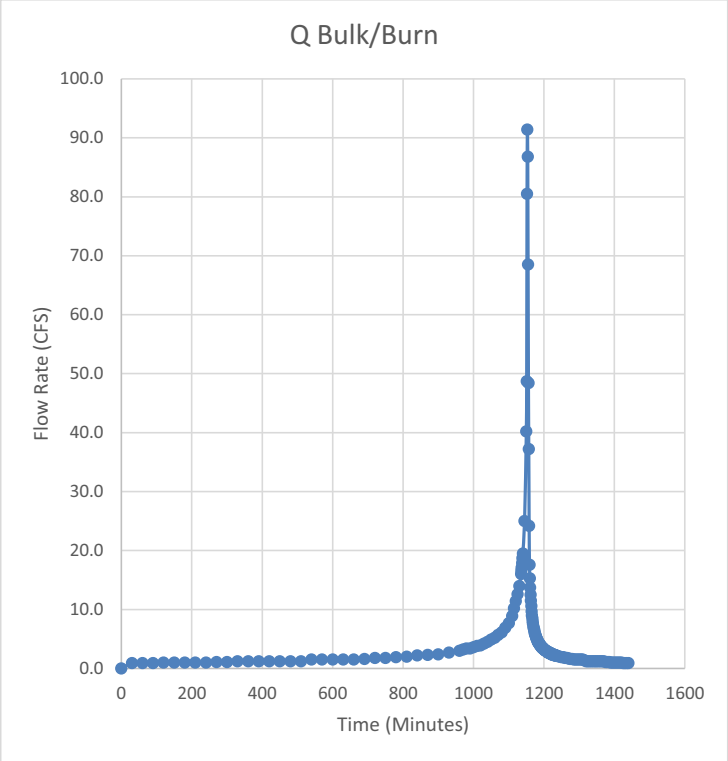
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 10

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

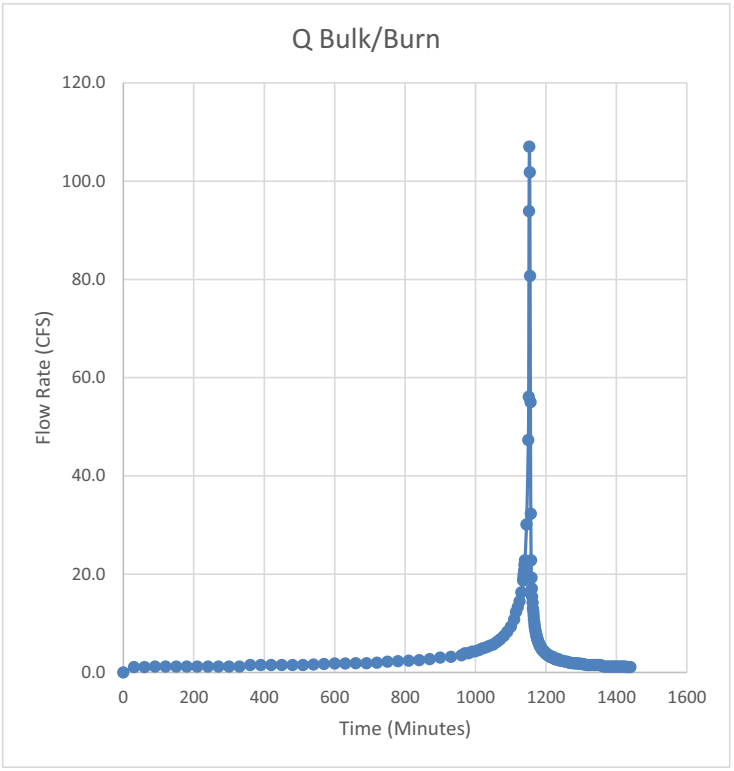
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 8.9 | 1185 | 4.3 | 1232 | 2.2 |
| 30 | 0.9 | 1115 | 10.2 | 1186 | 4.3 | 1233 | 2.2 |
| 60 | 0.9 | 1120 | 11.4 | 1187 | 4.2 | 1234 | 2.2 |
| 90 | 0.9 | 1125 | 12.6 | 1188 | 4.0 | 1235 | 2.2 |
| 120 | 1.0 | 1130 | 14.0 | 1189 | 3.9 | 1240 | 2.1 |
| 150 | 1.0 | 1135 | 16.0 | 1190 | 3.9 | 1245 | 2.0 |
| 180 | 1.0 | 1136 | 16.6 | 1191 | 3.9 | 1250 | 1.9 |
| 210 | 1.0 | 1137 | 17.1 | 1192 | 3.7 | 1255 | 1.9 |
| 240 | 1.0 | 1138 | 17.9 | 1193 | 3.6 | 1260 | 1.8 |
| 270 | 1.1 | 1139 | 18.7 | 1194 | 3.6 | 1265 | 1.8 |
| 300 | 1.1 | 1140 | 19.5 | 1195 | 3.6 | 1270 | 1.7 |
| 330 | 1.2 | 1145 | 25.0 | 1196 | 3.4 | 1275 | 1.6 |
| 360 | 1.2 | 1150 | 40.2 | 1197 | 3.4 | 1280 | 1.6 |
| 390 | 1.2 | 1151 | 48.7 | 1198 | 3.4 | 1285 | 1.5 |
| 420 | 1.2 | 1152 | 80.5 | 1199 | 3.4 | 1290 | 1.5 |
| 450 | 1.2 | 1153 | 91.4 | 1200 | 3.2 | 1295 | 1.5 |
| 480 | 1.2 | 1154 | 86.8 | 1201 | 3.2 | 1300 | 1.5 |
| 510 | 1.2 | 1155 | 68.5 | 1202 | 3.1 | 1305 | 1.5 |
| 540 | 1.5 | 1156 | 48.4 | 1203 | 3.1 | 1310 | 1.5 |
| 570 | 1.5 | 1157 | 37.2 | 1204 | 3.1 | 1315 | 1.4 |
| 600 | 1.5 | 1158 | 24.2 | 1205 | 3.0 | 1320 | 1.2 |
| 630 | 1.5 | 1159 | 17.6 | 1206 | 3.0 | 1325 | 1.2 |
| 660 | 1.5 | 1160 | 15.3 | 1207 | 3.0 | 1330 | 1.2 |
| 690 | 1.6 | 1161 | 13.7 | 1208 | 2.9 | 1335 | 1.2 |
| 720 | 1.8 | 1162 | 12.5 | 1209 | 2.8 | 1340 | 1.2 |
| 750 | 1.8 | 1163 | 11.5 | 1210 | 2.8 | 1345 | 1.2 |
| 780 | 1.9 | 1164 | 10.6 | 1211 | 2.7 | 1350 | 1.2 |
| 810 | 2.0 | 1165 | 9.7 | 1212 | 2.7 | 1355 | 1.2 |
| 840 | 2.2 | 1166 | 9.0 | 1213 | 2.7 | 1360 | 1.2 |
| 870 | 2.3 | 1167 | 8.5 | 1214 | 2.7 | 1365 | 1.2 |
| 900 | 2.4 | 1168 | 8.0 | 1215 | 2.7 | 1370 | 1.2 |
| 930 | 2.7 | 1169 | 7.6 | 1216 | 2.7 | 1375 | 1.1 |
| 960 | 3.0 | 1170 | 7.1 | 1217 | 2.7 | 1380 | 1.1 |
| 970 | 3.2 | 1171 | 6.8 | 1218 | 2.6 | 1385 | 1.1 |
| 980 | 3.4 | 1172 | 6.6 | 1219 | 2.5 | 1390 | 1.0 |
| 990 | 3.4 | 1173 | 6.3 | 1220 | 2.5 | 1395 | 1.0 |
| 1000 | 3.6 | 1174 | 6.0 | 1221 | 2.4 | 1400 | 1.0 |
| 1010 | 3.8 | 1175 | 5.8 | 1222 | 2.4 | 1405 | 1.0 |
| 1020 | 3.9 | 1176 | 5.6 | 1223 | 2.4 | 1410 | 1.0 |
| 1030 | 4.2 | 1177 | 5.5 | 1224 | 2.4 | 1415 | 1.0 |
| 1040 | 4.5 | 1178 | 5.2 | 1225 | 2.4 | 1420 | 1.0 |
| 1050 | 4.9 | 1179 | 5.1 | 1226 | 2.4 | 1425 | 0.9 |
| 1060 | 5.2 | 1180 | 5.0 | 1227 | 2.4 | 1430 | 0.9 |
| 1070 | 5.7 | 1181 | 4.8 | 1228 | 2.3 | 1435 | 0.9 |
| 1080 | 6.1 | 1182 | 4.6 | 1229 | 2.3 | 1440 | 0.9 |
| 1090 | 6.9 | 1183 | 4.6 | 1230 | 2.2 | | |
| 1100 | 7.7 | 1184 | 4.4 | 1231 | 2.2 | | |



# 100-Year Summary for POC: 10

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 10.8 | 1185 | 5.1 | 1232 | 2.7 |
| 30 | 1.1 | 1115 | 12.3 | 1186 | 5.1 | 1233 | 2.7 |
| 60 | 1.1 | 1120 | 13.3 | 1187 | 4.9 | 1234 | 2.7 |
| 90 | 1.2 | 1125 | 14.5 | 1188 | 4.8 | 1235 | 2.7 |
| 120 | 1.2 | 1130 | 16.3 | 1189 | 4.7 | 1240 | 2.4 |
| 150 | 1.2 | 1135 | 18.7 | 1190 | 4.6 | 1245 | 2.4 |
| 180 | 1.2 | 1136 | 19.3 | 1191 | 4.6 | 1250 | 2.3 |
| 210 | 1.2 | 1137 | 19.9 | 1192 | 4.5 | 1255 | 2.2 |
| 240 | 1.2 | 1138 | 20.8 | 1193 | 4.3 | 1260 | 2.2 |
| 270 | 1.2 | 1139 | 21.9 | 1194 | 4.3 | 1265 | 2.0 |
| 300 | 1.2 | 1140 | 22.8 | 1195 | 4.2 | 1270 | 2.0 |
| 330 | 1.2 | 1145 | 30.1 | 1196 | 4.2 | 1275 | 1.9 |
| 360 | 1.5 | 1150 | 47.3 | 1197 | 4.1 | 1280 | 1.9 |
| 390 | 1.5 | 1151 | 56.1 | 1198 | 3.9 | 1285 | 1.8 |
| 420 | 1.5 | 1152 | 93.9 | 1199 | 3.9 | 1290 | 1.8 |
| 450 | 1.5 | 1153 | 107.0 | 1200 | 3.9 | 1295 | 1.8 |
| 480 | 1.5 | 1154 | 101.8 | 1201 | 3.9 | 1300 | 1.7 |
| 510 | 1.5 | 1155 | 80.7 | 1202 | 3.7 | 1305 | 1.7 |
| 540 | 1.6 | 1156 | 55.0 | 1203 | 3.7 | 1310 | 1.6 |
| 570 | 1.7 | 1157 | 32.3 | 1204 | 3.6 | 1315 | 1.5 |
| 600 | 1.8 | 1158 | 22.8 | 1205 | 3.6 | 1320 | 1.5 |
| 630 | 1.8 | 1159 | 19.3 | 1206 | 3.5 | 1325 | 1.5 |
| 660 | 1.9 | 1160 | 17.1 | 1207 | 3.5 | 1330 | 1.5 |
| 690 | 1.9 | 1161 | 15.4 | 1208 | 3.4 | 1335 | 1.5 |
| 720 | 2.0 | 1162 | 14.2 | 1209 | 3.4 | 1340 | 1.5 |
| 750 | 2.2 | 1163 | 13.1 | 1210 | 3.4 | 1345 | 1.5 |
| 780 | 2.3 | 1164 | 12.4 | 1211 | 3.4 | 1350 | 1.5 |
| 810 | 2.4 | 1165 | 11.6 | 1212 | 3.2 | 1355 | 1.5 |
| 840 | 2.5 | 1166 | 10.8 | 1213 | 3.2 | 1360 | 1.3 |
| 870 | 2.7 | 1167 | 10.1 | 1214 | 3.2 | 1365 | 1.2 |
| 900 | 3.0 | 1168 | 9.5 | 1215 | 3.1 | 1370 | 1.2 |
| 930 | 3.2 | 1169 | 9.1 | 1216 | 3.1 | 1375 | 1.2 |
| 960 | 3.5 | 1170 | 8.6 | 1217 | 3.1 | 1380 | 1.2 |
| 970 | 3.9 | 1171 | 8.2 | 1218 | 3.0 | 1385 | 1.2 |
| 980 | 3.9 | 1172 | 7.8 | 1219 | 3.0 | 1390 | 1.2 |
| 990 | 4.2 | 1173 | 7.5 | 1220 | 3.0 | 1395 | 1.2 |
| 1000 | 4.3 | 1174 | 7.2 | 1221 | 3.0 | 1400 | 1.2 |
| 1010 | 4.6 | 1175 | 7.0 | 1222 | 3.0 | 1405 | 1.2 |
| 1020 | 4.9 | 1176 | 6.7 | 1223 | 3.0 | 1410 | 1.2 |
| 1030 | 5.1 | 1177 | 6.5 | 1224 | 2.8 | 1415 | 1.2 |
| 1040 | 5.4 | 1178 | 6.3 | 1225 | 2.8 | 1420 | 1.2 |
| 1050 | 5.7 | 1179 | 6.1 | 1226 | 2.7 | 1425 | 1.2 |
| 1060 | 6.2 | 1180 | 5.9 | 1227 | 2.7 | 1430 | 1.1 |
| 1070 | 6.7 | 1181 | 5.8 | 1228 | 2.7 | 1435 | 1.1 |
| 1080 | 7.4 | 1182 | 5.5 | 1229 | 2.7 | 1440 | 1.1 |
| 1090 | 8.3 | 1183 | 5.4 | 1230 | 2.7 | | |
| 1100 | 9.3 | 1184 | 5.4 | 1231 | 2.7 | | |



# SoCal Gas Project

## POC 10

### Stream Station = 10+00

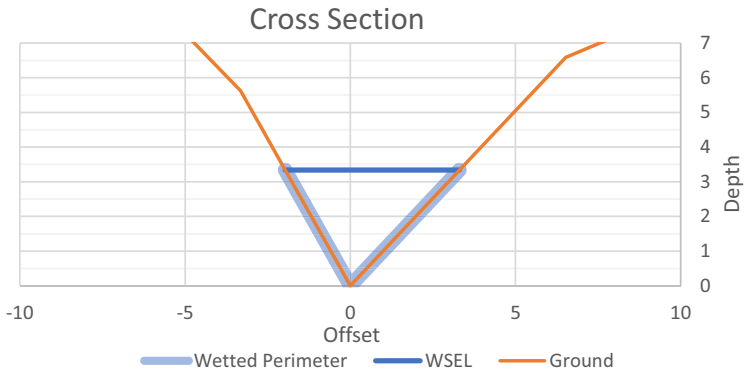
## INPUT

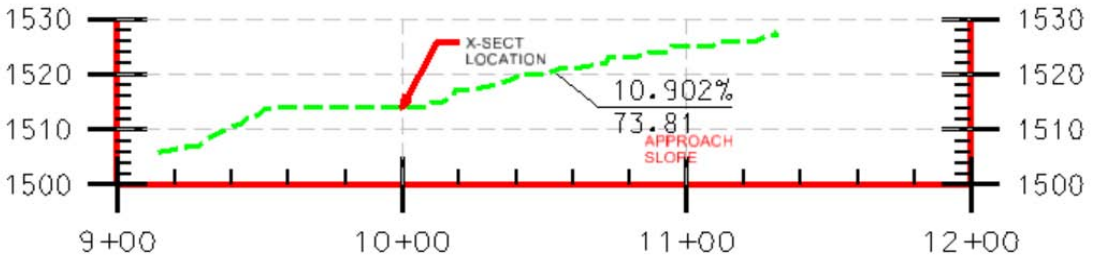
| | | |
|---|---|---|
| $Q_{50}$ | 91.0 | cfs |
| $Q_{100}$ | 110.0 | cfs |
| **$Q_{DESIGN}$** | **110.0** | **cfs** |
| | | |
| N | 0.040 | |
| So | 0.109 | ft/ft |

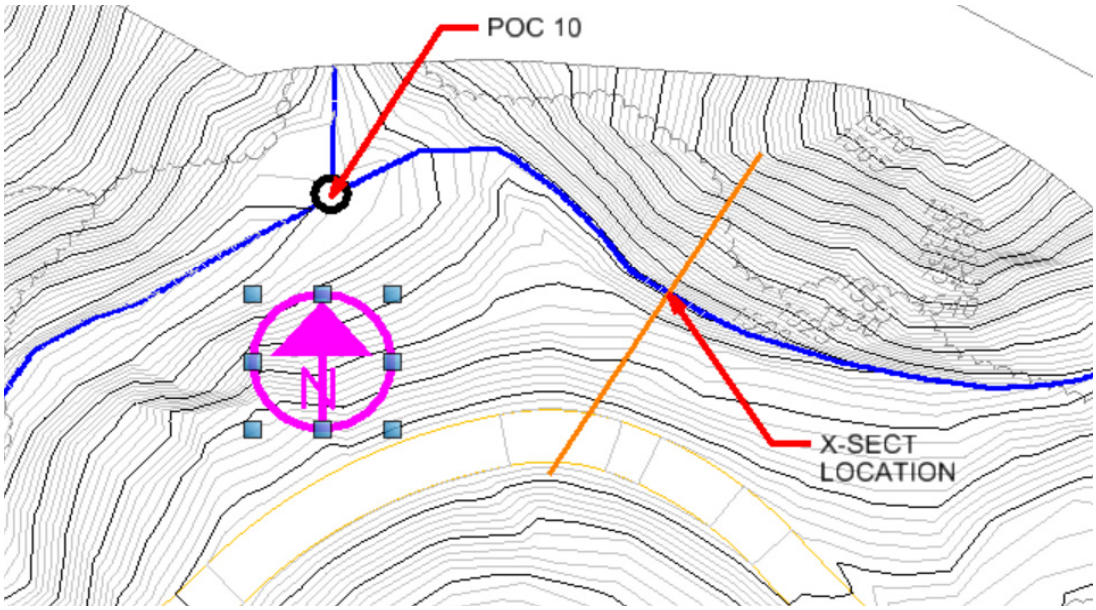
| Point | Station | Ground |
|---|---|---|
| 1 | -15.17 | 1531.26 |
| 2 | -3.32 | 1519.62 |
| 3 | 0 | 1514 |
| 4 | 6.52 | 1520.59 |
| 5 | 20.84 | 1526.33 |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **3.3** | **ft** | *(NORMAL DEPTH)* |
| Area= | 8.8 | $ft^2$ | |
| $P_W$ | 8.6 | ft | |
| R | 1.027 | ft | |
| **Velocity=** | **12.5** | **ft/s** | |
| $S_F$ | 0.109 | ft/ft | |



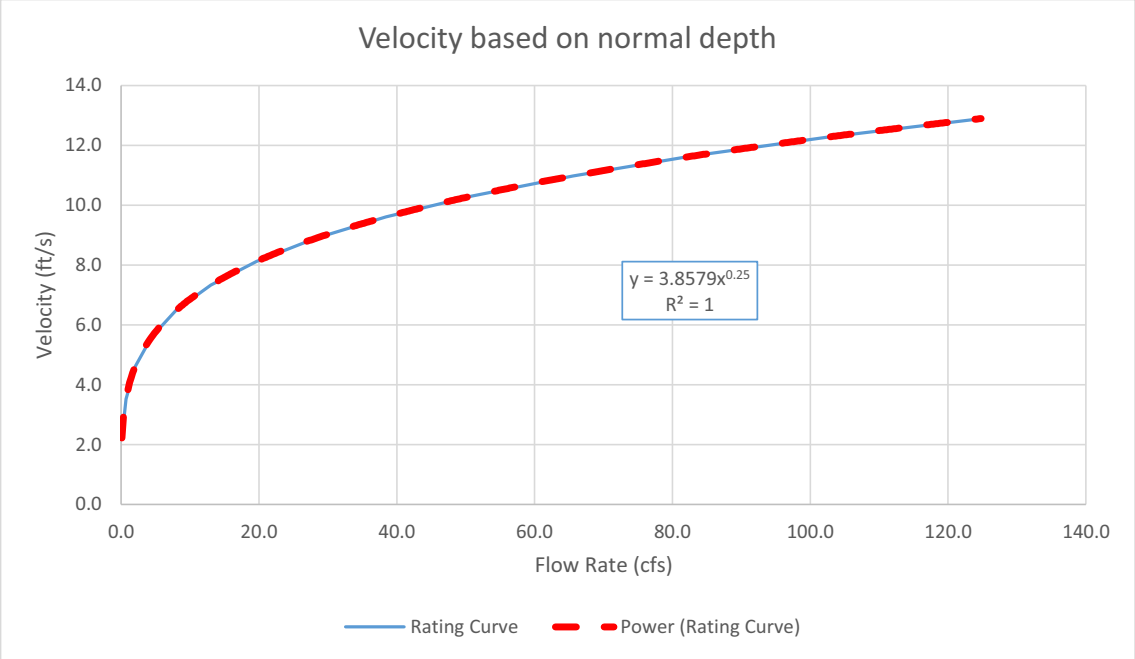



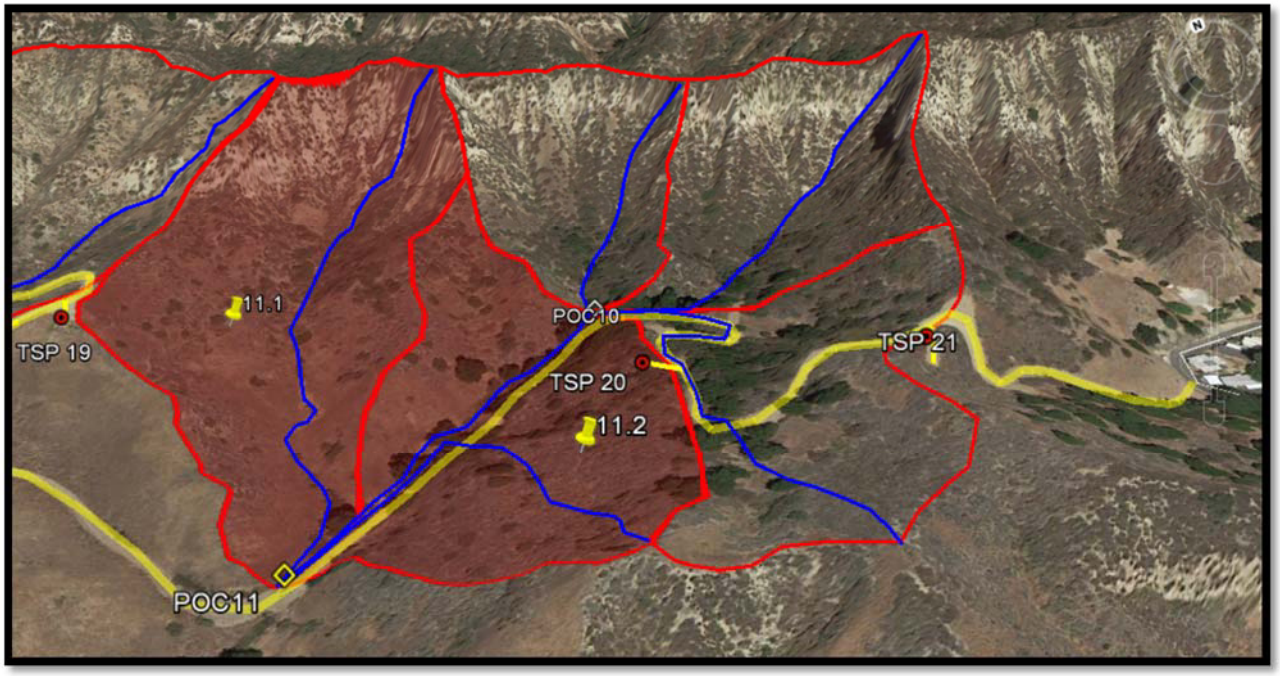
# SoCal Gas Project

## POC 10

### Stream Station = 10+00



# POC #11




## LOCATION

POC #11 receives flow from POC #10, and two other directly tributary areas, designated as areas 11.1 and 11.2. There is an existing 42-inch culvert at POC #11, however in the 50-year and 100-year events, the access road is likely to overtop, potentially damaging the access road.

*Approximate Latitude:* 34°21'9.53"N

*Approximate Longitude:* *118°32'40.63"W*

## DRAINAGE AREA INFORMATION

| Sub-drainage | Area (acres) | Length (ft) | Effective Slope (%) |
|---|---|---|---|
| **Routed POC 10** | 13 | 677 (routed) | 5.95% |
| **11.1** | 7.8 | 1104 | 18.9% |
| **11.2** | 6.3 | 780 | 17.9% |
| **POC11, including POC10** | **27.1** | | |

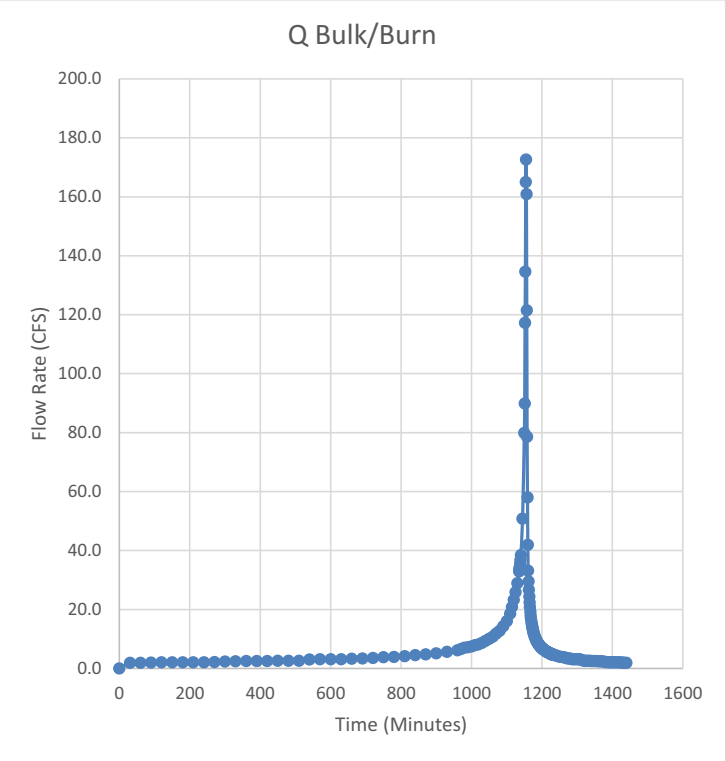
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 11

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

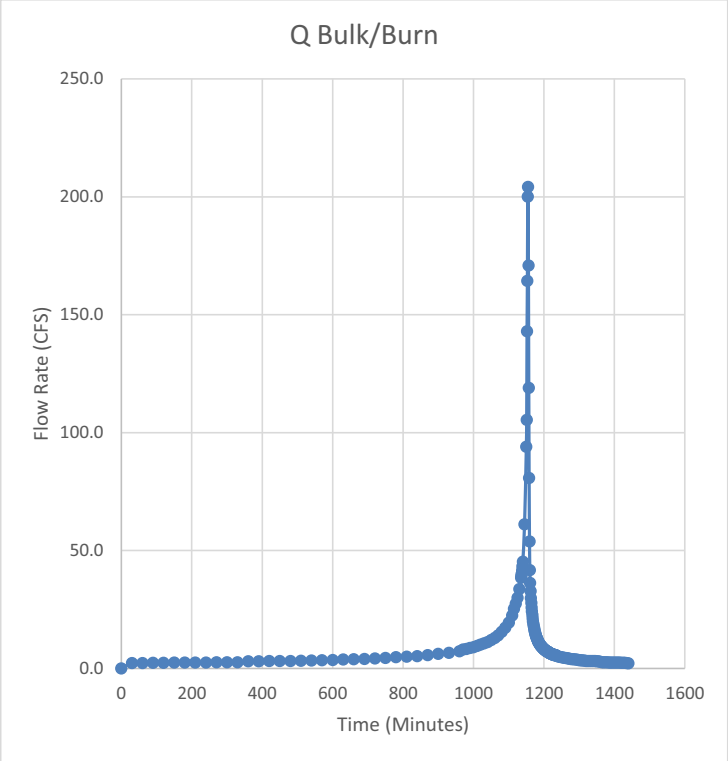
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 18.6 | 1185 | 9.4 | 1232 | 4.6 |
| 30 | 1.9 | 1115 | 20.8 | 1186 | 9.0 | 1233 | 4.6 |
| 60 | 1.9 | 1120 | 23.3 | 1187 | 8.8 | 1234 | 4.6 |
| 90 | 2.0 | 1125 | 25.9 | 1188 | 8.8 | 1235 | 4.5 |
| 120 | 2.1 | 1130 | 28.9 | 1189 | 8.5 | 1240 | 4.4 |
| 150 | 2.1 | 1135 | 32.9 | 1190 | 8.3 | 1245 | 4.2 |
| 180 | 2.1 | 1136 | 33.7 | 1191 | 8.0 | 1250 | 4.0 |
| 210 | 2.1 | 1137 | 34.3 | 1192 | 8.0 | 1255 | 3.9 |
| 240 | 2.1 | 1138 | 35.4 | 1193 | 7.9 | 1260 | 3.8 |
| 270 | 2.2 | 1139 | 36.7 | 1194 | 7.6 | 1265 | 3.7 |
| 300 | 2.3 | 1140 | 38.5 | 1195 | 7.5 | 1270 | 3.5 |
| 330 | 2.4 | 1145 | 50.8 | 1196 | 7.4 | 1275 | 3.4 |
| 360 | 2.5 | 1150 | 79.9 | 1197 | 7.3 | 1280 | 3.4 |
| 390 | 2.5 | 1151 | 89.9 | 1198 | 7.0 | 1285 | 3.1 |
| 420 | 2.5 | 1152 | 117.2 | 1199 | 7.0 | 1290 | 3.1 |
| 450 | 2.6 | 1153 | 134.6 | 1200 | 7.0 | 1295 | 3.1 |
| 480 | 2.6 | 1154 | 165.0 | 1201 | 6.8 | 1300 | 3.1 |
| 510 | 2.6 | 1155 | 172.6 | 1202 | 6.6 | 1305 | 3.1 |
| 540 | 3.0 | 1156 | 160.9 | 1203 | 6.6 | 1310 | 3.0 |
| 570 | 3.1 | 1157 | 121.5 | 1204 | 6.5 | 1315 | 2.8 |
| 600 | 3.1 | 1158 | 78.6 | 1205 | 6.4 | 1320 | 2.6 |
| 630 | 3.1 | 1159 | 58.0 | 1206 | 6.3 | 1325 | 2.6 |
| 660 | 3.3 | 1160 | 41.9 | 1207 | 6.2 | 1330 | 2.6 |
| 690 | 3.4 | 1161 | 33.2 | 1208 | 6.2 | 1335 | 2.6 |
| 720 | 3.6 | 1162 | 29.5 | 1209 | 6.1 | 1340 | 2.5 |
| 750 | 3.8 | 1163 | 26.7 | 1210 | 6.0 | 1345 | 2.5 |
| 780 | 3.9 | 1164 | 24.4 | 1211 | 5.8 | 1350 | 2.5 |
| 810 | 4.2 | 1165 | 22.4 | 1212 | 5.8 | 1355 | 2.5 |
| 840 | 4.5 | 1166 | 20.8 | 1213 | 5.6 | 1360 | 2.4 |
| 870 | 4.8 | 1167 | 19.2 | 1214 | 5.6 | 1365 | 2.4 |
| 900 | 5.1 | 1168 | 17.9 | 1215 | 5.6 | 1370 | 2.4 |
| 930 | 5.6 | 1169 | 16.9 | 1216 | 5.6 | 1375 | 2.3 |
| 960 | 6.2 | 1170 | 16.0 | 1217 | 5.5 | 1380 | 2.2 |
| 970 | 6.6 | 1171 | 15.2 | 1218 | 5.5 | 1385 | 2.2 |
| 980 | 7.0 | 1172 | 14.4 | 1219 | 5.4 | 1390 | 2.1 |
| 990 | 7.2 | 1173 | 13.8 | 1220 | 5.3 | 1395 | 2.1 |
| 1000 | 7.5 | 1174 | 13.3 | 1221 | 5.2 | 1400 | 2.1 |
| 1010 | 7.9 | 1175 | 12.7 | 1222 | 5.2 | 1405 | 2.1 |
| 1020 | 8.2 | 1176 | 12.2 | 1223 | 5.1 | 1410 | 2.1 |
| 1030 | 8.7 | 1177 | 11.8 | 1224 | 5.1 | 1415 | 2.1 |
| 1040 | 9.4 | 1178 | 11.3 | 1225 | 4.9 | 1420 | 2.1 |
| 1050 | 10.1 | 1179 | 11.1 | 1226 | 4.9 | 1425 | 2.0 |
| 1060 | 10.8 | 1180 | 10.6 | 1227 | 4.9 | 1430 | 2.0 |
| 1070 | 11.8 | 1181 | 10.4 | 1228 | 4.9 | 1435 | 1.9 |
| 1080 | 12.8 | 1182 | 10.2 | 1229 | 4.9 | 1440 | 1.9 |
| 1090 | 14.3 | 1183 | 9.8 | 1230 | 4.8 | | |
| 1100 | 16.1 | 1184 | 9.5 | 1231 | 4.8 | | |



# 100-Year Summary for POC: 11

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 22.5 | 1185 | 11.1 | 1232 | 5.6 |
| 30 | 2.3 | 1115 | 25.3 | 1186 | 10.9 | 1233 | 5.6 |
| 60 | 2.3 | 1120 | 27.5 | 1187 | 10.5 | 1234 | 5.5 |
| 90 | 2.4 | 1125 | 30.0 | 1188 | 10.3 | 1235 | 5.5 |
| 120 | 2.4 | 1130 | 33.6 | 1189 | 10.1 | 1240 | 5.1 |
| 150 | 2.5 | 1135 | 38.4 | 1190 | 9.8 | 1245 | 4.9 |
| 180 | 2.5 | 1136 | 39.2 | 1191 | 9.7 | 1250 | 4.8 |
| 210 | 2.5 | 1137 | 40.1 | 1192 | 9.4 | 1255 | 4.6 |
| 240 | 2.5 | 1138 | 41.6 | 1193 | 9.3 | 1260 | 4.5 |
| 270 | 2.6 | 1139 | 43.3 | 1194 | 9.2 | 1265 | 4.3 |
| 300 | 2.6 | 1140 | 45.3 | 1195 | 8.9 | 1270 | 4.2 |
| 330 | 2.6 | 1145 | 61.1 | 1196 | 8.8 | 1275 | 4.0 |
| 360 | 3.0 | 1150 | 94.0 | 1197 | 8.7 | 1280 | 3.9 |
| 390 | 3.0 | 1151 | 105.4 | 1198 | 8.5 | 1285 | 3.9 |
| 420 | 3.1 | 1152 | 143.0 | 1199 | 8.4 | 1290 | 3.8 |
| 450 | 3.1 | 1153 | 164.3 | 1200 | 8.1 | 1295 | 3.7 |
| 480 | 3.1 | 1154 | 200.1 | 1201 | 8.0 | 1300 | 3.5 |
| 510 | 3.2 | 1155 | 204.2 | 1202 | 8.0 | 1305 | 3.5 |
| 540 | 3.4 | 1156 | 170.9 | 1203 | 7.9 | 1310 | 3.4 |
| 570 | 3.5 | 1157 | 119.0 | 1204 | 7.6 | 1315 | 3.4 |
| 600 | 3.6 | 1158 | 80.8 | 1205 | 7.6 | 1320 | 3.1 |
| 630 | 3.8 | 1159 | 53.8 | 1206 | 7.4 | 1325 | 3.1 |
| 660 | 3.9 | 1160 | 41.7 | 1207 | 7.4 | 1330 | 3.1 |
| 690 | 4.0 | 1161 | 36.3 | 1208 | 7.3 | 1335 | 3.1 |
| 720 | 4.2 | 1162 | 32.8 | 1209 | 7.2 | 1340 | 3.1 |
| 750 | 4.5 | 1163 | 29.9 | 1210 | 7.0 | 1345 | 3.1 |
| 780 | 4.8 | 1164 | 27.8 | 1211 | 7.0 | 1350 | 3.0 |
| 810 | 5.0 | 1165 | 25.8 | 1212 | 7.0 | 1355 | 3.0 |
| 840 | 5.2 | 1166 | 24.2 | 1213 | 6.9 | 1360 | 2.8 |
| 870 | 5.6 | 1167 | 22.7 | 1214 | 6.6 | 1365 | 2.6 |
| 900 | 6.2 | 1168 | 21.3 | 1215 | 6.6 | 1370 | 2.6 |
| 930 | 6.6 | 1169 | 20.0 | 1216 | 6.6 | 1375 | 2.6 |
| 960 | 7.3 | 1170 | 18.9 | 1217 | 6.5 | 1380 | 2.6 |
| 970 | 8.0 | 1171 | 18.0 | 1218 | 6.4 | 1385 | 2.5 |
| 980 | 8.2 | 1172 | 17.2 | 1219 | 6.3 | 1390 | 2.5 |
| 990 | 8.7 | 1173 | 16.4 | 1220 | 6.2 | 1395 | 2.5 |
| 1000 | 9.0 | 1174 | 15.7 | 1221 | 6.2 | 1400 | 2.5 |
| 1010 | 9.5 | 1175 | 15.1 | 1222 | 6.2 | 1405 | 2.5 |
| 1020 | 10.1 | 1176 | 14.5 | 1223 | 6.1 | 1410 | 2.5 |
| 1030 | 10.6 | 1177 | 14.1 | 1224 | 6.1 | 1415 | 2.5 |
| 1040 | 11.2 | 1178 | 13.5 | 1225 | 6.1 | 1420 | 2.4 |
| 1050 | 12.0 | 1179 | 13.1 | 1226 | 5.8 | 1425 | 2.4 |
| 1060 | 12.9 | 1180 | 12.7 | 1227 | 5.8 | 1430 | 2.4 |
| 1070 | 14.0 | 1181 | 12.4 | 1228 | 5.7 | 1435 | 2.3 |
| 1080 | 15.5 | 1182 | 12.0 | 1229 | 5.6 | 1440 | 2.2 |
| 1090 | 17.3 | 1183 | 11.7 | 1230 | 5.6 | | |
| 1100 | 19.4 | 1184 | 11.2 | 1231 | 5.6 | | |



# SoCal Gas Project

## POC 11

**Stream Station = 10+96.42**

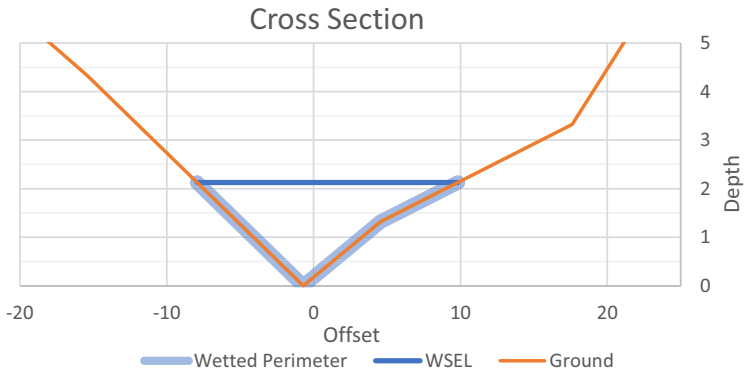
## INPUT

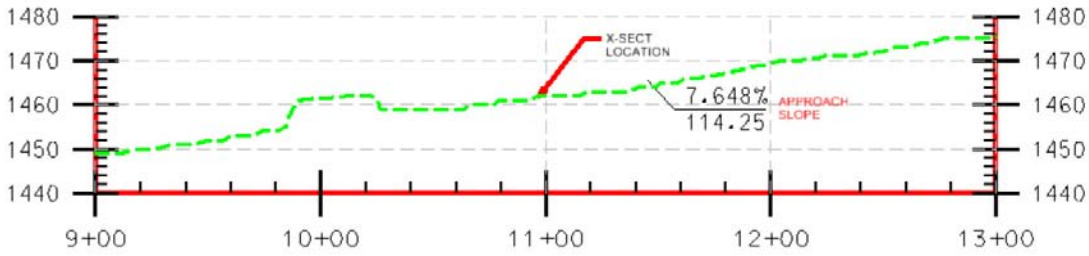
| | | |
|---|---|---|
| $Q_{50}$ | 170.0 | cfs |
| $Q_{100}$ | 200.0 | cfs |
| **$Q_{DESIGN}$** | **200.0** | **cfs** |
| | | |
| N | 0.035 | |
| So | 0.076 | ft/ft |

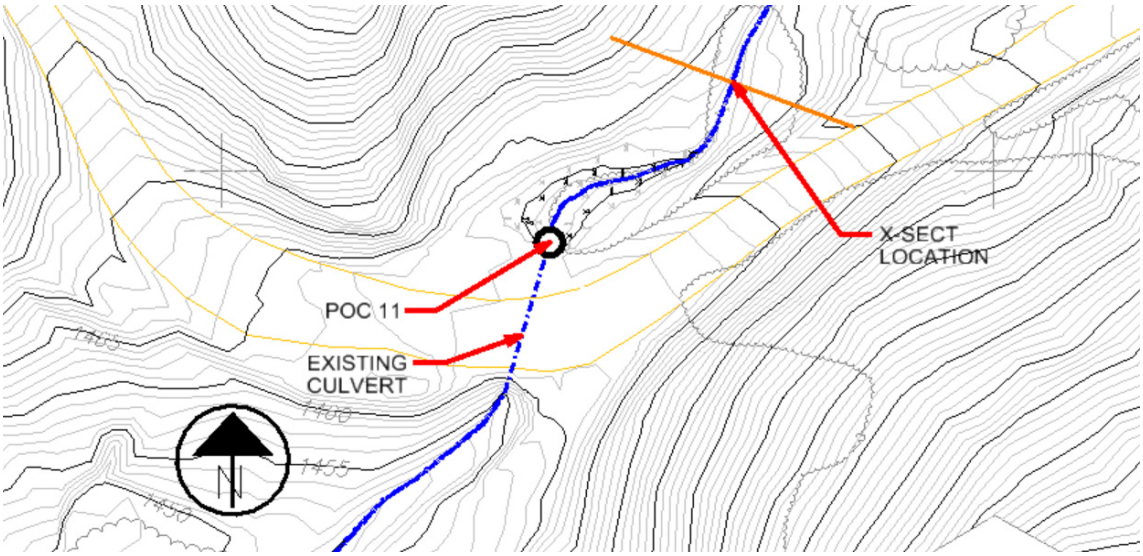
| Point | Station | Ground |
|---|---|---|
| 1 | -31.24 | 1470.19 |
| 2 | -15.38 | 1466 |
| 3 | -0.7 | 1461.68 |
| 4 | 4.56 | 1463 |
| 5 | 17.62 | 1465 |
| 6 | 30.03 | 1470.95 |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **2.1** | **ft** | *(NORMAL DEPTH)* |
| Area= | 17.5 | $ft^2$ | |
| $P_W$ | 18.3 | ft | |
| R | 0.958 | ft | |
| **Velocity=** | **11.4** | **ft/s** | |
| $S_F$ | 0.076 | ft/ft | |



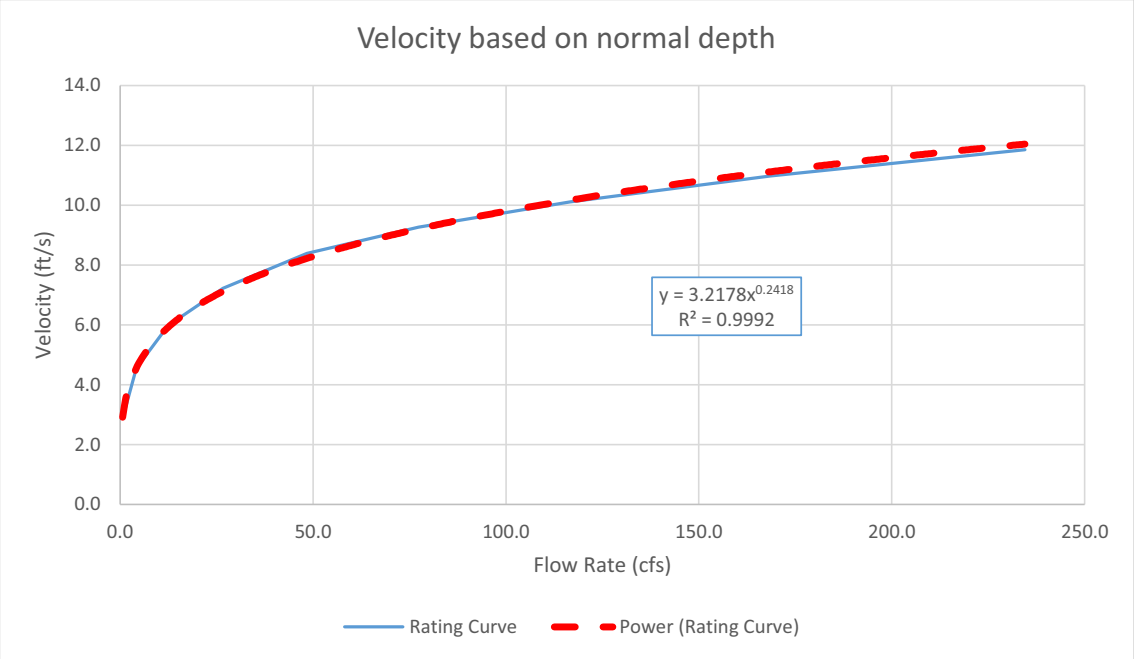



# SoCal Gas Project

## POC 11

### Stream Station = 10+96.42



# Culvert @ POC11 (Analysis of Existing Culvert)

## Physical Data

| | | |
|---|---|---|
| Q50 | 173.3 | cfs |
| Q100 | 204.2 | cfs |
| Length | 43 | feet |
| Diameter | 42 | inches |
| Cover over Top of Pipe (U/S Side) | 1 | feet |
| Cover over Top of Pipe (D/S Side) | 3 | feet |
| Road Elev (U/S Side) | 1462.00 | feet |
| Road Elev (D/S Side) | 1461.00 | feet |
| Slope | 0.07 | ft/ft |
| N-value | 0.023 | (per LAFCD) |

## Modeling Parameters (PER FHWA HDS-5 Methods)

| Type | CMP, Projecting Thin Wall | |
|---|---|---|
| K | 0.034 | |
| $K_S$ | -0.5 | |
| M | 1.5 | |
| c | 0.0553 | |
| Y | 0.54 | |
| Ke | 0.9 | FHWA Table C.2 |

Orifice Formula

$$\frac{HW_i}{D} = c\left[\frac{K_u Q}{AD^{0.5}}\right]^2 + Y + K_s S$$

Weir Formula

$$\frac{HW_i}{D} = \frac{H_c}{D} + K\left[\frac{K_u Q}{AD^{0.5}}\right]^M + K_s S$$

Friction Formula

$$HW_o + LS + \frac{V_u^2}{2g} = TW + \frac{V_d^2}{2g} + H_L$$

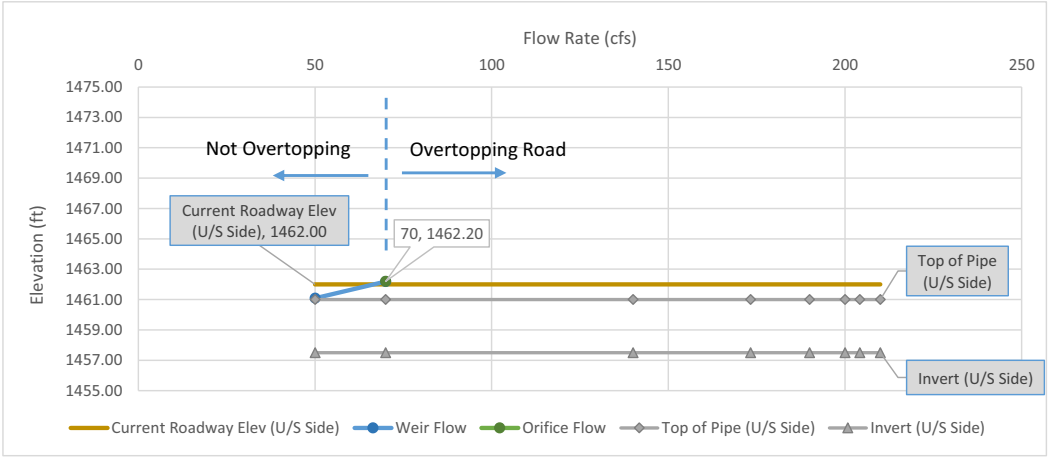
## Results

Findings

**The Existing 42" Culvert will only pass approximately 70 cfs before overtopping the road.**

Flow rates and corresponding WSEL (Upstream side of road)

| | 50 | 70 | 140 | 173.3 | 190 | 200 | 204.2 | 210 |
|---|---|---|---|---|---|---|---|---|
| **d/D (Normal Depth)** | 0.39 | 0.47 | 0.76 | 1 | 1 | 1 | 1 | 1 |
| **Area** | 3.47 | 4.44 | 7.85 | 9.62 | 9.62 | 9.62 | 9.62 | 9.62 |
| **Hyd Radius** | 0.74 | 0.84 | 1.06 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| **Velocity** | 14.4 | 15.8 | 17.8 | 18.0 | 19.7 | 20.8 | 21.2 | 21.8 |
| **Current Roadway Elev (U/S Side)** | 1462.00 | 1462 | 1462 | 1462 | 1462 | 1462 | 1462 | 1462 |
| **Top of Pipe (U/S Side)** | 1461.00 | 1461 | 1461 | 1461 | 1461 | 1461 | 1461 | 1461 |
| **Invert (U/S Side)** | 1457.5 | 1457.5 | 1457.5 | 1457.5 | 1457.5 | 1457.5 | 1457.5 | 1457.5 |
| **Weir Flow** | 1461.09 | 1462.19 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| **Orifice Flow** | #N/A | 1462.20 | 1470.98 | 1477.2099 | 1480.8344 | 1483.1643 | 1484.1785 | 1485.6137 |
| **Friction Control** | #N/A | #N/A | #N/A | 1475.1 | 1477.8 | 1479.6 | 1480.3 | 1481.4 |



# Culvert @ POC11 (Design of new Culvert - $Q_{50}$)

## Physical Data

| | | |
|---|---|---|
| Q50 | 173.3 | cfs |
| Q100 | 204.2 | cfs |
| Qdesign | 86.65 | cfs (assume 2 CMP) |
| Length | 43 | feet |
| Road Elev (U/S Side) | 1462.00 | feet |
| Road Elev (D/S Side) | 1461.00 | feet |
| Cover over Top of Pipe (U/S Side) | 1 | feet |
| Cover over Top of Pipe (D/S Side) | 3 | feet |
| Slope | 0.07 | ft/ft |
| N-value | 0.023 | (per LAFCD) |
| Friction Flow Below | 34.2 | in (diameter) |

## Modeling Parameters (PER FHWA HDS-5 Methods)

| | | |
|---|---|---|
| Type | CMP, Projecting Thin Wall | |
| K | 0.034 | |
| $K_S$ | -0.5 | |
| M | 1.5 | |
| c | 0.0553 | |
| Y | 0.54 | |
| Ke | 0.9 | FHWA Table C.2 |

Orifice Formula

$$\frac{HW_i}{D} = c\left[\frac{K_u Q}{AD^{0.5}}\right]^2 + Y + K_s S$$

Weir Formula

$$\frac{HW_i}{D} = \frac{H_c}{D} + K\left[\frac{K_u Q}{AD^{0.5}}\right]^M + K_s S$$

Friction Formula

$$HW_o + LS + \frac{V_u^2}{2g} = TW + \frac{V_d^2}{2g} + H_L$$

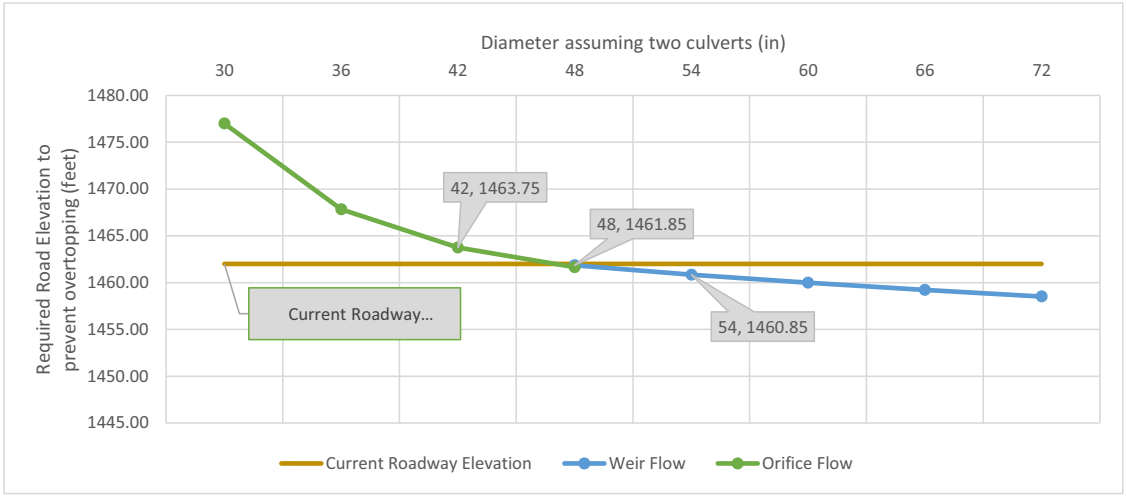
## Preliminary Results

Findings

Approximately two **48-inch CMP pipes would be required** to pass $Q_{50}$ without overtopping the existing road elevation.

**Pipe Diameters and corresponding WSEL (Upstream side of road)**

| Q100= 86.65 cfs | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
|---|---|---|---|---|---|---|---|---|
| **Current Roadway Elevation** | 1462.00 | 1462 | 1462 | 1462 | 1462 | 1462 | 1462 | 1462 |
| **d/D (Normal Depth)** | 1 | 0.72 | 0.54 | 0.44 | 0.37 | 0.32 | 0.28 | 0.25 |
| **Area** | 4.91 | 5.45 | 5.30 | 5.33 | 5.35 | 5.42 | 5.45 | 5.53 |
| **Hyd Radius** | 0.63 | 0.90 | 0.92 | 0.92 | 0.91 | 0.90 | 0.89 | 0.88 |
| **Velocity** | 17.7 | 15.9 | 16.3 | 16.3 | 16.2 | 16.0 | 15.9 | 15.7 |
| **Weir Flow** | #N/A | #N/A | #N/A | 1461.85 | 1460.85 | 1459.99 | 1459.22 | 1458.51 |
| **Orifice Flow** | 1476.99 | 1467.83 | 1463.75 | 1461.65 | #N/A | #N/A | #N/A | #N/A |
| **Friction Control** | 1475.7 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |



# Culvert @ POC11 (Design of new Culvert - $Q_{100}$)

## Physical Data

| | | |
|---|---|---|
| Q50 | 173.3 | cfs |
| Q100 | 204.2 | cfs |
| Qdesign | 102.1 | cfs (assume 2 CMP) |
| Length | 43 | feet |
| Road Elev (U/S Side) | 1462.00 | feet |
| Road Elev (D/S Side) | 1461.00 | feet |
| Cover over Top of Pipe (U/S Side) | 1 | feet |
| Cover over Top of Pipe (D/S Side) | 3 | feet |
| Slope | 0.07 | ft/ft |
| N-value | 0.023 | (per LAFCD) |
| Friction Flow Below | 36.4 | in (diameter) |

## Modeling Parameters (PER FHWA HDS-5 Methods)

| | | |
|---|---|---|
| Type | CMP, Projecting Thin Wall | |
| K | 0.034 | |
| $K_S$ | -0.5 | |
| M | 1.5 | |
| c | 0.0553 | |
| Y | 0.54 | |
| Ke | 0.9 | FHWA Table C.2 |

Orifice Formula

$$\frac{HW_i}{D} = c\left[\frac{K_u Q}{AD^{0.5}}\right]^2 + Y + K_s S$$

Weir Formula

$$\frac{HW_i}{D} = \frac{H_c}{D} + K\left[\frac{K_u Q}{AD^{0.5}}\right]^M + K_s S$$

Friction Formula

$$HW_o + LS + \frac{V_u^2}{2g} = TW + \frac{V_d^2}{2g} + H_L$$

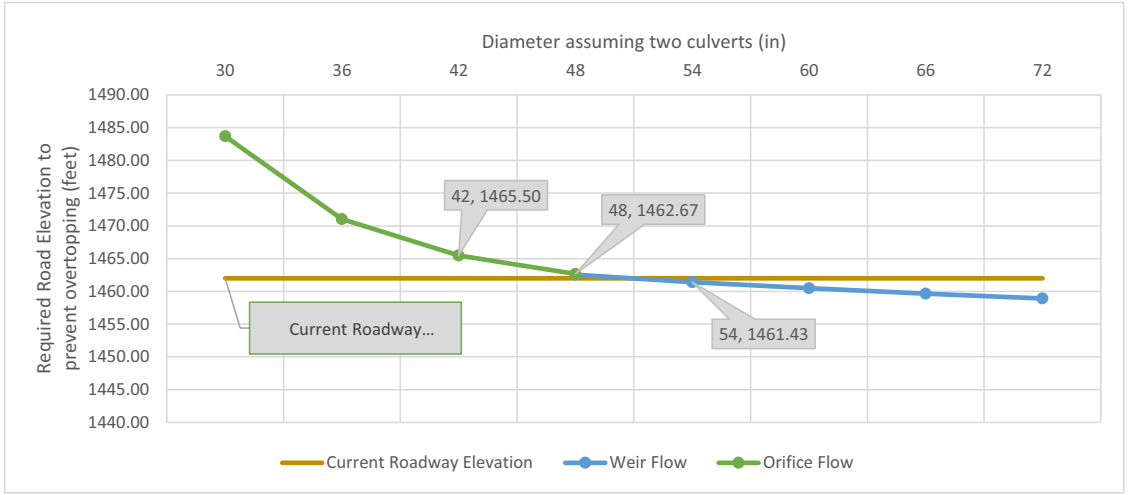
## Preliminary Results

Findings

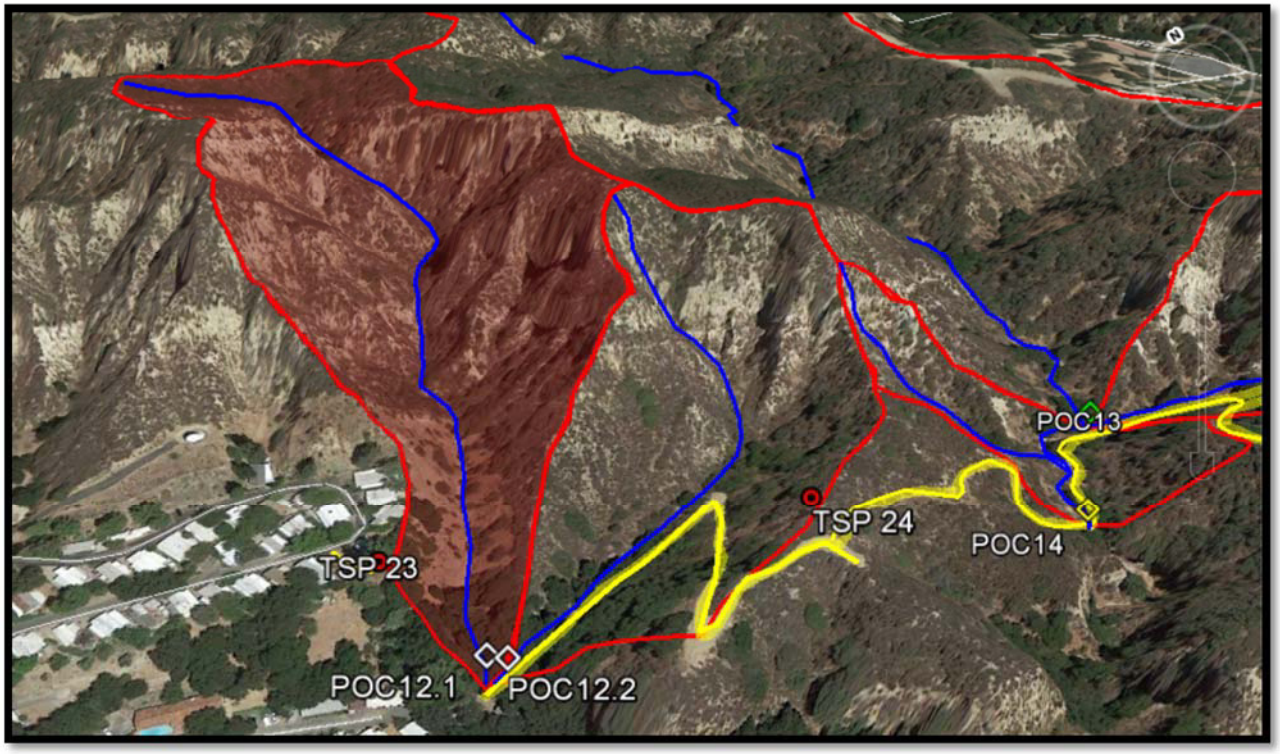
Approximately two **54-inch CMP pipes would be required** to pass the $Q_{100}$ without overtopping the existing road elevation. **If the roadway can be raised approximately 0.67 feet** such that the minimum elevation of the road in this area is of 1462.67, **then two 48-inch CMP culverts** can be used.

**Pipe Diameters and corresponding WSEL (Upstream side of road)**

| Q100= 102.1 cfs | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
|---|---|---|---|---|---|---|---|---|
| **Current Roadway Elevation** | 1462.00 | 1462 | 1462 | 1462 | 1462 | 1462 | 1462 | 1462 |
| **d/D (Normal Depth)** | 1 | 0.84 | 0.6 | 0.48 | 0.4 | 0.34 | 0.3 | 0.27 |
| **Area** | 4.91 | 6.34 | 6.03 | 5.96 | 5.94 | 5.89 | 5.99 | 6.16 |
| **Hyd Radius** | 0.63 | 0.91 | 0.97 | 0.97 | 0.96 | 0.95 | 0.94 | 0.94 |
| **Velocity** | 20.8 | 16.1 | 16.9 | 17.1 | 17.2 | 17.3 | 17.0 | 16.6 |
| **Weir Flow** | #N/A | #N/A | #N/A | 1462.56 | 1461.43 | 1460.49 | 1459.67 | 1458.92 |
| **Orifice Flow** | 1483.69 | 1471.05 | 1465.50 | 1462.67 | #N/A | #N/A | #N/A | #N/A |
| **Friction Control** | 1481.6 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |



# POC #12.1




## LOCATION

POC 12.1 crosses the maintenance access road that begins at the east end of a Mobile Home Park, leading to TSP 24. This area drains underneath the access road through an existing culvert. POC 12.1 and POC 12.2 were initially believed to confluence upstream of the maintenance access road, however since these two drainages cross under the road through separate culverts, it was determined these should be analyzed separately for this study, as POC 12.1 and POC 12.2.

*Approximate Latitude:* 34°21'2.83"N

*Approximate Longitude:* *118°32'17.02"W*

## DRAINAGE AREA INFORMATION

*Area:* 15 acres

*Flow Length:* 1836 feet

*Effective Slope:* 17.1%

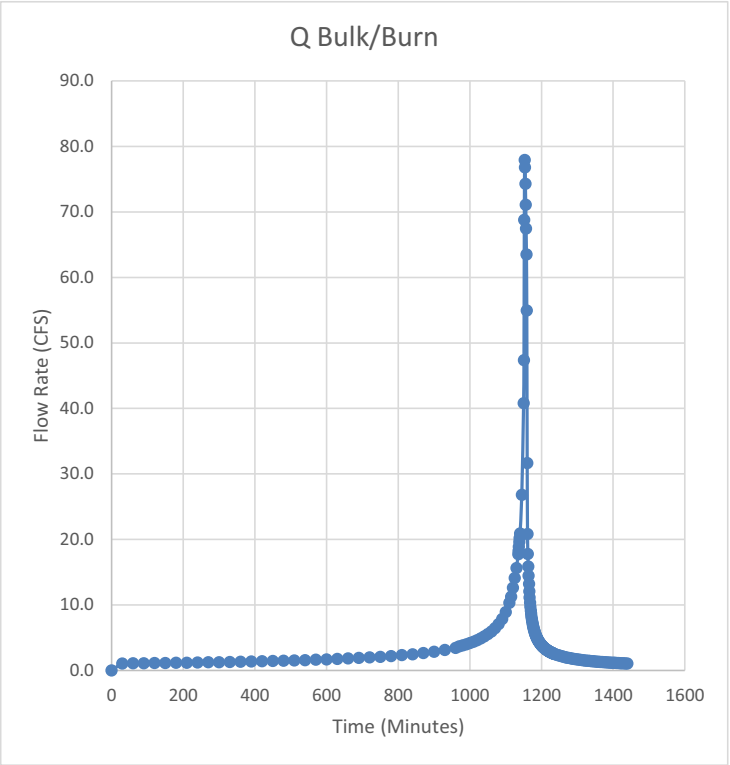
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 12.1

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

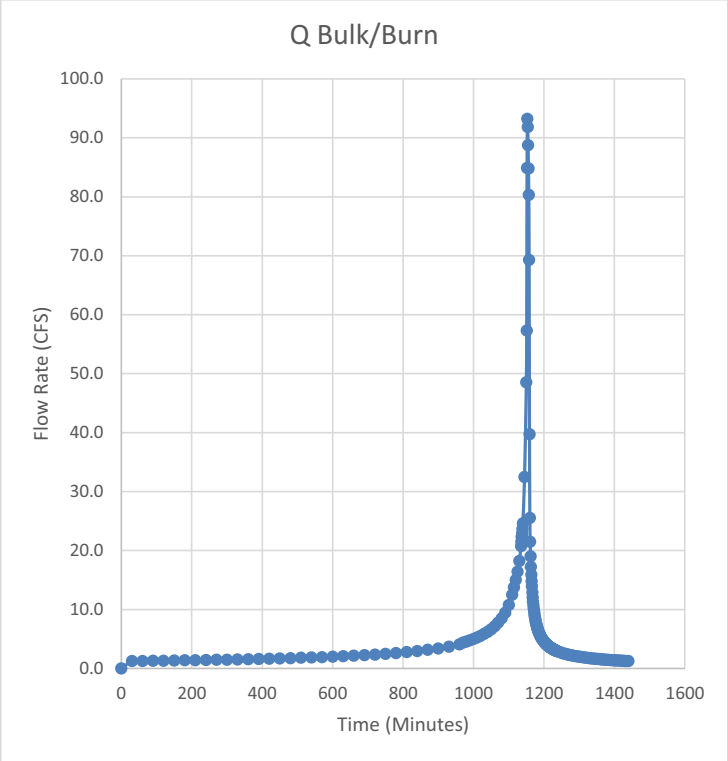
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 10.3 | 1185 | 5.2 | 1232 | 2.6 |
| 30 | 1.1 | 1115 | 11.2 | 1186 | 5.1 | 1233 | 2.6 |
| 60 | 1.1 | 1120 | 12.6 | 1187 | 5.0 | 1234 | 2.6 |
| 90 | 1.1 | 1125 | 14.1 | 1188 | 4.9 | 1235 | 2.5 |
| 120 | 1.1 | 1130 | 15.6 | 1189 | 4.8 | 1240 | 2.4 |
| 150 | 1.1 | 1135 | 17.7 | 1190 | 4.6 | 1245 | 2.3 |
| 180 | 1.2 | 1136 | 18.3 | 1191 | 4.5 | 1250 | 2.3 |
| 210 | 1.2 | 1137 | 18.9 | 1192 | 4.5 | 1255 | 2.2 |
| 240 | 1.2 | 1138 | 19.6 | 1193 | 4.4 | 1260 | 2.1 |
| 270 | 1.2 | 1139 | 20.2 | 1194 | 4.3 | 1265 | 2.0 |
| 300 | 1.3 | 1140 | 20.9 | 1195 | 4.2 | 1270 | 2.0 |
| 330 | 1.3 | 1145 | 26.8 | 1196 | 4.1 | 1275 | 1.9 |
| 360 | 1.3 | 1150 | 40.8 | 1197 | 4.1 | 1280 | 1.9 |
| 390 | 1.4 | 1151 | 47.4 | 1198 | 4.0 | 1285 | 1.8 |
| 420 | 1.4 | 1152 | 68.8 | 1199 | 3.9 | 1290 | 1.8 |
| 450 | 1.4 | 1153 | 77.9 | 1200 | 3.8 | 1295 | 1.7 |
| 480 | 1.5 | 1154 | 76.8 | 1201 | 3.8 | 1300 | 1.7 |
| 510 | 1.5 | 1155 | 74.3 | 1202 | 3.7 | 1305 | 1.6 |
| 540 | 1.6 | 1156 | 71.1 | 1203 | 3.7 | 1310 | 1.6 |
| 570 | 1.6 | 1157 | 67.4 | 1204 | 3.6 | 1315 | 1.6 |
| 600 | 1.7 | 1158 | 63.5 | 1205 | 3.6 | 1320 | 1.5 |
| 630 | 1.8 | 1159 | 54.9 | 1206 | 3.5 | 1325 | 1.5 |
| 660 | 1.8 | 1160 | 31.7 | 1207 | 3.5 | 1330 | 1.5 |
| 690 | 1.9 | 1161 | 20.8 | 1208 | 3.4 | 1335 | 1.4 |
| 720 | 2.0 | 1162 | 17.8 | 1209 | 3.4 | 1340 | 1.4 |
| 750 | 2.1 | 1163 | 15.9 | 1210 | 3.3 | 1345 | 1.4 |
| 780 | 2.2 | 1164 | 14.5 | 1211 | 3.3 | 1350 | 1.4 |
| 810 | 2.3 | 1165 | 13.2 | 1212 | 3.2 | 1355 | 1.3 |
| 840 | 2.5 | 1166 | 12.1 | 1213 | 3.2 | 1360 | 1.3 |
| 870 | 2.6 | 1167 | 11.1 | 1214 | 3.2 | 1365 | 1.3 |
| 900 | 2.9 | 1168 | 10.4 | 1215 | 3.1 | 1370 | 1.3 |
| 930 | 3.1 | 1169 | 9.7 | 1216 | 3.1 | 1375 | 1.3 |
| 960 | 3.4 | 1170 | 9.2 | 1217 | 3.0 | 1380 | 1.2 |
| 970 | 3.7 | 1171 | 8.7 | 1218 | 3.0 | 1385 | 1.2 |
| 980 | 3.8 | 1172 | 8.2 | 1219 | 3.0 | 1390 | 1.2 |
| 990 | 4.0 | 1173 | 7.9 | 1220 | 2.9 | 1395 | 1.2 |
| 1000 | 4.2 | 1174 | 7.5 | 1221 | 2.9 | 1400 | 1.2 |
| 1010 | 4.4 | 1175 | 7.2 | 1222 | 2.9 | 1405 | 1.2 |
| 1020 | 4.6 | 1176 | 6.9 | 1223 | 2.8 | 1410 | 1.1 |
| 1030 | 4.9 | 1177 | 6.7 | 1224 | 2.8 | 1415 | 1.1 |
| 1040 | 5.2 | 1178 | 6.4 | 1225 | 2.8 | 1420 | 1.1 |
| 1050 | 5.5 | 1179 | 6.2 | 1226 | 2.8 | 1425 | 1.1 |
| 1060 | 6.0 | 1180 | 6.0 | 1227 | 2.7 | 1430 | 1.1 |
| 1070 | 6.5 | 1181 | 5.8 | 1228 | 2.7 | 1435 | 1.1 |
| 1080 | 7.1 | 1182 | 5.7 | 1229 | 2.7 | 1440 | 1.1 |
| 1090 | 7.9 | 1183 | 5.5 | 1230 | 2.7 | | |
| 1100 | 8.9 | 1184 | 5.4 | 1231 | 2.6 | | |



# 100-Year Summary for POC: 12.1

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 12.5 | 1185 | 6.2 | 1232 | 3.1 |
| 30 | 1.2 | 1115 | 13.8 | 1186 | 6.0 | 1233 | 3.1 |
| 60 | 1.3 | 1120 | 15.0 | 1187 | 5.9 | 1234 | 3.0 |
| 90 | 1.3 | 1125 | 16.4 | 1188 | 5.8 | 1235 | 3.0 |
| 120 | 1.3 | 1130 | 18.2 | 1189 | 5.6 | 1240 | 2.9 |
| 150 | 1.3 | 1135 | 20.8 | 1190 | 5.5 | 1245 | 2.8 |
| 180 | 1.4 | 1136 | 21.5 | 1191 | 5.4 | 1250 | 2.7 |
| 210 | 1.4 | 1137 | 22.3 | 1192 | 5.3 | 1255 | 2.6 |
| 240 | 1.4 | 1138 | 22.9 | 1193 | 5.2 | 1260 | 2.5 |
| 270 | 1.5 | 1139 | 23.7 | 1194 | 5.1 | 1265 | 2.4 |
| 300 | 1.5 | 1140 | 24.6 | 1195 | 5.0 | 1270 | 2.3 |
| 330 | 1.5 | 1145 | 32.5 | 1196 | 4.9 | 1275 | 2.3 |
| 360 | 1.6 | 1150 | 48.5 | 1197 | 4.8 | 1280 | 2.2 |
| 390 | 1.6 | 1151 | 57.3 | 1198 | 4.7 | 1285 | 2.1 |
| 420 | 1.7 | 1152 | 84.9 | 1199 | 4.6 | 1290 | 2.1 |
| 450 | 1.7 | 1153 | 93.2 | 1200 | 4.6 | 1295 | 2.0 |
| 480 | 1.8 | 1154 | 91.8 | 1201 | 4.5 | 1300 | 2.0 |
| 510 | 1.8 | 1155 | 88.8 | 1202 | 4.4 | 1305 | 1.9 |
| 540 | 1.9 | 1156 | 84.8 | 1203 | 4.3 | 1310 | 1.9 |
| 570 | 1.9 | 1157 | 80.3 | 1204 | 4.3 | 1315 | 1.8 |
| 600 | 2.0 | 1158 | 69.3 | 1205 | 4.2 | 1320 | 1.8 |
| 630 | 2.1 | 1159 | 39.7 | 1206 | 4.2 | 1325 | 1.8 |
| 660 | 2.2 | 1160 | 25.5 | 1207 | 4.1 | 1330 | 1.7 |
| 690 | 2.3 | 1161 | 21.5 | 1208 | 4.0 | 1335 | 1.7 |
| 720 | 2.4 | 1162 | 19.0 | 1209 | 4.0 | 1340 | 1.7 |
| 750 | 2.5 | 1163 | 17.2 | 1210 | 3.9 | 1345 | 1.6 |
| 780 | 2.6 | 1164 | 15.9 | 1211 | 3.9 | 1350 | 1.6 |
| 810 | 2.8 | 1165 | 14.8 | 1212 | 3.8 | 1355 | 1.6 |
| 840 | 2.9 | 1166 | 13.9 | 1213 | 3.8 | 1360 | 1.6 |
| 870 | 3.1 | 1167 | 12.9 | 1214 | 3.7 | 1365 | 1.5 |
| 900 | 3.4 | 1168 | 12.1 | 1215 | 3.7 | 1370 | 1.5 |
| 930 | 3.7 | 1169 | 11.3 | 1216 | 3.6 | 1375 | 1.5 |
| 960 | 4.1 | 1170 | 10.7 | 1217 | 3.6 | 1380 | 1.5 |
| 970 | 4.4 | 1171 | 10.2 | 1218 | 3.6 | 1385 | 1.4 |
| 980 | 4.6 | 1172 | 9.7 | 1219 | 3.5 | 1390 | 1.4 |
| 990 | 4.8 | 1173 | 9.2 | 1220 | 3.5 | 1395 | 1.4 |
| 1000 | 5.0 | 1174 | 8.8 | 1221 | 3.4 | 1400 | 1.4 |
| 1010 | 5.2 | 1175 | 8.5 | 1222 | 3.4 | 1405 | 1.4 |
| 1020 | 5.5 | 1176 | 8.2 | 1223 | 3.4 | 1410 | 1.3 |
| 1030 | 5.8 | 1177 | 7.9 | 1224 | 3.3 | 1415 | 1.3 |
| 1040 | 6.2 | 1178 | 7.6 | 1225 | 3.3 | 1420 | 1.3 |
| 1050 | 6.6 | 1179 | 7.3 | 1226 | 3.3 | 1425 | 1.3 |
| 1060 | 7.2 | 1180 | 7.1 | 1227 | 3.2 | 1430 | 1.3 |
| 1070 | 7.8 | 1181 | 6.9 | 1228 | 3.2 | 1435 | 1.3 |
| 1080 | 8.5 | 1182 | 6.7 | 1229 | 3.2 | 1440 | 1.2 |
| 1090 | 9.5 | 1183 | 6.5 | 1230 | 3.1 | | |
| 1100 | 10.7 | 1184 | 6.3 | 1231 | 3.1 | | |



# SoCal Gas Project

## POC 12.1

### Stream Station = 10+00

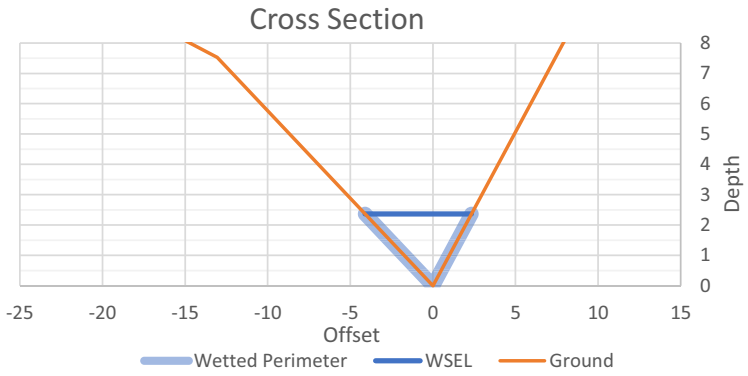
## INPUT

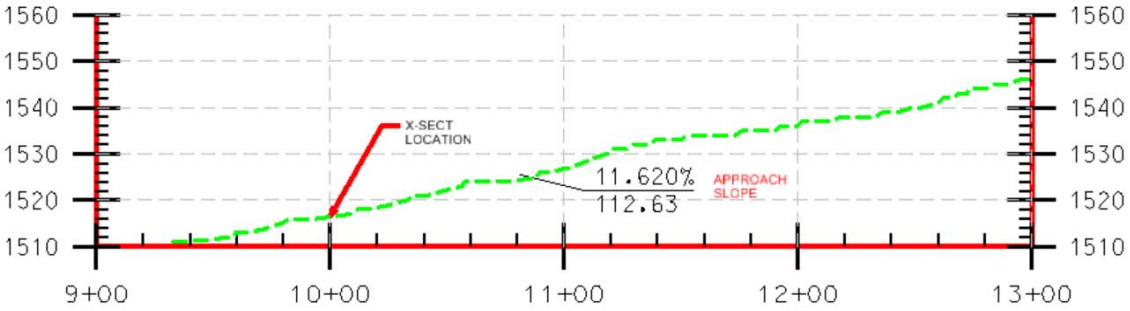
| | | |
|---|---|---|
| $Q_{50}$ | 78.0 | cfs |
| $Q_{100}$ | 93.0 | cfs |
| **$Q_{DESIGN}$** | **93.0** | **cfs** |
| | | |
| N | 0.040 | |
| So | 0.116 | ft/ft |

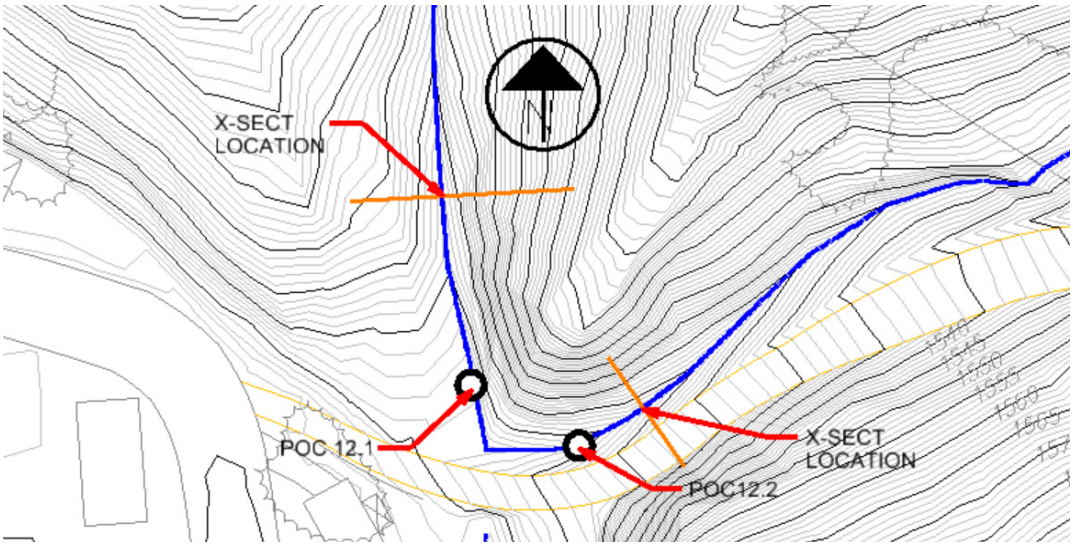
## Results

| | | | |
|---|---|---|---|
| **Depth=** | **2.4** | **ft** | *(NORMAL DEPTH)* |
| Area= | 7.6 | $ft^2$ | |
| $P_W$ | 8.1 | ft | |
| R | 0.945 | ft | |
| **Velocity=** | **12.2** | **ft/s** | |
| $S_F$ | 0.116 | ft/ft | |

| Point | Station | Ground |
|---|---|---|
| 1 | -34.6 | 1530.15 |
| 2 | -13.06 | 1524 |
| 3 | 0 | 1516.47 |
| 4 | 10.8 | 1527.42 |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

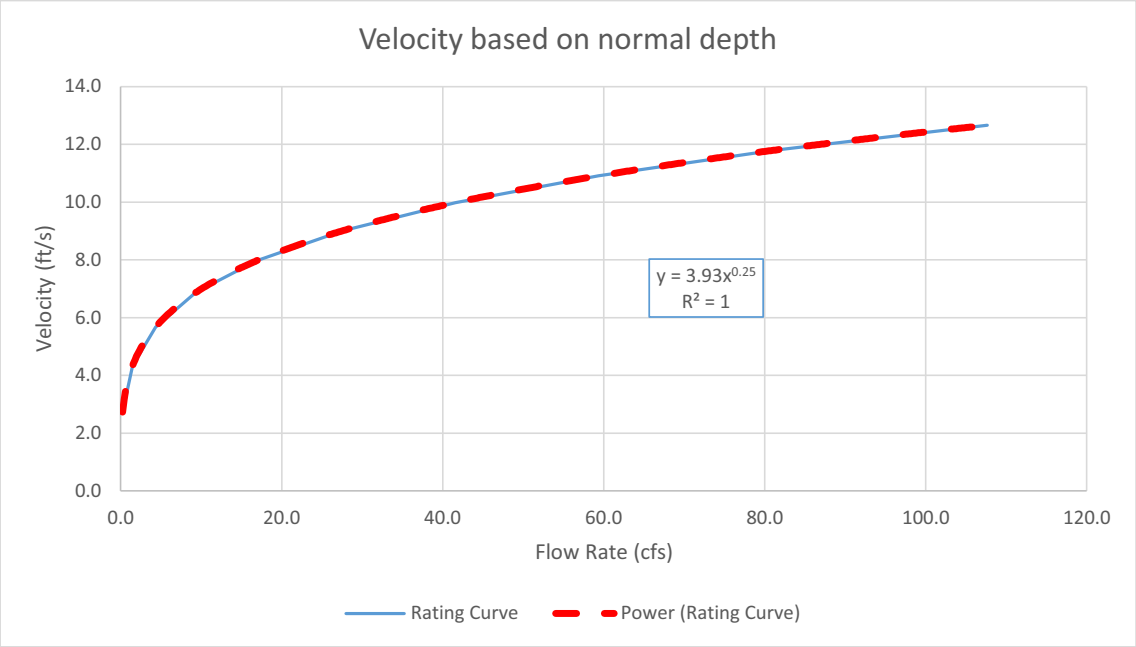


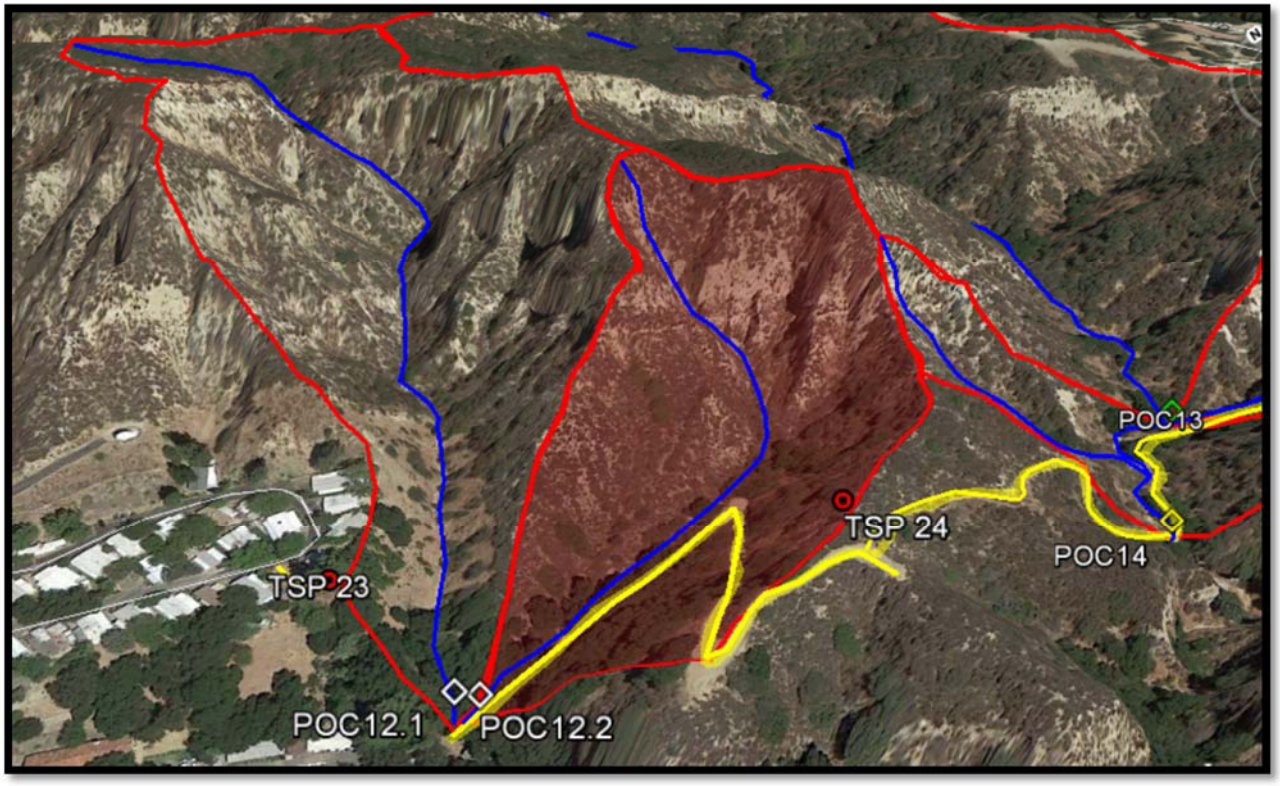



# SoCal Gas Project

## POC 12.1



# POC #12.2




## LOCATION

The drainage that leads to POC 12.2 is about half the size of the area for 12.1. Runoff from this area flows westerly parallel to the maintenance access road that leads to TSP 24. The drainage parallel to the access road is several feet lower than the access road, and the findings of this study are such that the flow depth should not exceed the elevation of the access road. At POC 12.2 the drainage crosses underneath the access road through an existing culvert that is near the culvert for POC 12.1.

*Approximate Latitude:* 34°21'2.68"N

*Approximate Longitude:* *118°32'16.73"W*

## DRAINAGE AREA INFORMATION

*Area:* 7.4 acres

*Flow Length:* 1028 feet

*Effective Slope:* 20.7%

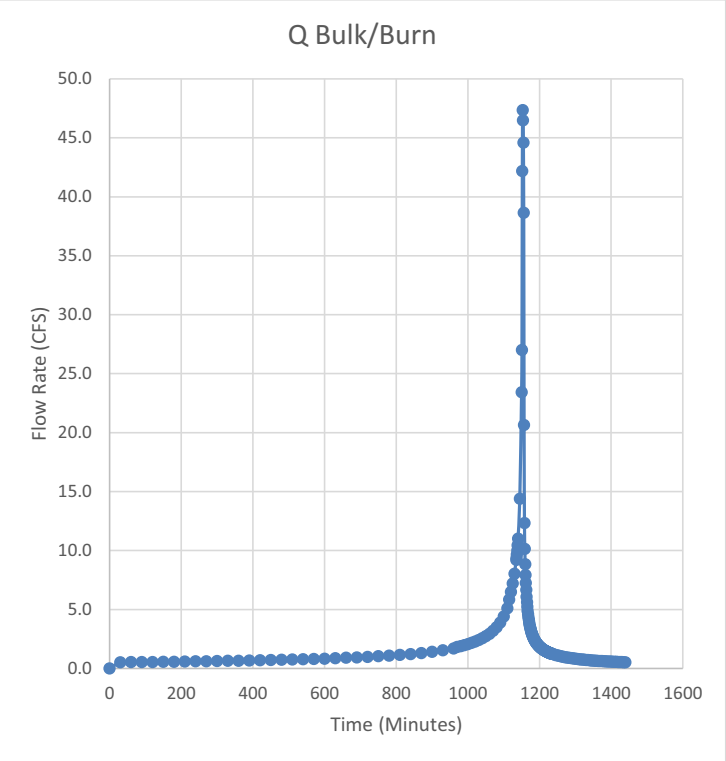
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 12.2

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

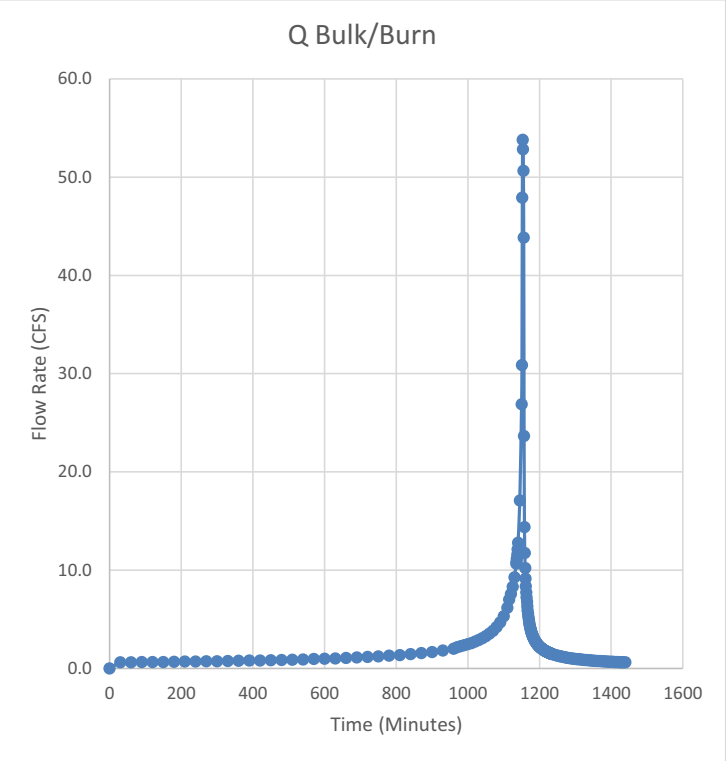
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 5.1 | 1185 | 2.5 | 1232 | 1.3 |
| 30 | 0.5 | 1115 | 5.8 | 1186 | 2.4 | 1233 | 1.3 |
| 60 | 0.5 | 1120 | 6.5 | 1187 | 2.4 | 1234 | 1.2 |
| 90 | 0.5 | 1125 | 7.2 | 1188 | 2.3 | 1235 | 1.2 |
| 120 | 0.6 | 1130 | 8.0 | 1189 | 2.3 | 1240 | 1.2 |
| 150 | 0.6 | 1135 | 9.2 | 1190 | 2.2 | 1245 | 1.1 |
| 180 | 0.6 | 1136 | 9.4 | 1191 | 2.2 | 1250 | 1.1 |
| 210 | 0.6 | 1137 | 9.7 | 1192 | 2.1 | 1255 | 1.1 |
| 240 | 0.6 | 1138 | 10.0 | 1193 | 2.1 | 1260 | 1.0 |
| 270 | 0.6 | 1139 | 10.4 | 1194 | 2.1 | 1265 | 1.0 |
| 300 | 0.6 | 1140 | 11.0 | 1195 | 2.0 | 1270 | 1.0 |
| 330 | 0.6 | 1145 | 14.4 | 1196 | 2.0 | 1275 | 0.9 |
| 360 | 0.7 | 1150 | 23.4 | 1197 | 1.9 | 1280 | 0.9 |
| 390 | 0.7 | 1151 | 27.0 | 1198 | 1.9 | 1285 | 0.9 |
| 420 | 0.7 | 1152 | 42.2 | 1199 | 1.9 | 1290 | 0.9 |
| 450 | 0.7 | 1153 | 47.3 | 1200 | 1.9 | 1295 | 0.8 |
| 480 | 0.7 | 1154 | 46.5 | 1201 | 1.8 | 1300 | 0.8 |
| 510 | 0.8 | 1155 | 44.6 | 1202 | 1.8 | 1305 | 0.8 |
| 540 | 0.8 | 1156 | 38.7 | 1203 | 1.8 | 1310 | 0.8 |
| 570 | 0.8 | 1157 | 20.6 | 1204 | 1.7 | 1315 | 0.8 |
| 600 | 0.8 | 1158 | 12.3 | 1205 | 1.7 | 1320 | 0.8 |
| 630 | 0.9 | 1159 | 10.1 | 1206 | 1.7 | 1325 | 0.7 |
| 660 | 0.9 | 1160 | 8.8 | 1207 | 1.7 | 1330 | 0.7 |
| 690 | 0.9 | 1161 | 7.9 | 1208 | 1.7 | 1335 | 0.7 |
| 720 | 1.0 | 1162 | 7.3 | 1209 | 1.6 | 1340 | 0.7 |
| 750 | 1.0 | 1163 | 6.7 | 1210 | 1.6 | 1345 | 0.7 |
| 780 | 1.1 | 1164 | 6.1 | 1211 | 1.6 | 1350 | 0.7 |
| 810 | 1.1 | 1165 | 5.6 | 1212 | 1.6 | 1355 | 0.7 |
| 840 | 1.2 | 1166 | 5.2 | 1213 | 1.5 | 1360 | 0.6 |
| 870 | 1.3 | 1167 | 4.9 | 1214 | 1.5 | 1365 | 0.6 |
| 900 | 1.4 | 1168 | 4.6 | 1215 | 1.5 | 1370 | 0.6 |
| 930 | 1.5 | 1169 | 4.4 | 1216 | 1.5 | 1375 | 0.6 |
| 960 | 1.7 | 1170 | 4.1 | 1217 | 1.5 | 1380 | 0.6 |
| 970 | 1.8 | 1171 | 3.9 | 1218 | 1.5 | 1385 | 0.6 |
| 980 | 1.9 | 1172 | 3.8 | 1219 | 1.4 | 1390 | 0.6 |
| 990 | 2.0 | 1173 | 3.6 | 1220 | 1.4 | 1395 | 0.6 |
| 1000 | 2.1 | 1174 | 3.5 | 1221 | 1.4 | 1400 | 0.6 |
| 1010 | 2.2 | 1175 | 3.3 | 1222 | 1.4 | 1405 | 0.6 |
| 1020 | 2.3 | 1176 | 3.2 | 1223 | 1.4 | 1410 | 0.6 |
| 1030 | 2.4 | 1177 | 3.1 | 1224 | 1.4 | 1415 | 0.6 |
| 1040 | 2.6 | 1178 | 3.0 | 1225 | 1.4 | 1420 | 0.5 |
| 1050 | 2.7 | 1179 | 2.9 | 1226 | 1.3 | 1425 | 0.5 |
| 1060 | 2.9 | 1180 | 2.8 | 1227 | 1.3 | 1430 | 0.5 |
| 1070 | 3.2 | 1181 | 2.8 | 1228 | 1.3 | 1435 | 0.5 |
| 1080 | 3.5 | 1182 | 2.7 | 1229 | 1.3 | 1440 | 0.5 |
| 1090 | 3.9 | 1183 | 2.6 | 1230 | 1.3 | | |
| 1100 | 4.4 | 1184 | 2.5 | 1231 | 1.3 | | |



# 100-Year Summary for POC: 12.2

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| (min) | (CFS) | (min) | (CFS) | (min) | (CFS) | (min) | (CFS) |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 6.2 | 1185 | 3.0 | 1232 | 1.5 |
| 30 | 0.6 | 1115 | 7.0 | 1186 | 2.9 | 1233 | 1.5 |
| 60 | 0.6 | 1120 | 7.6 | 1187 | 2.8 | 1234 | 1.5 |
| 90 | 0.6 | 1125 | 8.3 | 1188 | 2.8 | 1235 | 1.5 |
| 120 | 0.7 | 1130 | 9.3 | 1189 | 2.7 | 1240 | 1.4 |
| 150 | 0.7 | 1135 | 10.7 | 1190 | 2.7 | 1245 | 1.4 |
| 180 | 0.7 | 1136 | 10.9 | 1191 | 2.6 | 1250 | 1.3 |
| 210 | 0.7 | 1137 | 11.2 | 1192 | 2.6 | 1255 | 1.3 |
| 240 | 0.7 | 1138 | 11.6 | 1193 | 2.5 | 1260 | 1.2 |
| 270 | 0.7 | 1139 | 12.1 | 1194 | 2.5 | 1265 | 1.2 |
| 300 | 0.7 | 1140 | 12.8 | 1195 | 2.4 | 1270 | 1.1 |
| 330 | 0.8 | 1145 | 17.1 | 1196 | 2.4 | 1275 | 1.1 |
| 360 | 0.8 | 1150 | 26.9 | 1197 | 2.3 | 1280 | 1.1 |
| 390 | 0.8 | 1151 | 30.9 | 1198 | 2.3 | 1285 | 1.0 |
| 420 | 0.8 | 1152 | 47.9 | 1199 | 2.3 | 1290 | 1.0 |
| 450 | 0.8 | 1153 | 53.8 | 1200 | 2.2 | 1295 | 1.0 |
| 480 | 0.9 | 1154 | 52.8 | 1201 | 2.2 | 1300 | 1.0 |
| 510 | 0.9 | 1155 | 50.6 | 1202 | 2.1 | 1305 | 0.9 |
| 540 | 0.9 | 1156 | 43.9 | 1203 | 2.1 | 1310 | 0.9 |
| 570 | 1.0 | 1157 | 23.7 | 1204 | 2.1 | 1315 | 0.9 |
| 600 | 1.0 | 1158 | 14.4 | 1205 | 2.1 | 1320 | 0.9 |
| 630 | 1.0 | 1159 | 11.8 | 1206 | 2.0 | 1325 | 0.9 |
| 660 | 1.1 | 1160 | 10.2 | 1207 | 2.0 | 1330 | 0.9 |
| 690 | 1.1 | 1161 | 9.2 | 1208 | 2.0 | 1335 | 0.8 |
| 720 | 1.2 | 1162 | 8.4 | 1209 | 1.9 | 1340 | 0.8 |
| 750 | 1.2 | 1163 | 7.7 | 1210 | 1.9 | 1345 | 0.8 |
| 780 | 1.3 | 1164 | 7.2 | 1211 | 1.9 | 1350 | 0.8 |
| 810 | 1.4 | 1165 | 6.8 | 1212 | 1.9 | 1355 | 0.8 |
| 840 | 1.5 | 1166 | 6.3 | 1213 | 1.8 | 1360 | 0.8 |
| 870 | 1.6 | 1167 | 5.9 | 1214 | 1.8 | 1365 | 0.8 |
| 900 | 1.7 | 1168 | 5.6 | 1215 | 1.8 | 1370 | 0.7 |
| 930 | 1.8 | 1169 | 5.3 | 1216 | 1.8 | 1375 | 0.7 |
| 960 | 2.0 | 1170 | 5.0 | 1217 | 1.8 | 1380 | 0.7 |
| 970 | 2.2 | 1171 | 4.8 | 1218 | 1.7 | 1385 | 0.7 |
| 980 | 2.3 | 1172 | 4.5 | 1219 | 1.7 | 1390 | 0.7 |
| 990 | 2.4 | 1173 | 4.4 | 1220 | 1.7 | 1395 | 0.7 |
| 1000 | 2.5 | 1174 | 4.2 | 1221 | 1.7 | 1400 | 0.7 |
| 1010 | 2.6 | 1175 | 4.0 | 1222 | 1.7 | 1405 | 0.7 |
| 1020 | 2.7 | 1176 | 3.9 | 1223 | 1.6 | 1410 | 0.7 |
| 1030 | 2.9 | 1177 | 3.7 | 1224 | 1.6 | 1415 | 0.7 |
| 1040 | 3.1 | 1178 | 3.6 | 1225 | 1.6 | 1420 | 0.6 |
| 1050 | 3.3 | 1179 | 3.5 | 1226 | 1.6 | 1425 | 0.6 |
| 1060 | 3.5 | 1180 | 3.4 | 1227 | 1.6 | 1430 | 0.6 |
| 1070 | 3.8 | 1181 | 3.3 | 1228 | 1.6 | 1435 | 0.6 |
| 1080 | 4.2 | 1182 | 3.2 | 1229 | 1.6 | 1440 | 0.6 |
| 1090 | 4.7 | 1183 | 3.1 | 1230 | 1.5 | | |
| 1100 | 5.3 | 1184 | 3.1 | 1231 | 1.5 | | |



# SoCal Gas Project

## POC 12.2

### Stream Station = 10+00

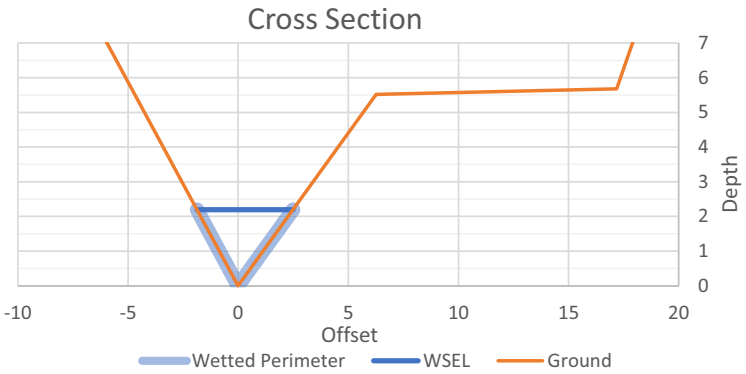
## INPUT

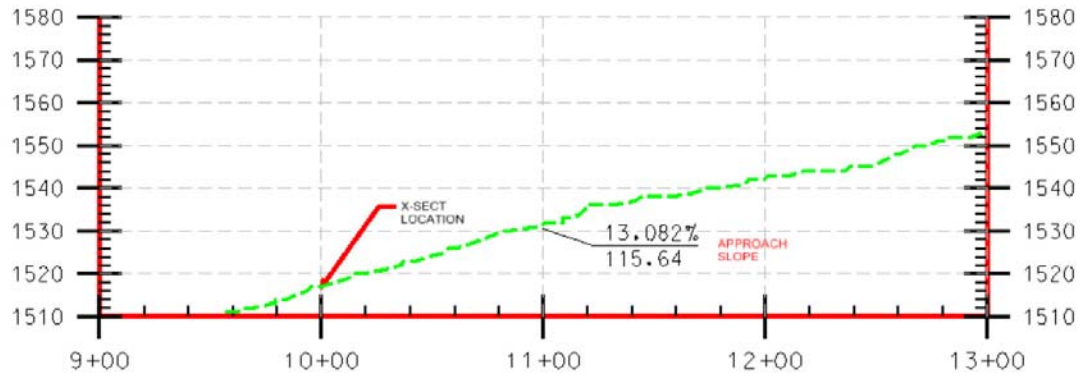
| | | |
|---|---|---|
| $Q_{50}$ | 47.0 | cfs |
| $Q_{100}$ | 54.0 | cfs |
| **$Q_{DESIGN}$** | **54.0** | **cfs** |
| | | |
| N | 0.040 | |
| So | 0.131 | ft/ft |

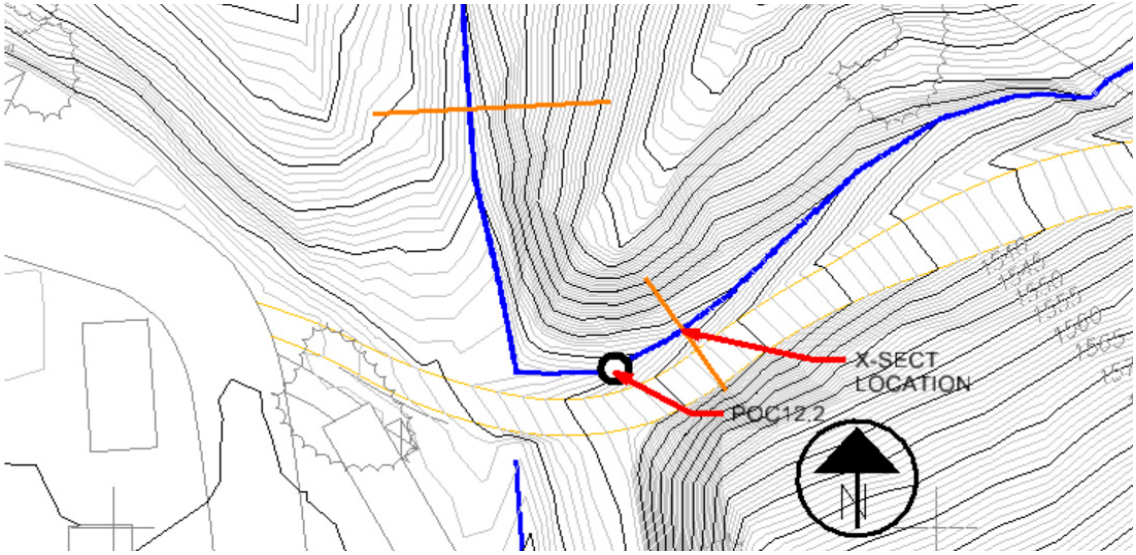
## Results

| | | | |
|---|---|---|---|
| **Depth=** | **2.2** | **ft** | *(NORMAL DEPTH)* |
| Area= | 4.8 | $ft^2$ | |
| $P_W$ | 6.2 | ft | |
| R | 0.771 | ft | |
| **Velocity=** | **11.3** | **ft/s** | |
| $S_F$ | 0.131 | ft/ft | |

| Point | Station | Ground |
|---|---|---|
| 1 | -12.63 | 1531.92 |
| 2 | 0 | 1517.06 |
| 3 | 6.27 | 1522.58 |
| 4 | 17.18 | 1522.74 |
| 5 | 22.23 | 1532 |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |



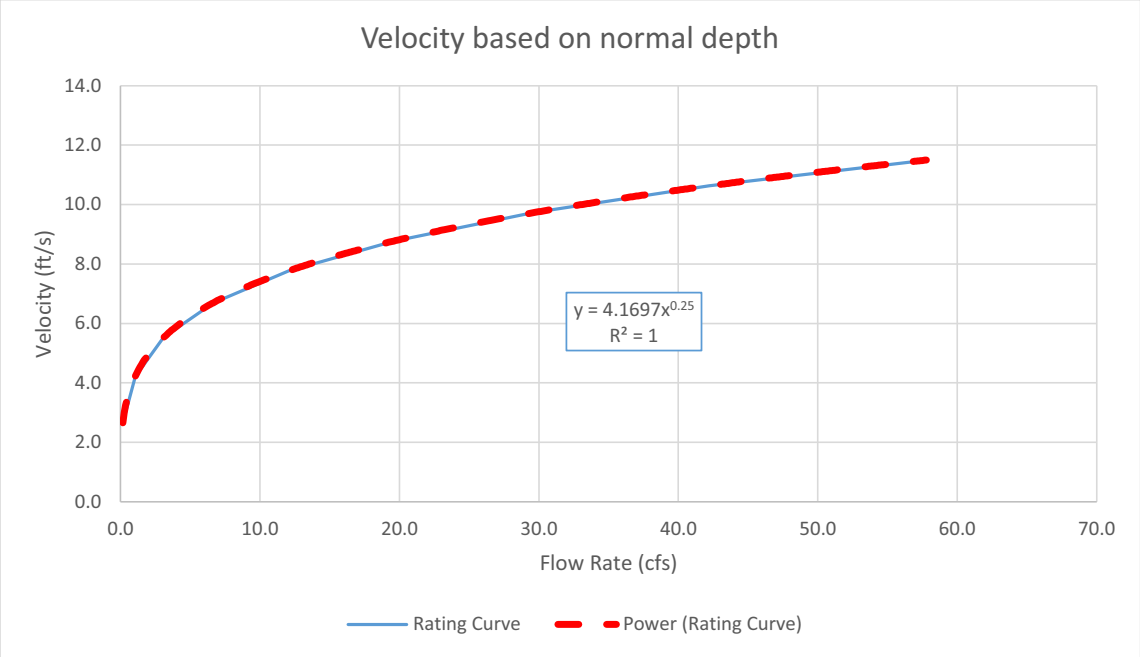



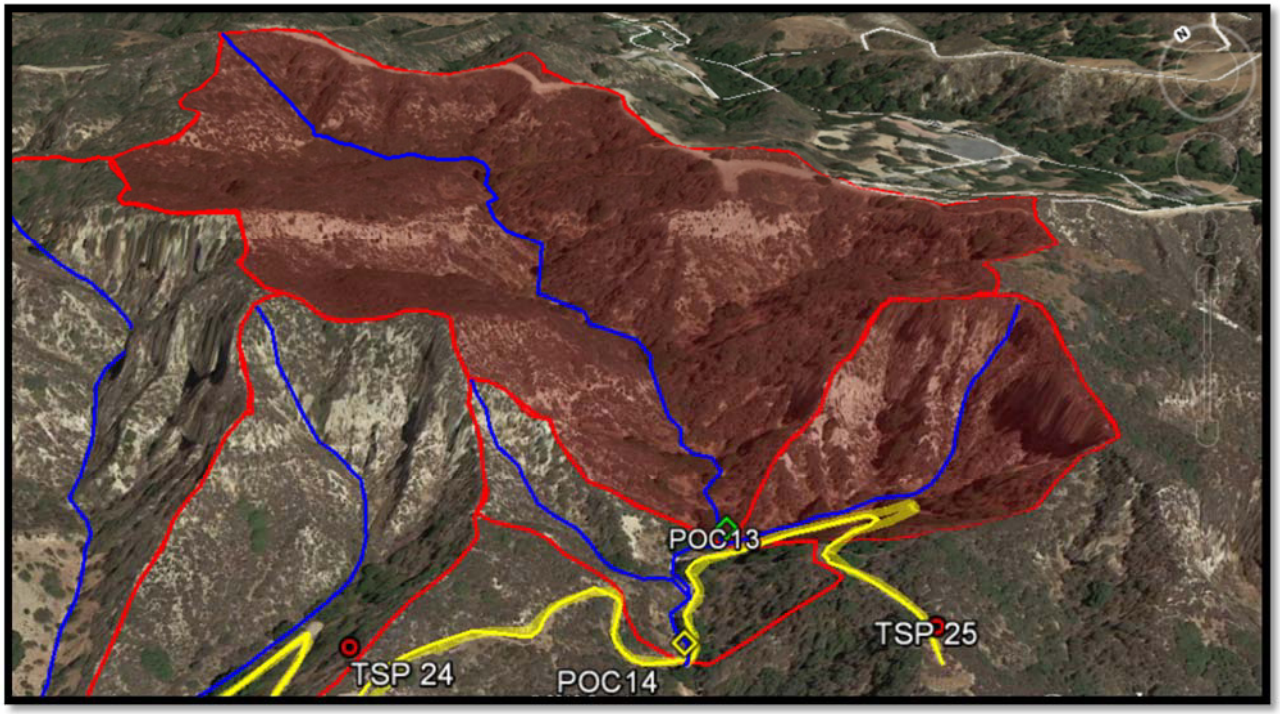
# SoCal Gas Project

## POC 12.2

### Stream Station = 10+00



# POC #13




## LOCATION

POC #13 is located North of TSP 25, and is comprised of the confluence of one large and one small drainage area, named 13.1 and 13.2 in this study. The confluence at POC 13 is in a dry creek that is adjacent to a proposed new access road that will be constructed as part of this project. This study analyzed the depth of flow at this location to assist with designing the roadway elevation. The runoff leaving POC #13 flows westerly alongside the proposed alignment for the new road to POC #14.

*Approximate Latitude:* 34°21'1.66"N

*Approximate Longitude:* *118°32'3.92"W*

## DRAINAGE AREA INFORMATION

| Sub-drainage | Area (acres) | Length (ft) | Effective Slope (%) |
|---|---|---|---|
| **13.1** | 46 | 2485 | 12.8% |
| **13.2** | 4.2 | 622 | 22.4% |
| **Total** | **50.2** | | |

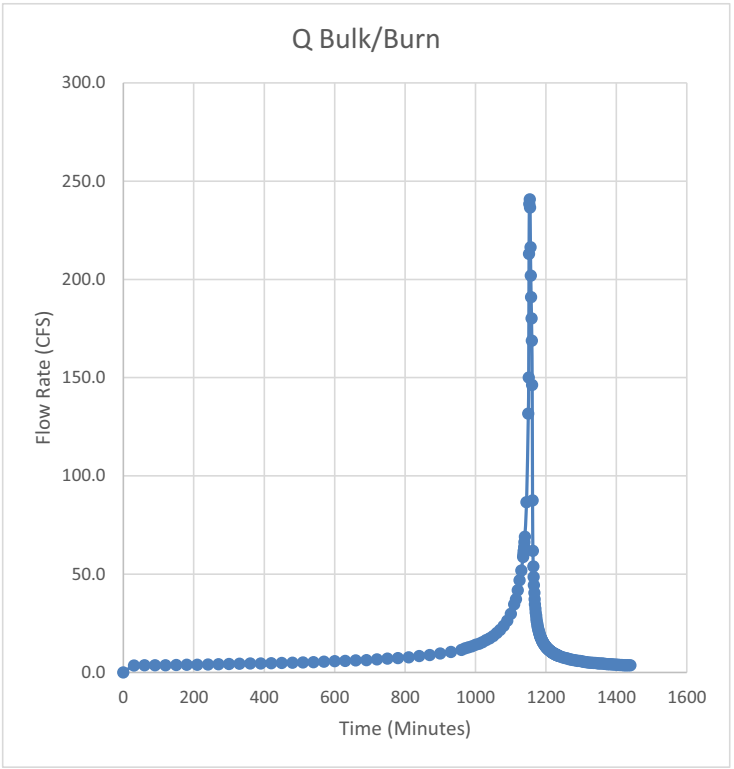
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 13

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

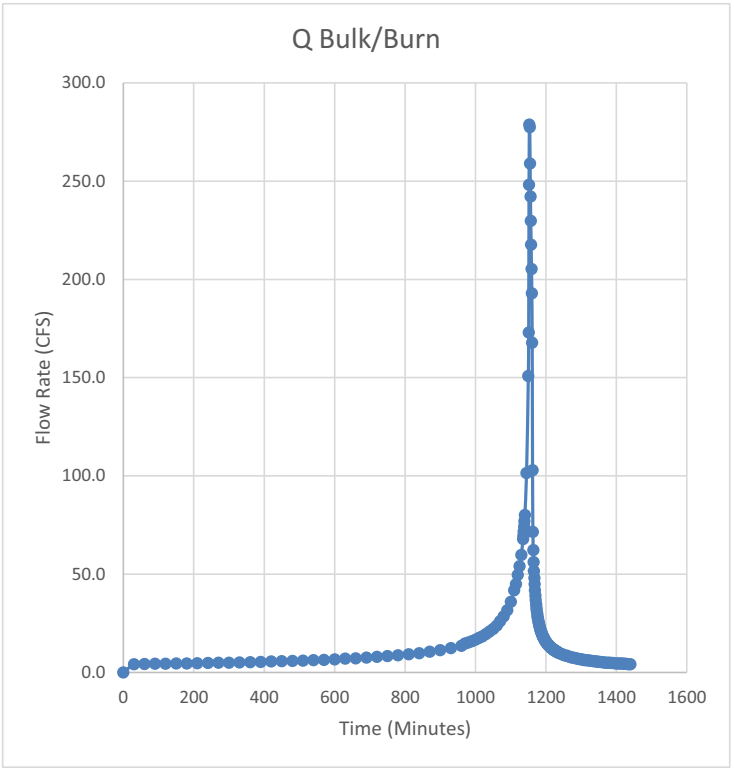
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 34.6 | 1185 | 17.9 | 1232 | 8.8 |
| 30 | 3.5 | 1115 | 37.2 | 1186 | 17.4 | 1233 | 8.7 |
| 60 | 3.6 | 1120 | 41.8 | 1187 | 17.0 | 1234 | 8.6 |
| 90 | 3.7 | 1125 | 46.9 | 1188 | 16.6 | 1235 | 8.5 |
| 120 | 3.7 | 1130 | 51.8 | 1189 | 16.2 | 1240 | 8.2 |
| 150 | 3.8 | 1135 | 58.7 | 1190 | 15.8 | 1245 | 7.8 |
| 180 | 3.9 | 1136 | 60.1 | 1191 | 15.5 | 1250 | 7.5 |
| 210 | 3.9 | 1137 | 61.8 | 1192 | 15.2 | 1255 | 7.3 |
| 240 | 4.0 | 1138 | 63.8 | 1193 | 14.9 | 1260 | 7.1 |
| 270 | 4.1 | 1139 | 66.3 | 1194 | 14.5 | 1265 | 6.8 |
| 300 | 4.3 | 1140 | 69.0 | 1195 | 14.3 | 1270 | 6.6 |
| 330 | 4.4 | 1145 | 86.6 | 1196 | 14.0 | 1275 | 6.4 |
| 360 | 4.5 | 1150 | 131.7 | 1197 | 13.8 | 1280 | 6.2 |
| 390 | 4.6 | 1151 | 150.1 | 1198 | 13.5 | 1285 | 6.1 |
| 420 | 4.7 | 1152 | 213.0 | 1199 | 13.3 | 1290 | 5.9 |
| 450 | 4.8 | 1153 | 238.4 | 1200 | 13.0 | 1295 | 5.8 |
| 480 | 4.9 | 1154 | 240.7 | 1201 | 12.8 | 1300 | 5.7 |
| 510 | 5.1 | 1155 | 236.6 | 1202 | 12.6 | 1305 | 5.5 |
| 540 | 5.2 | 1156 | 216.4 | 1203 | 12.4 | 1310 | 5.3 |
| 570 | 5.5 | 1157 | 201.9 | 1204 | 12.3 | 1315 | 5.2 |
| 600 | 5.7 | 1158 | 191.0 | 1205 | 12.1 | 1320 | 5.1 |
| 630 | 5.9 | 1159 | 180.1 | 1206 | 11.8 | 1325 | 5.0 |
| 660 | 6.1 | 1160 | 168.8 | 1207 | 11.7 | 1330 | 4.9 |
| 690 | 6.3 | 1161 | 146.3 | 1208 | 11.5 | 1335 | 4.8 |
| 720 | 6.7 | 1162 | 87.5 | 1209 | 11.4 | 1340 | 4.8 |
| 750 | 7.0 | 1163 | 61.9 | 1210 | 11.2 | 1345 | 4.7 |
| 780 | 7.3 | 1164 | 53.9 | 1211 | 11.1 | 1350 | 4.6 |
| 810 | 7.7 | 1165 | 48.6 | 1212 | 11.0 | 1355 | 4.5 |
| 840 | 8.3 | 1166 | 44.4 | 1213 | 10.8 | 1360 | 4.5 |
| 870 | 8.8 | 1167 | 40.5 | 1214 | 10.7 | 1365 | 4.4 |
| 900 | 9.6 | 1168 | 37.2 | 1215 | 10.5 | 1370 | 4.3 |
| 930 | 10.4 | 1169 | 34.6 | 1216 | 10.4 | 1375 | 4.2 |
| 960 | 11.5 | 1170 | 32.4 | 1217 | 10.2 | 1380 | 4.1 |
| 970 | 12.3 | 1171 | 30.5 | 1218 | 10.1 | 1385 | 4.1 |
| 980 | 12.8 | 1172 | 28.9 | 1219 | 10.0 | 1390 | 4.0 |
| 990 | 13.3 | 1173 | 27.4 | 1220 | 9.9 | 1395 | 4.0 |
| 1000 | 14.0 | 1174 | 26.1 | 1221 | 9.8 | 1400 | 3.9 |
| 1010 | 14.6 | 1175 | 25.0 | 1222 | 9.7 | 1405 | 3.9 |
| 1020 | 15.4 | 1176 | 24.0 | 1223 | 9.6 | 1410 | 3.8 |
| 1030 | 16.4 | 1177 | 23.0 | 1224 | 9.5 | 1415 | 3.8 |
| 1040 | 17.3 | 1178 | 22.2 | 1225 | 9.4 | 1420 | 3.7 |
| 1050 | 18.5 | 1179 | 21.4 | 1226 | 9.4 | 1425 | 3.7 |
| 1060 | 20.0 | 1180 | 20.7 | 1227 | 9.2 | 1430 | 3.6 |
| 1070 | 21.6 | 1181 | 20.0 | 1228 | 9.1 | 1435 | 3.6 |
| 1080 | 23.7 | 1182 | 19.5 | 1229 | 9.0 | 1440 | 3.6 |
| 1090 | 26.3 | 1183 | 18.8 | 1230 | 8.9 | | |
| 1100 | 29.8 | 1184 | 18.4 | 1231 | 8.8 | | |



# 100-Year Summary for POC: 13

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 41.8 | 1185 | 21.4 | 1232 | 10.4 |
| 30 | 4.1 | 1115 | 44.9 | 1186 | 20.9 | 1233 | 10.3 |
| 60 | 4.3 | 1120 | 49.6 | 1187 | 20.4 | 1234 | 10.2 |
| 90 | 4.4 | 1125 | 54.0 | 1188 | 19.8 | 1235 | 10.1 |
| 120 | 4.4 | 1130 | 59.8 | 1189 | 19.4 | 1240 | 9.7 |
| 150 | 4.5 | 1135 | 67.8 | 1190 | 19.0 | 1245 | 9.4 |
| 180 | 4.6 | 1136 | 69.6 | 1191 | 18.5 | 1250 | 8.9 |
| 210 | 4.7 | 1137 | 71.7 | 1192 | 18.1 | 1255 | 8.6 |
| 240 | 4.8 | 1138 | 74.2 | 1193 | 17.8 | 1260 | 8.4 |
| 270 | 4.9 | 1139 | 77.0 | 1194 | 17.4 | 1265 | 8.1 |
| 300 | 5.0 | 1140 | 80.1 | 1195 | 17.0 | 1270 | 7.8 |
| 330 | 5.1 | 1145 | 101.5 | 1196 | 16.7 | 1275 | 7.6 |
| 360 | 5.2 | 1150 | 150.8 | 1197 | 16.4 | 1280 | 7.4 |
| 390 | 5.3 | 1151 | 173.0 | 1198 | 16.2 | 1285 | 7.2 |
| 420 | 5.6 | 1152 | 248.2 | 1199 | 15.8 | 1290 | 7.0 |
| 450 | 5.7 | 1153 | 278.8 | 1200 | 15.6 | 1295 | 6.8 |
| 480 | 5.9 | 1154 | 277.4 | 1201 | 15.3 | 1300 | 6.6 |
| 510 | 6.0 | 1155 | 258.9 | 1202 | 15.1 | 1305 | 6.5 |
| 540 | 6.2 | 1156 | 242.2 | 1203 | 14.9 | 1310 | 6.3 |
| 570 | 6.4 | 1157 | 229.8 | 1204 | 14.6 | 1315 | 6.2 |
| 600 | 6.7 | 1158 | 217.7 | 1205 | 14.3 | 1320 | 6.1 |
| 630 | 7.0 | 1159 | 205.3 | 1206 | 14.1 | 1325 | 6.0 |
| 660 | 7.2 | 1160 | 192.9 | 1207 | 14.0 | 1330 | 5.8 |
| 690 | 7.5 | 1161 | 167.8 | 1208 | 13.8 | 1335 | 5.7 |
| 720 | 7.9 | 1162 | 102.9 | 1209 | 13.6 | 1340 | 5.6 |
| 750 | 8.3 | 1163 | 71.5 | 1210 | 13.4 | 1345 | 5.6 |
| 780 | 8.7 | 1164 | 62.2 | 1211 | 13.3 | 1350 | 5.4 |
| 810 | 9.3 | 1165 | 56.1 | 1212 | 13.0 | 1355 | 5.3 |
| 840 | 9.8 | 1166 | 51.6 | 1213 | 12.8 | 1360 | 5.2 |
| 870 | 10.6 | 1167 | 48.0 | 1214 | 12.7 | 1365 | 5.1 |
| 900 | 11.3 | 1168 | 44.9 | 1215 | 12.5 | 1370 | 5.0 |
| 930 | 12.4 | 1169 | 41.8 | 1216 | 12.4 | 1375 | 5.0 |
| 960 | 13.6 | 1170 | 39.1 | 1217 | 12.3 | 1380 | 4.9 |
| 970 | 14.7 | 1171 | 36.8 | 1218 | 12.1 | 1385 | 4.8 |
| 980 | 15.3 | 1172 | 34.7 | 1219 | 12.0 | 1390 | 4.8 |
| 990 | 15.9 | 1173 | 33.0 | 1220 | 11.8 | 1395 | 4.7 |
| 1000 | 16.7 | 1174 | 31.5 | 1221 | 11.6 | 1400 | 4.6 |
| 1010 | 17.6 | 1175 | 30.1 | 1222 | 11.5 | 1405 | 4.6 |
| 1020 | 18.4 | 1176 | 28.8 | 1223 | 11.4 | 1410 | 4.5 |
| 1030 | 19.5 | 1177 | 27.7 | 1224 | 11.3 | 1415 | 4.5 |
| 1040 | 20.8 | 1178 | 26.7 | 1225 | 11.2 | 1420 | 4.4 |
| 1050 | 22.2 | 1179 | 25.7 | 1226 | 11.1 | 1425 | 4.4 |
| 1060 | 23.9 | 1180 | 24.9 | 1227 | 11.0 | 1430 | 4.3 |
| 1070 | 26.0 | 1181 | 24.1 | 1228 | 10.9 | 1435 | 4.2 |
| 1080 | 28.5 | 1182 | 23.4 | 1229 | 10.8 | 1440 | 4.1 |
| 1090 | 31.7 | 1183 | 22.6 | 1230 | 10.7 | | |
| 1100 | 36.0 | 1184 | 22.1 | 1231 | 10.5 | | |



# SoCal Gas Project

## POC 13

### Stream Station = (POC OFF TOPO)

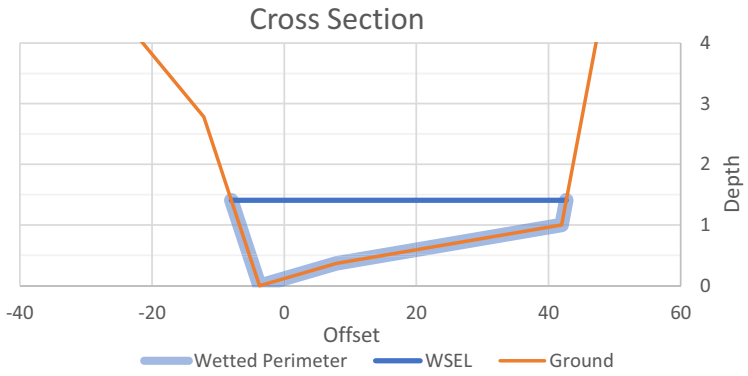
## INPUT

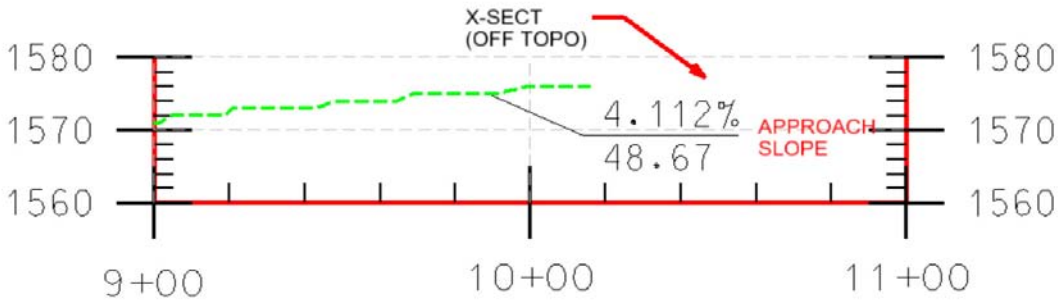
| | | |
|---|---|---|
| $Q_{50}$ | 240.0 | cfs |
| $Q_{100}$ | 280.0 | cfs |
| **$Q_{DESIGN}$** | **280.0** | **cfs** |
| | | |
| N | 0.040 | |
| So | 0.041 | ft/ft |

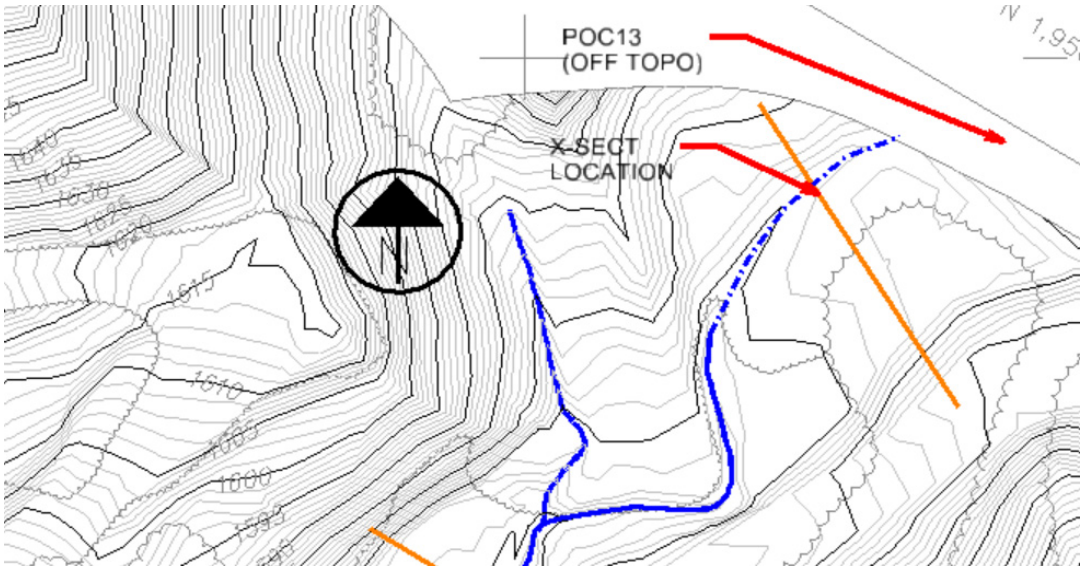
| Point | Station | Ground |
|---|---|---|
| 1 | -27.78 | 1581.06 |
| 2 | -12.16 | 1579 |
| 3 | -3.73 | 1576.22 |
| 4 | 7.91 | 1576.59 |
| 5 | 41.97 | 1577.22 |
| 6 | 49.27 | 1581.42 |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **1.4** | **ft** | *(NORMAL DEPTH)* |
| Area= | 42.1 | $ft^2$ | |
| $P_W$ | 51.0 | ft | |
| R | 0.824 | ft | |
| **Velocity=** | **6.7** | **ft/s** | |
| $S_F$ | 0.042 | ft/ft | |

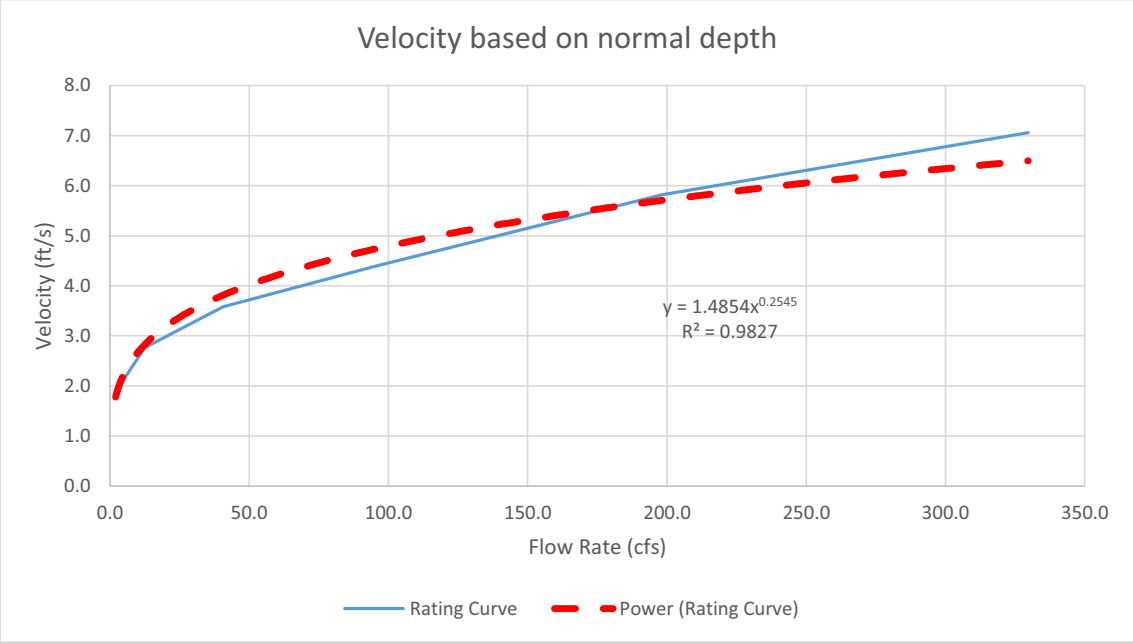


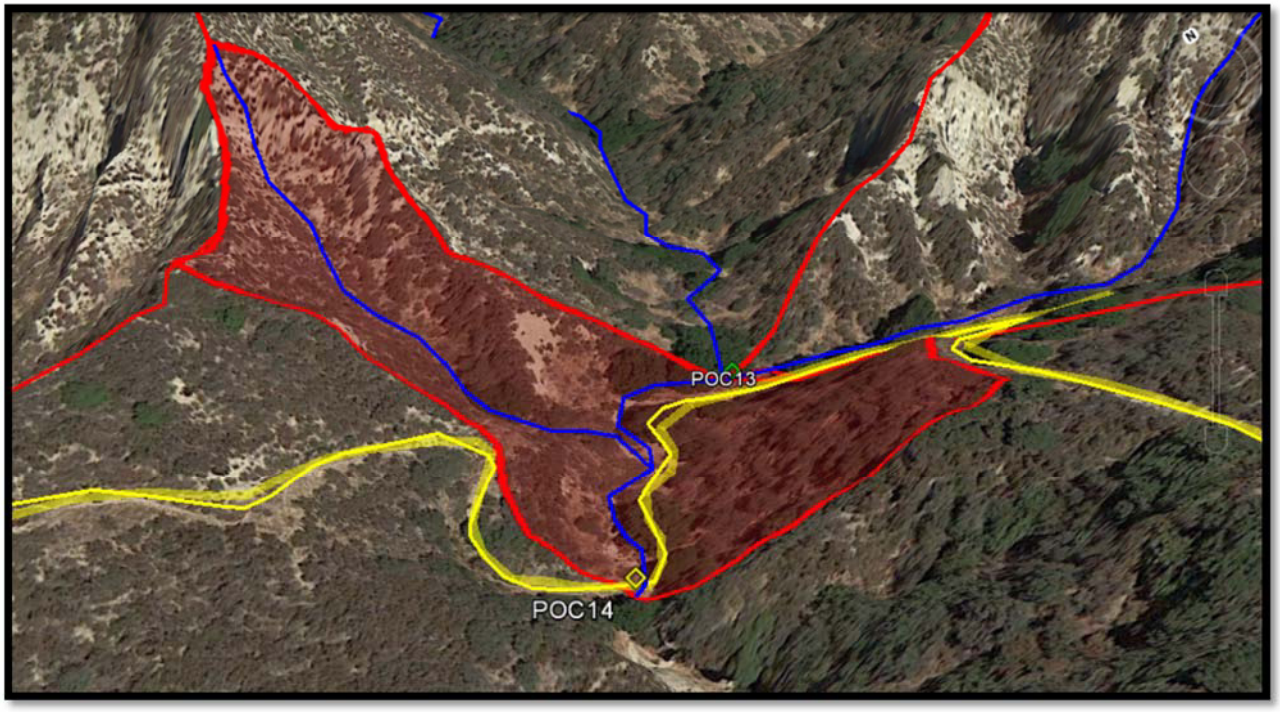



# SoCal Gas Project

## POC 13



# POC #14




## LOCATION

POC #14 is located in a dry creek at the bottom of a ravine, where a new proposed maintenance access road will be constructed. This study assessed the flow rate, depth and velocity and has proposed culvert design criteria for the design of the crossing of the dry creek. POC 14 receives routed runoff from POC 13 and drainage from the local hillside.

*Approximate Latitude:* 34°21'0.14"N

*Approximate Longitude:* *118°32'6.32"W*

## DRAINAGE AREA INFORMATION

| Sub-drainage | Area (acres) | Length (ft) | Effective Slope (%) |
|---|---|---|---|
| **Routed POC 13** | 13 | 336 (routed) | 7.83% |
| **DA14** | 2.8 | 622 | 21.4% |
| **POC 14, including POC #13** | **15.8** | | |

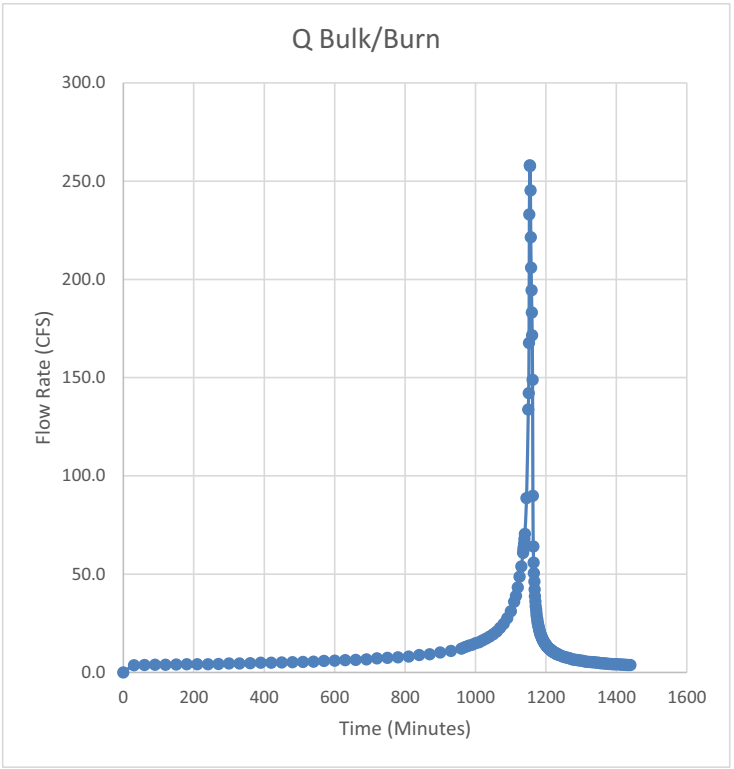
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 14

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

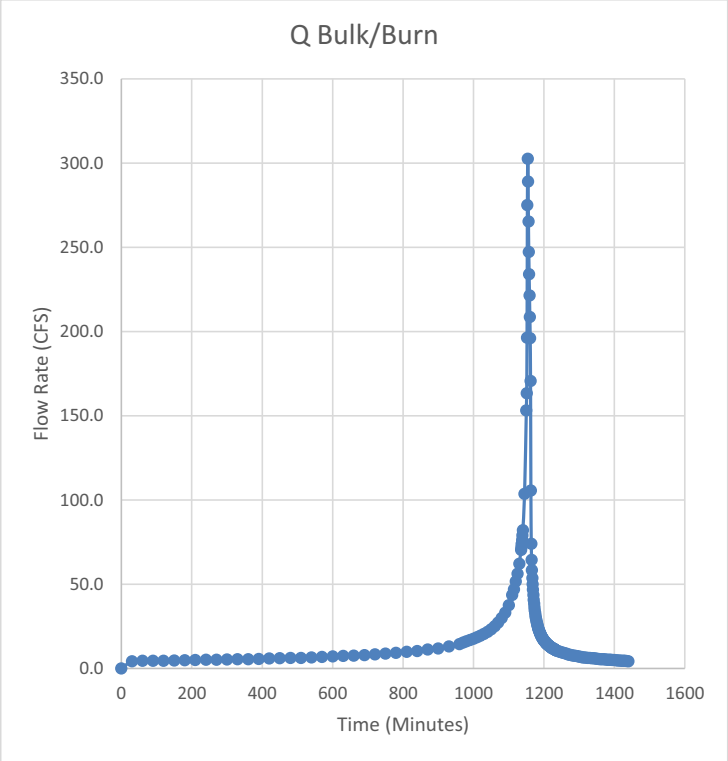
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 36.0 | 1185 | 19.3 | 1232 | 9.3 |
| 30 | 3.7 | 1115 | 39.0 | 1186 | 18.8 | 1233 | 9.3 |
| 60 | 3.8 | 1120 | 43.3 | 1187 | 18.3 | 1234 | 9.2 |
| 90 | 3.9 | 1125 | 48.7 | 1188 | 17.9 | 1235 | 9.1 |
| 120 | 3.9 | 1130 | 53.9 | 1189 | 17.4 | 1240 | 8.7 |
| 150 | 4.0 | 1135 | 60.8 | 1190 | 17.0 | 1245 | 8.3 |
| 180 | 4.1 | 1136 | 62.2 | 1191 | 16.6 | 1250 | 8.0 |
| 210 | 4.1 | 1137 | 63.7 | 1192 | 16.3 | 1255 | 7.7 |
| 240 | 4.2 | 1138 | 65.6 | 1193 | 16.0 | 1260 | 7.5 |
| 270 | 4.3 | 1139 | 67.8 | 1194 | 15.7 | 1265 | 7.3 |
| 300 | 4.5 | 1140 | 70.5 | 1195 | 15.2 | 1270 | 7.0 |
| 330 | 4.6 | 1145 | 88.7 | 1196 | 15.0 | 1275 | 6.7 |
| 360 | 4.7 | 1150 | 133.8 | 1197 | 14.7 | 1280 | 6.5 |
| 390 | 4.9 | 1151 | 142.1 | 1198 | 14.5 | 1285 | 6.4 |
| 420 | 5.0 | 1152 | 167.6 | 1199 | 14.2 | 1290 | 6.2 |
| 450 | 5.1 | 1153 | 233.0 | 1200 | 14.0 | 1295 | 6.1 |
| 480 | 5.2 | 1154 | 258.0 | 1201 | 13.7 | 1300 | 6.0 |
| 510 | 5.4 | 1155 | 257.7 | 1202 | 13.5 | 1305 | 5.9 |
| 540 | 5.5 | 1156 | 245.3 | 1203 | 13.3 | 1310 | 5.6 |
| 570 | 5.8 | 1157 | 221.4 | 1204 | 13.0 | 1315 | 5.5 |
| 600 | 6.0 | 1158 | 205.9 | 1205 | 12.9 | 1320 | 5.4 |
| 630 | 6.2 | 1159 | 194.5 | 1206 | 12.7 | 1325 | 5.3 |
| 660 | 6.4 | 1160 | 183.2 | 1207 | 12.4 | 1330 | 5.2 |
| 690 | 6.7 | 1161 | 171.6 | 1208 | 12.3 | 1335 | 5.2 |
| 720 | 7.1 | 1162 | 148.9 | 1209 | 12.1 | 1340 | 5.1 |
| 750 | 7.4 | 1163 | 89.9 | 1210 | 12.0 | 1345 | 5.0 |
| 780 | 7.7 | 1164 | 64.1 | 1211 | 11.8 | 1350 | 4.9 |
| 810 | 8.1 | 1165 | 55.9 | 1212 | 11.7 | 1355 | 4.7 |
| 840 | 8.8 | 1166 | 50.5 | 1213 | 11.6 | 1360 | 4.7 |
| 870 | 9.3 | 1167 | 46.2 | 1214 | 11.4 | 1365 | 4.6 |
| 900 | 10.1 | 1168 | 42.2 | 1215 | 11.3 | 1370 | 4.5 |
| 930 | 11.0 | 1169 | 38.8 | 1216 | 11.1 | 1375 | 4.4 |
| 960 | 12.1 | 1170 | 36.1 | 1217 | 10.9 | 1380 | 4.3 |
| 970 | 12.9 | 1171 | 33.8 | 1218 | 10.7 | 1385 | 4.3 |
| 980 | 13.5 | 1172 | 31.9 | 1219 | 10.6 | 1390 | 4.2 |
| 990 | 14.0 | 1173 | 30.2 | 1220 | 10.5 | 1395 | 4.2 |
| 1000 | 14.8 | 1174 | 28.7 | 1221 | 10.4 | 1400 | 4.1 |
| 1010 | 15.4 | 1175 | 27.3 | 1222 | 10.3 | 1405 | 4.1 |
| 1020 | 16.3 | 1176 | 26.2 | 1223 | 10.2 | 1410 | 4.0 |
| 1030 | 17.2 | 1177 | 25.1 | 1224 | 10.1 | 1415 | 4.0 |
| 1040 | 18.2 | 1178 | 24.1 | 1225 | 10.0 | 1420 | 3.9 |
| 1050 | 19.4 | 1179 | 23.3 | 1226 | 9.9 | 1425 | 3.9 |
| 1060 | 20.9 | 1180 | 22.4 | 1227 | 9.9 | 1430 | 3.8 |
| 1070 | 22.6 | 1181 | 21.7 | 1228 | 9.7 | 1435 | 3.8 |
| 1080 | 24.8 | 1182 | 21.0 | 1229 | 9.6 | 1440 | 3.8 |
| 1090 | 27.6 | 1183 | 20.5 | 1230 | 9.5 | | |
| 1100 | 31.1 | 1184 | 19.7 | 1231 | 9.4 | | |



# 100-Year Summary for POC: 14

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 43.6 | 1185 | 23.2 | 1232 | 11.1 |
| 30 | 4.3 | 1115 | 47.0 | 1186 | 22.5 | 1233 | 11.0 |
| 60 | 4.5 | 1120 | 51.6 | 1187 | 21.9 | 1234 | 10.8 |
| 90 | 4.6 | 1125 | 56.3 | 1188 | 21.4 | 1235 | 10.7 |
| 120 | 4.6 | 1130 | 62.2 | 1189 | 20.8 | 1240 | 10.3 |
| 150 | 4.7 | 1135 | 70.4 | 1190 | 20.4 | 1245 | 9.9 |
| 180 | 4.9 | 1136 | 71.9 | 1191 | 20.0 | 1250 | 9.5 |
| 210 | 5.0 | 1137 | 73.9 | 1192 | 19.4 | 1255 | 9.2 |
| 240 | 5.1 | 1138 | 76.3 | 1193 | 19.0 | 1260 | 8.9 |
| 270 | 5.2 | 1139 | 79.0 | 1194 | 18.7 | 1265 | 8.6 |
| 300 | 5.3 | 1140 | 82.0 | 1195 | 18.3 | 1270 | 8.2 |
| 330 | 5.4 | 1145 | 103.6 | 1196 | 17.9 | 1275 | 8.0 |
| 360 | 5.5 | 1150 | 153.2 | 1197 | 17.6 | 1280 | 7.8 |
| 390 | 5.6 | 1151 | 163.3 | 1198 | 17.2 | 1285 | 7.6 |
| 420 | 5.9 | 1152 | 196.3 | 1199 | 17.0 | 1290 | 7.4 |
| 450 | 6.0 | 1153 | 275.1 | 1200 | 16.6 | 1295 | 7.3 |
| 480 | 6.2 | 1154 | 302.6 | 1201 | 16.4 | 1300 | 7.0 |
| 510 | 6.3 | 1155 | 289.1 | 1202 | 16.1 | 1305 | 6.9 |
| 540 | 6.5 | 1156 | 265.4 | 1203 | 15.9 | 1310 | 6.6 |
| 570 | 6.8 | 1157 | 247.2 | 1204 | 15.7 | 1315 | 6.5 |
| 600 | 7.1 | 1158 | 234.0 | 1205 | 15.4 | 1320 | 6.4 |
| 630 | 7.4 | 1159 | 221.4 | 1206 | 15.0 | 1325 | 6.3 |
| 660 | 7.6 | 1160 | 208.7 | 1207 | 14.8 | 1330 | 6.2 |
| 690 | 7.9 | 1161 | 196.0 | 1208 | 14.7 | 1335 | 6.1 |
| 720 | 8.3 | 1162 | 170.7 | 1209 | 14.5 | 1340 | 6.0 |
| 750 | 8.8 | 1163 | 105.6 | 1210 | 14.3 | 1345 | 5.9 |
| 780 | 9.2 | 1164 | 74.0 | 1211 | 14.1 | 1350 | 5.7 |
| 810 | 9.8 | 1165 | 64.5 | 1212 | 14.0 | 1355 | 5.6 |
| 840 | 10.3 | 1166 | 58.3 | 1213 | 13.7 | 1360 | 5.5 |
| 870 | 11.2 | 1167 | 53.7 | 1214 | 13.5 | 1365 | 5.4 |
| 900 | 11.9 | 1168 | 50.0 | 1215 | 13.4 | 1370 | 5.4 |
| 930 | 13.1 | 1169 | 46.8 | 1216 | 13.2 | 1375 | 5.3 |
| 960 | 14.4 | 1170 | 43.6 | 1217 | 13.0 | 1380 | 5.2 |
| 970 | 15.4 | 1171 | 40.8 | 1218 | 12.9 | 1385 | 5.1 |
| 980 | 16.1 | 1172 | 38.4 | 1219 | 12.7 | 1390 | 5.1 |
| 990 | 16.8 | 1173 | 36.3 | 1220 | 12.6 | 1395 | 5.0 |
| 1000 | 17.6 | 1174 | 34.5 | 1221 | 12.4 | 1400 | 5.0 |
| 1010 | 18.5 | 1175 | 32.9 | 1222 | 12.2 | 1405 | 4.9 |
| 1020 | 19.4 | 1176 | 31.5 | 1223 | 12.1 | 1410 | 4.7 |
| 1030 | 20.5 | 1177 | 30.2 | 1224 | 12.0 | 1415 | 4.7 |
| 1040 | 21.7 | 1178 | 29.0 | 1225 | 11.9 | 1420 | 4.6 |
| 1050 | 23.2 | 1179 | 28.0 | 1226 | 11.8 | 1425 | 4.6 |
| 1060 | 25.1 | 1180 | 26.9 | 1227 | 11.7 | 1430 | 4.5 |
| 1070 | 27.2 | 1181 | 26.1 | 1228 | 11.6 | 1435 | 4.4 |
| 1080 | 29.9 | 1182 | 25.3 | 1229 | 11.5 | 1440 | 4.3 |
| 1090 | 33.2 | 1183 | 24.5 | 1230 | 11.4 | | |
| 1100 | 37.6 | 1184 | 23.7 | 1231 | 11.3 | | |



# SoCal Gas Project

## POC 14

**Stream Station = 10+57.57**

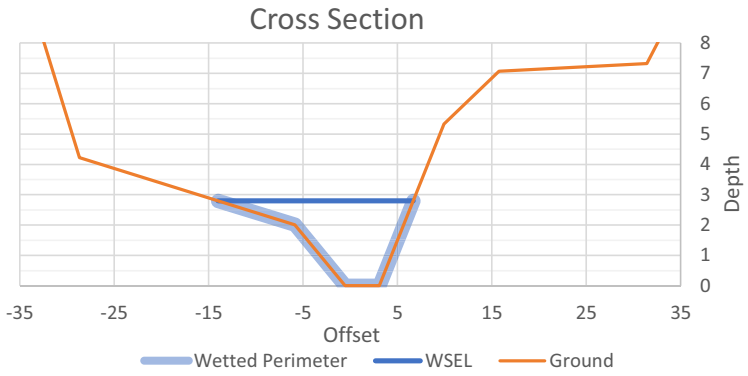
## INPUT

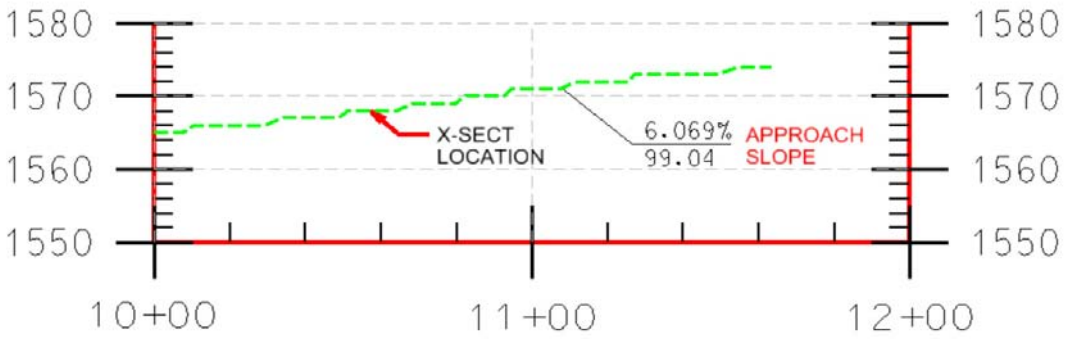
| | | |
|---|---|---|
| $Q_{50}$ | 260.0 | cfs |
| $Q_{100}$ | 300.0 | cfs |
| **$Q_{DESIGN}$** | **300.0** | **cfs** |
| | | |
| N | 0.040 | |
| So | 0.061 | ft/ft |

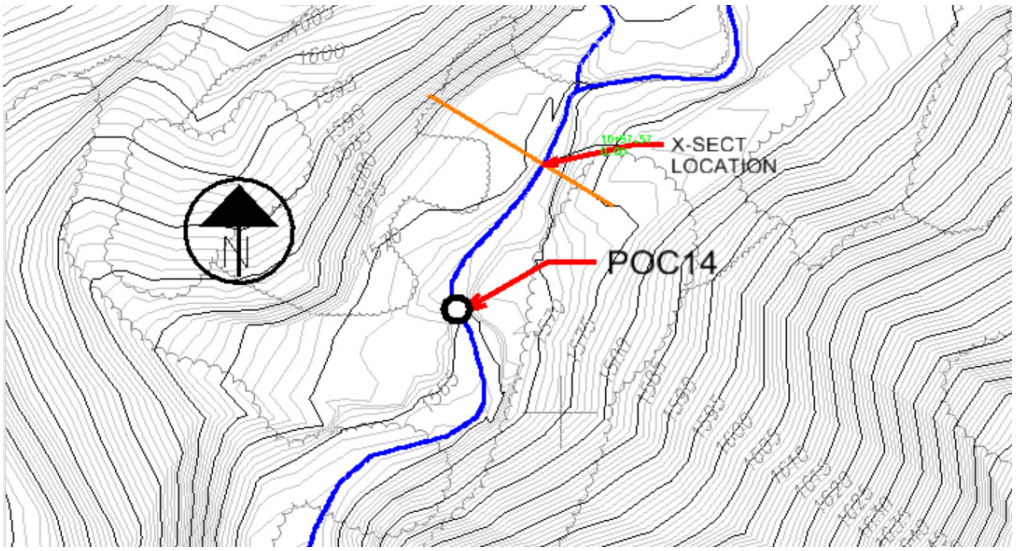
| Point | Station | Ground |
|---|---|---|
| 1 | -33.52 | 1577.12 |
| 2 | -28.67 | 1572.22 |
| 3 | -5.87 | 1570.01 |
| 4 | -0.55 | 1568 |
| 5 | 3.08 | 1568 |
| 6 | 9.92 | 1573.33 |
| 7 | 15.74 | 1575.07 |
| 8 | 31.41 | 1575.32 |
| 9 | 37.25 | 1578.81 |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **2.8** | **ft** | *(NORMAL DEPTH)* |
| Area= | 27.9 | $ft^2$ | |
| $P_W$ | 22.0 | ft | |
| R | 1.267 | ft | |
| **Velocity=** | **10.7** | **ft/s** | |
| $S_F$ | 0.061 | ft/ft | |



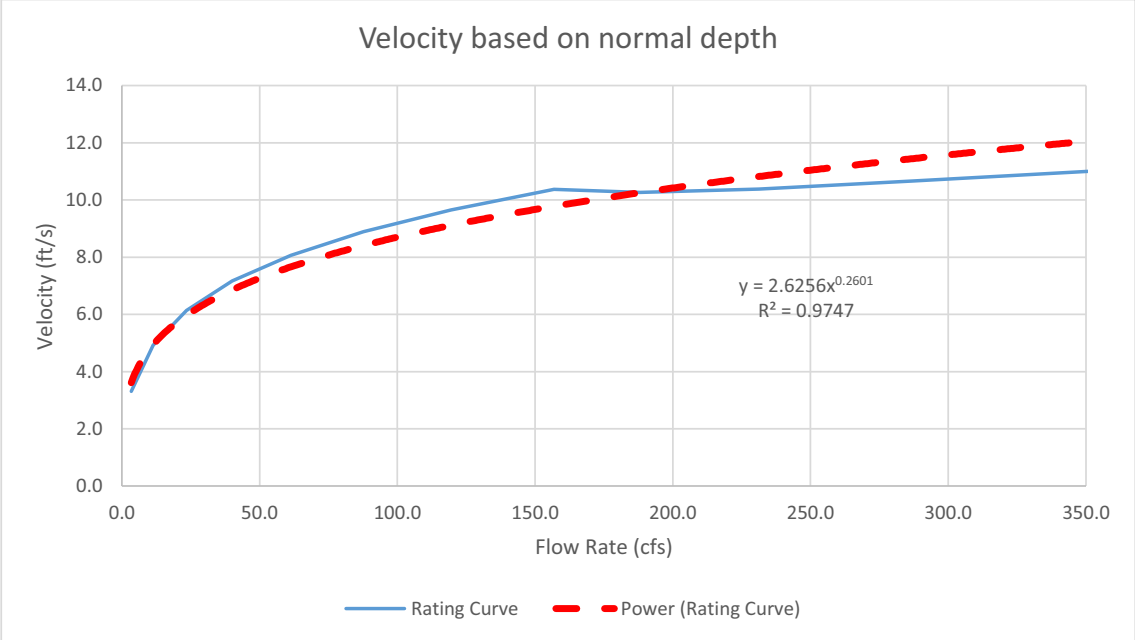



# SoCal Gas Project

## POC 14

### Stream Station = 10+57.57



# Culvert @ POC14 (Design of new culverts - $Q_{50}$)

## Physical Data

| | | |
|---|---|---|
| $Q_{50}$ | 258 | cfs |
| $Q_{100}$ | 302.6 | cfs |
| Qdesign | 129 | cfs **(assume 2 pipes)** |
| Length | 52 | feet |
| Invert Elev (U/S Side) | 1565.50 | feet* |
| Invert Elev (D/S Side) | 1562.50 | feet* |
| Cover over Top of Pipe (U/S Side) | 1 | feet |
| Slope | 0.06 | ft/ft |
| N-value | 0.023 | (CMP, per LAFCD) |

*Assuming that the culvert invert will match the existing streambed elevations,

## Modeling Parameters (PER FHWA HDS-5 Methods)

| | | |
|---|---|---|
| Type | CMP, Projecting Thin Wall | |
| K | 0.034 | |
| $K_S$ | -0.5 | |
| M | 1.5 | |
| c | 0.0553 | |
| Y | 0.54 | |
| Ke | 0.9 | FHWA Table C.2 |

Orifice Formula

$$\frac{HW_i}{D} = c\left[\frac{K_u Q}{AD^{0.5}}\right]^2 + Y + K_s S$$

Weir Formula

$$\frac{HW_i}{D} = \frac{H_c}{D} + K\left[\frac{K_u Q}{AD^{0.5}}\right]^M + K_s S$$

Friction Formula

$$HW_o + LS + \frac{V_u^2}{2g} = TW + \frac{V_d^2}{2g} + H_L$$

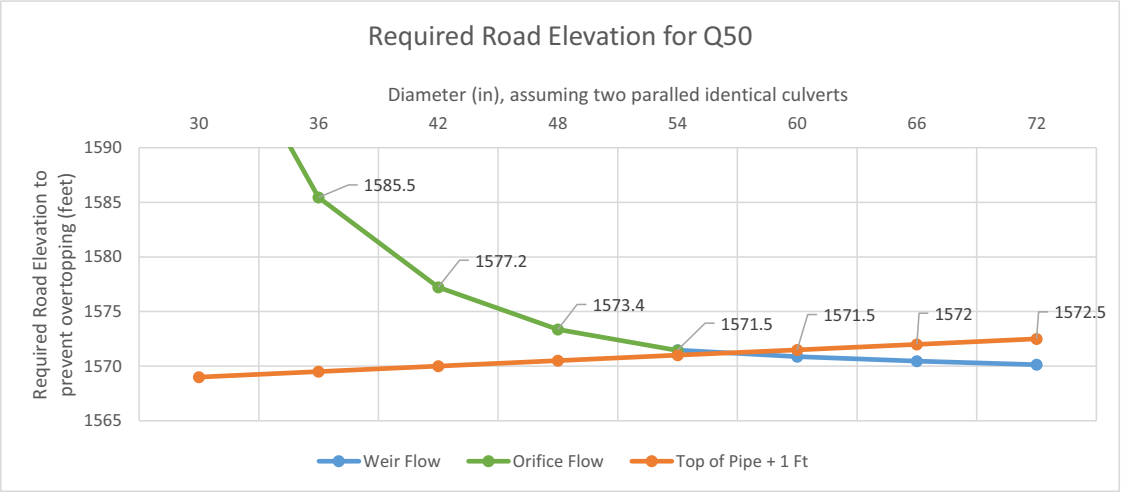
## Preliminary Results

Findings

Based on the design roadway elevation, The size of double CMP required to safely pass $Q_{50}$ without overtopping the road can be estimated by entering the design roadway elevation on the 'Y' axis of the graph below*, and reading the corresponding diameter. **The actual design of the culvert should be coordinated to verify consistency with modeling assumptions used.**

**Pipe Diameters and corresponding Road Elevation to prevent overtopping**

| Q100= 129 cfs | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
|---|---|---|---|---|---|---|---|---|
| **Top of Pipe + 1 Ft** | 1569.00 | 1569.5 | 1570 | 1570.5 | 1571 | 1571.5 | 1572 | 1572.5 |
| **d/D (Normal Depth)** | 1 | 1 | 0.77 | 0.59 | 0.49 | 0.41 | 0.36 | 0.32 |
| **Area** | 4.91 | 7.07 | 7.95 | 7.72 | 7.75 | 7.58 | 7.70 | 7.80 |
| **Hyd Radius** | 0.63 | 0.75 | 1.06 | 1.10 | 1.11 | 1.09 | 1.09 | 1.08 |
| **Velocity** | 26.3 | 18.2 | 16.2 | 16.7 | 16.6 | 17.0 | 16.8 | 16.5 |
| **Weir Flow** | #N/A | #N/A | #N/A | #N/A | 1571.5 | 1570.9 | 1570.5 | 1570.1 |
| **Orifice Flow** | 1605.0 | 1585.5 | 1577.2 | 1573.4 | 1571.44 | #N/A | #N/A | #N/A |
| **Friction Control** | 1601.5 | 1581.4 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |




The elevations shown on the above chart assume that the invert of the culvert is designed to match the existing streambed elevations. If alternative designs are pursued, these calculations can be revised.

# Culvert @ POC14 (Design of new culverts - $Q_{100}$)

## Physical Data

| | | |
|---|---|---|
| Q50 | 258 | cfs |
| Q100 | 302.6 | cfs |
| Qdesign | 151.3 | cfs **(assume 2 pipes)** |
| Length | 52 | feet |
| Invert Elev (U/S Side) | 1565.50 | feet |
| Invert Elev (D/S Side) | 1562.50 | feet |
| Cover over Top of Pipe (U/S Side) | 1 | feet |
| Slope | 0.06 | ft/ft |
| N-value | 0.023 | (CMP, per LAFCD) |

## Modeling Parameters (PER FHWA HDS-5 Methods)

| | | |
|---|---|---|
| Type | CMP, Projecting Thin Wall | |
| K | 0.034 | |
| $K_S$ | -0.5 | |
| M | 1.5 | |
| c | 0.0553 | |
| Y | 0.54 | |
| Ke | 0.9 | FHWA Table C.2 |

Orifice Formula

$$\frac{HW_i}{D} = c\left[\frac{K_u Q}{AD^{0.5}}\right]^2 + Y + K_s S$$

Weir Formula

$$\frac{HW_i}{D} = \frac{H_c}{D} + K\left[\frac{K_u Q}{AD^{0.5}}\right]^M + K_s S$$

Friction Formula

$$HW_o + LS + \frac{V_u^2}{2g} = TW + \frac{V_d^2}{2g} + H_L$$

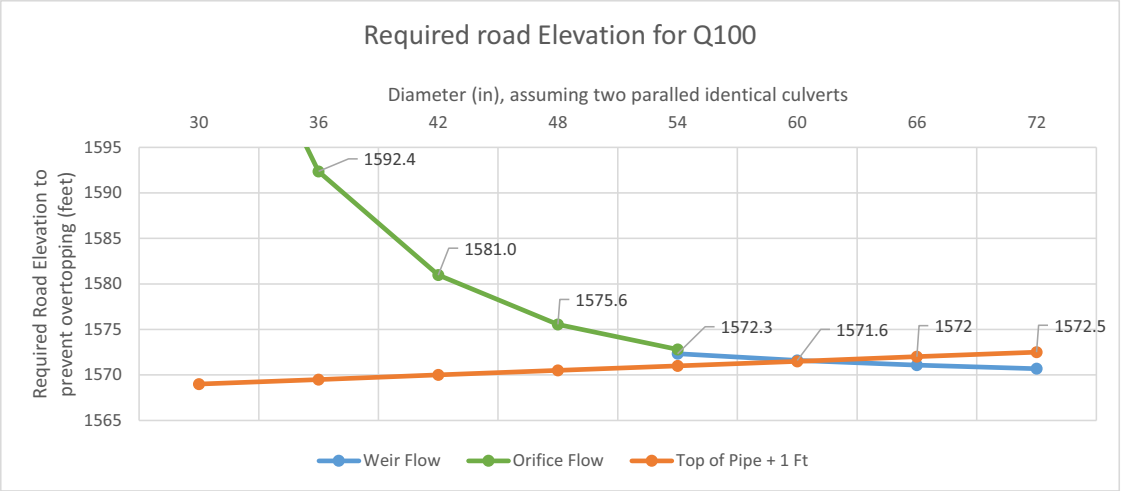
## Preliminary Results

Findings

Based on the design roadway elevation, The size of <u>double</u> CMP required to safely pass $Q_{100}$ without overtopping the road can be estimated by entering the design roadway elevation on the 'Y' axis of the graph below*, and reading the corresponding diameter. **The actual design of the culvert should be coordinated to verify consistency with modeling assumptions used.**

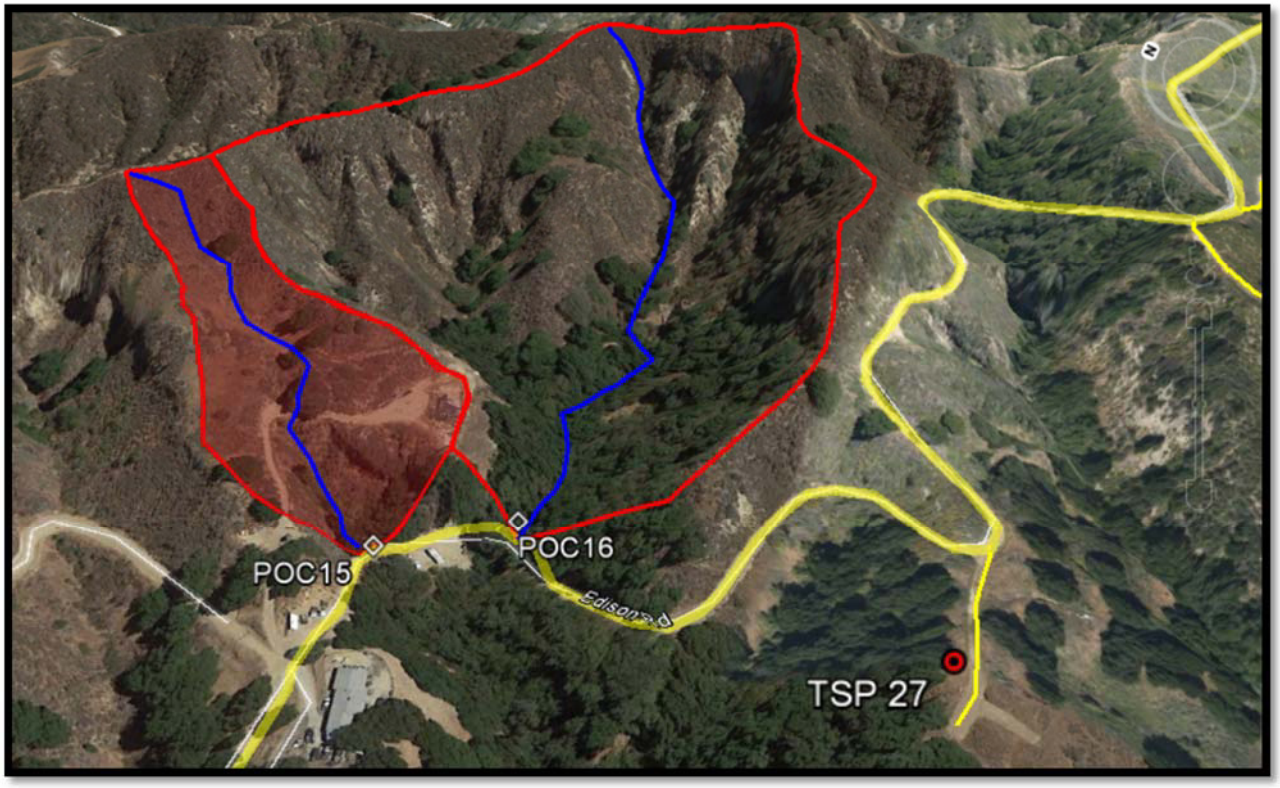
**Pipe Diameters and corresponding Road Elevation to prevent overtopping**

| Q100= 151.3 cfs | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
|---|---|---|---|---|---|---|---|---|
| **Top of Pipe + 1 Ft** | 1569.00 | 1569.5 | 1570 | 1570.5 | 1571 | 1571.5 | 1572 | 1572.5 |
| **d/D (Normal Depth)** | 1 | 1 | 1 | 0.66 | 0.53 | 0.45 | 0.39 | 0.35 |
| **Area** | 4.91 | 7.07 | 9.62 | 8.80 | 8.56 | 8.57 | 8.58 | 8.82 |
| **Hyd Radius** | 0.63 | 0.75 | 0.88 | 1.16 | 1.17 | 1.17 | 1.16 | 1.16 |
| **Velocity** | 30.8 | 21.4 | 15.7 | 17.2 | 17.7 | 17.7 | 17.6 | 17.2 |
| **Weir Flow** | #N/A | #N/A | #N/A | #N/A | 1572.3 | 1571.6 | 1571.1 | 1570.7 |
| **Orifice Flow** | 1619.3 | 1592.4 | 1581.0 | 1575.6 | 1572.80 | #N/A | #N/A | #N/A |
| **Friction Control** | 1615.2 | 1587.4 | 1577.0 | #N/A | #N/A | #N/A | #N/A | #N/A |




The elevations shown on the above chart assume that the invert of the culvert is designed to match the existing streambed elevations. If alternative designs are pursued, these calculations can be revised.

# POC #15




## LOCATION

POC #15 is a small drainage area that drains to an existing culvert that passes underneath the existing maintenance access road that leads to TSP 27.

*Approximate Latitude:* 34°20'50.14"N

*Approximate Longitude:* *118°31'42.48"W*

## DRAINAGE AREA INFORMATION

*Area:* 4.4 acres

*Flow Length:* 894 feet

*Effective Slope:* 19.7%

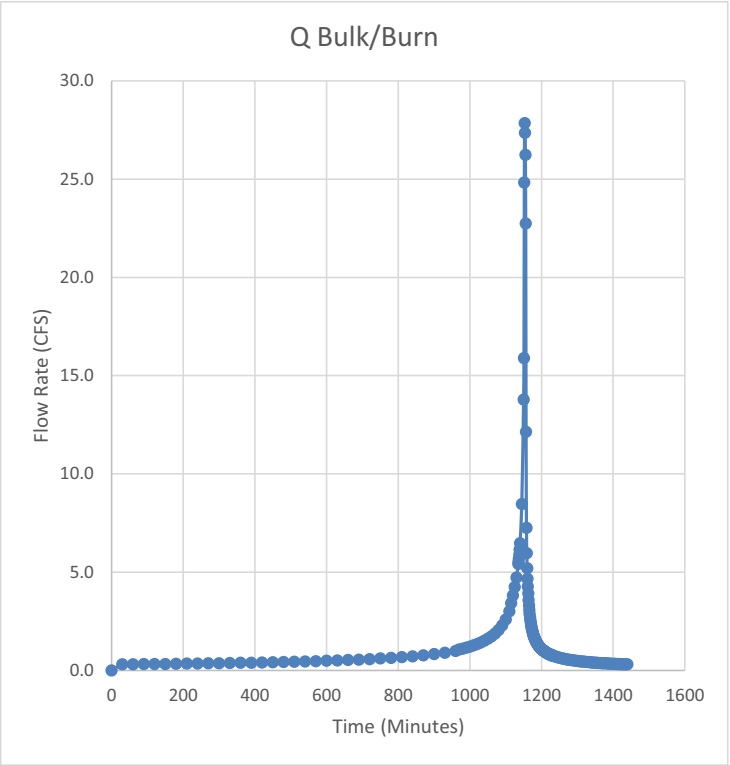
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 15

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

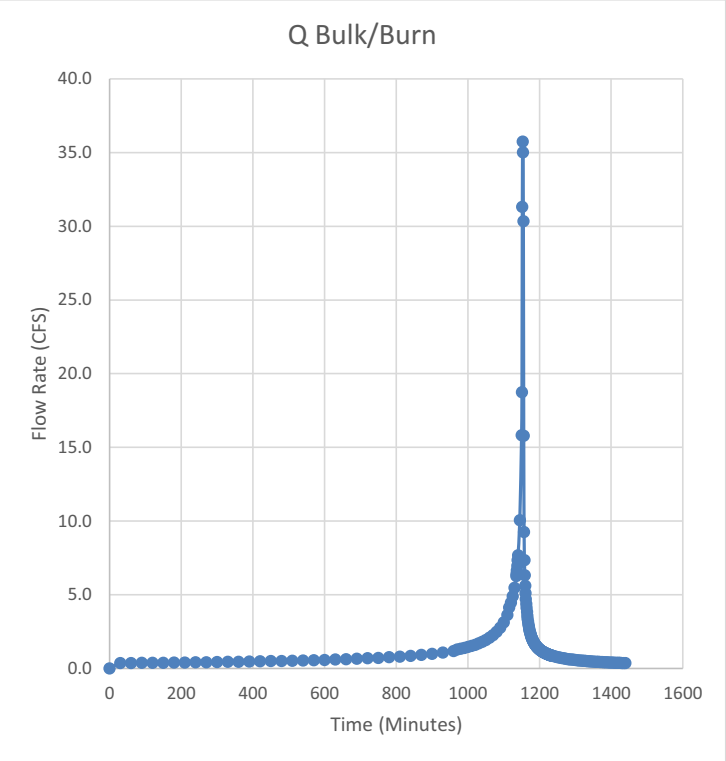
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 3.0 | 1185 | 1.5 | 1232 | 0.7 |
| 30 | 0.3 | 1115 | 3.4 | 1186 | 1.4 | 1233 | 0.7 |
| 60 | 0.3 | 1120 | 3.8 | 1187 | 1.4 | 1234 | 0.7 |
| 90 | 0.3 | 1125 | 4.2 | 1188 | 1.4 | 1235 | 0.7 |
| 120 | 0.3 | 1130 | 4.7 | 1189 | 1.3 | 1240 | 0.7 |
| 150 | 0.3 | 1135 | 5.4 | 1190 | 1.3 | 1245 | 0.7 |
| 180 | 0.3 | 1136 | 5.5 | 1191 | 1.3 | 1250 | 0.6 |
| 210 | 0.3 | 1137 | 5.7 | 1192 | 1.3 | 1255 | 0.6 |
| 240 | 0.4 | 1138 | 5.9 | 1193 | 1.2 | 1260 | 0.6 |
| 270 | 0.4 | 1139 | 6.1 | 1194 | 1.2 | 1265 | 0.6 |
| 300 | 0.4 | 1140 | 6.5 | 1195 | 1.2 | 1270 | 0.6 |
| 330 | 0.4 | 1145 | 8.5 | 1196 | 1.2 | 1275 | 0.5 |
| 360 | 0.4 | 1150 | 13.8 | 1197 | 1.1 | 1280 | 0.5 |
| 390 | 0.4 | 1151 | 15.9 | 1198 | 1.1 | 1285 | 0.5 |
| 420 | 0.4 | 1152 | 24.8 | 1199 | 1.1 | 1290 | 0.5 |
| 450 | 0.4 | 1153 | 27.9 | 1200 | 1.1 | 1295 | 0.5 |
| 480 | 0.4 | 1154 | 27.4 | 1201 | 1.1 | 1300 | 0.5 |
| 510 | 0.4 | 1155 | 26.2 | 1202 | 1.1 | 1305 | 0.5 |
| 540 | 0.5 | 1156 | 22.7 | 1203 | 1.0 | 1310 | 0.5 |
| 570 | 0.5 | 1157 | 12.1 | 1204 | 1.0 | 1315 | 0.5 |
| 600 | 0.5 | 1158 | 7.3 | 1205 | 1.0 | 1320 | 0.4 |
| 630 | 0.5 | 1159 | 6.0 | 1206 | 1.0 | 1325 | 0.4 |
| 660 | 0.5 | 1160 | 5.2 | 1207 | 1.0 | 1330 | 0.4 |
| 690 | 0.6 | 1161 | 4.7 | 1208 | 1.0 | 1335 | 0.4 |
| 720 | 0.6 | 1162 | 4.3 | 1209 | 1.0 | 1340 | 0.4 |
| 750 | 0.6 | 1163 | 3.9 | 1210 | 0.9 | 1345 | 0.4 |
| 780 | 0.6 | 1164 | 3.6 | 1211 | 0.9 | 1350 | 0.4 |
| 810 | 0.7 | 1165 | 3.3 | 1212 | 0.9 | 1355 | 0.4 |
| 840 | 0.7 | 1166 | 3.1 | 1213 | 0.9 | 1360 | 0.4 |
| 870 | 0.8 | 1167 | 2.9 | 1214 | 0.9 | 1365 | 0.4 |
| 900 | 0.8 | 1168 | 2.7 | 1215 | 0.9 | 1370 | 0.4 |
| 930 | 0.9 | 1169 | 2.6 | 1216 | 0.9 | 1375 | 0.4 |
| 960 | 1.0 | 1170 | 2.4 | 1217 | 0.9 | 1380 | 0.4 |
| 970 | 1.1 | 1171 | 2.3 | 1218 | 0.9 | 1385 | 0.4 |
| 980 | 1.1 | 1172 | 2.2 | 1219 | 0.8 | 1390 | 0.3 |
| 990 | 1.2 | 1173 | 2.1 | 1220 | 0.8 | 1395 | 0.3 |
| 1000 | 1.2 | 1174 | 2.0 | 1221 | 0.8 | 1400 | 0.3 |
| 1010 | 1.3 | 1175 | 2.0 | 1222 | 0.8 | 1405 | 0.3 |
| 1020 | 1.3 | 1176 | 1.9 | 1223 | 0.8 | 1410 | 0.3 |
| 1030 | 1.4 | 1177 | 1.8 | 1224 | 0.8 | 1415 | 0.3 |
| 1040 | 1.5 | 1178 | 1.8 | 1225 | 0.8 | 1420 | 0.3 |
| 1050 | 1.6 | 1179 | 1.7 | 1226 | 0.8 | 1425 | 0.3 |
| 1060 | 1.7 | 1180 | 1.7 | 1227 | 0.8 | 1430 | 0.3 |
| 1070 | 1.9 | 1181 | 1.6 | 1228 | 0.8 | 1435 | 0.3 |
| 1080 | 2.1 | 1182 | 1.6 | 1229 | 0.8 | 1440 | 0.3 |
| 1090 | 2.3 | 1183 | 1.5 | 1230 | 0.8 | | |
| 1100 | 2.6 | 1184 | 1.5 | 1231 | 0.8 | | |



# 100-Year Summary for POC: 15

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| (min) | (CFS) | (min) | (CFS) | (min) | (CFS) | (min) | (CFS) |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 3.6 | 1185 | 1.7 | 1232 | 0.9 |
| 30 | 0.4 | 1115 | 4.1 | 1186 | 1.7 | 1233 | 0.9 |
| 60 | 0.4 | 1120 | 4.5 | 1187 | 1.7 | 1234 | 0.9 |
| 90 | 0.4 | 1125 | 4.9 | 1188 | 1.6 | 1235 | 0.9 |
| 120 | 0.4 | 1130 | 5.5 | 1189 | 1.6 | 1240 | 0.8 |
| 150 | 0.4 | 1135 | 6.3 | 1190 | 1.5 | 1245 | 0.8 |
| 180 | 0.4 | 1136 | 6.4 | 1191 | 1.5 | 1250 | 0.8 |
| 210 | 0.4 | 1137 | 6.7 | 1192 | 1.5 | 1255 | 0.7 |
| 240 | 0.4 | 1138 | 7.0 | 1193 | 1.5 | 1260 | 0.7 |
| 270 | 0.4 | 1139 | 7.4 | 1194 | 1.4 | 1265 | 0.7 |
| 300 | 0.4 | 1140 | 7.7 | 1195 | 1.4 | 1270 | 0.7 |
| 330 | 0.4 | 1145 | 10.1 | 1196 | 1.4 | 1275 | 0.7 |
| 360 | 0.5 | 1150 | 15.8 | 1197 | 1.4 | 1280 | 0.6 |
| 390 | 0.5 | 1151 | 18.7 | 1198 | 1.3 | 1285 | 0.6 |
| 420 | 0.5 | 1152 | 31.3 | 1199 | 1.3 | 1290 | 0.6 |
| 450 | 0.5 | 1153 | 35.7 | 1200 | 1.3 | 1295 | 0.6 |
| 480 | 0.5 | 1154 | 35.0 | 1201 | 1.3 | 1300 | 0.6 |
| 510 | 0.5 | 1155 | 30.3 | 1202 | 1.3 | 1305 | 0.6 |
| 540 | 0.5 | 1156 | 15.8 | 1203 | 1.2 | 1310 | 0.5 |
| 570 | 0.6 | 1157 | 9.3 | 1204 | 1.2 | 1315 | 0.5 |
| 600 | 0.6 | 1158 | 7.3 | 1205 | 1.2 | 1320 | 0.5 |
| 630 | 0.6 | 1159 | 6.3 | 1206 | 1.2 | 1325 | 0.5 |
| 660 | 0.6 | 1160 | 5.6 | 1207 | 1.2 | 1330 | 0.5 |
| 690 | 0.7 | 1161 | 5.1 | 1208 | 1.2 | 1335 | 0.5 |
| 720 | 0.7 | 1162 | 4.7 | 1209 | 1.1 | 1340 | 0.5 |
| 750 | 0.7 | 1163 | 4.4 | 1210 | 1.1 | 1345 | 0.5 |
| 780 | 0.8 | 1164 | 4.1 | 1211 | 1.1 | 1350 | 0.5 |
| 810 | 0.8 | 1165 | 3.8 | 1212 | 1.1 | 1355 | 0.5 |
| 840 | 0.9 | 1166 | 3.6 | 1213 | 1.1 | 1360 | 0.5 |
| 870 | 0.9 | 1167 | 3.4 | 1214 | 1.1 | 1365 | 0.4 |
| 900 | 1.0 | 1168 | 3.2 | 1215 | 1.1 | 1370 | 0.4 |
| 930 | 1.1 | 1169 | 3.0 | 1216 | 1.0 | 1375 | 0.4 |
| 960 | 1.2 | 1170 | 2.9 | 1217 | 1.0 | 1380 | 0.4 |
| 970 | 1.3 | 1171 | 2.7 | 1218 | 1.0 | 1385 | 0.4 |
| 980 | 1.3 | 1172 | 2.6 | 1219 | 1.0 | 1390 | 0.4 |
| 990 | 1.4 | 1173 | 2.5 | 1220 | 1.0 | 1395 | 0.4 |
| 1000 | 1.5 | 1174 | 2.4 | 1221 | 1.0 | 1400 | 0.4 |
| 1010 | 1.5 | 1175 | 2.3 | 1222 | 1.0 | 1405 | 0.4 |
| 1020 | 1.6 | 1176 | 2.2 | 1223 | 1.0 | 1410 | 0.4 |
| 1030 | 1.7 | 1177 | 2.2 | 1224 | 1.0 | 1415 | 0.4 |
| 1040 | 1.8 | 1178 | 2.1 | 1225 | 0.9 | 1420 | 0.4 |
| 1050 | 1.9 | 1179 | 2.0 | 1226 | 0.9 | 1425 | 0.4 |
| 1060 | 2.1 | 1180 | 2.0 | 1227 | 0.9 | 1430 | 0.4 |
| 1070 | 2.3 | 1181 | 1.9 | 1228 | 0.9 | 1435 | 0.4 |
| 1080 | 2.5 | 1182 | 1.9 | 1229 | 0.9 | 1440 | 0.4 |
| 1090 | 2.8 | 1183 | 1.8 | 1230 | 0.9 | | |
| 1100 | 3.1 | 1184 | 1.8 | 1231 | 0.9 | | |



# SoCal Gas Project

## POC 15

### Stream Station = 10+00

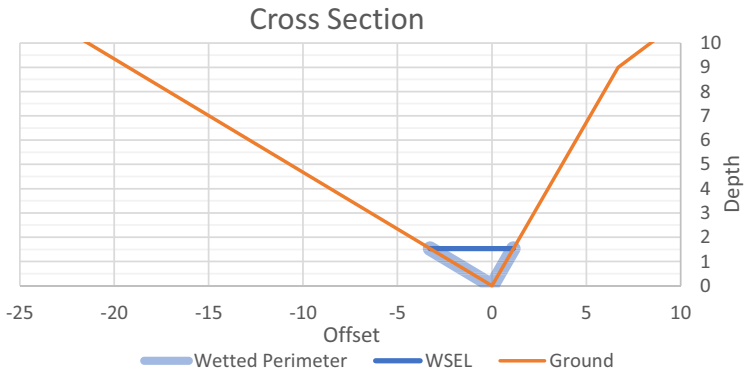
## INPUT

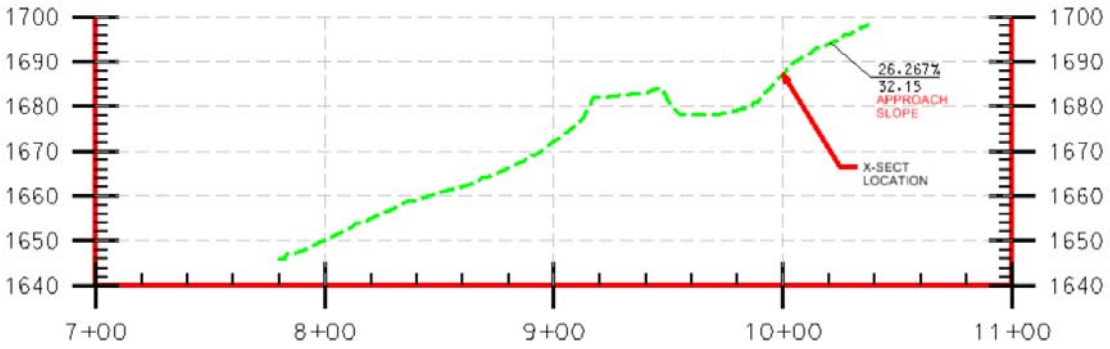
| | | |
|---|---|---|
| $Q_{50}$ | 29.0 | cfs |
| $Q_{100}$ | 37.0 | cfs |
| **$Q_{DESIGN}$** | **37.0** | **cfs** |
| | | |
| N | 0.050 | |
| So | 0.263 | ft/ft |

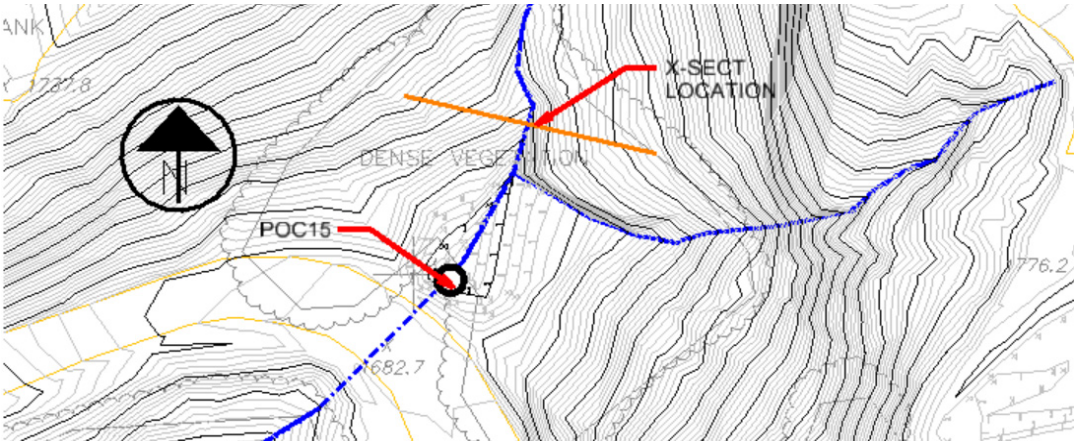
## Results

| | | | |
|---|---|---|---|
| **Depth=** | **1.5** | **ft** | *(NORMAL DEPTH)* |
| Area= | 3.4 | $ft^2$ | |
| $P_W$ | 5.5 | ft | |
| R | 0.612 | ft | |
| **Velocity=** | **11.0** | **ft/s** | |
| $S_F$ | 0.262 | ft/ft | |

| Point | Station | Ground |
|---|---|---|
| 1 | -22.22 | 1697.56 |
| 2 | 0 | 1687.17 |
| 3 | 6.68 | 1696.17 |
| 4 | 13.41 | 1700.08 |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |



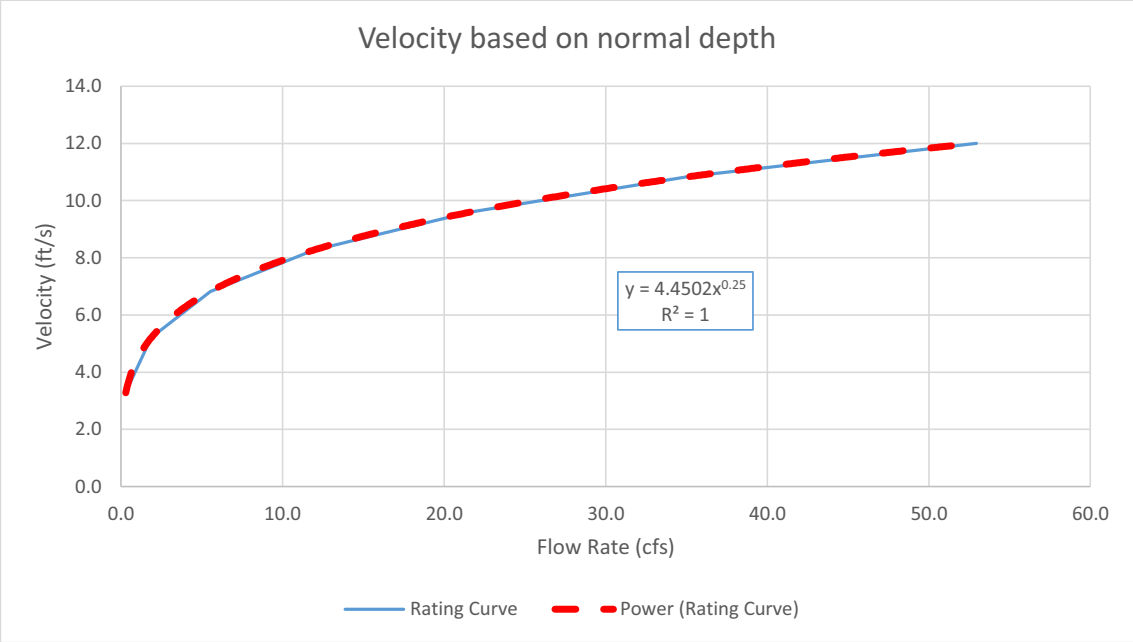



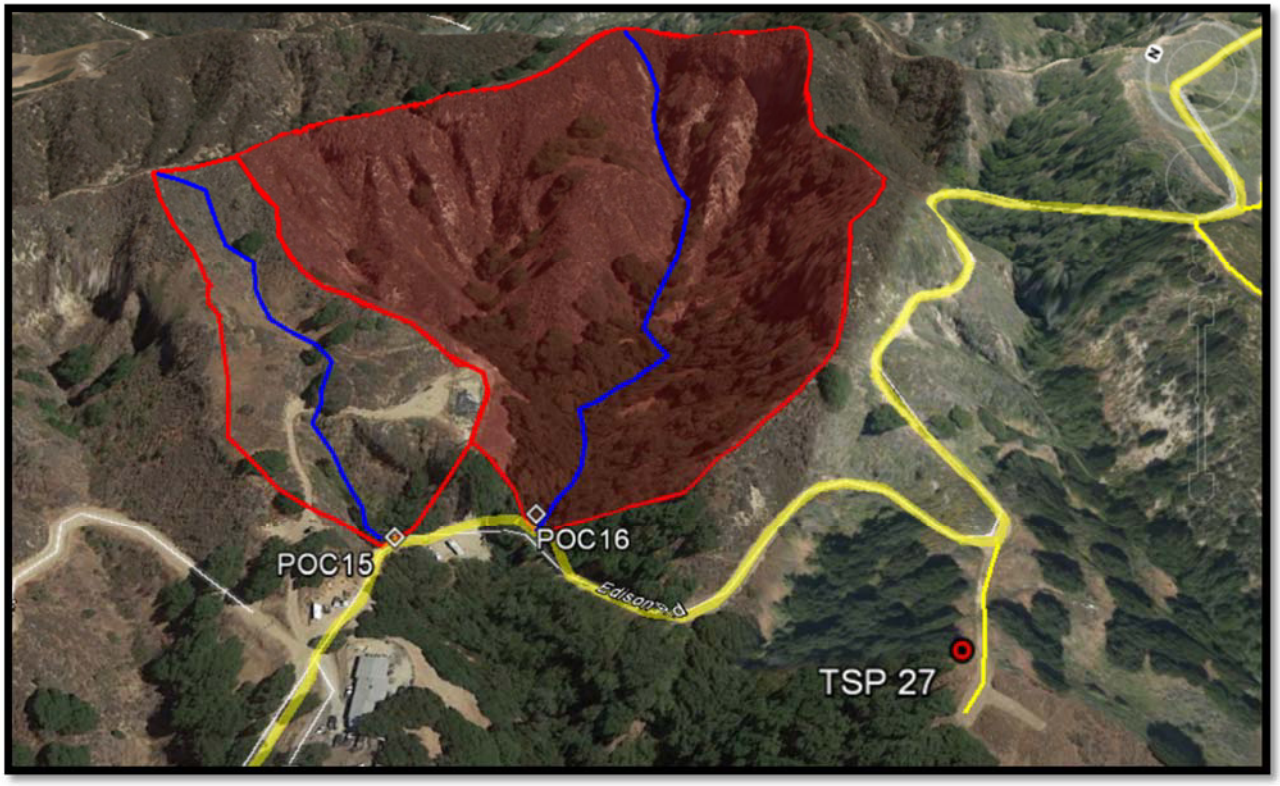
# SoCal Gas Project

## POC 15

### Stream Station = 10+00



# POC #16




## LOCATION

POC #16 is adjacent to POC #15 and drains a slightly larger area. This area also drains to an existing culvert that passes underneath the existing maintenance access road that leads to TSP 27.

*Approximate Latitude:* 34°20'48.71"N

*Approximate Longitude:* *118°31'40.91"W*

## DRAINAGE AREA INFORMATION

*Area:* 17.5acres

*Flow Length:* 1227 feet

*Effective Slope:* 20.4%

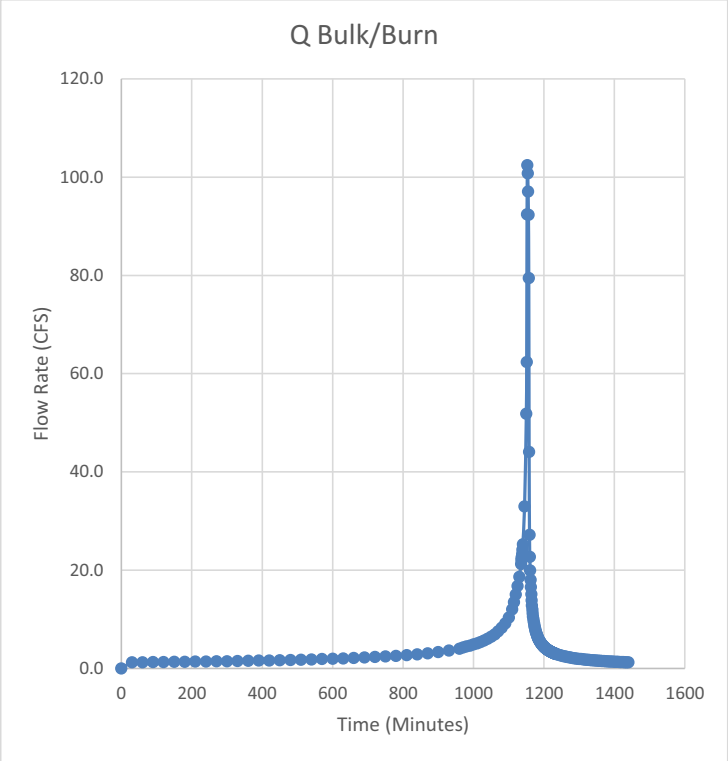
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 16

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

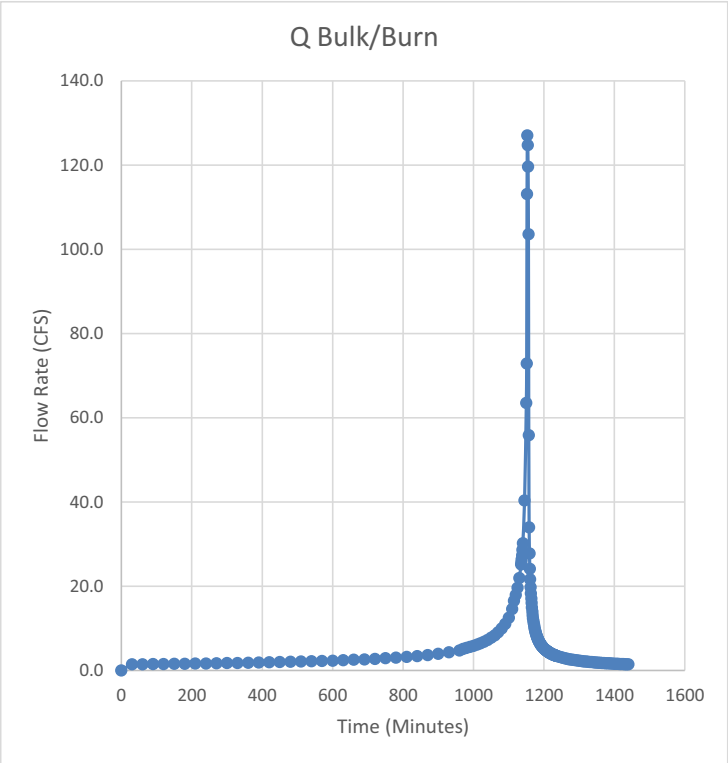
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 12.1 | 1185 | 5.9 | 1232 | 3.0 |
| 30 | 1.2 | 1115 | 13.5 | 1186 | 5.8 | 1233 | 3.0 |
| 60 | 1.3 | 1120 | 15.0 | 1187 | 5.7 | 1234 | 3.0 |
| 90 | 1.3 | 1125 | 16.8 | 1188 | 5.5 | 1235 | 2.9 |
| 120 | 1.3 | 1130 | 18.6 | 1189 | 5.4 | 1240 | 2.8 |
| 150 | 1.3 | 1135 | 21.3 | 1190 | 5.3 | 1245 | 2.7 |
| 180 | 1.4 | 1136 | 22.1 | 1191 | 5.2 | 1250 | 2.6 |
| 210 | 1.4 | 1137 | 22.6 | 1192 | 5.1 | 1255 | 2.5 |
| 240 | 1.4 | 1138 | 23.3 | 1193 | 5.0 | 1260 | 2.4 |
| 270 | 1.4 | 1139 | 24.2 | 1194 | 4.9 | 1265 | 2.4 |
| 300 | 1.5 | 1140 | 25.3 | 1195 | 4.8 | 1270 | 2.3 |
| 330 | 1.5 | 1145 | 33.0 | 1196 | 4.7 | 1275 | 2.2 |
| 360 | 1.6 | 1150 | 51.8 | 1197 | 4.6 | 1280 | 2.2 |
| 390 | 1.6 | 1151 | 62.4 | 1198 | 4.6 | 1285 | 2.1 |
| 420 | 1.6 | 1152 | 92.4 | 1199 | 4.5 | 1290 | 2.0 |
| 450 | 1.7 | 1153 | 102.4 | 1200 | 4.4 | 1295 | 2.0 |
| 480 | 1.7 | 1154 | 100.8 | 1201 | 4.3 | 1300 | 1.9 |
| 510 | 1.8 | 1155 | 97.1 | 1202 | 4.3 | 1305 | 1.9 |
| 540 | 1.8 | 1156 | 92.3 | 1203 | 4.2 | 1310 | 1.9 |
| 570 | 1.9 | 1157 | 79.4 | 1204 | 4.2 | 1315 | 1.8 |
| 600 | 2.0 | 1158 | 44.1 | 1205 | 4.1 | 1320 | 1.8 |
| 630 | 2.0 | 1159 | 27.2 | 1206 | 4.0 | 1325 | 1.7 |
| 660 | 2.1 | 1160 | 22.7 | 1207 | 4.0 | 1330 | 1.7 |
| 690 | 2.2 | 1161 | 20.0 | 1208 | 3.9 | 1335 | 1.7 |
| 720 | 2.3 | 1162 | 18.0 | 1209 | 3.9 | 1340 | 1.6 |
| 750 | 2.4 | 1163 | 16.6 | 1210 | 3.8 | 1345 | 1.6 |
| 780 | 2.6 | 1164 | 15.1 | 1211 | 3.8 | 1350 | 1.6 |
| 810 | 2.7 | 1165 | 13.9 | 1212 | 3.7 | 1355 | 1.6 |
| 840 | 2.9 | 1166 | 12.8 | 1213 | 3.7 | 1360 | 1.5 |
| 870 | 3.1 | 1167 | 12.0 | 1214 | 3.6 | 1365 | 1.5 |
| 900 | 3.3 | 1168 | 11.2 | 1215 | 3.6 | 1370 | 1.5 |
| 930 | 3.6 | 1169 | 10.6 | 1216 | 3.5 | 1375 | 1.5 |
| 960 | 4.0 | 1170 | 10.0 | 1217 | 3.5 | 1380 | 1.4 |
| 970 | 4.3 | 1171 | 9.6 | 1218 | 3.5 | 1385 | 1.4 |
| 980 | 4.5 | 1172 | 9.1 | 1219 | 3.4 | 1390 | 1.4 |
| 990 | 4.7 | 1173 | 8.7 | 1220 | 3.4 | 1395 | 1.4 |
| 1000 | 4.9 | 1174 | 8.4 | 1221 | 3.4 | 1400 | 1.4 |
| 1010 | 5.1 | 1175 | 8.1 | 1222 | 3.3 | 1405 | 1.3 |
| 1020 | 5.4 | 1176 | 7.8 | 1223 | 3.3 | 1410 | 1.3 |
| 1030 | 5.7 | 1177 | 7.5 | 1224 | 3.3 | 1415 | 1.3 |
| 1040 | 6.0 | 1178 | 7.2 | 1225 | 3.2 | 1420 | 1.3 |
| 1050 | 6.5 | 1179 | 7.0 | 1226 | 3.2 | 1425 | 1.3 |
| 1060 | 6.9 | 1180 | 6.8 | 1227 | 3.2 | 1430 | 1.3 |
| 1070 | 7.5 | 1181 | 6.6 | 1228 | 3.1 | 1435 | 1.2 |
| 1080 | 8.3 | 1182 | 6.4 | 1229 | 3.1 | 1440 | 1.2 |
| 1090 | 9.2 | 1183 | 6.3 | 1230 | 3.1 | | |
| 1100 | 10.4 | 1184 | 6.1 | 1231 | 3.0 | | |



# 100-Year Summary for POC: 16

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 14.6 | 1185 | 7.0 | 1232 | 3.6 |
| 30 | 1.5 | 1115 | 16.6 | 1186 | 6.9 | 1233 | 3.5 |
| 60 | 1.5 | 1120 | 17.9 | 1187 | 6.7 | 1234 | 3.5 |
| 90 | 1.5 | 1125 | 19.6 | 1188 | 6.6 | 1235 | 3.5 |
| 120 | 1.5 | 1130 | 21.9 | 1189 | 6.4 | 1240 | 3.3 |
| 150 | 1.6 | 1135 | 25.2 | 1190 | 6.3 | 1245 | 3.2 |
| 180 | 1.6 | 1136 | 25.7 | 1191 | 6.2 | 1250 | 3.1 |
| 210 | 1.6 | 1137 | 26.4 | 1192 | 6.0 | 1255 | 3.0 |
| 240 | 1.7 | 1138 | 27.4 | 1193 | 5.9 | 1260 | 2.9 |
| 270 | 1.7 | 1139 | 28.6 | 1194 | 5.8 | 1265 | 2.8 |
| 300 | 1.7 | 1140 | 30.2 | 1195 | 5.7 | 1270 | 2.7 |
| 330 | 1.8 | 1145 | 40.4 | 1196 | 5.6 | 1275 | 2.6 |
| 360 | 1.8 | 1150 | 63.5 | 1197 | 5.5 | 1280 | 2.5 |
| 390 | 1.9 | 1151 | 72.9 | 1198 | 5.4 | 1285 | 2.5 |
| 420 | 1.9 | 1152 | 113.1 | 1199 | 5.3 | 1290 | 2.4 |
| 450 | 2.0 | 1153 | 127.1 | 1200 | 5.2 | 1295 | 2.3 |
| 480 | 2.0 | 1154 | 124.8 | 1201 | 5.1 | 1300 | 2.3 |
| 510 | 2.1 | 1155 | 119.6 | 1202 | 5.1 | 1305 | 2.2 |
| 540 | 2.2 | 1156 | 103.6 | 1203 | 5.0 | 1310 | 2.2 |
| 570 | 2.3 | 1157 | 55.9 | 1204 | 4.9 | 1315 | 2.1 |
| 600 | 2.3 | 1158 | 34.0 | 1205 | 4.8 | 1320 | 2.1 |
| 630 | 2.4 | 1159 | 27.8 | 1206 | 4.8 | 1325 | 2.1 |
| 660 | 2.5 | 1160 | 24.1 | 1207 | 4.7 | 1330 | 2.0 |
| 690 | 2.6 | 1161 | 21.6 | 1208 | 4.6 | 1335 | 2.0 |
| 720 | 2.8 | 1162 | 19.8 | 1209 | 4.6 | 1340 | 1.9 |
| 750 | 2.9 | 1163 | 18.3 | 1210 | 4.5 | 1345 | 1.9 |
| 780 | 3.0 | 1164 | 17.1 | 1211 | 4.5 | 1350 | 1.9 |
| 810 | 3.2 | 1165 | 16.1 | 1212 | 4.4 | 1355 | 1.8 |
| 840 | 3.4 | 1166 | 14.9 | 1213 | 4.4 | 1360 | 1.8 |
| 870 | 3.7 | 1167 | 14.0 | 1214 | 4.3 | 1365 | 1.8 |
| 900 | 4.0 | 1168 | 13.1 | 1215 | 4.3 | 1370 | 1.8 |
| 930 | 4.3 | 1169 | 12.4 | 1216 | 4.2 | 1375 | 1.7 |
| 960 | 4.8 | 1170 | 11.8 | 1217 | 4.2 | 1380 | 1.7 |
| 970 | 5.1 | 1171 | 11.2 | 1218 | 4.1 | 1385 | 1.7 |
| 980 | 5.3 | 1172 | 10.7 | 1219 | 4.1 | 1390 | 1.6 |
| 990 | 5.6 | 1173 | 10.3 | 1220 | 4.0 | 1395 | 1.6 |
| 1000 | 5.8 | 1174 | 9.9 | 1221 | 4.0 | 1400 | 1.6 |
| 1010 | 6.1 | 1175 | 9.5 | 1222 | 3.9 | 1405 | 1.6 |
| 1020 | 6.4 | 1176 | 9.2 | 1223 | 3.9 | 1410 | 1.6 |
| 1030 | 6.8 | 1177 | 8.8 | 1224 | 3.8 | 1415 | 1.5 |
| 1040 | 7.2 | 1178 | 8.6 | 1225 | 3.8 | 1420 | 1.5 |
| 1050 | 7.8 | 1179 | 8.3 | 1226 | 3.8 | 1425 | 1.5 |
| 1060 | 8.3 | 1180 | 8.0 | 1227 | 3.7 | 1430 | 1.5 |
| 1070 | 9.1 | 1181 | 7.8 | 1228 | 3.7 | 1435 | 1.5 |
| 1080 | 9.9 | 1182 | 7.6 | 1229 | 3.7 | 1440 | 1.4 |
| 1090 | 11.1 | 1183 | 7.4 | 1230 | 3.6 | | |
| 1100 | 12.5 | 1184 | 7.2 | 1231 | 3.6 | | |



# SoCal Gas Project

## POC 16

### Stream Station = 10+00

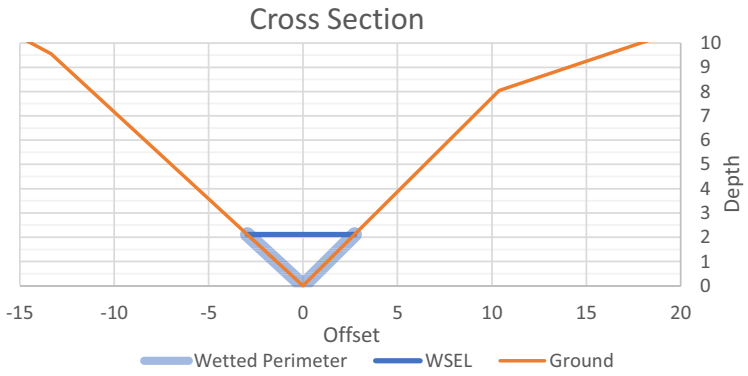
## INPUT

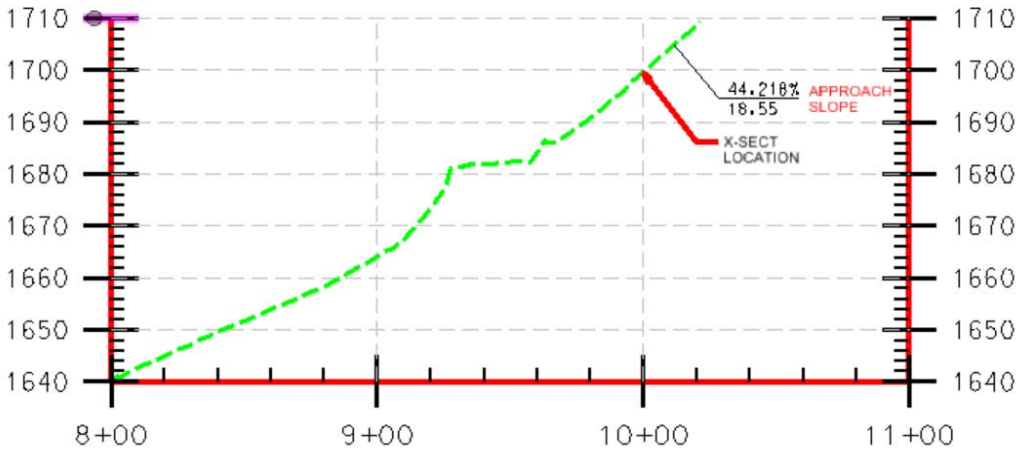
| | | |
|---|---|---|
| $Q_{50}$ | 110.0 | cfs |
| $Q_{100}$ | 133.0 | cfs |
| **$Q_{DESIGN}$** | **133.0** | **cfs** |
| | | |
| N | 0.040 | |
| So | 0.442 | ft/ft |

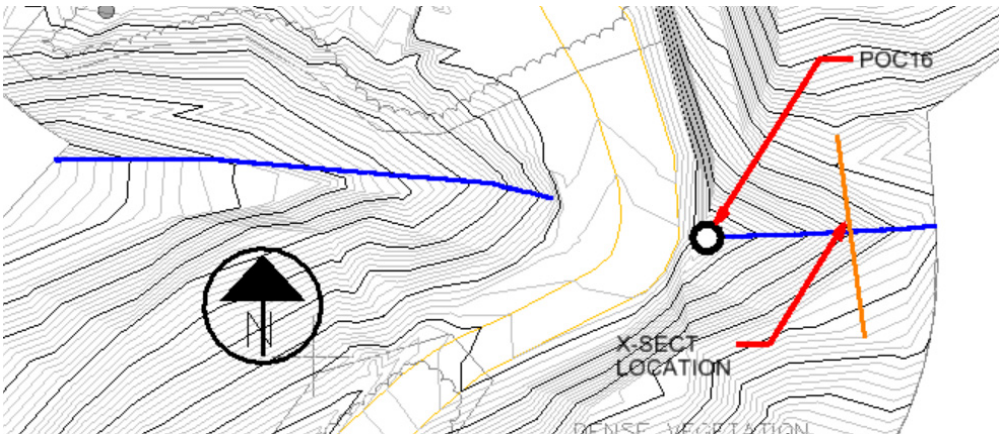
## Results

| | | | |
|---|---|---|---|
| **Depth=** | **2.1** | **ft** | *(NORMAL DEPTH)* |
| Area= | 6.0 | $ft^2$ | |
| $P_W$ | 7.1 | ft | |
| R | 0.848 | ft | |
| **Velocity=** | **22.1** | **ft/s** | |
| $S_F$ | 0.442 | ft/ft | |

| Point | Station | Ground |
|---|---|---|
| 1 | -25.38 | 1714 |
| 2 | -13.35 | 1709 |
| 3 | 0 | 1699.44 |
| 4 | 10.39 | 1707.48 |
| 5 | 25.02 | 1711.3 |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |



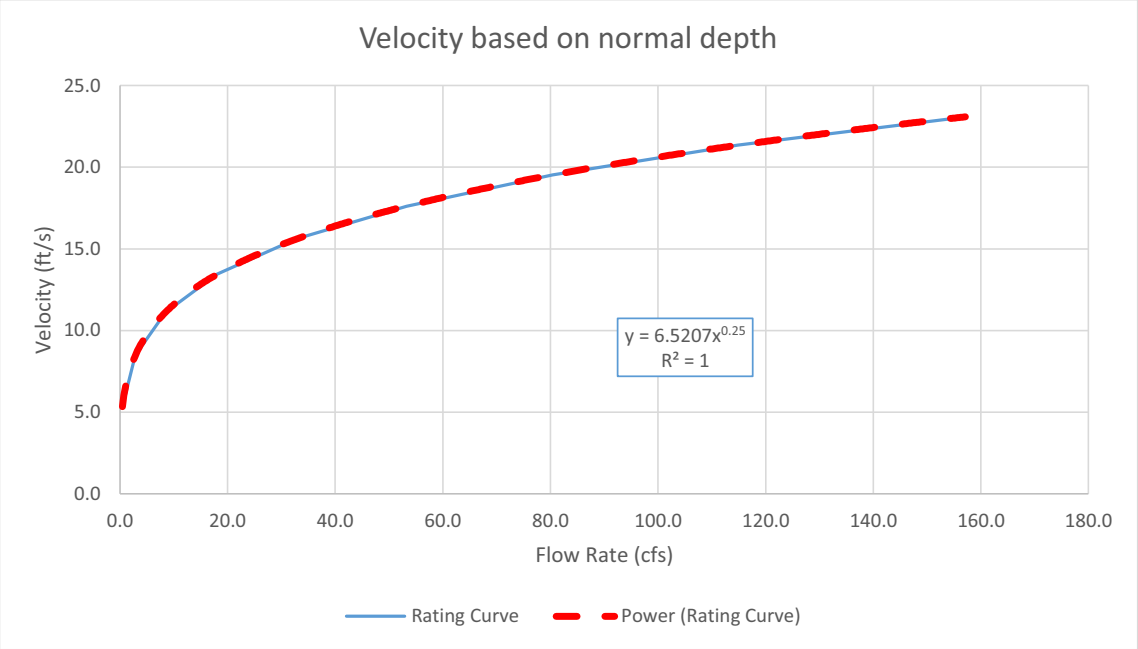



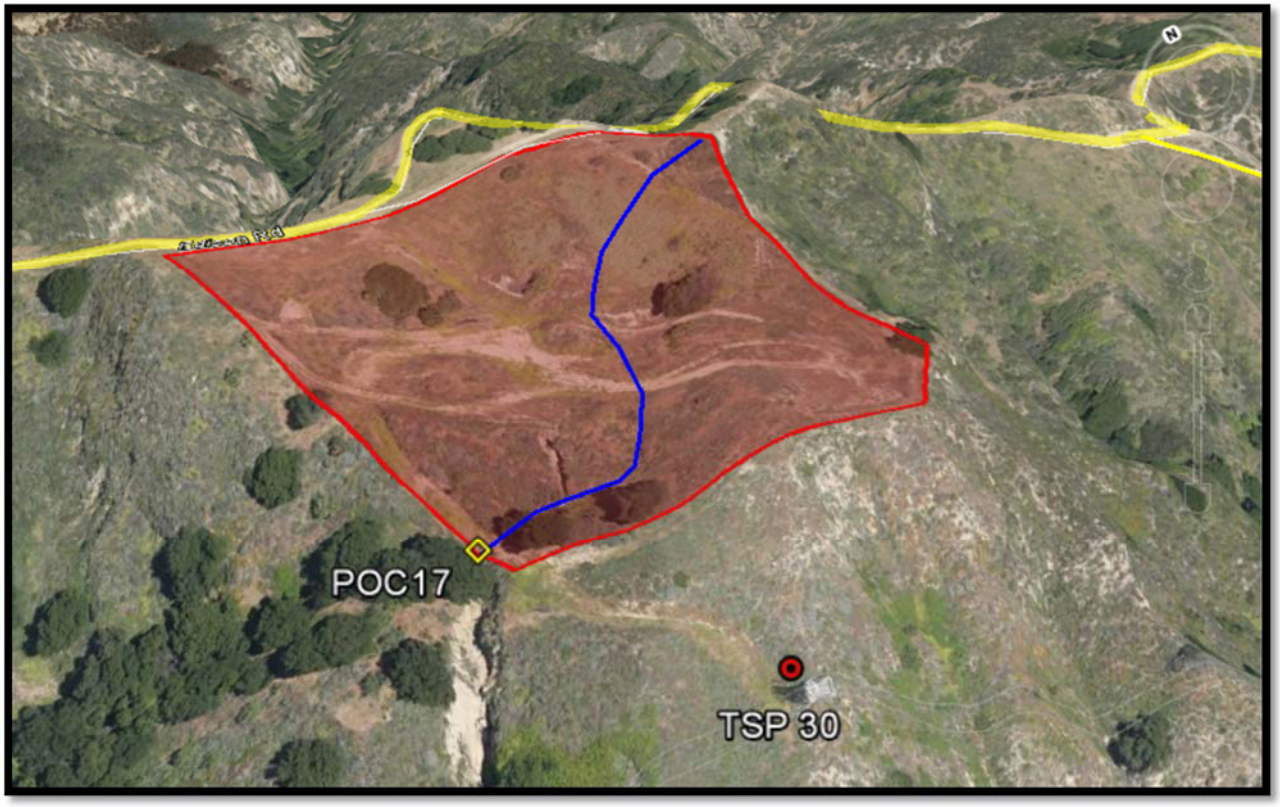
# SoCal Gas Project

## POC 16

### Stream Station = 10+00



# POC #17




## LOCATION

POC #17 is a smaller area that currently drains through a 36” CMP culvert that crosses an existing access road that leads to the location for TSP 30.The existing culvert is slightly damaged on the upstream side, and the downstream side of the culvert is highly eroded, as can be seen from the above image. This study assess the flow rates, depths and velocities at this culvert, and identified that with some maintenance on the upstream side the existing culvert should be serviceable.

*Approximate Latitude:* 34°20'35.70"N

*Approximate Longitude:* *118°31'20.60"W*

## DRAINAGE AREA INFORMATION

*Area:* 4.6 acres

*Flow Length:* 571 feet

*Effective Slope:* 19.0%

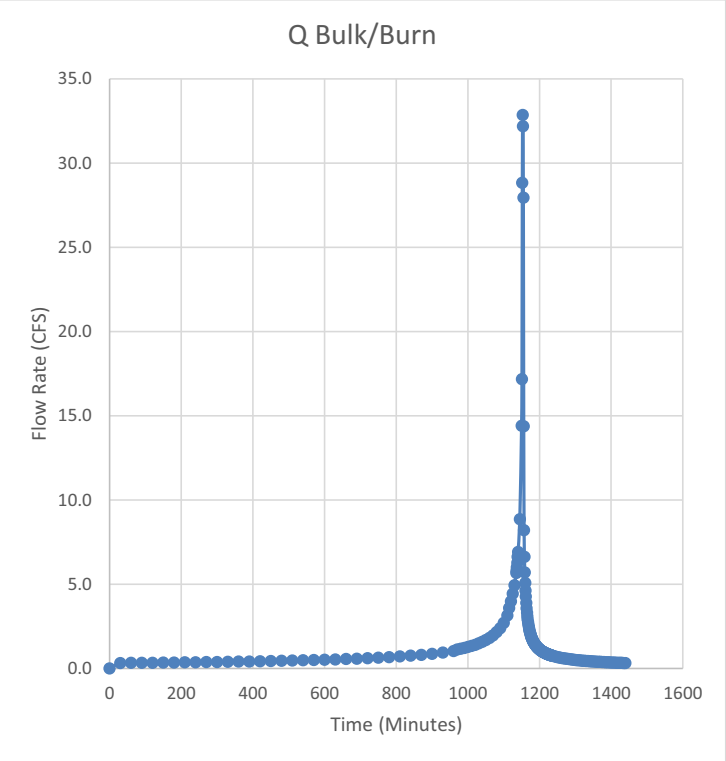
*Soil Type No:* 097

*Debris Production Area:* 3

# 50-Year Summary for POC: 17

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

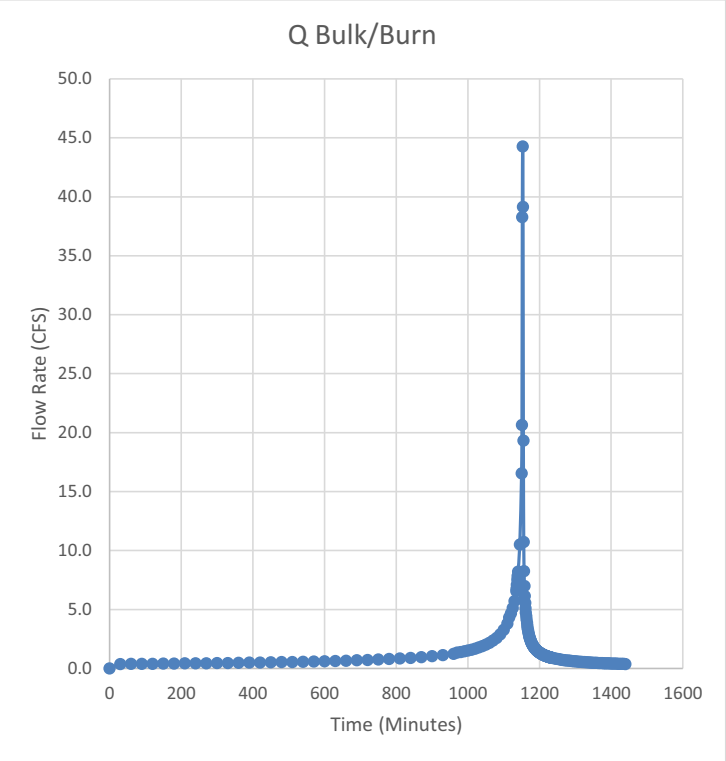
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 3.1 | 1185 | 1.5 | 1232 | 0.8 |
| 30 | 0.3 | 1115 | 3.6 | 1186 | 1.5 | 1233 | 0.8 |
| 60 | 0.3 | 1120 | 4.0 | 1187 | 1.4 | 1234 | 0.8 |
| 90 | 0.3 | 1125 | 4.4 | 1188 | 1.4 | 1235 | 0.8 |
| 120 | 0.3 | 1130 | 4.9 | 1189 | 1.4 | 1240 | 0.7 |
| 150 | 0.3 | 1135 | 5.7 | 1190 | 1.4 | 1245 | 0.7 |
| 180 | 0.4 | 1136 | 5.8 | 1191 | 1.3 | 1250 | 0.7 |
| 210 | 0.4 | 1137 | 6.0 | 1192 | 1.3 | 1255 | 0.7 |
| 240 | 0.4 | 1138 | 6.3 | 1193 | 1.3 | 1260 | 0.6 |
| 270 | 0.4 | 1139 | 6.6 | 1194 | 1.3 | 1265 | 0.6 |
| 300 | 0.4 | 1140 | 6.9 | 1195 | 1.2 | 1270 | 0.6 |
| 330 | 0.4 | 1145 | 8.9 | 1196 | 1.2 | 1275 | 0.6 |
| 360 | 0.4 | 1150 | 14.4 | 1197 | 1.2 | 1280 | 0.6 |
| 390 | 0.4 | 1151 | 17.2 | 1198 | 1.2 | 1285 | 0.5 |
| 420 | 0.4 | 1152 | 28.8 | 1199 | 1.1 | 1290 | 0.5 |
| 450 | 0.4 | 1153 | 32.9 | 1200 | 1.1 | 1295 | 0.5 |
| 480 | 0.5 | 1154 | 32.2 | 1201 | 1.1 | 1300 | 0.5 |
| 510 | 0.5 | 1155 | 27.9 | 1202 | 1.1 | 1305 | 0.5 |
| 540 | 0.5 | 1156 | 14.4 | 1203 | 1.1 | 1310 | 0.5 |
| 570 | 0.5 | 1157 | 8.2 | 1204 | 1.1 | 1315 | 0.5 |
| 600 | 0.5 | 1158 | 6.6 | 1205 | 1.1 | 1320 | 0.5 |
| 630 | 0.5 | 1159 | 5.7 | 1206 | 1.0 | 1325 | 0.5 |
| 660 | 0.6 | 1160 | 5.1 | 1207 | 1.0 | 1330 | 0.4 |
| 690 | 0.6 | 1161 | 4.6 | 1208 | 1.0 | 1335 | 0.4 |
| 720 | 0.6 | 1162 | 4.3 | 1209 | 1.0 | 1340 | 0.4 |
| 750 | 0.6 | 1163 | 3.9 | 1210 | 1.0 | 1345 | 0.4 |
| 780 | 0.7 | 1164 | 3.6 | 1211 | 1.0 | 1350 | 0.4 |
| 810 | 0.7 | 1165 | 3.3 | 1212 | 1.0 | 1355 | 0.4 |
| 840 | 0.8 | 1166 | 3.1 | 1213 | 0.9 | 1360 | 0.4 |
| 870 | 0.8 | 1167 | 2.9 | 1214 | 0.9 | 1365 | 0.4 |
| 900 | 0.9 | 1168 | 2.7 | 1215 | 0.9 | 1370 | 0.4 |
| 930 | 0.9 | 1169 | 2.6 | 1216 | 0.9 | 1375 | 0.4 |
| 960 | 1.0 | 1170 | 2.5 | 1217 | 0.9 | 1380 | 0.4 |
| 970 | 1.1 | 1171 | 2.4 | 1218 | 0.9 | 1385 | 0.4 |
| 980 | 1.2 | 1172 | 2.3 | 1219 | 0.9 | 1390 | 0.4 |
| 990 | 1.2 | 1173 | 2.2 | 1220 | 0.9 | 1395 | 0.4 |
| 1000 | 1.3 | 1174 | 2.1 | 1221 | 0.9 | 1400 | 0.4 |
| 1010 | 1.3 | 1175 | 2.0 | 1222 | 0.9 | 1405 | 0.3 |
| 1020 | 1.4 | 1176 | 1.9 | 1223 | 0.8 | 1410 | 0.3 |
| 1030 | 1.5 | 1177 | 1.9 | 1224 | 0.8 | 1415 | 0.3 |
| 1040 | 1.6 | 1178 | 1.8 | 1225 | 0.8 | 1420 | 0.3 |
| 1050 | 1.7 | 1179 | 1.8 | 1226 | 0.8 | 1425 | 0.3 |
| 1060 | 1.8 | 1180 | 1.7 | 1227 | 0.8 | 1430 | 0.3 |
| 1070 | 2.0 | 1181 | 1.7 | 1228 | 0.8 | 1435 | 0.3 |
| 1080 | 2.2 | 1182 | 1.6 | 1229 | 0.8 | 1440 | 0.3 |
| 1090 | 2.4 | 1183 | 1.6 | 1230 | 0.8 | | |
| 1100 | 2.7 | 1184 | 1.5 | 1231 | 0.8 | | |



# 100-Year Summary for POC: 17

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| (min) | (CFS) | (min) | (CFS) | (min) | (CFS) | (min) | (CFS) |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 3.8 | 1185 | 1.8 | 1232 | 0.9 |
| 30 | 0.4 | 1115 | 4.3 | 1186 | 1.7 | 1233 | 0.9 |
| 60 | 0.4 | 1120 | 4.7 | 1187 | 1.7 | 1234 | 0.9 |
| 90 | 0.4 | 1125 | 5.1 | 1188 | 1.7 | 1235 | 0.9 |
| 120 | 0.4 | 1130 | 5.7 | 1189 | 1.6 | 1240 | 0.9 |
| 150 | 0.4 | 1135 | 6.6 | 1190 | 1.6 | 1245 | 0.8 |
| 180 | 0.4 | 1136 | 6.8 | 1191 | 1.6 | 1250 | 0.8 |
| 210 | 0.4 | 1137 | 7.1 | 1192 | 1.5 | 1255 | 0.8 |
| 240 | 0.4 | 1138 | 7.5 | 1193 | 1.5 | 1260 | 0.7 |
| 270 | 0.4 | 1139 | 7.8 | 1194 | 1.5 | 1265 | 0.7 |
| 300 | 0.5 | 1140 | 8.2 | 1195 | 1.5 | 1270 | 0.7 |
| 330 | 0.5 | 1145 | 10.5 | 1196 | 1.4 | 1275 | 0.7 |
| 360 | 0.5 | 1150 | 16.5 | 1197 | 1.4 | 1280 | 0.7 |
| 390 | 0.5 | 1151 | 20.6 | 1198 | 1.4 | 1285 | 0.6 |
| 420 | 0.5 | 1152 | 38.3 | 1199 | 1.4 | 1290 | 0.6 |
| 450 | 0.5 | 1153 | 44.3 | 1200 | 1.3 | 1295 | 0.6 |
| 480 | 0.5 | 1154 | 39.2 | 1201 | 1.3 | 1300 | 0.6 |
| 510 | 0.5 | 1155 | 19.3 | 1202 | 1.3 | 1305 | 0.6 |
| 540 | 0.6 | 1156 | 10.7 | 1203 | 1.3 | 1310 | 0.6 |
| 570 | 0.6 | 1157 | 8.2 | 1204 | 1.3 | 1315 | 0.6 |
| 600 | 0.6 | 1158 | 7.0 | 1205 | 1.2 | 1320 | 0.5 |
| 630 | 0.6 | 1159 | 6.2 | 1206 | 1.2 | 1325 | 0.5 |
| 660 | 0.7 | 1160 | 5.6 | 1207 | 1.2 | 1330 | 0.5 |
| 690 | 0.7 | 1161 | 5.1 | 1208 | 1.2 | 1335 | 0.5 |
| 720 | 0.7 | 1162 | 4.7 | 1209 | 1.2 | 1340 | 0.5 |
| 750 | 0.8 | 1163 | 4.4 | 1210 | 1.2 | 1345 | 0.5 |
| 780 | 0.8 | 1164 | 4.2 | 1211 | 1.1 | 1350 | 0.5 |
| 810 | 0.8 | 1165 | 3.9 | 1212 | 1.1 | 1355 | 0.5 |
| 840 | 0.9 | 1166 | 3.6 | 1213 | 1.1 | 1360 | 0.5 |
| 870 | 1.0 | 1167 | 3.4 | 1214 | 1.1 | 1365 | 0.5 |
| 900 | 1.0 | 1168 | 3.2 | 1215 | 1.1 | 1370 | 0.5 |
| 930 | 1.1 | 1169 | 3.1 | 1216 | 1.1 | 1375 | 0.4 |
| 960 | 1.2 | 1170 | 2.9 | 1217 | 1.1 | 1380 | 0.4 |
| 970 | 1.3 | 1171 | 2.8 | 1218 | 1.1 | 1385 | 0.4 |
| 980 | 1.4 | 1172 | 2.7 | 1219 | 1.0 | 1390 | 0.4 |
| 990 | 1.5 | 1173 | 2.6 | 1220 | 1.0 | 1395 | 0.4 |
| 1000 | 1.5 | 1174 | 2.5 | 1221 | 1.0 | 1400 | 0.4 |
| 1010 | 1.6 | 1175 | 2.4 | 1222 | 1.0 | 1405 | 0.4 |
| 1020 | 1.7 | 1176 | 2.3 | 1223 | 1.0 | 1410 | 0.4 |
| 1030 | 1.8 | 1177 | 2.2 | 1224 | 1.0 | 1415 | 0.4 |
| 1040 | 1.9 | 1178 | 2.2 | 1225 | 1.0 | 1420 | 0.4 |
| 1050 | 2.0 | 1179 | 2.1 | 1226 | 1.0 | 1425 | 0.4 |
| 1060 | 2.2 | 1180 | 2.0 | 1227 | 1.0 | 1430 | 0.4 |
| 1070 | 2.4 | 1181 | 2.0 | 1228 | 1.0 | 1435 | 0.4 |
| 1080 | 2.6 | 1182 | 1.9 | 1229 | 0.9 | 1440 | 0.4 |
| 1090 | 2.9 | 1183 | 1.9 | 1230 | 0.9 | | |
| 1100 | 3.3 | 1184 | 1.8 | 1231 | 0.9 | | |



# SoCal Gas Project

## POC 17

### Stream Station = 10+49.82

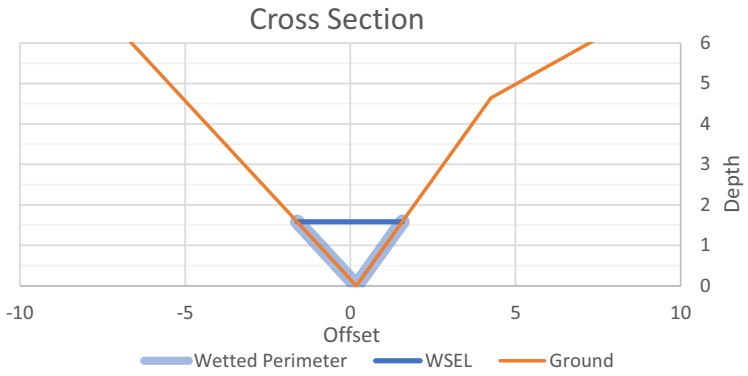
## INPUT

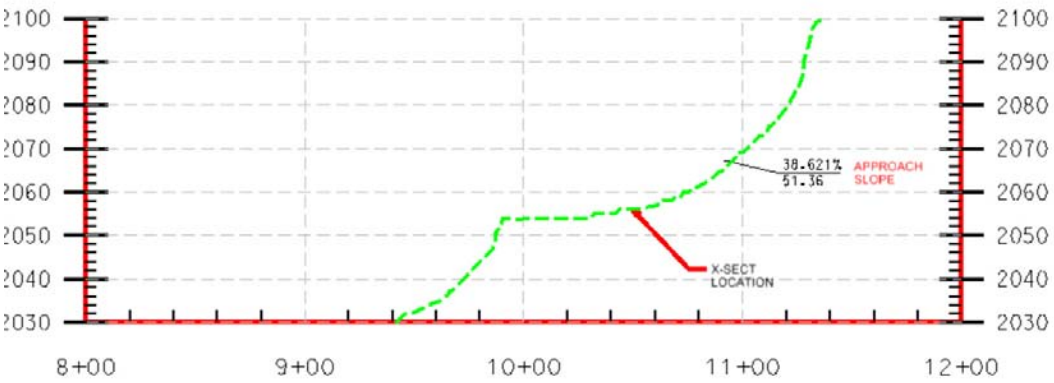
| | | |
|---|---|---|
| $Q_{50}$ | 34.0 | cfs |
| $Q_{100}$ | 45.0 | cfs |
| **$Q_{DESIGN}$** | **45.0** | **cfs** |
| Narrow Gulch | | |
| N | 0.035 | |
| So | 0.386 | ft/ft |

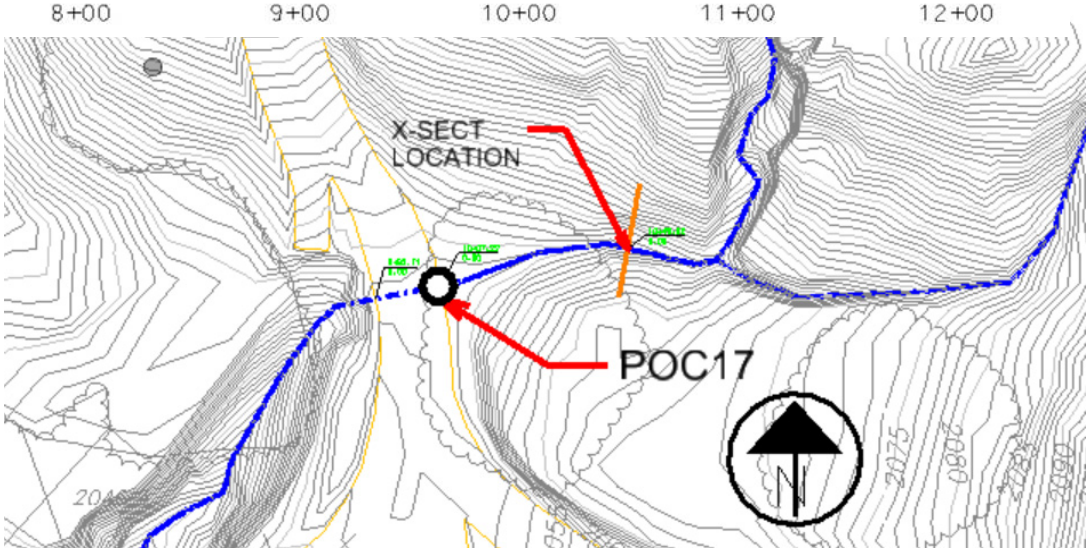
| Point | Station | Ground |
|---|---|---|
| 1 | -21.69 | 2073.36 |
| 2 | -8.81 | 2063.94 |
| 3 | 0.19 | 2056 |
| 4 | 4.26 | 2060.64 |
| 5 | 14.49 | 2065.31 |
| 6 | 37.01 | 2067 |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **1.6** | **ft** | *(NORMAL DEPTH)* |
| Area= | 2.5 | $ft^2$ | |
| $P_W$ | 4.5 | ft | |
| R | 0.559 | ft | |
| **Velocity=** | **17.9** | **ft/s** | |
| $S_F$ | 0.386 | ft/ft | |



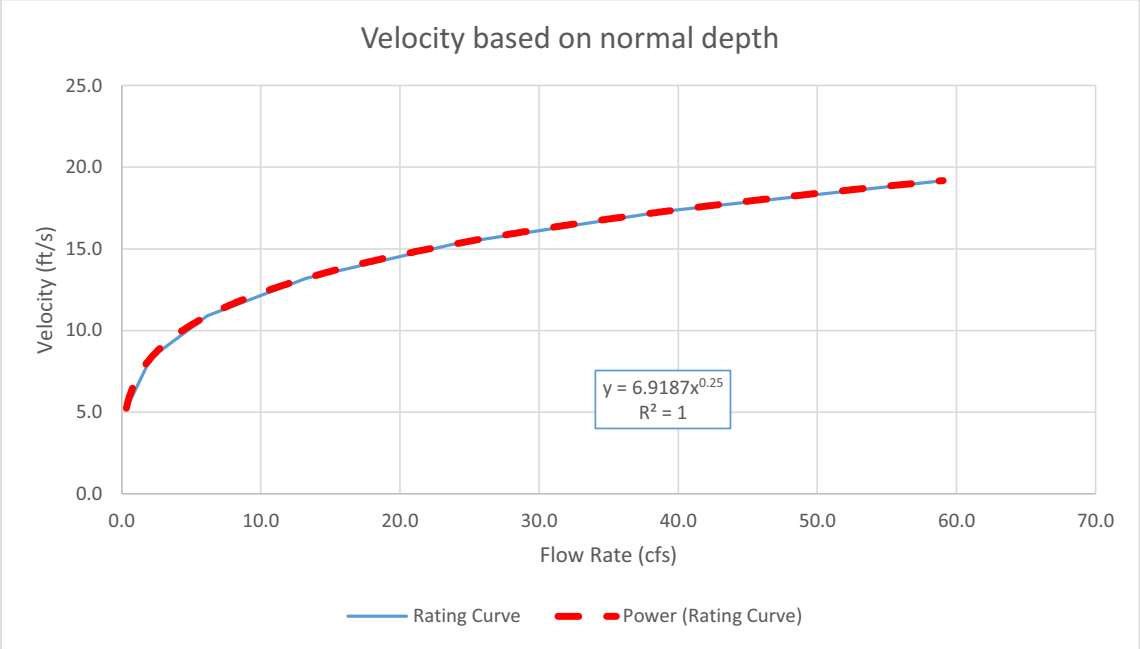



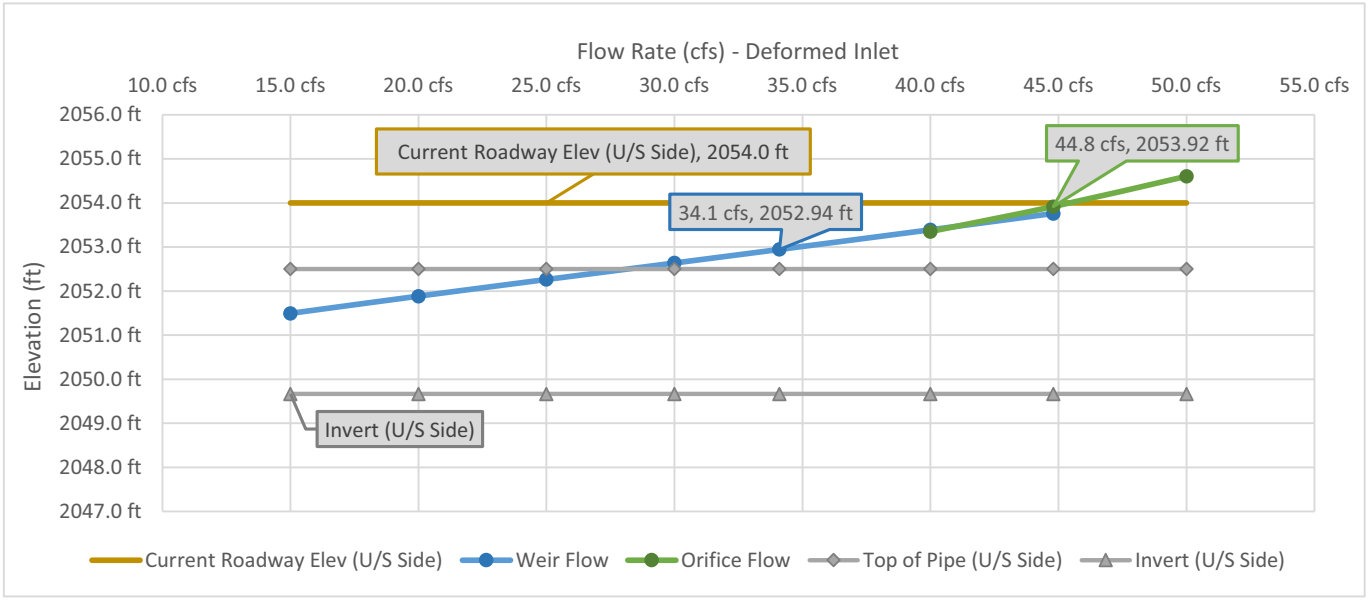



# SoCal Gas Project

## POC 17

### Stream Station = 10+49.82




Flow Rate (cfs) - Deformed Inlet
10.0 cfs
15.0 cfs
20.0 cfs
25.0 cfs
30.0 cfs
35.0 cfs
40.0 cfs
45.0 cfs
50.0 cfs
55.0 cfs
Elevation (ft)
2056.0 ft
2055.0 ft
2054.0 ft
2053.0 ft
2052.0 ft
2051.0 ft
2050.0 ft
2049.0 ft
2048.0 ft
2047.0 ft
Current Roadway Elev (U/S Side), 2054.0 ft
34.1 cfs, 2052.94 ft
44.8 cfs, 2053.92 ft
Invert (U/S Side)
Current Roadway Elev (U/S Side)
Weir Flow
Orifice Flow
Top of Pipe (U/S Side)
Invert (U/S Side)

# Culvert @ POC17 (clean 36" inlet)

## Physical Data

| | | |
|---|---|---|
| Q50 | 34.1 | cfs |
| Q100 | 44.8 | cfs |
| Length | 30 | feet |
| Diameter | 36 | inches |
| Cover over Top of Pipe (U/S Side) | 1.5 | feet |
| Cover over Top of Pipe (D/S Side) | 3 | feet |
| Road Elev (U/S Side) | 2054.00 | feet |
| Road Elev (D/S Side) | 2054.00 | feet |
| Slope | 0.05 | ft/ft |
| N-value | 0.023 | (per LAFCD) |

## Modeling Parameters (PER FHWA HDS-5 Methods)

| | | |
|---|---|---|
| Type | CMP, Projecting Thin Wall | |
| K | 0.034 | |
| $K_S$ | -0.5 | |
| M | 1.5 | |
| c | 0.0553 | |
| Y | 0.54 | |
| Ke | 0.9 | FHWA Table C.2 |

Orifice Formula

$$\frac{HW_i}{D} = c\left[\frac{K_u Q}{AD^{0.5}}\right]^2 + Y + K_s S$$

Weir Formula

$$\frac{HW_i}{D} = \frac{H_c}{D} + K\left[\frac{K_u Q}{AD^{0.5}}\right]^M + K_s S$$

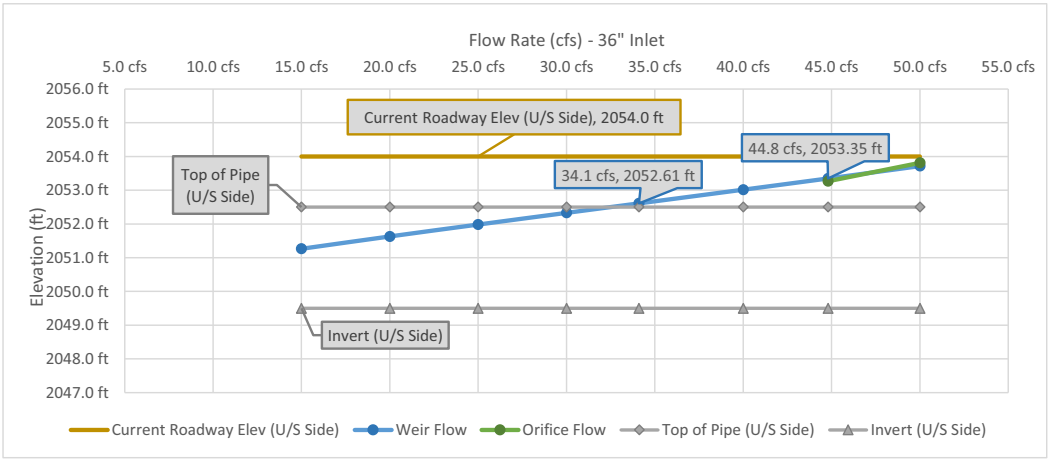
## Results

Findings

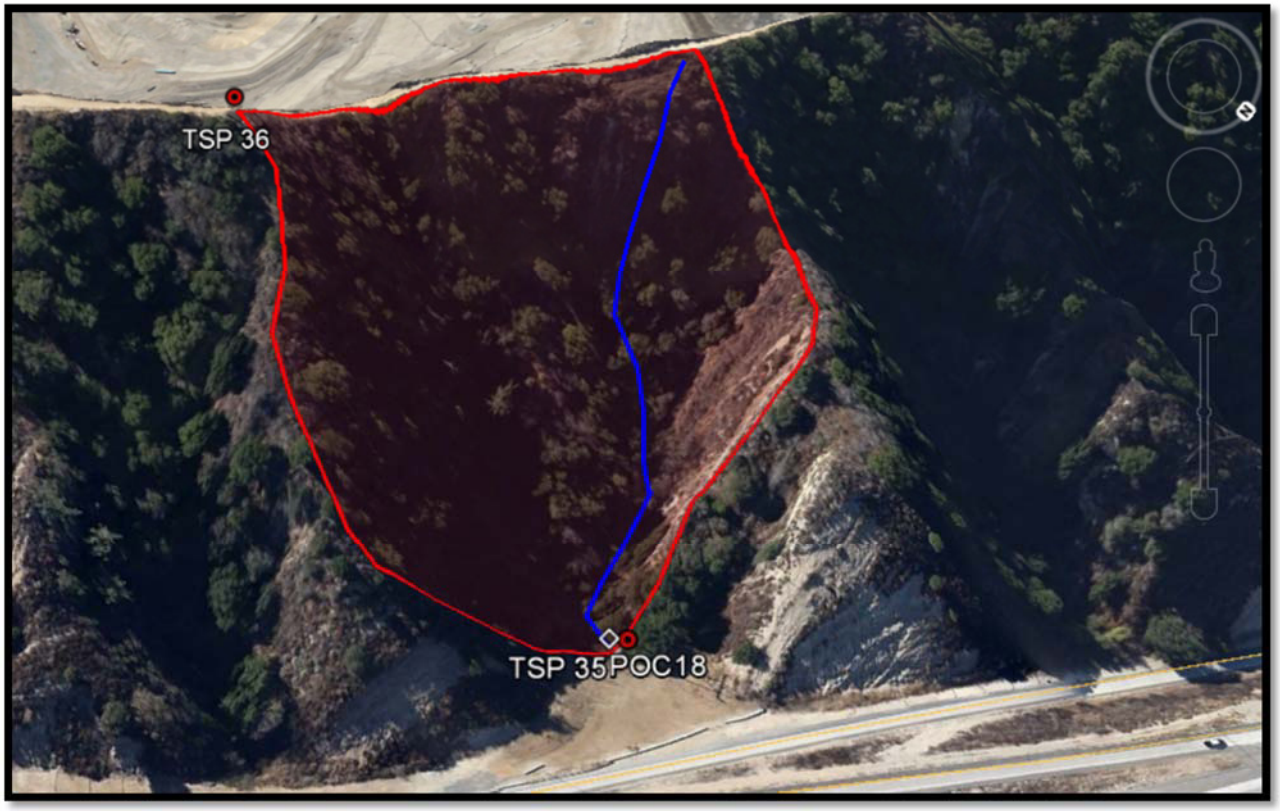
The existing 36" CMP Culvert is sufficient to pass the 100-year flow rate of 44.8 cfs without overtopping of the road. This culvert's performance is highly dependant on having clear conditions at the inlet, so it is recommended that the area just upstream of the inlet is cleared to provide a clear path into the culvert.

**Flow rates and corresponding WSEL (Upstream side of road)**

| | 15.0 cfs | 20.0 cfs | 25.0 cfs | 30.0 cfs | 34.1 cfs | 40.0 cfs | 44.8 cfs | 50.0 cfs |
|---|---|---|---|---|---|---|---|---|
| **d/D (Normal Depth)** | 0.28 | 0.33 | 0.37 | 0.41 | 0.44 | 0.48 | 0.51 | 0.55 |
| **Area** | 1.62 | 2.03 | 2.38 | 2.73 | 3.00 | 3.35 | 3.62 | 3.98 |
| **Hyd Radius** | 0.48 | 0.55 | 0.61 | 0.65 | 0.69 | 0.73 | 0.76 | 0.79 |
| **Velocity** | 9.3 | 9.8 | 10.5 | 11.0 | 11.4 | 11.9 | 12.4 | 12.6 |
| **Weir Flow** | 2051.26 ft | 2051.63 ft | 2051.98 ft | 2052.33 ft | 2052.61 ft | 2053.02 ft | 2053.35 ft | 2053.71 ft |
| **Orifice Flow** | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | 2053.27 ft | 2053.81 ft |
| **Friction Control** | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |



# POC #18




## LOCATION

POC #18 drains a steep hillside on the west side of Interstate 5, and is immediately adjacent to the originally proposed location for TSP 35. The original location is immediately adjacent to an existing gully and could be subject to erosional hazards. Through discussions with SCE, it is understood that this pole will be relocated away from this existing gully, downstream of a culvert that collects flows from this drainage area. If the pole is moved, there likely will be no hazards to the pole.

*Approximate Latitude:* 34°20'7.48"N

*Approximate Longitude:* *118°30'43.88"W*

## DRAINAGE AREA INFORMATION

*Area:* 6.2 acres

*Flow Length:* 643 feet

*Effective Slope:* 23.1%

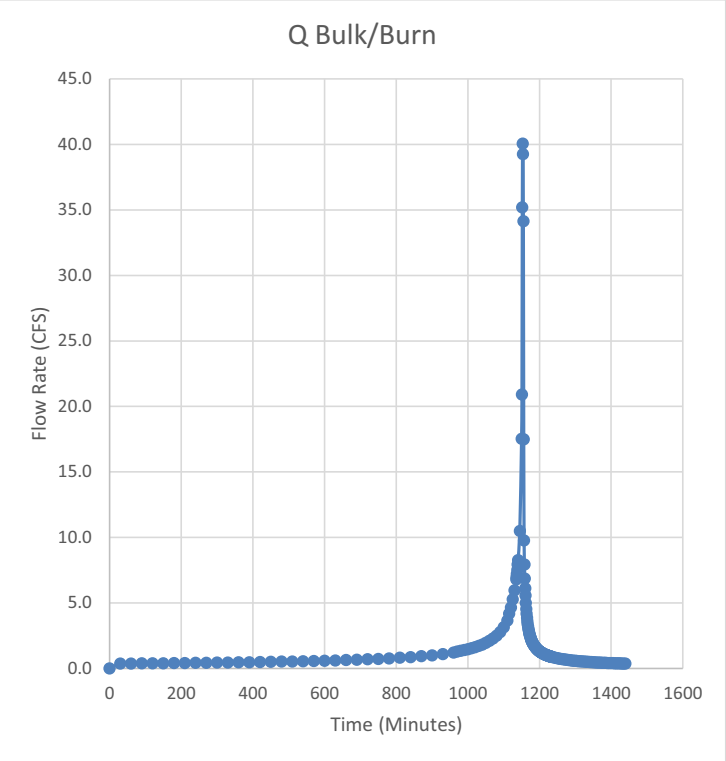
*Soil Type No:* 064

*Debris Production Area:* 5

# 50-Year Summary for POC: 18

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

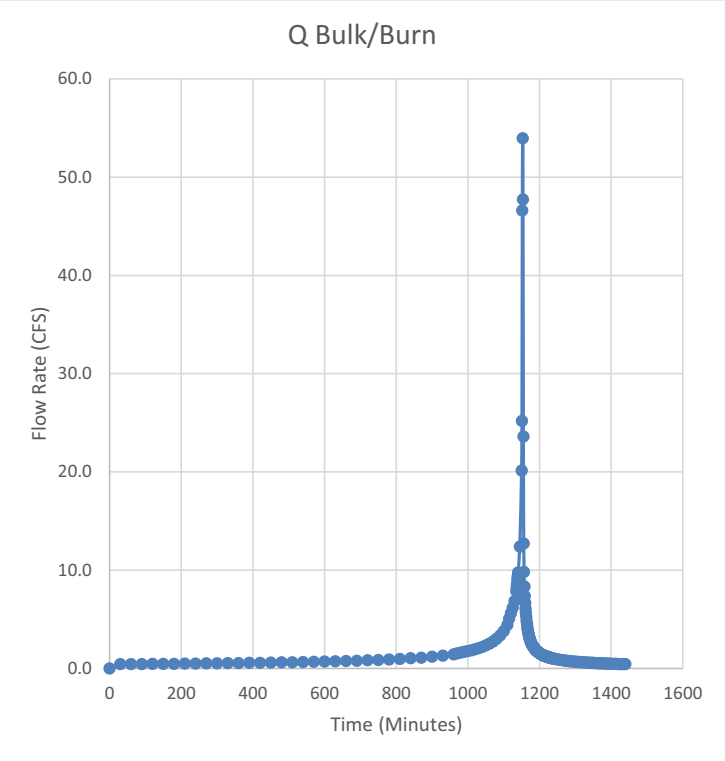
| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** | **T** | **Q Bulk/Burn** |
| 0 | 0.0 | 1110 | 3.7 | 1185 | 1.7 | 1232 | 0.9 |
| 30 | 0.4 | 1115 | 4.2 | 1186 | 1.7 | 1233 | 0.9 |
| 60 | 0.4 | 1120 | 4.7 | 1187 | 1.7 | 1234 | 0.9 |
| 90 | 0.4 | 1125 | 5.3 | 1188 | 1.6 | 1235 | 0.9 |
| 120 | 0.4 | 1130 | 6.0 | 1189 | 1.6 | 1240 | 0.8 |
| 150 | 0.4 | 1135 | 6.8 | 1190 | 1.6 | 1245 | 0.8 |
| 180 | 0.4 | 1136 | 7.0 | 1191 | 1.5 | 1250 | 0.8 |
| 210 | 0.4 | 1137 | 7.2 | 1192 | 1.5 | 1255 | 0.8 |
| 240 | 0.4 | 1138 | 7.5 | 1193 | 1.5 | 1260 | 0.7 |
| 270 | 0.4 | 1139 | 7.9 | 1194 | 1.4 | 1265 | 0.7 |
| 300 | 0.4 | 1140 | 8.3 | 1195 | 1.4 | 1270 | 0.7 |
| 330 | 0.5 | 1145 | 10.5 | 1196 | 1.4 | 1275 | 0.7 |
| 360 | 0.5 | 1150 | 17.5 | 1197 | 1.4 | 1280 | 0.6 |
| 390 | 0.5 | 1151 | 20.9 | 1198 | 1.4 | 1285 | 0.6 |
| 420 | 0.5 | 1152 | 35.2 | 1199 | 1.3 | 1290 | 0.6 |
| 450 | 0.5 | 1153 | 40.1 | 1200 | 1.3 | 1295 | 0.6 |
| 480 | 0.5 | 1154 | 39.2 | 1201 | 1.3 | 1300 | 0.6 |
| 510 | 0.5 | 1155 | 34.1 | 1202 | 1.3 | 1305 | 0.6 |
| 540 | 0.6 | 1156 | 17.5 | 1203 | 1.3 | 1310 | 0.6 |
| 570 | 0.6 | 1157 | 9.8 | 1204 | 1.2 | 1315 | 0.5 |
| 600 | 0.6 | 1158 | 7.9 | 1205 | 1.2 | 1320 | 0.5 |
| 630 | 0.6 | 1159 | 6.9 | 1206 | 1.2 | 1325 | 0.5 |
| 660 | 0.6 | 1160 | 6.1 | 1207 | 1.2 | 1330 | 0.5 |
| 690 | 0.7 | 1161 | 5.6 | 1208 | 1.2 | 1335 | 0.5 |
| 720 | 0.7 | 1162 | 5.0 | 1209 | 1.2 | 1340 | 0.5 |
| 750 | 0.7 | 1163 | 4.5 | 1210 | 1.1 | 1345 | 0.5 |
| 780 | 0.8 | 1164 | 4.2 | 1211 | 1.1 | 1350 | 0.5 |
| 810 | 0.8 | 1165 | 3.9 | 1212 | 1.1 | 1355 | 0.5 |
| 840 | 0.9 | 1166 | 3.6 | 1213 | 1.1 | 1360 | 0.5 |
| 870 | 0.9 | 1167 | 3.4 | 1214 | 1.1 | 1365 | 0.5 |
| 900 | 1.0 | 1168 | 3.2 | 1215 | 1.1 | 1370 | 0.4 |
| 930 | 1.1 | 1169 | 3.0 | 1216 | 1.1 | 1375 | 0.4 |
| 960 | 1.2 | 1170 | 2.9 | 1217 | 1.0 | 1380 | 0.4 |
| 970 | 1.3 | 1171 | 2.8 | 1218 | 1.0 | 1385 | 0.4 |
| 980 | 1.3 | 1172 | 2.6 | 1219 | 1.0 | 1390 | 0.4 |
| 990 | 1.4 | 1173 | 2.5 | 1220 | 1.0 | 1395 | 0.4 |
| 1000 | 1.5 | 1174 | 2.4 | 1221 | 1.0 | 1400 | 0.4 |
| 1010 | 1.5 | 1175 | 2.3 | 1222 | 1.0 | 1405 | 0.4 |
| 1020 | 1.6 | 1176 | 2.3 | 1223 | 1.0 | 1410 | 0.4 |
| 1030 | 1.7 | 1177 | 2.2 | 1224 | 1.0 | 1415 | 0.4 |
| 1040 | 1.8 | 1178 | 2.1 | 1225 | 1.0 | 1420 | 0.4 |
| 1050 | 2.0 | 1179 | 2.1 | 1226 | 0.9 | 1425 | 0.4 |
| 1060 | 2.1 | 1180 | 2.0 | 1227 | 0.9 | 1430 | 0.4 |
| 1070 | 2.3 | 1181 | 1.9 | 1228 | 0.9 | 1435 | 0.4 |
| 1080 | 2.5 | 1182 | 1.9 | 1229 | 0.9 | 1440 | 0.4 |
| 1090 | 2.8 | 1183 | 1.8 | 1230 | 0.9 | | |
| 1100 | 3.2 | 1184 | 1.8 | 1231 | 0.9 | | |



# 100-Year Summary for POC: 18

*Flow Rate reflects the runoff from a 'Burned' watershed and has been 'Bulked' to reflect debris loading*

| *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* | *(min)* | *(CFS)* |
|---|---|---|---|---|---|---|---|
| T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn | T | Q Bulk/Burn |
| 0 | 0.0 | 1110 | 4.4 | 1185 | 2.1 | 1232 | 1.1 |
| 30 | 0.4 | 1115 | 5.1 | 1186 | 2.0 | 1233 | 1.1 |
| 60 | 0.4 | 1120 | 5.6 | 1187 | 2.0 | 1234 | 1.0 |
| 90 | 0.5 | 1125 | 6.2 | 1188 | 1.9 | 1235 | 1.0 |
| 120 | 0.5 | 1130 | 6.9 | 1189 | 1.9 | 1240 | 1.0 |
| 150 | 0.5 | 1135 | 7.8 | 1190 | 1.9 | 1245 | 1.0 |
| 180 | 0.5 | 1136 | 8.1 | 1191 | 1.8 | 1250 | 0.9 |
| 210 | 0.5 | 1137 | 8.5 | 1192 | 1.8 | 1255 | 0.9 |
| 240 | 0.5 | 1138 | 9.0 | 1193 | 1.8 | 1260 | 0.9 |
| 270 | 0.5 | 1139 | 9.3 | 1194 | 1.7 | 1265 | 0.8 |
| 300 | 0.5 | 1140 | 9.8 | 1195 | 1.7 | 1270 | 0.8 |
| 330 | 0.5 | 1145 | 12.4 | 1196 | 1.7 | 1275 | 0.8 |
| 360 | 0.5 | 1150 | 20.1 | 1197 | 1.6 | 1280 | 0.8 |
| 390 | 0.6 | 1151 | 25.2 | 1198 | 1.6 | 1285 | 0.7 |
| 420 | 0.6 | 1152 | 46.6 | 1199 | 1.6 | 1290 | 0.7 |
| 450 | 0.6 | 1153 | 54.0 | 1200 | 1.6 | 1295 | 0.7 |
| 480 | 0.6 | 1154 | 47.7 | 1201 | 1.5 | 1300 | 0.7 |
| 510 | 0.6 | 1155 | 23.6 | 1202 | 1.5 | 1305 | 0.7 |
| 540 | 0.7 | 1156 | 12.7 | 1203 | 1.5 | 1310 | 0.7 |
| 570 | 0.7 | 1157 | 9.8 | 1204 | 1.5 | 1315 | 0.6 |
| 600 | 0.7 | 1158 | 8.3 | 1205 | 1.4 | 1320 | 0.6 |
| 630 | 0.7 | 1159 | 7.4 | 1206 | 1.4 | 1325 | 0.6 |
| 660 | 0.8 | 1160 | 6.7 | 1207 | 1.4 | 1330 | 0.6 |
| 690 | 0.8 | 1161 | 6.1 | 1208 | 1.4 | 1335 | 0.6 |
| 720 | 0.8 | 1162 | 5.7 | 1209 | 1.4 | 1340 | 0.6 |
| 750 | 0.9 | 1163 | 5.3 | 1210 | 1.3 | 1345 | 0.6 |
| 780 | 0.9 | 1164 | 4.8 | 1211 | 1.3 | 1350 | 0.6 |
| 810 | 1.0 | 1165 | 4.5 | 1212 | 1.3 | 1355 | 0.6 |
| 840 | 1.0 | 1166 | 4.2 | 1213 | 1.3 | 1360 | 0.5 |
| 870 | 1.1 | 1167 | 4.0 | 1214 | 1.3 | 1365 | 0.5 |
| 900 | 1.2 | 1168 | 3.8 | 1215 | 1.3 | 1370 | 0.5 |
| 930 | 1.3 | 1169 | 3.6 | 1216 | 1.3 | 1375 | 0.5 |
| 960 | 1.4 | 1170 | 3.4 | 1217 | 1.2 | 1380 | 0.5 |
| 970 | 1.5 | 1171 | 3.2 | 1218 | 1.2 | 1385 | 0.5 |
| 980 | 1.6 | 1172 | 3.1 | 1219 | 1.2 | 1390 | 0.5 |
| 990 | 1.7 | 1173 | 3.0 | 1220 | 1.2 | 1395 | 0.5 |
| 1000 | 1.8 | 1174 | 2.9 | 1221 | 1.2 | 1400 | 0.5 |
| 1010 | 1.8 | 1175 | 2.8 | 1222 | 1.2 | 1405 | 0.5 |
| 1020 | 1.9 | 1176 | 2.7 | 1223 | 1.2 | 1410 | 0.5 |
| 1030 | 2.1 | 1177 | 2.6 | 1224 | 1.1 | 1415 | 0.5 |
| 1040 | 2.2 | 1178 | 2.5 | 1225 | 1.1 | 1420 | 0.5 |
| 1050 | 2.3 | 1179 | 2.4 | 1226 | 1.1 | 1425 | 0.4 |
| 1060 | 2.5 | 1180 | 2.4 | 1227 | 1.1 | 1430 | 0.4 |
| 1070 | 2.7 | 1181 | 2.3 | 1228 | 1.1 | 1435 | 0.4 |
| 1080 | 3.0 | 1182 | 2.2 | 1229 | 1.1 | 1440 | 0.4 |
| 1090 | 3.4 | 1183 | 2.2 | 1230 | 1.1 | | |
| 1100 | 3.8 | 1184 | 2.1 | 1231 | 1.1 | | |



# SoCal Gas Project

## POC 18

### Stream Station = 10+00

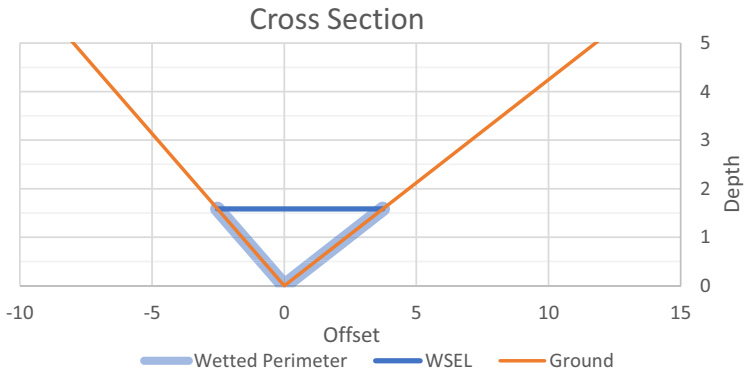
## INPUT

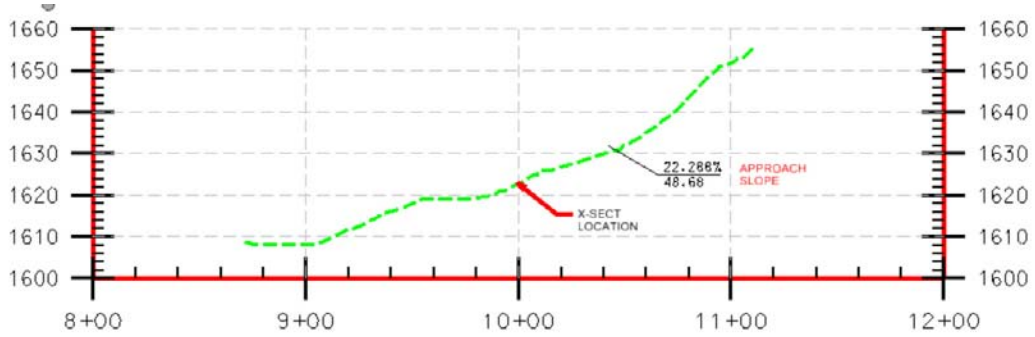
| | | |
|---|---|---|
| $Q_{50}$ | 42.0 | cfs |
| $Q_{100}$ | 55.0 | cfs |
| **$Q_{DESIGN}$** | **55.0** | **cfs** |
| | | |
| N | 0.050 | |
| So | 0.223 | ft/ft |

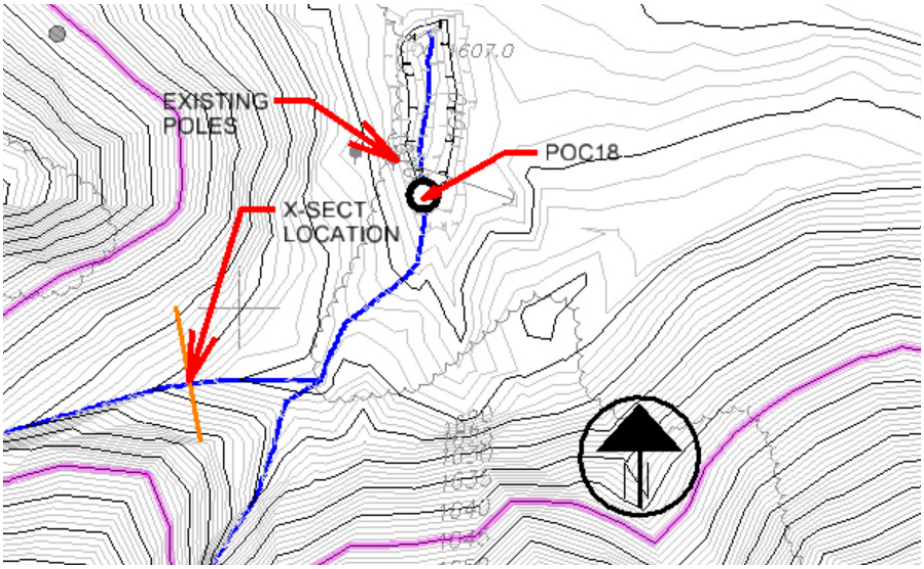
| Point | Station | Ground |
|---|---|---|
| 1 | -25.5 | 1636.53 |
| 2 | -13.58 | 1631.23 |
| 3 | 0 | 1622.72 |
| 4 | 21.9 | 1632.02 |
| 5 | 29.61 | 1637 |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

## Results

| | | | |
|---|---|---|---|
| **Depth=** | **1.6** | **ft** | *(NORMAL DEPTH)* |
| Area= | 5.0 | $ft^2$ | |
| $P_W$ | 7.0 | ft | |
| R | 0.704 | ft | |
| **Velocity=** | **11.1** | **ft/s** | |
| $S_F$ | 0.223 | ft/ft | |



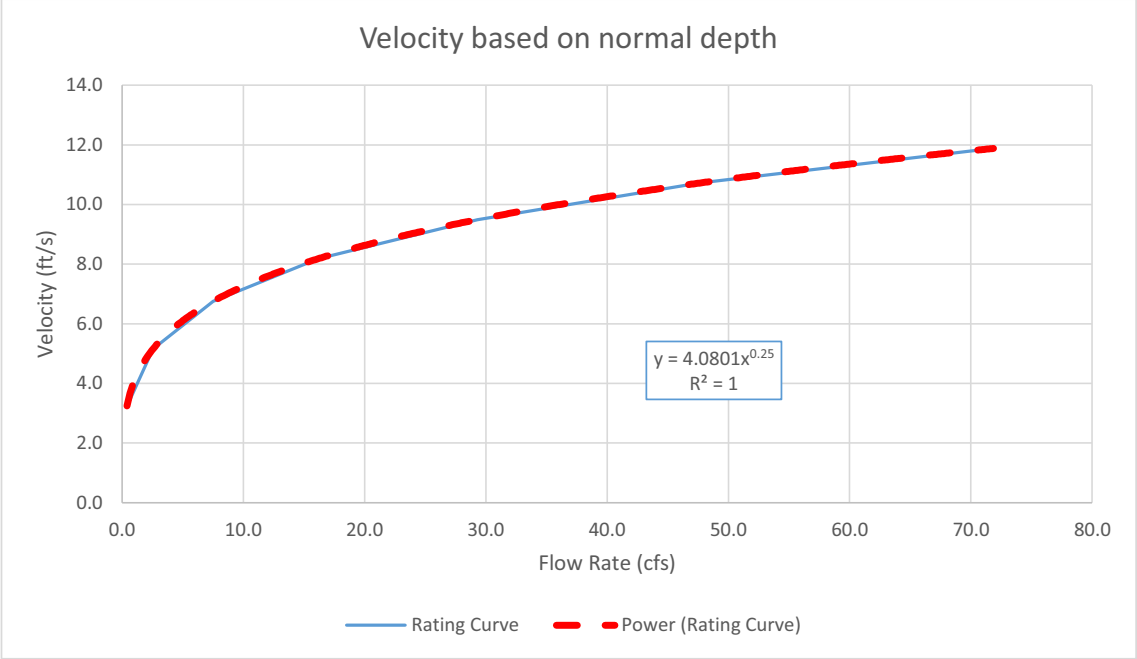



# SoCal Gas Project

## POC 18

### Stream Station = 10+00



# APPENDIX B

# HYDROLOGIC MODELING PARAMETERS

# APPENDIX B: HYDROLOGIC MODELING PARAMETERS

This section documents the primary parameters used in performing the Hydrology Study.

## COMPUTATIONAL METHOD

Both the Rational Method and the Modified Rational Method described in the Los Angeles County Hydrology Manual (January 2006) were initially calculated for this project and both methods yielded similar results. However, the calculation of peak flow rates for POC 11 and POC 14 required routing of flows from POCs 10 and 13 respectively, so the Modified Rational Method was used throughout this report.

## DRAINAGE AREA

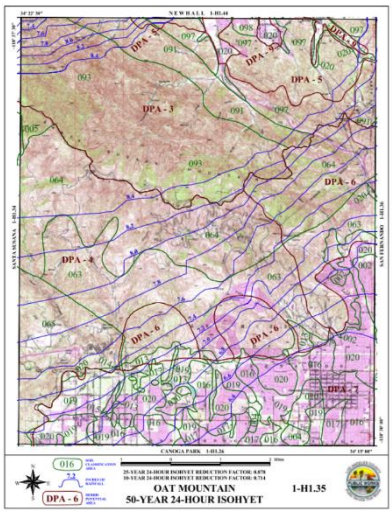
Since precise offsite topographic mapping was not available, the following resources were combined to determine the off-site drainage area that is tributary to the project:

1. *FEMA Flood Insurance Rate Maps (FIRM):* These maps show areas where FEMA has already identified and mapped an area known to be subject to erosion hazards. While these maps are helpful for identify areas of major flooding such as for major rivers and tributaries, they do not identify all areas where a flood hazard may exist.
2. *National Hydrography Dataset (NHD):* The NHD is a dataset developed and maintained by United States Geological Survey (USGS) which contains features such as lakes, ponds, streams, rivers, canals, dams and stream gages. This information can be used to identify any such water features that cross the project.
3. *Watershed Boundary Dataset (WBD):* This dataset is also developed and maintained by USGS and identifies drainage boundaries
4. *National Elevation Dataset (NED) / USGS Topographic Maps:* This information provides contour maps that can be used to delineate smaller drainage boundaries than those shown in the WBD, and is also helpful for determining relative elevations and slopes of land.
5. *Aerial Photography and Google Earth:* These tools were used to help refine drainage boundaries and drainage paths, as well as to look for areas of historic erosion.
6. *On-Site field visit:* An on-site review of the proposed TSP locations and access roads was performed to verify areas that may be subject to flood and erosion hazards.

These resources were used to identify 'Points of Concentration' along the Project, and drainage areas to each point of concentration.

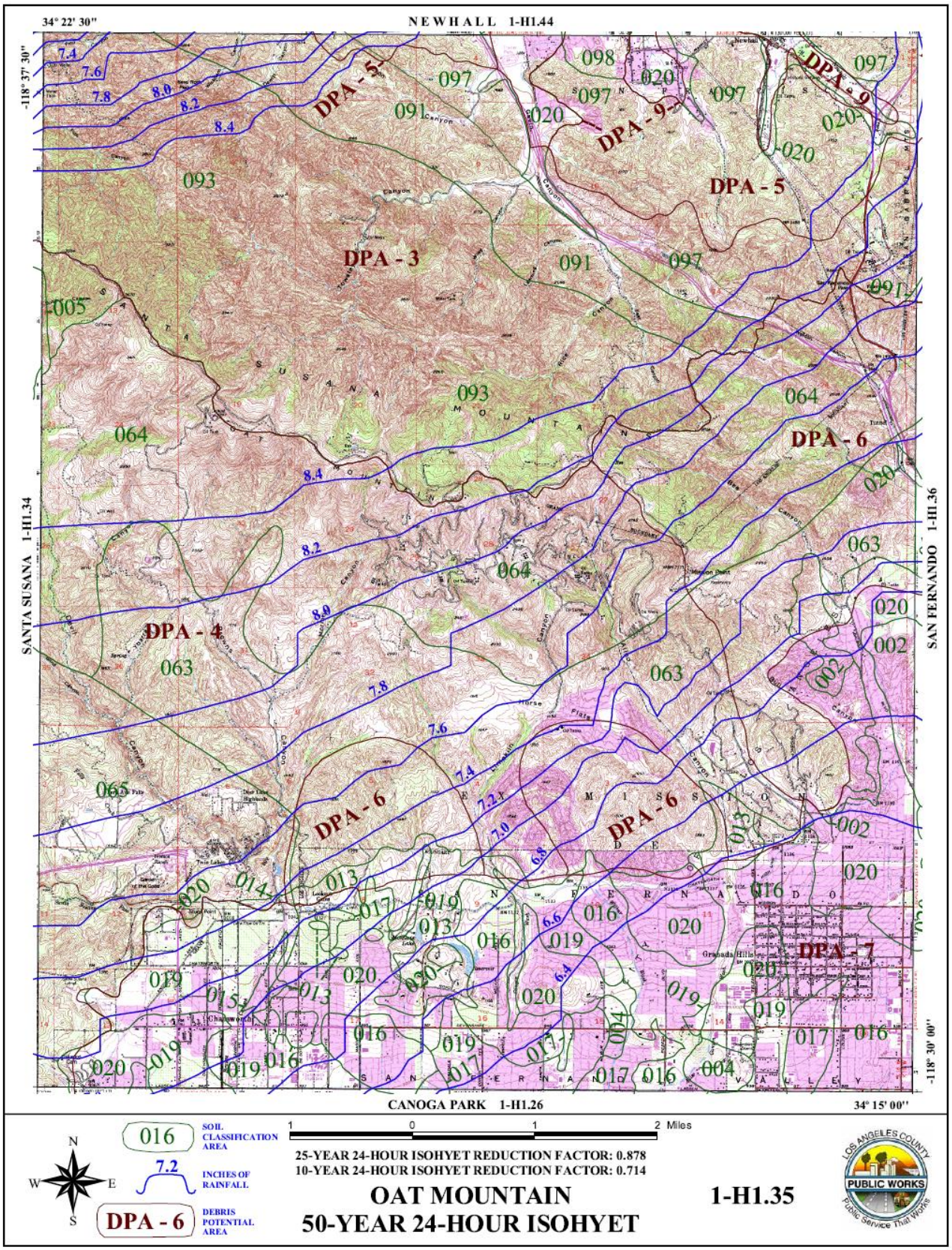
## PRECIPITATION

The Los Angeles County Hydrology Manual defines the Capital Flood as the 50-year flood. Additionally 100-year flow rates were requested to be provided as part of this study. The 'Oat Mountain' 50-year, 24-hour Isohyet Map was used for this project. The 50-year, 24-hour rainfall depths were converted to 100-year 24-hour rainfall depths following the methodologies identified in the Hydrology Manual.




The 50-year and 100-year rainfall depths used for this study are shown below:

| Point of Concentration | 50-Year, 24-Hour rainfall depth | 100-year, 24-Hour rainfall depth |
|---|---|---|
| **POC 18** | 7.8 inches | 8.75 |
| **All Others** | 8.4 inches | 9.42 |


34° 22' 30"
NEWHALL 1-H1.44
-118° 37' 30"
SANTA SUSANA 1-H1.34
SAN FERNANDO 1-H1.36
-118° 30' 00"
CANOGA PARK 1-H1.26
34° 15' 00"
DPA - 3
DPA - 4
DPA - 5
DPA - 6
DPA - 7
DPA - 9
SANTA SUSANA MOUNTAIN
SAN FERNANDO VALLEY
016 SOIL CLASSIFICATION AREA
7.2 INCHES OF RAINFALL
DPA - 6 DEBRIS POTENTIAL AREA
N
W
E
S
1 0 1 2 Miles
25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714
OAT MOUNTAIN
50-YEAR 24-HOUR ISOHYET
1-H1.35
LOS ANGELES COUNTY PUBLIC WORKS
Public Service That Works

## COEFFICIENT OF RUNOFF

Various factors will affect how much rainfall is converted into Runoff. The primary factors identified in the Los Angeles County Hydrology Manual include:

- Soil type
- Land Cover
- Wildfires

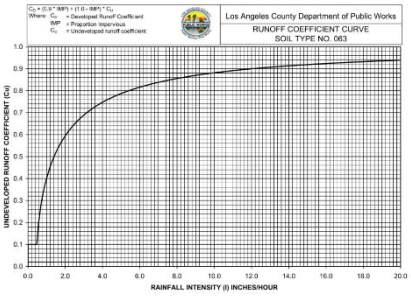
These factors were used to calculate a Coefficient of Runoff for a burned watershed, which is an empirically derived number that indicates the overall runoff potential from the area. Each of these factors, and the determination of SCS Curve Numbers are discussed below.

## SOILS

The infiltrative capacity of the native soil is important in hydrologic studies as it affects how much of the rain that hits the ground that will get converted to runoff. Soils with more clay will typically result in less infiltration and more runoff, whereas soils with higher sand content will typically result in much less runoff. Additionally, for a given soil, higher intensity rainfall (as opposed to the same amount of rain falling over a longer period of time) will result in higher runoff rates because the rate of rainfall exceeds the rate at which the soils can absorb the rainfall.

According to the Los Angeles County Hydrology Manual, the site is primarily underlain by the following Soil Type Numbers:

- Soil Type No 097 (This is the primary soil for the TSP locations along the East Alignment)
- Soil Type No 064 (This is the primary soil for the TSP locations along the West Alignment




The Hydrology Manual includes curves for each of these soils.

*These curves, included for reference on the following pages, were used together with the identified intensity of rainfall, to determine the 'Undeveloped' Coefficient of Runoff ($C_U$) for each Point of Concentration*.

As an additional point of reference for this project, the USGS soil types and descriptions were researched for this project The soil information from the USGS research is summarized in the table below. *Note that the soil names are hyperlinks to more detailed information on the soil types.*

| USGS Soil Type | Soil Name | TSPs | POC | Hydrologic Group |
|---|---|---|---|---|
| **YoA** | Yolo loam, 0 to 2 percent slopes | 3-6, 8-11 | N/A | B |
| **ScF** | Saugus loam, 30 to 50 percent slopes (Sandy Loam) | 7, 32, 33 | 1,2,3 | B |
| **CnG3** | Castaic and Saugus soils, 30 to 65 percent slopes, severely eroded (Castaic: Silty Clay) (Saugus: Sandy Loam) | 12, 13, 14 | 4,5,6,8,9, 10, 12, 13, 14 | B/C |
| **CmF** | Castaic-Balcom silty clay loams, 30 to 50 percent slopes (Silty Clay) | 15-21 | 7, 11 | B/C |
| **MhF2** | Millsholm rocky loam, 30 to 50 percent slopes, eroded (Clay Loam) | 22, 26-31, 34-36, Sunshine, bfi, 37, 38 | 15, 16, 17, 18 | D |
| **121** | Lopez shaly clay loam, 30 to 50 percent slopes | 39-44, 47-49 | N/A | D |
| **118** | Gazos silty clay loam, 15 to 30 percent slopes | 45 | N/A | C |
| **105** | Balcom silty clay loam, 9 to 15 percent slopes | 46 | N/A | B |

$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$

Where: $C_D$ = Developed Runoff Coefficient
IMP = Proportion Impervious
$C_U$ = Undeveloped runoff coefficient

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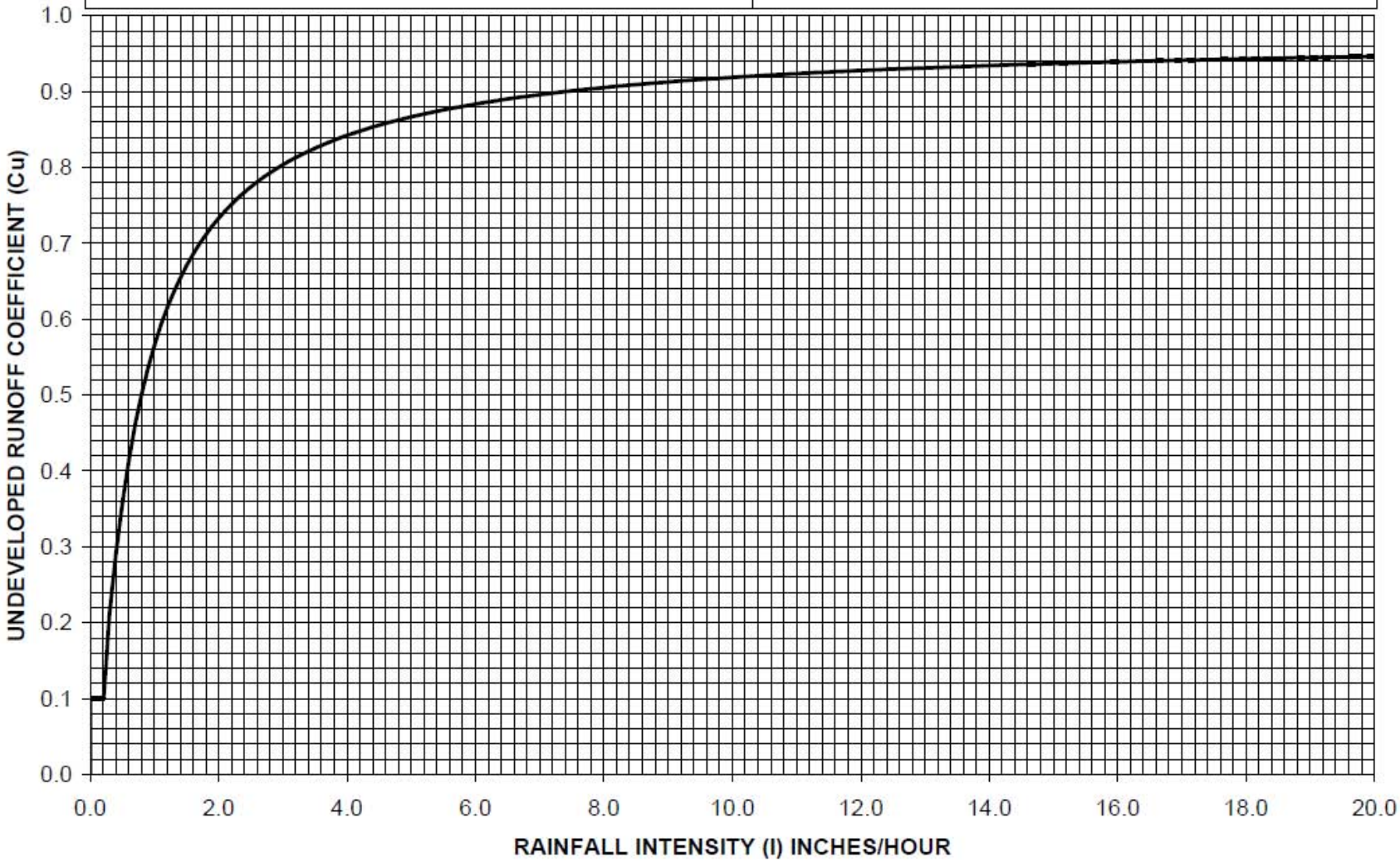
RUNOFF COEFFICIENT CURVE
SOIL TYPE NO. 064



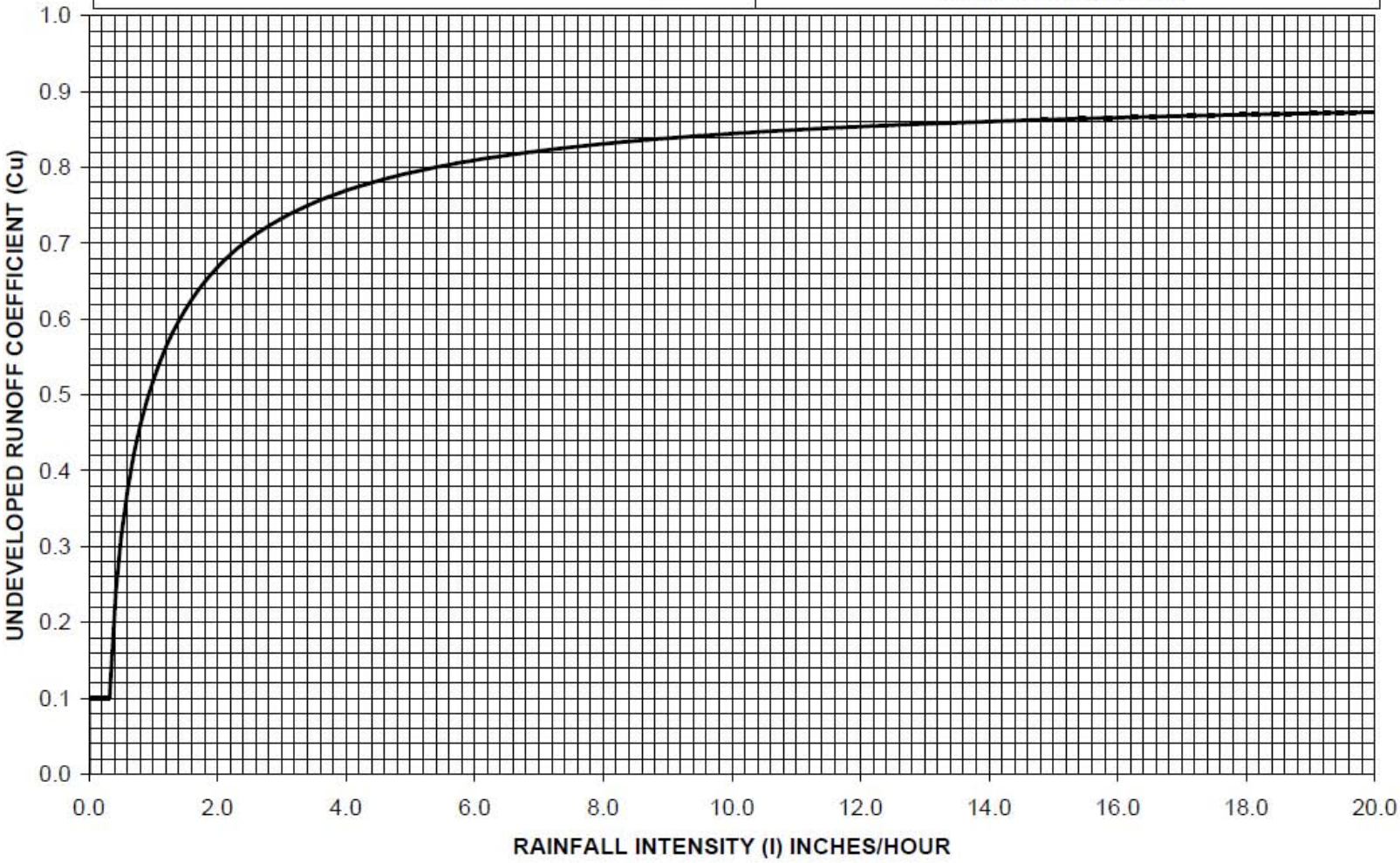

File:Soil Curve Data and Graphs 50-79 Tab:GN64 HYDROLOGY APPENDIX C BJW: 06/14/2004

$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$

Where: $C_D$ = Developed Runoff Coefficient
IMP = Proportion Impervious
$C_U$ = Undeveloped runoff coefficient

Los Angeles County Department of Public Works

RUNOFF COEFFICIENT CURVE
SOIL TYPE NO. 097

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## VEGETATIVE COVER AND WILDFIRE POTENTIAL

The east-facing slopes and the valleys have medium to dense coverage of Chaparral and Oak trees, whereas the west facing slopes are primarily dense seasonal brush.

Most of the year, the brush that covers much of these mountain ranges is dry and is a high risk for wild fires. When a hillside burns, the ability of the vegetation and the soils to reduce and slow runoff is significantly diminished, resulting in larger flow rates than might be expected from a similar un-burned watershed.

When performing hydrologic calculations for watersheds that are primarily naturally covered, such as for this project, the Los Angeles County Hydrology Manual requires the calculations to assume that the watershed is in a 'burned' condition.

Table 6.3.3 and Equation 6.3.3 in the Los Angeles County Hydrology Manual provide a methodology to convert the 'Undeveloped' Coefficient of Runoff ($C_U$) generated as described previously, to a higher coefficient of runoff representative of a burned watershed ($C_{BA}$)

| Watershed | Fire Factor |
|---|---|
| Santa Clara River Watershed & Antelope Valley | 0.34 |
| Los Angeles River Watershed | 0.71 |
| San Gabriel River Watershed | 0.71 |
| Coastal Watershed | 0.83 |

Only undeveloped subareas with 15% or less imperviousness require burn calculations. Equation 6.3.3 calculates the burned runoff coefficient.

$$C_{ba} = FF \times [(1-K) \times (1-C_u)] + C_u$$

## DEBRIS BULKING

Fires increase runoff and debris production. Higher runoff rates entrain more debris and burned watersheds have more debris available for entrainment. The Los Angeles County Hydrology Manual requires that peak flows from burned watersheds are "bulked" to account for volume changes caused by debris entrainment.

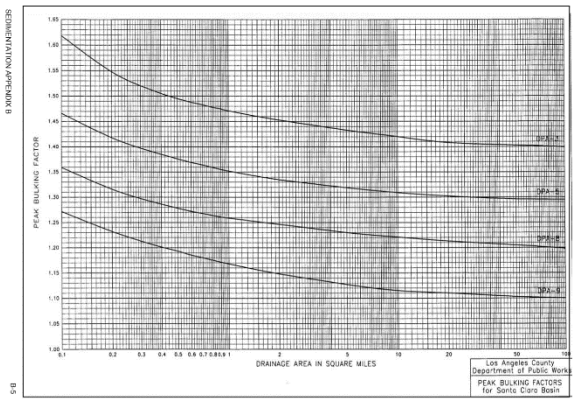
Methods to 'bulk' flows are identified in the Los Angeles County Sedimentation Manual (2nd Edition, March 2006) and involve:

1) IDENTIFYING THE 'DEBRIS PRODUCTION AREA' (DPA) applicable to the area being calculated. The debris production area is also shown on the Isohyetal maps previously discussed. The following DPAs apply to this project:

| POC | DPA |
|---|---|
| **5 through 17** | 3 |
| **1-4 and 18** | 5 |

2) DETERMINING THE 'BULKING FACTOR' (BF) based on the size of the drainage area and the applicable chart from Appendix B to the Sedimentation Manual. The bulking factors identified for this project are as follows.

| POC | BF |
|---|---|
| **5 through 17** | 1.62 |
| **1-4 and 18** | 1.465 |




The calculated flow rates for the burned watershed were 'Bulked' using the following equation and the above listed bulking factors:

$Q_B = BF_{(A)} \times Q_{(A)}$ **Equation 3.4.1**

## FLOW TRAVEL TIME

The determination of peak flow rates for both POC 11 and POC 14 required the routing of flows from upstream Points of Concentration (POC 10 and 13 respectively). This routing was accomplished by 'lagging' the upstream hydrograph by the amount of time it would take the flood hydrograph to travel to the downstream node.

Table 7.3.5 in the Los Angeles County Hydrology Manual identifies various equations that can be used to determine the time it takes for a flood hydrograph to move downstream. For the purposes of this study, the 'Natural Mountain Channel' equation, identified here for reference, was used.

$$V = 5.6 * Q^{0.333} S_{eff}^{0.500}$$