APPENDIX R HYDRAULIC ANALYSIS, GROUNDWATER EVALUATION TECHNICAL MEMORANDUM, CEQA DRAINAGE STUDY

AECOM

Environment

Prepared for:
County of San Diego

Prepared by:
AECOM
San Diego, CA
July 2018

Groundwater Evaluation Technical Memorandum

El Monte Sand Mine Project, Lakeside, San Diego County, California

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ACRONYMS AND ABBREVIATIONS

afy	acre-feet per year
amsl	above mean sea level
APN	Assessor's Parcel Number
bgs	below ground surface
CEQA	California Environmental Quality Act
CIMIS	California Irrigation Management Information System
CN	curve number
CNM	curve number method
DTW	depth to water
ET	Evapotranspiration
ETo	reference evapotranspiration
HWD	Helix Water District
MCL	maximum contaminant level
mg/L	milligram per liter
N	Nitrogen
NRCS	Natural Resources Conservation Service
PET	potential evapotranspiration
RO	run-off
S	Soil moisture retention
SMC	soil moisture-holding capacity
SWRCB	State Water Resources Control Board
USDA	United States Department of Agriculture
USGS	United States Geological Survey

Figures

Tables

1.0 Executive Summary

The proposed El Monte Sand Mine Project (project) covers approximately 479.5 acres and is located downstream of the El Capitan Reservoir in San Diego County. The project proposes to mine and export sand and will result in an estimated 228-acre reclaimed mining pit with maximum depths of 33 to 41 feet below ground surface.

Table 1-1: Proposed Activities and Areas of Disturbance

Activity	Area of Disturbance (acres)*
Mining Area (including trails, filled depression, and drop structure within mining footprint)	228
Northern Staging Area	8
Southern Staging Area	7
Subtotal Inside Mining Footprint	*243*
Trails (outside of mining area)	7
Fuel Modification (outside of mining area and not including trails	12
Subtotal Outside Mining Footprint	*19*
Impact Area Total	**262**
Open Space	217.5
MUP Boundary Total	**479.5**

*rounded to the nearest acre
Source: ESA 2018

The project will not use onsite surface water or groundwater per se, but will result in changes to the "water budget" as a consequence of the reclaimed pit topography. These include: 1) inflow of rainfall that runs off from upgradient in the watershed and runs into the pit, 2) potential evaporation losses if exposed water stands within the reclaimed pit, and 3) potential changes in the amount of evapotranspiration from on-site groundwater-dependent habitat. Based on our evaluation, the project is expected to result in a net-benefit to the groundwater system.

2.0 Site Background Information

2.1 Purpose

The purpose of this report is to document the existing groundwater resources of the El Monte Sand Mine Project (project) site and to evaluate potential impacts to groundwater resources as a result of the final configuration of the pit. The report will also document the existing conditions and, if necessary, recommend measures to avoid, minimize, and/or mitigate significant impacts consistent with federal, state, and local rules and regulations including California Environmental Quality Act (CEQA).

2.2 Applicable Groundwater Regulations

CEQA requires the review of all discretionary projects as defined within Section 21080 of CEQA. The project requires discretionary approval from the County of San Diego, and as a result, this evaluation has been completed. This groundwater investigation was performed in conformance with the County's Guidelines for Determining Significance and Report Format and Content Requirements – Groundwater Resources (Guidelines) (County 2007).

2.3 Project Location and Description

The proposed project covers approximately 479.5 acres located parallel to and between El Monte Road and Willow Road downstream of the El Capitan Reservoir in San Diego County (Figure 1). The project site is located on Assessor's Parcel Numbers (APNs) 390-040-51, 391-061-01, 391-071-04, 392-050-47, 392-060-29, 392-130-42, 392-150-17, and 393-011-01.

The tributary watershed area is about 8,862 acres and is located in portions of the San Vicente Reservoir, El Cajon, Alpine and El Cajon Mountain, California, U.S. Geological Survey (USGS) 7.5-minute quadrangles.

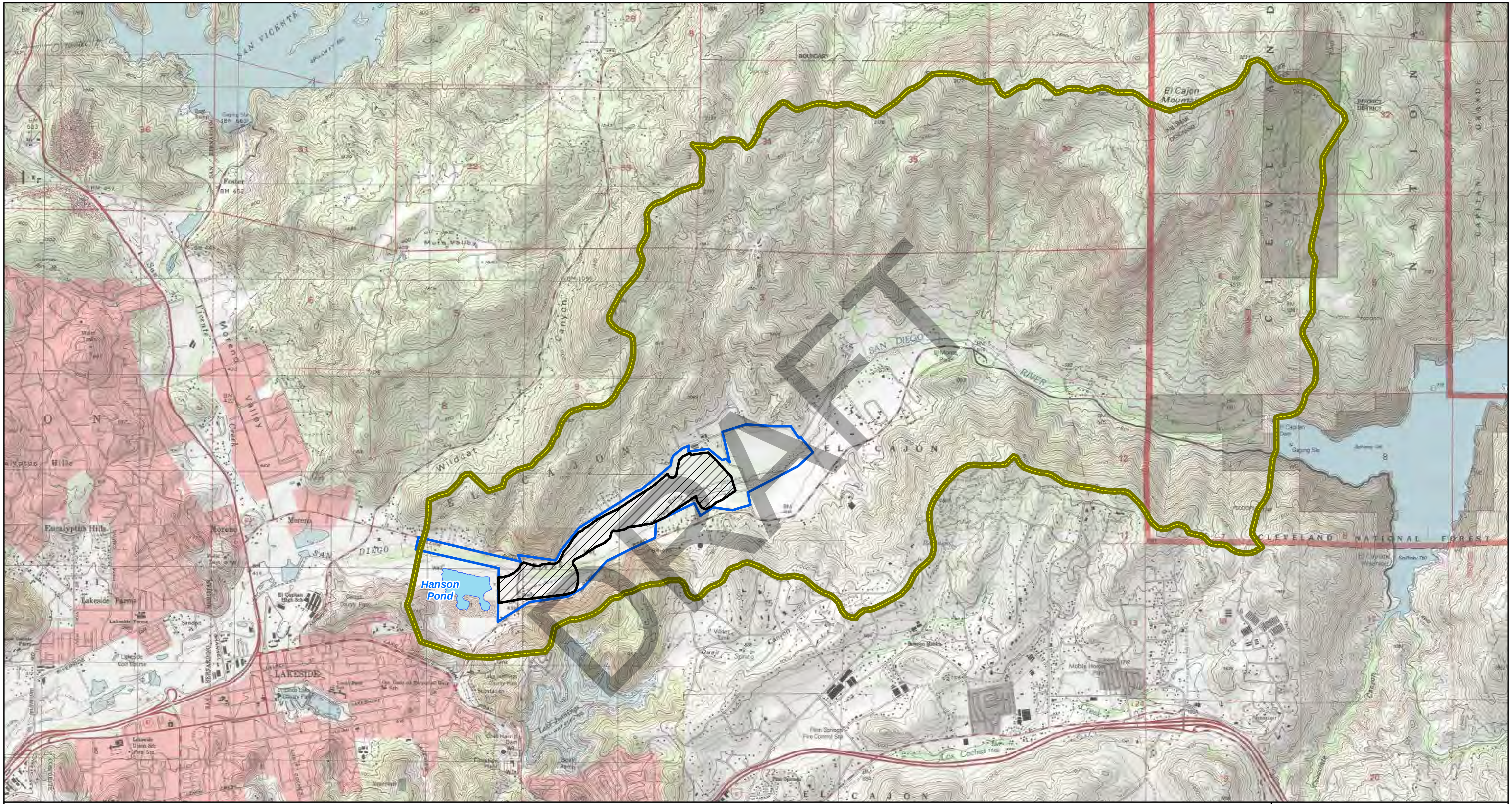
The project proposes to mine sand suitable for Portland cement concrete over an extended period of several designated phases. Excavation of an estimated 228-acre pit area will be to a maximum depth of 33 to 41 feet below ground surface (bgs). The Reclamation Plan estimates about 479.5 acres will be phased with mining operations and will be initiated immediately after the conclusion of resource extraction in an area of the project (EnviroMine, AECOM, and ESA 2017).

The anticipated maximum rate of aggregate production is 1.1 million tons per year. This production rate will be realized after 1 to 3 years of site and market development. Actual production rates and project life will depend on market demand but will not exceed the maximum permitted production level. The project is expected to continue for 16 years. This will include 12 years of extraction and reclamation of previously disturbed areas beginning in year 4. Final reclamation of the Phase 4 area and vegetation monitoring will continue for 4 years after cessation of mining. The site is designed to yield approximately 12.5 million tons of construction aggregate product.

The proposed project will not use groundwater directly. Any water needed for mining operations and habitat establishment will be imported.

If enough water runs off surrounding slopes of the tributary watershed and/or water is released from the El Capitan Reservoir during flood events, a pond would form in the pit. If the pit is filled to capacity, the water in the pit would be a maximum of 25 feet deep at the west end and impound 75 acres of surface water. This would equate to roughly 2,000 acre feet of water stored in the pit onsite [Wayne Chang, Chang Consultants, email communication, July 16, 2018].

The end use in the project area is proposed to be undeveloped open space with recreational trail easements.



Legend

- Tributary Watershed Area
- Project Boundary
- Pit Boundary

Notes:
Watershed boundaries only show those within the project vicinity.

N

0 3,000 6,000
Feet

Figure 1
Tributary Watershed Boundary and Proposed Project

El Monte Sand Mine Project
San Diego, Ca

AECOM
September 2017

Path: L:\ENV\ArcGIS\Shell\Criterion Catalysts\Updated MXDs\Figure 2 Watershed Boundary Proposed Project.mxd

3.0 Existing Conditions

The following paragraphs describe the regional topography, geology, and hydrogeology of the project site.

3.1 Topographic Setting

The site is situated within the San Diego River watershed, in the floodplain. The river flows through the central part of the project. It is located parallel to and between El Monte Road and Willow Road in Lakeside, California; an unincorporated area of San Diego County.

The project site is relatively flat; but grading activities associated with the development of an unfinished golf course in 2005–2006 have created undulating terrain in the eastern portion of the property. This area includes several large pits. Elevations range from approximately 490 feet above mean sea level (amsl) at the eastern portion of the property to approximately 430 feet amsl at the western end of the site. Elevations within the excavation area range from approximately 430 feet amsl to 475 feet amsl. The San Diego River extends in a general east-west direction and consists of a low-flow channel and associated floodplain.

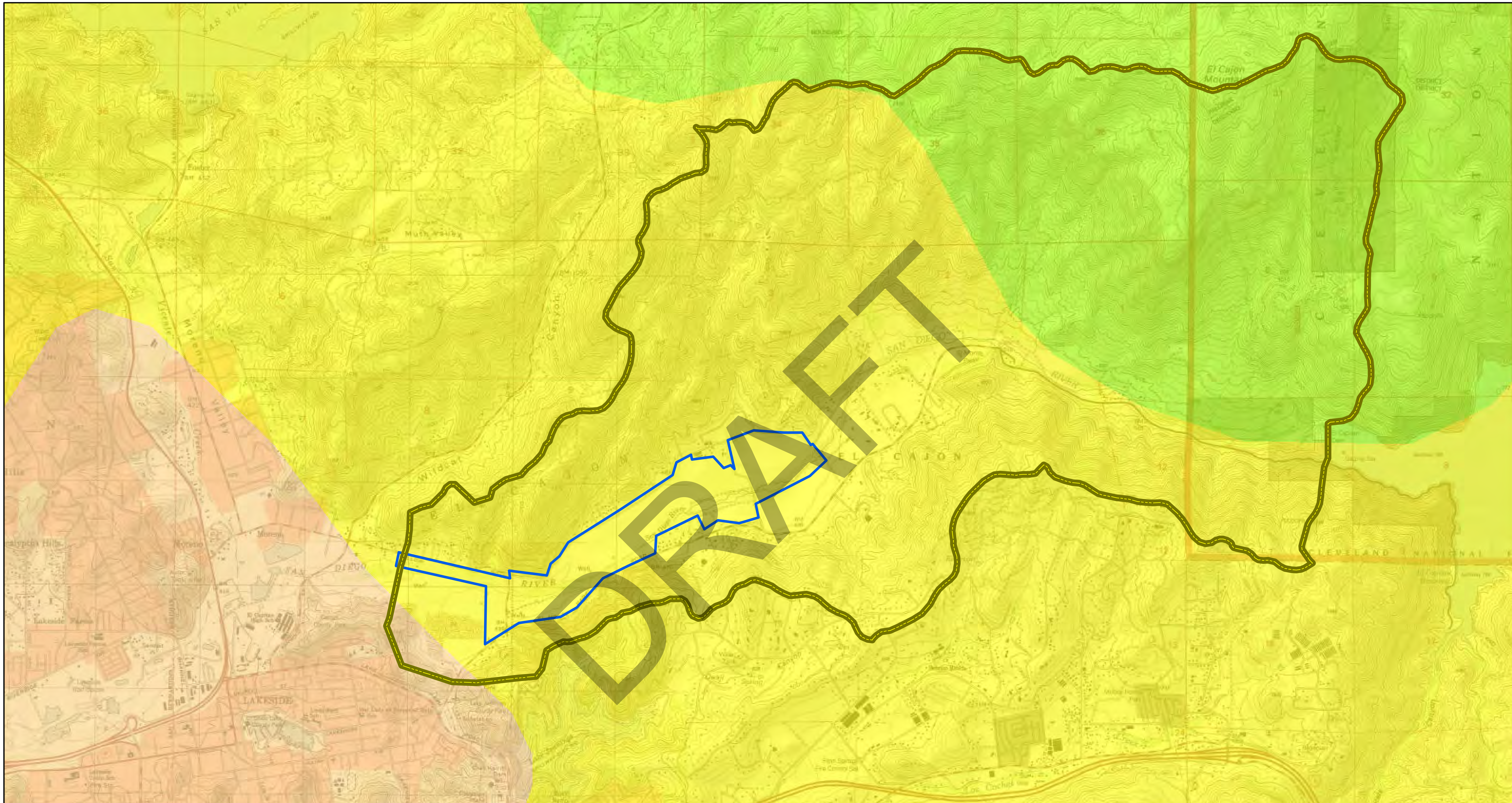
3.2 Climate

Precipitation

Precipitation data were collected from two rainfall gauges within the general area of the project: El Capitan Reservoir rainfall station and Lake Jennings rainfall station. The El Capitan Reservoir provided the majority of the data, with the Lake Jennings Reservoir supplementing the gaps. Complete monthly data were available from at least one of the two gauges for the rainfall years (July through June) 1974/1975 through 2014/2015 with the exception of one month. In that case, a single monthly data point was used from the Alpine rainfall station for December 1997.

The El Capitan rainfall station is located on the eastern edge of the tributary watershed at an elevation of approximately 600 feet amsl. The Lake Jennings rainfall station is located 0.75 miles south of the watershed at an approximate elevation of roughly 700 feet amsl. The Alpine rainfall station is located approximately four miles to the southeast of the project area watershed at an elevation of approximately 500 feet amsl. The average annual rainfall between the El Capitan and Lake Jennings rainfall stations (and one month's data from Alpine) was about 16 inches per year over the last 40 years, and has ranged between 5 and 31 inches.

According to the County's *Groundwater Limitations and Precipitation Map* (County 2004), the project site and the study area are located in the 15-to-18-inch and 18-to-21-inch mean annual rainfall belts (Figure 2).



Legend

Tributary Watershed Area

Project Boundary

Precipitation (Inches)
County of San Diego/SanGIS 2009)

3 - 6	15 - 18	27 - 30
6 - 9	18 - 21	30 - 33
9 - 12	21 -24	33 - 35
12 - 15	24 - 27	

N

0 3,000 6,000
Feet

Figure 2
County Groundwater Limitations and Precipitation Map

El Monte Sand Mine Project
San Diego, Ca

AECOM
September 2017

Notes:
Watershed boundaries only show those within the project vicinity.

Path: P:\ENV\60480712 El Monte\GIS_CAD\MXDs\Sand Extraction Nature Project Report\Figure 3 County Groundwater Limitations and Precipitation Map.mxd

Evapotranspiration

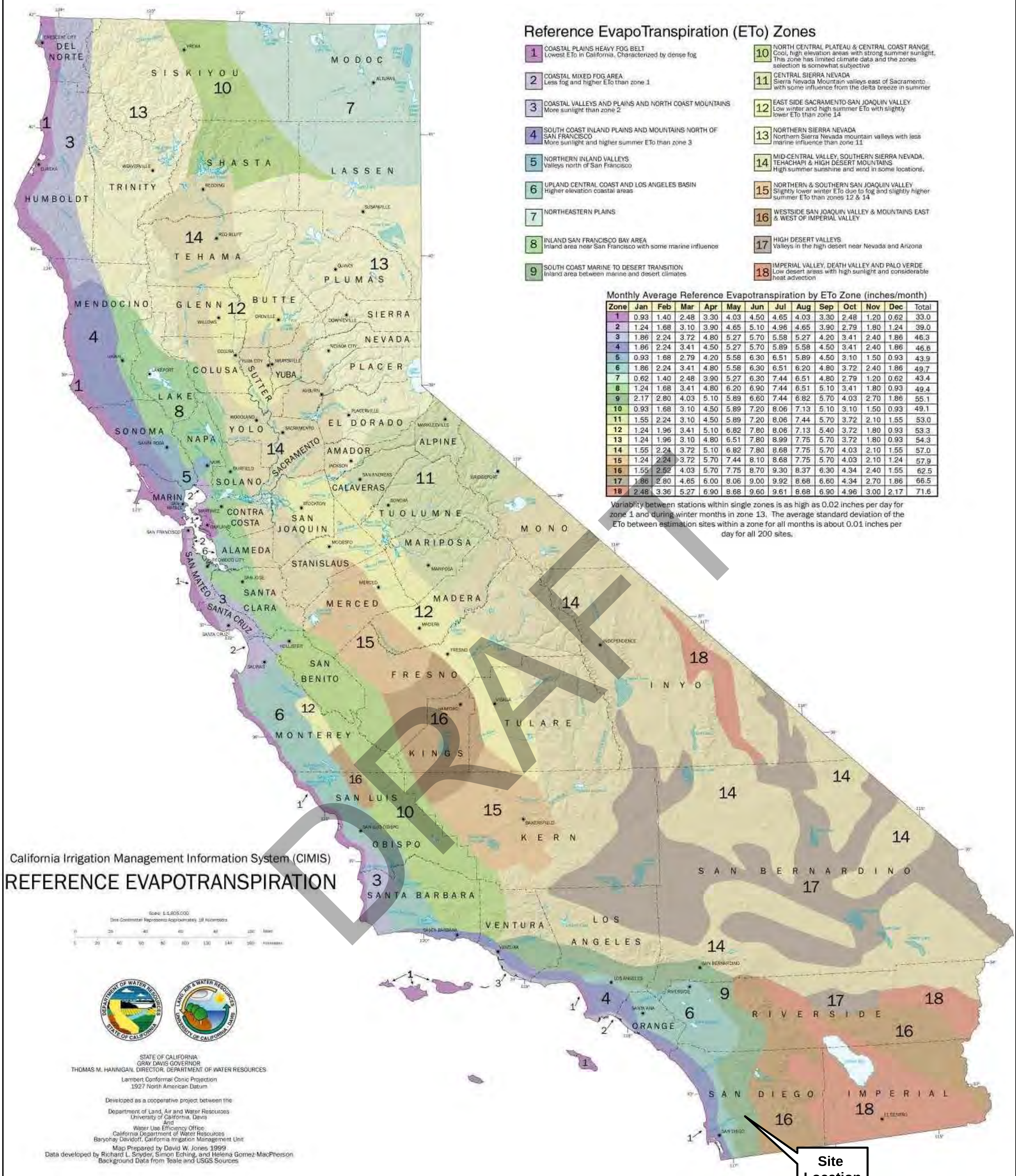
Potential evapotranspiration (PET) is the amount of water that could be evaporated and transpired typically through an irrigated nonspecific short green crop, if there was sufficient water available. Evapotranspiration is defined as the sum of water loss from evaporation from soil and plant surfaces, and plant transpiration. Reference evapotranspiration rates (ET_O), obtained from the California Irrigation Management Information System (CIMIS) ET_O map is a measure of PET from a known surface, such as grass or alfalfa (State of California 1999). The ET_O for this zone (Zone 9) is 55.1 inches as shown on Figure 3 and Table 1.

Evaporation

The reported average (1935 to 2005) annual pan-corrected evaporation rate of 54.63 inches, from the El Capitan Reservoir is also provided on Table 1. El Capitan Reservoir, located approximately 4 miles east of the project site, is within the same CIMIS Zone (Zone 9). Evaporation from the reservoir is reasonable to approximate on-site evaporation from standing water in the proposed excavation pit.

Table 1. Evaporation and Reference Evapotranspiration Rates

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
ET_O (inches)	7.44	6.82	5.70	4.03	2.70	1.86	2.17	2.80	4.03	5.10	5.89	6.60	55.1
Pan-Corrected Evaporation (inches)	7.54	7.37	6.29	4.81	3.13	2,27	2.03	2.13	2.87	4.20	5.41	6.58	54.6



Monthly Average Reference Evapotranspiration by ETo Zone (inches/month)

Zone	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	0.93	1.40	2.48	3.30	4.03	4.50	4.65	4.03	3.30	2.48	1.20	0.62	33.0
2	1.24	1.68	3.10	3.90	4.65	5.10	4.96	4.65	3.90	2.79	1.80	1.24	39.0
3	1.86	2.24	3.72	4.80	5.27	5.70	5.58	5.27	4.20	3.41	2.40	1.86	46.3
4	1.86	2.24	3.41	4.50	5.27	5.70	5.89	5.58	4.50	3.41	2.40	1.86	46.6
5	0.93	1.68	2.79	4.20	5.58	6.30	6.51	5.89	4.50	3.10	1.50	0.93	43.9
6	1.86	2.24	3.41	4.80	5.58	6.30	6.51	6.20	4.80	3.72	2.40	1.86	49.7
7	0.62	1.40	2.48	3.90	5.27	6.30	7.44	6.51	4.80	2.79	1.20	0.62	43.4
8	1.24	1.68	3.41	4.80	6.20	6.90	7.44	6.51	5.10	3.41	1.80	0.93	49.4
9	2.17	2.80	4.03	5.10	5.89	6.60	7.44	6.82	5.70	4.03	2.70	1.86	55.1
10	0.93	1.68	3.10	4.50	5.89	7.20	8.06	7.13	5.10	3.10	1.50	0.93	49.1
11	1.55	2.24	3.10	4.50	5.89	7.20	8.06	7.44	5.70	3.72	2.10	1.55	53.0
12	1.24	1.96	3.41	5.10	6.82	7.80	8.06	7.13	5.40	3.72	1.80	0.93	53.3
13	1.24	1.96	3.10	4.80	6.51	7.80	8.99	7.75	5.70	3.72	1.80	0.93	54.3
14	1.55	2.24	3.72	5.10	6.82	7.80	8.68	7.75	5.70	4.03	2.10	1.55	57.0
15	1.24	2.24	3.72	5.70	7.44	8.10	8.68	7.75	5.70	4.03	2.10	1.24	57.9
16	1.55	2.52	4.03	5.70	7.75	8.70	9.30	8.37	6.30	4.34	2.40	1.55	62.5
17	1.86	2.80	4.65	6.00	8.06	9.00	9.92	8.68	6.60	4.34	2.70	1.86	66.5
18	2.48	3.36	5.27	6.90	8.68	9.60	9.61	8.68	6.90	4.96	3.00	2.17	71.6

Variablity between stations within single zones is as high as 0.02 inches per day for zone 1 and during winter months in zone 13. The average standard deviation of the ETo between estimation sites within a zone for all months is about 0.01 inches per day for all 200 sites.

Figure 3
CIMIS ETo Map

El Monte Sand Mine Project
San Diego, Ca

AECOM
September 2017

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3.3 Land Use

Existing land uses within the 8,862-acre tributary watershed area were evaluated by review of current aerial photographs, the Land Use Element of the San Diego County General Plan/Lakeside Community Plan, recorded subdivision maps, and approved Specific Plans. The proposed project site represents approximately 5% of the tributary watershed surface area.

Many factors contribute to the ultimate land use for a vacant general plan land use designated property, including environmental constraints, access, slope, geotechnical considerations, wildfire hazard, and utility availability. Many of the parcels included in the tributary watershed area have already been developed with residential, agriculture, an equestrian facility, or recreational land uses. Large areas of the watershed are in public ownership and/or in permanent conservation/recreation areas. Approximately 4,744 acres (54%) of the watershed area are located within designated open space or public agency lands, and it is assumed that these lands will not be developed.

3.4 Current Water Demand

Total groundwater demands within the tributary watershed over the 40+ years from 1974/1975 to 2016/2017 have been estimated to range from about 1,240 acre feet per year (afy) to about 2,300 afy with a 40-year average annual groundwater demand of about 1,700 afy.

Current annual groundwater consumption within the study area includes residential water usage; Helix Water District (HWD) pumping; City of San Diego pumping; County of San Diego pumping for El Monte County Park; agricultural irrigation, transpiration of groundwater-dependent vegetation (phreatophytes), and surface water evaporation in Hanson Pond. Evapotranspiration losses from native vegetation (non-groundwater-dependent habitat) are accounted for in calculating groundwater recharge from rainfall.

Annual groundwater consumption within the study area over the last 40 years has fluctuated based on area-wide water levels affecting pond evaporation and phreatophyte demand, increase in residential water demand and corresponding decrease in agricultural irrigation, and changes in HWD and City of San Diego pumping. HWD pumping in the basin has varied historically from 0 to 446 afy. The City of San Diego has installed two wells downgradient of the El Capitan Dam. They began pumping one of the wells in 2013 and plan to bring the other online in the coming year. In the future, the City plans to pump these wells whenever water is being transferred from the El Capitan Reservoir to one of its surface water treatment plants via the existing raw water line located in El Monte Road. The County of San Diego receives raw water for irrigation of the El Monte Regional Park from the City of San Diego. The County of San Diego provides water for potable uses to the park from two wells located north of the park. This system is regulated by the County of San Diego Department of Environmental Health Small Water Systems program.

3.5 Geology and Soils

General

The proposed project is located in a complex geologic region that is part of the Peninsular Ranges Geomorphic Province. Prominent in the watershed are metavolcanics, monzogranite, and a few types of tonalite. The steep side slopes are underlain by exposed bedrock.

Bedrock underlying the study area has a mantle of weathered rock known as residuum or colloquially "decomposed granite," which is formed from the in-place chemical weathering of rock. The contact between the residuum and the unweathered bedrock varies throughout the area. In general, weathering is deeper in flat and valley bottom areas, and thinner in steeper upland areas; however, there are many exceptions to this generalization.

The El Monte Basin floor consists of recent alluvium including sand, silt, and gravel in the modern streambed. Recent alluvium is derived by weathering and erosion of granitic rock along the valley slopes and deposited by the San Diego River and tributary streams.

Colluvium, which is derived by rock falls and erosion which accumulates at the base of the slopes, as well as the alluvium underlie the San Diego River valleys and tributary.

Surficial Soils

Based on the San Diego Area Soil Survey (United States Department of Agriculture [USDA] 1973), soils that underlie the study area are grouped and described as follows:

Soil Group A

Comprising Riverwash, Stony land, and Tujunga sand with a slope of 0–5%, these soils underlie about 19% of the basin and are found primarily in the valley floor. This group has high infiltration and permeability rates with a low run-off potential.

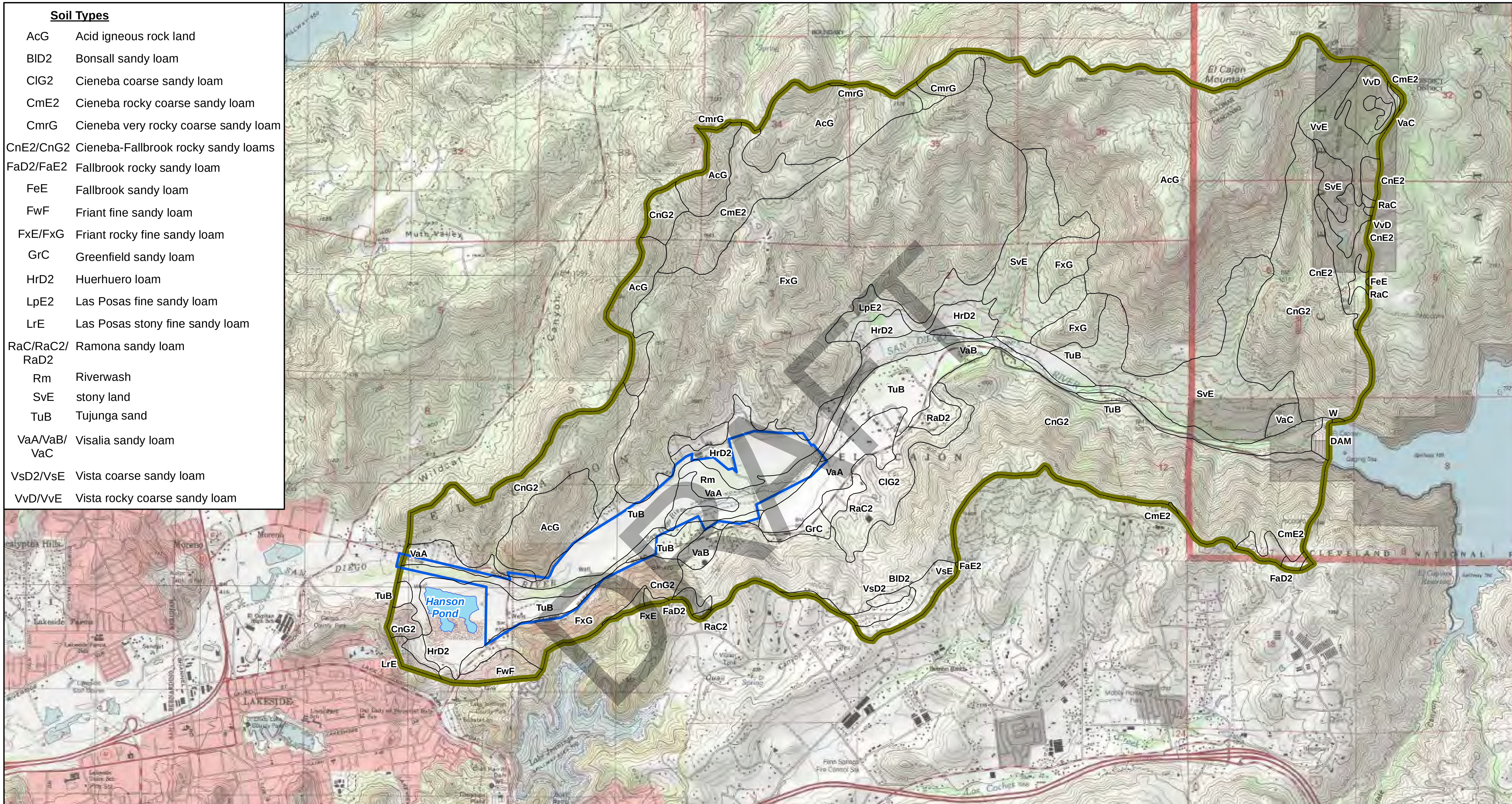
Soil Groups B/C

This group is a combination of soil types B and C and consists primarily of the Cieneba series, with smaller areas of the Greenfield, Visalia, Vista, Fallbrook and Ramona series. These soils underlie about 34% of the basin. These soils are variably shallow to steep rocky sandy loam, and have a moderate to low infiltration rate. These soil groups were combined into one because there was very little soil type C.

Soil Group D

Comprised primarily of Acid igneous rock land and the Friant series with minimal sections of Bonsall sandy loam, Huerhuero loam, and the Las Posas series, this group underlies about 47% of the basin and has a high run-off potential with very low infiltration rates.

A soils map is provided as Figure 4.



Legend

- Tributary Watershed Area
- Project Boundary
- USDA Soil Type Boundaries

N

0 3,000 6,000

Feet

Notes:
Watershed boundaries only show those within the project vicinity.

Figure 4
USDA Soil Types

El Monte Sand Mine Project
San Diego, Ca

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September 2017

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3.6 Hydrogeologic Units

Aquifer watershed boundaries are generally assumed coincident with surface topographic boundaries. The proposed project area is part of the larger El Monte Basin watershed and begins at the toe of the El Capitan Dam on the east and exits to the larger San Diego River watershed to the west. The upper reaches of the watershed were artificially cut off from the downstream portions by the construction of the dam in 1935. The El Monte (907.15), Santee (907.12), and Coches (907.14) Hydrologic Subareas compose the eastern end of the San Diego River hydrologic unit (907.00) as defined in California Regional Water Quality Control Board Basin Plan (RWQCB 1994).

Groundwater levels in upland areas are generally deeper than the alluvium, colluvium, and/or residuum contact with bedrock, therefore fractured bedrock represents the only viable water-bearing unit in side slopes of the study area. Because water can only occupy the fractures (joints and/or faults) in the unweathered rock, specific yields (essentially equivalent to the interconnected [or effective] porosity) in this rock are generally lower than in residuum and alluvium. Specific yields in fractured rock wells are generally reported on the order of 10^{-6} to 10^{-2} (0.0001% to 1%). Specific yield values of 10^{-4} and 10^{-3} (0.01% and 0.1%, respectively) were used for fractured rock in the slopes (greater than or equal to 25%) and flatter areas (slopes flatter than 25%), respectively.

Residuum is a zone of relatively high intergranular porosity and moderate permeability. Water that infiltrates this zone fills the voids and slowly leaks into the underlying fractured rock. Based on review of Bondy and Huntley (2001) saturated residuum is up to 15 feet thick in the lower elevations in the central part of the study area but is nonexistent elsewhere, especially on steeper slopes. Specific yields in residuum were reported to be on the order of 10^{-2} (1%) in nearby Lee Valley (Bondy and Huntley, 2001).

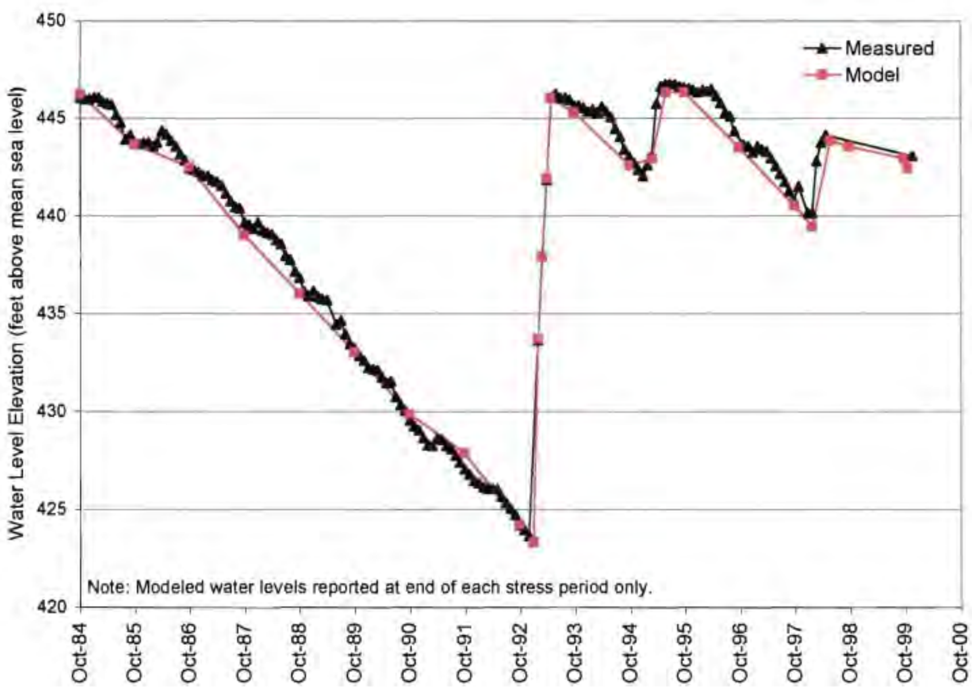
Alluvium ranges up to about 234 feet thick in the tributary watershed (Bondy and Huntley 2001). As developed during calibration of their numerical groundwater flow model, a specific yield value of 0.18 (18%) was used for this investigation. This value is within County Guidelines, where “typical ranges in sediments [are] from approximately 1% to 30%” (County 2007).

3.7 Hydrologic Inventory and Groundwater Levels

Sparse water level records have been maintained in the basin, but those available have been reviewed for this report. Well El Monte #14 water levels, located approximately between 423 and 447 ft amsl was recorded from 1984 to 1999. Inspection of Figure 5 (El Monte #14 hydrograph) reveals that the groundwater rose to an elevation of 446 feet amsl in 1984, 1994, 1995, and 1996. Between 1974/1975 and 2014/2015, the El Capitan Reservoir has spilled in 5 different rain years (1979/1980, 1980/1981, 1982/1983, 1983/1984, and 1992/1993). There were also unmeasured overtopping events in 1937, 1938, 1939, and 1941 (Bondy and Huntley 2001). Releases in the rain years 1979/1980, 1980/1981, 1982/1983, and 1983/1984, were significant (between about 15,900 acre-feet and 98,600 acre-feet) and essentially reset the groundwater storage basin to 100% full. At that point, the groundwater was approximately 5 to 10 feet bgs at El Monte #14. As depicted in Figure 5, groundwater rose to its highest elevation that was roughly equal to the ground surface elevation within the San Diego River at that cross section. Therefore, it was assumed that, at that elevation, the groundwater basin was essentially full.

It should be noted that the most recent dam spill event happened in 1993, and thus, groundwater levels have been declining thereafter. Dam releases are governed by the City of San Diego as a means to manage excess water stored in El Capitan Reservoir. It is in the interest of the City to limit the frequency of releases. Water utilization policy for the City’s reservoirs requires the use of local runoff first before imported water. The City's primary objective for the operation of these reservoirs is to maximize the capture and utilization of local runoff water. For this reason, the City Council has an established policy that requires El Capitan Reservoir to maintain 60 percent of the annual water requirement as active available storage (City of San Diego 1973). This policy sets the lower level of storage. It is a normal practice to maintain minimum water storage in these reservoirs each fall, just before the winter rainy season. This policy has reduced the chances for water releases and for an overtopping even to occur. However, predictions regarding future overtoppings/spills are highly uncertain.

Figure 5. Hydrograph of El Monte #14 vs. Modeled Water Levels



Notes:

Figure from Bondy & Huntley, 2001. Ground elevation at El Monte #14 is at approximately 455 ft amsl.

Well Furrier 1 water levels have been recorded since 1939. Figure 6 below presents the hydrograph from Furrier 1, located just outside the west end of the project site, from the late 1930s through the late 1990s, with a brief interruption in the early 1950s (Bondy & Huntley, 2001). Historic water levels in Furrier 1 ranged from approximately 365 feet above mean sea level to 425 ft above mean sea level. As discussed above, overtopping events occurred in different rain years (1937, 1938, 1939, 1941, 1979/1980, 1980/1981, 1982/1983, 1983/1984, and 1992/1993 [indicated by the yellow bands below]). These overtopping events are apparent in the Furrier 1 graph by the steep increase in groundwater levels over a relatively short period of time.

Figure 6. Hydrograph of Furrier 1

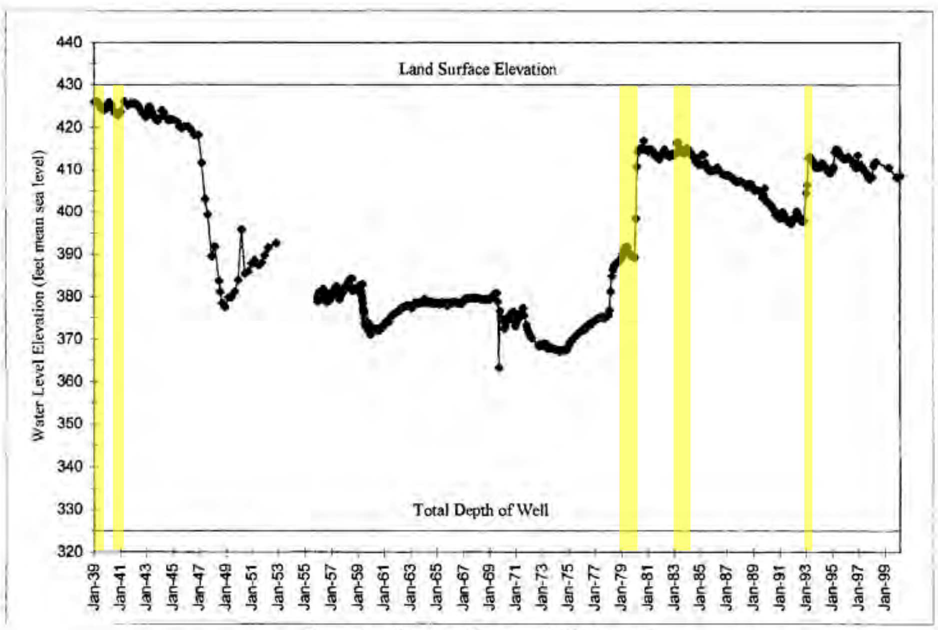


Figure E-2. Water Level Hydrograph Well Furrier 1

Source: Figure E-2 from Bondy and Huntley 2001. Yellow bands represent spill events that occurred between January 1939 and 1999.

Depth to water (DTW) measurements have been collected sporadically across the site. Groundwater levels onsite during the 1990s were approximately 15 to 25 ft bgs, and since then levels have declined to 40-50 ft bgs. A groundwater monitoring network was recently established, and measurements were collected from 2015 to 2017. From the first round of monitoring in 2015 to the second round of monitoring in late 2016, the groundwater elevations dropped sitewide. From late 2016 to the most recent monitoring event in April 2017, groundwater rose roughly half a foot to 2 feet across the site. This will not likely have a significant impact on the overall downward trend in water levels in the basin since the last overtopping event. A site map with the most recent DTW measurements is presented below as Figure 7.

Legend

Tributary Watershed Area

Project Boundary

Well Type

- Installed by Woodward-Clyde
- Installed by Ninyo & Moore
- Identified by Wiedlin & Associates
- Identified by Southern California Soil & Testing
- Identified by Earth Tech (1998)
- Owned and Operated by County of San Diego
- Identified by AECOM
- Wells with circle border verified/found by AECOM

N

0 1,500 3,000

Feet

Notes:
Watershed boundaries only show those within the project vicinity.
Additional wells identified by Bondy & Huntley Were not located or presented on this figure.

Path: P:\ENV\60480712 El Monte\GIS_CAD\MXDs\Figure X El Monte Site Map with Updated Wells.mxd

Figure 7
Depth to Water Measurements

El Monte Watershed
San Diego County, California.

AECOM
September 2017

4.0 Groundwater Impact Analysis

4.1 Groundwater Inflows and Outflows

The components of inflows and outflows of groundwater at the project site are represented below (Table 2). “Existing Conditions” represent current inflows and outflows prior to mining excavation, while “Future Conditions” represent components of inflow and outflow in post mining conditions. There are three significant expected changes to the groundwater system following excavation: (1) inflow to the pit and underlying groundwater system from rainfall run-on, (2) changes in the amount of evapotranspiration from on-site groundwater-dependent plant species, and (3) potential outflow from pit evaporation.

Table 2. Groundwater Fluxes

	Existing Conditions	Future Conditions
Inflows		
Rainfall recharge	X	X
Underflow beneath the El Capitan Dam	X	X
Stream bed infiltration	X	X
Return flows from landscape irrigation and septic systems	X	X
Rainfall Run-on into Mining Pit		XX
Spills and overtopping of El Capitan Reservoir	X	X
Outflows		
Evapotranspiration of groundwater-dependent plant species	X	XX
Groundwater pumping for residential, municipal supply, and irrigation purposes	X	X
Groundwater outflow into the basin to the west.	X	X
Evaporation off of existing water surfaces (e.g., Hanson Pond)	X	X
Evaporation from reclaimed pit pond (El Monte Sand Mine project)		XX

Note: double X's (XX) denotes a change in the groundwater flow component

These are described further below:

4.1.1 Inflow - Rainfall Run-on into Mining Pit

Following reclamation of the mining pit, a new source recharge is expected as a consequence of rainfall run-on into the pit. This is water that would have otherwise run out of the basin as surface water during periods of heavy rainfall not accompanied by overtopping of the El Capitan Dam. In addition to the recharge, the reclaimed pit has the potential to reduce damage further downstream due to catastrophic flooding events. This is a function of precipitation, run-off, and soil type. Precipitation was described in section 3.0, and the other components are described below:

The tributary watershed falls within the 18-to-21-inch and 15-to-18-inch rainfall belts on the San Diego County Groundwater Limitations Map (Figure 2). As discussed in Section 3.0, the average annual rainfall between El Capitan and Lake Jennings stations was about 16 inches per year over the last 40 years, and has ranged between 5 and 31 inches.

Run-on

Run-off to the pit, also called pit run-on (RO), can be estimated using the USDA Natural Resources Conservation Service (NRCS) curve number method (CNM) as expounded in the County of San Diego Hydrology Manual (County 2003). The CNM was designed to estimate run-off for watersheds in which no direct measurement was available. The CNM is based on a simplified infiltration model of run-off and empirical approximations. To compute RO using the CNM, two parameters must be known: precipitation (P) and the maximum soil moisture retention (S) after run-off has begun based on the following relationship.

$$RO = (P-.2S)^2 / (P+0.8S)$$

S is a function of soil type, with all soils having been classified by the NRCS into one of four hydrologic groups, A through D, based on the soil's run-off potential. Group A generally has the smallest run-off potential and highest infiltration rates and group D the greatest run-off potential, lowest infiltration rates, and lowest soil moisture retention. As discussed in Section 3.5, the soils within the project watershed were generally split into one of three hydrologic soil groups based on their respective soil moisture holding capacities and the *San Diego County Hydrology Manual* (County 2003) mapping (Figure 8).

The CNM requires the selection of a curve number (CN) based on a combination of soil conditions, land use (ground cover), and hydrologic conditions. These run-off factors, called run-off CNs, indicate the run-off potential of an area. The higher the CN is, the higher the run-off potential (County 2003).

CNs were selected from Table 3-2 (*Linking Land Uses and Hydrologic Soil Groups to Soil Curve Number*) of the *County of San Diego General Plan Update Groundwater Study* (County 2010) based on the 0.2 dwelling unit per acre cover code for each hydrologic soil group.

S is calculated from the CNs based on the following relationship:

$$S = 1000/CN-10$$

Soils

The soil types, average moisture holding capacities (SMCs), curve numbers, their corresponding hydrologic groups, and respective areas for each USDA soil group are shown in Table 3.

Table 3. Project Study Area Hydrologic Soil Groups

USDA Soil Group	Average SMC (inches)	NRCS CN	S	Approximate Area (acres)
Soil Group A	2.05	39	15.64	1,648
Soil Group B/C	2.18	67	5.15	3,028
Soil Group D	0.93	80	2.50	4,173

Using the monthly precipitation record and the assigned CNs, anticipated monthly run-off values for the project area were calculated for the 42-year period of record (1974–2016) of the precipitation data. A calibration analysis included in the County of San Diego General Plan Update Groundwater Study (County 2010) compared the run-off values using the CNM to existing conditions for periods when historical groundwater level data were available in the Lee Valley Basin. The County concluded that run-off values calculated using the CNM is generally overestimated. A reasonable relative match between calculated groundwater in storage compared to historical groundwater levels was obtained by applying an adjustment factor of 0.5 to the calculated run-off values. This adjustment factor of 0.5 was also used in the General Plan Update Groundwater Study (County 2010). A similar exercise was performed in the 22.5-square-mile Guejito Basin on the north side of San Pasqual Valley in San Diego County. In that relatively undeveloped basin (with available rainfall and stream gauge data) an adjustment value of 0.2 gave the best match.

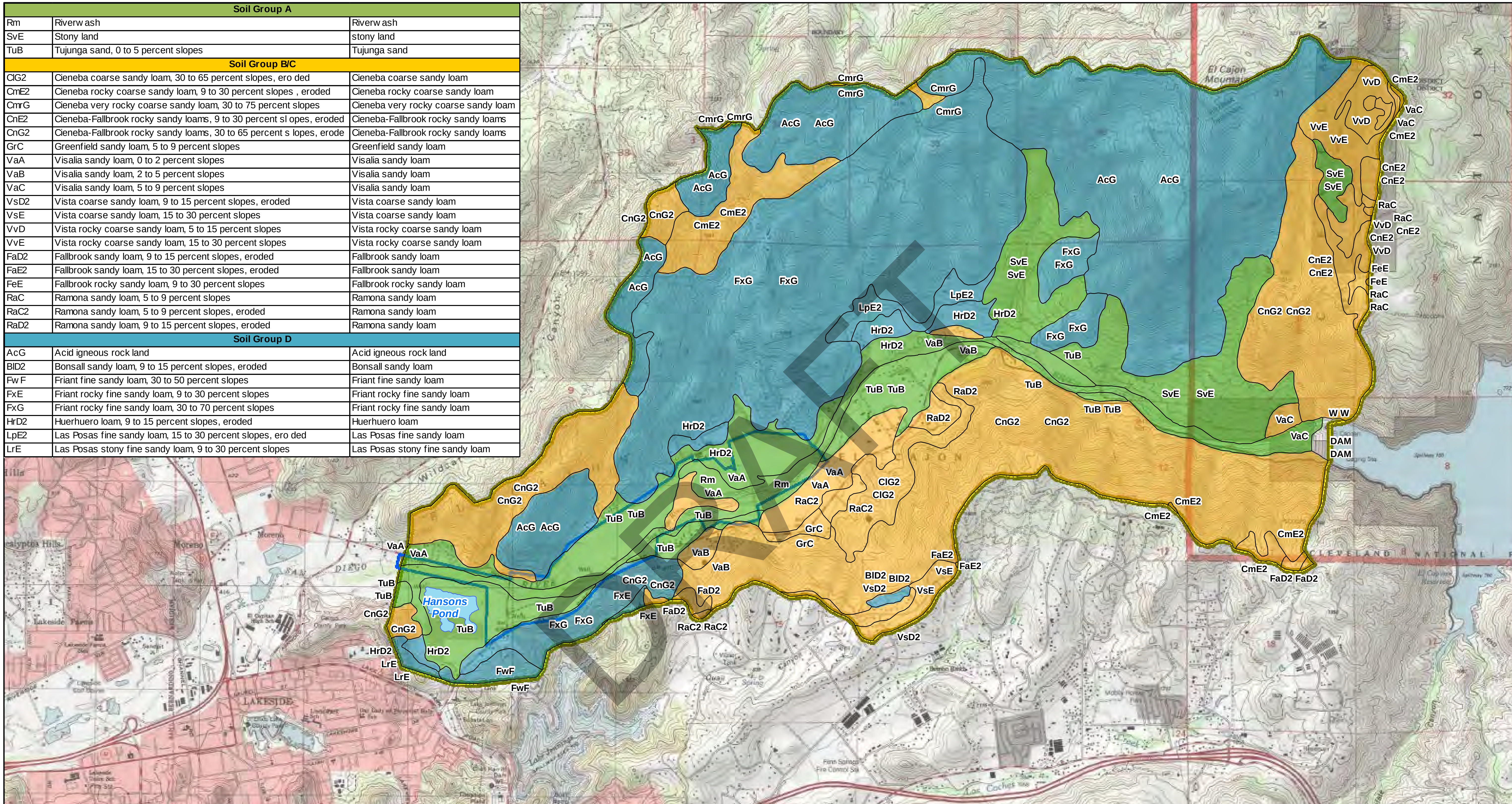
Due to potential overestimation using the CNM, a run-on adjustment coefficient of 0.1 was used to conservatively constrain the results. Using this method and the 1974/1975 to 2016/2017 rainfall record, it was estimated that pit run-on would range from about 19 to 1061 afy with an average of about 368 afy (Table 4).

Table 4. Estimated Run On

Rain Year	Total Rainfall (inches)	Pit Run-on (afy)
1974-1975	17.20	317
1975-1976	12.64	250
1976-1977	15.18	189
1977-1978	30.29	935
1978-1979	22.75	586
1979-1980	27.73	927
1980-1981	11.34	169
1981-1982	18.74	420
1982-1983	30.98	926
1983-1984	8.15	122
1984-1985	14.92	250
1985-1986	19.24	497
1986-1987	12.45	127

1987-1988	15.86	269
1988-1989	8.87	91
1989-1990	9.63	113
1990-1991	16.60	511
1991-1992	16.61	304
1992-1993	28.29	1061
1993-1994	9.42	246
1994-1995	29.18	939
1995-1996	10.82	193
1996-1997	10.12	262
1997-1998	27.29	884
1998-1999	9.53	99
1999-2000	9.86	171
2000-2001	13.80	233
2001-2002	5.04	19
2002-2003	17.79	334
2003-2004	10.34	191
2004-2005	26.29	846
2005-2006	3.36	44
2006-2007	7.88	76
2007-2008	9.27	300
2008-2009	12.03	291
2009-2010	21.39	573
2010-2011	22.71	611
2011-2012	12.27	199
2012-2013	9.92	115
2013-2014	7.91	52
2014-2015	11.94	154
2015-2016	16.41	257
2016-2017	22.58	657
Mean	**15.7**	**368**

Soil Group A		
Rm	Riverw ash	Riverw ash
SvE	Stony land	stony land
TuB	Tujunga sand, 0 to 5 percent slopes	Tujunga sand
Soil Group B/C		
ClG2	Cieneba coarse sandy loam, 30 to 65 percent slopes, ero ded	Cieneba coarse sandy loam
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes , eroded	Cieneba rocky coarse sandy loam
CmrG	Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes	Cieneba very rocky coarse sandy loam
CnE2	Cieneba-Fallbrook rocky sandy loams, 9 to 30 percent sl opes, eroded	Cieneba-Fallbrook rocky sandy loams
CnG2	Cieneba-Fallbrook rocky sandy loams, 30 to 65 percent s lopes, erode	Cieneba-Fallbrook rocky sandy loams
GrC	Greenfield sandy loam, 5 to 9 percent slopes	Greenfield sandy loam
VaA	Visalia sandy loam, 0 to 2 percent slopes	Visalia sandy loam
VaB	Visalia sandy loam, 2 to 5 percent slopes	Visalia sandy loam
VaC	Visalia sandy loam, 5 to 9 percent slopes	Visalia sandy loam
VsD2	Vista coarse sandy loam, 9 to 15 percent slopes, eroded	Vista coarse sandy loam
VsE	Vista coarse sandy loam, 15 to 30 percent slopes	Vista coarse sandy loam
VvD	Vista rocky coarse sandy loam, 5 to 15 percent slopes	Vista rocky coarse sandy loam
VvE	Vista rocky coarse sandy loam, 15 to 30 percent slopes	Vista rocky coarse sandy loam
FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	Fallbrook sandy loam
FaE2	Fallbrook sandy loam, 15 to 30 percent slopes, eroded	Fallbrook sandy loam
FeE	Fallbrook rocky sandy loam, 9 to 30 percent slopes	Fallbrook rocky sandy loam
RaC	Ramona sandy loam, 5 to 9 percent slopes	Ramona sandy loam
RaC2	Ramona sandy loam, 5 to 9 percent slopes, eroded	Ramona sandy loam
RaD2	Ramona sandy loam, 9 to 15 percent slopes, eroded	Ramona sandy loam
Soil Group D		
AcG	Acid igneous rock land	Acid igneous rock land
BlD2	Bonsall sandy loam, 9 to 15 percent slopes, eroded	Bonsall sandy loam
Fw F	Friant fine sandy loam, 30 to 50 percent slopes	Friant fine sandy loam
FxE	Friant rocky fine sandy loam, 9 to 30 percent slopes	Friant rocky fine sandy loam
FxG	Friant rocky fine sandy loam, 30 to 70 percent slopes	Friant rocky fine sandy loam
HrD2	Huerhuero loam, 9 to 15 percent slopes, eroded	Huerhuero loam
LpE2	Las Posas fine sandy loam, 15 to 30 percent slopes, ero ded	Las Posas fine sandy loam
LrE	Las Posas stony fine sandy loam, 9 to 30 percent slopes	Las Posas stony fine sandy loam



Legend

- Watershed Area
- Project Boundary
- USDA Soil Type Boundaries

N

0 3,000 6,000

Feet

Figure 8
Hydrological Soil Group

El Monte Sand Mine Project
San Diego, Ca

AECOM

September 2017

Notes:
Watershed boundaries only show those within the project vicinity.

Path: P:\ENV\60480712 El Monte\GIS_CAD\MXDs\Sand Extraction Nature Project Report\Figure 10 Hydro Soil Groups.mxd

4.1.2 Outflow - Potential Evaporation From Within Pit

As noted above, the project proposes to excavate a portion of the basin's aquifer, which will result in the removal of alluvium and create a 228-acre mining pit. While this enhances the run-on and infiltration of precipitation into the groundwater system, it will also have the potential to create standing water in the pit following wet years that will evaporate an estimated 4.55 afy per acre of exposed water (pan-corrected evaporation from Table 1). As groundwater levels in the basin fluctuate, so will the volume of groundwater within the pit (until groundwater is deeper than the pit floor) and thus evaporative loss each year is expected to vary. However, water level elevations in April of 2017 ranged from about 390 ft msl to 425 ft msl, which is approximately 40 to 50 feet below ground surface (Figure 7). This would be equal to approximately 5 to10 feet below the bottom of the reclaimed mining pit on the west end and 10 to 15 feet below the bottom of the reclaimed mining pit. The average decline in water level of 1.7 ft/yr was calculated from the hydrographs presented in Bondy & Huntley. If there is not another overtopping event within the next 15 years, water levels will decline approximately an additional 25 feet. Thus, water level elevations would be approximately 365 to 400 ft msl (65 to 75 feet below the ground surface), or roughly 30 to 35 feet below the bottom of the reclaimed mining pit on the west end and 35 to 40 feet below the bottom of the reclaimed mining pit. Unless another overtopping/spill event occurs, no standing water will exist within the pit, and therefore, no evaporation losses are assumed.

4.1.3 Outflow - Groundwater-dependent Habitat Demand

To determine potential significant impacts of the proposed El Monte project, the team biologist looked at the following groundwater-dependent habitat: Southern Cottonwood-Willow Riparian Forest, Vegetated Channel, Southern Willow Scrub, and Tamarisk Scrub (for current conditions only)[Jim Prine ESA, email communication, August 15, 2017].

During post-mining conditions, groundwater is anticipated to be approximately 30 to 40 feet below the bottom of the pit. Approximately 325 afy is predicted to be lost to evapotranspiration (ET) onsite. During post-mining if water conditions were the same as existing conditions where groundwater is approximately 5 to 15 feet below the bottom of the pit, approximately 366 afy is predicted to be lost to ET onsite [Jim Prine ESA, email communication, September 6, 2017]. The amount of phreatophyte loss depends on several factors, including depth of groundwater, species factor, density factor, microclimate factor, and the reference evapotranspiration rate as shown in Table 5 below.

Table 5. On-site Phreatophyte Evapotranspiration Estimates

Vegetation Community[2]	**Species Factor (K_s)**	**Density Factor (K_d)**	**Microclimate Factor (K_{mc})**	**Landscape Coefficient (K_L)**[2]	**Reference Evapotranspiration Rate (inches/year)**	**Estimated Evapotranspiration (inches/year)**[3]	**Mapped Area (acres)**	**ET Loss (afy)**
On-site Phreatophytes (Future Conditions) Depth to Water 30 to 40' below pit, 65 to 75' below ground outside pit[6]								
Southern Cottonwood-Willow Riparian Forest	0.44	1	1	0.44	55.1	24.24	58.86	118.9
Southern Willow Scrub	0.37	1	1	0.37	55.1	20.39	99.1	168.4
Southern Cottonwood-Willow Riparian Forest (existing - to remain)	0.42	1	1	0.42	55.1	23.14	11.26	21.7
Southern Willow Scrub (existing - to remain)	0.35	1	1	0.35	55.1	19.28	0.71	1.1
Vegetated Channel*	0.35	1	1	0.35	55.1	19.28	8.92	14.3
							Total Loss:	**324.4**

Vegetation Community[2]	**Species Factor (K_s)**	**Density Factor (K_d)**	**Microclimate Factor (K_{mc})**	**Landscape Coefficient (K_L)**[2]	**Reference Evapotranspiration Rate (inches/year)**	**Estimated Evapotranspiration (inches/year)**[3]	**Mapped Area (acres)**	**ET Loss (afy)**
On-site Phreatophytes (Future Conditions) Depth to Water 5 to 15' below pit, 40 to 50' below ground outside pit[5]								
Southern Cottonwood-Willow Riparian Forest	0.52	1	1	0.52	55.1	28.65	58.86	140.5
Southern Willow Scrub	0.41	1	1	0.41	55.1	22.59	99.1	186.6

Southern Cottonwood-Willow Riparian Forest (existing - to remain)	0.42	1	1	0.42	55.1	23.14	11.26	21.7
Southern Willow Scrub (existing - to remain)	0.35	1	1	0.35	55.1	19.28	0.71	1.1
Vegetated Channel*	0.39	1	1	0.39	55.1	21.49	8.92	16.0
							Total Loss:	**365.9**

Notes:

1. The Landscape Coefficients (K_L) for the vegetation communities was determined using The Landscape Coefficient Method and Water Use Classification of Landscape Species (WUCOLS) III in A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California (University of California Cooperative Extension, California Department of Water Resources, August 2000).

2. K_S x K_d x K_{mc} = K_L. Landscape coefficient values for the project factor in site conditions and groundwater elevations, and post-mining planting palettes which include riparian species and transitional upland species due to conditions that are drier than typical riverine systems. As groundwater elevation drops, fewer riparian species are expected to persist and landscape coefficient values would be reduced.

3. Landscape Coefficient (K_L) x Reference Evapotranspiration = Evapotranspiration (inches/year).

4. Landscape coefficients for the existing condition assume much of the vegetation cannot access the deep groundwater.

5. Non-Vegetated Channel currently occurs on-site. In post-mining areas (lowered approximately 33 to 41 feet) the central channel will be revegetated with lower-growing species (i.e., Douglas mugwort, Deergrass, etc.) that are considered non-phreatophytes. However, species such as cottonwood, willow and mule fat, which are phreatophytes, are expected to volunteer in low numbers in the channel area from adjacent Cottonwood-Willow Riparian Forest habitat.

6. Existing Tamarisk Scrub in the river channel will either be removed by mining and the area will be revegetated post-mining with Cottonwood-Willow Riparian Forest habitat, or enhanced outside of mining areas as part of project mitigation (i.e., removal of tamarisk and other exotic species) and converted to non-phreatophytic alluvial scrub habitat.

7. The Species Factor and Landscape Coefficient are expected to decrease within Vegetated Channel as groundwater level decreases.

4.2 Groundwater Storage

The surface mining and resultant pit will remove material that would have otherwise had the potential to store groundwater. Under current conditions groundwater levels would be below the bottom of the pit, in which case, the excavated material would not affect groundwater storage. In the event of a dam overtopping, the water table may rise above the pit bottom and a pond would form. The quantity of water stored as surface water (approximately 2,000 acre-feet) would be greater than if it was stored as groundwater. However, this increase in available storage would be subject to evaporation and induce groundwater inflow into the pit.

Because the first operations occurring onsite will be to clear the vegetation out of the mining pit area and the area east of the dairy, phreatophyte ET should be significantly less at that time than existing conditions. And since no groundwater will be used during mining operations, it is expected that impacts during mining will be less than significant.

4.3 Water Quality

In August 2016, AECOM collected water samples from Wells 1, 2, and 3 and analyzed for nitrate (as nitrogen [N]) and total dissolved solids (TDS). In addition, we obtained water quality data from one of the El Monte Regional Park supply wells. Sample results relative to the Primary State or Federal Maximum Contaminant Levels (MCLs) are summarized in Table 6.

Table 6. Summary of TDS and Nitrate Analytical Results – September 2016

Well	**Analytical Results**	
	TDS (mg/L)	**Nitrate (mg/L as N)**
Primary MCL	**1000**	**10**
County of San Diego El Monte Regional Park Well	N/A	2.5*
Well 1	350	0.21
Well 2	550	6.0
Well 3	500	10

Notes: * Well sampled April 18, 2016 by County of San Diego

Bondy and Huntley (2001) reviewed TDS data sourced from the U.S. Geological Survey from 1959 and 1983 (Figures 25 and 26 below, referenced from Bondy and Huntley [2001]). Those results indicate TDS concentrations of 290 to 1310 mg/L in the El Monte Basin.

Figures 25 and 26 from Bondy and Huntley (2001)

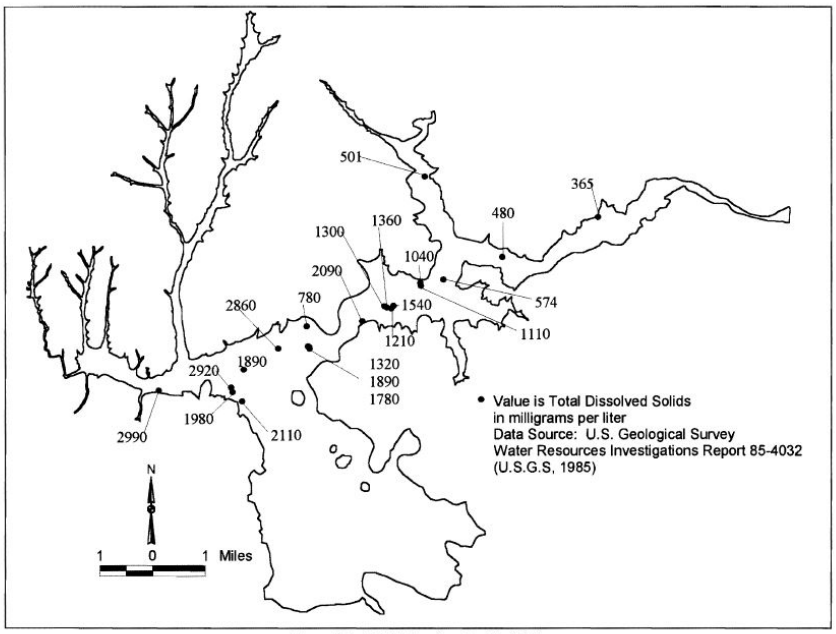


Figure 25. Total Dissolved Solids 1959

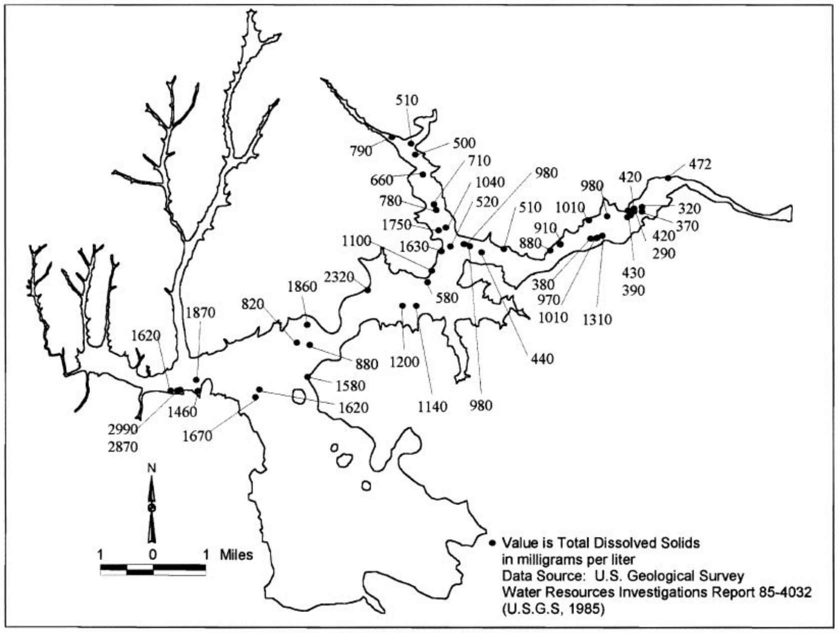


Figure 26. Total Dissolved Solids 1983

These data were provided to establish baseline conditions. Accordingly these results are not addressed further.

5.0 Summary of Project Impacts

Based upon the results of our study, we provide the following conclusions:

- El Capitan reservoir has spilled water episodically since its construction. Based on review of historic groundwater levels it appears that following in overtopping event the basin water levels rise to approximately 5 to 10 feet from the ground surface in the El Monte basin.

- In the absence of another spill event basin water levels have historically declined approximately 1.7 feet per year on average.

- Water levels today are currently about 40 to 50 feet below ground surface. This would be equal to approximately 5 to 15 to feet below the bottom of the reclaimed mining pit.

- If there is not another spill event within the next 15 years water levels will decline approximately another 25 feet. That would mean water levels would be approximately 65 to 75 feet below the ground surface. That would be equal to 30 to 40 feet below the bottom of the reclaimed mining pit.

- In the event that another dam spill were to occur, the reclaimed pit will have another benefit and that is the storage of surface water within the pit. Approximately 2,000 acre-feet would be temporarily stored if the pit were completely filled. Because the pit would be filling 100% of the air space in the 75 acres that would be inundated, this would provide significantly more surface water in the basin in the years following the overtopping event. While this water would also then be subject to evaporative losses, the temporary storage of surface water in the pit (until basin water levels decline below the bottom of the pit) could be an environmental benefit.

- Because the first operations occurring onsite will be to clear the vegetation out of the mining pit area and the area east of the dairy, phreatophyte ET should be significantly less at that time than existing conditions. And since no groundwater will be used during mining operations, it is expected that impacts during mining will be less than significant.

- The reclaimed pit has the potential to slightly reduce damage further downstream (e.g., Mission Valley) during catastrophic flooding events.

- Following reclamation, the project is expected to result in approximately 368 afy of rainfall run-on into the reclaimed mining pit

- Evapotranspiration from phreatophytes is expected range from about 325 to 366 afy assuming there are no more reservoir spills/overtopping in the next 15 years.

- **The *project can be considered a net benefit to the basin*** because induced run-on is greater than the anticipated evapotranspiration loss. The net effect of the induced run-on to the reclaimed pit would be a benefit to the groundwater system by allowing capture of water that would otherwise leave the basin.

6.0 Recommendations

We recommend that since all open wells could provide a conduit for groundwater contamination and could present a safety hazard, existing (and any future) on-site wells should be secured with locking covers. Wells that will not be used in the future should be properly abandoned.

7.0 References

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PRELIMINARY CEQA DRAINAGE STUDY

FOR THE

EL MONTE SAND MINING

AND

NATURE PRESERVE PROJECT

June 20, 2018

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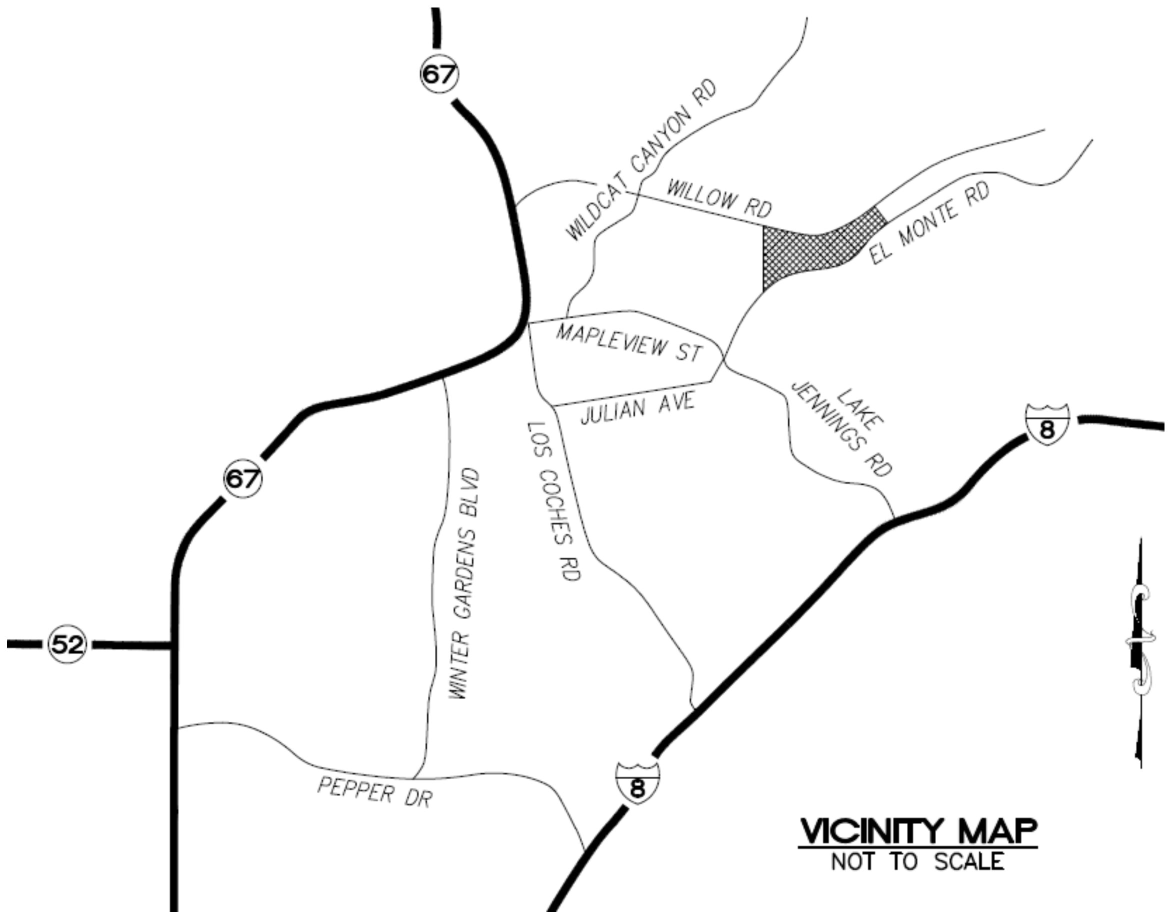
TABLE OF CONTENTS

APPENDICES

INTRODUCTION

El Monte Nature Preserve, L.L.C. is proposing the El Monte Sand Mining and Nature Preserve Project along the El Monte Valley in the Lakeside community of the county of San Diego (see the Vicinity Map). The project will extract up to approximately 12.5 million tons of mineral resource over a 12 year period within the San Diego River floodplain. The project is expected to be fully completed in 16 years. Mining will be ongoing for 12 years after inception, while reclamation will commence 4 years after the start of mining and progressively continue over a 16 year period. Reclaimed areas will be restored to an end use of open space with recreational trail easements. The combined mineral extraction and reclamation project will affect approximately 228 acres of land on 479.5 acres currently owned by the El Monte Nature Preserve, LLC.



Vicinity Map

The San Diego River flows in a westerly direction along the site. The San Diego River floodplain encompasses the majority of the proposed extraction area. In addition, the extraction area encroaches into portions of the County of San Diego defined floodway. Chang Consultant's June 20, 2018, *Hydraulic Analyses for the El Monte Sand Mining and Nature Preserve Project,* contains existing and proposed condition hydraulic analyses to assess the pre- and post-project floodplain and floodway impacts. The June 2018 report concludes that the project is within the County's effective floodway, but will not raise the 100-year water surface elevations, so meets the County and FEMA's floodway regulations. In addition, the project will not create adverse flood impacts within the study reach, which is consistent with the goals of floodplain regulations.

The 2018 report analyzes the project in relation to the San Diego River floodway and floodplain. On the other hand, this report contains a Preliminary CEQA drainage study for the proposed processing plant, which will be outside of the proposed condition floodplain and floodway. The processing plant will contain facilities that support mining such as the office, storage and maintenance area, scale and scale house, stockpiles, screens, etc. Existing and proposed condition hydrologic analyses have been performed for the processing plant.

HYDROLOGIC ANALYSES

The County of San Diego's 2003 *Hydrology Manual* rational method procedure was used for the 100-year hydrologic analyses. The existing and proposed condition rational method input parameters are summarized as follows:

- Precipitation: The 100-year, 6- and 24-hour precipitation values are 3.0 and 6.3 inches, respectively. The isopluvials are included in Appendix A.

- Drainage areas: The existing condition drainage area was delineated from the 1-foot contour interval topographic mapping used for the project. The proposed condition drainage area was delineated from the proposed reclamation plan. There is a proposed earthen berm around the south and west sides of the processing plant that define the drainage area. The Existing Condition Rational Method Work Map and Proposed Condition Rational Method Work Maps are included in Appendix A.

- Hydrologic soil groups: The hydrologic soil group was determined from the National Resources Conservation Service's "Web Soil Survey." The attached Web Soil Survey shows that the entire drainage area essentially contains soil group A.

- Runoff coefficients: Runoff coefficients were established for each drainage basin based on the estimated impervious percentage and soil group A. The existing condition land use consists of undisturbed natural terrain with no impervious surfaces. The proposed processing plant will be on the natural ground surface and contain minimal impervious surfaces. Therefore, the proposed condition land use was also modeled as natural terrain.

- Flow lengths and elevations: The flow lengths and elevations were digitized and obtained from the topographic mapping and reclamation plan. Under existing conditions, the drainage area is nearly level with several depressions that retain storm runoff. Under proposed conditions, the drainage area was assumed to be gently sloping towards the San Diego River.

The 100-year existing and proposed condition rational method results are in Appendix A. The analyses were performed using CivilDesign's San Diego County Rational Hydrology Program. The overall existing condition drainage area was set equal to the overall proposed condition drainage area to allow a comparison of the existing and proposed condition results. Table 1 summarizes the 100-year results. Table 1 shows that the project will slightly reduce the 100-year flow rate (from 3.7 to 3.4 cubic feet per second). This is due to the longer flow path under proposed conditions. The difference in flow rates is so small that the existing and proposed condition results are essentially the same.

Condition	H, ft	L, ft	C		T_c, min.	I, in/hr	Area, ac	Q_{100}, cfs
Existing	4.2	422	0.2		17.79	3.49	5.27	3.7
Proposed	3.1	528	0.2		20.21	3.21	5.27	3.4

Table 1. Summary of Rational Method Input and Results

CONCLUSION

Preliminary CEQA existing and proposed condition 100-year hydrologic analyses have been performed for the reclamation plan submittal of the El Monte Sand Mining and Nature Preserve Project. The analyses cover the processing plant, which will be outside of the proposed condition floodplain. A separate hydraulic analysis has been performed for the extraction area, which will be within the floodplain. The hydrologic results show that the processing plant will not cause an adverse increase in flow rates. The proposed time of concentration over the ground surface is long at over 20 minutes, which indicates that the overall velocities will not be erosive.

The existing drainage patterns will not be altered. Under existing conditions, the processing plant area is in the floodplain. Under proposed conditions, runoff from the processing plant will be directed north to the realigned floodplain. The 100-year flow rates at the processing plant are less than 4 cfs, while the 100-year flow rate in the river is 20,000 cfs, so the processing plant will not cause substantial erosion or siltation on- or off-site. In addition, the processing plant will not result in flooding on- or off-site since its flow contribution is so small.

The processing plant runoff will be conveyed by the San Diego River. The relatively small runoff generated by the plant will not create or contribute runoff that will exceed the capacity of downstream drainage facilities beyond their current capacities. The project does not propose housing, so will not place housing in a 100-year flood hazard area.

DECLARATION OF RESPONSIBLE CHARGE

Declaration of Responsible Charge
I hereby declare that I am the civil engineer of work for this project for hydraulic analyses of the San Diego River, that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with current design.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

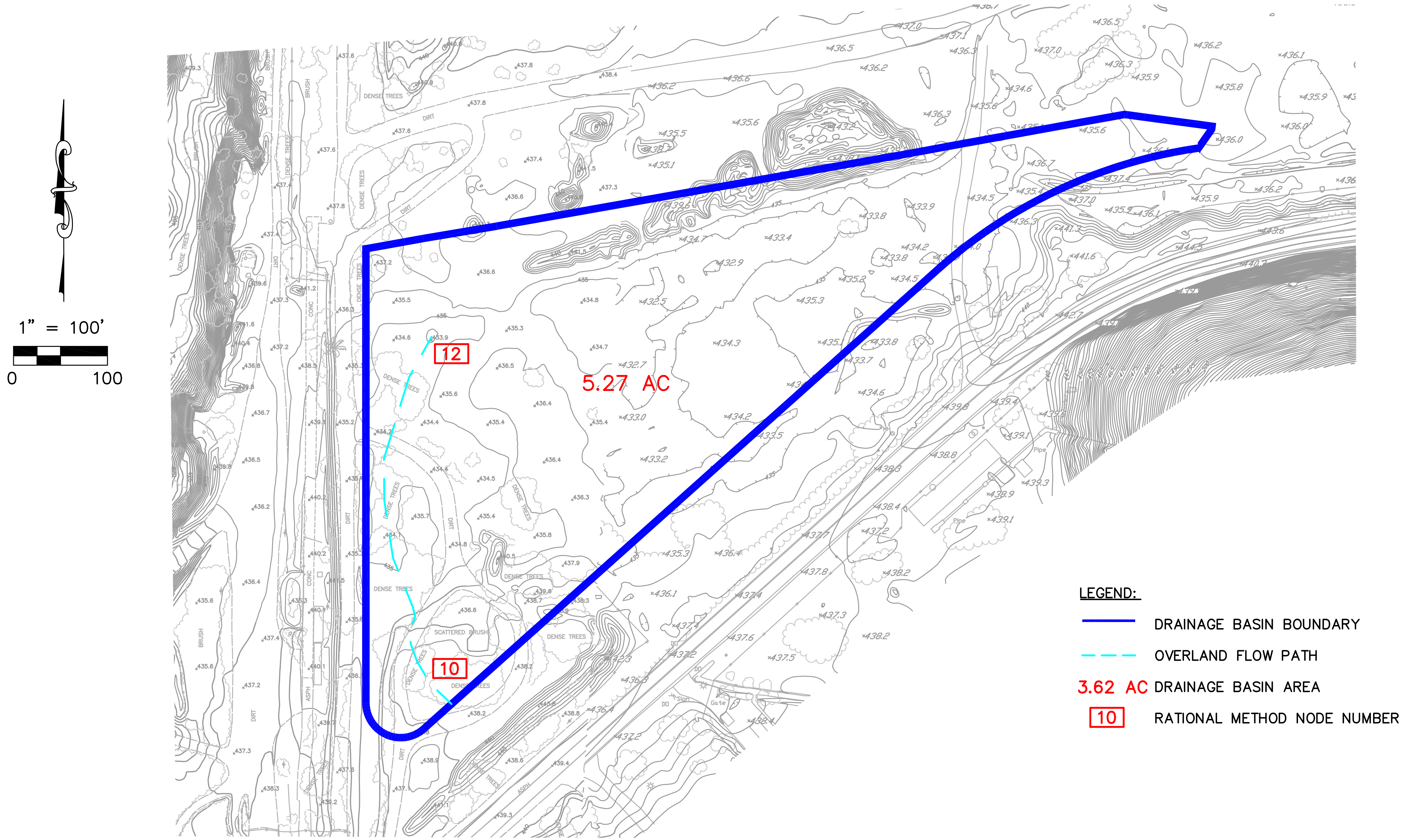
June 20, 2018

Wayne W. Chang
RCE 46548
Exp. June 30, 2019

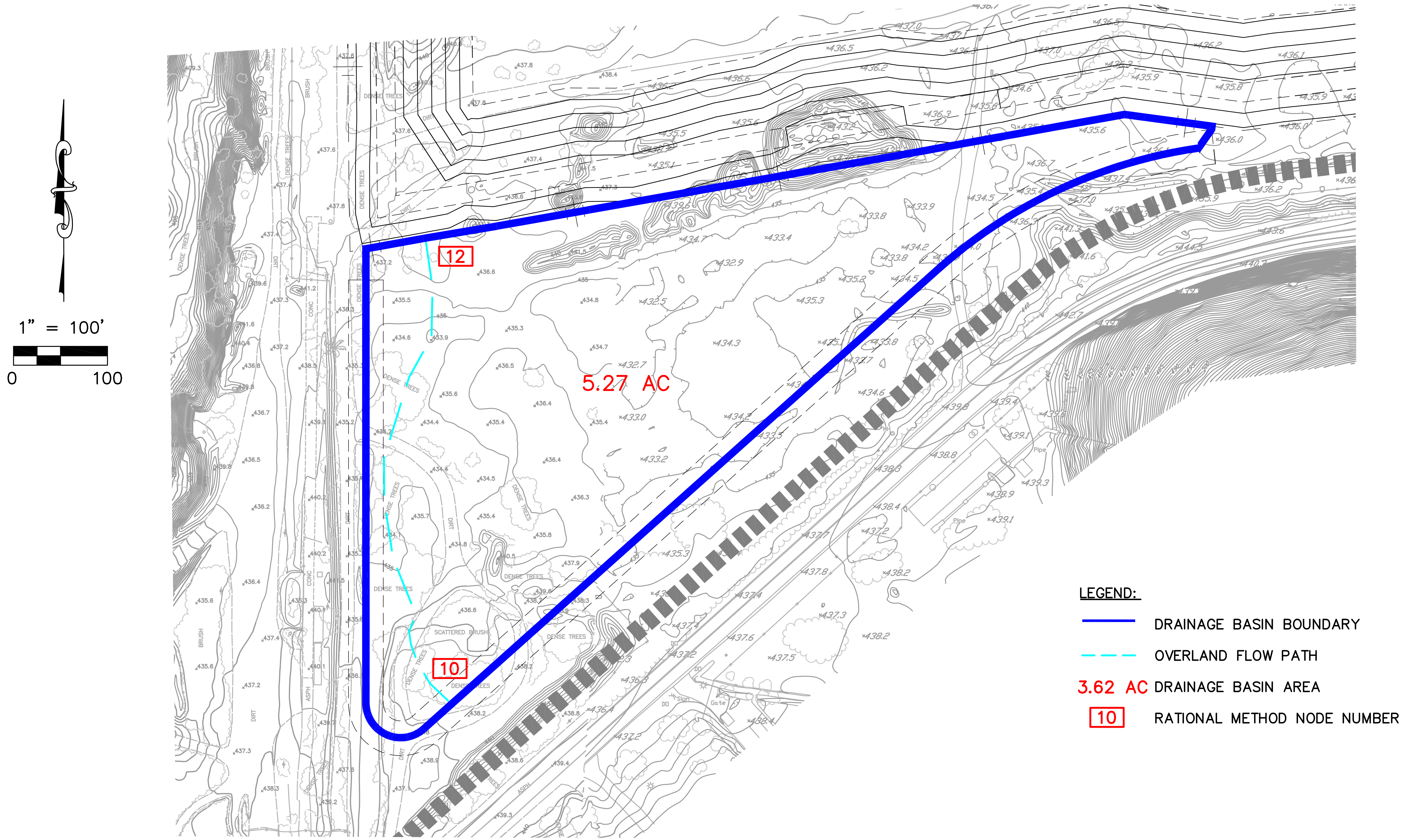
Date

APPENDIX A

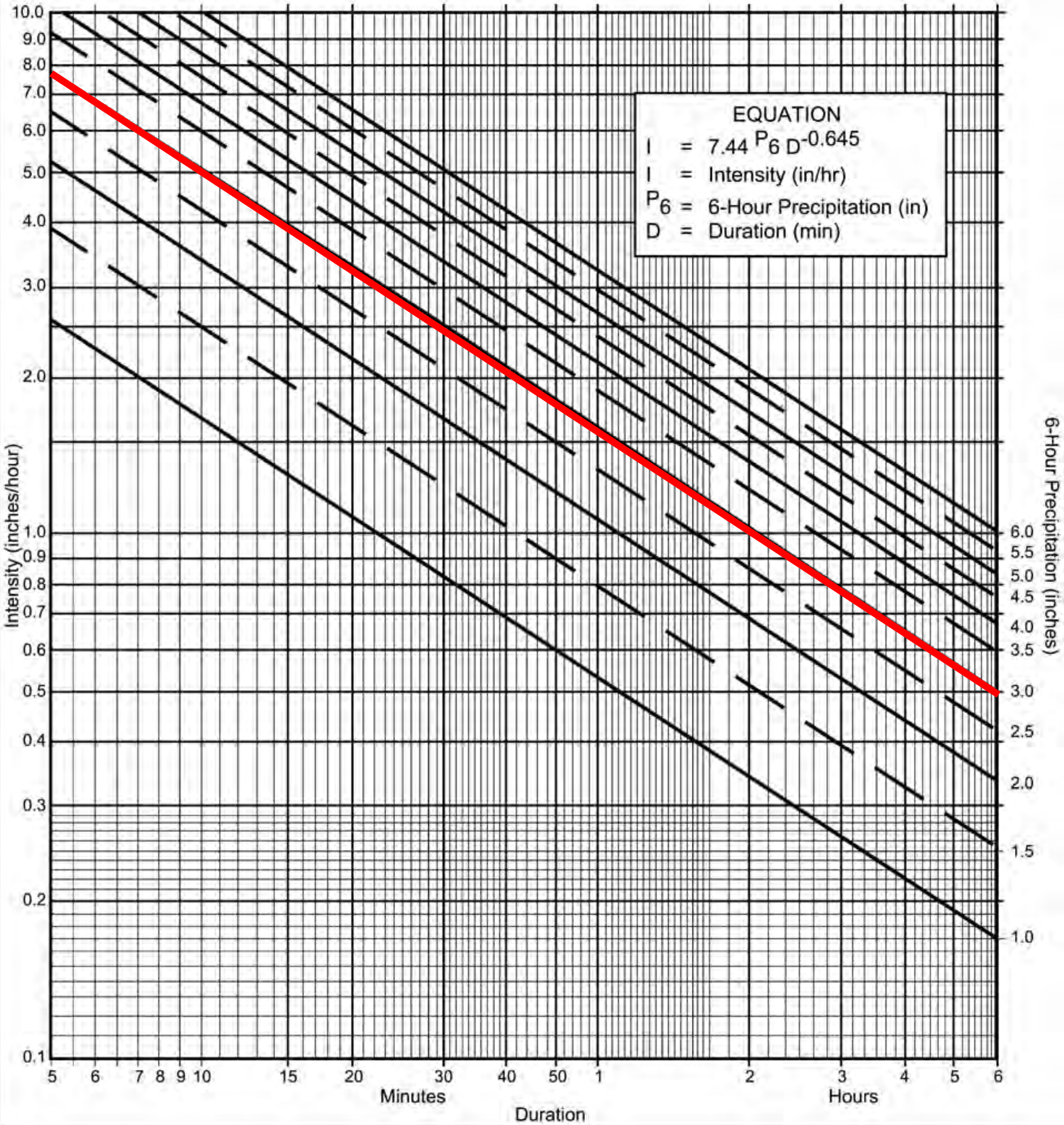
RATIONAL METHOD ANALYSES



EXISTING CONDITION
HEC-RAS WORK MAP



PROPOSED CONDITION
HEC-RAS WORK MAP



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100- year

(b) P_6 = 3.0 in., P_{24} = 6.3, $\frac{P_6}{P_{24}}$ = 47.6 %(2)

(c) Adjusted $P_6^{(2)}$ = 3.0 in.

(d) t_x = ______ min.

(e) I = ______ in./hr.

See rational method calculations for Tc and I.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

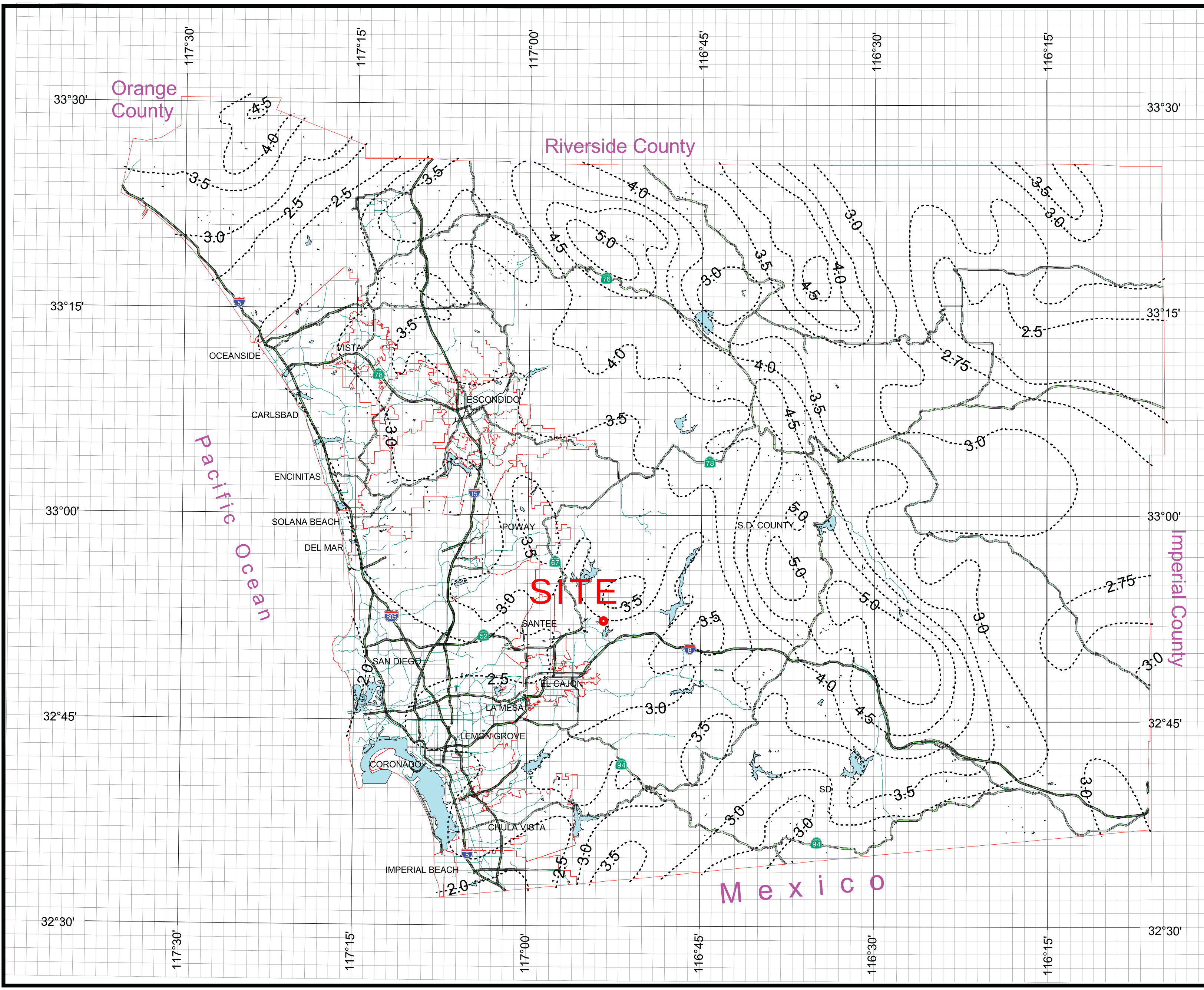
3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



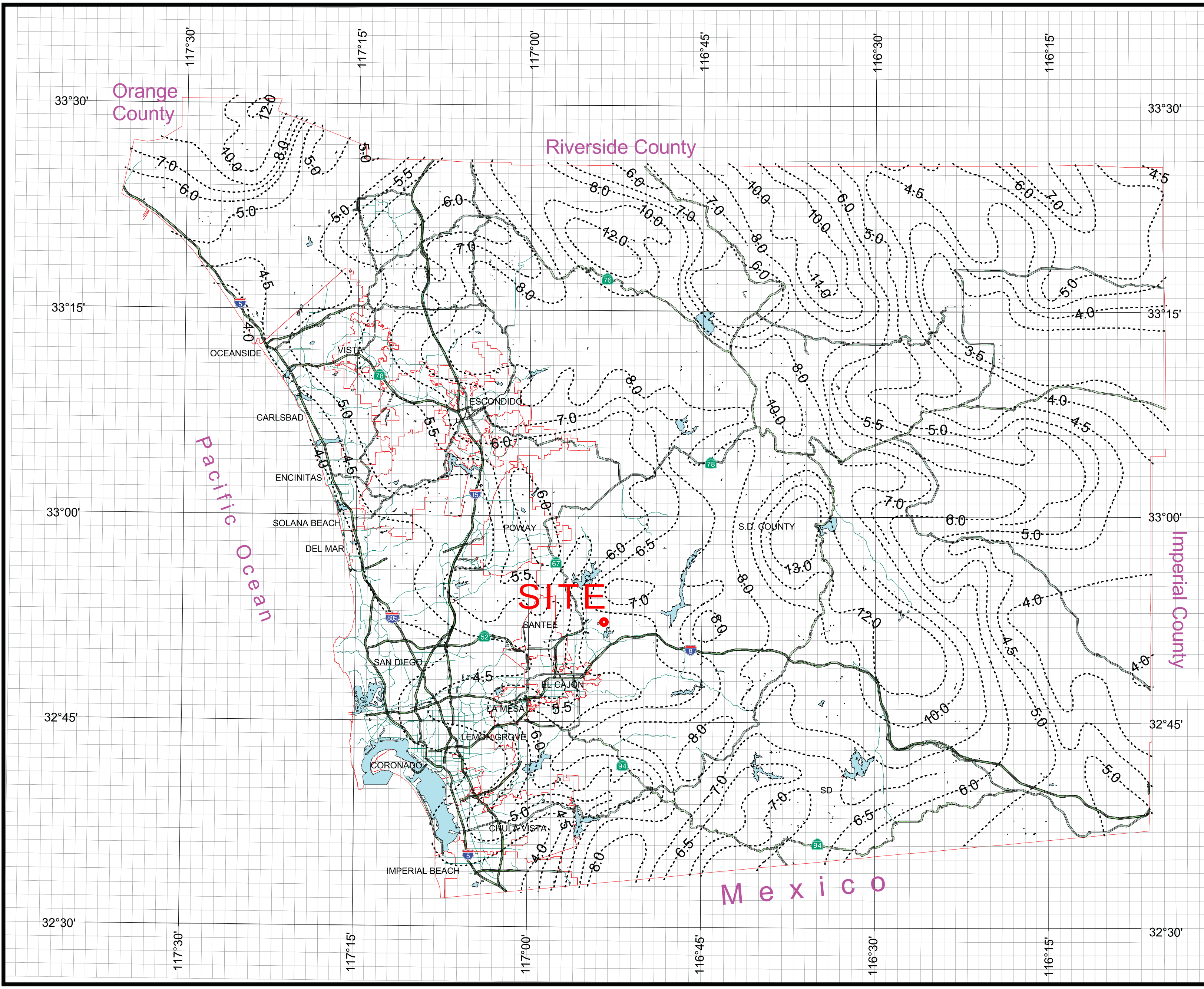
P6=3.0"

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24=6.3"

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

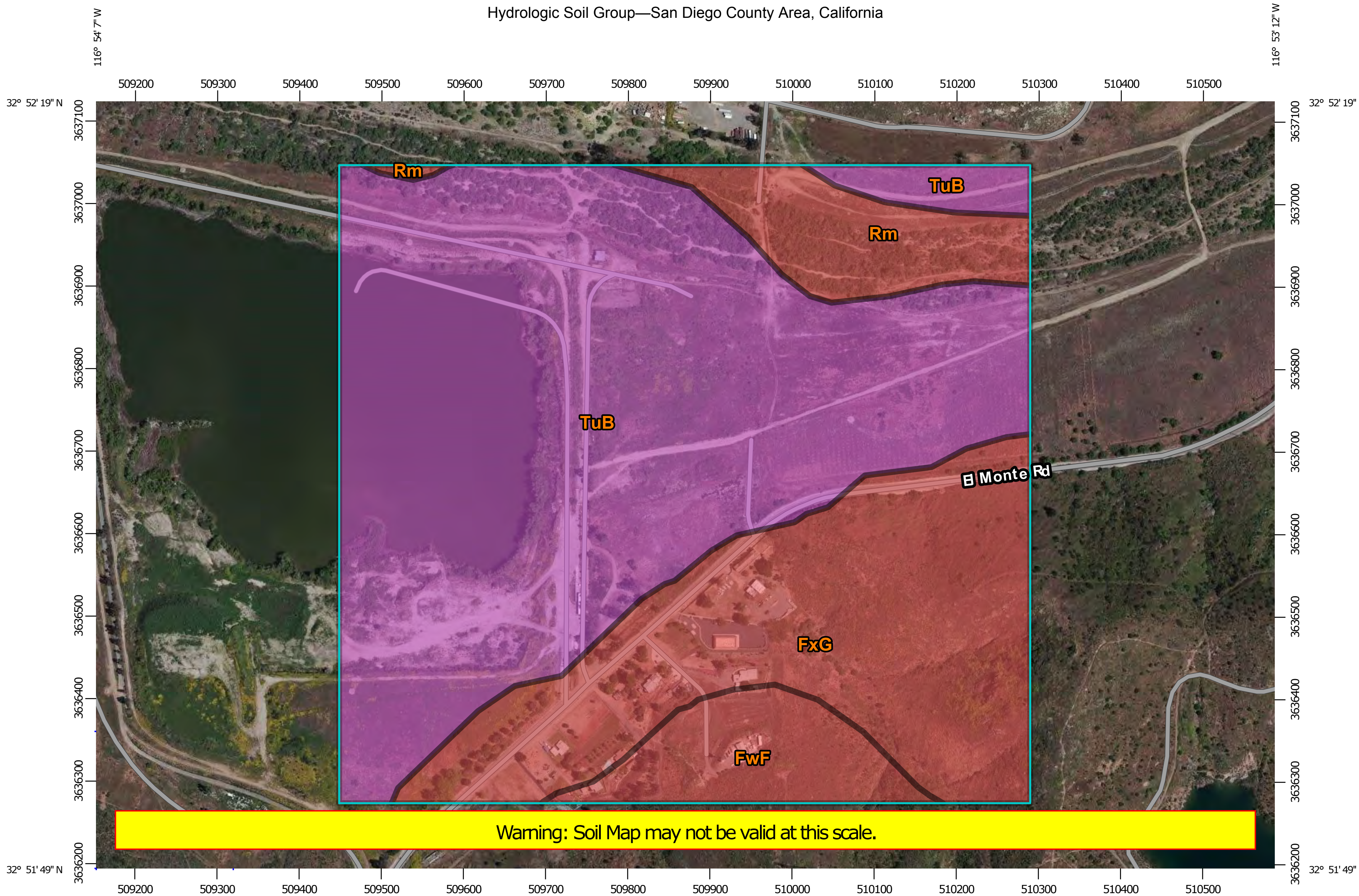
N
W E
S

3 0 3 Miles

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service



Map Scale: 1:6,560 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 9, Sep 17, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FwF	Friant fine sandy loam, 30 to 50 percent slopes	D	10.0	6.2%
FxG	Friant rocky fine sandy loam, 30 to 70 percent slopes	D	42.7	26.5%
Rm	Riverwash	D	11.0	6.8%
TuB	Tujunga sand, 0 to 5 percent slopes	A	97.7	60.5%
Totals for Area of Interest			**161.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

```
          San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2009 Version 7.8

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
     Rational Hydrology Study        Date: 11/14/16
------------------------------------------------------------------------
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El Monte San Mining and Nature Preserve Project
Plant Site Analysis
Existing Conditions
100-Year Flow Rate

```
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4028

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.000
24 hour precipitation(inches) =  6.300
P6/P24 =    47.6%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance  =  422.000(Ft.)
Highest elevation =  438.100(Ft.)
Lowest elevation =  433.900(Ft.)
Elevation difference =    4.200(Ft.) Slope =  0.995 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
```

```
Initial Area Time of Concentration =  13.58 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2000)*(  70.000^.5)/(   0.995^(1/3)]=  13.58
The initial area total distance of  422.00 (Ft.) entered leaves a
remaining distance of  352.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.21 minutes
for a distance of 352.00 (Ft.) and a slope of  1.00 %
with an elevation difference of   3.50(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.210 Minutes
Tt=[(11.9*0.0667^3)/(  3.50)]^.385=  4.21
Total initial area Ti =  13.58 minutes from Figure 3-3 formula plus
  4.21 minutes from the Figure 3-4 formula =  17.79 minutes
Rainfall intensity (I) =      3.486(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff =      3.675(CFS)
Total initial stream area =        5.270(Ac.)
End of computations, total study area =           5.270 (Ac.)
```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2009 Version 7.8

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 11/14/16

El Monte San Mining and Nature Preserve Project
Plant Site Analysis
Proposed Conditions
100-Year Flow Rate

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.000
24 hour precipitation(inches) = 6.300
P6/P24 = 47.6%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 10.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

____

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN]
(Permanent Open Space)
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance = 528.000(Ft.)
Highest elevation = 438.100(Ft.)
Lowest elevation = 435.000(Ft.)
Elevation difference = 3.100(Ft.) Slope = 0.587 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of 0.59 %, in a development type of
Permanent Open Space
In Accordance With Figure 3-3

```
Initial Area Time of Concentration =  13.68 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2000)*(  50.000^.5)/(   0.587^(1/3)]=  13.68
The initial area total distance of  528.00 (Ft.) entered leaves a
remaining distance of  478.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   6.53 minutes
for a distance of 478.00 (Ft.) and a slope of  0.59 %
with an elevation difference of   2.81(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    6.529 Minutes
Tt=[(11.9*0.0905^3)/(  2.81)]^.385=  6.53
Total initial area Ti =  13.68 minutes from Figure 3-3 formula plus
  6.53 minutes from the Figure 3-4 formula =  20.21 minutes
Rainfall intensity (I) =      3.211(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff =      3.384(CFS)
Total initial stream area =        5.270(Ac.)
End of computations, total study area =           5.270 (Ac.)
```

HYDRAULIC ANALYSES
FOR THE
EL MONTE SAND MINING
AND
NATURE PRESERVE PROJECT

August 27, 2018

Wayne W. Chang, MS, PE 46548

ChangConsultants
Civil Engineering ◦ Hydrology ◦ Hydraulics ◦ Sedimentation

P.O. Box 9496
Rancho Santa Fe, CA 92067
(858) 692-0760

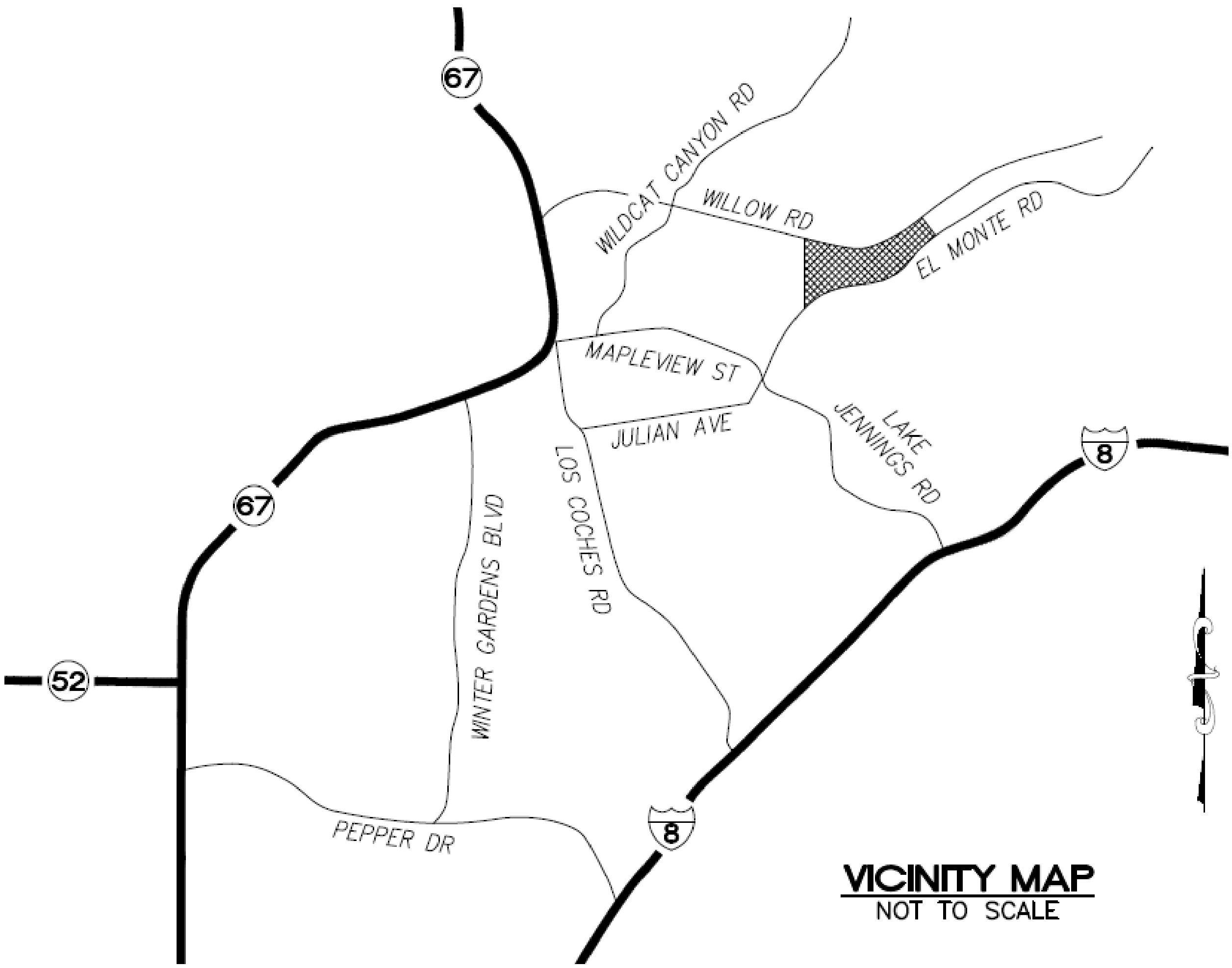
TABLE OF CONTENTS

APPENDICES

MAP POCKET

INTRODUCTION

El Monte Nature Preserve, L.L.C. is proposing the El Monte Sand Mining and Nature Preserve Project along the El Monte Valley in the Lakeside community of the county of San Diego (see the Vicinity Map). The project will extract up to approximately 12.5 million cubic yards of mineral resource over a 12 year period within the San Diego River floodplain. The project is expected to be fully completed in 16 years. Mining will be ongoing for 12 years after inception, while reclamation will commence 4 years after the start of mining and progressively continue over a 16 year period. Reclaimed areas will be restored to an end use of open space with recreational trail easements. The combined mineral extraction and reclamation project will affect approximately 228 acres of land on 479.5 acres currently owned by the El Monte Nature Preserve, L.L.C.



Vicinity Map

The San Diego River flows in a westerly direction along the site. The *Flood Insurance Rate Maps* (FIRM) covering the site are Map Numbers 06073C1394G, 1415G and 1660G, dated May 16, 2012 (included on attached CD). The FIRMs delineate an approximate Zone A floodplain along this portion of the river. The floodplain encompasses the majority of the proposed extraction area. The floodplain on the FIRMs covering the site generally match the floodplain shown on the County of San Diego's 1973, *Flood Area Map, Floodway Delineation, San Diego River* (sheets 254-1797, 254-1803, 258-1803, and 258-1809 are included on the CD). Consequently, although the floodplain is designated as approximate on the FIRMs, a detailed study was performed to establish the floodplain.

This report contains the outlines the historic FEMA and County floodplain information as well as an updated existing condition hydraulic analysis based on recent topographic mapping. The proposed condition hydraulic analyses model the project's extraction area under the fully mined scenario as well as under the four proposed extraction phases. The hydraulic analyses demonstrate the project does not cause adverse effects on the San Diego River floodplain.

According to William A. Steen and Associates, a prior grading permit (L-14105) was approved by the County of San Diego on July 31, 2003. Another grading permit under the same number was approved by the County of San Diego on December 13, 2006. A Conditional Letter of Map Revision (FEMA Case No. 02-09-804R) was prepared in 2002. Some, but not all, of the grading was performed at the site pursuant to the grading permit. The grading will not be completed, and the site is proposed to be developed pursuant to project outlined in this report. The County has indicated that the associated floodplain and floodway changes associated with the prior grading can be addressed through a Letter of Map Revision. A CLOMR (prior to grading) and LOMR (at project completion) will also be required for the current project.

HYDRAULIC ANALYSES

Effective Studies

As mentioned in the Introduction, the FIRMs covering the site are included on the CD and delineate an approximate Zone A floodplain along the San Diego River. The Zone A delineation is not representative of the current floodplain in at least some areas. For instance, it reflects an area of high ground within the abandoned Hanson Aggregates mining pond near the southwest corner of the site. The floodplain should extend across the entire pond surface.

The County of San Diego's hydraulic studies and work maps for this reach of the river were requested and obtained from the County's Flood Control Engineering Department. This data is included on the attached CD. The County's effective cross-section locations, 100-year floodplain, and floodway are also reproduced on the HEC-RAS Work Map in the map pocket. There are two sets of effective work maps covering the overall study reach. Both sets use the County's orthotopographic mapping as a base, which is on NGVD 29 vertical datum. One set is dated September 1985 and extends over the downstream end of the study reach (from station 880 to 920) analyzed in this report. The second set is on mapping from April 1973 and extends over the remainder of the study reach (including the portion along the project site). The stations on the second set are numbered in the 90's to 100's. Station 920 on the September 1985 work map is at the same location as Station 92 on the March 1973 work maps. Therefore, the 1973/1985 stations will be on the same numbering system if a zero is added to the March 1973 stations.

The 1973 and 1985 hydraulic analyses were performed using HEC-2. The HEC-2 input and output files were available for the 1985 analyses (see CD) and the results generally match the water surface elevations included on the 1985 work map. On the other hand, the County was not able to provide working HEC-2 data for the 1973 analyses, but the CD includes a pdf of the HEC-2 output. The 1973 work maps do not contain water surface elevations and the work maps have poor legibility, so the HEC-2 output cannot be compared to the floodplain shown on the work maps. The 1973 and 1985 100-year water surface elevations are summarized in Table 1.

The upstream end of the 1985 analysis is at station 920. The floodplain and floodway elevations at this location are 419.78 and 419.69 feet, respectively. The elevations at corresponding station 92 from the 1973 analysis are 421.54 and 422.48 feet, respectively. Therefore, the 1985 study apparently did not attempt to tie-in with the 1973 study. Regardless, the new existing and proposed condition analyses prepared for this report provide updated results based on recent topography (see discussion below).

Comparison of the FEMA Zone A floodplain with the County's effective work maps reveals that the FEMA floodplain generally matches the 1973 work maps.

Existing Condition

The existing condition HEC-RAS analysis extends from river station 880 to 1180. The cross-sections generally correspond to the cross-section locations from the County's effective model. The downstream end of the HEC-RAS analysis at station 880 ties into the 100-year water surface elevation (416.38 feet NAVD 88) from the County's 1985 effective model. The County's effective data does not provide cross-section GR points (the effective pdf document on the CD only contains the HEC-2 results) at the upstream end of the existing condition analysis. However, an electronic file obtained from the County contains station/elevation points for effective stations 116, 116.5, 117, and 118 – this file is not an executable HEC-2. These stations were added in the existing condition HEC-RAS analysis as 1160, 1165, 1170, and 1180 to allow an upstream tie-in. The 100-year flow rate from 19,000 to 20,000 cubic feet per second (cfs) from the effective HEC-2 was used.

The existing condition cross-sections at and below station 995 were created from 1-foot contour interval topographic mapping (NAVD 88) flown on April 21, 2013 (see the HEC-RAS Work Map in the map pocket). The cross-sections above station 995 to and including 1150 were created from 1-foot contour interval topographic mapping (NGVD 29) flown on October 27, 2005. As mentioned above, stations 1160 through 1180 were based on the effective County data to allow an upstream tie-in. The cross-sections above station 995 were increased in elevation by 2.04 feet to convert to NAVD 88 (see NGS Data Sheet from a mapping consultant included after this report text for conversion), which is consistent with the current FEMA datum.

The existing condition roughness coefficients were assigned based on a site investigation and review of aerial photographs. The channel bed contains a fairly dense cover of mature vegetation (brush and trees), so was assigned a value of n=0.075. The overbanks have less vegetation and were assigned a roughness of n=0.05.

Encroachments were used at some locations to keep the effective flow in the active portion of the main river channel. This includes along the existing berm separating the abandoned Hanson Aggregates mining pond from the main river channel and a nearby berm along the south river bank just upstream. The HEC-RAS results indicate that the 100-year flow in the main river channel will not overtop the berm separating the channel from the pond, so the encroachments are appropriate. Since the existing berm and nearby berm create a constriction along the southerly side of the floodplain, encroachments were also used for the flow approaching and exiting the berms. A 1:1 contraction was modeled for the flow approaching the nearby berm (based on typical standards and feedback from prior County projects), and a 3:1 expansion was used for flow downstream of the Hanson berm. The adjacent Hanson El Monte Pond Flood Control, Restoration, and Recharge Project has constructed a culvert in the berm to direct some river flow into the pond. The culvert will have minor impact on the floodplain, so was not included in the analyses in this report.

The existing condition 100-year HEC-RAS results are summarized in Table 1 following this report text, included in Appendix A, and the electronic files are on the CD.

Table 1 shows a variation between the effective and existing condition hydraulic results. The existing condition water surface elevations are generally lower than the effective elevations. This is attributed to physical manmade changes to the San Diego River that have occurred since the effective model was prepared. One of the primary changes includes significant channelization of the river associated with sand mining by Woodward Sand. Figure 1 contains a February 1980 photograph of the channelization along the project site and extending upstream. This channelization is not included in the 1975 effective model.

Proposed Condition

The project proposes in-stream resource extraction with the San Diego River floodplain and (County) floodway. The ultimate extraction grading is included on the HEC-RAS Work Map. Since the extraction will lower the natural river channel and expand the conveyance area, the project will not adversely increase water surface elevations and will generally reduce flow velocities.

The existing condition HEC-RAS model was modified to create the proposed condition model for the ultimate extraction. Cross-sections 992 to 1148 reflect the proposed extraction area. Near the downstream end of the extraction area, existing cross-sections 992 and 995 were modified with proposed cross-sections 992 and 995 to reflect the proposed conditions in this area. Near the upstream end of the extraction area, cross-section 1148 was added to reflect the proposed conditions in this area. The proposed condition HEC-RAS model is on NAVD 88 datum to be consistent with the current FEMA mapping. However, the project plans are on NGVD 29 datum to match the topographic mapping. As mentioned above, the conversion is 2.04 feet.

The roughness coefficients are the same as existing conditions except in some portions of the mining pit. The roughness in the extraction area will be lower during mining activities when the ground is disturbed, but can potentially be higher than existing conditions in some pit areas after habitat restoration following completion of mining. A roughness coefficient of 0.15 was used to conservatively model dense revegetation within the majority of the pit. The exception is between cross-sections 992 and 1040 after mining completion. Since the mining pit will likely contain some ponded water during a 100-year storm event, a lower roughness of 0.075 was assigned to these cross-sections. Blocked obstructions were assigned within the extraction area to reflect antecedent storm events that result in ponded water filling the extraction area. Based on the topographic mapping water can pond to approximately elevation 424 feet NAVD 88, so the block obstructions were set at this elevation in the cross-sections where the extraction will be below this elevation. Jim Prine, Senior Restoration Ecologist, prepared the memorandum included after this report text stating that the “post-mining riparian habitat density in the river corridor would be similar to the existing density of vegetation. . . .” The selected roughness of 0.15 in the extraction area was based on a more conservative condition than indicated by Mr. Prine. Therefore, the 0.15 roughness can potentially be lowered in the future if more detailed information is provided by Mr. Prine.

Temporary stockpiles will exist during mining operations. Per the reclamation plan drawings, the stockpiles will be placed around the perimeter of a mining phase at approximately 6 foot high with 1:1 slopes (12 feet wide at the base). The stockpile locations will be dynamic with lengths that increase and decrease based on operational needs. At many of the cross-sections, the stockpile heights will be lower than the top of the blocked obstruction, so they will have no impact on the hydraulic results. In other cross-sections, the stockpile encroachment will be so minor in comparison to the cross-sectional flow area that an adverse rise in water surface elevations will not occur based on review of the tabulated results discussed next. Taller stockpiles can occur in the processing area, but this area is outside the 100-year floodplain.

The proposed condition HEC-RAS results are summarized in Table 1 and included in Appendix A for the 100-year flow event. The results show that a decrease in water surface elevations varies within the extraction area, which is expected since the channel bed is being lowered and the channel is being widened. The flow velocities naturally lower due to the increase in conveyance area. As a result, the project will not create adverse inundation impacts and will reduce the potential for erosion with the extraction area. Beyond the extraction area, the water surface elevations and flow velocities are essentially unchanged.

Additional HEC-RAS analyses were performed to reflect progression along the four mining phases. Mining will proceed from east to west (upstream to downstream). The phase boundaries are included on the hydrology work map. During Phase 1, extractive operations would commence at the far eastern portion of the mining area approximately 300 feet west of Dairy Road for a 4-year duration. Approximately 93 acres is within in Phase 1. Phase 2 would continue the same extraction process as Phase 1 over 3 years on approximately 52 acres in an east to west direction within the adjacent area west of Phase 1. Phase 3 would continue the same extraction process as Phase 2 over 3 years on approximately 48 acres in an east to west direction within the adjacent area west of Phase 2. Phase 4 would continue the same extraction process as Phase 3 over 2 years on approximately 50 acres in an east to west direction to the western end of the mining pit. Additional HEC-RAS analyses were performed for Phase 1 (mining in cross-sections 1120 to 1148), Phase 1 and 2 (mining in cross-sections 1070 to 1148), and Phase 1 through 3 (mining in cross-sections 1030 to 1148). Although phase boundaries are defined, mining will generally be continuous from east to west, so the boundaries are merely general representations of the phasing. Blocked obstructions were included within the mining pit of each phasing analysis to reflect ineffective vertical flow areas. The blocked obstructions were set at the elevation where flow exits the downstream side of the phased pit. A high roughness coefficient of 0.15 was assumed within the pit for the phase analyses. The results are included Appendix 2 and summarized on Table 2. Comparison of the phased results with existing conditions reveals that the phases will not increase water surface elevations.

Since the river flow will occur over a hydraulically steep slope at the upstream end of the extraction area, grouted boulders shall be placed on the slope to prevent upstream headcutting. The plans show this structure extending just below the naturally occurring groundwater level. The groundwater acts as an energy dissipater such that the grouted boulders do not need to extend to the ultimate pit floor. Along the remainder of the naturally-lined mining pit from cross-section 992 to 1140, the flow velocities will decrease in comparison to existing conditions due to wider channelization created by the mining pit. The maximum 100-year flow velocity in the mining pit at project completion will be 3.8 feet per second (at cross-section 1040). Similar velocities will occur in the mining pit during the various phases. The entire pit will be revegetated. The County's September 2014, *Hydraulic Design Manual,* identifies a permissible velocity of 5 fps for unreinforced vegetation (Table 5-1). Since the flow velocities are less than the permissible velocity, erosion potential is mitigated.

Floodway Analyses

Existing and proposed condition floodway analyses have also been performed. These are based on the existing and proposed condition geometries, respectively. However, the analyses were shortened to start just downstream of the site at cross-section 988, i.e., the floodway will tie into the effective floodway just downstream of the site.. The effective floodplain and floodway elevations cannot be determined from the effective data, but the floodway widths are provided on the effective work maps. As a result, the starting floodplain water surface elevation is based on the existing and proposed condition results prepared for this report. The existing and proposed floodplain elevations are identical at this location since it is just downstream of the project. The floodway elevation was selected to be 1 foot higher. The floodway width was set equal to the effective floodway width at the downstream tie-in at cross-section 988 as well as at the upstream effective tie-in cross-sections 1160 to 1180. For existing conditions, a Method 4 encroachment was used for the remaining cross-sections. For proposed conditions, the floodway within the pit will match the floodplain since the pit acts as a channel.

CONCLUSION

Existing and proposed condition 100-year hydraulic analyses have been performed for the reclamation plan submittal of the El Monte Sand Mining and Nature Preserve Project. The project is within the County's effective floodway, but will not raise the 100-year water surface elevations, so meets the County and FEMA's floodway regulations. In addition, the project will not create adverse flood impacts within the study reach under the four phases or ultimate condition, which is consistent with the goals of floodplain regulations. The proposed condition floodway will be defined when the CLOMR, and then are prepared. Since the proposed condition floodplain is contained within the pit, the floodway will follow the floodplain in this area.

NO-RISE CERTIFICATION AND DECLARATION OF RESPONSIBLE CHARGE

No-Rise Certification

Hydraulic analyses have been performed for the proposed El Monte Sand Mining and Nature Preserve Project along the San Diego River in the county of San Diego, California. This report includes the existing and proposed condition 100-year HEC-RAS hydraulic analyses for the proposed project.

This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of California.

It is further to certify that the attached technical data supports the fact that proposed development (as defined in County of San Diego Ordinance Section 811.201(i)) associated with County of San Diego Project No. PDS2014-LDGRMJ-00012 within the designated floodway delineated on the County of San Diego Floodplain Maps will not result in any increase in flood levels or the volume or velocity of flood flows during the occurrence of the base flood discharge within the San Diego River in compliance with County of San Diego Ordinance Section 811.506.

Name of Report: *Hydraulic Analyses for the Proposed El Monte Sand Mining and Nature Preserve Project*

Date of Report: August 27, 2018

Declaration of Responsible Charge

I hereby declare that I am the civil engineer of work for this project for hydraulic analyses of the San Diego River, that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with current design.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

August 27, 2018

Wayne W. Chang
RCE 46548
Exp. June 30, 2019

Date

Cross-Section	100-Year Water Surface Elevations, feet (NAVD 88)			
	Effective Models[1]	Existing Conditions	Proposed Conditions (Phase 1-4)	Proposed – Existing
1180	485.53	485.30	485.30	0.00
1170	481.54	481.16	481.16	0.00
1165	478.26	478.74	478.74	0.00
1160	475.31	474.55	474.55	0.00
1150	473.15	467.32	462.76	-4.56
1148	---	---	449.93	---
1140	469.22	465.58	449.25	-16.33
1130	466.38	462.36	447.11	-15.25
1120	462.63	460.63	445.42	-15.21
1110	459.99	458.61	443.60	-15.01
1100	458.77	456.87	442.45	-14.42
1090	457.79	454.83	441.75	-13.08
1080	456.66	453.59	441.30	-12.29
1075	456.13	451.72	440.90	-10.82
1070	455.31	450.25	440.42	-9.83
1060	453.61	448.32	439.20	-9.12
1050	448.56	445.92	437.81	-8.11
1040	446.81	443.69	436.45	-7.24
1030	445.45	441.86	435.87	-5.99
1020	444.08	440.02	435.62	-4.40
1017	---	438.56	435.55	-3.01
1013	---	437.05	435.47	-1.58
1010	439.64	436.51	435.40	-1.11
1005	438.74	435.91	435.33	-0.58
1000	438.44	435.30	435.13	-0.17
995	438.00	---	---	---
992	---	434.54	434.53	-0.01
988	---	433.99	433.99	0.00
985	---	433.29	433.29	0.00
983	---	432.26	432.26	0.00
980	435.34	431.94	431.94	0.00
978	---	431.42	431.42	0.00
975	433.64	431.04	431.04	0.00
973	---	430.64	430.64	0.00
970	431.81	430.24	430.24	0.00
965	---	429.69	429.69	0.00
960	429.80	429.28	429.28	0.00
950	428.69	428.88	428.88	0.00
946	---	428.38	428.38	0.00
944	---	427.79	427.79	0.00
940	427.22	427.41	427.41	0.00
935	---	427.15	427.15	0.00
930	425.21	426.54	426.54	0.00
920	421.82	426.00	426.00	0.00
910	418.18	424.10	424.10	0.00
900	417.04	421.35	421.35	0.00
890	416.71	418.89	418.89	0.00
880	416.38	416.73	416.73	0.00

[1]The effective results for cross-sections 880 to 920 are from the County study approved in 1985. The remaining effective results are from the 1973 County study. A zero was added to the end of the 1973 cross-section numbers to be consistent with the other studies, e.g., cross-section 96 from the 1973 results corresponds to cross-section 960 in the table.

Table 1. Summary of HEC-RAS Results

Cross-Section	100-Year Water Surface Elevations, feet (NAVD 88)						
	Exist. Cond.	Prop. Cond. Phase 1	PC Ph 1 – Ex. Cond.	Prop. Cond. Phase 1-2	PC Ph 1-2 – Ex. Cond.	Prop. Cond. Phase 1-3	PC Ph 1-3 – Exist. Cond.
1180	485.30	485.30	0.00	485.30	0.00	485.30	0.00
1170	481.16	481.16	0.00	481.16	0.00	481.16	0.00
1165	478.74	478.74	0.00	478.74	0.00	478.74	0.00
1160	474.55	474.55	0.00	474.55	0.00	474.55	0.00
1150	467.32	462.76	-4.56	462.76	-4.56	462.76	-4.56
1148	---	461.58	---	452.68	---	450.48	---
1140	465.58	461.43	-4.15	452.48	-13.10	449.97	-15.61
1130	462.36	460.61	-1.75	451.95	-10.41	448.62	-13.74
1120	460.63	460.02	-0.61	451.64	-8.99	447.78	-12.85
1110	458.61	458.61	0.00	451.35	-7.26	447.13	-11.48
1100	456.87	456.87	0.00	451.11	-5.76	446.78	-10.09
1090	454.83	454.83	0.00	450.89	-3.94	446.56	-8.27
1080	453.59	453.59	0.00	450.69	-2.90	446.41	-7.18
1075	451.72	451.72	0.00	450.50	-1.22	446.25	-5.47
1070	450.25	450.25	0.00	450.21	-0.04	446.00	-4.25
1060	448.32	448.32	0.00	448.32	0.00	445.21	-3.11
1050	445.92	445.92	0.00	445.92	0.00	444.35	-1.57
1040	443.69	443.69	0.00	443.69	0.00	443.00	-0.69
1030	441.86	441.86	0.00	441.86	0.00	441.93	0.07
1020	440.02	440.02	0.00	440.02	0.00	440.02	0.00
1017	438.56	438.56	0.00	438.56	0.00	438.56	0.00
1013	437.05	437.05	0.00	437.05	0.00	437.05	0.00
1010	436.51	436.51	0.00	436.51	0.00	436.51	0.00
1005	435.91	435.91	0.00	435.91	0.00	435.91	0.00
1000	435.30	435.30	0.00	435.30	0.00	435.30	0.00
996	---	---	---	---	---	---	---
995	434.54	434.54	0.00	434.54	0.00	434.54	0.00
992	433.99	433.99	0.00	433.99	0.00	433.99	0.00
988	433.29	433.29	0.00	433.29	0.00	433.29	0.00
985	432.26	432.26	0.00	432.26	0.00	432.26	0.00
983	431.94	431.94	0.00	431.94	0.00	431.94	0.00
980	431.42	431.42	0.00	431.42	0.00	431.42	0.00
978	431.04	431.04	0.00	431.04	0.00	431.04	0.00
975	430.64	430.64	0.00	430.64	0.00	430.64	0.00
973	430.24	430.24	0.00	430.24	0.00	430.24	0.00
970	429.69	429.69	0.00	429.69	0.00	429.69	0.00
965	429.28	429.28	0.00	429.28	0.00	429.28	0.00
960	428.88	428.88	0.00	428.88	0.00	428.88	0.00
950	428.38	428.38	0.00	428.38	0.00	428.38	0.00
946	427.79	427.79	0.00	427.79	0.00	427.79	0.00
944	427.41	427.41	0.00	427.41	0.00	427.41	0.00
940	427.15	427.15	0.00	427.15	0.00	427.15	0.00
935	426.54	426.54	0.00	426.54	0.00	426.54	0.00
930	426.00	426.00	0.00	426.00	0.00	426.00	0.00
920	424.10	424.10	0.00	424.10	0.00	424.10	0.00
910	421.35	421.35	0.00	421.35	0.00	421.35	0.00
900	418.89	418.89	0.00	418.89	0.00	418.89	0.00
890	416.73	416.73	0.00	416.73	0.00	416.73	0.00
880	416.38	416.38	0.00	416.38	0.00	416.38	0.00

Table 2. Summary of Phased HEC-RAS Results

Figure 1. February 1980 Photograph Looking Upstream (East) at San Diego River Channelization along and near Project Site

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.2
1        National Geodetic Survey,   Retrieval Date = AUGUST  5, 2013
 DC0498 ***********************************************************************
 DC0498  DESIGNATION -  439.83 USGS
 DC0498  PID         -  DC0498
 DC0498  STATE/COUNTY-  CA/SAN DIEGO
 DC0498  COUNTRY     -  US
 DC0498  USGS QUAD   -  EL CAJON (1975)
 DC0498
 DC0498                         *CURRENT SURVEY CONTROL
 DC0498  ______________________________________________________________________
 DC0498* NAD 83(1986) POSITION- 32 52 00.     (N) 116 53 37.     (W)   SCALED
 DC0498* NAVD 88 ORTHO HEIGHT -    134.36   (+/-2cm)      440.8    (feet) VERTCON
 DC0498  ______________________________________________________________________
 DC0498  GEOID HEIGHT    -        -33.20  (meters)                     GEOID12A
 DC0498  VERT ORDER      -  FIRST     CLASS II (See Below)
 DC0498
 DC0498.The horizontal coordinates were scaled from a topographic map and have
 DC0498.an estimated accuracy of +/- 6 seconds.
 DC0498.
 DC0498.The NAVD 88 height was computed by applying the VERTCON shift value to
 DC0498.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 DC0498
 DC0498.The vertical order pertains to the NGVD 29 superseded value.
 DC0498
 DC0498;                    North         East     Units  Estimated Accuracy
 DC0498;SPC CA 6     -   577,820.    1,939,760.      MT  (+/- 180 meters Scaled)
 DC0498
 DC0498                          SUPERSEDED SURVEY CONTROL
 DC0498
 DC0498  NGVD 29 (??/??/??)  133.733  (m)           438.76    (f) ADJUSTED    1 2
 DC0498
 DC0498.Superseded values are not recommended for survey control.
 DC0498
 DC0498.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 DC0498.See file dsdata.txt to determine how the superseded data were derived.
 DC0498
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 DC0498
 DC0498_MARKER: DD = SURVEY DISK
 DC0498_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
 DC0498_SP_SET: SET IN TOP OF CONCRETE MONUMENT
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DC0498_STAMPING: 439.83
DC0498_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
DC0498+STABILITY: SURFACE MOTION
DC0498_SATELLITE: THE SITE LOCATION WAS REPORTED AS NOT SUITABLE FOR
DC0498+SATELLITE: SATELLITE OBSERVATIONS - February 04, 2012
DC0498
DC0498  HISTORY     - Date     Condition        Report By
DC0498  HISTORY     - UNK      MONUMENTED       USGS
DC0498  HISTORY     - 1955     GOOD             CGS
DC0498  HISTORY     - 20120204 GOOD             INDIV
DC0498
DC0498                          STATION DESCRIPTION
DC0498
DC0498'DESCRIBED BY COAST AND GEODETIC SURVEY 1955
DC0498'2 MI NE FROM LAKESIDE.
DC0498'2.0 MILES NORTHEAST ALONG SYCAMORE AND ELM STREETS FROM THE
DC0498'SECURITY TRUST AND SAVINGS BANK AT LAKESIDE, AT THE EL MONTE
DC0498'PUMPING PLANT OF LA MESA, LEMON GROVE, AND SPRING VALLEY
DC0498'IRRIGATION DISTRICT, 30 FEET SOUTHEAST OF THE CENTER LINE OF THE
DC0498'STREET, 16.0 FEET NORTH OF THE NORTH CORNER OF THE PLANT BUILDING,
DC0498'4 FEET SOUTHEAST OF POWER LINE POLE 7757-R, 2.0 FEET NORTHWEST
DC0498'OF THE NORTHWEST EDGE OF A CONCRETE WATER BASIN, ABOUT LEVEL
DC0498'WITH THE ROAD, UNDER A HEDGE, FLUSH WITH THE GROUND, AND SET IN
DC0498'THE TOP OF A CONCRETE POST.
DC0498
DC0498                          STATION RECOVERY (2012)
DC0498
DC0498'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2012 (JJH)
DC0498'DGPS POSITION IS 32 52 2.47 N LAT, 116 53 36.87 W LONG +/- 0.05 SEC
DC0498'USING 11 MINUTES OF LOGGED DATA.

*** retrieval complete.
Elapsed Time = 00:00:01
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ESA

550 West C Street
Suite 750
San Diego, CA 92101
619.719.4200 phone
619.719.4201 fax

www.esassoc.com

memorandum

date April 20, 2018

to Wayne Chang, Chang Consultants

cc Eric Ruby and Janelle Kassarjian, ESA

from Jim Prine, ESA

subject El Monte Sand Mining Project – Estimation of Vegetation Density after Proposed Mining and Habitat Revegetation

In response to your request, provided herein is information pertaining to the anticipated density of riparian vegetation in the San Diego River corridor (channel) after proposed mining and habitat revegetation activities. It is our understanding this information will help support the project's Hydraulic Study Flood Control analysis in response to County of San Diego review Comment 5. dated March 16, 2018 regarding determination of an "n" value.

Based on available information, it is the opinion of ESA that the post-mining riparian habitat density in the river corridor would be similar to the existing riparian vegetation density. As part of field surveys, data was not specifically collected regarding the existing density of vegetation (i.e., number of plants per acre and cover) in the river channel, however; from observations during multiple surveys it is estimated that vegetation cover generally ranges from approximately ≤20% to ≥90%. The denser vegetation areas include areas where additional water appears to enter the system (i.e., from lateral drainage/seepage and near adjacent residences) and where the non-native invasive plant species, tamarisk (*Tamarix ramosissima*), has colonized which can establish in both wetland/riparian and upland settings due in part to an extensive and deep root system.

The existing groundwater elevation within the project area is an average of 40 to 50 feet below the ground surface in the river channel (AECOM 2018). The proposed mining process would lower grades in portions of the basins by 25 to 30 feet, thereby establishing grades in the lower portions of the mining basins approximately 15 to 25 feet above the existing groundwater elevation. Based on a trend of groundwater decline (lowering) over recent history, groundwater levels are anticipated to decline by approximately 25 feet if there is not a spill event over the El Capitan Reservoir in the next 15 years (AECOM 2018). Based on the post-mining grades (i.e.,15 to 25 feet above the groundwater elevation) and a trend of groundwater decline, the County of San Diego directed the project to include a significant proportion of riparian-upland transitional and upland plant species in the proposed riparian plant palettes and seed mixes. The proposed lowering of grades would place portions of the river channel closer to groundwater than the existing condition and likely result in a small increase in downgrade water/moisture runoff accumulation, which could support a slightly higher native plant composition density. However, this slight potential increase in vegetation density would be expected to be offset compared to the existing condition by the control and removal of tamarisk (and other non-native species) as part of the project's proposed post-mining revegetation and mitigation program. Therefore, the vegetation density of the post-mining habitat (i.e., riparian habitat without invasive plant species) is expected on average to be similar to the existing habitat (i.e., riparian habitat with tamarisk and other invasive species).

In regard to the post-mining habitat in the river channel, the central low-flow channel would only be planted with low-growing native plants and no shrubs or trees, although some shrubs or trees would likely volunteer in the low-flow channel. In the lower portions of the basins on either side of the central low-flow channel for approximately 150 feet (i.e., approximately 300 feet wide total), riparian woodland habitat would be planted. In addition, riparian scrub habitat would be planted on the lower basin slopes beyond the riparian woodland habitat. Accounting for the planting densities in the proposed riparian habitat plant palettes in the project's conceptual revegetation plan (ESA 2018) and some plant mortality (i.e., conceptual revegetation plan includes success standard of 80% container plant survival), plant density for the post-mining riparian habitat is estimated at approximately 720 plants per acre not counting volunteer plants that might establish. Overall post-mining riparian habitat plant cover is estimated at approximately 65%, which corresponds with the conceptual revegetation plan success standard for native cover.

If you have questions, please contact me at 619.719.4212 or jprine@esassoc.com.

APPENDIX A

HEC-RAS ANALYSES

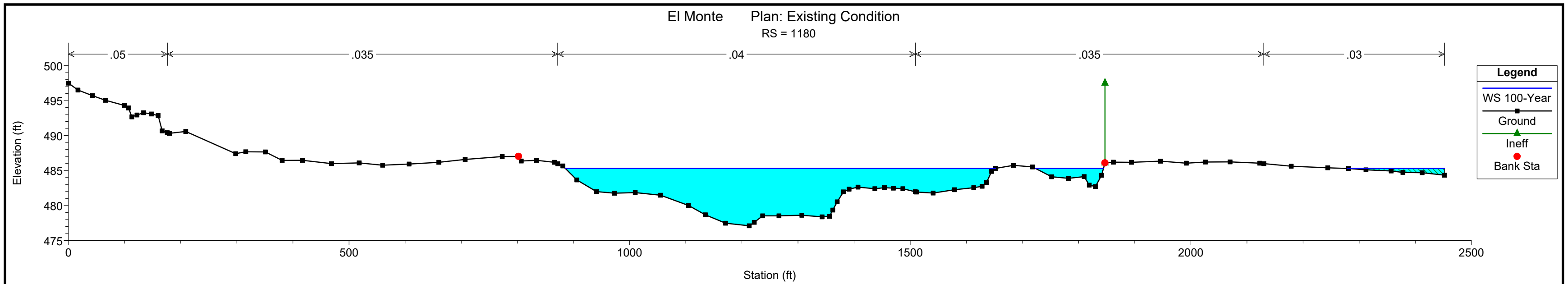
Existing Conditions

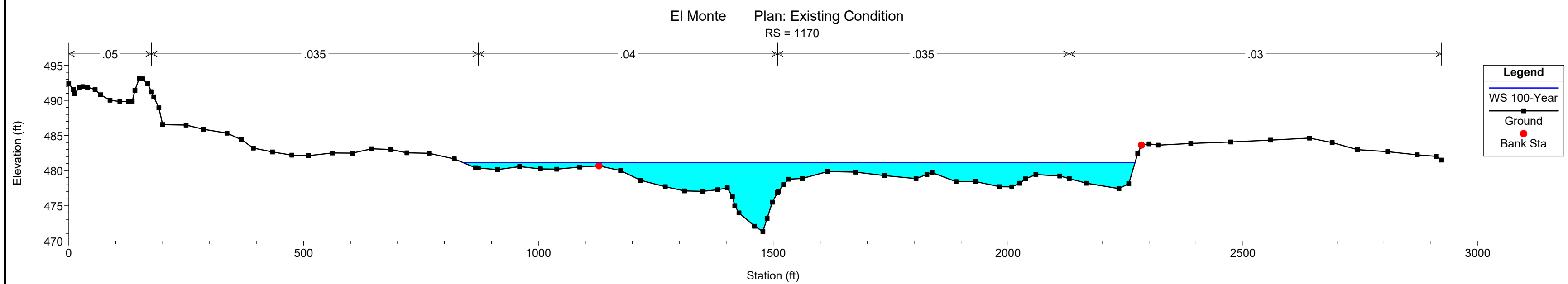
HEC-RAS Plan: Exist Cond   River: RIVER-1   Reach: Reach-1   Profile: 100-Year

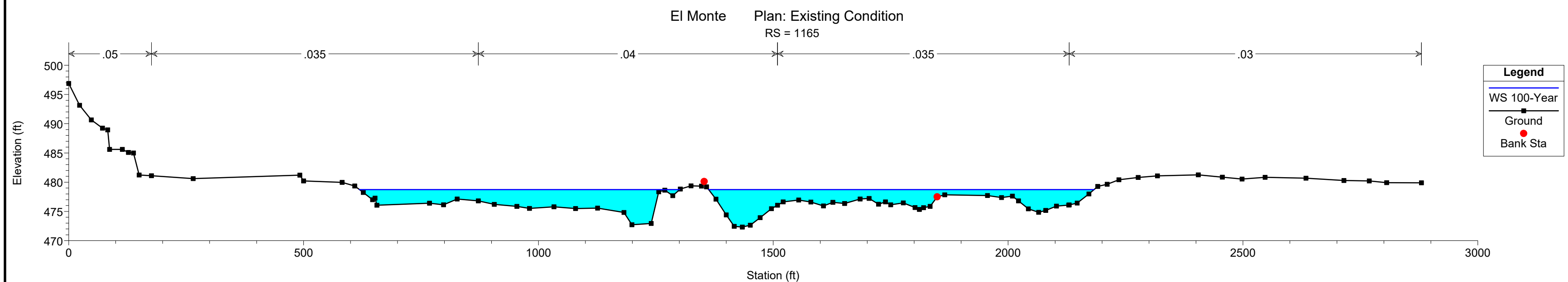
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1180	100-Year	19000.00	477.10	485.30		485.74	0.002858	5.35	3552.61	1060.59	0.47
Reach-1	1170	100-Year	19000.00	471.34	481.16		481.63	0.004095	5.55	3565.20	1431.43	0.57
Reach-1	1165	100-Year	19000.00	472.32	478.74	477.70	479.12	0.003946	5.32	3894.30	1502.74	0.55
Reach-1	1160	100-Year	19000.00	469.99	474.55	474.55	475.49	0.014342	7.31	2479.69	1362.41	0.93
Reach-1	1150	100-Year	19000.00	458.04	467.32		467.65	0.001850	3.30	4609.16	563.07	0.21
Reach-1	1140	100-Year	19000.00	456.04	465.58		466.14	0.005934	6.04	3170.44	647.40	0.38
Reach-1	1130	100-Year	19000.00	453.04	462.36		462.91	0.005890	5.97	3239.51	886.11	0.38
Reach-1	1120	100-Year	19000.00	451.04	460.63		460.90	0.002793	4.18	4684.34	734.85	0.26
Reach-1	1110	100-Year	19000.00	449.04	458.61	454.11	459.07	0.004642	5.44	3490.27	704.10	0.34
Reach-1	1100	100-Year	20000.00	447.04	456.87		457.23	0.003604	4.96	4237.13	1257.77	0.30
Reach-1	1090	100-Year	20000.00	445.04	454.83		455.29	0.004200	5.58	3949.94	941.90	0.33
Reach-1	1080	100-Year	20000.00	443.04	453.59		453.95	0.003349	4.94	4287.46	733.94	0.29
Reach-1	1075	100-Year	20000.00	441.04	451.72		452.23	0.004927	5.94	3658.45	676.31	0.35
Reach-1	1070	100-Year	20000.00	439.04	450.25		450.63	0.003218	5.07	4176.33	610.10	0.29
Reach-1	1060	100-Year	20000.00	435.04	448.32		448.74	0.003228	5.36	4065.62	685.91	0.29
Reach-1	1050	100-Year	20000.00	434.04	445.92		446.44	0.004035	5.90	3633.25	782.37	0.32
Reach-1	1040	100-Year	20000.00	432.04	443.69	437.55	444.08	0.003018	5.08	4038.52	869.58	0.28
Reach-1	1030	100-Year	20000.00	429.04	441.86		442.39	0.003722	5.83	3480.44	401.20	0.31
Reach-1	1020	100-Year	20000.00	428.04	440.02		440.62	0.004510	6.22	3228.40	341.92	0.34
Reach-1	1017	100-Year	20000.00	427.04	438.56		439.35	0.006561	7.12	2838.63	375.40	0.41
Reach-1	1013	100-Year	20000.00	426.04	437.05		437.69	0.005441	6.45	3099.78	387.19	0.37
Reach-1	1010	100-Year	20000.00	425.04	436.51		436.82	0.002673	4.70	4592.73	714.02	0.26
Reach-1	1005	100-Year	20000.00	424.04	435.91		436.14	0.001971	4.16	5316.23	880.08	0.23
Reach-1	1000	100-Year	20000.00	423.04	435.30		435.53	0.001907	4.18	5329.39	1157.70	0.23
Reach-1	995	100-Year	20000.00	421.50	434.54		434.83	0.002100	4.45	4772.50	949.35	0.24
Reach-1	992	100-Year	20000.00	420.80	433.99		434.36	0.002591	5.02	4240.64	817.36	0.26
Reach-1	988	100-Year	20000.00	421.00	433.29	427.43	433.77	0.003600	5.74	3807.85	718.35	0.31
Reach-1	985	100-Year	20000.00	419.00	432.26	427.71	432.90	0.005060	6.84	3312.60	2243.60	0.37
Reach-1	983	100-Year	20000.00	418.40	431.94	425.26	432.28	0.002390	4.86	4393.57	2267.80	0.25
Reach-1	980	100-Year	20000.00	418.00	431.42	425.16	431.84	0.002972	5.35	3984.14	2199.31	0.28
Reach-1	978	100-Year	20000.00	418.00	431.04	424.48	431.45	0.002795	5.29	4043.18	2228.92	0.27
Reach-1	975	100-Year	20000.00	417.00	430.64	424.17	431.00	0.002583	4.98	4258.09	2303.30	0.26
Reach-1	973	100-Year	20000.00	416.70	430.24	423.87	430.59	0.002590	4.95	4294.13	2361.87	0.26
Reach-1	970	100-Year	20000.00	415.70	429.69	423.18	430.06	0.002708	5.12	4263.54	2315.13	0.27
Reach-1	965	100-Year	20000.00	415.20	429.28	422.58	429.61	0.002416	4.91	4477.57	2252.77	0.26
Reach-1	960	100-Year	20000.00	414.70	428.88	421.68	429.17	0.001960	4.57	4841.62	2335.43	0.23
Reach-1	950	100-Year	20000.00	414.20	428.38	421.18	428.66	0.001845	4.48	5013.38	2463.93	0.23
Reach-1	946	100-Year	20000.00	413.60	427.79		428.11	0.002681	4.95	4580.39	811.72	0.27

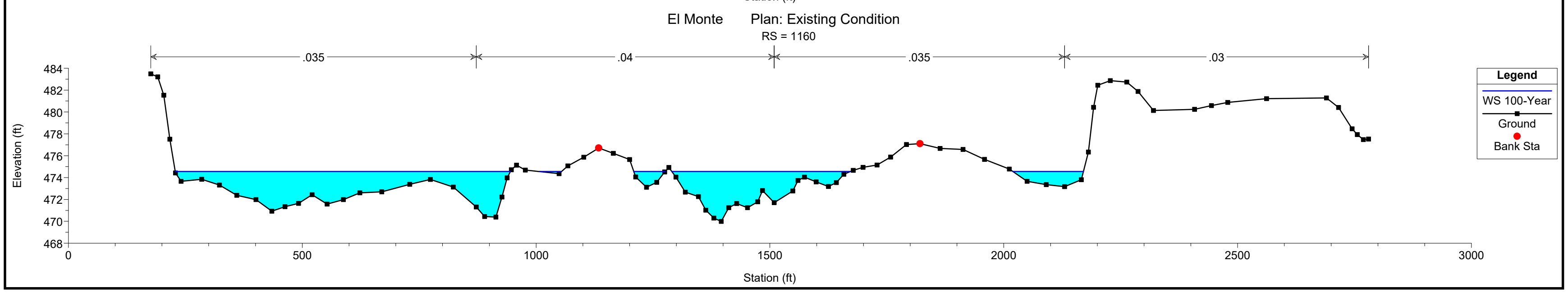
HEC-RAS Plan: Exist Cond River: RIVER-1 Reach: Reach-1 Profile: 100-Year (Continued)

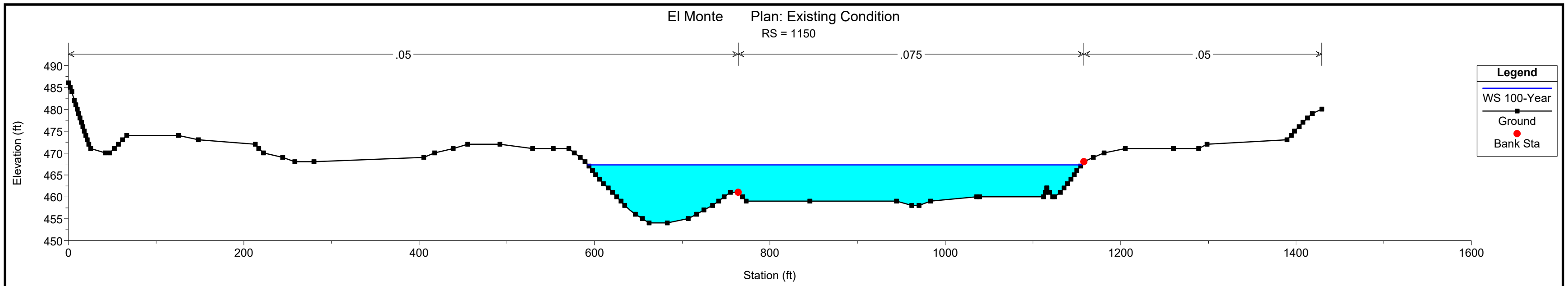
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	944	100-Year	20000.00	413.80	427.41		427.82	0.003449	6.01	4198.62	2010.58	0.31
Reach-1	940	100-Year	20000.00	413.90	427.15		427.41	0.002083	4.63	5113.21	1492.87	0.24
Reach-1	935	100-Year	20000.00	413.00	426.54		426.92	0.003177	5.80	4425.96	1397.69	0.29
Reach-1	930	100-Year	20000.00	412.50	426.00	421.47	426.31	0.002404	4.99	4788.01	1213.43	0.26
Reach-1	920	100-Year	20000.00	415.00	424.10		424.59	0.005934	6.22	3772.22	1090.18	0.38
Reach-1	910	100-Year	20000.00	411.90	421.35		421.84	0.005661	6.31	3814.74	1087.02	0.38
Reach-1	900	100-Year	20000.00	408.80	418.89		419.55	0.006822	6.93	3236.08	795.57	0.41
Reach-1	890	100-Year	20000.00	406.60	416.73	413.45	417.37	0.007507	6.39	3131.86	490.61	0.42
Reach-1	880	100-Year	20000.00	401.24	416.38	407.37	416.52	0.000601	2.49	7150.42	815.42	0.12


El Monte Plan: Existing Condition
RS = 1180
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

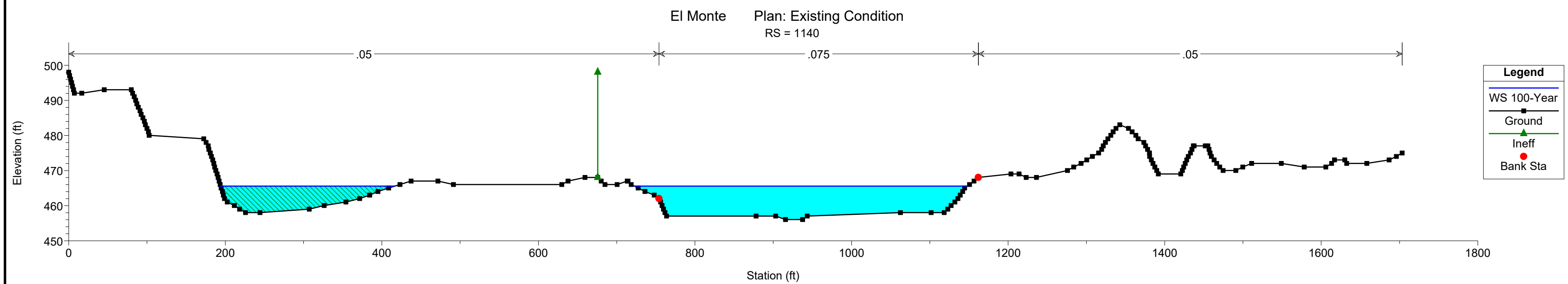

El Monte Plan: Existing Condition
RS = 1170
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Existing Condition
RS = 1165
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

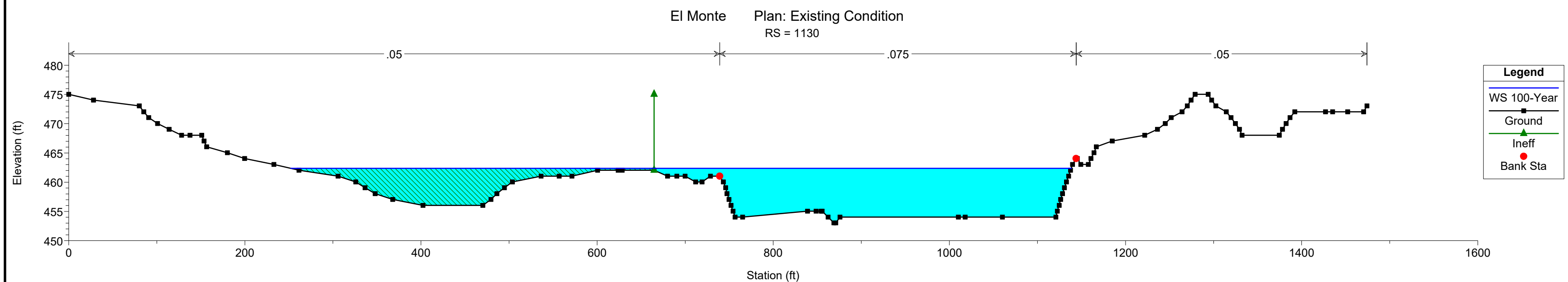

El Monte Plan: Existing Condition
RS = 1160
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta



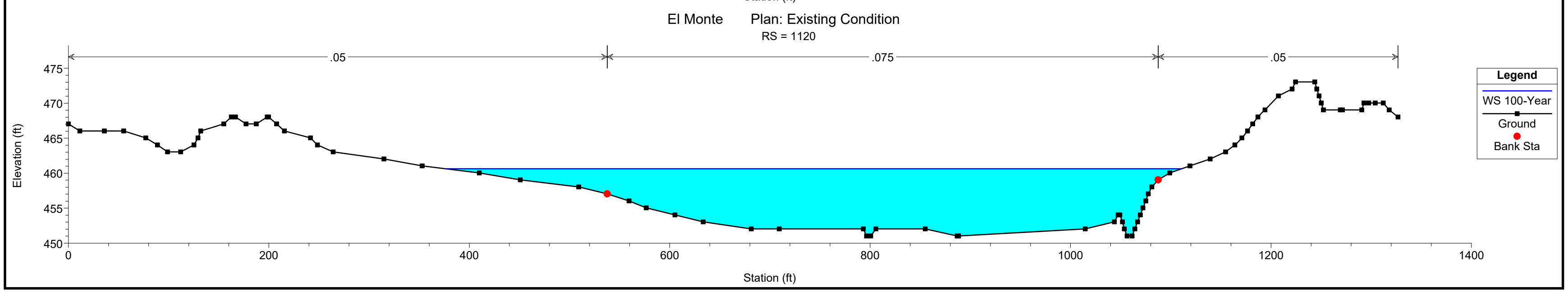
El Monte Plan: Existing Condition
RS = 1150
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta



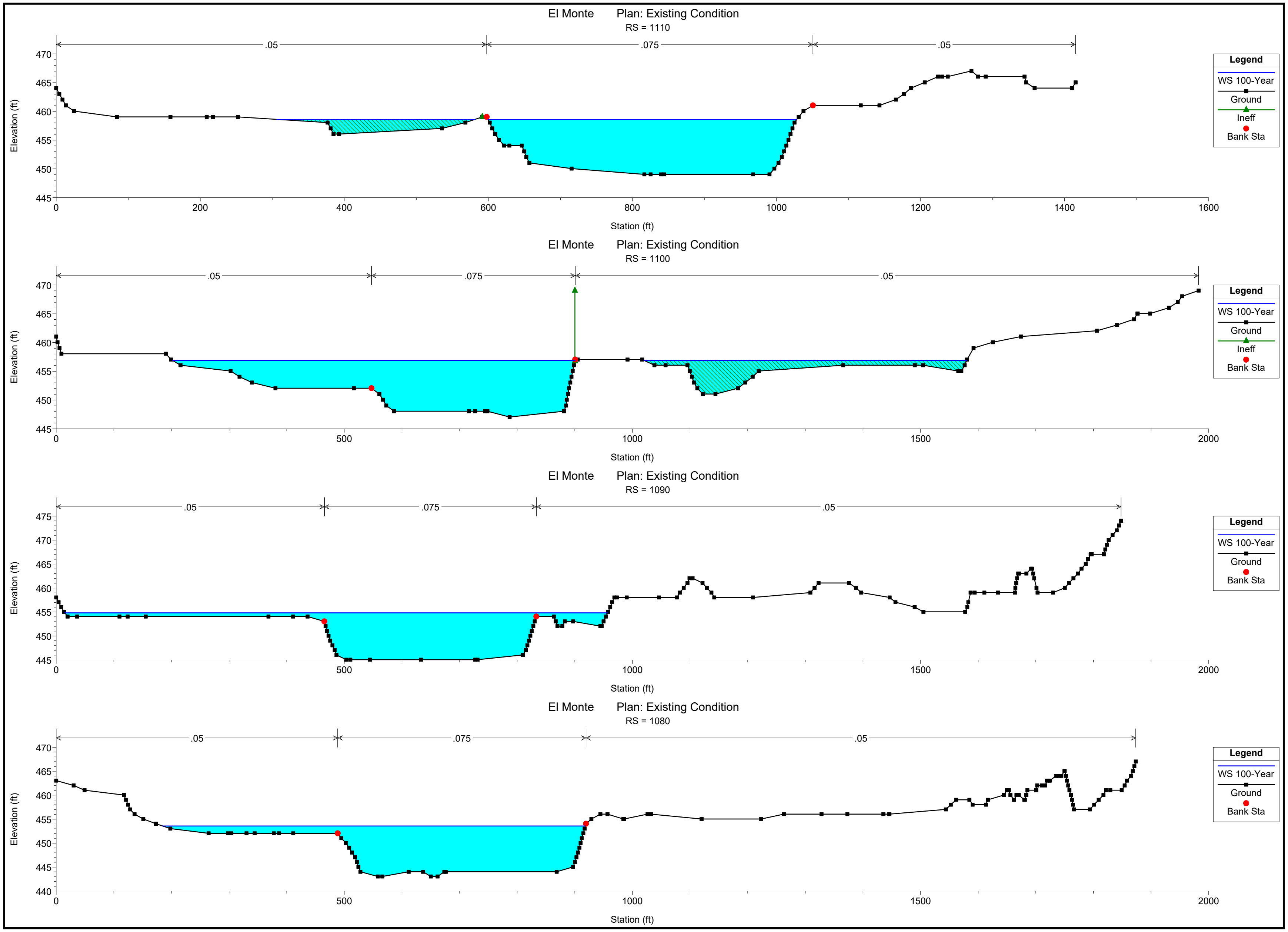
El Monte Plan: Existing Condition
RS = 1140
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

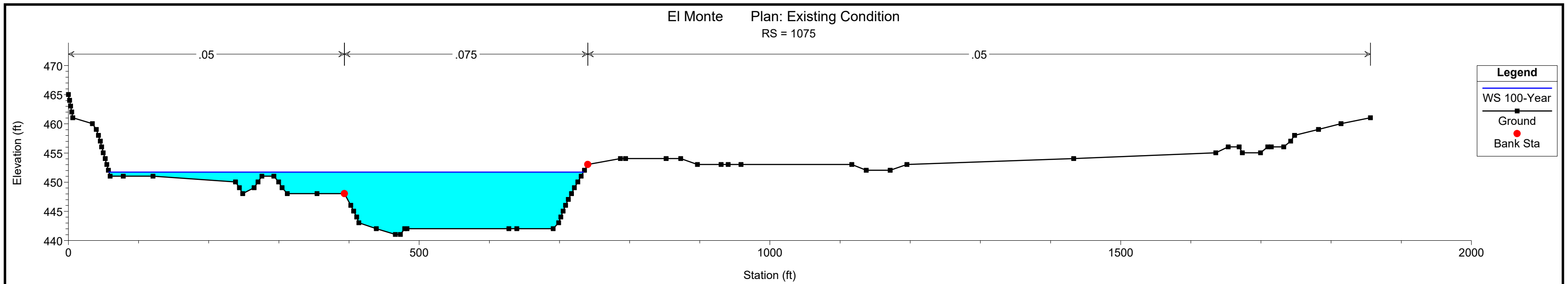


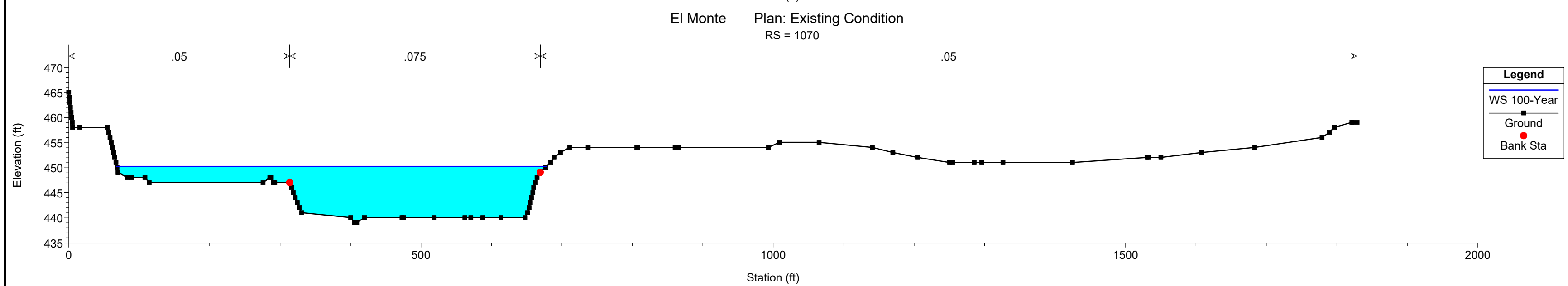
El Monte Plan: Existing Condition
RS = 1130
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

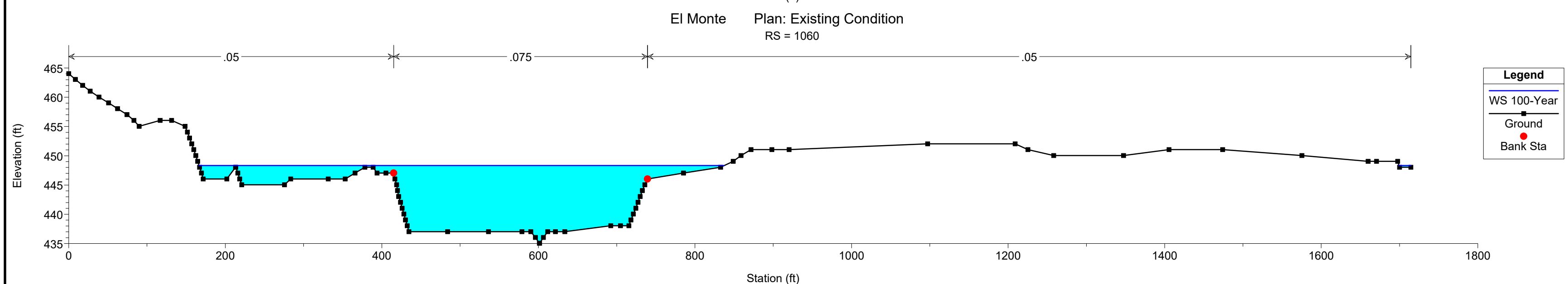


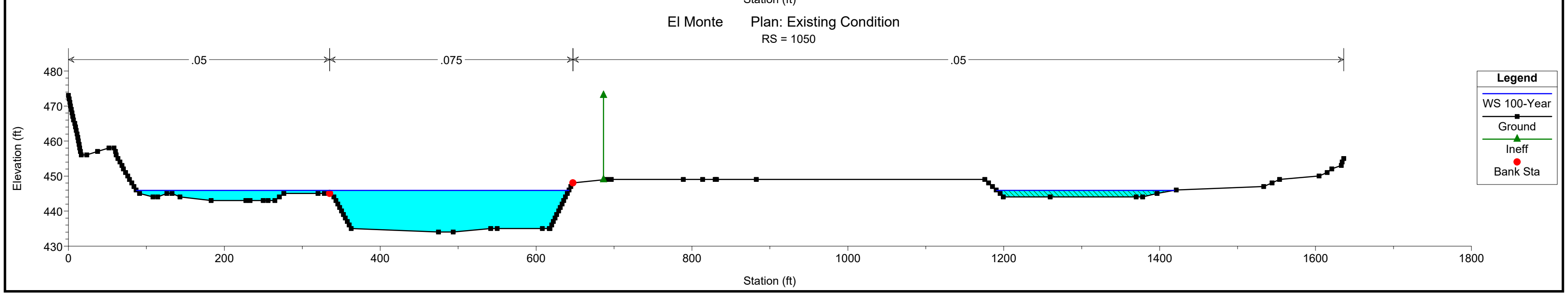
El Monte Plan: Existing Condition
RS = 1120
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

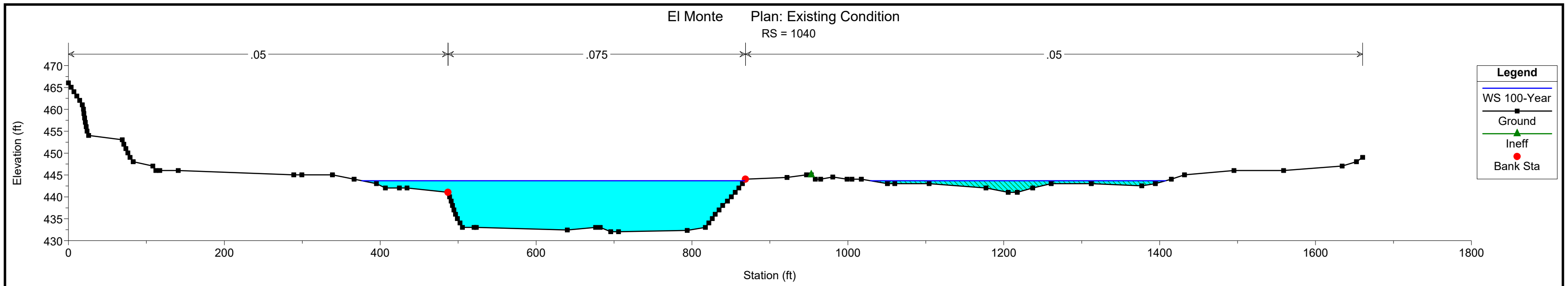

El Monte Plan: Existing Condition
RS = 1110
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 1100
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 1090
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Existing Condition
RS = 1080
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

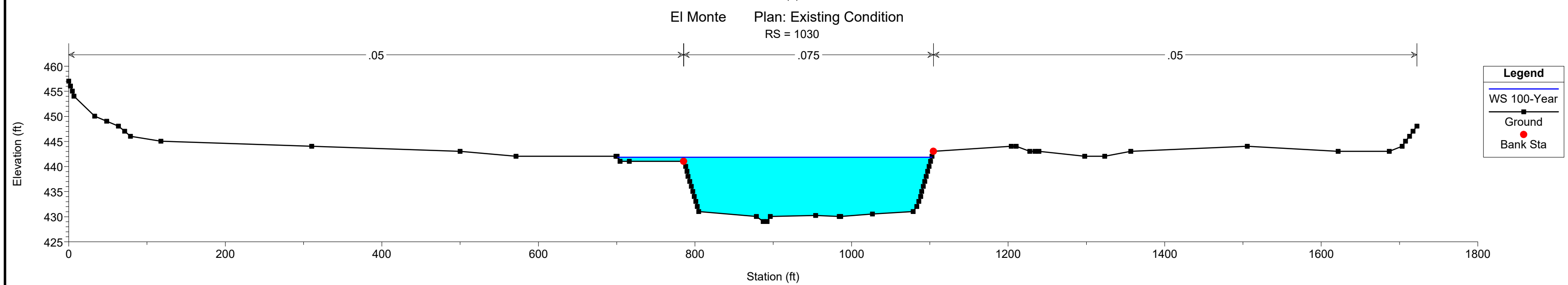

El Monte Plan: Existing Condition
RS = 1075
.05
.075
.05
Elevation (ft)
470
465
460
455
450
445
440
0
500
1000
1500
2000
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

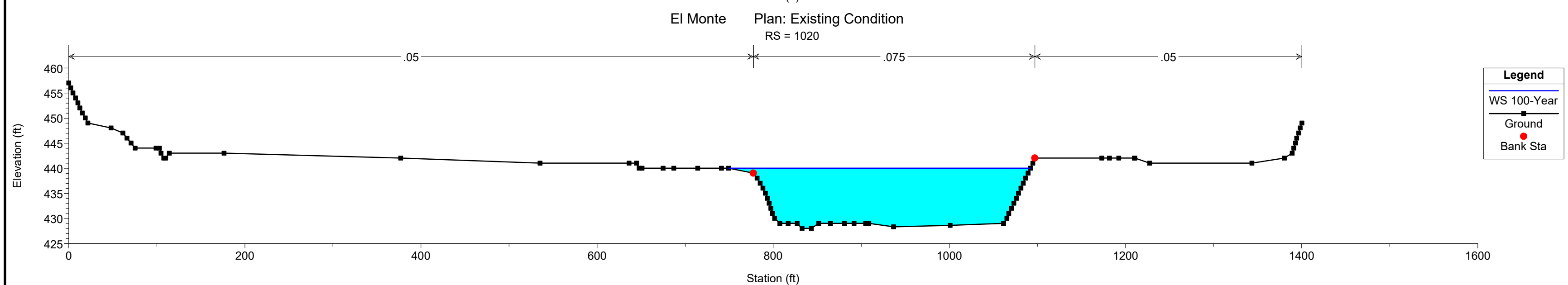

El Monte Plan: Existing Condition
RS = 1070
.05
.075
.05
Elevation (ft)
470
465
460
455
450
445
440
435
0
500
1000
1500
2000
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

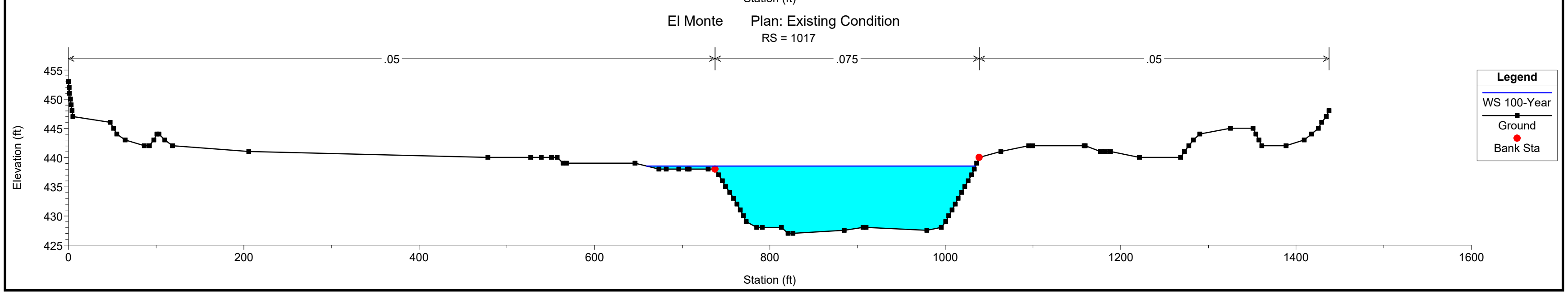

El Monte Plan: Existing Condition
RS = 1060
.05
.075
.05
Elevation (ft)
465
460
455
450
445
440
435
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

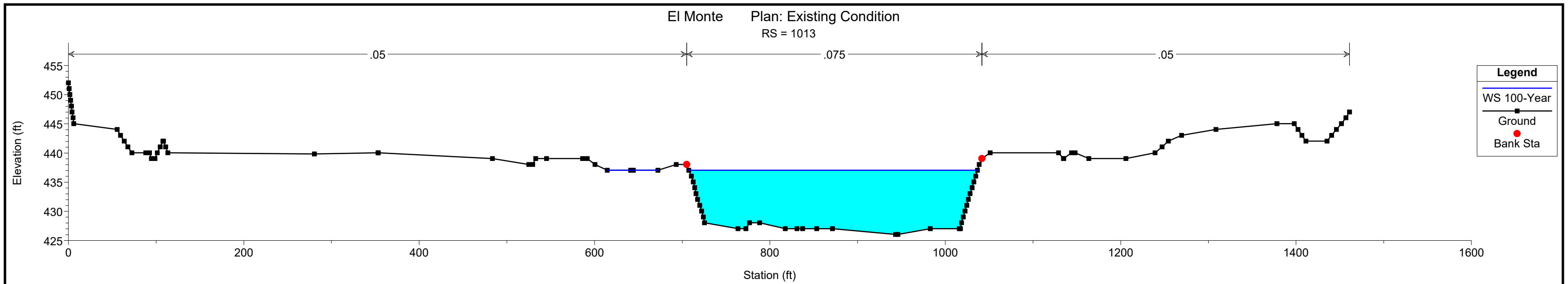

El Monte Plan: Existing Condition
RS = 1050
.05
.075
.05
Elevation (ft)
480
470
460
450
440
430
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

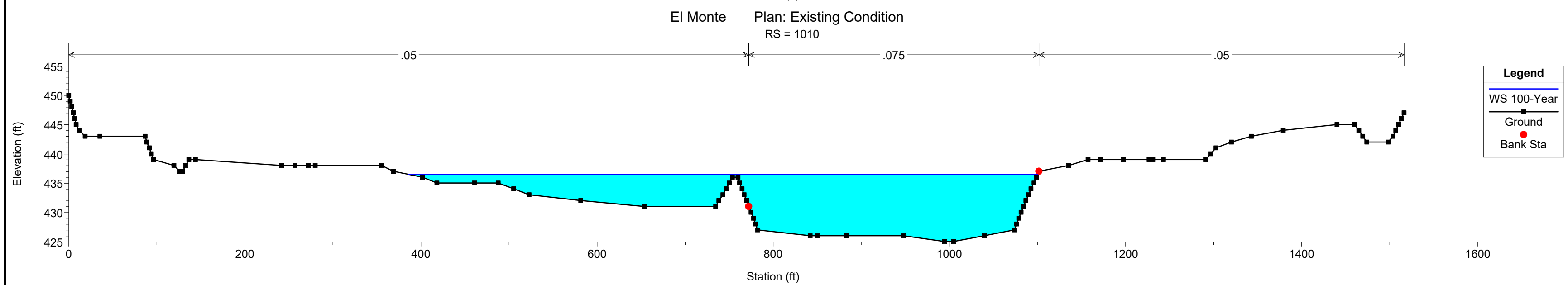

El Monte Plan: Existing Condition
RS = 1040
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

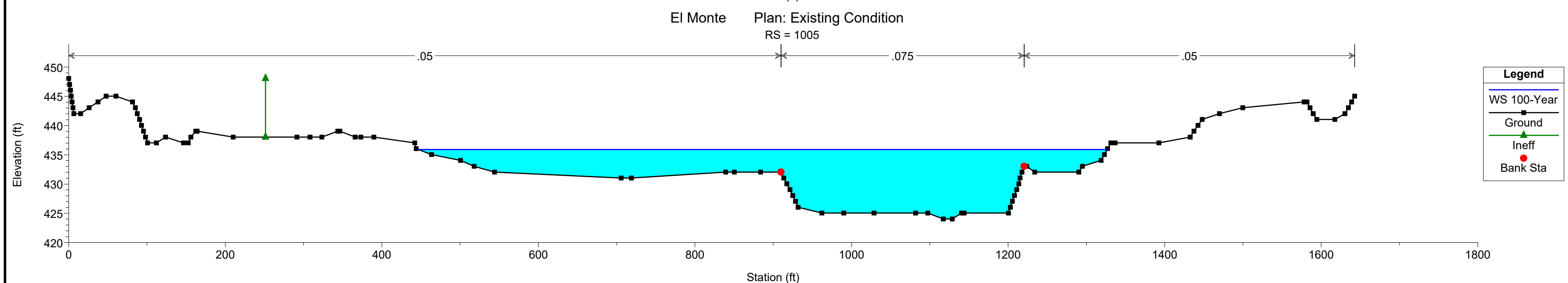

El Monte Plan: Existing Condition
RS = 1030
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

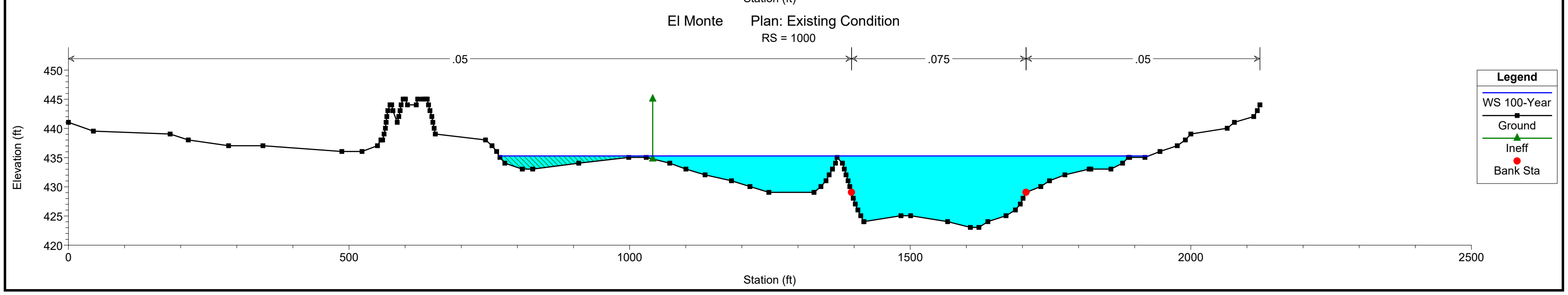

El Monte Plan: Existing Condition
RS = 1020
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

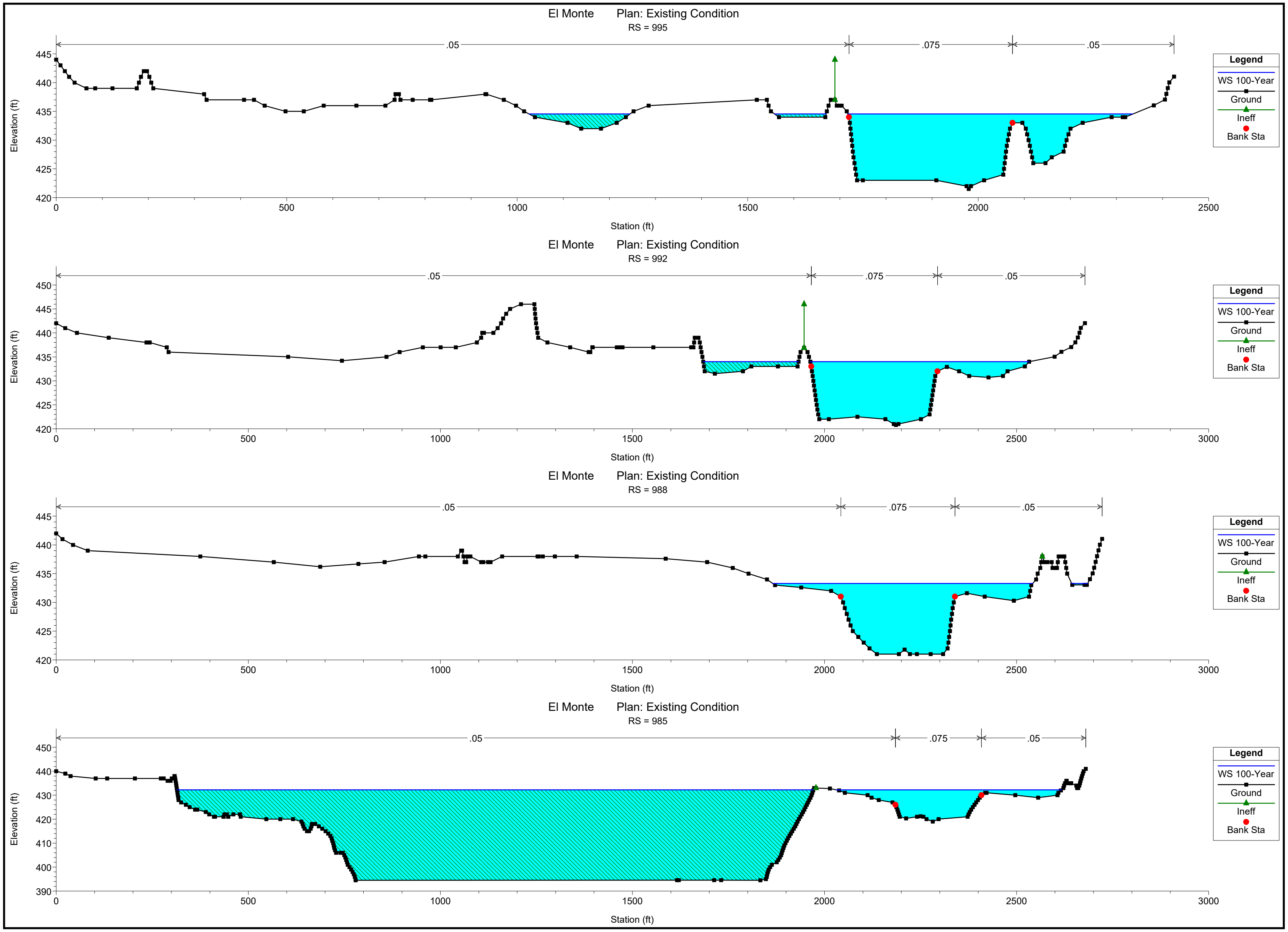

El Monte Plan: Existing Condition
RS = 1017
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

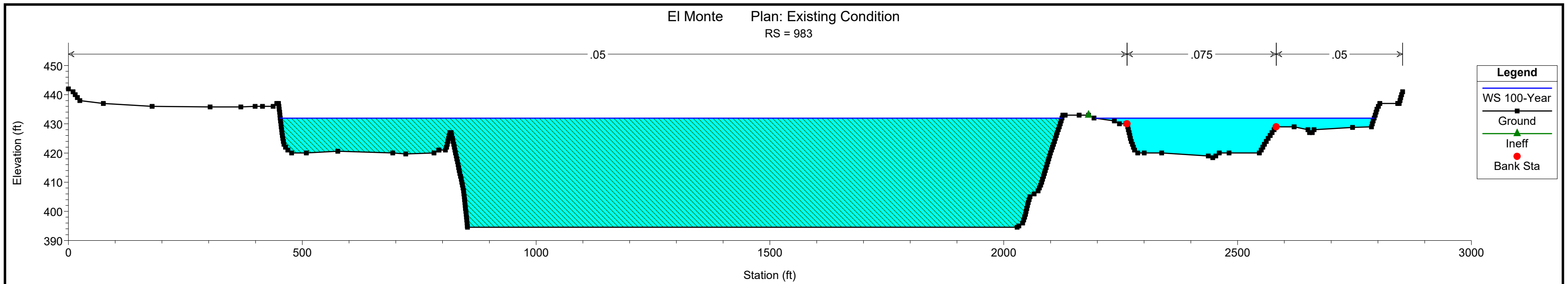

El Monte Plan: Existing Condition
RS = 1013
.05
.075
.05
Elevation (ft)
Station (ft)
425
430
435
440
445
450
455
0
200
400
600
800
1000
1200
1400
1600
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Existing Condition
RS = 1010
.05
.075
.05
Elevation (ft)
Station (ft)
425
430
435
440
445
450
455
0
200
400
600
800
1000
1200
1400
1600
Legend
WS 100-Year
Ground
Bank Sta

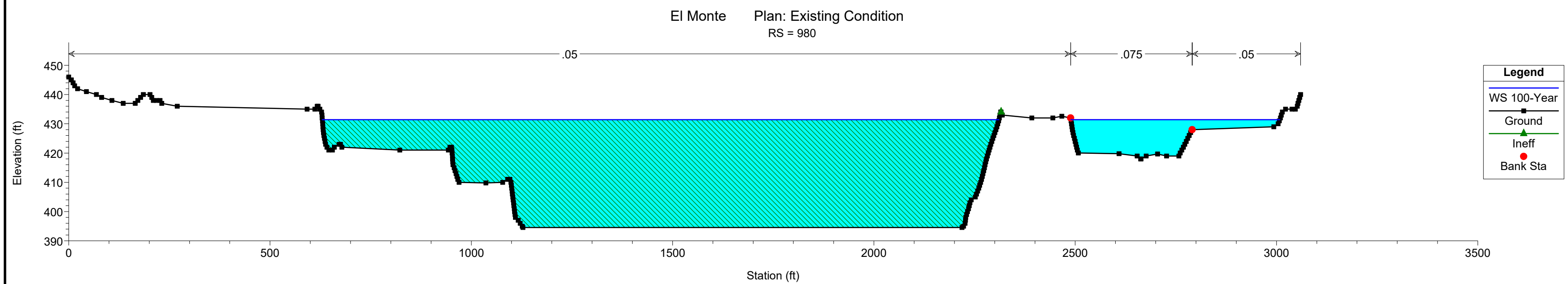

El Monte Plan: Existing Condition
RS = 1005
.05
.075
.05
Elevation (ft)
Station (ft)
420
425
430
435
440
445
450
0
200
400
600
800
1000
1200
1400
1600
1800
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Existing Condition
RS = 1000
.05
.075
.05
Elevation (ft)
Station (ft)
420
425
430
435
440
445
450
0
500
1000
1500
2000
2500
Legend
WS 100-Year
Ground
Ineff
Bank Sta

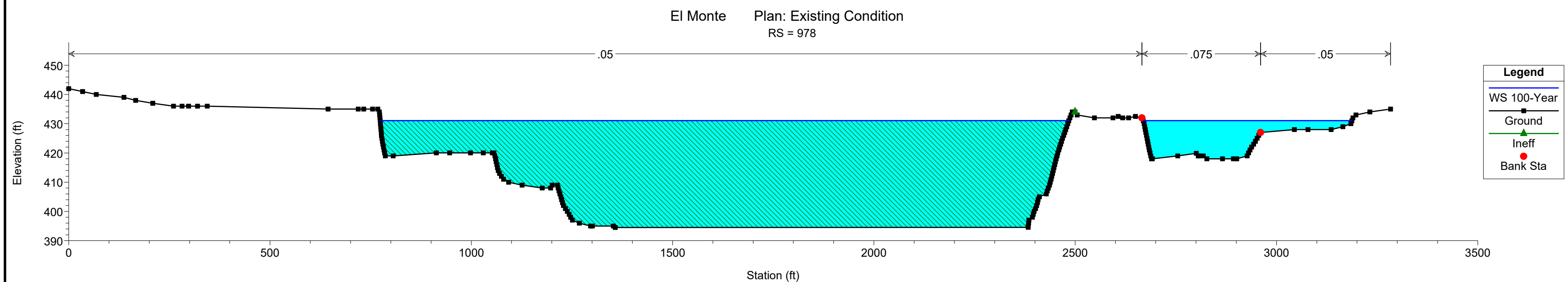

El Monte Plan: Existing Condition
RS = 995
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 992
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 988
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 985
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



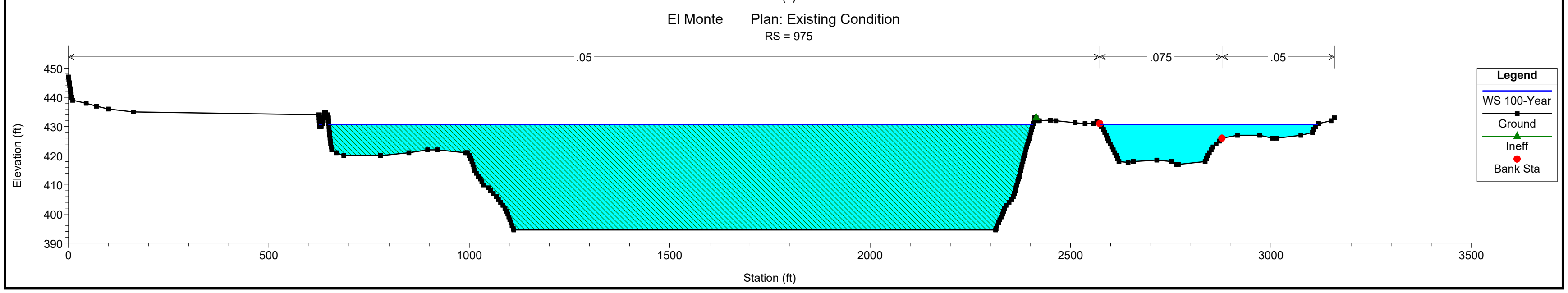
El Monte Plan: Existing Condition
RS = 983
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



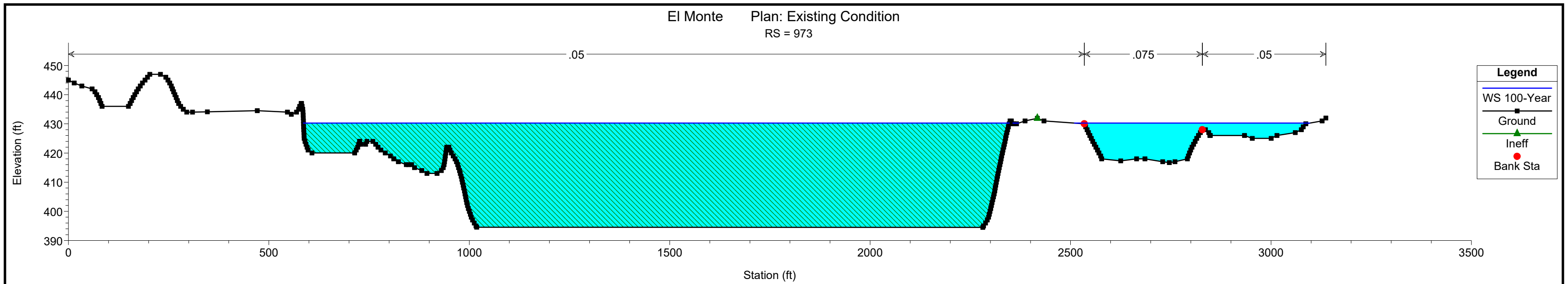
El Monte Plan: Existing Condition
RS = 980
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



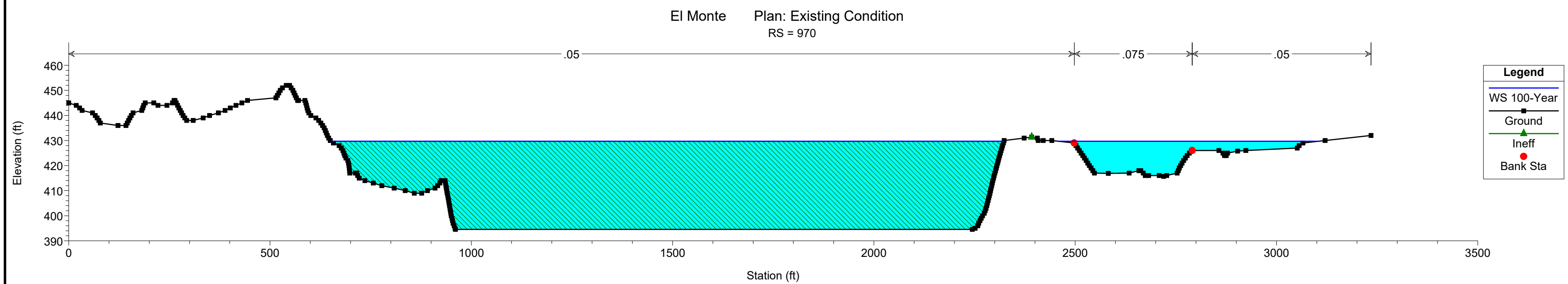
El Monte Plan: Existing Condition
RS = 978
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



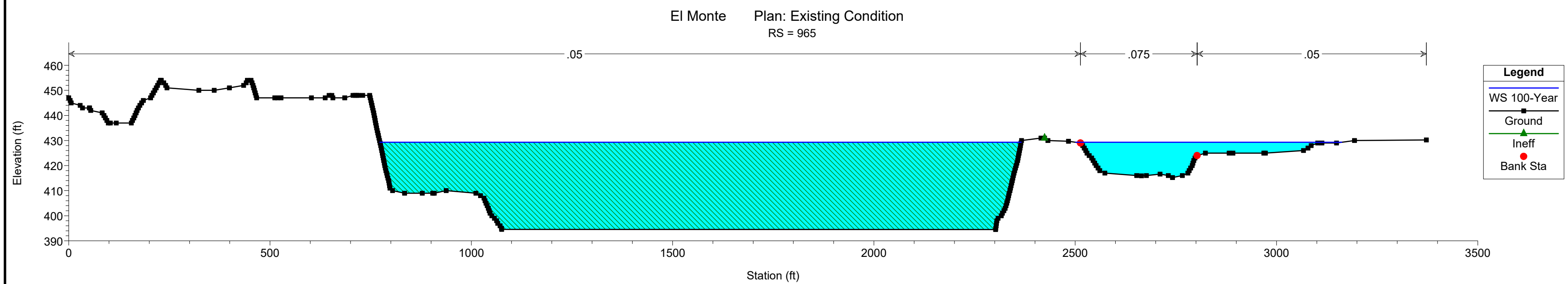
El Monte Plan: Existing Condition
RS = 975
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



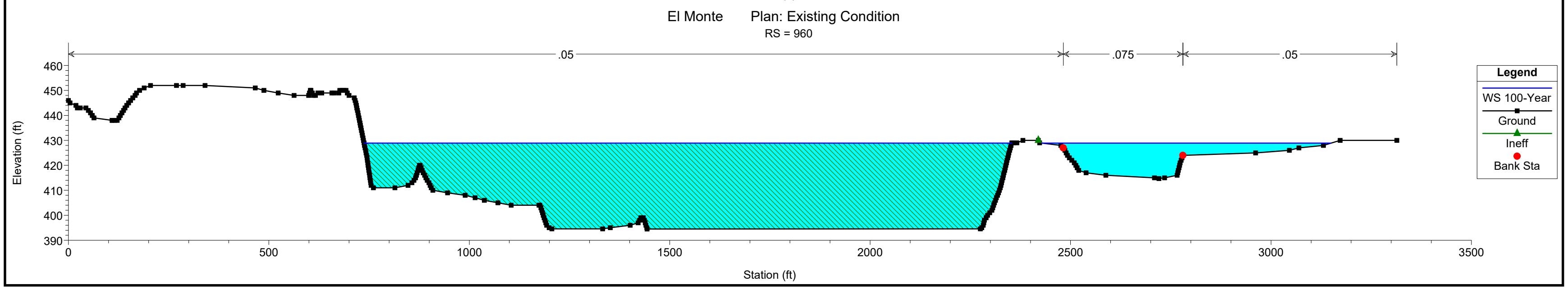
El Monte Plan: Existing Condition
RS = 973
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



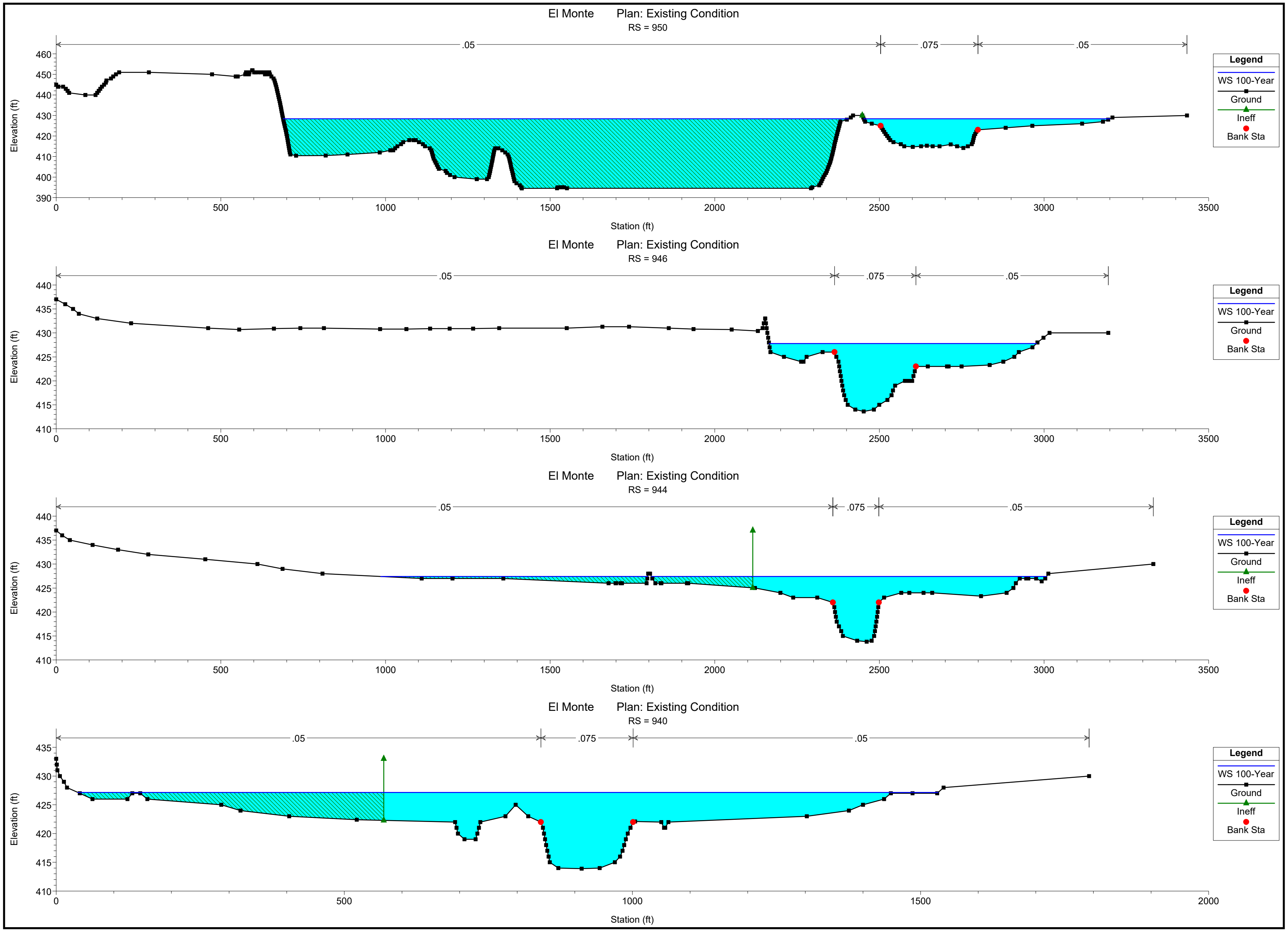
El Monte Plan: Existing Condition
RS = 970
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

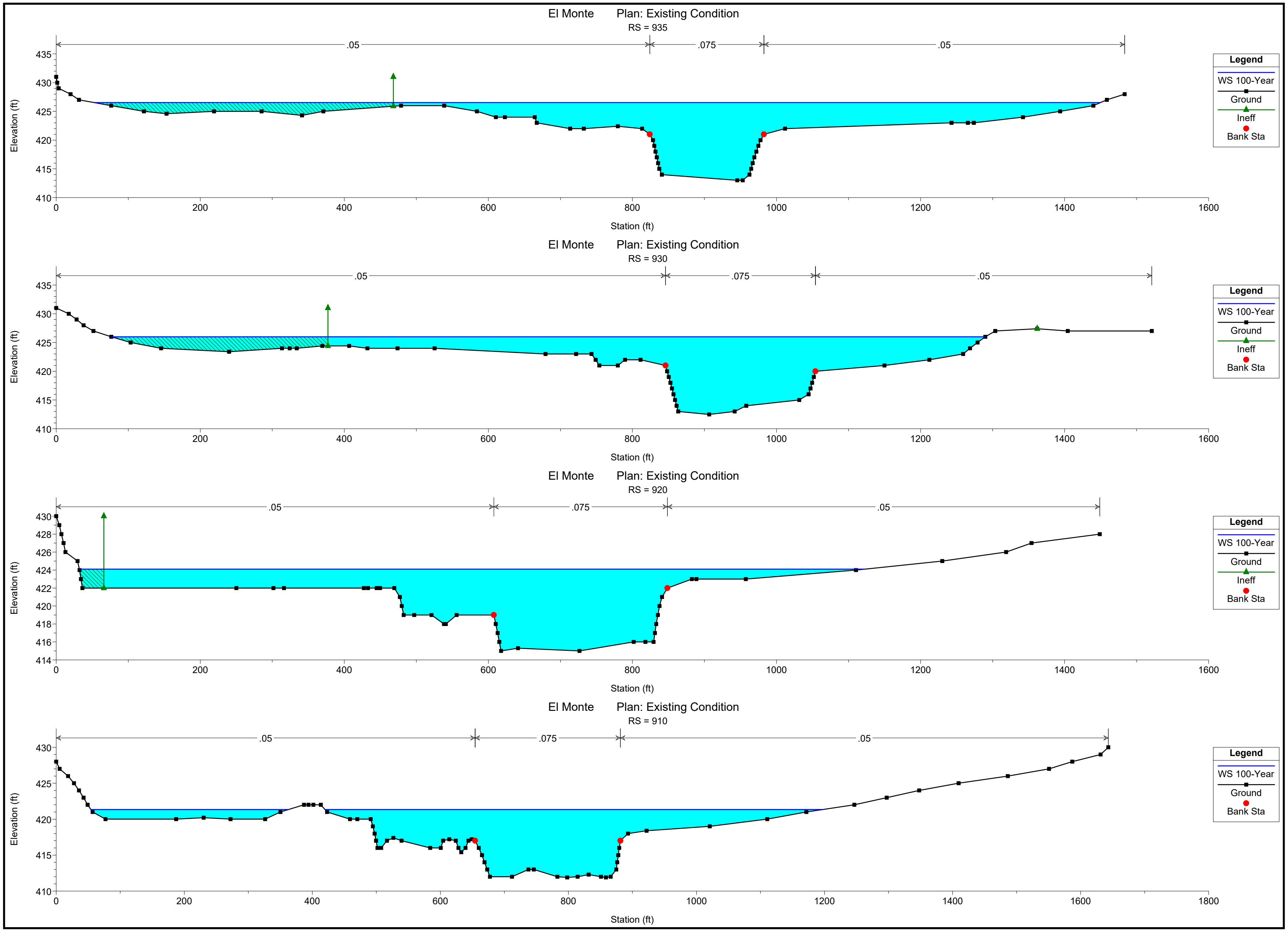


El Monte Plan: Existing Condition
RS = 965
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

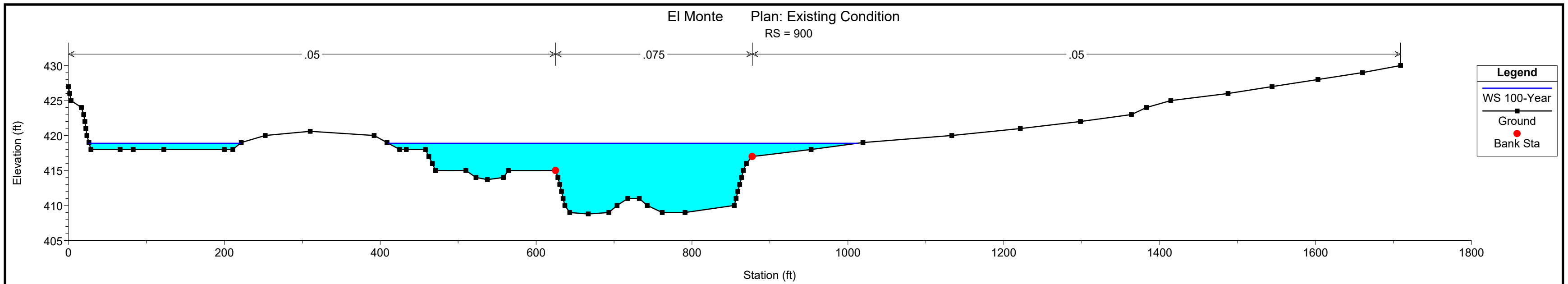


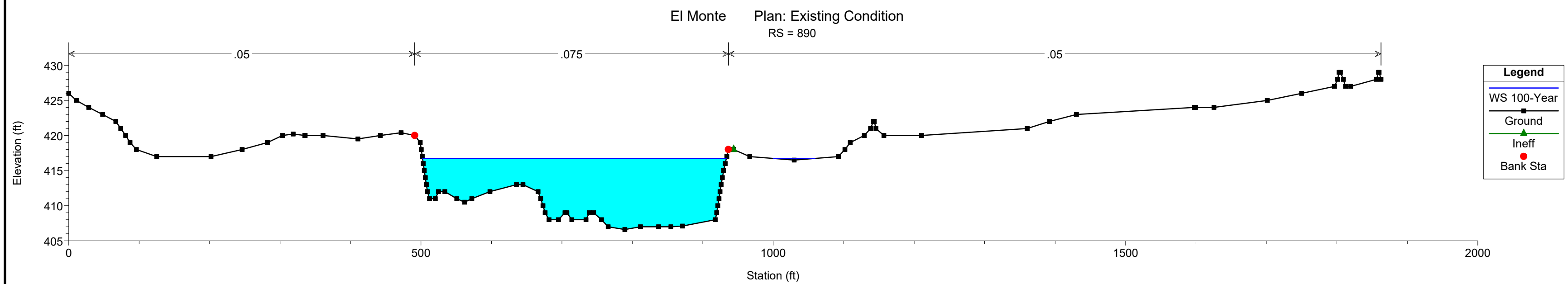
El Monte Plan: Existing Condition
RS = 960
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

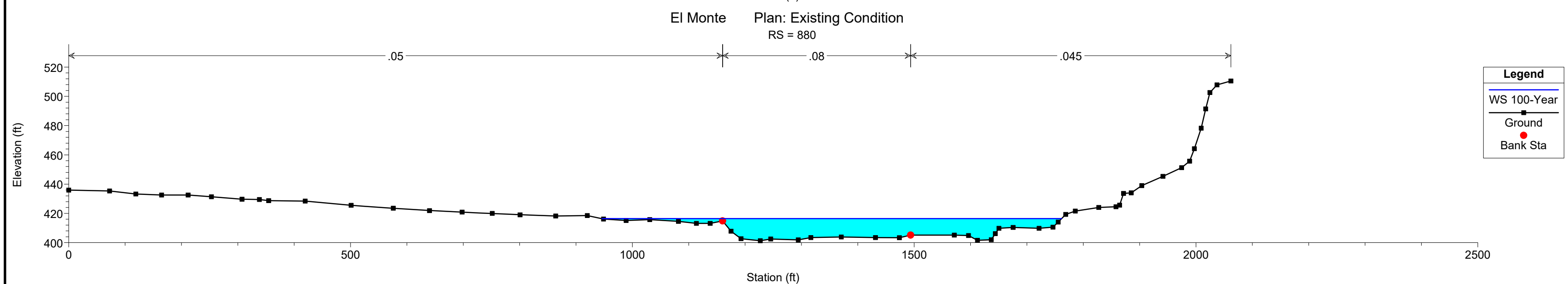

El Monte Plan: Existing Condition
RS = 950
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 946
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Existing Condition
RS = 944
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 940
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



El Monte Plan: Existing Condition
RS = 935
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 930
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 920
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Existing Condition
RS = 910
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Existing Condition
RS = 900
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Existing Condition
RS = 890
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Existing Condition
RS = 880
.05
.08
.045
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

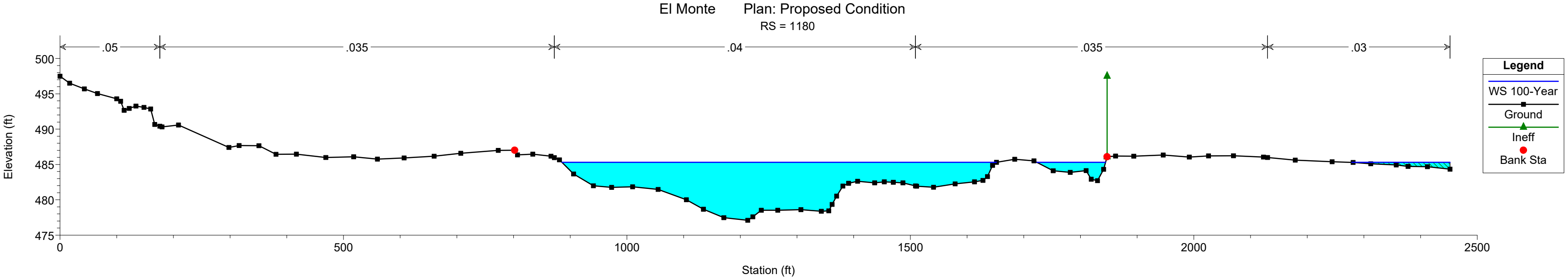
Proposed Conditions All Phases

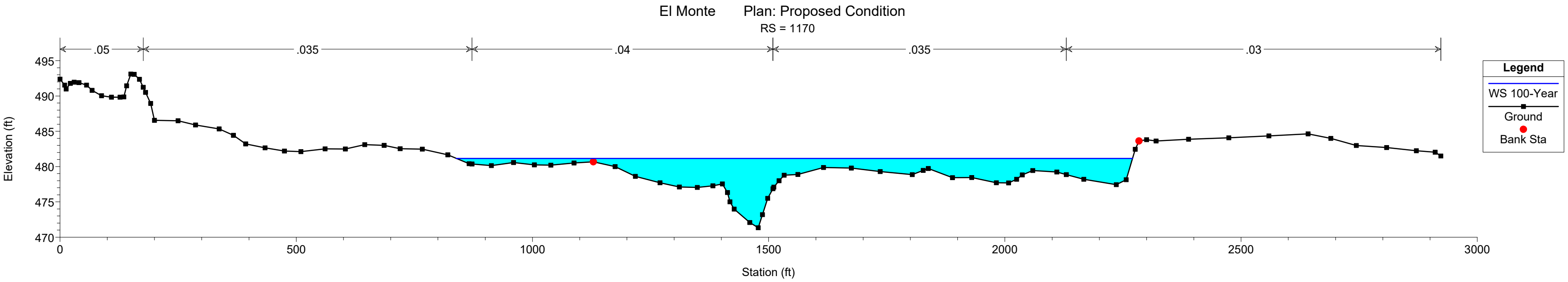
HEC-RAS Plan: Proposed Con River: RIVER-1 Reach: Reach-1 Profile: 100-Year

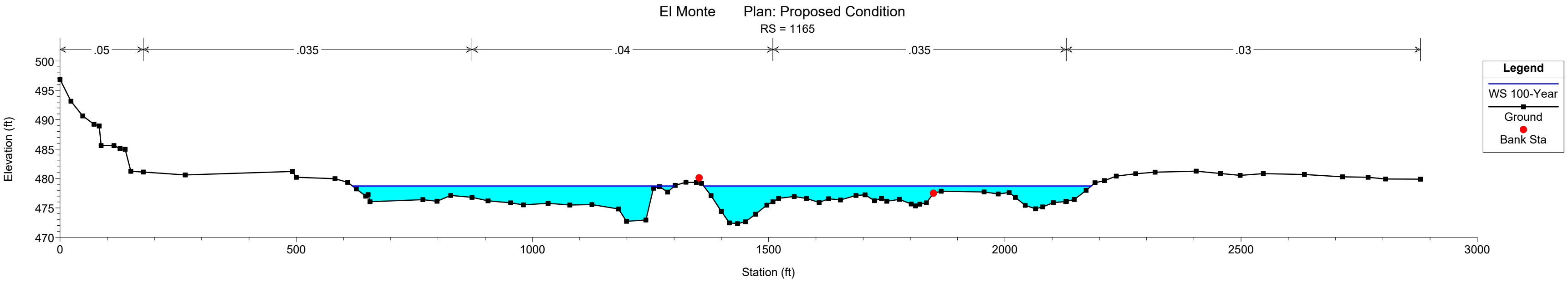
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1180	100-Year	19000.00	477.10	485.30		485.74	0.002859	5.35	3552.51	1060.54	0.47
Reach-1	1170	100-Year	19000.00	471.34	481.16		481.63	0.004095	5.54	3565.42	1431.43	0.57
Reach-1	1165	100-Year	19000.00	472.32	478.74	477.70	479.12	0.003948	5.32	3893.79	1502.72	0.55
Reach-1	1160	100-Year	19000.00	469.99	474.55	474.55	475.49	0.014382	7.32	2477.28	1361.69	0.93
Reach-1	1150	100-Year	19000.00	458.04	462.76	462.76	464.57	0.018925	6.09	2126.56	526.64	0.59
Reach-1	1148	100-Year	19000.00	442.04	449.93		450.42	0.002047	5.60	3392.00	464.91	0.37
Reach-1	1140	100-Year	19000.00	436.46	449.25		449.40	0.005968	3.11	6107.54	885.55	0.19
Reach-1	1130	100-Year	19000.00	434.16	447.11		447.19	0.002927	2.19	8657.38	1755.34	0.13
Reach-1	1120	100-Year	19000.00	432.01	445.42		445.51	0.003727	2.43	7820.29	1384.69	0.15
Reach-1	1110	100-Year	19000.00	429.69	443.60	436.92	443.68	0.003185	2.36	8036.79	920.33	0.14
Reach-1	1100	100-Year	20000.00	427.44	442.45		442.51	0.001921	1.97	10133.46	1041.36	0.11
Reach-1	1090	100-Year	20000.00	425.34	441.75		441.79	0.001253	1.73	11533.95	1044.36	0.09
Reach-1	1080	100-Year	20000.00	424.00	441.30		441.35	0.001066	1.71	11667.04	951.33	0.09
Reach-1	1075	100-Year	20000.00	424.00	440.90		440.95	0.001112	1.84	10856.96	819.07	0.09
Reach-1	1070	100-Year	20000.00	424.00	440.42	428.80	440.50	0.001564	2.26	8845.75	908.86	0.11
Reach-1	1060	100-Year	20000.00	424.00	439.20	427.69	439.29	0.001869	2.37	8428.91	931.27	0.12
Reach-1	1050	100-Year	20000.00	424.00	437.81	427.43	437.91	0.002096	2.44	8207.36	922.73	0.12
Reach-1	1040	100-Year	20000.00	424.00	436.45	428.37	436.68	0.001619	3.80	5257.38	836.46	0.21
Reach-1	1030	100-Year	20000.00	424.00	435.87		436.03	0.001061	3.15	6350.81	1304.48	0.17
Reach-1	1020	100-Year	20000.00	424.00	435.62		435.68	0.000411	2.01	9947.65	1060.30	0.11
Reach-1	1017	100-Year	20000.00	424.00	435.55		435.60	0.000301	1.69	11849.29	1084.29	0.09
Reach-1	1013	100-Year	20000.00	424.00	435.47		435.51	0.000320	1.73	11541.70	1062.68	0.09
Reach-1	1010	100-Year	20000.00	424.00	435.40		435.45	0.000304	1.69	11822.18	1087.79	0.09
Reach-1	1005	100-Year	20000.00	424.00	435.33		435.37	0.000255	1.55	12898.89	1186.89	0.08
Reach-1	1000	100-Year	20000.00	424.00	435.13		435.24	0.000712	2.62	7879.85	1317.13	0.14
Reach-1	995	100-Year	20000.00	422.00	434.53		434.82	0.002130	4.46	4762.99	1458.95	0.24
Reach-1	992	100-Year	20000.00	421.00	433.99		434.36	0.002523	4.96	4289.34	1488.46	0.26
Reach-1	988	100-Year	20000.00	421.00	433.29	427.43	433.77	0.003600	5.74	3807.85	718.35	0.31
Reach-1	985	100-Year	20000.00	419.00	432.26	427.71	432.90	0.005060	6.84	3312.60	2243.60	0.37
Reach-1	983	100-Year	20000.00	418.40	431.94	425.26	432.28	0.002390	4.86	4393.57	2267.80	0.25
Reach-1	980	100-Year	20000.00	418.00	431.42	425.16	431.84	0.002972	5.35	3984.14	2199.31	0.28
Reach-1	978	100-Year	20000.00	418.00	431.04	424.48	431.45	0.002795	5.29	4043.18	2228.92	0.27
Reach-1	975	100-Year	20000.00	417.00	430.64	424.17	431.00	0.002583	4.98	4258.09	2303.30	0.26
Reach-1	973	100-Year	20000.00	416.70	430.24	423.87	430.59	0.002590	4.95	4294.13	2361.87	0.26
Reach-1	970	100-Year	20000.00	415.70	429.69	423.18	430.06	0.002708	5.12	4263.54	2315.13	0.27
Reach-1	965	100-Year	20000.00	415.20	429.28	422.58	429.61	0.002416	4.91	4477.57	2252.77	0.26
Reach-1	960	100-Year	20000.00	414.70	428.88	421.68	429.17	0.001960	4.57	4841.62	2335.43	0.23
Reach-1	950	100-Year	20000.00	414.20	428.38	421.18	428.66	0.001845	4.48	5013.38	2463.93	0.23

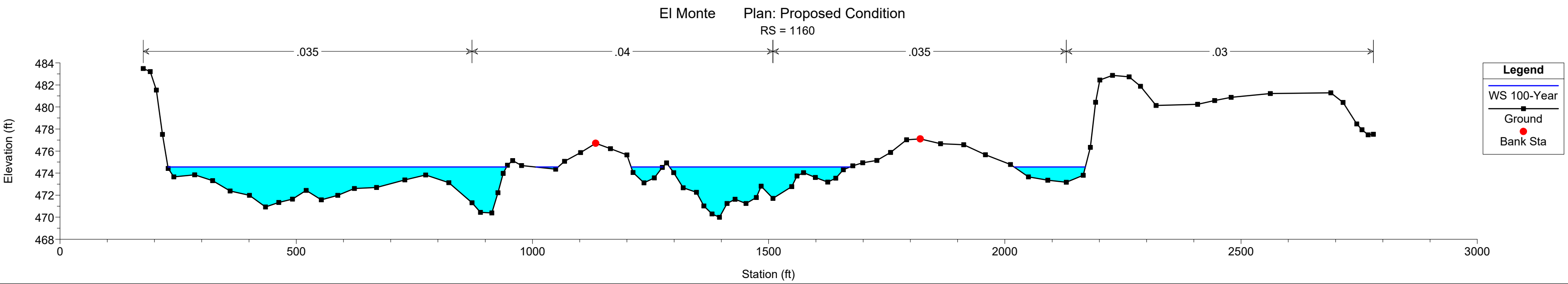
HEC-RAS Plan: Proposed Con   River: RIVER-1   Reach: Reach-1   Profile: 100-Year (Continued)

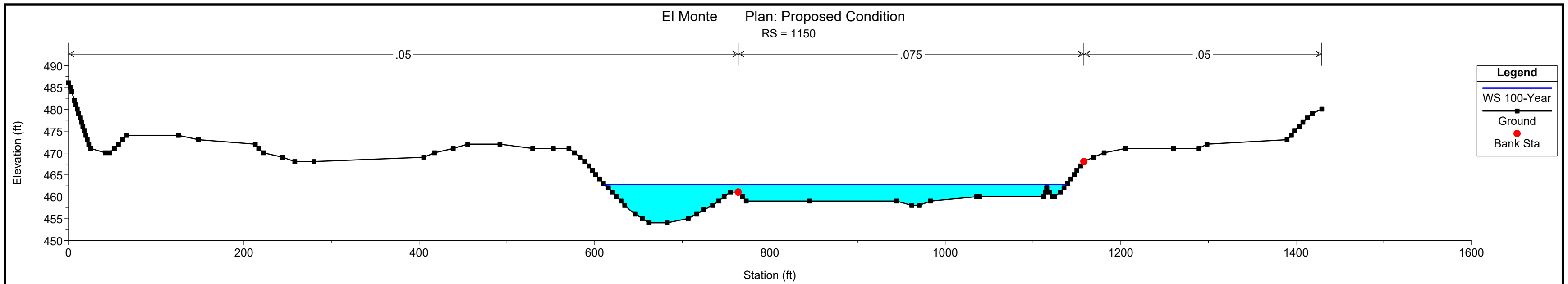
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	946	100-Year	20000.00	413.60	427.79		428.11	0.002681	4.95	4580.39	811.72	0.27
Reach-1	944	100-Year	20000.00	413.80	427.41		427.82	0.003449	6.01	4198.62	2010.58	0.31
Reach-1	940	100-Year	20000.00	413.90	427.15		427.41	0.002083	4.63	5113.21	1492.87	0.24
Reach-1	935	100-Year	20000.00	413.00	426.54		426.92	0.003177	5.80	4425.96	1397.69	0.29
Reach-1	930	100-Year	20000.00	412.50	426.00	421.47	426.31	0.002404	4.99	4788.01	1213.43	0.26
Reach-1	920	100-Year	20000.00	415.00	424.10		424.59	0.005934	6.22	3772.22	1090.18	0.38
Reach-1	910	100-Year	20000.00	411.90	421.35		421.84	0.005661	6.31	3814.74	1087.02	0.38
Reach-1	900	100-Year	20000.00	408.80	418.89		419.55	0.006822	6.93	3236.08	795.57	0.41
Reach-1	890	100-Year	20000.00	406.60	416.73	413.45	417.37	0.007507	6.39	3131.86	490.61	0.42
Reach-1	880	100-Year	20000.00	401.24	416.38	407.37	416.52	0.000601	2.49	7150.42	815.42	0.12

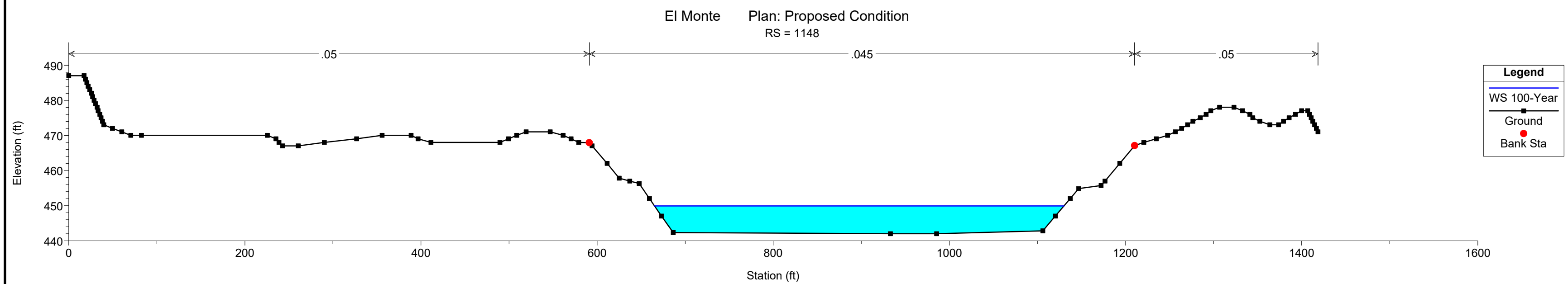

El Monte Plan: Proposed Condition
RS = 1180
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

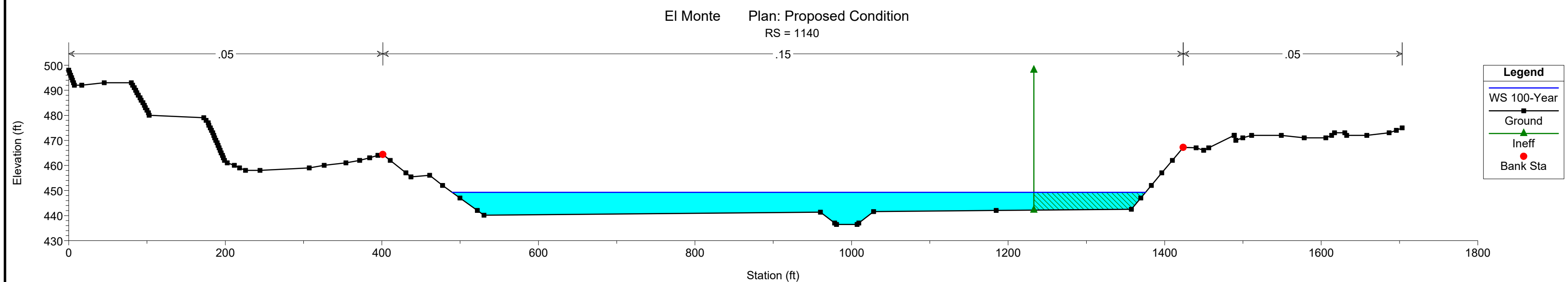

El Monte Plan: Proposed Condition
RS = 1170
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

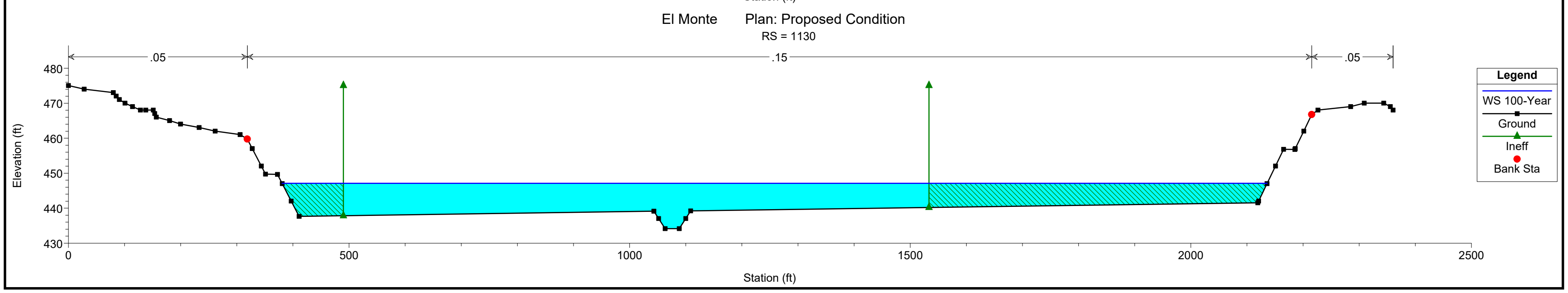

El Monte Plan: Proposed Condition
RS = 1165
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

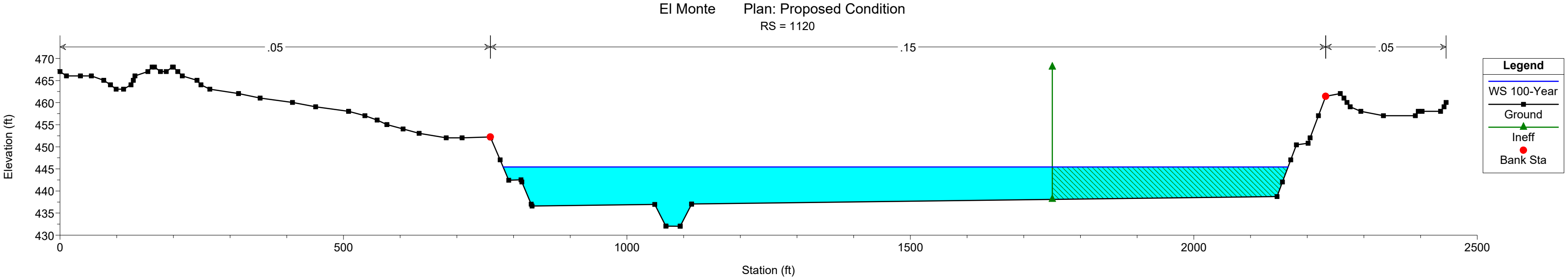

El Monte Plan: Proposed Condition
RS = 1160
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

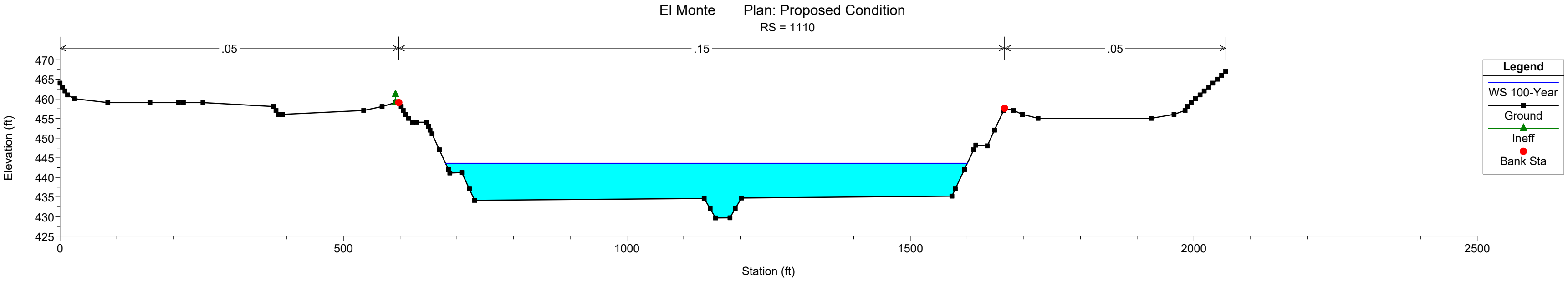

El Monte Plan: Proposed Condition
RS = 1150
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

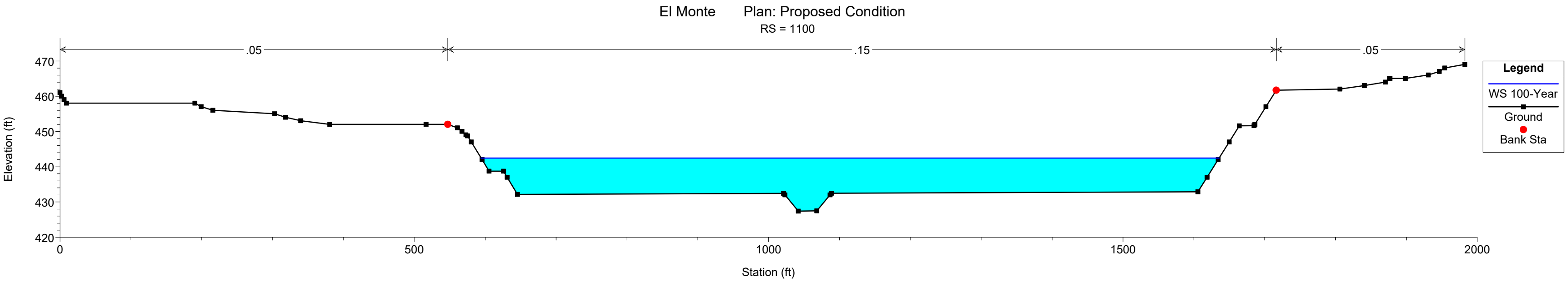

El Monte Plan: Proposed Condition
RS = 1148
.05
.045
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

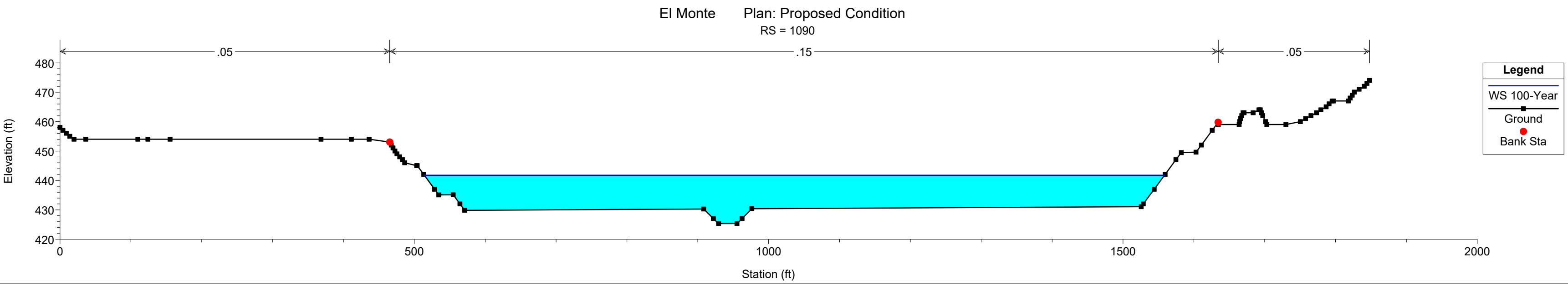

El Monte Plan: Proposed Condition
RS = 1140
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

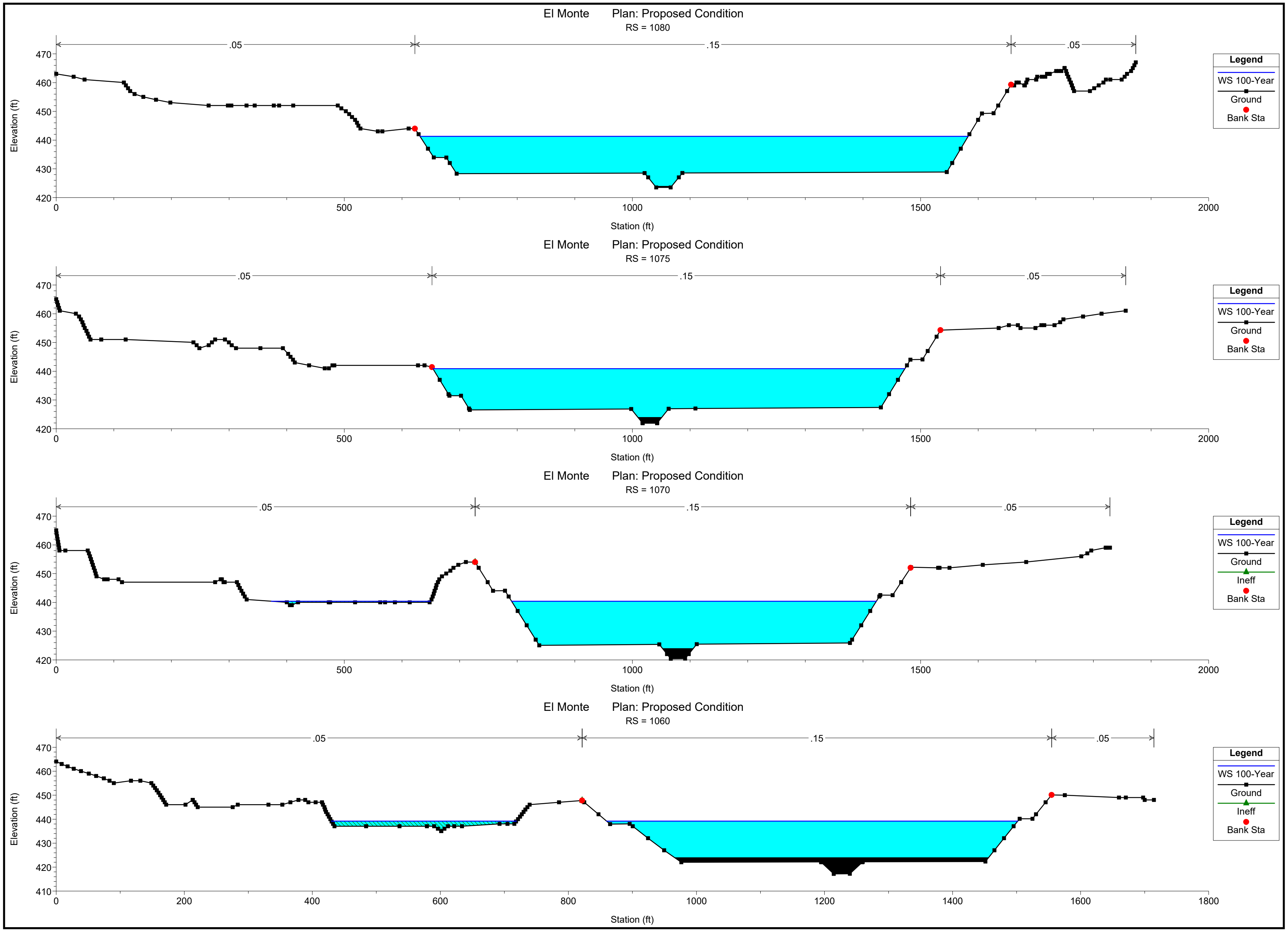

El Monte Plan: Proposed Condition
RS = 1130
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

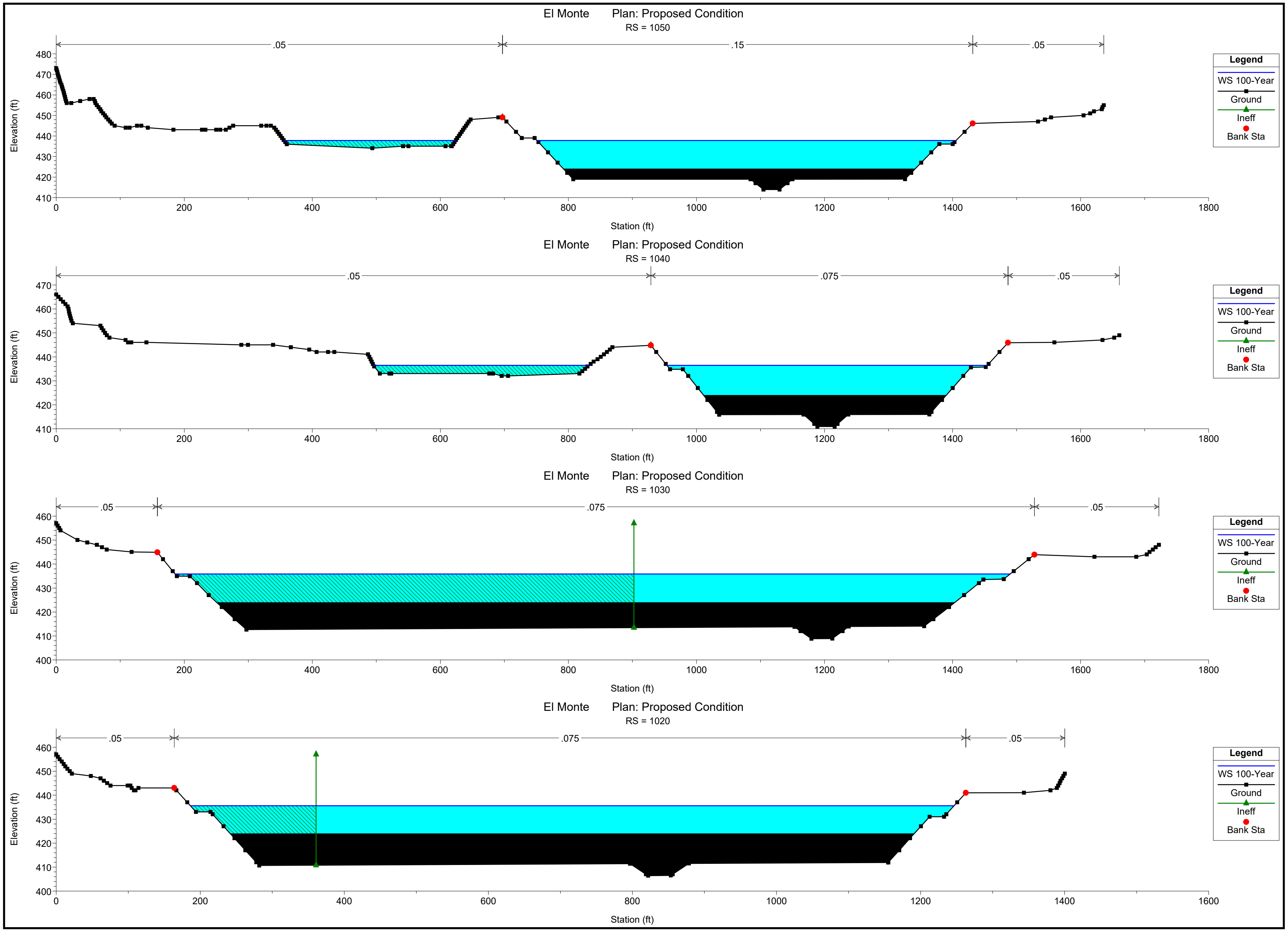

El Monte Plan: Proposed Condition
RS = 1120
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

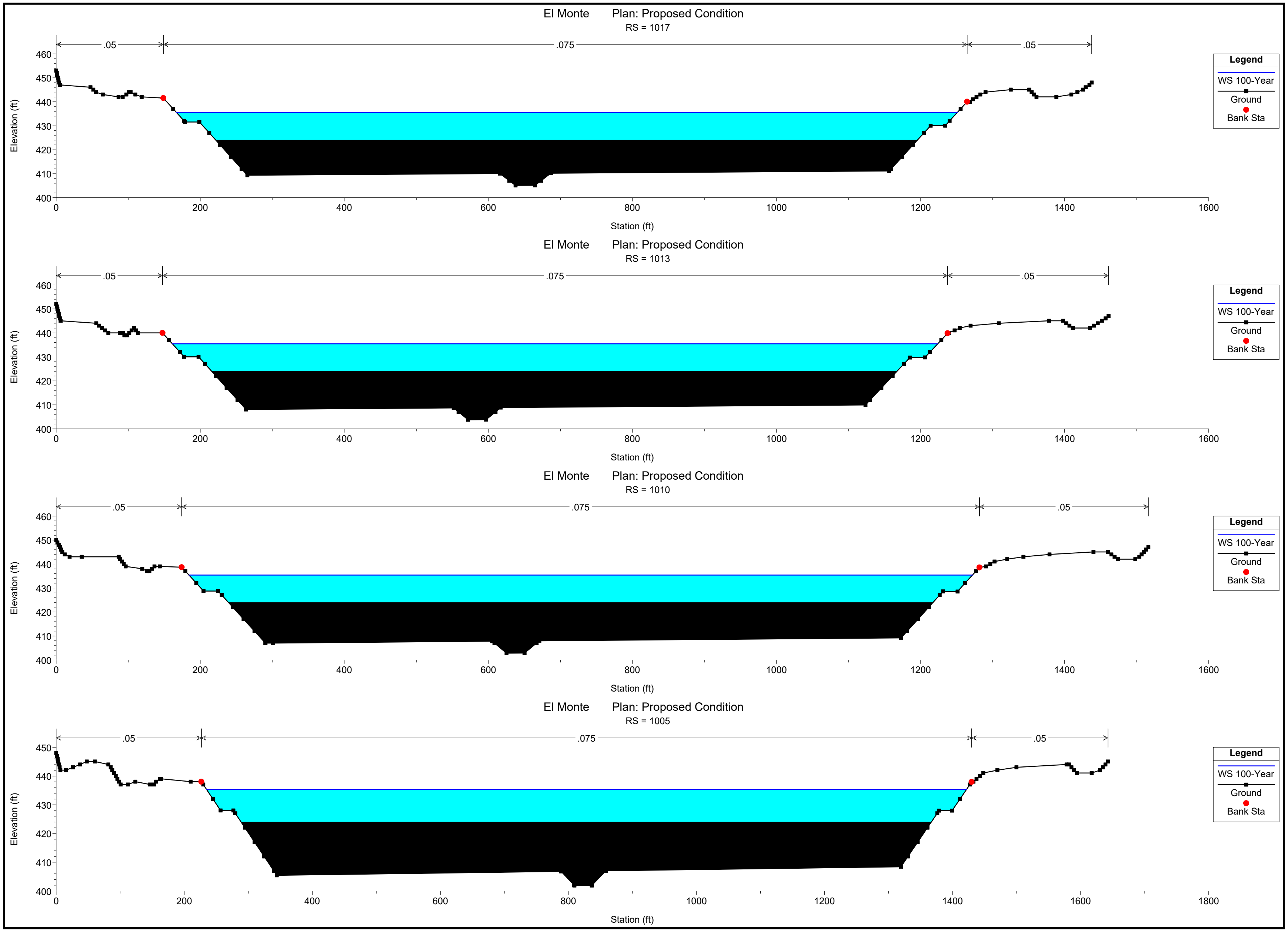

El Monte Plan: Proposed Condition
RS = 1110
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

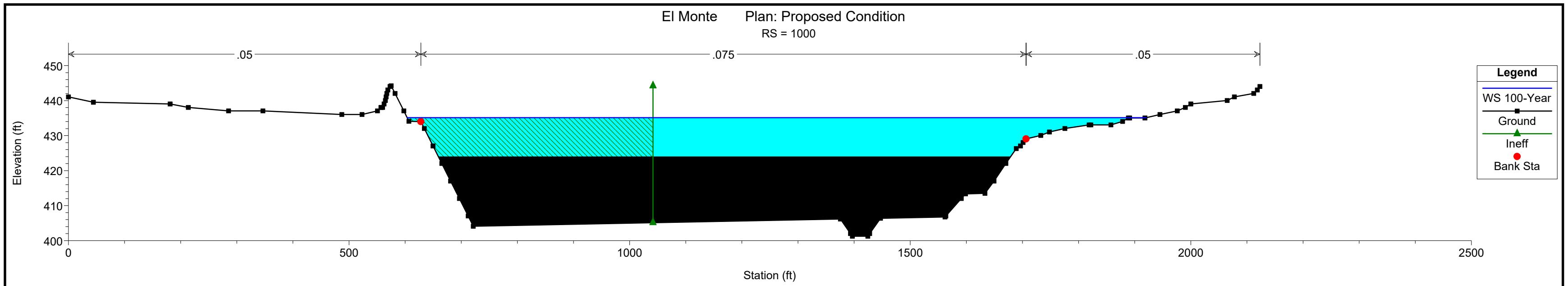

El Monte Plan: Proposed Condition
RS = 1100
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

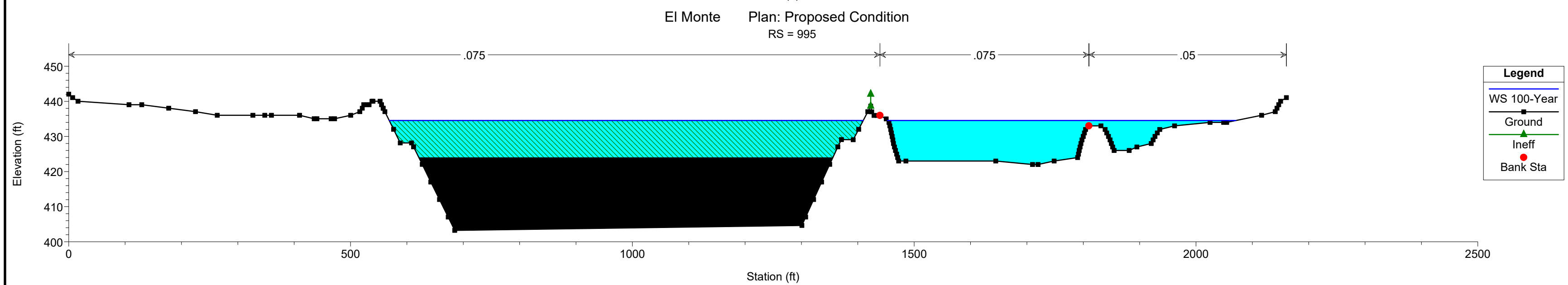

El Monte Plan: Proposed Condition
RS = 1090
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

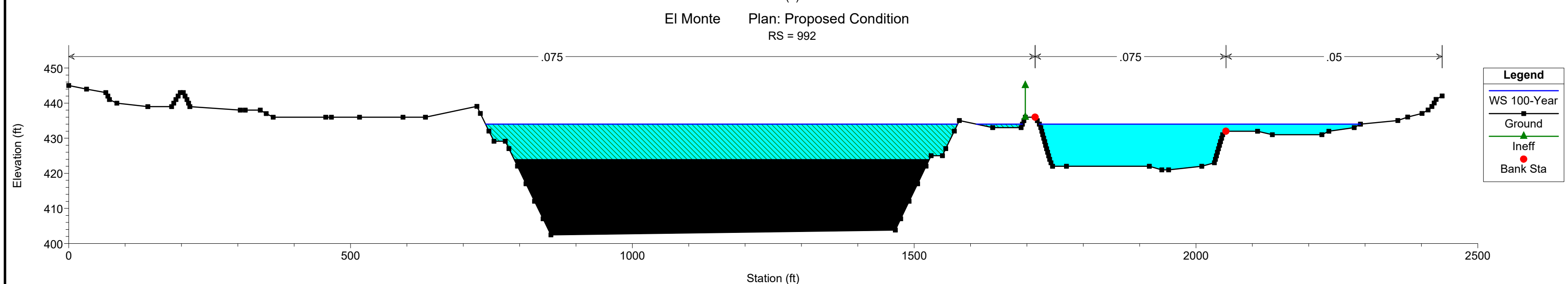

El Monte Plan: Proposed Condition
RS = 1080
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition
RS = 1075
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition
RS = 1070
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition
RS = 1060
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

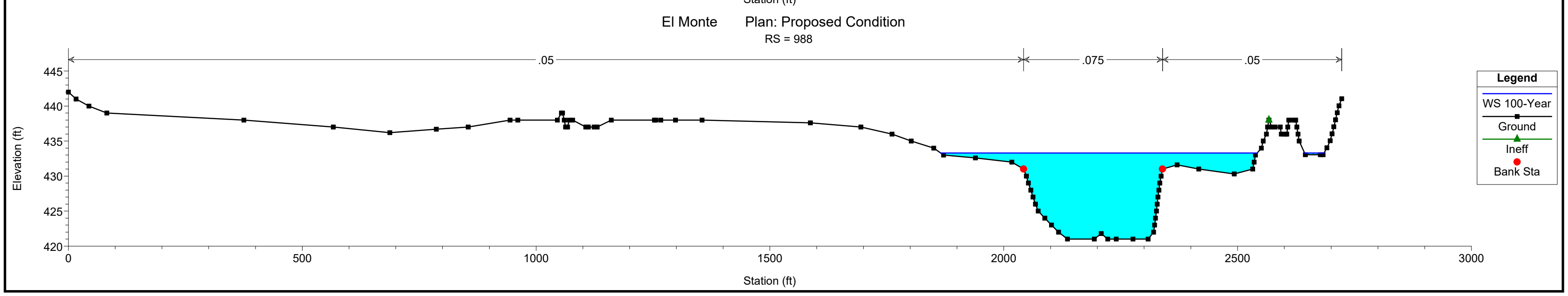

El Monte Plan: Proposed Condition
RS = 1050
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition
RS = 1040
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition
RS = 1030
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition
RS = 1020
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

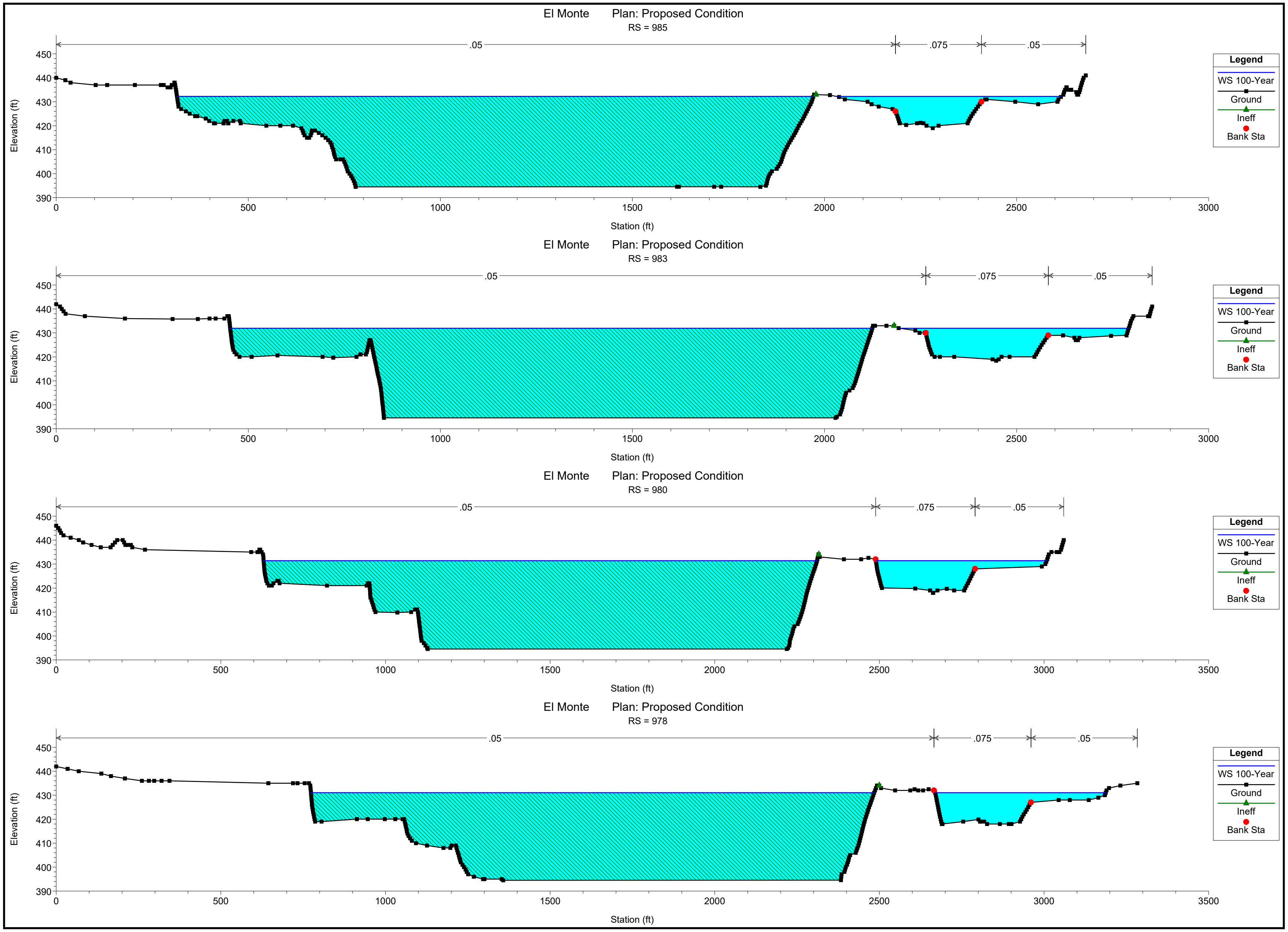

El Monte Plan: Proposed Condition
RS = 1017
.05
.075
.05
Legend
WS 100-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition
RS = 1013
.05
.075
.05
Legend
WS 100-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition
RS = 1010
.05
.075
.05
Legend
WS 100-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition
RS = 1005
.05
.075
.05
Legend
WS 100-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

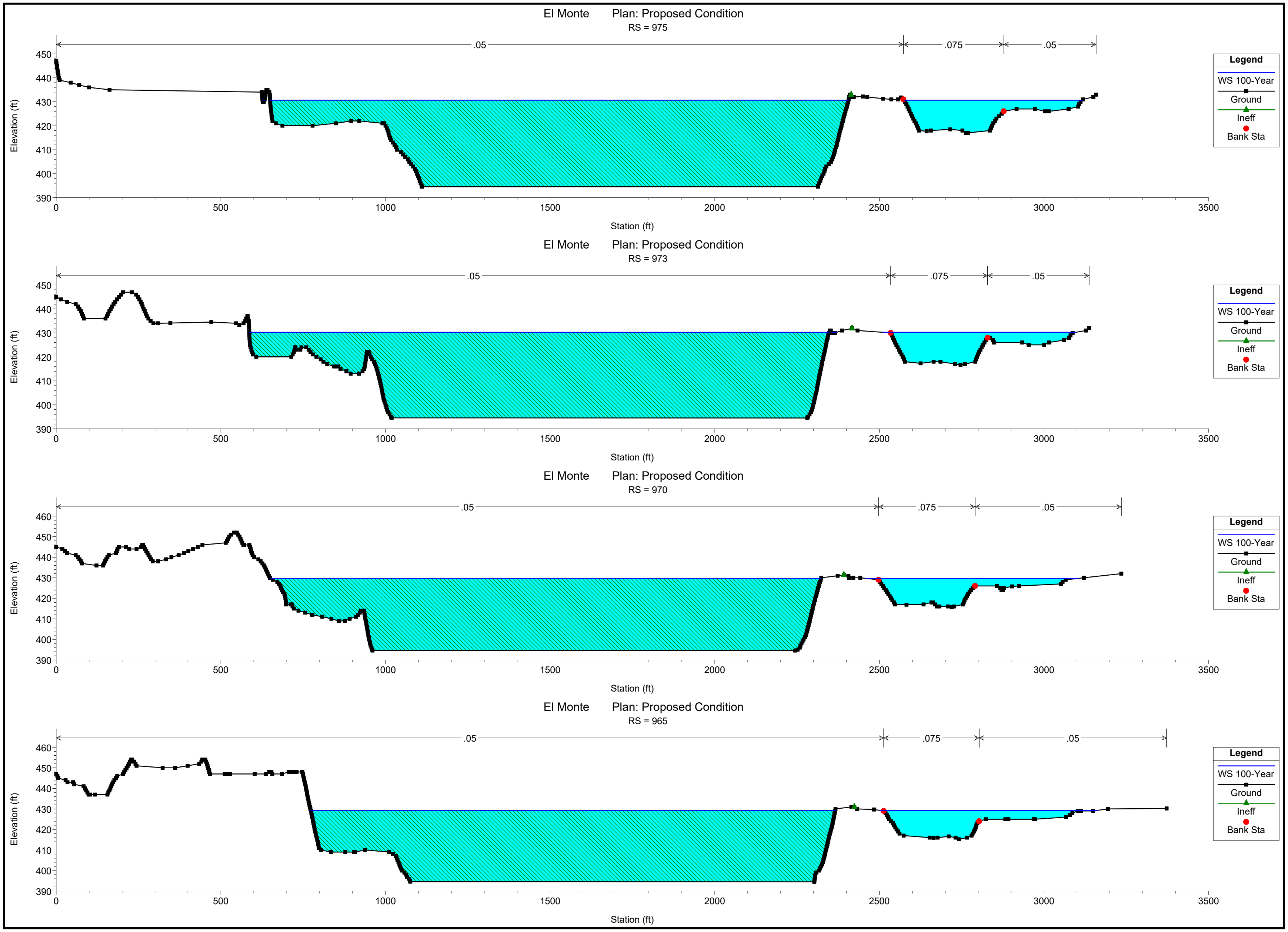

El Monte Plan: Proposed Condition
RS = 1000
.05
.075
.05
Elevation (ft)
Station (ft)
450
440
430
420
410
400
0
500
1000
1500
2000
2500
Legend
WS 100-Year
Ground
Ineff
Bank Sta

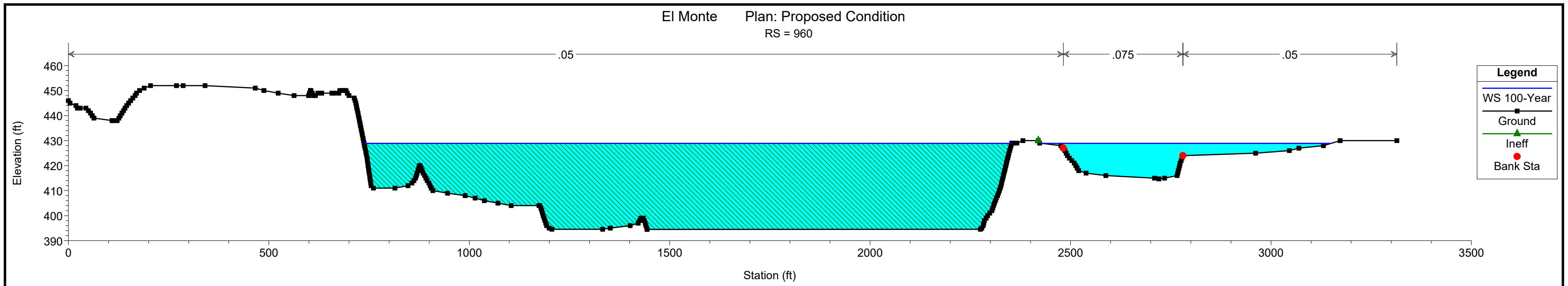

El Monte Plan: Proposed Condition
RS = 995
.075
.075
.05
Elevation (ft)
Station (ft)
450
440
430
420
410
400
0
500
1000
1500
2000
2500
Legend
WS 100-Year
Ground
Ineff
Bank Sta

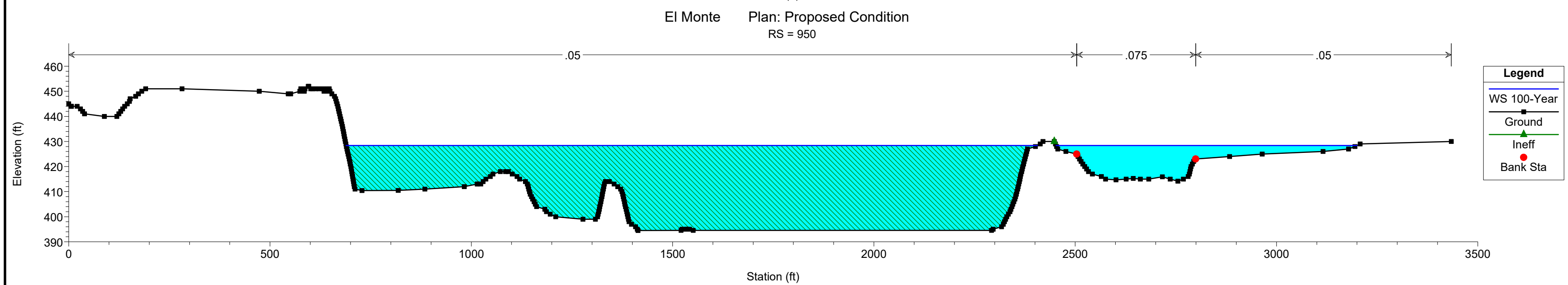

El Monte Plan: Proposed Condition
RS = 992
.075
.075
.05
Elevation (ft)
Station (ft)
450
440
430
420
410
400
0
500
1000
1500
2000
2500
Legend
WS 100-Year
Ground
Ineff
Bank Sta

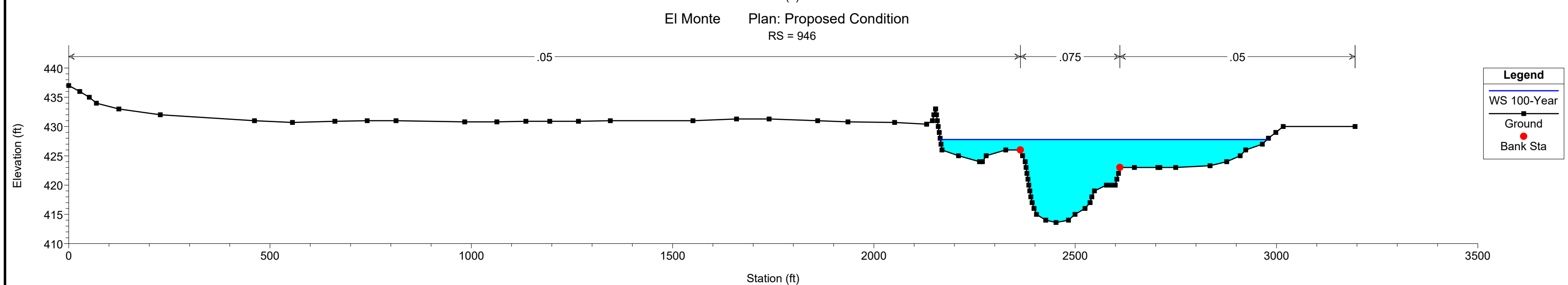

El Monte Plan: Proposed Condition
RS = 988
.05
.075
.05
Elevation (ft)
Station (ft)
445
440
435
430
425
420
0
500
1000
1500
2000
2500
3000
Legend
WS 100-Year
Ground
Ineff
Bank Sta

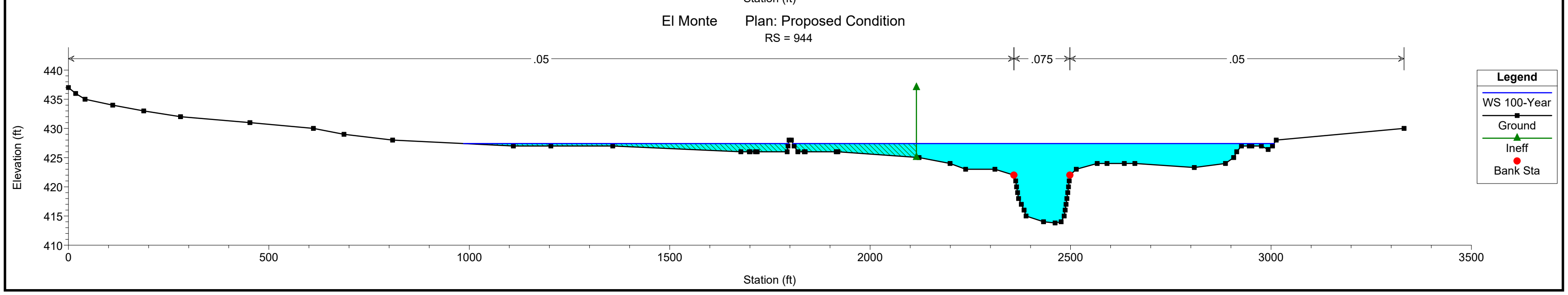

El Monte Plan: Proposed Condition
RS = 985
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition
RS = 983
El Monte Plan: Proposed Condition
RS = 980
El Monte Plan: Proposed Condition
RS = 978

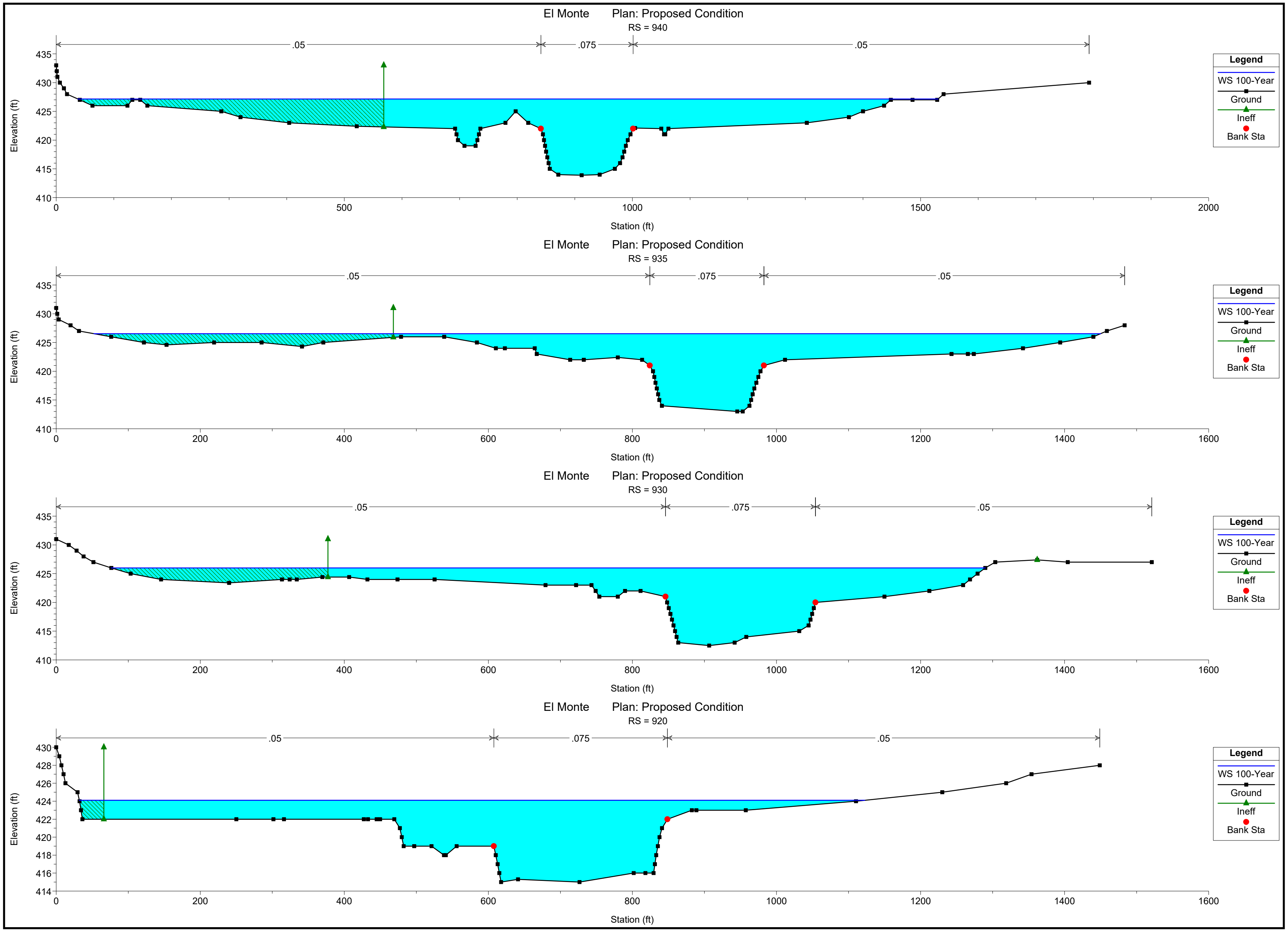

El Monte Plan: Proposed Condition
RS = 975
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition
RS = 973
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition
RS = 970
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition
RS = 965
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

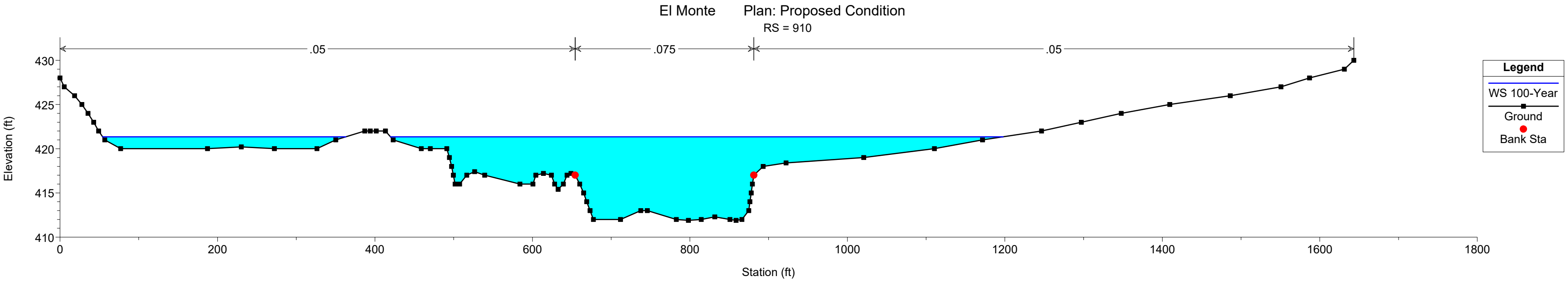

El Monte Plan: Proposed Condition
RS = 960
.05
.075
.05
Elevation (ft)
Station (ft)
460
450
440
430
420
410
400
390
0
500
1000
1500
2000
2500
3000
3500
Legend
WS 100-Year
Ground
Ineff
Bank Sta

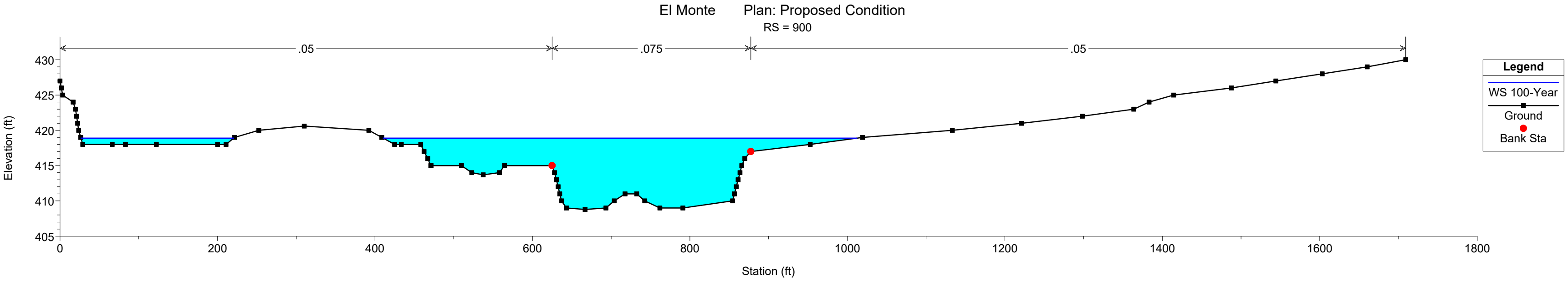

El Monte Plan: Proposed Condition
RS = 950
.05
.075
.05
Elevation (ft)
Station (ft)
460
450
440
430
420
410
400
390
0
500
1000
1500
2000
2500
3000
3500
Legend
WS 100-Year
Ground
Ineff
Bank Sta

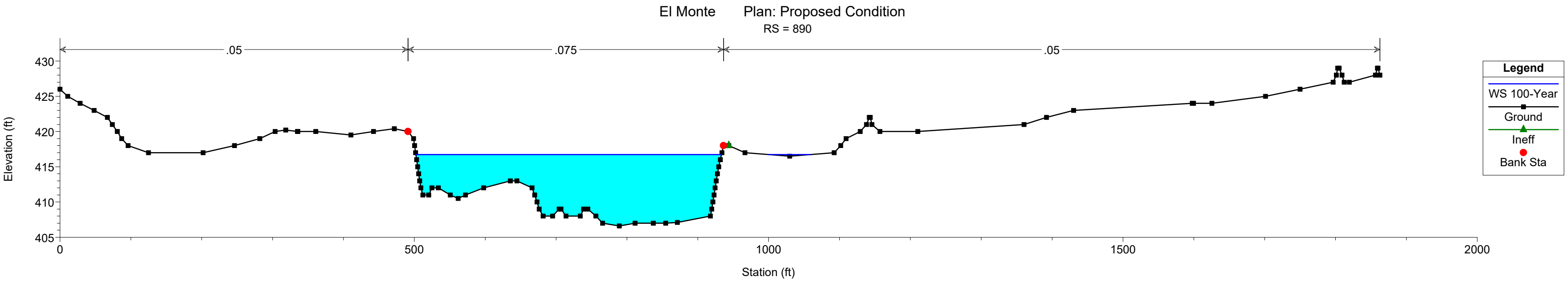

El Monte Plan: Proposed Condition
RS = 946
.05
.075
.05
Elevation (ft)
Station (ft)
440
435
430
425
420
415
410
0
500
1000
1500
2000
2500
3000
3500
Legend
WS 100-Year
Ground
Bank Sta

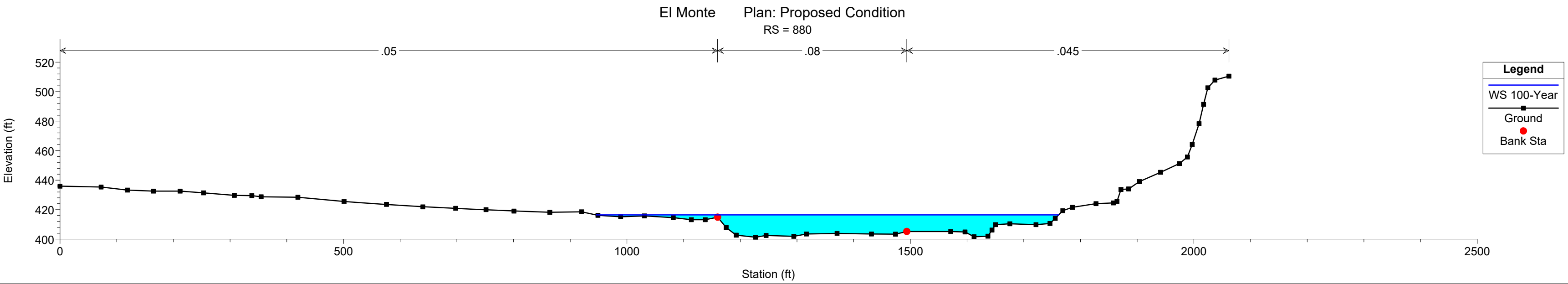

El Monte Plan: Proposed Condition
RS = 944
.05
.075
.05
Elevation (ft)
Station (ft)
440
435
430
425
420
415
410
0
500
1000
1500
2000
2500
3000
3500
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition
RS = 940
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition
RS = 935
El Monte Plan: Proposed Condition
RS = 930
El Monte Plan: Proposed Condition
RS = 920


El Monte Plan: Proposed Condition
RS = 910
.05
.075
.05
Elevation (ft)
410
415
420
425
430
Station (ft)
0
200
400
600
800
1000
1200
1400
1600
1800
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Proposed Condition
RS = 900
.05
.075
.05
Elevation (ft)
405
410
415
420
425
430
Station (ft)
0
200
400
600
800
1000
1200
1400
1600
1800
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Proposed Condition
RS = 890
.05
.075
.05
Elevation (ft)
405
410
415
420
425
430
Station (ft)
0
500
1000
1500
2000
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition
RS = 880
.05
.08
.045
Elevation (ft)
400
420
440
460
480
500
520
Station (ft)
0
500
1000
1500
2000
2500
Legend
WS 100-Year
Ground
Bank Sta

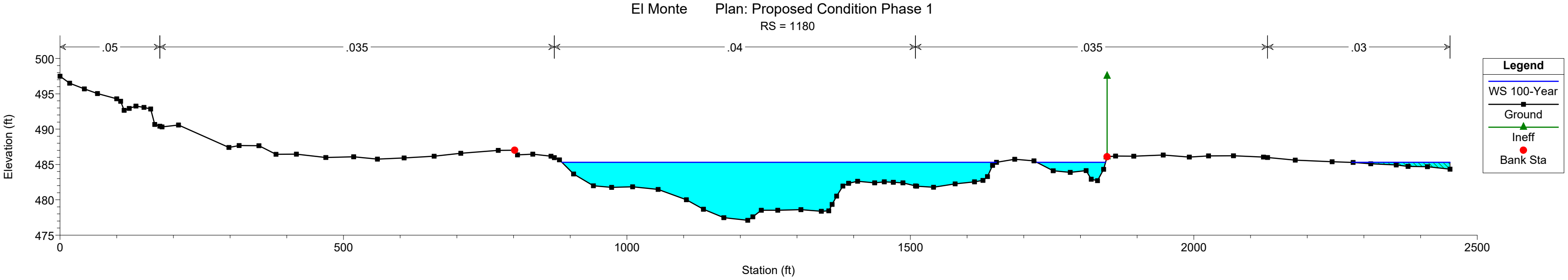
Proposed Conditions Phase 1

HEC-RAS Plan: PC Phase 1 River: RIVER-1 Reach: Reach-1 Profile: 100-Year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1180	100-Year	19000.00	477.10	485.30		485.74	0.002859	5.35	3552.51	1060.54	0.47
Reach-1	1170	100-Year	19000.00	471.34	481.16		481.63	0.004095	5.54	3565.42	1431.43	0.57
Reach-1	1165	100-Year	19000.00	472.32	478.74	477.70	479.12	0.003948	5.32	3893.79	1502.72	0.55
Reach-1	1160	100-Year	19000.00	469.99	474.55	474.55	475.49	0.014382	7.32	2477.28	1361.69	0.93
Reach-1	1150	100-Year	19000.00	458.04	462.76	462.76	464.57	0.018925	6.09	2126.56	526.64	0.59
Reach-1	1148	100-Year	19000.00	450.00	461.58		461.74	0.000404	3.15	6027.37	579.00	0.17
Reach-1	1140	100-Year	19000.00	450.00	461.43		461.50	0.001900	2.12	8951.35	1154.79	0.11
Reach-1	1130	100-Year	19000.00	450.00	460.61		460.65	0.001289	1.72	11068.02	1886.49	0.09
Reach-1	1120	100-Year	19000.00	450.00	460.02		460.07	0.001023	1.47	11568.96	1992.41	0.08
Reach-1	1110	100-Year	19000.00	449.04	458.61	454.11	459.07	0.004642	5.44	3490.27	704.10	0.34
Reach-1	1100	100-Year	20000.00	447.04	456.87		457.23	0.003604	4.96	4237.13	1257.77	0.30
Reach-1	1090	100-Year	20000.00	445.04	454.83		455.29	0.004200	5.58	3949.94	941.90	0.33
Reach-1	1080	100-Year	20000.00	443.04	453.59		453.95	0.003349	4.94	4287.46	733.94	0.29
Reach-1	1075	100-Year	20000.00	441.04	451.72		452.23	0.004927	5.94	3658.45	676.31	0.35
Reach-1	1070	100-Year	20000.00	439.04	450.25		450.63	0.003218	5.07	4176.33	610.10	0.29
Reach-1	1060	100-Year	20000.00	435.04	448.32		448.74	0.003228	5.36	4065.62	685.91	0.29
Reach-1	1050	100-Year	20000.00	434.04	445.92		446.44	0.004035	5.90	3633.25	782.37	0.32
Reach-1	1040	100-Year	20000.00	432.04	443.69	437.55	444.08	0.003018	5.08	4038.52	869.58	0.28
Reach-1	1030	100-Year	20000.00	429.04	441.86		442.39	0.003722	5.83	3480.44	401.20	0.31
Reach-1	1020	100-Year	20000.00	428.04	440.02		440.62	0.004510	6.22	3228.40	341.92	0.34
Reach-1	1017	100-Year	20000.00	427.04	438.56		439.35	0.006561	7.12	2838.63	375.40	0.41
Reach-1	1013	100-Year	20000.00	426.04	437.05		437.69	0.005441	6.45	3099.78	387.19	0.37
Reach-1	1010	100-Year	20000.00	425.04	436.51		436.82	0.002673	4.70	4592.73	714.02	0.26
Reach-1	1005	100-Year	20000.00	424.04	435.91		436.14	0.001971	4.16	5316.23	880.08	0.23
Reach-1	1000	100-Year	20000.00	423.04	435.30		435.53	0.001907	4.18	5329.39	1157.70	0.23
Reach-1	995	100-Year	20000.00	421.50	434.54		434.83	0.002100	4.45	4772.50	949.35	0.24
Reach-1	992	100-Year	20000.00	420.80	433.99		434.36	0.002591	5.02	4240.64	817.36	0.26
Reach-1	988	100-Year	20000.00	421.00	433.29	427.43	433.77	0.003600	5.74	3807.85	718.35	0.31
Reach-1	985	100-Year	20000.00	419.00	432.26	427.71	432.90	0.005060	6.84	3312.60	2243.60	0.37
Reach-1	983	100-Year	20000.00	418.40	431.94	425.26	432.28	0.002390	4.86	4393.57	2267.80	0.25
Reach-1	980	100-Year	20000.00	418.00	431.42	425.16	431.84	0.002972	5.35	3984.14	2199.31	0.28
Reach-1	978	100-Year	20000.00	418.00	431.04	424.48	431.45	0.002795	5.29	4043.18	2228.92	0.27
Reach-1	975	100-Year	20000.00	417.00	430.64	424.17	431.00	0.002583	4.98	4258.09	2303.30	0.26
Reach-1	973	100-Year	20000.00	416.70	430.24	423.87	430.59	0.002590	4.95	4294.13	2361.87	0.26
Reach-1	970	100-Year	20000.00	415.70	429.69	423.18	430.06	0.002708	5.12	4263.54	2315.13	0.27
Reach-1	965	100-Year	20000.00	415.20	429.28	422.58	429.61	0.002416	4.91	4477.57	2252.77	0.26
Reach-1	960	100-Year	20000.00	414.70	428.88	421.68	429.17	0.001960	4.57	4841.62	2335.43	0.23
Reach-1	950	100-Year	20000.00	414.20	428.38	421.18	428.66	0.001845	4.48	5013.38	2463.93	0.23

HEC-RAS Plan: PC Phase 1 River: RIVER-1 Reach: Reach-1 Profile: 100-Year (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	946	100-Year	20000.00	413.60	427.79		428.11	0.002681	4.95	4580.39	811.72	0.27
Reach-1	944	100-Year	20000.00	413.80	427.41		427.82	0.003449	6.01	4198.62	2010.58	0.31
Reach-1	940	100-Year	20000.00	413.90	427.15		427.41	0.002083	4.63	5113.21	1492.87	0.24
Reach-1	935	100-Year	20000.00	413.00	426.54		426.92	0.003177	5.80	4425.96	1397.69	0.29
Reach-1	930	100-Year	20000.00	412.50	426.00	421.47	426.31	0.002404	4.99	4788.01	1213.43	0.26
Reach-1	920	100-Year	20000.00	415.00	424.10		424.59	0.005934	6.22	3772.22	1090.18	0.38
Reach-1	910	100-Year	20000.00	411.90	421.35		421.84	0.005661	6.31	3814.74	1087.02	0.38
Reach-1	900	100-Year	20000.00	408.80	418.89		419.55	0.006822	6.93	3236.08	795.57	0.41
Reach-1	890	100-Year	20000.00	406.60	416.73	413.45	417.37	0.007507	6.39	3131.86	490.61	0.42
Reach-1	880	100-Year	20000.00	401.24	416.38	407.37	416.52	0.000601	2.49	7150.42	815.42	0.12


El Monte Plan: Proposed Condition Phase 1
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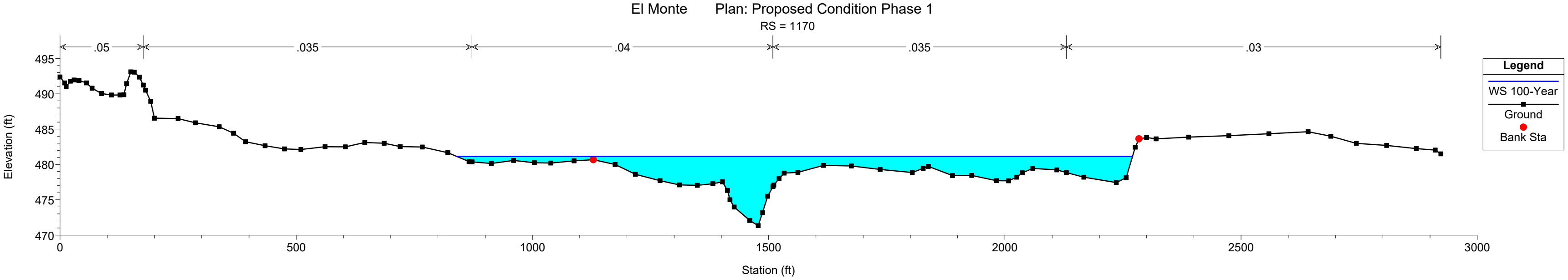
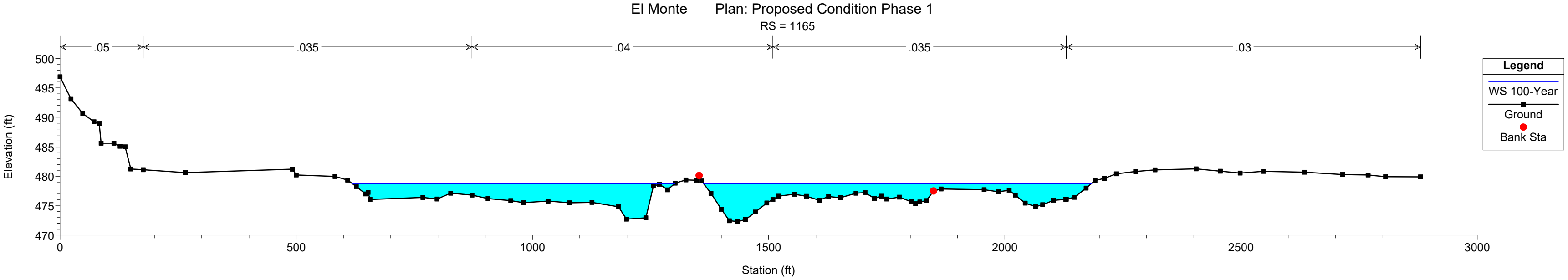
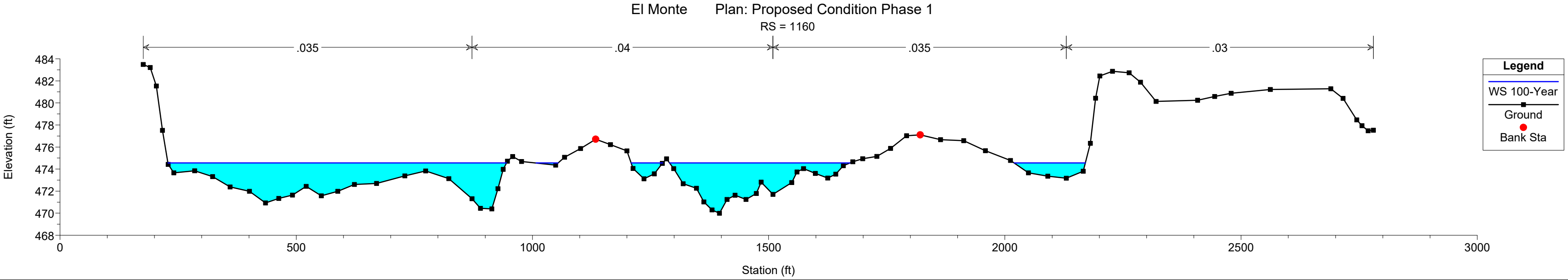
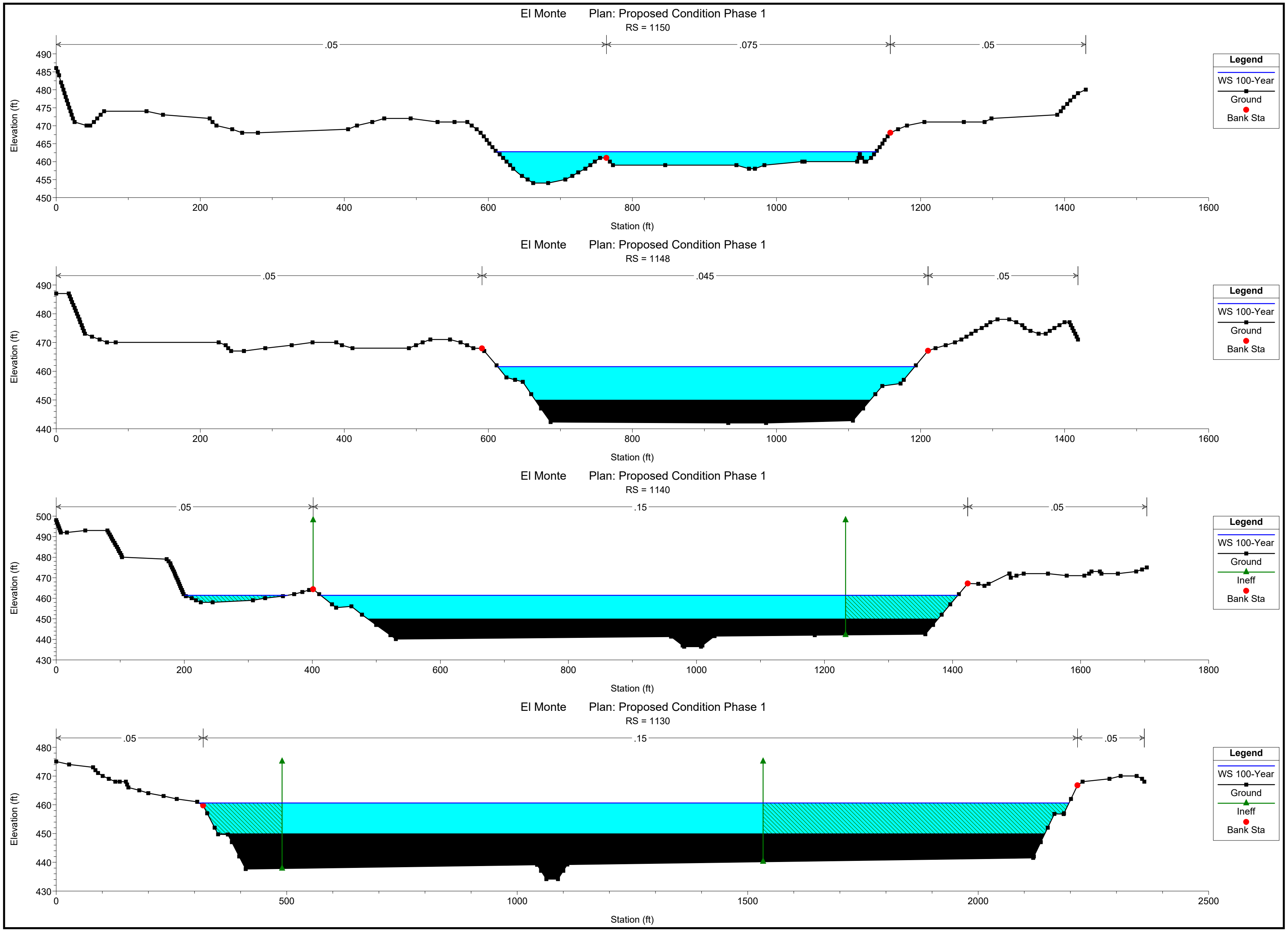
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

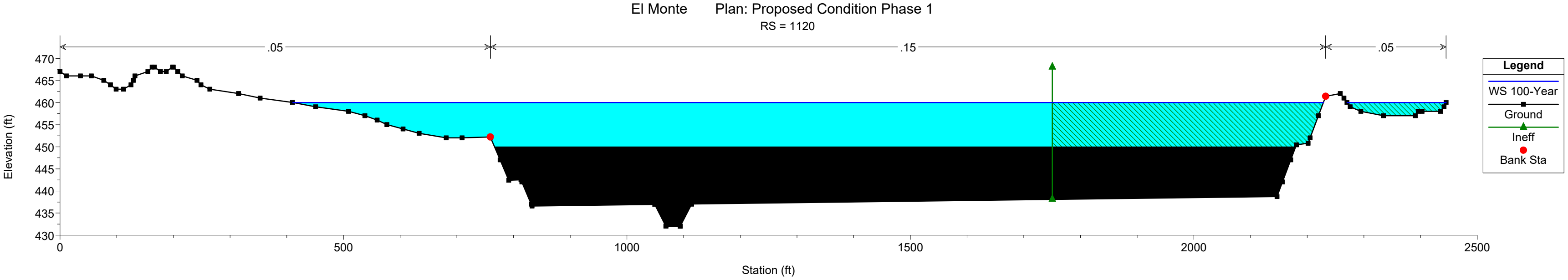

El Monte Plan: Proposed Condition Phase 1
RS = 1170
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

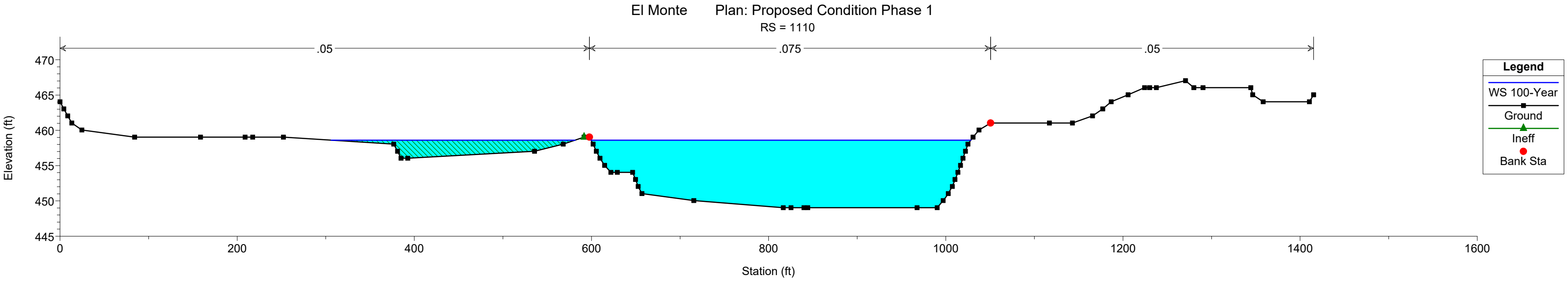

El Monte Plan: Proposed Condition Phase 1
RS = 1165
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

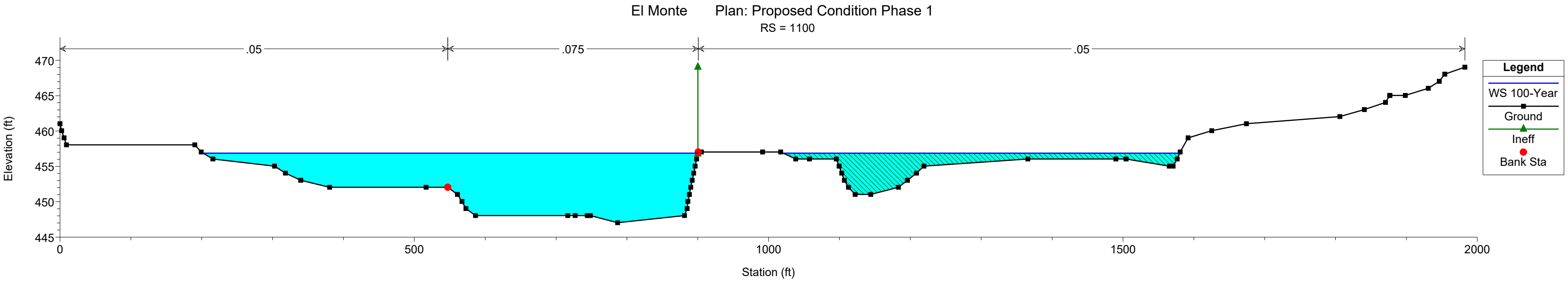

El Monte Plan: Proposed Condition Phase 1
RS = 1160
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

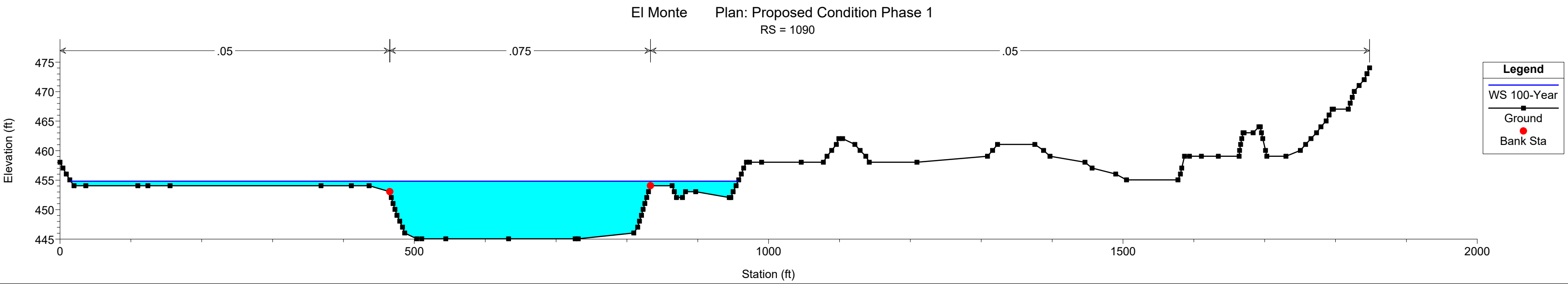


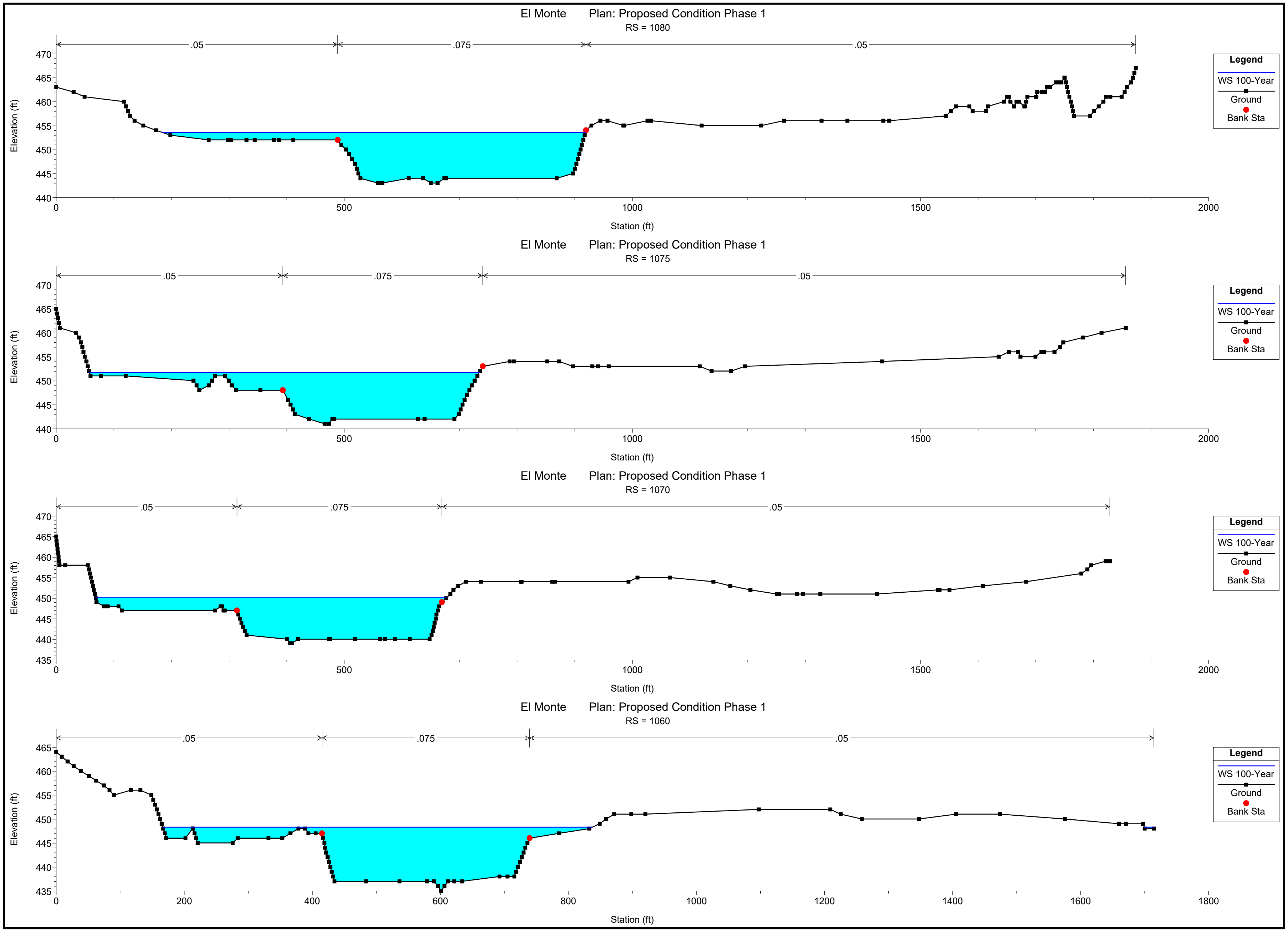
El Monte Plan: Proposed Condition Phase 1
RS = 1150
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1148
.05
.045
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1140
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1130
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

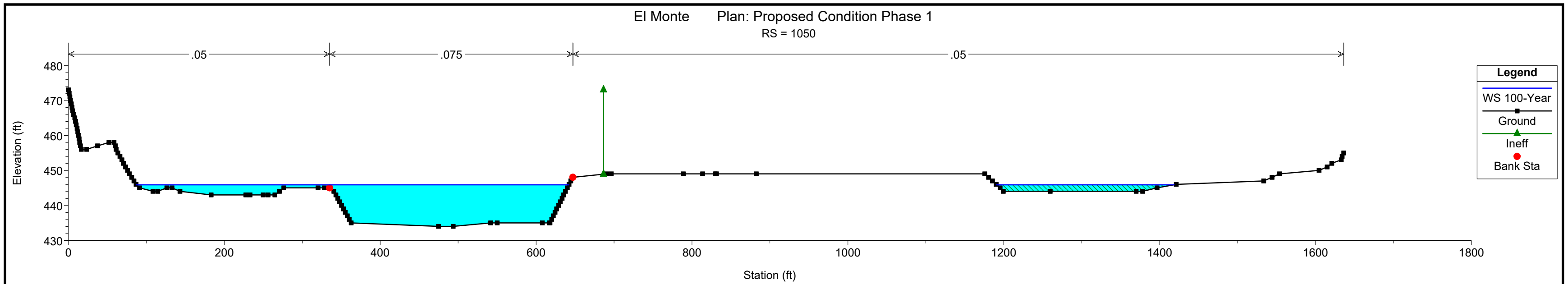

El Monte Plan: Proposed Condition Phase 1
RS = 1120
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

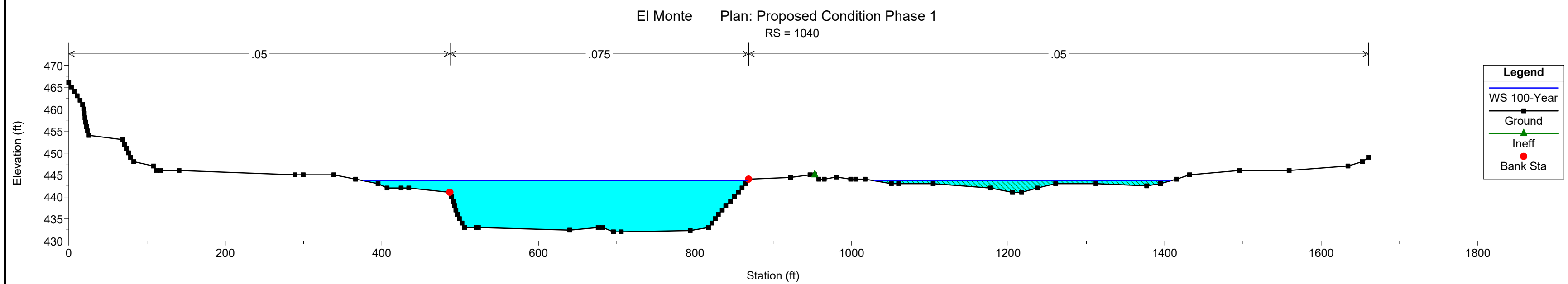

El Monte Plan: Proposed Condition Phase 1
RS = 1110
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

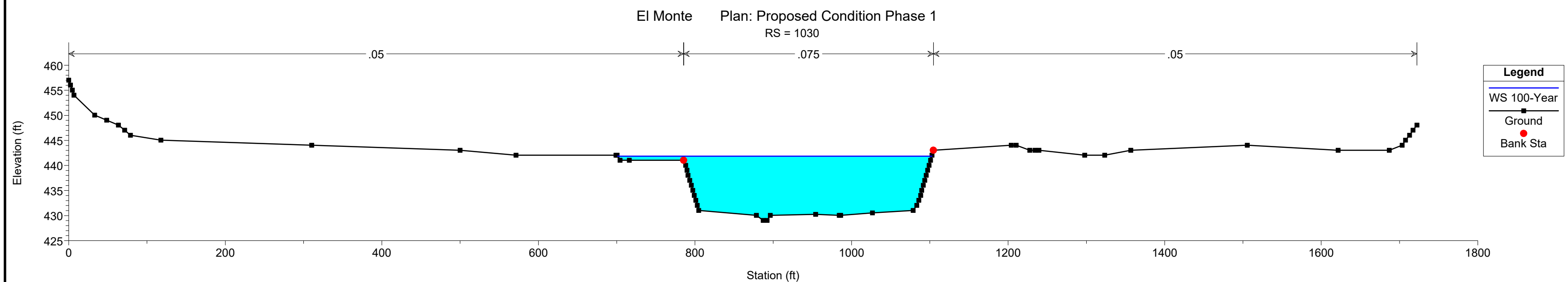

El Monte Plan: Proposed Condition Phase 1
RS = 1100
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

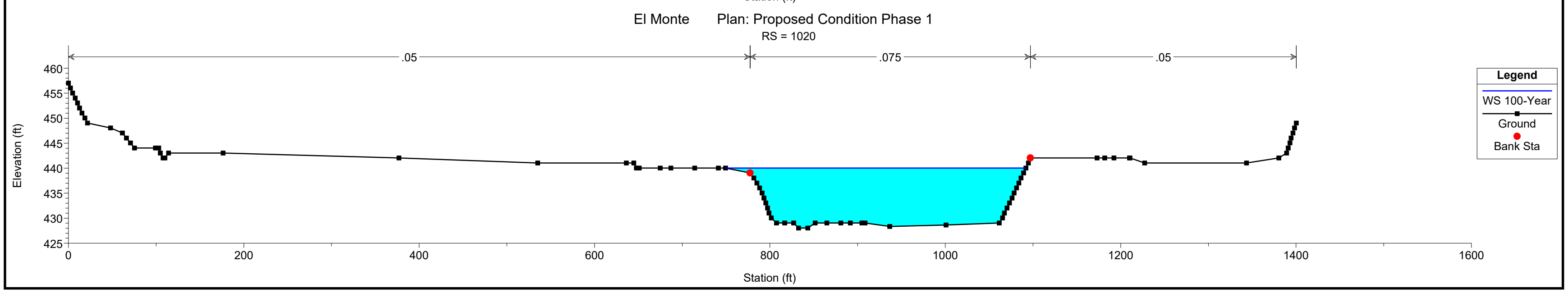

El Monte Plan: Proposed Condition Phase 1
RS = 1090
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

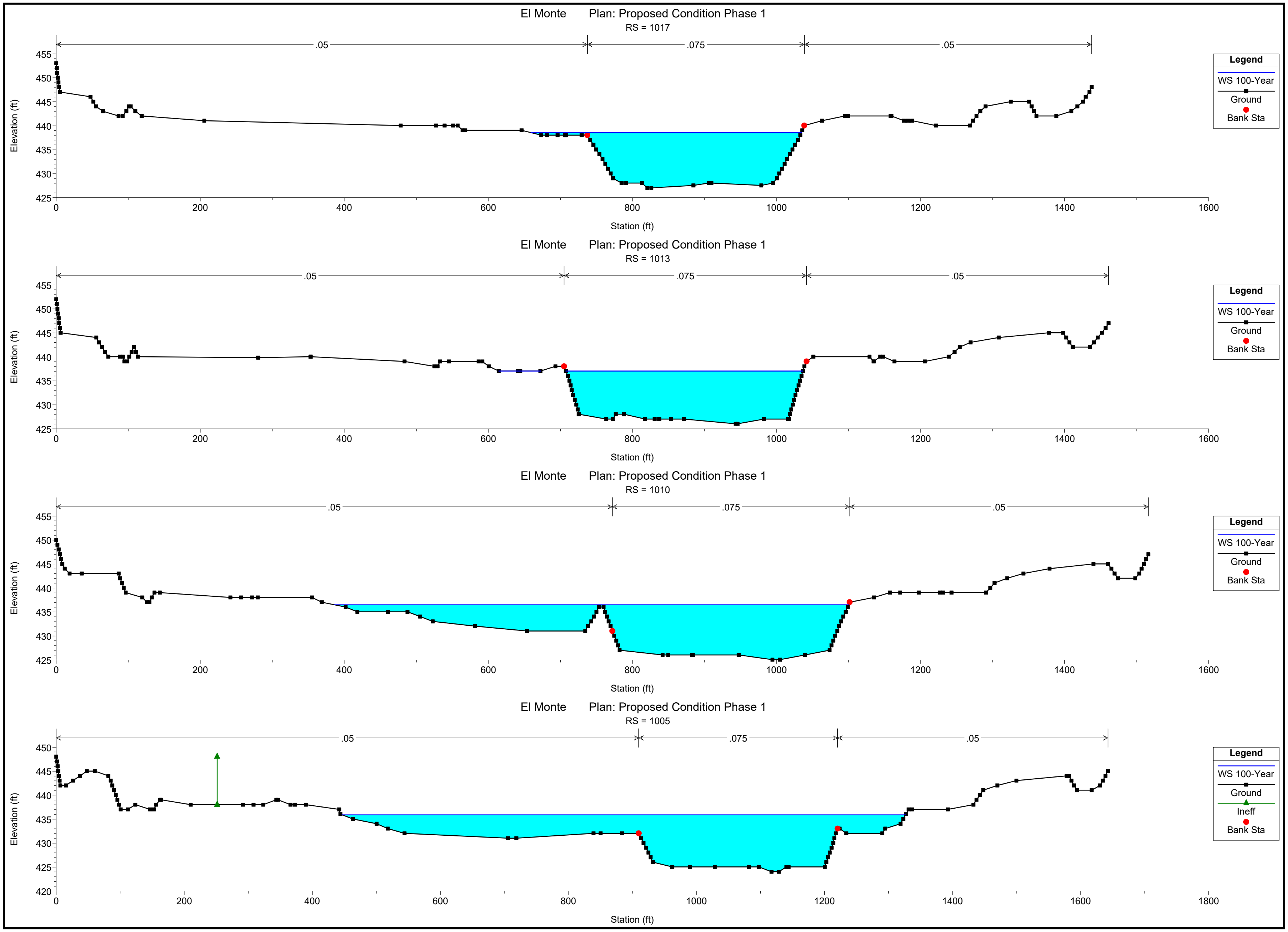

El Monte Plan: Proposed Condition Phase 1
RS = 1080
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1075
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1070
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1060
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

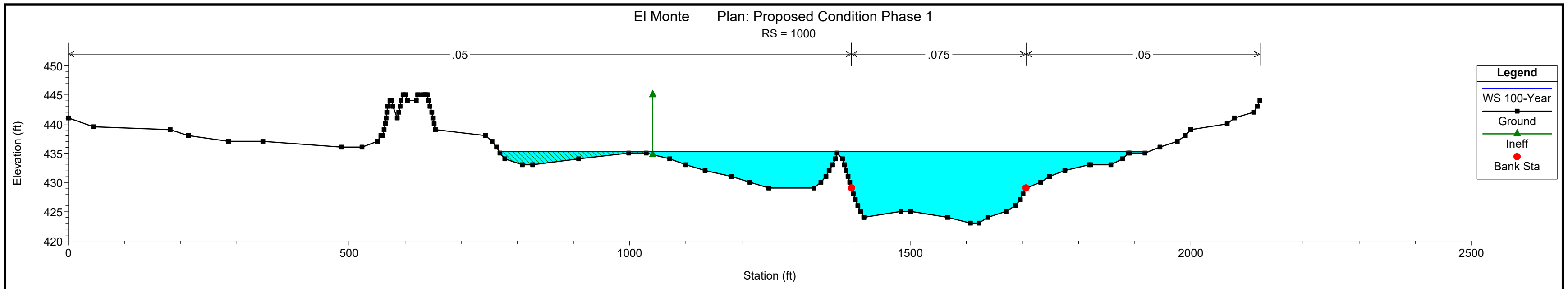

El Monte Plan: Proposed Condition Phase 1
RS = 1050
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1
RS = 1040
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

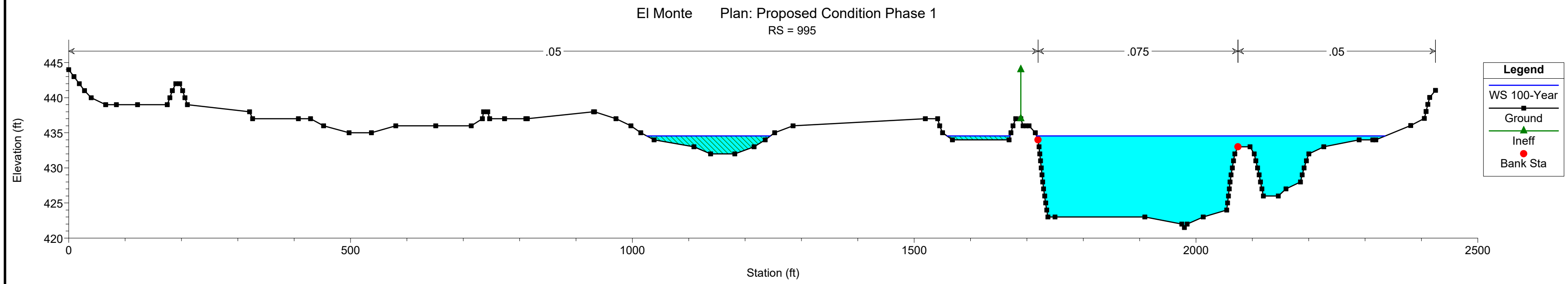

El Monte Plan: Proposed Condition Phase 1
RS = 1030
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Proposed Condition Phase 1
RS = 1020
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

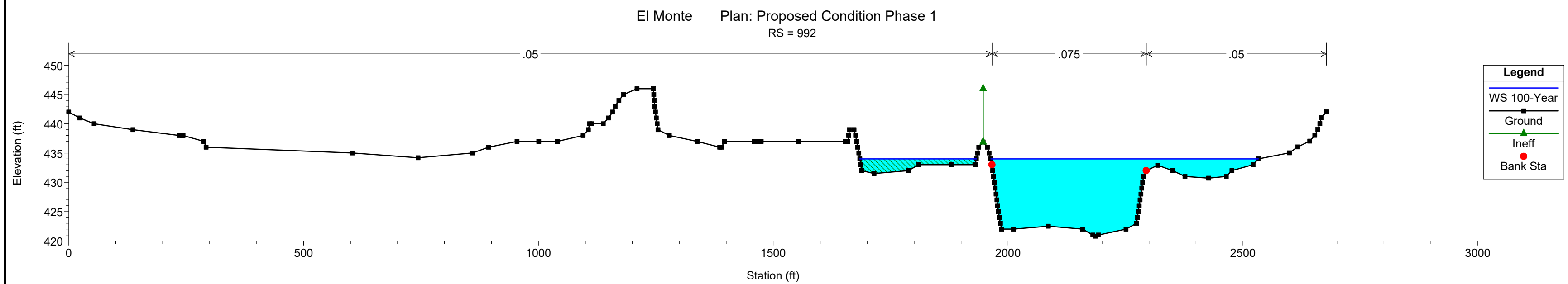

El Monte Plan: Proposed Condition Phase 1
RS = 1017
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1013
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1010
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 1005
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



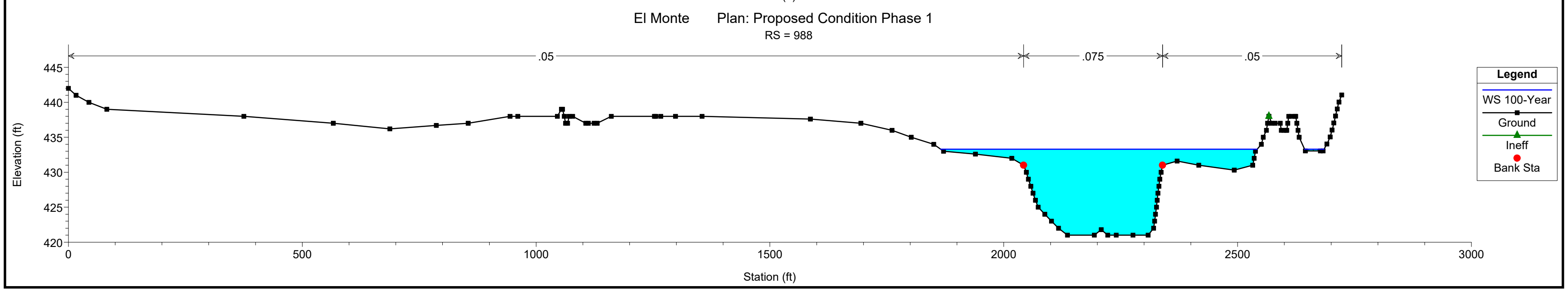
El Monte Plan: Proposed Condition Phase 1
RS = 1000
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



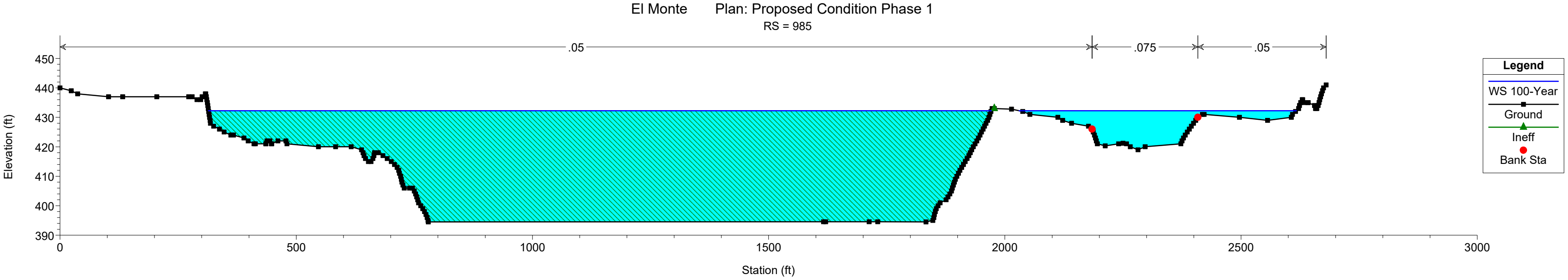
El Monte Plan: Proposed Condition Phase 1
RS = 995
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



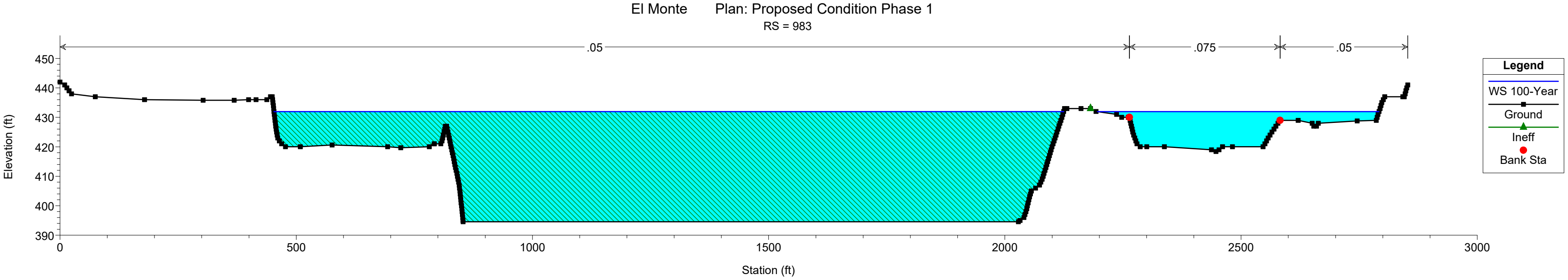
El Monte Plan: Proposed Condition Phase 1
RS = 992
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



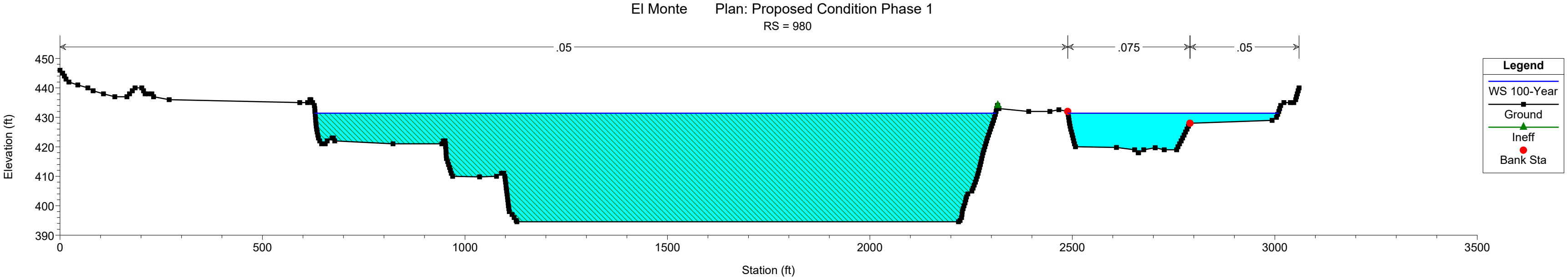
El Monte Plan: Proposed Condition Phase 1
RS = 988
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



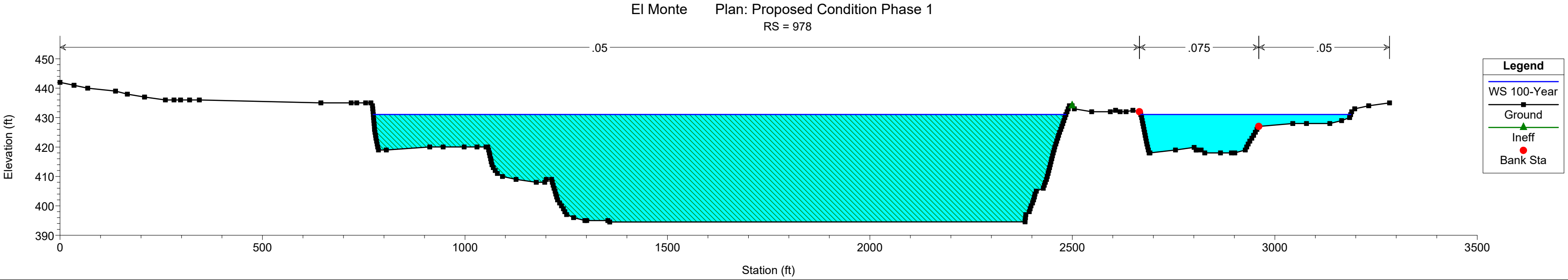
El Monte Plan: Proposed Condition Phase 1
RS = 985
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



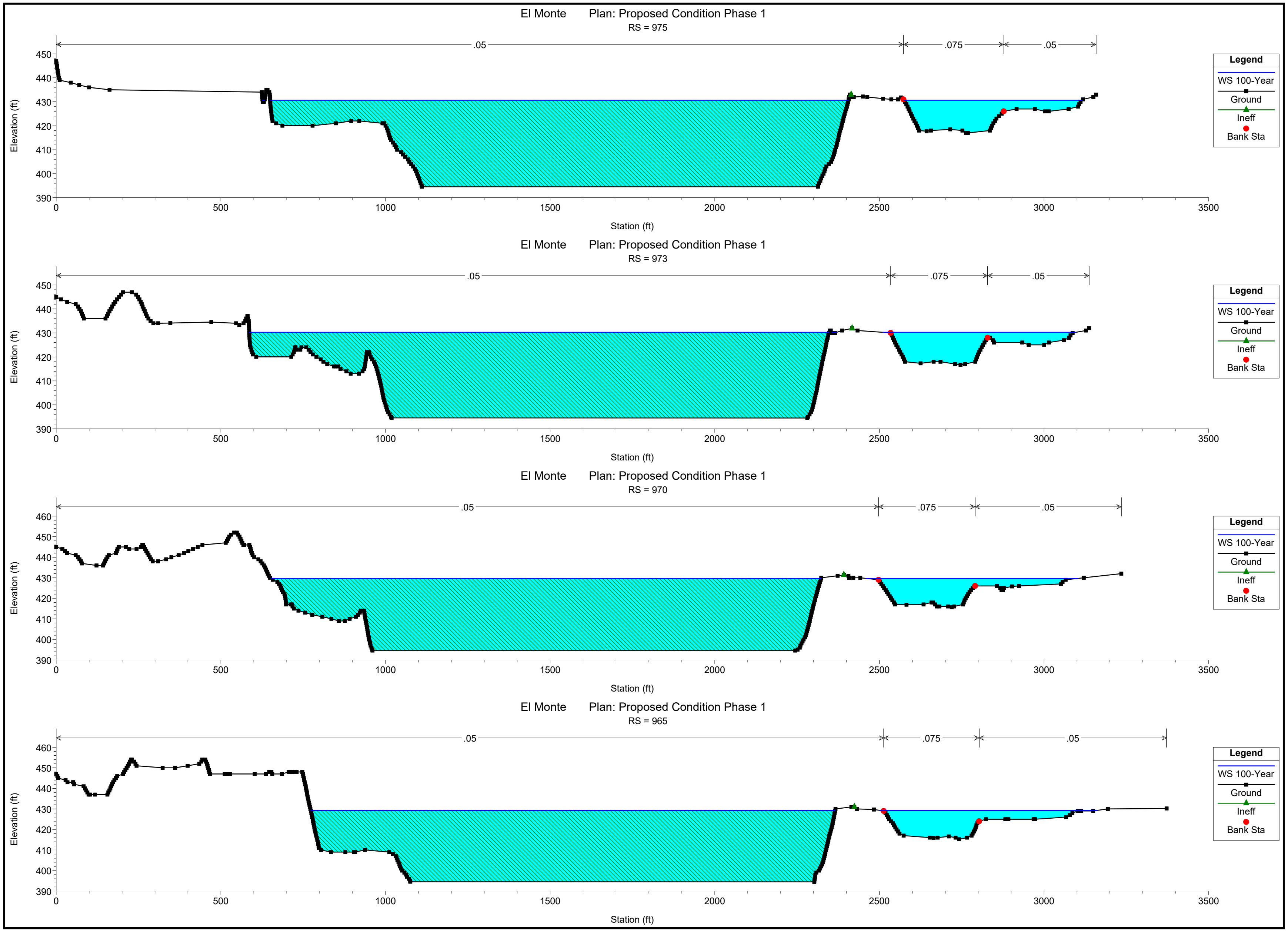
El Monte Plan: Proposed Condition Phase 1
RS = 983
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

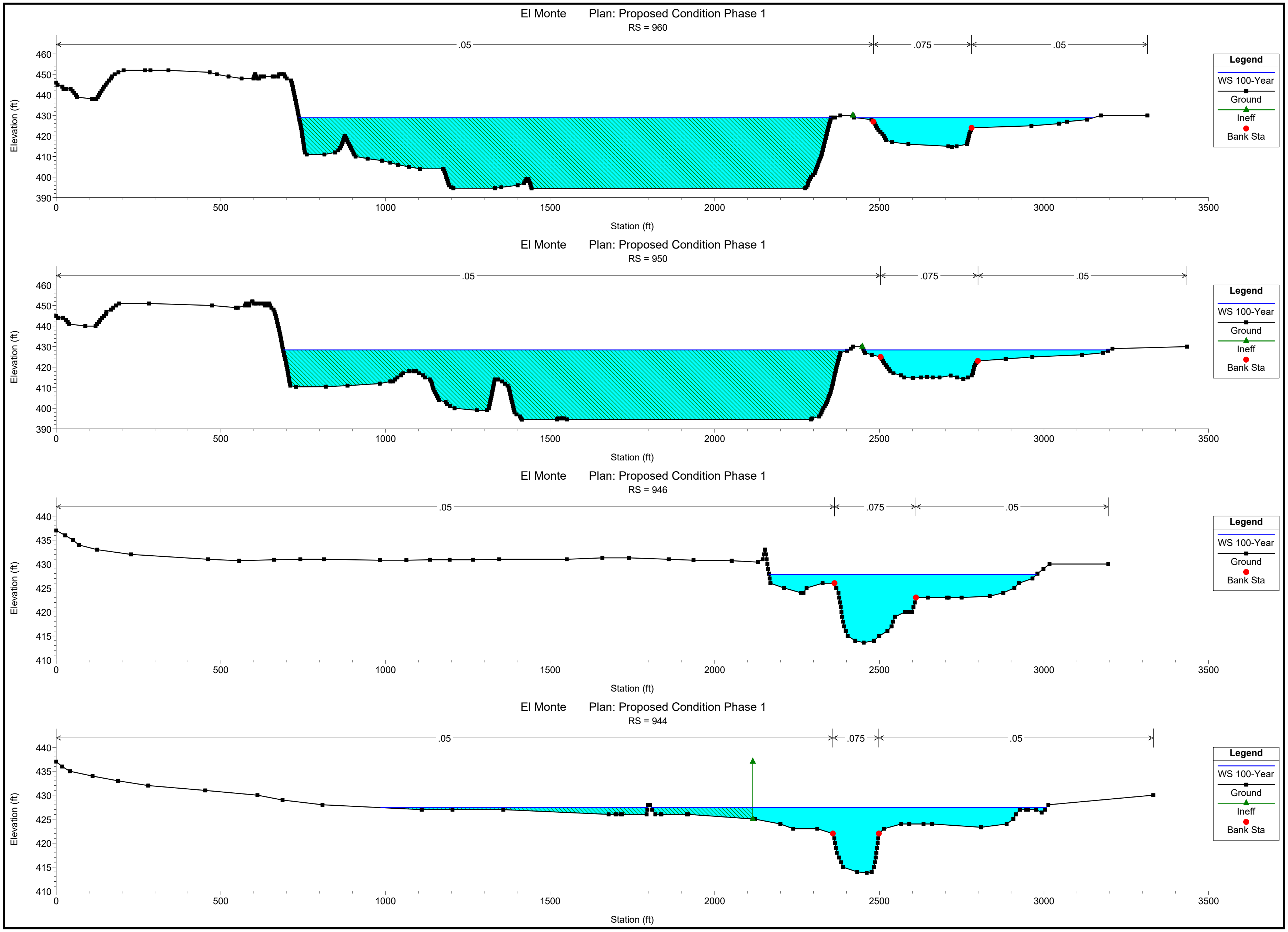


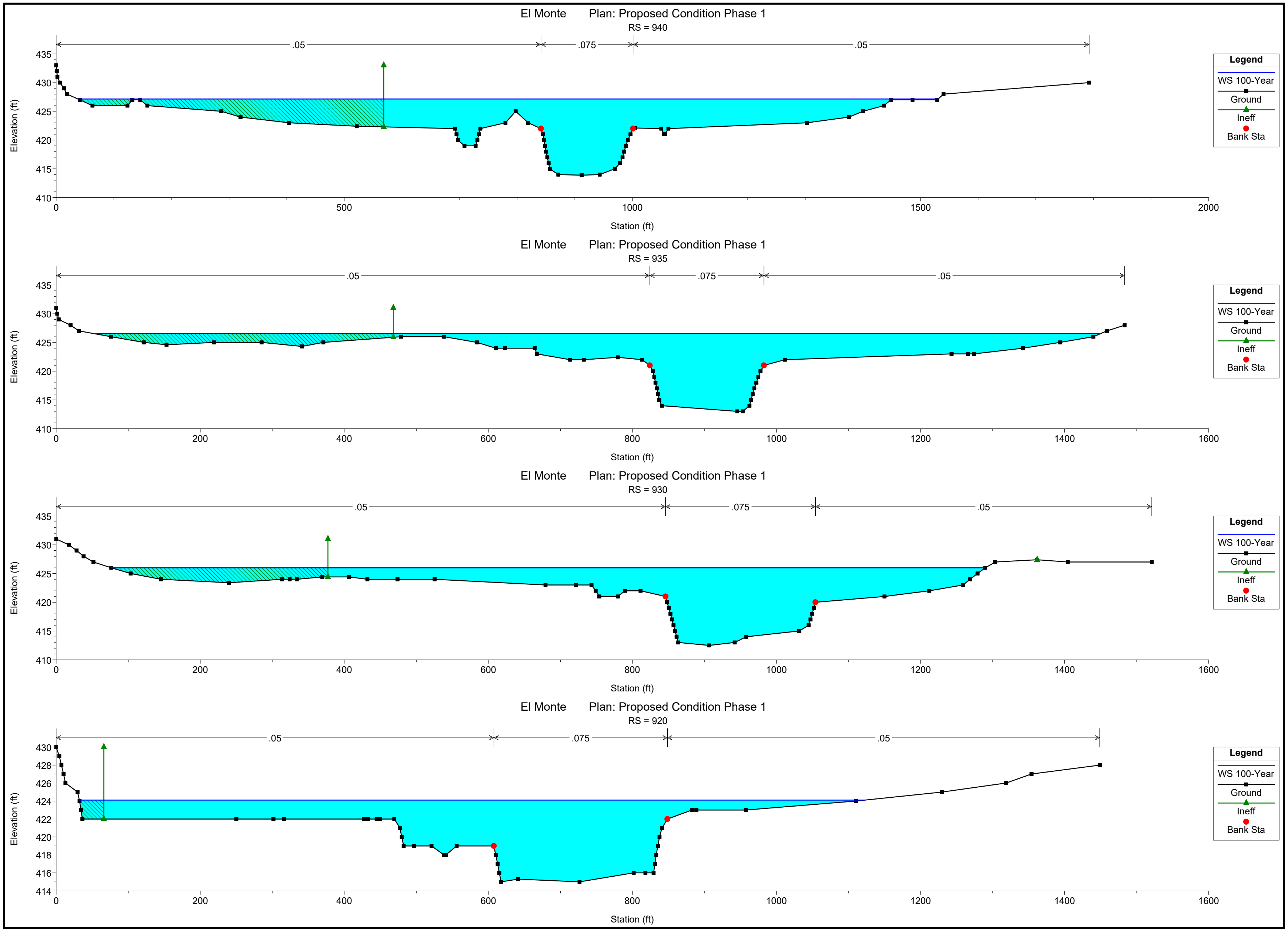
El Monte Plan: Proposed Condition Phase 1
RS = 980
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



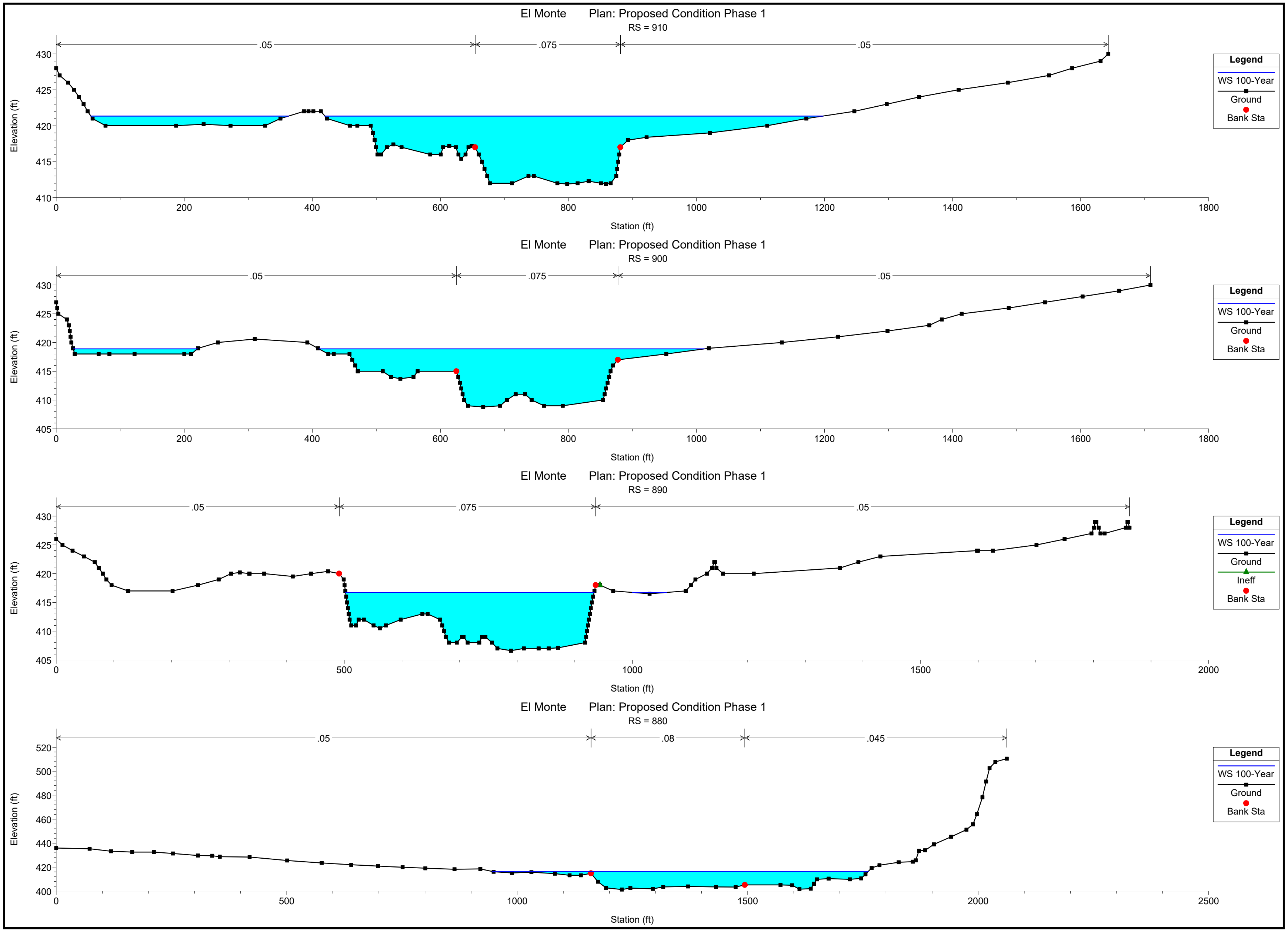
El Monte Plan: Proposed Condition Phase 1
RS = 978
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1
RS = 975
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 973
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 970
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 965
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1
RS = 960
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 950
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 946
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 944
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



El Monte Plan: Proposed Condition Phase 1
RS = 940
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 935
El Monte Plan: Proposed Condition Phase 1
RS = 930
El Monte Plan: Proposed Condition Phase 1
RS = 920


El Monte Plan: Proposed Condition Phase 1
RS = 910
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 900
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 890
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1
RS = 880
.05
.08
.045
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

Proposed Conditions Phase 1 and 2

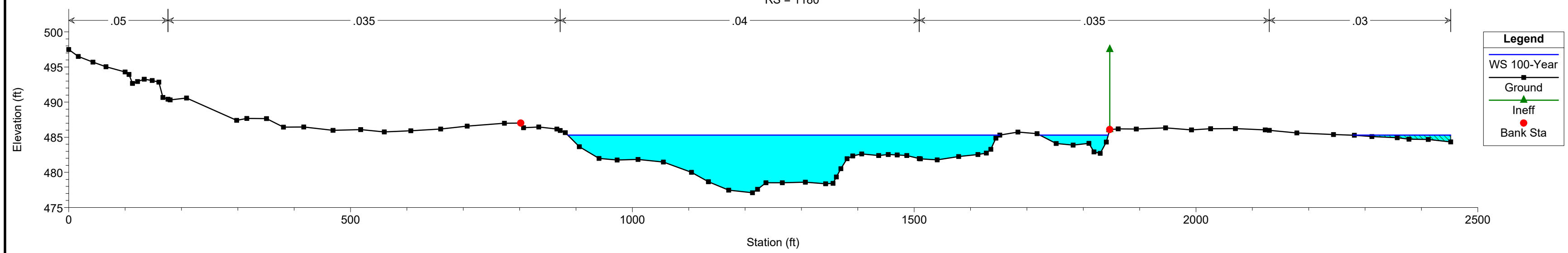
HEC-RAS Plan: PC Phase 1-2 River: RIVER-1 Reach: Reach-1 Profile: 100-Year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1180	100-Year	19000.00	477.10	485.30		485.74	0.002859	5.35	3552.51	1060.54	0.47
Reach-1	1170	100-Year	19000.00	471.34	481.16		481.63	0.004095	5.54	3565.42	1431.43	0.57
Reach-1	1165	100-Year	19000.00	472.32	478.74	477.70	479.12	0.003948	5.32	3893.79	1502.72	0.55
Reach-1	1160	100-Year	19000.00	469.99	474.55	474.55	475.49	0.014382	7.32	2477.28	1361.69	0.93
Reach-1	1150	100-Year	19000.00	458.04	462.76	462.76	464.57	0.018925	6.09	2126.56	526.64	0.59
Reach-1	1148	100-Year	19000.00	442.04	452.68		452.93	0.000729	4.05	4693.41	481.76	0.23
Reach-1	1140	100-Year	19000.00	436.46	452.48		452.56	0.002009	2.23	8532.31	908.41	0.12
Reach-1	1130	100-Year	19000.00	436.00	451.95		451.98	0.000642	1.39	13644.48	1806.78	0.07
Reach-1	1120	100-Year	19000.00	436.00	451.64		451.67	0.000585	1.38	13741.57	1442.94	0.07
Reach-1	1110	100-Year	19000.00	436.00	451.35	438.49	451.38	0.000541	1.35	14093.19	990.80	0.06
Reach-1	1100	100-Year	20000.00	436.00	451.11		451.14	0.000472	1.27	15792.73	1102.68	0.06
Reach-1	1090	100-Year	20000.00	436.00	450.89		450.91	0.000490	1.26	15812.91	1136.64	0.06
Reach-1	1080	100-Year	20000.00	436.00	450.69		450.72	0.000511	1.30	14875.41	1133.20	0.06
Reach-1	1075	100-Year	20000.00	436.00	450.50	438.70	450.54	0.000457	1.22	14443.10	1315.34	0.06
Reach-1	1070	100-Year	20000.00	436.00	450.21	439.22	450.28	0.001492	2.10	9531.31	1347.59	0.10
Reach-1	1060	100-Year	20000.00	435.04	448.32		448.74	0.003228	5.36	4065.62	685.91	0.29
Reach-1	1050	100-Year	20000.00	434.04	445.92		446.44	0.004035	5.90	3633.25	782.37	0.32
Reach-1	1040	100-Year	20000.00	432.04	443.69	437.55	444.08	0.003018	5.08	4038.52	869.58	0.28
Reach-1	1030	100-Year	20000.00	429.04	441.86		442.39	0.003722	5.83	3480.44	401.20	0.31
Reach-1	1020	100-Year	20000.00	428.04	440.02		440.62	0.004510	6.22	3228.40	341.92	0.34
Reach-1	1017	100-Year	20000.00	427.04	438.56		439.35	0.006561	7.12	2838.63	375.40	0.41
Reach-1	1013	100-Year	20000.00	426.04	437.05		437.69	0.005441	6.45	3099.78	387.19	0.37
Reach-1	1010	100-Year	20000.00	425.04	436.51		436.82	0.002673	4.70	4592.73	714.02	0.26
Reach-1	1005	100-Year	20000.00	424.04	435.91		436.14	0.001971	4.16	5316.23	880.08	0.23
Reach-1	1000	100-Year	20000.00	423.04	435.30		435.53	0.001907	4.18	5329.39	1157.70	0.23
Reach-1	995	100-Year	20000.00	421.50	434.54		434.83	0.002100	4.45	4772.50	949.35	0.24
Reach-1	992	100-Year	20000.00	420.80	433.99		434.36	0.002591	5.02	4240.64	817.36	0.26
Reach-1	988	100-Year	20000.00	421.00	433.29	427.43	433.77	0.003600	5.74	3807.85	718.35	0.31
Reach-1	985	100-Year	20000.00	419.00	432.26	427.71	432.90	0.005060	6.84	3312.60	2243.60	0.37
Reach-1	983	100-Year	20000.00	418.40	431.94	425.26	432.28	0.002390	4.86	4393.57	2267.80	0.25
Reach-1	980	100-Year	20000.00	418.00	431.42	425.16	431.84	0.002972	5.35	3984.14	2199.31	0.28
Reach-1	978	100-Year	20000.00	418.00	431.04	424.48	431.45	0.002795	5.29	4043.18	2228.92	0.27
Reach-1	975	100-Year	20000.00	417.00	430.64	424.17	431.00	0.002583	4.98	4258.09	2303.30	0.26
Reach-1	973	100-Year	20000.00	416.70	430.24	423.87	430.59	0.002590	4.95	4294.13	2361.87	0.26
Reach-1	970	100-Year	20000.00	415.70	429.69	423.18	430.06	0.002708	5.12	4263.54	2315.13	0.27
Reach-1	965	100-Year	20000.00	415.20	429.28	422.58	429.61	0.002416	4.91	4477.57	2252.77	0.26
Reach-1	960	100-Year	20000.00	414.70	428.88	421.68	429.17	0.001960	4.57	4841.62	2335.43	0.23
Reach-1	950	100-Year	20000.00	414.20	428.38	421.18	428.66	0.001845	4.48	5013.38	2463.93	0.23

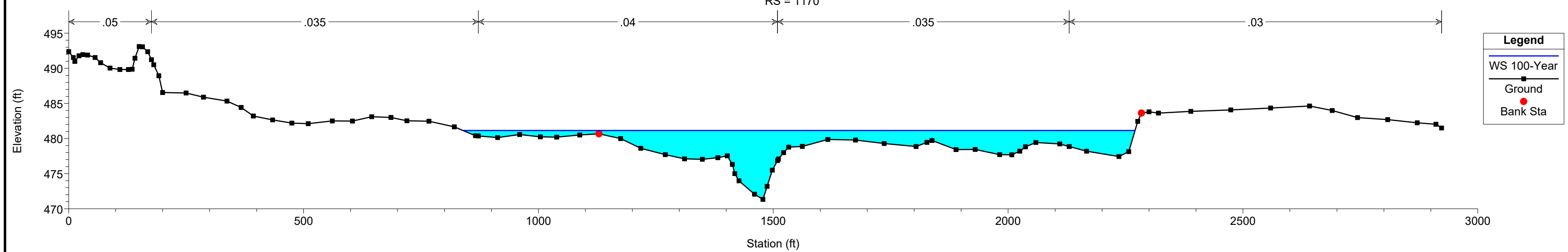
HEC-RAS Plan: PC Phase 1-2   River: RIVER-1   Reach: Reach-1   Profile: 100-Year (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	946	100-Year	20000.00	413.60	427.79		428.11	0.002681	4.95	4580.39	811.72	0.27
Reach-1	944	100-Year	20000.00	413.80	427.41		427.82	0.003449	6.01	4198.62	2010.58	0.31
Reach-1	940	100-Year	20000.00	413.90	427.15		427.41	0.002083	4.63	5113.21	1492.87	0.24
Reach-1	935	100-Year	20000.00	413.00	426.54		426.92	0.003177	5.80	4425.96	1397.69	0.29
Reach-1	930	100-Year	20000.00	412.50	426.00	421.47	426.31	0.002404	4.99	4788.01	1213.43	0.26
Reach-1	920	100-Year	20000.00	415.00	424.10		424.59	0.005934	6.22	3772.22	1090.18	0.38
Reach-1	910	100-Year	20000.00	411.90	421.35		421.84	0.005661	6.31	3814.74	1087.02	0.38
Reach-1	900	100-Year	20000.00	408.80	418.89		419.55	0.006822	6.93	3236.08	795.57	0.41
Reach-1	890	100-Year	20000.00	406.60	416.73	413.45	417.37	0.007507	6.39	3131.86	490.61	0.42
Reach-1	880	100-Year	20000.00	401.24	416.38	407.37	416.52	0.000601	2.49	7150.42	815.42	0.12

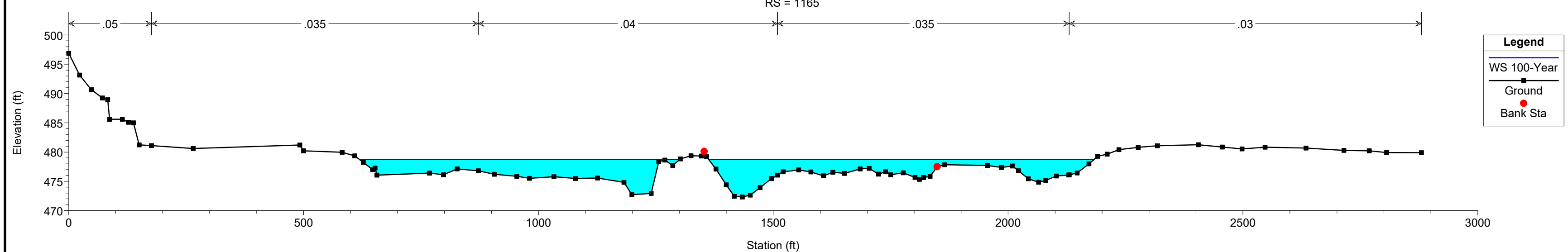
El Monte Plan: Proposed Condition Phase 1-2
RS = 1180



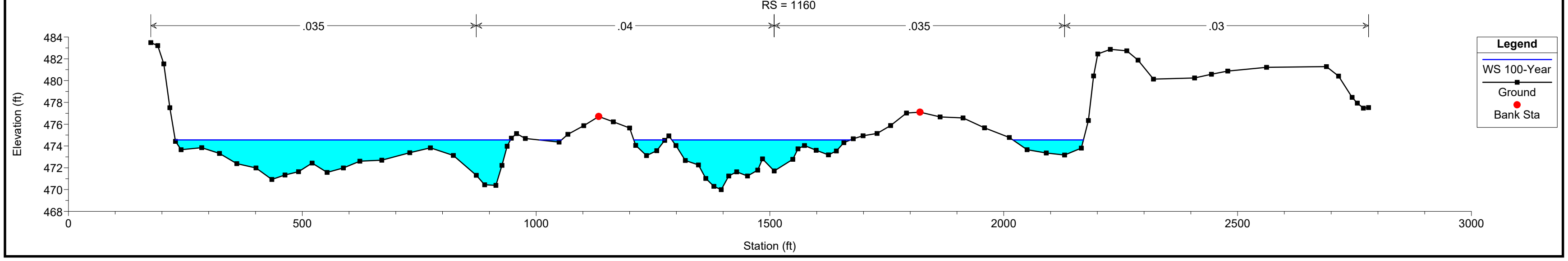
El Monte Plan: Proposed Condition Phase 1-2
RS = 1170

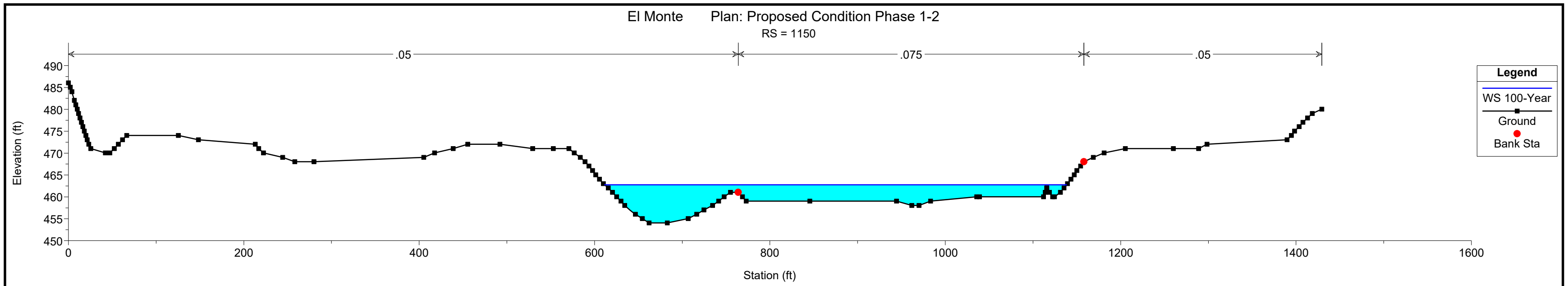


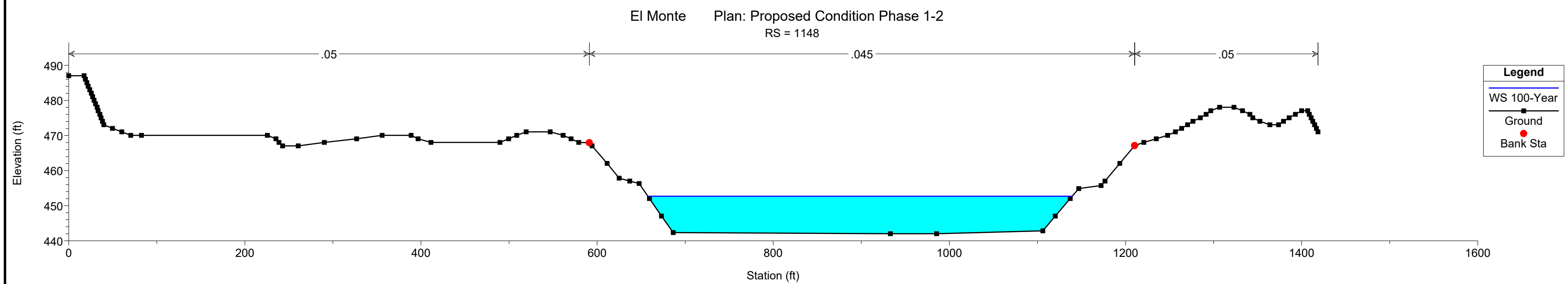
El Monte Plan: Proposed Condition Phase 1-2
RS = 1165

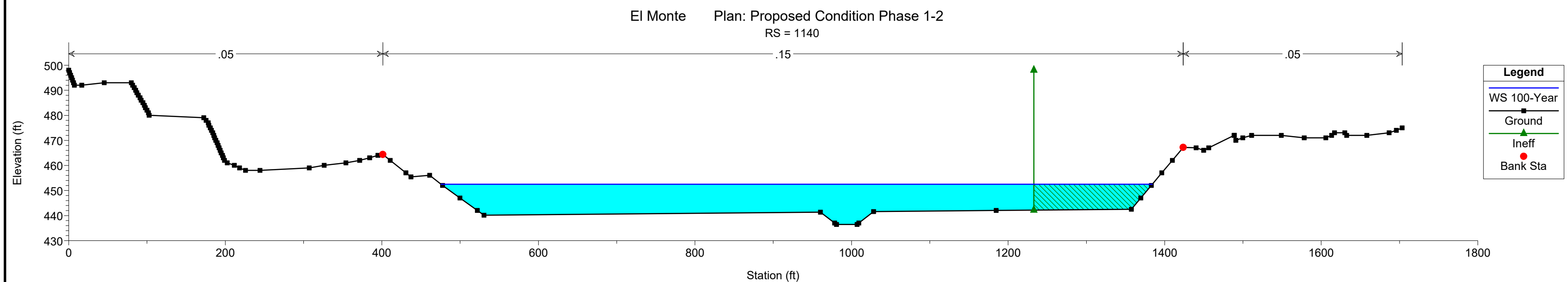


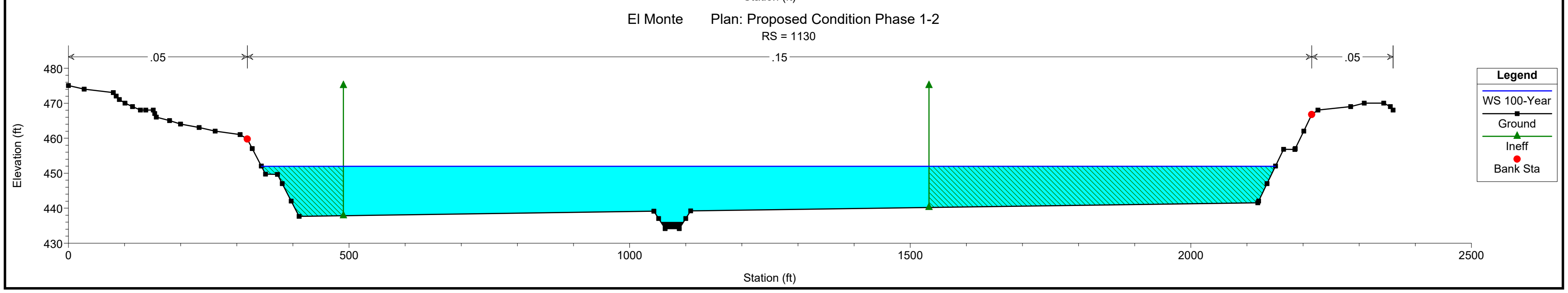
El Monte Plan: Proposed Condition Phase 1-2
RS = 1160

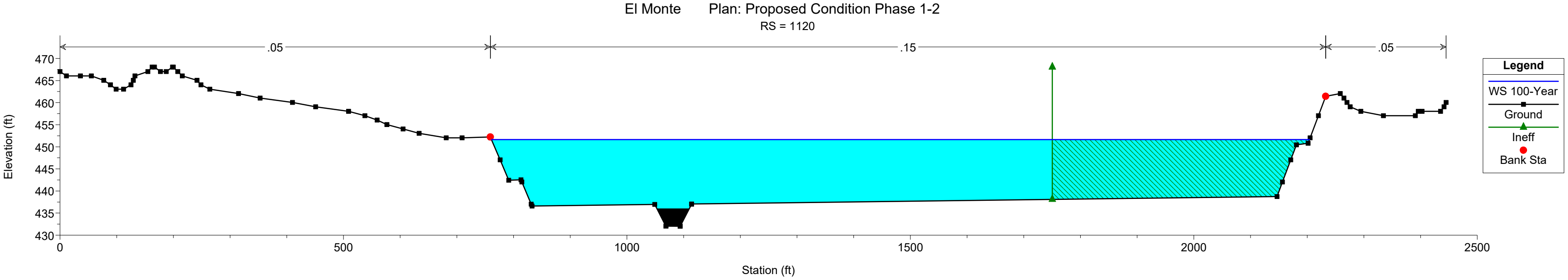



El Monte Plan: Proposed Condition Phase 1-2
RS = 1150
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

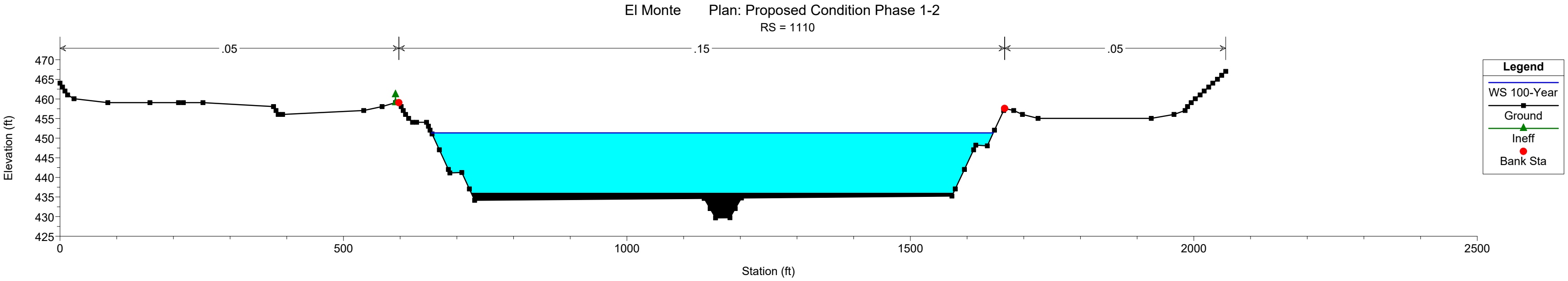

El Monte Plan: Proposed Condition Phase 1-2
RS = 1148
.05
.045
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Proposed Condition Phase 1-2
RS = 1140
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

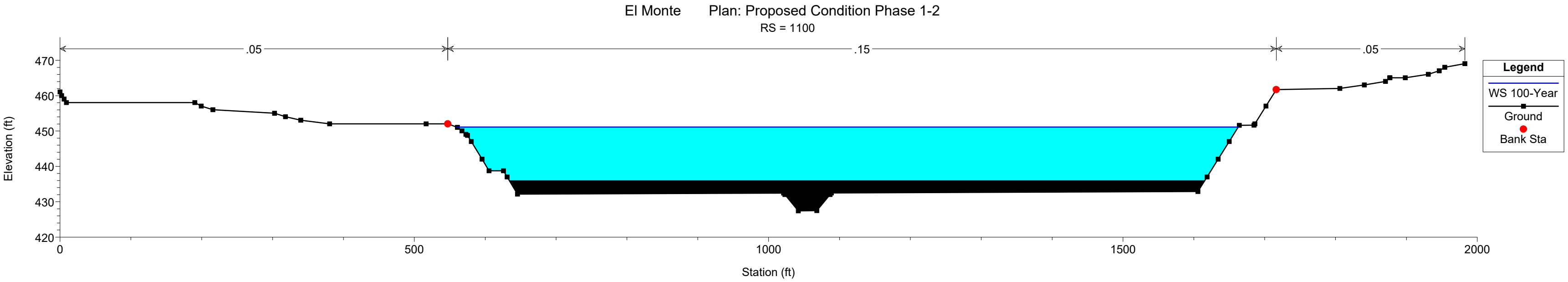

El Monte Plan: Proposed Condition Phase 1-2
RS = 1130
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



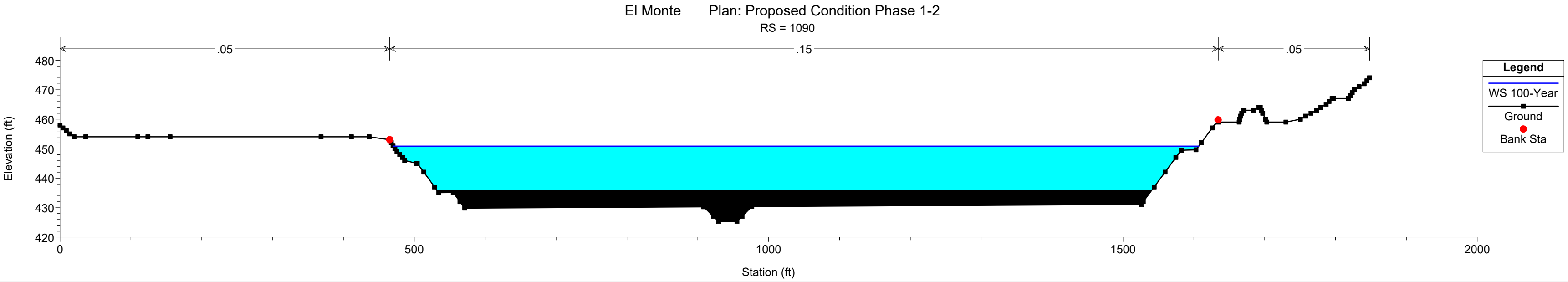
El Monte Plan: Proposed Condition Phase 1-2
RS = 1120
.05
.15
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)



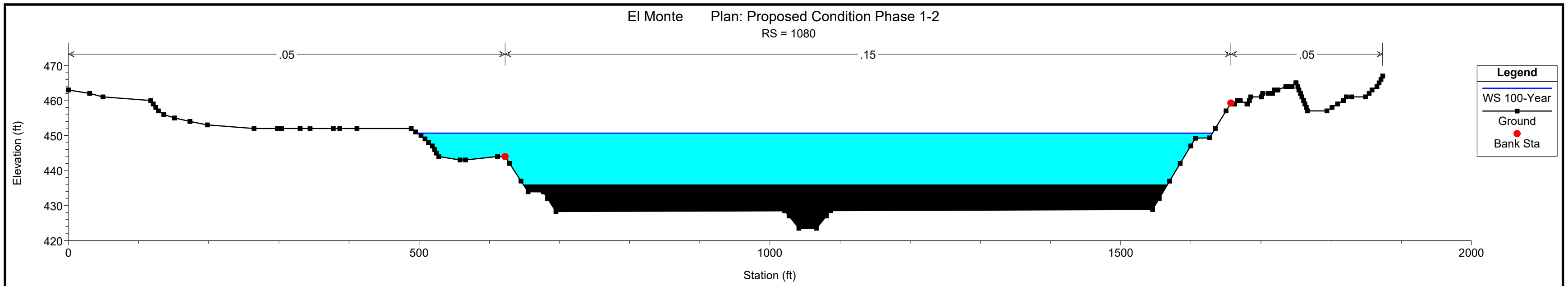
El Monte Plan: Proposed Condition Phase 1-2
RS = 1110
.05
.15
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

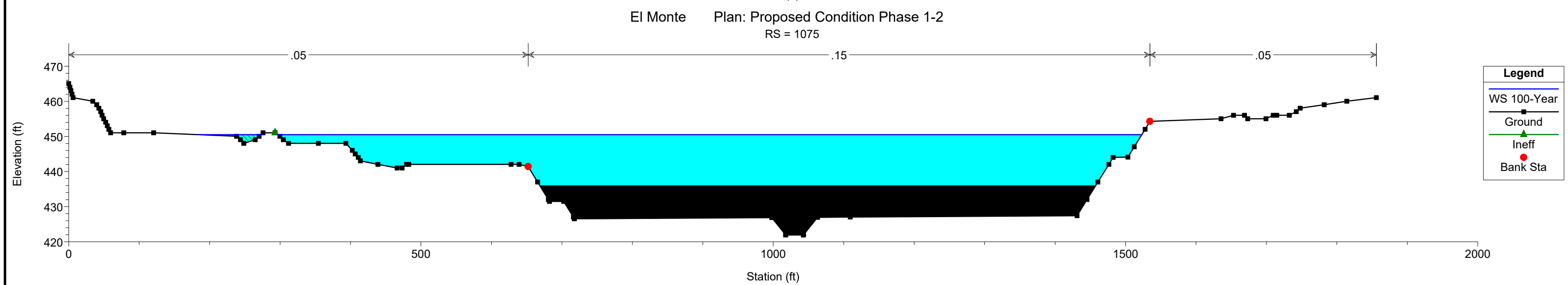


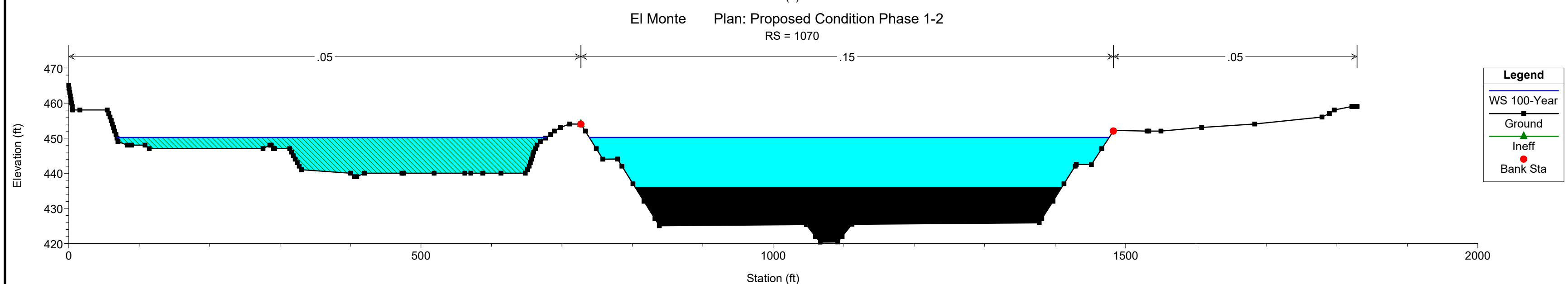
El Monte Plan: Proposed Condition Phase 1-2
RS = 1100
.05
.15
.05
Legend
WS 100-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

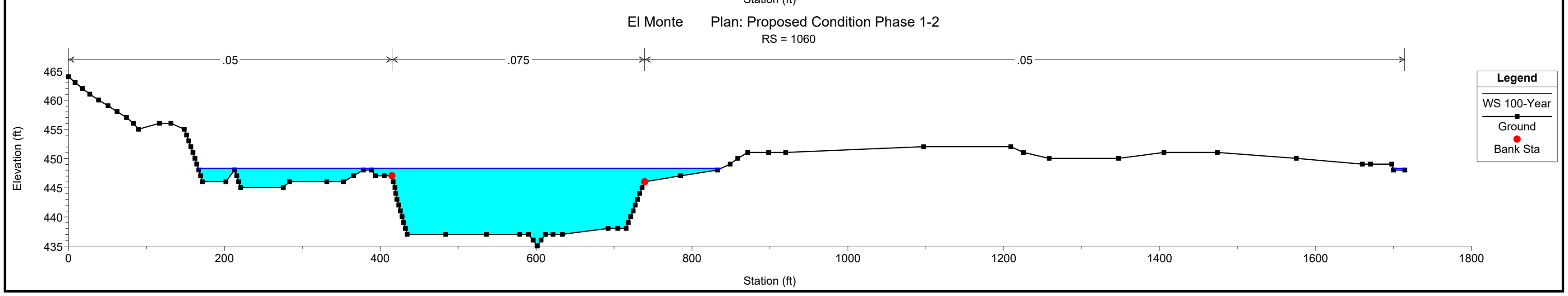


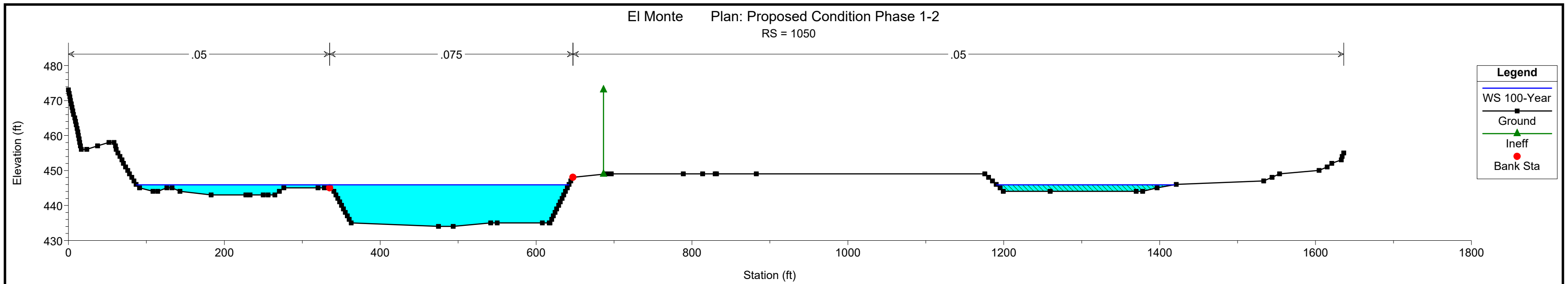
El Monte Plan: Proposed Condition Phase 1-2
RS = 1090
.05
.15
.05
Legend
WS 100-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

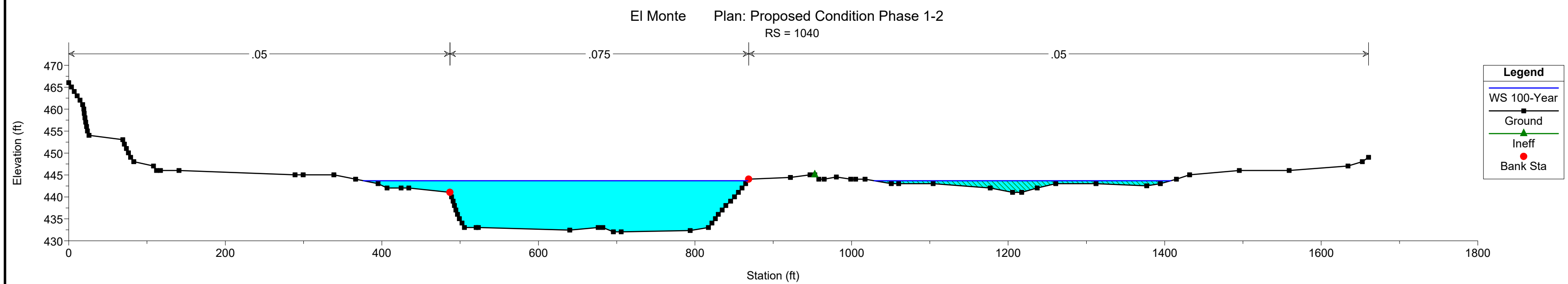

El Monte Plan: Proposed Condition Phase 1-2
RS = 1080
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

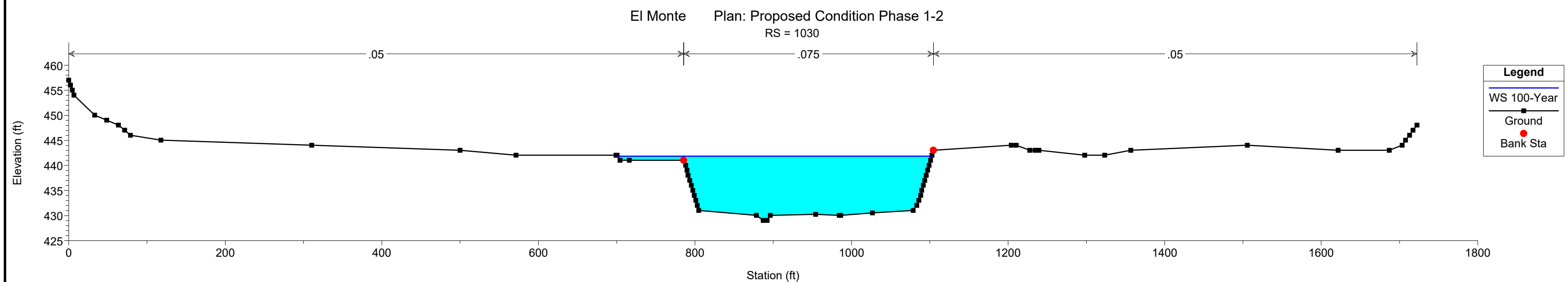

El Monte Plan: Proposed Condition Phase 1-2
RS = 1075
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

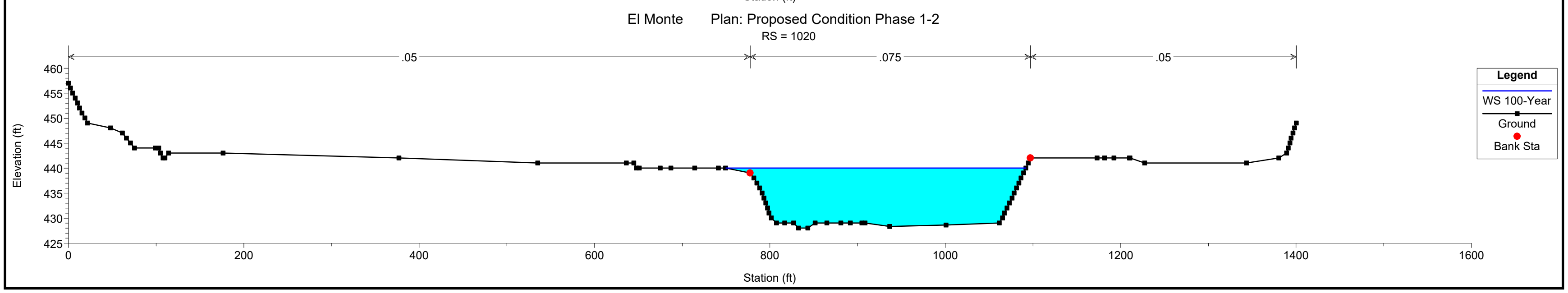

El Monte Plan: Proposed Condition Phase 1-2
RS = 1070
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

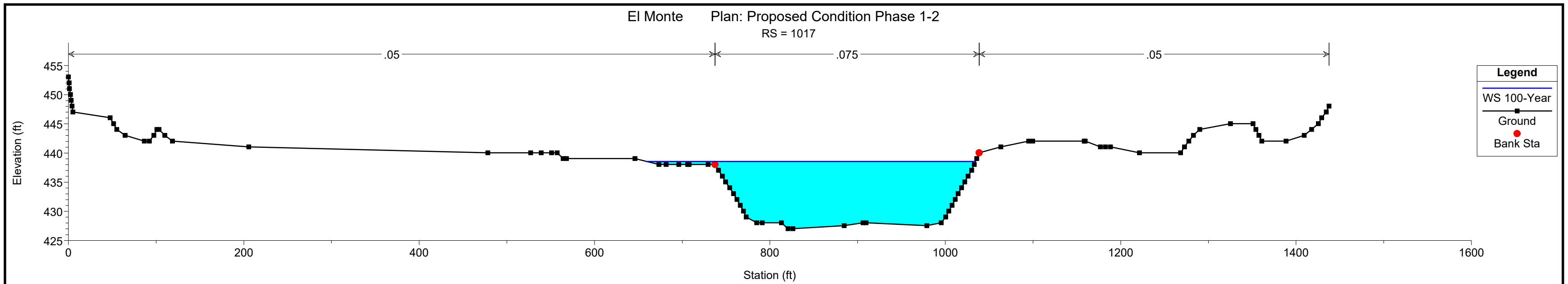

El Monte Plan: Proposed Condition Phase 1-2
RS = 1060
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

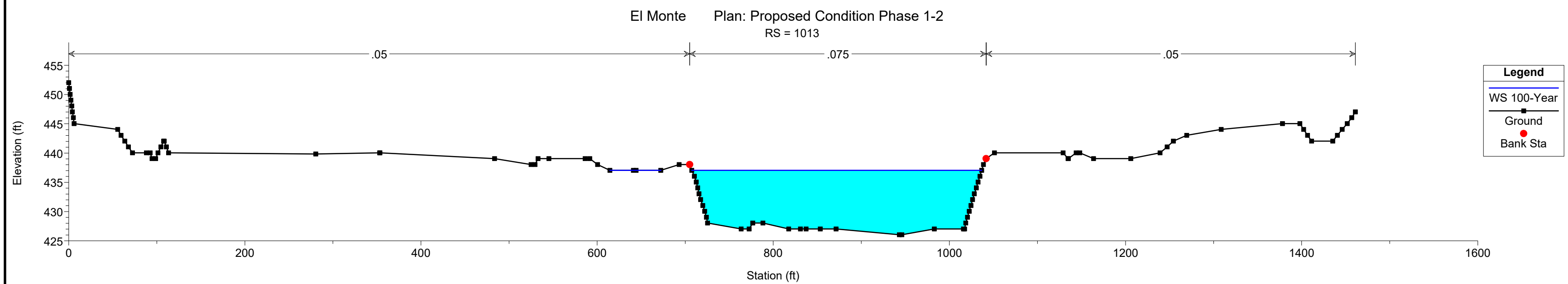

El Monte Plan: Proposed Condition Phase 1-2
RS = 1050
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

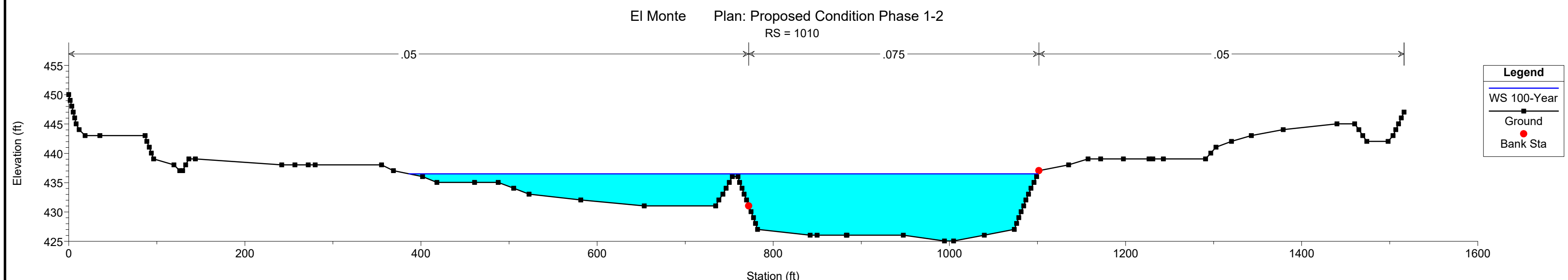

El Monte Plan: Proposed Condition Phase 1-2
RS = 1040
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

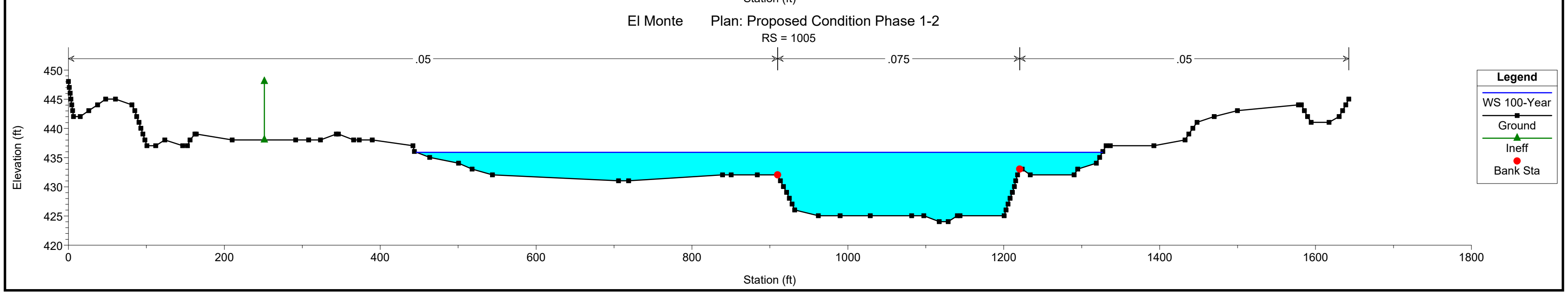

El Monte Plan: Proposed Condition Phase 1-2
RS = 1030
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

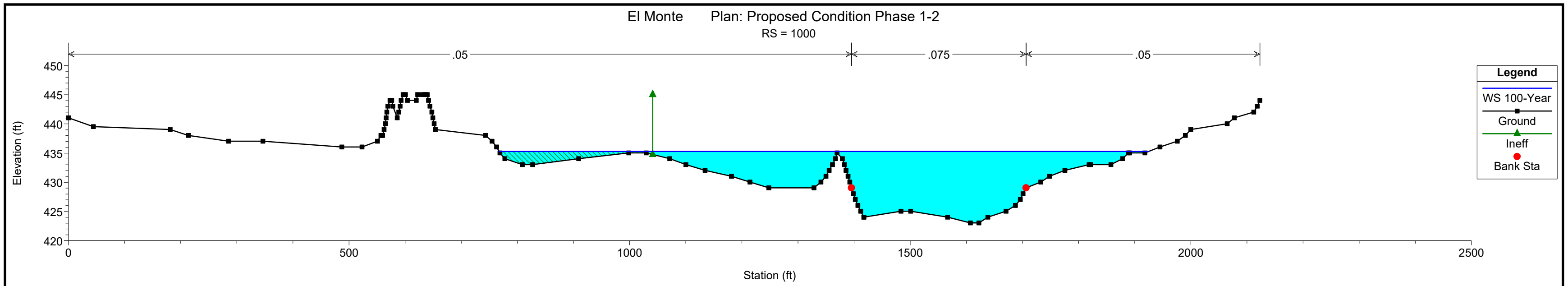

El Monte Plan: Proposed Condition Phase 1-2
RS = 1020
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

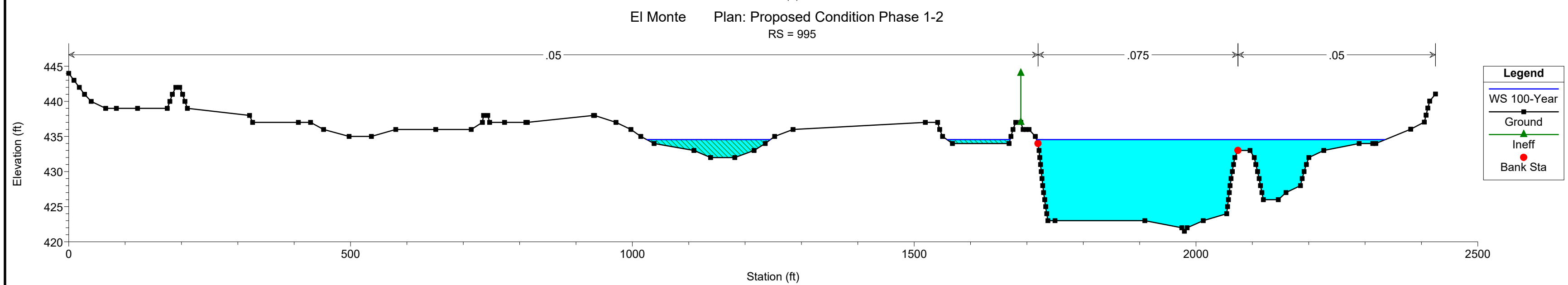

El Monte Plan: Proposed Condition Phase 1-2
RS = 1017
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

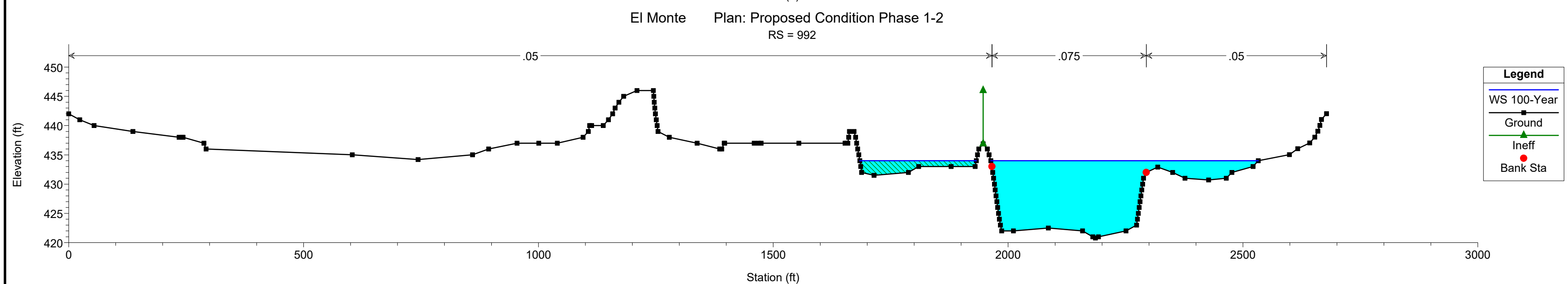

El Monte Plan: Proposed Condition Phase 1-2
RS = 1013
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

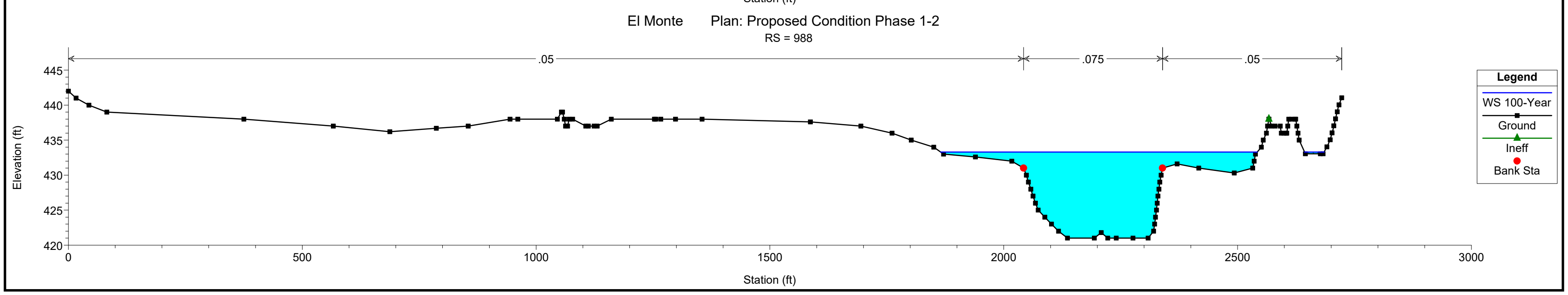

El Monte Plan: Proposed Condition Phase 1-2
RS = 1010
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

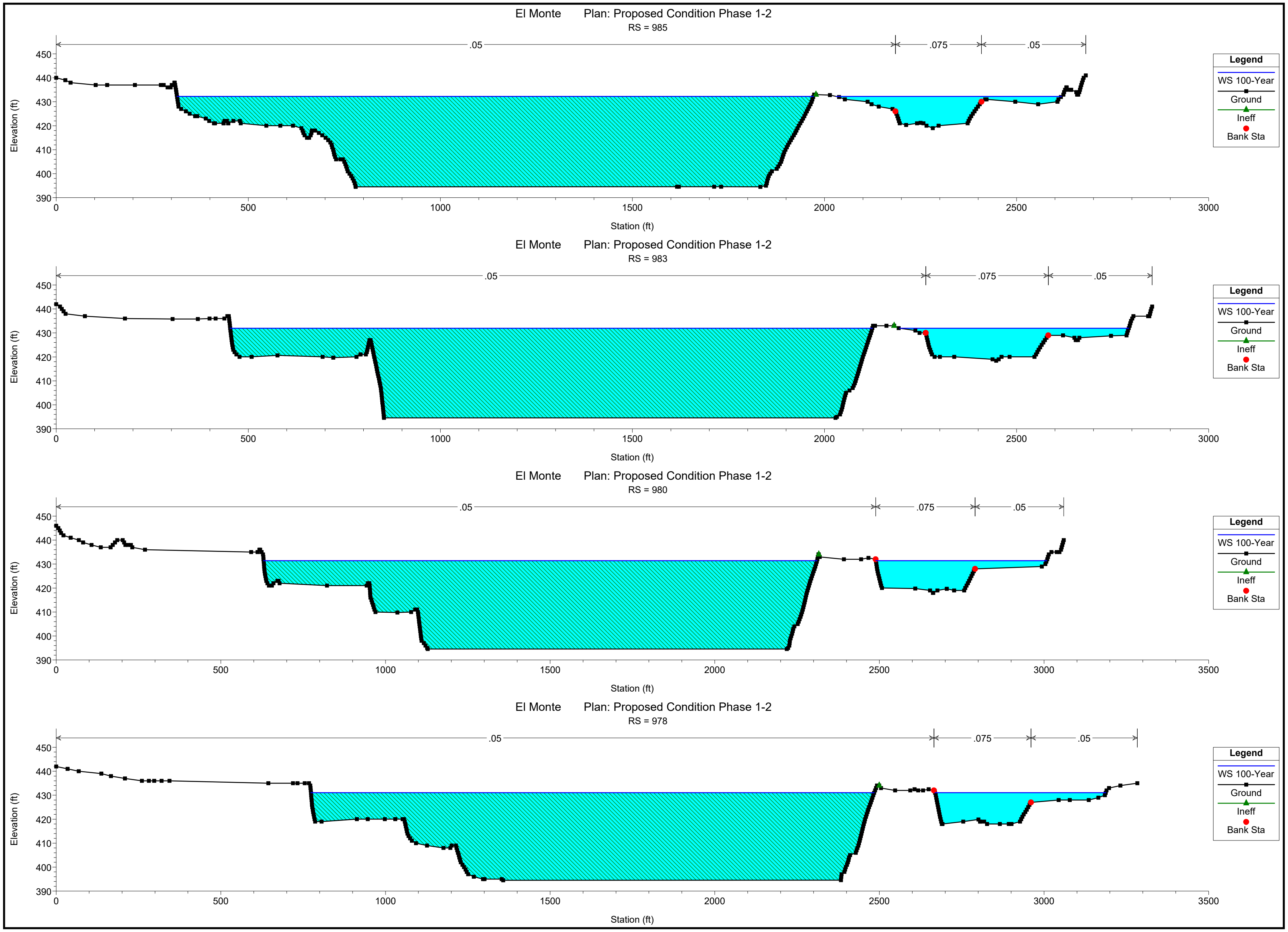

El Monte Plan: Proposed Condition Phase 1-2
RS = 1005
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

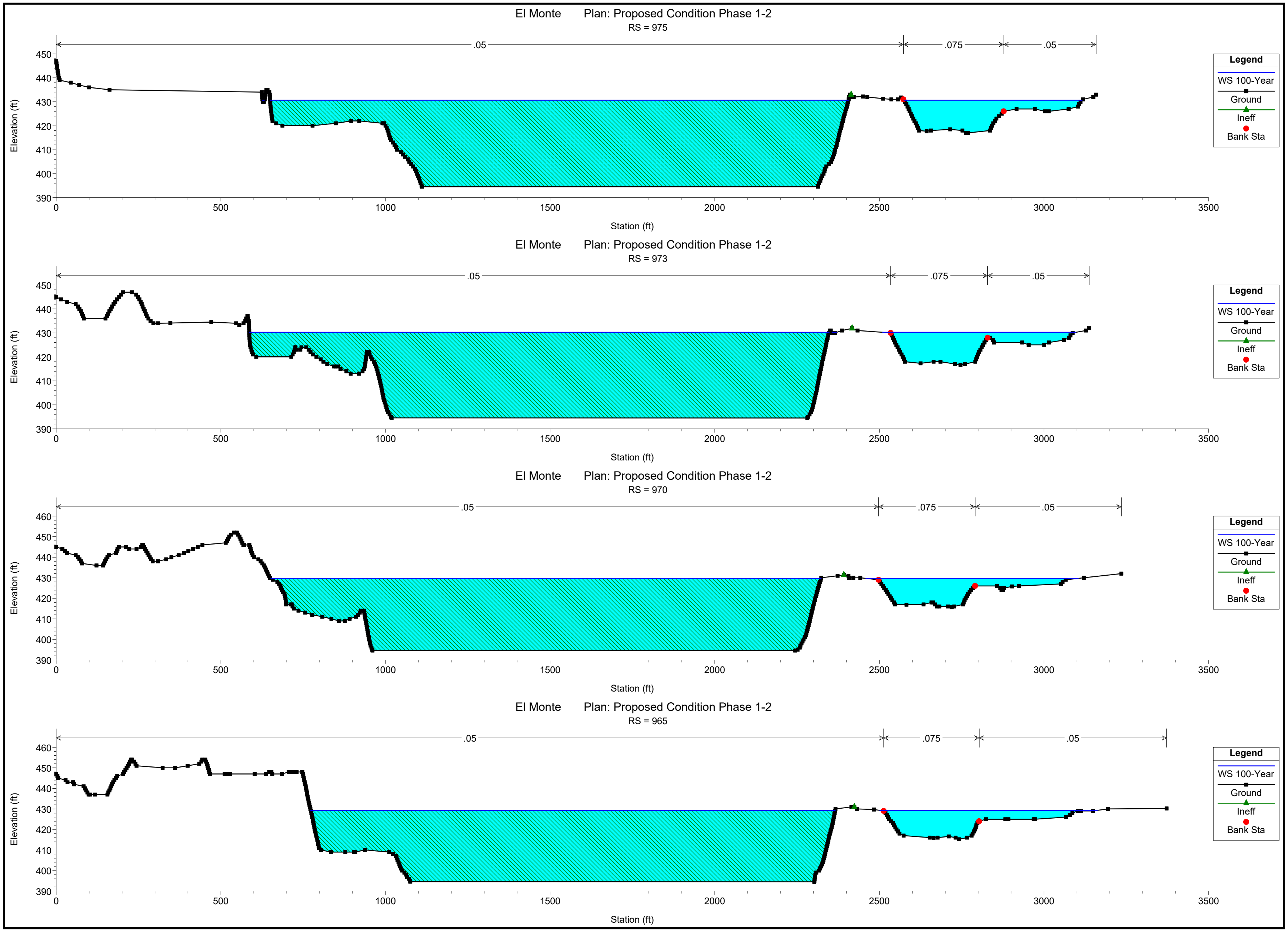

El Monte Plan: Proposed Condition Phase 1-2
RS = 1000
.05
.075
.05
Elevation (ft)
Station (ft)
0
500
1000
1500
2000
2500
420
425
430
435
440
445
450
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1-2
RS = 995
.05
.075
.05
Elevation (ft)
Station (ft)
0
500
1000
1500
2000
2500
420
425
430
435
440
445
Legend
WS 100-Year
Ground
Ineff
Bank Sta

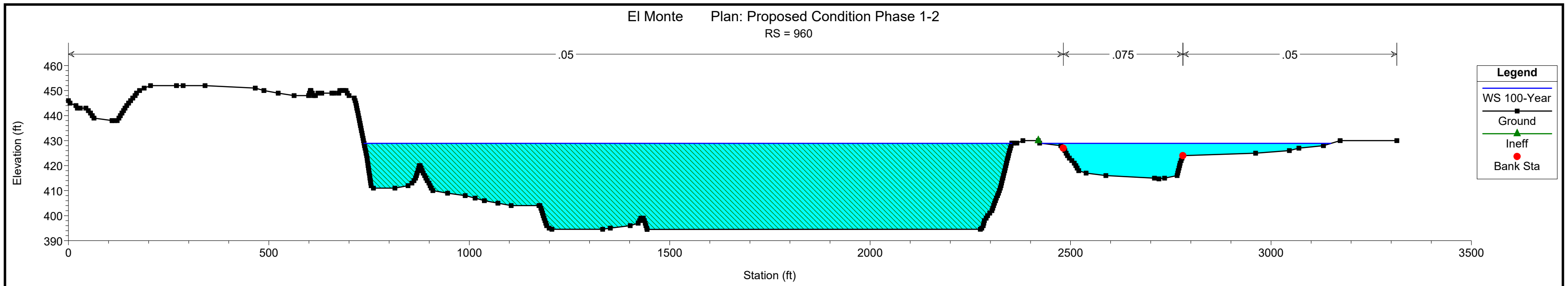

El Monte Plan: Proposed Condition Phase 1-2
RS = 992
.05
.075
.05
Elevation (ft)
Station (ft)
0
500
1000
1500
2000
2500
3000
420
425
430
435
440
445
450
Legend
WS 100-Year
Ground
Ineff
Bank Sta

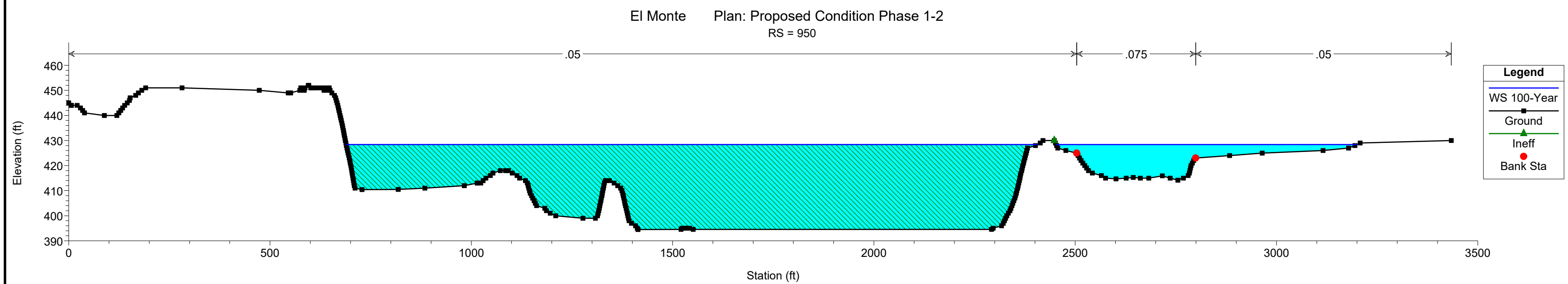

El Monte Plan: Proposed Condition Phase 1-2
RS = 988
.05
.075
.05
Elevation (ft)
Station (ft)
0
500
1000
1500
2000
2500
3000
420
425
430
435
440
445
Legend
WS 100-Year
Ground
Ineff
Bank Sta

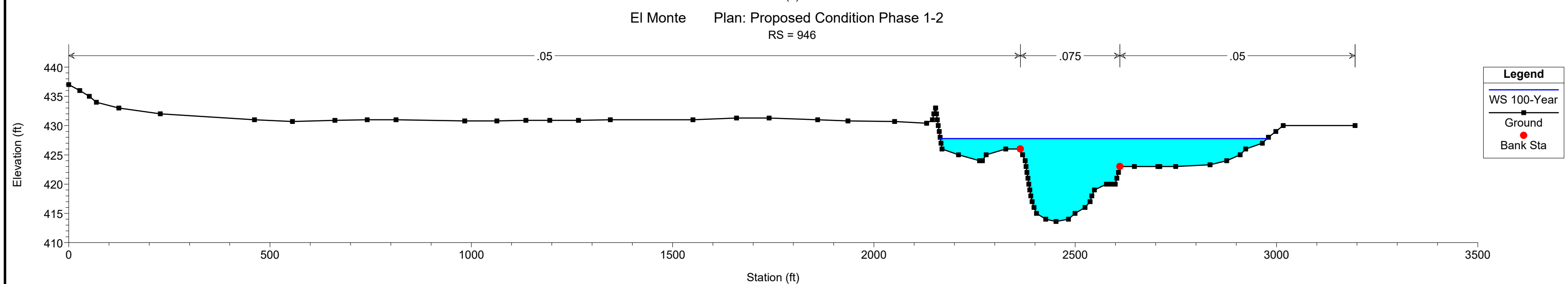

El Monte Plan: Proposed Condition Phase 1-2
RS = 985
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition Phase 1-2
RS = 983
El Monte Plan: Proposed Condition Phase 1-2
RS = 980
El Monte Plan: Proposed Condition Phase 1-2
RS = 978

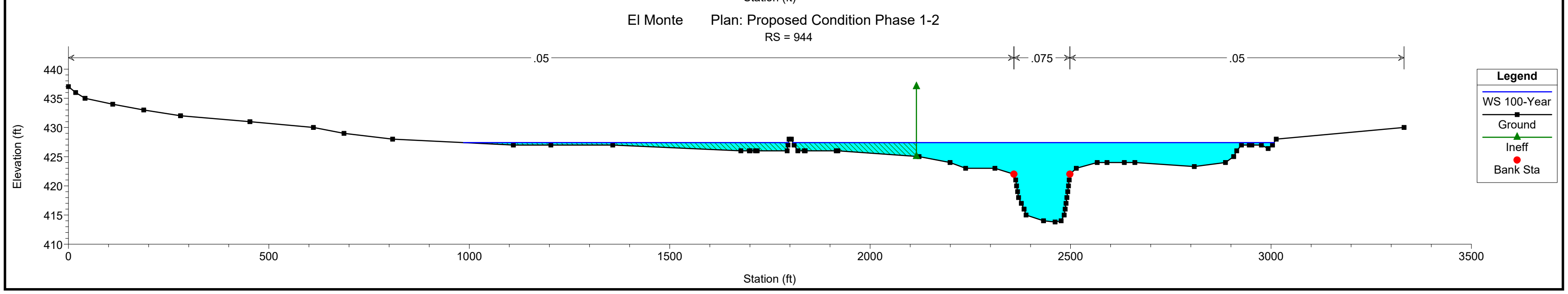


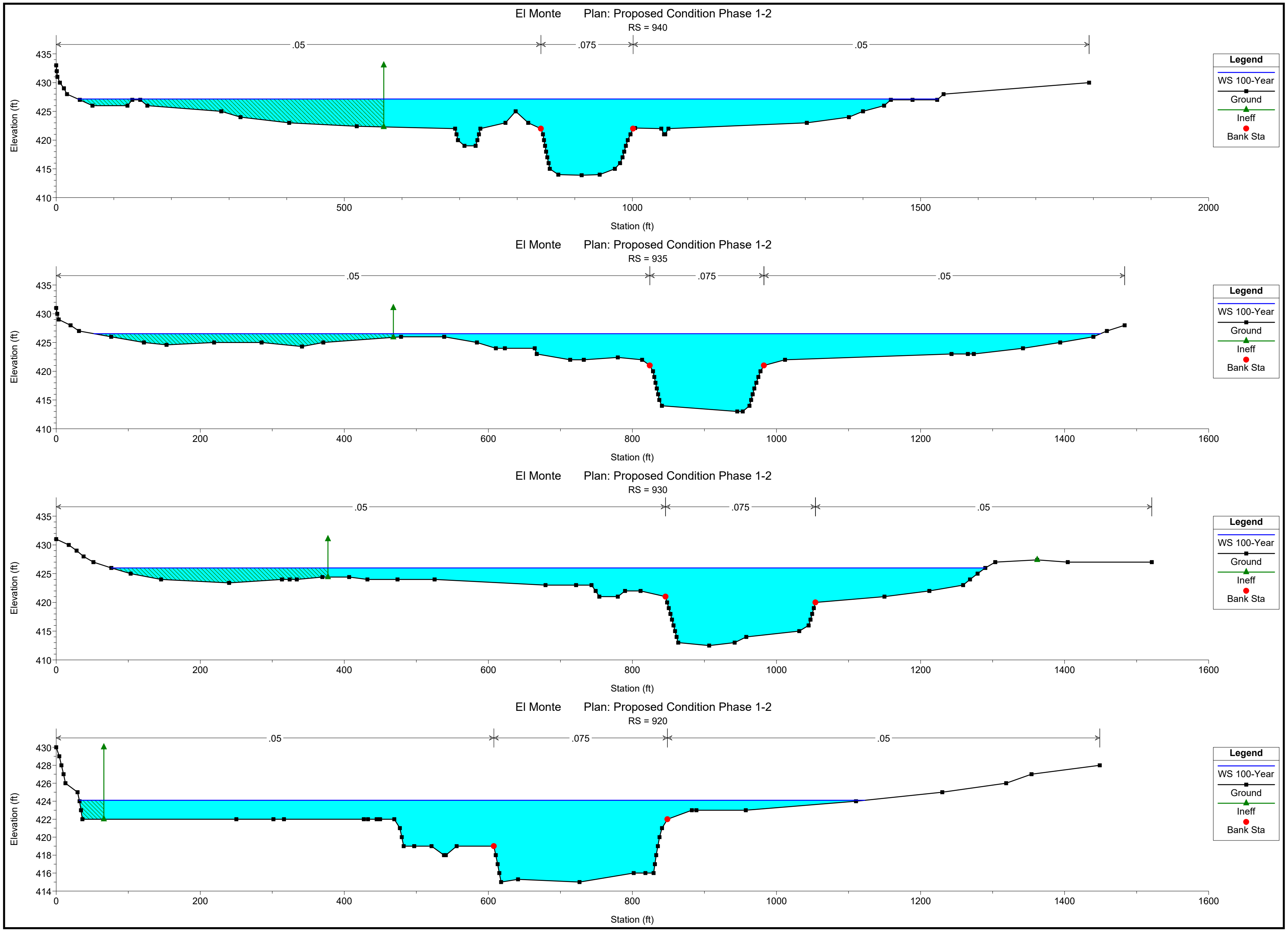
El Monte Plan: Proposed Condition Phase 1-2
RS = 975
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1-2
RS = 973
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1-2
RS = 970
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1-2
RS = 965
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1-2
RS = 960
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

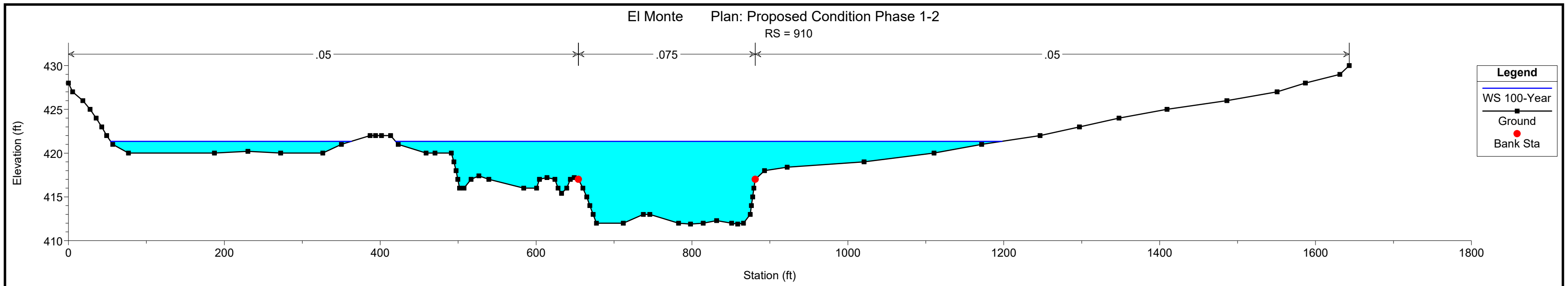

El Monte Plan: Proposed Condition Phase 1-2
RS = 950
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

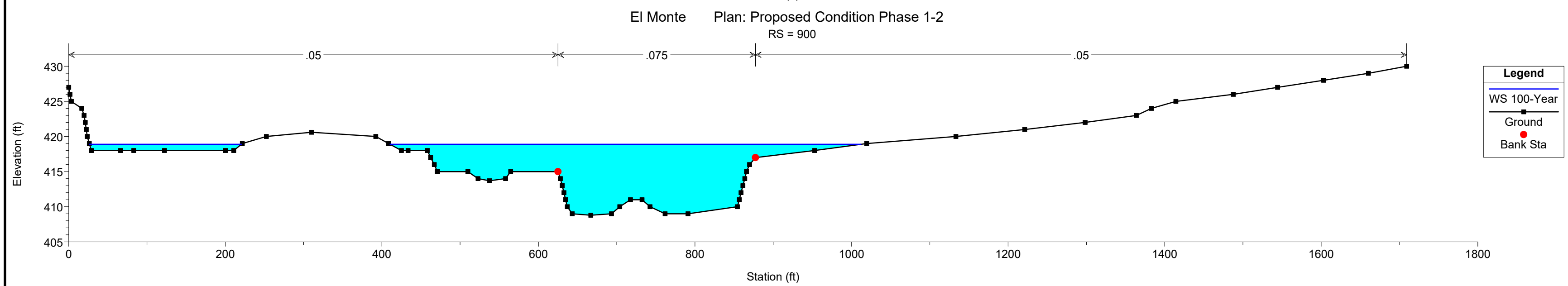

El Monte Plan: Proposed Condition Phase 1-2
RS = 946
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

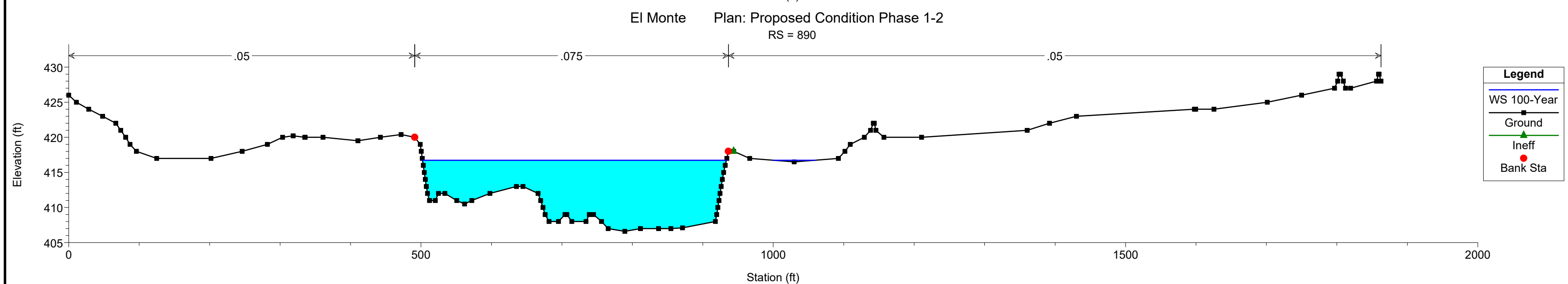

El Monte Plan: Proposed Condition Phase 1-2
RS = 944
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

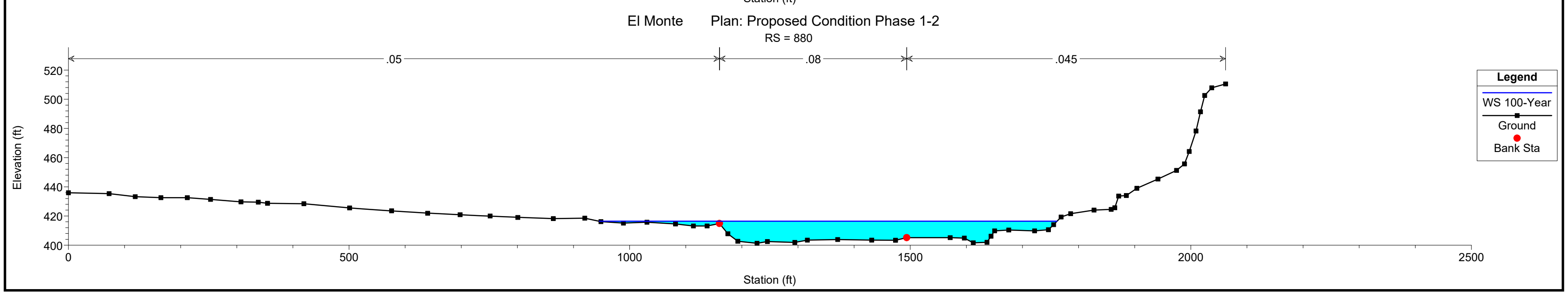


El Monte Plan: Proposed Condition Phase 1-2
RS = 940
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1-2
RS = 935
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1-2
RS = 930
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1-2
RS = 920
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1-2
RS = 910
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Proposed Condition Phase 1-2
RS = 900
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Proposed Condition Phase 1-2
RS = 890
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1-2
RS = 880
.05
.08
.045
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

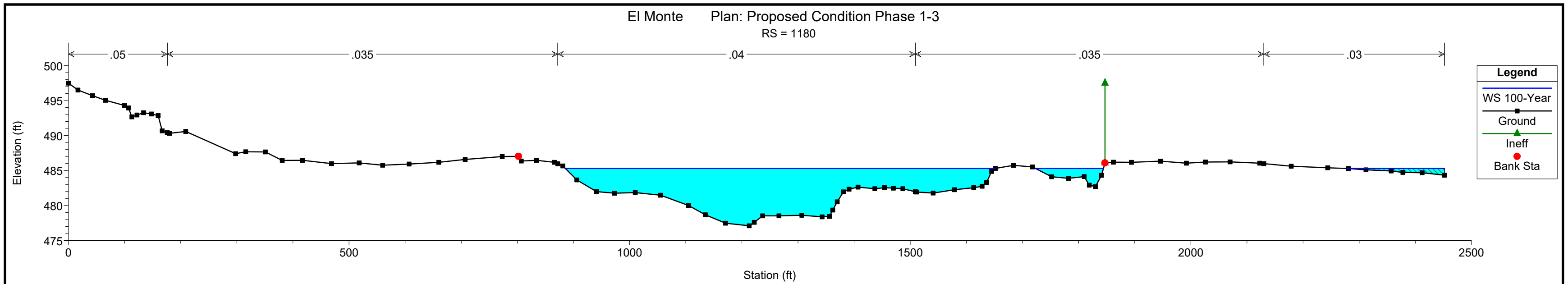
Proposed Conditions 1 through 3

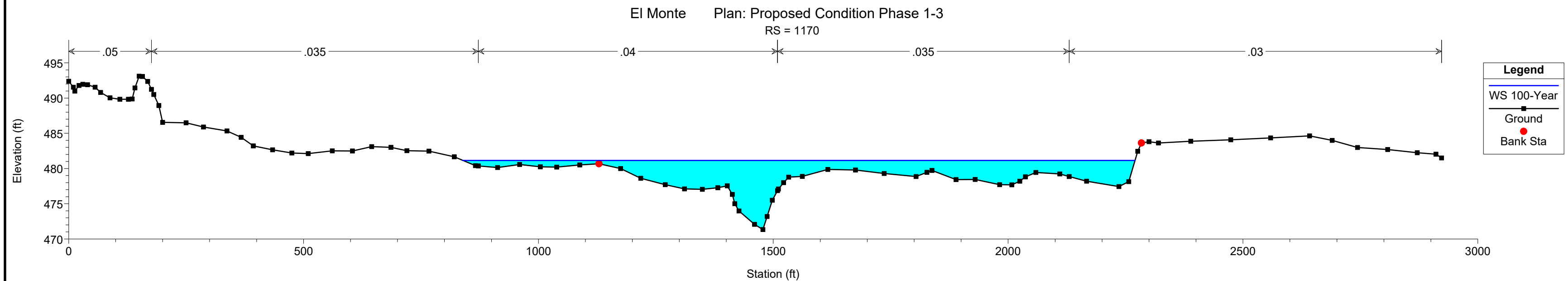
HEC-RAS Plan: PC Phase 1-3 River: RIVER-1 Reach: Reach-1 Profile: 100-Year

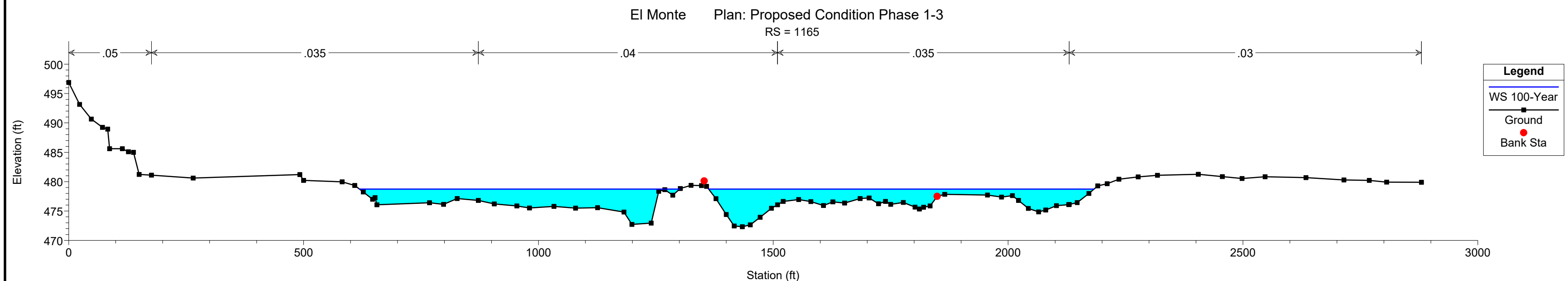
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1180	100-Year	19000.00	477.10	485.30		485.74	0.002859	5.35	3552.51	1060.54	0.47
Reach-1	1170	100-Year	19000.00	471.34	481.16		481.63	0.004095	5.54	3565.42	1431.43	0.57
Reach-1	1165	100-Year	19000.00	472.32	478.74	477.70	479.12	0.003948	5.32	3893.79	1502.72	0.55
Reach-1	1160	100-Year	19000.00	469.99	474.55	474.55	475.49	0.014382	7.32	2477.28	1361.69	0.93
Reach-1	1150	100-Year	19000.00	458.04	462.76	462.76	464.57	0.018925	6.09	2126.56	526.64	0.59
Reach-1	1148	100-Year	19000.00	442.04	450.48		450.90	0.001623	5.21	3647.76	468.27	0.33
Reach-1	1140	100-Year	19000.00	436.46	449.97		450.10	0.004538	2.86	6642.20	890.66	0.17
Reach-1	1130	100-Year	19000.00	434.16	448.62		448.67	0.001681	1.86	10224.04	1764.67	0.10
Reach-1	1120	100-Year	19000.00	432.01	447.78		447.84	0.001600	1.88	10112.71	1399.37	0.10
Reach-1	1110	100-Year	19000.00	429.69	447.13	436.92	447.18	0.001048	1.68	11330.98	942.96	0.09
Reach-1	1100	100-Year	20000.00	429.00	446.78		446.81	0.000583	1.37	14645.34	1067.95	0.07
Reach-1	1090	100-Year	20000.00	429.00	446.56		446.58	0.000402	1.21	16494.08	1088.56	0.05
Reach-1	1080	100-Year	20000.00	429.00	446.41		446.43	0.000369	1.23	16333.24	1077.12	0.05
Reach-1	1075	100-Year	20000.00	429.00	446.25		446.28	0.000451	1.33	14781.81	1108.43	0.06
Reach-1	1070	100-Year	20000.00	429.00	446.00	432.38	446.06	0.001008	1.89	10569.59	1054.74	0.09
Reach-1	1060	100-Year	20000.00	429.00	445.21		445.27	0.001214	2.01	9968.05	1081.48	0.09
Reach-1	1050	100-Year	20000.00	429.00	444.35	432.31	444.41	0.001263	2.02	9896.84	1161.44	0.10
Reach-1	1040	100-Year	20000.00	429.00	443.00	433.15	443.14	0.003220	2.99	6696.06	1011.19	0.15
Reach-1	1030	100-Year	20000.00	429.00	441.93		442.00	0.001714	2.19	9117.27	1351.25	0.11
Reach-1	1020	100-Year	20000.00	428.04	440.02		440.62	0.004510	6.22	3228.40	341.92	0.34
Reach-1	1017	100-Year	20000.00	427.04	438.56		439.35	0.006561	7.12	2838.63	375.40	0.41
Reach-1	1013	100-Year	20000.00	426.04	437.05		437.69	0.005441	6.45	3099.78	387.19	0.37
Reach-1	1010	100-Year	20000.00	425.04	436.51		436.82	0.002673	4.70	4592.73	714.02	0.26
Reach-1	1005	100-Year	20000.00	424.04	435.91		436.14	0.001971	4.16	5316.23	880.08	0.23
Reach-1	1000	100-Year	20000.00	423.04	435.30		435.53	0.001907	4.18	5329.39	1157.70	0.23
Reach-1	995	100-Year	20000.00	421.50	434.54		434.83	0.002100	4.45	4772.50	949.35	0.24
Reach-1	992	100-Year	20000.00	420.80	433.99		434.36	0.002591	5.02	4240.64	817.36	0.26
Reach-1	988	100-Year	20000.00	421.00	433.29	427.43	433.77	0.003600	5.74	3807.85	718.35	0.31
Reach-1	985	100-Year	20000.00	419.00	432.26	427.71	432.90	0.005060	6.84	3312.60	2243.60	0.37
Reach-1	983	100-Year	20000.00	418.40	431.94	425.26	432.28	0.002390	4.86	4393.57	2267.80	0.25
Reach-1	980	100-Year	20000.00	418.00	431.42	425.16	431.84	0.002972	5.35	3984.14	2199.31	0.28
Reach-1	978	100-Year	20000.00	418.00	431.04	424.48	431.45	0.002795	5.29	4043.18	2228.92	0.27
Reach-1	975	100-Year	20000.00	417.00	430.64	424.17	431.00	0.002583	4.98	4258.09	2303.30	0.26
Reach-1	973	100-Year	20000.00	416.70	430.24	423.87	430.59	0.002590	4.95	4294.13	2361.87	0.26
Reach-1	970	100-Year	20000.00	415.70	429.69	423.18	430.06	0.002708	5.12	4263.54	2315.13	0.27
Reach-1	965	100-Year	20000.00	415.20	429.28	422.58	429.61	0.002416	4.91	4477.57	2252.77	0.26
Reach-1	960	100-Year	20000.00	414.70	428.88	421.68	429.17	0.001960	4.57	4841.62	2335.43	0.23
Reach-1	950	100-Year	20000.00	414.20	428.38	421.18	428.66	0.001845	4.48	5013.38	2463.93	0.23

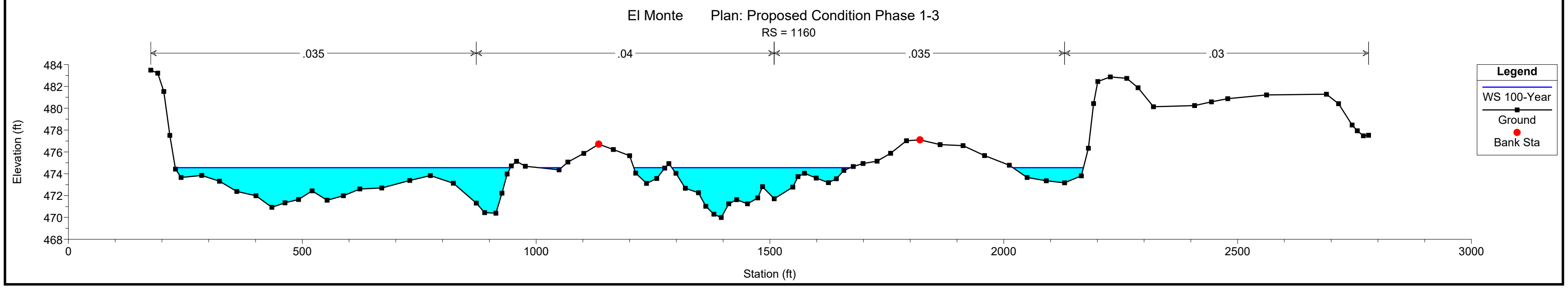
HEC-RAS Plan: PC Phase 1-3 River: RIVER-1 Reach: Reach-1 Profile: 100-Year (Continued)

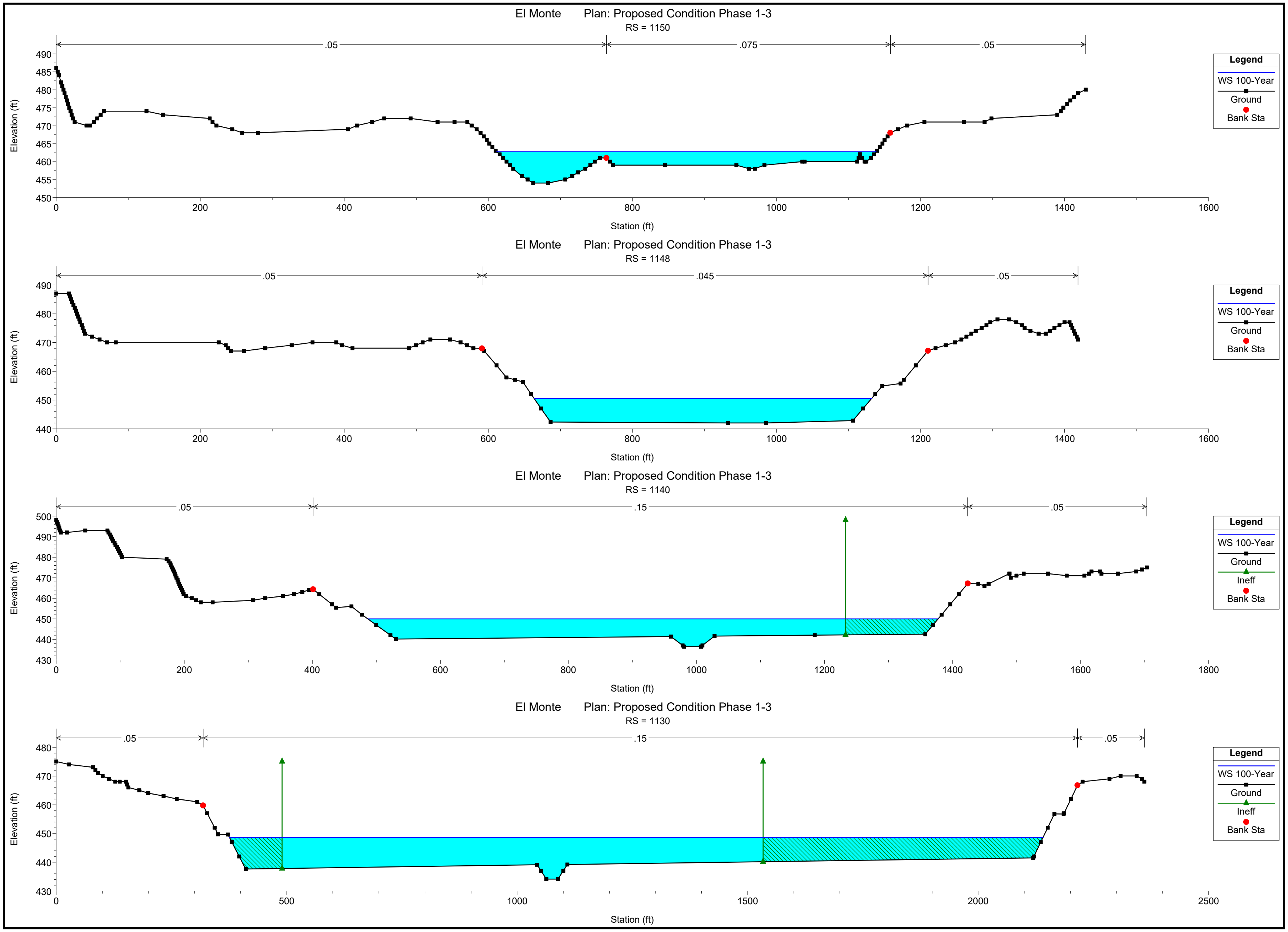
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	946	100-Year	20000.00	413.60	427.79		428.11	0.002681	4.95	4580.39	811.72	0.27
Reach-1	944	100-Year	20000.00	413.80	427.41		427.82	0.003449	6.01	4198.62	2010.58	0.31
Reach-1	940	100-Year	20000.00	413.90	427.15		427.41	0.002083	4.63	5113.21	1492.87	0.24
Reach-1	935	100-Year	20000.00	413.00	426.54		426.92	0.003177	5.80	4425.96	1397.69	0.29
Reach-1	930	100-Year	20000.00	412.50	426.00	421.47	426.31	0.002404	4.99	4788.01	1213.43	0.26
Reach-1	920	100-Year	20000.00	415.00	424.10		424.59	0.005934	6.22	3772.22	1090.18	0.38
Reach-1	910	100-Year	20000.00	411.90	421.35		421.84	0.005661	6.31	3814.74	1087.02	0.38
Reach-1	900	100-Year	20000.00	408.80	418.89		419.55	0.006822	6.93	3236.08	795.57	0.41
Reach-1	890	100-Year	20000.00	406.60	416.73	413.45	417.37	0.007507	6.39	3131.86	490.61	0.42
Reach-1	880	100-Year	20000.00	401.24	416.38	407.37	416.52	0.000601	2.49	7150.42	815.42	0.12


El Monte Plan: Proposed Condition Phase 1-3
RS = 1180
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

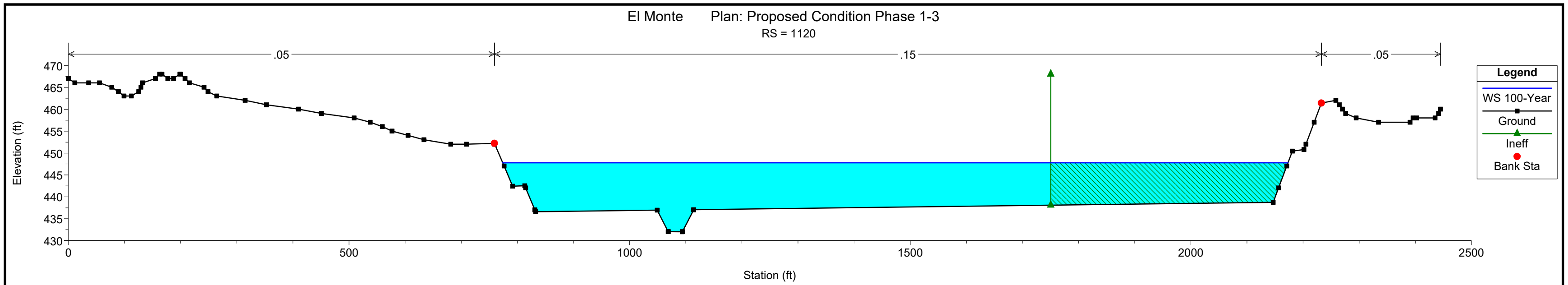

El Monte Plan: Proposed Condition Phase 1-3
RS = 1170
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

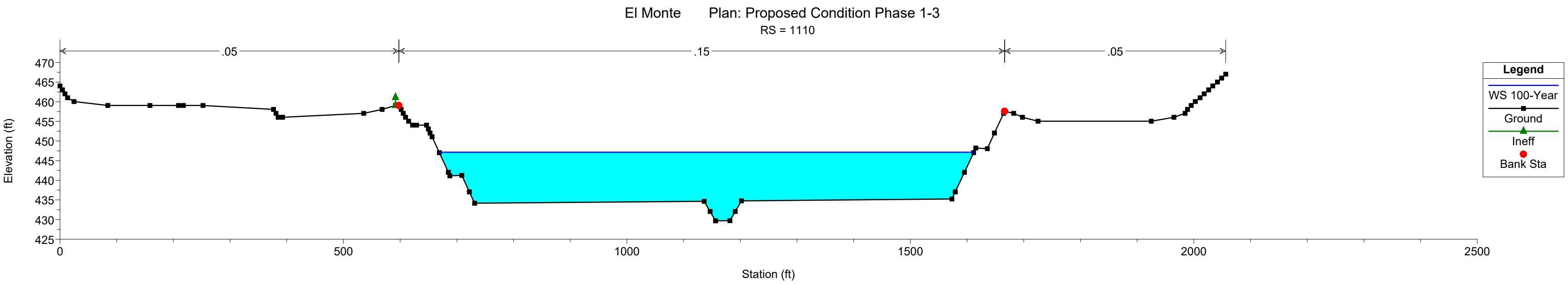

El Monte Plan: Proposed Condition Phase 1-3
RS = 1165
.05
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

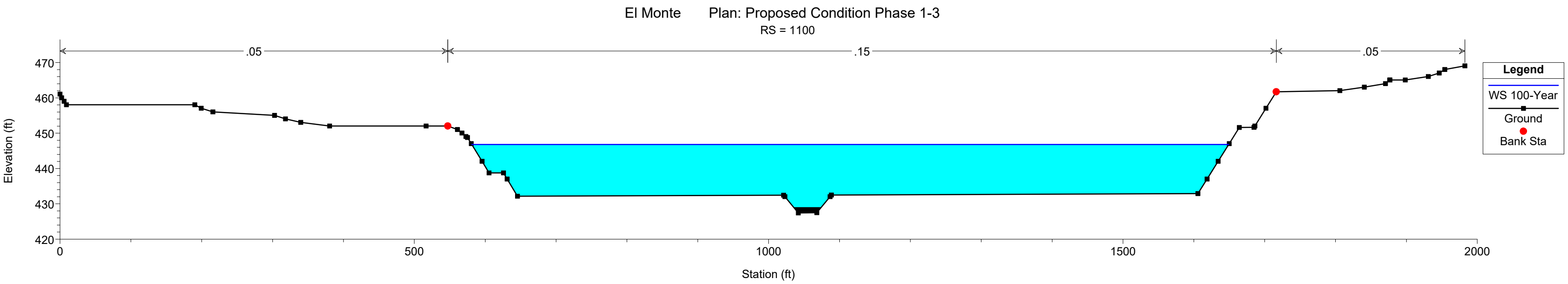

El Monte Plan: Proposed Condition Phase 1-3
RS = 1160
.035
.04
.035
.03
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

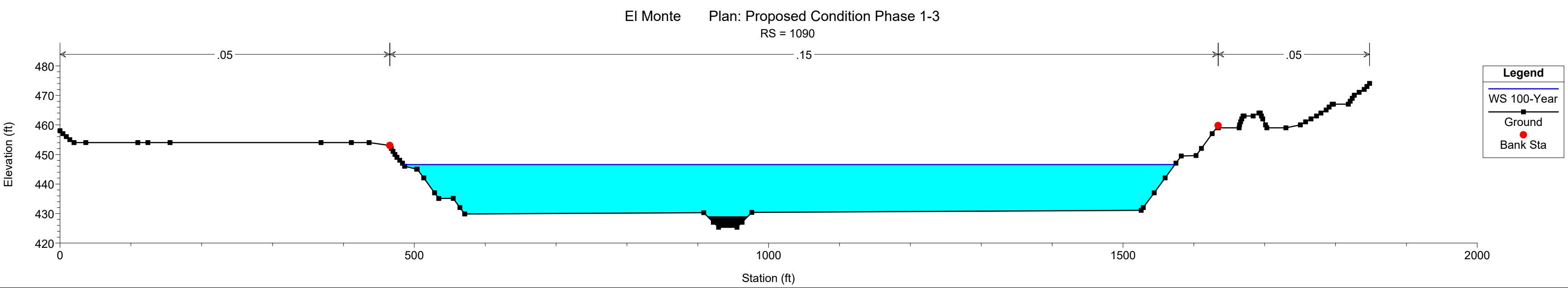


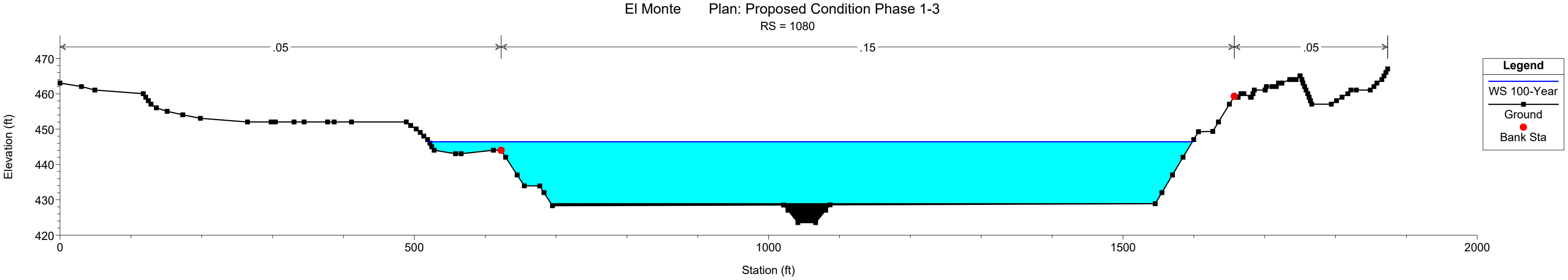
El Monte Plan: Proposed Condition Phase 1-3
RS = 1150
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1-3
RS = 1148
.05
.045
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta
El Monte Plan: Proposed Condition Phase 1-3
RS = 1140
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta
El Monte Plan: Proposed Condition Phase 1-3
RS = 1130
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

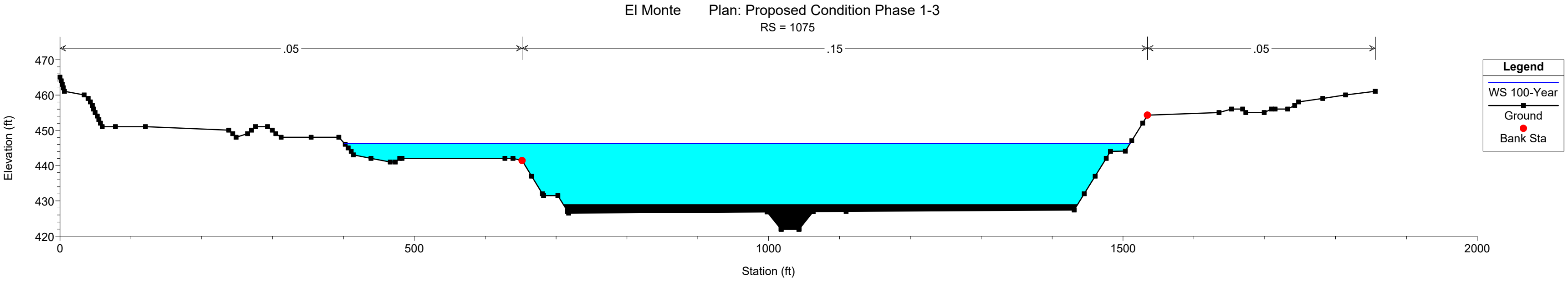

El Monte Plan: Proposed Condition Phase 1-3
RS = 1120
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

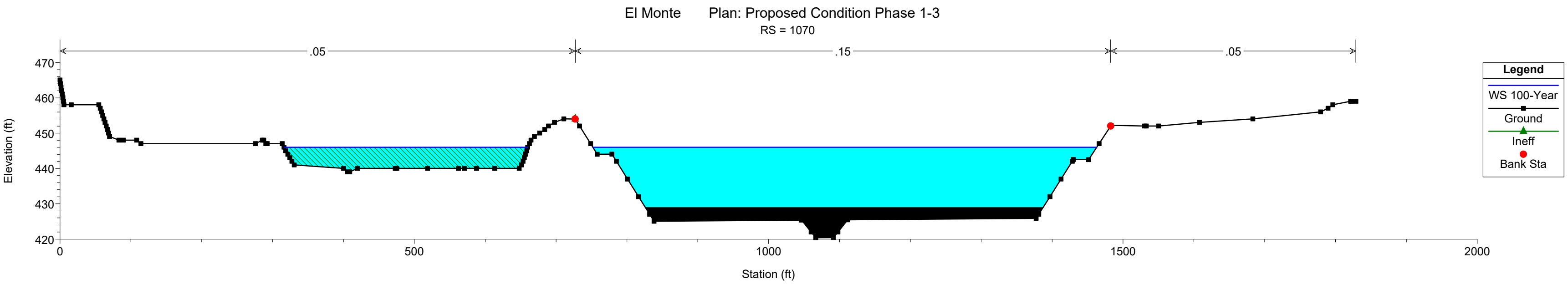

El Monte Plan: Proposed Condition Phase 1-3
RS = 1110
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

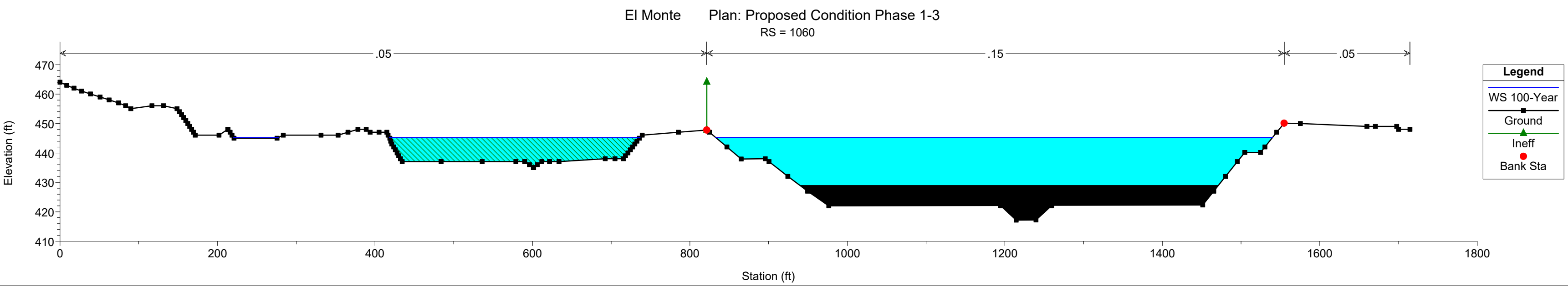

El Monte Plan: Proposed Condition Phase 1-3
RS = 1100
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

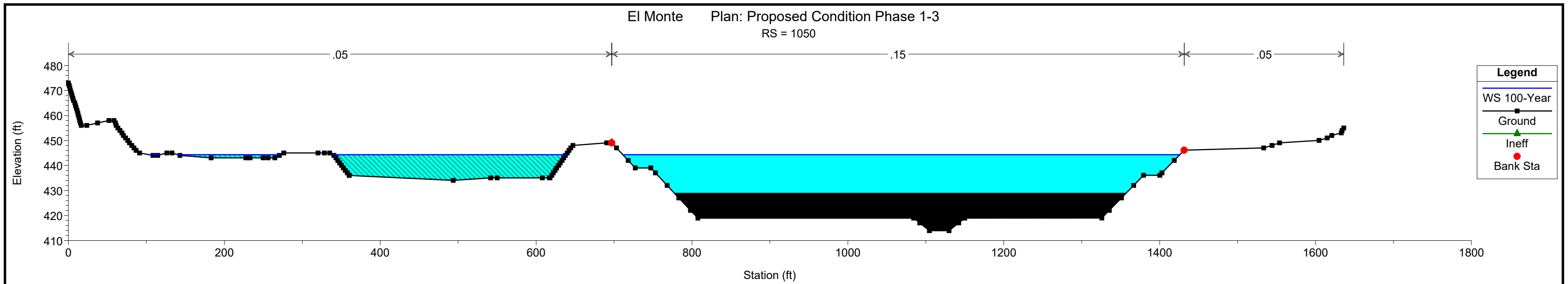

El Monte Plan: Proposed Condition Phase 1-3
RS = 1090
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

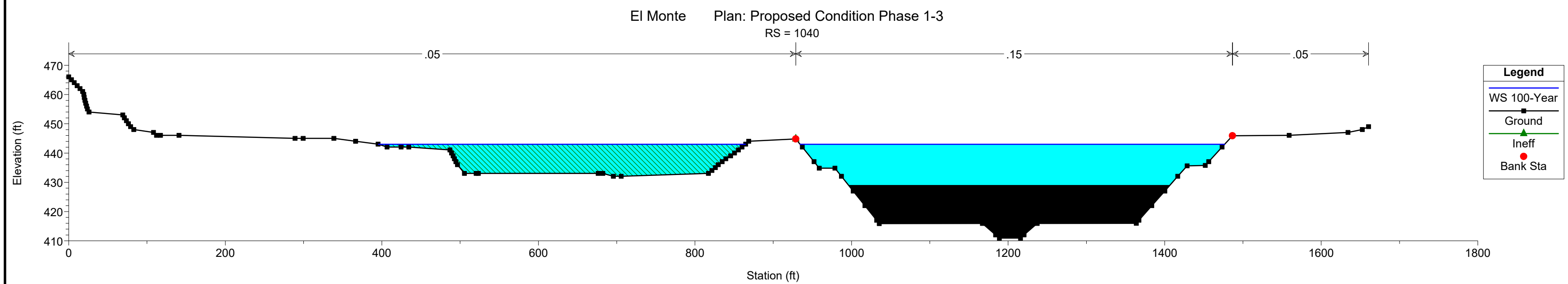

El Monte Plan: Proposed Condition Phase 1-3
RS = 1080
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

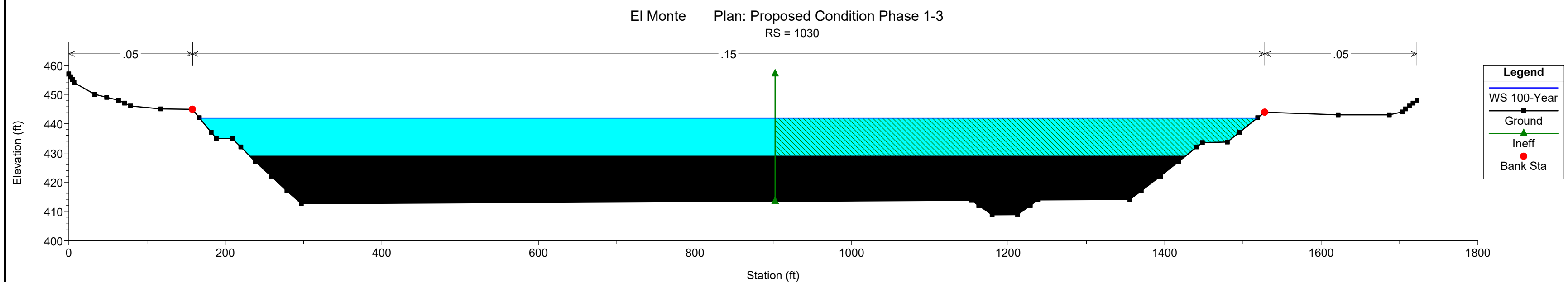

El Monte Plan: Proposed Condition Phase 1-3
RS = 1075
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

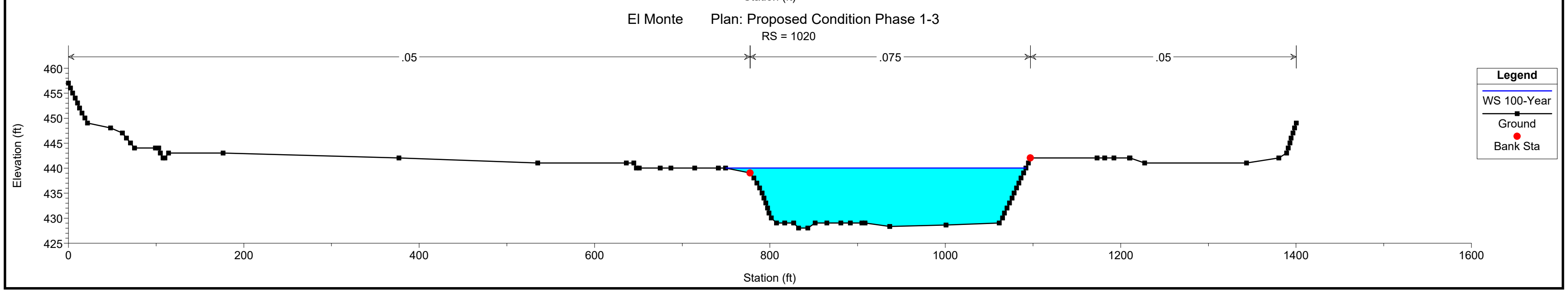

El Monte Plan: Proposed Condition Phase 1-3
RS = 1070
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

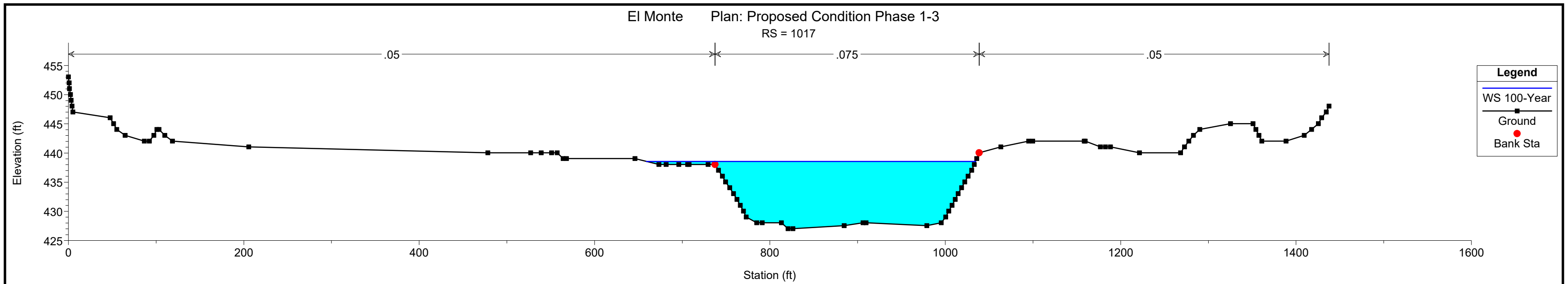

El Monte Plan: Proposed Condition Phase 1-3
RS = 1060
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

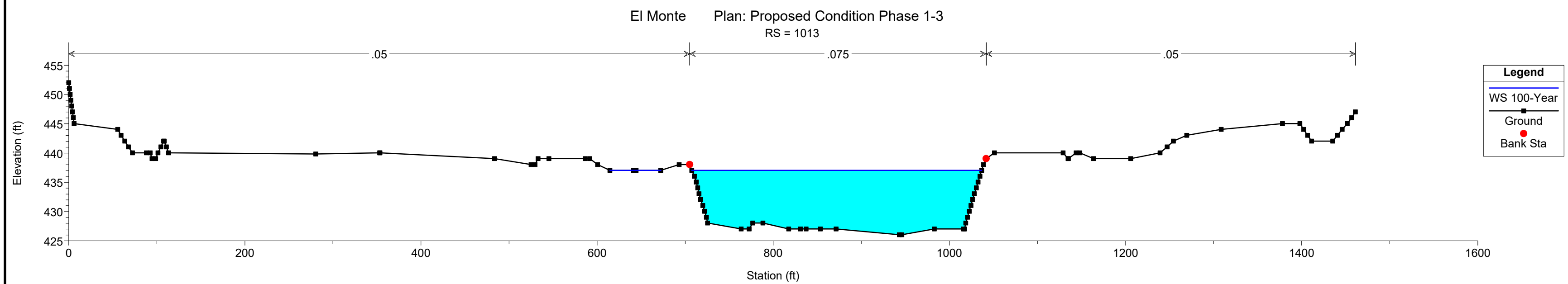

El Monte Plan: Proposed Condition Phase 1-3
RS = 1050
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

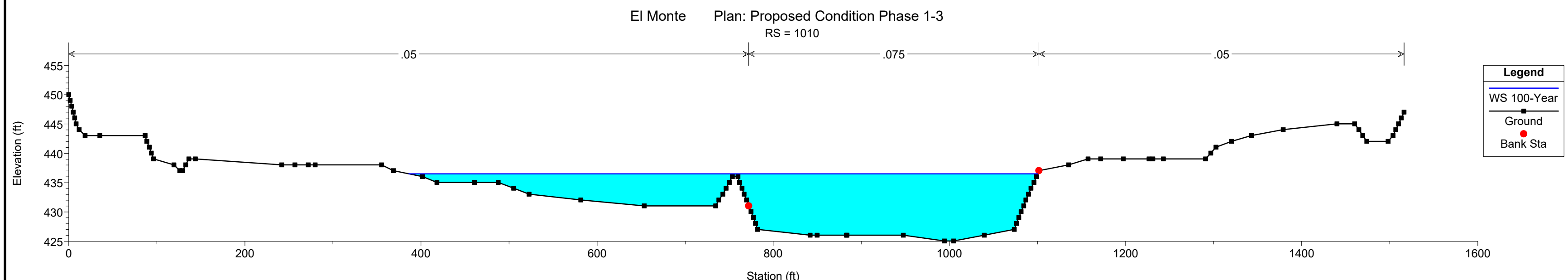

El Monte Plan: Proposed Condition Phase 1-3
RS = 1040
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

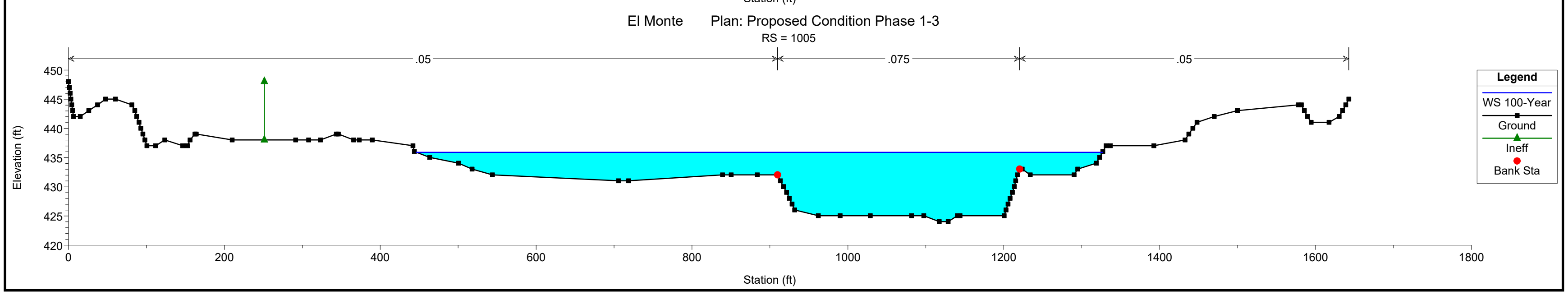

El Monte Plan: Proposed Condition Phase 1-3
RS = 1030
.05
.15
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

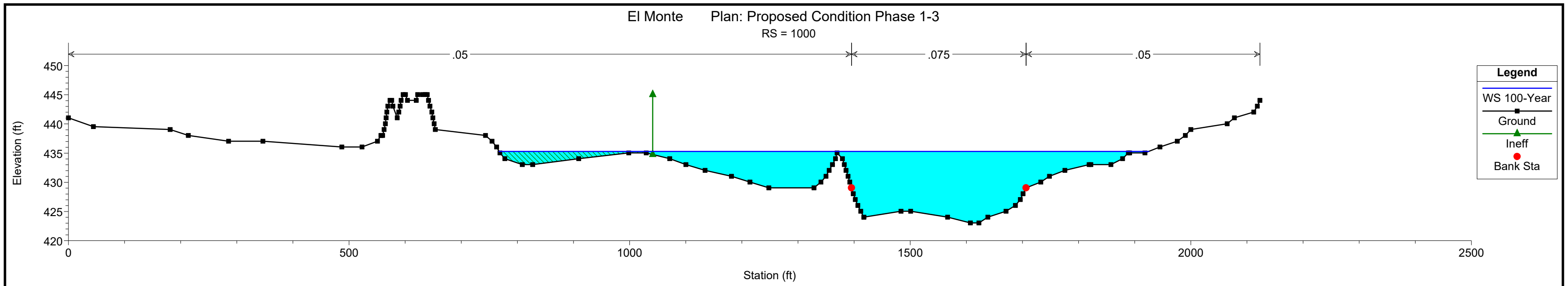

El Monte Plan: Proposed Condition Phase 1-3
RS = 1020
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

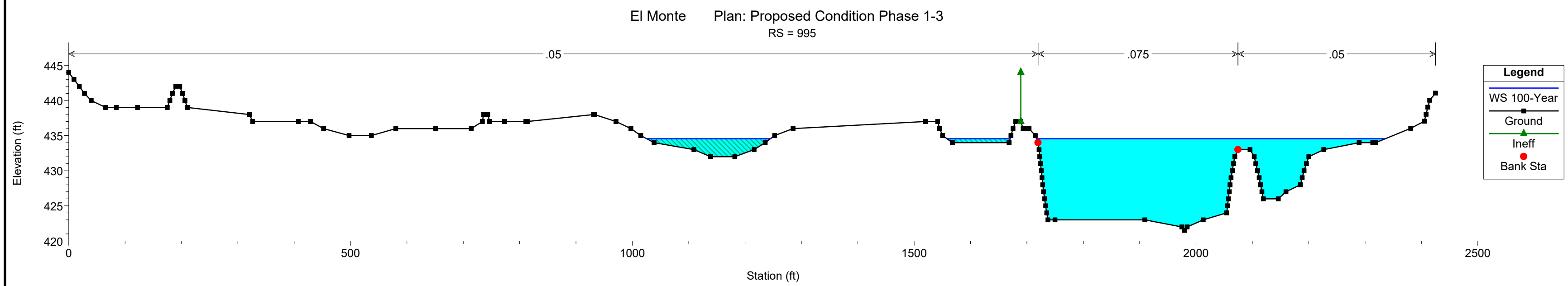

El Monte Plan: Proposed Condition Phase 1-3
RS = 1017
.05
.075
.05
Elevation (ft)
455
450
445
440
435
430
425
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

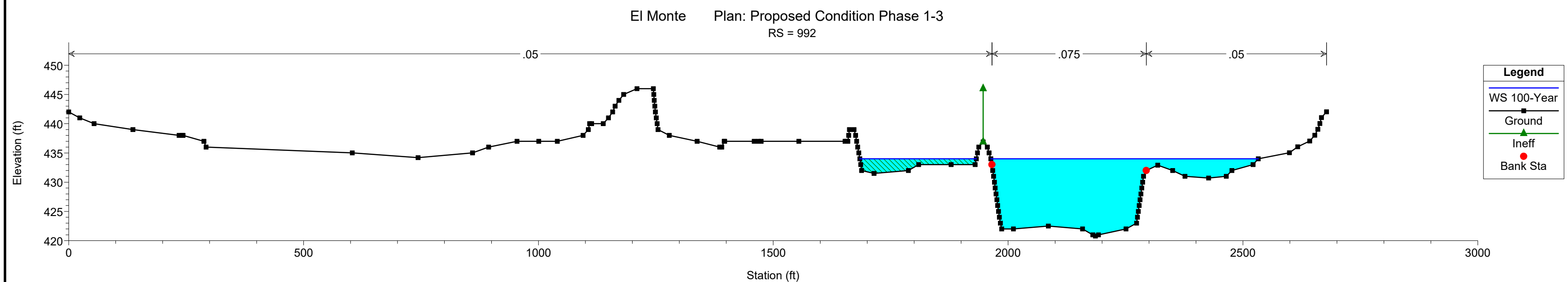

El Monte Plan: Proposed Condition Phase 1-3
RS = 1013
.05
.075
.05
Elevation (ft)
455
450
445
440
435
430
425
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

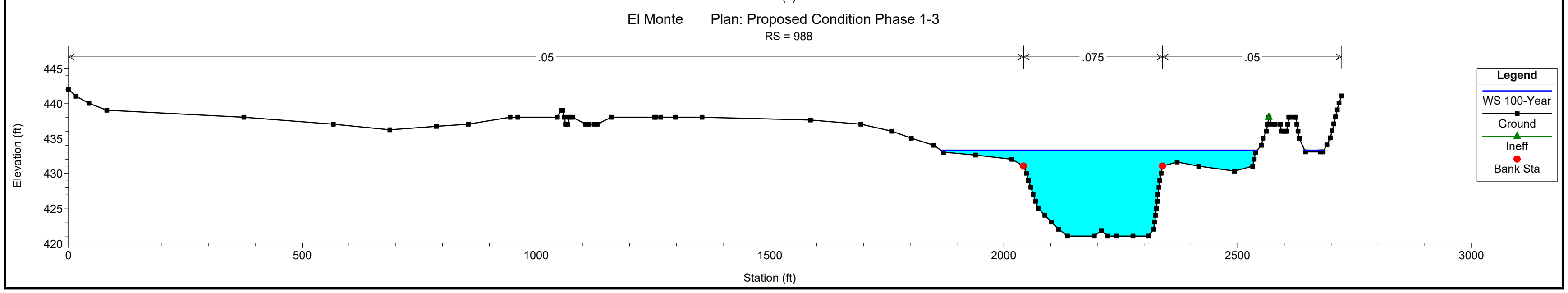

El Monte Plan: Proposed Condition Phase 1-3
RS = 1010
.05
.075
.05
Elevation (ft)
455
450
445
440
435
430
425
0
200
400
600
800
1000
1200
1400
1600
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

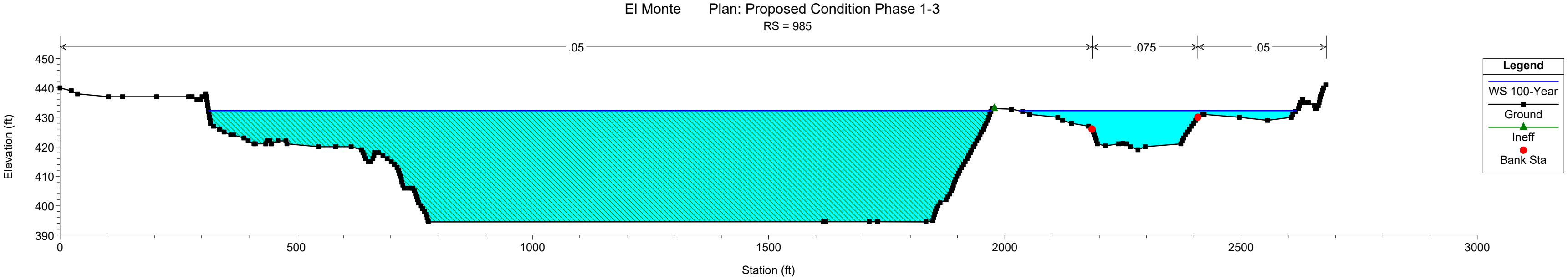

El Monte Plan: Proposed Condition Phase 1-3
RS = 1005
.05
.075
.05
Elevation (ft)
450
445
440
435
430
425
420
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1-3
RS = 1000
.05
.075
.05
Elevation (ft)
Station (ft)
450
445
440
435
430
425
420
0
500
1000
1500
2000
2500
Legend
WS 100-Year
Ground
Ineff
Bank Sta

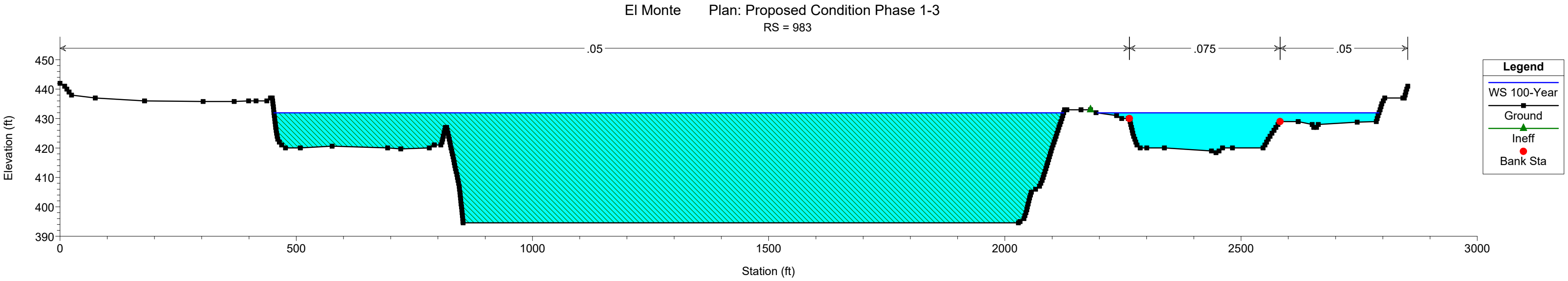

El Monte Plan: Proposed Condition Phase 1-3
RS = 995
.05
.075
.05
Elevation (ft)
Station (ft)
445
440
435
430
425
420
0
500
1000
1500
2000
2500
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1-3
RS = 992
.05
.075
.05
Elevation (ft)
Station (ft)
450
445
440
435
430
425
420
0
500
1000
1500
2000
2500
3000
Legend
WS 100-Year
Ground
Ineff
Bank Sta

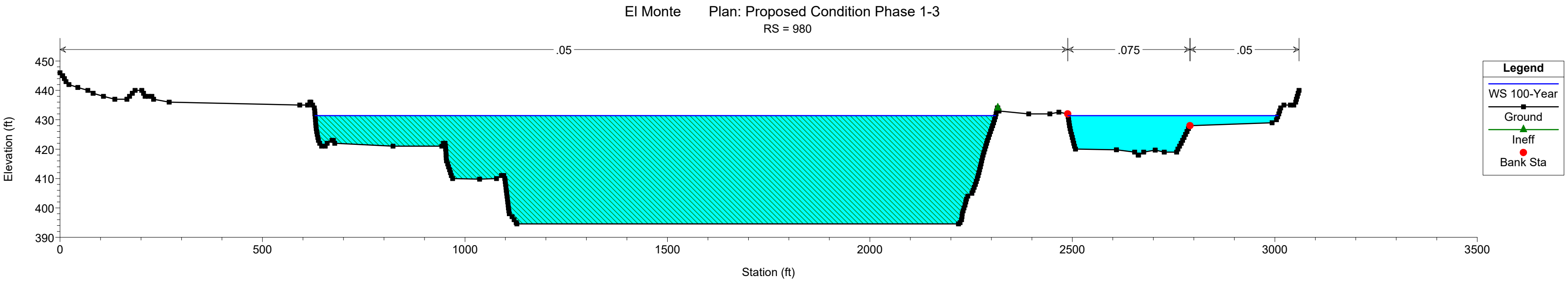

El Monte Plan: Proposed Condition Phase 1-3
RS = 988
.05
.075
.05
Elevation (ft)
Station (ft)
445
440
435
430
425
420
0
500
1000
1500
2000
2500
3000
Legend
WS 100-Year
Ground
Ineff
Bank Sta



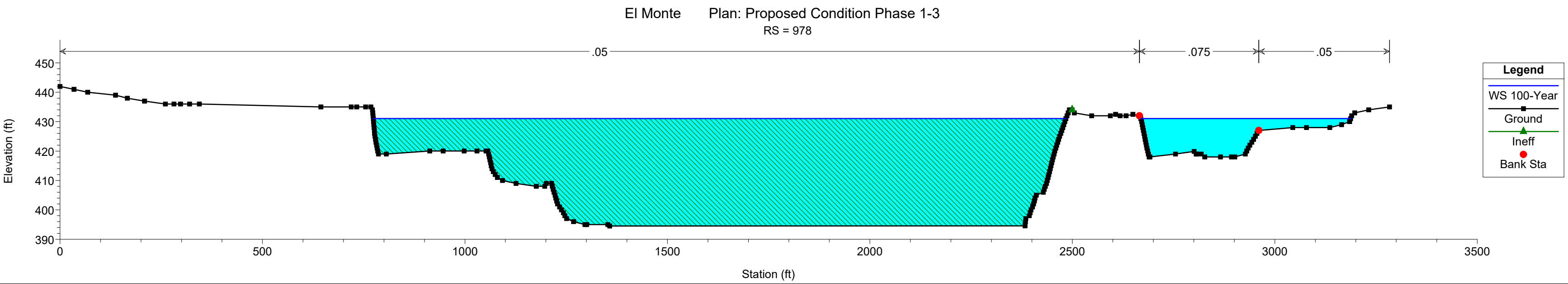
El Monte Plan: Proposed Condition Phase 1-3
RS = 985
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta



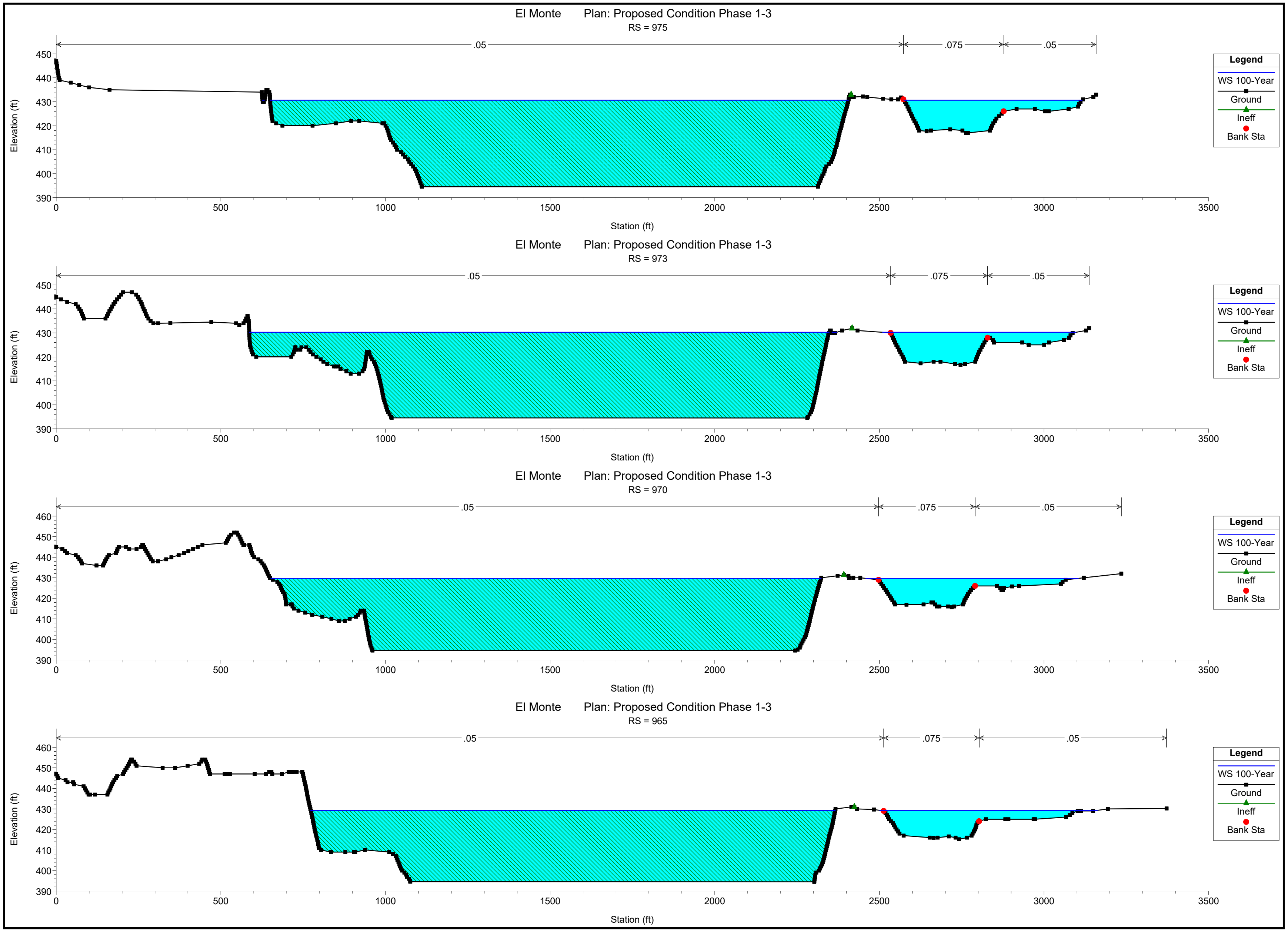
El Monte Plan: Proposed Condition Phase 1-3
RS = 983
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

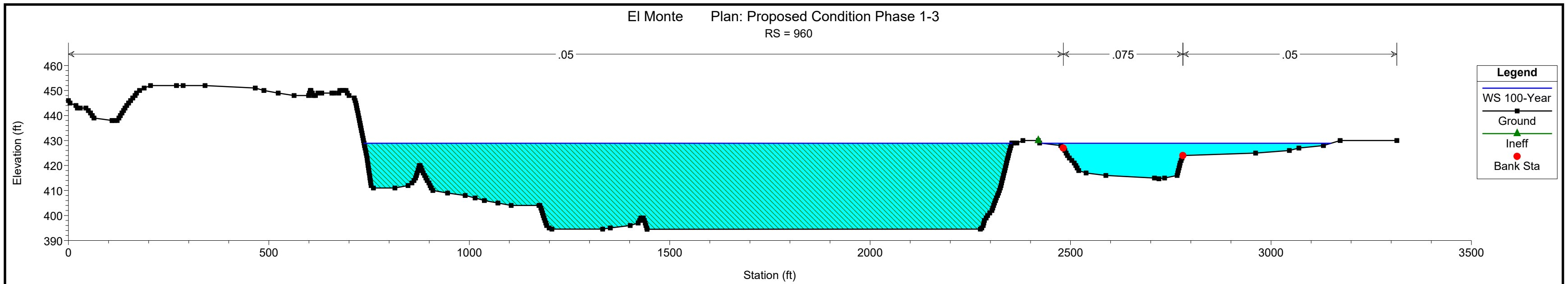


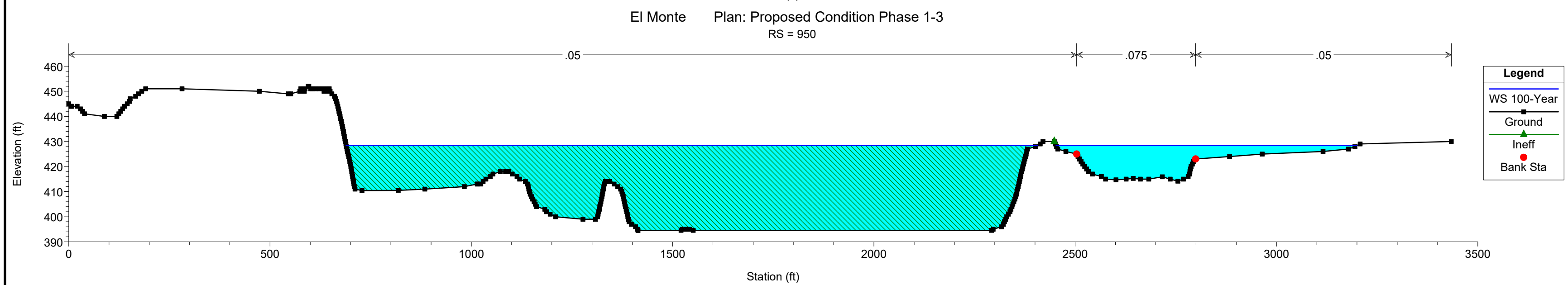
El Monte Plan: Proposed Condition Phase 1-3
RS = 980
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

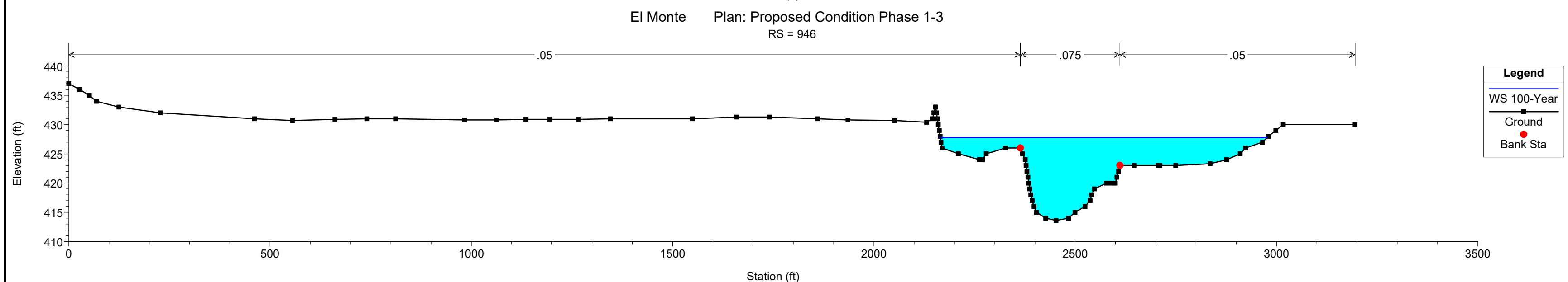


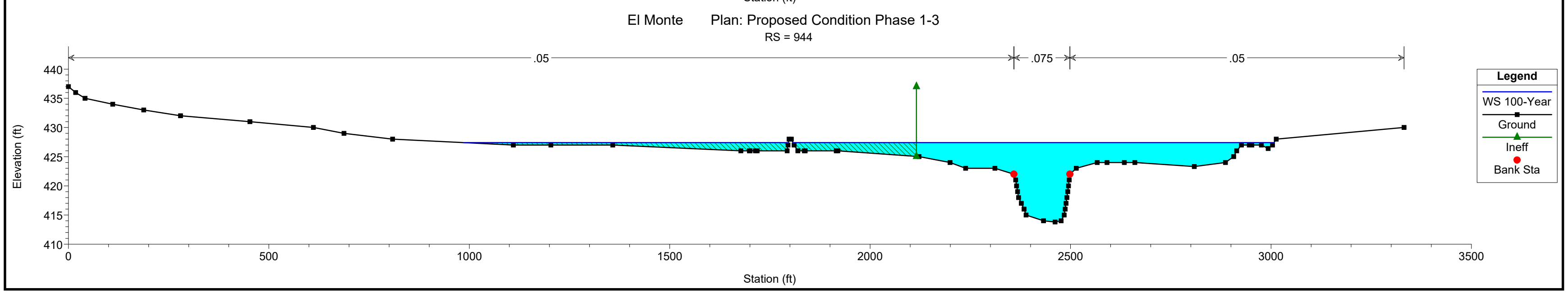
El Monte Plan: Proposed Condition Phase 1-3
RS = 978
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

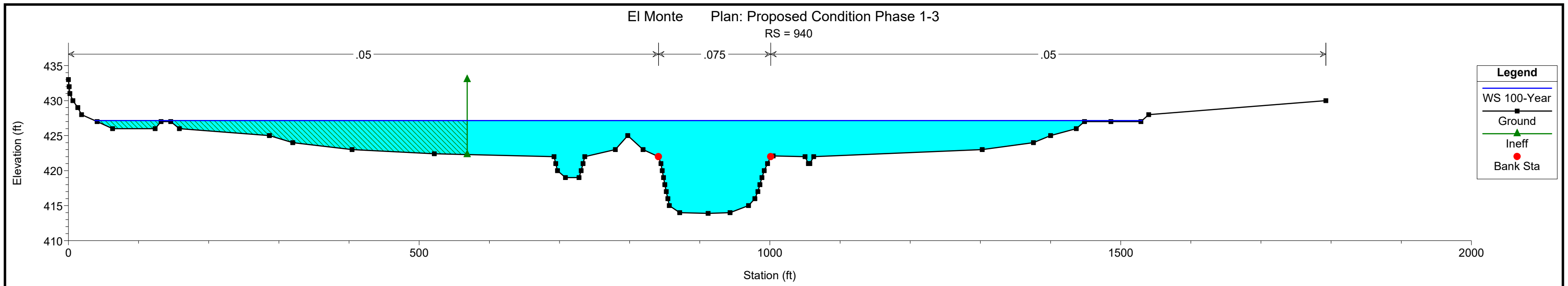

El Monte Plan: Proposed Condition Phase 1-3
RS = 975
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition Phase 1-3
RS = 973
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition Phase 1-3
RS = 970
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
El Monte Plan: Proposed Condition Phase 1-3
RS = 965
.05
.075
.05
Legend
WS 100-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

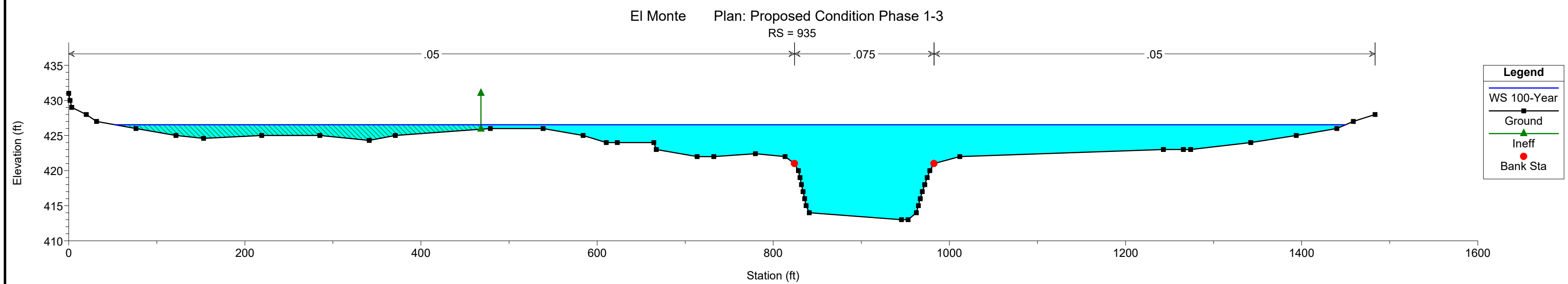

El Monte Plan: Proposed Condition Phase 1-3
RS = 960
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

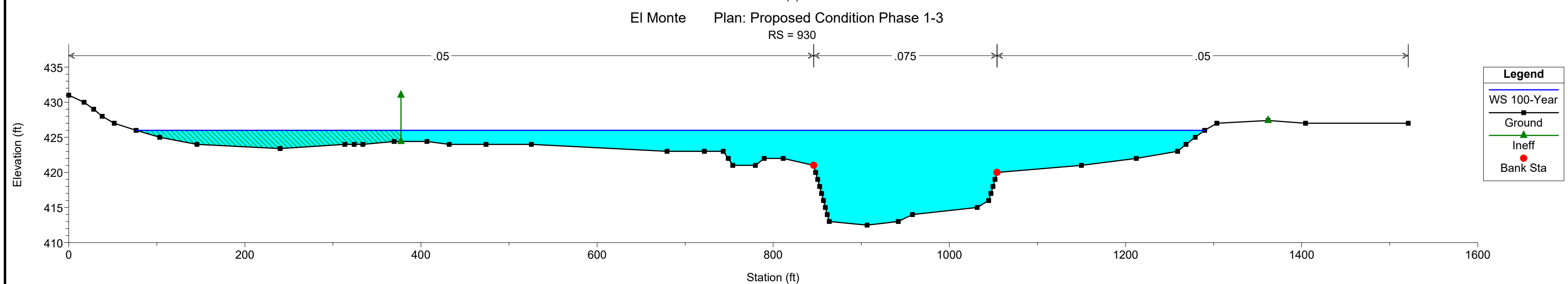

El Monte Plan: Proposed Condition Phase 1-3
RS = 950
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

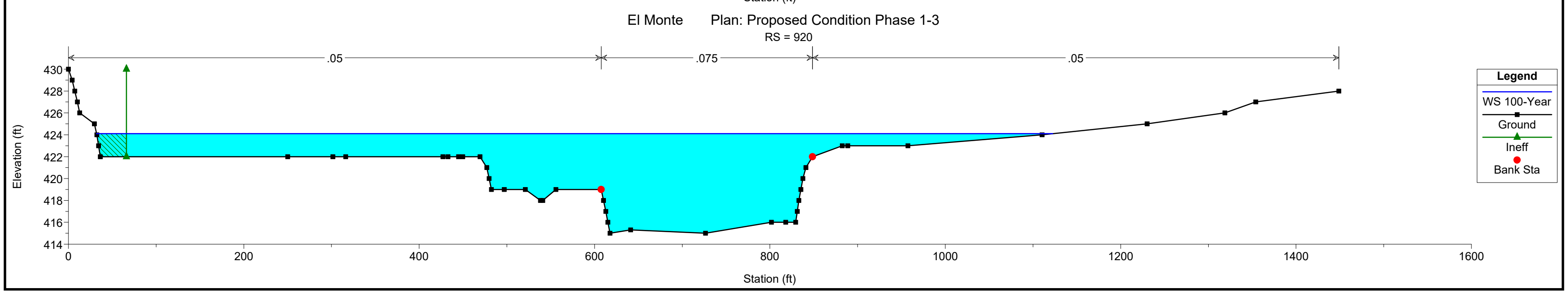

El Monte Plan: Proposed Condition Phase 1-3
RS = 946
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta

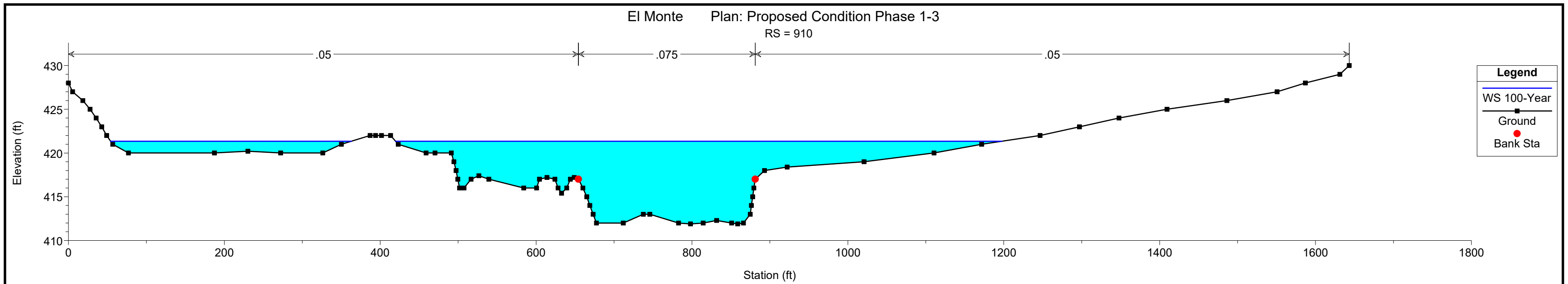

El Monte Plan: Proposed Condition Phase 1-3
RS = 944
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

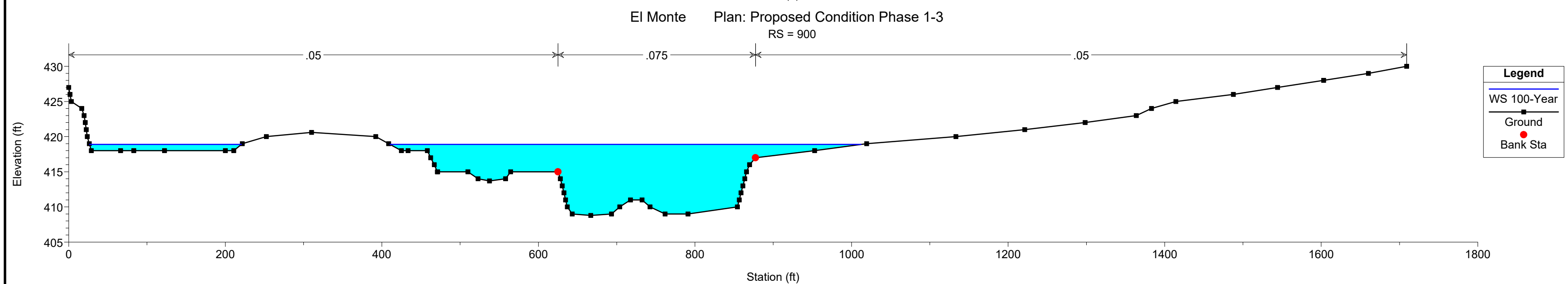

El Monte Plan: Proposed Condition Phase 1-3
RS = 940
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

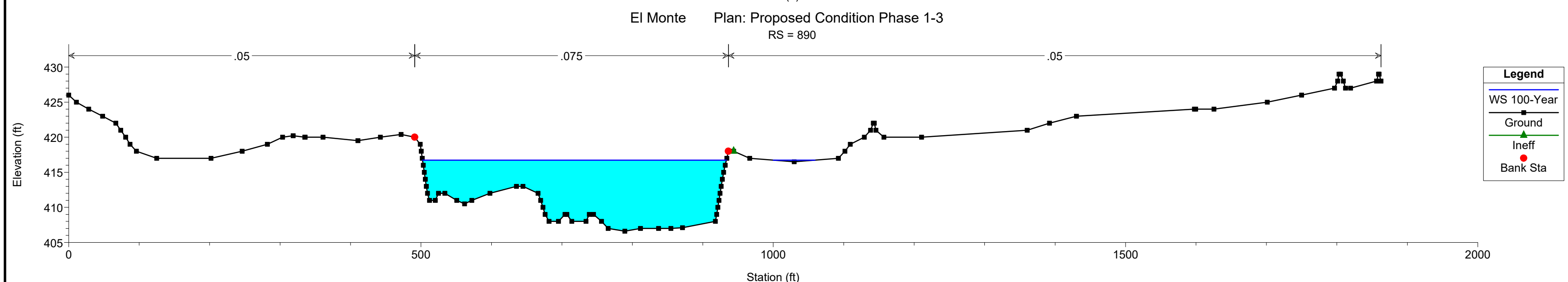

El Monte Plan: Proposed Condition Phase 1-3
RS = 935
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

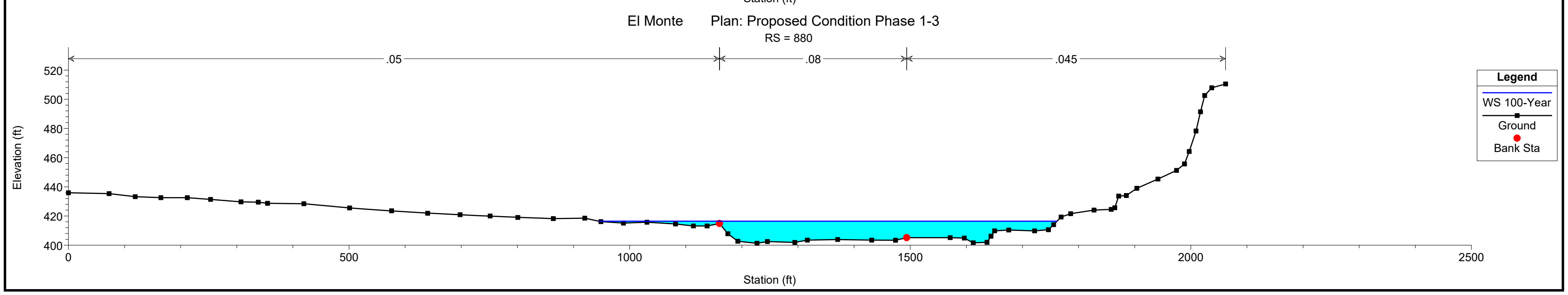

El Monte Plan: Proposed Condition Phase 1-3
RS = 930
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta

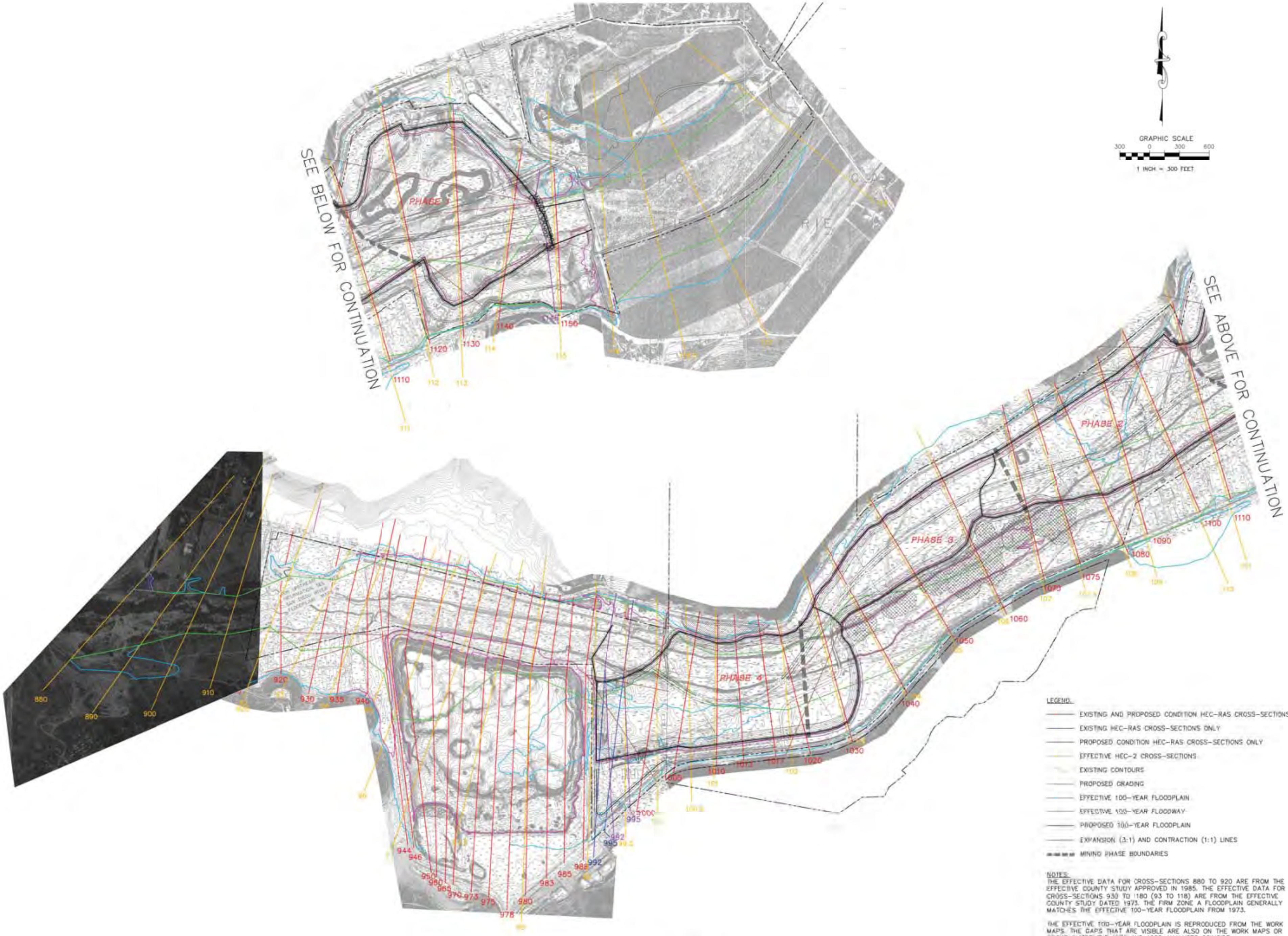

El Monte Plan: Proposed Condition Phase 1-3
RS = 920
.05
.075
.05
Elevation (ft)
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1-3
RS = 910
.05
.075
.05
Elevation (ft)
430
425
420
415
410
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Proposed Condition Phase 1-3
RS = 900
.05
.075
.05
Elevation (ft)
430
425
420
415
410
405
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta


El Monte Plan: Proposed Condition Phase 1-3
RS = 890
.05
.075
.05
Elevation (ft)
430
425
420
415
410
405
0
500
1000
1500
2000
Station (ft)
Legend
WS 100-Year
Ground
Ineff
Bank Sta


El Monte Plan: Proposed Condition Phase 1-3
RS = 880
.05
.08
.045
Elevation (ft)
520
500
480
460
440
420
400
0
500
1000
1500
2000
2500
Station (ft)
Legend
WS 100-Year
Ground
Bank Sta



NOTES:

THE EFFECTIVE DATA FOR CROSS-SECTIONS 880 TO 920 ARE FROM THE EFFECTIVE COUNTY STUDY APPROVED IN 1985. THE EFFECTIVE DATA FOR CROSS-SECTIONS 930 TO 1180 (93 TO 118) ARE FROM THE EFFECTIVE COUNTY STUDY DATED 1973. THE FIRM ZONE A FLOODPLAIN GENERALLY MATCHES THE EFFECTIVE 100-YEAR FLOODPLAIN FROM 1973.

THE EFFECTIVE 100-YEAR FLOODPLAIN IS REPRODUCED FROM THE WORK MAPS. THE GAPS THAT ARE VISIBLE ARE ALSO ON THE WORK MAPS OR OCCUR WHERE THE 1975 AND 1985 ANALYSES COINCIDE.

THE PROPOSED FLOODWAY WILL BE DEFINED WITH THE CLOMR/LOMR.

HYDRAULIC WORK MAP