Appendix D – New and Updated Appendices to the EIR

This appendix contains:

- Appendix E-6 (UPDATED): Detention Basin Analysis – Updated (AECOM 2023).
- Appendix E-8 (NEW): Floodplain Impact Certification, Grading and Flood Study Summary Report. Z-Best Compost Facility Expansion, Santa Clara County, California (Schaaf & Wheeler 2012).
- Appendix E-9 (NEW): Conditional Letter of Map Revision Based on Fill Comment Document (CLOMR-F) issued by the Federal Environmental Management Agency, May 21, 2018.
- Appendix H-1 (NEW): Additional Information regarding Feasibility of Enclosed Alternative (ECS 2023; Greenwaste 2023; WSP USA Inc. 2023).

- Appendix E-6 (UPDATED): Detention Basin Analysis – Updated (AECOM 2023).

AECOM

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Project name:
Z-Best Composting Facility

Project ref:
60666256

From: Elizabeth Nielsen, Water Resources Engineer, AECOM

Date:
July 28, 2023

To: Valerie Negrete
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CC: Emmanuel Ursu, Consultant Planner
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Memo

Subject: Detention Basin Analysis – replaces previous version dated April 7, 2023 in its entirety

This Technical Memorandum evaluates whether the storage capacity of the detention basins at the Z-Best Composting Facility, as proposed under the Z-Best Composing Facility Expansion and Upgrade Project (project), would be sufficient to detain without release, overtopping, or spill the recent sequence of atmospheric rivers experienced during December 2022 to March 2023. To provide additional context, a 64-year rainfall record was used to evaluate the frequency of overtopping that might occur with proposed conditions when evaluated against a historical daily rainfall record.

The analysis found that the proposed design capacity of the basins would be insufficient to detain the recent sequence of storm events and that, with consideration of antecedent rainfall conditions, the proposed design is unlikely to meet the required design conditions from the State Water Resources Control Board General Waste Discharge Requirements for Composting Operations (Composting Order), or equivalent conditions, which requires detention basins to be designed to contain all runoff from working surfaces in addition to direct precipitation from the 25-year, 24-hour storm event.

1. Background

Z-Best Products has applied to the County of Santa Clara for a major modification to its existing Use Permit at the Z-Best Composting Facility located at 980 State Route 25 (SR-25) in an unincorporated area approximately 5 miles southeast of Gilroy, California. Proposed facility modifications will also require Architecture and Site Approval and Grading Approval. Z-Best is proposing to replace the existing composting process it uses for processing municipal solid waste feedstock with an Engineered Composting System (ECS) process that uses aerated static piles (ASP); existing green waste composting operations would remain unchanged. Additional components of the proposed project include expanding the existing flood storage facility, modifying Detention Basin #1, relocating the existing facility entrance, and widening SR-25 along the project site frontage to enable installation of acceleration lanes and deceleration lanes into and out of the proposed relocated entrance.

As part of the proposed project, the ECS improvements area within Area 1 would be raised by approximately 1 to 2 feet; the existing flood storage basin would increase by approximately 7.2 acres; and the footprint and elevation of the perimeter berms for Detention Basin #1 would be modified. Perimeter berms at the drainage basin would be raised to protect the basin from a 100-year flood and the footprint of the drainage basin would decrease from 6.3 acres to approximately 2.4 acres. As a result of these modifications, Detention Basin #1 would increase its maximum capacity from approximately 9.1 million gallons to approximately 14.5 million gallons. No modifications to Detention Basin #2 are proposed as part of the project. See Figure 1 through 3 for project plans showing existing and proposed conditions.

2. Methodology

The proposed storage capacity for Detention Basin #1 was evaluated based on the methodology provided in Golder (2020) with project data updated based on Golder (2022a, b, and c). A water balance model was used to estimate basin storage needs that accounts for direct precipitation to the basin, runoff from the facility, evaporation from the basin, and operational outflows. Operational outflows include water used for green waste composting operations, dust control, and water used for ASP composting operations which was assumed to come from Detention Basin #1, Detention Basin #2, or groundwater. Operations for Detention Basin #1 and Detention Basin #2 have the potential to be interconnected via pumping and therefore inflows and outflows at both basins were modeled concurrently.

The major differences between the water balance presented herein and the one presented in Golder (2020) is the timestep of the model and input hydrology. This model uses a daily timestep and the long-term daily precipitation data measured at the Gilroy gauge for water years 1959 to 2023 (Station USC00043417; NOAA 2023a); no data was collected during water year 2020 at this station. These data were used to evaluate whether the storage capacity proposed for Detention Basin #1 would be sufficient to prevent release, overtopping, or spill in winter 2023 in light of the recent sequence of storm events experienced in the Gilroy area.

2.1 Input Data and Assumptions

The following input data and assumptions were used in the water balance.

- Detention basin characteristics. Detention basin capacity, surface area, and berm elevations and the contributing runoff area are described in Table 1.
- Stage-storage-area relationships. Information related to elevation, surface area, and volume for water stored within the detention basins is provided in Tables 2 and 3. These data are the same as those reported in Golder (2020). Where drainage basin capacity was found to be limited (i.e., the basin would have spilled or been overtopped), the volume and surface area were estimated based on trendlines fitted to these data. For the purpose of the modeling, where proposed capacity was limited, the berm elevations were assumed to increase (as opposed to changing the footprint of the detention basins or allowing discharge, spills, or overtopping) so as to contain all runoff from the facility without discharge from the detention basins.
- Direct precipitation. Direct precipitation to the basins was estimated based on rainfall and the footprints of the detention basins. Precipitation data recorded at the Gilroy gauge was scaled to 91 percent to reflect drier conditions expected at the project site compared to the gauge site. As discussed below, water year 2023 had a series of storms that when averaged over a longer period of record, such as a 45-day period, had an estimated return period greater than what would be

expected for the maximum single day event. Therefore, precipitation estimates for the site were scaled based on the ratio of the NOAA point precipitation frequency estimate for the Gilroy gauge vs. the site based on a 45-day averaging period (NOAA 2023c).

- Runoff. Runoff to the detention basins was estimated based on scaled rainfall, the size of the contributing drainage area, and a runoff coefficient for the contributing drainage area. The runoff coefficient for Area 1 was assumed to be 0.76 and the runoff coefficient for Area 2 was assumed to be 0.72, which were considered reasonable estimates provided in Golder (2022a). Note that proposed conditions include runoff from an approximate 2.6-acre area south of Area 1's compost pad which does not currently flow to Detention Basin #1 (Golder 2022a); in addition, the contributing drainage area from Area 2 was reduced to 24 acres to account for the increased size of the flood storage basin included in the proposed project, which captures about 2 acres of drainage that is currently part of Area 2.
- Evaporation. Evaporation from the detention basins was estimated based on the reference evapotranspiration rate (ETo) for Gilroy and the estimated surface area of the water stored in the detention basins.[1] The ETo values used in Golder (2020 and 2022a) were verified as reasonable and used to facilitate consistency in the modeling. See Table 4.
- Operations. Operational decisions affect either or both of the detention basins. Operational outflows include water used for green waste composting, for dust control, and for ASP composting.

  Water demands for primary and secondary green waste composting are each estimated at 176,000 gallons per day, Monday through Friday (260 days per year) with no reduction for concurrent rainfall or seasonal fluctuations in evaporation from the compost. The water demand for primary green waste composting was assumed to be met first from water stored in Detention Basin #1 until empty, then from Detention Basin #2. If both basins were insufficient or empty, demand would then be met by groundwater. The water demand for secondary green waste composting was assumed to be met from Detention Basin #2 or, if insufficient or empty, from groundwater.

  Water demands for dust control are estimated at 147,000 gallons per day, Monday through Friday, on days without rain. Water demand for dust control was assumed to be met after demands for green composting operations were resolved. Water for dust control was obtained first from the remaining water in Detention Basin #1, then Detention Basin #2, and, if both were empty or insufficient, from groundwater.

  Water demands for primary ASP composting are estimated at 20,000 gallons per day, 365 days per year and water demands for secondary ASP composting are estimated at 40,000 gallons per day, 365 days per year. Golder (2020) indicates that ASP primary and secondary composting demands would be met preferentially from groundwater but could also be met from water captured in Detention Basin #2. This assumption was updated based on personal communication from Z-Best Operations Manager, John Doyle in 2023; water for ASP composting would be obtained from Detention Basin #1, Detention Basin #2, or groundwater.
- Transfers between detention basins. For the purpose of the modeling, it was assumed that transfers would not occur between detention basins. However, as it is possible to pump water between the detention basins, the potential for overtopping has also been evaluated based on the combined capacity of the two detention basins.

[1] ETo is approximately equal to evaporation from a large body of water.

2.2 Hydrology

Precipitation data for Gilroy, California were downloaded from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information and NOAA's National Weather Service (NOAA 2023a, 2023b). Three weather stations recorded precipitation data in the Gilroy area during water year 2023; see Table 5 for a summary of these data. The National Weather Service reports daily precipitation for Gilroy, California based on data recorded at the weather station Gilroy, CA US, USC00043417, which has a long-term data record. Data from weather station Gilroy, CA US, USC00043417, was selected for the model to allow for comparison to the long-term record. Minor corrections were made by NOAA to the March 2023 data after initial review. The updated daily rainfall data were used in the modeling.

There have been several flood events in the vicinity of the project area in 2023. On January 9, 2023, and on March 10, 2023, storms caused flooding on Highway 101, Bloomfield Avenue, and Bolsa Road. Winter 2023 was particularly wet, with atmospheric rivers providing multiple inches of rain over several weeks-long periods. The March 10, 2023, storm was the largest 24-hour precipitation event during this period, with 4.05 inches of rain. December and early January also experienced substantial rainfall. The maximum 45-day averaging period during December and early January was 18.65 inches inclusive of the January 9, 2023, storm.

Table 6 compares point precipitation frequency estimates for the Gilroy, CA US, USC00043417 gauge location, obtained from NOAA's National Weather Service Hydrometeorological Design Studies Center (NOAA 2023c), to the precipitation data from this weather station for different averaging periods. The maximum 1-day precipitation of 4.05 inches was between a 5-year and a 10-year event and the maximum 45-day precipitation of 18.65 inches was between a 10-year and a 25-year event.

3. Results

The water balance predicts flooding under proposed conditions at the Z-Best Composting Facility and overtopping, spill, or discharge from the detention basins after the January 9, 2023, and March 10, 2023, storms. Although the capacity at the crest of Detention Basin #1 would increase from 9.1 million gallons to 14.5 million gallons as a result of the project, there may not be adequate storage within Detention Basin #1 and #2 to hold runoff from the facility as well as the direct precipitation to the basins during conditions preceding and following the January 9^{th} and March 10^{th} storms. The atmospheric river conditions experienced in December 2022 through March 2023 are predicted to fill the detention basins to 60 to 70 percent capacity prior to when these large events would occur, and water use demands are not expected to be sufficient to prevent discharge during the storm. Water use demands were assumed conservatively and did not account for reductions to demand based on concurrent rainfall or seasonal fluctuations in evaporation from the compost.

Because the proposed capacity was not predicted to be adequate to retain the runoff and precipitation from these storms, for the purpose of the modeling, increased capacity was assumed for the detention basins. As discussed in Section 2.1, where the proposed capacity was limiting, the berm elevations were assumed to increase (as opposed to increasing the footprint of the detention basins or allowing spill or discharge) until all runoff from the facility would be contained without discharge from the detention basins. This is a simplifying assumption and it does not represent optimization for site conditions.

Figures 4, 5, and 6 show the results of the water balance with the above-mentioned assumptions. Assuming that all runoff and precipitation could be held within the basins, the water balance indicates that approximately 3.9 million gallons of additional capacity would be needed to accommodate the post-January 9, 2023, storms without discharge. This value would increase to 7.4 million gallons of additional capacity below the freeboard, if 2 feet of freeboard would be maintained at each of the detention basins. Detailed results of the water balance model are shown in Attachment A.

In addition, the 64-year daily rainfall record was used to evaluate whether the proposed capacity for the detention basins (the combination of Detention Basin #1 and Detention Basin #2) would be adequate to prevent discharge. It is estimated that the proposed design capacity of the detention basins would be insufficient to detain runoff from the facility during winter 1969, 1997, 1998, and 2023 (See Figure 6b). This is an estimated return frequency of one out of every 16 winters.

4. Conclusions and Recommendations

The State Water Resources Control Board Composting Order requires detention basins to be designed to contain all runoff from working surfaces in addition to direct precipitation from the 25-year, 24-hour storm event. Specifically, it indicates that:

Detention ponds, if used, must be designed, constructed, and maintained to prevent conditions contributing to, causing, or threatening to cause contamination, pollution, or nuisance, and must be capable of containing, without overflow or overtopping (taking into consideration the crest of winddriven waves and water reused in the composting operation), all runoff from the working surfaces in addition to precipitation that falls into the detention pond from a 25-year, 24-hour peak storm event at a minimum, or equivalent alternative approved by the Regional Water Board.

According to NOAA point precipitation frequency estimate for the site, the 25-year, 24-hour storm event is 4.75 inches of rain (NOAA 2023c), and such an event could be accommodated if the detention basins were empty. A storm with 4.75 inches of rain is expected to fill the detention basins to approximately 55 percent of their combined capacity (10.2 million gallons of runoff plus direct precipitation vs 18.5 million gallons of combined capacity). However, as demonstrated in Golder (2020) and in this water balance model, operations of the detention basins will not draw down water levels to empty during extended periods of time in wet years. The maximum volume retained in the detention basins exceeded 8.3 million gallons for at least one day in 34 years out of 64 water years. In a few cases, volumes in excess of 8.3 million gallons were held in the basins for more than 2 months. In addition, extreme events such as the 25-year, 24-hour storm event are more likely to occur during wet years than dry years. As such, there remains a substantial risk of overtopping if an extreme event occurs during a wet year assuming the currently proposed capacity increase in Detention Basin #1.

It is recommended that design capacity of Detention Basin #1 consider the operational context of the detention basin in years that are wetter than average. A wet year is expected to provide antecedent rainfall conditions which would likely occupy a portion of the detention basins prior to an extreme event. Wet conditions would also reduce water use demands.

These findings continue to support the DEIR conclusion that there remains a substantial risk of overtopping, spill, or discharge if an extreme event occurs during a wet year when the detention basins are being used to hold prior runoff from the composting facility, assuming the currently proposed capacity increase in Detention Basin #1.

5. References

Doyle, John, pers. comm. 2023. Personal communication from Z-Best Operations Manager, John Doyle.

Golder Associates Inc. (Golder), 2020. Area 1 and Area 2 Water Balance. Appendix C of Z-Best Composting Facility Technical Report. Submitted by Golder Associates Inc. to Zanker Road Resource Management Ltd. December 2020.

Golder, 2022a. Water Supply Evaluation, Z-Best Compost Facility. August 15, 2022.

Golder, 2022b. Aerated Static Pile Composting Permit Package. Project No. 133-97640. County File No. 6498-81-11-09G 08P 08A 08EA. April 2022.

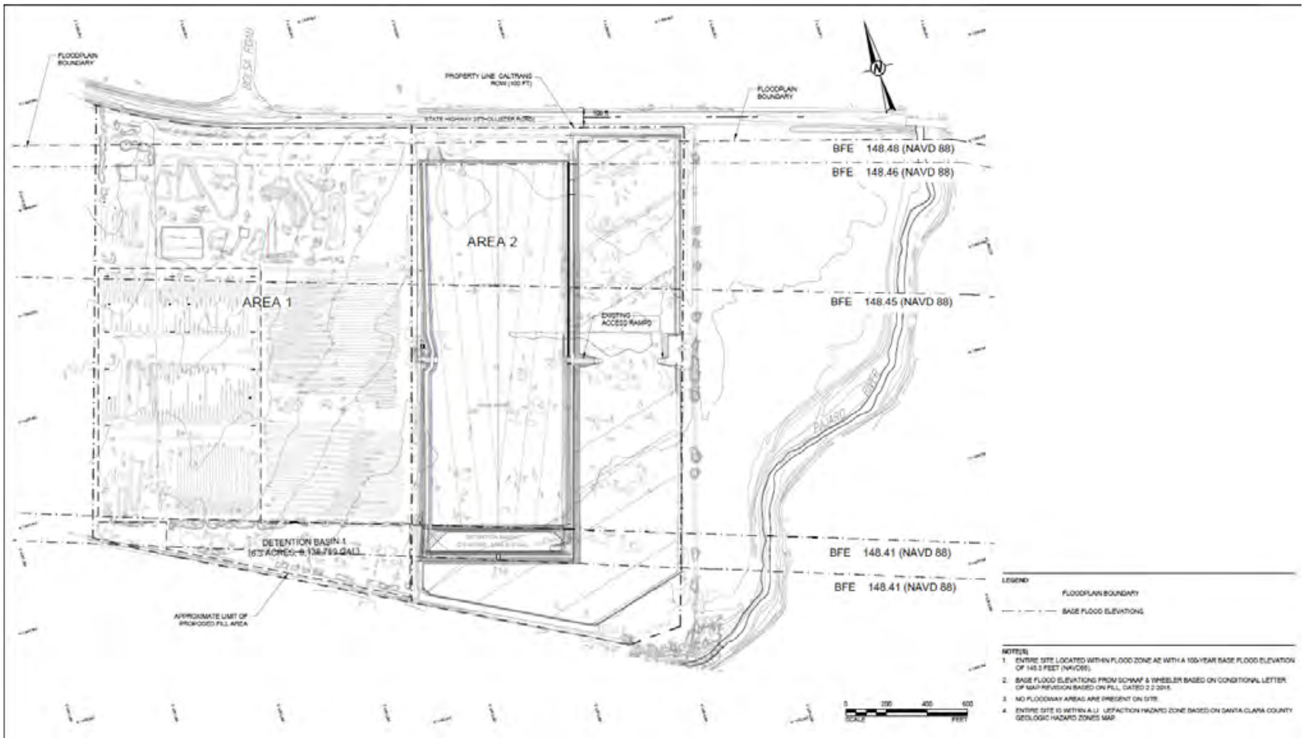
Golder, 2022c. Drawing 13, Proposed Detention Basin 1 - Plan and Section. Aerated Static Pile Composting Permit Package. Project No. 133-97640. County File No. 6498-81-11-09G 08P 08A 08EA. August 22, 2022.

National Oceanic and Atmospheric Administration (NOAA), 2023a. Climate Data Online. National Centers for Environmental Information. https://www.ncei.noaa.gov/cdo-web/

National Oceanic and Atmospheric Administration (NOAA), 2023b. NOWData – NOAA Online Weather Data. National Weather Service. https://www.weather.gov/wrh/Climate?wfo=mtr

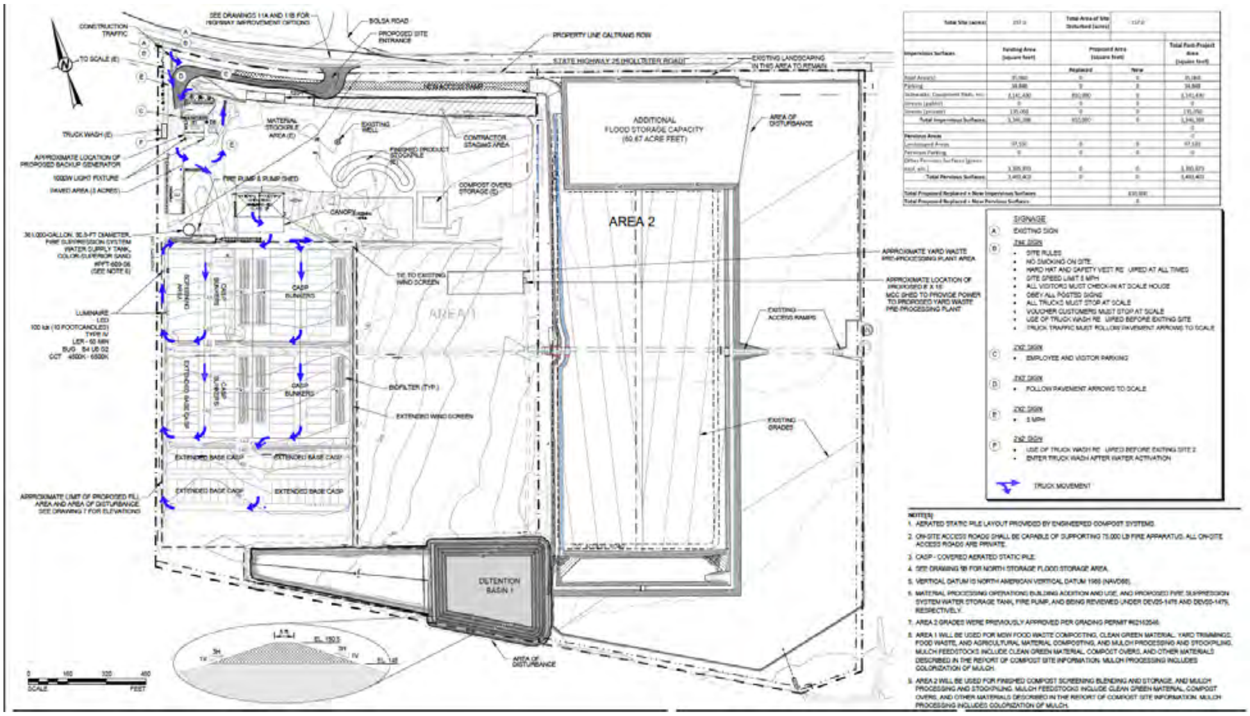
National Oceanic and Atmospheric Administration (NOAA), 2023c. NOAA Atlas 14 Point Precipitation Frequency Estimates. National Weather Service, Hydrometeorological Design Studies Center. https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

Figures



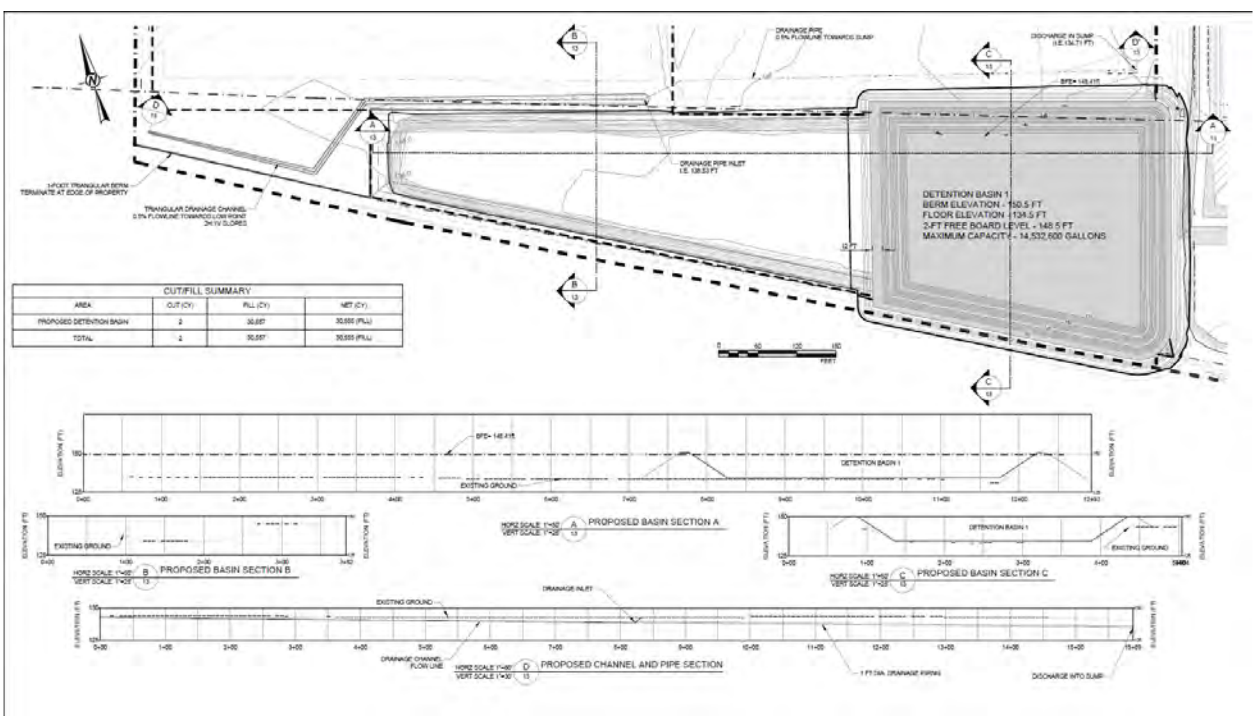
Source: Golder 2022b

Figure 1. Existing Site



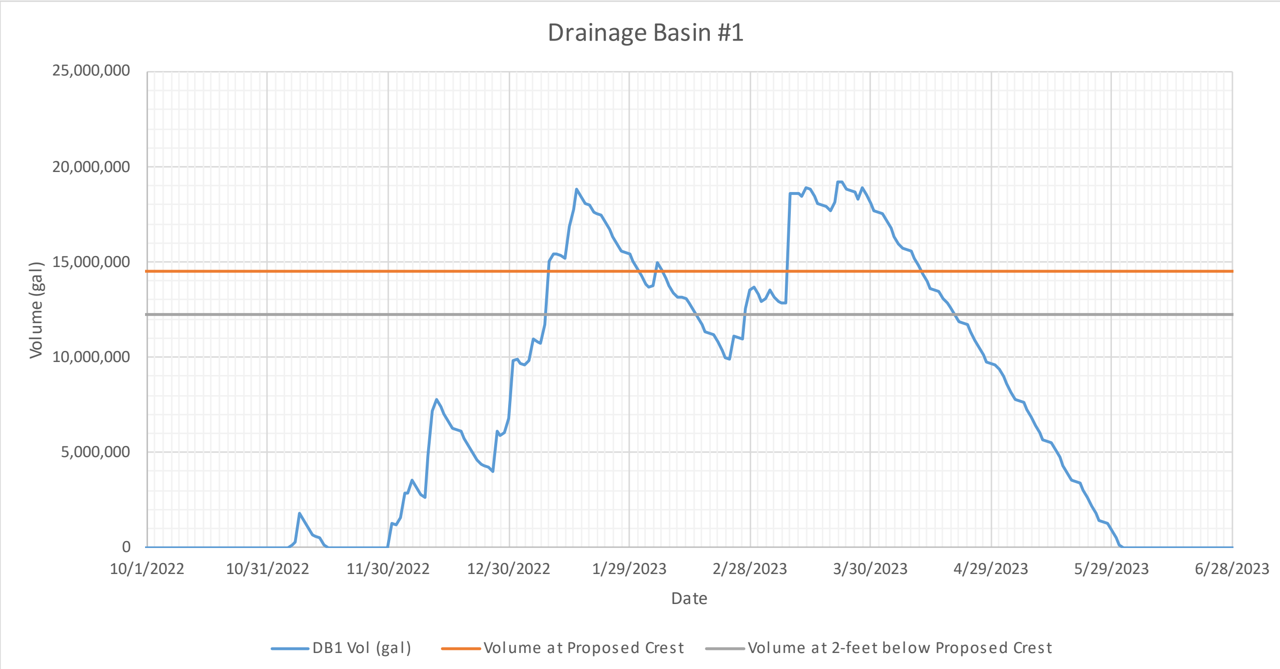
Source: Golder 2022b

Figure 2. Proposed Site Plan

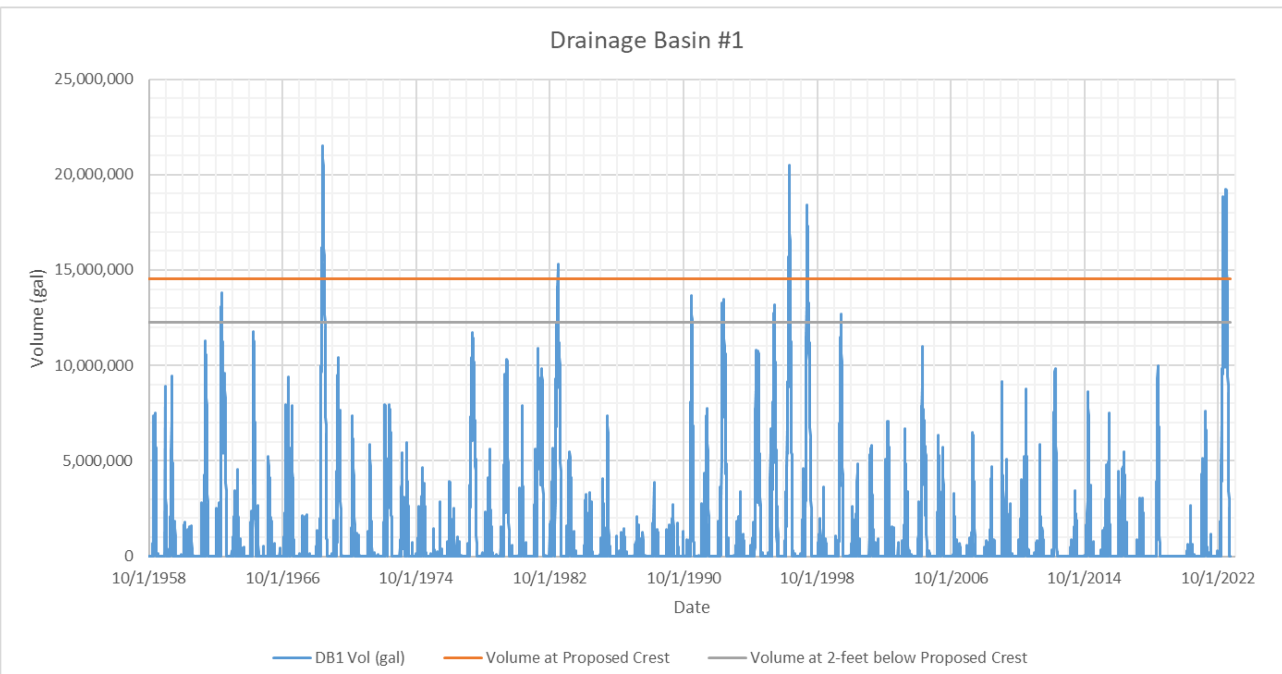


Source: Golder 2022c

Figure 3. Detail of Detention Basin #1, Proposed Site Plan

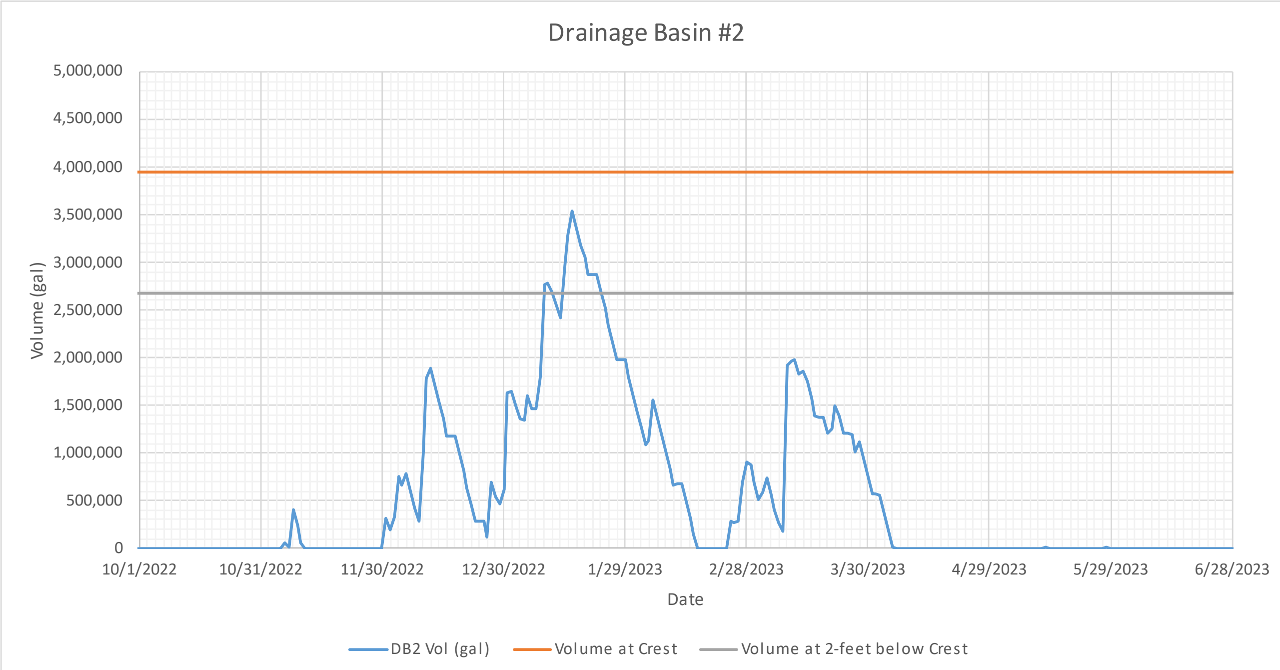


(a) Water Year 2023

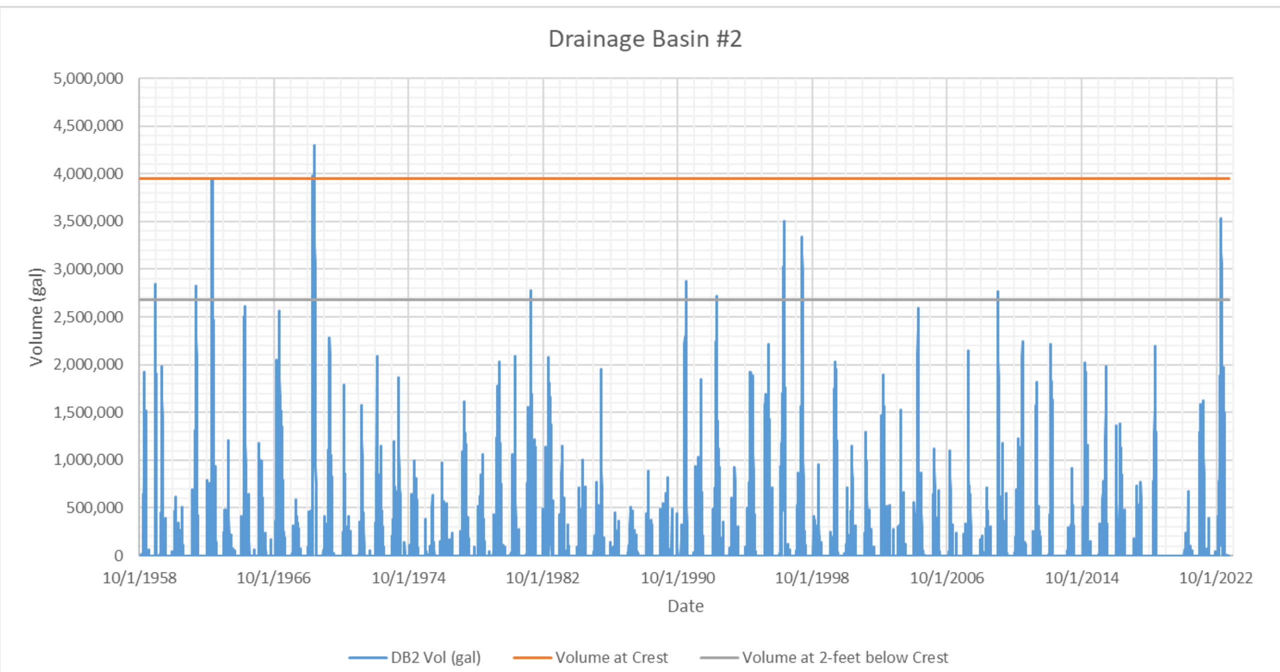


(b) Water Years 1959 to 2023

Figure 4. Model Results for Detention Basin #1

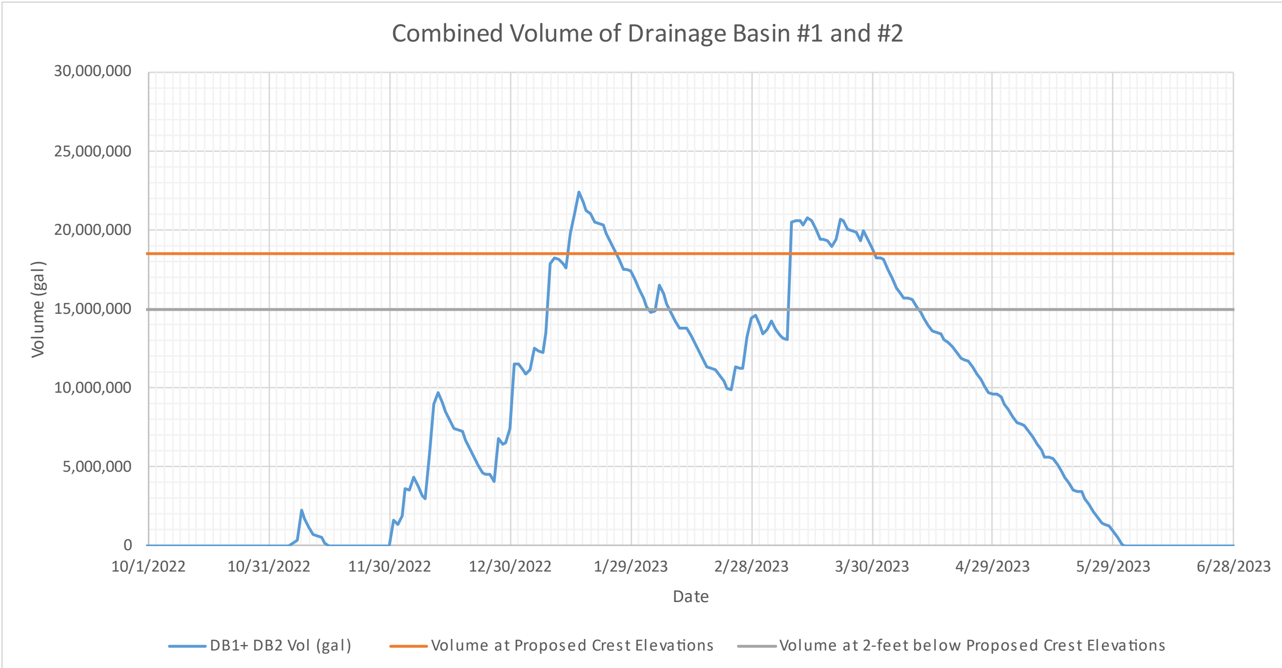


(a) Water Year 2023

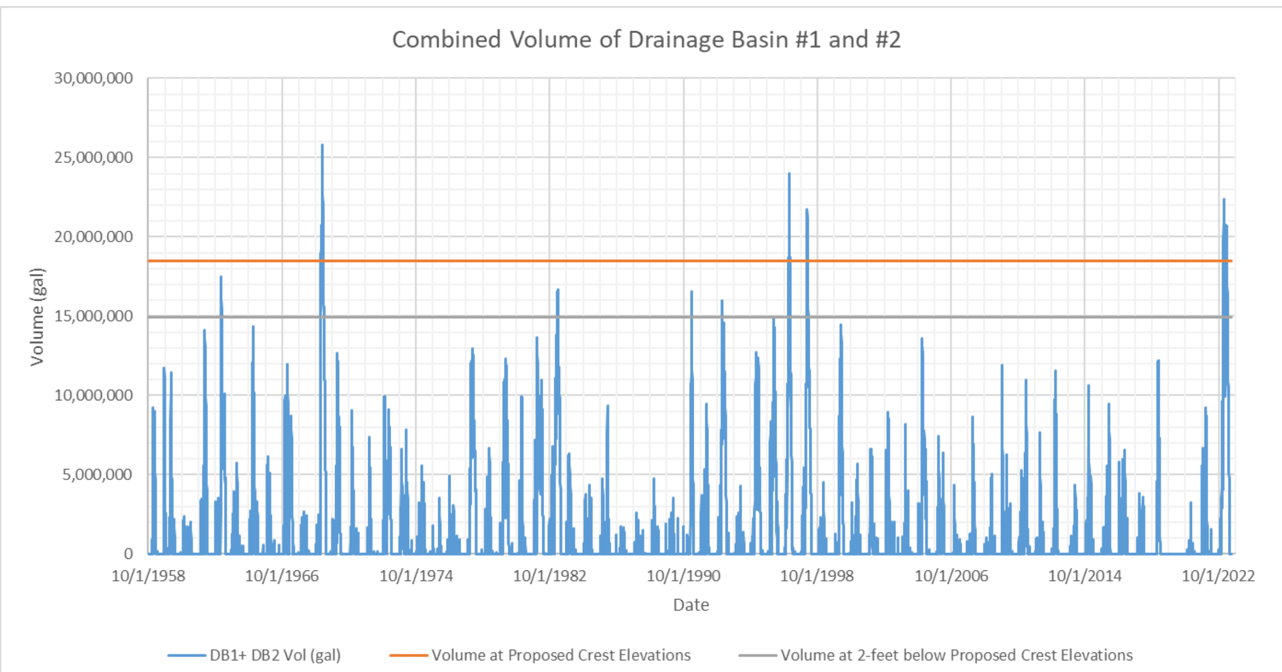


(b) Water Years 1959 to 2023

Figure 5. Model Results for Detention Basin #2



(a) Water Year 2023



(b) Water Years 1959 to 2023

Figure 6. Model Results for the Combined Capacity of Detention Basin #1 and #2

Tables

Table 1. Detention Basin Characteristics

Description	Value	Data Source
Area 1 drainage area, existing	3,057,780 sq ft (70.2 ac)	Golder 2022, table 5
Area 1 drainage area, proposed	3,170,560 sq ft (72.8 ac)	Golder 2022, table 12
DB1 capacity, existing	9,138,789 gal	Golder 2022, table 1
DB1 capacity, proposed	14,532,600 gal	Update to Drawing 13
DB1 surface area, proposed	185,388 sq ft	Golder 2022, page 10
DB1 floor elevation	134.5 ft	Update to Drawing 13
Base flood elevation of the 100-year floodplain	148.5 ft	2018 CLOMR
DB1 berm elevation, proposed	150.5 ft	Update to Drawing 13
Area 2 drainage area, existing	1,132,560 sq ft (26 acres)	Golder 2022
Area 2 drainage area, proposed	1,045,440 sq ft (24 acres)	Estimated from project plans
DB2 capacity	3,944,915 gal	Golder 2020
DB2 surface area	88,226 sq ft	Golder 2020
DB2 floor elevation	141.8 ft	Golder 2020
DB2 berm elevation	149 ft	Golder 2020

Source: Golder 2020 and 2022a; Project plans (Golder 2022b); Update to Drawing 13 (Golder 2022b)

Table 2. Detention Basin #1 Stage-Storage-Area Relationship, Proposed Condition

Elevation (ft)	Surface Area (sq ft)	Volume (Acre-ft)	Volume (gal)
150.5	156,295	44.5	14,532,595
150	153,947	42.8	13,952,443
149	149,301	39.3	12,818,295
148.5	147,008	37.6	12,264,196
148	144,722	35.9	11,718,661
147	140,209	32.7	10,653,019
146	135,762	29.5	9,620,887
145	131,381	26.4	8,621,771
144	127,066	23.5	7,655,177
143	122,818	20.6	6,720,611
142	118,635	17.8	5,817,576
141	114,519	15.2	4,945,579
140	110,469	12.6	4,104,126
139	106,485	10.1	3,292,721

Elevation (ft)	Surface Area (sq ft)	Volume (Acre-ft)	Volume (gal)
138	102,567	7.7	2,510,869
137	98,715	5.4	1,758,077
136	94,929	3.2	1,033,850
135	91,209	1.0	337,692
134.5	89,374	0.0	Approx. 0

Source: Golder 2020; elevations verified by Drawing 13 (Golder 2020c).

Table 3. Detention Basin #2 Stage-Storage-Area Relationship

Elevation (ft)	Surface Area (sq ft)	Volume (Acre-ft)	Volume (gal)
149	88,226	12.1	3,944,915
148	84,677	10.1	3,298,256
147	80,203	8.2	2,681,604
146	76,032	6.4	2,097,284
145	71,822	4.7	1,544,309
144	67,345	3.1	1,023,825
143	62,723	1.6	537,370
142	57,968	0.3	85,984
141.8	56,983	0.0	Approx. 0

Source: Golder 2020; elevations verified by project plans (Drawing 5B) (Golder 2022b)

Table 4. Reference Evapotranspiration for Gilroy, CA

Month	ETo (inches/month)	ETo (inches/day)
January	1.55	0.050
February	2.00	0.071
March	3.55	0.115
April	4.71	0.157
May	6.08	0.196
June	6.65	0.222
July	6.99	0.225
August	6.32	0.204
September	4.93	0.164
October	3.50	0.113
November	1.89	0.063
December	1.39	0.045

Source: Golder 2020 and 2022a

Table 5. Precipitation in Gilroy, California

Month	Gilroy, CA US (USC00043417), precipitation in inches	Gilroy 2.0 S, CA US (US1CASC0063), precipitation in inches	Gilroy 0.1 SE, CA US (US1CASC0054), precipitation in inches
October 2022	0	0	0
November 2022	1.61	3.24	3.04
December 2022	11.65	11.58	11.12
January 2023	8.25	11.52	11.74
February 2023	4.19	2.94	4.38
March 2023	8.10	11.03	11.45
April 2023	0.09	0.11	0.03
May 2023	0.85	1.14	0.98
June 2023	0	0.07	0.06
Total	34.74	41.63	42.8

Source: NOAA 2023a

Table 6. Comparison of Precipitation Frequency Estimates, in inches, to Water Year 2023 Data, in inches

Duration	Maximum precipitation, inches [1,2]	Average Return Interval, in years									
		1	2	5	10	25	50	100	200	500	1,000
24-hour	4.05	1.83	2.73	3.87	4.75	5.9	6.74	7.57	8.39	9.46	10.3
7-day	5.03	3.72	5.11	6.92	8.37	10.3	11.8	13.3	14.8	16.9	18.5
10-day	6.77	4.21	5.69	7.61	9.16	11.3	12.8	14.5	16.1	18.3	20
20-day	11.9	5.49	7.32	9.64	11.5	13.9	15.7	17.5	19.3	21.7	23.5
30-day	12.95	6.75	8.95	11.7	13.8	16.6	18.6	20.6	22.5	25	26.9
45-day	18.65	8.32	11	14.2	16.6	19.7	21.9	24	26.1	28.6	30.4
60-day	19.9	9.77	12.8	16.4	19.2	22.5	24.8	27	29.1	31.7	33.5

Source: NOAA Atlas 14, Volume 6, Version 2 Point Precipitation Frequency Estimates (NOAA 2023c)

Notes:

[1] Gauge location name: Gilroy, California, USA, Latitude: 37.0067°, Longitude: -121.5633°

[2] Maximum precipitation from October 1, 2022 to May 30, 2023.

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- Appendix E-8 (NEW): Floodplain Impact Certification, Grading and Flood Study Summary Report. Z-Best Compost Facility Expansion, Santa Clara County, California (Schaaf & Wheeler 2012).

Z-Best Compost Facility Expansion

Santa Clara County, California

FLOODPAIN IMPACT CERTIFICATION

GRADING AND FLOOD STUDY SUMMARY REPORT

zanker™ | rethink. reinvent. renew.

Prepared for
Zanker Road Resource Management, Limited

January 18, 2012

Schaaf & Wheeler
Consulting Civil Engineers

1171 Homestead Road, Suite 255
Santa Clara, CA 95050-5485
(408) 246-4848

Z-Best Compost Facility Expansion
"No Rise" Certification

Zanker Road Resource Management, Limited
Santa Clara County, California

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 support the fact that the proposed Z-Best Compost Facility Expansion in Santa Clara County, California will not impact the 100-year flood elevations on the Pajaro River as published in the Flood Insurance Study for Santa Clara County dated May 18, 2009 and will not impact the 100-year flood elevations at unpublished cross-sections in the vicinity of the proposed development.

Furthermore, proposed grading for the Z-Best Compost Facility Expansion in Santa Clara County, California will not (1) increase the flow velocities of the Pajaro River; (2) expand or change the limits of the floodplain; (3) alter or change the physical characteristics of the floodplain; or (4) decrease flood storage capacity within the floodplain.

Since proposed grading for the Z-Best Compost Facility Expansion in Santa Clara County, California will not cause an adverse impact related to one-percent flooding and there is no increase in the base flood elevation, there are no structures located within an area where one-percent flooding could be impacted by the proposed development.

CHARLES D. ANDERSON, RCE No. 43776 (Date)

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INTRODUCTION

This summary report documents how revised grading plans for the Z-Best Composting Facility expansion (Project) in Santa Clara County, California comply with County of Santa Clara Ordinance No. NS-1100.106, which relates to floodplain management. The Project is being undertaken by Zanker Road Resource Management, Ltd. (Owner).

This report describes the estimation of the base flood (100-year) water surface elevation in the Project vicinity, grading necessary to elevate the composting operations area above the base flood elevation, and the impact of this grading on flood risk within the Project vicinity. This report is complimentary to revised grading plans prepared in March 2011 and is supplementary to the Owner's application for a Conditional Letter of Map Revision (CLOMR).

Project Description

The Project is located immediately south of California Highway 25 (Hollister Road) and adjacent to the Pajaro River, which forms the boundary between Santa Clara and San Benito Counties. The area of expansion is between the existing operations and the river. This location is currently mapped as Special Flood Hazard Zone A (base flood elevations undetermined) on the Flood Insurance Rate Map (FIRM) for unincorporated Santa Clara County (Figure 1).

Project Objectives

The basic objective of revised grading for the Project is to provide a level pad for composting operations of at least 25 acres in area while meeting the requirements of the Santa Clara County floodplain management ordinance and other requirements previously expressed in written correspondence from County officials. Other Owner-furnished criteria include a minimum pad slope of one percent, maximum cut and fill slopes of 2:1, and a maximum preferred excavation from natural ground of six feet.

In essence, project grading aims to raise the composting operations pad above the base (100-year) flood elevation without compromising existing floodplain storage. Since the currently effective May 18, 2009 FIRM does not provide a base flood elevation (BFE) within the Project area, this report also documents how that BFE is determined through approximate methods following procedures outlined in FEMA 265.

It may also be noted that the Approximate Flood Hazard Zone A shown in Figure 1 is often colloquially known as "Soap Lake" and is referred to by this name in County correspondence and within this memorandum. The flood hazard zone and Soap Lake are not necessarily contiguous.

Figure 1. Project Location and FIRM

Sources of Data Used in Analyses

The cross section geometry used in the HEC-RAS model created for this flood study is a compilation of several different data sources. CH2M-Hill completed a cross section field survey within the Pajaro River channel banks as part of previous modeling work for the El Rancho San Benito project – a proposed large-scale development on the left (southeast; San Benito) overbank of the river and provided those cross sections as HEC-2 data. This data was furnished on the NGVD vertical datum, and the HEC-2 data has been imported to the HEC-RAS model furnished with this report. The CH2M-Hill El Rancho San Benito cross sections from U.S. Highway 101 to State Highway 25 are used for hydraulic modeling within the river banks.

Cross sections have been extended across the San Benito County overbank using additional aerial topography obtained for the El Rancho San Benito project by Carlson, Barbee and Gibson. Project owners granted permission for the use of their topography data in this study. That data was provided on the NAVD vertical datum and was consistently lowered by 2.75 feet to the NGVD datum to match the CH2M-Hill river survey.[1]

The right (looking downstream; Santa Clara County) overbank area of the model is constructed using Santa Clara County LiDAR data flown in 2006. This data is on the NAVD vertical datum and also lowered by 2.75 feet to the NGVD datum for model consistency and conformance to the Z-Best project datum.

Cross section locations and composite cross sections are included as Appendix A.

Another source of data (discharge and downstream boundary condition for water surface elevation) is the FEMA Flood Insurance Study for Santa Clara County dated May 18, 2009.

Report Outline

This report documents the development of base flood elevations within the Project vicinity – using procedures outlined in FEMA 265. With estimated base flood elevations, proposed Project grading plans are then evaluated for concurrence with relevant provisions from the Santa Clara County Grading and Floodplain Ordinance. This report summarizes relevant provisions of the County ordinance and how the Project will comply with those provisions. Additional requirements for water quality protection are also discussed and evaluated.

[1] Based on Corpscon Version 6.0.1 dated August, 2004 (USACE, Alexandria, VA)

BASE FLOOD ESTIMATION

Section C12-813(C) of the Floodplain Ordinance – "Review, Use and Development of Other Base Flood Data" states:

> "When base flood data has not been provided in accordance Sec. C12-806 [i.e. the May 18, 2009 FIRM for Santa Clara County], the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a federal or state agency, or other source.
>
> "A base flood elevation shall be obtained using one of two methods from the FEMA publication, FEMA 265, 'Managing Floodplain Development in Approximate Zone A Areas – A Guide for Obtaining and Developing Base (100-year) Flood Elevations' dated July 1995."

Base Flood Estimation Using FEMA 265

FEMA 265 requires a detailed method of base flood elevation computation be made for proposed development greater than 5 acres.[2] The detailed methods used for estimating 100-year base flood elevations near the Project using HEC-RAS are described herein.

The detailed method of base flood elevation computation considers three factors: 1) floodplain geometry (topography); 2) flood discharge (hydrology); and 3) flood height (hydraulics). For this study, topography has been provided as described previously for "Sources of Data Used in Analyses." As described in more detail subsequently, flood discharges are those published by FEMA in the Santa Clara and San Benito Flood Insurance Studies. Floodplain hydraulics are fully documented in this report.

Hydraulic Analyses

Hydraulic models of the Pajaro River and its overbanks, representing existing conditions and post-project conditions, have been completed for this flood study to estimate the base (100-year) flood elevation and evaluate potential floodplain impacts due to proposed grading activities. The HEC-RAS steady state backwater analysis program is used for all floodplain analyses. The use of HEC-RAS is approved in FEMA 265.

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[2]FEMA, "Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-year) Floodplain Elevations," April 1995.

To conduct floodplain analyses, and to provide design parameters used for the Project grading plan, an HEC-RAS model has been prepared to reflect conditions at the time of modeling and the improvements shown on the Conceptual Grading Plans prepared by the Project applicant. Relevant hydraulic modeling parameters including channel roughness, transition losses and boundary conditions are described herein.

An aerial view of the Project site and the surrounding floodplain (a.k.a. Soap Lake) is appended to this memorandum as Figure A1. This figure shows cross section locations, cross section numbers used in the HEC-RAS analysis, and the approximate limits of 100-year flooding between Highway 101 and Highway 25, which represent the detailed limits of study.

Channel Roughness

In one-dimensional open channel flow analysis, "Manning's n" is used to represent the retarding forces to flow imposed by the channel bed and banks. Roughness elements along the wetted perimeter of the Pajaro River and its overbanks will vary across an individual cross section. For instance, the river channel might contain elements of open water, gravel bars, grassed banks, and mature riparian vegetation including trees, shrubs or brush; while the overbanks are largely agricultural with both fallow and cultivated acreage, roads, isolated buildings, bare earth, and other obstructions. To compute water surface elevations in a cross section with variable roughness using a one-dimensional model (i.e. with a mean velocity), it is necessary to estimate an effective (composite) roughness value for each cross section.

Table 1 documents the estimation of composite roughness for various reaches of the Pajaro River floodplain. Composite roughness coefficients are estimated based on field reconnaissance with environmental conditions projected to winter flood flows, review of literature regarding Manning's "n" values, and previous experience with flood channel and floodplain analyses.

Table 1
Roughness Coefficients Used for Floodplain Analyses

Reach Element	Vegetation	Literature Citation	Composite Roughness (Manning's n)
Pajaro River U.S. Highway 101 to California Highway 25		Chow Table 5-6.D-3.b[3] (major stream >100' at flood stage; irregular and rough section)	0.10
San Benito Overbank		Chow Table 5-6.D-2.a,b No crop n = 0.030 Pasture high grass n=.035 Mature row crops n=.035 Mature field crops n=.040	0.04
Santa Clara Overbank Highway 101 to Soap Lake (XS 3864)		Chow Table 5-6.D-2.c Light brush and trees in winter	0.06
Santa Clara Overbank Soap Lake		Chow Table 5-6.D-2.a,b No crop n=0.030 Pasture high grass n=.035 Mature row crops n=.035 Mature field crops n=.040	0.04
Carnadero Creek		Chow Table 5-6.D-1.a.7 (minor stream on plain <100' at flood stage; sluggish, weedy)	0.08

Transition Losses

An energy loss takes place just upstream and downstream from each structure as flow contracts and expands into and out of a bridge, culvert, or other geometric channel transition. For gradual transitions or no transitions between channel sections, the default contraction coefficient (C_i) is 0.1 and the default expansion coefficient (C_o) is 0.3. At more abrupt transitions, such as where fill is placed in the floodplain; the respective contraction and expansion coefficients are 0.3 and 0.5.[4]

[3] Chow, Ven Te, Open-Channel Hydraulics, (New York: McGraw-Hill), 1959, excerpts appended.
[4] U.S. Army Corps of Engineers Hydraulic Engineering Center, HEC-RAS River Analysis System, *Hydraulic Reference Manual*, Version 4.0, March 2008, pp. 3-20 and 3-21, excerpt appended.

Boundary Conditions

For backwater analysis, a one-percent (100-year) downstream boundary (U.S. Highway 101) is required. According to the Santa Clara County Flood Insurance Study (effective May 18, 2009), the 100-year water surface elevation at the upstream face of the Highway 101 Bridge is 146.85 feet NAVD 88. FEMA's water surface profile is appended to this report (Appendix B). Using the stated datum conversion factor of 2.85 feet,[5] the starting water surface elevation at the Highway 101 Bridge is 144 feet NGVD29.

Discharge

The referenced FIS for Santa Clara County indicates a 100-year Pajaro River discharge of 30,500 cfs at Highway 101.[6]

Base Flood Elevation

Analytical results from HEC-RAS (Appendix C) for the referenced 100-year discharge and starting backwater conditions at Highway 101 are summarized by Figure 2. The elevation of Soap Lake is controlled by downstream backwater, and channel conditions in the valley between Highway 101 (XS 434) and Cross Section 3264.

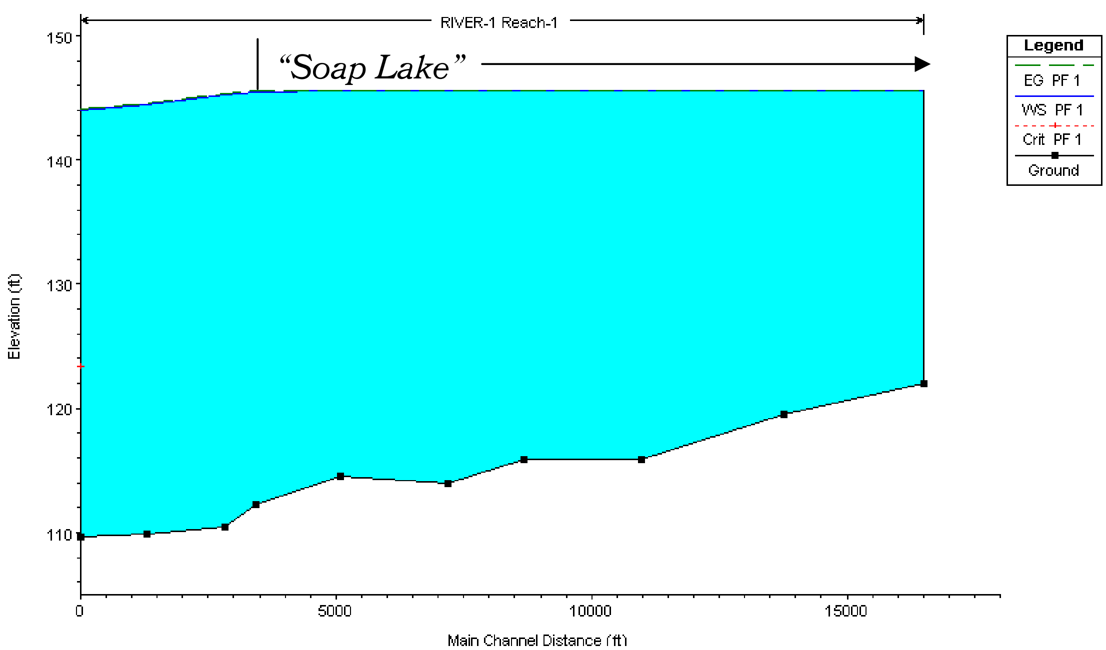

Figure 2. Pajaro River 100-Year Profile from Highway 101 to Highway 25 (NGVD)

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[5] FEMA, *Santa Clara County Flood Insurance Study, Volume 2 of 4*, p. 134, excerpt appended. Please note that this is the County-wide conversion used by FEMA to convert water surface elevations on previously studied creeks from NGVD29 to NAVD88, and is not the same as the local conversion used herein to reconcile cross sectional data.

[6] FEMA, *Santa Clara County Flood Insurance Study, Volume 1 of 4*, p. 81, excerpt appended.

The HEC-RAS model indicates that area above the Pajaro River constriction at Highway 101 functions essentially as a lake. (Maximum overbank flow velocity is on the order of 0.5 foot per second, so the specific energy is negligible.) There are backwater effects where the water is funneled through the river canyon, but upstream of that canyon the profile is essentially flat at an elevation of 145.6 feet NGVD, a vertical datum that is consistent with the Project grading plans. The base flood elevation is rounded to **146 feet NGVD** for development planning.

On the FEMA-adopted NAVD datum, 2.85 feet are added to the estimated base flood elevation, which equates to 148.5 feet NAVD88, which would be rounded to 149 feet NAVD for mapping.

EVALUATION OF PROJECT IMPACTS

Project grading aims to raise the composting operations pad above the base (100-year) flood elevation of 146 feet NGVD (149 feet NAVD) without compromising existing floodplain storage. Several provisions of the County Grading Ordinance are relevant.

Relevant Sections of Ordinance No. NS-1100.106

Santa Clara County Ordinance NS-1100.106 became effective on April 21, 2009 and its requirements will be applied to the Project. This ordinance was enacted to "reflect updates to floodplain management policies affecting real property located in designated flood hazard areas of the unincorporated territory of Santa Clara County." As previously noted, the Project is located within a Special Flood Hazard Zone of indeterminate elevation, and that elevation has been calculated as 146 feet NGVD.

The purpose of the Ordinance is to "promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by legally enforceable regulations applied uniformly throughout the unincorporated territory of the Santa Clara County to all publicly and privately owned land within flood prone…areas." Specific regulations include the following provisions of §C12-803:

A) Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;

B) Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

C) Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;

D) Control filling, grading, dredging, and other development which may increase flood damage; and

E) Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards in other areas.

Specific Ordinance sections that codify the above regulations are listed below, along with an explanation of how the revised grading plan meets the relevant codes.

§C12-816(C)(2). Standards of Construction – Elevation and Floodproofing (Nonresidential Construction): County staff has directed the Owner to elevate the composting operations area a minimum of one foot above the base flood elevation. This variance from the ordinance's normal elevation requirement of two feet above the base flood elevation is given because there will be no residential or insurable structures built on the elevated pad.

§C12-818(A). Standards for Subdivisions and Other Proposed Development: "All…proposed development…greater than…5 acres…shall:

"1) Identify the Special Flood Hazard Areas (SFHA) and Base Flood Elevations (BFE)."

The entire Project site is within Approximate Flood Hazard Zone A and the calculated Base Flood Elevation is 146 feet NGVD.

"2) Identify the elevations of lowest floors of all proposed structures and pads."

The minimum elevation of the expanded composting pad is 147.0 feet NGVD, which is one foot higher than the BFE in conformance with County direction. It is also noted that a containment levee at minimum elevation 148.0 feet NGVD is also proposed, but this levee will not be certified to NFIP standards since the site will be filled to above the BFE and levee certification is not required.

"3) If the site is filled above the base flood elevation,…as-built information for each structure shall be certified by a registered civil engineer or licensed land surveyor and provided as part of an application for a Letter of Map Revision based on Fill (LOMR-F) to the Floodplain Administrator."

The Owner will file a LOMR-F upon completion of grading operations, and file a Conditional LOMR-F (CLOMR-F) prior to County approval.

§C12-821(A). Floodways: "Until a regulatory floodway is adopted, no new construction, substantial development, or other development (including fill) shall be permitted within Zones A1-30 and AE, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other development, will not increase the water surface elevation of the base flood more than one foot at any point within Santa Clara County." Furthermore, although not specifically supported by the Ordinance, Santa Clara County requires a demonstration that the proposed fill results in "zero impact to the existing FEMA identified flood plain, neighboring properties, and public facilities." (ref. August 26, 2010 letter from Colleen Oda)

Floodplain Impacts

To have zero impact on the existing floodplain, two things must be demonstrated:

1. There is no net decrease in floodplain storage due to the placement of proposed fill; and

2. There is no net decrease in flow conveyance across the Project site after fill is placed.

Table 2 summarizes pertinent floodplain storage statistics based on the revised grading plan for the Z-Best Composting Facility expansion. These statistics are compiled by converting AutoCAD versions of the grading plan to ArcView GIS and creating Triangulated Irregular Networks (TINs) to analyze three dimensional surfaces. Project TINs for existing and proposed conditions are included in Appendix D.

Table 2
Project Floodplain Storage Statistics

Floodplain Storage Statistic	Volume (acre-feet)	Remarks
1. Existing floodplain storage on site below elevation 146 feet NGVD	678.1	Volume within property
2. Amount of project fill proposed on site below elevation 146 feet NGVD	163.3	
3. On-site excavation below existing ground	171.2	Maximum cut 6 feet bgs
4. Floodplain storage on site below elevation 146 feet NGVD after Project	686.0	(1) – (2) + (3)
Net increase in floodplain storage	7.9	(4) – (1); 1.2% increase in storage

Grading volume statistics compiled in Table 2 demonstrate that there is no net decrease in available storage below the base flood elevation. A figure demonstrating the project cut and fill areas is included in Appendix D. The HEC-RAS model described previously has also been modified to include the proposed site fill and excavation.

Storage of Flood Waters On-Site

The preservation of floodplain storage requires the excavation of roughly 171.2 acre-feet of native material outside of the expanded operations pad. The lowest elevation of the excavation is roughly 132 feet NGVD at the southeast corner of the site, which is roughly six feet below natural grade. The storage-elevation relationship for the new cut area is shown in Figure 3.

It is essential that backflow prevention is provided for the outfall that will release this stored flood water, noting that the newly excavated area could not fully drain until Pajaro River stage is below elevation 132 feet. While entirely dependent upon the river hydrograph, with a 24-inch diameter drain pipe the excavation could be fully drained within 48 hours assuming a free outfall condition.

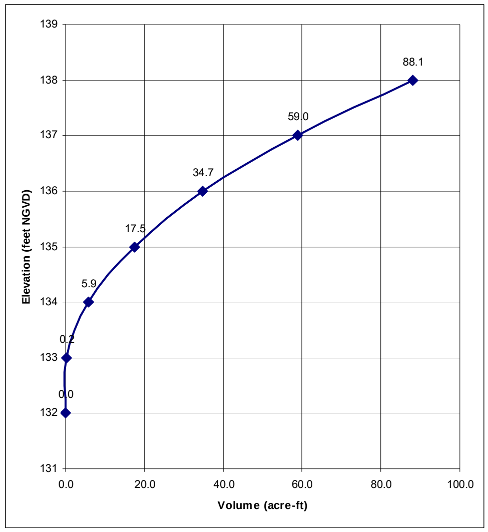


Figure 3. Storage-Elevation Curve for Excavated Area On-Site

Hydraulic Analysis of Flow Blockage due to Fill Placement

Although HEC-RAS modeling (Appendix C) demonstrates that flow velocity is very low through the floodplain (Soap Lake), the model has been modified to reflect the flow blockage caused by the proposed placement of fill to elevate the expanded operations area above the base flood elevation. HEC-RAS cross sections showing this blockage are appended to this technical report. Table 3 summarizes HEC-RAS model results, which show no increase in predicted base flood elevations in the post-fill condition, from Highway 101 to Highway 25, which is the upstream boundary of the Project site.

There is no increase in the base flood elevation at Highway 25. Highway 25 and its bridge crossing will not physically change. Therefore, since this is a backwater condition, there can be no project impact upstream of Highway 25 and there is no need to extend the modeling effort further upstream to make this determination.

The table compares pre-project (existing) water surface elevations to post-fill water surface elevations, showing no increase in flood elevation due to the placement of proposed fill. Appendix C also contains graphical cross sections showing hydraulic analysis results.

Table 3 provides comparative elevations in both NGVD29, consistent with Project grading plans, and NAVD88 to be consistent with the Santa Clara County FIS. For consistency with the effective County FIS vertical datum, 2.85 feet have been added to elevations on NGVD29.

The analyses described by this summary report demonstrate compliance with the County Ordinance and written instructions from County staff.

Table 3
Comparative Existing and Post-Project Base Flood Elevations

Cross Section No.	Feet NGVD29		Feet NAVD88	
	Existing WSEL	Post-Fill WSEL	Existing WSEL	Post-Fill WSEL
434	144.00	144.00	146.85	146.85
1734	144.45	144.45	147.30	147.30
3264	145.24	145.24	148.09	148.09
3864	145.50	145.50	148.35	148.35
5514	145.52	145.52	148.37	148.37
7614	145.53	145.53	148.38	148.38
9114	145.53	145.53	148.38	148.38
11414	145.53	145.53	148.38	148.38
14214	145.55	145.54	148.40	148.39
14403	145.55	145.55	148.40	148.40
16198	145.60	145.59	148.45	148.44
16944	145.62	145.60	148.47	148.45

OTHER COUNTY CRITERIA

To meet the requirements of the Clean Water Act, the County is also requiring the Project to retain the 24-hour, 100-year runoff volume from the developed site, and do so outside of the Soap Lake area. This volume is calculated using a method proscribed in the Santa Clara County Drainage Manual (2007).

Site area draining to retention pond = 31.74 acres

Mean Annual Precipitation = 21 inches

$P_{100,24} = A_{100,24} + B_{100,24}$ MAP = 0.814046 + (0.243391)(21) = 5.93 inches

Assume impervious surface and D-type soil. C = 0.85 (Table 3-1)

Adjust for volume calculation C′ = 0.85 + (1.0 – 0.85)/2 = 0.93

$V_{100,24}$ = (0.93)(31.74 acres)(5.93 inches) = 174.9 ac-in = **14.6 acre-feet**

Site runoff is conveyed to the retention pond using a perimeter ditch on each side of the expanded operations pad. The minimum pitch toward each ditch from a longitudinal center ridge is one percent, and the pad and ditches are longitudinally sloped at 0.1 percent toward the detention pond. Each ditch is three feet deep with a bottom width of 5 feet and 3:1 side slopes. Each ditch carries up to half of the site runoff sans areas directly tributary to the detention basin. The design 100-year site runoff is calculated in conformance with the 2007 County Drainage Manual.

Maximum tributary area = 14.71 acres

Runoff coefficient = 0.85

Length of Travel (L) = 340 feet at .01 ft/ft + 1,800 feet at .001 ft/ft

Time of Concentration (t_c) = $0.0078\left(\frac{L^2}{S}\right)^{0.385}$ minutes = 40 minutes

$P_{100,46m}$ = 0.57816 + (0.01297)(21) = 0.85 inch

$i_{100,46m}$ = 0.85″/0.67 hour = 1.28 in/hr

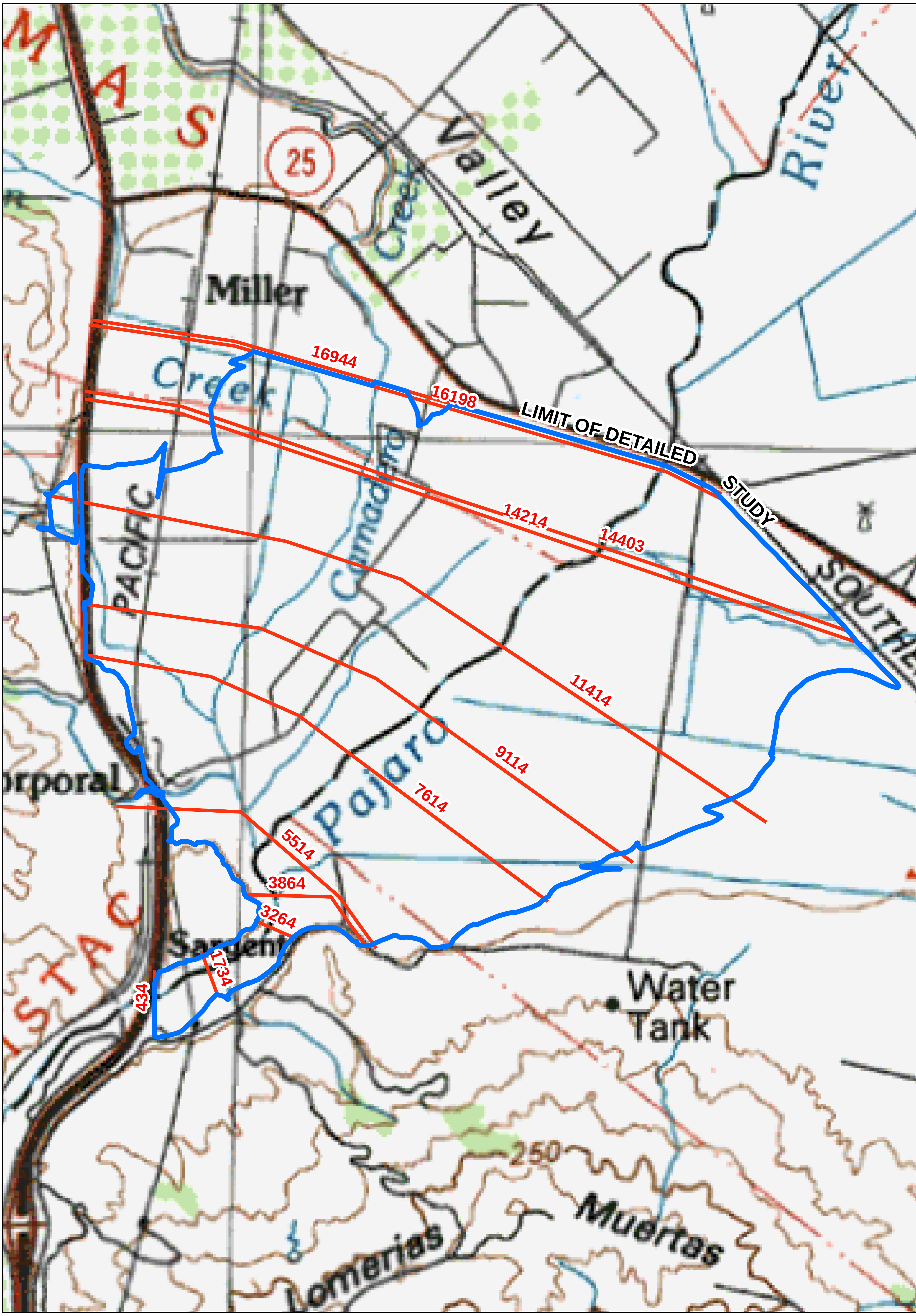
Q_{100} = (0.85)(14.71 acres)(1.28 in/hr) = 16 cfs

Depth in channel with n = 0.035 (capacity check) = 1.4 feet OK < 3′

Velocity in channel with n = 0.020 (scour check) = 1.9 feet per second OK

APPENDIX A

Aerial View of Study Area with HEC-RAS Cross Sections



Legend

100yr Floodplain within Limits of Detailed Study

Appendix E-8 (NEW)

HEC-RAS Cross Sections

0 875 1,750 3,500 5,250 7,000 Feet

N

APPENDIX B

Hydraulic Parameters from the Literature

FEMA Water Surface Profiles and Discharges for the Pajaro River

TABLE 5-6. VALUES OF THE ROUGHNESS COEFFICIENT n (*continued*)

Type of channel and description	Minimum	Normal	Maximum
C. EXCAVATED OR DREDGED			
a. Earth, straight and uniform			
1. Clean, recently completed	0.016	0.018	0.020
2. Clean, after weathering	0.018	**0.022**	0.025
3. Gravel, uniform section, clean	0.022	0.025	0.030
4. With short grass, few weeds	0.022	0.027	0.033
b. Earth, winding and sluggish			
1. No vegetation	0.023	0.025	0.030
2. Grass, some weeds	0.025	0.030	0.033
3. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. Earth bottom and rubble sides	0.028	0.030	0.035
5. Stony bottom and weedy banks	0.025	0.035	0.040
6. Cobble bottom and clean sides	0.030	0.040	0.050
c. Dragline-excavated or dredged			
1. No vegetation	0.025	0.028	0.033
2. Light brush on banks	0.035	0.050	0.060
d. Rock cuts			
1. Smooth and uniform	0.025	0.035	0.040
2. Jagged and irregular	0.035	0.040	0.050
e. Channels not maintained, weeds and brush uncut			
1. Dense weeds, high as flow depth	0.050	0.080	0.120
2. Clean bottom, brush on sides	0.040	0.050	0.080
3. Same, highest stage of flow	0.045	0.070	0.110
4. Dense brush, high stage	0.080	0.100	0.140
D. NATURAL STREAMS			
D-1. Minor streams (top width at flood stage <100 ft)			
a. Streams on plain			
1. Clean, straight, full stage, no rifts or deep pools	0.025	**0.030**	0.033
2. Same as above, but more stones and weeds	0.030	0.035	0.040
3. Clean, winding, some pools and shoals	0.033	0.040	0.045
4. Same as above, but some weeds and stones	0.035	0.045	0.050
5. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
6. Same as 4, but more stones	0.045	0.050	0.060
7. Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
8. Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150

TABLE 5-6. VALUES OF THE ROUGHNESS COEFFICIENT n (*continued*)

Type of channel and description	Minimum	Normal	Maximum
b. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages			
1. Bottom: gravels, cobbles, and few boulders	0.030	0.040	0.050
2. Bottom: cobbles with large boulders	0.040	0.050	0.070
D-2. Flood plains			
a. Pasture, no brush			
1. Short grass	0.025	0.030	0.035
2. High grass	0.030	0.035	0.050
b. Cultivated areas			
1. No crop	0.020	0.030	0.040
2. Mature row crops	0.025	0.035	0.045
3. Mature field crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. Dense willows, summer, straight	0.110	0.150	0.200
2. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050
3. Same as above, but with heavy growth of sprouts	0.050	0.060	0.080
4. Heavy stand of timber, a few down trees, little undergrowth, flood stage below branches	0.080	0.100	0.120
5. Same as above, but with flood stage reaching branches	0.100	0.120	0.160
D-3. Major streams (top width at flood stage >100 ft). The n value is less than that for minor streams of similar description, because banks offer less effective resistance.			
a. Regular section with no boulders or brush	0.025	.....	0.060
b. Irregular and rough section	0.035	.....	0.100

Horizontal variation of "k" values is described in the same manner as horizontal variation of Manning's "n" values. See chapter 6 of the HEC-RAS user's manual, to learn how to enter k values into the program. Up to twenty values of "k" can be specified for each cross section.

Tables and charts for determining "k" values for concrete-lined channels are provided in EM 1110-2-1601 [USACE, 1991]. Values for riprap-lined channels may be taken as the theoretical spherical diameter of the median stone size. Approximate "k" values [Chow, 1959] for a variety of bed materials, including those for natural rivers are shown in Table 3-2.

Table 3-2

Equivalent Roughness Values of Various Bed Materials

	k (Feet)
Brass, Cooper, Lead, Glass	0.0001 - 0.0030
Wrought Iron, Steel	0.0002 - 0.0080
Asphalted Cast Iron	0.0004 - 0.0070
Galvanized Iron	0.0005 - 0.0150
Cast Iron	0.0008 - 0.0180
Wood Stave	0.0006 - 0.0030
Cement	0.0013 - 0.0040
Concrete	0.0015 - 0.0100
Drain Tile	0.0020 - 0.0100
Riveted Steel	0.0030 - 0.0300
Natural River Bed	0.1000 - 3.0000

The values of "k" (0.1 to 3.0 ft.) for natural river channels are normally much larger than the actual diameters of the bed materials to account for boundary irregularities and bed forms.

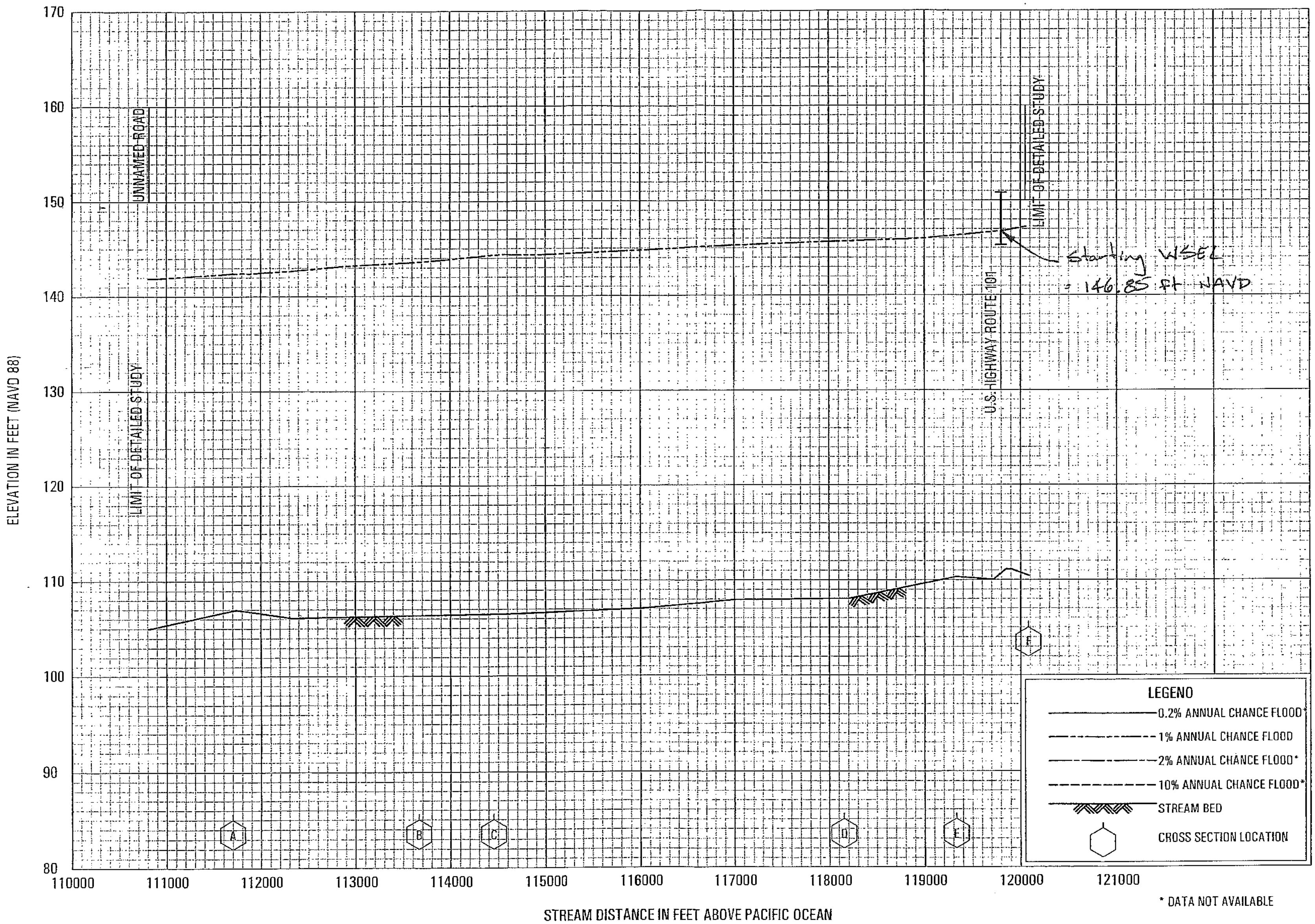
Contraction and Expansion Coefficients. Contraction or expansion of flow due to changes in the cross section is a common cause of energy losses within a reach (between two cross sections). Whenever this occurs, the loss is computed from the contraction and expansion coefficients specified on the cross section data editor. The coefficients, which are applied between cross sections, are specified as part of the data for the upstream cross section. The coefficients are multiplied by the absolute difference in velocity heads between the current cross section and the next cross section downstream, which gives the energy loss caused by the transition (Equation 2-2 of Chapter 2). Where the change in river cross section is small, and the flow is subcritical, coefficients of contraction and expansion are typically on the order of 0.1 and 0.3, respectively. When the change in effective cross section area is abrupt such as at bridges, contraction and expansion coefficients of 0.3 and 0.5 are often used. On occasion, the coefficients of contraction and expansion around bridges and culverts may be as high as 0.6 and 0.8, respectively. These values may be changed at any cross section. For additional information concerning transition losses and for information on bridge loss coefficients, see chapter 5, Modeling Bridges. Typical values for contraction and expansion coefficients, for subcritical flow, are shown in Table 3-3 below.

Table 3-3

Subcritical Flow Contraction and Expansion Coefficients

	Contraction	Expansion
No transition loss computed	0.0	0.0
Gradual transitions	0.1	0.3
Typical Bridge sections	0.3	0.5
Abrupt transitions	0.6	0.8

The maximum value for the contraction and expansion coefficient is one (1.0). **Note: In general, the empirical contraction and expansion coefficients should be lower for supercritical flow**. In supercritical flow the velocity heads are much greater, and small changes in depth can cause large changes in velocity head. Using contraction and expansion coefficients that would be typical for subcritical flow can result in over estimation of the energy losses and oscillations in the computed water surface profile. In constructed trapezoidal and rectangular channels, designed for supercritical flow, the user should set the contraction and expansion coefficients to zero in the reaches where the cross sectional geometry is not changing shape. In reaches where the flow is contracting and expanding, the user should select contraction and expansion coefficients carefully. Typical values for gradual transitions in supercritical flow would be around 0.01 for the contraction coefficient and 0.03 for the expansion coefficient. As the natural transitions begin to become more abrupt, it may be necessary to use higher values, such as 0.05 for the contraction coefficient and 0.2 for the expansion coefficient. If there is no contraction or expansion, the user may want to set the coefficients to zero for supercritical flow.



FEDERAL EMERGENCY MANAGEMENT AGENCY

SANTA CLARA COUNTY, CA
AND INCORPORATED AREAS

FLOOD PROFILES

PAJARO RIVER

97P

Table 6 – Summary of Discharges, continued

Flooding Source and Location	Drainage Area (sq mi)	Peak Discharges (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
MATADERO CREEK, continued					
At corporate limits	3.39	402	795	970	1,300
At El Camino Real	7.60	1,100	2,100	2,280	2,690
At Louis Road	9.40	1,380	1,500[1]	1,500[1]	1,500[1]
At Middlefield Road	9.40	1,380	1,900[1]	1,500[1]	1,900[1]
At Union Pacific Railroad	9.10	[2]	[2]	2,435	[2]
At U.S. Highway 101	13.60	1,660	1,775	1,775	1,775
Below confluence with Arastradero Creek	2.70	325	660	790	1,030
Upstream of Union Pacific Railroad	9.10	1,220	2,170	2,520	2,810
MILLER SLOUGH					
At U.S. Highway 101	1.80	[2]	[2]	760	[2]
MIDDLE ROAD OVERFLOW AREA					
At convergence with Llagas Creek	[2]	[2]	[2]	39	[2]
At divergence from West Little Llagas Creek	[2]	[2]	[2]	658	[2]
NORTH MOREY CREEK					
Upstream of Lions Creek	1.00	[2]	[2]	485	[2]
PAJARO RIVER					
At U.S. Highway 101	522	[2]	[2]	30,500	[2]
PERMANENTE CREEK					
At confluence with Hale Creek	13.50[3]	780[4]	1,650[4]	1,780[4]	1,980[4]
At El Camino Real	14.30[3]	1,150	1,310	1,310	1,310
At Union Pacific Railroad	15.20[3]	1,270	1,470	1,600	1,600
Downstream of confluence with Hale Creek	13.50[3]	1000[1]	1000[1]	1000[1]	1000[1]
Downstream of East Charleston Road	16.10[5]	1,390	1,400[1]	1,400[1]	1,400[1]
Downstream of Miramonte Avenue	8.9[2]	370	760	890	1,030

[1]*Decrease in flow rate based on capacity restrictions*

[2]*Data not available*

[3]*Decrease in flow rate due to storage along channel*

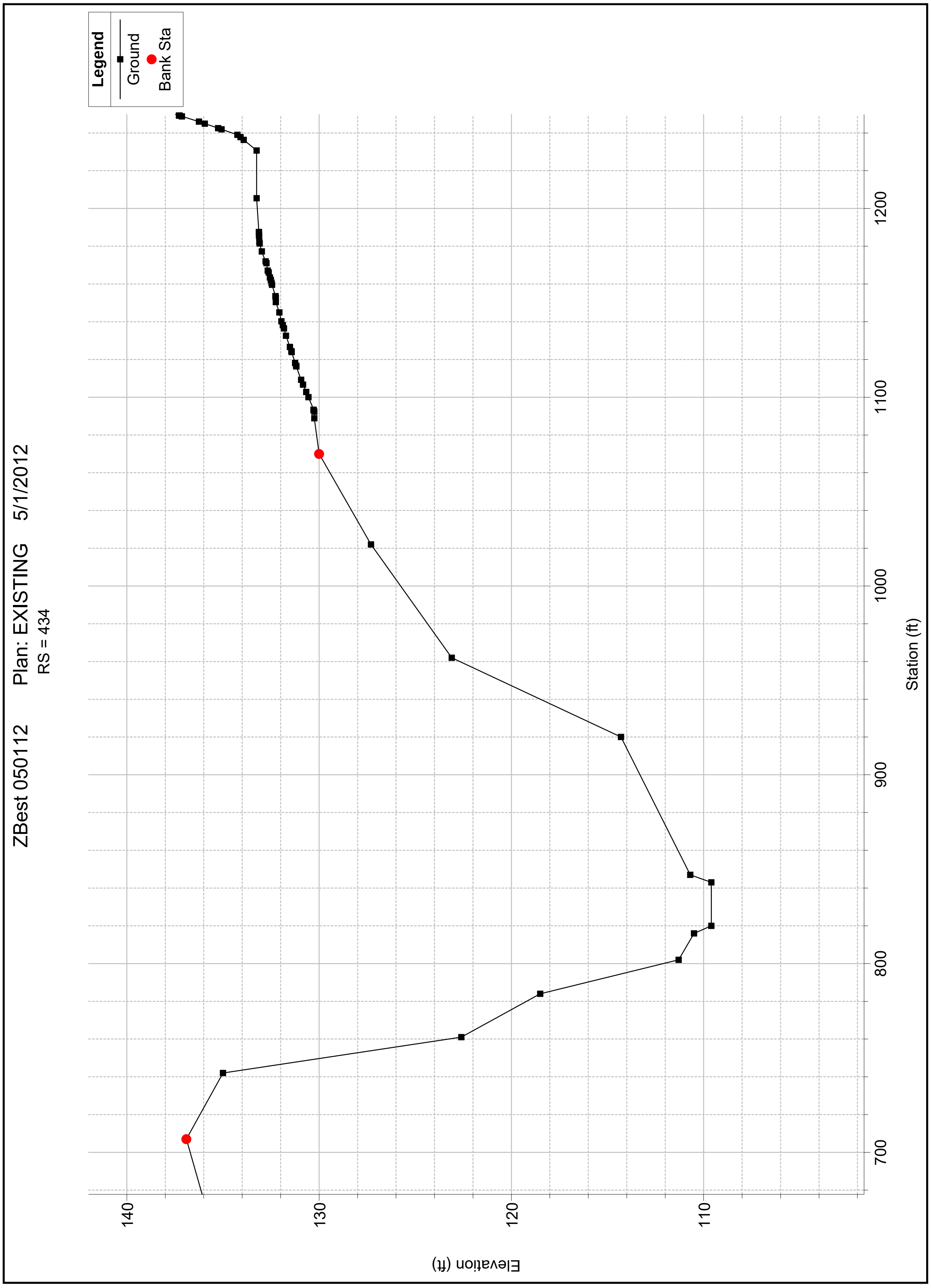
[4]*High flows affected by Permanente Diversion*

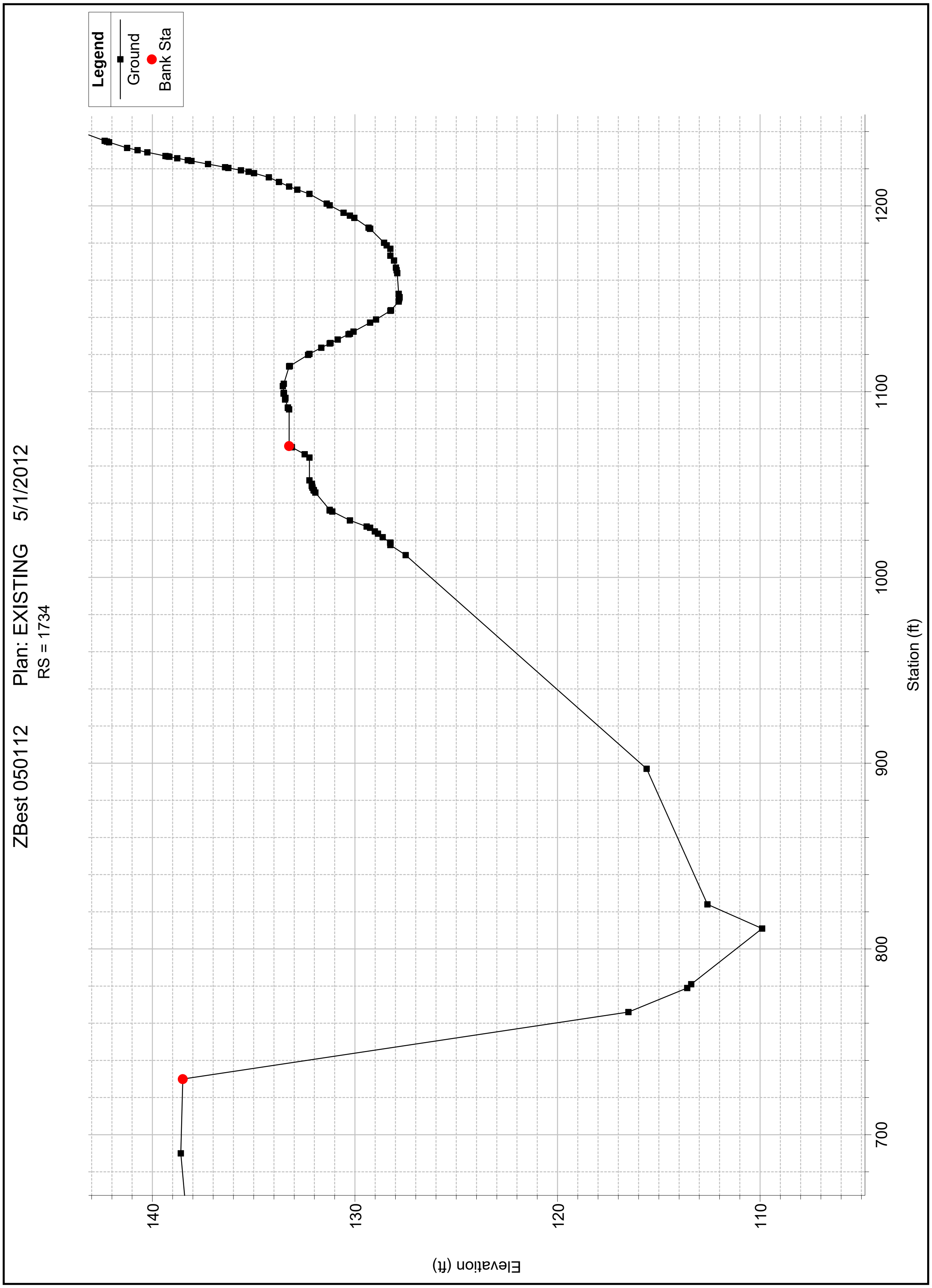
[5]*High flows diverted to Stevens Creek*

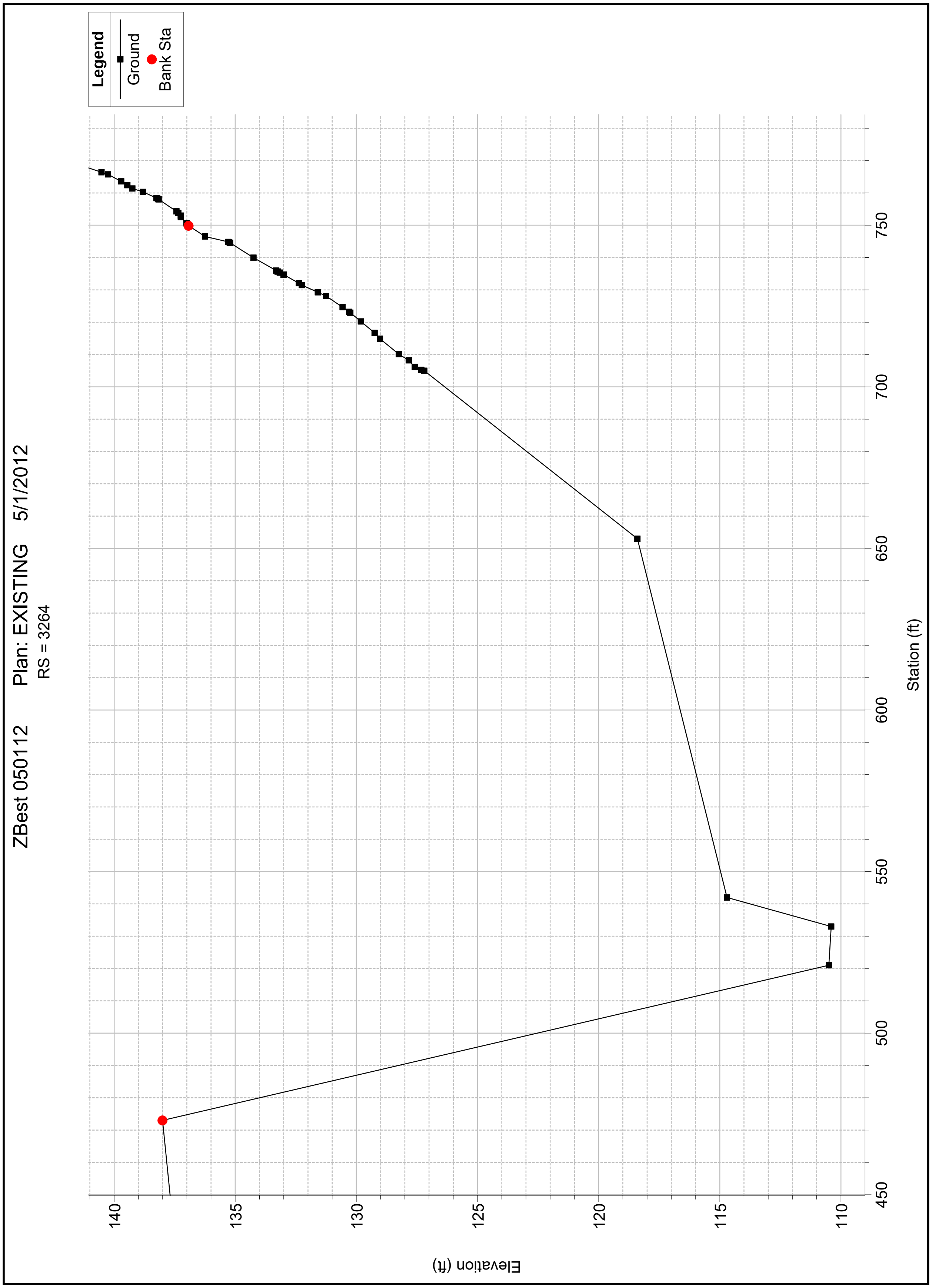
APPENDIX C

HEC-RAS Model Results

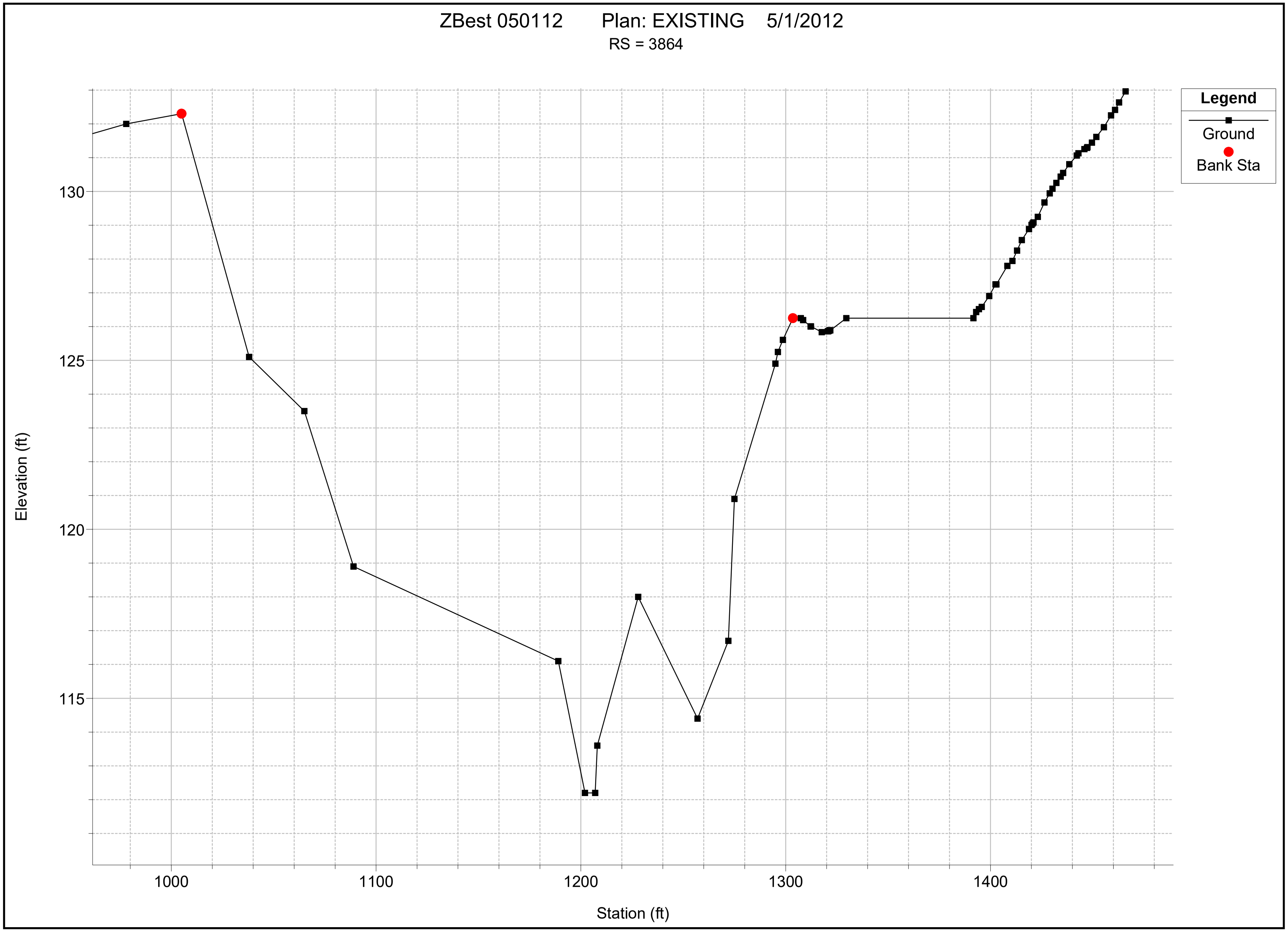
Bank to Bank River Sections from CH2M-Hill Field Survey

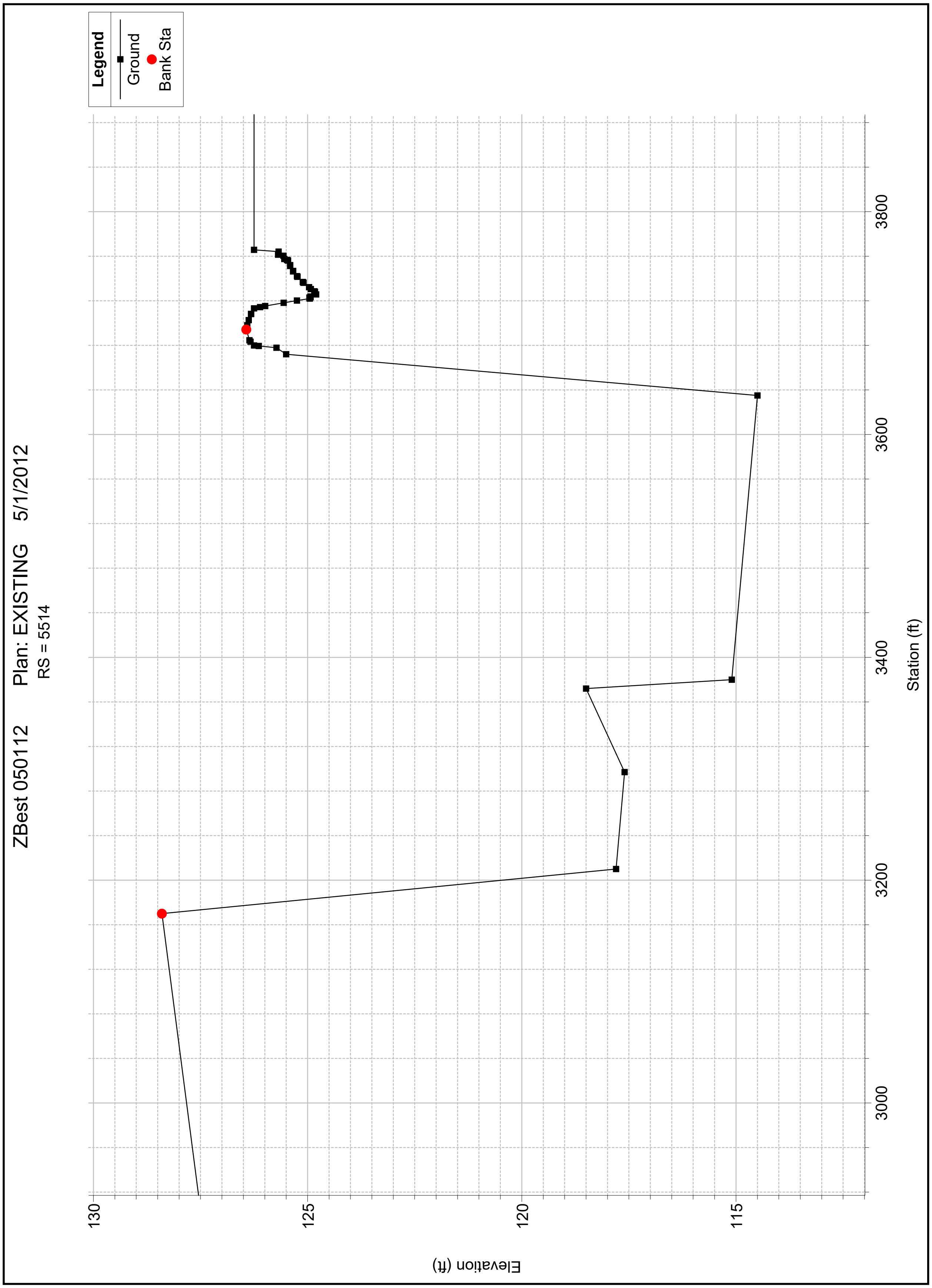



ZBest 050112 Plan: EXISTING 5/1/2012
RS = 1734
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
140
130
120
110
700
800
900
1000
1100
1200



ZBest 050112
Plan: EXISTING 5/1/2012
RS = 3264
Legend
Ground
Bank Sta
Elevation (ft)
140
135
130
125
120
115
110
Station (ft)
450
500
550
600
650
700
750


ZBest 050112 Plan: EXISTING 5/1/2012
RS = 3864
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
130
125
120
115
1000
1100
1200
1300
1400


ZBest 050112 Plan: EXISTING 5/1/2012
RS = 5514
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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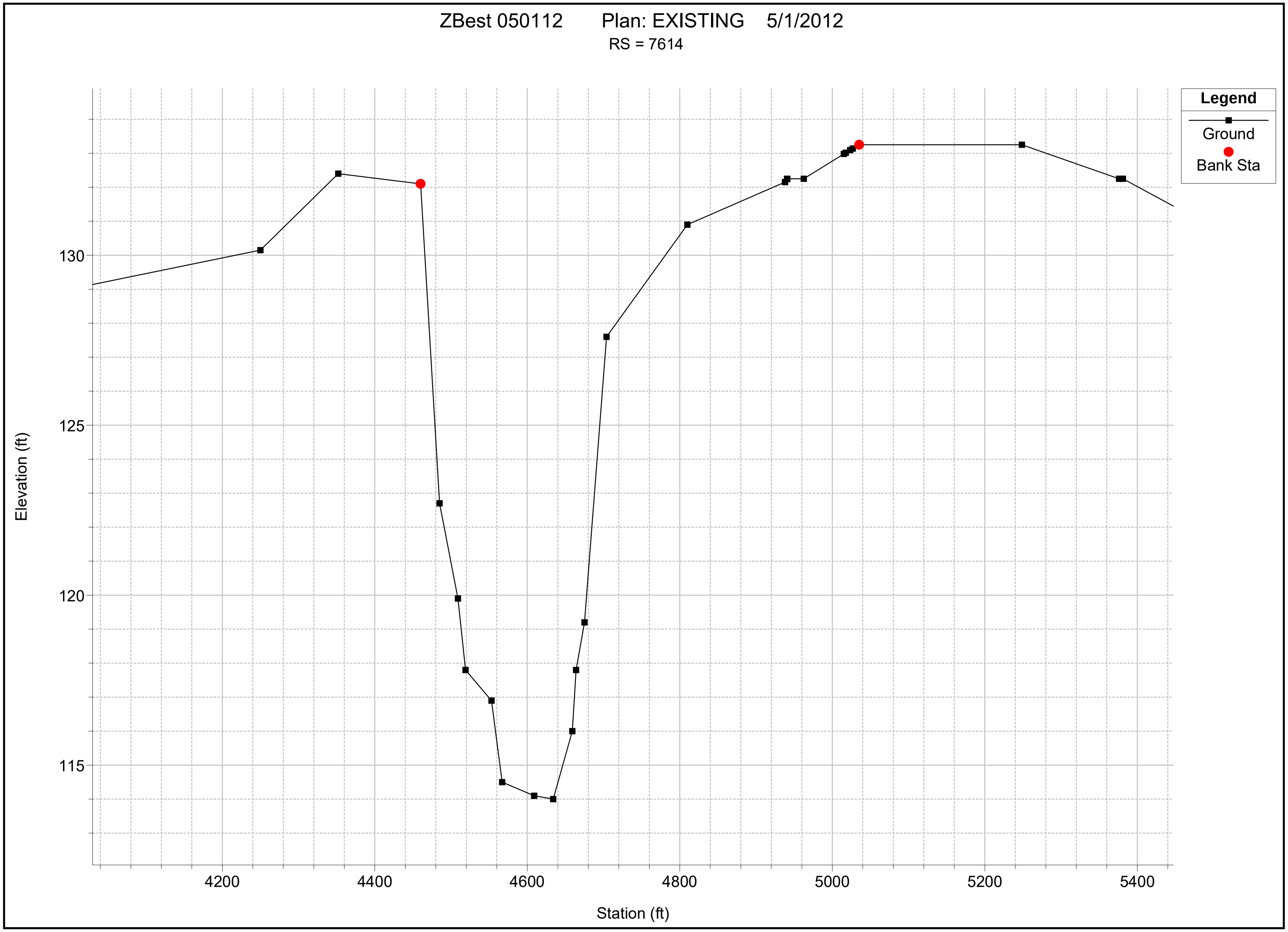
125
120
115
3000
3200
3400
3600
3800


ZBest 050112 Plan: EXISTING 5/1/2012
RS = 7614
Legend
Ground
Bank Sta
Elevation (ft)
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125
120
115
4200
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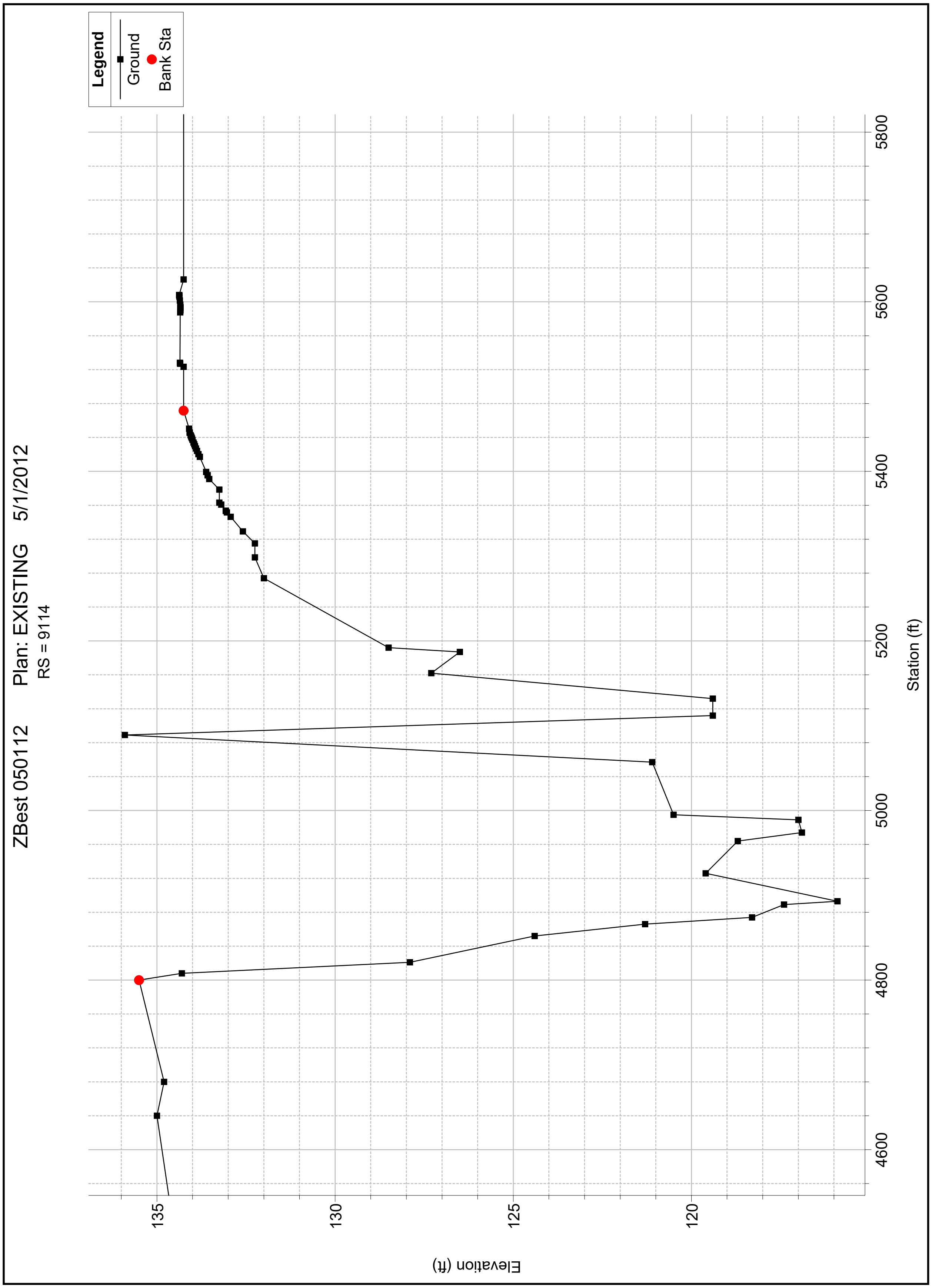
5000
5200
5400
Station (ft)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RS = 9114
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
135
130
125
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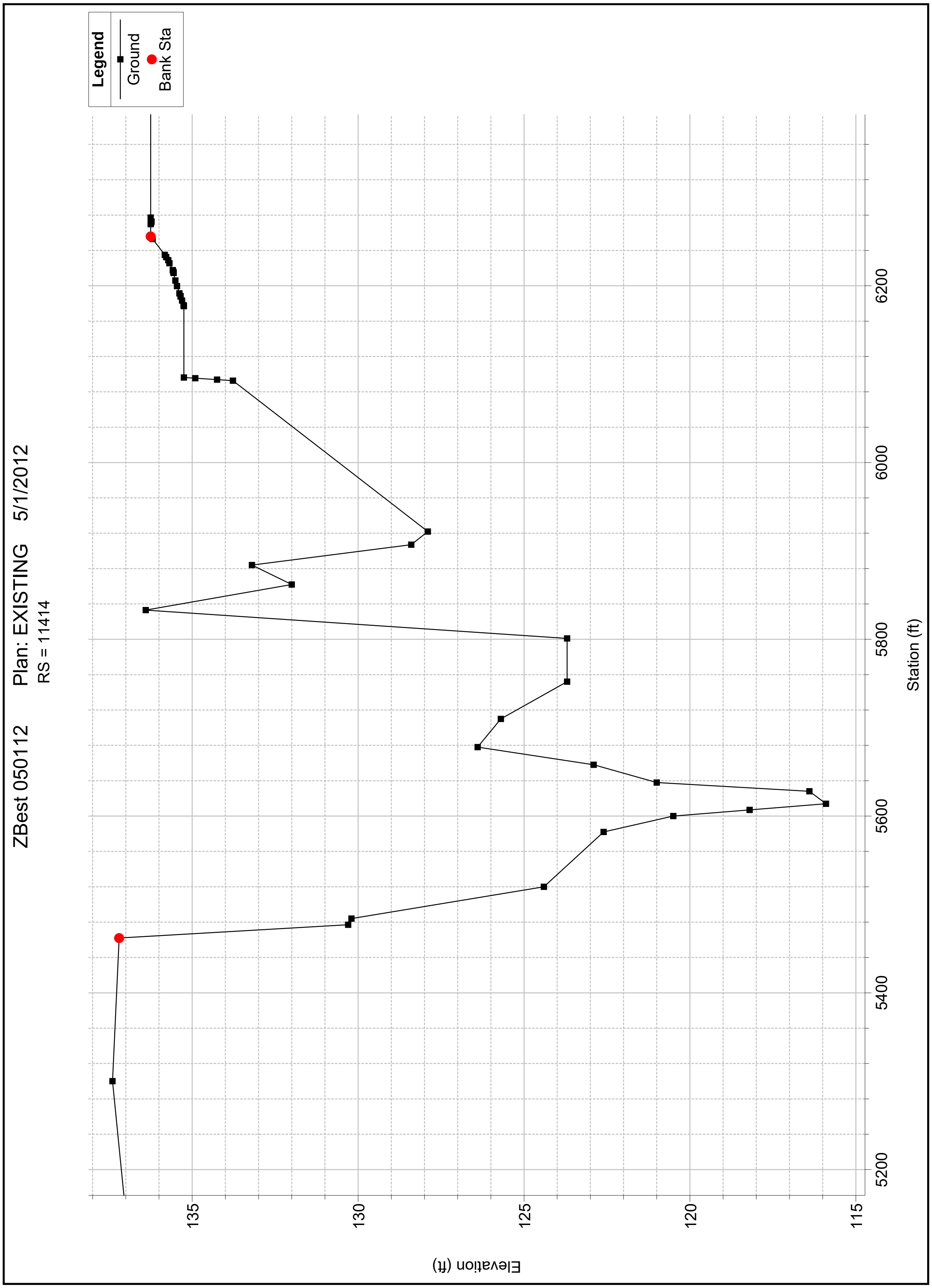
5200
5400
5600
5800


ZBest 050112   Plan: EXISTING   5/1/2012
RS = 11414
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
115
120
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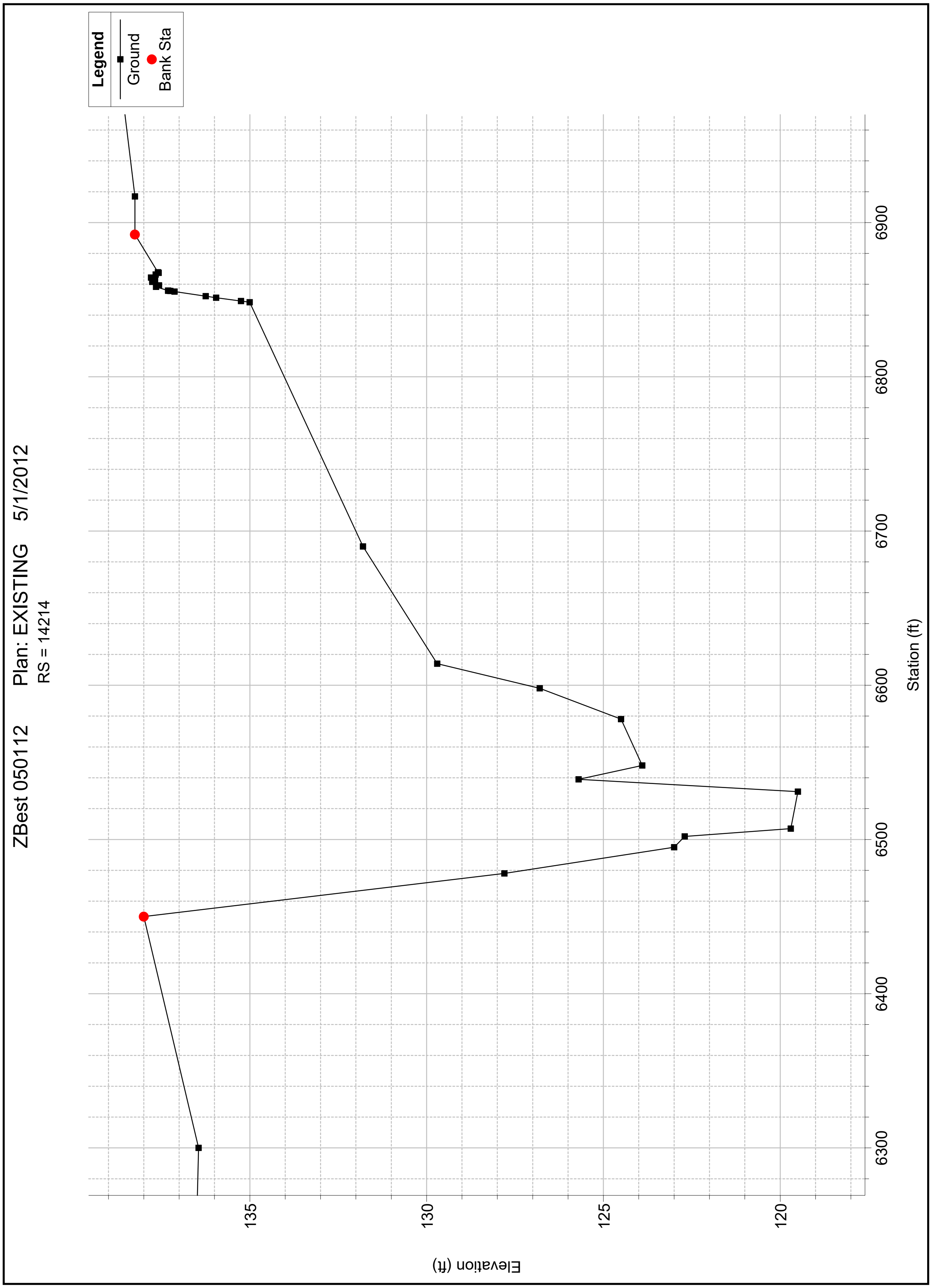
5600
5800
6000
6200


ZBest 050112 Plan: EXISTING 5/1/2012
RS = 14214
Legend
Ground
Bank Sta
Elevation (ft)
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130
125
120
Station (ft)
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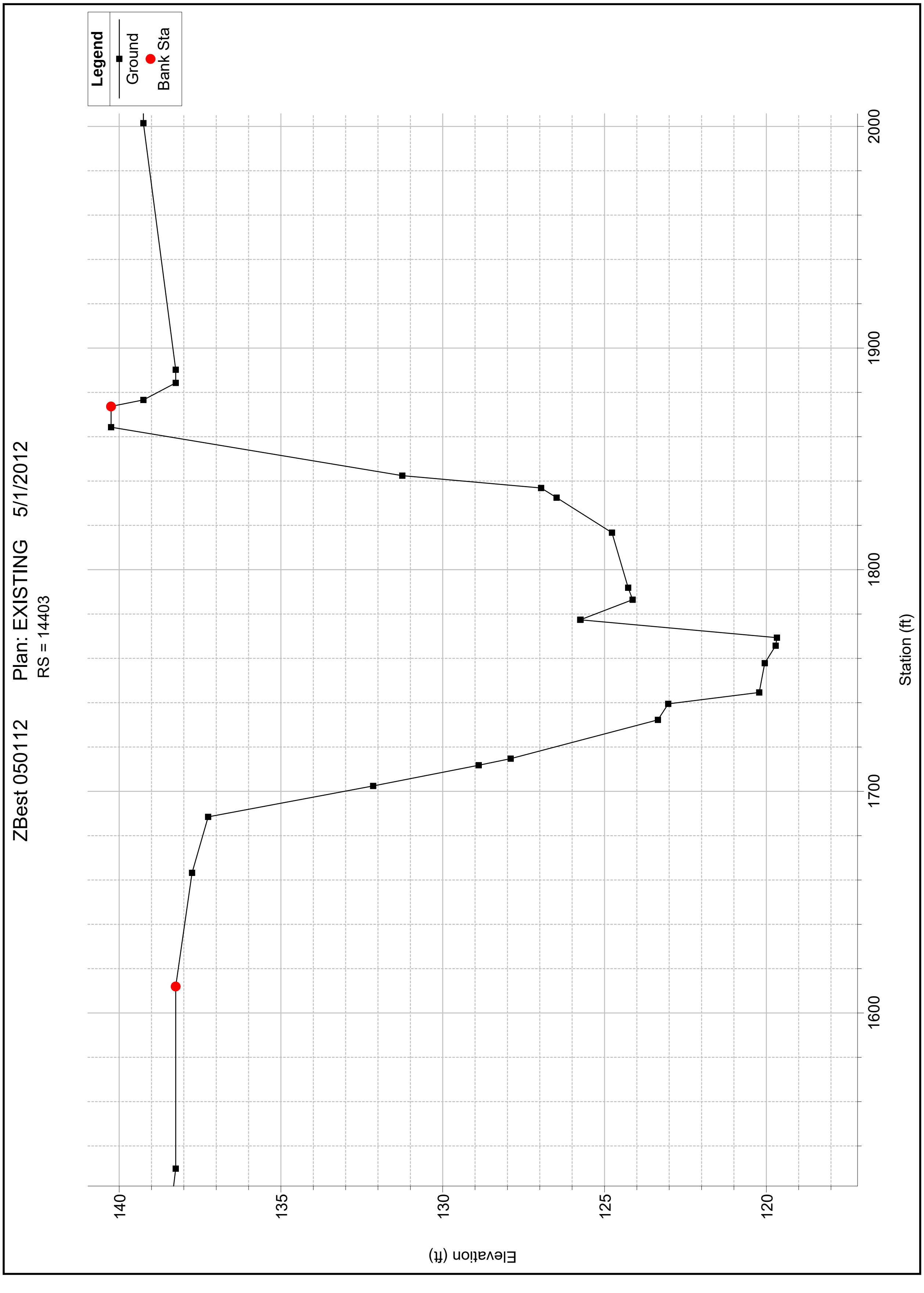
6600
6700
6800
6900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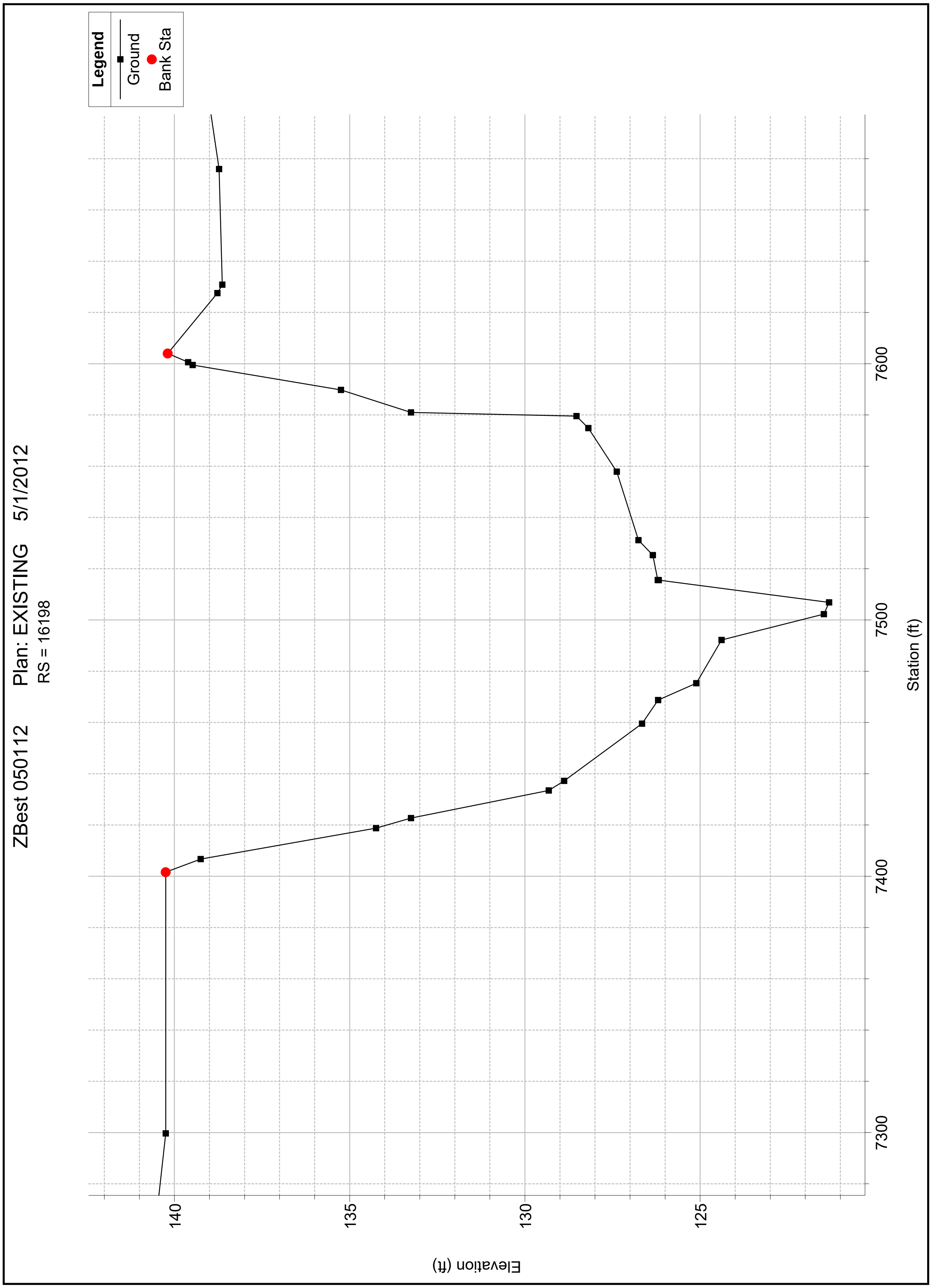
Ground
Bank Sta
Elevation (ft)
140
135
130
125
120
Station (ft)
1600
1700
1800
1900
2000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Ground
Bank Sta
Elevation (ft)
Station (ft)
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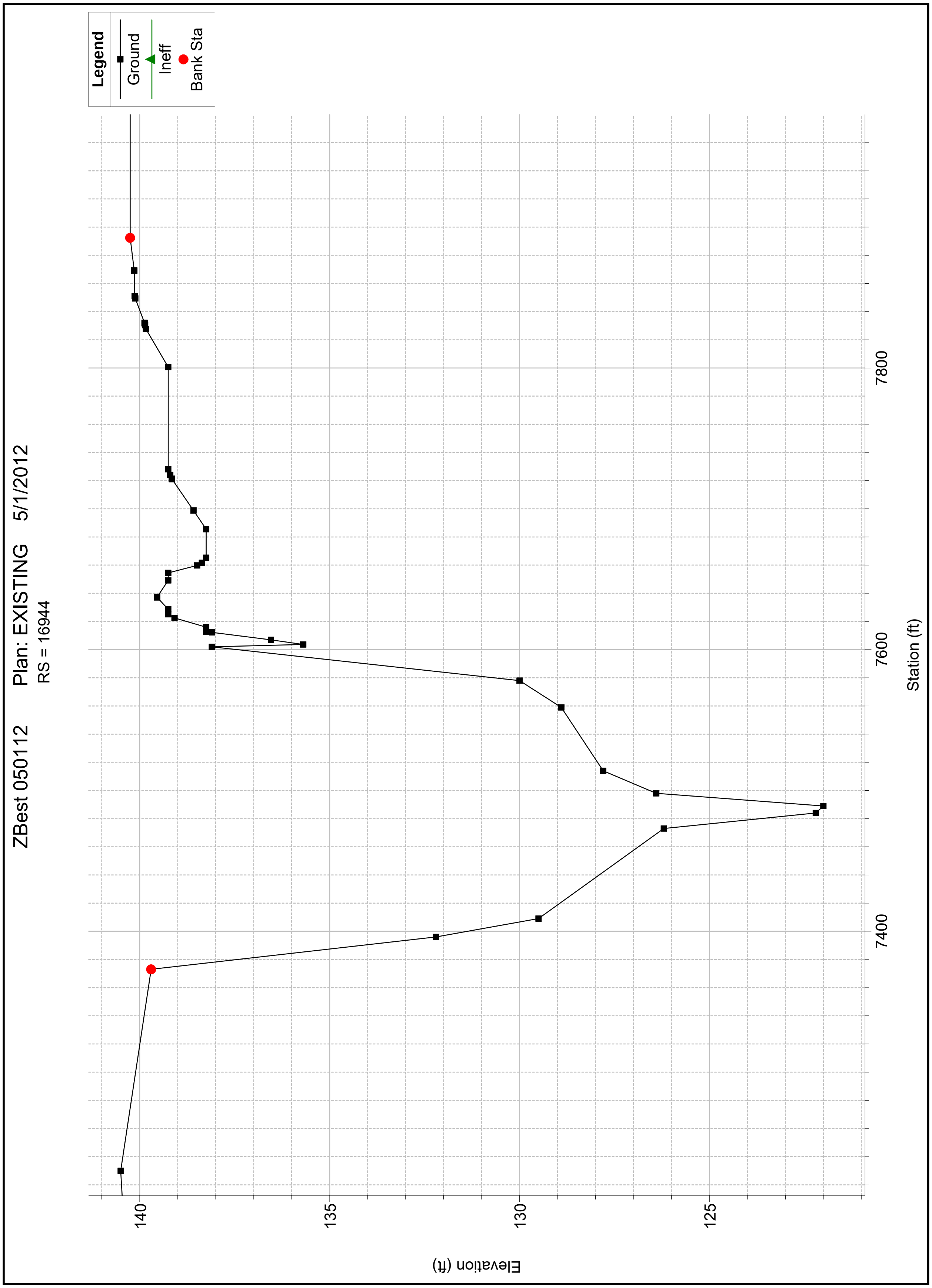
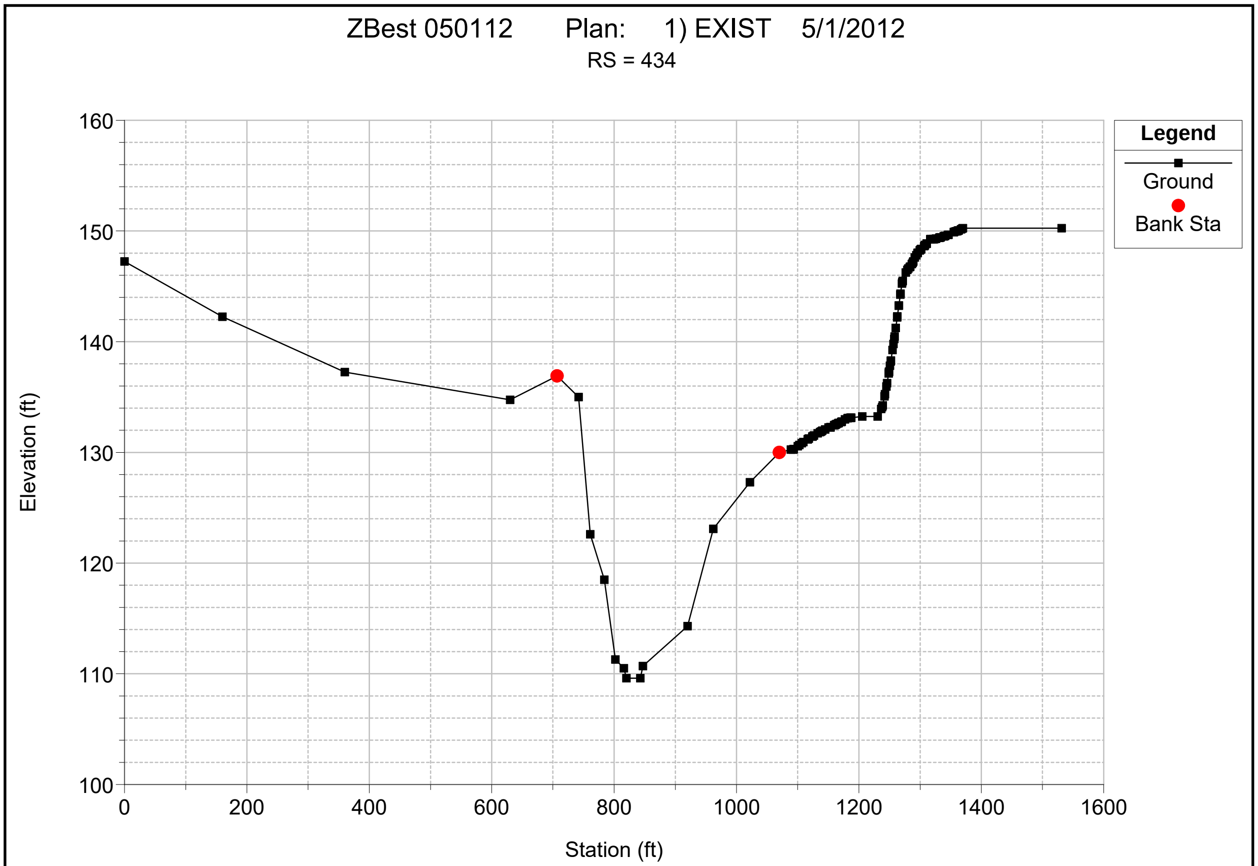
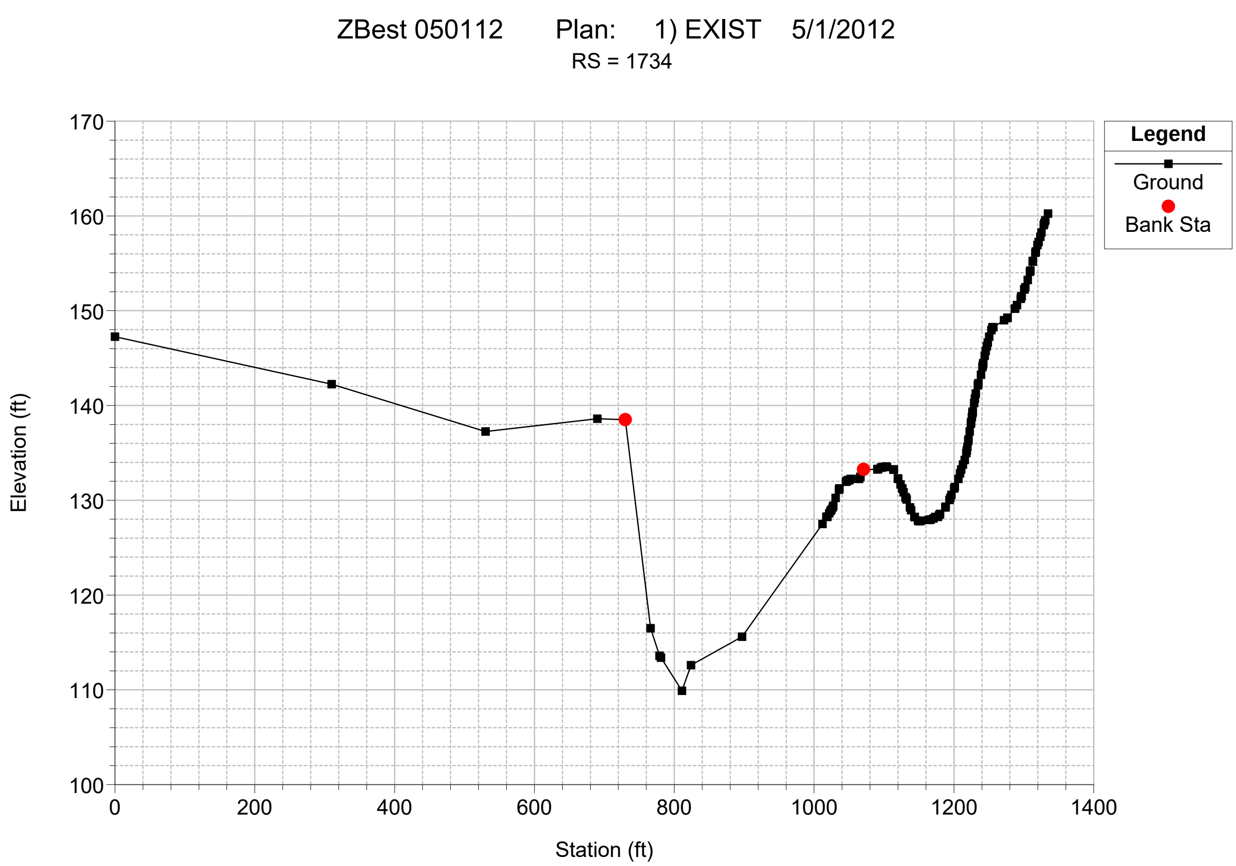
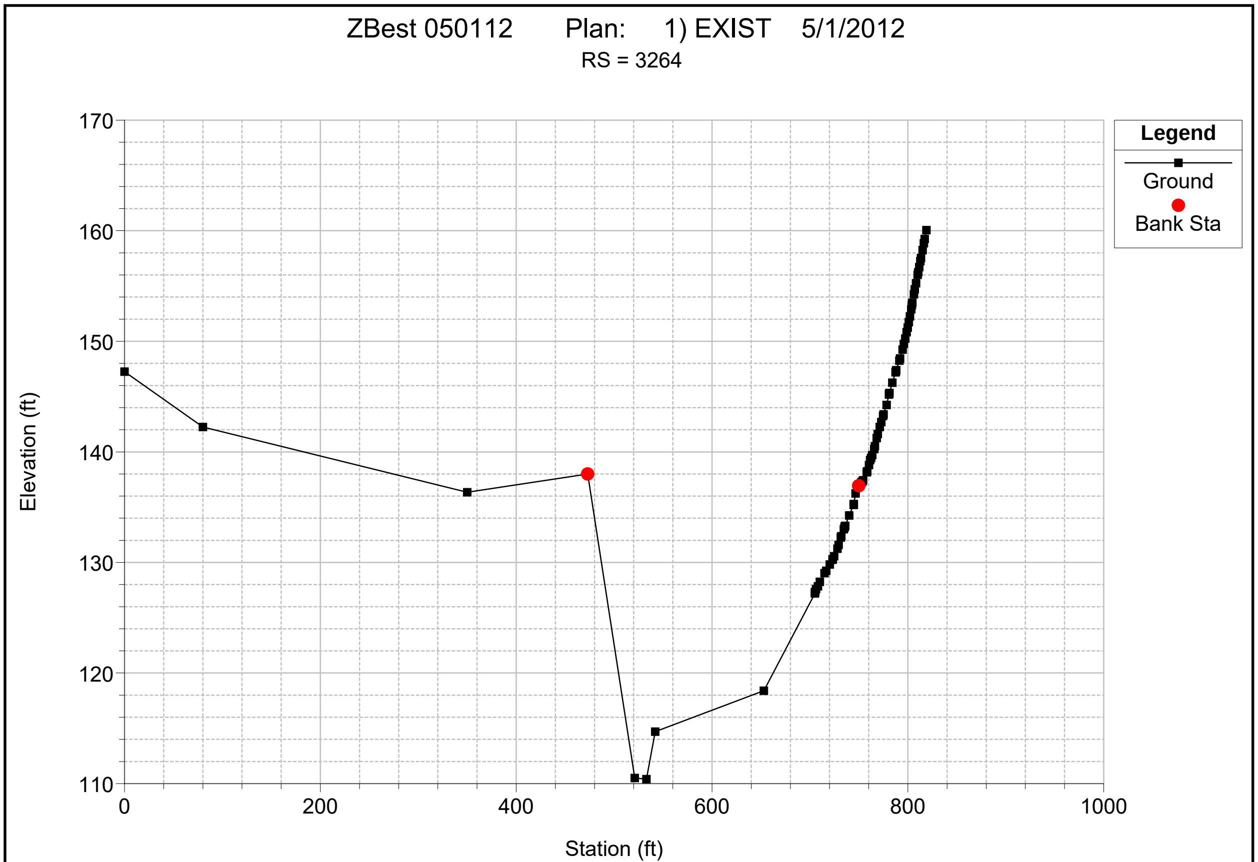
135
130
125
7300
7400
7500
7600

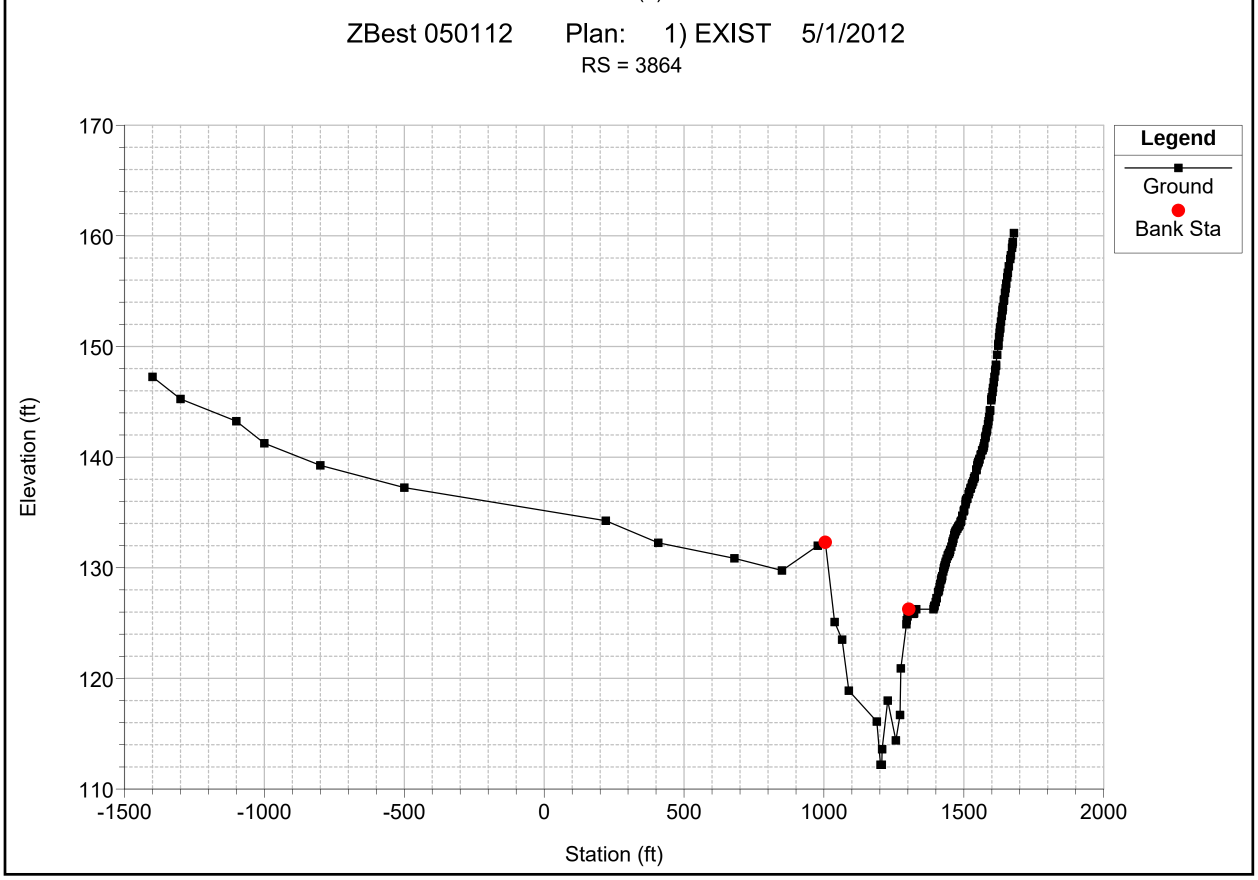

ZBest 050112
Plan: EXISTING 5/1/2012
RS = 16944
Legend
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
140
135
130
125
7400
7600
7800

Compiled Existing Cross Sections






ZBest 050112 Plan: 1) EXIST 5/1/2012
RS = 3264
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
170
160
150
140
130
120
110
0
200
400
600
800
1000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RS = 3864
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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160
150
140
130
120
110
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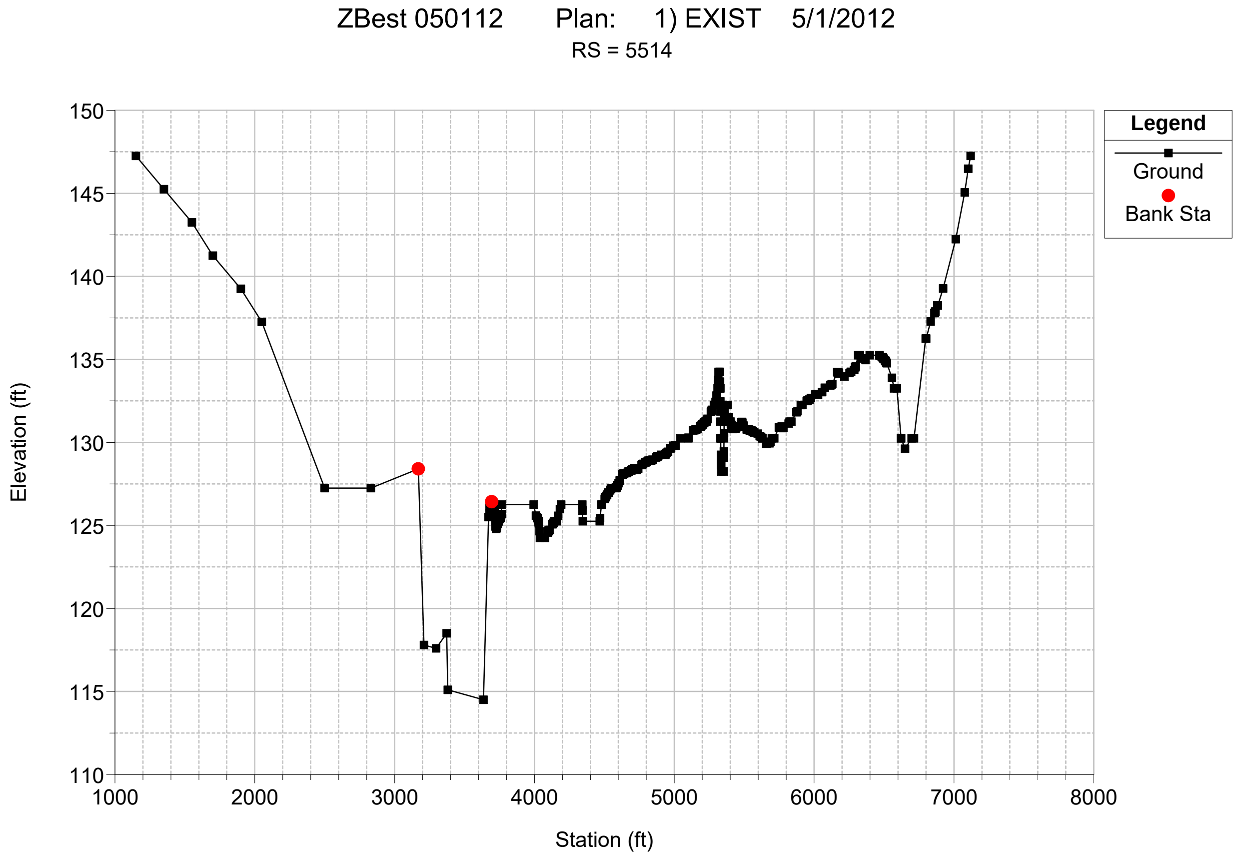
-1000
-500
0
500
1000
1500
2000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RS = 5514
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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145
140
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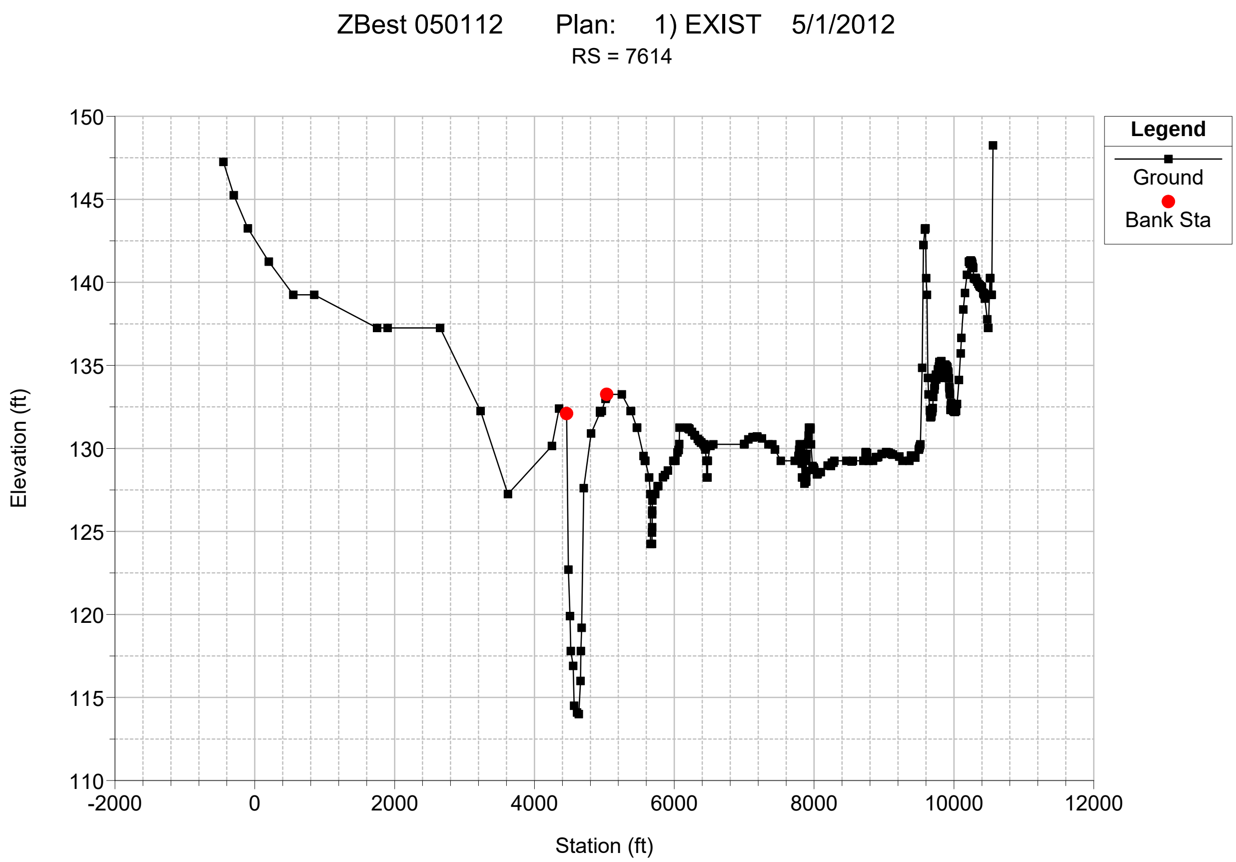
4000
5000
6000
7000
8000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RS = 7614
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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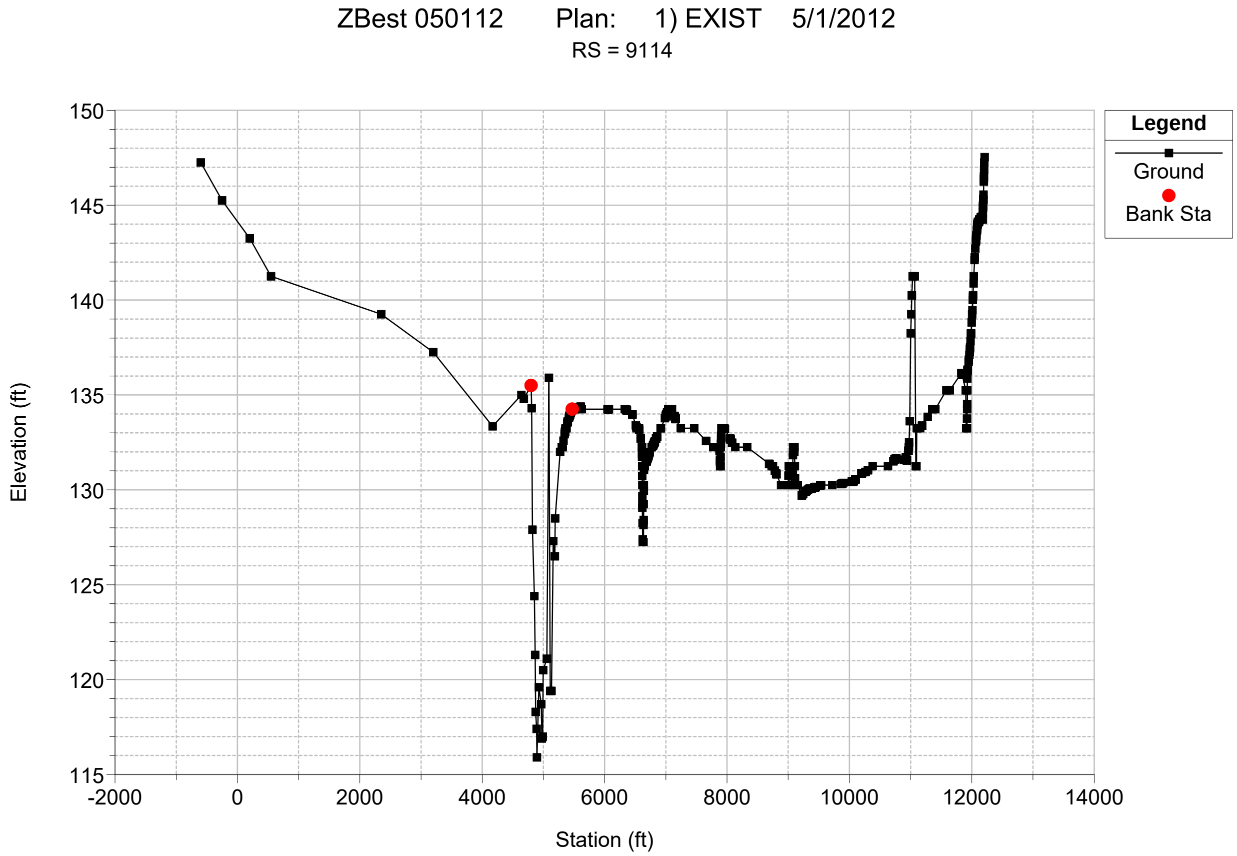
145
140
135
130
125
120
115
110
-2000
0
2000
4000
6000
8000
10000
12000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RS = 9114
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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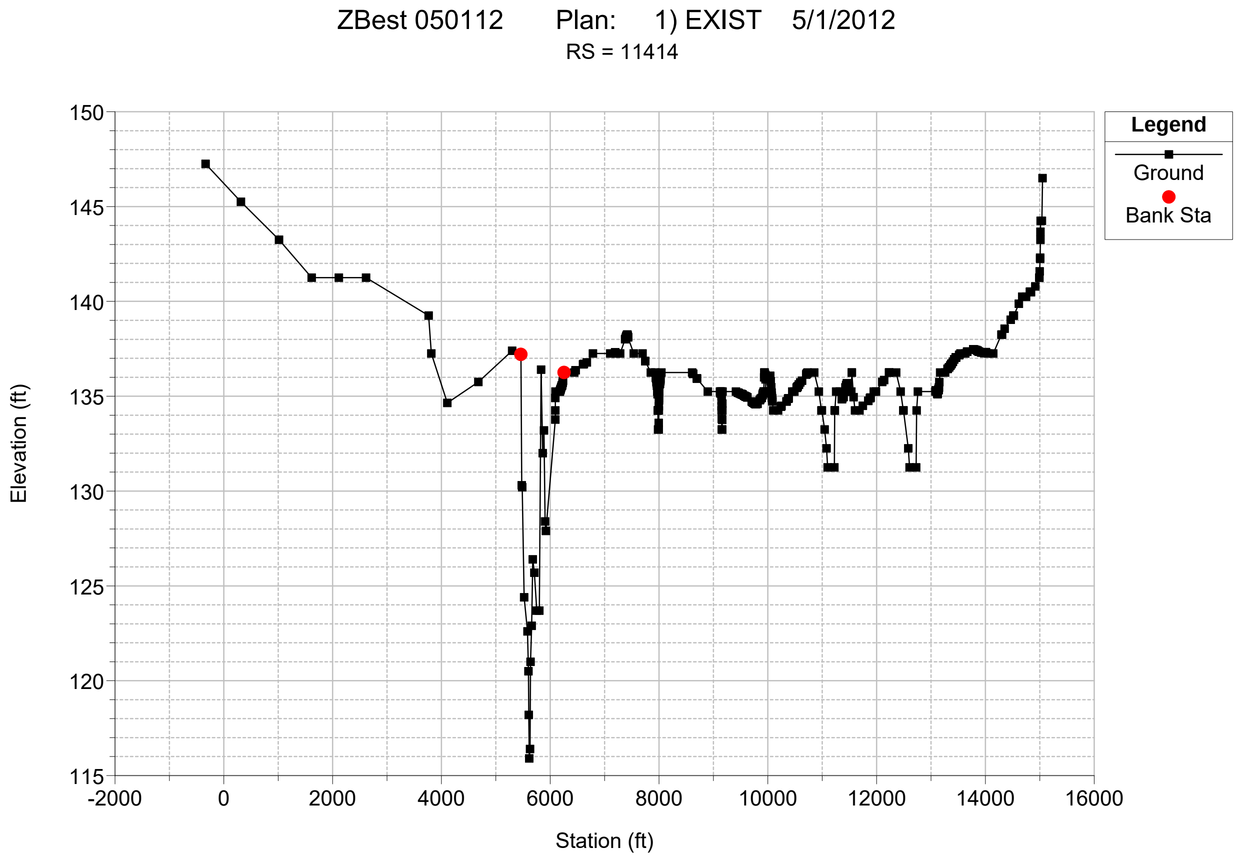
140
135
130
125
120
115
-2000
0
2000
4000
6000
8000
10000
12000
14000


ZBest 050112 Plan: 1) EXIST 5/1/2012
RS = 11414
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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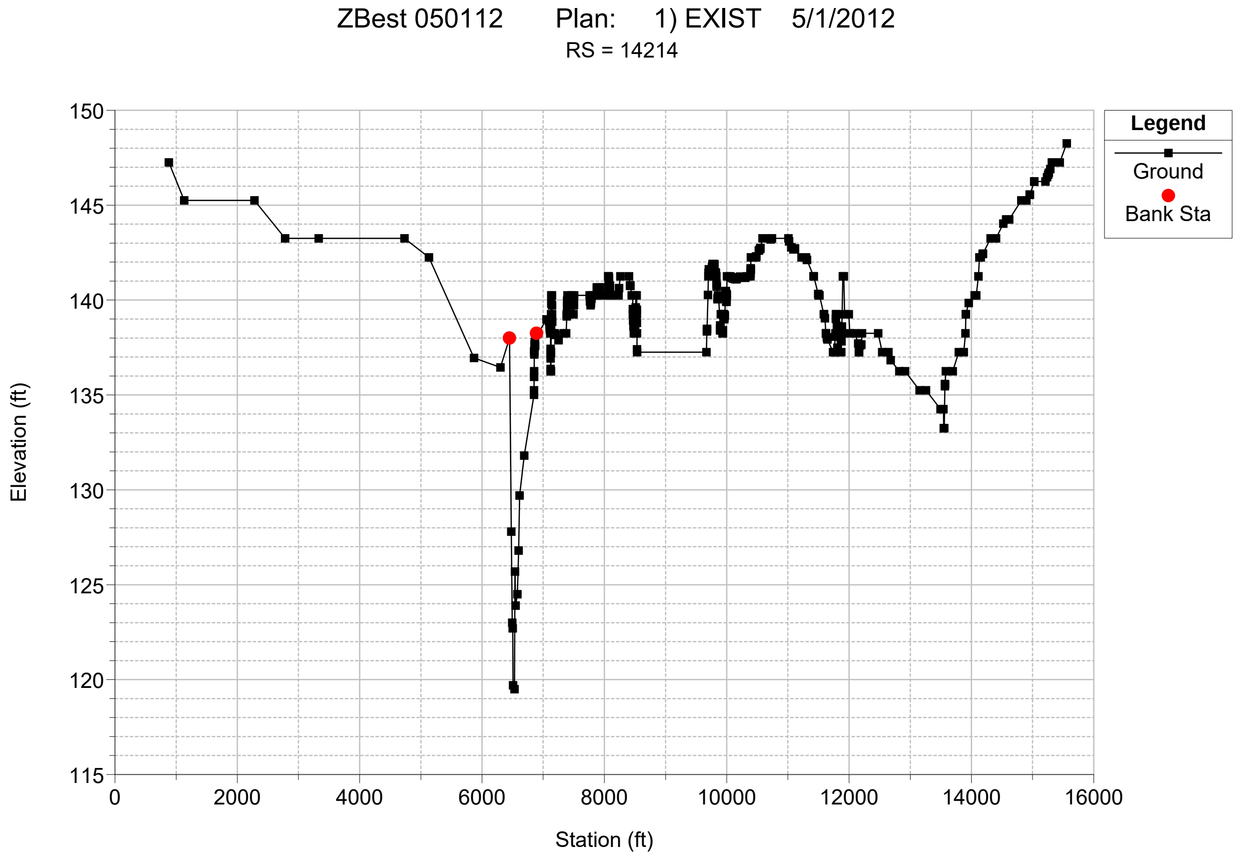
145
140
135
130
125
120
115
-2000
0
2000
4000
6000
8000
10000
12000
14000
16000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Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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140
135
130
125
120
115
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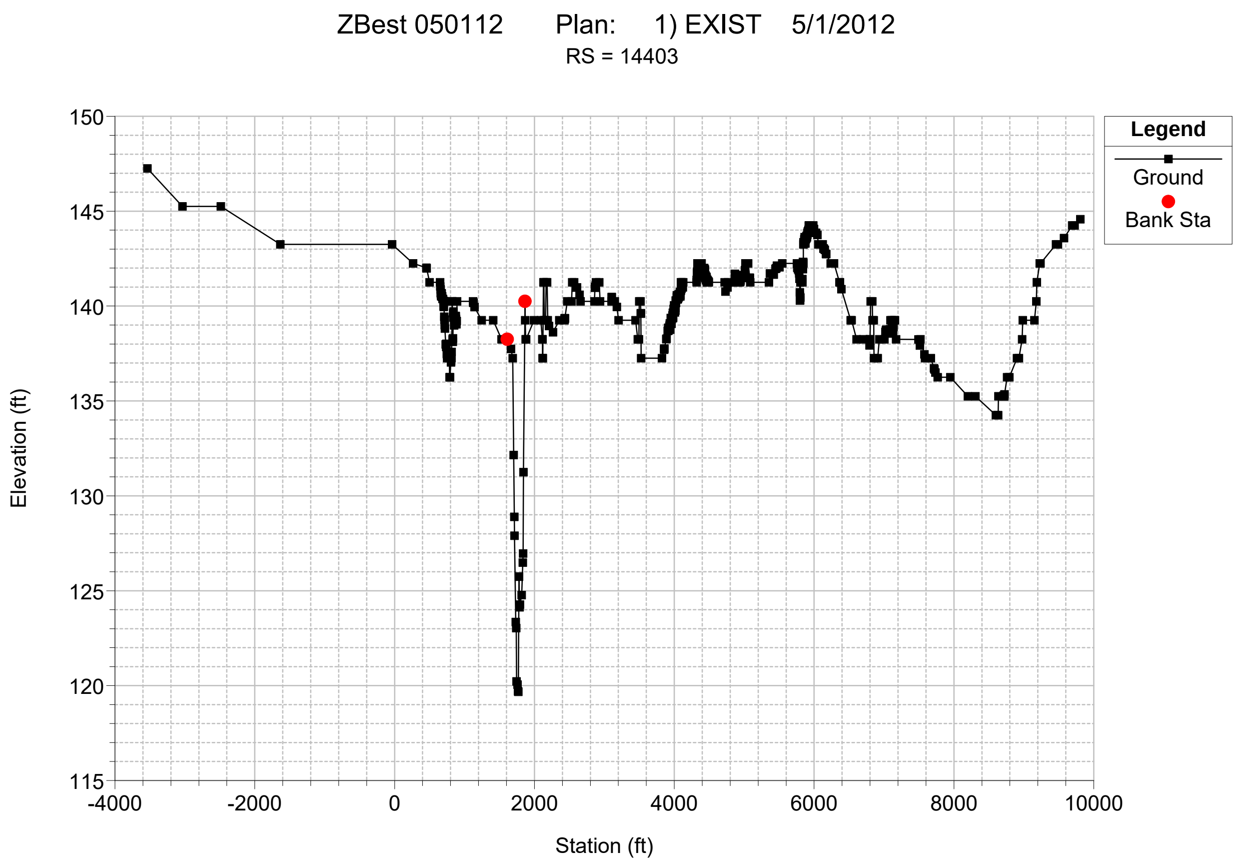
4000
6000
8000
10000
12000
14000
16000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RS = 14403
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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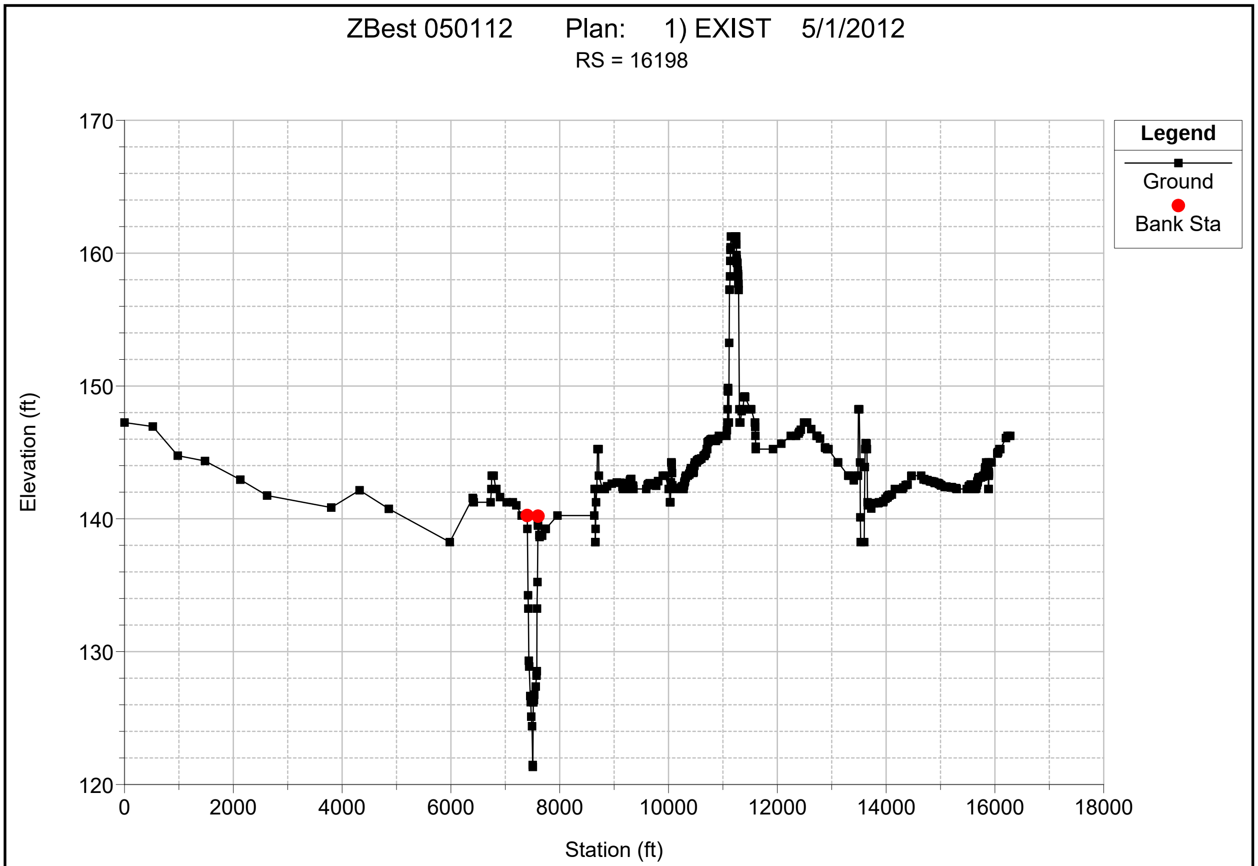
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Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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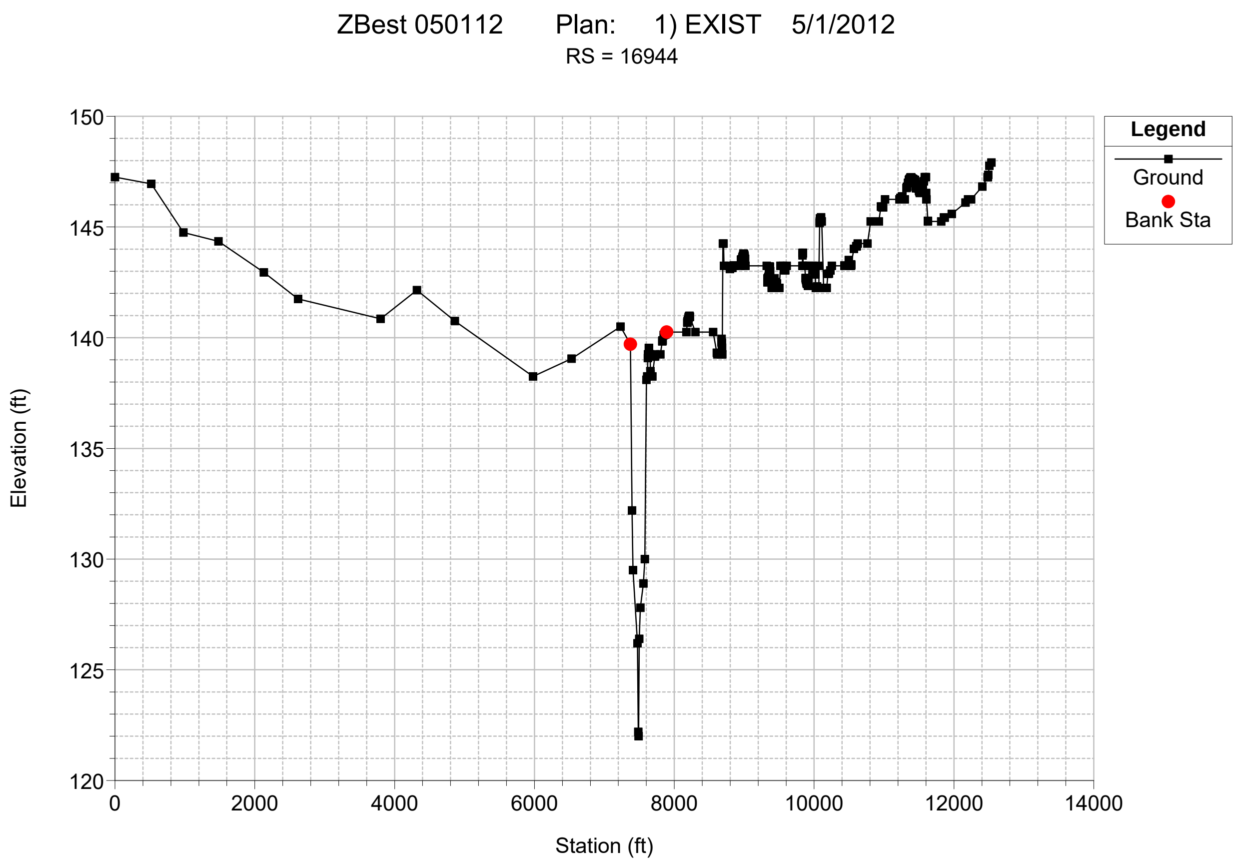
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RS = 16944
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
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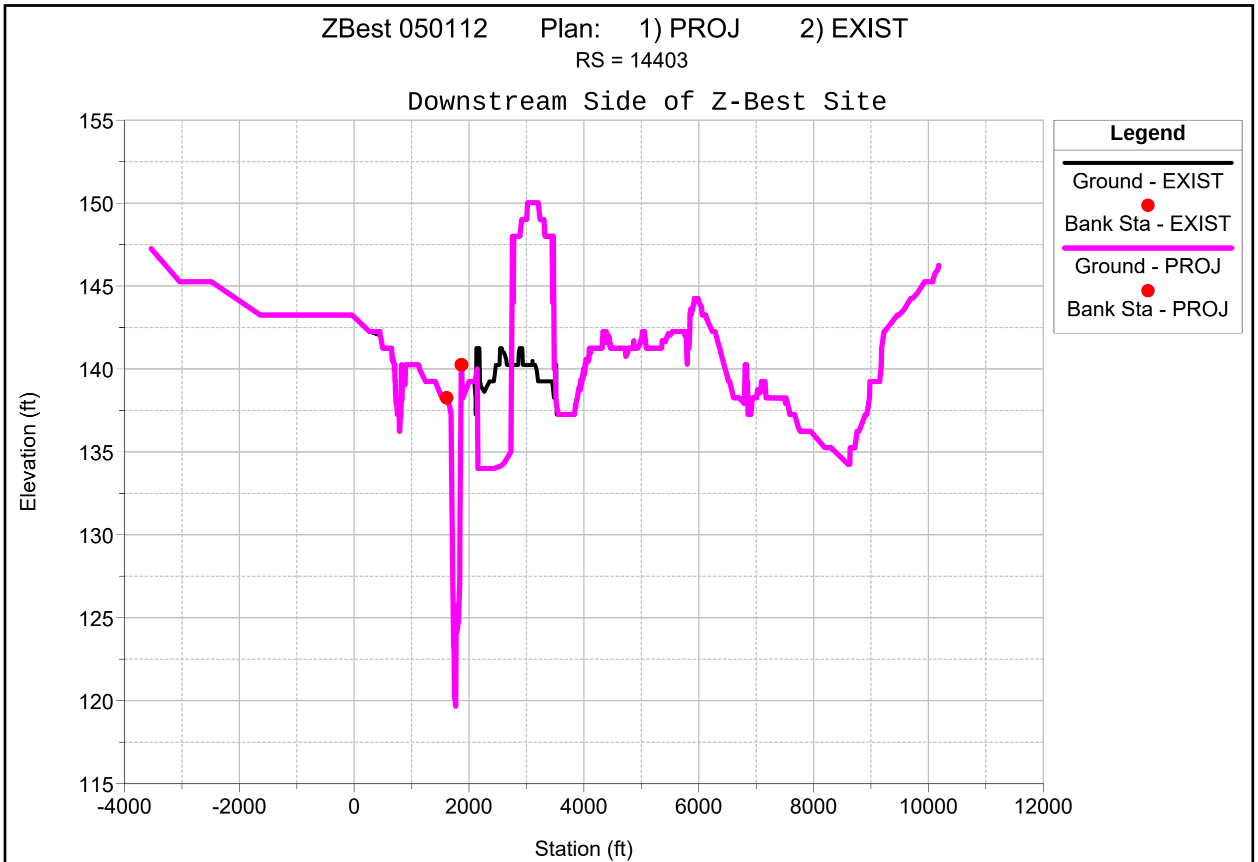
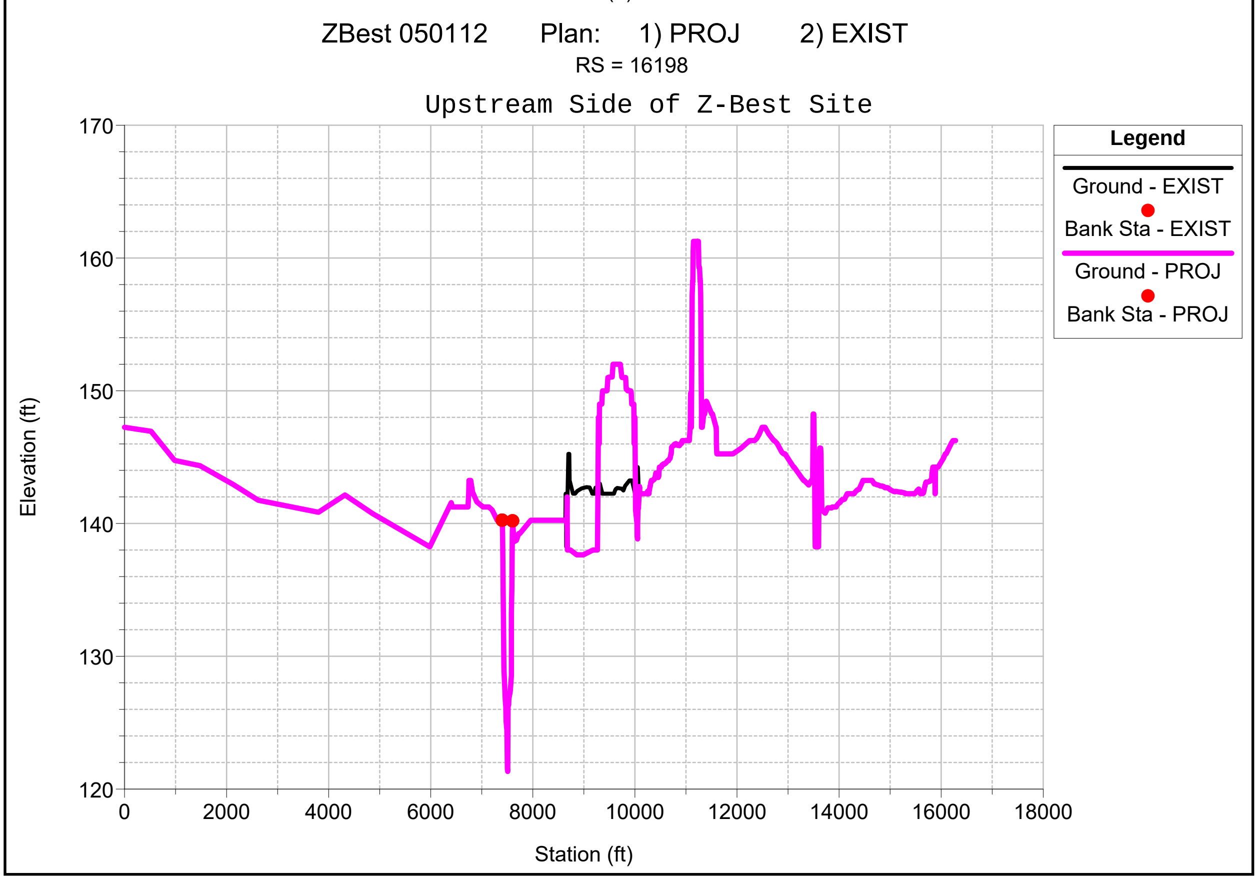
145
140
135
130
125
120
0
2000
4000
6000
8000
10000
12000
14000

Proposed Conditions



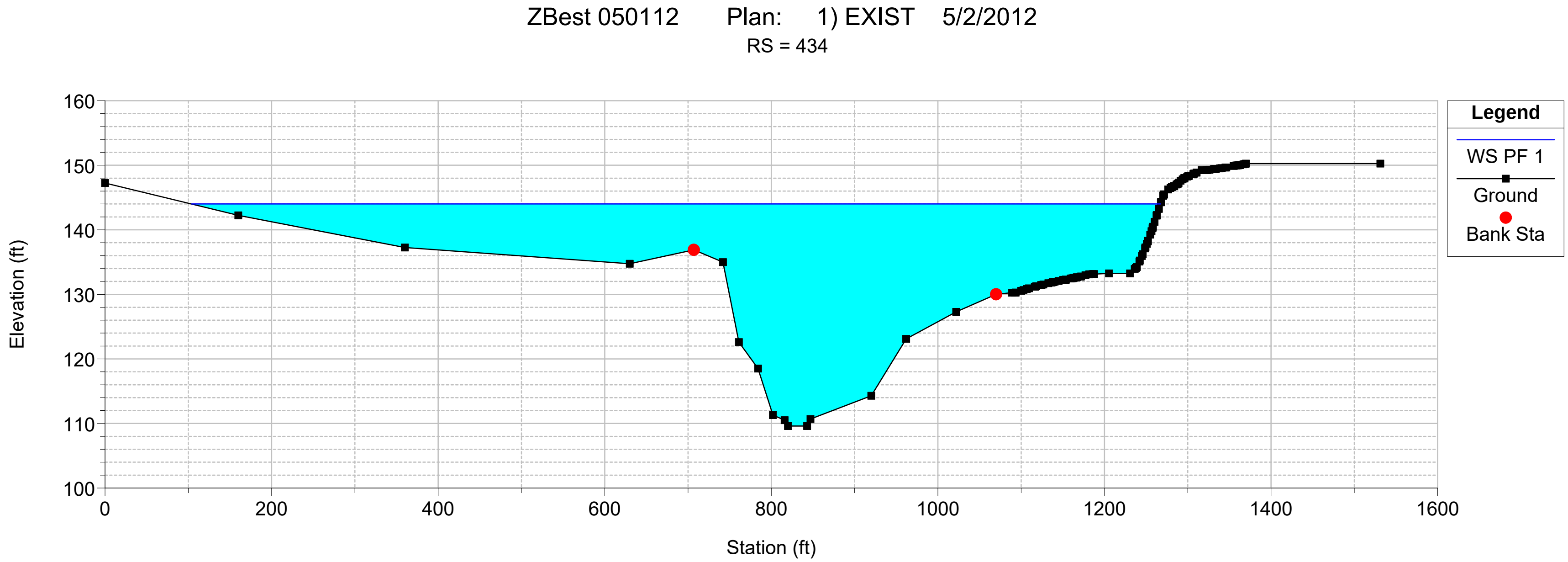


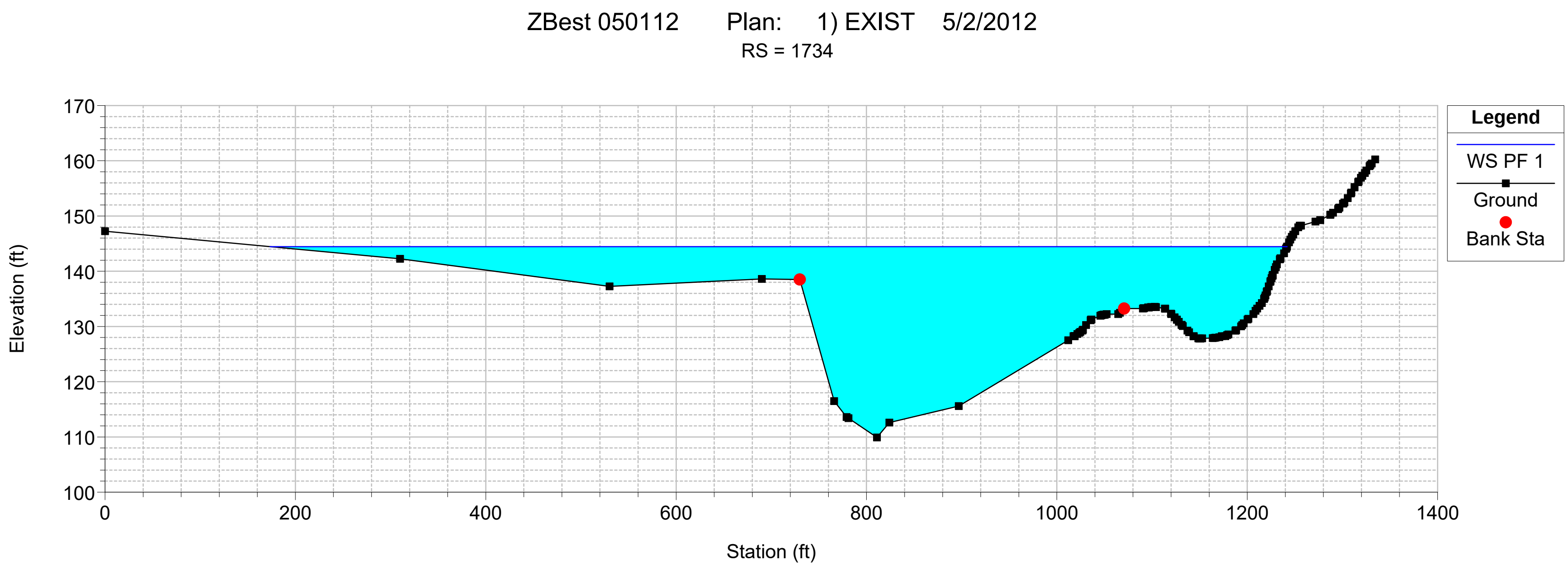
HEC-RAS MODEL RESULTS

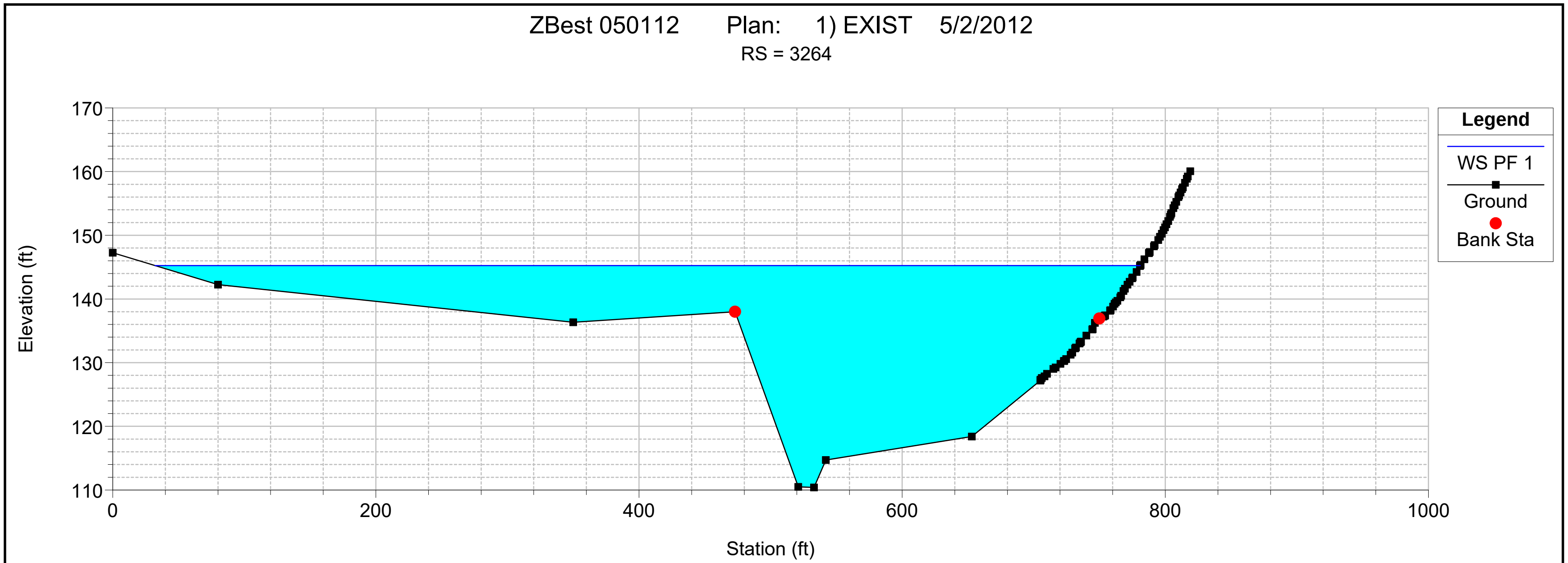
HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Plan	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	434	PF 1	PROJ	30500.00	109.60	144.00	123.40	144.07	0.000315	2.11	14236.96	1163.13	0.08
Reach-1	434	PF 1	EXIST	30500.00	109.60	144.00	123.40	144.07	0.000315	2.11	14236.96	1163.13	0.08
Reach-1	1734	PF 1	PROJ	30500.00	109.90	144.45		144.55	0.000413	2.46	12670.87	1068.48	0.09
Reach-1	1734	PF 1	EXIST	30500.00	109.90	144.45		144.55	0.000413	2.46	12670.87	1068.48	0.09
Reach-1	3264	PF 1	PROJ	30500.00	110.40	145.24		145.40	0.000705	3.22	9498.04	748.78	0.12
Reach-1	3264	PF 1	EXIST	30500.00	110.40	145.24		145.40	0.000705	3.22	9498.04	748.78	0.12
Reach-1	3864	PF 1	PROJ	30500.00	112.20	145.50		145.51	0.000036	0.77	33298.08	2912.39	0.03
Reach-1	3864	PF 1	EXIST	30500.00	112.20	145.50		145.51	0.000036	0.77	33298.08	2912.39	0.03
Reach-1	5514	PF 1	PROJ	30500.00	114.50	145.52		145.52	0.000003	0.24	85726.09	5762.48	0.01
Reach-1	5514	PF 1	EXIST	30500.00	114.50	145.52		145.52	0.000003	0.24	85726.09	5762.48	0.01
Reach-1	7614	PF 1	PROJ	30500.00	114.00	145.53		145.53	0.000001	0.17	135282.00	10874.68	0.01
Reach-1	7614	PF 1	EXIST	30500.00	114.00	145.53		145.53	0.000001	0.17	135282.00	10874.68	0.01
Reach-1	9114	PF 1	PROJ	30500.00	115.90	145.53		145.53	0.000002	0.17	131724.40	12488.56	0.01
Reach-1	9114	PF 1	EXIST	30500.00	115.90	145.53		145.53	0.000002	0.17	131724.40	12488.56	0.01
Reach-1	11414	PF 1	PROJ	30500.00	115.90	145.53		145.53	0.000003	0.22	124939.80	14823.18	0.01
Reach-1	11414	PF 1	EXIST	30500.00	115.90	145.53		145.53	0.000003	0.22	124939.80	14823.18	0.01
Reach-1	14214	PF 1	PROJ	30500.00	119.50	145.54		145.55	0.000010	0.48	78691.72	13855.69	0.02
Reach-1	14214	PF 1	EXIST	30500.00	119.50	145.55		145.55	0.000014	0.57	71383.08	13856.02	0.03
Reach-1	14403	PF 1	PROJ	30500.00	119.67	145.55		145.55	0.000018	0.38	63278.80	12498.68	0.02
Reach-1	14403	PF 1	EXIST	30500.00	119.67	145.55		145.55	0.000019	0.39	64012.07	12918.36	0.02
Reach-1	16198	PF 1	PROJ	30500.00	121.32	145.59		145.60	0.000038	0.59	51141.05	12884.13	0.03
Reach-1	16198	PF 1	EXIST	30500.00	121.32	145.60		145.60	0.000046	0.64	50367.50	13613.17	0.03
Reach-1	16944	PF 1	PROJ	30500.00	122.00	145.60		145.61	0.000045	0.48	47413.81	11237.74	0.03
Reach-1	16944	PF 1	EXIST	30500.00	122.00	145.62		145.62	0.000060	0.56	43517.14	10502.05	0.03

Existing Conditions 100-year Flooding



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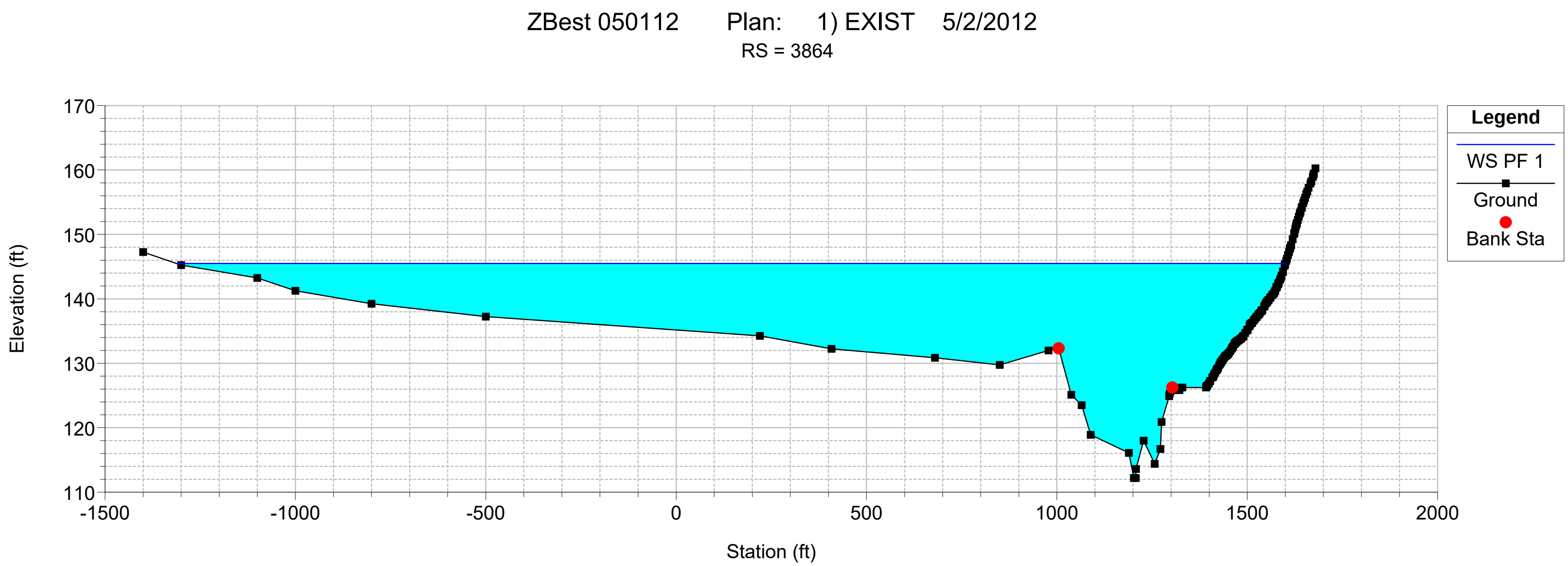
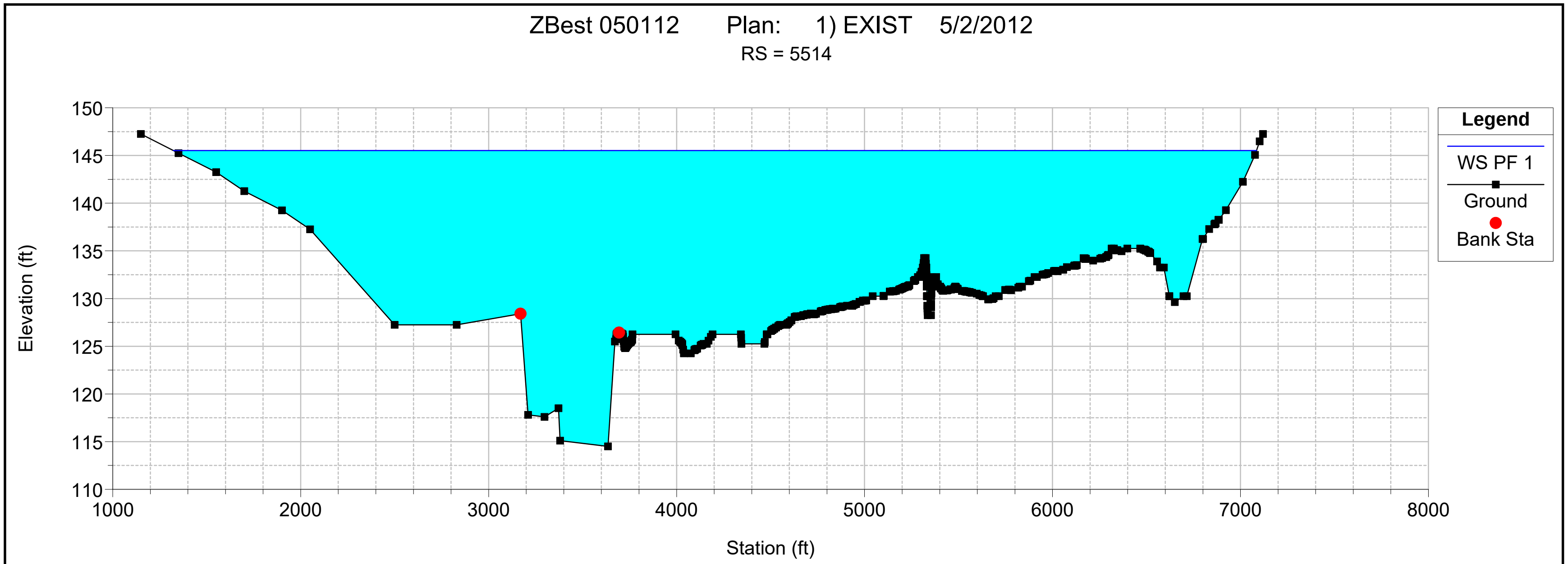
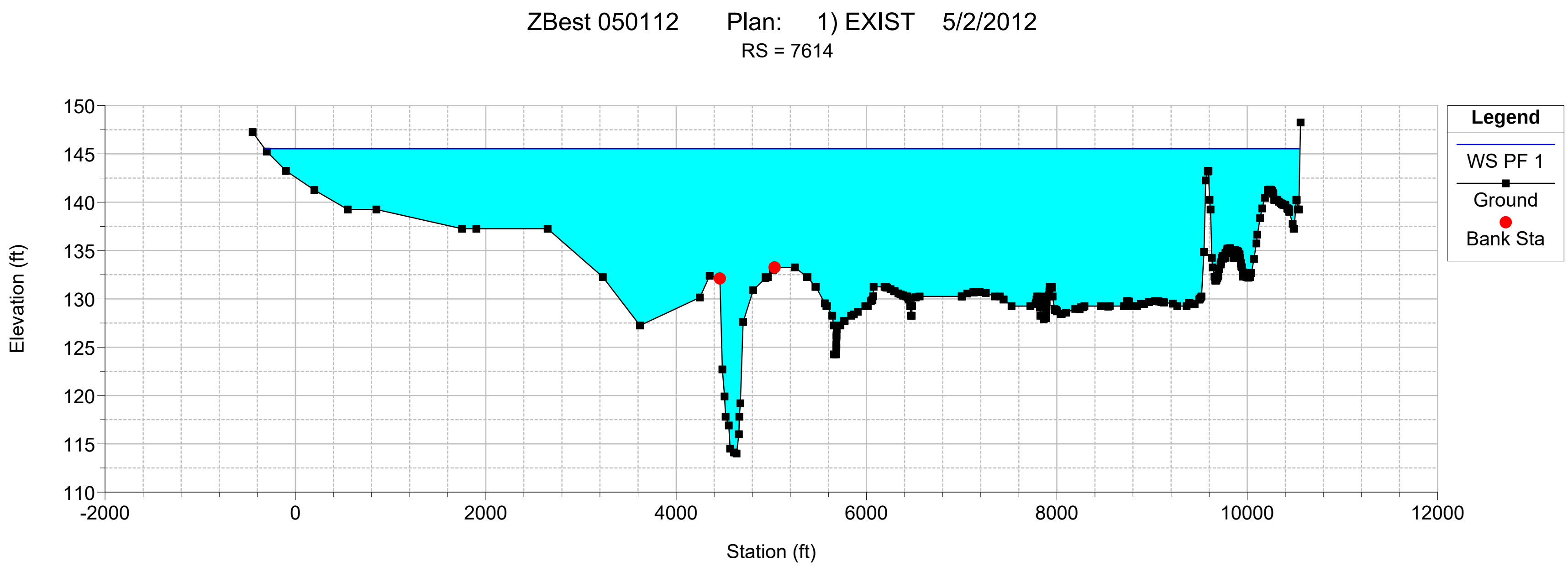
RS = 3264
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
170
160
150
140
130
120
110
0
200
400
600
800
1000


ZBest 050112 Plan: 1) EXIST 5/2/2012
RS = 3864
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
170
160
150
140
130
120
110
-1500
-1000
-500
0
500
1000
1500
2000


ZBest 050112 Plan: 1) EXIST 5/2/2012
RS = 5514
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
150
145
140
135
130
125
120
115
110
1000
2000
3000
4000
5000
6000
7000
8000
Station (ft)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RS = 7614
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
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145
140
135
130
125
120
115
110
-2000
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2000
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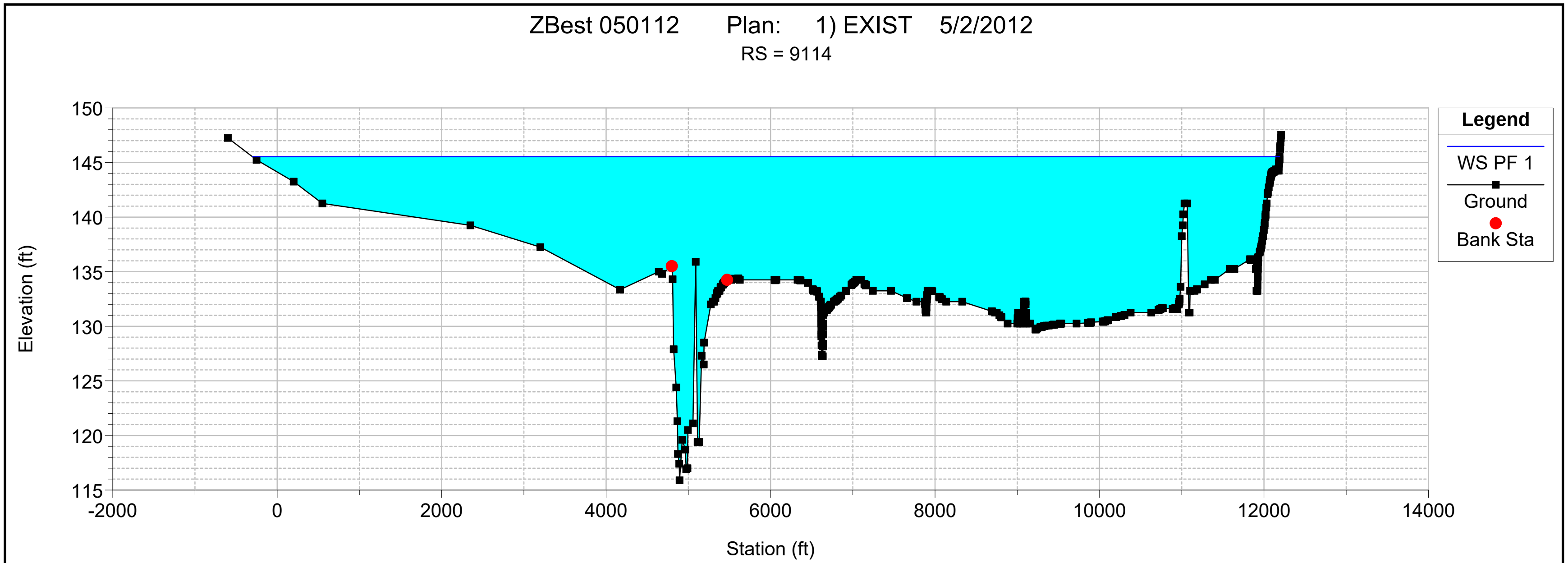
10000
12000
Station (ft)



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RS = 9114
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
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130
125
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-2000
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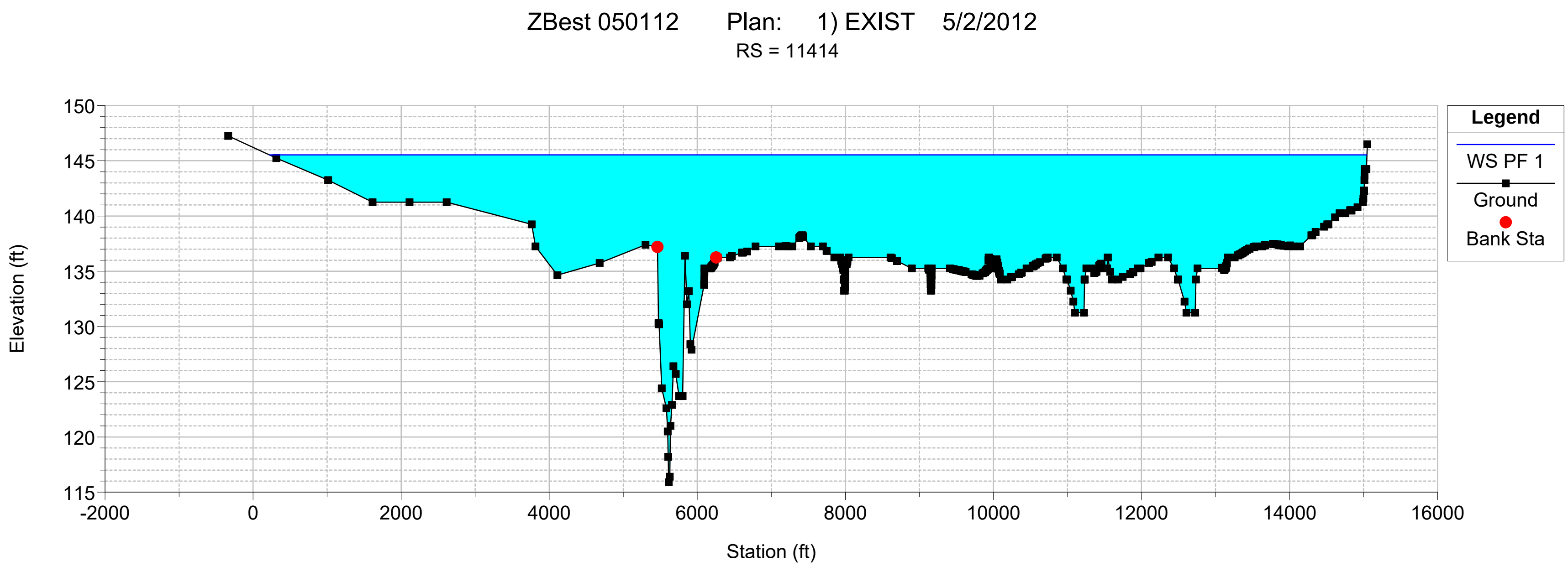
Station (ft)



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Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
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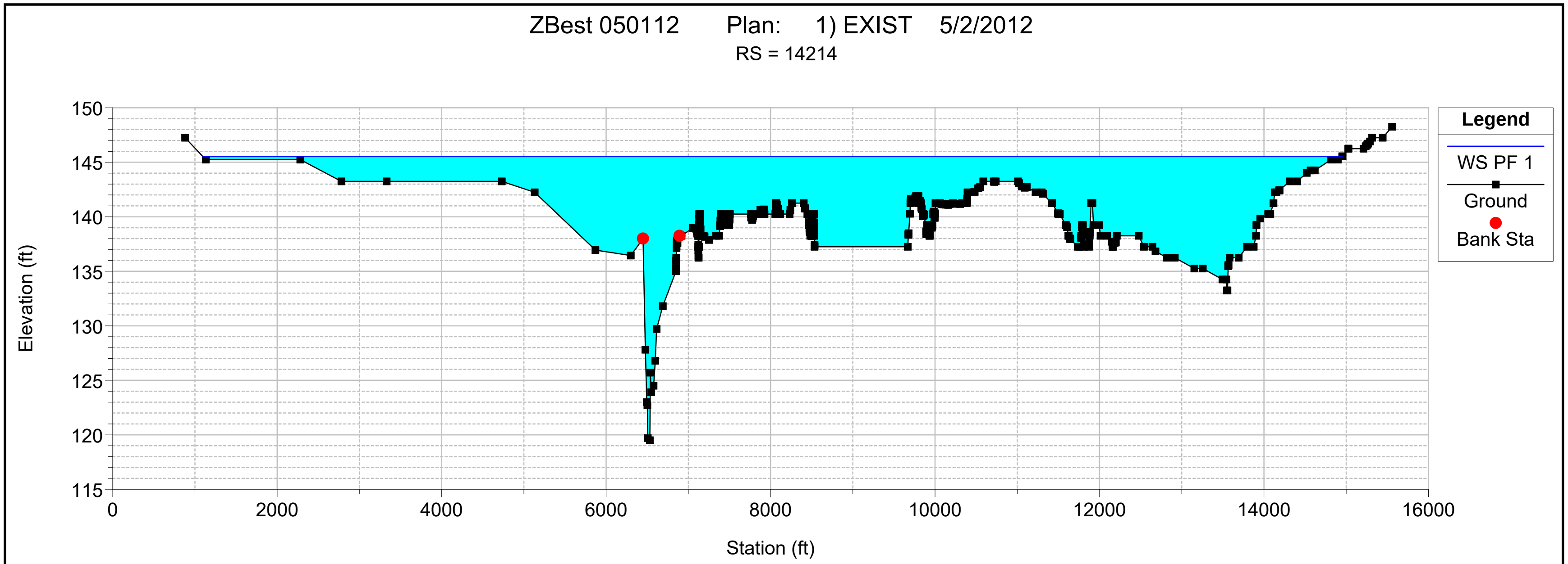
130
125
120
115
-2000
0
2000
4000
6000
8000
10000
12000
14000
16000
Station (ft)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Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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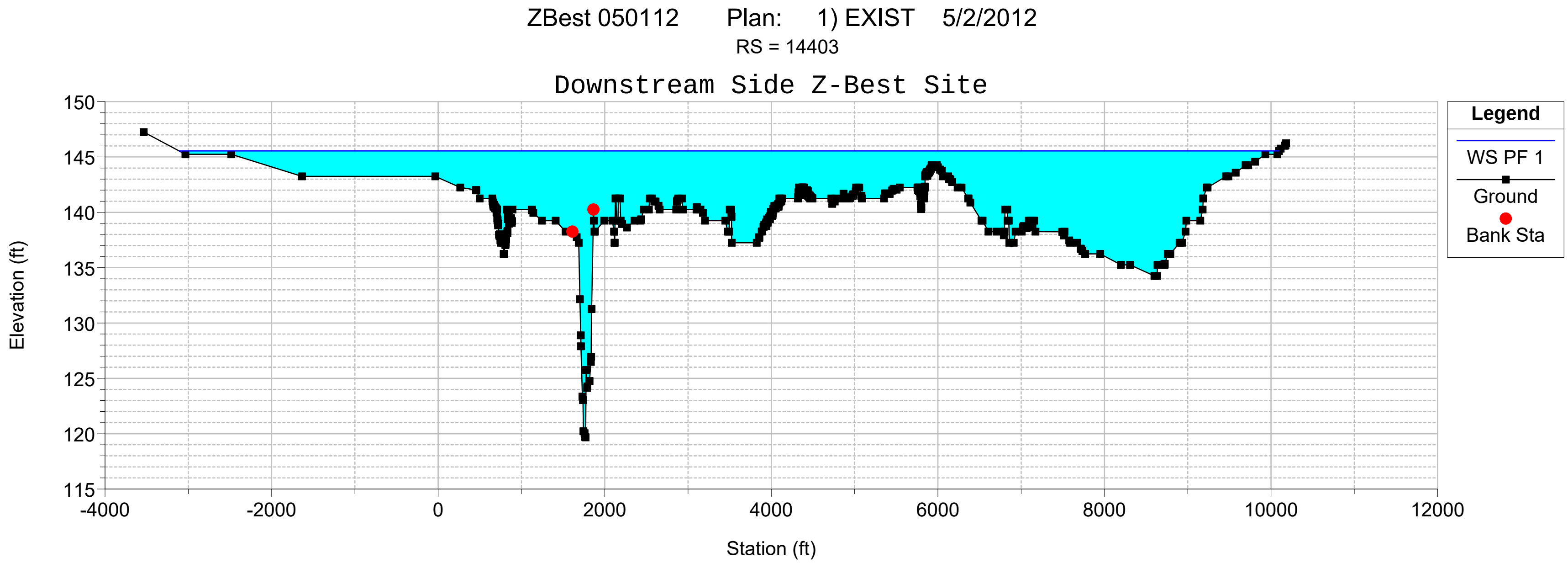
145
140
135
130
125
120
115
0
2000
4000
6000
8000
10000
12000
14000
16000


ZBest 050112 Plan: 1) EXIST 5/2/2012
RS = 14403
Downstream Side Z-Best Site
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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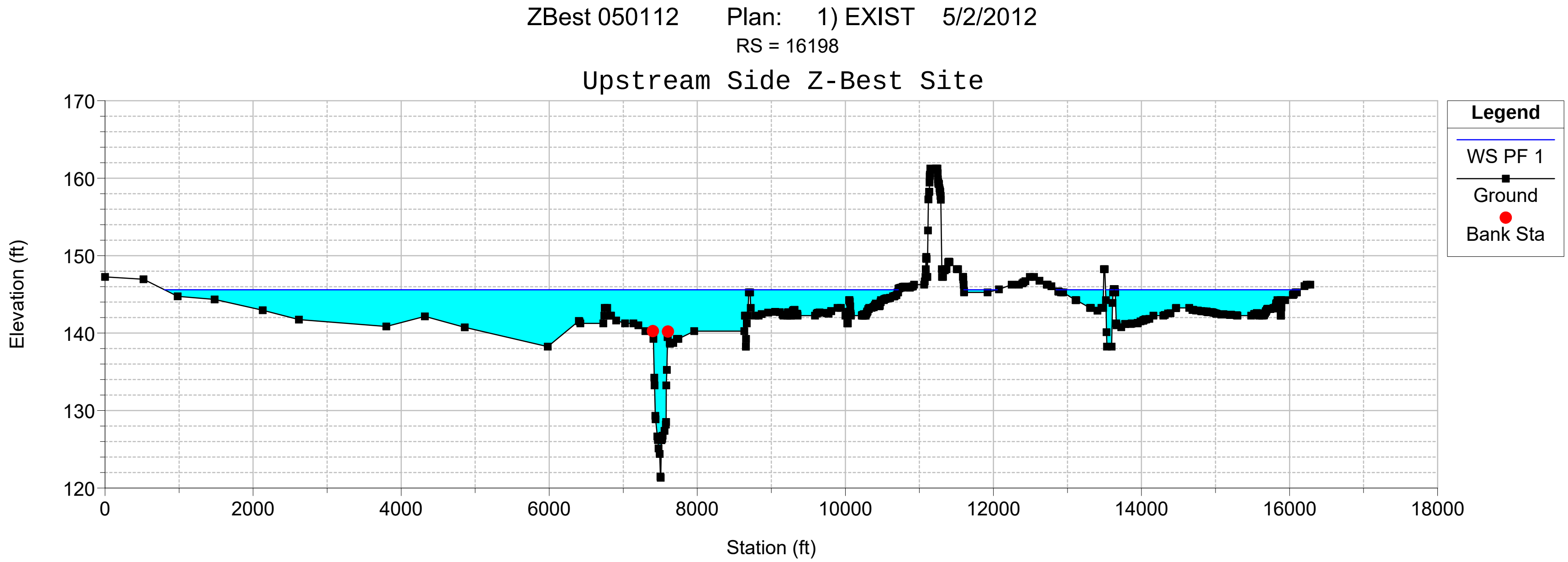
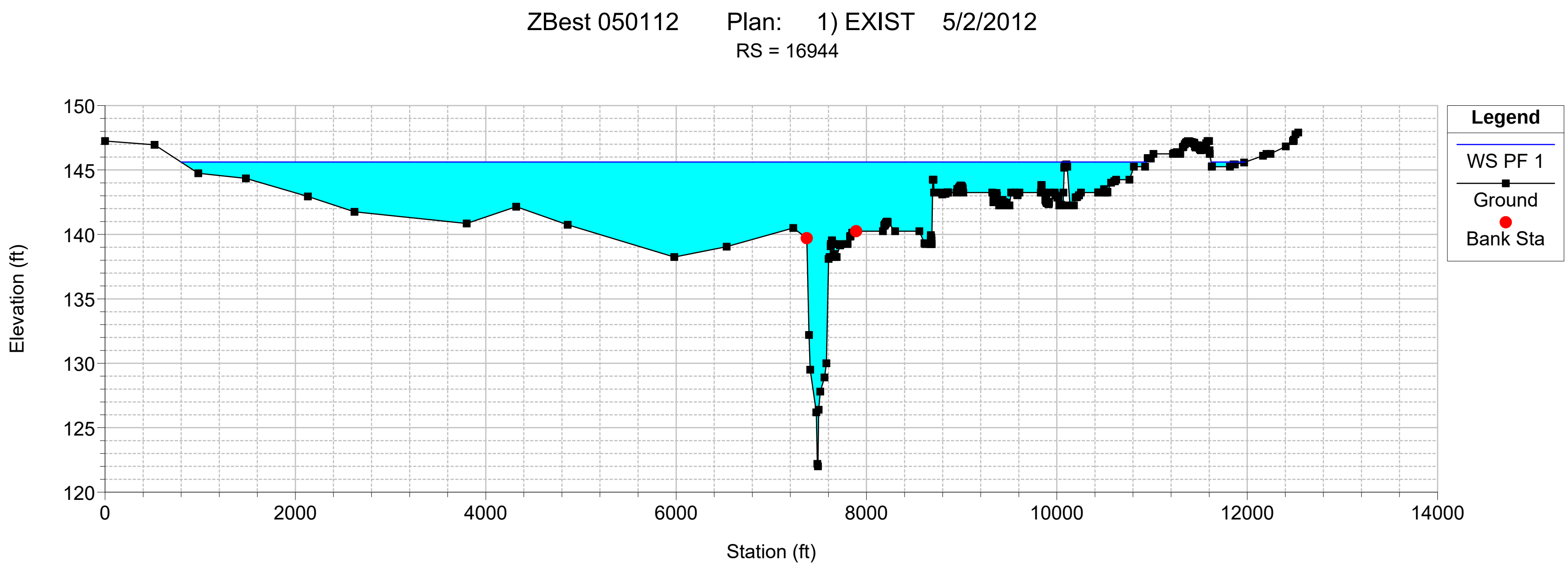
145
140
135
130
125
120
115
-4000
-2000
0
2000
4000
6000
8000
10000
12000

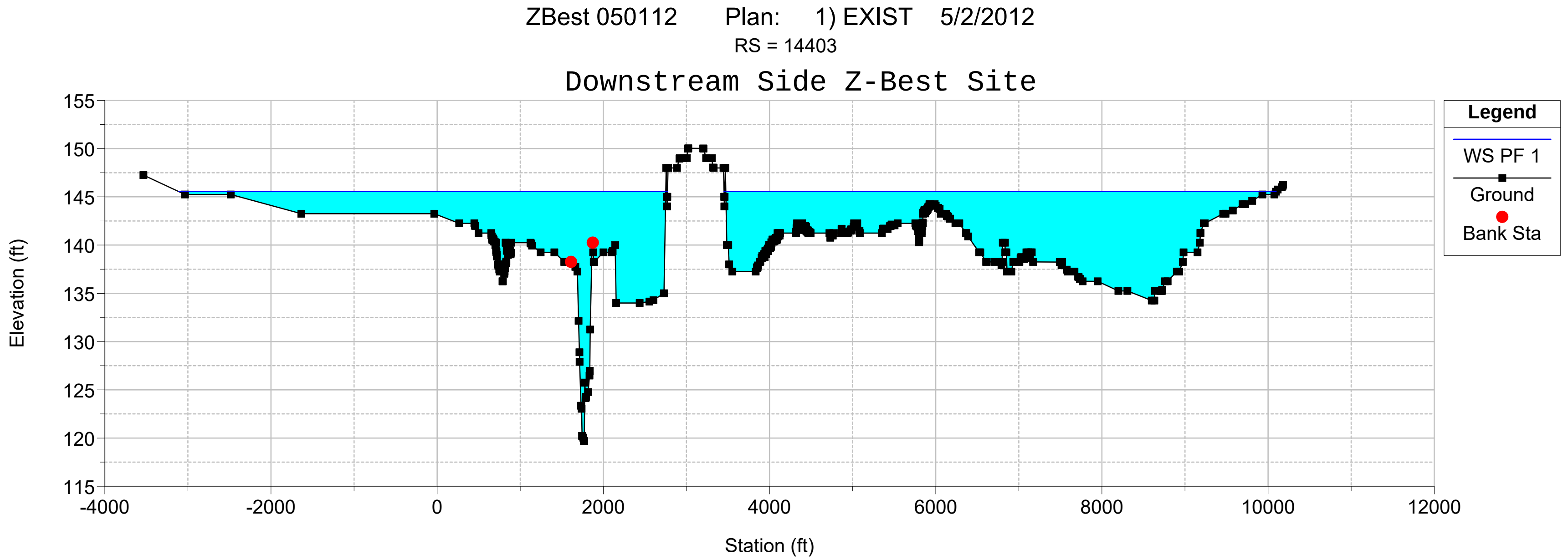


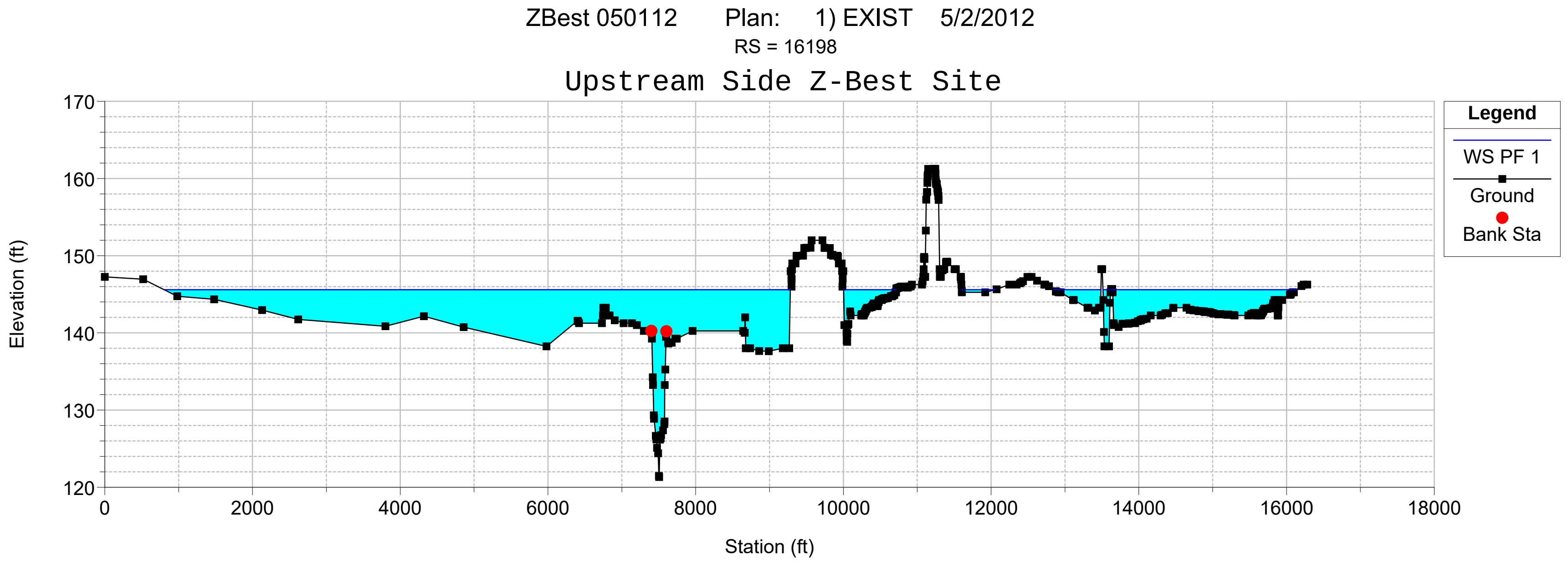
ZBest 050112 Plan: 1) EXIST 5/2/2012
RS = 16198
Upstream Side Z-Best Site
Elevation (ft)
Station (ft)
170
160
150
140
130
120
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Legend
WS PF 1
Ground
Bank Sta

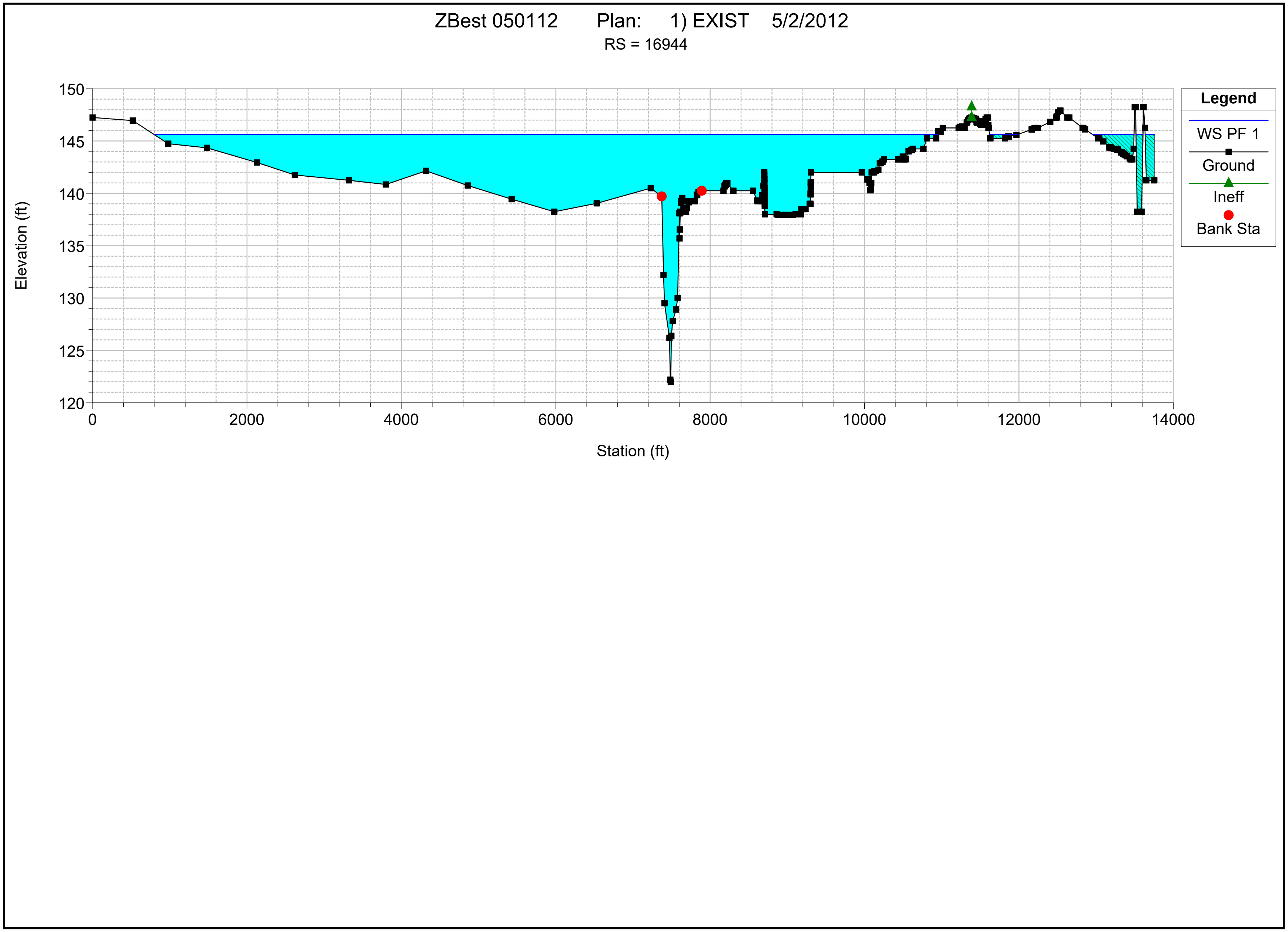


ZBest 050112 Plan: 1) EXIST 5/2/2012
RS = 16944
Elevation (ft)
Station (ft)
150
145
140
135
130
125
120
0
2000
4000
6000
8000
10000
12000
14000
Legend
WS PF 1
Ground
Bank Sta

Proposed Conditions 100-year Flooding







ZBest 050112 Plan: 1) EXIST 5/2/2012
RS = 16944
Legend
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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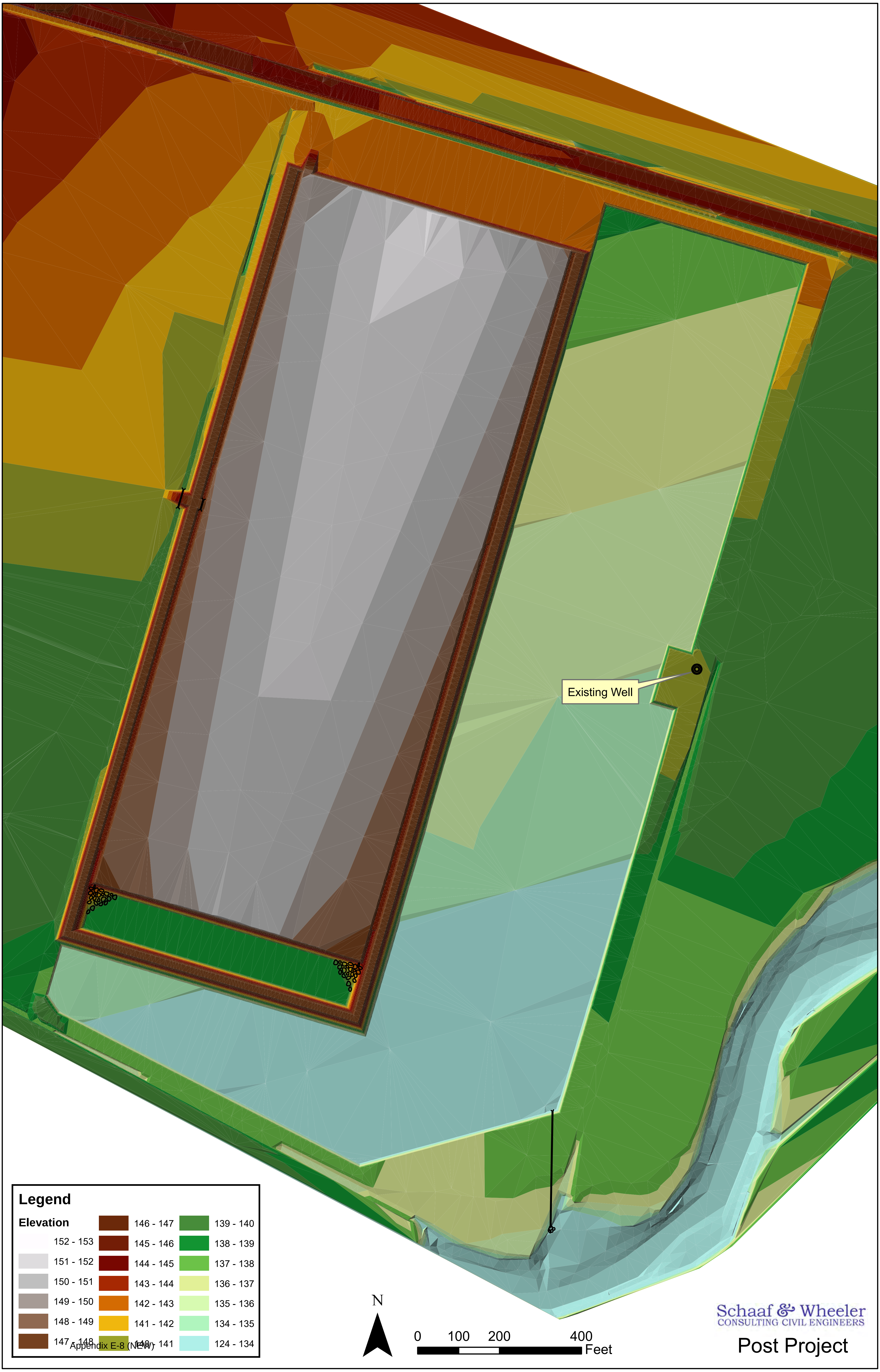
135
130
125
120
0
2000
4000
6000
8000
10000
12000
14000

APPENDIX D

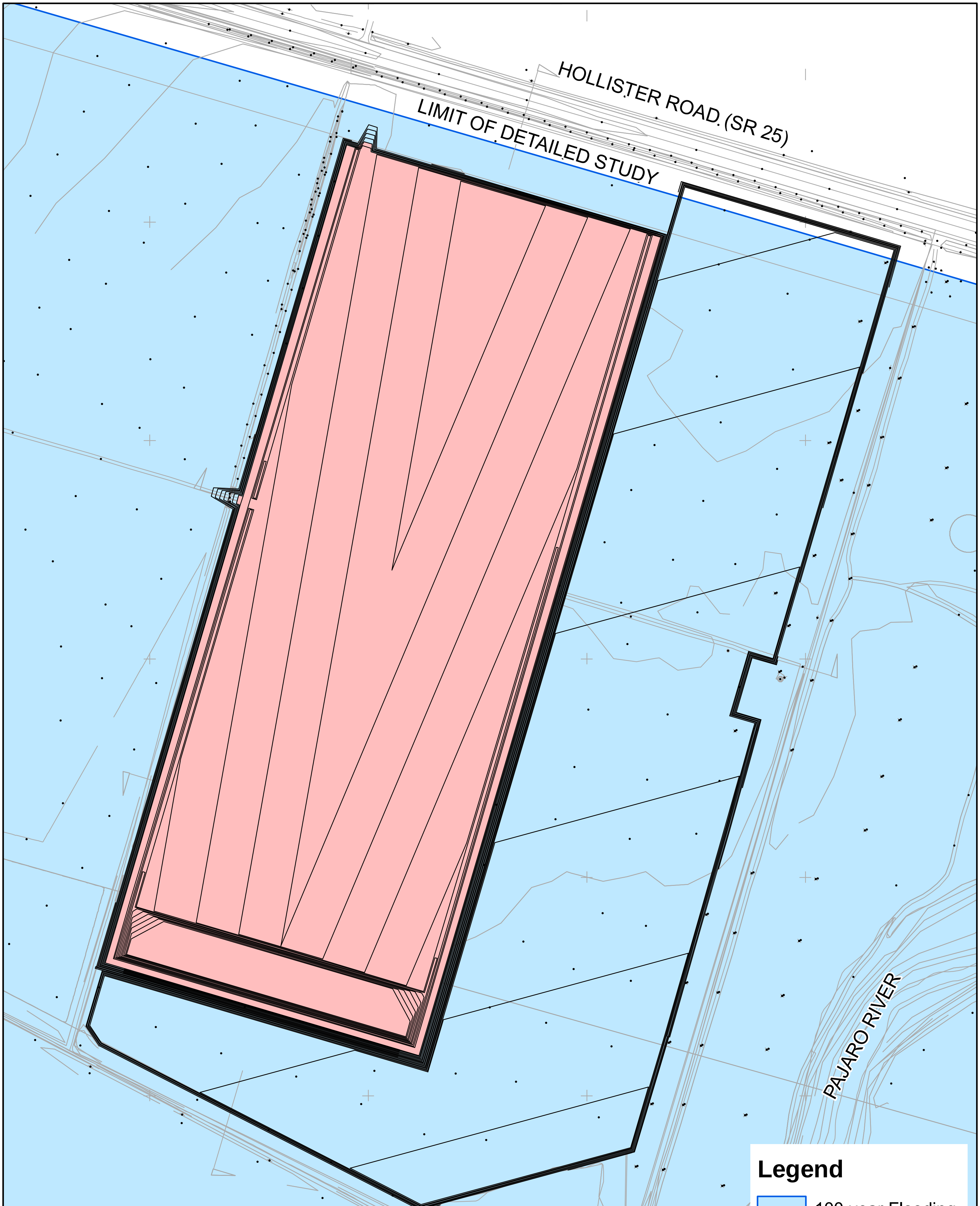
Project TINs for Existing and Proposed Conditions


Existing Well
Legend
Elevation
152 - 153
151 - 152
150 - 151
149 - 150
148 - 149
147 - 148
146 - 147
145 - 146
144 - 145
143 - 144
142 - 143
141 - 142
140 - 141
139 - 140
138 - 139
137 - 138
136 - 137
135 - 136
134 - 135
124 - 134
N
0
100
200
400
Feet
Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS
Existing Project Site


Existing Well
Legend
Elevation
152 - 153
151 - 152
150 - 151
149 - 150
148 - 149
147 - 148
146 - 147
145 - 146
144 - 145
143 - 144
142 - 143
141 - 142
140 - 141
139 - 140
138 - 139
137 - 138
136 - 137
135 - 136
134 - 135
124 - 134
N
0
100
200
400
Feet
Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS
Post Project

APPENDIX E

Revised Limits of 100-year Floodplain after Proposed Project



Appendix E-8 (NEW)

POST PROJECT 100-YEAR FLOODPLAIN

- Appendix E-9 (NEW): Conditional Letter of Map Revision Based on Fill Comment Document (CLOMR-F) issued by the Federal Environmental Management Agency, May 21, 2018.

Federal Emergency Management Agency

Washington, D.C. 20472

May 21, 2018

THE HONORABLE S. JOSEPH SIMITIAN
PRESIDENT, BOARD OF SUPERVISORS
SANTA CLARA COUNTY
70 WEST HEDDING STREET
SAN JOSE, CA 95110

CASE NO.: 18-09-1291C
COMMUNITY: CITY OF GILROY, SANTA CLARA COUNTY, CALIFORNIA
COMMUNITY NO.: 060340

DEAR MR. SIMITIAN:

This is in reference to a request that the Federal Emergency Management Agency (FEMA) determine if the property described in the enclosed document is located within an identified Special Flood Hazard Area, the area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), on the effective National Flood Insurance Program (NFIP) map. Using the information submitted and the effective NFIP map, our determination is shown on the attached Conditional Letter of Map Revision based on Fill (CLOMR-F) Comment Document. This comment document provides additional information regarding the effective NFIP map, the legal description of the property and our comments regarding this proposed project.

Additional documents are enclosed which provide information regarding the subject property and CLOMR-Fs. Please see the List of Enclosures below to determine which documents are enclosed. Other attachments specific to this request may be included as referenced in the Determination/Comment document. If you have any questions about this letter or any of the enclosures, please contact the FEMA Map Information eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, Engineering Library, 3601 Eisenhower Ave Ste 500, Alexandria, VA 22304-6426.

Sincerely,

Luis V. Rodriguez, P.E., Director
Engineering and Modeling Division
Federal Insurance and Mitigation Administration

LIST OF ENCLOSURES:

CLOMR-F COMMENT DOCUMENT

cc: Ms. Sarah Rahimi

 | Date: May 21, 2018 | Case No.: 18-09-1291C | CLOMR-F

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION BASED ON FILL COMMENT DOCUMENT

COMMUNITY AND MAP PANEL INFORMATION		LEGAL PROPERTY DESCRIPTION
COMMUNITY	CITY OF GILROY, SANTA CLARA COUNTY, CALIFORNIA	A portion of Lot 4 and Remainder, as described in the Grant Deed recorded as Document No. 14067638, in the Office of the Recorder, Santa Clara County, California The portion of property is more particularly described by the following metes and bounds:
	COMMUNITY NO.: 060340	
AFFECTED MAP PANEL	NUMBER: 06085C0760H	
	DATE: 5/18/2009	
FLOODING SOURCE: PAJARO RIVER		APPROXIMATE LATITUDE & LONGITUDE OF PROPERTY:36.946707, -121.526011 SOURCE OF LAT & LONG: LOMA LOGIC DATUM: NAD 83

COMMENT TABLE REGARDING THE PROPOSED PROPERTY (PLEASE NOTE THAT THIS IS NOT A FINAL DETERMINATION. A FINAL DETERMINATION WILL BE MADE UPON RECEIPT OF AS-BUILT INFORMATION REGARDING THIS PROPERTY.)

LOT	BLOCK/ SECTION	SUBDIVISION	STREET	**OUTCOME** WHAT WOULD BE REMOVED FROM THE SFHA	FLOOD ZONE	1% ANNUAL CHANCE FLOOD ELEVATION (NAVD 88)	LOWEST ADJACENT GRADE ELEVATION (NAVD 88)	LOWEST LOT ELEVATION (NAVD 88)
--	--	--	980 State Highway 25	Portion of Property	X (unshaded)	148.5 feet	--	149.0 feet

Special Flood Hazard Area (SFHA) - The SFHA is an area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood).

ADDITIONAL CONSIDERATIONS (Please refer to the appropriate section on Attachment 1 for the additional considerations listed below.)

LEGAL PROPERTY DESCRIPTION
PORTIONS REMAIN IN THE SFHA
CONDITIONAL LOMR-F DETERMINATION

ZONE A

This document provides the Federal Emergency Management Agency's comment regarding a request for a Conditional Letter of Map Revision based on Fill for the property described above. Using the information submitted and the effective National Flood Insurance Program (NFIP) map, we have determined that the proposed described portion(s) of the property(ies) would not be located in the SFHA, an area inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) if built as proposed. Our final determination will be made upon receipt of a copy of this document, as-built elevations, and a completed Community Acknowledgement form. Proper completion of this form certifies the subject property is reasonably safe from flooding in accordance with Part 65.5(a)(4) of our regulations. Further guidance on determining if the subject property is reasonably safe from flooding may be found in FEMA Technical Bulletin 10-01. A copy of this bulletin can be obtained by calling the FEMA Map Assistance Center toll free at (877) 336-2627 (877-FEMA MAP) or from our web site at http://www.fema.gov/mit/tb1001.pdf. This document is not a final determination; it only provides our comment on the proposed project in relation to the SFHA shown on the effective NFIP map.

This comment document is based on the flood data presently available. The enclosed documents provide additional information regarding this request. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, Engineering Library, 3601 Eisenhower Ave Ste 500, Alexandria, VA 22304-6426.

Luis V. Rodriguez, P.E., Director
Engineering and Modeling Division
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION BASED ON FILL COMMENT DOCUMENT

ATTACHMENT 1 (ADDITIONAL CONSIDERATIONS)

LEGAL PROPERTY DESCRIPTION (CONTINUED)

COMMENCING at a point lying on southerly line of said Remainder lot from which point the southeast corner of Lot 4 bears North 63°03’07” West and a distance of 60.04 feet; thence leaving said southerly line North 16°03’09” East for a distance of 130.00 feet, running along westerly line of Parcel C as filed in the Santa Clara County records, Document No. 14067638, also shown on Record of Survey in Book 820 of Maps at page 25 recorded in Santa Clara County Records; thence leaving said westerly line of Parcel C, South 73°56’51” East a distance of 43.00 feet; to the POINT OF BEGINNING; thence North 16°03’09” East a distance of 1174.48 feet running parallel with the westerly line of Parcel C as referenced above; thence South 73°49’15” East and a distance of 752.56; thence South 16°10’45” West a distance of 1174.48; thence North 73°49’15” West a distance of 749.96 feet to the POINT OF BEGINNING

PORTIONS OF THE PROPERTY REMAIN IN THE SFHA (This Additional Consideration applies to the preceding 1 Property.)

Portions of this property, but not the subject of the Determination/Comment document, may remain in the Special Flood Hazard Area. Therefore, any future construction or substantial improvement on the property remains subject to Federal, State/Commonwealth, and local regulations for floodplain management.

CONDITIONAL LOMR-F DETERMINATION (This Additional Consideration applies to the preceding 1 Property.)

Comments regarding this conditional request are based on the flood data presently available. Our final determination will be made upon receipt of this Comment Document, certified as-built elevations and/or certified as-built survey. Since this request is for a Conditional Letter of Map Revision based on Fill, we will also require the applicable processing fee, and the “Community Acknowledgement” form. Please note that additional items may be required before a final as-built determination is issued.

This letter does not relieve Federal agencies of the need to comply with Executive Order 11988 on Floodplain Management in carrying out their responsibilities and providing Federally undertaken, financed, or assisted construction and improvements, or in their regulating or licensing activities.

ZONE A (This Additional Consideration applies to the preceding 1 Property.)

The National Flood Insurance Program map affecting this property depicts a Special Flood Hazard Area that was determined using the best flood hazard data available to FEMA, but without performing a detailed engineering analysis. The flood elevation used to make this determination is based on approximate methods and has not been formalized through the standard process for establishing base flood elevations published in the Flood Insurance Study. This flood elevation is subject to change.

This attachment provides additional information regarding this request. If you have any questions about this attachment, please contact the FEMA Map Information eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, Engineering Library, 3601 Eisenhower Ave Ste 500, Alexandria, VA 22304-6426.

Luis V. Rodriguez, P.E., Director
Engineering and Modeling Division
Federal Insurance and Mitigation Administration

- Appendix H-1 (NEW): Additional Information regarding Feasibility of Enclosed Alternative (ECS 2023; Greenwaste 2023; WSP USA Inc. 2023).

Project Memo
272-207-11

DATE:	9/5/2023	ECS PROJECT #:	272-207
BY:	Baraka Poulin, Tim O'Neill	PROJECT NAME:	ZBest Expansion
TO:	John Doyle, Michael Gonzalez	COPY TO:	
SUBJECT:	Comparison of CASP vs IVC compost options for Zbest Upgrade		

Background:
ECS understands that the draft EIR process triggered a request to compare a fully enclosed compost alternative. Since developing this design would be expensive, ECS provides high level numbers below as directional guidance.

Clarification questions sent to ECS are shown in italics.

I. Construction Pricing - IVC

Provide additional breakdown and/or methodology for calculating both the $23.2M ECS and $58M construction costs. For instance, add estimated quantities and/or costs to the line items specified in the "ECS Scope of Work" pages of the estimate. We are open to other means of showing a breakdown of the costs or methodology to substantiate the estimate.

ECS provides a lump sum quote for the ECS provided scope of work (attached in Appendix 1 includes detailed description of these categories). Table 1 below shows an approximate breakout.

Vessels	11%
Above Grade	37%
Controls	7%
Below grade	32%
Biofilter	10%
Eng, Startup, CX	3%
	100%

Table 1 - Enclosed IVC ECS cost breakdown

ECS also provides an estimated Construction cost. This is based on lump sum values from past projects and past project detailed engineering estimates summarized in Table 2 and graphed in Figure 1. We look at the relative cost between the ECS equipment and construction cost, and use this ratio to estimate a construction cost for the current project. This should only be used for high level estimating. Some considerations include:

- The ratio looks at past projects (last ~10 years). The construction labor market, which has more influence on construction costs, has generally escalated more than the current commodity market, which has more influence on the ECS price.
- Construction costs have many site-specific variables. There is significant scatter in our limited data set. In general, construction costs in the Bay Area tend towards the higher end of the range.
- The cost of ECS supplied vessel doors has decreased relative to past projects. This may impact the ratio.
- This project is larger than our other estimates. We are not certain how economies of scale will factor in.

Site	ECS	Construction	Ratio
A	$ 2,600,000	$ 8,998,472	3.5
B	$ 2,300,000	$ 6,757,517	2.9
C	$ 794,000	$ 5,206,000	6.6
D	$ 4,895,000	$ 5,874,000	1.2
E	$ 2,300,000	$ 2,760,000	1.2
F	$ 1,752,000	$ 4,380,000	2.5
G	$ 455,000	$ 1,137,500	2.5
H	$ 880,000	$ 1,637,000	1.9

Table 2 - past IVC project costs

$58M is based on an assumed 2.5x multiplier from past projects and detailed estimates.

Although much smaller, sites A,B,D,H seem like the most representative. Note, the constructed cost includes all costs related to building the compost system. Additional roads, buildings, or rolling stock are not included.

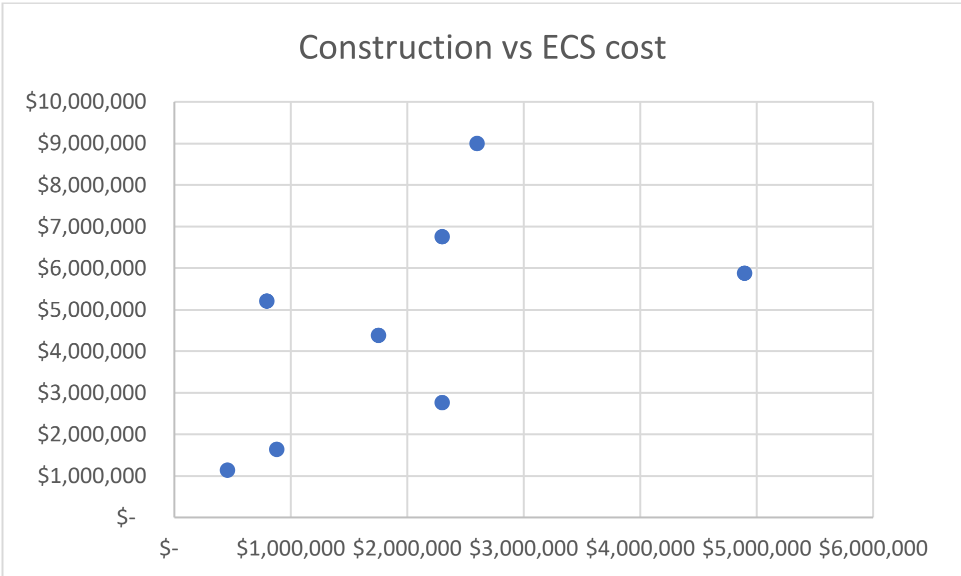


Figure 1 – Construction vs ECS equipment cost

Original Option - CASP + ASP

Sizing	(US units)	Active	Curing
Throughput	TPY	576,000	472,000
Throughput	TPM	48,000	39,333
Throughput (365 d/yr)	TPD	1,578	1,293
Density	lb/CY	950	950
Aeration Type		Reversing	Positive
Aeration Floor Type		Trench	B/G Sparger
Pile Arrangement		Bunker	Mass Bed
Retention Time	days	18	20
Independent Zones	#	60	50
Fan Groups	#	60	5
Zone Width	ft	34	34
Zone Length	ft	100	100
Pile Depth	ft	8.5	9.0
Cover Depth	ft	1.0	0.0
Time to Fill Zone	days	0.3	0.4
Total Volume Aerated	CY	61,200	54,500
Mechanical			
Aeration Rate - Peak	CFM/CY	5.0	2.0
Fan Power - Installed (total)	HP	1260	200
Fan Energy (Annual)	kWh/yr	5,400,000	800,000
Pile Surface Irrigation		Automated	Automated
Process Area			
Combined Biofilter Area	ft^2	31,000	
Paved Area (Process, Mechanical + Apron)	ft^2	273,000	227,500
linear ft of pushwall @10' height	ft	2,040	1,700
linear ft of bunker/side wall @10' height	ft	6,600	1,000

Cost Estimate		
Total ECS Scope of Work ($USD)		**$ 17,500,000**
Construction (ECS Guess)		**$ 22,500,000**
Constructed Price (ECS Guess)		**$ 40,000,000**

Option 1 - enclosed in-vessel

Sizing	(US units)	Active	Curing
Throughput	TPY	576,000	470,501
Throughput	TPM	48,000	39,208
Throughput (365 d/yr)	TPD	1,578	1,289
Density	lb/CY	950	950
Aeration Type		Recirculating	Recirculating
Aeration Floor Type		B/G Sparger	B/G Sparger
Pile Arrangement		Vessel	Vessel
Retention Time	days	18	20
Independent Zones	#	60	50
Fan Groups	#	60	5
Zone Width	ft	34	34
Zone Length	ft	100	100
Pile Depth	ft	8.5	9.0
Cover Depth	ft	0.0	0.0
Time to Fill Zone	days	0.3	0.4
Total Volume Aerated	CY	61,800	54,500
Process Mechanical			
Aeration Rate - Peak	CFM/CY	5.0	2.5
Fan Power - Installed (total)	HP	1300	575
Fan Energy (Annual)	kWh/yr	5,200,000	2,800,000
Pile Surface Irrigation		Automated	Automated
Process Area			
Combined Biofilter Area	ft^2	93,000	
Paved Area (Process, Mechanical + Apron)	ft^2	273,000	227,500
linear ft of pushwall @20' height	ft	2,040	1,700
linear ft of bunker wall @20' height	ft	6,600	5,600

Building Biofilter area (Primary + secondary combined)		
Vessel Apron Volume (50' wide)	ft^3	4,675,000
Total Enclosed Volume	ft^3	4,675,000
Additional Air Changes (beyond process air)	ACH	2
Building Exhaust	CFM	155,800
Process Exhaust	CFM	264,712
Total Exhaust (to BF)	CFM	420,545
Biofilter area	ft^2	93,000
# of Building EF's	#	4
Building Exhaust Fan - Installed (each)	HP	100
Building Exhaust Energy	kWh/yr	1,600,000

Cost Estimate		
Total ECS Scope of Work ($USD)		**$ 23,800,000**
Construction (ECS Guess)		**$ 59,500,000**
Constructed Price (ECS Guess)		**$ 83,300,000**

Figure 2 - Summary data for both options

II. Construction Pricing – CASP

Pricing Please also provide similar information in a similar format for the proposed project (for comparison with the enclosed alternative and better understanding of the differences).

Include above.

III. Energy use

Provide clarification of how the 8% increase in operational energy use that is mentioned in your cover letter was calculated. The ECS "Budgetary Quotation" page indicates that the enclosed alternative would use a total of approximately 6.33M kWh/yr (5,166,000 for primary fans + 644,000 for secondary fans + 523,000 for building exhaust), but the power use comparison previously provided by ECS for the proposed project (Appendix D-1 to RDEIR) indicates total energy use of 8.1M kWh/yr.

Total energy use is a tough number to pin down because of how many variables impact it. As we've updated the estimates over the years, we've fine-tuned some of the formulas, which may account for discrepancies between versions. Values below are approximate.

The two fundamental differences include:

- The addition of enclosed building space requires air changes (typically 3 ACH minimum), which increases the total CFM handled and requires more fan energy.
- The additional in-vessel composting will recirculate hot process air with lower density than ambient air. For the same amount of oxygen delivered to the microbes, the less dense air requires more energy to move.

Original Option:

- 60x 20HP zone fans
- 12x 5HP biofilter makeup air fans
- 5x 40HP secondary zone fans
- ~1400HP, ~1100 BHP, ~70% load factor,
- 5,400,000+800,000 = 6,200,000 kWh

All vessel Option:

- 60x 15HP zone fans
- 2x200HP process Exhaust fan
- 2x 100HP combined building exhaust fan
- 50x 7.5HP exhaust fan
- 2x 100HP biofilter exhaust
- ~2,300HP, ~1900 BHP, 70% load factor
- 5,200,000+2,800,000+1,600,000 = 8,600,000kWH

IV. Capacity

Provide clarification of how the 26% reduction in capacity for an enclosed facility was calculated. Your cover letter indicates that an enclosed alternative would reduce capacity from 576,000 TPY to 426,240 TPY, but the ECS table indicates a primary processing capacity of 576,000 TPY and secondary processing capacity of 470,501 TPY (i.e., secondary capacity is 19% less than primary capacity).

The sizing worksheet showing a ~18-20% reduction in secondary indicates that much of the mass will be volatilized during primary composting. The lower value (ie 470k TPY) is the remaining material that undergoes secondary composting.

The reduction in capacity was based on not changing the original footprint but enclosing the process completely. First of all, the increased exhaust CFM will require larger biofilters and exhaust air handling equipment. Also vessels with doors located within a building required more dedicated space for access aprons/drive aisles than an open system that can use drive aisles as access aprons. We are not 100% clear on the property limits, but understood there additional space is unavailable. So, if the facility needs to be enclosed, there will be less space for composting.

V. Schedule

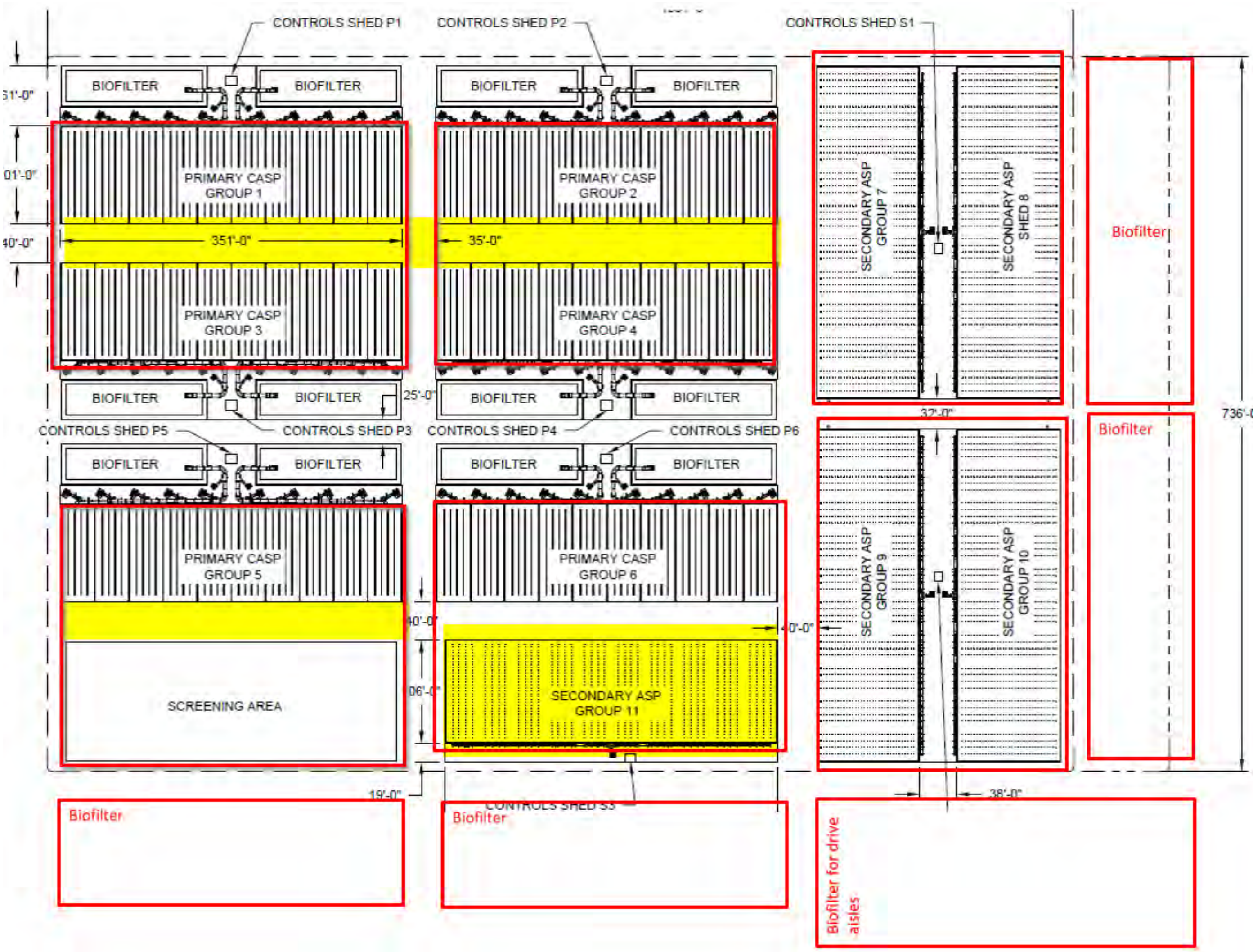
Show the estimated impact to the construction schedule for an enclosed facility versus the proposed project. If available, any information on the types and/or numbers of construction equipment that might be required for the alternative would also be useful. For reference, the table below is what was estimated for the proposed project.

See attached draft. This is a best guess. We expect the main difference will be substantially more construction time to build the vessels and buildings compared to the original CASP and ASP concept. The vessels require much more concrete work (more linear feet and taller walls)

VI. Building

Provide information regarding the approximate size (floor area and height) of the building(s) required to enclose the facility.

Enclosing everything approximately triples the total biofilter required space.



The drawing above is an incomplete draft. The secondary vessels would likely have an enclosed drive aisle similar to the primary vessels.

The system sizing assumes 50' drive aisles between facing zones, with 25' ceilings. These 6 spaces will receive 2 air changes per hour (ACH), for approximately 155,000CFM of airflow. The assumptions do not include a building space if the screening area were to be enclosed. Drawing above is not to scale.

Building Exhaust Air: Option 1

Building	Apron-Primary	Apron - Secondary	Total	
length	2040	1700		
Width	50	50		
Height	25	25		
Vol (CF)	2,550,000	2,125,000	**4,675,000**	
ACH	2	2	**2**	
CFM	**85,000**	**70,833**	**155,833**	
Fan Efficiency			450	CFM/HP
# of fans			4	
Bldg Fan Motor size each:			**100**	HP

Appendix 1 – ECS Scope of Supply (fully enclosed vessel option)

ECS SCOPE OF WORK

Client: GreenWaste

Basis: Option 1: In-vessel primary and secondary composting with enclosed drive aisle. Primary drive aisle includes 2 ACH of dedicate exhaust in addition the the ventilation drawn by the process fan.

Aeration System (Above Grade)	Description	By
Fans	Per ECS Spec	ECS
Aeration Ducting	Per ECS Spec	ECS
Duct Hangers and Supports	Per ECS Spec	ECS
Zone Damper Assemblies	Dampers per ECS Spec, Electric Actuators	ECS
Makeup Air Inlet Damper	Per ECS Spec, Electric Actuators	ECS
Irrigation - Control+Distribution	Control Valves, Integration to CompTroller, Distribution Hoses, Sprinklers	ECS
Irrigation - Water Supply	Pipe & Fittings to each zone.	OTHERS
Electrical	Wiring and Conduit	OTHERS
Duct & Fan Condensate Drains	Pipe & Fittings	OTHERS

Aeration Floor System	Description	By
HDPE Components	Fabricated HDPE Pipe & Fittings	ECS
Drainage Line: Zones to Sump	Pipe & Fittings, Level Maintained Sump	OTHERS
Drainage Line: Sump to Re-use System	Pipe & Fittings	OTHERS

Control System	Description	By
CompTroller Hardware & Software	Web-based, distributed, ruggedized	ECS
Fan Drives	Variable frequency drives, filters	ECS
Process Sensors	Temperature, pressure	ECS
Temp Probe Holders	Mild Steel	ECS
Electrical	Wiring and Conduit	OTHERS
Electrical Service	Fan Panel, MCC, Breakers, DCs, Fuse, Filters	OTHERS
Control Shed	Approximately 8x10ft shed	OTHERS

Vessel Components	Description	By
Vessel Doors	Insulated panels, Stainless Steel, Manual carrier	ECS
Vessel Irrigation System	Valves, Pipes, Nozzles	OTHERS
Vessel Exterior Insulation	Insulated Concrete Walls	OTHERS

Biofilter System	Description	By
Air Temperature & Pressure Sensors	Integrated with ECS Control System	ECS
Biofilter Media Temperature Probes	Integrated with ECS Control System	ECS
Building & Process Air Mixing Controls	Integrated with ECS Control System	ECS
Exhaust Duct Humidification System	Supply lines, filtration, pump, compressor, controls. Duct ring for nozzles.	ECS
Control of Air Humidification	Integrated with ECS Control System	ECS
Building Exhaust Fan VFDs	Network Drives	ECS
Building Makeup Air	MUA supply, Building Conditioning	OTHERS
Suspended Aeration Floor	Pre-stressed concrete panels, Rubber Pads	ECS
Exhaust Duct to Suspended Floor Inlets	SS304	ECS
Biofilter media Irrigation System	All mechanical components (installed by others)	ECS
Biofilter Media (i.e. wood chips)	Shredded wood per ECS spec	OTHERS
Suspended Aeration Floor Pillars	Concrete pillars formed in Sonotubes (~18"high x ~18" dia)	OTHERS
Suspended Aeration Floor Basin	Per ECS Design (~22" deep, area = BF footprint)	OTHERS
Biofilter Duct Supports	Painted Steel, duct saddles	OTHERS
Biofilter Basin, Floor Blocks & Apron	Concrete	OTHERS
Biofilter Drain	Drain to Sump	OTHERS

Other	Description	By
System Engineering	Technical Submittal, CASP system installation drawings, construction support	ECS
Startup	ECS on site commissioning, operator training and unlimited 1 year remote support. M&E construction must be complete before ECS visits the site.	ECS
Freight	Includes freight allowance FOB site	ECS
Warranty	1yr equipment warranty	ECS
Professional Services	Permitting, Civil/Structural Design, Construction Management	OTHERS
Concrete work	Design, Reinforcement, Supply, Installation	OTHERS
Installation	All ECS supplied equipment	OTHERS
Surface Water Management	Leachate + Stormwater Storage and Distribution, Design and Supply	OTHERS

OTHERS=Design and Supply by other team members

Note: ECS deliverables exclude: a lead role in obtaining permits, any professional engineering services required for permits or constructing the facility, construction management, any phase of construction or equipment installation, any equipment not specifically called out above, any local taxes or fees.

Zanker Road Resource Management, LLC
980 State Highway 25, Gilroy, CA 95020
O: (408) 846-1577
greenwaste.com

8-18-23

County of Santa Clara Planning
Attn. Valerie Negrete
70 West Hedding St.
San Jose, CA 95110

RE: Response to comment received regarding Z-Best recirculated draft EIR

Dear Ms. Negrete:

On behalf of Zanker Road Resource Management, LLC, owner of Z-Best Products, attached is the engineer's construction estimate prepared per the County's request to evaluate a fully enclosed facility as an alternative to the proposed project.

The estimate totals $81.2 million, over $40 million more than the proposed project estimated cost. In addition to the added cost, an enclosed facility would reduce ECS system capacity from the proposed 576,000 to 426,240 tons per year, a 26% reduction, because of the need for a larger biofiltration system required for an enclosed facility. The larger biofiltration system would add an additional 8% to operating utility costs, approximately $52,000 per year at today's electricity rates.

We would like to offer the following context and request it be included in the County's response to the comment submitted to the County regarding consideration of alternate proposals.

Our current revenue stream from our contracted cities would not cover the approximate $40 million in additional capital plus operating costs. For this reason, an enclosed facility is not a feasible alternative at this project site, and Z-Best would not pursue such an alternative.

Without the Z-Best facility providing the needed organics processing capacity for Bay Area cities, these cities would then have to look elsewhere for capacity in order to establish compliance with SB 1383. It would likely mean a new facility would then have to be built in California's central valley. In addition to delaying the jurisdictions ability to comply with SB1383 for several years, this would result in a significant increase in emissions associated with hauling organics the extra distance and would largely offset the intended climate/emissions goals of SB 1383.

Respectfully,

John Doyle

GreenWaste | General Manager
Office (408)846-1346 | Mobile (408)722-1999
980 State Highway 25
Gilroy, CA 95020

August 21, 2023

John Doyle
Greenwaste
980 State Highway 25
Gilroy, CA 95020

RE: REQUEST FOR INFORMATION - RESPONSES TO COMMENTS ON DRAFT EIR, Z-BEST COMPOST FACILITY, GILROY, CAFIFORNIA

Hello John,

WSP is providing this letter in response to the request for information (RFI) on the draft Environmental Impact Report (EIR). The RFI request item 3 stated *"Information on the feasibility of a fully enclosed facility, to respond to comment on alternatives considered but dismissed by Dorado Leasing/JRG Attorneys. Please provide detailed costs analysis that includes financial information for both construction and operation of the facility in comparison to the proposed project."* Attached is cost estimate for the construction of in-vessel facility for the proposed Z-Best Compost Facility Improvements.

The construction cost estimate for an in-vessel facility is estimated to be $81.2 million, which was prepared by Engineered Compost Systems (ECS) and reviewed by WSP (See Attachment). The facility design includes placing the proposed systems in in-vessel facilities, enclosing drive aisles, and adding fans and biofilters. With the additional equipment, the increase in power usage is estimated to be 8%.

In addition, the in-vessel systems would require addition pad space, which may decrease the facility throughput by 26%. For the facility to operate with the proposed throughout for the CASP system, the Compost Facility Improvements may be required to go back to redesign to develop a larger pad size and facility layout.

The estimates provided, are estimates based on the current industry rates and may be subject to change based on material availability.

WSP appreciates the opportunity to continue our working relationship with Greenwaste. Please call the undersigned if you have any questions or require additional information.

Sincerely,

WSP USA Inc.

Michael Gonzalez
Senior Consultant

Attachments: Attachment 1 – Construction Cost Estimate

https://wsponlinenam-my.sharepoint.com/personal/michael_a_gonzalez_wsp_com/documents/desktop/z-best/response to comments - z-best cost estimate.docx

ATTACHMENT 1

Construction Cost Estimate

engineered COMPOST systems

BUDGETARY QUOTATION

Client: GreenWaste
Facility: Zbest
By: Baraka Poulin
Date: 7/20/2023
Basis: Option 1: In-vessel primary and secondary composting with enclosed drive aisle. Primary drive aisle includes 2 ACH of dedicate exhaust in addition the the ventilation drawn by the process fan. Secondary drive aisle relies on the process fan only for ventilation.

		Option 1	
Sizing	**(US units)**	**Primary**	**Secondary**
Throughput	TPY	576,000	470,501
Throughput (365 d/yr)	TPD	1,578	1,289
Density	lb/CY	950	950
Aeration Type		Recirculating	Recirculating
Aeration Floor Type		B/G Sparger	B/G Sparger
Pile Arrangement		Vessel	Vessel
Retention Time	days	18	20
Independent Zones	#	60	50
Fan Groups	#	60	5
Zone Width	ft	34	34
Zone Length	ft	100	100
Pile Depth	ft	8.5	9.0
Cover Depth	ft	0.0	0.0
Time to Fill Zone	days	0.3	0.4
Total Volume Aerated	CY	61,800	54,500
Mechanical			
Aeration Rate - Peak	CFM/CY	5.0	2.5
Fan Power - Installed (total)	HP	1300	163
Fan Energy (Annual)	kWh/yr	5,166,000	644,000
Pile Surface Irrigation		Automated	Automated
Process Area			
Biofilter Area	ft^2	76,937	
Paved Area (Process, Mechanical + Apron)	ft^2	273,000	227,500

Biofilter		
Vessel Apron Volume (##' wide)	ft^3	2,550,000
Pre/Post Processing Bldg (##x###') Volume	ft^3	0
Total Enclosed Volume	ft^3	2,550,000
Additional Air Changes (beyond process air)	ACH	2
Building Exhaust	CFM	85,000
Process Exhaust	CFM	264,712
Total Exhaust (to BF)	CFM	349,712
Biofilter area	ft^2	70,000
# of Building EF's	#	2
Building Exhaust Fan - Installed (each)	HP	100
Building Exhaust Energy	kWh/yr	523,000

Cost Estimate		
Total ECS Scope of Work ($USD)		$ 23,200,000
Construction (ECS Estimate)		$ 58,000,000
Constructed Price (ECS Estimate)		$ 81,200,000

*throughput in US tons

ECS SCOPE OF WORK

Client: GreenWaste
Date: 7/20/2023
Basis: Option 1: In-vessel primary and secondary composting with enclosed drive aisle. Primary drive aisle includes

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