

Appendix E – Hydrology and Water Quality Supporting Information

Contains:

- 2020 Peer Review of Selected Water Quality and Hydrology Reports (Tetra Tech)
- 2022 Updated Floodplain Storage Analysis for Z-Best Compost Facility (Schaaf & Wheeler)
- 2022 Clarification of Previous Hydrology and Water Supply Analyses (Golder)
- 2022 Further Clarification of Previous Hydrology and Water Supply Analyses (Golder) and 2022 Water Supply Evaluation (Golder)
- 2022 Groundwater Drawdown Evaluation Memorandum (Golder)
- 2023 Detention Basin Evaluation (AECOM)
- 2023 Flood Frequency Evaluation (AECOM)

To: Ron Sissem, EMC Planning

From: Sujoy Roy, Ph.D. and Michael Unga

Date: 3/13/2020

Subject: Peer Review of Select Hydrology and Water Quality Technical Analyses from the Z-Best Project Applicant

The Z-Best Compositing Facility in Gilroy, CA is in the process of obtaining permits to expand their operations by converting the existing Municipal Solid Waste (MSW) composting system to an Engineered Compost System (ECS) using an aerated floor technology. They are in ongoing negotiations with the Santa Clara County Planning and County Land Development Engineering to address outstanding issues, which include those involving surface and groundwater hydrology and water quality. Tetra Tech has been tasked to assist in reviewing these issues by performing six tasks, listed below, that will be described and addressed in this memorandum.

1. Evaluate the proposed modified holding capacity of Detention Basin #1 based on the proposed as-built dimensions and elevations of the basin and ascertain whether it will be of sufficient volume to accommodate runoff from the project site under design storm conditions pursuant to the 2015 SWQCB Compost Order;
2. Review the proposed ECS CASP composting system specifications/design and proposed increase in feedstock input volume to ascertain whether the project has potential to increase leachate volume or leachate concentration in improved Detention Pond #1 relative to existing operations. Discuss potential environment effects of such increases, if any;
3. Review the project plans/ECS system design to determine adequacy of storm water runoff and leachate collection improvements planned for delivering both from the ECS system pad location to Detention Basin #1 in terms of volume and potential effects on surface and groundwater quality;
4. Qualitatively discuss the change in potential for groundwater contamination under existing Detention Basin #1 conditions (unlined) and under post Detention Pond #1 improvement conditions where the pond will be lined as required by the 2015 Compost Order;
5. Evaluate the future effect of sediment accumulation on the holding capacity of modified Detention Basin #1 and discuss maintenance activities that may be required to maintain holding capacity. Discuss disposal needs/requirements for excavated sediment as needed;
6. Review the applicant's specifications for the proposed new flood water storage facility located at the northern boundary of Area 2. Evaluate the applicant's revised No Net Fill/No Rise Certification to verify the adequacy of the flood storage facility design. Identify any other design issues for the storage facility which should be investigated to assess potential environmental impacts, if any; and
7. Prepare letter report with conclusions of document review and additional analysis. (This letter.)

The following table of acronyms and abbreviations are provided to clarify specific terms and to make the report easier to read by decreasing the repetition of lengthy expressions.

Acronyms and Abbreviations

BAAQMD	Bay Area Air Quality Management District
BGS	Below Ground Surface
Basin 1	Proposed Detention Basin #1 to be constructed with a liner
BFE	Base Flood Elevation based on NAVD88
BOD	Biological Oxygen Demand
CASP	Covered Aerated Static Pile
CCR	California Code of Regulations
CTI	Composite Technology International
eASP	Extended bed Aerated Static Pile
ECS	Engineered Compost Systems
EGWCA	Existing Green Waste Composting Area
Green Material	Defined in 14 CCR §17852(v) as any plant material that is separated at the point of generation, contains no greater than 1 percent of physical contaminants by weight, and meets the requirements of section 17868.5.
MSW	Mixed Solid Waste
NAVD88	North American Vertical Datum of 1988
NOP	Notice Of Preparation
SCCGOV	Santa Clara County <i>Department of Planning and Development</i>
TDS	Total Dissolved Solids
TPD	Tons Per Day
Z-Best	Z-Best Composting Facility

A description of each task is listed in italicized text, followed by a summary of the conclusions, and a detailed discussion and response to the Task.

Task 1. *Evaluate the proposed modified holding capacity of Detention Basin #1 based on the proposed as-built dimensions and elevations of the basin and ascertain whether it will be of sufficient volume to accommodate runoff from the project site under design storm conditions pursuant to the 2015 SWQCB Compost Order;*

Conclusion-Tetra Tech’s volume estimate for new Basin 1 is virtually identical to that given in Golder (2019, Drawing 12), of 12,264,500 gallons. The 100-year and 25-year storm event volume calculations are consistent with estimates reported by Golder, and if the detention basin is empty, storm runoff from both storms can be contained, as required by the 2015 State Board Compost Order.

Detention Basin 1 receives stormwater from Area 1, identified to be 70.2 acres (2016 Golder Technical Report, Appendix B). The 2015 State Board Compost Order requires a “detention pond, containment berm, and drainage conveyance systems to contain a 25-year, 24-hour peak storm event.” For the specific location of the facility (36.9520° Latitude; -121.5268° Longitude), NOAA Atlas 14 estimates a 24-hour 25-year rainfall of 4.78 inches, and a 100-year rainfall of 6.3 inches (https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html). The runoff coefficient estimated by Golder (of 0.72) is reasonable for the mix of surfaces in the facility. Based on the rainfall magnitudes and receiving water area of Area 1 and direct precipitation to an area equal to the original Detention Pond 1 (6.5 acres), the stormwater volumes are estimated as follows:

- 100-year event: 9.76 million gallons
- 25-year event: 7.34 million gallons

This is consistent with the 100-year estimate provided in Golder 2018 memorandum titled “Detention Basin 1 Water Balance Calculations-100 year, 24-hour Storm Event.”

The proposed Basin 1 is stated in Golder (2019, Drawing 12) to have a holding capacity of 12,264,500 gallons for leachate and stormwater. The bottom elevation is given as 134.5 feet and the upper water level elevation is given as 148.5 feet, which corresponds to the BFE of 148.4 feet. The Basin is also shown to be constructed with an additional 2 feet of freeboard above the BFE value.

Tetra Tech independently estimated the holding capacity of the new Basin 1 by digitizing the one-foot contour lines from the basin diagram shown in Golder (2019, Drawing 12) and re-scaled using the scale bar located in the lower right corner of the drawing. These digitized areas were multiplied by the differences in elevation between each contoured layer and then summed to give the total volume. This estimate was within 2 percent of the 12,264,500-gallon volume listed in the comment field of the drawing. Tetra Tech concludes that the new Basin 1 drawing from in Golder (2019, Drawing 12) has the capacity to hold 12,264,000 gallons.

Based on the above calculations, Tetra Tech independently estimates that the proposed Detention Basin 1, if empty, can store runoff from a 100-year or a 25-year storm event. This is the design basis required in the 2015 State Board Compost Order

(https://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2015/wqo2015_0121_dwq.pdf).

However, it is important to confirm that the basin is empty following the proposed lining for this project. Observations from 16 years of archived Google Earth images of the old Basin 1 indicate that the basin surface remained 100 percent covered with liquid during the months of Nov 2002, July 2003, July 2004, Nov 2004, Aug 2005, Dec 2005, Aug 2006, June 2007, Oct 2007, Sept 2010, Nov 2010, Sept 2011, Nov 2016, and Sept 2017. These photographic observations are contrary to the Golder (2016) water balance prediction that the old Basin 1 would be empty in May and remain dry until January of the following year due to the high potential evaporation rate. In part, this discrepancy is attributed not to rainfall but to groundwater seepage, which occurred because of the unlined nature of the historical pond and the relatively high groundwater table. In future, with the lining of Detention Basin 1, it is expected that this seepage will be minimized and that the pond will be dry during several months of the year when minimal rainfall and high potential evaporation rates occur.

Task 2. *Review the proposed ECS CASP composting system specifications/design and proposed increase in feedstock input volume to ascertain whether the project has potential to increase leachate volume or leachate concentration in improved Detention Pond #1 relative to existing operations. Discuss potential environment effects of such increases, if any;*

Conclusion-Tetra Tech concurs there will be substantially less leachate volume entering the new Basin 1 per ton of processed compost. The increased tonnage capacity of the facility will be countered by the lower per ton leachate volume, such that the total leachate generation may not be higher than produced in the present facility. The final effect on leachate concentration in Basin 1 is not very clear but the concentrations will most likely increase over time as the leachate evaporates and is recycled for dust control and compost moisturization. Regardless of change in water quality, the lining of Detention Pond 1 will prevent the release of these liquids into groundwater.

It appears there will be substantially less leachate volume going into the new Basin 1 per ton of compost processed. This is based on the proposed changes listed above for the CASP portion of Area 1. Golder (2016) states that Z-Best is currently permitted to accept a maximum of 1,500 tons/day (TPD) with a total permitted capacity of 576,000 cubic yards. The proposed project seeks to increase the maximum daily throughput from 1,500 to 2,750 TPD. In terms of leachate collection, the ECS system produces a composting process that is more aerated than the current CTI system being used. Golder (2019, Drawing 9) illustrates the design for a negative aeration system along the undersurface of every CASP bunker and below grade floor details of the eASP section in Area 1. Furthermore, Golder (2019, Drawing 7) illustrates the construction of a French drain, storm drain pipelines, collection sumps, drainage pump stations, and concrete curbs throughout the CASP region of Area 1. This will result in the generation of leachate with a lower volume of runoff liquid (from 25 to 75% less). The specific volume of leachate will depend on the total composted materials and the actual gain in efficiency of leachate generation, but assuming an approximate halving of the leachate generation and an approximate doubling of throughput and capacity, it is possible that there is not much net change in the leachate volume produced.

The water quality of the leachate is another aspect to be considered once the new project is implemented. The only known set of leachate samples taken from the old Basin 1 were collected on July 2, 2014, analyzed, and reported by BC LAB (2014). The leachate samples clearly indicate elevated concentrations in water analysis for general chemistry constituents (e.g., BOD, Ca, Cl, K, Na, P, & TDS). It should be obvious that the mass of chemicals leached out from the compost will increase approximately in proportion to the mass of compost being processed by the facility. Leachate is generated during the complex process of adding moisture to the compost, collecting excess

moisture generated during the digestion process, capture and adding the stormwater runoff from approximately 45 acres of surface soils, dust, and compost particulate in Area 1, and from the concentration of non-volatile chemicals by atmospheric evaporation from pooled leachate in the new basin. This is further complicated by the addition of rainfall directly into the approximate 3.5-acre surface area of the basin and the mixing of fresh groundwater and recycled leachate pumped from the basin before its use in Area 1 of the facility. There is no simple way to predict the change in leachate concentration over time in the old Basin 1 because the leachate flowing into the basin could become diluted with the addition of direct rainfall over its six acre surface area; recycled when pumped out for plant reuse in dust control and compost moisturization; and become more concentrated when its water content evaporates to the atmosphere. The impact on leachate concentration in Basin 1 is not very clear but it is reasonable to expect that it will increase over time as leachate evaporates and is recycled for dust control and compost moisturization. However, even if the concentrations are higher, the construction of the lined Detention Pond 1 will prevent the release of these liquids into groundwater.

Task 3. *Review the project plans/ECS system design to determine adequacy of storm water runoff and leachate collection improvements planned for delivering both from the ECS system pad location to Detention Basin #1 in terms of volume and potential effects on surface and groundwater quality;*

Conclusion-Stormwater and excess leachate from the project area is intercepted and conveyed to Detention Basin 1. The capacity of this basin is adequate to handle storm flows and minimize the potential of water quality impacts to the Pajaro River. Tetra Tech discovered an oversight issue in the most recent Golder (2019) drawings such that no conveyance or pump system is shown within the EGWCA portion of Area 1 to capture stormwater runoff or leachate and transfer it to the new Basin 1.

Currently, all stormwater runoff from Area 1 is intercepted and routed along ditches its southern boundary and discharged through a culvert into the northwest corner of the old Basin 1. During the wet season, the volumetric capacity of Detention Pond 1 is sufficient to handle large storm flows (25-year and 100-year storms) as well as excess leachate created during the composting process. During the dry season, water may need to be applied to the compost, from Detention Pond 1 or from groundwater. In terms of water quality, additional adverse effects to surface water and groundwater in future are not expected because of the construction of an adequately sized and lined detention basin. (See caveat below for EGWCA area, where no changes are planned, but there is a need for a pump to transfer water to the new Detention Pond 1.) Note that this comment specifically addresses impacts as consequences of future changes to the facility, and not to legacy impacts to groundwater, which are not addressed through this project.

For the future of Basin 1, Golder (2019, Drawings 4 and 7) shows no French drains, storm drains, drainage pipes, or pump stations extending into or within the EGWCA. As a result, all stormwater and leachate runoff from EGWCA will simply flow downgradient along the 20-foot access roads and overland to the southeast corner of the EGWCA. The ground surface in the southeastern corner of the EGWCA is at least five feet below the top of the berm for both the new Basin 1 and the existing Detention Basin 2. Hence, overland stormflow and leachate will bypass both basins and discharge directly into the southern border of the property boundary. Z-Best responded in SCCGOV (2019) to the apparent oversight to intercept stormwater runoff from the Green Waste portion of Area 1. They state that a pump system would be installed to deliver stormwater up and over the proposed berm of the new Basin 1. However, this pump system or any other conveyance system to intercept stormwater in EGWCA are not yet shown in the most recent Golder (2019) drawings.

Task 4. *Qualitatively discuss the change in potential for groundwater contamination under existing Detention Basin #1 conditions (unlined) and under post Detention Pond #1 improvement conditions where the pond will be lined as required by the 2015 Compost Order.;*

Conclusion- The lining of Detention Pond 1 will stop the percolation of leachate into groundwater, and thus minimize future new groundwater quality impacts from the facility. Tetra Tech concludes that simply removing 1/3 the length of the old Basin 1 sediment will have little impact on the legacy concentration of leachate chemicals in the local groundwater and their movement. This project does not address legacy contamination present in groundwater at the site.

Golder (2015, 2016) states “The site is situated on Holocene-age alluvial deposits from modern stream flow and floodplain processes. The site is mapped as underlain by Medium-grained Alluvium [labeled as a type Qham soil] which is described as unconsolidated, moderately sorted, moderately permeable fine sand, silt, and clayey silt with occasional thin beds of sand.” However, five test pits in Area 2 reveal soils in the top six feet to be more fine-grained and clay-rich than “Qham” soils.

When the old Basin 1 was first constructed, it had a surface area of approximately 6.3 acres and a capacity to hold approximately 1.34 million gallons (Golder, 2017). The basin has been used to store stormwater runoff, intercepted surface eroded materials, and recycled compost leachate for more than 19 years. As shown in Golder (2017, Drawing 3), Basin 1 was constructed without a liner. The most western end of the basin was dug to an approximate elevation of 134 feet compared to the local ground surface of 145 feet. There is no apparent reference for the sloping sides of Basin 1 having been treated by any special method that would have limited the horizontal flow through those portions of the basin sides that are below the local ground surface. Hence, there always has been the potential for horizontal seepage both out of and back into the basin. According to Golder (2016), the local groundwater table was encountered at depths between 6 and 8 feet BGS in May 2013 and between 5 and 8 feet BGS in May 2016. In comparison, the bottom of Basin 1 lies between 8 and 10 feet BGS. This suggests there has been the potential for leachate to escape horizontally into the water table and that the basin bottom lies below the water table during portions of the year. In confirmation of this hypothesis, it should be noted from the discussion related to Task 2 above that archived Google Earth images clearing indicate the bottom of Basin 1 to be 100% covered with liquid during the May-to-January period for many years despite being subjected to high potential evaporation rates.

In the future, approximately a 1/3 length of the current Basin 1 will be dug up and replaced with a new lined basin that is both deeper and higher. Sediment in the remaining 2/3 length of the current basin will be left in place, the basin filled with dirt to the local ground surface, and the top surface planted with grass. *Going forward*, this will effectively block the percolation of liquid from the pond into the surrounding groundwater.

Legacy contamination in bottom section of the pond to be filled in, and in the groundwater will remain, and not be affected by this project. Because of the long-term exposure to leachate runoff, one should expect the soil sediment along the bottom of the basin to have soil concentrations for non-volatile chemicals that are in equilibrium with the maximum leachate concentrations. These contaminated sediments will leach out their chemical concentrations into the bottom of the old basin and ultimately into the local groundwater if the contaminated sediment is exposed to either rainstorm water or to re-circulating groundwater. There are no published records of groundwater samples

having been taken near Basin 1. Because of close proximity of the local water table to the bottom of Basin 1 and the 19-year period in which Basin 1 was used, the potential for two-way flow of liquids into and out of the basin, the large acreage of the source, and small seepage velocity of the groundwater, one would also expect to find shallow groundwater concentrations to approach those of the leachate concentrations in Basin 1.

Task 5. *Evaluate the future effect of sediment accumulation on the holding capacity of modified Detention Basin #1 and discuss maintenance activities that may be required to maintain holding capacity. Discuss disposal needs/requirements for excavated sediment as needed;*

Conclusion-Sediments will accumulate at the bottom of the Detention Pond 1, although a low rate because of the nature of compost leachate (high dissolved solids and organic materials) and because significant changes in water holding capacity in the existing pond have not been reported. However, some sediment may accumulate and will need to be tracked over time. Sediment removal, if needed, must be performed with hand tools to not damage the line. Sediment disposal must be performed after a chemical analysis of the sediment to test the presence of any contaminants at hazardous levels.

The lined Detention Pond 1 will continue to accumulate sediments present in its inflow at the pond bottom. In theory, the accumulated sediment could reduce effective volume of the pond, and thus its capacity for preventing releases during large storm events. Although the specific depth of sediment accumulated has not been documented, the previous unlined pond has operated for several years without loss of notable storage capacity being reported in any of the project documents made available. This fact, and given the nature of compost leachate with high dissolved solids and organic matter (Chatterjee et al., 2013), suggests that inorganic sediment buildup is expected to occur at a gradual rate. Over time, however, it is possible that the buildup is sufficient and that removal is needed. Because of the need to protect the lined bottom, we are in agreement with the Golder approach of using hand tools to excavate sediments. Further, these sediments need to be analyzed for chemical contaminants, especially trace metals, prior to identifying a suitable location for final disposal.

Task 6. *Review the applicant's specifications for the proposed new flood water storage facility located at the northern boundary of Area 2. Evaluate the applicant's revised No Net Fill/No Rise Certification to verify the adequacy of the flood storage facility design. Identify any other design issues for the storage facility which should be investigated to assess potential environmental impacts, if any;*

Conclusion-Tetra Tech verified that the proposed Flood Storage Basin can indeed hold 34 acre-feet of flood water that is mentioned by Golder (2019, Drawing 5B), and that this is adequate to address the change in capacity noted in the updated Schaaf and Wheeler Floodplain Impact Analysis (2018).

The Z-Best facility lies in the floodplain of the Pajaro River, and Santa Clara County has a no-net fill policy in place for construction activities in the floodplain. To mitigate for the loss of floodplain storage on account of grading activities at the site, Schaaf and Wheeler prepared a Floodplain Impact Analysis and estimated the need for 29 acre-feet of new flood storage at a location north of Highway 25 (2017). They revised their calculations for a new location of the flood water storage of 34 acre-feet, south of Highway 25 contiguous to the Z-Best property (to avoid the need for a highway crossing). This amount of storage was shown to have no net change in the water surface elevation of the Pajaro River, computed using the standard Army Corps of Engineers HEC-RAS model. Tetra Tech is in agreement with the general approach and the calculations.

Golder (2019, Drawing 5B) states in a comment field that the Flood Storage Basin capacity is 34 acre-feet. To compute the flood holding capacity, diagrams from the more detailed illustrations of Golder (2019, Drawing 10C) show the bottom of the Flood Basin with an elevation of 138 feet and the top set at 148.48 feet. The Basin is shown to have a simple rectangular shape and its sides drawn with a 1V/2H slope. Tetra Tech digitized the diagram for Basin 2 given in Golder (2019, Drawing 10C), scaled the measurements, and calculated the volume to be within 1.3 percent of the 34 acre-feet value listed in the comment field of Golder (2019, Drawing 5B). Tetra Tech's independent analysis verifies that the proposed Flood Storage Basin illustrated in Golder (2019) can hold 34 acre-feet of floodwater.

References

BAAQMD, 2018, Notice of Preparation on Z-Best Composting Modifications, received by David Rader, Department of Planning and Development, San Jose, CA, dated Nov 15, 2018.

BC Lab, 2014, Doc "Detention Pond WQ Tests 2014.pdf" giving laboratory results for leachate samples collected from Z-Best Products Detention Pond, sampled on 7/2/2014 and reported on 7/14/2014; 22 pages, by BC Laboratories, Inc., Bakersfield CA.

Chatterjee, N., Flury, M., Hinman, C. and Cogger, C.G., 2013. "Chemical and physical characteristics of compost leachates." A Review Report prepared for the Washington State Department of Transportation. Washington State University.

Edgar, 2008, "Drainage Study and Floodplain Analysis for the Z-Best Composting Facility", 97 pages, prepared by Edgar & Associates, Inc, dated August 29, 2008

Golder, 2015, Doc "GW Monitoring Plan - See Appendix_1-27-16.pdf", 26 pages long. Within this document there is a 24-page report titled "Groundwater Protection Monitoring Plan, Z-Best Composting Facility, Gilroy, California"; dated December 2015, by Golder Associates.

Golder, 2016, Doc "2016-10-11_Technical Report_FINAL-Golder.pdf" labeled Technical Report, Z-Best Composting Facility, dated October 2016, 110 pages. The PDF contains a 13-page document with the subject titled: "Detention Basin 1 and 2 Water Balance Calculation, Revision 1", dated 10/11/2016 by Golder Associates.

Golder, 2017, document titled "Aerated Static Pile Composting Permit Drawings, Z-Best Products, Santa Clara County, Gilroy, California, June 2017", 12 pages, prepared by Golder Associates Inc., Sunnyvale, CA.

Drawing 3, titled: "Existing Site Plan".

Golder, 2019, document labeled the “Aerated Static Pile Composting Preliminary Grading Plan, Z-Best Products, Santa Clara County, Gilroy, California, September 2018”, 15 pages, stamped 3/31/2019; prepared by Golder Associates Inc., Sunnyvale, CA.

Drawing 4, titled: “Existing Site Plan”;

Drawing 5B, titled: “Area 2 Flood Storage Basin”;

Drawing 7, titled: “Grading and Drainage Plan”;

Drawing 9, titled: “Details [for both primary CASP bunkers and secondary eASP piles]”;

Drawing 10C, titled: “Area2 Flood Storage Basin Sections”;

Drawing 12, titled: “Proposed Detention Basin 1- Plan and Section”.

SCCGOV, 2018, “Doc 2A ECS Memo Responses to ZBest EIR Questions_R3.PDF”, has the email subject: “Z-Best Use Permit/ASA EIR Data Needs List (6498-16P), dated July 11, 2018”. This document presents on July 25, 2018 the ECS response to question Q3 from Ron Sisseem concerning ECS Section 36e-Management of Contact Water, 8 pages.

SCCGOV, 2019, “Z-Best Memo 1, Responses to 12-12-18 email re NOP.pdf”, County of Santa Clara, Department of Planning and Development, dated 4/15/2019, Zbest Input/Responses to NOP Comment Period 12-12-18 email request, 8 pages.

Schaaf and Wheeler, 2017, “Floodplain Impact Analysis for Z-Best Compost Facility Expansion near Gilroy” Memo dated, 2/7/2017.

Schaaf and Wheeler, 2017, “Z-Best Compost Facility Phase 2 Expansion” Memo dated, 9/14/2018.

MEMORANDUM

TO: John Doyle
Zanker Road Landfill

DATE: October 25, 2022

FROM: Charles D. Anderson, PE

JOB#: ZANK.04.21

SUBJECT: Updated Floodplain Storage Analysis for Z-Best Compost Facility

Introduction

The Z-Best Compost Facility Expansion Project (Project) consists of two phases. The first phase of work involved grading to provide a level pad for composting operations and balancing excavation to provide a no net fill below the base flood (100-year) elevation. The first phase of the project was analyzed for impacts to the regulatory floodplain in 2012.¹ FEMA issued a Conditional Letter of Map Revision (CLOMR) for the work based on that analysis on January 17, 2013.²

The second phase of work analyzed herein. Phase 2 of the expansion includes additional grading to the west of the Phase 1 area to create a level pad for composting operations (Figure 1). Work also includes, as shown in Figure 2, modifications to the Detention Basin 1 storm water quality basin and berm, the creation of additional floodplain storage between Highway 25 and "Area 1", and the widening of Highway 25 by the State for safer truck operations at the Z-Best site.

Potential impacts to net 100-year floodplain storage and conveyance are analyzed for the complete Project. That is, the post Phase 2 condition is compared to the pre-existing condition before Phase 1 to be sure that floodplain storage below the base flood elevation is no less than before the Project began and that the net placement of Project fill and excavation has not created blockage to flood flows sufficient to cause a significant rise in the base flood elevation.

This analysis supersedes the *No Net Fill/No Rise Certification* memorandum prepared September 14, 2018 to reflect the then-final permit drawings prepared by Golder Associates.

Base Flood Elevation

The Project site location is mapped as Special Flood Hazard Zone A (base flood elevations undetermined) on the effective Flood Insurance Rate Map (FIRM for unincorporated Santa Clara County that has an effective date of May 18, 2009). The referenced CLOMR approved in January 2013 establishes base flood elevations (BFEs) in the area as detailed in the referenced January 18, 2012 report. An effective Flood Insurance Study (FIS) peak discharge of 30,500 cfs was used to model the 100-year flood event on the Pajaro River. Based on this model, which also the basis for the flood impact analyses documented herein, the BFE at the Project site is 148.5 feet NAVD. The model is based on the NGVD datum. The Santa Clara County FIS adds 2.85 feet to elevations on NGVD to obtain elevations on NAVD.

¹ Schaaf & Wheeler, "Z-Best Compost Facility Expansion Flood Impact Certification, Grading, and Flood Study Summary Report," January 18, 2012.

² Case No. 12-09-62641R



Figure 1. Project Phasing

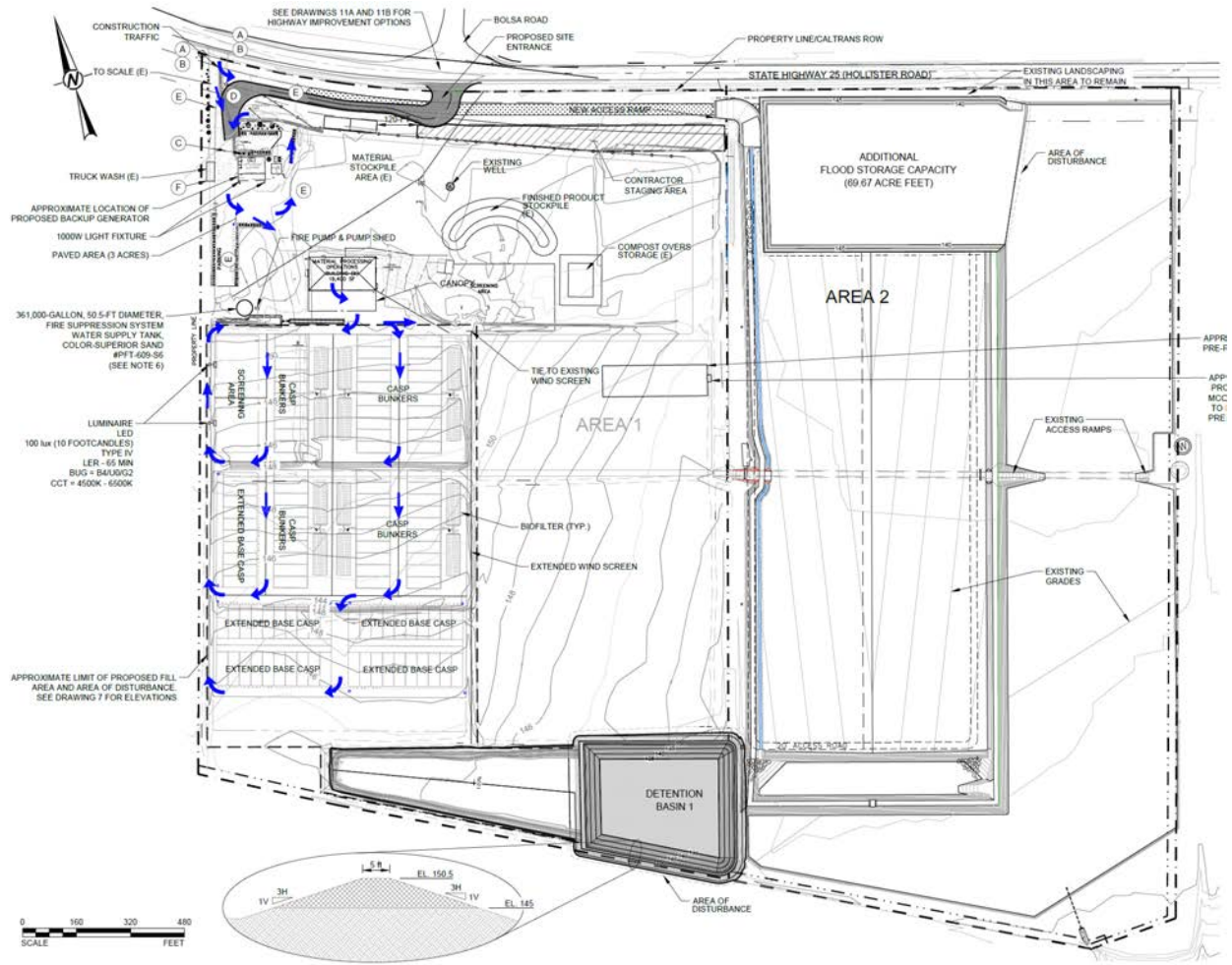


Figure 2. Proposed Site Development Showing Floodplain Storage Areas

Floodplain Storage

Golder Associates used their grading plan and Civil 3D program to calculate the volume of floodplain storage below the base flood elevation displaced by fill or by the bermed area of Detention Basin 1 and the amount of new floodplain storage created below the base flood elevation in Phase 2.

The affected floodplain encompasses both phases of the Z-best facility expansion. In addition, the State of California (Caltrans) will place fill within the same floodplain to complete improvements to California Highway 25 that mitigate for operational changes at the facility. Therefore, volumetric floodplain storage impacts are examined for both phases of the facility expansion and the work on Highway 25 as a net total. That is, the total Project impact with both phases completed compared to the pre-existing floodplain storage. The phasing indicated in Table 1 serves only to describe when the actions are taken.

As indicated by the summary provided as Table 1, there is no net loss of 100-year floodplain storage that would result from the two phases of Project construction and the associated Highway 25 improvements.

Table 1: Net Impact of Z-Best Project on Floodplain Storage

Floodplain storage below BFE removed by Phase 1 fill ³	163.3 acre-feet
Fill placed below BFE for Phase 2 compost pad	23.5 acre-feet
Area removed from 100-year floodplain below BFE due to Detention Basin 1 berms constructed in Phase 2	46.0 acre-feet
Highway 25 fill placed below BFE in Phase 2 (2,435 CY) ⁴	1.5 acre-feet
Floodplain Storage Lost	234.3 acre-feet
On-site excavation below BFE completed in Phase 1 ¹	171.2 acre-feet
Additional Phase 2 excavation proposed below BFE in Area 2	69.7 acre-feet
Additional Floodplain Storage Provided	240.9 acre-feet
Net Additional Floodplain Storage after Project Complete	6.6 acre-feet

Hydraulic Impact Analysis

A steady state hydraulic model of the Pajaro River and its overbanks, representing the pre-existing flood condition was used as the basis for FEMA's Conditional Letter of Map Revision. That same model has been updated to reflect all project changes, both Phase 1 and Phase 2, including modifications to Highway 25 and is used for this updated flood study to evaluate potential floodplain impacts from the Project. Cross sections and ineffective flow areas have been added to the model geometry to capture the changes in topography and flow blockage that results from fill placed below the base flood elevation. Figures 3 through 7 show the changes made to model cross sections caused by the Phase 1 and Phase 2 work, which are taken in combination. Figure 8 shows the ineffective flow areas caused by the placement of previously placed and new fill relative to the pre-existing ground conditions. Area 1, which is ungraded, is the same in both the pre-existing conditions model and post-Project model, noting that some of this cross-sectional flow area is already above the base flood elevation and is effectively blocked in both cases.

³ Schaaf & Wheeler, "Z-Best Compost Facility Expansion; Floodplain Impact Certification, Grading and Flood Study Summary Report," January 18, 2012.

⁴ Email from Richard Haughey, PE, Golder Associates, September 29, 2022.

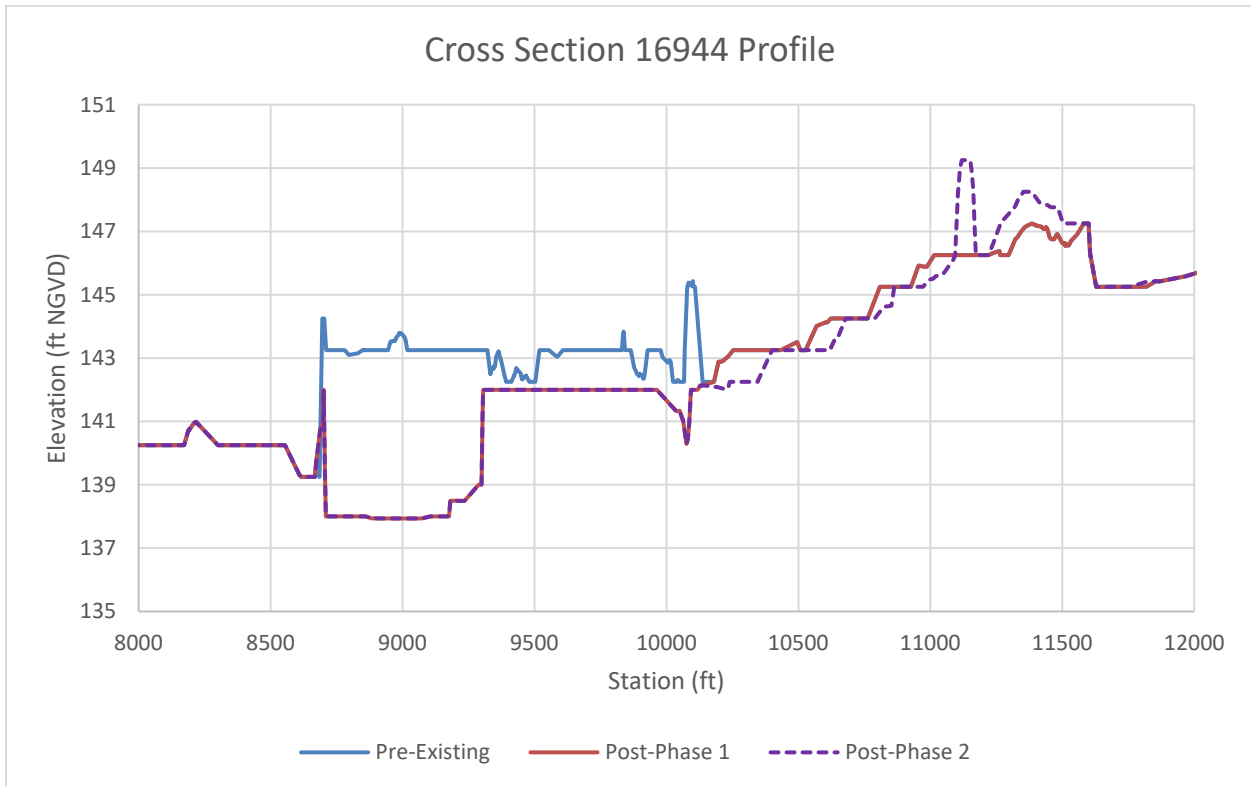
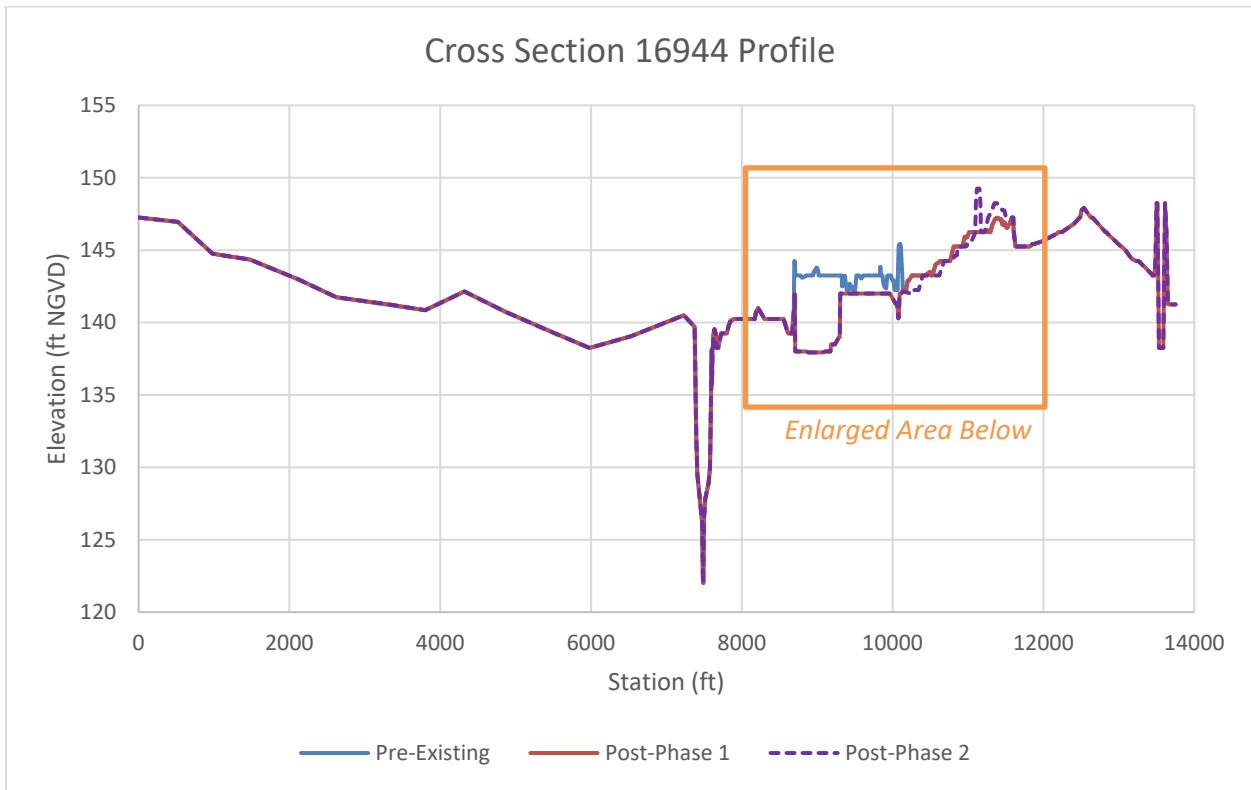


Figure 3. Cross Section Changes to Model Project Improvements

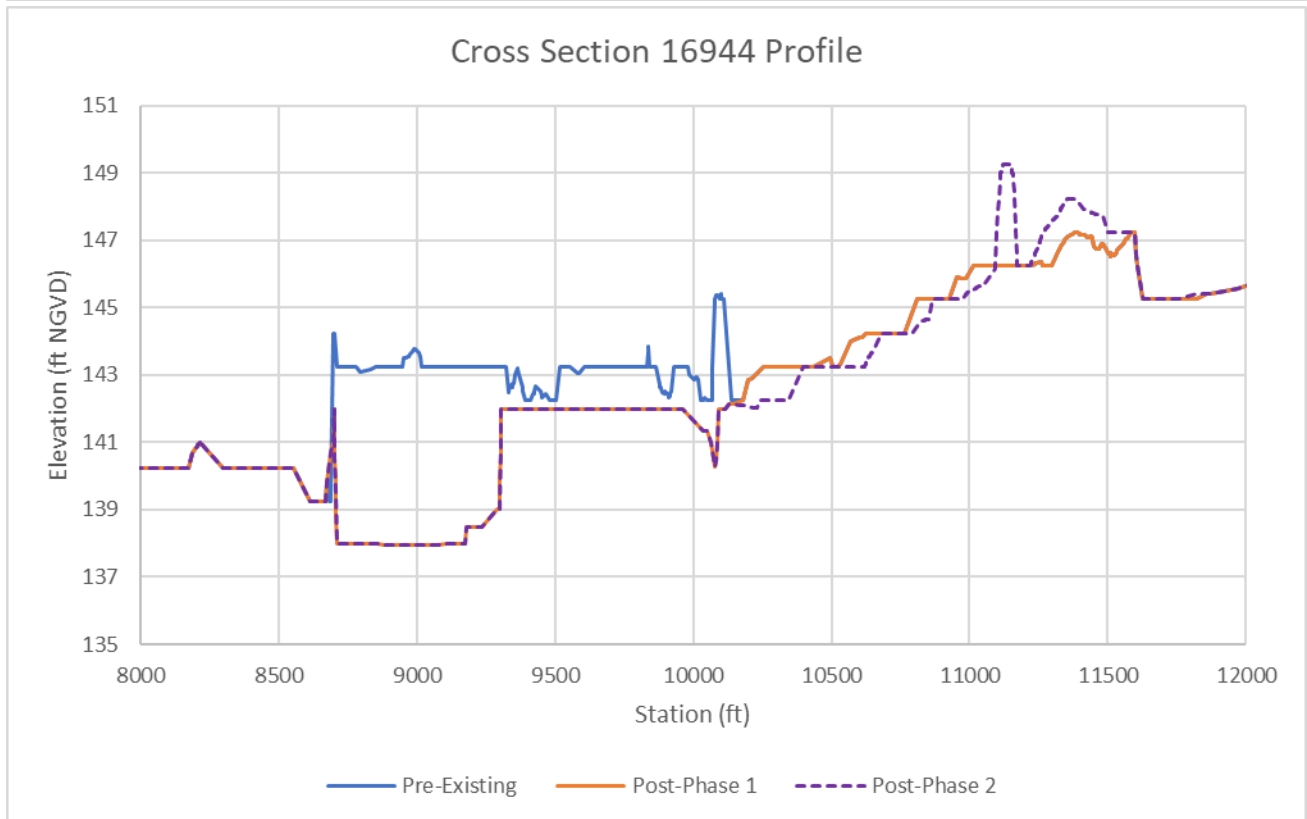
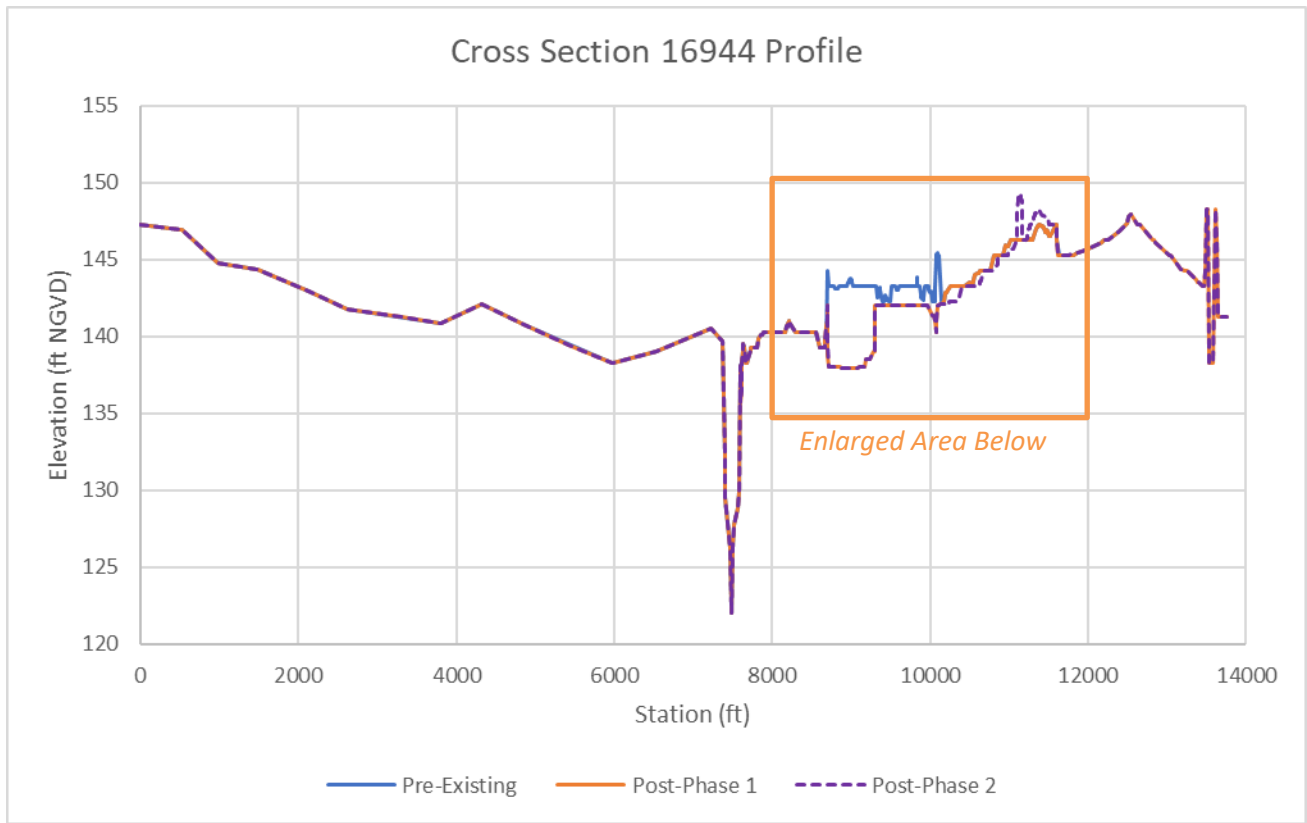


Figure 4. Cross Section Changes to Model Project Improvements

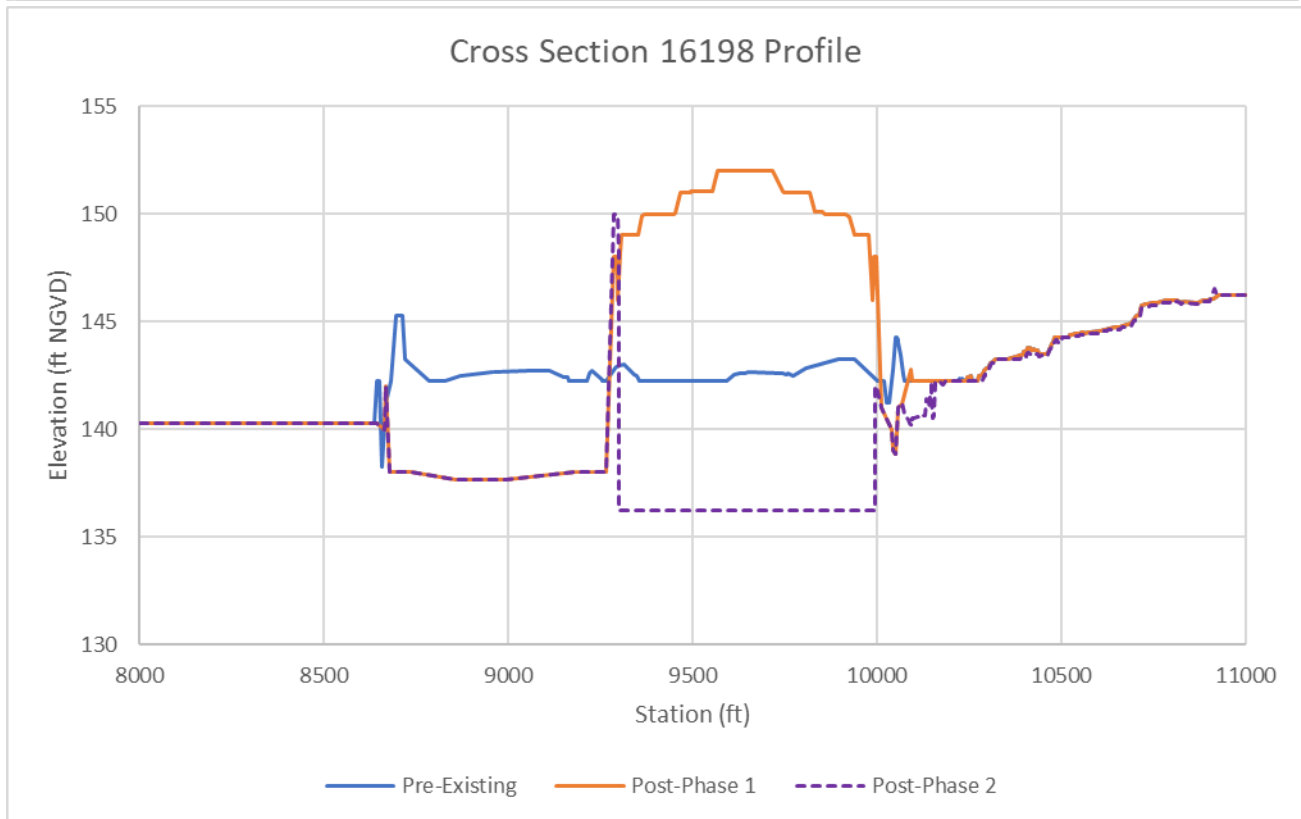
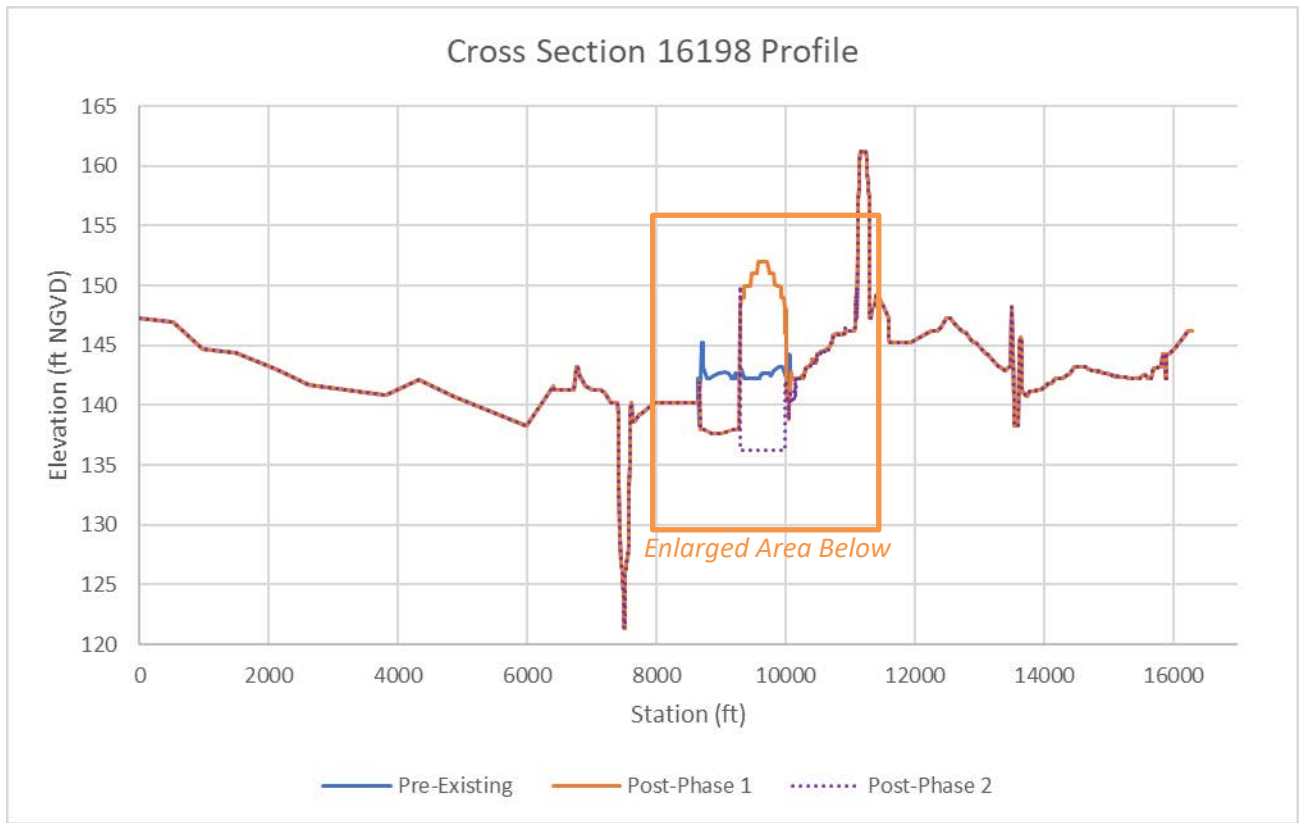


Figure 5. Cross Section Changes to Model Project Improvements

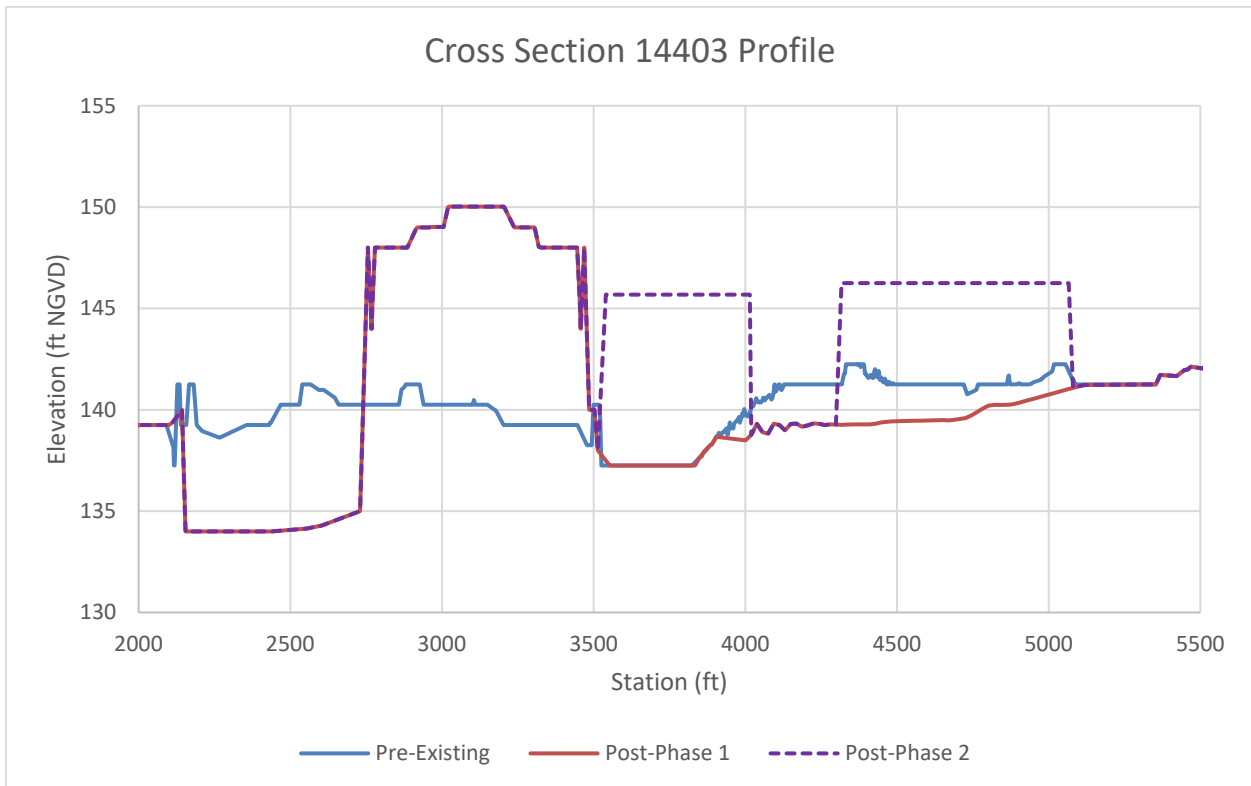
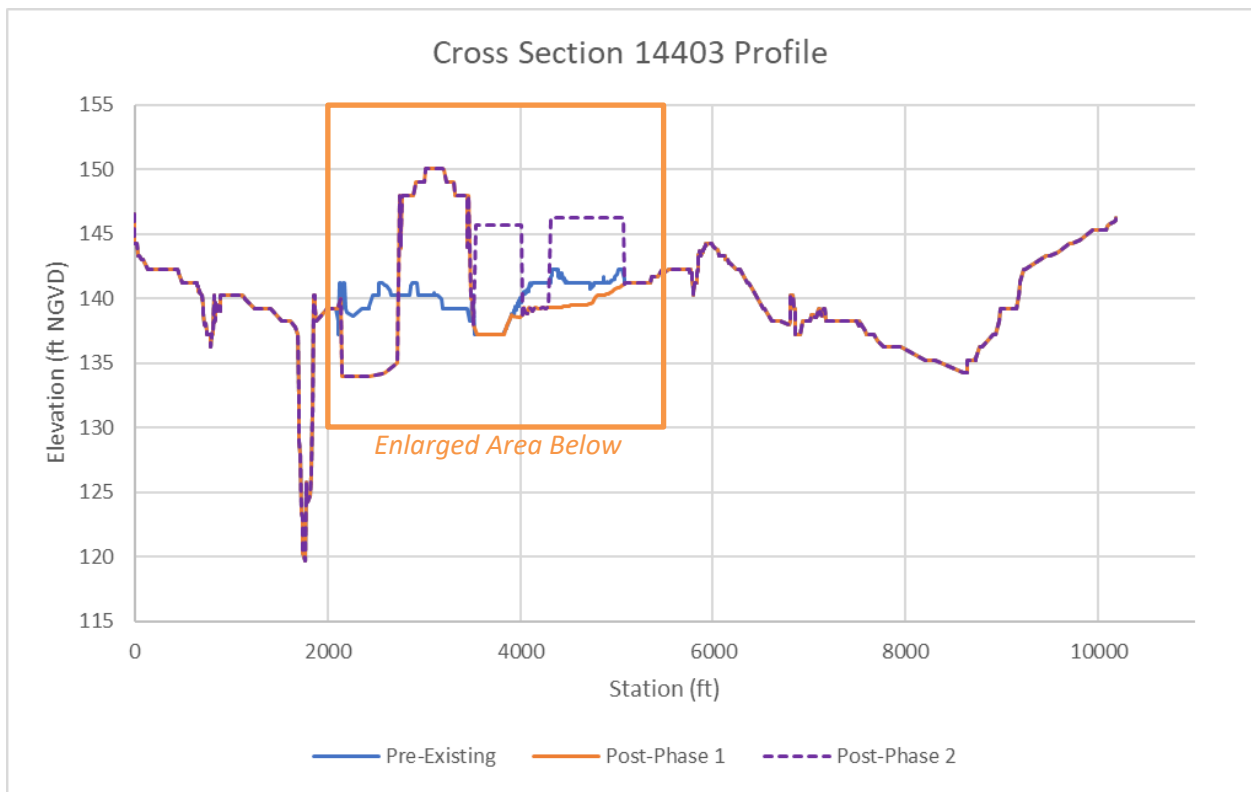


Figure 6. Cross Section Changes to Model Project Improvements

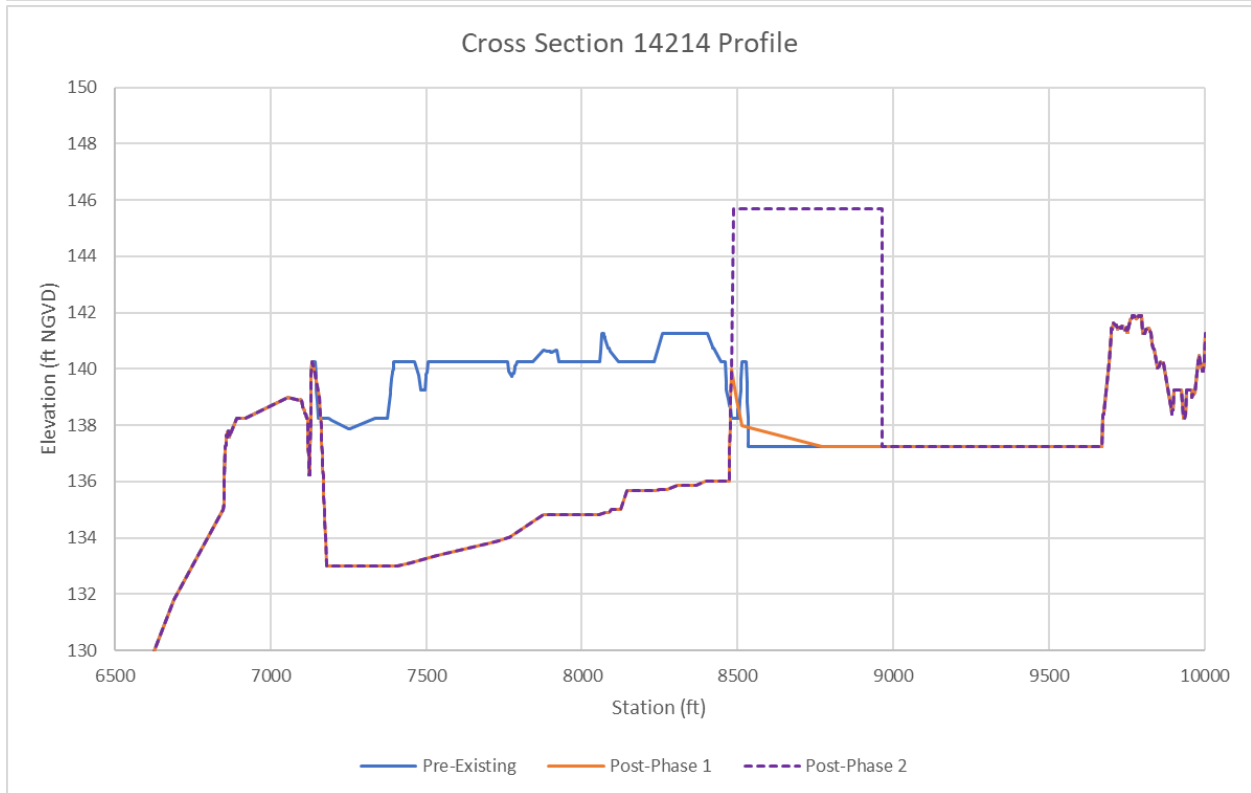
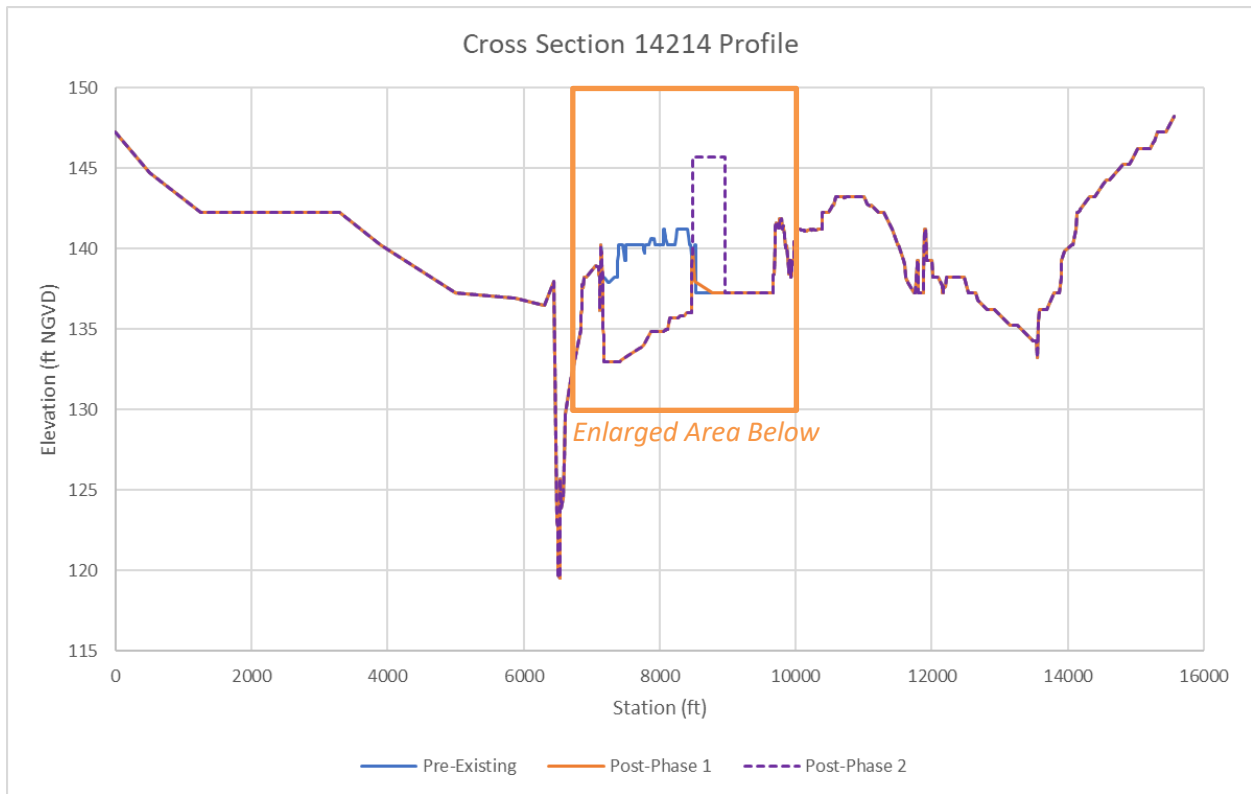


Figure 7. Cross Section Changes to Model Project Improvements

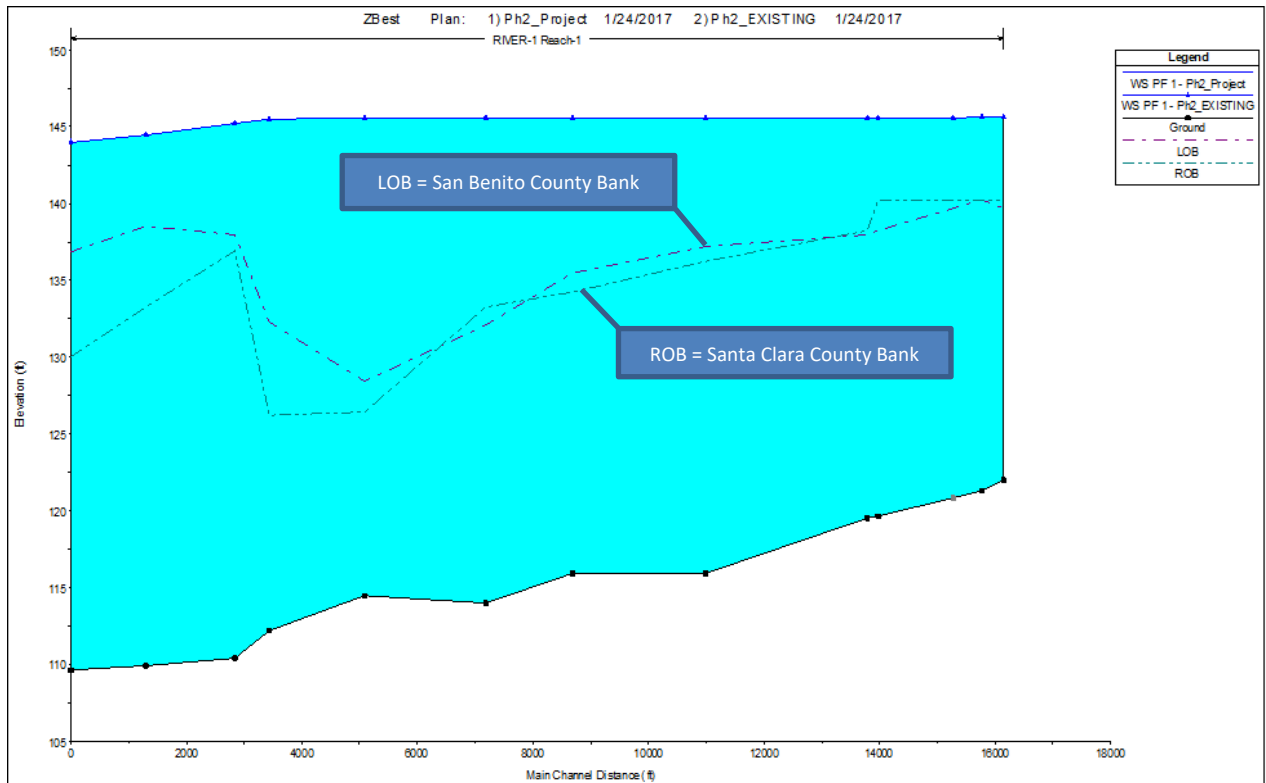


Figure 9. 100-yr WSELs through Soap Lake for the Pre-Existing and Project Scenarios

Table 2. Existing and Post-Project Scenario 100-YR Event WSELs

Model River Station XS	Pre-Existing WSEL (ft NGVD)	Post-Project WSEL (ft NGVD)	Difference
16944*	145.63	145.63	0.00
16198*	145.61	145.62	0.01
15998*	145.61	145.61	0.00
15698*	145.59	145.60	0.00
14403*	145.56	145.56	0.00
14214*	145.56	145.56	0.00
11414	145.55	145.55	0.00
9114	145.55	145.55	0.00
7614	145.55	145.55	0.00
5514	145.54	145.54	0.00
3864	145.50	145.50	0.00
3264	145.24	145.24	0.00
1734	144.45	144.45	0.00
434	144.00	144.00	0.00

*Cross Section thru Project Area

The floodplain model ends at Highway 25. Comparing proposed contours at the high point of the highway alignment to pre-existing contours (Figure 10), there is no significant difference in roadway elevations and overall, the regraded roadway appears to provide more flow conveyance than under pre-existing conditions. In other words, the slight decrease in grade is greater in volume than the slight increase in grade. This suggests that the impact analysis need not be carried further upstream. Flooding will not be deeper with increased flow conveyance over the highway.

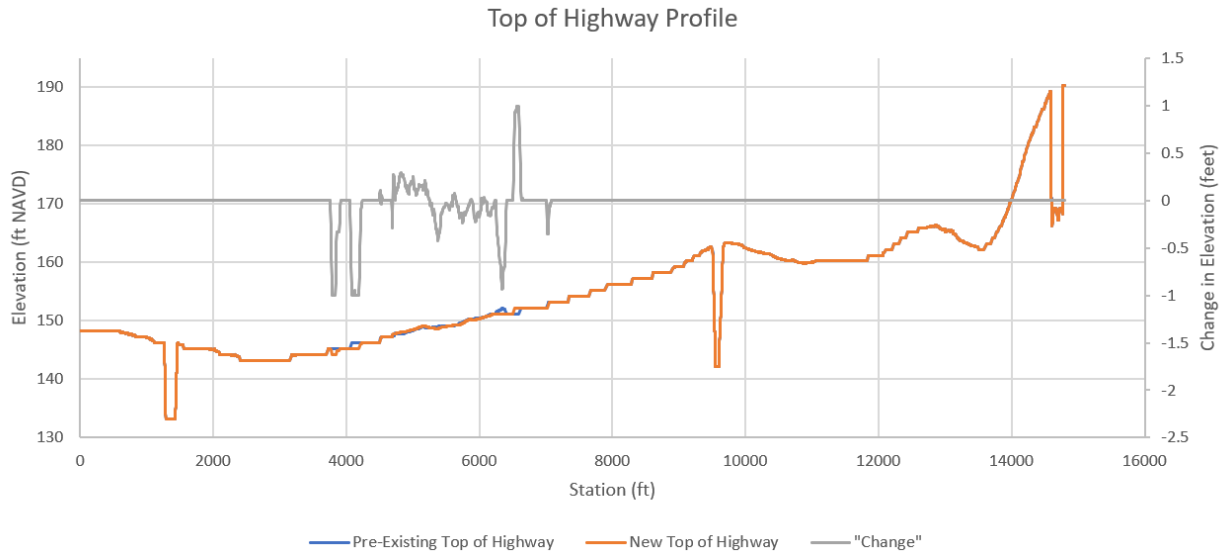


Figure 10. Nominal Grading Changes at Highway 25

Conclusion

Based on the hydraulic analysis documented herein, the Z-Best Expansion Project has no adverse impact on flood storage volumes or 100-yr water surface elevations.

TECHNICAL MEMORANDUM

DATE July 5, 2022

Project No. GL13397640

TO John Doyle
Z-Best Products

CC

FROM Richard Haughey

RE: CLARIFICATION OF PREVIOUS HYDROLOGY AND WATER SUPPLY ANALYSES, Z-BEST COMPOST FACILITY

This memorandum responds to comments/questions contained in the memorandum from AECOM to the County of Santa Clara, dated June 8, 2022, regarding existing hydrology and water supply analyses contained in the Draft Environmental Impact Report for the Z-Best Composting Project.

AECOM's comments and questions are primarily focused on the use of Golder's three memoranda (October 28, 2016, March 26, 2019, June 7, 2019) to satisfy CEQA requirements and on future groundwater use. As such, we are providing an overall response and not responding to each individual comment or question. The response below is being provided to estimate the anticipated change in groundwater usage at the site related to the proposed project.

We acknowledge that there are actual and perceived inconsistencies between the three memoranda, and the three memoranda contain information determined to be incorrect. The information contained in this memorandum supersedes the three memoranda.

The purpose of Golder's water balances was to comply with the requirements of the State Water Resources Control Board Order WQ 2015-0121-DWQ, General Waste Discharge Requirements for Composting Operations. The water balances review the current project and proposed project currently under design in terms of verifying adequate onsite storage for compost run-off based on average water usage at the site and a specified design storm event. As domestic water use does not affect the water balance, domestic water was not included in any of the water balances. Additionally, the water balances were not intended to comply with CEQA Guidelines or to evaluate the potential impact on nearby water supply wells.

As the project design has evolved, it was determined to not fill the western portion of Detention Basin 1 (DB-1). A drainage ditch will be constructed along the north side of the western portion of DB-1 to intercept storm runoff from the area between the ECS compost pad and DB-1 to prevent the storm runoff from flowing into the western portion of DB-1. The runoff will be conveyed to the redesigned DB-1 and used for the compost operation or for dust control. The unfilled western portion of DB-1 can be dredged, although, after the proposed project is constructed, the water collected in the unfilled western portion of DB-1 will be direct precipitation, which will be pumped out and used for the compost operation or for dust control.

Any sediments within the footprint of the redesigned DB-1 will be removed during grading and can be re-composted.

Although the relocated site entrance is not specifically discussed in Schaaf and Wheeler's January 19, 2022, memorandum, the relocated site entrance is clearly shown on Figure 1. Schaaf & Wheeler has reviewed its work and confirmed that the estimated floodplain loss stated in their January 19, 2022, memorandum includes the earthfill associated with the relocated site entrance. Additionally, Schaaf and Wheeler's January 19, 2022 memorandum considered the impacts of proposed work within the State Route 25 right-of-way.

After reviewing AECOM's comments, we revisited our water balances. To simplify comparison of the water balances, we worked backwards from the quantity of groundwater currently used to supplement surface water.

The existing compost operation is comprised of three activities:

- CTI MSW composting
- Yard waste (green waste) composting
- Storage and blending of cured compost

The CTI MSW composting is an in-vessel composting method and does not require moisture conditioning or make-up water. The yard waste composting requires moisture conditioning and make-up water for both the primary and secondary composting phases. The storage and blending operation does not require moisture condition or make-up water. In addition to moisture conditioning and make-up water for the yard waste composting operation, water is used for dust control. Water for moisture conditioning, make-up water, and dust control is obtained from two sources, the two on-site detention basins and groundwater.

The detention basins typically run dry by summer. As the water requirements for the composting operation and dust control exceed the water available from the detention basins, groundwater is used to make up the difference. Based on flow data reported to the Valley Water from 2015 to 2020, annual groundwater usage at the site varied from approximately 15.4 million gallons to approximately 38.7 million gallons. The lower groundwater usage was associated with periods of maintenance or repairs to the well pump. Because of this, approximately 31.6 million to 38.8 million gallons is more representative of typical annual groundwater usage.

Surface runoff flows to the two detention basins. Water is pumped from the detention basins for use in the composting operation and dust control. Water is also lost from the basins due to evaporation.

Based on the average rainfall, the annual inflow to the two detention basins is approximately 43.8 million gallons. The annual evaporation loss is approximately 11.1 million gallons. The resulting net available surface water is approximately 32.7 million gallons.

The annual water usage for the existing composting operation is the total of the net available surface water and the groundwater, approximately 64.3 million to 71.4 million gallons.

The proposed project will replace the CTI MSW composting with an Engineered Compost Systems (ECS) composting system, which includes a concrete compost pad. The Area 1 detention basin, DB-1, is being

reconfigured with less surface area resulting in a reduction in water loss due to evaporation. There is also an additional small area south of the compost pad that will drain to DB-1.

The ECS composting will require moisture conditioning and make-up water. The yard waste composting operation and cured compost storage and blending operation will be unchanged as will dust control. As a result, the annual water usage will increase by the water required for the ECS composting.

The increased water required by the ECS composting will be partially offset by a minor increase in the runoff from the ECS compost pad and the reduction in evaporation loss. The annual inflow to the two detention basins will be approximately 45.2 million gallons. The annual evaporation loss is approximately 8.4 million gallons. The resulting net available surface water is approximately 36.8 million gallons.

Based on information from ECS, the primary composting will require 20,000 gallons of water per day and the secondary composting will require 40,000 gallons of water per day, or an additional 21.9 million gallons per year.

The total annual water usage for the proposed project is 86.2 million to 93.3 million gallons. Subtracting the net available surface water, the annual quantity of groundwater required to supplement the surface water is 49.4 million to 56.5 million gallons, an increase of approximately 17.8 million gallons compared to the existing project.

Golder Associates USA Inc.



Richard D. Haughey, PE
Director, Civil Engineer

TECHNICAL MEMORANDUM

DATE October 25, 2022

Project No. GL13397640

TO John Doyle
Z-Best Products

CC Lindsey Angell

FROM Richard Haughey

EMAIL rhaughey@golder.com

RE: RESPONSE TO “MEMORANDUM: FURTHER CLARIFICATION OF HYDROLOGY AND SUPPLY ANALYSES AND THE GROUNDWATER DRAWDOWN EVALUATION”

This memorandum was prepared by WSP Golder to respond to the comment noted in AECOM’s October 21, 2022 email to you.

Comment: The table of monthly domestic water use from 2018 through 2021 within bullet 1 of Golder’s memo dated August 22, 2022 (revised Oct 11, 2022) was modified to include the previously missing April values, as requested. However, the total sum of all 12 months does not match the total annual value shown in the table (the difference for each year ranges from approximately 4,000 to 18,000). It is noted that the April values that were added to the table match exactly to the May values, therefore it is suspected that values from the wrong month were added to the table by mistake. I have attached a copy of Golder’s memo with the inconsistent values highlighted.

Response: Golder has revised its August 22, 2022 memorandum to correct the domestic water use table. When the April domestic water use quantities were omitted, the domestic water use quantities for following months were moved forward. The total domestic usage shown in the August 22, 2022 memorandum was correct.

Golder Associates USA Inc.

A handwritten signature in black ink that reads 'Richard D. Haughey'.

Richard D. Haughey, PE
Director, Civil Engineering

Distribution: Lindsey Angell

Attachment: August 22, 2022 Memorandum (Revised 10/25/2022)

[https://golderassociates.sharepoint.com/sites/129941/project files/5 technical work/permitting/memo_10252022.docx](https://golderassociates.sharepoint.com/sites/129941/project%20files/5%20technical%20work/permitting/memo_10252022.docx)

TECHNICAL MEMORANDUM

DATE August 22, 2022
(Rev. 10/25/2022)

Project No. GL13397640

TO John Doyle
Z-Best Products

CC Lindsey Angell, WSP Golder

FROM Richard Haughey

EMAIL rhaughey@golder.com

RE: FURTHER CLARIFICATION OF PREVIOUS HYDROLOGY AND WATER SUPPLY ANALYSES, Z-BEST COMPOST FACILITY

This memorandum responds to comments/questions contained in the memorandum from AECOM to the County of Santa Clara, dated July 20, 2022, regarding responses by Z-Best and Golder to AECOM's June 8, 2022, memorandum as well as other requested clarifications in AECOM's July 20, 2022, memorandum.

The comments/questions are repeated in italics below followed by the response.

- As stated in Golder's response memo (July 5, 2022), their water balance equations do not account for domestic water use. **Please provide site-specific data on existing domestic water usage.** If site-specific data is not provided by Z-Best, AECOM will need to research average per employee water use rates to determine an appropriate rate to apply in order to calculate the anticipated increase in domestic water use as a result of the Project.*

All water for domestic use is obtained from the shop domestic well. Based on groundwater quantities reported to Valley Water, domestic groundwater usage for the last 4 years is shown in the following table.

	2018	2019	2020	2021
January	30,720	14,290	12,450	57,090
February	15,390	25,320	12,240	17,530
March	44,710	15,280	10,520	17,570
April	20,420	10,720	37,500	24,430
May	21,040	19,220	57,200	33,230
June	48,310	14,880	40,690	32,140
July	83,480	79,140	82,520	65,510
August	76,300	79,270	57,480	37,590

September	51,180	72,590	149,300	65,510
October	35,520	84,427	55,000	37,590
November	57,300	60,311	122,900	27,510
December	24,750	18,512	56,110	12,860
Total	509,120	493,960	693,910	428,560

2. *The Golder response memo also does not evaluate the potential impact on nearby water supply wells. If such an evaluation is not provided by Z-Best or their consultants, AECOM hydrologists will need to model the anticipated radius of influence for the Z-Best on-site wells and amount of drawdown anticipated at the neighboring agricultural wells using Theis’s method for unsteady flow for a well (Kruseman and de Ridder 1991). The model can be run using conservative assumptions; however, the following information is requested (if available) to refine the model inputs:*
- a. *Details of the 3 existing Z-Best on-site wells and typical operation (e.g., depth to water, screening intervals, well logs, existing pump rates, typical distribution of pumping between the wells under existing and anticipated proposed use, if known—i.e., are the 3 wells pumped equally or is one used more than the others).*

Golder initiated work on evaluating the potential impact on nearby water supply wells based on comments from the July 15, 2022, meeting with the County and AECOM. It is anticipated that the evaluation will be completed within 1 week.

3. *The Golder response memo states that Schaaf and Wheeler has confirmed that the estimated floodplain loss stated in their January 19, 2022 memorandum accounted for the earthfill associated with the relocated site entrance and associated work within the State Route (SR) 25 right-of-way (ROW). However, Table 1 in Schaaf and Wheeler’s memo, which summarizes the various components of the project and the associated volume of floodplain storage, only lists the following components:*
- a. *Fill above [sic1] BFE for compost pad*
 - b. *Area removed from 100-yr floodplain due to Detention Basin 1 berms*
 - c. *Excavation below BFE in Area 2*

The latest design plans (April 2022) for the project state that 2,960 cubic yards of fill is proposed within the SR-25 ROW (Drawing 7) and indicate that at least a portion of that fill would be placed below the Base Flood Elevation (BFE) of 148.5 feet (Drawing 12D). However, the Schaaf & Wheeler reports do not include any mention of how many acre-feet of floodplain storage would be removed due to this fill.

Please ask Schaaf & Wheeler to revise their memo to correct the typographical error in Table 1 (see footnote 1) and to clarify how many acre-feet of floodplain storage would be lost due to fill in the SR-25 ROW and whether the proposed floodplain storage in Area 2 would be sufficient to account for this additional fill. A site map showing the various areas of flood storage gain and flood storage loss (and associated volumes) would also be helpful.

Please also ask Schaaf & Wheeler to provide backup data and calculations that are consistent with and support the updated floodplain storage analysis provided in their January 19, 2022 memorandum and that reflect the latest April 2022 project plans.

Schaaf & Wheeler have been requested to revise their memorandum and it will be submitted separately.

- 4. The Golder memo states that the information contained in their July 5 memorandum supersedes the three previous memoranda which contained inconsistencies and errors. Please ask Golder to provide backup data and calculations that are consistent with and support the summary water balance information provided in the July 5, 2022 memorandum.*

A memorandum providing the requested information is attached.

- 5. The Golder memo mentions a drainage ditch to be constructed along the north side of the western portion of Detention Basin #1, which does not appear to be shown on the project plans. Please provide an updated Drawing 13 showing the location and contours of the proposed drainage ditch and provide north-south sections through the western and eastern portions of the detention basin showing both existing and proposed ground surfaces. Please also update Proposed Basin Section A on Drawing 13 to show the proposed ground surface on the outer slopes of the Detention Basin #1 berms, which are currently missing from the section.*

A revised drawing 13 is attached.

- 6. The 2016 Golder memo (Section 4.2) mentions a 300,000-gallon leachate storage tank. Please confirm that this leachate storage tank is no longer part of current or proposed operations.*

A 300,000-gallon leachate storage tank has never been part of the current or proposed project.

- 7. The original Draft EIR (page 3-22) states that stormwater from the CTI processing area is considered leachate and is directed to unlined ditches that deliver the stormwater/leachate to Detention Basin #1. It also states that "leachate is also produced as a by-product of the composting process." Please provide clarification of how this "by-product leachate" is currently managed.*

In its General Compost Order, the State Water Resources Control Board defines runoff from a compost area as wastewater. Leachate is often used to describe runoff from a compost area. The MSW material received is high moisture content feedstock and thus produces leachate during composting. The excess moisture mixes with other surface runoff and flows to drainage ditches that convey the runoff to Detention Basin #1 where it is detained for on-site use. This leachate will continue to be produced with the proposed ECS system and will be managed in the same way.

- 8. Valley Water requested additional information in their comment letter on the original Draft EIR that does not appear to have been addressed/provided within the revised Golder or Schaaf & Wheeler memorandums. Please provide a copy of Schaaf & Wheeler's "Grading and Flood Study Summary Report" dated April 26, 2011 (Item 6 from Valley Water comment letter) or a more updated version detailing development of the hydraulic model used as the basis for Schaaf & Wheeler's January 2022 memo (see bullet point 3, above).*

Schaaf & Wheeler have been asked to respond to Valley Water's comment. Their response will be submitted separately.

If you have any questions or need additional information, contact the undersigned.

Golder Associates USA Inc.



Richard D. Haughey
Director, Civil Engineering

Attachments: Water Supply Evaluation Memorandum
Revised Drawing 13

[https://golderassociates.sharepoint.com/sites/129941/project files/5 technical work/permitting/aecom responses_08182022.docx](https://golderassociates.sharepoint.com/sites/129941/project%20files/5%20technical%20work/permitting/aecom%20responses_08182022.docx)

ATTACHMENT 1

**Water Supply Evaluation
Memorandum**

ATTACHMENT 2

Revised Drawing 13

ATTACHMENT 1

**Water Supply Evaluation
Memorandum**

Date:	August 15, 2022	Made by:	AB
Project No.:	GL13397640	Checked by:	HSG
Subject:	Water Supply Evaluation	Reviewed by:	LMA
Project Short Title:	Z-Best Compost Facility		

1.0 OBJECTIVE:

Evaluate water supply sources for existing and proposed compost facility operations.

2.0 METHODOLOGY:

Estimate monthly inflows and outflows for Detention Basin 1 and Detention Basin 2 (DB-1 and DB-2). Inflows consist of direct precipitation into DB-1 and DB-2 and facility runoff. Outflows include DB-1 and DB-2 evaporation and use of water for compost moisture conditioning and dust control. If compost operations water requirements exceed available water from DB-1 and DB-2, estimate the volume of groundwater required to make-up the difference.

Separate reports have been previously prepared presenting detailed water balances for the existing and proposed compost facility operations. This memorandum presents a conservative overview of water requirements and water supply sources.

3.0 ASSUMPTIONS/GIVENS:

The existing compost operation is comprised of three activities:

- CTI MSW composting
- Yard waste (green waste) composting
- Storage and blending of cured compost

The CTI MSW composting is an in-vessel composting method and does not require moisture conditioning or make-up water. The yard waste composting requires moisture conditioning and make-up water for both the primary and secondary composting phases. The storage and blending operation do not require moisture conditioning or make-up water. In addition to moisture conditioning and make-up water for the yard waste composting operation, water is used for dust control. Water for moisture conditioning, make-up water, and dust control is obtained from two sources, the two on-site detention basins and groundwater.

As part of proposed modifications to the compost operation, the CTI MSW composting will be replaced with an Engineered Compost Systems (ECS) composting system, which includes a concrete compost pad. The ECS composting will require moisture conditioning and make-up water. The existing yard waste composting operation and cured compost storage and blending operation will be unchanged as will dust control. As a result, the annual water usage will increase by the water required for the ECS composting.

For purposes of this evaluation, the composting system is assumed to operate in a steady-state condition, i.e., the quantity of feedstock entering the system is equivalent to the quantity of finished compost removed from the system. A detailed breakdown of each water use has not been prepared. The amount of water required for the compost facility operation is based on the available surface water and groundwater production records.

3.1 Stage-Storage Relationship

The stage-storage relationships for Detention Basins 1 and 2 at the Z-Best Compost Facility provide information relating the water elevation, surface area, and volume of the basins. These relationships were determined using the design grades for the existing detention basins. Tables 1 and 2 show Detention Basins 1 and 2 stage-storage relationship data.

Table 1: Existing Detention Basin 1 Stage-Storage Data

Elevation (ft)	Water Surface Area (sq ft)	Incremental Water Volume (gal)	Cumulative Water Volume (Acre-ft)
139	274,324	1,989,192	9,138,789
138	262,958	1,905,503	7,149,598
137	251,722	1,822,772	5,244,095
136	240,615	1,740,997	3,421,322
135	229,637	1,680,326	1,680,326
134	224,197	0	0

Table 2: Existing Detention Basin 2 Stage-Storage Data

Elevation (ft)	Water Surface Area (sq ft)	Incremental Water Volume (gal)	Cumulative Water Volume (Acre-ft)
145	85,340	614,939	3,240,686
144	80,764	583,891	2,625,747
143	76,949	555,552	2,041,855
142	73,111	526,297	1,486,304
141	69,051	495,813	960,006
140	64,880	464,194	464,194
139	60,515	0	0

4.0 EXISTING OPERATION WATER USAGE

The average annual conditions over a period of several years were used to estimate inflows and outflows for the existing operation. Each of the inflows and outflows are described in detail in the following sections.

4.1 Inflows

Inflows include direct precipitation to the detention basins and stormwater runoff from the operational areas as described below. It is assumed that the quantity of water used for the composting operations and dust control is the minimum required and, as a result, there is no runoff from the compost pad to the detention basins from the application of water for compost operations or dust control.

4.1.1 Direct Precipitation in Detention Basins

The Isohyetal Map of Santa Clara County Mean Annual Precipitation, included in the Santa Clara County Hydrology Manual (October 2007), shows a mean annual precipitation for the site of approximately 21 inches. Monthly precipitation data was obtained from the Western Regional Climate Center (WRCC) website. Precipitation data was also obtained from records for Weather Station 043417 in Gilroy, CA. This station is located at 37° 0' 24 N and 121° 33' 48 W at elevation 190 feet approximately 8 miles northwest from the site. The data range is March 1, 1906, to June 10, 2016. The mean annual precipitation for this range of data is 20.83 inches. Therefore, with over 100 years of precipitation data, the monthly precipitation data based on Gilroy Station 043417 with an annual mean precipitation of 20.83 inches was used.

Table 3: Average Monthly Precipitation

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual Total ¹
Average Precipitation (in)	4.70	3.74	3.24	1.40	0.39	0.10	0.05	0.05	0.32	0.90	2.21	3.72	20.83

¹ Precipitation values may not add to 20.83 inches due to rounding.

To apply the monthly precipitation as an inflow to the water balance model, the area of DB-1 footprint (274,324 sq ft) and DB-2 footprint (85,340 sq ft) is multiplied by the amount of rainfall in the particular month and converted to gallons, according to the equation below. The basin is always subject to precipitation inflow, regardless of whether the other operational inflows are occurring.

$$P = \frac{R \times A}{12} \times 7.481 \text{ gal/cf}$$

Where:

- P = monthly precipitation volume (gallons)
- R = monthly rainfall from historical data (inches)
- A = area of the Detention Basin footprint (ft²)

Table 4: Average Monthly Direct Precipitation

Month	Existing Detention Basin 1 (gal)	Existing Detention Basin 2 (gal)
January	803,785	250,051
February	639,608	198,977
March	554,099	172,367
April	239,425	74,483
May	66,697	20,749
June	17,102	5,320
July	8,551	2,660
August	8,551	2,660
September	54,726	17,025
October	153,916	47,882
November	377,950	117,577
December	636,188	197,913
Totals	3,560,598	1,107,674

4.1.2 Existing Compost Facility Stormwater Runoff

The compost facility pad stormwater runoff was calculated by multiplying the average monthly precipitation, the drainage area for each basin (sq ft), and the runoff coefficient. Area 1 will drain to DB-1 and Area 2 will drain to DB-2. The average runoff coefficient of 0.72 for DB-1 and DB-2 was estimated based on calculated coefficients at similar composting facilities. Tables 5 and 6 show the average monthly compost facility stormwater runoff.

Table 5: Existing Compost Facility Stormwater Runoff Calculation – DB-1

Month	Drainage Area (sq ft)	Runoff Coefficient C	Precipitation (inches)	Monthly Facility Direct Precipitation (gallons)	Stormwater Runoff (gallons)
January	3,057,780	0.72	4.70	7,253,744	6,449,959
February	3,057,780	0.72	3.74	5,772,128	5,132,520
March	3,057,780	0.72	3.24	5,000,453	4,446,355
April	3,057,780	0.72	1.40	2,160,690	1,921,264
May	3,057,780	0.72	0.39	601,906	535,209
June	3,057,780	0.72	0.10	154,335	137,233
July	3,057,780	0.72	0.05	77,167	68,617
August	3,057,780	0.72	0.05	77,167	68,617
September	3,057,780	0.72	0.32	493,872	439,146
October	3,057,780	0.72	0.90	1,389,015	1,235,098
November	3,057,780	0.72	2.21	3,410,803	3,032,853
December	3,057,780	0.72	3.72	5,741,261	5,105,074
Totals			20.83	32,132,543	28,571,945

Notes:

¹ The compost pad runoff volume was calculated by multiplying the monthly precipitation volume by the runoff coefficient.

² The monthly precipitation may not add to 20.83 inches due to rounding.

Table 6: Existing Compost Facility Runoff Calculation – DB-2

Month	Drainage Area (sq ft)	Runoff Coefficient C	Precipitation (inches)	Monthly Facility Direct Precipitation (gallons)	Stormwater Runoff (gallons)
January	1,132,560	0.72	4.70	3,318,023	2,388,977
February	1,132,560	0.72	3.74	2,640,299	1,901,016
March	1,132,560	0.72	3.24	2,287,318	1,646,869
April	1,132,560	0.72	1.40	988,347	711,610
May	1,132,560	0.72	0.39	275,325	198,234
June	1,132,560	0.72	0.10	70,596	50,829
July	1,132,560	0.72	0.05	35,298	25,415
August	1,132,560	0.72	0.05	35,298	25,415
September	1,132,560	0.72	0.32	225,908	162,654
October	1,132,560	0.72	0.90	635,366	457,464
November	1,132,560	0.72	2.21	1,560,177	1,123,327
December	1,132,560	0.72	3.72	2,626,180	1,890,850
Totals	26 acres	-	20.83 ³	14,698,137	10,582,659

Notes:

¹ The compost pad runoff volume was calculated by multiplying the monthly precipitation volume by the runoff coefficient.² Monthly precipitation may not add to 20.83 inches due to rounding.

4.2 Outflows

Outflows include basin evaporation and water usage for compost operations and dust control, as described below.

4.2.1 Monthly Evaporation

Evapotranspiration (ET_o) data was obtained from the CIMIS website from records for Station 211 in Gilroy, California. ET_o values are considered equal to evaporation from a large body of water, such as a basin or lake. The data range retrieved is September 1, 2009, to June 10, 2016. The mean annual evaporation for this range of data is 49.56 inches.

Table 7: Average Monthly Evaporation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Evaporation (in)	1.55	2.00	3.55	4.71	6.08	6.65	6.99	6.32	4.93	3.50	1.89	1.39	49.56

The monthly evaporation for the basins is calculated using the following equation:

$$E = \frac{R \times SA}{12} \times 7.481 \text{ gal / cf}$$

where:

- E = monthly evaporation (gallons)
- R = evaporation rate from historical data (inches)
- SA = surface area of basin at the beginning of month (ft²)

As conservative assumptions, for the purposes of estimating evaporation from DB-1 and DB-2, it is assumed both DB-1 and DB-2 are full, which will maximize the evaporation quantity. Monthly evaporation quantities are shown in Table 8.

Table 8: Average Monthly Evaporation Quantity

Month	Existing DB-1 (gal)	Existing DB-2 (gal)
January	265,078	82,464
February	342,036	106,405
March	607,114	188,868
April	805,496	250,583
May	1,039,790	323,470
June	1,137,271	353,796
July	1,195,417	371,885
August	1,080,835	336,239
September	843,119	262,288
October	598,564	186,208
November	323,224	100,552
December	237,715	73,951
Total	8,475,680	2,636,710

Notes:

¹ Evaporation was estimated by multiplying the average monthly evaporation from Table 8 by the maximum surface area.

² DB-1 and DB-2 were assumed to be full with a surface area of 274,324 sq ft and 85,340 sq ft, respectively.

4.2.2 Current Water Usage for Compost Operations

Current water usage for compost operations, including dust control, can be estimated based on the available water from DB-1 and DB-2 and groundwater production. Currently, DB-1 and DB-2 run dry during the summer months will all water either evaporating or being used for compost operations. The water requirements for the compost operations exceed the available water from DB-1 and DB-2. Groundwater is used to offset the shortfall. All groundwater for compost operations is provided by a well located at the eastern boundary of the site.

Groundwater production is metered as required by Valley Water for purposes of paying a pump tax. Based on metered data reported to Valley Water from 2015 to 2020, annual groundwater production for compost operations varied from approximately 15.4 million gallons to 38.7 million gallons. The lower groundwater production years were associated with periods of maintenance or repairs to the well pump. Because of this, approximately 31.6 million to 38.7 million gallons is likely more representative of typical annual groundwater production for compost operations.

Table 9: Historic Groundwater Production

Year	Groundwater Production (gal)
2015	31,611,000
2016	22,603,050
2017	15,433,255
2018	38,658,124
2019	17,762,000
2020	24,437,245

Notes:

¹ During times when the well pump was being maintained or repaired, the shared well was used. During those times, there is not available records of how much of the groundwater production was used for compost operations.

² A new well was installed in 2021 and there is not yet a full year groundwater production data available.

The total water requirement can be estimated by adding the available water from DB-1 and DB-2 and the groundwater production as summarized in Table 10.

Table 10: Existing Compost Operations Water Requirement (gallons)

Inflow	DB-1	32,132,543	
	DB-2	11,690,332	
	Subtotal	43,822,875	
Evaporation	DB-1	8,475,660	
	DB-2	2,636,710	
	Subtotal	11,112,370	
	Net Available Surface Water	32,710,505	
Groundwater Production		31,600,000	38,700,000
	Total Water Requirement	64,310,505	71,410,505

Note: Inflow includes direct precipitation and compost facility stormwater runoff.

5.0 PROPOSED COMPOST OPERATION WATER USAGE

5.1 Estimated Inflows and Outflows for Proposed Compost Operation

The proposed project will replace the CTI MSW composting with an ECS composting system, which includes a concrete compost pad. The stormwater runoff from the compost pad will increase slightly due to the higher runoff coefficient (0.76) of the concrete compost pad compared to the existing composting area (0.72). Stormwater runoff from an approximately 2.6-acre area south of the compost pad, which currently does not flow to Area 1 detention basin, DB-1, will be intercepted and conveyed to DB-1. DB-1 is being reconfigured with less surface area (185,388 sq ft) resulting in a reduction in direct precipitation and in water loss due to evaporation. Direct precipitation, runoff, and evaporation for the reconfigured DB-1 are shown in the following tables.

Table 11: Reconfigured DB-1 Direct Precipitation and Evaporation

Month	Direct Precipitation (gal)	Evaporation (gal)
January	543,198	768,567
February	432,247	807,862
March	374,460	730,427
April	161,804	569,780
May	45,074	404,509
June	11,557	218,435
July	5,779	160,648
August	5,779	179,140
September	36,984	231,148
October	104,017	410,288
November	255,418	544,353
December	429,935	702,690
Total	2,406,250	5,727,846

Table 12: Proposed Compost Operation Stormwater Runoff

Month	Drainage Area (sq ft)	Runoff Coefficient C	Precipitation (inches)	Monthly Facility Direct Precipitation (gallons)	Stormwater Runoff (gallons)
January	3,170,560	0.76	4.70	9,289,925	7,022,213
February	3,170,560	0.76	3.74	7,392,408	5,587,889
March	3,170,560	0.76	3.24	6,404,118	4,840,845
April	3,170,560	0.76	1.40	2,767,212	2,091,723
May	3,170,560	0.76	0.39	770,866	582,694
June	3,170,560	0.76	0.10	197,658	149,409
July	3,170,560	0.76	0.05	98,829	74,704
August	3,170,560	0.76	0.05	98,829	74,704
September	3,170,560	0.76	0.32	632,506	478,108
October	3,170,560	0.76	0.90	1,778,922	1,344,679
November	3,170,560	0.76	2.21	4,368,241	3,301,934
December	3,170,560	0.76	3.72	7,352,877	5,558,007
Total			20.83 ³	41,152,390	31,106,911

Notes:

¹ The drainage area includes an approximately 2.2.6-acre area south of the compost pad.

² The compost pad stormwater runoff volume was calculated by multiplying the monthly precipitation volume by the runoff coefficient.

³ Monthly precipitation may not add to 20.83 inches due to rounding.

The ECS composting will require moisture conditioning and make-up water. The existing yard waste composting operation and cured compost storage and blending operation will be unchanged as will dust control. As a result, the annual water usage will increase by the water required for the ECS composting.

Based on information from ECS, the primary composting phase will require an average 20,000 gallons of water per day and the secondary composting phase will require an average 40,000 gallons of water per day, or an additional 21.9 million gallons per year.

The total water requirement for the proposed compost operation can be estimated by adding the existing water requirement and additional water required by the ECS compost system as summarized in Table 13.

Table 13: Proposed Compost Operations Water Requirement (gallons)

Inflow	DB-1	33,513,161	
	DB-2	11,690,332	
	Subtotal	45,203,493	
Evaporation	DB-1	5,727,846	
	DB-2	2,636,710	
	Subtotal	8,364,556	
	Existing Water Usage	64,310,506	71,410,506
	ECS Compost System	21,900,000	21,900,000
	Total Water Usage	86,210,506	93,310,506
	Available Surface Water	36,838,938	36,838,938
	Required Groundwater	49,371,568	56,471,568
	Additional Groundwater	17,771,568	17,771,568

Note: Inflow includes direct precipitation and compost facility stormwater runoff.

The total annual water requirement for the proposed project is 86.2 million to 93.3 million gallons. Subtracting the net available surface water, the annual quantity of groundwater required to supplement the surface water is 49.4 million to 56.5 million gallons, an increase of approximately 17.8 million gallons compared to the existing project.

6.0 SUMMARY

Based on the average rainfall, the annual inflow to the two detention basins is approximately 43.8 million gallons for the current compost operation and approximately 45.2 million gallons for the proposed compost operation. The annual evaporation loss is approximately 11.1 million gallons for the current compost operation and approximately 8.4 million gallons for the proposed compost operation. The resulting net available surface water is

approximately 32.7 million gallons for the current compost operation and approximately 36.8 million gallons for the proposed compost operation.

Groundwater well meter records from the site indicate that annual groundwater usage is between 31.6 and 38.7 million gallons. Therefore, the total annual water usage for the current composting operation is approximately 64.3 million to 71.4 million gallons.

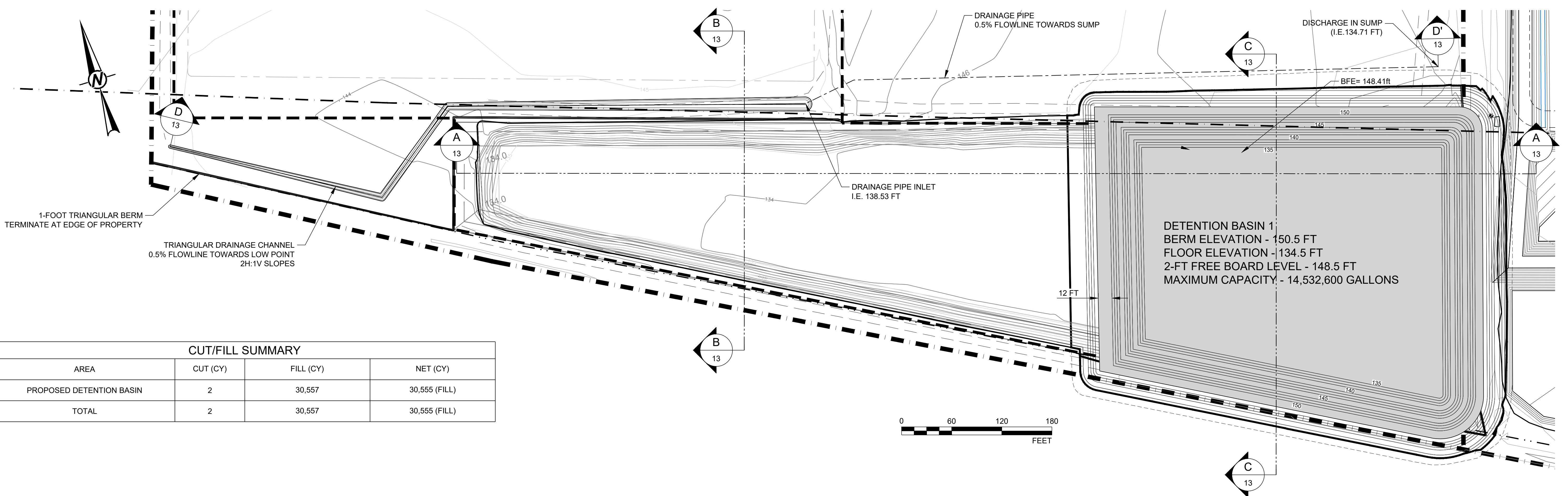
The proposed compost operation will increase the total annual water requirement by 21.9 million gallons to between approximately 86.2 and 93.3 million gallons. Additional groundwater production will be required to meet the increased annual water requirement. The annual groundwater usage will increase to between approximately 49.4 million gallons and 56.5 million gallons.

[https://golderassociates.sharepoint.com/sites/129941/project files/5 technical work/permitting/ceqa water balance calc 2022-08-15 existing operations.docx](https://golderassociates.sharepoint.com/sites/129941/project%20files/5%20technical%20work/permitting/ceqa%20water%20balance%20calc%202022-08-15%20existing%20operations.docx)

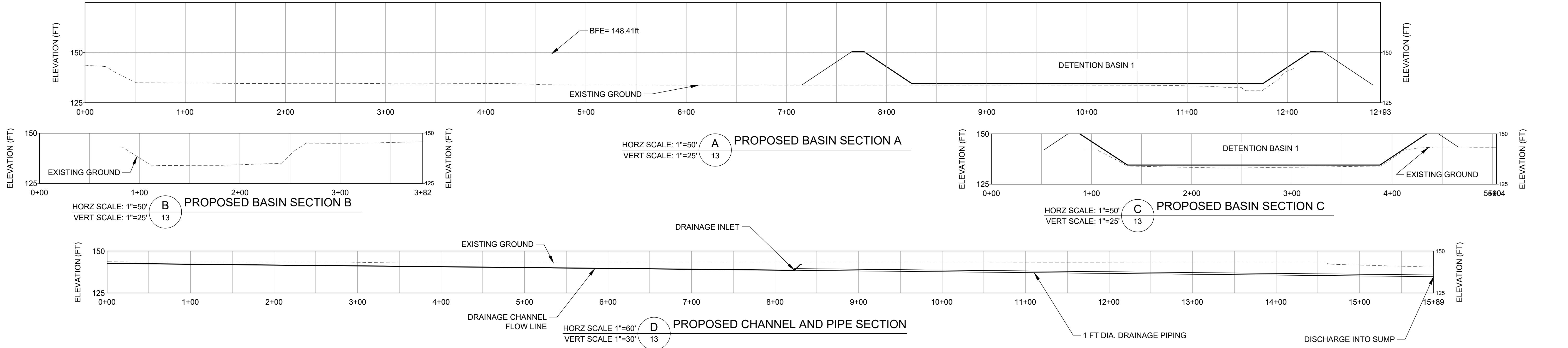
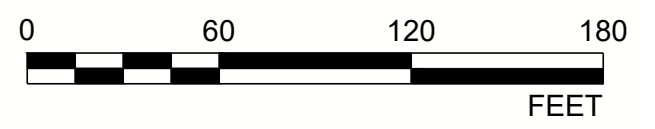
ATTACHMENT 2

Revised Drawing 13

Path: \\golder\gpc\comprodst\Office\Sacramento\Aerated\Static\Pile\Composting\Basin 1 (Sheet 13).dwg | Last Edited By: hggill | Date: 2022-08-22 | Time: 12:14:37 PM | Printed By: HSGH | Date: 2022-08-22 | Time: 12:15:03 PM




CUT/FILL SUMMARY			
AREA	CUT (CY)	FILL (CY)	NET (CY)
PROPOSED DETENTION BASIN	2	30,557	30,555 (FILL)
TOTAL	2	30,557	30,555 (FILL)



REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
6	2022-08-22	REVISED PER CEQA REVIEW COMMENTS	RDH	HSG	LMA	
5	2022-02-07	REVISED PER COUNTY COMMENTS	RDH	HSG	RDH	
4	2018-04-01	ISSUED FOR PERMIT	RDH	MAG	RDH	
3	2018-08-28	ISSUED FOR PERMIT	RDH	JMH	RDH	
2	2018-07-17	ISSUED FOR PERMIT	RDH	JDR	RDH	
1	2018-06-29	ISSUED FOR PERMIT	RDH	MAL	RDH	
0	2018-04-20	ISSUED FOR PERMIT	RDH	MAL	RDH	

CLIENT
Z-BEST COMPOST PRODUCTS
 COMPOSTING FACILITY
 GILROY, CALIFORNIA

CONSULTANT
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PROJECT
AERATED STATIC PILE COMPOSTING PERMIT PACKAGE

TITLE
PROPOSED DETENTION BASIN 1 - PLAN AND SECTION

PROJECT NO. 133-97640 COUNTY FILE NO. 6498-81-11-09G 08P 08A 08EA REV. 25 of 25 DRAWING 13

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS/D

TECHNICAL MEMORANDUM

DATE August 26, 2022
(Rev. 10/5/2022)

Project No. GL13397640

TO John Doyle
Z-Best Composting Facility

CC Richard Haughey

FROM George Wegmann, PG, CHG; Michael Bombard,
PG, CHG

EMAIL george.wegmann@wsp.com

GROUNDWATER DRAWDOWN EVALUATION, Z-BEST COMPOSTING FACILITY, GILROY, CALIFORNIA

1.0 INTRODUCTION

Golder Associates USA Inc. (Golder), a member of WSP, prepared this technical memorandum (memo) to address comments from the County of Santa Clara Department of Planning and Development regarding the potential impacts on nearby supply wells from the proposed project at the Z-Best Composting Facility in Gilroy, California.¹ Information requested by the County is stated below:

The Golder response memo also does not evaluate the potential impact on nearby water supply wells. If such an evaluation is not provided by Z-Best or their consultants, AECOM hydrologists will need to model the anticipated radius of influence for the Z-Best on-site wells and amount of drawdown anticipated at the neighboring agricultural wells using Theis's method for unsteady flow for a well (Kruseman and de Ridder 1991). The model can be run using conservative assumptions; however, the following information is requested (if available) to refine the model inputs:

o Details of the 3 existing Z-Best on-site wells and typical operation (e.g., depth to water, screening intervals, well logs, existing pump rates, typical distribution of pumping between the wells under existing and anticipated proposed use, if known—i.e., are the 3 wells pumped equally or is one used more than the others).

A Golder California Certified Hydrogeologist modeled the potential effects on neighboring wells from increasing the groundwater extraction rate from the existing onsite production well based on established hydrogeological principles as noted herein. Golder revised this memo based on AECOM's *Memorandum: Further clarification of Hydrology and Supply Analyses and the groundwater drawdown evaluation, dated September 28, 2022*. Golder's response to comments is attached to this memo.

1.1 Background

The site is in the Llagas Subbasin (DWR Basin Number 3-3.01), which is part of the Gilroy-Hollister Valley Groundwater Basin (DWR Basin Number Basin 3-3), and encompasses approximately 87 square miles (CGB, 2004). The Llagas Subbasin is comprised of unconsolidated alluvial sediments with discontinuous layers of gravel and sand (aquifer materials) and clay and silt (confining units) at various depths beneath the ground surface (Valley Water, 2021). Groundwater generally flows from north to south following the topography. The

¹ AECOM, July 20, 2022 Memorandum: Further Clarification of Previous Hydrology and Water Supply Analyses, Z-Best Composting Facility – CEQA Services, addressed to Mr. Bharat Singh, County of Santa Clara Department of Planning and Development, 70 West Hedding Street, 7th Floor East Wing San Jose, CA 95110

subbasin ranges in thickness from about 500 feet at the northern boundary to over 1,000 feet thick beneath the Pajaro River while principal aquifer zones generally occur at depths below 150 feet.

Groundwater in the groundwater basin is primarily used for public and domestic water supply and for irrigation purposes. Long-term groundwater levels are stable and demonstrate sustainable groundwater conditions where the subbasin has not been identified as being critically overdrafted (Valley Water, 2021). Operational storage capacity of the Llagas Subbasin is estimated to be 150,000 acre-feet with natural recharge is estimated to be 44,300 acre-feet per year or 14,400 million gallons per year (MGPY) (CGB, 2004).

1.2 Water Usage

There are three wells located onsite that are currently used to provide water for site operations as shown on Attachment A, Figure 1 and listed on Table 1. Golder calculated usage rates based on information provided by Z-Best, including Valley Water well meter records since 2018, as summarized below. Also included in the table is the anticipated change in production rate of 21.9 MGPY from the primary extraction well (Main Agriculture Well) as part of the proposed project. The production rates from the other onsite wells remain the same. Two other production wells, referred to as Old Well A and Well 1, are located on site; however, these wells are not currently in use.

Table 1: Groundwater Usage

Well ID	Existing Baseline Production Rate	Change in Production Rate	Anticipated Future Production Rate
Well Y (Domestic Well)	0.5 MGPY	0	0.5 MGPY
Well Z (Shared Well)	14.3 MGPY	0	14.1 MGPY
Main Agriculture Well (Primary Extraction Well)	39 MGPY	21.9 MGPY	60.7 MGPY

Main Agriculture Well is operated at an average flow rate of 381 gallons per minute (gpm), and the desired average flow rate will be 590 gpm. Well Z is operated at an average flow rate of 277 gpm and Well Y is operated at an average flow rate of 5 gpm. According to Z-Best, the wells are operated for about 33 hours per week.

1.3 Offsite Wells

Golder completed a review of California’s State Water Resources Control Board Division of Water Quality Groundwater Ambient Monitoring & Assessment Program (GAMA) database to identify offsite wells within the vicinity of the site. Production and domestic wells identified within a one-mile radius of the agriculture extraction well are shown in Figure 1 and listed in Section 2. It has not been confirmed if any of the identified wells are still in use or their production rates.

2.0 EVALUATION METHOD

Golder evaluated the potential impact of the increased pumping on water levels within one mile from the primary extraction well (referred to as Main Agriculture Well on Attachment A, Figure 1). A review of publicly available documents was completed to obtain basin-specific groundwater parameter data to calculate aquifer drawdown using the Theis solution for evaluating drawdown in a confined aquifer (Freeze and Cherry, 1979); however, specific information for the site vicinity was not identified. Z-Best provided pump test reports prepared by Integrated Water Management that provided well flow, pumping, and standing water level data. Golder was also able to obtain well logs for Well Y (domestic well), Well Z (shared well) and the Main Agriculture Well from the California Department of Water Resources Well Completion Reports Database. Copies of the well completion reports are included as Attachment B.

The well flow, and water level data was used to estimate the transmissivity (T) using Driscoll's approximation (Groundwater and Wells, Driscoll, 1986):

$$T = 2,000 \times Q / s_w$$

Where: T = transmissivity in gallons per day per foot (gpd/ft)
Q = flow in gallons per minute (gpm)
S_w = drawdown (feet)

Note: Driscoll's calculation assumes t = 1 day, r = 0.5 ft, T = 30,000 gpd/ft; S = 0.001 for a confined aquifer to calculate the factor of 2000. Using the assumed T and S to calculate the factor, errors of less than 7% were reported by Driscoll (Driscoll, 1986).

Golder used the 0.001 storativity value for our calculations. Additionally, Golder derived the average flow rate used in the calculations based on water use and operational data supplied by Z-Best. The annual usage rate of the domestic well (0.5 MGPY) is insignificant; therefore, this well was excluded from the analysis. Because the wells are operated approximately 33 hours per week or about 19.6 percent of the available hours and the model assumes continuous operation for the selected time period, use of the average flow rates listed in Section 1.2 as model values would greatly overstate the drawdown experienced at nearby wells. Therefore, proportional flow rates for Well Z's and Main Agriculture Well's current average flow rates and Main Agricultural Well's proposed average flow rate were calculated as follows:

$$\text{Average Well Flow Rate (gpm)} \times 0.196 = \text{Model Continuous Flow Rate}$$

For Well Z, the calculation is:

$$277 \text{ gpm} \times 0.196 = 54 \text{ gpm}$$

Performing the same calculations for the current and proposed average flow rates for Main Agriculture Well, results in model continuous flow rates of 75 gpm and 116 gpm, respectively. Table 2 below lists the parameters used in the calculation of potential drawdown associated with the current production rates from Well Z and Main Agriculture Well and the proposed increased production rate from Main Agriculture Well.

Table 2: Parameters Used in Drawdown Calculations

Aquifer Parameters		Well Parameters		
Main Agriculture Well (Primary Extraction Well)				
K	26 ft/dy	Q (current)	75 gpm	14,439 ft ³ /dy
S ¹	0.001	Q (proposed)	116 gpm	20,984 ft ³ /dy
b ²	497 ft	t	1, 6, 12, 60, and 120 months	
T ¹	12,707 ft ² /dy			
Well Z (Shared Well)				
K	140 ft/dy	Q (current)	54 gpm	10,396 ft ³ /dy
S ¹	2.03E-02	t	1, 6, 12, 60, and 120 months	
b ³	328 ft			
T ¹	45,875 ft ² /dy			
Well Operating Parameters				
Hours/Week	33	Weeks/Year	52	

Source: 1: Calculated using Driscoll's method from Groundwater and Wells, Driscoll 1986
2: Integrated Water Management Pump Test 7/20/2022
3: Integrated Water Management Pump Test 8/5/2022

K = hydraulic conductivity (calculated using the equation $K=T/b$)

S = Storativity

b = saturated thickness

T = Transmissivity

Q = average flow rate (adjusted in the model to be 19.6 percent of average flow rate based on well operating parameters)

t = time

The calculation of the drawdown in terms of radius and time is performed by first calculating u (a dimensionless variable necessary to performing the analytical drawdown solution), using the following equation:

$$u = \frac{r^2 S}{4Tt}$$

where:

r = radius (feet (ft)), S = storativity (dimensionless), T = Transmissivity (ft²/dy), and t = time (days)

The resultant value of u is used to derive the well function ($W(u)$) term using a table such as Table 3 below:

Table 3: Values of $W(u)$ for Various Values of u

u	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
$\times 1$	0.219	0.049	0.013	0.0038	0.0011	0.00036	0.00012	0.000038	0.000012
$\times 10^{-1}$	1.82	1.22	0.91	0.70	0.56	0.45	0.37	0.31	0.26
$\times 10^{-2}$	4.04	3.35	2.96	2.68	2.47	2.30	2.15	2.03	1.92
$\times 10^{-3}$	6.33	5.64	5.23	4.95	4.73	4.54	4.39	4.26	4.14
$\times 10^{-4}$	8.63	7.94	7.53	7.25	7.02	6.84	6.69	6.55	6.44
$\times 10^{-5}$	10.94	10.24	9.84	9.55	9.33	9.14	8.99	8.86	8.74
$\times 10^{-6}$	13.24	12.55	12.14	11.85	11.63	11.45	11.29	11.16	11.04
$\times 10^{-7}$	15.54	14.85	14.44	14.15	13.93	13.75	13.60	13.46	13.34
$\times 10^{-8}$	17.84	17.15	16.74	16.46	16.23	16.05	15.90	15.76	15.65
$\times 10^{-9}$	20.15	19.45	19.05	18.76	18.54	18.35	18.20	18.07	17.95
$\times 10^{-10}$	22.45	21.76	21.35	21.06	20.84	20.66	20.50	20.37	20.25
$\times 10^{-11}$	24.75	24.06	23.65	23.36	23.14	22.96	22.81	22.67	22.55
$\times 10^{-12}$	27.05	26.36	25.96	25.67	25.44	25.26	25.11	24.97	24.86
$\times 10^{-13}$	29.36	28.66	28.26	27.97	27.75	27.56	27.41	27.28	27.16
$\times 10^{-14}$	31.66	30.97	30.56	30.27	30.05	29.87	29.71	29.58	29.46
$\times 10^{-15}$	33.96	33.27	32.86	32.58	32.35	32.17	32.02	31.88	31.76

Source: Wenzel (1942).

The $W(u)$ term is inserted into the following equation:

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

where:

$h_0 - h$ = initial head – pumping head or drawdown (ft) at specified radius or time, Q = pumping rate (ft³/dy), T = Transmissivity (ft²/dy), $W(u)$ = dimensionless parameter derived from Table 3. Note, any system of units can be use to calculate the drawdown as long as consistent units are are used between the terms. The analysis assumes the following simplifying assumptions for the aquifer:

- horizontal
- infinite in horizontal extent
- constant thickness
- homogeneous and isotropic with respect to its hydrogeological parameters

Additional simplifying assumptions for using the analytical method are:

- there is only a single pumping well in the aquifer
- the pumping rate is constant over time
- the well diameter is infinitesimally small
- the well penetrates the entire aquifer
- the hydraulic head in the aquifer prior to pumping is uniform throughout the aquifer

Because the method assumes only one pumping well and two primary pumping wells (Main Agriculture Well and Well Z) are in use simultaneously at the site, Golder separately modelled the drawdown from the Main Agriculture Well and Well Z using the same eleven wells located within one mile of Main Agriculture Well. As noted previously, Well Y (domestic well) is excluded from the evaluation based on its minimal extraction rate and estimated drawdown. The parameters in Table 2 were then inserted into an analytical model to determine the drawdown at each off-site well based on transmissivity, pumping duration, and pumping flow rate. To model current conditions (both wells pumping simultaneously), the results of the modelled drawdown at each off-site well were summed to simulate the contribution of drawdown at the well from the simultaneous pumping at Main Agriculture Well and Well Z. The models were used to simulate drawdown for the following scenarios:

- Current drawdown based on existing baseline conditions
- Future drawdown based on proposed site operations

The model results for the above scenarios are included in Attachment C. Baseline conditions were calculated by adding the drawdown for the Main Agriculture Well and the Well Z under various timelines. The potential changes in drawdown from the project were determined by calculating an increased pumping rate of 21.9 MGPY for the Main Agriculture Well.

Table 4 below lists the offsite wells well within one mile of the Main Agriculture Well (Attachment A, Figure 1).

Table 4: Location Data for Wells Located within One-Mile Radius of Main Agricultural Well

Well ID	Distance from Main Agriculture Well (feet)	Distance from Well Z (feet)
Offsite Well No. 1	1,729	2,795
Offsite Well No. 6	2,184	2,259
Offsite Well No. 7	2,799	1,473
Offsite Well No. 5	3,012	5,743
Offsite Well No. 2	3,374	1,422
Offsite Well No. 4	3,443	4,465
Offsite Well No. 10	3,865	3,952

Well ID	Distance from Main Agriculture Well (feet)	Distance from Well Z (feet)
Offsite Well No. 8	4,025	6,910
Offsite Well No. 9	4,195	1,557
Offsite Well No. 9A	4,261	1,612
Offsite Well No. 3	5,109	4,669

For the purposes of this analysis, it is assumed that the offsite wells are screened at the same intervals and within the same units as the primary extraction well that is being modeled.

3.0 EVALUATION RESULTS

The results of the drawdown evaluation are presented in Table 5 below:

Table 5: Results of Drawdown Evaluation

Well ID	Distance from Main Agriculture Well (feet)	Calculated Change in Drawdown Over Time (feet)				
		1 month	6 months	1 year	5 years	10 years
Offsite Well No. 1	1,729	-0.23	-0.31	-0.34	-0.40	-0.43
Offsite Well No. 6	2,184	-0.21	-0.29	-0.32	-0.38	-0.41
Offsite Well No. 7	2,799	-0.19	-0.27	-0.30	-0.36	-0.39
Offsite Well No. 5	3,012	-0.19	-0.26	-0.29	-0.35	-0.38
Offsite Well No. 2	3,374	-0.18	-0.25	-0.28	-0.35	-0.37
Offsite Well No. 4	3,443	-0.18	-0.25	-0.28	-0.35	-0.37
Offsite Well No. 10	3,865	-0.17	-0.24	-0.27	-0.34	-0.36
Offsite Well No. 8	4,025	-0.16	-0.24	-0.27	-0.33	-0.36
Offsite Well No. 9	4,195	-0.16	-0.23	-0.26	-0.33	-0.36
Offsite Well No. 9A	4,261	-0.16	-0.23	-0.26	-0.33	-0.35
Offsite Well No. 3	5,109	-0.15	-0.22	-0.25	-0.31	-0.34

Notes:
Negative value indicates decreasing water level.

The additional drawdown was modeled from the increased production rate from each simulated well over five intervals: one month, 6 months, 12 months, 60 months, and 120 months. The closest offsite well (Offsite Well No. 1) is estimated to have an additional 0.23 feet of drawdown after 1 month and 0.43 feet of drawdown after 10 years. The drawdown rate decreases with time as steady state is approached.

Recharge to the groundwater system from precipitation is not considered with this evaluation. Additionally, the drawdown values calculated are based on literature-derived aquifer parameters and limited site-specific data. The use of published values, rather than site-specific data, coupled with the simplifying assumptions for the method, suggest that the calculated values represent an idealized drawdown and are likely conservative, worst-case estimates.

4.0 SUMMARY

The calculated drawdown values indicate minimal excess drawdown risk to existing offsite wells based on the increased pumping rate of 21.9 MGPY from the Main Agriculture Well.

Attachments:

- A: Figure 1
- B: Well Completion Reports
- C: Drawdown Results
- D: Response to Comments Memorandum

References:

- CGB, 2004. California's Groundwater Bulletin 118, Gilroy-Hollister Groundwater Basin, Llagas Subbasin, updated February 27, 2004.
- Driscoll, F.G., 1986. Ground Water and Wells. 2nd Edition, Johnson Division, St. Paul.
- Freeze and Cherry, 1979. Groundwater. Englewood Cliffs, N.J., Prentice-Hall.
- Valley Water, 2021. Santa Clara Valley Water District 2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasins. November 2021.

mb/gw

[https://golderassociates.sharepoint.com/sites/112344/project files/5 technical work/drawdown evaluation/revised memo/zbest_drawdown_tm_09292022.docx](https://golderassociates.sharepoint.com/sites/112344/project%20files/5%20technical%20work/drawdown%20evaluation/revised%20memo/zbest_drawdown_tm_09292022.docx)

ATTACHMENT A

Figure 1



LEGEND

- Well Location
- Well Location - Not in Use
- Parcel Line

Note: Wells within one mile of Main Agriculture Well are shown.

REFERENCE
 COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA III
 FIPS 0403 FEET

CLIENT
 Z-BEST COMPOSTING FACILITY
 GILROY, CALIFORNIA

PROJECT
 Z-BEST

TITLE
ON-SITE AND OFF-SITE WELL LOCATIONS

CONSULTANT	YYYY-MM-DD	2022-08-25
	PREPARED	SHL
	DESIGN	SHL
	REVIEW	GW
	APPROVED	

PROJECT No.	CONTROL	Rev.	FIGURE
GL13397640	---	---	1

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ATTACHMENT B

Well Completion Reports

State of California
Well Completion Report
 Form DWR 188 Auto-Completed 9/13/2021
 WCR2021-008568

Owner's Well Number _____ Date Work Began 04/21/2021 Date Work Ended 05/30/2021
 Local Permit Agency Santa Clara Valley Water District
 Secondary Permit Agency County of Santa Clara DEH Permit Number C20210317001 Permit Date 03/17/2021

Well Owner (must remain confidential pursuant to Water Code 13752)			
Name	XXXXXXXXXXXXXXXXXXXX		
Mailing Address	XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX		
City	State	XX	Zip XXXXX

Planned Use and Activity	
Activity	<u>New Well</u>
Planned Use	<u>Water Supply Irrigation - Agriculture</u>

Well Location					
Address <u>980 State 25 HWY</u>			APN <u>841-37-029</u>		
City <u>Gilroy</u>	Zip <u>95020</u>	County <u>Santa Clara</u>	Township <u>11 S</u>		
Latitude <u>36 56 47 N</u>	Longitude <u>-121 31 1 W</u>		Range <u>04 E</u>		
Deg. Min. Sec.	Deg. Min. Sec.		Section <u>27</u>		
Dec. Lat. <u>36.9463889</u>		Dec. Long. <u>-121.5169444</u>		Baseline Meridian <u>Mount Diablo</u>	
Vertical Datum _____		Horizontal Datum <u>WGS84</u>		Ground Surface Elevation <u>140</u>	
Location Accuracy <u>5 Ft</u>		Location Determination Method <u>GPS</u>		Elevation Accuracy <u>1 Ft</u>	
				Elevation Determination Method <u>GPS</u>	

Borehole Information	
Orientation <u>Vertical</u>	Specify _____
Drilling Method <u>Direct Rotary</u>	Drilling Fluid <u>Bentonite</u>
Total Depth of Boring <u>560</u>	Feet
Total Depth of Completed Well <u>551</u>	Feet

Water Level and Yield of Completed Well			
Depth to first water	<u>48</u>	(Feet below surface)	
Depth to Static	_____		
Water Level	<u>17</u> (Feet)	Date Measured	<u>05/24/2021</u>
Estimated Yield*	<u>1000</u> (GPM)	Test Type	<u>Air Lift</u>
Test Length	<u>50</u> (Hours)	Total Drawdown	<u>523</u> (feet)
*May not be representative of a well's long term yield.			

Geologic Log - Free Form		
Depth from Surface Feet to Feet		Description
0	3	Mended topsoil
3	13	Black adobe clay
13	48	Gray clay
48	67	Large gravel with cobbles
67	75	Gray sticky clay
75	90	Large gravel
90	110	Gray clay
110	135	Medium gravel
135	148	Gray clay
148	184	Small gravel
184	195	Gray swelling clay
195	210	Medium gravel
210	217	Gray clay
217	235	Rounded gravel
235	275	Gray sticky clay

275	310	Small gravel
310	327	Gray clay
327	375	Medium gravel
375	385	Gray clay
385	405	Small gravel with coarse sand
405	412	Gray clay
412	435	Medium gravel
435	443	Gray sandy clay
443	485	Tight gravel
485	505	Gray clay
505	525	Small gravel
525	530	Gray clay
530	550	Tight gravel
550	560	Cemented gray clay

Casings

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	19	Conductor or Fill Pipe	Low Carbon Steel	Grade: ASTM A53	0.25	30			
2	0	160	Blank	Low Carbon Steel	Grade: ASTM A53	0.25	16			
2	160	200	Screen	Low Carbon Steel	Grade: ASTM A53	0.25	16	Milled Slots	0.06	
2	200	351	Blank	Low Carbon Steel	Grade: ASTM A53	0.25	16			
2	351	551	Screen	Low Carbon Steel	Grade: ASTM A53	0.25	16	Milled Slots	0.06	

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	19	Cement	10.3 Sack Mix		sand slurry
0	110	Cement	10.3 Sack Mix		
110	560	Filter Pack	8 x 16		washed sand

Other Observations:

The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California
Well Completion Report

Refer to Instruction Pamphlet
No. e0087944

Page _____ of _____
Owner's Well Number _____
Date Work Began 3/16/09 Date Work Ended 5/13/09
Local Permit Agency S.C.V.W.D.
Permit Number D9400157 Permit Date 3-10-09

DWR Use Only - Do Not Fill In

11504E27E006
State Well Number/Site Number

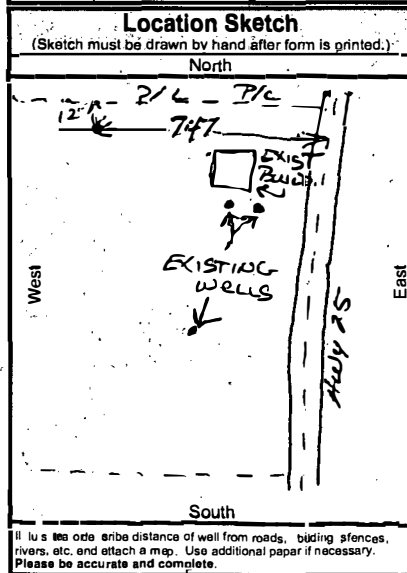
Latitude _____ N _____ W
Longitude _____

APN/TRS/Other _____

Geologic Log		
Orientation		Specify
<input checked="" type="radio"/> Vertical	<input type="radio"/> Horizontal	<input type="radio"/> Angle
Drilling Method <u>ROTARY</u>		Drilling Fluid <u>MUD</u>
Depth from Surface		Description
Feet	to Feet	Describe material, grain size, color, etc.
0	2	BASE ROCK
2	10	SANDY CLAY
10	15	SAND
15	28	BLUE CLAY
28	35	SANDY SILT
35	40	BLUE CLAY
40	44	SAND
44	68	GRAVEL
68	82	BLUE CLAY
82	84	SAND
84	93	BLUE CLAY w/ SAND STRCS
93	98	SAND
98	110	BLUE CLAY
110	122	SAND
122	130	SAND w/CLAY STRCS
130	140	SAND w/GRAVEL & SAND STRCS
140	157	SAND & GRAVEL
157	162	YELLOW CLAY
162	190	SANDY SILT
190	195	COURSE SAND
195	245	BLUE CLAY
245	263	SAND & BLUE CLAY
263	277	SAND & GRAVEL
277	218	BLUE CLAY
318	370	GRAVEL
370	377	GRAVELY SAND
377	403	GRAVEL
403	410	GRAY CLAY
Total Depth of Boring <u>410</u> Feet		
Total Depth of Completed Well <u>408</u> Feet		

Well Location

Address 980 STATE HWY 25
City GILROY County SANTA CLARA
Latitude _____ N Longitude _____ W
Datum _____ Decimal Lat. _____ Decimal Long. _____
APN Book 841 Page 37 Parcel 028
Township _____ Range _____ Section _____



Activity

New Well
 Modification/Repair
 Deepen
 Other _____
 Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

Water Supply
 Domestic Public
 Irrigation Industrial
 Cathodic Protection
 Dewatering
 Heat Exchange
 Injection
 Monitoring
 Remediation
 Sparging
 Test Well
 Vapor Extraction
 Other _____

Water Level and Yield of Completed Well

Depth to first water _____ (Feet below surface)
Depth to Static _____
Water Level 8 (Feet) Date Measured 5/13/09
Estimated Yield 2,500 (GPM) Test Type AIR
Test Length 6 HRS (Hours) Total Drawdown _____ (Feet)
*May not be representative of a well's long term yield.

Casings							
Depth from Surface	Borehole Diameter	Type	Material	Wall Thickness	Outside Diameter	Screen Type	Slot Size
Feet to Feet	(Inches)			(Inches)	(Inches)		(Inches)
0	138	24	BLANK SCH 40 PIPE	.5	15		
138	158	"	PERF	"	"	.032	.032
158	258	"	BLANK	"	"		
258	278	"	PERF	"	"	.032	
278	318	"	BLANK	"	"		
318	398	"	PERF	"	"	.032	

Annular Material			
Depth from Surface	Fill	Description	
Feet to Feet			
0	118	CONCRETE	10 SACK
118	408	SAND	COX8

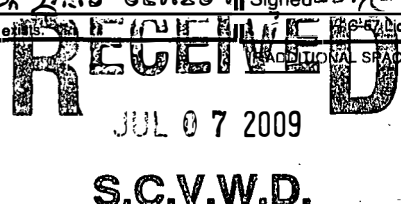
Attachments

Geologic Log
 Well Construction Diagram
 Geophysical Log(s)
 Soil/Water Chemical Analyses
 Other 2 in. 1/2" GENIE

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name ANDREW DAUGHERTY
Person, Firm, or Corporation
Address 1519 SAN MARTIN City CA State 95046 Zip
Signed [Signature] Date Signed 6/4/09 C-57 License Number 733914



*This Form-Active Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.
 File Original with DWR

Page 1 of 1
 Owner's Well Number _____
 Date Work Began 12/15
 Local Permit Agency SCWD
 Permit Number 08W00960 Permit Date 11-19-08

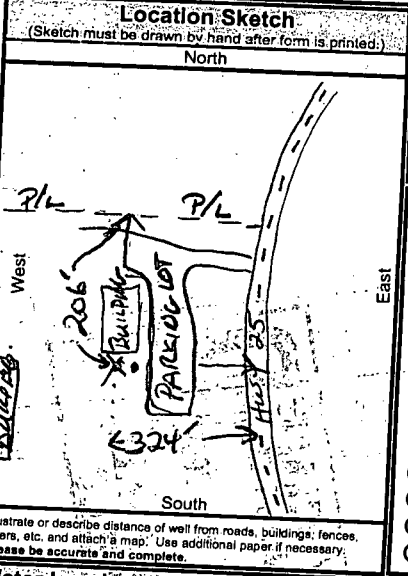
State of California
Well Completion Report
 Refer to Instruction Pamphlet
 No. e0082938

DWR Use Only - Do Not Fill In
11504E27E005
 State Well Number/Site Number
 Latitude _____ N _____ W
 Longitude _____
 APN/TRS/Other _____

Geologic Log		
Orientation		Specify
<input type="radio"/> Vertical	<input type="radio"/> Horizontal	<input type="radio"/> Angle
Drilling Method		Drilling Fluid
Depth from Surface		Description
Feet	to Feet	Describe material, grain size, color, etc.
0	5	GRAY GRAVELLY CLAY
5	13	GRAY SANDY CLAY
13	17	GRAY SILTY SAND
17	23	BLUE CLAY
23	30	BLUE CLAY WITH GRAVEL STRKS
30	40	COURSE GRAY SAND
40	45	SANDY CLAY
45	63	GRAVEL
63	75	SAND & GRAVEL
75	90	BLUE CLAY
90	100	BLUE SANDY CLAY
100	105	SAND
105	112	GRAVELLY CLAY
112	125	SAND & GRAVEL
125	163	SAND & GRAVEL
163	185	YELLOW CLAY
185	200	GRAY SAND WITH GRAVEL
200	217	GRAVELLY CLAY
217	220	SANDY CLAY
220	250	GRAY CLAY
250	264	GRAY CLAY WITH SAND STRKS
264	274	BLUE CLAY WITH SAND STRKS
274	277	GRAY GRAVELLY CLAY
277	285	GRAVEL
285	294	YELLOW GRAVELLY CLAY
294	320	BLUE CLAY
320	330	YELLOW CLAY WITH SAND STRKS
330	359	GRAVEL
359	370	BLUE CLAY W STRKS OF GRAVEL

Total Depth of Boring 370 Feet
 Total Depth of Completed Well 367 Feet

Well Location
 Address 480 STATE Highway 25
 City 1616204 County SANTA CLARA
 Latitude _____ Dec. _____ Min. _____ Sec. _____ N Longitude _____ Dec. _____ Min. _____ Sec. _____ W
 Datum _____ Decimal Lat. _____ Decimal Long. _____
 APN Book 841 Page 37 Parcel 02P
 Township _____ Range _____ Section _____



Activity
 New Well
 Modification/Repair
 Deepen
 Other
 Destroy
 Describe procedures and materials under "GEOLOGIC LOG"
 Planned Uses
 Water Supply
 Domestic Public
 Irrigation Industrial
 Cathodic Protection
 Dewatering
 Heat Exchange
 Injection
 Monitoring
 Remediation
 Sparging
 Test Well
 Vapor Extraction
 Other

Water Level and Yield of Completed Well
 Depth to first water _____ (Feet below surface)
 Depth to Static _____ (Feet below surface)
 Water Level 10 (Feet) Date Measured 12/20/08
 Estimated Yield * 100 (GPM) Test Type AIR LIFT
 Test Length 1 (Hours) Total Drawdown _____ (Feet)
 *May not be representative of a well's long term yield.

Casings						
Depth from Surface	Borehole Diameter	Type	Material	Wall Thickness	Outside Diameter	Screen Type
Feet to Feet	(Inches)			(Inches)	(Inches)	
0	327	10	BLANK PVC	200		
327	367	10	SPECIAL PVC	200		FACTORY .032

Annular Material		
Depth from Surface	Fill	Description
Feet to Feet		
0	250	CONCRETE
250	367	6 X 8 SAND

Attachments
 Geologic Log
 Well Construction Diagram
 Geophysical Log(s)
 Soil/Water Chemical Analyses
 Other
 Attach additional information, if it exists.

Certification Statement
 I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief
 Name Douglas Pump Service
 Person, Firm or Corporation
 Address P.O. Box 1519
 City SAN MARTIN State CA Zip 95046
 Signed [Signature] Date Signed 11/8/08 C-57 License Number 733914
 C-57 Licensed Water Well Contractor

ATTACHMENT C

Drawdown Results

Drawdown Evaluation Calculations 1 Month of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	gpm	$\frac{r^2}{d}$
S	1.00E-03		Duration (months)	1	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		140	Flow Rate	gpm	$\frac{r^2}{d}$
S	1.00E-03		Duration (months)	1	
b (ft)	328				
T (ft ² /dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Point ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remainder	W(u) minus	W(u) final
	1	30	12707	6.468E-10	20.58512	1.86129484	20.66	20.50	0.47	0.07488	20.59
	50	30	12707	1.617E-06	12.81427	1.158659003	13.24	12.55	0.617	0.42573	12.81
	100	30	12707	6.468E-06	11.37512	1.028531879	11.45	11.29	0.47	0.07488	11.38
	500	30	12707	0.000162	8.2022	0.741638258	8.63	7.94	0.62	0.4278	8.20
	1000	30	12707	0.000647	6.76950	0.612094339	6.84	6.69	0.47	0.0705	6.77
	1500	30	12707	0.001455	6.01605	0.543967819	6.33	5.64	0.455	0.31395	6.02
Offsite Well No. 1	1729	30	12707	0.001933	5.69	0.514145682	6.33	5.64	0.933	0.64377	5.69
	2000	30	12707	0.002587	5.39933	0.488204347	5.64	5.23	0.587	0.24067	5.40
Offsite Well No. 6	2184	30	12707	0.003085	5.2062	0.470741642	5.23	4.95	0.085	0.0238	5.21
	2500	30	12707	0.004043	4.94054	0.446720816	4.95	4.73	0.043	0.00946	4.94
Offsite Well No. 7	2799	30	12707	0.005069	4.71689	0.42649851	4.73	4.54	0.069	0.01311	4.72
	3000	30	12707	0.005821	4.5740	0.413579382	4.73	4.54	0.821	0.15599	4.57
Offsite Well No. 5	3012	30	12707	0.005869	4.56489	0.412754757	4.73	4.54	0.869	0.16511	4.56
Offsite Well No. 2	3374	30	12707	0.007363	4.34281	0.392674441	4.39	4.26	0.363	0.04719	4.34
Offsite Well No. 4	3443	30	12707	0.007667	4.30329	0.389101034	4.39	4.26	0.667	0.08671	4.30
	3500	30	12707	0.007923	4.27001	0.386091875	4.39	4.26	0.923	0.11999	4.27
Offsite Well No. 10	3865	30	12707	0.009664	4.0736	0.368332595	4.14	4.04	0.664	0.0664	4.07
	4000	30	12707	0.010349	4.015919	0.363117111	4.04	3.35	0.0349	0.024081	4.02
Offsite Well No. 8	4025	30	12707	0.010479	4.006949	0.362306049	4.04	3.35	0.0479	0.033051	4.01
Offsite Well No. 9	4195	30	12707	0.011384	3.944504	0.356659808	4.04	3.35	0.1384	0.095496	3.94
Offsite Well No. 9A	4261	30	12707	0.011745	3.919595	0.35440755	4.04	3.35	0.1745	0.120405	3.92
	4500	30	12707	0.013098	3.826238	0.345966263	4.04	3.35	0.3098	0.213762	3.83
	5000	30	12707	0.016170	3.61427	0.326800237	4.04	3.35	0.617	0.42573	3.61
Offsite Well No. 3	5109	30	12707	0.016883	3.565073	0.322351873	4.04	3.35	0.6883	0.474927	3.57
	5280	30	12707	0.018032	3.485792	0.31518333	4.04	3.35	0.8032	0.554208	3.49

Well Z

Point ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remainder	W(u) minus	W(u) final
	1	30	45875	1.792E-10	21.90352	0.394989	22.45	21.76	0.79	0.54648	21.90
	50	30	45875	4.479E-07	14.04462	0.253269	14.15	13.93	0.479	0.10538	14.04
	100	30	45875	1.792E-06	12.69352	0.228904	13.24	12.55	0.79	0.54648	12.69
	500	30	45875	0.00004479	9.44462	0.170316	9.55	9.33	0.479	0.10538	9.44
	1000	30	45875	0.0001792	8.08352	0.145771	8.63	7.94	0.79	0.54648	8.08
Offsite Well No. 2	1422	30	45875	0.000362	7.3564	0.132659	7.53	7.25	0.62	0.1736	7.36
Offsite Well No. 7	1473	30	45875	0.000389	7.2808	0.131296	7.53	7.25	0.89	0.2492	7.28
	1500	30	45875	0.000403	7.2431	0.130616	7.25	7.02	0.030	0.0069	7.24
Offsite Well No. 9	1557	30	45875	0.000434	7.1718	0.12933	7.25	7.02	0.34	0.0782	7.17
Offsite Well No. 9A	1612	30	45875	0.000466	7.0982	0.128003	7.25	7.02	0.66	0.1518	7.10
	2000	30	45875	0.000717	6.6662	0.120213	6.69	6.55	0.170	0.0238	6.67
Offsite Well No. 6	2259	30	45875	0.000914	6.4246	0.115856	6.44	6.33	0.140	0.0154	6.42
	2500	30	45875	0.001120	6.2472	0.112657	6.33	5.64	0.12	0.0828	6.25
Offsite Well No. 1	2795	30	45875	0.001400	6.05	0.109173	6.33	5.64	0.400	0.276	6.05
	3000	30	45875	0.001612	5.9077	0.106535	6.33	5.64	0.612	0.42228	5.91
	3500	30	45875	0.002195	5.56005	0.100265	5.64	5.23	0.195	0.07995	5.56
Offsite Well No. 10	3952	30	45875	0.002799	5.31241	0.095799	5.64	5.23	0.799	0.32759	5.31
	4000	30	45875	0.002867	5.28453	0.095297	5.64	5.23	0.867	0.35547	5.28
Offsite Well No. 4	4465	30	45875	0.003573	5.06956	0.09142	5.23	4.95	0.573	0.16044	5.07
	4500	30	45875	0.003628	5.05416	0.091142	5.23	4.95	0.628	0.17584	5.05
Offsite Well No. 3	4669	30	45875	0.003905	4.9766	0.089744	5.23	4.95	0.905	0.2534	4.98
	5000	30	45875	0.004479	4.84462	0.087364	4.95	4.73	0.479	0.10538	4.84
	5280	30	45875	0.004995	4.7311	0.085317	4.95	4.73	0.995	0.2189	4.73
Offsite Well No. 5	5743	30	45875	0.005909	3.515186	0.06339	4.04	3.35	0.7606	0.524814	3.52
Offsite Well No. 8	6910	30	45875	0.008554	2.919764	0.052653	2.96	2.68	0.1437	0.040236	2.92

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	gpm	$\frac{r^2}{d}$
S	1.00E-03		Duration (months)	1	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Point ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	Upper	Lower	der	minus	final
	1	30	12707	6.468E-10	20.58512	2.878802685	20.66	20.50	0.47	0.07488	20.59
	50	30	12707	1.617E-06	12.81427	1.792059259	13.24	12.55	0.617	0.42573	12.81
	100	30	12707	6.468E-06	11.37512	1.590795973	11.45	11.29	0.47	0.07488	11.38
	500	30	12707	0.000162	8.2022	1.147067172	8.63	7.94	0.62	0.4278	8.20
	1000	30	12707	0.000647	6.76950	0.946705911	6.84	6.69	0.47	0.0705	6.77
	1500	30	12707	0.001455	6.01605	0.841336893	6.33	5.64	0.455	0.31395	6.02
Offsite Well No. 1	1729	30	12707	0.001933	5.69	0.795211988	6.33	5.64	0.933	0.64377	5.69
	2000	30	12707	0.002587	5.39933	0.75508939	5.64	5.23	0.587	0.24067	5.40
Offsite Well No. 6	2184	30	12707	0.003085	5.2062	0.728080407	5.23	4.95	0.085	0.0238	5.21
	2500	30	12707	0.004043	4.94054	0.690928196	4.95	4.73	0.043	0.00946	4.94
Offsite Well No. 7	2799	30	12707	0.005069	4.71689	0.659651029	4.73	4.54	0.069	0.01311	4.72
	3000	30	12707	0.005821	4.5740	0.639669444	4.73	4.54	0.821	0.15599	4.57
Offsite Well No. 5	3012	30	12707	0.005869	4.56489	0.638394024	4.73	4.54	0.869	0.16511	4.56
Offsite Well No. 2	3374	30	12707	0.007363	4.34281	0.60733642	4.39	4.26	0.363	0.04719	4.34
Offsite Well No. 4	3443	30	12707	0.007667	4.30329	0.601809599	4.39	4.26	0.667	0.08671	4.30
	3500	30	12707	0.007923	4.27001	0.597155433	4.39	4.26	0.923	0.11999	4.27
Offsite Well No. 10	3865	30	12707	0.009664	4.0736	0.569687746	4.14	4.04	0.664	0.0664	4.07
	4000	30	12707	0.010349	4.015919	0.561621132	4.04	3.35	0.0349	0.024081	4.02
Offsite Well No. 8	4025	30	12707	0.010479	4.006949	0.560366689	4.04	3.35	0.0479	0.033051	4.01
Offsite Well No. 9	4195	30	12707	0.011384	3.944504	0.551633836	4.04	3.35	0.1384	0.095496	3.94
Offsite Well No. 9A	4261	30	12707	0.011745	3.919595	0.548150344	4.04	3.35	0.1745	0.120405	3.92
	4500	30	12707	0.013098	3.826238	0.535094487	4.04	3.35	0.3098	0.213762	3.83
	5000	30	12707	0.016170	3.61427	0.505451034	4.04	3.35	0.617	0.42573	3.61
Offsite Well No. 3	5109	30	12707	0.016883	3.565073	0.498570896	4.04	3.35	0.6883	0.474927	3.57
	5280	30	12707	0.018032	3.485792	0.48748355	4.04	3.35	0.8032	0.554208	3.49

Current Operation

Point ID	radius (ft)	h ₀ -h (ft)
	1	1.41
	50	1.26
	100	0.91
	500	0.76
	1000	0.68
	1500	0.67
Offsite Well No. 1	1729	0.62
	2000	0.61
Offsite Well No. 6	2184	0.59
	2500	0.56
Offsite Well No. 7	2799	0.56
	3000	0.52
Offsite Well No. 5	3012	0.48
Offsite Well No. 2	3374	0.53
Offsite Well No. 4	3443	0.48
	3500	0.49
Offsite Well No. 10	3865	0.

Drawdown Evaluation Calculations 6 Months of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	6	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		140	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	6	
b (ft)	328				
T (ft ² /dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	183	12707	1.078E-10	22.39618	2.025049855	22.45	21.76	0.08	0.05382	22.40
	50	183	12707	2.695E-07	14.56505	1.316963535	14.85	14.44	0.695	0.28495	14.57
	100	183	12707	1.078E-06	13.18618	1.192286894	13.24	12.55	0.08	0.05382	13.19
	500	183	12707	0.000027	9.962	0.900758373	10.24	9.84	0.695	0.278	9.96
	1000	183	12707	0.000108	8.57480	0.775328538	8.63	7.94	0.08	0.0552	8.57
	1500	183	12707	0.000243	7.7637	0.701989337	7.94	7.53	0.430	0.1763	7.76
Offsite Well No. 1	1729	183	12707	0.000322	7.47	0.675288479	7.53	7.25	0.220	0.0616	7.47
	2000	183	12707	0.000431	7.1787	0.64909397	7.25	7.02	0.310	0.0713	7.18
Offsite Well No. 6	2184	183	12707	0.000514	6.9948	0.632465837	7.02	6.84	0.140	0.0252	6.99
	2500	183	12707	0.000674	6.729	0.608432352	6.84	6.69	0.74	0.111	6.73
Offsite Well No. 7	2799	183	12707	0.000845	6.50105	0.587821243	6.55	6.44	0.445	0.04895	6.50
	3000	183	12707	0.000970	6.3630	0.57533884	6.44	6.33	0.7	0.077	6.36
Offsite Well No. 5	3012	183	12707	0.000978	6.3542	0.574543149	6.44	6.33	0.78	0.0858	6.35
Offsite Well No. 2	3374	183	12707	0.001227	6.17337	0.558192603	6.33	5.64	0.227	0.15663	6.17
Offsite Well No. 4	3443	183	12707	0.001278	6.13818	0.555010744	6.33	5.64	0.278	0.19182	6.14
	3500	183	12707	0.001321	6.10851	0.552327999	6.33	5.64	0.321	0.22149	6.11
Offsite Well No. 10	3865	183	12707	0.001611	5.90841	0.534235071	6.33	5.64	0.611	0.42159	5.91
	4000	183	12707	0.001725	5.82975	0.527122679	6.33	5.64	0.725	0.50025	5.83
OffSite Well No. 8	4025	183	12707	0.001746	5.81526	0.525812501	6.33	5.64	0.746	0.51474	5.82
Offsite Well No. 9	4195	183	12707	0.001897	5.71107	0.5163917	6.33	5.64	0.897	0.61893	5.71
Offsite Well No. 9A	4261	183	12707	0.001957	5.66967	0.512648336	6.33	5.64	0.957	0.66033	5.67
	4500	183	12707	0.002183	5.56497	0.503181422	5.64	5.23	0.183	0.07503	5.56
	5000	183	12707	0.002695	5.35505	0.484200575	5.64	5.23	0.695	0.28495	5.36
Offsite Well No. 3	5109	183	12707	0.002814	5.30626	0.479789011	5.64	5.23	0.814	0.33374	5.31
	5280	183	12707	0.003005	5.2286	0.472767037	5.23	4.95	0.005	0.0014	5.23

Well Z

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	183	45875	2.986E-11	21.90352	0.394989	22.45	21.76	0.79	0.54648	21.90
	50	183	45875	7.465E-08	14.04462	0.253269	14.15	13.93	0.479	0.10538	14.04
	100	183	45875	2.986E-07	12.69352	0.228904	13.24	12.55	0.79	0.54648	12.69
	500	183	45875	0.00000747	9.44462	0.170316	9.55	9.33	0.479	0.10538	9.44
	1000	183	45875	0.0000299	8.08352	0.145771	8.63	7.94	0.79	0.54648	8.08
Offsite Well No. 2	1422	183	45875	0.000060	7.3564	0.132659	7.53	7.25	0.62	0.1736	7.36
Offsite Well No. 7	1473	183	45875	0.000065	7.2808	0.131296	7.53	7.25	0.89	0.2492	7.28
	1500	183	45875	0.000067	7.2431	0.130616	7.25	7.02	0.030	0.0069	7.24
Offsite Well No. 9	1557	183	45875	0.000072	7.1718	0.12933	7.25	7.02	0.34	0.0782	7.17
Offsite Well No. 9A	1612	183	45875	0.000078	7.0982	0.128003	7.25	7.02	0.66	0.1518	7.10
	2000	183	45875	0.000119	6.6662	0.120213	6.69	6.55	0.170	0.0238	6.67
Offsite Well No. 6	2259	183	45875	0.000152	6.4246	0.115856	6.44	6.33	0.140	0.0154	6.42
	2500	183	45875	0.000187	6.2472	0.112657	6.33	5.64	0.12	0.0828	6.25
Offsite Well No. 1	2795	183	45875	0.000233	6.05	0.109173	6.33	5.64	0.400	0.276	6.05
	3000	183	45875	0.000269	5.9077	0.106535	6.33	5.64	0.612	0.42228	5.91
	3500	183	45875	0.000366	5.56005	0.100265	5.64	5.23	0.195	0.07995	5.56
Offsite Well No. 10	3952	183	45875	0.000466	5.31241	0.095799	5.64	5.23	0.799	0.32759	5.31
	4000	183	45875	0.000478	5.28453	0.095297	5.64	5.23	0.867	0.35547	5.28
Offsite Well No. 4	4465	183	45875	0.000595	5.06956	0.09142	5.23	4.95	0.573	0.16044	5.07
	4500	183	45875	0.000605	5.05416	0.091142	5.23	4.95	0.628	0.17584	5.05
Offsite Well No. 3	4669	183	45875	0.000651	4.9766	0.089744	5.23	4.95	0.905	0.2534	4.98
	5000	183	45875	0.000747	4.84462	0.087364	4.95	4.73	0.479	0.10538	4.84
	5280	183	45875	0.000832	4.7311	0.085317	4.95	4.73	0.995	0.2189	4.73
Offsite Well No. 5	5743	183	45875	0.000985	3.515186	0.06339	4.04	3.35	0.7606	0.524814	3.52
OffSite Well No. 8	6910	183	45875	0.001426	2.919764	0.052653	2.96	2.68	0.1437	0.040236	2.92

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	6	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	183	12707	1.078E-10	22.39618	3.132077108	22.45	21.76	0.08	0.05382	22.40
	50	183	12707	2.695E-07	14.56505	2.036903601	14.85	14.44	0.695	0.28495	14.57
	100	183	12707	1.078E-06	13.18618	1.844070396	13.24	12.55	0.08	0.05382	13.19
	500	183	12707	0.000027	9.962	1.39317295	10.24	9.84	0.695	0.278	9.96
	1000	183	12707	0.000108	8.57480	1.199174805	8.63	7.94	0.08	0.0552	8.57
	1500	183	12707	0.000243	7.7637	1.085743508	7.94	7.53	0.430	0.1763	7.76
Offsite Well No. 1	1729	183	12707	0.000322	7.47	1.044446181	7.53	7.25	0.220	0.0616	7.47
	2000	183	12707	0.000431	7.1787	1.003932007	7.25	7.02	0.310	0.0713	7.18
Offsite Well No. 6	2184	183	12707	0.000514	6.9948	0.978213827	7.02	6.84	0.140	0.0252	6.99
	2500	183	12707	0.000674	6.729	0.941042038	6.84	6.69	0.74	0.111	6.73
Offsite Well No. 7	2799	183	12707	0.000845	6.50105	0.909163522	6.55	6.44	0.445	0.04895	6.50
	3000	183	12707	0.000970	6.3630	0.889857406	6.44	6.33	0.7	0.077	6.36
Offsite Well No. 5	3012	183	12707	0.000978	6.3542	0.888626737	6.44	6.33	0.78	0.0858	6.35
Offsite Well No. 2	3374	183	12707	0.001227	6.17337	0.863337893	6.33	5.64	0.227	0.15663	6.17
Offsite Well No. 4	3443	183	12707	0.001278	6.13818	0.858416617	6.33	5.64	0.278	0.19182	6.14
	3500	183	12707	0.001321	6.10851	0.854267305	6.33	5.64	0.321	0.22149	6.11
Offsite Well No. 10	3865	183	12707	0.001611	5.90841	0.826283576	6.33	5.64	0.611	0.42159	5.91
	4000	183	12707	0.001725	5.82975	0.815283076	6.33	5.64	0.725	0.50025	5.83
OffSite Well No. 8	4025	183	12707	0.001746	5.81526	0.813256668	6.33	5.64	0.746	0.51474	5.82
Offsite Well No. 9	4195	183	12707	0.001897	5.71107	0.79868583	6.33	5.64	0.897	0.61893	5.71
Offsite Well No. 9A	4261	183	12707	0.001957	5.66967	0.792896093	6.33	5.64	0.957	0.66033	5.67
	4500	183	12707	0.002183	5.56497	0.778253932	5.64	5.23	0.183	0.07503	5.56
	5000	183	12707	0.002695	5.35505	0.748896889	5.64	5.23	0.695	0.28495	5.36
Offsite Well No. 3	5109	183	12707	0.002814	5.30626	0.74207367	5.64	5.23	0.814	0.33374	5.31
	5280	183	12707	0.003005	5.2286	0.731213018	5.23	4.95	0.005	0.0014	5.23

Current Operation

Well ID	Distance (ft)	Combined h ₀ -h (ft)
	1	2.42
	50	1.57
	100	1.42
	500	1.07
	1000	0.92
	1500	0.83
Offsite Well No. 1	1729	0.78
	2000	0.77
Offsite Well No. 6	2184	0.75
	2500	0.72
Offsite Well No. 7	2799	0.72
	3000	0.67
Offsite Well No. 5	3012	0.64
Offsite Well No. 2	3374	0.69
Offsite Well No. 4	3443	0.65
	3500	0.65
Offsite Well No. 10		

Drawdown Evaluation Calculations 12 Months of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	12	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		140	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	12	
b (ft)	328				
T (ft ² /dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	365	12707	5.390E-11	23.0698	2.085958192	23.14	22.96	0.39	0.0702	23.07
	50	365	12707	1.348E-07	15.29988	1.383406446	15.54	14.85	0.348	0.24012	15.30
	100	365	12707	5.390E-07	13.8598	1.253195231	13.93	13.75	0.39	0.0702	13.86
	500	365	12707	0.000013	10.73	0.970200496	10.94	10.24	0.3	0.21	10.73
	1000	365	12707	0.000054	9.25400	0.836744145	9.33	9.14	0.4	0.076	9.25
	1500	365	12707	0.000121	8.4851	0.767217915	8.63	7.94	0.210	0.1449	8.49
Offsite Well No. 1	1729	30	12707	0.001933	8.21	0.742262152	8.63	7.94	0.610	0.4209	8.21
	2000	30	12707	0.002587	7.8744	0.711998768	7.94	7.53	0.160	0.0656	7.87
Offsite Well No. 6	2184	30	12707	0.003085	7.7063	0.696799262	7.94	7.53	0.570	0.2337	7.71
	2500	30	12707	0.004043	7.4264	0.671490863	7.53	7.25	0.37	0.1036	7.43
Offsite Well No. 7	2799	30	12707	0.005069	7.1994	0.650965652	7.25	7.02	0.22	0.0506	7.20
	3000	365	12707	0.000485	7.0545	0.637863877	7.25	7.02	0.85	0.1955	7.05
Offsite Well No. 5	3012	30	12707	0.005869	7.0453	0.637032018	7.25	7.02	0.89	0.2047	7.05
Offsite Well No. 2	3374	30	12707	0.007363	6.819	0.616570101	6.84	6.69	0.14	0.021	6.82
Offsite Well No. 4	3443	30	12707	0.007667	6.7815	0.613179372	6.84	6.69	0.39	0.0585	6.78
	3500	30	12707	0.007923	6.75	0.61033116	6.84	6.69	0.6	0.09	6.75
Offsite Well No. 10	3865	30	12707	0.009664	6.5445	0.591749967	6.55	6.44	0.05	0.0055	6.54
	4000	30	12707	0.010349	6.4818	0.586080669	6.55	6.44	0.62	0.0682	6.48
OffSite Well No. 8	4025	30	12707	0.010479	6.4697	0.584986593	6.55	6.44	0.73	0.0803	6.47
Offsite Well No. 9	4195	30	12707	0.011384	6.3861	0.577427529	6.44	6.33	0.49	0.0539	6.39
Offsite Well No. 9A	4261	30	12707	0.011745	6.3531	0.574443688	6.44	6.33	0.79	0.0869	6.35
	4500	30	12707	0.013098	6.26721	0.566677563	6.33	5.64	0.091	0.06279	6.27
	5000	30	12707	0.016170	6.08988	0.550643485	6.33	5.64	0.348	0.24012	6.09
Offsite Well No. 3	5109	30	12707	0.016883	6.04917	0.54696251	6.33	5.64	0.407	0.28083	6.05
	5280	30	12707	0.018032	5.98293	0.540973127	6.33	5.64	0.503	0.34707	5.98

Well Z

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	365	45875	1.493E-11	24.40983	0.440186	24.75	24.06	0.49	0.34017	24.41
	50	365	45875	3.733E-08	16.53476	0.298174	16.74	16.46	0.733	0.20524	16.53
	100	365	45875	1.493E-07	15.19983	0.274101	15.54	14.85	0.49	0.34017	15.20
	500	365	45875	0.0000373	11.92743	0.215089	12.14	11.85	0.733	0.21257	11.93
	1000	365	45875	0.000149	10.59490	0.191059	10.94	10.24	0.49	0.3451	10.59
Offsite Well No. 2	1422	365	45875	0.000030	9.84	0.177446	9.84	9.55	0	0	9.84
Offsite Well No. 7	1473	365	45875	0.000032	9.782	0.1764	9.84	9.55	0.2	0.058	9.78
	1500	365	45875	0.000034	9.724	0.175354	9.84	9.55	0.400	0.116	9.72
Offsite Well No. 9	1557	365	45875	0.000036	9.666	0.174308	9.84	9.55	0.6	0.174	9.67
Offsite Well No. 9A	1612	365	45875	0.000039	9.579	0.172739	9.84	9.55	0.9	0.261	9.58
	2000	365	45875	0.000060	9.14	0.164823	9.14	8.99	0.000	0	9.14
Offsite Well No. 6	2259	365	45875	0.000076	8.912	0.160711	8.99	8.86	0.6	0.078	8.91
	2500	365	45875	0.000093	8.707	0.157015	8.74	8.63	0.3	0.033	8.71
Offsite Well No. 1	2795	365	45875	0.000117	8.51	0.153511	8.63	7.94	0.170	0.1173	8.51
	3000	365	45875	0.000134	8.3954	0.151395	8.63	7.94	0.34	0.2346	8.40
	3500	365	45875	0.000183	8.0573	0.145298	8.63	7.94	0.83	0.5727	8.06
Offsite Well No. 10	3952	365	45875	0.000233	7.8047	0.140743	7.94	7.53	0.33	0.1353	7.80
	4000	365	45875	0.000239	7.7801	0.1403	7.94	7.53	0.39	0.1599	7.78
Offsite Well No. 4	4465	365	45875	0.000298	7.5382	0.135937	7.94	7.53	0.98	0.4018	7.54
	4500	365	45875	0.000302	7.5244	0.135689	7.53	7.25	0.02	0.0056	7.52
Offsite Well No. 3	4669	365	45875	0.000325	7.46	0.134527	7.53	7.25	0.25	0.07	7.46
	5000	365	45875	0.000373	7.3256	0.132104	7.53	7.25	0.73	0.2044	7.33
	5280	365	45875	0.000416	7.2132	0.130077	7.25	7.02	0.16	0.0368	7.21
Offsite Well No. 5	5743	365	45875	0.000492	7.0384	0.126924	7.25	7.02	0.92	0.2116	7.04
OffSite Well No. 8	6910	365	45875	0.000713	6.6718	0.120314	6.69	6.55	0.13	0.0182	6.67

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	12	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	365	12707	5.390E-11	23.0698	3.226282003	23.14	22.96	0.39	0.0702	23.07
	50	365	12707	1.348E-07	15.29988	2.139668636	15.54	14.85	0.348	0.24012	15.30
	100	365	12707	5.390E-07	13.8598	1.938275291	13.93	13.75	0.39	0.0702	13.86
	500	365	12707	0.000013	10.73	1.500576767	10.94	10.24	0.3	0.21	10.73
	1000	365	12707	0.000054	9.25400	1.294160056	9.33	9.14	0.4	0.076	9.25
	1500	365	12707	0.000121	8.4851	1.186630375	8.63	7.94	0.210	0.1449	8.49
Offsite Well No. 1	1729	365	12707	0.000161	8.21	1.148032128	8.63	7.94	0.610	0.4209	8.21
	2000	365	12707	0.000216	7.8744	1.101224762	7.94	7.53	0.160	0.0656	7.87
Offsite Well No. 6	2184	365	12707	0.000257	7.7063	1.077716192	7.94	7.53	0.570	0.2337	7.71
	2500	365	12707	0.000337	7.4264	1.038572535	7.53	7.25	0.37	0.1036	7.43
Offsite Well No. 7	2799	365	12707	0.000422	7.1994	1.006826876	7.25	7.02	0.22	0.0506	7.20
	3000	365	12707	0.000485	7.0545	0.986562796	7.25	7.02	0.85	0.1955	7.05
Offsite Well No. 5	3012	365	12707	0.000489	7.0453	0.985276188	7.25	7.02	0.89	0.2047	7.05
Offsite Well No. 2	3374	365	12707	0.000614	6.819	0.953628422	6.84	6.69	0.14	0.021	6.82
Offsite Well No. 4	3443	365	12707	0.000639	6.7815	0.948384095	6.84	6.69	0.39	0.0585	6.78
	3500	365	12707	0.000660	6.75	0.943978861	6.84	6.69	0.6	0.09	6.75
Offsite Well No. 10	3865	365	12707	0.000805	6.5445	0.915239949	6.55	6.44	0.05	0.0055	6.54
	4000	365	12707	0.000862	6.4818	0.906471434	6.55	6.44	0.62	0.0682	6.48
OffSite Well No. 8	4025	365	12707	0.000873	6.4697	0.904779265	6.55	6.44	0.73	0.0803	6.47
Offsite Well No. 9	4195	365	12707	0.000949	6.3861	0.893087912	6.44	6.33	0.49	0.0539	6.39
Offsite Well No. 9A	4261	365	12707	0.000979	6.3531	0.888472904	6.44	6.33	0.79	0.0869	6.35
	4500	365	12707	0.001091	6.26721	0.876461297	6.33	5.64	0.091	0.06279	6.27
	5000	365	12707	0.001348	6.08988	0.851661924	6.33	5.64	0.348	0.24012	6.09
Offsite Well No. 3	5109	365	12707	0.001407	6.04917	0.845968682	6.33	5.64	0.407	0.28083	6.05
	5280	365	12707	0.001503	5.98293	0.836705103	6.33	5.64	0.503	0.34707	5.98

Current Operation

Well ID	Distance (ft)	Combined h ₀ -h (ft)
	1	2.53
	50	1.68
	100	1.53
	500	1.19
	1000	1.03
	1500	0.94
Offsite Well No. 1	1729	0.90
	2000	0.88
Offsite Well No. 6	2184	0.86
	2500	0.83
Offsite Well No. 7	2799	0.83
	3000	0.79
Offsite Well No. 5	3012	0.76
Offsite Well No. 2	3374	0.79
Offsite Well No. 4	3443	0.75
	3500	0.76
Offsite Well No. 10	3865	0.73
	4000	0.73
OffSite Well No. 8	4025	0.71
Offsite Well No. 9	4195	0.75
Offsite Well No. 9A	4261	0.75
	4500	0.70
	5000	0.68
Offsite Well No. 3	5109	0.68
	5280	0.67

Additional Main Ag Well Pumping

Drawdown Evaluation Calculations 60 Months of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	75	ft ³ /d
S	1.00E-03		Duration (months)	60	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		140	Flow Rate	54	ft ³ /d
S	1.00E-03		Duration (months)	60	
b (ft)	328				
T (ft ² /dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	1825	12707	1.078E-11	24.69618	2.233014546	24.75	24.06	0.08	0.05382	24.70
	50	1825	12707	2.695E-08	16.86505	1.524928227	17.15	16.74	0.695	0.28495	16.87
	100	1825	12707	1.078E-07	15.48618	1.400251586	15.54	14.85	0.08	0.05382	15.49
	500	1825	12707	0.000003	12.263	1.108813484	12.55	12.14	0.7	0.287	12.26
	1000	1825	12707	0.000011	10.87000	0.982859216	10.94	10.24	0.1	0.07	10.87
	1500	1825	12707	0.000024	10.08	0.911427866	10.24	9.84	0.400	0.16	10.08
Offsite Well No. 1	1729	1825	12707	0.000032	9.78	0.884482875	9.84	9.55	0.200	0.058	9.78
	2000	1825	12707	0.000043	9.484	0.857537885	9.55	9.33	0.300	0.066	9.48
Offsite Well No. 6	2184	1825	12707	0.000051	9.311	0.841895323	9.33	9.14	0.100	0.019	9.31
	2500	1825	12707	0.000067	9.035	0.81693956	9.14	8.99	0.7	0.105	9.04
Offsite Well No. 7	2799	1825	12707	0.000084	8.812	0.796776027	8.86	8.74	0.4	0.048	8.81
	3000	1825	12707	0.000097	8.6630	0.783303532	8.74	8.63	0.7	0.077	8.66
Offsite Well No. 5	3012	1825	12707	0.000098	8.652	0.782308918	8.74	8.63	0.8	0.088	8.65
Offsite Well No. 2	3374	1825	12707	0.000123	8.4713	0.765970127	8.63	7.94	0.23	0.1587	8.47
Offsite Well No. 4	3443	1825	12707	0.000128	8.4368	0.762850656	8.63	7.94	0.28	0.1932	8.44
	3500	1825	12707	0.000132	8.4092	0.76035508	8.63	7.94	0.32	0.2208	8.41
Offsite Well No. 10	3865	1825	12707	0.000161	8.2091	0.742262152	8.63	7.94	0.61	0.4209	8.21
	4000	1825	12707	0.000172	8.1332	0.735399317	8.63	7.94	0.72	0.4968	8.13
OffSite Well No. 8	4025	1825	12707	0.000175	8.1125	0.733527635	8.63	7.94	0.75	0.5175	8.11
Offsite Well No. 9	4195	1825	12707	0.000190	8.009	0.724169224	8.63	7.94	0.9	0.621	8.01
Offsite Well No. 9A	4261	1825	12707	0.000196	7.9676	0.720425859	8.63	7.94	0.96	0.6624	7.97
	4500	1825	12707	0.000218	7.6202	0.689014149	7.94	7.53	0.78	0.3198	7.62
	5000	1825	12707	0.000270	5.847	0.528682414	6.33	5.64	0.7	0.483	5.85
Offsite Well No. 3	5109	1825	12707	0.000281	7.6079	0.68790199	7.94	7.53	0.81	0.3321	7.61
	5280	1825	12707	0.000301	7.5272	0.680605142	7.53	7.25	0.01	0.0028	7.53

Well Z

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	1825	45875	2.986E-12	25.9656	0.468241	26.36	25.96	0.99	0.3944	25.97
	50	1825	45875	7.465E-09	18.13955	0.327113	18.20	18.07	0.465	0.06045	18.14
	100	1825	45875	2.986E-08	16.74574	0.301978	17.15	16.74	0.99	0.40426	16.75
	500	1825	45875	0.00000075	13.53	0.243988	13.60	13.46	0.5	0.07	13.53
	1000	1825	45875	0.0000030	12.14000	0.218922	12.14	11.85	0.00	0	12.14
Offsite Well No. 2	1422	1825	45875	0.00000604	11.4436	0.206364	11.45	11.29	0.04	0.0064	11.44
Offsite Well No. 7	1473	1825	45875	0.0000065	11.37	0.205037	11.45	11.29	0.5	0.08	11.37
	1500	1825	45875	0.0000067	11.338	0.20446	11.45	11.29	0.700	0.112	11.34
Offsite Well No. 9	1557	1825	45875	0.0000072	11.264	0.203125	11.29	11.16	0.2	0.026	11.26
Offsite Well No. 9A	1612	1825	45875	0.0000078	11.064	0.199519	11.16	11.04	0.8	0.096	11.06
	2000	1825	45875	0.000012	10.8	0.194758	10.94	10.24	0.200	0.14	10.80
Offsite Well No. 6	2259	1825	45875	0.000015	10.59	0.190971	10.94	10.24	0.500	0.35	10.59
	2500	1825	45875	0.000019	10.31	0.185922	10.94	10.24	0.9	0.63	10.31
Offsite Well No. 1	2795	1825	45875	0.000023	10.13	0.182622	10.25	9.84	0.300	0.123	10.13
	3000	1825	45875	0.000027	9.9630	0.179664	10.25	9.84	0.7	0.287	9.96
	3500	1825	45875	0.000037	9.637	0.173785	9.84	9.55	0.7	0.203	9.64
Offsite Well No. 10	3952	1825	45875	0.000047	9.374	0.169043	9.55	9.33	0.8	0.176	9.37
	4000	1825	45875	0.000048	9.374	0.169043	9.55	9.33	0.8	0.176	9.37
Offsite Well No. 4	4465	1825	45875	0.0000595	8.9975	0.162253	9.14	8.99	0.95	0.1425	9.00
	4500	1825	45875	0.0000605	9.1325	0.164688	9.14	8.99	0.05	0.0075	9.13
Offsite Well No. 3	4669	1825	45875	0.000065	9.065	0.16347	9.14	8.99	0.5	0.075	9.07
	5000	1825	45875	0.000075	8.925	0.160946	8.99	8.86	0.5	0.065	8.93
	5280	1825	45875	0.000083	8.824	0.159124	8.86	8.74	0.3	0.036	8.82
Offsite Well No. 5	5743	1825	45875	0.000098	8.652	0.156023	8.74	8.63	0.8	0.088	8.65
Offsite Well No. 8	6910	1825	45875	0.000143	8.5334	0.153884	8.63	7.94	0.14	0.0966	8.53

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	116	ft ³ /d
S	1.00E-03		Duration (months)	60	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	1825	12707	1.078E-11	24.69618	3.453729165	24.75	24.06	0.08	0.05382	24.70
	50	1825	12707	2.695E-08	16.86505	2.358555657	17.15	16.74	0.695	0.28495	16.87
	100	1825	12707	1.078E-07	15.48618	2.165722452	15.54	14.85	0.08	0.05382	15.49
	500	1825	12707	0.0000027	12.263	1.714964855	12.55	12.14	0.7	0.287	12.26
	1000	1825	12707	0.000011	10.87000	1.520155588	10.94	10.24	0.1	0.07	10.87
	1500	1825	12707	0.000024	10.08	1.409675099	10.24	9.84	0.400	0.16	10.08
Offsite Well No. 1	1729	1825	12707	0.000032	9.78	1.36800018	9.84	9.55	0.200	0.058	9.78
	2000	1825	12707	0.000043	9.484	1.326325262	9.55	9.33	0.300	0.066	9.48
Offsite Well No. 6	2184	1825	12707	0.000051	9.311	1.302131433	9.33	9.14	0.100	0.019	9.31
	2500	1825	12707	0.000067	9.035	1.263533186	9.14	8.99	0.7	0.105	9.04
Offsite Well No. 7	2799	1825	12707	0.000084	8.812	1.232346922	8.86	8.74	0.4	0.048	8.81
	3000	1825	12707	0.000097	8.6630	1.211509462	8.74	8.63	0.7	0.077	8.66
Offsite Well No. 5	3012	1825	12707	0.000098	8.652	1.209971126	8.74	8.63	0.8	0.088	8.65
Offsite Well No. 2	3374	1825	12707	0.000123	8.4713	1.184700463	8.63	7.94	0.23	0.1587	8.47
Offsite Well No. 4	3443	1825	12707	0.000128	8.4368	1.179875682	8.63	7.94	0.28	0.1932	8.44
	3500	1825	12707	0.000132	8.4092	1.176015857	8.63	7.94	0.32	0.2208	8.41
Offsite Well No. 10	3865	1825	12707	0.000161	8.2091	1.148032128	8.63	7.94	0.61	0.4209	8.21
	4000	1825	12707	0.000172	8.1332	1.13741761	8.63	7.94	0.72	0.4968	8.13
OffSite Well No. 8	4025	1825	12707	0.000175	8.1125	1.134522742	8.63	7.94	0.75	0.5175	8.11
Offsite Well No. 9	4195	1825	12707	0.000190	8.009	1.120048399	8.63	7.94	0.9	0.621	8.01
Offsite Well No. 9A	4261	1825	12707	0.000196	7.9676	1.114258662	8.63	7.94	0.96	0.6624	7.97
	4500	1825	12707	0.000218	7.6202	1.065675217	7.94	7.53	0.78	0.3198	7.62
	5000	1825	12707	0.000270	5.847	0.817695467	6.33	5.64	0.7	0.483	5.85
Offsite Well No. 3	5109	1825	12707	0.000281	7.6079	1.063955078	7.94	7.53	0.81	0.3321	7.61
	5280	1825	12707	0.000301	7.5272	1.052669286	7.53	7.25	0.01	0.0028	7.53

Current Operation

Well ID	Distance (ft)	Combined h ₀ -h (ft)
	1	2.70
	50	1.85
	100	1.70
	500	1.35
	1000	1.20
	1500	1.12
Offsite Well No. 1	1729	1.07
	2000	1.05
Offsite Well No. 6	2184	1.03
	2500	1.00
Offsite Well No. 7	2799	1.00
	3000	0.96
Offsite Well No. 5	3012	0.94
Offsite Well No. 2	3374	0.97
Offsite Well No. 4	3443	0.93
	3500	0.93
Offsite Well No. 10	3865	0.91
	4000	0.90
OffSite Well No. 8	4025	0.89
Offsite Well No. 9	4195	0.93
Offsite Well No. 9A	4261	0.92
	4500	0.8

Drawdown Evaluation Calculations
120 Months of Operation

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	120	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		140	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	120	
b (ft)	328				
T (ft ² /dy)		45875			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 8/5/2022

Ag Well Existing Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	3650	12707	5.390E-12	25.3698	2.293922883	25.44	25.26	0.39	0.0702	25.37
	50	3650	12707	1.348E-08	17.59988	1.591371137	17.84	17.15	0.348	0.24012	17.60
	100	3650	12707	5.390E-08	16.1598	1.461159923	16.23	16.05	0.39	0.0702	16.16
	500	3650	12707	0.0000013	13.033	1.178436446	13.24	12.55	0.3	0.207	13.03
	1000	3650	12707	0.000005	11.55800	1.045067785	11.63	11.45	0.4	0.072	11.56
	1500	3650	12707	0.000012	10.8	0.976529856	10.94	10.24	0.200	0.14	10.80
Offsite Well No. 1	1729	3650	12707	0.000016	10.52	0.951212415	10.94	10.24	0.600	0.42	10.52
	2000	3650	12707	0.000022	10.16	0.91866142	10.24	9.84	0.200	0.08	10.16
Offsite Well No. 6	2184	3650	12707	0.000026	10	0.904194311	10.24	9.84	0.600	0.24	10.00
	2500	3650	12707	0.000034	9.724	0.879238548	9.84	9.55	0.4	0.116	9.72
Offsite Well No. 7	2799	3650	12707	0.000042	9.506	0.859527112	9.55	9.33	0.2	0.044	9.51
	3000	3650	12707	0.000049	9.3630	0.846597133	9.55	9.33	0.85	0.187	9.36
Offsite Well No. 5	3012	3650	12707	0.000049	9.3542	0.845801442	9.55	9.33	0.89	0.1958	9.35
Offsite Well No. 2	3374	3650	12707	0.000061	9.125	0.825077309	9.14	8.99	0.1	0.015	9.13
Offsite Well No. 4	3443	3650	12707	0.000064	9.08	0.821008434	9.14	8.99	0.4	0.06	9.08
	3500	3650	12707	0.000066	9.05	0.818295852	9.14	8.99	0.6	0.09	9.05
Offsite Well No. 10	3865	3650	12707	0.000081	8.848	0.800031126	8.86	8.74	0.1	0.012	8.85
	4000	3650	12707	0.000086	8.788	0.794605961	8.86	8.74	0.6	0.072	8.79
OffSite Well No. 8	4025	3650	12707	0.000087	8.776	0.793520927	8.86	8.74	0.7	0.084	8.78
Offsite Well No. 9	4195	3650	12707	0.000095	8.685	0.785292759	8.74	8.63	0.5	0.055	8.69
Offsite Well No. 9A	4261	3650	12707	0.000098	8.652	0.782308918	8.74	8.63	0.8	0.088	8.65
	4500	3650	12707	0.000109	8.5679	0.774704644	8.63	7.94	0.09	0.0621	8.57
	5000	3650	12707	0.000135	8.3885	0.758483398	8.63	7.94	0.35	0.2415	8.39
Offsite Well No. 3	5109	3650	12707	0.000141	8.3471	0.754740033	8.63	7.94	0.41	0.2829	8.35
	5280	3650	12707	0.000150	8.6231	0.779695796	8.63	7.94	0.01	0.0069	8.62

Well Z

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	3650	45875	1.493E-12	26.70983	0.481662	27.05	26.36	0.49	0.34017	26.71
	50	3650	45875	3.733E-09	18.83743	0.339698	19.05	18.76	0.733	0.21257	18.84
	100	3650	45875	1.493E-08	17.49983	0.315577	17.84	17.15	0.49	0.34017	17.50
	500	3650	45875	0.00000037	14.237	0.256738	14.44	14.15	0.7	0.203	14.24
	1000	3650	45875	0.0000015	12.89500	0.232537	13.24	12.55	0.5	0.345	12.90
Offsite Well No. 2	1422	3650	45875	0.0000030	12.14	0.218922	12.14	11.85	0	0	12.14
Offsite Well No. 7	1473	3650	45875	0.0000032	12.082	0.217876	12.14	11.85	0.2	0.058	12.08
	1500	3650	45875	0.0000034	12.024	0.216831	12.14	11.85	0.4	0.116	12.02
Offsite Well No. 9	1557	3650	45875	0.0000036	11.966	0.215785	12.14	11.85	0.6	0.174	11.97
Offsite Well No. 9A	1612	3650	45875	0.0000039	11.879	0.214216	12.14	11.85	0.9	0.261	11.88
	2000	3650	45875	0.0000060	11.45	0.206479	11.45	11.29	0	0	11.45
Offsite Well No. 6	2259	3650	45875	0.0000076	11.19	0.201813	11.29	11.16	0.76	0.0988	11.19
	2500	3650	45875	0.0000093	11.01	0.198545	11.04	10.94	0.3	0.03	11.01
Offsite Well No. 1	2795	3650	45875	0.0000117	10.82	0.195137	10.94	10.24	0.170	0.119	10.82
	3000	3650	45875	0.000013	10.7300	0.193496	10.94	10.24	0.3	0.21	10.73
	3500	3650	45875	0.000018	10.38	0.187184	10.94	10.24	0.8	0.56	10.38
Offsite Well No. 10	3952	3650	45875	0.000023	10.12	0.182495	10.24	9.84	0.3	0.12	10.12
	4000	3650	45875	0.000024	10.08	0.181774	10.24	9.84	0.4	0.16	10.08
Offsite Well No. 4	4465	3650	45875	0.0000298	9.848	0.17759	10.24	9.84	0.98	0.392	9.85
	4500	3650	45875	0.0000302	9.8342	0.177342	9.84	9.55	0.02	0.0058	9.83
Offsite Well No. 3	4669	3650	45875	0.000033	9.753	0.175877	9.84	9.55	0.3	0.087	9.75
	5000	3650	45875	0.000037	9.637	0.173785	9.84	9.55	0.7	0.203	9.64
	5280	3650	45875	0.000042	9.506	0.171423	9.55	9.33	0.2	0.044	9.51
Offsite Well No. 5	5743	3650	45875	0.000049	9.352	0.168646	9.55	9.33	0.9	0.198	9.35
OffSite Well No. 8	6910	3650	45875	0.000071	8.977	0.161884	8.99	8.86	0.1	0.013	8.98

$$u = \frac{r^2 S}{4Tt}$$

$$h_0 - h = \frac{Q}{4\pi T} W(u)$$

Aquifer Parameters			Well Parameters		
K (ft/dy)		26	Flow Rate	gpm	ft ³ /d
S	1.00E-03		Duration (months)	120	
b (ft)	497				
T (ft ² /dy)		12707			

Sources: Groundwater and Wells, Driscoll 1986
Integrated Water Management Pump Test 7/20/2022

Ag Well Proposed Pumping Rate

Well ID	radius (ft)	time (dy)	T (ft ² /dy)	u	W(u)	h ₀ -h (ft)	W(u) Upper	W(u) Lower	u remain-der	W(u) minus	W(u) final
	1	3650	12707	5.390E-12	25.3698	3.54793406	25.44	25.26	0.39	0.0702	25.37
	50	3650	12707	1.348E-08	17.59988	2.461320692	17.84	17.15	0.348	0.24012	17.60
	100	3650	12707	5.390E-08	16.1598	2.259927347	16.23	16.05	0.39	0.0702	16.16
	500	3650	12707	0.0000013	13.033	1.822648369	13.24	12.55	0.3	0.207	13.03
	1000	3650	12707	0.0000054	11.55800	1.616371507	11.63	11.45	0.4	0.072	11.56
	1500	3650	12707	0.000012	10.8	1.510366177	10.94	10.24	0.200	0.14	10.80
Offsite Well No. 1	1729	3650	12707	0.000016	10.52	1.471208536	10.94	10.24	0.600	0.42	10.52
	2000	3650	12707	0.000022	10.16	1.420862996	10.24	9.84	0.200	0.08	10.16
Offsite Well No. 6	2184	3650	12707	0.000026	10	1.398487201	10.24	9.84	0.600	0.24	10.00
	2500	3650	12707	0.000034	9.724	1.359888954	9.84	9.55	0.4	0.116	9.72
Offsite Well No. 7	2799	3650	12707	0.000042	9.506	1.329401933	9.55	9.33	0.2	0.044	9.51
	3000	3650	12707	0.0000485	9.3630	1.309403566	9.55	9.33	0.85	0.187	9.36
Offsite Well No. 5	3012	3650	12707	0.0000489	9.3542	1.308172898	9.55	9.33	0.89	0.1958	9.35
Offsite Well No. 2	3374	3650	12707	0.000061	9.125	1.276119571	9.14	8.99	0.1	0.015	9.13
Offsite Well No. 4	3443	3650	12707	0.000064	9.08	1.269826379	9.14	8.99	0.4	0.06	9.08
	3500	3650	12707	0.000066	9.05	1.265630917	9.14	8.99	0.6	0.09	9.05
Offsite Well No. 10	3865	3650	12707	0.000081	8.848	1.237381476	8.86	8.74	0.1	0.012	8.85
	4000	3650	12707	0.000086	8.788	1.228990552	8.86	8.74	0.6	0.072	8.79
OffSite Well No. 8	4025	3650	12707	0.000087	8.776	1.227312368	8.86	8.74	0.7	0.084	8.78
Offsite Well No. 9	4195	3650	12707	0.000095	8.685	1.214586134	8.74	8.63	0.5	0.055	8.69
Offsite Well No. 9A	4261	3650	12707	0.000098	8.652	1.209971126	8.74	8.63	0.8	0.088	8.65
	4500	3650	12707	0.000109	8.5679	1.198209849	8.63	7.94	0.09	0.0621	8.57
	5000	3650	12707	0.000135	8.3885	1.173120989	8.63	7.94	0.35	0.2415	8.39
Offsite Well No. 3	5109	3650	12707	0.000141	8.3471	1.167331252	8.63	7.94	0.41	0.2829	8.35
	5280	3650	12707	0.000150	8.6231	1.205929498	8.63	7.94	0.01	0.0069	8.62

Current Operation

Well ID	radius (ft)	combined h ₀ -h (ft)
	1	2.78
	50	1.93
	100	1.78
	500	1.44
	1000	1.28
	1500	1.20
Offsite Well No. 1	1729	1.15
	2000	1.13
Offsite Well No. 6	2184	1.11
	2500	1.08
Offsite Well No. 7	2799	1.08
	3000	1.04
Offsite Well No. 5	3012	1.01
Offsite Well No. 2	3374	1.04
Offsite Well No. 4	3443	1.00
	3500	1.01
Offsite Well No. 10	3865	0.98
	4000	0.98
OffSite Well No. 8	4025	0.96
Offsite Well No. 9	4195	1.00
Offsite Well No. 9A	4261	1.00
	4500	0.95
	5000	0.93
Offsite Well No. 3	5109	0.93
	5280	0.95

ATTACHMENT D

Response to Comments Memorandum

MEMORANDUM

DATE October 5, 2022

Project No. GL13397640

TO John Doyle
Z-Best Composting Facility

CC Richard Haughey

FROM George Wegmann, PG, CHG; Michael Bombard
PG, CHG

EMAIL george.wegmann@wsp.com

RESPONSES TO: *Memorandum: Further Clarification of Hydrology and Supply Analyses and the Groundwater Drawdown Evaluation*

This memorandum (memo) was prepared by Golder Associates USA (Golder), a member of WSP, to provide responses to the comments noted in the subject memorandum, which was prepared by AECOM and dated September 28, 2022 (AECOM Memorandum). This memorandum addresses only those comments in the AECOM memorandum related to Golder's August 26, 2022 Groundwater Drawdown Evaluation memorandum. Each related comment is presented below with its corresponding response.

Comment 2, 4th Bullet: Due to uncertainty in annual inflow to the drainage basins due to water year type, it would be more conservative to estimate the change in groundwater drawdown based on the proposed usage for primary and secondary composting of 21.9 MGPY, instead of the adjusted value of 18 MGPY which is based on a change in excess surface water. **It is recommended that Golder revise their August 26, 2022 memo to include calculation of the groundwater drawdown based on the more conservative value of 21.9 MGPY for the proposed change in composting use.**

Response: Golder has revised the memo to include calculation of the groundwater drawdown based on 21.9 MGPY.

Comment 3: Clarifications needed in Table 1 and Table 2. The Golder groundwater drawdown evaluation memo (August 26, 2022) includes a groundwater usage summary (Table 1). The values provided in Table 1 include annual volume (in MGPY) and estimated pumping rate (in gallons per minute; gpm). The main body of the text indicates that the operational period is approximately 30 hours per week. Table 2 of the memo provides the "parameters used in the drawdown calculation" and includes flow rates in gpm and daily usage in cubic feet per day. Attachment C directly shows the calculations used in the drawdown estimates and includes the input flow rate in gpm and cubic feet per day. **It is recommended that Golder revise their August 26, 2022 memo to resolve inconsistencies in the values shown at these three locations.**

Response: Golder has revised the memorandum to provide additional clarity.

Comment 3, Bullet 1: In Table 1, the annual volume/annual rate used in the estimates, but not the instantaneous rate in gpm, should be reported. (Golder does not use the gpm reported in Table 1 in the calculations in Attachment C.) In Table 2, actual flow rates used in Attachment C should be reported. (This will require moving up the explanation that 39 MGPY = 381 gpm @ 33 hours per week = 75 gpm @ 168 hours per week, etc., but this will reduce confusion later.)

Response: Golder has revised Table 1 and Table 2 as requested. The explanation of the proportional calculation of the model continuous flow rates was moved to above Table 2.

Comment 3, Bullet 2: In Table 1, Golder should only show the existing baseline value for the primary extraction well that was used in the calculations shown in Attachment C. It appears that only the 39 MGPY value was used in the estimates.

Response: Golder has revised Table 1 as requested.

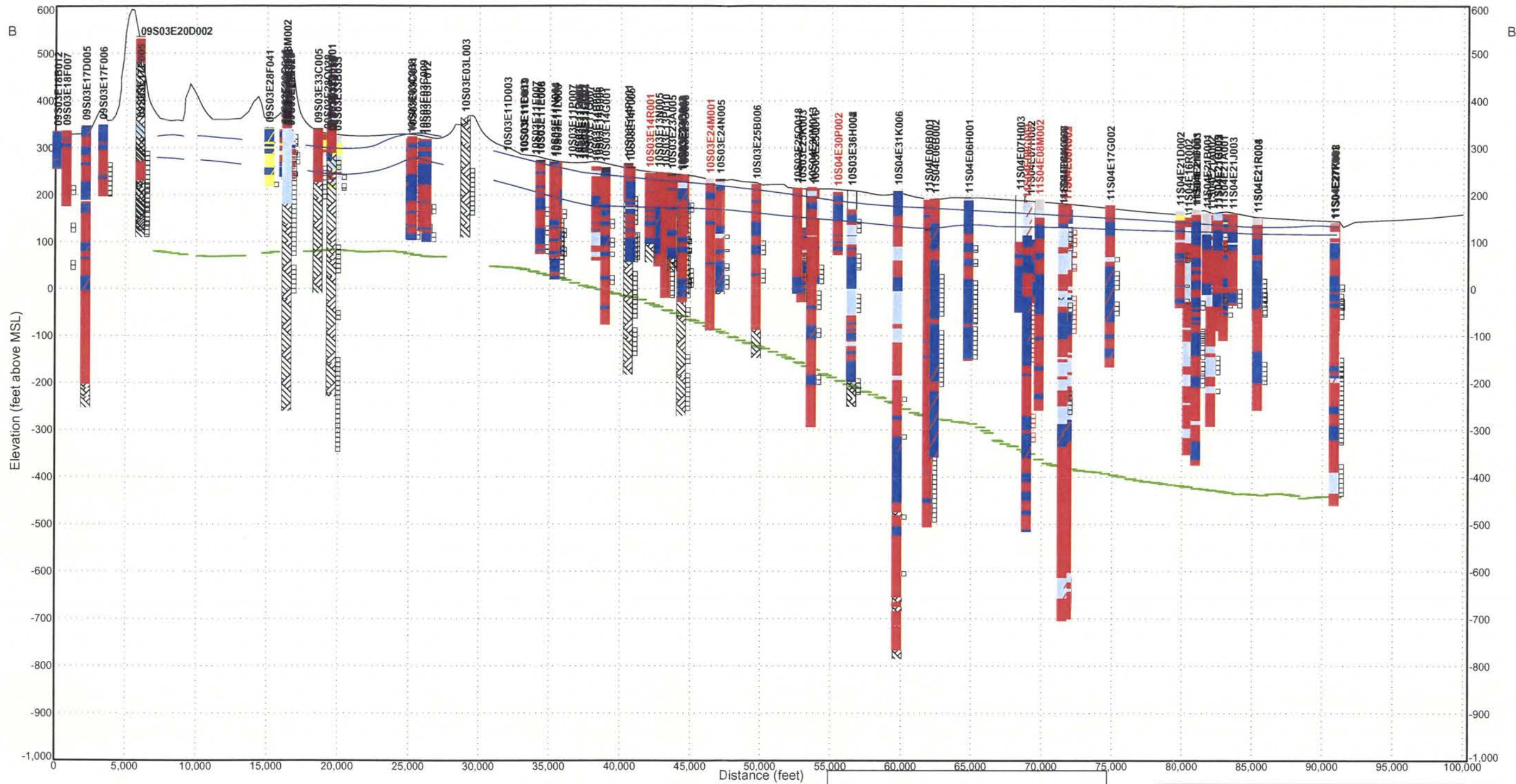
Comment 4: **Provide drawdown estimates for the river distance.** The Golder groundwater drawdown evaluation memo (August 26, 2022) provides estimated drawdown at offsite wells. Because the Pajaro River is also a sensitive receptor, the estimated drawdown at the closes riverine location should also be provided. **It is recommended that Golder revise their August 26, 2022 memo to include the estimated drawdown for the closest riverine location to the well.**

Response: Golder disagrees with this recommendation. As shown in the well log for Main Aquifer Well, the top of screened interval is at 160 feet below ground surface (bgs). The well log also shows thick clay layers above the screened interval at 135 to 148 bgs, 90 to 110 feet bgs and 13 to 48 feet bgs. Attached with this memo, are two cross sections from the report titled *Llagas Basin Numerical Groundwater Model*, prepared for Santa Clara Valley Water District by CH2M Hill and dated May 2005. The cross sections, oriented roughly north to south and west to east, show two thick continuous clay layers located at depths above the reported screened interval for Main Aquifer Well that extend to the bank of the river (i.e., the model boundary). Further, as observed in well logs reviewed by Golder, the uppermost clay layer extends from the base of a thin (typically less than 3 feet thick) surficial topsoil layer to a depth below the bottom of the river. These data suggest a separation from the upper unconfined zone that includes the river and the deeper confined zones in which the Main Agriculture Well is screened. Therefore, it is highly unlikely that Main Agricultural Well is in hydraulic communication with the river.

An additional consideration is that the Theis method and Driscoll's approximation used to calculate the drawdown are based on confined aquifer conditions. The use of the Theis method for calculating drawdown in an unconfined receptor would be inappropriate. Based on these factors, no changes are proposed for the revised memorandum with respect to Comment 4.

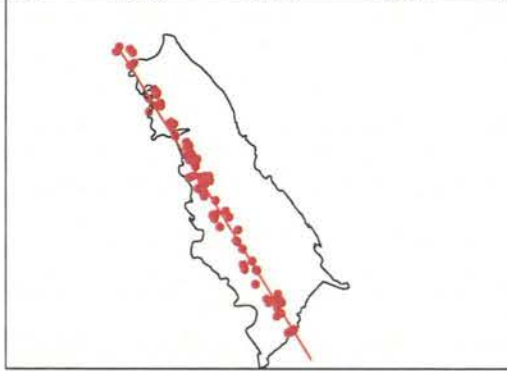
End of Technical Memorandum

[https://golderassociates.sharepoint.com/sites/112344/project files/5 technical work/drawdown evaluation/revised memo/z-best response to comments.docx](https://golderassociates.sharepoint.com/sites/112344/project%20files/5%20technical%20work/drawdown%20evaluation/revised%20memo/z-best%20response%20to%20comments.docx)



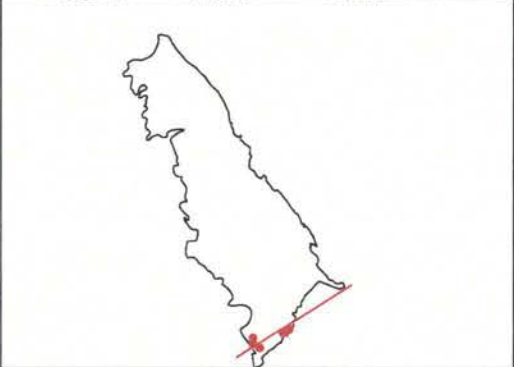
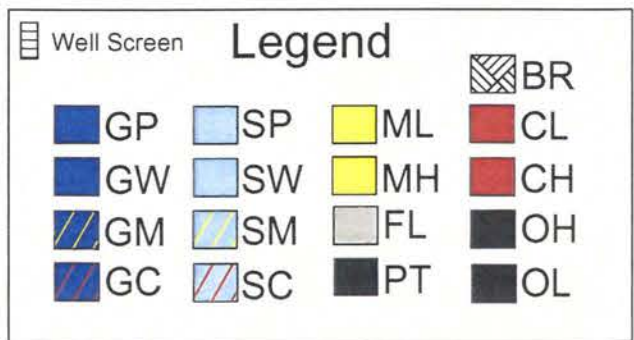
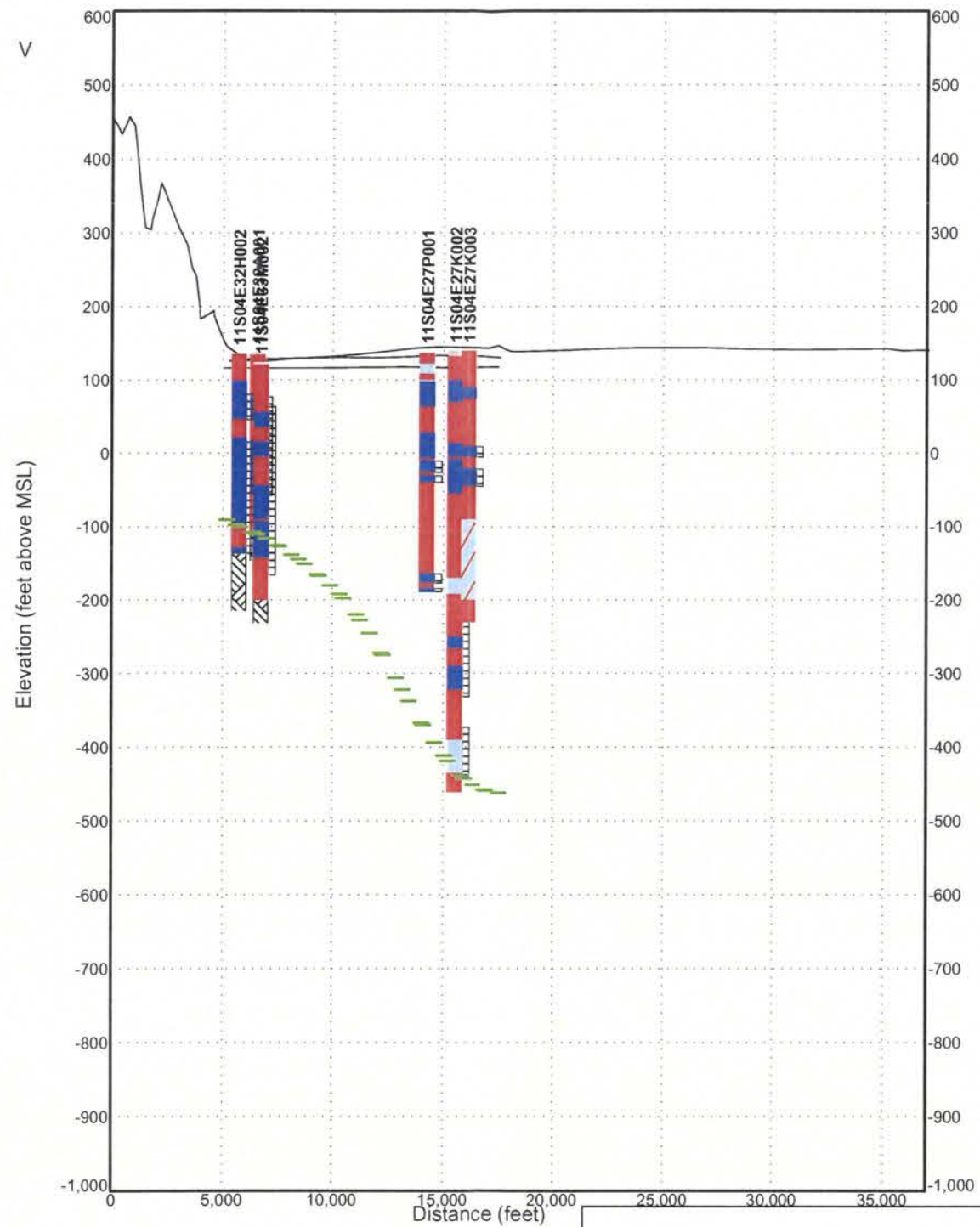
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Legend			
	Well Screen		BR
	GP		CL
	GW		CH
	GM		OH
	GC		OL
	SP		ML
	SW		MH
	SM		FL
	SC		PT



XSection B-B'	
Santa Clara Valley	
Date: 02 Mar 04	Figure

FIGURE 1-11
CROSS SECTION B-B'
 LLAGAS BASIN GROUNDWATER MODEL
 SANTA CLARA VALLEY DISTRICT



XSection V-V'	
Santa Clara Valley	
Date: 01 Mar 04	Figure

FIGURE 1-31
CROSS SECTION V-V'
 LLAGAS BASIN GROUNDWATER MODEL
 SANTA CLARA VALLEY WATER DISTRICT

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