

# The Niles Cone Saltwater Intrusion and Aquifer Characterization Project **FINAL REPORT**



# **THE NILES CONE SALTWATER INTRUSION AND AQUIFER CHARACTERIZATION PROJECT**

**DWR Agreement 4600010336**

Prepared for  
State of California  
Department of Water Resources  
Division of Planning and Local Assistance  
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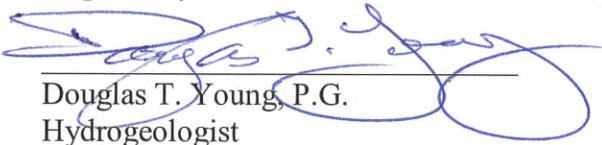
March 24, 2016

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# **THE NILES CONE SALTWATER INTRUSION AND AQUIFER CHARACTERIZATION PROJECT**

## **1.0 EXECUTIVE SUMMARY**

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This report presents the results of the assessment of the geologic and hydrogeologic conditions in the western and southwestern portions of the Niles Cone Groundwater Basin (NCGB) as well as an evaluation of the chemical make-up of two of its major water bearing zones, Centerville and Fremont Aquifers. Key goals of this project were to: 1) gain a better understanding of the geological process that formed the Niles Cone aquifer system; 2) allow long term monitoring of Centerville and Fremont Aquifers in the western and southwestern portions of the Niles Cone; 3) evaluate the western and southwestern extent of brackish water that could potentially impact ACWD's active water supply wells in the Mowry Wellfield; and 4) evaluate and compare the chemical signatures of the Centerville and Fremont Aquifers.

On April 3, 2014 the Alameda County Water District (ACWD) entered into an agreement with the State of California Department of Water Resources (DWR) to evaluate the chemical signatures of the Centerville and Fremont Aquifers and the installation of six monitoring wells at four sites in the western and southwestern portions of ACWD's service area. Due, in part, to the California drought and the high demand for drilling contractors, ACWD received two competitive bids that were above its estimated costs. ACWD determined that the need for the monitoring well points warranted the additional costs and proceeded with the project. DWR was informed of the change in contractor costs and that ACWD would pay the cost difference. The six monitoring wells at the four proposed drilling sites were located either within United States Fish and Wildlife (US Fish & Wildlife) managed properties or right-a-ways and one site is on Caltrans property. The wells were proposed in these areas in an attempt to identify the western and southwestern extent of brackish water identified near ACWD's Wellfields, due to the lack of geologic and hydrogeologic information along the western and southwestern boundary of ACWD, and because of the need for long-term groundwater monitoring points to evaluate groundwater quality trends.

Field activities were performed between August 20, 2014, and October 2, 2015, with the collection of 31 groundwater samples for the Aquifer Characterization evaluation, installation and development of five monitoring wells, and collection of water quality samples during ACWD's fall and spring groundwater monitoring events. Monitoring well installation and development activities were performed between September 12, 2014, and January 9, 2015. The following summary table describes the approved changes in well installation activities due to field conditions:

Site Location	Well Identification	Completed Aquifer	Reason for Change
Site 5	Mowry Slough - C	Centerville Aquifer	No Change
Site 6	AutoMall Parkway Landfill Levee – D2	Deep 2 Aquifer	Originally proposed as a Centerville Aquifer well, it was determined that the Centerville Aquifer does not exist at this location. The next permeable zone corresponded to the Deep 2 Aquifer. The well was completed and renamed to reflect the change.
Site 7	Dumbarton Pier	Centerville Aquifer	No Change. Although the geologic logging indicated that the classic model of the depositional environment for the NCGB does not locally apply, this location may still be hydraulically connected to the NCGB.
Site 7	Dumbarton Parking Lot - F	---	Was not installed due to a lack of low permeable material between the expected target depths of the Centerville and Fremont Aquifers. It did not appear to be beneficial to install two monitoring wells in this location.
Site 8	Jarvis - F	Fremont Aquifer	No Change
Site 8	Jarvis - C	Centerville Aquifer	No Change
<b>4 Sites</b>	<b>6 Wells</b>	<b>5 Wells</b>	<b>1 Less Well</b>

Detailed lithologic characterizations and electric logs were conducted at all four drill sites to a depth of 800 feet below ground surface (bgs) or bedrock, whichever was encountered first. The locations of the drill sites were selected based on their proximity to the western and southwestern extent of the inferred limits of brackish groundwater and available access.

Along the western boundary of ACWD, the Centerville and Fremont Aquifers consist primarily of coarse grained gravelly sands and sandy gravels. The Centerville Aquifer ranges in thickness from 25 feet (Jarvis) to 60 feet (Mowry Slough). The Fremont Aquifer ranges in thickness from 15 feet (Jarvis) to 25 feet (Mowry Slough). Neither aquifer was definitively identified at the Automall Parkway Landfill Levee or Dumbarton Pier locations. The Centerville and Fremont Aquifers are separated by the Mission Aquitard which consists of silty or sandy clay and ranges in thickness from 70 feet (Jarvis) to 80 feet (Mowry Slough).

Ten samples of fine grained material (aquitards) between water-bearing zones that were equivalent in elevation to the shallow water-bearing zone, and the Newark, Centerville, Fremont, Deep 1, Deep 2, and Deep 3 Aquifers were collected for permeability testing from the drilling activities for the wells installed during this project. A summary of the ranges of permeability is documented in the following table:

	<b>Permeability Range (cm/sec)</b>	<b>Between Aquifers</b>
<b>Newark Aquitard</b>	2.00 X 10 <sup>-7</sup> to 3.00 X 10 <sup>-8</sup>	Shallow Zone and Newark Aquifer
<b>Irvington Aquitard</b>	1.34 X 10 <sup>-7</sup> to 2.11 X 10 <sup>-9</sup>	Newark and Centerville Aquifers
<b>Mission Aquitard</b>	<1.00 X 10 <sup>-8</sup> to 4.15 X 10 <sup>-9</sup>	Centerville and Fremont Aquifers
<b>Deep 1 Aquitard</b>	<1.00 X 10 <sup>-8</sup> (one sample)	Fremont and Deep 1 Aquifers
<b>Deep 2 Aquitard</b>	1.54 X 10 <sup>-8</sup> (one sample)	Deep 1 and Deep 2 Aquifers
<b>Deep 3 Aquitard</b>	<1.00 X 10 <sup>-8</sup> (one sample)	Deep 2 and Deep 3 Aquifers

cm/sec= centimeters/second

The results indicate a low vertical transmission rates between all of the aquifers where samples were collected (2.00 X 10<sup>-7</sup> to 4.15 X 10<sup>-9</sup> cm/sec).

Groundwater samples collected from the paired monitoring wells during the fall monitoring event, were analyzed for chloride, hardness (as Calcium Chloride), and total dissolved solids. A summary table of the range of analytical results is presented below:

<b>Constituent</b>	<b>Centerville Aquifer (20 samples)</b>	<b>Fremont Aquifer (20 samples)</b>
<b>Chloride</b>	13.3 to 25,993.7 ppm	12.9 to 1,136.2 ppm
<b>Hardness</b>	70.0 to 15,300.0 ppm	75.0 to 1,040.0 ppm
<b>Total Dissolved Solids</b>	270.0 to 41,000.0 ppm	290.0 to 2,500.0 ppm

ppm = parts per million

Thirty one samples were collected throughout the NCGB for the Aquifer Characterization analysis portion of the project. The wells were chosen based on aerial variability throughout the basin, existing well clusters with specifically screened Centerville and Fremont Aquifer wells, and newly installed wells from this project. The data indicated the water characteristics of both the Centerville and Fremont Aquifers were very similar with slight chemical percentage changes as the groundwater moves west from the forebay area. Unfortunately, the groundwater chemical analysis was inconclusive and there were no distinctive chemical differences between the two aquifer zones. These results were not totally unexpected since the source of water for both aquifer zones is the same (ACWD's recharge ponds, Alameda Creek, and rainwater infiltration through the forebay area). Water chemistry differences between samples collected from monitoring wells along the western boundary of ACWD and those further inland appear to vary significantly. The consistency of the chemical signatures from samples collected from the monitoring wells along the western boundary indicates a possible change in source water or depositional environment. Further studies will need to be conducted to evaluate the possible causes for this variance in chemical signature.

Differences in water level elevations (between 0.21 and 10.4 feet) in well clusters specifically screened in the Centerville and Fremont Aquifers and the relatively low permeability values documented in the Mission Aquitard (between the Centerville and Fremont Aquifers) indicate that a hydraulic separation exists between the two aquifers in the central, southern and western portions of the NCGB. This data supports the conclusions presented in the previously completed "Inland Saltwater Intrusion

Monitoring Wells Project” study that the Centerville and Fremont Aquifers may not be specifically acting as one water bearing unit and may need to be treated as separate water bearing units.

Lithological and groundwater data collected during this project has delineated the brackish water plume along ACWD’s western and southwestern boundary in the Centerville and Fremont Aquifers. The lack of a Centerville and Fremont Aquifers at the expected depths in the southern portion of the study (Site 6) geologically limits any southern migration of brackish water. Groundwater samples collected from the Centerville Aquifer monitoring well installed in the southwest portion of the study area (Site 5) did not document the presence of brackish water. The well installed in the western portion of the study area, east of the Coyote hill outcrop (Site 8) documented 25,993.7 mg/L of chlorides which indicates the presence of a continuing source of brackish water in this area. The monitoring well installed at Site 7 (west of Site 8) did not document the presence of brackish water limiting the western extent of the brackish water plume.

The data collected during this study made a significant contribution to the understanding of the brackish water bulge in the Centerville and Fremont Aquifers located in the vicinity of the Mowry Wellfield. On-going monitoring of the wells will allow ACWD to develop a plan to prevent brackish water intrusion from reaching the Mowry Wellfield and yield a better understanding of chloride movement and groundwater flow direction over time. As a result of DWR’s Local Groundwater Management Assistance Grant Program, all of the key goals of the Niles Cone Saltwater Intrusion and Aquifer Characterization Project were accomplished.

## 2.0 INTRODUCTION

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### 2.1 Background

The goals of the Niles Cone Saltwater Intrusion and Aquifer Characterization Project (Project) were to gain a better understanding of the geological process that formed the Niles Cone Groundwater Basin (NCGB) aquifer system, allow long term monitoring of Centerville and Fremont Aquifers in the southern and southwestern portions of the Niles Cone, evaluate the western and southwestern extent of brackish water plume near Alameda County Water District's (ACWD) active water supply wells in the Mowry Wellfield, and evaluate the chemical characteristics of the Centerville and Fremont Aquifers. The area of study is presented on Figure 1. To obtain these goals, ACWD installed five groundwater monitoring wells along the western and southwestern boundary of ACWD's service area. The locations were selected based on areas where the extent of the brackish water plume was unknown, critical data gaps exist, available open space, and long term access.

A Notice of Commitment from DWR for a \$225,000 grant was received by ACWD on February 15, 2014. On April 7, 2014, ACWD and DWR entered into an agreement (No. 4600010336) for implementation of the Nile Cone Saltwater Intrusion and Aquifer Characterization Project.

### 2.2 Original Proposal

The original proposal called for the installation of six monitoring wells at four sites (two with one well and two with clustered pairs). One monitoring well (Centerville Aquifer) was planned at two of the sites (Site 5 and 6) and a cluster pairing of two wells (one in the Centerville and one Fremont Aquifer) were planned for the other two sites (Sites 7 and 8). The two single well Centerville Aquifer sites were proposed for Sites 5 and 6 since the Fremont Aquifer was already delineated to the southwest. The cluster pairing at Sites 7 and 8 was proposed in an attempt to complete the delineation of the brackish water in both the Centerville and Fremont Aquifers to the west. The locations are presented on Figure 2. One pilot boring was to be drilled at each of the four new sites to a total depth of 800 feet below ground surface or to bedrock, whichever came first, to obtain a detailed geologic profile of the alluvial material. Each of the pilot borings were planned to be converted into monitoring wells screened within Centerville Aquifer (Site 5 and 6) or the Fremont Aquifer (Site 7 and 8).

### 2.3 Revised Scope of Work

Under the California Environmental Quality Act (CEQA), ACWD had originally planned to file for Categorical Exemption 15306. Information Collection (Class 6) since the project goals were to collect basic data, conduct research, and conduct resource evaluation. Due to the locations of the drilling sites on federal wildlife refuge property

and in possible endangered species habitat areas, it was determined that preparation of a Mitigated Negative Declaration (MND) was more appropriate. The MND was completed and submitted for public review on May 7, 2014. One comment was received and addressed, so the MND was adopted by the ACWD Board of Directors on July 10, 2014. The approved MND is presented in Appendix A.

When preparing the original scope of work, ACWD outlined a program that hopefully would delineate western and southwestern extent of brackish water identified in the Centerville and Fremont Aquifers while considering the constraints of available space in highly urbanized and environmentally sensitive areas. The Project scope was based on past work conducted by ACWD and DWR. During implementation of the well installation portion of the Project, geologic material encountered during drilling of the pilot borings at Sites 6 and 7 did not match the expected lithologic profile. The change at Site 6 involved the installation of a deeper than expected monitoring well due to the lack of a Centerville Aquifer at the location. At Site 7, the expected classic model of the depositional environment for the NCGB does not seem to locally apply. The material encountered appeared more like a sandbar deposit and tidal deposition than the stream channel deposition classically associated with alluvial fan deposits. Given the uniformity of the material and the lack of fine grained material that would separate the classic Centerville and Fremont Aquifers, it was determined that a single monitoring well was sufficient at this location. As such, modifications were made to the scope of work at Sites 6 and 7 with the verbal approval of DWR (Laura Peters and Kelsey McGrath) on September 29 and November 20, 2014, respectively.

The subtraction of one new well installation at Site 7 resulted in the elimination of one of the proposed Centerville/Fremont Aquifer pairs that were proposed to be sampled for the Aquifer Characterization testing portion of the project. As such, an additional pair was added to keep number of sampling pairs the same. Since a sample was still collected from the new well at Site 7, the overall number of samples collected under this part of the program increased by one to a total of thirty-one. The modification to the scope was verbally communicated to and approved by DWR (Kelsey McGrath) on November 20, 2014.

During drilling operations, difficulty in collecting samples was encountered due to stiffness and plasticity of the fine grained material encountered. Attempts to capture a sample using different methods were only successful half of the time. As such, ten of the proposed 20 samples were collected for analytical testing. The change in the number of samples collected was verbally communicated and approved by DWR (Kelsey McGrath) on November 20, 2014.

On June 11, 2015, ACWD submitted an Amendment Request to DWR outlining the changes in scope identified above. The Amendment Request was approved and signed on June 29, 2015.

## **2.4 Project Goals and Objectives**

The primary goals of this project were to drill and install groundwater monitoring wells in the western and southwestern portion of ACWD's service area to obtain geologic and hydrogeologic information in this critical area, to evaluate the extent of brackish groundwater identified in the area, and to evaluate the chemical signatures of the Centerville and Fremont Aquifers. The specific objectives of the project as stated in ACWD's proposal and approved change of scope are summarized below:

- Drill four 800 foot (maximum) exploratory borings and install monitoring wells completed in the Centerville Aquifer (Site 5 and 7), the Fremont Aquifer (Site 8), and Deep Aquifer (Site 6).
- Install Centerville Aquifer monitoring wells next the new Fremont Aquifer monitoring wells to evaluate water quality and vertical transmissivity (Site 8).
- Collect ten undisturbed core samples from the fine grained material between the water-bearing zones for the purposes of conducting vertical permeability analysis.
- Collect aquifer specific groundwater elevation data from the newly installed monitoring wells during ACWD's fall and spring groundwater monitoring events.
- Collect aquifer specific groundwater quality data from the newly installed monitoring wells during ACWD's fall and spring groundwater monitoring events.
- Collect groundwater aquifer characterization from thirty-one monitoring wells.
- Gain a better understanding of the geology and hydrogeology of the western and southwestern regions of the NCGB.
- Add needed groundwater monitoring points to the groundwater monitoring network that will provide long term aquifer specific groundwater elevation and groundwater quality monitoring.
- Share and discuss groundwater elevation and groundwater quality information obtained from the Project.

Share information with other interested parties by including the results in ACWD's annual Groundwater Monitoring Report.

## **2.5 Project Scope**

The above objectives were met by drilling and constructing groundwater monitoring wells to obtain detailed geologic and hydrogeologic data along the western and southwestern boundary of ACWD, collection of groundwater samples for Aquifer Characterization analysis, collection of groundwater samples for water quality analysis,

and to provide long term monitoring points to evaluate groundwater flow and quality. The sites were selected based on the identification of areas where ACWD needed additional information to improve our understanding of the localized geology, groundwater flow, and water quality conditions. The wells were also located in areas that will have long term accessibility, thus providing long term groundwater monitoring points.

Several modifications were made to the original proposed project scope due to geologic material encountered during drilling of the pilot borings at Sites 6 and 7 did not match the expected lithologic profile. A summary of the changes to the scope of work are as follows:

- Due to the absence of both a Centerville and Fremont Aquifer zone at Site 6, a Deep Aquifers monitoring well was installed for the purposes of providing a regional water quality monitoring point.
- The lithologic profile encountered during the drilling of the pilot boring for Site 7 did not match the expected classic model of the depositional environment for the NCGB. Instead of observing the expected stream channel depositional model, the material was more characteristic of a sandbar deposit and tidal deposition environment. The extent of the permeability deposit extended through the expected depths of both the Centerville and Fremont Aquifers so it was not beneficial to install two monitoring wells in this location. Consequently, it was determined that a single monitoring well completed in the permeability material at a target depth between the Centerville and Fremont Aquifers was sufficient to monitor both target water bearing zones.
- Due to the high plasticity of the fine grained material encountered, the project was only able to collect ten of the proposed twenty samples for permeability testing.
- With the elimination of the Centerville Aquifer monitoring well from Site 7, another Centerville and Fremont Aquifer pair was selected to complete the comparison set for the Aquifer Characterization evaluation of the project. Given the uniqueness of the sandbar and tidal deposition type lithology at Site 7, it was determined that collecting a groundwater sample for aquifer characterization parameters was still beneficial at this location to assist in evaluating interconnectivity. With the elimination of one and the addition of two samples, the number of Aquifer Characterization points increased from thirty to thirty-one.

The changes in scope were approved by DWR (Laura Peters and Kelsey McGrath) and satisfy the objectives of the project by helping identify the extent of the identified brackish groundwater plume where there was a lack of geologic and hydrogeologic data, adding additional data points to the Aquifer Characterization evaluation set, and adding a monitoring point to the monitoring program that will assist in evaluating regional water quality trends. The final project well locations and identifications are presented in Figure 3 and the drilling activities at each site are described below.

*Monitoring Well Drill Site: Mowry Slough*

A single boring was drilled to 610 feet below ground surface (bgs). Bedrock was encountered at approximately 608 feet bgs. The boring was sampled and geophysically logged for the purpose of creating a detailed geologic record for the site. The log is being used to further understand the geology and hydrogeology of the Niles Cone aquifer system. Upon completion of drilling and logging of the exploratory boring, a monitoring well, 5S/2W-24B003 (Mowry Slough-C), was installed to a depth of 250 feet bgs. This depth generally corresponds to the Centerville Aquifer identified regionally throughout much of the Niles Cone Groundwater Basin.

*Monitoring Well Drill Site 6: Automall Parkway Landfill Levee*

A single boring was drilled to 776 feet bgs. The boring was sampled and geophysically logged for the purpose of creating a detailed geologic record for the site. The log is being used to further understand the geology and hydrogeology of the Niles Cone aquifer system. Upon completion of drilling and logging of the exploratory boring, a monitoring well, 5S/1W-20G001 (AutoMall Parkway Landfill Levee-D2), was completed to a depth of 590 feet bgs. This depth generally corresponds to the second identified water-bearing zone of the Deep Aquifers (Deep 2). No permeable water bearing material was identified at the expected depths of the Centerville, Fremont, or first permeable zone of the Deep Aquifers.

*Monitoring Well Drill Site 7: Dumbarton Pier*

A single boring was drilled to 465 feet bgs. The boring was sampled and geophysically logged for the purpose of creating a detailed geologic record for the site. The log is being used to further understand the geology and hydrogeology of the Niles Cone aquifer system. Upon completion of drilling and logging of the exploratory boring, a monitoring well, 5S/2W-08M011 (Dumbarton Pier), was installed to a depth of 290 feet bgs. Due the absence of fine grained material separating the expected depths of the Centerville and Fremont Aquifers and uniformity of permeable geologic material from 70 to 460 feet below ground surface, it was determined that a single monitoring well screened between the expected depths of the Centerville and Fremont Aquifers would be sufficient to monitor this location and a second monitoring well was not necessary.

*Monitoring Well Drill Site 8: Jarvis*

A single boring was drilled to 345 feet bgs. The boring was sampled and geophysically logged for the purpose of creating a detailed geologic record for the site. Upon completion of drilling and logging of the exploratory boring, a monitoring well, 5S/2W-03H005 (Jarvis-F), was installed to a depth of 300 feet bgs. An

additional monitoring well, 5S/2W-03H004 (Jarvis-C), was completed to a depth of 210 bgs. These depths generally correspond to the Fremont and Centerville Aquifers.

The installation of the wells allow for long term monitoring of the Centerville and Fremont Aquifers along the western and southwestern edge of ACWD's service area and help in the determination of trends in vertical flow and water quality between the two aquifers over time.

## **2.6 Geology and Hydrogeology**

The NCGB is an alluvial aquifer system consisting of unconsolidated gravel, sand, silt, and clay. The gravel and sand deposits have the highest permeability and thus comprise the aquifers; conversely, silt and clay layers have low permeability and form the aquitards. An aquifer is a water-bearing geologic formation which will yield an appreciable or economically beneficial supply of water. In 1968, DWR used the term aquiclude, a saturated geologic unit that is incapable of transmitting significant quantities of water under ordinary hydraulic gradients, for the low permeability beds that confine the aquifers. In 1973, DWR reclassified these confining beds as aquitards, which are relatively low permeability geologic beds in a stratigraphic sequence that store water, but will not transmit it rapidly enough to supply wells or springs. These beds may be permeable enough to transmit water in quantities that are significant for the study area, even though water movement per acre is insignificant.

The NCGB is divided by the Hayward Fault. The Hayward Fault is an active fault with low permeability that impedes the lateral flow of groundwater. Large differences in water level elevations on either side of the fault demonstrate the relatively impermeable nature of the fault. ACWD manages both the AHF and the BHF sub-basins. The AHF sub-basin on the east side of the Hayward Fault is composed of highly permeable sediments referred to as the AHF Aquifer. The BHF sub-basin is composed of a series of relatively flat lying aquifers separated by extensive clay aquitards (Figure 4).

Over time, the alluvial/fluvial depositional environment produced thick coarse grain sediments along present day Alameda Creek and also along historic stream channels (now buried). With distance westward, both the thickness and grain size of the aquifers decreases while the intervening clay aquitards become thicker. The aquitards appear to be absent just west of the Hayward Fault in the hydrogeologic region called the forebay area.

The shallowest regional aquifer in the BHF sub-basin, the Newark Aquifer, is an extensive permeable gravel and sand layer between 40 and 140 feet below ground surface (bgs), except in the forebay area where it begins at the surface. The thickness of the Newark Aquifer ranges from less than 20 feet at the western edge of the basin to more than 140 feet at the Hayward Fault. The Newark Aquifer is overlain in most of the sub-basin by a thick layer of silt and clay called the Newark Aquitard. The Newark Aquitard is absent in the forebay area, allowing direct recharge to the Newark Aquifer from

Alameda Creek and the recharge ponds. Within the Newark Aquitard, layers of sand and silt comprise a non-regional hydrogeologic unit known commonly as the shallow water-bearing zone.

An extensive thick clay aquitard separates the Newark Aquifer from the Centerville Aquifer. The Centerville Aquifer, the top of which lies at an average depth of 180 to 230 feet bgs, overlies a thick clay aquitard (Irvington Aquitard), which in turn overlies the Fremont Aquifer which exists in the interval of 290 to 390 feet bgs. Although the Centerville and Fremont Aquifers are separate aquifers, they have been considered as one water bearing unit (Centerville-Fremont Aquifer), based on historical water level data that indicated that they are in good hydrogeologic connection (Figure 4). However, lithologic analysis, water level, and water chemistry results from this program and previous studies indicate that these two aquifers are independent from each other in the central, southern, and western areas of the NCGB with the exception of limited isolated areas (i.e., forebay area). This isolation is best seen at some of the well clusters with wells screened in each aquifer from this and previous studies. Below the Fremont Aquifer lies the Deep Aquifer system. The Deep Aquifer system is made up of alternating sand and gravel layers separated by clay beds and extends to bedrock. The number of Deep Aquifer water bearing layers at any specific location is dependent on the proximity to the bedrock. Decrease in the number of layers encountered is most prominent in the borings nearest the Coyote Hills outcrop.

Saltwater from San Francisco Bay and the adjacent salt ponds intruded into the Newark Aquifer as a result of over pumping of groundwater and was first noted in the 1920's. The Newark Aquifer became unsuitable for irrigation and deeper wells were drilled and also over pumped. Brackish water appeared in the deeper aquifers in the 1940's. Intrusion occurred as far inland as the Hayward Fault.

Starting in 1962, ACWD began to supplement local recharge with water purchased from the State Water Project to raise groundwater levels. By 1972, the groundwater head in the Newark Aquifer had been restored to above sea level and the natural bayward flow direction was re-established. In 1974, ACWD implemented the Aquifer Reclamation Program (ARP) to expedite the removal of brackish water from the Newark, Centerville, and Deep Aquifers. The brackish water from ARP pumping was originally discharged to flood control channels that flowed into San Francisco Bay. In 2003, ACWD began operating a desalination facility to treat the brackish water pumped from the ARP wells prior to its addition to the distribution system. This has been a highly successful program which has resulted in substantial improvement in water quality in both the Newark and Centerville Aquifers as well as creating a beneficial use for the brackish groundwater. However, brackish water still remains in all the aquifers.

## **3.0 METHODOLOGY**

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This section presents the field methodology that was implemented to obtain the data necessary to meet the project objectives. Information presented in this section includes a description of pre-field activities such as permitting and underground utility clearance, as well as soil boring and groundwater well installation procedures, and soil and groundwater sampling methodologies.

### **3.1 Pre-Field Mobilization Activities**

#### **3.1.1 Drilling Permits**

ACWD issued six drilling permits for the installation of the proposed wells under the original proposal. One monitoring well was canceled so a total of five permits were fulfilled. Copies of the permits are presented in Appendix B.

#### **3.1.2 Access Agreements**

ACWD obtained four encroachment permits (US Department of Fish and Wildlife, Caltrans, Cargill Salt Inc., and Alameda County Public Works) for the installation of the monitoring wells. Four of the wells were installed on US Department of Fish and Wildlife property and one was installed on Caltrans property that was managed by the US Department of Fish and Wildlife. Access to two of the well sites required passage access through property owned by Cargill Salt Inc. and Alameda County, respectively. Copies of the permits and access agreement are presented in Appendix C.

#### **3.1.3 Underground Utility Surveys**

Prior to drilling activities, ACWD personnel visited the drill sites to mark the proposed locations for the wells and met with the facility contacts to discuss the location of underground utilities. Underground Service Alert (USA) was contacted, after the field locations were marked, at least 72 hours prior to field mobilization.

### **3.2 Soil Boring and Well Installation Procedures**

#### **3.2.1 Subsurface Drilling**

Drilling of the borings and installation of the monitoring wells were performed by Gregg Drilling & Testing, Inc. (Gregg Drilling) of Signal Hills, California. The borings were drilled with a Delta Base 540 mud rotary drilling rig with an 8.75-inch diameter drill bit. At each new drilling location, pilot holes were drilled to a maximum depth of 800 feet bgs. The pilot holes were drilled for the purposes of creating a lithologic log of the boreholes, running geophysical logs, and designing the monitoring wells. Samples of geologic material were collected at five foot intervals, examined, and documented on a

field log data sheet. Undisturbed soil samples were collected of the fine grained material between aquifers for permeability testing. The undisturbed soil samples were collected by advancing the boring to a point immediately above the desired sampling depth and then pushing a Modified California Split Spoon Sampler lined with three brass tubes, into the undisturbed soil. The sampler was then extracted from the borehole, the ends of the bottom tube were covered with plastic end caps, the vertical orientation of the sample was noted (which end was up), and labeled with a unique identification number. Samples not retained for analytical testing were used for lithologic evaluation.

### **3.2.2 Well Installation**

Five new monitoring wells were installed as part of this project. Four of the wells (5S/2W-24B003 [Mowry Slough-C], 5S/1W-20G001 [AutoMall Parkway Landfill Levee-D2], 5S/2W-03H004 [Jarvis-C], and 5S/2W-03H005 [Jarvis -F]) were installed on US Fish & Wildlife property. One new monitoring well (45/2W-08M011 [Dumbarton Pier]) was installed on Caltrans property (managed by the US Fish & Wildlife). Well construction details are discussed below and summarized in Table 1. Unless otherwise stated, well installations were conducted using the following general specifications:

- Installation of monitoring wells within the pilot borings 5S/2W-24B003 (Mowry Slough-C), 5S/1W-20G001 (AutoMall Parkway Landfill Levee-D2), 5S/2W-03H005 (Jarvis-F), and 45/2W-08M011 (Dumbarton Pier) were done upon completion of geophysical logging (resistivity, spontaneous potential, conductivity, gamma, and temperature) of the wells by Dewey Data of Stockton California. Neat cement was tremied from the bottom of the boring to within 10 feet of the designed bottom of the well. The neat cement was allowed to cure a minimum of 24-hours prior to reaming out the borehole with an 8.75-inch diameter drill bit to the designed well depth. Upon completion of reaming, installation of the monitoring well casing and material was performed.
- Design and installation of monitoring well 5S/2W-03H004 (Jarvis-C) was based on the pilot boring for monitoring well 5S/2W-03H005 (Jarvis-F) which is located approximately 10 feet to the northeast. The borehole was drilled to the design depth with an 8.75-inch diameter drill bit. Upon completion of drilling, installation of the monitoring well casing and material was performed.
- Casing and screen for all the monitoring wells were constructed of flush threaded 2-inch diameter Schedule 80 polyvinyl chloride (PVC) plastic with factory slotted well screen (slot size 0.020-inch).
- All sand packs were constructed using coarse aquarium (4x12) sand. Due to the density of the drilling fluid and sealing depths, it was not practical to place a fine separator sand. Instead, additional coarse aquarium sand was placed between 15 to 20 feet above the top of the designed screened portion of the monitoring well. The additional thickness of coarse aquarium sand sufficiently retarded the

intrusion of the sand-cement slurry, keeping it out of the screened portion of the well.

- All the wells were grouted from the top of the sand pack to the surface using a sand-cement slurry.
- Drilling mud displaced by the well installation activities was placed in a trailer mounted storage tank and transported to ACWD's storage site.
- A traffic-rated well cover was installed flush to the existing grade with a concrete pad surrounding the well cover.

### **3.2.3 Well Development**

The sand-cement slurry was allowed to cure 72-hours prior to well development. The goals of development were to remove fine sediment from the well casing and screen, to stabilize the filter pack, and to maximize water flow between the well and the aquifer. Well development was performed using the drop pipe and air lift method. The drop pipe was moved up and down the well to agitate sediment in the well and to set up a surging action within the well screen. The well was then purged using compressed air to lift both water and sediment out of the well. Field parameters (temperature, pH, electrical conductivity, and turbidity) were measured at approximately 500 to 1,000 gallon intervals. Development continued until turbidity was reduced to 5 nephelometric turbidity units (NTU) or removal of 2,000 gallons, whichever came first. Development water containing drilling mud was placed in a truck mounted storage tank and transported to ACWD's property for storage.

### **3.3 Monitoring Well Survey Procedures**

The monitoring wells were surveyed by ACWD using a Trimble R8 GPS (Global Positioning System). The monitoring wells were located, within limitations of the equipment, to approximate vertical and horizontal accuracies of  $\pm 0.2$  and  $\pm 0.1$  of a foot, respectively. The survey data is presented in Table 2.

### **3.4 Storm Water Protection and Emergency Response Plans**

ACWD required Gregg Drilling to prepare a Storm Water Protection and an Emergency Response Plan for the project. The plans were prepared and in place prior to implementing field activities. ACWD required the preparation of plans to minimize the effects of sediment runoff and potential unauthorized spills to the environment. Copies of the plans are presented in Appendix D.

### **3.5 Sampling and Analysis Procedures**

#### **3.5.1 Soil Permeability Testing**

Selected soil samples were collected using a 24-inch long Modified California Split Spoon Sampler with 2.5-inch brass liners. The sampler was pushed 24 inches into the underlying sediment using a hydraulic head on the drilling rig. The sampler was then removed and the sample liners removed. The sample retained for testing was capped with plastic end caps, orientated, labeled, packaged, and delivered to a soils laboratory certified by the American Association of State Highway and Transportation Officials (AASHTO) for soil permeability testing. No preservation procedures were required. The testing laboratory used was SIGNET Laboratories of Hayward, California. The soil cores were analyzed by Falling-Head Flexible Wall Permeability Testing by ASTM Method D-5084. Soil samples were collected in fine grained material for the purposes of evaluating the vertical permeability between identified aquifers.

#### **3.5.2 Groundwater Testing**

General groundwater quality samples were collected and analyzed for physical characteristics, chlorides (EPA Method 300), total dissolved solids (Standard Methods 2540C), and hardness (Standard Methods 2340B). The wells were purged by air lifting with a minimum of three casing volumes removed prior to sampling. Upon completion of purging, the samples were collected in unpreserved 250 milliliter glass Teflon-capped laboratory-supplied bottles and delivered under chain of custody record to ACWD's water quality laboratory. ACWD's laboratory is a state certified laboratory and is part of the Environmental Laboratory Accreditation Program.

#### **3.5.3 Aquifer Characterization Testing**

Aquifer Characterization samples were collected at the same time groundwater samples were collected and analyzed for Total Alkalinity (SM 2320B), Calcium (SM 3111B), Chloride EPA 300.1, Magnesium (SM 2320B), Sodium (SM 2320B), Potassium (SM 2320B), and Sulfates (EPA 300.1). The samples were collected from monitoring wells installed during this program and exiting monitoring well pairs screened in the Centerville and Fremont Aquifers. The aquifer characterization testing specifically focused on the Centerville and Fremont Aquifers to evaluate where the two aquifers may be interconnected and distinctly separated. Upon completion of purging, the samples were collected in unpreserved 250 milliliter polyethylene laboratory-supplied bottles and delivered under chain of custody record to ACWD's water quality laboratory. ACWD's laboratory is a state certified laboratory and is part of the Environmental Laboratory Accreditation Program.

### **3.6 Soil Disposal Procedures**

Soil and drilling mud generated during field operations were removed from the well locations and transported to ACWD's storage site located on Mission Boulevard next to Alameda Creek in Fremont, California.

## 4.0 RESULTS

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### 4.1 Geology

The geological data collected from this project is consistent with alluvial channel deposition. The general lithology consists of inter-bedded clays, sands, and gravels with intermingled silts. The lithologic data is fairly consistent with the general first encountered depth below ground surface of the Newark (40 to 50 feet bgs), Centerville (180 to 230 feet bgs), and the Fremont (290 to 325 feet bgs) aquifer zones with the exception of the borings at Site 6 (absent Centerville and Fremont Aquifers) and Site 7 (sand bar type deposition). A graphical presentation of the relationship and makeup of the Centerville and Fremont Aquifers beneath the central portion and the western areas of ACWD are presented in two hydrogeologic formation cross-sections (Figure 5). The Cross-sections, A-A' and B'B' are presented in Figures 6 and 7, respectively. Intact shells recovered at Site 8 from the logged borehole for Jarvis-F (5S/2W-03H005) were sent to Dr. Jonathan Hendricks of the Geology Department at San Jose State University for identification. He identified two modern species (or close relatives): *Cerithidea* (or *Cerithideopsis*) *californica* and *Epitonium hindsii* of mollusk fossils/sub-fossils in the samples. The former is a species common on mud flats and marsh pans, while the latter species is of marine origin. These mollusk species have existed for quite a long time and evolutionally change is very slow, thus based on visual examination of the shells, age determination of the source bed could not to be done. Geologic well logs presenting the lithologic log, geophysical log, and well completion are presented in Appendix E.

### 4.2 Groundwater Elevations

Water level measurements were collected in fifteen paired clustered monitoring wells sampled during the fall monitoring event within a 10 day window from September 21 to October 2, 2015. The fall monitoring data was used for evaluation because a larger data set of wells was sampled during this event. Groundwater elevations within the Centerville Aquifer ranged from 5.8 feet Mean Sea Level (MSL) to -11.62 feet MSL in monitoring wells Eden Landing C-1 (4S/2W-05G005) and Well U (4S/2W-36N011), respectively (Figure 8). Groundwater elevations within the Fremont Aquifer ranged from 5.87 feet MSL to -7.95 feet MSL in monitoring wells DE1-F (5S/2W-14E006) and Blacow-F (4S/1W-32N002), respectively (Figure 9). Water level elevations collected at each of the cluster well sites consistently documented lower groundwater elevations in the Fremont Aquifer wells than the Centerville Aquifer wells. The elevation difference ranged from 0.10 foot to 10.4 foot difference in the Lake Chad and Eden Landing clusters, respectively. Generally, groundwater elevations in both the Centerville and Fremont Aquifers exhibit the classic elevation decrease from east to west generally following the topographic surface (with the exceptions in areas affected by groundwater pumping). Groundwater elevation comparisons between wells along the bay margin to those further inland document elevation increases in excess of 10.01 feet between DE1-C (5S/2W-

14E007) and Well U (4S/2W-36N011) and 12.98 feet between DE1-F (5S/2W-14E006) and Well T (4S/2W-36N010) in the Centerville and Fremont Aquifers, respectively.

To compare overall elevation differences with minimal effects due to active pumping, water level data from the 2009 fall groundwater monitoring event was used to obtain baseline values (ACWD pumping wells in the area were deactivated due to upgrades to ACWD’s Desalination Facility). The Centerville and Fremont aquifer well pairs selected for water level comparison were ones that documented observable minimal effects due to pumping between the 2009 and 2015 sampling events. A summary data table for the Centerville and Fremont Aquifer wells sampled during the 2015 fall groundwater monitoring event is presented in Table 3. Groundwater elevations appear to be elevational higher in the westernmost wells in each aquifer zone along the bay margin.

### 4.3 Groundwater Analytical Testing

Upon completion of installation of the new wells, the wells were developed to remove sediment that had accumulated in the well as a result of well construction activities. All the wells were developed to the goal of 5 NTUs or 2,000 gallons removed, whichever came first. Appendix F contains the development records for the new monitoring wells.

After the new wells were developed, they were incorporated into ACWD’s Groundwater Monitoring Program and sampled during the fall and spring 2015 monitoring events (Figure 10). All the wells samples were purged, sampled, and delivered to the analytical laboratory under chain-of-custody record for testing.

Laboratory results for water samples collected from the Centerville and Fremont Aquifer wells during the 2015 fall monitoring event were used in the analysis of the brackish water plume (Table 3). Chloride iso-concentration maps are presented for the Centerville and Fremont Aquifers in Figures 11 and 12, respectively. ACWD’s standard semiannual sampling does not specifically encompass the analysis for hardness, thus the hardness as CaCO<sub>3</sub> (collected during the Aquifer Characterization sampling) was presented. The table below summarizes the ranges of analytical results for the Centerville and Fremont Aquifers:

	Centerville Aquifer (20 samples)	Fremont Aquifer (21 samples)
Chloride	13.3 to 25,993.7 mg/l	12.9 to 1,061.1 mg/l
Hardness (as CaCO <sub>3</sub> )	70.0 to 15,300.0 mg/l	75.0 to 1,040.0 mg/l
Total Dissolved Solids	270.0 to 41,000.0 mg/l	290.0 to 2,500.0 mg/l

mg/l = milligrams per liter

The data tables for the Spring and Fall groundwater monitoring events from the 2015 Groundwater Monitoring Report event are presented in Appendix G.

#### 4.4 Soil Permeability Testing

A total of 10 soil samples were collected from installation of the new wells and tested for evaluation of vertical permeability (Table 4). The samples were collected from the Newark Aquitard, aquitards between Newark and Centerville Aquifers (Irvington Aquitard), Centerville and Fremont Aquifers (Mission Aquitard), and Fremont and Deep Aquifers (Deep 1, Deep 2, and Deep 3 Aquitard). Below is a summary table presenting the results of the permeability testing:

	Permeability Range	Between Aquifers
Newark Aquitard (3 samples)	$2.00 \times 10^{-7}$ to $6.11 \times 10^{-8}$ cm/sec.	Shallow and Newark Aquifer
Irvington Aquitard (2 samples)	$1.34 \times 10^{-7}$ to $2.11 \times 10^{-9}$ cm/sec.	Newark and Centerville Aquifers
Mission Aquitard (2 samples)	$4.22 \times 10^{-7}$ to $3.16 \times 10^{-8}$ cm/sec.	Centerville and Fremont Aquifers
Deep 1 Aquitard (1 sample)	$<1.00 \times 10^{-8}$ cm/sec.	Fremont and Deep 1 Aquifers
Deep 2 Aquitard (1 sample)	$1.54 \times 10^{-8}$ cm/sec.	Deep 1 and Deep 2 Aquifers
Deep 3 Aquitard (1 sample)	$<1.00 \times 10^{-8}$ cm/sec.	Deep 2 and Deep 3 Aquifers

cm/sec= centimeters/second

The results indicate low vertical transmission rates in the Newark, Irvington, Mission, and the Deep Aquitards. Laboratory Reports are presented in Appendix H.

#### 4.5 Aquifer Characterization Testing

A total of thirty-one soil samples were collected for aquifer chemical characteristics testing from new and existing Centerville and Fremont Aquifer monitoring wells (Figure 13). When available, well pair clusters were incorporated into the program so comparison of groundwater characteristics could be evaluated at specific locations. The analytical data for each monitoring well was plotted on a tri-linear graphical representation plot of the chemistry of a specific water sample (piper diagram). This representation plot is a combination of the percentages of anions and cations within the groundwater sample (laboratory reporting sheet is presented in Appendix I). Groundwater from a similar source will have the same general anion and cation makeup and plot within the same area of the graph. A piper diagram was created for each of the wells in the evaluation (Appendix J). The piper diagrams were then compared and the differences in water quality signatures analyzed. There appears to be two generally distinct chemical signatures that appear: 1) relatively higher in bicarbonate + carbonate and sodium + potassium percentages but lower in magnesium, calcium, sulfates, and chloride + fluoride percentages (Chemical Signature A) and 2) relatively higher in calcium, bicarbonate + carbonate, sodium + potassium, and chloride + fluoride percentages but lower in magnesium and sulfate percentages (Chemical Signature B). An exception to these two chemical signatures is the sample collected from monitoring well 5S/2W-03H004 that has a highly elevated chloride concentration that is likely skewing the chloride percentages. Figure 14 presents the results of the aquifer characterization analysis. Centerville Aquifer monitoring wells (5S/1W-16M007, 5S/1W-05H004, 5S/2W-03H005, and 5S/2W-14E006), Fremont Aquifer monitoring wells (5S/1W-16M006, 5S/2W-24B003, and 5S/2W-14E007), and monitoring well 5S/2W-08M011 (screened across the sand bar deposit) along the western boundary of ACWD exhibit ion

percentages similar to Chemical Signature A. The remaining sampled monitoring wells from both the Centerville and Fremont Aquifers exhibit ion percentages similar to Chemical Signature B (excluding monitoring well 5S/2W-03H004). The accuracy of the map is limited due to the minimal number of data points available.

## 5.0 CONCLUSIONS

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The drilling locations were selected based on work previously conducted by DWR (documented in DWR Bulletin No. 118-1, Evaluation of Ground Water Resources South Bay, Appendix A: Geology, August 1967), investigative studies conducted by ACWD through the DWR-LGA Grant Program, analytical data collected during ACWD's semiannual groundwater monitoring program, and available drilling locations. The locations were selected to further define the southwestern and western boundaries of the brackish water plume, to evaluate water quality, and to evaluate if it was possible to chemically distinguish between the Centerville and Fremont Aquifers. The project achieved all of these goals.

Overall, the geological data collected during the drilling of the soil borings is consistent with the alluvial channel depositional environment in the NCGB. Previous studies have documented significant amounts of sands and gravels at depths comparable to the Centerville and Fremont Aquifers. In the monitoring wells installed during this project, the logged boreholes for Site 8 (Jarvis-F [5S/2W-03H004]), and Site 5 (Mowry Slough [5S/2W-08B003]), documented Centerville and Fremont Aquifers at expected depths with thicknesses ranging from 75 to 80 feet and 18 to 25 feet, respectively. In the logged boreholes for Site 6 (Automall Parkway Landfill Levee [5S/1W-20G001]), and Site 7 (Dumbarton Pier [5S/2W-08M011]), located along the western margin of the basin, significant unexpected variations were noted. At Site 6, both Centerville and Fremont Aquifer zones appear to be absent. At Site 7, the expected classic model of the depositional environment for the NCGB does not seem to locally apply. The material encountered (390 feet of interlayered sandy silts, poorly graded sand, and clayey gravels) appear more like a sandbar deposit and tidal deposition than the stream channel deposition classically associated with alluvial fan deposits. Further, Site 7 is located west of the Coyote Hills outcrop. The difference in depositional environment documented at this site may be due to the direct exposure of the western side of Coyote Hills to tidal scouring and associated sand deposition within San Francisco Bay. This scenario may also explain the extensive amount of shells documented in the Centerville and Fremont Aquifer zones at Site 8, which is located directly east of the Coyote Hills outcrop. This area may have been sheltered by the Coyote Hills outcrop thus allowing the development of a sheltered lagoon type setting favorable to mollusk community growth (Figure 6). Further investigation would need to be performed to support this scenario. As previous noted, at Site 6, both Centerville and Fremont Aquifer zones appear to be absent. The absence of the two aquifers at Site 6 may be due to the distance of the site from the source area of the Niles Cone Alluvial Fan (decreasing bed thickness further from the source area) and the relative strike-slip northward movement along the Hayward Fault (shifting the western side deposited material northward)(Figure 7).

The geologic, chloride, hydrologic, and permeability data seem to generally correlate well in monitoring wells located within the core portion of the basin. Hydraulically, differences in water level elevations vary between 0.10 (Lake Chad-C [4S/2W-14D006]

and Lake Chad-F [4S/2W-14D005]) and 3.49 (Blacow-C [4S/1W-32N001] and Blacow-F [4S/2W-32N002]) feet between the Centerville and Fremont Aquifers, respectively. Combining this information with the relatively low permeability values documented in the Mission Aquitard (between the Centerville and Fremont Aquifers), supports (in concert with the geologic and chloride data) the inference that a hydraulic separation exists between the two aquifers. A significant change in groundwater elevation levels occur in the monitoring wells along the western boundary of the basin where variations in excess of 10.01 feet between DE1-C (5S/2W-14E007) and Well U (4S/2W-36N011) and 12.98 feet between DE1-F (5S/2W-14E006) and Well T (4S/2W-36N010) in the Centerville and Fremont Aquifers. The changes in groundwater elevation levels elevations appear to generally correspond to the lineation of the Coyote Hills uplift and noted change in depositional environment documented in the logged borehole data from the new monitoring wells. The lack of data points in this specific portion of the basin makes it difficult to draw any definitive conclusions on the reasons for the elevated groundwater levels.

In addition to evaluating the geology and water level elevations, water samples were collected from the newly installed wells to determine water quality in the Centerville and Fremont Aquifers during ACWD's fall groundwater monitoring event. The purpose of ACWD's fall groundwater monitoring event is to evaluate water quality parameters in wells located throughout the basin and within the individual aquifer zones when water elevations tend to be at their lowest levels. The primary constituent of concern tested for during the program was chloride. Analytical testing of groundwater samples collected from the monitoring wells installed during a previous study (Inland Saltwater Intrusion Monitoring Wells Project, April 28, 2010) documented the presence of chloride concentrations above the secondary maximum contaminant level (MCL) for drinking water (250 ppm) in one of the wells. To better understand the distribution of chloride in and around the brackish water plume, chloride data collected from both the newly installed monitoring wells and existing wells that were sampled during ACWD's fall monitoring program, within the Centerville and Fremont Aquifers, was evaluated. Prior to this study, the limits of brackish groundwater in the Centerville Aquifer were identified except to the west and southwest. Data collected from the new monitoring wells at Sites 5 (130 mg/l), Site 6 (no Centerville Aquifer), and Site 8 (158.7 mg/l) appears to have identified the general extent of brackish groundwater in the Centerville Aquifer. Brackish groundwater in the Fremont Aquifer had been defined except to the southwest. Groundwater sampling data from monitoring wells installed at Site 7 (158.7 mg/l) and Site 8 (158.8 mg/l) indicate that the limits of brackish groundwater have been identified in the Fremont Aquifer. Thus, the delineation of brackish groundwater in both aquifers has been completed. Elevated concentrations of chlorides were documented at Site 8 in monitoring well Jarvis-C (5S/2W-03H004) at 25,993.7 mg/l. The location of Site 8 is in close proximity to existing salt evaporation ponds where improperly destroyed irrigation water supply wells are known to exist. It is plausible that the elevated chlorides documented in groundwater samples from this well may be related to the salt evaporation ponds through one or more of the former irrigation supply wells.

Permeability results from soil samples collected during the project documented low permeability values in aquitards separating water-bearing zones that are equivalent in elevation to the Newark, Centerville, Fremont, and between Deep Aquifers within the study area. The permeability values for the samples collected in the Newark (between the Shallow and Newark Aquifer), Irvington (between the Newark and Centerville Aquifer), Mission (between the Centerville and Fremont Aquifers), Deep 1 (between the Fremont and Deep 1 Aquifers) and Deep 2 and 3 (low permeable zones within the Deep Aquifer zone) Aquitards revealed similar results, ranging from  $2.00 \times 10^{-7}$  cm/sec to  $1.0 \times 10^{-8}$  cm/sec. For comparison, the requirement for a liner beneath a Class 1 Hazardous Waste Landfill is  $1.0 \times 10^{-7}$  cm/sec. This information suggests considerable natural resistance to vertical flow between these aquifers.

The primary proposed purpose of the aquifer characterization task of the project was to determine if the Centerville and Fremont Aquifers could be differentiated by chemical make-up. The analytical results from the inland cluster pairs used in the study revealed that the difference between samples was insufficient to distinctively differentiate the two aquifers (Chemical Signature B). This may be due to the fact that the groundwater in the two aquifer zones are in close proximity to the same source (Quarry Lakes and Alameda Creek) and have a relatively low residence time due to pumping of the aquifers (ACWD Desalination source wells in the Centerville Aquifer and Cargill production wells in the Fremont Aquifer). There was an identified variation in groundwater chemical signature in the monitoring wells installed along the western boundary of ACWD and three inland Fremont Aquifer monitoring wells (Chemical Signature A). The introduction of Chemical Signature A groundwater in the inland Fremont Aquifer monitoring wells may be due to preferential groundwater flow along the southern major axis of geologic deposition due to pumping at ACWD's Mowry Wellfield. The variation in water quality could indicate a possible introduction of an unidentified water source or a geologic change in environment northwest, west, and/or southwest of ACWD. Presently there are an insufficient number of data points to draw a definitive conclusion for the reason for or to accurately identify the limits of these variances in chemical makeup.

Although the aquifer characterization task of the project did not identify definitive chemical differences between groundwater in the Centerville and Fremont Aquifers, data collected during this study support the conclusions of a previous study (Inland Saltwater Intrusion Monitoring Wells Project, April 28, 2010) that a significant hydraulic separation exists between the two aquifers beneath the central, southern, and western portion of the NCGB. Groundwater elevation data collected during the Fall 2015 monitoring event was plotted independently for the Centerville and Fremont Aquifers. The Centerville Aquifer Groundwater Contour Map (Figure 8) presents a distinct groundwater elevational low in the area of ACWD's Centerville Aquifer extraction wells (4S/2W-36A007 and 5S/1W-05C001). Comparison with the Fremont Aquifer Groundwater Contour Map (Figure 9) reveals no such corresponding groundwater elevational depression. The reverse is also true where pumping from the Cargill Salt production well is creating a significant groundwater elevation depression (>10 foot contour area) and there is no associated groundwater elevational depression on the Centerville Aquifer Groundwater Contour Map. Additionally, the Mission Aquitard

(located between the Centerville and Fremont Aquifers) is regionally over 60 feet thick (except in the area of the forebay) and has documented vertical permeability values in excess of  $4.15 \times 10^{-9}$  centimeters per second (cm/sec) indicating very low flow between the two aquifers.

The installation of monitoring wells and analytical data collected during this project has already provided valuable information to ACWD. Limited information existed on the geology and hydrogeology along the western and southwestern boundary of ACWD and to what extent brackish groundwater had impacted the Centerville and Fremont Aquifers. Although previous studies had characterized the northern, southern, and eastern extent of the brackish groundwater plume near the Mowry Wellfield in the Centerville and Fremont Aquifers, the western and southwestern extent had not been defined nor had the source of the chlorides been definitively identified. The installation of the wells associated with this project has greatly increased our understanding of the brackish water plume and yielded valuable data to assist ACWD in its management of the NCGB. ACWD has incorporated these wells into its Spring and Fall Monitoring Program so that water level and water quality information can be collected on a regular basis. At the end of each year, this information will be used to construct water level and water quality contour figures that are included in the annual Groundwater Monitoring Report. This report will allow ACWD to assess the effectiveness of groundwater basin management activities related to saltwater intrusion. A copy of the annual groundwater monitoring report is submitted to DWR as part of ACWD's groundwater management plan annual update.

The Niles Cone Saltwater Intrusion and Aquifer Characterization Project final report will be posted on ACWD's website for all interested parties, stakeholders, agencies and the general public to access.

## 6.0 RECOMMENDATIONS

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Data collected during the project, significantly increased ACWDs understanding of the geologic depositional history of the area along the western and southwestern boundary of ACWD. Analytical data collected for groundwater quality, groundwater characterization, and soil permeability evaluation have delineated the boundaries of the brackish water plume in the Centerville and Fremont Aquifers near the Mowry Wellfield, identified a possible source of chlorides in the Centerville Aquifer, yielded data supporting the concept that the Centerville and Fremont Aquifers within the center, southern, and western portions of the NCGB should be considered as independent water bearing zones (with the exception of the forebay area), and identified geologic and chemical signature variations along the western boundary of ACWD.

Although there is sufficient data to support recommending evaluating the Centerville and Fremont Aquifers as separate water bearing zones (specifically in the central, southern, and western boundaries of ACWD) further study in the northern area of ACWD needs to be performed to evaluate the interconnection of the two aquifers. Historical water elevation data in this area document minimal groundwater elevation differences between the two aquifers and documents similar responses to seasonal fluxuations. Interconnections between the two zones may be more prevalent or the dynamics of the depositional environment may have changed as to allow the aquifers to act as a single unit.

The identification of an elevated source of chlorides near monitoring well 5S/2W-03H004 poses a distinct risk to ACWD's drinking water supply. Additional review of historical documents will need to be completed to identify the locations of abandoned wells in the area, determine well construction details, and have them properly destroyed in order to mitigate the risk.

Further, the documentation of groundwater elevation differences, variations in chemical groundwater signature, and change in depositional environment between the monitoring wells along the San Francisco Bay margin of ACWD and inland monitoring wells warrants additional study to understand geologic and hydrogeologic processes related to groundwater movement in and around the western boundary of ACWD.

Finally, continued monitoring of the existing well network is imperative to document the movement of the brackish water plume over time. The evaluation of the data will determine if the mitigation plan resulting from the work conducted under this project is sufficient or if additional corrective action will need to be implemented.

## 7.0 SCHEDULE INFORMATION

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The implementation schedule for the project was 24 months with approximately seven months of well installation field operations scheduled to begin in September 2014. Even with the addition of a preparation and implementation of a Mitigated Negative Declaration, field activities started on schedule. Some delays were incurred during field operations (equipment downtime, weather, etc.), but well installation field operations were completed by February 11, 2015, approximately fifteen weeks ahead of the scheduled completion date.

The scheduled completion date for the project (submittal of the final report) is March 31, 2016. Submittal of this report constitutes a completion of the project approximately 1 week ahead of schedule.

## 8.0 BUDGET INFORMATION

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The original total proposed budget amount was \$491,446 with DWR grant funding covering \$225,000.00 of these costs and with ACWD responsible for the remaining costs of \$266,446.00. Due to the on-going drought conditions, drilling contractors were in high demand. Calls to the contractors that did not submit bids confirmed that this project was considered relatively small and was not of interest. Consequently, due to the higher costs for well drilling and installation, ACWD reviewed the scope of work. It was determined that the information was necessary, thus ACWD increased its share cost while keeping the costs covered by the DWR grant the same.

Additional budget increases were realized during implementation of the project. These increases include: preparation of a Mitigated Negative Declaration, increased soil disposal costs, increase in well materials cost, and increasing the number of aquifer characterization samples collected and analyzed. Much of these cost increases were balanced by cost savings which included: shallower than anticipated logged boreholes, decrease in the number of permeability samples, and the elimination of one monitoring well from the scope of work.

A memorandum outlining the change in scope of work was submitted to DWR for approval on June 11, 2015, and was approved by DWR on June 29, 2015. This addition to the scope of work decreased the total modified budget amount to \$487,046.25 with DWR grant funding remaining the same at \$225,000.00. As stated in ACWD's original proposal, DWR grant funding was used only for contractor expenses and not for ACWD labor costs. As presented in Table 6, contractor costs (drilling contractor and outside laboratory costs) and ACWD labor costs were \$284,538.00 and \$122,587.25, respectively. ACWD is responsible for all remaining costs above the \$225,000 grant amount. Table 5 presents the final accrued costs and a summary of invoices submitted for reimbursement is presented in Table 6.

# Tables

**Table 1  
Well Completion and Well Identification Summary Sheet**

ACWD* ID Number	Well Completion Date	ACWD * Elevation Equivalent Aquifer	Borehole Depth (feet)	Well Completion Depth (feet)	Screen Interval (feet)	State ID Number
Automall Parkway Landfill Levee	10/3/2014	Deep 2	776	590	550 - 590	5S/1W-20G001
Mowry Slough	10/27/2014	Centerville	610	250	180 - 240	5S/2W-24B003
Jarvis- C	10/27/2014	Centerville	220	220	150 - 200	5S/2W-03H004
Jarvis- F	10/27/2014	Fremont	345	300	270 - 290	5S/2W-03H005
Dumbarton Pier	11/19/2014	Centerville	465	290	220 - 290	5S/2W-08M011

\*\* = Alameda County Water District

**Table 2  
Survey Data**

State ID Number	ACWD* ID Number	Well Completion Date	ACWD* Elevation Equivalent Aquifer	Reference Elevation (feet msl)	Northing	Easting
5S/1W-20G001	Automall Parkway Landfill Levee	10/3/2014	Deep 2	11.67	2007148.428	6130874.502
5S/2W-24B003	Mowry Slough	10/27/2014	Centerville	8.73	2004450.671	6117026.572
5S/2W-03H004	Jarvis- C	10/27/2014	Centerville	5.84	2019025.56	6108551.847
5S/2W-03H005	Jarvis- F	10/27/2014	Fremont	5.8	2019006.424	6108546.802
5S/2W-08M011	Dumbarton Pier	11/19/2014	Centerville	6.45	2012996.945	6094863.449

\* = Alameda County Water District

**Table 3**  
**Summary of Groundwater Sampling Results**  
**Centerville and Fremont Aquifer Monitoring Wells**  
**Fall 2015**

Well pair Identification Name	Well Pairs State Identification Numbers	Aquifer	TDS (mg/l)	Hardness (as CaCO <sub>3</sub> ) mg/l	GW Elv.	GW Elv. Difference (ft)	Aquifer	Chloride (mg/l)	Chloride Difference (mg/l)
Eden Landing-F1	4S/2W-05G001	Fremont	430	--	-4.6	10.4	Fremont	67.4	74.6
Eden landing-C1	4S/2W-05G005	Centerville	590	--	5.8		Centerville	142	
Lake Chad-F	4S/2W-14D005	Fremont	890	543	-3.68	0.1	Centerville	252.7	210.4
Lake Chad-C	4S/2W-14D006	Centerville	540	394	-3.78		Centerville	42.3	
Pacific & Lewis-F	4S/2W-12K009	Fremont	620	435	-3.6	0.9	Fremont	140	72
Pacific & Lewis-C	4S/2W-12K010	Centerville	570	365	-2.7		Centerville	68	
Well H-1 (F)	4S/2W-13P006	Fremont	720	555	-4.07	0.21	Fremont	195	63
Well I-1	4S/2W-13P007	Centerville	690	576	-3.86		Centerville	132	
Well I	4S/1W-19N004	Fremont	720	468	-4.76	0.46	Fremont	239	157.9
Well J	4S/1W-19N005	Centerville	420	268	-4.3		Centerville	81.1	
Well O	4S/1W-30A002	Fremont	630	410	-5.07	0.96	Fremont	208.7	125.6
Well Q	4S/1W-30A004	Centerville	440	252	-4.11		Centerville	83.1	
Well B	4S/1W-28D008	Fremont	480	--	-4.86	0.75	Fremont	94	13.3
Well A	4S/1W-28D001	Centerville	440	--	-4.11		Centerville	80.7	
Hastings-F	4S/1W-28M009	Fremont	1600	1040	-4.9	0.46	Fremont	634.9	532
Hastings-C	4S/1W-28M010	Centerville	610	369	-4.44		Centerville	102.9	
Well F	4S/1W-28P007	Fremont	1700	--	-5.25	1.61	Fremont	765.6	676.4
Beacon	4S/1W-28P004	Centerville	560	--	-3.64		Centerville	89.2	
Jarvis-F	5S/2W-03H005	Fremont	830	107	4.41	4.88	Fremont	153.8	25839.9
Jarvis-C	5S/2W-03H004	Centerville	41000	15300	-0.47		Centerville	25993.7	
Well T	4S/2W-36N010	Fremont	2400	394	-7.11	4.51	Fremont	1136.2	818.1
Well U	4S/2W-36N011	Centerville	780	364	-11.62		Centerville	318.1	
DE1-F	5S/2W-14E006	Fremont	290	99.9	5.87	2.16	Fremont	33.4	20.1
DE1-C	5S/2W-14E007	Centerville	270	70	3.71		Centerville	13.3	
AutoMall-F	5S/1W-16M007	Fremont	380	75	-4.94	0.93	Fremont	12.9	764.3
AutoMall-C	5S/1W-16M006	Centerville	1900	1150	-5.87		Centerville	777.2	
Well D-1	5S/1W-05H004	Fremont	360	140	-5.29	1.37	Fremont	25.9	521.3
Well E-1	5S/1W-05H005	Centerville	1500	808	-6.66		Centerville	547.2	
Robin & Ladner-F	5S/1W-04H005	Fremont	700	221	-4.59	0.41	Fremont	215.5	19
Robin & Ladner-C	5S/1W-04H004	Centerville	860	576	-5		Centerville	234.5	
Margery & Blanchard-F	4S/1W-33R008	Fremont	770	448	-5.08	0.16	Fremont	156.4	53.1
Margery & Blanchard-C	4S/1W-33R007	Centerville	810	510	-5.24		Centerville	103.3	
Blacow-F	4S/1W-32N002	Fremont	2500	--	-5.79	3.49	Fremont	1061.1	916.2
Blacow-C	4S/1W-32N001	Centerville	650	--	-9.28		Centerville	144.9	
Knoll Park-F	4S/1W-33N003	Fremont	670	--	-5.21	0.85	Fremont	188.7	515.8
Knoll Park-C	4S/1W-33N002	Centerville	1800	--	-6.06		Centerville	704.5	
Serra Place-F	4S/1W-32K011	Fremont	2000	--	-5.18	2.5	Fremont	830.4	356.1
Serra Place-C	4S/1W-32K014	Centerville	1300	--	-7.68		Centerville	474.3	
Meyers Park-F	4S/1W-32E012	Fremont	680	373	-5.04	2.33	Fremont	219.6	52.6
Meyers Park-C	4S/1W-32E011	Centerville	640	366	-7.37		Centerville	167	
Centerville Park	4S/1W-29H002	Fremont	460	--	-4.28	4.28	Fremont	113.9	34.9
City of Fremont	4S/1W-29J003	CF	430	--	0		CF	79	
Mowry Slough	5S/2W-24B003	Centerville	370	158	5.32	--	Centerville	80	--
Automall Parkway Landfill Levee	5S/1W-20G001	Deep 2	430	44	-4.23	--	Deep 2	63	--
Dumbarton Pier	5S/2W-08M011	Centerville	620	108	4.84	--	Centerville	159	--

**Table 4**  
**Inland Saltwater Intrusion Monitoring Wells Project**  
**Permeability Data Summary Spreadsheet**

Sample Date	ACWD* Sample ID	Aquitards Between the Following Aquifers	Date of Delivery to Lab (per COC**)	Received by (at lab)	Date of Lab Report	Sample Results (cm/sec)
<b>Signet Testing Laboratories</b>						
9/16/2014	AC Levee - 20.5-21.0	Shallow Aquitard	9/18/2014	Signet Testing Labs	10/14/2014	2.00E-07
9/17/2014	AC Levee - 166-166.5	Mission Aquitard	9/18/2014	Signet Testing Labs	10/22/2014	<1E-08
9/18/2014	WC - 346.0- 346.5	Deep 1 Aquitard	9/25/2014	Signet Testing Labs	10/15/2014	<1E-08
9/23/2014	WC - 526.0- 526.5	Deep 3 Aquitard	9/25/2014	Signet Testing Labs	10/22/2014	<1E-08
10/13/2014	MS - 30.5- 31.0	Shallow Aquitard	10/17/2014	Signet Testing Labs	12/16/2014	6.11E-08
10/13/2014	MS - 150.5- 151	Irvington Aquitard	10/18/2014	Signet Testing Labs	12/17/2014	2.11E-09
10/14/2014	MS - 256.5- 257	Mission Aquitard	10/19/2014	Signet Testing Labs	12/17/2014	4.15E-09
10/15/2014	MS - 436.0- 436.5	Deep 2 Aquitard	10/20/2014	Signet Testing Labs	12/17/2014	1.54E-08
11/3/2014	OJ - 21.0- 21.5	Shallow Aquitard	12/8/2014	Signet Testing Labs	12/16/2014	3.00E-08
11/13/2014	DBFP - 31.0- 31.5	Irvington Aquitard	12/8/2014	Signet Testing Labs	12/16/2014	1.34E-07

\* = Alameda County Water District

\*\* = Chain of Custody

**Table 5  
DWR Cost Summary Sheet**

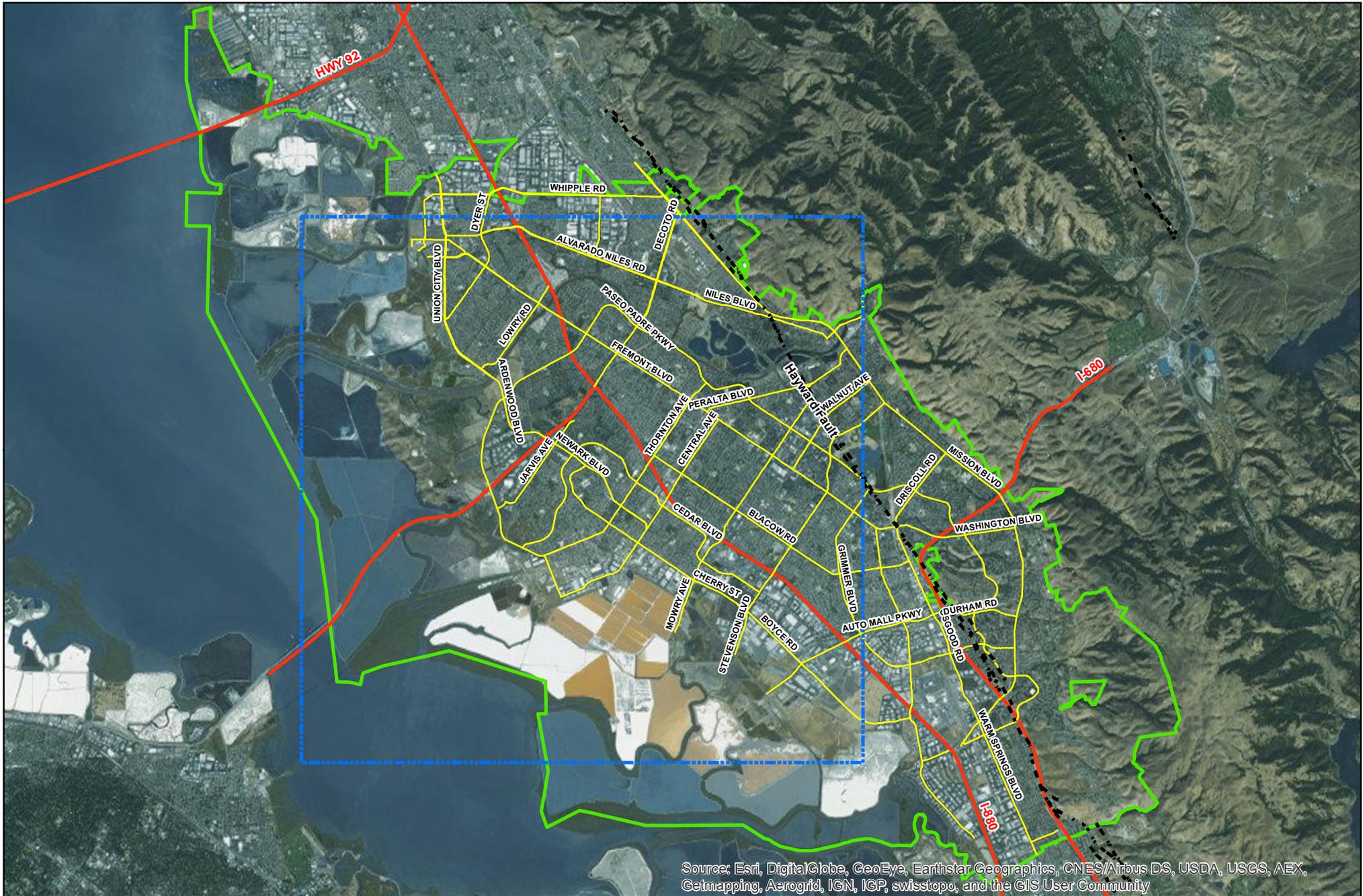
Task No.	Description from Original Approved Budget	Budget Amount by Task	Contractor Costs Accrued	ACWD Labor Costs Accrued	Remaining Budget
1.1	Finalize well locations	\$13,811.00	\$0.00	\$1,428.32	\$12,382.68
1.2	Drilling contract selection and Compliance Contractor	\$15,629.00	\$1,800.00	\$8,532.00	\$5,297.00
1.3	Permitting process	\$17,456.00	\$0.00	\$16,184.75	\$1,271.25
1.4	Public notification	\$4,268.00	\$2,231.25	\$3,481.25	(\$1,444.50)
2.1	Equipment mobilization	\$5,000.00	\$5,000.00	\$0.00	\$0.00
2.2	Drilling Additives	\$7,400.00	\$5,155.00	\$0.00	\$2,245.00
2.3	Drill and log 4 boreholes to 800 feet	\$140,531.00	\$87,825.00	\$28,282.11	\$24,423.89
2.4	Geophysical Logging	\$25,804.00	\$15,200.00	\$9,688.00	\$916.00
2.5	Drill 2 boreholes to 250 feet	\$31,210.00	\$15,400.00	\$635.22	\$15,174.78
2.6	Install six 2-inch monitoring wells (two to 350 ft; four to 250 feet)	\$76,939.00	\$54,257.00	\$2,394.69	\$20,287.31
2.7	Well completion materials	\$23,800.00	\$9,798.00	\$0.00	\$14,002.00
2.8	Collect and classify samples	\$13,425.00	\$0.00	\$5,570.82	\$7,854.18
2.9	Review logs and finalize well design	\$1,693.00	\$0.00	\$2,011.00	(\$318.00)
2.10	Grout Boreholes	\$12,532.00	\$6,219.00	\$2,032.72	\$4,280.28
2.11	Develop wells	\$23,978.00	\$27,000.00	\$1,714.28	(\$4,736.28)
2.12	Dispose of cuttings	\$27,265.00	\$37,500.00	\$1,016.00	(\$11,251.00)
2.13	install surface completion well box	\$2,745.00	\$5,000.00	\$0.00	(\$2,255.00)
2.14	GPS new well locations	\$1,685.00	\$0.00	\$635.67	\$1,049.33
3.1	Collection and test permeability sample cores	\$8,775.00	\$7,200.00	\$790.00	\$785.00
3.2	Collect and analyze groundwater samples upon well completion	\$2,906.00	\$0.00	\$5,076.00	(\$2,170.00)
4.1	Collect groundwater samples	\$5,223.00	\$0.00	\$5,371.00	(\$148.00)
4.2	Analyze groundwater samples	\$6,095.00	\$5,684.00	\$4,210.00	(\$3,799.00)
5.1	Submit quarterly progress reports to DWR	\$5,285.00	\$0.00	\$1,524.42	\$3,760.58
5.2	Submit final project summary to DWR	\$15,900.00	\$0.00	\$16,009.00	(\$109.00)
5.3	Distribute report to stakeholders	\$2,500.00	\$0.00	\$2,342.00	\$158.00
SUBTOTALS			\$285,269.25	\$118,929.25	
TOTALS		\$491,855.00	\$404,198.50		\$87,656.50

**Table 6  
Invoice Record**

Invoice Number	Date of Invoice	Amount of Invoice	Cost Share*	Grant Share	Remitted Check Received Date	Amount of Remitted Check	Notes
1	19-May-15	\$367,935.50	\$142,935.50	\$225,000.00	5-Aug-15	\$213,750.00	
2	18-Mar-16	36,263.00	36,263.00	0	In Progress	0	Reached Grant Share Limit Minus Retention
Retention	10-Mar-15	0	0	0	In Progress	\$11,250.00	Not Received
Totals		404,198.50	179,198.50	225,000.00		225,000.00	

\* = ACWD labor + contractor costs above Grant Share amount

# Figures

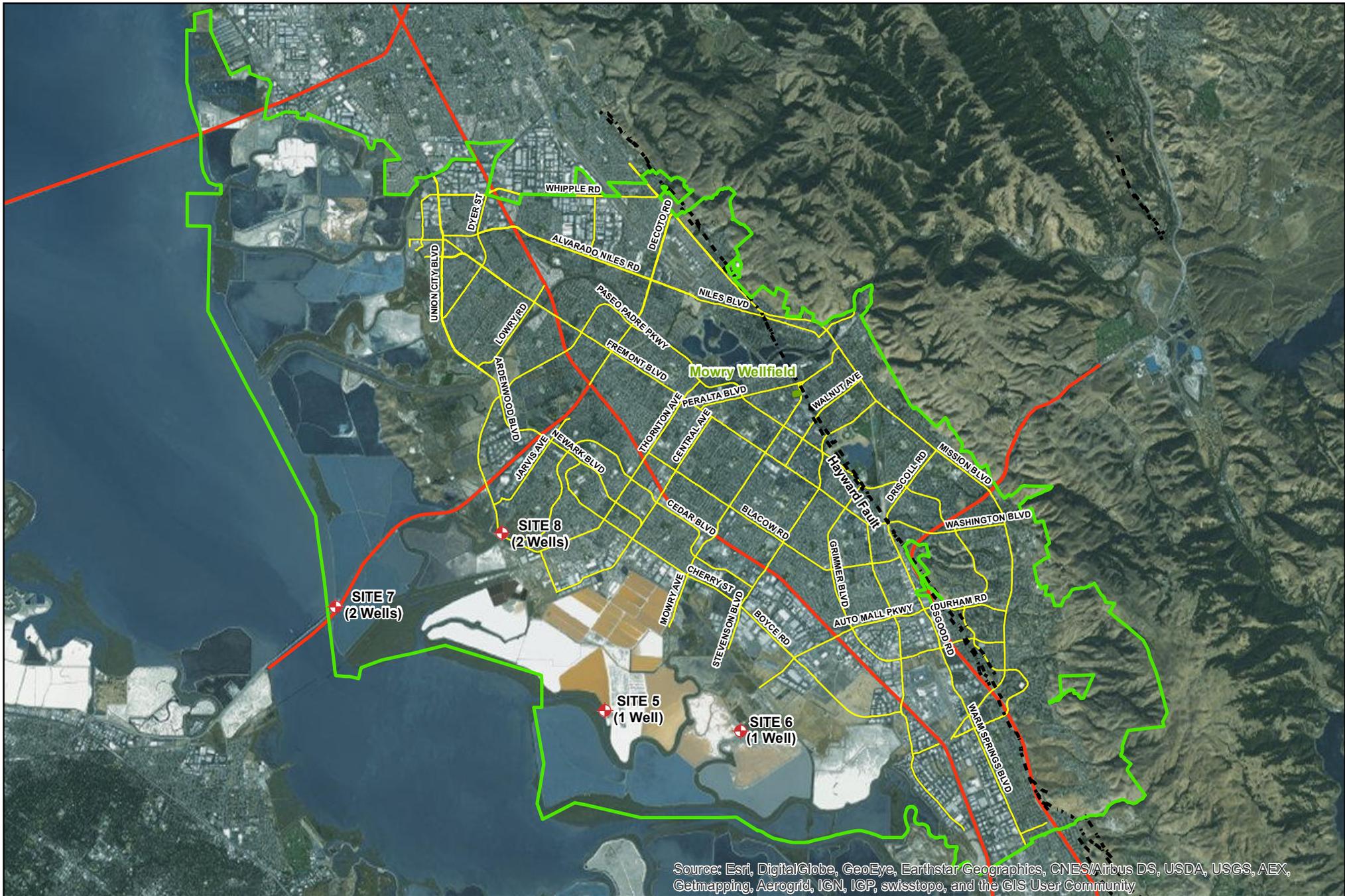


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

**Figure 1: Area of Study**

- ACWD Boundary
- Highway
- - - Hayward Fault
- - - - Area of Study





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 2: Original Well Locations

— ACWD Boundary  
◆ Proposed New Monitoring Well Site  
 Hayward Fault

0 1 2 4 Miles

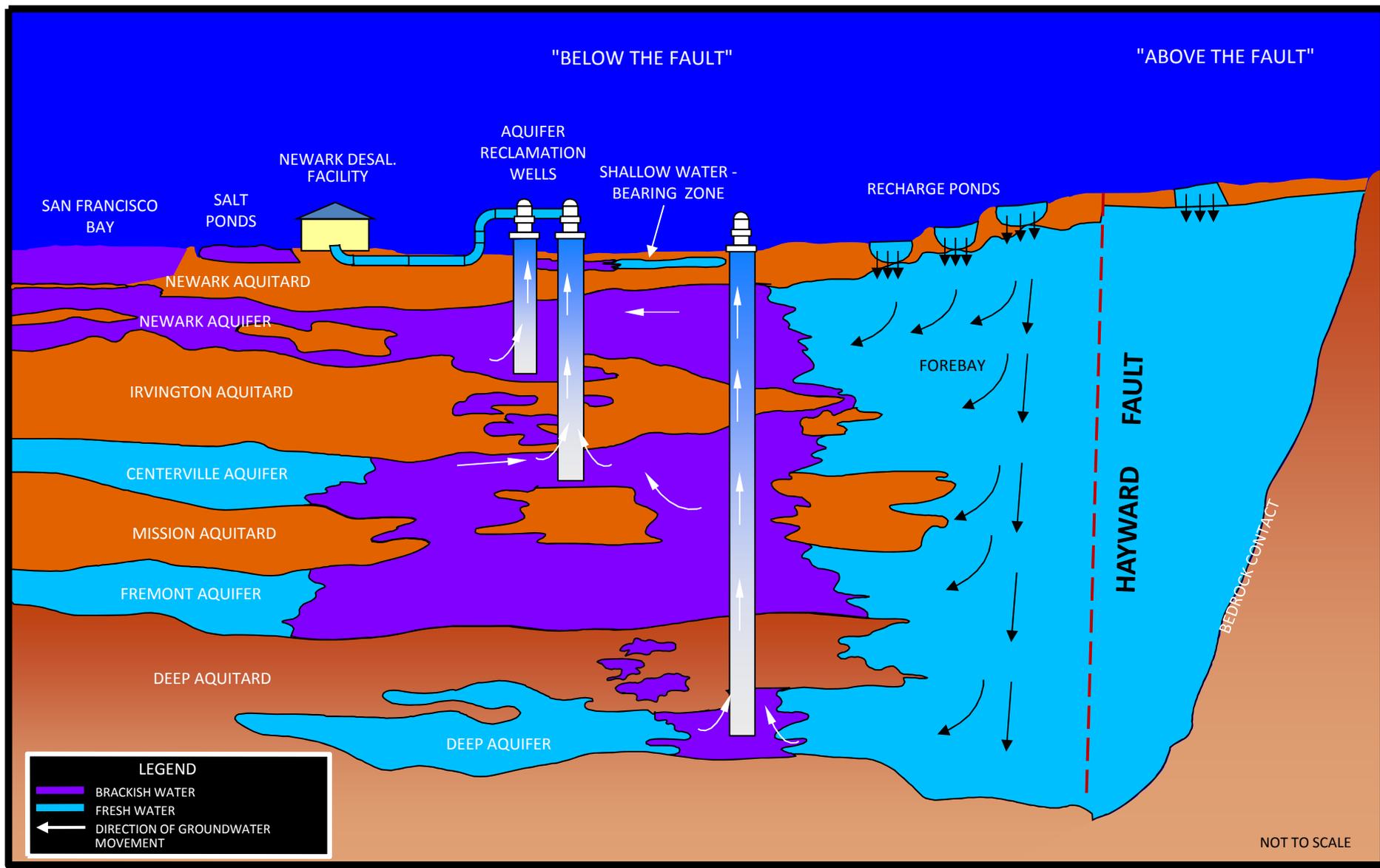


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

**Figure 3: Final Well Locations**

<span style="color: red;">●</span> Fremont Aquifer Well	<span style="color: magenta;">●</span> Deep Aquifer Well	<span style="color: green;">—</span> ACWD Boundary
<span style="color: blue;">●</span> Centerville Aquifer Well	<span style="color: purple;">●</span> Fremont/Centerville Interconnected Monitoring Well	- - - - Hayward Fault

0 1 2 4 Miles



CONCEPTUAL MODEL OF THE NILES CONE ALLUVIAL FAN  
 FIGURE 4



Mowry Production Wellfield

4S/1W-28M010

4S/1W-32E012

4S/2W-36N011

5S/2W-03H005

5S/2W-08M011

5S/2W-14E007

5S/2W-24B003

5S/1W-20G001

B

A

B

**Figure 5**  
Geologic Cross - Sections locations

- Centerville Aquifer Well
- Fremont Aquifer Well
- Deep Aquifer Well

0 0.5 1 Miles



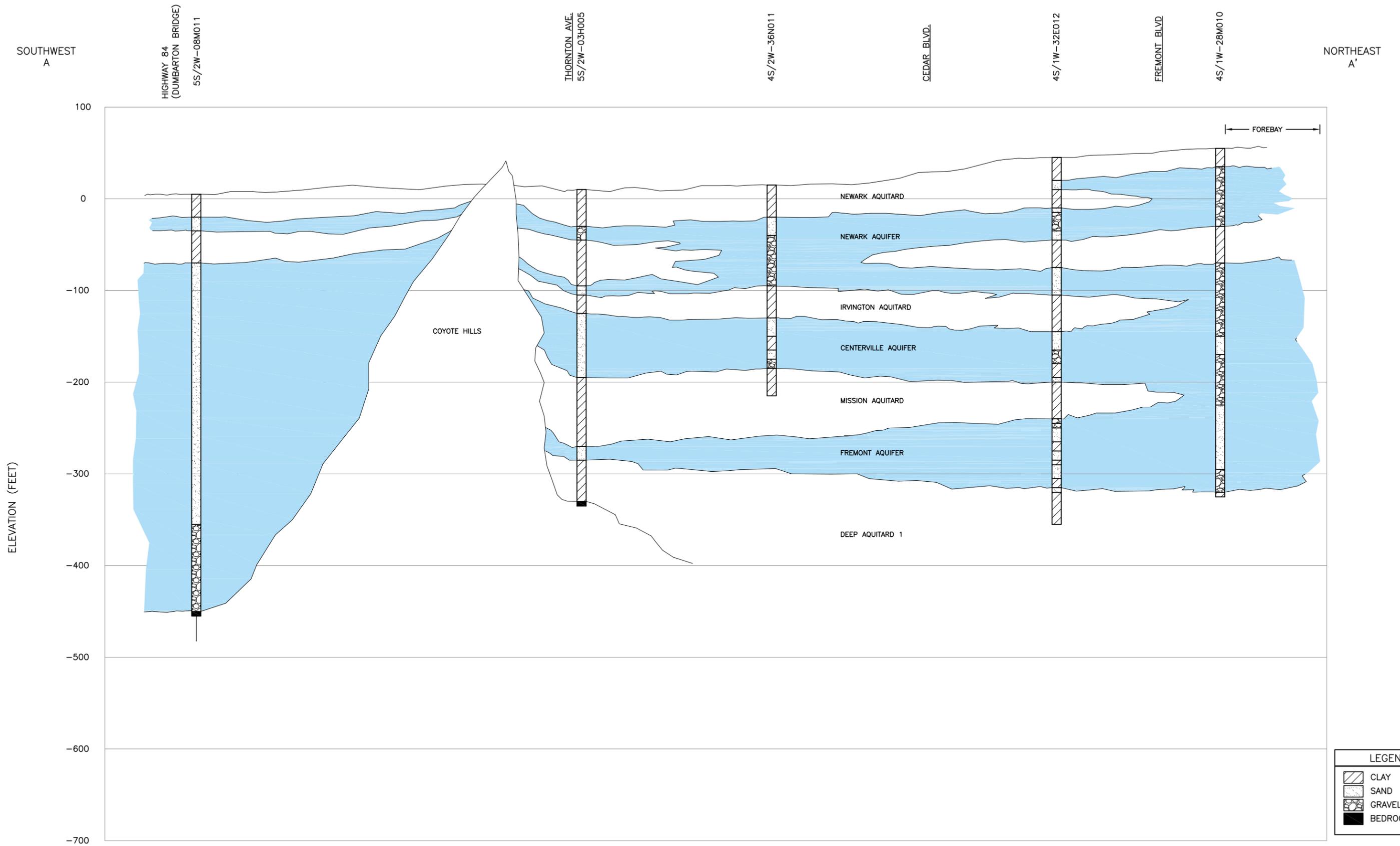


FIGURE 6  
CROSS SECTION A-A'



NORTHWEST  
B

SOUTHEAST  
B'

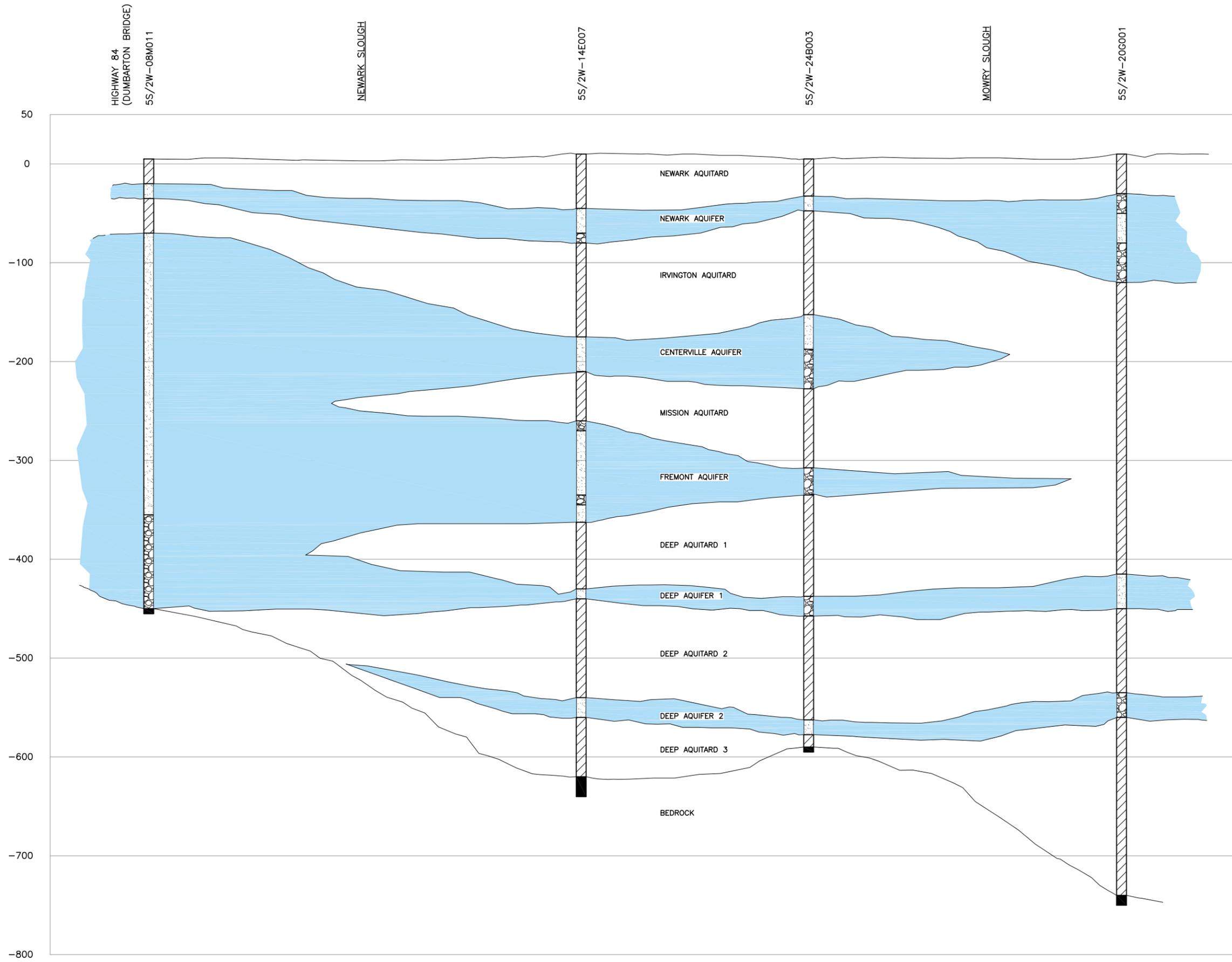


FIGURE 7  
CROSS SECTION B-B'



**Figure 8: Centerville Aquifer Groundwater Elevation Map**

- Centerville Aquifer Contour Boundary (Defined)
- - - Centerville Aquifer Contour Boundary (Inferred)
- 5 Groundwater Contours
- Centerville Aquifer Monitoring Wells
- Centerville/Fremont Aquifer Monitoring Wells
- ★ 4S/2W-36A006 & 5S/1W-05C001

0 0.5 1 2 Miles



Units: All contour intervals are in feet above/below mean sea level  
 Source: All data has been acquired from ACWD's Fall 2015 Groundwater Monitoring event

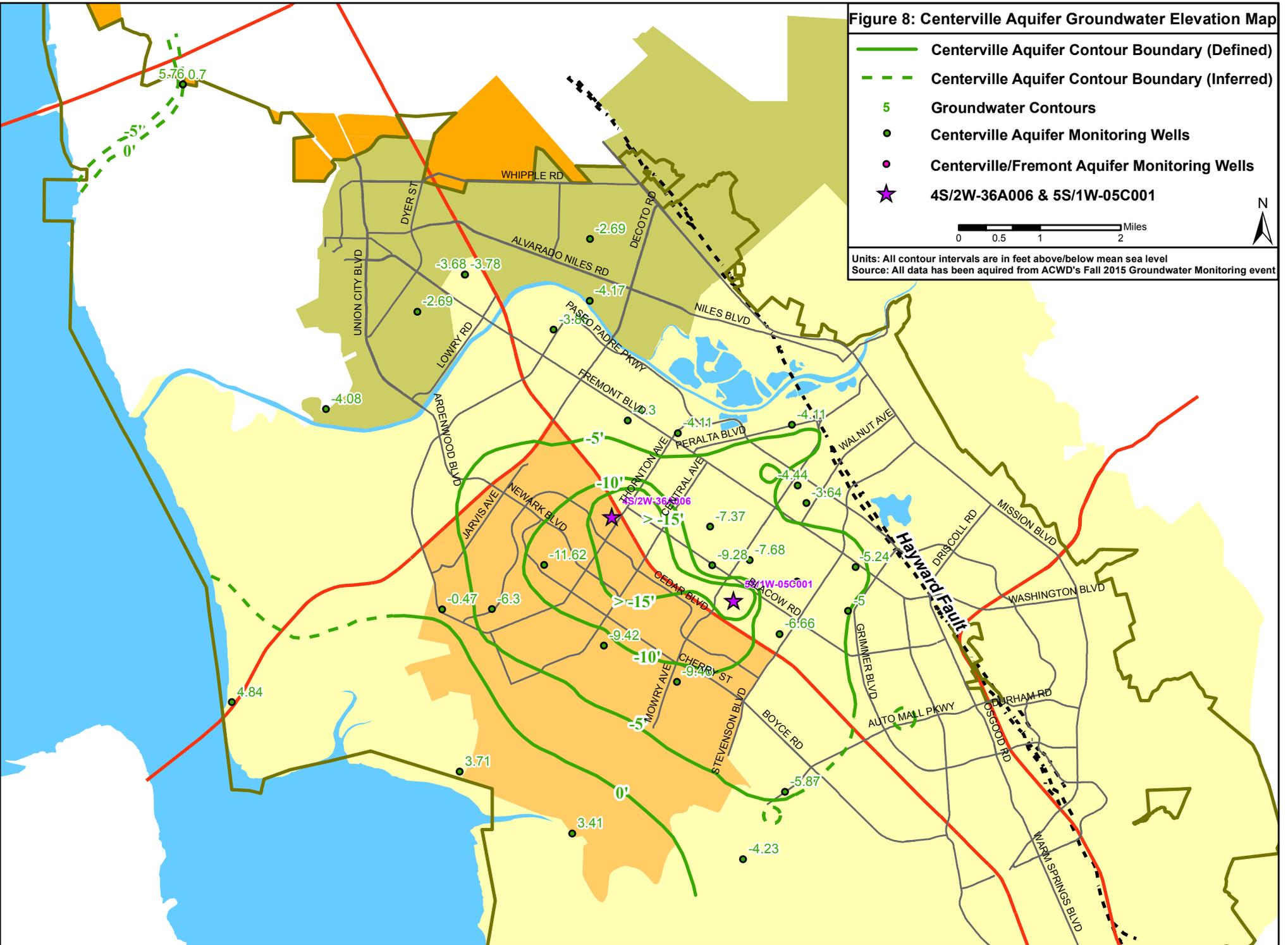


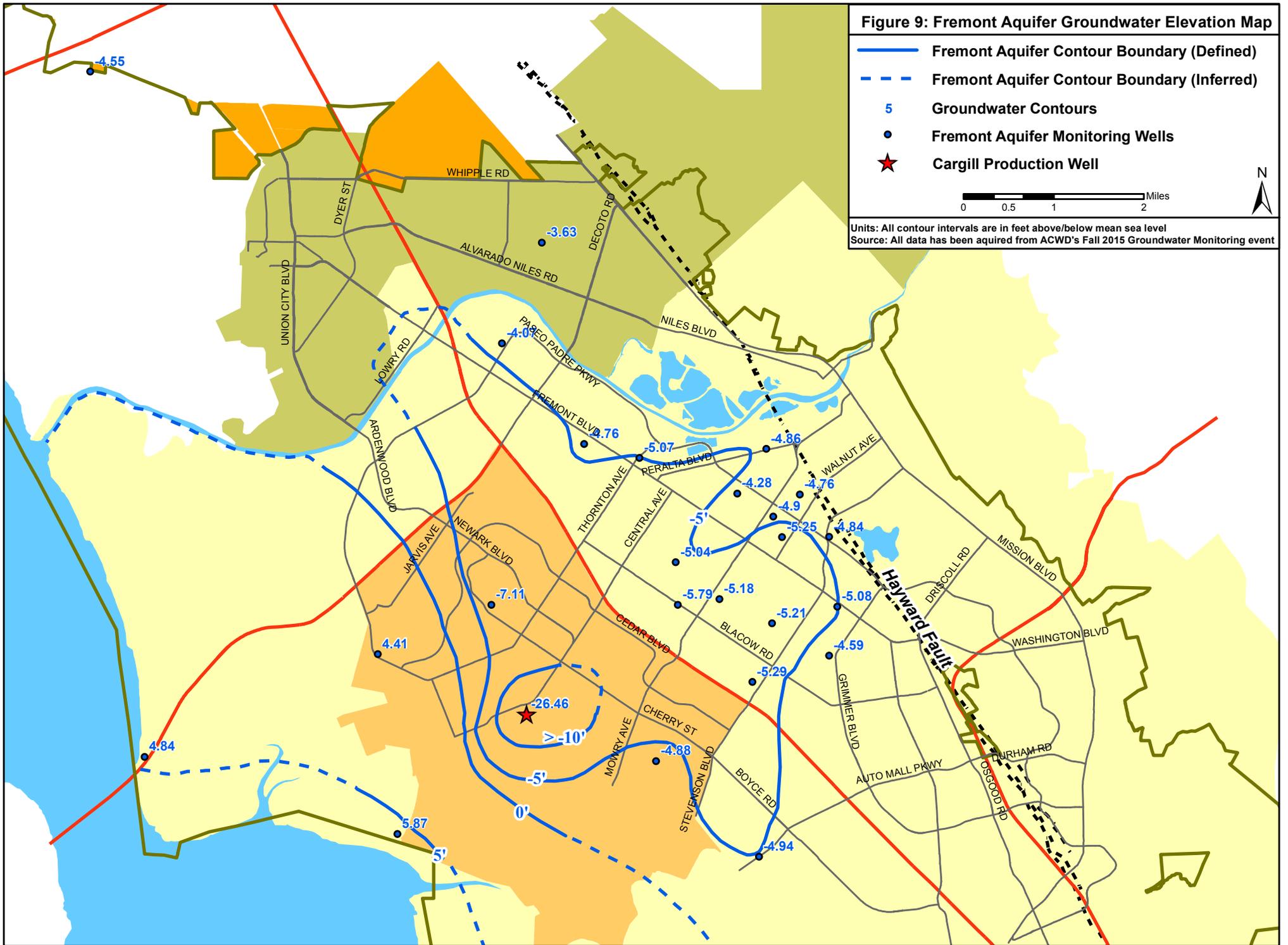
Figure 9: Fremont Aquifer Groundwater Elevation Map

- Fremont Aquifer Contour Boundary (Defined)
- - - Fremont Aquifer Contour Boundary (Inferred)
- 5 Groundwater Contours
- Fremont Aquifer Monitoring Wells
- ★ Cargill Production Well

0 0.5 1 2 Miles



Units: All contour intervals are in feet above/below mean sea level  
Source: All data has been acquired from ACWD's Fall 2015 Groundwater Monitoring event





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

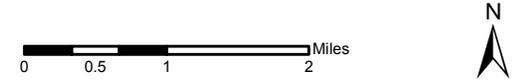
**Figure 10: Fall Monitoring Program Well Locations**

<span style="color: red;">●</span> Fremont Aquifer Well	<span style="color: green;">●</span> Deep Aquifer Well	---	Hayward Fault
<span style="color: blue;">●</span> Centerville Aquifer Well	<span style="color: purple;">●</span> Fremont/Centerville Interconnected Monitoring Well		

0 0.5 1 2 Miles

**Figure 11: Centerville Aquifer Chloride Isocron Map**

-  Centerville Aquifer Contour Boundary (Defined)
-  Centerville Aquifer Contour Boundary (Inferred)
-  250 Chloride Contours
-  Centerville Aquifer Monitoring Wells



Units: All contour intervals are in 250 milligrams per liter (mg/L)  
Source: All data has been acquired from ACWD's Fall 2015 Groundwater

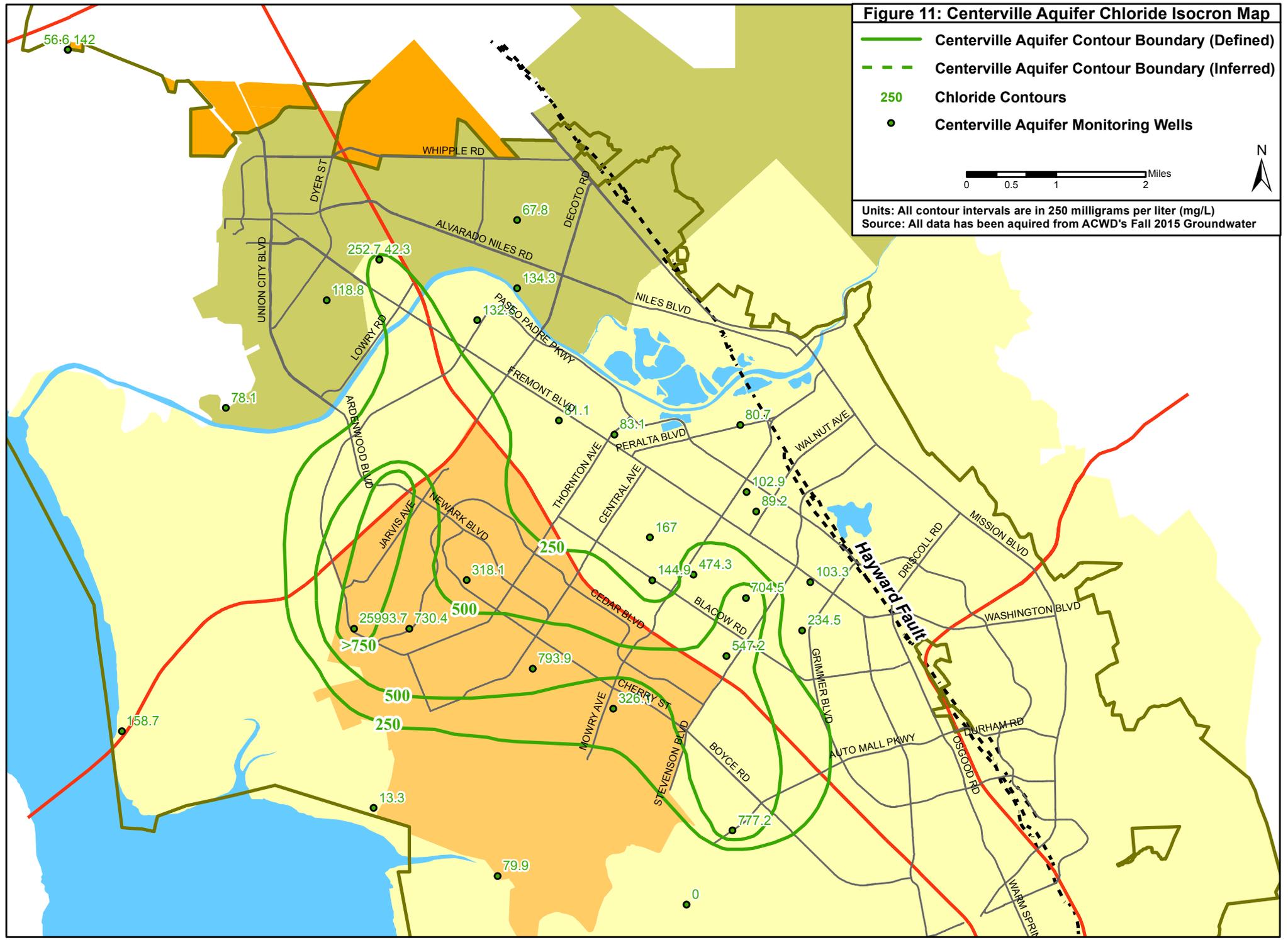


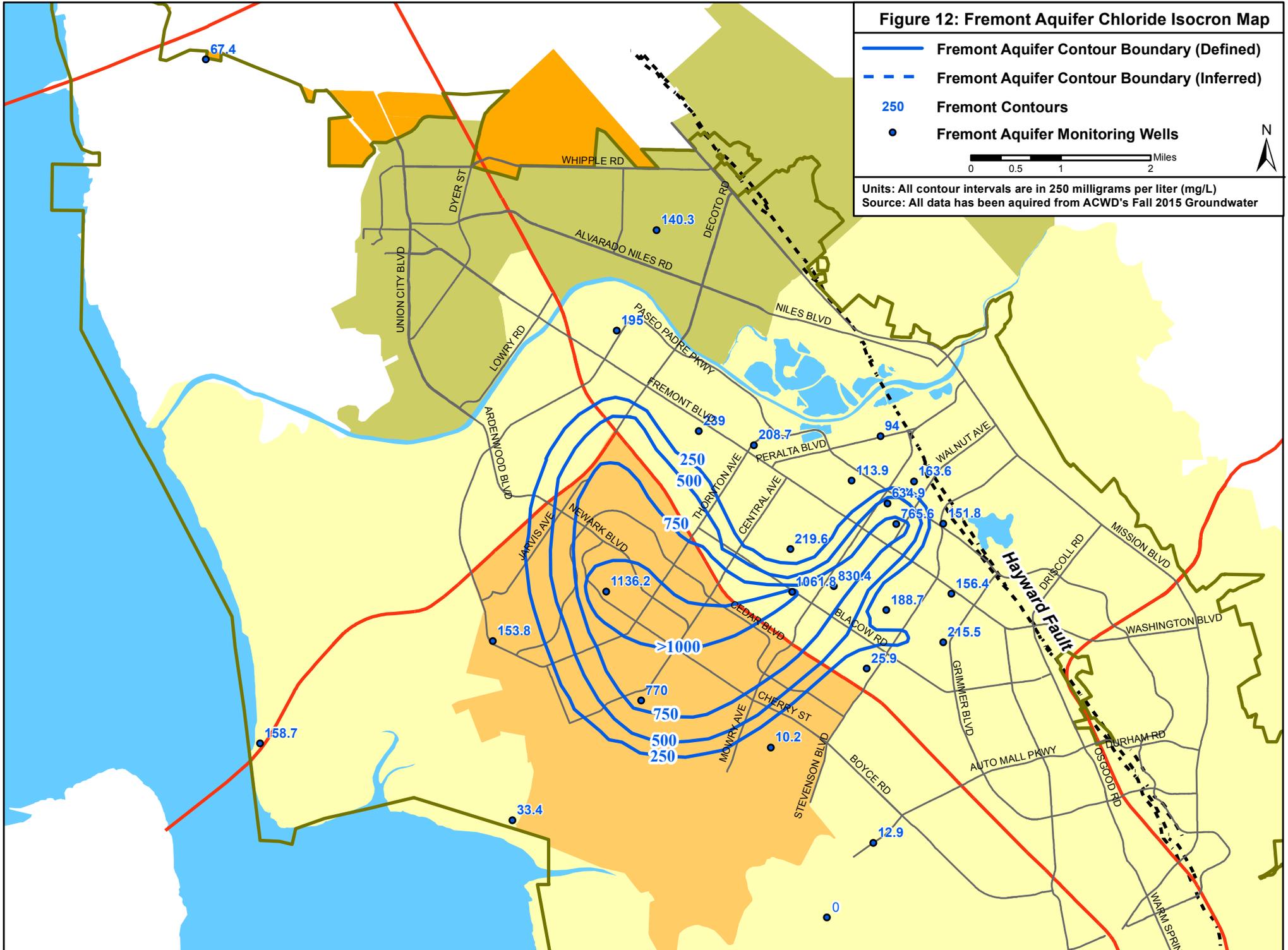
Figure 12: Fremont Aquifer Chloride Isocron Map

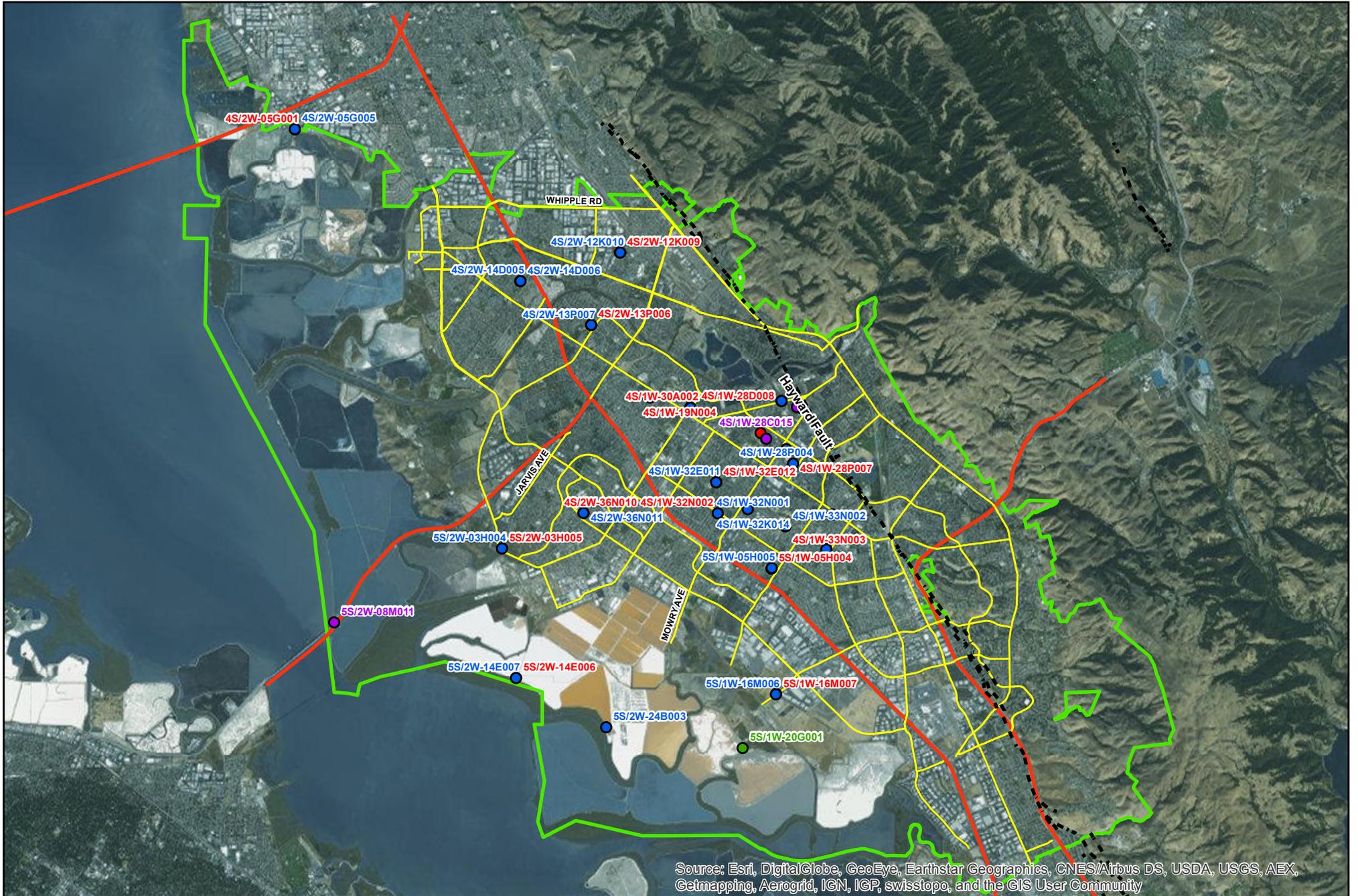
-  Fremont Aquifer Contour Boundary (Defined)
-  Fremont Aquifer Contour Boundary (Inferred)
- 250** Fremont Contours
-  Fremont Aquifer Monitoring Wells

0 0.5 1 2 Miles



Units: All contour intervals are in 250 milligrams per liter (mg/L)  
Source: All data has been acquired from ACWD's Fall 2015 Groundwater



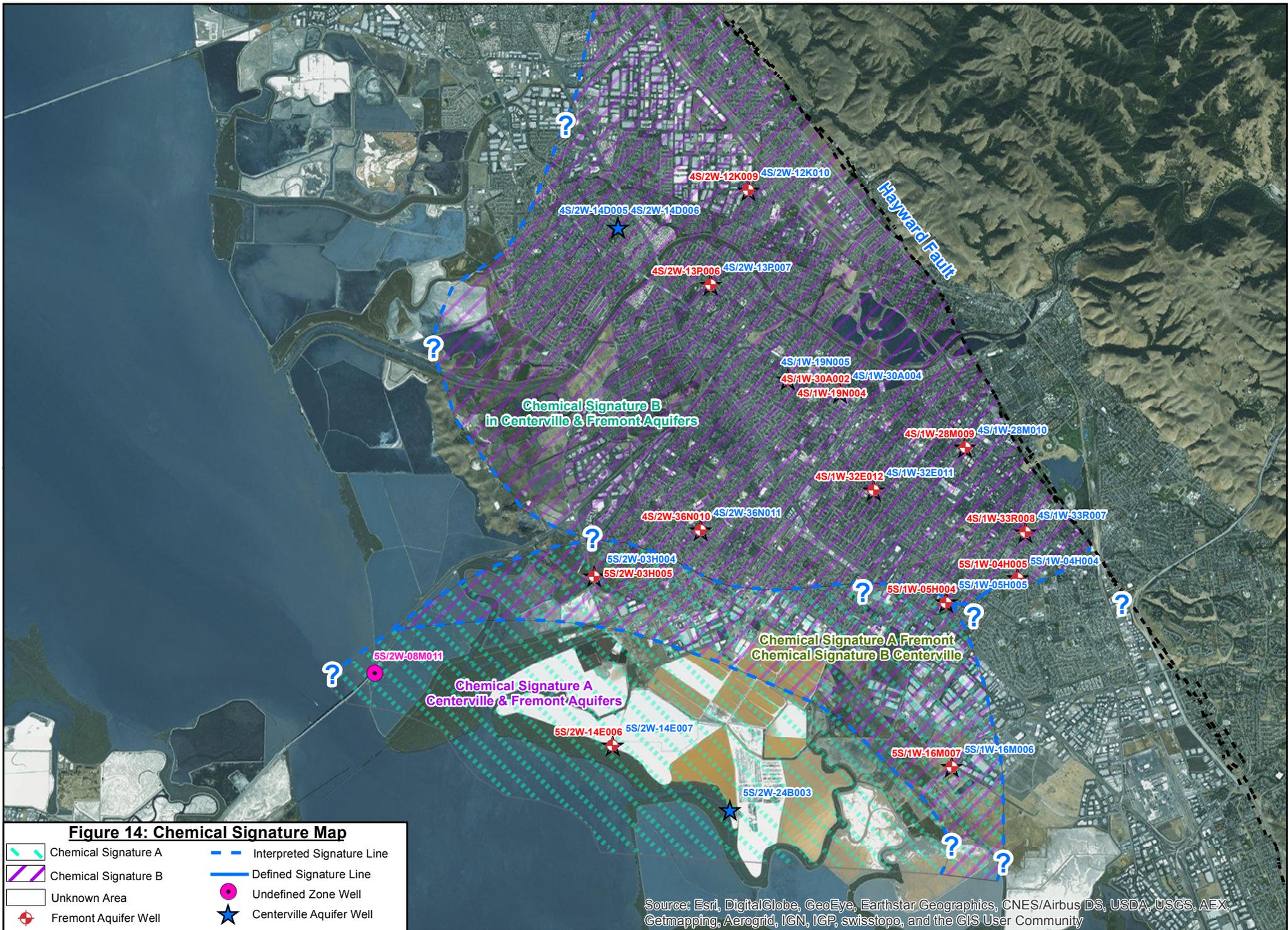


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

**Figure 13: Aquifer Characterization Testing Well Locations**

<span style="color: red;">●</span> Fremont Aquifer Well	<span style="color: green;">●</span> Deep Aquifer Well	<span style="color: green;">—</span> ACWD Boundary
<span style="color: blue;">●</span> Centerville Aquifer Well	<span style="color: purple;">●</span> Fremont/Centerville Interconnected Monitoring Well	- - - - Hayward Fault

Miles



Appendix A  
CEQA Negative Declaration

# ALAMEDA COUNTY WATER DISTRICT

## NILES CONE SALTWATER INTRUSION AND AQUIFER CHARACTERIZATION PROJECT

### **Negative Declaration**

### **Initial Study and CEQA Checklist**

Prepared by

Alameda County Water District  
P.O. Box 5110  
Fremont, CA 94537

May 7, 2014

## NEGATIVE DECLARATION

The California Environmental Quality Act (CEQA) was enacted in 1970 for the purpose of providing decision-makers and the public with information regarding environmental effects of proposed projects; identifying means of avoiding environmental damage; and disclosing to the public the reasons behind a project's approval even if it leads to environmental damage. The proposed project is subject to CEQA and no exemptions apply. Therefore, the preparation of an Initial Study (IS) is required.

An IS is a preliminary analysis conducted by the lead agency, in consultation with other agencies (responsible or trustee agencies, as applicable), to determine whether there is substantial evidence that a project may have a significant effect on the environment. If the initial study concludes that the project, with mitigation, may have a significant effect on the environment, an Environmental Impact Report (EIR) should be prepared; otherwise the lead agency may adopt a Negative Declaration (ND) or Mitigated Negative Declaration (MND).

The IS/ND contained herein have been prepared in accordance with CEQA (Public Resources Code 21000 et seq.) and the State CEQA Guidelines (Title 14, California Code of Regulations 15000 et seq.).

The following discussion of potential environmental effects was completed in accordance with Section 15063(d)(3) of the CEQA Guidelines to determine if the project may have significant effect on the environment.

**NAME OF PROJECT:** Niles Cone Saltwater Intrusion and Aquifer Characterization Project

**PROJECT NO.:** 4342

**DESCRIPTION OF PROJECT:** The Alameda County Water District's (ACWD) study, "Niles Cone Saltwater Intrusion and Aquifer Characterization Project," proposes the installation of six groundwater monitoring wells in the southern and western sections of the Niles Cone Groundwater Basin where brackish water has been detected and potentially threatens ACWD's Mowry Wellfield. The Niles Cone Groundwater Basin underlies the cities of Fremont, Newark, and Union City and ACWD depends on it for up to 60% of its water supply. The Mowry Wellfield is located west of the Hayward Fault and is one of several wellfields operated by ACWD as a municipal water source.

The purpose of drilling these wells is to explore the subsurface geology in this sensitive area where Department of Water Resources (DWR) has documented inferred major depositional channels and to further evaluate the extent of brackish water near the Mowry Wellfield; to allow long term monitoring of water quality and water level fluctuations in the Centerville and Fremont Aquifers; and to gain a better understanding of the relationship between the Centerville and Fremont Aquifers.

The six wells are proposed to be installed at four sites (Figure 1). The four proposed well sites are in locations that are needed to delineate the southern and western extent of the brackish water in the two aquifers. One pilot boring will be drilled at each site to a depth of 800 feet below ground surface to obtain a detailed geologic profile of the alluvial material. Each of the pilot borings will be

converted into Fremont Aquifer monitoring wells at an approximate depth of 350 feet with an additional Centerville Aquifer well completed at two of the sites to an approximate depth of 250 feet. The new monitoring wells will provide long term monitoring points needed for tracking groundwater flow patterns and groundwater quality.

In summary, these exploratory borings and associated monitoring wells are necessary for the following reasons: 1) groundwater is a significant source of drinking water in the area; 2) saltwater intrusion is a significant impairment to groundwater quality; and 3) long term monitoring points are required to properly monitor the brackish water, manage the Niles Cone Groundwater Basin, and protect the Mowry Wellfield.

**LOCATION OF PROJECT:** Four (4) locations on public lands operated and managed by the Don Edwards San Francisco Bay National Wildlife Refuge, 1 Marshlands Road, Fremont, California 94555.

**APN:** 537 080100405, 537 070100102, 092 A05013412, 537 060100403

**NAME OF AUTHORIZED AGENT OF APPLICANT:** Douglas Young, Project Manager, Alameda County Water District, Tel: (510) 668-4452; Fax: (510) 651-1760; Email: douglas.young@acwd.com

**MAILING ADDRESS OF APPLICANT OR AGENT:** Alameda County Water District, 43885 South Grimmer Boulevard, Fremont, CA 94538-6348

**EXPLANATION OF REASONS FOR THE FINDING:** The proposed project sites are located on lands that are operated and managed by the Don Edwards San Francisco Bay National Wildlife Refuge (National Wildlife Refuge or Refuge). Consultations detailing the scope of work of the project have been held with the Refuge. The Refuge has approved the project and issued an Endangered Species Consultation Determination letter and a Special Use Permit (SUP) (see attached). The Refuge found that the work is expected to have minimal environmental impact with the additions of the conditions of the SUP added to the scope of work. Further, the four (4) sites are located in or near areas with high construction or public automotive/truck traffic. Due to the pre-existing high level of human activity at/near the site locations, the limited time of field operations associated with this project, and incorporation of Refuge SUP conditions into the project plans, all potential impacts from the project will be minimal and do not require mitigation.

**FINDING:** Based on the findings of the IS, there is no substantial evidence that the project will have a significant effect on the environment.

Environmental Impact Analysis  
Initial Study

1. **Project Title:** Niles Cone Saltwater Intrusion and Aquifer Characterization Project

2. **Lead agency name and address:**

Alameda County Water District  
43885 South Grimmer Boulevard  
Fremont, CA 94538-6348

3. **Contact person and phone number:**

Douglas Young, Project Manager  
(510) 668-4452, Fax: (510) 651-1760  
douglas.young@acwd.com

4. **Project location:**

Four (4) locations on Don Edwards San Francisco Bay National Wildlife Refuge  
APN: 537 080100405, 537 070100102, 092 A05013412, 537 060100403

5. **Project sponsor's name and address:**

Alameda County Water District  
43885 South Grimmer Boulevard  
Fremont, CA 94538-6348

6. **General plan designation:**

Baylands

7. **Zoning:**

Open Space – Conservation District

8. **Description of project:**

The Alameda County Water District's (ACWD) study, "Niles Cone Saltwater Intrusion and Aquifer Characterization Project," proposes the installation of six groundwater monitoring wells at four sites in the southern and western sections of the Niles Cone Groundwater Basin. The completed project will consist of below-ground well installations with at grade surface completion.

The purpose of drilling these wells is to explore the subsurface geology in this sensitive area where DWR has documented inferred major depositional channels to further evaluate the extent of brackish water near the Mowry Wellfield; to allow long term monitoring of water

quality and water level fluctuations in the Centerville and Fremont Aquifers; and to gain a better understanding of the relationship between the Centerville and Fremont Aquifers.

The six wells are proposed to be installed at four sites (Figure 1). The four proposed well sites are in locations that are needed to delineate the southern and western extent of the brackish water in the two aquifers. One pilot boring will be drilled at each site to a depth of 800 feet below ground surface to obtain a detailed geologic profile of the alluvial material. Each of the pilot borings will be converted into Fremont Aquifer monitoring wells at an approximate depth of 350 feet with an additional Centerville Aquifer well completed at two of the sites to an approximate depth of 250 feet. The new monitoring wells will provide long term monitoring points needed for tracking groundwater flow patterns and groundwater quality.

In summary, these exploratory borings and associated monitoring wells are necessary for the following reasons: 1) groundwater is a significant source of drinking water in the area; 2) saltwater intrusion is a significant impairment to groundwater quality; and 3) long term monitoring points are required to properly monitor the brackish water, manage the Niles Cone Groundwater Basin, and protect the Mowry Wellfield.

**9. Surrounding land uses and setting: Briefly describe the project surroundings:**

The four (4) well sites are located in different areas along the eastern boundary of the National Wildlife Refuge (Figure 1). The well sites are on man-made levees, and are next to a landfill, salt production facility, a main access corridor to Highway 84, and the Dumbarton Bridge eastern section of Highway 84. Three well sites are in highly restricted vehicle access areas that require permission to enter. The fourth site (next to the Dumbarton Bridge) is in an asphalt paved parking area. At all the locations, there are extreme amounts of human activity in the form of heavy earth moving type equipment or auto and truck traffic.

**10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.):**

- Don Edwards San Francisco Bay National Wildlife Refuge
- Caltrans

**Environmental Factors Potentially Affected**

The Project has been prepared in consultation with the United States Fish and Wildlife Service (USFWS), Don Edwards National Wildlife Refuge. ACWD and the National Wildlife Refuge have reviewed the project and determined that the project, including the incorporation of the condition outlined in the Special Use Permit, will have not have a significant effect on the following environmental factors:

- Aesthetics
- Agriculture and Forestry Resources
- Air Quality
- Biological Resources

- Cultural Resources
- Geology/Soils
- Greenhouse Gas Emissions
- Hazards & Hazardous Materials
- Hydrology/Water Quality
- Land Use/Planning
- Mineral Resources
- Noise
- Population/Housing
- Public Services
- Recreation
- Transportation/Traffic
- Use of Energy
- Utilities/Service Systems
- Mandatory Findings of Significance

**DETERMINATION:**

On the basis of this initial evaluation:

- The Alameda County Water District Board of Directors find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
- The Alameda County Water District Board of Directors finds that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because mitigation of the project has been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
- The Alameda County Water District Board of Directors find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
- The Alameda County Water District Board of Directors find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

- The Alameda County Water District Board of Directors find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature: Robert Shaver Date: 7/25/14

Printed Name: Robert Shaver For: Alameda County Water District

### EVALUATION OF ENVIRONMENTAL IMPACTS:

This section identifies the environmental impacts of this project by answering questions from Appendix G of the CEQA Guidelines, the Environmental Checklist Form. The environmental issues evaluated include:

- Aesthetics
- Agricultural & Forest Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Geology/Soils
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation/Traffic
- Utilities and Services Systems
- Mandatory Findings of Significance

All analyses take into account the entire action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts. Impacts are categorized as follows:

**Potentially Significant Impact** is appropriate if there is substantial evidence that an effect is significant, or where the established threshold has been exceeded. If there are one or more "Potentially Significant Impact" entries when the determination is made, an Environmental Impact Report (EIR) may be required.

**Less Than Significant with Mitigation Incorporated** applies where the incorporation of mitigation measures would reduce an effect from Potentially Significant Impact to a Less Than Significant Impact. Mitigation measures are prescribed to reduce the effect to a less than significant level.

**Less Than Significant** applies when the project will affect or is affected by the environment, but based on sources cited in the report, the impact will not have an adverse effect. For the purpose of this report, beneficial impacts are also identified as less than significant. The benefit is identified in the discussion of impacts, which follows each checklist category.

**A No Impact** answer is adequately supported if referenced information sources show that the impact simply does not apply to projects like the one involved. A No Impact Answer is explained where it is based on project-specific factors as well as general standards.

## I. Aesthetics

Would the project:

- a) Have a substantial adverse effect on a scenic vista?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- c) Substantially degrade the existing visual character or quality of the site and its surroundings?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** There are no above grade surface structures or buildings associated with this project. The proposed project is the installation of monitoring wells which are completed below surface grade with an at grade access port thus will not impede any visual vistas. The proposed sites are located on or next to existing man-made San Francisco Bay front dirt levees with little to no vegetation, natural rock outcroppings or buildings thus will not substantially damage any scenic resources or degrade the existing visual character or quality of the site. The proposed project is the installation of monitoring wells which are completed below surface grade and will not substantially degrade the existing visual characteristic or quality of the site or its surroundings. There are no structures or equipment associated with the well completions that will be above surface grade or material used that would generate or reflect light or glare. The Refuge has reviewed proposed surface completion drawings and has approved the proposed surface completion.

## II. Agricultural and Forest Resources

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead

agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment project and the Forest legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

- a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in public Resources Code section 12220(g)) timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland production (as defined by Government Code section 51104(g))?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- d) Result in the loss of forest land or conversion of forest land to non-forest use?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The California Department of Conservation (DOC), Farmland Mapping and Monitoring Program (FMMP) depicts the well sites as Urban and Build up Lands and Other Lands (which include Salt Ponds and open areas). Based on discussions with the National Wildlife Refuge, there are no plans to covert or rezone the proposed drilling sites to farming, forest or timber lands. Thus the proposed well sites will not affect farming, forest, or timber lands.

### III. Air Quality

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

a) Conflict with or obstruct implementation of the applicable air quality plan?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input checked="" type="checkbox"/> Less Than Significant Impact	<input type="checkbox"/> No Impact

d) Expose sensitive receptors to substantial pollutant concentrations?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input checked="" type="checkbox"/> Less Than Significant Impact	<input type="checkbox"/> No Impact

e) Create objectionable odors affecting a substantial number of people?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input checked="" type="checkbox"/> Less Than Significant Impact	<input type="checkbox"/> No Impact

**Discussion:** Alameda County is within the jurisdiction of the Bay Area Air Quality Management District (BAAQMD), which regulates air quality in the San Francisco Bay Area. The most recent BAAQMD plan for attaining California Ambient Air Quality Standards, the 2010 Clean Air Plan, was adopted on September 15, 2010. The Clean Air plan demonstrated how the San Francisco Bay Area will achieve compliance with the State 1-hour air quality standard for ozone and how the region will reduce transport of ozone and ozone precursors to neighboring air basins. The purpose of the Clean Air Plan is to 1) update the Bay Area 2005 Ozone Strategy in accordance with the requirements of the California Clean Air Act; 2) consider the impacts of ozone control measures on particulate matter, air toxics, and greenhouse gases in a single, integrated plan; 3) review progress in improving air quality; and 4) establish emission control measures to be adopted or Implemented during the 2009 to

2012 time frame. The project sites are located in the San Francisco Bay air basin and are within the jurisdiction of the BAAQMD. The proposed project would not conflict with the strategies outlined in the Clean Air Plan for bringing the area into compliance. In June 2010, BAAQMD adopted updated draft California Environmental Quality Act (CEQA) Air Quality Guidelines and finalized them in May 2011. These guidelines superseded previously adopted agency air quality guidelines of 1999 and were intended to evaluate potential air quality impacts, both long and short term. The proposed project includes Best Management Practices (BMPs) and has insignificant long-term emission issues. No stationary sources are associated with the project and, once completed, will not generate significant vehicle or other emissions except for bi-annual monitoring visits. Short-term emissions with the proposed project would occur during well drilling and construction activities (up to 10 days at each site). The drilling and construction activities would only include the exhaust emissions from utility engines (standard truck engines) from the drilling equipment and support vehicles. The emission generated would be minor to the emissions generated daily by the heavy equipment and public vehicle traffic from the landfill, salt harvesting activities, freeway access corridor, and State Highway 84 located in the vicinity of the drilling sites. Therefore, the proposed project will not contribute substantially to the existing air quality. As discussed previously, with the implementation of BMPs, the proposed project would not be expected to result in significant levels of criteria air pollutants. Thus, construction and operations associated with the project would not significantly contribute cumulatively to pollution levels in the air basin. The proposed project may expose surrounding land uses to a small quantity of pollutants associated with the use of drilling and support equipment (e.g., diesel-fueled vehicles). As discussed above, with implementation of BMPs, the proposed project would not result in any long-term quality impacts. The BAAQMD CEQA Guidelines lists potential odors sources that could cause significant environmental impacts. The well installation operations that would occur on the project site are not included in this list and would not generate objectionable odors. Some objectionable odors could be generated from the operation of diesel-powered equipment during the project well construction period; however, these odors would be short-term in nature and would not result in permanent impacts to the surrounding land use.

**IV. Biological Resources**

Would the project:

- a) Have a substantial adverse impact, either directly or through habitat modifications, on a species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by California Department of Fish and Game or U.S. Fish and Wildlife Service?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or US Fish and Wildlife Service?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The sites are located on National Wildlife Refuge property, in areas with little to no vegetation or identified wetlands. Thus there is no conflict with any local policies protecting biological resources. The Refuge was also consulted as to potential effects to flora, fauna, and Federal and California endangered species in the vicinity of the sites. The Refuge evaluated the Project in accordance with Section 7 of the Endangered Species Act (16 U.S.C. 1531. *et seq.*) and determined that the proposed project is not likely to adversely affect the Endangered California Clapper Rail in the vicinity of the sites and that no further action is currently necessary (as noted in the attached Endangered Species Consultation Determination Letter). Additionally, the Refuge has issued a Special Use Permit to ACWD with permit conditions, including conservation measures at Well Site 8 to avoid and minimize potential effects on the Salt Marsh Harvest Mouse and their habitats. (See attached) ACWD has incorporated the SUP conditions as part of the scope of work for the Project. Further, California Fish and Wildlife was consulted as to the scope of the project

and noted they have no permit to issue because all of the special status species are either fully protected or a species of special concern and that we should consult with the National Wildlife Refuge.

V. Cultural Resources

Would the project:

- a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- d) Disturb any human remains, including those interred outside of formal cemeteries?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Comments:** There are no cultural resources at the well locations. The Fremont Draft General Plan Update (2011) identifies historic resources to the north of the project sites (Coyote Hills) and to the south (Mowry Landing). Minimal excavation work is associated with the project and will be limited to the well sites only. There are also no known unique paleontological resources, unique geologic features or known cemeteries on or near the project site. In the event that archaeological or paleontological resources are encountered during the course of drilling, all activities shall temporarily cease within the vicinity of the area until a qualified professional is brought onto the project site to properly assess the resources and make recommendation for their disposition. In the event that human remains are discovered, there shall be no disposition of such human remains, other than in accordance with the procedures and requirements set forth in California Health and Safety Code Section 7050.5 and Public Resources Code Section 5073.98. These code provisions require notification of the County Coroner and the Native American Heritage Commission, who in turn must notify those persons believed to be most likely descended from the deceased Native American for appropriate disposition of the remains.

**VI. Geology and Soils**

Would the project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

ii) Strong seismic ground shaking?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

iii) Seismic-related ground failure, including liquefaction?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

iv) Landslides?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b) Result in substantial soil erosion or the loss of topsoil?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The proposed sites are subsurface well completion with no above ground surface structures. None of the sites are located within 50 feet of an identified active fault. No operation associated with the project will increase the potential of ground shaking, liquefaction, landslides, loss of soil or topsoil. No above ground structures are planned for or anticipated to be erected now or in the future in connection with the project. These levees are inspected and maintained by the Refuge, Cargill Salt, and Caltrans and are structurally stable.

## VII. Greenhouse Gas Emissions

Would the project:

- a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input checked="" type="checkbox"/> Less Than Significant Impact	<input type="checkbox"/> No Impact

- b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** Greenhouse Gas (GHG) emissions associated with implementation of the proposed project would occur over the short term from well installation activities, consisting primarily of emissions from equipment exhaust. Once completed, the proposed project would generate a minor amount of GHG emissions resulting from bi-annual vehicle trips to monitor the wells. The long-term GHG emissions would be insignificant compared to normal equipment and vehicle traffic near the sites. Short-term GHG emissions would consist of combustion emissions from the drilling rig and support vehicles, which typically use fossil-based fuels to operate. The combustion of fossil-based fuels creates GHGs such as carbon dioxide, methane, and nitrous oxide. Exhaust emissions from on-site equipment and vehicles would vary daily as installation activities levels change. The equipment on-site

would consist of a drill rig (consistently running), support truck (running twice a day to bring men and supplies), and a pickup truck (twice a day for the inspector). The project emissions would be a very small fraction of the total GHGs that are released daily from the nearby landfill, salt harvesting operations, freeway access road, and State Highway 84. Therefore, the project would not generate significant GHG emissions.

**VIII. Hazards and Hazardous Materials**

Would the project:

- a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- f) For a project within the vicinity of a private airstrip, would the project result in a

safety hazard for people residing or working in the project area?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

*Discussion:* The nearest school and airport to the project are over  $\frac{3}{4}$  of a mile away and over 10 miles away, respectively. The site is not located near an urbanized area. No hazardous materials are being used for the drilling, installation, or completion of the wells nor are the sites located on hazardous materials sites. The only exception is the use of fuels and oils for the drilling equipment. ACWD will be applying best management practices which include storage of fuels and oils off-site, plastic liners beneath all equipment, daily check of all equipment for wear and leaks, and when possible, re-fueling off-site when staging between well sites. Additionally, the Refuge SUP contains conditions for management of equipment fluids (fuels and oils) which are incorporated into the scope of work for the project (see attached). At all times, ACWD will use these best management practices to avoid significant hazards or impacts to the environment.

## IX. Hydrology and Water Quality

Would the project:

a) Violate any water quality standards or waste discharge requirements?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

f) Otherwise substantially degrade water quality?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input checked="" type="checkbox"/> Less Than Significant Impact	<input type="checkbox"/> No Impact

j) Inundation by seiche, tsunami, or mudflow?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The proposed project will utilize existing municipal water service supplies and, as such, will not deplete groundwater supplies or interfere with groundwater recharge. Additionally, no physical changes are proposed for the site that would create or contribute additional stormwater runoff, provide substantial sources of polluted runoff, or violate any water quality standards. A Stormwater Pollution Prevention Plan has been prepared for the project in case of inclement weather during installation of the wells. The plan provides for adding straw berming around the work area to filter the runoff water and contain sediment within the work area. Drilling mud and well development water will be contained on-site in an above ground portable drilling mud pit and properly disposed of off-site. The proposed project would not result in the construction of large areas of impervious surfaces that would prevent water from infiltrating into the groundwater nor would it result in direct additions or withdrawals to existing groundwater. No significant change in either drainage patterns or on-site or off-site effects from erosion and siltation would occur. Development of the proposed project would not significantly alter existing drainage patterns, including alteration of the course of a stream or river or a substantial increase in the rate/amount of surface runoff that could lead to on-site or off-site flooding. The project location is on National Wildlife Refuge land and is not within a 100-year flood hazard area and standing water around the well sites are in direct contact with San Francisco Bay. Although one site is within the Tsunami Inundation Map (the sites are not identified on any seiche or mudflow maps), the project structures are completed below surface grade thus poses no significant risk to people or other structures. Well installation activities do not involve excavation or sidewall activities thus will not affect the structural integrity of the levee. Thus the proposed project would not expose people or structures or people to significant risk of loss, injury, or death. Interestingly, the installation of these well will be used to better understand the hydrogeology of the groundwater basin so that water quality in the area can be eventually improved.

**X. Land Use and Planning**

Would the project:

a) Physically divide an established community?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The sites are located on property operated and protected by the Don Edwards San Francisco Bay Wildlife Refuge. The proposed project plans have been reviewed and approved by the Refuge and the land use is planned to remain the same; to preserve and enhance wildlife habitat; protect migratory birds and threatened and endangered species; and provide opportunities for wildlife-oriented recreation and nature study for the surrounding communities. This project will have no impact on present or expected future land use.

**XI. Mineral Resources**

Would the project:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The City of Fremont Draft General Plan Update (July 2011) identifies lands west of interstate 880 (Sector K) as being designated by the State Mining and Geology Board as containing regionally significant aggregate resources. The proposed project sites are located in the Don Edwards San Francisco Bay Wildlife Refuge with no active mining sites in the vicinity. The construction of the proposed project would not require the use of significant aggregate resources. Therefore, the implementation of the proposed project will not result in the loss of availability of mineral resources that would be of value to the region and the residents of the state.

**XII. Noise**

Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** There will be no substantial permanent increase in ambient noise levels in the project vicinity once the wells are installed. During installation, ACWD will adhere to the City of Newark and City of Fremont Municipal Codes concerning noise. The well sites are over 10 miles from the nearest airstrip and there is no expectation of exceeding any noise limits since the proposed sites are located next to active site with heavy earth moving equipment or heavy public traffic. Well sites 5 and 6 are located next to the Newark Cargill Salt Production Facility and the Tri-City Waste Management Recycling and Landfill, respectively, where multiple pieces of heavy earth moving equipment are continually operating on a daily basis. Well sites 7 and 8 are located next to Thornton Avenue (a major

artery to the Dumbarton Bridge) and the Dumbarton Bridge, respectively. Heavy auto and truck traffic is continually moving along these transportation corridors. The well installation activities will occur only normal daylight hours. It will take two to three weeks to complete at each site and the amount of noise generated during this time would be insignificant to what is currently generated without the project.

**XIII. Population and Housing**

Would the project:

- a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The sites are located on property operated and protected by the Don Edwards San Francisco Bay Wildlife Refuge. There is no housing on or in the vicinity of the sites nor are there plans for any development of the land. As such, there is no impact to population or housing.

**XIV. Public Services and Safety**

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

- a.) Fire protection?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b.) Police protection?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

c.) Schools?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

d.) Parks?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

e.) Other public facilities?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The sites are located on engineered dirt levees with no structures and minimal vegetation. The project will not add any structures or additional population in the area thus, the project will not impact public services or governmental facilities.

**XV. Recreation**

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The project will not increase the use of the Refuge nor does it include the construction of any structures of facilities for human occupancy that would impact the present recreational use of the area, thus there will be no impact to recreational use.

**XVI. Transportation and Traffic**

Would the project:

- a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highway and freeways, pedestrian and bicycle paths, and mass transit?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- b) Conflict with an applicable congestion management program, including, but not limited to level of service standard and travel demanded measures, or other standards established by the county congestion management agency for designated roads or highways?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- e) Result in inadequate emergency access?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The proposed sites are located on vehicle access restricted dirt levees managed and operated by the Refuge. As such, activities at the well sites will not impact public vehicle accessible streets, highways, freeways, air traffic patterns, or public transportation. Further, the well sites are sited in turnaround or turnout areas and do not restrict access along the levees thus do not restrict bicycle or pedestrian use. As such, there will be no impact to transportation and traffic.

**XVII. Utilities and Service Systems**

Would the project:

- a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

- f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

g) Comply with federal, state, and local statutes and regulations related to solid waste?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** The proposed project does not require the installation of additional utilities or service systems, nor will it generate significant new amounts of solid waste that cannot be accommodated by ACWD's storage facility. As such, there is no impact to utility or service systems.

**XVIII. Mandatory Findings of Significance**

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input checked="" type="checkbox"/> Less Than Significant Impact	<input type="checkbox"/> No Impact

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

<input type="checkbox"/> Potentially Significant Impact	<input type="checkbox"/> Less Than Significant with Mitigation Incorporated
<input type="checkbox"/> Less Than Significant Impact	<input checked="" type="checkbox"/> No Impact

**Discussion:** As presented in this IS, Don Edwards San Francisco Bay Wildlife Refuge was consulted as to the potential effects of the project on the habitat in the vicinity of the well sites. The Refuge found that work at the well sites had minimal to no effects with the exception of Site 8 where avoidance conditions (as presented in the Special Use Permit) will be implemented. The project does not degrade the quality of the environment, impact fish or wildlife habitat or populations, threaten to eliminate a plant or animal community, reduce

the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory. The project only minimally adds to the cumulative considerable impacts given that past and/or present activities in the vicinity of the well sites were/are salt harvesting operations or are in close proximity of highly active traffic corridors. Discussions with the Refuge indicate that there are no activities planned near the well sites in the near future. Due to the location of the well sites, safety precautions built into the project, and limited time duration of activities at each site, there will be minimal effects to human beings and the environment.

### **Project Specific Source References**

1. Endangered Species Consultation Determination Letter – Don Edwards Wildlife Refuge
2. Special Use Permit - US Department of Fish and Wildlife
3. Best Management Practices Construction Handbook – Caltrans
4. Air Quality Guidelines – Bay Area Air Quality Management District
5. California Code of Regulations (CCR)
6. City of Fremont Municipal Code Chapter 18.50.040(a)(1)
7. City of Newark municipal Code 17.24.120
8. City of Fremont Draft General Plan Update July 2011, Mineral Resources (4-313)
9. City of Fremont Draft General Plan Update July 2011, Agricultural Resources (4-288)
10. City of Fremont Draft General Plan Update July 2011, Agricultural Resources (4-272)
11. Niles Cone Saltwater Intrusion and Characterization Project, Site Safety Plan.
12. California Emergency Management Agency, Tsunami Inundation Map (July 2009)
13. Bay Area Air Quality Management District, CEQA Guidelines
14. Bay Area Air Quality Management District, Air Quality Standards



FIGURE 5

ALAMEDA COUNTY WATER DISTRICT  
 FREMONT, CALIFORNIA

PROPOSED  
 WELL  
 LOCATIONS



# United States Department of the Interior



FISH AND WILDLIFE SERVICE  
San Francisco Bay National Wildlife Refuge Complex  
1 Marshlands Road, Fremont CA 94555

March 19, 2014

Mr. Douglas T. Young  
Alameda County Water District  
43885 South Grimmer Boulevard  
Fremont, CA 94538-6348

Subject: Endangered Species Consultation on the Proposed Niles Cone Saltwater Intrusion and Aquifer Characterization Project, Alameda County, California

Dear Mr. Young:

The Don Edwards San Francisco Bay National Wildlife Refuge (Refuge) has reviewed the proposed Niles Cone Saltwater Intrusion and Aquifer Characterization Project (Project). We understand that Alameda County Water District will be installing six groundwater monitoring wells at four sites on or near the Refuge. We have evaluated the proposed Project in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act). All except one of your well sites are located on top of existing dirt levees. One site (#8) is located on disturbed land which is approximately 300 feet from salt marsh harvest mouse (*Reithrodontomys raviventris raviventris*) habitat. We have identified conservation measures in your revised Special Use Permit that shall be implemented at Site #8 to avoid and minimize potential effects on the harvest mouse. We have determined that the proposed Project is not likely to adversely affect the endangered California clapper rail (*Rallus longirostris obsoletus*).

Unless new information reveals effects of the proposed action that may affect listed species in a manner or to an extent not considered, or a new species or critical habitat is designated or proposed that may be affected by the proposed Project, no further action pursuant to the Act is necessary. If you have any questions regarding our response, please contact Melisa Amato (melisa\_amato@fws.gov) at (510) 792-0222 (ext. 124).

Sincerely,

Anne Morkill  
Manager, San Francisco Bay  
National Wildlife Refuge Complex

TAKE PRIDE<sup>®</sup>  
IN AMERICA 



UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE

Don Edwards San Francisco Bay NWR  
1 Marshlands Road, Fremont, CA 94555  
510/792-0222

SPECIAL USE PERMIT

Station No. to be Created Permit No.

81640 - 2014-015

Date March 31, 2014

Period of Use (inclusive)

From March 31, 2014  
To March 31, 2016

Permittee Name

Douglas Young - 510 668-4452  
Alameda Co. Water District

Permittee Address

ACWD  
43885 South Grimmer Blvd.  
Fremont, Ca. 94538

Purpose (specify in detail privilege requested, or units of products involved)

Installation of 6 new monitoring wells at 4 sites located on Don Edwards NWR.

Description (specify unit numbers: metes and bounds, or other recognizable designations)

This proposal is for the drilling and construction of six groundwater monitoring wells targeting the southern and western extent of brackish groundwater in the Centerville and Fremont Aquifers near ACWD's Mowry Wellfield as well as aquifer chemical characterization testing. The installation of these wells and aquifer chemical characterization testing will enable ACWD to obtain geologic, hydrogeologic, and chemical data of the area, gain a better understanding of the relationship between the Centerville and Fremont Aquifers, assist in evaluating the extent of the brackish water in the vicinity of the Mowry Wellfield, and provide long

Amount of fee \$0 if not a fixed payment, specify rate and unit of charge:

- Payment Exempt - Justification: Research beneficial to Refuge
- Full Payment
- Partial Payment - Balance of payments to be made as follows:

Record of Payments

N/A

Special Conditions

See Attached Special Conditions

This permit is issued by the U.S. Fish and Wildlife Service and accepted by the undersigned, subject to the terms, covenants, obligations, and reservations, expressed or implied herein, and to the conditions and requirements appearing on the reverse side.

Permittee Signature

Issuing

Digitally signed by Eric Mruz  
DN: cn=Eric Mruz, o=USFWS, ou,  
email=eric\_mruz@fws.gov, c=US  
Date: 2014.03.31 11:36:06 -07'00'

FOR ANY LAW ENFORCEMENT ISSUES PLEASE CALL DISPATCH AT 415-561-5510. BE PREPARED TO EXPLAIN WHO AND WHERE YOU ARE.

1. Permittee or designee must carry a copy of permit when on Refuge lands and the research / study proposal.
2. As part of the proposed Project, the following conservation measures will be implemented at Site 8 to avoid and minimize potential effects on the salt marsh harvest mouse and their habitats.
  - A. All vegetation within the project area and within a 2-foot buffer around the project area shall be removed by hand using only non-mechanized hand tools (i.e., trowel, hoe, rake, and shovel) or weed whacker prior to the initiation of work within these areas. Vegetation shall be removed to bare ground or stubble no higher than 1 inch. Vegetation removal shall start at the center of the project area (site 8 location) and work its way towards the salt marsh or the better salt marsh habitat (moving east).
  - B. To prevent salt marsh harvest mice from moving through the proposed project site during construction, temporary exclusion fencing shall be placed around a defined work area prior to the start of construction activities. The temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that salt marsh harvest mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest adjacent vegetation with a maximum height of 4 feet. All supports for the exclusion fencing shall be placed on the inside of the work area.
3. All work will occur during normal daylight working hours.
4. Before the start of work each day, an approved worker will check for animals under any equipment and vehicles within the project area. If a salt marsh harvest mouse is encountered, work will stop, and the Service and CDFW will be notified immediately for guidance on how to proceed.
5. Access routes and work areas will be limited to the minimum amount necessary to achieve the project goals.
6. All foods and food-related trash items will be enclosed in sealed trash containers and removed from the site at the end of each workday.
7. No pets will be allowed on the project site.
8. All equipment will be maintained such that there will be no leaks of machine fluids such as gasoline, diesel, or oils.
9. Hazardous materials such as fuels and oils will be stored in sealable containers in a designated location that is at least 200 feet from any aquatic habitat.
10. At completion of the authorized work, the District will leave the property in reasonable condition. Any fence which is opened by the District to allow access for maintenance vehicles will be restored to its original condition once the work has been completed. The District will repair any damage to the premises caused by its activities while accomplishing sediment disposal or ancillary work activities.
11. All work will be conducted in a manner which minimizes disturbance to wildlife and damage to wetland habitat. Noise must be minimized to prevent wildlife disturbance.
12. Permittee may not drive on levees for 3-5 days after a moderate rain or under conditions that may damage the levee. When permittee encounters visitors on Refuge trails, speed will be reduced to prevent dust and unnecessary disturbance of visitors.

RESOLUTION NO. 14-031

OF BOARD OF DIRECTORS OF ALAMEDA COUNTY WATER DISTRICT  
ADOPTING A NEGATIVE DECLARATION FOR AND APPROVING THE  
NILES CONE SALTWATER INTRUSION AND AQUIFER  
CHARACTERIZATION PROJECT, JOB 4342 (REFERENCED AS  
98G02/GG0601B WITHIN THE DISTRICT'S CAPITAL IMPROVEMENT  
PROGRAM), AND DIRECTING THE FILING OF A NOTICE OF  
DETERMINATION

WHEREAS, the ALAMEDA COUNTY WATER DISTRICT (District) has included the Niles Cone Saltwater Intrusion and Aquifer Characterization Project (Project) in the District's Capital Improvement Program;

WHEREAS, the District has prepared an Initial Study of the potential environmental impacts of the Project, which found that the Project would not have a significant effect on the environment because avoidance protocols and best management practices have been incorporated into the Project;

WHEREAS, the District gave public notice of the Initial Study and of its intention to adopt a Negative Declaration, including a 30-day public review period which ended June 6, 2014.

WHEREAS, only one written comment was received by the District during the public review period but that comment was subsequently withdrawn; and

WHEREAS, pursuant to the requirements of 14 CCR Section 15074, the District has considered the Initial Study and the proposed Negative Declaration.

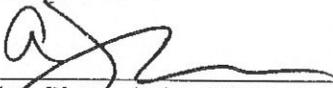
NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Alameda County Water District as follows:

1. The Board of Directors finds on the basis of the whole record, including the Initial Study and the Negative Declaration, that there is no substantial evidence that the Project will have a significant effect on the environment and that the Negative Declaration reflects the District's independent judgment and analysis.

CERTIFICATE

I, the undersigned District Secretary of ALAMEDA COUNTY WATER DISTRICT, do hereby certify that the foregoing is a full, true and correct copy of a Resolution of the Board of Directors of ALAMEDA COUNTY WATER DISTRICT, a political subdivision, which said Resolution was duly adopted at a meeting of said Board regularly held on July 10, 2014, that a copy of said Resolution was forthwith duly entered in the minutes of said meeting of said Board, and that the same is in full force and effect.

Dated: July 11, 2014

  
\_\_\_\_\_  
Andrew Warren, Assistant District Secretary  
Alameda County Water District

EMFAC2011 Emissions Inventory

Region	Calendar Year	Season	Vehicle Class	Vehicle Type	Approximate Vehicle Weight (lbs)	Fuel	Model Year	Speed (miles/hour)	RUNEX or IDLE	CO2	CH4	
Alameda 2007 Annual GHG Emissions for vehicles <10,000 lbs										1.57E+04	1.701	
Alameda 2007 Annual GHG Emissions for Vehicles >10,000 lbs										3.31E+03	1.48E-01	
Alameda	2014	AA	LDT1	ACWD pick-up truck	3,000	GAS	2011	25	RUNEX	1.20E-02	2.00E-07	
Alameda	2014	AA	T7 tractor construction	Support truck	40,000	DSL	1995	25	RUNEX	4.84E-02	1.88E-06	
Areas not in the South Coast Air Basin and Ventura County	2014	AWS	T7	Rig Truck	65,000	DSL	1995		IDLE for 10 hours	6.72E-02	5.57E-06	
Areas not in the South Coast Air Basin and Ventura County	2014	AWS	T7	Shaker Truck	15,500	DSL	1995		IDLE for 10 hours	6.72E-02	5.57E-06	
TOTAL EMISSIONS (TONS/DAY):										1.948E-01	1.322E-05 =	1.948E-01
* TOTAL 2007 GHG EMISSIONS (TONS/DAY) :										1.905E+04	1.849E+00 =	1.905E+04

Units: Tons/Day, unless otherwise noted

RUNEX: Emissions that comes out of the vehicle's tailpipe while it is traveling on road.

IDLE: Emissions that comes out of the vehicle's tailpipe when it is operating but not traveling

LDT1: Light Duty Truck (0-3,750 pounds)

T7 tractor construction: Heavy-Heavy Duty Diesel Tractor Construction Truck

HHDV: Heavy-Heavy Duty Vehicle

GHG: Green House Gases

\*Sum of the Alameda 2007 Annual GHG Emissions for Vehicle <10,000lbs and Alameda 2007 Annual GHG Emissions for Vehicles >10,000lbs.

Alameda 2007 Annual CO2 Emmisions for vehicles <10,000 = 5,744,125 Tons/Year

Alameda 2007 Annual CH4 Emmisions for vehicles <10,000 = 621 Tons/Year

Alameda 2007 Annual CO2 Emmisions for vehicles >10,000 = 1,209,381tons/Year

Alameda 2007 Annual CH4 Emmisions for vehicles >10,000 = 54 Tons/Year

AA: Annual average

AWS: Average winter and summer high idle

lbs: Pounds

Gas: Gasoline

DSL: Diesel

TOG: Total Organic Gas

CO2: Carbon Dioxide

CH4: Methane

Appendix B  
ACWD Well Permits

APPLICATION  
 FOR  
 DRILLING PERMIT

COMPUTER POSTED

Application Received: 8/15/14 By: pm Permit Issued: 8/27/14 Permit Expiration: 10/27/14 Job No.: 21075 Permit No.: 2014-0324 Well No.: 55/1W 206001

JOB ADDRESS: Salt Pond Levee, approx 7,500 feet SW of AutoMall Pkwy & Cushing Pkwy intersection. (37° 29' 07" N, 121° 59' 38" W)

PROPERTY OWNER: NAME: US Fish and Wildlife Service ADDRESS: Don Edwards San Francisco Bay NWR 1 Marshlands Road, Fremont, CA 94555 TELEPHONE: 510-377-9450

CONSULTING ENGINEER: NAME: Alameda County Water District - Douglas Young ADDRESS: 43885 South Grimmer Boulevard Fremont, Ca. 94538-6348 TELEPHONE: 510-668-4452 RG/CEG/RCE NO. PG 5859

DRILLING CONTRACTOR: NAME: Gregg Drilling & Testing, Inc. ADDRESS: 950 Howe Road Martine 2 CA 94553 E-MAIL ADDRESS: www.greggdrilling.com TELEPHONE: 925-313-5800 STATE LIC. NO. C57 485165

When properly signed WM-C

**THIS APPLICATION IS A VALID PERMIT**

to perform only work described below at the given job address, in accordance with ACWD Ordinance No. 2010-01 and all other applicable laws and regulations. Discontinuation of work may result in revocation of permit. Permittee must schedule the work in advance with ACWD. ACWD's approval of drawings, designs, specifications, work plans, reports or incidental work and materials shall not relieve the permittee of responsibility for the technical adequacy of the work. Except for special circumstances, all work to be inspected must be performed within ACWD work hours - 7:00 a.m. to 4:30 p.m., Monday through Friday.

PLEASE CHECK TYPE OF PROPOSED WORK  
 Each well or other excavation requires a separate permit application form unless otherwise indicated.  
 Only one specific type of work can be checked per permit application.

WELLS			EXPLORATORY HOLES	OTHER EXCAVATIONS		
<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> REPAIR	<input type="checkbox"/> DESTRUCTION	<input type="checkbox"/> CONSTRUCT./DESTRUCT.	<input type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> REPAIR	<input type="checkbox"/> DESTRUCTION
<input type="checkbox"/> Water Well			Multiple exploratory holes of the same type may be grouped together on the same permit application form.	<input type="checkbox"/> Cathodic Protection Well	<input type="checkbox"/> Inclinator	
Monitoring Well: <input checked="" type="checkbox"/> Chemical Investigation				<input type="checkbox"/> Vibrating Wire Piezometer	<input type="checkbox"/> Elevator Shaft	
<input type="checkbox"/> Injection Well (for Chemical Cleanup)			Multiple other excavations of the same type may be grouped together on the same permit application form for the following:	<input type="checkbox"/> Cleanup Site Excavation(s)		
<input checked="" type="checkbox"/> Geotechnical Investigation				<input type="checkbox"/> Shaft, Tunnel, or Directional Borehole (s)	<input type="checkbox"/> Support Piers, Piles, or Caissons	
<input type="checkbox"/> Geothermal Heat Exchange Well				<input type="checkbox"/> Other:	Quantity: _____	
<input type="checkbox"/> Dewatering Well (Multiple dewatering wells may be grouped together on the same permit application form)			Quantity: _____	Quantity: _____		

DESCRIPTION OF PROPOSED WORK: Drilling and sampling of one 800 foot boring, grouting of approx 550 feet of boring, installation of an approx 250 foot-2" monitoring well, and surface completion (4x4 pad). TOTAL ESTIMATED COST \$ 35,000

PERMIT CONDITIONS: Monitoring Well Construction to comply with current Acwmp Standards.

FEES:  Private  City  Governmental Agency

GUARANTEE OF PERFORMANCE:  Cash Deposit  Bond

REFUND: Amount \$ \_\_\_\_\_ Reason: \_\_\_\_\_

FEES/DEPOSIT: Date Received \_\_\_\_\_ Estimated Amount \$ \_\_\_\_\_  
 Check No. \_\_\_\_\_ Actual Amount \$ \_\_\_\_\_  
 Cash \_\_\_\_\_ Difference \$ \_\_\_\_\_

ACWD SITE NO. \_\_\_\_\_ APPROVED FOR SCHEDULING BY: [Signature] DATE: 8/29/14 APPROVED BY: [Signature] DATE: 8/29/14

I hereby agree to comply with all conditions of this permit in accordance with ACWD Ordinance No. 2010-01 and to furnish the District a completed copy of D.W.R. Drillers Report (form 188) within sixty (60) days after completion as well as any chemical testing results within thirty (30) days after completion.

Title: Hydrogeologist Signature: [Signature] Date: 8/15/2014  
 Representing: Alameda County Water District Name (printed): Douglas Young

APPLICATION  
 FOR  
 DRILLING PERMIT

COMPUTER POSTED

Application Received Date: 8/15/14 By: Pm Permit Issued Date: 8/27/14 Permit Expiration Date: 10/27/14 Job No. 21075 Permit No. 2014-0326 Well No. 55/2w-03h004

JOB ADDRESS:  
Approx 215 feet North of the intersection of Marshlands Road & Thornton Avenue. (37° 31' 46" N, 122° 03' 45" W)

PROPERTY OWNER  
 NAME: US Fish and Wildlife Service  
 ADDRESS: Don Edwards San Francisco Bay NWR  
1 Marshlands Road, Fremont, CA 94555  
 TELEPHONE: 510-377-9450

CONSULTING ENGINEER  
 NAME: Alameda County Water District - Douglas Young  
 ADDRESS: 43885 South Grimmer Boulevard  
Fremont, Ca. 94538-6348  
 TELEPHONE: 510-668-4452 RG/CEG/RCE NO. PG 5859

DRILLING CONTRACTOR  
 NAME: Gregg Drilling & Testing, Inc.  
 ADDRESS: 950 Howe Road  
Martinez, CA 94553  
 E-MAIL ADDRESS: www.greggdrilling.com  
 TELEPHONE: 925-313-5800 STATE LIC. NO. C57 485165

When properly signed *Old Jarvis F*

**THIS APPLICATION IS A VALID PERMIT**

to perform only work described below at the given job address, in accordance with ACWD Ordinance No. 2010-01 and all other applicable laws and regulations. Discontinuation of work may result in revocation of permit. **Permittee must schedule the work in advance with ACWD.** ACWD's approval of drawings, designs, specifications, work plans, reports or incidental work and materials shall not relieve the permittee of responsibility for the technical adequacy of the work. Except for special circumstances, all work to be inspected must be performed within ACWD work hours - 7:00 a.m. to 4:30 p.m., Monday through Friday.

PLEASE CHECK TYPE OF PROPOSED WORK

Each well or other excavation requires a separate permit application form unless otherwise indicated. Only one specific type of work can be checked per permit application.

WELLS	EXPLORATORY HOLES	OTHER EXCAVATIONS
<input checked="" type="checkbox"/> CONSTRUCTION <input type="checkbox"/> REPAIR <input type="checkbox"/> DESTRUCTION <input type="checkbox"/> Water Well Monitoring Well: <input checked="" type="checkbox"/> Chemical Investigation <input checked="" type="checkbox"/> Injection Well (for Chemical Cleanup) <input checked="" type="checkbox"/> Geotechnical Investigation <input type="checkbox"/> Geothermal Heat Exchange Well <input type="checkbox"/> Dewatering Well (Multiple dewatering wells may be grouped together on the same permit application form) Quantity: _____	<input type="checkbox"/> CONSTRUCT./DESTRUCT. Multiple exploratory holes of the same type may be grouped together on the same permit application form. <input type="checkbox"/> Chemical Investigation <input type="checkbox"/> Injection Boreholes <input type="checkbox"/> Soil Vapor Sampling <input type="checkbox"/> Geotechnical Investigation Quantity: _____	<input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> REPAIR <input type="checkbox"/> DESTRUCTION <input type="checkbox"/> Cathodic Protection Well <input type="checkbox"/> Inclinator <input type="checkbox"/> Vibrating Wire Piezometer <input type="checkbox"/> Elevator Shaft Multiple other excavations of the same type may be grouped together on the same permit application form for the following: <input type="checkbox"/> Cleanup Site Excavation(s) <input type="checkbox"/> Wick Drains <input type="checkbox"/> Shaft, Tunnel, or Directional Borehole (s) <input type="checkbox"/> Support Piers, Piles, or Caissons <input type="checkbox"/> Other: _____    Quantity: _____

DESCRIPTION OF PROPOSED WORK:  
Drilling and sampling of one 800 foot boring, grouting of approx 450 feet of boring, installation of an approx 350 foot-2" monitoring well, and surface completion (4x4 pad). TOTAL ESTIMATED COST \$ 35,000

PERMIT CONDITIONS:  
Monitoring Well construction to comply with current ACWD standards.

FEES:     Private     City     Governmental Agency    FEES/    Date Received \_\_\_\_\_    Estimated Amount \$ \_\_\_\_\_  
 GUARANTEE OF PERFORMANCE:     Cash Deposit     Bond    DEPOSIT:    Check No. \_\_\_\_\_    Actual Amount \$ \_\_\_\_\_  
 REFUND:    Amount \$ \_\_\_\_\_    Reason: \_\_\_\_\_    Cash \_\_\_\_\_    Difference \$ \_\_\_\_\_

ACWD SITE NO. \_\_\_\_\_  
 APPROVED FOR SCHEDULING BY: My DATE: 8/29/14 APPROVED BY: Midulity DATE: 8/29/14

I hereby agree to comply with all conditions of this permit in accordance with ACWD Ordinance No. 2010-01 and to furnish the District a completed copy of D.W.R. Drillers Report (form 188) within sixty (60) days after completion as well as any chemical testing results within thirty (30) days after completion.  
 Title: Hydrogeologist    Signature: \_\_\_\_\_    Date: 8/15/2014  
 Representing: Alameda County Water District    Name (printed): Douglas Young

# APPLICATION FOR DRILLING PERMIT

COMPUTER POSTED

Application Received Date: <u>8/15/2014</u>	Permit Issued Date: <u>8/27/14</u>	Permit Expiration Date: <u>10/27/14</u>	Job No. <u>21075</u>
By: <u>pm</u>			Permit No. <u>2014-0327</u> Well No. <u>55/2w-03H005</u>

JOB ADDRESS:  
Approx 215 feet North of the intersection of Marshlands Road & Thornton Avenue. (37° 31' 46" N, 122° 03' 45" W)

PROPERTY OWNER  
 NAME: US Fish and Wildlife Service  
 ADDRESS: Don Edwards San Francisco Bay NWR  
1 Marshlands Road, Fremont, CA 94555  
 TELEPHONE: 510-377-9450

CONSULTING ENGINEER  
 NAME: Alameda County Water District - Douglas Young  
 ADDRESS: 43885 South Grimmer Boulevard  
Fremont, Ca. 94538-6348  
 TELEPHONE: 510-668-4452 RG/CEG/RCE NO. PG 5859

DRILLING CONTRACTOR  
 NAME: Gregg Drilling & Testing, Inc.  
 ADDRESS: 950 Howe Road  
Martinez, CA 94553  
 E-MAIL ADDRESS: www.greggdrilling.com  
 TELEPHONE: 925-313-5800 STATE LIC. NO. C57 485165

When properly signed *id forms-C*  
**THIS APPLICATION  
IS A VALID PERMIT**

*to perform only work described below at the given job address, in accordance with ACWD Ordinance No. 2010-01 and all other applicable laws and regulations. Discontinuation of work may result in revocation of permit. Permittee must schedule the work in advance with ACWD. ACWD's approval of drawings, designs, specifications, work plans, reports or incidental work and materials shall not relieve the permittee of responsibility for the technical adequacy of the work. Except for special circumstances, all work to be inspected must be performed within ACWD work hours - 7:00 a.m. to 4:30 p.m., Monday through Friday.*

**PLEASE CHECK TYPE OF PROPOSED WORK**  
*Each well or other excavation requires a separate permit application form unless otherwise indicated.  
 Only one specific type of work can be checked per permit application.*

WELLS	EXPLORATORY HOLES	OTHER EXCAVATIONS
<input checked="" type="checkbox"/> CONSTRUCTION <input type="checkbox"/> REPAIR <input type="checkbox"/> DESTRUCTION <input type="checkbox"/> Water Well <input type="checkbox"/> Monitoring Well: <input checked="" type="checkbox"/> Chemical Investigation <input type="checkbox"/> Injection Well (for Chemical Cleanup) <input checked="" type="checkbox"/> Geotechnical Investigation <input type="checkbox"/> Geothermal Heat Exchange Well <input type="checkbox"/> Dewatering Well ( <i>Multiple dewatering wells may be grouped together on the same permit application form</i> ) Quantity: _____	<input type="checkbox"/> CONSTRUCT./DESTRUCT. <i>Multiple exploratory holes of the same type may be grouped together on the same permit application form.</i> <input type="checkbox"/> Chemical Investigation <input type="checkbox"/> Injection Boreholes <input type="checkbox"/> Soil Vapor Sampling <input type="checkbox"/> Geotechnical Investigation Quantity: _____	<input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> REPAIR <input type="checkbox"/> DESTRUCTION <input type="checkbox"/> Cathodic Protection Well <input type="checkbox"/> Inclinator <input type="checkbox"/> Vibrating Wire Piezometer <input type="checkbox"/> Elevator Shaft <hr/> <i>Multiple other excavations of the same type may be grouped together on the same permit application form for the following:</i> <input type="checkbox"/> Cleanup Site Excavation(s) <input type="checkbox"/> Wick Drains <input type="checkbox"/> Shaft, Tunnel, or Directional Borehole (s) <input type="checkbox"/> Support Piers, Piles, or Caissons <input type="checkbox"/> Other: _____    Quantity: _____

DESCRIPTION OF PROPOSED WORK:  
Drilling one approximate 250 foot boring, installation of an approx 250 foot-2" monitoring well, and surface completion (4x4 pad).

TOTAL ESTIMATED COST  
\$ 20,000

PERMIT CONDITIONS:  
Monitoring Well Construction to comply with current ACWD standards

FEES: <input type="checkbox"/> Private <input type="checkbox"/> City <input checked="" type="checkbox"/> Governmental Agency GUARANTEE OF PERFORMANCE: <input type="checkbox"/> Cash Deposit <input type="checkbox"/> Bond REFUND:    Amount \$ _____    Reason: _____	FEES/    Date Received _____    Estimated Amount \$ _____ DEPOSIT:    Check No. _____    Actual Amount \$ _____ Cash    Difference \$ _____
--	---

ACWD SITE NO. \_\_\_\_\_  
 APPROVED FOR SCHEDULING BY: [Signature] DATE: 8/29/14    APPROVED BY: [Signature] DATE: 8/29/14

I hereby agree to comply with all conditions of this permit in accordance with ACWD Ordinance No. 2010-01 and to furnish the District a completed copy of D.W.R. Drillers Report (form 188) within sixty (60) days after completion as well as any chemical testing results within thirty (30) days after completion.

Title: Hydrogeologist    Signature: [Signature]    Date: 8/15/2014  
 Representing: Alameda County Water District    Name (printed): Douglas Young

APPLICATION  
 FOR  
 DRILLING PERMIT

COMPUTER POSTED

Application Received Date: 8/15/14 By: Pm Permit Issued Date: 8/27/14 Permit Expiration Date: 10/27/14 Job No.: 21075 Permit No.: 2014-0326 Well No.: 55/2w-03H004

JOB ADDRESS:  
Approx 215 feet North of the intersection of Marshlands Road & Thomson Avenue. (37° 31' 46" N, 122° 03' 45" W)

PROPERTY OWNER  
 NAME: US Fish and Wildlife Service  
 ADDRESS: Don Edwards San Francisco Bay NWR  
1 Marshlands Road, Fremont, CA 94555  
 TELEPHONE: 510-377-9450

CONSULTING ENGINEER  
 NAME: Alameda County Water District - Douglas Young  
 ADDRESS: 43885 South Grimmer Boulevard  
Fremont, Ca. 94538-6348  
 TELEPHONE: 510-668-4452 RG/CEG/RCE NO. PG 5859

DRILLING CONTRACTOR  
 NAME: Gregg Drilling & Testing, Inc.  
 ADDRESS: 950 Howe Road  
Martinez, CA 94553  
 E-MAIL ADDRESS: www.greggdrilling.com  
 TELEPHONE: 925-313-5800 STATE LIC. NO. C57 485165

When properly signed <sup>Old Jarvis-F</sup>  
**THIS APPLICATION IS A VALID PERMIT**  
 to perform only work described below at the given job address, in accordance with ACWD Ordinance No. 2010-01 and all other applicable laws and regulations. Discontinuation of work may result in revocation of permit. Permittee must schedule the work in advance with ACWD. ACWD's approval of drawings, designs, specifications, work plans, reports or incidental work and materials shall not relieve the permittee of responsibility for the technical adequacy of the work. Except for special circumstances, all work to be inspected must be performed within ACWD work hours - 7:00 a.m. to 4:30 p.m., Monday through Friday.

PLEASE CHECK TYPE OF PROPOSED WORK

Each well or other excavation requires a separate permit application form unless otherwise indicated. Only one specific type of work can be checked per permit application.

WELLS	EXPLORATORY HOLES	OTHER EXCAVATIONS
<input checked="" type="checkbox"/> CONSTRUCTION <input type="checkbox"/> REPAIR <input type="checkbox"/> DESTRUCTION <input type="checkbox"/> Water Well <input type="checkbox"/> Monitoring Well: <input checked="" type="checkbox"/> Chemical Investigation <input type="checkbox"/> Injection Well (for Chemical Cleanup) <input checked="" type="checkbox"/> Geotechnical Investigation <input type="checkbox"/> Geothermal Heat Exchange Well <input type="checkbox"/> Dewatering Well (Multiple dewatering wells may be grouped together on the same permit application form) Quantity: _____	<input type="checkbox"/> CONSTRUCT./DESTRUCT. Multiple exploratory holes of the same type may be grouped together on the same permit application form. <input type="checkbox"/> Chemical Investigation <input type="checkbox"/> Injection Boreholes <input type="checkbox"/> Soil Vapor Sampling <input type="checkbox"/> Geotechnical Investigation Quantity: _____	<input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> REPAIR <input type="checkbox"/> DESTRUCTION <input type="checkbox"/> Cathodic Protection Well <input type="checkbox"/> Inclinator <input type="checkbox"/> Vibrating Wire Piezometer <input type="checkbox"/> Elevator Shaft Multiple other excavations of the same type may be grouped together on the same permit application form for the following: <input type="checkbox"/> Cleanup Site Excavation(s) <input type="checkbox"/> Wick Drains <input type="checkbox"/> Shaft, Tunnel, or Directional Borehole (s) <input type="checkbox"/> Support Piers, Piles, or Caissons <input type="checkbox"/> Other: _____    Quantity: _____

DESCRIPTION OF PROPOSED WORK:  
Drilling and sampling of one 800 foot boring, grouting of approx 450 feet of boring, installation of an approx 350 foot-2" monitoring well, and surface completion (4x4 pad). TOTAL ESTIMATED COST \$ 35,000

PERMIT CONDITIONS:  
Monitoring Well construction to comply with current ACWD standards.

FEES: <input type="checkbox"/> Private <input type="checkbox"/> City <input checked="" type="checkbox"/> Governmental Agency	FEES/ DEPOSIT: Date Received _____ Estimated Amount \$ _____
GUARANTEE OF PERFORMANCE: <input type="checkbox"/> Cash Deposit <input type="checkbox"/> Bond	DEPOSIT: Check No. _____ Actual Amount \$ _____
REFUND: Amount \$ _____ Reason: _____	Cash _____ Difference \$ _____

ACWD SITE NO. \_\_\_\_\_ APPROVED FOR SCHEDULING BY: [Signature] DATE: 8/29/14 APPROVED BY: [Signature] DATE: 8/29/14

I hereby agree to comply with all conditions of this permit in accordance with ACWD Ordinance No. 2010-01 and to furnish the District a completed copy of D.W.R. Drillers Report (form 188) within sixty (60) days after completion as well as any chemical testing results within thirty (30) days after completion.

Title: Hydrogeologist Signature: [Signature] Date: 8/15/2014  
 Representing: Alameda County Water District Name (printed): Douglas Young

APPLICATION  
 FOR  
 DRILLING PERMIT

COMPUTER POSTED

Application Received Date: 8/15/14 By: pm Permit Issued Date: 8/27/14 Permit Expiration Date: 10/27/14 Job No. 21075 Permit No. 2014-0329 Well No. 55/zw-06M011

JOB ADDRESS:  
Dumbarton Bridge Fishing Pier Parking Lot at the end of Marshlands Road.  
(37° 30' 44" N, 122° 06' 34" W)

When properly signed Dumbarton

**THIS APPLICATION  
 IS A VALID PERMIT**

*to perform only work described below at the given job address, in accordance with ACWD Ordinance No. 2010-01 and all other applicable laws and regulations. Discontinuation of work may result in revocation of permit. Permittee must schedule the work in advance with ACWD. ACWD's approval of drawings, designs, specifications, work plans, reports or incidental work and materials shall not relieve the permittee of responsibility for the technical adequacy of the work. Except for special circumstances, all work to be inspected must be performed within ACWD work hours - 7:00 a.m. to 4:30 p.m., Monday through Friday.*

PROPERTY OWNER  
 NAME: Caltrans - District 4  
 ADDRESS: PO Box 23660  
Oakland California 94623-0660  
 TELEPHONE: 510-377-9450

CONSULTING ENGINEER  
 NAME: Alameda County Water District - Douglas Young  
 ADDRESS: 43885 South Grimmer Boulevard  
Fremont, Ca. 94538-6348  
 TELEPHONE: 510-668-4452 RG/CEG/RCE NO. PG 5859

DRILLING CONTRACTOR  
 NAME: Gregg Drilling & Testing, Inc.  
 ADDRESS: 950 Howe Road  
Martinez, CA 94553  
 E-MAIL ADDRESS: www.greggdrilling.com  
 TELEPHONE: 925-313-5800 STATE LIC. NO. C57 485165

PLEASE CHECK TYPE OF PROPOSED WORK

*Each well or other excavation requires a separate permit application form unless otherwise indicated. Only one specific type of work can be checked per permit application.*

WELLS			EXPLORATORY HOLES	OTHER EXCAVATIONS		
<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> REPAIR	<input type="checkbox"/> DESTRUCTION	<input type="checkbox"/> CONSTRUCT./DESTRUCT.	<input type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> REPAIR	<input type="checkbox"/> DESTRUCTION
<input type="checkbox"/> Water Well			<i>Multiple exploratory holes of the same type may be grouped together on the same permit application form.</i>	<input type="checkbox"/> Cathodic Protection Well	<input type="checkbox"/> Inclinator	
<input type="checkbox"/> Monitoring Well:				<input type="checkbox"/> Vibrating Wire Piezometer	<input type="checkbox"/> Elevator Shaft	
<input checked="" type="checkbox"/> Chemical Investigation			<input type="checkbox"/> Chemical Investigation	<i>Multiple other excavations of the same type may be grouped together on the same permit application form for the following:</i>		
<input type="checkbox"/> Injection Well (for Chemical Cleanup)			<input type="checkbox"/> Injection Boreholes	<input type="checkbox"/> Cleanup Site Excavation(s)	<input type="checkbox"/> Wick Drains	
<input checked="" type="checkbox"/> Geotechnical Investigation			<input type="checkbox"/> Soil Vapor Sampling	<input type="checkbox"/> Shaft, Tunnel, or Directional Borehole (s)	<input type="checkbox"/> Support Piers, Piles, or Caissons	
<input type="checkbox"/> Geothermal Heat Exchange Well			<input type="checkbox"/> Geotechnical Investigation	<input type="checkbox"/> Other: _____	Quantity: _____	
<input type="checkbox"/> Dewatering Well <i>(Multiple dewatering wells may be grouped together on the same permit application form)</i>						
Quantity: _____			Quantity: _____			

DESCRIPTION OF PROPOSED WORK:  
Drilling and sampling of a 800 foot boring, grouting of approx. 450 feet of boring, installation of an approx 350 foot-2" monitoring well, and surface completion (flush with parking lot surface). TOTAL ESTIMATED COST \$ 35,000

PERMIT CONDITIONS:  
Monitoring Well Construction to comply with current ACWD Standards.

FEES: <input type="checkbox"/> Private <input type="checkbox"/> City <input checked="" type="checkbox"/> Governmental Agency	FEES/ Date Received _____ Estimated Amount \$ _____
GUARANTEE OF PERFORMANCE: <input type="checkbox"/> Cash Deposit <input type="checkbox"/> Bond	DEPOSIT: Check No. _____ Actual Amount \$ _____
REFUND: Amount \$ _____ Reason: _____	Cash _____ Difference \$ _____

ACWD SITE NO. \_\_\_\_\_ APPROVED FOR SCHEDULING BY: [Signature] DATE: 8/29/14 APPROVED BY: [Signature] DATE: 8/29/14

I hereby agree to comply with all conditions of this permit in accordance with ACWD Ordinance No. 2010-01 and to furnish the District a completed copy of D.W.R. Drillers Report (form 188) within sixty (60) days after completion as well as any chemical testing results within thirty (30) days after completion.

Title: Hydrogeologist Signature: [Signature] Date: 8/15/2014

Representing: Alameda County Water District Name (printed): Douglas Young

APPLICATION  
 FOR  
 DRILLING PERMIT

COMPUTER POSTED

Application Received Date: 8/15/14 By: Pr Permit Issued Date: 8/22/14 Permit Expiration Date: 10/27/14 Job No. 21075 Permit No. 2014-0325 Well No. 55J2W-243003

JOB ADDRESS:  
Salt Pond Levee, approx 10,500 feet SE of Willow Street & Central Avenue  
intersection in Newark. (37° 29' 23" N, 122° 01' 53" W)

PROPERTY OWNER  
 NAME: US Fish and Wildlife Service  
 ADDRESS: Don Edwards San Francisco Bay NWR  
1 Marshlands Road, Fremont, CA 94555  
 TELEPHONE: 510-377-9450

CONSULTING ENGINEER  
 NAME: Alameda County Water District - Douglas Young  
 ADDRESS: 43885 South Grimmer Boulevard  
Fremont, Ca. 94538-6348  
 TELEPHONE: 510-668-4452 RG/CEG/RCE NO. PG 5859

DRILLING CONTRACTOR  
 NAME: Gregg Drilling & Testing, Inc.  
 ADDRESS: 950 Howe Road  
Martinez, CA 94553  
 E-MAIL ADDRESS: www.greggdrilling.com  
 TELEPHONE: 925-313-5800 STATE LIC. NO. C57 485165

When properly signed Henry Skogh  
**THIS APPLICATION IS A VALID PERMIT**  
 to perform only work described below at the given job address, in accordance with ACWD Ordinance No. 2010-01 and all other applicable laws and regulations. Discontinuation of work may result in revocation of permit. Permittee must schedule the work in advance with ACWD. ACWD's approval of drawings, designs, specifications, work plans, reports or incidental work and materials shall not relieve the permittee of responsibility for the technical adequacy of the work. Except for special circumstances, all work to be inspected must be performed within ACWD work hours - 7:00 a.m. to 4:30 p.m., Monday through Friday.

PLEASE CHECK TYPE OF PROPOSED WORK

Each well or other excavation requires a separate permit application form unless otherwise indicated.  
 Only one specific type of work can be checked per permit application.

WELLS	EXPLORATORY HOLES	OTHER EXCAVATIONS
<input checked="" type="checkbox"/> CONSTRUCTION <input type="checkbox"/> REPAIR <input type="checkbox"/> DESTRUCTION <input type="checkbox"/> Water Well <input type="checkbox"/> Monitoring Well: <input checked="" type="checkbox"/> Chemical Investigation <input checked="" type="checkbox"/> Injection Well (for Chemical Cleanup) <input checked="" type="checkbox"/> Geotechnical Investigation <input type="checkbox"/> Geothermal Heat Exchange Well <input type="checkbox"/> Dewatering Well (Multiple dewatering wells may be grouped together on the same permit application form) Quantity: _____	<input type="checkbox"/> CONSTRUCT./DESTRUCT. Multiple exploratory holes of the same type may be grouped together on the same permit application form. <input type="checkbox"/> Chemical Investigation <input type="checkbox"/> Injection Boreholes <input type="checkbox"/> Soil Vapor Sampling <input type="checkbox"/> Geotechnical Investigation Quantity: _____	<input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> REPAIR <input type="checkbox"/> DESTRUCTION <input type="checkbox"/> Cathodic Protection Well <input type="checkbox"/> Inclinator <input type="checkbox"/> Vibrating Wire Piezometer <input type="checkbox"/> Elevator Shaft Multiple other excavations of the same type may be grouped together on the same permit application form for the following: <input type="checkbox"/> Cleanup Site Excavation(s) <input type="checkbox"/> Wick Drains <input type="checkbox"/> Shaft, Tunnel, or Directional Borehole (s) <input type="checkbox"/> Support Piers, Piles, or Caissons <input type="checkbox"/> Other: _____    Quantity: _____

DESCRIPTION OF PROPOSED WORK:  
Drilling and sampling of one 800 foot boring, grouting of approx 550 feet of boring, installation of an approx 250 foot-2" monitoring well, and surface completion (4x4 pad). TOTAL ESTIMATED COST \$ 35,000

PERMIT CONDITIONS:  
Monitoring Well Construction to comply with current ACWD Standards

FEES:  Private     City     Governmental Agency    FEES/ Date Received \_\_\_\_\_ Estimated Amount \$ \_\_\_\_\_  
 GUARANTEE OF PERFORMANCE:  Cash Deposit     Bond    DEPOSIT: Check No. \_\_\_\_\_ Actual Amount \$ \_\_\_\_\_  
 REFUND: Amount \$ \_\_\_\_\_ Reason: \_\_\_\_\_    Cash \_\_\_\_\_ Difference \$ \_\_\_\_\_

ACWD SITE NO. \_\_\_\_\_ APPROVED FOR SCHEDULING BY: Michael Flynn DATE: 8/29/14 APPROVED BY: Michael Flynn DATE: 8/29/14

I hereby agree to comply with all conditions of this permit in accordance with ACWD Ordinance No. 2010-01 and to furnish the District a completed copy of D.W.R. Drillers Report (form 188) within sixty (60) days after completion as well as any chemical testing results within thirty (30) days after completion.

Title: Hydrogeologist Signature: \_\_\_\_\_ Date: 8/15/2014  
 Representing: Alameda County Water District Name (printed): Douglas Young

# Appendix C

## Encroachment Permits



Public Works Agency  
Alameda County

# Flood Permit

Work Order # **06000**

Permit # **F06LD13503**

Permit Issuance Date **8/18/2014**

Permit Expiration Date **9/18/2014**

**Name & Address of Property Owner:**  
Alameda County Water District  
43885 S Grimmer Blvd  
Fremont, CA 94536  
**Phone Number:** 510-668-4452

**Job Site Address:**  
US Fish and Wildlife  
Fremont, CA

**Name & Address of Applicant:**  
Gregg Drilling & Testing Inc.  
950 Howe Road  
Martinez, CA 94553  
**Phone Number:** 925-313-5800

**Zone:** 6

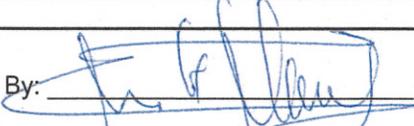
**Line:** N

**The permittee intends to perform the following work scope:**

Access along top of flood control levee to get to work site that is on US Fish & wildlife property

**All work and/or access shall be performed in accordance with the attached General Provisions and the following Special Provisions:**

Bond Type:	Bond Value:	Deposit:	Permit Fee:
	\$0.00	\$0.00	\$0.00

By:  Alameda County	Work Completed (Date): _____ Inspector: _____
--	--

**I agree to comply with all of the terms and conditions of this Permit, including any Special Provisions specified above.**

 Permittee (Signature)	<u>8/18/2014</u> Date
--	--------------------------

**Call 510-670-5450, at least 24hr. in advance of starting work, to schedule an inspection.**  
If the work is within 500' of a traffic signal or in proximity to a streetlight pole, call (510) 670 - 5537 at least 48 hr. in advance to verify the location of County conduits and detector loops.

**THIS PERMIT IS INCOMPLETE WITHOUT THE ATTACHED GENERAL PROVISIONS**

Work Order (WO)\* Number:  
\*This WO is \_\_\_ / is not \_\_\_ open for charges.

Permit Number: \_\_\_\_\_  
Permit Issuance Date: \_\_\_\_\_  
Permit Expiration Date: \_\_\_\_\_

**Alameda County Flood Control & Water Conservation District  
FLOOD ENCROACHMENT PERMIT**

Name & Address of Property Owner:  
Alameda County Water District  
43885 S. Grammer Blvd.  
Fremont, CA 94536  
Phone Number: Doug Young  
510-668-4452

Job Site Address:  
On US Fish & Wildlife Property  
2600feet SW of Landfill  
Line: G-N

Name & Address of Contractor:  
Gregg Drilling & Testing Inc  
950 Howe Road  
Martinez CA 94553  
Phone Number: 925-313-5800

(This statement to be completed by the District)  
This permit is issued to the owner  / contractor ;  
if "owner" is checked, he/she is  / is not  exempt  
from the requirement that work in the District right-of  
way be performed by a licensed contractor.

The Applicant intends to perform the following work scope:  
access along top of Flood Control Levee to get to work  
site that is on US Fish & Wildlife property

Licensed Contractor Declaration:  
I hereby affirm, under penalty of perjury, that I hold the  
following contractor's license, which is in full force and  
effect, under the applicable provisions of the State  
Business and Professions Code.  
License Class and No. 485165 C57  
Contractor's Signature: Mary Ward

Worker's Compensation Insurance Declaration:  
I hereby affirm, under penalty of perjury, that I will, during  
the performance of any and all work authorized by this  
permit, satisfy the requirements of the State Labor Code  
with regard to Worker's Compensation Insurance, as  
declared below:  
 I will maintain a certificate of consent to self-insure.  
 I will maintain the following insurance policy:  
Carrier's Name and Policy No.:  
SON AICW01041302  
 I will not employ any person in any manner so as to become  
subject to the worker's compensation laws of the State.  
Owner's/Contractor's Signature: Mary Ward

This permit is issued pursuant to District Ordinance 0-2000-37 in order to authorize an encroachment into District right-of-way at the location described above. The said encroachment shall comply with the requirements of this Ordinance and, unless otherwise specified below, with the attached General Provisions:

CALL THIS NUMBER FOR INSPECTIONS: (510) 670-5450

Bond Information:  
  
BY: \_\_\_\_\_, ACFC&WCD

Insp. Fee \_\_\_ or Deposit \_\_\_:  
  
Work Completed (Date): \_\_\_\_\_  
Inspector: \_\_\_\_\_

I certify that the information that I have entered into this permit application is correct, and I agree to comply with all of the terms and conditions and other requirements of the issued Permit.  
Steven D. Law 8/18/2014  
Signature of Applicant Date

**THIS PERMIT IS INCOMPLETE WITHOUT THE ATTACHED GENERAL PROVISIONS.**

## INSPECTION REQUIREMENTS

- All activities authorized by this Permit are subject to monitoring, inspection, and/or testing by a District representative; notify the District before you enter District property by calling the number on the front of this form.
- No person other than a District representative is authorized to approve, disapprove, accept, or reject any work performed within the right-of-way of the District.
- The Permittee shall provide the designated inspector with a schedule indicating the construction and inspection milestones for District facilities and related items.
- In the event that the actual condition of District facilities is found to be different from those described in the approved plans, the Permittee shall promptly notify the designated inspector. The inspector shall have the authority to resolve such conflicts.
- If the face of this Permit is marked to indicate that the assigned District Work Order is open for charges, a job account will be opened and the assigned inspectors and other representatives will charge the actual cost of all required tests and inspections against this account. All cost overruns must be resolved prior to close-out of this Permit. Any underruns will be returned to the Permittee as soon as possible following the close-out.

### CAUTION!

The modification of existing flood control facilities may require the implementation of a stormwater diversion plan; any such plan must be approved by the District inspector, prior to the start of construction. Construction activities in or around flood control facilities may also require the installation of silt/debris fences, berms, or other protective measures intended to prevent pollution of the said facilities; any such installations within District right-of-way must be approved by the District inspector.

### WARNING!

ACCESSING DISTRICT PROPERTY, OPENING A DISTRICT FACILITY, OR ENGAGING IN OTHER ACTIVITIES WITHIN DISTRICT RIGHT-OF-WAY BEYOND THE WORK SCOPE AUTHORIZED BY THIS PERMIT COULD BE AN INFRACTION OR A MISDEMEANOR UNDER THE PROVISIONS OF CHAPTER 6.36 OF THE GENERAL ORDINANCE CODE OF THE COUNTY AND COULD RESULT IN FINE OR IMPRISONMENT. MOREOVER, UNDER THE TERMS OF THE SAME CHAPTER, AN UNAUTHORIZED MODIFICATION OF DISTRICT PROPERTY OR FACILITIES COULD BE CONSIDERED AS A PUBLIC NUISANCE AND MAY BE SUBJECT TO ABATEMENT.

**Discharging untested groundwater into a District facility is illegal!**

Consult with your inspector to determine how to handle the disposal of surface and underground water and other potential pollutants in the encroachment area.

gate



US Fish & Wildlife



Google earth



**ENCROACHMENT PERMIT**

TR-0120

Permit No. <b>0414-NMW1576</b>	
Dist/Co/Rte/PM <b>04-ALA-84- 0.76</b>	
Date <b>August 22, 2014</b>	
Fee Paid \$	Deposit \$
Performance Bond Amount (1)	Payment Bond Amount (2)
Bond Company	
Bond Number (1)	Bond Number (2)

In compliance with (Check one):

- Your application of August 1, 2014
- Utility Notice No. \_\_\_\_\_ of \_\_\_\_\_
- Agreement No. \_\_\_\_\_ of \_\_\_\_\_
- R/W Contract No. \_\_\_\_\_ of \_\_\_\_\_

TO: Alameda County Water District  
43885 S. Grimmer Blvd  
Fremont, CA 94538  
Attn: Steven Inn  
Phone: (510) 668-4441 , PERMITTEE

And subject to the following, **PERMISSION IS HEREBY GRANTED** to:

Drill and install two groundwater monitoring wells at Fishing Pier Parking lot and at the end of Marshland Road, on State Highway 04-ALA-84, Post Mile 0.76, in the City of Fremont.

A minimum of one week prior to start of work under this permit, notice shall be given to, and approval of construction details, operations, public safety, and traffic control shall be obtained from State representative Mr. Surya Mantravadi, Telephone number (510) 614-5951, between 7:30 AM and 4:00 PM. Monday- Friday.

All permitted work requires the permittee to apply for and obtain a work authorization number prior to start of work. See the attached "Encroachment Permit Project Work Scheduling Procedures" and the attached "Permit Project Work Scheduling Request Form". Additional time beyond the minimum seven days advanced notice required in the above paragraph may be required for obtaining the traffic control approval.

The following attachments are also included as part of this permit (Check applicable):

- Yes     No    General Provisions
- Yes     No    Utility Maintenance Provisions
- Yes     No    Storm water Special Provisions
- Yes     No    A Cal-OSHA permit required prior to beginning work:  
# \_\_\_\_\_

In addition to fee, the permittee will be billed actual costs for:

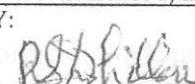
- Yes     No    Review
- Yes     No    Inspection
- Yes    -----    Field Work

(If any Caltrans effort expended)

Yes     No    The information in the environmental documentation has been reviewed and considered prior to approval of this permit.

This permit is void unless the work is completed before August 31, 2019.

This permit is to be strictly construed and no other work other than specifically mentioned is hereby authorized. No project work shall be commenced until all other necessary permits and environmental clearances have been obtained.

MD  CC: Permit: SM Maint: B. Kimball TMC: J. Richardson, D4TMC/D04/Caltrans/CAGov	APPROVED:  <b>BIJAN SARTIPI, District Director</b> BY:  <b>DAVID SALLADAY, District Permit Engineer</b>
---	--

All personnel shall wear appropriate personal protective equipment, including hard hats and bright colored vest, shirts, or jackets with retro-reflective material while on State Right-of-Way.

Suitable barricades, signs and lights, as approved by State representative, to warn and protect traffic effectively shall enclose the site of the work.

Caltrans is not subscribed to Underground Services Alert (USA). Caltrans may have existing electrical, signal and communication facilities within 9" from the surface. Permittee shall identify all existing underground facilities prior to perform trenching or boring and also repair/replace any damaged Caltrans facility due to their operation.

The Permittee shall make appropriate arrangement with a licensed vendor and California Highway Patrol (CHP) or a local Traffic Control Officers for traffic control and management, at Permittee's expense, in accordance with the approved traffic control plan.

The Permittee or the Contractor shall notify the State representative and submit an Encroachment Permit Work Scheduling Request Form 7days prior to the scheduled work activities.

Before any work is begun which will interrupt the normal flow of public traffic, approval shall be obtained from State representative.

No vehicle or equipment shall be stored overnight within the right-of-way; it shall be removed immediately at the completion of the project.

Permittee shall be responsible for the collection and removal of trash or garbage generated by these construction activities.

All debris shall be removed from the right of way and the area left in a safe and presentable condition at the end of each presentable day.

Any damage to existing State's facilities shall be repaired or replaced in kind by the Permittee at Permittee's expense.

Permittee shall provide safe pedestrian and bicycle passage around construction area.

All traffic signs to comply with 2012 MUTCD Section, 6F.01 through Section 6F.04. The signs shall have orange background. The Link: [http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/ca\\_mutcd2012.htm](http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/ca_mutcd2012.htm)

All utility work shall be performed in accordance with the applicable provision contained in the Department of Transportation Encroachment Permit Utility, Tree Trimming and Tree Removal Provisions per 2010

No lane closure permitted.

Provide access to and from Ramps at all times. No ramp closure necessary or permitted.

The details of Traffic Control and Monitoring will be discussed during Pre-Construction meeting by the State Representative.

No ingress or egress from the freeway to the worksite is permitted. Access to the work site for construction and any future maintenance activities shall be performed on local road.

Permittee and the Contractor shall check with the Caltrans Office of Construction for to cooperate and coordinate with all other construction work activities in that vicinity.

The permittee shall place the monitoring well outside of the State on-ramp perimeter, it should be off the paved area, on the grassy area behind the shoulder lane.

Any damage to existing facilities, landscaping or irrigation within the State Right-of-Way shall be replace in kind by the Permittee at Permittee's expense. Any damaged concrete sidewalk shall be replaced from score-line to score-line and shall be ADA Compliant.

If an accident or other incident (related to or not related to the permitted activity) occurs within, or close to the permitted activity, the Permittee shall immediately stop work and remove traffic controls from the highway unless public health, welfare and safety is endangered by unfinished work. Only traffic control to protect open excavations may remain in place. After free traffic flow is restored, work in accordance with the conditions of the permit may be returned.

Residue from saw cutting, coring and grinding operation shall be picked up by vacuum device. Residue shall not be allowed to flow across the pavement and shall not be left on the surface of the pavement.

Vacuumed slurry residue shall be disposed in accordance with, "Solid Waste Management" and "Storm Water Special Provisions for Minimal or No Impact."

Permittee shall remove and dispose of all spoils outside of State Right-of-Way. Permittee shall provide records of all the sites of disposal facilities to State representative.

No excavation shall be left open overnight without written permission from the Caltrans representative or unless otherwise specified herein.

Pavement to be removed must be saw cut to a minimum depth of 4 inches to provide a neat and straight pavement break along both sides of trench. Asphalt Concrete (AC) pavement must be saw cut to the full depth. Where the edge of trench is within 2 feet of existing curb, gutter, or pavement edge, Asphalt Concrete (AC) pavement between the trench and curb, gutter, or pavement edge must be removed, or as otherwise authorized by the State Representative.

Where there are potential Caltrans electrical facilities (lighting, signal, metering, etc) exist on the project site and not shown on the plans, the Permittee shall be responsible to resolve any conflicts and changes during construction. The Permittee shall incur any additional cost when there are changes to the original plans.

Permitter reserves the right to impose any additional requirements or conditions, including considerations, for the use of its right of way, if such requirements or conditions are allowed by future legislation, administrative determination, and/or court decisions.

The Permittee is responsible for any contaminated material and/or groundwater, which are generated due to excavation under this permit. The Permittee shall also adhere to all current rules and regulations which may apply for the containment, disposal and/or clean-up of any contaminated material and/or groundwater which is excavated.

A copy of this permit and local permits, complete with all attachments, shall be kept by Permittee/Contractor working under this permit and must be shown to the State representatives, or Law Enforcement Officer, on demand.

Permittee understands and agrees that it will comply with the obligations of Titles II and III of the Americans with Disabilities Act of 1990 in the conduct of the event, and further agrees to indemnify and save harmless the State of California, all officers and employees thereof, including but not limited to the Director of Transportation, from any claims or liability arising out of or by virtue of said act.

Notwithstanding General Provision No.4, your contractor is required to apply for and obtain an encroachment permit prior to starting work. A fee deposit of **\$492.00** is required at the time of application together with a letter from the **Alameda County Water District** stating that all surety bonds have been received and accepted. Any additional inspection cost shall be billed to the permittee's contractor upon completion of the work. The permittee's contractor may be billed for the actual time of inspection at the current Caltrans rate of \$82.00 per hour.

The permittee's contractor shall obtain and submit to Caltrans \$10,000.00 bonds, \$5,000.00 per well, prior to issuance of permit.

**The permittee and the contractor shall apply for renewal of the permit, one month prior to expiration date.**

**Permittee shall apply all necessary permits from all local and regulatory agencies prior to beginning of work.**

**Permittee shall be responsible for full compliance with the Caltrans Storm Water Program and the Caltrans NPDES permit requirements. Please see the Storm Water Special Provisions attached to this Permit.**

**The Permittee shall provide signed and sealed construction detail plans for the State representative for review and approval a week before construction.**

**Permittee shall refer to State's 2010 Standard Specifications and 2010 Standard Plans.**

**Permittee shall be responsible for any liability issue due to the proposed improvements within State Right-of-Way.**

**California Endangered Species Act must be adhered to the law, regulations and policies in the provisions, <http://www.dfg.ca.gov/habcon/cesa/>.**

**Migratory Bird Treaty Act must be adhered to the law, regulations and policies in the provisions, <http://www.fws.gov/migratorybirds/RegulationsandPolicies.html> ; no work shall be allowed during bird nesting and the nesting area must not be disturbed and shall be protected.**

**Abandoning water well shall be per requirement and regulation of the State Water Quality Board.**

**Changes to the Plans, Specifications, and Permit Provisions are not allowed without prior approval from the State representative.**

**Immediately following completion of the work permitted herein, the Permittee shall fill out and mail the Notice of Completion attached to this permit.**

STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION  
ENCROACHMENT PERMIT GENERAL PROVISIONS  
TR-0045 (REV. 05/2007)

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1. **AUTHORITY:** The Department's authority to issue encroachment permits is provided under, Div. 1, Chpt. 3, Art. 1, Sect. 660 to 734 of the Streets and Highways Code.
2. **REVOCAION:** Encroachment permits are revocable on five days notice unless otherwise stated on the permit and except as provided by law for public corporations, franchise holders, and utilities. These General Provisions and the Encroachment Permit Utility Provisions are subject to modification or abrogation at any time. Permittees' joint use agreements, franchise rights, reserved rights or any other agreements for operating purposes in State highway right of way are exceptions to this revocation.
3. **DENIAL FOR NONPAYMENT OF FEES:** Failure to pay permit fees when due can result in rejection of future applications and denial of permits.
4. **ASSIGNMENT:** No party other than the permittee or permittee's authorized agent is allowed to work under this permit.
5. **ACCEPTANCE OF PROVISIONS:** Permittee understands and agrees to accept these General Provisions and all attachments to this permit, for any work to be performed under this permit.
6. **BEGINNING OF WORK:** When traffic is not impacted (see Number 35), the permittee shall notify the Department's representative, two (2) days before the intent to start permitted work. Permittee shall notify the Department's Representative if the work is to be interrupted for a period of five (5) days or more, unless otherwise agreed upon. All work shall be performed on weekdays during regular work hours, excluding holidays, unless otherwise specified in this permit.
7. **STANDARDS OF CONSTRUCTION:** All work performed within highway right of way shall conform to recognized construction standards and current Department Standard Specifications, Department Standard Plans High and Low Risk Facility Specifications, and Utility Special Provisions. Where reference is made to "Contractor and Engineer," these are amended to be read as "Permittee and Department representative."
8. **PLAN CHANGES:** Changes to plans, specifications, and permit provisions are not allowed without prior approval from the State representative.
9. **INSPECTION AND APPROVAL:** All work is subject to monitoring and inspection. Upon completion of work, permittee shall request a final inspection for acceptance and approval by the Department. The local agency permittee shall not give final construction approval to its contractor until final acceptance and approval by the Department is obtained.
10. **PERMIT AT WORKSITE:** Permittee shall keep the permit package or a copy thereof, at the work site and show it upon request to any Department representative or law enforcement officer. If the permit package is not kept and made available at the work site, the work shall be suspended.
11. **CONFLICTING ENCROACHMENTS:** Permittee shall yield start of work to ongoing, prior authorized, work adjacent to or within the limits of the project site. When existing encroachments conflict with new work, the permittee shall bear all cost for rearrangements, (e.g., relocation, alteration, removal, etc.).
12. **PERMITS FROM OTHER AGENCIES:** This permit is invalidated if the permittee has not obtained all permits necessary and required by law, from the Public Utilities Commission of the State of California (PUC), California Occupational Safety and Health Administration (Cal-OSHA), or any other public agency having jurisdiction.
13. **PEDESTRIAN AND BICYCLIST SAFETY:** A safe minimum passageway of 4' shall be maintained through the work area at existing pedestrian or bicycle facilities. At no time shall pedestrians be diverted onto a portion of the street used for vehicular traffic. At locations where safe alternate passageways cannot be provided, appropriate signs and barricades shall be installed at the limits of construction and in advance of the limits of construction at the nearest crosswalk or intersection to detour pedestrians to facilities across the street. Attention is directed to Section 7-1.09 Public Safety of the Department Standard Specifications.
14. **PUBLIC TRAFFIC CONTROL:** As required by law, the permittee shall provide traffic control protection warning signs, lights, safety devices, etc., and take all other measures necessary for traveling public's safety. While providing traffic control, the needs and control of all road users [motorists, bicyclists and pedestrians, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA)] shall be an essential part of the work activity.  
  
Day and night time lane closures shall comply with the California Manual on Uniform Traffic Control Devices (Part 6, Temporary Traffic Control), Standard Plans, and Standard Specifications for traffic control systems. These General Provisions are not intended to impose upon the permittee, by third parties, any duty or standard of care, greater than or different from, as required by law.
15. **MINIMUM INTERFERENCE WITH TRAFFIC:** Permittee shall plan and conduct work so as to create the least possible inconvenience to the traveling public; traffic shall not be unreasonably delayed. On conventional highways, permittee shall place properly attired flagger(s) to stop or warn the traveling public in compliance with the California Manual on Uniform Traffic Control Devices (Chapter 6E, Flagger Control).
16. **STORAGE OF EQUIPMENT AND MATERIALS:** The storage of equipment or materials is not allowed within State highway right-of-way, unless specified within the Special Provisions of this specific encroachment permit. If Encroachment Permit Special Provisions allow for the storage of equipment or materials within the State right of way, the equipment and material storage shall comply with Standard Specifications, Standard Plans, Special Provisions, and the Highway Design Manual. The clear recovery zone widths must be followed and are the minimum desirable for the type of facility indicated below: freeways and expressways - 30', conventional highways (no curbs) - 20', conventional highways (with curbs) - 1.5'. If a fixed object cannot be eliminated, moved outside the clear recovery zone, or modified to be made yielding, it should be shielded by a guardrail or a crash cushion.
17. **CARE OF DRAINAGE:** Permittee shall provide alternate drainage for any work interfering with an existing drainage facility in compliance with the Standard Specifications, Standard Plans and/or as directed by the Department's representative.
18. **RESTORATION AND REPAIRS IN RIGHT OF WAY:** Permittee is responsible for restoration and repair of State highway right of way resulting from permitted work (State Streets and Highways Code, Sections 670 et. seq.).

19. **RIGHT OF WAY CLEAN UP:** Upon completion of work, permittee shall remove and dispose of all scraps, brush, timber, materials, etc. off the right of way. The aesthetics of the highway shall be as it was before work started.
20. **COST OF WORK:** Unless stated in the permit, or a separate written agreement, the permittee shall bear all costs incurred for work within the State right of way and waives all claims for indemnification or contribution from the State.
21. **ACTUAL COST BILLING:** When specified in the permit, the Department will bill the permittee actual costs at the currently set hourly rate for encroachment permits.
22. **AS-BUILT PLANS:** When required, permittee shall submit one (1) set of folded as-built plans within thirty (30) days after completion and approval of work in compliance with requirements listed as follows:
1. Upon completion of the work provided herein, the permittee shall send one vellum or paper set of As-Built plans, to the State representative. Mylar or paper sepia plans are not acceptable.
  2. All changes in the work will be shown on the plans, as issued with the permit, including changes approved by Encroachment Permit Rider.
  3. The plans are to be stamped or otherwise noted AS-BUILT by the permittee's representative who was responsible for overseeing the work. Any original plan that was approved with a State stamp, or Caltrans representative signature, shall be used for producing the As-Built plans.
  4. If As-Built plans include signing or striping, the dates of signing or striping removal, relocation, or installation shall be shown on the plans when required as a condition of the permit. When the construction plans show signing and striping for staged construction on separate sheets, the sheet for each stage shall show the removal, relocation or installation dates of the appropriate staged striping and signing.
  5. As-Built plans shall contain the Permit Number, County, Route, and Post Mile on each sheet.
  6. Disclaimer statement of any kind that differ from the obligations and protections provided by Sections 6735 through 6735.6 of the California Business and Professions Code, shall not be included on the As-Built plans. Such statements constitute non-compliance with Encroachment Permit requirements, and may result in the Department of Transportation retaining Performance Bonds or deposits until proper plans are submitted. Failure to comply may also result in denial of future permits, or a provision requiring a public agency to supply additional bonding.
23. **PERMITS FOR RECORD PURPOSES ONLY:** When work in the right of way is within an area under a Joint Use Agreement (JUA) or a Consent to Common Use Agreement (CCUA), a fee exempt permit is issued to the permittee for the purpose of providing a notice and record of work. The Permittee's prior rights shall be preserved without the intention of creating new or different rights or obligations. "Notice and Record Purposes Only" shall be stamped across the face of the permit.
24. **BONDING:** The permittee shall file bond(s), in advance, in the amount set by the Department. Failure to maintain bond(s) in full force and effect will result in the Department stopping of all work and revoking permit(s). Bonds are not required of public corporations or privately owned utilities, unless permittee failed to comply with the provision and conditions under a prior permit. The surety company is responsible for any latent defects as provided in California Code of Civil Procedures, Section 337.15. Local agency permittee shall comply with requirements established as follows: In recognition that project construction work done on State property will not be directly funded and paid by State, for the purpose of protecting stop notice claimants and the interests of State relative to successful project completion, the local agency permittee agrees to require the construction contractor furnish both a payment and performance bond in the local agency's name with both bonds complying with the requirements set forth in Section 3-1.02 of State's current Standard Specifications before performing any project construction work. The local agency permittee shall defend, indemnify, and hold harmless the State, its officers and employees from all project construction related claims by contractors and all stop notice or mechanic's lien claimants. The local agency also agrees to remedy, in a timely manner and to State's satisfaction, any latent defects occurring as a result of the project construction work.
25. **FUTURE MOVING OF INSTALLATIONS:** Permittee understands and agrees to relocate a permitted installation upon notice by the Department. Unless under prior property right or agreement, the permittee shall comply with said notice at his sole expense.
26. **ARCHAEOLOGICAL/HISTORICAL:** If any archaeological or historical resources are revealed in the work vicinity, the permittee shall immediately stop work, notify the Department's representative, retain a qualified archaeologist who shall evaluate the site, and make recommendations to the Department representative regarding the continuance of work.
27. **PREVAILING WAGES:** Work performed by or under a permit may require permittee's contractors and subcontractors to pay appropriate prevailing wages as set by the Department of Industrial Relations. Inquiries or requests for interpretations relative to enforcement of prevailing wage requirements are directed to State of California Department of Industrial Relations, 525 Golden Gate Avenue, San Francisco, California 94102.
28. **RESPONSIBILITY FOR DAMAGE:** The State of California and all officers and employees thereof, including but not limited to the Director of Transportation and the Deputy Director, shall not be answerable or accountable in any manner for injury to or death of any person, including but not limited to the permittee, persons employed by the permittee, persons acting in behalf of the permittee, or for damage to property from any cause. The permittee shall be responsible for any liability imposed by law and for injuries to or death of any person, including but not limited to the permittee, persons employed by the permittee, persons acting in behalf of the permittee, or for damage to property arising out of work, or other activity permitted and done by the permittee under a permit, or arising out of the failure on the permittee's part to perform his obligations under any permit in respect to maintenance or any other obligations, or resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or other activity or at any subsequent time, work or other activity is being performed under the obligations provided by and contemplated by the permit.
- The permittee shall indemnify and save harmless the State of California, all officers, employees, and State's contractors, thereof, including but not limited to the Director of Transportation and the Deputy Director, from all claims, suits or actions of every name, kind and description brought for or on account of injuries to or death of any person, including but not limited to the permittee, persons employed by the permittee, persons acting in behalf of the permittee and the public, or damage to property resulting from the performance of work or other activity under the permit, or arising out of the failure on the permittee's part to perform his obligations under any permit in respect to maintenance or any other obligations, or resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or other activity or at any subsequent time, work or other activity is being performed under the obligations provided by and contemplated by the permit, except as otherwise provided by statute.

The duty of the permittee to indemnify and save harmless includes the duties to defend as set forth in Section 2778 of the Civil Code. The permittee waives any and all rights to any type of expressed or implied indemnity against the State, its officers, employees, and State contractors. It is the intent of the parties that the permittee will indemnify and hold harmless the State, its officers, employees, and State's contractors, from any and all claims, suits or actions as set forth above regardless of the existence or degree of fault or negligence, whether active or passive, primary or secondary, on the part of the State, the permittee, persons employed by the permittee, or acting on behalf of the permittee.

For the purpose of this section, "State's contractors" shall include contractors and their subcontractors under contract to the State of California performing work within the limits of this permit.

29. **NO PRECEDENT ESTABLISHED:** This permit is issued with the understanding that it does not establish a precedent.
30. **FEDERAL CIVIL RIGHTS REQUIREMENTS FOR PUBLIC ACCOMMODATION:**  
A. The permittee, for himself, his personal representative, successors in interest, and assigns as part of the consideration hereof, does hereby covenant and agree that:
1. No person on the grounds of race, color, or national origin shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.
  2. That in connection with the construction of any improvements on said lands and the furnishings of services thereon, no discrimination shall be practiced in the selection and retention of first-tier subcontractors in the selection of second-tier subcontractors.
  3. That such discrimination shall not be practiced against the public in their access to and use of the facilities and services provided for public accommodations (such as eating, sleeping, rest, recreation), and operation on, over, or under the space of the right of way.
  4. That the permittee shall use the premises in compliance with all other requirements imposed pursuant to Title 15, Code of Federal Regulations, Commerce and Foreign Trade, Subtitle A, Office of the Secretary of Commerce, Part 8 (15 C.F.R. Part 8) and as said Regulations may be amended.
  5. That in the event of breach of any of the above nondiscrimination covenants, the State shall have the right to terminate the permit and to re-enter and repossess said land and the land and the facilities thereon, and hold the same as if said permit had never been made or issued.
31. **MAINTENANCE OF HIGHWAYS:** The permittee agrees, by acceptance of a permit, to properly maintain any encroachment. This assurance requires the permittee to provide inspection and repair any damage, at permittee's expense, to State facilities resulting from the encroachment.
32. **SPECIAL EVENTS:** In accordance with subdivision (a) of Streets and Highways Code Section 682.5, the Department of Transportation shall not be responsible for the conduct or operation of the permitted activity, and the applicant agrees to defend, indemnify, and hold harmless the State and the city or county against any and all claims arising out of any activity for which the permit is issued.

The permittee understands and agrees to comply with the obligations of Titles II and III of the Americans with Disabilities Act of 1990 in the conduct of the event, and further agrees to indemnify and save harmless the State of California, all officers and employees thereof, including but not limited to the Director of Transportation, from any claims or liability arising out of or by virtue of said Act.

33. **PRIVATE USE OF RIGHT OF WAY:** Highway right of way shall not be used for private purposes without compensation to the State.

The gifting of public property use and therefore public funds is prohibited under the California Constitution, Article 16.

34. **FIELD WORK REIMBURSEMENT:** Permittee shall reimburse State for field work performed on permittee's behalf to correct or remedy hazards or damaged facilities, or clear debris not attended to by the permittee.
35. **NOTIFICATION OF DEPARTMENT AND TMC:** The permittee shall notify the Department's representative and the Transportation Management Center (TMC) at least 7 days before initiating a lane closure or conducting an activity that may cause a traffic impact. A confirmation notification should occur 3 days before closure or other potential traffic impacts. In emergency situations when the corrective work or the emergency itself may affect traffic, TMC and the Department's representative shall be notified as soon as possible.
36. **SUSPENSION OF TRAFFIC CONTROL OPERATION:** The permittee, upon notification by the Department's representative, shall immediately suspend all lane closure operations and any operation that impedes the flow of traffic. All costs associated with this suspension shall be borne by the permittee.
37. **UNDERGROUND SERVICE ALERT (USA) NOTIFICATION:** Any excavation requires compliance with the provisions of Government Code Section 4216 et. seq., including, but not limited to notice to a regional notification center, such as Underground Service Alert (USA). The permittee shall provide notification at least 48 hours before performing any excavation work within the right of way.



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
San Francisco Bay National Wildlife Refuge Complex  
1 Marshlands Rd.  
Fremont, California 94555



July 11, 2012

Walter Wadlow  
General Manager  
Alameda County Water District  
43885 South Grimmer Boulevard  
Fremont, California 94538

Subject: U.S. Fish and Wildlife Service Support for Inland Saltwater Intrusion and Aquifer Characterization Project

Dear Mr. Wadlow:

It has come to my attention that the Alameda County Water District (ACWD) is proposing a project to install six new groundwater monitoring wells in the central portion of the Niles Cone Groundwater Basin and that ACWD is applying to the Department of Water Resources for a Local Groundwater Assistance Program grant to fund this project.

The wells which will be installed in two major aquifers would be located on the Don Edwards San Francisco Bay National Wildlife Refuge which is managed by the U.S. Fish and Wildlife Service. We have, and still do work closely with ACWD on projects concerning saltwater intrusion in the Niles Cone Groundwater Basin. The information gathered by these proposed wells would be useful to the Refuge.

The U.S. Fish and Wildlife Service supports this application request and will provide access and guidance with wildlife issues that may arise. This project will provide valuable information and allow ACWD to better manage the Niles Cone Groundwater Basin.

If I can be of any assistance, please contact me at 510 792-0222.

Sincerely,

Digitally signed by Eric Mruz  
DN: cn=Eric Mruz, o=US Fish and  
Wildlife Service, ou=Don Edwards  
San Francisco Bay NWR,  
email=eric\_mruz@fws.gov, c=US  
Date: 2012.07.11 09:09:15 -07'00'

Eric Mruz, Manager

Don Edwards San Francisco Bay NWR.



FIGURE 5

RECEIVED

SEP 16 2014

A.C.W.D.  
ENGINEERING DEPT.

ACCESS AGREEMENT

(Crossing only)

2001.008:28

Alameda County Water District ("ACWD")  
Monitor Well Drilling

**THIS AGREEMENT**, made and entered into this 1st day of September, 2014, by and between **CARGILL, INCORPORATED**, a Delaware corporation, with offices and principal place of business at 15407 McGinty Road West, Wayzata, MN through its Cargill Land Management Business Unit ("Cargill"), and **ALAMEDA COUNTY WATER DISTRICT**, a county water district, ("ACWD") whose principle address is: 43885 South Grimmer Blvd, Fremont, CA 94538.

**WITNESSETH:**

**WHEREAS**, ACWD, a county water district, is seeking access to a portion of property owned and/or operated by Cargill (such Property is shown on the attached Exhibit "A"), in order to conduct additional monitor well drilling for continued studies to better understand saltwater intrusion into the Niles Cone Groundwater Basin ("Work").

The primary contact for ACWD will be Douglas Young, 43885 South Grimmer Blvd., Fremont, CA 94538, (510) 668-4452.

**WHEREAS**, ACWD requests such access in order to conduct additional (2 new sites) monitor well drilling for continued studies to better understand saltwater intrusion into the Niles Cone Groundwater Basin, ACWD acknowledges and agrees that it will not conduct any survey's, mapping or monitoring of, or on, any land owned or operated by Cargill, and, there will be no observations or information obtained relating to any Cargill operations.

**WHEREAS**, ACWD agrees to obtain all permits and/or permission necessary to perform such well drilling, on land owned by others.

**NOW, THEREFORE**, it is agreed by and between the parties as follows:

1. Cargill grants to ACWD, their employees, agents and subcontractors (ACWD's employees, agents and subcontractors are collectively referred to herein as "Authorized Representatives") this limited right to enter and cross such Property owned and/or operated by Cargill, subject to ACWD's acknowledgment that there will be no observations or information obtained relating to any lands owned or operated by Cargill, or related to any Cargill operations. All survey's mapping and/or monitoring ("Work"), shall be limited to land owned by others and performed for the sole purpose of its work.
2. Cargill grants ACWD and its Authorized Representatives this limited right to enter and cross such Property owned and/or operated by Cargill, subject to ACWD's acknowledgment that any items or materials brought on to Property, including but not limited to, fuel or petroleum, tools, etc, shall at all times be properly contained and handled in a manner consistent with the Safety Guidelines attached herein as Exhibit B. In addition, ACWD agrees that they have read and will follow any and all applicable Safety Provisions as outlined in the attached Exhibit B.
3. ACWD and its Authorized Representatives shall notify Cargill at least 48 hours prior to scheduled Work. For each site visit, ACWD is allowed to access Cargill's property through the Newark Solar Plant #2 access gate located at the end of Morton Ave. to reach the area or work indicated on Exhibit A (site #5). Cargill may determine, in its sole and absolute discretion, whether or not ACWD shall be accompanied by a Cargill Representative while conducting said Work.
4. Any disturbance to Property resulting from the Work shall be repaired, corrected and/or restored immediately, at ACWD's sole expense. A Cargill appointed and authorized contractor (Galindo Construction) will be contracted by ACWD to repair any damage.

5. ACWD and its Authorized Representatives, agrees to indemnify, defend and hold Cargill harmless from any and all claims arising from or relating to the Work.
6. The term of this Agreement shall be in effect for the period September 1, 2014, through October 31, 2014, with the provision that the Agreement may be extended annually (in writing), at Cargill's sole discretion, however, all other provisions of this Agreement shall remain in effect in perpetuity. Notwithstanding the above, this Agreement may be terminated by Cargill, at its sole discretion, by giving ACWD twenty-four (24) hours written notice.
7. ACWD agrees to provide Cargill with copies of any reports produced in conjunction with this Work.
8. Cargill and ACWD agree that notification, notices and copies of all materials hereunder will be addressed in the first instance to the following contact people:

For Cargill:

Anthony Paredes, Jr. "Butch"  
c/o Cargill, Incorporated  
7220 Central Avenue  
Newark, CA 94560  
Phone: (510)790-8165  
Fax: (510)790-8180  
E-mail: [butch\\_paredes@cargill.com](mailto:butch_paredes@cargill.com)

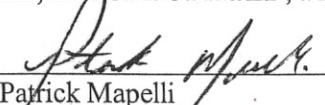
For ACWD:

Mr. Douglas T. Young  
c/o Alameda County Water District  
43885 South Grimmer Blvd.  
Fremont, CA 94538  
Phone: (510) 668-4452  
E-mail: [douglas.young@acwd.com](mailto:douglas.young@acwd.com)

**APPROVED AND ACCEPTED**

IN WITNESS WHEREOF, the parties hereto have hereunder set their hands and seals the day and year first above written.

**CARGILL, INCORPORATED**, a Delaware corporation

By:   
Patrick Mapelli  
Its: Manager - Real Property  
Date: 9/15/14

**ALAMEDA COUNTY WATER DISTRICT**, a County Water District

By:   
Its: GENERAL MANAGER  
Date: 9/9/14

## TERMS AND CONDITIONS

1. ACWD agrees that it, and its employees, agents, licensees, invitees, and subcontractors shall present proper credentials when seeking access; shall comply with all applicable safety and environmental laws and regulations, including required review of and will follow, any and all applicable portions of Cargill's Safety Requirements per the attached Exhibit B, when on or about the premises. ACWD further agrees that Cargill may, at the sole cost and risk of ACWD, stop Work and deny future access to the premises to any person or entity for failure to comply with applicable safety, environmental laws, regulations or Cargill's safety requirements, or in the event of ACWD's breach of this Agreement, for any reason. Cargill may withhold or withdraw its approval of access at any time, for any reason, or for no reason at all.
2. ACWD and its Authorized Representatives shall notify Cargill at least 48 hours prior to scheduled Work. For each site visit, ACWD must check-in with the main Newark Plant Site office (contact Butch at 510-790-8165), and will be escorted across lands owned or operated by Cargill to construction locations indicated on Exhibit A. Cargill may determine, in its sole and absolute discretion, whether or not ACWD shall be accompanied by a Cargill Representative while on the Property.
3. ACWD and its Authorized Representatives shall conduct the Work at its sole risk and expense and in compliance with all applicable laws, rules, ordinances, codes and orders. ACWD shall be responsible for and pay all charges made, levied, or assessed by any third party in connection with the Work, including without limitation any taxes, charges, licensing fees, and the like, levied against ACWD, its Authorized Representatives or Cargill.
4. Prior to the execution of this Agreement and upon the renewal of any Policy, ACWD and each permitted subcontractor shall furnish to Cargill copies of insurance certificates, evidencing that it maintains the following coverage's or any higher amounts as required by law or regulation:

<u>Types of Insurance</u>	<u>Limits</u>
Workers' Compensation	Statutory
Employer's Liability	\$1,000,000 each occurrence
Commercial General Liability including Contractual	Bodily injury and death: \$2,000,000 combined single limit
Liability and Automobile Liability	Property damage: \$2,000,000 Combined single limit

The certificates of Commercial General Liability insurance shall name Cargill as an Additional Insured and provide Cargill not less than thirty (30) days written notice before cancellation or any material change in the insurance. The insurance coverage shall be written on an occurrence rather than on a claims made basis; shall be written by carriers satisfactory to Cargill; and shall remain in effect during the term of this Agreement.

5. ACWD shall release, hold harmless, defend and indemnify Cargill from and against all claims, including but not limited to claims arising under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, the Resource Conservation and Recovery Act of 1976, and similar state laws, arising from or relating to this Agreement and the Work.
6. This Agreement and any referenced Exhibits (which are hereby incorporated by this reference) are the entire agreement between the parties and shall not be modified in any manner except in writing executed by both parties.
7. This Agreement shall bind and inure to the benefit of the parties hereto and their respective heirs, successors and assigns. Neither party shall assign this Agreement without the prior written consent of the other.

8. In the event a dispute arises under this Agreement, such dispute shall be resolved in arbitration conducted in accordance with the Uniform Arbitration Act, and the Rules of the American Arbitration Association shall govern. Any award which might be rendered by an arbitrator shall be final and binding upon the parties.

9. The law of the State of California shall apply to the interpretation of this Agreement notwithstanding the conflicts of laws rules.

10. Any provision of this Agreement which shall prove to be invalid, void or illegal will in no way affect, impair or invalidate any other provision hereof and such remaining provisions shall remain in full force and effect. The failure of either of the parties hereto to exercise any of its rights or remedies under this Agreement shall not operate as a waiver of any such right or remedy on later occasions.

**CARGILL, INCORPORATED**, a Delaware corporation

By:

Patrick Mapelli  
Patrick Mapelli

Its: Manager, Real Property

Date:

9/15/14

**ALAMEDA COUNTY WATER DISTRICT**, a County Water District

By:

Walter W. W. W.

Its:

GENERAL MANAGER

Date:

9/9/14

**EXHIBIT A**  
**"Access Route and location of Work"**

Access to such Work area(s) shall be as follows:

1. ACWD to notify Cargill at least 48 hours prior to scheduled Work - contact Butch Paredes 510-790-8165 / 510-378-1824 cell.
2. ACWD shall meet a designated Cargill representative at the main office (7220 Central Avenue, Newark, CA) and shall be escorted by such representative to the Work location.
3. Cargill's designated representative will determine the route of travel (based on the needs of Cargill's ongoing operations), and will require an escort for ACWD along such route to its Work location.
4. Cargill's designated representative may also determine whether or not ACWD must be accompanied by a Cargill representative while performing such Work.

Access and the rights granted under this Agreement shall only be applicable this particular location of said Work, and shall not extend to any other land owned or operated by Cargill.

**EXHIBIT B**  
**SAFETY GUIDELINES**  
Cargill, Incorporated

**JOB INFORMATION:**

Name of Company performing "Work": Alameda County Water District / Gregg Drilling & Testing, Inc.

Job: Drilling Monitor Wells

Consultant employees date reviewed: \_\_\_\_\_

**PURPOSE:**

These guidelines are intended as general guidance for Consultant and subcontractor activities concerning safety performance while performing work at Cargill Salt's Western Region facilities. Consultant, subcontractors and their employees and agents (hereafter referred to collectively as Consultant and subconsultants) will be required to meet all applicable local, state, and federal laws and regulations which will take precedence over these guidelines in event of a conflict. It will be the responsibility of the Consultant and subconsultants to become knowledgeable of and comply with the safety guidelines set forth in this document. These guidelines must be communicated by Consultant and subconsultants to their employees and agents at pre-job safety meetings.

**CONSULTANT/SUBCONSULTANT(S) RESPONSIBILITIES:**

1. To ensure that Consultant/subconsultant's employees and agents on Cargill property are familiar with and follow all guidelines set forth in this document.
2. To ensure that all employees and agents of Consultant and subconsultants are physically able and properly trained to perform their duties.
3. To ensure compliance with all applicable local, state and federal laws and regulations.
4. To report all incidents and hazardous conditions to Cargill management immediately. All incidents are to be investigated by the Consultant within 24 hours and a copy of the investigation report to be given to the Cargill Plant Manager within 48 hours.
5. To maintain and furnish to each of their employees all personal protective equipment required.
6. IF THERE ARE ANY QUESTIONS DURING THE JOB, STOP! CONSULT WITH CARGILL SUPERVISOR BEFORE PROCEEDING. DO NOT TAKE UNNECESSARY RISKS.

**CONSULTANT/SUBCONSULTANT(S) SAFETY RULES AND PROCEDURES**

1. Consultant and subconsultants must wear hard hats, safety shoes that meet ASTM F 2412-05 and 2413-05 standards, gloves, safety glasses with side shields, long pants and sleeved shirts whenever they are on Cargill property. Hearing protection must be worn in posted areas. Without the proper PPE Consultant and subconsultants will not be allowed to work. Knee and body pad use is encouraged to prevent contact stress injuries.
2. In the event of an emergency such as fire or earthquake, the evacuation location for Solar is the Water Tower, Refinery is the parking lot outside the old administration building and Redwood City is the red Leslie salt tank by the front gate. Do not leave the location until the foreman or emergency leader has accounted for you. Emergency notification is via horns, radios, or verbal.
3. If you discover a fire, immediately call 911 (on many phones it is necessary to first dial a 9 for an outside line) and notify the Cargill supervisor or a foreman so that they can implement the plant emergency procedures. If you use a Cargill fire extinguisher, notify the Cargill supervisor so that it may be refilled.

4. If a Consultant or subconsultants employee is injured and requires medical attention, immediately call 911 and notify the Cargill supervisor or a foreman so that someone can direct the emergency services to your location.
5. Any spills of fuel, oil, solvent, brine, chemicals, or any other pollutant must be contained and reported to the Cargill supervisor immediately. The Consultant and subconsultant will be required to participate in the incident investigation and the physical clean-up and will be required to bear the costs of clean-up and proper disposal.
6. No individual shall lift a weight greater than 70 pounds. If an object weighing more than 70 pounds must be lifted multiple people will be used or mechanical lifting such as a forklift or crane will be used.
7. Consultant and subconsultants entering any confined space will be required to know and understand Cargill's confined space entry procedures. Consultant and subconsultants must provide training for their employees in confined space entry and attendance. If the Consultant and subconsultant may enter a confined space, the Cargill supervisor must provide additional training on confined space procedures.
8. The Cargill equipment lock-out/tag-out/test procedure must be understood and followed by all Consultant and subconsultants. Consultant and subconsultants must supply their own locks and tags.
9. Fall protection is required for all work performed above 4 feet. Consultant and subconsultants shall provide all fall protection equipment for their employees. Consultant and subconsultants are not to go on any building roofs without approval of the Cargill supervisor. Consultant and subconsultants not following the Cargill fall protection policy will be asked to leave the location. See Cargill's Fall Protection Program for more information.
10. Consultant and subconsultants are to use proper ladders or scaffolding where appropriate. Climbing on piping, equipment or structural steel is not allowed.
11. Consultant and subconsultants performing any non-routine work that would involve working 4 feet or more above ground level must get a Non-Routine Elevated Work Permit.
12. In the course of work at this location, Consultant and subconsultants may be in areas where we use hazardous chemicals. Consultant and subconsultants must stay in their designated work area. MSDS can be accessed by calling 3E at 1-800-451-8346.
13. Consultant and subconsultants must provide a complete list of chemicals or substances they will bring on location and provide an MSDS if requested by the Cargill supervisor.
14. All cutting and welding requires a Cutting and Welding Permit issued by a Cargill supervisor. Cal/OSHA approved eye and face protection must be worn whenever cutting and welding is performed.
15. GFCIs must be used with all portable equipment. If you do not have GFCIs the Cargill supervisor can provide them for your use.
16. No Consultant or subconsultant is allowed to start or stop any equipment, change process flows, or cut pipes or conduits without prior approval from the Cargill supervisor.
17. Obey all posted traffic signs. Drive slowly and carefully through the plant, maintaining an awareness of pedestrians.
18. There shall be no walking between uncoupled railroad cars unless there is no switch engine within sight and there is at least 30 feet of space between cars,
19. Use care when crossing the railroad tracks as the signal lights do occasionally fail. Do not block railroad tracks.

20. The Consultant and subconsultants are expected to keep work areas clean and orderly.
21. Consultant and subconsultants will be required to furnish all tools needed for the job being performed. Cargill tools and equipment are only to be used by Consultant and subconsultants when they are specific to a piece of equipment and only after a Hold Harmless agreement is executed.
22. Consultant and subconsultants must comply with Cargill's drug and alcohol policy. Consultant and subconsultants employees may not be in possession of or under the influence of any mood altering substance as detailed in the policy.
23. Smoking is not allowed on Cargill property, including vehicles.
24. Warning of corrosive conditions: This facility is a salt production facility. Under certain conditions salt can cause corrosion to your equipment. Consultant and subconsultants should take appropriate measures to protect their equipment to minimize salt-induced corrosion. By signing this form Consultant and subconsultants acknowledge that they shall be solely responsible for any damage to equipment caused by salt. Consultant and subconsultants shall notify all individuals involved with the Work of the possibility of salt-induced corrosion prior to the beginning of such Work.
25. All Consultant and subconsultants must know and comply with local, state and federal safety and environmental laws and regulations.
26. Behavior-based safety trained observers at this location perform observations of Cargill and contract employees recording safe and at-risk behaviors. A list of behaviors that the observer looks for is attached to this packet. No names are recorded on these observations; they are simply a means for discussing at-risk behaviors and recording data and using it to look for trends and problem areas. For more information, ask a Cargill supervisor about the Home Team.
27. At food grade locations all Consultant and subconsultants are expected to ensure their work does not lead to any contamination of the salt products. Consultant and subconsultants are expected to follow the Good Manufacturing Practices (G.M.P.) presented by the Cargill supervisor.
28. No job is complete until the Cargill supervisor has approved the safety, environmental, operating and housekeeping conditions of the project and completed the Consultant valuation as well as reporting total hours worked and any incidents occurring to Cargill EHS.
29. Consultant and subconsultants in violation of these rules will not be allowed to work and must leave plant property.
30. It is the Consultant and subconsultants supervisor's responsibility to know these rules and see that they are followed by his/her employees. No Consultant or subconsultant may start work until the signatures below have been obtained.
31. Although Cargill may direct safety, the Consultant and subconsultant is responsible for the safety and conduct of their employees.
32. The maximum speed on levees is 35 MPH – weather, darkness, or other adverse conditions will dictate the safe traveling speed. When levees are moist, be careful as they may become very slippery. Always yield to wildlife.
33. Pickleweed or other vegetation must not be disturbed when working on levees, or near sloughs or marshes without prior approval from the Cargill project Manager. If mud, rock or other debris inadvertently comes in contact with marsh vegetation, contact Cargill Project Manager immediately.

34. Seat belts must be worn at all times.
35. Compressed gas cylinders must be stored properly.
36. Firearms or weapons are not permitted on Cargill Property – even in personal vehicles.
37. Life jackets must be worn when working on boats, or on docks or wooden structures without railings.
38. Do not sit or lay under heavy equipment when it is not in use.
39. Gloves must be worn at all times, unless job function prohibits or creates a greater risk.
40. Some endangered species live on Cargill property. Do not disturb wildlife. When driving, be constantly alert for nesting birds, including marked and unmarked Snowy Plover nests. Please avoid any unmarked Snowy Plover nest locations and immediately report such locations to Cargill's Real Property Manager, Pat Mapelli at (510) 790-8610.
41. If excavation is required, Consultant and subconsultant must know and enforce pertinent OSHA regulations. It is especially important to know and follow the pertinent OSHA regulations in regards to the proper clearance of overhead power line.
42. Cellular phones cannot be used by a driver when their vehicle is in motion.

I have read the above safety rules, understand them, and agree to comply.

**Alameda County Water District, a County Water District,**

By: Walt Ward

Its: GENERAL MANAGER

Date: 9/9/14





UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE

Don Edwards San Francisco Bay  
National Wildlife Refuge  
1 Marshlands Rd. Fremont, CA. 94555  
510/792-0222

**SPECIAL USE PERMIT**

Station No. to be Credited Permit No.  
**81640 - 2014-034**

Date July 2, 2014

Period of Use (inclusive)

From July 2, 2014

To July 2, 2016

Permittee Name

Michelle A. Myers 510/668-4454  
fax: 651-1760

Permittee Address

Alameda County Water District  
43885 South Grimmer Boulevard  
Fremont, CA 94538

Purpose (specify in detail privilege requested, or units of products involved)

To access portions of of the Don Edwards San Francisco Bay NWR for the purpose of monitoring the quality and water levels in the Niles Cone Groundwater Basin and investigate potential historic ground water wells.

Renewed permit from 2012-031

Description (specify unit numbers: metes and bounds, or other recognizable designations)

For monitoring Niles Cone wells, access wells listed in the continuation sheet with 2 pickup trucks twice a year; Once from mid-March to mid-April and once from mid-September to mid-October subject to conditions listed in continuation sheet. Search for historic wells in Drawbridge and Ponds A22/23 when snowy plovers are not nesting. see attached map for well sites.

Amount of fee \$0 if not a fixed payment, specify rate and unit of charge:

- Payment Exempt - Justification: Data beneficial to Refuge  
 Full Payment  
 Partial Payment - Balance of payments to be made as follows:

Record of Payments

N/A

Special Conditions

See Continuation Sheet

This permit is issued by the U.S. Fish and Wildlife Service and accepted by the undersigned, subject to the terms, covenants, obligations, and reservations, expressed or implied herein, and to the conditions and requirements appearing on the reverse side.

Permittee Signature

*Anna Lopez* <sup>ADH</sup>

Issued

*Eric C. Mruz*

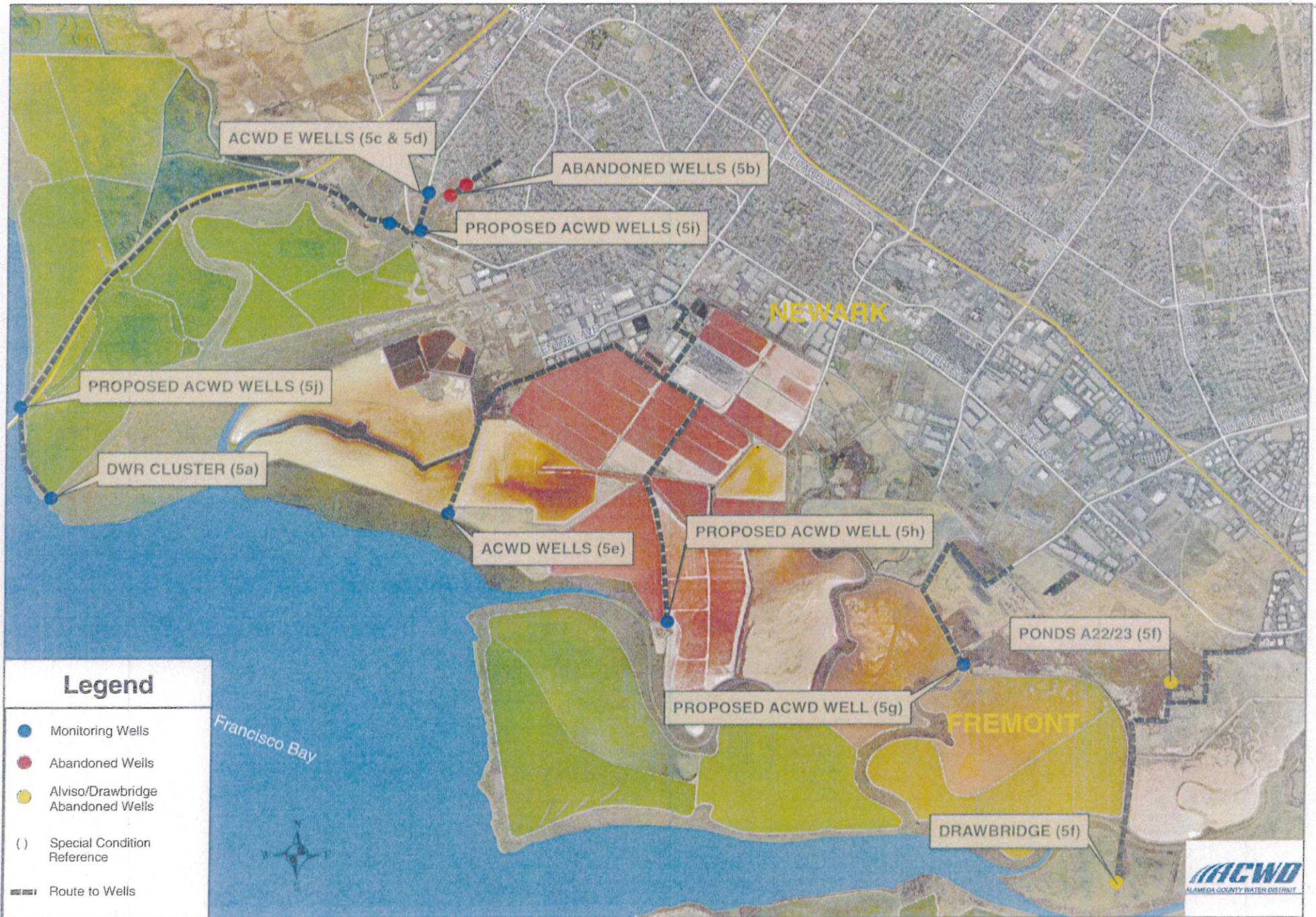
Digitally signed by Eric Mruz  
DN: cn=Eric Mruz, o=USFWS, ou,  
email=eric\_mruz@fws.gov, c=US  
Date: 2014.06.30 15:20:32 -0700'

Form 3-1383 (Rev. 5/97)

*Michelle A. Myers*  
Well Ordinance Supervisor

Special Conditions (continued) - Permit # 81640-2014-034

1. Access permission is granted to permittee and assistants.
2. Permittee and assistants must carry a copy of permit when on refuge property. Permittees and designees will place the attached placard on the dashboard of all vehicles while on the Refuge.
3. Permittee may not drive on levees under conditions that may damage the levee such as after a rain.
4. Vehicle access is permitted only on roads and levees built and maintained for vehicles. Driving vehicles on Marshlands Road is limited to  $\leq 15$  mph to avoid impacts to immature shorebirds from April 1st to August 31. Limited foot or bicycle access on levee roads and trails is permitted where motorized vehicles can not go.
5. Access is limited to the following areas and wells:
  - a. DWR Cluster of two wells: 5S/2W-17F02 and 5S/2W-17F03 will be accessed via Marshlands Road and South Shoreline Trail to the Hetch Hetchy Pipeline.
  - b. Abandoned wells: 5S/2W-02D01 and 5S/2W-02C01 on Mayhews Landing will be accessed along the flood control channel on the northeast side of the property.
  - c. Wells E-48 5S/2W-03A3, and E-47 5S/2W-03H02 will be accessed off the Old Jarvis Road along Mayhews Landing.
  - d. Well E-44 5S/2W-03G01 will be accessed off Marshlands Road.
  - e. Wells 5S/2W-14E005, 5S/2W-14E006, 5S/2W-14E007, 5S/2W-14E008, and 5S/2W-14E009 will be accessed through Cargill Salt (see attached map)
  - f. Search for historic wells in Drawbridge and Ponds A22/23 is only allowed after calling the Refuge Manager to confirm that the proposed activity will not impact endangered species such as snowy plovers.
  - g. Well 5S/1W-20G001 will be accessed through the former Waste Management facility at the end of Auto Mall Parkway.
  - h. Well 5S/2W-24B003 will be accessed through Cargill Salt.
  - i. Wells 5S/2W-03H004 and 5S/2W-03H005 will be accessed by the old Jarvis Road along Mayhews Landing and Thornton Avenue.
  - j. Wells 5S/2W-08M011 and 5S/2W-08M012 will be accessed through Marshlands Road.
6. Access to salt marsh habitat is prohibited. All work will be done in a manner that minimizes habitat destruction and wildlife disturbance.
7. One refuge barrel lock key (#0137) is loaned to the permittee and will be returned within two weeks of the termination of this permit or a late fee of \$50.00 per key will be assessed. Lost keys will result in a fine of \$100.00 per key.
8. The Don Edwards San Francisco Bay National Wildlife Refuge and U.S. Fish and Wildlife Service will be acknowledged in any communication, report, presentation, or publication resulting from this study.



USFWS Well Location Map



UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE

Don Edwards San Francisco Bay NWR  
1 Marshlands Road, Fremont, CA 94555  
510/792-0222

### SPECIAL USE PERMIT

Station No. to be Credited Permit No.

**81640 - 2014-015**

Date **March 31, 2014**

Period of Use (inclusive)

From **March 31, 2014**

To **March 31, 2016**

Permittee Name

Douglas Young - 510 668-4452  
Alameda Co. Water District

Permittee Address

ACWD  
43885 South Grimmer Blvd.  
Fremont, Ca. 94538

Purpose (specify in detail privilege requested, or units of products involved)

Installation of 6 new monitoring wells at 4 sites located on Don Edwards NWR.

Description (specify unit numbers: metes and bounds, or other recognizable designations)

This proposal is for the drilling and construction of six groundwater monitoring wells targeting the southern and western extent of brackish groundwater in the Centerville and Fremont Aquifers near ACWD's Mowry Wellfield as well as aquifer chemical characterization testing. The installation of these wells and aquifer chemical characterization testing will enable ACWD to obtain geologic, hydrogeologic, and chemical data of the area, gain a better understanding of the relationship between the Centerville and Fremont Aquifers, assist in evaluating the extent of the brackish water in the vicinity of the Mowry Wellfield, and provide long

Amount of fee **\$0** if not a fixed payment, specify rate and unit of charge:

- Payment Exempt - Justification: Research beneficial to Refuge
- Full Payment
- Partial Payment - Balance of payments to be made as follows:

Record of Payments

N/A

Special Conditions

See Attached Special Conditions

This permit is issued by the U.S. Fish and Wildlife Service and accepted by the undersigned, subject to the terms, covenants, obligations, and reservations, expressed or implied herein, and to the conditions and requirements appearing on the reverse side.

Permittee Signature

Issuing

Digitally signed by Eric Mruz  
DN: cn=Eric Mruz, o=USFWS, ou,  
email=eric\_mruz@fws.gov, c=US  
Date: 2014.03.31 11:36:06 -07'00'





UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE

Don Edwards San Francisco Bay  
National Wildlife Refuge  
1 Marshlands Rd. Fremont, CA. 94555  
510/792-0222

**SPECIAL USE PERMIT**

Station No. to be Credited Permit No.  
**81640 - 2014-034**

Date **July 2, 2014**

Period of Use (inclusive)

From **July 2, 2014**

To **July 2, 2016**

Permittee Name

Michelle A. Myers 510/668-4454  
fax: 651-1760

Permittee Address

Alameda County Water District  
43885 South Grimmer Boulevard  
Fremont, CA 94538

Purpose (specify in detail privilege requested, or units of products involved)

To access portions of of the Don Edwards San Francisco Bay NWR for the purpose of monitoring the quality and water levels in the Niles Cone Groundwater Basin and investigate potential historic ground water wells.

**Renewed permit from 2012-031**

Description (specify unit numbers: metes and bounds, or other recognizable designations)

For monitoring Niles Cone wells, access wells listed in the continuation sheet with 2 pickup trucks twice a year; Once from mid-March to mid-April and once from mid-September to mid-October subject to conditions listed in continuation sheet. Search for historic wells in Drawbridge and Ponds A22/23 when snowy plovers are not nesting. see attached map for well sites.

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Record of Payments

N/A

Special Conditions

See Continuation Sheet

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Permittee Signature

*ADA*  
*Anna Lopez*

Issued

*Eric C. Mruz*

Digitally signed by Eric Mruz  
DN: cn=Eric Mruz, o=USFWS, ou,  
email=eric\_mruz@fws.gov, c=US  
Date: 2014.06.30 15:20:32 -07'00'

Form 2-1383 (Rev. 5/97)

*Michelle A. Myers*  
*Well Ordinance Supervisor*

Special Conditions (continued) - Permit # 81640-2014-034

1. Access permission is granted to permittee and assistants.
2. Permittee and assistants must carry a copy of permit when on refuge property. Permittees and designees will place the attached placard on the dashboard of all vehicles while on the Refuge.
3. Permittee may not drive on levees under conditions that may damage the levee such as after a rain.
4. Vehicle access is permitted only on roads and levees built and maintained for vehicles. Driving vehicles on Marshlands Road is limited to  $\leq 15$  mph to avoid impacts to immature shorebirds from April 1st to August 31. Limited foot or bicycle access on levee roads and trails is permitted where motorized vehicles can not go.
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  - b. Abandoned wells: 5S/2W-02D01 and 5S/2W-02C01 on Mayhews Landing will be accessed along the flood control channel on the northeast side of the property.
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  - h. Well 5S/2W-24B003 will be accessed through Cargill Salt.
  - i. Wells 5S/2W-03H004 and 5S/2W-03H005 will be accessed by the old Jarvis Road along Mayhews Landing and Thornton Avenue.
  - j. Wells 5S/2W-08M011 and 5S/2W-08M012 will be accessed through Marshlands Road.
6. Access to salt marsh habitat is prohibited. All work will be done in a manner that minimizes habitat destruction and wildlife disturbance.
7. One refuge barrel lock key (#0137) is loaned to the permittee and **will be returned within two weeks of the termination of this permit or a late fee of \$50.00 per key will be assessed. Lost keys will result in a fine of \$100.00 per key.**
8. The Don Edwards San Francisco Bay National Wildlife Refuge and U.S. Fish and Wildlife Service will be acknowledged in any communication, report, presentation, or publication resulting from this study.
9. Verbal communication with Eric Mruz<sup>(Refuge Manager)</sup> clarified access to the isolated monitoring wells will be limited to water level monitoring only from April 1 to August 31 due to endangered species nesting.

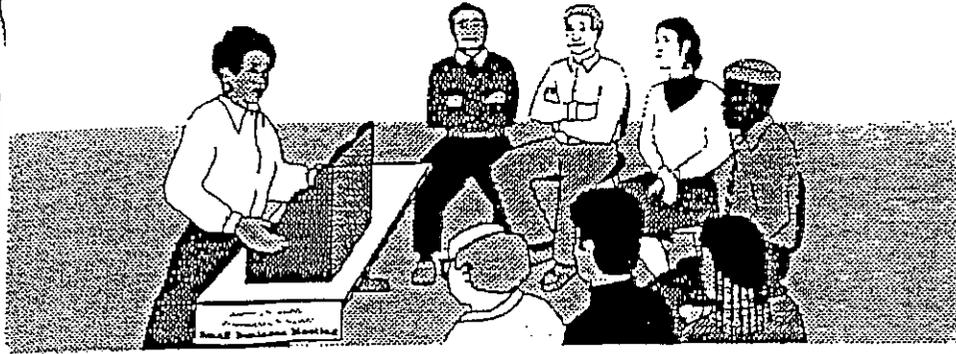


USFWS Well Location Map

## Appendix D

# Storm Water Protection and Emergency Response Plan

## ACTIVITY: EMPLOYEE/SUBCONTRACTOR TRAINING



### Objectives

Housekeeping Practices

Contain Waste

Minimize Disturbed Areas

Stabilize Disturbed Areas

Protect Slopes/Channels

Control Site Perimeter

Control Internal Erosion

### DESCRIPTION

Employee/subcontractor training, like maintenance or a piece of equipment, is not so much a best management practice as it is a method by which to implement BMPs. This fact sheet highlights the importance of training and of integrating the elements of employee/subcontractor training from the individual source controls into a comprehensive training program as part of a company's Storm Water Pollution Prevention Plan (SWPPP).

The specific employee/subcontractor training aspects of each of the source controls are highlighted in the individual fact sheets. The focus of this fact sheet is more general, and includes the overall objectives and approach for assuring employee/subcontractor training in storm water pollution prevention. Accordingly, the organization of this fact sheet differs somewhat from the other fact sheets in this chapter.

### OBJECTIVES

Employee/subcontractor training should be based on four objectives:

- Promote a clear identification and understanding of the problem, including activities with the potential to pollute storm water;  
Identify solutions (BMPs);
- Promote employee/subcontractor ownership of the problems and the solutions; and
- Integrate employee/subcontractor feedback into training and BMP implementation.

### APPROACH

- Integrate training regarding storm water quality management with existing training programs that may be required for your business by other regulations such as: the Illness and Injury Prevention Program (IIPP) (SB 198) (California Code of Regulations Title 8, Section 3203), the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard (29 CFR 1910.120), the Spill Prevention Control and Countermeasure (SPCC) Plan (40 CFR 112), and the Hazardous Materials Management Plan (Business Plan) (California Health and Safety Code, Section 6.95).
- Businesses, particularly smaller ones that may not be regulated by Federal, State, or local regulations, may use the information in this Handbook to develop a training program to reduce their potential to pollute storm water.
- Use the quick reference on disposal alternatives (Table 4.2) to train employee/subcontractors in proper and consistent methods for disposal.

# CA40



## ACTIVITY: EMPLOYEE/SUBCONTRACTOR TRAINING (Continued)

- Consider posting the quick reference table around the job site or in the on-site office trailer to reinforce training.
- Train employee/subcontractors in standard operating procedures and spill cleanup techniques described in the fact sheets. Employee/subcontractors trained in spill containment and cleanup should be present during the loading/unloading and handling of materials.
- Personnel who use pesticides should be trained in their use. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct on-site inspections.
- Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employee/subcontractors can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do on-site.

CA40



## 4. BMPs FOR CONTRACTOR ACTIVITIES

### INTRODUCTION

This chapter describes specific Best Management Practices (BMPs)

for common construction activities that may pollute storm water. Chapter 2 led you through the steps of identifying activities at your site that can pollute storm water, while Chapter 3 provided guidance on BMP selection. This chapter will provide a list of BMPs that can be used to fit your site's needs.

BMP fact sheets are provided for each of the contractor's activities, noted in the box, are consistent with Worksheet 4 in Chapter 2.

Each fact sheet contains a cover sheet with:

- A description of the BMP
- Approach
- Requirements
  - Costs, including capital costs, and operation and maintenance (O&M) costs
  - Maintenance (including administrative and staffing)
- Limitations
- References

The side bar presents information on which BMP objective applies, targeted constituents, and an indication of the level of effort and costs to implement. For some BMPs, further information is provided in additional sheets.

### Contractor Activities

#### Construction Practices

- CA1 Dewatering Operations
- CA2 Paving Operations
- CA3 Structure Construction and Painting

#### Material Management

- CA10 Material Delivery and Storage
- CA11 Material Use
- CA12 Spill Prevention and Control

#### Waste Management

- CA20 Solid Waste Management
- CA21 Hazardous Waste Management
- CA22 Contaminated Soil Management
- CA23 Concrete Waste Management
- CA24 Sanitary/Septic Waste Management

#### Vehicle and Equipment Management

- CA30 Vehicle and Equipment Cleaning
- CA31 Vehicle and Equipment Fueling
- CA32 Vehicle and Equipment Maintenance

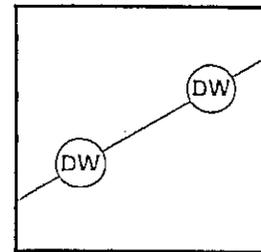
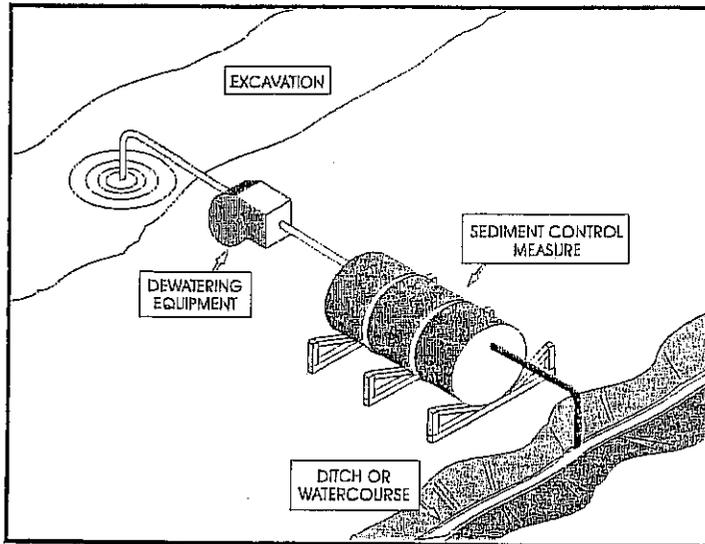
#### Contractor Training

- CA40 Employee/Subcontractor Training

These BMP fact sheets are suitable for inclusion in many storm water pollution prevention plans for typical contractor activities. The BMPs listed are not an exhaustive list, nor will every BMP be appropriate for every situation. Therefore, suggested BMPs which are inappropriate may be deleted and additional BMPs for specific site conditions should be added. In addition, your selection and implementation of BMPs should be reviewed on a regular basis to match the changing conditions at construction sites.

TABLE 4.1 CONTRACTOR ACTIVITIES AND BMP OBJECTIVES

BMP CATEGORY	BMP OBJECTIVES						
	PRACTICE GOOD HOUSE-KEEPING	CONTAIN WASTE	MINIMIZE DISTURBED AREA	STABILIZE DISTURBED AREA	PROTECT SLOPES AND CHANNELS	CONTROL SITE PERIMETER	CONTROL INTERNAL EROSION
<b>Construction Practices</b>							
CA01	Dewatering Operations	✓				✓	✓
CA02	Paving Operations	✓					
CA03	Structure Construction and Painting	✓			✓		
<b>Material Management</b>							
CA10	Material Delivery and Storage	✓					
CA11	Material Use	✓					
CA12	Spill Prevention and Control	✓					
<b>Waste Management</b>							
CA20	Solid Waste Management		✓				
CA21	Hazardous Waste Management		✓				
CA22	Contaminated Soil Management		✓	✓	✓		
CA23	Concrete Waste Management		✓				
CA24	Sanitary/Septic Waste Management		✓				
<b>Vehicle and Equipment Management</b>							
CA30	Vehicle and Equipment Cleaning	✓					✓
CA31	Vehicle and Equipment Fueling	✓					
CA32	Vehicle and Equipment Maintenance	✓					
<b>Contractor Training</b>							
CA40	Employee/Subcontractor Training	✓	✓				



- BMP Objectives**
- Soil Stabilization
  - Sediment Control
  - Tracking Control
  - Wind Erosion Control
  - Non-Storm Water Management
  - Materials and Waste Management

**Definition and Purpose** Dewatering operations are practices that manage the discharge of pollutants from groundwater and accumulated precipitation dewatering operations.

**Appropriate Applications** These practices are implemented where groundwater or accumulated precipitation will be discharged from a construction site. Controlling sediment from dewatering operations is required on all projects that pump sediment-laden water from work areas and plan to discharge the pumped water into a conveyance system or water body. Dewatering discharges include but are not limited to:

- Removal of uncontaminated groundwater.
- Removal of accumulated rainwater from work areas.
- Removing water from cofferdams or diversions.

**Limitations**

- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this best management practice (BMP) address sediment only. If the presence of polluted water is identified in the contract, the contractor shall implement dewatering pollution controls as required by the contract documents. If the quality of water to be removed by dewatering is not identified as polluted in the contract documents, but is later determined by observation or testing to be polluted, the contractor shall notify the Resident Engineer (RE) and comply with Standard Specifications Section 5-1.116, "Differing Site Conditions."
- The controls detailed in this BMP only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.

## Standards and Specifications

- Dewatering operations will require, and must comply with, applicable local permits.
- Avoid dewatering discharges where possible by using the water for dust control, by infiltration, etc.
- The flow chart shown in page 3 of this BMP shall be utilized to guide dewatering operations.
- Contractor shall notify the RE of planned discharges.
- The RE will coordinate monitoring and permit compliance.
- Discharges must comply with regional and watershed-specific discharge requirements.
- Ensure that dewatering discharges do not cause erosion at the discharge point.
- Sediment Control Treatment: Dewatering effluent (groundwater and accumulated precipitation) that is laden with suspended solids shall be treated by a device designed to remove soil particles down to 0.02 mm in size. Desilting basins (see BMP SC-2) and sediment traps (see BMP SC-3) are examples of temporary treatment devices; these devices shall be designed according to the respective BMPs.
- A filtration device may be substituted for a desilting basin or sediment trap if the Contractor can demonstrate, to the RE's satisfaction, that the filtration device provides equivalent or greater removal of suspended solids than the basin.
- Filter bags may be used for small-scale dewatering operations.

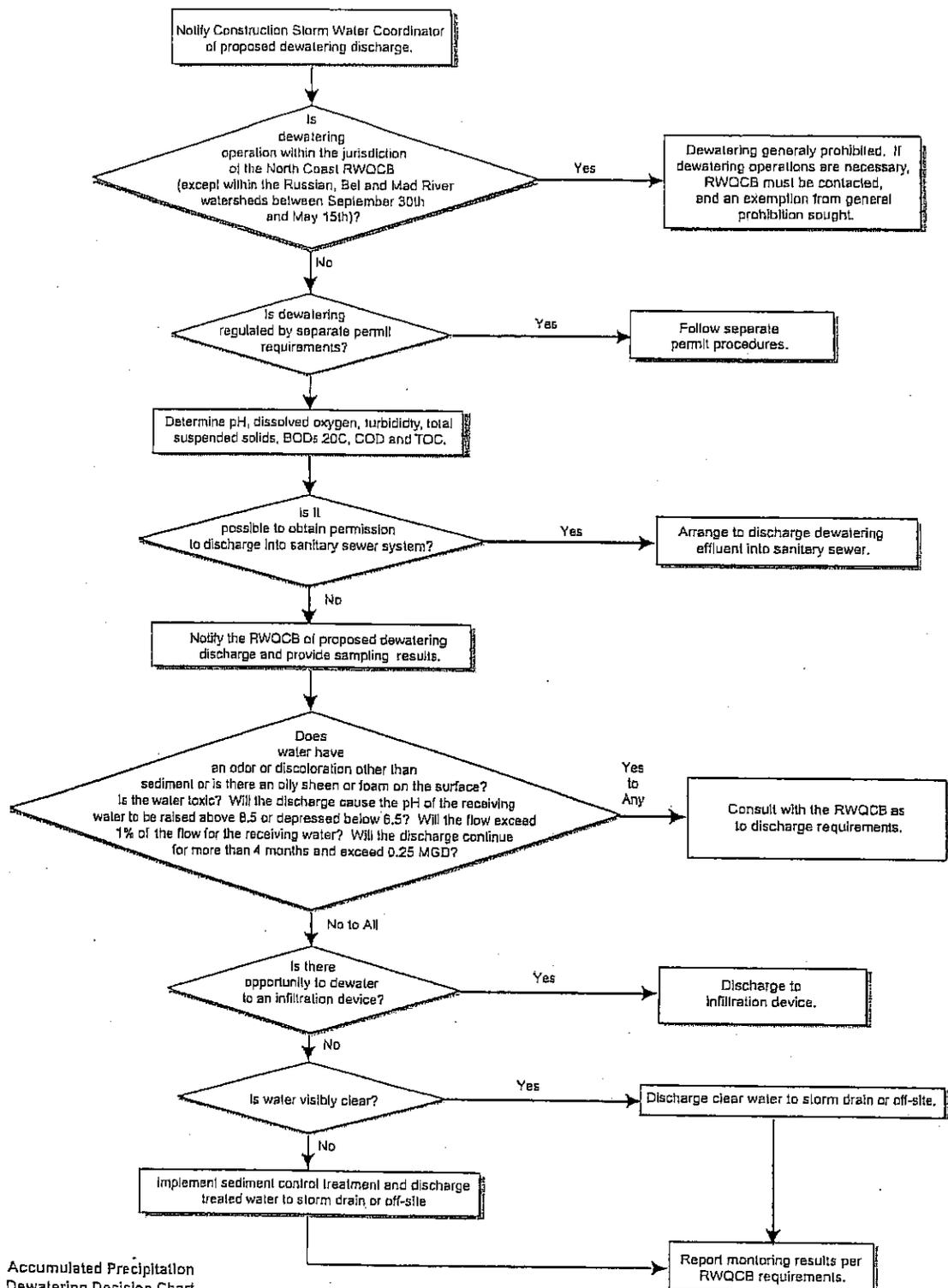
## Maintenance and Inspection

- Prior to completion of permit application, notify the District Environmental Unit to perform testing requirements and complete necessary paper work for the permit.
- Inspect filtering device frequently and repair or replace once the sediment build-up prevents the structure from functioning as designed.
- Accumulated suspended solids removed from a dewatering device shall be spread on the project site and stabilized at locations designated by the RE, or shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.



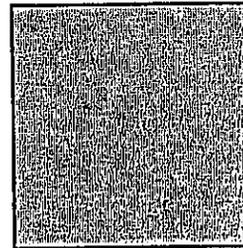
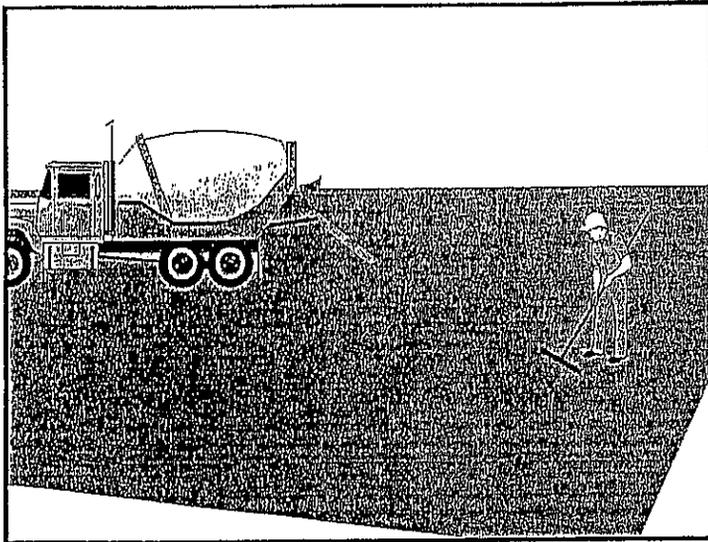
# Dewatering Operations

NS-2



Accumulated Precipitation  
Dewatering Decision Chart





### BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose	Procedures that minimize pollution of storm water runoff during paving operations, including new paving and preparation of existing paved surfaces for overlays.
Appropriate Applications	These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute storm water runoff or discharge to the storm drain system or watercourses.
Limitations	<ul style="list-style-type: none"> <li>■ Finer solids are not effectively removed by filtration systems.</li> <li>■ Paving opportunities may be limited during wet weather.</li> </ul>
Standards and Specifications	<ul style="list-style-type: none"> <li>■ Substances used to coat asphalt transport trucks and asphalt trucks and asphalt spreading equipment shall not contain soap and shall be non-foaming and non-toxic.</li> <li>■ Place drip pans or absorbent materials under paving equipment while not in use, to catch and/or contain drips and leaks. See also BMP WM-10, "Liquid Waste Management".</li> <li>■ When paving involves asphaltic concrete (AC), the following steps shall be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:             <ul style="list-style-type: none"> <li>- Minimize the washing of sand or gravel from new asphalt into storm drains, streets, and creeks by sweeping where practical.</li> <li>- Old or spilled asphalt must be disposed as approved by the Resident Engineer (RE).</li> </ul> </li> </ul>

# Vehicle and Equipment Cleaning

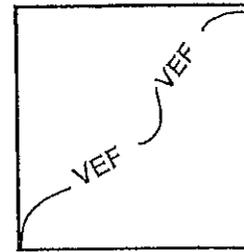
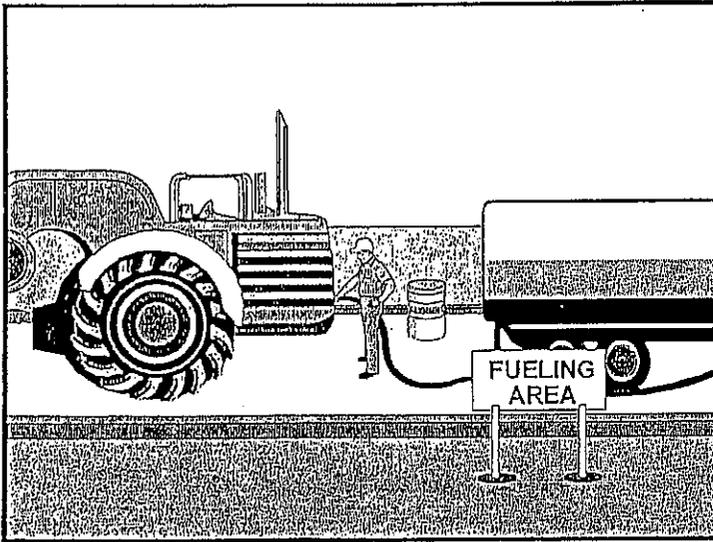
NS-8

following characteristics, and shall be arranged with the construction storm water coordinator:

- Located away from storm drain inlets, drainage facilities, or watercourses
- Paved with concrete or asphalt and bermed to contain wash waters and to prevent run-on and runoff
- Configured with a sump to allow collection and disposal of wash water
- Wash waters shall not be discharged to storm drains or watercourses
- Used only when necessary
- When cleaning vehicles/equipment with water:
  - Use as little water as possible. High pressure sprayers may use less water than a hose, and shall be considered.
  - Use positive shutoff valve to minimize water usage.
- The control measure shall be inspected at a minimum of once a week.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed or as directed by the RE.

Maintenance and  
Inspection





- BMP Objectives**
- Soil Stabilization
  - Sediment Control
  - Tracking Control
  - Wind Erosion Control
  - Non-Storm Water Management
  - Materials and Waste Management

**Definition and Purpose** Procedures and practices to minimize or eliminate the discharge of fuel spills and leaks into the storm drain system or to watercourses.

**Appropriate Applications** These procedures are applied on all construction sites where vehicle and equipment fueling takes place.

**Limitations**

- On-site vehicle and equipment fueling shall only be used where it's impractical to send vehicles and equipment off-site for fueling.

- Standards and Specifications**
- When fueling must occur on-site, the contractor shall select and designate an area to be used, subject to approval of the Resident Engineer (RE).
  - Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and shall be disposed of properly after use.
  - Drip pans or absorbent pads shall be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
  - Dedicated fueling areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
  - Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips. Fueling operations shall not be left unattended.



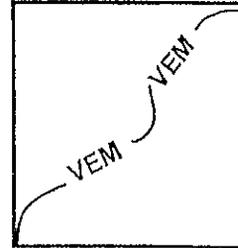
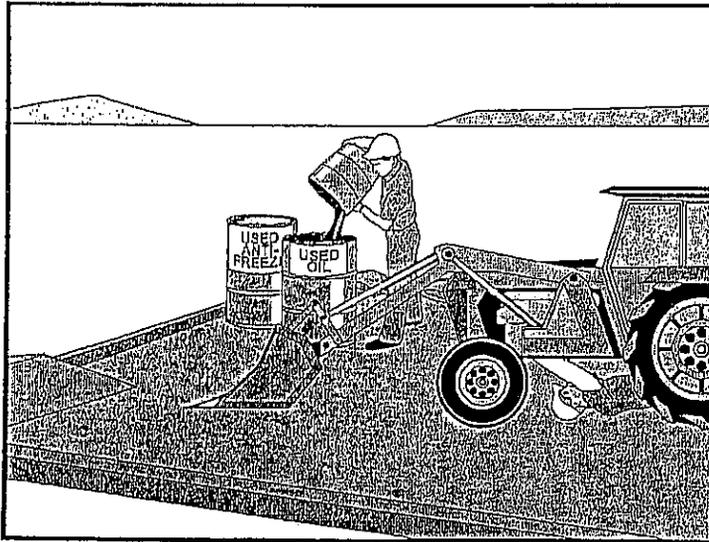
# Vehicle and Equipment Fueling

NS-9

- Protect fueling areas with berms and/or dikes to prevent run-on, runoff, and to contain spills.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Fuel tanks shall not be "topped-off."
- Vehicles and equipment shall be inspected on each day of use for leaks. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.
- Absorbent materials shall be used on small spills instead of hosing down or burying techniques. The spent absorbent material shall be removed promptly and disposed of properly.
- Federal, state, and local requirements shall be observed for any stationary above ground storage tanks.
- Mobile fueling of construction equipment throughout the site shall be minimized. Whenever practical, equipment shall be transported to the designated fueling area.
- Fueling areas and storage tanks shall be inspected on a regular basis.
- Keep an ample supply of spill cleanup material on the site.
- Immediately cleanup spills and properly dispose of contaminated soil and cleanup materials.

## Maintenance and Inspection





### BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

**Definition and Purpose** Procedures and practices to minimize or eliminate the discharge of pollutants to the storm drain system or to watercourses from vehicle and equipment maintenance procedures.

**Appropriate Applications** These procedures are applied on all construction projects where an on-site yard area is necessary for storage and maintenance of heavy equipment and vehicles.

**Limitations** None identified.

- Standards and Specifications**
- Drip pans or absorbent pads shall be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
  - All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
  - Dedicated maintenance areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m from downstream drainage facilities and watercourses.
  - Drip Pans or plastic sheeting shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.
  - Absorbent spill clean-up materials shall be available in maintenance areas and shall be disposed of properly after use. Substances used to coat asphalt transport trucks and asphalt spreading equipment shall be non-toxic. Drainage inlet structures and manholes shall be covered with filter fabric



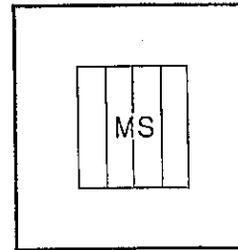
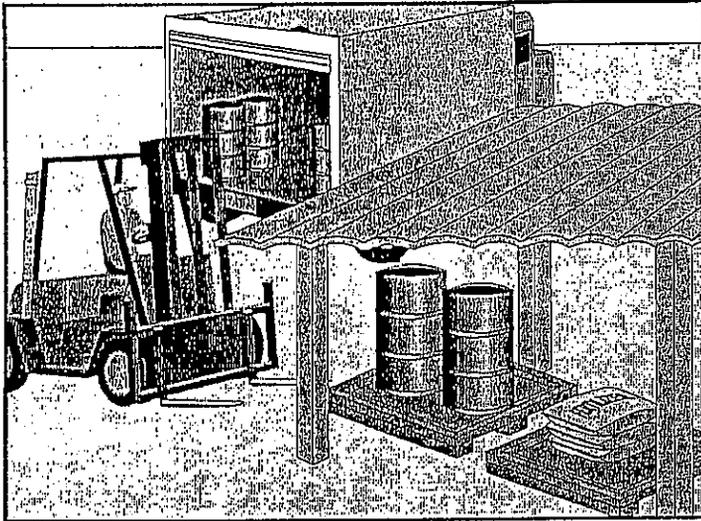
# Vehicle and Equipment Maintenance **NS-10**

when seal coat, tack coat, slurry seal, or fog seal is applied to adjacent surfaces. Seal coat, tack coat, slurry seal, or fog seal shall not be applied if rainfall or thunderstorms are predicted to occur during the application or curing period.

- Use off-site maintenance facilities whenever practical.
- For long-term projects, consider using portable tents or covers over maintenance areas.
- Properly dispose of used oils, fluids, lubricants and spill cleanup materials.
- Do not dump fuels and lubricants onto the ground.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.
- Repair leaks of fluids and oil immediately.
- Provide spill containment dikes or secondary containment around stored oil and chemical drums.
- Maintain waste fluid containers in leak proof condition.
- Vehicle and equipment maintenance areas shall be inspected regularly.
- Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately or the problem vehicle(s) or equipment shall be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

## Maintenance and Inspection





- BMP Objectives**
- Soil Stabilization
  - Sediment Control
  - Tracking Control
  - Wind Erosion Control
  - Non-Storm Water Management
  - Materials and Waste Management

**Definition and Purpose** Procedures and practices for the proper handling and storage of materials in a manner that minimizes or eliminates the discharge of these materials to the storm drain system or to watercourses.

**Appropriate Applications** These procedures are implemented at all construction sites with delivery and storage of the following:

- Soil
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

**Limitations**

- Space limitation may preclude indoor storage.
- Storage sheds must meet building & fire code requirements.



## Standards and Specifications *General*

- Train employees and subcontractors on the proper material delivery and storage practices.
- Temporary storage area shall be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials stored.

### *Material Storage Areas and Practices*

Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be handled in conformance with the following provisions:

- Storage, preparation, and mixing shall be accomplished in temporary containment facilities. Each temporary containment facility shall provide a spill containment volume equal to 1.5 times the volume of all containers therein and shall be impervious to the materials contained therein for a minimum contact time of 72 hours.
- Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
- To provide protection from wind and rain, throughout the rainy season, temporary containment facilities shall be covered during non-working days and prior to rain events.
- Temporary containment facilities shall be maintained free of accumulated rainwater and spills.
- Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.
- Liquid materials, petroleum products, and substances listed in 40 CFR Parts 110, 117 or 302 shall be stored in approved containers and drums shall not be overfilled. Containers shall be placed in temporary containment facilities for storage.
- Bagged and boxed materials shall be stored on pallets and shall not be allowed to accumulate on the ground. To provide protection from wind and rain, throughout the rainy season, bagged and boxed materials shall be covered during non-working days and prior to rain events.



- Stockpiles shall be protected in accordance with BMP WM-3, "Stockpile Management".
- Minimize the material inventory stored on-site (e.g., only a few days supply).
- Store materials indoors within existing structures or sheds when available.
- Have proper storage instructions posted at all times in an open and conspicuous location.
- Do not store hazardous chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and when possible, under cover in secondary containment.
- Keep hazardous chemicals well labeled and in their original containers.
- Keep ample supply of appropriate spill clean up material near storage areas.
- Also see BMP WM-6, "Hazardous Waste Management", for storing of hazardous materials.

### *Material Delivery Practices*

- Keep an accurate, up-to-date inventory of material delivered and stored on-site.
- Employees trained in emergency spill clean-up procedures shall be present when dangerous materials or liquid chemicals are unloaded.

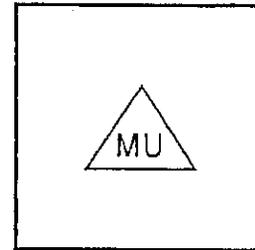
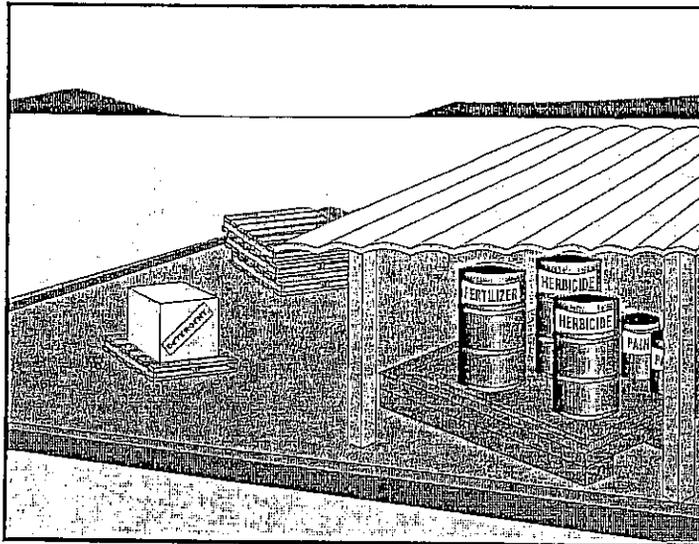
### *Spill Clean-up*

- Contain and clean up any spill immediately.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose any hazardous materials or contaminated soil.
- See BMP WM-4, "Spill Prevention and Control", for spills of chemicals and/or hazardous materials.

### Maintenance and Inspection

- Storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Inspect storage areas before and after rainfall events, and at least weekly during other times.





### BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

**Definition and Purpose** These are procedures and practices for use of construction material in a manner that minimizes or eliminates the discharge of these materials to the storm drain system or to watercourses.

**Appropriate Applications** This BMP applies to all construction projects. These procedures apply when the following materials are used or prepared on site:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

**Limitations** ■ Safer alternative building and construction products may not be available or suitable in every instance.

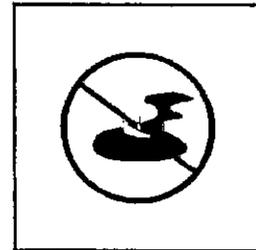
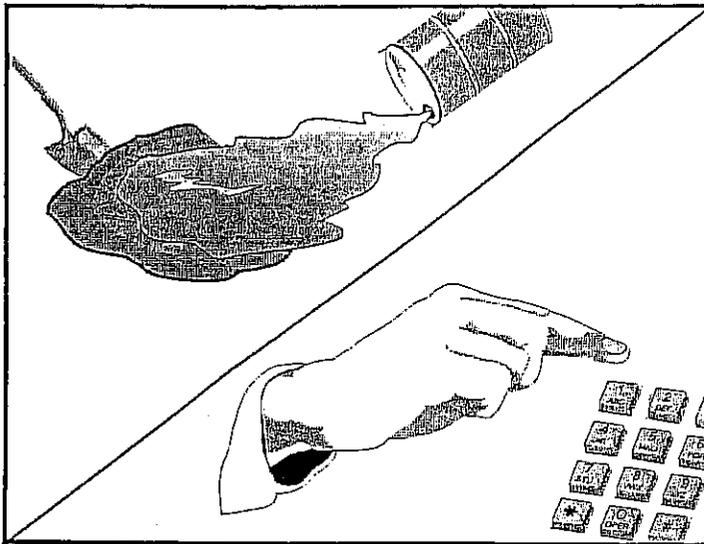
## Standards and Specifications

- Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials.
- Latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, may be disposed of with other construction debris.
- Do not remove the original product label, it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors, or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain or watercourse. Dispose of any paint thinners, residue and sludge(s), that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practical, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practical and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials on-site when practical.
- Do not over-apply fertilizers and pesticides. Prepare only the amount needed. Strictly follow the recommended usage instructions. Apply surface dressings in smaller applications, as opposed to large applications, to allow time for it to work in and to avoid excess materials being carried off-site by runoff.
- Application of herbicides and pesticides shall be performed by a licensed applicator.
- Contractors are required to complete the "Report of Chemical Spray Forms" when spraying herbicides and pesticides.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

## Maintenance and Inspections

- Spot check employees and subcontractors monthly throughout the job to ensure appropriate practices are being employed.





### BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

**Definition and Purpose** These are procedures and practices implemented to prevent and control spills in a manner that minimizes or prevents the discharge of spilled material to the drainage system or watercourses.

**Appropriate Application** This best management practice (BMP) applies to all construction projects. Spill control procedures are implemented anytime chemicals and/or hazardous substances are stored. Substances may include, but are not limited to:

- Soil stabilizers/binders
- Dust Palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals
- Fuels
- Lubricants
- Other petroleum distillates

To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110, 117, and 302, and sanitary and septic wastes shall be contained and cleaned up immediately.

- Limitations
- This BMP only applies to spills caused by the contractor.
  - Procedures and practices presented in this BMP are general. Contractor shall identify appropriate practices for the specific materials used or stored on-site.

- Standards and Specifications
- To the extent that it doesn't compromise clean up activities, spills shall be covered and protected from storm water run-on during rainfall.
  - Spills shall not be buried or washed with water.
  - Used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose shall be stored and disposed of in conformance with the provisions in these special provisions.
  - Water used for cleaning and decontamination shall not be allowed to enter storm drains or watercourses and shall be collected and disposed of in accordance with BMP WM-10, "Liquid Waste Management".
  - Water overflow or minor water spillage shall be contained and shall not be allowed to discharge into drainage facilities or watercourses.
  - Proper storage, clean-up and spill reporting instruction for hazardous materials stored or used on the project site shall be posted at all times in an open, conspicuous and accessible location.
  - Waste storage areas shall be kept clean, well organized and equipped with ample clean-up supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners shall be repaired or replaced as needed to maintain proper function.

### *Education*

- Educate employees and subcontractors on what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.



- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper spill prevention and control measures.

## *Clean up and Storage Procedures*

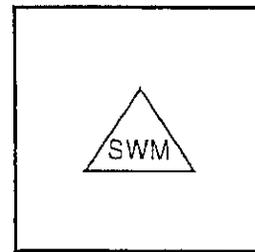
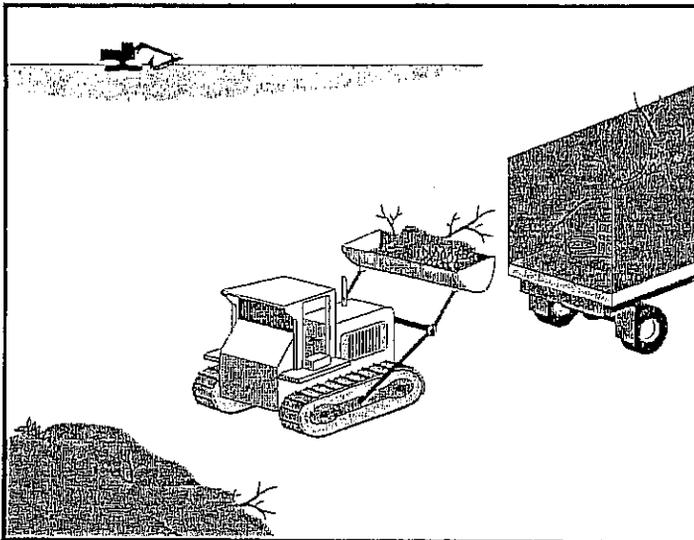
- Minor Spills
  - Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
  - Use absorbent materials on small spills rather than hosing down or burying the spill.
  - Remove the absorbent materials promptly and dispose of properly.
  - The practice commonly followed for a minor spill is:
    1. Contain the spread of the spill.
    2. Recover spilled materials.
    3. Clean the contaminated area and/or properly dispose of contaminated materials.
- Semi-Significant Spills
  - Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.
  - Clean up spills immediately:
    1. Notify the project foreman immediately. The foreman shall notify the Resident Engineer (RE).
    2. Contain spread of the spill.
    3. If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
    4. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
    5. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

- Significant/Hazardous Spills
  - For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps shall be taken:
    1. Notify the RE immediately and follow up with a written report.
    2. Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
    3. Notify the Governor's Office of Emergency Services Warning Center, (805) 852-7550.
    4. For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor shall notify the National Response Center at (800) 424-8802.
    5. Notification shall first be made by telephone and followed up with a written report.
    6. The services of a spills contractor or a Haz-Mat team shall be obtained immediately. Construction personnel shall not attempt to clean up until the appropriate and qualified staff have arrived at the job site.
    7. Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

## Maintenance and Inspection

- Verify weekly that spill control clean up materials are located near material storage, unloading, and use areas.
- Update spill prevention and control plans and stock appropriate clean-up materials whenever changes occur in the types of chemicals on site.





- BMP Objectives**
- Soil Stabilization
  - Sediment Control
  - Tracking Control
  - Wind Erosion Control
  - Non-Storm Water Management
  - Materials and Waste Management

**Definition and Purpose** These are procedures and practices to minimize or eliminate the discharge of pollutants to the drainage system or to watercourses as a result of the creation, stockpiling, and removal of construction site wastes.

**Appropriate Applications** Solid waste management practices are implemented on all construction projects that generate solid wastes.

Solid wastes include but are not limited to:

- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials.
- Highway planting wastes, including vegetative material, plant containers, and packaging materials.
- Litter, including food containers, beverage cans, coffee cups, paper bags, plastic wrappers, and smoking materials, including litter generated by the public.

**Limitations** Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

**Standards and Specifications** *Education*

- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper solid waste procedures and practices.

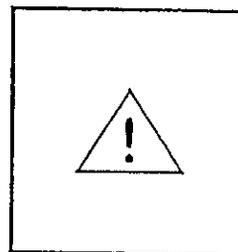
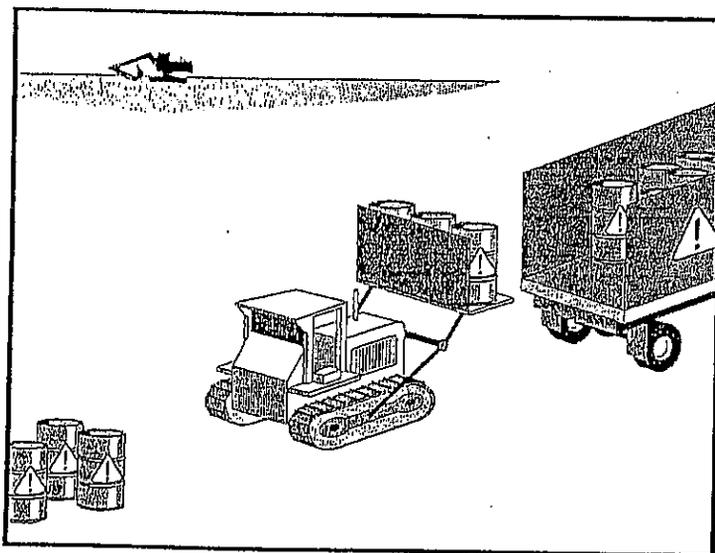
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Wherever possible, minimize production of solid waste materials.

### *Collection, Storage, and Disposal*

- Littering on the project site shall be prohibited.
- To prevent clogging of the storm drainage system litter and debris removal from drainage grates, trash racks, and ditch lines shall be a priority.
- Trash receptacles shall be provided in the Contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site shall be collected and placed in water tight dumpsters at least weekly regardless of whether the litter was generated by the Contractor, the public, or others. Collected litter and debris shall not be placed in or next to drain inlets, storm water drainage systems or watercourses.
- Dumpsters of sufficient size and number shall be provided to contain the solid waste generated by the project.
- Full dumpsters shall be removed from the project site and the contents shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.
- Litter stored in collection areas and containers shall be handled and disposed of by trash hauling contractors.
- Materials that are disposed of or temporarily stockpiled outside the highway right-of-way but are visible from the Highway, shall be in a neat and orderly fashion to the satisfaction of the Resident Engineer (RE).
- Storm water run-on shall be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or

through the use of measures to elevate waste from site surfaces.

- Solid waste storage areas shall be located at least 15m from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.
  - Except during fair weather, construction and highway planting waste not stored in watertight dumpsters shall be protected from wind and rain by securely covering the waste with tarps or plastic sheeting or protected in conformance with the applicable Disturbed Soil Area protection.
  - Dumpster washout on the project site is not allowed.
  - Notify trash hauling contractors that only watertight dumpsters are acceptable for use on-site.
  - Plan for additional containers during the demolition phase of construction.
  - Plan for more frequent pickup during the demolition phase of construction.
  - Designate on-site waste storage areas and obtain approval of the RE.
  - Segregate potentially hazardous waste from non-hazardous construction site waste.
  - Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
  - Dispose of non-hazardous waste in accordance with Standard Specification 7-1.13, Disposal of Material Outside the Highway right-of-way.
  - For disposal of hazardous waste, see BMP WM-6, "Hazardous Waste Management". Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
  - Salvage or recycle useful vegetation debris, packaging and/or surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.
- Maintenance and Inspection
- The WPCM shall monitor on-site solid waste storage and disposal procedures.
  - Police site for litter and debris.



### BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

**Definition and Purpose** These are procedures and practices to minimize or eliminate the discharge of pollutants from construction site hazardous waste to the storm drain system or to watercourses.

### Appropriate Applications

- This best management practice (BMP) applies to all construction projects.
- Hazardous waste management practices are implemented on construction projects that generate waste from the use of:
  - Petroleum Products,
  - Concrete Curing Compounds,
  - Palliatives,
  - Septic Wastes,
  - Stains,
  - Wood Preservatives,
  - Asphalt Products,
  - Pesticides,
  - Acids,
  - Paints,
  - Solvents,
  - Roofing Tar, or
  - Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302.

### Limitations

- Nothing in this BMP relieves the Contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to BMP WM-7, Contaminated Soil Management, and the project Special Provisions.



## Standards and Specifications

### *Education*

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

### *Storage Procedures*

- Wastes shall be stored in sealed containers constructed of a suitable material and shall be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172,173, 178, and 179.
- All hazardous waste shall be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers shall be stored in temporary containment facilities that shall comply with the following requirements:
  - Temporary containment facility shall provide a spill containment volume equal to 1.5 times the volume of all containers.
  - Temporary containment facility shall be impervious to the materials contained for a minimum contact time of 72 hours.
  - Temporary containment facilities shall be maintained free of accumulated rainwater and spills.
  - Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
  - Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities shall be covered during non-working days, prior to rain events.
- Drums shall not be overfilled and wastes shall not be mixed.
- Paint brushes and equipment for water and oil based paints shall be cleaned within a contained area and shall not be allowed to contaminate site soils, watercourses or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.
- Ensure that adequate hazardous waste storage volume is available.
- Ensure that hazardous waste collection containers are conveniently located.
- Designate hazardous waste storage areas on site away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
- Minimize production or generation of hazardous materials and hazardous waste on the job site.
- Use containment berms in fueling and maintenance areas and where the potential for spills is high.
- Segregate potentially hazardous waste from non-hazardous construction site debris.
- Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.
- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Unless watertight, containers of dry waste shall be stored on pallets.
- Do not mix wastes.

## *Disposal Procedures*

- Waste shall be disposed of outside the highway right-of-way within 90 days of being generated, or as directed by the Resident Engineer (RE).
- To minimize on-site storage, full containers of waste shall be disposed of outside the highway right-of-way at least weekly. In no case shall hazardous waste storage exceed requirements in Title 22 CCR, section 66262.34.
- Waste shall be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Waste Manifest forms. In no case shall hazardous waste storage exceed requirements in Title 22 CCR, section 66262.34.
- A Caltrans certified laboratory shall sample waste to determine the appropriate disposal facility.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for solid waste construction debris.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Recycle any useful material such as used oil or water-based paint when practical.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

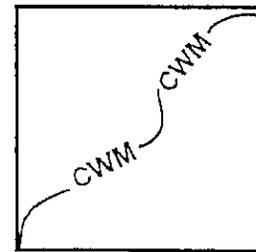
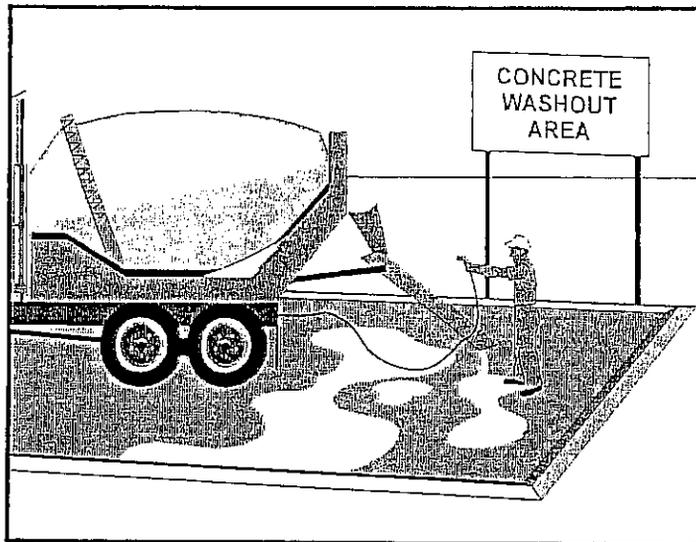
## Maintenance and Inspection

- The WPCM shall monitor on-site hazardous waste storage and disposal procedures.
- Waste storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Storage areas shall be inspected in conformance with the provisions in the contract documents.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Hazardous spills shall be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.



- The National Response Center, at (800) 424-8802, shall be notified of spills of Federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302.
- Copy of Bill of Laden and disposal receipts shall be provided to the RE.





- BMP Objectives**
- Soil Stabilization
  - Sediment Control
  - Tracking Control
  - Wind Erosion Control
  - Non-Storm Water Management
  - Materials and Waste Management

**Definition and Purpose** These are procedures and practices that are implemented to minimize or eliminate the discharge of concrete waste materials to the storm drain system or to watercourses.

- Appropriate Applications**
- Concrete waste management practices are implemented on construction projects where concrete is used as a construction material or where concrete dust and debris result from demolition activities.
  - Where slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from sawcutting, coring, grinding, grooving, and hydro-concrete demolition.
  - Where concrete trucks and other concrete-coated equipment are washed on site, when approved by the Resident Engineer (RE). See also NS-8, Vehicle and Equipment Cleaning.
  - Where mortar-mixing stations exist.

**Limitations** None identified.

- Standards and Specifications** *Education*
- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
  - The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce concrete waste management procedures.

## *Concrete Slurry Wastes*

- PCC and AC waste shall not be allowed to enter storm drains or watercourses.
- PCC and AC waste shall be collected and disposed of outside the highway right-of-way in conformance with section 7-1.13 of Standard Specifications or placed in a temporary concrete washout facility.
- Disposal of hardened PCC and AC waste shall be in conformance with Section 15-3.02 of the Standard Specifications.
- A sign shall be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.
- Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.
- Do not allow slurry residue from wet coring or saw-cutting AC or PCC to enter storm drains or receiving waters by:
  - Placing temporary berms or sandbags around coring or saw-cutting locations to capture and contain slurry runoff.
  - Placing straw bales, sandbags, or gravel dams around inlets to prevent slurry from entering storm drains.
- Vacuum slurry residue and dispose in a temporary pit (as described in *On-Site Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures*, below) and allow slurry to dry. Dispose of dry slurry residue in accordance with BMP WM-5, "Solid Waste Management", or, for on-site disposal, in accordance with Standard Specification 15-3.02, Removal Methods.
- Collect residue from grooving and grinding operations in accordance with Standard Specifications Section 42-1.02 and 42-2.02, "Construction."

## *On-site Temporary Concrete Washout Facility, Transit Truck Washout Procedures*

- Temporary concrete washout facilities shall be located a minimum of 15 m (50 ft) from storm drain inlets, open drainage facilities, and watercourses, unless determined unfeasible by the RE. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign shall be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities. The sign shall be



installed as shown on the plans and in conformance with the provisions in Section 56-2, "Roadside Signs", of the Standard Specifications.

- Temporary concrete washout facilities shall be constructed above grade or below grade at the option of the Contractor. Temporary concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Temporary washout facilities shall have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Perform washout of concrete trucks in designated areas only.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of per BMP WM-5, "Solid Waste Management", and in conformance with the provisions in Section 15-3.02, "Removal Methods", of the Standard Specifications. Dispose of hardened concrete on a regular basis.
- *Temporary Concrete Washout Facility (Type Above Grade)*
  - Temporary concrete washout facility (type above grade) shall be constructed as shown on the plans, with a recommended minimum length and minimum width of 3m, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the RE.
  - Straw bales, wood stakes, and sandbag materials shall conform to the provisions in BMP SC-9, "Straw Bale Barrier".
  - Plastic lining material shall be a minimum of 60 mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material.
  - Portable delineators shall conform to the provisions in Section 12-3.04, "Portable Delineators", of the Standard Specifications. The delineator bases shall be cemented to the pavement in the same manner as provided for cementing pavement markers to pavement in Section 85-1.06, "Placement", of the Standard Specifications. Portable delineators shall be applied only to a clean, dry surface.
- *Temporary Concrete Washout Facility (Type Below Grade)*
  - Temporary concrete washout facility (type below grade) shall be constructed as shown on the plans, with a recommended minimum

length and minimum width of 3m (10 ft). The quantity and volume shall be sufficient to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the RE. Lath and flagging shall be commercial type.

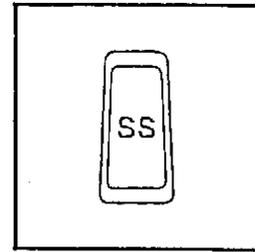
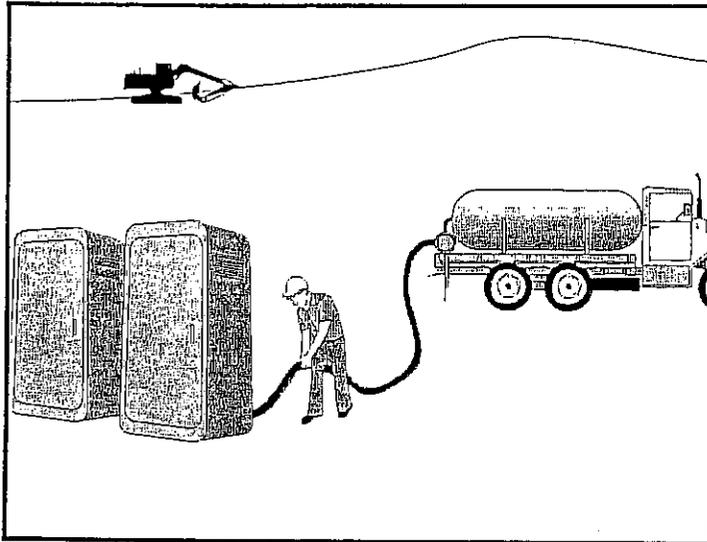
## *Removal of Temporary Concrete Washout Facilities*

- When temporary concrete washout facilities are no longer required for the work, as determined by the RE, the hardened concrete shall be removed and disposed of in conformance with the provisions in Section 15-3.02 of the Standard Specifications. Materials used to construct temporary concrete washout facilities shall become the property of the Contractor, shall be removed from the site of the work, and shall be disposed of outside the highway right-of-way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.
- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

## Maintenance and Inspection

- The Contractor's Water Pollution Control Manager (WPCM) shall monitor on site concrete waste storage and disposal procedures at least weekly.
- The WPCM shall monitor concrete working tasks, such as saw cutting, coring, grinding and grooving at least weekly to ensure proper methods are employed.
- Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100mm for above grade facilities and 300mm for below grade facilities. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications.
- Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.





- BMP Objectives**
- Soil Stabilization
  - Sediment Control
  - Tracking Control
  - Wind Erosion Control
  - Non-Storm Water Management
  - Materials and Waste Management

**Definition and Purpose** Procedures and practices to minimize or eliminate the discharge of construction site sanitary/septic waste materials to the storm drain system or to watercourses.

**Appropriate Applications** Sanitary/septic waste management practices are implemented on all construction sites that use temporary or portable sanitary/septic waste systems.

**Limitations** Not applicable.

**Standards and Specifications**

*Education*

- Educate employees, subcontractors, and suppliers on sanitary/septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary/septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary/septic waste.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

*Storage and Disposal Procedures*

- Temporary sanitary facilities shall be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk of high winds, as determined by the Resident Engineer (RE), temporary



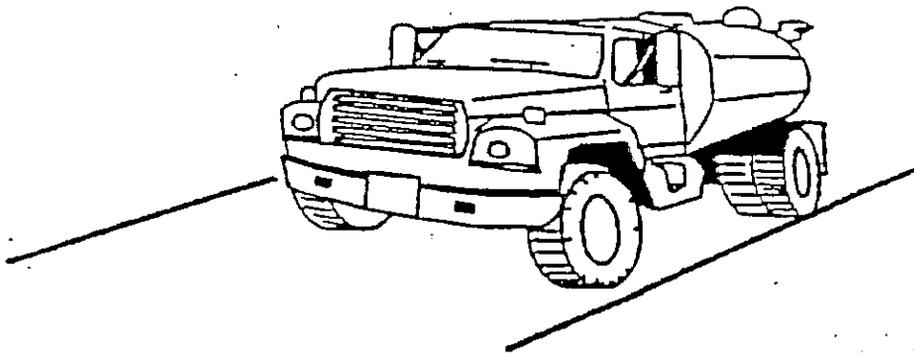
sanitary facilities shall be secured to prevent overturning.

- Wastewater shall not be discharged or buried within the highway right-of-way.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, shall comply with the local health agency, city, county, and sewer district requirements.
- If using an on site disposal system, such as a septic system, comply with local health agency requirements.
- Properly connect temporary sanitary facilities that discharge to the sanitary sewer system to avoid illicit discharges.
- Ensure that sanitary/septic facilities are maintained in good working order by a licensed service.
- Use only reputable, licensed sanitary/septic waste haulers.
- The Contractor's Water Pollution Control Manager (WPCM) shall monitor on site sanitary/septic waste storage and disposal procedures at least weekly.

Maintenance and  
Inspection



## BMP: DUST CONTROLS



### Objectives

*Housekeeping Practices*

*Contain Waste*

*Minimize Disturbed Areas*

*Stabilize Disturbed Areas*

*Protect Slopes/Channels*

*Control Site Perimeter*

*Control Internal Erosion*

### GENERAL DESCRIPTION

Dust control measures are used to stabilize soil from wind erosion, and reduce dust generated by construction activities.

### SUITABLE APPLICATIONS

- Clearing and grading activities.
- Construction vehicle traffic on unpaved roads.
- Drilling and blasting activities.
- Sediment tracking onto paved roads.
- Soil and debris storage piles.
- Batch drop from front end loaders.
- Areas with unstabilized soil.
- Final grading/site stabilization usually is sufficient to control post-construction dust sources.

### INSTALLATION/APPLICATION CRITERIA

- Schedule construction activities to minimize exposed area (See ESC 1).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering (See ESC 10 and 11).
- Identify and stabilize key access points prior to commencement of construction (See ESC 24).
- Minimizing the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site (See ESC 23).

### REQUIREMENTS

- Maintenance
  - Most dust control measures require frequent, often daily, attention.
- Cost
  - Installation costs for water/chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

### LIMITATIONS

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Overwatering may cause erosion.
- Oil should not be used for dust control because the oil may migrate into drainageway and/or seep into the soil.
- Certain chemically-treated subgrades may make soil water repellant, increasing runoff.

### Targeted Pollutants

- Sediment*
- Nutrients*
- Toxic Materials*
- Oil & Grease*
- Floatable Materials*
- Other Construction Waste*

- Likely to Have Significant Impact*
- Probable Low or Unknown Impact*

### Implementation Requirements

- Capital Costs*
- O&M Costs*
- Maintenance*
- Training*
- Suitability for Slopes >5%*

- High*    *Low*

## ESC21



## Additional Information — Dust Controls

California's mediterranean climate, with short wet seasons and long hot dry seasons, allow the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbance and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast and Sacramento, among others have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line. Recently, the State Air Resources Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). 90% of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and/or public health departments are in place in some regions within California. For jurisdictions that have no formal dust control regulations and/or standards, Sections 10, 17 and 18 of CalTrans' Standard Specifications provide detailed provisions for dust control practices.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction & Grading Permits: Require provisions for dust control plans;
- Opacity Emission Limits: Enforce compliance with California air pollution control laws;
- Increase overall enforcement activities: Priority given to cases involving citizen complaints;
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

### Dust Control Practices

Dust control BMP's generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. Table ESC21.1 shows which Dust Control BMPs apply to site conditions which cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel or asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching and sand fences can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting on-site vehicle traffic to 15 miles per hour, and controlling the number and activity of vehicles on a site at any given time.

Many of the reasonably available control measures for controlling dust from construction sites can also be implemented as BMPs for storm water pollution prevention. Those BMPs include:

- Pave, vegetate, or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid clean-up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize unpaved haul roads, parking and staging areas. Reduce speed and trips on unpaved roads.
- Implement dust control measures for material stockpiles.
- Prevent drainage of sediment laden storm water onto paved surfaces.
- Stabilize abandoned construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For the chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. The types of chemicals available and recommendations for their use are tabulated in Table ESC 21.2, Commonly Used Chemicals for Dust Control.

ESC21



## Additional Information — Dust Controls

In addition, there are many other BMPs identified in this handbook that provide dust control including:

- Seeding and Plantings (ESC 10)
- Mulching (ESC 11)
- Construction Road Stabilization (ESC 23)
- Stabilized Construction Entrances (ESC 24)

### Limitations

- Oil treated subgrades should not be used because the oil may migrate into drainageways and/or seep into the soil.
- Chemically treated subgrades may make the soil water repellent, interfering with long-term infiltration, and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24 hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

### REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, 1992.

CalTrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

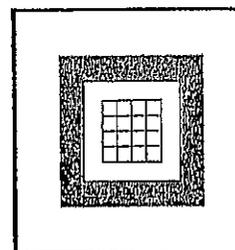
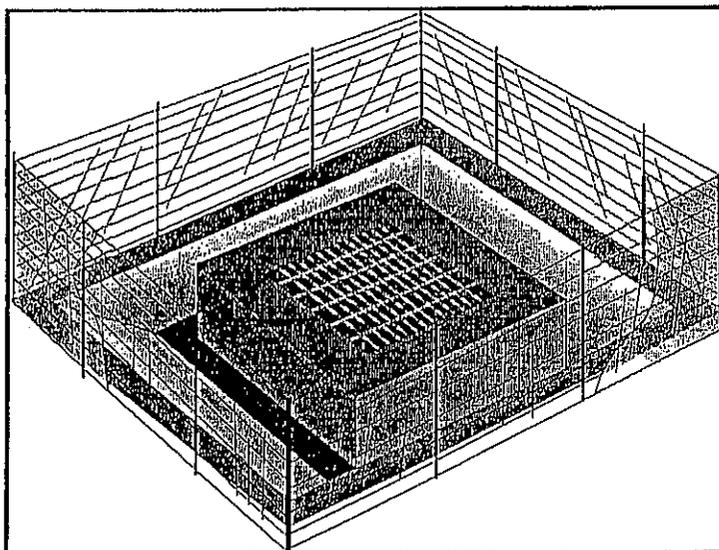
Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Sacramento County, Winterization Ordinance & Dust Control Ordinance (example).

USDA Soil Conservation Service, "Guides for Erosion and Sediment Control".

ESC21





- BMP Objectives**
- Soil Stabilization
  - Sediment Control
  - Tracking Control
  - Wind Erosion Control
  - Non-Storm Water Management
  - Materials and Waste Management

**Definition and Purpose** Devices used at storm drain inlets that are subject to runoff from construction activities to detain and/or to filter sediment-laden runoff to allow sediment to settle and/or to filter sediment prior to discharge of storm water into storm water drainage systems or watercourses.

- Appropriate Applications**
- Where ponding will not encroach into highway traffic.
  - Where sediment laden surface runoff may enter an inlet.
  - Where disturbed drainage areas have not yet been permanently stabilized.
  - Where the drainage area is 0.4 ha (1 ac) or less.
  - Appropriate during wet and snow-melt seasons.

- Limitations**
- Use only when ponding will not encroach into highway traffic or onto erodible surfaces and slopes. If safety is a concern, use other methods of temporary protection to prevent sediment-laden storm water and non-storm water discharges to enter the storm drain system.
  - Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other on-site sediment trapping techniques in conjunction with inlet protection.
  - Frequent maintenance is required.
  - For drainage areas larger than 0.4 ha (1ac), runoff shall be routed to a sediment trapping device designed for larger flows. See BMPs SC-2, "Desilting Basin", and SC-3 "Sediment Traps".



- Filter fabric fence inlet protection appropriate in open areas is subject to sheet flow and for flows not exceeding 0.014 m<sup>3</sup>/s (0.5 cfs).
- Sandbag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.014 m<sup>3</sup>/s (0.5 cfs), and it is necessary to allow for overtopping to prevent flooding.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected and overflow capability is needed.

**Standards and Specifications** Identify existing and/or planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed, and which method to use.

### *Methods and Installation*

- **DI Protection Type 1 - Filter Fabric Fence** - The filter fabric fence (Type 1) protection is illustrated in Page 4. Similar to constructing a silt fence. See BMP SC-1, "Silt Fence". Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
- **DI Protection Type 2 - Excavated Drop Inlet Sediment Trap** - The excavated drop inlet sediment trap (Type 2) is illustrated in Page 5. Similar to constructing a temporary silt fence, See BMP SC-1, "Silt Fence". Size excavated trap to provide a minimum storage capacity calculated at the rate of 130 m<sup>3</sup>/ha (67 yd<sup>3</sup>/ac) of drainage area.
- **DI Protection Type 3 - Sandbag Barrier** - The sandbag barrier (Type 3) is illustrated in Page 6. Flow from a severe storm shall not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct sandbags in accordance with BMP SC-8, "Sandbag Barrier".

**Maintenance and Inspection** *General*

- Inspect all inlet protection devices before and after every rainfall event, and weekly during the rest of the rainy season. During extended rainfall events, inspect inlet protection devices at least once every 24 hours.
- Inspect the storm drain inlet after severe storms in the rainy season to check for bypassed material.
- Remove all inlet protection devices within thirty days after the site is stabilized, or when the inlet protection is no longer needed.



- Bring the disturbed area to final grade and smooth and compact it. Appropriately stabilize all bare areas around the inlet.
- Clean and re-grade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

## *Requirements by Method*

### ■ *Type 1 - Filter Fabric Fence*

- Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.
- Replace or clean the fabric when the fabric becomes clogged with sediment. Make sure the fabric does not have any holes or tears. Repair or replace fabric as needed or as directed by the Resident Engineer (RE).
- At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

### ■ *Type 2 - Excavated Drop Inlet Sediment Trap*

- Remove sediment from basin when the volume of the basin has been reduced by one-half.

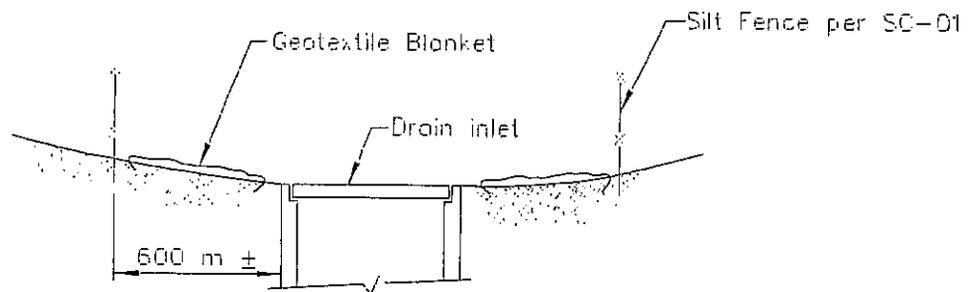
### ■ *Type 3 - Sandbag Barrier*

- Inspect bags for holes, gashes, and snags.
- Check sandbags for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

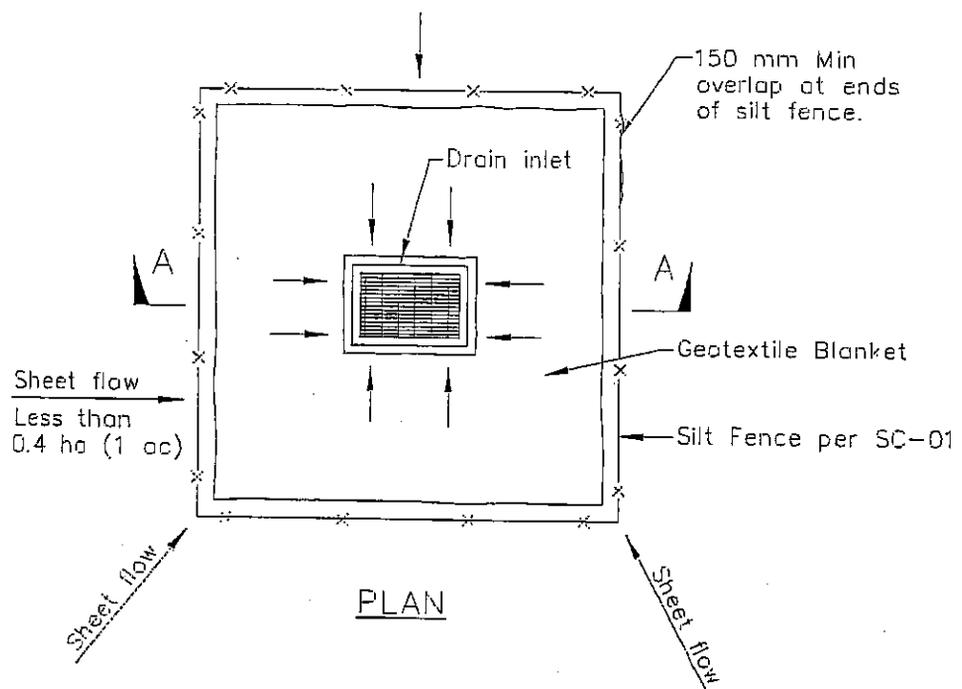


# Storm Drain Inlet Protection

SC-10



SECTION A-A



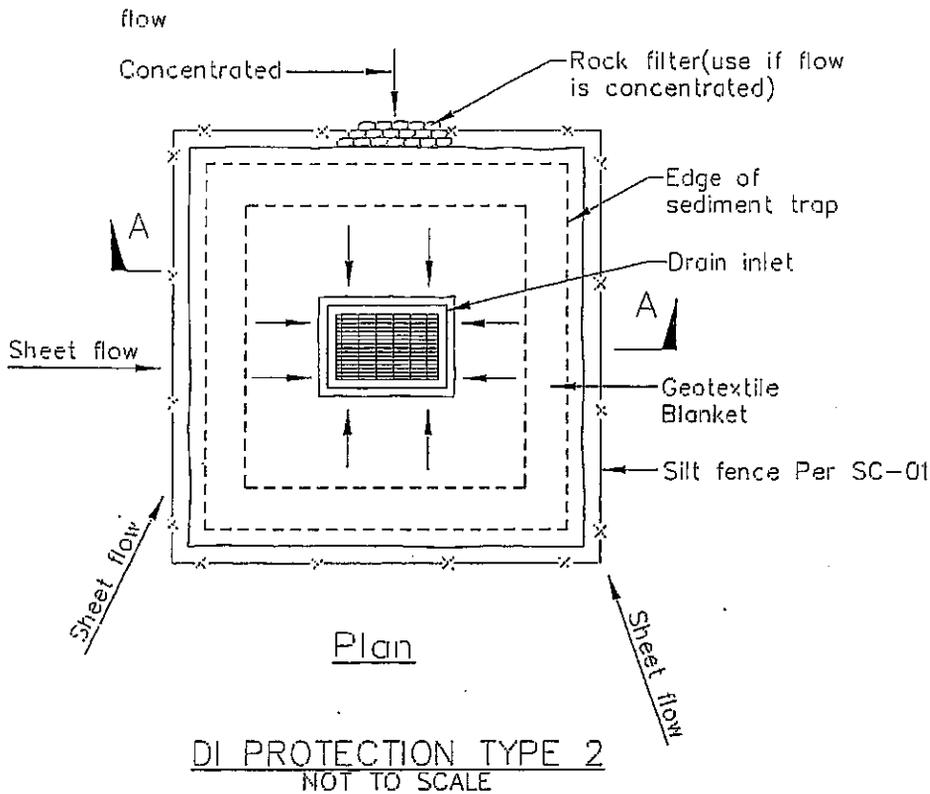
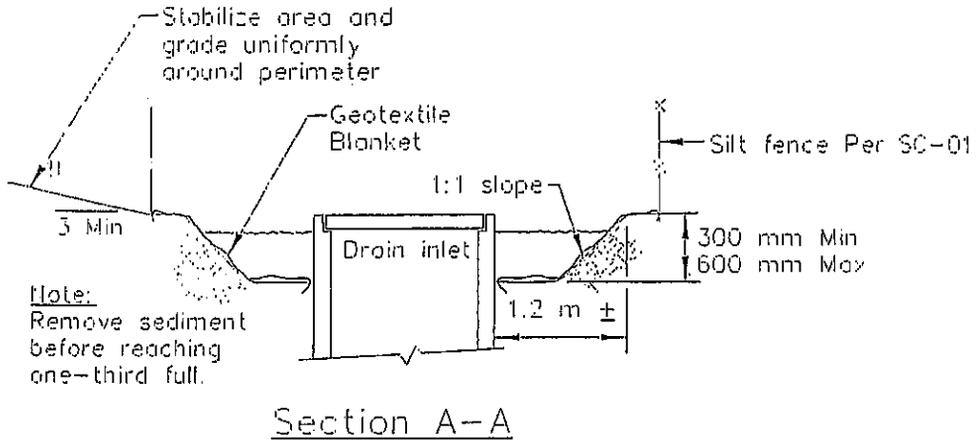
PLAN

DI PROTECTION TYPE 1  
NOT TO SCALE

## NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.





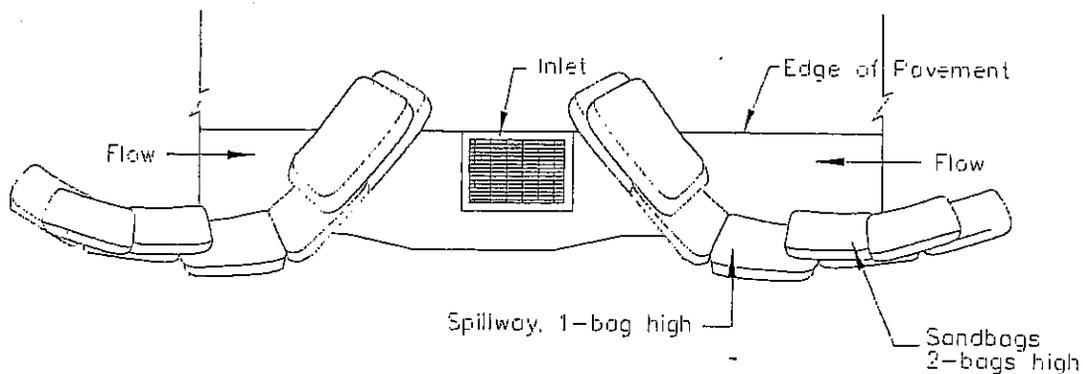
### Notes

1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.

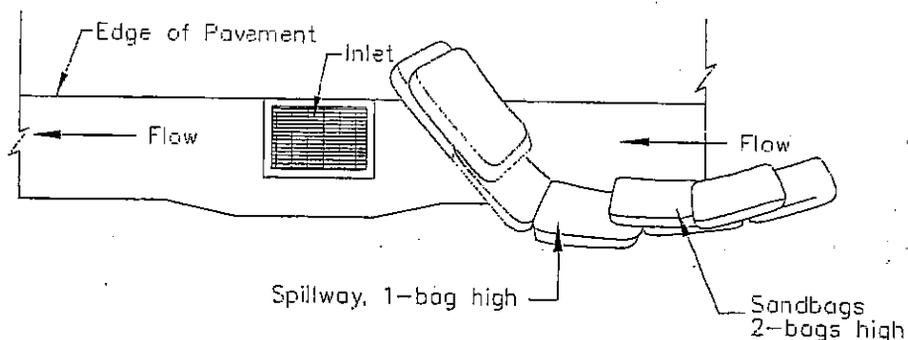


# Storm Drain Inlet Protection

SC-10



TYPICAL PROTECTION FOR INLET ON SUMP



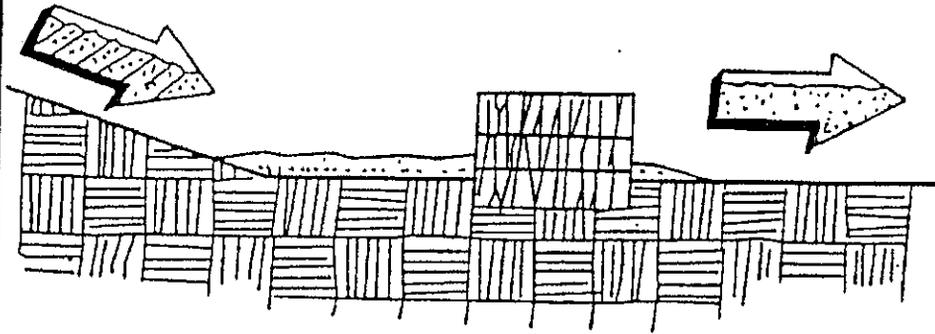
TYPICAL PROTECTION FOR INLET ON GRADE

## NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed.
5. Not applicable in areas with high silts and clays without filter fabric.



## BMP: STRAW BALE BARRIERS



### Objectives

- Housekeeping Practice*
- Contain Waste*
- Minimize Disturbed Areas*
- Stabilize Disturbed Areas*
- Protect Slopes/Channels*
- Control Site Perimeter*
- Control Internal Erosion*

### GENERAL DEFINITION

A straw bale barrier consists of straw bales placed end to end along a level contour in a shallow trench and staked to hold them in place. The barrier detains runoff, creating a pond behind the barrier where sedimentation occurs.

### SUITABLE APPLICATIONS

- Along the perimeter of the site.
- Along streams and channels.
- Across swales with small catchments.
- Around temporary spoil areas.
- Below other small, cleared areas.

### INSTALLATION/APPLICATION CRITERIA

- Use primarily in areas where sheet or rill flow occurs.
- No more than 1/4 acre per 100 feet of barrier should drain to the barrier.
- Install along a level contour.
- Place in a 4-inch deep trench.
- Backfill and compact the excavated soil on the upstream face of the barrier.
- Secure each bale with two stakes.
- Leave enough area (about 1200 sq. ft. per acre) behind the barrier for runoff to pond (no more than 1.5 ft. depth) and sediment to settle.

### REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rain.
  - Replace bales which have decomposed or whose bindings have broken.
  - Remove sediment behind the barrier when it reaches a depth of 6 inches.
- Costs (source: EPA, 1992)
  - Average annual cost for installation and maintenance (assumes 3 month useful life): \$17 per lineal foot (\$6,800 per drainage acre).

### LIMITATIONS

- Straw bale barriers are not to be used for extended periods of time because they tend to rot and fall apart.
- Suitable only for sheet flow on slopes of 2% or flatter.
- Not appropriate for large drainage areas, limit to one acre or less.
- Straw bales lose their effectiveness rapidly due to rotting, thus constant maintenance is required.
- Not recommended for concentrated flow, inlet protection, channel flow, and live streams.
- Bale bindings of jute or cotton not recommended.

### Targeted Pollutants

- Sediment*
- Nutrients*
- Toxic Materials*
- Oil & Grease*
- Floatable Materials*
- Other Construction Waste*

- Likely to Have Significant Impact*
- Probable Low or Unknown Impact*

### Implementation Requirements

- Capital Costs*
- O&M Costs*
- Maintenance*
- Training*
- Suitability for Slopes >5%*

- High*    *Low*

## ESC51



## BMP: STRAW BALE BARRIERS (Continue)

- Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainageways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow.

ESC51



## Additional Information — Straw Bale Barrier

A straw bale barrier consists of a series of secured anchored bales placed to intercept sediment-laden runoff from small drainage areas of disturbed soil. The barrier ponds runoff and allow sediment to settle. Straw bale dikes should not be used for extended periods of time because they tend to rot and fall apart.

The straw bale barrier is used where there are no concentrations of water in a channel or drainageway, and where erosion would occur from sheet flow. These barriers are typically constructed below disturbed areas subject to sheet flow of runoff.

### Installation/Application

Straw bale barriers should be used for drainage areas no more than 1/4 acre per 100 feet of barrier length, with no more than 100 ft upstream of any point along the barrier. The barrier should be placed along a level contour no greater than 2:1. When installed and maintained according to the guidelines on this fact sheet, straw bale dikes remove approximately 67% of the sediment transported in construction site runoff. This optimum efficiency can only be achieved through careful maintenance, with special attention to replacing rotted or broken bales. The barrier should be constructed on a level contour to prevent concentration of flow against a small portion of the barrier.

An effective straw bale barrier should be installed in the following manner:

1. Bales should be placed on the contour and in a row with ends tightly abutting the adjacent bales.
2. Leave area for runoff to pond upstream of the barrier by locating barrier away from the toe of slopes. This also provides access for maintenance.
3. Each bale should be embedded in the soil a minimum of (4) inches and placed so the bindings are horizontal. Bindings placed on soil will soon disintegrate and cause the barrier to fail.
4. Bales should be securely anchored in place by either two stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale at an angle to force the bales together. Stakes should be driven flush with the bale.
5. Backfill and compact the excavated soil along the upstream face of the barrier.
6. Remove the barrier when it has served its usefulness so as not to block or impede storm flow or drainage.

### REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

"Environmental Criteria Manual", City of Austin, Texas.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, Jun 1981.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April, 1992.

Stormwater Management Water for the Puget Sound Basin, Washington State Department of Ecology, The Technical Manual - February 1992, Publication # 91-75.

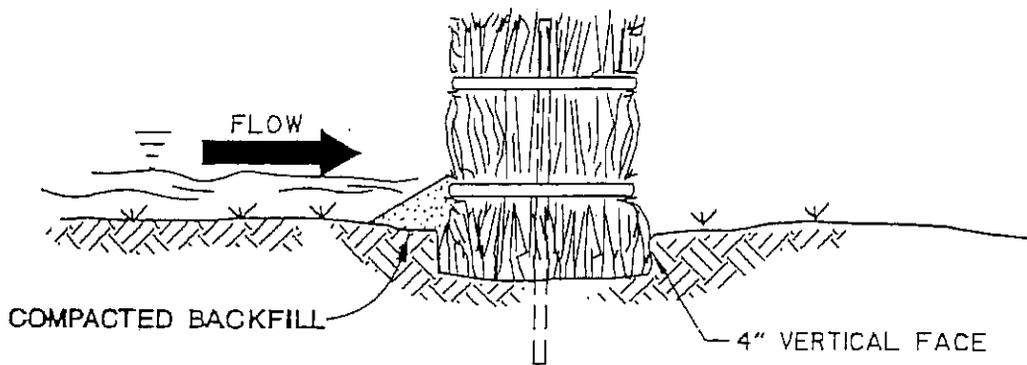
Water Quality for Construction Businesses, City of Bellevue, Washington.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC51

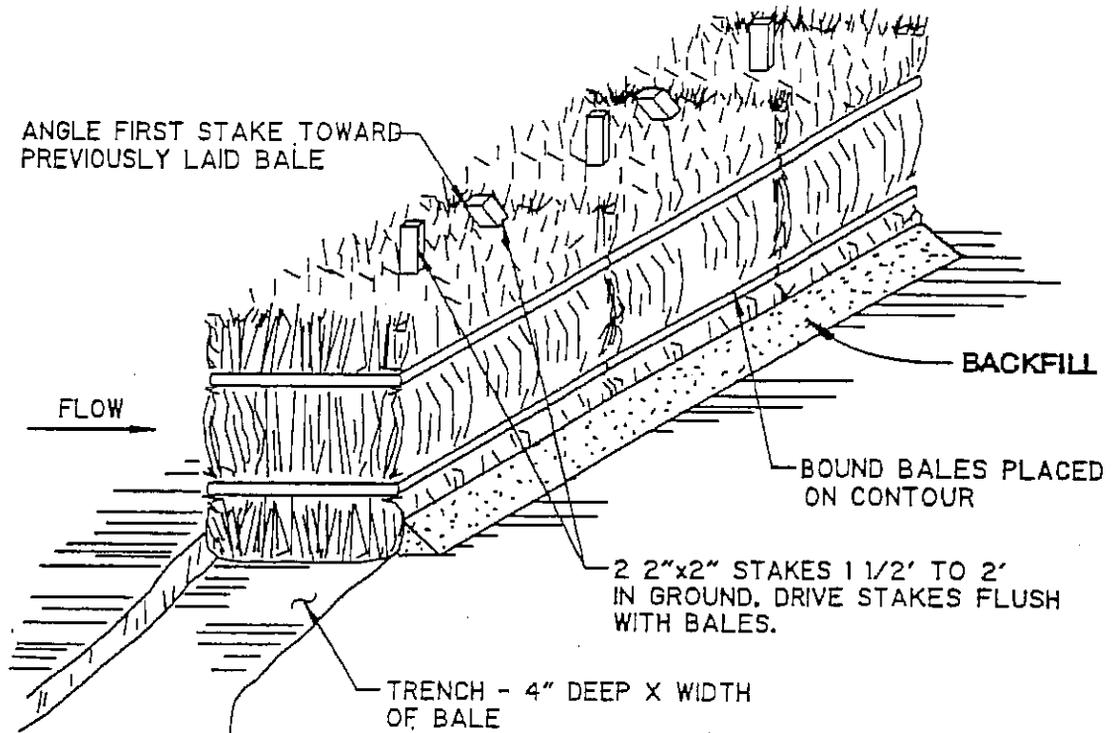


## Additional Information — Straw Bale Barrier



- PROMOTES ON SITE SEDIMENTATION BY CREATING A TEMPORARY POND.

### BEDDING DETAIL



SUBSTITUTION OF STEEL BARS FOR WOODEN STAKES IS NOT RECOMMENDED DUE TO POTENTIAL FOR DAMAGING CONSTRUCTION EQUIPMENT

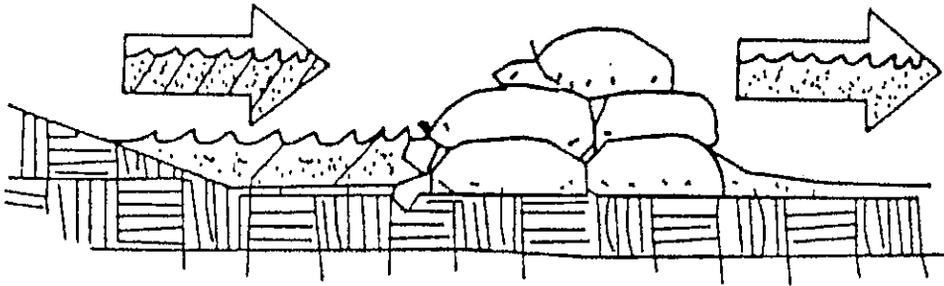
### ANCHORING DETAIL

## STRAW BALE BARRIERS

ESC51



# BMP: SAND BAG BARRIER



## Objectives

- Housekeeping Practices*
- Contain Waste*
- Minimize Disturbed Areas*
- Stabilize Disturbed Areas*
- Protect Slopes/Channels*
- Control Site Perimeter*
- Control Internal Erosion*

## GENERAL DEFINITION

Stacking sand bags along a level contour creates a barrier which detains sediment-laden water, ponding water upstream of the barrier and promoting sedimentation.

## SUITABLE APPLICATIONS

- Along the perimeter of the site.
- Check dams across streams and channels.
- Along streams and channels.
- Barrier for utility trenches in a channel.
- Across swales with small catchments.
- Division dike or berm.
- Below the toe of a cleared slope.
- Create a temporary sediment trap.
- Around temporary spoil areas.
- Below other small cleared areas.

## INSTALLATION/APPLICATION CRITERIA

- May be used in drainage areas up to 5 acres.
- Install along a level contour.
- Base of sand bag barrier should be at least 48 inches wide.
- Height of sand bag barrier should be at least 18 inches high.
- 4 inch PVC pipe may be installed between the top layer of sand bags to drain large flood flows.
- Provide area behind barrier for runoff to pond and sediment to settle, size according to sediment trap BMP criteria (ESC55).
- Place below the toe of a slope.
- Use sand bags large enough and sturdy enough to withstand major flooding.

## REQUIREMENTS

- Maintenance
  - Inspect after each rain.
  - Reshape or replace damaged sand bags immediately.
  - Remove sediment when it reaches six inches in depth.
- Cost
  - Sand bag barriers are more costly, but typically have a longer useful life than other barriers.

## LIMITATIONS

- Sand bags are more expensive than other barriers, but also more durable.
- Burlap should not be used for sand bags.

## Targeted Pollutants

- Sediment
- Nutrients
- Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Construction Waste

- Likely to Have Significant Impact
- Probable Low or Unknown Impact

## Implementation Requirements

- Capital Costs
- O&M Costs
- Maintenance
- Training
- Suitability for Slopes >5%

- High
- Low

# ESC52



## Additional Information — Sand Bag Barrier

### Suitable Applications

Sand bag berms may be used during construction activities in stream beds and utility construction in channels, temporary channel crossing for construction equipment, etc. Sand bag berms may also be installed parallel to roadway construction. Sand bag berms may also be used to create temporary sediment traps, retention basins and in place of straw bales or silt fences. Examples of applications include:

- Check dams across stream channels.
- Barriers for utility trenches or other construction in a stream channel.
- At temporary channel crossings.
- May be used on a slope where straw bales and silt fences are not appropriate.
- As a diversion dike.
- Embankment for a temporary sediment basin or retention basin.
- Sediment barriers near the toe of slopes.
- At construction perimeter.

### Advantages

- Provides a semi-permeable barrier in potentially wet areas.
- More permanent than silt fences or straw bales.
- Allows for easy relocation on site to meet changing needs during construction.

### Installation/Application

Sand bag barriers may be used for sediment trapping in locations where silt fences and straw bale barriers are not strong enough. In addition, sand bag barriers are appropriate to use when construction of check dams or sumps in a stream is undesirable. The sand bag berms can provide the same function as a check dam without disturbing the stream or vegetation. The sand bag berm will also allow a small sediment retention area to be created prior to construction of final detention basins. For installation of a sand bag berm, the following criteria should be observed:

- Drainage Area - Up to five (5) acres.
- Height of Berm - 18 inches minimum height, measured from the top of the existing ground at the upslope toe to the top of the barrier.
- Width of Berm - 48 inches minimum width measured at the bottom of the barrier, 18 inches at the top.
- Sand bag Size - Length 24 to 30 inches, width 16 to 18 inches and thickness six (6) to eight (8) inches. Weight 90 to 125 pounds.
- Sand bag Material - Polypropylene, polyethylene or polyamide woven fabric, minimum unit weight four (4) ounces per square yard, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70 percent. Use of burlap is discouraged since it rots and deteriorates easily.
- Grade of Sand - Coarse sand, gravel.
- Runoff water should be allowed to flow over the tops of the sand bags or through four (4) inch polyvinyl chloride pipes embedded below the top layer of bags.
- Area behind the sand bag barrier should be established according to sizing criteria for sediment trap BMP (ESC55).

### **REFERENCES**

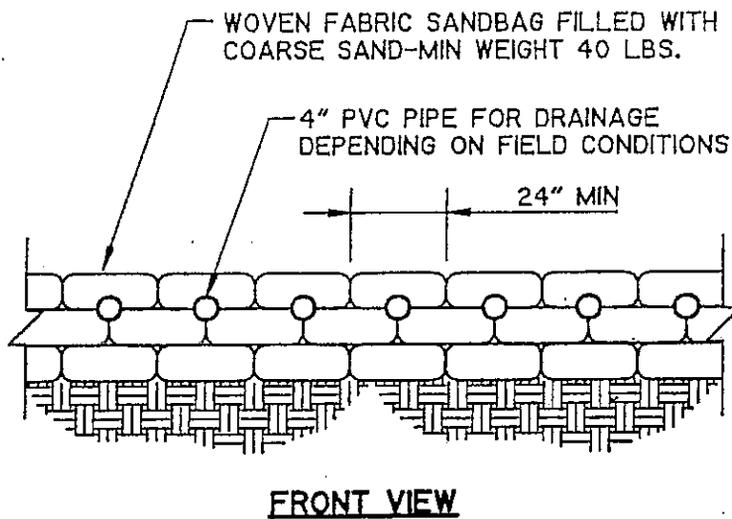
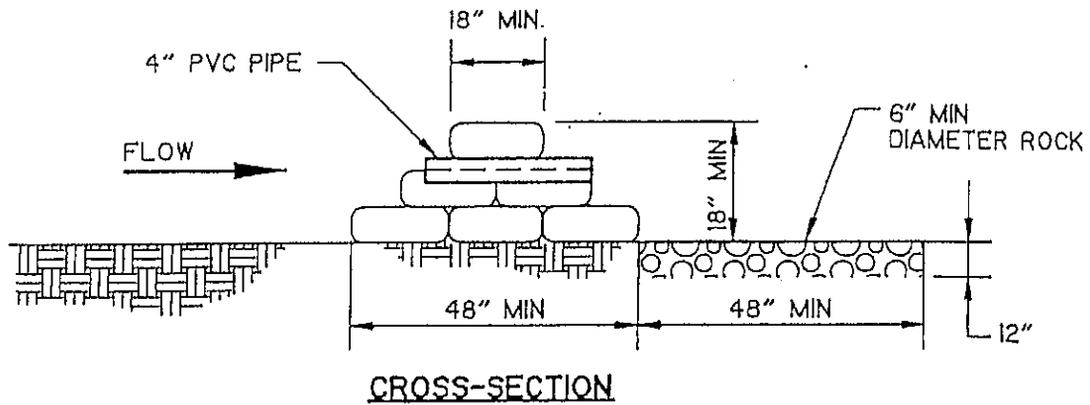
Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC52



# Additional Information — Sand Bag Barrier



## SAND BAG BERM:

ESC52



# Appendix E

## Boring Logs and Well Completion Diagrams

# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

JOB NUMBER: 21075

LOCATION: Behind Tri-Cities Landfill of Automall Parkway

DATE: 9/12/2014

LOGGED BY: Douglas Young

ELECTRIC LOG BY: Dewey Data, Inc.

HOLE DIAMETER 8.00 "

DRILLER: Gregg Drilling and Testing, Inc.

DRILLING METHOD: Mud Rotary

TOTAL DEPTH: 767 feet

STATE ID: 5S/1W 20G001

SHEET: 1 of 6

**BORING:**  
Automall Parkway  
Landfill Levee

## LITHOLOGIC DESCRIPTION

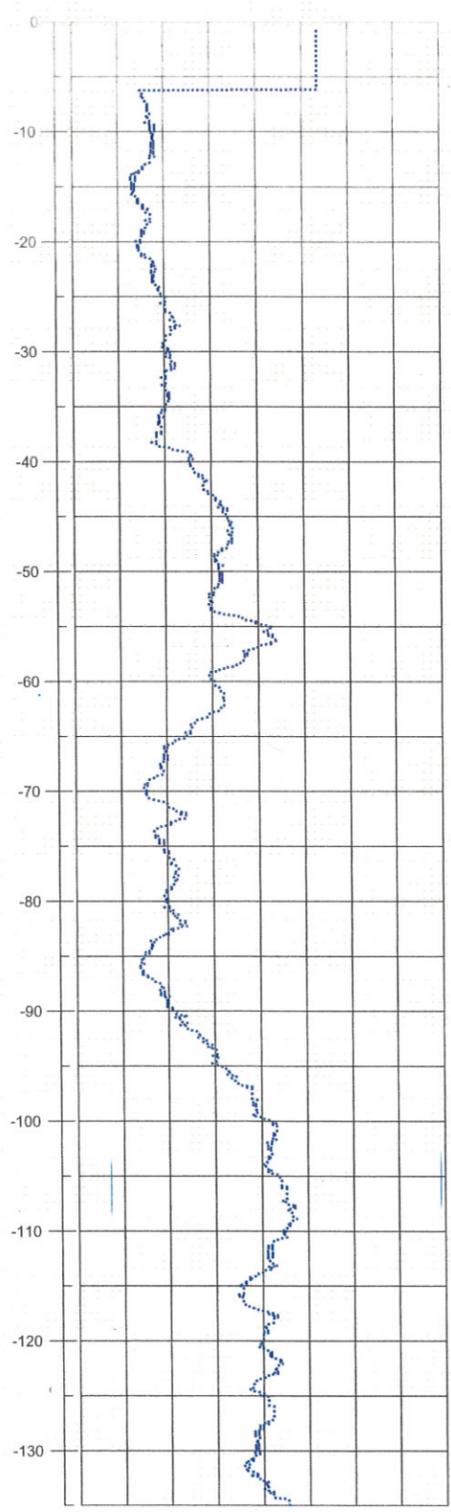
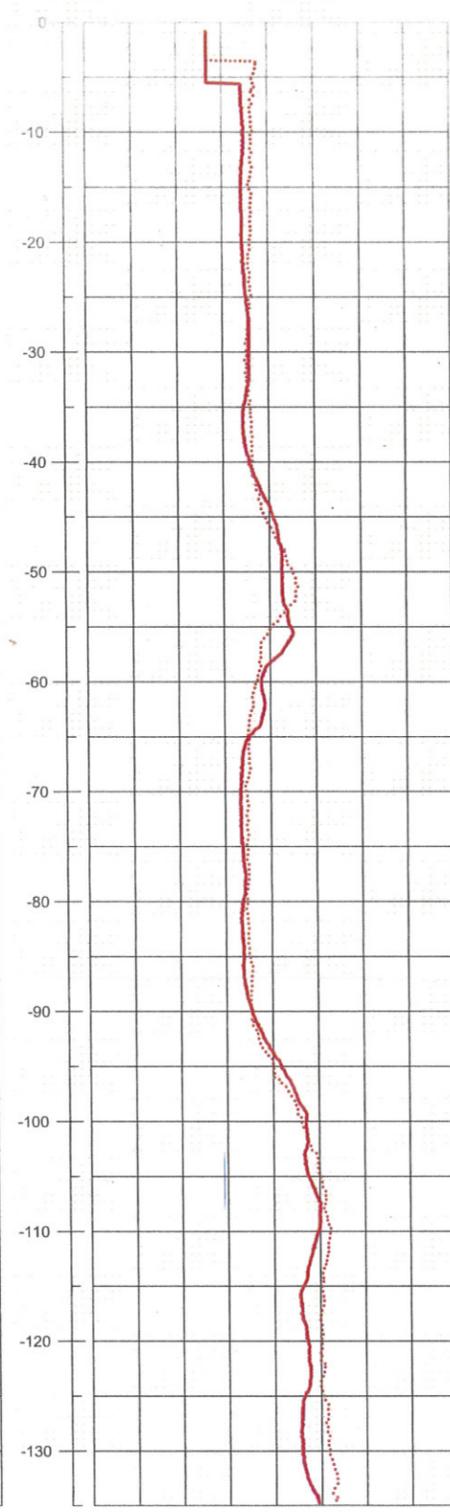
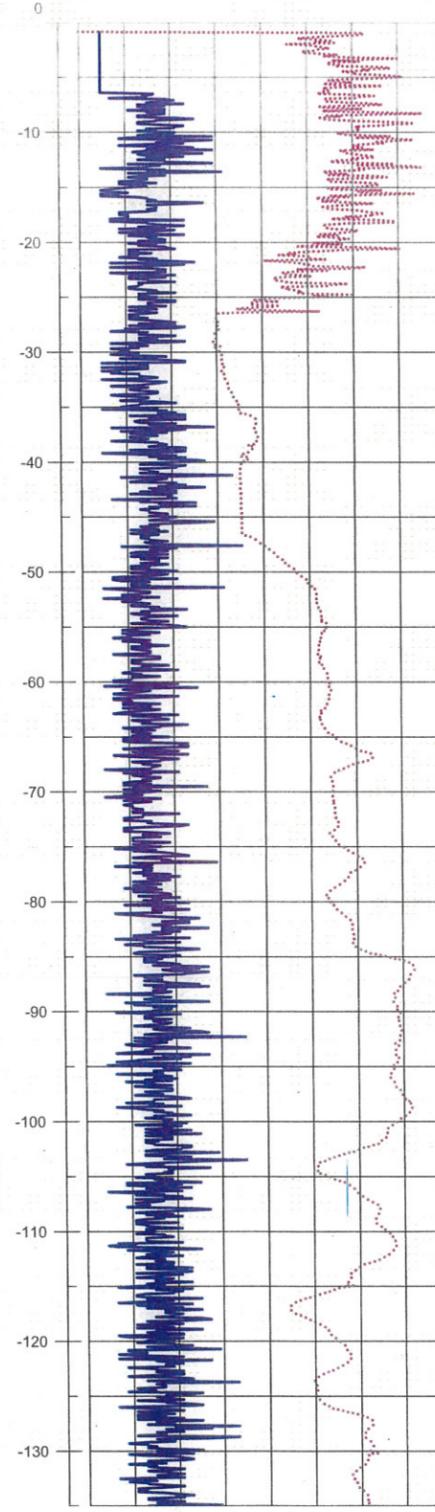
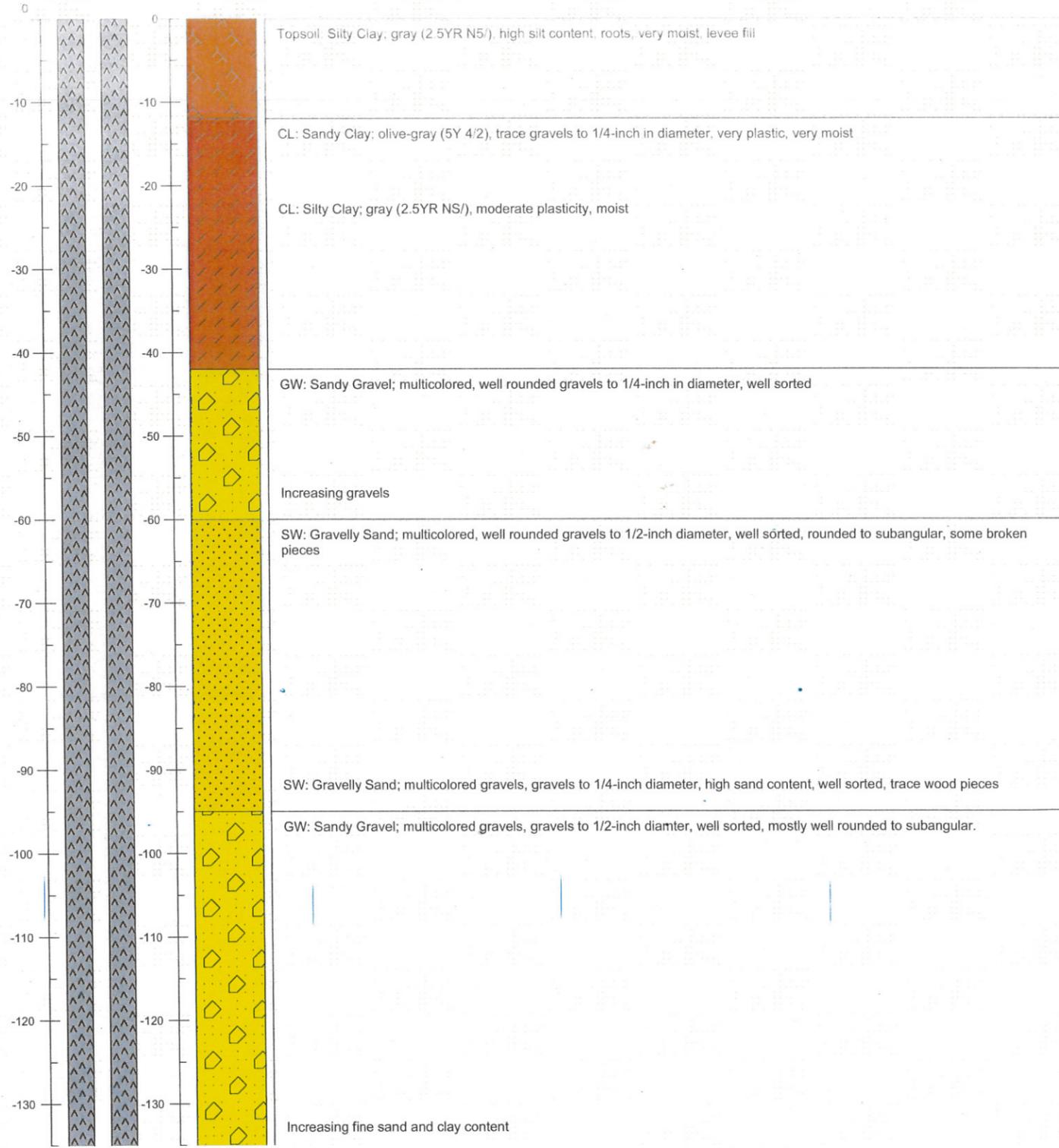
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) (-25 410)  
(- Spontaneous Potential (mV) +)

Short Normal (Ohm-m) (-25 50)  
Long Normal (Ohm-m) (-25 50)

Point Resistivity (Ohm) (-.10 5)



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

JOB NUMBER: 21075

LOCATION: Behind Tri-Cities Landfill of of Automall Parkway

DATE: 9/12/2014

LOGGED BY: Douglas Young

ELECTRIC LOG BY: Dewey Data, Inc.

HOLE DIAMETER 8.00 "

DRILLER: Gregg Drilling and Testing, Inc.

DRILLING METHOD: Mud Rotary

TOTAL DEPTH: 767 feet

STATE ID:

5S/1W 20G001

SHEET: 2 of 6

BORING:

Automall Parkway  
Landfill Levee

## LITHOLOGIC DESCRIPTION

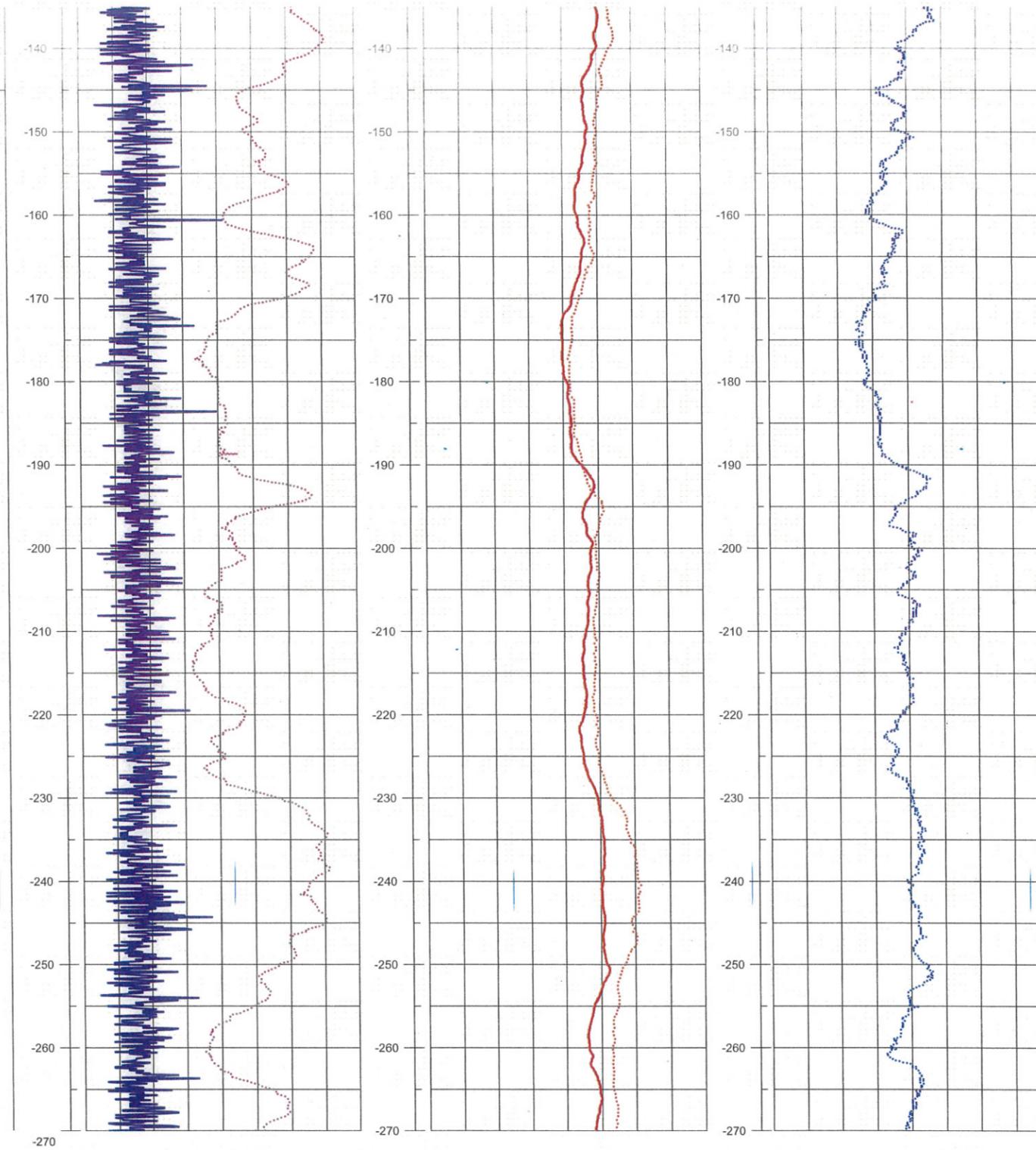
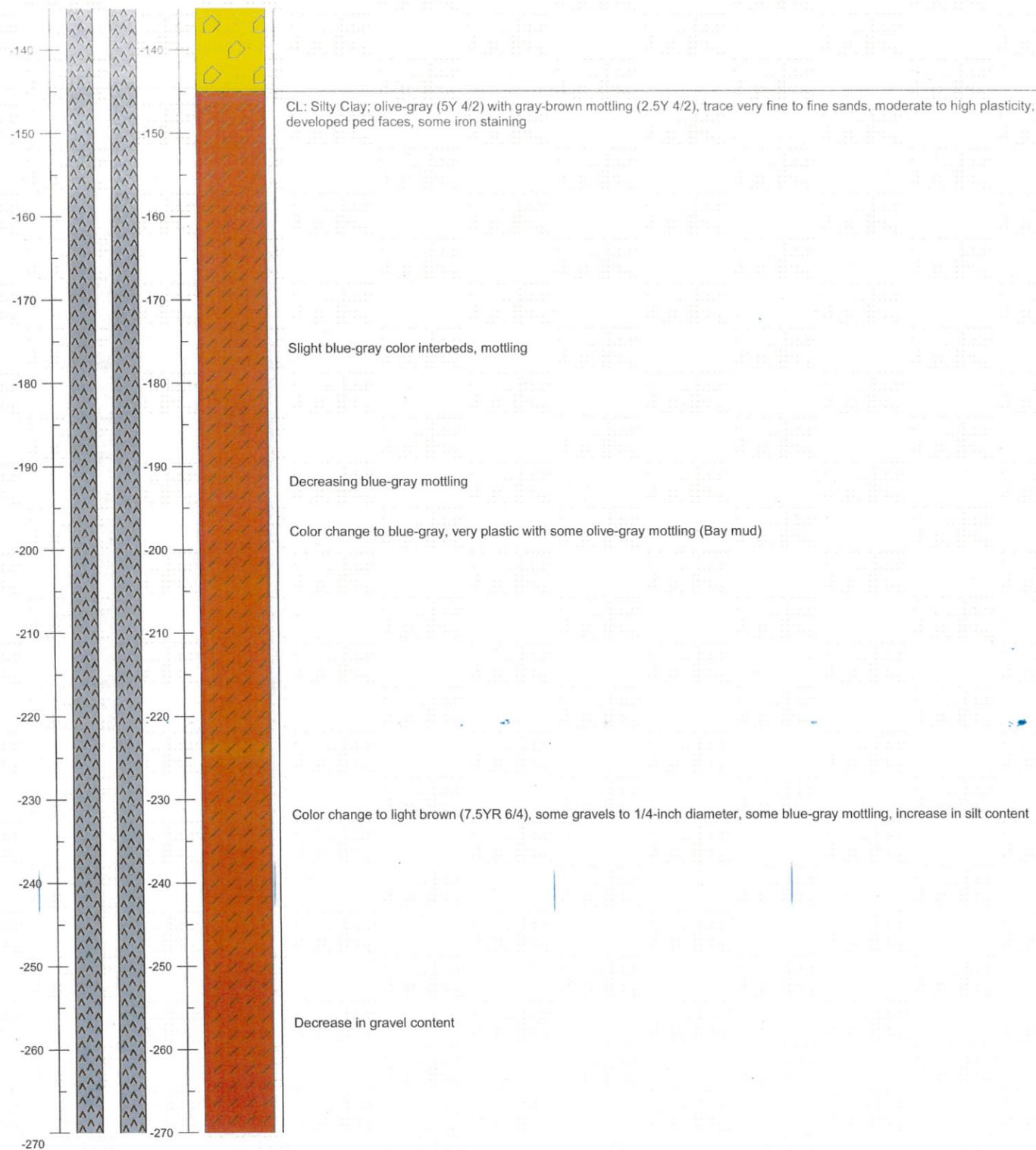
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) 25 410  
(- Spontaneous Potential (mV) +)

Short Normal (Ohm-m) 25 50  
Long Normal (Ohm-m) 25 50

Point Resistivity (Ohm) 10 5



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID: 5S/1W 20G001

BORING: Automall Parkway Landfill Levee

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

SHEET: 3 of 6

JOB NUMBER: 21075

LOCATION: Behind Tri-Cities Landfill of of Automall Parkway

DATE: 9/12/2014

HOLE DIAMETER 8.00 "

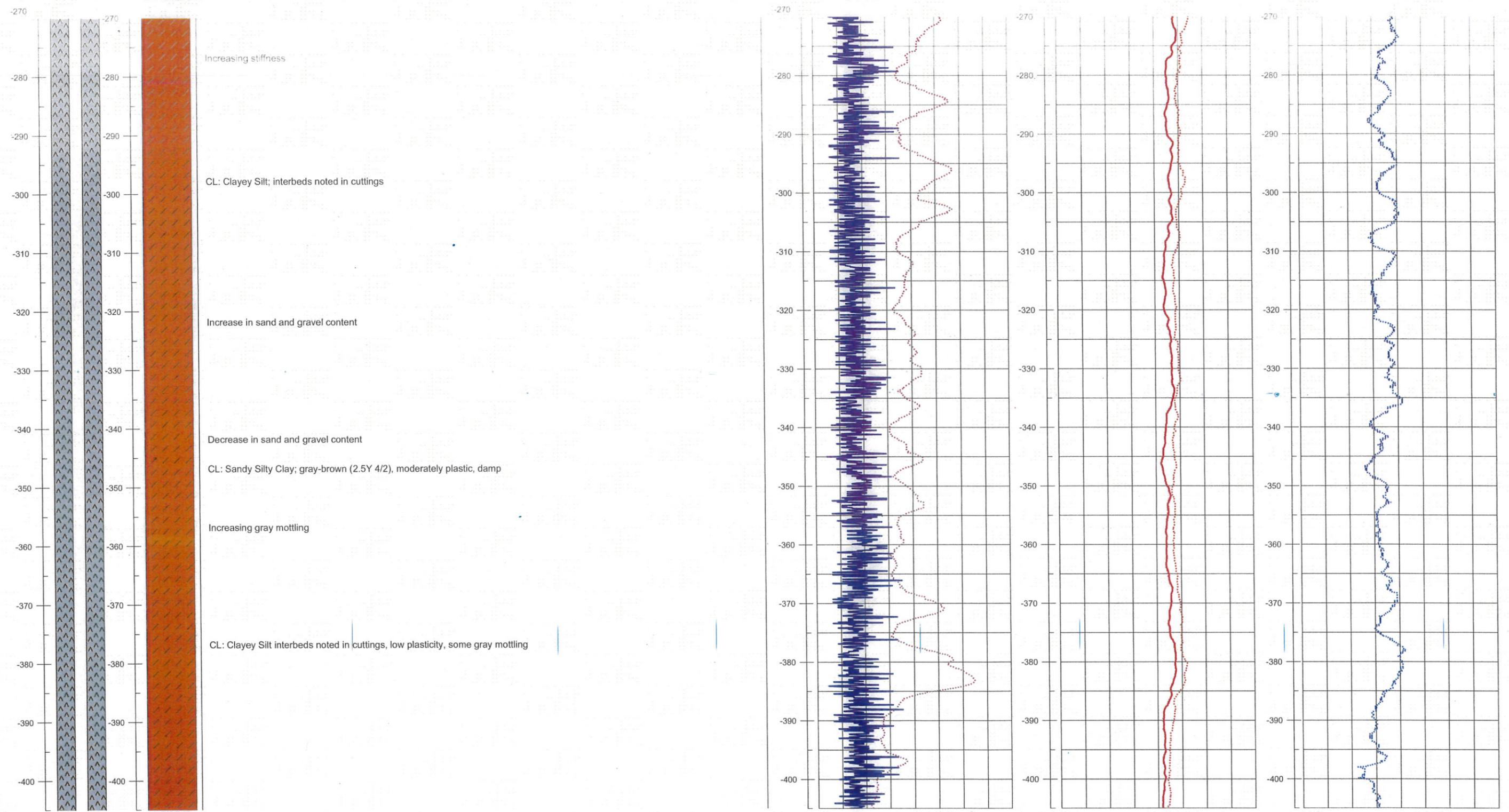
TOTAL DEPTH: 767 feet

## LITHOLOGIC DESCRIPTION

## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) (-25 410)  
Short Normal (Ohm-m) (-25 50)  
Long Normal (Ohm-m) (-25 50)  
Point Resistivity (Ohm) (0.10 5)



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID: 5S/1W 20G001

BORING: Automall Parkway Landfill Levee

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

SHEET: 4 of 6

JOB NUMBER: 21075

LOCATION: Behind Tri-Cities Landfill of of Automall Parkway

DATE: 9/12/2014

HOLE DIAMETER 8.00 "

TOTAL DEPTH: 767 feet

## LITHOLOGIC DESCRIPTION

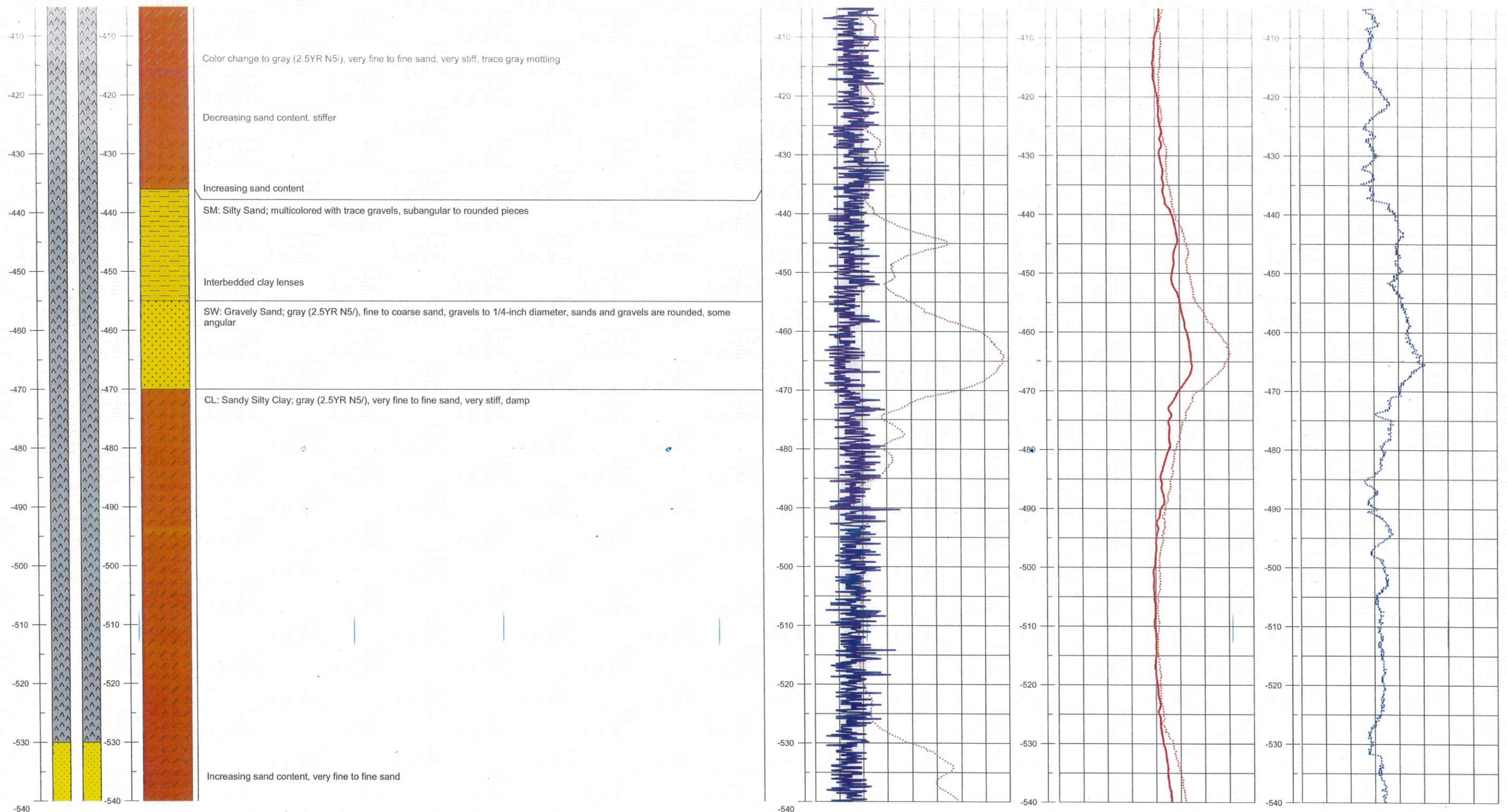
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) 25 410  
(- Spontaneous Potential (mV) +)

Short Normal (Ohm-m) 25 50  
Long Normal (Ohm-m) 25 50

(.10 Point Resistivity (Ohm) .5)



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID: 5S/1W 20G001

BORING: Automall Parkway Landfill Levee

JOB NUMBER: 21075

LOCATION: Behind Tri-Cities Landfill of of Automall Parkway

DATE: 9/12/2014

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

SHEET: 5 of 6

HOLE DIAMETER 8.00 "

TOTAL DEPTH: 767 feet

## LITHOLOGIC DESCRIPTION

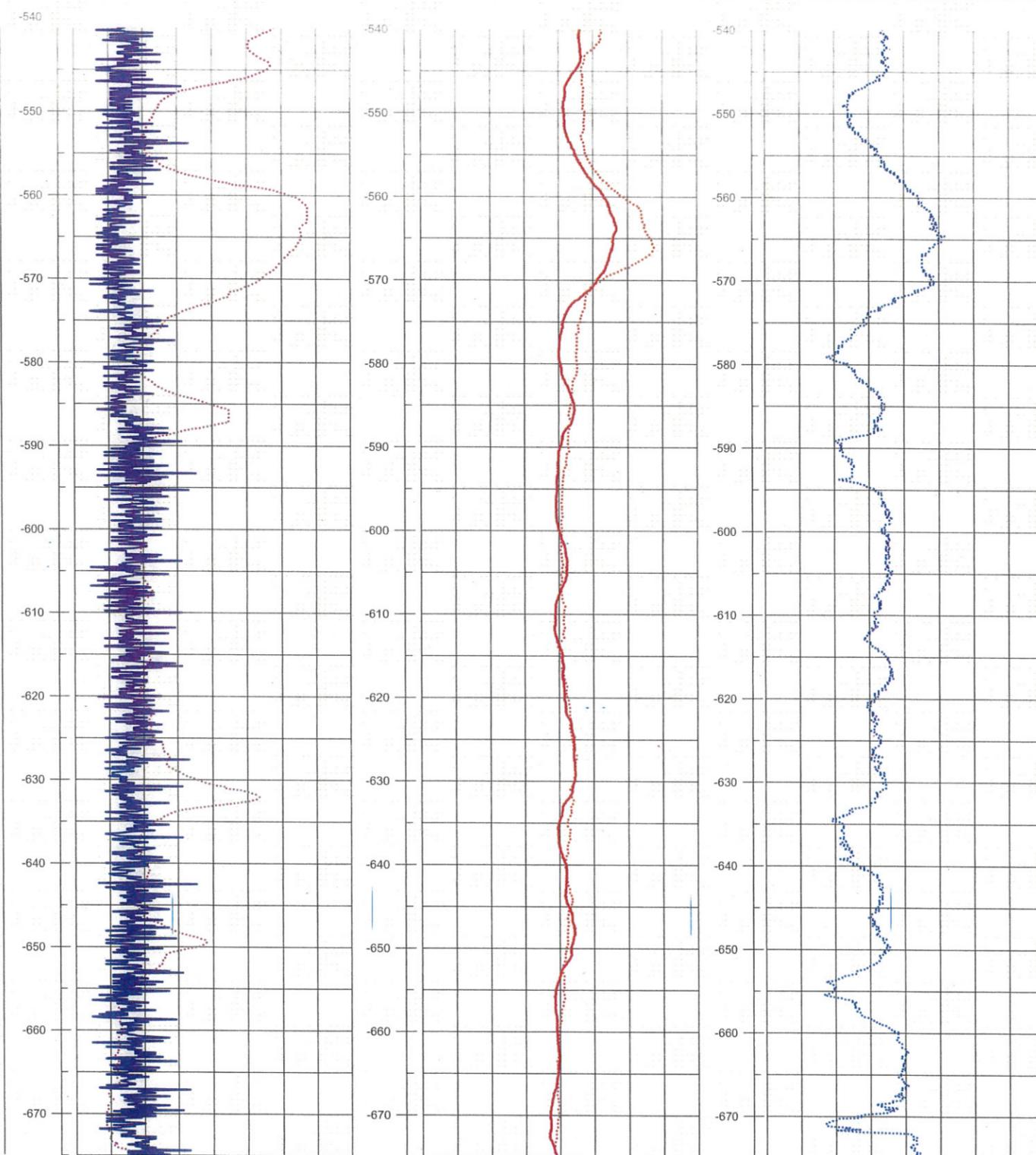
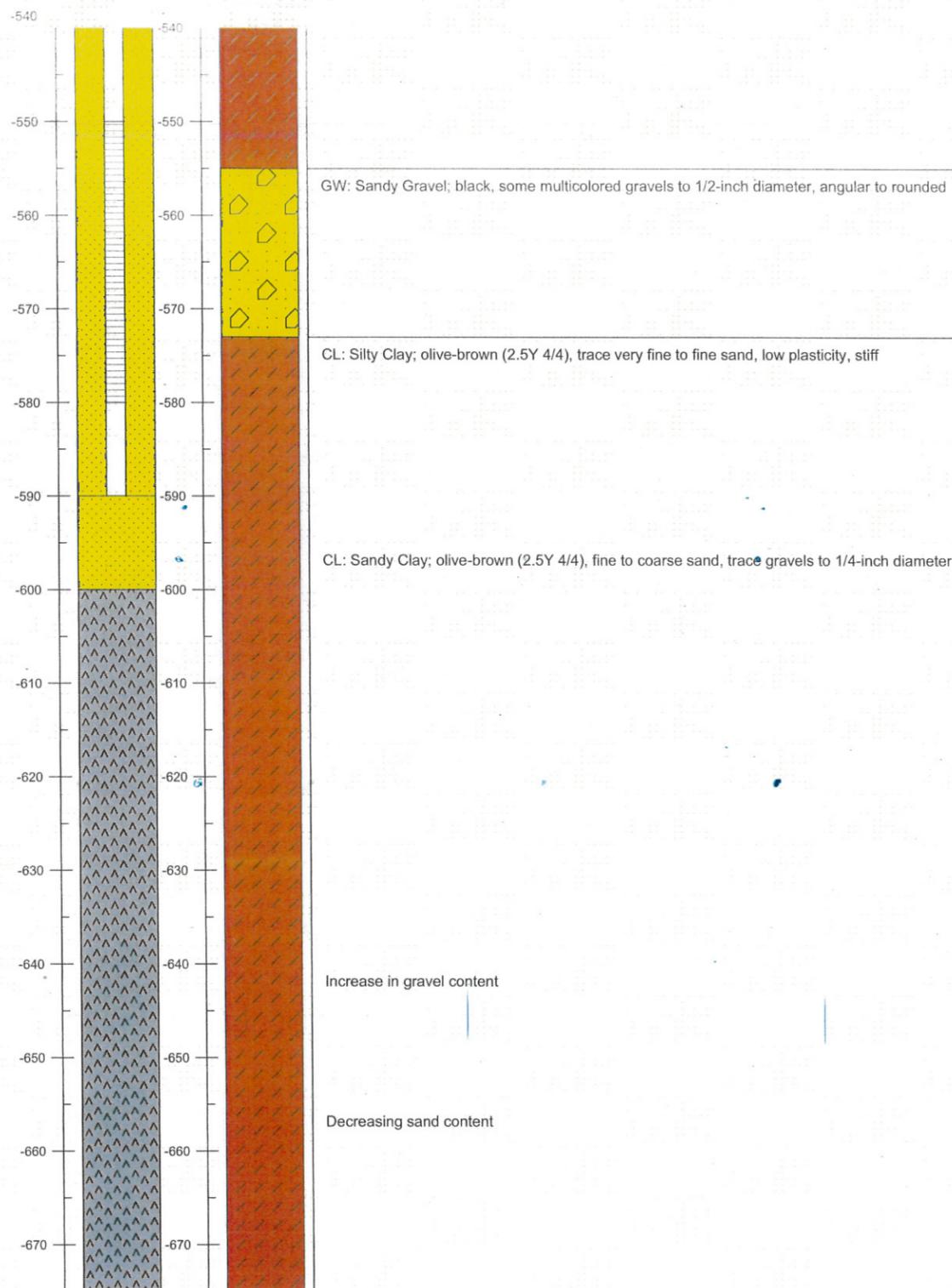
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) (-25 410)  
(- Spontaneous Potential (mV) +)

Short Normal (Ohm-m) (-25 50)  
Long Normal (Ohm-m) (-25 50)

Point Resistivity (Ohm) (-.10 .5)



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

JOB NUMBER: 21075    LOCATION: Behind Tri-Cities Landfill of of Automall Parkway    DATE: 9/12/2014

LOGGED BY: Douglas Young  
ELECTRIC LOG BY: Dewey Data, Inc.  
HOLE DIAMETER 8.00 "

DRILLER: Gregg Drilling and Testing, Inc.  
DRILLING METHOD: Mud Rotary  
TOTAL DEPTH: 767 feet

STATE ID: 5S/1W 20G001  
SHEET: 6 of 6

BORING: Automall Parkway Landfill Levee

## LITHOLOGIC DESCRIPTION

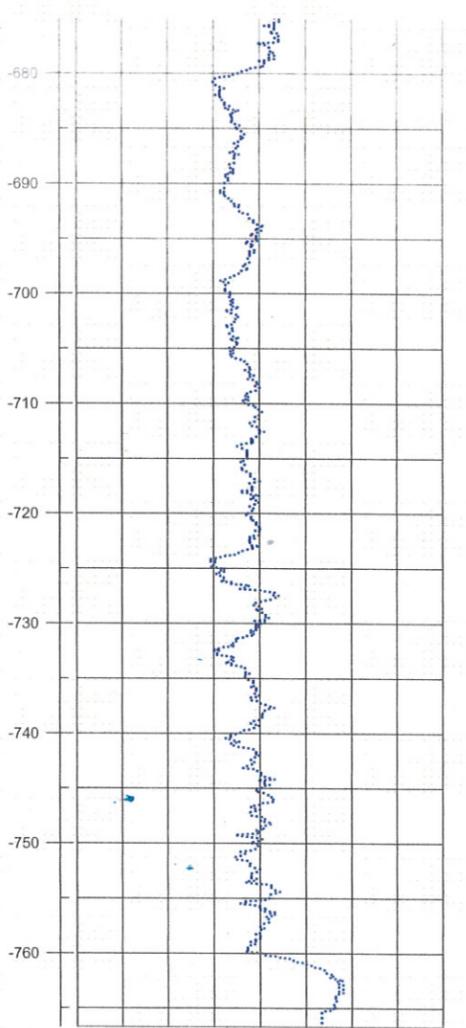
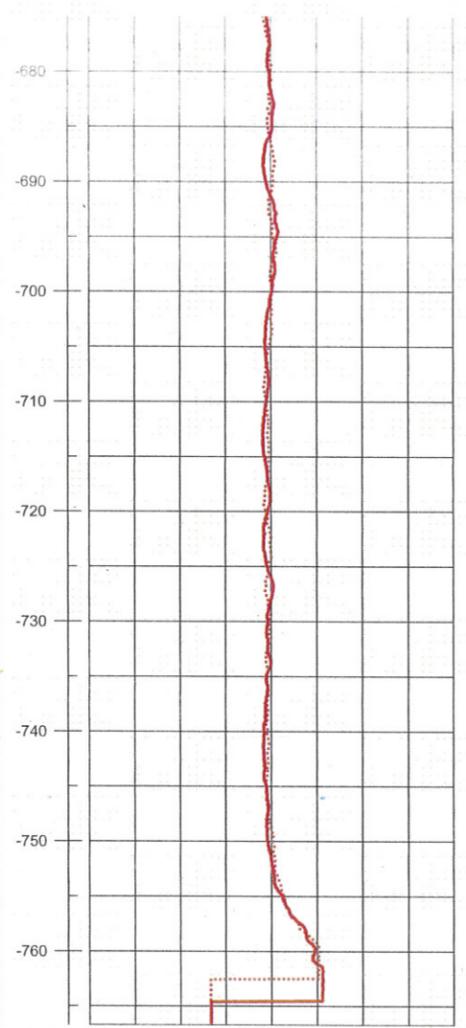
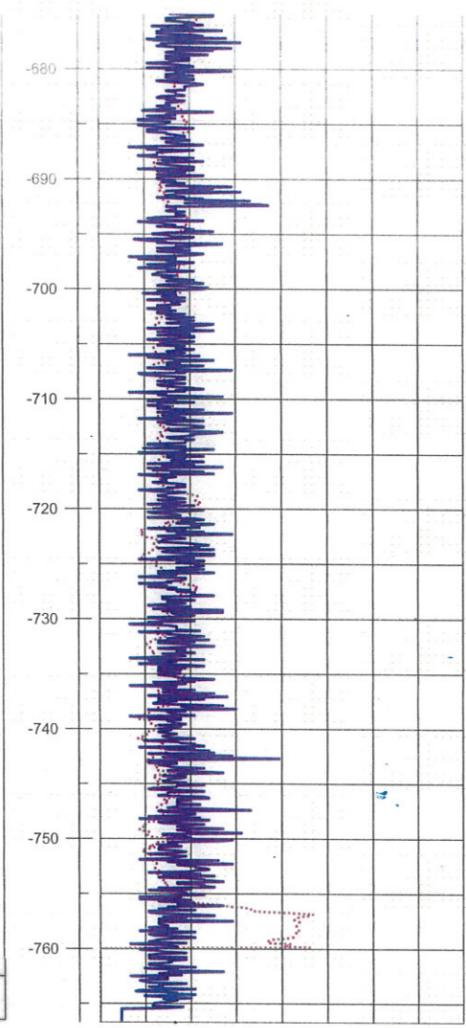
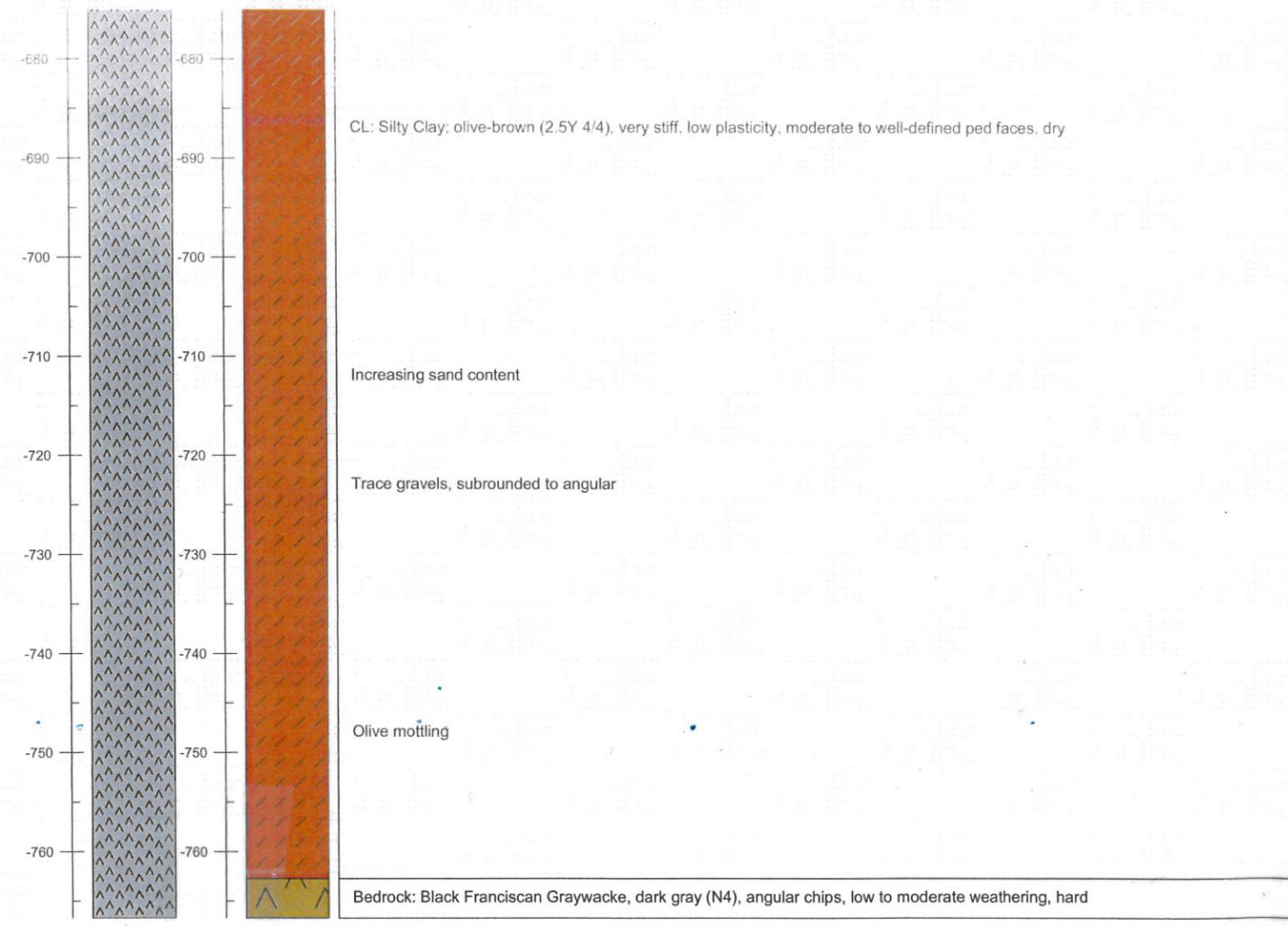
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) (-25 410)  
(- Spontaneous Potential (mV) +)

Short Normal (Ohm-m) (-25 50)  
Long Normal (Ohm-m) (-25 50)

Point Resistivity (Ohm) (-10 5)



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID: 5S/2W 08M011

BORING: Dumbarton Pier

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

SHEET: 1 of 4

JOB NUMBER: 21075

LOCATION: Dumbarton fishing pier parking lot

DATE: 11/10/2014

HOLE DIAMETER 8.00 "

TOTAL DEPTH: 465 feet

## LITHOLOGIC DESCRIPTION

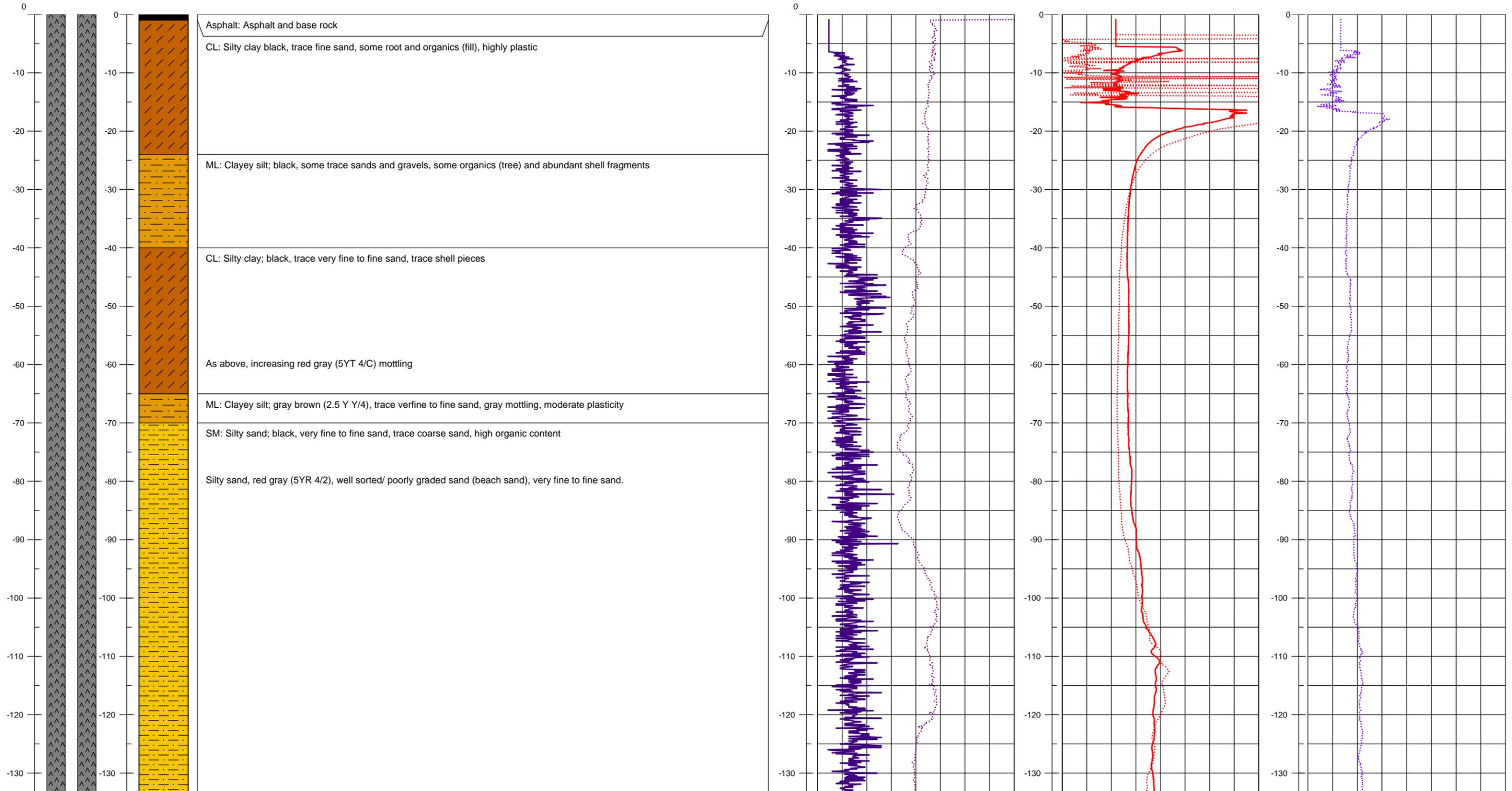
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

-25 Gamma (API-GR) 410  
- Spontaneous Potential (mV) +

-15 Short Normal (Ohm-m) 40  
-15 Long Normal (Ohm-m) 40

-5 Point Resistivity (Ohm) 25



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID: 5S/2W 08M011

BORING: Dumbarton Pier

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

SHEET: 2 of 4

JOB NUMBER: 21075

LOCATION: Dumbarton fishing pier parking lot

DATE: 11/10/2014

HOLE DIAMETER 8.00 "

TOTAL DEPTH: 465 feet

## LITHOLOGIC DESCRIPTION

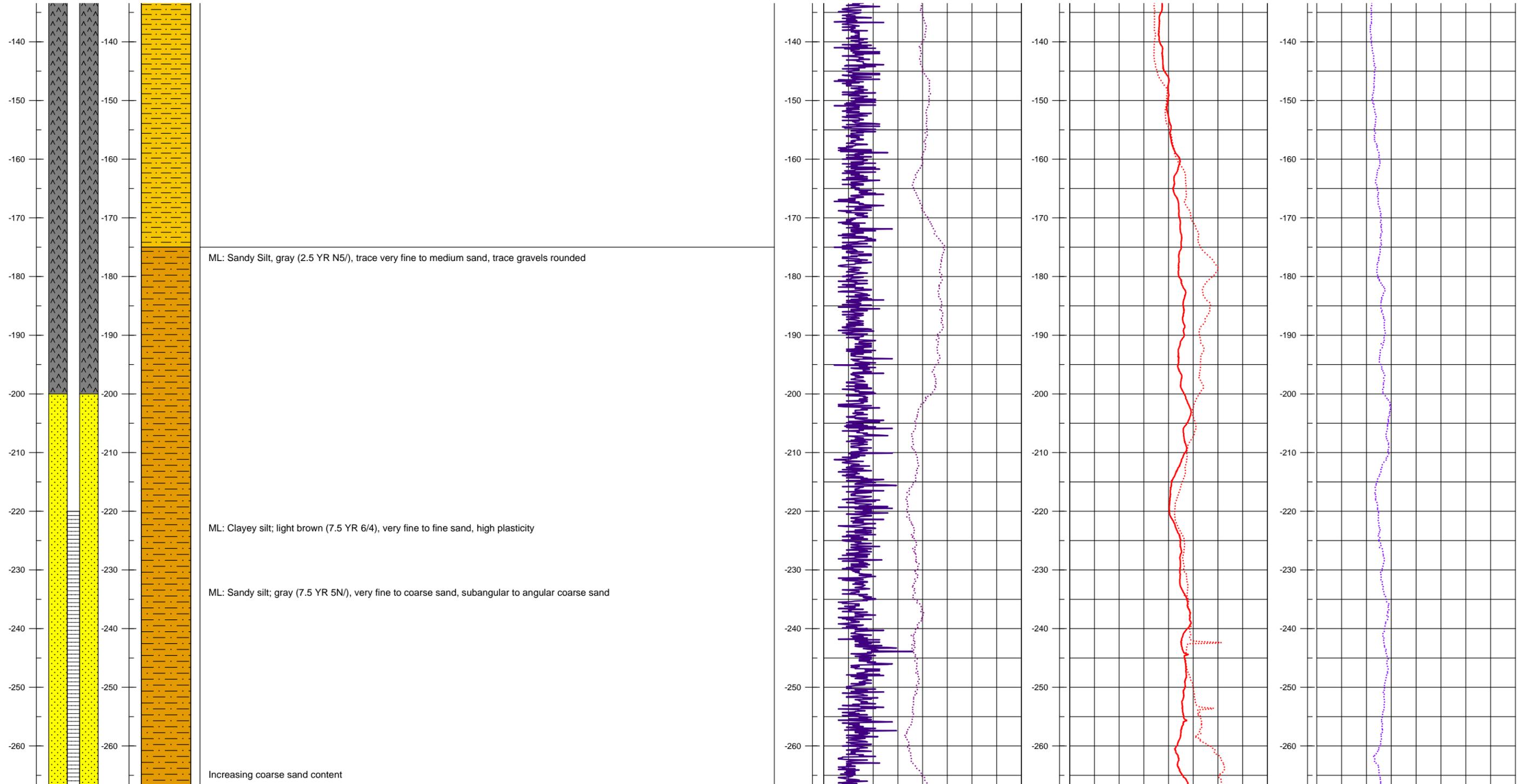
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

-25 Gamma (API-GR) 410  
- Spontaneous Potential (mV) +

-15 Short Normal (Ohm-m) 40  
-15 Long Normal (Ohm-m) 40

-5 Point Resistivity (Ohm) 25



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID: 5S/2W 08M011

BORING: Dumbarton Pier

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

JOB NUMBER: 21075

LOCATION: Dumbarton fishing pier parking lot

DATE: 11/10/2014

HOLE DIAMETER 8.00"

TOTAL DEPTH: 465 feet

SHEET: 3 of 4

## LITHOLOGIC DESCRIPTION

## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

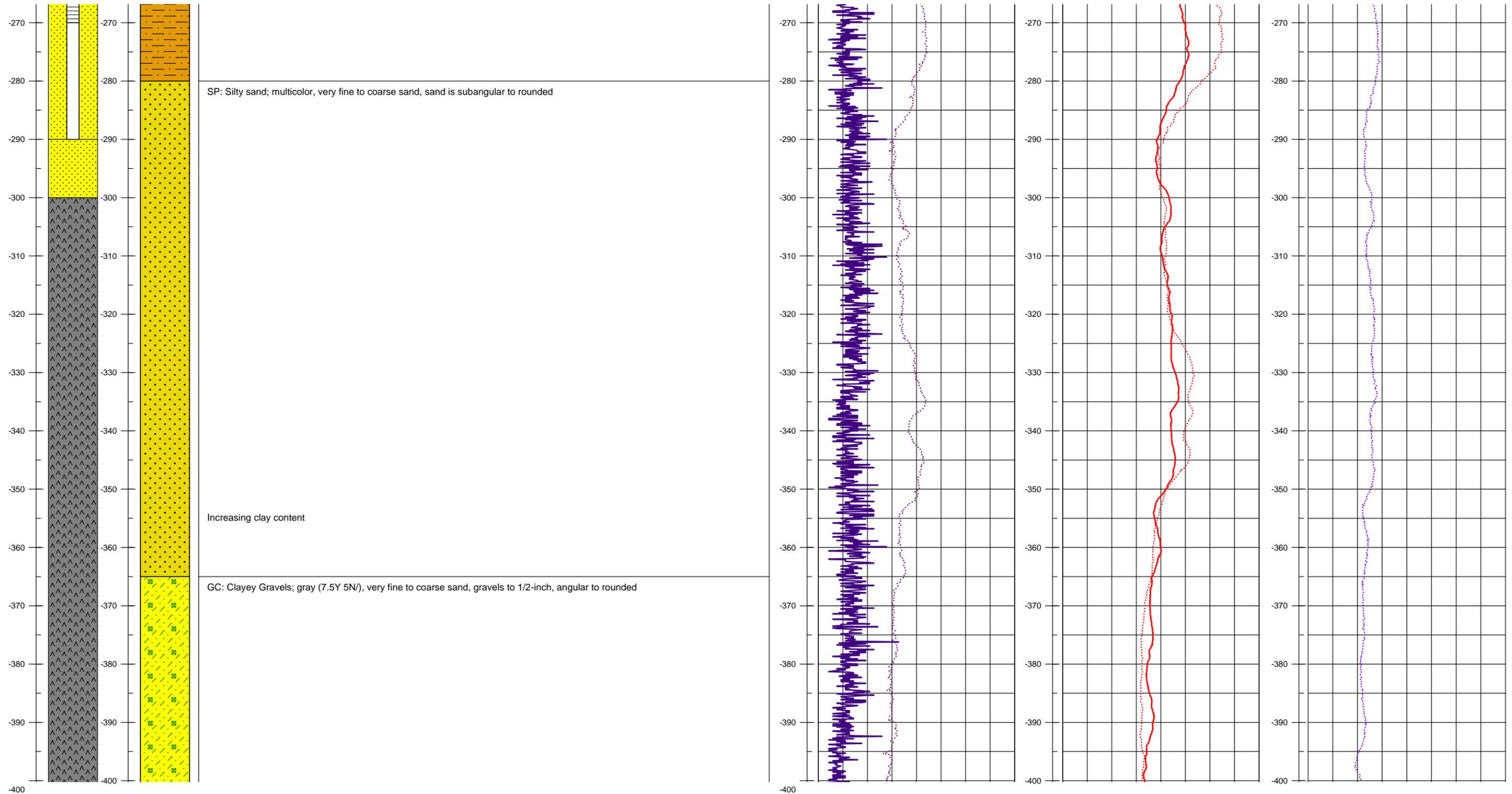
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-15 Short Normal (Ohm-m) 40

- Spontaneous Potential (mV) +

-15 Long Normal (Ohm-m) 40

-5 Point Resistivity (Ohm) 25



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

JOB NUMBER: 21075

LOCATION: Dumbarton fishing pier parking lot

DATE: 11/10/2014

LOGGED BY: Douglas Young

ELECTRIC LOG BY: Dewey Data, Inc.

HOLE DIAMETER 8.00 "

DRILLER: Gregg Drilling and Testing, Inc.

DRILLING METHOD: Mud Rotary

TOTAL DEPTH: 465 feet

STATE ID:

5S/2W 08M011

SHEET: 4 of 4

BORING:

Dumbarton Pier

## LITHOLOGIC DESCRIPTION

## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

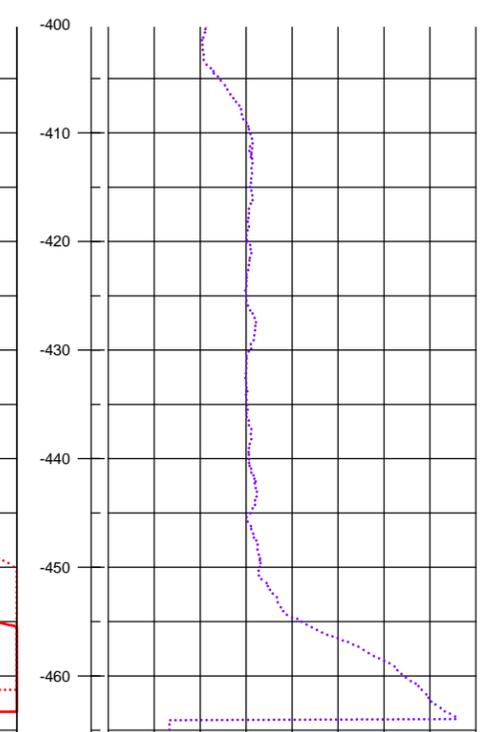
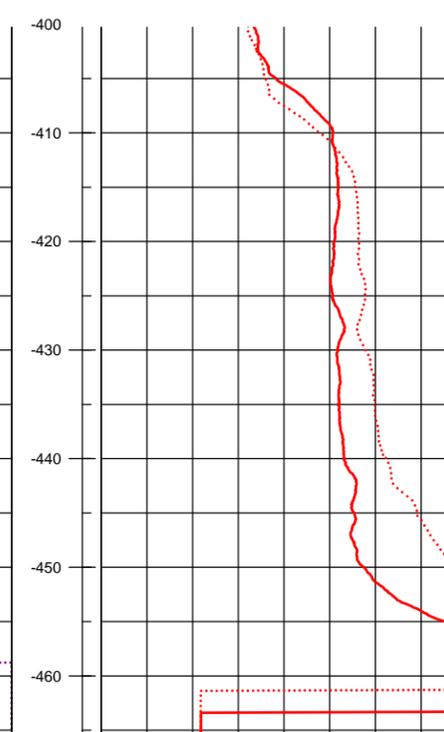
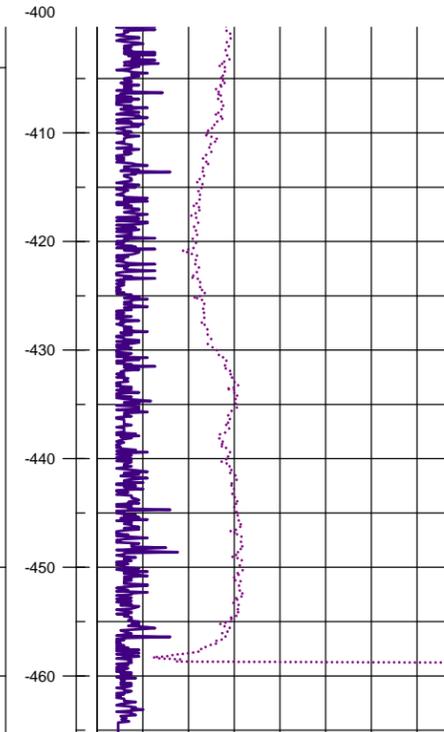
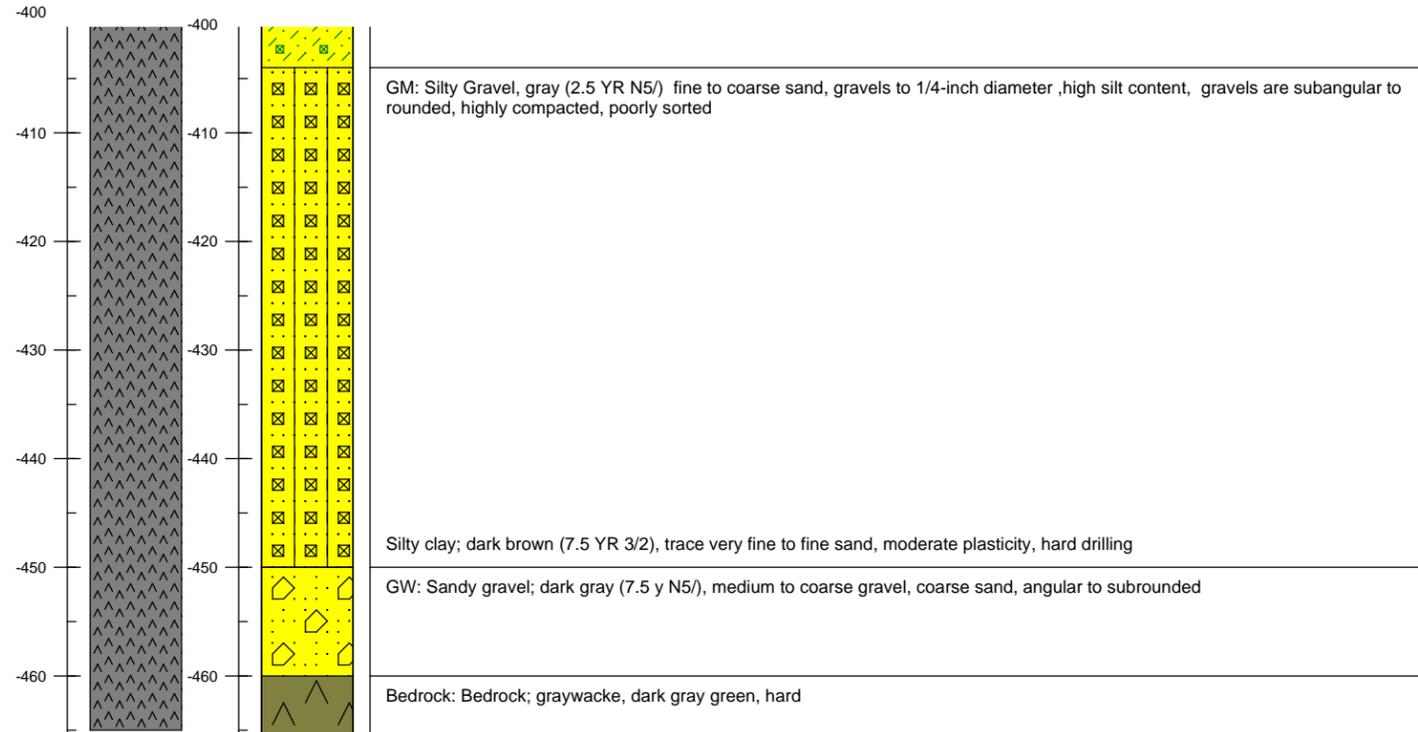
-25 Gamma (API-GR) 410

-15 Short Normal (Ohm-m) 40

- Spontaneous Potential (mV) +

-15 Long Normal (Ohm-m) 40

-5 Point Resistivity (Ohm) 25



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

JOB NUMBER: 21075

LOCATION: Old Jarvis Avenue

DATE: 11/3/2014

LOGGED BY: Douglas Young

ELECTRIC LOG BY: Dewey Data, Inc.

HOLE DIAMETER 8.00 "

DRILLER: Gregg Drilling and Testing, Inc.

DRILLING METHOD: Mud Rotary

TOTAL DEPTH: 220 feet

STATE ID:

5S/2W 03H004

SHEET: 1 of 2

BORING:

Jarvis-C

## LITHOLOGIC DESCRIPTION

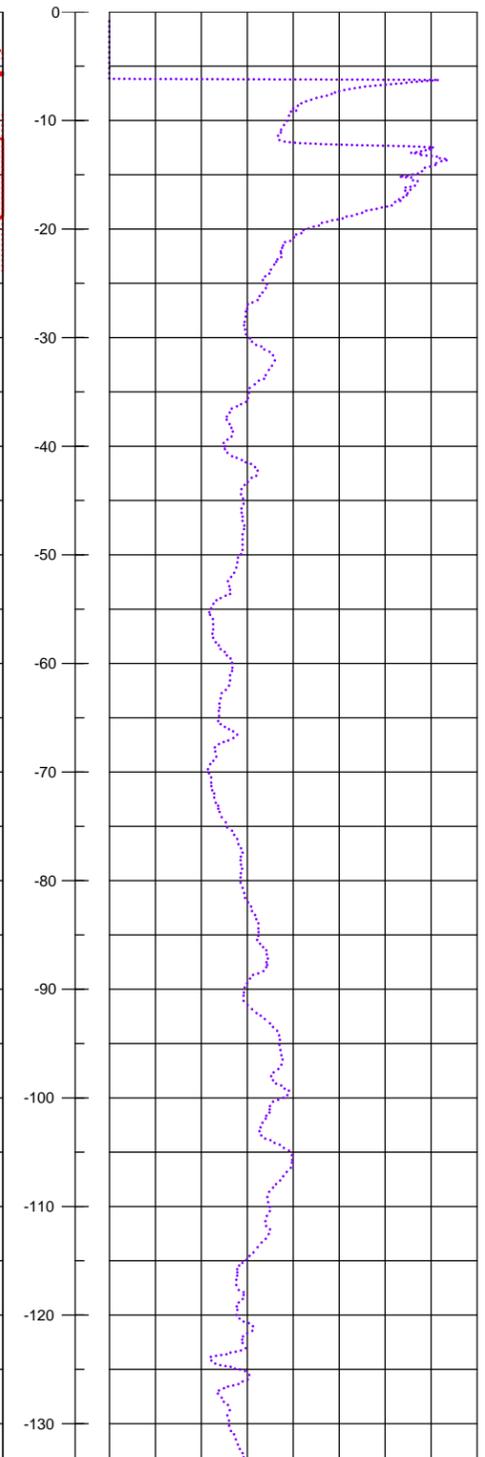
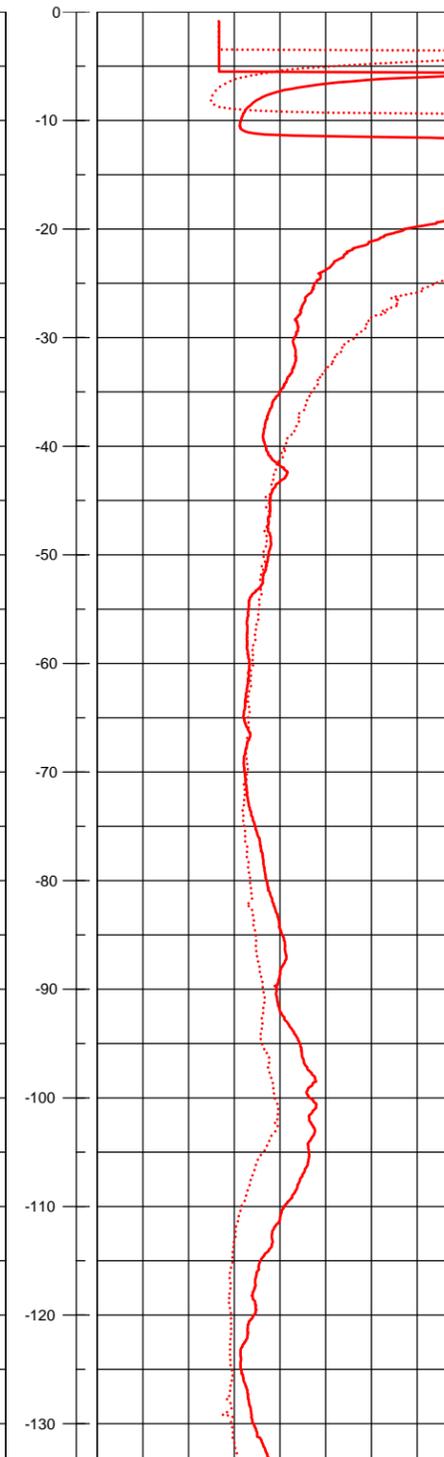
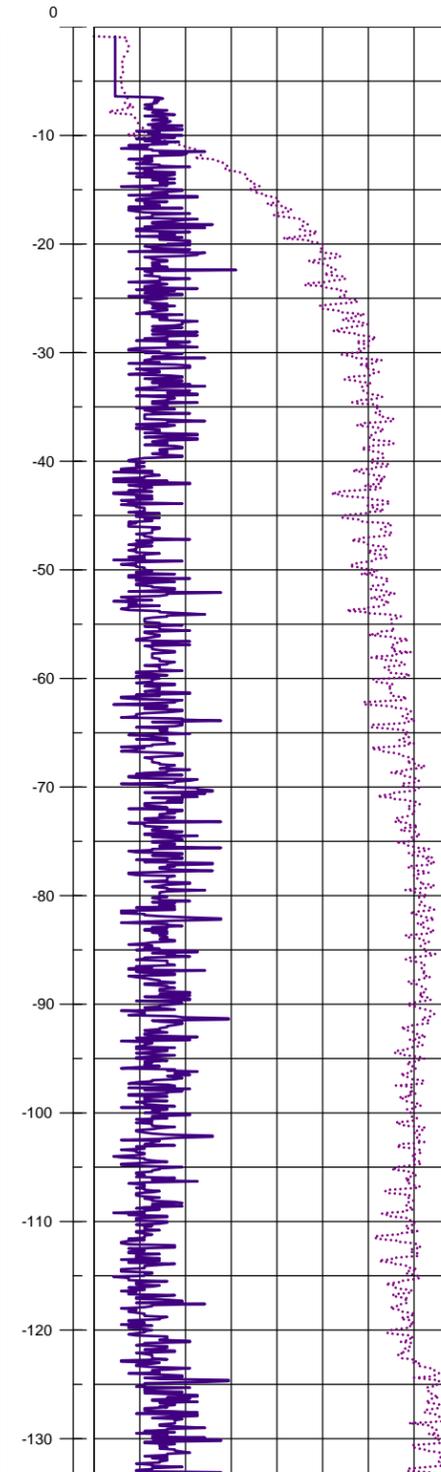
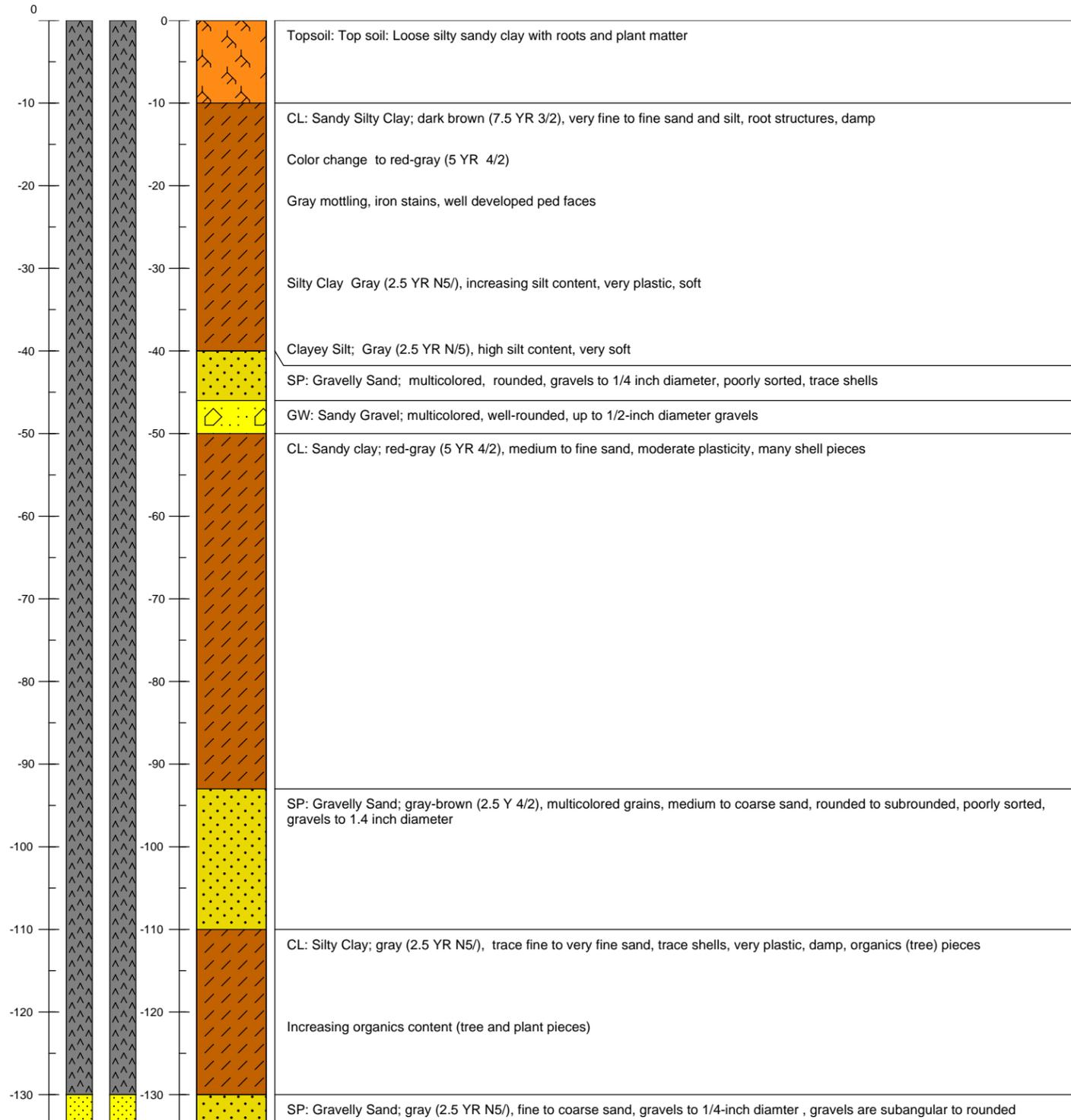
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) 410  
Spontaneous Potential (mV) -25 +

Short Normal (Ohm-m) -25 50  
Long Normal (Ohm-m) -25 50

Point Resistivity (Ohm) 0 35



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

JOB NUMBER: 21075

LOCATION: Old Jarvis Avenue

DATE: 11/3/2014

LOGGED BY: Douglas Young

ELECTRIC LOG BY: Dewey Data, Inc.

HOLE DIAMETER 8.00 "

DRILLER: Gregg Drilling and Testing, Inc.

DRILLING METHOD: Mud Rotary

TOTAL DEPTH: 220 feet

STATE ID:

5S/2W 03H004

SHEET: 2 of 2

BORING:

Jarvis-C

## LITHOLOGIC DESCRIPTION

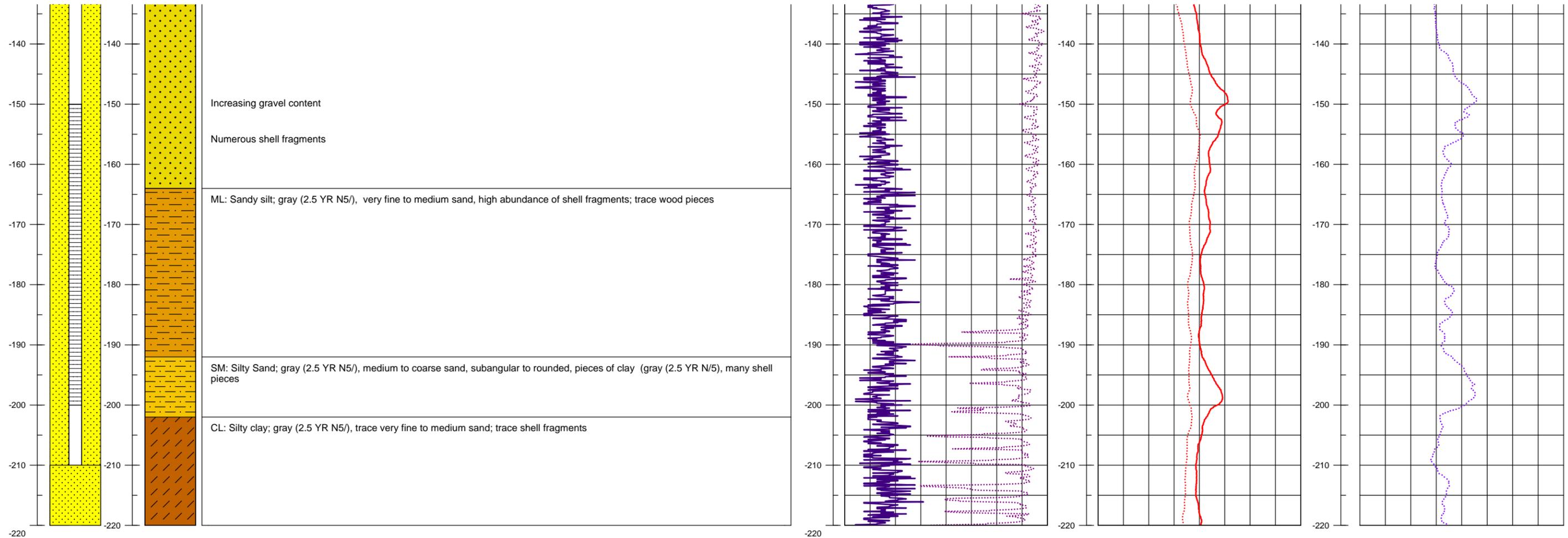
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) 410  
Spontaneous Potential (mV) - +

Short Normal (Ohm-m) 50  
Long Normal (Ohm-m) 50

Point Resistivity (Ohm) 0 35





# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID:

BORING:

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

5S/2W 03H005

Jarvis-F

JOB NUMBER: 21075

LOCATION: Old Jarvis Avenue

DATE: 10/24/2014

HOLE DIAMETER 8.00 "

TOTAL DEPTH: 345 feet

SHEET: 2 of 3

## LITHOLOGIC DESCRIPTION

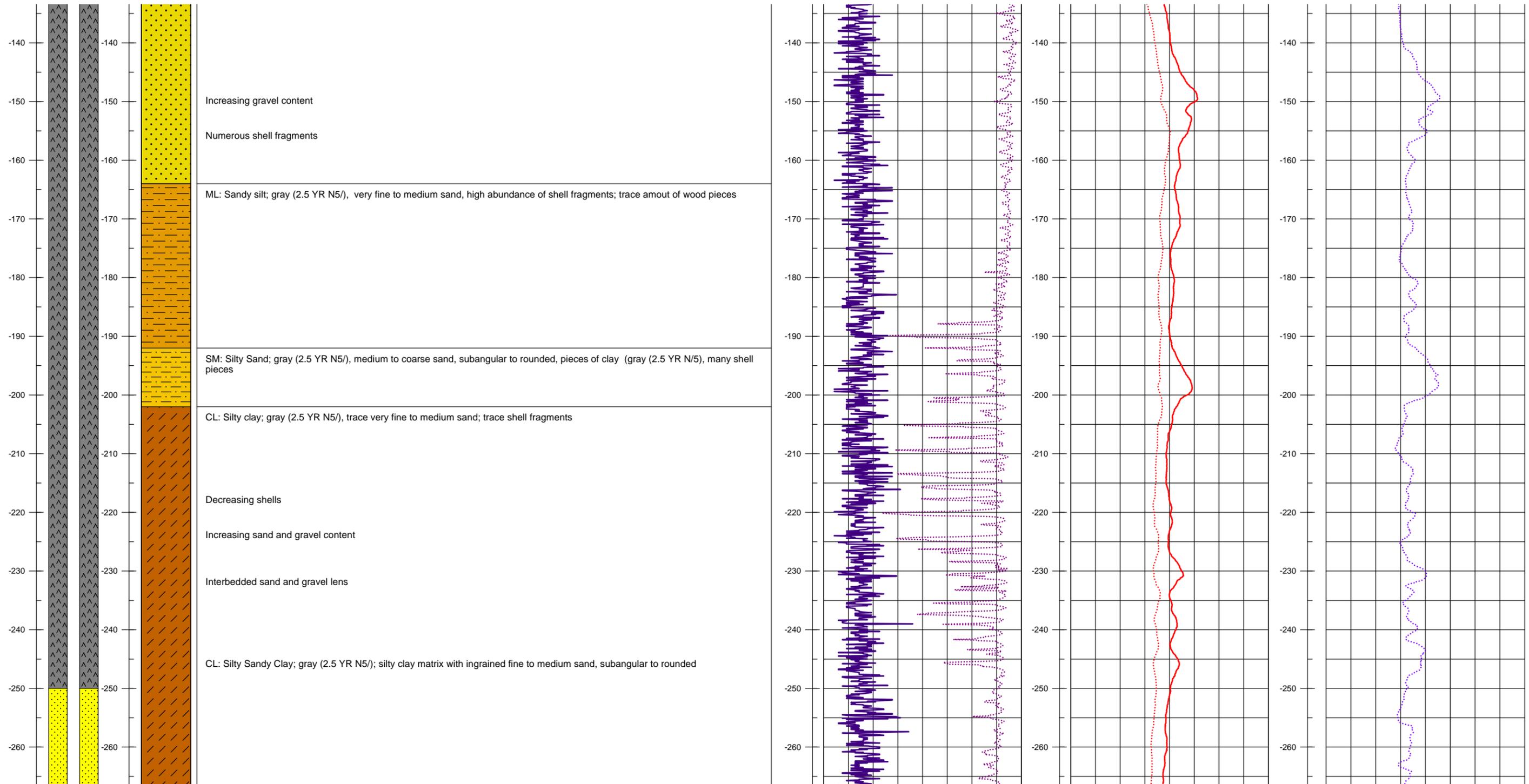
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) -25 410  
Spontaneous Potential (mV) - +

Short Normal (Ohm-m) -25 50  
Long Normal (Ohm-m) -25 50

Point Resistivity (Ohm) 0 35



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID:

BORING:

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

5S/2W 03H005

Jarvis-F

JOB NUMBER: 21075

LOCATION: Old Jarvis Avenue

DATE: 10/24/2014

HOLE DIAMETER 8.00 "

TOTAL DEPTH: 345 feet

SHEET: 3 of 3

## LITHOLOGIC DESCRIPTION

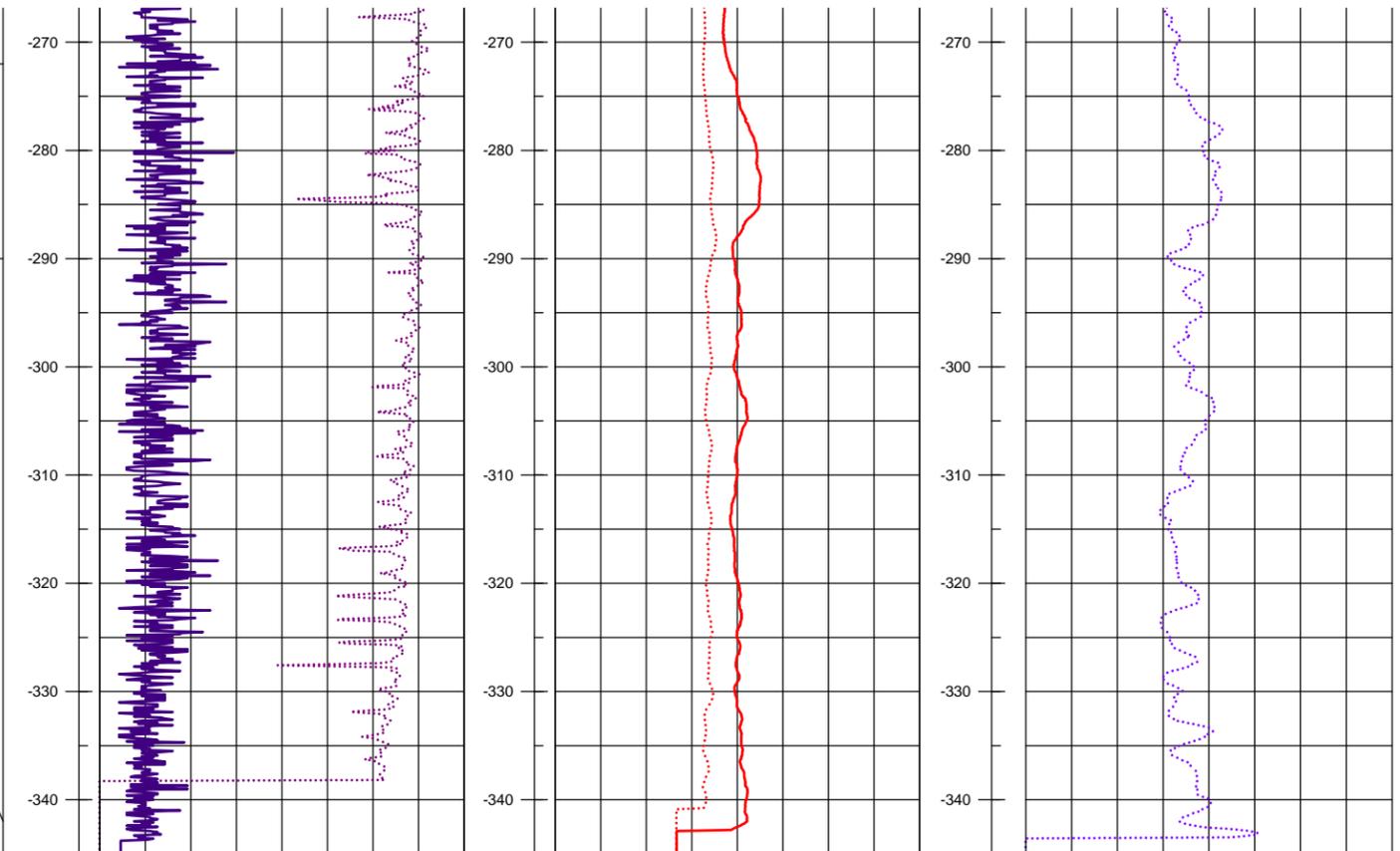
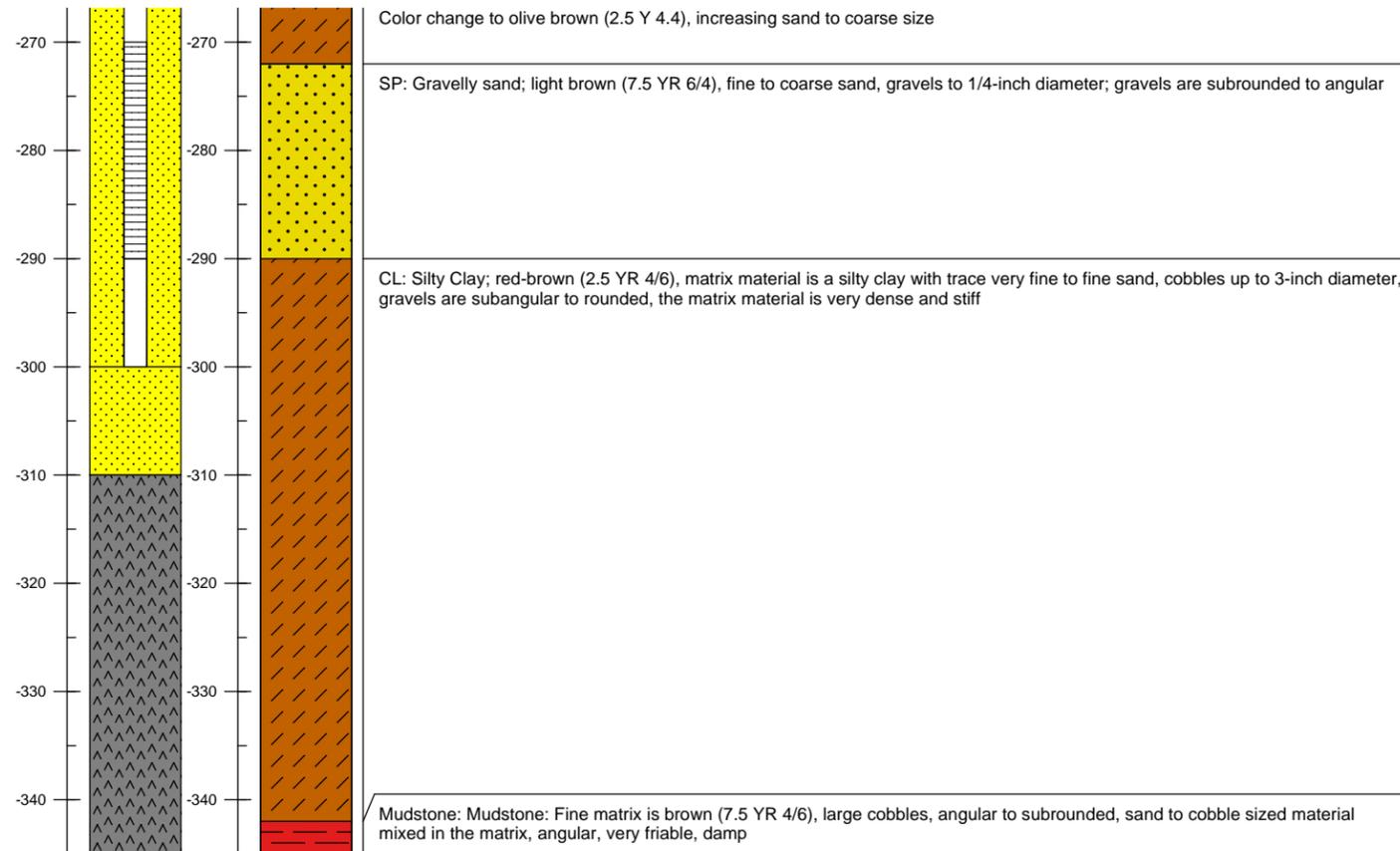
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) -25 410  
Spontaneous Potential (mV) - +

Short Normal (Ohm-m) -25 50  
Long Normal (Ohm-m) -25 50

Point Resistivity (Ohm) 0 35



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

JOB NUMBER: 21075

LOCATION: Behind Cargill Salt

DATE: 10/13/2014

LOGGED BY: Douglas Young

ELECTRIC LOG BY: Dewey Data, Inc.

HOLE DIAMETER 8.00 "

DRILLER: Gregg Drilling and Testing, Inc.

DRILLING METHOD: Mud Rotary

TOTAL DEPTH: 610 feet

STATE ID:

5S/2W 24B003

SHEET: 1 of 5

BORING:

Mowry Slough - C

## LITHOLOGIC DESCRIPTION

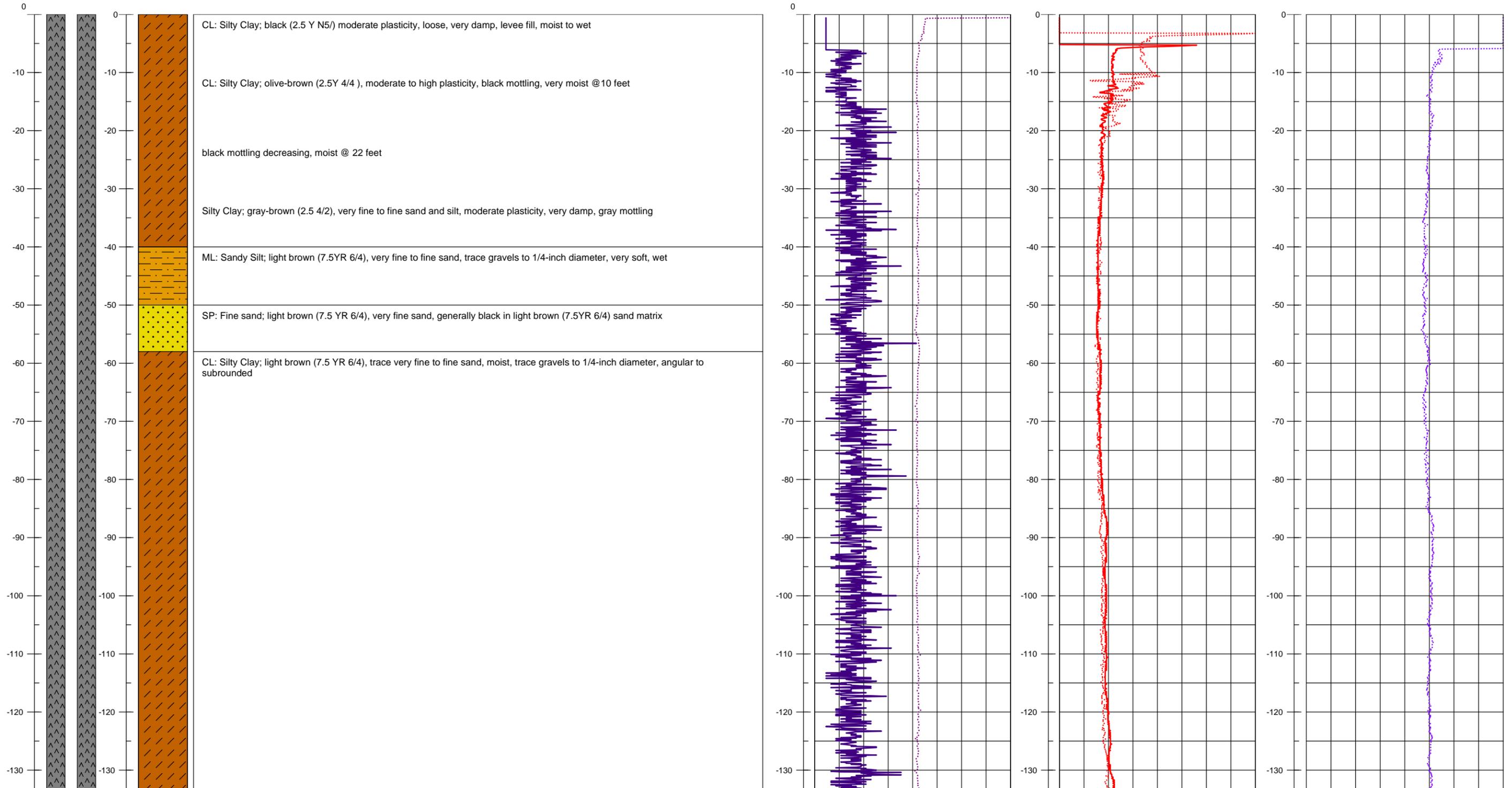
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR)      -25      410  
Spontaneous Potential (mV)      (-)      (+)

Short Normal (Ohm-m)      0      30  
Long Normal (Ohm-m)      0      30

Point Resistivity (Ohm)      -0.25      0



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID:

BORING:

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

5S/2W 24B003

Mowry Slough - C

JOB NUMBER: 21075

LOCATION: Behind Cargill Salt

DATE: 10/13/2014

HOLE DIAMETER 8.00"

TOTAL DEPTH: 610 feet

SHEET: 2 of 5

## LITHOLOGIC DESCRIPTION

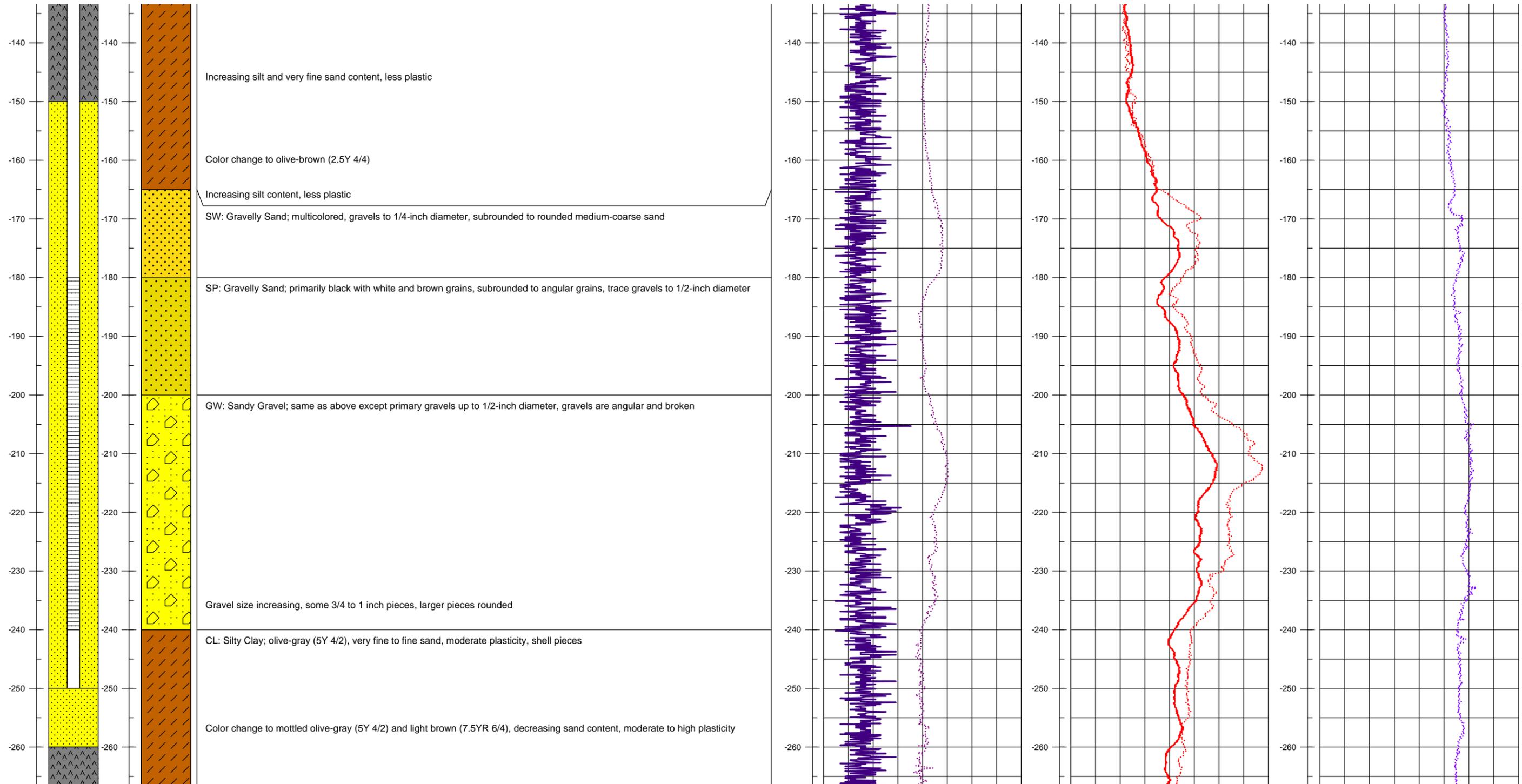
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR) 410  
Spontaneous Potential (mV)

Short Normal (Ohm-m) 30  
Long Normal (Ohm-m) 30

Point Resistivity (Ohm) 0



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID: 5S/2W 24B003

BORING: Mowry Slough - C

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

SHEET: 3 of 5

JOB NUMBER: 21075

LOCATION: Behind Cargill Salt

DATE: 10/13/2014

HOLE DIAMETER 8.00 "

TOTAL DEPTH: 610 feet

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

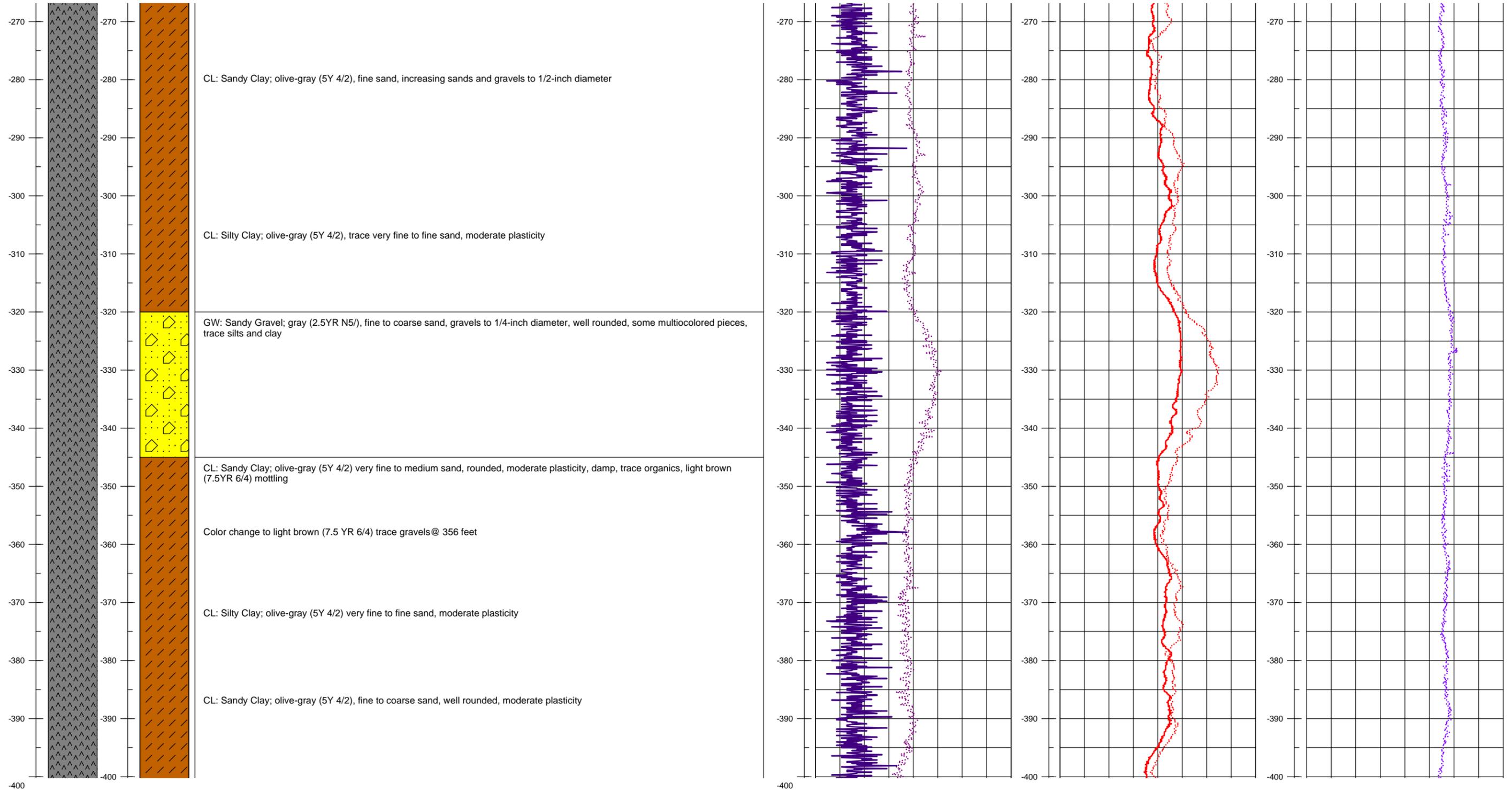
## LITHOLOGIC DESCRIPTION

## GEOPHYSICAL DATA

Gamma (API-GR) -25 410  
Spontaneous Potential (mV) (- +)

Short Normal (Ohm-m) 0 30  
Long Normal (Ohm-m) 0 30

Point Resistivity (Ohm) -25 0



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

JOB NUMBER: 21075

LOCATION: Behind Cargill Salt

DATE: 10/13/2014

LOGGED BY: Douglas Young

ELECTRIC LOG BY: Dewey Data, Inc.

HOLE DIAMETER 8.00 "

DRILLER: Gregg Drilling and Testing, Inc.

DRILLING METHOD: Mud Rotary

TOTAL DEPTH: 610 feet

STATE ID:

5S/2W 24B003

SHEET: 4 of 5

BORING:

Mowry Slough - C

## LITHOLOGIC DESCRIPTION

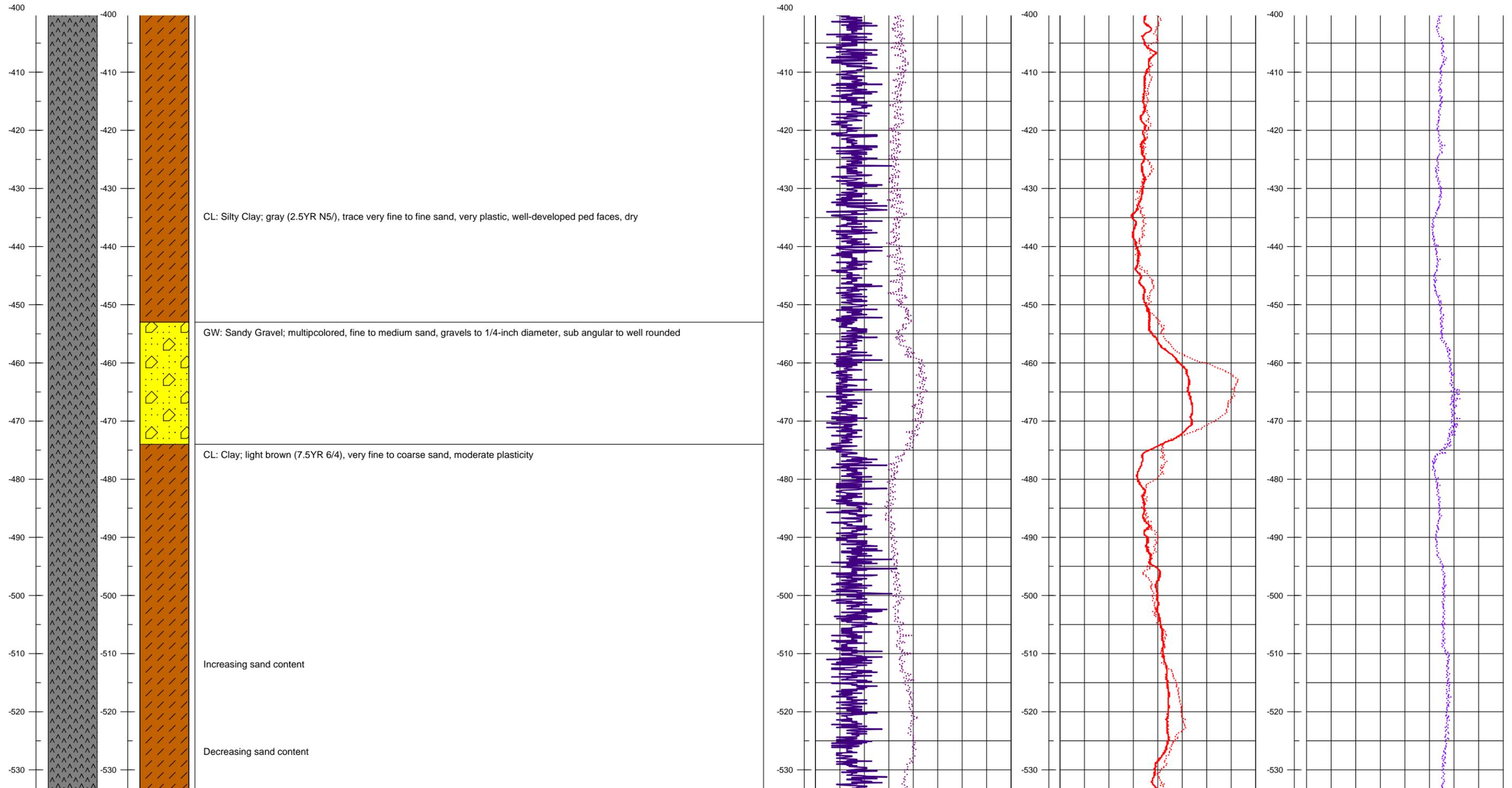
## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

Gamma (API-GR)      -25      410  
Spontaneous Potential (mV)      (-)      (+)

Short Normal (Ohm-m)      0      30  
Long Normal (Ohm-m)      0      30

Point Resistivity (Ohm)      -0.25      0



# Niles Cone Saltwater Intrusion and Aquifer Characterization Project

LOGGED BY: Douglas Young

DRILLER: Gregg Drilling and Testing, Inc.

STATE ID:

BORING:

ELECTRIC LOG BY: Dewey Data, Inc.

DRILLING METHOD: Mud Rotary

5S/2W 24B003

Mowry Slough - C

JOB NUMBER: 21075

LOCATION: Behind Cargill Salt

DATE: 10/13/2014

HOLE DIAMETER 8.00 "

TOTAL DEPTH: 610 feet

SHEET: 5 of 5

## LITHOLOGIC DESCRIPTION

## GEOPHYSICAL DATA

Depth (in feet)  
Well Construction  
Lithologic Pattern  
Geophysical Sample

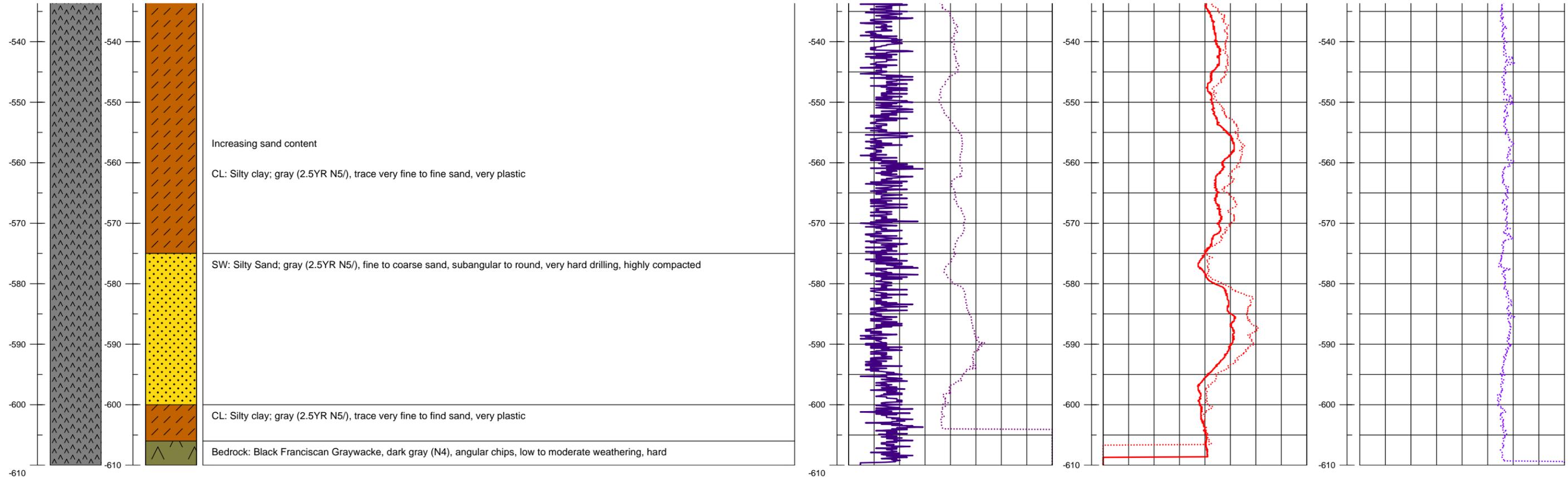
-25 Gamma (API-GR) 410

0 Short Normal (Ohm-m) 30

(- Spontaneous Potential (mV) +)

0 Long Normal (Ohm-m) 30

.25 Point Resistivity (Ohm) 0



# Appendix F

## Development Logs



Auto mill PARKWAY LANDFILL LEVEE - D2

MONITORING WELL DEVELOPMENT LOG

All measurements taken from:  Top of Casing  Protective Casing  Ground Level

Sample ID \_\_\_\_\_

Well Number 5S1W206001  
Date 10/16/14  
Time Start: 600 End: 300  
Client Alameda WATER  
Project 7016 AUTO MILL, FREMONT, CA  
Job Number D2140458  
Installation Date —  
Well Diameter 2"

Borehole Diameter 88  
Screen Length 30 FT  
Measured Depth (pre-development) —  
Measured Depth (post-development) 586.80  
Static Water Level (ft.) 17.63  
Standing Water Column (ft.) —  
One Casing Volume (gal.) —  
One Annulus Vol. (gal.) —

Qty. of Drilling Fluid Lost \_\_\_\_\_  
Minimum Gal. to be Purged \_\_\_\_\_  
Development Method Bail-Surge  
Bail-air lift  
Purging Equipment S Bailed-air  
Water Level Equipment Solinst  
pH/EC Meter HORIBA US3  
Turbidity Meter HORIBA US3  
Other —

Time	Amount Purged (gal.)	Field Parameters Measured							Comments	Field Tech.
		pH	EC	Turbidity	D.O.	Temperature	SAL	GPM		
1101	300	8.44	4.47	89.0	-	19.25	2.4	10 gpm	Bail-25 gal	
1111	400	7.93	3.96	23.6	-	18.66	2.1		Surge-40 min	
1141	500	7.86	2.91	94.3	-	18.50	1.5		Bail-30 gal	
1131	600	7.90	2.75	71.5	-	18.69	1.5		- 1051 -	
1141	700	7.83	2.79	42.9	-	18.71	1.5			
1151	800	7.98	2.54	18.6	-	19.11	1.3			
1201	900	7.98	2.40	23.7	-	18.51	1.3			
1206	950	7.99	2.41	14.3	-	18.66	1.3			
1211	1000	7.96	2.44	16.4	-	18.76	1.3			
1216	1050	7.98	2.46	22.0	-	18.74	1.3			
1221	1,100	7.99	2.53	20.7	-	18.79	1.3			

FINAL FIELD PARAMETER MEASUREMENTS

1220	1,150	7.96	2.54	21.8	-	18.42	1.3			
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All measurements taken from:  Top of Casing  Protective Casing  Ground Level

Well Number 5S1W206  
 Date 10/16/14  
 Time Start: 800 End: 300  
 Client Alameda WATER  
 Project 7010 AUTOMAIL, FREMONT, CA  
 Job Number D2140458  
 Installation Date -  
 Well Diameter 2'

Borehole Diameter 8'  
 Screen Length 30 FT  
 Measured Depth (pre-development) 590.00  
 Measured Depth (post-development) 586.60  
 Static Water Level (ft.) 17.63  
 Standing Water Column (ft.) \_\_\_\_\_  
 One Casing Volume (gal.) \_\_\_\_\_  
 One Annulus Vol. (gal.) \_\_\_\_\_

Sample ID \_\_\_\_\_  
 Qty. of Drilling Fluid Lost \_\_\_\_\_  
 Minimum Gal. to be Purged \_\_\_\_\_  
 Development Method Bail-Surge  
Bail-pickup  
 Purging Equipment SS Bailor-Air  
 Water Level Equipment Salinst  
 pH/EC Meter HORIBA US3  
 Turbidity Meter HORIBA US3  
 Other \_\_\_\_\_

Time	Amount Purged (gal.)	Field Parameters Measured							GPM	Comments	Field Tech.
		pH	EC	Turbidity	D.O.	Temperature	SAL.				
1231	1,200	7.94	2.36	31.8	-	18.21	1.0	10	END WATER LEVEL 26.88		
1236	1,250	7.97	2.15	27.5	-	18.25	1.0				
1241	1,306	7.94	1.81	14.3	-	18.36	0.9				
1246	1,358	7.97	1.79	12.7	-	18.15	0.9				
1251	1,460	7.98	1.82	15.5	-	18.14	0.9				
1256	1,458	7.99	1.83	11.5	-	18.11	0.9				
1:01	1,500	7.95	1.85	7.3	-	18.14	0.9				
1:06	1,600	7.97	1.81	8.4	-	18.19	0.9				
1:16	1,700	7.97	1.85	6.3	-	18.21	0.9				
1:46	1,800	7.96	1.87	7.0	-	18.26	0.9				
1:42	1,700	7.98	1.83	8.6	-	18.24	0.9				
FINAL FIELD PARAMETER MEASUREMENTS											
1:52	2,000	7.99	1.88	9.3	-	18.26	0.9				

## MONITORING WELL DEVELOPMENT LOG

All measurements taken from:  Top of Casing  Protective Casing  Ground Level

Well Number 552W3H4  
 Date 11/12/14  
 Time Start: 9:00 End: \_\_\_\_\_  
 Client Alameda Water District  
 Project Niles Cone  
 Job Number D2140458  
 Installation Date \_\_\_\_\_  
 Well Diameter 2"

Borehole Diameter 8"  
 Screen Length 50 FT  
 Measured Depth (pre-development) 210.50  
 Measured Depth (post-development) 210.55  
 Static Water Level (ft.) 2.25  
 Standing Water Column (ft.) \_\_\_\_\_  
 One Casing Volume (gal.) \_\_\_\_\_  
 One Annulus Vol. (gal.) \_\_\_\_\_

Sample ID \_\_\_\_\_  
 Qty. of Drilling Fluid Lost \_\_\_\_\_  
 Minimum Gal. to be Purged \_\_\_\_\_  
 Development Method Bail-Surge  
Bail-air Lift  
 Purging Equipment SS Bailor-Air  
 Water Level Equipment Solinst  
 pH/EC Meter HORIBA US2  
 Turbidity Meter HORIBA US2  
 Other \_\_\_\_\_

Time	Amount Purged (gal.)	Field Parameters Measured							Comments	Field Tech.
		pH	EC	Turbidity	D.O.	Temperature	SAL	GPM		
125	500	7.22	77.4	227	-	19.10	48.3	10	Bail: 25 gal	
135	550	7.21	78.0	132	-	19.88	53.9	10	Surge- 40 min	
140	600	7.28	79.2	141	-	19.11	53.8	16	Bail: 30 gal	
145	650	7.25	76.4	122	-	19.16	53.1	10		
150	700	7.29	74.5	104	-	19.52	51.3	10		
155	750	7.31	74.8	116	-	19.49	51.5	10		
200	800	7.26	74.3	86.3	-	19.64	51.0	10		
205	850	7.23	74.4	70.5	-	19.54	51.2	10		
210	900	7.24	74.8	87.3	-	19.50	51.2	10		
215	950	7.22	73.8	77.1	-	19.44	51.3	16		
220	1000	7.20	72.5	61.5	-	19.43	51.2	10		

FINAL FIELD PARAMETER MEASUREMENTS

230	1100	7.18	72.3	59.2	-	19.46	51.1	16		
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Jarvis - F

MONITORING WELL DEVELOPMENT LOG

All measurements taken from:  Top of Casing  Protective Casing  Ground Level

Well Number 552W3H5  
Date 11/14/14  
Time Start: 900 End: 300  
Client Almed water  
Project Niles cone  
Job Number D2140458  
Installation Date \_\_\_\_\_  
Well Diameter 2

Borehole Diameter 8"  
Screen Length 20 FT  
Measured Depth (pre-development) 300.00  
Measured Depth (post-development) 300.00  
Static Water Level (ft.) 2.45  
Standing Water Column (ft.) \_\_\_\_\_  
One Casing Volume (gal.) \_\_\_\_\_  
One Annulus Vol. (gal.) \_\_\_\_\_

Sample ID \_\_\_\_\_  
Qty. of Drilling Fluid Lost \_\_\_\_\_  
Minimum Gal. to be Purged \_\_\_\_\_  
Development Method Bail - Surge  
Bail - AIR LIFT  
Purging Equipment SS Bailar. Air  
Water Level Equipment Solinst  
pH/EC Meter HORIBA US2  
Turbidity Meter HORIBA US2  
Other \_\_\_\_\_

Time	Amount Purged (gal.)	Field Parameters Measured							Comments	Field Tech.
		pH	EC	Turbidity	D.O.	Temperature	SAL	GPM		
945	100	7.10	50.2	385	-	17.11	31.5	2	11/12/14 Bail - 10 gal Surge - 3 min Bail - 20 gal	
				- well dry stop to Recharge						
1020	70	7.00	54.9	184	-	17.25	25.4			
				- well dry stop to Recharge						
1115	80	7.25	49.2	155	-	17.00	19.7			
				- well dry stop to Recharge						
1200	90	7.44	50.1	115	-	16.98	24.6			
				- well dry stop to Recharge						
1250	100	7.31	48.5	76.5	-	17.20	25.2			
				well dry stop to Recharge						
135	110	7.28	47.2	58.1	-	17.13	25.6			
				- Recharge - FINAL FIELD PARAMETER MEASUREMENTS						
215	120	7.25	47.4	46.7	-	17.25	25.3			



MONITORING WELL DEVELOPMENT LOG

All measurements taken from:  Top of Casing  Protective Casing  Ground Level

Well Number 55/2w. 08M011  
 Date 12-1-14  
 Time Start: 750 End: 220  
 Client OCW  
 Project \_\_\_\_\_  
 Job Number \_\_\_\_\_  
 Installation Date \_\_\_\_\_  
 Well Diameter 2"

Borehole Diameter 8"  
 Screen Length 28 FT  
 Measured Depth (pre-development) 290  
 Measured Depth (post-development) 290  
 Static Water Level (ft.) 1.33  
 Standing Water Column (ft.) \_\_\_\_\_  
 One Casing Volume (gal.) \_\_\_\_\_  
 One Annulus Vol. (gal.) \_\_\_\_\_

Sample ID \_\_\_\_\_  
 Qty. of Drilling Fluid Lost \_\_\_\_\_  
 Minimum Gal. to be Purged \_\_\_\_\_  
 Development Method Bail-Surge  
Bail-Air Lift  
 Purging Equipment SSBoiler-Air  
 Water Level Equipment Solinst  
 pH/EC Meter HORIBA US2  
 Turbidity Meter HORIBA US2  
 Other \_\_\_\_\_

Time	Amount Purged (gal.)	Field Parameters Measured							Comments	Field Tech.
		pH	EC	Turbidity	D.O.	Temperature	SAL	GPM / W.L.		
1240	1,000	7.14	2.89	39.4	-	17.90	1.5	Air	Bail-25 gal	
1245	1,050	7.25	1.77	42.8	-	17.83	1.5		Surge-20 Min	
1250	1,100	7.11	1.96	29.8	-	17.62	1.5		Bail-25 gal	
1255	1,150	7.27	1.97	20.3	-	17.70	1.3			
1300	1,200	7.23	1.96	28.1	-	17.69	1.3			
1316	1,300	7.28	1.90	21.5	-	17.71	1.3			
1320	1,400	7.31	1.98	27.3	-	17.66	1.1			
1330	1,500	7.45	1.99	18.5	-	17.70	1.1			
140	1,600	7.44	1.96	13.7	-	17.74	1.1			
150	1,700	7.46	1.91	17.4	-	17.73	1.1			
200	1,800	7.47	1.93	19.1	-	17.71	1.1			

FINAL FIELD PARAMETER MEASUREMENTS

216	1,900	7.45	1.92	18.5	-	17.73	1.1			
220	2,000	7.47	1.95	20.2	-	17.71	1.1			





# Appendix G

## 2015 Spring and Fall Groundwater Monitoring Data Tables

Alameda County Water District  
Groundwater Monitoring Program  
Spring 2015

Well Number	Alternate Well ID	Aquifer	Owner	Date of Water Level	Reference Elevation (feet MSL)	Water Elevation (feet MSL)	Water Sample Date	Chloride (ppm)	TDS (ppm)	Remarks
3S/3W-25C020	WD2	D	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	8.84	-6.6	- -			PWC
4S/1W-07K001		D	Masonic Homes of California	3/24/2015	67.4	-1.3	- -			PI
4S/1W-07N005		CF	City of Union City	3/25/2015	55.29	2.0	- -			UTS
4S/1W-17M006	Well L	D	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	49.9	-0.8	- -			PWC
4S/1W-17M007	Well M	CF	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	50	1.8	- -			PWC
4S/1W-17M008	Well N	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	49.62	14.0	- -			PWC
4S/1W-18K005		CF	City of Union City	- -	48.6		- -			NA NMP UTM UTS
4S/1W-18M010		CF	Frank J & Catherine M Thrall	4/2/2015	39.92	-0.3	- -			
4S/1W-18N004		CF	Eleanor Kabrich	3/26/2015	41.6	1.5	- -			T
4S/1W-19A003		F	Alameda County Flood Control	3/24/2015	54.37	-4.6	- -			
4S/1W-19E002	PIEZ#4	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	37.95	13.1	- -			PWC
4S/1W-19J006		N	Alameda County Flood Control	3/24/2015	51.28	14.1	- -			PWC
4S/1W-19L002		CF	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	40.39	0.2	- -			OBS@160' PWC
4S/1W-19N002	Well H	D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	40.45	-0.9	3/24/2015	342	920	PWC
4S/1W-19N003		CF	CITY OF FREMONT	3/31/2015	39.81	-1.3	- -			OBS@200' PWC pumped @190'
4S/1W-19N004	Well I	F	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	40.68	-1.2	3/24/2015	239	700	PWC
4S/1W-19N005	Well J	C	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	40.55	-0.6	3/24/2015	80	430	PWC
4S/1W-19N014	Well K	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	40.5	12.6	3/24/2015	85	450	PWC
4S/1W-20A003	Nursery Well	CF	ALAMEDA COUNTY WATER DISTRICT	3/27/2015	63.42	-9.6	- -			
4S/1W-20G001		CFD	ALAMEDA COUNTY WATER DISTRICT	3/27/2015	60.72	5.1	- -			UTS
4S/1W-20H003		N	ALAMEDA COUNTY WATER DISTRICT	- -	67.52		- -			NA OBS PWC UTM Trees cut down over well
4S/1W-20J004	UP-1A	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	58.9	20.3	- -			PWC smaller lid, need new bolts; has transducer
4S/1W-20J005	UP-1C	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	59.14	15.3	- -			PWC UTS small lid, leftmost facing creek; need new bolts
4S/1W-20J006	UP-1B	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	59.07	19.8	- -			PWC smaller lid, need new bolts
4S/1W-20R003	UP-2A	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	59.11	17.3	- -			PWC UTS
4S/1W-20R004	UP-2B	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	59.2	15.7	- -			PWC
4S/1W-20R005	UP-2C	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	59.06	14.5	- -			PWC Leftmost Well
4S/1W-21H002		AHF	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	75.08	46.2	- -			PWC
4S/1W-21J003		AHF	ALAMEDA COUNTY WATER DISTRICT	3/27/2015	77.3	41.9	- -			PWC pumped@90', GW deeper than expected
4S/1W-21L003		AHF	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	66.57	39.7	- -			transducer
4S/1W-21L005		AHF	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	67.46	40.2	- -			PWC Pumped@65', GW deeper than expected
4S/1W-21L006		AHF	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	67.81	46.6	- -			transducer
4S/1W-21L007		AHF	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	70.62	41.2	- -			transducer
4S/1W-21L008		AHF	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	66.94	39.7	- -			PWC
4S/1W-21P004		AHF	CITY OF FREMONT	3/24/2015	65.29	38.5	- -			EPD UTS
4S/1W-21P006	P.T. #1	AHF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	66.37	32.6	4/14/2015	94	550	RUN
4S/1W-21P007	P.T. #2	AHF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	66.77	19.6	4/1/2015	95	540	NMP RUN UTM
4S/1W-21P008	P.T. #3	AHF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	66.54	26.3	4/1/2015	102	480	RUN
4S/1W-21P009	P.T. #4	AHF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	66.44	27.7	4/1/2015	98	470	RUN
4S/1W-21P010	P.T. #5	AHF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	67.28	34.1	4/13/2015	98	480	
4S/1W-21P011	P.T. #6	AHF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	67.69	34.2	- -			
4S/1W-21P012	P.T. #7	AHF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	68.36	37.0	- -			NMP
4S/1W-21P013	P.T. #8	AHF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	68.86	25.8	4/1/2015	101	460	RUN
4S/1W-21R007		AHF	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	72.21	41.2	- -			PWC pumped@70'
4S/1W-22P006		AHF	ALVIN MARTIN	3/30/2015	80.61	40.9	- -			RUN T CUST REQ. RESULTS WHEN SAMPLED
4S/1W-26L006		AHF	CITY OF FREMONT	- -	67.79		- -			UTM
4S/1W-26Q011		AHF	ERNIE SILVA	3/26/2015	96.44	73.6	- -			T UTM
4S/1W-27A002		AHF	Fremont Community Church	3/26/2015	71.09	41.8	- -			
4S/1W-27D008	AHF Indicator	AHF	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	66.59	40.9	- -			PWC
4S/1W-27E001		AHF	CHURCH OF JESUS CHRIST	3/25/2015	62.86	40.6	- -			PI T UTS
4S/1W-27G002		AHF	CITY OF FREMONT	- -			- -			OFF UTM UTS
4S/1W-27P001		AHF	CITY OF FREMONT	3/25/2015	54.04	43.4	- -			OFF
4S/1W-27P002		AHF	CITY OF FREMONT	3/25/2015	52.65	42.6	- -			

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Well Number	Alternate Well ID	Aquifer	Owner	Date of Water Level	Reference Elevation (feet MSL)	Water Elevation (feet MSL)	Water Sample Date	Chloride (ppm)	TDS (ppm)	Remarks
4S/1W-28C001	Mowry #1	N	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	64.81	10.4	4/6/2015	92	470	RUN
4S/1W-28C014	Mowry #2	D	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	63.64	-3.0	- -			RUN transducer
4S/1W-28C015	Mowry #3	CF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	63.87	-2.1	3/30/2015	81	450	RUN
4S/1W-28C016	Mowry #4	N	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	66.08	10.6	4/8/2015	93	470	RUN
4S/1W-28C018	Mowry #6	CF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	64.8	-2.4	- -			
4S/1W-28C019	Mowry #7	N	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	63.82	10.4	- -			RUN
4S/1W-28C020	Mowry #8	N	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	64.13	11.4	- -			RUN transducer
4S/1W-28C021	Mowry #9	CF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	65.02	-2.5	- -			transducer
4S/1W-28D001	Well A	D	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	63.03	-1.4	- -			PWC well head needs to be modified
4S/1W-28D008	Well B	F	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	62.77	-1.5	- -			PWC needs new paint
4S/1W-28D011	Well C	C	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	62.9	-0.7	- -			PWC needs new paint
4S/1W-28D012	Well D	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	62.86	12.3	- -			PWC needs new paint
4S/1W-28F018		N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	58.71	11.2	4/1/2015	59	540	PWC pumped @ 75' for 20 min.
4S/1W-28F024	BART WAY-F	F	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	59.15	-1.1	4/1/2015	168	740	PWC
4S/1W-28G005		C	Washington Township Healthcare Dist	4/1/2015	57.79	-1.5	- -			not hooked up yet
4S/1W-28H007		AHF	SAL R. GUARDINO	3/27/2015	63.04	40.4	- -			RUN T , MTBE
4S/1W-28M002		N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	53.81	11.2	3/24/2015	89	600	PWC Replaced Lid
4S/1W-28M005		D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	54.12	-1.3	3/24/2015	129	500	PWC Replaced Lid
4S/1W-28M006		CF	Mercedes Williams	4/1/2015	57.09	-1.7	- -			PI UTS
4S/1W-28M009		F	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	54.21	-1.5	3/24/2015	624	1,600	PWC Replaced Lid
4S/1W-28M010		C	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	54.2	-1.1	3/24/2015	104	590	PWC Replaced Lid
4S/1W-28P001		CF	Central Realty Company	3/25/2015	55.62	7.1	- -			OBS@60' PWC UTS
4S/1W-28P004	BEACON	C	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	53.56	-1.1	3/24/2015	91	610	PWC
4S/1W-28P006	Well E	D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	53.66	-1.9	3/24/2015	208	630	PWC
4S/1W-28P007	Well F	F	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	53.5	-2.0	3/24/2015	804	1,700	PWC
4S/1W-28P008	Well G	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	53.53	10.9	3/24/2015	102	780	PWC
4S/1W-28R003	Fmt. Library F	F	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	59.7	-1.5	- -			PWC well box flooded
4S/1W-29A006	BHF Indicator	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	61.23	13.9	- -			PWC
4S/1W-29F002		N	Robert D & Virginia W. Grate	3/27/2015	51.93	12.6	- -			PWC
4S/1W-29H002	Centerville Par	F	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	52.44	-1.3	- -			PWC
4S/1W-29J003		CF	CITY OF FREMONT	- -	55.28	- -	- -			NMP OFF UTM UTS
4S/1W-29J008		N	Eugene Dias	3/25/2015	58.48	11.4	- -			PI T UTS
4S/1W-29L012	Fremont Mattos	D	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	50.62	-2.3	- -			M PWC Need 2" pipe
4S/1W-30A002	Well O	FD	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	51.81	-1.6	- -			PWC transducer
4S/1W-30A004	Well Q	C	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	52.01	-0.4	- -			PWC
4S/1W-30A005	Well R	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	52.2	12.6	- -			PWC
4S/1W-30E003	CORONADO 2	D	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	42.12	-1.9	- -			PWC transducer
4S/1W-30E004	CORONADO 1	N	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	42.17	11.8	- -			PWC
4S/1W-30J002		N	Jeffery H. Lee	3/30/2015	46.74	11.8	- -			PWC
4S/1W-30L006		D	Joseph G. Dutra	3/30/2015	42.23	-1.5	- -			UTS , call first for permission
4S/1W-30L008		N	Joseph G. Dutra	3/30/2015	41.9	11.7	- -			UTS , call first for permission
4S/1W-30R002		CF	Frank G. & Alice C. Garcia	3/31/2015	46.14	-6.5	- -			PI T
4S/1W-30R004		N	Frank G. & Alice C. Garcia	3/31/2015	45.19	11.3	- -			NA PWC
4S/1W-31B003	Willowood #1	D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	43.54	-1.5	- -			PWC
4S/1W-31B011	Willowood # 2	CF	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	44.47	-3.8	- -			UTS
4S/1W-31C003		N	ALAMEDA COUNTY WATER DISTRICT	4/2/2015	36.56	11.0	4/2/2015	111	550	PWC
4S/1W-31J001		D	GLENMOOR GARDENS HOMEOWNERS ASSOCIA	3/25/2015	38.94	-2.7	- -			T
4S/1W-31L008		N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	36.76	10.4	- -			PWC
4S/1W-31L009		N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	33.94	10.2	- -			PWC Replaced Lid
4S/1W-31N001	Cedar #1	CF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	35.37	-35.7	- -			RUN UTM
4S/1W-31N003	Cedar #2	N	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	35.2	7.8	- -			RUN UTM
4S/1W-32E011	Meyer Park - C	C	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	43.68	-4.1	- -			PWC
4S/1W-32E012	Meyer Park - F	F	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	43.89	-1.9	- -			PWC

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4S/1W-32K011	Serra Place-F	F	ALAMEDA COUNTY WATER DISTRICT	4/1/2015	43.39	-2.0	- -			PWC Transducer
4S/1W-32K014	Serra-C	C	ALAMEDA COUNTY WATER DISTRICT	4/1/2015	43.28	-4.3	- -			PWC
4S/1W-32M010		N	ALAMEDA COUNTY WATER DISTRICT	4/1/2015	38.67	10.7	- -			M PWC Well head is crooked
4S/1W-32N001	Blacow - C	C	ALAMEDA COUNTY WATER DISTRICT	3/27/2015	37.65	-5.7	3/26/2015	144	620	PWC
4S/1W-32N002	Blacow - F	F	ALAMEDA COUNTY WATER DISTRICT	3/27/2015	37.59	-2.2	3/26/2015	1,113	2,200	PWC
4S/1W-33N002	Knoll Park	C	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	43.75	-2.6	3/25/2015	751	1,700	PWC
4S/1W-33N003	Knoll Park - F	F	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	43.64	-1.7	3/25/2015	208	650	PWC
4S/1W-33R007	Margery/BI - C	C	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	53.25	-1.9	- -			PWC
4S/1W-33R008	Margery/BI - F	F	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	53.18	-1.8	- -			PWC
4S/1W-34A002		AHF	Elsie Nines	3/30/2015	60	52.3	- -			T
4S/1W-34C001		AHF	CITY OF FREMONT	- -	61.3		- -			NA NMP RUN UTM Gate locked
4S/1W-35R003		AHF	Mary A Souza	3/31/2015	190.16	176.4	- -			T UTS no sample point
4S/2W-02H001		D	Bay Area Rapid Transit District	3/31/2015	36.21	-2.5	- -			T UTS Flashlight
4S/2W-03R003		CF	F E DUBOIS	3/24/2015	12	-12.5	- -			RUN T
4S/2W-04E002	E-3	N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	4.72	-1.8	- -			PWC
4S/2W-05G001	Eden Landing F1	F	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	6.75	-3.9	- -			PWC
4S/2W-05G002	Eden Landing D1	D	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	6.35	-4.6	- -			PWC
4S/2W-05G003	Eden Landing D2	D	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	5.82	-8.0	- -			PWC
4S/2W-05G004	Eden Landing C2	C	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	6.73	0.9	- -			PWC
4S/2W-05G005	Eden Landing	C	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	6.93	6.2	- -			PWC
4S/2W-08Q001	2D2	D	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	9.25	-2.0	- -			PWC transducer
4S/2W-09F014	Veasy Bridgegat	D	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	8.25	-2.1	3/27/2015	641	1,400	PWC transducer
4S/2W-09L002	E-12	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	9.11	3.1	- -			PWC
4S/2W-09P010	E-17	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	11.31	3.1	3/27/2015	6,726	13,000	PWC
4S/2W-10E004	Tidewater	D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	14.54	-2.5	3/25/2015	130	470	PWC transducer
4S/2W-11A003		D	U.S. PIPE HOLDINGS CORPORATION	3/24/2015	40.58	-1.6	3/30/2015	83	420	RUN
4S/2W-12C001	Whipple Well	D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	68.61	-2.3	- -			transducer
4S/2W-12K008		D	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	53.11	-1.9	- -			PWC Transducer
4S/2W-12K009		F	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	53.41	-0.2	- -			PWC transducer
4S/2W-12K010		C	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	53.39	0.9	- -			PWC transducer
4S/2W-12K011		N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	53.67	13.2	- -			PWC transducer
4S/2W-13C004		CF	MANUEL SOARES	3/30/2015	33.56	0.7	- -			OFF UTS
4S/2W-13E003		N	ALAMEDA COUNTY FLOOD CONTROL	3/30/2015	27.93	11.8	- -			PWC
4S/2W-13H004		N	CITY OF UNION CITY	3/30/2015	37.55	12.5	3/30/2015	100	600	measuring pt is under gray plastic cap
4S/2W-13K004		C	RAYMOND N. NELSEN	3/30/2015	35.04	-1.6	- -			T Need Wrench
4S/2W-13M005		CF	ROSIE & JOEY OROCCHI	3/30/2015	26.46	0.5	- -			
4S/2W-13M006		CF	ROSEMARY & ROBERT MAZZA	3/30/2015	27.42	0.2	- -			
4S/2W-13P004	PIEZ#3	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	25.9	12.0	- -			PWC Transducer
4S/2W-13P005	WELL G-1	D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	25.98	-1.5	- -			PWC
4S/2W-13P006	WELL H-1	F	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	26.15	-0.8	- -			PWC
4S/2W-13P007	WELL I-1	C	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	26	-0.4	- -			PWC
4S/2W-14C001		CF	HARVEY, T.	3/24/2015	23.27	-0.4	- -			T
4S/2W-14D003	Lake Chad	D	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	13.95	-2.0	3/25/2015	44	360	PWC Transducer
4S/2W-14D004		D	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	13.9	-2.1	3/25/2015	150	540	PWC Transducer
4S/2W-14D005		C	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	14.1	-0.2	3/25/2015	254	790	PWC
4S/2W-14D006		C	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	14.18	-0.3	3/25/2015	84	510	PWC
4S/2W-14D007		N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	14.07	9.0	3/25/2015	41	390	PWC
4S/2W-14H003		N	ACFC & WCD	- -	25.22		- -			NMP UTM
4S/2W-14L006	PIEZ#2	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	14.97	9.3	- -			PWC
4S/2W-14N001	Lowry	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	22.64	11.6	- -			
4S/2W-15C007	PIEZ#1	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	9.31	6.2	3/25/2015	48	450	PWC
4S/2W-15L005	Contempo Pk	D	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	7.63	-2.0	3/25/2015	282	750	PWC Transducer
4S/2W-15L006		C	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	7.59	-0.4	3/25/2015	120	620	PWC

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4S/2W-15L007		N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	7.66	7.8	3/25/2015	561	1,400	PWC Artesian
4S/2W-15M003		CF	CITY OF UNION CITY	- -	7.77		- -			NA UTM UTS no key to door
4S/2W-15M004		CF	CITY OF UNION CITY	3/24/2015	7.73	-0.5	- -			
4S/2W-15P001	PIEZ#10	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	6.1	7.4	- -			PWC Artesian
4S/2W-16C011	E-19	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	14.16	6.9	- -			PWC
4S/2W-16C012	E-20	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	4.62	3.2	3/31/2015	5,783	11,000	PWC
4S/2W-16J002	E-23	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	8.38	6.2	- -			PWC
4S/2W-16L011	E-26	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	3.34	4.8	- -			NA PWC UTS Ground too soft for Pump Truck, Artesian
4S/2W-16L014	E-101	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	8.5	4.7	4/10/2015	3,446	6,500	M PWC well head needs to be modified
4S/2W-16L015	Site E	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	11.82	4.5	- -			
4S/2W-16Q001	E-27	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	9.13	5.2	4/2/2015	4,423	7,600	PWC
4S/2W-21B007	Site D	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	10.94	5.6	- -			
4S/2W-21G001		CF	ALAMEDA COUNTY FLOOD CONTROL	3/26/2015	8.08	1.4	- -			UTS
4S/2W-21G004	E-31	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	8.79	5.2	- -			PWC
4S/2W-21G009	E-109	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	8.96	5.6	4/2/2015	2,382	4,300	PWC
4S/2W-21J001		CF	ALAMEDA COUNTY FLOOD CONTROL	3/26/2015	7.07	-0.9	- -			
4S/2W-21N001	E-40	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	5.49	3.8	- -			PWC
4S/2W-21P001		C	ALAMEDA COUNTY FLOOD CONTROL	3/26/2015	8.17	-2.5	- -			OBS@140' PWC
4S/2W-21P003	E-39	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	3.96	3.6	- -			PWC
4S/2W-21Q001		CF	ALAMEDA COUNTY FLOOD CONTROL	3/26/2015	5.73	-1.0	- -			PWC
4S/2W-21Q002	E-36	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	5.57	5.0	- -			M PWC well head needs to be modified
4S/2W-22H003		N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	18.16	8.5	- -			PWC
4S/2W-22J001		CF	Founders Title Co	- -	13.09		- -			RUN UTM rehabilitated as of 04.22.14
4S/2W-22P002	#8	CF	EAST BAY REGIONAL PARK DIST.	3/24/2015	10.91	-0.5	- -			OFF UTS
4S/2W-23F002		CF	CITY OF FREMONT	3/26/2015	15.76	-0.4	- -			Call to sample
4S/2W-23J002		N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	24.14	11.1	- -			PWC
4S/2W-24A007		CF	DINO R & RINA M CIARLO	- -	42.7		- -			DA NA T owners not home
4S/2W-24F011		N	LEONARD GEORGE	- -	30.01		- -			DA NA OBS@3.78 UTM , Needs new GPS coordinates
4S/2W-24L001		CF	O.G. JOHNSON	- -	31.63		- -			NA PI UTM covered by building
4S/2W-24L003		C	Sohan S & Bhupinder K Virdee	3/26/2015	33.43	-0.5	- -			well runs periodically
4S/2W-24L006		F	BETTY KITANI	3/30/2015	32	-4.8	- -			T call for appointment
4S/2W-25D001	CLSTR#1	D	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	22.23	-2.8	4/1/2015	318	740	PWC transducer
4S/2W-25D002	CLSTR#1	CF	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	23.47	-1.0	4/1/2015	433	990	PWC
4S/2W-25D003	CLSTR#1	N	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	22.99	10.9	4/1/2015	126	1,300	PWC
4S/2W-25F002		CF	City Of Newark	- -	31.19		- -			DA NA UTM Well is covered by a 36" manhole
4S/2W-25M001		N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	22.14	9.7	- -			PWC
4S/2W-26H001		D	EAST BAY REGIONAL PARK DIST.	3/30/2015	19.94	-1.5	- -			UTS , well not running
4S/2W-26K004	CLSTR#2	D	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	20.31	-1.5	- -			PWC
4S/2W-26K005	CLSTR#2	CF	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	19.91	-1.8	- -			PWC
4S/2W-26K006	CLSTR#2	N	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	19.77	9.3	- -			PWC
4S/2W-26L001	CLSTR#3	D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	15.74	-2.0	4/1/2015	263	800	M PWC cracked pad
4S/2W-26L002	CLSTR#3	CF	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	15.26	-2.3	4/1/2015	1,198	2,400	PWC
4S/2W-26M008	CLSTR#3	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	14.38	7.9	4/1/2015	166	880	M PWC Lid, well head needs to be modified
4S/2W-27L001	#10	CF	Founders Title Co.	3/24/2015	9.18	-1.4	- -			UTS
4S/2W-27L004	#12	CF	Founders Title Co.	3/24/2015	9.6	-0.3	- -			UTS
4S/2W-28A001	E-37	N	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	6.97	4.2	- -			PWC
4S/2W-28C001	E-42	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	4.69	2.7	- -			PWC
4S/2W-28D001	E-43	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	4.84	2.7	- -			PWC
4S/2W-28G001	E-41	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	6.71	3.2	4/2/2015	11,226	20,000	PWC
4S/2W-35B002		N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	15.05	8.8	- -			M OBS@80' PWC well head needs replacement
4S/2W-36A006	Darvon #1	N	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	34.06	11.0	- -			OFF UTS scada
4S/2W-36A007	Darvon #2	CF	ALAMEDA COUNTY WATER DISTRICT	3/30/2015	33.6	-17.6	4/15/2015	231	700	RUN scada
4S/2W-36D003		D	CITY OF NEWARK	- -	22.62		- -			UTM UTS

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Well Number	Alternate Well ID	Aquifer	Owner	Date of Water Level	Reference Elevation (feet MSL)	Water Elevation (feet MSL)	Water Sample Date	Chloride (ppm)	TDS (ppm)	Remarks
4S/2W-36F005	PIEZ#5	N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	21.43	9.7	- -			PWC
4S/2W-36N006		N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	14.67	8.0	- -			PWC
4S/2W-36N010	Well T	F	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	16.77	-3.3	3/26/2015	1,122	2,000	PWC
4S/2W-36N011	Well U	C	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	17.5	-8.1	3/26/2015	336	790	PWC
4S/2W-36N012	Well V	N	ALAMEDA COUNTY WATER DISTRICT	3/23/2015	15.86	9.3	3/26/2015	5,455	9,900	PWC
5S/1W-02N001		N	Dean A. & Donna H. Olsen	4/1/2015	38.01	22.2	- -			
5S/1W-03C007		CF	PRESBYTERY OF SAN FRANCISCO	3/24/2015	50.39	-2.6	- -			T .probe stuck F04
5S/1W-03G003		N	LEONCIO H & MAGDELENA C ISLAYA	- -	49.24		- -			EPD NMP OBS@surface
5S/1W-04H003	PIEZ#9	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	42.88	10.1	- -			OBS@ 120' PWC UTS Well doesn't yield water
5S/1W-04H004	Robin & Ladner	C	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	45.11	-2.6	- -			PWC
5S/1W-04H005	Robin & Ladner	F	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	44.92	-1.6	- -			PWC
5S/1W-04P002		N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	28.16	9.9	3/31/2015	223	1,100	PWC
5S/1W-05B001		N	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	38.26	10.2	- -			PWC
5S/1W-05C001	Farwell	CF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	38.29	-16.6	4/15/2015	498	1,100	RUN transducer
5S/1W-05H003	WELL C-1	D	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	34.31	-2.0	3/26/2015	31	340	M PWC Well #'s need repainting
5S/1W-05H004	WELL D-1	F	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	34.25	-2.1	3/26/2015	27	350	PWC
5S/1W-05H005	WELL E-1	C	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	34.31	-3.8	3/26/2015	571	1,400	PWC
5S/1W-05H006	WELL F-1	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	34.29	9.9	3/26/2015	264	1,100	PWC
5S/1W-05M001	PIEZ#7	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	29.42	9.6	3/26/2015	1,220	2,700	PWC
5S/1W-06H001		CF	Sam L. Arnold	- -	28.54		- -			DA EPD UTS C.O.N. gated area
5S/1W-06H004	Bellflower	CF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	30.25	-13.5	4/15/2015	474	1,100	OFF
5S/1W-06N006	Site B	N	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	21.04	9.3	- -			M Weed Overgrowth
5S/1W-06N007		CF	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	21.65	-7.8	- -			M PWC UTS Weed Overgrowth
5S/1W-07B036	Silliman - MW	C	ALAMEDA COUNTY WATER DISTRICT	4/3/2015	16	-7.3	3/26/2015	289	730	PWC
5S/1W-07G010	Y	D	ALAMEDA COUNTY WATER DISTRICT	3/26/2015	13.06	-3.8	- -			PWC
5S/1W-07H002		CF	Brook R. & Forrest E. Heath	3/26/2015	10.37	-2.8	- -			EPD M OBS@18.0 UTM Weed Overgrowth
5S/1W-07J001	E-77	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	9.51	5.5	- -			PWC
5S/1W-07J003	Site A	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	11.48	7.5	- -			OFF
5S/1W-07J005	Site A -MW	F	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	11.45	-1.6	- -			OFF PWC
5S/1W-08D001	E-117	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	18.15	9.0	- -			PWC
5S/1W-08G002	E-81	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	15.36	8.8	- -			PWC
5S/1W-08P004	E-82	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	8.7	7.5	- -			PWC
5S/1W-10K002		CF	SOUTHLAKE MOBIL HOME PARK	- -	26.96		- -			NMP UTM
5S/1W-14B003		N	J.C. & A.C. LOPES	3/24/2015	38.26	15.5	- -			
5S/1W-16M006	AutoMall-C	C	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	11.67	-2.9	- -			PWC
5S/1W-16M007	AutoMall-F	F	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	11.91	-1.9	- -			PWC
5S/1W-16M008	AutoMall D1	D	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	11.86	-1.2	- -			PWC
5S/1W-17A003	E-115	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	10.2	8.3	4/10/2015	1,087	2,600	PWC
5S/1W-17J001		CF	OAKLAND SCAVENGER CO.	- -	6.47		- -			NMP RUN UTM T
5S/1W-17J004	E-88	N	ALAMEDA COUNTY WATER DISTRICT	- -	6.74		- -			NA PWC UTM
5S/1W-17J006	E-113	N	ALAMEDA COUNTY WATER DISTRICT	- -	6.25		- -			NA PWC UTM
5S/1W-17R021		CF	WASTE MANAGEMENT OF ALAMEDA COUNTY	- -	9.67		3/25/2015	73	280	NMP UTM
5S/1W-20G001		D	ALAMEDA COUNTY WATER DISTRICT	4/2/2015	8.29	-1.0	4/2/2015	101	320	PWC
5S/1W-22H001	E-100	N	ALAMEDA COUNTY WATER DISTRICT	3/24/2015	10.42	3.5	- -			PWC
5S/2W-01B002		C	J.S. OLIVEIRA	4/1/2015	18.59	-12.3	- -			M OBS@100' PWC steel casing is damaged
5S/2W-01E007		N	SERAFINA M. MENDES	- -	16.86		- -			DA NMP UTM
5S/2W-01R001	E-68	N	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	17.04	9.8	- -			PWC
5S/2W-01R014		C	ALAMEDA COUNTY WATER DISTRICT	3/31/2015	18.28	-7.9	- -			PWC
5S/2W-02C005	E-123	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	9.81	6.3	- -			PWC
5S/2W-02E002	E-104	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	5.09	2.5	- -			PWC
5S/2W-02F003	Well W	C	ALAMEDA COUNTY WATER DISTRICT	4/2/2015	10.36	-4.5	3/27/2015	761	1,800	PWC
5S/2W-02F004	Well X	N	ALAMEDA COUNTY WATER DISTRICT	4/2/2015	10.34	6.8	3/27/2015	900	2,100	PWC
5S/2W-02M006	E-51	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	7.93	3.0	- -			M PWC Post mislabeled

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5S/2W-02M007	Site C	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	11.08	3.7	- -			UTS
5S/2W-02Q001		N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	9.5	5.9	- -			PWC
5S/2W-03G001	E-44	N	ALAMEDA COUNTY WATER DISTRICT	4/2/2015	6.9	3.9	3/27/2015	14,736	26,000	PWC
5S/2W-03H002	E-47	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	4.89	3.8	- -			PWC
5S/2W-03H004		C	ALAMEDA COUNTY WATER DISTRICT	4/2/2015	5.84	0.4	3/27/2015	26,383	43,000	PWC
5S/2W-03H005		F	ALAMEDA COUNTY WATER DISTRICT	4/2/2015	5.8	3.9	3/31/2015	163	750	PWC
5S/2W-08M011		F	ALAMEDA COUNTY WATER DISTRICT	4/3/2015	6.45	3.8	3/27/2015	220	700	PWC
5S/2W-11H002	E-60	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	9.47	5.2	- -			PWC
5S/2W-12B008		D	LESLIE SALT CO.	4/1/2015	12.49	-9.7	4/1/2015	416	790	RUN capped M.P.
5S/2W-12B020		F	MORTON SALT CO.	- -	12.73		4/1/2015	747	1,600	OFF sample any well that's running
5S/2W-12B024	#9	D	Morton Salt	- -	14.93		- -			NMP OFF UTM
5S/2W-12C003	E-62	N	ALAMEDA COUNTY WATER DISTRICT	3/25/2015	10.1	5.5	- -			PWC
5S/2W-14E005	DE1-D1	D	ALAMEDA COUNTY WATER DISTRICT	4/1/2015	7.92	7.2	- -			PWC
5S/2W-14E006	DE1-F	F	ALAMEDA COUNTY WATER DISTRICT	4/1/2015	7.96	5.7	- -			PWC
5S/2W-14E007	DE1-C	C	ALAMEDA COUNTY WATER DISTRICT	4/1/2015	7.77	4.0	- -			PWC
5S/2W-14E008	DE1-N	N	ALAMEDA COUNTY WATER DISTRICT	4/1/2015	7.75	3.2	- -			PWC
5S/2W-14E009	DE1-D2	D	ALAMEDA COUNTY WATER DISTRICT	4/1/2015	7.88	A	- -			PWC Artesian
5S/2W-17F002		N	LESLIE SALT CO.	4/1/2015	7.7	2.5	- -			M PWC re label wells
5S/2W-17F003		CF	LESLIE SALT CO.	4/1/2015	7.8	2.5	- -			M PWC re label wells
5S/2W-24B003		C	ALAMEDA COUNTY WATER DISTRICT	4/2/2015	8.73	3.1	- -			PWC

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Well Number	Alternate Well ID	Aquifer	Owner	Date of Water Level	Reference Elevation (feet MSL)	Water Elevation (feet MSL)	Water Sample Date	Chloride (ppm)	TDS (ppm)	Remarks
3S/3W-25C020	WD2	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	8.84	-5.7	9/29/2015	79	430	PWC
4S/1W-07K001		D	Masonic Homes of California	9/22/2015	67.40	-4.0	-			PI
4S/1W-07N005		CF	City of Union City	9/21/2015	55.29	-1.5	-			UTS
4S/1W-17M006	Well L	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	49.90	-4.2	8/28/2015	126	540	PWC
4S/1W-17M007	Well M	CF	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	50.00	-1.7	8/28/2015	79	460	PWC
4S/1W-17M008	Well N	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	49.62	10.4	8/28/2015	81	430	PWC
4S/1W-18K005		CF	City of Union City	-	48.60	-	-			NA NMP UTM UTS
4S/1W-18M010		CF	Frank J & Catherine M Thrall	9/24/2015	39.92	-2.5	-			
4S/1W-18N004		CF	Eleanor Kabrich	9/23/2015	41.60	-3.0	-			T
4S/1W-19A003		F	Alameda County Flood Control	9/21/2015	54.37	-3.7	-			
4S/1W-19E002	PIEZ#4	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	37.95	10.0	8/27/2015	93	480	PWC
4S/1W-19J006		N	Alameda County Flood Control	9/21/2015	51.28	10.7	-			PWC
4S/1W-19L002		CF	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	40.39	-3.4	-			OBS@160' PWC
4S/1W-19N002	Well H	D	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	40.45	-4.6	8/28/2015	337	990	PWC
4S/1W-19N003		CF	CITY OF FREMONT	9/21/2015	39.81	-4.2	-			OBS@200' PWC pumped @190'
4S/1W-19N004	Well I	F	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	40.68	-4.8	8/28/2015	239	720	PWC
4S/1W-19N005	Well J	C	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	40.55	-4.3	8/28/2015	81	420	PWC
4S/1W-19N014	Well K	N	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	40.50	10.0	8/28/2015	88	440	PWC
4S/1W-20A003	Nursery Well	CF	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	63.42	-10.9	-			
4S/1W-20G001		CFD	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	60.72	3.4	-			UTS
4S/1W-20H003		N	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	67.52	18.7	-			NA OBS PWC UTM Trees cut down over well
4S/1W-20J004	UP-1A	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	58.90	18.6	-			PWC smaller lid, need new bolts; has transducer
4S/1W-20J005	UP-1C	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	59.14	12.2	9/22/2015	46	380	PWC UTS small lid, leftmost facing creek; need new bolts
4S/1W-20J006	UP-1B	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	59.07	17.9	-			PWC smaller lid, need new bolts
4S/1W-20R003	UP-2A	N	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	59.11	14.0	-			PWC UTS
4S/1W-20R004	UP-2B	N	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	59.20	12.5	-			PWC
4S/1W-20R005	UP-2C	N	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	59.06	11.4	-			PWC
4S/1W-21H002		AHF	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	75.08	43.6	-			PWC
4S/1W-21J003		AHF	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	77.30	39.8	9/22/2015	102	500	PWC pumped@90', GW deeper than expected
4S/1W-21L003		AHF	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	66.57	39.1	-			transducer
4S/1W-21L005		AHF	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	67.46	38.7	9/22/2015	102	490	PWC Pumped@65', GW deeper than expected
4S/1W-21L006		AHF	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	67.81	38.9	-			transducer
4S/1W-21L007		AHF	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	70.62	39.2	-			transducer
4S/1W-21L008		AHF	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	66.94	38.3	-			PWC
4S/1W-21P004		AHF	CITY OF FREMONT	9/22/2015	65.29	37.7	-			EPD UTS
4S/1W-21P006	P.T. #1	AHF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	66.37	37.8	9/21/2015	97	580	
4S/1W-21P007	P.T. #2	AHF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	66.77	37.9	9/15/2015	98	570	
4S/1W-21P008	P.T. #3	AHF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	66.54	37.9	9/15/2015	104	510	
4S/1W-21P009	P.T. #4	AHF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	66.44	37.5	9/8/2015	101	560	
4S/1W-21P010	P.T. #5	AHF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	67.28	37.8	-			
4S/1W-21P011	P.T. #6	AHF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	67.69	37.9	9/8/2015	110	510	
4S/1W-21P012	P.T. #7	AHF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	68.36	38.2	9/21/2015	113	510	
4S/1W-21P013	P.T. #8	AHF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	68.86	37.8	9/29/2015	106	470	
4S/1W-21R007		AHF	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	72.21	39.7	10/1/2015	112	530	PWC pumped@70'
4S/1W-26L006		AHF	CITY OF FREMONT	-	67.79	-	-			UTM
4S/1W-26Q011		AHF	ERNIE SILVA	9/28/2015	96.44	73.4	9/28/2015	79	630	T UTM
4S/1W-27A002		AHF	Fremont Community Church	9/23/2015	71.09	39.1	9/23/2015	127	920	
4S/1W-27D008	AHF Indicator	AHF	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	66.59	38.6	-			PWC
4S/1W-27E001		AHF	CHURCH OF JESUS CHRIST	9/28/2015	62.86	38.1	-			PI T UTS
4S/1W-27G002		AHF	CITY OF FREMONT	9/24/2015	---	---	9/24/2015	74	730	OFF UTM UTS
4S/1W-27P001		AHF	CITY OF FREMONT	-	54.04	-	9/24/2015	132	910	OFF RUN UTM
4S/1W-27P002		AHF	CITY OF FREMONT	-	52.65	-	-			RUN UTM
4S/1W-28C001	Mowry #1	N	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	64.81	7.6	9/14/2015	90	490	RUN
4S/1W-28C014	Mowry #2	D	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	63.64	-6.0	-			RUN transducer
4S/1W-28C015	Mowry #3	CF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	63.87	-5.2	8/31/2015	81	440	RUN
4S/1W-28C016	Mowry #4	N	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	66.08	7.9	-			RUN

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4S/1W-28C018	Mowry #6	CF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	64.80	-5.6	9/8/2015	86	490	
4S/1W-28C019	Mowry #7	N	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	63.82	7.9	9/21/2015	94	510	RUN
4S/1W-28C020	Mowry #8	N	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	64.13	8.7	- -			RUN transducer
4S/1W-28C021	Mowry #9	CF	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	65.02	-5.5	- -			transducer
4S/1W-28D001	Well A	D	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	63.03	-4.9	8/25/2015	91	440	PWC Casing needs to be cut for Blue Lid
4S/1W-28D008	Well B	F	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	62.77	-4.9	8/25/2015	94	480	PWC needs new paint
4S/1W-28D011	Well C	C	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	62.90	-4.1	8/25/2015	81	440	PWC needs new paint
4S/1W-28D012	Well D	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	62.86	8.9	8/25/2015	100	460	PWC needs new paint
4S/1W-28F018		N	ALAMEDA COUNTY WATER DISTRICT	10/2/2015	58.71	9.0	10/2/2015	56	550	PWC pumped @ 75' for 20 min.
4S/1W-28F024	BART WAY-F	F	ALAMEDA COUNTY WATER DISTRICT	10/2/2015	59.15	-4.8	10/2/2015	164	810	PWC
4S/1W-28G005		C	Washington Township Healthcare Dist	9/30/2015	57.79	-4.1	- -			
4S/1W-28H007		AHF	SAL R. GUARDINO	9/28/2015	63.04	38.5	- -			
4S/1W-28M002		N	ALAMEDA COUNTY WATER DISTRICT	11/3/2015	53.81	8.8	8/25/2015	91	600	PWC
4S/1W-28M005		D	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	54.12	-4.9	8/25/2015	129	500	PWC
4S/1W-28M006		CF	Mercedes Williams	9/22/2015	57.09	-10.1	- -			PI UTS
4S/1W-28M009		F	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	54.21	-4.9	8/25/2015	635	1,600	PWC
4S/1W-28M010		C	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	54.20	-4.4	8/25/2015	103	610	PWC Replaced Lid
4S/1W-28P001		CF	Central Realty Company	9/24/2015	55.62	4.7	- -			OBS@60' PWC UTS
4S/1W-28P004	BEACON	C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	53.56	-3.6	8/25/2015	89	560	PWC
4S/1W-28P006	Well E	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	53.66	-5.1	8/25/2015	208	630	PWC
4S/1W-28P007	Well F	F	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	53.50	-5.3	8/25/2015	766	1,700	PWC
4S/1W-28P008	Well G	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	53.53	9.0	8/25/2015	101	820	PWC
4S/1W-28R003	Fmt. Library F	F	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	59.70	-4.8	8/28/2015	152	840	PWC well box flooded
4S/1W-29A006	BHF Indicator	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	61.23	11.0	- -			PWC
4S/1W-29F002		N	Robert D & Virginia W. Grate	9/21/2015	51.93	9.9	- -			PWC
4S/1W-29H002	Centerville Par	F	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	52.44	-4.3	10/1/2015	114	460	PWC
4S/1W-29J003		CF	CITY OF FREMONT	- -	55.28	- -	10/1/2015	79	430	NMP OFF UTM UTS
4S/1W-29J008		N	Eugene Dias	9/28/2015	58.48	9.0	- -			PI T UTS
4S/1W-29L012	Fremont Mattos	D	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	50.62	-5.2	- -			M PWC Need 2" pipe
4S/1W-30A002	Well O	FD	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	51.81	-5.1	9/1/2015	209	630	PWC transducer
4S/1W-30A004	Well Q	C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	52.01	-4.1	9/1/2015	83	440	PWC
4S/1W-30A005	Well R	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	52.20	9.6	9/1/2015	87	440	PWC
4S/1W-30E003	CORONADO 2	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	42.12	-5.4	- -			PWC transducer
4S/1W-30E004	CORONADO 1	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	42.17	9.1	- -			PWC
4S/1W-30J002		N	Jeffery H. Lee	9/29/2015	46.74	9.4	- -			PWC
4S/1W-30L006		D	Joseph G. Dutra	9/23/2015	42.23	-3.0	- -			UTS , call first for permission
4S/1W-30L008		N	Joseph G. Dutra	9/23/2015	41.90	9.1	- -			UTS , call first for permission
4S/1W-30R002		CF	Frank G. & Alice C. Garcia	9/23/2015	46.14	-5.0	- -			PI T
4S/1W-30R004		N	Frank G. & Alice C. Garcia	9/23/2015	45.19	9.2	- -			NA PWC
4S/1W-31B003	Willowood #1	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	43.54	-4.9	- -			PWC
4S/1W-31B011	Willowood # 2	CF	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	44.47	-7.3	- -			UTS
4S/1W-31C003		N	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	36.56	8.9	9/1/2015	109	570	PWC
4S/1W-31J001		D	GLENMOOR GARDENS HOMEOWNERS ASSOCIA	9/23/2015	38.94	-6.2	9/23/2015	98	300	T
4S/1W-31L008		N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	36.76	8.5	8/26/2015	154	710	PWC
4S/1W-31L009		N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	33.94	8.4	- -			PWC Replaced Lid
4S/1W-31N001	Cedar #1	CF	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	35.37	-37.4	9/28/2015	429	1,200	RUN UTM
4S/1W-31N003	Cedar #2	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	35.20	5.4	9/28/2015	239	1,000	RUN UTM
4S/1W-32E011	Meyer Park - C	C	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	43.68	-7.4	9/3/2015	167	640	PWC
4S/1W-32E012	Meyer Park - F	F	ALAMEDA COUNTY WATER DISTRICT	9/28/2015	43.89	-5.0	9/3/2015	220	680	PWC
4S/1W-32K011	Serra Place-F	F	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	43.39	-5.2	9/15/2015	830	2,000	PWC Levellogger Transducer
4S/1W-32K014	Serra-C	C	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	43.28	-7.7	9/15/2015	474	1,300	PWC
4S/1W-32M010		N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	38.67	8.9	10/1/2015	142	1,200	M PWC Well head is crooked
4S/1W-32N001	Blacow - C	C	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	37.65	-9.3	9/3/2015	145	650	PWC
4S/1W-32N002	Blacow - F	F	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	37.59	-5.8	9/3/2015	1,062	2,500	PWC
4S/1W-33N002	Knoll Park	C	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	43.75	-6.1	9/15/2015	705	1,800	PWC
4S/1W-33N003	Knoll Park - F	F	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	43.64	-5.2	9/15/2015	189	670	PWC

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Well Number	Alternate Well ID	Aquifer	Owner	Date of Water Level	Reference Elevation (feet MSL)	Water Elevation (feet MSL)	Water Sample Date	Chloride (ppm)	TDS (ppm)	Remarks
4S/1W-33R007	Margery/BI - C	C	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	53.25	-5.2	9/15/2015	103	810	PWC
4S/1W-33R008	Margery/BI - F	F	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	53.18	-5.1	9/15/2015	156	770	PWC
4S/1W-34A002		AHF	Elsie Nines	9/30/2015	60.00	48.0	- -			T
4S/1W-34C001		AHF	CITY OF FREMONT	- -	61.30		10/1/2015	6	990	NA NMP RUN UTM Gate locked
4S/1W-35R003		AHF	Mary A Souza	9/24/2015	190.16	175.8	- -			T UTS no sample point
4S/2W-02H001		D	Bay Area Rapid Transit District	9/24/2015	36.21	-6.2	- -			UTS
4S/2W-03R003		CF	F E DUBOIS	9/21/2015	12.00	-3.5	9/21/2015	33	330	RUN T
4S/2W-04E002	E-3	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	4.72	-4.2	- -			PWC
4S/2W-04F006	Hayward Emergen	D	City of Hayward	- -	---		9/22/2015	116	500	
4S/2W-04R001	Hayward Emergen	D	City of Hayward	- -	---		9/22/2015	121	500	
4S/2W-05G001	Eden Landing F1	F	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	6.75	-4.6	9/29/2015	67	430	PWC
4S/2W-05G002	Eden Landing D1	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	6.35	-6.5	9/29/2015	80	440	PWC
4S/2W-05G003	Eden Landing D2	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	5.82	-8.2	9/29/2015	580	1,300	PWC
4S/2W-05G004	Eden Landing C2	C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	6.73	0.7	9/29/2015	57	440	PWC
4S/2W-05G005	Eden Landing	C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	6.93	5.8	9/29/2015	142	590	PWC
4S/2W-08Q001	2D2	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	9.25	-3.2	9/29/2015	216	720	PWC transducer
4S/2W-09F014	Veasy Bridgegat	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	8.25	-5.5	9/29/2015	639	1,600	PWC transducer
4S/2W-09L002	E-12	N	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	9.11	2.3	9/25/2015	2,935	5,700	PWC
4S/2W-09P010	E-17	N	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	11.31	1.8	9/25/2015	6,951	14,000	PWC
4S/2W-10E004	Tidewater	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	14.54	-5.8	9/2/2015	130	510	PWC transducer
4S/2W-11A003		D	U.S. PIPE HOLDINGS CORPORATION	9/21/2015	40.58	-5.6	9/24/2015	82	430	RUN
4S/2W-12C001	Whipple Well	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	68.61	-5.6	- -			transducer
4S/2W-12K008		D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	53.11	-5.3	9/25/2015	42	370	PWC Transducer
4S/2W-12K009		F	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	53.41	-3.6	9/25/2015	140	620	PWC transducer
4S/2W-12K010		C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	53.39	-2.7	9/25/2015	68	570	PWC transducer
4S/2W-12K011		N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	53.67	10.2	9/25/2015	32	420	PWC transducer
4S/2W-13C004		CF	MANUEL SOARES	9/21/2015	33.56	-11.7	- -			OFF UTS
4S/2W-13E003		N	ALAMEDA COUNTY FLOOD CONTROL	9/21/2015	27.93	9.2	- -			PWC
4S/2W-13H004		N	CITY OF UNION CITY	9/21/2015	37.55	9.9	- -			measuring pt is under gray plastic cap
4S/2W-13K004		C	RAYMOND N. NELSEN	9/21/2015	35.04	-4.2	9/21/2015	134	970	T Need Wrench
4S/2W-13M005		CF	ROSIE & JOEY OROCCHI	9/24/2015	26.46	-5.6	- -			
4S/2W-13M006		CF	ROSEMARY & ROBERT MAZZA	9/21/2015	27.42	-3.3	- -			
4S/2W-13P004	PIEZ#3	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	25.90	9.2	8/26/2015	131	720	PWC Transducer
4S/2W-13P005	WELL G-1	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	25.98	-4.7	8/26/2015	532	1,300	PWC
4S/2W-13P006	WELL H-1	F	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	26.15	-4.1	8/26/2015	195	720	PWC
4S/2W-13P007	WELL I-1	C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	26.00	-3.9	8/26/2015	132	690	PWC
4S/2W-14C001		CF	HARVEY, T.	9/21/2015	23.27	-4.0	- -			T
4S/2W-14D003	Lake Chad	D	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	13.95	-5.4	8/27/2015	44	370	PWC Transducer
4S/2W-14D004		D	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	13.90	-5.6	8/27/2015	141	520	PWC Transducer
4S/2W-14D005		C	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	14.10	-3.7	8/27/2015	253	890	PWC
4S/2W-14D006		C	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	14.18	-3.8	8/27/2015	42	540	PWC
4S/2W-14D007		N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	14.07	7.1	8/27/2015	50	450	PWC
4S/2W-14H003		N	ACFC & WCD	- -	25.22		- -			NMP UTM
4S/2W-14L006	PIEZ#2	N	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	14.97	7.3	8/27/2015	110	760	PWC
4S/2W-14N001	Lowry	N	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	22.64	10.1	- -			
4S/2W-15C007	PIEZ#1	N	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	9.31	5.1	8/27/2015	26	350	PWC
4S/2W-15L005	Contempo Pk	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	7.63	-5.5	8/26/2015	245	710	PWC Transducer
4S/2W-15L006		C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	7.59	-2.7	8/26/2015	119	660	PWC
4S/2W-15L007		N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	7.66	6.2	8/26/2015	557	1,400	PWC
4S/2W-15M003		CF	CITY OF UNION CITY	- -	7.77		- -			NA UTM UTS no key to door
4S/2W-15M004		CF	CITY OF UNION CITY	9/21/2015	7.73	-4.9	- -			
4S/2W-15P001	PIEZ#10	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	6.10	6.3	- -			PWC Artesian
4S/2W-16C011	E-19	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	14.16	6.0	9/29/2015	8,448	16,000	PWC
4S/2W-16C012	E-20	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	4.62	2.2	9/30/2015	5,984	11,000	PWC
4S/2W-16J002	E-23	N	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	8.38	4.8	9/25/2015	2,006	4,700	PWC
4S/2W-16L011	E-26	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	3.34	2.3	- -			NA PWC UTS Ground too soft for Pump Truck

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4S/2W-16L014	E-101	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	8.50	3.5	9/30/2015	7,900	15,000	M PWC well head needs to be modified for blue lid
4S/2W-16L015	Site E	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	11.82	3.3	-	-	-	-
4S/2W-16Q001	E-27	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	9.13	3.9	9/30/2015	11,338	20,000	PWC
4S/2W-21B007	Site D	N	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	10.94	4.4	-	-	-	-
4S/2W-21G001		CF	ALAMEDA COUNTY FLOOD CONTROL	9/21/2015	8.08	-3.6	-	-	-	UTS
4S/2W-21G004	E-31	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	8.79	3.8	9/30/2015	12,255	24,000	PWC
4S/2W-21G009	E-109	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	8.96	4.4	9/30/2015	2,270	4,900	PWC
4S/2W-21J001		CF	ALAMEDA COUNTY FLOOD CONTROL	9/23/2015	7.07	-3.1	-	-	-	-
4S/2W-21N001	E-40	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	5.49	3.6	-	-	-	PWC
4S/2W-21P001		C	ALAMEDA COUNTY FLOOD CONTROL	9/30/2015	8.17	-4.1	10/2/2015	78	550	OBS@140' PWC
4S/2W-21P003	E-39	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	3.96	2.3	-	-	-	PWC
4S/2W-21Q001		CF	ALAMEDA COUNTY FLOOD CONTROL	9/23/2015	5.73	-3.8	-	-	-	PWC
4S/2W-21Q002	E-36	N	ALAMEDA COUNTY WATER DISTRICT	10/2/2015	5.57	3.8	10/2/2015	8,488	16,000	M PWC well head needs to be modified for blue lid
4S/2W-22H003		N	ALAMEDA COUNTY WATER DISTRICT	9/21/2015	18.16	6.8	-	-	-	PWC
4S/2W-22J001		CF	Founders Title Co	-	13.09	-	-	-	-	RUN UTM rehabbed as of 04.22.14
4S/2W-22P002	#8	CF	EAST BAY REGIONAL PARK DIST.	9/29/2015	10.91	-3.7	-	-	-	OFF UTS
4S/2W-23F002		CF	CITY OF FREMONT	9/23/2015	15.76	-3.8	-	-	-	Call to sample
4S/2W-23J002		N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	24.14	8.6	9/30/2015	353	1,000	PWC
4S/2W-24A007		CF	DINO R & RINA M CIARLO	9/24/2015	42.70	-8.3	-	-	-	DA NA T call for appt. 793-2175
4S/2W-24L001		CF	O.G. JOHNSON	-	31.63	-	-	-	-	NA PI UTM covered by building
4S/2W-24L003		C	Sohan S & Bhupinder K Virdee	9/23/2015	33.43	-4.2	-	-	-	well runs periodically
4S/2W-24L006		F	BETTY KITANI	9/30/2015	32.00	-8.5	-	-	-	T call for appointment
4S/2W-25D001	CLSTR#1	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	22.23	-7.2	9/18/2015	309	770	PWC transducer
4S/2W-25D002	CLSTR#1	CF	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	23.47	-4.6	9/18/2015	428	1,400	PWC
4S/2W-25D003	CLSTR#1	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	22.99	8.7	9/18/2015	577	1,700	PWC
4S/2W-25F002		CF	City Of Newark	-	31.19	-	-	-	-	DA NA UTM Well is covered by a 36" manhole
4S/2W-25M001		N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	22.14	7.7	9/16/2015	171	760	PWC
4S/2W-26H001		D	EAST BAY REGIONAL PARK DIST.	-	19.94	-	9/22/2015	164	570	UTS , well not running
4S/2W-26K004	CLSTR#2	D	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	20.31	-9.3	9/24/2015	110	490	PWC
4S/2W-26K005	CLSTR#2	CF	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	19.91	-5.4	9/24/2015	459	1,200	PWC
4S/2W-26K006	CLSTR#2	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	19.77	7.5	9/24/2015	138	800	PWC
4S/2W-26L001	CLSTR#3	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	15.74	-7.7	9/16/2015	278	870	M PWC cracked pad
4S/2W-26L002	CLSTR#3	CF	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	15.26	-5.6	9/16/2015	1,189	2,400	PWC
4S/2W-26M008	CLSTR#3	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	14.38	6.4	9/16/2015	158	880	M PWC Lid, well head needs to be modified for blue lid
4S/2W-27L001	#10	CF	Founders Title Co.	9/24/2015	9.18	-4.4	-	-	-	UTS
4S/2W-27L004	#12	CF	Founders Title Co.	9/24/2015	9.60	-5.5	-	-	-	UTS photo
4S/2W-28A001	E-37	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	6.97	2.9	-	-	-	PWC
4S/2W-28C001	E-42	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	4.69	1.7	-	-	-	PWC
4S/2W-28D001	E-43	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	4.84	1.5	9/16/2015	24,519	42,000	PWC
4S/2W-28G001	E-41	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	6.71	1.5	9/16/2015	11,271	21,000	PWC
4S/2W-35B002		N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	15.05	7.2	9/24/2015	464	1,500	M OBS@80' PWC well head needs replacement
4S/2W-36A006	Darvon #1	N	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	34.06	8.0	-	-	-	OFF UTS scada
4S/2W-36A007	Darvon #2	CF	ALAMEDA COUNTY WATER DISTRICT	9/30/2015	33.60	-21.1	9/28/2015	228	730	RUN scada
4S/2W-36D003		D	CITY OF NEWARK	-	22.62	-	-	-	-	UTM UTS
4S/2W-36F005	PIEZ#5	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	21.43	8.0	9/24/2015	281	1,100	PWC
4S/2W-36N006		N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	14.67	7.4	9/1/2015	8,003	14,000	PWC
4S/2W-36N010	Well T	F	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	16.77	-7.1	9/1/2015	1,136	2,400	PWC
4S/2W-36N011	Well U	C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	17.50	-11.6	9/1/2015	318	780	PWC
4S/2W-36N012	Well V	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	15.86	6.7	9/1/2015	6,036	11,000	PWC
5S/1W-02N001		N	Dean A. & Donna H. Olsen	9/24/2015	38.01	20.5	-	-	-	-
5S/1W-03C007		CF	PRESBYTERY OF SAN FRANCISCO	9/24/2015	50.39	-5.0	-	-	-	T
5S/1W-03G003		N	LEONCIO H & MAGDELENA C ISLAYA	-	49.24	-	-	-	-	EPD NMP OBS@surface
5S/1W-04H003	PIEZ#9	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	42.88	9.2	9/17/2015	104	910	OBS@120' PWC UTS Well doesn't yield water
5S/1W-04H004	Robin & Ladner	C	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	45.11	-5.0	9/2/2015	235	860	PWC
5S/1W-04H005	Robin & Ladner	F	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	44.92	-4.6	9/2/2015	216	700	PWC
5S/1W-04P002		N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	28.16	8.9	9/17/2015	199	1,100	PWC

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Groundwater Monitoring Program  
Fall 2015

Well Number	Alternate Well ID	Aquifer	Owner	Date of Water Level	Reference Elevation (feet MSL)	Water Elevation (feet MSL)	Water Sample Date	Chloride (ppm)	TDS (ppm)	Remarks
5S/1W-05B001		N	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	38.26	8.8	9/17/2015	314	1,200	PWC
5S/1W-05C001	Farwell	CF	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	38.29	-20.5	9/28/2015	483	1,400	RUN transducer, unable to open digital panel
5S/1W-05H003	WELL C-1	D	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	34.31	-5.2	9/17/2015	31	380	M PWC Well #'s need repainting
5S/1W-05H004	WELL D-1	F	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	34.25	-5.3	10/2/2015	26	360	PWC
5S/1W-05H005	WELL E-1	C	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	34.31	-6.7	9/17/2015	547	1,500	PWC
5S/1W-05H006	WELL F-1	N	ALAMEDA COUNTY WATER DISTRICT	9/29/2015	34.29	8.7	10/2/2015	266	1,200	PWC
5S/1W-05M001	PIEZ#7	N	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	29.42	8.3	9/9/2015	1,430	3,300	PWC
5S/1W-06H001		CF	Sam L. Arnold	- -	28.54	- -	- -	- -	- -	DA EPD UTS C.O.N. gated area
5S/1W-06H004	Bellflower	CF	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	30.25	-12.3	9/28/2015	471	1,200	RUN
5S/1W-06N006	Site B	N	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	21.04	8.1	- -	- -	- -	M
5S/1W-06N007		CF	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	21.65	-9.4	- -	- -	- -	M PWC UTS
5S/1W-07B036	Silliman - MW	C	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	16.00	-9.5	9/9/2015	326	880	PWC
5S/1W-07G010	Y	D	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	13.06	-7.6	9/9/2015	95	450	PWC
5S/1W-07H002		CF	Brook R. & Forrest E. Heath	- -	10.37	- -	- -	- -	- -	EPD M OBS@20.67 UTM
5S/1W-07J001	E-77	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	9.51	6.9	9/9/2015	4,758	9,000	PWC
5S/1W-07J003	Site A	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	11.48	6.5	10/1/2015	1,524	3,300	OFF
5S/1W-07J005	Site A - MW	F	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	11.45	-4.9	9/9/2015	10	350	PWC
5S/1W-08D001	E-117	N	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	18.15	7.9	10/1/2015	2,785	5,300	PWC
5S/1W-08G002	E-81	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	15.36	7.7	9/3/2015	620	1,700	PWC
5S/1W-08P004	E-82	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	8.70	6.6	- -	- -	- -	PWC Pumps sand
5S/1W-10K002		CF	SOUTHLAKE MOBIL HOME PARK	- -	26.96	- -	9/29/2015	233	770	NMP UTM
5S/1W-14B003		N	J.C. & A.C. LOPES	9/24/2015	38.26	14.9	- -	- -	- -	- -
5S/1W-16M006	AutoMall-C	C	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	11.67	-5.9	9/22/2015	777	1,900	PWC
5S/1W-16M007	AutoMall-F	F	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	11.91	-4.9	9/22/2015	13	380	PWC
5S/1W-16M008	AutoMall D1	D	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	11.86	-4.6	9/22/2015	12	340	PWC
5S/1W-17A003	E-115	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	10.20	7.3	10/1/2015	1,062	2,500	PWC
5S/1W-17J001		CF	OAKLAND SCAVENGER CO.	- -	6.47	- -	- -	- -	- -	NMP RUN UTM T
5S/1W-17J004	E-88	N	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	6.74	A	- -	- -	- -	NA PWC Artesian 09/15
5S/1W-17J006	E-113	N	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	6.25	A	9/17/2015	1,261	3,000	NA PWC Artesian 09/15
5S/1W-17R021		CF	WASTE MANAGEMENT OF ALAMEDA COUNTY	- -	9.67	- -	9/29/2015	98	450	NMP UTM
5S/1W-20G001		D	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	8.29	-4.2	9/3/2015	63	430	PWC
5S/1W-22H001	E-100	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	10.42	3.0	10/1/2015	29,518	46,000	PWC
5S/2W-01B002		C	J.S. OLIVEIRA	- -	18.59	- -	- -	- -	- -	DA M NA OBS@100' PWC casing damaged,
5S/2W-01R001	E-68	N	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	17.04	8.5	9/24/2015	3,054	6,700	PWC
5S/2W-01R014		C	ALAMEDA COUNTY WATER DISTRICT	9/24/2015	18.28	-9.4	9/24/2015	794	1,800	PWC
5S/2W-02C005	E-123	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	9.81	5.3	9/24/2015	8,654	15,000	PWC
5S/2W-02E002	E-104	N	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	5.09	2.0	9/10/2015	12,713	22,000	PWC
5S/2W-02F003	Well W	C	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	10.36	-6.3	9/2/2015	730	1,600	PWC
5S/2W-02F004	Well X	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	10.34	5.6	9/2/2015	750	2,100	PWC
5S/2W-02M006	E-51	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	7.93	2.4	9/10/2015	21,243	37,000	M PWC Post mislabeled
5S/2W-02M007	Site C	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	11.08	3.1	- -	- -	- -	UTS
5S/2W-02Q001		N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	9.50	5.0	- -	- -	- -	PWC
5S/2W-03G001	E-44	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	6.90	3.4	9/10/2015	15,013	27,000	PWC
5S/2W-03H002	E-47	N	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	4.89	3.3	- -	- -	- -	PWC
5S/2W-03H004	Old Jarvis-C	C	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	5.84	-0.5	9/10/2015	25,994	41,000	PWC
5S/2W-03H005	Old Jarvis-F	F	ALAMEDA COUNTY WATER DISTRICT	9/22/2015	5.80	4.4	9/10/2015	154	830	PWC
5S/2W-08M011		F	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	6.45	4.8	9/9/2015	159	620	PWC
5S/2W-11H002	E-60	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	9.47	4.4	9/23/2015	937	2,100	PWC
5S/2W-12B008		D	LESLIE SALT CO.	9/25/2015	12.49	-13.6	- -	- -	- -	RUN capped M.P.
5S/2W-12B020		F	MORTON SALT CO.	9/25/2015	12.73	-26.5	9/25/2015	770	1,800	RUN sample any well that's running
5S/2W-12B024	#9	D	Morton Salt	9/25/2015	14.93	-6.2	- -	- -	- -	NMP OFF UTM
5S/2W-12C003	E-62	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	10.10	4.8	9/23/2015	26,853	56,000	PWC
5S/2W-14E005	DE1-D1	D	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	7.92	A	9/23/2015	38	370	PWC Artesian
5S/2W-14E006	DE1-F	F	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	7.96	5.9	9/23/2015	33	290	PWC
5S/2W-14E007	DE1-C	C	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	7.77	3.7	9/23/2015	13	270	PWC
5S/2W-14E008	DE1-N	N	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	7.75	3.3	9/23/2015	45,422	79,000	PWC

Alameda County Water District  
Groundwater Monitoring Program  
Fall 2015

Well Number	Alternate Well ID	Aquifer	Owner	Date of Water Level	Reference Elevation (feet MSL)	Water Elevation (feet MSL)	Water Sample Date	Chloride (ppm)	TDS (ppm)	Remarks
5S/2W-14E009	DE1-D2	D	ALAMEDA COUNTY WATER DISTRICT	9/23/2015	7.88	A	9/23/2015	62	440	PWC Artesian
5S/2W-17F002		N	LESLIE SALT CO.	9/25/2015	7.70	3.5	- -			M PWC re label wells
5S/2W-17F003		CF	LESLIE SALT CO.	9/25/2015	7.80	4.9	- -			M PWC re label wells
5S/2W-24B003		C	ALAMEDA COUNTY WATER DISTRICT	9/25/2015	8.73	3.4	9/23/2015	80	370	PWC

# Appendix H

## Permeability Laboratory Results

January 7, 2015

**STL NO.:** 46228460  
**CONTRACT:** PO#50060 OB  
**LAB NO.:** 7786

FILE COPY

**PROJECT:** FY 2014-2015 FLEXIBLE WALL PERMEABILITY  
VARIOUS SITES, FREMONT/NEWARK/UNION CITY CA

**SUBJECT:** WEEKLY SUMMARY OF SPECIAL INSPECTION(S)

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Enclosed is a report from Inspection Services, Inc. covering the Hydraulic Conductivity ASTM D 5084, Method C: Falling Head Rising Tailwater for the referenced project.

If we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,  
**Signet Testing Laboratories, Inc.**

  
**Gabriel Hernandez, P.E.**  
**Professional Engineer, Civil 73201**

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c: ALAMEDA COUNTY WATER DISTRICT/DOUGLAS YOUNG  
FILE COPY



**PERMEABILITY TEST ( ASTM D5084-90, method C )**

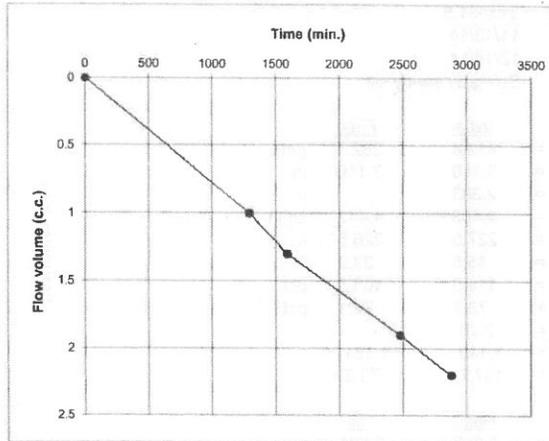
Client Project Number : 46228460 Lab Number 7786  
 Client : ACWD  
 Project : Old Jarvis Road  
 Job # : 1179-006  
 Boring # : OJ  
 Depth (ft) : 21.0-21.5  
 Date Sampled : 11/13/14  
 Date setup for test : 12/16/14  
 Soil type : Greenish gray clay

Specimen:

	<u>Initial</u>	<u>Final</u>	
Total wt. =	313.1	304.7	gms
Ht. =	2.330	2.330	in
Ave dia. =	2.397		in
Area =	4.513	4.487	sq.in
Volume =	172.3	171.3	c.c.
Moisture =	42.9	39.1	%
Total density =	113.4	111.0	pcf
Dry density =	79.3	79.8	pcf
Gs (Assumed) =	2.70		
Void ratio =	1.124	1.112	
% Saturation =	103.1	95.0	

Area of pipettes = Head Tail  
 = 0.862 0.861 sq. cm.

Sig3 = 20



Data reductions:	<u>Elapsed Time (min)</u>	<u>Inflow (c.c.)</u>	<u>Outflow (c.c.)</u>	<u>Inflow / Outflow</u>	<u>h1 (cm)</u>	<u>h2 (cm)</u>	<u>Ln(h1/h2)</u>	<u>Rt</u>	<u>Gradient</u>	<u>K20 (cm/sec)</u>	<u>Ht</u>	<u>Area</u>
	1290.0	0.90	1.00	0.90	91.7	89.5	0.02433	0.979	15.3	2.71E-08	2.330	4.487
	300.0	0.30	0.30	1.00	89.5	88.8	0.00781	0.967	15.1	3.69E-08	2.330	4.487
	885.0	0.70	0.60	1.17	88.8	87.3	0.01713	0.973	14.9	2.76E-08	2.330	4.487
	405.0	0.30	0.30	1.00	87.3	86.6	0.00801	0.970	14.7	2.82E-08	2.330	4.487

**AVERAGE**  
**3.00E-08**

**PERMEABILITY TEST ( ASTM D5084-90, method C )**

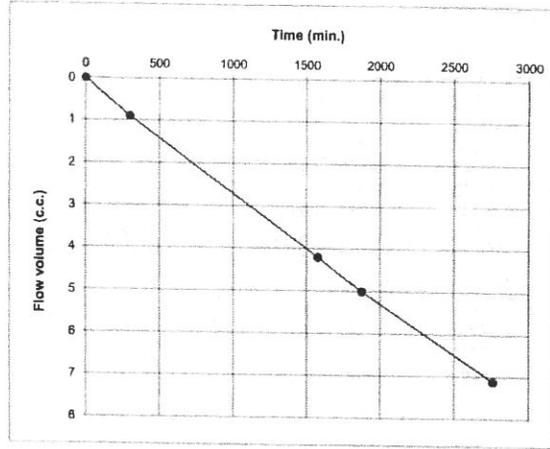
Client Project Number : 46228460 Lab Number 7786  
 Client : ACWD  
 Project : Dumbarton Bridge Fishing Pier Lot  
 Job # : 1179-006  
 Boring # : DBFP  
 Depth (ft) : 31.0-31.5  
 Date Sampled : 11/13/14  
 Date setup for test : 12/16/14  
 Soil type : Soft gray sandy silt

Specimen:

	<u>Initial</u>	<u>Final</u>	
Total wt. =	417.4	382.1	gms
Ht. =	3.110	3.110	in
Ave dia. =	2.383		in
Area =	4.463	4.443	sq.in
Volume =	227.5	226.5	c.c.
Moisture =	45.5	33.2	%
Total density =	114.5	105.3	pcf
Dry density =	78.7	79.1	pcf
Gs (Assumed) =	2.70		
Void ratio =	1.140	1.131	
% Saturation =	107.7	79.2	

	<u>Head</u>	<u>Tail</u>	
Area of pipettes =	0.865	0.865	sq. cm.

Sig3 = 20



Data reductions:	<u>Elapsed Time (min)</u>	<u>Inflow (c.c.)</u>	<u>Outflow (c.c.)</u>	<u>Inflow / Outflow</u>	<u>h1 (cm)</u>	<u>h2 (cm)</u>	<u>Ln(h1/h2)</u>	<u>Rt</u>	<u>Gradient</u>	<u>K20 (cm/sec)</u>	<u>Ht</u>	<u>Area</u>
	300.0	0.70	0.90	0.78	92.3	90.4	0.02024	0.991	11.6	1.33E-07	3.110	4.443
	1275.0	3.20	3.30	0.97	90.4	82.9	0.08671	0.979	11.0	1.32E-07	3.110	4.443
	300.0	0.70	0.80	0.87	82.9	81.2	0.02112	0.967	10.4	1.35E-07	3.110	4.443
	885.0	2.10	2.10	1.00	81.2	76.3	0.06164	0.973	10.0	1.35E-07	3.110	4.443

AVERAGE 1.34E-07
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January 7, 2015

STL NO.: 46228460  
CONTRACT: PO#50060 OB  
LAB NO.: 7774

FILE COPY

**PROJECT:** FY 2014-2015 FLEXIBLE WALL PERMEABILITY  
VARIOUS SITES, FREMONT/NEWARK/UNION CITY CA

**SUBJECT:** WEEKLY SUMMARY OF SPECIAL INSPECTION(S)

Enclosed is a report from Inspection Services, Inc. covering the Hydraulic Conductivity ASTM D 5084, Method C: Falling Head Rising Tailwater for the referenced project.

If we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,  
*Signet Testing Laboratories, Inc.*

  
**Gabriel Hernandez, P.E.**  
**Professional Engineer, Civil 73201**

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c: ALAMEDA COUNTY WATER DISTRICT/DOUGLAS YOUNG  
FILE COPY



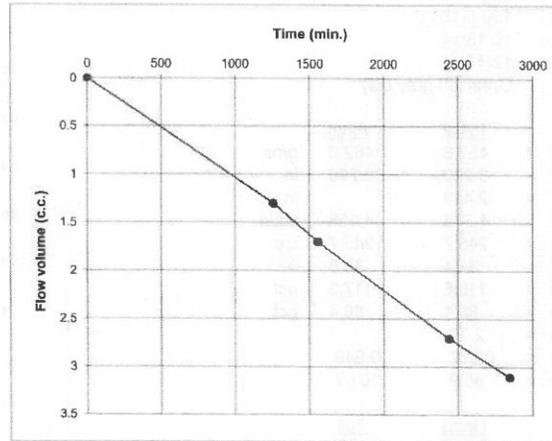
**PERMEABILITY TEST ( ASTM D5084-90, method C )**

Client Project Number 46228460 Lab Number 7774  
 Client : ACWD  
 Project : Mowry Slough Behind Cargill  
 Job # : 1179-006  
 Boring # : MS  
 Depth (ft) : 30.5-31.0  
 Date Sampled : 10-13-14  
 Date setup for test : 12/16/14  
 Soil type : Grayish brown clay

Specimen:

	<u>Initial</u>	<u>Final</u>	
Total wt. =	507.5	506.3	gms
Ht. =	3.220	3.220	in
Ave dia. =	2.397		in
Area =	4.513	4.494	sq.in
Volume =	238.1	237.1	c.c.
Moisture =	19.9	19.6	%
Total density =	133.0	133.2	pcf
Dry density =	110.9	111.4	pcf
Gs (Assumed) =	2.70		
Void ratio =	0.519	0.512	
% Saturation =	103.4	103.2	
	<u>Head</u>	<u>Tail</u>	
Area of pipettes =	0.866	0.865	sq. cm.

Sig3 = 20



Data reductions:	Elapsed Time (min)	Inflow (c.c.)	Outflow (c.c.)	Inflow / Outflow	h1 (cm)	h2 (cm)	Ln(h1/h2)	Rt	Gradient	K20 (cm/sec)	Ht	Area
	1255.0	1.90	1.30	1.46	89.9	86.2	0.04199	0.979	10.8	6.66E-08	3.220	4.494
	300.0	0.30	0.40	0.75	86.2	85.4	0.00943	0.967	10.5	6.18E-08	3.220	4.494
	885.0	1.00	1.00	1.00	85.4	83.1	0.02743	0.973	10.3	6.14E-08	3.220	4.494
	405.0	0.40	0.40	1.00	83.1	82.1	0.01119	0.970	10.1	5.45E-08	3.220	4.494

**AVERAGE**  
6.11E-08

**PERMEABILITY TEST ( ASTM D5084-90, method C )**

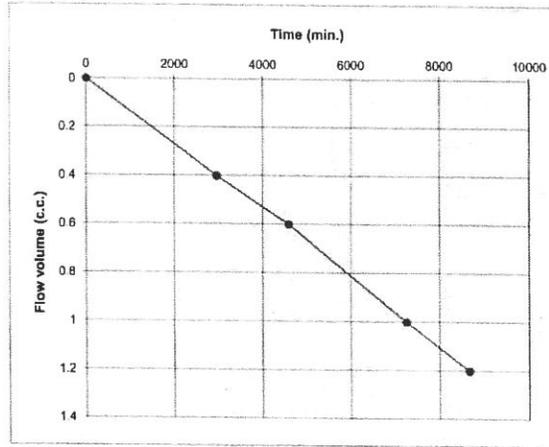
Client Project Number : 46228460 Lab Number 7774  
 Client : ACWD  
 Project : Mowry Slough Behind Cargill  
 Job # : 1179-006  
 Boring # : MS  
 Depth (ft.) : 150.5-151.0  
 Date Sampled : 10/13/14  
 Date setup for test : 12/17/14  
 Soil type : Greenish gray clay

Specimen:

	<u>Initial</u>	<u>Final</u>	
Total wt. =	457.3	462.0	gms
Ht. =	3.290	3.290	in
Ave dia. =	2.413		in
Area =	4.576	4.558	sq.in
Volume =	246.7	245.7	c.c.
Moisture =	34.4	35.8	%
Total density =	115.6	117.3	pcf
Dry density =	86.1	86.4	pcf
Gs (Assumed) =	2.70		
Void ratio =	0.957	0.949	
% Saturation =	96.9	101.7	

	<u>Head</u>	<u>Tail</u>	
Area of pipettes =	0.866	0.865	sq. cm.

Sig3 = 20



Data reductions:	Elapsed Time (min)	Inflow (c.c.)	Outflow (c.c.)	Inflow / Outflow	h1 (cm)	h2 (cm)	Ln(h1/h2)	Rt	Gradient	K20 (cm/sec)	Ht	Area
	2955.0	0.70	0.40	1.75	370.2	368.9	0.00344	1.014	44.2	2.42E-09	3.290	4.558
	1620.0	0.30	0.20	1.50	368.9	368.4	0.00157	1.055	44.1	2.09E-09	3.290	4.558
	2670.0	0.40	0.40	1.00	368.4	367.4	0.00251	1.051	44.0	2.03E-09	3.290	4.558
	1420.0	0.20	0.20	1.00	367.4	367.0	0.00126	1.045	43.9	1.90E-09	3.290	4.558

AVERAGE  
2.11E-09

November 5, 2014

STL NO.: 46228460  
CONTRACT: PO#50060 OB  
LAB NO.: 7658

FILE COPY

**PROJECT:** FY 2014-2015 FLEXIBLE WALL PERMEABILITY  
VARIOUS SITES, FREMONT/NEWARK/UNION CITY CA  
**SUBJECT:** WEEKLY SUMMARY OF SPECIAL INSPECTION(S)

Enclosed is a report from Cooper Testing Laboratories covering the Hydraulic Conductivity ASTM D 5084, Method C: Falling Head Rising Tailwater for the referenced project.

If additional information is required or if we can be of further assistance, please do not hesitate to contact our office.

If you have any questions or if we can be of further assistance, please do not hesitate to contact our office.

if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,  
**Signet Testing Laboratories, Inc.**

  
**Gabriel Hernandez, P.E.**  
**Professional Engineer, Civil 73201**

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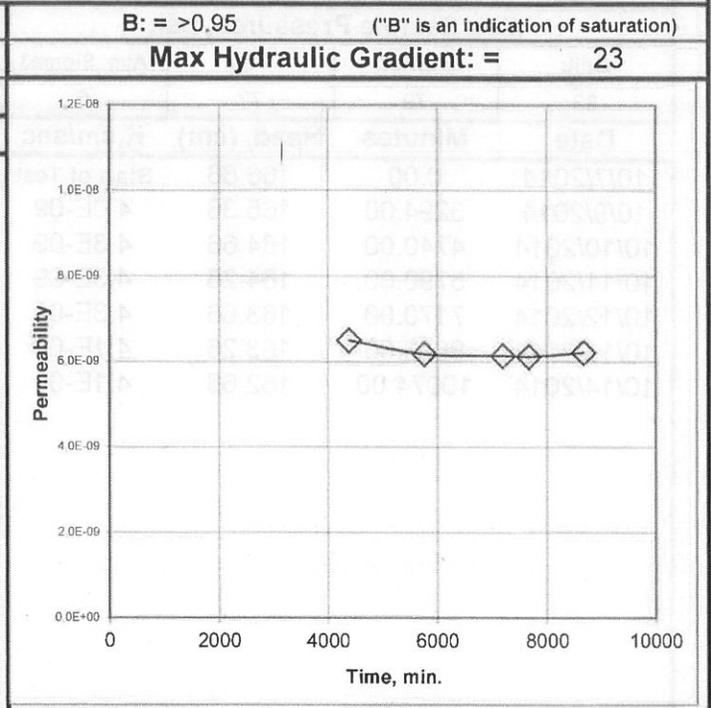
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**Hydraulic Conductivity**  
**ASTM D 5084**  
 Method C: Falling Head Rising Tailwater

Job No: 652-009      Boring: WC-346.0-346.5      Date: 10/15/14  
 Client: Signet Testing      Sample:      By: MD/PJ  
 Project: 7658      Depth, ft.:      Remolded:        
 Visual Classification: Olive CLAY

Max Sample Pressures, psi:			
Cell:	Bottom	Top	Avg. Sigma3
53.5	49.5	47.5	5
Date	Minutes	Head, (cm)	K, cm/sec
10/8/2014	0.00	167.66	Start of Test
10/11/2014	4386.00	164.86	6.5E-09
10/12/2014	5767.00	164.16	6.2E-09
10/13/2014	7200.00	163.36	6.1E-09
10/13/2014	7667.00	162.96	6.1E-09
10/14/2014	8673.00	162.46	6.2E-09



**Average Hydraulic Conductivity: <1X10-8 cm/sec**

Sample Data:	Initial (As-Received)	Final (At-Test)
Height, in	2.82	2.84
Diameter, in	2.42	2.45
Area, in <sup>2</sup>	4.58	4.71
Volume in <sup>3</sup>	12.92	13.40
Total Volume, cc	211.7	219.6
Volume Solids, cc	125.0	125.0
Volume Voids, cc	86.7	94.6
Void Ratio	0.7	0.8
Total Porosity, %	41.0	43.1
Air-Filled Porosity (θ <sub>a</sub> ), %	0.9	0.3
Water-Filled Porosity (θ <sub>w</sub> ), %	40.1	42.8
Saturation, %	97.9	99.3
Specific Gravity	2.80      Assumed	2.80
Wet Weight, gm	434.8	443.8
Dry Weight, gm	349.9	349.9
Tare, gm	0.00	0.00
Moisture, %	24.3	26.8
Wet Bulk Density, pcf	128.2	126.1
Dry Bulk Density, pcf	103.2	99.4
Wet Bulk Dens.pb, (g/cm <sup>3</sup> )	2.05	2.02
Dry Bulk Dens.pb, (g/cm <sup>3</sup> )	1.65	1.59

Remarks: Permeabilities in the range of 10<sup>-9</sup> cm/sec are difficult to measure accurately. Therefore, a permeability of less than 1 x 10<sup>-8</sup> cm/sec is reported instead of the average of the actual readings as is normally done.



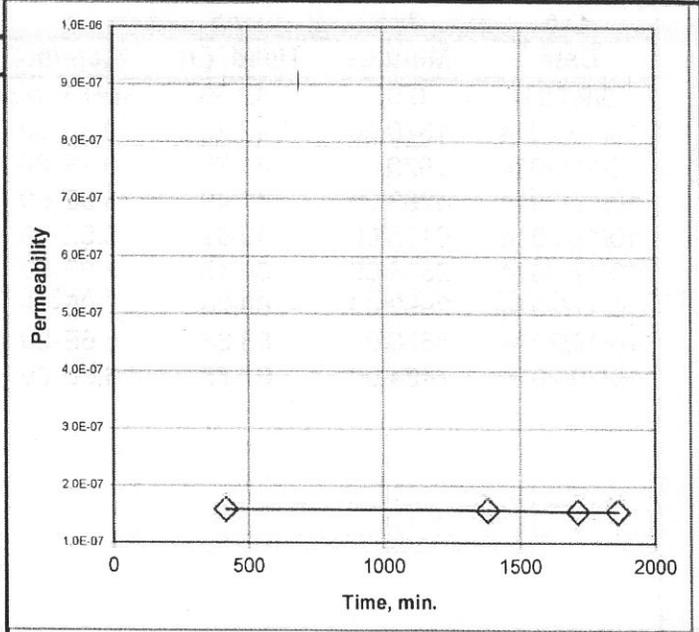
**Hydraulic Conductivity**  
**ASTM D 5084**  
 Method C: Falling Head Rising Tailwater

Job No: 652-010 Boring: AC Levee Date: 10/14/14  
 Client: Signet Sample: By: MD/PJ  
 Project: 7636 Depth, ft.: 20.5-21.0 Remolded:  
 Visual Classification: Greenish Gray CLAY

Max Sample Pressures, psi:			
Cell:	Bottom	Top	Avg. Sigma3
53.5	49	48	5

B: = >0.95 ("B" is an indication of saturation)  
 Max Hydraulic Gradient: = 15

Date	Minutes	Head, (in)	K, cm/sec
10/9/2014	0.00	42.69	Start of Test
10/9/2014	418.00	40.59	1.6E-07
10/10/2014	1382.00	36.19	1.6E-07
10/10/2014	1715.00	34.89	1.6E-07
10/10/2014	1863.00	34.29	1.6E-07



**Average Hydraulic Conductivity: 2.E-07 cm/sec**

Sample Data:	Average Hydraulic Conductivity: 2.E-07 cm/sec	
	Initial (As-Received)	Final (At-Test)
Height, in	2.83	2.80
Diameter, in	2.41	2.42
Area, in <sup>2</sup>	4.56	4.60
Volume in <sup>3</sup>	12.92	12.88
Total Volume, cc	211.8	211.0
Volume Solids, cc	119.6	119.6
Volume Voids, cc	92.2	91.4
Void Ratio	0.8	0.8
Total Porosity, %	43.5	43.3
Air-Filled Porosity (θ <sub>a</sub> ), %	-1.5	0.3
Water-Filled Porosity (θ <sub>w</sub> ), %	45.0	43.0
Saturation, %	103.5	99.3
Specific Gravity	2.75 Assumed	2.75
Wet Weight, gm	424.3	419.7
Dry Weight, gm	329.0	329.0
Tare, gm	0.00	0.00
Moisture, %	29.0	27.6
Wet Bulk Density, pcf	125.0	124.1
Dry Bulk Density, pcf	96.9	97.3
Wet Bulk Dens.pb, (g/cm <sup>3</sup> )	2.00	1.99
Dry Bulk Dens.pb, (g/cm <sup>3</sup> )	1.55	1.56

Remarks:

November 5, 2014

**STL NO.:** 46228460  
**CONTRACT:** PO#50060 OB  
**LAB NO.:** 7658

FILE COPY

**PROJECT:** FY 2014-2015 FLEXIBLE WALL PERMEABILITY  
VARIOUS SITES, FREMONT/NEWARK/UNION CITY CA

**SUBJECT:** WEEKLY SUMMARY OF SPECIAL INSPECTION(S)

Enclosed is a report from Cooper Testing Laboratories covering the Hydraulic Conductivity ASTM D 5084, Method C: Falling Head Rising Tailwater for the referenced project.

If additional information is required or if we can be of further assistance, please do not hesitate to contact our office.

If you have any questions or if we can be of further assistance, please do not hesitate to contact our office.

if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,  
**Signet Testing Laboratories, Inc.**

  
**Gabriel Hernandez, P.E.**  
**Professional Engineer, Civil 73201**

/s/

c: ALAMEDA COUNTY WATER DISTRICT/DOUGLAS YOUNG  
FILE COPY





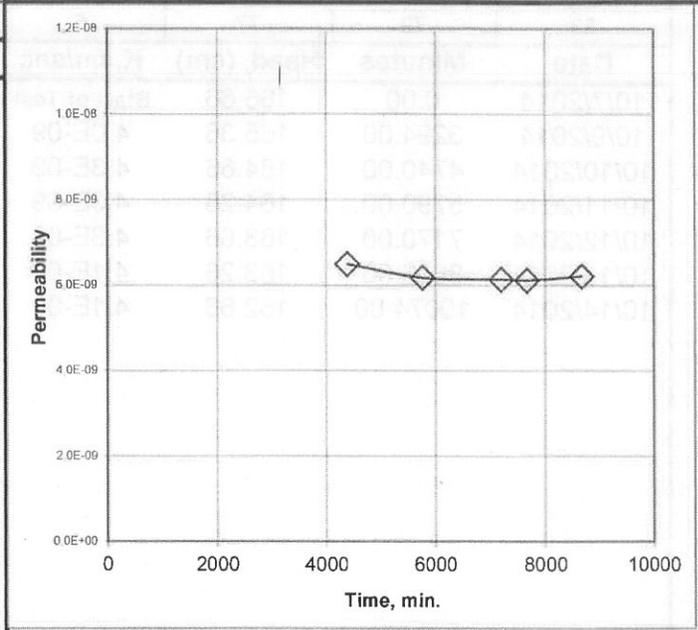
**Hydraulic Conductivity**  
**ASTM D 5084**  
 Method C: Falling Head Rising Tailwater

Job No: 652-009      Boring: WC-346.0-346.5      Date: 10/15/14  
 Client: Signet Testing      Sample:      By: MD/PJ  
 Project: 7658      Depth, ft.:      Remolded:        
 Visual Classification: Olive CLAY

Max Sample Pressures, psi:			
Cell:	Bottom	Top	Avg. Sigma3
53.5	49.5	47.5	5

B: = >0.95      ("B" is an indication of saturation)  
**Max Hydraulic Gradient: = 23**

Date	Minutes	Head, (cm)	K, cm/sec
10/8/2014	0.00	167.66	Start of Test
10/11/2014	4386.00	164.86	6.5E-09
10/12/2014	5767.00	164.16	6.2E-09
10/13/2014	7200.00	163.36	6.1E-09
10/13/2014	7667.00	162.96	6.1E-09
10/14/2014	8673.00	162.46	6.2E-09



**Average Hydraulic Conductivity: <1X10-8 cm/sec**

Sample Data:	Initial (As-Received)	Final (At-Test)
Height, in	2.82	2.84
Diameter, in	2.42	2.45
Area, in <sup>2</sup>	4.58	4.71
Volume in <sup>3</sup>	12.92	13.40
Total Volume, cc	211.7	219.6
Volume Solids, cc	125.0	125.0
Volume Voids, cc	86.7	94.6
Void Ratio	0.7	0.8
Total Porosity, %	41.0	43.1
Air-Filled Porosity (θ <sub>a</sub> ), %	0.9	0.3
Water-Filled Porosity (θ <sub>w</sub> ), %	40.1	42.8
Saturation, %	97.9	99.3
Specific Gravity	2.80	Assumed 2.80
Wet Weight, gm	434.8	443.8
Dry Weight, gm	349.9	349.9
Tare, gm	0.00	0.00
Moisture, %	24.3	26.8
Wet Bulk Density, pcf	128.2	126.1
Dry Bulk Density, pcf	103.2	99.4
Wet Bulk Dens.pb, (g/cm <sup>3</sup> )	2.05	2.02
Dry Bulk Dens.pb, (g/cm <sup>3</sup> )	1.65	1.59

Remarks: Permeabilities in the range of 10<sup>-9</sup> cm/sec are difficult to measure accurately. Therefore, a permeability of less than 1 x 10<sup>-8</sup> cm/sec is reported instead of the average of the actual readings as is normally done.



## Hydraulic Conductivity ASTM D 5084

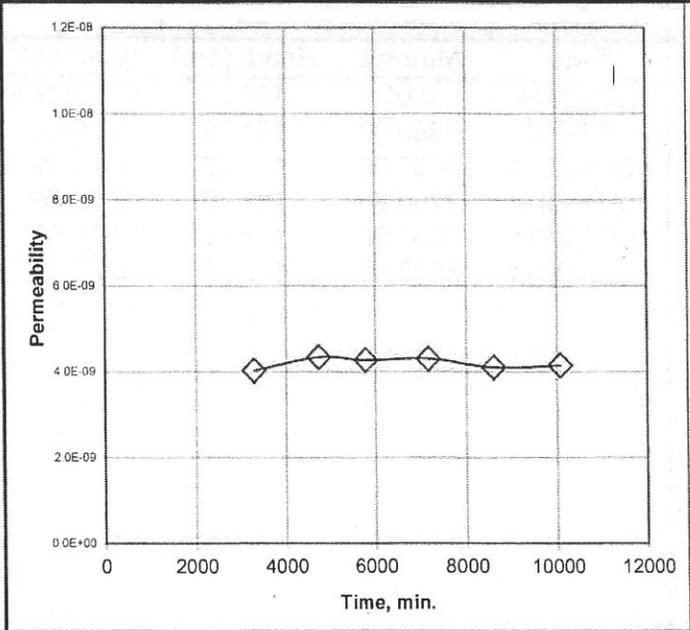
Method C: Falling Head Rising Tailwater

Job No: 652-009      Boring: WC-526-526.5      Date: 10/22/14  
 Client: Signet      Sample: \_\_\_\_\_      By: MD/PJ  
 Project: 7658      Depth, ft.: \_\_\_\_\_      Remolded: \_\_\_\_\_  
 Visual Classification: Greenish Gray CLAY

Max Sample Pressures, psi:			
Cell:	Bottom	Top	Avg. Sigma3
83	79	77	5

B: = >0.95 ("B" is an indication of saturation)  
**Max Hydraulic Gradient: = 23**

Date	Minutes	Head, (cm)	K,cm/sec
10/7/2014	0.00	166.66	Start of Test
10/9/2014	3294.00	165.36	4.0E-09
10/10/2014	4740.00	164.66	4.3E-09
10/11/2014	5790.00	164.26	4.3E-09
10/12/2014	7170.00	163.66	4.3E-09
10/13/2014	8606.00	163.26	4.1E-09
10/14/2014	10074.00	162.66	4.1E-09



**Average Hydraulic Conductivity: <1E-08 cm/sec**

Sample Data:	Initial (As-Received)	Final (At-Test)
Height, in	2.84	2.89
Diameter, in	2.41	2.46
Area, in <sup>2</sup>	4.56	4.76
Volume in <sup>3</sup>	12.96	13.77
Total Volume, cc	212.3	225.7
Volume Solids, cc	129.3	129.3
Volume Voids, cc	83.0	96.5
Void Ratio	0.6	0.7
Total Porosity, %	39.1	42.7
Air-Filled Porosity (θ <sub>a</sub> ), %	0.9	0.7
Water-Filled Porosity (θ <sub>w</sub> ), %	38.2	42.0
Saturation, %	97.6	98.3
Specific Gravity	2.80	2.80
	Assumed	
Wet Weight, gm	443.0	456.8
Dry Weight, gm	361.9	361.9
Tare, gm	0.00	0.00
Moisture, %	22.4	26.2
Wet Bulk Density, pcf	130.2	126.3
Dry Bulk Density, pcf	106.4	100.1
Wet Bulk Dens.pb, (g/cm <sup>3</sup> )	2.09	2.02
Dry Bulk Dens.pb, (g/cm <sup>3</sup> )	1.70	1.60

Remarks: \_\_\_\_\_

November 5, 2014

**STL NO.:** 46228460  
**CONTRACT:** PO#50060 OB  
**LAB NO.:** 7636

FILE COPY

**PROJECT:** FY 2014-2015 FLEXIBLE WALL PERMEABILITY  
VARIOUS SITES, FREMONT/NEWARK/UNION CITY CA  
**SUBJECT:** WEEKLY SUMMARY OF SPECIAL INSPECTION(S)

Enclosed is a report from Cooper Testing Laboratories covering the Hydraulic Conductivity ASTM D 5084, Method C: Falling Head Rising Tailwater for the referenced project.

If additional information is required or if we can be of further assistance, please do not hesitate to contact our office.

If you have any questions or if we can be of further assistance, please do not hesitate to contact our office.

if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,  
**Signet Testing Laboratories, Inc.**

  
**Gabriel Hernandez, P.E.**  
**Professional Engineer, Civil 73201**

/vi

c: ALAMEDA COUNTY WATER DISTRICT/DOUGLAS YOUNG  
FILE COPY

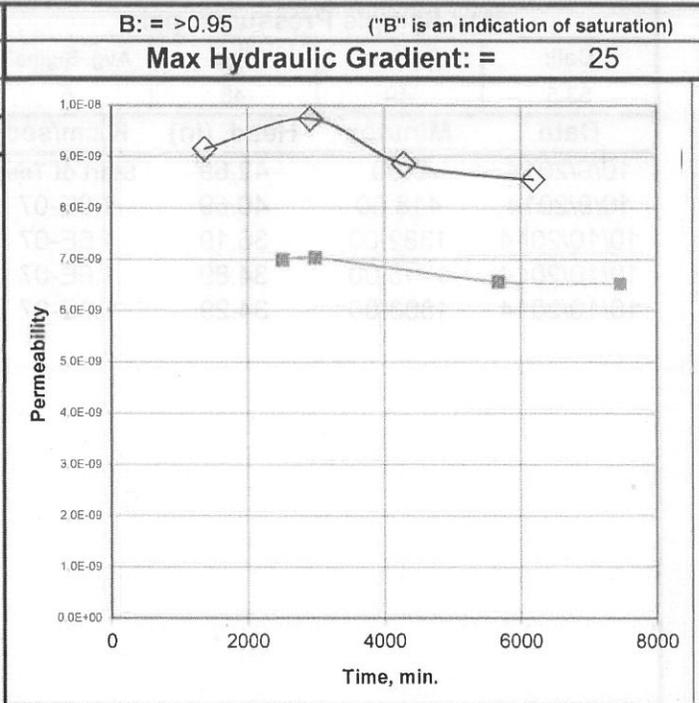




**Hydraulic Conductivity**  
**ASTM D 5084**  
 Method C: Falling Head Rising Tailwater

Job No: 652-010 Boring: AC Levee Date: 10/22/14  
 Client: Signet Sample: By: MD/PJ  
 Project: 7636 Depth, ft.: 166-166.5 Remolded:  
 Visual Classification: Greenish Gray CLAY

Max Sample Pressures, psi:			
Cell:	Bottom	Top	Avg. Sigma3
43.5	39.5	37.5	5
Date	Minutes	Head, (in)	K, cm/sec
10/9/2014	0.00	42.69	Start of Test
10/10/2014	1370.00	42.29	9.1E-09
10/11/2014	2920.00	41.79	9.7E-09
10/12/2014	4283.00	41.49	8.9E-09
10/13/2014	6185.00	40.99	8.5E-09
10/17/2014	2518.00	69.48	7.0E-09
10/17/2014	2992.00	69.28	7.0E-09
10/19/2014	5678.00	68.38	6.6E-09
10/20/2014	7464.00	67.78	6.5E-09



**Average Hydraulic Conductivity: <1E-08 \* cm/sec**

Sample Data:	Initial (As-Received)	Final (At-Test)
Height, in	2.84	2.84
Diameter, in	2.41	2.43
Area, in <sup>2</sup>	4.56	4.62
Volume in <sup>3</sup>	12.96	13.12
Total Volume, cc	212.3	214.9
Volume Solids, cc	122.3	122.3
Volume Voids, cc	90.0	92.7
Void Ratio	0.7	0.8
Total Porosity, %	42.4	43.1
Air-Filled Porosity (θ <sub>a</sub> ), %	0.6	0.3
Water-Filled Porosity (θ <sub>w</sub> ), %	41.8	42.8
Saturation, %	98.5	99.2
Specific Gravity	2.80 Assumed	2.80
Wet Weight, gm	431.0	434.3
Dry Weight, gm	342.3	342.3
Tare, gm	0.00	0.00
Moisture, %	25.9	26.9
Wet Bulk Density, pcf	126.7	126.1
Dry Bulk Density, pcf	100.6	99.4
Wet Bulk Dens.pb, (g/cm <sup>3</sup> )	2.03	2.02
Dry Bulk Dens.pb, (g/cm <sup>3</sup> )	1.61	1.59

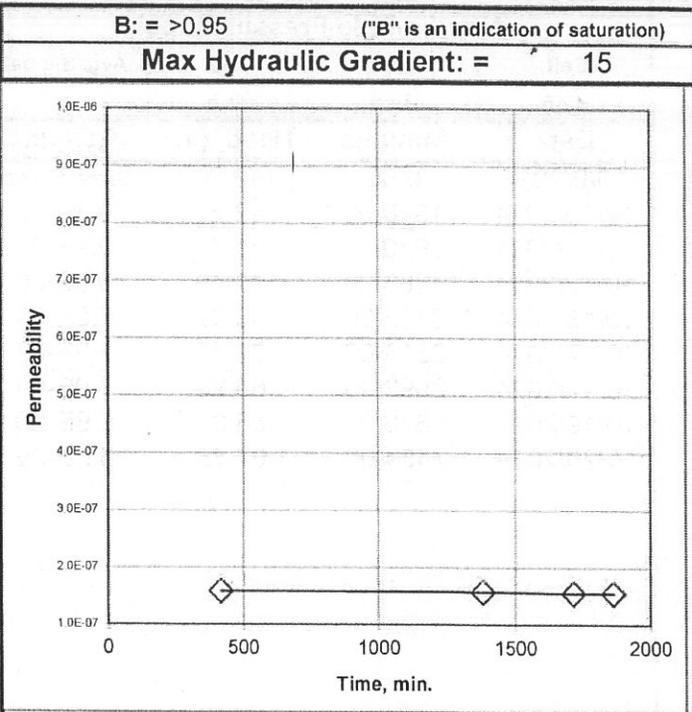
Remarks: \*Permeabilities in the range of 10<sup>-9</sup> cm/sec are difficult to measure accurately. Therefore, a permeability of less than 1 x 10<sup>-8</sup> cm/sec is reported instead of the average of the actual readings as is normally done.



**Hydraulic Conductivity**  
**ASTM D 5084**  
 Method C: Falling Head Rising Tailwater

Job No: 652-010 Boring: AC Levee Date: 10/14/14  
 Client: Signet Sample: \_\_\_\_\_ By: MD/PJ  
 Project: 7636 Depth, ft.: 20.5-21.0 Remolded: \_\_\_\_\_  
 Visual Classification: Greenish Gray CLAY

Max Sample Pressures, psi:			
Cell:	Bottom	Top	Avg. Sigma3
53.5	49	48	5
Date	Minutes	Head, (in)	K,cm/sec
10/9/2014	0.00	42.69	Start of Test
10/9/2014	418.00	40.59	1.6E-07
10/10/2014	1382.00	36.19	1.6E-07
10/10/2014	1715.00	34.89	1.6E-07
10/10/2014	1863.00	34.29	1.6E-07



**Average Hydraulic Conductivity: 2.E-07 cm/sec**

Sample Data:	Initial (As-Received)	Final (At-Test)
Height, in	2.83	2.80
Diameter, in	2.41	2.42
Area, in <sup>2</sup>	4.56	4.60
Volume in <sup>3</sup>	12.92	12.88
Total Volume, cc	211.8	211.0
Volume Solids, cc	119.6	119.6
Volume Voids, cc	92.2	91.4
Void Ratio	0.8	0.8
Total Porosity, %	43.5	43.3
Air-Filled Porosity (θ <sub>a</sub> ), %	-1.5	0.3
Water-Filled Porosity (θ <sub>w</sub> ), %	45.0	43.0
Saturation, %	103.5	99.3
Specific Gravity	2.75 Assumed	2.75
Wet Weight, gm	424.3	419.7
Dry Weight, gm	329.0	329.0
Tare, gm	0.00	0.00
Moisture, %	29.0	27.6
Wet Bulk Density, pcf	125.0	124.1
Dry Bulk Density, pcf	96.9	97.3
Wet Bulk Dens.pb, (g/cm <sup>3</sup> )	2.00	1.99
Dry Bulk Dens.pb, (g/cm <sup>3</sup> )	1.55	1.56

Remarks: \_\_\_\_\_



### Hydraulic Conductivity

ASTM D 5084

Method C: Falling Head Rising Tailwater

Job No: 652-009 Boring: WC-526-526.5 Date: 10/22/14  
 Client: Signet Sample: By: MD/PJ  
 Project: 7658 Depth, ft.: Remolded:  
 Visual Classification: Greenish Gray CLAY

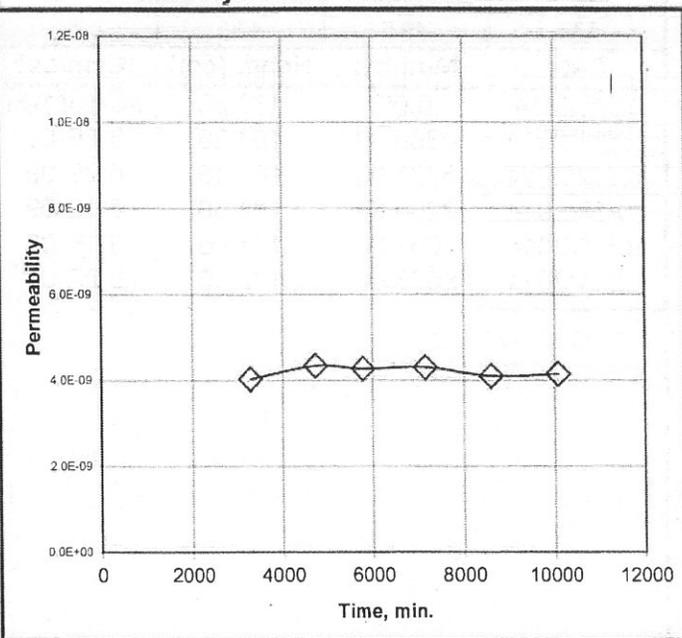
**Max Sample Pressures, psi:**

B: = >0.95 ("B" is an indication of saturation)

Cell:	Bottom	Top	Avg. Sigma3
83	79	77	5

**Max Hydraulic Gradient: = 23**

Date	Minutes	Head, (cm)	K, cm/sec
10/7/2014	0.00	166.66	Start of Test
10/9/2014	3294.00	165.36	4.0E-09
10/10/2014	4740.00	164.66	4.3E-09
10/11/2014	5790.00	164.26	4.3E-09
10/12/2014	7170.00	163.66	4.3E-09
10/13/2014	8606.00	163.26	4.1E-09
10/14/2014	10074.00	162.66	4.1E-09



**Average Hydraulic Conductivity: <1E-08 cm/sec**

Sample Data:	Initial (As-Received)	Final (At-Test)
Height, in	2.84	2.89
Diameter, in	2.41	2.46
Area, in <sup>2</sup>	4.56	4.76
Volume in <sup>3</sup>	12.96	13.77
Total Volume, cc	212.3	225.7
Volume Solids, cc	129.3	129.3
Volume Voids, cc	83.0	96.5
Void Ratio	0.6	0.7
Total Porosity, %	39.1	42.7
Air-Filled Porosity (θ <sub>a</sub> ), %	0.9	0.7
Water-Filled Porosity (θ <sub>w</sub> ), %	38.2	42.0
Saturation, %	97.6	98.3
Specific Gravity	2.80 Assumed	2.80
Wet Weight, gm	443.0	456.8
Dry Weight, gm	361.9	361.9
Tare, gm	0.00	0.00
Moisture, %	22.4	26.2
Wet Bulk Density, pcf	130.2	126.3
Dry Bulk Density, pcf	106.4	100.1
Wet Bulk Dens.pb, (g/cm <sup>3</sup> )	2.09	2.02
Dry Bulk Dens.pb, (g/cm <sup>3</sup> )	1.70	1.60

Remarks:

# Appendix I

## Aquifer Characterization Laboratory Reports

Aquifer Characterization Analytical Data v2.txt

Sample_Sampling_Point	Sample_Sample_Name	Sample_Sampled_Date	Result_Name
Result_Text	Result_Units	Sample_Job_Name	Sample_ID_Numeric
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	Ca 115.9 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	Cl 239.7 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	Cl 239.7 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	K 2.7 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	Mg 40.54 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	Na 88.24 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	SO4 70 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	SO4 70 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	ALK-OH <1 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	ALK-CO3 <1 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	Total Alkalinity 219 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N04	4s1w 19n04	9/9/2014 9:55	ALK-HCO3 219 mg/L
NILES-CONE-09-14-12	256243		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	Ca 63.29 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	Cl 78.2 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	Cl 78.2 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	K 1.9 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	Mg 26.53 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	Na 49.32 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	SO4 72.8 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	SO4 72.8 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	ALK-HCO3 189 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	ALK-CO3 <1 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	ALK-OH <1 mg/L
NILES-CONE-09-14-12	256242		
4S1W-19N05	4s1w 19n05	9/9/2014 9:48	Total Alkalinity 189 mg/L
NILES-CONE-09-14-12	256242		
4S1W-28M09	4s1w 28m09	8/29/2014 8:27	Ca 274.1 mg/L
NILES-CONE-09-14-10	255956		
4S1W-28M09	4s1w 28m09	8/29/2014 8:27	Cl 630.7 mg/L
NILES-CONE-09-14-10	255956		
4S1W-28M09	4s1w 28m09	8/29/2014 8:27	Cl 630.7 mg/L
NILES-CONE-09-14-10	255956		
4S1W-28M09	4s1w 28m09	8/29/2014 8:27	K 4.1 mg/L
NILES-CONE-09-14-10	255956		
4S1W-28M09	4s1w 28m09	8/29/2014 8:27	Mg 87.75 mg/L
NILES-CONE-09-14-10	255956		
4S1W-28M09	4s1w 28m09	8/29/2014 8:27	Na 132.8 mg/L
NILES-CONE-09-14-10	255956		
4S1W-28M09	4s1w 28m09	8/29/2014 8:27	SO4 81.3 mg/L

Aquifer Characterization Analytical Data v2.txt

NILES-CONE-09-14-10	255956									
4S1w-28M09	4s1w 28m09	8/29/2014	8:27	SO4	81.3	mg/L				
NILES-CONE-09-14-10	255956									
4S1w-28M09	4s1w 28m09	8/29/2014	8:27	Total Alkalinity			291	mg/L		
NILES-CONE-09-14-10	255956									
4S1w-28M09	4s1w 28m09	8/29/2014	8:27	ALK-CO3	<1	mg/L				
NILES-CONE-09-14-10	255956									
4S1w-28M09	4s1w 28m09	8/29/2014	8:27	ALK-HCO3			291	mg/L		
NILES-CONE-09-14-10	255956									
4S1w-28M09	4s1w 28m09	8/29/2014	8:27	ALK-OH	<1	mg/L				
NILES-CONE-09-14-10	255956									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	Ca	91.92	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	Cl	105.4	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	Cl	105.4	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	K	2.5	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	Mg	33.85	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	Na	86.27	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	SO4	77.7	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	SO4	77.7	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	ALK-OH	<1	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	ALK-CO3	<1	mg/L				
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	Total Alkalinity			307	mg/L		
NILES-CONE-09-14-10	255957									
4S1w-28M10	4s1w 28m10	8/29/2014	8:57	ALK-HCO3			307	mg/L		
NILES-CONE-09-14-10	255957									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	Ca	102.6	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	Cl	212.4	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	Cl	212.4	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	K	2.6	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	Mg	38.59	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	Na	81.63	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	SO4	69.7	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	SO4	69.7	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	ALK-CO3	<1	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	ALK-HCO3			201	mg/L		
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	ALK-OH	<1	mg/L				
NILES-CONE-08-14-07	255730									
4S1w-30A02	4s1w 30a02	8/20/2014	10:39	Total Alkalinity			201	mg/L		
NILES-CONE-08-14-07	255730									
4S1w-30A04	4s1w 30a04	8/20/2014	10:39	Ca	58.15	mg/L				
NILES-CONE-08-14-07	255729									
4S1w-30A04	4s1w 30a04	8/20/2014	10:39	Cl	80.9	mg/L				
NILES-CONE-08-14-07	255729									

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4S1W-30A04	4s1w	30a04	8/20/2014	10:39	Cl	80.9	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	K	2	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	Mg	25.79	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	Na	69.2	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	SO4	82.5	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	SO4	82.5	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	ALK-HCO3	199	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	ALK-OH	<1	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	Total Alkalinity	199	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-30A04	4s1w	30a04	8/20/2014	10:39	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-07		255729							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	Ca	83.99	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	Cl	213.8	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	Cl	213.8	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	K	2.2	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	Mg	37.96	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	Na	114.3	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	SO4	87.6	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	SO4	87.6	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	ALK-HCO3	213	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	ALK-OH	<1	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E11	4s1w	32e11	9/11/2014	10:47	Total Alkalinity	213	mg/L		
NILES-CONE-09-14-15		256313							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	Ca	99.73	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	Cl	208.4	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	Cl	208.4	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	K	2.3	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	Mg	30.26	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	Na	99.91	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	SO4	84.3	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	SO4	84.3	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-15		256314							
4S1W-32E12	4s1w	32e12	9/11/2014	10:44	ALK-OH	<1	mg/L		

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NILES-CONE-09-14-15	256314								
4S1W-32E12	4s1w 32e12	9/11/2014	10:44	Total Alkalinity		198		mg/L	
NILES-CONE-09-14-15	256314								
4S1W-32E12	4s1w 32e12	9/11/2014	10:44	ALK-HCO3	198			mg/L	
NILES-CONE-09-14-15	256314								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Ca	136.3			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Cl	105			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Cl	105			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	K	3.9			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Mg	39.42			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Na	105.4			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	SO4	78.6			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	SO4	78.6			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	ALK-CO3	<1			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	ALK-OH	<1			mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	ALK-HCO3		439		mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Total Alkalinity		439		mg/L	
NILES-CONE-09-14-16	256322								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Ca	122.3			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Cl	130.2			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Cl	130.2			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	K	2.8			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Mg	36.17			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Na	109.2			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	SO4	73.6			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	SO4	73.6			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	ALK-OH	<1			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Total Alkalinity		366		mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	ALK-CO3	<1			mg/L	
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	ALK-HCO3		366		mg/L	
NILES-CONE-09-14-16	256321								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	Ca	122.8			mg/L	
NILES-CONE-09-14-09	255943								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	Cl	140.9			mg/L	
NILES-CONE-09-14-09	255943								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	Cl	140.9			mg/L	
NILES-CONE-09-14-09	255943								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	K	2.5			mg/L	
NILES-CONE-09-14-09	255943								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	Mg	33.33			mg/L	
NILES-CONE-09-14-09	255943								

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4S2W-12K09	4s2w	12k09	8/28/2014	11:36	Na	48.94	mg/L		
NILES-CONE-09-14-09		255943							
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	SO4	52.6	mg/L		
NILES-CONE-09-14-09		255943							
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	SO4	52.6	mg/L		
NILES-CONE-09-14-09		255943							
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	Total Alkalinity			265	mg/L
NILES-CONE-09-14-09		255943							
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-09		255943							
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	ALK-HCO3			265	mg/L
NILES-CONE-09-14-09		255943							
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	ALK-OH	<1	mg/L		
NILES-CONE-09-14-09		255943							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Ca	104.2	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Cl	67.8	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Cl	67.8	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	K	2.4	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Mg	27.52	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Na	61.06	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	SO4	63.1	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	SO4	63.1	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	ALK-OH	<1	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Total Alkalinity			296	mg/L
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	ALK-HCO3			296	mg/L
NILES-CONE-09-14-09		255944							
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-09		255944							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Ca	151.3	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Cl	194.1	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Cl	194.1	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	K	2.6	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Mg	44.27	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Na	45.5	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	SO4	73.2	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	SO4	73.2	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	ALK-HCO3			256	mg/L
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	ALK-OH	<1	mg/L		
NILES-CONE-08-14-08		255743							
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Total Alkalinity			256	mg/L
NILES-CONE-08-14-08		255743							
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Ca	157.2	mg/L		

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NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Cl	134.5	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Cl	134.5	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	K	3.1	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Mg	43.01	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Na	51.79	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	SO4	85.5	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	SO4	85.5	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Total Alkalinity			332	mg/L
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	ALK-OH	<1	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	ALK-HCO3			332	mg/L
NILES-CONE-08-14-08	255742								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Ca	154.1	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Cl	253.3	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Cl	253.3	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	K	2.9	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Mg	40.76	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Na	49.55	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	SO4	49.3	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	SO4	49.3	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	ALK-OH	<1	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Total Alkalinity			215	mg/L
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	ALK-HCO3			215	mg/L
NILES-CONE-09-14-11	256098								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Ca	105.1	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Cl	83.6	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Cl	83.6	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	K	2.7	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Mg	28.89	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Na	46.98	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	SO4	57.2	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	SO4	57.2	mg/L		
NILES-CONE-09-14-11	256099								

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4S2W-14D06	4s2w	14d06	9/3/2014	11:50	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-11		256099							
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Total Alkalinity			270	mg/L
NILES-CONE-09-14-11		256099							
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	ALK-HCO3		270	mg/L	
NILES-CONE-09-14-11		256099							
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	ALK-OH	<1	mg/L		
NILES-CONE-09-14-11		256099							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	Ca	315.4	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	Cl	1114.4	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	Cl	1114.4	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	K	3.8	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	Mg	69.9	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	Na	322.8	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	SO4	44	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	SO4	44	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	ALK-HCO3	146	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	Total Alkalinity			146	mg/L
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N10	4s2w	36n10	8/20/2014	13:48	ALK-OH	<1	mg/L		
NILES-CONE-08-14-07		255731							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	Ca	90.39	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	Cl	339.9	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	Cl	339.9	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	K	4.7	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	Mg	33.61	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	Na	174.6	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	SO4	37.6	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	SO4	37.6	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	Total Alkalinity			226	mg/L
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	ALK-OH	<1	mg/L		
NILES-CONE-08-14-07		255732							
4S2W-36N11	4s2w	36n11	8/20/2014	14:20	ALK-HCO3	226	mg/L		
NILES-CONE-08-14-07		255732							
5S1W-20G01	5s/1w	20G001	2/5/2015	14:50	Ca	8.9	mg/L		
NILES-CONE-02-15-19		260615							
5S1W-20G01	5s/1w	20G001	2/5/2015	14:50	Cl	67.7	mg/L		
NILES-CONE-02-15-19		260615							
5S1W-20G01	5s/1w	20G001	2/5/2015	14:50	Cl	67.7	mg/L		
NILES-CONE-02-15-19		260615							
5S1W-20G01	5s/1w	20G001	2/5/2015	14:50	K	1.22	mg/L		

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NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	Mg	5.25	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	Na	169	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	SO4	40.2	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	SO4	40.2	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	ALK-OH	<1	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	Total Alkalinity			264	mg/L	
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	ALK-CO3	16	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	ALK-HCO3			148	mg/L	
NILES-CONE-02-15-19	260615								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Ca	1723	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Cl	27424.5	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Cl	27424.5	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	K	76.95	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Mg	2695	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Na	12520	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	SO4	2830	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	SO4	2830	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	ALK-OH	<1	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	ALK-CO3	<1	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Total Alkalinity			340	mg/L	
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	ALK-HCO3			340	mg/L	
NILES-CONE-02-15-19	260618								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Ca	17.76	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Cl	222.6	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Cl	222.6	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	K	4.75	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Mg	15.44	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Na	289.2	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	SO4	122	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	SO4	122	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Total Alkalinity			292	mg/L	
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	ALK-CO3	20	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	ALK-HCO3			272	mg/L	

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5S2W-03H05	5S/2W-03H005	2/4/2015 15:20	ALK-OH	<1	mg/L	
NILES-CONE-02-15-19	260619					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Ca	21.69	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Cl	335.3	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Cl	335.3	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	K	3.79	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Mg	12.56	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Na	296.2	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	SO4	57.2	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	SO4	57.2	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Total Alkalinity	229	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	ALK-OH	<1	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	ALK-HCO3	209	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	ALK-CO3	20	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Ca	37.03	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Cl	133.3	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Cl	133.3	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	K	6.42	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Mg	15.81	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Na	139.4	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	SO4	30.9	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	SO4	30.9	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Total Alkalinity	193	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	ALK-CO3	32	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	ALK-HCO3	161	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	ALK-OH	<1	mg/L	
NILES-CONE-02-15-19	260616					
5S1W-04H04	5s1w 04h04	9/16/2014 15:25	Ca	150	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5s1w 04h04	9/16/2014 15:25	Cl	230.9	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5s1w 04h04	9/16/2014 15:25	Cl	230.9	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5s1w 04h04	9/16/2014 15:25	K	4.3	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5s1w 04h04	9/16/2014 15:25	Mg	49.43	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5s1w 04h04	9/16/2014 15:25	Na	106.9	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5s1w 04h04	9/16/2014 15:25	SO4	82.9	mg/L	

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NILES-CONE-09-14-17	5S1w-04H04	256480	9/16/2014	15:25	SO4	82.9	mg/L		
NILES-CONE-09-14-17	5S1w-04H04	256480	9/16/2014	15:25	ALK-OH	<1	mg/L		
NILES-CONE-09-14-17	5S1w-04H04	256480	9/16/2014	15:25	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-17	5S1w-04H04	256480	9/16/2014	15:25	ALK-HCO3	373	mg/L		
NILES-CONE-09-14-17	5S1w-04H04	256480	9/16/2014	15:25	Total Alkalinity	373	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	Ca	59.17	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	Cl	216	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	Cl	216	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	K	2.7	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	Mg	18.38	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	Na	178	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	SO4	51	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	SO4	51	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	ALK-OH	<1	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	Total Alkalinity	261	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-17	5S1w-04H05	256481	9/16/2014	15:27	ALK-HCO3	261	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	Ca	37.68	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	Cl	29.5	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	Cl	29.5	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	K	1.6	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	Mg	11.07	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	Na	86	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	SO4	44.1	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	SO4	44.1	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	ALK-HCO3	248	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	ALK-OH	<1	mg/L		
NILES-CONE-09-14-13	5S1w-05H04	256274	9/10/2014	9:22	Total Alkalinity	248	mg/L		
NILES-CONE-09-14-13	5S1w-05H05	256275	9/10/2014	9:36	Ca	212.3	mg/L		
NILES-CONE-09-14-13	5S1w-05H05	256275	9/10/2014	9:36	Cl	585.7	mg/L		

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5S1W-05H05	5s1w	05h05	9/10/2014 9:36	Cl	585.7	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	K	4.8	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	Mg	69.43	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	Na	227.7	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	SO4	106	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	SO4	106	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	ALK-OH	<1	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	ALK-HCO3	326	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014 9:36	Total Alkalinity	326	mg/L		
NILES-CONE-09-14-13		256275						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	Ca	275.5	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	Cl	779.8	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	Cl	779.8	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	K	7.3	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	Mg	105.1	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	Na	142.6	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	SO4	42.5	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	SO4	42.5	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	ALK-OH	<1	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	ALK-HCO3	240	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014 9:09	Total Alkalinity	240	mg/L		
NILES-CONE-09-14-11		256096						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	Ca	19.47	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	Cl	12.7	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	Cl	12.7	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	K	1.4	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	Mg	6.68	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	Na	123.4	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	SO4	34.2	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	SO4	34.2	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	ALK-HCO3	283	mg/L		
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014 9:36	Total Alkalinity	283	mg/L		

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NILES-CONE-09-14-11	256097							
5S1W-16M07	5s1w 16m07	9/3/2014 9:36	ALK-CO3	<1	mg/L			
NILES-CONE-09-14-11	256097							
5S1W-16M07	5s1w 16m07	9/3/2014 9:36	ALK-OH	<1	mg/L			
NILES-CONE-09-14-11	256097							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	Ca	27.55	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	Cl	36.5	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	Cl	36.5	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	K	1.3	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	Mg	7.28	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	Na	73.24	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	SO4	24.2	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	SO4	24.2	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	ALK-OH	<1	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	ALK-HCO3	186	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	ALK-CO3	<1	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E06	5s2w 14e06	9/24/2014 12:24	Total Alkalinity	186	mg/L			
NILES-CONE-09-14-18	256719							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	Ca	17.41	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	Cl	13.6	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	Cl	13.6	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	K	2.8	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	Mg	6.72	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	Na	71.93	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	SO4	15	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	SO4	15	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	ALK-CO3	<1	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	ALK-HCO3	208	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	Total Alkalinity	208	mg/L			
NILES-CONE-09-14-18	256720							
5S2W-14E07	5s2w 14e07	9/24/2014 11:48	ALK-OH	<1	mg/L			
NILES-CONE-09-14-18	256720							

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Sample_Sampling_Point	Result_Text	Sample_Units	Sample_Sample_Name	Sample_Sampled_Date	Sample_ID_Numeric	Result_Name
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	Ca	115.9	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	Cl	239.7	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	Cl	239.7	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	K	2.7	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	Mg	40.54	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	Na	88.24	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	SO4	70	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	SO4	70	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	ALK-OH	<1	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	ALK-CO3	<1	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	Total Alkalinity	219	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N04	4s1w	19n04	9/9/2014 9:55	ALK-HCO3	219	mg/L
NILES-CONE-09-14-12		256243				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	Ca	63.29	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	Cl	78.2	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	Cl	78.2	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	K	1.9	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	Mg	26.53	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	Na	49.32	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	SO4	72.8	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	SO4	72.8	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	ALK-HCO3	189	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	ALK-CO3	<1	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	ALK-OH	<1	mg/L
NILES-CONE-09-14-12		256242				
4S1W-19N05	4s1w	19n05	9/9/2014 9:48	Total Alkalinity	189	mg/L
NILES-CONE-09-14-12		256242				
4S1W-28M09	4s1w	28m09	8/29/2014 8:27	Ca	274.1	mg/L
NILES-CONE-09-14-10		255956				
4S1W-28M09	4s1w	28m09	8/29/2014 8:27	Cl	630.7	mg/L
NILES-CONE-09-14-10		255956				
4S1W-28M09	4s1w	28m09	8/29/2014 8:27	Cl	630.7	mg/L
NILES-CONE-09-14-10		255956				
4S1W-28M09	4s1w	28m09	8/29/2014 8:27	K	4.1	mg/L
NILES-CONE-09-14-10		255956				
4S1W-28M09	4s1w	28m09	8/29/2014 8:27	Mg	87.75	mg/L
NILES-CONE-09-14-10		255956				
4S1W-28M09	4s1w	28m09	8/29/2014 8:27	Na	132.8	mg/L
NILES-CONE-09-14-10		255956				
4S1W-28M09	4s1w	28m09	8/29/2014 8:27	SO4	81.3	mg/L

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NILES-CONE-09-14-10	4S1W-28M09	4s1w	28m09	255956	8/29/2014	8:27	SO4	81.3	mg/L		
NILES-CONE-09-14-10	4S1W-28M09	4s1w	28m09	255956	8/29/2014	8:27	Total Alkalinity			291	mg/L
NILES-CONE-09-14-10	4S1W-28M09	4s1w	28m09	255956	8/29/2014	8:27	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-10	4S1W-28M09	4s1w	28m09	255956	8/29/2014	8:27	ALK-HCO3			291	mg/L
NILES-CONE-09-14-10	4S1W-28M09	4s1w	28m09	255956	8/29/2014	8:27	ALK-OH	<1	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255956	8/29/2014	8:57	Ca	91.92	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	Cl	105.4	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	Cl	105.4	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	K	2.5	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	Mg	33.85	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	Na	86.27	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	SO4	77.7	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	SO4	77.7	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	ALK-OH	<1	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	Total Alkalinity			307	mg/L
NILES-CONE-09-14-10	4S1W-28M10	4s1w	28m10	255957	8/29/2014	8:57	ALK-HCO3			307	mg/L
NILES-CONE-09-14-10	4S1W-30A02	4s1w	30a02	255957	8/20/2014	10:39	Ca	102.6	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	Cl	212.4	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	Cl	212.4	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	K	2.6	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	Mg	38.59	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	Na	81.63	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	SO4	69.7	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	SO4	69.7	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	ALK-HCO3			201	mg/L
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	ALK-OH	<1	mg/L		
NILES-CONE-08-14-07	4S1W-30A02	4s1w	30a02	255730	8/20/2014	10:39	Total Alkalinity			201	mg/L
NILES-CONE-08-14-07	4S1W-30A04	4s1w	30a04	255730	8/20/2014	10:39	Ca	58.15	mg/L		
NILES-CONE-08-14-07	4S1W-30A04	4s1w	30a04	255729	8/20/2014	10:39	Cl	80.9	mg/L		
NILES-CONE-08-14-07				255729							

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4S1W-30A04	4s1w	30a04	8/20/2014 10:39	Cl	80.9	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	K	2	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	Mg	25.79	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	Na	69.2	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	SO4	82.5	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	SO4	82.5	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	ALK-HCO3	199	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	ALK-OH	<1	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	Total Alkalinity	199	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-30A04	4s1w	30a04	8/20/2014 10:39	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-07		255729						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	Ca	83.99	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	Cl	213.8	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	Cl	213.8	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	K	2.2	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	Mg	37.96	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	Na	114.3	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	SO4	87.6	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	SO4	87.6	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	ALK-HCO3	213	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	ALK-OH	<1	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E11	4s1w	32e11	9/11/2014 10:47	Total Alkalinity	213	mg/L		
NILES-CONE-09-14-15		256313						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	Ca	99.73	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	Cl	208.4	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	Cl	208.4	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	K	2.3	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	Mg	30.26	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	Na	99.91	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	SO4	84.3	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	SO4	84.3	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-15		256314						
4S1W-32E12	4s1w	32e12	9/11/2014 10:44	ALK-OH	<1	mg/L		

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NILES-CONE-09-14-15	256314								
4S1W-32E12	4s1w 32e12	9/11/2014	10:44	Total Alkalinity	198	mg/L			
NILES-CONE-09-14-15	256314								
4S1W-32E12	4s1w 32e12	9/11/2014	10:44	ALK-HCO3	198	mg/L			
NILES-CONE-09-14-15	256314								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Ca	136.3	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Cl	105	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Cl	105	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	K	3.9	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Mg	39.42	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Na	105.4	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	SO4	78.6	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	SO4	78.6	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	ALK-CO3	<1	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	ALK-OH	<1	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	ALK-HCO3	439	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R07	4s1w-33r07	9/12/2014	15:13	Total Alkalinity	439	mg/L			
NILES-CONE-09-14-16	256322								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Ca	122.3	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Cl	130.2	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Cl	130.2	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	K	2.8	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Mg	36.17	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Na	109.2	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	SO4	73.6	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	SO4	73.6	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	ALK-OH	<1	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	Total Alkalinity	366	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	ALK-CO3	<1	mg/L			
NILES-CONE-09-14-16	256321								
4S1W-33R08	4s1w-33r08	9/12/2014	15:22	ALK-HCO3	366	mg/L			
NILES-CONE-09-14-16	256321								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	Ca	122.8	mg/L			
NILES-CONE-09-14-09	255943								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	Cl	140.9	mg/L			
NILES-CONE-09-14-09	255943								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	Cl	140.9	mg/L			
NILES-CONE-09-14-09	255943								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	K	2.5	mg/L			
NILES-CONE-09-14-09	255943								
4S2W-12K09	4s2w 12k09	8/28/2014	11:36	Mg	33.33	mg/L			
NILES-CONE-09-14-09	255943								

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4S2W-12K09	4s2w	12k09	8/28/2014	11:36	Na	48.94	mg/L	
NILES-CONE-09-14-09		255943						
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	SO4	52.6	mg/L	
NILES-CONE-09-14-09		255943						
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	SO4	52.6	mg/L	
NILES-CONE-09-14-09		255943						
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	Total Alkalinity	265	mg/L	
NILES-CONE-09-14-09		255943						
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	ALK-CO3	<1	mg/L	
NILES-CONE-09-14-09		255943						
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	ALK-HCO3	265	mg/L	
NILES-CONE-09-14-09		255943						
4S2W-12K09	4s2w	12k09	8/28/2014	11:36	ALK-OH	<1	mg/L	
NILES-CONE-09-14-09		255943						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Ca	104.2	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Cl	67.8	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Cl	67.8	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	K	2.4	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Mg	27.52	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Na	61.06	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	SO4	63.1	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	SO4	63.1	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	ALK-OH	<1	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	Total Alkalinity	296	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	ALK-HCO3	296	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-12K10	4s2w	12k10	8/28/2014	12:24	ALK-CO3	<1	mg/L	
NILES-CONE-09-14-09		255944						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Ca	151.3	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Cl	194.1	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Cl	194.1	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	K	2.6	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Mg	44.27	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Na	45.5	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	SO4	73.2	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	SO4	73.2	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	ALK-CO3	<1	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	ALK-HCO3	256	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	ALK-OH	<1	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P06	4s2w	13p06	8/27/2014	11:56	Total Alkalinity	256	mg/L	
NILES-CONE-08-14-08		255743						
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Ca	157.2	mg/L	

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NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Cl	134.5	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Cl	134.5	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	K	3.1	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Mg	43.01	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Na	51.79	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	SO4	85.5	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	SO4	85.5	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	Total Alkalinity		332	mg/L	
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	ALK-OH	<1	mg/L		
NILES-CONE-08-14-08	255742								
4S2W-13P07	4s2w	13p07	8/27/2014	11:24	ALK-HCO3		332	mg/L	
NILES-CONE-08-14-08	255742								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Ca	154.1	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Cl	253.3	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Cl	253.3	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	K	2.9	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Mg	40.76	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Na	49.55	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	SO4	49.3	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	SO4	49.3	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	ALK-OH	<1	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	Total Alkalinity		215	mg/L	
NILES-CONE-09-14-11	256098								
4S2W-14D05	4s2w	14d05	9/3/2014	11:16	ALK-HCO3		215	mg/L	
NILES-CONE-09-14-11	256098								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Ca	105.1	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Cl	83.6	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Cl	83.6	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	K	2.7	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Mg	28.89	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	Na	46.98	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	SO4	57.2	mg/L		
NILES-CONE-09-14-11	256099								
4S2W-14D06	4s2w	14d06	9/3/2014	11:50	SO4	57.2	mg/L		
NILES-CONE-09-14-11	256099								

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4S2W-14D06	4s2w	14d06	9/3/2014 11:50	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-11		256099						
4S2W-14D06	4s2w	14d06	9/3/2014 11:50	Total Alkalinity			270	mg/L
NILES-CONE-09-14-11		256099						
4S2W-14D06	4s2w	14d06	9/3/2014 11:50	ALK-HCO3		270	mg/L	
NILES-CONE-09-14-11		256099						
4S2W-14D06	4s2w	14d06	9/3/2014 11:50	ALK-OH	<1	mg/L		
NILES-CONE-09-14-11		256099						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	Ca	315.4	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	Cl	1114.4	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	Cl	1114.4	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	K	3.8	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	Mg	69.9	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	Na	322.8	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	SO4	44	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	SO4	44	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	ALK-HCO3		146	mg/L	
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	Total Alkalinity			146	mg/L
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N10	4s2w	36n10	8/20/2014 13:48	ALK-OH	<1	mg/L		
NILES-CONE-08-14-07		255731						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	Ca	90.39	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	Cl	339.9	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	Cl	339.9	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	K	4.7	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	Mg	33.61	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	Na	174.6	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	SO4	37.6	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	SO4	37.6	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	Total Alkalinity			226	mg/L
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	ALK-CO3	<1	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	ALK-OH	<1	mg/L		
NILES-CONE-08-14-07		255732						
4S2W-36N11	4s2w	36n11	8/20/2014 14:20	ALK-HCO3		226	mg/L	
NILES-CONE-08-14-07		255732						
5S1W-20G01	5s/1w	20G001	2/5/2015 14:50	Ca	8.9	mg/L		
NILES-CONE-02-15-19		260615						
5S1W-20G01	5s/1w	20G001	2/5/2015 14:50	Cl	67.7	mg/L		
NILES-CONE-02-15-19		260615						
5S1W-20G01	5s/1w	20G001	2/5/2015 14:50	Cl	67.7	mg/L		
NILES-CONE-02-15-19		260615						
5S1W-20G01	5s/1w	20G001	2/5/2015 14:50	K	1.22	mg/L		

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NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	Mg	5.25	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	Na	169	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	SO4	40.2	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	SO4	40.2	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	ALK-OH	<1	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	Total Alkalinity			264	mg/L	
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	ALK-CO3	16	mg/L			
NILES-CONE-02-15-19	260615								
5S1W-20G01	5S/1W-20G001	2/5/2015	14:50	ALK-HCO3			148	mg/L	
NILES-CONE-02-15-19	260615								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Ca	1723	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Cl	27424.5	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Cl	27424.5	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	K	76.95	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Mg	2695	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Na	12520	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	SO4	2830	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	SO4	2830	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	ALK-OH	<1	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	ALK-CO3	<1	mg/L			
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	Total Alkalinity			340	mg/L	
NILES-CONE-02-15-19	260618								
5S2W-03H04	5S/2W-03H004	2/4/2015	14:57	ALK-HCO3			340	mg/L	
NILES-CONE-02-15-19	260618								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Ca	17.76	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Cl	222.6	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Cl	222.6	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	K	4.75	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Mg	15.44	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Na	289.2	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	SO4	122	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	SO4	122	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	Total Alkalinity			292	mg/L	
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	ALK-CO3	20	mg/L			
NILES-CONE-02-15-19	260619								
5S2W-03H05	5S/2W-03H005	2/4/2015	15:20	ALK-HCO3			272	mg/L	

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5S2W-03H05	5S/2W-03H005	2/4/2015 15:20	ALK-OH	<1	mg/L	
NILES-CONE-02-15-19	260619					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Ca	21.69	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Cl	335.3	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Cl	335.3	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	K	3.79	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Mg	12.56	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Na	296.2	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	SO4	57.2	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	SO4	57.2	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	Total Alkalinity		229	mg/L
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	ALK-OH	<1	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	ALK-HCO3	209	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-08M11	5S/2W-08M011	2/4/2015 14:00	ALK-CO3	20	mg/L	
NILES-CONE-02-15-19	260617					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Ca	37.03	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Cl	133.3	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Cl	133.3	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	K	6.42	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Mg	15.81	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Na	139.4	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	SO4	30.9	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	SO4	30.9	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	Total Alkalinity		193	mg/L
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	ALK-CO3	32	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	ALK-HCO3	161	mg/L	
NILES-CONE-02-15-19	260616					
5S2W-24B03	5S/2W-24B003	2/4/2015 11:56	ALK-OH	<1	mg/L	
NILES-CONE-02-15-19	260616					
5S1W-04H04	5S1w 04h04	9/16/2014 15:25	Ca	150	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5S1w 04h04	9/16/2014 15:25	Cl	230.9	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5S1w 04h04	9/16/2014 15:25	Cl	230.9	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5S1w 04h04	9/16/2014 15:25	K	4.3	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5S1w 04h04	9/16/2014 15:25	Mg	49.43	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5S1w 04h04	9/16/2014 15:25	Na	106.9	mg/L	
NILES-CONE-09-14-17	256480					
5S1W-04H04	5S1w 04h04	9/16/2014 15:25	SO4	82.9	mg/L	

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NILES-CONE-09-14-17	256480								
5S1W-04H04	5s1w	04h04	9/16/2014	15:25	SO4	82.9	mg/L		
NILES-CONE-09-14-17	256480								
5S1W-04H04	5s1w	04h04	9/16/2014	15:25	ALK-OH	<1	mg/L		
NILES-CONE-09-14-17	256480								
5S1W-04H04	5s1w	04h04	9/16/2014	15:25	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-17	256480								
5S1W-04H04	5s1w	04h04	9/16/2014	15:25	ALK-HCO3	373	mg/L		
NILES-CONE-09-14-17	256480								
5S1W-04H04	5s1w	04h04	9/16/2014	15:25	Total Alkalinity	373	mg/L		
NILES-CONE-09-14-17	256480								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	Ca	59.17	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	Cl	216	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	Cl	216	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	K	2.7	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	Mg	18.38	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	Na	178	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	SO4	51	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	SO4	51	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	ALK-OH	<1	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	Total Alkalinity	261	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-04H05	5s1w	04h05	9/16/2014	15:27	ALK-HCO3	261	mg/L		
NILES-CONE-09-14-17	256481								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	Ca	37.68	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	Cl	29.5	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	Cl	29.5	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	K	1.6	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	Mg	11.07	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	Na	86	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	SO4	44.1	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	SO4	44.1	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	ALK-HCO3	248	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	ALK-CO3	<1	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	ALK-OH	<1	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H04	5s1w	05h04	9/10/2014	9:22	Total Alkalinity	248	mg/L		
NILES-CONE-09-14-13	256274								
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	Ca	212.3	mg/L		
NILES-CONE-09-14-13	256275								
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	Cl	585.7	mg/L		
NILES-CONE-09-14-13	256275								

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5S1W-05H05	5s1w	05h05	9/10/2014	9:36	Cl	585.7	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	K	4.8	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	Mg	69.43	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	Na	227.7	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	SO4	106	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	SO4	106	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	ALK-OH	<1	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	ALK-HCO3	326	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	ALK-CO3	<1	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-05H05	5s1w	05h05	9/10/2014	9:36	Total Alkalinity	326	mg/L	
NILES-CONE-09-14-13		256275						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	Ca	275.5	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	Cl	779.8	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	Cl	779.8	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	K	7.3	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	Mg	105.1	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	Na	142.6	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	SO4	42.5	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	SO4	42.5	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	ALK-OH	<1	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	ALK-CO3	<1	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	ALK-HCO3	240	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M06	5s1w	16m06	9/3/2014	9:09	Total Alkalinity	240	mg/L	
NILES-CONE-09-14-11		256096						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	Ca	19.47	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	Cl	12.7	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	Cl	12.7	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	K	1.4	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	Mg	6.68	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	Na	123.4	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	SO4	34.2	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	SO4	34.2	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	ALK-HCO3	283	mg/L	
NILES-CONE-09-14-11		256097						
5S1W-16M07	5s1w	16m07	9/3/2014	9:36	Total Alkalinity	283	mg/L	

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NILES-CONE-09-14-11	256097								
5S1W-16M07	5s1w 16m07	9/3/2014	9:36	ALK-CO3	<1	mg/L			
NILES-CONE-09-14-11	256097								
5S1W-16M07	5s1w 16m07	9/3/2014	9:36	ALK-OH	<1	mg/L			
NILES-CONE-09-14-11	256097								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	Ca	27.55	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	Cl	36.5	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	Cl	36.5	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	K	1.3	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	Mg	7.28	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	Na	73.24	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	SO4	24.2	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	SO4	24.2	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	ALK-OH	<1	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	ALK-HCO3	186	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	ALK-CO3	<1	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E06	5s2w 14e06	9/24/2014	12:24	Total Alkalinity	186	mg/L			
NILES-CONE-09-14-18	256719								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	Ca	17.41	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	Cl	13.6	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	Cl	13.6	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	K	2.8	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	Mg	6.72	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	Na	71.93	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	SO4	15	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	SO4	15	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	ALK-CO3	<1	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	ALK-HCO3	208	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	Total Alkalinity	208	mg/L			
NILES-CONE-09-14-18	256720								
5S2W-14E07	5s2w 14e07	9/24/2014	11:48	ALK-OH	<1	mg/L			
NILES-CONE-09-14-18	256720								

# Appendix J

## Piper Diagrams

# Chemical Signature A Plots

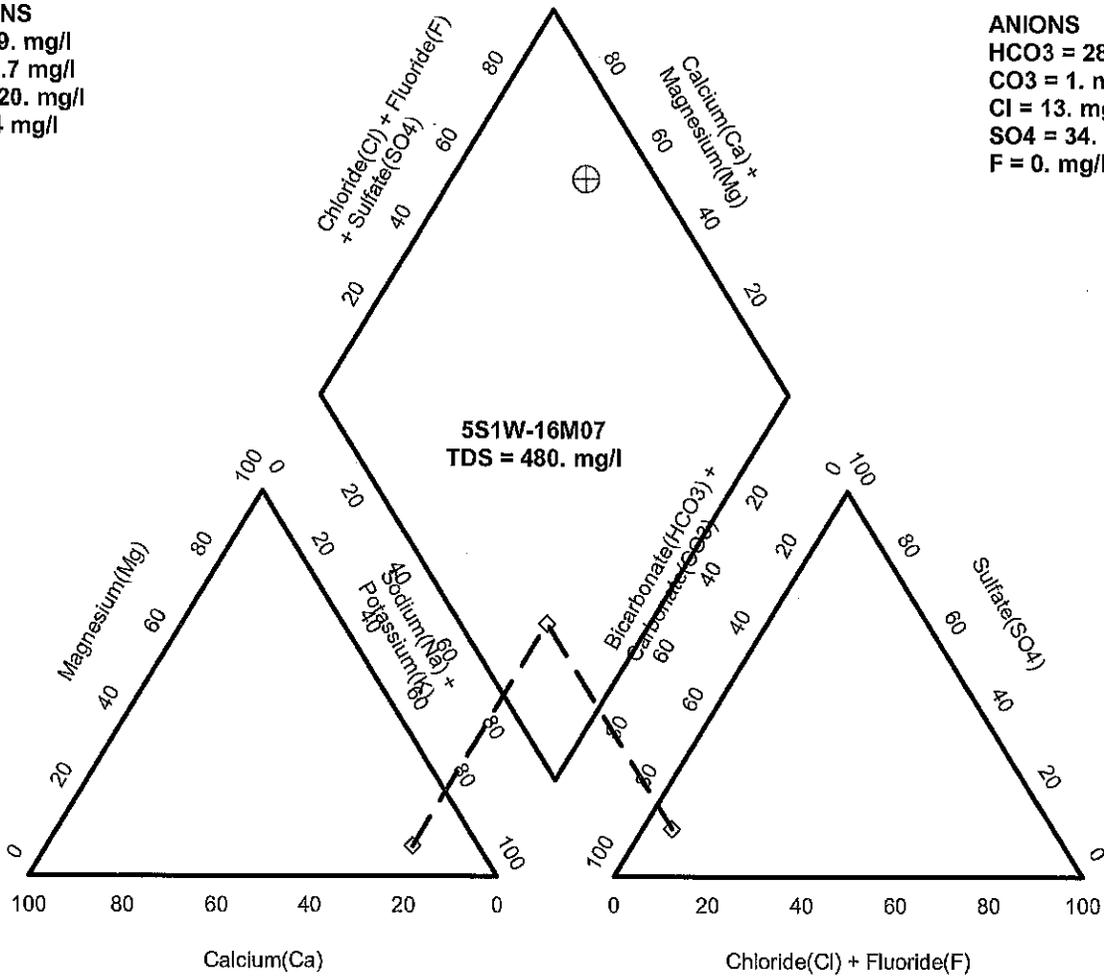
# Piper Plot

## CATIONS

Ca = 19. mg/l  
 Mg = 6.7 mg/l  
 Na = 120. mg/l  
 K = 1.4 mg/l

## ANIONS

HCO<sub>3</sub> = 280. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 13. mg/l  
 SO<sub>4</sub> = 34. mg/l  
 F = 0. mg/l



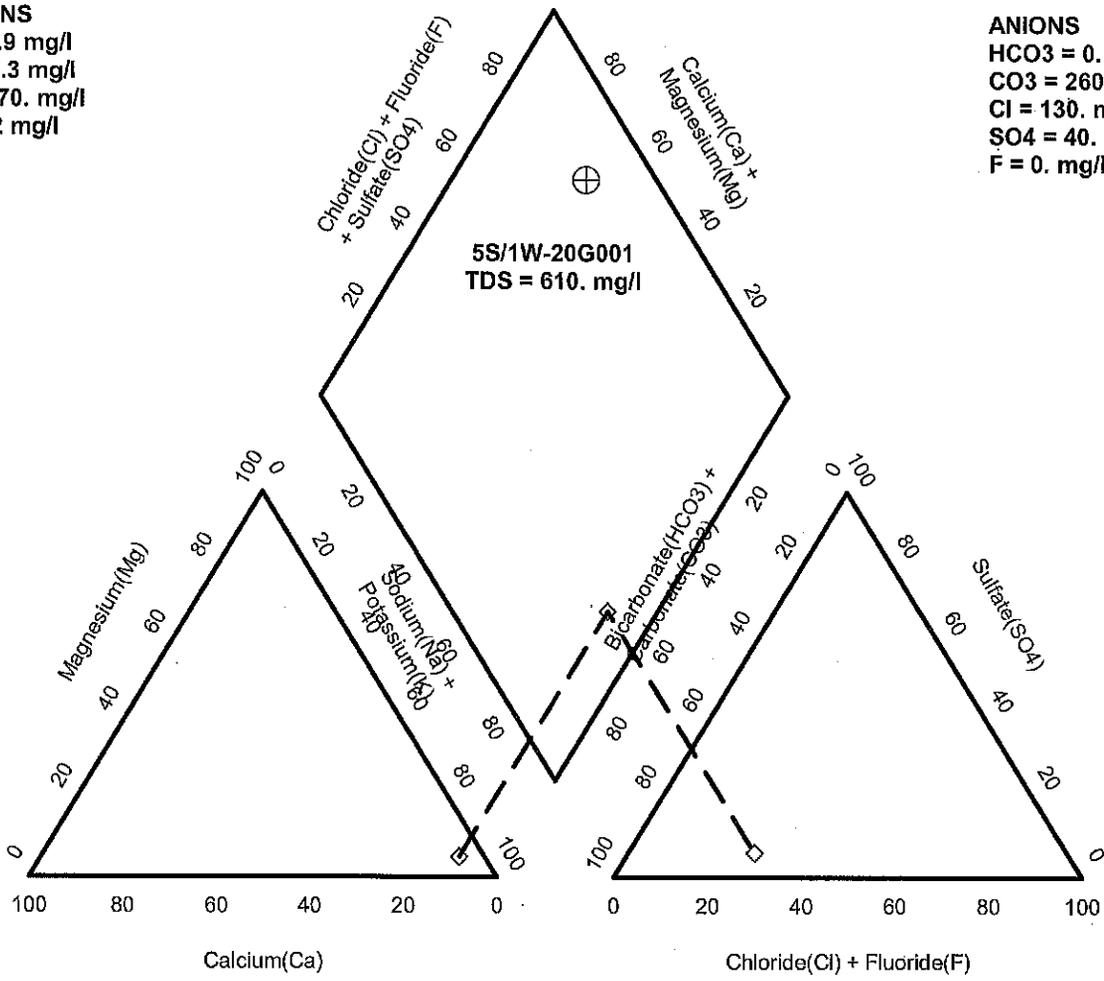
# Piper Plot

## CATIONS

Ca = 8.9 mg/l  
 Mg = 5.3 mg/l  
 Na = 170. mg/l  
 K = 1.2 mg/l

## ANIONS

HCO<sub>3</sub> = 0. mg/l  
 CO<sub>3</sub> = 260. mg/l  
 Cl = 130. mg/l  
 SO<sub>4</sub> = 40. mg/l  
 F = 0. mg/l



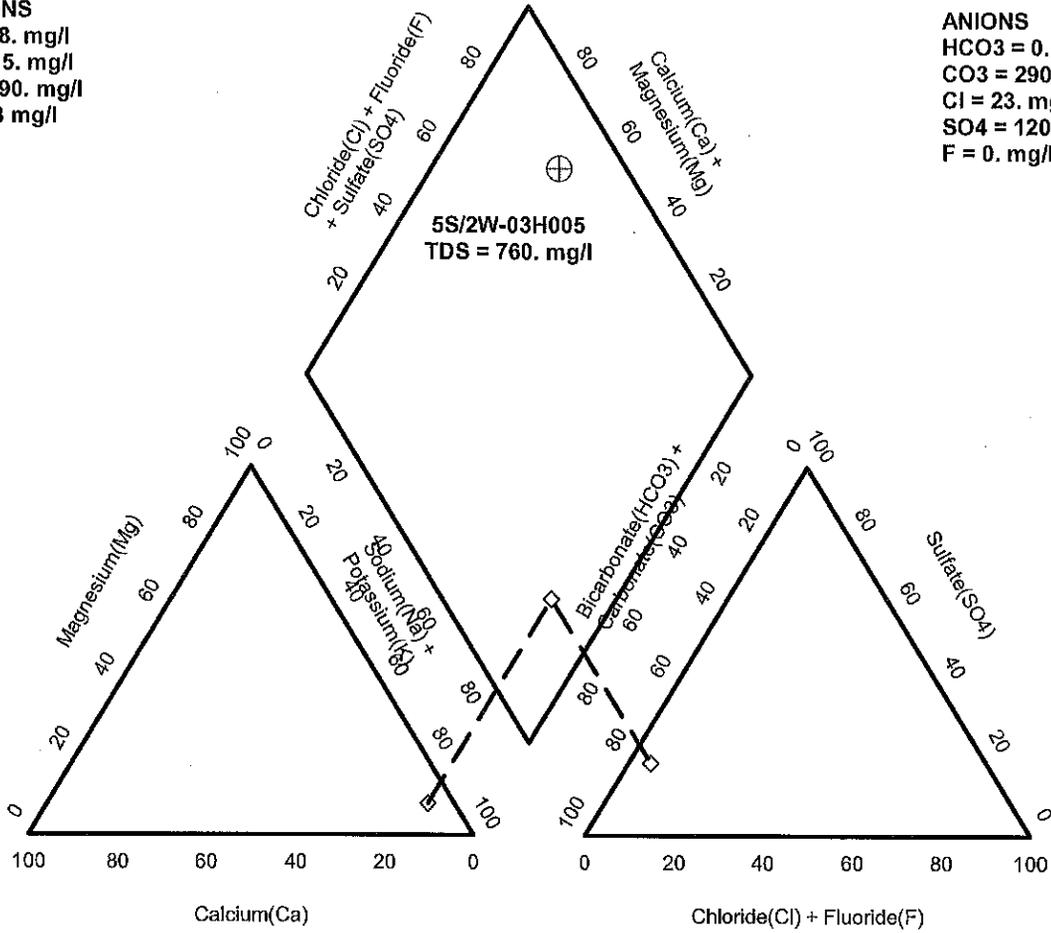
Piper Plot

CATIONS

Ca = 18. mg/l  
 Mg = 15. mg/l  
 Na = 290. mg/l  
 K = 4.8 mg/l

ANIONS

HCO<sub>3</sub> = 0. mg/l  
 CO<sub>3</sub> = 290. mg/l  
 Cl = 23. mg/l  
 SO<sub>4</sub> = 120. mg/l  
 F = 0. mg/l



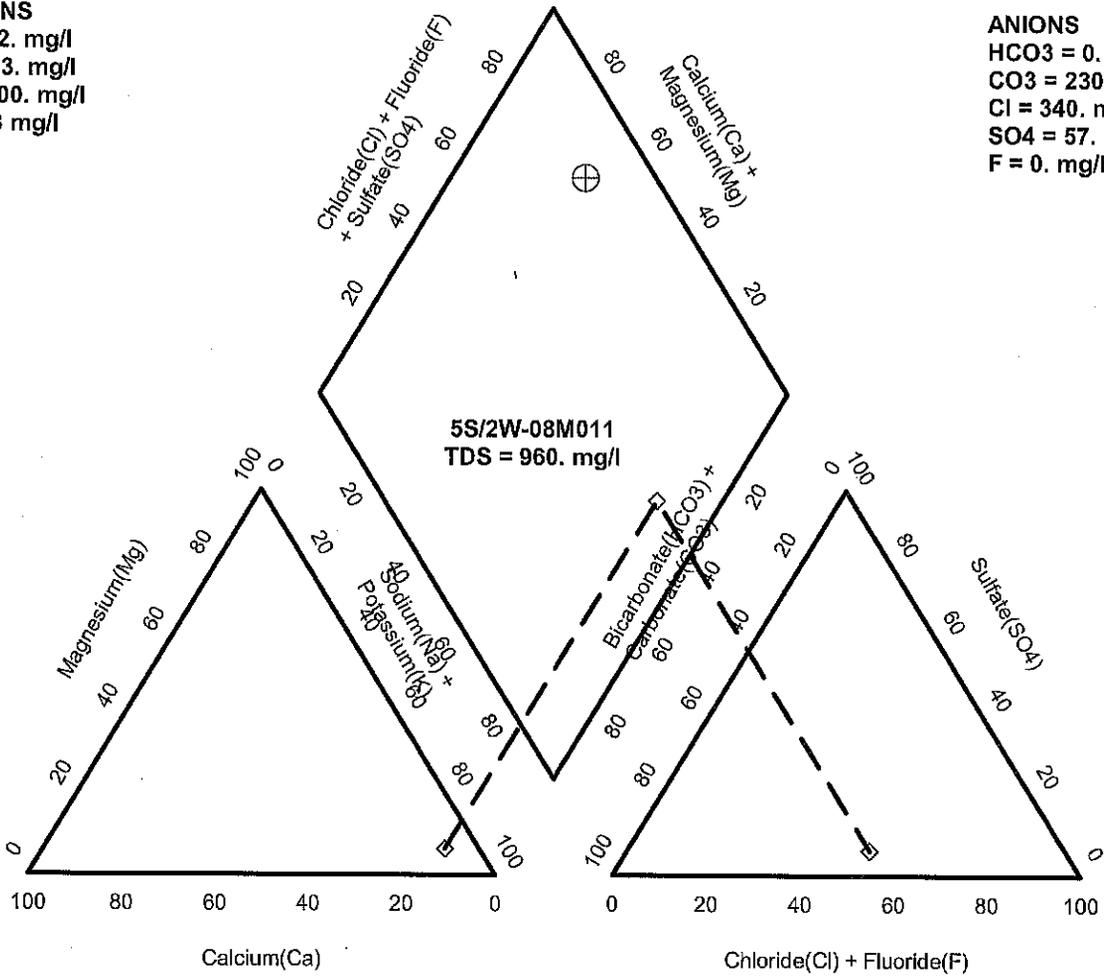
Piper Plot

**CATIONS**

Ca = 22. mg/l  
 Mg = 13. mg/l  
 Na = 300. mg/l  
 K = 3.8 mg/l

**ANIONS**

HCO<sub>3</sub> = 0. mg/l  
 CO<sub>3</sub> = 230. mg/l  
 Cl = 340. mg/l  
 SO<sub>4</sub> = 57. mg/l  
 F = 0. mg/l



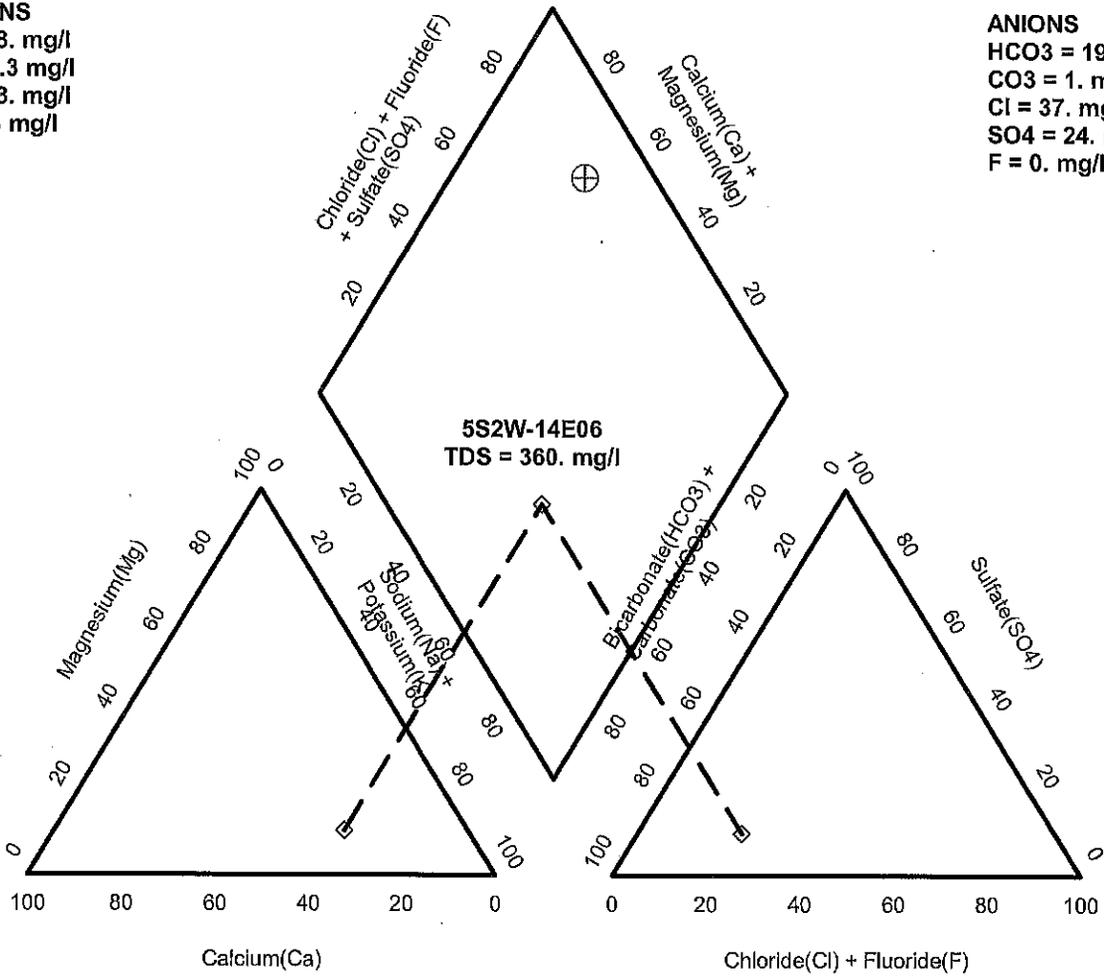
# Piper Plot

## CATIONS

Ca = 28. mg/l  
 Mg = 7.3 mg/l  
 Na = 73. mg/l  
 K = 1.3 mg/l

## ANIONS

HCO<sub>3</sub> = 190. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 37. mg/l  
 SO<sub>4</sub> = 24. mg/l  
 F = 0. mg/l



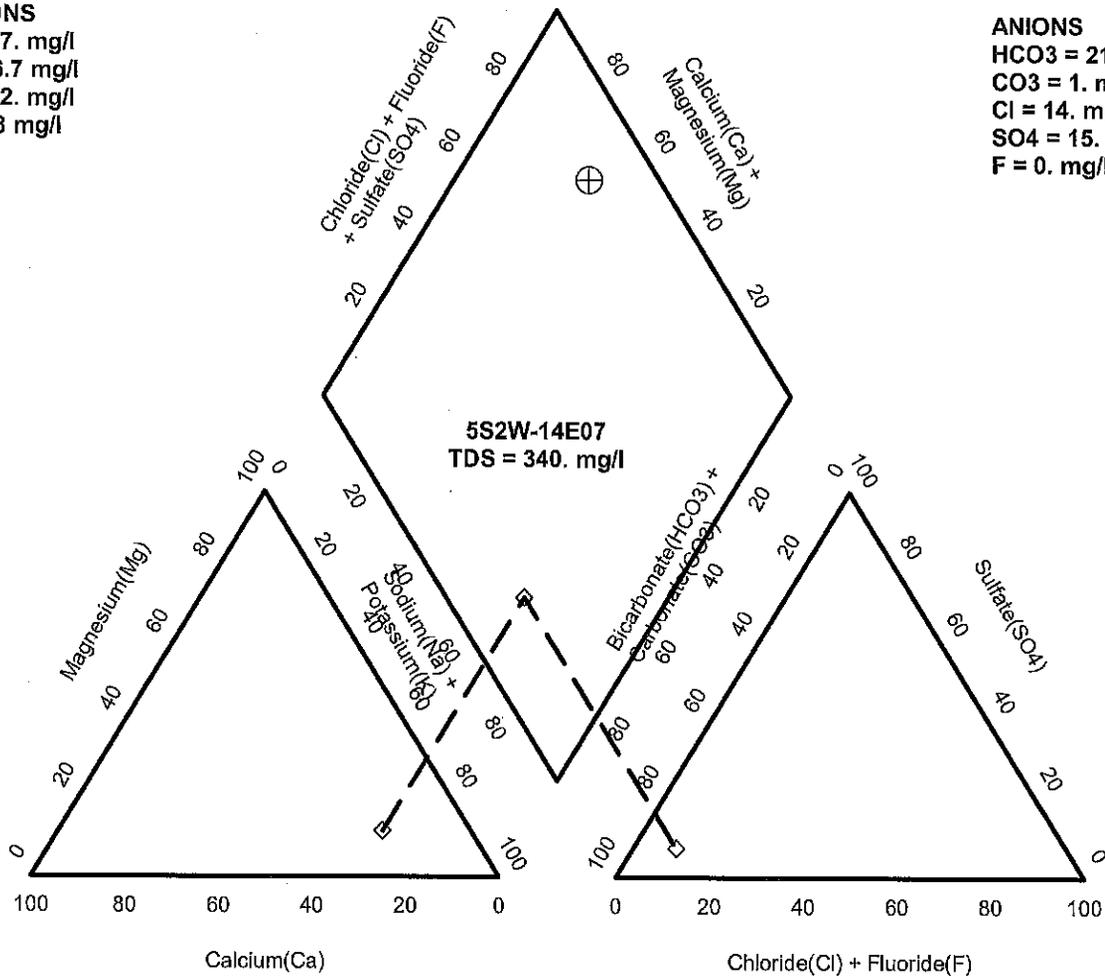
# Piper Plot

## CATIONS

Ca = 17. mg/l  
 Mg = 6.7 mg/l  
 Na = 72. mg/l  
 K = 2.8 mg/l

## ANIONS

HCO<sub>3</sub> = 210. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 14. mg/l  
 SO<sub>4</sub> = 15. mg/l  
 F = 0. mg/l



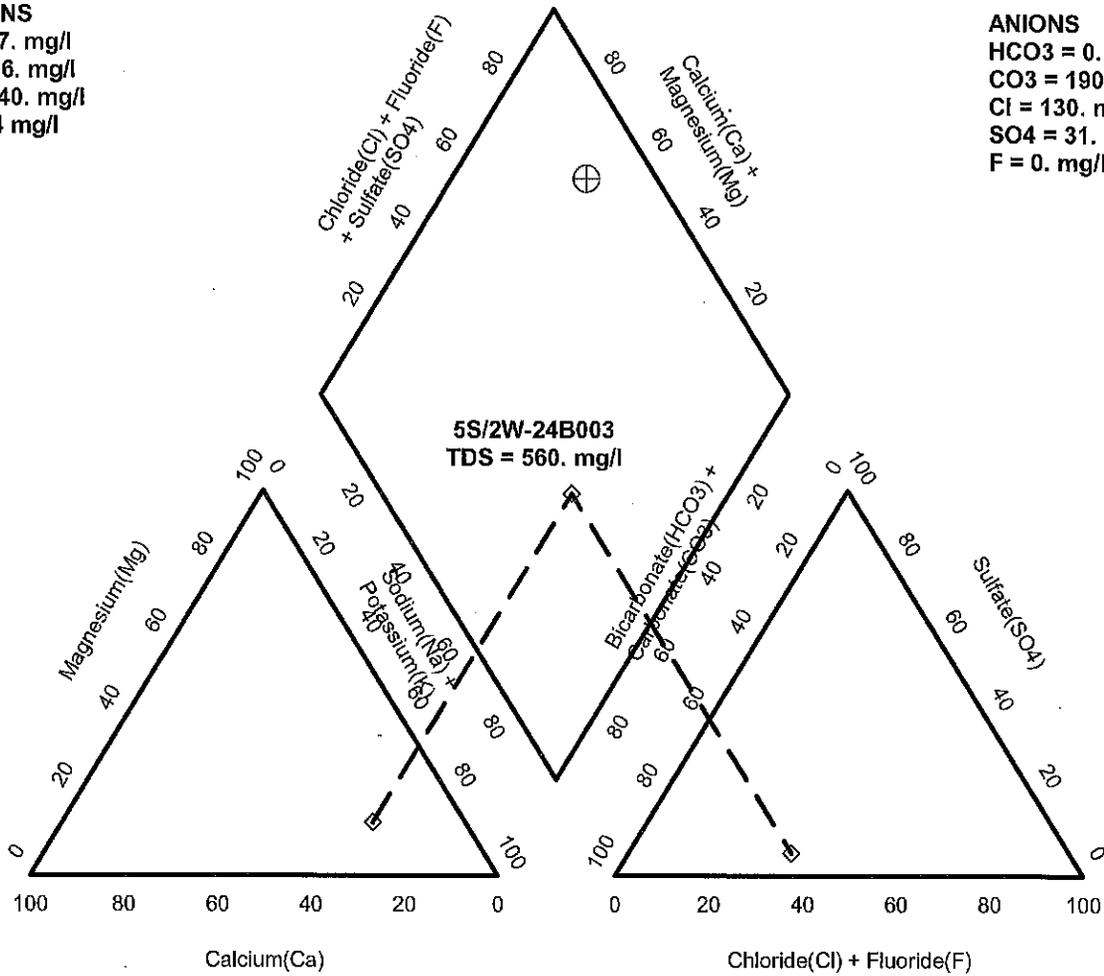
# Piper Plot

## CATIONS

Ca = 37. mg/l  
 Mg = 16. mg/l  
 Na = 140. mg/l  
 K = 6.4 mg/l

## ANIONS

HCO<sub>3</sub> = 0. mg/l  
 CO<sub>3</sub> = 190. mg/l  
 Cl = 130. mg/l  
 SO<sub>4</sub> = 31. mg/l  
 F = 0. mg/l



# Chemical Signature B Plots

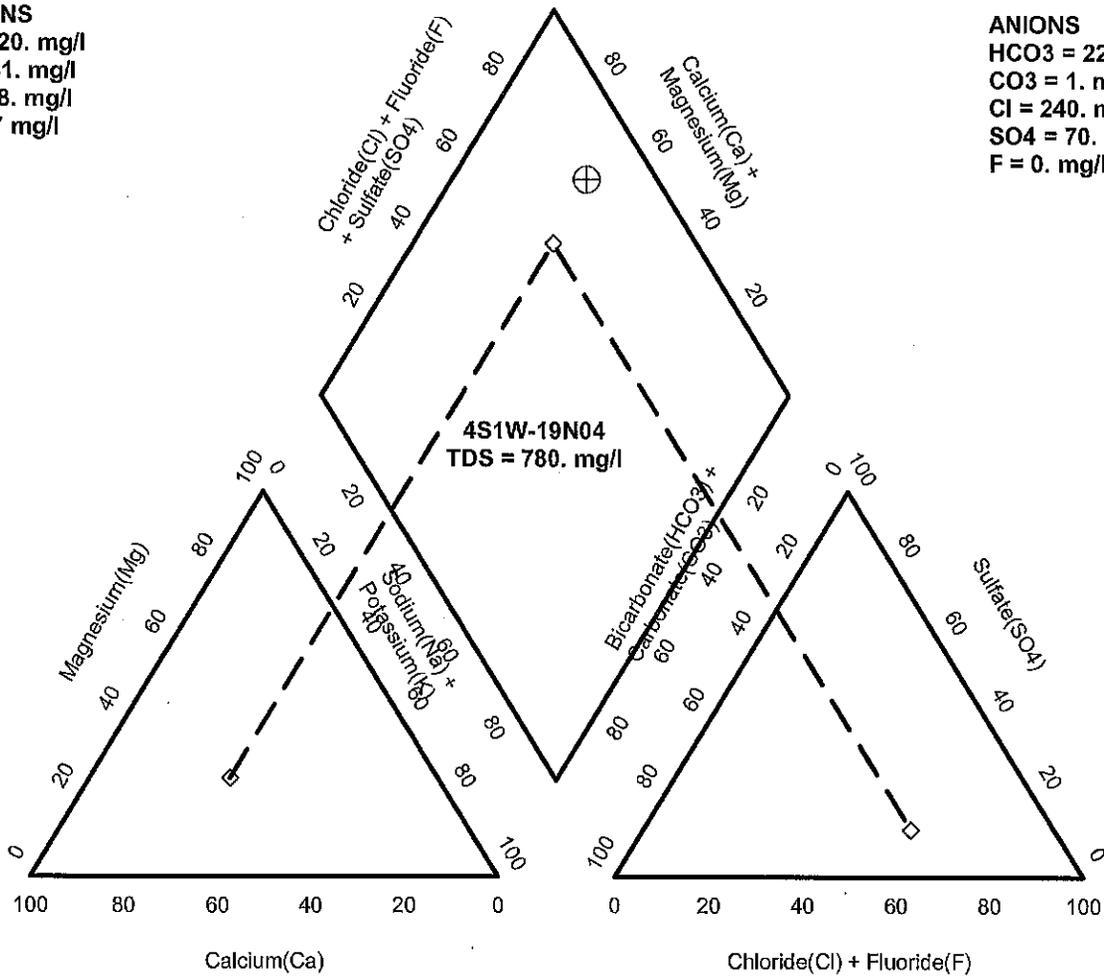
# Piper Plot

## CATIONS

Ca = 120. mg/l  
 Mg = 41. mg/l  
 Na = 88. mg/l  
 K = 2.7 mg/l

## ANIONS

HCO<sub>3</sub> = 220. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 240. mg/l  
 SO<sub>4</sub> = 70. mg/l  
 F = 0. mg/l



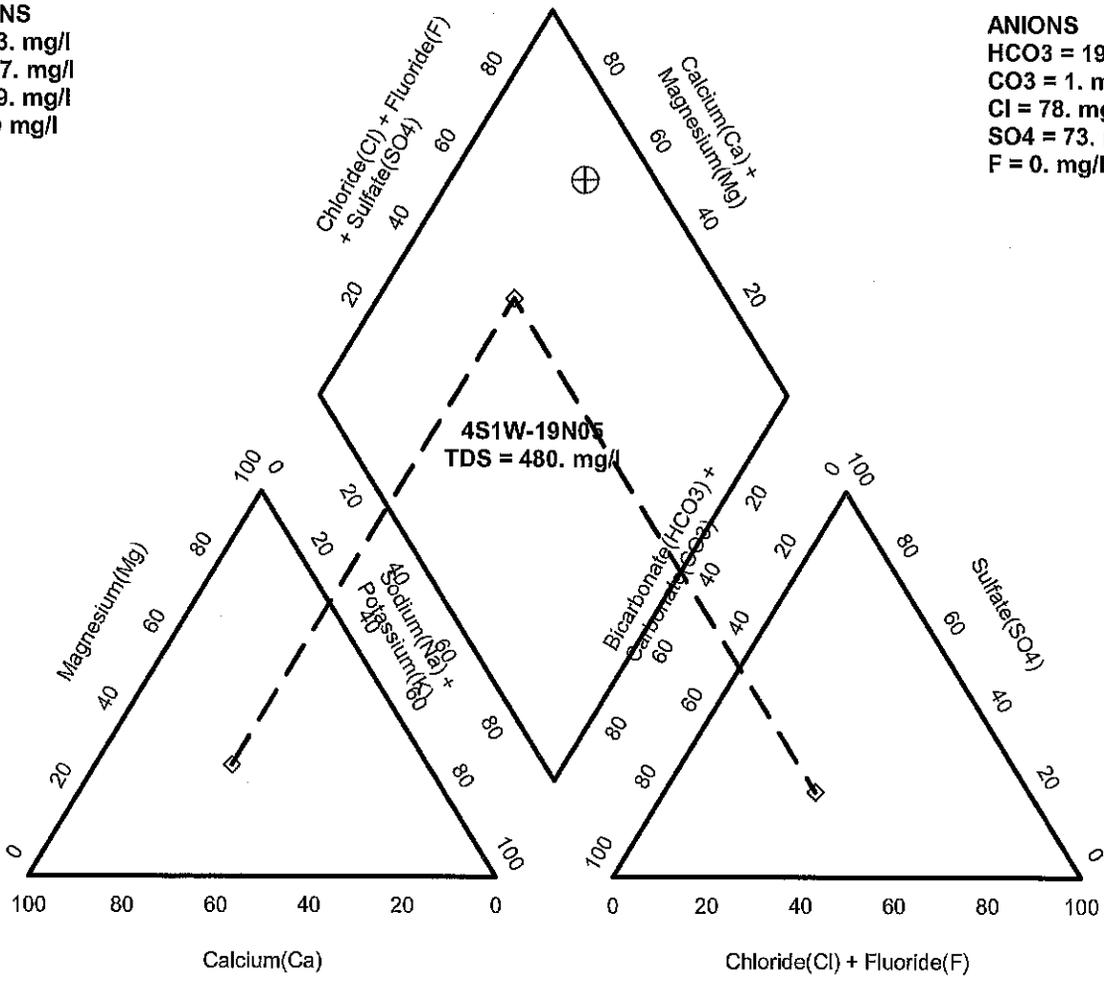
# Piper Plot

## CATIONS

Ca = 63. mg/l  
 Mg = 27. mg/l  
 Na = 49. mg/l  
 K = 1.9 mg/l

## ANIONS

HCO<sub>3</sub> = 190. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 78. mg/l  
 SO<sub>4</sub> = 73. mg/l  
 F = 0. mg/l



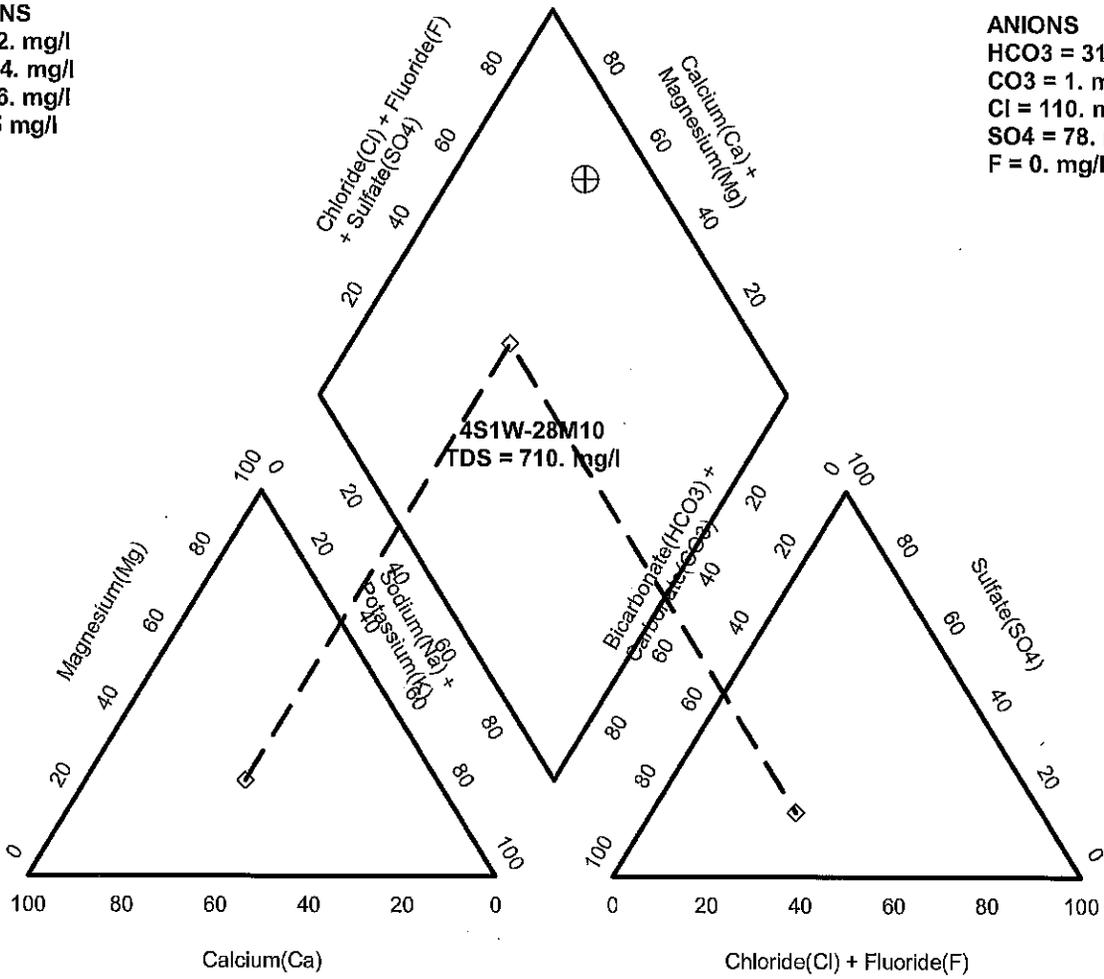
# Piper Plot

## CATIONS

Ca = 92. mg/l  
 Mg = 34. mg/l  
 Na = 86. mg/l  
 K = 2.5 mg/l

## ANIONS

HCO<sub>3</sub> = 310. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 110. mg/l  
 SO<sub>4</sub> = 78. mg/l  
 F = 0. mg/l



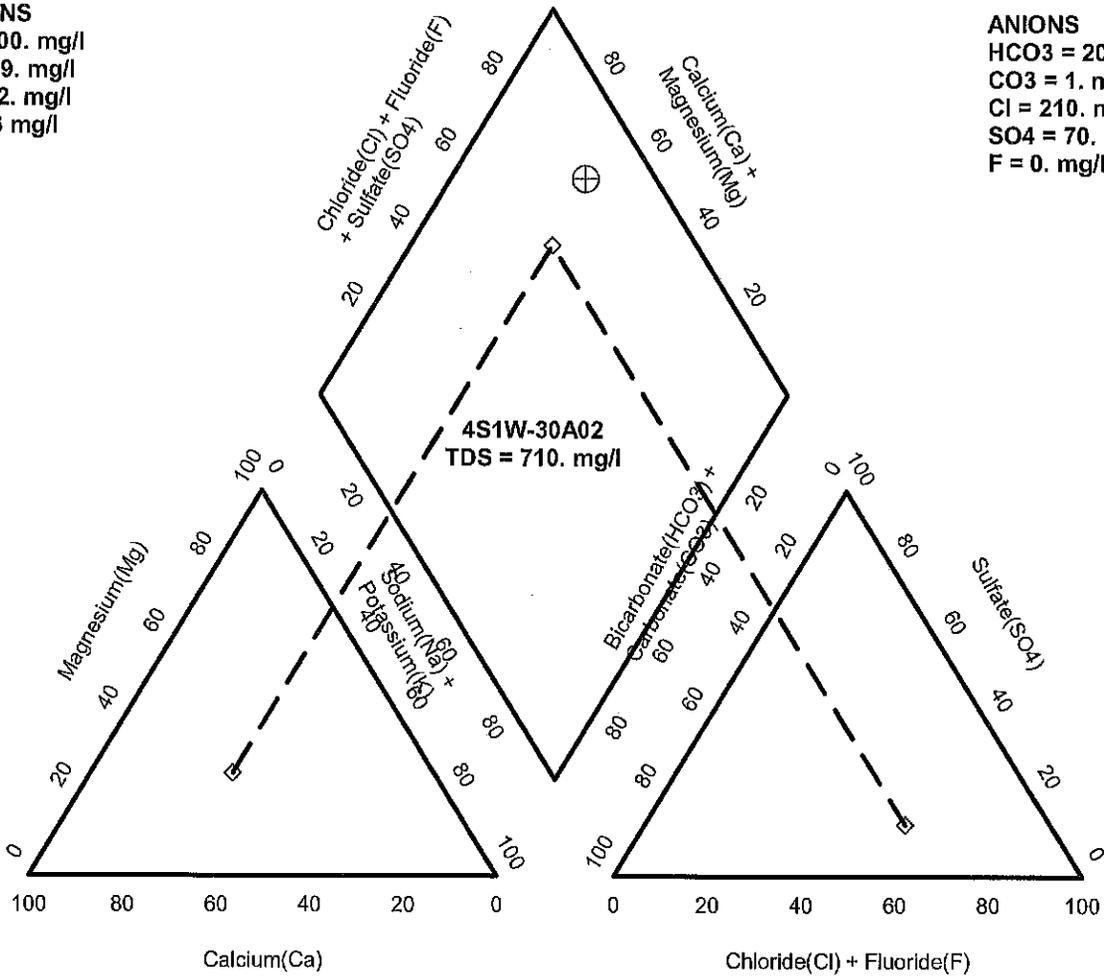
# Piper Plot

## CATIONS

Ca = 100. mg/l  
 Mg = 39. mg/l  
 Na = 82. mg/l  
 K = 2.6 mg/l

## ANIONS

HCO<sub>3</sub> = 200. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 210. mg/l  
 SO<sub>4</sub> = 70. mg/l  
 F = 0. mg/l



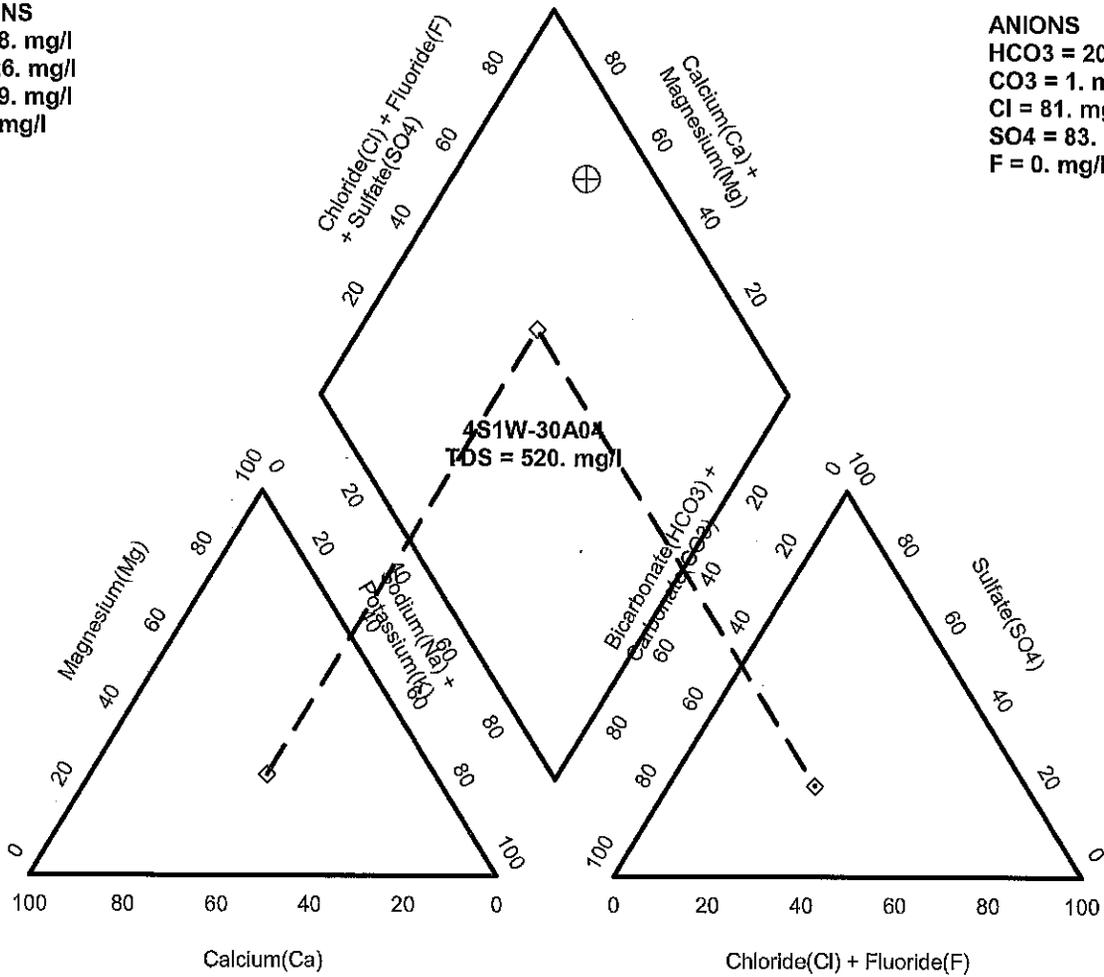
# Piper Plot

## CATIONS

Ca = 58. mg/l  
 Mg = 26. mg/l  
 Na = 69. mg/l  
 K = 2. mg/l

## ANIONS

HCO<sub>3</sub> = 200. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 81. mg/l  
 SO<sub>4</sub> = 83. mg/l  
 F = 0. mg/l



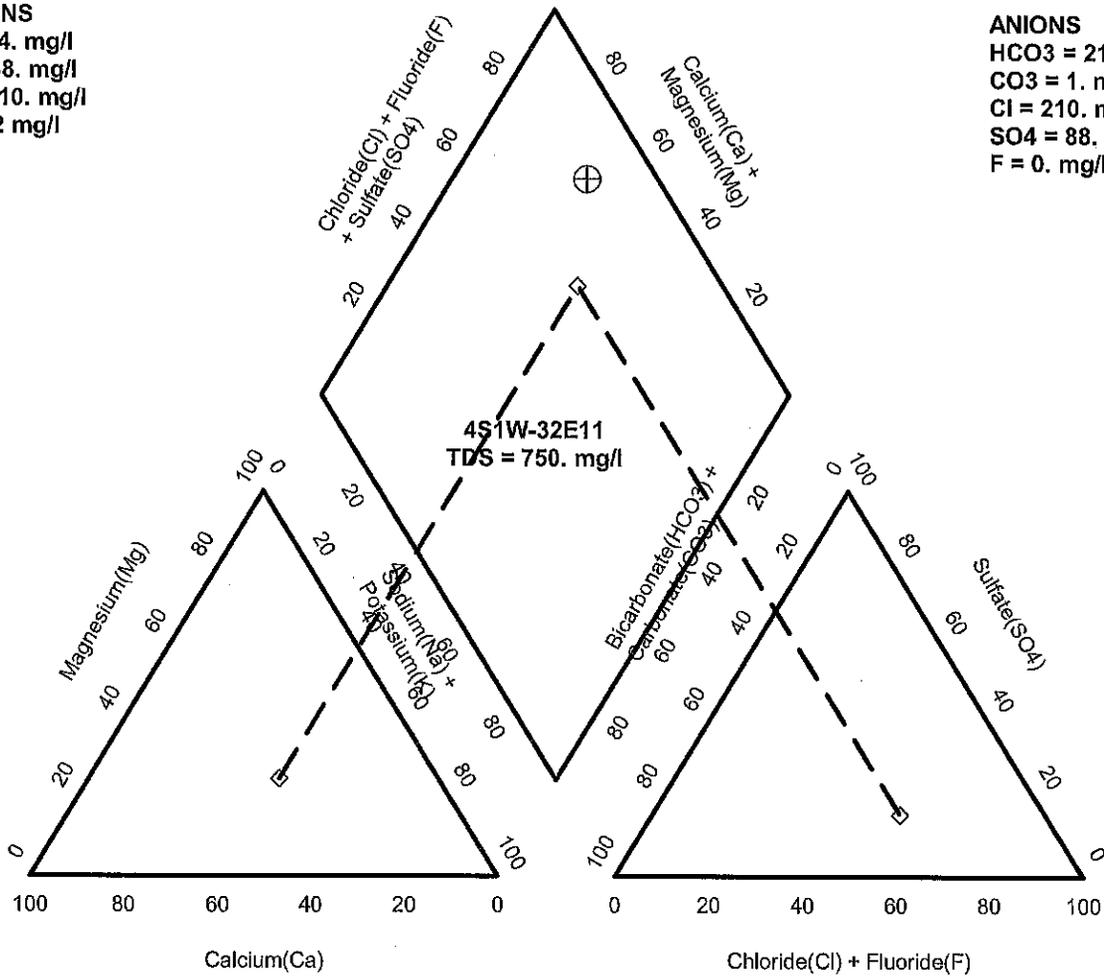
# Piper Plot

## CATIONS

Ca = 84. mg/l  
 Mg = 38. mg/l  
 Na = 110. mg/l  
 K = 2.2 mg/l

## ANIONS

HCO<sub>3</sub> = 210. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 210. mg/l  
 SO<sub>4</sub> = 88. mg/l  
 F = 0. mg/l



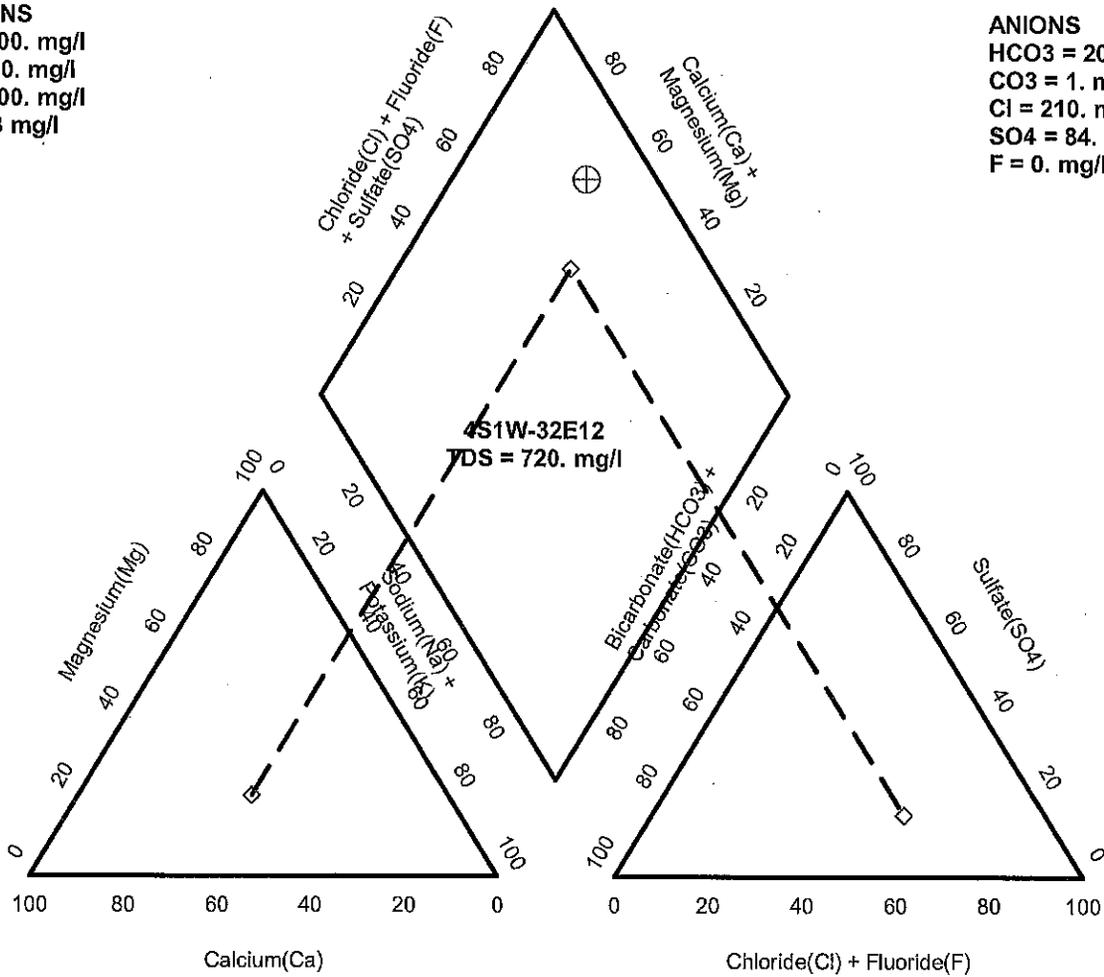
# Piper Plot

## CATIONS

Ca = 100. mg/l  
 Mg = 30. mg/l  
 Na = 100. mg/l  
 K = 2.3 mg/l

## ANIONS

HCO<sub>3</sub> = 200. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 210. mg/l  
 SO<sub>4</sub> = 84. mg/l  
 F = 0. mg/l



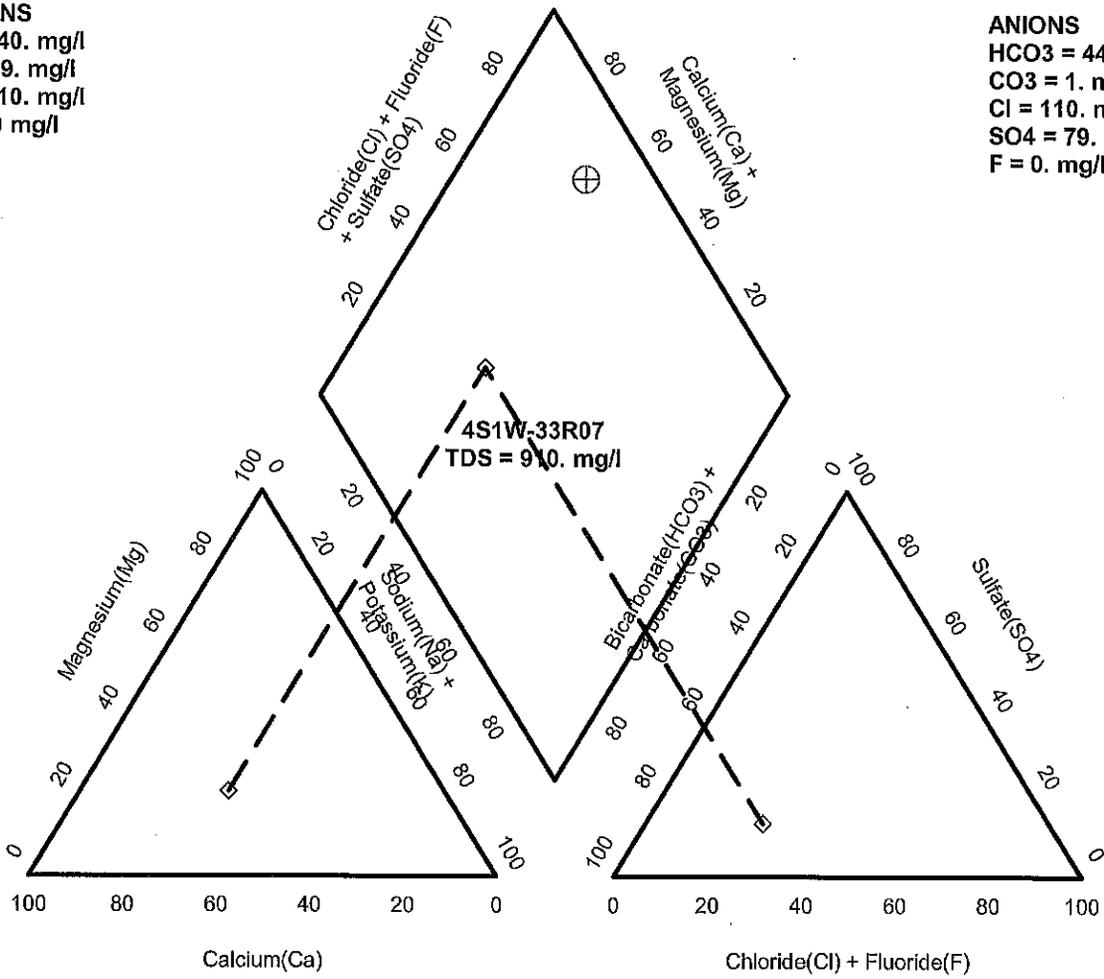
# Piper Plot

## CATIONS

Ca = 140. mg/l  
 Mg = 39. mg/l  
 Na = 110. mg/l  
 K = 3.9 mg/l

## ANIONS

HCO<sub>3</sub> = 440. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 110. mg/l  
 SO<sub>4</sub> = 79. mg/l  
 F = 0. mg/l



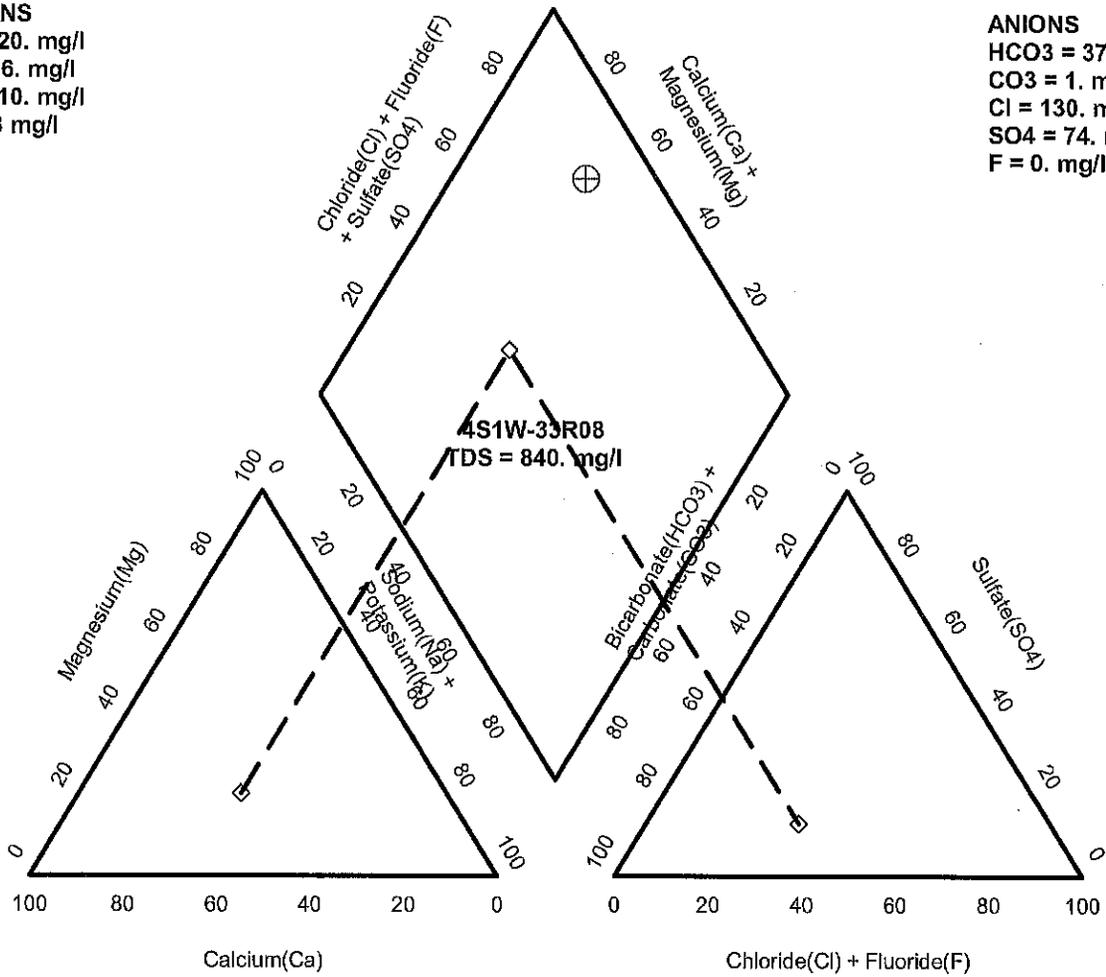
# Piper Plot

## CATIONS

Ca = 120. mg/l  
 Mg = 36. mg/l  
 Na = 110. mg/l  
 K = 2.8 mg/l

## ANIONS

HCO<sub>3</sub> = 370. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 130. mg/l  
 SO<sub>4</sub> = 74. mg/l  
 F = 0. mg/l



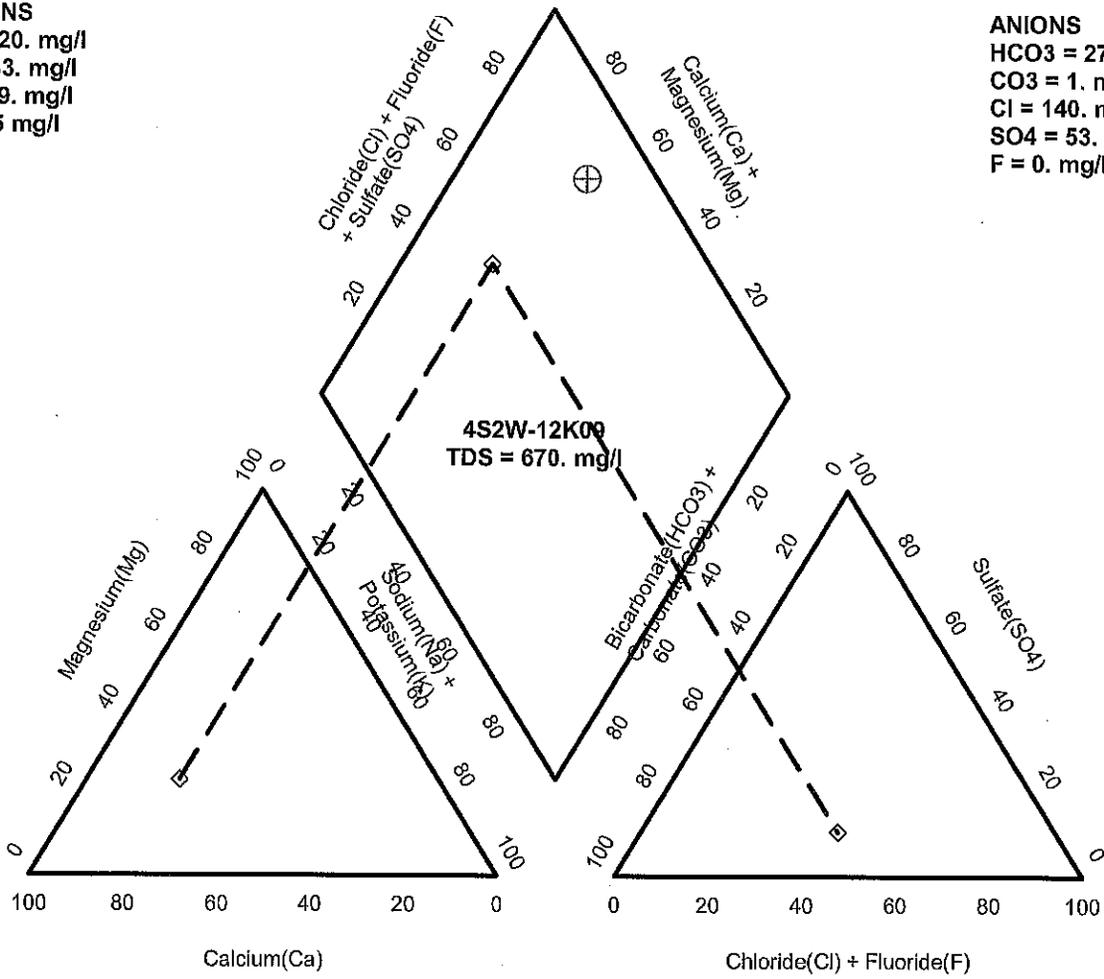
# Piper Plot

## CATIONS

Ca = 120. mg/l  
 Mg = 33. mg/l  
 Na = 49. mg/l  
 K = 2.5 mg/l

## ANIONS

HCO<sub>3</sub> = 270. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 140. mg/l  
 SO<sub>4</sub> = 53. mg/l  
 F = 0. mg/l



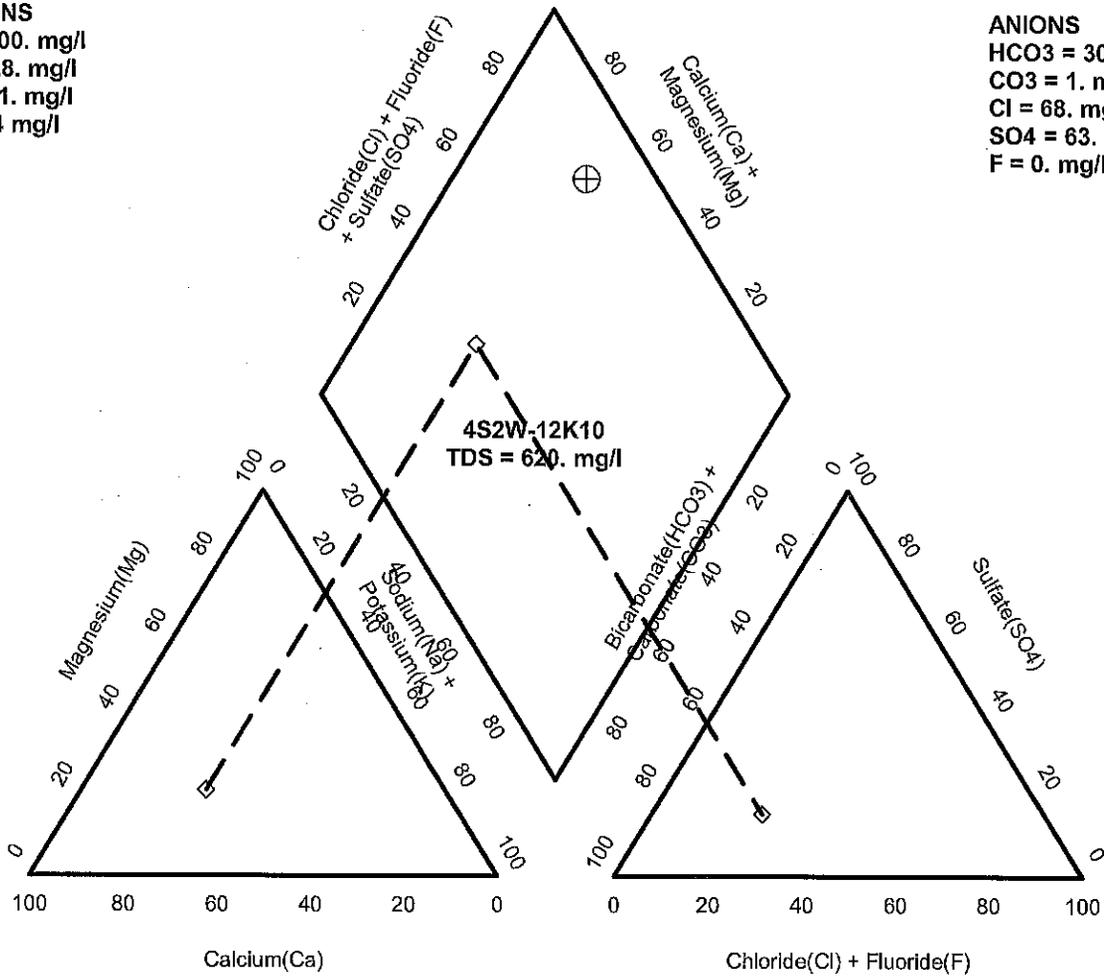
# Piper Plot

## CATIONS

Ca = 100. mg/l  
 Mg = 28. mg/l  
 Na = 61. mg/l  
 K = 2.4 mg/l

## ANIONS

HCO<sub>3</sub> = 300. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 68. mg/l  
 SO<sub>4</sub> = 63. mg/l  
 F = 0. mg/l



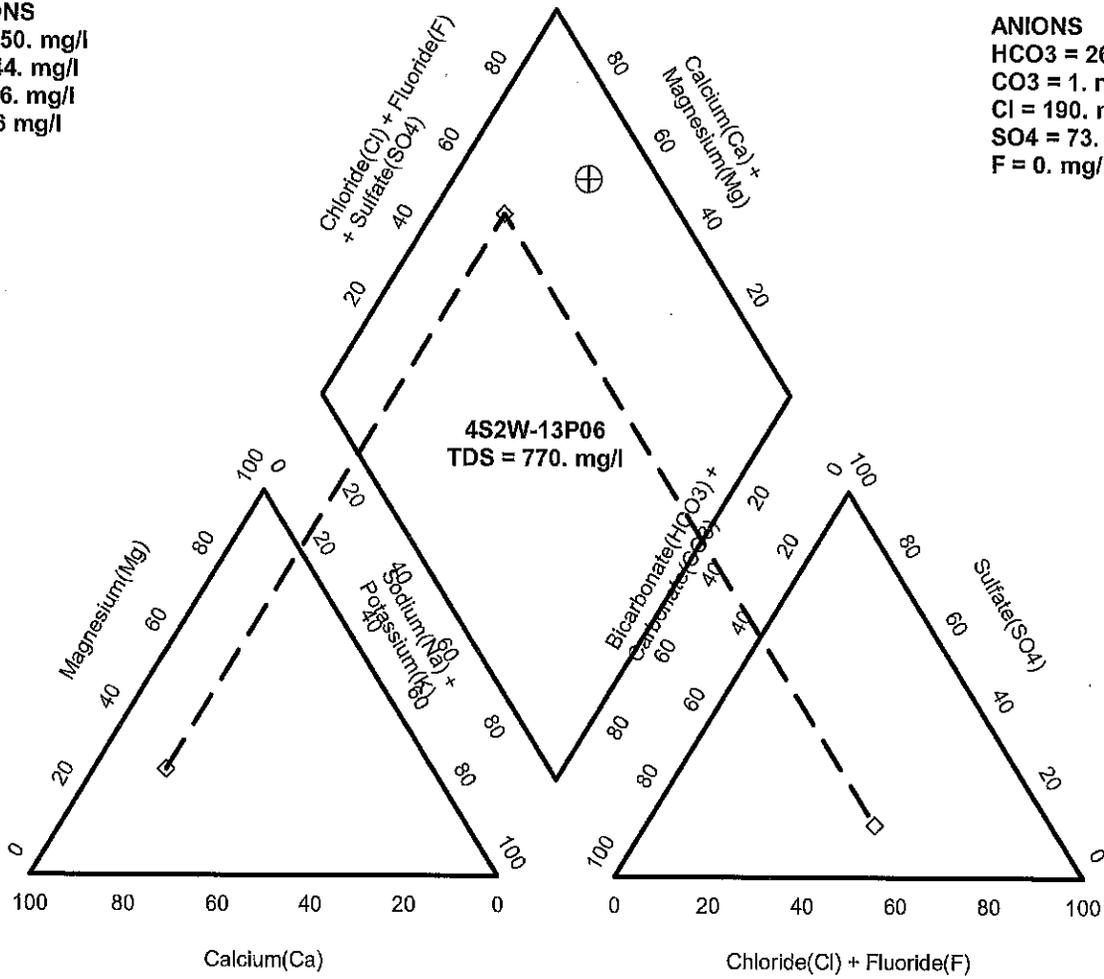
# Piper Plot

## CATIONS

Ca = 150. mg/l  
 Mg = 44. mg/l  
 Na = 46. mg/l  
 K = 2.6 mg/l

## ANIONS

HCO<sub>3</sub> = 260. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 190. mg/l  
 SO<sub>4</sub> = 73. mg/l  
 F = 0. mg/l



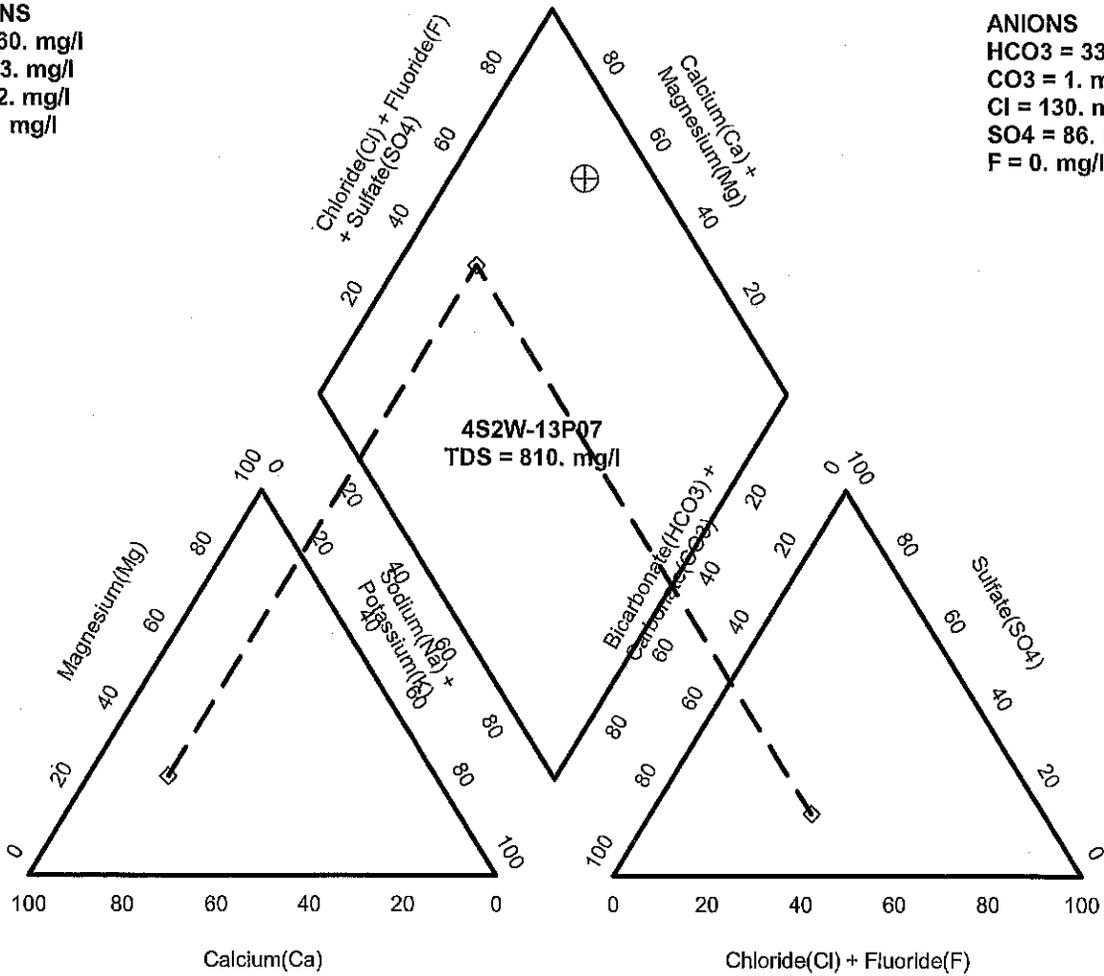
Piper Plot

CATIONS

Ca = 160. mg/l  
 Mg = 43. mg/l  
 Na = 52. mg/l  
 K = 3.1 mg/l

ANIONS

HCO<sub>3</sub> = 330. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 130. mg/l  
 SO<sub>4</sub> = 86. mg/l  
 F = 0. mg/l



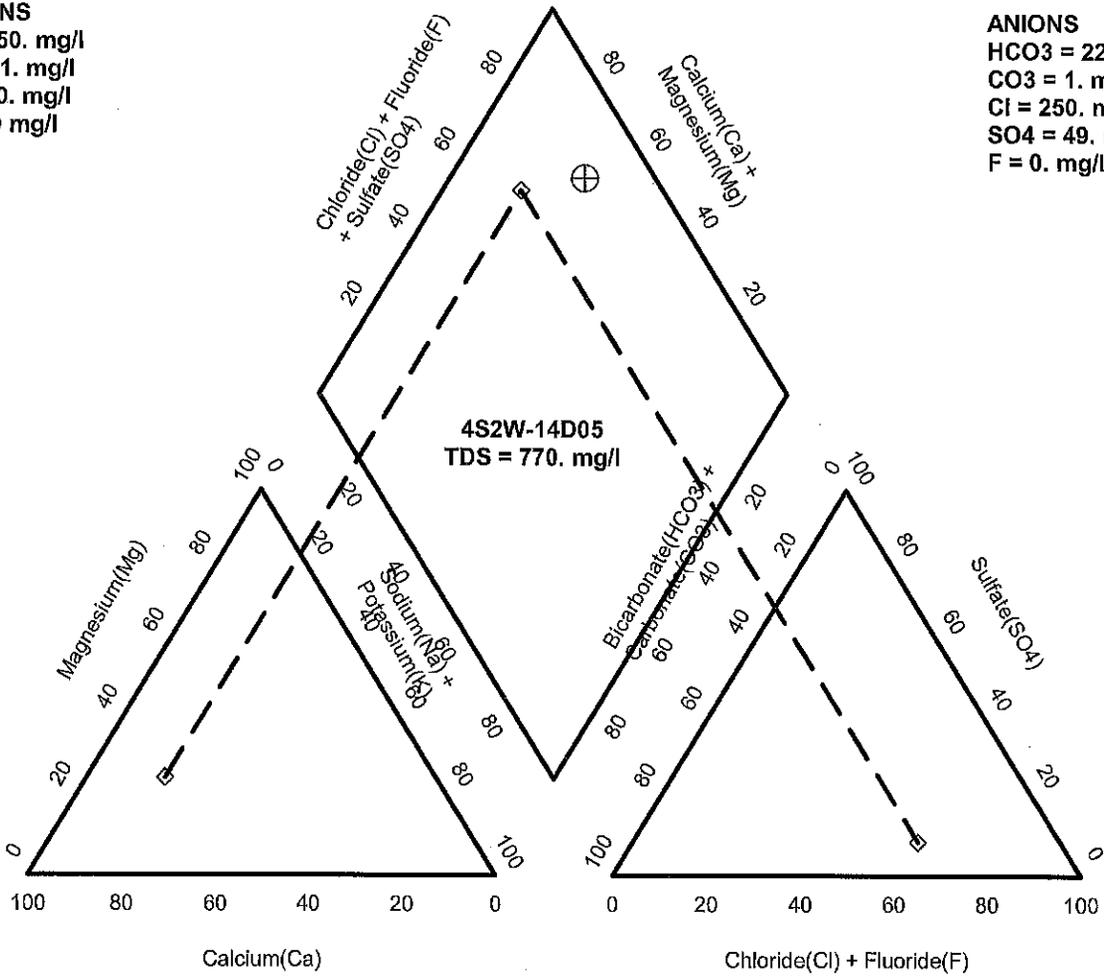
# Piper Plot

## CATIONS

Ca = 150. mg/l  
 Mg = 41. mg/l  
 Na = 50. mg/l  
 K = 2.9 mg/l

## ANIONS

HCO<sub>3</sub> = 220. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 250. mg/l  
 SO<sub>4</sub> = 49. mg/l  
 F = 0. mg/l



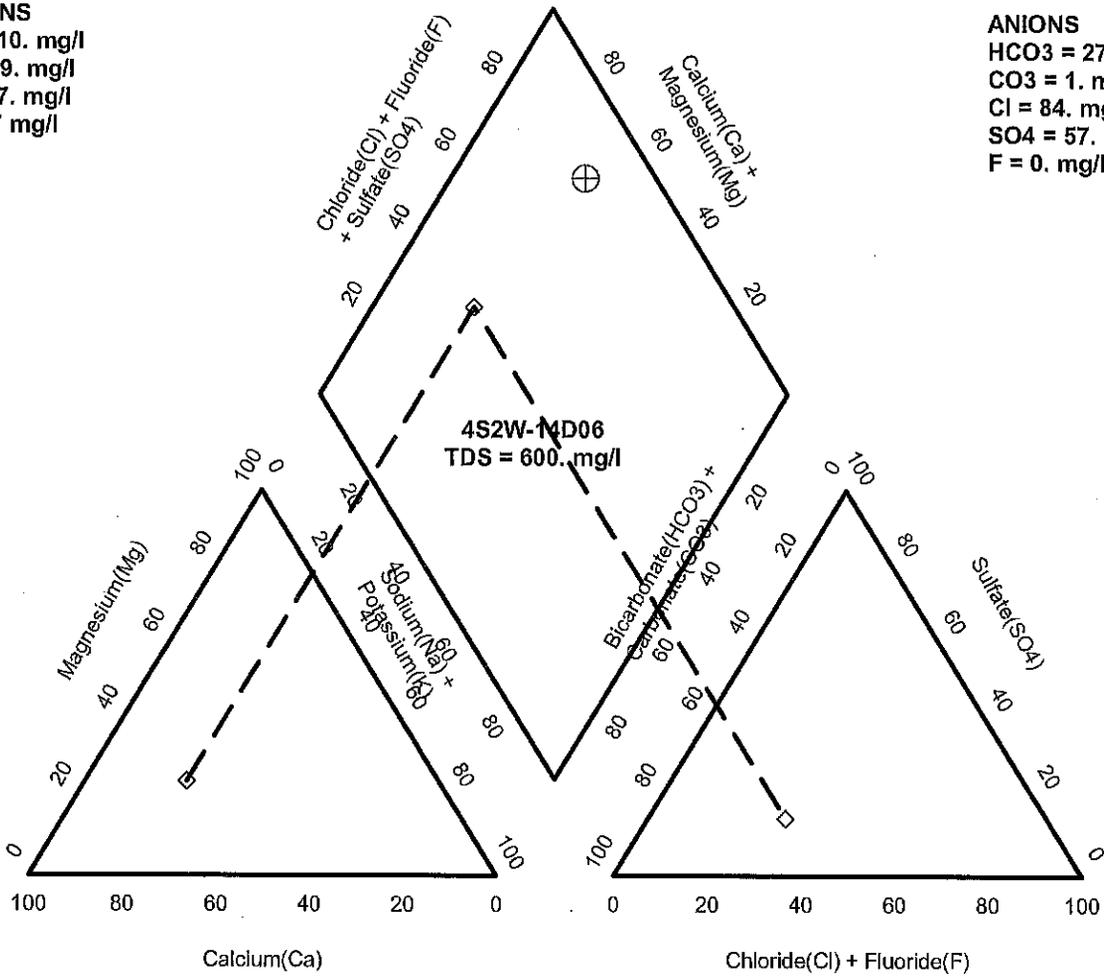
# Piper Plot

## CATIONS

Ca = 110. mg/l  
 Mg = 29. mg/l  
 Na = 47. mg/l  
 K = 2.7 mg/l

## ANIONS

HCO<sub>3</sub> = 270. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 84. mg/l  
 SO<sub>4</sub> = 57. mg/l  
 F = 0. mg/l



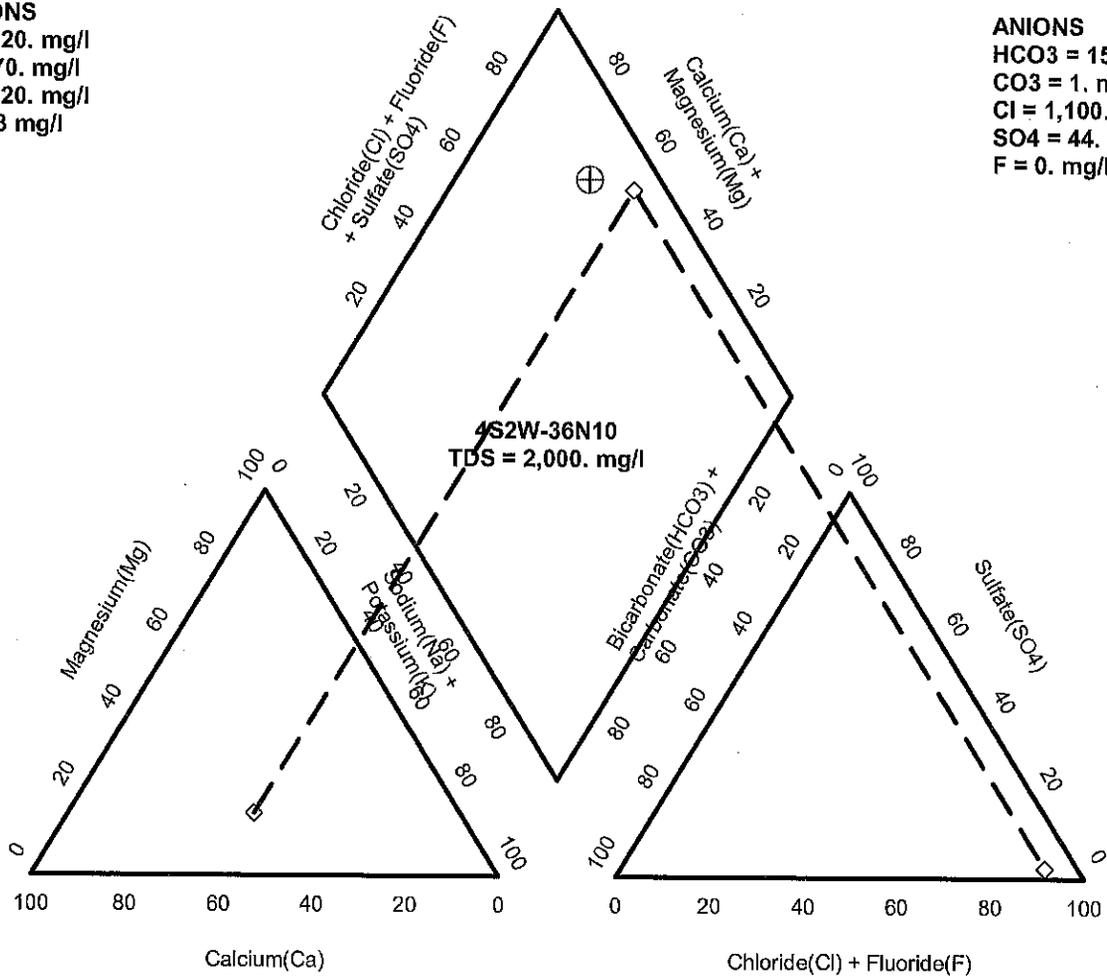
# Piper Plot

## CATIONS

Ca = 320. mg/l  
 Mg = 70. mg/l  
 Na = 320. mg/l  
 K = 3.8 mg/l

## ANIONS

HCO<sub>3</sub> = 150. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 1,100. mg/l  
 SO<sub>4</sub> = 44. mg/l  
 F = 0. mg/l



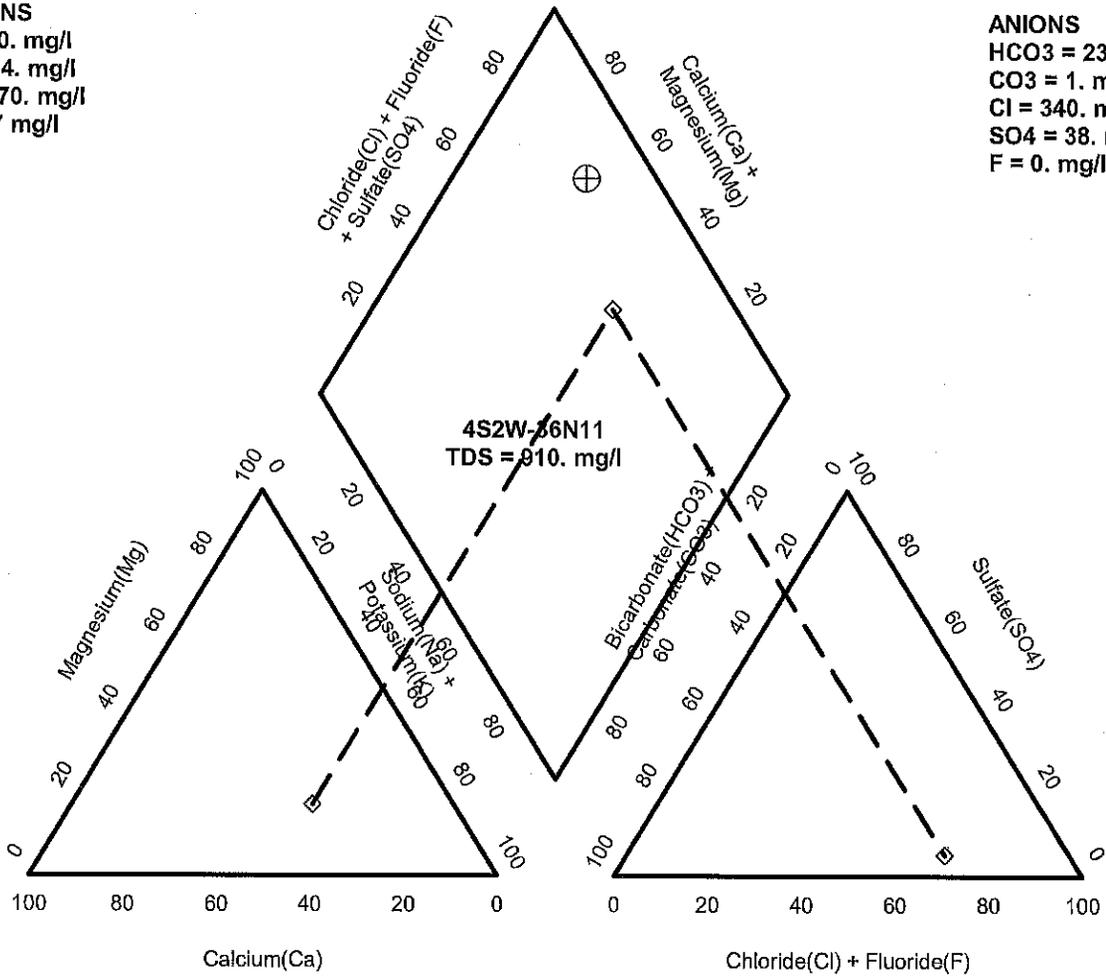
# Piper Plot

## CATIONS

Ca = 90. mg/l  
 Mg = 34. mg/l  
 Na = 170. mg/l  
 K = 4.7 mg/l

## ANIONS

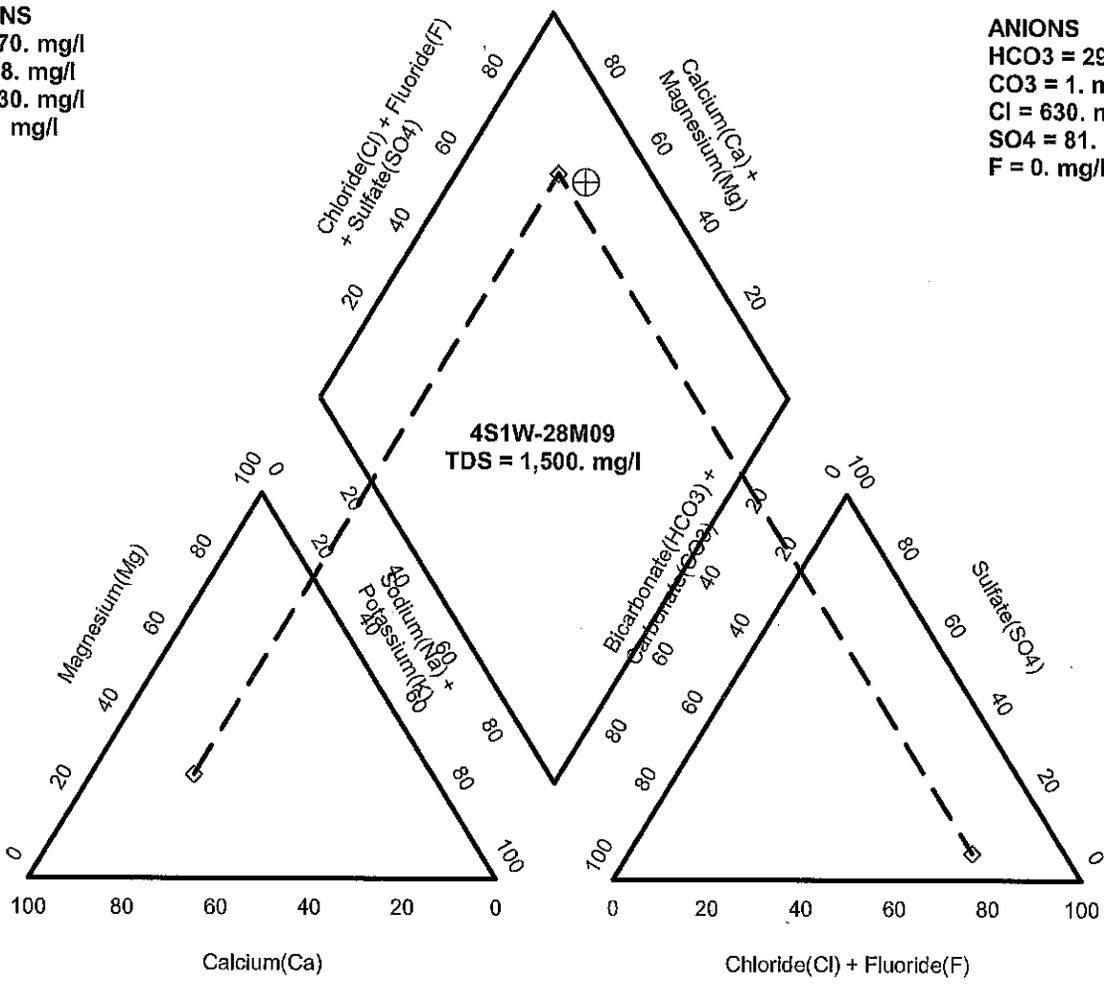
HCO<sub>3</sub> = 230. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 340. mg/l  
 SO<sub>4</sub> = 38. mg/l  
 F = 0. mg/l



# Piper Plot

**CATIONS**  
 Ca = 270. mg/l  
 Mg = 88. mg/l  
 Na = 130. mg/l  
 K = 4.1 mg/l

**ANIONS**  
 HCO<sub>3</sub> = 290. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 630. mg/l  
 SO<sub>4</sub> = 81. mg/l  
 F = 0. mg/l



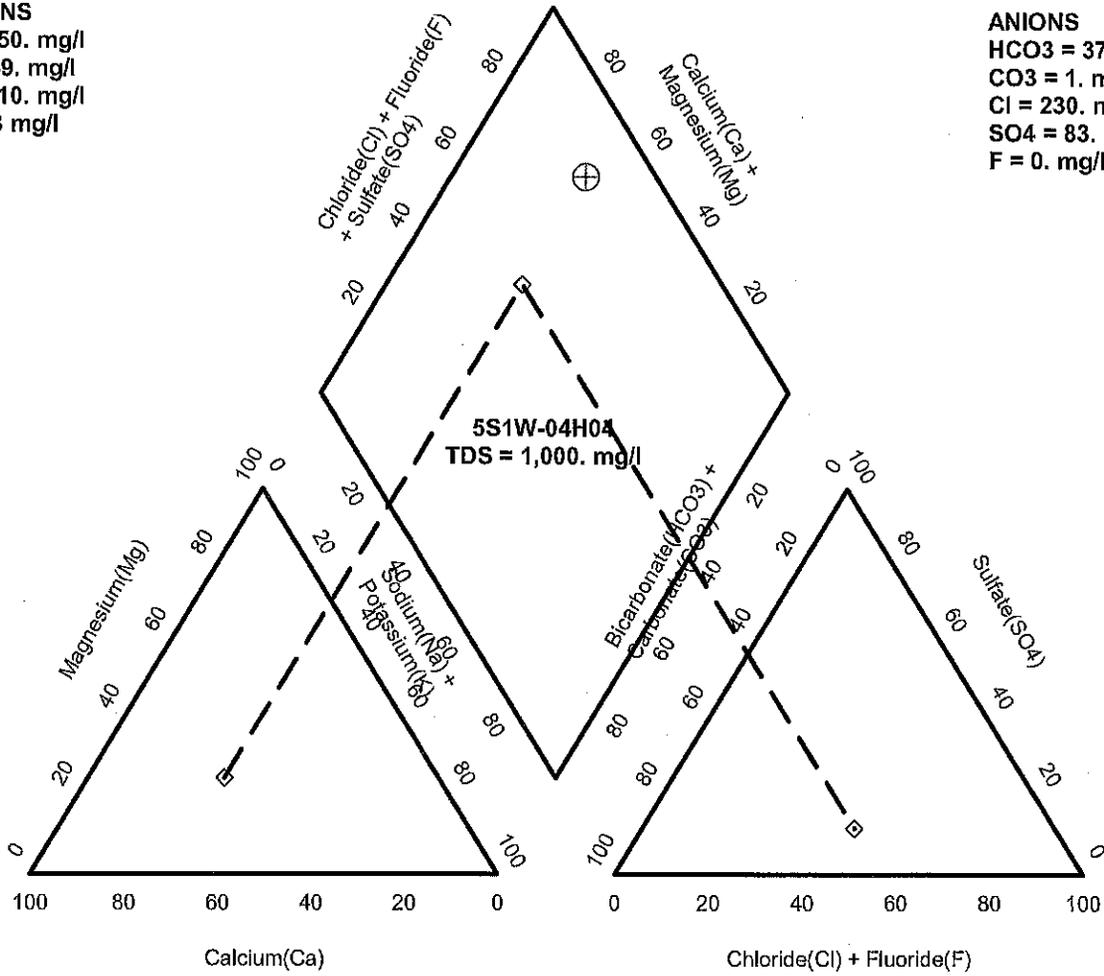
# Piper Plot

## CATIONS

Ca = 150. mg/l  
 Mg = 49. mg/l  
 Na = 110. mg/l  
 K = 4.3 mg/l

## ANIONS

HCO<sub>3</sub> = 370. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 230. mg/l  
 SO<sub>4</sub> = 83. mg/l  
 F = 0. mg/l



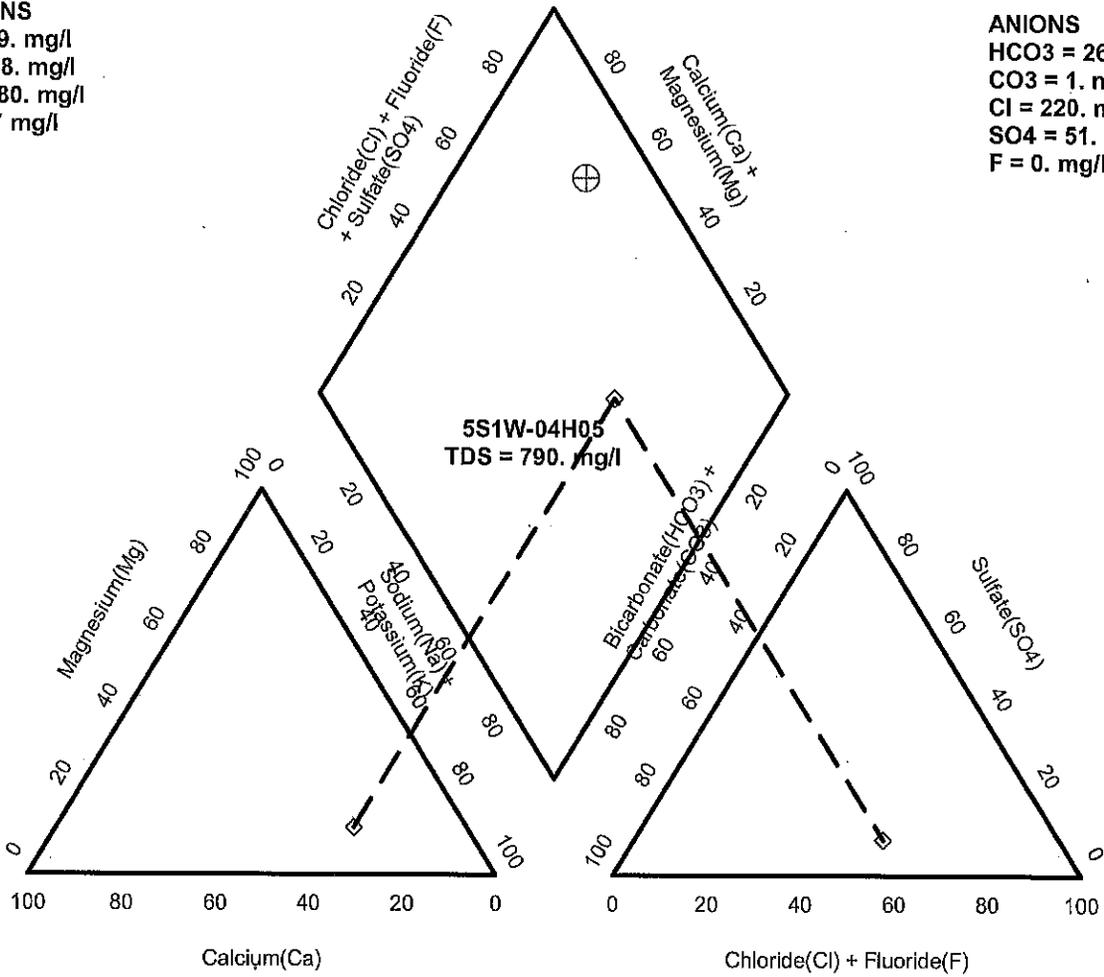
# Piper Plot

## CATIONS

Ca = 59. mg/l  
 Mg = 18. mg/l  
 Na = 180. mg/l  
 K = 2.7 mg/l

## ANIONS

HCO<sub>3</sub> = 260. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 220. mg/l  
 SO<sub>4</sub> = 51. mg/l  
 F = 0. mg/l



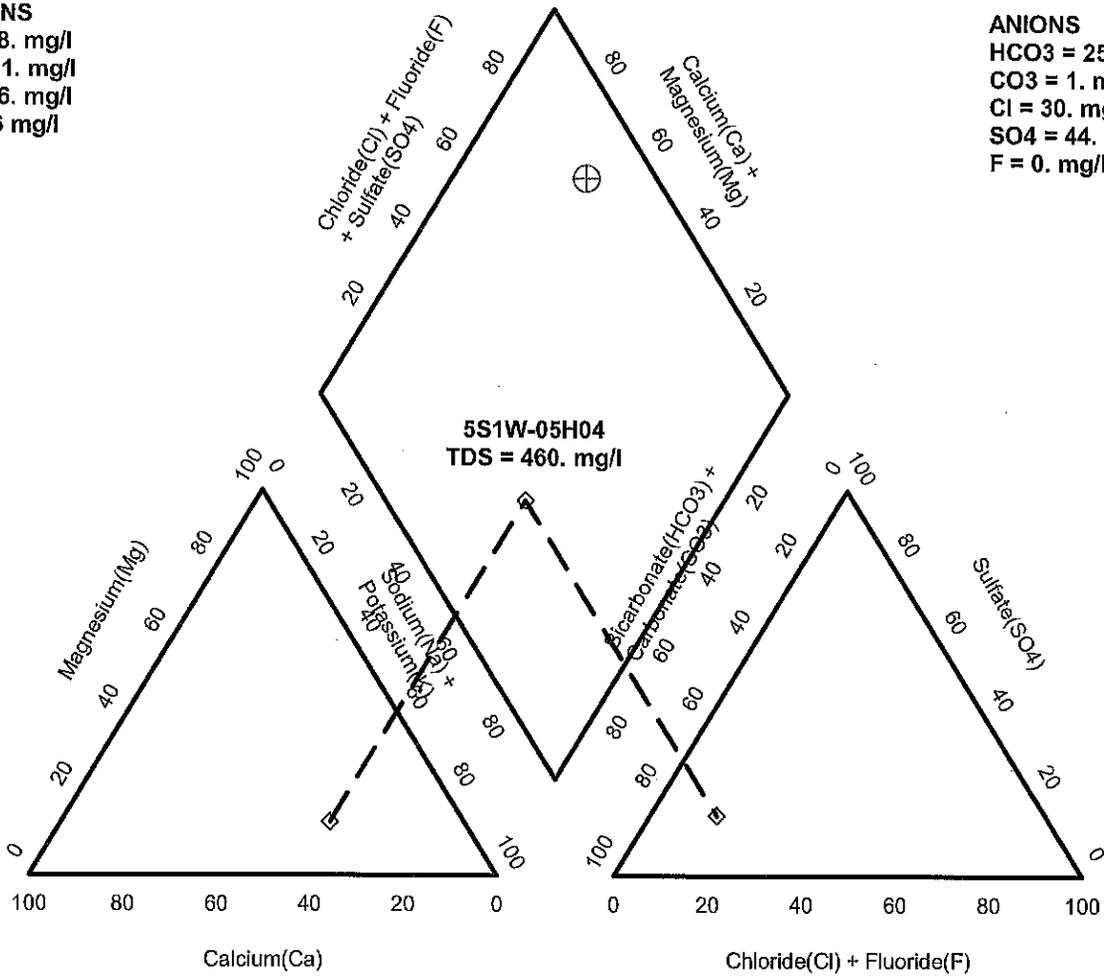
# Piper Plot

## CATIONS

Ca = 38. mg/l  
 Mg = 11. mg/l  
 Na = 86. mg/l  
 K = 1.6 mg/l

## ANIONS

HCO<sub>3</sub> = 250. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 30. mg/l  
 SO<sub>4</sub> = 44. mg/l  
 F = 0. mg/l



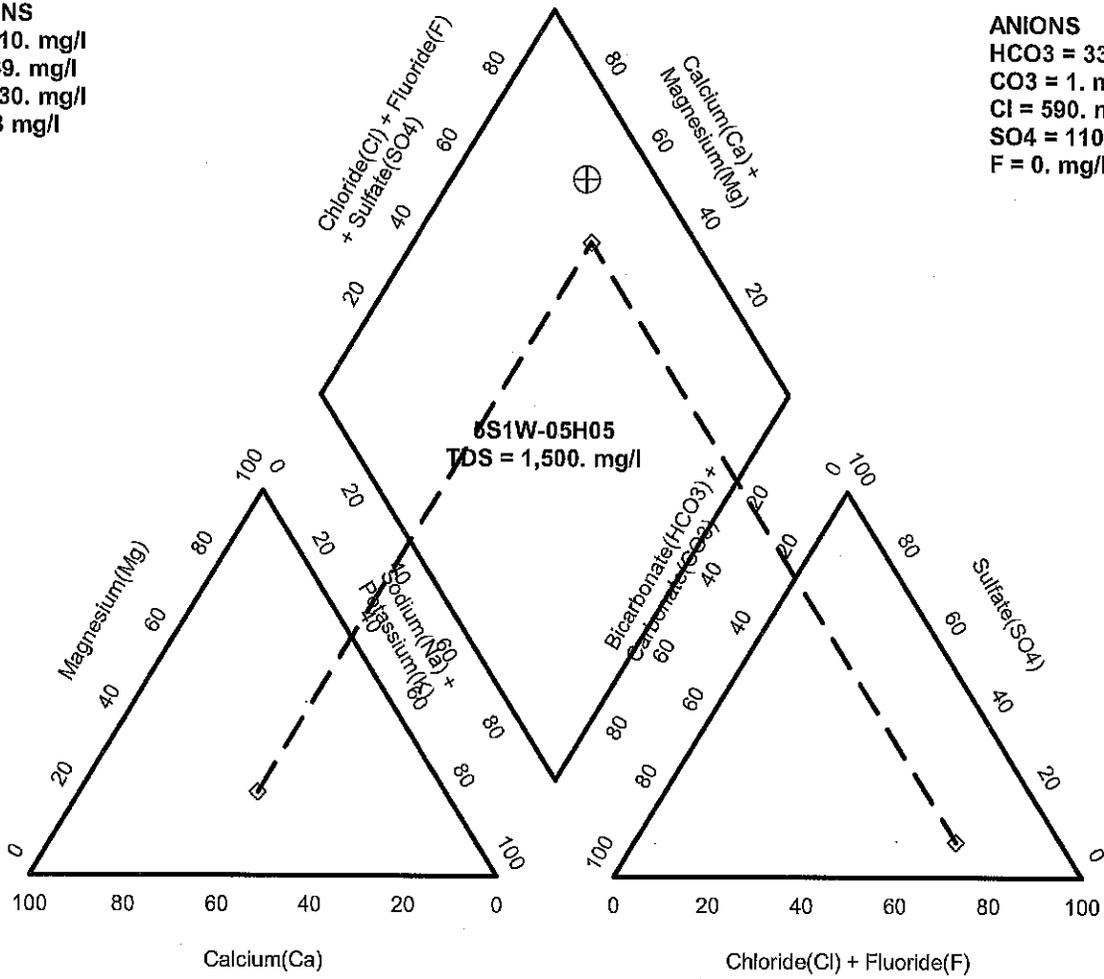
# Piper Plot

## CATIONS

Ca = 210. mg/l  
 Mg = 69. mg/l  
 Na = 230. mg/l  
 K = 4.8 mg/l

## ANIONS

HCO<sub>3</sub> = 330. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 590. mg/l  
 SO<sub>4</sub> = 110. mg/l  
 F = 0. mg/l



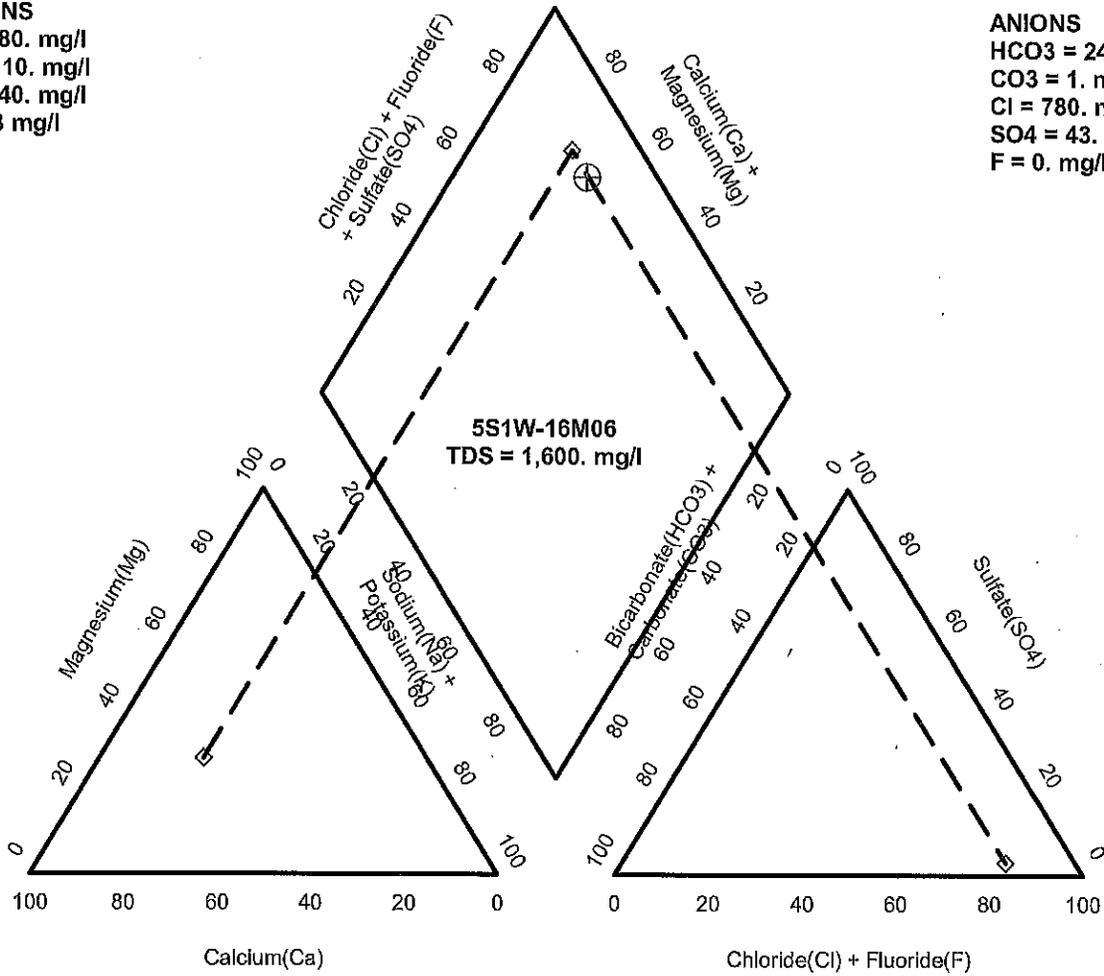
# Piper Plot

## CATIONS

Ca = 280. mg/l  
 Mg = 110. mg/l  
 Na = 140. mg/l  
 K = 7.3 mg/l

## ANIONS

HCO<sub>3</sub> = 240. mg/l  
 CO<sub>3</sub> = 1. mg/l  
 Cl = 780. mg/l  
 SO<sub>4</sub> = 43. mg/l  
 F = 0. mg/l



# Chloride Interference

# Piper Plot

## CATIONS

Ca = 1,700. mg/l  
 Mg = 2,700. mg/l  
 Na = 13,000. mg/l  
 K = 77. mg/l

## ANIONS

HCO<sub>3</sub> = 0. mg/l  
 CO<sub>3</sub> = 340. mg/l  
 Cl = 27,000. mg/l  
 SO<sub>4</sub> = 2,800. mg/l  
 F = 0. mg/l

