NORTHWEST NILES CONE MONITORING WELLS PROJECT

DWR Agreement 4600003644

Prepared for
State of California
Department of Water Resources
Conjunctive Water Management Branch
901 P Street
P.O. Box 942836
Sacramento, California 94236-0001

Prepared by
Alameda County Water District
43885 South Grimmer Boulevard
Fremont, California 94538

April 12, 2006

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1.0 EXECUTIVE SUMMARY

This report presents the results of the assessment of the geologic and hydrogeologic conditions in the northwest portion of the Niles Cone Groundwater Basin (NCGB). Key goals of this project were to: 1) collect geologic and hydrogeologic data, 2) characterize existing groundwater quality and evaluate the potential for saltwater intrusion within the water-bearing zones encountered, 3) establish long-term groundwater monitoring points, and 4) further evaluate previously documented hydrogeologic interconnections between the NCGB and the South East Bay Plain Groundwater Basin (SEBPGB).

On October 5, 2004, the Alameda County Water District (ACWD) entered into agreement with the State of California Department of Water Resources (DWR) for the installation of eight monitoring wells at four sites in the northwestern portion of ACWD's service area. The four proposed drilling sites were located within the Eden Landing Ecological Reserve (Reserve) operated by the State of California Department of Fish and Game (DFG). The wells were installed in these areas due to the lack of geologic and hydrogeologic information in this region and the need for long-term groundwater monitoring points to establish groundwater quality and to evaluate potential effects from East Bay Municipal Utility District's (EBMUD) Bayside Groundwater Project.

The first phase of field activities was conducted between October 2004 and March 2005. During implementation of this phase, modifications to the original well drilling locations were made due to changes in planning of the Reserve as part of the South Bay Salt Pond Restoration Project. These modifications included the elimination of the access levee to the westernmost proposed drilling location. The well cluster, originally proposed for the most western drilling location was relocated to a northern location. Upon completion of the first phase of drilling, field operations were suspended until October 2005. Suspension of operations was due to DFG restrictions on field activities in reference to endangered species nesting activities, thus necessitating renegotiation of the drilling contract with the drilling contractor.

The second phase of field operations was conducted between October 2005 and January 2006. This phase consisted of installing one well at the southernmost proposed location and installing a well in the northernmost portion of the study area, replacing the westernmost well location that had been eliminated due to proposed modifications in the Reserve. The relocation of this well was necessitated by both the elimination of access to the original proposed drilling location and the discovery of elevated chloride concentrations in Deep Aquifer groundwater samples that had been collected from the cluster well site installed during the first phase.

Detailed lithologic characterizations and electric logs were conducted at each of the four drill sites. The lithologic data collected at these locations were then superimposed on existing geologic cross-sections, and the cross-sections were refined. The analysis confirms the existence of interconnections between the NCGB and the City of Hayward's emergency supply wells in all the major aquifers. The data also reaffirms the existence of a continuous deep aquifer zone beneath the southern portion of the SEBPGB and the NCGB.

Thirteen samples of fine grained material between water-bearing zones (aquitards) that are equivalent in elevation to the Newark, Centerville, Fremont, and Deep Aquifers were collected for permeability testing. Results of the testing ranged from 1.77×10^{-9} centimeters/second (cm/sec) to 1.70×10^{-7} cm/sec. The results indicate a low vertical transmission rate between aquifers.

Groundwater samples collected from the monitoring wells were analyzed for chlorides, hardness, and total dissolved solids. Chloride, hardness, and total dissolved solids concentrations ranged from 74 parts per million (ppm) to 2,300 ppm, 192 ppm to 652 ppm, and 447 ppm to 3,191 ppm, respectively. The groundwater sample results of most interest are those from monitoring wells screened in the Deep Aquifers, in which City of Hayward emergency production wells and the proposed EBMUD Bayside Groundwater Project aquifer storage and recovery well are screened. Groundwater samples collected from the Deep Aquifers monitoring wells document chloride concentrations ranging from 270 ppm in the southernmost monitoring well to 495 ppm in the northernmost monitoring well. The highest concentration of chlorides detected in groundwater during this study was detected in a Deep Aquifer monitoring well within the well cluster at 2,300 ppm. It was this concentration that prompted the relocation and installation of the northernmost monitoring well.

The data collected during this study made a significant contribution to the understanding of the area between the NCGB and the SEBPGB, as demonstrated by the confirmation of the existence of hydraulic interconnections between the two basins and the discovery of elevated concentrations of chlorides in the Deep Aquifers. On-going monitoring of the wells will yield a better understanding of chloride movement over time and will allow the collection of valuable water level information prior to startup of EBMUD's Bayside Groundwater Project well, during the startup period of the project, and over the long term. As a result of DWR's Local Groundwater Management Assistance Grant Program, all of the key goals of the Northwest Niles Cone Monitoring Wells Project were accomplished.

2.0 INTRODUCTION

The purpose of this project was to collect geologic data, supplement the existing groundwater monitoring network, evaluate groundwater quality, and to monitor the effects of East Bay Municipal Utility District's (EBMUD) proposed Bayside Groundwater Project (Bayside Project) on groundwater flow in the northwest portion of Alameda County Water District's (ACWD) jurisdiction, which coincides with the Niles Cone Groundwater Basin (NCGB) (Figure 1). To obtain these goals, ACWD installed eight groundwater monitoring wells in locations where there is a lack of geologic and hydrogeologic information in the northwest region of the NCGB and adjacent to the South East Bay Plain Groundwater Basin (SEBPGB). Since EBMUD's proposed Bayside Project will produce groundwater from the SEBPGB during droughts (in recent years, EBMUD and ACWD have used the label "South East Bay Plain" to refer collectively to the San Lorenzo Cone, San Leandro Cone, and other East Bay aquifer systems north of the Niles Cone), there is consensus that regional groundwater monitoring will be a critical element for generating the hydrologic data that will enable both agencies to cooperate on groundwater management issues. The installation of monitoring wells in the northwest portion of the NCGB, in part, is consistent with this monitoring objective because it fills an important gap in the monitoring well network between the two groundwater basins.

The original proposal called for installation of eight monitoring wells at four sites with one of the sites consisting of a cluster of five wells (Figure 2). One pilot boring was to 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 would then be converted into monitoring wells screened within the Deep Aquifers encountered above 600 feet. The site with the monitoring well cluster would consist of monitoring wells completed in five separate water-bearing zones.

2.1 Background

On May 5, 2004, ACWD was awarded a DWR Local Groundwater Management Assistance Program Grant for implementation of the Northwest Niles Cone Monitoring Wells Project. A Notice of Commitment from DWR was received by ACWD on July 8, 2004 with the receipt of the grant agreement (4600003644) on October 5, 2004. DWR's grant agreement was approved by ACWD's Board of Directors on October 14, 2004.

2.2 Project Goals and Objectives

The primary goals of this project were to drill and install eight groundwater monitoring wells in the northwest portion of ACWD's service area and to obtain geologic and hydrogeologic information in this critical area. The specific objectives of the project are summarized below:

- Drill 800 foot exploratory borings and install monitoring wells completed in the lowermost water-bearing zone above depths of 600 feet below ground surface (bgs) in three locations as identified in Figure 3.

- Drill one 800 foot exploratory boring and install five separate monitoring wells in water-bearing zones above 600 feet bgs at the proposed well cluster location in Figure 3.

- Collect 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 eight wells.

- Collect aquifer specific groundwater quality data from the eight wells.

- Gain a better understanding of the geology and hydrogeology of the northwest region of the NCGB.

- Add needed groundwater monitoring points to the groundwater monitoring network for the two groundwater basins 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 monitoring sites with stakeholders operating in the NCGB and adjacent SEBPGB.

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

2.3 Project Scope

The above objectives were met by drilling and constructing groundwater monitoring wells to obtain detailed geologic and hydrogeologic data of the area, and to provide long term monitoring points to evaluate groundwater flow and quality. Eight wells were installed at four sites, with five monitoring wells in a cluster at one site. The locations for the well sites are presented in Figure 3. 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, water quality conditions, and to provide long term groundwater monitoring points due to the proposed EBMUD Bayside Groundwater Project.

Prior to the beginning of field activities, modifications were made to the Reserve by DFG as part of the South Bay Salt Pond Restoration Project. One of the modifications included the elimination of the access levee to the proposed well cluster drilling site. Consequently, the well cluster site was relocated to a northern drilling location. Also, due to groundwater sampling results obtained from the Deep Aquifer groundwater

monitoring wells, an additional modification to the work plan was submitted and approved by the Department of Water Resources (DWR) in August 2005 to relocate the westernmost proposed drilling site (the former well cluster location) to the most northern portion of ACWD's jurisdiction.

- *Single Monitoring Well Sites*
  At the three sites identified for single monitoring well installation (identified as a green circle on Figure 3), borings were drilled to 800 feet bgs or bedrock (whichever came first) at each site. The borings were sampled and geophysically logged for the purpose of creating a detailed geologic record for the site. The logs are being used to further understand the geological process that created the Niles Cone aquifer system and assist stakeholders in evaluating the hydraulic interconnections between groundwater basins. Upon completion of drilling and logging of the exploratory borings, a monitoring well was constructed in the water-bearing zone that corresponded to the Niles Cone Groundwater Basin Deep Aquifers and the estimated depth of the well that will be used for the EBMUD Bayside Groundwater Project. Monitoring wells were installed to depths of 445 feet, 450 feet, and 530 feet bgs at well locations 4S/2W-8Q001 (2D2), 4S/2W-9F014 (3D1), and 3S/3W-25C020 (WD2), respectively.

- *Monitoring Well Cluster Site*
  At the site identified for the monitoring well cluster (identified as a green square on Figure 3), a single boring was drilled to bedrock which was encountered at 790 feet bgs. The boring was sampled and geophysically logged for the purpose of creating a geologic record for the site. Upon completion of drilling and logging of the exploratory boring, a monitoring well was installed to a depth of 590 feet bgs at well location 4S/2W-5G003 (4D2). Four additional monitoring wells were installed at this site in water-bearing zones identified by the geologic log created from the exploratory boring. The monitoring wells were installed to depths of 170 feet, 215 feet, 355 feet, and 440 feet bgs at well locations 4S/2W-5G005 (4C1), 4S/2W-5G004 (4C2), 4S/2W-5G001 (4F1), and 4S/2W-5G002 (4D1), respectively. These depths correspond to the Newark/upper Centerville, Centerville, Fremont, and Deep Aquifers identified regionally throughout much of the NCGB. The installation of a well cluster allows long term monitoring of all the aquifers, determination of trends in vertical flow between aquifers, and evaluation of hydraulic interconnections between the NCGB and the SEBPGB groundwater basins over time.

2.4 Geology and Hydrogeology

The project area is located in the northwestern portion of the NCGB and ACWD's service area, north of Old Alameda Creek, west of the City of Union City, and south of Winton Avenue in the City of Hayward. The project area is underlain by sediments of the Niles Cone and the South East Bay Plain with a loosely defined transition zone between the two basins where components of both groundwater basins apparently become interbedded.

The Niles Cone is an alluvial fan formed by Alameda Creek and by interfingering sediments of San Francisco Bay. Water-bearing deposits are composed of Quaternary alluvium comprised of varying mixtures of gravel, sand, silt and clay. The portion of the NCGB beneath the study area is composed of gently westward-dipping aquifers separated by clay aquitards. The aquifers are gravels and sands from Alameda Creek (fluvial and alluvial). Aquitards are silts and clays from distal fan deposits and the Bay. Primary aquifers in the Niles Cone Groundwater Basin include the Newark Aquifer (between 40 to 180 feet bgs), Centerville Aquifer (between 200 and 280 feet bgs), Fremont Aquifer (between 300 and 380 feet bgs), and Deep Aquifers (between 400 and 600 feet bgs). Bedrock is encountered beneath the NCGB at depths of approximately 800 feet bgs (DWR, 1967).

The South East Bay Plain is composed of a Deep Aquifer between depths of 400 to 500 feet bgs. Overlying the Deep Aquifer is a predominately fine-grained sequence of silts and clays with interbedded thin, discontinuous sands which is termed the South East Bay Plain Alluvium. Below the Deep Aquifer is a sequence of older mudstones and claystones devoid of sand beds lying on top of older consolidated sedimentary bedrock (Luhdorff & Scalmanini, 2003).

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. 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. There has been substantial improvement in water quality in all aquifers; however, brackish water still remains in the aquifers.

3.0 METHODOLOGY

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 obtained eight drilling permits from the Alameda County Public Works Agency. Copies of the permits are presented in Appendix A.

3.1.2 Access Agreements

ACWD obtained permission to access and install monitoring wells on State of California Department of Fish and Game (Fish and Game) and the City of Hayward properties. Seven of the monitoring wells were installed on Fish and Game's property at the Eden Landing Ecological Reserve (Reserve) and one monitoring well was installed on the City of Hayward's Sewer Treatment Plant property. All locations are within the City of Hayward. Copies of the access agreements are presented in Appendix B.

3.1.3 Underground Utility Surveys

Prior to drilling activities, ACWD personnel visited the drilling locations to stake/mark the locations and meet with the facility contacts to discuss the location of underground utilities. Underground Service Alert (USA) was contacted, after the field locations were staked/marked, at least 48 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 Maggiora Bros. Drilling, Inc. (Maggiora Bros.) of Watsonville, California. The borings were drilled with an Ingersoll Rand TH-60 mud rotary drilling rig with an 8.75-inch diameter drill bit. At each location, pilot holes were drilled to bedrock or a maximum depth of 800 feet bgs, whichever came first. 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 removed from the bottom of the boring. The ends of the bottom tube were covered with plastic end caps, identified with the orientation of the sample, and labeled with a unique identification number. Samples not retained for analytical testing were used for lithologic evaluation.

3.2.2 Well Installation

Eight new monitoring wells were installed as part of this project. Seven of the wells (4S/2W-9F014 (3D1), 4S/2W-8Q001 (2D2), 4S/2W-5G001 (4F1), 4S/2W-5G002 (4D1), 4S/2W-5G003 (4D2), 4S/2W-5G004 (4C2), and 4S/2W-5G005 (4C1)) were installed within the Reserve property on levees that were formerly used for salt production. The eighth monitoring well, 3S/3W-25C020 (WD2), was installed on the City of Hayward's Sewer Treatment Plant property. Well construction details are discussed below and summarized in Table 1. Unless otherwise stated, well installations were conducted using the following general specifications:

- For installation of monitoring wells within the pilot borings (4S/2W-9F014 (3D1), 4S/2W-8Q001 (2D2), 4S/2W-5G003 (4D2), and 3S/3W-25C020 (WD2)), upon completion of geophysical logging (resistivity, spontaneous potential, conductivity, gamma, and temperature) of the wells by Newman Well Surveys of Prundale California or Welenco of Bakersfield California, the borings were reamed with an 8.75-inch diameter drill bit to total depth to clean out the borehole. The driller then tremmied 11-sack sand-cement slurry from the bottom of the boring to within 10 feet of the designed bottom of the well. The sand-cement slurry was allowed to cure a minimum of 24-hours prior to installation of the monitoring well casing.

- Casing and screen for all the monitoring wells were constructed of 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 the fine separator sand as proposed. Instead, additional coarse aquarium sand was placed between 20 to 30 feet above the top of the designed screened portion of the monitoring well. The additional thickness of coarse aquarium sand sufficiently retards 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 11-sack sand-cement slurry.

- Drilling mud displaced by the well installation activities was placed in a truck mounted storage tank and transported to ACWD's storage site.

- A traffic-rated well cover was installed flush to the existing grade with a 4-foot by 4-foot concrete pad surrounding the well cover.

- A 6-inch diameter marker post with the state well identification number was installed.

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 (EC), and turbidity) were measured at approximately 500 to 1,000 gallon intervals. No detergents, soaps acids, bleaches, or other additives were used to develop the monitoring wells. Development continued until turbidity was reduced to 5 nephelometric turbidity units (NTU) or less. As approved by the Regional Water Quality Control Board, as documented in a letter sent by ACWD on July 21, 2004 (Appendix A), turbid water containing drilling mud was placed in truck mounted storage tank and transported to ACWD's property for storage. Development water, clear of drilling mud, was allowed to discharge to existing salt marshes or soil piles (in the case of well WD2).

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 vertically and horizontally 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 Maggiora Bros. to prepare a Storm Water Protection (SWP) and an Emergency Response Plan for the project. The plans were prepared and in place prior to Maggiora Bros. implementing field activities. ACWD required the preparation of plans to minimize the effects of potential unauthorized spills to the environment. Copies of the plans are presented in Appendix C.

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 the hydraulics of the drilling rig. The sampler was then removed and the sample liners removed. The sample retained for testing was capped

with plastic end caps, 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 two testing laboratories used were Kleinfelder Inc. of San Jose, California and 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.

3.6 SOIL DISPOSAL PROCEDURES

As outlined in the permit requirements for Fish and Game, 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. Soil and drilling mud generated during field operations on the City of Hayward's Sewer Treatment Plant property were left on-site as approved in the City of Hayward's access agreement.

4.0 RESULTS

4.1 GEOLOGY

The geological data collected from this project is consistent with the alluvial channel deposition observed in other boreholes in the surrounding area. The general lithology consists of inter-bedded clays, sands, and gravels. Bedrock was encountered at 695 feet, 793 feet, and 740 feet below ground surface in borings 4S/2W-8Q001 (2D2), 4S/2W-9F014 (3D1), and 4S2W-5G003 (4D2), respectively. Bedrock was not encountered in boring 3S/3W-25C020 (WD2). The bedrock consisted of highly to moderately weathered Franciscan Graywacke. Geologic well logs presenting the lithologic log, geophysical log, and well completion are presented in Appendix D.

4.2 GROUNDWATER ANALYTICAL TESTING

Upon completion of well construction, the wells were developed to remove sediment that had accumulated in the well as a result of well construction activities. All the wells installed were developed to the development goal of 5 NTUs. Appendix E contains the development records for the monitoring wells. Upon completion of development and purging, samples were collected and delivered to the analytical laboratory under chain-of-custody record (Appendix F) for testing. The laboratory results documented that Total Dissolved Solids (TDS) ranged from 461 parts per million (ppm) in 4S/2W-05G001 (4F1) to 3,191 ppm in 4S/2W-05G003 (4D2), hardness concentrations ranged from 192 ppm in 4S/2W-05G005 (4C1) to 615 ppm in 4S/2W- 05G003 (4D2), and chlorides ranged from a low of 97 ppm in 4S/2W-05G001 (4F1) to a high of 2,300 ppm in 4S/2W-05G003 (4D2). A summary of the results are presented in Table 3.

4.3 SOIL PERMIBILITY TESTING

A total of 12 soil samples were collected and tested for evaluation of vertical permeability. The single samples collected from the aquitards at comparable depths between the Newark and Centerville Aquifers and between the Fremont and Deep Aquifers documented values of 1.70×10^{-7} cm/sec and $<2.1 \times 10^{-9}$ cm/sec, respectively. Three samples collected from the aquitards at comparable depths between the Centerville and Fremont Aquifers documented values ranging from $<2.1 \times 10^{-9}$ cm/sec to 9.57×10^{-9} cm/sec. Three samples collected from the clay zone within the Deep Aquifers documented values ranging from $<1.0 \times 10^{-8}$ cm/sec to 1.77×10^{-9} cm/sec. Four samples collected from the comparable depth of the aquitard below the Deep Aquifers documented values ranging from <2.1 X 10-9 cm/sec to 6.08×10^{-9} cm/sec. Laboratory reports are presented in Appendix G and a summary of the results of the testing are presented in Table 4.

5.0 CONCLUSIONS

The geological data collected during the drilling of the soil borings confirms that geological interconnections exist between the NCGB and the SEBPGB. Geological cross-sections (Figure 4 and 5) developed by Luhdorff & Scalmannini Consulting Engineers (Luhdorff & Scalmannini) of Woodland, California, presents the complexity of the subsurface between the two basins (Luhdorff & Scalmannini, 2003). A generalized location map of the cross-sections is presented in Figure 6. Superimposing the boring logs for new monitoring wells 4S/2W-5G003 (4D2), 4S/2W-9F14 (3D1), and 3S/3W-25C020 (WD2) on these cross-sections (Figure 7 and 8) clarifies the interconnections between the two basins, specifically at depths above 500 feet bgs.

Hydrogeologically, the refinement of the geologic data is significant because the City of Hayward Wells "B" and "C" are drawing water from shallow to intermediate water-bearing zones that emanate from the Niles Cone. They are also screened in the Deep Aquifers in which an interconnection between the SEBPGB and NCGB is well documented and confirmed by this study.

Analytical testing of groundwater collected from the monitoring wells documented the presence of chloride concentrations above secondary maximum contaminant levels (MCL) for drinking water (250 ppm) in several of the wells. Concentrations of chloride detected in 4S/2W-05G005 (4C1), 4S/2W-05G004 (4C2), and 4S/2W-05G001 (4F1) were as expected due to the depths of each of the aquifers relative to ground surface (ranging from 74 ppm at approximately 200 feet bgs to 295 ppm at approximately 130 feet bgs, respectively). Chloride concentrations within the monitoring wells in the upper portion of the Deep Aquifer ranged from 125 ppm to 702 ppm in 4S/2W-05G002 (4D1) and 4S/2W-09F014 (3D1), respectively and 2,300 ppm in the deeper water-bearing zone monitoring well 4S/2W-05G003 (4D2). The chloride result from the northernmost monitoring well 3S/3W-25C020 (WD2), located approximately 1 mile from the Bayside Groundwater Project, documented 495 ppm chloride. Although insufficient information exists for a proper evaluation of the source of chlorides within the Deep Aquifers, a likely scenario is the transmission of brackish water from salt ponds and/or the Newark Aquifer to the Deep Aquifers through abandoned water wells that are known to exist in the immediate area (68 abandoned wells have been identified in the vicinity of these monitoring wells).

Permeability results from soil samples collected during the study documented low permeability values in aquitards separating water-bearing zones that are equivalent in elevation to the Newark, Centerville, Fremont, and Deep Aquifers within the study area. This information suggests considerable natural resistance to vertical flow between these aquifers.

The application of the results of this study has greatly enhanced the understanding of and the relationship between the NCGB and the SEPBGB. The information collected, along

with future data that will be collected from the monitoring wells, will assist in the management and future planning of both groundwater basins.

6.0 SCHEDULE INFORMATION

The original implementation schedule for the project is presented in Figure 9. Due to the heavy rains of 2004/2005, the completion schedule for the study was delayed relative to the original schedule. The rains saturated the access roads to the drilling locations making them impassable. These rain delays extended the schedule into the nesting season of endangered species located within the Eden Landing Ecological Reserve. As required by the permit requirements for access to the Reserve, field operations were suspended through the nesting season and resumed in the Fall of 2005. Field operations were completed in January 2006. The actual implementation schedule is presented in Figure 10.

7.0 BUDGET INFORMATION

The original contract schedule for the drilling contractor was designed as a short term field program with start to completion of field activities within a four month period. The heavy rains of 2004/2005, forced an extension of field activities beyond the original contracted time frame. The extended time frame and suspension of drilling activities due to endangered species nesting activities required ACWD to re-bid the drilling contract.

Costs incurred by ACWD under the grant share were $41,706.10 over that of the original proposed budget. The re-bidding process resulted in higher unit costs for well drilling and installation than originally proposed (unit costs varied by task). Due to the weight and speed limitations placed on the levees by permit requirements, additional costs for the transportation and disposal of soil generated during the drilling operations were significantly higher. This additional total cost will be covered by ACWD. Table 5 presents the original budgeted amount and final costs incurred by task for items that were to be paid for by the Grant.

The costs incurred by ACWD under its Agency Share Costs also were significantly higher than projected due to the additional time necessary for inspecting field operations (which were greatly prolonged due to the rain and difficult drilling conditions) and the preparation and implementation of specifications for the re-bidding process. Table 6 presents ACWD's original proposed and final incurred Agency Share costs.

Tables

Table 1 Well Completion and Well Indentification Summary Sheet						
ACPW* Permit Number	ACWD* * ID Number	Well Completion Date	ACWD ** Elevation Equilevant Aquifer	Depth (feet)	Screen Interval (feet)	State ID Number
WO4-1037	WD2	1/25/2006	Deep	800	490-530	3S/3W-25C020
WO4-1038	4F1	2/24/2005	Fremont	365	315-355	4S/2W-5G001
WO4-1039	3D1	12/15/2004	Deep	800	390-450	4S/2W-9F014
WO4-1040	4D1	2/11/2005	Deep	445	400-440	4S/2W-5G002
WO4-1041	4D2	1/28/2005	Deep	800	550-590	4S/2W-5G003
WO4-1042	4C2	3/3/2005	Centerville	225	180-220	4S/2W-5G004
WO4-1043	2D2	12/9/2005	Deep	730	425-445	4S/2W-8Q001
WO4-1044	4C1	3/9/2005	Centerville	180	135-170	4S/2W-5G005

* = Alameda County Public Works
** = Alameda County Water District

Table 2 Survey Data						
State ID Number	ACWD* * ID Number	Well Completion Date	ACWD ** Elevation Equivalent Aquifer	Reference Elevation	Easting	Northing
3S/3W-25C020	WD2	1/25/2006	Deep	11.663	2060619.716	6084589.174
4S/2W-05G001	4F1	2/24/2005	Fremont	9.500	2053132.186	6091675.010
4S/2W-05G002	4D1	2/11/2005	Deep	9.103	2053119.427	6091673.272
4S/2W-05G003	4D2	1/28/2005	Deep	8.568	2053103.888	6091671.905
4S/2W-05G004	4C2	3/3/2005	Centerville	9.477	2053146.192	6091677.072
4S/2W-05G005	4C1	3/9/2005	Centerville	9.683	2053161.112	6091680.239
4S/2W-08Q001	2D2	12/9/2005	Deep	11.996	2042334.933	6096390.441
4S/2W-09F014	3D1	12/15/2004	Deep	11.004	2044957.359	6100332.633

** = Alameda County Water District

Table 3
Summary of Groundwater Sampling Results

Well Numbers	ACWD* Well I.D.	ACWD* Elevation Equivalent Aquifer	Date of Water Level	Depth to Water (feet)	Reference Elevation (feet msl)	Water Elevation (feet msl)	Water Sample Date	Chloride Result (ppm)	TDS (ppm)	Hardness (ppm)
3S/3W-25C020	WD2	Deep	---	---	---	---	1/31/2006	**495**	**1,205**	328
4S/2W-05G001	4F1	Fremont	---	---	---	---	3/23/2005	232	**738**	225
4S/2W-05G001	4F1	Fremont	9/1/2005	9.6	9	-0.6	9/1/2005	97	461	---
4S/2W-05G002	4D1	Deep	---	---	---	---	3/24/2005	189	**646**	198
4S/2W-05G002	4D1	Deep	9/1/2005	12.6	9	-3.6	9/1/2005	125	479	---
4S/2W-05G003	4D2	Deep	---	---	---	---	3/17/2005	**1,200**	**2,038**	584
4S/2W-05G003	4D2	Deep	---	---	---	---	3/25/2005	**1,200**	**1,945**	615
4S/2W-05G003	4D2	Deep	9/1/2005	18.8	9	-9.8	9/1/2005	**2,300**	**3,191**	---
4S/2W-05G004	4C2	Centerville	---	---	---	---	3/23/2005	105	**542**	248
4S/2W-05G004	4C2	Centerville	9/1/2005	2.8	9	6.2	9/1/2005	74	447	---
4S/2W-05G005	4C1	Centerville	---	---	---	---	3/18/2005	102	**516**	192
4S/2W-05G005	4C1	Centerville	9/1/2005	Artesian	9	---	9/2/2005	**295**	**936**	---
4S/2W-08Q001	2D2	Deep	---	---	---	---	1/12/2006	**270**	**1,121**	340
4S/2W-09F014	3D1	Deep	4/1/2005	5.4	11	5.6	4/1/2005	**689**	**1922**	652
4S/2W-09F014	3D1	Deep	9/2/2005	10.9	11	0.1	9/2/2005	**702**	**1,946**	---

* = Alameda County Water District
2300 = value in bold above Secondary Maximum Contaminant Levels

Table 4
Northwest Niles Cone Monitoring Wells Project
Permeability Data Summary Spreadsheet

Sample Date	Sample ID	Date of Delivery to Lab (per COC)	Received by (at lab)	Date of Lab Report	Sample Results (cm/sec)	Between Elevation Equivalent Aquifers
Klienfelder Inc.						
10/29/2004	3D2@223'	11/2/2004	C. Liang	11/19/2004	1.70E-07	Newark/Centerville
11/4/2004	3D2@320'	11/8/2004	C. Liang	8/12/2005	<2.1E-9	Centerville/Fremont
11/5/2004	3D2@450.5'	11/8/2004	C. Liang	1/10/2005	1.00E-08	U Deep/ L Deep**
11/10/2004	3D2@470'	11/12/2004	E. Biala	1/10/2005	1.30E-08	U Deep/ L Deep**
11/19/2004	3D2@630'	11/24/2004	N. Baldock	1/24/2005	2.10E-09	Below Deep
1/7/2005	4D2-592.5'	1/11/2005	C.Liang	8/12/2005	<2.1E-9	Below Deep
2/9/2005	4D1-451'	2/9/2005	C.Liang	8/12/2005	<2.1E-9	U Deep/ L Deep**
2/17/2005	4F1-360	2/18/2005	C.Liang	8/12/2005	<2.1E-9	Fremont/Deep
2/28/2005	4C2- 225	NA	NA	NA	NA	Unrecoverable
3/7/2005	4C1-175	NA	NA	NA	NA	Unrecoverable
Signet Testing Laboratories						
11/10/2005	2D2@215	NA	NA	NA	NA	Unrecoverable
11/10/2005	2D2@320	11/15/2005	P. Slavin	12/22/2005	9.57E-09	Centerville/Fremont
11/16/2005	2D2@455	11/17/2005	P. Slavin	12/22/2005	1.77E-09	U Deep/ L Deep**
11/22/2005	2D2@548.5	11/23/2005	P. Slavin	1/9/2006	6.08E-09	Below Deep
12/2/2005	2D2@610	NA	NA	NA	NA	Unrecoverable
12/13/2005	WD2@210	NA	NA	NA	NA	Unrecoverable
12/14/2005	WD2@311	12/14/2005	P. Slavin	1/16/2006	5.36E-09	Centerville/Fremont
12/19/2005	WD2@410	NA	NA	NA	NA	Gravelly Zone
12/27/2005	WD2@510	NA	NA	NA	NA	Gravelly Zone
1/6/2006	WD2@631.5	1/12/2006	P. Slavin	2/8/2006	1.29E-08	Below Deep

* = Alameda County Water District
** = Upper Portion of the Deep Aquifer Zone and Lower Portion of the Deep Aquifer Zone
NA= No Analysis

Table 5
DWR Cost Summary Sheet

Task No.and Description from Approved Budget	Budget Amount by Task (Grant Share)	Total Billed To Date	Remaining Balance
1.1) Finalize Well Locations		$ -	$ -
1.2) Drilling Contract		$ -	$ -
1.3) Permitting Process		$ -	$ -
2.1) Drill and collect lithologic data for 4 boreholes to 800 feet	$104,400.00	$ 111,806.10	$ (7,406.10)
2.2) Geophysical logs	$6,000.00	$ 10,000.00	$ (4,000.00)
2.3) Construct 4 - 600 foot deep 2-inch monitoring wells	$66,800.00	$ 45,800.00	$ 21,000.00
2.4) Drill 1 borehole and install a 2-inch monitoring well to 500 feet	$18,700.00	$ 38,250.00	$ (19,550.00)
2.5) Drill 1 borehole and install a 2-inch monitoring well to 400 feet	$16,200.00	$ 18,250.00	$ (2,050.00)
2.6) Drill 1 borehole and install a 2-inch monitoring well to 300 feet	$12,700.00	$ 10,500.00	$ 2,200.00
2.7) Drill 1 borehole and install a 2-inch monitoring well to 200 feet	$7,700.00	$ 7,650.00	$ 50.00
2.8) Collect and classify samples		$ -	$ -
2.9) Review logs and finilize well design		$ -	$ -
2.10) Develop wells	$4,000.00	$ 9,050.00	$ (5,050.00)
2.11) Dispose of drilling fluids and cuttings	$4,000.00	$ 27,600.00	$ (23,600.00)
2.12) Install stove pipes and protective standards	$2,400.00	$ 8,300.00	$ (5,900.00)
2.13) GPS new well locations		$ -	$ -
3.1) Collection and permeability testing of sample cores	$7,000.00	$ 4,400.00	$ 2,600.00
3.2) Collection and analyze groundwater samples upon well completion		$ -	$ -
4.1) Submit quarterly progress reports to DWR		$ -	$ -
4.2) Submit final project summary to DWR		$ -	$ -
TOTALS	$249,900.00	$ 291,606.10	$ (41,706.10)

Table 6
Agency Cost Summary Sheet

Task No.and Description from Approved Budget	Budget Amount by Task	Actual Costs Accrued	Difference
1.1) Finalize Well Locations	$3,184.00	$ 10,496.22	$ (7,312.22)
1.2) Drilling Contract	$2,840.00	$ 3,052.12	$ (212.12)
1.3) Permitting Process	$8,400.00	$ 9,086.56	$ (686.56)
2.1) Drill and collect lithologic data for 4 boreholes to 800 feet	$14,260.00	$ 72,057.26	$ (57,797.26)
2.2) Geophysical logs		$ 3,323.67	$ (3,323.67)
2.3) Construct 4 - 600 foot deep 2-inch monitoring wells	$4,900.00	$ 21,594.52	$ (16,694.52)
2.4) Drill 1 borehole and install a 2-inch monitoring well to 500 feet	$500.00	$ 17,314.19	$ (16,814.19)
2.5) Drill 1 borehole and install a 2-inch monitoring well to 400 feet	$500.00	$ 8,782.45	$ (8,282.45)
2.6) Drill 1 borehole and install a 2-inch monitoring well to 300 feet	$500.00	$ 7,081.97	$ (6,581.97)
2.7) Drill 1 borehole and install a 2-inch monitoring well to 200 feet	$500.00	$ 8,876.46	$ (8,376.46)
2.8) Collect and classify samples	$9,000.00	$ 10,859.12	$ (1,859.12)
2.9) Review logs and finilize well design	$1,120.00	$ 3,732.43	$ (2,612.43)
2.10) Develop wells		$ 6,685.98	$ (6,685.98)
2.11) Dispose of drilling fluids and cuttings	$1,030.00	$ 1,864.42	$ (834.42)
2.12) Install stove pipes and protective standards	$120.00	$ 776.38	$ (656.38)
2.13) GPS new well locations	$1,000.00	$ 1,253.46	$ (253.46)
3.1) Collection and permeability testing of sample cores	$1,224.00	$ 3,249.48	$ (2,025.48)
3.2) Collection and analyze groundwater samples upon well complet	$724.00	$ 864.25	$ (140.25)
4.1) Submit quarterly progress reports to DWR	$1,200.00	$ 1,699.05	$ (499.05)
4.2) Submit final project summary to DWR	$2,116.00	$ 2,495.90	$ (379.90)
TOTALS	$53,118.00	$ 195,145.89	$ (142,027.89)

FIGURE 1: NILES CONE GROUNDWATER BASIN AND STUDY AREA

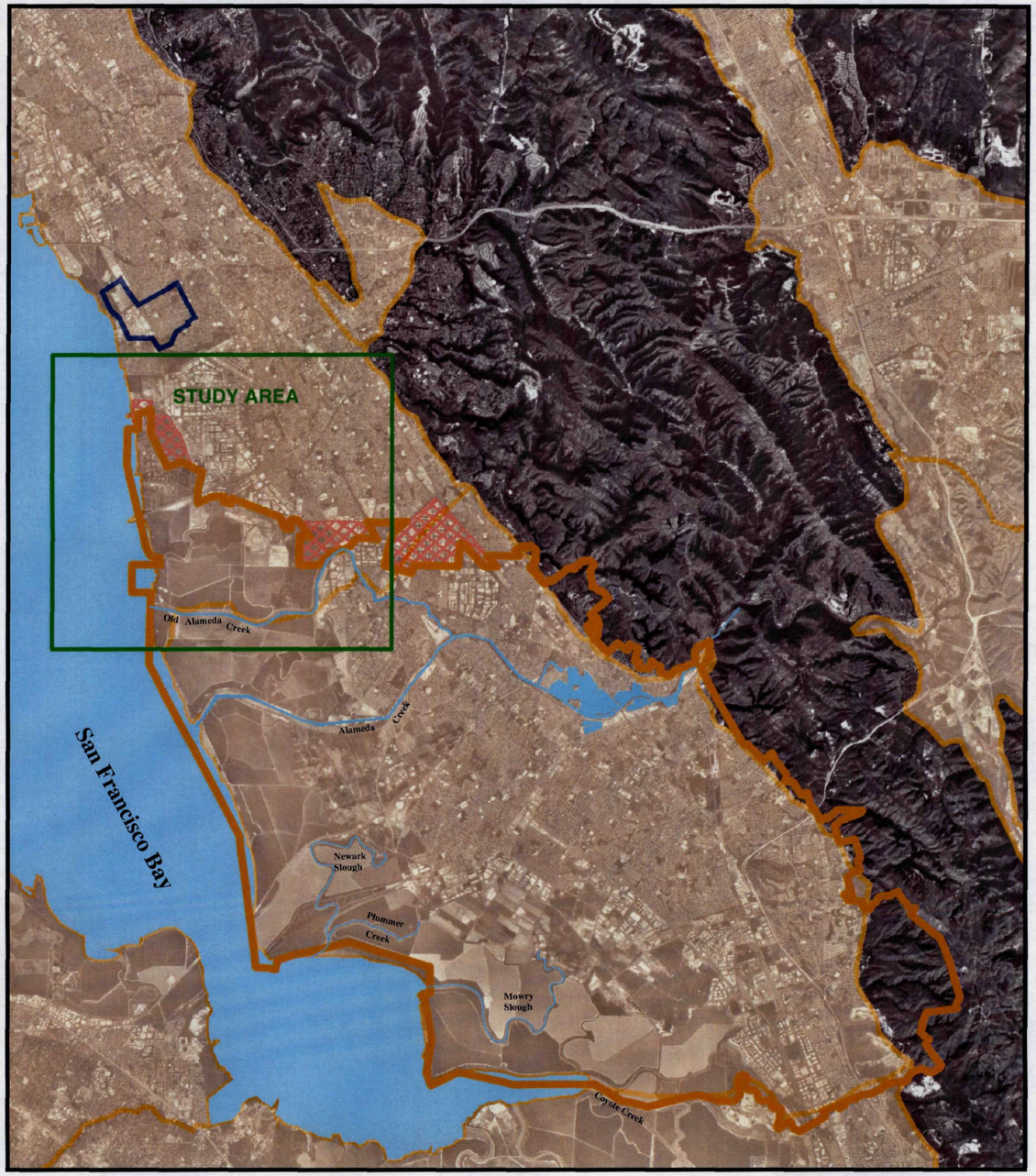


FIGURE 2: ORIGINAL GROUNDWATER MONITORING WELL LOCATIONS

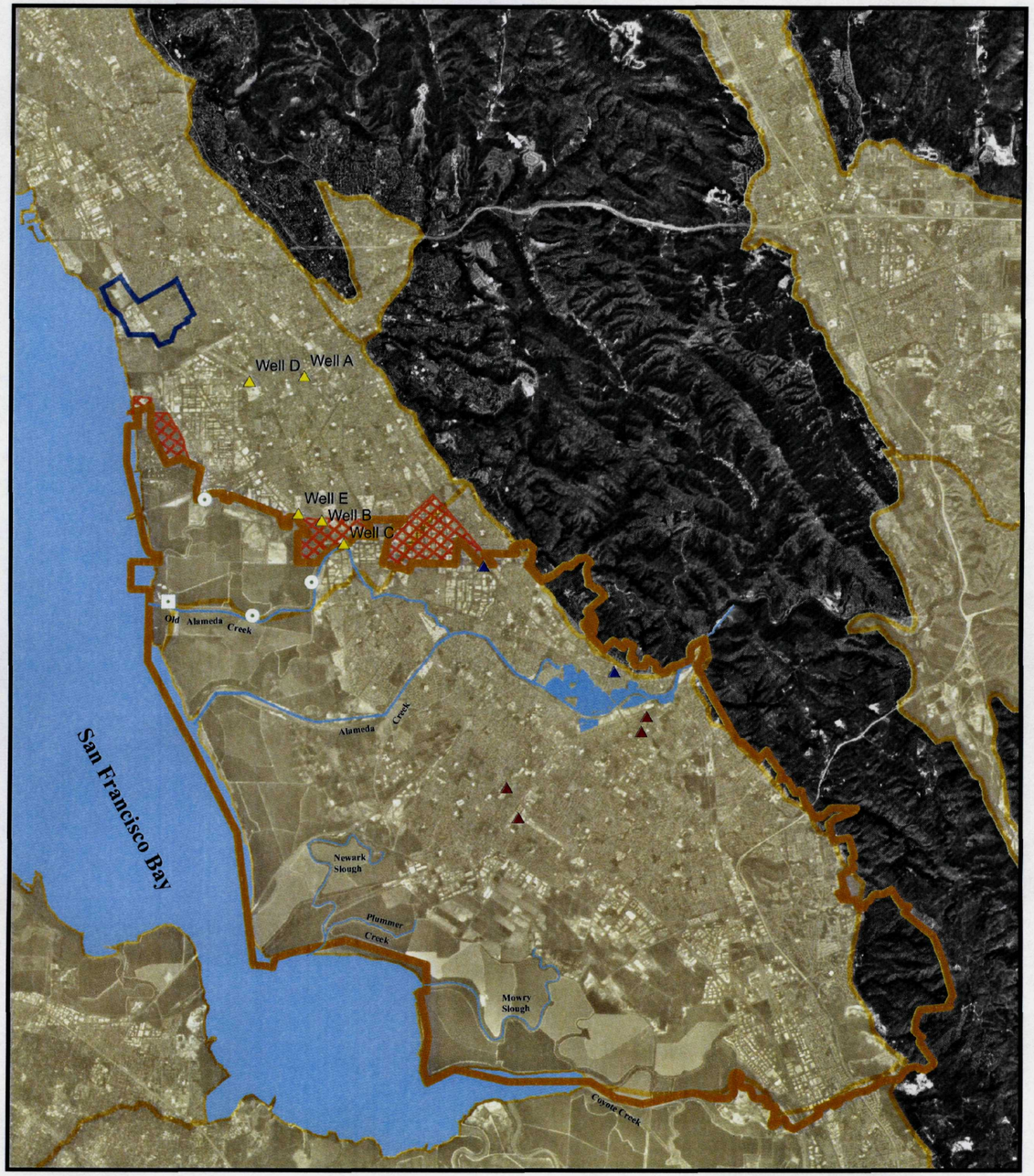
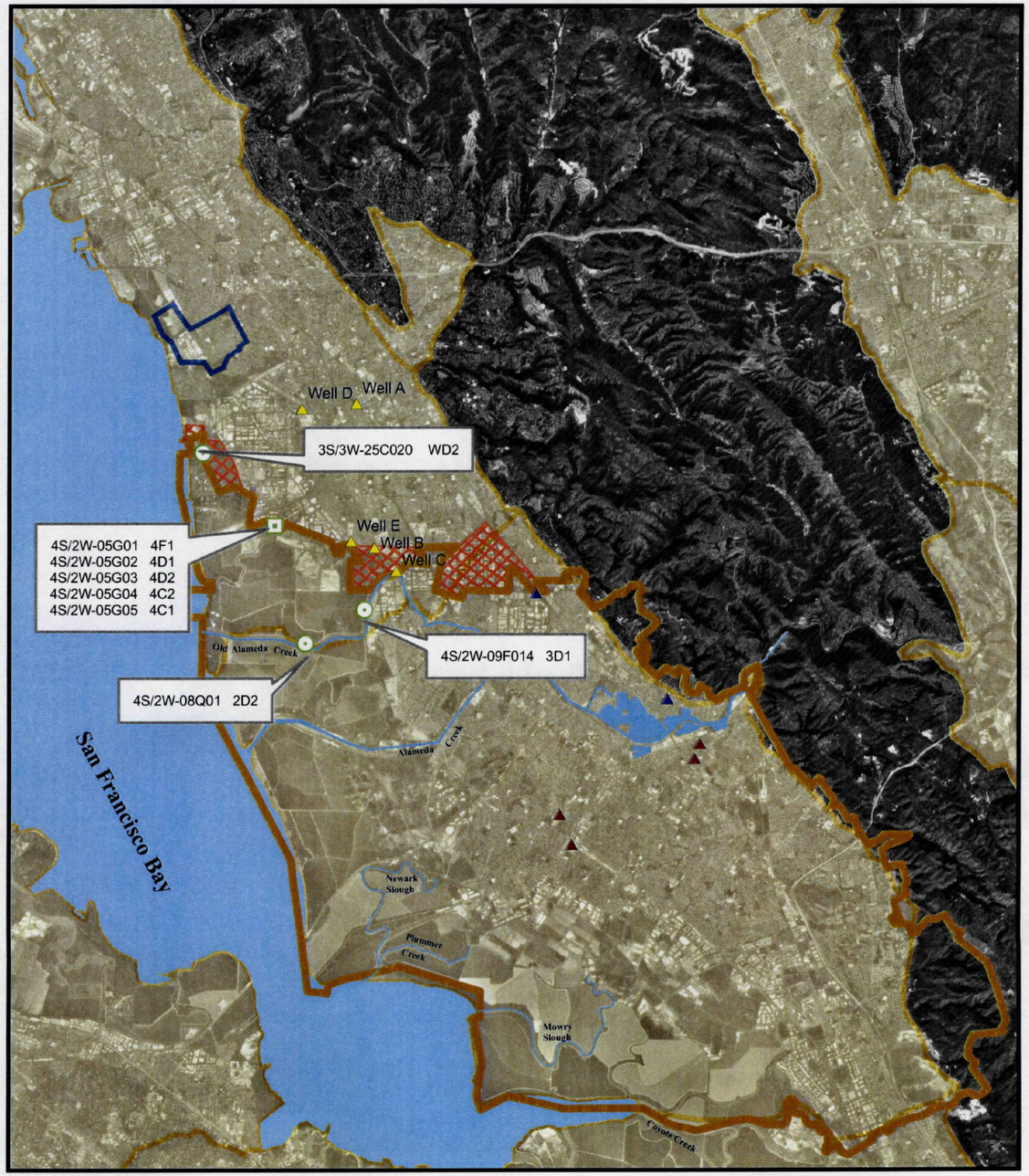
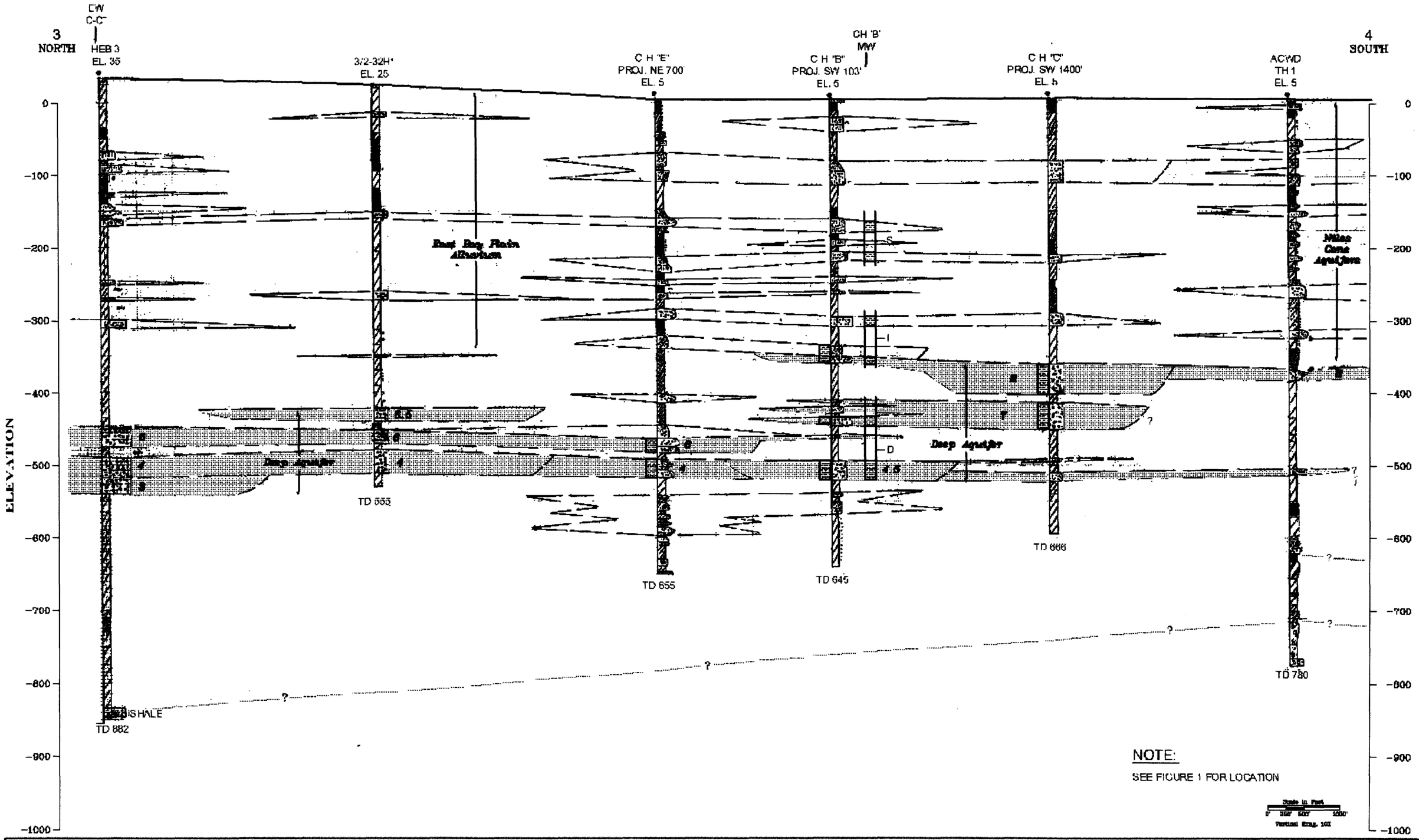


FIGURE 3: ACTUAL GROUNDWATER MONITORING WELL LOCATIONS





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LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

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Figure 4
Geologic Cross Section North-South 3-4

1

NORTHWEST

2

SOUTH EAST BAY PLAIN — TRANSITION ZONE — NILES CONE

PROJ. W 34 R
MARINA
PROJ. E
MWR
MWS
ORO LOMA
MWQ
PROJ. W WELL "D" HEB 4
PROJ. W HEB 3
WELL "E"
WELL "B"
WELL "C"
ALAMEDA CREEK
ACWD TH 1
PROJ. W ACWD T.W
ACWD TH 2
ACWD CO. PK.
ACWD 26M7

200
0
-200
-400
-600
-800
-1000
-1200

ELEVATION

South East Bay Plain Alluvium

Deep Aquifer

Newark

Centerville / Fremont

Niles Cone Alluvium

FRANCISAN BEDROCK ?

FRANCISAN BEDROCK

LEGEND

- WELL I.D.
- TEST HOLE W/ E LOG
- THIN SAND/GRAVEL
- THICK SAND/GRAVEL
- DEEP AQUIFER SUBUNIT
- DEEP AQUIFER SUBUNITS
- BOTTOM OF WELL / TEST HOLE
- BASE TEST HOLE CONTROL

0' 5000' 10000' 15000' 20000' 25000' 30000' 35000' 40000' 45000' 50000' 55000' 60000' 65000' 70000'

Scale in Feet

Scale in Feet
0' 1250' 2500' 5000'
Vertical Exag. 25X

CAD FILE: G:/Projects/Alameda County Water District/01-1-080/CompositeX.dwg CFG FILE: LSCE2500.PCP_MRG DATE: 10-14-02 10:51am

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

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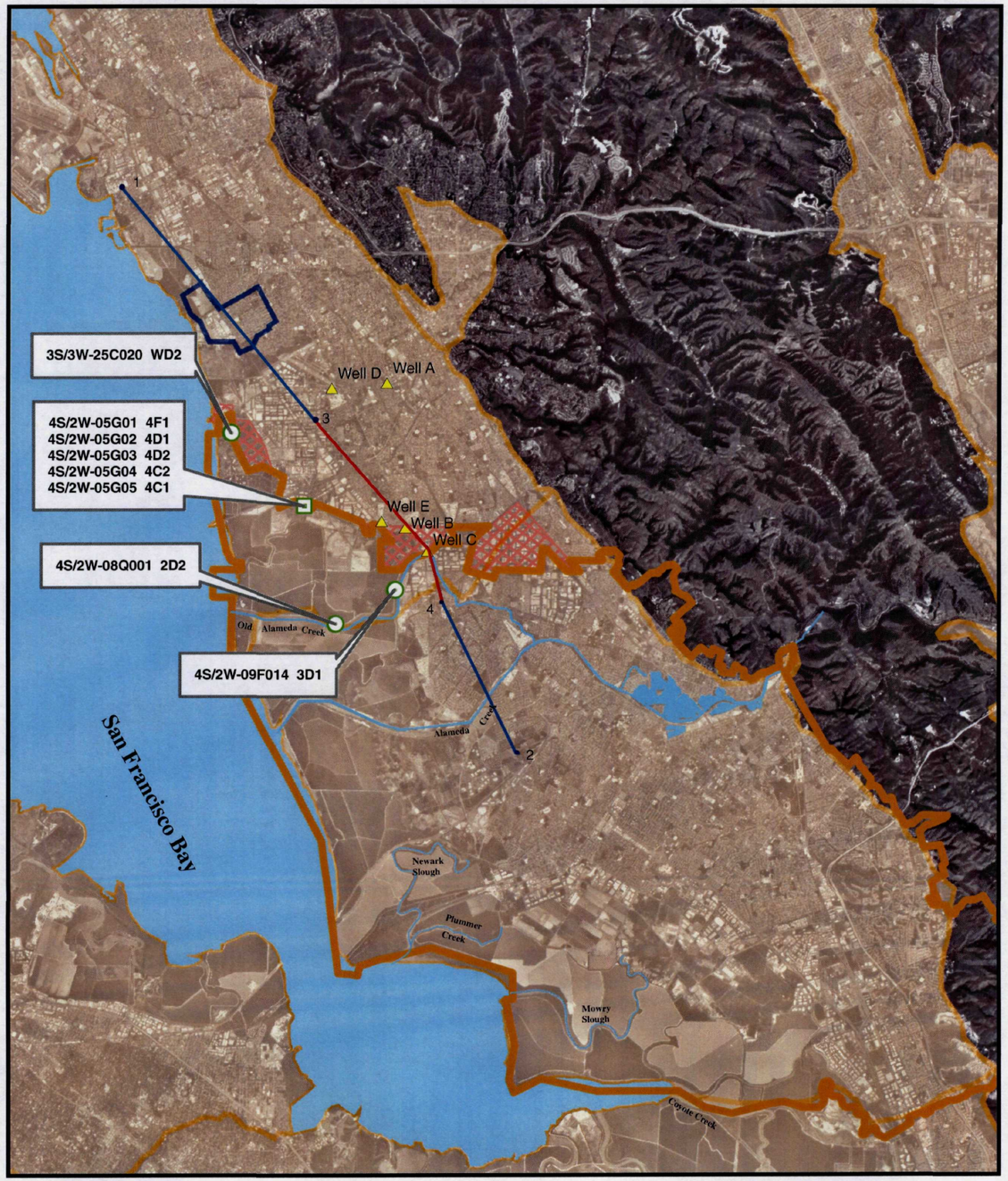
Figure 5
Generalized Geologic Cross Section 1-2

FIGURE 6: GENERALIZED GEOLOGIC CROSS SECTION LINES



Northwest Niles Cone Monitoring Well Project Well Cluster

Northwest Niles Cone Monitoring Well Project Well

EBMUD Bayside Groundwater Project Location

Hayward Emergency Wells

Hayward Detachment

ACWD Niles Cone Boundary

DWR Groundwater Basins

1 3 Cross Section Line

N W E S

0 1 2 Miles

3 NORTH

4 SOUTH

HEB 3 EL. 35

4S/2W 5G003

3/2-32H1 EL. 25

C H "E" PROJ. NE 700' EL. 5

C H "B" PROJ. SW 103' EL. 5

CH 'B' MW

C H "C" PROJ. SW 1400' EL. 5

4S/2W 9F14

ACWD TH 1 EL. 5

ELEVATION

0
-100
-200
-300
-400
-500
-600
-700
-800
-900
-1000

4C1
4C2
4F1
4D1
4D2
3D1

East Bay Plain Alluvium

Niles Cone Aquifers

Deep Aquifer

Deep Aquifer

6.5
6.5
6
6
6
4
4
3
3?
8
7
4.5
7-8?
8
?
?
?
?
S
I
D

TD 882
TD 800
TD 555
TD 655
TD 645
TD 666
TD 800
TD 780

SHALE

Legend

- Geologic Interpretation from Luhdorff & Scalmanini Report
- Modified Geologic Interpretation based on new ACWD Monitoring Well
- New ACWD Monitoring Well
- Existing Monitoring Well
- Screen Interval
- Screen Interval (associated cluster well)

Scale in Feet
0' 250' 500' 1000'
Vertical Exag. 10X

Base Map from Luhdorff & Scalmanini Consulting Engineers Report East Bay Plain Aquifer Test Project, April 2003

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Figure 7
Revised Geologic Cross Section North-South 3-4
Job No. 6241

1

NORTHWEST

2

SOUTH EAST BAY PLAIN — TRANSITION ZONE — NILES CONE

PROJ. W 34 R

MARINA

PROJ. E MWR ORO LOMA

MWQ

MWS

35/3W 25C020

PROJ. W WELL "D" HEB 4

PROJ. W HEB 3

4S/2W 5G003

WELL "E"

WELL "B"

WELL "C"

4S/2W 9F014

ALAMEDA CREEK

ACWD TH 1

PROJ. W ACWD T.W

ACWD TH 2

ACWD CO. PK.

ACWD 26M7

200

0

−200

−400

−600

−800

−1000

−1200

ELEVATION

South East Bay Plain Alluvium

Deep Aquifer

Newark

Centerville / Fremont

Niles Cone Alluvium

FRANCISAN BEDROCK ?

FRANCISAN BEDROCK

LEGEND

- WELL I.D.
- TEST HOLE W/ E LOG
- THIN SAND/GRAVEL
- THICK SAND/GRAVEL
- DEEP AQUIFER SUBUNIT
- DEEP AQUIFER SUBUNITS
- BOTTOM OF WELL / TEST HOLE
- BASE TEST HOLE CONTROL
- ACWD MONITORING WELL (LOCATIONS WITH SCREENED INTERVALS)

0' 5000' 10000' 15000' 20000' 25000' 30000' 35000' 40000' 45000' 50000' 55000' 60000' 65000' 70000'

Scale in Feet

Scale in Feet

0' 1250' 2500' 5000'

Vertical Exag. 25X

Base Map from Luhdorff & Scalmanini Consulting Engineers
Report East Bay Plain
Aquifer Test Project, April 2003

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Figure 8
Revised Generalized Geologic Cross Section 1-2
Job No. 6241

Figure 9, Original Schedule Northwest Niles Cone Groundwater Monitoring Well Project

ID	Task Name	Duration	Start
1	*Authorization to Proceed*	0 days	Fri 10/1/04
2	**Task 1-Pre-construction Activities**	**67 days**	**Fri 10/1/04**
3	Task 1.1- Finalize Boring Locations	7 days	Fri 10/1/04
4	Task 1.2 Drilling Contract	60 days	Tue 10/12/04
5	Task 1.3-Permitting Process	60 days	Tue 10/12/04
6	*Completion of pre-field activities*	0 days	Mon 1/3/05
7	**Task 2-Drilling, Well Construction, and Development**	**94 days**	**Mon 1/3/05**
8	Task 2.1-Drilling 4 boreholes to 800 feet	94 days	Mon 1/3/05
9	Task 2.1.1-Boring 1	12 days	Tue 1/4/05
10	Task 2.2.2-Boring 2	12 days	Thu 1/27/05
11	Task 2.2.3-Boring 3	12 days	Mon 2/21/05
12	Task 2.2.4-Boring 4	12 days	Wed 3/16/05
13	Task 2.2-Geophysical Logs	1 day	Mon 1/12/04
14	Task 2.2.1-Boring 1	1 day	Thu 1/20/05
15	Task 2.2.2-Boring 2	1 day	Mon 2/14/05
16	Task 2.2.3-Boring 3	1 day	Wed 3/9/05
17	Task 2.2.4-Boring 4	1 day	Fri 4/1/05
18	Task 2.3-Construct 4 2-inch monitoring wells to 600 feet	1 day	Mon 1/26/04
19	Task 2.3.1-Boring 1	4 days	Fri 1/21/05
20	Task 2.3.2-Boring 2	4 days	Tue 2/15/05
21	Task 2.3.3-Boring 3	4 days	Thu 3/10/05
22	Task 2.3.4-Boring 4	4 days	Mon 4/4/05
23	Task 2.4-Drill and Construct a 2-inch well to 500 feet	8 days	Fri 4/8/05
24	Task 2.5-Drill and Construct a 2-inch well to 400 feet	8 days	Wed 4/20/05
25	Task 2.6-Drill and Construct a 2-inch well to 300 feet	5 days	Mon 5/2/05
26	Task 2.7-Drill and Construct a 2-inch well to 200 feet	4 days	Mon 5/9/05
27	Task 2.8-Collect and classify samples	68 days	Tue 1/4/05
28	Task 2.9- Review of logs and finalize well designs	52 days	Thu 1/20/05
29	Task 2.10-Develop monitoring wells	8 days	Fri 5/13/05
30	Task 2.11-Dispose of Drilling fluids and cuttings	45 days	Wed 4/13/05
31	Task 2.12-Install stovepipes and protective standards	2 days	Fri 5/13/05
32	Task 2.13-GPS new well locations	1 day	Fri 5/13/05
33	*Completion of Field Activities*	0 days	Tue 5/24/05
34	**Task 3-Analytical Testing and Evaluation**	**116 days**	**Tue 1/4/05**
35	Task 3.1-Collection and geophysical testing of sample cores	60 days	Tue 1/4/05
36	Task 3.2-Collection and testing of groundwater samples	15 days	Wed 5/25/05
37	**Task 4- Reporting**	**131 days**	**Fri 1/7/05**
38	Task 4.1-Quarterly Reporting	65 days	Fri 1/7/05
39	Task 4.1.1-Fourth Qt 2004 progress report	0 days	Fri 1/7/05
40	Task 4.1.2-First Qt 2005 progress report	0 days	Fri 4/8/05
41	Task 4.2-Final Project Summary Report	80 days	Mon 3/21/05
42	*Project Completion*	0 days	Fri 7/8/05

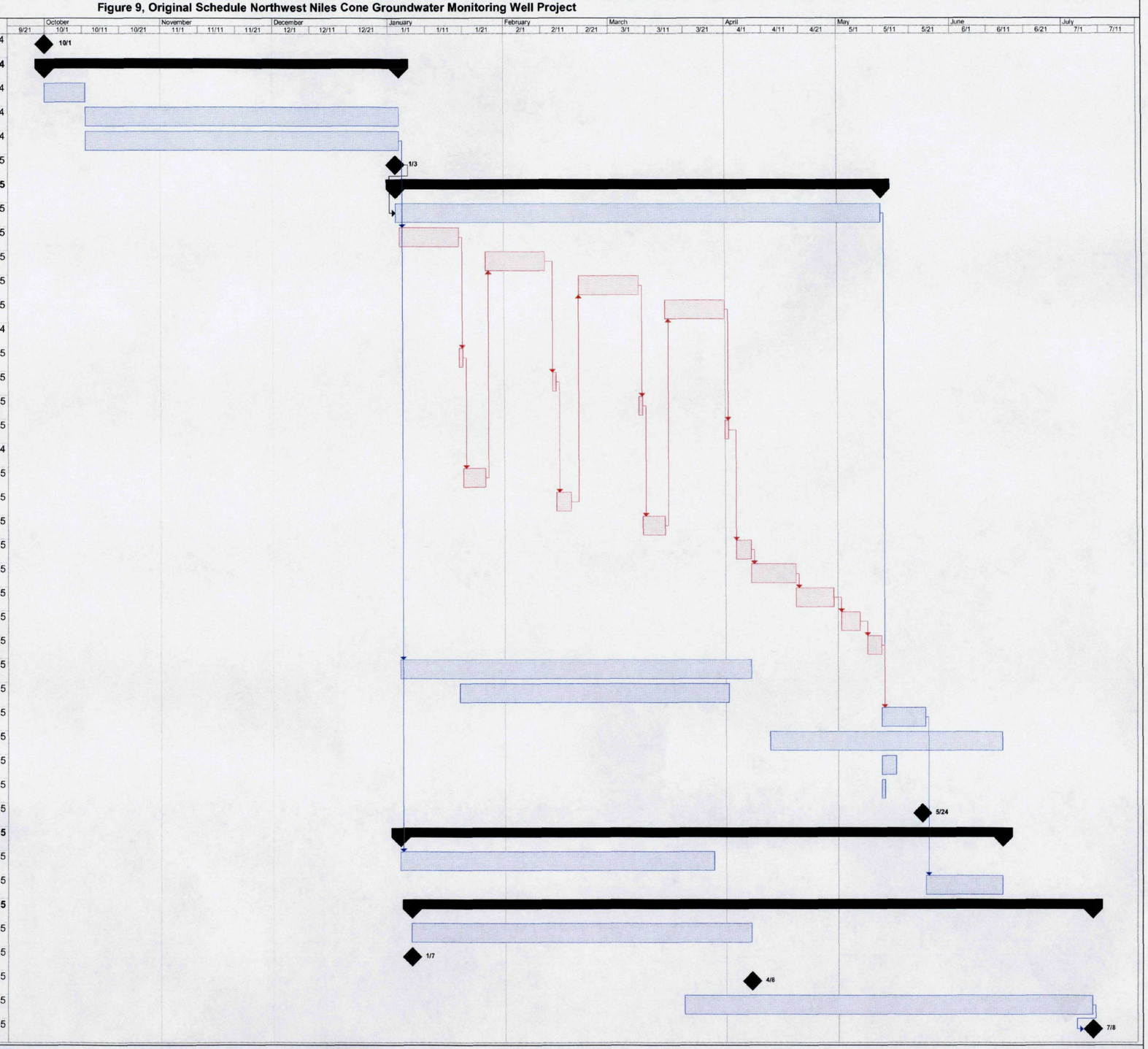

Figure 9
Project: Original Schedule
Date: January 26, 2004

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Figure 10, Actual Northwest Niles Cone Groundwater Monitoring Well Project Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	*Authorization to Proceed*	0 days	Fri 10/1/04	Fri 10/1/04	
2	**Task 1-Pre-construction Activities**	**240 days**	**Fri 10/1/04**	**Thu 9/1/05**	
3	Task 1.1- Finalize Boring Locations	7 days	Fri 10/1/04	Mon 10/11/04	
4	Task 1.2 Drilling Contract	60 days	Tue 10/12/04	Mon 1/3/05	
5	Task 1.3-Permitting Process	60 days	Tue 10/12/04	Mon 1/3/05	
6	*Completion of pre-field activities*	0 days	Mon 1/3/05	Mon 1/3/05	
7	Endangered Species Nesting Period	110 days	Fri 4/1/05	Thu 9/1/05	6
8	**Task 2-Drilling, Well Construction, and Development**	**115 days**	**Fri 9/2/05**	**Thu 2/9/06**	
9	Task 2.1-Drilling 4 boreholes to 800 feet	115 days	Fri 9/2/05	Thu 2/9/06	7
10	Task 2.1.1-Boring 4	12 days	Mon 12/20/04	Tue 1/4/05	
11	Task 2.2.2-Boring 2	12 days	Mon 11/14/05	Tue 11/29/05	20
12	Task 2.2.3-Boring 3	26 days	Tue 10/26/04	Tue 11/30/04	
13	Task 2.2.4-Boring W	24 days	Tue 12/13/05	Fri 1/13/06	
14	Task 2.2-Geophysical Logs	1 day	Mon 1/12/04	Mon 1/12/04	
15	Task 2.2.1-Boring 4	1 day	Wed 1/5/05	Wed 1/5/05	10
16	Task 2.2.2-Boring 2	1 day	Wed 12/7/05	Wed 12/7/05	11
17	Task 2.2.3-Boring 3	1 day	Thu 12/2/04	Thu 12/2/04	12
18	Task 2.2.4-Boring W	1 day	Mon 1/16/06	Mon 1/16/06	13
19	Task 2.3-Construct 4 2-inch monitoring wells to 600 feet	1 day	Mon 1/26/04	Mon 1/26/04	
20	Task 2.3.1-Boring 4	4 days	Mon 1/3/05	Thu 1/6/05	
21	Task 2.3.2-Boring 2	4 days	Thu 12/8/05	Tue 12/13/05	16
22	Task 2.3.3-Boring 3	8 days	Mon 12/6/04	Wed 12/15/04	
23	Task 2.3.4-Boring W	5 days	Tue 1/17/06	Mon 1/23/06	18
24	Task 2.4-Drill and Construct a 2-inch well to 500 feet	10 days	Tue 2/1/05	Mon 2/14/05	
25	Task 2.5-Drill and Construct a 2-inch well to 400 feet	11 days	Mon 2/14/05	Mon 2/28/05	
26	Task 2.6-Drill and Construct a 2-inch well to 300 feet	6 days	Mon 2/28/05	Mon 3/7/05	
27	Task 2.7-Drill and Construct a 2-inch well to 200 feet	3 days	Mon 3/7/05	Wed 3/9/05	
28	Task 2.8-Collect and classify samples, Sites 3 and 4	68 days	Tue 1/4/05	Thu 4/7/05	
29	Collect and classify samples, Sites 2 and W	45 days	Mon 11/14/05	Fri 1/13/06	
30	Task 2.9- Review of logs and finalize well designs, Sites 3 and 4	52 days	Thu 1/20/05	Fri 4/1/05	
31	Review of logs and finalize well designs, Sites 2 and W	45 days	Mon 11/14/05	Fri 1/13/06	
32	Task 2.10-Develop monitoring wells, Site 3 and 4	8 days	Thu 3/24/05	Mon 4/4/05	
33	Develop monitoring wells, Sites 2 and W	4 days	Wed 1/25/06	Mon 1/30/06	
34	Task 2.11-Dispose of Drilling fluids and cuttings, Sites 3 and 4	120 days	Tue 10/19/04	Mon 4/4/05	
35	Dispose of Drilling fluids and cuttings, Sites 2 and W	50 days	Mon 11/14/05	Fri 1/20/06	
36	Task 2.12-Install protective standards, Sites 3 and 4	14 days	Mon 3/14/05	Thu 3/31/05	
37	Install protective standards, Sites 2 and W	7 days	Mon 1/23/06	Tue 1/31/06	
38	Task 2.13-GPS new well locations	1 day	Mon 1/23/06	Mon 1/23/06	
39	*Completion of Field Activities*	0 days	Tue 1/31/06	Tue 1/31/06	
40	**Task 3-Analytical Testing and Evaluation**	**334 days**	**Tue 10/19/04**	**Fri 1/27/06**	
41	Task 3.1-Collection and geophysical testing of sample cores ,Sites 3 and 4	115 days	Tue 10/19/04	Mon 3/28/05	
42	Collection and geophysical testing of sample cores , Sites 2 and W	45 days	Mon 11/14/05	Fri 1/13/06	
43	Task 3.2-Collection and testing of groundwater samples	5 days	Mon 3/21/05	Fri 3/25/05	
44	Collection and geophysical testing of groundwater samples from wells 2D2	5 days	Mon 1/23/06	Fri 1/27/06	
45	**Task 4- Reporting**	**331 days**	**Fri 1/7/05**	**Fri 4/14/06**	
46	Task 4.1-Quarterly Reporting	65 days	Fri 1/7/05	Thu 4/7/05	
47	Task 4.1.1-Fourth Qt 2004 progress report	0 days	Fri 1/14/05	Fri 1/14/05	
48	Task 4.1.2-First Qt 2005 progress report	0 days	Fri 4/15/05	Fri 4/15/05	
49	Task 4.1.2-Second Qt 2005 progress report	0 days	Fri 7/15/05	Fri 7/15/05	
50	Task 4.1.2-Third Qt 2005 progress report	0 days	Fri 10/14/05	Fri 10/14/05	
51	Task 4.1.1-Fourth Qt 2005 progress report	0 days	Fri 1/13/06	Fri 1/13/06	
52	Task 4.2-Final Project Summary Report	112 days	Thu 11/10/05	Fri 4/14/06	
53	*Project Completion*	0 days	Fri 4/14/06	Fri 4/14/06	52

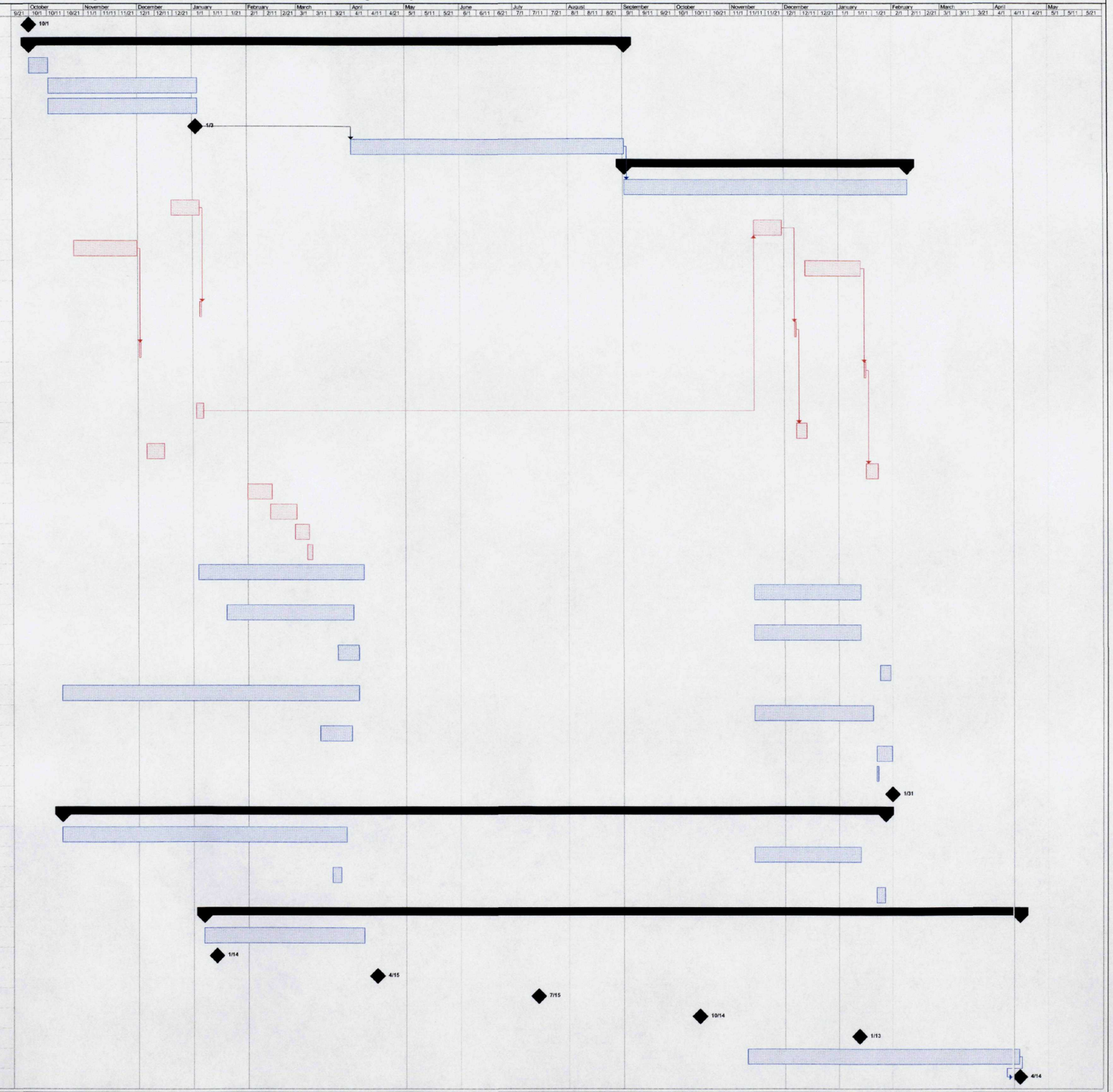

Figure 10
Project: Actual Project Schedule Northwest Niles Cone Monitoirng Wells
Date: March 21 2006

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

Appendix A
Permits

File 6241
Corr.

COUNTY OF ALAMEDA
PUBLIC WORKS AGENCY
399 Elmhurst Street • Hayward, CA 94544-1395
(510) 670-5480

November 2, 2005

RECEIVED
NOV - 4 2005
A.C.W.D.
ENGINEERING DEPT.

Mr. Doug Young
Alameda County Water District
43885 South Grimmer Blvd
Fremont, CA 94538

RE: Drilling Permits Extension for Permit No. W04-1037 & W04-0144

Dear Mr. Young:

Your drilling permit request for extension has been approved and will expire November 30, 2005 as requested for drilling permit applications, W04-1037 and W04-1044. All conditions of approval shall remain the same.

Within 60 days after completion of the work, please submit the State DWR 188 forms to this office.

Please submit the revised well location map. We will use the previous State well number for the time being on these permits, until I can check the location of these wells. I will later assign a new State well number, so they may fit the State Township, Range, Section and code for this area.

If you have any questions, please feel free to contact me at (510) 670-6633.

Sincerely,

James Yoo
Engineer-Scientist
Water Resources Section

JY:
Attachments:

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

APPLICANTS: PLEASE ATTACH A SITE MAP FOR ALL DRILLING PERMIT APPLICATIONS
DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT STATE OF CALIFORNIA wetland Restoration Property. Eden Landing Ecological Reserve (See attached map)

CLIENT
Name Alameda County Water District
Address 43885 Grimmer Blvd Phone 510-668-4452
City Fremont CA Zip 94537

APPLICANT
Name Alameda County Water District
Fax 510-651-1760
Address 3664 Beard Road Phone 510-668-4452
City Fremont Zip 94537

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection	General
ter Supply	Contamination
nitoring	Well Destruction

PROPOSED WATER SUPPLY WELL USE

New Domestic	Replacement Domestic	N/A
Municipal	Irrigation	
Industrial	Other	

DRILLING METHOD:

(Mud Rotary)	Air Rotary	Auger
Cable	Other	

DRILLER'S NAME Maggiora Bros. Drilling, Inc.
DRILLER'S LICENSE NO. 249957

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 200 ft.
Surface Seal Depth 150 ft. Owner's Well Number 4N

GEOTECHNICAL/CONTAMINATION PROJECTS
Number of Borings _____ Maximum
Hole Diameter _____ in. Depth _____ ft.

STARTING DATE 12/20/04
COMPLETION DATE 12/22/04

FOR OFFICE USE

PERMIT NUMBER _____
WELL NUMBER _____
APN _____

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and Industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL/CONTAMINATION
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site.A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED _____ DATE _____

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ DATE 9/15/04

PRINT NAME Douglas T. Young

Rev.5-11-04

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

APPLICANTS: PLEASE ATTACH A SITE MAP FOR ALL DRILLING PERMIT APPLICATIONS
DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT STATE OF CALIFORNIA
Wetland Restoration Property, Eden
Landing Ecological Reserve
(See attached map)

CLIENT
Name Alameda County Water District
Address 43885 Grimmer Blvd Phone 510-668-4452
City Fremont CA Zip 94537

APPLICANT
Name Alameda County Water District
Fax 510-651-1760
Address 3664 Beard Road Phone 510-668-4452
City Fremont Zip 94537

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection	General
er Supply	Contamination
itoring	Well Destruction

PROPOSED WATER SUPPLY WELL USE

New Domestic	Replacement Domestic	N/A
Municipal	Irrigation	
Industrial	Other	

DRILLING METHOD:

Mud Rotary	Air Rotary	Auger
Cable	Other	

DRILLER'S NAME Maggiora Bros. Drilling, Inc.

DRILLER'S LICENSE NO. 249957

WELL PROJECTS

Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 400 ft.
Surface Seal Depth 350 ft. Owner's Well Number 4F

GEOTECHNICAL/CONTAMINATION PROJECTS

Number of Borings _____ Maximum
Hole Diameter _____ in. Depth _____ ft.

STARTING DATE 12/13/04

COMPLETION DATE 12/16/04

FOR OFFICE USE

PERMIT NUMBER _____
WELL NUMBER _____
APN _____

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and Industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL/CONTAMINATION
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED _____ DATE _____

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ DATE 9/15/04

PRINT NAME Douglas T. Young

Rev.5-11-04

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

APPLICANTS: PLEASE ATTACH A SITE MAP FOR ALL DRILLING PERMIT APPLICATIONS
DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT STATE OF CALIFORNIA wetland Restoration Property. Eden Landing Ecological Reserve (See attached map)

CLIENT
Name Alameda County Water District
Address 43885 Grimmer Blvd Phone 510-668-4452
City Fremont CA Zip 94537

APPLICANT
Name Alameda County Water District
Fax 510-651-1760
Address 3664 Beard Road Phone 510-668-4452
City Fremont Zip 94537

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection	General
Water Supply	Contamination
Monitoring	Well Destruction

PROPOSED WATER SUPPLY WELL USE

New Domestic	Replacement Domestic	N/A
Municipal	Irrigation	
Industrial	Other	

DRILLING METHOD:

Mud Rotary	Air Rotary	Auger
Cable	Other	

DRILLER'S NAME Maggiora Bros. Drilling, Inc.

DRILLER'S LICENSE NO. 249957

WELL PROJECTS

Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 300 ft.
Surface Seal Depth 250 ft. Owner's Well Number 4C

GEOTECHNICAL/CONTAMINATION PROJECTS

Number of Borings _____ Maximum
Hole Diameter _____ in. Depth _____ ft.

STARTING DATE 12/16/04

COMPLETION DATE 12/20/04

FOR OFFICE USE

PERMIT NUMBER _____
WELL NUMBER _____
APN _____

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and Industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL/CONTAMINATION
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site.A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED _____ DATE _____

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ DATE 9/15/04

PRINT NAME Douglas T. Young

Rev.5-11-04

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

APPLICANTS: PLEASE ATTACH A SITE MAP FOR ALL DRILLING PERMIT APPLICATIONS
DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT STATE OF CALIFORNIA
wetland Restoration Property, Eden
Landing Ecological Reserve
(See attached map)

CLIENT
Name Alameda County Water District
Address 43885 Grimmer Blvd Phone 510-668-4452
City Fremont CA Zip 94537

APPLICANT
Name Alameda County Water District
Fax 510-651-1760
Address 3664 Beard Road Phone 510-668-4452
City Fremont Zip 94537

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection	General
Water Supply	Contamination
Monitoring	Well Destruction

PROPOSED WATER SUPPLY WELL USE

New Domestic	Replacement Domestic	N/A
Municipal	Irrigation	
Industrial	Other	

DRILLING METHOD:

(Mud Rotary)	Air Rotary	Auger
Cable	Other	

DRILLER'S NAME Maggiora Bros. Drilling, Inc.

DRILLER'S LICENSE NO. 249957

WELL PROJECTS

Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 500 ft.
Surface Seal Depth 450 ft. Owner's Well Number 4D1

GEOTECHNICAL/CONTAMINATION PROJECTS

Number of Borings _____ Maximum
Hole Diameter _____ in. Depth _____ ft.

STARTING DATE 12/6/04

COMPLETION DATE 12/10/04

FOR OFFICE USE

PERMIT NUMBER _____
WELL NUMBER _____
APN _____

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and Industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL/CONTAMINATION
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED _____ DATE _____

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ DATE 12/15/04

PRINT NAME Douglas T. Young

Rev.5-11-04

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

APPLICANTS: PLEASE ATTACH A SITE MAP FOR ALL DRILLING PERMIT APPLICATIONS
DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT STATE OF CALIFORNIA wetland Restoration Property. Eden Landing Ecological Reserve (See attached map)

CLIENT
Name Alameda County Water District
Address 43885 Grimmer Blvd Phone 510-668-4452
City Fremont CA Zip 94537

APPLICANT
Name Alameda County Water District
Fax 510-651-1760
Address 3664 Beard Road Phone 510-668-4452
City Fremont Zip 94537

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection	General
Water Supply	Contamination
Monitoring	Well Destruction

PROPOSED WATER SUPPLY WELL USE

New Domestic	Replacement Domestic	N/A
Municipal	Irrigation	
Industrial	Other	

DRILLING METHOD:

Mud Rotary	Air Rotary	Auger
Cable	Other	

DRILLER'S NAME Maggiora Bros. Drilling, Inc.

DRILLER'S LICENSE NO. 249957

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 600 ft.
Surface Seal Depth 550 ft. Owner's Well Number 4D2

GEOTECHNICAL/CONTAMINATION PROJECTS
Number of Borings _____ Maximum
Hole Diameter _____ in. Depth _____ ft.

STARTING DATE 11/22/04

COMPLETION DATE 12/3/04

FOR OFFICE USE

PERMIT NUMBER _____
WELL NUMBER _____
APN _____

PERMIT CONDITIONS

Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

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C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
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2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL/CONTAMINATION
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED _____ DATE _____

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ DATE 9/15/04

PRINT NAME Douglas T. Young

Rev.5-11-04

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

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DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT STATE OF CALIFORNIA
wetland Restoration Property. Eden
Landing Ecological Reserve
(See attached map)

CLIENT
Name Alameda County Water District
Address 43885 Grimmer Blvd Phone 510-668-4452
City Fremont CA Zip 94537

APPLICANT
Name Alameda County Water District
Fax 510-651-1760
Address 3664 Beard Road Phone 510-668-4452
City Fremont Zip 94537

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection	General
Water Supply	Contamination
(Monitoring)	Well Destruction

PROPOSED WATER SUPPLY WELL USE

New Domestic	Replacement Domestic	N/A
Municipal	Irrigation	
Industrial	Other	

DRILLING METHOD:

(Mud Rotary)	Air Rotary	Auger
Cable	Other	

DRILLER'S NAME Maggiora Bros. Drilling, Inc.

DRILLER'S LICENSE NO. 249957

WELL PROJECTS

Drill Hole Diameter	8 in.	Maximum Depth	600 ft.
Casing Diameter	2 in.	Owner's Well Number	3D2
Surface Seal Depth	550 ft.		

GEOTECHNICAL/CONTAMINATION PROJECTS

Number of Borings		Maximum Depth	ft.
Hole Diameter	in.		

STARTING DATE 11/8/04

COMPLETION DATE 11/19/04

FOR OFFICE USE

PERMIT NUMBER _____
WELL NUMBER _____
APN _____

PERMIT CONDITIONS

Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

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E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED _____ DATE _____

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ DATE 9/15/04

PRINT NAME Douglas T. Young

Rev.5-11-04

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

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DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT STATE OF CALIFORNIA Wetland Restoration Property. Eden Landing Ecological Reserve (See attached map)

CLIENT
Name Alameda County Water District
Address 43885 Grimmer Blvd Phone 510-668-4452
City Fremont CA Zip 94537

APPLICANT
Name Alameda County Water District
Fax 510-651-1760
Address 3664 Beard Land Phone 510-668-4452
City Fremont Zip 94537

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection	General
ter Supply	Contamination
(nitoring)	Well Destruction

PROPOSED WATER SUPPLY WELL USE

New Domestic	Replacement Domestic	N/A
Municipal	Irrigation	
Industrial	Other	

DRILLING METHOD:

(Mud Rotary)	Air Rotary	Auger
Cable	Other	

DRILLER'S NAME Maggiora Bros. Drilling, Inc.

DRILLER'S LICENSE NO. 249957

WELL PROJECTS

Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 600 ft.
Surface Seal Depth 550 ft. Owner's Well Number 2D2

GEOTECHNICAL/CONTAMINATION PROJECTS

Number of Borings _____ Maximum
Hole Diameter _____ in. Depth _____ ft.

STARTING DATE 10/25/04

COMPLETION DATE 11/5/04

FOR OFFICE USE

PERMIT NUMBER _____
WELL NUMBER _____
APN _____

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

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2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL/CONTAMINATION
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED _____ DATE _____

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ DATE 9/15/04

PRINT NAME Douglas T. Young

Rev.5-11-04

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 James Yoo
FAX (510) 782-1939 www.acfcwcd.org

APPLICANTS: PLEASE ATTACH A SITE MAP FOR ALL DRILLING PERMIT APPLICATIONS
DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT STATE OF CALIFORNIA wetland Restoration Property. Eden Landing Ecological Reserve (See attached map)

CLIENT
Name Alameda County Water District
Address 43885 Grimmer Blvd Phone 510-668-4452
City Fremont CA Zip 94537

APPLICANT
Name Alameda County Water District
Fax 510-651-1760
Address 3664 Beard Road Phone 510-668-4452
City Fremont Zip 94537

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection	General
Water Supply	Contamination
(Monitoring)	Well Destruction

PROPOSED WATER SUPPLY WELL USE

New Domestic	Replacement Domestic	N/A
Municipal	Irrigation	
Industrial	Other	

DRILLING METHOD:

(Mud Rotary)	Air Rotary	Auger
Cable	Other	

DRILLER'S NAME Maggiora Bros. Drilling, Inc.
DRILLER'S LICENSE NO. 249957

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 600 ft.
Surface Seal Depth 550 ft. Owner's Well Number 1D2

GEOTECHNICAL/CONTAMINATION PROJECTS
Number of Borings _____ Maximum
Hole Diameter _____ in. Depth _____ ft.

STARTING DATE 10/11/04
COMPLETION DATE 10/22/04

FOR OFFICE USE

PERMIT NUMBER _____
WELL NUMBER _____
APN _____

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and Industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL/CONTAMINATION
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site.A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED _____ DATE _____

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ DATE 9/15/04

PRINT NAME Douglas T. Young

Rev.5-11-04

ALAMEDA COUNTY WATER DISTRICT

DIRECTORS
JAMES G. GUNTHER
President
JUDY C. HUANG
Vice President
MARTIN L. KOLLER
ARTHUR LAMPERT
JOHN H. WEED

43885 SOUTH GRIMMER BOULEVARD • P.O. BOX 5110, FREMONT, CALIFORNIA 94537-5110
(510) 668-4200 • FAX (510) 770-1793 • www.acwd.org

MANAGEMENT
PAUL PIRAINO
General Manager
ROBERT SHAVER
Engineering Manager
KARL B. STINSON
Operations Manager
WILLIAM J. ZENONI
Finance and Administration Manage

July 21, 2004

Mr. John Wolfenden
Section Leader, Alameda and Santa Clara County
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, California 94612

Dear Mr. Wolfenden:

Subject: Development Water from ACWD Monitoring Well Installations

As discussed during our telephone conversation of June 29, 2004, the Alameda County Water District (ACWD) will be installing eight monitoring wells in the Fall of 2004 to monitor chloride concentrations and water levels in the Niles Cone Groundwater Basin. The proposed wells will be installed at three locations along the Old Alameda Creek Flood Control Channel levee and near the intersection of Eden Landing Road and Arden Road in the City of Hayward, California.

The monitoring wells are anticipated to be discreetly screened within the Newark, Centerville, Fremont, and Deep Aquifers. We would like to discharge the development water to the Old Alameda Creek Flood Control Channel (at the three locations along the levee and a nearby storm drain (at the Eden Landing Road/Arden Road location). The water quality from each well will vary as a function of the intercepted aquifer and location. The water quality anticipated from each well is provided in the table below.

Wells	Location	Aquifer	Anticipated Chloride (mg/L)	Anticipated TDS (mg/L)
Well 1	Old Alameda Creek Levee West	Newark	3600	7530

Well 2	Old Alameda Creek Levee West	Centerville	25	350
Well 3	Old Alameda Creek Levee West	Fremont	25	350
Well 4	Old Alameda Creek Levee West	Deep	120	570
Well 5	Old Alameda Creek Levee West	Deep 2	90	470
Well 6	Old Alameda Creek Levee Center	Deep 2	90	470
Well 7	Old Alameda Creek Levee East	Deep 2	90	470
Well 8	Intersection of Eden Landing Road and Arden Road	Deep 2	90	470

Anticipated discharge volume from the monitoring wells is expected to range between 2,000 and 3,000 gallons per well. ACWD will require that the development water be pumped into a sediment settlement tank to remove entrained solids prior to discharge.

The estimated water quality is based upon water quality data from regional monitoring wells. A map showing the drilling locations for the wells is attached. We made a similar request at this time in 2000 and received a response letter from the Regional Water Quality Control Board (Regional Board) approving the request.

Per our telephone conversation, it is our understanding that the Regional Board verbally approves our request and that a NPDES permit will not be needed. We appreciate your time in discussing this request with us. We have prepared this letter to confirm the information discussed during our telephone conversation and to document Regional

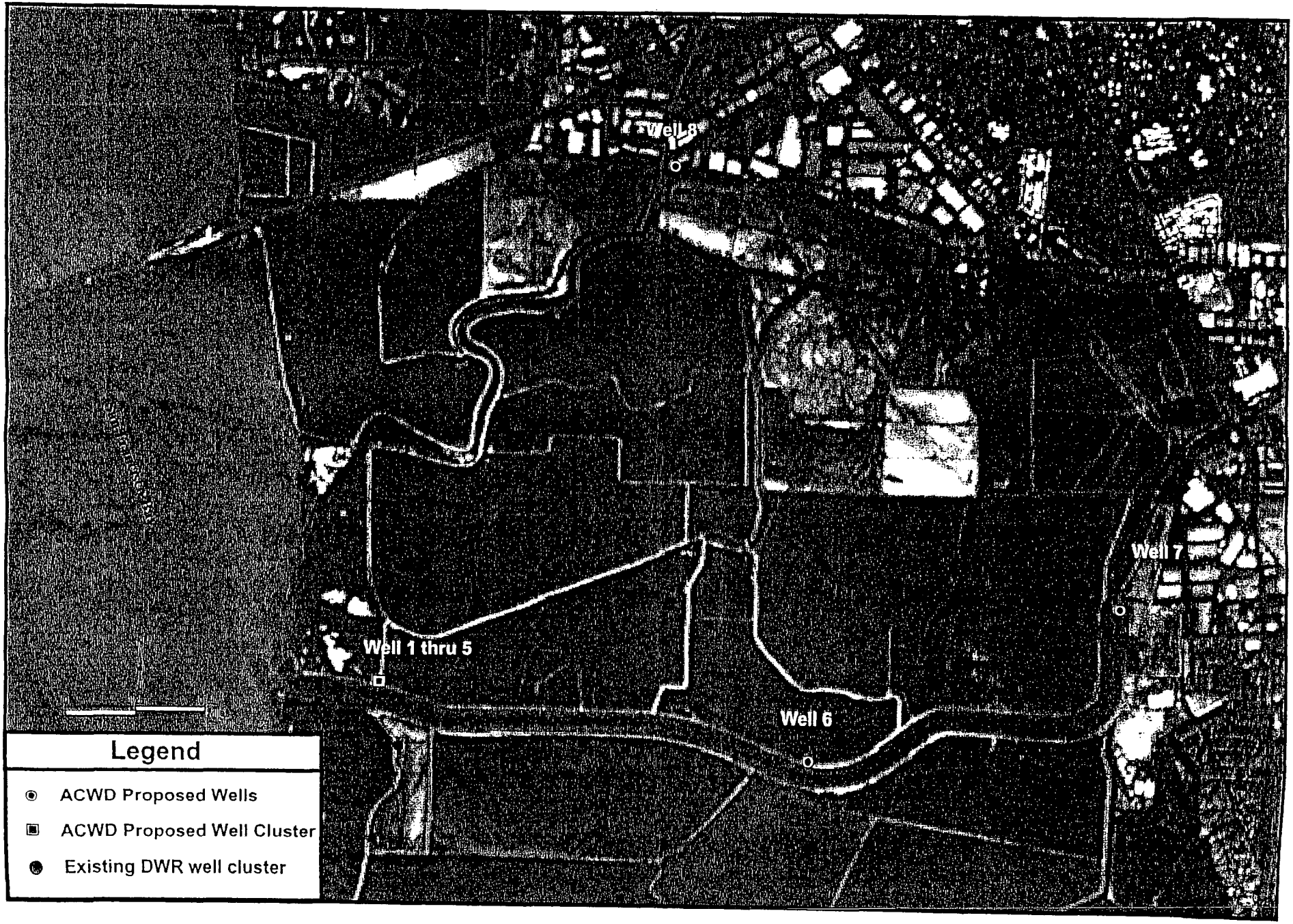
Board approval of this request. If you have any questions, please call me at 510-668-4452.

Sincerely,

Douglas T. Young, R.G.
Hydrogeologist

dty/bk
attachments

PROPOSED ... ELL LOCATIONS



Appendix B
Access Agreements

State of California – The Resources Agency
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

ARNOLD SCHWARZENEGGER, Governor

September 17, 2004

Steven D. Inn
Groundwater Resources Manager
Alameda County Water District
Post Office Box 5110
Fremont, CA 94537-5110

Dear Mr. Inn:

Letter of Agreement
Right of Entry, Eden Landing Ecological Reserve, Alameda County
Northwest Niles Cone Monitoring Well Construction Project

The Alameda County Water District (ACWD) supplies water to the Cities of Fremont, Newark, and Union City. As part of the management of the groundwater basin, ACWD has a number of groundwater monitoring wells (wells) located throughout the basin that act as water quality monitoring points to identify possible contaminants entering the basin. A number of these wells are on the Eden Landing Ecological Reserve (ELER) property in Alameda County, which is owned and managed by the Department of Fish and Game (Department).

ACWD monitors a nested, steel casing well cluster along the south-eastern side of ELER known as Whale's Tail marsh, at the mouth of Old Alameda Creek. The wells are described as nested since all three wells were completed within the same borehole. Groundwater water level and water quality data indicate that the wells in the ELER are reaching the end of their operational usefulness and, since the well casings are steel, are beginning to degrade. Subsequently, the facility is scheduled to be destroyed in the near future. The loss of this monitoring point leaves a large data gap in the understanding of the groundwater hydraulics of the basin and needs to be replaced. Furthermore, the facility may be in conflict with the proposed wetland restoration proposed for ELER.

The purpose of the project is the installation of new wells by ACWD in ELER. ACWD, working in conjunction with the State of California, Department of Water Resources (DWR), has been awarded a grant to explore, evaluate, and monitor geologic and hydro-geologic conditions in this area. ACWD needs to complete well installation activities and begin monitoring of these proposed monitoring wells by spring of 2005. The project involves construction of new wells located on levee margins in ruderal, upland habitat, adjacent to fully tidal or managed wetlands and channel habitats.

ACWD is proposing to install eight (8) groundwater monitoring wells at four (4) locations in ELER. Three of the locations will have one (1) well each and the fourth will have a monitoring well cluster of five (5) monitoring wells. The monitoring well cluster is located in the vicinity of the existing DWR monitoring well facility. The proposed drilling locations are presented on the attached figures (provided by ACWD). Drilling activities will involve the use of a drilling rig, one to two support trucks, and an ACWD inspector pickup truck. Drill cuttings and well development material generated by these activities will be removed from the site and transported to an ACWD facility. Upon completion of well installation activities, the site will be returned to its pre-field activities condition with the exception of at-grade valve pots and concrete and bollard marker posts. The monitoring well drilling activities are expected to take six to eight weeks to complete.

The wells will be drilled and constructed by a drilling contractor licensed in the State of California with a valid C-57 license. The boreholes will be drilled using a mud rotary drilling rig. The drilling team is expected to consist of a drill rig, support truck and pickup truck. Additionally, ACWD may have inspection vehicles at the site. During drilling operations, drilling mud will be used to lift cuttings out of the borehole. The drilling mud will be contained within a portable mud pit and the drill cuttings removed from the pit to a portable storage bin. When full, the bin will be transported to an ACWD owned property where the drill cuttings will be stored.

All well boreholes will be drilled to a diameter of at least six inches. All the wells will be completed as 2-inch monitoring wells constructed of Schedule 80 PVC casing with a 20 foot long well screen. The annular space next to the screened portion will be backfilled with clean sand. The annular space above the sand will be sealed with neat cement grout. All wells will be constructed in accordance with ACWD Monitoring Guidelines and California Well Standards. During drilling, samples will be collected and materials will be classified by a Registered Geologist following the Manual Soil Description Standard (ASTM D2488-00) and the Unified Soils Classification System.

The monitoring wells will be initially developed using a surge block and bailer on the drill rig. The drilling team will be followed by a well development team responsible for final well development. The wells will be developed using a surge

block/airlift method. Debris in the bottom of the well will be bailed out. Development water will be retained in a portable storage tank and entrained sediment allowed to settle. Upon completion of the settlement process, the clear development water will be discharged to the adjacent salt pond, as directed by the Department. The sediment remaining in the tank will be transported off-site to an ACWD facility for storage.

Once well construction and development are complete, a traffic rated utility box will be installed to protect the well from contamination or vandalism. Each well will be engraved with the well identification and state reference number and the utility box will be set in a 2-foot-by-2-foot concrete pad with a concrete bollard.

Equipment or material not utilized during specific phases of the well installation process will be stored off-site. Well casing and monitoring well material will not be stored on-site during the borehole drilling phase of work.

ACWD shall be allowed access to ELER for construction, and physical access will continue to be available thereafter for maintenance and monitoring of the wells, as described in the conditions below, with restrictions.

This agreement expires on January 31, 2005 unless modified and approved in advance.

Conditions

1. The ACWD and its contractors shall provide the Department evidence of liability insurance naming the Department as a covered party. The amount of coverage should be at least $1,000,000.00.

2. It is understood that the Department is not obligated to maintain vehicular access for ACWD to the wells, since vehicular access may not be feasible due to breaches in the levees which will occur as part of the Department's restoration activities (restoration of North Creek via breach into Old Alameda Creek) or may be planned as part of the long-term restoration plan (South Bay Salt Pond Restoration Project). Other means of access (i.e. via boat) to remote well sites will be permitted if the sites are not

physically accessible by vehicle; however, seasonal restrictions may be required to protect sensitive species or habitats.

3. All construction work will be confined to the period September 1, 2004 to January 31, 2005, unless modified and approved in advance. It is understood that the unimproved levee roads are rendered impassable and unsafe after light or heavy rain, and access is limited to use of the levees during dry periods only. If a rainfall event occurs during the construction project, or immediately prior to monitoring periods thereafter, the use of the levee roads will be restricted until sufficient time has elapsed that the levee is dry and passable in a safe manner.

4. The new well locations have been identified as adjacent to habitat that is known to be, or potentially is, inhabited by California clapper rail, California black rail, western snowy plover, and salt marsh harvest mouse, among other sensitive resources. This agreement does not allow for the take or incidental take of any State or Federally listed threatened or endangered listed species. Any unauthorized take of such listed species or their habitat may result in prosecution.

5. Department personnel may inspect the work site at any time for the duration of the construction of this project or during monitoring periods thereafter.

6. ACWD, its contractors or agents, shall provide the Department a detailed construction schedule and identify the approximate beginning and completion date for each well. The construction schedule shall be sent to the attention of John Krause, Associate Wildlife Biologist, P. O. Box 47, Yountville, CA 94599. The names, phone numbers, cellular phone numbers, and pager numbers of key personnel shall be included in this notification.

7. All earth excavated during drilling must be hauled off site and shall at no time be placed in sensitive habitat areas adjacent to the upland construction sites. For the proposed well locations where construction activities require storage of water encountered or otherwise used, turbid water shall be pumped to a temporary, mobile, settling basin (e.g. Baker

Tank). Clarified water may be discharged to the adjacent pond from the settling basin in a manner that does not result in erosion of the pond bottom or levees.

8. An emergency response plan shall be prepared prior to the start of construction. The plan shall identify the actions which will be taken in the event of spill of petroleum products, or other material harmful to aquatic or plant life, and the emergency response materials which will be kept at the site to allow the rapid containment and clean up of any spilled material.

9. Staging and storage areas for equipment, materials, fuels, lubricants and solvents, shall be located on levees only. Stationary equipment shall be positioned over drip pans.

10. Any equipment or vehicles driven and/or operated within ELER must be checked and maintained daily, to prevent leaks of materials that if introduced to water could be deleterious to aquatic life. Vehicles requiring refueling and/or lubrication shall be removed from ELER to complete such maintenance.

11. All construction debris and associated materials shall be removed from the work site upon completion of this project.

12. ACWD shall notify the Department upon completion of this project. A final inspection may be made when all construction work is completed to ensure the sites are acceptable to the Department.

13. A copy of this agreement must be provided to the contractor and all subcontractors who work within the site and must be in their possession at the work site.

14. Debris, soil, silt, bark, rubbish, creosote-treated wood, raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, soaps, detergents, paints or any other substances which could be hazardous to aquatic life, resulting from project related activities, shall be prevented from contaminating the soil and/or entering wetlands or waters of the State. Except as authorized elsewhere in this agreement, none of these materials shall be placed within or where they may

enter wetlands or waters of the State, by operator or any party working under contract and all materials not required shall be removed immediately.

15. The contractor shall not dump any construction debris food or litter within ELER. All debris and waste shall be picked up daily and properly disposed of at an appropriate site.

16. The operator is liable for compliance with the terms of this Agreement, including violations committed by the contractors and/or subcontractors. The Department reserves the right to suspend this agreement if the Department determines any of the following has occurred and if the operator or its contractors or agents cannot or does not promptly correct the alleged deficiency once it has been brought to their attention:

    A) Failure to comply with any of the conditions.
    B) Information provided in support of the Agreement is determined by the Department to be materially inaccurate.
    C) Information becomes available to the Department that was not known when preparing the original conditions of this Agreement (including, but not limited to, the occurrence of State or Federally listed species in the area or risk to resources not previously observed)
    D) The project as described in the Agreement has materially changed or conditions affecting fish and wildlife resources materially change.

Amendments and Renewals

ACWD, or its agents, shall notify the Department before any modifications are made in the project plans described in this agreement and submitted to the Department. A written request for an amendment must be submitted. Modifications may require an amendment or a new agreement, which may be issued at the discretion of the Department.

To renew the Agreement beyond the expiration date, a written request for a renewal must be submitted to the Department. Renewal of the original Agreement will be issued at the discretion of the Department.

If ACWD, or its agents, need more time to complete the authorized activity, the work period may be extended on a weekly basis by calling John Krause, Associate Wildlife Biologist, at (415) 454-8050.

Sincerely,

Robert W. Floerke
Regional Manager
Central Coast Region

Attachment

I, the undersigned, understand and agree to the conditions specified above.

Alameda County Water District
(Signature)

Steven O. Inn
(Print Name)

9/22/2004
Date

File 6291

State of California – T Resources Agency A')LD SCHWARZENEGGER, Governor
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

October 5, 2005

Douglas T. Young, R.G.
Hydrologist
Alameda County Water District
Post Office Box 5110
Fremont, CA 94537-5110

Dear Mr. Young:

Second Extension of Access Permit for
Installation of Monitoring Wells at ACWD Site No. 1 and 2
Eden Landing Ecological Reserve
Alameda County, California

By this letter the Department of Fish and Game extends your existing Access Permit until December 31, 2005. All of the requirements of the Access Permit will remain in effect.

If you have questions concerning the Access Permit or the extension, please contact Mr. John Krause, Associate Wildlife Biologist, at jkrause@dfg.ca.gov or (415) 454-8050; or Mr. Carl Wilcox, Habitat Conservation Manager, at (707) 944-5525.

Sincerely,

Robert W. Floerke
Regional Manager
Central Coast Region

ALAMEDA COUNTY WATER DISTRICT

43885 SOUTH GRIMMER BOULEVARD • P.O. BOX 5110, FREMONT, CALIFORNIA 94537-5110
(510) 668-4200 • FAX (510) 770-1793 • www.acwd.org

November 17, 2005

Mr. Greg Shreeve
Manager
Water Pollution Control Facility
City of Hayward
3700 Enterprise Avenue
Hayward, California 94545-3208

Dear Mr. Shreeve:

Subject: Monitoring Well Installation, City of Hayward Water Pollution Control Facility Compost Project Site, Winton Avenue, Hayward, California

Alameda County Water District (ACWD) would like to thank you for all the time and effort you put into assisting us in obtaining permission to install a monitoring well at the City of Hayward Water Pollution Control Facility Compost Project site. The installation of this monitoring well will greatly enhance our understanding of the movement of elevated concentrations of chlorides detected in other monitoring wells in the area.

We have prepared this letter as a follow up to our telephone conversation on November 7, 2005, giving ACWD permission to install the monitoring well on City of Hayward property, and our site meeting with you on November 9, 2005, to identify a location for the monitoring well. The monitoring well location is presented on the attached Figure 1 and has been placed in a location agreeable to both the City of Hayward and ACWD as not to interfere with present operations at the facility. Soil cuttings generated by the drilling operations will be placed in a location on a site approved by the City of Hayward.

We understand that the site is not scheduled for development in the near future which is important because ACWD plans to use this well for long-term monitoring. ACWD also will require periodic access to the monitoring well for purposes of monitoring, sampling, and maintenance.

Again, thank you for taking the time and effort in obtaining access and approval for the monitoring well installation. If you have any questions, please call me at 510-668-4452.

Sincerely,

Douglas T. Young, P.G.
Hydrogeologist

dty/bk
cc: Steven Inn, ACWD

Acknowledged and Agreed to by the City of Hayward by:

Greg Shreeve

Greg Shreeve
Manager
City of Hayward
Water Pollution Control Facility

11/28/05

Date:

Appendix C
Storm Water Protection and Emergency Response Plans

MAGGIORA BROS. DRILLING, INC.

DRILLING CONTRACTORS - PUMP SALES & SERVICE

CALIFORNIA CONTRACTOR'S LICENSE NO. 249957

Corporate Office
595 Airport Blvd.
Watsonville, CA 95076

Tel: (831) 724-1338
Tel: (800) 728-1480
Fax: (831) 724-3228

SEPTEMBER 30, 2004

ALAMEDA COUNTY WATER DISTRICT
43885 SOUTH GRIMMER BOULEVARD
FREEMONT, CALIFORNIA 94537

SUBJECT; STORM DRAIN PROTECTION AND EMERGENCY RESPONSE PLAN.

DEAR DOUG YOUNG,

To prepare for the drilling of the monitoring wells we plan to have the following supplies on the job site.

One half a yard of sand (bagged) with two hundred sand bags.

Petroleum products Absorbent towels.

One hundred fifty lbs. of absorbent powder.

One hundred feet of erosion control and sediment retention WATTLES.

One hundred by ten feet sheet of filter cloth.

And all tools and materials needed to properly install and maintain these supplies.

THE PLAN

Park equipment on plastic sheets and build containment vessel by placing sand bags and wattles under the edges of the plastic.

On wells sites #1 and #2 we will have drilling fluids and cuttings from the shaker will go directly into a dump truck and dumped at the determined dump site.

MAGGIORA BROS. DRILLING, INC.

DRILLING CONTRACTORS - PUMP SALES & SERVICE

CALIFORNIA CONTRACTOR'S LICENSE NO. 249957

Corporate Office
595 Airport Blvd.
Watsonville, CA 95076

Tel: (831) 724-1338
Tel: (800) 728-1480
Fax: (831) 724-3228

SUBMITTAL TRANSMITTAL

Date:	10-01-04
Project:	NORTHWEST NILES CONE MONITORING WELLS
Submittal No.	MBD 1
Subject:	SWPPP AND ERP PLANS
Spec. Sec.. Ref.:	E-14.8
Supplier:	MAGGIORA BROS. DRILLING

Contract Deviations(if any):

To:	**ACWD. DOUG YOUNG**
Submitted By:	**JIM PROOST**

Comments: PLAN ATTACHED.

MAGGIORA BROS. DRILLING, INC.

DRILLING CONTRACTORS - PUMP SALES & SERVICE

CALIFORNIA CONTRACTOR'S LICENSE NO. 249957

We will pump excess cement back into the concrete truck for them to dispose of.

Excess water from drilling and well developing will be pumped into a water truck. We will decant the clean water at a site approved by ACWD. The rest will go to the dump site.

When we start drilling we will protect drainage with filter cloth, sand bags and wattles.

If it was to start raining we will have visquine to cover any material that may enter the water ways.

We have a BMPs FOR CONTRACTORS ACTIVITIES PLAN and have trained staff.

In the event that a situation would occur that was beyond the control of the personal on hand the ERP for notification of proper personal would be utilized.

By having this plan in place there is little chance that a leak could occur that the crew on hand could not control.

In the event that a HASMAT spill was to happen I feel that the supplies on hand could control that spill and a clean up plan would then be planned. The dump truck tha will be used on this job is sealed because of the amount of sand that we haul and it will be on site during the critical times of the job. That would leave us to find a back-ho street sweeper or what was needed to clean up the site.

Jim Proost

Project Coordinator

MAGGIORA BROS. DRILLING, INC.

DRILLING CONTRACTORS - PUMP SALES & SERVICE

CALIFORNIA CONTRACTOR'S LICENSE NO. 249957

Corporate Office
595 Airport Blvd.
Watsonville, CA 95076

Tel: (831) 724-1338
Tel: (800) 728-1480
Fax: (831) 724-3228

ON SITE REVIEW OF SPILL PREVENTION AND SPILL PLAN

TASK	YES	NO	DATE TIME	OPER ATOR	YES	NO	DATE TIME	OPER ATOR
EQUIPMENT PARKED ON PLASTIC SHEETS								
PLASTIC EDGES ARE BERMED 4" FOR CONTAINMENT AND ARE IN PLACE.								
FUELING AREA IS SUPPLIED WITH ABSORBENTS AND WASTE BARREL.								
INSPECT EQUIPMENT FOR LEAKS AT THE BEGINNING OF EACH SHIFT.								
IF LEAK IS NOTICED PLACE ABSORBENT PADS AND DRIP PAN IF NEEDED.								
MAKE NOTE OF **MINOR** LEAK FOR NEXT SHIFT AND CHANGED PADS HAS NEEDED.								
PUT USED PADS IN PLASTIC BAGS THEN INTO WASTE BARREL.								
ARE SUPPLIES SUFFICIENT FOR NEXT SHIFT?								
DO YOU HAVE THE SPILL CONTAINMENT PLAN?								
DID A **SEMI-SIGNIFICANT SPILL** OCCUR AND WAS CONTAINED?								
DID A **SIGNIFICANT SPILL** OCCUR AND DID A NOTIFICATION PLAN TAKE PLACE?								
IS RAIN EMINENT AND WAS THE STORM DRAIN PROTECTION PLAN PERFORMED?								

FOR A SIGNIFICANT SPILL NOTIFY THE FOLLOWING PEOPLE

Notification shall be given to:

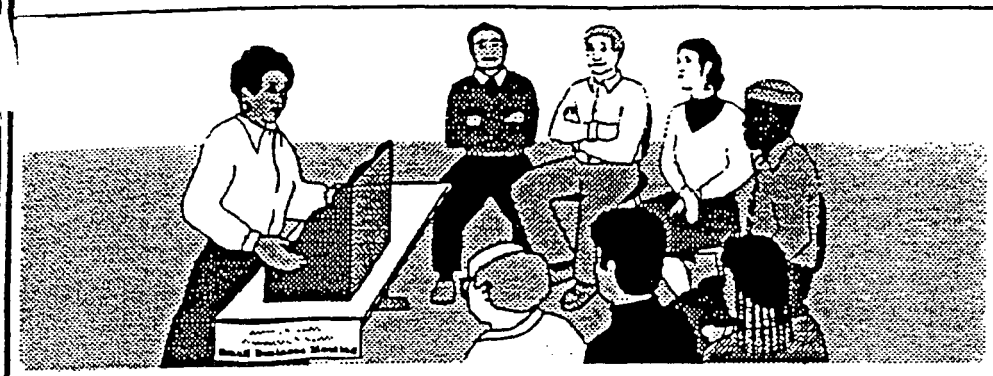
Alameda County Water District
43885 South Grimmer Boulevard
PO Box 5110
Fremont, California 94537
Contact: Douglas Young
Telephone: (510) 668-4452

Alameda County Public Works
399 Elmhurst Street
Hayward, California 94544
Contact: James Yoo
Telephone: (510) 670-5588

State of California Fish and Game
P.O. Box 47
Yountville, California 94599
Contact: John Krause
Telephone: (415) 454-8050

MAGGIORA BROS. DRILLING
595 AIRPORT BLVD.
WATSONVILLE, CA 95076
CONTACT: MARK MAGGIORA
DAY PHONE 831-724-1338
NITE PHONE 831-901-7505

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

Best Management Practices

ACTIVITY: EMPLOYEE/SUBCONTRACTOR TRAINING (Continue)

- 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

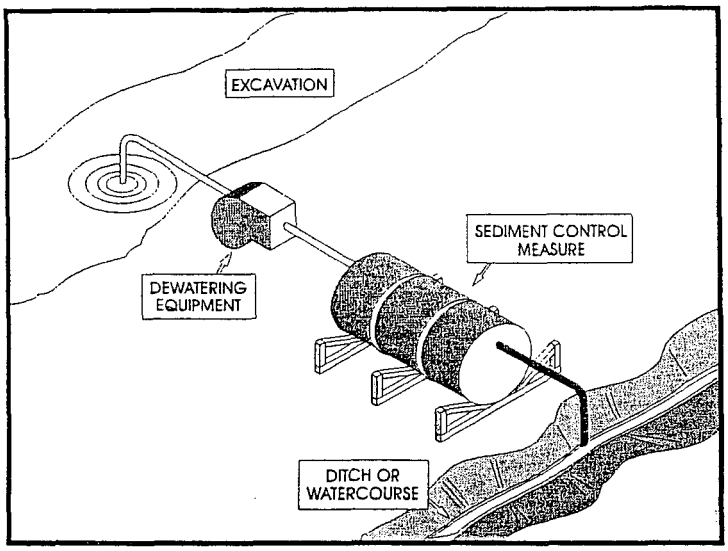
These BMP fact sheets are suitable for inclusion in many storm water pollution prevention plans for typical contractor activities. The BMPs listed are not an exhaustive list, nor will every BMP be appropriate for every situation. Therefore, suggested BMPs which are inappropriate may be deleted and additional 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.

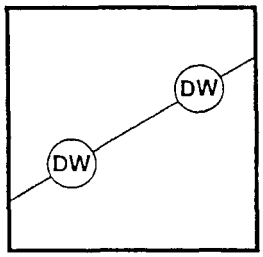
TABLE 4.1 CONTRACTOR ACTIVITIES AND BMP OBJECTIVES

	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
	Construction Practices							
CA01	Dewatering Operations	✓				✓	✓	✓
CA02	Paving Operations	✓						
CA03	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	✓	✓					

Dewatering Operations

NS-2





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.

Dewatering Operations

NS-2

- 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.

Standards and Specifications

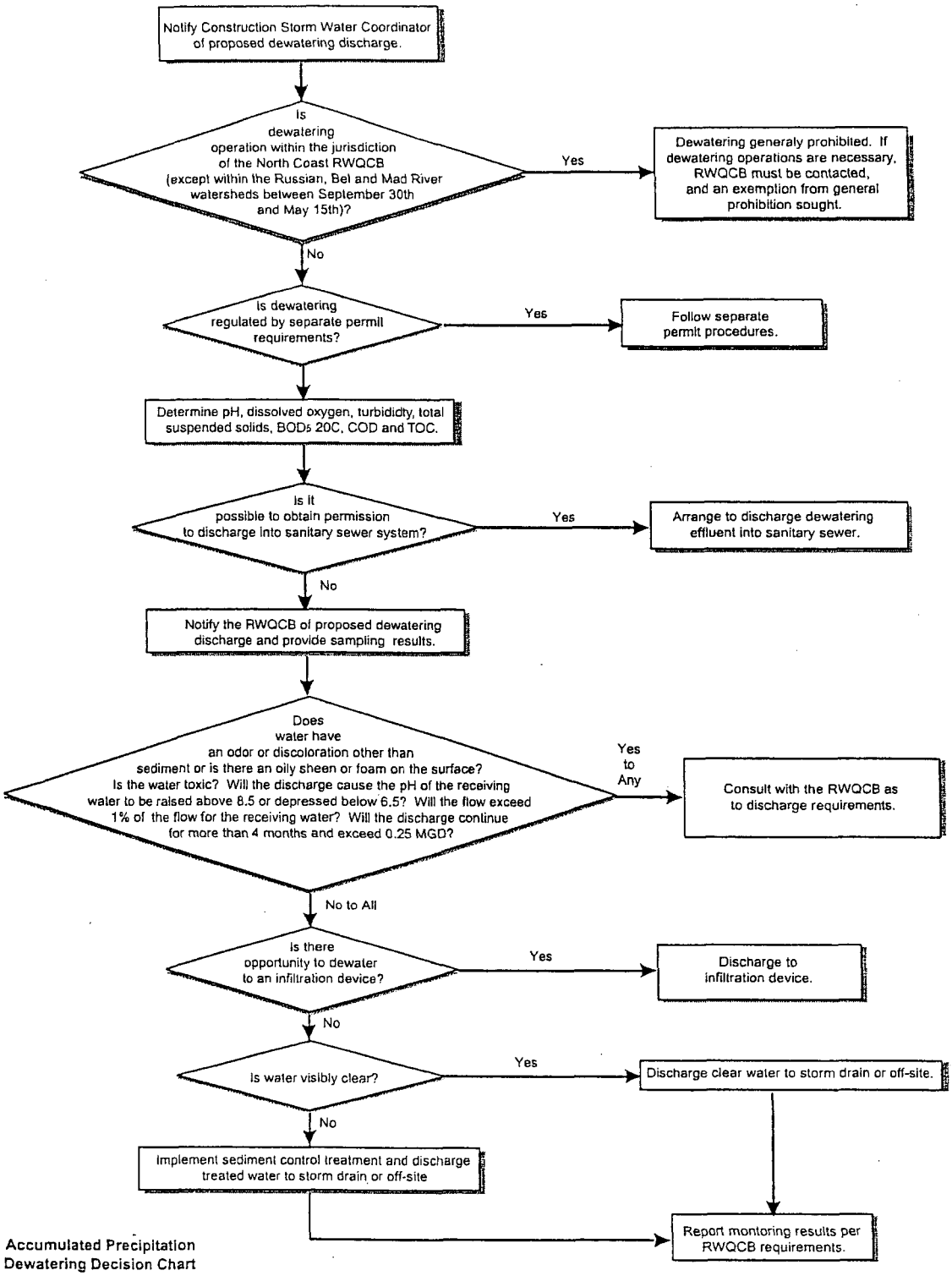
- The flow chart shown in page 3 of this BMP shall be utilized to guide dewatering operations.
- Contractor shall notify the RE of planned discharges.
- The RE will coordinate monitoring and permit compliance.
- Discharges must comply with regional and watershed-specific discharge requirements.
- Ensure 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 devise 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

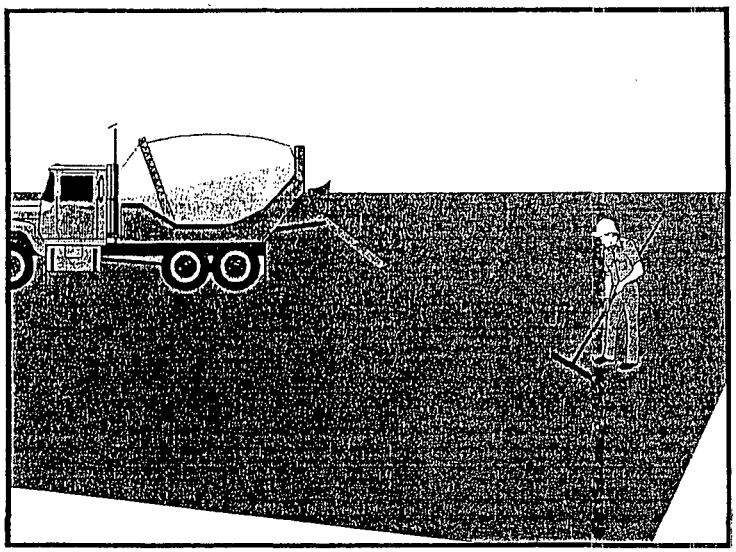
NS-2

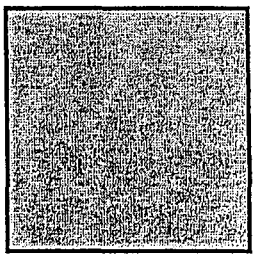


Accumulated Precipitation Dewatering Decision Chart

Paving and Grinding Operations

NS-3





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

- Finer solids are not effectively removed by filtration systems.
- Paving opportunities may be limited during wet weather.

Standards and Specifications

- 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.
- 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".
- 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:
  - Minimize the washing of sand or gravel from new asphalt into storm drains, streets, and creeks by sweeping where practical.
  - Old or spilled asphalt must be disposed as approved by the Resident Engineer (RE).

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.

Maintenance and Inspection

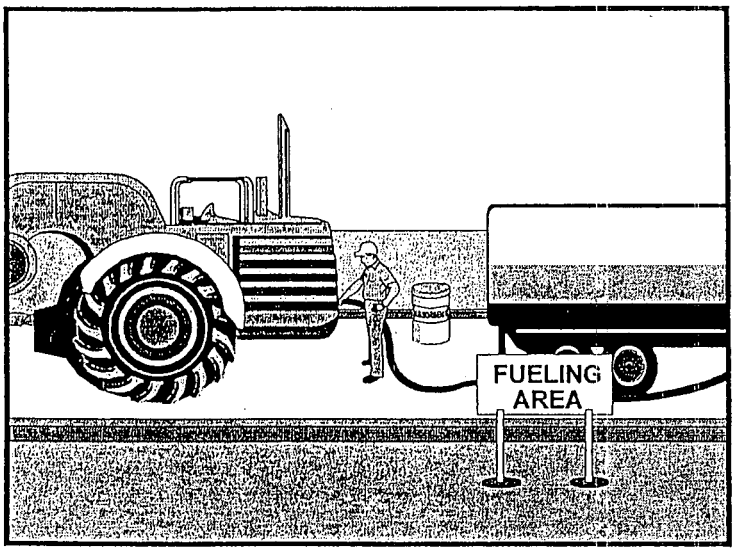
■ The control measure shall be inspected at a minimum of once a week.

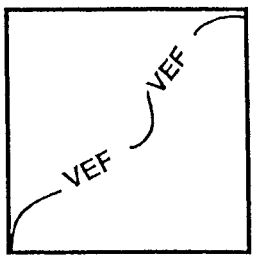
■ Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.

■ Inspect sump regularly and remove liquids and sediment as needed or as directed by the RE.

Vehicle and Equipment Fueling

NS-9





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

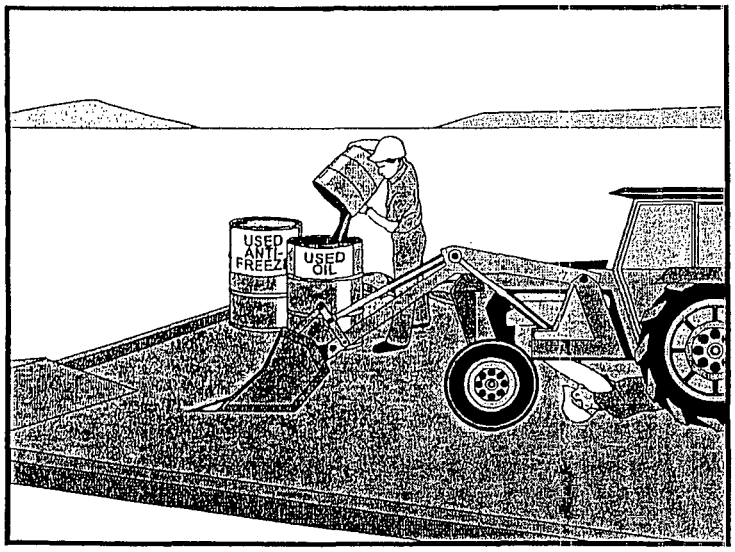
NS-9

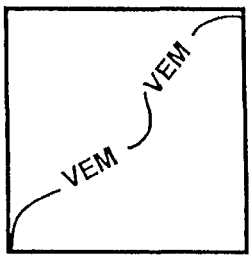
- Protect fueling areas with berms and/or dikes to prevent run-on, runoff, and to contain spills.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Fuel tanks shall not be "topped-off."
- Vehicles and equipment shall 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.

Maintenance and Inspection

- 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.

Vehicle and Equipment Maintenance NS-10





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

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.

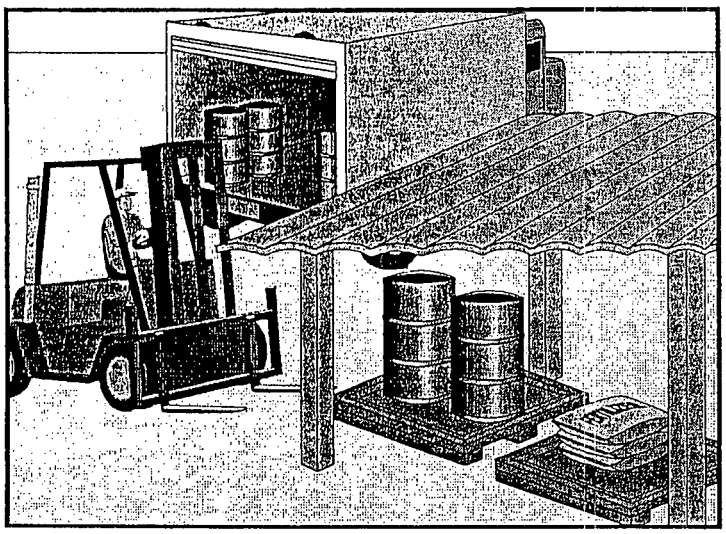
- Use off-site maintenance facilities whenever practical.
- For long-term projects, consider using portable tents or covers over maintenance areas.
- Properly dispose of used oils, fluids, lubricants and spill cleanup materials.
- Do not dump fuels and lubricants onto the ground.
- Do not place used 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.

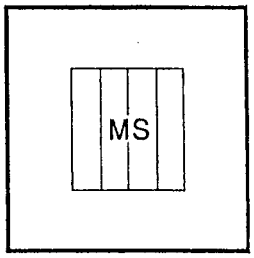
Maintenance and Inspection

- 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.

Material Delivery and Storage

WM-1





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.

Material Delivery and Storage

WM-1

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

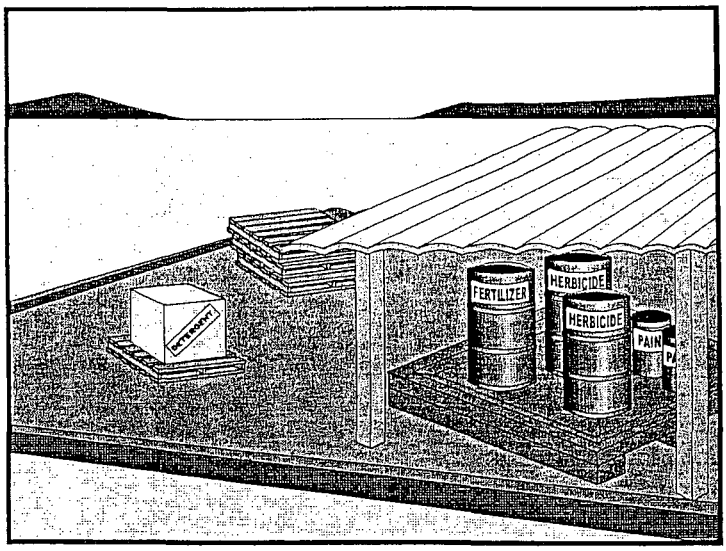
- Contain and clean up any spill immediately.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose any hazardous materials or contaminated soil.
- See BMP WM-4, "Spill Prevention and Control", for spills of chemicals and/or hazardous materials.

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.

Material Use

WM-2



MU

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

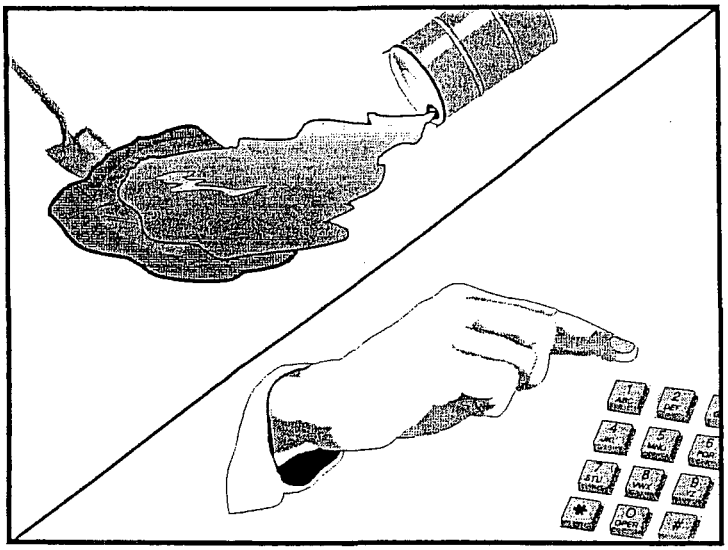
- Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials.
- Latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, may be disposed of with other construction debris.
- Do not 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.

Spill Prevention and Control

WM-4



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.

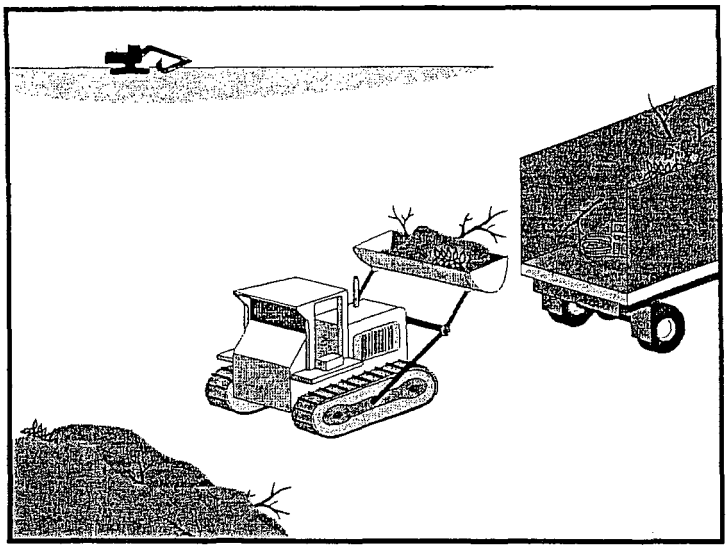
- Significant/Hazardous Spills
  - For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps shall be taken:
    1. Notify the RE immediately and follow up with a written report.
    2. Notify the local emergency response by dialing 911. 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.

Solid Waste Management

WM-5



SWM

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 form site surfaces.

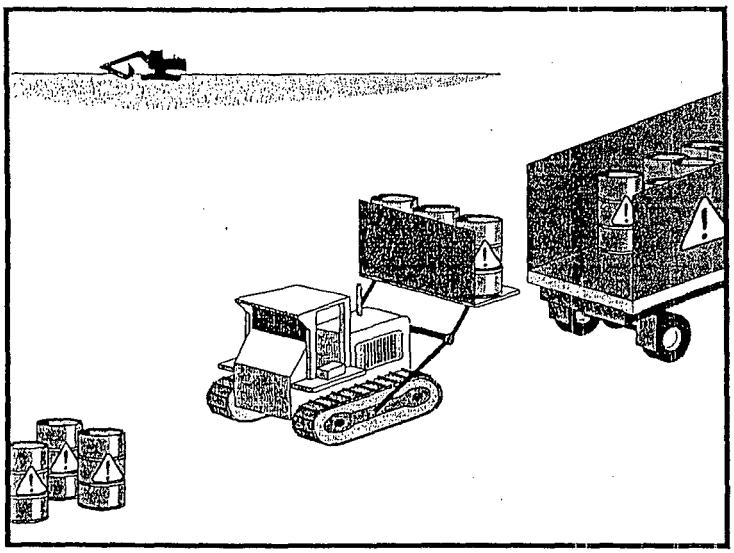
- Solid waste storage areas shall be located at least 15m from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters shall be protected from wind and 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.

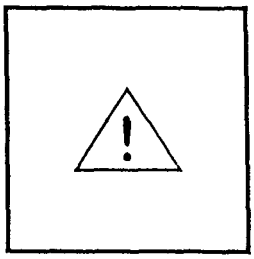
Maintenance and Inspection

- The WPCM shall monitor on-site solid waste storage and disposal procedures.
- Police site for litter and debris.

Hazardous Waste Management

WM-6





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,
  - Asphalt Products,
  - Concrete Curing Compounds,
  - Pesticides,
  - Palliatives,
  - Acids,
  - Septic Wastes,
  - Paints,
  - Stains,
  - Solvents,
  - Wood Preservatives,
  - 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.

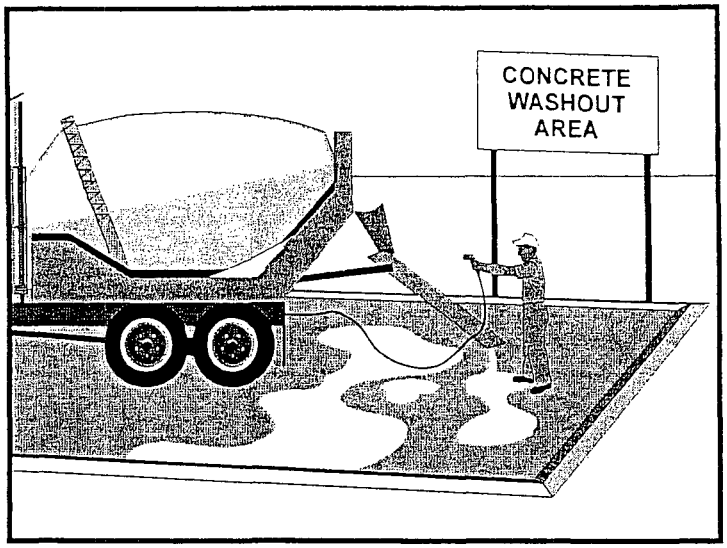
Maintenance and Inspection

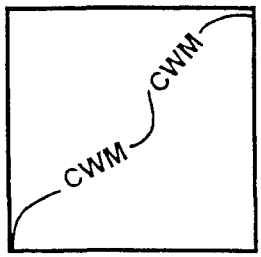
- The WPCM shall monitor on-site hazardous waste storage and disposal procedures.
- Waste storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Storage areas shall be inspected in conformance with the provisions in 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.

Concrete Waste Management

WM-8





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 form 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 freeof 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

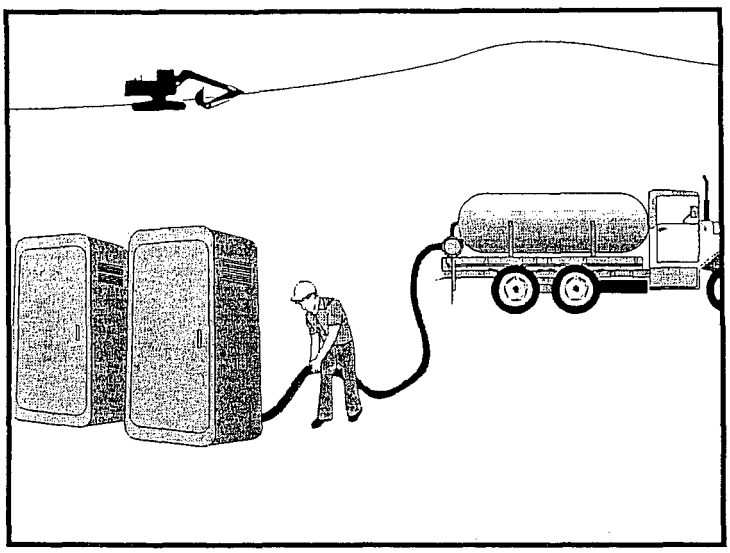
- When temporary concrete washout facilities are no longer required for the work, as determined by the RE, the hardened concrete shall be removed and disposed of in conformance with the provisions in Section 15-3.02 of the Standard Specifications. Materials used to construct temporary concrete washout 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.

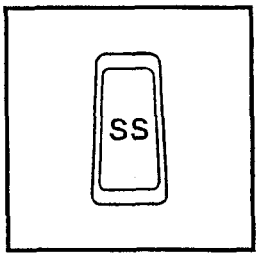
Maintenance and Inspection

- 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.

Sanitary/Septic Waste Management

WM-9





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

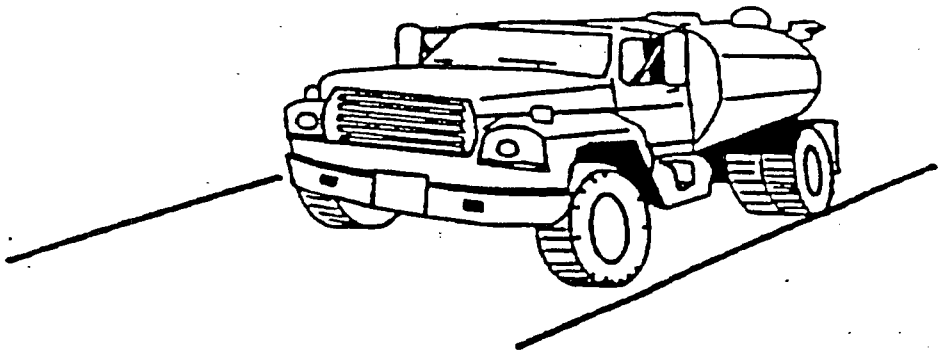
sanitary facilities shall be secured to prevent overturning.

- 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.

Maintenance and Inspection

- The Contractor's Water Pollution Control Manager (WPCM) shall monitor on site sanitary/septic waste storage and disposal procedures at least weekly.

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

Best Management Practices

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 repellant, 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.

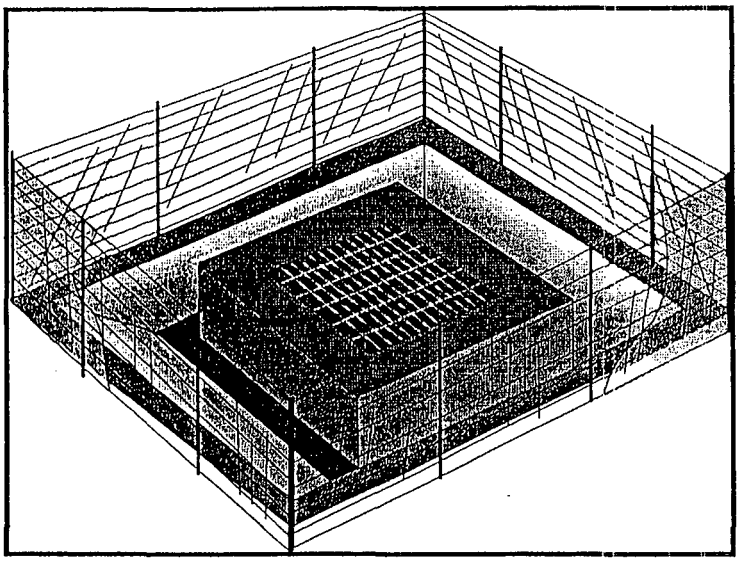
Sacramento County, Winterization Ordinance & Dust Control Ordinance (example).

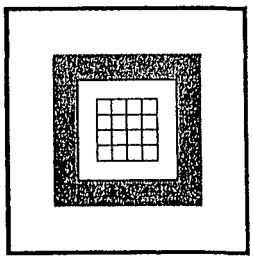
USDA Soil Conservation Service, "Guides for Erosion and Sediment Control".

ESC21

Storm Drain Inlet Protection

SC-10





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-rnelt 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^3/s (0.5 cfs).
- Sandbag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.014 m^3/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^3/ha (67 yd^3/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

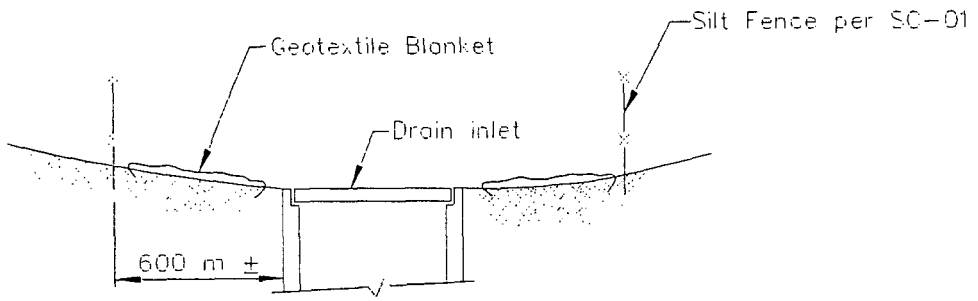
General

- 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.

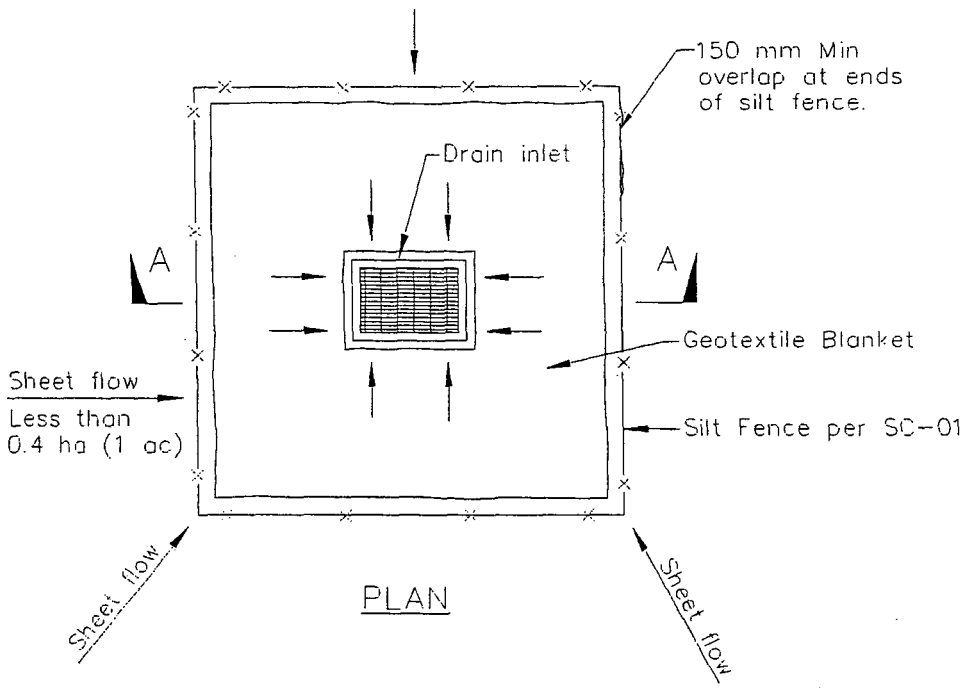
- Bring the disturbed area to final grade and smooth and compact it. Appropriately stabilize all bare areas around the inlet.
- Clean and re-grade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

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.



SECTION A–A

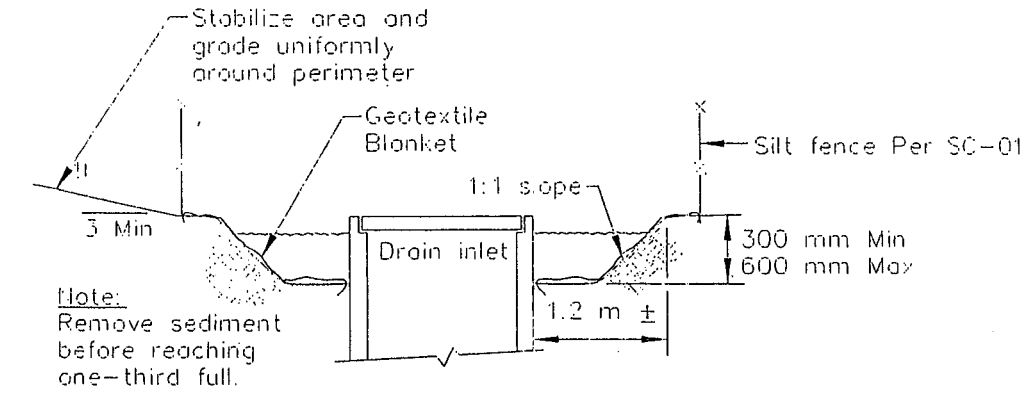


PLAN

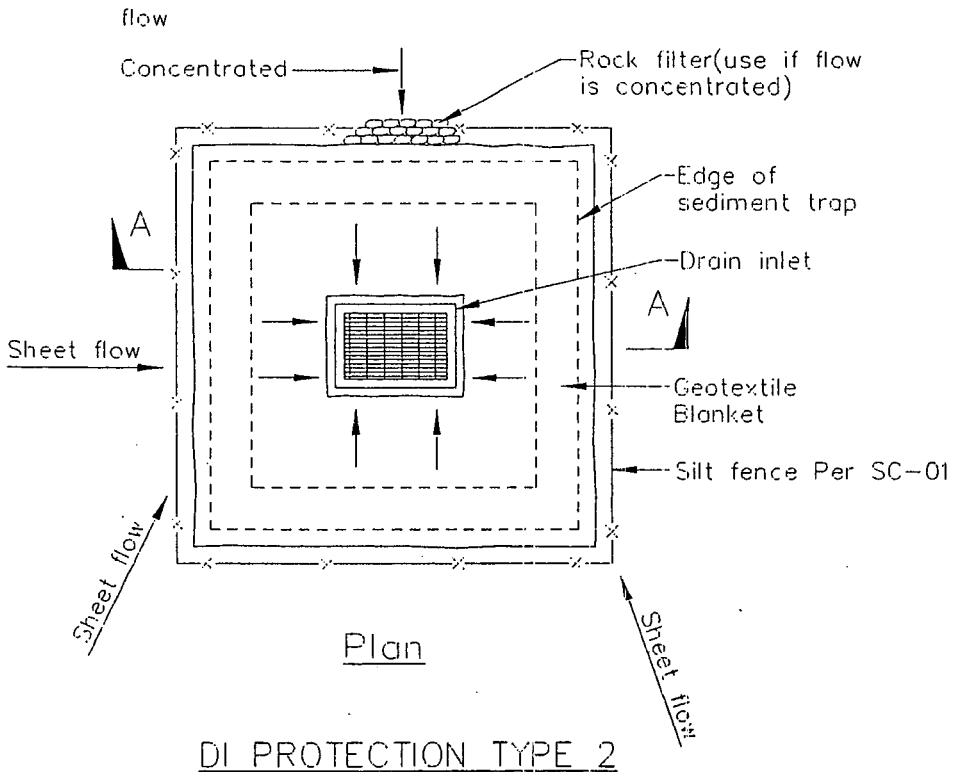
DI PROTECTION TYPE 1
NOT TO SCALE

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.



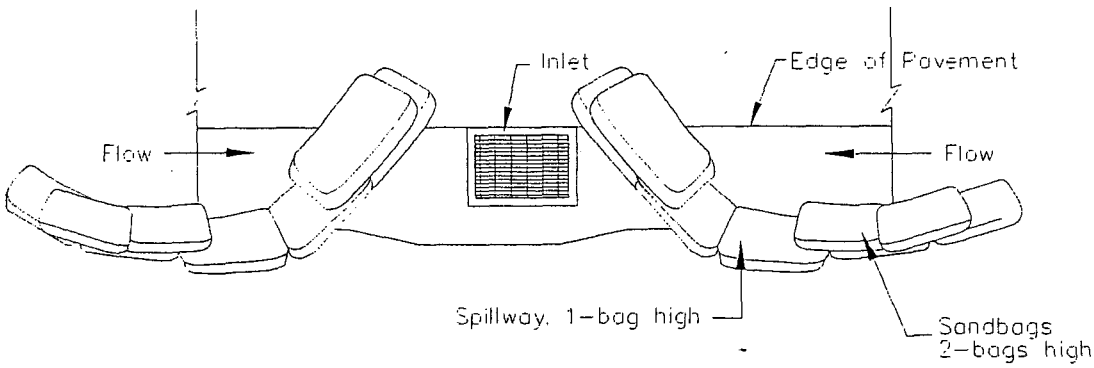
Section A-A



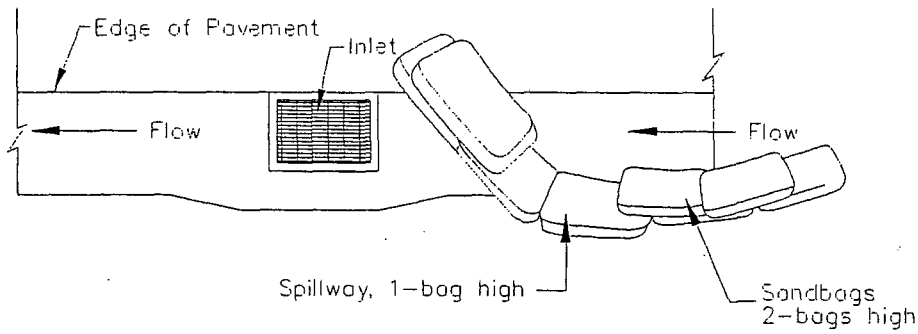
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

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.



TYPICAL PROTECTION FOR INLET ON SUMP

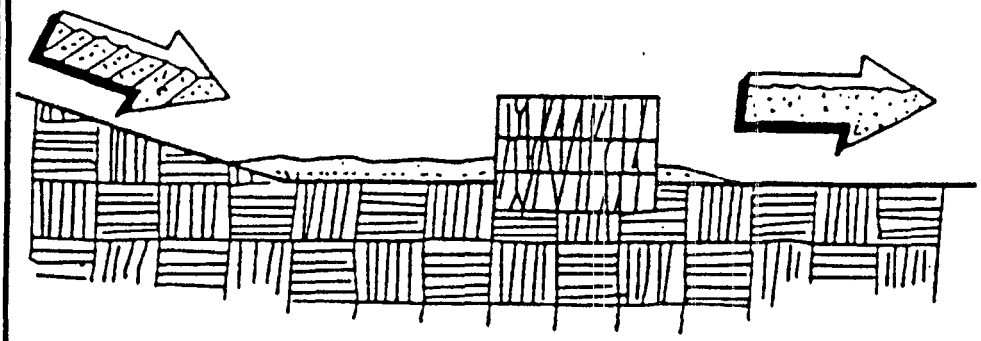


TYPICAL PROTECTION FOR INLET ON GRADE

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*
- ○ *Suitibility for Slopes >5%*

● *High* ○ *Low*

ESC51

Best Management Practices

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.

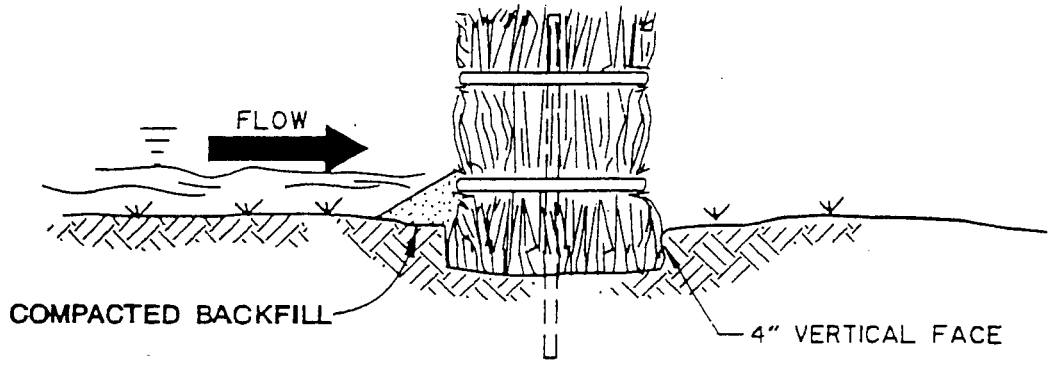
Stormwater Management Water for the Puget Sound Basin, Washington State Department of Ecology, The Technical Manual - February 1992, Publication # 91-75.

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.

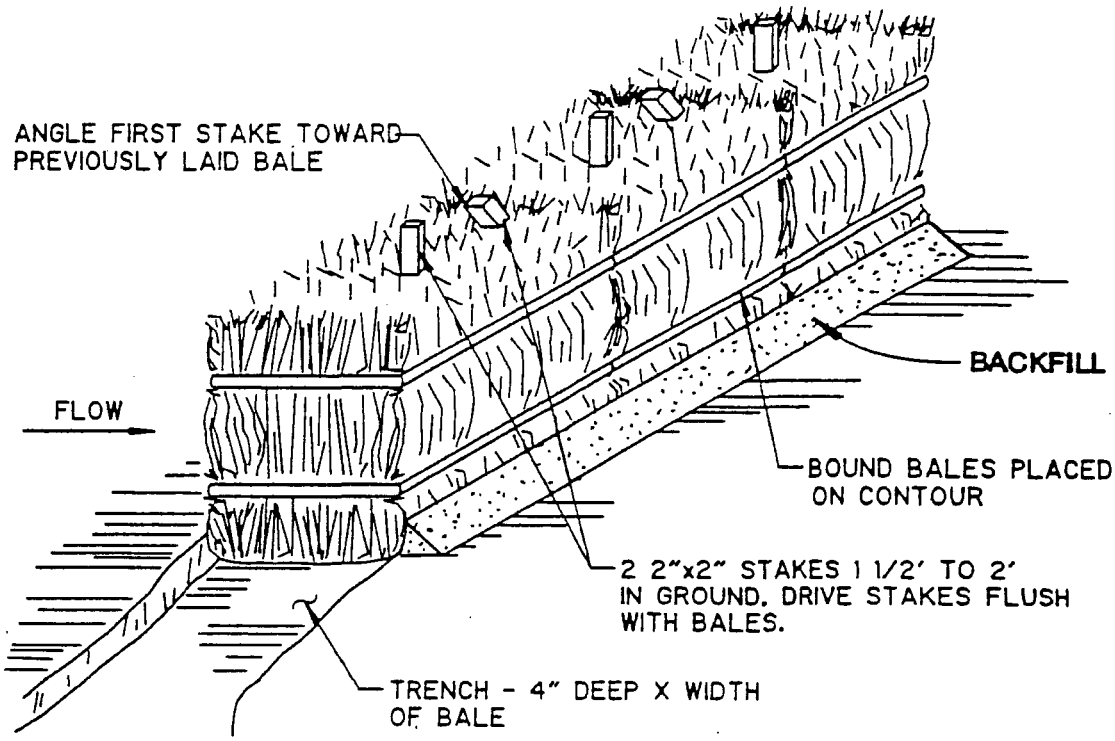
ESC51

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

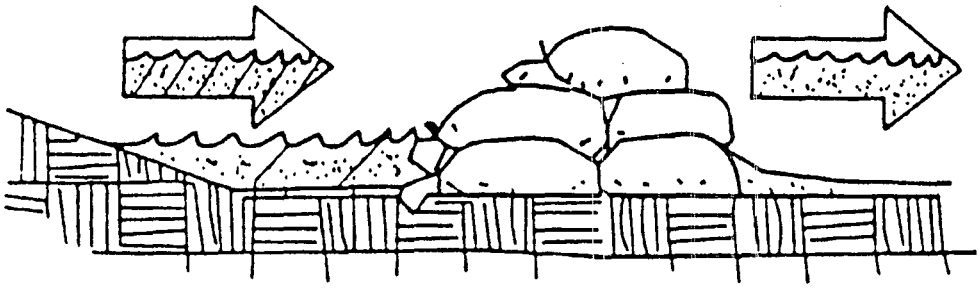
ANCHORING DETAIL

STRAW BALE BARRIERS

ESC51

Best Management Practices

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 <u>below</u> 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

Best Management Practices

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:

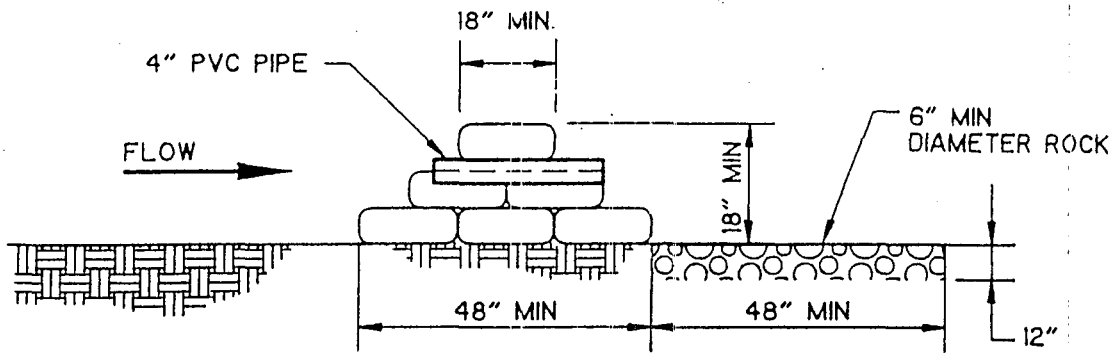
- Drainage Area - Up to five (5) acres.
- Height of Berm - 18 inches minimum height, measured from the top of the existing ground at the upslope toe to the top of the barrier.
- Width of Berm - 48 inches minimum width measured at the bottom of the barrier; 18 inches at the top.
- Sand bag Size - Length 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

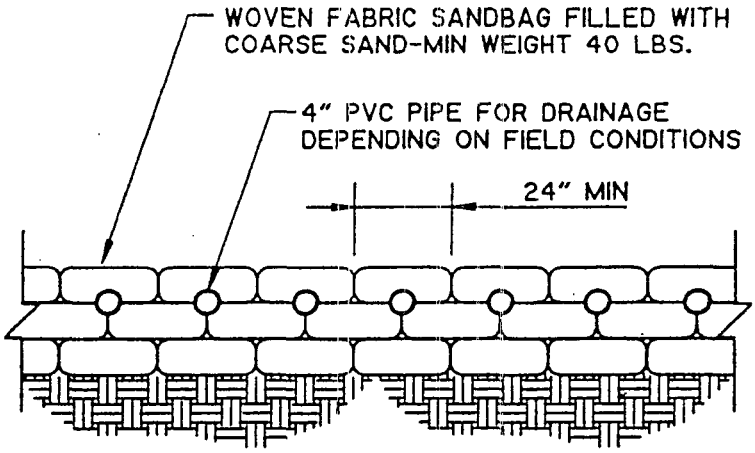
Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC52



CROSS-SECTION



FRONT VIEW

SAND BAG BERM

ESC52

Best Management Practices

Appendix D
Boring Logs
and
Well Completion Diagrams

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site #2	**DATE:** 11/3/05 to 12/13/05	**LOGGED BY:** Douglas Young & Sean Gehlke	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-8Q001	**BORING** 2D2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 1 of 4	

Depth (in feet)
Well Construction
Lithologic Pattern
Geophysical Samples

LITHOLOGIC DESCRIPTION

Unknown: Unknown: Levee fill material, assorted clay, sand and gravel

CL: Sandy Clay; Olive gray (5Y 3/2); contains clay, medium to coarse sand, silt, moderate plasticity; mottled Dusky Blue-gray (5BG 3/2) with shell fragments and roots

ML: Sandy Silt; Light Olive gray (5Y 5/2); contains silt, very fine to fine sand, medium sand; low plasticity; sands are subangular

SM: Silty Sand; Olive gray (5Y 3/2); very fine to medium sand, medium sand, silt, trace organics; @50 feet sand content increases; well sorted / poorly graded

SP: Gravelly Sand; Olive gray (5Y 4/2); contains fine to coarse gravel and sand, fine sand, multi color material; sub angular to rounded; poorly graded / well sorted

ML: Clayey Silt; Moderate Yellowish-brown (5YR 4/4); contains silt, clay, very fine to fine sand; low plasticity

GP: Sandy Gravel; Olive gray (5Y 4/2); contains fine to coarse sand and gravel, coarse to fine sand, silt; multi color gravels to 1/2 " diameter; sub angular to angular, some rounded

SM: Silty Sand; Olive gray (5Y 3/2); contains very fine to fine sand; medium sand, multi color, rounded to sub angular; silt

ML: Clayey Silt; Light Olive gray (5Y 3/2); contains silt, clay, fine sand, trace organic material

CL: Sandy Clay; Olive gray (5Y 3/2); contains clay, fine sand, silt, moderate plasticity; color change to Light Olive brown (5Y 5/2) @115 feet with mottled Medium to Light Gray (N6) and increasing fine sands; color change to Grayish Olive (10Y 4/2) @125 feet

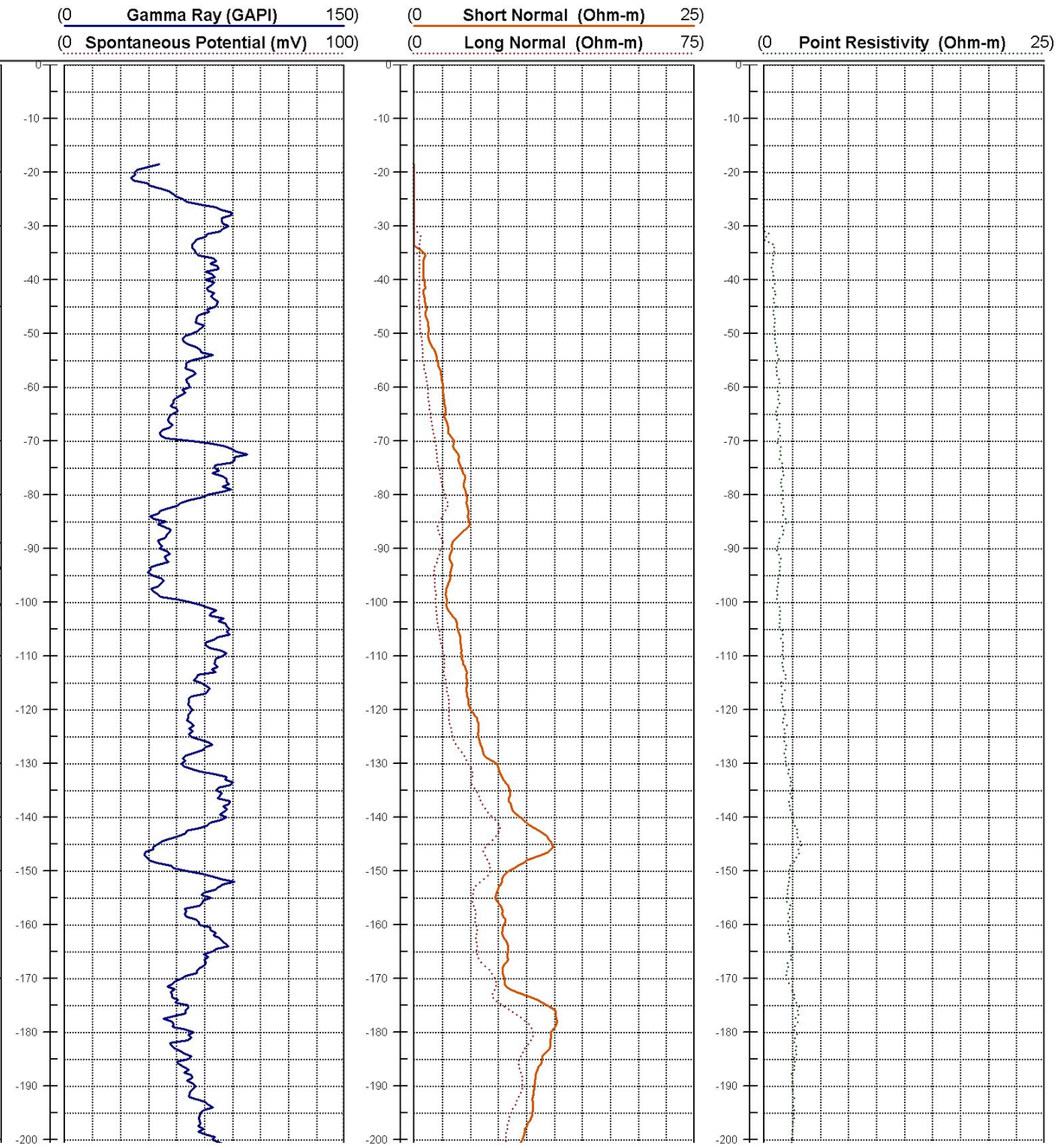
CL: Silty Clay; Medium Olive gray (5Y 4/2); contains clay, fine sand, silt; high organic material (shells); moderate to high plasticity

SP: Gravelly Sand; Grayish olive (10Y 4/2) contains medium to coarse sand, very fine to fine sand; organic material (shells)

CL: Silty Clay; Greenish black (5G 2/1); contains clay, very fine to fine sand, silt; moderate to high plasticity; trace Yellowish brown mottling (10YR 5/4);

GP: Sandy Gravel; Olive gray (5Y 3/2); angular to sub rounded; well sorted / poorly graded; organic material (plant roots); gravels between 1/4 to 1/2 inch diameter, multi color, angular to rounded; minor coarse sand; trace shell fragments at 190 feet

GEOPHYSICAL DATA



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site #2	**DATE:** 11/3/05 to 12/13/05	**LOGGED BY:** Douglas Young & Sean Gehlke	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-8Q001	**BORING** 2D2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 2 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Samples

LITHOLOGIC DESCRIPTION

CL: Silty Clay; Grayish olive (10Y 4/2); contains clay and medium to coarse sand

GP: Sandy Gravel; Olive gray (5Y 3/2); angular to sub rounded; well sorted / poorly graded; organic material (plant roots); gravels between 1/4 to 1/2 inch diameter, multi color, angular to rounded; minor coarse sand; trace shell fragments at 190 feet

SC: Clayey Sand; Olive brown (2.5Y 4/4); contains fine to very fine sand, clay w/silt; sub angular; well consolidated

SP: Gravelly Sand; Light olive gray (5Y 3/2); contains fine to medium sand, very fine to fine sand, and gravels; gravels angular to sub rounded, multi color (weathered)

CL: Sandy Clay; H Olive brown (5Y 5/6); contains clay, very fine sand, silt; high plasticity; Grayish olive (10Y 4/2) mottling; trace broken shell fragments @ 325 feet; shell fragments up to 1 1/4 length @ 330 feet

SM: Sandy Silt; Light Olive gray (5Y 6/3); contains fine to coarse sand, fine sand, silt, gravel; trace organic material (roots, plant matter); decreasing gravel content, trace shell fragments @ 355 feet

GP: Sandy Gravel; Multi color clasts; contains gravels, medium to coarse sand, fine sand; clasts to 3/4 inch diameter, sub angular to rounded, some broken; poorly graded / well sorted

SP: Gravelly Sand; Multi color gravel clasts to 1/2 inch diameter, sub angular to rounded; poorly graded / well sorted

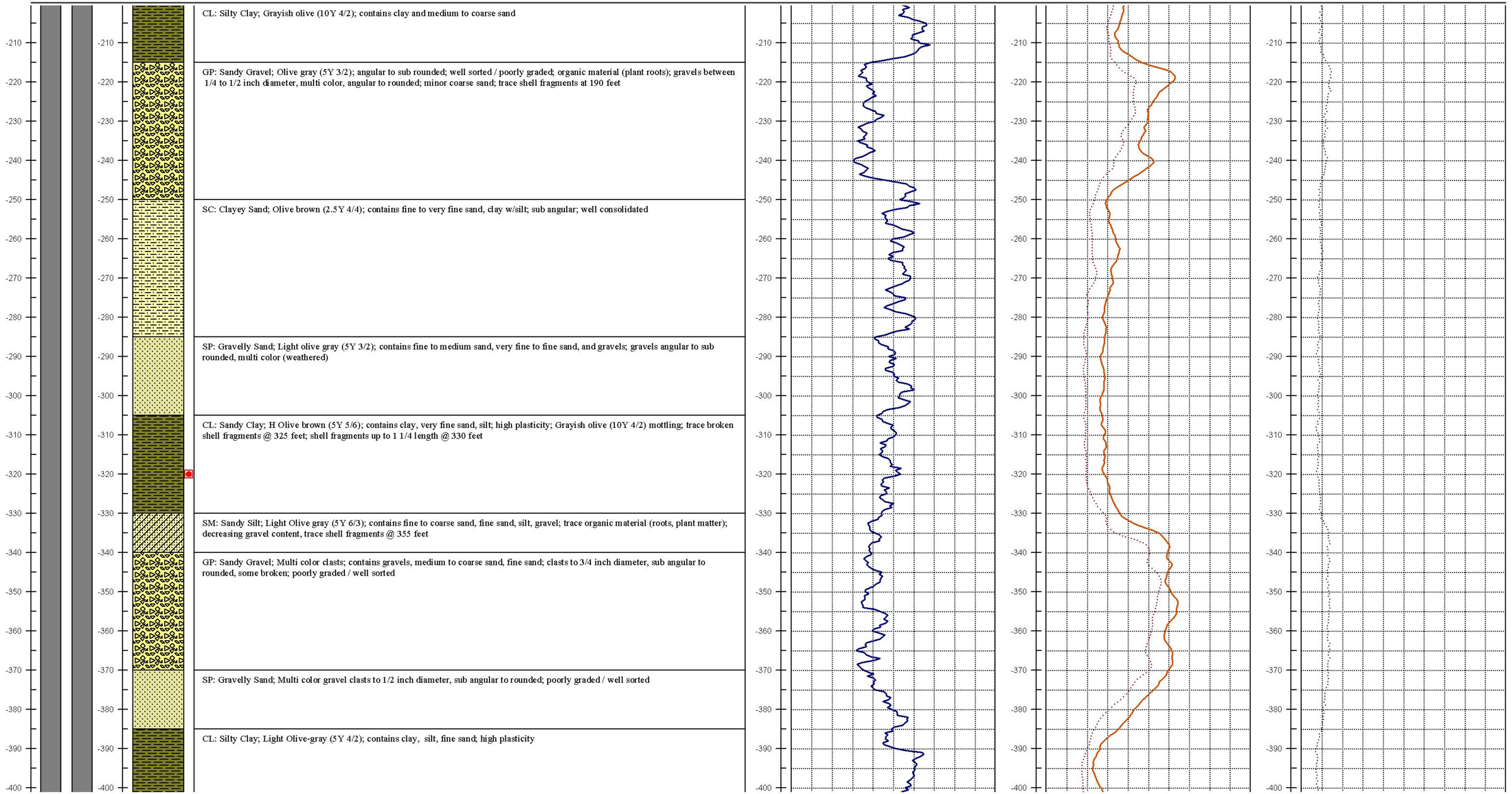
CL: Silty Clay; Light Olive-gray (5Y 4/2); contains clay, silt, fine sand; high plasticity

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)

(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)

(0 Point Resistivity (Ohm-m) 25)



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site #2	**DATE:** 11/3/05 to 12/13/05	**LOGGED BY:** Douglas Young & Sean Gehlke	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-8Q001	**BORING** 2D2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 3 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Samples

LITHOLOGIC DESCRIPTION

GP: Sandy Gravel; Multi color clasts; contains gravels, medium to coarse sand; clasts to 1/2 inch diameter, sub angular to rounded, some broken; poorly graded / well sorted; minor shell fragments up to 1/4 inch length

CL: Silty Clay; H Grayish olive (10Y 4/2); high plasticity; medium bluish gray (5B 5/1) mottling, presence of calcite

CL: Sandy Clay; Light to Medium brown (5YR 5/4); contains clay, sand, silt; light olive-gray (5Y 5/2) mottling; medium to low plasticity; increased silt content from 500 to 505 feet; increased iron staining, olive gray mottling (5Y 3/2), sandy clay matrix with silty clay interbeds @ 510 feet

CL: Sandy Clay; Grayish olive (10Y 4/2); contains clay, fine to medium sand, silt; high plasticity

CL: Silty Clay; Olive gray (5Y 3/2); contains clay, silt, fine sand; high plasticity

CL: Sandy Clay; Grayish olive (10Y 4/2); Moderate Yellowish brown mottling (10YR 5/4); color change to Grayish Olive green (5GY 3/2), presence of shell fragments @ 535 feet

CL: Silty Clay; Light Olive-gray (5Y 4/2); iron staining

CL: Silty Clay; interbedded Light Olive gray (5Y 5/2) and Grayish Olive green (5GY 3/2); shell fragments; dense with high plasticity

SM: Silty Sand; Light Olive gray (5Y 5/2) with light olive brown mottling; contains very fine to fine sand, silt, clay; well sorted / poorly graded; consolidated; moist

CL: Silty Clay; Medium bluish gray (5B 5/1); high plasticity

CL: Sandy Clay; Light Olive gray (5Y 5/2); increasing coarse sand content @ 590 feet

CL: Sandy Clay; Medium bluish gray (5B 5/1); coarse sand; shell fragments

CL: Sandy Clay; Light Olive gray (5Y 5/2); coarse sand

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)

(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)

(0 Point Resistivity (Ohm-m) 25)

-410 -420 -430 -440 -450 -460 -470 -480 -490 -500 -510 -520 -530 -540 -550 -560 -570 -580 -590 -600

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site #2	**DATE:** 11/3/05 to 12/13/05	**LOGGED BY:** Douglas Young & Sean Gehlke	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-8Q001	**BORING** 2D2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 4 of 4	

Depth (in feet)
Well Construction
Lithologic Pattern
Geophysical Samples

LITHOLOGIC DESCRIPTION

CL: Sandy Clay; Light Olive gray (5Y 5/2); occasional gravel clasts up to 1.5 cm length

SC: Clayey Sand; variable color, clay is Light Olive gray (5Y 5/2); fine to coarse sand; well sorted / poorly graded; increasing coarse-grained sand and rock fragments up to 2 cm length @630 feet

CL: Sandy Clay; Moderate Yellowish brown (10 YR 5/4); contains clay, fine to very coarse sand, occasional gravel clasts up to 1 cm length

CL: Sandy Clay; Light Olive gray (5Y 5/2) and Medium Bluish gray (5B 5/1); occasional gravel size fragments up to 2 cm length

CL: Sandy Clay; variable color; contains clay, fine to very coarse sand, Moderate Yellowish brown clay (10YR 5/4)

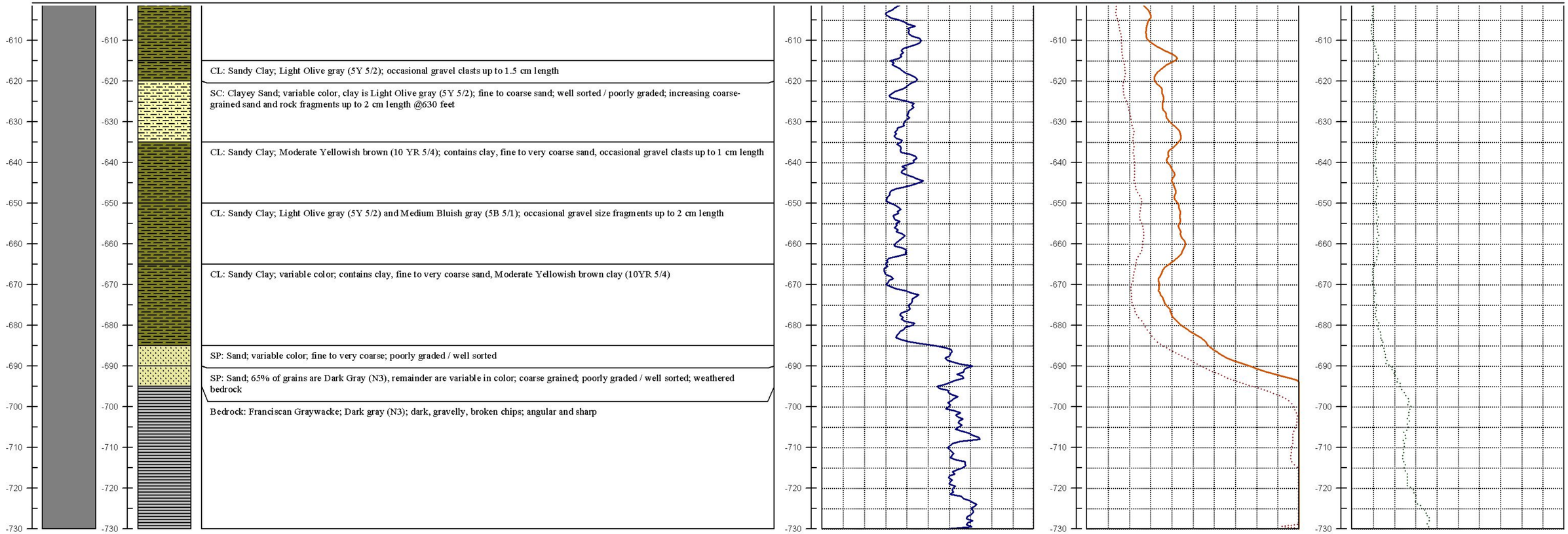
SP: Sand; variable color; fine to very coarse; poorly graded / well sorted

SP: Sand; 65% of grains are Dark Gray (N3), remainder are variable in color; coarse grained; poorly graded / well sorted; weathered bedrock

Bedrock: Franciscan Graywacke; Dark gray (N3); dark, gravelly, broken chips; angular and sharp

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)
(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)
(0 Point Resistivity (Ohm-m) 25)



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site #3	**DATE:** 10/26/2004 to 12/15/2004	**LOGGED BY:** Douglas Young & Ante Milnarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-9F014	**BORING** 3D1
				ELECTRIC LOG BY: Newman Well Surveys	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-600'); 6.125" (600'-800')	**TOTAL DEPTH:** 800 feet	**SHEET:** 1 of 4	

Depth (in feet)
Well Construction
Lithologic Pattern
Geophysical Samples

LITHOLOGIC DESCRIPTION

Unknown: Levee fill material; assorted clay, sand, and gravel

SM: Silty Sand; Olive-gray (5Y 3/2); contains fine-sand, silt; angular to subrounded; loose

CL: Silty Clay; Dusky Blue-green (5BG 3/2); contains clay, very fine- to fine-sand, silt; high plasticity, trace organic material

Lower plasticity and increase in organic material

CL: Silty Clay; Dusky Blue-green (5BG 3/2); contains clay, silt, very fine sand; mottled Light Olive-gray (5Y 5/2), moderate plasticity

ML: Clayey Silt; Light Olive-gray (5Y 5/2); contains silt, clay, very fine sand; mottled Dusky Blue-gray (5BG 3/2)

Increasing fine sand

CL: Sandy Clay; Olive-gray (5Y 3/2); contains clay, very fine sand, angular to subrounded; silt; mottled Light Olive-brown (5Y 5/6), moderate plasticity
Change in color to Dusky Blue-green (5BG 3/2), increasing silt and clay

SM: Silty Sand; Olive-gray (5Y 3/2); contains very fine to coarse sand, silt; some clasts 2 cm in diameter, angular to subrounded

SM: Silty Sand; Olive-gray (5Y 3/2); contains very fine to fine sand, silt; well sorted, poorly graded

GP: Sandy Gravel; Olive-gray (5Y 4/2); contains fine to coarse gravel, silt and fine sand; multicolored gravels; well sorted; poorly graded; angular to subrounded

CL: Sandy Clay; Olive-gray (5Y 5/2); contains clay, fine sand and silt, gravel; mottled Olive-brown (5Y 5/6)

ML: Clayey Silt; Light Olive-gray (5Y 3/2); contains silt, clay, fine sand; trace organic material

Increasing fine sand and organic material

CL: Sandy Clay; Olive-gray (5Y 4/2); contains clay, fine sand , silt

Change in color to Light Olive-brown (5Y 5/2); mottled Medium to Light Gray (N6); increasing fine sand and silt

CH: Silty Clay; Medium Olive-Gray (5Y 4/2); contains clay, silt, very fine sand; mottled Moderate Yellowish-brown (10 YR 5/4)
Increasing fine sand, decreasing silt; high plasticity

CL: Silty Clay; Medium Olive-gray (5Y 4/2); contains clay, fine sand, silt; organic material (shell fragments)
Increasing clay and silt; increasing organic material (shell fragments and plant material); high plastisity

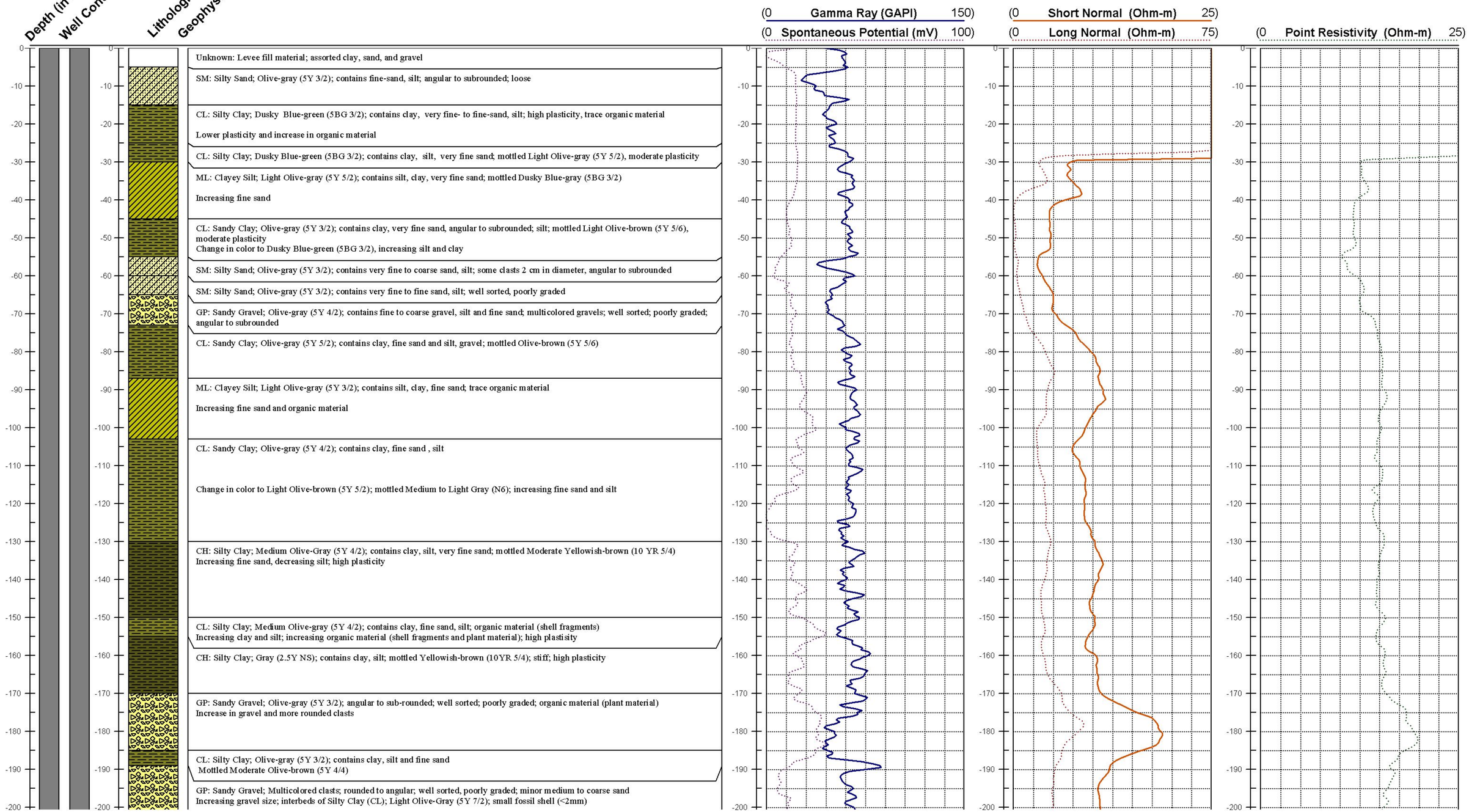
CH: Silty Clay; Gray (2.5Y NS); contains clay, silt; mottled Yellowish-brown (10YR 5/4); stiff; high plasticity

GP: Sandy Gravel; Olive-gray (5Y 3/2); angular to sub-rounded; well sorted; poorly graded; organic material (plant material)
Increase in gravel and more rounded clasts

CL: Silty Clay; Olive-gray (5Y 3/2); contains clay, silt and fine sand
Mottled Moderate Olive-brown (5Y 4/4)

GP: Sandy Gravel; Multicolored clasts; rounded to angular; well sorted, poorly graded; minor medium to coarse sand
Increasing gravel size; interbeds of Silty Clay (CL); Light Olive-Gray (5Y 7/2); small fossil shell (<2mm)

GEOPHYSICAL DATA



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site #3	**DATE:** 10/26/2004 to 12/15/2004	**LOGGED BY:** Douglas Young & Ante Milnarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-9F014	**BORING** 3D1
				ELECTRIC LOG BY: Newman Well Surveys	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-600'); 6.125" (600'-800')	**TOTAL DEPTH:** 800 feet	**SHEET:** 2 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Samples

LITHOLOGIC DESCRIPTION

SM: Silty Sand; Olive-brown (2.5Y 4/4); contains fine sand, silt and clay; subangular well consolidated; mottled Moderate Brown (5YR 4/4);

SC: Clayey Sand; Olive-gray (5Y 4/1); contains fine sand, silt, clay; subandular; well consolidated; mottled Gray (2.5YR NS); organic material (root structures)

CL: Silty Clay; Olive-gray (5Y 3/2); organic material (root structures)

SC: Clayey Sand; Moderate Yellowish-brown (10YR 5/4); contains very fine to fine sand, clay, silt;

CL: Silty Clay; Olive-gray (5Y 3/2); mottled Dusky Red (5R 3/4); interbeds of Medium bluish clay; moderate to high plastisity

GW: Sandy Gravel; Multicolored clasts; average clast size ~1/2"; rounded to angular; poorly sorted; well graded; organic material (wood chips)
Interbeds of Silty Clay (CL); Olive-gray (5Y 3/2); contains clay, silt; mottled Moderate Brown (5YR 4/4)
Interbeds of Silty Sand (SM); Light Olive-Brown (5Y5/4); contains sand, silt and clay

SM: Silty Sand; Grayish Olive-green (5GY 3/2); contains very fine to fine sand, silt and minor clay; subangular

CH: Silty Clay; Light Olive-gray (5Y 4/2); contains clay, silt, fine sand; organic material (plant material); high plasticity
Increasing organic material (wood chips and root structures)

GP: Sandy Gravel; Multicolored clasts; mostly fine gravels and coarse sand; subrounded to subangular clasts; well sorted; poorly graded; minor organic material

GW: Sandy Gravel; Multicolored clasts; mostly fine gravels; subrounded to subangular clasts; poorly sorted; well graded; very minor organic material
Clasts as large as 1" in diameter

CH: Silty Clay; Light Olive-gray (5Y 5/2); contains clay, silt; high plasticity, organic material (root structures)
Change in color to Olive-gray (5Y 3/2); increasing silt and organic material (root structures)
Change in color to Light Olive-gray (5Y 4/2); interbeds of Silty Sand (SM) Dusky Yellow to Light Olive-brown (5Y 5/5) containing fine sand, silt and clay

SM: Silty Sand; Light Olive-gray to Dusky Yellow (5Y 6/3); contains fine sand, silt and clay; minor organic material; stiff

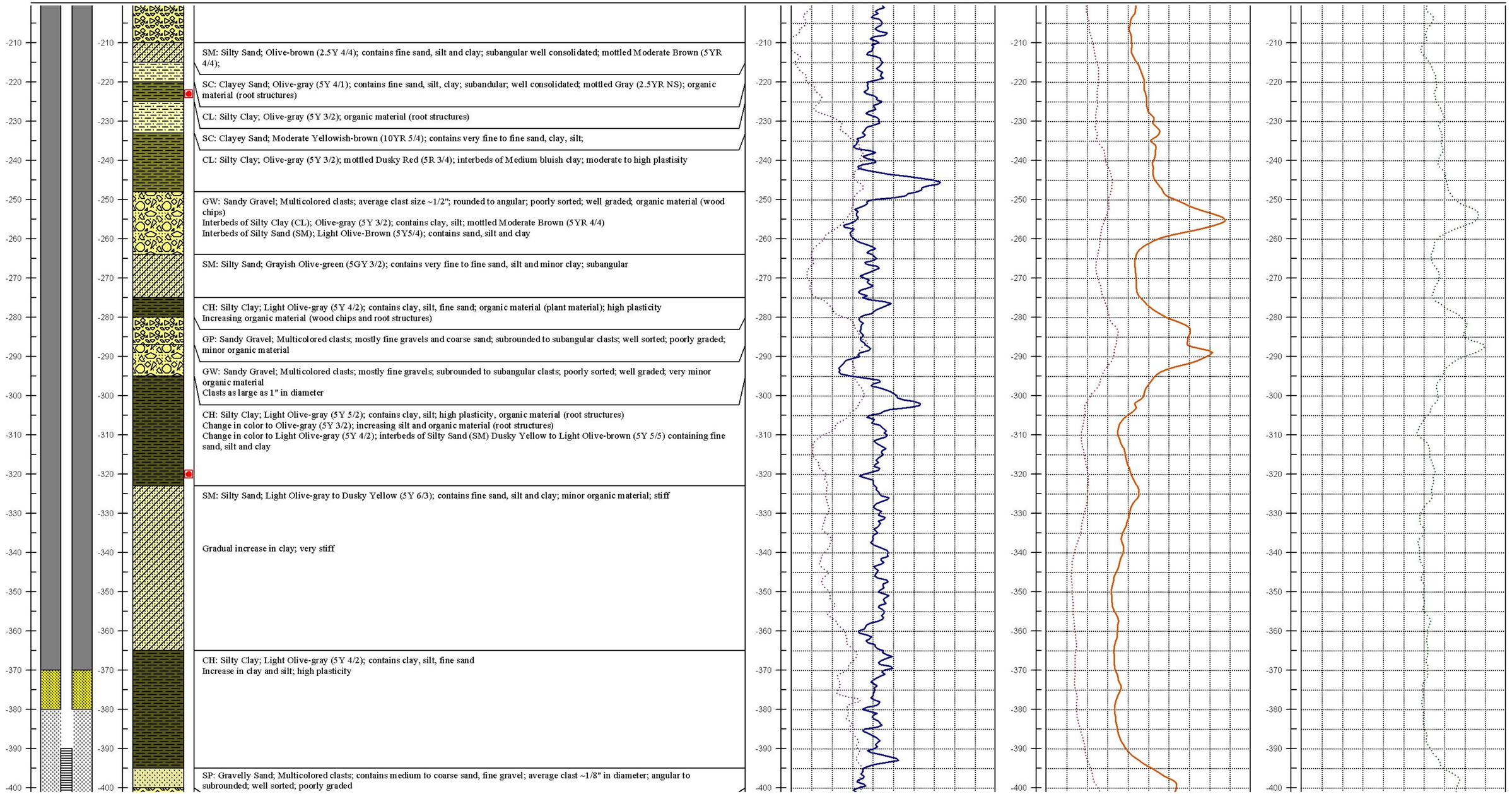
Gradual increase in clay; very stiff

CH: Silty Clay; Light Olive-gray (5Y 4/2); contains clay, silt, fine sand
Increase in clay and silt; high plasticity

SP: Gravelly Sand; Multicolored clasts; contains medium to coarse sand, fine gravel; average clast ~1/8" in diameter; angular to subrounded; well sorted; poorly graded

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)
(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)
(0 Point Resistivity (Ohm-m) 25)



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site #3	**DATE:** 10/26/2004 to 12/15/2004	**LOGGED BY:** Douglas Young & Ante Milnarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-9F014	**BORING** 3D1
				ELECTRIC LOG BY: Newman Well Surveys	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-600'); 6.125" (600'-800')	**TOTAL DEPTH:** 800 feet	**SHEET:** 3 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Samples

LITHOLOGIC DESCRIPTION

GP: Sandy Gravel; Multicolored clasts; contains fine gravel, coarse sand; average clast ~1/4" in diameter; angular to subrounded; well sorted; poorly graded

GW: Sandy Gravel; Multicolored clasts; contains fine gravel, coarse sand; clasts as large as 3/4" in diameter; angular to rounded; poorly sorted; well graded

Increase in sand and organic material

CH: Silty Clay; Light Olive-brown (5Y 5/6); contains clay, silt; high plasticity

Increasing silt; mottled Medium Olive-gray (5Y 4/2)

CH: Silty Clay; Light Olive-brown (5Y 5/6); contains clay, silt and very fine sand; organic material (root structures); high plasticity

Color change to Moderate Yellowish-brown (10YR 5/4);Interbeds of Organic Clay (OH); Black (N1); high percentage of clay; high plasticity; contains sheen and odor; organic material (root structures)

Interbeds of Silty Clay (CH); Medium Bluish-gray (5B 5/1); high plasticity

CL: Sandy Clay; Light to Moderate Brown (5YR 5/4); contains clay, very fine sand, silt; low to moderate plasticity; interbeds of medium to coarse sand

Change in color to Moderate Olive-brown (5Y 4/2); minor organic material (root structures)

CH: Silty Clay; Olive-gray (5Y 3/2); contains clay, silt and fine sand; minor organic material; high plasticity
Change in color to Light Olive-brown (5Y 5/6)

CL: Silty Clay; Light Olive-gray (5Y 5/4); contains clay, silt and very fine sand; minor organic material; moderate plasticity

CH: Silty Clay; Light Olive-brown (5Y 5/6); contains clay, silt; organic material (root structures); high plasticity; stiff

Increase in silt and fine sand; change in color to Medium Bluish-gray (5B 6/1)

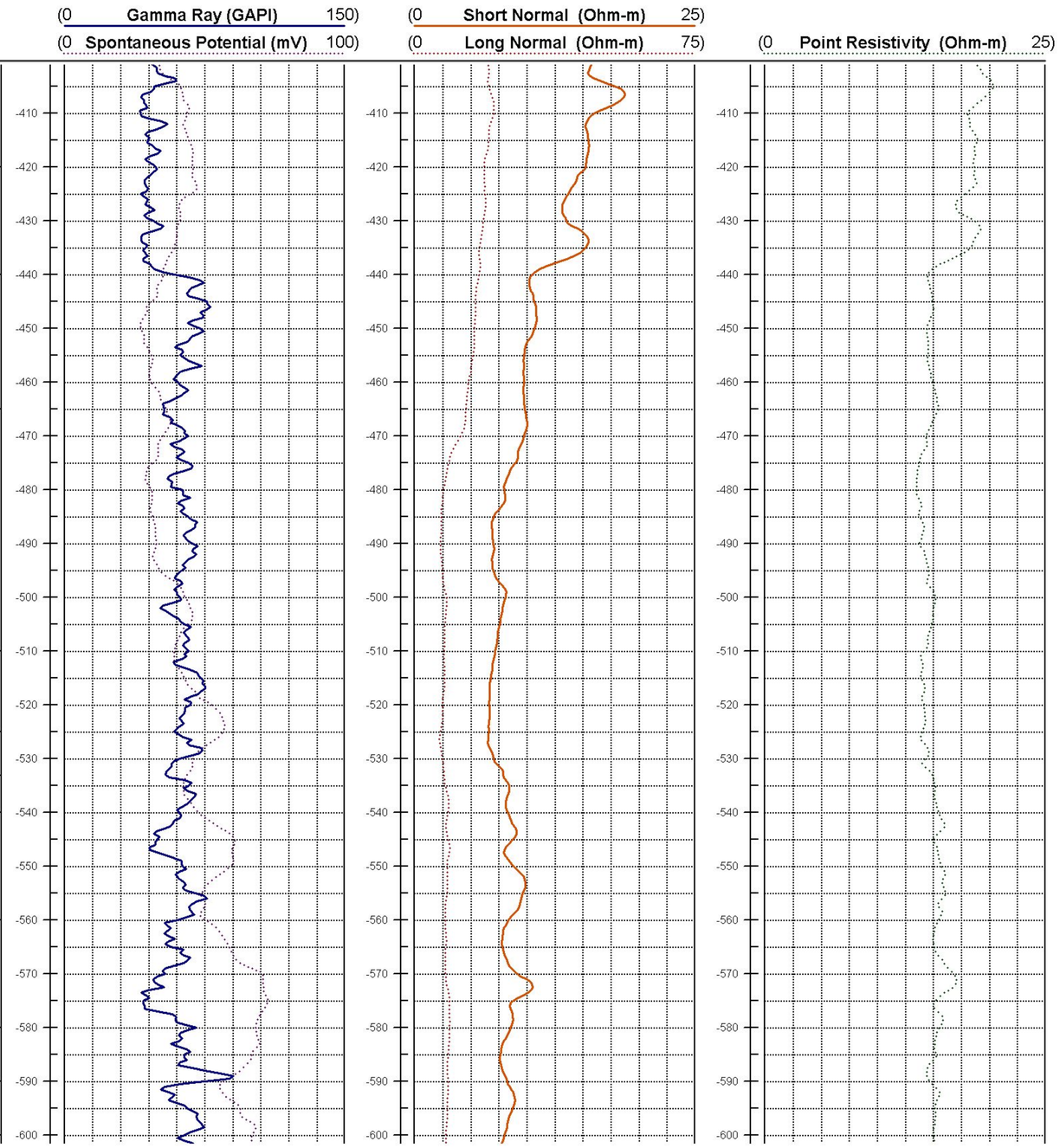
Change in color to Olive-gray (5Y 3/2)

CL: Sandy Clay; Dark Yellowish-brown (10YR 4/2); contains clay, fine sand and silt; minor organic material; stiff
Increase in clay and silt; increase in organic material (root structures); interbeds of fine to medium sand

CH: Silty Clay; Grayish-green (5G 5/6); contains clay, silt and fine sand; high plasticity

CL: Silty Clay; Dark Greenish-gray (5G 5/1); contains clay, silt; stiff; moderate plasticity; interbeds of Silty Clay (CH); Light Olive-gray (5Y 5/2); moderate plasticity

GEOPHYSICAL DATA



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site #3	**DATE:** 10/26/2004 to 12/15/2004	**LOGGED BY:** Douglas Young & Ante Milnarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-9F014	**BORING** 3D1
				ELECTRIC LOG BY: Newman Well Surveys	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-600'); 6.125" (600'-800')	**TOTAL DEPTH:** 800 feet	**SHEET:** 4 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Samples

LITHOLOGIC DESCRIPTION

CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; high plasticity

Increase in silt with interbeds of Sandy Clay (CL); Grayish-green (5G 5/2) and Moderate Yellowish-brown (10YR 5/4); contains clay,fine sand and silt

Interbeds of Clayey Silt (ML); Pinkish-gray (5YR 5/1); possible ash or carbonate material; gravelly; clasts as large as 1/2" in diameter

CL: Sandy Clay; Light Olive-brown (5Y 5/2); contains clay, fine sand and silt; moderate plasticity
Increase in fine sand and silt; mottled Grayish-Orange (10YR 7/4); rust-colored spots (<1/8" in diameter); blotchy white calcium-rich zones; moderate plasticity; stiff

CH: Silty Clay; Grayish-green (5G 5/2); contains clay, silt; high plasticity
Interbeds of Organic Clays (OH); Dark Gray (N3); organic rich; also interbeds of Sandy Silt (ML); Pinkish-gray (5YR 8/1); possibly ash or carbonate material

CL: Silty Clay; Moderate Olive-brown (5Y 4/4); contains clay, silt and very fine to fine sand

Interbeds of Organic Clay (OH) and Sandy Silt (ML); stiff

Increasing organic material (root structures); interbeds of Organic Clay (OH)and Silty Clay (CL)

ML: Clayey Silt; contains silt, clay, fine sand, rich in organic material (root structures and bark); interbeds of Organic Clay (OH)

Interbeds of organic material and possible ash or carbonate type material; minor sands and gravels (red chert clasts)

CL: Silty Clay; Moderate-brown (5YR 3/4); moderate plasticity
Change in color to Moderate Yellowish-brown (10YR 5/4); increase in clay, sand, and gravel (chert-rich); decrease in organic material; possible ash or carbonate type material
Change in color to Dark Yellowish-brown (10YR 4/2); very stiff; red and green chert clasts

GW: Sandy Gravel; Dusky Red (5R 3/4); mostly chert clasts (red with minor blue and green); angular to subangular; poorly sorted; well graded; organic material (peat type material)
Interbeds of Silty Clay (CH); Dark Yellowish-orange (10YR 6/6); contains clay, silt; high plasticity; increasing organic material

CH: Silty Clay; Moderate Yellowish-brown (10YR 5/6); contains clay, silt; interbeds of Silty Clay (CL); Light Brown (5YR 5/6); consisting of clay, silt; Increase in organic material (root structures and stems); gravelly; high plasticity

Note: cemented tube-structure found (1/2" long and 1/8" wide)

Increase in Silty Clay (CL); moderate to low plasticity; stiff; gravelly

GC: Sandy Gravel; Multicolored clasts; angular; average clast ~1/4" in diameter; poorly sorted; well graded; organics (root structures)

Interbeds of Silty Clay (CL); rich in organic material (root structures)

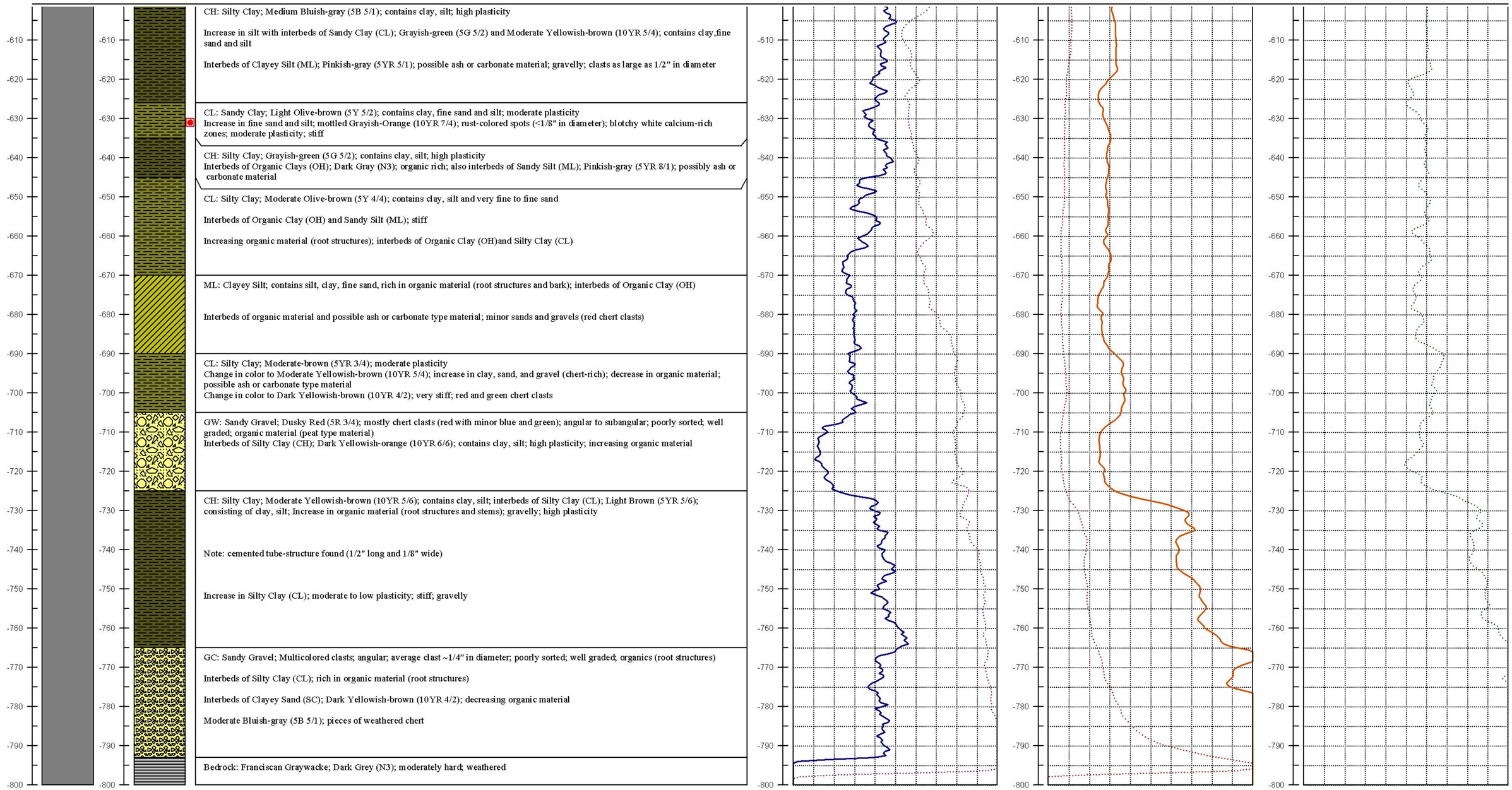
Interbeds of Clayey Sand (SC); Dark Yellowish-brown (10YR 4/2); decreasing organic material

Moderate Bluish-gray (5B 5/1); pieces of weathered chert

Bedrock: Franciscan Graywacke; Dark Grey (N3); moderately hard; weathered

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)
(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)
(0 Point Resistivity (Ohm-m) 25)



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 3/5/2005 to 3/9/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G005	**BORING** 4C1
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-180')	**TOTAL DEPTH:** 180 feet	**SHEET:** 1 of 1	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION*

GW: Fill; road base gravel

CL: Sandy Clay; contains clay, fine to medium sand, gravels (see above); rounded to subangular sand and gravel

SW: Gravelly Sand; Medium Bluish-gray (5B 5/1); contains medium to coarse sand, fine gravel; subangular to angular, poorly sorted; well graded; shell fragments; clasts as large as 1/4'

CL: Sandy Clay; Dark Yellowish-brown (10YR 4/2); contains clay, very fine to fine sand, silt; minor gravels (see above)
Change in color to Moderate Yellowish-brown (10YR 5/2)
Change in color to Light Olive-gray (5Y 5/2); moderate plasticity
Change in color to Moderate Yellowish-brown (10YR 5/2)
Increase in fine sand; change in color to Light Olive-brown (5Y 5/6)

Increase in gravels at 47'

SM: Silty Sand; Dark Yellowish-brown (10YR 4/2); contains medium to fine sand, silt, clay; subangular
Increase in fine gravel clasts as large as 1/4" in diameter

GW: Sandy Gravel; Light Olive-gray (5Y 5/2); multicolored clasts; round to angular; poorly sorted; well graded; clasts as large as 1" in diameter

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains medium to fine sand, silt, clay; mottled Dark Greenish-gray (5GY 4/1)

CH: Silty Clay; Olive-gray (5Y 4/1); contains clay, silt, fine sand; high plasticity
Increase in clay; decrease in fine sand
Change in color to Greenish-gray (5G 6/1)
Change in color to Dark Greenish Gray (5G 4/1)

GP: Sandy Gravel; contains gravels, silty clay; clasts are 1/8" to 1/2" in diameter; angular to subangular; well sorted; poorly graded

SW: Gravelly Sand; Medium Dark-gray (N4); contains coarse sand, gravel, silt; minor shell fragments; subrounded to angular; poorly sorted; well graded

CH: Silty Clay; Grayish-brown (5Yr 3/2); contains clay, silt, fine sand; high plasticity; mottled Moderate Yellowish-brown (10YR 5/4) and Greenish-gray (5G 6/1)
Change in color to Medium Bluish-gray (5G 6/1); "Bay mud"; stiff and dry

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; well sorted; poorly graded; angular to subrounded

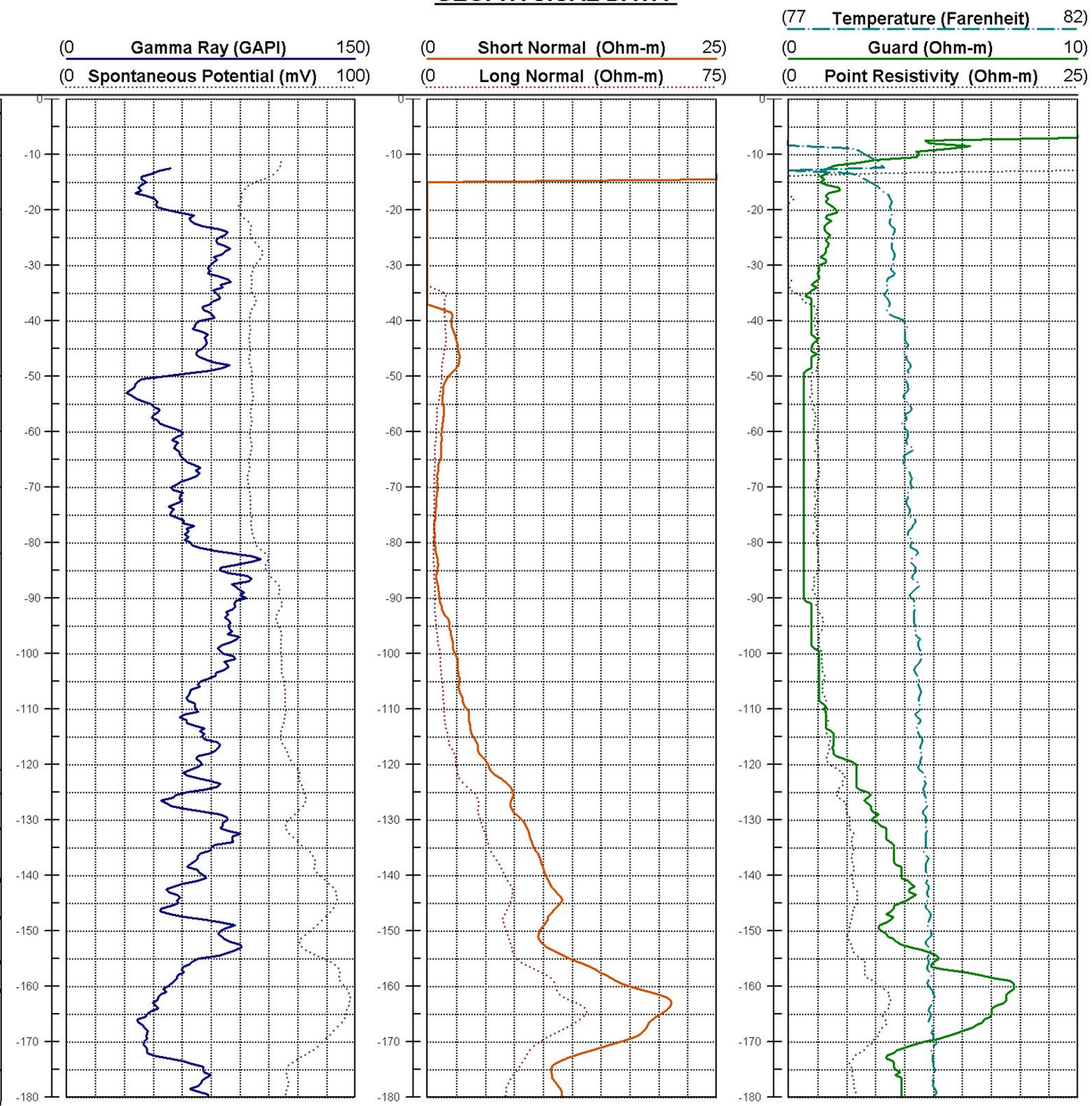
CL: Silty Clay; Light Olive-gray (5Y 5/4); contains clay, silt, medium sand; stiff
Change in color to Medium Bluish-gray (5B 5/1); Increase in clay; minor organic material

SM: Silty Sand; Olive Gray (5Y 4/1); contains sand, silt, clay; angular to subrounded

GW: Sandy Gravel; multicolored clasts; contains gravel, coarse and medium sand; subround to angular; poorly sorted; well graded; clasts as large as 3/8" in diameter
Increase in grain size; clast as large as 1/2" in diameter

CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt, trace fine sand; high plasticity
Change in color to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a sandy clay (CL)
Change back to Medium Bluish-gray (5B 5/1); contains mostly clay with some silt; high plasticity; stiff
Change back to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a clayey sand (SC)

GEOPHYSICAL DATA*



* Based on boring 4D2

* Based on boring 4D2

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 2/25/2005 to 3/3/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G004	**BORING** 4C2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-225')	**TOTAL DEPTH:** 225 feet	**SHEET:** 1 of 2	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION*

GW: Fill; road base gravel

CL: Sandy Clay; contains clay, fine to medium sand, gravels (see above); rounded to subangular sand and gravel

SW: Gravelly Sand; Medium Bluish-gray (5B 5/1); contains medium to coarse sand, fine gravel; subangular to angular, poorly sorted; well graded; shell fragments; clasts as large as 1/4'

CL: Sandy Clay; Dark Yellowish-brown (10YR 4/2); contains clay, very fine to fine sand, silt; minor gravels (see above)
Change in color to Moderate Yellowish-brown (10YR 5/2)
Change in color to Light Olive-gray (5Y 5/2); moderate plasticity
Change in color to Moderate Yellowish-brown (10YR 5/2)
Increase in fine sand; change in color to Light Olive-brown (5Y 5/6)

Increase in gravels at 47'

SM: Silty Sand; Dark Yellowish-brown (10YR 4/2); contains medium to fine sand, silt, clay; subangular
Increase in fine gravel clasts as large as 1/4" in diameter

GW: Sandy Gravel; Light Olive-gray (5Y 5/2); multicolored clasts; round to angular; poorly sorted; well graded; clasts as large as 1" in diameter

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains medium to fine sand, silt, clay; mottled Dark Greenish-gray (5GY 4/1)

CH: Silty Clay; Olive-gray (5Y 4/1); contains clay, silt, fine sand; high plasticity
Increase in clay; decrease in fine sand
Change in color to Greenish-gray (5G 6/1)
Change in color to Dark Greenish Gray (5G 4/1)

GP: Sandy Gravel; contains gravels, silty clay; clasts are 1/8" to 1/2" in diameter; angular to subangular; well sorted; poorly graded

SW: Gravelly Sand; Medium Dark-gray (N4); contains coarse sand, gravel, silt; minor shell fragments; subrounded to angular; poorly sorted; well graded

CH: Silty Clay; Grayish-brown (5Yr 3/2); contains clay, silt, fine sand; high plasticity; mottled Moderate Yellowish-brown (10YR 5/4) and Greenish-gray (5G 6/1)
Change in color to Medium Bluish-gray (5G 6/1); "Bay mud"; stiff and dry

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; well sorted; poorly graded; angular to subrounded

CL: Silty Clay; Light Olive-gray (5Y 5/4); contains clay, silt, medium sand; stiff
Change in color to Medium Bluish-gray (5B 5/1); Increase in clay; minor organic material

SM: Silty Sand; Olive Gray (5Y 4/1); contains sand, silt, clay; angular to subrounded

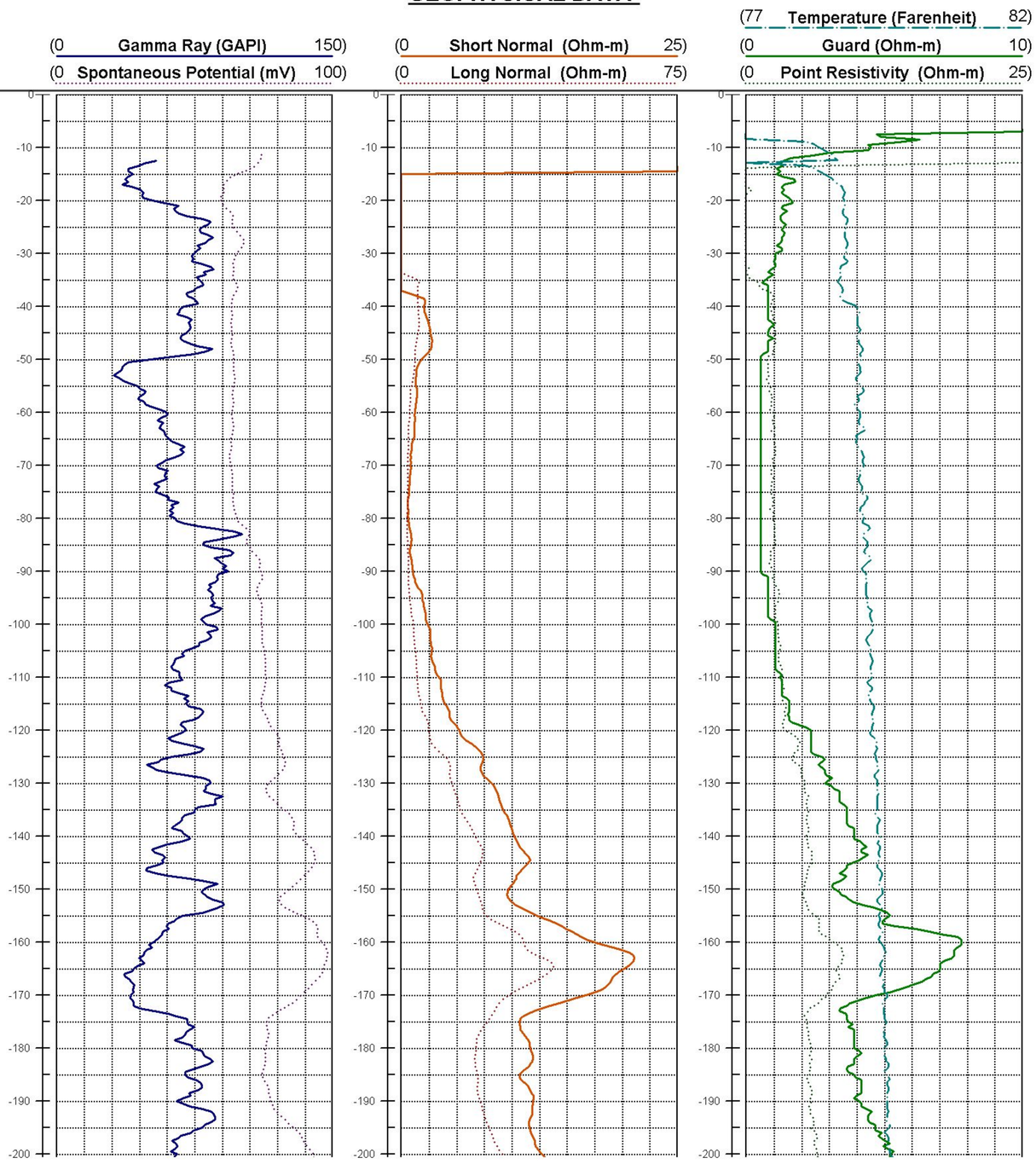
GW: Sandy Gravel; multicolored clasts; contains gravel, coarse and medium sand; subround to angular; poorly sorted; well graded; clasts as large as 3/8" in diameter
Increase in grain size; clast as large as 1/2" in diameter

CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt, trace fine sand; high plasticity
Change in color to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a sandy clay (CL)
Change back to Medium Bluish-gray (5B 5/1); contains mostly clay with some silt; high plasticity; stiff
Change back to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a clayey sand (SC)

CL: Silty Clay; Moderate yellowish-brown (10YR 5/4); contains clay, silt, fine sand; trace organic material moderate plasticity

* Based on boring 4D2

GEOPHYSICAL DATA*

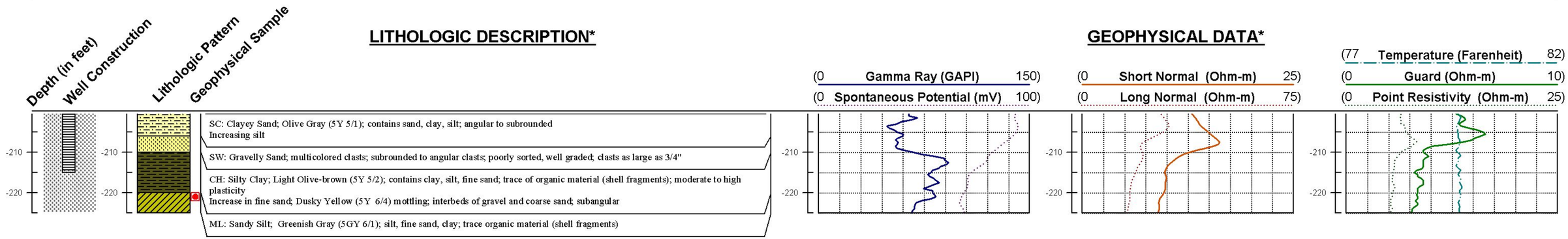


* Based on boring 4D2

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 2/25/2005 to 3/3/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G004	**BORING** 4C2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-225')	**TOTAL DEPTH:** 225 feet	**SHEET:** 2 of 2	



* Based on boring 4D2

* Based on boring 4D2

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 2/1/2005 to 2/11/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G002	**BORING** 4D1
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-455')	**TOTAL DEPTH:** 455 feet	**SHEET:** 1 of 3	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION*

GW: Fill; road base gravel

CL: Sandy Clay; contains clay, fine to medium sand, gravels (see above); rounded to subangular sand and gravel

SW: Gravelly Sand; Medium Bluish-gray (5B 5/1); contains medium to coarse sand, fine gravel; subangular to angular, poorly sorted; well graded; shell fragments; clasts as large as 1/4'

CL: Sandy Clay; Dark Yellowish-brown (10YR 4/2); contains clay, very fine to fine sand, silt; minor gravels (see above)
Change in color to Moderate Yellowish-brown (10YR 5/2)
Change in color to Light Olive-gray (5Y 5/2); moderate plasticity
Change in color to Moderate Yellowish-brown (10YR 5/2)
Increase in fine sand; change in color to Light Olive-brown (5Y 5/6)

Increase in gravels at 47'

SM: Silty Sand; Dark Yellowish-brown (10YR 4/2); contains medium to fine sand, silt, clay; subangular
Increase in fine gravel clasts as large as 1/4" in diameter

GW: Sandy Gravel; Light Olive-gray (5Y 5/2); multicolored clasts; round to angular; poorly sorted; well graded; clasts as large as 1" in diameter

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains medium to fine sand, silt, clay; mottled Dark Greenish-gray (5GY 4/1)

CH: Silty Clay; Olive-gray (5Y 4/1); contains clay, silt, fine sand; high plasticity
Increase in clay; decrease in fine sand
Change in color to Greenish-gray (5G 6/1)
Change in color to Dark Greenish Gray (5G 4/1)

GP: Sandy Gravel; contains gravels, silty clay; clasts are 1/8" to 1/2" in diameter; angular to subangular; well sorted; poorly graded

SW: Gravelly Sand; Medium Dark-gray (N4); contains coarse sand, gravel, silt; minor shell fragments; subrounded to angular; poorly sorted; well graded

CH: Silty Clay; Grayish-brown (5Yr 3/2); contains clay, silt, fine sand; high plasticity; mottled Moderate Yellowish-brown (10YR 5/4) and Greenish-gray (5G 6/1)
Change in color to Medium Bluish-gray (5G 6/1); "Bay mud"; stiff and dry

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; well sorted; poorly graded; angular to subrounded

CL: Silty Clay; Light Olive-gray (5Y 5/4); contains clay, silt, medium sand; stiff
Change in color to Medium Bluish-gray (5B 5/1); Increase in clay; minor organic material

SM: Silty Sand; Olive Gray (5Y 4/1); contains sand, silt, clay; angular to subrounded

GW: Sandy Gravel; multicolored clasts; contains gravel, coarse and medium sand; subround to angular; poorly sorted; well graded; clasts as large as 3/8" in diameter
Increase in grain size; clast as large as 1/2" in diameter

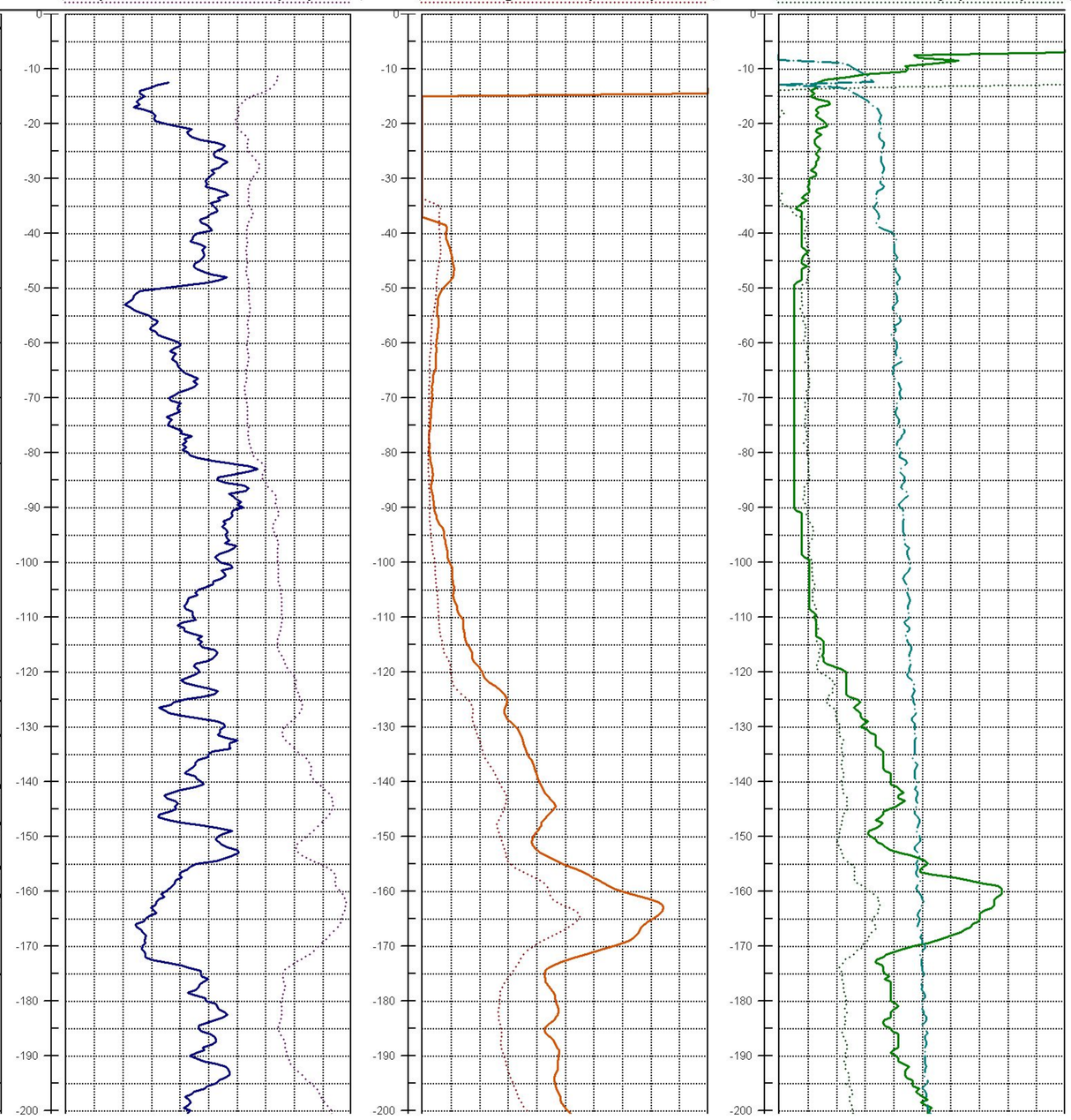
CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt, trace fine sand; high plasticity
Change in color to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a sandy clay (CL)
Change back to Medium Bluish-gray (5B 5/1); contains mostly clay with some silt; high plasticity; stiff
Change back to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a clayey sand (SC)

CL: Silty Clay; Moderate yellowish-brown (10YR 5/4); contains clay, silt, fine sand; trace organic material moderate plasticity

* Based on boring 4D2

GEOPHYSICAL DATA*

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)
(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)
(77 Temperature (Farenheit) 82)
(0 Guard (Ohm-m) 10)
(0 Point Resistivity (Ohm-m) 25)



* Based on boring 4D2

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 2/1/2005 to 2/11/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G002	**BORING** 4D1
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-455')	**TOTAL DEPTH:** 455 feet	**SHEET:** 2 of 3	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION*

SC: Clayey Sand; Olive Gray (5Y 5/1); contains sand, clay, silt; angular to subrounded
Increasing silt

SW: Gravelly Sand; multicolored clasts; subrounded to angular clasts; poorly sorted, well graded; clasts as large as 3/4"

CH: Silty Clay; Light Olive-brown (5Y 5/2); contains clay, silt, fine sand; trace of organic material (shell fragments); moderate to high plasticity
Increase in fine sand; Dusky Yellow (5Y 6/4) mottling; interbeds of gravel and coarse sand; subangular

ML: Sandy Silt; Greenish Gray (5GY 6/1); silt, fine sand, clay; trace organic material (shell fragments)

CL: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; moderate plasticity; stiff; mottled Dusky Yellow (5Y 6/4)

ML: Sandy Silt; Greenish Gray (5GY 6/1); contains silt, fine sand, clay; interbeds of silty clay (as above); trace of organic material (shell fragments)

CL: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; moderate to low plasticity; stiff
Interbeds of silty sand (SM); Light Olive-gray (5Y 5/2) containing fine sand, silt, clay

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; interbeds of silty clay (CL), same color; clay, silt; subrounded
Increase in silt and clay; change in color to Moderate Yellowish-brown (10YR 4/2)

CL: Silty Clay; Moderate Olive-gray (5Y 4/4); contains clay, silt, fine sand; moderate plasticity; stiff; interbeds of coarse sand
Increase in silt and sand

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; very stiff
Increase in clay and decrease in sand
Change in color to Yellowish Brown (10YR 5/4) increase in sand (micaceous) and clay; stiff

CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; high plasticity; stiff
Interbeds of sandy clay (CL); Moderate Yellowish-brown (10YR 5/4); containing clay, fine sand, silt

CL: Silty Clay; Grayish Olive (10Y 4/2); contains clay, silt; stiff; interbeds of high plasticity clays (as above); medium to low plasiticity

CH: Silty Clay; Dark Gray (N3); clay, silt; high plasticity; stiff

SW: Gravelly Sand; multicolored clasts; contains coarse to medium sand, fine gravel; subrounded to angular; poorly sorted, well graded

GW: Sandy Gravel; multicolored clasts; contains gravel, coarse and medium sand; subround to angular; poorly sorted; well graded; clasts as large as 1/2"
Increase in grain size; more rounded to subangular
Increase in grain size, minor coarse sand; clasts as large as 3/4" in diameter; moderatly sorted and graded

GP: Gravels; multicolored clasts; coarse to fine gravels (trace sand); rounded to angular; poorly sorted, well graded; few clasts > 1" diameter; clasts appear to be mostly sandstone

SM: Silty Sand; Moderate Brown (5YR 4/4); contains medium to fine sand, silt; well sorted; poorly graded; interbeds of gravel (as above); angular to subangular

CL: Silty Clay; Dark Yellowish-orange (10YR 6/6); contains clay, silt, clay; minor medium to coarse sand; mottled Dark Gray (N3) and Dark Yellowish-brown (10YR 4/2); gravelly sand (from above); moderate plasticity
Change in color to Grayish Orange(10YR 7/4); increase in silt and fine sand; interbeds of gravel

ML: Clayey Silt; Dark Yellowish-brown (10YR 4/2); contains clay, silt, fine sand; stiff

SM: Silty Sand; Moderate Yellowish-brown (10YR 5/2); contains fine sand, silt, clay; angular to subangular; stiff
Increase in fine sand

SW: Gravelly Sand; multicolored clasts; contains coarse to fine sand, fine gravel; subrounded to angular; poorly sorted, well graded; interbeds of Silty Sand (SM); Moderate Yellowish-brown (10YR 5/4); containing fine sand, silt, clay

* Based on boring 4D2

GEOPHYSICAL DATA*

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)

(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)

(77 Temperature (Farenheit) 82)
(0 Guard (Ohm-m) 10)
(0 Point Resistivity (Ohm-m) 25)

-210 -220 -230 -240 -250 -260 -270 -280 -290 -300 -310 -320 -330 -340 -350 -360 -370 -380 -390 -400

* Based on boring 4D2

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 2/1/2005 to 2/11/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G002	**BORING** 4D1
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-455')	**TOTAL DEPTH:** 455 feet	**SHEET:** 3 of 3	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION*

ML: Sandy Silt; Moderate Yellowish-brown (10YR 5/4); contains silt, fine sand, clay; moderately stiff
Increase in fine sand and gravel
Increase in clay and gravel

CL: Silty Clay; Moderate Yellowish-brown (10YR 5/4); contains clay, silt, fine sand; moderate to high plasticity
Minor Gravelly Sand (SW); clasts < 1/2" in diameter

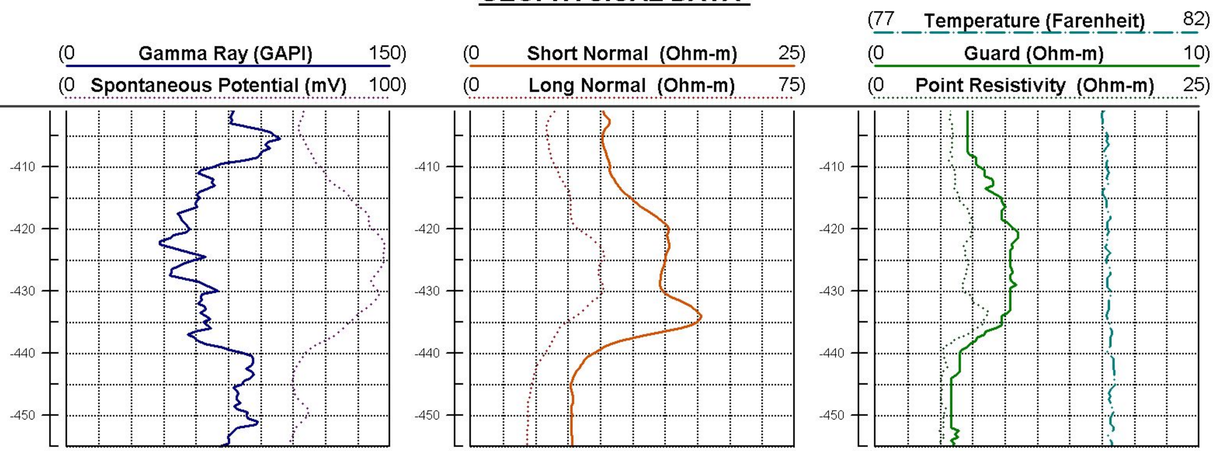
GW: Sandy Gravel; multicolored clasts; contains fine gravel, coarse and medium sand; round to angular; poorly sorted; well graded; clasts appear to be mostly sandstone

SW: Gravelly Sand; multicolored clasts; contains coarse to medium sand, fine gravel (< 3/8"); subrounded to angular; poorly sorted, well graded; trace of organic material

SM: Silty Sand; Moderate Yellowish-brown (10YR 5/2); contains fine sand, silt, clay; andgular to subrounded; stiff
Increasing fine to medium sand and silt; interbeds of gravel
Interbeds of coarse to medium sand

CL: Silty Clay; Light Olive-gray (5Y 5/2); contains clay, silt, fine sand; moderately stiff; trace mottling of Dark Yellowish-brown (10YR 4/2)
Increase in clay and silt; mottled Moderate Yellowish-brown (10YR 5/4); interbeds of silty clay (CH); Medium Bluish Gray (5B 5/1); containing clay, silt

GEOPHYSICAL DATA*



* Based on boring 4D2

* Based on boring 4D2

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 12/20/2004 to 1/28/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G003	**BORING** 4D2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 1 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION

GW: Fill; road base gravel

CL: Sandy Clay; contains clay, fine to medium sand, gravels (see above); rounded to subangular sand and gravel

SW: Gravelly Sand; Medium Bluish-gray (5B 5/1); contains medium to coarse sand, fine gravel; subangular to angular, poorly sorted; well graded; shell fragments; clasts as large as 1/4'

CL: Sandy Clay; Dark Yellowish-brown (10YR 4/2); contains clay, very fine to fine sand, silt; minor gravels (see above)
Change in color to Moderate Yellowish-brown (10YR 5/2)
Change in color to Light Olive-gray (5Y 5/2); moderate plasticity
Change in color to Moderate Yellowish-brown (10YR 5/2)
Increase in fine sand; change in color to Light Olive-brown (5Y 5/6)

Increase in gravels at 47'

SM: Silty Sand; Dark Yellowish-brown (10YR 4/2); contains medium to fine sand, silt, clay; subangular
Increase in fine gravel clasts as large as 1/4" in diameter

GW: Sandy Gravel; Light Olive-gray (5Y 5/2); multicolored clasts; round to angular; poorly sorted; well graded; clasts as large as 1" in diameter

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains medium to fine sand, silt, clay; mottled Dark Greenish-gray (5GY 4/1)

CH: Silty Clay; Olive-gray (5Y 4/1); contains clay, silt, fine sand; high plasticity
Increase in clay; decrease in fine sand
Change in color to Greenish-gray (5G 6/1)
Change in color to Dark Greenish Gray (5G 4/1)

GP: Sandy Gravel; contains gravels, silty clay; clasts are 1/8" to 1/2" in diameter; angular to subangular; well sorted; poorly graded

SW: Gravelly Sand; Medium Dark-gray (N4); contains coarse sand, gravel, silt; minor shell fragments; subrounded to angular; poorly sorted; well graded

CH: Silty Clay; Grayish-brown (5Yr 3/2); contains clay, silt, fine sand; high plasticity; mottled Moderate Yellowish-brown (10YR 5/4) and Greenish-gray (5G 6/1)
Change in color to Medium Bluish-gray (5G 6/1); "Bay mud"; stiff and dry

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; well sorted; poorly graded; angular to subrounded

CL: Silty Clay; Light Olive-gray (5Y 5/4); contains clay, silt, medium sand; stiff
Change in color to Medium Bluish-gray (5B 5/1); Increase in clay; minor organic material

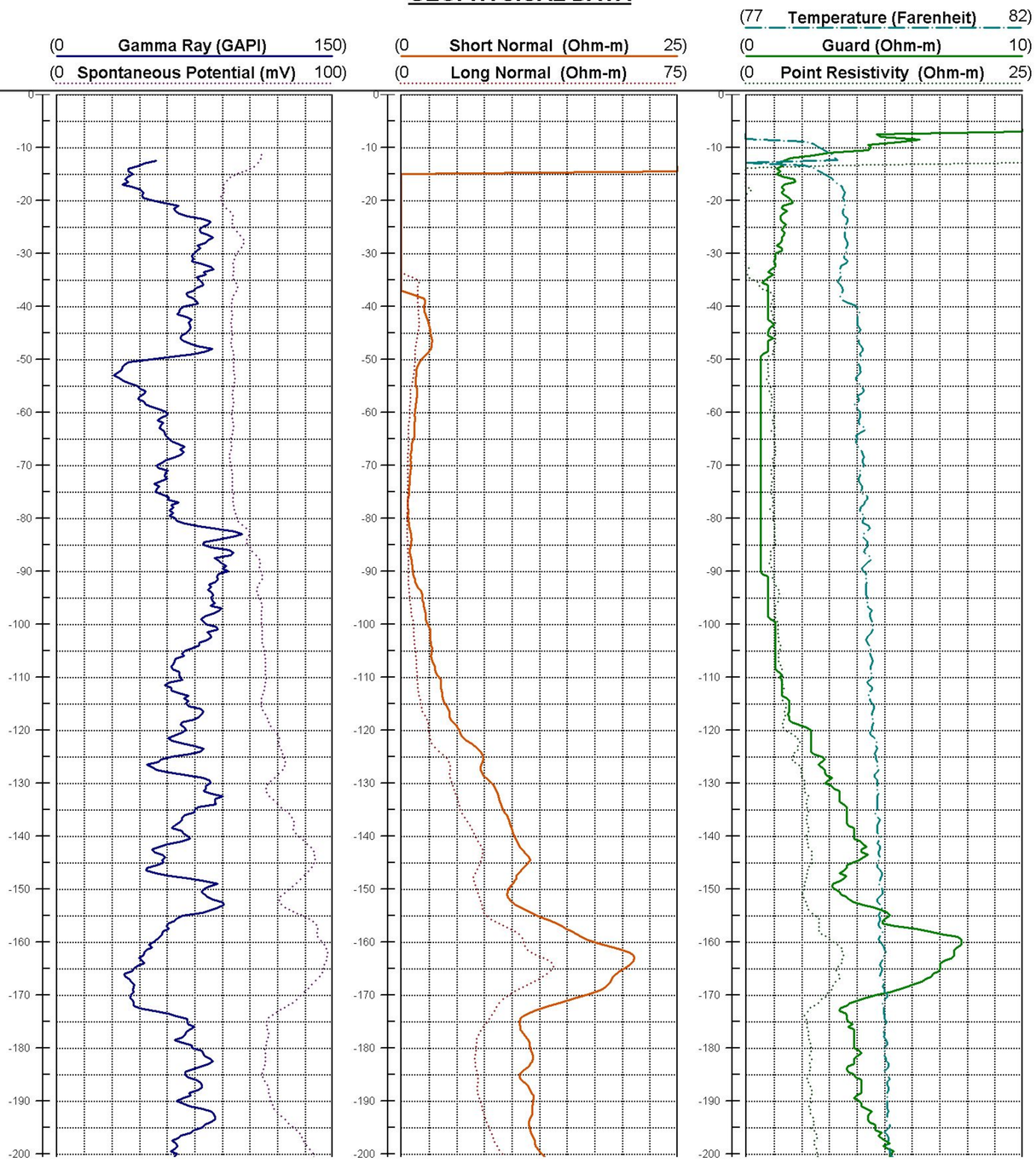
SM: Silty Sand; Olive Gray (5Y 4/1); contains sand, silt, clay; angular to subrounded

GW: Sandy Gravel; multicolored clasts; contains gravel, coarse and medium sand; subround to angular; poorly sorted; well graded; clasts as large as 3/8" in diameter
Increase in grain size; clast as large as 1/2" in diameter

CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt, trace fine sand; high plasticity
Change in color to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a sandy clay (CL)
Change back to Medium Bluish-gray (5B 5/1); contains mostly clay with some silt; high plasticity; stiff
Change back to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a clayey sand (SC)

CL: Silty Clay; Moderate yellowish-brown (10YR 5/4); contains clay, silt, fine sand; trace organic material moderate plasticity

GEOPHYSICAL DATA



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 12/20/2004 to 1/28/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G003	**BORING** 4D2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 2 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION

SC: Clayey Sand; Olive Gray (5Y 5/1); contains sand, clay, silt; angular to subrounded
Increasing silt

SW: Gravelly Sand; multicolored clasts; subrounded to angular clasts; poorly sorted, well graded; clasts as large as 3/4"

CH: Silty Clay; Light Olive-brown (5Y 5/2); contains clay, silt, fine sand; trace of organic material (shell fragments); moderate to high plasticity
Increase in fine sand; Dusky Yellow (5Y 6/4) mottling; interbeds of gravel and coarse sand; subangular

ML: Sandy Silt; Greenish Gray (5GY 6/1); silt, fine sand, clay; trace organic material (shell fragments)

CL: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; moderate plasticity; stiff; mottled Dusky Yellow (5Y 6/4)

ML: Sandy Silt; Greenish Gray (5GY 6/1); contains silt, fine sand, clay; interbeds of silty clay (as above); trace of organic material (shell fragments)

CL: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; moderate to low plasticity; stiff
Interbeds of silty sand (SM); Light Olive-gray (5Y 5/2) containing fine sand, silt, clay

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; interbeds of silty clay (CL), same color; clay, silt; subrounded
Increase in silt and clay; change in color to Moderate Yellowish-brown (10YR 4/2)

CL: Silty Clay; Moderate Olive-gray (5Y 4/4); contains clay, silt, fine sand; moderate plasticity; stiff; interbeds of coarse sand
Increase in silt and sand

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; very stiff
Increase in clay and decrease in sand
Change in color to Yellowish Brown (10YR 5/4) increase in sand (micaceous) and clay; stiff

CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; high plasticity; stiff
Interbeds of sandy clay (CL); Moderate Yellowish-brown (10YR 5/4); containing clay, fine sand, silt

CL: Silty Clay; Grayish Olive (10Y 4/2); contains clay, silt; stiff; interbeds of high plasticity clays (as above); medium to low plasiticity

CH: Silty Clay; Dark Gray (N3); clay, silt; high plasticity; stiff

SW: Gravelly Sand; multicolored clasts; contains coarse to medium sand, fine gravel; subrounded to angular; poorly sorted, well graded

GW: Sandy Gravel; multicolored clasts; contains gravel, coarse and medium sand; subround to angular; poorly sorted; well graded; clasts as large as 1/2"
Increase in grain size; more rounded to subangular
Increase in grain size, minor coarse sand; clasts as large as 3/4" in diameter; moderatly sorted and graded

GP: Gravels; multicolored clasts; coarse to fine gravels (trace sand); rounded to angular; poorly sorted, well graded; few clasts > 1" diameter; clasts appear to be mostly sandstone

SM: Silty Sand; Moderate Brown (5YR 4/4); contains medium to fine sand, silt; well sorted; poorly graded; interbeds of gravel (as above); angular to subangular

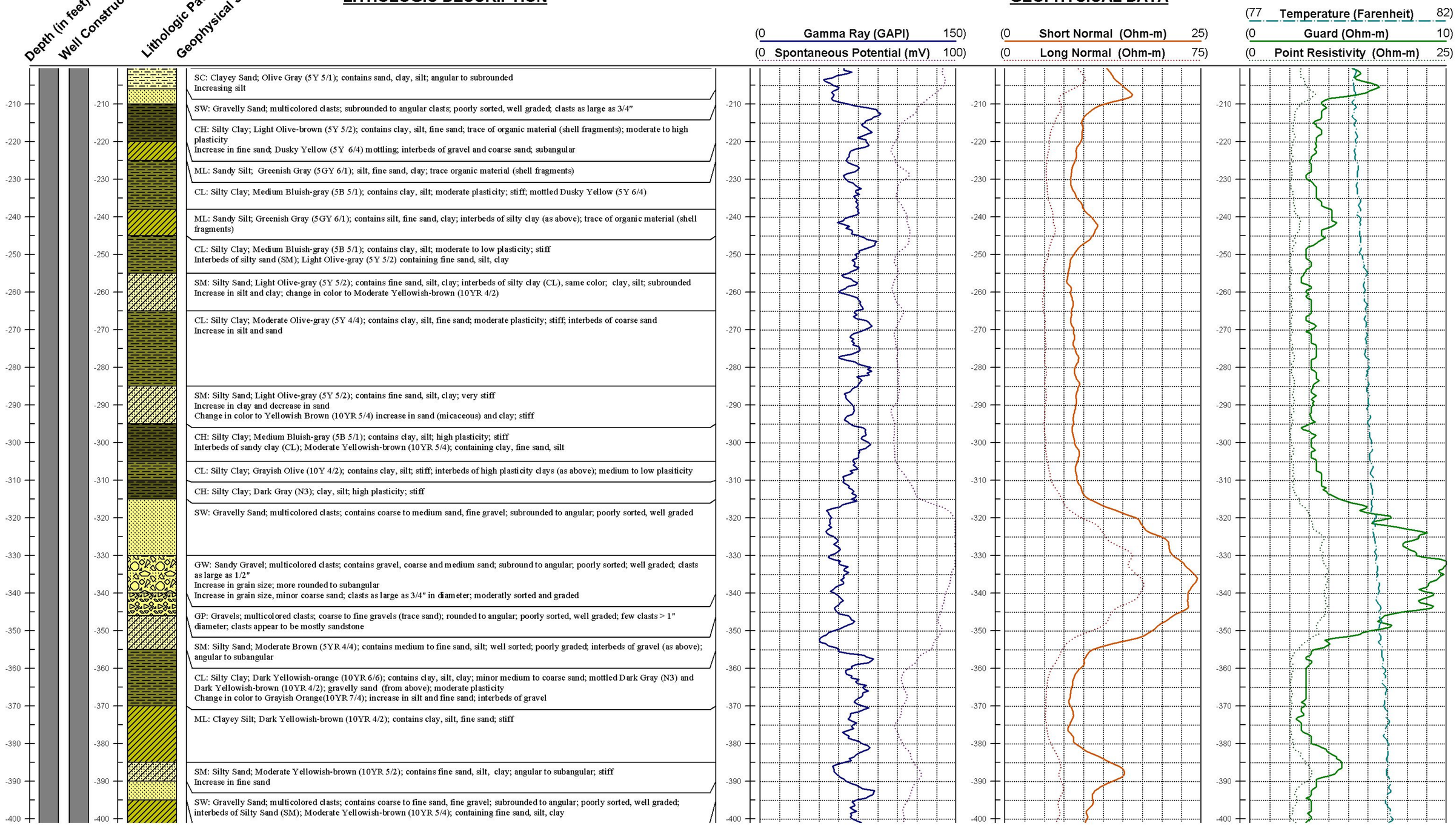
CL: Silty Clay; Dark Yellowish-orange (10YR 6/6); contains clay, silt, clay; minor medium to coarse sand; mottled Dark Gray (N3) and Dark Yellowish-brown (10YR 4/2); gravelly sand (from above); moderate plasticity
Change in color to Grayish Orange(10YR 7/4); increase in silt and fine sand; interbeds of gravel

ML: Clayey Silt; Dark Yellowish-brown (10YR 4/2); contains clay, silt, fine sand; stiff

SM: Silty Sand; Moderate Yellowish-brown (10YR 5/2); contains fine sand, silt, clay; angular to subangular; stiff
Increase in fine sand

SW: Gravelly Sand; multicolored clasts; contains coarse to fine sand, fine gravel; subrounded to angular; poorly sorted, well graded; interbeds of Silty Sand (SM); Moderate Yellowish-brown (10YR 5/4); containing fine sand, silt, clay

GEOPHYSICAL DATA



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 12/20/2004 to 1/28/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G003	**BORING** 4D2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 3 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION

ML: Sandy Silt; Moderate Yellowish-brown (10YR 5/4); contains silt, fine sand, clay; moderately stiff
Increase in fine sand and gravel
Increase in clay and gravel

CL: Silty Clay; Moderate Yellowish-brown (10YR 5/4); contains clay, silt, fine sand; moderate to high plasticity
Minor Gravelly Sand (SW); clasts < 1/2" in diameter

GW: Sandy Gravel; multicolored clasts; contains fine gravel, coarse and medium sand; round to angular; poorly sorted; well graded; clasts appear to be mostly sandstone

SW: Gravelly Sand; multicolored clasts; contains coarse to medium sand, fine gravel (< 3/8"); subrounded to angular; poorly sorted, well graded; trace of organic material

SM: Silty Sand; Moderate Yellowish-brown (10YR 5/2); contains fine sand, silt, clay; andgular to subrounded; stiff
Increasing fine to medium sand and silt; interbeds of gravel
Interbeds of coarse to medium sand

CL: Silty Clay; Light Olive-gray (5Y 5/2); contains clay, silt, fine sand; moderately stiff; trace mottling of Dark Yellowish-brown (10YR 4/2)
Increase in clay and silt; mottled Moderate Yellowish-brown (10YR 5/4); interbeds of silty clay (CH); Medium Bluish Gray (5B 5/1); containing clay, silt

ML: Clayey Silt; Light Olive-gray (5Y 5/2); contains silt, clay, fine sand; mottled Moderate Yellowish-brown (10YR 5/4)
Increase in silt and fine sand; interbeds of Silty Sand (SM); Olive Gary (5Y 3/2); containing sand, silt, clay;

CL: Silty Clay; Light Olive-brown (5Y 5/6); mottled Dusky Yellow (5Y 6/4); contains clay, silt

ML: Clayey Silt; Pale Olive (10Y 6/2); contains silt, clay, fine sand; mottled and interbeded with Light Olive Gray (5Y 3/2)
Increase in clay; interbeds of Silty Clay (CL); Modereate Yellowish-brown (10TR 5/4)
Increase in clay, interbeds of Pale Olive lime mud; chips of Silty Clay (CL); Olive Gray (5Y 3/2); stiff

CL: Silty Clay; Pale Green (10G 6/2) to Dark Greenish-gray (5G 5/1); contains clay, silt, fine sand; very stiff

SC: Clayey Sand; Moderate Yellowish-brown (10YR 5/4); contains fine sand, clay, silt; interbeds of coarse sand
Few gravels

SM: Silty Sand; Moderate Yellowish-brown (10YR 5/4); contains fine sand, silt,clay; angular to subangular; interbeds of Clayey Silt (ML); Very Pale-orange (10YR 8/2); lime mud (effervesses in HCL)

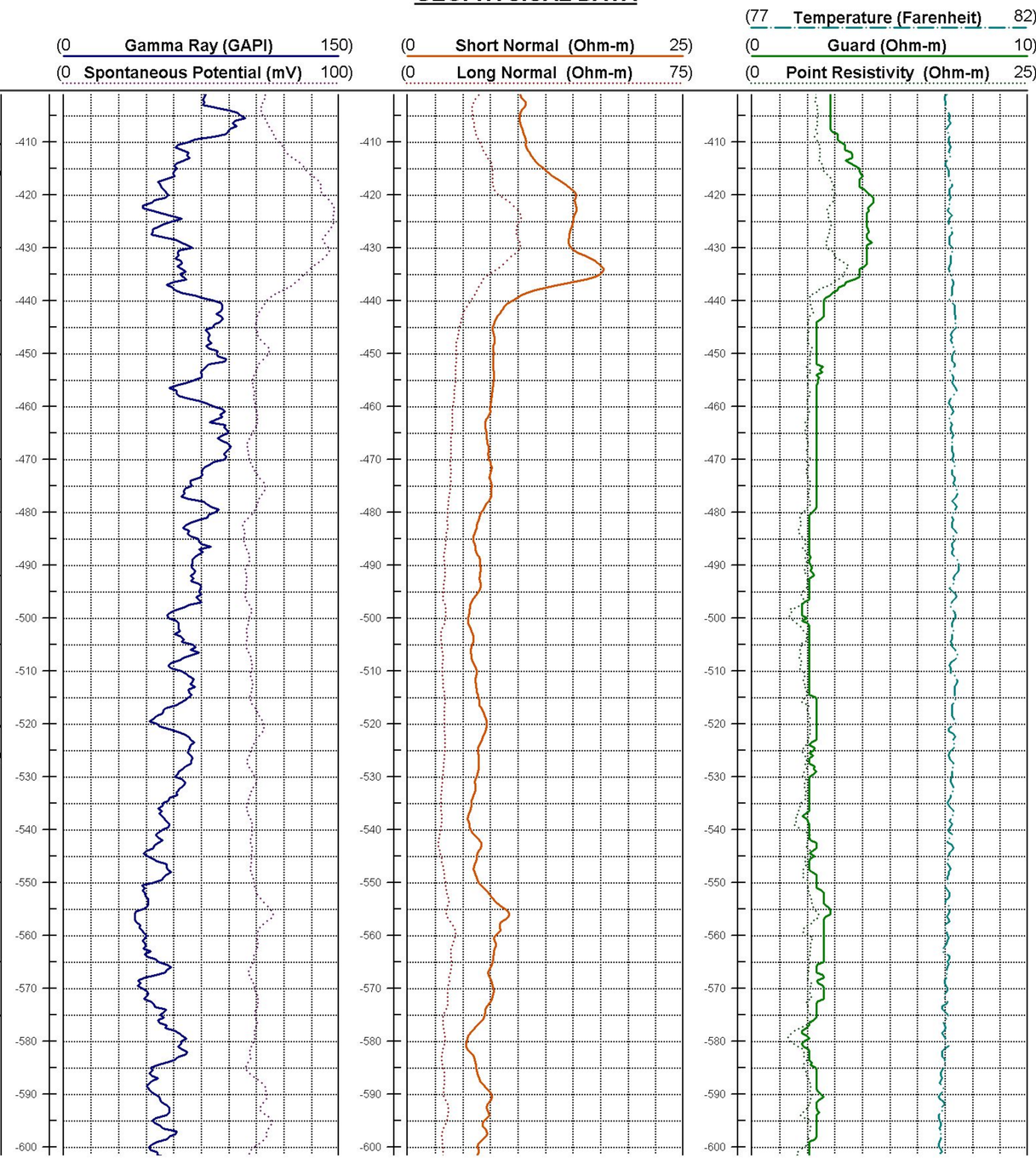
CL: Silty Clay; Very Pale-orange (10YR 8/2); calcium inclusions (effervesses in HCL); contains clay, silt; interbeds of Silty Sand (SM) Dark Yellowish-brown (10YR 4/2); containing sand, silt, clay; moderatly stiff; well sorted, poorly graded sand (fine to medium)
Change in color to more Pale Yellowish-brown (10YR 6/2)
Change in color to Moderate Yellowish-brown (10TR 5/4); contains lime mud

GW: Sandy Gravel; multicolored (mostly black, brown, and red); contains fine gravel, medium to coarse sand; poorly sorted, well graded; angular to subrounded; clasts as large as 1/4" in diameter, interbeds of Silty Clay (CL) calcium inclusions

SC: Clayey Sand; Light Olive-brown (5Y 5/6); contains fine to medium sand, clay, silt; soft; minor gravels (as above); poorly sorted; angular to subrounded
Change in color to Moderate Yellowish-brown (10YR 5/4); interbeds of Clayey Silt (ML); same color; contains silt, clay, fine sand

CL: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; stiff; interbeds of Silty Clay (CL); containing clay, silt; Very Pale-orange (10YR 8/2) to Pale Olive (10Y 6/2); calcium inclusions; moderate to high plasticity

GEOPHYSICAL DATA



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 12/20/2004 to 1/28/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G003	**BORING** 4D2
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 4 of 4	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION

ML: Sandy Silt; Dark Yellowish-orange (10YR 6/6); contains silt, fine sand, clay; interbeds of blue Silty Clay; containing clay, silt; trace gravel
Increase in clay and gravel (angular to rounded)

SM: Silty Sand; Moderate Yellowish-brown (10YR 5/4); contains fine sand, silt, clay; very well sorted poorly graded; minor rounded to subangular gravel clasts; interbeds of blue Silty Clay
Change in color to Moderate Brown (5YR 4/4); slight increase in grain size and minor medium sand

SP: Coarse Sand; Multicolored (dark red, brown, black, and white); angular to subrounded; mostly coarse sand with no gravel; intrebeds of blue clay and silty sand (as above)

SM: Silty Sand; Moderate Yellowish-brown (10YR 5/4); contains fine sand, silt, clay; well sorted and poorly graded; interbeds of blue clay and coarse sand; angular to subrounded

SC: Clayey Sand; Moderate Yellowish-brown (10YR 5/4); contains fine sand, silt, clay; well sorted and poorly graded sand; interbeds of blue clay, white silty lime mud, olive-gray clay, and minor coarse sand (as above)

CH: Silty Clay; Moderate Yellowish-brown (10YR 5/4); contains clay, silt, fine sand; high plasticity; interbeds of blue clay and minor coarse sand (as above)
Decreasing interbeds of mostly blue clay; increase in coarse sand
Very stiff; increase in angular coarse sand and fine gravel; minor interbeds of blue clay; white calcareous interbeds

SC: Clayey Sand; multicolored clasts with interbeds of blue and brown clay and brown sand; clasts are angular to subangular with minor rounded dark-brown sandstone clasts
Minor fine sand concreations (tube structures) and shell fragments

SW: Gravelly Sand; multicolored clasts; contains medium to coarse sand, fine gravel; angular to rounded clasts
Increasing percentage of black clasts (shale and mudstone)

Bedrock: Black Franciscan Graywacke; Dark gray (N3); very angular chips; highly weathered
Increase in rigidity from 750' to 780'; more coherent rock;

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)
(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)
(77 Temperature (Farenheit) 82)
(0 Guard (Ohm-m) 10)
(0 Point Resistivity (Ohm-m) 25)

-610 -620 -630 -640 -650 -660 -670 -680 -690 -700 -710 -720 -730 -740 -750 -760 -770 -780 -790 -800

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 2/14/2005 to 2/24/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G001	**BORING** 4F1
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-365')	**TOTAL DEPTH:** 365 feet	**SHEET:** 1 of 2	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION*

GW: Fill; road base gravel

CL: Sandy Clay; contains clay, fine to medium sand, gravels (see above); rounded to subangular sand and gravel

SW: Gravelly Sand; Medium Bluish-gray (5B 5/1); contains medium to coarse sand, fine gravel; subangular to angular, poorly sorted; well graded; shell fragments; clasts as large as 1/4'

CL: Sandy Clay; Dark Yellowish-brown (10YR 4/2); contains clay, very fine to fine sand, silt; minor gravels (see above)
Change in color to Moderate Yellowish-brown (10YR 5/2)
Change in color to Light Olive-gray (5Y 5/2); moderate plasticity
Change in color to Moderate Yellowish-brown (10YR 5/2)
Increase in fine sand; change in color to Light Olive-brown (5Y 5/6)

Increase in gravels at 47'

SM: Silty Sand; Dark Yellowish-brown (10YR 4/2); contains medium to fine sand, silt, clay; subangular
Increase in fine gravel clasts as large as 1/4" in diameter

GW: Sandy Gravel; Light Olive-gray (5Y 5/2); multicolored clasts; round to angular; poorly sorted; well graded; clasts as large as 1" in diameter

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains medium to fine sand, silt, clay; mottled Dark Greenish-gray (5GY 4/1)

CH: Silty Clay; Olive-gray (5Y 4/1); contains clay, silt, fine sand; high plasticity
Increase in clay; decrease in fine sand
Change in color to Greenish-gray (5G 6/1)
Change in color to Dark Greenish Gray (5G 4/1)

GP: Sandy Gravel; contains gravels, silty clay; clasts are 1/8" to 1/2" in diameter; angular to subangular; well sorted; poorly graded

SW: Gravelly Sand; Medium Dark-gray (N4); contains coarse sand, gravel, silt; minor shell fragments; subrounded to angular; poorly sorted; well graded

CH: Silty Clay; Grayish-brown (5Yr 3/2); contains clay, silt, fine sand; high plasticity; mottled Moderate Yellowish-brown (10YR 5/4) and Greenish-gray (5G 6/1)
Change in color to Medium Bluish-gray (5G 6/1); "Bay mud"; stiff and dry

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; well sorted; poorly graded; angular to subrounded

CL: Silty Clay; Light Olive-gray (5Y 5/4); contains clay, silt, medium sand; stiff
Change in color to Medium Bluish-gray (5B 5/1); Increase in clay; minor organic material

SM: Silty Sand; Olive Gray (5Y 4/1); contains sand, silt, clay; angular to subrounded

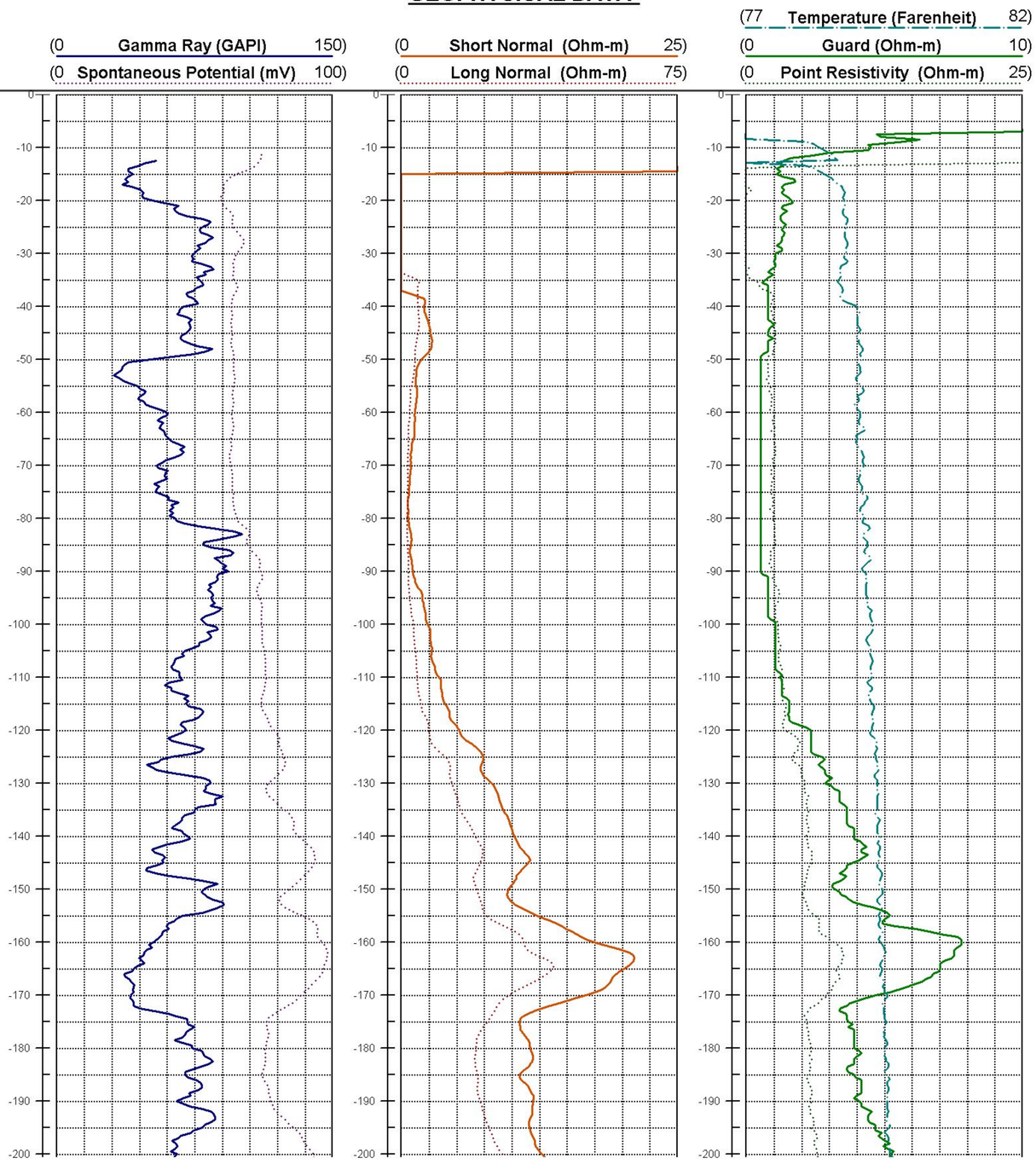
GW: Sandy Gravel; multicolored clasts; contains gravel, coarse and medium sand; subround to angular; poorly sorted; well graded; clasts as large as 3/8" in diameter
Increase in grain size; clast as large as 1/2" in diameter

CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt, trace fine sand; high plasticity
Change in color to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a sandy clay (CL)
Change back to Medium Bluish-gray (5B 5/1); contains mostly clay with some silt; high plasticity; stiff
Change back to Moderate Yellowish-brown (10YR 5/4); increase in silt and sand; interbedded with a clayey sand (SC)

CL: Silty Clay; Moderate yellowish-brown (10YR 5/4); contains clay, silt, fine sand; trace organic material moderate plasticity

* Based on boring 4D2

GEOPHYSICAL DATA*



* Based on boring 4D2

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site # 4	**DATE:** 2/14/2005 to 2/24/2005	**LOGGED BY:** Douglas Young & Ante Mlinarevic	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 4S/2W-5G001	**BORING** 4F1
				ELECTRIC LOG BY: WELENCO	**DRILLING METHOD:** Mud Rotary		
				HOLE DIAMETER: 8.75" (0-365')	**TOTAL DEPTH:** 365 feet	**SHEET:** 2 of 2	

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Sample

LITHOLOGIC DESCRIPTION*

SC: Clayey Sand; Olive Gray (5Y 5/1); contains sand, clay, silt; angular to subrounded
Increasing silt

SW: Gravelly Sand; multicolored clasts; subrounded to angular clasts; poorly sorted, well graded; clasts as large as 3/4"

CH: Silty Clay; Light Olive-brown (5Y 5/2); contains clay, silt, fine sand; trace of organic material (shell fragments); moderate to high plasticity
Increase in fine sand; Dusky Yellow (5Y 6/4) mottling; interbeds of gravel and coarse sand; subangular

ML: Sandy Silt; Greenish Gray (5GY 6/1); silt, fine sand, clay; trace organic material (shell fragments)

CL: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; moderate plasticity; stiff; mottled Dusky Yellow (5Y 6/4)

ML: Sandy Silt; Greenish Gray (5GY 6/1); contains silt, fine sand, clay; interbeds of silty clay (as above); trace of organic material (shell fragments)

CL: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; moderate to low plasticity; stiff
Interbeds of silty sand (SM); Light Olive-gray (5Y 5/2) containing fine sand, silt, clay

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; interbeds of silty clay (CL), same color; clay, silt; subrounded
Increase in silt and clay; change in color to Moderate Yellowish-brown (10YR 4/2)

CL: Silty Clay; Moderate Olive-gray (5Y 4/4); contains clay, silt, fine sand; moderate plasticity; stiff; interbeds of coarse sand
Increase in silt and sand

SM: Silty Sand; Light Olive-gray (5Y 5/2); contains fine sand, silt, clay; very stiff
Increase in clay and decrease in sand
Change in color to Yellowish Brown (10YR 5/4) increase in sand (micaceous) and clay; stiff

CH: Silty Clay; Medium Bluish-gray (5B 5/1); contains clay, silt; high plasticity; stiff
Interbeds of sandy clay (CL); Moderate Yellowish-brown (10YR 5/4); containing clay, fine sand, silt

CL: Silty Clay; Grayish Olive (10Y 4/2); contains clay, silt; stiff; interbeds of high plasticity clays (as above); medium to low plasiticity

CH: Silty Clay; Dark Gray (N3); clay, silt; high plasticity; stiff

SW: Gravelly Sand; multicolored clasts; contains coarse to medium sand, fine gravel; subrounded to angular; poorly sorted, well graded

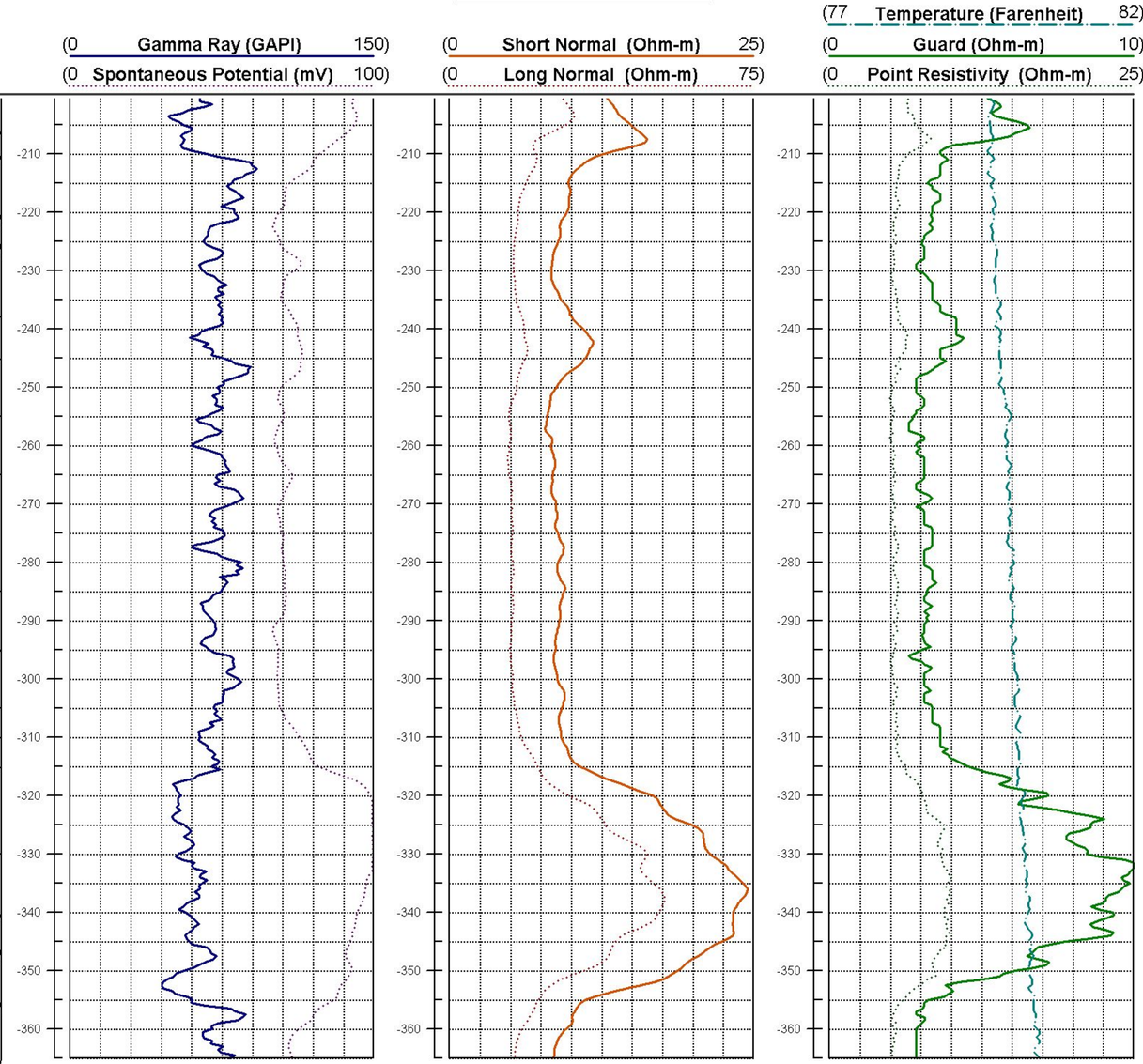
GW: Sandy Gravel; multicolored clasts; contains gravel, coarse and medium sand; subround to angular; poorly sorted; well graded; clasts as large as 1/2"
Increase in grain size; more rounded to subangular
Increase in grain size, minor coarse sand; clasts as large as 3/4" in diameter; moderatly sorted and graded

GP: Gravels; multicolored clasts; coarse to fine gravels (trace sand); rounded to angular; poorly sorted, well graded; few clasts > 1" diameter; clasts appear to be mostly sandstone

SM: Silty Sand; Moderate Brown (5YR 4/4); contains medium to fine sand, silt; well sorted; poorly graded; interbeds of gravel (as above); angular to subangular

CL: Silty Clay; Dark Yellowish-orange (10YR 6/6); contains clay, silt, clay; minor medium to coarse sand; mottled Dark Gray (N3) and Dark Yellowish-brown (10YR 4/2); gravelly sand (from above); moderate plasticity
Change in color to Grayish Orange(10YR 7/4); increase in silt and fine sand; interbeds of gravel

GEOPHYSICAL DATA*



* Based on boring 4D2

* Based on boring 4D2

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site W	**DATE:** 12/14/2005 to 1/26/2006	**LOGGED BY:** Douglas Young & Sean Gehlke	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 3S/3W-25C020
				ELECTRIC LOG BY: Newman Well Surveys	**DRILLING METHOD:** Mud Rotary	**BORING** **WD2**
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 1 of 4

Depth (in feet)
Well Construction
Lithologic Pattern
Geophysical Samples

LITHOLOGIC DESCRIPTION

unknown

SC: Clayey Sand; Light Olive-gray (5Y 5/2); fine to coarse sand; sub-angular to sub-rounded

SP: Coarse Sand; Multicolor grains; sub-angular to sub-rounded; poorly graded / well sorted

GC: Clayey Gravel; Multicolor clasts up to 2 cm length; clay is light olive gray (5Y 5/2), fine to coarse sand content; angular to sub-rounded; well graded / poorly sorted

SW: Coarse Sand; Muticolor grains; sub-angular to sub-rounded; well graded / poorly sorted

GW: Sandy Gravel; Multicolor clasts up to 1 cm length; coarse to very coarse sand; sub-angular to sub-rounded; well graded / poorly sorted; minor shell fragments

GC: Clayey Gravel; Multicolor clasts up to 1.5 cm length; clay is light olive gray (5Y 5/2), fine to coarse sand content; angular to sub-rounded; well graded / poorly sorted

CL: Sandy Clay; Light Olive-gray (5Y 5/2); coarse sand content; low plasticity

CL: Sandy Clay; Moderate Olive-brown (5Y 4/4); contains clay, silt, and fine to coarse sand; moderate plasticity; increasing coarse sand and gravel content with depth

CL: Sandy Clay; Olive-gray (5Y 3/2); fine to medium sand content; moderate plasticity

CL: Sandy Clay; Light Olive-gray (5Y 5/2); silt and fine sand content; high plasticity; minor shell fragments; increased medium to coarse sand content at 105 to 110 feet

CL: Silty Clay; Olive-gray (5Y 3/2); low plasticity; 25% shell fragments, increasing with depth

SC: Clayey Sand; Multicolor grains; Olive-gray (5Y 3/2) clay content; coarse to very coarse sand; sub-angular to sub-rounded; shell fragments

SC: Clayey Sand; Multicolor grains; Light Olive-brown (5Y 5/6) and minor Olive-gray (5Y 3/2) clay content; silt and fine to coarse sand; sub-angular to sub-rounded

CL: Silty Clay; Light Olive-brown (5Y 3/2) and minor Olive-gray (5Y 3/2); silt and fine to coarse sand content; high plasticity

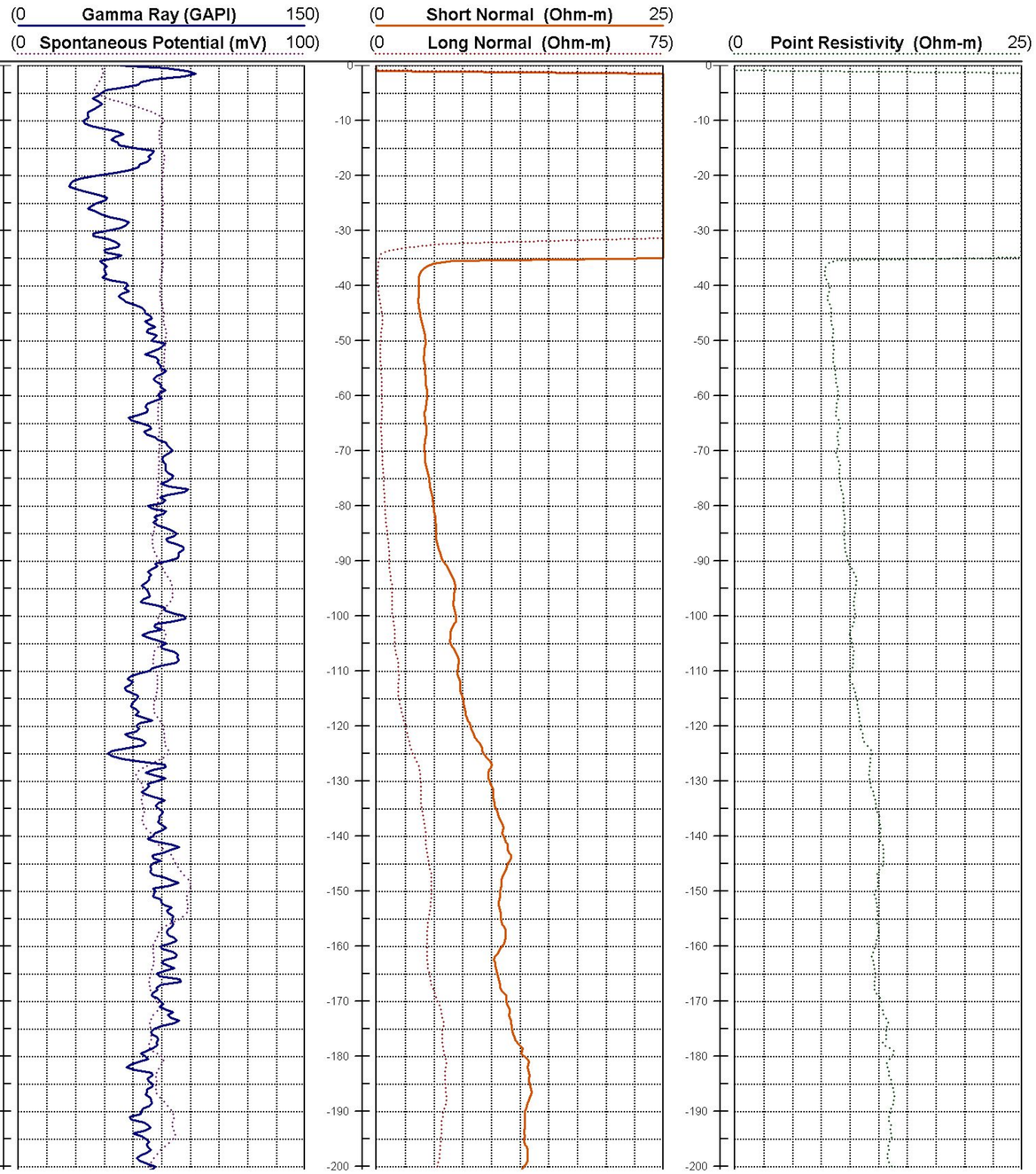
CL: Silty Clay; Dark Greenish-gray (5G 4/1); low plasticity

CL: Sandy Clay; Dark greenish gray (5G 4/1); contains fine to medium sand; low plasticity

CL: Sandy Clay; Light Olive-gray (5Y 5/2); contains silt, fine to coarse sand; sub-angular to rounded sand grains; moderate plasticity

CL: Sandy Clay; Moderate Yellowish-brown (10 YR 5/4); contains silt, very fine to medium sand; moderate plasticity; increasing fines, silt with depth

GEOPHYSICAL DATA



ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site W	**DATE:** 12/14/2005 to 1/26/2006	**LOGGED BY:** Douglas Young & Sean Gehlke	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 3S/3W-25C020
				ELECTRIC LOG BY: Newman Well Surveys	**DRILLING METHOD:** Mud Rotary	**BORING** **WD2**
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 2 of 4

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Samples

LITHOLOGIC DESCRIPTION

CL: Sandy Clay; Light Olive-gray (5Y 5/2); contains fine to coarse sand; low plasticity; decreasing coarse sand and moderate plasticity (240-255 feet)

SC: Clayey Sand; Multicolor grains; fine to very coarse; angular to sub-roundedj well graded / poorly sorted

CL: Sandy Clay; Light Olive-gray (5Y 5/2); contains fine to very coarse sand; moderate plasticity

CL: Sandy Clay; Light Olive-gray (5Y 6/1); contains silt and very fine sand; moderate plasticity

CL: Sandy Clay; Light Olive-brown (5Y 5/6); contains silt, very fine to coarse sand; moderate plasticity

GP: Sandy Gravel; Multicolor clasts up to 1 1/4 cm length; coarse to very coarse sand, minor Grayish-olive (10Y 4/2) clay; poorly graded / well sorted

CL: Gravelly Clay; Moderate Yellowish-brown (10 YR 5/4) w/minor Medium Bluish-gray (5B 5/1); gravel clasts to 1/5 cm length; moderate plasticity; decreasing gravel content with depth

CL: Sandy Clay; Moderate Yellowish-brown (10 YR 5/4); contains fine to coarse sand; moderate plasticity

SC: Clayey Sand; Light Olive-gray (5Y 5/2); fine to coarse sand; sub-angular to sub-rounded

CL: Sandy Clay; Light Olive-gray (5Y 5/2); contains fine to coarse sand; moderate plasticity; minor Medium Bluish-gray clay (5B 5/1) at 355 feet.

SC: Clayey Sand; Moderate Yellowish-brown (10 YR 5/4); fine to coarse sand; sub-angular to sub-rounded

SW: Coarse Sand; Multicolor grains; sub-angular to sub-rounded; well graded / poorly sorted

GW: Sandy Gravel; Multicolor clasts up to 1.5 cm length; fine to very coarse sand; sub-angular to rounded; well graded / poorly sorted

CL: Sandy Clay; Moderate Yellowish-brown (10YR 5/4); fine to very coarse sand content; moderate plasticity

GC: Clayey Gravel; Multicolor; clasts up to 1.5 cm length; fine to coarse sand content; Moderate Yellowish-brown clay (10YR 5/4)

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)

(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)

(0 Point Resistivity (Ohm-m) 25)

-210 -220 -230 -240 -250 -260 -270 -280 -290 -300 -310 -320 -330 -340 -350 -360 -370 -380 -390 -400

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site W	**DATE:** 12/14/2005 to 1/26/2006	**LOGGED BY:** Douglas Young & Sean Gehlke	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 3S/3W-25C020
				ELECTRIC LOG BY: Newman Well Surveys	**DRILLING METHOD:** Mud Rotary	**BORING** **WD2**
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 3 of 4

Depth (in feet)
Well Construction
Lithologic Pattern
Geophysical Samples

LITHOLOGIC DESCRIPTION

SW: Gravelly Sand; Multicolor grains; gravel clasts to 1 cm length, fine to coarse sand; sub-angular to rounded; well graded / poorly sorted

GC: Clayey Gravel; Multicolor; clasts up to 1 3/4 cm length; contains Moderate Yellowish-brown (10YR 5/4) clay, silt, fine to very coarse sand

SP: Coarse Sand; Multicolor; medium to very coarse sand; sub-angular to sub-rounded; poorly graded / well sorted

GC: Clayey Gravel; Multicolor; clasts up to 1.5 cm length; fine to coarse sand content

SW: Gravelly Sand; Multicolor grains; gravel clasts to 1.5 cm length, medium to very coarse sand; sub-angular to sub-rounded; well graded / poorly sorted; decreasing gravels with depth

GW: Sandy Gravel; Multicolor clasts up to 1 3/4 cm length; fine to coarse sand, minor clay; sub-angular to rounded; well graded / poorly sorted

SW: Gravelly Sand; Multicolor grains; gravel clasts to 1.5 cm length, medium to very coarse sand; sub-angular to rounded; well graded / poorly sorted

GW: Sandy Gravel; Multicolor clasts up to 2.5 cm length; medium to very coarse sand; sub-angular to rounded; well graded / poorly sorted

SW: Gravelly Sand; Multicolor grains; gravel clasts to 2 cm length, medium to very coarse sand; sub-angular to rounded; well graded / poorly sorted

CL: Sandy Clay; Moderate Yellowish-brown (10YR 5/4); contains fine to coarse sand, minor gravel clasts up to 2.5 cm length; moderate plasticity; increasing clay content at 550 feet depth; decreasing coarse sand content, primarily fine to medium sand at 560 feet depth

CL: Sandy Clay; Light Olive-gray (5Y 5/2); contains fine to coarse sand; sub-angular to sub-rounded; moderate plasticity

CL: Sandy Clay; Moderate Yellowish-brown (10YR 5/4); contains fine to very coarse sand, minor gravel clasts up to 1.0 cm length; moderate plasticity

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)
(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)
(0 Point Resistivity (Ohm-m) 25)

-410 -420 -430 -440 -450 -460 -470 -480 -490 -500 -510 -520 -530 -540 -550 -560 -570 -580 -590 -600

ALAMEDA COUNTY WATER DISTRICT

Northwest Niles Cone Monitoring Wells Project

JOB NUMBER: 6241	**DWG NUMBER:** G06-04B-37-02	**LOCATION:** Site W	**DATE:** 12/14/2005 to 1/26/2006	**LOGGED BY:** Douglas Young & Sean Gehlke	**DRILLER:** Maggiora Bros. Drilling, Inc.	**STATE ID:** 3S/3W-25C020
				ELECTRIC LOG BY: Newman Well Surveys	**DRILLING METHOD:** Mud Rotary	**BORING** **WD2**
				HOLE DIAMETER: 8.75"	**TOTAL DEPTH:** 800 feet	**SHEET:** 4 of 4

Depth (in feet) | Well Construction | Lithologic Pattern | Geophysical Samples

LITHOLOGIC DESCRIPTION

CL: Sandy Clay; Olive-gray (5Y 3/2); contains fine to coarse sand; moderate plasticity; Moderate Yellowish-brown (10YR 5/4) mottling

CL: Sandy Clay; Dark Greenish-gray (5G 4/1); contains fine to coarse sand; moderate to high plasticity; decreasing coarse sand content with depth

GC: Clayey Gravel; Multicolor; clasts up to 1.0 cm length; contains fine to coarse sand, Dark greenish gray (5G 4/1) clay

CL: Sandy Clay; Greenish-black (5G 2/1); contains very fine to coarse sand, gravel clasts to 1 cm; low plasticity; increasing Very Light Gray (N8) clay content between 650-655 foot depths

SC: Clayey Sand; variable color; fine to coarse sand; angular to sub-rounded

CL: Sandy Clay; Pale Yellowish-brown (10YR 6/2); contains fine to coarse sand, minor gravel clasts up to 1.0 cm length

CL: Sandy Clay; Light Olive-gray (5Y 5/2); contains fine to coarse sand, occasional gravel clasts to 1 cm length; moderate plasticity

CL: Sandy Clay; Moderate Yellowish-brown (10YR 5/4); contains silt, fine to coarse sand; moderate plasticity; increasing coarse sand content at 685 feet

CL: Sandy Clay; Medium Bluish-gray (5B 5/1) and minor Moderate Yellowish brown (10YR 5/4); contains silt, fine to coarse sand; moderate plasticity

CL: Sandy Clay; Dark Greenish-gray (5G 4/1) with minor streaks of Moderate Yellowish brown (10YR 5/4); contains silt, fine to coarse sand; moderate plasticity; increasing coarse sand content (715-755 feet); color change to Olive-gray (5Y 4/1) at 750 feet

CL: Sandy Clay; Light Olive-gray (5Y 5/2); contains fine to coarse sand; minor Dark greenish gray clay (5G 4/1) from 765-775 feet; color change to Moderate Yellowish-brown (10YR 5/4) at 770 feet

SC: Clayey Sand; Variable color, mostly Moderate Yellowish-brown (10 YR 5/4); fine to coarse sand

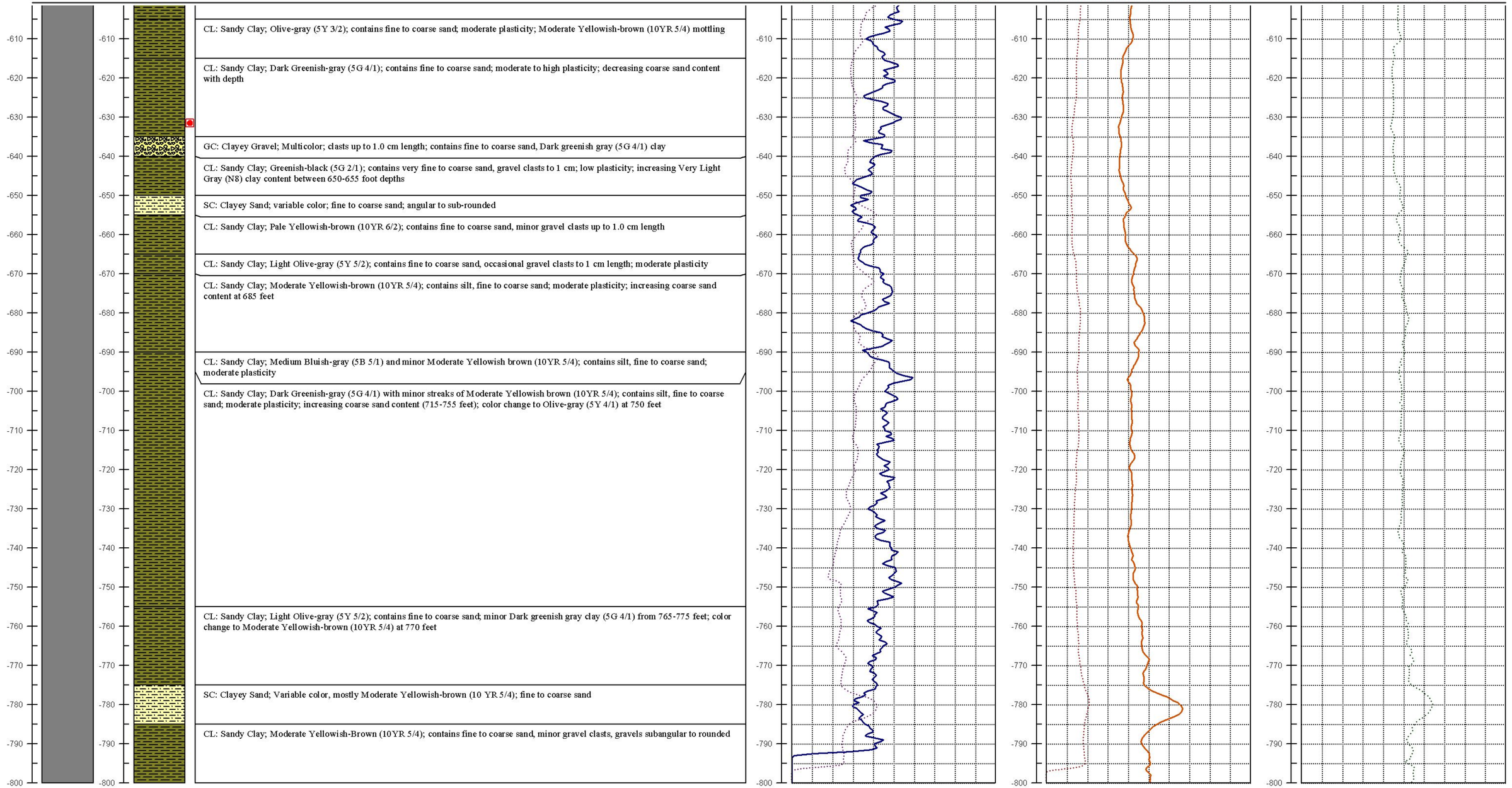
CL: Sandy Clay; Moderate Yellowish-Brown (10YR 5/4); contains fine to coarse sand, minor gravel clasts, gravels subangular to rounded

GEOPHYSICAL DATA

(0 Gamma Ray (GAPI) 150)
(0 Spontaneous Potential (mV) 100)

(0 Short Normal (Ohm-m) 25)
(0 Long Normal (Ohm-m) 75)

(0 Point Resistivity (Ohm-m) 25)



ALAMEDA COUNTY WATER DISTRICT

Appendix E
Well Development Logs

ALAMEDA COUNTY WATER DISTRICT

MONITORING WELL SAMPLING RECORD

WELL ID: WD2
PROJECT NO:
PROJECT NAME:
DATE: 1/31/06
SAMPLED BY: Hoton Stanko

DEPTH TO WATER:
TOTAL DEPTH OF WELL:
WELL DIAMETER: 2"
CASING VOLUME:
METHOD OF PURGING:

TIME	CUMULATIVE VOL REMOVED (GALLONS)	Turbidity	Color	Sediments	REMARKS
1400					STILL WORKING TO BOTTOM
15:45	1350gal	3.74	Clear	None	1350 gal
15:54	1440	2.64	Clear	None	Temp 20.4, 8.29 pH, 1830 cond
16:05	1550	2.34	Clear	None	Temp 20.3, 8.31 pH, 1845 cond

NOTES: Stanpipe 57.5 Measured at 58.4

ACWD
ALAMEDA COUNTY WATER DISTRICT

MONITORING WELL SAMPLING RECORD

(#3)

WELL ID: 4S/2W-5G1 4F1
PROJECT NO:
PROJECT NAME:
DATE:
SAMPLED BY:

DEPTH TO WATER:
TOTAL DEPTH OF WELL:
WELL DIAMETER:
CASING VOLUME:
METHOD OF PURGING:

TIME	CUMULATIVE VOL. REMOVED (GALLONS)	TEMPERATURE (°C)	pH (UNITS)	SPECIFIC CONDUCTANCE (UMHOS/CM)	REMARKS (COLOR, TURBIDITY & SEDIMENT)
0		20	8.29	12.9MS	
15		18.1	8.15	9.0	
30		18.3	8.09	12.0	
45		18.2	8.04	10.7	
60		18.5	8.02	11.0	

NOTES: needs coupling

ALAMEDA COUNTY WATER DISTRICT

MONITORING WELL SAMPLING RECORD

WELL ID: 3D2
PROJECT NO: 6241
PROJECT NAME: NW Niles Cone MW Const Proj
DATE: 1/5/05
SAMPLED BY: D Young + A M

DEPTH TO WATER:
TOTAL DEPTH OF WELL: 450'
WELL DIAMETER: 2"
CASING VOLUME:
METHOD OF PURGING: air lift

TIME	CUMULATIVE VOL REMOVED (GALLONS)	Turbidity	Color	Sediments	REMARKS
11:30	200	off scale	Lt Brown	Heavy	occasionally stopping
12:30	400	8.7	clear	None	to move air discharge
13:35	600	3.1	"	"	pipe up + down through
13 45	800	1.4	"	"	column.
14 30	1000	1.3	"	"	
15:30	1200	2.0	"	"	

NOTES: Discharge ≈ 18 gpm using air lift method

ACWD
ALAMEDA COUNTY WATER DISTRICT

MONITORING WELL SAMPLING RECORD

WELL ID: 4S/2W-5G2
PROJECT NO:
PROJECT NAME:
DATE:
SAMPLED BY:

DEPTH TO WATER:
TOTAL DEPTH OF WELL:
WELL DIAMETER:
CASING VOLUME:
METHOD OF PURGING:

TIME	CUMULATIVE VOL. REMOVED (GALLONS)	TEMPERATURE (°C)	pH (UNITS)	SPECIFIC CONDUCTANCE (UMHOS/CM)	REMARKS (COLOR, TURBIDITY & SEDIMENT)
0		22.5	8.27	0.0	
15		22.7	8.22	321	
30		22.6	8.12	554	
45		23.1	8.18	501	
60		23.8	8.19	489	

NOTES: needs coupling

ACWD
ALAMEDA COUNTY WATER DISTRICT

MONITORING WELL SAMPLING RECORD

WELL ID: 4S/2W-5G3 4D2
PROJECT NO:
PROJECT NAME:
DATE:
SAMPLED BY:

DEPTH TO WATER:
TOTAL DEPTH OF WELL:
WELL DIAMETER:
CASING VOLUME:
METHOD OF PURGING:

TIME	CUMULATIVE VOL. REMOVED (GALLONS)	TEMPERATURE (°C)	pH (UNITS)	SPECIFIC CONDUCTANCE (UMHOS/CM)	REMARKS (COLOR, TURBIDITY & SEDIMENT)
0		21.8	8.05	2.3	
15		31.2	8.17	2.9	
30		30.0	8.26	3.9	
45		35.6	8.28	0.9	
60		~~31.8~~ 25.4	8.31	0.7	

NOTES: casing cracked, need coupling

ALAMEDA COUNTY WATER DISTRICT

MONITORING WELL SAMPLING RECORD

WELL ID: 4S/2W-5G4 (4C2)
PROJECT NO:
PROJECT NAME:
DATE:
SAMPLED BY:

DEPTH TO WATER:
TOTAL DEPTH OF WELL:
WELL DIAMETER:
CASING VOLUME:
METHOD OF PURGING:

TIME	CUMULATIVE VOL. REMOVED (GALLONS)	TEMPERATURE (°C)	pH (UNITS)	SPECIFIC CONDUCTANCE (UMHOS/CM)	REMARKS (COLOR, TURBIDITY & SEDIMENT)
0		17.4	8.15	9.8	
15		17.0	8.24	6.4	
30		17.6	8.21	1.0	
45		18.1	8.23	1.1	

NOTES:

ALAMEDA COUNTY WATER DISTRICT

MONITORING WELL SAMPLING RECORD

WELL ID: 9C1
PROJECT NO: 6241
PROJECT NAME: MW Niles Cone
DATE: 3/22/05
SAMPLED BY:

DEPTH TO WATER: Artisan
TOTAL DEPTH OF WELL:
WELL DIAMETER: 2"
CASING VOLUME:
METHOD OF PURGING: Natural

TIME	CUMULATIVE VOL REMOVED (GALLONS)	Turbidity	Color	Sediments	REMARKS

NOTES: Well was allowed to run naturally and self developed. Drill rod was put into well to surge screen. No development perameters taken

ACWD
ALAMEDA COUNTY WATER DISTRICT

MONITORING WELL SAMPLING RECORD

WELL ID: 2D2
PROJECT NO: 6241
PROJECT NAME:
DATE: 1/12/06
SAMPLED BY: Jane Lee

DEPTH TO WATER:
TOTAL DEPTH OF WELL: 450
WELL DIAMETER: 2"
CASING VOLUME:
METHOD OF PURGING: AIR LIFT @ 260'

TIME	CUMULATIVE VOL REMOVED (GALLONS)	Turbidity	~~Color~~ pH	~~Sediments~~ Temp with almonds Corrected (-1.4)	REMARKS Cond
10:55	~0	Too High	8.52	19.2	Too High (Or)
11:05	~500 gal	36.0 NTU	8.27	19.5	(Or)
11:15	~1000 gal	9.02 NTU	8.30	19.3	Or
11:25	~1500	10.7 NTU	8.31	19.0	Or
11:35	~2000	6.85 NTU	8.33	19.2	Or
11:45	~2500	5.04 NTU	8.33	19 19.4	Or
11:55	~3000 gal	4.71 NTU ~~6.86 NTU~~	8.35	18.7	Or
12:05	~3500 gal	4.27	8.35	19.4	Or

NOTES: Measured 5 gal / 6 sec 600 sec/60 sec/min every 10 min

Appendix F
Groundwater Sample
Chain-of-Custody Records

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #	SITE NAME AND ADDRESS
6241	

SAMPLER ID (NAME AND ORGANIZATION)
Jane Lee (ACWD GW)
Results to Doug Young

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: Cl 270 mg/L; TDS 1121 mg/L; HARDNESS 340 mg/L; 4	COMMENTS
	1/12/06	12:05	WELL 2D2	W	250 mL	1	X X X	

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	1/12/06	2PM	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

495 mg/L SO4
1205 mg/L TDS SO4
328 mg/L SO4

PROJECT # 62241

SITE NAME AND ADDRESS

SAMPLER ID (NAME AND ORGANIZATION)
ACWD WD2

Results to Doug Yang

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: Chlorides	TDS	Hardness done 2/1/06						COMMENTS
1	1/31/06	1610	WD2	W	250	1	X	X	X						1/2 Full Sample } Single sample
2	1/31/06	1610	WD2	W	250	1	X	X	X						1/2 Full Sample } Single sample

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	2/1/06	7:30	[signature]
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT # 1008

SITE NAME AND ADDRESS: SPRING MTG.

SAMPLER ID (NAME AND ORGANIZATION): Results to Eileen Chen
Doug Young ~~Doug Young~~ x4452

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: Chloride	TDS	hardness	COMMENTS
	~~3/23~~						~~X~~	~~X~~	~~X~~	
	3/23/05	1300	4C2	W	250ml	1	X	X	X	
	3/23/05	1500	4F1	W	250ml	1	X	X	X	

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
Patti McMahon	3/24/05	1040	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #	SITE NAME AND ADDRESS
1008	NW NILES CONE MW CONSTR. SPRING/FALL MONITORING WELLS 4D1 & 4D2

SAMPLER ID (NAME AND ORGANIZATION)
LARRY MOORE
RESULTS TO EILEEN CHEN x4486

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: CL	TDS	HARDNESS	COMMENTS
4D1	3/24/5	1030	ARDEN & EDENLAND WELL HEAD	W	250ML GLASS	1	✓	✓	✓	
4D2	3/25/5	1240	" "	W	250ML GLASS	1	✓	✓	✓	

FIELD CONDITIONS (WEATHER, ETC)
SUNNY, MILD

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
Larry Moore	3/29/5	0740	Anna Melamud
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT # 1008

SITE NAME AND ADDRESS: Spring Program 05

SAMPLER ID (NAME AND ORGANIZATION): Tien Ho

Results to E. Chen X 4486

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: TDS	Cl	HARD	COMMENTS
	3/24	945	4S/1W-28P7	W	250mL	1	X	X	X	
		845	4S/1W-28P8							
		1530	4S/1W-31C3							
	3/17/05	1545	4D2							
	3/18/05	1130	4C1							

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	3/24	1600	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT # 1008

SITE NAME AND ADDRESS: Spring Program 05'

SAMPLER ID (NAME AND ORGANIZATION): Tien Ho

Results to E. Chen X4486

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: TDS	CL	HARDNESS	COMMENTS
	3/31/05	1337	4S/1W-18M9	GW	250mL	1	X	X	X	
	↓	1430	4S/2W-21P3	↓	↓	↓	↓	↓	↓	
		1045	4S/2W 36N12							
		900	4S/2W-25M1							
	4/1/05	945	4S/2W-25D2							
	↓	1600	3D1							
		1100	4S/2W-26L2							
		1315	4S/2W-26M8							
	4/5/05	1135	4S/1W-34C1							
	↓	1130	4S/2W-35B2							
				↓		↓				

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	4/5	1620	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #	SITE NAME AND ADDRESS
1008	Fall Program 05

SAMPLER ID (NAME AND ORGANIZATION)
TIEN Ho x4486
Results to E. Chen

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: TDS	REQUESTED ANALYSES: CL	COMMENTS
	8/31	1345	4S/2W-9L2	RGW	250mL	1	X	X	
		930	4S/2W-10E4						
		1115	4S/2W-10D4A						
		1215	4S/2W-10D4B						
	9/1	1530	4S/2W-5G3						
		1145	4S/2W-5G4						
		1345	4S/2W-5G2						
		1000	4S/2W-5G1						
		1130	4S/2W-5G5						
	9/2	1000	4S/2W-9F14						
		1330	4S/2W-16C11						
		1130	4S/2W-9F10						
		1515	4S/2W-16A4						

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	9/2	1630	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

Appendix G
Permeability Laboratory Reports

Sample	Depth	Hydraulic Conductivity (K) @ 20°C (cm/sec)	Water Content (%)	Dry Density (pcf)
3D2	223.0	1.70E-07	23.6	103
3D2	320.0	<2.10E-09*	--	--
3D2	450.5	1.00E-08	25.5	88
3D2	470.0	1.30E-08	17.2	116
3D2	630.0	2.10E-09	16.5	118
4D2	592.5	<2.10E-09*	19.4	108
4D1	451.0	<2.10E-09*	18.2	113
4F1	360.0	<2.10E-09*	17.3	113

Note:
* Sample tested according to ASTM specifications, however the hydraulic conductivity too low to be determined by our equipment. The K value is therefore less than 2.10E-09, which is the lowest recordable result.

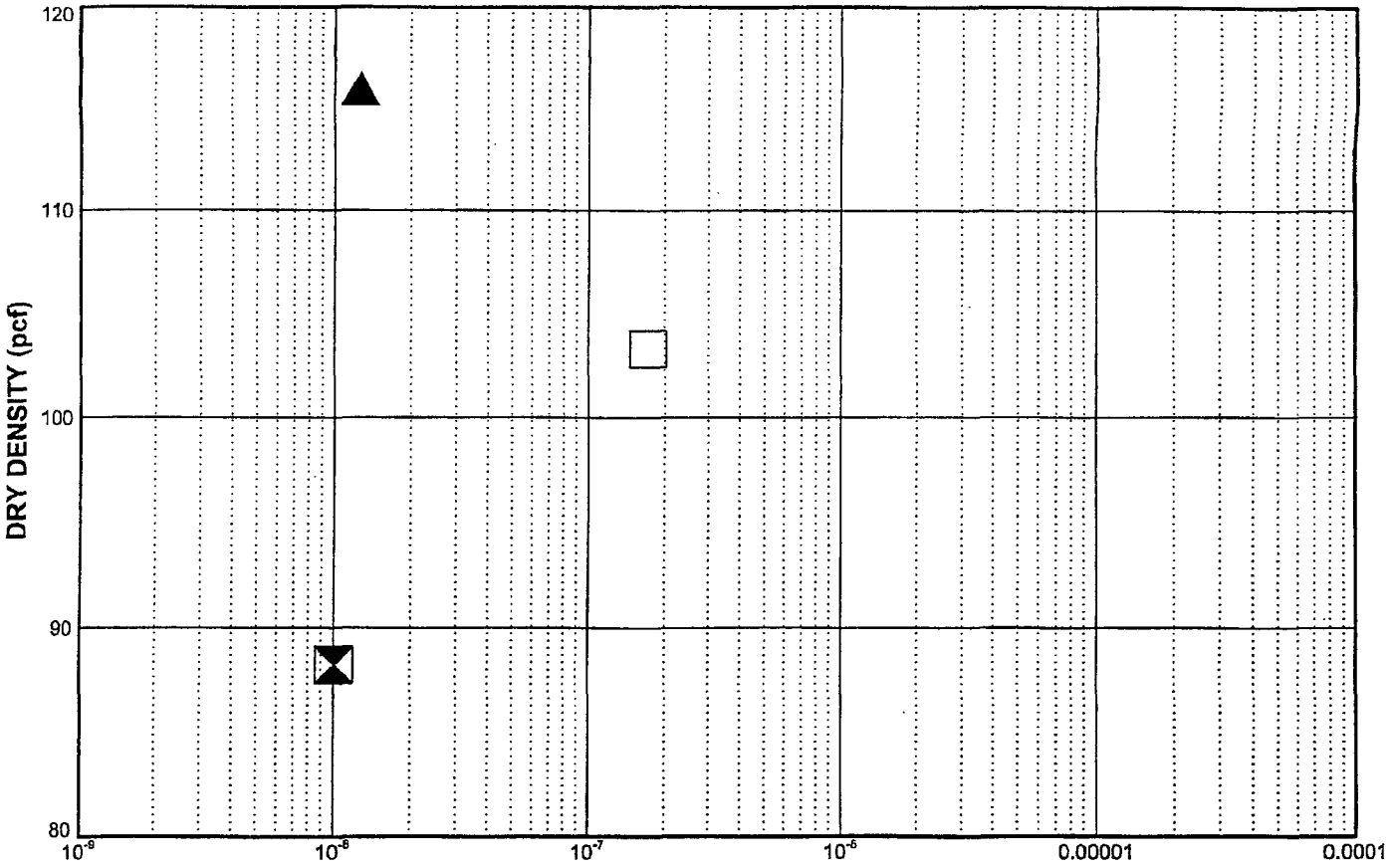
KLEINFELDER

Project No.: *52972 & 51267*

Hydraulic Conductivity Test Data (ASTM D5084)

ACDW Lab Testing

Plate 1



Test Type: FALLING HEAD *Saturation Method: BACKPRESSURE*

Symbol		□	⊠	▲
INITIAL	Diameter (mm)	62.43	61.44	61.57
	Height (mm)	54.58	90.17	64.24
	Moisture Content (%)	23.6	25.5	17.2
	Dry Density (pcf)	103	88	116
	Void Ratio			
	Saturation (%)			
FINAL	Consol. Pressure (psi)	4.00	4.00	4.00
	Water Content (%)	23.8	28.4	17.7
	Dry Density (pcf)	103	86	115
	Void Ratio			
	Saturation (%)			
Permeability (cm/sec)		1.7E-07	1.0E-08	1.3E-08
Sample Source:		3D2 @ 223.0'	3D2 @ 450.5'	3D2 @ 470.0'
Classification:		Olive Brown Silty Clay	Mottled Olive Brown Clay	Olive Brown Clay
Specimen Type:				

KLEINFELDER

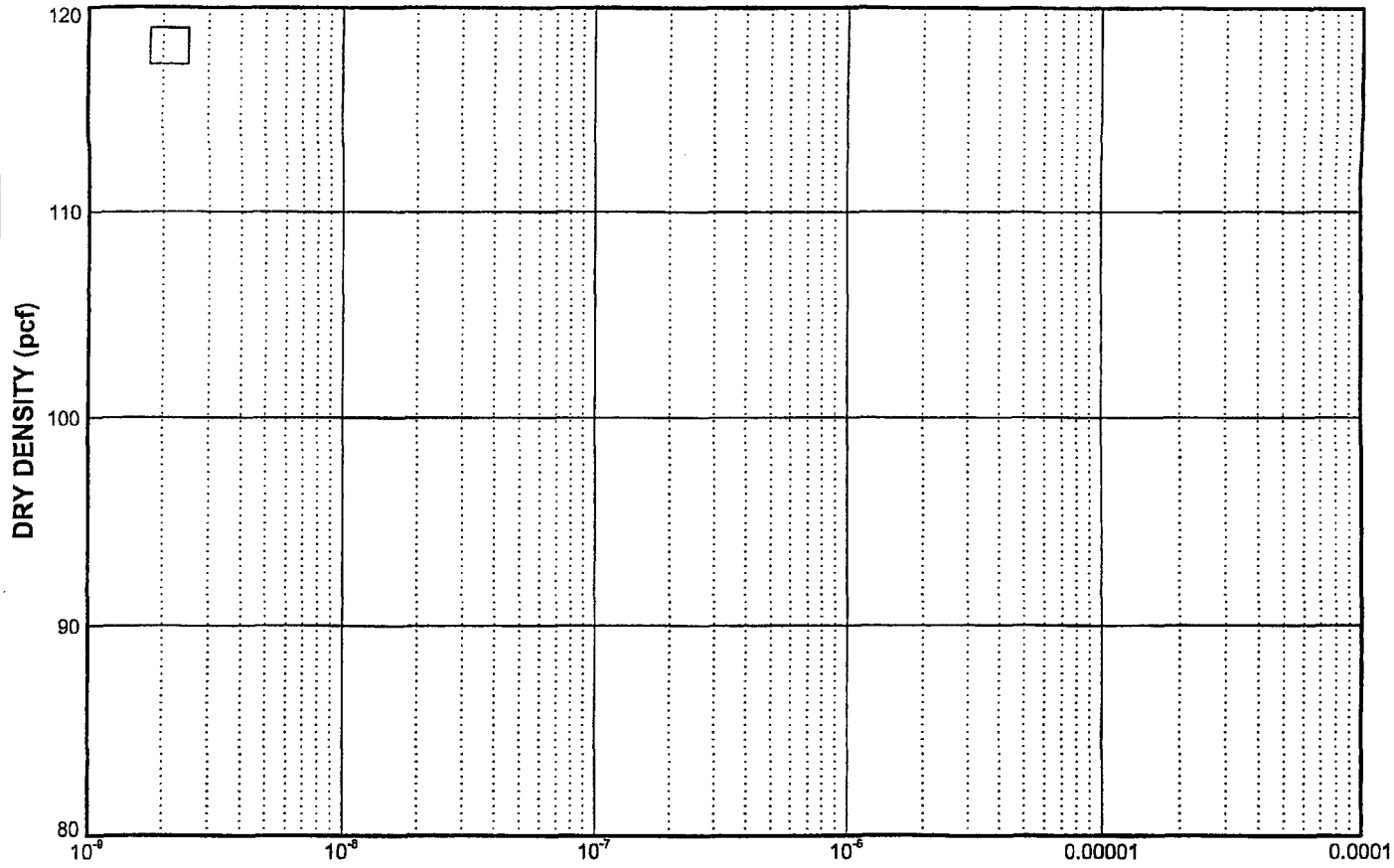
PROJECT NO. *51267*

PERMEABILITY TEST DATA

ACDW Lab Testing

PLATE

2



Test Type: FALLING HEAD *Saturation Method: BACKPRESSURE*

Symbol		□		
INITIAL	Diameter (mm)	61.34		
	Height (mm)	72.49		
	Moisture Content (%)	16.5		
	Dry Density (pcf)	118		
	Void Ratio			
	Saturation (%)			
FINAL	Consol. Pressure (psi)	4.00		
	Water Content (%)	13.1		
	Dry Density (pcf)	122		
	Void Ratio			
	Saturation (%)			
Permeability (cm/sec)		2.1E-09		
Sample Source:		3D2 @ 630.0'		
Classification:		Olive Brown Clay		
Specimen Type:				

KLEINFELDER

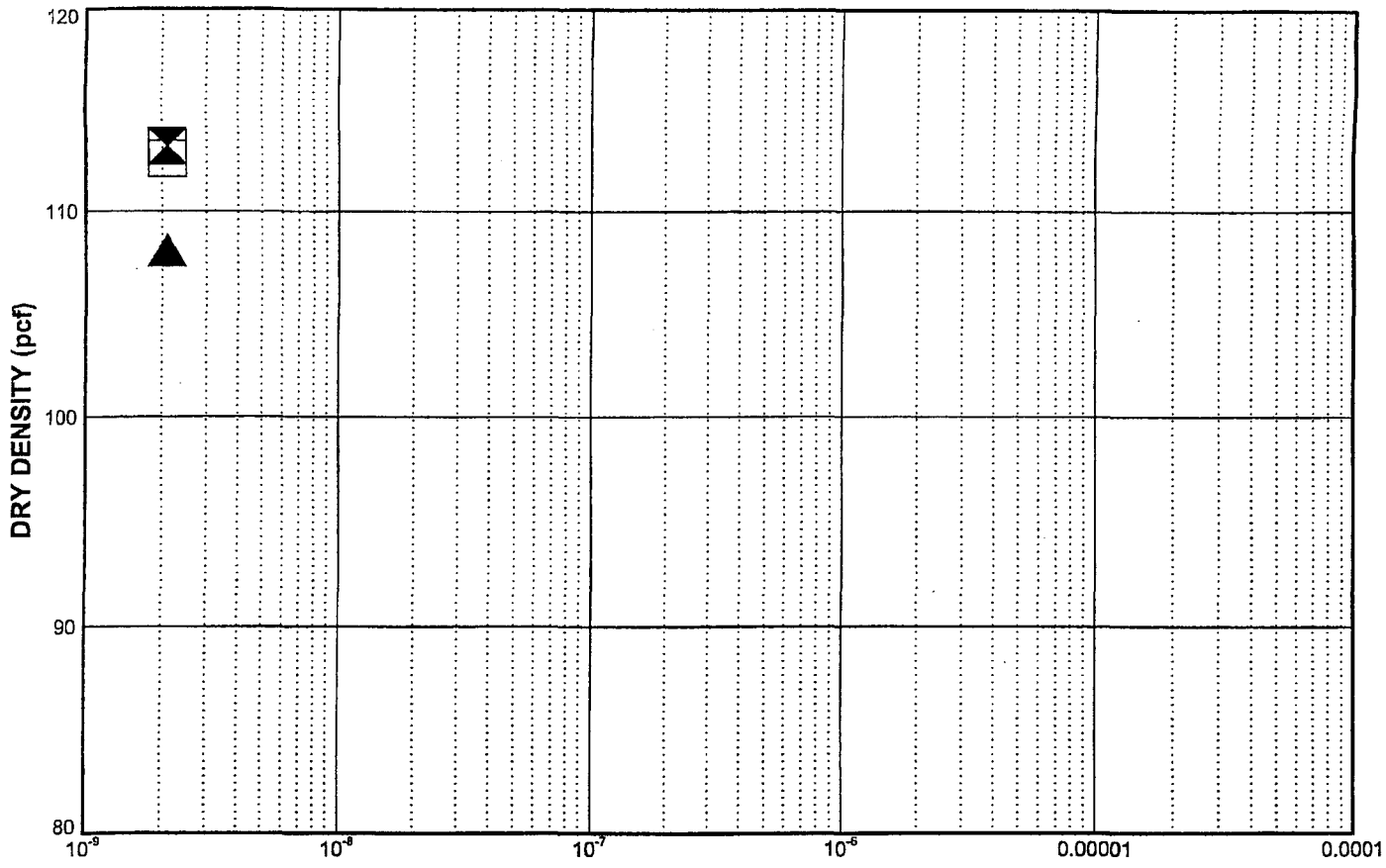
PROJECT NO. *51267*

PERMEABILITY TEST DATA

ACDW Lab Testing

PLATE

3



Test Type: FALLING HEAD *Saturation Method: BACKPRESSURE*

Symbol		□	⊠	▲
INITIAL	Diameter (mm)	61.52	61.90	49.05
	Height (mm)	91.90	75.51	76.96
	Moisture Content (%)	18.2	17.3	19.4
	Dry Density (pcf)	113	113	108
	Void Ratio			
	Saturation (%)			
FINAL	Consol. Pressure (psi)	85.00	65.00	77.00
	Water Content (%)	17.2	249.0	22.7
	Dry Density (pcf)	113	38	105
	Void Ratio			
	Saturation (%)			
Permeability (cm/sec)		<2.1E-09	<2.1E-09	<2.1E-09
Sample Source:		4D1 @ 451.0'	4F1 @ 360.0'	MW 4D2 @ 592.5'
Classification:		Olive Brown Clay	Olive Brown Clay	Olive Brown Clay
Specimen Type:				

KLEINFELDER

PROJECT NO. 52972

PERMEABILITY TEST DATA

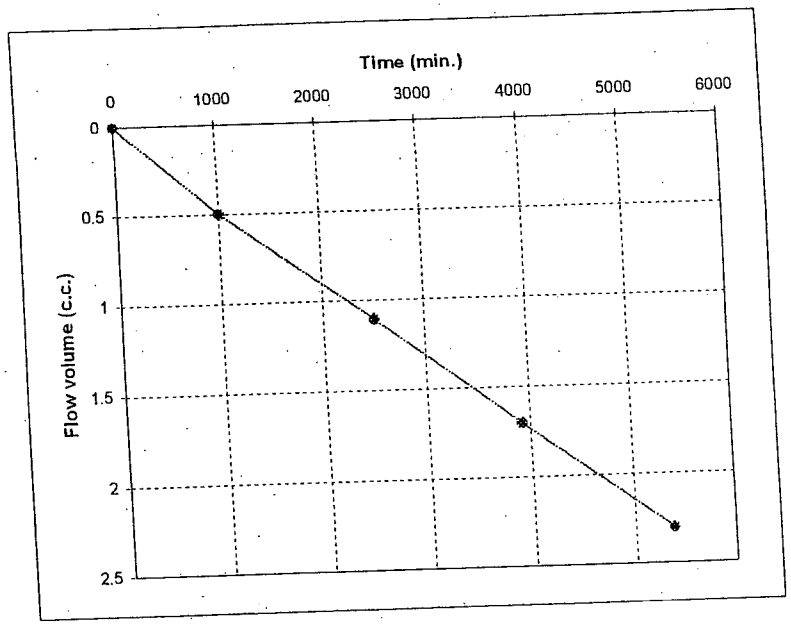
ACDW Lab Testing

PLATE

4

PERMEABILITY TEST (ASTM D5084-90, method C)

Client : Alameda County Water District
Project : New Niles Cone
Purchase Order No : 36409
Boring # : 2D2
Sample # : Site 2
Depth (ft) : 320
Date setup for test : 11/16/05
Soil type : Olive gray clay with gravel



Specimen:

	Initial	Final	
Total wt. =	873.0	823.2	gms
Ht. =	5.970	5.793	in
Ave dia. =	2.417		in
Area =	4.589	4.308	sq.in
Volume =	448.9	408.9	c.c.
Moisture =	31.3	23.8	%
Total density =	121.3	125.6	pcf
Dry density =	92.4	101.5	pcf
Gs (Assumed) =	2.70		
Void ratio =	0.823	0.661	
% Saturation =	102.7	97.3	

	Head	Tail	
Area of pipettes =	0.875	0.879	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)
1010.0	0.50	0.50	1.00	367.1	365.9	0.00311	0.974	24.9	1.16E-08
1495.0	0.50	0.60	0.83	365.9	364.7	0.00343	0.985	24.8	8.75E-09
1410.0	0.50	0.60	0.83	364.7	363.4	0.00345	0.974	24.7	9.21E-09
1475.0	0.60	0.60	1.00	363.4	362.0	0.00377	0.970	24.7	9.60E-09
1535.0	0.60	0.50	1.20	362.0	360.8	0.00347	0.991	24.6	8.67E-09

Overall average: 9.57E-09

PERMEABILITY TEST (ASTM D5084-90, method C

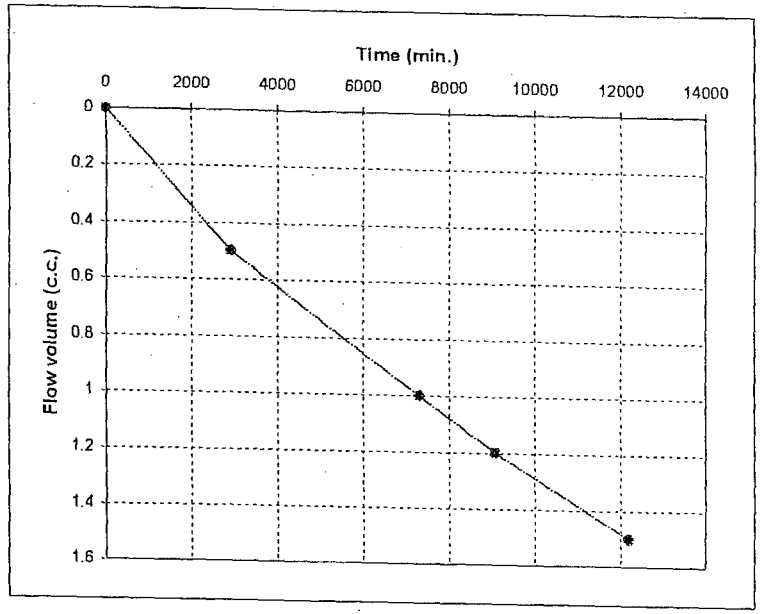
Client : Alameda County Water District
Project : New Niles Cone
Purchase Order No : 36409
Boring # : 2D2
Sample # : Well Site
Depth (ft) : 455
Date setup for test : 11/18/05
Soil type : Yellowish brown silty clay

Specimen:

		Initial	Final	
Total wt.	=	1011.0	1025.4	gms
Ht.	=	6.000	5.996	in
Ave dia.	=	2.430		in
Area	=	4.640	4.633	sq.in
Volume	=	456.2	455.2	c.c.
Moisture	=	14.4	16.1	%
Total density	=	138.3	140.6	pcf
Dry density	=	120.8	121.1	pcf
Gs (Assumed)	=	2.70		
Void ratio	=	0.394	0.391	
% Saturation	=	98.9	110.9	

		Head	Tail	
Area of pipettes	=	0.865	0.875	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)
2905.0	0.00	0.50	0.00	373.0	372.5	0.00153	0.974	24.5	1.90E-09
4400.0	0.20	0.50	0.40	374.3	373.5	0.00215	1.008	24.6	1.82E-09
1760.0	0.10	0.20	0.50	373.5	373.1	0.00092	0.997	24.5	1.93E-09
3140.0	0.20	0.30	0.67	373.1	372.6	0.00154	0.970	24.5	1.76E-09
2300.0	0.10	0.20	0.50	372.6	372.2	0.00092	0.978	24.5	1.45E-09

Overall average: 1.77E-09

PERMEABILITY TEST (ASTM D5084-90, metho)

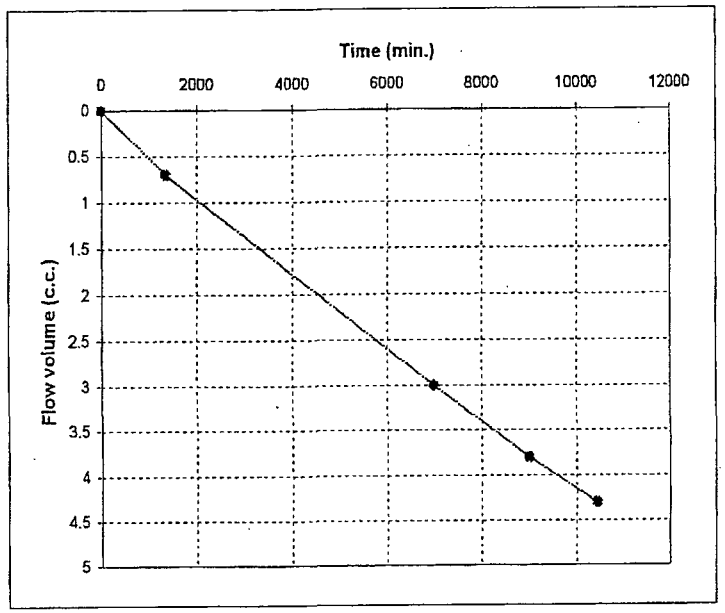
Client : Alameda County Water District
Project : NW Niles Cone MW Project
Job # : 29374 PO# 36409
Boring # : 2D2
Sample # :
Depth (ft) : 548.5
Date setup for test : 12/20/05
Soil type : Olive gray clay

Specimen:

		Initial	Final	
Total wt.	=	620.3	631.7	gms
Ht.	=	4.010	4.006	in
Ave dia.	=	2.427		in
Area	=	4.627	4.617	sq.in
Volume	=	304.0	303.0	c.c.
Moisture	=	22.5	24.7	%
Total density	=	127.3	130.1	pcf
Dry density	=	103.9	104.3	pcf
Gs (Assumed)	=	2.70		
Void ratio	=	0.621	0.616	
% Saturation	=	97.8	108.5	

		Head	Tail	
Area of pipettes	=	0.875	0.875	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)
1345.0	0.60	0.70	0.86	374.6	373.1	0.00397	0.974	36.7	7.17E-09
5663.0	2.60	2.30	1.13	373.1	367.5	0.01513	0.987	36.4	6.57E-09
1995.0	0.70	0.80	0.87	367.5	365.8	0.00468	0.970	36.0	5.66E-09
1436.0	0.60	0.50	1.20	365.8	364.5	0.00344	0.930	35.9	5.55E-09
1469.0	0.50	0.60	0.83	364.5	363.2	0.00346	0.930	35.8	5.45E-09

7.60E-09
4.86E-09

Overall average: 6.08E-09

PERMEABILITY TEST (ASTM D5084-90, method C)

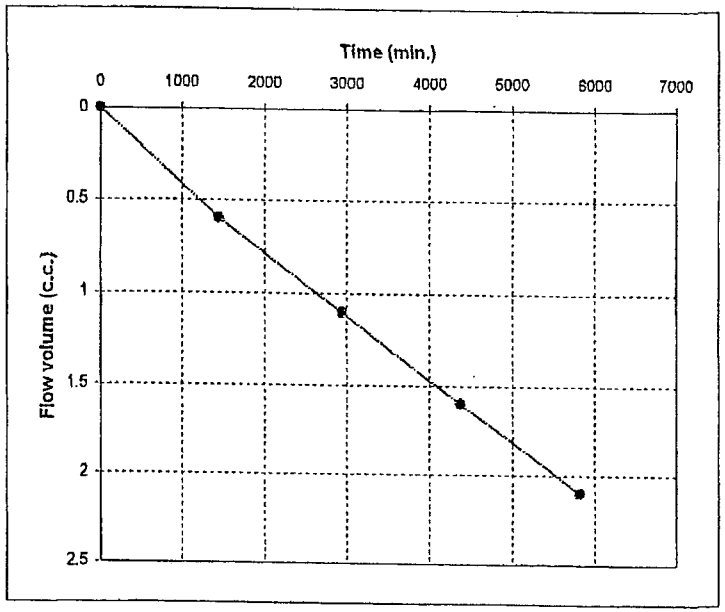
Client : Alameda County Water District
Project : NW Niles Cone MW Project
Job # : 6241
Boring # : WD2
Sample # :
Depth (ft) : 311
Date setup for test : 01/07/06
Soil type : Olive brown clay

Specimen:

		Initial	Final	
Total wt.	=	540.2	522.3	gms
Ht.	=	3.910	3.905	in
Ave dia.	=	2.363		in
Area	=	4.388	4.378	sq.in
Volume	=	281.2	280.2	c.c.
Moisture	=	24.2	20.0	%
Total density	=	119.9	116.3	pcf
Dry density	=	96.6	96.9	pcf
Gs (Assumed)	=	2.70		
Void ratio	=	0.745	0.739	
% Saturation	=	87.6	73.3	

		Head	Tail	
Area of pipettes	=	0.875	0.879	sq. cm.

Sig3 = 20



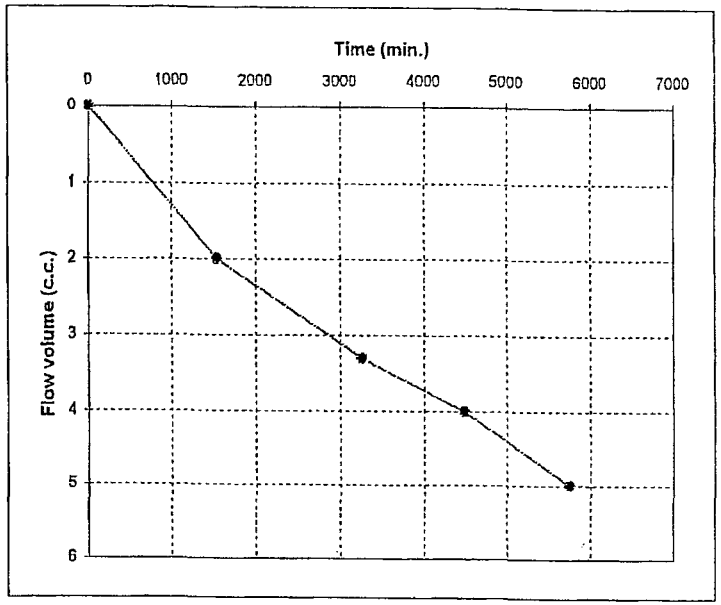
Data reductions:

Elapsed Time (min)	Inflow (c.c.)	Outflow (c.c.)	Inflow / Outflow	h1 (cm)	h2 (cm)	Ln(h1/h2)	Rt	Gradient	K20 (cm/sec)
1442.0	0.40	0.60	0.67	370.0	368.9	0.00309	0.970	37.2	5.33E-09
1493.0	0.40	0.50	0.80	368.9	367.8	0.00279	0.984	37.1	4.71E-09
1440.0	0.50	0.50	1.00	367.8	366.7	0.00311	0.981	37.0	5.43E-09
1440.0	0.50	0.50	1.00	366.7	365.6	0.00311	1.018	36.9	5.65E-09
1440.0	0.50	0.50	1.00	365.6	364.4	0.00312	1.021	36.8	5.68E-09
									6.70E-09
									4.29E-09

Overall average: 5.36E-09

PERMEABILITY TEST (ASTM D5084-90, method C)

Client : Alameda County Water District
Project : NW Niles Cone MW Project
Job # : 6241
Boring # : WD2
Sample # :
Depth (ft) : 631.5
Date setup for test : 01/30/06
Soil type : Olive gray gravelly clay



Specimen:

	Initial	Final	
Total wt. =	792.8	465.3	gms
Ht. =	4.520	4.516	in
Ave dia. =	2.430		in
Area =	4.640	4.631	sq.in
Volume =	343.6	342.6	c.c.
Moisture =	134.9	37.9	%
Total density =	144.0	84.7	pcf
Dry density =	61.3	61.5	pcf
Gs (Assumed) =	2.70		
Void ratio =	1.749	1.741	
% Saturation =	208.3	58.7	

	Head	Tail	
Area of pipettes =	0.875	0.879	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)
1542.0	1.00	2.00	0.50	371.6	368.2	0.00924	0.964	32.2	1.62E-08
1715.0	1.20	1.30	0.92	368.2	365.3	0.00777	0.978	32.0	1.24E-08
1240.0	0.80	0.70	1.14	365.3	363.6	0.00469	0.984	31.8	1.04E-08
1260.0	1.00	1.00	1.00	363.6	361.3	0.00629	1.001	31.6	1.40E-08
1540.0	1.00	1.00	1.00	361.3	359.1	0.00633	1.001	31.4	1.15E-08

1.62E-08
1.03E-08

Overall average: 1.29E-08

SIGNET Testing Labs

March 15, 2006

REPORT NO: 05G265

STL NO.: 0018092
PO NO.: 36409 OS

REPORT TO: ALAMEDA COUNTY WATER DISTRICT
MR. DOUG YOUNG
43885 SOUTH GRIMMER BOULEVARD
FREMONT, CA 94538

PROJECT: GEO LAB - DOUG YOUNG
43885 SOUTH GRIMMER BOULEVARD
FREMONT, CA

SUBJECT: GEOTECHNICAL LABORATORY TESTING

REPORT

Our firm has performed laboratory testing for the above referenced project. Please see the attached laboratory data sheets for test information.

We trust that this information will meet your needs at this time. If additional information is required, or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,
SIGNET TESTING LABORATORIES, INC.

Patricia Slavin-Hodgkins
Geotechnical Laboratory Manager

PMH/kv

cc: ALAMEDA COUNTY WATER DISTRICT/MR. DOUG YOUNG
* FILE COPY*

3121 Diablo Avenue • Hayward, CA 94545 • (510) 887-8484 • Fax: (510) 783-4295

[redacted] Testing Labs, Inc. 05G265

PROJECT: ACWD STL NO.: 0018092

REQUESTED BY: Doug Young

DATE RECEIVED:	11-23-05
DATE DUE:	
DATE COMPLETED:	3-10-06

Client's P.O. #: 36409
Client's Project #: 29374
Client's Project Name: NW Niles Cone MW Project

SAMPLE I.D.

Test Description	Work To Be Performed	Remarks	Code	QTY	Lab Use ONLY Price	Lab Use ONLY Subtotal
INDEX TESTS						
Moisture			2221			
Moisture/Density "U" Type			2222			
Moisture/Density Piston			2223			
Moisture/Density Shelby/Pitcher			2224			
Liquid & Plastic Limits (Dry)			2225			
Liquid & Plastic Limits (Wet)			2226			
% passing #200 sieve			2227			
Sieve (from 1/2" to #200)			2228			
Sieve (from 1" to #200)			2229			
Sieve (from 2" to #200)			2230			
Sieve plus Hydrometer			2231			
Specific Gravity			2232			
Organic Content			2233			
Visual Classification			2234			
Pinhole			2235			
COMPACTION TESTS						
Standard Proctor 4" mold			2237			
Standard Proctor 6" mold			2238			
Modified Proctor 4" mold			2239			
Modified Proctor 6" mold			2240			
Single Point 4" mold			2241			
Single Point 6" mold			2242			
Calif. Impact test (Calif 216)			2243			
Relative Density (0.1 cu. ft.)			2244			
HYDRAULIC CONDUCTIVITY						
Rigid wall						
Constant head (spec ht. ~ 1")			2246			
Falling head (spec ht. ~ 1")			2247			
Additional stress level			2248			
Remold test specimen			2249			
Flexible wall						
Sandy soil			2250			
Clayey soil			2251	1		
Additional stress level			2252			
Remold test specimen			2253			
Compatability			2254			
CONSOLIDATION PROPERTIES						
Consolidation (1 cycle, 1 time rate)			2256			
Additional Time-Rate curve			2257			
Unload Reload cycle			2258			

SIGNET TESTING LAB
ATTN: PATRICIA SLAVIN
E-MAIL: PATRICIA_SLAVIN-HODGKINS@URSCORP.COM

3121 DIABLO AVENUE
HAYWARD, CA 94545

(510) 887-8484 x158
FAX: (510) 732-5060
LAB EXTENSION: 117

INFORMATION FROM CLIENT

Company Name Alameda County
Delivered By
Project Manager Doug Young
Phone Number *
Fax Number *
Email Address *
Project Name NW Niles Cone MW Project 29374 *
Project Number ~~36409~~ 29374 PO# 36409 *

DATES

SAMPLES RECEIVED 11-23-05
TEST REQUEST RECEIVED
* PRELIMINARY NEEDED
* FINALS NEEDED

SIGNET TESTING INFO

GEOTECH LAB NO 05G265
SOILS LAB NO
STL NUMBER

PAGE ____ OF ____

BORING NO	SAMPLE NO	DEPTH (ft)	Baggie	2.43 X6"	SHELBY TUBE	2.43 X 20"	1.93x6"	Moisture Content	MC with Dry Density	% Passing No 200 Sieve	Sieve (No. 4-No.200)	Hydrometer	Plasticity Index	Unconfined Compression	Direct Shear	Consolidation with 1 TR	Triaxial-UU	Triaxial CU	Triaxial Perm	Compaction	R-value	LVS	Remold	Specific Gravity	Organic Content	Log Tube			SPECIAL INSTRUCTIONS: TXUU'S =Confining Pressure (PSF), DIRECT SHEAR = Normal Loads, CONSOLS = Time Rate Load, REMOLDING INSTRUCTIONS (I.e. ##% of MDD at OMC +#%), etc
2D2		54&5																X											confining pressure = 20psi. hydraulic gradient = 5psi
PAGE TOTALS								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROJECT TOTALS																													
SIGNET BILLING								2221	2222	2227	2228	2231	2226	2267		2256	2270	2272	2251		4232				2232	2233			

Alameda County Water District
Chain of Custody

Project: NW Livermore Core MW project
Project #: [redacted] 29374
Sampler ID: 2D2 @ 548.5

P.O. # 36409

ID #	Date	Time	Sampling Location	Sample Matrix S= Soil W = Water	Type of Container	Number of Containers	Metals Asym method D-5084							Comments
	11/22/05	1330	2D2 @ 548.5	S	brass	1								

Field Conditions (weather, etc.)

clear, cool

Field Procedures (Preservation, Quality Control, etc.)

Brass liner

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
Sean Hattin	11/23/05	3:10	
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LAB BY:

LABORATORY COMMENTS: (SAMPLE CONDITION, PRESERVATION, ETC.)

PERMEABILITY TEST (ASTM D5084-90, method C)

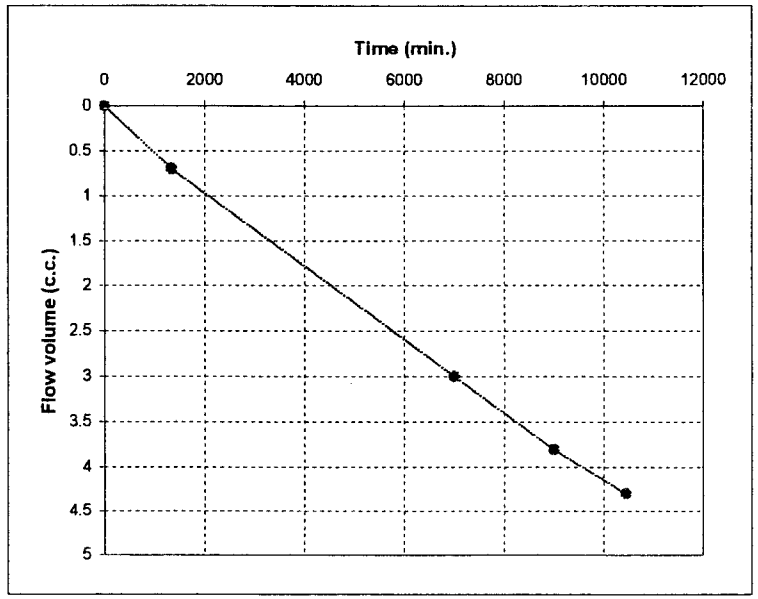
Client : Alameda County Water District
Project : NW Niles Cone MW Project
Job # : 29374 PO# 36409
Boring # : 2D2
Sample # :
Depth (ft) : 548.5
Date setup for test : 12/20/05
Soil type : Olive gray clay

Specimen:

		Initial	Final	
Total wt.	=	620.3	631.7	gms
Ht.	=	4.010	4.006	in
Ave dia.	=	2.427		in
Area	=	4.627	4.617	sq.in
Volume	=	304.0	303.0	c.c.
Moisture	=	22.5	24.7	%
Total density	=	127.3	130.1	pcf
Dry density	=	103.9	104.3	pcf
Gs (Assumed)	=	2.70		
Void ratio	=	0.621	0.616	
% Saturation	=	97.8	108.5	

		Head	Tail	
Area of pipettes	=	0.875	0.875	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)
1345.0	0.60	0.70	0.86	374.6	373.1	0.00397	0.974	36.7	7.17E-09
5663.0	2.60	2.30	1.13	373.1	367.5	0.01513	0.987	36.4	6.57E-09
1995.0	0.70	0.80	0.87	367.5	365.8	0.00468	0.970	36.0	5.66E-09
1436.0	0.60	0.50	1.20	365.8	364.5	0.00344	0.930	35.9	5.55E-09
1469.0	0.50	0.60	0.83	364.5	363.2	0.00346	0.930	35.8	5.45E-09

Overall average: 6.08E-09

Permeabilty Test

Lab No. 056265

Client : Alameda County Water District
Project Name : NW Niles Cone MW Project
Project Number : 29374 PO# 36409
Boring Number : 202
Sample Number :
Depth (ft) : 548.5
SigC = _____ psf = 20 psi
Date tested : 12-20-05
Tested by : PH
Visual Classification : Olive gray Clay

Tube Type : 2" x 6" (2.43 x 6") 2.87" x 36"
2.43" x 20" (circle one)

Sample conditions : Undisturbed or Remolded
~~(circle one)~~

	Before Test	After Test	Trimming
Specimen Wt (gm) =	620.29		
Specimen Ht (in) =	4.01		
Dia (in) - top =	2.43		
- mid =	2.42		
- bot =	2.43		
Dish # =		3	
Wet soil + dish (gm) =		916.0	
Dry soil + dish (gm) =		790.71	
Wt. of dish (gm) =		284.32	

sample had 1/8-1/4" gouge up one side - tried to patch.

CELL NO. K

STATION NUMBER PP-SG

TOP

BOTTOM

Length of Tube 6"

if sample was 2.43" x 20" or 2.87" x 36" sketch where sample was taken from in the tube

Be sure you mark where the soil started and ended if the tube was not completely full to each end

Signet Testing Labs

Computerized By_____

Checked by PH

Laboratory Test Data

Client: Alameda County — Lab No. 056265

Project: NW Niles Cone MW Project — Job no.: 29374 PO# 36409

Boring No. 202 — Sample No. ____ — Depth. 548.5

Classification: Olive gray clay — Type of test: Perm — SigC = 20

Cell No. K — (for perms only) Hydraulic Gradient = .5

STATION NO. PP-SG

		Applied Pressure (psi)			Burette Readings (c.c.)							
Date	Time	Cell	Back (bot.)	Back (top)	Cell	Head	Tail	P.W.P. (psi)	Chg. in P.W.P.	Chg. in Cell P.	"B" Value	Notes
12-20	11:00	2	0	0	0.2	0.0	0.0	FLUSH / REFILL				
	1115	2	0	0	0.3	0.2	1.0	SEEP				
12-27	10:45	2	0	0	3.9	2.0	1.0	FLUSH / REFILL				
	10:53	12	10	10	3.9	0.8	1.0	BP				
	12:00	22	20	20	5.0	1.2	2.2					
	13:25	32	30	30	6.3	1.4	2.6					
	14:35	42	40	40	7.9	1.5	2.9					
	16:00	52	50	50	9.3	1.7	3.2					
12-28	13:40	52	50	50	9.5	2.4	3.9					
		62					BV	50.9	60.7	9.8	0.98	
	13:42	70	50	50	14.7	2.4	3.9					
	13:46	✓	✓	✓	15.7	2.1	3.4					
12-29	1018	✓	✓	✓	0.0	-0.5	0.7					
				reset	FOR PERM							
12-29	10:22	70	55	50	10.0	1.0	21.0	70°F				
12-30	0847				14.2	1.6	20.3	70.5°F				
1-3	0710				18.3	4.2	18.0	68.0				
1-4	1625				18.5	4.9	17.2	73°F				
1-5	1621				18.8	5.5	16.7	74.0				
1-6	1650				19.2	6.0	16.1	73.0				

Draft computerized by_____

SIGNET Testing Labs

March 15, 2006

REPORT NO: 06G001

STL NO.: 0018092
PO NO.: 36409 OS

REPORT TO: ALAMEDA COUNTY WATER DISTRICT
MR. DOUG YOUNG
43885 SOUTH GRIMMER BOULEVARD
FREMONT, CA 94538

PROJECT: GEO LAB - DOUG YOUNG
43885 SOUTH GRIMMER BOULEVARD
FREMONT, CA

SUBJECT: GEOTECHNICAL LABORATORY TESTING

REPORT

Our firm has performed laboratory testing for the above referenced project. Please see the attached laboratory data sheets for test information.

We trust that this information will meet your needs at this time. If additional information is required, or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,
SIGNET TESTING LABORATORIES, INC.

Patricia Slavin-Hodgkins
Geotechnical Laboratory Manager

PMH/kv

cc: ALAMEDA COUNTY WATER DISTRICT/MR. DOUG YOUNG
* FILE COPY*

3121 Diablo Avenue • Hayward, CA 94545 • (510) 887-8484 • Fax: (510) 783-4295

[redacted] Testing Labs, Inc. 06G001

PROJECT: ACWD STL NO.: 001809.2

REQUESTED BY: Doug Young

DATE RECEIVED: 12-20-05
DATE DUE:
DATE COMPLETED: 3-10-06

Client's P.O. #: 36409
Client's Project #: 29374
Client's Project Name: NW Niles Cone MW Project

Test Description	Work To Be Performed	Remarks	Code	QTY	Lab Use ONLY Price	Lab Use ONLY Subtotal
INDEX TESTS						
Moisture			2221			
Moisture/Density "U" Type			2222			
Moisture/Density Piston			2223			
Moisture/Density Shelby/Pitcher			2224			
Liquid & Plastic Limits (Dry)			2225			
Liquid & Plastic Limits (Wet)			2226			
% passing #200 sieve			2227			
Sieve (from 1/2" to #200)			2228			
Sieve (from 1" to #200)			2229			
Sieve (from 2" to #200)			2230			
Sieve plus Hydrometer			2231			
Specific Gravity			2232			
Organic Content			2233			
Visual Classification			2234			
Pinhole			2235			
COMPACTION TESTS						
Standard Proctor 4" mold			2237			
Standard Proctor 6" mold			2238			
Modified Proctor 4" mold			2239			
Modified Proctor 6" mold			2240			
Single Point 4" mold			2241			
Single Point 6" mold			2242			
Calif. Impact test (Calif 216)			2243			
Relative Density (0.1 cu. ft.)			2244			
HYDRAULIC CONDUCTIVITY						
Rigid wall						
Constant head (spec ht. ~ 1")			2246			
Falling head (spec ht. ~ 1")			2247			
Additional stress level			2248			
Remold test specimen			2249			
Flexible wall						
Sandy soil			2250			
Clayey soil			2251	1		
Additional stress level			2252			
Remold test specimen			2253			
Compatability			2254			
CONSOLIDATION PROPERTIES						
Consolidation (1 cycle, 1 time rate)			2256			
Additional Time-Rate curve			2257			
Unload-Reload cycle			2258			

SIGNET TESTING LAB
ATTN: PATRICIA SLAVIN
E-MAIL: PATRICIA_SLAVIN-HODGKINS@URSCORP.COM

3121 DIABLO AVENUE
HAYWARD, CA 94545

(510) 887-8484 x158
FAX: (510) 732-5060
LAB EXTENSION. 117

INFORMATION FROM CLIENT

Company Name Alameda County
Delivered By
Project Manager Doug Young
Phone Number *
Fax Number *
Email Address *
Project Name NW Niles Cone MW Project *
Project Number 6241 *

DATES

SAMPLES RECEIVED 12-20-05
TEST REQUEST RECEIVED
* PRELIMINARY NEEDED
* FINALS NEEDED

SIGNET TESTING INFO

GEOTECH LAB NO 06G001
SOILS LAB NO
STL NUMBER 0018092

PAGE ____ OF ____

BORING NO	SAMPLE NO	DEPTH (ft)	Baggie	2.43 X6"	SHELBY TUBE	2.43 X 20"	1.93x6"	Moisture Content	MC with Dry Density	% Passing No 200 Sieve	Sieve (No. 4-No.200)	Hydrometer	Plasticity Index	Unconfined Compression	Direct Shear	Consolidation with 1 TR	Triaxial-UU	Triaxial CU	Triaxial Perm	Compaction	R-value	LVS	Remold	Specific Gravity	Organic Content	Log Tube				SPECIAL INSTRUCTIONS: TXUU'S =Confining Pressure (PSF), DIRECT SHEAR = Normal Loads, CONSOLS = Time Rate Load, REMOLDING INSTRUCTIONS (I.e. ###% of MDD at OMC +#%), etc
WD2		31'	✓															⧓												Conf press = 20 hyd. grad = 5
PAGE TOTALS								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PROJECT TOTALS																														
SIGNET BILLING								2221	2222	2227	2228	2231	2226	2267		2256	2270	2272	2251		4232			2232	2233					

Alameda County Water District
Chain of Custody

066001

Project: N W Niles Cone MW Project
Project #: 6241
Sampler ID: WD2 @ 311

ID #	Date	Time	Sampling Location	Sample Matrix S= Soil W = Water	Type of Container	Number of Containers	~~Metals~~ ASTM Method D-5084						Comments
1	12/16/05	11:00	WD2	S	brass	1	X						

Field Conditions (weather, etc.)
cloudy + overcast

Field Procedures (Preservation, Quality Control, etc.)

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
[signature]	12/14/05	16:00	[signature]
RELINQUISHED BY: [signature]	DATE: 12/29/05	TIME: 13:30	RECEIVED BY: [signature]
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LAB BY:

LABORATORY COMMENTS: (SAMPLE CONDITION, PRESERVATION, ETC.)
Report to: Doug Young
(510) 668-4452 phone
Fax # 510-651-1760

PERMEABILITY TEST (ASTM D5084-90, method C)

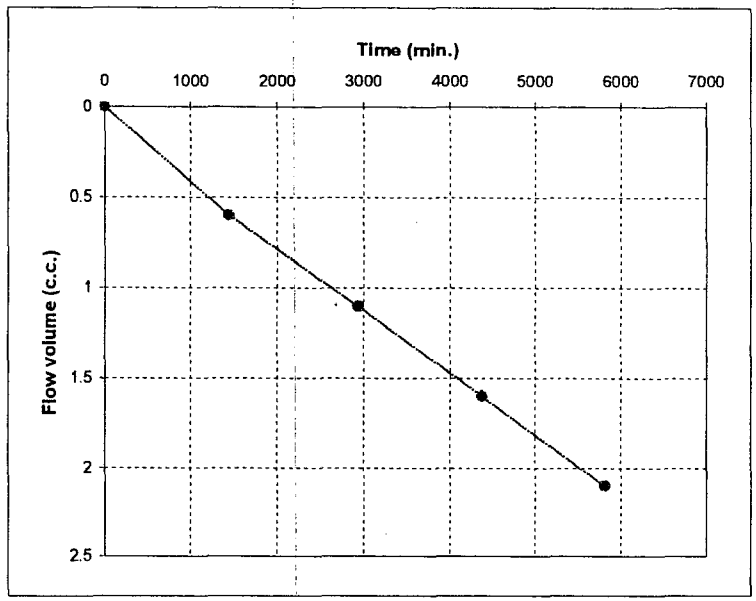
Client : Alameda County Water District
Project : NW Niles Cone MW Project
Job # : 6241
Boring # : WD2
Sample # :
Depth (ft) : 311
Date setup for test : 01/07/06
Soil type : Olive brown clay

Specimen:

	Initial	Final	
Total wt. =	540.2	522.3	gms
Ht. =	3.910	3.905	in
Ave dia. =	2.363		in
Area =	4.388	4.378	sq.in
Volume =	281.2	280.2	c.c.
Moisture =	24.2	20.0	%
Total density =	119.9	116.3	pcf
Dry density =	96.6	96.9	pcf
Gs (Assumed) =	2.70		
Void ratio =	0.745	0.739	
% Saturation =	87.6	73.3	

	Head	Tail	
Area of pipettes =	0.875	0.879	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)
1442.0	0.40	0.60	0.67	370.0	368.9	0.00309	0.970	37.2	5.33E-09
1493.0	0.40	0.50	0.80	368.9	367.8	0.00279	0.984	37.1	4.71E-09
1440.0	0.50	0.50	1.00	367.8	366.7	0.00311	0.981	37.0	5.43E-09
1440.0	0.50	0.50	1.00	366.7	365.6	0.00311	1.018	36.9	5.65E-09
1440.0	0.50	0.50	1.00	365.6	364.4	0.00312	1.021	36.8	5.68E-09

Overall average: 5.36E-09

Permeabilty Test

Lab No. 06G001

Client : Alameda County Water District
Project Name : NW Niles Cone MW Project
Project Number : 6241
Boring Number : WD 2
Sample Number :
Depth (ft) : 311
SigC = _____ psf = 20 psi
Date tested : 1-7-06
Tested by : JH
Visual Classification : olive brown clay

Tube Type : 2" x 6" (2.43 x 6") 2.87" x 36"
2.43" x 20" (circle one)

Sample conditions : Undisturbed or Remolded
(circle one)

	Before Test	After Test	Trimming
Specimen Wt (gm) =	540.22		
Specimen Ht (in) =	3.91		
Dia (in) - top =	2.37		
- mid =	2.36		
- bot =	2.36		
Dish # =		18	
Wet soil + dish (gm) =		817.6	
Dry soil + dish (gm) =		730.37	
Wt. of dish (gm) =		295.30	

CELL NO. K

STATION NUMBER
PA 5 G1

TOP

Length of Tube___

BOTTOM

if sample was 2.43" x 20" or 2.87" x 36" sketch where sample was taken from in the tube

Be sure you mark where the soil started and ended if the tube was not completely full to each end

Signet Testing Labs

Computerized By_____

Checked by PH

Laboratory Test Data

Client: Alameda County Lab No 060001

Project: New Niles Canyon Fill Project Job no.: 6241

Boring No. WD2 Sample No. _____ Depth. 3/1

Classification: olive brown clay Type of test: Perm SigC = 20

Cell No. 12 (for perms only) Hydraulic Gradient = 0.1

		Applied Pressure (psi)			Burette Readings (c.c.)			STATION NO. RP-56				
Date	Time	Cell	Back (bot.)	Back (top)	Cell	Head 9.00	Tail 8.96	P.W.P. (psi)	Chg. in P.W.P.	Chg. in Cell P.	"B" Value	Notes
1-7	1755	0	0	0	0.7	1.0	2.7	F/R				
	1805	2	0	0	6.6	0.5	0.5	Seep				
1-8	1000	2	0	0	11.3	0.4	0.5	F/R				
	1030	2	0	0	11.5	0.5	0.7					
	1145	12	10	10	14.7	1.7	1.4					
	1245	22	20	20	17.0	1.9	1.7					
	1405	32	30	30	18.7	2.2	1.9					
	1510	42	40	40	20.3	2.3	2.1					
1-9	1710	52	50	50	22.5	2.6	2.3	50.9	9.7	10	(.97)	
		62	Control		22.5	2.6	2.3	60.5				
	1715	62	42	42	6.8	21.1	21.1					
1-10	735	62	42	42	18.7	15.0	15.4					
		Perm										
	737	62	47	42	18.7	3.5	21.0				68.0	
1-11	840				20.3	3.5	19.5				71.0	
		Reset Cell Burette										
1-11	905	62	47	42	9.0	3.5	19.6				72.0	
1-12	907				9.5	3.9	19.0				69.0	
1-13	1000				9.7	4.3	18.5				70.0	
1-14	1000				9.8	4.8	18.0				69.5	
1-15	1000				10.0	5.3	17.5				64.5	
1-16	1000				10.2	5.8	17.0				69.0	

Draft computerized by _____

Signet Testing Labs, Inc.

SIGNET Testing Labs

March 15, 2006

REPORT NO: 06G018

STL NO.: 0018092
PO NO.: 36409 OS

REPORT TO: ALAMEDA COUNTY WATER DISTRICT
MR. DOUG YOUNG
43885 SOUTH GRIMMER BOULEVARD
FREMONT, CA 94538

PROJECT: GEO LAB - DOUG YOUNG
43885 SOUTH GRIMMER BOULEVARD
FREMONT, CA

SUBJECT: GEOTECHNICAL LABORATORY TESTING

REPORT

Our firm has performed laboratory testing for the above referenced project. Please see the attached laboratory data sheets for test information.

We trust that this information will meet your needs at this time. If additional information is required, or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,
SIGNET TESTING LABORATORIES, INC.

Patricia Slavin-Hodgkins
Geotechnical Laboratory Manager

PMH/kv

cc: ALAMEDA COUNTY WATER DISTRICT/MR. DOUG YOUNG
* FILE COPY*

3121 Diablo Avenue • Hayward, CA 94545 • (510) 887-8484 • Fax: (510) 783-4295

Testing Labs, Inc. 06G018

PROJECT: ACWD STL NO.: 0018092

REQUESTED BY: Doug Young

DATE RECEIVED:	1-12-06
DATE DUE:	
DATE COMPLETED:	3-10-06

Client's P.O. #: 36409
Client's Project #: 29374
Client's Project Name: NW Niles Cone MW Project

SAMPLE I.D.

Test Description	Work To Be Performed	Remarks	Code	QTY	Price	Subtotal
INDEX TESTS						
Moisture			2221			
Moisture/Density "U" Type			2222			
Moisture/Density Piston			2223			
Moisture/Density Shelby/Pitcher			2224			
Liquid & Plastic Limits (Dry)			2225			
Liquid & Plastic Limits (Wet)			2226			
% passing #200 sieve			2227			
Sieve (from 1/2" to #200)			2228			
Sieve (from 1" to #200)			2229			
Sieve (from 2" to #200)			2230			
Sieve plus Hydrometer			2231			
Specific Gravity			2232			
Organic Content			2233			
Visual Classification			2234			
Pinhole			2235			
COMPACTION TESTS						
Standard Proctor 4" mold			2237			
Standard Proctor 6" mold			2238			
Modified Proctor 4" mold			2239			
Modified Proctor 6" mold			2240			
Single Point 4" mold			2241			
Single Point 6" mold			2242			
Calif. Impact test (Calif 216)			2243			
Relative Density (0.1 cu. ft.)			2244			
HYDRAULIC CONDUCTIVITY						
Rigid wall						
Constant head (spec ht. ~ 1")			2246			
Falling head (spec ht. ~ 1")			2247			
Additional stress level			2248			
Remold test specimen			2249			
Flexible wall						
Sandy soil			2250			
Clayey soil			2251	1		
Additional stress level			2252			
Remold test specimen			2253			
Compatability			2254			
CONSOLIDATION PROPERTIES						
Consolidation (1 cycle, 1 time rate)			2256			
Additional Time-Rate curve			2257			
Unload-Reload cycle			[illegible]			

Chain of Custody

Project: NW Niles Cone MW project
Project #: 6241
Sampler ID: WD2 @ 631.5

066018

ID #	Date	Time	Sampling Location	Sample Matrix S= Soil W = Water	Type of Container	Number of Containers	Moisture ASTM method D 3545	Comments
	1/6/06	16:00	WD2	S	Brass Liner	1		

Field Conditions (weather, etc.)

Field Procedures (Preservation, Quality Control, etc.)

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
	1-12-06	12:37	
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LAB BY:

LABORATORY COMMENTS: (SAMPLE CONDITION, PRESERVATION, ETC.)

Report data results to
Day Young @ 510-668-4452

PERMEABILITY TEST (ASTM D5084-90, method C)

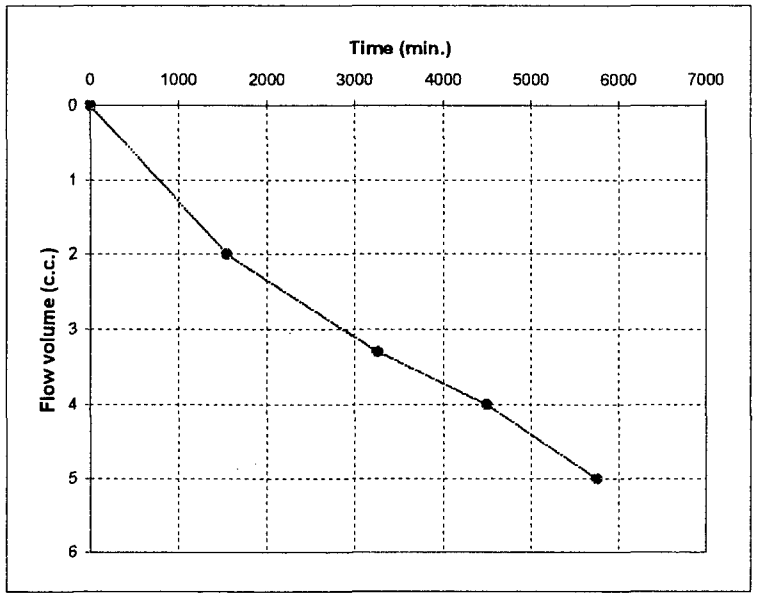
Client : Alameda County Water District
Project : NW Niles Cone MW Project
Job # : 6241
Boring # : WD2
Sample # :
Depth (ft) : 631.5
Date setup for test : 01/30/06
Soil type : Olive gray gravelly clay

Specimen:

		Initial	Final	
Total wt.	=	545.9	465.3	gms
Ht.	=	4.520	4.516	in
Ave dia.	=	2.430		in
Area	=	4.640	4.631	sq.in
Volume	=	343.6	342.6	c.c.
Moisture	=	61.7	37.9	%
Total density	=	99.1	84.7	pcf
Dry density	=	61.3	61.5	pcf
Gs (Assumed)	=	2.70		
Void ratio	=	1.749	1.741	
% Saturation	=	95.3	58.7	

		Head	Tail	
Area of pipettes	=	0.875	0.879	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)
1542.0	1.00	2.00	0.50	371.6	368.2	0.00924	0.964	32.2	1.62E-08
1715.0	1.20	1.30	0.92	368.2	365.3	0.00777	0.978	32.0	1.24E-08
1240.0	0.80	0.70	1.14	365.3	363.6	0.00469	0.984	31.8	1.04E-08
1260.0	1.00	1.00	1.00	363.6	361.3	0.00629	1.001	31.6	1.40E-08
1540.0	1.00	1.00	1.00	361.3	359.1	0.00633	1.001	31.4	1.15E-08

Overall average: 1.29E-08

Permeabilty Test

Lab No: 06G018

Client : Alameda County Water District

Project Name : NW Niles Canyon MW project

Project Number : 6241

Boring Number : WD2

Sample Number :

Depth (ft) : 631.5

SigC = _____ psf = 20 psi

Date tested : 1-30-06

Tested by : JH

Visual Classification : olive gray gravelly clay

TOP

Length of Tube___

BOTTOM

Tube Type : 2" x 6" 2.43 x 6" 2.87" x 36" 2.43" x 20" (circle one)

Sample conditions : Undisturbed or Remolded (circle one)

	Before Test	After Test	Trimming
Specimen Wt (gm) =	792.84		
Specimen Ht (in) =	4.52		
Dia (in) - top =	2.43		
- mid =	2.43		
- bot =	2.43		
Dish # =		8	
Wet soil + dish (gm) =		760.64	
Dry soil + dish (gm) =		632.80	
Wt. of dish (gm) =		295.30	

Tare wt 246.96 ←

if sample was 2.43" x 20" or 2.87" x 36" sketch where sample was taken from in the tube

Be sure you mark where the soil started and ended if the tube was not completely full to each end

CELL NO. K

STATION NUMBER PP-5G

Signet Testing Labs

Computerized By_____

Checked by JH

Laboratory Test Data

Client: Alameda County — Lab No 060018

Project: NW Nitro Cone MW project — Job no.: 6241

Boring No. WD2 — Sample No. ____ — Depth. 631.5

Classification: olive gray gravelly clay — Type of test: Perm — SigC = 20

Cell No. K — (for perms only) Hydraulic Gradient=

STATION NO. PP-SG

		Applied Pressure (psi)			Burette Readings (c.c.)							
Date	Time	Cell	Back (bot.)	Back (top)	Cell	Head 9.00	Tail 8.96	P.W.P. (psi)	Chg. in P.W.P.	Chg. in Cell P.	"B" Value	Notes
1-30	745	0	0	0	0.5	6.0	5.8	F/R				
	800	2	0	0	0.5	0.0	0.5	Seep				
1-31	800	2	0	0	5.1	5.1	0.5	F/R				
	805	2	0	0	1.5	1.0	1.0					
	905	12	10	10	5.5	1.3	1.7					
	1005	22	20	20	8.1	1.7	2.5					
	1110	32	30	30	10.7	1.8	2.7					
	1210	42	40	40	12.1	2.1	3.0					
2-1	750	52	50	50	14.7	2.9	3.4	50.9	9.9	10	.99	
		62	Consol		14.7	2.9	3.4	60.8				
	755	52	32	32	4.9	20.2	20.5					
2-2	730	52	32	32	21.5	15.0	15.5					
		Perm										
	733	52	35	30		3.5	21.0					72.0
2-3	915					4.5	19.0					70.0
2-4	1350					5.7	17.7					70.0
2-5	1070					6.5	17.0					69.0
2-6	730					7.5	16.0					67.5
2-7	910					8.5	15.0					69.0

Draft computerized by _____

Signet Testing Labs, Inc.

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #	SITE NAME AND ADDRESS
6241	NW NILES CONE MW-3D2

SAMPLER ID (NAME AND ORGANIZATION)

LARRY MOORE

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM method D-5084	COMMENTS
223'	10/29/4	1440	3D2-223'	S	6" BRASS SLEEVE	1	X	

FIELD CONDITIONS (WEATHER, ETC)

SUNNY, MILD

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

DIRECT PUSH (ROD WEIGHTED) MUD ROTARY RIG

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	10/29/4	1505	[signature]
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	11/2/04	11:00	C. Dia
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

Alameda County Water District
Chain of Custody

Project: NW Niles Cone MW project
Project #: [redacted] 29374
Sampler ID: 2D2 @ 548.5

P.O.# 36409

ID #	Date	Time	Sampling Location	Sample Matrix S= Soil W = Water	Type of Container	Number of Containers	Metals & Hyd method D-5084	Comments
	11/22/05	1330	2D2 @ 548.5'	S	brass	1		

Field Conditions (weather, etc.)

clear, cool

Field Procedures (Preservation, Quality Control, etc.)

Brass liner

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	LABORATORY COMMENTS: (SAMPLE CONDITION, PRESERVATION, ETC.)
Sean Hellman	11/23/05	3:10		
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LAB BY:	

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT # 29374 ~~6291~~

SITE NAME AND ADDRESS: NILES CONE MW PROJ. WELL 3D2

SAMPLER ID (NAME AND ORGANIZATION)

SEND RESULTS TO DOUG YOUNG (ACWCD) 668-4452

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM Method D-5084	COMMENTS
	11/4/05	1215	WELL 3D2 @ 320'	S	6" BRASS TUBE	1	X	

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
Patt McMahon	11/4/04	1705	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	11/8/04	1352	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:
	11/8/04	14:20	

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #	SITE NAME AND ADDRESS
29374	NW Niles Cone MW Const Project well site 3D2

SAMPLER ID (NAME AND ORGANIZATION)

Results to Dory Young

510-668-4452

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM method D-5084	COMMENTS
	11/5/04	1350	well 3D2 @ 450.5	S	6" brass	1	X	

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	11/8/04	1352	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	11/8/04	14:20	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #	SITE NAME AND ADDRESS
6241	SOIL SAMPLE @ 470'

SAMPLER ID (NAME AND ORGANIZATION)
RESULTS TO DOUG YOUNG
668-4452

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM Method D-5084	COMMENTS
	11/10/04		WELL 3D2	S	BRASS LINER	1	X	

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
Patti McMahon	11/10/04	1640	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	11/12/04	10:00	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:
Emily Biala	11/12/04	10:35	

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #	SITE NAME AND ADDRESS
29374	NW NILES CONE MW PROJ. WELL 3D2

SAMPLER ID (NAME AND ORGANIZATION)
SEND RESULTS TO DOUG YOUNG
ACWD
668-4452

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM METHOD D-5084	COMMENTS
	11/19/04	1530	WELL 3D2 @ 630'	S	6" BRASS TUBE	1	X	

FIELD CONDITIONS (WEATHER, ETC)
SUNNY, COOL

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	11/19/4	1630	[signature]
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	11/24/04	10:04	[signature]
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:
[signature]			

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT # 29374

SITE NAME AND ADDRESS: NW Nile Cone MW Proj well 4D2

SAMPLER ID (NAME AND ORGANIZATION): Send Results to Doug Young ACWD 668-4452

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM Method D 5084	COMMENTS
	1/7/05	15:00	4D2 - 592.5	S	Brass Liner	1		

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	1/7/05	1630	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	1/11/05	11:10	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #: 6241

SITE NAME AND ADDRESS: EDEN LANDING ROAD SITE
NW Niles Cone MW Project

SAMPLER ID (NAME AND ORGANIZATION)

4F1-360'

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM Method D-5084	COMMENTS
4F1	2/17/05	1430	WELL 4F1	S	BRASS SLEEVE	1		

FIELD CONDITIONS (WEATHER, ETC)

CLOUDY

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	2/17/05	1620	[signature]
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	2/18/05	16:50	[signature]
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

PROJECT #	SITE NAME AND ADDRESS
6241	EDEN LANDING Road site NW Niles Cone MW Project

SAMPLER ID (NAME AND ORGANIZATION)

401 - 451'

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM Method D-5084	COMMENTS
1	2/9/05	13:00	401 - 451'	S	Boats	1	X	

FIELD CONDITIONS (WEATHER, ETC)

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	2/9/05	1330	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
	2/9/05	1445	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:
	2/9/05	16:50	

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

Alameda County Water District
Chain of Custody

05G220

Project: NW Niles Cone MW Project
Project #: 62
Sampler ID: site 2 well 2D2
Sample ID 2D2 @ 320
P.O. # 36409

ID #	Date	Time	Sampling Location	Sample Matrix S= Soil W = Water	Type of Container	Number of Containers	Metals ASTM Method D-5384							Comments
2D2	11/10/05	10:00	site # 2	S	brass	1	X							
@320														

Field Conditions (weather, etc.)
Sunny - overcast

Field Procedures (Preservation, Quality Control, etc.)
NONE

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	LABORATORY COMMENTS: (SAMPLE CONDITION, PRESERVATION, ETC.)
Ken Dahlhaus	~~11/10/05~~ 11/15/05	~~1000~~ 1130		Report Results to Doug Young @ 510-668-4452
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LAB BY:	

ALAMEDA COUNTY WATER DISTRICT
CHAIN OF CUSTODY

05G236

PROJECT # 29374

SITE NAME AND ADDRESS: NW NILES CONE MW CONSTR. PROJECT WELL SITE 202

SAMPLER ID (NAME AND ORGANIZATION)

RESULTS TO: DOUG YOUNG
510-668-4452

ID #	DATE	TIME	SAMPLING LOCATION	SAMPLE MATRIX S = SOIL W = WATER	TYPE OF CONTAINER	NUMBER OF CONTAINERS	REQUESTED ANALYSES: ASTM METHOD D-5084	COMMENTS
	11/16/5	1330	WELL 202 @ 455'	S	6" BRASS	1	X	

FIELD CONDITIONS (WEATHER, ETC)

SUNNY, WARM

FIELD PROCEDURES (PRESERVATION, QUALITY CONTROL, ETC)

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	11/16/5	1640	[signature]
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
[signature]	11/17/5	1254	[signature]
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LABORATORY BY:

LABORATORY COMMENTS (SAMPLE CONDITION, PRESERVATION, ETC)

Alameda County Water District
Chain of Custody

Project: N W Niles Cone MW Project
Project #: 6241
Sampler ID: WD2 @ 311

ID #	Date	Time	Sampling Location	Sample Matrix S= Soil W = Water	Type of Container	Number of Containers	Methods ASTM Method D-5084							Comments
1	12/16/05	11:00	WD2	S	brass	1	X							

Field Conditions (weather, etc.)
cloudy overcast

Field Procedures (Preservation, Quality Control, etc.)

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
[signature]	12/14/05	16:00	
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LAB BY:

LABORATORY COMMENTS: (SAMPLE CONDITION, PRESERVATION, ETC.)
Report to Doug Young
(510) 668-4452 phone

Chain of Custody

Project: NW Niles Cone MW Project
Project #: 6241
Sampler ID: WD2 @ 631.5

ID #	Date	Time	Sampling Location	Sample Matrix S= Soil W = Water	Type of Container	Number of Containers	~~Metals~~ 45TM method D:5045						Comments
	1/6/06	16:00	WD2	S	Brass liner	1							

Field Conditions (weather, etc.)

Field Procedures (Preservation, Quality Control, etc.)

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
[signature]	1-12-06	12/37	[signature]
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LAB BY:

LABORATORY COMMENTS: (SAMPLE CONDITION, PRESERVATION, ETC.)

Report data results to Day Young @ 510-668-4452