

APPENDIX A

Land Use and Topography on the Former Benicia Arsenal

INTRODUCTION

Details about the historical land use for the former Arsenal during the Army occupation is described in detail in the Records Research Report (RRR; Jacobs, 1999). In the RRR, the former Arsenal is divided into five areas shown on Figure 1-1, based on their current land use. These are the "WIRMS" areas:

- W (Warehouses),
- I (Industrial),
- R (Revetment),
- M (Motor Pool), and
- S (Storage/Igloos) areas).

Summary descriptions from the RRR for the post-Arsenal land use of the WIRMS areas are presented below. A summary of historical information and artificial fill areas are presented on Figure 2-1 and discussed below.

Area W. Since Arsenal closure in 1964, numerous businesses have either leased or purchased property within Area W. These businesses include automotive, chemical, construction, distribution, electrical, fabrication, glassware, manufacturing, petroleum, plastics, retail, transportation, warehousing, and waste management firms. Some of these businesses store and/or use petroleum products and other chemicals. Leaking underground storage tanks (USTs) have been identified at several of these business locations. Some of these businesses are registered hazardous waste generators. The primary land use in Area W is commercial and most of the area is paved.

With the use of artificial fill, areas were developed where previous construction would have been prohibitive. Two areas with significant amounts of artificial fill, based on the review of aerial photos and historical maps, are the former marshland along the eastern edge of Area W adjacent to the Carquinez Strait, and the Sulphur Springs Creek drainage. A portion of the fill in the area of Sulphur Springs Creek has been attributed to construction of State Highway 680. One spoils area is shown on Figure 3-4. Areas with measurable amounts of artificial fill are presented on Figure 2-1 for the entire former Arsenal.

Topography in Area W is relatively flat and ranges from mean sea level (msl) at the Carquinez Strait to 100 feet above msl along the eastern boundary of the area. Along the western portion of the area the ground surface is relatively flat with an average elevation of approximately 10 to 20 feet above msl.

Area I. Post-closure uses of property within Area I has varied and included ownership and or/occupancy by automotive, chemical, construction, distribution, fabrication, manufacturing, plastics, retail, transportation, and warehousing businesses. Industrial activities associated with these businesses include machine shop work, servicing and repair of equipment, metal fabrication and casting, plastics manufacturing, assembly and distribution of marine equipment, silk screen printing, fabrication of shipping containers, leather processing, welding, painting, chemical manufacturing, and woodworking. Offices, retail shops, restaurants, and private residences also occupy portions of Area I. The primary land use in Area I is commercial and the area is almost completely paved.

Based on the review of aerial photos and historic maps, there is one area with significant amounts of artificial fill in Area I. It is associated with the former marshland along the southern portion of the area adjacent to the Carquinez Strait (Figure 2-1).

Topography in Area I is relatively flat along the Carquinez Strait and then climbs to an elevation of over 100 feet msl. The highest point in the area is a northwest-southeast trending ridge where the historical Clocktower resides (see Figure 1-3). Views of the Carquinez Strait and the Benicia-Martinez Bridge can be seen from this vantage point.

Area R. Most of Area R is undeveloped open space. Pacific Bay Homes is in the process of developing the northwestern portion of Area R (the Tourtelot Property) for residential use (Area F on Figure 1-2). Private industries that occupy portions of Area R include steel, petroleum, welding, plumbing, lumber, and storage firms. The primary land use in Area R is residential and commercial and most of the area is unpaved. There are no areas of mapable artificial fill in Area R.

Topography in Area R is comprised of a saddle between low-lying hills. The dip in the saddle gently slopes from north to south and is the drainage for Sulphur Springs Creek and Paddy Creek. The average elevation of the saddle is approximately 50 to 100 feet msl. Low-lying hills bound the

western and eastern sides of the saddle, the highest elevation is approximately 260 feet msl for both sides.

Area M. Open space within Area M was utilized for storage and maintenance of vehicles and artillery. Much of the area remains as undeveloped open space. Four reservoirs are in Area M, including Pine Lake (see Figure 1-3), were used to store water for fire-fighting purposes and for domestic use. Two quarries, which provided the sandstone used to build some of the original former Arsenal structures, are located within Area M.

Since transfer of ownership to the City of Benicia in 1965, much of Area M has been developed by Benicia Industries, Inc. (BII) as an industrial park. Major occupants include Valero (formerly Exxon), the City of Benicia, The Marcus Company, A.B.C. Towing, Inc., and Benicia Foundry and Iron Works, Inc. A significant portion of the land within Area M has been used for construction of the freeway corridors for Highway 680 and Highway 780. The State Highway 680 and 780 interchange is present within the higher part of Area M. Toyota Motor Sales Co. utilizes the portion of Area M located adjacent to Suisun Bay for vehicle storage. The primary land use in this area is commercial or industrial, most of the area is unpaved with some paved portions along the Carquinez Strait.

There are three areas with significant amounts of artificial fill in Area M (Figure 2-1), and five spoils areas (Figure 3-4). One area is located between State Highway 680 and the Carquinez Strait. The other two are located in drainage valleys on the north side of the Clocktower Hill.

Topography for most of Area M is comprised of gentle rolling hills that drop in elevation into the Sulphur Springs Creek drainage basin and toward the Carquinez Strait.

Area S. Area S is currently owned by Valero. The eastern half of the area is almost completely paved and contains the Valero oil refinery. The western half is generally unpaved, unimproved land, with the exception of the Benicia City Yard (presumably leased from Valero). Several underground storage igloos formerly used by the Army for artillery projectile, aerial bomb, and guided missile storage are currently used by Valero. The primary land use in Area M is commercial (Valero Refinery personal communication, 2001).

Topography over most of Area S is comprised of gentle rolling hills, which drops into the Sulphur Springs Creek drainage basin along the eastern boundary. The highest point is just over 400 feet msl along the western boundary of the area. The average elevation within the Sulphur Springs Creek drainage basin is approximately 10 to 20 feet msl.

There is one area with significant amounts of artificial fill in Area S. This area is associated with the Sulphur Springs Creek drainage basin along the eastern boundary. Fill areas are presented on Figure 2-1 for the entire former Arsenal.

APPENDIX B

Sources of Data from Previous Investigations

INTRODUCTION

Information regarding the hydrogeology of the former Arsenal was collected from previous investigations. Sources for the previous investigations are presented below. Summaries of selected previous investigations are presented in Appendix C.

- **City of Benicia Public Works.** FA/BC reviewed 24 geotechnical reports for properties throughout the former Arsenal. Most of the properties are located in the Sulphur Springs Creek drainage.
- **Solano County Department of Environmental Management.** FA/BC reviewed four site investigations, which were performed as part of the Leaking Underground Storage Tank Program.
- **Valero Refinery.** FA/BC acquired historical groundwater elevation data and a map for wells associated with the Valero Refinery.
- **United States Army Corps of Engineers (USACE).** Two reports were reviewed from a private landowner for Buildings 48, 49, and 99, and for the Benicia-Martinez Wetland Mitigation Project.
- **CalTrans.** Borehole logs for the test borings for the Benicia-Martinez bridge, sheets 1 through 7 (CalTrans, 1995b). The logs are presented in Appendix E.
- **Department of Water Resources (DWR).** Ninety nine Well Completion Reports were reviewed. These reports can provide information about the locations of wells, well owner, an approximate depth to groundwater, stratigraphic information, and type of well (i.e., municipal, domestic, agricultural or other). Locations of the wells are presented on Figure 1-3.
- **Records Research Report (RRR; Jacobs, 1999).** This report provides information on geologic and hydrogeologic data for the former Arsenal as a result of Department of Defense (DoD) activities and from site investigations conducted during post-Arsenal use.

- **Regional Water Quality Control Board (RWQCB).** The California RWQCB is the lead regulatory agency for numerous site investigations in the Benicia area. The majority of these sites are on the Valero Refinery property (formerly Exxon and Humble Oil).

- **Department of Toxic Substance Control (DTSC).** The California DTSC made available information on the groundwater quality and quantity of an area just north of the former Arsenal at the Panoche landfill: *Monitoring Program for the Central Area Drainage Work Plan 12 and Report 5* (IT Corporation, 2001) and the *Hydrogeologic Assessment Report* (IT Corporation, 1987).

- **Private Reports.** These reports are typically confidential, and as a result are not referenced in this document.

- **Aerial Photographs and Historic Maps.** A wide variety of historical aerial photographs and maps were used to assess various aspects of Arsenal geology and hydrogeology, including historical extent of wetlands and extent of fill. The maps and photos include:
 - 1918 drawing of the U.S. Military Reserve borrowed from the Camel Barn Museum.
 - 1924 aerial photograph of the Arsenal and surrounding area (Jacobs, 1999).
 - 1928 aerial photograph of a portion of the Arsenal (southern half shown) (Jacobs, 1999).
 - 1945 aerial photograph of the Arsenal and surrounding area (Jacobs, 1999).
 - 1947 aerial photograph of the Arsenal and surrounding area (Jacobs, 1999).
 - 1952 aerial photograph of the Arsenal and surrounding area (Jacobs, 1999).
 - 1969 topographic map with general soil description (Schwafel, 1969) focused on Sulphur Springs Creek and shows areas of fill, Bay Mud, overburden, and bedrock. The thickness of fill material is shown using isopach lines for the Sulphur Springs Creek area only.
 - 1999 geologic map of the northern part of the Benicia 7.5 minute quadrangle (Graymer et. al., 1999).

APPENDIX C

Previous Investigation Summaries

INTRODUCTION

This appendix presents a brief description of selected previous investigations at or near the former Benicia Arsenal that were used to develop the hydrogeologic conceptual model. The locations of these investigations are presented on Figure 1-2 and flagged with an asterisk in Table 1-1. Paragraph headings (bold) in this appendix correspond to the site identification numbers (Site ID #) listed in Table 1-1.

Site ID # 1 (1051 Tyler Street, Building 48)

Building 48 was built in 1911 as a storage facility (Jacobs, 1999). The U.S. Army used the facility for machining and cleaning metal stock parts (HLA, 1997). Weldon Leather occupied the building from approximately 1967 to 1974 and tanned leather. After 1978, BII undercoated automobiles and tested them for water leaks (HLA, 1997a). A 1,000-gallon gasoline UST was installed by BII. UST installation date and status is unknown. Location of Building 48 is shown on Figure 1-2 of the report and listed in Table 1-1 as Site ID #1.

A preliminary site assessment was conducted by HLA at Building 48 in 1994 (HLA, 1997). A floor drain and sump were found inside Building 48. Soil samples were taken beneath the floor drain. The sample was analyzed for metals, benzene, ethylbenzene, toluene, and xylenes (BTEX), semi-volatile organic compounds (SVOCs), and halogenated organic compounds (HVOCs). BTEX and SVOCs were not detected in the soil sample and low concentrations of HVOCs (a total of 0.3 mg/kg HVOCs) were reported. Three soil borings were drilled and sampled outside of the building to determine the lateral extent of detected HVOCs from the floor drain sample. The borings were drilled to a depth of 13 to 17 feet. Groundwater was encountered at a depth of 10 to 12 feet (HLA, 1997) in two of three borings and grab groundwater samples were collected. Trichloroethene (TCE), cis-1,2-DCE (cis-1,2-dichloroethene), trans-1,2-DCE (trans-1,2-dichloroethene), PCE (tetrachloroethene), and vinyl chloride was detected in the groundwater samples at elevated concentrations (maximum TCE concentration – 10,000 µg/L [micrograms per liter]). Based on these results, additional investigation was recommended by HLA.

Between February 1995 and February 1997, HLA conducted a site investigation, groundwater monitoring and a risk analysis in the vicinity of Building 48. The investigation included a document

review, an underground utility survey, collection of a sediment sample from the bottom of the floor drain, twelve soil borings, installation of five groundwater monitoring wells, monitoring and gauging of the groundwater wells, testing the aquifer using slug test techniques, excavation of five test pits, and assessment of human health and ecological risk. Soil and grab groundwater samples were collected from the borings and test pits. Two soil samples of Bay Mud were submitted for hydraulic conductivity testing.

Fill, Bay Mud and bedrock were encountered during the drilling of the boreholes for this investigation. Fill is generally 5 to 15 feet thick (HLA, 1997a). Based on a previous geotechnical investigation (Hultgren Geotechnical Engineering, 1995) and the lithology from this investigation, HLA identified a north to northwest trending ancestral ravine filled with Bay Mud. The Bay Mud ranges in thickness from 0 to approximately 50 feet. Locally, the bedrock consists of interbedded mudstone and sandstone of the Martinez Formation. Depth to bedrock was encountered near surface near the escarpment at the north side of the building to 22 feet south of Building 48 and north of Tyler Street. South of Tyler Street, borings were advanced to a total depth of 15 feet into the Bay Mud but were not deep enough to determine the thickness of the Bay Mud. The geotechnical investigation included three cone penetrometer holes drilled to depths of approximately 90 feet in the area south of Bayshore Road. The piezometer identified Bay Mud overlying a sand/silty sand unit. The contact between the Bay Mud and the sand/silty sand is approximately 60 feet bgs. The sand/silty sand units extended to the maximum depth that was probed.

Groundwater is found within the fill material. Four of the five groundwater monitoring wells are screened in the fill material from 5 to 12.5, 15, 15, and 20 feet bgs. The other well is screened within the Martinez Formation from 24 to 39 feet bgs. In 1995, depth to water in the shallow wells ranged from approximately 2.5 feet to 11.7 feet bgs. All of the wells are located near Building 48 and north of Bayshore Road. Borings drilled south of Bayshore Road and near the Carquinez Strait indicated first groundwater at approximately 1 foot. Depth to water in the deeper well ranged from approximately 4.7 to 7.8 feet bgs, but was first encountered during drilling at approximately 33 feet. Based on the 1995 data, groundwater flows to the south-southwest in the shallow groundwater under an average hydraulic gradient of 0.005 to 0.01 near Building 48.

Results of the slug tests indicate an average hydraulic conductivity of the fill is 3.4×10^{-6} centimeters per second (cm/s) to 0.0016 cm/s. The vertical conductivity tests on the Bay Mud indicate a rate of 1.3×10^{-7} cm/s and 5.2×10^{-8} cm/s (HLA, 1997a).

The source of the HVOCs in groundwater was determined to be the Building 48 floor drain. HVOCs are detected in the shallow and the deeper water bearing zones. Based on the 1995 data, the lateral extent of HVOCs in groundwater was within approximately 400 feet downgradient of the building and had not reached the borings near the Carquinez Strait. HLA concluded that the shallow water bearing zone in the site vicinity is not potentially suitable for municipal or domestic water supply because of its high TDS (1,500 milligrams per liter [mg/L]) and limited potential supply. An approximate TDS of 18,000 mg/L was calculated for the deeper water bearing zone.

Site ID #3 (945 Teal Street)

A Phase I Environmental Site Assessment was conducted at this site in January 2001. Results for the assessment determined that additional investigation was warranted in order to identify the status of two USTs at this site. The location of 945 Teal Street is shown on 23, Site ID #37. Follow-up investigation included a geophysical survey and a subsurface investigation (URS, 2001). In summary, there was no evidence of the USTs based on the geophysical survey. Two borings were drilled in the area of the suspected location of the USTs. Groundwater encountered in both soil borings at a depth of approximately 6 feet bgs (URS, 2001). Low concentrations of petroleum hydrocarbons were reported in groundwater from both borings, but detected above reporting limits in soil samples. The borings were drilled to a depth of 8.5 and 9 feet. Sandy fill material was identified throughout the entire length of each boring. A draft letter from SCDEM indicates that SCDEM will be granting closure of the site (SCDEM, 2001).

Site ID #5 through #12 and #E (State Highway 680 and 780 in the Benicia Area)

Three sources of information were reviewed for the area of California State Highway 680 and 780, the Benicia-Martinez Bridge, and a nearby wharf. Two of the three sources were gathered from the California Department of Transportation and the other from a report produced for Humble Oil & Refining (now Valero Refining). State Highways 680 and 780 meet on the former Arsenal. From the Arsenal, State Highway 680 heads north-northeast along the west side of the tidal wetlands of

the Suisun Bay and State Highway 780 heads west-northwest into Vallejo. From the confluence of these highways, State Highway 780 ends and 680 continues south over the Benicia-Martinez Bridge into Martinez. A wharf exists at Army Point, near the base of the Benicia-Martinez Bridge.

The first source of information is a plan for construction of 3.88 miles of State Highway 780 between the Benicia Airport and the Benicia-Martinez Bridge (Caltrans, 1955). As part of this project, numerous borings were drilled along the alignment of State Highway 780 and within the planned elevated interchange of State Highway 680/780. There are three locations near and within the former Arsenal boundaries that were reviewed for this report. They are East 5th Street Undercrossing, Pine Lake Undercrossing, and the 680/780 Interchange (Figure 1-2, IDs #5 through 12). Borings associated with these locations indicate depth to fill, alluvium and bedrock and occurrence of groundwater (if encountered).

The second source of information is the test pit logs for the "B" Line for the expansion project of the new Northbound Benicia-Martinez Bridge (Caltrans, 1995b), Benicia-Martinez Bridge Seismic Retrofit Project (Caltrans, 1995a), and the Earthquake Retrofit Project for the Benicia-Martinez Bridge Main Span (Caltrans, 1996). These logs spanned the entire distance from the Benicia abutment to the Martinez abutment (Figure 1-2, ID #E). In addition to the logs are profiles of the ground and bottom of the Carquinez Strait. Details about location of alluvium and bedrock are found on these test pit logs. In general, the deepest part of Strait is western side of the channel at a depth of approximately 80 feet msl. All borings along the Strait contain varying thickness of alluvium (maximum of 60 feet thick) overlying sandstone or siltstone bedrock. The deepest boring drilled is to minus 240 feet msl. The alluvium is a mixture of silty clays to silty sand. Based on the depth to bedrock encountered along the alignment of the borings near the north side of the Strait an approximate apparent dip of bedding was determined to be approximately 68 degrees towards the south.

Site ID #33 (2060 Camel Road, Camel Barn Museum, Powder Magazine 2)

Magazine 2, formerly called Magazine 1 by the Army, was constructed in 1855. This magazine is part of the Camel Barn Museum at 2060 Camel Road, Benicia (Figure 1-2, ID 1# 33). The sandstone building was used to store ammunition and black powder, when occupied by the Army.

BCLA conducted a hazardous waste assessment, which included a review of historical information, and collection and analysis of surface soil samples for 17 metals. BCLA determined that lead was the only contaminant of concern. Follow-on work was conducted by BCLA in August of 1987 and in January 1988 to evaluate the extent of lead contamination in near-surface soil. Fifteen test pits were excavated to depths ranging from 3 to 6 feet. Surface soils within a 10-foot radius of the building are a black, granular material, which appears to be charcoal from the 1983 roof fire. Silty clay with slate chips and brick fragments was encountered at depths of 1 to 3 feet. Below the fill, native soils of silty clay to clayey silts were encountered to the maximum depth excavated. Sandstone was encountered at 2.3 to 2.5 feet bgs in two of the test pits. Groundwater was not encountered in the investigation. A location map of the test pits was not available for review.

Site ID #34 (1 Oak Road)

This area of the former Arsenal is designated as Open Storage 14 in the RRR (Jacobs, 1999). The area is used for temporary storage of vehicles from overseas. Toyota Motor Sales currently owns the property. In 1977, a geotechnical investigation was conducted by HLA. Four test borings were placed near the corners of a proposed building. Static water was measured at approximately 7 feet bgs. Approximately 17 feet of fill was recorded. It consists of sandy gravel to sandy silt. Below the fill is approximately 7 feet of blue-gray clayey silt (presumed to be Bay Mud), which overlies siltstone (HLA, 1977). One 3,000-gallon kerosene UST was removed on January 5, 1987 and two 10,000-gallon gasoline USTs were removed on February 14, 1995 (SCEDM, 1995). Six groundwater monitoring wells were installed. Depth to highest groundwater was recorded at 2.25 feet and lowest was greater than 24.2 feet. Groundwater flow direction is to the south. Low concentrations of petroleum hydrocarbons remain in the soil and groundwater. The case was closed by SCEDM on September 6, 1995. This site is shown on Figure 1-2 as ID #34.

Site ID #35 (700 Bayshore Road)

Benicia Industries installed a 10,000-gallon UST at this location (Figure 1-2, ID #35) in 1977. The Solano County Hazardous Materials Management Plan for 1995 states the existing business use is auto processing and storage. Two groundwater monitoring wells were installed in 1987. Water in one of the wells has been periodically dry due to the shallow depth of the well (HLA, 1997b).

Groundwater ranged in depth from 0.93 feet on 3/13/96 to 6.51 feet on 9/19/96. Low to non-detectable concentrations of petroleum hydrocarbons were reported in groundwater samples collected in March 1997.

Site ID #36 (2650 Harbor Way)

Benicia Industries installed a 4,000-gallon UST in 1980 at 2650 Harbor Way (Figure 1-2, ID #36). Three groundwater monitoring wells were installed in 1987. The UST was removed on July 8, 1996 according to the SCDEM Case Closure Summary (SCEDM, 1996). Highest groundwater recorded is 2.1 feet and the lowest depth is 8 feet. Groundwater flow direction is to the southeast. Low concentrations of kerosene remain in the soil and groundwater. The case was closed by SCEDM on October 30, 1996.

Site ID #38 (116 West Channel Road)

The site is currently used by Pacific Pride, a cardlock fueling station, and operated by Golden Gate Petroleum. The site is shown on Figure 1-2, Site ID #38. One UST was installed in the early 1990s. The UST is divided into two sections for the purpose of storing gasoline and diesel fuel. A total of eight groundwater monitoring wells are associated with this site. Clay to sand is found in the subsurface to a depth of at least 20 feet. Water was first encountered at 6 to 7 feet bgs. Static water is approximately 4 to 5 feet bgs in March 2001. Groundwater direction is to the east-southeast under a gradient of approximately 0.015 (Clearwater Group, 2001). Elevated concentrations of gasoline and diesel were identified in soil and groundwater. Clearwater Group recommended continued quarterly groundwater monitoring.

Site ID # 52 and #53 (Crude Pier and Product Pier)

The last source of information is a soil and foundation investigation report for a proposed marine facility. The proposed marine facility would accommodate ships servicing the refinery, which at that time was in the process of being built. The refinery was called Humble Oil & Refining, which was later bought by Exxon, and now is owned by Valero Refining. The purpose of the investigation was to explore the subsurface conditions in the vicinity of two proposed piers and to provide design data and installation guidelines for the piles to construct the proposed piers (Dames & Moore, 1967).

There were two proposed piers, the "Crude Pier" and the "Product Pier". The "Crude Pier" would connect to the existing wharf and head northeast along the shoreline, approximately 600 feet, to Army Point and then turn north approximately 600 feet (Figure 1-2, ID #52). The "Product Pier" was located 0.5 mile southwest of the end of the existing wharf and parallel to the shoreline (Figure 1-2, ID #53).

Three borings were drilled at the "Crude Pier" site. Soft organic clay was generally found above bedrock at this site (Dames & Moore, 1967). Bedrock was described as a weathered sandstone and siltstone to a depth of 55 and 62 feet below sea level. Six borings were drilled at the "Product Pier" site. Soft organic clay contained some peat and sand was encountered at and near the strait bottom in this area (Dames & Moore, 1967). Sandy soils were encountered at a depth of 45 and 54 feet below sea level. Competent sand was found at 108 feet below sea level. The deepest borings were terminated in hard sandy clay containing gravel and rock fragments at about 121 feet below sea level.

Site ID #50 Series (938-940 & 954 Tyler Street and 969-989 Lincoln Street , 50 Series Complex, Buildings 57A and 57B)

Eleven shallow soil borings were drilled and soil samples were collected and analyzed for halogenated volatile organics, total recoverable petroleum hydrocarbons, metals (Method 6000/7000 series) and lead in June 1994 (Meredith/Boli & Associates, Inc., 1994). The investigation was conducted by the landowner, Mr. Gordon Potter in response to a bank loan submittal. The location of the investigation was conducted inside Buildings 57A and 57B. Buildings 57A and 57B are part of an 11 building complex, which has been termed the 50 Series Complex by FA/BC. No groundwater was encountered during this investigation. The location of this investigation is shown on Figure 1-2 (ID # 50 Series), and listed in Table 1.

In September 1999, an investigation was conducted by FA/BC to determine the vertical and lateral extent of the VOC contamination found in June 1994. Soil gas, soil and groundwater samples were collected from two borings in Building 57A. A grab water sample was collected from a standpipe within the vat. Results of the investigation indicate VOC soil concentrations were comparable to the 1994 investigation. Groundwater is impacted with VOCs at a maximum of 2,000 ug/L of cis-1,2-dichloroethylene.

Site ID B-49 (Adams Street and Bayshore Road, Building 49)

This building was constructed in 1862 and was one of the original machine shops at the Former Arsenal. Its function later changed to Fire Control/Optical Shop (Jacobs, 1999). The building was demolished in the early 1970s and the lot is currently vacant, but the former building foundation remains. An assessment of lead contamination was conducted at Building 49 (Figure 1-2, ID #B49) by BCL Associates (BCLA) and HLA on behalf of the landowner, Benicia Industries, Inc. In 1987, BCLA conducted a preliminary hazardous waste assessment. Details about the BCLA investigation are not known, but results indicated that lead concentrations (maximum of 634 mg/kg) were at elevated concentrations in near-surface soil at Building 49.

In January and March 1988, HLA conducted further investigations to determine the nature and extent of the elevated lead levels. Aerial photos and BCLA results were reviewed in order to locate 15 test pits. Fill was reported to a maximum depth of 3 feet and 2 feet in the test pits at Building 49 and the adjacent hillside, respectively. Depth to bedrock (siltstone) was encountered at Building 49 at approximately 3.5 to 4 feet and 1 to 3 feet at the adjacent hillside. Although they did not excavate to groundwater HLA assumed it was about 20 to 30 feet bgs.

Site ID B-99 (North Side of Tyler Street and Bayshore Road, Building 99)

This building is north and adjacent to Building 48 (Figure 1-2, ID #B99). Building 99 was constructed in 1942 as a storehouse, but was also used for the manufacturing of ball bearings. Details about the investigation at Building 99 is included in the discussion for Building 48.

Site ID #C (Wetlands between Industrial Way and the Southern Pacific Railroad Tracks, adjacent to 4000 Industrial Way)

This report was generated for Caltrans to assess the temporary and permanent impacts to the freshwater marsh and estuarine habitats as a result of a proposed new bridge construction (Caltrans and GEOCON, 2001). The site is located just east of the former Arsenal boundary, along the Southern Pacific Railroad tracks and the marshes of the western side of Suisun Bay (Figure 1-2, ID # C). The report includes an aerial photograph survey from as old as 1958 to 2000. Five previous investigations were performed at this site and are listed in the report.

Groundwater is impacted with TCE from an unknown source. The lithology of the area consists of three to six feet of imported fill material overlying Bay Mud (3 to 33 feet thick), and sand deposits. The sand deposits under the Bay Mud are greenish-gray silty sand, three to six feet thick. These are underlain by yellowish-brown sand that is about 40 feet thick. The yellowish-brown sand overlies weathered siltstone/sandstone bedrock, that is about 50 feet bgs (Caltrans and GEOCON, 2001).

Included in the study are a groundwater flow direction and hydraulic gradient study. Monitoring wells and piezometers at the site are subject to tidal influence of about 0.07 feet. The minor fluctuations in the water levels did not alter the groundwater flow directions or the hydraulic gradient. The groundwater at the site flows toward the east. Detailed information about groundwater gradients is discussed in the report.

Site ID #D (Valero Refinery (formerly Humble Oil Refinery and Exxon Refinery))

Valero Refinery occupies approximately 400 acres of the former Arsenal, which was originally purchased by Humble Oil in 1966 (Figure 1-2, ID #D). The refinery has a large groundwater monitoring network of approximately 100 wells, and began routine monitoring since 1988. There are three areas of the Valero Refinery: the Marketing Terminal at East 2nd Street, the refinery, and the area on the south of State Highway 680. Wells logs were reviewed for geologic and hydrogeologic information. Historical groundwater data was requested from Valero to determine depth to groundwater and groundwater flow direction. Groundwater appears to follow the topography and generally flows to the east at the Marketing Terminal, to the east and southeast at the refinery and southeast to northeast at the in the area south of Highway 680. In general, depth to water ranges from 30 to 50 feet bgs at the Marketing Terminal, 10 to 50 feet bgs at the refinery and 0.5 to 8 feet bgs at the in the area south of Highway 680. The average gradients at the three areas are 0.09, 0.05, and 0.007 based on data from January 2001. Chemical data was unavailable for review. There is abundant data for the Valero site that could not be presented in this report, but can be used in future work in the area.

Panoche Landfill (northeast of the former Arsenal)

Hydrogeologic concepts were incorporated into the conceptual model from studies conducted at the Panoche landfill, located within a small valley in the foothills northeast of the former Arsenal in the Highland area. Groundwater quality and quantity information collected in the vicinity of the Panoche landfill includes data from monitoring wells and nearby water supply wells. The hydrogeologic information is included in two reports: the *Monitoring Program Assessment for the Central Area Drainage Work Plan 12 and Report 5*, (IT Corporation, 2001), and the *Hydrogeologic Assessment Report* (IT Corporation, 1987), and are summarized below.

- The Panoche Landfill is a valley that was filled with municipal waste.
- Bedrock beneath the Panoche site consists of the Panoche Formation, a marine sequence of shales, claystones, and mudstones mapped by Dibblee (1980), it is equivalent to the Great Valley Sequence mapped by Graymer et. al (1999). Terminologies from the most recent geologic maps of Graymer et. al (1999) are cited in the conceptual model.
- Bedrock weathering extends from 1 foot on the valley edges to 27 feet in the center of the valley, but typically averages 10 to 20 feet thick within the central drainage areas.
- Most of the groundwater flow occurs within the overburden and the weathered Panoche Formation.
- Saturated thickness is about 60 feet within the center of the valley and thins at the valley edges.
- Discharge from wells within the central portion of the valley ranges from 0.01 gallons per minute (gpm) to 4.5 gpm or 14 gallons per day (gpd) to 6,480 gpd.
- A limited amount of groundwater occurs within the upper 25 feet of the unweathered bedrock based on water occurrences or water losses in fractures during drilling. Below the upper 25 feet of the unweathered bedrock, the bedrock largely functions as an aquitard.

Nineteen water supply wells were identified within 1 mile of the Panoche landfill (Figure 1-2). Four of the wells (13L1, 13Q1, 24G1, 24J1) are located within 1 mile of, or on the former Arsenal and within surface water drainages of Paddy Creek and Sulphur Springs Creek. These wells are identified based on the rectangular system for the subdivision of public lands (e.g. 19L1 refers to

Section 19, "L" refers to 40-acre subdivision of the section, and the number "1" refers to a sequential number).

The remaining 16 wells are located approximately 1 mile northeast of the Arsenal along Highway 680 in the low-lying foothills of Goodyear Slough. All of the wells are located within the Highland area valleys. Information about usage, depth of the well and purge rates is not available for all the wells. One well drilled to 270 feet bgs yields up to 40 gpm (57,600 gpd). The geologic unit identified as supplying water for each well is based the location and depth of the well (Table 2-1). Most of the wells are located in the Sonoma Volcanics (approximately 1.5 miles east of the facility) or the Panoche Formation, but three wells (13Q1, 24G1, and 24J1) located near the former Arsenal are hand dug and appear to be completed within the alluvium or in the weathered Panoche bedrock (Figure 1-2). Water quality samples were collected from 12 of the 20 water supply wells. The concentration of TDS ranged from 230 to 1,200 mg/L. These wells have "small yields and are used for domestic water supply and livestock watering" (IT Corporation, 1987). Groundwater quality from three background monitoring wells at the Panoche facility are similar in water quality as the samples collected from the water supply wells.

Surface water and springs within 1 mile of the Panoche facility were inventoried and sampled in 1986 and 1987. Surface water features sampled included 11 locations within Paddy Creek and Goodyear Slough drainage basins. The surface water features included springs or seeps, stock ponds and points within the creek itself (IT Corporation, 1987). Locations of springs, ponds, creeks and the Goodyear Slough are identified on Figure 1-3. The springs and ponds are identified in the same manner as the wells.

Surface water flow rates were estimated and varied from trace to 10 gpm with most averaging less than 1 gpm for the majority of the springs and streams. In Paddy Creek, flow rates from 135 to 2,900 gpm were estimated during the spring and summer months. The 1987 IT Corporation report indicated that there is probably an interchange between stream flow and groundwater flow from the main channel of the streams and the underlying alluvium. Except during very wet periods, flow rates in the streams in the area are typically less than 0.5 gpm with the majority of the water consumed by evapotranspiration, and/or by percolating back into the alluvium with the drainages (IT Corporation, 1987). In 1986, several springs (8M2, 18F2, 19A2, 13P1) were reported to have year round flow with rates of 0.6 to 7.5 gpm in the spring and up to 0.5 gpm in late summer or fall.

Surface water quality was consistent, regardless of season. The concentration of TDS ranged from 450 to 1,100 mg/L (IT Corporation, 1987).

Other Site Investigations

Sources of information about the geology and hydrogeology are listed below by type of investigation. As stated at the beginning of this section, the location of these sites are referenced on Figure 1-2 and listed in Table 1-1.

Geotechnical Studies

Rose Drive, Southhampton Units D-1 through D-7 (Engeo Inc., 1990)

250 West Channel Road (Kleinfelder & Associates, 1986)

Park Road at Industrial Road

684 acres A.D. Seeno Property, (Engeo, 1981)

635 Indiana Street (Environmental Geotechnical Consultants, 1995)

6000 and 6050 Egret Court (east of former Arsenal) (HLA, 1988)

Northwest corner of Iowa Street and Stone Road (United Soil Engineering, 1978)

Lake Herman Road at Goodyear Road (east of former Arsenal) (Youngdahl & Associates, 1998)

Northeast corner of Industrial Way and Oregon Street (HLA, 1979)

3130 Bayshore Road

380 Industrial Court

440 feet south of Lake Herman Road, north side of Industrial Way (Donald E. Banta & Associates, 1989)

Southeast corner of Wagner Street and Park Road (east of former Arsenal) (Lowney Associates, 1995)

On south side of East 2nd Street, approximately 850 feet west of Stone Road (east of former Arsenal) (Engeo, Inc., 1990)

Land between R/R tracks east of Lake Herman Road (east of former Arsenal) (HLA, 1987)

East 2nd Street, between Rose Drive and Reservoir Road

5200 East 2nd Street (east of former Arsenal Boundary) (Lowney Associates, 1997)

3601 and 3651 Park Road (Cooper Engineers, 1983)

4950 East 2nd Street (east of former Arsenal)

101 East Channel Road

605 Industrial Way

Industrial Way, approximately 0.5 mile south of Lake Herman Road (east of former Arsenal)
(Subsurface Consultants, 1989)

4588 East 2nd Street (east of former Arsenal)

North of Bayshore Road Between Industrial and Sulphur Springs Road (United Soil Engineering,
1980)

Site Investigations

3150 Bayshore Road (Geomatrix, 1994)

711 Jackson Street, Benicia Mini-Storage (RUST, 1996), (Jacobs, 1999 [reference #479], Building
165, Area I)

433 Industrial Way, Ryder Truck Rental (SCDEM, 1996)

4457 Park Road, The Customer Company (Kaprealian Engineering, 1989)

2050 Park Road (Jacobs, 1999 [reference #481], Building 175, Former Gasoline Service Station and
Vicinity of Building T226 in Area M)

3001 Bayshore Road, Irving Lutz Property (Aqua Science, 1997), (Jacobs, 1999 [reference #507],
Building 155, Area M)

155 East Channel Way, Former Pie Truck Rental; Terminal (SEC Donahue, 1996)

3781 Mallard Drive, L&M Pallet/Dresser Rand Company (SCDEM, 1989)

100 Industrial Way (Tank Project Engineering, 1997)

865 Teal Court (Jacobs, 1999 [reference #506], east of Building W6, Area W)

APPENDIX D
Climate Information

MARTINEZ WATER PLANT, CALIFORNIA

Monthly Total Precipitation (inches)

(045378)

File last updated on Mar 30, 2005

*** Note *** Provisional Data *** After Year/Month 200412

a = 1 day missing, b = 2 days missing, c = 3 days, ..etc.,

z = 26 or more days missing, A = Accumulations present

Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.

MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5

Individual Months not used for annual or monthly statistics if more than 5 days are missing.

Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1970	0.00	z 1.43	1.41	0.20	0.00	0.07	0.00	0.00	0.00	0.45	5.82	6.37	15.75
1971	1.96	0.16	2.62	0.81	0.27	0.00	0.00	0.00	0.08	0.01	0.88	3.84	10.63
1972	1.00	1.66	0.32	0.79	0.00	0.14	0.00	0.00	0.43	2.99	5.16	2.21	14.70
1973	9.31	5.11	1.76	0.14	0.00	0.00	0.00	0.00	0.21	1.58	5.73	4.05	27.89
1974	2.39	1.09	5.02	1.80	0.00	0.00	0.28	0.00	0.00	0.89	0.64	2.06	14.17
1975	1.40	4.89	5.90	1.71	0.00	0.02	0.16	0.03	0.00	1.57	0.18	0.52	16.38
1976	0.35	2.02	0.92	0.46	0.00	0.00	0.00	0.58	0.76	0.48	0.70	1.53	7.80
1977	1.57	1.20	1.63	0.05	0.61	0.00	0.00	0.00	0.64	0.08	2.72	4.63	13.13
1978	8.03	3.72	5.73	2.67	0.08	0.00	0.00	0.00	0.13	0.00	1.14	0.68	22.18
1979	5.90	4.50	3.62	1.16	0.46	0.00	0.00	0.00	0.00	1.20	2.58	4.86	24.28
1980	5.18	7.51	2.55	1.23	0.17	0.02	0.18	0.00	0.00	0.20	0.06	1.94	19.04

Period of Record Statistics

MEAN	3.98	3.73	2.97	1.03	0.45	0.11	0.02	0.06	0.22	0.90	2.69	3.39	19.53
S.D.	3.00	3.04	2.46	1.03	0.64	0.25	0.06	0.18	0.33	0.82	2.25	2.36	6.90
SKEW	0.63	1.08	1.20	1.34	1.80	3.88	3.26	2.89	1.71	0.75	0.58	0.81	0.80
MAX	10.38	12.18	10.00	4.10	2.66	1.37	0.28	0.71	1.23	2.99	6.86	10.31	39.09
MIN	0.33	0.13	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	7.80
NO YRS	35	35	35	35	35	35	35	35	35	35	35	35	34

MARTINEZ WATER PLANT, CALIFORNIA (045378)

Period of Record Monthly Climate Summary

Period of Record : 2/ 1/1970 to 12/31/2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
Average Max. Temperature (F)		55.1	61.0	66.3	72.1	79.1	85.4	88.9	88.2	85.0	76.8	63.9	55.5	73.1
Average Min. Temperature (F)		39.2	42.0	44.5	46.1	49.9	53.7	54.9	54.9	53.9	49.4	43.7	39.0	47.6
Average Total Precipitation (in.)		3.98	3.73	2.97	1.03	0.45	0.11	0.02	0.06	0.22	0.90	2.69	3.39	19.54
Average Total SnowFall (in.)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.

Max. Temp.: 99.6% Min. Temp.: 99.5% Precipitation: 100% Snowfall: 100% Snow Depth: 100%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

PORT CHICAGO NAVAL DEP, CALIFORNIA

Monthly Total Precipitation (inches)

(047070)

File last updated on Mar 30, 2005

*** Note *** Provisional Data *** After Year/Month 197509

a = 1 day missing, b = 2 days missing, c = 3 days, ..etc.,

z = 26 or more days missing, A = Accumulations present

Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.

MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5

Individual Months not used for annual or monthly statistics if more than 5 days are missing.

Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	
1948	0.00	z 0.00	z 0.00	z 0.00	z 0.00	z 0.00	z 0.00	g	0.00	0.00	0.52	0.26	c 2.88	3.66
1949	1.33	1.51	3.14	0.00	0.16	0.00	0.07	0.07	0.00	0.00	1.10	1.54	8.92	
1950	4.85	1.85	1.45	1.04	0.22	0.03	0.00	0.00	0.06	1.94	3.61	4.95	20.00	
1951	2.55	1.90	1.09	0.48	0.32	0.01	0.00	0.10	0.09	0.88	2.77	4.29	14.48	
1952	7.27	1.98	3.44	1.38	0.08	0.19	0.00	0.00	0.17	0.00	1.69	5.64	g	
	16.20													
1953	2.36	0.00	1.58	1.19	0.59	0.45	0.00	0.10	0.00	0.12	1.57	0.51	8.47	
1954	2.39	2.23	2.40	0.82	0.14	0.02	0.00	0.00	0.00	0.00	1.78	3.52	13.30	
1955	3.38	1.78	0.44	1.07	0.53	0.00	0.00	a 0.00	0.00	0.02	1.17	9.69	18.08	
1956	5.45	1.90	0.13	0.93	0.68	0.00	0.00	0.00	0.39	1.32	0.05	0.23	11.08	
1957	2.31	3.27	1.84	0.88	2.63	0.00	0.00	0.00	0.25	1.71	0.23	2.99	a 16.11	

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1958	5.70	6.20	5.11	5.31	0.61	0.37	0.02	0.00	0.04	0.17	0.03	0.88	24.44
1959	3.27	4.12	0.31	0.33	0.00	0.00	0.00	0.00	1.07	0.00	0.00	1.48	10.58
1960	3.53	3.60	1.39	0.77	0.89	0.00	0.00	0.00	0.00	0.14	3.41	0.66	14.39
1961	2.10	0.96	2.10	0.88	0.44	0.00	0.00	0.05	0.25	0.09	2.52	2.16	11.55
1962	0.74	6.23	1.95	0.15	0.00	0.00	0.00	0.00	0.00	8.05	0.41	1.64	19.17
1963	1.93	4.18	2.83	3.44	0.59	0.06	0.00	0.00	0.16	1.27	2.95	0.35	17.76
1964	3.41	0.03	0.98	0.18	0.14	0.70	0.00	0.02	0.00	1.18	2.55	4.95	14.14
1965	2.56	0.47	1.07	3.10	0.00	0.00	0.00	0.17	0.00	0.02	4.20	3.48	15.07
1966	2.23	1.31	0.24	0.50	0.28	0.02	0.18	0.17	0.18	0.00	2.96	2.70	10.77
1967	6.65	0.29	4.61	4.17	0.06	0.93	0.00	0.00	0.06	0.41	1.08	1.46	19.72
1968	4.07	1.57	2.46	0.40	0.00	0.00	0.00	0.00	0.00	0.13	2.49	2.82	13.94
1969	7.38	6.75	0.91	1.32	0.00	0.00	0.00	0.00	0.00	1.17	0.58	4.73	22.84
1970	6.39	1.15	0.75	0.15	0.00	0.55	0.00	0.00	0.00	0.32	5.64	4.75	19.70
1971	1.51	0.82	2.13	0.76	0.44	0.00	0.00	0.00	0.06	0.06	0.79	3.40	9.97
1972	1.04	1.09	0.08	0.86	0.00	0.16	0.00	0.00	0.41	3.63	4.64	1.88	13.79
1973	8.26	4.94	1.48	0.46	0.84	0.00	0.00	0.00	0.19	1.48	5.37	4.42	27.44
1974	2.94	1.05	3.83	1.79	0.00	0.00	0.32	0.00	0.00	0.81	0.52	1.57	12.83
1975	1.57	4.14	5.40	1.88	0.00	0.00	0.24	0.04	0.00	0.00	z 0.00	z 0.00	z 13.27

Period of Record Statistics

MEAN	3.60	2.42	1.97	1.27	0.36	0.13	0.03	0.03	0.12	0.94	2.01	2.84	15.54
S.D.	2.14	1.95	1.49	1.30	0.54	0.25	0.08	0.05	0.22	1.65	1.67	2.06	4.93
SKEW	0.74	0.85	0.82	1.76	2.95	1.99	2.63	1.94	3.05	3.21	0.62	1.33	0.65
MAX	8.26	6.75	5.40	5.31	2.63	0.93	0.32	0.17	1.07	8.05	5.64	9.69	27.44
MIN	0.74	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	8.47
NO YRS	27	27	27	27	27	27	27	28	28	27	27	26	25

PORT CHICAGO NAVAL DEP, CALIFORNIA (047070)

Period of Record Monthly Climate Summary

Period of Record : 7/ 8/1948 to 9/30/1975

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	54.7	60.3	64.3	69.8	75.8	82.6	87.5	87.1	84.3	76.2	64.6	55.4	71.9
Average Min. Temperature (F)	34.6	37.5	38.6	42.0	46.3	51.3	53.0	52.8	50.8	45.5	39.7	35.7	44.0
Average Total Precipitation (in.)	3.60	2.42	1.97	1.27	0.36	0.13	0.03	0.03	0.12	0.94	2.01	2.84	15.72
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.

Max. Temp.: 99.8% Min. Temp.: 99.3% Precipitation: 99.9% Snowfall: 99.6% Snow Depth: 99.6%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

MARTINEZ WATER PLANT, CALIFORNIA (045378)

Period of Record Monthly Climate Summary

Period of Record : 2/ 1/1970 to 12/31/2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
Average Max. Temperature (F)	55.1	61.0	66.3	72.1	79.1	85.4	88.9	88.2	85.0	76.8	63.9	55.5	55.5	73.1
Average Min. Temperature (F)	39.2	42.0	44.5	46.1	49.9	53.7	54.9	54.9	53.9	49.4	43.7	39.0	39.0	47.6
Average Total Precipitation (in.)	3.98	3.73	2.97	1.03	0.45	0.11	0.02	0.06	0.22	0.90	2.69	3.39	3.39	19.54
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.

Max. Temp.: 99.6% Min. Temp.: 99.5% Precipitation: 100% Snowfall: 100% Snow Depth: 100%

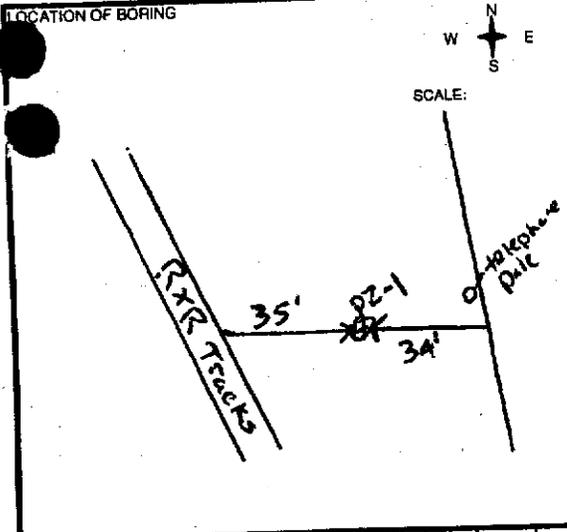
Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrc@dr.edu

APPENDIX E

Well Construction and Geologic Logs for Piezometers

Piezometers PZ-1 and PZ-3 were logged by Brad Ziegler (Forsgren and Associates) and Shalom Marquardt (Brown and Caldwell). Piezometers PZ-2, PZ-4, PZ-5, PZ-6, PZ-11, and PZ-20 were logged by Brad Ziegler. Piezometers PZ-7, PZ-9, PZ-10, PZ-12, PZ-13, PZ-14, PZ-17, PZ18, and PZ-19 were logged by Rachel Goldberg (Brown and Caldwell). Wendy Linck of Brown and Caldwell was the professional geologist (California Registered Geologist) responsible for the content of the logs.



CLIENT USACE	BORING NUMBER PZ-1
LOCATION Benicia, CA	SHEET 1 OF 1
PROJECT NAME Benicia SHM	DRILLING CONTRACTOR Gregg
JOB NUMBER 00701	RIG TYPE (CIRCLE ONE) <input checked="" type="checkbox"/> DP <input type="checkbox"/> MJD <input type="checkbox"/> ARCH <input type="checkbox"/> NONE
DRILLING METHOD, FLUID USED	START TIME 11:45
SOIL SAMPLING METHOD (CIRCLE ONE) <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> CC <input type="checkbox"/> ACETATE <input type="checkbox"/> NONE	FINISH TIME 12:20
MONITORING INSTRUMENT (CIRCLE ONE) <input checked="" type="checkbox"/> FID <input type="checkbox"/> LEL <input type="checkbox"/> RAD <input type="checkbox"/> NONE	DATE 01/14/02
SURFACE CONDITIONS (CIRCLE ONE) <input checked="" type="checkbox"/> ASPHALT <input type="checkbox"/> CONCRETE <input type="checkbox"/> DIRT <input checked="" type="checkbox"/> DRY <input type="checkbox"/> WET	DATE 01/14/02

FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION

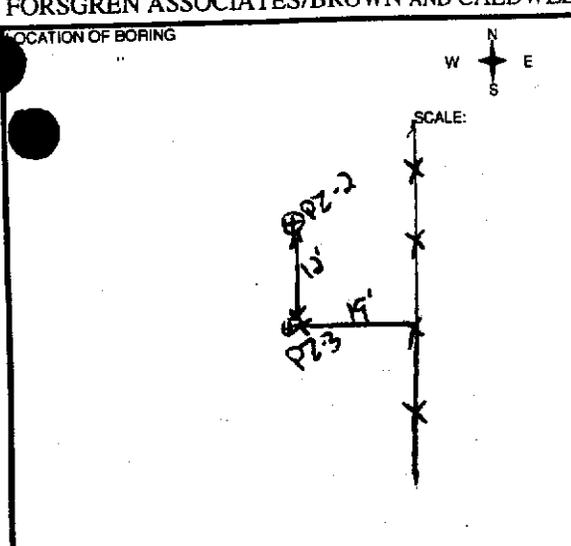
COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADUATION (g/m), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION

WELL CONSTRUCTION	SOIL SAMPLING	DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	SAMPLE TYPE: INTERVAL DESCRIPTION
ANNULUS: Net Cement Grout	SAMPLER USED: 2" SSB	0			0-8" asphalt surface
CASING: 2" SSB	BLOWS/INTERVAL: 10	0-2.5		CL	8"-2.5' road base material
	INTERVAL SAMPLED: 10	2.5-4		ML	2.5-4 CL - clay with silt, greenish black (2.5/150) yellow mottling, moist
	RECOVERY: 10	4-7		CL	4-7 ML - silt dark gray (4/101) low plasticity
	ANALYTICAL SAMPLE (A,B,C): 2/4	7-16		CH	(15, 35, 50) mottled with yellowish brown (10/16/16)
	WATER LEVEL (INITIAL/STATIC): 2/4				7-16 CH - clay, Olive (5Y4/3), (15, 25, 60) moist wet, low plasticity med-high, dark gray (5Y4/1) etc color change @ 7.5ft, some gravel pieces angular ~ 1cm dia, some organics, high ratio of organics @ 12ft - 16ft, strong organic odor
	DEPTH (FEET): 2/4				Total Depth @ 16ft
					Materials Used:
					Sand: 3.5 bags Cement: 3 bags
					berchips: 1/2 bag
					Cement: 1 bag

Berchips

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

- A SHMP2001-A-S01A D _____
- B SHMP2001-A-S02A E _____
- C SHMP2001-B-S02A F _____



CLIENT USACE	BORING NUMBER PZ-3	
LOCATION Benicia, CA	SHEET 1 OF 348	
PROJECT NAME Benicia SHM	DRILLING CONTRACTOR Gregg	
JOB NUMBER 00701	START TIME 1420	FINISH TIME 110
DRILLING CONTRACTOR Gregg	DATE 011402	DATE 011502
RIG TYPE (CIRCLE ONE) <input checked="" type="checkbox"/> H DP MUD ARCH NONE	WELL CONSTRUCTION	
DRILLING METHOD, FLUID USED	START TIME 1200	FINISH TIME 1630
SOIL SAMPLING METHOD (CIRCLE ONE) <input checked="" type="checkbox"/> SPLIT SHOON CC ACETATE NONE	DATE 011502	DATE 011502
MONITORING INSTRUMENT (CIRCLE ONE) <input checked="" type="checkbox"/> FID LEL RAD NONE	WELL CONSTRUCTION	
SURFACE CONDITIONS (CIRCLE ONE) <input checked="" type="checkbox"/> ASPHALT CONCRETE DIRT WET	START TIME 1200	FINISH TIME 1630
	DATE 011502	DATE 011502

WELL CONSTRUCTION		SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION	COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADATION (g/m), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)					
									0		0-6" Asphalt
			80					CL	6"-2.5 CL - clay with silt (5.10, 85) greenish black (25/104)		
			114					ML	3.5-4 CL - clay with silt (5.10, 85) yellowish brown (5/9 10YR) low plasticity		
			127					ML	4-8 ML - silt with sand (5.30, 65) yellowish brown (5/8 10YR) dry, soft, grayish @ 6.5 moist @ 8 ft		
			145					CL	8-11 CL - clay (10.5, 95) yellowish brown (5/6 10YR) wet, high plasticity, soft, sharp color change @ 10 ft dark bluish gray (6EY2 5/5B) mild organic odor.		
			222						11-15.5 CL - same as above moist, strong odor @ 15.5 ft, high presence of organics, wet @ 17 ft 50% organics @ 18.5		
			234								
			237								
			244								
			245								

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

- A SHMP2003-A-S01A D _____
- B SHMP2003-A-S02A E _____
- C _____ F _____

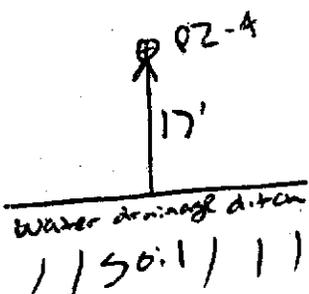
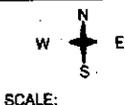
LOCATION OF BORING  SCALE:	CLIENT USACE	BORING NUMBER PZ-3 SHEET 2 OF 34
	LOCATION Benicia, CA	
	PROJECT NAME Benicia SHM	
	JOB NUMBER 00701	
	DRILLING CONTRACTOR Gregg	
	RIG TYPE (CIRCLE ONE) <input checked="" type="checkbox"/> SA DP MUD ARCH NONE	
	DRILLING METHOD, FLUID USED	
	SOIL SAMPLING METHOD (CIRCLE ONE) SPLIT <input checked="" type="checkbox"/> SON CC ACETATE NONE	
	MONITORING INSTRUMENT (CIRCLE ONE) <input checked="" type="checkbox"/> PR FID LEL RAD NONE	
	SURFACE CONDITIONS (CIRCLE ONE) <input checked="" type="checkbox"/> ASPHALT CONCRETE DIRT <input checked="" type="checkbox"/> WET	
DRILLING	START TIME 011402	FINISH TIME 011502
	DATE 1420	DATE 1110
	WELL CONSTRUCTION	
	START TIME 1200	FINISH TIME 1630
	DATE 011502	DATE 011502

WELL CONSTRUCTION		SOIL SAMPLING						DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION	COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADATION (g/m ³), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)	WATER LEVEL (INITIAL/STATIC)					
								2.0	0 ppm	CL	SAMPLE TYPE: INTERVAL: DESCRIPTION 20-27.5 CL - clay (0,0,100) greenish black (2.5/110Y) high organic content of reddish wood chips, strong odor, soft, moist, high plasticity, wet @ 23 organics ~5% @ 24.5ft, 1/2	
								25	0		27.5-31 CL - clay same as above high organics 50%, moist	
								30	0		31-40 CL - clay same as above, increase in organics moist-wet	
								35	0			
								40	0			

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	_____	D	_____
B	_____	E	_____
C	_____	F	_____

LOCATION OF BORING



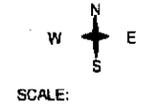
CLIENT USACE	BORING NUMBER PZ-4
LOCATION Benicia, CA	
PROJECT NAME Benicia SHM	
JOB NUMBER 00726	SHEET 1 OF 1
DRILLING CONTRACTOR Gress	DRILLING
DRILLING METHOD, FLUID USED DP	START TIME 0745
SOIL SAMPLING METHOD (CIRCLE ONE) DP	FINISH TIME 1050
SPLIT SOX	DATE 01/17/02
MONITORING INSTRUMENT (CIRCLE ONE) PI	DATE 01/17/02
SURFACE CONDITIONS (CIRCLE ONE) ASPH	WELL CONSTRUCTION
	START TIME 1055
	FINISH TIME 1230
	DATE 01/17/02
	DATE 01/17/02

WELL CONSTRUCTION		SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/IN INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)				
										SAMPLE TYPE: INTERVAL: DESCRIPTION
									ML	0-2 Asphalt + road base material
									CL	2-6 ML Sand, silt w/ gravel very dark gray (16 LEY, 3/11), (10, 40, 50), non plastic, dry, no odor, hard, well graded (fill material)
										6-10 CH, clay, dark bluish gray (26 LEY, 3/10B) med plasticity, low toughness, moist, organic odor, very soft, ~25% organics (mud material)
										10-20 CH, clay, same color as above, med plasticity low toughness, moist-wet (wet bit 12-13') no odor, very soft, no organics present (dry mud)
										TD=26' Well set @ 1505' bgs

Berronite Chips
 #3 SAND
 2" PVC
 1/2" Black PVC

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	SHMPZ004-A-S01A	D	_____
B	SHMPZ004-A-S02A	E	_____
C		F	_____

LOCATION OF BORING  SCALE: 026 PZ-5 OVER HAD CLOSE	CLIENT	USACE	BORING NUMBER	PZ-5
	LOCATION	Benicia, CA		
	PROJECT NAME	Benicia SHM	SHEET	1 OF 1
	JOB NUMBER	00726	DRILLING	
	DRILLING CONTRACTOR	Gregg	START TIME	FINISH TIME
	RIG TYPE (CIRCLE ONE)	OTHER _____	1230	1315
	DRILLING METHOD, FLUID USED	DP MUD ARCH NONE	DATE	DATE
	SOIL SAMPLING METHOD (CIRCLE ONE)	OTHER _____	01/16/02	01/16/02
	SPLIT SOON CC ACETATE NONE		WELL CONSTRUCTION	
	MONITORING INSTRUMENT (CIRCLE ONE)	OTHER _____	START TIME	FINISH TIME
PID FID LEL RAD NONE		1315	1430	
SURFACE CONDITIONS (CIRCLE ONE)	OTHER _____	DATE	DATE	
ASPHALT CONCRETE DIRT DRY WET		01/16/02	01/16/02	

FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION

COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADATION (g_m), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION

DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	SAMPLE TYPE: INTERVAL DESCRIPTION
0			0-3 Asphalt + road base material
3-6.5			Silty sand w/ gravel, brown (7.5YR, 5/4) (15, 50, 35) nonplastic, well graded, dry, moderate cementation, med perm (Fill material)
6.5-8			silty sand, bluish black (2.6GY, 2.5/5B) (5, 70, 25) nonplastic, subrounded, moist, no odor, weak cementation, high-med perm, well graded (Fill material)
			(See boring log w adjacent PZ-6 for remaining litho description)
			TD = 15' bgs well set @ 15' bgs

WELL CONSTRUCTION		SOIL SAMPLING						DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)	WATER LEVEL (INITIAL/STATIC)			
	3" SAND	0.020 silted sch. PVC	25	30			11.4			
	New Cement Grout		10	15						
			12	25						
			3							

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A SHMPZ005-A-S01A

B SHMPZ005-A-S02A

C

D _____

E _____

F _____

LOCATION OF BORING		CLIENT	BORING NUMBER	
		USACE	PZ-9	
		LOCATION	Benicia, CA	
		PROJECT NAME	Benicia SHM	
		JOB NUMBER	00726	
DRILLING CONTRACTOR		SHEET 1 OF 1		
Gress		DRILLING		
RIG TYPE (CIRCLE ONE)		START TIME	FINISH TIME	
<input checked="" type="checkbox"/> DP <input type="checkbox"/> MUD <input type="checkbox"/> ARCH <input type="checkbox"/> NONE		1400	1455	
DRILLING METHOD, FLUID USED		DATE	DATE	
		1/24/02	1/24/02	
SOIL SAMPLING METHOD (CIRCLE ONE)		OTHER		WELL CONSTRUCTION
<input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> ACETATE <input type="checkbox"/> NONE				START TIME
MONITORING INSTRUMENT (CIRCLE ONE)		OTHER		FINISH TIME
<input checked="" type="checkbox"/> FID <input type="checkbox"/> LEL <input type="checkbox"/> RAD <input type="checkbox"/> NONE				1455
SURFACE CONDITIONS (CIRCLE ONE)		OTHER		DATE
<input checked="" type="checkbox"/> ASHALT <input type="checkbox"/> CONCRETE <input type="checkbox"/> DIRT <input type="checkbox"/> DRY <input type="checkbox"/> WET				1/24/02

WELL CONSTRUCTION		SOIL SAMPLING				DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/B INTERVAL	INTERVAL SAMPLED	RECOVERY				
									SAMPLE TYPE: INTERVAL: DESCRIPTION
						0			0' Asphalt & base
						1.0-9.7'			lean clay with sand; very dark grayish brown (10YR 3/6); (5, 20, 75); fine to coarse sand; low plasticity; medium soft; moist
						~ 8.5-9'			gravel content increases to 10% sub sampler to sub rounded; fine to med. gravel
						9.7-10'			sandy silt; very dark grayish brown (10YR 3/6); (0, 35, 65); non plastic fines; fine grain sand; med soft; moist to wet
						10-11.5'			lean clay; very dark grayish brown (10YR 3/2); (0, 10, 90); low plasticity; med soft; moist
						11.5-12.5'			sandy silt with clay; very dark grayish brown (2.5Y 4/2); non plastic and slightly plastic fines; (0, 35, 65); fine grain sand; med soft; very moist; graditic contact
						12.5-EOB			fat clay; very dark gray (2.5Y/N3); (0, 10, 90); med-high plasticity; med soft to stiff; no plant roots; organic odor; sharp contact
						20'			End of boring - ran split spm 18.5-20 to see sample weathered sandstone, being hard.

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

- A SNMPZ009-A-S01A
- B SNMPZ009-A-S02A
- C _____

- D _____
- E _____
- F _____

LOCATION OF BORING 	CLIENT	USACE	BORING NUMBER	PZ-10
	LOCATION	Benicia, CA	SHEET	1 OF 2
	PROJECT NAME	Benicia SHM	DRILLING	
	JOB NUMBER	00726	START TIME	0855
DRILLING CONTRACTOR	Greig	FINISH TIME	1130	
RIG TYPE (CIRCLE ONE)	OTHER	DATE	1/24/02	1/24/02
<input checked="" type="checkbox"/> DP <input type="checkbox"/> MJD <input type="checkbox"/> ARCH <input type="checkbox"/> NONE		WELL CONSTRUCTION	START TIME	1130
DRILLING METHOD, FLUID USED		DATE	1/24/02	1/24/02
SOIL SAMPLING METHOD (CIRCLE ONE)	OTHER	FINISH TIME	1130	1330
<input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> ACETATE <input type="checkbox"/> NONE		DATE	1/24/02	1/24/02
MONITORING INSTRUMENT (CIRCLE ONE)	OTHER	TIME	1130	1330
<input checked="" type="checkbox"/> RD <input type="checkbox"/> LEL <input type="checkbox"/> RAD <input type="checkbox"/> NONE		DATE	1/24/02	1/24/02
SURFACE CONDITIONS (CIRCLE ONE)	OTHER	DATE	1/24/02	1/24/02
<input checked="" type="checkbox"/> ASPHALT <input type="checkbox"/> CONCRETE <input type="checkbox"/> DIRT <input type="checkbox"/> DRY <input type="checkbox"/> WET				

WELL CONSTRUCTION		SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (ppm)	USGS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)				
	2" PVC Blank	HA						0		SAMPLE TYPE: INTERVAL DESCRIPTION
								0		0-1' Asphalt and base
								5	CL	1'-11' Clay; Very dark grayish brown (10YR 3/2); (s, s, 90); low plasticity, medium soft; moist
								5		~5' size distribution changes to (10, 10, 80)
								10	ML	11'-11.5' Sandy silt; very dark grayish brown (10YR 3/2); (0.40, 60); nonplastic fines; fine grained sand; medium soft; to stiff wet
								10	CH	sharp contact
								15		11.5'-12' Clay; very dark grayish brown (10YR 3/2); (0, 10, 90); Mod plasticity; medium soft to stiff; moist; sharp contact
								15		~15' color change to black (10YR 2/1); plant roots; organic odor
								20		20'-21' Clayey Sand sandstone
								20		Clayey weathered bedrock with clay; dark

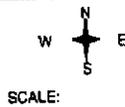
ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A SNMPZ 009-A-S01A D _____

B SNMPZ 010-A-S02A E _____

C _____ F _____

LOCATION OF BORING



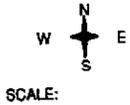
CLIENT USACE	BORING NUMBER PZ-10
LOCATION Benicia, CA	
PROJECT NAME Benicia SHM	
JOB NUMBER 00726	SHEET 2 OF 2
DRILLING CONTRACTOR Gregg	DRILLING
RIG TYPE (CIRCLE ONE) <input checked="" type="checkbox"/> DP <input type="checkbox"/> MUD <input type="checkbox"/> ARCH <input type="checkbox"/> NONE	START TIME
DRILLING METHOD, FLUID USED	FINISH TIME
SOIL SAMPLING METHOD (CIRCLE ONE) <input checked="" type="checkbox"/> SPLIT SPON <input checked="" type="checkbox"/> ACETATE <input type="checkbox"/> NONE	DATE
MONITORING INSTRUMENT (CIRCLE ONE) <input checked="" type="checkbox"/> P <input type="checkbox"/> FID <input type="checkbox"/> LEL <input type="checkbox"/> RAD <input type="checkbox"/> NONE	WELL CONSTRUCTION
SURFACE CONDITIONS (CIRCLE ONE) <input checked="" type="checkbox"/> ASPHALT <input type="checkbox"/> CONCRETE <input type="checkbox"/> DIRT <input type="checkbox"/> DRY <input type="checkbox"/> WET	START TIME
	FINISH TIME
	DATE
	DATE

WELL CONSTRUCTION		SOIL SAMPLING					WATER LEVEL (INITIAL/STATIC)	DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/6" INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)					
	2 1/2" bitum casing		20'	30" 50/6"			20			blue brown (2.5Y 3/3); 3-40% clay low plasticity; ~60% fine grained sand and weathered sandstone; severely weathered; very soft; gradational contact	
	2" SPI 1/4" spacer		21.5'	30" 50/6"			25			* 21.5' weathered calcareous claystone; dark grayish brown (10Y 5 1/2); severely weathered; very soft; gradational contact - met when broken apart	
	2" SPI 1/4" spacer		24.5'	30" 50/5"			30			24.5'-26' weathered sandstone; yellowish brown (10YR 5/6); fine grained; severely to moderately weathered; soft to very soft; gradational contact	
	2" SPI 1/4" spacer		26'	30" 50/6"			35			26'-EOB weathered sandstone claystone; dark grayish brown (2.5Y 4/6); severely-mod weathered; moderately soft; gradational contact	
	2" SPI 1/4" spacer		34'							34' End of boring	

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	_____	D	_____
B	_____	E	_____
C	_____	F	_____

LOCATION OF BORING



CLIENT USACE	BOREHOLE NUMBER PZ-11
LOCATION Benicia, CA	SHEET 1 OF 1
PROJECT NAME Benicia-SHM	DRILLING CONTRACTOR
JOB NUMBER 60726	DRILLING
DRILLING CONTRACTOR	START TIME 0900
RIG TYPE (CIRCLE ONE) H&R DP MUD ARCH NONE	FINISH TIME 1015
DRILLING METHOD, FLUID USED	DATE 01/18/02
SOIL SAMPLING METHOD (CIRCLE ONE)	DATE 01/18/02
SPLIT SPOON X CC ACETATE NONE	WELL CONSTRUCTION
MONITORING INSTRUMENT (CIRCLE ONE) PH FID LEL RAD NONE	START TIME 1045
SURFACE CONDITIONS (CIRCLE ONE) ASPHLT CONCRETE DIRT DRY WET	FINISH TIME 1245
	DATE 01/18/02
	DATE 01/18/02

WELL CONSTRUCTION		SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (mm)	USCS GROUP SYMBOL	
ANNULUS	CASING	SAMPLER USED	BLOWS/8" INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)				WATER LEVEL (INITIAL/STATIC)
									0	OVM
									0	CL
									5	
									10	MM
									10	CL
									15	
									15	
									20	

FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION

COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADATION (g/m²), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION

SAMPLE TYPE: INTERVAL-DESCRIPTION

0-2 Asphalt + road base material

2-5 CL Silty clay, (5, 15, 80), dark yellowish brown (10YR, 3/4), med plasticity, low toughness, dry, no odor, well sorted (fill material)

6.5-10 MM Silt, (15, 10, 75) light yellowish brown (10YR, 6/4) nonplastic, dry, no odor, siltstone present fissured + subangular

10-15 CL clay, (0, 10, 90), dark bluish gray (2.5GY, 3/10B), med plasticity, low-med toughness, dry (moist-wet @ 12'), slight organic odor, soft, few organics present (moist-wet from 12'-13' by then moist 13-15) (gray mud)

15-17 same as above except increase in presence of organics to ~ 25%-50%.

17-20 same as 10-15

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A SHMPZ011-A-S01A

B SHMPZ011-B-S01A

C SHMPZ011-A-S02A

D _____

E _____

F _____

LOCATION OF BORING 	CLIENT	USACG	BORING NUMBER PZ-12
	LOCATION	Benicia, CA	
	PROJECT NAME	Benicia SWM	
	JOB NUMBER	007210	
DRILLING CONTRACTOR	Gress		SHEET 1 OF 1 DRILLING
RIG TYPE (CIRCLE ONE)	OTHER _____ <input checked="" type="radio"/> HSA <input type="radio"/> B-80 DP	MUD _____ <input type="radio"/> ARCH <input type="radio"/> NONE	START TIME 0845 FINISH TIME 1015
DRILLING METHOD, FLUID USED			DATE 1/18/02 DATE 1/18/02
SOIL SAMPLING METHOD (CIRCLE ONE)	OTHER _____		WELL CONSTRUCTION
SPLIT SPOON	<input checked="" type="radio"/> ACETATE <input type="radio"/> NONE		START TIME 1020 FINISH TIME 1215
MONITORING INSTRUMENT (CIRCLE ONE)	<input checked="" type="radio"/> FID <input type="radio"/> LEL <input type="radio"/> RAD <input type="radio"/> NONE		DATE 1/18/02 DATE 1/18/02
SURFACE CONDITIONS (CIRCLE ONE)	<input checked="" type="radio"/> ASPHALT <input type="radio"/> CONCRETE <input type="radio"/> DIRT <input type="radio"/> DRY <input type="radio"/> WET		

ANNULUS	CASING	SOIL SAMPLING				WATER LEVEL (GPI/STATIC)	DEPTH (FEET)	INSTRUMENT READING (gpm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION
		SAMPLER USED	BLOWB'S INTERVAL	INTERVAL SAMPLED	RECOVERY					
	2" PVC 1/2" I.D.								CL	0-2.5' Asphalt and road base 2.5'-8.5' clay (dark brown) (2.5, 95); low-med plasticity, dry to moist; trace angular pebbles 1" diameter ~5.0' color change to very dark brown (10YR 2/2) mottled with yellowish brown (10YR 5/6)
	3 1/2" Gress								SM	8.5'-9.0' Sandy clay (CL); brown-dark brown (10YR 4/3) (5, 40, 55); low-med plasticity, moist 9.0'-11' Silty Sand (SM) dark yellowish brown (10YR 3/4); (5, 70, 25); well graded-subangular grains; loose to medium dense; wet/saturated
	5' foot concrete sampler								SP	11'-12' well graded sand with silt dark yellowish brown (10YR 3/4); (5, 85, 10); angular to sub-rounded; loose-med dense; wet/saturated 12'-EOB Poorly graded sand dark yellowish brown (10YR 3/4); (5, 95, 5); subangular to subrounded; loose-med dense; wet/saturated
										19' End of Boring

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

- A SHMPZ012-A-S01A
 - B SHMPZ012-A-S02A
 - C
- } Submitted to EAB on 1/25/02

Note: All sample IDs as marked on this log as shown: SHMPZ012-A-S01A @ 2.5-3', SHMPZ012-A-S02A @ 9-9.5'

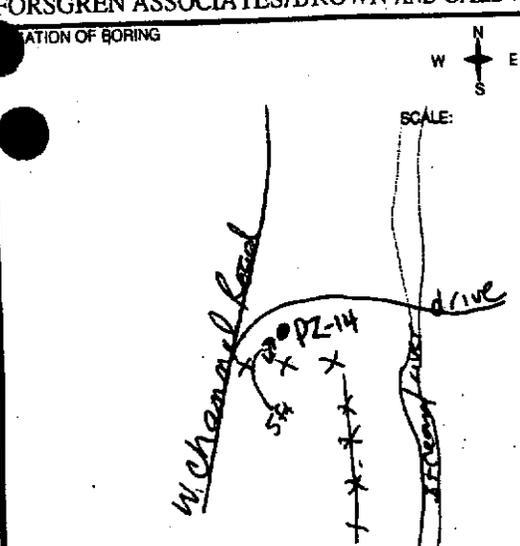
2/21/02 LW

LOCATION OF BORING 	CLIENT	USACE		BORING NUMBER	PZ-14	
	LOCATION	Benicia, CA			SHEET 1 OF 2	
	PROJECT NAME	Benicia SHW		DRILLING		
	JOB NUMBER	00726		START TIME	FINISH TIME	
	DRILLING CONTRACTOR	Gregg		1410	1635	
	RIG TYPE (CIRCLE ONE)	OTHER			DATE	DATE
<input checked="" type="checkbox"/> HSA <input type="checkbox"/> DP <input type="checkbox"/> MUD <input type="checkbox"/> ARCH <input type="checkbox"/> NONE				01/21/02	1/21/02	
DRILLING METHOD, FLUID USED			WELL CONSTRUCTION			
SOIL SAMPLING METHOD (CIRCLE ONE)	OTHER			START TIME	FINISH TIME	
<input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> CO ACETATE <input type="checkbox"/> NONE				1535	1700	
MONITORING INSTRUMENT (CIRCLE ONE)	OTHER			DATE	DATE	
<input checked="" type="checkbox"/> PIS <input type="checkbox"/> PID <input type="checkbox"/> LEL <input type="checkbox"/> RAD <input type="checkbox"/> NONE				1/22/02	1/22/02	
SURFACE CONDITIONS (CIRCLE ONE)	OTHER					
<input checked="" type="checkbox"/> ASPHALT <input type="checkbox"/> CONCRETE <input type="checkbox"/> DIRT <input type="checkbox"/> DRY <input type="checkbox"/> WET						

WELL CONSTRUCTION		SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)				
	2" PVC Blank Casing	7A							CL	SAMPLE TYPE: INTERVAL DESCRIPTION 0-2.0 Asphalt & roadbase 2.0-5.0 Sandy clay with gravel dark brown (10YR 3/3); (15, 35, 50); due to coarse sand; subangular to subrounded sand & gravel; fine gravel; low plastic fines; medium soft; moist; ~2.5 ft large cobble 5.0'-22.5' lean clay; dark olive gray (5Y 3/2); (5, 10, 85); low plasticity; medium soft to hard; moist ~8.5' lense of sandy clay - fine sand; low plastic fines ~9.0 color change to dark olive brown (7.5Y 3/3) ~10.0 becoming (10, 5, 95) 20' of water slowly rising at 1" / 2 min; sandstone cobble; wet; subangular to subrounded.

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	_____	D	_____
B	_____	E	_____
C	_____	F	_____



CLIENT USACE	BOREHOLE NUMBER PZ-14
LOCATION Bemera, CA	SHEET 2 OF 2
PROJECT NAME Bemera SHM	DRILLING CONTRACTOR Greger
JOB NUMBER 00726	DRILLING START TIME 1410
DRILLING CONTRACTOR Greger	DRILLING FINISH TIME 1635
RIG TYPE (CIRCLE ONE) <input checked="" type="checkbox"/> PIG <input type="checkbox"/> DP <input type="checkbox"/> MUD <input type="checkbox"/> ARCH <input type="checkbox"/> NONE	DATE 1/21/02
DRILLING METHOD, FLUID USED	DATE 1/21/02
SOIL SAMPLING METHOD (CIRCLE ONE) <input checked="" type="checkbox"/> SPLIT PISTON <input checked="" type="checkbox"/> ACETATE <input type="checkbox"/> NONE	WELL CONSTRUCTION START TIME 1535
MONITORING INSTRUMENT (CIRCLE ONE) <input checked="" type="checkbox"/> PIG <input type="checkbox"/> FID <input type="checkbox"/> LEL <input type="checkbox"/> RAD <input type="checkbox"/> NONE	WELL CONSTRUCTION FINISH TIME 1700
SURFACE CONDITIONS (CIRCLE ONE) <input checked="" type="checkbox"/> ASPHALT <input type="checkbox"/> CONCRETE <input type="checkbox"/> DIRT <input type="checkbox"/> DRY <input type="checkbox"/> WET	DATE 1/22/02
	DATE 1/22/02

WELL CONSTRUCTION		SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)				
	002" Slot Screen								20	~22' sandstone, cobbles increasing
			50%					SP	22-23.5	Partly graded sand with rock frag; Olive (5y ⁴ / ₅) (5,90,5); fine grained sand; very dense; sandstone rock fragments up to 1" diameter
			100%						25	23.5-25 Sandstone cobbles with clay and sand; Olive (5y ⁴ / ₅); subangular to subrounded gravel size particles; hard; maximum size about 1 inch; wet; no reaction with HCl.
									30	~25' some shale fragments; lost split spoon in hole; very hard.
									35	25.5 EOB
									40	End of boring

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	_____	D	_____
B	_____	E	_____
C	_____	F	_____

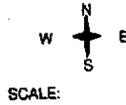
LOCATION OF BORING 	CLIENT USACE	BORING NUMBER PZ-17
	LOCATION Banica CA	SHEET 1 OF 2
	PROJECT NAME Banica SIRM	DRILLING CONTRACTOR Gregg
	JOB NUMBER 007210	DRILLING METHOD, FLUID USED ASPHALT
DRILLING CONTRACTOR Gregg	FIG TYPE (CIRCLE ONE) <input checked="" type="checkbox"/> DP <input type="checkbox"/> MUD <input type="checkbox"/> ARCH <input type="checkbox"/> NONE	DRILLING START TIME 0930 FINISH TIME 1240
DRILLING METHOD, FLUID USED ASPHALT	SOIL SAMPLING METHOD (CIRCLE ONE) <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> ACETATE <input type="checkbox"/> NONE	DATE 1/23/02
SOIL SAMPLING METHOD (CIRCLE ONE) <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> ACETATE <input type="checkbox"/> NONE	MONITORING INSTRUMENT (CIRCLE ONE) <input checked="" type="checkbox"/> FID <input type="checkbox"/> LEL <input type="checkbox"/> RAD <input type="checkbox"/> NONE	WELL CONSTRUCTION START TIME 1240 FINISH TIME 1520
MONITORING INSTRUMENT (CIRCLE ONE) <input checked="" type="checkbox"/> FID <input type="checkbox"/> LEL <input type="checkbox"/> RAD <input type="checkbox"/> NONE	SURFACE CONDITIONS (CIRCLE ONE) <input checked="" type="checkbox"/> ASPHALT <input type="checkbox"/> CONCRETE <input type="checkbox"/> DIRT <input type="checkbox"/> DRY <input type="checkbox"/> WET	DATE 1/23/02

WELL CONSTRUCTION		SOIL SAMPLING					WATER LEVEL (INITIAL/STATIC)	DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION	COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADATION (g _m), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	RECOVERY	ANALYTICAL SAMPLE (A,B,C)	SOIL TYPE: INTERVAL: DESCRIPTION						
							0				0-3.0 Asphalt and base rock	
							3.0		CU		3.0'-9.0' Clay with sand; dark grayish brown (10YR 4/2); (S, 20, 75); low plasticity; fine to coarse sand grains; stiff ; moist	
							5.0				~5.0' cobbles shale fragment up to 1" diameter	
							6.0				~6.0' several cobble size shale fragments up to 1.5" diameter	
							8.0		SC		~8.0' color change to very dark gray (2.5Y N3); sandstone sized cobbles - up to 0.5-2" diam	
							9.0		CL		fine grain sand; gradational contact	
							9.0-9.5		SP		9.0'-9.5' Clay sand; dark yellowish brown (10YR 3/4); (0, 25, 75); low plastic fines; fine grained sand; moist loose to not dense; moist	
							9.5				9.5'-11' Clay with sand; dark yellowish brown (10YR 3/4); (0, 15, 85); low plasticity; very stiff; moist; fine grain sand; gwa rises rapidly; gradational contact	
							11				11'-12' Sand; fine grad sand with clay; Dark yellowish brown (10YR 4/4); (0, 20, 80); low plastic fines; fine grain sand; not dense; starting to cement; moist	
							20				gradational contact	

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	SNMP2017-A-S01A	D	_____
B	SNMP2017-B-S01A	E	_____
C	SNMP2017-A-S02A	F	_____

LOCATION OF BORING



CLIENT USACE
LOCATION Benicia, CA
PROJECT NAME Benicia SHM
JOB NUMBER 00726
DRILLING CONTRACTOR Gress
RIG TYPE (CIRCLE ONE) OTHER _____ <input checked="" type="checkbox"/> SA DP MUD ARCH NONE
DRILLING METHOD, FLUID USED
SOIL SAMPLING METHOD (CIRCLE ONE) OTHER _____ <input checked="" type="checkbox"/> SPLIT SPOON CC ACETATE NONE
MONITORING INSTRUMENT (CIRCLE ONE) OTHER _____ <input checked="" type="checkbox"/> FID LEL RAD NONE
SURFACE CONDITIONS (CIRCLE ONE) OTHER _____ <input checked="" type="checkbox"/> ASPHALT CONCRETE DIRT DRY WET

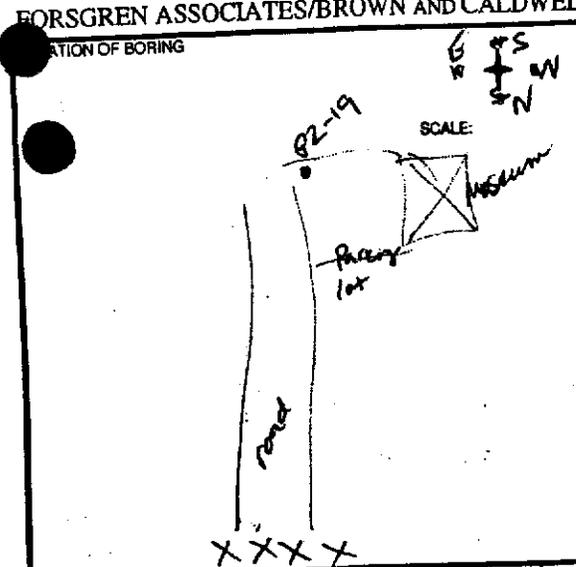
BORING NUMBER PZ-17	
SHEET 2 OF 2	
DRILLING	
START TIME 0930	FINISH TIME 1240
DATE 1/23/02	DATE 1/23/02
WELL CONSTRUCTION	
START TIME 1240	FINISH TIME 1520
DATE 1/23/02	DATE 1/23/02

WELL CONSTRUCTION		SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (ppm)	USGS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION	COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADATION (gms), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)					
								20			12-13.5' Poorly graded sand; Dark brown (10YR 3/3); (0, 100, 0); fine grained sand; loose-med dense; wet; silty sand, m. clay
								25			13.5-20.5' Silty sand; very dark gray (2.5Y/N3); (0.75, 25); nonplastic fines; ~20% low plastic fines; beginning cement; wet; fine grained sand poorly graded; sharp contact
								30			20.5-22' Silty sand; dark gray (2.5Y/N3); (0.75, 25); nonplastic fines; fine grained sand; wet; very dense; consist to wet; some cementation, breaks up easily; gradation contact
								35			22' Some bedrock fragments; sandstone; some calc veins, HCL effervescent; very hard
								40			23.5' Bottom End of boring; auger refusal.

Handwritten notes:
 23.5'
 2" dia. x 4' long
 2" dia. casing
 4.11

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	_____	D	_____
B	_____	E	_____
C	_____	F	_____



CLIENT	USACE		BOREHOLE NUMBER	PZ-19	
LOCATION	Bericia, CA		SHEET 1 OF 2		
PROJECT NAME	Bericia SHM		DRILLING		
JOB NUMBER	00724		START TIME	0910	
DRILLING CONTRACTOR	Gress		FINISH TIME	1200	
RIG TYPE (CIRCLE ONE)	OTHER _____		DATE	1/22/02	
DRILLING METHOD, FLUID USED	<input checked="" type="checkbox"/> PDA <input type="checkbox"/> DP <input type="checkbox"/> MUD <input type="checkbox"/> ARCH <input type="checkbox"/> NONE		DATE	1/22/02	
SOIL SAMPLING METHOD (CIRCLE ONE)	OTHER _____		WELL CONSTRUCTION		
SPLIT SPOON	<input checked="" type="checkbox"/> ACETATE		START TIME	1200	
MONITORING INSTRUMENT (CIRCLE ONE)	OTHER _____		FINISH TIME	1500	
SURFACE CONDITIONS (CIRCLE ONE)	OTHER _____		DATE	1/22/02	
	<input checked="" type="checkbox"/> ASPHALT <input checked="" type="checkbox"/> CONCRETE <input type="checkbox"/> DIRT <input type="checkbox"/> DRY <input type="checkbox"/> WET		DATE	1/22/02	

WELL CONSTRUCTION	SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (dpm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION
	ANNULUS	CASING	SAMPLER USED	BLOWS/IN INTERVAL SAMPLED	RECOVERY				
		4"				0		CL	0.0-4' Asphalt and road base -
		2" Split Spoon	12 14 12	Ø	A	5		CL (Fin)	4-6' Gravelly clay with sand; Dark yellow brown (10YR 4/4); (25, 15, 60); low plasticity; stiff moist. (Fin) pushed split spoon back to get sample
		2" Split Spoon			B	10		CL (Fin)	6-11.5' Clay with sand; Blue brown (2.5Y 7/3); (0, 15, 85); low plasticity; fine toned sand grains, moist very stiff; moist. (Fin)
		2" Split Spoon				15		weathered bedrock	10'-11.5' Clay with shale fragments; yellowish brown (10YR 5/6); 1/2 ~ 40% shale fragments, 60% clay low plasticity; dry very stiff; dry to slightly moist (Fin)
		2" Split Spoon				18.5			11.5' weathered bedrock - shale/chertstone; light blue gray (5Y 6/2); very hard; dry; no reaction with HCl; granular contact.
		2" Split Spoon				20			18.5' very small pore space with water color change to dark gray (5Y 4/1)

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	SHMP2019-A-S01A	D	_____
B	SHMP2019-A-S02A	E	_____
C		F	_____

LOCATION OF BORING 	CLIENT	USACE	BORING NUMBER	PZ-20
	LOCATION	Benicia, CA	SHEET	1 OF 2
	PROJECT NAME	00726	DRILLING	
	JOB NUMBER	Benicia - SHM	START TIME	1300
	DRILLING CONTRACTOR	Gregg	FINISH TIME	1620
	RIG TYPE (CIRCLE ONE)	HA DP MUD ARCH NONE	DATE	01/17/02
	DRILLING METHOD, FLUID USED		DATE	01/17/02
	SOIL SAMPLING METHOD (CIRCLE ONE)	SPLIT SPOON CC ACETATE NONE	WELL CONSTRUCTION	
	MONITORING INSTRUMENT (CIRCLE ONE)	FD LEL RAD NONE	START TIME	1625
	SURFACE CONDITIONS (CIRCLE ONE)	ASPHALT CONCRETE DIRT DRY WET	DATE	01/17/02

WELL CONSTRUCTION		SOIL SAMPLING						DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION	COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADATION (g ₆₀), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION
ANNULUS	CASING	SAMPLER USED	BLOWS/INTERVAL	INTERVAL SAMPLED	RECOVERY	ANALYTICAL SAMPLE (A,B,C)	WATER LEVEL (INITIAL/STATIC)					
	Neat Cement Grout	HA						0		ML	0-1.5' Asphalt + road base material	
	2" SCH 80 PVC Blank	SS						5		CL	1.5-2.5 ML Sandy silt w/ gravel (10, 35, 85%), pale brown (10YR, 6/3), nonplastic, dry, no odor, soft, well graded (fill material)	
								10		OH	2.5-9 CL silty clay (5, 25, 70), dark brown (7.5YR, 3/2), low-med plasticity, high toughness, dry, firm consistency, low perm	
								15		MH	9-15 MH silt, pale brown (10YR, 6/3), nonplastic, dry, no odor, stratified, hard, low perm	
								18		MH	15-18 MH silt w/ gravel, same color as above (2.5, 10, 65), non-plastic, dry, no odor, fissured, hard, low-med perm.; moist for 2" w/ 18', then dry	
								20			18 sand as above except moist	

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A	SHMPZ.020-A-S01A	D	
B	SHMPZ.020-A-S02A	E	
C		F	

LOCATION OF BORING  SCALE:		CLIENT USACE			BORING NUMBER PZ-20	
		LOCATION Benicia, CA				
		PROJECT NAME Benicia SHM			SHEET 2 OF 2	
		JOB NUMBER 00726			DRILLING	
		DRILLING CONTRACTOR Gregg			START TIME	FINISH TIME
		RIG TYPE (CIRCLE ONE) HA DP MUD ARCH NONE			1300	1620
		DRILLING METHOD, FLUID USED			DATE	DATE
					01/17/02	04/17/02
		SOIL SAMPLING METHOD (CIRCLE ONE) SPLIT <input checked="" type="checkbox"/> SOON CC ACETATE NONE			WELL CONSTRUCTION	
		MONITORING INSTRUMENT (CIRCLE ONE) PB FID LEL RAD NONE			START TIME	FINISH TIME
		SURFACE CONDITIONS (CIRCLE ONE) ASPHALT CONCRETE DIRT GRAY WET			DATE	DATE
					01/17/02	

WELL CONSTRUCTION	SOIL SAMPLING					DEPTH (FEET)	INSTRUMENT READING (ppm)	USCS GROUP SYMBOL	FINE GRAINED AND ORGANIC SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, SIZE DISTRIBUTION, PLASTICITY, DRY STRENGTH, DILATANCY, TOUGHNESS, MOISTURE, ODOR, STRUCTURE, CONSISTENCY, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, CONTACT DESCRIPTION	COARSE GRAINED SOIL DESCRIPTION: GROUP NAME, MUNSELL COLOR, COLOR, GRADATION (g/m ³), SIZE DISTRIBUTION, PLASTICITY, SHAPE, ANGULARITY, MOISTURE, ODOR, STRUCTURE, CEMENTATION, RELATIVE PERMEABILITY, LOCAL GEOLOGIC NAME, MINERALOGY, CONTACT DESCRIPTION
	ANNULUS	CASING	SAMPLER USED	BLOWS/6" INTERVAL	INTERVAL SAMPLED					
						20		MH	19-23 MH, silt w/ gravel (20, 0, 80), nonplastic, dry, no odor, homogeneous, hard, low perm, gravel is angular/subangular (silt stone); some color as etc.	
						25			23-24 same as 15-19' bgs	
						30			24-26 MH silt w/ gravel (same as 19-23 except color change to 5 bluish gray (2.6 LEY, 4/5B)) moist lens @ 25.5-26' w 3" thick	
						35			26-29 same as 19-23 moist-wet @ 28.5' bgs	
						40			29-34.5 same as 24-26 except moist-wet	

ANALYTICAL SAMPLE ID (SEE ABOVE FOR LOCATION)

A _____ D _____

B _____ E _____

C _____ F _____