Geotechnical Data Report

Nacimiento Water Project - Pipelines
San Luis Obispo County, California

Prepared for:

Black & Veatch Corporation
15615 Alton Parkway, Suite 300
Irvine, California 92618

March, 2007

Project No. 10352

Geomatrix

Geomatrix

March 30, 2007
Project 10352.000

Mr. Steve Foellmi
Black & Veatch Corporation
15615 Alton Parkway, Suite 300
Irvine, California 92618

Subject: Geotechnical Data Report
Nacimiento Water Project - Pipelines
San Luis Obispo County, California

Dear Mr. Foellmi:

Geomatrix Consultants, Inc. (Geomatrix) is pleased to submit this Geotechnical Data Report (GDR), which summarizes the geologic and geotechnical data collected by Geomatrix to support the design of the pipeline for the Nacimiento Water Project (NWP) in San Luis Obispo County, California. This GDR was developed in accordance with the Agreement for Engineering Consulting Services that was assigned to Black & Veatch Corporation on July 19, 2005. A separate Geotechnical Interpretive Report (GIR) was submitted containing the geologic/geotechnical evaluations, interpretations, and recommendations for the design of the NWP pipeline. Our study included compiling and reviewing existing information, performing a field exploration program, and performing laboratory tests on soil and rock samples.

Geomatrix has appreciated the opportunity to work with you and the rest of the Design Team and we look forward to working with you during construction of the project.

Sincerely yours,
GEOMATRIX CONSULTANTS, INC.

Signature and stamp on file.

Hans AbramsonWard, CEG
Project Engineering Geologist

Signature and stamp on file.

Michael L. Traubenik, G.E.
Principal Geotechnical Engineer

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GEOTECHNICAL DATA REPORT

Nacimiento Water Project - Pipelines
San Luis Obispo County, California

1.0 INTRODUCTION

In an effort to increase future water supply to customers within the County of San Luis Obispo, and increase system reliability, the San Luis Obispo County Flood Control and Water Conservation District (District) has implemented the Nacimiento Water Project (NWP). The NWP consists of a water transmission pipeline that will extend approximately 45 miles from Lake Nacimiento to the City of San Luis Obispo, and will range from 12 inches to 36 inches in diameter. The NWP will include three water storage tanks, two pump stations, an intake and pump station at Lake Nacimiento and other minor appurtenances. The NWP will supply entitlement water to the City of Paso Robles, Templeton Community Services District, Atascadero Mutual Water Company, and City of San Luis Obispo. The approximate NWP pipeline alignment and facility locations are shown on Figure 1.

This Geotechnical Data Report (GDR) presents the information and data collected during the field exploration and laboratory testing programs performed by Geomatrix Consultants, Inc. (Geomatrix) for the geologic/geotechnical study of the NWP pipeline alignment. Interpretations and recommendations developed from the data and information contained in this GDR are presented in a separate Geotechnical Interpretive Report (GIR).

Separate GDRs also were submitted to present the data collected during the geologic/geotechnical study for the tank and pump station (facility) sites (Geomatrix, 2007b) and the lake intake and pump station structure site (Geomatrix, 2007c) associated with the NWP.

1.1 PURPOSE AND SCOPE

The purpose of the study performed by Geomatrix is to provide the geologic and geotechnical data, interpretations, and recommendations needed for preliminary and final design of the NWP. The purpose of this GDR is to present the data collected/developed in the following tasks of our scope of work.

Task	Description
A	Data Review (including aerial photographs)
B	Field Exploration
C	Laboratory Testing

The work performed in each task is described in Attachment A – Scope of Services, Design Phase Geotechnical Engineering Services, of the Agreement for Engineering Consulting Services (Agreement) between San Luis Obispo County Flood Control and Water Conservation District (District) and Geomatrix dated June 7, 2005. The District later assigned the Agreement to Black & Veatch Corporation (B&V) on July 19, 2005.

1.2 TEAM ORGANIZATION

The work described in this report was coordinated with the following individuals:

- Mr. John Hollenbeck, P.E., NWP Project Manager, District
- Mr. Steve Foellmi, P.E, Project Manager, B&V
- Mr. Paul Kneitz, P.E., Deputy Project Manager & Chief Engineer, B&V
- Mr. Rich Terrazas, P.E., Engineering Manager, B&V
- Mr Madhaven Jayakumar, P.E., Engineering Manager, B&V
- Mr. David Yankovich, P.E., Crossings Task Leader, B&V
- Mr. Clay Haynes, P.E., B&V
- Mr. Andy Romer, P.E., Pipeline Task Leader, Boyle Engineering Corporation
- Ms. Christine Halley, P.E., Project Engineer, TJCross Engineers
- Mr. Tom Roberts, Project Manager, ESA Biological Resources
- Mr. Chris Rogers, ESA Biological Resources
- Ms. Lillian Jewell, Project Manager, Hamner-Jewell & Associates
- Mr. John Butler, Hamner-Jewell & Associates

Key Geomatrix personnel who participated in the study included:

- Mr. Michael L. Traubenik, G.E., Project Manager and Principal Geotechnical Engineer
- Mr. Hans AbramsonWard, CEG, Project Engineering Geologist
- Dr. Robert H. Wright, CEG, Senior Engineering Geologist
- Dr. Timothy Mote, PG, Senior Geologist
- Ms. Annmarie Behan, P.E., Staff Engineer
- Ms. Tami Darden, Staff Geologist
- Mr. James Allen, Staff Geologist
- Mr. Ron Rubin, PG, Staff Geologist
- Mr. Kevin Burlingham, Staff Engineer
- Mr. James B French, G.E., Senior Geotechnical Engineer

1.3 REPORT ORGANIZATION

A brief project description is presented in Section 2.0. Section 3.0 discusses the field exploration and laboratory testing performed for this study. A review of geologic/geotechnical studies performed by other investigators in the vicinity of the NWP is also described in Section 3.0. General descriptions of the surface geologic conditions along the pipeline alignment are described in Section 4.0. Section 5.0 describes the limitations of this GDR. References are compiled in Section 6.0.

This report includes several appendices. Appendix A describes the field exploration program in more detail and includes the logs of the exploratory borings and test pits, and photographs of the rock core samples. Appendix B presents the results of the cone penetration test (CPT) probes that were advanced during the field program. The laboratory testing program is described in more detail in Appendix C. Appendix D includes the results of seismic refraction surveys that were performed along the pipeline alignment. Appendix E includes existing data that were reviewed prior to the field program.

2.0 PROJECT DESCRIPTION

As described in Section 1.0, the NWP consists of a water transmission pipeline that will extend approximately 45 miles from Lake Nacimiento to the City of San Luis Obispo. The NWP will

include three water storage tanks, two pump stations, an intake and pump station at Lake Nacimiento and other minor appurtenances. The NWP includes several turnouts that will supply entitlement water to the City of Paso Robles, Templeton Community Services District (CSD), Atascadero Mutual Water Company (MWC), and City of San Luis Obispo (Figure 1).

The proposed NWP alignment extends from Lake Nacimiento, east to the Salinas River and south to the San Luis Obispo Water Treatment Plant. The pipeline will range from 12 to 36 inches in diameter and will be designed for pressure flow. The pipeline will be installed using conventional trenching and trenchless pipe installation techniques.

The NWP pipeline has been divided into fourteen units (A, A1, C, C1, D, E, F, G, G1, H1, T2, T4, T6, and T11) in order to offer construction contracts to multiple contractors of different sizes. Each unit consists of a main feature (such as a section of pipeline, tank, or a pump station) and several appurtenances. The units are shown on Figure 1 and their main features are summarized below:

- Unit A is the Lake Nacimiento Intake and Pump Station, and the section of the pipeline that extends to the Camp Roberts West Property Line. From the Lake Nacimiento Intake and Pump Station, the pipeline follows River Road east to the west boundary of Camp Roberts.

- Unit A1 is the section of the pipeline that extends from the Camp Roberts West Property Line to the Camp Roberts Tank, and the Camp Roberts Tank. From the Camp Roberts West Property Line the pipeline follows River Road east to the Nacimiento River. A trenchless crossing from the west side to the east side of the Nacimiento River is planned in Camp Roberts. From the Nacimiento River, the pipeline traverses Camp Roberts in a southeasterly direction by following Dirt Farm Road and Boy Scout Road east, and turning south along West Perimeter Road and Generals Road. The Camp Roberts Tank site is located adjacent to Generals Road in Camp Roberts.

- Unit B is the Santa Ysabel Pump Station, located on Santa Ysabel Ranch in the southern part of the City of Paso Robles.

- Unit C is the section of the pipeline that extends east from the Camp Roberts Tank site to intersection of Old Highway 101 (Monterey Road) and Wellsona Road, including the highway crossing. The alignment extends east over open space and private property from the Camp Roberts Tank before joining back into the public right-of-way at Mahoney Road. It follows Mahoney Road east towards San Marcos Road and continues east along the privately-owned, Texas Road. After Texas Road terminates, the alignment traverses east across the northern portion of the Rabbit

Ridge Winery. After crossing the winery, the alignment turns south, crosses San Marcos Creek, and follows Wellsona Road, to the south and east. The alignment crosses Highway 101 at Wellsona Road and joins Unit C1 approximately at the intersection with Monterey Road. The Unit C segment of the alignment crosses four notable features. These features are: 1) a steep incised creek on private property directly west of the point where the alignment joins Mahoney Road, 2) a steep, incised creek within the Rabbit Ridge Winery, 3) the crossing of San Marcos creek just outside the winery, which will probably be a trenchless crossing, and 4) a trenchless crossing of Highway 101 at the Wellsona Road exit.

- Unit C1 is the section of the pipeline that extends from the intersection of Old Highway 101 (Monterey Road) with Wellsona Road to the mainline connection for the City of Paso Robles turnout, including a Salinas River crossing. The alignment extends south along Monterey Road from the end of Unit C. Near the southern terminus of Monterey Road, the alignment extends east across the Salinas River where it turns south, following adjacent to River Road, then joins River Road in Paso Robles. The alignment turns south and follows North River Road to South River Road, crossing a creek located near the intersection of South River Road and Santa Ysabel Avenue. Then, the pipeline continues south along Santa Ysabel Avenue, through the privately-owned, developing residential community known as Santa Ysabel Ranch. Unit C1 includes trenchless crossings of the Salinas River, Niblick Road, and a creek near the intersection of South River Road and Santa Ysabel Avenue.

- Unit D is the section of the pipeline that extends from the intersection with the City of Paso Robles turnout to the intersection with the Templeton CSD turnout. The alignment extends south from the City of Paso Robles turnout, through the privately-owned Santa Ysabel Ranch, towards the Salinas River, past the Santa Ysabel Pump Station site (Unit B), to the north side of a large meander of the Salinas River. At this point, a trenchless crossing is proposed under the meander. After this Salinas River crossing, the alignment follows the Salinas River south, follows a private road, and extends east along this road until it joins back into the public right-of-way at Vaquero Drive. The alignment follows Vaquero Drive south until El Pomar Drive, continues in a southwesterly direction along El Pomar Drive, and then south along Templeton Road to the Templeton CSD turnout.

- Unit E is a relatively short section of the pipeline that extends southeast along Templeton Road from the Templeton CSD turnout to the Atascadero MWC turnout.

- Unit F is the section of the pipeline that extends from the Atascadero MWC turnout to the inlet of the Rocky Canyon Tank. From the Atascadero MWC turnout, the alignment follows Templeton Road a short distance to the east, turns southeast and traverses through private property before turning east to rejoin Templeton Road. The alignment follows Templeton Road south to its intersection with Highway 41, at which point Templeton Road becomes Rocky Canyon Road. A trenchless

crossing is proposed at Highway 41. After this crossing, the alignment follows Rocky Canyon Road in a southerly direction to the inlet of the Rocky Canyon Tank and Pump Station Site.

- Unit F1 is the Rocky Canyon Tank and the suction connection to the Rocky Canyon Pump Station.

- Unit F2 is the Rocky Canyon Pump Station, including the discharge pipe and connection to the pipeline.

- Unit G is the section of the pipeline that extends from the Rocky Canyon Tank and Pump Station discharge to the intersection of State Route 58 (El Camino Real) and Maria Avenue. The alignment continues south along Rocky Canyon Road until its intersection with Halcon Road. After this intersection, the alignment follows the east side of the Salinas River by traversing private property. A trenchless crossing is proposed from the east side of the Salinas River to the west side where the pipeline will intersect with and follow Santa Clara Road to the Union Pacific Railroad (UPRR). At this point, another trenchless crossing is proposed under the UPRR. After this crossing, the pipeline follows Sandoval Road south towards its intersection with El Camino Real in the unincorporated area just south of the City of Atascadero. The pipeline will cross the Santa Margarita Creek where El Camino Real crosses the creek. The alignment continues along El Camino Real, skirts around the west side of the unincorporated community of Santa Margarita, and then enters Santa Margarita on Yerba Buena Road. The pipeline rejoins El Camino Real (at this point it is also called Highway 58) and heads southwest one block to the intersection with Maria Avenue and the junction with Unit G1.

- Unit G1 is the section of the pipeline that extends from the intersection of State Route 58 (El Camino Real) and Maria Avenue to the Cuesta Tunnel Tank inlet. From the intersection with Maria Avenue, the pipeline traverses the southwestern part Santa Margarita within State Route 58. After reaching the western limits of Santa Margarita, a trenchless crossing of State Route 58 is planned. South of the crossing, the pipeline heads south along the frontage road adjacent to Highway 101 between Highway 58 and the Santa Margarita Booster Station. A trenchless crossing of Highway 101 is planned directly south of the existing Santa Margarita Booster Station. After crossing Highway 101, the pipeline generally follows the unpaved frontage road on the west side of Highway 101, then turns southwest along the unpaved access road to the inlet for the Cuesta Tunnel Tank.

- Unit G2 is the Cuesta Tunnel Tank and the section of pipeline that extends from the Cuesta Tunnel Tank to the north portal flange of the existing Cuesta Tunnel Pipeline.

- Unit H is the Cuesta Tunnel, and consists of the existing Nacimiento Pipeline in the tunnel from the existing north portal inlet flange to the south portal outlet flange.

- Unit H1 is the section of the pipeline that extends from the south portal outlet flange of the Cuesta Tunnel to the San Luis Obispo Water Treatment Plant (WTP). From the south portal, the pipeline traverses southwest over open space within the right of way granted to the County of San Luis Obispo for the 16-inch Salinas Pipeline and the 18-inch Chorro pipeline. Along this reach, the alignment crosses a tributary of Stenner Creek, and the main channel of Stenner Creek. Directly beyond the second creek crossing, the alignment diverts from the routes of the two existing pipelines and follows an unpaved access road until it reaches and crosses the Union Pacific Railroad (UPRR). The pipeline follows the UPRR alignment on the downhill side of the tracks for about one mile, traversing several gentle swales. Then, the pipeline alignment crosses open space downslope to the old San Luis Obispo WTP. The alignment enters the property of the old WTP, diverts around the south side of the existing structures, and joins Stenner Creek Road. The pipeline follows Stenner Creek Road southwest to the turnout for the San Luis Obispo WTP. Where Stenner Creek road crosses Stenner Creek, the pipeline will be fitted into an existing abandoned pipeline that crosses below the channel of Stenner Creek.

- Unit T2 is the City of Paso Robles turnout, including a trenchless crossing of the Salinas River.

- Unit T4 is the Templeton CSD turnout, including a trenchless crossing of the Salinas River.

- Unit T6 is the Atascadero MWC turnout, including a trenchless crossing of the Salinas River.

- Unit T11 is the City of San Luis Obispo turnout.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Field exploration that was completed along the proposed pipeline alignment consists of:

- Mapping surface geology;

- Drilling, logging, and sampling 97 borings;

- Advancing 7 cone penetration test (CPT) probes;

- Excavating 23 test pits; and,

- Performing 2 seismic refraction surveys.

In general, the borings and CPT probes were located at more or less regular intervals along or adjacent to the proposed alignment. Special care was taken to locate exploration points within each of the mapped geologic units that the alignment crosses. Additional exploration points

were used to explore locations where trenchless pipeline installation techniques are planned (e.g. river/creek/drainages, roadway, or railroad crossings).

Test pits were excavated along the NWP alignment and at the NWP facility sites to expose bedrock conditions and evaluate bedrock discontinuities. Test pits were excavated along the unpaved frontage road adjacent to Highway 101, north of the Cuesta Tunnel Tank site, where a landslide was identified from our review of available information and geologic mapping. Test pits were also excavated along the pipeline alignment south of the Cuesta Tunnel and north of the San Luis Obispo WTP.

Seismic refraction surveys were performed along the NWP alignment and at the NWP facility sites where bedrock is likely to be encountered close to the ground surface, and where earthquake faults likely exist. Seismic refraction surveys were performed at the Nacimiento River crossing in Camp Roberts, at the Intake and Pump Station site, the Rocky Canyon Tank and Pump Station site, and the Cuesta Tunnel Tank site.

The approximate locations of borings, CPTs, test pits, and seismic refraction surveys that were used to explore subsurface conditions along the NWP alignment are shown on Plates 1-2 through 1-18. The approximate locations of the exploration points at the NWP lake intake and pump station and other facility sites are shown on figures presented in the GDRs for these facilities (Geomatrix 2007b and 2007c). The field exploration program is briefly described below and is discussed in more detail in Appendix A.

3.1 DATA REVIEW

As part of planning for the field exploration program, Geomatrix project files, the files of outside consultants, and the files and published maps of several public agencies were searched for information regarding subsurface conditions along the proposed pipeline alignment and its alternatives. Documents from the following sources were reviewed:

- Geomatrix project archives;
- Project archives of outside consultants;
- San Luis Obispo County;
- City of Paso Robles

- The State Department of Transportation (Caltrans);
- State of California Division of Safety of Dams;
- State of California, Department of Water Resources (DWR); and,
- United States Geological Survey.

Approximately 68 geotechnical or environmental investigation reports were reviewed for the NWP. Each of these case history reports was assigned an index number. The index numbers are arbitrary, as they were assigned in roughly the order in which the reports were catalogued. Of the 68 case history reports reviewed, approximately 24 reports contained subsurface data that was relevant and near to the NWP pipeline alignment. These case history reports are listed in Table E-1, Summary of Case History Reports, and their approximate locations are shown on Plates 1-2 through 1-18. Copies of the subsurface information from these previous investigations are presented in electronic format on a CD in Appendix E. The subsurface information from these reports was used to supplement the data gathered during the field exploration program performed for this study.

3.2 AERIAL PHOTOGRAPH REVIEW

Prior to the field mapping, Geomatrix reviewed stereo aerial photographs along the alignment taken in 2002, and recent stereo photographs of the alignment taken by the project surveyor in 2005. The purpose of the review was to identify potential geologic hazards (e.g., landslides and erosion) and/or ground conditions (e.g., areas modified by historical land use or grading) that could potentially impact the NWP. The information compiled from the aerial photographs is presented on Plates 1-2 through 1-18.

3.3 FIELD GEOLOGIC MAPPING

Field geologic mapping of the NWP alignment north of the Cuesta Tunnel and along Stenner Creek Road was conducted between July 18 and July 22, 2005. Field geologic mapping of the NWP alignment south of the Cuesta Tunnel was conducted in June 2006. Also during June and July 2006, geologic mapping was performed along segments of the NWP alignment and at some of the facility sites to review features and conditions that may affect the project's design.

The majority of the field mapping was done at a scale of 1:1,200, utilizing aerial photograph base maps provided by San Luis Obispo County. Observed features were approximately located using available reference points shown on the base maps and identified in the field. The mapping focused on documenting the distribution, type (i.e., lithology), and structural characteristics (bedding and joint/fracture orientations) of the bedrock materials, and on the distribution and characteristics of slope instabilities along the alignment. The distribution of significant artificial (man made) fills also was documented. Qualitative estimates of bedrock hardness, strength, and weathering also were made. Structural data was obtained by examining both man-made (road cuts and cut slopes) and natural exposures that were encountered while walking and/or driving along the alignment. A Brunton compass was used to measure the orientation (strike and dip) of bedding and bedrock discontinuities observed in the field. Information collected from the field mapping activities is presented on Plates 1-2 through 1-18.

3.4 BORINGS

The borings were drilled and sampled at different times between October 2005 and September 2006. Borings were drilled with truck- or track-mounted drill rigs to depths ranging from 13 feet to about 175 feet using hollow stem auger or rotary wash techniques in soil, and continuous coring in rock and harder formations. A summary of borings that were drilled, logged, and sampled is presented in Table 1. The purpose of the borings was to obtain subsurface information to depths sufficiently below the planned pipeline trench and at locations where trenchless methods (e.g., directional drilling, microtunneling) will be used. Soil samples were recovered from each boring using Standard Penetration Split Spoon (SPT) and Modified California drive (2 ½ inch ([I.D.], 3 inch [O.D.]) samplers. The samples were visually examined and logged in the field, and sealed to preserve their natural moisture content. Bulk samples were collected from cuttings and stored in buckets.

Where bedrock or harder formations were encountered, borings were advanced by continuous coring using an HQ wire line coring system. Cores were examined and logged in the field, wrapped in plastic to seal their natural moisture content, and stored in wooden core boxes. The samples (both rock and soil) were then taken to our laboratory for further examination and testing.

Boring logs were prepared in the field by examining drill cuttings, soil samples, and rock cores. Final boring and test pit logs were prepared based on the field logs, examination of samples in

the laboratory, and laboratory test results. The final boring logs and photographs of rock core samples are included in Appendix A. The approximate locations of the borings are shown on Plates 1-2 through 1-18.

Groundwater detected during our drilling operations and/or before the borings were backfilled was recorded on the field logs. Because fluid is used while using rotary wash drilling methods, groundwater often could not be observed during the drilling of the borings drilled with rotary wash methods. To monitor groundwater, selected borings were converted into open-standpipe groundwater monitoring wells (piezometers) at the completion of drilling. The construction of the piezometers is described in Section 3.4.1.

3.4.1 Piezometers

Borings UA-23A, UA-26A, UC-2A, UC-6A, UC-11A, UC-25A, UD-1A, UF-6A, UG-5A, UG-8R, UG-9A, UG-18A, UG-22R, and UG-32A were converted into 2-inch-diameter open-standpipe groundwater monitoring wells (piezometers). The construction of the piezometers is shown on Figures A1-2a and A1-2b in Appendix A. Piezometer construction details are summarized in Table 1.

Groundwater levels in the piezometers constructed in 2005 have been measured four times following their construction. Groundwater levels in the piezometers constructed in 2006 have been measured at least twice following their construction. Piezometer groundwater measurements are summarized in Table 2.

It should be noted that the piezometers installed during this study can be monitored prior to, and during, construction of the NWP. However, after they are no longer needed, the piezometers should be abandoned/destroyed by the contractor(s) selected for the project in accordance with City, County, and/or State requirements.

3.4.2 Drilling Difficulties

In October 2005, difficult drilling conditions were experienced while drilling and coring boring UA-15R. Gravelly soils were encountered between depths ranging from 18 to 27 feet; core runs in these materials resulted in limited to no sample recovery. Drive samples collected in these materials encountered refusal and/or resulted in limited recovery. Additionally, soft rock conditions were encountered between depths ranging between 27 and 50 feet; core runs in these materials resulted in limited to no sample recovery and core wash out. Two drive samples

collected in this interval encountered refusal and limited recovery; one drive sample was successful. Over 700 gallons of drilling mud was lost to the borehole in the interval from 18 to 50 feet. Additional problems occurred due to the vibration and warping of the drill stem while drilling. The loose sandy soils near the surface caved significantly during drilling, resulting in a borehole much larger in diameter (about 1 foot at the surface) than the drill rods (only 4 inches).

During drilling of boring UD-3A, a 6 to 8-inch PVC water line was damaged at a depth of approximately 3 feet. This water line was an inactive water line installed as a storm water outlet for the current Santa Ysabel Ranch development. The boring was relocated approximately 10 feet northeast and redrilled. The damaged pipe was repaired by Weyrich Development.

During drilling of boring UG-18A, telecommunication lines belonging to SBC were damaged at a depth of approximately 3 to 3½ feet. Prior to drilling, USA had been notified and SBC pavement markings had indicated that the area was clear of any telecommunication lines. The damaged telecommunication lines were repaired by SBC.

Boring UG-23R, drilled in November 2005, was terminated at a depth of 13.5 feet below the ground surface after encountering hydrocarbon contamination. The boring was backfilled with cement grout to the surface. This boring was located at the west side of the planned trenchless crossing of Highway 101 near Santa Margarita.

Boring UG-23Ra, drilled in May 2006 adjacent to boring UG-23R, extended the depth of exploration to about 30 feet. Hydrocarbon contamination was again encountered in the soils overlying bedrock. The boring was backfilled with cement grout to the ground surface upon completion.

The spoils generated from borings UG-23R and UG-23Ra were placed into 55-gallon drums and brought to a temporary storage location in Atascadero. The soil contained in the drums were tested for proper disposal.

3.5 CONE PENETRATION TEST PROBES

On November 15 and 16, 2005, seven CPT probes were used to explore the locations shown on Plates 1-2 through 1-18. The CPT probes were advanced to depths ranging from approximately

13 to 75 feet below the ground surface. Continuous graphic logs and the tabulated field data are presented in Appendix B.

3.6 TEST PITS

Test pits were excavated along the NWP alignment and the NWP tank and pump station sites. Three test pits were excavated along the unpaved frontage road adjacent to Highway 101 north of the Cuesta Tunnel Tank site where a landslide had been identified during our geologic mapping (test pits LS-UG-7T through LS-UG-9T). A total of 23 test pits were excavated along the NWP alignment south of the Cuesta Tunnel and north of the San Luis Obispo WTP (test pits G-UH-1T through G-UH-20T). The approximate locations of the test pits are shown on Plates 1-17 and 1-18. Test pits were also excavated at some of the NWP tank and pump station sites. Test pits were excavated to depths ranging from about 3 to 12 feet with a backhoe excavator using a 36-inch-wide bucket.

Field test pit logs were prepared by examining: the soil exposed in the test pit walls, the test pit spoil piles, and soil samples. Final test pit logs were prepared based on the field logs, examination of samples in the laboratory, and laboratory test results. The final test pit logs are included in Appendix A. Only the logs of the test pits excavated along the NWP pipeline alignment are included in this GDR; the logs of the test pits excavated at the tank and pump station sites are included in the GDR for the NWP facilities (Geomatrix, 2007a).

3.7 SEISMIC REFRACTION SURVEYS

Two seismic refraction survey lines were performed along the NWP alignment, each were approximately 240 feet long. These survey lines (Lines UA-16S and UA-17S) were performed on each side of the Nacimiento River in Camp Roberts at the planned trenchless undercrossing. Six seismic refraction survey lines also were performed at the lake intake and at some of the NWP tank and pump station sites. The seismic refraction surveys were performed to estimate the depth to bedrock and to provide velocity information that can be used to evaluate the excavation characteristics of the bedrock. A report on the seismic refraction surveys, which includes a detailed description of field methods and an interpretation of the seismic velocity profile at each location, are included in Appendix D. Only the data obtained along the NWP alignment are included in this GDR; the data from the seismic surveys performed at the tank and pump station sites and at the lake intake and pump station are included in separate GDRs (Geomatrix, 2007b and 2007c).

3.8 LABORATORY TESTING

Laboratory tests were performed on selected soil and rock samples to evaluate their physical characteristics and engineering properties. Samples were tested for dry density, moisture content, Atterberg limits, grain size distribution, compaction, unconfined compressive strength (soil and rock), undrained shear strength, direct shear strength, and point load strength. Geomatrix also provided M.J. Schiff & Associates, the Project Team's corrosion consultant, soil and rock samples for corrosion potential testing.

The laboratory testing program is described, and tabular and graphic presentations of the test results are presented, in Appendix C. Results of moisture content, dry density, Atterberg limits, grain-size distribution, and the samples tested for strength are also indicated at the corresponding sample locations on the boring logs in Appendix A.

4.0 GEOLOGY

This section summarizes the regional geologic conditions along the NWP pipeline alignment. Section 4.1 describes the general regional geologic setting of the alignment. In Section 4.2, the geologic units along the proposed pipeline alignment are discussed in more detail, including general descriptions of geologic units and surficial deposits. Section 4.3 summarizes the seismic setting of the alignment, including notable faults and fault zones.

4.1 GEOLOGIC SETTING

The NWP alignment is located in the central California Coast Ranges Geomorphic Province, a tectonically active region characterized by relatively rugged and youthful north-northwest trending mountain ranges separated by intervening alluvial valleys. Most active faults and folds within this province also trend north-northwest. This dominant structural trend is generally parallel to the San Andreas fault zone, the active transform fault boundary between the Pacific and North American tectonic plates.

The geology of the Coast Ranges generally consists of Holocene (less than 11,000 years old) to Quaternary (less than 1.8 million years old) alluvium overlying Tertiary (65 to 1.8 million years old) terrestrial sedimentary and volcanic rocks, and marine sedimentary rocks. These units, in turn, overlie late Mesozoic (250 to 65 million years old) basement rocks that include either granitic rocks of the Cretaceous (145 to 65 million years old) Salinian Block or the Franciscan Complex, a suite of pervasively sheared and faulted deep sea sediments and crustal rocks that were deposited during Cretaceous to Jurassic time (210 million to 65 million years

ago). Basement rocks of the Salinian Block are limited to the region bounded by the San Andreas fault on the east and the Nacimiento fault on the west. Basement rocks of the Franciscan Complex occur east of the San Andreas fault, and west of the Nacimiento fault. The proposed NWP alignment traverses terrain on both sides of the Nacimiento fault, and will therefore likely encounter either intact rock, or sediments derived from both the Salinian Block granitics and the Franciscan Complex.

4.2 GEOLOGIC CONDITIONS

This section provides a description of the distribution and composition of major geologic units located along or near the proposed NWP alignment. The summary is based on a review of available information, including published geologic maps by Dibblee, Jr. (1971a, 1971b, 2004a-2004e), Hall and others (1979), Hall and Weise (1974), Durham (1968, and 1974), and Hart (1976), a review and interpretation of air photos, field mapping and exploration, and a review of existing reports (summarized in Appendix E). The distribution of major geologic units found along the NWP alignment is shown on Plates 1-2 through 1-18, and is discussed below. The distribution of major geologic units found along the turnout alignments is shown on Plate 2. Brief descriptions of the geologic units likely to be encountered along the NWP alignment are provided in Section 4.3.

The proposed pipeline and appurtenant facilities of the NWP will traverse at least three physiographically distinct regions: (1) the low hills and valleys from Lake Nacimiento to the Salinas River; (2) the Salinas River valley to Santa Margarita; and (3) the moderately high hills near San Luis Obispo via the Cuesta Tunnel. Based on geologic conditions indicated in the references above, the NWP alignment was divided into the five general segments described below.

4.2.1 Lake Nacimiento to Dry Creek

The alignment follows the Nacimiento River and traverses alluvium and uplifted river terraces. Geologic units along this part of the alignment include recent alluvium, older alluvium (including the weakly indurated older alluvium of the Paso Robles Formation), landslide deposits, and bedrock (Vaqueros, Monterey, and Santa Margarita Formations). This part of the alignment crosses active and/or potentially active traces of the San Marcos and Rinconada faults.

4.2.2 Dry Creek to Wellsona

This pipeline segment heads southeast from the Nacimiento River and follows Dry Creek valley, traverses low rolling hills, crosses San Marcos Creek valley, and descends into the Salinas River valley. Geologic units along this part of the alignment include recent alluvium, older alluvium, landslide deposits, and weakly indurated old alluvium (Paso Robles Formation).

4.2.3 Wellsona to Santa Margarita

The alignment follows river terraces of the Salinas River and the Santa Margarita Creek valley. Geologic units along this part of the alignment include alluvium, older alluvium, weakly indurated old alluvium (Paso Robles Formation), and bedrock (predominantly Monterey and Santa Margarita Formations). This part of the alignment crosses active and/or potentially active traces of the Rinconada fault (several crossings).

4.2.4 Santa Margarita to Cuesta Tunnel

The alignment follows the upper reaches of the Santa Margarita Creek valley to join with the existing Nacimiento pipeline at the Cuesta Tunnel portal. The pipeline traverses alluvium (that locally includes boulders of hard rock), landslide deposits (including a large serpentine landslide), and bedrock (including the volcanic Obispo Formation, Cretaceous marine sandstone shale of the Atascadero and Toro Formations, serpentine, and hard and dense ultramafic rocks of the Coast Range Ophiolite). It is important to note the presence of serpentinite along the alignment because of potential environmental and/or construction issues associated with this rock type, as described below. This part of the alignment crosses potentially active traces of the Nacimiento fault zone (including the Lucia fault and the Cuesta fault) and other unnamed faults.

4.2.5 Cuesta Tunnel to San Luis Obispo Water Treatment Plant

From the Cuesta Tunnel to the San Luis Obispo Water Treatment Plant the alignment traverses alluvium associated with Stenner Creek and several large landslides. Bedrock along the alignment includes the marine sedimentary Lospe, Monterey, and Vaqueros Formations, the volcanic Obispo Formation, large bodies of serpentinite, and mélange of the Franciscan Complex. The mélange is predominately shale but also contains sandstone, volcanic rocks, metamorphic rocks, chert, and serpentinite. It is important to note the presence of serpentinite along the alignment because of potential environmental and/or construction issues associated

with this rock type, as described below. This part of the alignment crosses active and/or potentially active traces of the Oceanic-West Huasna, Serrano, and Cambria faults.

4.3 DESCRIPTION OF GEOLOGIC UNITS

This section describes the geologic units that will likely be encountered along the NWP alignment.

4.3.1 Young Surficial Deposits

Artificial Fill (af): Although not completely delineated on Plate 1, artificial (man-made) fills of unknown composition and consistency exist along the NWP alignment. The artificial fill incorporates a broad range of man-made deposits and ranges from engineered fill to undocumented dumped debris of highly variable properties. Artificial fill includes construction pads, stockpiles, road and bridge embankments greater than about 3 feet thick, and culvert backfill. Typically, the fills are associated with road construction and other infrastructure.

Colluvium (Qc): Colluvium generally is found mantling slopes and accumulated in swales in hilly terrain. Colluvium is generally derived from the underlying bedrock by the process of weathering and has undergone some degree of downslope movement. Along the NWP alignment, the colluvium generally consists of organic-rich clay to sandy clay. Where bedrock is mapped, but not exposed in outcrop, it also is typically overlain by colluvium of variable thickness. In general, colluvium is thinnest near the tops of hillslopes, and thickest near swale bottoms.

Alluvium (Qa). According to published maps cited above, much of the NWP alignment is underlain by relatively recent alluvium. Sediment eroded from the uplifting ranges has accumulated as various types of soil in the adjacent low-lying areas such as the Salinas River valley, as well as locally along tributary stream channels in the surrounding hills. Alluvial aprons, formed at the bases of slopes, typically have high percentages of fines (silt and clay). Where rivers and streams have transported sediments some distance, the resulting channel deposits generally consist primarily of sand and gravel containing low percentages of fines. Sediment deposited away from the main channel during floods usually consists mostly of fines. Within upland valleys, such as within Camp Roberts, south of Santa Margarita, and along Stenner Creek, the thickness of alluvium varies greatly; alluvium is generally thickest near the center of the valley, possibly reaching more than 15 feet thick locally, tapering to only a few

feet thick near the bases of the valley slopes. Within the Salinas River valley, the thickness of young alluvium typically reaches several tens of feet.

Stream Channel Deposits (Qr): Stream channel deposits generally consist primarily of sands and gravels with low percentages of fines that have been transported some distance down the channel of a large stream or river. These deposits are associated with larger drainages in the NWP area, including the Salinas River, the Nacimiento River, San Marcos Creek, and Santa Margarita Creek.

Landslide Deposits (Qls). Landslide deposits are located in several areas in the vicinity of the NWP pipeline alignment. These deposits typically consist of unsorted gravel, boulders, sand and/or clay that vary in lithology, size, and angularity that have been mobilized from source areas located adjacent and upslope. The size of the landslide deposits vary from small features consisting of only a few cubic feet to very large features covering square miles of area. A few large bedrock landslides have been mapped along the NWP pipeline alignment, which generally consist of a mass of disrupted, fractured, and/or rotated bedrock that has been translated downslope some distance on a sheared basal slide plane.

4.3.2 Older Surficial Deposits

The NWP alignment will encounter older alluvium, including the Plio-Pleistocene (about 5 million to 11,000 years old) Paso Robles Formation throughout much of the project area.

Older Alluvium (Qoa). Older alluvial deposits are typically located on terrace surfaces adjacent to larger drainages, and below younger alluvium within alluvial valleys. These deposits are typically composed of weakly to non-cemented gravel, sand, silt, and clay in varying abundances. Older alluvium is often overlain by local colluvial layers along terrace margins. Thicknesses of older alluvial deposits likely vary from less than ten feet to several tens of feet.

Paso Robles Formation (QTp). The Paso Robles Formation is a weakly indurated alluvial conglomerate that consists of dense mixtures of pebble gravel, sand, silt, and clay. Clasts are dominantly angular white siliceous shale derived from the Monterey Formation but also include granitic rocks derived from the Salinian basement. It occurs along much of the proposed alignment from Camp Roberts to Santa Margarita.

4.3.3 Bedrock Formations

Bedrock formations along the NWP alignment are predominantly Tertiary marine sedimentary units and serpentenite with more localized Tertiary volcanic rocks and Cretaceous marine sediments. These units are described below.

Santa Margarita Formation (Tsm). The Santa Margarita Formation is a semi-lithified, semi-friable massive white sandstone of late Miocene (25 to 5 million years old) age that was deposited in a shallow marine environment and contains large marine mollusks. Along the NWP alignment, it is exposed west of the Rinconada fault from the Nacimiento River to Santa Margarita.

Monterey Formation (Tm, Tml, Tmc). The Monterey Formation consists of moderately lithified deep marine rocks of late to middle Miocene age. The Monterey Formation is encountered in several locations along the pipeline alignment, from Camp Roberts to Santa Margarita. In the project area, the Monterey Formation includes the following sub-units:

Tm: Upper part, thinly (less than ½ inch) to thickly (greater than 3 feet) bedded diatomaceous, porcellaneous, opaline, and cherty shale, diatomite, and silty sandstone. Color is variable, but commonly white, brown to gray, and reddish brown, weathering to chalky white. Generally brittle, with subconchoidal fracturing, but also includes beds of black chert and resistant, hard siliceous shale.

Tml: Lower part, siliceous to semi-siliceous shale, brown, weathers cream-white, thin-bedded, includes soft fissile shale, and thin, hard dolomite layers.

Tmc: Claystone to shale, local siltstone or blocky dolomitic claystone, gray to tan or yellowish white, commonly soft and weathered to clay soil.

Obispo Formation (Tot, Tob). The Obispo Formation consists of a tan rhyolitic tuff breccia and dark gray basalt to mafic andesite, of early to late Miocene age. This unit is present near the pipeline alignment west of Santa Margarita and south of the Cuesta Tunnel.

Vaqueros Sandstone (Tvs). The Vaqueros Formation is light to dark brown or gray, massive, calcareous, moderately well-lithified, fairly poorly- to well-graded sandstone of Miocene to Oligocene (37 to 25 million years old) age. Hall and others (1979) indicate that the quartz content of the Vaqueros Sandstone ranges from 50 percent to more than 90 percent. It is

encountered at the lake intake, near the alignment in the vicinity of Santa Margarita, and south of the Cuesta Tunnel.

Lospe Formation (Tl). The Lospe Formation includes green and red conglomerate, sandstone, and silty claystone of Oligocene age (37 to 25 million years old). Clasts in the conglomerate are mostly varicolored chert, serpentinite, andesite, dacite, sandstone, and granitic rocks. This unit is encountered south of the Cuesta Tunnel.

Atascadero Formation (Ka). The Atascadero Formation is late Cretaceous in age and consists of two units: a hard, tan, arkosic sandstone and a micaceous clay shale with thin layers of fine-grained sandstone. This formation is encountered west of Santa Margarita.

Toro Formation (Ktsh). The Toro Formation consists of lithified marine sediments including dark gray, micaceous, thinly bedded shale with minor thin layers of fine-grained sandstone of late Jurassic to early Cretaceous age. This formation is present from west of Santa Margarita to the proposed Cuesta Tank site.

Serpentinite (sp). The unnamed serpentinite present along the pipeline alignment is blue-green to gray in color, slickensided, with widely varying densities and hardness. In the project area, large bodies of serpentinite are likely the result of serpentinization (hydrothermal alteration of minerals) of ultramafic rocks associated with the Coast Range Ophiolite complex. Large bodies of serpentinite are located along the NWP alignment north of San Luis Obispo, and in the vicinity of the Cuesta Tunnel. It is important to note that serpentinite can contain chrysotile, a fibrous mineral commonly known as asbestos, a potentially hazardous substance. Based on Geomatrix's experience, serpentinite also can contain soluble heavy metals including nickel and chromium.

Ophiolite (ob). The ophiolite in the project area is part of the Coast Range Ophiolite, a suite of ultramafic (very iron-rich) rocks that were formed in the upper mantle and igneous rocks of the oceanic crust. Rock types in this unit include gabbro, basalt, diorite, and quartz diorite. When exposed to extreme heat and pressure, and in the presence of water (which is typical for oceanic crustal rocks) various minerals within ultramafic rocks often metamorphose to serpentine. As a result, ophiolites in the region commonly also include some amount of serpentinite.

Granitic Basement Rocks (gr). This unit consists of light gray, hard to somewhat incoherent where weathered, massive granodiorite to quartz monzonite of Cretaceous age. It is the

plutonic basement rock of the Salinian Block, underlying sedimentary and volcanic units east of the Nacimiento fault zone.

Franciscan Complex (fm). The Franciscan Complex consists of a pervasively sheared mélange of Jurassic-Cretaceous marine and crustal rocks, including dark claystone, greenstone, greywacke sandstone, chert, blueschist, diabase, serpentinite, tuff, gabbro, and silica-carbonate rocks. It is pervasively sheared and is the basement rock underlying sedimentary and volcanic units west of the Nacimiento fault zone.

4.4 SEISMIC SETTING AND LOCAL FAULTING

As mentioned above, the NWP is located within the tectonically- and seismically-active California Coast Ranges. Significant Holocene-active faults within the Coast Ranges near the NWP include the Hosgri, San Simeon, Los Osos, and San Andreas faults[1] (Figure 2). It is very likely that during its design life the NWP will experience strong ground shaking during an earthquake on one of these faults.

In addition to seismic shaking, a significant fault rupture hazard exists for the NWP. According to published maps, the NWP alignment crosses several active[2] or potentially active faults. Major faults that cross the NWP alignment are shown on Plates 1-2 through 1-18. These faults and the approximate locations of the crossings are briefly described below.

Rinconada Fault Zone. The Rinconada fault zone extends approximately 110 miles from the north end of the Salinas Valley to a junction with the East Huasna fault and the South Cuyama fault east of the City of San Luis Obispo (Jennings, 1994). Dibblee (1976) extends the fault farther south to join with the Big Pine fault, approximately 60 to 70 miles southeast of the City of San Luis Obispo. The current understanding of the Rinconada fault zone is largely based on a professional paper by Dibblee (1976) in which several smaller, previously mapped fault segments are linked to form a single through-going fault zone (the Rinconada) that is interpreted to account for approximately 11 miles of post Miocene (approximately 24 million to 5 million years ago) right-lateral slip. Within the project area, the Rinconada fault zone is expressed alternately as a zone of sub-parallel fault traces, or as a single fault trace.

[1] For the purposes of this report, the term "fault" refers to a mapped fault as a whole, which can appear maps as either a single trace (i.e., line) or a collection (i.e., zone) of related traces.

[2] According to State of California definitions, *active* faults have a documented history of slip within the past 11,000 years of geologic time (the Holocene epoch), and *potentially active* faults have slipped within the past 1.6 million years (the Quaternary period).

The Rinconada fault zone is designated as an active fault for the 1997 Uniform Building Code (UBC) and the 2002 California Building Code (CBC) based on maps of Near Source Zones in California prepared by the California Department of Mines and Geology (CDMG, 1998). However, it is not zoned by the State of California as an active fault according to the most recent Alquist Priolo Earthquake Fault Zone maps (CDMG, 2000). Jennings (1994) maps the segments of the Rinconada fault zone that traverse the NWP alignment as active during the late Quaternary (it offsets deposits or surfaces less than ~700,000 years old but does not offset Holocene deposits or surfaces). It is considered in the statewide Probabilistic Seismic Hazard Assessment (Peterson and others, 1996; Cao and others, 2003). Cao and others (2003) estimate that the Rinconada fault has a slip rate of 1±1 millimeter per year (mm/yr), and is capable of an earthquake as large as moment magnitude (Mw) 7.3. They estimate a recurrence interval of 1764 years for earthquakes on a particular segment of the fault. Earthquakes above M 6 ½ commonly are associated with ground surface rupture (Wells and Coppersmith, 1994), suggesting that the Rinconada fault zone poses a rupture hazard to the pipeline. The pipeline alignment crosses primary traces of the Rinconada fault zone at as many as six locations along the route, from Camp Roberts to south of the Rocky Canyon Tank site.

The NWP alignment crosses a trace of the Rinconada fault directly east of the Nacimiento River crossing on Camp Roberts (Plate 1-2; Dibblee, 1971b; Dibblee, 1976; Dibblee, 2006a, Jennings, 1994). This fault segment was earlier mapped by Durham (1968, 1974) as the Jolon fault. The Jolon fault is exposed at the surface north of the NWP alignment in the Town of Jolon, in Monterey County (Durham, 1974). Based on juxtaposition of dissimilar geologic units and interpretation of regional gravity data, Durham (1974) extended the Jolon fault south from its exposure in Town of Jolon, through Lake San Antonio, and southeast to the Salinas River in the vicinity of Templeton. However, the portion of the Jolon fault south of Lake San Antonio was subsequently re-interpreted by Dibblee (1976) as part of the larger Rinconada fault zone. Subsequent publications (Jennings, 1994; Dibblee, 2004a; Dibblee, 2006a, b, c) show this fault segment as part of the Rinconada fault zone. The pipeline also crosses a second fault trace (the San Marcos Fault, discussed below) directly west of the Nacimiento River crossing (Plate 1-2) that is interpreted to be a secondary trace of the Rinconada fault zone.

San Antonio Fault-San Marcos Fault. The NWP alignment crosses a fault mapped as the San Marcos fault (Durham, 1968; Durham, 1974) directly west of the Nacimiento River crossing in Camp Roberts. According to published mapping, this fault is a right-lateral strike-slip fault that is sub-parallel to the Rinconada fault. The San Marcos fault extends

southeast from San Antonio Lake approximately 18 ½ miles to the vicinity of Templeton, west of the Salinas River. Dibblee (1971b, 2006a) also maps an unnamed right-lateral strike-slip fault at this location. Dibblee (2006b) shows this unnamed fault as a southward extension of the northwest-trending, southwest-vergent reverse San Antonio Fault. This fault is mapped by Jennings (1994) as Quaternary in age (i.e., it displaces deposits or surfaces less than 1.8 million years old). Durham (1974) identifies this trace as a secondary trace of the Jolon-Rinconada fault zone. This fault does not cross the NWP alignment at any other location.

Nacimiento Fault Zone. The Nacimiento fault zone is a complex network of north-northwest trending faults of varying types and ages. This zone separates basement rock of the Franciscan Complex on the west from the granitic rocks of the Salinian Block on the east. It is mapped by Jennings (1994) as pre-Quaternary (i.e., does not offset deposits or surfaces less than 1.8 million years old). However, Jennings (1994) also indicates that the Nacimiento fault zone within the project area is associated with a significant linear trend of accurately located earthquake epicenters. The Nacimiento fault is not zoned by the State of California as an active fault according to the most recent Alquist Priolo Earthquake Fault Zone maps (CDMG, 2000), nor is it considered in the statewide Probabilistic Seismic Hazard Assessment (Peterson and others, 1996; Cao and others, 2003). In the project area, faults belonging to the Nacimiento fault zone include the Lucia fault in Santa Margarita, and several traces of the Cuesta fault southwest of Santa Margarita (Plates 1-17 and 1-18).

Oceanic-West Huasna Fault Zone. The Oceanic-West Huasna fault zone is mapped by Jennings (1994) as active during the Late Quaternary (it offsets deposits or surfaces less than ~700,000 years old but does not offset Holocene deposits or surfaces).
The Oceanic-West Huasna fault zone is not zoned by the State of California as an active fault according to the most recent Alquist Priolo Earthquake Fault Zone maps (CDMG, 2000), nor is it considered in the statewide Probabilistic Seismic Hazard Assessment (Peterson and others, 1996; Cao and others, 2003). However, this fault zone likely was the source of the Mw 6.5 San Simeon earthquake that occurred in December 2003. The occurrence of the 2003 San Simeon earthquake suggests that this fault zone may be active. The NWP alignment crosses two fault traces south of the Cuesta Tunnel that could be considered part of this fault zone. These are labeled the Oceanic fault and Serrano fault on Plate 1-18. If this fault zone is active, the Oceanic and Serrano faults may pose surface rupture hazards to the pipeline.

Cambria Fault Zone. The Cambria fault zone is mapped by Jennings (1994) as active during the Late Quaternary (it offsets deposits or surfaces less than ~700,000 years old but does not offset Holocene deposits or surfaces). The Cambria fault zone is not zoned by the State of California as an active fault according to the most recent Alquist Priolo Earthquake Fault Zone maps (CDMG, 2000), nor is it considered in the statewide
Probabilistic Seismic Hazard Assessment (Peterson and others, 1996; Cao and others, 2003). Approximately 5 miles east of the NWP alignment, the Cambria fault zone bifurcates from the Oceanic-West Huasna fault zone, which may be considered active (see above). The linkage of these fault zones suggests the Cambria fault zone may be active also. If this fault zone is active, traces of the fault zone that cross the pipeline alignment may pose surface rupture hazards to the pipeline.

5.0 LIMITATIONS

In the performance of its professional services, Geomatrix, its employees, and its agents comply with the standards of care and skill ordinarily exercised by members of our profession practicing in the same or similar localities. This report may not provide all of the information needed by a Contractor to construct the NWP. No warranty, either express or implied, is made or intended in connection with the work performed by us, or by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings. In the event conclusions or recommendations based on these data are made by others, such conclusions and recommendations are not our responsibility unless we have been given an opportunity to review and concur with such conclusions or recommendations in writing.

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TABLES

TABLE 1

SUMMARY OF EXPLORATION METHODS AND PIEZOMETER CONSTRUCTION

Nacimiento Water Project
San Luis Obispo County, California

Exploration No.	Facility	Depth of Exploration (feet)	Exploration Date	Method of Exploration[2,3,4,5]	Groundwater Level from Ground Surface at Time of Drilling[1] (feet)	Piezometer (Yes or No)	Depth to Bottom of Well Screen (feet)	Length of Well Screen (feet)	Depth to Top of Sensing Zone (feet)
UA-10A	Pipeline Alignment	16.5	6/26/2006	CME 75	None	No	--	--	--
UA-11A	Pipeline Alignment	16.1	6/26/2006	CME 75	15	No	--	--	--
UA-12A	Pipeline Alignment	15.3	6/26/2006	CME 75	15.3	No	--	--	--
UA-13A	Pipeline Alignment	16.5	6/26/2006	CME 75	None	No	--	--	--
UA-14R	Pipeline Alignment	50.0	10/24/2005	CME 75	9	No	--	--	--
UA-15R	Pipeline Alignment	50.0	10/27/2005	CME 75	N/A*	No	--	--	--
UA-16S	Pipeline Alignment	240 feet long	12/13/2005	SRS	--	--	--	--	--
UA-17S	Pipeline Alignment	240 feet long	12/12/2005	SRS	--	--	--	--	--
UA-18A	Pipeline Alignment	15.5	10/24/2005	CME 75	None	No	--	--	--
UA-19A	Pipeline Alignment	19.4	10/24/2005	CME 75	None	No	--	--	--
UA-20A	Pipeline Alignment	15.5	10/24/2005	CME 75	None	No	--	--	--
UA-21A	Pipeline Alignment	15.5	10/24/2005	CME 75	None	No	--	--	--
UA-22A	Pipeline Alignment	20.4	6/26/2006	CME 75	13.0	--	--	--	--
UA-23A	Pipeline Alignment	30.5	10/26/2005	CME 75	None	Yes	30	5	20
UA-24A	Pipeline Alignment	20.3	6/26/2006	CME 75	None	--	--	--	--
UA-25A	Pipeline Alignment	14.9	10/24/2005	CME 75	None	No	--	--	--
UA-26A	Pipeline Alignment	15.0	10/24/2005	CME 75	None	Yes	15	5	9
UA-27A	Pipeline Alignment	14.9	10/25/2005	CME 75	None	No	--	--	--
UA-28A	Pipeline Alignment	15.5	10/25/2005	CME 75	None	No	--	--	--
UA-29A	Pipeline Alignment	15.5	10/25/2005	CME 75	9	No	--	--	--
UA-30A	Pipeline Alignment	15.3	10/25/2005	CME 75	None	No	--	--	--
UA-31A	Pipeline Alignment	29.8	10/25/2005	CME 75	None	No	--	--	--
UA-32A	Pipeline Alignment	16.5	10/26/2005	CME 75	None	No	--	--	--
UC-1A	Pipeline Alignment	50.8	12/13/2005	CME 75	39	No	--	--	--
UC-2A	Pipeline Alignment	50.5	11/2/2005	CME 55	28	Yes	49	5	25
UC-3A	Pipeline Alignment	14.8	11/2/2005	CME 75	13.5	No	--	--	--
UC-4A	Pipeline Alignment	16.5	6/28/2006	CME 75	None	--	--	--	--

TABLE 1

SUMMARY OF EXPLORATION METHODS AND PIEZOMETER CONSTRUCTION

Exploration No.	Facility	Depth of Exploration (feet)	Exploration Date	Method of Exploration[2,3,4,5]	Groundwater Level from Ground Surface at Time of Drilling[1] (feet)	Piezometer (Yes or No)	Depth to Bottom of Well Screen (feet)	Length of Well Screen (feet)	Depth to Top of Sensing Zone (feet)
UC-5A	Pipeline Alignment	16.5	6/28/2006	CME 75	None	--	--	--	--
UC-6A	Pipeline Alignment	20.5	10/28/2005	CME 75	None	Yes	19	5	9
UC-7A	Pipeline Alignment	20.8	10/28/2005	CME 75	None	No	--	--	--
UC-8A	Pipeline Alignment	20.5	10/28/2005	CME 75	None	No	--	--	--
UC-9A	Pipeline Alignment	15.5	10/28/2005	CME 75	None	No	--	--	--
UC-11A	Pipeline Alignment	31.5	5/25/2006	CME 55	None	Yes	31.5	10.0	18.0
UC-12A	Pipeline Alignment	15.5	10/31/2005	CME 75	None	No	--	--	--
UC-13A	Pipeline Alignment	15.5	10/27/2005	CME 75	None	No	--	--	--
UC-14A	Pipeline Alignment	15.5	10/27/2005	CME 75	None	No	--	--	--
UC-15A	Pipeline Alignment	50.3	10/27/2005	CME 75	None	No	--	--	--
UC-16A	Pipeline Alignment	30.5	10/31/2005	CME 75	9	No	--	--	--
UC-16R	Pipeline Alignment	53.0	11/2/2005	CME 75	10	No	--	--	--
UC-17A	Pipeline Alignment	29.8	10/31/2005	CME 75	15	No	--	--	--
UC-18R	Pipeline Alignment	175.0	9/28/2006	CME 55	N/A*	No	--	--	--
UC-19C	Pipeline Alignment	50.2	11/16/2005	CPT	Not Measured	No	--	--	--
UC-21A	Pipeline Alignment	15.4	6/27/2006	CME 75	None	--	--	--	--
UC-22A	Pipeline Alignment	15.5	10/31/2005	CME 75	None	No	--	--	--
UC-23A	Pipeline Alignment	15.5	10/31/2005	CME 75	13.5	No	--	--	--
UC-24A	Pipeline Alignment	15.5	11/2/2005	CME 75	None	No	--	--	--
UC-25A	Pipeline Alignment	26.5	10/19/2005	CME 75	None	Yes	25	5	15
UC-26A	Pipeline Alignment	25.5	10/19/2005	CME 75	23	No	--	--	--
UC-27A	Pipeline Alignment	15.5	11/1/2005	CME 75	None	No	--	--	--
UC-28A	Pipeline Alignment	14.8	11/1/2005	CME 75	None	No	--	--	--
UC-29A	Pipeline Alignment	16.5	6/26/2006	CME 75	None	No	--	--	--
UC-30A	Pipeline Alignment	16.5	6/27/2006	CME 75	None	No	--	--	--
UC-31A	Pipeline Alignment	16.5	6/28/2006	CME 75	None	No	--	--	--
UD-1A	Pipeline Alignment	24.6	10/19/2005	CME 75	None	Yes	24	5	15
UD-2C	Pipeline Alignment	13.3	11/16/2005	CPT	Not Measured	No	--	--	--
UD-3A	Pipeline Alignment	16.0	10/20/2005	CME 75	None	No	--	--	--
UD-4A	Pipeline Alignment	16.0	10/20/2005	CME 75	None	No	--	--	--

TABLE 1

SUMMARY OF EXPLORATION METHODS AND PIEZOMETER CONSTRUCTION

Exploration No.	Facility	Depth of Exploration (feet)	Exploration Date	Method of Exploration[2,3,4,5]	Groundwater Level from Ground Surface at Time of Drilling[1] (feet)	Piezometer (Yes or No)	Depth to Bottom of Well Screen (feet)	Length of Well Screen (feet)	Depth to Top of Sensing Zone (feet)
UD-5R	Pipeline Alignment	31.5	10/31/2005	CME 75	29	No	--	--	--
UD-6R	Pipeline Alignment	135.0	11/30/2005	CME 75	17.1	No	--	--	--
UD-7R	Pipeline Alignment	175.0	8/30/2006	CME 55	N/A*	No	--	--	--
UD-9R	Pipeline Alignment	175.0	8/28/2006	CME 55	N/A*	No	--	--	--
UD-10R	Pipeline Alignment	31.5	10/31/2005	CME 75	13	No	--	--	--
UD-11A	Pipeline Alignment	16.5	10/31/2005	CME 75	None	No	--	--	--
UD-12A	Pipeline Alignment	20.5	11/3/2005	CME 75	13	No	--	--	--
UD-13A	Pipeline Alignment	15.5	11/3/2005	CME 75	None	No	--	--	--
UD-14A	Pipeline Alignment	15.5	11/3/2005	CME 75	None	No	--	--	--
UD-15A	Pipeline Alignment	14.4	11/3/2005	CME 75	None	No	--	--	--
UE-1A	Pipeline Alignment	30.5	11/1/2005	CME 75	19	No	--	--	--
UE-2A	Pipeline Alignment	15.5	10/21/2005	CME 75	None	No	--	--	--
UF-1A	Pipeline Alignment	15.5	11/1/2005	CME 75	None	No	--	--	--
UF-2A	Pipeline Alignment	15.5	11/1/2005	CME 75	None	No	--	--	--
UF-3A	Pipeline Alignment	15.5	11/1/2005	CME 75	None	No	--	--	--
UF-4A	Pipeline Alignment	15.5	11/8/2005	CME 75	None	No	--	--	--
UF-5A	Pipeline Alignment	16.5	6/27/2006	CME 75	None	No	--	--	--
UF-6A	Pipeline Alignment	25.5	10/21/2005	CME 75	None	Yes	24	5	14
UF-7C	Pipeline Alignment	25.3	11/16/2005	CPT	Not Measured	No	--	--	--
UF-8A	Pipeline Alignment	15.5	11/8/2005	CME 75	None	No	--	--	--
UF-9A	Pipeline Alignment	15.5	11/8/2005	CME 75	None	No	--	--	--
UF-10A	Pipeline Alignment	15.5	11/8/2005	CME 75	None	No	--	--	--
UG-1A	Pipeline Alignment	16.5	6/27/2006	CME 75	14.0	No	--	--	--
UG-2A	Pipeline Alignment	16.5	6/27/2006	CME 75	13.0	No	--	--	--
UG-3R	Pipeline Alignment	76.5	11/1/2005	CME 75	14	No	--	--	--
UG-4C	Pipeline Alignment	75.3	11/16/2005	CPT	Not Measured	No			
UG-5A	Pipeline Alignment	25.5	10/20/2005	CME 75	15.3	Yes	23	5	13
UG-6C	Pipeline Alignment	25.3	11/16/2005	CPT	Not Measured	No	--	--	--
UG-8R	Pipeline Alignment	54.5	11/3/2005	CME 75	23.5	Yes	50	3	47
UG-9A	Pipeline Alignment	25.5	10/20/2005	CME 75	24	Yes	25	5	15

TABLE 1

SUMMARY OF EXPLORATION METHODS AND PIEZOMETER CONSTRUCTION

Exploration No.	Facility	Depth of Exploration (feet)	Exploration Date	Method of Exploration[2,3,4,5]	Groundwater Level from Ground Surface at Time of Drilling[1] (feet)	Piezometer (Yes or No)	Depth to Bottom of Well Screen (feet)	Length of Well Screen (feet)	Depth to Top of Sensing Zone (feet)
UG-10A	Pipeline Alignment	25.5	10/21/2005	CME 75	21	No	--	--	--
UG-13C	Pipeline Alignment	20.3	11/15/2005	CPT	Not Measured	No			
UG-14A	Pipeline Alignment	16.5	6/28/2006	CME 75	5.0	No	--	--	--
UG-15C	Pipeline Alignment	21.8	11/15/2005	CPT	Not Measured	No	--	--	--
UG-16A	Pipeline Alignment	15.5	11/7/2005	CME 75	14	No	--	--	--
UG-17A	Pipeline Alignment	15.5	11/7/2005	CME 75	12.5	No	--	--	--
UG-18A	Pipeline Alignment	15.5	11/8/2005	CME 75	None	Yes	14	5	7
UG-19A	Pipeline Alignment	15.5	11/7/2005	CME 75	None	No	--	--	--
UG-20A	Pipeline Alignment	15.5	11/7/2005	CME 75	None	No	--	--	--
UG-21A	Pipeline Alignment	15.5	11/7/2005	CME 75	None	No	--	--	--
UG-22R	Pipeline Alignment	34.8	11/4/2005	CME 75	N/A*	Yes	34.8	10.0	12.0
UG-23R	Pipeline Alignment	13.5	11/10/2005	CME 75	None	No	--	--	--
UG-23Ra	Pipeline Alignment	30.0	5/31/2006	CME 55	8.2	No	--	--	--
UG-32A	Pipeline Alignment	31.5	6/29/2006	CME 75	10.0	Yes	31.5	10.0	19.0
LS-UG-7T	Pipeline Alignment	8.0	7/11/2006	Backhoe	None	--	--	--	--
LS-UG-8T	Pipeline Alignment	4.0	7/11/2006	Backhoe	None	--	--	--	--
LS-UG-9T	Pipeline Alignment	4.0	7/11/2006	Backhoe	None	--	--	--	--
UH-6R	Pipeline Alignment	45.8	9/6/2006	CME 55	N/A*	Yes	45.8	10.0	17.0
UH-11R	Pipeline Alignment	27.8	12/14/2005	CME 75	9.6	No	--	--	--
UH-12R	Pipeline Alignment	30.2	12/14/2005	CME 75	12.4	No	--	--	--
UH-13R	Pipeline Alignment	25.5	12/15/2005	CME 75	10.1	No	--	--	--
UH-16R	Pipeline Alignment	21.5	12/15/2005	CME 75	9.0	No	--	--	--
G-UH-1T	Pipeline Alignment	4.0	7/13/2006	Backhoe	None	--	--	--	--
G-UH-2T	Pipeline Alignment	5.0	7/13/2006	Backhoe	None	--	--	--	--
G-UH-3T	Pipeline Alignment	6.0	7/13/2006	Backhoe	None	--	--	--	--
G-UH-4T	Pipeline Alignment	5.0	7/13/2006	Backhoe	None	--	--	--	--
G-UH-5T	Pipeline Alignment	4.5	7/13/2006	Backhoe	None	--	--	--	--
G-UH-6T	Pipeline Alignment	3.5	7/13/2006	Backhoe	None	--	--	--	--
G-UH-7T	Pipeline Alignment	5.0	7/14/2006	Backhoe	None	--	--	--	--
G-UH-8T	Pipeline Alignment	12.0	7/14/2006	Backhoe	None	--	--	--	--

TABLE 1

SUMMARY OF EXPLORATION METHODS AND PIEZOMETER CONSTRUCTION

Exploration No.	Facility	Depth of Exploration (feet)	Exploration Date	Method of Exploration[2,3,4,5]	Groundwater Level from Ground Surface at Time of Drilling[1] (feet)	Piezometer (Yes or No)	Depth to Bottom of Well Screen (feet)	Length of Well Screen (feet)	Depth to Top of Sensing Zone (feet)
G-UH-9T	Pipeline Alignment	8.0	7/14/2006	Backhoe	None	--	--	--	--
G-UH-10T	Pipeline Alignment	5.5	7/14/2006	Backhoe	None	--	--	--	--
G-UH-11T	Pipeline Alignment	4.5	7/14/2006	Backhoe	None	--	--	--	--
G-UH-12T	Pipeline Alignment	5.5	7/14/2006	Backhoe	None	--	--	--	--
G-UH-13T	Pipeline Alignment	5.0	7/14/2006	Backhoe	None	--	--	--	--
G-UH-14T	Pipeline Alignment	5.5	7/14/2006	Backhoe	None	--	--	--	--
G-UH-15T	Pipeline Alignment	5.5	7/14/2006	Backhoe	None	--	--	--	--
G-UH-16T	Pipeline Alignment	6.5	7/14/2006	Backhoe	None	--	--	--	--
G-UH-17T	Pipeline Alignment	5.8	7/14/2006	Backhoe	None	--	--	--	--

1. Asterisk (*) indicates that ground water level was not measured due to mud rotary drilling method.
2. CME 75/CME 55 = Central Mine Equipment drill rig used to advance both rotary wash and hollow-stem auger borings (see text in Appendix A for further explanation)
3. CPT = Cone Penetration Test
4. SRS = Seismic Refraction Survey
5. Backhoe = 310 SE John Deere Backhoe with 36-inch bucket

Geomatrix

TABLE 2

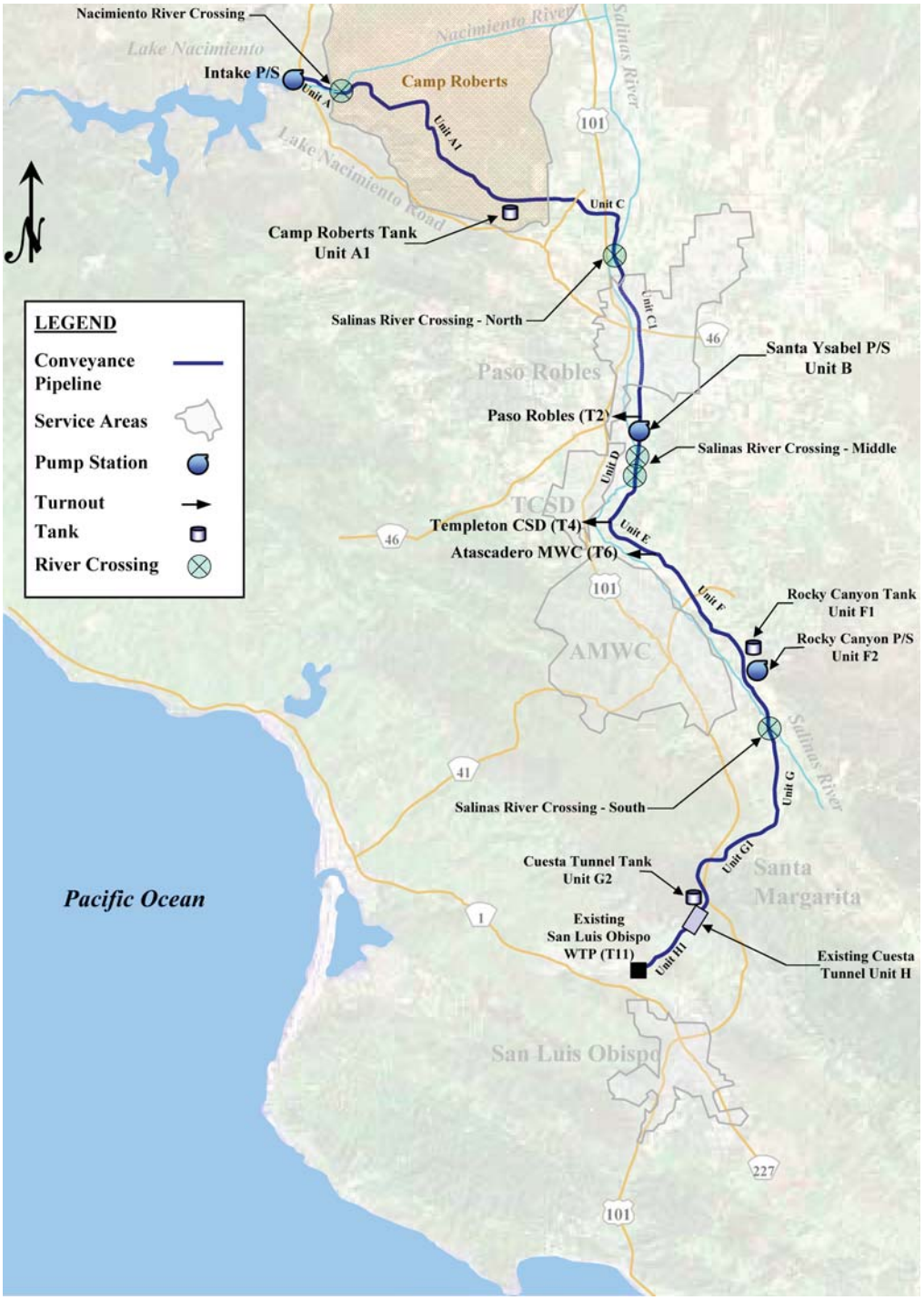
SUMMARY OF GROUNDWATER LEVELS

Nacimiento Water Project
San Luis Obispo County, California

Boring No.	Construction Condition at Location of Boring	Depth of Boring (feet)	Date Drilled	Groundwater Level from Ground Surface at Time of Drilling (feet)	Groundwater Level from Ground Surface (feet), measured 3/17/06	Groundwater Level from Ground Surface (feet), measured 7/18/06-7/19/06	Groundwater Level from Ground Surface (feet), measured 9/26/06-9/27/06	Groundwater Level from Ground Surface (feet), measured 2/14/07-2/16/07
UA-23A	Pipeline Alignment	30.5	10/26/2005	Not Encountered	26.0	28.4	28.3	27.4
UA-26A	Pipeline Alignment	15.0	10/24/2005	Not Encountered	--	NONE	NONE	NONE
UC-2A	Pipeline Alignment	50.5	11/2/2005	28.0	21.0	26.7	28.0	28.2
UC-6A	Pipeline Alignment	20.5	10/28/2005	Not Encountered	10.0	9.3**	13.5	14.5**
UC-11A	Pipeline Alignment	31.5	5/25/2006	N/A*	--	NONE	NONE	NONE
UC-25A	Pipeline Alignment	26.5	10/19/2005	Not Encountered	N/A	NONE	NONE	NONE
UD-1A	Pipeline Alignment	24.6	10/19/2005	Not Encountered	20.5	23.9	24.0	23.9
UF-6A	Pipeline Alignment	25.5	10/21/2005	Not Encountered	--	18.5	20.6	23.1
UG-5A	Pipeline Alignment	25.5	10/20/2005	15.3	12.0	12.5	14.1	15.0
UG-8R	Pipeline Alignment	54.5	11/3/2005	N/A*	--	--	--	--
UG-9A	Pipeline Alignment	25.5	10/20/2005	24.0	11.5	13.4	15.0	14.3
UG-18A	Pipeline Alignment	15.5	11/8/2005	Not Encountered	--	13.5	15.8	15.7
UG-22R	Pipeline Alignment	34.5	11/4/2005	N/A*	--	?	9.7	4.9
UG-32A	Pipeline Alignment	31.5	6/29/2006	10	--	10.8	12.7	10.5
UH-6R	Pipeline Alignment	45.8	9/6/2006	N/A*	--	--	33.6	32.5

* Indicates that the ground water level was not measured due to mud rotary drilling.
** Annulus above top of pipe filled with water. Water was bailed to below the top of pipe prior to taking the measurement.

FIGURES



0 10 miles

NACIMIENTO WATER PROJECT MAP
Nacimiento Water Project
San Luis Obispo County, California

By: HAW	Date: 03/2007	Project No. 10352.000
Geomatrix		Figure 1

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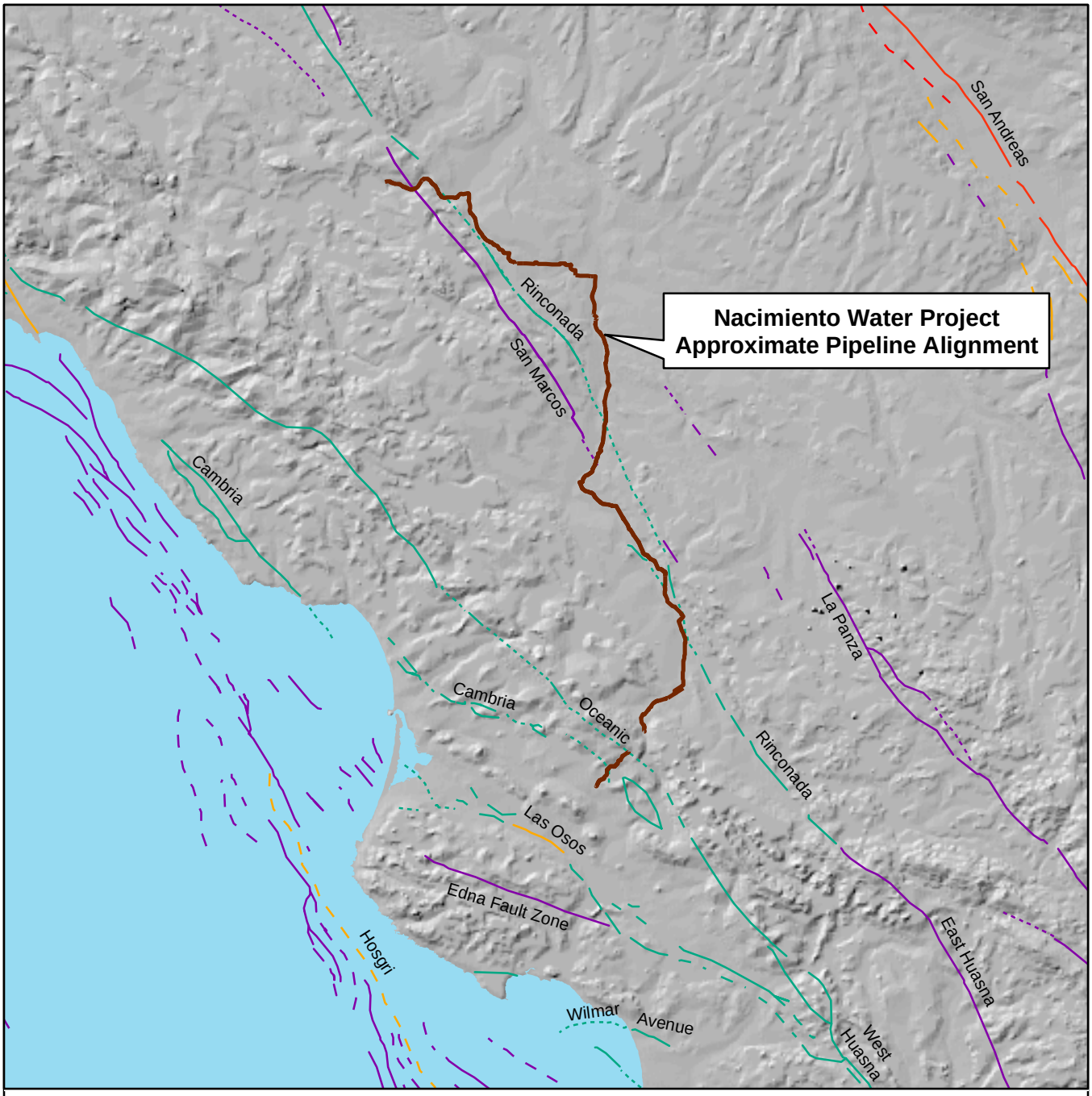

Fault Recency Classification

- Faults with historic surface rupture or creep
- Faults that displace Holocene (~11ka) deposits or geomorphic surfaces
- Faults that displace late Quaternary (~700 ka) deposits or geomorphic surfaces
- Quaternary faults; show evidence for displacement sometime within past 1.6 Million years

0 8 Kilometers

0 8 Miles

Notes

1. Fault traces from Jennings (1994).
2. Faults mapped as pre-Quaternary are not shown.
3. Several faults discussed in the text (e.g., various traces of the Nacimiento fault zone) are not shown because they are classified as pre-Quaternary

Scale=1:500,000

REGIONAL FAULT ACTIVITY MAP
Nacimiento Water Project
San Luis Obispo County, California

By: HAW	Date:03/30/07	Project No. 10352.000
Geomatrix		Figure 2

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PROJECT: Nacimiento Water Project San Luis Obispo County, California		**Log of Boring No. UG-17A**	
BORING LOCATION: El Camino Real		ELEVATION AND DATUM:	
DRILLING CONTRACTOR: S & G Drilling		DATE STARTED: 11/7/2005	DATE FINISHED: 11/7/2005
DRILLING EQUIPMENT: CME-75		TOTAL DEPTH (feet): 15.5	MEASURING POINT: Ground Surface
DRILLING METHOD: 8-inch diameter hollow-stem auger		DEPTH TO FREE WATER FIRST ENCOUNTERED (feet): Not Encountered	
SAMPLING METHOD: See Figure A1-1, Boring Log Explanation		DEPTH TO WATER AT COMPLETION (feet, date/time): 12.5	
HAMMER WEIGHT: 140 pounds	HAMMER DROP: 30 inches	LOGGED BY: A. Behan	

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/foot	MATERIAL DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other
1, 2, 3	1	■		CLAY (CL) Stiff, very dark gray (2.5Y 3/1) to black (10YR 2/1), dry, medium plasticity, contains trace fine to medium sand, contains scattered fine gravels; [ALLUVIUM]	8		
4, 5, 6, 7	2	☒	17	SANDY CLAY (CL) Stiff, mottled light olive brown (2.5Y 5/3) with very dark gray (2.5Y 3/1), dry, sand is fine to medium, contains abundant silt; [ALLUVIUM]	11	92	<200=63% UC=3300 Bulk sample of cuttings taken between 5 to 10 feet Sieve <200=53% LL=35 PI=18 D1557
8, 9, 10, 11, 12, 13	3	☒	13	CLAYEY SAND (SC) Loose, light gray (2.5Y 7/2) to light brownish gray (2.5Y 6/2), moist, sand is predominantly fine with some medium grains; [ALLUVIUM] ▼ medium dense, grades to white (5Y 8/1), decrease in clay content	19	108	Sieve <200=26%
14, 15	4	☒	35		21	106	
16, 17				Bottom of boring at 15.5 feet. Boring grouted.			

GT-1 (8/01)

Project No. 10352.000	**Geomatrix Consultants**	Figure A1-86

PROJECT: Nacimiento Water Project San Luis Obispo County, California		**Log of Boring No. UG-32A**	
BORING LOCATION: El Camino Real		ELEVATION AND DATUM:	
DRILLING CONTRACTOR: S & G Drilling		DATE STARTED: 6/29/2006	DATE FINISHED: 6/29/2006
DRILLING EQUIPMENT: CME-75		TOTAL DEPTH (feet): 31.5	MEASURING POINT: Ground Surface
DRILLING METHOD: 8-inch diameter hollow-stem auger		DEPTH TO FREE WATER FIRST ENCOUNTERED (feet): 10	
SAMPLING METHOD: See Figure A1-1, Boring Log Explanation		DEPTH TO WATER AT COMPLETION (feet, date/time): Not Measured	
HAMMER WEIGHT: 140 pounds	HAMMER DROP: 30 inches	LOGGED BY: J. Allen	

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/foot	MATERIAL DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other
1, 2				SANDY CLAY/SANDY SILT (CL/ML) Medium stiff, dark brown (7.5YR 3/2) and brown (7.5YR 4/4), dry to slightly moist; [FILL]			Bulk sample of cuttings taken between 0 to 10 feet
3, 4, 5, 6, 7	1	X	8	CLAY (CL) Medium stiff, dark brown (7.5YR 3/2), moist, silty; [COLLUVIUM]			LL=31 PI=15
8, 9, 10, 11, 12, 13, 14	2	X	4	CLAYEY SAND (SC) Very loose, olive gray (5Y 4/2), moist to wet, medium grained; [ALLUVIUM] ATD ▽	18	112	Sieve <200=24%
15, 16, 17	3		0	CLAYEY SAND (SC) Very loose, olive brown (2.5Y 4/4), wet, sand is very fine grained, clayey and silty; [ALLUVIUM]			

GT-1 (8/01)

Project No. 10352.000	**Geomatrix Consultants**	Figure A1-94

PROJECT: Nacimiento Water Project
San Luis Obispo County, California

Log of Boring No. UG-32A cont.

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/foot	MATERIAL DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other
18				CLAYEY SAND (SC), as before			
19							
20				SANDY CLAY (CH) Very soft, olive brown (2.5Y 4/4), wet, very fine to fine sand, silty. [ALLUVIUM]			
	4	X	4				
21							
22							
23							
24				CLAY (CH) Very soft to soft, very dark grayish brown (2.5Y 3/2), wet; [ALLUVIUM]			
25							
	5	X	7				
26							
27							
28							
29							
30							
	6	X	2	grades very soft, with trace coarse angular sand (up to 1/4-inch)			
31							
				Bottom of boring at 31.5. Piezometer constructed in boring.			

GT-2 (8/01)

Project No. 10352.000 | Geomatrix Consultants | Figure A1-94 Cont.

GES-8/01 SOILLOGS_PIPELINES_10352.GPJ GES32003-7.GDT 03/26/07