Appendix H – TM 10.5

Subsidence

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May 7, 2012

Project No. 04.B0103128

TECHNICAL MEMORANDUM

To: Mr. Greg Bartow and Mr. Jeff Gilman
San Francisco Public Utilities Commission

From: Peter Leffler, C.Hg.; Ron Bajuniemi, P.E., G.E.

Subject: **Subsidence Analysis for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project**

INTRODUCTION

This Technical Memorandum (TM) was prepared to document work performed by Fugro and as part of contract CS-879A with Kennedy/Jenks Consultants (Kennedy/Jenks) for the San Francisco Public Utilities Commission (SFPUC) pursuant to the amended Task Order authorizations CUW30103-TO-1.12 of the Regional Groundwater Storage and Recovery (GSR) Project and CUW30102-TO-2.7 of the San Francisco Groundwater Supply (SFGW) Project. These projects are funded by the SFPUC's Water System Improvement Program (WSIP).

The San Francisco Public Utilities Commission (SFPUC) is conducting environmental review for the proposed Groundwater Storage and Recovery (GSR) project in the South Westside Groundwater Basin in northern San Mateo County and the San Francisco Groundwater Supply (SFGW) project in the North Westside Groundwater Basin in the City and County of San Francisco. The proposed GSR project involves a partnership between SFPUC and the City of Daly City, California Water Service Company (Cal Water), and the City of San Bruno. The study area encompasses a portion of San Mateo County located between Millbrae and Daly City. Each of the Partner Agencies (Daly City, Cal Water, and San Bruno) has historically obtained municipal water supplies from a combination of groundwater and SFPUC surface water. In the proposed project, the SFPUC would provide a greater allocation of surface water to Partner Agencies during average and wet years in order to allow Partner Agencies to reduce groundwater pumping. The project would create in-lieu groundwater recharge, which would be tapped during drought cycles via new wells installed by the SFPUC between Millbrae and Daly City.

The proposed SFGW project involves groundwater extraction of 3 to 4 million gallons per day (MGD) from four to six new wells installed in the vicinity of Lake Merced, the Sunset District, and Golden Gate Park. The study area encompasses the western portion of San Francisco between the San Francisco/San Mateo county line and Golden Gate Park. The scope of the proposed project (3 or 4 MGD) would depend upon whether or not recycled water would replace a portion of irrigation pumping in Golden Gate Park. If the recycled water project is implemented, two existing irrigation wells at the west end of Golden Gate Park would be converted to municipal supply wells, and four additional municipal supply wells would be brought online to pump a total of 4 MGD from six wells. If the recycled water project is not implemented, the two Golden Gate Park irrigation wells would continue irrigation pumping, and only the four new municipal supply wells would be used to pump 3 MGD for the SFGW project.

Purpose of Study

The proposed GSR project in northern San Mateo County would only extract groundwater up to the amount stored via in-lieu recharge. However, due to potential for localized effects (i.e., greater drawdown in the vicinity of proposed GSR wells), this study is being conducted to evaluate potential for subsidence that may be caused by localized areas of water level drawdowns that may exceed historic lows and exceed future expected groundwater levels without the proposed project(s).

This study addresses the following technical issues:

- The geologic setting of the area (presence of semi-consolidated, fine-grained deposits) with regard to the potential for subsidence.
- Compilation of historical survey and monument data for the study area that could document the existence of and nature of historical subsidence in the area. If data allow – evaluate if subsidence has occurred or is occurring, where it is occurring, and the causes.
- The historical range of water level variations in the principal aquifer units in the study area related to groundwater withdrawal.
- Evaluation of the potential for subsidence related to several proposed scenarios of in-lieu recharge and groundwater extraction in the Westside Basin.

For the purpose of this study, the area evaluated includes the Westside Groundwater Basin in San Francisco and northern San Mateo counties as generally defined by Luhdorff & Scalmanini (2010) and the “model domain” used by Kennedy/Jenks (2012). The area of study is shown on Figure 1, which also shows the approximate location of survey benchmarks with vertical elevation control data from the National Geodetic Survey (NGS).

Background and Previous Studies

A previous study conducted by CH2M Hill (1996) evaluated subsidence associated with potential development of new municipal groundwater supply wells in the Golden Gate Park, Sunset District, North Lake Merced, and South Lake Merced areas. The results estimated total subsidence of up to one foot in the Golden Gate Park area, 0.8 foot in the Sunset District, and 1.4 feet for continuous 5-year pumping rates of 1,400 gpm (approximately 2 MGD) in each respective area. The study did not identify any clay layers of significance in the South Lake Merced area; hence, it was assumed no subsidence would occur in this area. The CH2M Hill study effectively assumes all project pumping comes from one well.

The CH2M Hill study states that subsidence generally occurs in confined aquifers with compressible clay layers, whereas the Westside Basin is generally described as unconfined to semi-confined. Although not explicitly stated in terms of soil compressibility values used in the CH2M Hill subsidence model, it appears that compressible clay values were used based upon data from Santa Clara Valley and Central Valley. Nonetheless, the CH2M Hill study assumes the Westside Basin in San Francisco is confined with compressible clay layers.

The study based the head changes on analytical calculations of drawdown from a well pumping at various discharge rates, with the maximum rate being 1,400 gpm. This calculation resulted in drawdowns (and head changes for subsidence calculations) in excess of 200 feet, and essentially assumes that historic lows are exceeded by greater than 200 feet. The transmissivity value used in the drawdown calculations (13,280 gpd/ft) is too low for the higher pumping rates (e.g., 1,000 and 1,400 gpm) used in the study, and results in excessive drawdown being used in the calculations. Typical pumping rates associated with a T value of 13,280 would be less than 800 gpm. Review of study results for a more realistic individual well pumping rate (relative to a T value of 13,280 gpd/ft) range from 0 to 0.6 feet for a 500 gpm well.

Clay properties used in the calculations were not explicitly stated in the CH2M Hill study; however, two figures provided in the study indicated that clays were assumed to have high compressibility as derived from unconsolidated Santa Clara Valley and Central Valley clay deposits. The semi-consolidated nature of the Westside Basin Merced Formation means its clay units are much less compressible than more recently deposited alluvial clays in Santa Clara Valley and the Central Valley. Furthermore, the CH2M Hill study assumes that all clay layers have the same head change, whereas the current study is based on the different head changes that occur at different depths in clay layers.

The current study that is the subject of this TM uses more realistic soil compressibility parameters and drawdown estimates (especially relative to preconsolidation stresses), as compared to the CH2M Hill study, and thus the results of the current study are more realistic and applicable. It should be further noted that all the areas addressed in the CH2M Hill Subsidence Study currently have or historically have had significant groundwater pumping that will require substantially lower water levels in the future to have any potential of subsidence. For example, the Lake Merced area has historically had significant pumping at nearby golf course irrigation wells that was largely replaced by recycled water in 2005. The Sunset region had an extensive well field in the 1930s and likely much lower water levels at that time compared to today. Irrigation wells have operated historically and continue presently in Golden Gate Park.

A calibrated transient numerical groundwater flow model of the Westside Groundwater Basin, developed by HydroFocus (2011) and applied by Kennedy/Jenks (2012), predicts the extent and magnitude of water level declines in five model layers under various scenarios of in-lieu recharge and groundwater extraction. The Technical Memo completed for Task 10-1 provides a discussion of the HydroFocus model and how it was applied for Task 10 studies (Kennedy/Jenks, 2012). The maximum model-predicted drawdowns in the South Westside Basin related to the GSR project occur at the end of the Design Drought. The maximum model predicted drawdowns in the North Westside Basin related to the SFGW project generally occur at the end of the model run (47 years), which also happens to generally coincide with the Design Drought sequence. The magnitude and extent of the predicted water level declines would theoretically control the extent of potential subsidence and are appropriate to use in the analysis, subject to the discussion provided below. These predicted water level fluctuations are provided in Appendix A – Groundwater Model Results.

Luhdorff and Scalmanini completed a study that documents the hydrogeologic setting of the Westside Basin (TM1: Hydrologic Setting of Westside Basin; Luhdorff and Scalmanini, 2010). The geologic setting of the Westside Basin has been characterized as containing semi-consolidated, unconfined to confined aquifers with variable percentages of interbedded fine-grained deposits depending on location in the basin. Several geologic cross-sections included in this study were utilized in evaluation of well locations selected for subsidence calculations.

Water level declines that would be created from the GSR project or SFGW project may have the potential to cause aquitard (i.e., clay layer) compaction, leading to ground subsidence. This study was conducted to evaluate the potential for ground subsidence related to the proposed GSR and SFGW projects, as well as other reasonable foreseeable future projects ("cumulative scenario").

SUBSIDENCE CONCEPTUAL MODEL

Theory and Cause of Subsidence Related to Fluid Withdrawal

Causes of subsidence and the mechanics of aquifer system responses to fluid withdrawals have been the subject of considerable research in California, largely due to the pioneering efforts of Dr. Joseph Poland. AEG Special Publication No. 8 (Borchers, 1998) provides a wealth of information on subsidence in California caused by groundwater withdrawal. The forces acting on a clay layer at depth include the weight/mass of the overlying sediments and water acting in a downward direction (total stress), balanced by the intergranular skeleton (effective stress) and pore pressures (pore fluid stress) acting in an upward direction (Galloway, et.al., 1999). As the upward forces must balance the downward forces, a decrease in the pore pressure increases the effective stress borne by the soil skeleton. In the case of unconsolidated and semi-consolidated clays, an increase in the effective stress may cause compaction of the clay layers and subsidence at the land surface. Coarse-grained layers would tend to experience some compaction as well, but generally at one to two orders of magnitude less than clay layers. Furthermore, the slight compaction of coarse-grained layers is often elastic and can be reversed when pumping stops or is decreased.

As pore pressures are reduced in a sequence of interbedded aquifers and aquitards due to pumping, compaction of the sequence can only occur as rapidly as excess pore pressures dissipate or reach equilibrium. In aquitard deposits (clay and silt beds) such as those that exist in the Westside Groundwater Basin, the time required for pore pressures to reach equilibrium (i.e., maximum consolidation) can be a slow process requiring several months or even years. Our analysis assumes that the drawdown condition is maintained long enough for residual excess pore pressures to fully dissipate (i.e., steady-state conditions) resulting in the maximum consolidation of the aquitards.

Aquitard values of specific storage (elastic and inelastic) and/or properties of compressibility are required to calculate the theoretical compaction of fine-grained deposits. Knowledge of such values is limited and often imprecise, and hence so are predictions of ultimate aquitard consolidation. Site-specific laboratory test results were not available for this study. We assumed typical soil compressibility values and estimates of the stress history of the Merced Formation, as discussed in other sections of this TM.

Unconsolidated confined aquifers (and aquitards) even at great depth are sensitive to changes in effective stress; small stress changes may cause permanent, widespread compaction. Semi-consolidated aquifers and aquitards (such as exist in the Westside groundwater basin) are generally less susceptible to subsidence due to greater pre-existing consolidation of the sediments. Nonetheless some potential for subsidence may exist for semi-consolidated aquifers/aquitards depending on the magnitude of the changes in hydraulic head (pore pressures) and soil properties.

Groundwater level declines, such as predicted in the numerical model, are an estimate of effective stress changes that would occur in the aquifer system. Aquifer/aquitard compaction may be either recoverable (elastic) or irrecoverable (inelastic) based on the degree of effective stress change and the characteristics of the deposits (compressibility, stress history). During the first cycle of groundwater withdrawal, much of the pumped water comes from the unrecoverable compaction of the aquifer system. In the study area, substantial historical groundwater extractions have occurred by such entities as the San Francisco Water Department in the Sunset area of San Francisco (in the 1930s), San Francisco Zoo, Golden Gate Park, Daly City, Cal-Water Service in the South San Francisco area, the City of San Bruno, various golf courses, and the Colma cemeteries. In cases where well field yields and transient drawdowns were relatively large, such “first cycle of pumped water” may already have occurred, with resultant subsidence. During subsequent cycles of water level declines or to the extent the proposed SFPUC groundwater withdrawals result in water level declines greater than the historical range, the aquifer system preconsolidation stresses again would be exceeded, resulting in renewed potential for layer compaction and land subsidence.

Conceptual Analysis Evaluation

It should be noted that historic subsidence in the Westside Groundwater Basin study area has not occurred (or at least it has not been documented) as it has further south in the area from Redwood City to San Jose. The fact that extensive historic groundwater extraction has resulted in associated declines in groundwater levels, but without any apparent substantial subsidence, suggests that the semi-consolidated Merced Formation sediments have limited compressibility. Therefore, based on a conceptual understanding of the mechanisms required for land subsidence and the apparent lack of historic subsidence in the study area, the potential for future subsidence even with additional lowering of groundwater levels below historic lows is likely limited due to low compressibility of semi-consolidated Merced Formation sediments.

DATA COLLECTION AND REVIEW

Geologic/Hydrogeologic Setting and Selection of Representative Well Locations

The hydrogeologic investigations of the study area conducted by Luhdorff & Scalmanini (2010), Kennedy/Jenks (2009 and 2010), and others provide detailed information on the geologic setting and aquifer/aquitard variability and characteristics. Luhdorff & Scalmanini has prepared geologic cross-sections for the Westside Groundwater Basin extending from Golden Gate Park in the north to Millbrae in the south. Clay and sandy clay layers are present at variable depths in most areas of the basin. Two prominent clay layers present in the Lake Merced area include the X clay and the W clay. The W clay is regionally continuous and extends south through Daly City and Colma. Other clay layers are present in South San Francisco and San Bruno as well.

North Westside Basin

The north-south geologic cross-section prepared by Luhdorff & Scalmanini (2010) extends from Golden Gate Park in the north through Millbrae on the south. This cross-section shows the general location of the predominant clay layers in the groundwater basin. In particular, prominent clay layers identified around the Lake Merced and Sunset areas in San Francisco include the -100 foot clay, X Clay, and W Clay. The two representative locations selected from among the SFGW Project wells were the South Sunset Playground (South Sunset well) and Lake Merced Pump Station (LMPS well). Wells from these two areas were selected over a site in Golden Gate Park due to the greater prevalence of clay layers in the Sunset/Lake Merced areas compared to Golden Gate Park.

The LMPS well has substantial clay layers present both above (333 to 390 feet below ground surface (bgs)) and below (454 to 542 feet bgs) the proposed pumped zone. The more confined nature of the LMPS well might be expected to result in greater head declines, and its location in the southern portion of San Francisco would experience some contribution to head losses from the GSR project in addition to the primary groundwater level declines related to the SFGW project. Therefore, the LMPS location may be considered more susceptible to project-related subsidence effects than a location in Golden Gate Park.

The South Sunset Well has a shallow sandy clay layer within the upper 100 feet, several intermediate depth clay layers between 290 and 390 feet, and a deeper clay layer below 500 feet. In addition, review of the geophysical and geologic logs show that clayey sand (and sand with clay) layers present at 320-335, 340-348, 430-447, 450-476, and 514-570 feet bgs display similar characteristics to layers logged as clay and sandy clay on the geologic log. Therefore, clayey sand and sand with clay layers in the geologic log were treated as clay layers for the subsidence analysis. The South Sunset well is located between the LMPS well on the south and West Sunset well to the north, both of which should add some mutual interference drawdown to the South Sunset well location (which would tend to result in a more conservative analysis).

South Westside Basin

Geologic cross-sections and well data were reviewed for the South Westside Groundwater Basin to select two representative locations for analysis of subsidence. In general, the selected locations should emphasize basin areas with greater thicknesses of clay layers and anticipated lower groundwater elevations since these characteristics create more potential for subsidence. Review of geologic cross-sections indicates clay layers are less prevalent in the north (Daly City area) and more prevalent in the central to southern portion of the basin (in the Colma area and further south). The Colma and South San Francisco areas were selected over the San Bruno/Millbrae areas further south due to the concentration of proposed GSR wells in the Colma and South San Francisco areas compared to the San Bruno/Millbrae areas.

In terms of the South Westside Groundwater Basin, the shallow (-100 foot clay) and intermediate (X Clay) layers appear to pinch out in the Daly City area – thus reducing the potential for subsidence. An intermediate depth clay layer occurs again in the Colma area along with continuing presence of the deeper W Clay. Due to the comprehensive nature of boring data collected as part of the GSR monitoring well installation program (geologists log, geophysical log, drillers log) (Kennedy/Jenks, 2009 and 2010), the SFPUC nested well data were reviewed to select representative locations.

Consistent with the overall geology shown in the Luhdorff & Scalmanini cross-sections, CUP- 6, 7, and 10A (locations shown in Figure 2) in the Daly City area generally had greater prevalence of sand over clay compared to areas further south and were not selected. CUP-18, 19, 22A, and 23 (locations shown in Figure 2) were reviewed as a group, and CUP-19 was selected to be representative the Colma area. CUP-19 appears to have clay layers that are representative of other well locations in the Colma area. The proposed CUP-19 well site has both intermediate depth and deep clay layers. In addition, CUP-19 provides a location that should be representative of the extensive Take pumping proposed for this area. The combination of clay layers and the amount of proposed pumping in this area make CUP-19 a good selection for calculation of subsidence potential.

Further to the south along the Luhdorff & Scalmanini axial cross-section in South San Francisco it is apparent that the deeper W clay pinches out; however, a much thicker intermediate clay layer is present along with a shallow clay layer. A thinner deep clay layer also is present at the location of proposed CUP 41-4. Therefore, the fourth site selected for subsidence analysis was the proposed CUP-41-4 well location based on the presence of the clay layers discussed above. In addition, CUP-41-4 was selected over a location in San Bruno due to the greater influence of Take-year pumping on groundwater levels around CUP-41-4 compared to sites in the City of San Bruno. The location/thickness of clay layers and the potential head declines are thought to create more potential for project-related subsidence effects at CUP-41-4 than in San Bruno. Although the San Bruno area has a lot of clay at shallow to intermediate depths, there is less groundwater extraction from proposed GSR wells in the area and thus head changes would be smaller than other areas.

Survey Data

Sources of information on the location of survey monuments and the history of vertical measurements of elevation changes within the study area are limited. Review of the National Geodetic Survey's (NGS) database (http://www.ngs.noaa.gov/cgi-bin/datasheet.prl) indicates that benchmark data are available for 57 stations within the study area. For the most part, all survey data from these benchmarks represent one or two time measurements performed by the National Geodetic Survey (NGS) and others. Printouts of the station reports that are typical of the limited history for vertical elevation measurements in the area are provided in Appendix B - NGS Survey Data.

Although the available survey data do not allow for any conclusions to be reached with regard to historic subsidence due to lack of enough measurements at any given location, the data are provided in this study for documentation purposes and possible use as baseline data to compare against future measurements.

Review of Historic Groundwater Level Data

Historical water level data for the study area were obtained from SFPUC and Partner Agencies. As previously discussed, compaction of interbedded aquifer and aquitard materials can occur only as rapidly as pore pressures in the materials are reduced as a result of lower water levels. Past groundwater extractions in the area have resulted in sustained lowered water levels (and increase in effective stress) in the various aquifers. Land subsidence due to such groundwater withdrawal in the area would be expected to have already occurred if the area were susceptible; however, no historic subsidence has been documented.

Groundwater level elevation hydrographs for 11 wells (which are limited to South Westside Basin locations due to the general lack of groundwater level data prior to the 1980s in the North Westside Basin) of various depths with the longest historic records in the study area are provided in Appendix C – Groundwater Hydrographs. Table 1 provides a summary of historical groundwater level data from the wells included in Appendix C and several additional wells from the North and South Westside Basins with shorter periods of record. A few wells in the South Westside Basin have water level records extending back to the 1940s or 50s and provide a limited representation of static water level variations since that time. A map showing the distribution of wells in the study area for which hydrographs have been prepared is included in Figure 2. The data contained in Appendix C and summarized in Table 1 indicate the hydrograph records are quite variable in terms of the number and temporal span of water level measurements. To the extent that data on the perforated interval is available, it is provided in Table 1.

Although essentially no wells in the North Westside Basin have water level data extending back to the 1940s to 1970s, it is known that an extensive well field was developed in the Sunset District from 1930 to 1935. The historic Sunset Well Field consisted of 21 wells along 43rd and 44th Avenue between Kirkham and Taraval streets. The average depth of the wells was 250 feet and the total pumping capacity of the wells was about 6.5 MGD (4,500 gpm). The wells were operated from October 1930 to October 1935. Documented monthly pumping totals from May to October 1931 showing water production of 165 to 186 million gallons per month from the Sunset Well Field (3,850 to 4,200 gpm) (San Francisco Water Department, 1931).

Given that historic groundwater pumping from this well field is estimated at up to 6.5 MGD, it is likely that substantial groundwater level decline occurred that would have caused a proportional amount of subsidence in the area (again assuming clays have substantial compressibility), if the area were susceptible. However, given the lack of documentation of historic lows during the 1930-35 time period, this era of groundwater extraction in San Francisco was not used as a basis for historic lows in the Sunset District. Golden Gate Park also has an extensive history of pumping groundwater for irrigation, but little water level data prior to the late 1980s are available; thus, possible pre-1980s groundwater levels lower than recent historic lows are discounted.

Groundwater level data for wells located in San Francisco are generally limited to the time period from the late 1980s until present, and most available historic data are from the last 10 years. Thus, it is unlikely that historic lows have been captured in the available measured groundwater level data. Nonetheless, groundwater level data that are available from selected wells extending from Golden Gate Park in the north to Lake Merced in the south of San Francisco were reviewed with respect to lowest recorded groundwater levels. The shallow aquifer at the North and South Windmill wells has historic low groundwater level measurements ranging from -6 to 7 feet NGVD 29, whereas the deeper zone has a historic low of -26 feet NGVD 29. Since the time it was installed in 1993, the lowest measured historical groundwater level at the West Sunset Well was 14 feet NGVD 29 in 1995. Groundwater level data collected in the last few years show low groundwater levels of -9 feet NGVD 29 and -99 feet NGVD 29 in the primary and deep aquifers at Lake Merced Pump Station nested monitoring wells. The deepest recorded level at the Olympic Club Well 1 was -47 feet NGVD 29.

Inspection of the hydrographs with long histories of water level data extending back to the 1950's or earlier in the South Westside Basin (DC-1, DC-8, DC-9, SS1-14, SS1-17, SS1-18) generally shows water levels declining until the early 1970s. Since the early 1970s water levels have tended to fluctuate around an average level without much of a net rise or decline until the In-Lieu Recharge Demonstration Study was implemented in 2002. Since 2002 the hydrographs with water level data available from 2000 to 2009 (DC-1, DC-8, SS1-02, and SB-12) show substantial rises in water level (although SB-12 subsequently declined back to its 2002 level after normal pumping resumed from 2005 to 2008). Based on these water level variations, subsidence due to historic groundwater extractions would be expected to have already occurred in proportion to historic lows to the extent that fine-grained aquitard layers may be present within the associated depth intervals and to the extent that semi-consolidated clays of the Merced Formation are compressible.

Screen interval data are only available for one of the three Daly City wells (DC-1, DC-8, and DC-9) with long-term water level records. However, the range of historic lows (-142 to -154 feet NGVD 29) and available screen data indicate these water levels are likely most representative of the shallow to intermediate depth aquifer zones.

Cal-Water wells SS1-14 through SS1-18 are more representative of shallow aquifer zones based on screen intervals, and SS1-21 is representative primarily of the deeper more confined aquifer that has been the primary municipal aquifer pumped in recent years. Historic lows in the Cal-Water area represented by shallow-screened wells ranged from -150 to -169 feet NGVD 29, whereas the one well screened in the deeper confined aquifer has a historic low of -229 feet NGVD 29. Of the two other Cal-Water wells (SS1-19 and SS1-20) with more intermediate depth upper screen zones, SS1-19 has a historic low more consistent with shallow screened wells whereas SS1-20 has a historic low more consistent with the deeper screened well. Overall, historic low water levels in Cal-Water wells are generally consistent with the observations from nested monitoring wells in the basin that show lower groundwater elevations with increasing screen depths. This vertical downward gradient is likely a function of most existing municipal and irrigation wells being screened in and pumping from the deeper aquifers (i.e., screened at depths below 350 feet).

Historical groundwater level data for San Bruno wells prior to 1996 are very limited and no data are available during the last major drought period (1988-1992). Thus, it is difficult to evaluate representative historic lows from measured data in the San Bruno area. Measured historic lows in recent years ranged from -144 to -213 feet NGVD 29 and occurred in the 1999-2001 timeframe.

With respect to groundwater level declines indicated by historic data, WRIME has evaluated the issue of historical subsidence as part of their work in preparing a draft groundwater management plan for the South Westside Basin (WRIME, October 2011). WRIME states the following with respect to subsidence south of the study area, "There are no available records of historical subsidence in the South Westside Basin. Significant studies have been performed to the south in the Santa Clara Valley, due to extensive subsidence in that area. Those studies show that the extent of subsidence in the area is focused on Santa Clara, where land subsided 8 ft from 1934 to 1967. To the north, subsidence is more limited, with less than 1 foot of subsidence in the Palo Alto area and approximately an inch of subsidence in the Redwood City area (Poland and Ireland, 1988). Studies have not been performed farther north, likely due to a lack of evidence of active subsidence." WRIME further states the following with regard to the study area itself, "There has been no evidence of historical land subsidence, even though water levels have declined significantly from pre-development levels. Land subsidence is most rapid immediately after the initial dewatering of sediments. Thus, land subsidence is not anticipated from sediments that have been historically dewatered. Should water levels decline in the future, it is unlikely that subsidence would occur as these materials are similar to those historically dewatered and would likely exhibit the same limited compressibility."

GROUNDWATER MODEL RESULTS

Introduction

The numerical groundwater flow model for the Westside Basin was developed over a period of time from 2003 to 2011 by HydroFocus and Gus Yates, who were retained by Daly City (2007, 2009, and 2011). It was a collaborative effort sponsored by Daly City with review by the SFPUC, Cal Water, San Bruno and their respective consultants. The Project EIR efforts being conducted by the SFPUC for the SFGW and GSR projects have utilized the calibrated Westside Basin Groundwater-Flow Model as one of the tools for evaluating potential project effects. Kennedy/Jenks Consultants have been the lead in applying the existing model to future project scenarios for the respective EIR efforts (with review and input by Luhdorff & Scalmanini and Fugro). The following sections describe groundwater levels derived from model results of the HydroFocus (2011) calibration run (historic results), and groundwater levels predicted by the model over various future project scenario runs performed by Kennedy/Jenks (2012).

Historic Results from 1959-2009

The historic model results over the 1959 to 2009 time frame are used to supplement the available record of actual historic groundwater level measurements described in the previous section of this report. Historic low groundwater levels from model results for selected wells are provided in Tables 2 through 5. The limited availability of historic groundwater level measurements and screening over multiple layers of many wells with historic data make the use of model-estimated historic groundwater levels very important in the subsidence analysis. The model results provide a predicted continuous (monthly) record of groundwater levels by discrete depth zones (model layers). Review of the historic model results allows for selection of a more representative historic low due to the continuous record (limited historic measurements likely missed the historic low from a timing standpoint) and output of groundwater levels by model layer (many wells with historic measurements are screened across multiple aquifers or model layers). Because the historic model-predicted groundwater levels are calibrated to the limited available measured data, model-based historic lows should provide a reasonable approximation of actual historic lows. At a minimum the groundwater model provides the best means available to derive historic lows.

Model-derived historic lows for the area around CUP-19 for two well locations (Cypress 2 and Holy Cross 2) for the various model layers ranged from -53 to -61 feet NGVD 29 in model layer 1 to -170 to -179 in model layer 5. The proposed municipal well at CUP-19 is planned to be screened in model layers 3, 4, and 5, where model historic lows at nearby wells range from -111 to -179 feet NGVD 29 (Table 2). The measured historic low for Holy Cross 1 was -162 feet NGVD 29 in June 2000 based upon a limited number of measurements since 1986.

Model-derived historic lows for the area around CUP-41-4 for three well locations (California Golf Club 6, SSF-02, and SB-12) for the various model layers ranged from -71 to -84 feet NGVD 29 in model layer 1 to -226 feet NGVD 29 in model layer 4. The proposed municipal well at CUP-41-4 is planned to be screened in model layers 4 and 5, where model historic lows from nearby wells range from -171 to -226 feet NGVD 29 (Table 3). Measured historic lows for SSF-02 and SB-12 are -131 and -210 feet NGVD 29, respectively.

Model-derived historic lows for the area around Lake Merced Pump Station Well at three nearby well locations (Olympic, Harding Park, Higuera) for the various model layers ranged from -8 to 13 feet NGVD 29 in model layer 1 to -70 to -146 feet NGVD 29 in model layer 5. The Lake Merced Pump Station Well is screened in model layer 4, where model historic lows at nearby wells range from -22 to -68 feet NGVD 29 (Table 4). Measured historic lows for the Olympic Club Well 1 and Olympic Club MW range from -56 to -5 feet NGVD 29.

Model-derived historic lows for the area around the South Sunset Well at three well locations (LMMW-4, LMMW-5, and Santiago) for the various model layers ranged from 9 to 26 feet NGVD 29 in Model Layer 1 to -31 feet NGVD 29 in Model Layer 5. The South Sunset Well is screened in model layers 1 through 4, where model historic lows at three surrounding well locations range from -11 to 26 feet NGVD 29 (Table 5). The West Sunset Well had a measured historic low of 14 feet NGVD 29 based on limited data.

Future Results from 2009-2056

The model scenarios run to simulate future project conditions were used to assess the likelihood of historic low groundwater levels being exceeded and, if exceeded, the approximate magnitude and duration by which historic lows may be exceeded. The results of this analysis provide key input data to the subsidence calculations presented later in this report.

The future groundwater model scenarios are described in detail by Kennedy/Jenks (2012). The subsidence analysis evaluated scenarios 1, 2, 3a, 3b, and 4, which are described below. All scenarios are 47.25-year runs based in part on historical hydrology but also including a Design Drought. The Design Drought ends with the 1976-77 drought added onto the end of the 1987-92 drought, to simulate a 7.5-year drought. Scenario 1 includes existing pumping conditions and no proposed SFPUC projects, and begins with June 2009 basin groundwater levels.

Scenario 2 is based on implementation of the proposed GSR project. Scenarios 3a and 3b simulate implementation of the proposed SFGW project with total pumping of 3 MGD (3a) and 4 MGD (3b). Scenario 3a includes 3 MGD of SFGW project pumping via four wells located in central Golden Gate Park, the Sunset District, and at the Lake Merced Pump Station, while maintaining irrigation pumping at the western Golden Gate Park irrigation wells. Scenario 3b includes 4 MGD of SFGW project pumping from six wells in Golden Gate Park, the Sunset

District, and the Lake Merced Pump Station. Scenarios 3a and 3b start with June 2009 groundwater levels (consistent with scenario 1).

Scenario 4 represents a cumulative scenario and includes simulation of both the proposed GSR and SFGW projects together. In addition, scenario 4 includes other reasonably foreseeable future projects such as implementation of supplemental water to help maintain Lake Merced surface water levels, and expansion of the Holy Cross Cemetery with an associated increase in irrigation pumping.

CUP-19

The Cypress 2 Well in the groundwater model was used as the basis for historic lows in groundwater levels for comparison to future model-predicted groundwater levels at CUP-19. The results are tabulated in Table 2 (and Appendix D). Under the existing conditions model scenario (1), historic lows would be exceeded by 3 to 18 feet in model layers 1 through 3 and by 24 feet in model layer 5. Under model scenario 2, historic lows are estimated to be exceeded by 49 to 118 feet for model layers 1 through 4 and by 173 feet for model layer 5.

However, the best comparison to evaluate actual project effects is to compare model scenario 2 (and 4) to model scenario 1, which represents that incremental head drop caused by the project. Comparison of scenario 2 to 1 shows incremental head decreases of 31 to 125 feet for model layers 1 through 4 and 149 feet for model layer 5. Scenario 4 heads were 3 to 7 feet higher than heads for scenario 2, possibly related to slight differences between scenarios 2 and 4 with respect to locations of municipal (existing vs. replacement) well(s) along with the general lack of impact from scenario 3 at this location.

CUP-41-4

There were no adjacent wells to CUP-41-4 in the historical groundwater model run to use for assessment of model-predicted historical groundwater levels. Therefore, an average of three wells (CGC-6, SSSF-02, and SB-12) was used as a basis for comparison to future model-predicted groundwater levels at CUP-41-4. The results are tabulated in Table 3 (and Appendix D). Groundwater elevations under the existing conditions model run (model scenario 1) were higher than historic lows in model layers 1 through 3. Historic lows were exceeded by 10 to 23 feet in model layers 4 and 5. Under model scenario 2, historic lows were not exceeded in model layers 1 and 2, but were exceeded by 50 to 174 feet for model layers 3 through 5.

As stated above, actual project effects are best evaluated by comparing model scenario 2 (and 4) to model scenario 1, which represents the incremental head drop caused by the project. Comparison of scenario 2 to 1 shows incremental head decreases of 0 to 153 feet for model layers 1 through 4 and 151 feet for model layer 5. Scenario 4 shows negligible differences as compared to results of scenario 2 at CUP-41-4, likely due to the substantial distance between the proposed CUP-41-4 well and the proposed SFGW project wells.

Lake Merced Pump Station (LMPS) Well

There are three wells in close proximity to the LMPS Well in the historical groundwater model run that were used for assessment of model-predicted historical groundwater levels (Olympic, Harding Park, and Higuera). Higuera was used as the basis for comparison to future model-predicted groundwater levels at the LMPS Well due to its close proximity. The results are tabulated in Table 4 (and Appendix D). Under the existing conditions model run (1), historic lows would be exceeded by 3 to 4 feet in model layers 1 and 2, but not exceeded in layers 3 through 5. Under model scenario 2, historic lows are estimated to be exceeded by 4 to 10 feet for model layers 1 through 4 and by 58 feet for model layer 5. Under model scenarios 3a and 3b, historic lows are estimated to be exceeded by 18 to 57 feet in model layers 1 through 4 and by 5 feet in model layer 5.

Scenario 4 exceeds historic lows by 6 to 56 feet in model layers 1 through 5. Scenario 4 groundwater elevation lows were higher than scenario 3 lows for model layers 1 through 3. This is likely due to incorporation of supplemental water for Lake Merced in Scenario 4, which was not included in Scenario 3 (a and b).

Again, actual project effects are best evaluated by comparing model scenario 2 (and 3a, 3b, 4) to model scenario 1, which represents the incremental head drop caused by the project. Comparison of scenario 2 to 1 shows incremental head decreases of 0 to 15 feet for model layers 1 through 4 and 63 feet for model layer 5. Comparison of scenario 3a/3b to 1 shows incremental head decreases of 10 to 21 feet for model layers 1, 2, 3, and 5, and a 62 feet incremental head decrease for model layer 4. Comparison of scenario 4 to 1 shows incremental head decreases of 2 to 16 feet for model layers 1 through 3 and 59 to 61 feet for model layers 4 and 5.

South Sunset Well

There are three wells surrounding the South Sunset Well in the historical groundwater model run that were used for assessment of model-predicted historical groundwater levels. The average of three wells (LMMW-4, LMMW-5, and Santiago) was used as a basis for comparison to future model-predicted groundwater levels at South Sunset Well. The results are tabulated in Table 5 (and Appendix D). Under the existing conditions model run (1), historic lows were exceeded only by 1 to 2 feet. Under model scenario 3a, historic lows are estimated to be exceeded by 22 to 33 feet for model layers 1 through 4 and by 7 feet for model layer 5. The amount by which historic lows would be exceeded under scenario 3b is 21 to 31 feet for model layers 1 through 4 and by 7 feet for layer 5. The amounts by which historic lows are exceeded under scenario 4 are slightly less than under scenarios 3a and 3b (16 to 26 feet for model layers 1 through 4 and 14 feet in model layer 5); the likely reason for this prediction is that Lake Merced supplemental water was included in scenario 4 but not in scenarios 3a/3b (see Kennedy/Jenks, 2012).

Actual project effects are best evaluated by comparing model scenario 3a (and 3b, 4) to model scenario 1, which represents that incremental head drop caused by the project. Comparison of scenario 3a to scenario 1 shows incremental head decreases of 21 to 32 feet for model layers 1 through 4 (6 feet for model layer 5). The amount by which scenario 1 lows would be exceeded under scenario 3b is 1 to 2 feet less than under scenario 3a. Comparison of scenario 4 to scenario 1 shows incremental head decreases of 15 to 25 feet for model layers 1 through 4 and 13 feet for layer 5.

SUBSIDENCE CALCULATIONS

As discussed above, substantial land subsidence is not known to have occurred in the study area even with documented historic declines in groundwater levels over 200 feet below the ground surface. Nonetheless, based on the data analysis described above, it is apparent that withdrawals of groundwater under the two proposed projects being considered by the SFPUC has some potential to create land subsidence due to compaction of fine-grained deposits within and adjacent to the pumped aquifer. The groundwater model results predict relatively substantial drawdowns and exceedence of historic low groundwater levels in the pumped aquifer over a broad geographic area under the various proposed project scenarios.

Potential subsidence was estimated using an analytical equation for various proposed scenarios using representative subsurface profiles at the four well locations described above (CUP-19, CUP-41-4, LMPS, and South Sunset). The detailed assumptions and results of the subsidence calculations are presented in Appendix E. Initial groundwater levels were derived from historic model runs (with some validation by measured water levels) and from model scenario 1 (existing conditions with no proposed projects). Final groundwater levels at each of the four well locations were taken as the lowest predicted future groundwater elevations under each respective scenario. Subsidence estimates are provided for the area in the general vicinity of the pumping well analyzed in each of the four cases, but can be considered to be a representative but conservative estimate of broader areas around the wells.

The amount of subsidence was estimated using the following equation:

$$S = C_{ec} \times H \times \log (\sigma'_f/\sigma'_i)$$

Where:

S = subsidence
C_{ec} = compression ratio (or C_{er} – recompression ratio)
H = layer thickness
σ'_i = initial effective stress
$\sigma'f$ = final effective stress

Site-specific field/lab compressibility data for the Merced Formation were not available. Therefore, the compression ratios used in the subsidence estimates were from areas of known land subsidence based on our interpretation of available geologic/geophysical logs, published information from the Santa Clara Valley subsidence studies (Poland, 1971; Poland and Ireland, 1988), and our engineering judgment. This approach is conservative because the compression ratios used are based on younger and less consolidated sediments with known land subsidence compared to Merced Formation sediments.

The USGS (Poland, 1971) reported virgin compression ratios of approximately 0.17 to 0.2 for clays in the Santa Clara Valley. For clay layers, we assumed a virgin compression ratio of 0.18 and a re-compression ratio of 0.03 (approximately one-sixth of the compression ratio). We also assigned compression ratios of 0.01 to 0.005 for sand layers in virgin compression and re-compression, respectively (Pestana and Whittle, 1995; Mitchell and Soga, 2005). It should be noted that Santa Clara Valley clay deposits are considered to be of a more recent age and unconsolidated nature compared to the older semi-consolidated Pliocene to Pleistocene age Merced Formation clay layers. Thus, it would be expected that Santa Clara Valley clay compression ratios should be greater than Merced Formation clay compression ratios (resulting in a more conservative analysis).

Many factors affect the compressibility of geologic materials. The primary factors are: the previous loading history caused by deposition and subsequent erosion of sediments, and fluctuations in groundwater levels. Secondary factors include: desiccation due to wetting and drying cycles, freezing and thawing cycles, chemical changes caused by precipitation and/or oxidation, and cementation or interparticle bonding. Due to the geologic age of the Plio-Pleistocene Merced Formation, we assumed that the soils would be in recompression under the proposed pumping conditions. This assumption is considered valid because the proposed pumping conditions would result in a maximum increase in effective stress of no more than 30%.

Pore pressures were computed for individual layers using initial groundwater levels (either historic low or scenario 1 low) and final groundwater levels (lowest groundwater elevation for the given project scenario) for each scenario. Our analysis assumes that the lowest groundwater elevation in each scenario is maintained long enough for residual excess pore pressures to fully dissipate (i.e., steady-state conditions) resulting in the maximum consolidation of the aquitards. Effective stresses were estimated by subtracting pore pressures from total stresses. The increase in effective stress due to the proposed groundwater pumping was generally less that 30 percent of the current effective stress condition.

Subsidence estimates are summarized in Table 6. Appendix E includes spreadsheets showing the assumptions and results of the calculations performed. Overall, the estimates of subsidence range from 1.5 to 3.5 inches when comparing to historical low groundwater elevations, depending on the location and scenario. The subsidence estimates for the project scenarios compared to scenario 1 ranged from 1.0 to 3.5 inches. The settlement estimates include compression of both aquitard (clay) and aquifer (sand). Permanent (inelastic) subsidence (assumed to be equal to estimated compaction of clay layers) would likely be on the order of two-thirds the estimates presented Table 6. Thus, based on the parameters and assumptions used for this analysis, the estimated potential permanent subsidence attributable to the proposed project(s) is less than 3 inches.

In the South Westside Basin, subsidence estimates are about 3 inches compared to historical lows for the two locations evaluated (CUP-19 and CUP-41-4). In terms of potential project impacts (i.e., comparison to Scenario 1), the estimated subsidence at CUP-41-4 is about 3.5 inches compared to about 2.9 inches at CUP-19. The fact that subsidence estimated at CUP-41-4 is slightly greater compared to Scenario 1 than compared to historical lows is likely related to model predictions of rising groundwater levels in the future (scenario 1) in some model layers at this location. Also, the similar to slightly greater overall subsidence estimates at CUP-41-4 compared to CUP-19 despite a lower GSR pumping rate at CUP-41-4 (220 gpm vs. 400 gpm) are likely related to a greater total thickness of clay at the CUP-41-4 location. This slight difference in potential project impacts also occurs despite the greater concentration of GSR project wells in the Colma vicinity (around CUP-19) as compared to the South San Francisco/San Bruno area (around CUP-41-4). In general, it is expected that calculation of potential subsidence based upon groundwater levels at GSR well locations will result in equal or greater amounts of predicted subsidence as compared to locations in between GSR well locations due to cones of depressions that typically occur around pumping wells.

In the North Westside Basin, subsidence estimates for scenarios 3a, 3b, and 4 range from about 1.7 to 3.4 inches compared to historical lows (and 1.5 inches for scenario 2 at LMPS). The subsidence estimates at the Lake Merced Pump Station Well are slightly greater than for the South Sunset Well for a given scenario due to overall greater groundwater level fluctuations at the LMPS Well. The greater groundwater level fluctuations at the LMPS Well may be attributable in part to the more confined nature of the primary production zone at this location, and possibly its closer proximity to the GSR project (relative to scenario 4). In terms of potential project impacts (i.e., comparison to Scenario 1), the estimated subsidence at South Sunset Well (1.5 to 1.9 inches) is similar to but slightly less than the range estimated for LMPS Well (2.8 to 3.0 inches) for scenarios 3a, 3b, and 4. In general, it is expected that calculation of potential subsidence based upon groundwater levels at SFGW project well locations will result in equal or greater amounts of predicted subsidence as compared to locations in between SFGW project well locations due to cones of depressions that typically occur around pumping wells.

DISCUSSION OF RESULTS

It is important to recognize that there can be a substantial time lag between the drop in head (effective stress) created by pumping and the slow drainage and compaction of the aquitard deposits. The proposed (and modeled) scenario for the SFPUC GSR project assumes that GSR pumping during the major (design) drought period extends for a relatively long duration (7.5 years of continuous pumping). The subsidence estimates are based on the lowest model-estimated future groundwater elevations at any time during this drought period (or at any other time during the model simulation), and from that perspective, represent conservative estimates in that lag times are not considered. The calculations described above assume steady-state conditions (i.e., their ultimate compaction if excess pore pressures fully dissipate). Because of the transient nature of the proposed groundwater conditions (especially for the GSR project), the calculations of potential subsidence that have been presented are likely overestimated with respect to (lack of) time lag considerations.

The greatest uncertainty in the subsidence analysis is likely the clay properties with respect to compression ratios. As noted above, the subsidence estimates are based on assumed compression ratios from review of geologic/geophysical logs, literature review, and engineering judgment. From the standpoint of the sensitivity of this assumption, it is worth noting that even if clay compression ratios were assumed to fall on the virgin compression curve as opposed to the recompression curve (resulting in an approximately 6 times greater compression ratio for clay layers), estimated total subsidence would not exceed 16 inches compared to the estimated range of 1.0 to 3.5 inches given above. The subsidence estimates described in this study of less than 4 inches are consistent with the lack of historic subsidence despite past groundwater pumping and dewatering of sediments.

Several other factors that may make the subsidence calculations conservative include:

1. Use of groundwater levels from proposed project production wells,
2. Selection of representative well locations intended to emphasize areas of greater presence of clay and/or greater drawdowns, and

3. Not factoring in probable lower historical groundwater levels in the North Westside Basin related to operation of the Sunset well field in the 1930s and extensive historic pumping for Golden Gate Park irrigation, due to lack of available historic groundwater level data for these areas and time periods.

In terms of use of production well water levels, the typical pattern of cones of depression around pumping wells would be expected to result in greater drawdowns at these locations compared to locations in between production wells. Thus, estimated subsidence would be expected to be somewhat less than presented in this TM at locations in between proposed production wells. As described in this TM, hydrogeologic cross-sections, boring logs, and geophysical logs were reviewed in conjunction with overall distribution of proposed project wells to select four representative well locations for subsidence calculations. It is anticipated that this methodology for well selection would tend to emphasize locations with equal or greater potential for subsidence compared to other proposed well locations. Historical documents and data indicate that substantial groundwater pumping (on the order of 5 MGD) occurred at a well field in the Sunset District from 1930 to 1935; thus, it is likely that historic low groundwater levels in this area were lower than those used in the current study. If historic groundwater elevations were lower in the 1930s the amount of potential subsidence calculated in this study would be lower. Similarly, historic groundwater pumping in Golden Gate Park likely generated lower historic lows than were captured in the available historic groundwater level data records used in the current study.

With respect to Item 1 above regarding the use of groundwater levels at proposed production wells, these estimated subsidence results are still expected to be generally representative (while being somewhat greater as described above) of areas in between the selected wells in both the North and South Westside Basins. The reason for this is that these in-between areas will experience overlapping drawdowns (similar to mutual interference) from multiple wells such that there will be some amount of regional groundwater level decline related to the proposed project(s).

SUMMARY AND CONCLUSIONS

The proposed GSR and SFGW projects have a potential to cause subsidence if a sufficient thickness of compressible clay layers is present and pore pressures of those clay layers are decreased below historic low groundwater elevations. Given data and/or assumptions about soil properties and changes in groundwater levels caused by the proposed project(s), the estimated amount of subsidence due to the proposed project(s) can be calculated. This study included:

1. Review of available data on the geologic setting with regard to subsidence potential, and selection of four representative well locations;
2. Evaluation and assignment of soil compressibility properties for Merced Formation clay and sand layers;
3. Review of historic measured groundwater level data to obtain historic low groundwater elevations;

4. Review of Westside Basin Groundwater-Flow Model historic and future model scenario results to obtain estimates of historic low and anticipated future groundwater elevations both with and without the proposed SFPUC projects; and
5. Application of an analytical equation to calculate the amount of subsidence that is estimated to occur under various scenarios related to the proposed SFPUC projects.

Based upon review of the South Westside Basin geologic setting and locations of proposed pumping wells for the GSR project, the two locations selected for subsidence calculations were CUP-19 (to be representative of the Colma area) and CUP-41-4 (to be representative of the South San Francisco area). Based upon review of the North Westside Basin geologic setting and locations of proposed pumping wells for the SFGW project, the two locations selected for subsidence calculations were the South Sunset Well (to be representative of the Sunset District) and LMPS Well (to be representative of the Lake Merced area). These two well locations were selected over a Golden Gate Park location due largely to the presence of more clay layers at the South Sunset and LMPS well locations. Permanent (inelastic) subsidence (assumed to be equal to estimated compaction of clay layers) would likely be on the order of two-thirds the estimates presented Table 6. Thus, based on the parameters and assumptions used for this analysis, the estimated potential permanent subsidence attributable to the proposed project(s) is less than 3 inches.The total subsidence (compaction of clay and sand layers) estimate for the proposed project(s) is less than 4 inches.

Site-specific soil compressibility data were not available for this study. Based upon review of literature for the Santa Clara Valley and Central Valley, soil compressibility data from Santa Clara Valley were used to estimate clay compressibility values for the Merced Formation. Other literature sources were used to estimate sand layer compressibility values. Due to the fact that the Merced Formation is older than Santa Clara Valley sediments responsible for subsidence in that area and due to the more semi-consolidated nature of Merced Formation sediments (compared to the younger more unconsolidated Santa Clara Valley sediments), assignment of clay compressibility values from Santa Clara Valley soil data should be more conservative (i.e., tend to result in higher estimates of subsidence). The clay layer compressibility ratios were 0.18 for virgin compression and 0.03 for recompression, whereas sand layer compressibility ratios were 0.01 for virgin compression and 0.005 for recompression. Given the geologic age of the Merced Formation (Plio-Pleistocene) and the potential magnitude of increase in effective stress, it was assumed that clay layers would be in recompression.

The number of wells with a good record of historic groundwater levels is very limited. Essentially no wells in the North Westside Basin have groundwater level records extending back prior to the late 1980s. In the South Westside Basin, a few wells in Daly City and South San Francisco had historic groundwater levels extending back to the 1950s or earlier. In general, groundwater levels in the South Westside Basin declined over time from the 1940s/1950s through the 1970s due to increased groundwater pumping for municipal and irrigation purposes. Beginning in the 1970s the Partner Agencies (Daly City, Cal Water, San Bruno) were able to obtain increased amounts of surface water from the SFPUC so that their groundwater pumping could be somewhat reduced and stabilized. The increased use of surface water slowed the rate of groundwater level decline and generally helped stabilize groundwater levels from the 1970s through about 2002. Implementation of the In-Lieu Recharge Demonstration Study beginning in 2002 has led to general increases in groundwater levels in the South Westside Basin.

Due to the sparse measured historic groundwater level data, the groundwater model results were used to help estimate both historic low groundwater elevations and anticipated future low groundwater elevations related to several potential scenarios for implementation of the GSR and SFGW projects. Comparisons (and subsidence calculations) were made between future model-predicted lows with the proposed project(s) and historic lows, and between future model-predicted lows with the proposed project(s) compared to future model-predicted lows without the proposed projects. The calculations performed for this study provided estimates of subsidence that are less than 4 inches for the various scenarios at the four well locations.

Finally, several factors should be noted that likely make the subsidence calculations presented in this TM conservative including: using the lowest predicted groundwater levels without regard to lag time to reach equilibrium in aquitards, use of a conservative consolidation factor, the use of groundwater levels from proposed project production wells, selection of representative well locations intended to emphasize areas of greater presence of clay and/or greater drawdowns, and not factoring in probable lower historical groundwater levels in the North Westside Basin related to operation of the Sunset well field in the 1930s and extensive historic pumping for Golden Gate Park irrigation, due to lack of available historic groundwater level data for these areas and time periods. Consideration of these factors would likely result in lower estimates of potential subsidence.

Attachments: Tables 1 through 6
Figures 1 and 2
Appendices A through E

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Table 1. Summary of Historical Groundwater Level Data

Well I.D.	Screen Interval (feet, bgs) [1]	Period of Record	Measured Historic Low Date	Measured Historic Low GW Elevation (feet, NAVD88) [2]
N.Windmill (Windmill NE)		1987-1992	May 1988	7.6 NGVD [3]
Windmill NW		1987-1992; 2001-	May 1990	11.5 NGVD
S.Windmill (SWM-GS-S) (also known as S. Windmill MW-57)	30-50	1989-1993; 2001-2002; 2006-	July 2009	-3
S. Windmill (SWM-GS-M) (also known as S. Windmill MW-140)	118-138	1989-1993; 2001-2002; 2006-	June 2008	-19
S. Windmill (SWM-GS-D)	372-387	1989-1990; 2001-2002	Oct. 1989	-26 NGVD
W. Sunset Playground	150-330	1995-1996;2000-2009	1995	14 NGVD
LMPS-440	410-430	2005-2009	Sept. 2008	-6
LMPS-575	555-565	2004-2009	Sept. 2008	-96
LMMW-3D	180-200	2002-2009	June 2002	-33
Olympic MW	36-46	1990-1993	Sept. 1992	-2
Olympic Club 1		1959, 1971, 1988-1993	Jan. 1988	-53
San Francisco Golf Club No. 1		1951; 1990-1992	Sept. 1991	-36 NGVD
San Francisco Golf Club No. 2		1985; 1989-1990, 1993	May 1990	-74 NGVD
DC-1	190-370	1954-2009	August 1988	-151
DC-8	N/A; TD=479	1958-2009	April 1996	-139
DC-9	N/A, TD=476	1958-2003	July 1996	-150
Holy Cross - 1	368-458; 478-668	1986; 1989-1991; 1998-2001; 2010	June 2000	-162 NGVD
SS1-02	N/A; TD=249	1950-2009	September 1982	-131
SS1-14	69-560	1952-1997	July 1985	-147

Well I.D.	Screen Interval (feet, bgs) [1]	Period of Record	Measured Historic Low Date	Measured Historic Low GW Elevation (feet, NAVD88) [2]
SS1-15	128-535	1965-1997	October 1975	-166
SS1-17	150-460	1939-2003	October 1982 October 1987	-158
SS1-18	160-557	1942-2003	August 1980	-147
SS1-19	216-528	1954-2003	January 1963	-143
SS1-20	220-580	1973-2008	August 1977	-209
SS1-21	370-580	1977-1997	August 1990	-226
Linear Park MW-440	360-370; 420-430	2007-2009	July 2009	-175
Linear Park MW-520	500-510	2007-2009	July 2009	-180
SB-12	146-482	1971; 1996-2009	April 2001	-210
SB-13	185-500	1998-2005	November 2000	-210
SB-14	TD=434	1998-2005	December 2001	279 (DTW)
SB-15	300-500	1998-2005	December 1999	-141

NOTES:

1 – bgs below ground surface

2 – Groundwater elevations are referenced to North American Vertical Datum 1988 (NAVD88) unless otherwise indicated

3 – NGVD29 National Geodetic Vertical Datum 1929

4 – TD total depth

Table 2. CUP-19 Groundwater Level Data Analysis

Table 2a. Lowest Model-Predicted Groundwater Elevations (Feet, NGVD 29)

	Model Historic Lows			Scenario 1		Scenario 2		Scenario 4	
Model Layer	Cypress 2	Holy Cross 2	Historic Low Average	CUP-19	CUP-23	CUP-19	CUP-23	CUP-19	CUP-23
1	-61	-53	-57	-79	-51	-110	-63	-107	-62
2	-73	-63	-68	-87	-60	-122	-75	-118	-74
3	-112	-111	-112	-115	-113	-207	-190	-200	-189
4	-143	-156	-150	-136	-159	-261	-289	-255	-289
5	-170	-179	-175	-194	-190	-343	-317	-338	-318

Table 2b. Difference Between Model Scenario Lows and Model Historic Lows (Feet)

	Model Historic Lows			Scenario 1		Scenario 2		Scenario 4	
Model Layer	Cypress 2	Holy Cross 2	Average	CUP-19	CUP-23	CUP-19	CUP-23	CUP-19	CUP-23
1				-18	2	-49	-10	-46	-9
2				-14	3	-49	-12	-45	-11
3				-3	-2	-95	-79	-88	-78
4				7	-3	-118	-133	-112	-133
5				-24	-11	-173	-138	-168	-139

Table 2c. Difference Between Project Model Scenario Lows and Existing Conditions Model Scenario 1 Lows (Feet)

	Model Historic Lows			Scenario 1		Scenario 2		Scenario 4	
Model Layer	Cypress 2	Holy Cross 2	Average	CUP-19	CUP-23	CUP-19	CUP-23	CUP-19	CUP-23
1						-31	-12	-28	-11
2						-35	-15	-31	-14
3						-92	-77	-85	-76
4						-125	-130	-119	-130
5						-149	-127	-144	-128

Table 2d. Top and Bottom Elevations of Model Layers and Clay Layers and Thickness of Clay Layers in each Model Layer at CUP-19

	CUP-19			Clay Layers		Clay Thickness		
Model Layer	Top Elev	Bot Elev	Model Layer Thickness (Feet)	Top Elev	Bot Elev	Interval (Feet)	Layer Total (Feet)	Scenario 2 compared to historic lows
1	114	-162	276	-156		6	6	6 feet has pore pressure drop of 49 feet
2	-162	-231	69		-181	19	19	19 feet has pore pressure head drop of 49 feet
3	-231	-300	69			0	0	
4	-300	-474	174	-366	-396	30		
				-411	-421	10		
				-471		3	43	43 feet has pore pressure head drop of 116 feet
5	-474	-700	226		-481	7	7	7 feet has pore pressure head drop of 173 feet

Note: Top Elev and Bot Elev are Top Elevation and Bottom Elevation in Feet, NGVD.

Table 3. CUP-41-4 Groundwater Level Data Analysis

Table 3a. Lowest Model-Predicted Groundwater Elevations (Feet, NGVD 29)

	Model Historic Lows				Scenario 1		Scenario 2		Scenario 4	
Model Layer	CGC-6	SSF-02	SB-12	Historic Low Average	CUP 41-4	SB-12	CUP 41-4	SB-12	CUP 41-4	SB-12
1	-71	-84	-84	-80	-26	-9	-26	-9	-26	-9
2	-82	-110	-108	-100	-47	-27	-58	-27	-58	-27
3	-115	-127	-140	-127	-121	-118	-177	-157	-177	-157
4	-171	-185	-226	-194	-204	-260	-357	-350	-358	-350
5	-176	-189	NA	-183	-205	NA	-356	NA	-358	NA

Table 3b Difference Between Model Scenario Lows and Model Historic Lows (Feet)

	Model Historic Lows				Scenario 1		Scenario 2		Scenario 4	
Model Layer	CGC-6	SSF-02	SB-12	Average	CUP 41-4	SB-12	CUP 41-4	SB-12	CUP 41-4	SB-12
1					54	75	54	75	54	75
2					53	81	42	81	42	81
3					6	22	-50	-17	-50	-17
4					-10	-34	-163	-124	-164	-124
5					-23	NA	-174	NA	-176	NA

Table 3c. Difference Between Project Model Scenario Lows and Existing Conditions Model Scenario 1 Lows (Feet)

	Model Historic Lows				Scenario 1		Scenario 2		Scenario 4	
Model Layer	CGC-6	SSF-02	SB-12	Average	CUP 41-4	SB-12	CUP 41-4	SB-12	CUP 41-4	SB-12
1							0	0	0	0
2							-11	0	-11	0
3							-56	-39	-56	-39
4							-153	-90	-154	-90
5							-151	NA	-153	NA

Table 3d. Top and Bottom Elevations of Model Layers and Clay Layers and Thickness of Clay Layers in each Model Layer at CUP-41-4

	CUP 41-4			Clay Layers		Clay Thickness		
Model Layer	Top Elev	Bot Elev	Model Layer Thickness (Feet)	Top Elev	Bot Elev	Interval (Feet)	Layer Total (Feet)	Scenario 2 compared to Scenario 1
1	24	-164	188	24	7	17		
				-67	-73	6		
				-130	-134	4	27	27 feet has no change in pore pressure
2	-164	-232	68	-174	-176	2		
				-220		12	14	14 feet has pore pressure head decrease of 11 feet
3	-232	-300	68		-284	52		
				-295		5	57	57 feet has pore pressure head drop of 56 feet
4	-300	-460	160		-316	16		
				-364	-376	12		
				-446	-460	14	42	42 feet has pore pressure head drop of 153 feet
5	-460	-556	96			0	0	

Note: Top Elev and Bot Elev are Top Elevation and Bottom Elevation in Feet, NGVD.

Table 4. Lake Merced Pump Station Well Groundwater Level Data Analysis

Table 4a. Lowest Model-Predicted Groundwater Elevations (Feet, NGVD 29)

	Model Historic Lows				1	2	3a	3b	4
Model Layer	Olympic	Harding Park	Higuera	Historic Low Average	LMPS	LMPS	LMPS	LMPS	LMPS
1	-8	11	13	5	9	9	-5	-5	7
2	-17	10	10	1	7	6	-8	-8	4
3	-40	-7	-16	-21	-15	-25	-36	-35	-31
4	-68	-22	-35	-42	-30	-45	-92	-92	-91
5	-146	-70	-97	-104	-92	-155	-102	-102	-151

Table 4b. Difference Between Model Scenario Lows and Model Historic Lows (Feet)

	Model Historic Lows				1	2	3a	3b	4
Model Layer	Olympic	Harding Park	Higuera	Average	LMPS	LMPS	LMPS	LMPS	LMPS
1					-4	-4	-18	-18	-6
2					-3	-4	-18	-18	-6
3					1	-9	-20	-19	-15
4					5	-10	-57	-57	-56
5					5	-58	-5	-5	-54

Table 4c. Difference Between Project Model Scenario Lows and Existing Conditions Model Scenario 1 Lows (Feet)

	Model Historic Lows				1	2	3a	3b	4
Model Layer	Olympic	Harding Park	Higuera	Average	LMPS	LMPS	LMPS	LMPS	LMPS
1						0	-14	-14	-2
2						-1	-15	-15	-3
3						-10	-21	-20	-16
4						-15	-62	-62	-61
5						-63	-10	-10	-59

Table 4d. Top and Bottom Elevations of Model Layers and Clay Layers and Thickness of Clay Layers in each Model Layer at LMPS Well

	LMPS			Clay Layers		Clay Thickness		
Model Layer	Top Elev	Bot Elev	Model Layer Thickness (Feet)	Top Elev	Bot Elev	Interval (Feet)	Layer Total (Feet)	Scenario 4 compared to Scenario 1
1	43	-28	71			0	0	
2	-28	-150	122			0	0	
3	-150	-300	150	-290	-300	10	10	10 feet has pore pressure head drop of 10 feet
4	-300	-496	196	-300	-347	47		
				-411	-496	85	132	132 feet has pore pressure head drop of 49 feet
5	-496	-572	76	-496	-499	3	3	3 feet has pore pressure had drop of 47 feet

Note: Top Elev and Bot Elev are Topo Elevation and Bottom Elevation in Feet, NGVD.

Table 5. South Sunset Well Groundwater Level Data Analysis

Table 5a. Lowest Model-Predicted Groundwater Elevations (Feet, NGVD 29)

	Model Historic Lows				Scenario 1		Scenario 3a		Scenario 3b		Scenario 4	
Model Layer	LMMW-4S	LMMW-5S	Santiago-S	Historic Low Average	South Sunset	West Sunset	South Sunset	West Sunset	South Sunset	West Sunset	South Sunset	West Sunset
1	9	26	11	15	14	14	-7	-24	-6	-21	-1	-19
2	8	23	10	14	13	13	-19	-23	-17	-21	-12	-19
3	-1	6	2	2	0	4	-28	-16	-27	-15	-23	-12
4	-11	NA	-5	-8	-10	-2	-37	-14	-36	-14	-34	-12
5	-31	NA	-8	-20	-20	-5	-26	-12	-26	-12	-33	-13

Table 5b. Difference Between Model Scenario Lows and Model Historic Lows (Feet)

	Model Historic Lows				Scenario 1		Scenario 3a		Scenario 3b		Scenario 4	
Model Layer	LMMW-4S	LMMW-5S	Santiago-S	Average	South Sunset	West Sunset	South Sunset	West Sunset	South Sunset	West Sunset	South Sunset	West Sunset
1					-1	3	-22	-35	-21	-32	-16	-30
2					-1	3	-33	-33	-31	-31	-26	-29
3					-2	2	-30	-18	-29	-17	-25	-14
4					-2	3	-29	-9	-28	-9	-26	-7
5					-1	3	-7	-4	-7	-4	-14	-5

Table 5c. Difference Between Project Model Scenario Lows and Existing Conditions Model Scenario 1 Lows (Feet)

	Model Historic Lows				Scenario 1		Scenario 3a		Scenario 3b		Scenario 4	
Model Layer	LMMW-4S	LMMW-5S	Santiago-S	Average	South Sunset	West Sunset	South Sunset	West Sunset	South Sunset	West Sunset	South Sunset	West Sunset
1							-21	-38	-20	-35	-15	-33
2							-32	-36	-30	-34	-25	-32
3							-28	-20	-27	-19	-23	-16
4							-27	-12	-26	-12	-24	-10
5							-6	-7	-6	-7	-13	-8

Table 5d. Top and Bottom Elevations of Model Layers and Clay Layers and Thickness of Clay Layers in each Model Layer at South Sunset Well

	South Sunset			Clay Layers		Clay Thickness		
Model Layer	Top Elev	Bot Elev	Model Layer Thickness (Feet)	Top Elev	Bot Elev	Interval (Feet)	Layer Total (Feet)	Scenario 3a compared to historic lows
1	83	-152	235	41	9	32		6 feet dewatered
				-127	-129	2	34	2 feet has pore pressure head drop of 22 feet
2	-152	-226	74	-207	-217	10	10	10 feet has pore pressure head drop of 33 feet
3	-226	-300	74	-237	-252	15		
				-257	-265	8		
				-279	-287	8	31	31 feet has pore pressure head drop of 30 feet
4	-300	-454	154	-300	-304	4		
				-347	-393	46		
				-417	-454	37	87	87 feet has pore pressure head drop of 29 feet
5	-454	-463	9	-454	-487	33	33	33 feet has pore pressure head drop of 7 feet

Note: Top Elev and Bot Elev are Top Elevation and Bottom Elevation in Feet, NGVD.

Table 6. Summary of Subsidence Estimates

Well CUP-19	Subsidence (inches)		
Scenario	Sand Layers	Clay Layers	Total
2 to HL	1.54	1.55	3.09
4 to HL	1.48	1.47	2.95
2 to 1	1.43	1.46	2.89
4 to 1	1.36	1.38	2.74

Well CUP-41-4	Subsidence (inches)		
Scenario	Sand Layers	Clay Layers	Total
2 to HL	0.87	1.90	2.77
4 to HL	0.88	1.90	2.78
2 to 1	1.17	2.27	3.44
4 to 1	1.17	2.28	3.45

LMPS Well	Subsidence (inches)		
Scenario	Sand Layers	Clay Layers	Total
2 to HL	0.59	0.95	1.54
3a to HL	0.99	2.54	3.53
3b to HL	0.98	2.54	3.52
4 to HL	0.83	2.52	3.35
2 to 1	0.34	0.61	0.95
3a to 1	0.75	2.21	2.96
3b to 1	0.74	2.20	2.94
4 to 1	0.59	2.18	2.77

South Sunset Well	Subsidence (inches)		
Scenario	Sand Layers	Clay Layers	Total
3a to HL	0.76	1.23	1.99
3b to HL	0.73	1.19	1.92
4 to HL	0.60	1.07	1.67
3a to 1	0.72	1.15	1.87
3b to 1	0.69	1.10	1.79
4 to 1	0.56	0.99	1.55

Note: HL is Historical Low Groundwater Elevation

FIGURES

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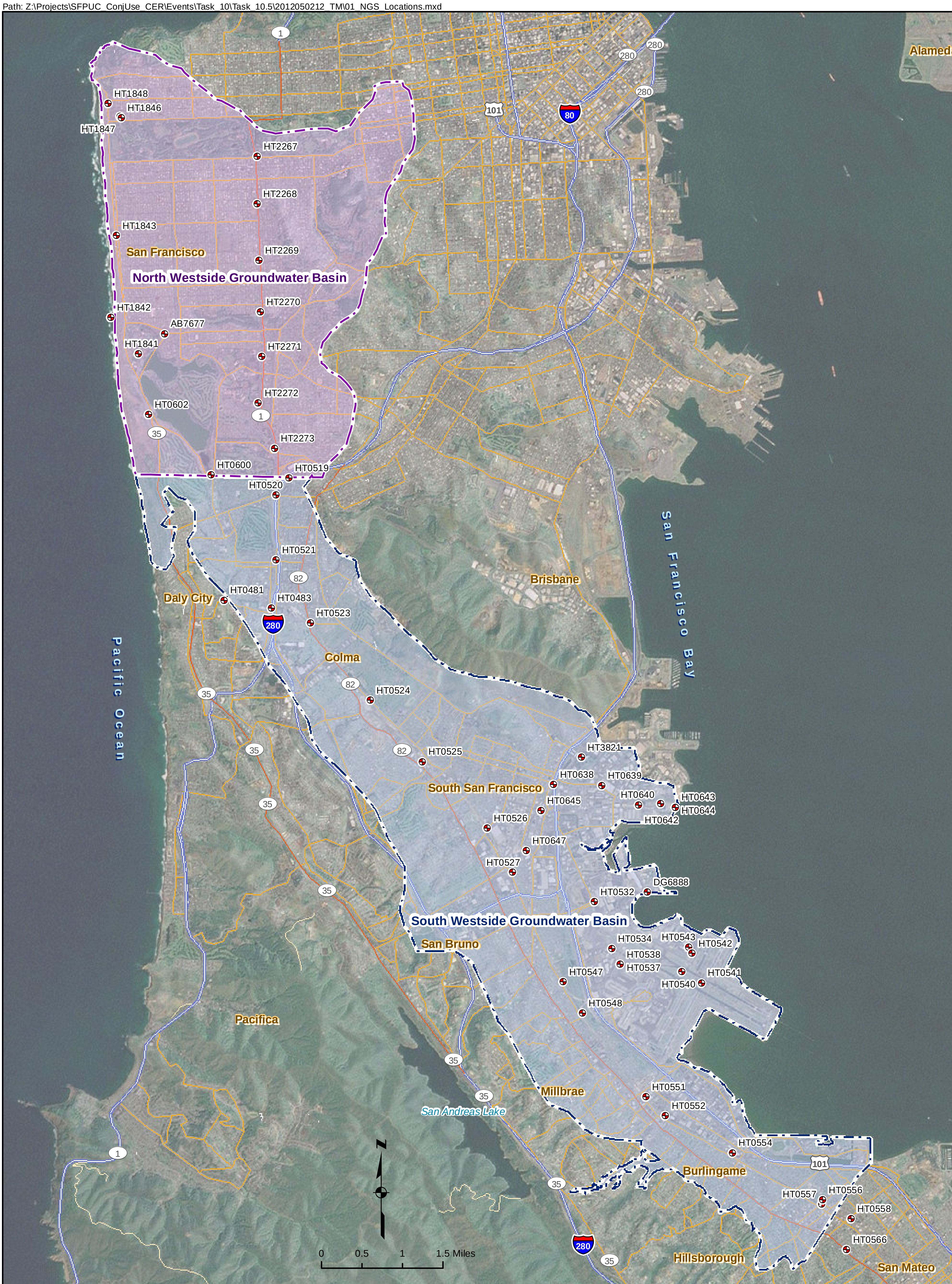

Aerial Photo Source: World Imagery from ESRI. Copyright:© 2009 ESRI, AND, TANA, UNEP-WCMC

Note:
See Appendix B for more information on the NGS monuments,

Legend

National Geodetic Survey Monument Locations (NAD83)

North Westside Groundwater Basin

South Westside Groundwater Basin

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
ENGINEERING MANAGEMENT BUREAU

STUDY AREA MAP AND NATIONAL GEODETIC SURVEY MONUMENT LOCATIONS

Kennedy/Jenks Consultants
303 Second Street, Suite 300 South
San Francisco, CA 94107

Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project

Figure
1

Date
May 2012

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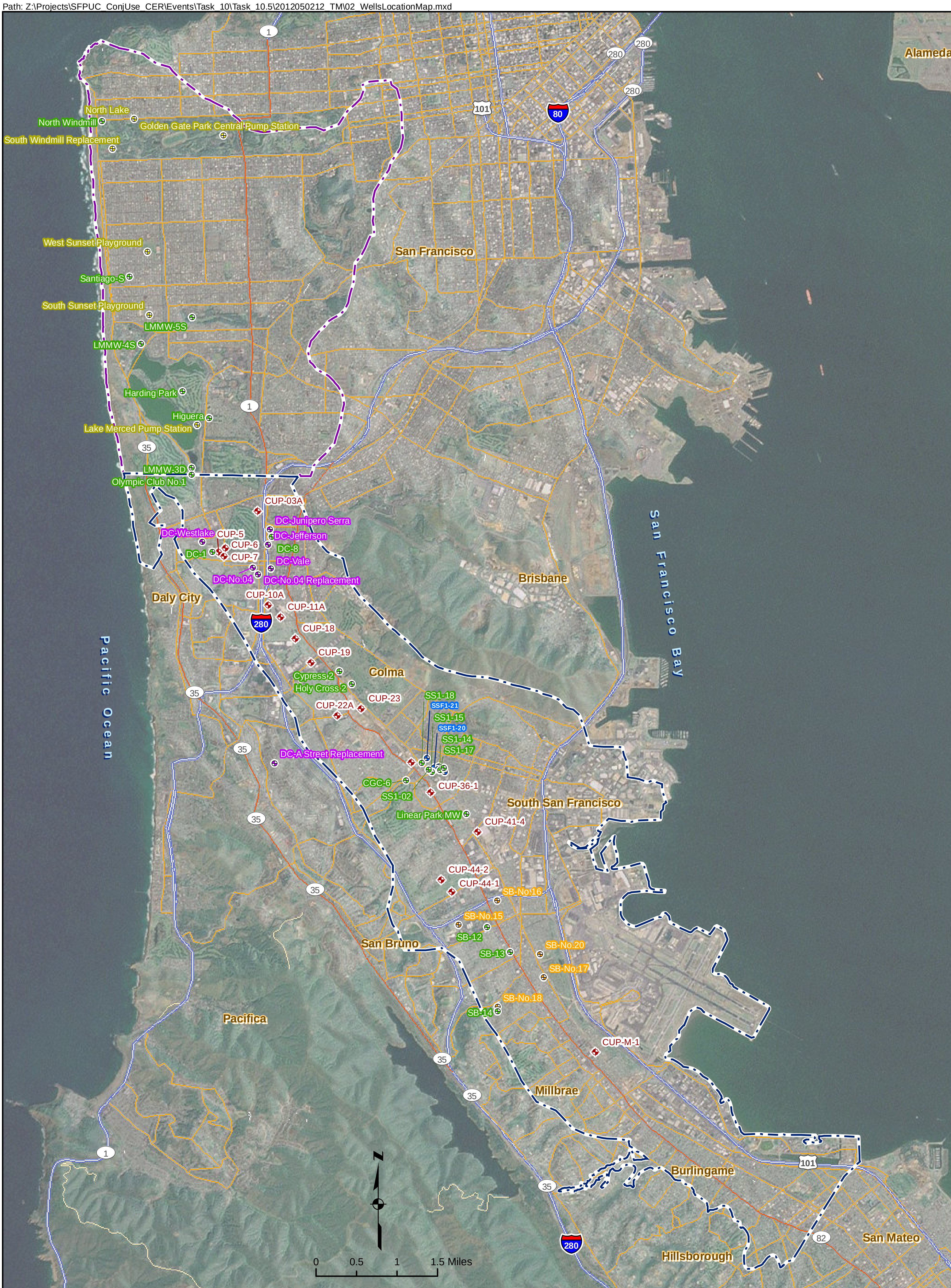


Aerial Photo Source: World Imagery from ESRI. Copyright:© 2009 ESRI, AND, TANA, UNEP-WCMC

Legend

- Selected Groundwater Model Wells
- GSR Project Proposed Municipal Wells
- SFGW Project Proposed Municipal Wells
- Cal Water Municipal Wells
- Daly City Municipal Wells
- San Bruno Municipal Wells
- North Westside Groundwater Basin
- South Westside Groundwater Basin

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION
ENGINEERING MANAGEMENT BUREAU

WELL LOCATION MAP

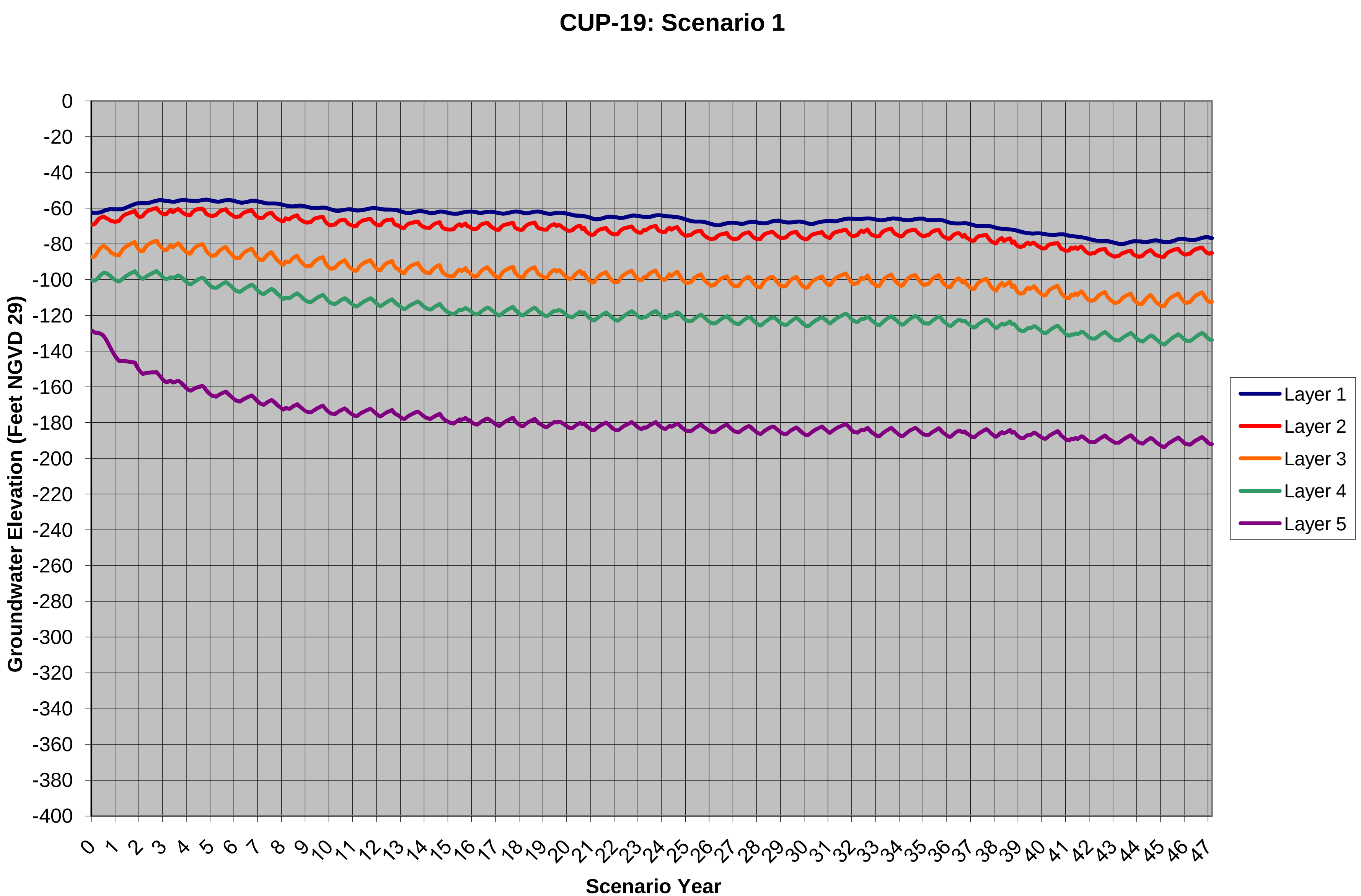
Kennedy/Jenks Consultants
303 Second Street, Suite 300 South
San Francisco, CA 94107

Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project

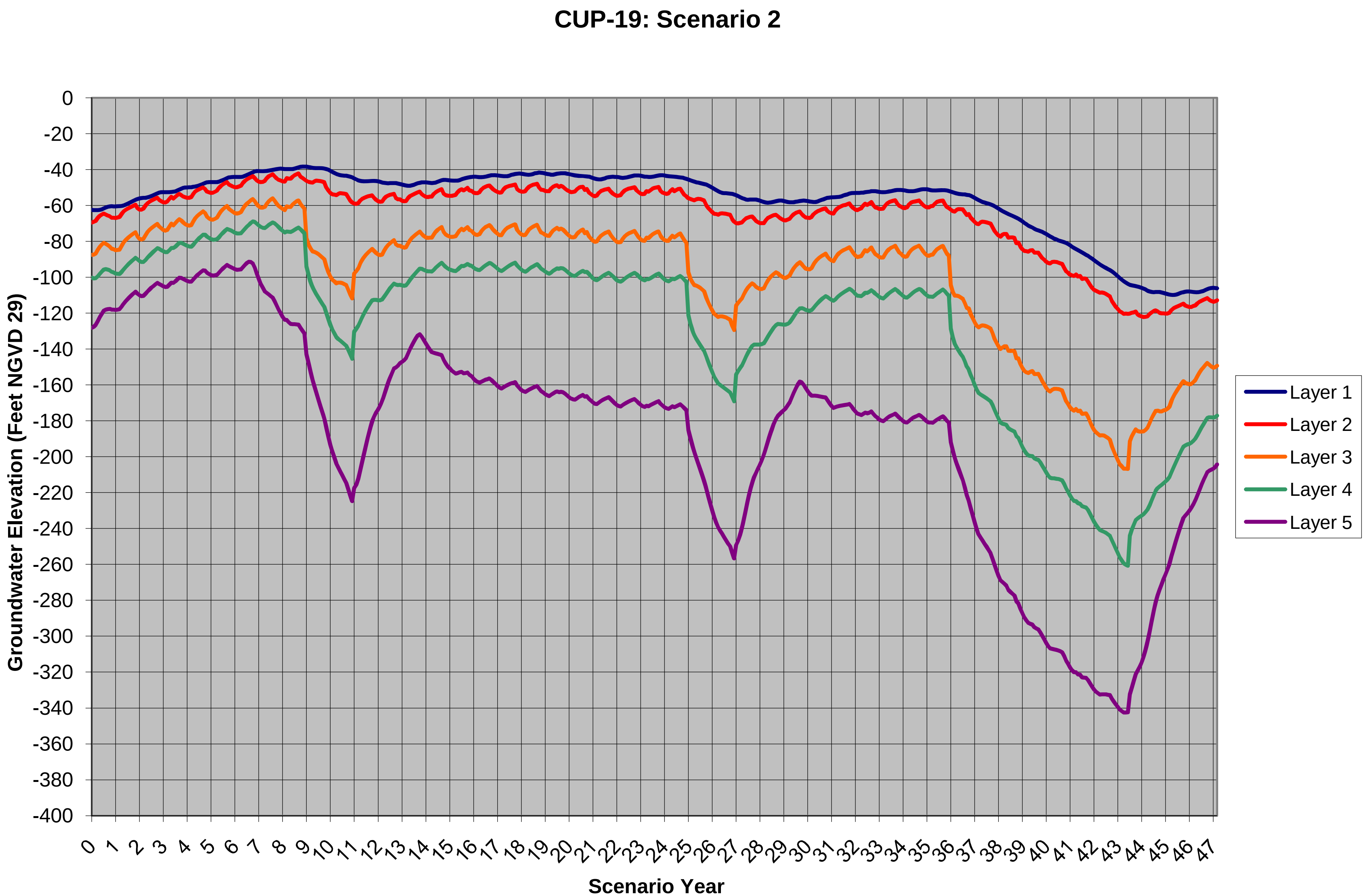
Figure
2

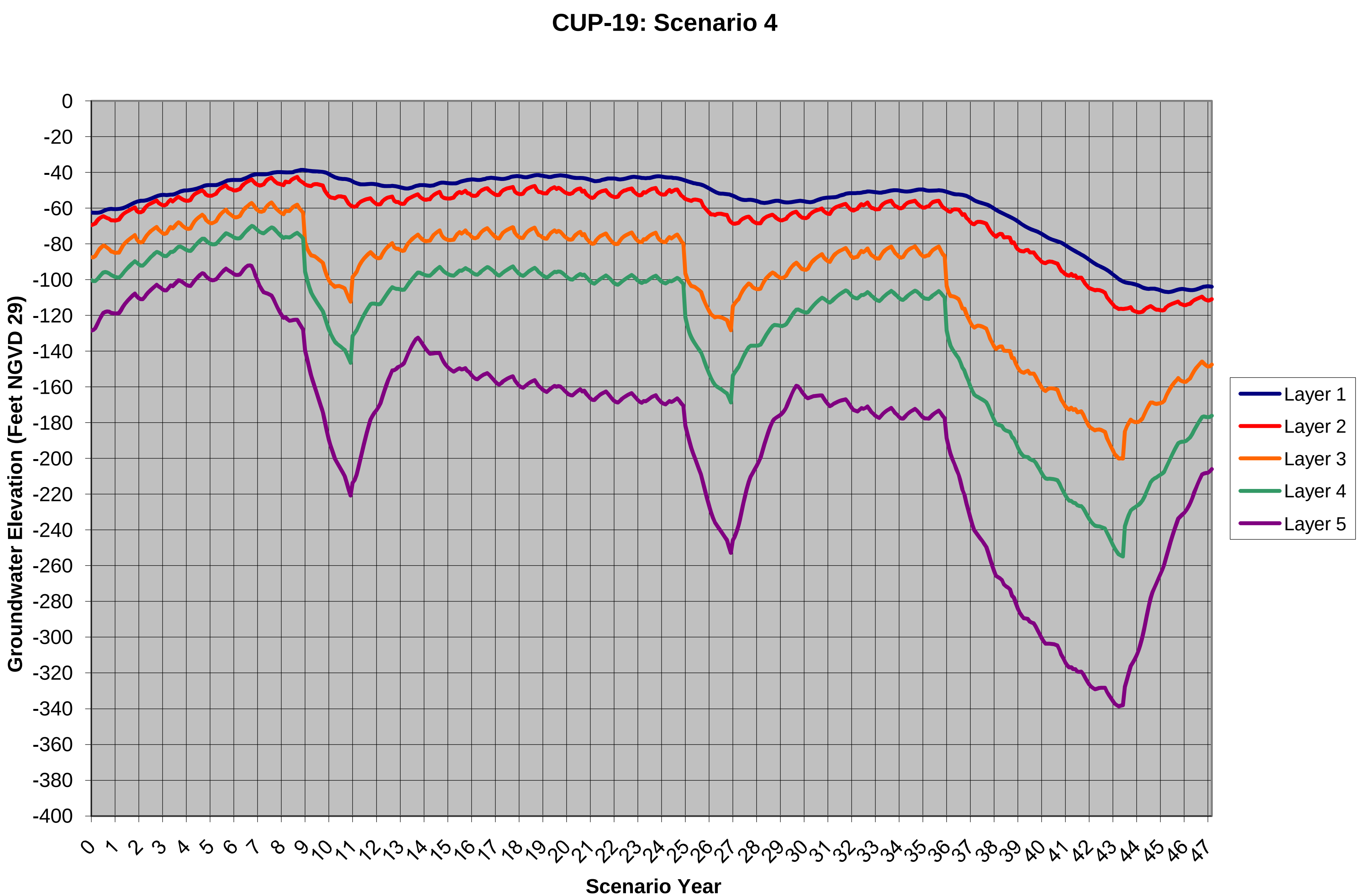
Date
May 2012

APPENDIX A



CUP-19: Scenario 1
Groundwater Elevation (Feet NGVD 29)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-280
-300
-320
-340
-360
-380
-400
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5


CUP-19: Scenario 2
Groundwater Elevation (Feet NGVD 29)
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5



CUP-19: Scenario 4
Groundwater Elevation (Feet NGVD 29)
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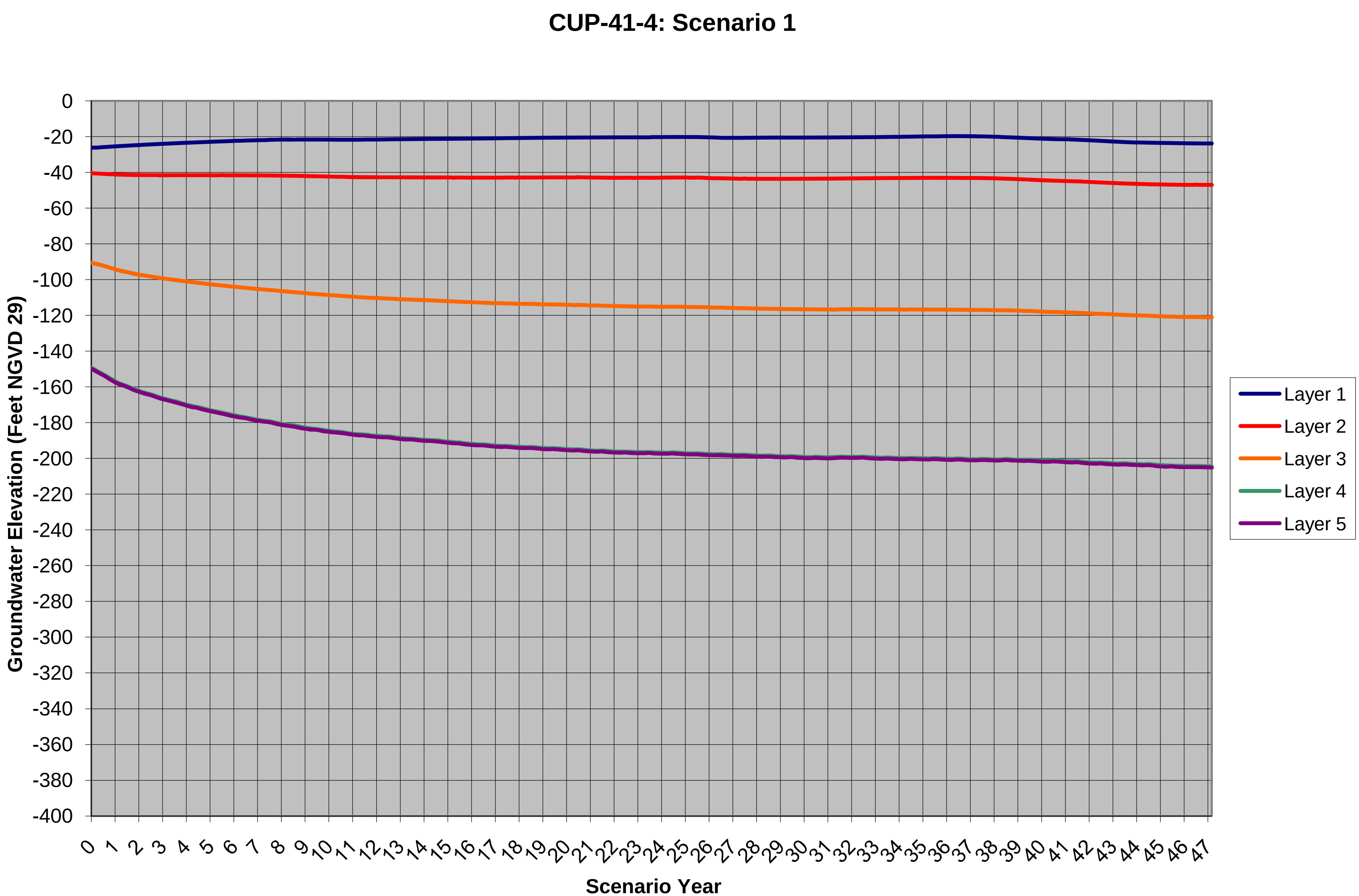
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-280
-300
-320
-340
-360
-380
-400
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5



CUP-41-4: Scenario 1
Groundwater Elevation (Feet NGVD 29)
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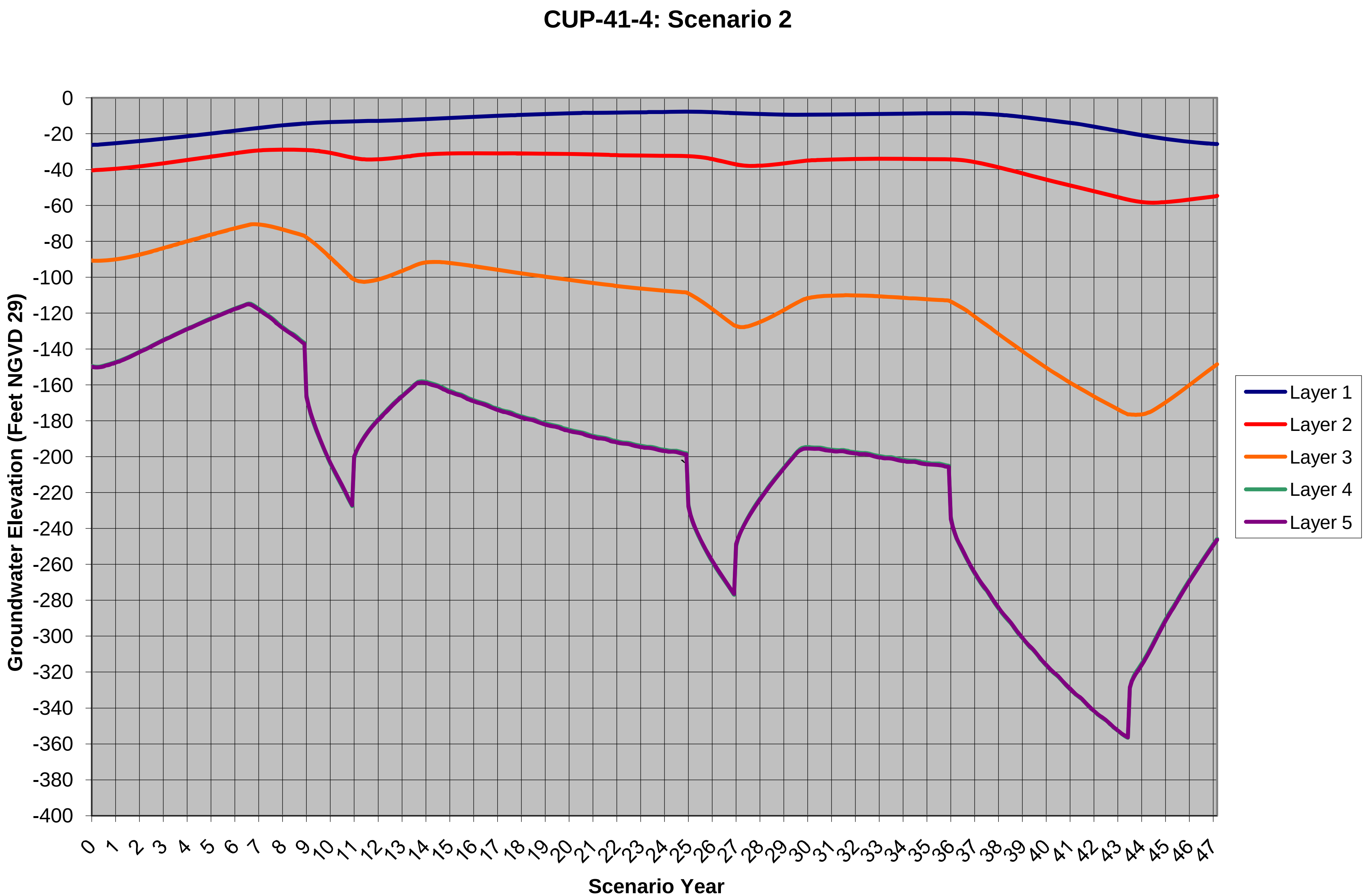
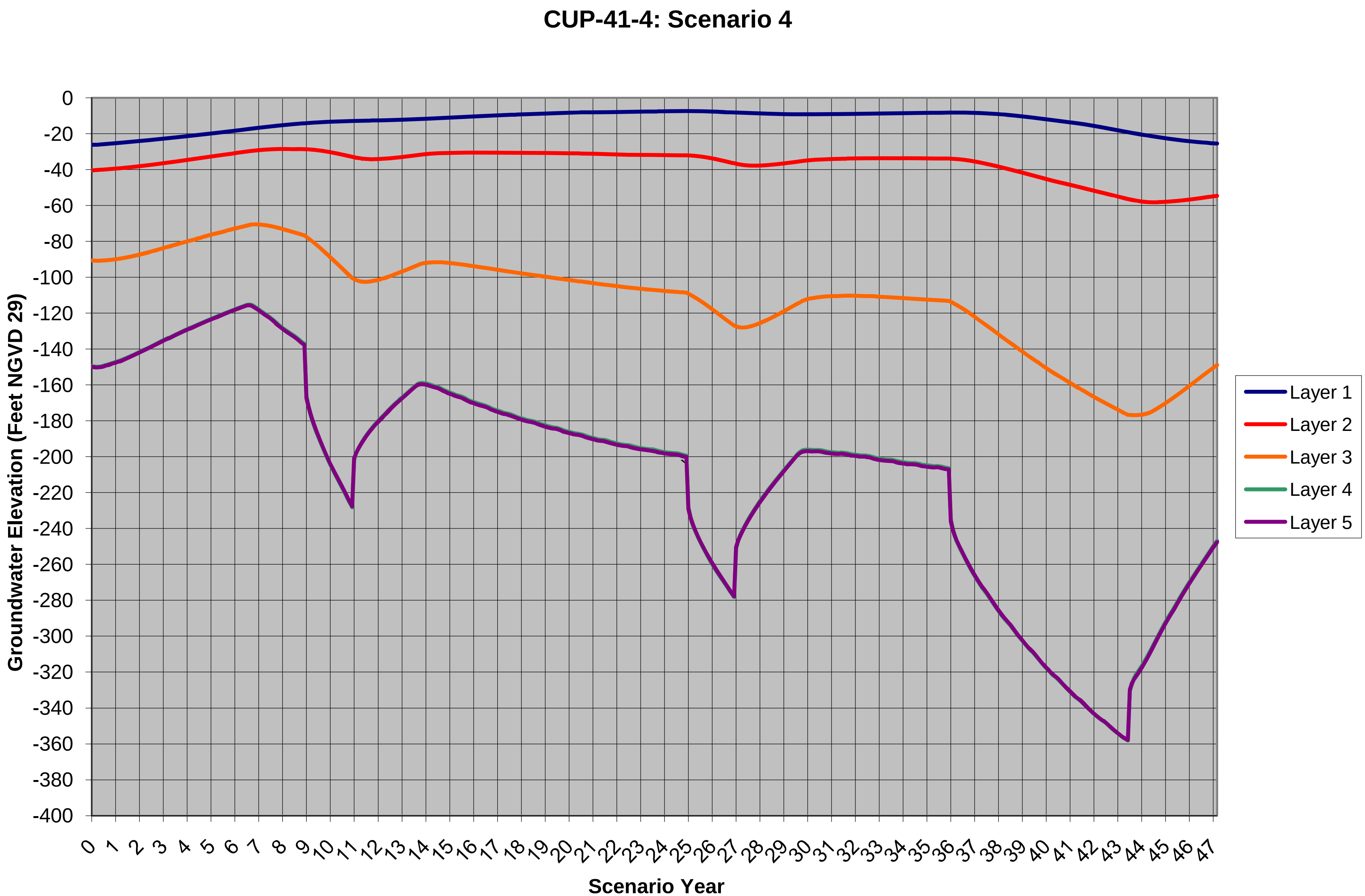
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-280
-300
-320
-340
-360
-380
-400
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5



CUP-41-4: Scenario 2
Groundwater Elevation (Feet NGVD 29)
Scenario Year
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-280
-300
-320
-340
-360
-380
-400
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5



CUP-41-4: Scenario 4
Groundwater Elevation (Feet NGVD 29)
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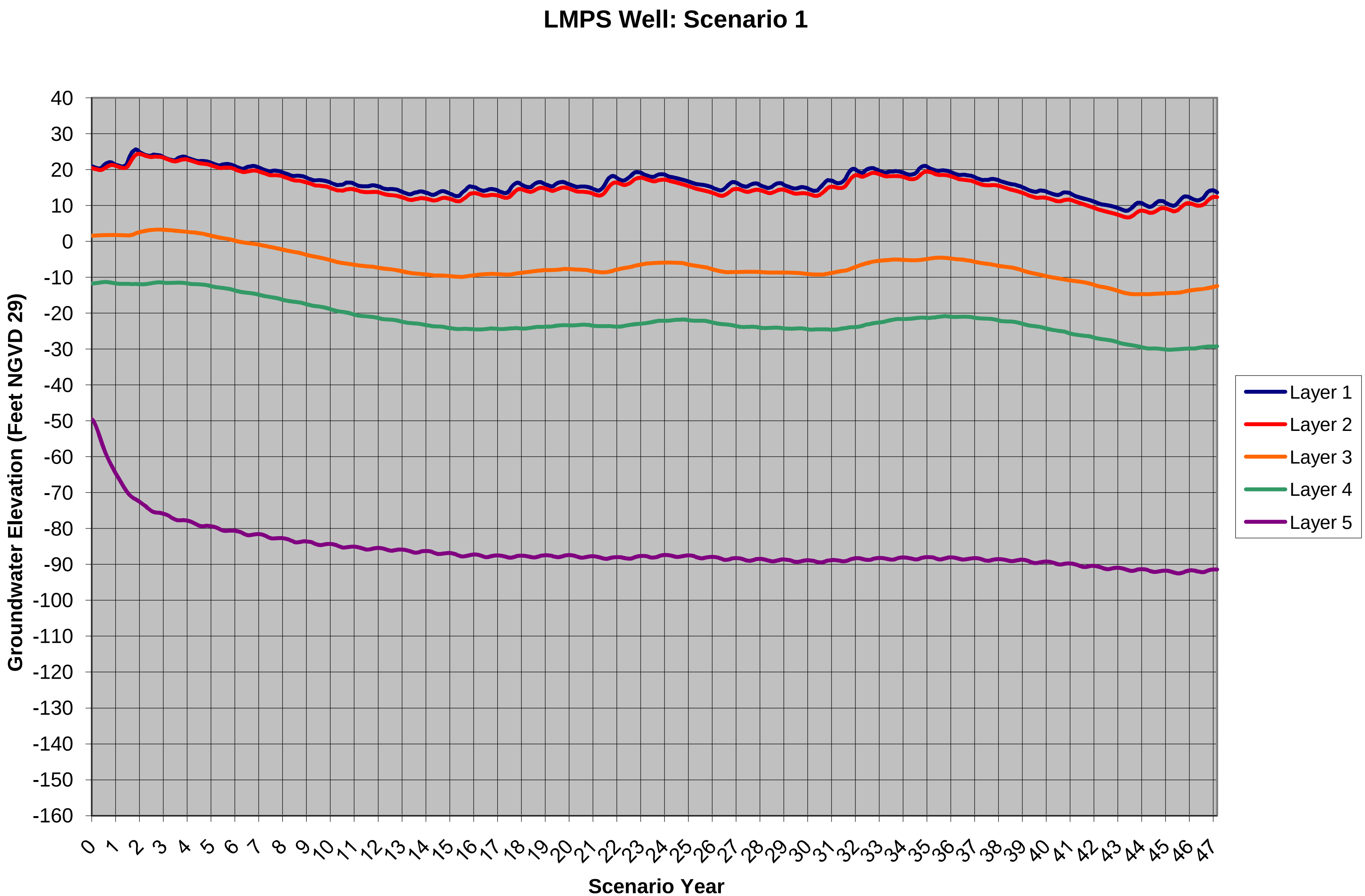
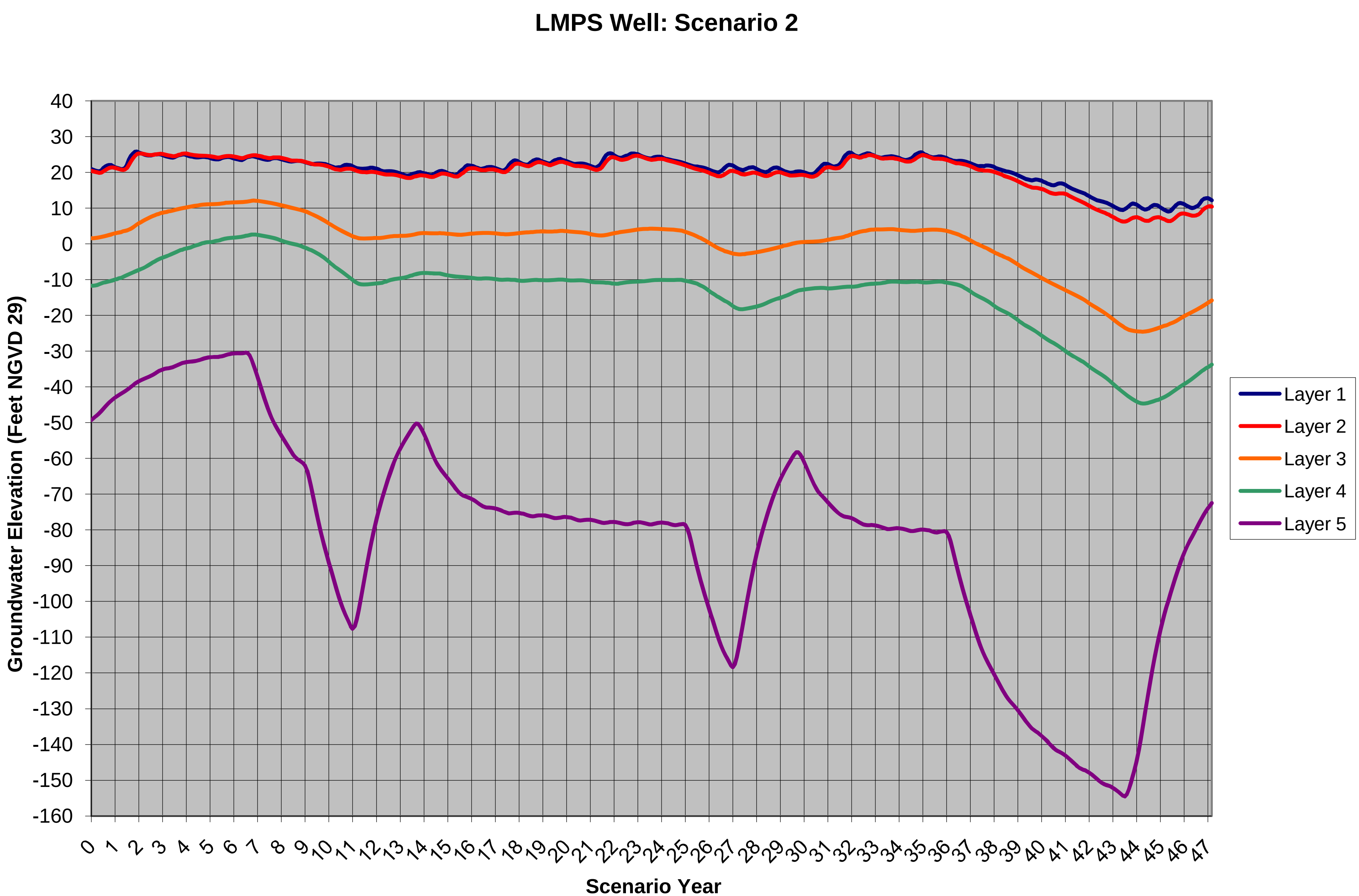
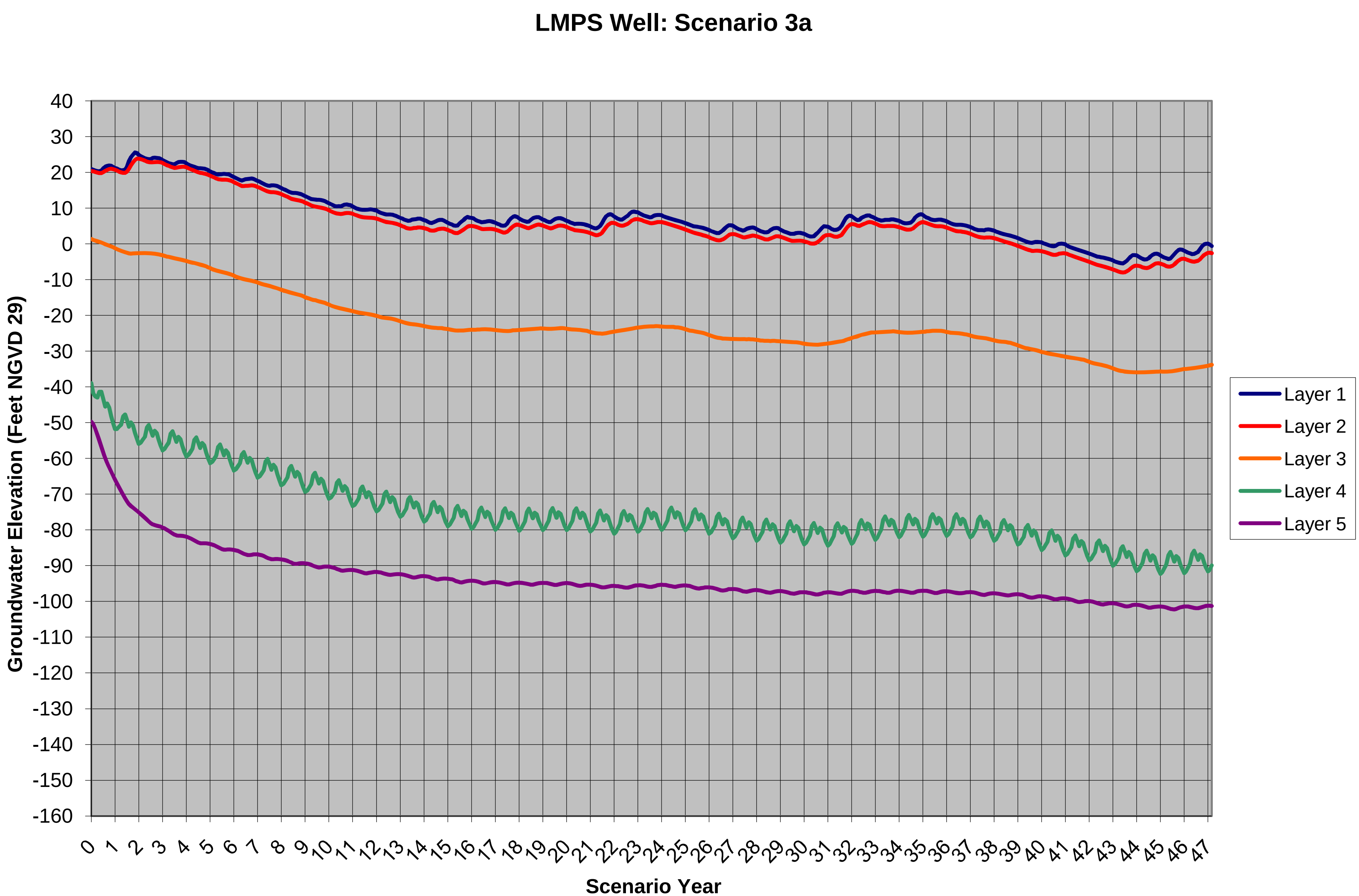
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
-240
-260
-280
-300
-320
-340
-360
-380
-400
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5

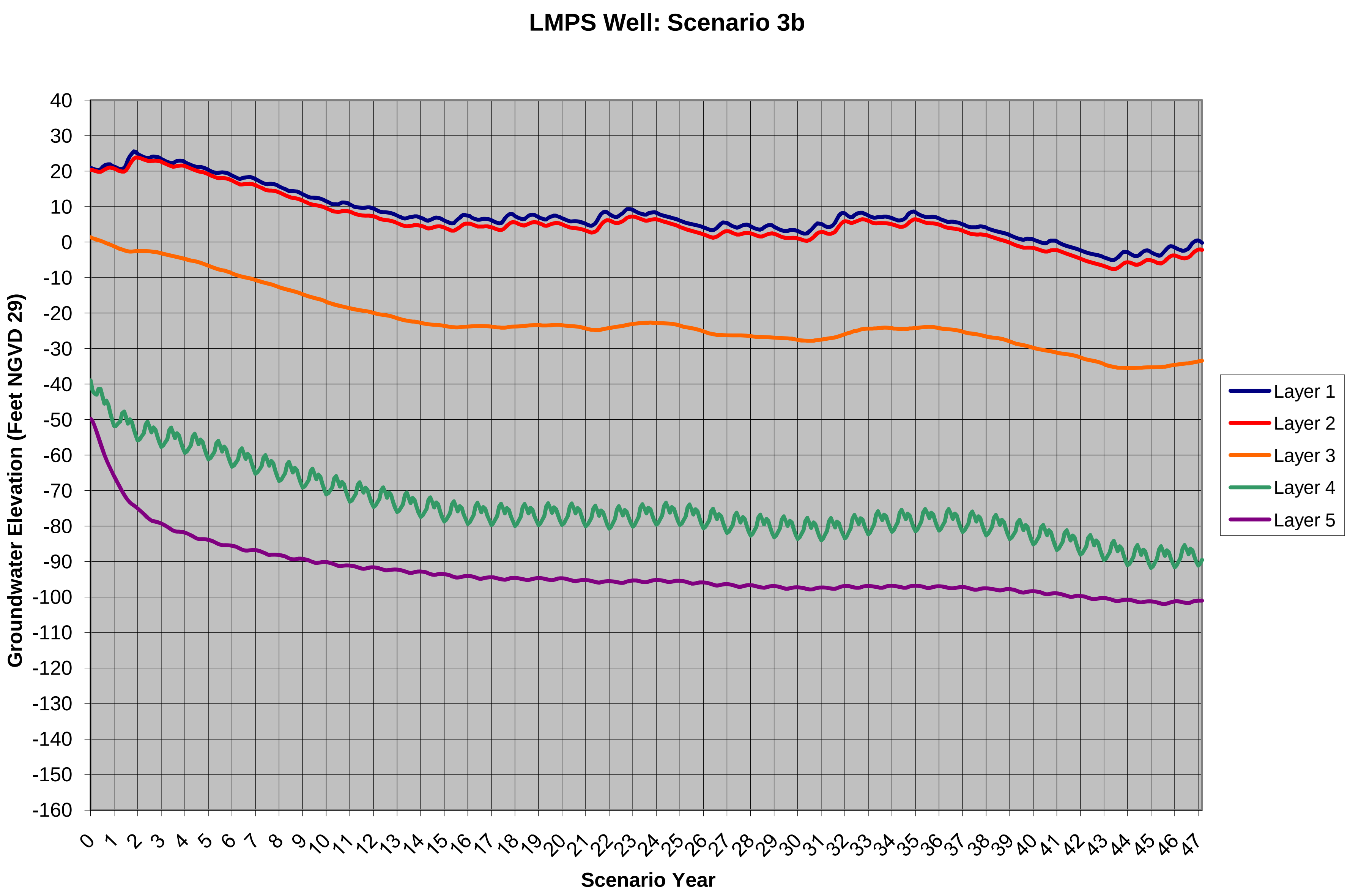


LMPS Well: Scenario 1
Groundwater Elevation (Feet NGVD 29)
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5

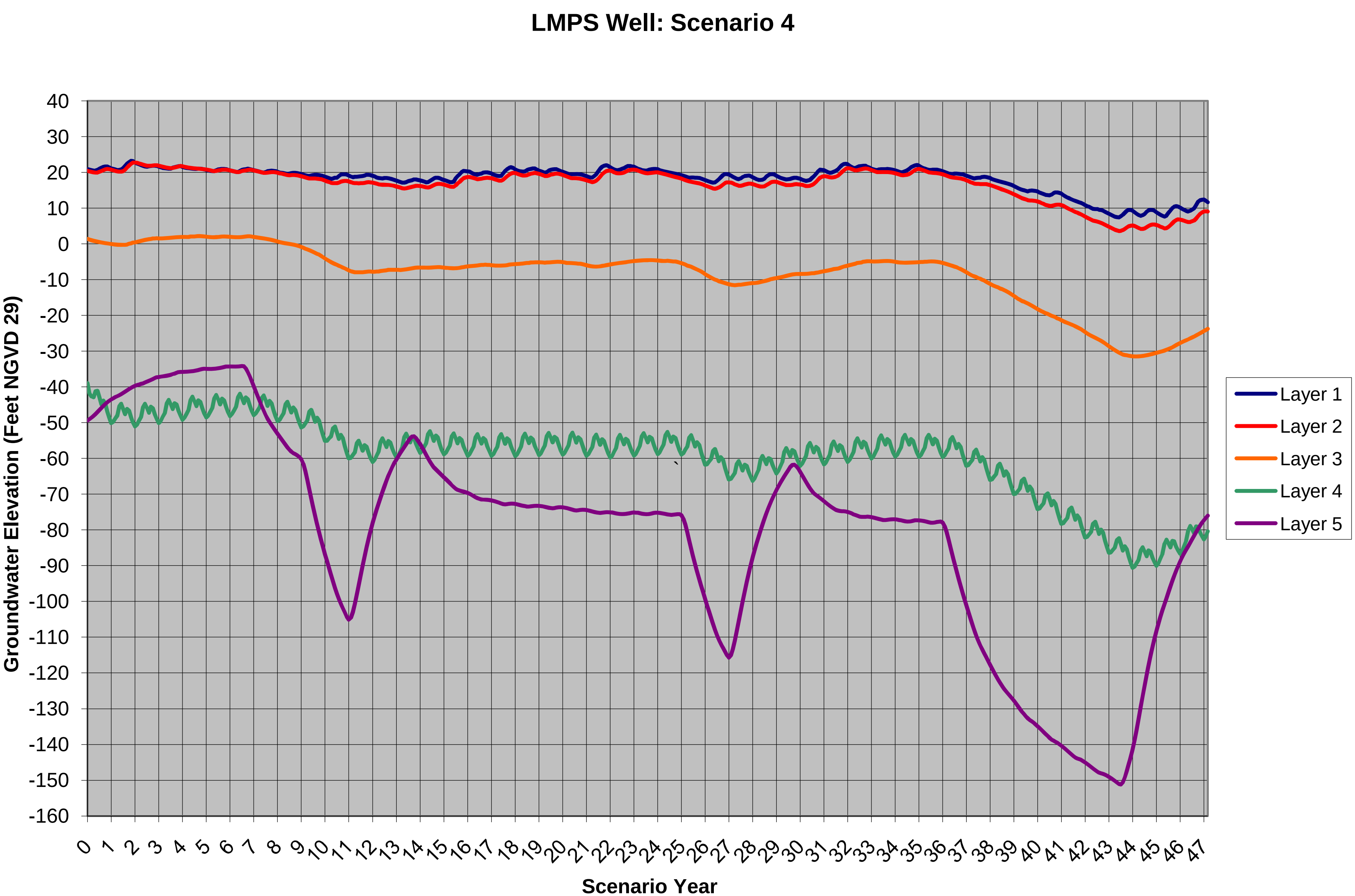


LMPS Well: Scenario 2
Groundwater Elevation (Feet NGVD 29)
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5


LMPS Well: Scenario 3a
Groundwater Elevation (Feet NGVD 29)
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5



LMPS Well: Scenario 3b
Groundwater Elevation (Feet NGVD 29)
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5



LMPS Well: Scenario 4
Groundwater Elevation (Feet NGVD 29)
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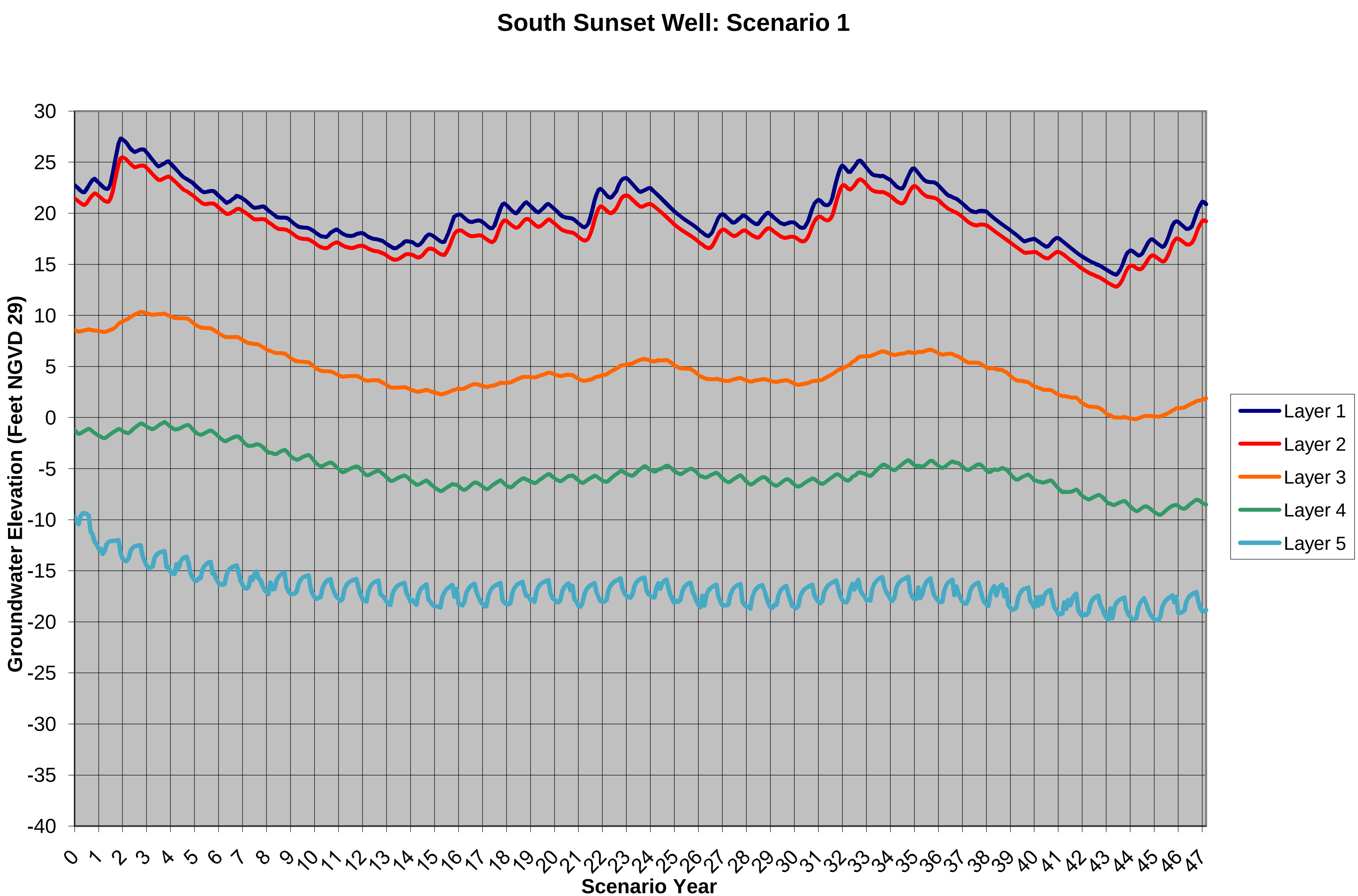
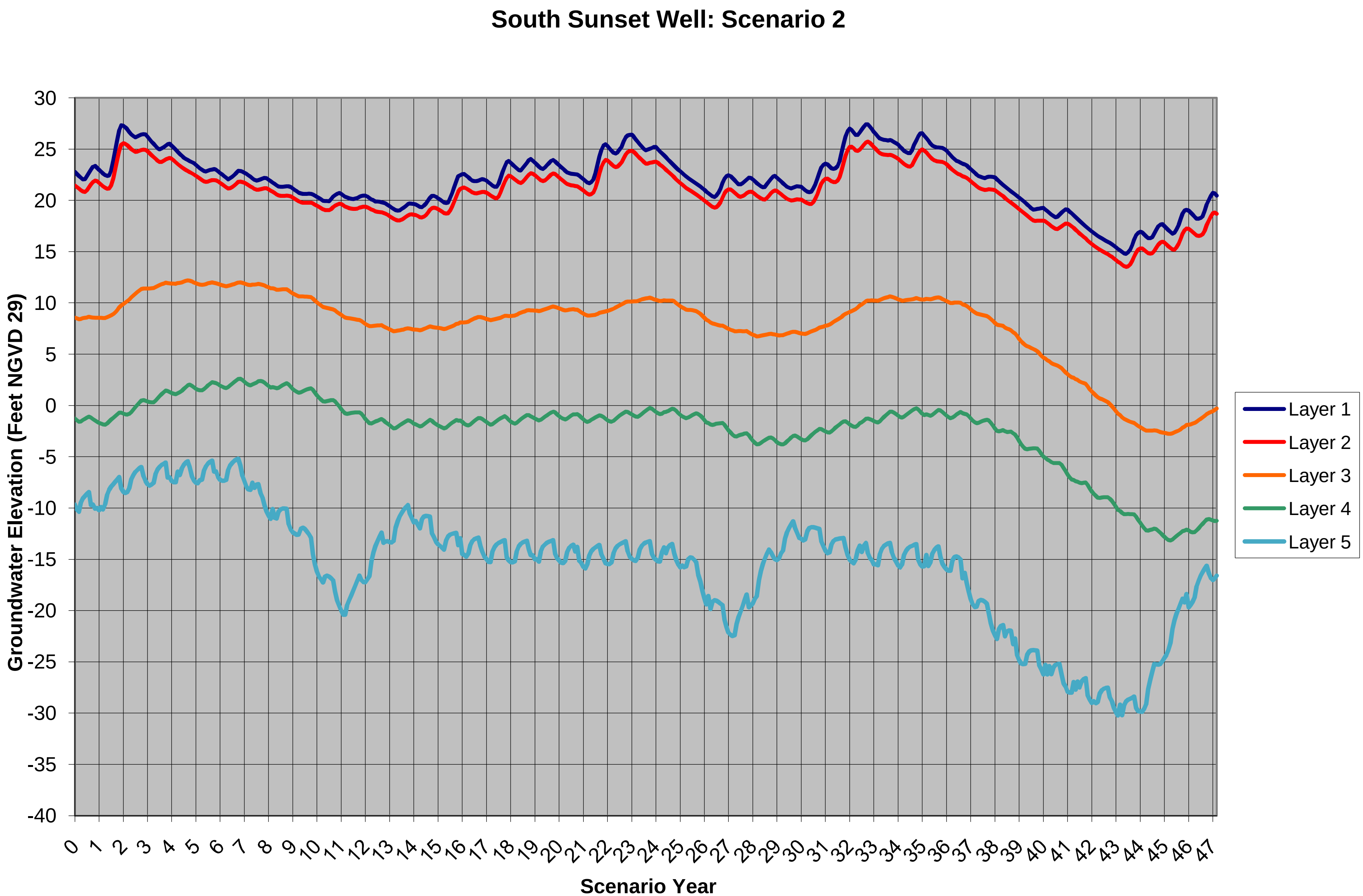
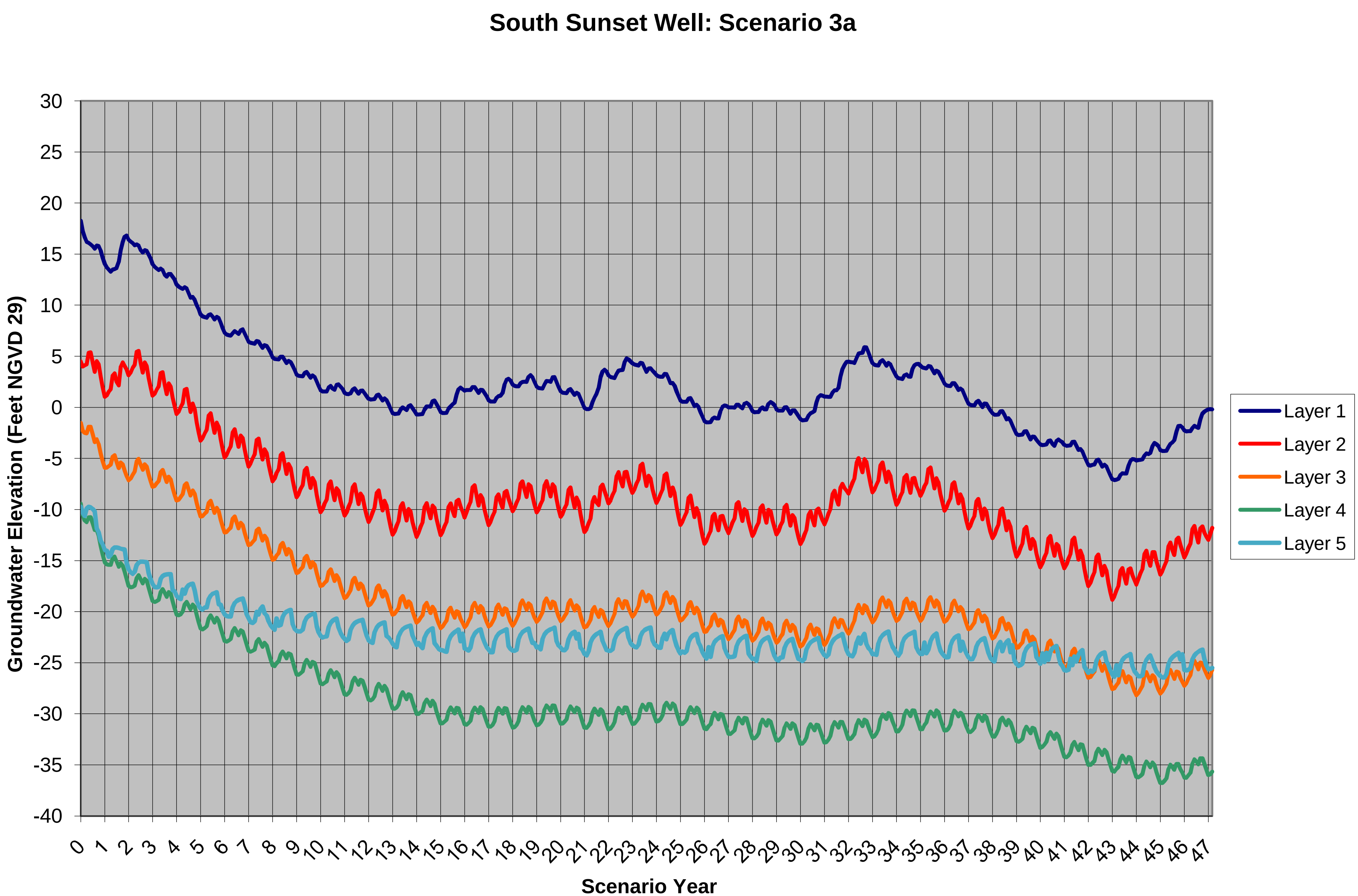
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5

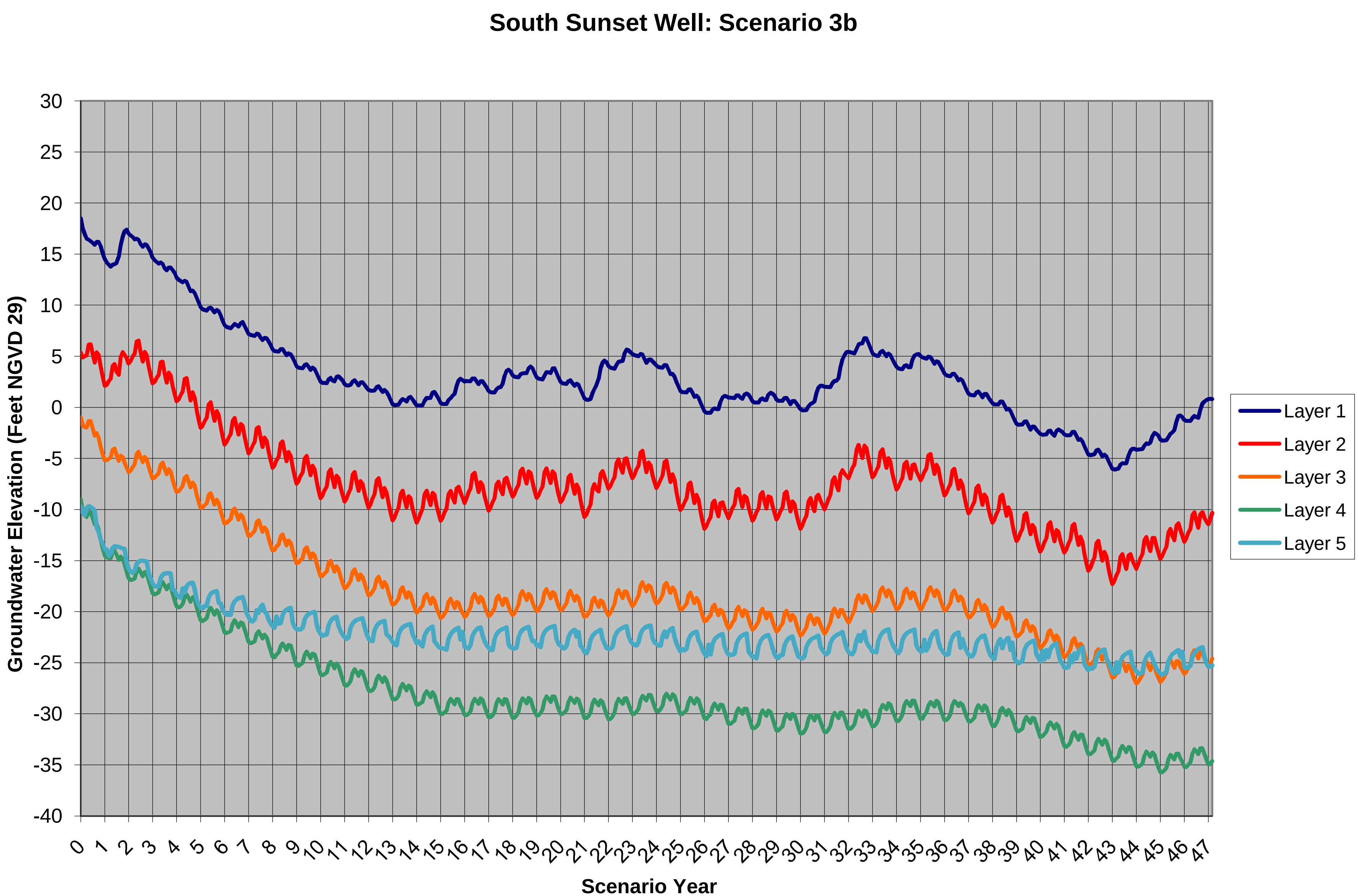


South Sunset Well: Scenario 1
Groundwater Elevation (Feet NGVD 29)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5


South Sunset Well: Scenario 2
Groundwater Elevation (Feet NGVD 29)
Scenario Year
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5

South Sunset Well: Scenario 3a




South Sunset Well: Scenario 3b
Groundwater Elevation (Feet NGVD 29)
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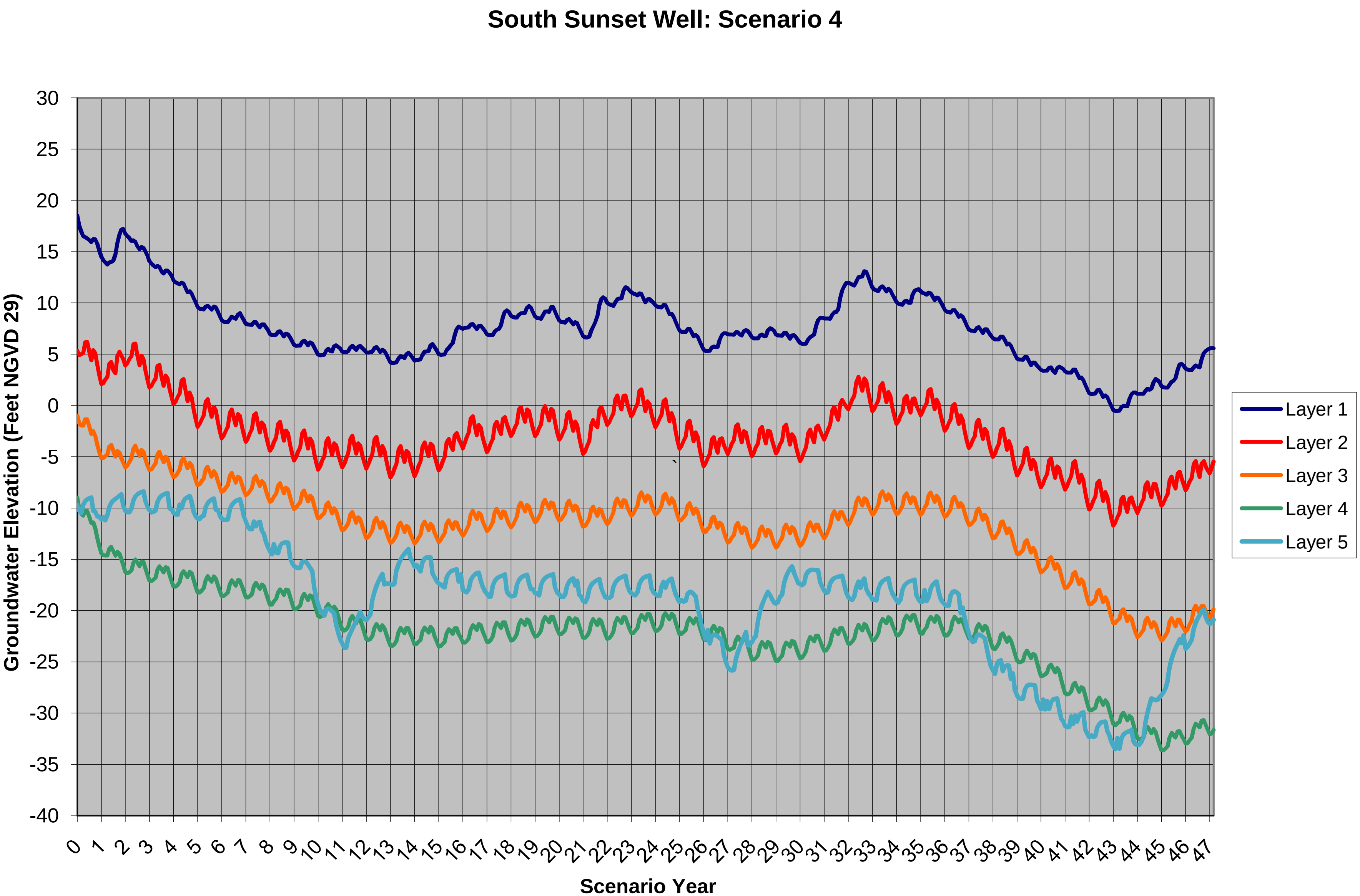
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5


South Sunset Well: Scenario 4
Groundwater Elevation (Feet NGVD 29)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Scenario Year
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5

APPENDIX B

NGS Monuments within Study Area

PID[1]	Latitude (N)[2]			Longitude (W)		
AB7677	37	44	0.33344	122	29	49.03035
HT0600	37	42	30	122	29	9
HT0602	37	43	8.00	122	30	1.00
HT2271	37	43	47.00	122	28	30
HT1841	37	43	47.00	122	30	10
HT1842	37	44	10.00	122	30	33
HT1843	37	45	3.00	122	30	30
HT2267	37	45	56.00	122	28	37
HT2268	37	45	25.32	122	28	36.35587
HT2269	37	44	49.00	122	28	34
HT1848	37	46	28.00	122	30	39
HT1847	37	46	20.00	122	30	29
HT1846	37	46	19.00	122	30	28
HT2270	37	44	15.72	122	28	31.9305
HT2272	37	43	17.00	122	28	32
HT2273	37	42	48.00	122	28	18
HT0519	37	42	29.00	122	28	6
HT0521	37	41	36.00	122	28	15
HT0520	37	42	18.00	122	28	16
HT0481	37	41	9.43	122	28	56.41929
HT0483	37	41	5.00	122	28	18
HT0523	37	40	56.00	122	27	46
HT0540	37	37	16.00	122	22	39
HT0541	37	37	9.00	122	22	23
HT0544	37	37	32.00	122	22	34
HT0557	37	34	48.00	122	20	42
HT0641	37	39	4.00	122	22	59
HT0642	37	39	2.00	122	22	47
HT0532	37	38	0.00	122	23	51
HT0554	37	35	20.00	122	21	55
HT0543	37	37	32.00	122	22	34
HT3821	37	39	33.00	122	24	4
HT0542	37	37	28.00	122	22	31
HT0638	37	39	15.00	122	24	26
HT0639	37	39	15.00	122	23	47
HT0645	37	38	58.00	122	24	36
HT0647	37	38	32.00	122	24	47
HT0527	37	38	18.00	122	24	58
HT0537	37	37	20.00	122	23	29
HT0552	37	35	43	122	22	50
DG6888	37	38	6.88788	122	23	8.17798
HT0525	37	39	28	122	26	13
HT0644	37	39	2	122	22	47
HT0640	37	39	3	122	23	17
HT0643	37	39	2	122	22	47
HT0526	37	38	46	122	25	19
HT0556	37	34	50.73	122	20	41.37
HT0558	37	34	39	122	20	18
HT0524	37	40	7	122	26	56

[1]Point ID
[2]Latitude and Longitude in NAD83 coordinates

HT2430	37	36	42.8427	122	32	32.93442
HT0528	37	37	44	12	24	39
HT0551	37	35	55	122	23	6
HT0566	37	34	19	122	20	21
HT0538	37	37	20	122	23	29
HT0547	37	37	8	122	24	15
HT0534	37	37	30	122	23	36
HT0548	37	36	48	122	23	59

DSDATA.TXT

```
"@(#)dsdata.txt 1.20 - 2009/04/14 15:05:54"
**********************************************************************
*                        dsdata.txt                                  *
**********************************************************************

OVERVIEW:

Information about survey monuments on record with the National Geodetic
Survey (NGS) is published in a Digital Survey DATA (DSDATA) format.
The format consists of fixed field records in an 80 column ASCII text file.
The authoritative source for digital survey data format is the NGS bluebook.
This document is an extract of the bluebook for public convenience.

An individual DSDATA record of a monument is called a datasheet.  Datasheets
are sorted alphanumerically by station designation within a DSDATA file.

The last line of a correctly retrieved DSDATA file is:
***retrieval complete.

The first line of each datasheet is:
1        NATIONAL GEODETIC SURVEY,   Retrieval Date =
followed by the date the data was extracted from the NGS database.

The second line of each datasheet begins with the PID in column 2,
then is followed by a row of asterisks that begins in column 9.

Most other data items are identified by the data identifier text in cc 10-22.
Data identifier text text is characterised by a hyphen(-) in column 22.

The following data items are exceptions that require the use of cc 10-22,
and are identified by the following codes, all which start in column 8.
Note that projection data items are identified by codes in cc 8-11:

  Identifier     Data Item

      *          Current Survey Control

      .          Data Determination Text

      ;SPC       SPC Data

      ;UTM       UTM Data

      :          Primary Azimuth Object

      |          Box Score (Reference Objects)

      _          Mark Setting Information

      +          Mark Setting Information Continued
```

```
SUMMARY OF DATA ITEMS:

                               ***
 DATA ITEM: Special Control Station Header
 DISPLAYED: Only when station is one of those types listed under EXAMPLES.
 COMMENTS :
 EXAMPLES :________________________________________________________________
 AA3495  CORS         -  This is a GPS Continuously Operating Reference Station.
 HV8128  FBN          -  This is a Federal Base Network Control Station.
 HV9260  CBN          -  This is a Cooperative Base Network Control Station.
 RF0849  PACS         -  This is a Primary Airport Control Station.
 RF0850  SACS         -  This is a Secondary Airport Control Station.
 CJ0500  TIDAL BM     -  This is a Tidal Bench Mark

                               ***
 DATA ITEM: Designation
 DISPLAYED: Always
 COMMENTS : Usually the DESIGNATION does not match exactly with the STAMPING.
 EXAMPLES :________________________________________________________________
 AA3495  DESIGNATION -  GAITHERSBURG CORS L1 PHASE CENTER
 RF0849  DESIGNATION -  CARIPORT
 CA0570  DESIGNATION -  MP 77-5015
 AA8531  DESIGNATION -  66-26

                               ***
 DATA ITEM: CORS Identifier
 DISPLAYED: When Station is a Continuously Operational Reference Station
 COMMENTS :
 EXAMPLES :________________________________________________________________
 AW5607  CORS_ID      -  HOUS
 ER0702  CORS_ID      -  PIE1
 AA3495  CORS_ID      -  GAIT

                               ***
 DATA ITEM: Station Permanent Identifier (PID)
 DISPLAYED: Always
 COMMENTS : The PID is also found on the left side of each datasheet record.
            The PID is always 2 upper case letters followed by 4 numbers.
 EXAMPLES :________________________________________________________________
 AA3495  PID          -  AA3495
 RF0849  PID          -  RF0849
 TV0007  PID          -  TV0007

                               ***
 DATA ITEM: STATE/COUNTY
 DISPLAYED: Always, but County may be blank.
 COMMENTS : Bououghs may be used for Alaska; Parishes are used for Louisiana
 EXAMPLES :________________________________________________________________
 FV1057  STATE/COUNTY-  CA/SAN LUIS OBISPO
 BW0029  STATE/COUNTY-  LA/POINTE COUPEE
 TT0026  STATE/COUNTY-  AK/
 TT4608  STATE/COUNTY-  AK/MATANUSKA-SUSITNA

                               ***
 DATA ITEM: USGS Quad
 DISPLAYED: Always, but may be blank
 COMMENTS : This is the name of the USGS 7.5 minute series map sheet which
            shows the area of the station.  The station may or may not appear
            as a map feature.  NGS sometimes publishes data according to the
            USGS quadrangle (quad) system, for which the USGS quad sheet
            name is used as a reference.
 EXAMPLES :________________________________________________________________
 AA3495  USGS QUAD   -  GAITHERSBURG (1986)
 FA3038  USGS QUAD   -  ELLENDALE (1973)
 TV1290  USGS QUAD   -
 FV1057  USGS QUAD   -  CYPRESS MOUNTAIN (1979)
```

```
                           ***
DATA ITEM: Current Survey Control
DISPLAYED: Always, but the HEIGHT may be blank if the station
           is a horizontal control station only.
COMMENTS : Current Survey Control is identified by a '*' in cc8
           and comes under the heading "*CURRENT SURVEY CONTROL"

           The horizontal datum in use is the North American Datum of 1983 (NAD 83).
           This datum also defines ellipsoid vertical height. The orthometric vertical
           datum in use in the conterminous United States and Alaska is the North American
           Vertical Datum of 1988 (NAVD 88).  The orthometric vertical datum in Hawaii is
           referenced as Local Tidal.  This tag also applies to all orthometric heights in
           the United States territories that were determined prior to the establishment
           of the vertical datums listed below

           American Samoa: American Samoa Vertical Datum of 2002 (ASVD 02)
           Guam: Guam Vertical Datum of 2004 (GUVD 04)
           Northern Marianas: Northern Marianas Vertical Datum of 2003 (NMVD 03)
           Puerto Rico: Puerto Rico Vertical Datum of 2002 (PRVD 02)
           U.S. Virgin Islands: Virgin Islands Vertical Datum of 2009 (VIVD 09)

           NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
           Care should be taken not to "mix" current datum(s) with
           past datum(s) within a project.

           NAD83 (1986) indicates positions on the NAD83 datum for the
           North American Adjustment, completed in 1986.
           NAD83 (nnnn) indicates positions on the NAD83 datum for the
           North American Adjustment, but readjusted to a State High
           Accuracy Reference Network (HARN) on the date shown in (nnnn).
           NAD83 (CORS) indicates positions which are part of the CORS
           network.

           There are various Horizontal Control sources, as specified below:

           ADJUSTED = Least squares adjustment.
                      (Rounded to 5 decimal places.)

           HD_HELD1 = Differentially corrected hand held GPS observations.
                      (Rounded to 2 decimal places.)

           HD_HELD2 = Autonomous hand held GPS observations.
                      (Rounded to 1 decimal places.)

           SCALED   = Scaled from a topographic map.
                      (Rounded to 0 decimal places.)


           NAVD 88 orthometric heights are displayed where available.
           If there was a height for the station on the National Geodetic
           Vertical Datum of 1929 (NGVD 29), then that height will be
           displayed under SUPERSEDED SURVEY CONTROL.

           There are various Vertical Control sources, as specified below:

           ADJUSTED = Direct Digital Output from Least Squares Adjustment
                      of Precise Leveling.
                      (Rounded to 3 decimal places.)

           ADJ UNCH = Manually Entered (and NOT verified) Output of
                      Least Squares Adjustment of Precise Leveling.
                      (Rounded to 3 decimal places.)

           POSTED   = Pre-1991 Precise Leveling Adjusted to
                      the NAVD 88 Network After Completion of
```

```
                 the NAVD 88 General Adjustment of 1991.
                 (Rounded to 3 decimal places.)

      READJUST = Precise Leveling Readjusted as Required
                 by Crustal Motion or Other Cause.
                 (Rounded to 2 decimal places.)

      N HEIGHT = Computed from Precise Leveling Connected
                 at Only One Published Bench Mark.
                 (Rounded to 2 decimal places.)

      RESET    = Reset Computation of Precise Leveling.
                 (Rounded to 2 decimal places.)

      COMPUTED = Computed from Precise Leveling Using
                 Non-rigorous Adjustment Technique.
                   (Rounded to 2 decimal places.)

      GPSCONLV = Leveled Orthometric Height tied to GPS
                 HT_MOD Orthometric Height.
                 (Rounded to 2 decimal places.)

      LEVELING = Precise Leveling Performed by Horizontal
                 Field Party.
                  (Rounded to 2 decimal places.)

      H LEVEL  = Level between control points not connected
                 to bench mark.
                  (Rounded to 1 decimal places.)

      GPS OBS  = Computed from GPS Observations.
                 (Rounded to 1 decimal places.)

      VERT ANG = Computed from Vertical Angle Observations.
                 (Rounded to 1 decimal place;
                  If No Check, to 0 decimal places.)

      SCALED   = Scaled from a Topographic Map.
                 (Rounded to 0 decimal places.)

      U HEIGHT = Unvalidated height from precise leveling
                 connected at only one NSRS point.
                 (Rounded to 2 decimal places.)

      VERTCON  = The NAVD 88 height was computed by applying the
                 VERTCON shift value to the NGVD 29 height.
                 (Rounded to 0 decimal places.)


      NOTE:    NAVD 88 and NGVD 29 heights in meters are
               converted to U.S. Survey Feet by using the
               conversion factor:
                 U.S. Survey Feet = (39.37 / 12.00) x meters
               Height in feet is rounded to 1 less decimal
               place than the corresponding height in meters.

 EXAMPLES :________________________________________________________________
 AA0000                        *CURRENT SURVEY CONTROL
 AA0000
```

NGS has adopted a realization of NAD83 called NAD83(NSRS2007) for the distribution of coordinates at approximately 70,000 passive geodetic control monuments. This realization approximates (but is not, and can never be, equivalent to) the more rigorously defined NAD 83 (CORS96) realization in which Continuously Operating Reference Sstations (CORS) coordinates are distributed.

NAD 83 (NSRS2007) was created by adjusting GPS data collected during various campaign-style geodetic surveys performed between the mid-1980's and 2005. For this adjustment, NAD 83 (CORS96) positional coordinates for approximately 700 CORS were held fixed (predominately at the 2002.0 epoch for the stable north American plate, but 2007.0 in Alaska and western CONUS) to obtain consistent positional coordinates for the approximately 70,000 passive marks, as described by Vorhauer [2007]. Derived NAD 83(NSRS2007) positional coordinates should be consistent with corresponding NAD 83(CORS96) positional coordinates to within the accuracy of the GPS data used in the adjustment and the accuracy of the corrections applied to these data for systematic errors, such as refraction. In particular, there were no corrections made to the observations for vertical crustal motion when converting from the epoch of the GPS survey into the epoch of the adjustment, while the NAD 83(CORS96) coordinates do reflect motion in all three directions at CORS sites.
For this reason alone, there can never be total equivalency between NAD 83(NSRS2007) and NAD 83(CORS96).

Note: NGS has not computed NAD83 (NSRS2007) velocities for any of the apprroximately 70,000 passive marks involved in this adjustment. Also, the positional coordinates of a passive mark will make reference to an "epoch date". Epoch dates are the date for which the positional coordinates were adjusted, and are therefore considered "valid" (within the tolerance of not applying vertical crustal motion). because a mark's positional coordinates will change due to the dynamic nature of the earth's crust, the coordinates of a mark on epochs different than the listed "epoch date" can only be accurately known if a 3-dimensional velocity has been computed and applied to that mark.

Loading of the National Readjustment data commenced on September 14, 2007. Before this the format of the position and elevation lines appeared as follows:

```
 AA3495* NAD 83(CORS)-  39 08 02.34046(N)    077 13 15.51884(W)     ADJUSTED
 AA3495* NAD 88     -       140.76   (meters)     461.8    (feet)  GPS OBS
```

After the readjustment, the position and elevation lines on a datasheet will appear in a slightly modified format to accomodate the larger datum tag field (i.e. NSRS2007) as shown in the below examples.

```
______________________________________________________________
 DF9012* NAD 83(NSRS2007)-  42 56 15.39233(N) 071 26 19.03487(W)    ADJUSTED
 AA3495* NAD 83(CORS)    -  39 08 02.34046(N) 077 13 15.51884(W)    ADJUSTED
 RF0849* NAD 83(NSRS2007)-  46 52 08.05186(N) 068 00 53.02328(W)    ADJUSTED
 TA0047* NAD 83(1986)    -  48 04 54.20   (N) 090 45 48.42   (W)    HD_HELD1
 AC3384* NAD 83(1986)    -  25 57 14.7    (N) 081 43 29.2    (W)    HD_HELD2
 HV0454* NAD 83(1986)    -  38 20 52.     (N) 076 13 39.     (W)    SCALED
 DX3756* NAD 83(NSRS2007)-  33 38 08.42412(N) 117 05 10.37961(W)    ADJUSTED
 FQ0856* NAD 83(1986)    -  35 47 36.     (N) 111 52 56.     (W)    SCALED
 DB0356* NAVD 88         -      -11.886  (meters)  -39.00  (feet)  READJUSTED
 DC2131* NAVD 88         -     1096.93   (meters) 3598.8   (feet)  N HEIGHT
 AI5086* NAVD 88         -      123.68   (meters)  405.8   (feet)  GPS OBS
 GP0162* NAVD 88         -     1456.97   (meters) 4780.1   (feet)  RESET
 DE3069* NAVD 88         -       38.25   (meters)  125.5   (feet)  GPS OBS
 GP0641* NAVD 88         -     1831.8    (meters) 6010.    (feet)  GPS OBS
 BW0768* NAVD 88         -       59.70   (+/-2cm)  195.9   (feet)  VERTCON
 BW2469* NAVD 88         -      125.     (meters)  410.    (feet)  SCALED
 FG1799* NAVD 88         -
 TV0377* LOCAL TIDAL     -         7.2    (meters)   24.    (feet)  VERT ANG
```

***

DATA ITEM: Epoch Date
DISPLAYED: When Horizontal Position Requires
COMMENTS : The epoch date is used for stations in regions of episodic and/or continuous horizontal crustal motion where the position changes in time. The epoch date indicates the time the published horizontal coordinates are valid.

All stations with an adjusted horizontal position that falls within

```
          a designated crustal motion region will have an epoch date displayed
          on the datasheet.  Stations outside of these regions will not have
          an epoch date.  As the crustal motion effect tapers to zero before
          reaching a region's boundary, stations immediately inside that
          boundary and having an epoch date will normally have consistant
          positions with stations outside that boundary with no epoch date.

          To aid users with changing coordinates through epochs, NGS has
          developed software package HTDP to model changes in California
          and parts of Alaska.  HTDP is available from the NGS Information
          Services Branch.
EXAMPLES :________________________________________________________________
AA3495  EPOCH DATE  -        1996.00
EV3471  EPOCH DATE  -        1991.35

                               ***
DATA ITEM: X, Y, Z
DISPLAYED: When adjusted Horizontal Position and Ellipsoid Height are available.
COMMENTS : These values represent earth-centered earth-fixed coordinates,
          where the X axis follows zero degrees longitude, the Z axis follows
          positive 90 degrees latitude and the Y axis completes a right hand
          system.
EXAMPLES :________________________________________________________________
AA3495  X           -   1,095,790.787 (meters)                         COMP
AA3495  Y           -  -4,831,328.133 (meters)                         COMP
AA3495  Z           -   4,003,934.481 (meters)                         COMP

                               ***
DATA ITEM: Laplace Correction
DISPLAYED: For stations that have an adjusted position and that are
          within areas that have a geoid model with a derived
          vertical deflection model.
COMMENTS : The Laplace correction is the quantity which, when added to an
          astronomic azimuth, yields a geodetic azimuth.

          The simplified Laplace equation, which assumes horizontal lines
          of sight (cotangent of zenith angle ~ zero) and which assumes a
          clockwise reference frame during model development is:

          LAPLACE CORR = (a - A)
                       = (eta) * tan(geodetic latitude)
          where:
          a    =  Geodetic azimuth
          A    =  Astronomic azimuth
          eta  =  Deflection of the vertical in the prime-vertical plane,
                  an east-west component.

          The reader is cautioned that the Laplace equation has also been
          derived by others using a counterclockwise reference frame,
          which leads to subtracting the Laplace correction from the
          astronomic azimuth to yield a geodetic azimuth:
                Laplace corr = (A - a).
          However, NGS uses a clockwise reference frame.
EXAMPLES :________________________________________________________________
RF0849  LAPLACE CORR-           3.14  (seconds)                        USDV2009
EV3471  LAPLACE CORR-           0.60  (seconds)                        USDV2009
TV1290  LAPLACE CORR-           0.12  (seconds)                        USDV2009
EZ4149  LAPLACE CORR-          -3.23  (seconds)                        USDV2009

                               ***
DATA ITEM: Ellipsoid Height
DISPLAYED: When available
COMMENTS : The ellipsoid height is the elevation of the station above the
          reference ellipsoid for horizontal datum, currently the NAD83
          ellipsoid.  The ellipsoid is a reference surface for how the
          world appears, with respect to physical location.
```

```
          As a very close approximation:

                   h = H + N
          where
             h  =  ellipsoid height
             H  =  orthometric height
             N  =  geoid height

          In theory this equation is not exact because the ellipsoid height
          is normal to the ellipsoid, orthometric height is normal to the
          geoid, and these two surfaces are not necessarily parallel.
          In practice these three data item quantities will not usually
          satisfy the above equation since they were derived from seperate
          sources.  The above equation assumes a model where the geoid
          is above the ellipsoid, and terrain above the geoid.
          The date (mm/dd/yy) attached to the ellipsoid height is the date
          when the ellipsoid height was adjusted.  If the day is unknown
          then it is filled with "??".
EXAMPLES :________________________________________________________________
AA3495  ELLIP HEIGHT-         109.047 (meters)           (03/??/02) GPS OBS
HV8128  ELLIP HEIGHT-         -24.700 (meters)           (02/12/02) GPS OBS
FT1606  ELLIP HEIGHT-         974.023 (meters)           (03/??/02) GPS OBS

                               ***
DATA ITEM: Geoid Height
DISPLAYED: For areas covered by the 'GEOID' software.
COMMENTS : The geoid height is the elevation of the geoid above the horizontal
          datum's reference ellipsoid.  The geoid is a specific equi-
          geopotential surface (geop), that best fits global mean sea level.
          The geoid is a reference surface for how the world acts,
          with respect to the geopotential force of gravity.
          The majority of the conterminous United States shows a negative
          geoid height, indicating that the geoid is below the ellipsoid.
EXAMPLES :________________________________________________________________
RF0849  GEOID HEIGHT-         -23.39  (meters)                     GEOID96
TU0165  GEOID HEIGHT-         -28.00  (meters)                     GEOID96
TV0007  GEOID HEIGHT-         -40.70  (meters)                     GEOID96

                               ***

DATA ITEM: Dynamic Height
DISPLAYED: For stations with an NAVD88 height and Modeled Gravity.
COMMENTS : The dynamic height of a benchmark is the height at
          a reference latitude of the geopotential surface through the
          benchmark.  This value is of interest because two stations with
          different orthometric heights may have similar geopotential,
          due to undulations of the geopotential reference surface (geoid).
          The source of a dynamic height is always computed.
          The reference latitude for the United States is North 45 degrees.

          Dynamic heights were computed from geopotential heights
          (geopotential numbers) which were obtained for all bench marks
          in the general adjustment of the North American Vertical
          Datum of 1988 (NAVD88).  A dynamic height referenced to the
          International Great Lakes Datum of 1985 is then obtained by
          dividing the adjusted NAVD88 geopotential height of a
          bench mark by the normal gravity value (G) computed on the
          Geodetic Reference System of 1980 (GRS 80) ellipsoid
          at 45 degrees latitude (G = 980.6199 gal).

          A related unit for measuring geopotential is the geopotential
          number (C), which was adopted by the IAG in 1955.
          The geopotential number equals the dynamic height multiplied by
          the normal gravity at the reference latitude:
                        C = H(dynamic) * gamma(ref).
          The geopotential number (C) is measured in geopotential units
```

(g.p.u.), where:
1 g.p.u. = 1 kgal meter = 1000 gal meter.

Since local gravity near sea level is approximately 0.98 kgal, the magnitude of geopotential numbers (C) are approximately that of orthometric height in meters, which leads to better intuitive understanding.

EXAMPLES :

DB0356	DYNAMIC HT -	-11.870	(meters)	-38.94	(feet)	COMP
HV0454	DYNAMIC HT -	1.026	(meters)	3.37	(feet)	COMP
DC0409	DYNAMIC HT -	1055.66	(meters)	3463.4	(feet)	COMP

***

DATA ITEM: Modeled Gravity
DISPLAYED: When available.
COMMENTS : The interpolated gravity value which was used in the NAVD 88 general adjustment.

EXAMPLES :

HV8128	MODELED GRAV-	980,028.4	(mgal)	NAVD 88
EV3471	MODELED GRAV-	979,412.1	(mgal)	NAVD 88
CA0570	MODELED GRAV-	979,272.6	(mgal)	NAVD 88

***

DATA ITEM: Survey Control Order and Class
DISPLAYED: For Adjusted Control Only
COMMENTS : The Order will be 'HORZ ORDER', 'VERT ORDER' or 'ELLIP ORDER' depending on whether it refers to Horizontal control, Vertical Orthometric control or Vertical Ellipsoid control.

ORDER AND CLASS: HORIZONTAL
****

With the conclusion of the national readjustment, we will no longer publish horizontal order and class. Instead we will publish network and local accuracies.

For publication purposes, the network accuracy of a control point is a value that represents the uncertainty of its coordinates with respect to the geodetic datum at the 95 percent confidence level. Since the datum is considered to be best expressed by the Continuous Operating Reference Stations (CORS), which are held fixed during the adjustment. Local and Network accuracy values at CORS sites are considered to be infinitesimal (approach zero). The Local Accuracy of a control point is a value that represents the uncertainly of its coordinates relative to other directly connected, adjacent control points at the 95-percent confidence level. This value represents the relative positional error which surveyors can expect between survey marks in a locality. It also represents an approximate average of the indicudual local accuracy values between this control point and other observed control points used to establish its coordinates although, in general, all of the immediately surrounding stations will not necessarily have been used in teh survey which established the original coordinates.

These accuracies have been implemented with the publication of the National Readjustment.

Note: CORS stations that are NOT part of the National CORS program in NGS (e.g. California CORS) will show both network and local accuracies. This is because they are in a separate program from that National CORS and thereby are not constricted to the rules of the National CORS on NGS datasheets.

ORDER AND CLASS: ORTHOMETRIC VERTICAL
****

Vertical station order and class for first-, second-, and third-order stations are defined in the Federal Geodetic Control Committee publication "Standards and Specifications for Geodetic Control Networks". In addition:

Normal bench marks with unknown order will display a '?'. Vertical control which were determined only for the purpose of supplying a height for Horizontal Distance Reductions are assigned an order of 'THIRD'. If these types of heights do not have supporting observations then the Order is displayed as 'THIRD ?'.

Class 0 is used for special cases of orthometric vertical control as follows:

Vertical Order/Class		Tolerance Factor
FIRST	CLASS 0	2.0 mm or less
SECOND	CLASS 0	8.4 mm or less
THIRD	CLASS 0	12.0 mm or less

"Posted bench marks" are vertical control points in the NGS data base which were excluded from the NAVD 88 general adjustment. Some of the bench marks were excluded due to large adjustment residuals, possibly caused by vertical movement of the bench marks during the time interval between different leveling epochs. Adjusted NAVD 88 are computed for posted bench marks by supplemental adjustments.

A range of mean distribution rate corrections is listed for each posted bench mark in the data portion of the publication. A summary table of the mean distribution rates and their codes is listed below. The mean distribution rate corrections which were applied to the original leveling observations is a good indication of the usefulness of the posted bench marks' adjusted NAVD 88 heights.

Distribution Rate Code	Distribution Rate Correction
"a"	0.0 thru 1.0 mm/km
"b"	1.1 thru 2.0 "
"c"	2.1 thru 3.0 "
"d"	3.1 thru 4.0 "
"e"	4.1 thru 8.0 "
"f"	greater than 8.0 mm/km

POSTED BENCH MARKS SHOULD BE USED WITH CAUTION. As is the case for all leveling projects, the manditory FGCS check leveling two-mark or three-mark tie procedure will usually detect any isolated movement (or other problem) at an individual bench mark. Of course, regional movement affecting all the marks equally is not detected by the two- or three-mark tie procedure.

GPS CONSTRAINED LEVELED HEIGHT. The height was determined by differential leveling referenced to only one NSRS GPS Height Mod determined height. Therefore this height should be used with CAUTION.

ORDER AND CLASS: ELLIPSOID VERTICAL
****

The following ellipsoid height order and class relative accuracy standards have not yet been adopted by the Federal Geodetic Control Subcommittee, but are currently in use by NGS:

```
     Ellipsoid Height                    Maximum Height
      Classification                   Difference Accuracy
    ------------------                 -------------------
    FIRST      CLASS 1                  0.5 (mm)/sqrt(km)
    FIRST      CLASS 2                  0.7
    SECOND     CLASS 1                  1.0
    SECOND     CLASS 2                  1.3
    THIRD      CLASS 1                  2.0
    THIRD      CLASS 2                  3.0
    FOURTH     CLASS 1                  6.0
    FOURTH     CLASS 2                 15.0
    FIFTH      CLASS 1                 30.0
    FIFTH      CLASS 2                 60.0

The ellipsoid height difference accuracy (b) is computed from a
a minimally constrained correctly weighted least squares adjustment
by:
     b = s / sqrt(d)

where
     b = height difference accuracy
     s = propagated standard deviation of ellipsoid height
         difference in millimeters between control points
         obtained from the least squares adjustment.
     d = horizontal distance between control points in kilometers
```

```
 EXAMPLES :________________________________________________________________
 AA3495  HORZ ORDER  -  SPECIAL (CORS)
 HV8128  HORZ ORDER  -  A
 HV9260  HORZ ORDER  -  B
 AA0169  HORZ ORDER  -  FIRST
 FG1796  HORZ ORDER  -  SECOND
 FG1797  HORZ ORDER  -  THIRD

 HV8128  VERT ORDER  -  FIRST     CLASS II
 HU0680  VERT ORDER  -  SECOND    CLASS 0
 FG0846  VERT ORDER  -  THIRD (See Below)
 GP0162  VERT ORDER  -  THIRD
 HH0701  VERT ORDER  -  THIRD     CLASS 0
 LX7164  VERT ORDER  -  THIRD ?
 FG0744  VERT ORDER  -  ?
 FQ0849  VERT ORDER  -  * POSTED, Code a , SEE BELOW
 GP0241  VERT ORDER  -  * POSTED, Code b , SEE BELOW
 FR0070  VERT ORDER  -  * POSTED, Code c , SEE BELOW
 TF1074  VERT ORDER  -  * POSTED, Code d , SEE BELOW
 TF1144  VERT ORDER  -  * POSTED, Code e , SEE BELOW
 TF0916  VERT ORDER  -  * POSTED, Code f , SEE BELOW
 FR0371  VERT ORDER  -  * POSTED, Code NC , SEE BELOW
 EV3471  VERT ORDER  -  * READJUSTED, Code A , SEE BELOW
 AA3495  ELLP ORDER  -  SPECIAL (CORS)

 TV1290  ELLP ORDER  -  FIRST     CLASS II
 RF0849  ELLP ORDER  -  THIRD     CLASS I
 HV8128  ELLP ORDER  -  FOURTH    CLASS I

                               ***
 DATA ITEM: Text regarding Horizontal Control
 DISPLAYED: As required when explaining source of data values.
 COMMENTS :
 EXAMPLES :________________________________________________________________
AA0000.The horizontal coordinates were established by classical geodetic methods
AA0000.and adjusted by the National Geodetic Survey in June, 1995.

AA0000.The horizontal coordinates were established by classical geodetic methods
AA0000.and adjusted by the National Geodetic Survey.
```

```
AA0000.The horizontal coordinates were established by GPS observations
AA0000.and adjusted by the National Geodetic Survey in June, 1995.

AA0000.The horizontal coordinates were established by GPS observations
AA0000.and adjusted by the National Geodetic Survey.

AA0000.The horizontal coordinates were established by VLBI observations
AA0000.and local terrestrial surveys and adjusted by the National Geodetic
AA0000.Survey in June, 1995.

AA0000.The horizontal coordinates were established by VLBI observations
AA0000.and local terrestrial surveys and adjusted by the National Geodetic
AA0000.Survey.

AA0000.The horizontal coordinates were scaled from a topographic map and have
AA0000.an estimated accuracy of +/- 6 seconds.

AA0000.No horizontal observational check was made to the station.

AA0000.This is a SPECIAL STATUS position.  See SPECIAL STATUS under the
AA0000.DATUM ITEM on the data sheet items page.

AA0000.The horizontal coordinates are valid at the epoch date displayed above.
AA0000.The epoch date for horizontal control is a decimal equivalence
AA0000.of Year/Month/Day.

                                ***
 DATA ITEM: Text regarding Vertical Control
 DISPLAYED: As required when explaining source of data values.
 COMMENTS :
 EXAMPLES :________________________________________________________________
AA0000.The orthometric height was determined by differential leveling
AA0000.and adjusted by the National Geodetic Survey in June, 1990.

AA0000.The orthometric height was determined by differential leveling
AA0000.and adjusted by the National Geodetic Survey.

AA0000.The orthometric height was computed from unverified reset data.

AA0000.The orthometric height was key entered from printed documents
AA0000.and not key verified.

AA0000.The approximate orthometric height was determined by applying
AA0000.unadjusted height differences to other nearby adjusted values.

AA0000.The orthometric height was determined by differential leveling.
AA0000.The vertical network tie was performed by a horz. field party for horz.
AA0000.obs reductions. Reset procedures were used to establish the elevation.

AA0000.The orthometric height was determined by vertical angle observations.

AA0000.The orthometric height was determined by GPS observations.

AA0000.The orthometric height was scaled from a topographic map.
AA0000.The NAVD 88 height was computed by applying the VERTCON shift value to
AA0000.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)

AA0000.No vertical observational check was made to the station.

AA0000.* This is a POSTED BENCH MARK height.  Code A indicates a distribution
AA0000.rate of 0.0 thru 1.0 mm/km.

AA0000.* This is a READJUSTED BENCH MARK height.  Code NC indicates the bench
AA0000.mark was located on a no-check spur therefore a value was not computed.

AA0000.The height was derived from older observations constrained to new
```

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AA0000.heights in a crustal motion area.  The height is approximate in
AA0000.relation to other heights in its vicinity.

AA0000.The height was determined by precise leveling from only one NGRS
AA0000.bench mark.  This was not adequate "tie leveling" to NGRS and was
AA0000.allowed ONLY to validate the GPS-derived height.

AA0000.WARNING-GPS observations at this control monument resulted in a GPS
AA0000.derived orthometric height which differed from the leveled height by
AA0000.more than one decimeter (0.1 meter).

AA0000.WARNING-Repeat measurements at this control monument indicate possible
AA0000.vertical movement.

CJ0500.This mark is designated as VM 4064 in the Oceanographic Products
CJ0500.and Services Division Tidal Bench Mark database.
       NOTE: If a web browser is used to retrieve an NGS bench mark that is
       also a tidal bench mark, the words "Oceanographic Products" will be
       highlighted and will provide a link to the series of descriptions and
       tide height references in the Oceanographic Products and Services
       Division (OPSD) Tidal Bench Mark database that includes the bench mark.
       The specific bench mark is uniquely identified by a corresponding
       tide station number and state, which are provided at an intermediate
       web page, where a link to the OPSD Home Page is also available
       for further tidal bench mark information.

                           ***
 DATA ITEM: Text regarding Other Data Control
 DISPLAYED: As required when explaining source of data values.
 COMMENTS :
 EXAMPLES :________________________________________________________________
 AA0000.The XYZ, and position/ellipsoidal ht. are equivalent.
 AA0000.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA0000.The Laplace correction was computed from DEFLEC93 derived deflections.
 AA0000.The ellipsoidal height was determined by GPS observations
 AA0000.and is referenced to NAD 83.
 AA0000.The geoid height was determined by GEOID93.
 AA0000.The dynamic height is computed by dividing the NAVD 88
 AA0000.geopotential number by the normal gravity value computed on the
 AA0000.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 AA0000.degrees latitude (G = 980.6199 gals).
 AA0000.The modeled gravity was interpolated from observed gravity values.
 AA3495.No superseded survey control is available for this station.
 AA0000.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 AA0000.See file format.dat to determine how the superseded data were derived.
 AA0170.The vertical order pertains to the superseded datum.

                           ***
 DATA ITEM: Grid Coordinate Systems:
            State Plane Coordinate System of 1983 (SPC)
            Universal Transverse Mercator (UTM)
 DISPLAYED: SPC coordinates are shown where zones where available.
            UTM zones are available worldwide, but coordinates are shown only
            for those stations with horizontal control.
 COMMENTS : UTM units are always in meters(MT).  In addition to meters,
            SPC units may also be expressed in U.S. Survey Foot(sFT), or
            International Foot(iFT), where:

            U.S. Survey Foot   :=  39.37 inches = 1 meter, exactly
            International Foot :=        1 inch = 2.54 centimeters, exactly

            All azimuths are referenced clockwise from north.
            Stations near zone limits may report positions for each zone.
            Scale Factor multiplied by ellipsoid distance equals grid distance.
            Convergence is also known as the mapping angle.
            Convergence plus grid azimuth yields geodetic azimuth.
```

```
          The second-term correction known as the Arc-to-Chord correction
          has not been included in the convergence.

          Scaled SPC values that are provided for stations which do not
          have adjusted horizontal control have no digits to the right
          of the decimal.  Scaled SPC do not report a Scale Factor or
          Convergence, but report an Estimated Accuracy.

          A Grid Coordinate record contains:
                     |   Northing |   Easting  |Units|  Scale   | Convergence
                     |            |            |     |  Factor  | (d mm ss.s)
         Type,Zone-
EXAMPLES :________________________________________________________________
RF0849;SPC ME E     -   355,965.757   336,994.238   MT  0.99991682 +0 21 14.9
HV8128;SPC MD       -   257,462.59  1,245,959.54   sFT  0.99998804 -0 08 43.1
CK3919;SPC SC       -   342,482.46  2,008,965.76   iFT  0.99991459 +0 00 58.2
FB2124;SPC TN       -   186,810.      805,260.      MT  (+/- 180 meters Scaled)
RF0849;UTM  19      - 5,191,067.175   575,088.597   MT  0.99966930 +0 43 08.7
FT1606;UTM  11      - 3,919,831.845   510,241.833   MT  0.99960129 +0 03 55.4
FV1057;UTM  10      - 3,937,617.155   689,693.779   MT  1.00004345 +1 13 03.9

                              ***

DATA ITEM: Grid Azimuth for Primary Reference Object
DISPLAYED: When Box Score is available.
COMMENTS : The grid azimuth applies to the specified map projection only.
EXAMPLES :________________________________________________________________
RF0849:SPC ME E     -   CARIPORT AZ MK                           338 16 51.1
RF0849:UTM  19      -   CARIPORT AZ MK                           337 54 57.3

                              ***

DATA ITEM: Box Score
DISPLAYED: When available for Old Horizontal Control marks.
COMMENTS : Distance may be blank;  PID may be blank.
           There may be unadjusted marks not shown that are
           in the vicinity of the Old Horizontal Control mark.
           Contact NGS regarding their information.
EXAMPLES :________________________________________________________________
MC0588|----------------------------------------------------------------------|
MC0588| PID    Reference Object                     Distance      Geod. Az  |
MC0588|                                                           dddmmss.s |
MC0588| MC1379 WESTON MUNICIPAL TANK              APPROX.14.8 KM 0024913.8 |
MC0588| MC0587 FRANK RM 1                          36.576 METERS 10109      |
MC0588|        HOYTVILLE N BALT GRAIN ELEV        APPROX. 3.0 KM 1400111.8 |
MC0588| MC1373 MC COMB MUNICIPAL TANK             APPROX.11.7 KM 1753525.4 |
MC0588| MC0586 FRANK AZ MK                                       1800257.9 |
MC0588| MC0592 FRANK AZ MK 2                                     2563259.8 |
MC0588| MC1376 DESHLER MUNICIPAL TANK             APPROX. 7.9 KM 2694631.8 |
MC0588| MC0589 FRANK RM 2                          34.759 METERS 34452      |
MC0588|----------------------------------------------------------------------|

                              ***

DATA ITEM: Superseded Survey Control
DISPLAYED: When available.
COMMENTS : Superceded control are previously published data control values
           that are obsolete but reprinted for continuity of records.
           Format is similar to 'Current Survey Control',
           but is not marked with '*' in cc 8.
           AD means ADJUSTED, referring to horizontal position.
           GP means GPS_OBS,  referring to GPS derived ellipsoidal height.
           This is followed by an epoch date (if available).
           This is followed by Order (if available, Horizontal or Vertical),
           then is followed by Class (if available, Vertical only).

           A horizontal Order of 'c' is used for CORS stations.
           Superseded elevations have no epoch date but the
           Order and Class are displayed for bench mark heights.
```

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           The determination text used for superseded elevations
           is identical to that used for the current survey control.
EXAMPLES :___________________________________________________________________
AA0000                         SUPERSEDED SURVEY CONTROL
AA0000
AB6382  NAD 83(CORS)-  31 52 26.11223(N)   102 18 54.55641(W) AD(1996.00) c
FV1057  NAD 83(1992)-  35 33 50.72286(N)   120 54 24.79262(W) AD(1991.35) 1
HW3152  NAD 83(1986)-  38 26 14.08939(N)   079 49 54.57180(W) AD(       ) 3
HW3152  NAD 27      -  38 26 13.66570(N)   079 49 55.35309(W) AD(       ) 3
TV1290  PR          -  18 28 33.07855(N)   066 48 04.76640(W) AD(       ) 2
TU3368  OLD HI      -  21 12 45.75000(N)   156 58 20.86500(W) AD(       ) 3
RF0849  ELLIP HT    -       164.56   (m)           (04/19/96) GP(1995.00) 3 1
HV9260  ELLIP HT    -       131.19   (m)           (06/29/94) GP(       ) 4 1
HV0454  NGVD 29     -         1.266  (m)           4.15   (f) ADJUSTED    1 2
GW1440  NGVD 29     -       304.876  (m)        1000.25   (f) ADJ UNCH    2 0
AA4380  NGVD 29     -       175.86   (m)         577.0    (f) LEVELING    3
FE2754  NGVD 29     -        84.07   (m)         275.8    (f) N HEIGHT    3
FV1057  NGVD 29     -       564.37   (m)        1851.6    (f) RESET       3
CA0570  NGVD 29     -       545.10   (m)        1788.4    (f) COMPUTED    1 2
AA8531  NGVD 29     -        75.8    (m)         249.     (f) GPS OBS
UV2087  NGVD 29     -         6.8    (m)          22.     (f) VERT ANG
LX3119.No superseded survey control is available for this station.

                               ***
DATA ITEM: U.S. NATIONAL GRID SPATIAL ADDRESS
DISPLAYED: When available.
COMMENTS : The U.S. National Grid System is an alpha-numeric reference
           system that overlays the UTM coordinate system. It is a
           Federal Geographic Data Committee (FGDC) standard
           developed to improve public safety, commerce,
           as well as aid the casual GPS user.
           The USNG provides an easy to use geoaddress system for
           identifying and determining locations with the help of a
           USNG gridded map and/or a USNG enabled GPS system.

           To learn how to read USNG coordinates see:
           http://www.fgdc.gov/usng/how-to-read-usng/index_html
           and follow the link "US National Grid (USNG)"
           in the second paragraph.

           For further information about the U.S. National Grid System,
           see the Federal Geographic Data Committee's Standard
           for the United States Nation Grid at:
           http://www.fgdc.gov/usng
           and select paper fgdc_std_011_2001_usng.pdf
EXAMPLES :________________________________________________________________
KF0798_U.S. NATIONAL GRID SPATIAL ADDRESS: 14SPJ8660324404(NAD 83)
HV0454_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUH927451(NAD 83)

                               ***
DATA ITEM: Mark Setting Information
DISPLAYED: When available.
COMMENTS : _ is used as an identifier for the data record.
           + is used as an identifier for a record continuation.
EXAMPLES :________________________________________________________________
RF0849_MARKER: DH = HORIZONTAL CONTROL DISK
RF0849_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT (ROUND)
RF0849_STAMPING: CARIPORT 1985
RF0849_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
RF0849+STABILITY: SURFACE MOTION

RF0849_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
RF0849+SATELLITE: SATELLITE OBSERVATIONS - October 15, 1995

PU1648_SATELLITE: THE SITE LOCATION WAS REPORTED AS NOT SUITABLE FOR
PU1648+SATELLITE: SATELLITE OBSERVATIONS - August 19, 1991
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                          ***
DATA ITEM: Recovery History Records
DISPLAYED: Always.
COMMENTS : Landmarks will say 'FIRST OBSERVERED' rather than 'MONUMENTED'
           The Month/Day are displayed if available.
           Refer to the bluebook for recovery agency acronyms.
EXAMPLES :________________________________________________________________
MC0588  HISTORY     - Date     Condition        Recov. By
MC0588  HISTORY     - 1943     MONUMENTED       CGS
MC0588  HISTORY     - 1968     GOOD             NGS
MC0588  HISTORY     - 1968     GOOD             CGS
MC0588  HISTORY     - 1984     MARK NOT FOUND   USPSQD
MC0588  HISTORY     - 19940826 GOOD             OH-063

                          ***
DATA ITEM: Description and Recovery text
DISPLAYED: When available.
COMMENTS : Displayed chronologically.  The description format has evolved
           through time.  The authoritative reference for descriptions is
           the NGS bluebook, chapter three.  A current format is as follows.
           The phrases "DESCRIBED BY... " and "RECOVERY BY..." are inserted
           by NGS during processing.
           The first paragraph gives the general location of the station and
           the landowner and/or the person to contact for station access.
           The second paragraph gives a "to-reach". The to-reach begins at a
           well-known location that will remain through time, such as the
           junction of state, federal or interstate highways.   Legs along the
           the route are given as right or left turn, compass direction
           followed, road name if any, distance traveled in kilometers (miles),
           and leg terminating feature. The to-reach ends with the phrase,
           "TO THE STATION ON THE RIGHT/LEFT."
           The third paragraph first details the survey mark that is observed,
           then the monument in which the mark is set, then ties are given
           FROM features in the vicinity of the station TO the station, with
           horizontal distances reported to the closest 0.1 m (0.1 ft).
           A vertical tie is encouraged to assist with recovery of stations
           that may become buried.
           A fourth paragraph may be added to include notes, such as
           obstructions to GPS visibility or hazards of station occupation.
EXAMPLES :________________________________________________________________
HU0680                          STATION DESCRIPTION
HU0680
HU0680 DESCRIBED BY COAST AND GEODETIC SURVEY 1942
HU0680 1.5 MI SE FROM SALEM.
HU0680 THIS MARK IS ABOUT 1.5 MILES SOUTHEAST OF THE JUNCTION WITH
HU0680 HIGHWAY U.S. 50 ALONG A GRAVEL ROAD FROM SALEM, DORCHESTER COUNTY,
HU0680 0.25 MILE NORTHEAST ALONG A DIRT ROAD TO THE FARM HOUSE, ABOUT
HU0680 100 FEET NORTH OF THE STATION, 20 FEET NORTHEAST OF THE NORTHEAST
HU0680 CORNER OF THE HOUSE, 1 FOOT WEST OF A WIRE FENCE ROW, AND IS A
HU0680 STANDARD REFERENCE DISK SET IN THE TOP OF A CONCRETE POST.
HU0680
HU0680                          STATION RECOVERY (1988)
HU0680
HU0680 RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1988
HU0680 THE MARK IS LOCATED ABOUT 1.9 KM (1.20 MI) SOUTH OF THE SMALL COMUNITY
HU0680 OF SALEM.  OWNERSHIP--EDGAR S. GORE, RD 1 BOX 85, VIENNA, MD. 21869.
HU0680 PHONE (301) 228-2862.
HU0680 TO REACH THE STATION FROM THE POST OFFICE IN LINKWOOD, GO SOUTHEAST ON
HU0680 U.S. HIGHWAY 50 FOR 3.55 KM (2.20 MI) TO A SIDE ROAD RIGHT.  TURN
HU0680 RIGHT AND GO SOUTHEAST ON SALEM ROAD FOR 0.85 KM (0.55 MI) TO A SIDE
HU0680 ROAD RIGHT.  TURN RIGHT AND GO SOUTH ON RAVENWOOD ROAD FOR 1.90 KM
HU0680 (1.20 MI) TO A SIDE ROAD LEFT.  TURN LEFT AND GO EAST ON A DIRT
HU0680 DRIVEWAY FOR 0.42 KM (0.25 MI) TO THE MARK ON THE LEFT.
HU0680 THE MARK IS A CGS TRIANGULATION DISK SET IN THE TOP OF A 0.3 M (1.0 FT)
HU0680 SQUARE CONCRETE POST PROJECTING 0.13 M (0.4 FT) ABOVE THE GROUND.  THE
```

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HU0680 STATION IS LOCATED 15.7 M (51.5 FT) SOUTHWEST FROM THE SOUTHWEST EDGE
HU0690 OF A CULTIVATED FIELD, 8.1 M (26.6 FT) SOUTH-SOUTHEAST FROM A 0.25 M
HU0690 (0.8 FT) CHERRY TREE, 7.7 M (25.3 FT) NORTHEAST FROM THE NORTHEAST
HU0690 CORNER OF A TWO STORY HOUSE AND 7.0 M (23.0 FT) NORTH FROM THE NORTH
HU0690 CORNER OF A BLOCK BUILDING.

                              ***
```

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE =  ,PROGRAM = datasheet, VERSION = 7.85
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0566 ***********************************************************************
 HT0566  DESIGNATION -  XX 109
 HT0566  PID         -  HT0566
 HT0566  STATE/COUNTY-  CA/SAN MATEO
 HT0566  USGS QUAD   -  SAN MATEO (1997)
 HT0566
 HT0566                         *CURRENT SURVEY CONTROL
 HT0566
 HT0566* NAD 83(1986)-  37 34 19.     (N)    122 20 21.     (W)     SCALED
 HT0566* NAVD 88     -        15.10   (+/-2cm)      49.5    (feet)  VERTCON
 HT0566
 HT0566  GEOID HEIGHT-         -32.59  (meters)                     GEOID09
 HT0566  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0566
 HT0566.The horizontal coordinates were scaled from a topographic map and have
 HT0566.an estimated accuracy of +/- 6 seconds.
 HT0566
 HT0566.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0566.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0566.The vertical order pertains to the NGVD 29 superseded value.
 HT0566
 HT0566.The geoid height was determined by GEOID09.
 HT0566
 HT0566;                    North         East     Units  Estimated Accuracy
 HT0566;SPC CA 3     -   620,560.    1,837,550.      MT  (+/- 180 meters Scaled)
 HT0566
 HT0566                          SUPERSEDED SURVEY CONTROL
 HT0566
 HT0566  NGVD 29 (??/??/92)   14.262  (m)           46.79   (f) ADJ UNCH    1 2
 HT0566
 HT0566.Superseded values are not recommended for survey control.
 HT0566.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0566.See file dsdata.txt to determine how the superseded data were derived.
 HT0566
 HT0566_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG583585(NAD 83)
 HT0566_MARKER: DB = BENCH MARK DISK
 HT0566_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT0566_SP_SET: CONCRETE BLOCK
 HT0566_STAMPING: XX 109 1932
 HT0566_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0566
 HT0566  HISTORY     - Date     Condition        Report By
 HT0566  HISTORY     - 1932     MONUMENTED       CGS
 HT0566  HISTORY     - 1951     GOOD             NGS
 HT0566  HISTORY     - 1967     GOOD             NGS
 HT0566
 HT0566                          STATION DESCRIPTION
 HT0566
 HT0566'DESCRIBED BY NATIONAL GEODETIC SURVEY 1951
 HT0566'AT SAN MATEO.
 HT0566'AT SAN MATEO, IN A SMALL PARK IN A TRIANGLE FORMED BY THE
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 HT0566'JUNCTION OF U.S. HIGHWAY 101 (NORTH EL CAMINO REAL) AND CLARK
 HT0566'DRIVE, 81.9 FEET SOUTHWEST OF SOUTHWEST CURB OF EL CAMINO
 HT0566'REAL, 47.6 FEET EAST OF EAST CURB ON WESTERN LEG OF TRIANGLE, AT THE
 HT0566'APPROXIMATE CENTER OF THE NORTHEAST SIDE OF A SMALL TRIANGULAR CLUMP
 HT0566'OF BUSHES ABOUT 2 FEET HIGHER THAN THE HIGHWAY, IN TOP OF A
 HT0566'3-FOOT BY 3-FOOT CONCRETE BLOCK FLUSH WITH THE GROUND.
 HT0566
 HT0566                          STATION RECOVERY (1967)
 HT0566
 HT0566'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1967
 HT0566'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0558 ***********************************************************************
 HT0558  DESIGNATION -  W 109
 HT0558  PID         -  HT0558
 HT0558  STATE/COUNTY-  CA/SAN MATEO
 HT0558  USGS QUAD   -  SAN MATEO (1997)
 HT0558
 HT0558                         *CURRENT SURVEY CONTROL
 HT0558  ___________________________________________________________________
 HT0558* NAD 83(1986)-  37 34 39.     (N)    122 20 18.     (W)     SCALED
 HT0558* NAVD 88     -         9.83   (+/-2cm)      32.3    (feet)  VERTCON
 HT0558  ___________________________________________________________________
 HT0558  GEOID HEIGHT-         -32.59  (meters)                     GEOID09
 HT0558  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0558
 HT0558.The horizontal coordinates were scaled from a topographic map and have
 HT0558.an estimated accuracy of +/- 6 seconds.
 HT0558
 HT0558.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0558.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0558.The vertical order pertains to the NGVD 29 superseded value.
 HT0558
 HT0558.The geoid height was determined by GEOID09.
 HT0558
 HT0558;                    North         East     Units  Estimated Accuracy
 HT0558;SPC CA 3     -   621,180.    1,837,630.      MT  (+/- 180 meters Scaled)
 HT0558
 HT0558                          SUPERSEDED SURVEY CONTROL
 HT0558
 HT0558  NGVD 29 (??/??/92)    9.000  (m)           29.53    (f) ADJ UNCH    1 2
 HT0558
 HT0558.Superseded values are not recommended for survey control.
 HT0558.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0558.See file dsdata.txt to determine how the superseded data were derived.
 HT0558
 HT0558_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG584591(NAD 83)
 HT0558_MARKER: DB = BENCH MARK DISK
 HT0558_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
 HT0558_SP_SET: CONCRETE POST
 HT0558_STAMPING: W 109 1932
 HT0558_MARK LOGO: CGS
 HT0558_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
 HT0558+STABILITY: SURFACE MOTION
 HT0558
 HT0558  HISTORY     - Date     Condition        Report By
 HT0558  HISTORY     - 1932     MONUMENTED       CGS
 HT0558  HISTORY     - 1952     GOOD             NGS
 HT0558  HISTORY     - 1967     GOOD             NGS
 HT0558  HISTORY     - 1986     GOOD             NGS
```

```
 HT0558
 HT0558                          STATION DESCRIPTION
 HT0558
 HT0558'DESCRIBED BY NATIONAL GEODETIC SURVEY 1952
 HT0558'0.4 MI SE FROM BURLINGAME.
 HT0558'0.4 MILE SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
 HT0558'FROM THE STATION AT BURLINGAME, AT THE PENINSULAR AVENUE CROSSING,
 HT0558'76.7 FEET NORTHEAST OF THE NORTHEAST RAIL OF THE MAIN TRACK,
 HT0558'21.6 FEET SOUTHWEST OF THE WEST CORNER OF A WIRE FENCE AROUND
 HT0558'THE STANDARD OIL COMPANY YARD, 15.3 FEET SOUTHEAST OF THE
 HT0558'SOUTHEAST CURB OF THE AVENUE, 6 1/2 FEET NORTH OF A LARGE
 HT0558'EUCALYPTUS TREE, 1.3 FEET SOUTHWEST OF A WITNESS POST, ABOUT
 HT0558'LEVEL WITH THE TRACK, AND SET IN THE TOP OF A CONCRETE POST
 HT0558'PROJECTING 0.6 FOOT ABOVE THE GROUND.
 HT0558
 HT0558                          STATION RECOVERY (1967)
 HT0558
 HT0558'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1967
 HT0558'RECOVERED IN GOOD CONDITION.
 HT0558
 HT0558                          STATION RECOVERY (1986)
 HT0558
 HT0558'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0558'RECOVERED IN GOOD CONDITION. THE DESCRIPTION IS ADEQUATE EXCEPT ADD
 HT0558'2.0 METERS (6.5 FT) NORTHWEST OF A LARGE TRIPLE TRUNKED EUCALYPTUS
 HT0558'TREE.
 HT0558'THE MARK IS 0.3 METERS  NW FROM  A WITNESS POST
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0557 ***********************************************************************
 HT0557  DESIGNATION -  B 814
 HT0557  PID         -  HT0557
 HT0557  STATE/COUNTY-  CA/SAN MATEO
 HT0557  USGS QUAD   -  SAN MATEO (1997)
 HT0557
 HT0557                         *CURRENT SURVEY CONTROL
 HT0557  ___________________________________________________________________
 HT0557* NAD 83(1986)-  37 34 48.     (N)    122 20 42.     (W)     SCALED
 HT0557* NAVD 88     -        10.10   (+/-2cm)      33.1    (feet)  VERTCON
 HT0557  ___________________________________________________________________
 HT0557  GEOID HEIGHT-         -32.59  (meters)                     GEOID09
 HT0557  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0557
 HT0557.The horizontal coordinates were scaled from a topographic map and have
 HT0557.an estimated accuracy of +/- 6 seconds.
 HT0557
 HT0557.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0557.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0557.The vertical order pertains to the NGVD 29 superseded value.
 HT0557
 HT0557.The geoid height was determined by GEOID09.
 HT0557
 HT0557;                   North         East     Units  Estimated Accuracy
 HT0557;SPC CA 3     -   621,470.    1,837,050.      MT  (+/- 180 meters Scaled)
 HT0557
 HT0557                          SUPERSEDED SURVEY CONTROL
 HT0557
 HT0557  NGVD 29 (??/??/92)    9.266  (m)           30.40   (f) ADJ UNCH    1 2
 HT0557
 HT0557.Superseded values are not recommended for survey control.
 HT0557.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
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HT0557.See file dsdata.txt to determine how the superseded data were derived.
HT0557
HT0557_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG578594(NAD 83)
HT0557_MARKER: DB = BENCH MARK DISK
HT0557_SETTING: 34 = SET IN THE FOOTINGS OF SMALL/MEDIUM STRUCTURES
HT0557_SP_SET: RAILROAD DEPOT FOUNDATION
HT0557_STAMPING: B 814 1952
HT0557_MARK LOGO: CGS
HT0557_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
HT0557+STABILITY: SURFACE MOTION
HT0557
HT0557  HISTORY     - Date     Condition        Report By
HT0557  HISTORY     - 1952     MONUMENTED       CGS
HT0557  HISTORY     - 1956     GOOD             NGS
HT0557  HISTORY     - 1965     GOOD             NGS
HT0557  HISTORY     - 1986     GOOD             NGS
HT0557
HT0557                          STATION DESCRIPTION
HT0557
HT0557'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
HT0557'AT BURLINGAME.
HT0557'AT BURLINGAME, SET VERTICALLY IN THE NORTHEAST FACE OF THE
HT0557'CONCRETE FOUNDATION OF THE SOUTHERN PACIFIC COMPANY RAILROAD
HT0557'STATION, 47.6 FEET SOUTHWEST OF THE SOUTHWEST RAIL, 2.1 FEET
HT0557'NORTHWEST OF THE EAST CORNER OF THE BUILDING, AND 0.3 FOOT ABOVE
HT0557'THE SIDEWALK.
HT0557
HT0557                          STATION RECOVERY (1965)
HT0557
HT0557'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
HT0557'RECOVERED IN GOOD CONDITION.
HT0557
HT0557                          STATION RECOVERY (1986)
HT0557
HT0557'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
HT0557'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
HT0556 ***********************************************************************
HT0556  DESIGNATION -  VV 109
HT0556  PID         -  HT0556
HT0556  STATE/COUNTY-  CA/SAN MATEO
HT0556  USGS QUAD   -  SAN MATEO (1997)
HT0556
HT0556                         *CURRENT SURVEY CONTROL
HT0556  ___________________________________________________________________
HT0556* NAD 83(1986)-  37 34 50.73   (N)    122 20 41.37   (W)     HD_HELD1
HT0556* NAVD 88     -         9.39   (+/-2cm)      30.8    (feet)  VERTCON
HT0556  ___________________________________________________________________
HT0556  GEOID HEIGHT-         -32.59  (meters)                     GEOID09
HT0556  VERT ORDER  -  FIRST     CLASS II (See Below)
HT0556
HT0556.The horizontal coordinates were established by differentially corrected
HT0556.hand held GPS obs and have an estimated accuracy of +/- 3 meters.
HT0556
HT0556.The NAVD 88 height was computed by applying the VERTCON shift value to
HT0556.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
HT0556.The vertical order pertains to the NGVD 29 superseded value.
HT0556
HT0556.Photographs are available for this station.
HT0556
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 HT0556.The geoid height was determined by GEOID09.
 HT0556
 HT0556;                     North         East     Units  Estimated Accuracy
 HT0556;SPC CA 3     -   621,549.2   1,837,067.8     MT  (+/- 3 meters HH1 GPS)
 HT0556
 HT0556                          SUPERSEDED SURVEY CONTROL
 HT0556
 HT0556  NGVD 29 (??/??/92)    8.565  (m)           28.10   (f) ADJ UNCH    1 2
 HT0556
 HT0556.Superseded values are not recommended for survey control.
 HT0556.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0556.See file dsdata.txt to determine how the superseded data were derived.
 HT0556
 HT0556_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG5784859502(NAD 83)
 HT0556_MARKER: DB = BENCH MARK DISK
 HT0556_SETTING: 35 = SET IN A MAT FOUNDATION OR CONCRETE SLAB OTHER THAN
 HT0556+WITH SETTING: PAVEMENT
 HT0556_SP_SET: FLAGPOLE BASE
 HT0556_STAMPING: VV 109 1932
 HT0556_MARK LOGO: CGS
 HT0556_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
 HT0556+STABILITY: SURFACE MOTION
 HT0556
 HT0556  HISTORY     - Date     Condition        Report By
 HT0556  HISTORY     - 1932     MONUMENTED       CGS
 HT0556  HISTORY     - 1952     GOOD             NGS
 HT0556  HISTORY     - 1965     GOOD             NGS
 HT0556  HISTORY     - 1986     GOOD             NGS
 HT0556  HISTORY     - 20090111 POOR             GEOCAC
 HT0556
 HT0556                          STATION DESCRIPTION
 HT0556
 HT0556'DESCRIBED BY NATIONAL GEODETIC SURVEY 1952
 HT0556'AT BURLINGAME.
 HT0556'AT BURLINGAME, AT WASHINGTON PARK, ABOUT 100 YARDS NORTH OF AND
 HT0556'ACROSS THE TRACKS FROM THE SOUTHERN PACIFIC COMPANY RAILROAD
 HT0556'STATION, IN THE TOP OF THE SOUTH CONCRETE BASE FOR A FLAGPOLE,
 HT0556'ABOUT 45 YARDS NORTHEAST OF THE APPROXIMATE CENTER OF THE
 HT0556'JUNCTION OF CAROLAN AND NORTH LANE AVENUES, 22.5 FEET SOUTHWEST
 HT0556'OF THE WEST CORNER OF A WIRE FENCE AROUND A TENNIS COURT, 17.3
 HT0556'FEET NORTH OF A STREET LIGHT, AND 1.6 FEET ABOVE THE GROUND.
 HT0556
 HT0556                          STATION RECOVERY (1965)
 HT0556
 HT0556'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0556'RECOVERED IN GOOD CONDITION.
 HT0556
 HT0556                          STATION RECOVERY (1986)
 HT0556
 HT0556'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0556'RECOVERED IN GOOD CONDITION.
 HT0556
 HT0556                          STATION RECOVERY (2009)
 HT0556
 HT0556'RECOVERY NOTE BY GEOCACHING 2009 (RM)
 HT0556'THE MARK'S SURFACE IS DAMAGED.  THE DISK'S STAMPING IS DIFFICULT TO
 HT0556'READ BUT IS
 HT0556'LEGIBLE.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0554 ***********************************************************************
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HT0554  DESIGNATION -  J 553
HT0554  PID         -  HT0554
HT0554  STATE/COUNTY-  CA/SAN MATEO
HT0554  USGS QUAD   -  SAN MATEO (1997)
HT0554
HT0554                         *CURRENT SURVEY CONTROL
HT0554  ___________________________________________________________________
HT0554* NAD 83(1986)-  37 35 20.     (N)    122 21 55.     (W)     SCALED
HT0554* NAVD 88     -         4.72   (+/-2cm)      15.5    (feet)  VERTCON
HT0554  ___________________________________________________________________
HT0554  GEOID HEIGHT-         -32.59  (meters)                     GEOID09
HT0554  VERT ORDER  -  FIRST     CLASS II (See Below)
HT0554
HT0554.The horizontal coordinates were scaled from a topographic map and have
HT0554.an estimated accuracy of +/- 6 seconds.
HT0554
HT0554.The NAVD 88 height was computed by applying the VERTCON shift value to
HT0554.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
HT0554.The vertical order pertains to the NGVD 29 superseded value.
HT0554
HT0554.The geoid height was determined by GEOID09.
HT0554
HT0554;                    North         East    Units  Estimated Accuracy
HT0554;SPC CA 3     -   622,490.    1,835,280.      MT  (+/- 180 meters Scaled)
HT0554
HT0554                          SUPERSEDED SURVEY CONTROL
HT0554
HT0554  NGVD 29 (??/??/92)    3.888  (m)           12.76   (f) ADJ UNCH    1 2
HT0554
HT0554.Superseded values are not recommended for survey control.
HT0554.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0554.See file dsdata.txt to determine how the superseded data were derived.
HT0554
HT0554_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG560603(NAD 83)
HT0554_MARKER: DB = BENCH MARK DISK
HT0554_SETTING: 34 = SET IN THE FOOTINGS OF SMALL/MEDIUM STRUCTURES
HT0554_SP_SET: BUILDING FOUNDATION
HT0554_STAMPING: J 553 1956
HT0554_MARK LOGO: CGS
HT0554_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
HT0554+STABILITY: SURFACE MOTION
HT0554
HT0554  HISTORY     - Date     Condition        Report By
HT0554  HISTORY     - 1956     MONUMENTED       CGS
HT0554  HISTORY     - 1965     GOOD             NGS
HT0554  HISTORY     - 1986     GOOD             NGS
HT0554
HT0554                          STATION DESCRIPTION
HT0554
HT0554'DESCRIBED BY COAST AND GEODETIC SURVEY 1956
HT0554'AT BROADWAY.
HT0554'AT BROADWAY, 0.1 MILE NORTHWEST ALONG THE SOUTHERN PACIFIC
HT0554'COMPANY RAILROAD FROM THE STATION, 1.4 MILES SOUTHWEST OF
HT0554'MILLBRAE, AT THE WEST CORNER OF THE BUILDING OF THE AETNA
HT0554'MANUFACTURING COMPANY, IN THE TOP OF THE NORTHWEST SIDE OF A
HT0554'CONCRETE FOUNDATION FOR THE WEST CORNER OF THE BUILDING, 66.1
HT0554'FEET NORTHEAST OF THE NORTHEAST RAIL OF THE NORTHEAST MAIN TRACK,
HT0554'36 1/2 FEET EAST OF THE THIRD TELEPHONE POLE SOUTHEAST OF
HT0554'MILEPOST 15, 2.5 FEET ABOVE AN ASPHALT PARKING LOT, AND ABOUT
HT0554'1 FOOT HIGHER THAN THE TRACK.
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 HT0554
 HT0554                          STATION RECOVERY (1965)
 HT0554
 HT0554'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0554'RECOVERED IN GOOD CONDITION.
 HT0554
 HT0554                          STATION RECOVERY (1986)
 HT0554
 HT0554'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0554'RECOVERED IN GOOD CONDITION. THE DESCRIPTION IS ADEQUATE EXCEPT ADD IN
 HT0554'THE FIRST LARGE BUILDING NORTHWEST OF THE BEKINS STORAGE BUILDING.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0552 ***********************************************************************
 HT0552  DESIGNATION -  S 109
 HT0552  PID         -  HT0552
 HT0552  STATE/COUNTY-  CA/SAN MATEO
 HT0552  USGS QUAD   -  MONTARA MOUNTAIN (1997)
 HT0552
 HT0552                         *CURRENT SURVEY CONTROL
 HT0552  ___________________________________________________________________
 HT0552* NAD 83(1986)-  37 35 43.     (N)    122 22 50.     (W)     SCALED
 HT0552* NAVD 88     -         3.40   (+/-2cm)      11.2    (feet)  VERTCON
 HT0552  ___________________________________________________________________
 HT0552  GEOID HEIGHT-         -32.60  (meters)                     GEOID09
 HT0552  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0552
 HT0552.The horizontal coordinates were scaled from a topographic map and have
 HT0552.an estimated accuracy of +/- 6 seconds.
 HT0552
 HT0552.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0552.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0552.The vertical order pertains to the NGVD 29 superseded value.
 HT0552
 HT0552.The geoid height was determined by GEOID09.
 HT0552
 HT0552;                    North         East     Units  Estimated Accuracy
 HT0552;SPC CA 3     -   623,220.    1,833,950.      MT  (+/- 180 meters Scaled)
 HT0552
 HT0552                          SUPERSEDED SURVEY CONTROL
 HT0552
 HT0552  NGVD 29 (??/??/92)    2.567  (m)            8.42   (f) ADJ UNCH    1 2
 HT0552
 HT0552.Superseded values are not recommended for survey control.
 HT0552.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0552.See file dsdata.txt to determine how the superseded data were derived.
 HT0552
 HT0552_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG546610(NAD 83)
 HT0552_MARKER: DB = BENCH MARK DISK
 HT0552_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
 HT0552_SP_SET: SET IN TOP OF CONCRETE MONUMENT
 HT0552_STAMPING: S 109 1932
 HT0552_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
 HT0552+STABILITY: SURFACE MOTION
 HT0552
 HT0552  HISTORY     - Date     Condition        Report By
 HT0552  HISTORY     - 1932     MONUMENTED       CGS
 HT0552  HISTORY     - 1952     GOOD             NGS
 HT0552  HISTORY     - 1965     GOOD             NGS
 HT0552  HISTORY     - 1986     MARK NOT FOUND   NGS
 HT0552
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 HT0552                          STATION DESCRIPTION
 HT0552
 HT0552'DESCRIBED BY NATIONAL GEODETIC SURVEY 1952
 HT0552'0.4 MI SE FROM MILLBRAE.
 HT0552'0.4 MILE SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
 HT0552'FROM THE STATION AT MILLBRAE, AT A DIRT ROAD CROSSING, 45.2 FEET
 HT0552'NORTHEAST OF THE NORTHEAST RAIL, 40 FEET NORTHWEST OF THE 3RD
 HT0552'TELEGRAPH LINE POLE SOUTHEAST OF MILEPOLE 14, 31.2 FEET SOUTH
 HT0552'OF A BOARD FENCE, 24 1/2 FEET EAST OF THE CENTER LINE OF THE
 HT0552'ROAD, 1.6 FEET WEST OF A WITNESS POST, ABOUT 1 1/2 FEET LOWER
 HT0552'THAN THE TRACK, AND SET IN THE TOP OF A CONCRETE POST PROJECTING
 HT0552'0.2 FOOT ABOVE THE GROUND.
 HT0552
 HT0552                          STATION RECOVERY (1965)
 HT0552
 HT0552'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0552'RECOVERED IN GOOD CONDITION.
 HT0552
 HT0552                          STATION RECOVERY (1986)
 HT0552
 HT0552'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0552'NOT RECOVERED.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0551 ***********************************************************************
 HT0551  DESIGNATION -  X 984 RESET
 HT0551  PID         -  HT0551
 HT0551  STATE/COUNTY-  CA/SAN MATEO
 HT0551  USGS QUAD   -  MONTARA MOUNTAIN (1997)
 HT0551
 HT0551                         *CURRENT SURVEY CONTROL
 HT0551  ___________________________________________________________________
 HT0551* NAD 83(1986)-  37 35 55.     (N)    122 23 06.     (W)     SCALED
 HT0551* NAVD 88     -         3.63   (+/-2cm)      11.9    (feet)  VERTCON
 HT0551  ___________________________________________________________________
 HT0551  GEOID HEIGHT-         -32.60  (meters)                     GEOID09
 HT0551  VERT ORDER  -  THIRD (See Below)
 HT0551
 HT0551.The horizontal coordinates were scaled from a topographic map and have
 HT0551.an estimated accuracy of +/- 6 seconds.
 HT0551
 HT0551.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0551.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0551.The vertical order pertains to the NGVD 29 superseded value.
 HT0551
 HT0551.The geoid height was determined by GEOID09.
 HT0551
 HT0551;                   North         East     Units  Estimated Accuracy
 HT0551;SPC CA 3     -   623,600.    1,833,560.      MT  (+/- 180 meters Scaled)
 HT0551
 HT0551                          SUPERSEDED SURVEY CONTROL
 HT0551
 HT0551  NGVD 29 (??/??/??)    2.79   (m)            9.2    (f) RESET       3
 HT0551
 HT0551.Superseded values are not recommended for survey control.
 HT0551.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0551.See file dsdata.txt to determine how the superseded data were derived.
 HT0551
 HT0551_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG542614(NAD 83)
 HT0551_MARKER: DB = BENCH MARK DISK
 HT0551_SETTING: 30 = SET IN A LIGHT STRUCTURE
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 HT0551_SP_SET: CONCRETE MANHOLE BOX
 HT0551_STAMPING: X 984 RESET 1969
 HT0551_MARK LOGO: CGS
 HT0551_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0551
 HT0551  HISTORY     - Date     Condition        Report By
 HT0551  HISTORY     - 1969     MONUMENTED       CGS
 HT0551  HISTORY     - 1983     GOOD             USGS
 HT0551  HISTORY     - 1986     GOOD             NGS
 HT0551
 HT0551                          STATION DESCRIPTION
 HT0551
 HT0551'DESCRIBED BY COAST AND GEODETIC SURVEY 1969
 HT0551'AT MILLBRAE.
 HT0551'AT MILLBRAE, ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD, 0.1
 HT0551'MILE SOUTHEAST OF THE STATION, AT A POWERLINE CROSSING, SET IN
 HT0551'THE TOP OF A 6 X 14-FOOT CONCRETE BOX, 49.2 FEET SOUTHWEST OF
 HT0551'A GUYED POWERLINE POLE AT THE CENTER OF THE POWERLINE CROSSING,
 HT0551'13.0 FEET NORTHEAST OF THE NORTHEAST RAIL OF THE NORTHWEST-BOUND
 HT0551'TRACK, 11.7 FEET NORTHWEST OF THE EXTENDED CENTERLINE OF
 HT0551'MURCHISON DRIVE, 2.8 FEET WEST OF THE CENTER OF A 28-INCH
 HT0551'MANHOLE, 0.7 FOOT EAST OF THE WEST CORNER OF THE CONCRETE BOX,
 HT0551'AND ABOUT 2 FEET LOWER THAN THE TRACK.
 HT0551
 HT0551                          STATION RECOVERY (1983)
 HT0551
 HT0551'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1983
 HT0551'RECOVERED IN GOOD CONDITION.
 HT0551
 HT0551                          STATION RECOVERY (1986)
 HT0551
 HT0551'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0551'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT2430 ***********************************************************************
 HT2430  SACS        -  This is a Secondary Airport Control Station.
 HT2430  DESIGNATION -  X 1383
 HT2430  PID         -  HT2430
 HT2430  STATE/COUNTY-  CA/SAN MATEO
 HT2430  USGS QUAD   -  SAN MATEO (1997)
 HT2430
 HT2430                         *CURRENT SURVEY CONTROL
 HT2430  ___________________________________________________________________
 HT2430* NAD 83(2007)-  37 36 42.84271(N)    122 22 32.93442(W)     ADJUSTED
 HT2430* NAVD 88     -         1.84   (meters)       6.0    (feet)  GPS OBS
 HT2430  ___________________________________________________________________
 HT2430  EPOCH DATE  -       2007.00
 HT2430  X           -  -2,708,842.844 (meters)                     COMP
 HT2430  Y           -  -4,272,438.470 (meters)                     COMP
 HT2430  Z           -   3,871,391.091 (meters)                     COMP
 HT2430  LAPLACE CORR-           0.59  (seconds)                    DEFLEC09
 HT2430  ELLIP HEIGHT-         -30.788 (meters)         (02/10/07) ADJUSTED
 HT2430  GEOID HEIGHT-         -32.60  (meters)                     GEOID09
 HT2430
 HT2430  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 HT2430  Type    PID    Designation                      North   East  Ellip
 HT2430  -------------------------------------------------------------------
 HT2430  NETWORK HT2430 X 1383                            0.53   0.74   3.10
 HT2430  -------------------------------------------------------------------
 HT2430
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HT2430.This mark is at San Francisco Intl Airport (SFO)
HT2430
HT2430.The horizontal coordinates were established by GPS observations
HT2430.and adjusted by the National Geodetic Survey in February 2007.
HT2430
HT2430.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
HT2430.See National Readjustment for more information.
HT2430.The horizontal coordinates are valid at the epoch date displayed above.
HT2430.The epoch date for horizontal control is a decimal equivalence
HT2430.of Year/Month/Day.
HT2430
HT2430.The orthometric height was determined by GPS observations and a
HT2430.high-resolution geoid model.
HT2430
HT2430.GPS derived orthometric heights for airport stations designated as
HT2430.PACS or SACS are published to 2 decimal places.  This maintains
HT2430.centimeter relative accuracy between the PACS and SACS.  It does
HT2430.not indicate centimeter accuracy relative to other marks which are
HT2430.part of the NAVD 88 network.
HT2430
HT2430.The X, Y, and Z were computed from the position and the ellipsoidal ht.
HT2430
HT2430.The Laplace correction was computed from DEFLEC09 derived deflections.
HT2430
HT2430.The ellipsoidal height was determined by GPS observations
HT2430.and is referenced to NAD 83.
HT2430
HT2430.The geoid height was determined by GEOID09.
HT2430
HT2430;                   North         East     Units Scale Factor Converg.
HT2430;SPC CA 3     -   625,059.178 1,834,400.390   MT  0.99993211   -1 08 54.4
HT2430;SPC CA 3     - 2,050,714.99  6,018,361.95   sFT  0.99993211   -1 08 54.4
HT2430;UTM  10      - 4,162,939.168   555,089.591   MT  0.99963738   +0 22 51.4
HT2430
HT2430!             -  Elev Factor  x  Scale Factor =   Combined Factor
HT2430!SPC CA 3     -   1.00000483  x   0.99993211  =   0.99993694
HT2430!UTM  10      -   1.00000483  x   0.99963738  =   0.99964221
HT2430
HT2430                          SUPERSEDED SURVEY CONTROL
HT2430
HT2430  NAD 83(1998)-  37 36 42.83405(N)    122 22 32.92625(W) AD(1998.50) 1
HT2430  ELLIP H (05/31/01)  -30.770  (m)                       GP(1998.50) 2 1
HT2430  NAD 83(1992)-  37 36 42.82728(N)    122 22 32.92011(W) AD(1991.35) 3
HT2430  NAD 83(1992)-  37 36 42.82738(N)    122 22 32.92013(W) AD(1991.35) 3
HT2430  ELLIP H (11/17/92)  -30.651  (m)                       GP(1991.35) 5 1
HT2430  NAD 83(1986)-  37 36 42.82510(N)    122 22 32.91626(W) AD(1984.00) 3
HT2430  NGVD 29 (10/13/92)    1.02   (m)            3.3    (f) LEVELING    3
HT2430
HT2430.Superseded values are not recommended for survey control.
HT2430.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT2430.See file dsdata.txt to determine how the superseded data were derived.
HT2430
HT2430_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG5508962939(NAD 83)
HT2430_MARKER: I = METAL ROD
HT2430_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
HT2430_SP_SET: STAINLESS STEEL ROD
HT2430_STAMPING: X 1383 1986
HT2430_MARK LOGO: NGS
HT2430_PROJECTION: PROJECTING 1 CENTIMETERS
HT2430_MAGNETIC: N = NO MAGNETIC MATERIAL
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HT2430_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
HT2430_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
HT2430+SATELLITE: SATELLITE OBSERVATIONS - January 29, 2002
HT2430_ROD/PIPE-DEPTH: 19.5 meters
HT2430
HT2430  HISTORY     - Date     Condition        Report By
HT2430  HISTORY     - 1986     MONUMENTED       NGS
HT2430  HISTORY     - 19920618 GOOD             NGS
HT2430  HISTORY     - 20001205 GOOD             NGS
HT2430  HISTORY     - 20020129 GOOD             NGS
HT2430
HT2430                          STATION DESCRIPTION
HT2430
HT2430'DESCRIBED BY NATIONAL GEODETIC SURVEY 1986
HT2430'IN SAN FRANCISCO INTL AIRPORT.
HT2430'THE MARK IS ABOVE LEVEL WITH THE ASPHALT.
HT2430'IN SAN FRANCISCO INTERNATIONAL AIRPORT, ABOUT 1.0 KM (0.6 MI)
HT2430'EAST-SOUTHEAST OF THE CENTER OF THE MAIN TERMINAL PARKING GARAGE, SET
HT2430'THROUGH THE ASPHALT AND NEAR THE CENTER OF THE ASPHALT TRIANGLE
HT2430'INTERSECTION OF TAXIWAY L AND G, 32.6 METERS (107 FT) WEST-NORTHWEST
HT2430'OF THE CENTERLINE OF TAXIWAY L, 3.7 METERS (12.0 FT) EAST-SOUTHEAST OF
HT2430'THE EXTENDED CENTERLINE OF TAXIWAY G, 4.0 METERS (13.0 FT) SOUTHEAST
HT2430'OF THE SOUTH CORNER OF A 4- BY 4-FOOT CATCH BASIN.  NOTE--ACCESS TO
HT2430'DATUM POINT IS HAD THROUGH A 5-INCH LOGO CAP.
HT2430
HT2430                          STATION RECOVERY (1992)
HT2430
HT2430'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1992
HT2430'CALL AT LEAST A WEEK IN ADVANCE TO MAKE ARRANGEMENTS TO BE ESCORTED TO
HT2430'STATION.  NEW FAA SECURITY REQUIREMENTS MAY SPECIFY BADGES, TRUCK TAG
HT2430'NUMBERS, PERSONNEL NAME AND IDENTIFICATION.  EAR PROTECTION IS
HT2430'SUGGESTED.
HT2430'STATION IS LOCATED AT THE SAN FRANCISCO INTERNATIONAL AIRPORT, ABOUT 1
HT2430'KM (0.6 MI) EAST-SOUTHEAST OF THE CONTROL TOWER, IN A PAVED
HT2430'TRIANGULAR-SHAPED PLOT BORDERED BY L TAXI, G TAXI NORTH, AND G TAXI
HT2430'SOUTH.  OWNERSHIP--CITY AND COUNTY OF SAN FRANCISCO, SAN FRANCISCO
HT2430'AIRPORT COMMISSION. SAN FRANCISCO, CA 94102.  CONTACT GLEN BROTMAN,
HT2430'AIRFIELD OPERATIONS, PHONE 415-876-2223 FOR ACCESS.  CHIEF AIRPORT
HT2430'SURVEYOR RAYMOND MASON, PHONE 415-737-7765, IS FAMILIAR WITH THE
HT2430'STATION SITE.
HT2430'STATION MARK IS A PUNCH HOLE TOP CENTER ON A STEEL ROD ENCASED IN A
HT2430'PVC PIPE WITH LOGO CAP PROJECTING 2 CM.  IT IS 1.2 PACE SOUTHWEST OF
HT2430'A FIBERGLASS WITNESS POST, 4 PACES SOUTHEAST OF THE SOUTHEAST CORNER
HT2430'OF A CATCH BASIN, 23 PACES WEST OF THE WEST EDGE OF L TAXI, 34 PACES
HT2430'SOUTHEAST OF THE EDGE OF G TAXI NORTH, AND 30 PACES NORTHEAST OF THE
HT2430'EDGE OF G TAXI SOUTH.
HT2430'DESCRIBED BY G.R.HEID
HT2430
HT2430                          STATION RECOVERY (2000)
HT2430
HT2430'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2000 (BW)
HT2430'THIS STATION IS DESIGNATED AS A SENONDARY AIRPORT CONTROL
HT2430'STATION (SACS).
HT2430'
HT2430'THE STATION IS LOCATED AT THE SAN FRANCISCO INTERNATIONAL AIRPORT
HT2430'IN A TRIANGULAR CONCRETE ISLAND SOUTHEAST OF RUNWAY 1R-19L,
HT2430'BORDERED BY TAXIWAYS L TO THE SOUTHEAST, TAXIWAY G-NORTH, ON THE
HT2430'NORTH, AND G-SOUTH TO THE SOUTH.
HT2430'
HT2430'OWNERSHIP--THE CITY AND COUNTY OS SAN FRANCISCO, SAN FRANCISCO
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 HT2430'AIRPORT COMMISSION, SAN FRANCISCO CA 94102.
 HT2430'FOR ACCESS--CONTACT--AIRFIELD OPERATIONS--GLEN BROTMAN,
 HT2430'PHONE-650-794-3349.  CHIEF AIRPORT SURVEYOR--HUGO TUPAC,
 HT2430'PHONE--650-821-7770, FAX--650-635-2246.  FAA FACILITIES MANAGER--PAUL
 HT2430'CANDELARIE, PHONE--650-876-2839.
 HT2430'
 HT2430'NOTE--CONTACT THE AIRPORT A MINIMUM OF ONE WEEK IN ADVANCE TO
 HT2430'MAKE ARRANGEMENTS FOR AN ESCORT.  BADGES AND VEHICLE PASSES ARE
 HT2430'REQUIRED.   ESCORT BY AN AIRPORT SAFETY OFFICIAL IS MANDITORY WHILE
 HT2430'WORKING AROUND RUNWAYS.  AIRPORT SURVEY PERSONNEL CAN ESCORT
 HT2430'YOU TO ALL STATION ON THE AIRPORT.  EAR PROTECTION IS HIGHLY
 HT2430'ADVISED.
 HT2430'
 HT2430'TO REACH THE STATION FROM THE OVERPASS OF HIGHWAY 101 NORTH AND
 HT2430'MILLBRAE AVENUE.  TAKE THE MILLBRAE EXIT EAST ON MILLBRAE AVENUE
 HT2430'OFF OF HIGHWAY 101 NORTH AND GO 0.3 MILE TO SOUTH MCDANALD
 HT2430'AVENUE.  TURN LEFT, WEST, ONTO SOUTH MCDONALD AVENUE AND
 HT2430'CONTINUE FOR 0.02 MILES TO MILLBRAE GATE.  THERE IS A CALL BOX AT THE
 HT2430'GATE TO CONTACT AIRPORT AUTHORITIES TO OPEN THE GATE AND
 HT2430'PROVIDE ESCORT.  ADVANCED ARRANGEMENTS CAN BE MADE FOR AIRPORT
 HT2430'PERSONNEL TO MEET YOU AT THE GATE AT SPECIFIC TIMES AND ESCORT
 HT2430'YOU ON THE AIRPORT.  PASS THROUGH THE GATE ON ACCESS ROAD (OLD
 HT2430'BAYSHORE ROAD)  AND CONTINUE NORTHWEST FOR 0.05 MILES TO THE
 HT2430'AIRPORT SERVICE ROAD, TURNING RIGHT, NORTHEAST, ON THE SERVICE
 HT2430'ROAD FOR 0.5 MILES TO THE STATION ON THE LEFT.
 HT2430'
 HT2430'THE STATION IS IN THE CENTER OF THE CONCRETE ISLAND, 4 M (13.12 FT)
 HT2430'SOUTHEAST OF THE SOUTHEAST CORNER OF A CATCH BASIN, 22 M (72.18 FT)
 HT2430'WEST OF THE WEST EDGE OF TAXIWAY L, 33 M (108.27 FT) SOUTHEAST OF
 HT2430'THE SOUTHEAST EDGE OF TAXIWAY G-NORTH, 29 M NORTHEAST OF THE
 HT2430'NORTHEAST EDGE OF TAXIWAY G-SOUTH.
 HT2430'
 HT2430'NOTE--SANDBAGS ARE HIGHLY RECOMMENDED FOR ANY TROPOD SETUP
 HT2430'DUE TO CONCRETE BASE AND AIRCRAFT TURBULANCE.
 HT2430'
 HT2430
 HT2430                          STATION RECOVERY (2002)
 HT2430
 HT2430'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2002 (DAH)
 HT2430'RECOVERED AS DESCRIBED
 HT2430'
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0548 ***********************************************************************
 HT0548  DESIGNATION -  Z 813
 HT0548  PID         -  HT0548
 HT0548  STATE/COUNTY-  CA/SAN MATEO
 HT0548  USGS QUAD   -  MONTARA MOUNTAIN (1997)
 HT0548
 HT0548                         *CURRENT SURVEY CONTROL
 HT0548  ___________________________________________________________________
 HT0548* NAD 83(1986)-  37 36 48.     (N)    122 23 59.     (W)     SCALED
 HT0548* NAVD 88     -         2.56   (+/-2cm)       8.4    (feet)  VERTCON
 HT0548  ___________________________________________________________________
 HT0548  GEOID HEIGHT-        -32.62  (meters)                      GEOID09
 HT0548  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0548
 HT0548.The horizontal coordinates were scaled from a topographic map and have
 HT0548.an estimated accuracy of +/- 6 seconds.
 HT0548
 HT0548.The NAVD 88 height was computed by applying the VERTCON shift value to
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 HT0548.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0548.The vertical order pertains to the NGVD 29 superseded value.
 HT0548
 HT0548.The geoid height was determined by GEOID09.
 HT0548
 HT0548;                    North         East     Units  Estimated Accuracy
 HT0548;SPC CA 3     -   625,260.    1,832,290.      MT  (+/- 180 meters Scaled)
 HT0548
 HT0548                          SUPERSEDED SURVEY CONTROL
 HT0548
 HT0548  NGVD 29 (??/??/92)    1.718  (m)           5.64   (f) ADJ UNCH    1 2
 HT0548
 HT0548.Superseded values are not recommended for survey control.
 HT0548.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0548.See file dsdata.txt to determine how the superseded data were derived.
 HT0548
 HT0548_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG529630(NAD 83)
 HT0548_MARKER: DB = BENCH MARK DISK
 HT0548_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT0548_SP_SET: CULVERT
 HT0548_STAMPING: Z 813 1952
 HT0548_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0548
 HT0548  HISTORY     - Date     Condition        Report By
 HT0548  HISTORY     - 1952     MONUMENTED       CGS
 HT0548  HISTORY     - 1956     GOOD             NGS
 HT0548  HISTORY     - 1965     GOOD             NGS
 HT0548  HISTORY     - 1986     MARK NOT FOUND   NGS
 HT0548
 HT0548                          STATION DESCRIPTION
 HT0548
 HT0548'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0548'1.1 MI NW FROM MILLBRAE.
 HT0548'1.1 MILES NORTHWEST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
 HT0548'FROM THE STATION AT MILLBRAE, 1.4 MILES SOUTHEAST OF THE
 HT0548'STATION AT SAN BRUNO, ABOUT 0.2 MILE NORTHWEST FROM THE CROSSING
 HT0548'OF CENTER STREET, AT 16-INCH IRON PIPE CULVERT NO. 12.52, IN
 HT0548'THE TOP OF THE NORTHWEST END OF THE SOUTHWEST CONCRETE HEAD
 HT0548'WALL, 19.4 FEET SOUTHWEST OF THE SOUTHWEST RAIL OF THE SOUTHWEST
 HT0548'MAIN TRACK, AND ABOUT 6 FEET LOWER THAN THE TRACK.
 HT0548
 HT0548                          STATION RECOVERY (1965)
 HT0548
 HT0548'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0548'RECOVERED IN GOOD CONDITION.
 HT0548
 HT0548                          STATION RECOVERY (1986)
 HT0548
 HT0548'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0548'NOT RECOVERED.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0547 ***********************************************************************
 HT0547  DESIGNATION -  Y 813
 HT0547  PID         -  HT0547
 HT0547  STATE/COUNTY-  CA/SAN MATEO
 HT0547  USGS QUAD   -  MONTARA MOUNTAIN (1997)
 HT0547
 HT0547                         *CURRENT SURVEY CONTROL
 HT0547  ___________________________________________________________________
 HT0547* NAD 83(1986)-  37 37 08.     (N)    122 24 15.     (W)     SCALED
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HT0547* NAVD 88     -         3.97   (+/-2cm)      13.0    (feet)  VERTCON
HT0547  ___________________________________________________________________
HT0547  GEOID HEIGHT-         -32.62  (meters)                     GEOID09
HT0547  VERT ORDER  -  FIRST     CLASS II (See Below)
HT0547
HT0547.The horizontal coordinates were scaled from a topographic map and have
HT0547.an estimated accuracy of +/- 6 seconds.
HT0547
HT0547.The NAVD 88 height was computed by applying the VERTCON shift value to
HT0547.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
HT0547.The vertical order pertains to the NGVD 29 superseded value.
HT0547
HT0547.The geoid height was determined by GEOID09.
HT0547
HT0547;                    North         East    Units  Estimated Accuracy
HT0547;SPC CA 3     -   625,890.    1,831,910.      MT  (+/- 180 meters Scaled)
HT0547
HT0547                          SUPERSEDED SURVEY CONTROL
HT0547
HT0547  NGVD 29 (??/??/92)    3.126  (m)           10.26   (f) ADJ UNCH    1 2
HT0547
HT0547.Superseded values are not recommended for survey control.
HT0547.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0547.See file dsdata.txt to determine how the superseded data were derived.
HT0547
HT0547_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG525636(NAD 83)
HT0547_MARKER: DB = BENCH MARK DISK
HT0547_SETTING: 32 = SET IN A RETAINING WALL OR CONCRETE LEDGE
HT0547_SP_SET: CULVERT HEADWALL
HT0547_STAMPING: Y 813 1952
HT0547_MARK LOGO: CGS
HT0547_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
HT0547+STABILITY: SURFACE MOTION
HT0547_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
HT0547+SATELLITE: SATELLITE OBSERVATIONS - October 31, 2004
HT0547
HT0547  HISTORY     - Date     Condition        Report By
HT0547  HISTORY     - 1952     MONUMENTED       CGS
HT0547  HISTORY     - 1964     GOOD             NGS
HT0547  HISTORY     - 1986     GOOD             NGS
HT0547  HISTORY     - 20041031 GOOD             SMCSS
HT0547  HISTORY     - 20061220 MARK NOT FOUND   CONDOR
HT0547
HT0547                          STATION DESCRIPTION
HT0547
HT0547'DESCRIBED BY NATIONAL GEODETIC SURVEY 1964
HT0547'1 MI SE FROM SAN BRUNO.
HT0547'0.95 MILES SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
HT0547'FROM THE STATION AT SAN BRUNO, 6 RAILS NORTHWEST ALONG THE
HT0547'RAILROAD FROM THE LOMITA PARK PASSENGER STOP, IN THE TOP OF
HT0547'THE SOUTHEAST END OF THE SOUTHWEST CONCRETE HEAD WALL OF TWIN
HT0547'36-INCH CORRUGATED METAL PIPE CULVERT 11.94, 18.1 FEET SOUTHWEST
HT0547'OF THE SOUTHWEST RAIL OF THE SOUTHWEST MAIN TRACK, AND ABOUT 2
HT0547'FEET LOWER THAN THE TRACK.
HT0547
HT0547                          STATION RECOVERY (1986)
HT0547
HT0547'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
HT0547'RECOVERED IN GOOD CONDITION. THE DESCRIPTION IS ADEQUATE EXCEPT ADD
HT0547'NEAR THE EAST END OF SAN FELIPE AVENUE.
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HT0547
HT0547                          STATION RECOVERY (2004)
HT0547
HT0547'RECOVERY NOTE BY SMITH AND COMPANY SURVEYING SRV INC 2004 (MW)
HT0547'RECOVERED IN GOOD CONDITION.
HT0547
HT0547                          STATION RECOVERY (2006)
HT0547
HT0547'RECOVERY NOTE BY CONDOR TECHNOLOGIES 2006 (DLS)
HT0547'DESTROYED- SOMEBODY POPPED THAT DISK RIGHT OFF THE HEADWALL- LEFT THE
HT0547'IMPRINT IN THE CONCRETE
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
HT0541 ***********************************************************************
HT0541  DESIGNATION -  35
HT0541  PID         -  HT0541
HT0541  STATE/COUNTY-  CA/SAN MATEO
HT0541  USGS QUAD   -  SAN MATEO (1997)
HT0541
HT0541                         *CURRENT SURVEY CONTROL
HT0541  ___________________________________________________________________
HT0541* NAD 83(1986)-  37 37 09.     (N)    122 22 23.     (W)     SCALED
HT0541* NAVD 88     -         2.62   (+/-2cm)       8.6    (feet)  VERTCON
HT0541  ___________________________________________________________________
HT0541  GEOID HEIGHT-        -32.60  (meters)                      GEOID09
HT0541  VERT ORDER  -  FIRST     CLASS II (See Below)
HT0541
HT0541.This mark is at San Francisco Intl Airport (SFO)
HT0541
HT0541.The horizontal coordinates were scaled from a topographic map and have
HT0541.an estimated accuracy of +/- 6 seconds.
HT0541
HT0541.The NAVD 88 height was computed by applying the VERTCON shift value to
HT0541.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
HT0541.The vertical order pertains to the NGVD 29 superseded value.
HT0541
HT0541.The geoid height was determined by GEOID09.
HT0541
HT0541;                   North         East     Units  Estimated Accuracy
HT0541;SPC CA 3     -   625,860.    1,834,660.      MT  (+/- 180 meters Scaled)
HT0541
HT0541                          SUPERSEDED SURVEY CONTROL
HT0541
HT0541  NGVD 29 (??/??/92)    1.787  (m)            5.86   (f) ADJ UNCH    1 2
HT0541
HT0541.Superseded values are not recommended for survey control.
HT0541.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0541.See file dsdata.txt to determine how the superseded data were derived.
HT0541
HT0541_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG553637(NAD 83)
HT0541_MARKER: Z = SEE DESCRIPTION
HT0541_SETTING: 45 = UNSPECIFIED DEEP UNSLEEVED SETTING (10 FT.+)
HT0541_SP_SET: 60 FT IRON PIPE
HT0541_MARK LOGO: USE
HT0541_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
HT0541
HT0541  HISTORY     - Date     Condition        Report By
HT0541  HISTORY     - 1956     MONUMENTED       DOD
HT0541  HISTORY     - 1972     GOOD             NGS
HT0541  HISTORY     - 1977     GOOD             NGS
HT0541  HISTORY     - 1986     GOOD             NGS
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 HT0541
 HT0541                          STATION DESCRIPTION
 HT0541
 HT0541'DESCRIBED BY US DEPARTMENT OF DEFENSE 1956
 HT0541'AT SAN FRANCISCO AIRPORT.
 HT0541'AT THE SAN FRANCISCO INTERNATIONAL AIRPORT, ABOUT 0.5 MILE
 HT0541'NORTHEAST OF THE NEW TERMINAL BUILDING, AT THE CROSSING AND
 HT0541'ON THE WEST EDGE OF RUNWAY 19-L 1-R, BETWEEN RUNWAYS 28 R 10 L
 HT0541'AND 28 L 10 R, 294 FEET NORTH OF THE NORTH EDGE OF RUNWAY
 HT0541'28 L 10 R, 250 FEET EAST OF THE T.V.O.R BUILDING (C.A.A.), 219
 HT0541'FEET SOUTH OF THE SOUTH EDGE OF RUNWAY 28 R 10 L, 24.1 FEET
 HT0541'NORTHEAST OF RUNWAY LIGHT NO. D 57, AND ABOUT 1 1/2 FEET LOWER
 HT0541'THAN THE RUNWAY.  NOTE-- THE TOP OF A 1-INCH IRON PIPE DROVE
 HT0541'60-FEET INTO THE GROUND, ACCESS TO WHICH IS HAD THROUGH AN
 HT0541'8-INCH CLAY PIPE WITH A CONCRETE LID.
 HT0541
 HT0541                          STATION RECOVERY (1972)
 HT0541
 HT0541'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1972
 HT0541'RECOVERED IN GOOD CONDITION.
 HT0541
 HT0541                          STATION RECOVERY (1977)
 HT0541
 HT0541'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
 HT0541'RECOVERED IN GOOD CONDITION.
 HT0541
 HT0541                          STATION RECOVERY (1986)
 HT0541
 HT0541'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0541'RECOVERED IN GOOD CONDITION EXCEPT THAT THE MARK IS THE TOP OF THE
 HT0541'1-INCH IRON PIPE.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0540 ***********************************************************************
 HT0540  DESIGNATION -  34
 HT0540  PID         -  HT0540
 HT0540  STATE/COUNTY-  CA/SAN MATEO
 HT0540  USGS QUAD   -  MONTARA MOUNTAIN (1997)
 HT0540
 HT0540                         *CURRENT SURVEY CONTROL
 HT0540  ___________________________________________________________________
 HT0540* NAD 83(1986)-  37 37 16.     (N)    122 22 39.     (W)     SCALED
 HT0540* NAVD 88     -         2.07   (+/-2cm)       6.8    (feet)  VERTCON
 HT0540  ___________________________________________________________________
 HT0540  GEOID HEIGHT-        -32.61  (meters)                      GEOID09
 HT0540  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0540
 HT0540.This mark is at San Francisco Intl Airport (SFO)
 HT0540
 HT0540.The horizontal coordinates were scaled from a topographic map and have
 HT0540.an estimated accuracy of +/- 6 seconds.
 HT0540
 HT0540.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0540.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0540.The vertical order pertains to the NGVD 29 superseded value.
 HT0540
 HT0540.The geoid height was determined by GEOID09.
 HT0540
 HT0540;                   North         East    Units  Estimated Accuracy
 HT0540;SPC CA 3     -   626,080.    1,834,270.      MT  (+/- 180 meters Scaled)
 HT0540
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HT0540                          SUPERSEDED SURVEY CONTROL
HT0540
HT0540  NGVD 29 (??/??/92)    1.242  (m)            4.07   (f) ADJ UNCH    1 2
HT0540
HT0540.Superseded values are not recommended for survey control.
HT0540.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0540.See file dsdata.txt to determine how the superseded data were derived.
HT0540
HT0540_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG549639(NAD 83)
HT0540_MARKER: Z = SEE DESCRIPTION
HT0540_SETTING: 45 = UNSPECIFIED DEEP UNSLEEVED SETTING (10 FT.+)
HT0540_SP_SET: 60 FT IRON PIPE
HT0540_MARK LOGO: USE
HT0540_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
HT0540
HT0540  HISTORY     - Date     Condition        Report By
HT0540  HISTORY     - UNK      MONUMENTED       DOD
HT0540  HISTORY     - 1956     GOOD             NGS
HT0540  HISTORY     - 1977     GOOD             NGS
HT0540  HISTORY     - 1986     GOOD             NGS
HT0540
HT0540                          STATION DESCRIPTION
HT0540
HT0540'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
HT0540'AT SAN FRANCISCO AIRPORT.
HT0540'AT THE SAN FRANCISCO INTERNATIONAL AIRPORT, 0.3 MILE NORTHEAST
HT0540'ACROSS COUNTRY FROM THE NEW TERMINAL BUILDING, AT THE CROSSING
HT0540'OF TAXIWAY NO. 3, BETWEEN RUNWAYS 10L AND 10R, 285 FEET NORTHEAST
HT0540'OF THE NORTHEAST EDGE OF RUNWAY 10R, 213 FEET SOUTHWEST OF THE
HT0540'SOUTHWEST EDGE OF RUNWAY 10L, 91 FEET NORTHWEST OF THE NORTHWEST
HT0540'EDGE OF THE TAXIWAY, 5.5 FEET SOUTHWEST OF A BLACK AND YELLOW
HT0540'STRIPPED 4- BY 4-INCH POST, ABOUT 1 FOOT LOWER THAN THE RUNWAY,
HT0540'AND ABOUT 1 FOOT UNDERGROUND.  NOTE-- THE TOP OF A 1-INCH IRON
HT0540'PIPE DROVE 60-FEET INTO THE GROUND, ACCESS TO WHICH IS HAD
HT0540'THROUGH AN 8-INCH CLAY PIPE WITH A 10-INCH CONCRETE LID.
HT0540
HT0540                          STATION RECOVERY (1977)
HT0540
HT0540'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
HT0540'AT THE SAN FRANCISCO INTL AIRPORT, 0.3 MILE NORTHEAST ACROSS COUNTRY
HT0540'FROM THE NEW TERMINAL BUILDING, AT THE CROSSING OF TAXIWAY NO. E,
HT0540'BETWEEN RUNWAYS 10L AND 10R, 285 FEET NORTHEAST OF THE NORTHEAST EDGE
HT0540'OF RUNWAY 10R, 213 FEET SOUTHWEST OF THE SOUTHWEST EDGE OF RUNWAY
HT0540'10L, 91 FEET NORTHWEST OF THE NORTHWEST EDGE OF THE TAXIWAY NO.E,
HT0540'ABOUT 1 FOOT LOWER THAN THE RUNWAY, AND ABOUT 1 FOOT UNDERGROUND,
HT0540'SOUTH OF TAXIWAY NO. T. NOTE-- THE TOP OF A 1 INCH IRON PIPE DROVE 60
HT0540'FEET INTO THE GROUND, ACCESS TO WHICH IS HAD THROUGH AN 8 INCH CLAY
HT0540'PIPE WITH A 10 INCH CONCRETE LID.
HT0540
HT0540                          STATION RECOVERY (1986)
HT0540
HT0540'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
HT0540'RECOVERED IN GOOD CONDITION. NEW DESCRIPTION FOLLOWS. IN SAN FRANCISCO
HT0540'INTERNATIONAL AIRPORT, ABOUT 1.0 KM (0.6 MI) NORTHEAST OF THE MAIN
HT0540'TERMINAL PARKING GARAGE, 28.1 METERS (92.2 FT) NORTHWEST OF THE
HT0540'NORTHWEST PAINTED EDGE OF TAXIWAY E, 34.5 METERS (113 FT) NORTH OF THE
HT0540'WEST OF A 28L-10R RUNWAY SIGN, 25.1 METERS (82.3 FT) WEST-SOUTHWEST OF
HT0540'THE SOUTHERNMOST 1 OF 5 BLUE TAXI LIGHTS, BETWEEN 2 WITNESS POSTS.
HT0540'NOTE--THE MARK IS THE TOP OF A 1-INCH IRON PIPE SET 60 FT DEEP AND
HT0540'FLUSH WITH THE GROUND.
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 HT0540'THE MARK IS 0.3 METERS  S FROM  A WITNESS POST
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0537 ***********************************************************************
 HT0537  DESIGNATION -  R 737 C OF SF
 HT0537  PID         -  HT0537
 HT0537  STATE/COUNTY-  CA/SAN MATEO
 HT0537  USGS QUAD   -  MONTARA MOUNTAIN (1997)
 HT0537
 HT0537                         *CURRENT SURVEY CONTROL
 HT0537  ___________________________________________________________________
 HT0537* NAD 83(1986)-  37 37 20.     (N)    122 23 29.     (W)     SCALED
 HT0537* NAVD 88     -         1.73   (+/-2cm)       5.7    (feet)  VERTCON
 HT0537  ___________________________________________________________________
 HT0537  GEOID HEIGHT-         -32.61  (meters)                     GEOID09
 HT0537  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0537
 HT0537.This mark is at San Francisco Intl Airport (SFO)
 HT0537
 HT0537.The horizontal coordinates were scaled from a topographic map and have
 HT0537.an estimated accuracy of +/- 6 seconds.
 HT0537
 HT0537.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0537.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0537.The vertical order pertains to the NGVD 29 superseded value.
 HT0537
 HT0537.The geoid height was determined by GEOID09.
 HT0537
 HT0537;                    North         East     Units  Estimated Accuracy
 HT0537;SPC CA 3     -   626,230.    1,833,050.      MT  (+/- 180 meters Scaled)
 HT0537
 HT0537                          SUPERSEDED SURVEY CONTROL
 HT0537
 HT0537  NGVD 29 (??/??/92)    0.891  (m)            2.92   (f) ADJ UNCH    1 2
 HT0537
 HT0537.Superseded values are not recommended for survey control.
 HT0537.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0537.See file dsdata.txt to determine how the superseded data were derived.
 HT0537
 HT0537_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG537640(NAD 83)
 HT0537_MARKER: DD = SURVEY DISK
 HT0537_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0537_SP_SET: BUILDING
 HT0537_STAMPING: R 737 1944
 HT0537_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0537
 HT0537  HISTORY     - Date     Condition        Report By
 HT0537  HISTORY     - 1944     MONUMENTED       CA3290
 HT0537  HISTORY     - 1968     GOOD             NGS
 HT0537  HISTORY     - 1972     GOOD             NGS
 HT0537
 HT0537                          STATION DESCRIPTION
 HT0537
 HT0537'DESCRIBED BY NATIONAL GEODETIC SURVEY 1968
 HT0537'AT SAN FRANCISCO INTL AIRPORT.
 HT0537'AN UPDATED DESCRIPTION FOLLOWS-- AT THE SAN FRANCISCO INTERNATIONAL
 HT0537'AIRPORT, AT THE WEST CORNER OF A CONCRETE SHOP BUILDING OF
 HT0537'QANTAS AIRLINE, IN THE TOP OF A CONCRETE PROJECTION OF THE WEST
 HT0537'CORNER OF THE CONCRETE FOUNDATION, 59.2 FEET SOUTHWEST OF BENCH
 HT0537'MARK Y 736, 52.6 FEET EAST OF AND ACROSS A DRIVEWAY FROM
 HT0537'FIREHOUSE 1, 5.5 FEET SOUTHEAST OF THE SOUTHEAST CURB OF THE
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 HT0537'DRIVEWAY, 0.7 FOOT NORTHWEST OF THE NORTHWEST FACE OF THE
 HT0537'BUILDING AND ABOUT 1 FOOT HIGHER THAN A SIDEWALK.  NOTE-- NUMBERS
 HT0537'5.953 HAVE BEEN PUNCHED ON THE DISK WITH A SHARP OBJECT.
 HT0537
 HT0537                          STATION RECOVERY (1972)
 HT0537
 HT0537'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1972
 HT0537'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0538 ***********************************************************************
 HT0538  DESIGNATION -  Y 736 C OF SF
 HT0538  PID         -  HT0538
 HT0538  STATE/COUNTY-  CA/SAN MATEO
 HT0538  USGS QUAD   -  MONTARA MOUNTAIN (1997)
 HT0538
 HT0538                         *CURRENT SURVEY CONTROL
 HT0538  ___________________________________________________________________
 HT0538* NAD 83(1986)-  37 37 20.     (N)    122 23 29.     (W)     SCALED
 HT0538* NAVD 88     -         1.73   (+/-2cm)       5.7    (feet)  VERTCON
 HT0538  ___________________________________________________________________
 HT0538  GEOID HEIGHT-         -32.61  (meters)                     GEOID09
 HT0538  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0538
 HT0538.This mark is at San Francisco Intl Airport (SFO)
 HT0538
 HT0538.The horizontal coordinates were scaled from a topographic map and have
 HT0538.an estimated accuracy of +/- 6 seconds.
 HT0538
 HT0538.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0538.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0538.The vertical order pertains to the NGVD 29 superseded value.
 HT0538
 HT0538.The geoid height was determined by GEOID09.
 HT0538
 HT0538;                    North         East     Units  Estimated Accuracy
 HT0538;SPC CA 3     -   626,230.    1,833,050.      MT  (+/- 180 meters Scaled)
 HT0538
 HT0538                          SUPERSEDED SURVEY CONTROL
 HT0538
 HT0538  NGVD 29 (??/??/92)    0.896  (m)            2.94   (f) ADJ UNCH    1 2
 HT0538
 HT0538.Superseded values are not recommended for survey control.
 HT0538.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0538.See file dsdata.txt to determine how the superseded data were derived.
 HT0538
 HT0538_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG537640(NAD 83)
 HT0538_MARKER: DD = SURVEY DISK
 HT0538_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0538_SP_SET: BUILDING
 HT0538_STAMPING: Y 736 1944
 HT0538_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0538
 HT0538  HISTORY     - Date     Condition        Report By
 HT0538  HISTORY     - 1944     MONUMENTED       CA3290
 HT0538  HISTORY     - 1968     GOOD             NGS
 HT0538  HISTORY     - 1972     GOOD             NGS
 HT0538
 HT0538                          STATION DESCRIPTION
 HT0538
 HT0538'DESCRIBED BY NATIONAL GEODETIC SURVEY 1968
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 HT0538'AT SAN FRANCISCO AIRPORT.
 HT0538'AN UPDATED DESCRIPTION FOLLOWS-- AT THE SAN FRANCISCO INTERNATIONAL
 HT0538'AIRPORT AT THE NORTHEAST CORNER OF A CONCRETE SHOP BUILDING OF
 HT0538'QANTAS AIRLINE, IN THE TOP OF A PROJECTION OF THE NORTHEAST
 HT0538'CORNER OF THE CONCRETE FOUNDATION, 47.0 FEET SOUTH OF THE
 HT0538'SOUTHEAST CORNER OF FIREHOUSE 1.  IT IS 1.0 FOOT NORTH OF THE
 HT0538'NORTH FACE OF THE SHOP BUILDING, AND ABOUT 1 FOOT HIGHER THAN
 HT0538'THE DRIVEWAY.
 HT0538
 HT0538                          STATION RECOVERY (1972)
 HT0538
 HT0538'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1972
 HT0538'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0542 ***********************************************************************
 HT0542  DESIGNATION -  L 553
 HT0542  PID         -  HT0542
 HT0542  STATE/COUNTY-  CA/SAN MATEO
 HT0542  USGS QUAD   -  SAN MATEO (1997)
 HT0542
 HT0542                         *CURRENT SURVEY CONTROL
 HT0542  ___________________________________________________________________
 HT0542* NAD 83(1986)-  37 37 28.     (N)    122 22 31.     (W)     SCALED
 HT0542* NAVD 88     -         3.02   (+/-2cm)       9.9    (feet)  VERTCON
 HT0542  ___________________________________________________________________
 HT0542  GEOID HEIGHT-         -32.60  (meters)                     GEOID09
 HT0542  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0542
 HT0542.This mark is at San Francisco Intl Airport (SFO)
 HT0542
 HT0542.The horizontal coordinates were scaled from a topographic map and have
 HT0542.an estimated accuracy of +/- 6 seconds.
 HT0542
 HT0542.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0542.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0542.The vertical order pertains to the NGVD 29 superseded value.
 HT0542
 HT0542.The geoid height was determined by GEOID09.
 HT0542
 HT0542;                   North         East    Units  Estimated Accuracy
 HT0542;SPC CA 3     -   626,450.    1,834,480.      MT  (+/- 180 meters Scaled)
 HT0542
 HT0542                          SUPERSEDED SURVEY CONTROL
 HT0542
 HT0542  NGVD 29 (??/??/92)    2.192  (m)           7.19   (f) ADJ UNCH    1 2
 HT0542
 HT0542.Superseded values are not recommended for survey control.
 HT0542.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0542.See file dsdata.txt to determine how the superseded data were derived.
 HT0542
 HT0542_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG551643(NAD 83)
 HT0542_MARKER: DB = BENCH MARK DISK
 HT0542_SETTING: 34 = SET IN THE FOOTINGS OF SMALL/MEDIUM STRUCTURES
 HT0542_SP_SET: BUILDING FOUNDATION
 HT0542_STAMPING: L 553 1956
 HT0542_MARK LOGO: CGS
 HT0542_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
 HT0542+STABILITY: SURFACE MOTION
 HT0542
 HT0542  HISTORY     - Date     Condition        Report By
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 HT0542  HISTORY     - 1956     MONUMENTED       CGS
 HT0542  HISTORY     - 1972     GOOD             NGS
 HT0542  HISTORY     - 1983     GOOD             USGS
 HT0542  HISTORY     - 1986     GOOD             NGS
 HT0542  HISTORY     - 20060129 GOOD             GEOCAC
 HT0542
 HT0542                          STATION DESCRIPTION
 HT0542
 HT0542'DESCRIBED BY COAST AND GEODETIC SURVEY 1956
 HT0542'AT SAN FRANCISCO AIRPORT.
 HT0542'AT THE SAN FRANCISCO INTERNATIONAL AIRPORT, AT FIREHOUSE NO.
 HT0542'3, IN THE TOP OF THE SOUTHEAST EDGE OF THE CONCRETE FOUNDATION
 HT0542'AND AT THE EAST CORNER OF THE BUILDING, 0.5 FOOT SOUTH OF THE
 HT0542'EAST CORNER OF THE BUILDING, 0.3 FOOT NORTHEAST OF THE NORTHEAST
 HT0542'EDGE OF A CONCRETE DRAIN BOX, 0.4 FOOT ABOVE THE GROUND, AND
 HT0542'ABOUT 0.6 FOOT HIGHER THAN A DRIVEWAY.
 HT0542
 HT0542                          STATION RECOVERY (1972)
 HT0542
 HT0542'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1972
 HT0542'RECOVERED IN GOOD CONDITION.
 HT0542
 HT0542                          STATION RECOVERY (1983)
 HT0542
 HT0542'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1983
 HT0542'RECOVERED IN GOOD CONDITION.
 HT0542
 HT0542                          STATION RECOVERY (1986)
 HT0542
 HT0542'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0542'RECOVERED IN GOOD CONDITION. THE DESCRIPTION IS ADEQUATE EXCEPT ADD AT
 HT0542'FIREHOUSE NUMBER 2 NOT NUMBER 3.
 HT0542
 HT0542                          STATION RECOVERY (2006)
 HT0542
 HT0542'RECOVERY NOTE BY GEOCACHING 2006 (SW)
 HT0542'OLD FIREHOUSE IS NOW USED BY A TENANT AS A GARAGE FOR VEHICLE
 HT0542'MAINTENANCE.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0534 ***********************************************************************
 HT0534  DESIGNATION -  Z 736 C OF SF
 HT0534  PID         -  HT0534
 HT0534  STATE/COUNTY-  CA/SAN MATEO
 HT0534  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0534
 HT0534                         *CURRENT SURVEY CONTROL
 HT0534  ___________________________________________________________________
 HT0534* NAD 83(1986)-  37 37 30.     (N)    122 23 36.     (W)     SCALED
 HT0534* NAVD 88     -         1.03   (+/-2cm)       3.4    (feet)  VERTCON
 HT0534  ___________________________________________________________________
 HT0534  GEOID HEIGHT-         -32.61  (meters)                     GEOID09
 HT0534  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0534
 HT0534.This mark is at San Francisco Intl Airport (SFO)
 HT0534
 HT0534.The horizontal coordinates were scaled from a topographic map and have
 HT0534.an estimated accuracy of +/- 6 seconds.
 HT0534
 HT0534.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0534.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
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HT0534.The vertical order pertains to the NGVD 29 superseded value.
HT0534
HT0534.The geoid height was determined by GEOID09.
HT0534
HT0534;                    North         East    Units  Estimated Accuracy
HT0534;SPC CA 3     -   626,540.    1,832,880.      MT  (+/- 180 meters Scaled)
HT0534
HT0534                          SUPERSEDED SURVEY CONTROL
HT0534
HT0534  NGVD 29 (??/??/92)    0.197  (m)           0.65   (f) ADJ UNCH    1 2
HT0534
HT0534.Superseded values are not recommended for survey control.
HT0534.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0534.See file dsdata.txt to determine how the superseded data were derived.
HT0534
HT0534_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG535643(NAD 83)
HT0534_MARKER: DD = SURVEY DISK
HT0534_SETTING: 30 = SET IN A LIGHT STRUCTURE
HT0534_SP_SET: CULVERT
HT0534_STAMPING: Z 736 1944
HT0534_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
HT0534
HT0534  HISTORY     - Date     Condition         Report By
HT0534  HISTORY     - 1944     MONUMENTED        CA3290
HT0534  HISTORY     - 1956     GOOD              NGS
HT0534  HISTORY     - 1968     MARK NOT FOUND    NGS
HT0534
HT0534                          STATION DESCRIPTION
HT0534
HT0534'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
HT0534'AT SAN FRANCISCO AIRPORT.
HT0534'AT THE SAN FRANCISCO INTERNATIONAL AIRPORT, AT THE FORMER MAIN
HT0534'ENTRANCE, IN THE TOP OF THE CONCRETE HEAD WALL OF A CULVERT
HT0534'(BURIED BY A FILL) 270.0 FEET WEST OF THE SOUTHWEST CORNER OF
HT0534'THE FORMER ADMINISTRATION BUILDING, 84.0 FEET NORTHWEST OF A
HT0534'FIRE PLUG, 81.1 FEET SOUTHEAST OF BENCH MARK W 736, 23 FEET
HT0534'SOUTH OF THE SOUTH CURB OF THE EAST BOUND TRAFFIC LANES, 19 1/2
HT0534'FEET EAST OF THE CENTER LINE OF A PRIVATE ROAD LEADING SOUTH
HT0534'TO THE NEW ADMINISTRATION BUILDING, 1.3 FEET NORTH OF A WITNESS
HT0534'POST, AND ABOUT 2 1/2 FEET LOWER THAN THE ROAD.  NOTE-- ACCESS
HT0534'IS HAD TO MARK THROUGH A 6-INCH CLAY PIPE WITH A 10-INCH WOODEN
HT0534'COVER.
HT0534
HT0534                          STATION RECOVERY (1968)
HT0534
HT0534'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1968
HT0534'MARK NOT FOUND.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
HT0544 ***********************************************************************
HT0544  DESIGNATION -  42 C OF SF
HT0544  PID         -  HT0544
HT0544  STATE/COUNTY-  CA/SAN MATEO
HT0544  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
HT0544
HT0544                         *CURRENT SURVEY CONTROL
HT0544  ___________________________________________________________________
HT0544* NAD 83(1986)-  37 37 32.     (N)    122 22 34.     (W)     SCALED
HT0544* NAVD 88     -         3.63   (+/-2cm)      11.9    (feet)  VERTCON
HT0544  ___________________________________________________________________
HT0544  GEOID HEIGHT-        -32.61  (meters)                      GEOID09
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 HT0544  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0544
 HT0544.This mark is at San Francisco Intl Airport (SFO)
 HT0544
 HT0544.The horizontal coordinates were scaled from a topographic map and have
 HT0544.an estimated accuracy of +/- 6 seconds.
 HT0544
 HT0544.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0544.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0544.The vertical order pertains to the NGVD 29 superseded value.
 HT0544
 HT0544.The geoid height was determined by GEOID09.
 HT0544
 HT0544;                    North         East     Units  Estimated Accuracy
 HT0544;SPC CA 3     -   626,580.    1,834,410.      MT   (+/- 180 meters Scaled)
 HT0544
 HT0544                          SUPERSEDED SURVEY CONTROL
 HT0544
 HT0544  NGVD 29 (??/??/92)    2.807  (m)           9.21   (f) ADJ UNCH    1 2
 HT0544
 HT0544.Superseded values are not recommended for survey control.
 HT0544.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0544.See file dsdata.txt to determine how the superseded data were derived.
 HT0544
 HT0544_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG550644(NAD 83)
 HT0544_MARKER: Z = SEE DESCRIPTION
 HT0544_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT0544_SP_SET: STEEL LEG CONCRETE FOUNDATION
 HT0544_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0544
 HT0544  HISTORY     - Date     Condition        Report By
 HT0544  HISTORY     - UNK      MONUMENTED       CA3290
 HT0544  HISTORY     - 1956     GOOD             NGS
 HT0544
 HT0544                          STATION DESCRIPTION
 HT0544
 HT0544'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0544'AT SAN FRANCISCO AIRPORT.
 HT0544'AT THE SAN FRANCISCO INTERNATIONAL AIRPORT, AT THE RADAR TOWER,
 HT0544'ON THE TOP OF THE EAST CORNER OF THE NORTHEAST CONCRETE
 HT0544'FOUNDATION OF THE NORTHEAST STEEL LEG, 17.7 FEET EAST OF BENCH
 HT0544'MARK K 553 1956, ABOUT 1 1/2 FEET HIGHER THAN THE GROUND, AND
 HT0544'MARKED WITH WHITE PAINTED LETTERS AND NUMBERS B M 42.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0543 ***********************************************************************
 HT0543  DESIGNATION -  K 553
 HT0543  PID         -  HT0543
 HT0543  STATE/COUNTY-  CA/SAN MATEO
 HT0543  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0543
 HT0543                         *CURRENT SURVEY CONTROL
 HT0543  ___________________________________________________________________
 HT0543* NAD 83(1986)-  37 37 32.     (N)    122 22 34.     (W)     SCALED
 HT0543* NAVD 88     -         3.63   (+/-2cm)      11.9    (feet)  VERTCON
 HT0543  ___________________________________________________________________
 HT0543  GEOID HEIGHT-         -32.61  (meters)                     GEOID09
 HT0543  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0543
 HT0543.This mark is at San Francisco Intl Airport (SFO)
 HT0543
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 HT0543.The horizontal coordinates were scaled from a topographic map and have
 HT0543.an estimated accuracy of +/- 6 seconds.
 HT0543
 HT0543.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0543.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0543.The vertical order pertains to the NGVD 29 superseded value.
 HT0543
 HT0543.The geoid height was determined by GEOID09.
 HT0543
 HT0543;                    North         East     Units  Estimated Accuracy
 HT0543;SPC CA 3     -   626,580.    1,834,410.      MT  (+/- 180 meters Scaled)
 HT0543
 HT0543                          SUPERSEDED SURVEY CONTROL
 HT0543
 HT0543  NGVD 29 (??/??/92)    2.807  (m)            9.21    (f) ADJ UNCH    1 2
 HT0543
 HT0543.Superseded values are not recommended for survey control.
 HT0543.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0543.See file dsdata.txt to determine how the superseded data were derived.
 HT0543
 HT0543_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG550644(NAD 83)
 HT0543_MARKER: DB = BENCH MARK DISK
 HT0543_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT0543_SP_SET: STEP
 HT0543_STAMPING: K 553 1956
 HT0543_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0543
 HT0543  HISTORY     - Date     Condition        Report By
 HT0543  HISTORY     - 1956     MONUMENTED       CGS
 HT0543  HISTORY     - 1968     GOOD             NGS
 HT0543
 HT0543                          STATION DESCRIPTION
 HT0543
 HT0543'DESCRIBED BY COAST AND GEODETIC SURVEY 1956
 HT0543'AT SAN FRANCISCO AIRPORT.
 HT0543'AT THE SAN FRANCISCO INTERNATIONAL AIRPORT, AT THE RADAR TOWER,
 HT0543'IN THE TOP OF THE WEST SIDE OF A CONCRETE FOUNDATION FOR THE
 HT0543'WEST LEG AND THE STEEL STEPS OF THE TOWER, 5.0 FEET EAST OF THE
 HT0543'NORTH CORNER OF THE C.A.A. BUILDING, AND ABOUT 1 1/2 FEET HIGHER
 HT0543'THAN THE GROUND.
 HT0543
 HT0543                          STATION RECOVERY (1968)
 HT0543
 HT0543'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1968
 HT0543'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0528 ***********************************************************************
 HT0528  DESIGNATION -  X 813
 HT0528  PID         -  HT0528
 HT0528  STATE/COUNTY-  CA/SAN MATEO
 HT0528  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0528
 HT0528                         *CURRENT SURVEY CONTROL
 HT0528  ___________________________________________________________________
 HT0528* NAD 83(1986)-  37 37 44.     (N)    122 24 39.     (W)     SCALED
 HT0528* NAVD 88     -         5.78   (+/-2cm)      19.0    (feet)  VERTCON
 HT0528  ___________________________________________________________________
 HT0528  GEOID HEIGHT-         -32.63  (meters)                     GEOID09
 HT0528  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0528
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 HT0528.The horizontal coordinates were scaled from a topographic map and have
 HT0528.an estimated accuracy of +/- 6 seconds.
 HT0528
 HT0528.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0528.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0528.The vertical order pertains to the NGVD 29 superseded value.
 HT0528
 HT0528.The geoid height was determined by GEOID09.
 HT0528
 HT0528;                   North         East     Units  Estimated Accuracy
 HT0528;SPC CA 3     -   627,010.    1,831,350.      MT  (+/- 180 meters Scaled)
 HT0528
 HT0528                          SUPERSEDED SURVEY CONTROL
 HT0528
 HT0528  NGVD 29 (??/??/92)    4.942  (m)           16.21   (f) ADJ UNCH    1 2
 HT0528
 HT0528.Superseded values are not recommended for survey control.
 HT0528.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0528.See file dsdata.txt to determine how the superseded data were derived.
 HT0528
 HT0528_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG519648(NAD 83)
 HT0528_MARKER: DB = BENCH MARK DISK
 HT0528_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0528_SP_SET: ABUTMENT
 HT0528_STAMPING: X 813 1952
 HT0528_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0528
 HT0528  HISTORY     - Date     Condition        Report By
 HT0528  HISTORY     - 1952     MONUMENTED       CGS
 HT0528  HISTORY     - 1956     GOOD             NGS
 HT0528  HISTORY     - 1965     GOOD             NGS
 HT0528  HISTORY     - 1986     MARK NOT FOUND   NGS
 HT0528
 HT0528                          STATION DESCRIPTION
 HT0528
 HT0528'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0528'AT SAN BRUNO.
 HT0528'AT SAN BRUNO, 0.15 MILE SOUTHEAST ALONG THE SOUTHERN PACIFIC
 HT0528'COMPANY RAILROAD FROM THE STATION, 0.2 MILE SOUTHEAST OF MILEPOST
 HT0528'11, AT WOODEN BRIDGE NO. 11.21, IN THE TOP OF THE SOUTHWEST
 HT0528'END OF THE NORTHWEST CONCRETE ABUTMENT, 6.6 FEET SOUTHWEST OF
 HT0528'THE SOUTHWEST RAIL OF THE SOUTHWEST MAIN TRACK, AND ABOUT 1 1/2
 HT0528'FEET LOWER THAN THE TRACK.
 HT0528
 HT0528                          STATION RECOVERY (1965)
 HT0528
 HT0528'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0528'RECOVERED IN GOOD CONDITION.
 HT0528
 HT0528                          STATION RECOVERY (1986)
 HT0528
 HT0528'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0528'NOT RECOVERED, BRIDGE HAS BEEN REMOVED.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0532 ***********************************************************************
 HT0532  DESIGNATION -  H 553
 HT0532  PID         -  HT0532
 HT0532  STATE/COUNTY-  CA/SAN MATEO
 HT0532  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0532
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HT0532                         *CURRENT SURVEY CONTROL
HT0532  ___________________________________________________________________
HT0532* NAD 83(1986)-  37 38 00.     (N)    122 23 51.     (W)     SCALED
HT0532* NAVD 88     -         2.33   (+/-2cm)       7.6    (feet)  VERTCON
HT0532  ___________________________________________________________________
HT0532  GEOID HEIGHT-         -32.62  (meters)                     GEOID09
HT0532  VERT ORDER   -  FIRST     CLASS II (See Below)
HT0532
HT0532.The horizontal coordinates were scaled from a topographic map and have
HT0532.an estimated accuracy of +/- 6 seconds.
HT0532
HT0532.The NAVD 88 height was computed by applying the VERTCON shift value to
HT0532.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
HT0532.The vertical order pertains to the NGVD 29 superseded value.
HT0532
HT0532.The geoid height was determined by GEOID09.
HT0532
HT0532;                    North         East     Units  Estimated Accuracy
HT0532;SPC CA 3     -   627,480.    1,832,540.      MT  (+/- 180 meters Scaled)
HT0532
HT0532                          SUPERSEDED SURVEY CONTROL
HT0532
HT0532  NGVD 29 (??/??/92)    1.500  (m)            4.92   (f) ADJ UNCH    1 2
HT0532
HT0532.Superseded values are not recommended for survey control.
HT0532.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0532.See file dsdata.txt to determine how the superseded data were derived.
HT0532
HT0532_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG531653(NAD 83)
HT0532_MARKER: DB = BENCH MARK DISK
HT0532_SETTING: 36 = SET IN A MASSIVE STRUCTURE
HT0532_SP_SET: BUILDING
HT0532_STAMPING: H 553 1956
HT0532_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
HT0532
HT0532  HISTORY     - Date     Condition        Report By
HT0532  HISTORY     - 1956     MONUMENTED       CGS
HT0532  HISTORY     - 1968     GOOD             NGS
HT0532  HISTORY     - 1986     MARK NOT FOUND   NGS
HT0532
HT0532                          STATION DESCRIPTION
HT0532
HT0532'DESCRIBED BY COAST AND GEODETIC SURVEY 1956
HT0532'0.8 MI E FROM SAN MATEO.
HT0532'0.8 MILE EAST ALONG SAN BRUNO AVENUE FROM THE SOUTHERN PACIFIC
HT0532'COMPANY RAILROAD STATION AT SAN BRUNO, AT THE UNITED AIR LINES
HT0532'MAINTENANCE BASE OF THE SAN FRANCISCO INTERNATIONAL AIRPORT,
HT0532'SET VERTICALLY IN THE SOUTHWEST FACE OF A CONCRETE WALL AND
HT0532'DOOR COLUMN, 1.4 FEET NORTHWEST OF THE SOUTH CORNER OF THE
HT0532'BUILDING, 0.3 FOOT SOUTHEAST OF THE SOUTHEAST EDGE OF A CONCRETE
HT0532'AND METAL DOOR GUARD, AND ABOUT 1 FOOT ABOVE THE DRIVE.
HT0532
HT0532                          STATION RECOVERY (1968)
HT0532
HT0532'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1968
HT0532'RECOVERED IN GOOD CONDITION.
HT0532
HT0532                          STATION RECOVERY (1986)
HT0532
HT0532'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
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 HT0532'NOT RECOVERED. THE DESCRIBED BUILDING IS NOT LOCATED ON THE CURRENT
 HT0532'UNITED AIRLINES PROPERTY.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 DG6888 ***********************************************************************
 DG6888  HT_MOD       -  This is a Height Modernization Survey Station.
 DG6888  DESIGNATION -  SEAPLANE
 DG6888  PID          -  DG6888
 DG6888  STATE/COUNTY-  CA/SAN MATEO
 DG6888  USGS QUAD    -  SAN FRANCISCO SOUTH (1995)
 DG6888
 DG6888                         *CURRENT SURVEY CONTROL
 DG6888  ___________________________________________________________________
 DG6888* NAD 83(2007)-  37 38 06.88788(N)    122 23 08.17798(W)     ADJUSTED
 DG6888* NAVD 88      -         3.00   (meters)       9.8    (feet)  GPS OBS
 DG6888  ___________________________________________________________________
 DG6888  EPOCH DATE   -        2007.00
 DG6888  X            -  -2,708,726.064 (meters)                     COMP
 DG6888  Y            -  -4,270,640.549 (meters)                     COMP
 DG6888  Z            -   3,873,444.070 (meters)                     COMP
 DG6888  LAPLACE CORR-           1.07  (seconds)                    DEFLEC09
 DG6888  ELLIP HEIGHT-         -29.637 (meters)        (02/10/07) ADJUSTED
 DG6888  GEOID HEIGHT-         -32.61  (meters)                     GEOID09
 DG6888
 DG6888  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 DG6888  Type    PID    Designation                       North   East  Ellip
 DG6888  -------------------------------------------------------------------
 DG6888  NETWORK DG6888 SEAPLANE                           0.27   0.29   1.14
 DG6888  -------------------------------------------------------------------
 DG6888
 DG6888.The horizontal coordinates were established by GPS observations
 DG6888.and adjusted by the National Geodetic Survey in February 2007.
 DG6888
 DG6888.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 DG6888.See National Readjustment for more information.
 DG6888.The horizontal coordinates are valid at the epoch date displayed above.
 DG6888.The epoch date for horizontal control is a decimal equivalence
 DG6888.of Year/Month/Day.
 DG6888
 DG6888.The orthometric height was determined by GPS observations and a
 DG6888.high-resolution geoid model using precise GPS observation and
 DG6888.processing techniques.
 DG6888
 DG6888.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 DG6888
 DG6888.The Laplace correction was computed from DEFLEC09 derived deflections.
 DG6888
 DG6888.The ellipsoidal height was determined by GPS observations
 DG6888.and is referenced to NAD 83.
 DG6888
 DG6888.The geoid height was determined by GEOID09.
 DG6888
 DG6888;                   North         East     Units Scale Factor Converg.
 DG6888;SPC CA 3      -   627,666.988 1,833,588.443   MT  0.99993121   -1 09 15.9
 DG6888;SPC CA 3      - 2,059,270.78  6,015,698.08   sFT  0.99993121   -1 09 15.9
 DG6888;UTM  10       - 4,165,523.614   554,208.587   MT  0.99963619   +0 22 30.6
 DG6888
 DG6888!              -  Elev Factor  x  Scale Factor =   Combined Factor
 DG6888!SPC CA 3      -   1.00000465  x   0.99993121  =   0.99993586
 DG6888!UTM  10       -   1.00000465  x   0.99963619  =   0.99964084
 DG6888
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 DG6888                          SUPERSEDED SURVEY CONTROL
 DG6888
 DG6888  NAD 83(1998)-  37 38 06.88353(N)    122 23 08.17330(W) AD(2002.75) B
 DG6888  ELLIP H (08/23/04)  -29.568  (m)                       GP(       ) 4 1
 DG6888
 DG6888.Superseded values are not recommended for survey control.
 DG6888.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 DG6888.See file dsdata.txt to determine how the superseded data were derived.
 DG6888
 DG6888_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG5420865523(NAD 83)
 DG6888_MARKER: DD = SURVEY DISK
 DG6888_SETTING: 37 = SET IN A MASSIVE RETAINING WALL
 DG6888_SP_SET: THICK CONCRETE WALL
 DG6888_STAMPING: SEAPLANE
 DG6888_MARK LOGO: CSRC
 DG6888_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
 DG6888+STABILITY: SURFACE MOTION
 DG6888_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DG6888+SATELLITE: SATELLITE OBSERVATIONS - 2002
 DG6888
 DG6888  HISTORY     - Date     Condition        Report By
 DG6888  HISTORY     - 2002     MONUMENTED       CSRC
 DG6888
 DG6888                          STATION DESCRIPTION
 DG6888
 DG6888'DESCRIBED BY CALIFORNIA SPATIAL REFERENCE CENTER 2002 (RAF)
 DG6888'THE STATION IS 1.7 KM (1.05 MI) EAST-NORTHEAST OF SAN BRUNO, CA. THE
 DG6888'STATION IS ON THE  NORTH SHORE OF THE SEAPLANE HARBOR, NORTH OF SAN
 DG6888'FRANCISCO  AIRPORT, IN SAN BRUNO.
 DG6888'
 DG6888'FROM THE INTERSECTION OF HWY 101 AND HWY 380 (WEST)/NORTH  ACCESS
 DG6888'RD(EAST), EXIT ON NORTH ACCESS ROAD.  DRIVE EAST FOR 1.3 KM (0.8  MI),
 DG6888'FOLLOWING THE ROAD WHEN IT MAKES A SHARP RIGHT TURN.  TURN LEFT  ONTO
 DG6888'CLEARWATER DR AND DRIVE 0.2 KM (0.1 MI), WITH THE CITY COLLEGE OF  SF
 DG6888'AIRCRAFT TECHNICIAN SCHOOL ON THE RIGHT AND THE WATER QUALITY  CONTROL
 DG6888'PLANT ON THE LEFT.  NEAR THE END OF THE ROAD, BEAR RIGHT AND GO  ABOUT
 DG6888'114 M (375 FT) TOWARDS THE OCEAN.  THE STATION IS ABOUT 114 M  (375
 DG6888'FT) SOUTHERLY OF THE INTERSECTION OF NORTH ACCESS ROAD AND  CLEARWATER
 DG6888'DRIVE, 1.1 M (3.5 FT) SOUTHERLY OF THE SOUTHERLY FACE OF A  CONCRETE
 DG6888'SEAWALL, 3.5 M (11.4 FT) EASTERLY OF THE EASTERLY EDGE OF A  CONCRETE
 DG6888'LAUNCH RAMP, 4.0 M (13 FT) EAST-SOUTHEASTERLY OF THE SOUTHEAST  CORNER
 DG6888'OF A 3.0 M (10 FT) HIGH CHAIN LINK FENCE, AND 2.6 M (8.5 FT)  WESTERLY
 DG6888'OF THE WESTERLY EDGE OF A 91 CM (36 IN) DIAMETER STEEL PIPE.   THE
 DG6888'MARK IS AN 8.9 CM (3.5 IN) ALUMINUM CALIFORNIA SPATIAL REFERENCE
 DG6888'CENTER DISK STAMPED 'SEAPLANE 2002', CEMENTED IN A DRILL HOLE IN THE
 DG6888'TOP OF A 30 CM (1 FT) WIDE CONCRETE WALL AT THE NORTHWEST CORNER OF A
 DG6888'2.1 M (7 FT) BY 6.7 M (22 FT) CONCRETE STRUCTURE WITH A 91 CM (36 IN)
 DG6888'DIAMETER STEEL PIPE.
 DG6888'
 DG6888'THIS STATION IS SET NEAR BENCH MARKS FOR TIDE GAGE 941 4413. THIS
 DG6888'STATION WAS OBSERVED AS PART OF THE SOUTH SAN FRANCISCO BAY HEIGHT
 DG6888'MODERNIZATION  PROJECT.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0647 ***********************************************************************
 HT0647  DESIGNATION -  P 571 RESET 1950
 HT0647  PID         -  HT0647
 HT0647  STATE/COUNTY-  CA/SAN MATEO
 HT0647  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0647
 HT0647                         *CURRENT SURVEY CONTROL
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 HT0647  ________________________________________________________________
 HT0647* NAD 83(1986)-  37 38 32.     (N)    122 24 47.     (W)     SCALED
 HT0647* NAVD 88     -         4.96   (+/-2cm)      16.3    (feet)  VERTCON
 HT0647  ________________________________________________________________
 HT0647  GEOID HEIGHT-         -32.63  (meters)                     GEOID09
 HT0647  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0647
 HT0647.The horizontal coordinates were scaled from a topographic map and have
 HT0647.an estimated accuracy of +/- 6 seconds.
 HT0647
 HT0647.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0647.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0647.The vertical order pertains to the NGVD 29 superseded value.
 HT0647
 HT0647.The geoid height was determined by GEOID09.
 HT0647
 HT0647;                    North         East     Units  Estimated Accuracy
 HT0647;SPC CA 3     -   628,490.    1,831,180.      MT  (+/- 180 meters Scaled)
 HT0647
 HT0647                          SUPERSEDED SURVEY CONTROL
 HT0647
 HT0647  NGVD 29 (??/??/92)    4.123  (m)          13.53   (f) ADJ UNCH    1 2
 HT0647
 HT0647.Superseded values are not recommended for survey control.
 HT0647.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0647.See file dsdata.txt to determine how the superseded data were derived.
 HT0647
 HT0647_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG517662(NAD 83)
 HT0647_MARKER: DB = BENCH MARK DISK
 HT0647_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT0647_SP_SET: CULVERT
 HT0647_STAMPING: P 571 1939 RESET 1950
 HT0647_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0647
 HT0647  HISTORY     - Date     Condition        Report By
 HT0647  HISTORY     - 1950     MONUMENTED       CGS
 HT0647  HISTORY     - 1956     GOOD             NGS
 HT0647  HISTORY     - 1965     GOOD             NGS
 HT0647
 HT0647                          STATION DESCRIPTION
 HT0647
 HT0647'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0647'1 MI S FROM SAN FRANCISCO.
 HT0647'1.0 MILE SOUTH ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM
 HT0647'THE STATION AT SOUTH SAN FRANCISCO, AT CROSSING NO. 10.2 OF SOUTH
 HT0647'LYNDEN AVENUE, IN THE TOP OF THE EAST END OF THE SOUTH CONCRETE
 HT0647'HEAD WALL OF A 12-INCH CONCRETE PIPE CULVERT UNDER THE AVENUE,
 HT0647'32.0 FEET WEST OF THE WEST RAIL OF THE WEST MAIN TRACK, 27 1/2
 HT0647'FEET SOUTH OF THE CENTER LINE OF THE AVENUE, 18.8 FEET EAST OF
 HT0647'THE CURB OF DOLLAR AVENUE, 13.3 FEET EAST OF THE CENTER OF A
 HT0647'CROSSING SIGNAL, AND ABOUT 1 FOOT LOWER THAN THE RAILROAD TRACK.
 HT0647
 HT0647                          STATION RECOVERY (1965)
 HT0647
 HT0647'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0647'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0526 ***********************************************************************
 HT0526  DESIGNATION -  U 813
 HT0526  PID         -  HT0526
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HT0526  STATE/COUNTY-  CA/SAN MATEO
HT0526  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
HT0526
HT0526                         *CURRENT SURVEY CONTROL
HT0526  ___________________________________________________________________
HT0526* NAD 83(1986)-  37 38 46.     (N)    122 25 19.     (W)     SCALED
HT0526* NAVD 88     -         7.43   (+/-2cm)       24.4    (feet)  VERTCON
HT0526  ___________________________________________________________________
HT0526  GEOID HEIGHT-         -32.65  (meters)                      GEOID09
HT0526  VERT ORDER  -  FIRST     CLASS II (See Below)
HT0526
HT0526.The horizontal coordinates were scaled from a topographic map and have
HT0526.an estimated accuracy of +/- 6 seconds.
HT0526
HT0526.The NAVD 88 height was computed by applying the VERTCON shift value to
HT0526.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
HT0526.The vertical order pertains to the NGVD 29 superseded value.
HT0526
HT0526.The geoid height was determined by GEOID09.
HT0526
HT0526;                    North         East     Units  Estimated Accuracy
HT0526;SPC CA 3     -   628,940.    1,830,410.      MT  (+/- 180 meters Scaled)
HT0526
HT0526                          SUPERSEDED SURVEY CONTROL
HT0526
HT0526  NGVD 29 (??/??/92)    6.591  (m)           21.62   (f) ADJ UNCH    1 2
HT0526
HT0526.Superseded values are not recommended for survey control.
HT0526.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0526.See file dsdata.txt to determine how the superseded data were derived.
HT0526
HT0526_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG509667(NAD 83)
HT0526_MARKER: DB = BENCH MARK DISK
HT0526_SETTING: 32 = SET IN A RETAINING WALL OR CONCRETE LEDGE
HT0526_SP_SET: CULVERT HEADWALL
HT0526_STAMPING: U 813 1952
HT0526_MARK LOGO: CGS
HT0526_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
HT0526+STABILITY: SURFACE MOTION
HT0526
HT0526  HISTORY     - Date     Condition        Report By
HT0526  HISTORY     - 1952     MONUMENTED       CGS
HT0526  HISTORY     - 1986     GOOD             NGS
HT0526
HT0526                          STATION DESCRIPTION
HT0526
HT0526'DESCRIBED BY COAST AND GEODETIC SURVEY 1952
HT0526'0.5 MI NW FROM TANFORAN.
HT0526'0.5 MILE NORTHWEST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
HT0526'FROM THE STATION AT TANFORAN, AT THE HAZELWOOD DRIVE CROSSING,
HT0526'3.7 MILES SOUTHEAST OF COLMA, IN THE TOP OF THE NORTHWEST END
HT0526'OF THE SOUTHWEST HEAD WALL OF A LARGE STONE ARCH CULVERT, 75
HT0526'FEET NORTHWEST OF THE CENTER LINE OF THE DRIVE, 12.5 FEET
HT0526'SOUTHWEST OF THE SOUTHWEST RAIL, AND ABOUT 6 FEET LOWER THAN
HT0526'THE TRACK.
HT0526
HT0526                          STATION RECOVERY (1986)
HT0526
HT0526'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
HT0526'RECOVERED IN GOOD CONDITION. THE DESCRIPTION IS ADEQUATE EXCEPT ADD
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 HT0526'TANFORAN IS NOW CONSIDERED TO BE PART OF SOUTH SAN FRANCISCO, AND THE
 HT0526'MARK IS AT THE SPRUCE AVENUE CROSSING OF THE SOUTHERN PACIFIC COMPANY
 HT0526'RAILROAD.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0645 ***********************************************************************
 HT0645  DESIGNATION -  N 571
 HT0645  PID         -  HT0645
 HT0645  STATE/COUNTY-  CA/SAN MATEO
 HT0645  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0645
 HT0645                         *CURRENT SURVEY CONTROL
 HT0645  ___________________________________________________________________
 HT0645* NAD 83(1986)-  37 38 58.     (N)    122 24 36.     (W)     SCALED
 HT0645* NAVD 88     -         4.91   (+/-2cm)      16.1    (feet)  VERTCON
 HT0645  ___________________________________________________________________
 HT0645  GEOID HEIGHT-         -32.63  (meters)                     GEOID09
 HT0645  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0645
 HT0645.The horizontal coordinates were scaled from a topographic map and have
 HT0645.an estimated accuracy of +/- 6 seconds.
 HT0645
 HT0645.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0645.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0645.The vertical order pertains to the NGVD 29 superseded value.
 HT0645
 HT0645.The geoid height was determined by GEOID09.
 HT0645
 HT0645;                   North         East     Units  Estimated Accuracy
 HT0645;SPC CA 3     -   629,290.    1,831,470.      MT  (+/- 180 meters Scaled)
 HT0645
 HT0645                          SUPERSEDED SURVEY CONTROL
 HT0645
 HT0645  NGVD 29 (??/??/92)    4.083  (m)           13.40   (f) ADJ UNCH    1 2
 HT0645
 HT0645.Superseded values are not recommended for survey control.
 HT0645.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0645.See file dsdata.txt to determine how the superseded data were derived.
 HT0645
 HT0645_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG520670(NAD 83)
 HT0645_MARKER: DB = BENCH MARK DISK
 HT0645_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0645_SP_SET: ABUTMENT
 HT0645_STAMPING: N 571 1939
 HT0645_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0645
 HT0645  HISTORY     - Date     Condition        Report By
 HT0645  HISTORY     - 1939     MONUMENTED       CGS
 HT0645  HISTORY     - 1956     GOOD             NGS
 HT0645  HISTORY     - 1965     GOOD             NGS
 HT0645
 HT0645                          STATION DESCRIPTION
 HT0645
 HT0645'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0645'0.5 MI SW FROM SAN FRANCISCO.
 HT0645'0.5 MILE SOUTHWEST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
 HT0645'FROM THE STATION AT SOUTH SAN FRANCISCO, AT WOODEN BRIDGE 9.72,
 HT0645'IN THE TOP OF THE SOUTHEAST END OF THE SOUTHWEST CONCRETE ABUTMENT,
 HT0645'33.1 FEET SOUTHEAST OF THE SOUTEAST RAIL OF THE SOUTHEAST MAIN
 HT0645'TRACK, 2 1/2 FEET SOUTHEAST OF THE SOUTHEAST WOODEN GUARDRAIL,
 HT0645'AND ABOUT 1 FOOT LOWER THAN THE MAIN TRACK.
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 HT0645
 HT0645                          STATION RECOVERY (1965)
 HT0645
 HT0645'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0645'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0642 ***********************************************************************
 HT0642  DESIGNATION -  G 553
 HT0642  PID         -  HT0642
 HT0642  STATE/COUNTY-  CA/SAN MATEO
 HT0642  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0642
 HT0642                         *CURRENT SURVEY CONTROL
 HT0642  ___________________________________________________________________
 HT0642* NAD 83(1986)-  37 39 02.     (N)    122 22 47.     (W)     SCALED
 HT0642* NAVD 88     -         5.24   (+/-2cm)      17.2    (feet)  VERTCON
 HT0642  ___________________________________________________________________
 HT0642  GEOID HEIGHT-        -32.60  (meters)                      GEOID09
 HT0642  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0642
 HT0642.The horizontal coordinates were scaled from a topographic map and have
 HT0642.an estimated accuracy of +/- 6 seconds.
 HT0642
 HT0642.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0642.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0642.The vertical order pertains to the NGVD 29 superseded value.
 HT0642
 HT0642.The geoid height was determined by GEOID09.
 HT0642
 HT0642;                    North         East    Units  Estimated Accuracy
 HT0642;SPC CA 3     -   629,360.    1,834,140.      MT  (+/- 180 meters Scaled)
 HT0642
 HT0642                          SUPERSEDED SURVEY CONTROL
 HT0642
 HT0642  NGVD 29 (??/??/92)    4.416  (m)           14.49   (f) ADJ UNCH    1 2
 HT0642
 HT0642.Superseded values are not recommended for survey control.
 HT0642.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0642.See file dsdata.txt to determine how the superseded data were derived.
 HT0642
 HT0642_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG547672(NAD 83)
 HT0642_MARKER: DB = BENCH MARK DISK
 HT0642_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0642_SP_SET: BUILDING
 HT0642_STAMPING: G 553 1956
 HT0642_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0642
 HT0642  HISTORY     - Date     Condition        Report By
 HT0642  HISTORY     - 1956     MONUMENTED       CGS
 HT0642  HISTORY     - 1973     GOOD             NGS
 HT0642
 HT0642                          STATION DESCRIPTION
 HT0642
 HT0642'DESCRIBED BY COAST AND GEODETIC SURVEY 1956
 HT0642'1.5 MI E FROM SAN FRANCISCO.
 HT0642'0.1 MILE SOUTH ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM
 HT0642'THE STATION AT SOUTH SAN FRANCISCO, THENCE 1.4 MILE EAST ALONG
 HT0642'GRAND AVENUE, AT THE W.P. FULLER PAINT COMPANY YARD, AT THE
 HT0642'SOUTHWEST CORNER OF A LARGE CONCRETE BUILDING, SET VERTICALLY
 HT0642'IN THE SOUTH FACE OF THE SOUTH CONCRETE WALL, 5.4 FEET WEST OF
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 HT0642'THE CENTER OF AN ELEVATOR DOOR, 1.0 FEET EAST OF THE SOUTHWEST
 HT0642'CORNER OF THE BUILDING, 2.3 FEET ABOVE THE ASPHALT AND ABOUT
 HT0642'2 FEET HIGHER THAN THE GROUND.
 HT0642
 HT0642                          STATION RECOVERY (1973)
 HT0642
 HT0642'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1973
 HT0642'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0640 ***********************************************************************
 HT0640  DESIGNATION -  TIDAL 3
 HT0640  PID         -  HT0640
 HT0640  STATE/COUNTY-  CA/SAN MATEO
 HT0640  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0640
 HT0640                         *CURRENT SURVEY CONTROL
 HT0640  ___________________________________________________________________
 HT0640* NAD 83(1986)-  37 39 03.     (N)    122 23 17.     (W)     SCALED
 HT0640* NAVD 88     -         4.31   (+/-2cm)      14.1    (feet)  VERTCON
 HT0640  ___________________________________________________________________
 HT0640  GEOID HEIGHT-         -32.61  (meters)                     GEOID09
 HT0640  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0640
 HT0640.The horizontal coordinates were scaled from a topographic map and have
 HT0640.an estimated accuracy of +/- 6 seconds.
 HT0640
 HT0640.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0640.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0640.The vertical order pertains to the NGVD 29 superseded value.
 HT0640
 HT0640.The geoid height was determined by GEOID09.
 HT0640
 HT0640;                    North         East     Units  Estimated Accuracy
 HT0640;SPC CA 3     -   629,400.    1,833,410.      MT  (+/- 180 meters Scaled)
 HT0640
 HT0640                          SUPERSEDED SURVEY CONTROL
 HT0640
 HT0640  NGVD 29 (??/??/92)    3.482  (m)           11.42   (f) ADJ UNCH    1 2
 HT0640
 HT0640.Superseded values are not recommended for survey control.
 HT0640.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0640.See file dsdata.txt to determine how the superseded data were derived.
 HT0640
 HT0640_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG539672(NAD 83)
 HT0640_MARKER: DB = BENCH MARK DISK
 HT0640_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0640_SP_SET: BUILDING
 HT0640_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0640
 HT0640  HISTORY     - Date     Condition        Report By
 HT0640  HISTORY     - UNK      MONUMENTED       CGS
 HT0640  HISTORY     - 1956     GOOD             NGS
 HT0640
 HT0640                          STATION DESCRIPTION
 HT0640
 HT0640'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0640'1.1 MI E FROM SAN FRANCISCO.
 HT0640'0.1 MILE SOUTH ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM
 HT0640'THE STATION AT SOUTH SAN FRANCISCO, THENCE 1.0 MILE EAST ALONG
 HT0640'GRAND AVENUE, ON POINT SAN BRUNO, AT THE SWIFT COMPANY PACKING
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 HT0640'PLANT, AT THE SOUTHEAST CORNER OF BRICK BUILDING NO 13, SET
 HT0640'VERTICALLY IN THE EAST FACE OF A BRICK WALL, 175 FEET SOUTH
 HT0640'OF THE CENTER LINE OF THE AVENUE, 130.0 FEET WEST OF THE SOUTHWEST
 HT0640'CORNER OF A LARGE BRICK CHIMNEY EAST OF THE BUILDING, 1.0
 HT0640'FEET NORTH OF THE SOUTHEAST CORNER OF THE BUILDING, 2.5 FEET
 HT0640'HIGHER THAN THE GROUND, AND 2 1/2 FEET LOWER THAN THE TOP OF
 HT0640'A LOADING PLATFORM.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0641 ***********************************************************************
 HT0641  DESIGNATION -  BM 5 TIDAL MARK
 HT0641  PID         -  HT0641
 HT0641  STATE/COUNTY-  CA/SAN MATEO
 HT0641  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0641
 HT0641                         *CURRENT SURVEY CONTROL
 HT0641  ___________________________________________________________________
 HT0641* NAD 83(1986)-  37 39 04.     (N)    122 22 59.     (W)     SCALED
 HT0641* NAVD 88     -         3.71   (+/-2cm)      12.2    (feet)  VERTCON
 HT0641  ___________________________________________________________________
 HT0641  GEOID HEIGHT-        -32.61  (meters)                      GEOID09
 HT0641  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0641
 HT0641.The horizontal coordinates were scaled from a topographic map and have
 HT0641.an estimated accuracy of +/- 6 seconds.
 HT0641
 HT0641.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0641.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0641.The vertical order pertains to the NGVD 29 superseded value.
 HT0641
 HT0641.The geoid height was determined by GEOID09.
 HT0641
 HT0641;                    North         East     Units  Estimated Accuracy
 HT0641;SPC CA 3     -   629,420.    1,833,850.      MT   (+/- 180 meters Scaled)
 HT0641
 HT0641                          SUPERSEDED SURVEY CONTROL
 HT0641
 HT0641  NGVD 29 (??/??/92)    2.892  (m)           9.49   (f) ADJ UNCH    1 2
 HT0641
 HT0641.Superseded values are not recommended for survey control.
 HT0641.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0641.See file dsdata.txt to determine how the superseded data were derived.
 HT0641
 HT0641_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG544672(NAD 83)
 HT0641_MARKER: DB = BENCH MARK DISK
 HT0641_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0641_SP_SET: BUILDING
 HT0641_STAMPING: NO 5 1941
 HT0641_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0641
 HT0641  HISTORY     - Date     Condition        Report By
 HT0641  HISTORY     - 1941     MONUMENTED       CGS
 HT0641  HISTORY     - 1956     GOOD             NGS
 HT0641
 HT0641                          STATION DESCRIPTION
 HT0641
 HT0641'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0641'1.4 MI E FROM SAN FRANCISCO.
 HT0641'0.1 MILE SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
 HT0641'FROM THE STATION AT SOUTH SAN FRANCISCO, THENCE 1.3 MILE EAST
 HT0641'ALONG GRAND AVENUE, 375 FEET SOUTHWEST OF THE SOUTHWEST CORNER
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 HT0641'OF THE W.P. FULLER INDUSTRIAL BUILDING, AT A CONCRETE STORAGE
 HT0641'BUILDING (INSIDE OF A FENCE) FOR INFLAMMABLE MATERIAL, IN THE
 HT0641'TOP OF THE CENTER OF A LARGE CONCRETE BASE FOUNDATION WHICH
 HT0641'PROJECTS 1 FOOT ABOVE THE GROUND, 270 FEET SOUTH OF THE CENTER
 HT0641'LINE OF THE AVENUE, 23.5 FEET SOUTH OF THE NORTHWEST CORNER
 HT0641'OF THE FENCE, 2.0 FEET EAST OF THE FENCE, AND ABOUT 3 1/2 FEET
 HT0641'LOWER THAN THE STREET.  NOTE-- THIS MARK WILL BE DESTROYED BY
 HT0641'A FILL, A W.P. FULLER AND COMPANY ENGINEER WILL NOTIFY THE COAST
 HT0641'AND GEODETIC SURVEY AS TO WHEN THE FILL WILL BE CONSTRUCTED.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0638 ***********************************************************************
 HT0638  DESIGNATION -  L 571 RESET 1948
 HT0638  PID         -  HT0638
 HT0638  STATE/COUNTY-  CA/SAN MATEO
 HT0638  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0638
 HT0638                         *CURRENT SURVEY CONTROL
 HT0638  ___________________________________________________________________
 HT0638* NAD 83(1986)-  37 39 15.     (N)    122 24 26.     (W)     SCALED
 HT0638* NAVD 88     -         6.60   (+/-2cm)      21.7    (feet)  VERTCON
 HT0638  ___________________________________________________________________
 HT0638  GEOID HEIGHT-         -32.63  (meters)                     GEOID09
 HT0638  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0638
 HT0638.The horizontal coordinates were scaled from a topographic map and have
 HT0638.an estimated accuracy of +/- 6 seconds.
 HT0638
 HT0638.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0638.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0638.The vertical order pertains to the NGVD 29 superseded value.
 HT0638
 HT0638.The geoid height was determined by GEOID09.
 HT0638
 HT0638;                    North         East     Units  Estimated Accuracy
 HT0638;SPC CA 3     -   629,810.    1,831,720.      MT  (+/- 180 meters Scaled)
 HT0638
 HT0638                          SUPERSEDED SURVEY CONTROL
 HT0638
 HT0638  NGVD 29 (??/??/92)    5.770  (m)           18.93   (f) ADJ UNCH    1 2
 HT0638
 HT0638.Superseded values are not recommended for survey control.
 HT0638.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0638.See file dsdata.txt to determine how the superseded data were derived.
 HT0638
 HT0638_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG522676(NAD 83)
 HT0638_MARKER: DB = BENCH MARK DISK
 HT0638_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0638_SP_SET: PIER
 HT0638_STAMPING: L 571 RESET 1948 1939
 HT0638_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0638
 HT0638  HISTORY     - Date     Condition        Report By
 HT0638  HISTORY     - 1939     MONUMENTED       CGS
 HT0638  HISTORY     - 1956     GOOD             NGS
 HT0638  HISTORY     - 1965     GOOD             NGS
 HT0638
 HT0638                          STATION DESCRIPTION
 HT0638
 HT0638'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0638'AT SAN FRANCISCO.
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 HT0638'AT SOUTH SAN FRANCISCO, AT THE CROSSING OF GRAND AVENUE, INSIDE
 HT0638'OF THE STATE HIGHWAY YARDS, IN THE TOP OF THE CENTER OF THE
 HT0638'FOURTH CONCRETE PIER NORTH OF THE SOUTH END OF THE WEST U.S.
 HT0638'101 BAYSHORE HIGHWAY OVERPASS, 106.9 FEET SOUTH OF THE SOUTH
 HT0638'CURB OF THE AVENUE, 100.2 FEET NORTHWEST OF THE WEST RAIL OF THE
 HT0638'WEST MAIN TRACK OF THE SOUTHERN PACIFIC COMPANY RAILROAD, AND
 HT0638'ABOUT 4 1/2 FEET HIGHER THAN THE TRACK.
 HT0638
 HT0638                          STATION RECOVERY (1965)
 HT0638
 HT0638'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0638'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0639 ***********************************************************************
 HT0639  DESIGNATION -  M 571
 HT0639  PID         -  HT0639
 HT0639  STATE/COUNTY-  CA/SAN MATEO
 HT0639  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0639
 HT0639                         *CURRENT SURVEY CONTROL
 HT0639  ___________________________________________________________________
 HT0639* NAD 83(1986)-  37 39 15.     (N)    122 23 47.     (W)     SCALED
 HT0639* NAVD 88     -         5.81   (+/-2cm)      19.1    (feet)  VERTCON
 HT0639  ___________________________________________________________________
 HT0639  GEOID HEIGHT-        -32.62  (meters)                      GEOID09
 HT0639  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0639
 HT0639.The horizontal coordinates were scaled from a topographic map and have
 HT0639.an estimated accuracy of +/- 6 seconds.
 HT0639
 HT0639.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0639.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0639.The vertical order pertains to the NGVD 29 superseded value.
 HT0639
 HT0639.The geoid height was determined by GEOID09.
 HT0639
 HT0639;                   North         East     Units  Estimated Accuracy
 HT0639;SPC CA 3     -   629,790.    1,832,680.      MT  (+/- 180 meters Scaled)
 HT0639
 HT0639                          SUPERSEDED SURVEY CONTROL
 HT0639
 HT0639  NGVD 29 (??/??/92)    4.980  (m)           16.34   (f) ADJ UNCH    1 2
 HT0639
 HT0639.Superseded values are not recommended for survey control.
 HT0639.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0639.See file dsdata.txt to determine how the superseded data were derived.
 HT0639
 HT0639_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG532676(NAD 83)
 HT0639_MARKER: DB = BENCH MARK DISK
 HT0639_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT0639_SP_SET: WALL
 HT0639_STAMPING: M 571 1939
 HT0639_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0639
 HT0639  HISTORY     - Date     Condition        Report By
 HT0639  HISTORY     - 1939     MONUMENTED       CGS
 HT0639  HISTORY     - 1956     GOOD             NGS
 HT0639
 HT0639                          STATION DESCRIPTION
 HT0639
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 HT0639'DESCRIBED BY NATIONAL GEODETIC SURVEY 1956
 HT0639'AT SAN FRANCISCO.
 HT0639'AT SOUTH SAN FRANCISCO, 0.1 MILE SOUTH ALONG THE SOUTHERN PACIFIC
 HT0639'COMPANY RAILROAD, THENCE 0.5 MILE EAST ALONG GRAND AVENUE,
 HT0639'ON THE OUTSIDE OF A CURVE, AT THE CONCRETE BUILDING OF THE SOUTH
 HT0639'SAN FRANCISCO COLD STORAGE COMPANY, SET VERTICALLY IN THE SOUTH
 HT0639'FACE OF THE SOUTH CONCRETE WALL, 64.5 FEET EAST OF THE SOUTHWEST
 HT0639'CORNER OF THE SOUTH SAN FRANCISCO FIRE HOUSE STATION, 54 FEET
 HT0639'NORTH OF THE CENTER LINE OF THE AVENUE, 49.5 FEET EAST OF THE
 HT0639'SOUTHWEST CORNER OF THE BUILDING, 3 1/2 FEET EAST OF THE CENER
 HT0639'OF A SMALL DOOR TO AN OFFICE, 3.2 FEET HIGHER THAN THE CONCRETE
 HT0639'AND WOODEN SIDEWALK, AND ABOUT 3 1/2 FEET HIGHER THAN THE AVENUE.
 HT0639'NOTE-- IT WAS REPORTED IN 1960 THAT THE SOUTH SAN FRANCISCO COLD
 HT0639'STORAGEG CO. IS NOW THE GENERAL COLD STORAGE CO.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0525 ***********************************************************************
 HT0525  DESIGNATION -  T 813
 HT0525  PID         -  HT0525
 HT0525  STATE/COUNTY-  CA/SAN MATEO
 HT0525  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0525
 HT0525                         *CURRENT SURVEY CONTROL
 HT0525  ___________________________________________________________________
 HT0525* NAD 83(1986)-  37 39 28.     (N)    122 26 13.     (W)     SCALED
 HT0525* NAVD 88     -        14.45   (+/-2cm)      47.4    (feet)  VERTCON
 HT0525  ___________________________________________________________________
 HT0525  GEOID HEIGHT-         -32.67  (meters)                     GEOID09
 HT0525  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0525
 HT0525.The horizontal coordinates were scaled from a topographic map and have
 HT0525.an estimated accuracy of +/- 6 seconds.
 HT0525
 HT0525.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0525.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0525.The vertical order pertains to the NGVD 29 superseded value.
 HT0525
 HT0525.The geoid height was determined by GEOID09.
 HT0525
 HT0525;                    North         East    Units  Estimated Accuracy
 HT0525;SPC CA 3     -   630,260.    1,829,110.      MT  (+/- 180 meters Scaled)
 HT0525
 HT0525                          SUPERSEDED SURVEY CONTROL
 HT0525
 HT0525  NGVD 29 (??/??/92)   13.602  (m)           44.63   (f) ADJ UNCH    1 2
 HT0525
 HT0525.Superseded values are not recommended for survey control.
 HT0525.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0525.See file dsdata.txt to determine how the superseded data were derived.
 HT0525
 HT0525_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG496679(NAD 83)
 HT0525_MARKER: DB = BENCH MARK DISK
 HT0525_SETTING: 32 = SET IN A RETAINING WALL OR CONCRETE LEDGE
 HT0525_SP_SET: DITCH RETAINING WALL
 HT0525_STAMPING: T 813 1952
 HT0525_MARK LOGO: CGS
 HT0525_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
 HT0525+STABILITY: SURFACE MOTION
 HT0525
 HT0525  HISTORY     - Date     Condition        Report By
 HT0525  HISTORY     - 1952     MONUMENTED       CGS
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 HT0525  HISTORY     - 1986     GOOD             NGS
 HT0525
 HT0525                          STATION DESCRIPTION
 HT0525
 HT0525'DESCRIBED BY COAST AND GEODETIC SURVEY 1952
 HT0525'2.7 MI SE FROM COLMA.
 HT0525'2.7 MILES SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
 HT0525'FROM THE STATION AT COLMA, 0.1 MILE SOUTH OF THE GRAND AVENUE
 HT0525'CROSSING, IN THE TOP OF THE NORTHEAST END OF THE NORTHWEST
 HT0525'CONCRETE RETAINING WALL FOR A LARGE DRAINAGE DITCH, 58.5 FEET
 HT0525'SOUTHWEST OF THE SOUTHWEST RAIL, 52 1/2 FEET SOUTHWEST OF THE
 HT0525'NORTHWEST CORNER OF A TRESTLE, 9.0 FEET SOUTH OF A POWER LINE
 HT0525'POLE, 0.7 FOOT SOUTHWEST OF THE NORTHEAST END OF THE WALL,
 HT0525'AND ABOUT 1 1/2 FEET LOWER THAN THE TRACK.
 HT0525
 HT0525                          STATION RECOVERY (1986)
 HT0525
 HT0525'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0525'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT3821 ***********************************************************************
 HT3821  TIDAL BM     -  This is a Tidal Bench Mark.
 HT3821  DESIGNATION -  K 571 RESET
 HT3821  PID         -  HT3821
 HT3821  STATE/COUNTY-  CA/SAN MATEO
 HT3821  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT3821
 HT3821                         *CURRENT SURVEY CONTROL
 HT3821  ___________________________________________________________________
 HT3821* NAD 83(1986)-  37 39 33.     (N)    122 24 04.     (W)    SCALED
 HT3821* NAVD 88     -         5.87   (+/-2cm)      19.3    (feet)  VERTCON
 HT3821  ___________________________________________________________________
 HT3821  GEOID HEIGHT-         -32.62  (meters)                     GEOID09
 HT3821  VERT ORDER  -  THIRD (See Below)
 HT3821
 HT3821.The horizontal coordinates were scaled from a topographic map and have
 HT3821.an estimated accuracy of +/- 6 seconds.
 HT3821
 HT3821.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT3821.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT3821.The vertical order pertains to the NGVD 29 superseded value.
 HT3821
 HT3821.This Tidal Bench Mark is designated as VM 17230
 HT3821.by the CENTER FOR OPERATIONAL OCEANOGRAPHIC PRODUCTS AND SERVICES.
 HT3821
 HT3821.The geoid height was determined by GEOID09.
 HT3821
 HT3821;                   North         East    Units  Estimated Accuracy
 HT3821;SPC CA 3     -   630,350.    1,832,270.     MT  (+/- 180 meters Scaled)
 HT3821
 HT3821                          SUPERSEDED SURVEY CONTROL
 HT3821
 HT3821  NGVD 29 (08/19/04)    5.04   (m)           16.5    (f) RESET      3
 HT3821
 HT3821.Superseded values are not recommended for survey control.
 HT3821.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT3821.See file dsdata.txt to determine how the superseded data were derived.
 HT3821
 HT3821_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG528681(NAD 83)
 HT3821_MARKER: DV = VERTICAL CONTROL DISK
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 HT3821_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
 HT3821_SP_SET: CONCRETE POST
 HT3821_STAMPING: K 571 RESET 1982
 HT3821_MARK LOGO: NGS
 HT3821_MAGNETIC: N = NO MAGNETIC MATERIAL
 HT3821_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
 HT3821+STABILITY: SURFACE MOTION
 HT3821
 HT3821  HISTORY     - Date     Condition        Report By
 HT3821  HISTORY     - 1982     MONUMENTED       NGS
 HT3821
 HT3821                          STATION DESCRIPTION
 HT3821
 HT3821'DESCRIBED BY NATIONAL GEODETIC SURVEY 1982
 HT3821'0.5 KM (0.30 MI) NORTHEAST ALONG INDUSTRIAL WAY FROM EAST GRAND
 HT3821'AVENUE, 6.25 METERS (20.51 FT) WEST FROM THE CENTER OF INDUSTRIAL
 HT3821'WAY, 20.4 METERS (66.9 FT) SOUTHWEST FROM A FIRE HYDRANT, 22 METERS
 HT3821'(72.2 FT) NORTHWEST FROM A ENTRANCE TO US STEEL PARKING LOT, 3.1
 HT3821'METERS (10.2 FT) EAST OF AN ANGLE IRON RAIL, 0.9 METERS (3.0 FT)
 HT3821'NORTH OF A TELEPHONE POLE, 0.3 METERS (1.0 FT) SOUTH OF A PLASTIC
 HT3821'WITNESS POST, FLUSH WITH THE SURFACE, NEAR THE SOUTH END OF A NARROW
 HT3821'PARKING AREA, ABOUT 20 FEET (6.1 M) EAST OF THE EAST RAIL OF THE
 HT3821'SOUTHERN PACIFIC RAILROAD, ABOUT 6 FEET (1.8 M) HIGHER THAN THE
 HT3821'RAILROAD, ABOUT 0.2 KM (0.10 MI) EAST OF US HIGHWAY 101, SET IN THE
 HT3821'TOP OF A CONCRETE POST FLUSH WITH THE GROUND.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0524 ***********************************************************************
 HT0524  DESIGNATION -  W 6
 HT0524  PID         -  HT0524
 HT0524  STATE/COUNTY-  CA/SAN MATEO
 HT0524  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0524
 HT0524                         *CURRENT SURVEY CONTROL
 HT0524  ___________________________________________________________________
 HT0524* NAD 83(1986)-  37 40 07.     (N)    122 26 56.     (W)     SCALED
 HT0524* NAVD 88     -        27.63   (+/-2cm)      90.6    (feet)  VERTCON
 HT0524  ___________________________________________________________________
 HT0524  GEOID HEIGHT-         -32.69  (meters)                     GEOID09
 HT0524  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0524
 HT0524.The horizontal coordinates were scaled from a topographic map and have
 HT0524.an estimated accuracy of +/- 6 seconds.
 HT0524
 HT0524.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0524.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0524.The vertical order pertains to the NGVD 29 superseded value.
 HT0524
 HT0524.The geoid height was determined by GEOID09.
 HT0524
 HT0524;                    North         East     Units  Estimated Accuracy
 HT0524;SPC CA 3     -   631,480.    1,828,080.      MT  (+/- 180 meters Scaled)
 HT0524
 HT0524                          SUPERSEDED SURVEY CONTROL
 HT0524
 HT0524  NGVD 29 (??/??/92)   26.784  (m)           87.87   (f) ADJ UNCH    1 2
 HT0524
 HT0524.Superseded values are not recommended for survey control.
 HT0524.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0524.See file dsdata.txt to determine how the superseded data were derived.
 HT0524
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 HT0524_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG486691(NAD 83)
 HT0524_MARKER: DB = BENCH MARK DISK
 HT0524_SETTING: 66 = SET IN ROCK OUTCROP
 HT0524_SP_SET: ROCK
 HT0524_MARK LOGO: CGS
 HT0524_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
 HT0524+STABILITY: POSITION/ELEVATION WELL
 HT0524
 HT0524  HISTORY     - Date     Condition        Report By
 HT0524  HISTORY     - 1952     MONUMENTED       CGS
 HT0524  HISTORY     - 1965     GOOD             NGS
 HT0524  HISTORY     - 1986     GOOD             NGS
 HT0524
 HT0524                          STATION DESCRIPTION
 HT0524
 HT0524'DESCRIBED BY COAST AND GEODETIC SURVEY 1952
 HT0524'1.7 MI SE FROM COLMA.
 HT0524'1.7 MILES SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD
 HT0524'FROM THE STATION AT COLMA, AT THE HOLY CROSS CEMETERY, BETWEEN
 HT0524'THE RAILROAD AND THE OLD MISSION ROAD, SET VERTICALLY IN THE
 HT0524'NORTHEAST FACE OF A 3-FOOT HIGH CONICAL ROCK IN SHRUBBERY,
 HT0524'81.7 FEET EAST OF THE EAST RAIL, 66.4 FEET NORTHWEST OF THE
 HT0524'NORTHEAST CORNER OF THE OFFICE BUILDING, 36 1/2 FEET SOUTHWEST
 HT0524'OF THE CENTER LINE OF THE ROAD, AND ABOUT 2 FEET HIGHER THAN
 HT0524'THE ROAD.
 HT0524
 HT0524                          STATION RECOVERY (1965)
 HT0524
 HT0524'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1965
 HT0524'RECOVERED IN GOOD CONDITION.
 HT0524
 HT0524                          STATION RECOVERY (1986)
 HT0524
 HT0524'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0524'RECOVERED IN GOOD CONDITION. THE DESCRIPTION IS ADEQUATE EXCEPT ADD
 HT0524'THE OFFICE BUILDING IS NOW MACHINIST UNION LOCAL NUMBER 68.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0523 ***********************************************************************
 HT0523  DESIGNATION -  P 109
 HT0523  PID         -  HT0523
 HT0523  STATE/COUNTY-  CA/SAN MATEO
 HT0523  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0523
 HT0523                         *CURRENT SURVEY CONTROL
 HT0523  ___________________________________________________________________
 HT0523* NAD 83(1986)-  37 40 56.     (N)    122 27 46.     (W)     SCALED
 HT0523* NAVD 88     -        46.89   (+/-2cm)     153.8    (feet)  VERTCON
 HT0523  ___________________________________________________________________
 HT0523  GEOID HEIGHT-         -32.72  (meters)                     GEOID09
 HT0523  VERT ORDER  -  FIRST     CLASS II (See Below)
 HT0523
 HT0523.The horizontal coordinates were scaled from a topographic map and have
 HT0523.an estimated accuracy of +/- 6 seconds.
 HT0523
 HT0523.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0523.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0523.The vertical order pertains to the NGVD 29 superseded value.
 HT0523
 HT0523.The geoid height was determined by GEOID09.
 HT0523
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 HT0523;                    North         East     Units  Estimated Accuracy
 HT0523;SPC CA 3     -   633,020.    1,826,890.      MT  (+/- 180 meters Scaled)
 HT0523
 HT0523                          SUPERSEDED SURVEY CONTROL
 HT0523
 HT0523  NGVD 29 (??/??/92)   46.037  (m)          151.04   (f) ADJ UNCH    1 2
 HT0523
 HT0523.Superseded values are not recommended for survey control.
 HT0523.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0523.See file dsdata.txt to determine how the superseded data were derived.
 HT0523
 HT0523_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG473706(NAD 83)
 HT0523_MARKER: DB = BENCH MARK DISK
 HT0523_SETTING: 38 = SET IN THE ABUTMENT OR PIER OF A LARGE BRIDGE
 HT0523_SP_SET: BRIDGE ABUTMENT
 HT0523_STAMPING: P 109 1932
 HT0523_MARK LOGO: CGS
 HT0523_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 HT0523
 HT0523  HISTORY     - Date     Condition        Report By
 HT0523  HISTORY     - 1932     MONUMENTED       CGS
 HT0523  HISTORY     - 1952     GOOD             NGS
 HT0523  HISTORY     - 1962     GOOD             NGS
 HT0523  HISTORY     - 1986     GOOD             NGS
 HT0523
 HT0523                          STATION DESCRIPTION
 HT0523
 HT0523'DESCRIBED BY NATIONAL GEODETIC SURVEY 1952
 HT0523'0.5 MI SE FROM COLMA.
 HT0523'0.5 MILE SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM
 HT0523'THE STATION AT COLMA, AT THE OVERPASS CROSSING OVER U.S. HIGHWAY
 HT0523'101, IN THE TOP OF THE NORTHWEST CORNER OF THE SOUTH CONCRETE
 HT0523'ABUTMENT AND JUST OUTSIDE THE HAND RAIL, 9 1/4 RAILS SOUTHEAST
 HT0523'OF MILE POST 9, 6.2 FEET SOUTHWEST OF THE SOUTHWEST RAIL, AND
 HT0523'ABOUT LEVEL WITH THE TRACK.
 HT0523
 HT0523                          STATION RECOVERY (1962)
 HT0523
 HT0523'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1962
 HT0523'RECOVERED IN GOOD CONDITION.
 HT0523
 HT0523                          STATION RECOVERY (1986)
 HT0523
 HT0523'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0523'RECOVERED IN GOOD CONDITION. NEW DESCRIPTION FOLLOWS. IN COLMA, AT THE
 HT0523'JUNCTION OF EL CAMINO REAL (STATE HIGHWAY 82) AND F STREET, IN TOP OF
 HT0523'THE NORTHWEST CORNER OF THE SOUTH CONCRETE ABUTMENT FOR A RAILROAD
 HT0523'BRIDGE THAT HAS BEEN REMOVED FROM THE EAST SIDE OF THE HIGHWAY, JUST
 HT0523'OUTSIDE THE IRON HANDRAIL.
 HT0523'THE MARK IS 4.6 M ABOVE HIGHWAY 82.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0483 ***********************************************************************
 HT0483  DESIGNATION -  M 1241
 HT0483  PID         -  HT0483
 HT0483  STATE/COUNTY-  CA/SAN MATEO
 HT0483  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0483
 HT0483                         *CURRENT SURVEY CONTROL
 HT0483  ___________________________________________________________________
 HT0483* NAD 83(1986)-  37 41 05.     (N)    122 28 18.     (W)     SCALED
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HT0483* NAVD 88      -        71.210  (meters)     233.63   (feet)  ADJUSTED
HT0483  __________________________________________________________________
HT0483  GEOID HEIGHT-          -32.74  (meters)                      GEOID09
HT0483  DYNAMIC HT   -          71.162 (meters)     233.47   (feet)  COMP
HT0483  MODELED GRAV-     979,952.4    (mgal)                        NAVD 88
HT0483  OBS GRAVITY -     979,955.9    (mgal)                        GRAV_OBS
HT0483
HT0483  VERT ORDER   -  FIRST     CLASS I
HT0483
HT0483.The horizontal coordinates were scaled from a topographic map and have
HT0483.an estimated accuracy of +/- 6 seconds.
HT0483
HT0483.The orthometric height was determined by differential leveling and
HT0483.adjusted in June 1991.
HT0483
HT0483.The geoid height was determined by GEOID09.
HT0483
HT0483.The dynamic height is computed by dividing the NAVD 88
HT0483.geopotential number by the normal gravity value computed on the
HT0483.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
HT0483.degrees latitude (g = 980.6199 gals.).
HT0483
HT0483.The modeled gravity was interpolated from observed gravity values.
HT0483.The observed gravity was obtained from relative gravimeter ties
HT0483.to the IGSN71 gravity network.
HT0483
HT0483;                    North         East     Units  Estimated Accuracy
HT0483;SPC CA 3     -   633,310.    1,826,110.      MT  (+/- 180 meters Scaled)
HT0483
HT0483                          SUPERSEDED SURVEY CONTROL
HT0483
HT0483  NGVD 29 (10/21/93)   70.364  (m)          230.85   (f) ADJUSTED    1 1
HT0483
HT0483.Superseded values are not recommended for survey control.
HT0483.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0483.See file dsdata.txt to determine how the superseded data were derived.
HT0483
HT0483_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG465709(NAD 83)
HT0483_MARKER: DB = BENCH MARK DISK
HT0483_SETTING: 31 = SET IN A PAVEMENT SUCH AS STREET, SIDEWALK, CURB, ETC.
HT0483_SP_SET: CONCRETE GUARDRAIL
HT0483_STAMPING: M 1241 1972
HT0483_MARK LOGO: NGS
HT0483_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
HT0483
HT0483  HISTORY     - Date     Condition        Report By
HT0483  HISTORY     - 1972     MONUMENTED       NGS
HT0483  HISTORY     - 1977     GOOD             NGS
HT0483  HISTORY     - 1986     GOOD             NGS
HT0483
HT0483                          STATION DESCRIPTION
HT0483
HT0483'DESCRIBED BY NATIONAL GEODETIC SURVEY 1972
HT0483'AT DALY CITY.
HT0483'AT THE JUNCTION OF EASTMOOR AVENUE AND SULLIVAN AVENUE AT DALY
HT0483'CITY, IN THE TOP AND 5.0 FEET EAST OF THE WEST END OF THE NORTH
HT0483'CONCRETE GUARDRAIL BASE OF EASTMOOR AVENUE BRIDGE 35-181 OVER
HT0483'INTERSTATE HIGHWAY 280, 6.0 FEET NORTH OF THE NORTH CURB OF
HT0483'EASTMOOR AVENUE, 39 FEET EAST OF THE EAST CURB LINE OF SULLIVAN
HT0483'AVENUE, 5.3 FEET EAST OF THE EAST END OF A CYCLONE FENCE, AND ABOUT
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 HT0483'2 1/2 FEET HIGHER THAN THE AVENUES.
 HT0483
 HT0483                          STATION RECOVERY (1977)
 HT0483
 HT0483'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
 HT0483'RECOVERED IN GOOD CONDITION.
 HT0483
 HT0483                          STATION RECOVERY (1986)
 HT0483
 HT0483'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0483'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0481 ***********************************************************************
 HT0481  DESIGNATION -  L 1241
 HT0481  PID         -  HT0481
 HT0481  STATE/COUNTY-  CA/SAN MATEO
 HT0481  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0481
 HT0481                         *CURRENT SURVEY CONTROL
 HT0481  ___________________________________________________________________
 HT0481* NAD 83(2007)-  37 41 09.43316(N)    122 28 56.41929(W)     ADJUSTED
 HT0481* NAVD 88     -       123.180  (meters)     404.13   (feet)  ADJUSTED
 HT0481  ___________________________________________________________________
 HT0481  EPOCH DATE  -        2007.00
 HT0481  X           -  -2,714,136.777 (meters)                     COMP
 HT0481  Y           -  -4,263,240.759 (meters)                     COMP
 HT0481  Z           -   3,877,972.784 (meters)                     COMP
 HT0481  LAPLACE CORR-           5.60  (seconds)                    DEFLEC09
 HT0481  ELLIP HEIGHT-          90.400 (meters)         (02/10/07) ADJUSTED
 HT0481  GEOID HEIGHT-         -32.77  (meters)                     GEOID09
 HT0481  DYNAMIC HT  -         123.095 (meters)     403.85  (feet)  COMP
 HT0481
 HT0481  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 HT0481  Type    PID    Designation                      North   East  Ellip
 HT0481  -------------------------------------------------------------------
 HT0481  NETWORK HT0481 L 1241                            0.29   0.31   1.18
 HT0481  -------------------------------------------------------------------
 HT0481  MODELED GRAV-     979,941.0   (mgal)                       NAVD 88
 HT0481
 HT0481  VERT ORDER  -  FIRST     CLASS I
 HT0481
 HT0481.The horizontal coordinates were established by GPS observations
 HT0481.and adjusted by the National Geodetic Survey in February 2007.
 HT0481
 HT0481.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 HT0481.See National Readjustment for more information.
 HT0481.The horizontal coordinates are valid at the epoch date displayed above.
 HT0481.The epoch date for horizontal control is a decimal equivalence
 HT0481.of Year/Month/Day.
 HT0481
 HT0481.The orthometric height was determined by differential leveling and
 HT0481.adjusted in June 1991.
 HT0481
 HT0481.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 HT0481
 HT0481.The Laplace correction was computed from DEFLEC09 derived deflections.
 HT0481
 HT0481.The ellipsoidal height was determined by GPS observations
 HT0481.and is referenced to NAD 83.
 HT0481
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HT0481.The geoid height was determined by GEOID09.
HT0481
HT0481.The dynamic height is computed by dividing the NAVD 88
HT0481.geopotential number by the normal gravity value computed on the
HT0481.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
HT0481.degrees latitude (g = 980.6199 gals.).
HT0481
HT0481.The modeled gravity was interpolated from observed gravity values.
HT0481
HT0481;                   North         East     Units Scale Factor Converg.
HT0481;SPC CA 3     -   633,469.732 1,825,171.781   MT  0.99992982   -1 12 49.1
HT0481;SPC CA 3     - 2,078,308.61  5,988,084.42   sFT  0.99992982   -1 12 49.1
HT0481;UTM  10      - 4,171,097.909   545,642.570   MT  0.99962566   +0 18 59.3
HT0481
HT0481!             -  Elev Factor  x  Scale Factor =   Combined Factor
HT0481!SPC CA 3     -   0.99998581  x   0.99992982  =   0.99991564
HT0481!UTM  10      -   0.99998581  x   0.99962566  =   0.99961148
HT0481
HT0481                          SUPERSEDED SURVEY CONTROL
HT0481
HT0481  NAD 83(1998)-  37 41 09.42923(N)    122 28 56.41440(W) AD(2002.75) B
HT0481  ELLIP H (08/23/04)   90.474  (m)                       GP(        ) 4 1
HT0481  NAD 83(1992)-  37 41 09.42414(N)    122 28 56.41045(W) AD(1997.30) 1
HT0481  ELLIP H (07/10/98)   90.413  (m)                       GP(1997.30) 4 1
HT0481  NAD 83(1992)-  37 41 09.42198(N)    122 28 56.40906(W) AD(1995.42) 1
HT0481  ELLIP H (12/22/97)   90.473  (m)                       GP(1995.42) 4 1
HT0481  NAVD 88 (12/22/97)  123.18   (m)          404.1    (f) LEVELING    3
HT0481  NGVD 29 (??/??/92)  122.330  (m)          401.34   (f) ADJ UNCH    1 1
HT0481
HT0481.Superseded values are not recommended for survey control.
HT0481.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0481.See file dsdata.txt to determine how the superseded data were derived.
HT0481
HT0481_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG4564271097(NAD 83)
HT0481_MARKER: DB = BENCH MARK DISK
HT0481_SETTING: 31 = SET IN A PAVEMENT SUCH AS STREET, SIDEWALK, CURB, ETC.
HT0481_SP_SET: CONCRETE CATCH BASIN
HT0481_STAMPING: L 1241 1972
HT0481_MARK LOGO: NGS
HT0481_MAGNETIC: N = NO MAGNETIC MATERIAL
HT0481_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
HT0481_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
HT0481+SATELLITE: SATELLITE OBSERVATIONS - September 28, 2002
HT0481
HT0481  HISTORY     - Date     Condition        Report By
HT0481  HISTORY     - 1972     MONUMENTED       NGS
HT0481  HISTORY     - 1977     GOOD             NGS
HT0481  HISTORY     - 1986     GOOD             NGS
HT0481  HISTORY     - 19950915 GOOD             NGS
HT0481  HISTORY     - 200209   GOOD             JOHFRA
HT0481  HISTORY     - 20020928 GOOD             INDIV
HT0481
HT0481                          STATION DESCRIPTION
HT0481
HT0481'DESCRIBED BY NATIONAL GEODETIC SURVEY 1972
HT0481'AT DALY CITY.
HT0481'AT THE JUNCTION OF EASTMOOR AVENUE AND AN ASPHALT STREET SOUTH
HT0481'TO THE WESTMOOR HIGH SCHOOL PARKING LOT AT DALY CITY, IN THE TOP
HT0481'AND AT THE NORTHEAST CORNER OF A CONCRETE CATCH BASIN AT THE WEST
HT0481'CURB OF THE STREET, 18 FEET SOUTH OF THE SOUTH CURB LINE OF THE
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 HT0481'AVENUE, 155 FEET WEST OF THE EXTENDED CENTER LINE OF TERRACE
 HT0481'VIEW COURT, 255 FEET WEST OF THE EXTENDED CENTER LINE OF GILMAN
 HT0481'DRIVE, 0.8 FOOT WEST OF THE WEST CURB OF THE STREET TO THE
 HT0481'PARKING LOT, AND ABOUT 1 FOOT HIGHER THAN THE STREET AND AVENUE.
 HT0481
 HT0481                          STATION RECOVERY (1977)
 HT0481
 HT0481'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
 HT0481'RECOVERED IN GOOD CONDITION.
 HT0481
 HT0481                          STATION RECOVERY (1986)
 HT0481
 HT0481'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0481'RECOVERED IN GOOD CONDITION. THE DESCRIPTION IS ADEQUATE EXCEPT ADD
 HT0481'7.0 METERS (23.0 FT) EAST-NORTHEAST OF AN IRON ENTRANCE SIGN TO THE
 HT0481'SCHOOL, AND 8.5 METERS (28.0 FT) NORTH OF A 15 MPH STREET SIGN.
 HT0481
 HT0481                          STATION RECOVERY (1995)
 HT0481
 HT0481'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1995 (JDD)
 HT0481'THE STATION WAS RECOVERED.  TO REACH THE STATION FROM THE INTERSECTION
 HT0481'OF INTERSTATE HIGHWAY 280 AND EASTMOOR AVENUE IN DALY CITY, GO WEST ON
 HT0481'EASTMOOR AVENUE FOR 0.6 MI (1.0 KM) TO A PAVED SIDE ROAD LEFT, THE
 HT0481'ENTRANCE TO WESTMOOR HIGH SCHOOL AND THE STATION ON THE LEFT IN THE
 HT0481'SOUTHWEST QUADRANT.
 HT0481
 HT0481                          STATION RECOVERY (2002)
 HT0481
 HT0481'RECOVERY NOTE BY JOHNSON-FRANK 2002 (MSP)
 HT0481'RECOVERED AS DESCRIBED. FROM THE INTERSECTION OF HWY 1 AND HWY
 HT0481'35/SKYLINE BLVD, DRIVE NORTH ON HWY 35 FOR 1 MI.   EXIT ON WESTMOOR
 HT0481'AVE, TURN RIGHT AND DRIVE EAST FOR 0.4 MI AS THE ROAD STARTS TO CURVE
 HT0481'LEFT (NORTH).  CONTINUE FOR 0.1 MI TO THE ENTRANCE TO WESTMOOR HIGH
 HT0481'SCHOOL AND THE  STATION ON THE RIGHT AS PREVIOUSLY DESCRIBED. THIS
 HT0481'STATION WAS OBSERVED AS PART OF THE SOUTH SAN FRANCISCO BAY HEIGHT
 HT0481'MODERNIZATION  PROJECT.
 HT0481
 HT0481                          STATION RECOVERY (2002)
 HT0481
 HT0481'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2002 (DBT)
 HT0481'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0521 ***********************************************************************
 HT0521  DESIGNATION -  N 1241
 HT0521  PID         -  HT0521
 HT0521  STATE/COUNTY-  CA/SAN MATEO
 HT0521  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0521
 HT0521                         *CURRENT SURVEY CONTROL
 HT0521  ___________________________________________________________________
 HT0521* NAD 83(1986)-  37 41 36.     (N)    122 28 15.     (W)     SCALED
 HT0521* NAVD 88     -        58.520  (meters)     191.99   (feet)  ADJUSTED
 HT0521  ___________________________________________________________________
 HT0521  GEOID HEIGHT-         -32.73  (meters)                     GEOID09
 HT0521  DYNAMIC HT  -          58.480 (meters)     191.86  (feet)  COMP
 HT0521  MODELED GRAV-     979,952.7   (mgal)                       NAVD 88
 HT0521
 HT0521  VERT ORDER  -  FIRST     CLASS I
 HT0521
 HT0521.The horizontal coordinates were scaled from a topographic map and have
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 HT0521.an estimated accuracy of +/- 6 seconds.
 HT0521
 HT0521.The orthometric height was determined by differential leveling and
 HT0521.adjusted in June 1991.
 HT0521
 HT0521.The geoid height was determined by GEOID09.
 HT0521
 HT0521.The dynamic height is computed by dividing the NAVD 88
 HT0521.geopotential number by the normal gravity value computed on the
 HT0521.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 HT0521.degrees latitude (g = 980.6199 gals.).
 HT0521
 HT0521.The modeled gravity was interpolated from observed gravity values.
 HT0521
 HT0521;                    North         East     Units  Estimated Accuracy
 HT0521;SPC CA 3     -   634,270.    1,826,200.      MT  (+/- 180 meters Scaled)
 HT0521
 HT0521                          SUPERSEDED SURVEY CONTROL
 HT0521
 HT0521  NGVD 29 (??/??/92)   57.676  (m)          189.23   (f) ADJ UNCH    1 1
 HT0521
 HT0521.Superseded values are not recommended for survey control.
 HT0521.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0521.See file dsdata.txt to determine how the superseded data were derived.
 HT0521
 HT0521_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG466719(NAD 83)
 HT0521_MARKER: DB = BENCH MARK DISK
 HT0521_SETTING: 31 = SET IN A PAVEMENT SUCH AS STREET, SIDEWALK, CURB, ETC.
 HT0521_SP_SET: BRIDGE GUARDRAIL
 HT0521_STAMPING: N 1241 1972
 HT0521_MARK LOGO: NGS
 HT0521_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0521
 HT0521  HISTORY     - Date     Condition        Report By
 HT0521  HISTORY     - 1972     MONUMENTED       NGS
 HT0521  HISTORY     - 1977     GOOD             NGS
 HT0521  HISTORY     - 1986     GOOD             NGS
 HT0521
 HT0521                          STATION DESCRIPTION
 HT0521
 HT0521'DESCRIBED BY NATIONAL GEODETIC SURVEY 1972
 HT0521'AT DALY CITY.
 HT0521'AT THE NORTHEAST CORNER OF THE JUNCTION OF JUNIPERO SERRA
 HT0521'BOULEVARD AND SCHOOL STREET AT DALY CITY, 5.2 FEET EAST OF THE
 HT0521'WEST END OF THE NORTH CONCRETE GUARDRAIL BASE OF SCHOOL STREET
 HT0521'BRIDGE 35-183 OVER INTERSTATE HIGHWAY 280, 38 FEET EAST OF THE
 HT0521'EAST CURB LINE OF THE BOULEVARD, 26 FEET NORTH OF THE CENTER
 HT0521'LINE OF SCHOOL STREET, ABOUT 1 1/2 FEET HIGHER THAN THE CONCRETE
 HT0521'WALK WAY, AND 2 1/2 FEET HIGHER THAN THE STREET.
 HT0521
 HT0521                          STATION RECOVERY (1977)
 HT0521
 HT0521'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
 HT0521'RECOVERED IN GOOD CONDITION.
 HT0521
 HT0521                          STATION RECOVERY (1986)
 HT0521
 HT0521'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
 HT0521'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
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HT0520 ***********************************************************************
HT0520  DESIGNATION -  P 1241
HT0520  PID         -  HT0520
HT0520  STATE/COUNTY-  CA/SAN MATEO
HT0520  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
HT0520
HT0520                         *CURRENT SURVEY CONTROL
HT0520  ___________________________________________________________________
HT0520* NAD 83(1986)-  37 42 18.     (N)    122 28 16.     (W)     SCALED
HT0520* NAVD 88     -        73.250  (meters)     240.32   (feet)  ADJUSTED
HT0520  ___________________________________________________________________
HT0520  GEOID HEIGHT-         -32.72  (meters)                     GEOID09
HT0520  DYNAMIC HT  -          73.201 (meters)      240.16  (feet)  COMP
HT0520  MODELED GRAV-     979,957.4   (mgal)                        NAVD 88
HT0520
HT0520  VERT ORDER  -  FIRST     CLASS I
HT0520
HT0520.The horizontal coordinates were scaled from a topographic map and have
HT0520.an estimated accuracy of +/- 6 seconds.
HT0520
HT0520.The orthometric height was determined by differential leveling and
HT0520.adjusted in June 1991.
HT0520
HT0520.The geoid height was determined by GEOID09.
HT0520
HT0520.The dynamic height is computed by dividing the NAVD 88
HT0520.geopotential number by the normal gravity value computed on the
HT0520.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
HT0520.degrees latitude (g = 980.6199 gals.).
HT0520
HT0520.The modeled gravity was interpolated from observed gravity values.
HT0520
HT0520;                    North         East     Units  Estimated Accuracy
HT0520;SPC CA 3     -   635,560.    1,826,210.      MT  (+/- 180 meters Scaled)
HT0520
HT0520                          SUPERSEDED SURVEY CONTROL
HT0520
HT0520  NGVD 29 (??/??/92)   72.407  (m)          237.56   (f) ADJ UNCH    1 1
HT0520
HT0520.Superseded values are not recommended for survey control.
HT0520.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT0520.See file dsdata.txt to determine how the superseded data were derived.
HT0520
HT0520_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG466732(NAD 83)
HT0520_MARKER: DB = BENCH MARK DISK
HT0520_SETTING: 36 = SET IN A MASSIVE STRUCTURE
HT0520_SP_SET: BRIDGE
HT0520_STAMPING: P 1241 1972
HT0520_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
HT0520
HT0520  HISTORY     - Date     Condition        Report By
HT0520  HISTORY     - 1972     MONUMENTED       NGS
HT0520  HISTORY     - 1977     GOOD             NGS
HT0520
HT0520                          STATION DESCRIPTION
HT0520
HT0520'DESCRIBED BY NATIONAL GEODETIC SURVEY 1972
HT0520'AT DALY CITY.
HT0520'AT THE SOUTHWEST CORNER OF THE JUNCTION OF JUNIPERO SERRA
HT0520'BOULEVARD AND KNOWLES AVENUE AT DALY CITY, IN THE TOP AND 5.0
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 HT0520'FEET NORTH OF THE SOUTH END OF THE SOUTH CONCRETE GUARDRAIL
 HT0520'BASE OF KNOWLES AVENUE BRIDGE 35-172 OVER INTERSTATE HIGHWAY 280,
 HT0520'5.9 FEET WEST OF THE WEST CURB OF THE BOULEVARD, 70 FEET SOUTH
 HT0520'OF THE SOUTH LANES OF THE AVENUE, 1 1/2 FEET HIGHER THAN THE
 HT0520'CONCRETE WALK WAY, 2 1/2 FEET HIGHER THAN THE BOULEVARD.
 HT0520
 HT0520                          STATION RECOVERY (1977)
 HT0520
 HT0520'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
 HT0520'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0519 ***********************************************************************
 HT0519  DESIGNATION -  N 109 RESET 1964
 HT0519  PID         -  HT0519
 HT0519  STATE/COUNTY-  CA/SAN MATEO
 HT0519  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0519
 HT0519                         *CURRENT SURVEY CONTROL
 HT0519  ___________________________________________________________________
 HT0519* NAD 83(1986)-  37 42 29.     (N)    122 28 06.     (W)     SCALED
 HT0519* NAVD 88     -        82.137  (meters)     269.48   (feet)  ADJUSTED
 HT0519  ___________________________________________________________________
 HT0519  GEOID HEIGHT-         -32.71  (meters)                     GEOID09
 HT0519  DYNAMIC HT  -          82.082 (meters)     269.30  (feet)  COMP
 HT0519  MODELED GRAV-     979,956.5   (mgal)                       NAVD 88
 HT0519
 HT0519  VERT ORDER  -  FIRST     CLASS I
 HT0519
 HT0519.The horizontal coordinates were scaled from a topographic map and have
 HT0519.an estimated accuracy of +/- 6 seconds.
 HT0519
 HT0519.The orthometric height was determined by differential leveling and
 HT0519.adjusted in June 1991.
 HT0519
 HT0519.The geoid height was determined by GEOID09.
 HT0519
 HT0519.The dynamic height is computed by dividing the NAVD 88
 HT0519.geopotential number by the normal gravity value computed on the
 HT0519.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 HT0519.degrees latitude (g = 980.6199 gals.).
 HT0519
 HT0519.The modeled gravity was interpolated from observed gravity values.
 HT0519
 HT0519;                   North         East     Units  Estimated Accuracy
 HT0519;SPC CA 3     -   635,900.    1,826,460.      MT  (+/- 180 meters Scaled)
 HT0519
 HT0519                          SUPERSEDED SURVEY CONTROL
 HT0519
 HT0519  NGVD 29 (??/??/92)   81.292  (m)          266.71   (f) ADJ UNCH    1 1
 HT0519
 HT0519.Superseded values are not recommended for survey control.
 HT0519.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0519.See file dsdata.txt to determine how the superseded data were derived.
 HT0519
 HT0519_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG468735(NAD 83)
 HT0519_MARKER: DD = SURVEY DISK
 HT0519_SETTING: 36 = SET IN A MASSIVE STRUCTURE
 HT0519_SP_SET: BRIDGE
 HT0519_STAMPING: N 109 RESET 1964
 HT0519_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
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 HT0519
 HT0519  HISTORY     - Date     Condition        Report By
 HT0519  HISTORY     - 1964     MONUMENTED       CADH
 HT0519  HISTORY     - 1972     GOOD             NGS
 HT0519  HISTORY     - 1977     GOOD             NGS
 HT0519
 HT0519                          STATION DESCRIPTION
 HT0519
 HT0519'DESCRIBED BY NATIONAL GEODETIC SURVEY 1972
 HT0519'AT DALY CITY.
 HT0519'AT THE ST. CHARLES AVENUE BRIDGE, OVER INTERSTATE HIGHWAY 280,
 HT0519'TO A BART STATION AT DALY CITY, 0.2 MILE SOUTHEAST ALONG ST.
 HT0519'CHARLES AVENUE FROM THE JUNCTION OF ALEMANY BOULEVARD, 0.05 MILE
 HT0519'SOUTHEAST ALONG ST. CHARLES AVENUE FROM THE JUNCTION OF BELLE
 HT0519'AVENUE, IN THE TOP AND 13.0 FEET NORTHWEST OF THE SOUTHEAST END
 HT0519'OF THE NORTHEAST CONCRETE WALK WAY OF THE BRIDGE, 3.0 FEET
 HT0519'SOUTHWEST OF THE SOUTHWEST FACE OF THE NORTHEAST CONCRETE
 HT0519'GUARDRAIL BASE, AND ABOUT 1 FOOT HIGHER THAN THE AVENUE.
 HT0519
 HT0519                          STATION RECOVERY (1977)
 HT0519
 HT0519'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1977
 HT0519'RECOVERED IN GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0600 ***********************************************************************
 HT0600  DESIGNATION -  L 568
 HT0600  PID         -  HT0600
 HT0600  STATE/COUNTY-  CA/SAN MATEO
 HT0600  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0600
 HT0600                         *CURRENT SURVEY CONTROL
 HT0600  ___________________________________________________________________
 HT0600* NAD 83(1986)-  37 42 30.     (N)    122 29 09.     (W)     SCALED
 HT0600* NAVD 88     -        29.80   (+/-2cm)      97.8    (feet)  VERTCON
 HT0600  ___________________________________________________________________
 HT0600  GEOID HEIGHT-         -32.77  (meters)                     GEOID09
 HT0600  VERT ORDER  -  SECOND    CLASS 0 (See Below)
 HT0600
 HT0600.The horizontal coordinates were scaled from a topographic map and have
 HT0600.an estimated accuracy of +/- 6 seconds.
 HT0600
 HT0600.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0600.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0600.The vertical order pertains to the NGVD 29 superseded value.
 HT0600
 HT0600.The geoid height was determined by GEOID09.
 HT0600
 HT0600;                   North         East    Units  Estimated Accuracy
 HT0600;SPC CA 3     -   635,960.    1,824,920.     MT  (+/- 180 meters Scaled)
 HT0600
 HT0600                          SUPERSEDED SURVEY CONTROL
 HT0600
 HT0600  NGVD 29 (??/??/92)   28.960  (m)           95.01   (f) ADJ UNCH    2 0
 HT0600
 HT0600.Superseded values are not recommended for survey control.
 HT0600.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0600.See file dsdata.txt to determine how the superseded data were derived.
 HT0600
 HT0600_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG453735(NAD 83)
 HT0600_MARKER: DB = BENCH MARK DISK
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 HT0600_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT0600_SP_SET: CULVERT
 HT0600_STAMPING: L 568 1939
 HT0600_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0600
 HT0600  HISTORY     - Date     Condition        Report By
 HT0600  HISTORY     - 1939     MONUMENTED       CGS
 HT0600  HISTORY     - 1958     GOOD             NGS
 HT0600  HISTORY     - 1958     MARK NOT FOUND   NGS
 HT0600
 HT0600                          STATION DESCRIPTION
 HT0600
 HT0600'DESCRIBED BY NATIONAL GEODETIC SURVEY 1958
 HT0600'0.9 MI W FROM DALY CITY.
 HT0600'0.9 MILE WEST ALONG STATE HIGHWAY 1 FROM THE WEST CITY LIMITS
 HT0600'OF DALY CITY, SAN MATEO COUNTY, OPPOSITE THE EAST END OF THE
 HT0600'TRIANGLE FORMED AT THE Y-JUNCTION OF LAKE MERCED BOULEVARD,
 HT0600'AT A CULVERT UNDER STATE HIGHWAY 1, IN THE TOP OF THE SOUTHEAST
 HT0600'CORNER OF THE SOUTH CONCRETE HEADWALL, 35 FEET SOUTH OF THE
 HT0600'CENTERLINE OF THE HIGHWAY, AND 14 FEET WEST OF THE CENTERLINE
 HT0600'OF A FARM ROAD.  A STANDARD DISK, STAMPED L 568 1939.  NOTE-- THERE
 HT0600'IS NOW A SIX-LANE HIGHWAY AT THIS LOCATION AND NO CONCRETE
 HT0600'HEADWALL.
 HT0600
 HT0600                          STATION RECOVERY (1958)
 HT0600
 HT0600'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1958
 HT0600'MARK NOT FOUND.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT2273 ***********************************************************************
 HT2273  DESIGNATION -  W 1320
 HT2273  PID         -  HT2273
 HT2273  STATE/COUNTY-  CA/SAN FRANCISCO
 HT2273  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT2273
 HT2273                         *CURRENT SURVEY CONTROL
 HT2273  ___________________________________________________________________
 HT2273* NAD 83(1986)-  37 42 48.     (N)    122 28 18.     (W)     SCALED
 HT2273* NAVD 88     -        58.189  (meters)     190.91   (feet)  ADJUSTED
 HT2273  ___________________________________________________________________
 HT2273  GEOID HEIGHT-         -32.71  (meters)                     GEOID09
 HT2273  DYNAMIC HT  -          58.150 (meters)     190.78  (feet)  COMP
 HT2273  MODELED GRAV-     979,963.4   (mgal)                       NAVD 88
 HT2273  OBS GRAVITY -     979,965.8   (mgal)                       GRAV_OBS
 HT2273
 HT2273  VERT ORDER  -  FIRST     CLASS I
 HT2273
 HT2273.The horizontal coordinates were scaled from a topographic map and have
 HT2273.an estimated accuracy of +/- 6 seconds.
 HT2273
 HT2273.The orthometric height was determined by differential leveling and
 HT2273.adjusted in June 1991.
 HT2273
 HT2273.The geoid height was determined by GEOID09.
 HT2273
 HT2273.The dynamic height is computed by dividing the NAVD 88
 HT2273.geopotential number by the normal gravity value computed on the
 HT2273.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 HT2273.degrees latitude (g = 980.6199 gals.).
 HT2273
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 HT2273.The modeled gravity was interpolated from observed gravity values.
 HT2273.The observed gravity was obtained from relative gravimeter ties
 HT2273.to the IGSN71 gravity network.
 HT2273
 HT2273;                    North         East     Units  Estimated Accuracy
 HT2273;SPC CA 3     -   636,490.    1,826,180.      MT  (+/- 180 meters Scaled)
 HT2273
 HT2273                          SUPERSEDED SURVEY CONTROL
 HT2273
 HT2273  NGVD 29 (10/21/93)   57.345  (m)          188.14   (f) ADJUSTED    1 1
 HT2273
 HT2273.Superseded values are not recommended for survey control.
 HT2273.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT2273.See file dsdata.txt to determine how the superseded data were derived.
 HT2273
 HT2273_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG465741(NAD 83)
 HT2273_MARKER: DB = BENCH MARK DISK
 HT2273_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT2273_SP_SET: CURB
 HT2273_STAMPING: W 1320 1977
 HT2273_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT2273
 HT2273  HISTORY     - Date     Condition        Report By
 HT2273  HISTORY     - 1977     MONUMENTED       NGS
 HT2273
 HT2273                          STATION DESCRIPTION
 HT2273
 HT2273'DESCRIBED BY NATIONAL GEODETIC SURVEY 1977
 HT2273'IN SAN FRANCISCO.
 HT2273'AT SAN FRANCISCO, SET IN THE CURB ON THE WEST SIDE OF JUNIPERO
 HT2273'SERRA BLVD, JUST NORTH OF WHERE IT CROSSES BROTHERHOOD WAY.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT0602 ***********************************************************************
 HT0602  DESIGNATION -  M 568 RESET 1955
 HT0602  PID         -  HT0602
 HT0602  STATE/COUNTY-  CA/SAN FRANCISCO
 HT0602  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT0602
 HT0602                         *CURRENT SURVEY CONTROL
 HT0602  ___________________________________________________________________
 HT0602* NAD 83(1986)-  37 43 08.     (N)    122 30 01.     (W)     SCALED
 HT0602* NAVD 88     -        12.67   (+/-2cm)      41.6    (feet)  VERTCON
 HT0602  ___________________________________________________________________
 HT0602  GEOID HEIGHT-         -32.80  (meters)                     GEOID09
 HT0602  VERT ORDER  -  THIRD (See Below)
 HT0602
 HT0602.The horizontal coordinates were scaled from a topographic map and have
 HT0602.an estimated accuracy of +/- 6 seconds.
 HT0602
 HT0602.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT0602.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT0602.The vertical order pertains to the NGVD 29 superseded value.
 HT0602
 HT0602.The geoid height was determined by GEOID09.
 HT0602
 HT0602;                    North         East     Units  Estimated Accuracy
 HT0602;SPC CA 3     -   637,160.    1,823,670.      MT  (+/- 180 meters Scaled)
 HT0602
 HT0602                          SUPERSEDED SURVEY CONTROL
 HT0602
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 HT0602  NGVD 29 (??/??/??)   11.83   (m)           38.8    (f) RESET       3
 HT0602
 HT0602.Superseded values are not recommended for survey control.
 HT0602.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT0602.See file dsdata.txt to determine how the superseded data were derived.
 HT0602
 HT0602_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG440747(NAD 83)
 HT0602_MARKER: DB = BENCH MARK DISK
 HT0602_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT0602_SP_SET: FLAGPOLE CONCRETE BASE
 HT0602_STAMPING: M 568 RESET 1955
 HT0602_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT0602
 HT0602  HISTORY     - Date     Condition        Report By
 HT0602  HISTORY     - 1955     MONUMENTED       CGS
 HT0602
 HT0602                          STATION DESCRIPTION
 HT0602
 HT0602'DESCRIBED BY COAST AND GEODETIC SURVEY 1955
 HT0602'IN SAN FRANCISCO.
 HT0602'ABOUT 0.8 MILE NORTH ALONG SKYLINE BLVD. FROM THE SOUTH CITY
 HT0602'LIMITS OF SAN FRANCISCO, ON THE WEST SHORE OF LAKE MERCED.
 HT0602'SET IN A DRILL HOLE IN THE CONCRETE BASE OF THE FLAG POLE IN FRONT
 HT0602'OF THE SAN FRANCISCO POLICE PISTOL RANGE BUILDING.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT2272 ***********************************************************************
 HT2272  DESIGNATION -  V 1320
 HT2272  PID         -  HT2272
 HT2272  STATE/COUNTY-  CA/SAN FRANCISCO
 HT2272  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT2272
 HT2272                         *CURRENT SURVEY CONTROL
 HT2272  ___________________________________________________________________
 HT2272* NAD 83(1986)-  37 43 17.     (N)    122 28 32.     (W)     SCALED
 HT2272* NAVD 88     -        49.702  (meters)     163.06   (feet)  ADJUSTED
 HT2272  ___________________________________________________________________
 HT2272  GEOID HEIGHT-        -32.71  (meters)                      GEOID09
 HT2272  DYNAMIC HT  -         49.669 (meters)      162.96  (feet)  COMP
 HT2272  MODELED GRAV-     979,968.2  (mgal)                        NAVD 88
 HT2272
 HT2272  VERT ORDER  -  FIRST     CLASS I
 HT2272
 HT2272.The horizontal coordinates were scaled from a topographic map and have
 HT2272.an estimated accuracy of +/- 6 seconds.
 HT2272
 HT2272.The orthometric height was determined by differential leveling and
 HT2272.adjusted in June 1991.
 HT2272
 HT2272.The geoid height was determined by GEOID09.
 HT2272
 HT2272.The dynamic height is computed by dividing the NAVD 88
 HT2272.geopotential number by the normal gravity value computed on the
 HT2272.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 HT2272.degrees latitude (g = 980.6199 gals.).
 HT2272
 HT2272.The modeled gravity was interpolated from observed gravity values.
 HT2272
 HT2272;                   North         East     Units  Estimated Accuracy
 HT2272;SPC CA 3     -   637,390.    1,825,850.      MT  (+/- 180 meters Scaled)
 HT2272
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 HT2272                          SUPERSEDED SURVEY CONTROL
 HT2272
 HT2272  NGVD 29 (10/21/93)   48.860  (m)          160.30   (f) ADJUSTED    1 1
 HT2272
 HT2272.Superseded values are not recommended for survey control.
 HT2272.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT2272.See file dsdata.txt to determine how the superseded data were derived.
 HT2272
 HT2272_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG462750(NAD 83)
 HT2272_MARKER: DB = BENCH MARK DISK
 HT2272_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT2272_SP_SET: CURB
 HT2272_STAMPING: V 1320 1977
 HT2272_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT2272
 HT2272  HISTORY     - Date     Condition        Report By
 HT2272  HISTORY     - 1977     MONUMENTED       NGS
 HT2272
 HT2272                          STATION DESCRIPTION
 HT2272
 HT2272'DESCRIBED BY NATIONAL GEODETIC SURVEY 1977
 HT2272'IN SAN FRANCISCO.
 HT2272'AT SAN FRANCISCO, ON THE CAMPUS OF CALIFORNIA STATE UNIVERSITY IN THE
 HT2272'SOUTHWEST PART OF THE CITY , SET IN THE TOP OF A CONCRETE
 HT2272'BORDER OF THE
 HT2272'H H L ENERGY CONSERVATION BUILDING AT THE NORTHEAST CORNER, JUST NORTH
 HT2272'OF A 15 MINUTE PARKING ZONE, AND 0.6 FOOT WEST OF THE SIDEWALK.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT2271 ***********************************************************************
 HT2271  DESIGNATION -  M 6 C OF SF
 HT2271  PID         -  HT2271
 HT2271  STATE/COUNTY-  CA/SAN FRANCISCO
 HT2271  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT2271
 HT2271                         *CURRENT SURVEY CONTROL
 HT2271  ___________________________________________________________________
 HT2271* NAD 83(1986)-  37 43 47.     (N)    122 28 30.     (W)     SCALED
 HT2271* NAVD 88     -        63.620  (meters)     208.73   (feet)  ADJUSTED
 HT2271  ___________________________________________________________________
 HT2271  GEOID HEIGHT-         -32.70  (meters)                     GEOID09
 HT2271  DYNAMIC HT  -          63.578 (meters)     208.59  (feet)  COMP
 HT2271  MODELED GRAV-     979,966.0   (mgal)                       NAVD 88
 HT2271
 HT2271  VERT ORDER  -  FIRST     CLASS I
 HT2271
 HT2271.The horizontal coordinates were scaled from a topographic map and have
 HT2271.an estimated accuracy of +/- 6 seconds.
 HT2271
 HT2271.The orthometric height was determined by differential leveling and
 HT2271.adjusted in June 1991.
 HT2271
 HT2271.The geoid height was determined by GEOID09.
 HT2271
 HT2271.The dynamic height is computed by dividing the NAVD 88
 HT2271.geopotential number by the normal gravity value computed on the
 HT2271.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 HT2271.degrees latitude (g = 980.6199 gals.).
 HT2271
 HT2271.The modeled gravity was interpolated from observed gravity values.
 HT2271
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 HT2271;                    North         East     Units  Estimated Accuracy
 HT2271;SPC CA 3     -   638,310.    1,825,920.      MT  (+/- 180 meters Scaled)
 HT2271
 HT2271                          SUPERSEDED SURVEY CONTROL
 HT2271
 HT2271  NGVD 29 (10/21/93)   62.779  (m)          205.97   (f) ADJUSTED    1 1
 HT2271
 HT2271.Superseded values are not recommended for survey control.
 HT2271.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT2271.See file dsdata.txt to determine how the superseded data were derived.
 HT2271
 HT2271_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG462759(NAD 83)
 HT2271_MARKER: DD = SURVEY DISK
 HT2271_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT2271_SP_SET: SIDEWALK
 HT2271_STAMPING: M 6 1974
 HT2271_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT2271
 HT2271  HISTORY     - Date     Condition        Report By
 HT2271  HISTORY     - 1974     MONUMENTED       CA3290
 HT2271  HISTORY     - 1977     GOOD             NGS
 HT2271
 HT2271                          STATION DESCRIPTION
 HT2271
 HT2271'DESCRIBED BY NATIONAL GEODETIC SURVEY 1977
 HT2271'IN SAN FRANCISCO.
 HT2271'AT SAN FRANCISCO, ON 19 TH AVE AT STONETOWN MALL, A DISK SET IN THE
 HT2271'SIDEWALK IN THE CENTER OF A PAINTED WHITE CROSS, 10 FEET SOUTH OF
 HT2271'THE STEPS LEADING TO THE MALL AT THE NORTH END, AND 5 FEET WEST OF THE
 HT2271'WEST CURB OF 19 TH AVE.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT1841 ***********************************************************************
 HT1841  DESIGNATION -  N 568
 HT1841  PID         -  HT1841
 HT1841  STATE/COUNTY-  CA/SAN FRANCISCO
 HT1841  USGS QUAD   -
 HT1841
 HT1841                         *CURRENT SURVEY CONTROL
 HT1841  ___________________________________________________________________
 HT1841* NAD 83(1986)-  37 43 47.     (N)    122 30 10.     (W)     SCALED
 HT1841* NAVD 88     -        17.71   (+/-2cm)      58.1    (feet)  VERTCON
 HT1841  ___________________________________________________________________
 HT1841  GEOID HEIGHT-         -32.79  (meters)                     GEOID09
 HT1841  VERT ORDER  -  SECOND    CLASS 0 (See Below)
 HT1841
 HT1841.The horizontal coordinates were scaled from a topographic map and have
 HT1841.an estimated accuracy of +/- 6 seconds.
 HT1841
 HT1841.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT1841.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT1841.The vertical order pertains to the NGVD 29 superseded value.
 HT1841
 HT1841.The geoid height was determined by GEOID09.
 HT1841
 HT1841;                    North         East     Units  Estimated Accuracy
 HT1841;SPC CA 3     -   638,370.    1,823,470.      MT  (+/- 180 meters Scaled)
 HT1841
 HT1841                          SUPERSEDED SURVEY CONTROL
 HT1841
 HT1841  NGVD 29 (??/??/92)   16.874  (m)           55.36   (f) ADJ UNCH    2 0
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 HT1841
 HT1841.Superseded values are not recommended for survey control.
 HT1841.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT1841.See file dsdata.txt to determine how the superseded data were derived.
 HT1841
 HT1841_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG438759(NAD 83)
 HT1841_MARKER: DB = BENCH MARK DISK
 HT1841_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT1841_SP_SET: WALL
 HT1841_STAMPING: N 568 1939
 HT1841_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT1841_SATELLITE: THE SITE LOCATION WAS REPORTED AS NOT SUITABLE FOR
 HT1841+SATELLITE: SATELLITE OBSERVATIONS - January 11, 2009
 HT1841
 HT1841  HISTORY     - Date     Condition        Report By
 HT1841  HISTORY     - 1939     MONUMENTED       CGS
 HT1841  HISTORY     - 1973     GOOD             NGS
 HT1841  HISTORY     - 20090109 GOOD             GEOCAC
 HT1841  HISTORY     - 20090111 GOOD             GEOCAC
 HT1841
 HT1841                          STATION DESCRIPTION
 HT1841
 HT1841'DESCRIBED BY NATIONAL GEODETIC SURVEY 1973
 HT1841'AT SAN FRANCISCO.
 HT1841'AT SAN FRANCISCO, SAN FRANCISCO COUNTY, AT THE NORTHEAST CORNER
 HT1841'OF FORT FUNSTON, 78 FEET SOUTH OF THE CENTER OF THE ENTRANCE, 20.7
 HT1841'FEET SOUTHWEST OF A FENCE, IN THE CONCRETE WALL OF A PUMP HOUSE,
 HT1841'8 INCHES FROM THE NORTHWEST CORNER, AND ABOUT 4 FEET ABOVE THE
 HT1841'GROUND.  A STANDARD DISK, STAMPED N 568 1939 AND SET VERTICALLY.
 HT1841
 HT1841                          STATION RECOVERY (2009)
 HT1841
 HT1841'RECOVERY NOTE BY GEOCACHING 2009 (RM)
 HT1841'RECOVERED BENCHMARK IN GOOD CONDITION.  NGS DESCRIPTION (1973) IS
 HT1841'ADEQUATE.
 HT1841
 HT1841                          STATION RECOVERY (2009)
 HT1841
 HT1841'RECOVERY NOTE BY GEOCACHING 2009 (RM)
 HT1841'PERMISSION WAS GRANTED TO PROCEED THROUGH THE SAN FRANCISCO ZOO GATES
 HT1841'TO
 HT1841'ACCESS THE PUMPHOUSE FROM THE NORTHWEST WHERE THE STATION WAS
 HT1841'RECOVERED IN
 HT1841'GOOD CONDITION.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 AB7677 ***********************************************************************
 AB7677  DESIGNATION -  HPGN D CA 04 GE
 AB7677  PID         -  AB7677
 AB7677  STATE/COUNTY-  CA/SAN FRANCISCO
 AB7677  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 AB7677
 AB7677                         *CURRENT SURVEY CONTROL
 AB7677  ___________________________________________________________________
 AB7677* NAD 83(2007)-  37 44 00.33344(N)    122 29 49.03035(W)     ADJUSTED
 AB7677* NAVD 88     -        23.69   (meters)      77.7    (feet)  LEVELING
 AB7677  ___________________________________________________________________
 AB7677  EPOCH DATE  -        2007.00
 AB7677  X           -  -2,713,450.334 (meters)                     COMP
 AB7677  Y           -  -4,259,763.765 (meters)                     COMP
 AB7677  Z           -   3,882,080.400 (meters)                     COMP
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AB7677  LAPLACE CORR-          6.47  (seconds)                        DEFLEC09
AB7677  ELLIP HEIGHT-         -9.035 (meters)             (02/10/07) ADJUSTED
AB7677  GEOID HEIGHT-        -32.76  (meters)                         GEOID09
AB7677
AB7677  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
AB7677  Type    PID    Designation                      North   East  Ellip
AB7677  -------------------------------------------------------------------
AB7677  NETWORK AB7677 HPGN D CA 04 GE                    0.71   1.16   5.84
AB7677  -------------------------------------------------------------------
AB7677  VERT ORDER  -  THIRD ?
AB7677
AB7677.The horizontal coordinates were established by GPS observations
AB7677.and adjusted by the National Geodetic Survey in February 2007.
AB7677
AB7677.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AB7677.See National Readjustment for more information.
AB7677.The horizontal coordinates are valid at the epoch date displayed above.
AB7677.The epoch date for horizontal control is a decimal equivalence
AB7677.of Year/Month/Day.
AB7677
AB7677.The orthometric height was determined by differential leveling.
AB7677.The vertical network tie was performed by a horz. field party for horz.
AB7677.obs reductions. Reset procedures were used to establish the elevation.
AB7677
AB7677.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AB7677
AB7677.The Laplace correction was computed from DEFLEC09 derived deflections.
AB7677
AB7677.The ellipsoidal height was determined by GPS observations
AB7677.and is referenced to NAD 83.
AB7677
AB7677.The geoid height was determined by GEOID09.
AB7677
AB7677;                   North         East     Units Scale Factor Converg.
AB7677;SPC CA 3     -   638,764.560 1,823,995.524   MT  0.99992923   -1 13 21.4
AB7677;SPC CA 3     - 2,095,680.06  5,984,225.31   sFT  0.99992923   -1 13 21.4
AB7677;UTM  10      - 4,176,357.833   544,325.733   MT  0.99962420   +0 18 28.3
AB7677
AB7677!             -  Elev Factor  x  Scale Factor =   Combined Factor
AB7677!SPC CA 3     -   1.00000142  x   0.99992923  =   0.99993065
AB7677!UTM  10      -   1.00000142  x   0.99962420  =   0.99962562
AB7677
AB7677                          SUPERSEDED SURVEY CONTROL
AB7677
AB7677  NAD 83(1992)-  37 44 00.31877(N)    122 29 49.01603(W) AD(1991.35) 1
AB7677  ELLIP H (10/31/96)   -8.940  (m)                        GP(        ) 4 1
AB7677
AB7677.Superseded values are not recommended for survey control.
AB7677.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AB7677.See file dsdata.txt to determine how the superseded data were derived.
AB7677
AB7677_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG4432576357(NAD 83)
AB7677_MARKER: DD = SURVEY DISK
AB7677_SETTING: 50 = ALUMINUM ALLOY ROD W/O SLEEVE (10 FT.+)
AB7677_STAMPING: CA-HPGN-DENSIFICATION STA. 04-GE 1994
AB7677_MARK LOGO: CADT
AB7677_PROJECTION: FLUSH
AB7677_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
AB7677_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AB7677_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
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 AB7677+SATELLITE: SATELLITE OBSERVATIONS - 1994
 AB7677_ROD/PIPE-DEPTH: 7.8  meters
 AB7677
 AB7677  HISTORY     - Date     Condition        Report By
 AB7677  HISTORY     - 1994     MONUMENTED       CADT
 AB7677
 AB7677                          STATION DESCRIPTION
 AB7677
 AB7677'DESCRIBED BY CALTRANS 1994 (DAN)
 AB7677'THE STATION IS LOCATED NEAR THE INTERSECTION OF SKYLINE BLVD (STATE
 AB7677'HIGHWAY 35) AND SLOAT BLVD AT THE NORTHEAST CORNER OF THE SAN
 AB7677'FRANCISCO ZOO, ABOUT 6 MI (9.7 KM) SOUTHWEST OF DOWNTOWN SAN
 AB7677'FRANCISCO.  TO REACH THE STATION FROM THE INTERSECTION OF SLOAT BLVD
 AB7677'(STATE HIGHWAY 35) AND 19TH AVE (STATE HIGHWAY 1) , GO WEST ON SLOAT
 AB7677'BLVD, CROSSING OVER SUNSET BLVD, FOR 1.2 MI (1.9 KM) TO THE
 AB7677'Y-INTERSECTION WITH SKYLINE BLVD (STATE HIGHWAY 35) .  BEAR LEFT AND
 AB7677'GO SOUTHWEST ON SKYLINE BLVD FOR ABOUT 165 FT (50.3 M) TO THE STATION
 AB7677'ON THE LEFT IN THE RAISED MEDIAN ISLAND AT POST MILE 1.8.  THE STATION
 AB7677'IS A SURVEY DISK ENCASED IN PVC PIPE WITH ACCESS COVER SET IN CONCRETE
 AB7677'FLUSH WITH THE SURFACE OF THE RAISED MEDIAN ISLAND, ABOUT 165 FT (50.3
 AB7677'M) SOUTHWEST OF THE INTERSECTION OF SKYLINE BLVD AND SLOAT BLVD, 118.5
 AB7677'FT (36.1 M) NORTHWEST OF THE NORTHWEST CORNER OF THE HOUSE AT 379
 AB7677'SKYLINE BLVD, 96.4 FT (29.4 M) NORTHEAST OF A LIGHT POST AT THE SOUTH
 AB7677'END OF THE MEDIAN ISLAND, 74.3 FT (22.6 M) SOUTHWEST OF LIGHT POST
 AB7677'E0/1 AT THE NORTH END OF THE MEDIAN ISLAND, 65.0 FT (19.8 M) WEST OF
 AB7677'AND ACROSS THE NORTH-BOUND LANES OF SKYLINE BLVD FROM LIGHT POST 0/6,
 AB7677'18.4 FT (5.6 M) EAST OF THE WEST CURB OF THE MEDIAN ISLAND AND 7.3 FT
 AB7677'(2.2 M) WEST OF THE EAST CURB OF THE MEDIAN ISLAND.  THE DISK IS 0.3
 AB7677'FT (0.1 M) BELOW THE LID OF THE ACCESS COVER.  THIS STATION WAS
 AB7677'OCCUPIED AS PART OF A CALIFORNIA HPGN DENSIFICATION SURVEY IN 1994.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT1842 ***********************************************************************
 HT1842  DESIGNATION -  P 568
 HT1842  PID         -  HT1842
 HT1842  STATE/COUNTY-  CA/SAN FRANCISCO
 HT1842  USGS QUAD   -
 HT1842
 HT1842                         *CURRENT SURVEY CONTROL
 HT1842  ___________________________________________________________________
 HT1842* NAD 83(1986)-  37 44 10.     (N)    122 30 23.     (W)     SCALED
 HT1842* NAVD 88     -        10.20   (+/-2cm)      33.5    (feet)  VERTCON
 HT1842  ___________________________________________________________________
 HT1842  GEOID HEIGHT-         -32.79  (meters)                     GEOID09
 HT1842  VERT ORDER  -  SECOND    CLASS 0 (See Below)
 HT1842
 HT1842.The horizontal coordinates were scaled from a topographic map and have
 HT1842.an estimated accuracy of +/- 6 seconds.
 HT1842
 HT1842.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT1842.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT1842.The vertical order pertains to the NGVD 29 superseded value.
 HT1842
 HT1842.The geoid height was determined by GEOID09.
 HT1842
 HT1842;                   North         East    Units  Estimated Accuracy
 HT1842;SPC CA 3     -   639,080.    1,823,170.      MT  (+/- 180 meters Scaled)
 HT1842
 HT1842                          SUPERSEDED SURVEY CONTROL
 HT1842
 HT1842  NGVD 29 (??/??/92)    9.361  (m)           30.71   (f) ADJ UNCH    2 0
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 HT1842
 HT1842.Superseded values are not recommended for survey control.
 HT1842.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT1842.See file dsdata.txt to determine how the superseded data were derived.
 HT1842
 HT1842_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG434766(NAD 83)
 HT1842_MARKER: DB = BENCH MARK DISK
 HT1842_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT1842_SP_SET: CULVERT
 HT1842_STAMPING: P 568 1939
 HT1842_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT1842
 HT1842  HISTORY     - Date     Condition        Report By
 HT1842  HISTORY     - 1939     MONUMENTED       CGS
 HT1842  HISTORY     - 1973     GOOD             NGS
 HT1842
 HT1842                          STATION DESCRIPTION
 HT1842
 HT1842'DESCRIBED BY NATIONAL GEODETIC SURVEY 1973
 HT1842'AT SAN FRANCISCO.
 HT1842'AT SAN FRANCISCO, SAN FRANCISCO COUNTY, ON GREAT HIGHWAY, AT THE
 HT1842'FOOT OF WAWONA STREET, 75 FEET SOUTH OF A COMFORT STATION, 39
 HT1842'FEET EAST OF THE EAST BOUNDARY OF THE MIDDLE LANE, AT THE EAST
 HT1842'END OF A CULVERT UNDER THE HIGHWAY, AND IN THE TOP OF A SOUTH
 HT1842'HEADWALL.  A STANDARD DISK, STAMPED P 568 1939.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT2270 ***********************************************************************
 HT2270  DESIGNATION -  U 1320
 HT2270  PID         -  HT2270
 HT2270  STATE/COUNTY-  CA/SAN FRANCISCO
 HT2270  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT2270
 HT2270                         *CURRENT SURVEY CONTROL
 HT2270  ___________________________________________________________________
 HT2270* NAD 83(2007)-  37 44 15.72379(N)    122 28 31.93050(W)     ADJUSTED
 HT2270* NAVD 88     -        83.942  (meters)     275.40   (feet)  ADJUSTED
 HT2270  ___________________________________________________________________
 HT2270  EPOCH DATE  -        2007.00
 HT2270  X           -  -2,711,727.558 (meters)                     COMP
 HT2270  Y           -  -4,260,572.965 (meters)                     COMP
 HT2270  Z           -   3,882,492.556 (meters)                     COMP
 HT2270  LAPLACE CORR-            5.70  (seconds)                   DEFLEC09
 HT2270  ELLIP HEIGHT-           51.257 (meters)          (02/10/07) ADJUSTED
 HT2270  GEOID HEIGHT-          -32.68  (meters)                    GEOID09
 HT2270  DYNAMIC HT  -           83.886 (meters)     275.22  (feet) COMP
 HT2270
 HT2270  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 HT2270  Type    PID    Designation                       North   East  Ellip
 HT2270  -------------------------------------------------------------------
 HT2270  NETWORK HT2270 U 1320                             0.49   0.84   4.31
 HT2270  -------------------------------------------------------------------
 HT2270  MODELED GRAV-     979,961.5   (mgal)                       NAVD 88
 HT2270  OBS GRAVITY -     979,965.1   (mgal)                       GRAV_OBS
 HT2270
 HT2270  VERT ORDER  -  FIRST     CLASS I
 HT2270
 HT2270.The horizontal coordinates were established by GPS observations
 HT2270.and adjusted by the National Geodetic Survey in February 2007.
 HT2270
 HT2270.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
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HT2270.See National Readjustment for more information.
HT2270.The horizontal coordinates are valid at the epoch date displayed above.
HT2270.The epoch date for horizontal control is a decimal equivalence
HT2270.of Year/Month/Day.
HT2270
HT2270.The orthometric height was determined by differential leveling and
HT2270.adjusted in June 1991.
HT2270
HT2270.The X, Y, and Z were computed from the position and the ellipsoidal ht.
HT2270
HT2270.The Laplace correction was computed from DEFLEC09 derived deflections.
HT2270
HT2270.The ellipsoidal height was determined by GPS observations
HT2270.and is referenced to NAD 83.
HT2270
HT2270.The geoid height was determined by GEOID09.
HT2270
HT2270.The dynamic height is computed by dividing the NAVD 88
HT2270.geopotential number by the normal gravity value computed on the
HT2270.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
HT2270.degrees latitude (g = 980.6199 gals.).
HT2270
HT2270.The modeled gravity was interpolated from observed gravity values.
HT2270.The observed gravity was obtained from relative gravimeter ties
HT2270.to the IGSN71 gravity network.
HT2270
HT2270;                    North         East     Units Scale Factor Converg.
HT2270;SPC CA 3     -   639,198.858 1,825,892.844   MT  0.99992921   -1 12 34.2
HT2270;SPC CA 3     - 2,097,104.92  5,990,450.11   sFT  0.99992921   -1 12 34.2
HT2270;UTM  10      - 4,176,842.504   546,210.203   MT  0.99962630   +0 19 15.6
HT2270
HT2270!             -  Elev Factor  x  Scale Factor =   Combined Factor
HT2270!SPC CA 3     -   0.99999196  x   0.99992921  =   0.99992117
HT2270!UTM  10      -   0.99999196  x   0.99962630  =   0.99961826
HT2270
HT2270                          SUPERSEDED SURVEY CONTROL
HT2270
HT2270  NAD 83(1992)-  37 44 15.71536(N)    122 28 31.92128(W) AD(1997.30) 1
HT2270  ELLIP H (07/10/98)   51.275  (m)                       GP(1997.30) 4 1
HT2270  NAD 83(1992)-  37 44 15.71326(N)    122 28 31.91994(W) AD(1995.42) 1
HT2270  ELLIP H (12/22/97)   51.336  (m)                       GP(        ) 4 1
HT2270  NAVD 88 (12/22/97)   83.94   (m)          275.4    (f) LEVELING    3
HT2270  NGVD 29 (10/21/93)   83.101  (m)          272.64   (f) ADJUSTED    1 1
HT2270
HT2270.Superseded values are not recommended for survey control.
HT2270.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HT2270.See file dsdata.txt to determine how the superseded data were derived.
HT2270
HT2270_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG4621076842(NAD 83)
HT2270_MARKER: DB = BENCH MARK DISK
HT2270_SETTING: 30 = SET IN A LIGHT STRUCTURE
HT2270_SP_SET: CONCRETE CATCH BASIN
HT2270_STAMPING: U 1320 1977
HT2270_MARK LOGO: NGS
HT2270_MAGNETIC: N = NO MAGNETIC MATERIAL
HT2270_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
HT2270_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
HT2270+SATELLITE: SATELLITE OBSERVATIONS - September 15, 1995
HT2270
HT2270  HISTORY     - Date     Condition        Report By
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 HT2270  HISTORY     - 1977     MONUMENTED       NGS
 HT2270  HISTORY     - 19950915 GOOD             NGS
 HT2270
 HT2270                          STATION DESCRIPTION
 HT2270
 HT2270'DESCRIBED BY NATIONAL GEODETIC SURVEY 1977
 HT2270'IN SAN FRANCISCO.
 HT2270'AT SAN FRANCISCO, ON THE WEST SIDE OF 19TH AVE, IN THE SOUTH END OF
 HT2270'LARSEN PARK, SET IN THE TOP OF A CATCH BASIN JUST NORTH OF A SET OF
 HT2270'STEPS LEADING TO THE ENTRANCE OF AN INDOOR SWIMMING POOL.
 HT2270
 HT2270                          STATION RECOVERY (1995)
 HT2270
 HT2270'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1995 (JDD)
 HT2270'THE STATION WAS RECOVERED.  TO REACH THE STATION FROM THE INTERSECTION
 HT2270'OF LINCOLN AND AND STATE HIGHWAY 1, 19TH STREET, AT THE SOUTH END OF
 HT2270'GOLDEN GATE PARK GO SOUTH ON 19TH STREET FOR 1.95 MI (3.14 KM) TO THE
 HT2270'STATION ON THE RIGHT.$THE STATION IS NEAR THE ENTRANCE TO THE CHARLIE
 HT2270'SAVA SWIMMING POOL IN LARSEN PARK.  IT IS 27.6 M (90.6 FT) NORTH OF
 HT2270'THE CENTERLINE OF WAWONA, 20.3 M (66.6 FT) WEST OF THE CENTERLINE OF
 HT2270'19TH STREET, 7.3 M (24.0 FT) NORTHEAST OF A FLAG POLE, 4.4 M (14.4 FT)
 HT2270'EAST OF THE SOUTHEAST CORNER OF THE SWIMMING POOL BUILDING AND 1.1 M
 HT2270'(3.6 FT) NORTH OF THE CENTERLINE OF A CONCRETE STAIRWAY.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT2269 ***********************************************************************
 HT2269  DESIGNATION -  T 1320
 HT2269  PID         -  HT2269
 HT2269  STATE/COUNTY-  CA/SAN FRANCISCO
 HT2269  USGS QUAD   -  SAN FRANCISCO SOUTH (1995)
 HT2269
 HT2269                         *CURRENT SURVEY CONTROL
 HT2269  ___________________________________________________________________
 HT2269* NAD 83(1986)-  37 44 49.     (N)    122 28 34.     (W)     SCALED
 HT2269* NAVD 88     -       128.511  (meters)     421.62   (feet)  ADJUSTED
 HT2269  ___________________________________________________________________
 HT2269  GEOID HEIGHT-         -32.67  (meters)                     GEOID09
 HT2269  DYNAMIC HT  -         128.425 (meters)     421.34  (feet)  COMP
 HT2269  MODELED GRAV-     979,957.5   (mgal)                       NAVD 88
 HT2269
 HT2269  VERT ORDER  -  FIRST     CLASS I
 HT2269
 HT2269.The horizontal coordinates were scaled from a topographic map and have
 HT2269.an estimated accuracy of +/- 6 seconds.
 HT2269
 HT2269.The orthometric height was determined by differential leveling and
 HT2269.adjusted in June 1991.
 HT2269
 HT2269.The geoid height was determined by GEOID09.
 HT2269
 HT2269.The dynamic height is computed by dividing the NAVD 88
 HT2269.geopotential number by the normal gravity value computed on the
 HT2269.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 HT2269.degrees latitude (g = 980.6199 gals.).
 HT2269
 HT2269.The modeled gravity was interpolated from observed gravity values.
 HT2269
 HT2269;                   North         East    Units  Estimated Accuracy
 HT2269;SPC CA 3     -   640,230.    1,825,860.     MT  (+/- 180 meters Scaled)
 HT2269
 HT2269                          SUPERSEDED SURVEY CONTROL
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 HT2269
 HT2269  NGVD 29 (10/21/93)  127.671  (m)          418.87   (f) ADJUSTED    1 1
 HT2269
 HT2269.Superseded values are not recommended for survey control.
 HT2269.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
 HT2269.See file dsdata.txt to determine how the superseded data were derived.
 HT2269
 HT2269_U.S. NATIONAL GRID SPATIAL ADDRESS: 10SEG461778(NAD 83)
 HT2269_MARKER: DB = BENCH MARK DISK
 HT2269_SETTING: 30 = SET IN A LIGHT STRUCTURE
 HT2269_SP_SET: CURB
 HT2269_STAMPING: T 1320 1977
 HT2269_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
 HT2269
 HT2269  HISTORY     - Date     Condition        Report By
 HT2269  HISTORY     - 1977     MONUMENTED       NGS
 HT2269
 HT2269                          STATION DESCRIPTION
 HT2269
 HT2269'DESCRIBED BY NATIONAL GEODETIC SURVEY 1977
 HT2269'IN SAN FRANCISCO.
 HT2269'AT SAN FRANCISCO, SET IN THE NORTHWEST CURB AT THE INTERSECTION OF
 HT2269'19TH AVE AND RIVERA STREET.
1        National Geodetic Survey,   Retrieval Date = JUNE  2, 2010
 HT1843 ***********************************************************************
 HT1843  DESIGNATION -  Q 568
 HT1843  PID         -  HT1843
 HT1843  STATE/COUNTY-  CA/SAN FRANCISCO
 HT1843  USGS QUAD   -  POINT BONITA (1993)
 HT1843
 HT1843                         *CURRENT SURVEY CONTROL
 HT1843  ___________________________________________________________________
 HT1843* NAD 83(1986)-  37 45 03.     (N)    122 30 30.     (W)     SCALED
 HT1843* NAVD 88     -         7.56   (+/-2cm)      24.8    (feet)  VERTCON
 HT1843  ___________________________________________________________________
 HT1843  GEOID HEIGHT-         -32.77  (meters)                     GEOID09
 HT1843  VERT ORDER  -  SECOND    CLASS 0 (See Below)
 HT1843
 HT1843.The horizontal coordinates were scaled from a topographic map and have
 HT1843.an estimated accuracy of +/- 6 seconds.
 HT1843
 HT1843.The NAVD 88 height was computed by applying the VERTCON shift value to
 HT1843.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 HT1843.The vertical order pertains to the NGVD 29 superseded va
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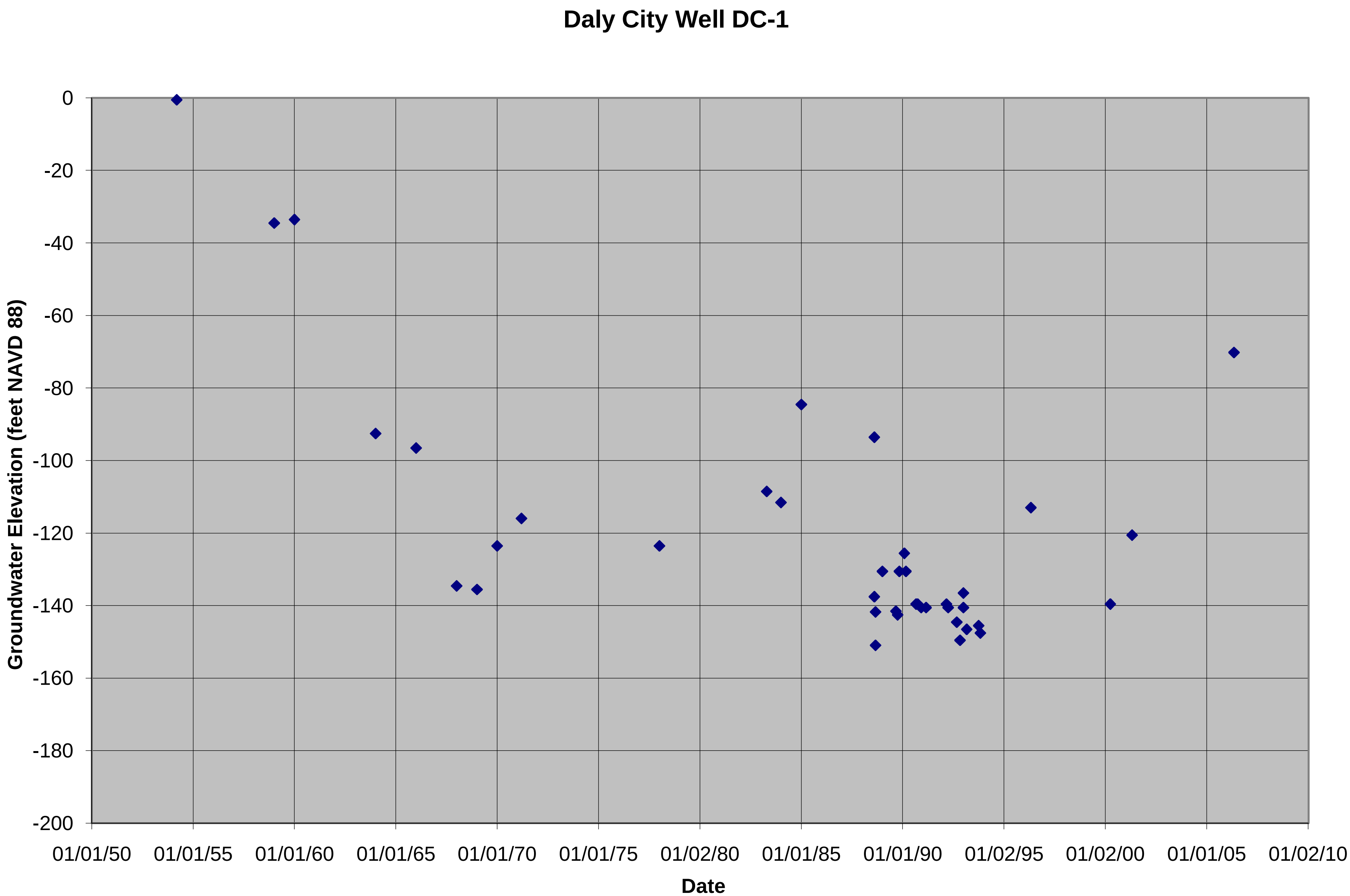
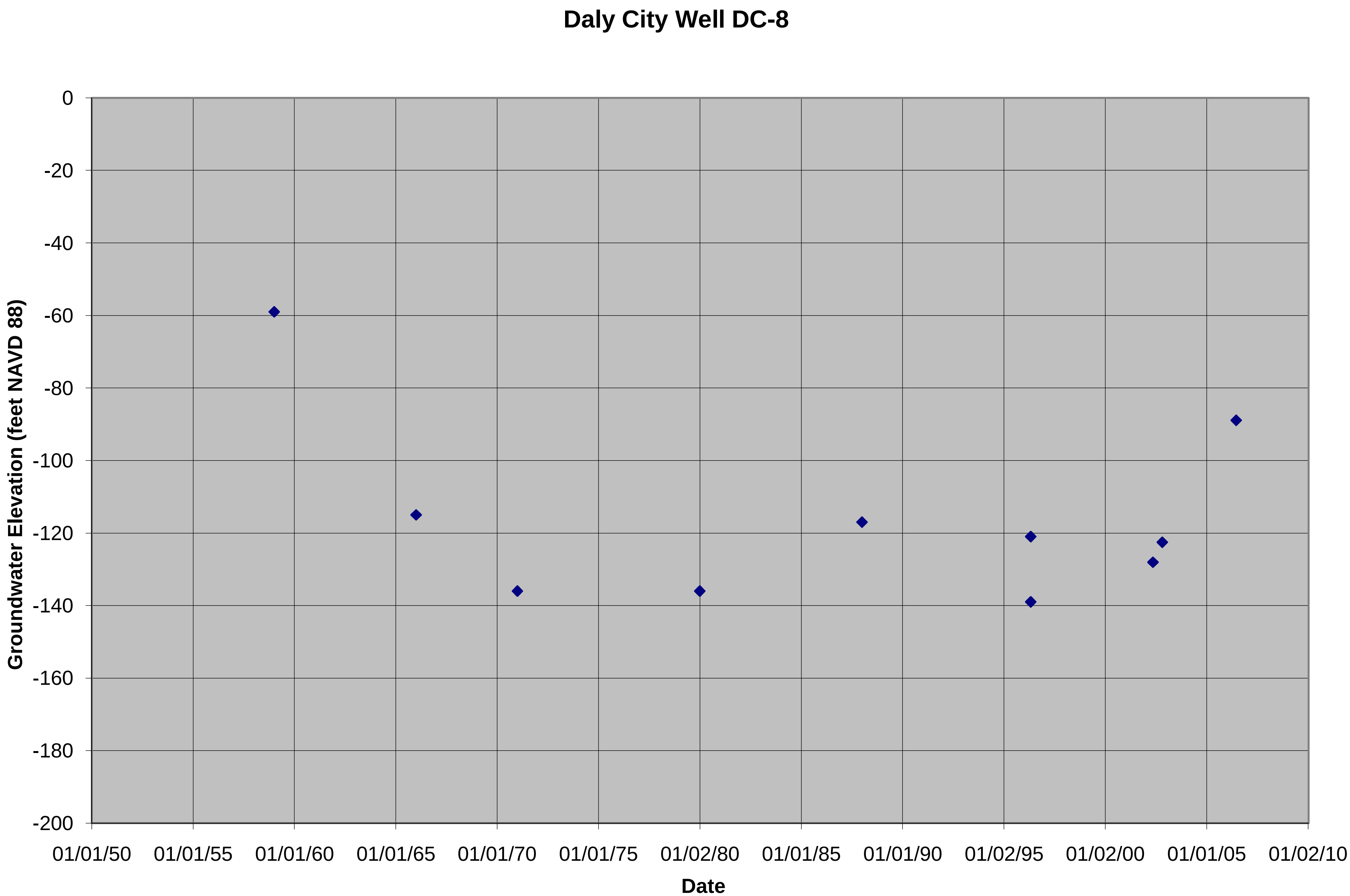
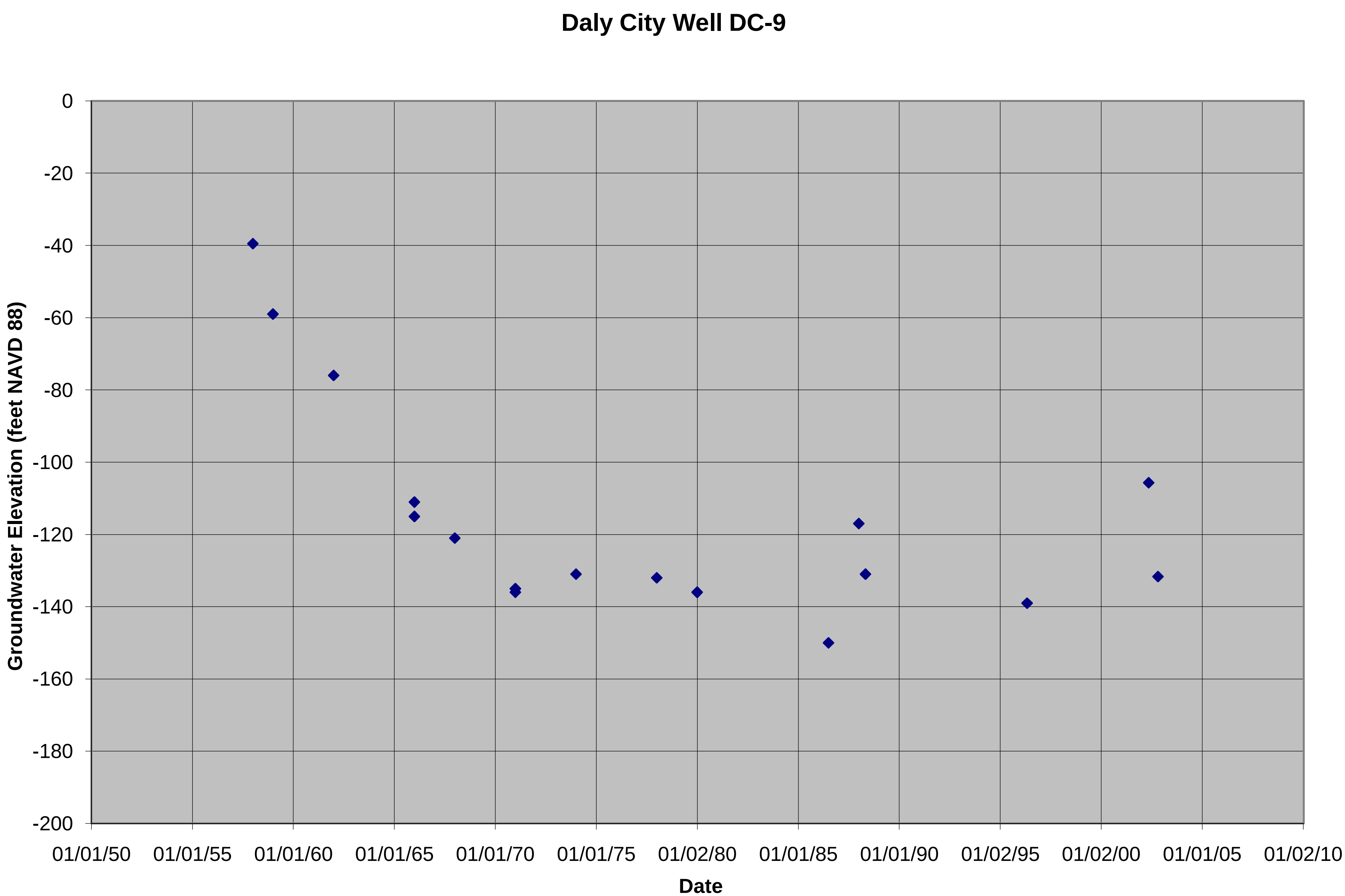
APPENDIX C

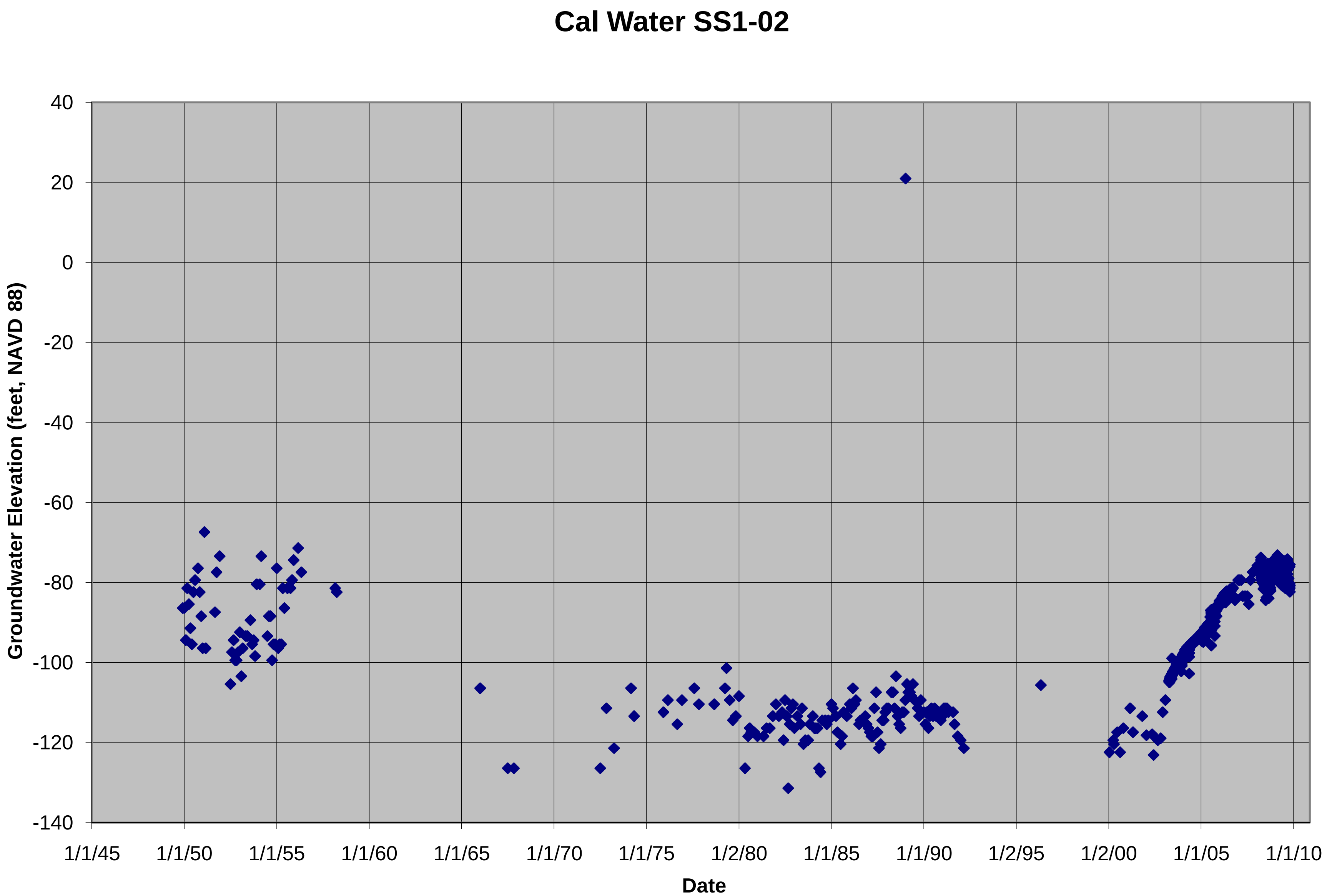


Daly City Well DC-1
Groundwater Elevation (feet NAVD 88)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
01/01/50
01/01/55
01/01/60
01/01/65
01/01/70
01/01/75
01/02/80
01/01/85
01/01/90
01/02/95
01/02/00
01/01/05
01/02/10
Date

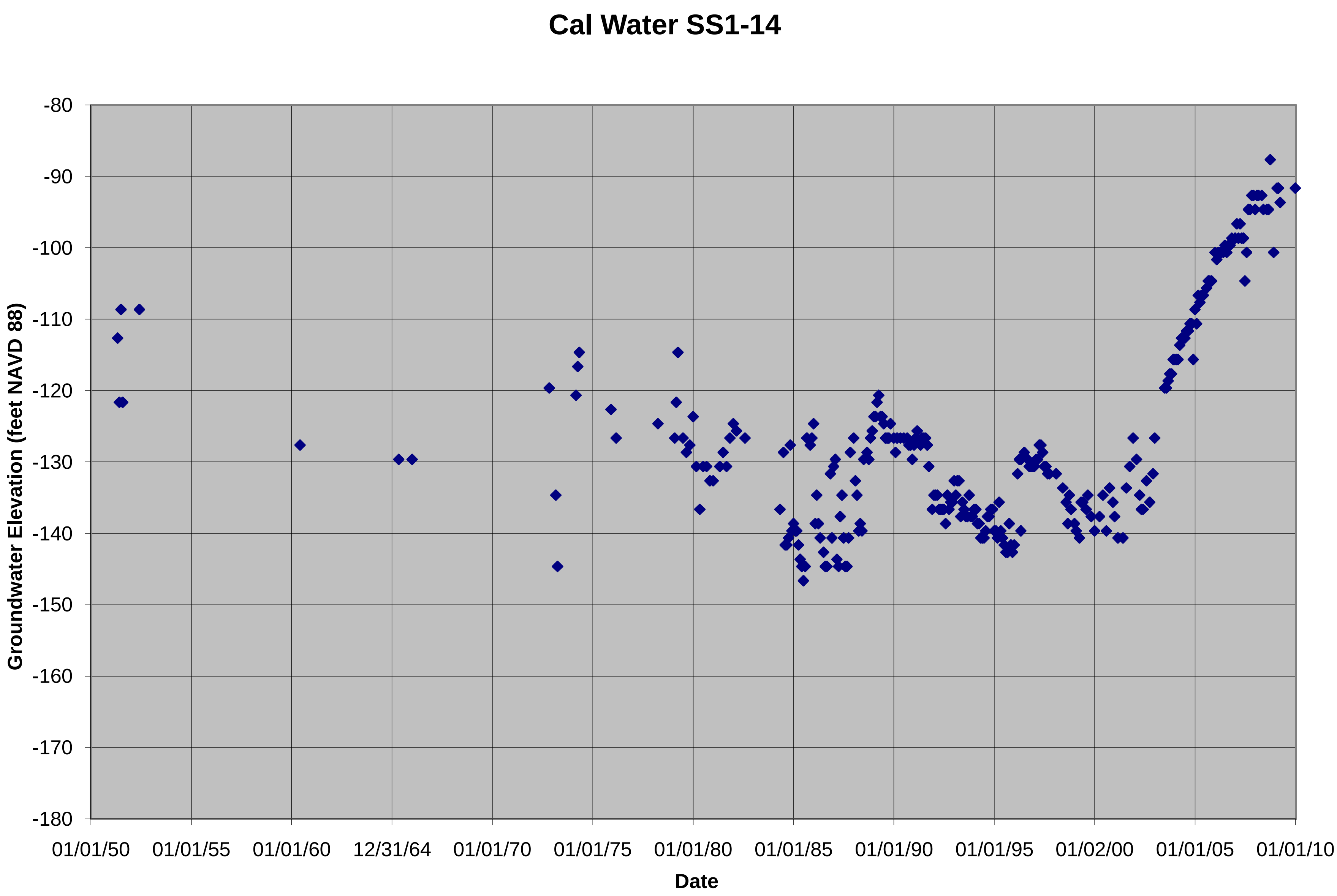


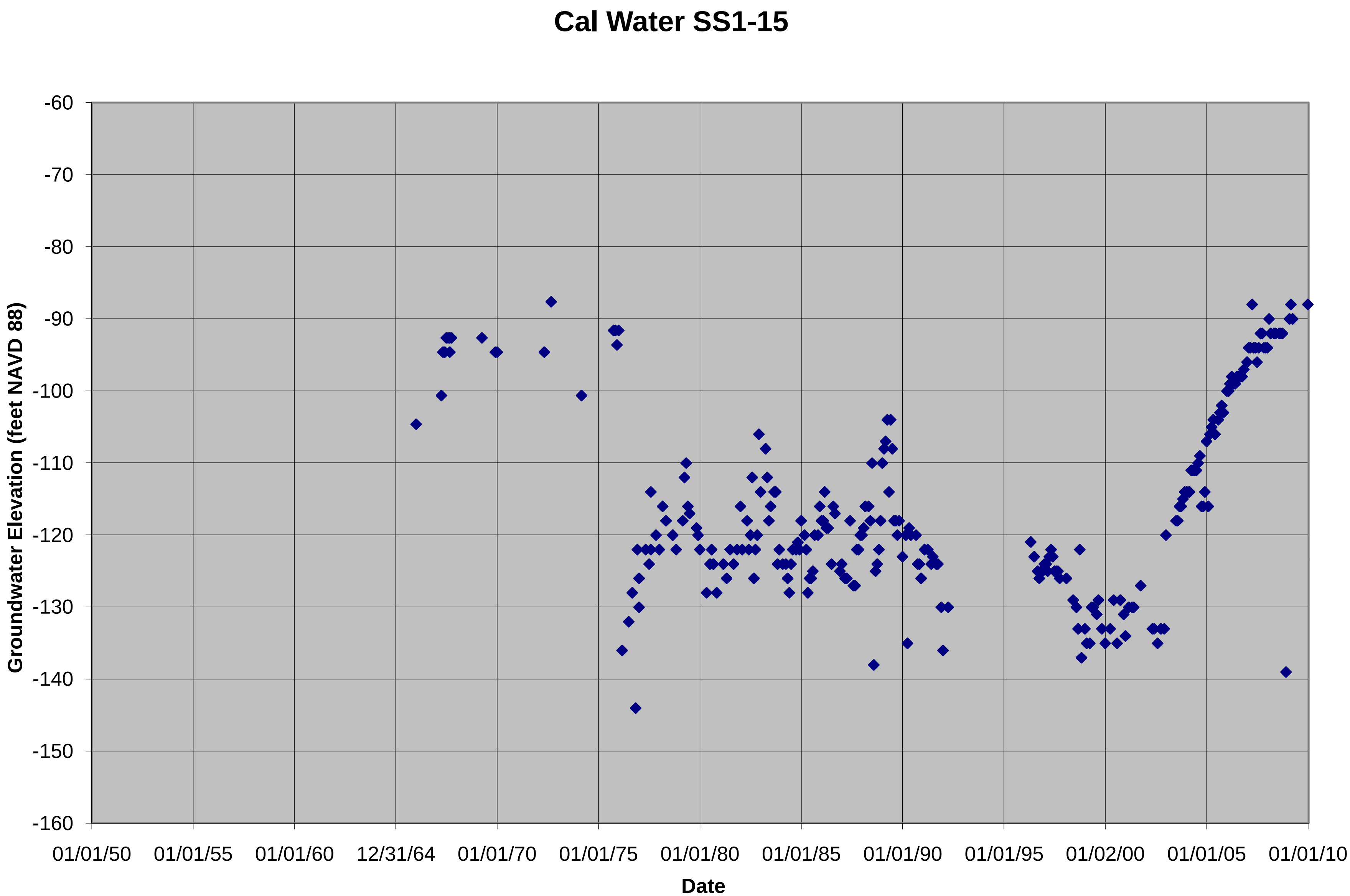
Daly City Well DC-8
Groundwater Elevation (feet NAVD 88)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
01/01/50
01/01/55
01/01/60
01/01/65
01/01/70
01/01/75
01/02/80
01/01/85
01/01/90
01/02/95
01/02/00
01/01/05
01/02/10
Date


Daly City Well DC-9
Groundwater Elevation (feet NAVD 88)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
01/01/50
01/01/55
01/01/60
01/01/65
01/01/70
01/01/75
01/02/80
01/01/85
01/01/90
01/02/95
01/02/00
01/01/05
01/02/10
Date



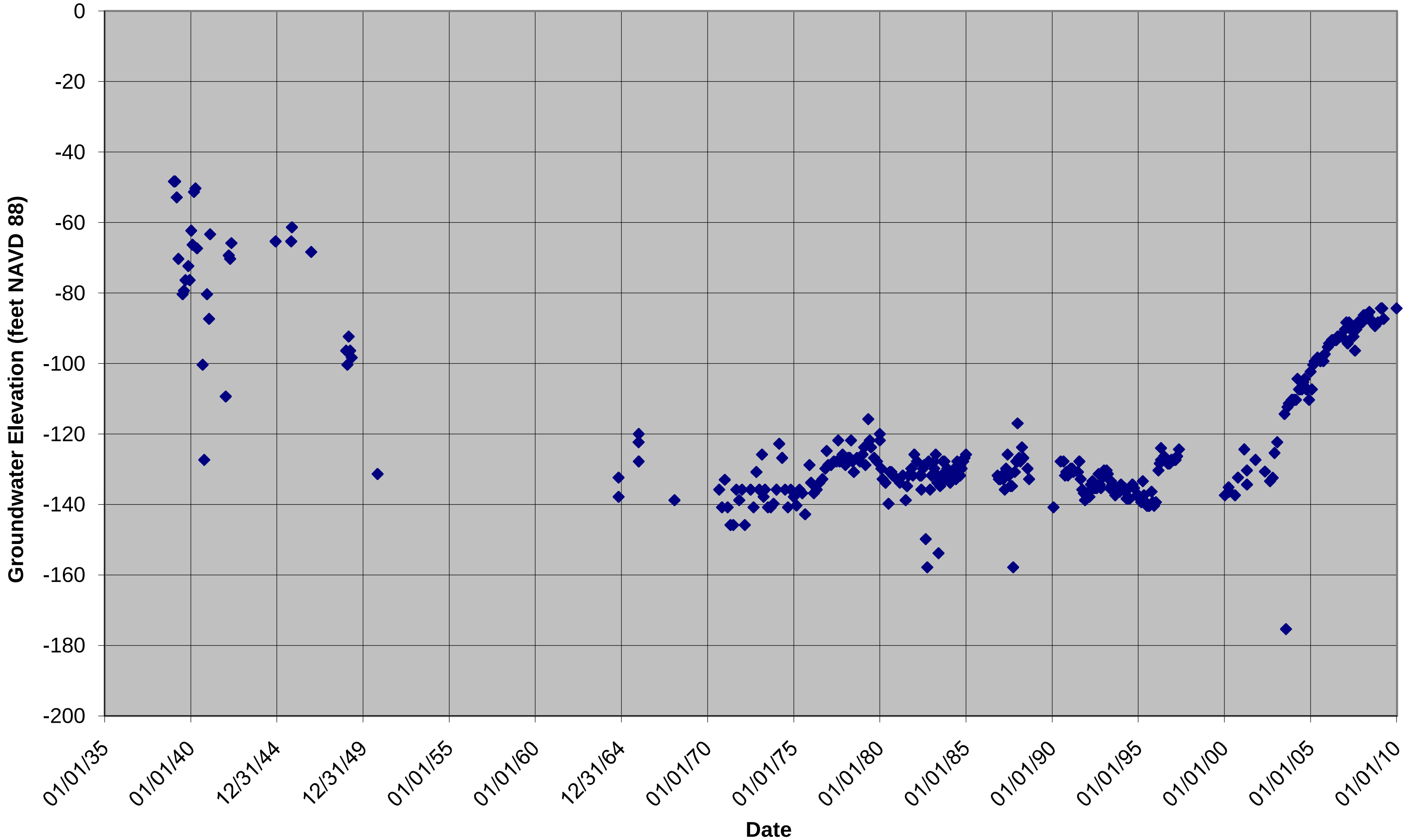
Cal Water SS1-02
Groundwater Elevation (feet, NAVD 88)
40
20
0
-20
-40
-60
-80
-100
-120
-140
1/1/45
1/1/50
1/1/55
1/1/60
1/1/65
1/1/70
1/1/75
1/2/80
1/1/85
1/1/90
1/2/95
1/2/00
1/1/05
1/1/10
Date


Cal Water SS1-14
Groundwater Elevation (feet NAVD 88)
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
01/01/50
01/01/55
01/01/60
12/31/64
01/01/70
01/01/75
01/01/80
01/01/85
01/01/90
01/01/95
01/02/00
01/01/05
01/01/10
Date

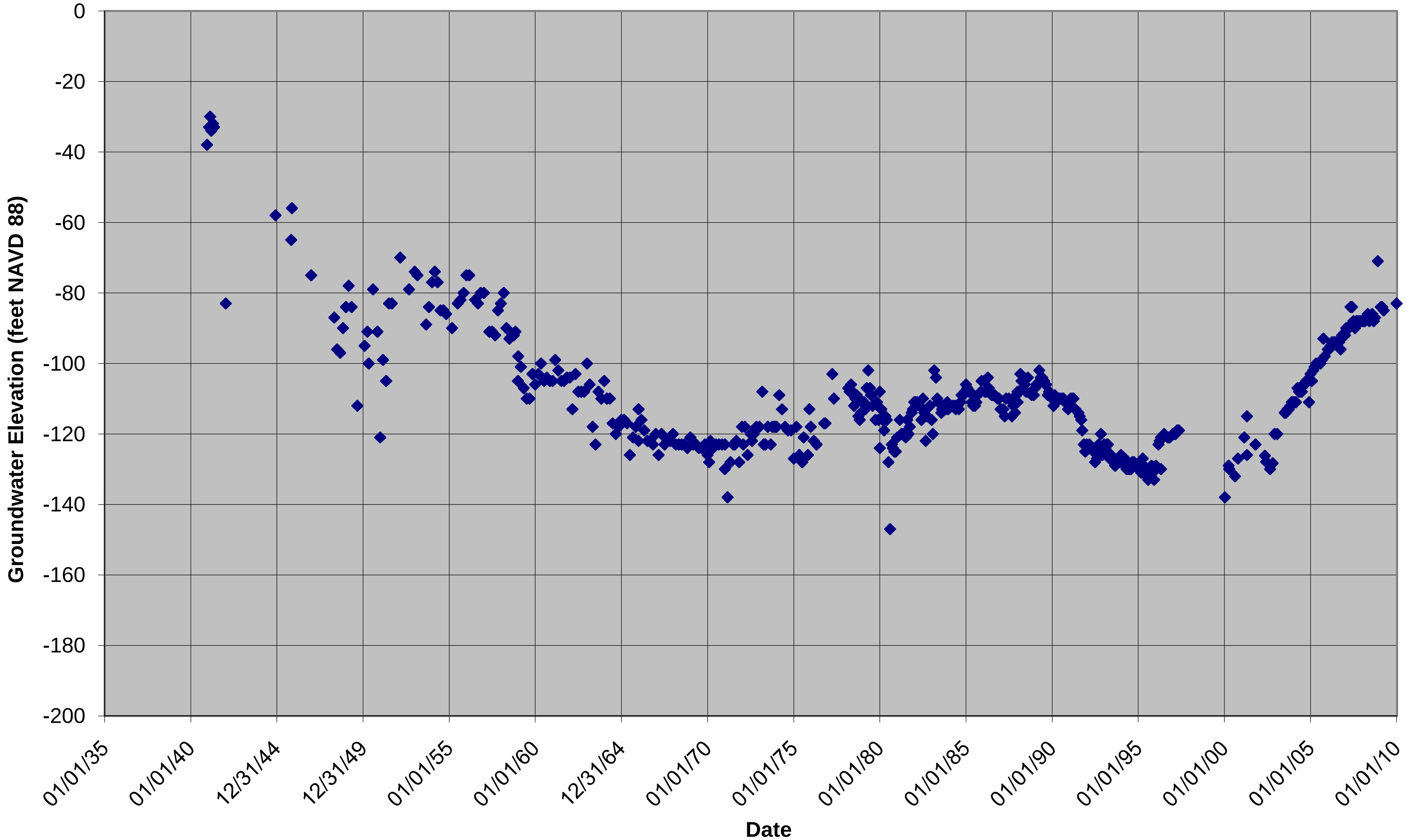


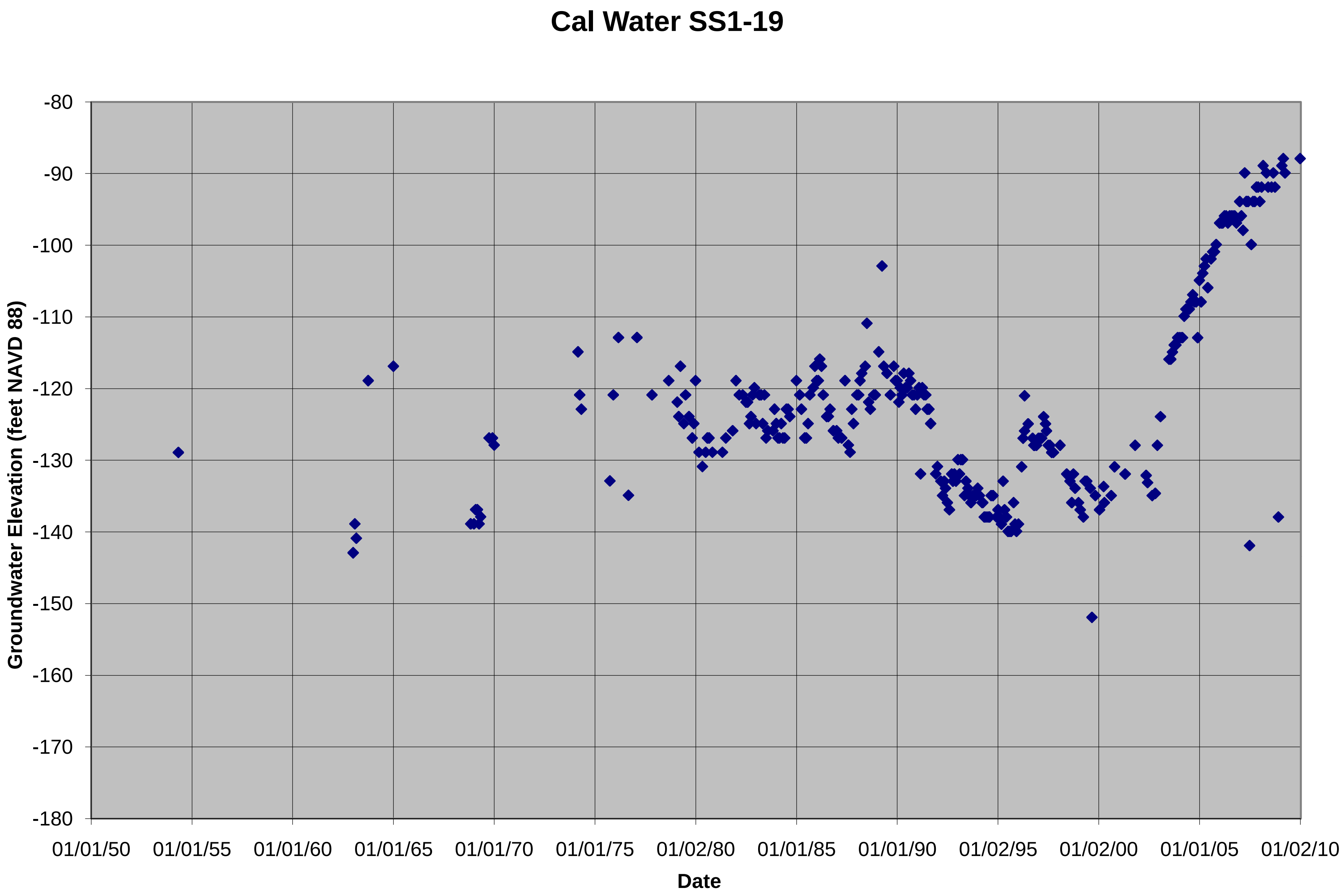
Cal Water SS1-15
Groundwater Elevation (feet NAVD 88)
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
01/01/50
01/01/55
01/01/60
12/31/64
01/01/70
01/01/75
01/01/80
01/01/85
01/01/90
01/01/95
01/01/00
01/01/05
01/01/10
Date

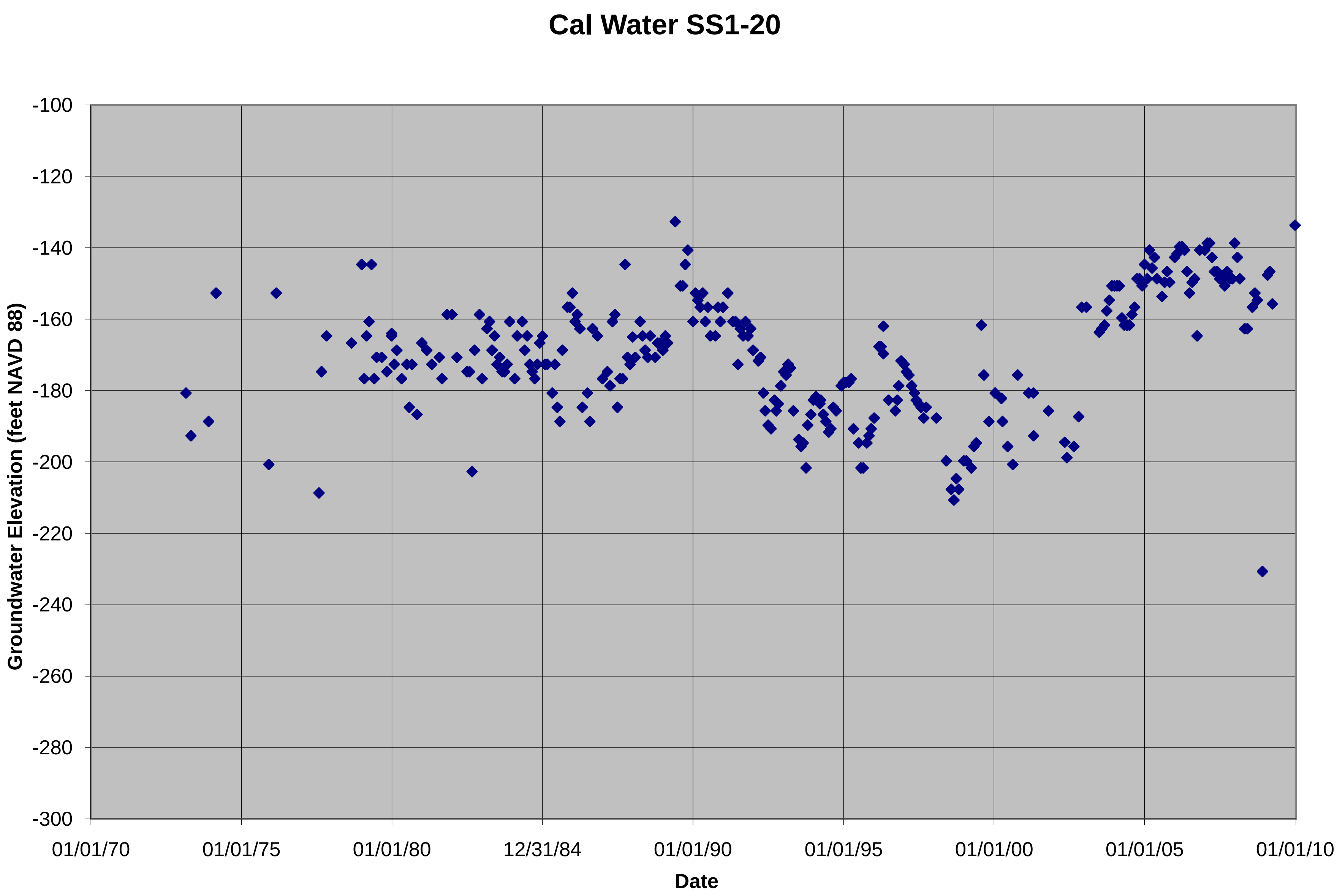
Cal Water SS1-17



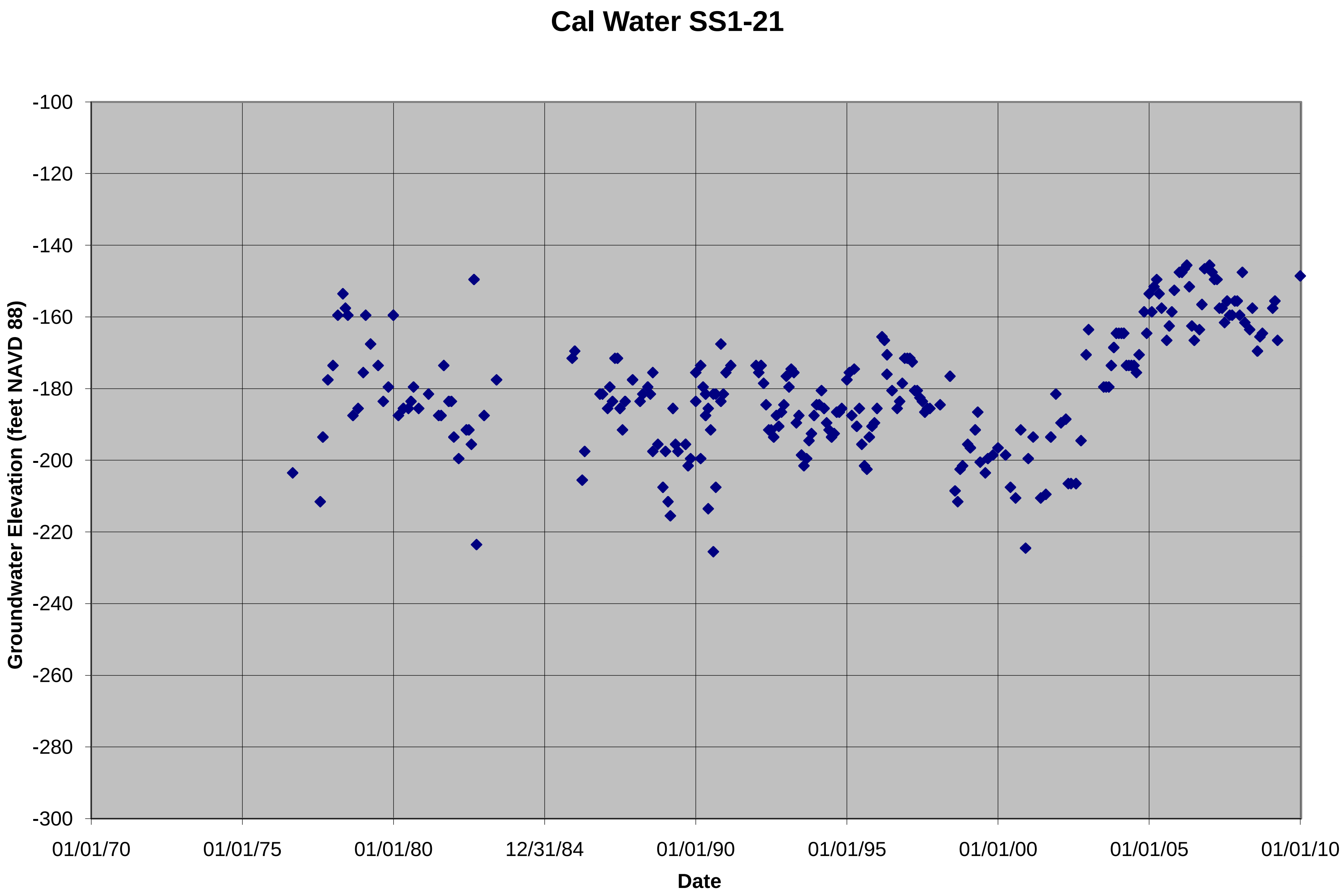
Cal Water SS1-18




Cal Water SS1-19
Groundwater Elevation (feet NAVD 88)
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
01/01/50
01/01/55
01/01/60
01/01/65
01/01/70
01/01/75
01/02/80
01/01/85
01/01/90
01/02/95
01/02/00
01/01/05
01/02/10
Date



Cal Water SS1-20
Groundwater Elevation (feet NAVD 88)
-100
-120
-140
-160
-180
-200
-220
-240
-260
-280
-300
01/01/70
01/01/75
01/01/80
12/31/84
01/01/90
01/01/95
01/01/00
01/01/05
01/01/10
Date



Cal Water SS1-21
Groundwater Elevation (feet NAVD 88)
-100
-120
-140
-160
-180
-200
-220
-240
-260
-280
-300
01/01/70
01/01/75
01/01/80
12/31/84
01/01/90
01/01/95
01/01/00
01/01/05
01/01/10
Date

APPENDIX D

Form: Vta.(comp 11/93)

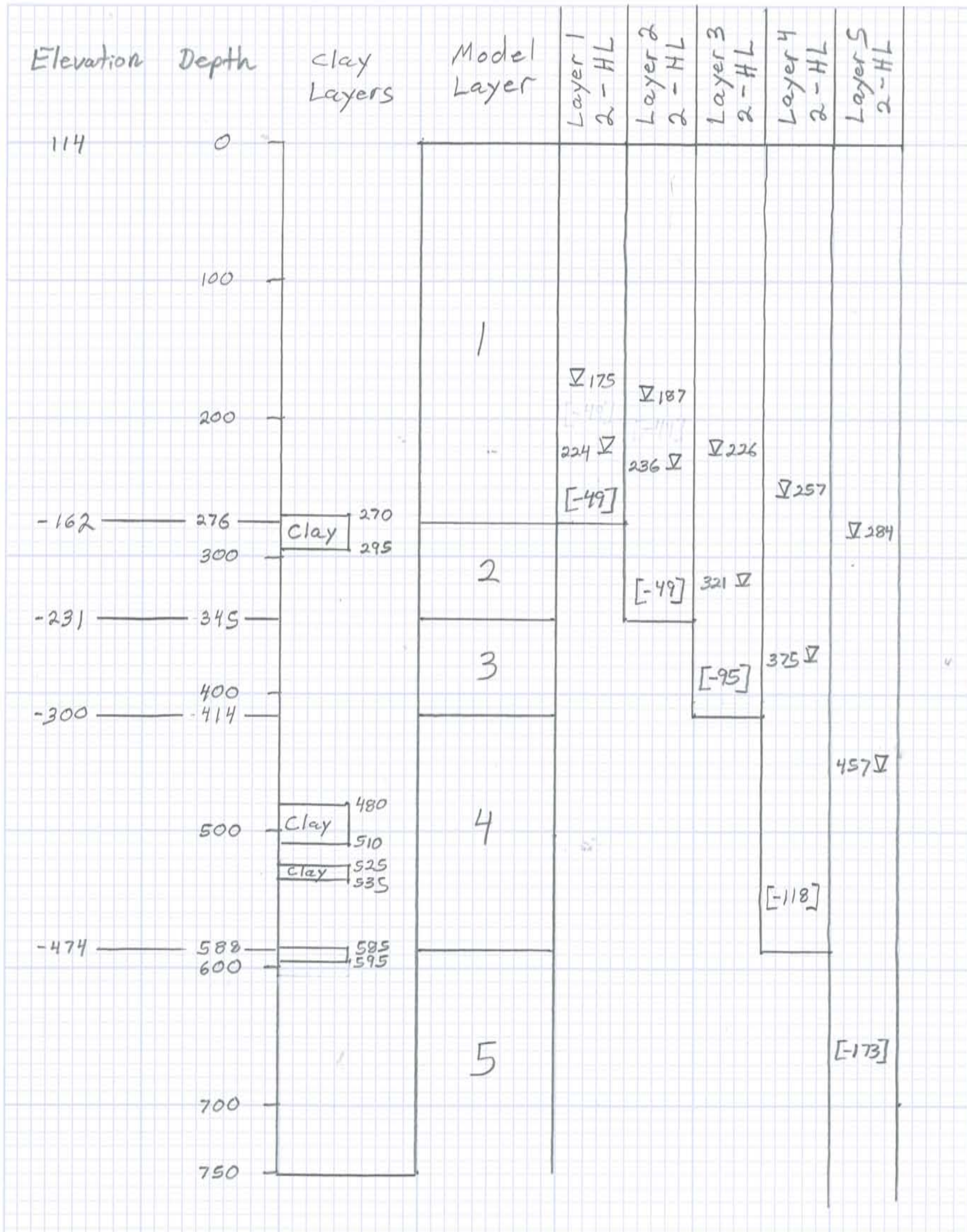
COMPUTATIONS

Job No.: ______ By: PML Date: 4/6/12

Checked By: ______ Date: ______ Sheet No. 1 of 4

Subject: CUP-19 Scenario 2 compared to Historic Lows

FUGRO



Form: Vta.(comp 11/93)

COMPUTATIONS

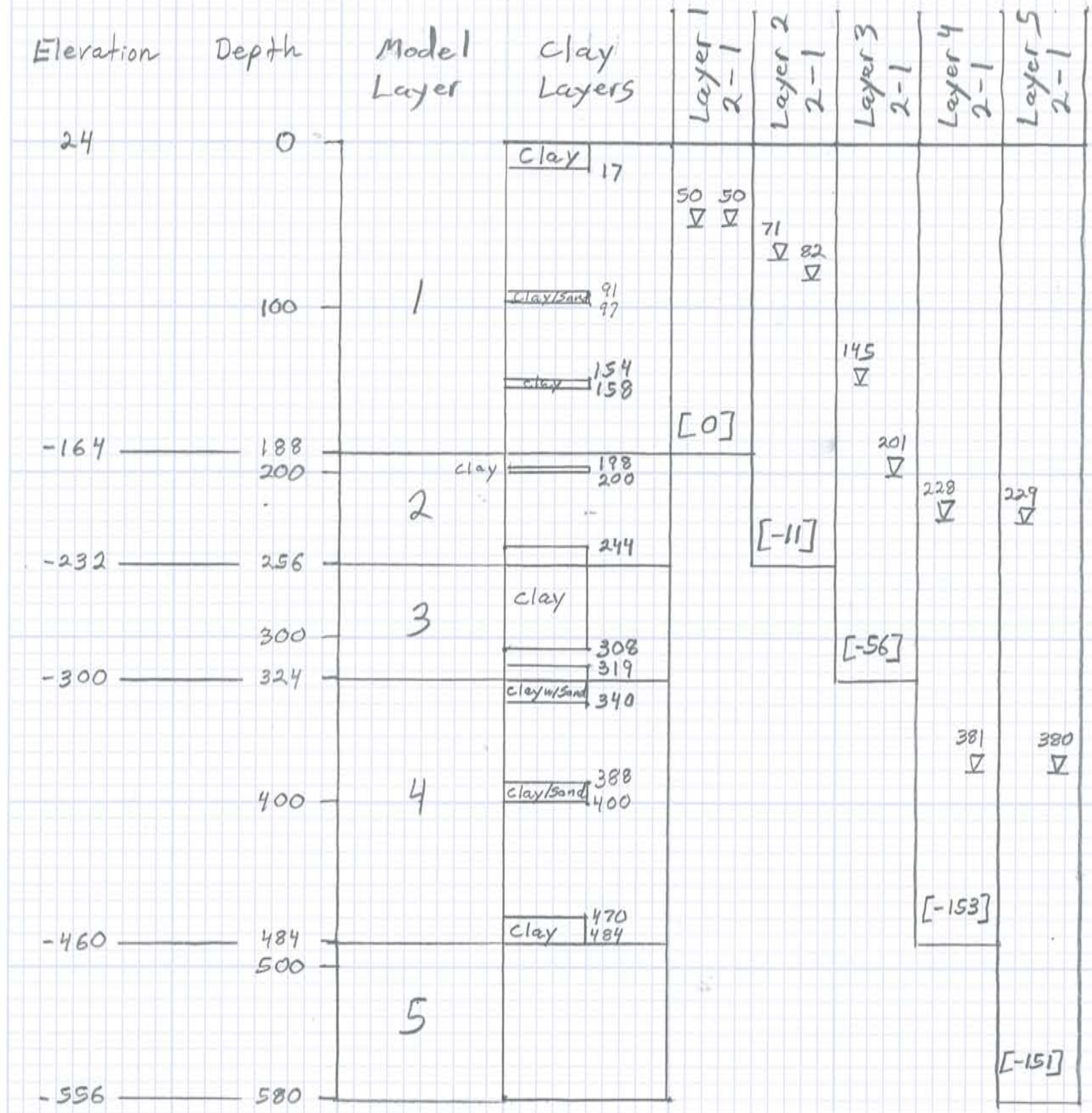
Job No.: ______ By: PML Date: 4/6/12

Checked By: ______ Date: ______ Sheet No. ___ of ___

Subject: CUP-41-4 Scenario 2

Compared to Scenario 1

FUGRO



Form: Vta.(comp 11/93)
COMPUTATIONS

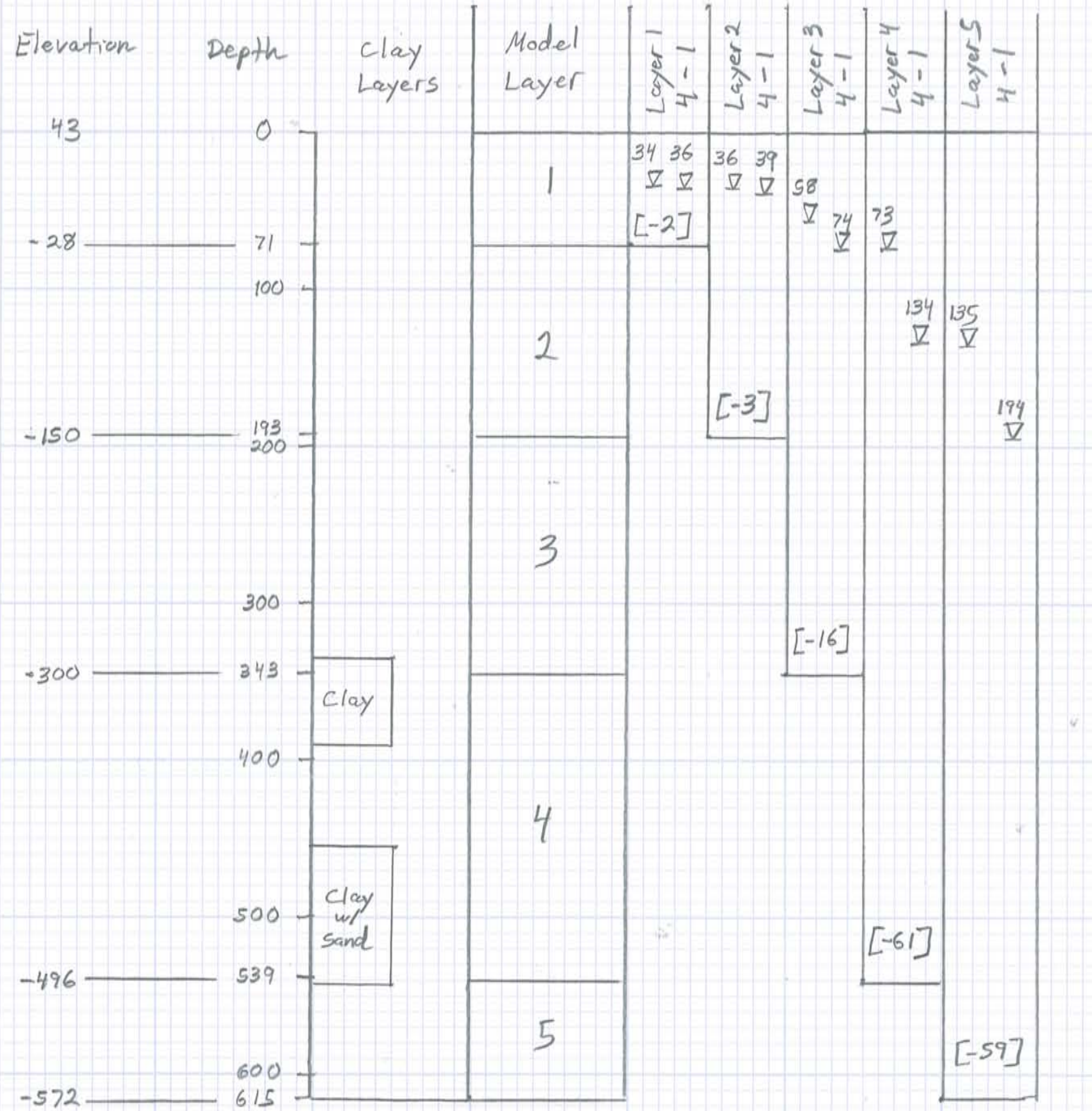
Job No.: ______ By: PML Date: 4/6/12

Checked By: ______ Date: ______ Sheet No. 3 of 4

Subject: LMPS Scenario 4

FUGRO

Compared to 1



Form: Vta.(comp 11/93)

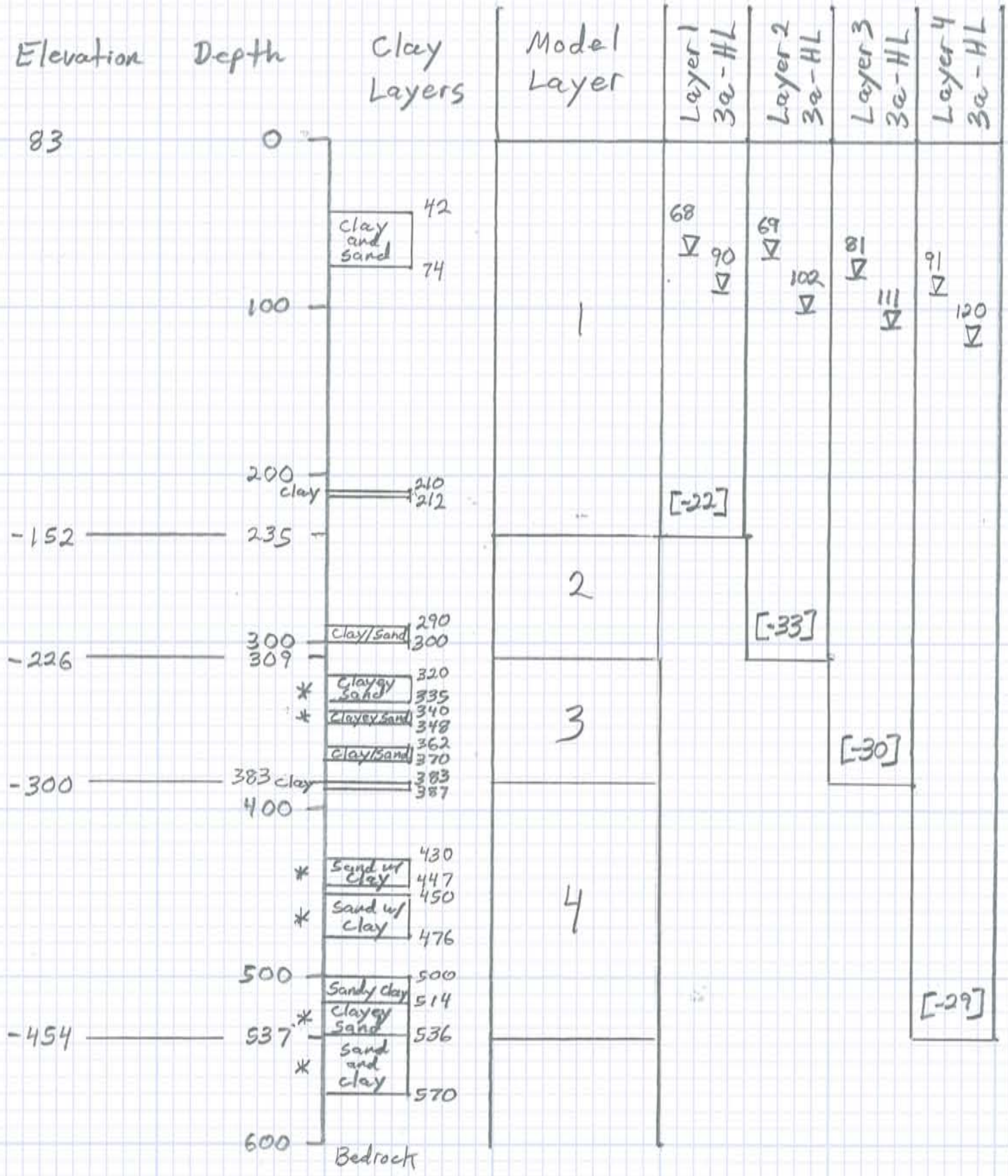
COMPUTATIONS

Job No.: ______ By: PML Date: 4/6/12

Checked By: ______ Date: ______ Sheet No. 4 of 4

Subject: South Sunset Scenario 3a

Compared to Historic Lows



APPENDIX E

Date 4/5/2012
Job No. 103.128

Boring ID CUP-19
Scenario 2 to HL
Elevation 114 feet AMSL
Depth to Compressible 270 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec
1	175	224	0.005	0.01	0.03	0.18
2	187	236	0.005	0.01	0.03	0.18
3	226	321	0.005	0.01	0.03	0.18
4	257	375	0.005	0.01	0.03	0.18
5	284	457	0.005	0.01	0.03	0.18

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	50	25	114	64	89	50	123	175	224	3,075	6,149	3,075	0	0	3,075	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	Sand	50	100	75	64	14	39	50	124	175	224	9,242	12,334	9,242	0	0	9,242	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	3	Sand	100	150	125	14	-36	-11	50	124	175	224	15,436	18,537	15,436	0	0	15,436	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	4	Sand	150	200	175	-36	-86	-61	50	124	175	224	21,648	24,759	21,648	0	0	21,648	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	5	Sand	200	250	225	-86	-136	-111	50	125	175	224	27,879	30,999	27,879	0	0	27,879	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	6	Sand	250	270	260	-136	-156	-146	20	125	175	224	32,251	33,502	32,251	0	0	32,251	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	7	Clay	270	276	273	-156	-162	-159	6	125	175	224	33,878	34,253	27,763	98	6,115	30,820	49	3,058	3,058	1.11	0.030	0.00	0.10	0.10
2	8	Clay	276	295	285.5	-162	-181	-171.5	19	126	187	236	35,446	36,639	29,300	99	6,146	32,357	50	3,089	3,058	1.10	0.030	0.00	0.29	0.29
2	9	Sand	295	320	307.5	-181	-206	-193.5	25	126	187	236	38,213	39,787	30,694	121	7,519	33,752	72	4,462	3,058	1.10	0.005	0.06	0.00	0.06
2	10	Sand	320	345	332.5	-206	-231	-218.5	25	126	187	236	41,362	42,936	32,282	146	9,079	35,340	97	6,022	3,058	1.09	0.005	0.06	0.00	0.06
3	11	Sand	345	370	357.5	-231	-256	-243.5	25	126	226	321	44,515	46,094	36,310	132	8,206	42,238	37	2,278	5,928	1.16	0.005	0.10	0.00	0.10
3	12	Sand	370	400	385	-256	-286	-271	30	126	226	321	47,989	49,884	38,068	159	9,922	43,996	64	3,994	5,928	1.16	0.005	0.11	0.00	0.11
3	13	Sand	400	414	407	-286	-300	-293	14	127	226	321	50,771	51,658	39,477	181	11,294	45,405	86	5,366	5,928	1.15	0.005	0.05	0.00	0.05
4	14	Sand	414	440	427	-300	-326	-313	26	127	257	375	53,311	54,964	42,703	170	10,608	50,066	52	3,245	7,363	1.17	0.005	0.11	0.00	0.11
4	15	Sand	440	480	460	-326	-366	-346	40	127	257	375	57,506	60,049	44,839	203	12,667	52,202	85	5,304	7,363	1.16	0.005	0.16	0.00	0.16
4	16	Clay	480	495	487.5	-366	-381	-373.5	15	128	257	375	61,005	61,962	46,622	231	14,383	53,985	113	7,020	7,363	1.16	0.030	0.00	0.34	0.34
4	17	Clay	495	510	502.5	-381	-396	-388.5	15	128	257	375	62,918	63,875	47,599	246	15,319	54,962	128	7,956	7,363	1.15	0.030	0.00	0.34	0.34
4	18	Sand	510	525	517.5	-396	-411	-403.5	15	128	257	375	64,831	65,787	48,576	261	16,255	55,939	143	8,892	7,363	1.15	0.005	0.06	0.00	0.06
4	19	Clay	525	535	530	-411	-421	-416	10	128	257	375	66,425	67,063	49,390	273	17,035	56,753	155	9,672	7,363	1.15	0.030	0.00	0.22	0.22
4	20	Sand	535	560	547.5	-421	-446	-433.5	25	128	257	375	68,657	70,251	50,530	291	18,127	57,893	173	10,764	7,363	1.15	0.005	0.09	0.00	0.09
4	21	Sand	560	585	572.5	-446	-471	-458.5	25	128	257	375	71,850	73,450	52,163	316	19,687	59,526	198	12,324	7,363	1.14	0.005	0.09	0.00	0.09
4	22	Clay	585	588	586.5	-471	-474	-472.5	3	128	257	375	73,641	73,833	53,081	330	20,561	60,444	212	13,198	7,363	1.14	0.030	0.00	0.06	0.06
5	23	Clay	588	595	591.5	-474	-481	-477.5	7	128	284	457	74,281	74,729	55,093	308	19,188	65,888	135	8,393	10,795	1.20	0.030	0.00	0.20	0.20
5	24	Sand	595	600	597.5	-481	-486	-483.5	5	128	284	457	75,050	75,371	55,487	314	19,562	66,283	141	8,767	10,795	1.19	0.005	0.02	0.00	0.02
5	25	Sand	600	650	625	-486	-536	-511	50	128	284	457	78,580	81,788	57,301	341	21,278	68,096	168	10,483	10,795	1.19	0.005	0.22	0.00	0.22
5	26	Sand	650	700	675	-536	-586	-561	50	128	284	457	84,997	88,206	60,599	391	24,398	71,394	218	13,603	10,795	1.18	0.005	0.21	0.00	0.21
5	27	Sand	700	750	725	-586	-636	-611	50	128	284	457	91,415	94,624	63,897	441	27,518	74,692	268	16,723	10,795	1.17	0.005	0.20	0.00	0.20
																							Total Settlement (in) =	1.54	1.55	3.09
																							Total Layer Thickness (feet) =	405	75	480

Date 4/5/2012
Job No. 103.128

Boring ID CUP-19
Scenario 4 to HL
Elevation 114 feet AMSL
Depth to Compressible 270 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec
1	175	221	0.005	0.01	0.03	0.18
2	187	232	0.005	0.01	0.03	0.18
3	226	314	0.005	0.01	0.03	0.18
4	257	369	0.005	0.01	0.03	0.18
5	284	452	0.005	0.01	0.03	0.18

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Stresses @ mid point Pore Water (feet)	Initial Stresses @ mid point Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Stresses @ mid point Pore Water (feet)	Final Stresses @ mid point Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	50	25	114	64	89	50	123	175	221	3,075	6,149	3,075	0	0	3,075	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	Sand	50	100	75	64	14	39	50	124	175	221	9,242	12,334	9,242	0	0	9,242	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	3	Sand	100	150	125	14	-36	-11	50	124	175	221	15,436	18,537	15,436	0	0	15,436	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	4	Sand	150	200	175	-36	-86	-61	50	124	175	221	21,648	24,759	21,648	0	0	21,648	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	5	Sand	200	250	225	-86	-136	-111	50	125	175	221	27,879	30,999	27,879	0	0	27,879	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	6	Sand	250	270	260	-136	-156	-146	20	125	175	221	32,251	33,502	32,251	0	0	32,251	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	7	Clay	270	276	273	-156	-162	-159	6	125	175	221	33,878	34,253	27,763	98	6,115	30,633	52	3,245	2,870	1.10	0.030	0.00	0.09	0.09
2	8	Clay	276	295	285.5	-162	-181	-171.5	19	126	187	232	35,446	36,639	29,300	99	6,146	32,108	54	3,338	2,808	1.10	0.030	0.00	0.27	0.27
2	9	Sand	295	320	307.5	-181	-206	-193.5	25	126	187	232	38,213	39,787	30,694	121	7,519	33,502	76	4,711	2,808	1.09	0.005	0.06	0.00	0.06
2	10	Sand	320	345	332.5	-206	-231	-218.5	25	126	187	232	41,362	42,936	32,282	146	9,079	35,090	101	6,271	2,808	1.09	0.005	0.05	0.00	0.05
3	11	Sand	345	370	357.5	-231	-256	-243.5	25	126	226	314	44,515	46,094	36,310	132	8,206	41,801	44	2,714	5,491	1.15	0.005	0.09	0.00	0.09
3	12	Sand	370	400	385	-256	-286	-271	30	126	226	314	47,989	49,884	38,068	159	9,922	43,559	71	4,430	5,491	1.14	0.005	0.11	0.00	0.11
3	13	Sand	400	414	407	-286	-300	-293	14	127	226	314	50,771	51,658	39,477	181	11,294	44,968	93	5,803	5,491	1.14	0.005	0.05	0.00	0.05
4	14	Sand	414	440	427	-300	-326	-313	26	127	257	369	53,311	54,964	42,703	170	10,608	49,692	58	3,619	6,989	1.16	0.005	0.10	0.00	0.10
4	15	Sand	440	480	460	-326	-366	-346	40	127	257	369	57,506	60,049	44,839	203	12,667	51,828	91	5,678	6,989	1.16	0.005	0.15	0.00	0.15
4	16	Clay	480	495	487.5	-366	-381	-373.5	15	128	257	369	61,005	61,962	46,622	231	14,383	53,611	119	7,394	6,989	1.15	0.030	0.00	0.33	0.33
4	17	Clay	495	510	502.5	-381	-396	-388.5	15	128	257	369	62,918	63,875	47,599	246	15,319	54,588	134	8,330	6,989	1.15	0.030	0.00	0.32	0.32
4	18	Sand	510	525	517.5	-396	-411	-403.5	15	128	257	369	64,831	65,787	48,576	261	16,255	55,565	149	9,266	6,989	1.14	0.005	0.05	0.00	0.05
4	19	Clay	525	535	530	-411	-421	-416	10	128	257	369	66,425	67,063	49,390	273	17,035	56,379	161	10,046	6,989	1.14	0.030	0.00	0.21	0.21
4	20	Sand	535	560	547.5	-421	-446	-433.5	25	128	257	369	68,657	70,251	50,530	291	18,127	57,519	179	11,138	6,989	1.14	0.005	0.08	0.00	0.08
4	21	Sand	560	585	572.5	-446	-471	-458.5	25	128	257	369	71,850	73,450	52,163	316	19,687	59,152	204	12,698	6,989	1.13	0.005	0.08	0.00	0.08
4	22	Clay	585	588	586.5	-471	-474	-472.5	3	128	257	369	73,641	73,833	53,081	330	20,561	60,069	218	13,572	6,989	1.13	0.030	0.00	0.06	0.06
5	23	Clay	588	595	591.5	-474	-481	-477.5	7	128	284	452	74,281	74,729	55,093	308	19,188	65,576	140	8,705	10,483	1.19	0.030	0.00	0.19	0.19
5	24	Sand	595	600	597.5	-481	-486	-483.5	5	128	284	452	75,050	75,371	55,487	314	19,562	65,971	146	9,079	10,483	1.19	0.005	0.02	0.00	0.02
5	25	Sand	600	650	625	-486	-536	-511	50	128	284	452	78,580	81,788	57,301	341	21,278	67,784	173	10,795	10,483	1.18	0.005	0.22	0.00	0.22
5	26	Sand	650	700	675	-536	-586	-561	50	128	284	452	84,997	88,206	60,599	391	24,398	71,082	223	13,915	10,483	1.17	0.005	0.21	0.00	0.21
5	27	Sand	700	750	725	-586	-636	-611	50	128	284	452	91,415	94,624	63,897	441	27,518	74,380	273	17,035	10,483	1.16	0.005	0.20	0.00	0.20
																							Total Settlement (in) =	1.48	1.47	2.94
																							Total Layer Thickness (feet) =	405	75	480

Date 4/5/2012
Job No. 103.128

Boring ID CUP-19
Scenario 2 to 1
Elevation 114 feet AMSL
Depth to Compressible 270 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec
1	193	224	0.005	0.01	0.03	0.18
2	201	236	0.005	0.01	0.03	0.18
3	229	321	0.005	0.01	0.03	0.18
4	250	375	0.005	0.01	0.03	0.18
5	308	457	0.005	0.01	0.03	0.18

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	50	25	114	64	89	50	123	193	224	3,075	6,149	3,075	0	0	3,075	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	Sand	50	100	75	64	14	39	50	124	193	224	9,242	12,334	9,242	0	0	9,242	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	3	Sand	100	150	125	14	-36	-11	50	124	193	224	15,436	18,537	15,436	0	0	15,436	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	4	Sand	150	200	175	-36	-86	-61	50	124	193	224	21,648	24,759	21,648	0	0	21,648	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	5	Sand	200	250	225	-86	-136	-111	50	125	193	224	27,879	30,999	27,879	0	0	27,879	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	6	Sand	250	270	260	-136	-156	-146	20	125	193	224	32,251	33,502	32,251	0	0	32,251	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	7	Clay	270	276	273	-156	-162	-159	6	125	193	224	33,878	34,253	28,886	80	4,992	30,820	49	3,058	1,934	1.07	0.030	0.00	0.06	0.06
2	8	Clay	276	295	285.5	-162	-181	-171.5	19	126	201	236	35,446	36,639	30,173	85	5,273	32,357	50	3,089	2,184	1.07	0.030	0.00	0.21	0.21
2	9	Sand	295	320	307.5	-181	-206	-193.5	25	126	201	236	38,213	39,787	31,568	107	6,646	33,752	72	4,462	2,184	1.07	0.005	0.04	0.00	0.04
2	10	Sand	320	345	332.5	-206	-231	-218.5	25	126	201	236	41,362	42,936	33,156	132	8,206	35,340	97	6,022	2,184	1.07	0.005	0.04	0.00	0.04
3	11	Sand	345	370	357.5	-231	-256	-243.5	25	126	229	321	44,515	46,094	36,497	129	8,018	42,238	37	2,278	5,741	1.16	0.005	0.10	0.00	0.10
3	12	Sand	370	400	385	-256	-286	-271	30	126	229	321	47,989	49,884	38,255	156	9,734	43,996	64	3,994	5,741	1.15	0.005	0.11	0.00	0.11
3	13	Sand	400	414	407	-286	-300	-293	14	127	229	321	50,771	51,658	39,664	178	11,107	45,405	86	5,366	5,741	1.14	0.005	0.05	0.00	0.05
4	14	Sand	414	440	427	-300	-326	-313	26	127	250	375	53,311	54,964	42,266	177	11,045	50,066	52	3,245	7,800	1.18	0.005	0.11	0.00	0.11
4	15	Sand	440	480	460	-326	-366	-346	40	127	250	375	57,506	60,049	44,402	210	13,104	52,202	85	5,304	7,800	1.18	0.005	0.17	0.00	0.17
4	16	Clay	480	495	487.5	-366	-381	-373.5	15	128	250	375	61,005	61,962	46,185	238	14,820	53,985	113	7,020	7,800	1.17	0.030	0.00	0.37	0.37
4	17	Clay	495	510	502.5	-381	-396	-388.5	15	128	250	375	62,918	63,875	47,162	253	15,756	54,962	128	7,956	7,800	1.17	0.030	0.00	0.36	0.36
4	18	Sand	510	525	517.5	-396	-411	-403.5	15	128	250	375	64,831	65,787	48,139	268	16,692	55,939	143	8,892	7,800	1.16	0.005	0.06	0.00	0.06
4	19	Clay	525	535	530	-411	-421	-416	10	128	250	375	66,425	67,063	48,953	280	17,472	56,753	155	9,672	7,800	1.16	0.030	0.00	0.23	0.23
4	20	Sand	535	560	547.5	-421	-446	-433.5	25	128	250	375	68,657	70,251	50,093	298	18,564	57,893	173	10,764	7,800	1.16	0.005	0.09	0.00	0.09
4	21	Sand	560	585	572.5	-446	-471	-458.5	25	128	250	375	71,850	73,450	51,726	323	20,124	59,526	198	12,324	7,800	1.15	0.005	0.09	0.00	0.09
4	22	Clay	585	588	586.5	-471	-474	-472.5	3	128	250	375	73,641	73,833	52,644	337	20,998	60,444	212	13,198	7,800	1.15	0.030	0.00	0.06	0.06
5	23	Clay	588	595	591.5	-474	-481	-477.5	7	128	308	457	74,281	74,729	56,591	284	17,690	65,888	135	8,393	9,298	1.16	0.030	0.00	0.17	0.17
5	24	Sand	595	600	597.5	-481	-486	-483.5	5	128	308	457	75,050	75,371	56,985	290	18,065	66,283	141	8,767	9,298	1.16	0.005	0.02	0.00	0.02
5	25	Sand	600	650	625	-486	-536	-511	50	128	308	457	78,580	81,788	58,799	317	19,781	68,096	168	10,483	9,298	1.16	0.005	0.19	0.00	0.19
5	26	Sand	650	700	675	-536	-586	-561	50	128	308	457	84,997	88,206	62,096	367	22,901	71,394	218	13,603	9,298	1.15	0.005	0.18	0.00	0.18
5	27	Sand	700	750	725	-586	-636	-611	50	128	308	457	91,415	94,624	65,394	417	26,021	74,692	268	16,723	9,298	1.14	0.005	0.17	0.00	0.17
																							Total Settlement (in) =	1.43	1.46	2.89
																							Total Layer Thickness (feet) =	405	75	480

Date 4/5/2012
Job No. 103.128

Boring ID CUP-19
Scenario 4 to 1
Elevation 114 feet AMSL
Depth to Compressible 270 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec
1	193	221	0.005	0.01	0.03	0.18
2	201	232	0.005	0.01	0.03	0.18
3	229	314	0.005	0.01	0.03	0.18
4	250	369	0.005	0.01	0.03	0.18
5	308	452	0.005	0.01	0.03	0.18

Model	Sub		Depth			Elevation					Total Head		Total Stress		Initial Stresses @ mid point			Final Stresses @ mid point			Delta	$\sigma'_{vf}/\sigma'_{vi}$	Comp	Settlement		
Layer	Layer	Material	Top (feet)	Bottom (feet)	Middle (feet)	Top (feet)	Bottom (feet)	Middle (feet)	Thickness (feet)	Unit wt (pcf)	Initial (feet)	Final (feet)	Mid point (psf)	Bottom (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Eff. Stress (psf)		Index	Sand (inches)	Clay (inches)	Total (inches)
1	1	Sand	0	50	25	114	64	89	50	123	193	221	3,075	6,149	3,075	0	0	3,075	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	Sand	50	100	75	64	14	39	50	124	193	221	9,242	12,334	9,242	0	0	9,242	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	3	Sand	100	150	125	14	-36	-11	50	124	193	221	15,436	18,537	15,436	0	0	15,436	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	4	Sand	150	200	175	-36	-86	-61	50	124	193	221	21,648	24,759	21,648	0	0	21,648	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	5	Sand	200	250	225	-86	-136	-111	50	125	193	221	27,879	30,999	27,879	0	0	27,879	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	6	Sand	250	270	260	-136	-156	-146	20	125	193	221	32,251	33,502	32,251	0	0	32,251	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	7	Clay	270	276	273	-156	-162	-159	6	125	193	221	33,878	34,253	28,886	80	4,992	30,633	52	3,245	1,747	1.06	0.030	0.00	0.06	0.06
2	8	Clay	276	295	285.5	-162	-181	-171.5	19	126	201	232	35,446	36,639	30,173	85	5,273	32,108	54	3,338	1,934	1.06	0.030	0.00	0.18	0.18
2	9	Sand	295	320	307.5	-181	-206	-193.5	25	126	201	232	38,213	39,787	31,568	107	6,646	33,502	76	4,711	1,934	1.06	0.005	0.04	0.00	0.04
2	10	Sand	320	345	332.5	-206	-231	-218.5	25	126	201	232	41,362	42,936	33,156	132	8,206	35,090	101	6,271	1,934	1.06	0.005	0.04	0.00	0.04
3	11	Sand	345	370	357.5	-231	-256	-243.5	25	126	229	314	44,515	46,094	36,497	129	8,018	41,801	44	2,714	5,304	1.15	0.005	0.09	0.00	0.09
3	12	Sand	370	400	385	-256	-286	-271	30	126	229	314	47,989	49,884	38,255	156	9,734	43,559	71	4,430	5,304	1.14	0.005	0.10	0.00	0.10
3	13	Sand	400	414	407	-286	-300	-293	14	127	229	314	50,771	51,658	39,664	178	11,107	44,968	93	5,803	5,304	1.13	0.005	0.05	0.00	0.05
4	14	Sand	414	440	427	-300	-326	-313	26	127	250	369	53,311	54,964	42,266	177	11,045	49,692	58	3,619	7,426	1.18	0.005	0.11	0.00	0.11
4	15	Sand	440	480	460	-326	-366	-346	40	127	250	369	57,506	60,049	44,402	210	13,104	51,828	91	5,678	7,426	1.17	0.005	0.16	0.00	0.16
4	16	Clay	480	495	487.5	-366	-381	-373.5	15	128	250	369	61,005	61,962	46,185	238	14,820	53,611	119	7,394	7,426	1.16	0.030	0.00	0.35	0.35
4	17	Clay	495	510	502.5	-381	-396	-388.5	15	128	250	369	62,918	63,875	47,162	253	15,756	54,588	134	8,330	7,426	1.16	0.030	0.00	0.34	0.34
4	18	Sand	510	525	517.5	-396	-411	-403.5	15	128	250	369	64,831	65,787	48,139	268	16,692	55,565	149	9,266	7,426	1.15	0.005	0.06	0.00	0.06
4	19	Clay	525	535	530	-411	-421	-416	10	128	250	369	66,425	67,063	48,953	280	17,472	56,379	161	10,046	7,426	1.15	0.030	0.00	0.22	0.22
4	20	Sand	535	560	547.5	-421	-446	-433.5	25	128	250	369	68,657	70,251	50,093	298	18,564	57,519	179	11,138	7,426	1.15	0.005	0.09	0.00	0.09
4	21	Sand	560	585	572.5	-446	-471	-458.5	25	128	250	369	71,850	73,450	51,726	323	20,124	59,152	204	12,698	7,426	1.14	0.005	0.09	0.00	0.09
4	22	Clay	585	588	586.5	-471	-474	-472.5	3	128	250	369	73,641	73,833	52,644	337	20,998	60,069	218	13,572	7,426	1.14	0.030	0.00	0.06	0.06
5	23	Clay	588	595	591.5	-474	-481	-477.5	7	128	308	452	74,281	74,729	56,591	284	17,690	65,576	140	8,705	8,986	1.16	0.030	0.00	0.16	0.16
5	24	Sand	595	600	597.5	-481	-486	-483.5	5	128	308	452	75,050	75,371	56,985	290	18,065	65,971	146	9,079	8,986	1.16	0.005	0.02	0.00	0.02
5	25	Sand	600	650	625	-486	-536	-511	50	128	308	452	78,580	81,788	58,799	317	19,781	67,784	173	10,795	8,986	1.15	0.005	0.19	0.00	0.19
5	26	Sand	650	700	675	-536	-586	-561	50	128	308	452	84,997	88,206	62,096	367	22,901	71,082	223	13,915	8,986	1.14	0.005	0.18	0.00	0.18
5	27	Sand	700	750	725	-586	-636	-611	50	128	308	452	91,415	94,624	65,394	417	26,021	74,380	273	17,035	8,986	1.14	0.005	0.17	0.00	0.17
																							Total Settlement (in) =	1.36	1.38	2.74
																							Total Layer Thickness (feet) =	405	75	480

Date	5/7/2012	
Job No.	103.128	
Boring ID	CUP-41-4	
Scenario	2 To HL	
Elevation	24	feet AMSL
Depth to Compressible	158	feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	104	50	0.005	0.01	0.03	0.18	0.025	0.15
2	124	82	0.005	0.01	0.03	0.18	0.025	0.15
3	151	201	0.005	0.01	0.03	0.18	0.025	0.15
4	218	381	0.005	0.01	0.03	0.18	0.025	0.15
5	207	380	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth			Elevation					Total Head		Total Stress		Initial Stresses @ mid point			Final Stresses @ mid point			Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement		
			Top (feet)	Bottom (feet)	Middle (feet)	Top (feet)	Bottom (feet)	Middle (feet)	Thickness (feet)	Unit wt (pcf)	Initial (feet)	Final (feet)	Mid point (psf)	Bottom (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)				Sand (inches)	Clay (inches)	Total (inches)
1	1	Clay	0	17	8.5	24	7	15.5	17	123	104	50	1,045	2,091	1,045	0	0	1,045	0	0	0	1.00	0.030	Incomp.	Incomp.	0.00
1	2	Sand	17	50	33.5	7	-26	-9.5	33	124	104	50	4,132	6,173	4,132	0	0	4,132	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	3	Sand	50	91	70.5	-26	-67	-46.5	41	124	104	50	8,716	11,259	8,716	0	0	8,716	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	4	CLS	91	97	94	-67	-73	-70	6	124	104	50	11,633	12,006	11,633	0	0	11,633	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	5	Sand	97	154	125.5	-73	-130	-101.5	57	125	104	50	15,563	19,120	15,563	0	0	15,563	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	6	Clay	154	158	156	-130	-134	-132	4	125	104	50	19,370	19,620	19,370	0	0	19,370	0	0	0	1.00	0.030	Incomp.	Incomp.	0.00
1	7	Sand	158	188	173	-134	-164	-149	30	125	104	50	21,498	23,375	17,192	69	4,306	13,823	123	7,675	-3,370	0.80	0.005	-0.17	0.00	-0.17
2	8	Sand	188	198	193	-164	-174	-169	10	126	124	82	24,003	24,631	19,698	69	4,306	17,077	111	6,926	-2,621	0.87	0.005	-0.04	0.00	-0.04
2	9	Clay	198	200	199	-174	-176	-175	2	126	124	82	24,757	24,883	20,077	75	4,680	17,456	117	7,301	-2,621	0.87	0.030	0.00	-0.04	-0.04
2	10	Sand	200	244	222	-176	-220	-198	44	126	124	82	27,654	30,424	21,538	98	6,115	18,918	140	8,736	-2,621	0.88	0.005	-0.15	0.00	-0.15
2	11	Clay	244	256	250	-220	-232	-226	12	126	124	82	31,182	31,940	23,320	126	7,862	20,699	168	10,483	-2,621	0.89	0.030	0.00	-0.22	-0.22
3	12	Clay	256	282	269	-232	-258	-245	26	126	151	201	33,583	35,225	26,219	118	7,363	29,339	68	4,243	3,120	1.12	0.030	0.00	0.46	0.46
3	13	Clay	282	308	295	-258	-284	-271	26	127	151	201	36,872	38,520	27,887	144	8,986	31,007	94	5,866	3,120	1.11	0.030	0.00	0.43	0.43
3	14	Sand	308	319	313.5	-284	-295	-289.5	11	127	151	201	39,219	39,918	29,079	163	10,140	32,199	113	7,020	3,120	1.11	0.005	0.03	0.00	0.03
3	15	CLS	319	324	321.5	-295	-300	-297.5	5	127	151	201	40,236	40,554	29,597	171	10,639	32,717	121	7,519	3,120	1.11	0.025	0.00	0.07	0.07
4	16	CLS	324	340	332	-300	-316	-308	16	128	218	381	41,574	42,594	34,460	114	7,114	41,574	0	0	7,114	1.21	0.025	0.00	0.39	0.39
4	17	Sand	340	388	364	-316	-364	-340	48	128	218	381	45,655	48,716	36,545	146	9,110	45,655	0	0	9,110	1.25	0.005	0.28	0.00	0.28
4	18	CLS	388	400	394	-364	-376	-370	12	128	218	381	49,481	50,246	38,499	176	10,982	48,670	13	811	10,171	1.26	0.025	0.00	0.37	0.37
4	19	Sand	400	470	435	-376	-446	-411	70	128	218	381	54,710	59,173	41,169	217	13,541	51,340	54	3,370	10,171	1.25	0.005	0.40	0.00	0.40
4	20	Clay	470	484	477	-446	-460	-453	14	128	218	381	60,066	60,959	43,904	259	16,162	54,076	96	5,990	10,171	1.23	0.030	0.00	0.46	0.46
5	21	Sand	484	520	502	-460	-496	-478	36	128	207	380	63,262	65,564	44,854	295	18,408	55,649	122	7,613	10,795	1.24	0.005	0.20	0.00	0.20
5	22	Sand	520	580	550	-496	-556	-526	60	128	207	380	69,403	73,241	47,999	343	21,403	58,795	170	10,608	10,795	1.22	0.005	0.32	0.00	0.32
																							Total Settlement (in) =	0.87	1.90	2.77
																							Total Layer Thickness (feet) =	309	113	422

Date 5/7/2012
Job No. 103.128

Boring ID CUP-41-4
Scenario 4 To HL
Elevation 24 feet AMSL
Depth to Compressible 158 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	104	50	0.005	0.01	0.03	0.18	0.025	0.15
2	124	82	0.005	0.01	0.03	0.18	0.025	0.15
3	151	201	0.005	0.01	0.03	0.18	0.025	0.15
4	218	382	0.005	0.01	0.03	0.18	0.025	0.15
5	207	382	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Clay	0	17	8.5	24	7	15.5	17	123	104	50	1,045	2,091	1,045	0	0	1,045	0	0	0	1.00	0.030	Incomp.	Incomp.	0.00
1	2	Sand	17	50	33.5	7	-26	-9.5	33	124	104	50	4,132	6,173	4,132	0	0	4,132	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	3	Sand	50	91	70.5	-26	-67	-46.5	41	124	104	50	8,716	11,259	8,716	0	0	8,716	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	4	CLS	91	97	94	-67	-73	-70	6	124	104	50	11,633	12,006	11,633	0	0	11,633	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	5	Sand	97	154	125.5	-73	-130	-101.5	57	125	104	50	15,563	19,120	15,563	0	0	15,563	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	6	Clay	154	158	156	-130	-134	-132	4	125	104	50	19,370	19,620	19,370	0	0	19,370	0	0	0	1.00	0.030	Incomp.	Incomp.	0.00
1	7	Sand	158	188	173	-134	-164	-149	30	125	104	50	21,498	23,375	17,192	69	4,306	13,823	123	7,675	-3,370	0.80	0.005	-0.17	0.00	-0.17
2	8	Sand	188	198	193	-164	-174	-169	10	126	124	82	24,003	24,631	19,698	69	4,306	17,077	111	6,926	-2,621	0.87	0.005	-0.04	0.00	-0.04
2	9	Clay	198	200	199	-174	-176	-175	2	126	124	82	24,757	24,883	20,077	75	4,680	17,456	117	7,301	-2,621	0.87	0.030	0.00	-0.04	-0.04
2	10	Sand	200	244	222	-176	-220	-198	44	126	124	82	27,654	30,424	21,538	98	6,115	18,918	140	8,736	-2,621	0.88	0.005	-0.15	0.00	-0.15
2	11	Clay	244	256	250	-220	-232	-226	12	126	124	82	31,182	31,940	23,320	126	7,862	20,699	168	10,483	-2,621	0.89	0.030	0.00	-0.22	-0.22
3	12	Clay	256	282	269	-232	-258	-245	26	126	151	201	33,583	35,225	26,219	118	7,363	29,339	68	4,243	3,120	1.12	0.030	0.00	0.46	0.46
3	13	Clay	282	308	295	-258	-284	-271	26	127	151	201	36,872	38,520	27,887	144	8,986	31,007	94	5,866	3,120	1.11	0.030	0.00	0.43	0.43
3	14	Sand	308	319	313.5	-284	-295	-289.5	11	127	151	201	39,219	39,918	29,079	163	10,140	32,199	113	7,020	3,120	1.11	0.005	0.03	0.00	0.03
3	15	CLS	319	324	321.5	-295	-300	-297.5	5	127	151	201	40,236	40,554	29,597	171	10,639	32,717	121	7,519	3,120	1.11	0.025	0.00	0.07	0.07
4	16	CLS	324	340	332	-300	-316	-308	16	128	218	382	41,574	42,594	34,460	114	7,114	41,574	0	0	7,114	1.21	0.025	0.00	0.39	0.39
4	17	Sand	340	388	364	-316	-364	-340	48	128	218	382	45,655	48,716	36,545	146	9,110	45,655	0	0	9,110	1.25	0.005	0.28	0.00	0.28
4	18	CLS	388	400	394	-364	-376	-370	12	128	218	382	49,481	50,246	38,499	176	10,982	48,732	12	749	10,234	1.27	0.025	0.00	0.37	0.37
4	19	Sand	400	470	435	-376	-446	-411	70	128	218	382	54,710	59,173	41,169	217	13,541	51,402	53	3,307	10,234	1.25	0.005	0.40	0.00	0.40
4	20	Clay	470	484	477	-446	-460	-453	14	128	218	382	60,066	60,959	43,904	259	16,162	54,138	95	5,928	10,234	1.23	0.030	0.00	0.46	0.46
5	21	Sand	484	520	502	-460	-496	-478	36	128	207	382	63,262	65,564	44,854	295	18,408	55,774	120	7,488	10,920	1.24	0.005	0.20	0.00	0.20
5	22	Sand	520	580	550	-496	-556	-526	60	128	207	382	69,403	73,241	47,999	343	21,403	58,919	168	10,483	10,920	1.23	0.005	0.32	0.00	0.32
																							Total Settlement (in) =	0.88	1.90	2.79
																							Total Layer Thickness (feet) =	309	113	422

Date	5/7/2012	
Job No.	103.128	
Boring ID	CUP-41-4	
Scenario	2 To 1	
Elevation	24	feet AMSL
Depth to Compressible	158	feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	50	50	0.005	0.01	0.03	0.18	0.025	0.15
2	71	82	0.005	0.01	0.03	0.18	0.025	0.15
3	145	201	0.005	0.01	0.03	0.18	0.025	0.15
4	228	381	0.005	0.01	0.03	0.18	0.025	0.15
5	229	380	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Clay	0	17	8.5	24	7	15.5	17	123	50	50	1,045	2,091	1,045	0	0	1,045	0	0	0	1.00	0.030	Incomp.	Incomp.	0.00
1	2	Sand	17	50	33.5	7	-26	-9.5	33	124	50	50	4,132	6,173	4,132	0	0	4,132	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	3	Sand	50	91	70.5	-26	-67	-46.5	41	124	50	50	8,716	11,259	8,716	0	0	8,716	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	4	CLS	91	97	94	-67	-73	-70	6	124	50	50	11,633	12,006	11,633	0	0	11,633	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	5	Sand	97	154	125.5	-73	-130	-101.5	57	125	50	50	15,563	19,120	15,563	0	0	15,563	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	6	Clay	154	158	156	-130	-134	-132	4	125	50	50	19,370	19,620	19,370	0	0	19,370	0	0	0	1.00	0.030	Incomp.	Incomp.	0.00
1	7	Sand	158	188	173	-134	-164	-149	30	125	50	50	21,498	23,375	13,823	123	7,675	13,823	123	7,675	0	1.00	0.005	0.00	0.00	0.00
2	8	Sand	188	198	193	-164	-174	-169	10	126	71	82	24,003	24,631	16,390	122	7,613	17,077	111	6,926	686	1.04	0.005	0.01	0.00	0.01
2	9	Clay	198	200	199	-174	-176	-175	2	126	71	82	24,757	24,883	16,770	128	7,987	17,456	117	7,301	686	1.04	0.030	0.00	0.01	0.01
2	10	Sand	200	244	222	-176	-220	-198	44	126	71	82	27,654	30,424	18,231	151	9,422	18,918	140	8,736	686	1.04	0.005	0.04	0.00	0.04
2	11	Clay	244	256	250	-220	-232	-226	12	126	71	82	31,182	31,940	20,013	179	11,170	20,699	168	10,483	686	1.03	0.030	0.00	0.06	0.06
3	12	Clay	256	282	269	-232	-258	-245	26	126	145	201	33,583	35,225	25,845	124	7,738	29,339	68	4,243	3,494	1.14	0.030	0.00	0.52	0.52
3	13	Clay	282	308	295	-258	-284	-271	26	127	145	201	36,872	38,520	27,512	150	9,360	31,007	94	5,866	3,494	1.13	0.030	0.00	0.49	0.49
3	14	Sand	308	319	313.5	-284	-295	-289.5	11	127	145	201	39,219	39,918	28,705	169	10,514	32,199	113	7,020	3,494	1.12	0.005	0.03	0.00	0.03
3	15	CLS	319	324	321.5	-295	-300	-297.5	5	127	145	201	40,236	40,554	29,222	177	11,014	32,717	121	7,519	3,494	1.12	0.025	0.00	0.07	0.07
4	16	CLS	324	340	332	-300	-316	-308	16	128	228	381	41,574	42,594	35,084	104	6,490	41,574	0	0	6,490	1.18	0.025	0.00	0.35	0.35
4	17	Sand	340	388	364	-316	-364	-340	48	128	228	381	45,655	48,716	37,169	136	8,486	45,655	0	0	8,486	1.23	0.005	0.26	0.00	0.26
4	18	CLS	388	400	394	-364	-376	-370	12	128	228	381	49,481	50,246	39,123	166	10,358	48,670	13	811	9,547	1.24	0.025	0.00	0.34	0.34
4	19	Sand	400	470	435	-376	-446	-411	70	128	228	381	54,710	59,173	41,793	207	12,917	51,340	54	3,370	9,547	1.23	0.005	0.38	0.00	0.38
4	20	Clay	470	484	477	-446	-460	-453	14	128	228	381	60,066	60,959	44,528	249	15,538	54,076	96	5,990	9,547	1.21	0.030	0.00	0.43	0.43
5	21	Sand	484	520	502	-460	-496	-478	36	128	229	380	63,262	65,564	46,226	273	17,035	55,649	122	7,613	9,422	1.20	0.005	0.17	0.00	0.17
5	22	Sand	520	580	550	-496	-556	-526	60	128	229	380	69,403	73,241	49,372	321	20,030	58,795	170	10,608	9,422	1.19	0.005	0.27	0.00	0.27
																							Total Settlement (in) =	1.17	2.27	3.44
																							Total Layer Thickness (feet) =	309	113	422

Date	5/7/2012	
Job No.	103.128	
Boring ID	CUP-41-4	
Scenario	4 To 1	
Elevation	24	feet AMSL
Depth to Compressible	158	feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	50	50	0.005	0.01	0.03	0.18	0.025	0.15
2	71	82	0.005	0.01	0.03	0.18	0.025	0.15
3	145	201	0.005	0.01	0.03	0.18	0.025	0.15
4	228	382	0.005	0.01	0.03	0.18	0.025	0.15
5	229	382	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Stresses @ mid point Pore Water (feet)	Initial Stresses @ mid point Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Stresses @ mid point Pore Water (feet)	Final Stresses @ mid point Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Clay	0	17	8.5	24	7	15.5	17	123	50	50	1,045	2,091	1,045	0	0	1,045	0	0	0	1.00	0.030	Incomp.	Incomp.	0.00
1	2	Sand	17	50	33.5	7	-26	-9.5	33	124	50	50	4,132	6,173	4,132	0	0	4,132	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	3	Sand	50	91	70.5	-26	-67	-46.5	41	124	50	50	8,716	11,259	8,716	0	0	8,716	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	4	CLS	91	97	94	-67	-73	-70	6	124	50	50	11,633	12,006	11,633	0	0	11,633	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	5	Sand	97	154	125.5	-73	-130	-101.5	57	125	50	50	15,563	19,120	15,563	0	0	15,563	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	6	Clay	154	158	156	-130	-134	-132	4	125	50	50	19,370	19,620	19,370	0	0	19,370	0	0	0	1.00	0.030	Incomp.	Incomp.	0.00
1	7	Sand	158	188	173	-134	-164	-149	30	125	50	50	21,498	23,375	13,823	123	7,675	13,823	123	7,675	0	1.00	0.005	0.00	0.00	0.00
2	8	Sand	188	198	193	-164	-174	-169	10	126	71	82	24,003	24,631	16,390	122	7,613	17,077	111	6,926	686	1.04	0.005	0.01	0.00	0.01
2	9	Clay	198	200	199	-174	-176	-175	2	126	71	82	24,757	24,883	16,770	128	7,987	17,456	117	7,301	686	1.04	0.030	0.00	0.01	0.01
2	10	Sand	200	244	222	-176	-220	-198	44	126	71	82	27,654	30,424	18,231	151	9,422	18,918	140	8,736	686	1.04	0.005	0.04	0.00	0.04
2	11	Clay	244	256	250	-220	-232	-226	12	126	71	82	31,182	31,940	20,013	179	11,170	20,699	168	10,483	686	1.03	0.030	0.00	0.06	0.06
3	12	Clay	256	282	269	-232	-258	-245	26	126	145	201	33,583	35,225	25,845	124	7,738	29,339	68	4,243	3,494	1.14	0.030	0.00	0.52	0.52
3	13	Clay	282	308	295	-258	-284	-271	26	127	145	201	36,872	38,520	27,512	150	9,360	31,007	94	5,866	3,494	1.13	0.030	0.00	0.49	0.49
3	14	Sand	308	319	313.5	-284	-295	-289.5	11	127	145	201	39,219	39,918	28,705	169	10,514	32,199	113	7,020	3,494	1.12	0.005	0.03	0.00	0.03
3	15	CLS	319	324	321.5	-295	-300	-297.5	5	127	145	201	40,236	40,554	29,222	177	11,014	32,717	121	7,519	3,494	1.12	0.025	0.00	0.07	0.07
4	16	CLS	324	340	332	-300	-316	-308	16	128	228	382	41,574	42,594	35,084	104	6,490	41,574	0	0	6,490	1.18	0.025	0.00	0.35	0.35
4	17	Sand	340	388	364	-316	-364	-340	48	128	228	382	45,655	48,716	37,169	136	8,486	45,655	0	0	8,486	1.23	0.005	0.26	0.00	0.26
4	18	CLS	388	400	394	-364	-376	-370	12	128	228	382	49,481	50,246	39,123	166	10,358	48,732	12	749	9,610	1.25	0.025	0.00	0.34	0.34
4	19	Sand	400	470	435	-376	-446	-411	70	128	228	382	54,710	59,173	41,793	207	12,917	51,402	53	3,307	9,610	1.23	0.005	0.38	0.00	0.38
4	20	Clay	470	484	477	-446	-460	-453	14	128	228	382	60,066	60,959	44,528	249	15,538	54,138	95	5,928	9,610	1.22	0.030	0.00	0.43	0.43
5	21	Sand	484	520	502	-460	-496	-478	36	128	229	382	63,262	65,564	46,226	273	17,035	55,774	120	7,488	9,547	1.21	0.005	0.18	0.00	0.18
5	22	Sand	520	580	550	-496	-556	-526	60	128	229	382	69,403	73,241	49,372	321	20,030	58,919	168	10,483	9,547	1.19	0.005	0.28	0.00	0.28
																							Total Settlement (in) =	1.17	2.28	3.45
																							Total Layer Thickness (feet) =	309	113	422

Date 4/5/2012
Job No. 103.128

Boring ID LMPS
Scenario 2 to HL
Elevation 43 feet AMSL
Depth to Compressible 71 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	32	34	0.005	0.01	0.03	0.18	0.025	0.15
2	33	37	0.005	0.01	0.03	0.18	0.025	0.15
3	50	68	0.005	0.01	0.03	0.18	0.025	0.15
4	65	88	0.005	0.01	0.03	0.18	0.025	0.15
5	113	198	0.005	0.01	0.03	0.18	0.025	0.15

Model	Sub		Depth			Elevation					Total Head		Total Stress		Initial Stresses @ mid point			Final Stresses @ mid point			Delta	$\sigma'_{vf}/\sigma'_{vi}$	Comp	Settlement		
Layer	Layer	Material	Top (feet)	Bottom (feet)	Middle (feet)	Top (feet)	Bottom (feet)	Middle (feet)	Thickness (feet)	Unit wt (pcf)	Initial (feet)	Final (feet)	Mid point (psf)	Bottom (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Eff. Stress (psf)		Index	Sand (inches)	Clay (inches)	Total (inches)
1	1	Sand	0	71	35.5	43	-28	7.5	71	123	32	34	4,367	8,733	4,367	0	0	4,367	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
2	2	Sand	71	100	85.5	-28	-57	-42.5	29	124	33	37	10,531	12,329	7,255	53	3,276	7,505	49	3,026	250	1.03	0.005	0.03	0.00	0.03
2	3	Sand	100	143	121.5	-57	-100	-78.5	43	124	33	37	14,995	17,661	9,473	89	5,522	9,722	85	5,273	250	1.03	0.005	0.03	0.00	0.03
2	4	Sand	143	193	168	-100	-150	-125	50	124	33	37	20,761	23,861	12,337	135	8,424	12,587	131	8,174	250	1.02	0.005	0.03	0.00	0.03
3	5	Sand	193	233	213	-150	-190	-170	40	125	50	68	26,361	28,861	16,190	163	10,171	17,313	145	9,048	1,123	1.07	0.005	0.07	0.00	0.07
3	6	Sand	233	283	258	-190	-240	-215	50	125	50	68	31,986	35,111	19,007	208	12,979	20,130	190	11,856	1,123	1.06	0.005	0.07	0.00	0.07
3	7	Sand	283	333	308	-240	-290	-265	50	125	50	68	38,236	41,361	22,137	258	16,099	23,260	240	14,976	1,123	1.05	0.005	0.06	0.00	0.06
3	8	Clay	333	343	338	-290	-300	-295	10	126	50	68	41,991	42,621	24,020	288	17,971	25,143	270	16,848	1,123	1.05	0.030	0.00	0.07	0.07
4	9	Clay	343	360	351.5	-300	-317	-308.5	17	126	65	88	43,692	44,763	25,814	287	17,878	27,250	264	16,442	1,435	1.06	0.030	0.00	0.14	0.14
4	10	Clay	360	375	367.5	-317	-332	-324.5	15	126	65	88	45,708	46,653	26,832	303	18,876	28,267	280	17,441	1,435	1.05	0.030	0.00	0.12	0.12
4	11	Clay	375	390	382.5	-332	-347	-339.5	15	126	65	88	47,598	48,543	27,786	318	19,812	29,221	295	18,377	1,435	1.05	0.030	0.00	0.12	0.12
4	12	Sand	390	420	405	-347	-377	-362	30	126	65	88	50,433	52,323	29,217	340	21,216	30,652	317	19,781	1,435	1.05	0.005	0.04	0.00	0.04
4	13	Sand	420	454	437	-377	-411	-394	34	127	65	88	54,482	56,641	31,269	372	23,213	32,704	349	21,778	1,435	1.05	0.005	0.04	0.00	0.04
4	14	CLS	454	474	464	-411	-431	-421	20	127	65	88	57,911	59,181	33,013	399	24,898	34,449	376	23,462	1,435	1.04	0.025	0.00	0.11	0.11
4	15	CLS	474	494	484	-431	-451	-441	20	127	65	88	60,451	61,721	34,305	419	26,146	35,741	396	24,710	1,435	1.04	0.025	0.00	0.11	0.11
4	16	CLS	494	514	504	-451	-471	-461	20	128	65	88	63,001	64,281	35,607	439	27,394	37,043	416	25,958	1,435	1.04	0.025	0.00	0.10	0.10
4	17	CLS	514	539	526.5	-471	-496	-483.5	25	128	65	88	65,881	67,481	37,083	462	28,798	38,519	439	27,362	1,435	1.04	0.025	0.00	0.12	0.12
5	18	CLS	539	542	540.5	-496	-499	-497.5	3	128	113	198	67,673	67,865	40,997	428	26,676	46,301	343	21,372	5,304	1.13	0.025	0.00	0.05	0.05
5	19	Sand	542	555	548.5	-499	-512	-505.5	13	128	113	198	68,697	69,529	41,522	436	27,175	46,826	351	21,871	5,304	1.13	0.005	0.04	0.00	0.04
5	20	Sand	555	575	565	-512	-532	-522	20	128	113	198	70,809	72,089	42,604	452	28,205	47,908	367	22,901	5,304	1.12	0.005	0.06	0.00	0.06
5	21	Sand	575	595	585	-532	-552	-542	20	128	113	198	73,369	74,649	43,916	472	29,453	49,220	387	24,149	5,304	1.12	0.005	0.06	0.00	0.06
5	22	Sand	595	615	605	-552	-572	-562	20	128	113	198	75,929	77,209	45,228	492	30,701	50,532	407	25,397	5,304	1.12	0.005	0.06	0.00	0.06
																							Total Settlement (in) =	0.59	0.95	1.53
																							Total Layer Thickness (feet) =	399	145	544

Date	4/5/2012	
Job No.	103.128	
Boring ID	LMPS	
Scenario	3a to HL	
Elevation	43	feet AMSL
Depth to Compressible	71	feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand		Clay		Sandy Clay	
			Cer	Cec	Cer	Cec	Cer	Cec
1	32	48	0.005	0.01	0.03	0.18	0.025	0.15
2	33	51	0.005	0.01	0.03	0.18	0.025	0.15
3	50	79	0.005	0.01	0.03	0.18	0.025	0.15
4	65	135	0.005	0.01	0.03	0.18	0.025	0.15
5	113	145	0.005	0.01	0.03	0.18	0.025	0.15

Model	Sub		Depth			Elevation					Total Head		Total Stress		Initial Stresses @ mid point			Final Stresses @ mid point			Delta	σ'vf/σ'vi	Comp	Settlement		
Layer	Layer	Material	Top (feet)	Bottom (feet)	Middle (feet)	Top (feet)	Bottom (feet)	Middle (feet)	Thickness (feet)	Unit wt (pcf)	Initial (feet)	Final (feet)	Mid point (psf)	Bottom (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Eff. Stress (psf)		Index	Sand (inches)	Clay (inches)	Total (inches)
1	1	Sand	0	71	35.5	43	-28	7.5	71	123	32	48	4,367	8,733	4,367	0	0	4,367	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
2	2	Sand	71	100	85.5	-28	-57	-42.5	29	124	33	51	10,531	12,329	7,255	53	3,276	8,378	35	2,153	1,123	1.15	0.005	0.11	0.00	0.11
2	3	Sand	100	143	121.5	-57	-100	-78.5	43	124	33	51	14,995	17,661	9,473	89	5,522	10,596	71	4,399	1,123	1.12	0.005	0.13	0.00	0.13
2	4	Sand	143	193	168	-100	-150	-125	50	124	33	51	20,761	23,861	12,337	135	8,424	13,460	117	7,301	1,123	1.09	0.005	0.11	0.00	0.11
3	5	Sand	193	233	213	-150	-190	-170	40	125	50	79	26,361	28,861	16,190	163	10,171	17,999	134	8,362	1,810	1.11	0.005	0.11	0.00	0.11
3	6	Sand	233	283	258	-190	-240	-215	50	125	50	79	31,986	35,111	19,007	208	12,979	20,816	179	11,170	1,810	1.10	0.005	0.12	0.00	0.12
3	7	Sand	283	333	308	-240	-290	-265	50	125	50	79	38,236	41,361	22,137	258	16,099	23,946	229	14,290	1,810	1.08	0.005	0.10	0.00	0.10
3	8	Clay	333	343	338	-290	-300	-295	10	126	50	79	41,991	42,621	24,020	288	17,971	25,829	259	16,162	1,810	1.08	0.030	0.00	0.11	0.11
4	9	Clay	343	360	351.5	-300	-317	-308.5	17	126	65	135	43,692	44,763	25,814	287	17,878	30,182	217	13,510	4,368	1.17	0.030	0.00	0.42	0.42
4	10	Clay	360	375	367.5	-317	-332	-324.5	15	126	65	135	45,708	46,653	26,832	303	18,876	31,200	233	14,508	4,368	1.16	0.030	0.00	0.35	0.35
4	11	Clay	375	390	382.5	-332	-347	-339.5	15	126	65	135	47,598	48,543	27,786	318	19,812	32,154	248	15,444	4,368	1.16	0.030	0.00	0.34	0.34
4	12	Sand	390	420	405	-347	-377	-362	30	126	65	135	50,433	52,323	29,217	340	21,216	33,585	270	16,848	4,368	1.15	0.005	0.11	0.00	0.11
4	13	Sand	420	454	437	-377	-411	-394	34	127	65	135	54,482	56,641	31,269	372	23,213	35,637	302	18,845	4,368	1.14	0.005	0.12	0.00	0.12
4	14	CLS	454	474	464	-411	-431	-421	20	127	65	135	57,911	59,181	33,013	399	24,898	37,381	329	20,530	4,368	1.13	0.025	0.00	0.32	0.32
4	15	CLS	474	494	484	-431	-451	-441	20	127	65	135	60,451	61,721	34,305	419	26,146	38,673	349	21,778	4,368	1.13	0.025	0.00	0.31	0.31
4	16	CLS	494	514	504	-451	-471	-461	20	128	65	135	63,001	64,281	35,607	439	27,394	39,975	369	23,026	4,368	1.12	0.025	0.00	0.30	0.30
4	17	CLS	514	539	526.5	-471	-496	-483.5	25	128	65	135	65,881	67,481	37,083	462	28,798	41,451	392	24,430	4,368	1.12	0.025	0.00	0.36	0.36
5	18	CLS	539	542	540.5	-496	-499	-497.5	3	128	113	145	67,673	67,865	40,997	428	26,676	42,994	396	24,679	1,997	1.05	0.025	0.00	0.02	0.02
5	19	Sand	542	555	548.5	-499	-512	-505.5	13	128	113	145	68,697	69,529	41,522	436	27,175	43,519	404	25,178	1,997	1.05	0.005	0.02	0.00	0.02
5	20	Sand	555	575	565	-512	-532	-522	20	128	113	145	70,809	72,089	42,604	452	28,205	44,601	420	26,208	1,997	1.05	0.005	0.02	0.00	0.02
5	21	Sand	575	595	585	-532	-552	-542	20	128	113	145	73,369	74,649	43,916	472	29,453	45,913	440	27,456	1,997	1.05	0.005	0.02	0.00	0.02
5	22	Sand	595	615	605	-552	-572	-562	20	128	113	145	75,929	77,209	45,228	492	30,701	47,225	460	28,704	1,997	1.04	0.005	0.02	0.00	0.02
																							Total Settlement (in) =	0.99	2.54	3.53
																							Total Layer Thickness (feet) =	399	145	544

Date 4/5/2012
Job No. 103.128

Boring ID LMPS
Scenario 3b to HL
Elevation 43 feet AMSL
Depth to Compressible 71 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	32	48	0.005	0.01	0.03	0.18	0.025	0.15
2	33	51	0.005	0.01	0.03	0.18	0.025	0.15
3	50	78	0.005	0.01	0.03	0.18	0.025	0.15
4	65	135	0.005	0.01	0.03	0.18	0.025	0.15
5	113	145	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	71	35.5	43	-28	7.5	71	123	32	48	4,367	8,733	4,367	0	0	4,367	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
2	2	Sand	71	100	85.5	-28	-57	-42.5	29	124	33	51	10,531	12,329	7,255	53	3,276	8,378	35	2,153	1,123	1.15	0.005	0.11	0.00	0.11
2	3	Sand	100	143	121.5	-57	-100	-78.5	43	124	33	51	14,995	17,661	9,473	89	5,522	10,596	71	4,399	1,123	1.12	0.005	0.13	0.00	0.13
2	4	Sand	143	193	168	-100	-150	-125	50	124	33	51	20,761	23,861	12,337	135	8,424	13,460	117	7,301	1,123	1.09	0.005	0.11	0.00	0.11
3	5	Sand	193	233	213	-150	-190	-170	40	125	50	78	26,361	28,861	16,190	163	10,171	17,937	135	8,424	1,747	1.11	0.005	0.11	0.00	0.11
3	6	Sand	233	283	258	-190	-240	-215	50	125	50	78	31,986	35,111	19,007	208	12,979	20,754	180	11,232	1,747	1.09	0.005	0.11	0.00	0.11
3	7	Sand	283	333	308	-240	-290	-265	50	125	50	78	38,236	41,361	22,137	258	16,099	23,884	230	14,352	1,747	1.08	0.005	0.10	0.00	0.10
3	8	Clay	333	343	338	-290	-300	-295	10	126	50	78	41,991	42,621	24,020	288	17,971	25,767	260	16,224	1,747	1.07	0.030	0.00	0.11	0.11
4	9	Clay	343	360	351.5	-300	-317	-308.5	17	126	65	135	43,692	44,763	25,814	287	17,878	30,182	217	13,510	4,368	1.17	0.030	0.00	0.42	0.42
4	10	Clay	360	375	367.5	-317	-332	-324.5	15	126	65	135	45,708	46,653	26,832	303	18,876	31,200	233	14,508	4,368	1.16	0.030	0.00	0.35	0.35
4	11	Clay	375	390	382.5	-332	-347	-339.5	15	126	65	135	47,598	48,543	27,786	318	19,812	32,154	248	15,444	4,368	1.16	0.030	0.00	0.34	0.34
4	12	Sand	390	420	405	-347	-377	-362	30	126	65	135	50,433	52,323	29,217	340	21,216	33,585	270	16,848	4,368	1.15	0.005	0.11	0.00	0.11
4	13	Sand	420	454	437	-377	-411	-394	34	127	65	135	54,482	56,641	31,269	372	23,213	35,637	302	18,845	4,368	1.14	0.005	0.12	0.00	0.12
4	14	CLS	454	474	464	-411	-431	-421	20	127	65	135	57,911	59,181	33,013	399	24,898	37,381	329	20,530	4,368	1.13	0.025	0.00	0.32	0.32
4	15	CLS	474	494	484	-431	-451	-441	20	127	65	135	60,451	61,721	34,305	419	26,146	38,673	349	21,778	4,368	1.13	0.025	0.00	0.31	0.31
4	16	CLS	494	514	504	-451	-471	-461	20	128	65	135	63,001	64,281	35,607	439	27,394	39,975	369	23,026	4,368	1.12	0.025	0.00	0.30	0.30
4	17	CLS	514	539	526.5	-471	-496	-483.5	25	128	65	135	65,881	67,481	37,083	462	28,798	41,451	392	24,430	4,368	1.12	0.025	0.00	0.36	0.36
5	18	CLS	539	542	540.5	-496	-499	-497.5	3	128	113	145	67,673	67,865	40,997	428	26,676	42,994	396	24,679	1,997	1.05	0.025	0.00	0.02	0.02
5	19	Sand	542	555	548.5	-499	-512	-505.5	13	128	113	145	68,697	69,529	41,522	436	27,175	43,519	404	25,178	1,997	1.05	0.005	0.02	0.00	0.02
5	20	Sand	555	575	565	-512	-532	-522	20	128	113	145	70,809	72,089	42,604	452	28,205	44,601	420	26,208	1,997	1.05	0.005	0.02	0.00	0.02
5	21	Sand	575	595	585	-532	-552	-542	20	128	113	145	73,369	74,649	43,916	472	29,453	45,913	440	27,456	1,997	1.05	0.005	0.02	0.00	0.02
5	22	Sand	595	615	605	-552	-572	-562	20	128	113	145	75,929	77,209	45,228	492	30,701	47,225	460	28,704	1,997	1.04	0.005	0.02	0.00	0.02
																							Total Settlement (in) =	0.98	2.54	3.52
																							Total Layer Thickness (feet) =	399	145	544

Date	4/5/2012	
Job No.	103.128	
Boring ID	LMPS	
Scenario	4 to HL	
Elevation	43	feet AMSL
Depth to Compressible	71	feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	32	36	0.005	0.01	0.03	0.18	0.025	0.15
2	33	39	0.005	0.01	0.03	0.18	0.025	0.15
3	50	74	0.005	0.01	0.03	0.18	0.025	0.15
4	65	134	0.005	0.01	0.03	0.18	0.025	0.15
5	113	194	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	71	35.5	43	-28	7.5	71	123	32	36	4,367	8,733	4,367	0	0	4,367	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
2	2	Sand	71	100	85.5	-28	-57	-42.5	29	124	33	39	10,531	12,329	7,255	53	3,276	7,629	47	2,902	374	1.05	0.005	0.04	0.00	0.04
2	3	Sand	100	143	121.5	-57	-100	-78.5	43	124	33	39	14,995	17,661	9,473	89	5,522	9,847	83	5,148	374	1.04	0.005	0.04	0.00	0.04
2	4	Sand	143	193	168	-100	-150	-125	50	124	33	39	20,761	23,861	12,337	135	8,424	12,711	129	8,050	374	1.03	0.005	0.04	0.00	0.04
3	5	Sand	193	233	213	-150	-190	-170	40	125	50	74	26,361	28,861	16,190	163	10,171	17,687	139	8,674	1,498	1.09	0.005	0.09	0.00	0.09
3	6	Sand	233	283	258	-190	-240	-215	50	125	50	74	31,986	35,111	19,007	208	12,979	20,504	184	11,482	1,498	1.08	0.005	0.10	0.00	0.10
3	7	Sand	283	333	308	-240	-290	-265	50	125	50	74	38,236	41,361	22,137	258	16,099	23,634	234	14,602	1,498	1.07	0.005	0.09	0.00	0.09
3	8	Clay	333	343	338	-290	-300	-295	10	126	50	74	41,991	42,621	24,020	288	17,971	25,517	264	16,474	1,498	1.06	0.030	0.00	0.09	0.09
4	9	Clay	343	360	351.5	-300	-317	-308.5	17	126	65	134	43,692	44,763	25,814	287	17,878	30,120	218	13,572	4,306	1.17	0.030	0.00	0.41	0.41
4	10	Clay	360	375	367.5	-317	-332	-324.5	15	126	65	134	45,708	46,653	26,832	303	18,876	31,138	234	14,570	4,306	1.16	0.030	0.00	0.35	0.35
4	11	Clay	375	390	382.5	-332	-347	-339.5	15	126	65	134	47,598	48,543	27,786	318	19,812	32,092	249	15,506	4,306	1.15	0.030	0.00	0.34	0.34
4	12	Sand	390	420	405	-347	-377	-362	30	126	65	134	50,433	52,323	29,217	340	21,216	33,523	271	16,910	4,306	1.15	0.005	0.11	0.00	0.11
4	13	Sand	420	454	437	-377	-411	-394	34	127	65	134	54,482	56,641	31,269	372	23,213	35,575	303	18,907	4,306	1.14	0.005	0.11	0.00	0.11
4	14	CLS	454	474	464	-411	-431	-421	20	127	65	134	57,911	59,181	33,013	399	24,898	37,319	330	20,592	4,306	1.13	0.025	0.00	0.32	0.32
4	15	CLS	474	494	484	-431	-451	-441	20	127	65	134	60,451	61,721	34,305	419	26,146	38,611	350	21,840	4,306	1.13	0.025	0.00	0.31	0.31
4	16	CLS	494	514	504	-451	-471	-461	20	128	65	134	63,001	64,281	35,607	439	27,394	39,913	370	23,088	4,306	1.12	0.025	0.00	0.30	0.30
4	17	CLS	514	539	526.5	-471	-496	-483.5	25	128	65	134	65,881	67,481	37,083	462	28,798	41,389	393	24,492	4,306	1.12	0.025	0.00	0.36	0.36
5	18	CLS	539	542	540.5	-496	-499	-497.5	3	128	113	194	67,673	67,865	40,997	428	26,676	46,051	347	21,622	5,054	1.12	0.025	0.00	0.05	0.05
5	19	Sand	542	555	548.5	-499	-512	-505.5	13	128	113	194	68,697	69,529	41,522	436	27,175	46,576	355	22,121	5,054	1.12	0.005	0.04	0.00	0.04
5	20	Sand	555	575	565	-512	-532	-522	20	128	113	194	70,809	72,089	42,604	452	28,205	47,659	371	23,150	5,054	1.12	0.005	0.06	0.00	0.06
5	21	Sand	575	595	585	-532	-552	-542	20	128	113	194	73,369	74,649	43,916	472	29,453	48,971	391	24,398	5,054	1.12	0.005	0.06	0.00	0.06
5	22	Sand	595	615	605	-552	-572	-562	20	128	113	194	75,929	77,209	45,228	492	30,701	50,283	411	25,646	5,054	1.11	0.005	0.06	0.00	0.06
																							Total Settlement (in) =	0.83	2.52	3.35
																							Total Layer Thickness (feet) =	399	145	544

Date 4/5/2012
Job No. 103.128

Boring ID LMPS
Scenario 2 to 1
Elevation 43 feet AMSL
Depth to Compressible 71 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	34	34	0.005	0.01	0.03	0.18	0.025	0.15
2	36	37	0.005	0.01	0.03	0.18	0.025	0.15
3	58	68	0.005	0.01	0.03	0.18	0.025	0.15
4	73	88	0.005	0.01	0.03	0.18	0.025	0.15
5	135	198	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	71	35.5	43	-28	7.5	71	123	34	34	4,367	8,733	4,367	0	0	4,367	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
2	2	Sand	71	100	85.5	-28	-57	-42.5	29	124	36	37	10,531	12,329	7,442	50	3,089	7,505	49	3,026	62	1.01	0.005	0.01	0.00	0.01
2	3	Sand	100	143	121.5	-57	-100	-78.5	43	124	36	37	14,995	17,661	9,660	86	5,335	9,722	85	5,273	62	1.01	0.005	0.01	0.00	0.01
2	4	Sand	143	193	168	-100	-150	-125	50	124	36	37	20,761	23,861	12,524	132	8,237	12,587	131	8,174	62	1.00	0.005	0.01	0.00	0.01
3	5	Sand	193	233	213	-150	-190	-170	40	125	58	68	26,361	28,861	16,689	155	9,672	17,313	145	9,048	624	1.04	0.005	0.04	0.00	0.04
3	6	Sand	233	283	258	-190	-240	-215	50	125	58	68	31,986	35,111	19,506	200	12,480	20,130	190	11,856	624	1.03	0.005	0.04	0.00	0.04
3	7	Sand	283	333	308	-240	-290	-265	50	125	58	68	38,236	41,361	22,636	250	15,600	23,260	240	14,976	624	1.03	0.005	0.04	0.00	0.04
3	8	Clay	333	343	338	-290	-300	-295	10	126	58	68	41,991	42,621	24,519	280	17,472	25,143	270	16,848	624	1.03	0.030	0.00	0.04	0.04
4	9	Clay	343	360	351.5	-300	-317	-308.5	17	126	73	88	43,692	44,763	26,314	279	17,378	27,250	264	16,442	936	1.04	0.030	0.00	0.09	0.09
4	10	Clay	360	375	367.5	-317	-332	-324.5	15	126	73	88	45,708	46,653	27,331	295	18,377	28,267	280	17,441	936	1.03	0.030	0.00	0.08	0.08
4	11	Clay	375	390	382.5	-332	-347	-339.5	15	126	73	88	47,598	48,543	28,285	310	19,313	29,221	295	18,377	936	1.03	0.030	0.00	0.08	0.08
4	12	Sand	390	420	405	-347	-377	-362	30	126	73	88	50,433	52,323	29,716	332	20,717	30,652	317	19,781	936	1.03	0.005	0.02	0.00	0.02
4	13	Sand	420	454	437	-377	-411	-394	34	127	73	88	54,482	56,641	31,768	364	22,714	32,704	349	21,778	936	1.03	0.005	0.03	0.00	0.03
4	14	CLS	454	474	464	-411	-431	-421	20	127	73	88	57,911	59,181	33,513	391	24,398	34,449	376	23,462	936	1.03	0.025	0.00	0.07	0.07
4	15	CLS	474	494	484	-431	-451	-441	20	127	73	88	60,451	61,721	34,805	411	25,646	35,741	396	24,710	936	1.03	0.025	0.00	0.07	0.07
4	16	CLS	494	514	504	-451	-471	-461	20	128	73	88	63,001	64,281	36,107	431	26,894	37,043	416	25,958	936	1.03	0.025	0.00	0.07	0.07
4	17	CLS	514	539	526.5	-471	-496	-483.5	25	128	73	88	65,881	67,481	37,583	454	28,298	38,519	439	27,362	936	1.02	0.025	0.00	0.08	0.08
5	18	CLS	539	542	540.5	-496	-499	-497.5	3	128	135	198	67,673	67,865	42,370	406	25,303	46,301	343	21,372	3,931	1.09	0.025	0.00	0.03	0.03
5	19	Sand	542	555	548.5	-499	-512	-505.5	13	128	135	198	68,697	69,529	42,895	414	25,802	46,826	351	21,871	3,931	1.09	0.005	0.03	0.00	0.03
5	20	Sand	555	575	565	-512	-532	-522	20	128	135	198	70,809	72,089	43,977	430	26,832	47,908	367	22,901	3,931	1.09	0.005	0.04	0.00	0.04
5	21	Sand	575	595	585	-532	-552	-542	20	128	135	198	73,369	74,649	45,289	450	28,080	49,220	387	24,149	3,931	1.09	0.005	0.04	0.00	0.04
5	22	Sand	595	615	605	-552	-572	-562	20	128	135	198	75,929	77,209	46,601	470	29,328	50,532	407	25,397	3,931	1.08	0.005	0.04	0.00	0.04
																							Total Settlement (in) =	0.34	0.61	0.95
																							Total Layer Thickness (feet) =	399	145	544

Date	4/5/2012
Job No.	103.128
Boring ID	LMPS
Scenario	3a to 1
Elevation	43 feet AMSL
Depth to Compressible	71 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	34	48	0.005	0.01	0.03	0.18	0.025	0.15
2	36	51	0.005	0.01	0.03	0.18	0.025	0.15
3	58	79	0.005	0.01	0.03	0.18	0.025	0.15
4	73	135	0.005	0.01	0.03	0.18	0.025	0.15
5	135	145	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	71	35.5	43	-28	7.5	71	123	34	48	4,367	8,733	4,367	0	0	4,367	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
2	2	Sand	71	100	85.5	-28	-57	-42.5	29	124	36	51	10,531	12,329	7,442	50	3,089	8,378	35	2,153	936	1.13	0.005	0.09	0.00	0.09
2	3	Sand	100	143	121.5	-57	-100	-78.5	43	124	36	51	14,995	17,661	9,660	86	5,335	10,596	71	4,399	936	1.10	0.005	0.10	0.00	0.10
2	4	Sand	143	193	168	-100	-150	-125	50	124	36	51	20,761	23,861	12,524	132	8,237	13,460	117	7,301	936	1.07	0.005	0.09	0.00	0.09
3	5	Sand	193	233	213	-150	-190	-170	40	125	58	79	26,361	28,861	16,689	155	9,672	17,999	134	8,362	1,310	1.08	0.005	0.08	0.00	0.08
3	6	Sand	233	283	258	-190	-240	-215	50	125	58	79	31,986	35,111	19,506	200	12,480	20,816	179	11,170	1,310	1.07	0.005	0.08	0.00	0.08
3	7	Sand	283	333	308	-240	-290	-265	50	125	58	79	38,236	41,361	22,636	250	15,600	23,946	229	14,290	1,310	1.06	0.005	0.07	0.00	0.07
3	8	Clay	333	343	338	-290	-300	-295	10	126	58	79	41,991	42,621	24,519	280	17,472	25,829	259	16,162	1,310	1.05	0.030	0.00	0.08	0.08
4	9	Clay	343	360	351.5	-300	-317	-308.5	17	126	73	135	43,692	44,763	26,314	279	17,378	30,182	217	13,510	3,869	1.15	0.030	0.00	0.36	0.36
4	10	Clay	360	375	367.5	-317	-332	-324.5	15	126	73	135	45,708	46,653	27,331	295	18,377	31,200	233	14,508	3,869	1.14	0.030	0.00	0.31	0.31
4	11	Clay	375	390	382.5	-332	-347	-339.5	15	126	73	135	47,598	48,543	28,285	310	19,313	32,154	248	15,444	3,869	1.14	0.030	0.00	0.30	0.30
4	12	Sand	390	420	405	-347	-377	-362	30	126	73	135	50,433	52,323	29,716	332	20,717	33,585	270	16,848	3,869	1.13	0.005	0.10	0.00	0.10
4	13	Sand	420	454	437	-377	-411	-394	34	127	73	135	54,482	56,641	31,768	364	22,714	35,637	302	18,845	3,869	1.12	0.005	0.10	0.00	0.10
4	14	CLS	454	474	464	-411	-431	-421	20	127	73	135	57,911	59,181	33,513	391	24,398	37,381	329	20,530	3,869	1.12	0.025	0.00	0.28	0.28
4	15	CLS	474	494	484	-431	-451	-441	20	127	73	135	60,451	61,721	34,805	411	25,646	38,673	349	21,778	3,869	1.11	0.025	0.00	0.27	0.27
4	16	CLS	494	514	504	-451	-471	-461	20	128	73	135	63,001	64,281	36,107	431	26,894	39,975	369	23,026	3,869	1.11	0.025	0.00	0.27	0.27
4	17	CLS	514	539	526.5	-471	-496	-483.5	25	128	73	135	65,881	67,481	37,583	454	28,298	41,451	392	24,430	3,869	1.10	0.025	0.00	0.32	0.32
5	18	CLS	539	542	540.5	-496	-499	-497.5	3	128	135	145	67,673	67,865	42,370	406	25,303	42,994	396	24,679	624	1.01	0.025	0.00	0.01	0.01
5	19	Sand	542	555	548.5	-499	-512	-505.5	13	128	135	145	68,697	69,529	42,895	414	25,802	43,519	404	25,178	624	1.01	0.005	0.00	0.00	0.00
5	20	Sand	555	575	565	-512	-532	-522	20	128	135	145	70,809	72,089	43,977	430	26,832	44,601	420	26,208	624	1.01	0.005	0.01	0.00	0.01
5	21	Sand	575	595	585	-532	-552	-542	20	128	135	145	73,369	74,649	45,289	450	28,080	45,913	440	27,456	624	1.01	0.005	0.01	0.00	0.01
5	22	Sand	595	615	605	-552	-572	-562	20	128	135	145	75,929	77,209	46,601	470	29,328	47,225	460	28,704	624	1.01	0.005	0.01	0.00	0.01
																							Total Settlement (in) =	0.75	2.21	2.95
																							Total Layer Thickness (feet) =	399	145	544

Date	4/5/2012	
Job No.	103.128	
Boring ID	LMPS	
Scenario	3b to 1	
Elevation	43	feet AMSL
Depth to Compressible	71	feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	34	48	0.005	0.01	0.03	0.18	0.025	0.15
2	36	51	0.005	0.01	0.03	0.18	0.025	0.15
3	58	78	0.005	0.01	0.03	0.18	0.025	0.15
4	73	135	0.005	0.01	0.03	0.18	0.025	0.15
5	135	145	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	71	35.5	43	-28	7.5	71	123	34	48	4,367	8,733	4,367	0	0	4,367	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
2	2	Sand	71	100	85.5	-28	-57	-42.5	29	124	36	51	10,531	12,329	7,442	50	3,089	8,378	35	2,153	936	1.13	0.005	0.09	0.00	0.09
2	3	Sand	100	143	121.5	-57	-100	-78.5	43	124	36	51	14,995	17,661	9,660	86	5,335	10,596	71	4,399	936	1.10	0.005	0.10	0.00	0.10
2	4	Sand	143	193	168	-100	-150	-125	50	124	36	51	20,761	23,861	12,524	132	8,237	13,460	117	7,301	936	1.07	0.005	0.09	0.00	0.09
3	5	Sand	193	233	213	-150	-190	-170	40	125	58	78	26,361	28,861	16,689	155	9,672	17,937	135	8,424	1,248	1.07	0.005	0.08	0.00	0.08
3	6	Sand	233	283	258	-190	-240	-215	50	125	58	78	31,986	35,111	19,506	200	12,480	20,754	180	11,232	1,248	1.06	0.005	0.08	0.00	0.08
3	7	Sand	283	333	308	-240	-290	-265	50	125	58	78	38,236	41,361	22,636	250	15,600	23,884	230	14,352	1,248	1.06	0.005	0.07	0.00	0.07
3	8	Clay	333	343	338	-290	-300	-295	10	126	58	78	41,991	42,621	24,519	280	17,472	25,767	260	16,224	1,248	1.05	0.030	0.00	0.08	0.08
4	9	Clay	343	360	351.5	-300	-317	-308.5	17	126	73	135	43,692	44,763	26,314	279	17,378	30,182	217	13,510	3,869	1.15	0.030	0.00	0.36	0.36
4	10	Clay	360	375	367.5	-317	-332	-324.5	15	126	73	135	45,708	46,653	27,331	295	18,377	31,200	233	14,508	3,869	1.14	0.030	0.00	0.31	0.31
4	11	Clay	375	390	382.5	-332	-347	-339.5	15	126	73	135	47,598	48,543	28,285	310	19,313	32,154	248	15,444	3,869	1.14	0.030	0.00	0.30	0.30
4	12	Sand	390	420	405	-347	-377	-362	30	126	73	135	50,433	52,323	29,716	332	20,717	33,585	270	16,848	3,869	1.13	0.005	0.10	0.00	0.10
4	13	Sand	420	454	437	-377	-411	-394	34	127	73	135	54,482	56,641	31,768	364	22,714	35,637	302	18,845	3,869	1.12	0.005	0.10	0.00	0.10
4	14	CLS	454	474	464	-411	-431	-421	20	127	73	135	57,911	59,181	33,513	391	24,398	37,381	329	20,530	3,869	1.12	0.025	0.00	0.28	0.28
4	15	CLS	474	494	484	-431	-451	-441	20	127	73	135	60,451	61,721	34,805	411	25,646	38,673	349	21,778	3,869	1.11	0.025	0.00	0.27	0.27
4	16	CLS	494	514	504	-451	-471	-461	20	128	73	135	63,001	64,281	36,107	431	26,894	39,975	369	23,026	3,869	1.11	0.025	0.00	0.27	0.27
4	17	CLS	514	539	526.5	-471	-496	-483.5	25	128	73	135	65,881	67,481	37,583	454	28,298	41,451	392	24,430	3,869	1.10	0.025	0.00	0.32	0.32
5	18	CLS	539	542	540.5	-496	-499	-497.5	3	128	135	145	67,673	67,865	42,370	406	25,303	42,994	396	24,679	624	1.01	0.025	0.00	0.01	0.01
5	19	Sand	542	555	548.5	-499	-512	-505.5	13	128	135	145	68,697	69,529	42,895	414	25,802	43,519	404	25,178	624	1.01	0.005	0.00	0.00	0.00
5	20	Sand	555	575	565	-512	-532	-522	20	128	135	145	70,809	72,089	43,977	430	26,832	44,601	420	26,208	624	1.01	0.005	0.01	0.00	0.01
5	21	Sand	575	595	585	-532	-552	-542	20	128	135	145	73,369	74,649	45,289	450	28,080	45,913	440	27,456	624	1.01	0.005	0.01	0.00	0.01
5	22	Sand	595	615	605	-552	-572	-562	20	128	135	145	75,929	77,209	46,601	470	29,328	47,225	460	28,704	624	1.01	0.005	0.01	0.00	0.01
																							Total Settlement (in) =	0.74	2.20	2.94
																							Total Layer Thickness (feet) =	399	145	544

Date 4/5/2012
Job No. 103.128

Boring ID LMPS
Scenario 4 to 1
Elevation 43 feet AMSL
Depth to Compressible 71 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	34	36	0.005	0.01	0.03	0.18	0.025	0.15
2	36	39	0.005	0.01	0.03	0.18	0.025	0.15
3	58	74	0.005	0.01	0.03	0.18	0.025	0.15
4	73	134	0.005	0.01	0.03	0.18	0.025	0.15
5	135	194	0.005	0.01	0.03	0.18	0.025	0.15

Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	71	35.5	43	-28	7.5	71	123	34	36	4,367	8,733	4,367	0	0	4,367	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
2	2	Sand	71	100	85.5	-28	-57	-42.5	29	124	36	39	10,531	12,329	7,442	50	3,089	7,629	47	2,902	187	1.03	0.005	0.02	0.00	0.02
2	3	Sand	100	143	121.5	-57	-100	-78.5	43	124	36	39	14,995	17,661	9,660	86	5,335	9,847	83	5,148	187	1.02	0.005	0.02	0.00	0.02
2	4	Sand	143	193	168	-100	-150	-125	50	124	36	39	20,761	23,861	12,524	132	8,237	12,711	129	8,050	187	1.01	0.005	0.02	0.00	0.02
3	5	Sand	193	233	213	-150	-190	-170	40	125	58	74	26,361	28,861	16,689	155	9,672	17,687	139	8,674	998	1.06	0.005	0.06	0.00	0.06
3	6	Sand	233	283	258	-190	-240	-215	50	125	58	74	31,986	35,111	19,506	200	12,480	20,504	184	11,482	998	1.05	0.005	0.07	0.00	0.07
3	7	Sand	283	333	308	-240	-290	-265	50	125	58	74	38,236	41,361	22,636	250	15,600	23,634	234	14,602	998	1.04	0.005	0.06	0.00	0.06
3	8	Clay	333	343	338	-290	-300	-295	10	126	58	74	41,991	42,621	24,519	280	17,472	25,517	264	16,474	998	1.04	0.030	0.00	0.06	0.06
4	9	Clay	343	360	351.5	-300	-317	-308.5	17	126	73	134	43,692	44,763	26,314	279	17,378	30,120	218	13,572	3,806	1.14	0.030	0.00	0.36	0.36
4	10	Clay	360	375	367.5	-317	-332	-324.5	15	126	73	134	45,708	46,653	27,331	295	18,377	31,138	234	14,570	3,806	1.14	0.030	0.00	0.31	0.31
4	11	Clay	375	390	382.5	-332	-347	-339.5	15	126	73	134	47,598	48,543	28,285	310	19,313	32,092	249	15,506	3,806	1.13	0.030	0.00	0.30	0.30
4	12	Sand	390	420	405	-347	-377	-362	30	126	73	134	50,433	52,323	29,716	332	20,717	33,523	271	16,910	3,806	1.13	0.005	0.09	0.00	0.09
4	13	Sand	420	454	437	-377	-411	-394	34	127	73	134	54,482	56,641	31,768	364	22,714	35,575	303	18,907	3,806	1.12	0.005	0.10	0.00	0.10
4	14	CLS	454	474	464	-411	-431	-421	20	127	73	134	57,911	59,181	33,513	391	24,398	37,319	330	20,592	3,806	1.11	0.025	0.00	0.28	0.28
4	15	CLS	474	494	484	-431	-451	-441	20	127	73	134	60,451	61,721	34,805	411	25,646	38,611	350	21,840	3,806	1.11	0.025	0.00	0.27	0.27
4	16	CLS	494	514	504	-451	-471	-461	20	128	73	134	63,001	64,281	36,107	431	26,894	39,913	370	23,088	3,806	1.11	0.025	0.00	0.26	0.26
4	17	CLS	514	539	526.5	-471	-496	-483.5	25	128	73	134	65,881	67,481	37,583	454	28,298	41,389	393	24,492	3,806	1.10	0.025	0.00	0.31	0.31
5	18	CLS	539	542	540.5	-496	-499	-497.5	3	128	135	194	67,673	67,865	42,370	406	25,303	46,051	347	21,622	3,682	1.09	0.025	0.00	0.03	0.03
5	19	Sand	542	555	548.5	-499	-512	-505.5	13	128	135	194	68,697	69,529	42,895	414	25,802	46,576	355	22,121	3,682	1.09	0.005	0.03	0.00	0.03
5	20	Sand	555	575	565	-512	-532	-522	20	128	135	194	70,809	72,089	43,977	430	26,832	47,659	371	23,150	3,682	1.08	0.005	0.04	0.00	0.04
5	21	Sand	575	595	585	-532	-552	-542	20	128	135	194	73,369	74,649	45,289	450	28,080	48,971	391	24,398	3,682	1.08	0.005	0.04	0.00	0.04
5	22	Sand	595	615	605	-552	-572	-562	20	128	135	194	75,929	77,209	46,601	470	29,328	50,283	411	25,646	3,682	1.08	0.005	0.04	0.00	0.04
																							Total Settlement (in) =	0.59	2.18	2.77
																							Total Layer Thickness (feet) =	399	145	544

Date 5/7/2012
Job No. 103.128

Boring ID So. Sunset Well
Scenario 3a to HL
Elevation 83 feet AMSL
Depth to Compressible 74 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	68	90	0.005	0.01	0.03	0.18	0.025	0.15
2	69	102	0.005	0.01	0.03	0.18	0.025	0.15
3	81	111	0.005	0.01	0.03	0.18	0.025	0.15
4	91	120	0.005	0.01	0.03	0.18	0.025	0.15
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Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	42	21	83	41	62	42	123	68	90	2,583	5,166	2,583	0	0	2,583	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	CLS	42	57	49.5	41	26	33.5	15	124	68	90	6,096	7,026	6,096	0	0	6,096	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	3	CLS	57	74	65.5	26	9	17.5	17	124	68	90	8,080	9,134	8,080	0	0	8,080	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	4	Sand	74	100	87	9	-17	-4	26	124	68	90	10,746	12,358	9,560	19	1,186	10,746	0	0	1,186	1.12	0.005	0.08	0.00	0.08
1	5	Sand	100	150	125	-17	-67	-42	50	125	68	90	15,483	18,608	11,926	57	3,557	13,299	35	2,184	1,373	1.12	0.005	0.14	0.00	0.14
1	6	Sand	150	210	180	-67	-127	-97	60	125	68	90	22,358	26,108	15,369	112	6,989	16,742	90	5,616	1,373	1.09	0.005	0.13	0.00	0.13
1	7	Clay	210	212	211	-127	-129	-128	2	125	68	90	26,233	26,358	17,310	143	8,923	18,683	121	7,550	1,373	1.08	0.030	0.00	0.02	0.02
1	8	Sand	212	235	223.5	-129	-152	-140.5	23	126	68	90	27,807	29,256	18,104	156	9,703	19,477	134	8,330	1,373	1.08	0.005	0.04	0.00	0.04
2	9	Sand	235	265	250	-152	-182	-167	30	126	69	102	31,146	33,036	19,852	181	11,294	21,911	148	9,235	2,059	1.10	0.005	0.08	0.00	0.08
2	10	Sand	265	290	277.5	-182	-207	-194.5	25	126	69	102	34,611	36,186	21,601	209	13,010	23,660	176	10,951	2,059	1.10	0.005	0.06	0.00	0.06
2	11	CLS	290	300	295	-207	-217	-212	10	126	69	102	36,816	37,446	22,714	226	14,102	24,773	193	12,043	2,059	1.09	0.025	0.00	0.11	0.11
2	12	Sand	300	309	304.5	-217	-226	-221.5	9	126	69	102	38,013	38,580	23,318	236	14,695	25,377	203	12,636	2,059	1.09	0.005	0.02	0.00	0.02
3	13	Sand	309	320	314.5	-226	-237	-231.5	11	127	81	111	39,279	39,977	24,708	234	14,570	26,580	204	12,698	1,872	1.08	0.005	0.02	0.00	0.02
3	14	Clay	320	335	327.5	-237	-252	-244.5	15	127	81	111	40,930	41,882	25,548	247	15,382	27,420	217	13,510	1,872	1.07	0.030	0.00	0.17	0.17
3	15	Sand	335	340	337.5	-252	-257	-254.5	5	127	81	111	42,200	42,517	26,194	257	16,006	28,066	227	14,134	1,872	1.07	0.005	0.01	0.00	0.01
3	16	Clay	340	348	344	-257	-265	-261	8	127	81	111	43,025	43,533	26,614	263	16,411	28,486	233	14,539	1,872	1.07	0.030	0.00	0.09	0.09
3	17	Sand	348	362	355	-265	-279	-272	14	127	81	111	44,422	45,311	27,324	274	17,098	29,196	244	15,226	1,872	1.07	0.005	0.02	0.00	0.02
3	18	CLS	362	370	366	-279	-287	-283	8	127	81	111	45,819	46,327	28,035	285	17,784	29,907	255	15,912	1,872	1.07	0.025	0.00	0.07	0.07
3	19	Sand	370	383	376.5	-287	-300	-293.5	13	127	81	111	47,153	47,978	28,713	296	18,439	30,585	266	16,567	1,872	1.07	0.005	0.02	0.00	0.02
4	20	Clay	383	387	385	-300	-304	-302	4	127	91	120	48,232	48,486	29,886	294	18,346	31,696	265	16,536	1,810	1.06	0.030	0.00	0.04	0.04
4	21	Sand	387	417	402	-304	-334	-319	30	127	91	120	50,391	52,296	30,985	311	19,406	32,794	282	17,597	1,810	1.06	0.005	0.04	0.00	0.04
4	22	Sand	417	430	423.5	-334	-347	-340.5	13	127	91	120	53,122	53,947	32,374	333	20,748	34,183	304	18,938	1,810	1.06	0.005	0.02	0.00	0.02
4	23	CLS	430	447	438.5	-347	-364	-355.5	17	127	91	120	55,027	56,106	33,343	348	21,684	35,152	319	19,874	1,810	1.05	0.025	0.00	0.12	0.12
4	24	Clay	447	450	448.5	-364	-367	-365.5	3	127	91	120	56,297	56,487	33,989	358	22,308	35,798	329	20,498	1,810	1.05	0.030	0.00	0.02	0.02
4	25	CLS	450	476	463	-367	-393	-380	26	127	91	120	58,138	59,789	34,925	372	23,213	36,735	343	21,403	1,810	1.05	0.025	0.00	0.17	0.17
4	26	Sand	476	500	488	-393	-417	-405	24	127	91	120	61,313	62,837	36,540	397	24,773	38,350	368	22,963	1,810	1.05	0.005	0.03	0.00	0.03
4	27	Clay	500	514	507	-417	-431	-424	14	127	91	120	63,726	64,615	37,768	416	25,958	39,577	387	24,149	1,810	1.05	0.030	0.00	0.10	0.10
4	28	CLS	514	536	525	-431	-453	-442	22	127	91	120	66,012	67,409	38,930	434	27,082	40,740	405	25,272	1,810	1.05	0.025	0.00	0.13	0.13
4	29	CLS	536	570	553	-453	-487	-470	34	127	91	120	69,568	71,727	40,739	462	28,829	42,549	433	27,019	1,810	1.04	0.025	0.00	0.19	0.19
4	30	Sand	570	600	585	-487	-517	-502	30	127	91	120	73,632	75,537	42,806	494	30,826	44,616	465	29,016	1,810	1.04	0.005	0.03	0.00	0.03
																							Total Settlement (in) =	0.76	1.23	1.99
																							Total Layer Thickness (feet) =	363	163	526

Date	5/7/2012	
Job No.	103.128	
Boring ID	So. Sunset Well	
Scenario	3b to HL	
Elevation	83	feet AMSL
Depth to Compressible	74	feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	68	89	0.005	0.01	0.03	0.18	0.025	0.15
2	69	100	0.005	0.01	0.03	0.18	0.025	0.15
3	81	110	0.005	0.01	0.03	0.18	0.025	0.15
4	91	119	0.005	0.01	0.03	0.18	0.025	0.15
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Model Layer	Sub Layer	Material	Depth			Elevation			Thickness	Unit wt	Total Head		Total Stress		Initial Stresses @ mid point			Final Stresses @ mid point			Delta	$\sigma'_{vf}/\sigma'_{vi}$	Comp	Settlement		
			Top (feet)	Bottom (feet)	Middle (feet)	Top (feet)	Bottom (feet)	Middle (feet)	(feet)	(pcf)	Initial (feet)	Final (feet)	Mid point (psf)	Bottom (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Effective (psf)	Pore Water (feet)	Pore Water (psf)	Eff. Stress (psf)		Index	Sand (inches)	Clay (inches)	Total (inches)
1	1	Sand	0	42	21	83	41	62	42	123	68	89	2,583	5,166	2,583	0	0	2,583	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	CLS	42	57	49.5	41	26	33.5	15	124	68	89	6,096	7,026	6,096	0	0	6,096	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	3	CLS	57	74	65.5	26	9	17.5	17	124	68	89	8,080	9,134	8,080	0	0	8,080	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	4	Sand	74	100	87	9	-17	-4	26	124	68	89	10,746	12,358	9,560	19	1,186	10,746	0	0	1,186	1.12	0.005	0.08	0.00	0.08
1	5	Sand	100	150	125	-17	-67	-42	50	125	68	89	15,483	18,608	11,926	57	3,557	13,237	36	2,246	1,310	1.11	0.005	0.14	0.00	0.14
1	6	Sand	150	210	180	-67	-127	-97	60	125	68	89	22,358	26,108	15,369	112	6,989	16,680	91	5,678	1,310	1.09	0.005	0.13	0.00	0.13
1	7	Clay	210	212	211	-127	-129	-128	2	125	68	89	26,233	26,358	17,310	143	8,923	18,620	122	7,613	1,310	1.08	0.030	0.00	0.02	0.02
1	8	Sand	212	235	223.5	-129	-152	-140.5	23	126	68	89	27,807	29,256	18,104	156	9,703	19,414	135	8,393	1,310	1.07	0.005	0.04	0.00	0.04
2	9	Sand	235	265	250	-152	-182	-167	30	126	69	100	31,146	33,036	19,852	181	11,294	21,786	150	9,360	1,934	1.10	0.005	0.07	0.00	0.07
2	10	Sand	265	290	277.5	-182	-207	-194.5	25	126	69	100	34,611	36,186	21,601	209	13,010	23,535	178	11,076	1,934	1.09	0.005	0.06	0.00	0.06
2	11	CLS	290	300	295	-207	-217	-212	10	126	69	100	36,816	37,446	22,714	226	14,102	24,648	195	12,168	1,934	1.09	0.025	0.00	0.11	0.11
2	12	Sand	300	309	304.5	-217	-226	-221.5	9	126	69	100	38,013	38,580	23,318	236	14,695	25,252	205	12,761	1,934	1.08	0.005	0.02	0.00	0.02
3	13	Sand	309	320	314.5	-226	-237	-231.5	11	127	81	110	39,279	39,977	24,708	234	14,570	26,518	205	12,761	1,810	1.07	0.005	0.02	0.00	0.02
3	14	Clay	320	335	327.5	-237	-252	-244.5	15	127	81	110	40,930	41,882	25,548	247	15,382	27,358	218	13,572	1,810	1.07	0.030	0.00	0.16	0.16
3	15	Sand	335	340	337.5	-252	-257	-254.5	5	127	81	110	42,200	42,517	26,194	257	16,006	28,004	228	14,196	1,810	1.07	0.005	0.01	0.00	0.01
3	16	Clay	340	348	344	-257	-265	-261	8	127	81	110	43,025	43,533	26,614	263	16,411	28,423	234	14,602	1,810	1.07	0.030	0.00	0.08	0.08
3	17	Sand	348	362	355	-265	-279	-272	14	127	81	110	44,422	45,311	27,324	274	17,098	29,134	245	15,288	1,810	1.07	0.005	0.02	0.00	0.02
3	18	CLS	362	370	366	-279	-287	-283	8	127	81	110	45,819	46,327	28,035	285	17,784	29,845	256	15,974	1,810	1.06	0.025	0.00	0.07	0.07
3	19	Sand	370	383	376.5	-287	-300	-293.5	13	127	81	110	47,153	47,978	28,713	296	18,439	30,523	267	16,630	1,810	1.06	0.005	0.02	0.00	0.02
4	20	Clay	383	387	385	-300	-304	-302	4	127	91	119	48,232	48,486	29,886	294	18,346	31,634	266	16,598	1,747	1.06	0.030	0.00	0.04	0.04
4	21	Sand	387	417	402	-304	-334	-319	30	127	91	119	50,391	52,296	30,985	311	19,406	32,732	283	17,659	1,747	1.06	0.005	0.04	0.00	0.04
4	22	Sand	417	430	423.5	-334	-347	-340.5	13	127	91	119	53,122	53,947	32,374	333	20,748	34,121	305	19,001	1,747	1.05	0.005	0.02	0.00	0.02
4	23	CLS	430	447	438.5	-347	-364	-355.5	17	127	91	119	55,027	56,106	33,343	348	21,684	35,090	320	19,937	1,747	1.05	0.025	0.00	0.11	0.11
4	24	Clay	447	450	448.5	-364	-367	-365.5	3	127	91	119	56,297	56,487	33,989	358	22,308	35,736	330	20,561	1,747	1.05	0.030	0.00	0.02	0.02
4	25	CLS	450	476	463	-367	-393	-380	26	127	91	119	58,138	59,789	34,925	372	23,213	36,672	344	21,466	1,747	1.05	0.025	0.00	0.17	0.17
4	26	Sand	476	500	488	-393	-417	-405	24	127	91	119	61,313	62,837	36,540	397	24,773	38,287	369	23,026	1,747	1.05	0.005	0.03	0.00	0.03
4	27	Clay	500	514	507	-417	-431	-424	14	127	91	119	63,726	64,615	37,768	416	25,958	39,515	388	24,211	1,747	1.05	0.030	0.00	0.10	0.10
4	28	CLS	514	536	525	-431	-453	-442	22	127	91	119	66,012	67,409	38,930	434	27,082	40,678	406	25,334	1,747	1.04	0.025	0.00	0.13	0.13
4	29	CLS	536	570	553	-453	-487	-470	34	127	91	119	69,568	71,727	40,739	462	28,829	42,486	434	27,082	1,747	1.04	0.025	0.00	0.19	0.19
4	30	Sand	570	600	585	-487	-517	-502	30	127	91	119	73,632	75,537	42,806	494	30,826	44,554	466	29,078	1,747	1.04	0.005	0.03	0.00	0.03
																							Total Settlement (in) =	0.73	1.19	1.91
																							Total Layer Thickness (feet) =	363	163	526

Date 5/7/2012
Job No. 103.128

Boring ID So. Sunset Well
Scenario 4 to HL
Elevation 83 feet AMSL
Depth to Compressible 74 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	68	84	0.005	0.01	0.03	0.18	0.025	0.15
2	69	95	0.005	0.01	0.03	0.18	0.025	0.15
3	81	106	0.005	0.01	0.03	0.18	0.025	0.15
4	91	117	0.005	0.01	0.03	0.18	0.025	0.15
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Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	42	21	83	41	62	42	123	68	84	2,583	5,166	2,583	0	0	2,583	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	CLS	42	57	49.5	41	26	33.5	15	124	68	84	6,096	7,026	6,096	0	0	6,096	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	3	CLS	57	74	65.5	26	9	17.5	17	124	68	84	8,080	9,134	8,080	0	0	8,080	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	4	Sand	74	100	87	9	-17	-4	26	124	68	84	10,746	12,358	9,560	19	1,186	10,559	3	187	998	1.10	0.005	0.07	0.00	0.07
1	5	Sand	100	150	125	-17	-67	-42	50	125	68	84	15,483	18,608	11,926	57	3,557	12,925	41	2,558	998	1.08	0.005	0.10	0.00	0.10
1	6	Sand	150	210	180	-67	-127	-97	60	125	68	84	22,358	26,108	15,369	112	6,989	16,368	96	5,990	998	1.06	0.005	0.10	0.00	0.10
1	7	Clay	210	212	211	-127	-129	-128	2	125	68	84	26,233	26,358	17,310	143	8,923	18,308	127	7,925	998	1.06	0.030	0.00	0.02	0.02
1	8	Sand	212	235	223.5	-129	-152	-140.5	23	126	68	84	27,807	29,256	18,104	156	9,703	19,102	140	8,705	998	1.06	0.005	0.03	0.00	0.03
2	9	Sand	235	265	250	-152	-182	-167	30	126	69	95	31,146	33,036	19,852	181	11,294	21,474	155	9,672	1,622	1.08	0.005	0.06	0.00	0.06
2	10	Sand	265	290	277.5	-182	-207	-194.5	25	126	69	95	34,611	36,186	21,601	209	13,010	23,223	183	11,388	1,622	1.08	0.005	0.05	0.00	0.05
2	11	CLS	290	300	295	-207	-217	-212	10	126	69	95	36,816	37,446	22,714	226	14,102	24,336	200	12,480	1,622	1.07	0.025	0.00	0.09	0.09
2	12	Sand	300	309	304.5	-217	-226	-221.5	9	126	69	95	38,013	38,580	23,318	236	14,695	24,940	210	13,073	1,622	1.07	0.005	0.02	0.00	0.02
3	13	Sand	309	320	314.5	-226	-237	-231.5	11	127	81	106	39,279	39,977	24,708	234	14,570	26,268	209	13,010	1,560	1.06	0.005	0.02	0.00	0.02
3	14	Clay	320	335	327.5	-237	-252	-244.5	15	127	81	106	40,930	41,882	25,548	247	15,382	27,108	222	13,822	1,560	1.06	0.030	0.00	0.14	0.14
3	15	Sand	335	340	337.5	-252	-257	-254.5	5	127	81	106	42,200	42,517	26,194	257	16,006	27,754	232	14,446	1,560	1.06	0.005	0.01	0.00	0.01
3	16	Clay	340	348	344	-257	-265	-261	8	127	81	106	43,025	43,533	26,614	263	16,411	28,174	238	14,851	1,560	1.06	0.030	0.00	0.07	0.07
3	17	Sand	348	362	355	-265	-279	-272	14	127	81	106	44,422	45,311	27,324	274	17,098	28,884	249	15,538	1,560	1.06	0.005	0.02	0.00	0.02
3	18	CLS	362	370	366	-279	-287	-283	8	127	81	106	45,819	46,327	28,035	285	17,784	29,595	260	16,224	1,560	1.06	0.025	0.00	0.06	0.06
3	19	Sand	370	383	376.5	-287	-300	-293.5	13	127	81	106	47,153	47,978	28,713	296	18,439	30,273	271	16,879	1,560	1.05	0.005	0.02	0.00	0.02
4	20	Clay	383	387	385	-300	-304	-302	4	127	91	117	48,232	48,486	29,886	294	18,346	31,509	268	16,723	1,622	1.05	0.030	0.00	0.03	0.03
4	21	Sand	387	417	402	-304	-334	-319	30	127	91	117	50,391	52,296	30,985	311	19,406	32,607	285	17,784	1,622	1.05	0.005	0.04	0.00	0.04
4	22	Sand	417	430	423.5	-334	-347	-340.5	13	127	91	117	53,122	53,947	32,374	333	20,748	33,996	307	19,126	1,622	1.05	0.005	0.02	0.00	0.02
4	23	CLS	430	447	438.5	-347	-364	-355.5	17	127	91	117	55,027	56,106	33,343	348	21,684	34,965	322	20,062	1,622	1.05	0.025	0.00	0.11	0.11
4	24	Clay	447	450	448.5	-364	-367	-365.5	3	127	91	117	56,297	56,487	33,989	358	22,308	35,611	332	20,686	1,622	1.05	0.030	0.00	0.02	0.02
4	25	CLS	450	476	463	-367	-393	-380	26	127	91	117	58,138	59,789	34,925	372	23,213	36,548	346	21,590	1,622	1.05	0.025	0.00	0.15	0.15
4	26	Sand	476	500	488	-393	-417	-405	24	127	91	117	61,313	62,837	36,540	397	24,773	38,163	371	23,150	1,622	1.04	0.005	0.03	0.00	0.03
4	27	Clay	500	514	507	-417	-431	-424	14	127	91	117	63,726	64,615	37,768	416	25,958	39,390	390	24,336	1,622	1.04	0.030	0.00	0.09	0.09
4	28	CLS	514	536	525	-431	-453	-442	22	127	91	117	66,012	67,409	38,930	434	27,082	40,553	408	25,459	1,622	1.04	0.025	0.00	0.12	0.12
4	29	CLS	536	570	553	-453	-487	-470	34	127	91	117	69,568	71,727	40,739	462	28,829	42,362	436	27,206	1,622	1.04	0.025	0.00	0.17	0.17
4	30	Sand	570	600	585	-487	-517	-502	30	127	91	117	73,632	75,537	42,806	494	30,826	44,429	468	29,203	1,622	1.04	0.005	0.03	0.00	0.03

Total Settlement (in) = 0.60 1.07 1.67
Total Layer Thickness (feet) = 363 163 526

Date 5/7/2012
Job No. 103.128

Boring ID So. Sunset Well
Scenario 3a to 1
Elevation 83 feet AMSL
Depth to Compressible 74 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	69	90	0.005	0.01	0.03	0.18	0.025	0.15
2	70	102	0.005	0.01	0.03	0.18	0.025	0.15
3	83	111	0.005	0.01	0.03	0.18	0.025	0.15
4	93	120	0.005	0.01	0.03	0.18	0.025	0.15
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Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	42	21	83	41	62	42	123	69	90	2,583	5,166	2,583	0	0	2,583	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	CLS	42	57	49.5	41	26	33.5	15	124	69	90	6,096	7,026	6,096	0	0	6,096	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	3	CLS	57	74	65.5	26	9	17.5	17	124	69	90	8,080	9,134	8,080	0	0	8,080	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	4	Sand	74	100	87	9	-17	-4	26	124	69	90	10,746	12,358	9,623	18	1,123	10,746	0	0	1,123	1.12	0.005	0.07	0.00	0.07
1	5	Sand	100	150	125	-17	-67	-42	50	125	69	90	15,483	18,608	11,989	56	3,494	13,299	35	2,184	1,310	1.11	0.005	0.14	0.00	0.14
1	6	Sand	150	210	180	-67	-127	-97	60	125	69	90	22,358	26,108	15,432	111	6,926	16,742	90	5,616	1,310	1.08	0.005	0.13	0.00	0.13
1	7	Clay	210	212	211	-127	-129	-128	2	125	69	90	26,233	26,358	17,372	142	8,861	18,683	121	7,550	1,310	1.08	0.030	0.00	0.02	0.02
1	8	Sand	212	235	223.5	-129	-152	-140.5	23	126	69	90	27,807	29,256	18,166	155	9,641	19,477	134	8,330	1,310	1.07	0.005	0.04	0.00	0.04
2	9	Sand	235	265	250	-152	-182	-167	30	126	70	102	31,146	33,036	19,914	180	11,232	21,911	148	9,235	1,997	1.10	0.005	0.07	0.00	0.07
2	10	Sand	265	290	277.5	-182	-207	-194.5	25	126	70	102	34,611	36,186	21,663	208	12,948	23,660	176	10,951	1,997	1.09	0.005	0.06	0.00	0.06
2	11	CLS	290	300	295	-207	-217	-212	10	126	70	102	36,816	37,446	22,776	225	14,040	24,773	193	12,043	1,997	1.09	0.025	0.00	0.11	0.11
2	12	Sand	300	309	304.5	-217	-226	-221.5	9	126	70	102	38,013	38,580	23,380	235	14,633	25,377	203	12,636	1,997	1.09	0.005	0.02	0.00	0.02
3	13	Sand	309	320	314.5	-226	-237	-231.5	11	127	83	111	39,279	39,977	24,833	232	14,446	26,580	204	12,698	1,747	1.07	0.005	0.02	0.00	0.02
3	14	Clay	320	335	327.5	-237	-252	-244.5	15	127	83	111	40,930	41,882	25,673	245	15,257	27,420	217	13,510	1,747	1.07	0.030	0.00	0.15	0.15
3	15	Sand	335	340	337.5	-252	-257	-254.5	5	127	83	111	42,200	42,517	26,319	255	15,881	28,066	227	14,134	1,747	1.07	0.005	0.01	0.00	0.01
3	16	Clay	340	348	344	-257	-265	-261	8	127	83	111	43,025	43,533	26,739	261	16,286	28,486	233	14,539	1,747	1.07	0.030	0.00	0.08	0.08
3	17	Sand	348	362	355	-265	-279	-272	14	127	83	111	44,422	45,311	27,449	272	16,973	29,196	244	15,226	1,747	1.06	0.005	0.02	0.00	0.02
3	18	CLS	362	370	366	-279	-287	-283	8	127	83	111	45,819	46,327	28,160	283	17,659	29,907	255	15,912	1,747	1.06	0.025	0.00	0.06	0.06
3	19	Sand	370	383	376.5	-287	-300	-293.5	13	127	83	111	47,153	47,978	28,838	294	18,314	30,585	266	16,567	1,747	1.06	0.005	0.02	0.00	0.02
4	20	Clay	383	387	385	-300	-304	-302	4	127	93	120	48,232	48,486	30,011	292	18,221	31,696	265	16,536	1,685	1.06	0.030	0.00	0.03	0.03
4	21	Sand	387	417	402	-304	-334	-319	30	127	93	120	50,391	52,296	31,109	309	19,282	32,794	282	17,597	1,685	1.05	0.005	0.04	0.00	0.04
4	22	Sand	417	430	423.5	-334	-347	-340.5	13	127	93	120	53,122	53,947	32,498	331	20,623	34,183	304	18,938	1,685	1.05	0.005	0.02	0.00	0.02
4	23	CLS	430	447	438.5	-347	-364	-355.5	17	127	93	120	55,027	56,106	33,467	346	21,559	35,152	319	19,874	1,685	1.05	0.025	0.00	0.11	0.11
4	24	Clay	447	450	448.5	-364	-367	-365.5	3	127	93	120	56,297	56,487	34,113	356	22,183	35,798	329	20,498	1,685	1.05	0.030	0.00	0.02	0.02
4	25	CLS	450	476	463	-367	-393	-380	26	127	93	120	58,138	59,789	35,050	370	23,088	36,735	343	21,403	1,685	1.05	0.025	0.00	0.16	0.16
4	26	Sand	476	500	488	-393	-417	-405	24	127	93	120	61,313	62,837	36,665	395	24,648	38,350	368	22,963	1,685	1.05	0.005	0.03	0.00	0.03
4	27	Clay	500	514	507	-417	-431	-424	14	127	93	120	63,726	64,615	37,892	414	25,834	39,577	387	24,149	1,685	1.04	0.030	0.00	0.10	0.10
4	28	CLS	514	536	525	-431	-453	-442	22	127	93	120	66,012	67,409	39,055	432	26,957	40,740	405	25,272	1,685	1.04	0.025	0.00	0.12	0.12
4	29	CLS	536	570	553	-453	-487	-470	34	127	93	120	69,568	71,727	40,864	460	28,704	42,549	433	27,019	1,685	1.04	0.025	0.00	0.18	0.18
4	30	Sand	570	600	585	-487	-517	-502	30	127	93	120	73,632	75,537	42,931	492	30,701	44,616	465	29,016	1,685	1.04	0.005	0.03	0.00	0.03
																							Total Settlement (in) =	0.72	1.15	1.87
																							Total Layer Thickness (feet) =	363	163	526

Date 5/7/2012
Job No. 103.128

Boring ID So. Sunset Well
Scenario 3b to 1
Elevation 83 feet AMSL
Depth to Compressible 74 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	69	89	0.005	0.01	0.03	0.18	0.025	0.15
2	70	100	0.005	0.01	0.03	0.18	0.025	0.15
3	83	110	0.005	0.01	0.03	0.18	0.025	0.15
4	93	119	0.005	0.01	0.03	0.18	0.025	0.15
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Model	Sub		Depth			Elevation					Total Head		Total Stress		Initial Stresses @ mid point			Final Stresses @ mid point			Delta	$\sigma'_{vf}/\sigma'_{vi}$	Comp	Settlement		
Layer	Layer	Material	Top	Bottom	Middle	Top	Bottom	Middle	Thickness	Unit wt	Initial	Final	Mid point	Bottom	Effective	Pore Water		Effective	Pore Water		Eff. Stress		Index	Sand	Clay	Total
			(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(pcf)	(feet)	(feet)	(psf)	(psf)	(psf)	(feet)	(psf)	(psf)	(feet)	(psf)	(psf)			(inches)	(inches)	(inches)
1	1	Sand	0	42	21	83	41	62	42	123	69	89	2,583	5,166	2,583	0	0	2,583	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	CLS	42	57	49.5	41	26	33.5	15	124	69	89	6,096	7,026	6,096	0	0	6,096	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	3	CLS	57	74	65.5	26	9	17.5	17	124	69	89	8,080	9,134	8,080	0	0	8,080	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	4	Sand	74	100	87	9	-17	-4	26	124	69	89	10,746	12,358	9,623	18	1,123	10,746	0	0	1,123	1.12	0.005	0.07	0.00	0.07
1	5	Sand	100	150	125	-17	-67	-42	50	125	69	89	15,483	18,608	11,989	56	3,494	13,237	36	2,246	1,248	1.10	0.005	0.13	0.00	0.13
1	6	Sand	150	210	180	-67	-127	-97	60	125	69	89	22,358	26,108	15,432	111	6,926	16,680	91	5,678	1,248	1.08	0.005	0.12	0.00	0.12
1	7	Clay	210	212	211	-127	-129	-128	2	125	69	89	26,233	26,358	17,372	142	8,861	18,620	122	7,613	1,248	1.07	0.030	0.00	0.02	0.02
1	8	Sand	212	235	223.5	-129	-152	-140.5	23	126	69	89	27,807	29,256	18,166	155	9,641	19,414	135	8,393	1,248	1.07	0.005	0.04	0.00	0.04
2	9	Sand	235	265	250	-152	-182	-167	30	126	70	100	31,146	33,036	19,914	180	11,232	21,786	150	9,360	1,872	1.09	0.005	0.07	0.00	0.07
2	10	Sand	265	290	277.5	-182	-207	-194.5	25	126	70	100	34,611	36,186	21,663	208	12,948	23,535	178	11,076	1,872	1.09	0.005	0.05	0.00	0.05
2	11	CLS	290	300	295	-207	-217	-212	10	126	70	100	36,816	37,446	22,776	225	14,040	24,648	195	12,168	1,872	1.08	0.025	0.00	0.10	0.10
2	12	Sand	300	309	304.5	-217	-226	-221.5	9	126	70	100	38,013	38,580	23,380	235	14,633	25,252	205	12,761	1,872	1.08	0.005	0.02	0.00	0.02
3	13	Sand	309	320	314.5	-226	-237	-231.5	11	127	83	110	39,279	39,977	24,833	232	14,446	26,518	205	12,761	1,685	1.07	0.005	0.02	0.00	0.02
3	14	Clay	320	335	327.5	-237	-252	-244.5	15	127	83	110	40,930	41,882	25,673	245	15,257	27,358	218	13,572	1,685	1.07	0.030	0.00	0.15	0.15
3	15	Sand	335	340	337.5	-252	-257	-254.5	5	127	83	110	42,200	42,517	26,319	255	15,881	28,004	228	14,196	1,685	1.06	0.005	0.01	0.00	0.01
3	16	Clay	340	348	344	-257	-265	-261	8	127	83	110	43,025	43,533	26,739	261	16,286	28,423	234	14,602	1,685	1.06	0.030	0.00	0.08	0.08
3	17	Sand	348	362	355	-265	-279	-272	14	127	83	110	44,422	45,311	27,449	272	16,973	29,134	245	15,288	1,685	1.06	0.005	0.02	0.00	0.02
3	18	CLS	362	370	366	-279	-287	-283	8	127	83	110	45,819	46,327	28,160	283	17,659	29,845	256	15,974	1,685	1.06	0.025	0.00	0.06	0.06
3	19	Sand	370	383	376.5	-287	-300	-293.5	13	127	83	110	47,153	47,978	28,838	294	18,314	30,523	267	16,630	1,685	1.06	0.005	0.02	0.00	0.02
4	20	Clay	383	387	385	-300	-304	-302	4	127	93	119	48,232	48,486	30,011	292	18,221	31,634	266	16,598	1,622	1.05	0.030	0.00	0.03	0.03
4	21	Sand	387	417	402	-304	-334	-319	30	127	93	119	50,391	52,296	31,109	309	19,282	32,732	283	17,659	1,622	1.05	0.005	0.04	0.00	0.04
4	22	Sand	417	430	423.5	-334	-347	-340.5	13	127	93	119	53,122	53,947	32,498	331	20,623	34,121	305	19,001	1,622	1.05	0.005	0.02	0.00	0.02
4	23	CLS	430	447	438.5	-347	-364	-355.5	17	127	93	119	55,027	56,106	33,467	346	21,559	35,090	320	19,937	1,622	1.05	0.025	0.00	0.10	0.10
4	24	Clay	447	450	448.5	-364	-367	-365.5	3	127	93	119	56,297	56,487	34,113	356	22,183	35,736	330	20,561	1,622	1.05	0.030	0.00	0.02	0.02
4	25	CLS	450	476	463	-367	-393	-380	26	127	93	119	58,138	59,789	35,050	370	23,088	36,672	344	21,466	1,622	1.05	0.025	0.00	0.15	0.15
4	26	Sand	476	500	488	-393	-417	-405	24	127	93	119	61,313	62,837	36,665	395	24,648	38,287	369	23,026	1,622	1.04	0.005	0.03	0.00	0.03
4	27	Clay	500	514	507	-417	-431	-424	14	127	93	119	63,726	64,615	37,892	414	25,834	39,515	388	24,211	1,622	1.04	0.030	0.00	0.09	0.09
4	28	CLS	514	536	525	-431	-453	-442	22	127	93	119	66,012	67,409	39,055	432	26,957	40,678	406	25,334	1,622	1.04	0.025	0.00	0.12	0.12
4	29	CLS	536	570	553	-453	-487	-470	34	127	93	119	69,568	71,727	40,864	460	28,704	42,486	434	27,082	1,622	1.04	0.025	0.00	0.17	0.17
4	30	Sand	570	600	585	-487	-517	-502	30	127	93	119	73,632	75,537	42,931	492	30,701	44,554	466	29,078	1,622	1.04	0.005	0.03	0.00	0.03
																							Total Settlement (in) =	0.69	1.10	1.79
																							Total Layer Thickness (feet) =	363	163	526

Date 5/7/2012
Job No. 103.128

Boring ID So. Sunset Well
Scenario 4 to 1
Elevation 83 feet AMSL
Depth to Compressible 74 feet

Model Layer	Initial Head (feet)	Final Head (feet)	Sand Cer	Sand Cec	Clay Cer	Clay Cec	Sandy Clay Cer	Sandy Clay Cec
1	69	84	0.005	0.01	0.03	0.18	0.025	0.15
2	70	95	0.005	0.01	0.03	0.18	0.025	0.15
3	83	106	0.005	0.01	0.03	0.18	0.025	0.15
4	93	117	0.005	0.01	0.03	0.18	0.025	0.15
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Model Layer	Sub Layer	Material	Depth Top (feet)	Depth Bottom (feet)	Depth Middle (feet)	Elevation Top (feet)	Elevation Bottom (feet)	Elevation Middle (feet)	Thickness (feet)	Unit wt (pcf)	Total Head Initial (feet)	Total Head Final (feet)	Total Stress Mid point (psf)	Total Stress Bottom (psf)	Initial Stresses @ mid point Effective (psf)	Initial Pore Water (feet)	Initial Pore Water (psf)	Final Stresses @ mid point Effective (psf)	Final Pore Water (feet)	Final Pore Water (psf)	Delta Eff. Stress (psf)	$\sigma'_{vf}/\sigma'_{vi}$	Comp Index	Settlement Sand (inches)	Settlement Clay (inches)	Settlement Total (inches)
1	1	Sand	0	42	21	83	41	62	42	123	69	84	2,583	5,166	2,583	0	0	2,583	0	0	0	1.00	0.005	Incomp.	Incomp.	0.00
1	2	CLS	42	57	49.5	41	26	33.5	15	124	69	84	6,096	7,026	6,096	0	0	6,096	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	3	CLS	57	74	65.5	26	9	17.5	17	124	69	84	8,080	9,134	8,080	0	0	8,080	0	0	0	1.00	0.025	Incomp.	Incomp.	0.00
1	4	Sand	74	100	87	9	-17	-4	26	124	69	84	10,746	12,358	9,623	18	1,123	10,559	3	187	936	1.10	0.005	0.06	0.00	0.06
1	5	Sand	100	150	125	-17	-67	-42	50	125	69	84	15,483	18,608	11,989	56	3,494	12,925	41	2,558	936	1.08	0.005	0.10	0.00	0.10
1	6	Sand	150	210	180	-67	-127	-97	60	125	69	84	22,358	26,108	15,432	111	6,926	16,368	96	5,990	936	1.06	0.005	0.09	0.00	0.09
1	7	Clay	210	212	211	-127	-129	-128	2	125	69	84	26,233	26,358	17,372	142	8,861	18,308	127	7,925	936	1.05	0.030	0.00	0.02	0.02
1	8	Sand	212	235	223.5	-129	-152	-140.5	23	126	69	84	27,807	29,256	18,166	155	9,641	19,102	140	8,705	936	1.05	0.005	0.03	0.00	0.03
2	9	Sand	235	265	250	-152	-182	-167	30	126	70	95	31,146	33,036	19,914	180	11,232	21,474	155	9,672	1,560	1.08	0.005	0.06	0.00	0.06
2	10	Sand	265	290	277.5	-182	-207	-194.5	25	126	70	95	34,611	36,186	21,663	208	12,948	23,223	183	11,388	1,560	1.07	0.005	0.05	0.00	0.05
2	11	CLS	290	300	295	-207	-217	-212	10	126	70	95	36,816	37,446	22,776	225	14,040	24,336	200	12,480	1,560	1.07	0.025	0.00	0.09	0.09
2	12	Sand	300	309	304.5	-217	-226	-221.5	9	126	70	95	38,013	38,580	23,380	235	14,633	24,940	210	13,073	1,560	1.07	0.005	0.02	0.00	0.02
3	13	Sand	309	320	314.5	-226	-237	-231.5	11	127	83	106	39,279	39,977	24,833	232	14,446	26,268	209	13,010	1,435	1.06	0.005	0.02	0.00	0.02
3	14	Clay	320	335	327.5	-237	-252	-244.5	15	127	83	106	40,930	41,882	25,673	245	15,257	27,108	222	13,822	1,435	1.06	0.030	0.00	0.13	0.13
3	15	Sand	335	340	337.5	-252	-257	-254.5	5	127	83	106	42,200	42,517	26,319	255	15,881	27,754	232	14,446	1,435	1.05	0.005	0.01	0.00	0.01
3	16	Clay	340	348	344	-257	-265	-261	8	127	83	106	43,025	43,533	26,739	261	16,286	28,174	238	14,851	1,435	1.05	0.030	0.00	0.07	0.07
3	17	Sand	348	362	355	-265	-279	-272	14	127	83	106	44,422	45,311	27,449	272	16,973	28,884	249	15,538	1,435	1.05	0.005	0.02	0.00	0.02
3	18	CLS	362	370	366	-279	-287	-283	8	127	83	106	45,819	46,327	28,160	283	17,659	29,595	260	16,224	1,435	1.05	0.025	0.00	0.05	0.05
3	19	Sand	370	383	376.5	-287	-300	-293.5	13	127	83	106	47,153	47,978	28,838	294	18,314	30,273	271	16,879	1,435	1.05	0.005	0.02	0.00	0.02
4	20	Clay	383	387	385	-300	-304	-302	4	127	93	117	48,232	48,486	30,011	292	18,221	31,509	268	16,723	1,498	1.05	0.030	0.00	0.03	0.03
4	21	Sand	387	417	402	-304	-334	-319	30	127	93	117	50,391	52,296	31,109	309	19,282	32,607	285	17,784	1,498	1.05	0.005	0.04	0.00	0.04
4	22	Sand	417	430	423.5	-334	-347	-340.5	13	127	93	117	53,122	53,947	32,498	331	20,623	33,996	307	19,126	1,498	1.05	0.005	0.02	0.00	0.02
4	23	CLS	430	447	438.5	-347	-364	-355.5	17	127	93	117	55,027	56,106	33,467	346	21,559	34,965	322	20,062	1,498	1.04	0.025	0.00	0.10	0.10
4	24	Clay	447	450	448.5	-364	-367	-365.5	3	127	93	117	56,297	56,487	34,113	356	22,183	35,611	332	20,686	1,498	1.04	0.030	0.00	0.02	0.02
4	25	CLS	450	476	463	-367	-393	-380	26	127	93	117	58,138	59,789	35,050	370	23,088	36,548	346	21,590	1,498	1.04	0.025	0.00	0.14	0.14
4	26	Sand	476	500	488	-393	-417	-405	24	127	93	117	61,313	62,837	36,665	395	24,648	38,163	371	23,150	1,498	1.04	0.005	0.03	0.00	0.03
4	27	Clay	500	514	507	-417	-431	-424	14	127	93	117	63,726	64,615	37,892	414	25,834	39,390	390	24,336	1,498	1.04	0.030	0.00	0.08	0.08
4	28	CLS	514	536	525	-431	-453	-442	22	127	93	117	66,012	67,409	39,055	432	26,957	40,553	408	25,459	1,498	1.04	0.025	0.00	0.11	0.11
4	29	CLS	536	570	553	-453	-487	-470	34	127	93	117	69,568	71,727	40,864	460	28,704	42,362	436	27,206	1,498	1.04	0.025	0.00	0.16	0.16
4	30	Sand	570	600	585	-487	-517	-502	30	127	93	117	73,632	75,537	42,931	492	30,701	44,429	468	29,203	1,498	1.03	0.005	0.03	0.00	0.03
																							Total Settlement (in) =	0.56	0.99	1.55
																							Total Layer Thickness (feet) =	363	163	526