

APPENDIX F OIL WELL DOGGR REPORTS

Appendix F

Figure F-1: Oil Well Records from DOGGR

Figure F-2: Oil Well Survey Reports

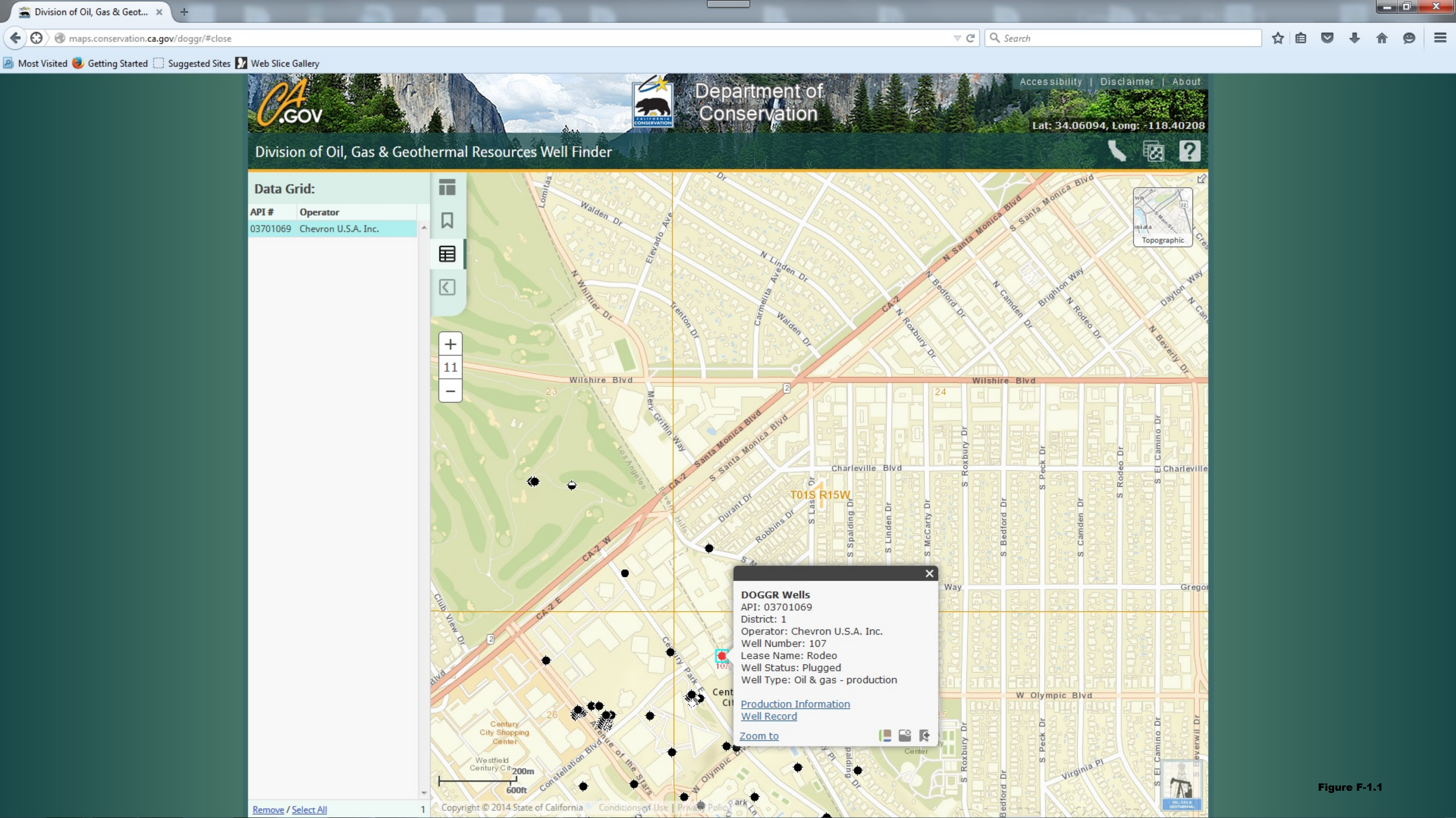


Figure F-1.1

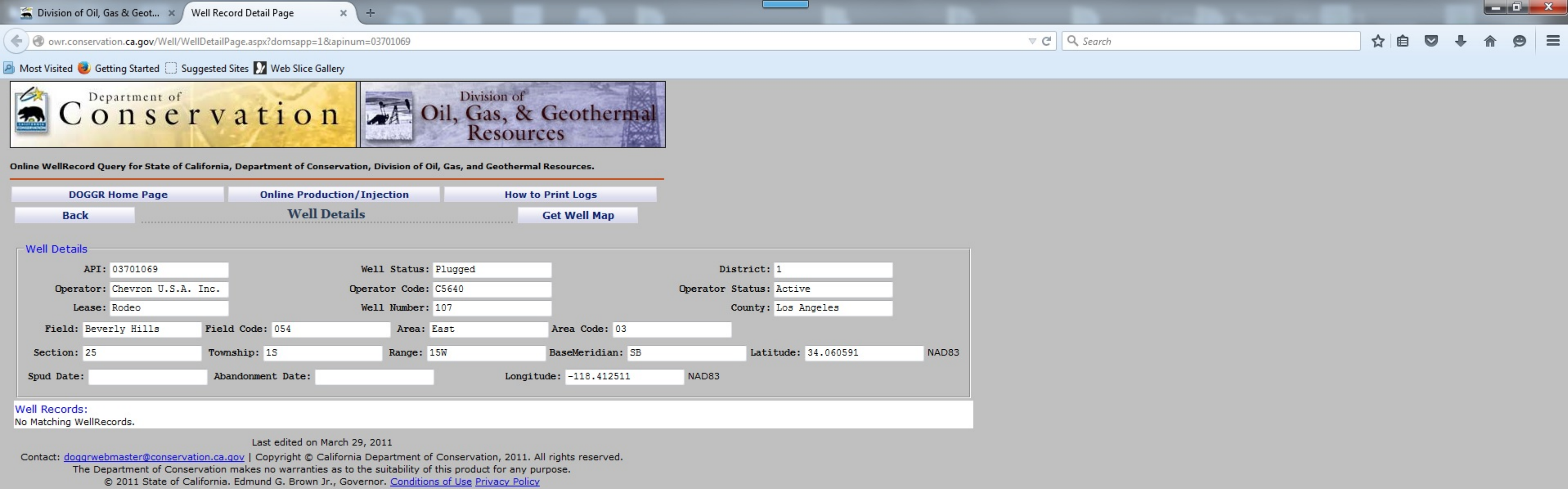
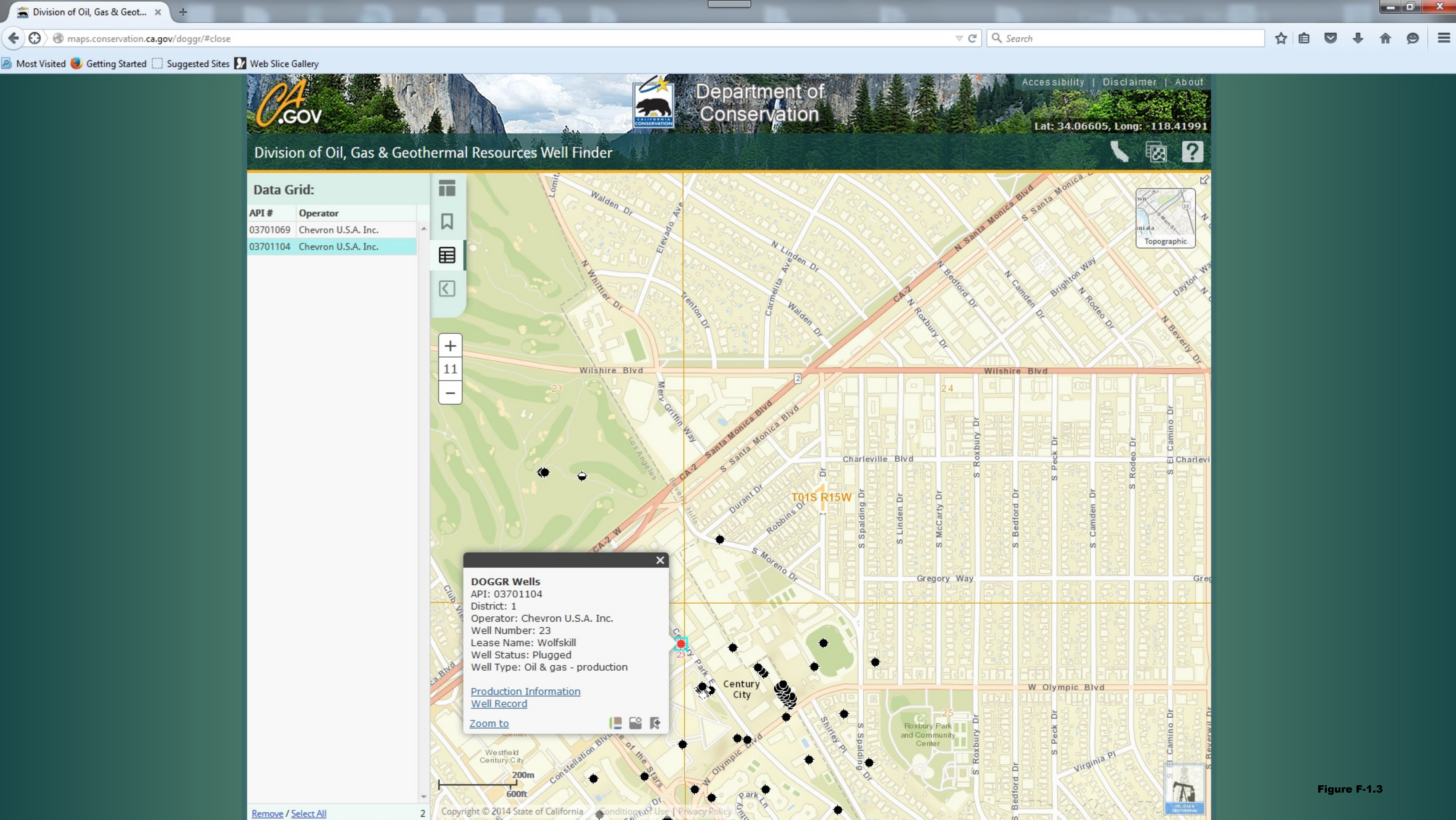


Figure F-1.2





Division of Oil, Gas & Geot...Well Record Detail Page

owr.conservacion.ca.gov/Well/WellDetailPage.aspx?domsapp=1&apinum=03701104

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Online WellRecord Query for State of California, Department of Conservation, Division of Oil, Gas, and Geothermal Resources.

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Back

Well Details

Get Well Map

Well Details

API: 03701104

Well Status: Plugged

District: 1

Operator: Chevron U.S.A. Inc.

Operator Code: C5640

Operator Status: Active

Lease: Wolfskill

Well Number: 23

County: Los Angeles

Field: Beverly Hills

Field Code: 054

Area: East

Area Code: 03

Section: 25

Township: 1S

Range: 15W

BaseMeridian: SB

Latitude: 34.060671

NAD83

Spud Date:

Abandonment Date:

Longitude: -118.413967

NAD83

Well Records:

No Matching WellRecords.

Last edited on March 29, 2011

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Figure F-1.4



REPORT GEOPHYSICAL INVESTIGATION

Geophysical Survey for the MTA Westside Extension Beverly Hills, California

GEOVision Project No. 11065

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Report 11065-001

April 8, 2011

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1 INTRODUCTION

A geophysical investigation was conducted on February 27th, March 5th and March 19th, 2011, for MACTEC Engineering and Consulting, Inc. in Beverly Hills, California. The purpose of the investigation was to locate any existing abandoned oil wells in the alignment right of way of the MTA Westside Extension at three locations at Beverly Hills High School: the tennis courts and front lawn, the football field and the lacrosse field (Figure 1).

The portions of Beverly Hills High School surveyed during this investigation consisted of: natural and artificial grass fields, reinforced concrete tennis courts, an asphalt road and a reinforced concrete sidewalk (Figure 1).

The geophysical techniques used during this investigation were the magnetic method and the electromagnetic (EM) method. These methods complement one another as each responds to different physical properties and has different strengths and limitations. The magnetic method is the most commonly used geophysical technique for locating abandoned oil wells because the magnetic anomalies associated with oil wells have very high amplitudes, large spatial dimensions and a different signature from many other types of buried metallic objects. The electromagnetic (EM) method was used to scan selected areas for metallic pipes and to further characterize anomalies found in the magnetic data.

The geophysical techniques used during the investigation are discussed in Section 2. Field procedures are described in Section 3. Data processing and interpretation are discussed in Section 4. The results of the geophysical survey are presented in Section 5 and our professional certification is presented in Section 6.

2 GEOPHYSICAL TECHNIQUES

This section presents background information on the magnetic and electromagnetic methods used during this investigation. A description of the geophysical methods used during this investigation, common applications of the method, photographs of the instruments and example applications are included in Appendix A.

2.1 *Magnetic Method*

The magnetometer used during this investigation consisted of a Geometrics G-858 optically pumped cesium-vapor magnetometer (G-858). This instrument measures the intensity of the earth's magnetic field in nanoteslas (nT) and, optionally, the vertical gradient of the earth's magnetic field in nanoteslas per meter (nT/m). The vertical magnetic gradient is calculated by measuring the total magnetic field with two sensors at different heights, subtracting the top sensor reading from the bottom sensor reading and dividing by the sensor separation. The vertical magnetic gradient has better lateral resolution than total magnetic field measurements and is less sensitive to deep (e.g. geologic) structure.

The earth's magnetic field is believed to originate in convection currents in the earth's liquid outer core. The magnetic field varies in intensity from about 25,000 nT at the equator, where it is parallel to the earth's surface, to about 70,000 nT at the poles where it is perpendicular to the earth's surface. The intensity of the earth's magnetic field in North America varies from about 48,000 to 60,000 nT, and has an associated inclination that varies from about 60 to 75 degrees.

The earth's magnetic field undergoes low-frequency diurnal variations (drift) caused by the earth's rotation. The magnetic field can also undergo short-period, high-amplitude variations during periods of sunspot activity called magnetic storms. Often magnetic field intensity can be so variable during a magnetic storm that meaningful magnetic data cannot be acquired. When necessary to correct for magnetic drift, a base station magnetometer is set up in a quiet portion of the site and programmed to record total magnetic field intensity at fixed increments (i.e. 5-second intervals) throughout the day. This base station data is then used to remove the effects of drift from the field data. In small survey areas, where the data is acquired over a small amount of time and the anomalies have large amplitudes, correction for magnetic drift is not necessary.

Buried ferromagnetic objects give rise to local perturbations (anomalies) in the earth's magnetic field. There are two types of magnetic anomalies: an anomaly induced in an object or rock by the earth's magnetic field (induced magnetic anomaly) and an anomaly associated with remnant or permanent magnetism. In North America, the induced magnetic anomaly associated with an oil well consists of a very high amplitude, positive magnetic anomaly with the maximum response (peak) about 1- foot, or more, south of the well. In very rare cases, the conductor casing or oil well casing may have a permanent magnetism in the opposite direction of the earth's magnetic field, which, therefore subtracts from the induced magnetic field. If the permanent magnetic field associated with the well casing is stronger than the induced magnetic field then a negative magnetic anomaly may result. These cases have been

observed and documented on very few sites previously by **GEOVision** and such wells can be difficult to detect, especially in the presence of other subsurface infrastructure, due to the atypical nature of the magnetic response. Other buried ferrous metallic objects; such as pipes, drums, tanks and debris, generally give rise to dipolar anomalies with a positive response south of the object and a negative response north of the object. The dimensions and amplitude of a magnetic anomaly are a function of the size, mass, depth and magnetic properties of the source. The magnetic anomaly over a buried oil well often has a diameter of over 50 feet and amplitude of several thousand nanoteslas above background, depending on depth and casing characteristics. A magnetometer can typically locate an abandoned oil well to a depth of over 20 feet providing background noise levels are not too high and the well casing is not significantly corroded. Magnetometers are not able to detect nonferrous metals such as aluminum or brass.

Typical applications of the magnetic method include:

- Locating pits and trenches containing ferrous metallic debris
- Locating buried drums, tanks and pipes
- Delineating boundaries of landfills containing ferrous debris
- Locating abandoned steel well casing
- Detecting unexploded ordnance
- Mapping basement faults and geology
- Mapping archeological sites

Some advantages of magnetic surveys are:

- Rapid – modern instruments can acquire up to 10 readings per second as the operator walks down survey lines
- Depth of investigation – magnetometers can often locate buried ferrous metallic objects to greater depths than other methods
- Anomalies are much larger than the source allowing for larger line spacing in some situations

Some limitations of the magnetic surveys are:

- Unable to detect non-ferrous metals such as aluminum or brass
- Magnetic anomalies may be asymmetrical and much larger than the source and it can, therefore, be difficult to determine the precise locations and size of the source
- Ineffective in areas having extensive metallic debris at the surface, as no distinction can be made between anomalies caused by surface and buried debris
- Metallic structures such as buildings, fences, reinforced concrete and light posts interfere with the measurements
- High voltage power lines can often strongly interfere with the measurements
- Data can be very noisy in areas containing volcanic rock, specifically basalt

2.2 Electromagnetic Method

EM equipment used during this investigation consisted of a Geonics EM-61 Mk2A high-resolution digital metal detector (EM-61). The EM-61 has a single transmitter and two receiver coils. The bottom coil is the transmitter during the current on-time and receiver during current off-time. The top coil, mounted 40-cm above the bottom coil, is a receiver coil only. The transmitter and receiver electronics controls are mounted on a backpack or on the instrument handle. A hand-held data logger is used to store field measurements. During operation, a half-duty cycle waveform is applied to the transmitter coil. During the off-time, the receiver coils measure the decay of eddy currents, in millivolts (mV), produced in subsurface metallic objects by the pulsed primary EM field. The top coil is gained in such a manner that the instrument response to a metallic object lying on the ground surface will be approximately equal at both the top and bottom coils. The effects of surface debris can, therefore, be suppressed by calculating the differential response (subtraction of the bottom coil from top coil response). Positive EM-61 anomalies centered over the source are typically observed over buried metallic objects. Above ground metallic objects will often give rise to a negative differential response, as the top coil response is larger than the bottom coil response.

3 FIELD PROCEDURES

This section describes the field procedures used during the investigation, including site preparation and the magnetometer and EM-61 Mk2A survey procedures.

3.1 Site Preparation

Before conducting the geophysical investigation, the suspected well locations in each area were marked by a representative from MACTEC Engineering and Consulting, Inc. Each area was then visually inspected for anything that may interfere with the survey and, if possible, it was removed from the survey area. The magnetometer and the EM-61 were used in conjunction with a Trimble ProXRS GPS system with OmniSTAR real-time, submeter corrections as discussed below. GPS data were collected in the geodetic coordinate system and then converted to California State Plane 1983, NAD83, Zone V (0405) in US Survey Feet during data processing. Data were not collected in areas where there were surface obstructions or other limiting features, or where the GPS did not have sufficient satellite coverage. Obvious surface cultural features that could potentially affect the geophysical data (e.g. metal fences, goalposts and other surface metallic objects) were identified in the field and their positions recorded using the submeter GPS system. Color contour maps showing surface metallic objects and the geophysical anomalies are presented as Figures 2 through 6.

3.2 Geometrics G-858 Survey

Prior to data acquisition, the G-858 was programmed with the appropriate sampling interval and GPS input settings. Measurements of the earth's total magnetic field and vertical magnetic gradient were made in accessible areas at 0.2-second intervals as the operator walked along approximately south to north (S-N) survey lines nominally spaced 5 feet apart. A Trimble ProXRS GPS system with OmniSTAR differential corrections was used for spatial control. Real-time submeter corrections were input every second into the data collector of the magnetometer using a serial cable and a GGA NMEA stream GPS output. The magnetic data were stored in the internal memory of the magnetometer, along with GPS statistics and location data. If a location error was made on a survey line (large data gap, etc.) the line was repeated to attain desired coverage. Magnetic data were downloaded to a laptop computer at the end of the survey using the program MAGMAP 2000 by Geometrics, Inc.

3.3 Geonics EM-61 Mk2A Survey

The EM-61 was assembled and battery levels were checked and found to be within acceptable levels. The EM-61 digital data logger was then programmed with the appropriate file name and sample rate (10 readings/sec). EM-61 measurements were made in accessible areas, along approximately S-N survey lines nominally spaced 5 feet apart for each area where deemed necessary. EM-61 measurements were not collected in areas containing reinforced concrete (e.g. the tennis courts and the small area southeast of the lacrosse field) due to the interference of surface metal. EM-61 data were also not collected in the front lawn area, as the magnetic data indicated no significant subsurface anomalies warranting further

investigation. A Trimble ProXRS GPS system with OmniSTAR differential corrections was used for spatial control. Real-time submeter corrections were input every second into the data collector of the EM-61 using a serial cable and a GGA NMEA stream GPS output. The EM-61 data were stored in a digital data logger, along with GPS statistics and location data. If a location error was made on a survey line (large data gap, etc.) the line was repeated to attain desired coverage. EM-61 data were downloaded to a laptop computer at the end of the survey using the computer program Trackmaker61 by Geomar Software, Inc. The EM-61 is a wheel mounted system and data coverage was limited to areas where the instrument was able to be pushed, where there was no metal reinforcement and where there was sufficient GPS satellite coverage.

4 DATA PROCESSING AND INTERPRETATION

This section presents the data processing procedures and interpretation of the geophysical data.

4.1 Data Processing

Color-enhanced contour maps of the magnetic data were generated using the GEOSOFT® Oasis montaj™ geophysical mapping system. The maps were color-enhanced to aid in the interpretation of subtle anomalies. Prior to map generation, a number of preprocessing steps were completed and included:

- Backup of all original field data files to computer.
- Correcting of all data acquisition errors (typically removing null data and erroneous GPS points).
- Reformatting field data files to free format XYZ files containing at a minimum GPS time and field measurements.
- Merging GPS position data and geophysical data using commercial and in-house software.
- Merging of multiple data files into a single file and sorting, if necessary.
- Converting of data files to State Plane northings and eastings.

These data adjustments were made using a combination of commercial and in-house software. All adjustments made to data files and resulting file names were documented and are retained in project files. The outputs of the data preprocessing were data files containing the various data measurements. The magnetic data file contained total field and vertical gradient response.

Data processing steps included the following:

- Reformatting of data files to GEOSOFT® format.
- Generating final map scale.
- Gridding data using down- and cross-line splines or minimum curvature.
- Masking grid in areas where data not acquired (i.e. around site perimeter or building).
- Applying Hanning filter to smooth the data, as necessary.
- Generating color zone file describing color for different data ranges.
- Contouring the data.
- Generating map surrounds (title block, legend, scale, color bar, north arrow, etc.).
- Annotating anomalies.
- Merging various plot files and plotting final map.

The names of the files generated and the processing parameters used were documented and are retained in project files. All files generated during the processing sequence were archived on a backup drive.

4.2 Interpretation

Color-enhanced contour maps of the magnetic total field response generated for each area (the tennis courts and front lawn area, the football field and the lacrosse field) are presented as Figures 2, 3 and 5, respectively. For the football and lacrosse field areas, color-enhanced contour maps of the EM-61 Mk2A Channel 3 response are presented as Figures 4 and 6, respectively. The coordinates shown on all figures reference the California State Plane 1983, NAD83, Zone V (0405) coordinate system, in US Survey Feet. The color bar indicates the amplitude of the measured quantity with the magenta and cyan colors representing high and low amplitudes, respectively. The light orange, yellow and light green colors indicate average "background" values of the measured quantity.

An example magnetic anomaly from an oil well is presented in Appendix A. The typical magnetic anomaly characteristics of an oil well are: a monopolar response (large positive peak with only a minor negative response to the north); a large diameter anomaly (50 to 100 ft typical) and a large amplitude for shallow wells. However, in very rare cases, a monopolar, magnetic low have been observed for an oil well response. In these cases, the permanent magnetic field of the oil well casing is stronger than the induced magnetic field and a magnetic low is observed.

4.2.1 Tennis Courts and Front Lawn

The color-enhanced contour map of the total magnetic field response is presented as Figure 2. No abandoned oil well anomalies are interpreted in the magnetic data. The top portion of the site consists of a grass lawn with sidewalks and some surface metal, such as signage, posts or rails. The tennis courts in the lower portion of the area consist of reinforced concrete bounded by metallic chain link fencing on all sides. All magnetic anomalies are accounted for by surface metallic objects at this location.

4.2.2 Football Field – “Rodeo” 114

The color-enhanced contour map of the total magnetic field response is presented as Figure 3. The color-enhanced contour map of the EM-61 Mk2A Channel 3 response is presented as Figure 4. No abandoned oil well anomalies are interpreted in the magnetic data. Several linear anomalies were interpreted in both the total magnetic field response and EM-61 Channel 3 response and are marked with a “P” on both figures. These anomalies bear responses that are indicative of buried metallic pipes or utilities. There are also several small monopolar anomalies in the total magnetic field response that correlate with small amplitude anomalies in the EM-61 Channel 3 response. These anomalies are indicative of small buried metallic objects and are marked with a “B” on the figures.

4.2.3 Lacrosse Field – “Wolfskill” 23 and “Rodeo” 107

The color-enhanced contour maps of the total magnetic field response and the EM-61 Mk2A Channel 3 response are presented as Figures 5 and 6, respectively. Several linear anomalies were interpreted in both the total magnetic field response and EM-61 Channel 3 response and are marked with a “P” on both figures. These anomalies bear responses that are indicative of buried metallic pipes, utilities or previous building footings. There are also several small

dipolar anomalies in the total magnetic field response that correlate with small amplitude anomalies in the EM-61 Channel 3 data. These anomalies are indicative of small buried metallic objects, marked with a “B” on the figures.

Four large magnetic anomalies are present in the total magnetic field data, and are labeled as anomalies A-1 through A-4 (Figure 5). Anomalies A-1 through A-3 are located on or near the grass lacrosse field, which is surrounded by a metallic chain link fence to the north, south and east and a block retaining wall to the west, south and east. Anomaly A-4 is located southeast of the lacrosse field, in a small area adjacent to an asphalt road with utility vaults, chain link fencing, reinforced concrete, a building and a retaining wall.

The western most anomaly, A-1, located at 6,436,652E, 1,844,819N, presents with a strong dipolar magnetic response (a low of 45,300 nT and a high of 49,000 nT) and a strong EM-61 response (4,200 mV). This anomaly may be related to a pipe segment or previous building infrastructure. However, it cannot be fully discounted that this anomaly is related to an abandoned oil well or its infrastructure.

The southwestern most anomaly, A-2, located at 6,436,780E, 1,844,724N, also presents as a strong, dipolar magnetic response (a low of 45,550 nT and a high of 49,650 nT), but as a weaker EM-61 response (196 mV). This may indicate that the source of this anomaly is deeper than the source of anomaly A-1. This anomaly may be related to a pipe segment or previous building infrastructure. However, it cannot be fully discounted that this anomaly is related to an abandoned oil well or its infrastructure.

The northeastern most anomaly, A-3, located at 6,436,897E, 1,844,758N, presents as a broad positive magnetic response (greater than 48,000 nT), but is not evident in the EM-61 data. However, it cannot be fully discounted that this anomaly is related to a steel-cased abandoned oil well due to the large magnetic response. It is estimated that the source of this anomaly is east of the fencing and retaining wall surrounding the lacrosse field. An additional survey would be needed to further characterize this anomaly. Due to the proximity of the anomaly to surface metallic features (e.g. metal fencing, retaining walls and reinforced concrete), there is no guarantee that results from a further investigation would be conclusive.

The southeastern most anomaly, A-4, located at 6,437,017E, 1,844,638N on asphalt, presents with a strong positive magnetic response (greater than 52,000 nT). The suspected location of abandoned oil well “Rodeo” 107 was surveyed and marked on the ground near the retaining wall in this area. The source of this anomaly is located outside of the survey boundary in an area that could not be surveyed due to poor satellite coverage. However, due to the intensity of the magnetic response, it cannot be fully discounted that this anomaly is related to a steel-cased abandoned oil well. An additional gridded survey would need to be conducted on the asphalt road to further characterize this anomaly.

5 CONCLUSIONS

A geophysical survey was conducted at Beverly Hills High School in Beverly Hills, California. The purpose of the survey was to screen three areas: the tennis courts and front lawn, the football field and the lacrosse field, for multiple suspected abandoned, steel-cased oil wells in the alignment right of way of the MTA Westside Extension.

In the area consisting of the tennis courts and the front lawn, there was no indication of any abandoned oil wells in the magnetic data. In the area consisting of the football field, where the suspected location of abandoned oil well “Rodeo” 114 was marked, there was no indication of any abandoned oil wells in the magnetic or EM data. Four anomalies were interpreted in the magnetic and EM data, in the area consisting of the lacrosse field and adjacent area where suspected abandoned oil well “Rodeo” 107 was marked. Anomalies A-1 and A-2 may be related to abandoned oil well infrastructure or other buried metallic debris. Anomalies A-3 and A-4 may be related to steel-cased abandoned oil wells. However, further investigation would be needed to fully characterize anomalies A-3 and A-4.

The geophysical survey was designed to map abandoned wells with ferrous metallic pipe in the upper 15 feet. It is our opinion that the geophysical survey was appropriately designed to locate such objects less than about 15 feet deep; except in portions of the survey area where data were affected by surface structures, such as reinforced concrete, utility corridors, obstructing foliage and other large surface metallic objects.

6 CERTIFICATION

All geophysical data, analysis, interpretations, conclusions and recommendations in this document have been prepared under the supervision of and reviewed by a **GEOVision** California Professional Geophysicist.

Prepared by



04/08/11

Emily Feldman
Staff Geophysicist
GEOVision Geophysical Services

Date

Reviewed and approved by



04/08/11

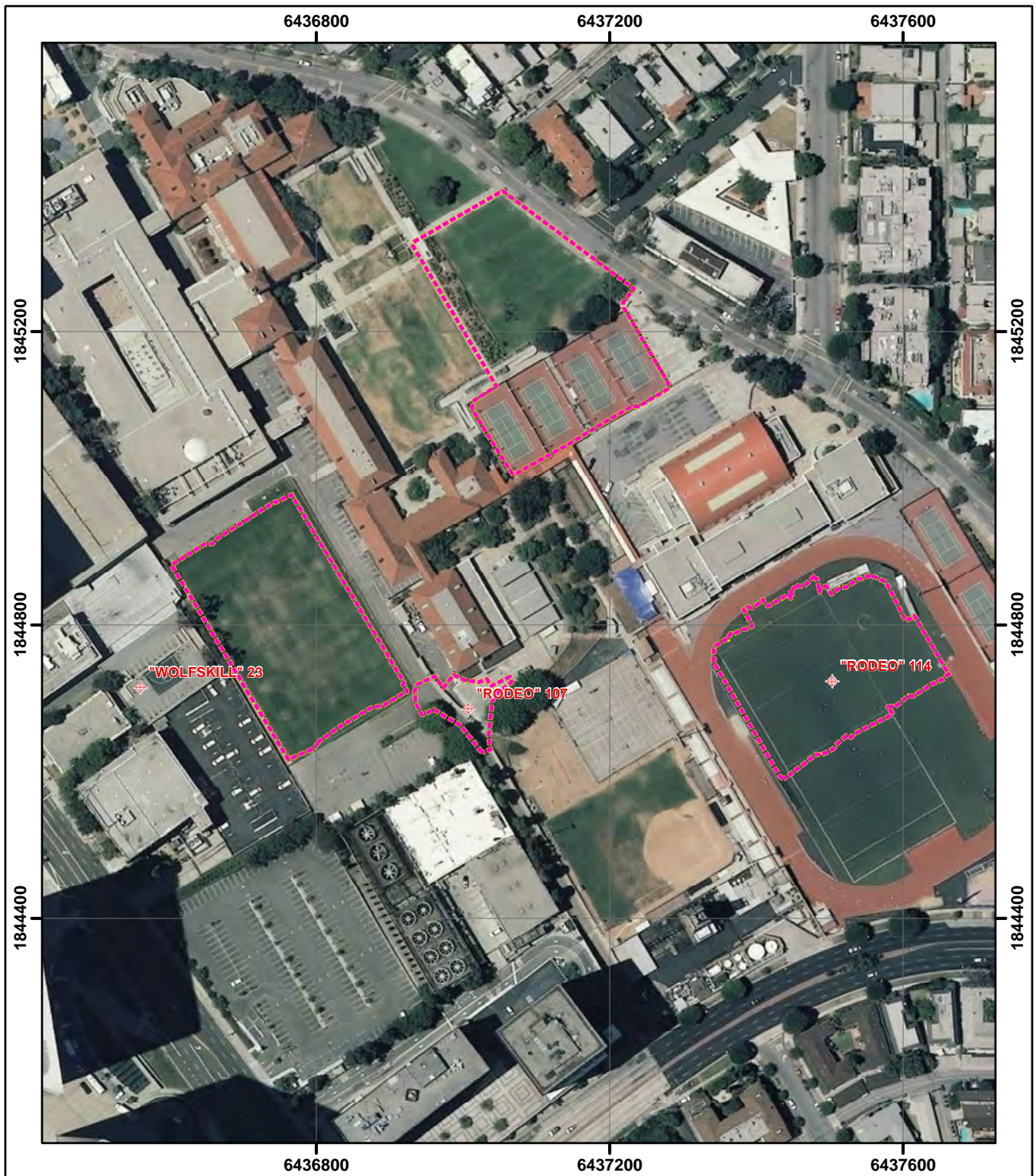
Antony Martin
California Professional Geophysicist, P.GP 989
GEOVision Geophysical Services

Date

- * This geophysical investigation was conducted under the supervision of a California Professional Geophysicist using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

A professional geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

- ## FIGURES



Legend



Geophysical survey boundary



Suspected location of abandoned oil well



NOTES:

1. California State Plane Coordinate System NAD 83, Zone V (0405), US Survey Feet
2. Image Source: ESRI, i-cubed, UDSA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IG



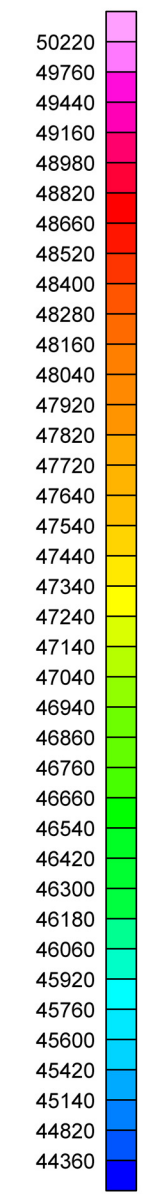
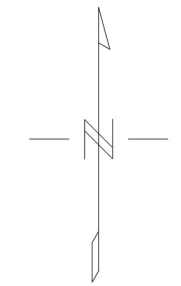
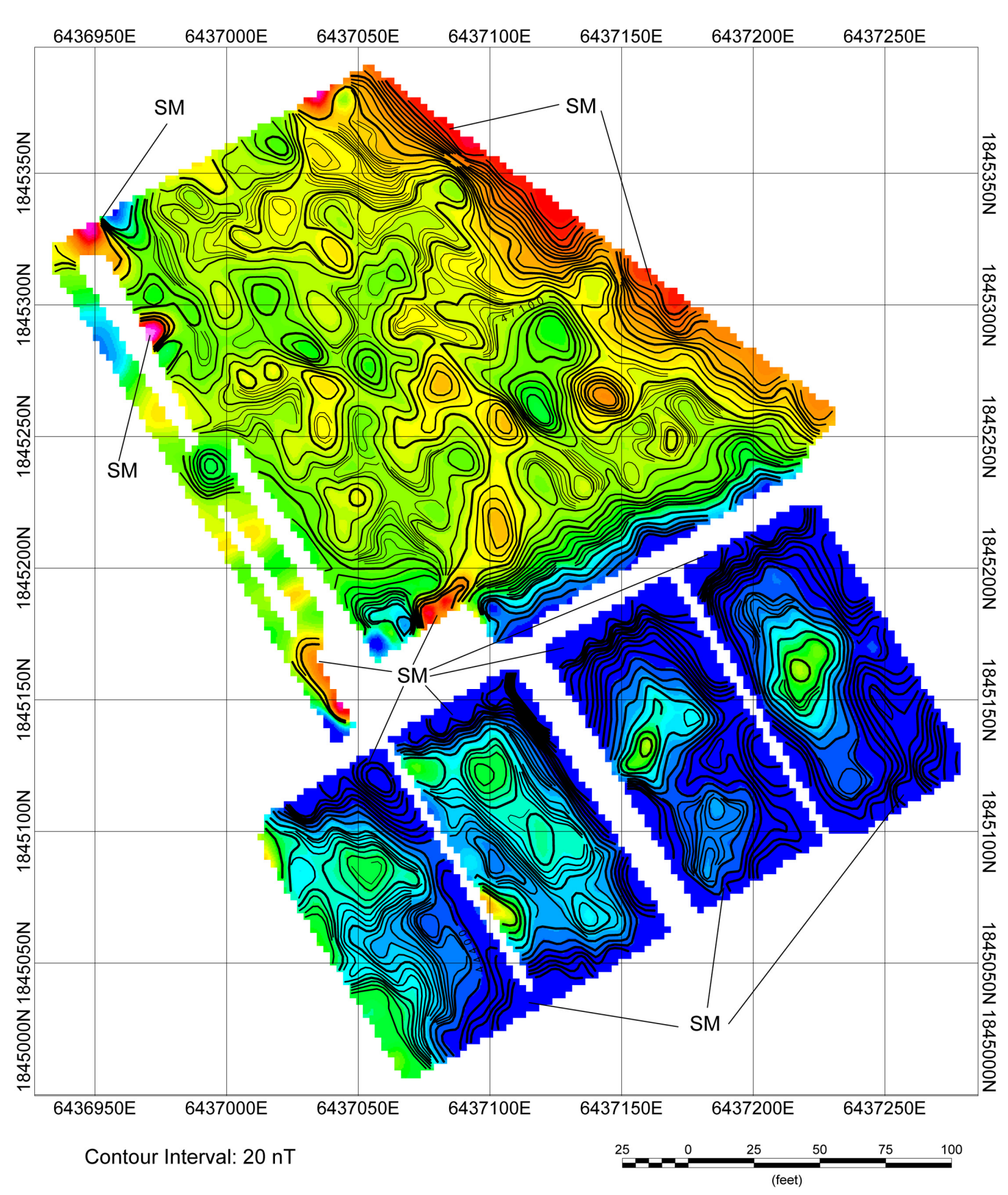
GEOVision
geophysical services

Date:	4/7/2011
GV Project:	11065
Developed by:	E Feldman
Drawn by:	T Rodriguez
Approved by:	L Demine
File Name:	11065-1

FIGURE 1 SITE MAP

**BEVERLY HILLS HIGH SCHOOL
BEVERLY HILLS, CALIFORNIA**

**PREPARED FOR
MACTEC ENGINEERING AND CONSULTING, INC.**



**Total Magnetic Field Intensity
(nT)**

LEGEND
SM Surface Metallic Object



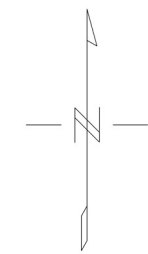
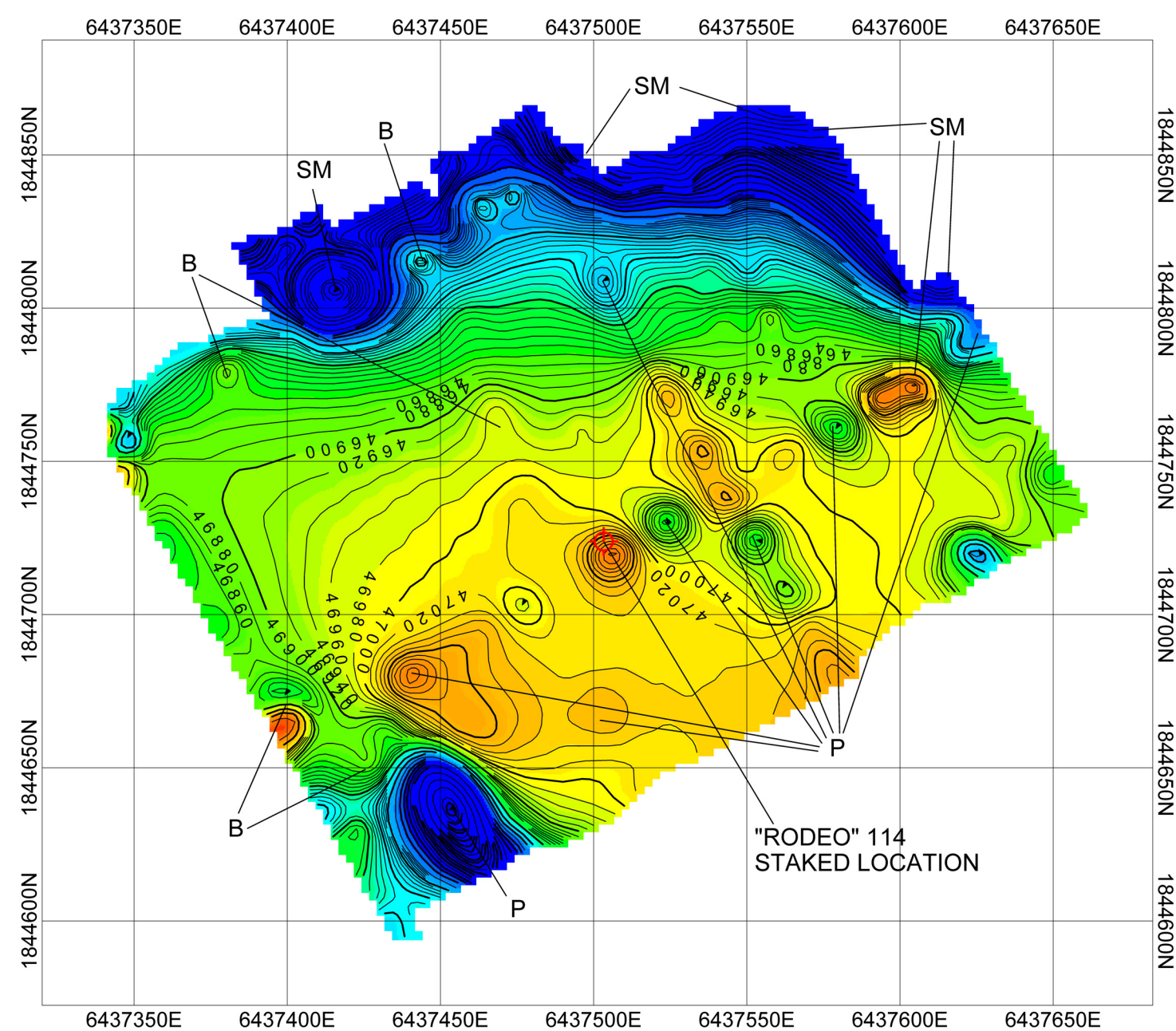
FIGURE 2

**G-858 TOTAL MAGNETIC FIELD RESPONSE, TENNIS COURTS & FRONT LAWN
PROJECT NO. 11065**

BEVERLY HILLS HIGH SCHOOL
BEVERLY HILLS, CALIFORNIA

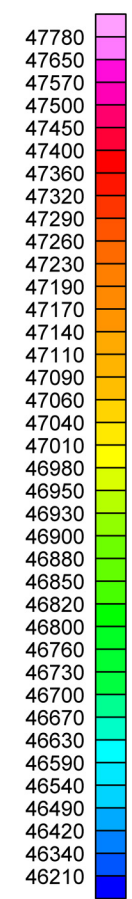
PREPARED FOR MACTEC ENGINEERING AND CONSULTING, INC.

Notes: 1. Coordinate System California State Plane, NAD83, Zone V (0405), US Survey Feet
2. Positions collected using a Trimble ProXRS GPS with OmniSTAR real-time, submeter differential corrections



LEGEND

- SM Surface Metallic Object
- P Underground Pipe/Previous Building Footing
- B Small Buried Metallic Object



Total Magnetic Field Intensity
(nT)

Contour Interval: 20 nT



Notes: 1. Coordinate System California State Plane, NAD83, Zone V (0405), US Survey Feet
2. Positions collected using a Trimble ProXRS GPS with OmniSTAR real-time, submeter differential corrections

	FIGURE 3
	G-858 TOTAL MAGNETIC FIELD RESPONSE, FOOTBALL FIELD PROJECT NO. 11065
	BEVERLY HILLS HIGH SCHOOL BEVERLY HILLS, CALIFORNIA
	PREPARED FOR MACTEC ENGINEERING AND CONSULTING, INC.

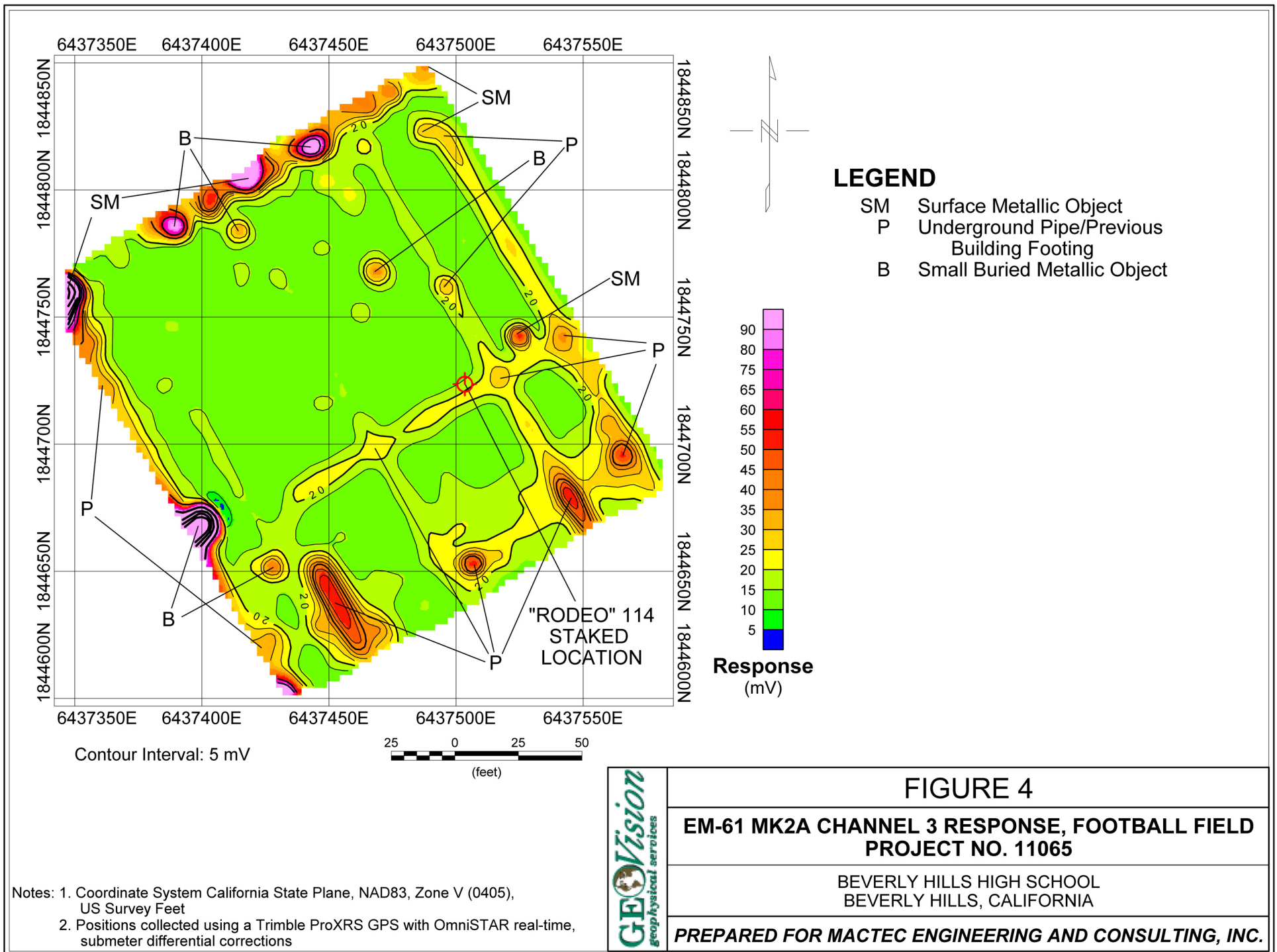


Figure F-2.18

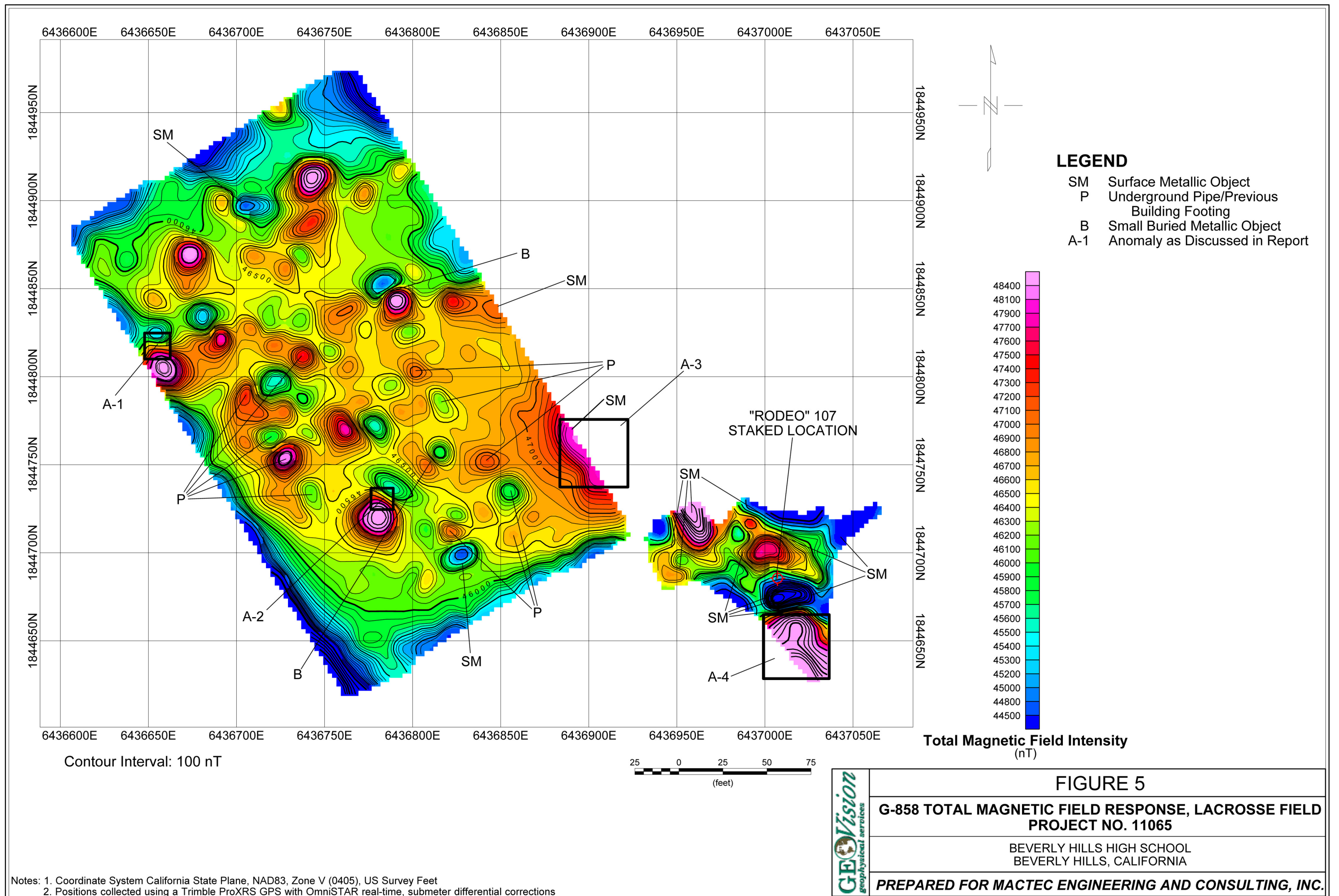
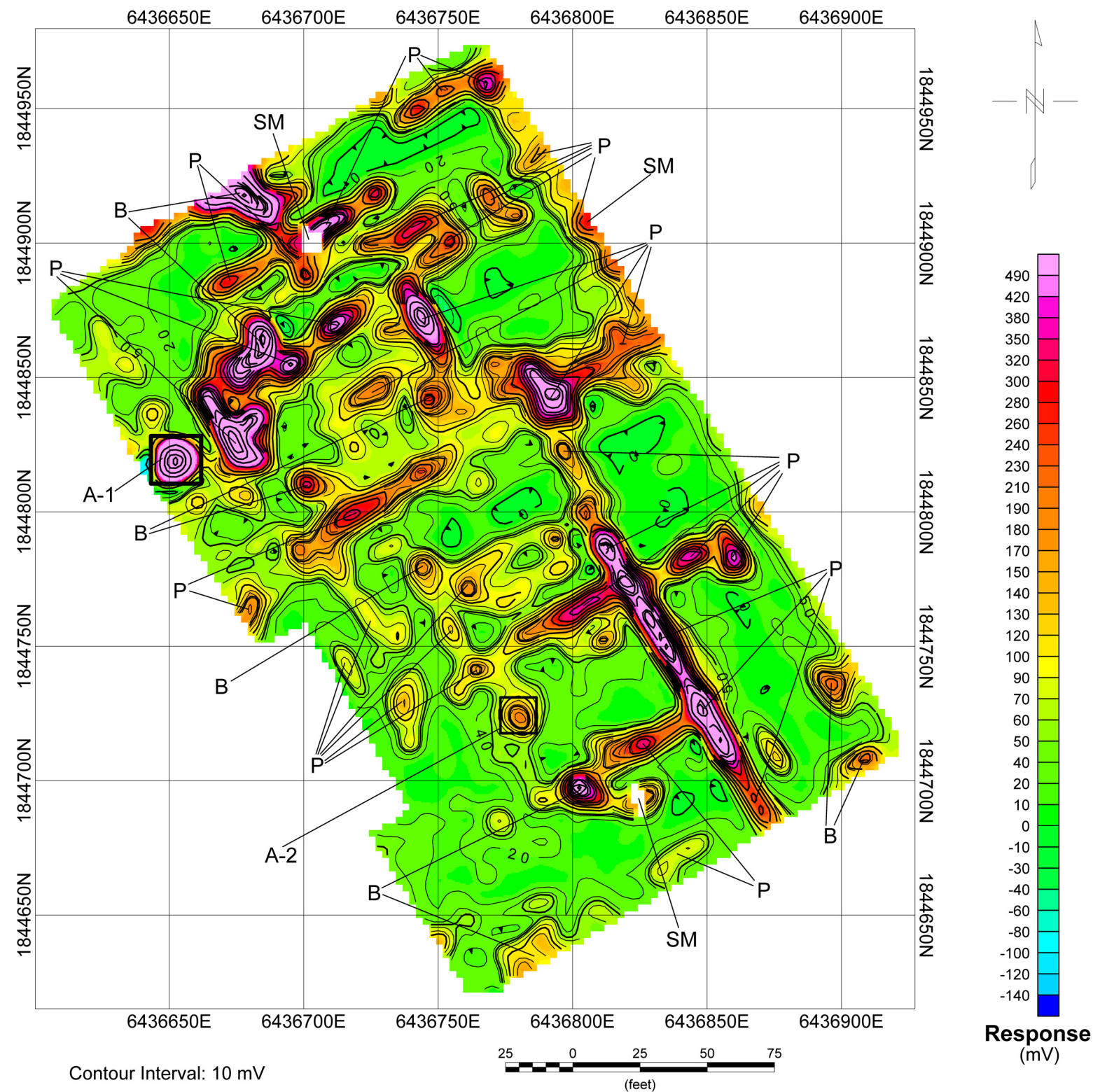


Figure F-2.19



LEGEND

- SM Surface Metallic Object
- P Underground Pipe/Previous Building Footing
- B Small Buried Metallic Object
- A-1 Anomaly as Discussed in Report

FIGURE 6

EM-61 MK2A CHANNEL 3 RESPONSE, LACROSSE FIELD
PROJECT NO. 11065

BEVERLY HILLS HIGH SCHOOL
BEVERLY HILLS, CALIFORNIA

PREPARED FOR MACTEC ENGINEERING AND CONSULTING, INC.

Notes: 1. Coordinate System California State Plane, NAD83, Zone V (0405), US Survey Feet
2. Positions collected using a Trimble ProXRS GPS with OmniSTAR real-time, submeter differential corrections

- ## APPENDICES

GEOPHYSICAL TECHNIQUES FOR SHALLOW ENVIRONMENTAL INVESTIGATIONS



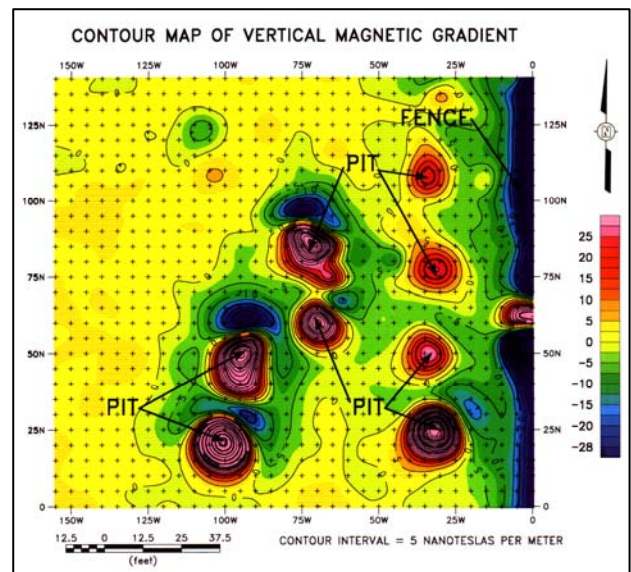
MAGNETIC METHOD

The magnetic method generally involves the measurement of the earth's magnetic field intensity or vertical gradient of the earth's magnetic field. Anomalies in the earth's magnetic field are caused by induced or remanent magnetism. Induced magnetic anomalies are the result of secondary magnetization induced in a ferrous body by the earth's magnetic field. The shape and amplitude of an induced magnetic anomaly is a function of the orientation, geometry, size, depth, and magnetic susceptibility of the body as well as the intensity and inclination of the earth's magnetic field in the survey area. The magnetic method is an effective way to search for small metallic objects, such as buried ordnance and drums, because magnetic anomalies have spatial dimensions much larger than those of the objects themselves. Typically, a single buried drum can be detected to a depth of about 10 feet. Larger metallic objects can often be located to greater depths. Induced magnetic anomalies over buried objects such as drums, pipes, tanks, and buried metallic debris generally exhibit an asymmetrical, south up/north down signature (positive response south of the object and negative response to the north).

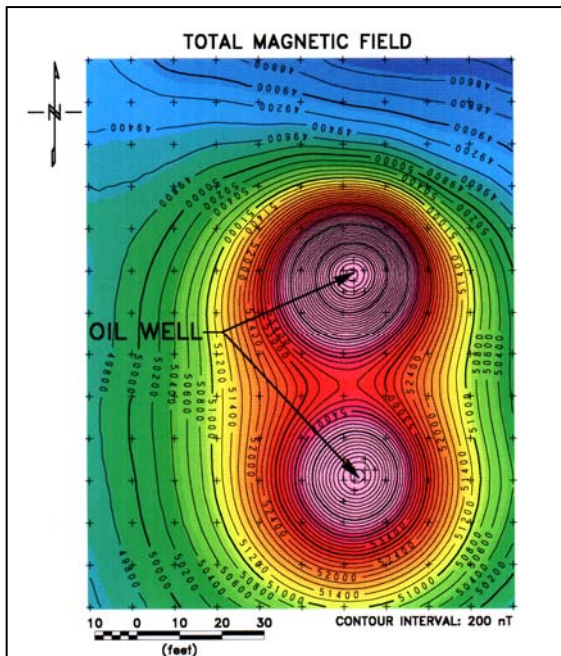
Magnetic data is typically acquired along a grid with results being presented as color-enhanced contour maps generated by the Geosoft™ Mapping System or OASIS montaj. The approximate location and depth of magnetic objects can be calculated using the Geosoft™ UXO System.



Geometrics G858 Cesium Magnetic Gradiometer



**Magnetic Survey to Locate Pits Containing
Buried Metallic Containers**



**Magnetic Survey to Locate Abandoned Oil
Wells**

Magnetic surveys are typically conducted to:

- Locate abandoned steel well casings
- Locate buried tanks and pipes
- Locate pits and trenches containing buried metallic debris
- Detect buried unexploded ordnance (UXO)
- Map old waste sites and landfill boundaries
- Clear drilling locations
- Map basement faults and geology
- Investigate archaeological sites

□

ELECTROMAGNETIC METHODS

Electromagnetic (EM) methods typically applied to shallow environmental investigations include frequency domain EM methods, such as EM induction and EM utility location methods, time domain electromagnetic (TDEM) metal detection methods, and ground penetrating radar (GPR) methods.

EM Induction Method

EM induction surveys are often conducted using the Geonics EM-31 terrain conductivity meter (EM-31). The EM-31 consists of a transmitter coil mounted at one end and a receiver coil mounted at the other end of a 3.7-meter long plastic boom. Electrical conductivity and in-phase component field strength are measured and stored along with line and station numbers in a digital data logger. In-phase component measurements generally only respond to buried metallic objects; whereas conductivity measurements also respond to conductivity variations caused by changes in soil type, moisture or salinity and the presence of nonmetallic bulk wastes. The EM-31 must pass over or immediately adjacent to a buried metallic object to detect it. Typical EM-31 anomalies over small, buried metallic objects consist of a negative response centered over the object and a lower amplitude positive response to the sides of the object. When the instrument boom is oriented parallel to long,

linear conductors such as pipelines a strong positive response is observed. The EM-31 can explore to depths of about 6 meters, but is most sensitive to materials about 1 meter below ground surface. Single buried drums can typically be detected to depths of about 5 feet.

EM-31 surveys are typically conducted to:

- Locate buried tanks and pipes
- Locate pits and trenches containing metallic and/or nonmetallic debris
- Delineate landfill boundaries
- Delineate oil production sumps and mud pits
- Map conductive soil and groundwater contamination
- Map soil salinity in agricultural areas
- Characterize shallow subsurface hydrogeology
 - Map buried channel deposits
 - Locate sand and gravel deposits
 - Locate conductive fault and fracture zones

□

□



□

□

EM Utility Location Methods

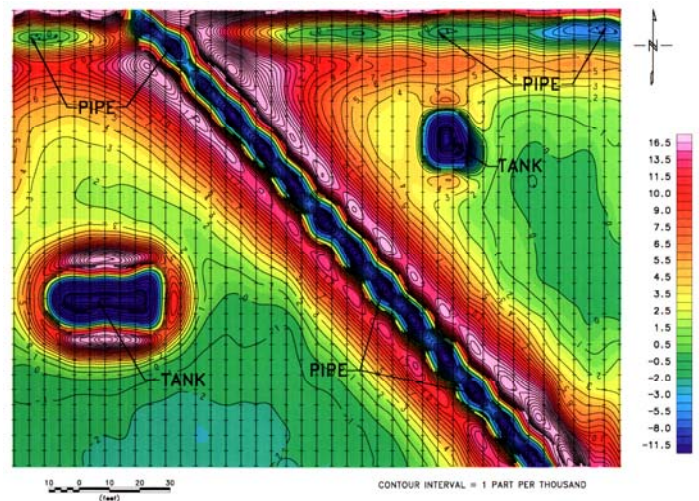
EM utility locators; such as the Metrotech 810, Metrotech 9890 and Radiodetection RD400, are designed to accurately trace metallic pipes and utility cables and clear drilling/excavation locations. These utility locators consist of a separate transmitter and a receiver. The transmitter emits a radio frequency EM field that induces secondary fields in nearby metallic pipes and cables. The receiver detects these fields and is used to accurately locate and trace the pipes, often to distances over 200 feet from the transmitter. Many of the utility locators have a passive 60Hz mode to locate live electrical lines. Modern utility locators are also capable of providing rough depth estimates of the pipes.



Metrotech EM Utility Locator



Geonics EM-31 Terrain Conductivity Meter



Geonics EM-31 Survey to Locate Underground Storage Tanks

TDEM Metal Detection Methods

A Geonics EM-61 (EM-61) is a high sensitivity, time-domain, digital metal detector which is often used to detect both ferrous and non-ferrous metallic objects. It is designed specifically to locate buried metallic objects such as drums, tanks, pipes, UXO, and metallic debris and to be relatively insensitive to above ground structures such as fences, buildings, and vehicles.

The EM-61 consists of two square, 1-meter coils, one mounted over the other and arranged on a hand-towed cart. The bottom coil acts as both a transmitter and receiver while the top coil is a receiver only. While transmitting the bottom coil generates a pulsed primary magnetic field, which induces eddy currents into nearby metallic objects. When the transmitter is in its off cycle both coils measure the decay of these eddy currents in millivolts (mV) with the results being stored in a digital data logger along with position information. The decay of the eddy currents is proportional to the size and depth of the metallic target. A symmetrical positive anomaly is recorded over metallic objects with the peak centered over the object.

The signal from the top coil is amplified in such a way that both coils record effectively the same response for a metallic object on the surface and the top coil records a larger response for buried metallic objects. The response of near surface objects can, therefore, be suppressed by subtracting the lower coil response from the upper coil response (differential response).

In practice, the usable depth of investigation of the EM-61 depends on the size and shape of the object and the amount of above ground interference encountered at the site. A single buried drum can often be detected at a depth of about 10 feet.

Geonics EM-61 Survey to Map Subsurface Infrastructure



GPR Methods

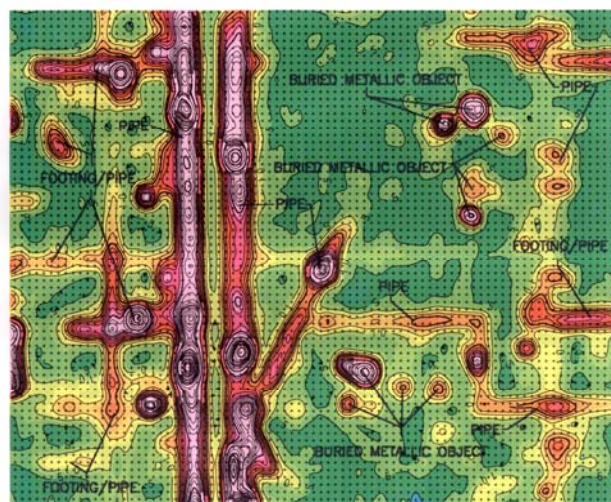
Ground-penetrating radar (GPR) is a high-frequency electromagnetic method commonly applied to a number of engineering and environmental problems.



GSSI SIR-10A GPR Unit



Geonics EM-61 Digital Metal Detector



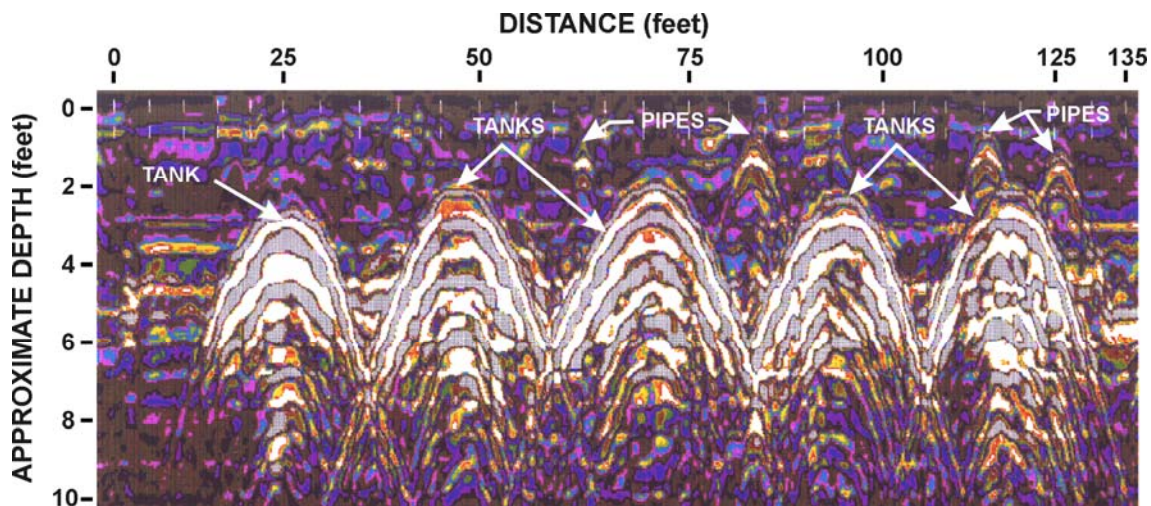
A GPR system radiates short pulses of high-frequency EM energy into the ground from a transmitting antenna. This EM wave propagates into the ground at a velocity that is primarily a function of the relative dielectric permittivity of subsurface materials. When this wave encounters the interface of two materials having different dielectric properties, a portion of the energy is reflected back to the surface, where it is detected by a receiver antenna and transmitted to a control unit for processing and display.

Depth penetration is a function of antenna frequency and the electrical conductivity of the soils in the survey area. Lower frequency antennas achieve greater depth penetration than higher frequency antennas, but have poorer spatial resolution. Conductive soils, such as clays, attenuate the radar waves much more rapidly than resistive dry sand and rock. In many environments in California, depth penetration of 500 and 300 MHz antennas is limited to 3 to 5 feet. Depth penetration may be greater if shallow soils consist of clean sands and less if shallow soils consist of clay.

GPR surveys are typically conducted to:

- Locate and delineate underground storage tanks (metallic and non-metallic)
- Locate metallic and nonmetallic pipes and utility cables
- Map rebar in concrete structures
- Map landfill boundaries
- Delineate pits and trenches containing metallic and nonmetallic debris
- Delineate leach fields and industrial cribs
- Delineate previously excavated and backfilled areas
- Map shallow groundwater tables
- Map shallow soil stratigraphy
- Map shallow bedrock topography
- Map shallow subsurface voids and cavities
- Characterize archaeological sites

Geophysical Survey Systems Inc. (GSSI) SIR-2 or SIR-10 GPR systems with antennas in the frequency range of 50 to 1,000 MHz are often used during GPR investigations. Mala Geoscience and Sensors and Software, Ltd also manufacture GPR systems. GPR data is processed using a variety of software including the RADAN™ or GRADIX software packages by GSSI and Interpex Ltd., respectively.



GPR Survey to Locate Underground Storage Tanks



REPORT GEOPHYSICAL INVESTIGATION

Geophysical Survey for the MTA Westside Extension Santa Monica, California

GEO Vision Project No. 11065-2

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Report 11065-002

July 13, 2011

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APPENDIX A MAGNETIC METHOD

1 INTRODUCTION

A geophysical investigation was conducted on June 30th and July 1st, 2011, for MACTEC Engineering and Consulting, Inc. (now Amec) in Santa Monica, California. The purpose of the investigation was to locate any existing abandoned oil wells in the alignment right of way of the MTA Westside Extension at two locations in Santa Monica: the Bodies in Motion Parking Structure (Figure 1) and the lot located NE of Constellation Blvd and Ave of the Stars (Figure 3). A previous survey was conducted at the Beverly Hills High School and was submitted as **GEOVision** Report 11065-001.

The area surveyed in the Bodies in Motion parking structure consisted of asphalt over concrete floors with reinforced concrete ceilings. The area also consisted of parking stops, metallic debris and a debris/grass planter on the eastern side of the structure (Figure 1). The area survey NE of Constellation Blvd and Ave of the Stars consisted of a concrete sidewalk with desert landscaping and a chain link fence surrounding a former structure. The area of the former structure still contained an old road, railings, high walls and demolition debris. Long grass with flooded sections were located in the northern section of the lot. Areas with standing water limited data collection to the north side of the area, but were also outside the designated survey area and proposed right of way alignment (Figure 3).

The geophysical technique used during this investigation was the magnetic method. The magnetic method is the most commonly used geophysical technique for locating abandoned oil wells because the magnetic anomalies associated with oil wells have very high amplitudes, large spatial dimensions and a different signature from many other types of buried metallic objects.

The geophysical technique used during the investigation is discussed in Section 2. Field procedures are described in Section 3. Data processing and interpretation are discussed in Section 4. The results of the geophysical survey are presented in Section 5 and our professional certification is presented in Section 6.

2 GEOPHYSICAL TECHNIQUES

This section presents background information on the magnetic method used during this investigation. A description of the geophysical method used during this investigation, common applications of the method, photographs of the instrument and example applications are included in Appendix A.

2.1 *Magnetic Method*

The magnetometer used during this investigation consisted of a Geometrics G-858 optically pumped cesium-vapor magnetometer (G-858). This instrument measures the intensity of the earth's magnetic field in nanoteslas (nT) and, optionally, the vertical gradient of the earth's magnetic field in nanoteslas per meter (nT/m). The vertical magnetic gradient is calculated by measuring the total magnetic field with two sensors at different heights, subtracting the top sensor reading from the bottom sensor reading and dividing by the sensor separation. The vertical magnetic gradient has better lateral resolution than total magnetic field measurements and is less sensitive to deep (e.g. geologic) structure.

The earth's magnetic field is believed to originate in convection currents in the earth's liquid outer core. The magnetic field varies in intensity from about 25,000 nT at the equator, where it is parallel to the earth's surface, to about 70,000 nT at the poles where it is perpendicular to the earth's surface. The intensity of the earth's magnetic field in North America varies from about 48,000 to 60,000 nT, and has an associated inclination that varies from about 60 to 75 degrees.

The earth's magnetic field undergoes low-frequency diurnal variations (drift) caused by the earth's rotation. The magnetic field can also undergo short-period, high-amplitude variations during periods of sunspot activity called magnetic storms. Often magnetic field intensity can be so variable during a magnetic storm that meaningful magnetic data cannot be acquired. When necessary to correct for magnetic drift, a base station magnetometer is set up in a quiet portion of the site and programmed to record total magnetic field intensity at fixed increments (i.e. 5-second intervals) throughout the day. This base station data is then used to remove the effects of drift from the field data. In small survey areas, where the data is acquired over a small amount of time and the anomalies have large amplitudes, correction for magnetic drift is not necessary.

Buried ferromagnetic objects give rise to local perturbations (anomalies) in the earth's magnetic field. There are two types of magnetic anomalies: an anomaly induced in an object or rock by the earth's magnetic field (induced magnetic anomaly) and an anomaly associated with remnant or permanent magnetism. In North America, the induced magnetic anomaly associated with an oil well consists of a very high amplitude, positive magnetic anomaly with the maximum response (peak) about 1- foot, or more, south of the well. In very rare cases, the conductor casing or oil well casing may have a permanent magnetism in the opposite direction of the earth's magnetic field, which, therefore subtracts from the induced magnetic field. If the permanent magnetic field associated with the well casing is stronger than the induced magnetic field then a negative magnetic anomaly may result. These cases have been

observed and documented on very few sites previously by **GEOVision** and such wells can be difficult to detect, especially in the presence of other subsurface infrastructure, due to the atypical nature of the magnetic response. Other buried ferrous metallic objects; such as pipes, drums, tanks and debris, generally give rise to dipolar anomalies with a positive response south of the object and a negative response north of the object. The dimensions and amplitude of a magnetic anomaly are a function of the size, mass, depth and magnetic properties of the source. The magnetic anomaly over a buried oil well often has a diameter of over 50 feet and amplitude of several thousand nanoteslas above background, depending on depth and casing characteristics. A magnetometer can typically locate an abandoned oil well to a depth of over 20 feet providing background noise levels are not too high and the well casing is not significantly corroded. Magnetometers are not able to detect nonferrous metals such as aluminum or brass.

Typical applications of the magnetic method include:

- Locating pits and trenches containing ferrous metallic debris
- Locating buried drums, tanks and pipes
- Delineating boundaries of landfills containing ferrous debris
- Locating abandoned steel well casing
- Detecting unexploded ordnance
- Mapping basement faults and geology
- Mapping archeological sites

Some advantages of magnetic surveys are:

- Rapid – modern instruments can acquire up to 10 readings per second as the operator walks down survey lines
- Depth of investigation – magnetometers can often locate buried ferrous metallic objects to greater depths than other methods
- Anomalies are much larger than the source allowing for larger line spacing in some situations

Some limitations of the magnetic surveys are:

- Unable to detect non-ferrous metals such as aluminum or brass
- Magnetic anomalies may be asymmetrical and much larger than the source and it can, therefore, be difficult to determine the precise locations and size of the source
- Ineffective in areas having extensive metallic debris at the surface, as no distinction can be made between anomalies caused by surface and buried debris
- Metallic structures such as buildings, fences, reinforced concrete and light posts interfere with the measurements
- High voltage power lines can often strongly interfere with the measurements
- Data can be very noisy in areas containing volcanic rock, specifically basalt

3 FIELD PROCEDURES

This section describes the field procedures used during the investigation, including site preparation and the magnetometer survey procedures.

3.1 Site Preparation

Bodies in Motion Parking Structure

MACTEC Engineering and Consulting, Inc. (now Amec) was unable to locate the suspected well location of “Wolfskill” 23 within the structure. The survey was conducted to cover the first floor of the parking structure, the alleyway on the eastern side of the structure and part of the road entering the structure. The area was visually inspected for anything that may interfere with the survey and, if possible, it was removed from the survey area. Afterwards, a 5- by 5-foot grid was marked on the ground within the survey area using surveyor paint and a 300 ft survey rope. The geophysical survey grid was not tied to the State Plane Coordinate System and is estimated to have an accuracy of about 2 feet. Obvious surface cultural features that could potentially affect the geophysical data (i.e. parking stops, cleanouts, etc.) were identified in the field and plotted onto a scaled, hand-drawn site map. A site map, transcribed from the hand-drawn site map showing the location of the geophysical survey area and surficial features is presented as Figure 1. A color contour map showing surface metallic objects and the geophysical anomalies is presented as Figure 2.

Area Northeast of Constellation Blvd and Ave of the Stars

Before conducting the geophysical investigation, the three of the suspected well locations in area were marked by GEOVision and a representative from MACTEC Engineering and Consulting, Inc. (now Amec). The magnetometer was used in conjunction with a Trimble ProXRS GPS system with OmniSTAR real-time, submeter differential corrections as discussed below. GPS data were collected in the geodetic coordinate system and then converted to California State Plane, NAD83, Zone V (0405) in US Survey Feet during data processing. Data were not collected in areas where there were surface obstructions or other limiting features, such as standing water or where the GPS did not have sufficient satellite coverage. Obvious surface cultural features that could potentially affect the geophysical data (e.g. vaults, walls and other surface metallic objects) were identified in the field and their positions recorded using the submeter GPS system. A site map, showing the extents of the geophysical survey, geophysical anomalies and an aerial photo of the site is presented as Figure 3. A color contour map showing surface metallic objects and the geophysical anomalies is presented as Figure 4.

3.2 Geometrics G-858 Survey

Gridded Survey

Prior to data acquisition, the G858 was programmed with the appropriate sampling interval and grid settings. Measurements of the earth's total magnetic field intensity and vertical gradient data were made with the G-858 at 0.2-second intervals as the operator walked along parallel south to north (S-N) survey lines spaced 5 feet apart. A marker was inserted in the

data as the operator crossed a 5 ft grid mark. The 0.2-second sampling interval resulted in an average station spacing of about 0.5 feet. The magnetic data were stored in the internal memory of the magnetometer along with time of measurement. If an error was made on a survey line (wrong survey line, etc.), the line was repeated. Magnetic data were downloaded to a laptop computer at the end of the survey using the program MAGMAP 2000 by Geometrics, Inc.

GPS Based Survey

Prior to data acquisition, the G-858 was programmed with the appropriate sampling interval and GPS input settings. Measurements of the earth's total magnetic field and vertical magnetic gradient were made in accessible areas at 0.2-second intervals as the operator walked along approximately south to north (S-N) survey lines nominally spaced 7.5 feet apart. A Trimble ProXRS GPS system with OmniSTAR differential corrections was used for spatial control. Real-time submeter corrections were input every second into the data collector of the magnetometer using a serial cable and a GGA NMEA stream GPS output. The magnetic data were stored in the internal memory of the magnetometer, along with GPS statistics and location data. If a location error was made on a survey line (large data gap, etc.) the line was repeated to attain desired coverage. Magnetic data were downloaded to a laptop computer at the end of the survey using the program MAGMAP 2000 by Geometrics, Inc.

4 DATA PROCESSING AND INTERPRETATION

This section presents the data processing procedures and interpretation of the geophysical data.

4.1 Data Processing

Color-enhanced contour maps of the magnetic data were generated using the GEOSOFT® Oasis montaj™ geophysical mapping system. The maps were color-enhanced to aid in the interpretation of subtle anomalies. Prior to map generation, a number of preprocessing steps were completed and included:

- Backup of all original field data files to computer.
- Correcting of all data acquisition errors (typically removing null data and erroneous GPS points, if applicable).
- Reformatting field data files to free format XYZ files containing at a minimum GPS time and field measurements.
- Merging GPS position data and geophysical data using commercial and in-house software, if applicable.
- Merging of multiple data files into a single file and sorting, if necessary.
- Converting of data files to State Plane northings and eastings, if applicable.

These data adjustments were made using commercial software. All adjustments made to data files and resulting file names were documented and are retained in project files. The outputs of the data preprocessing were data files containing the various data measurements. The magnetic data file contained total field and vertical gradient response.

Data processing steps included the following:

- Reformatting of data files to GEOSOFT® format.
- Generating final map scale.
- Gridding data using down- and cross-line splines or minimum curvature.
- Masking grid in areas where data not acquired (i.e. around site perimeter or building).
- Applying Hanning filter to smooth the data, as necessary.
- Generating color zone file describing color for different data ranges.
- Contouring the data.
- Generating map surrounds (title block, legend, scale, color bar, north arrow, etc.).
- Annotating anomalies.
- Merging various plot files and plotting final map.

The names of the files generated and the processing parameters used were documented and are retained in project files. All files generated during the processing sequence were archived on a backup drive.

4.2 Interpretation

Color-enhanced contour maps of the total magnetic field response generated for each area (the Bodies in Motion Parking Structure and the lot NE of Constellation Blvd and Ave of the Stars) are presented as Figures 2 and 4, respectively. The coordinates shown on the color-enhanced contour map of total magnetic field response of the Bodies in Motion parking structure (Figure 2) reference the relative geophysical grid are not tied to the State Plane coordinate system. The coordinates shown on the total magnetic field color-enhanced contour map for the lot NE of Constellation Blvd and Ave of the Stars reference the California State Plane 1983, NAD83, Zone V (0405) coordinate system, in US Survey Feet. Color-enhanced contour maps of the magnetic vertical gradient data were also generated but are not presented as they did not reveal additional information and were, therefore, considered redundant. The color bar indicates the amplitude of the measured quantity with the magenta and cyan colors representing high and low amplitudes, respectively. The light orange, yellow and light green colors indicate average "background" values of the measured quantity.

An example magnetic anomaly from an oil well is presented in Appendix A. The typical magnetic anomaly characteristics of an oil well are: a monopolar response (large positive peak with only a minor negative response to the north); a large diameter anomaly (50 to 100 ft typical) and a large amplitude for shallow wells. However, in very rare cases, a monopolar, magnetic low have been observed for an oil well response. In these cases, the permanent magnetic field of the oil well casing is stronger than the induced magnetic field and a magnetic low is observed.

4.2.1 Bodies in Motion Parking Structure

The color-enhanced contour map of the total magnetic field response is presented as Figure 2. No abandoned oil well anomalies are interpreted in the magnetic data. The site consisted of a multi-story parking structure with reinforced concrete, parking stops and other metallic debris. Typically, an area with both reinforcement in the floor and ceiling will have a severe impact on the ability of the magnetometer to resolve subsurface structures. However, a very strong anomaly, such as one for a shallow (within 5 ft depth) oil well, may be able to be imaged regardless of the significant surrounding infrastructure. Only one sizable anomaly was interpreted in the magnetic data. The anomaly is linear in nature and is located approximately 81E, 63N to 130E, 55N. There are two cleanouts in the area that may be related to this anomaly and is suspected to be a subsurface utility or other subsurface linear structure. There is no anomaly in the magnetic data that bears the typical response of a steel-cased, abandoned oil well. However, it cannot be fully discounted that the significant metallic structures may be masking any magnetic response of a steel-cased, abandoned oil well in area.

4.2.2 Lot NE of Constellation Blvd and Ave of the Stars

The color-enhanced contour map of the total magnetic field response is presented as Figure 4. Using the coordinates in the DOGGR online database, three wells were suspected to be in the right of way of the proposed subway extension. For reference, the additional, suspected well locations in the same area, were also included on both the site map (Figure 3) and the

total magnetic field response contour map (Figure 4). Several abandoned oil wells were located in the magnetic data. Anomalies were also observed to the north of the survey area and therefore, the survey area was extended in an attempt to characterize the additional anomalies. The survey was not continued north of the original survey area where there were surface obstructions, such as standing water. No attempt was made to differentiate each individual well anomaly, since the wells were located in close proximity to one another and the well bank was outside of the proposed subway right of way. Using the total magnetic field response (Figure 4) and the vertical gradient response (not presented), three areas of abandoned oil well locations were interpreted. Additional abandoned oil wells part of the same bank, may be located north of the survey area. The area located on the northeast corner of Constellation Blvd and Ave of the Stars is considered to be the area of most concern. According to the DOGGR online database, three abandoned oil wells (API No. 03716548, 03716549 and 03716453) may be located in the proposed subway right of way. However, only one anomaly was interpreted in that area and is likely related to large utility vaults. This anomaly does not bear the typical response of one or more steel-cased abandoned oil wells.

5 CONCLUSIONS

A geophysical survey was conducted at the Bodies in Motion Parking Structure and at a lot northeast of Constellation Blvd and Ave of the Stars. The purpose of the survey was to screen both areas for suspected abandoned, steel-cased oil wells in the alignment right of way of the MTA Westside Extension.

Abandoned oil well, “Wolfskill” 23 was suspected to be located in the vicinity of the Bodies in Motion Parking Garage (Figure 1). A suspect location of “Wolfskill” 23 could not be marked out preceding the geophysical survey. The first floor of the parking structure, part of the alley east of the structure and part of the asphalt road west of the structure were included in the survey. No well-like anomalies were interpreted in the geophysical data for the Bodies in Motion Parking Garage (Figure 2). However, there was significant interference from the existing structure that may have masked a typical oil well response. Regardless, a shallow (5 ft deep) oil well within the survey area is expected to present with an interpretable response, even within the parking structure, as surveyed.

Three abandoned oil wells on the northeast corner of Constellation Blvd and Ave of the Stars were suspected to be located in the proposed right of way for the subway extension (Figure 3). These three wells were part of a larger bank of wells in the area. Several oil well anomalies were interpreted in the geophysical section for the area. However, there were no significant well-like anomalies located in the proposed right of way of the subway extension. No attempt was made to further characterize each well located, as the wells were outside the area of interest.

The geophysical survey was designed to map abandoned wells with ferrous metallic pipe in the upper 10 feet. It is our opinion that the geophysical survey was appropriately designed to locate such objects less than about 15 feet deep; except in portions of the survey area where data were affected by surface structures, such as reinforced concrete, utility corridors, obstructing foliage and other large surface metallic objects.

6 CERTIFICATION

All geophysical data, analysis, interpretations, conclusions and recommendations in this document have been prepared under the supervision of and reviewed by a **GEOVision** California Professional Geophysicist.

Prepared by



07/13/11

William Dalrymple
Sr. Project Geophysicist
GEOVision Geophysical Services

Date

Reviewed and approved by



07/13/11

Antony Martin
California Professional Geophysicist, P.GP 989
GEOVision Geophysical Services

Date

- * This geophysical investigation was conducted under the supervision of a California Professional Geophysicist using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

A professional geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

- ## FIGURES

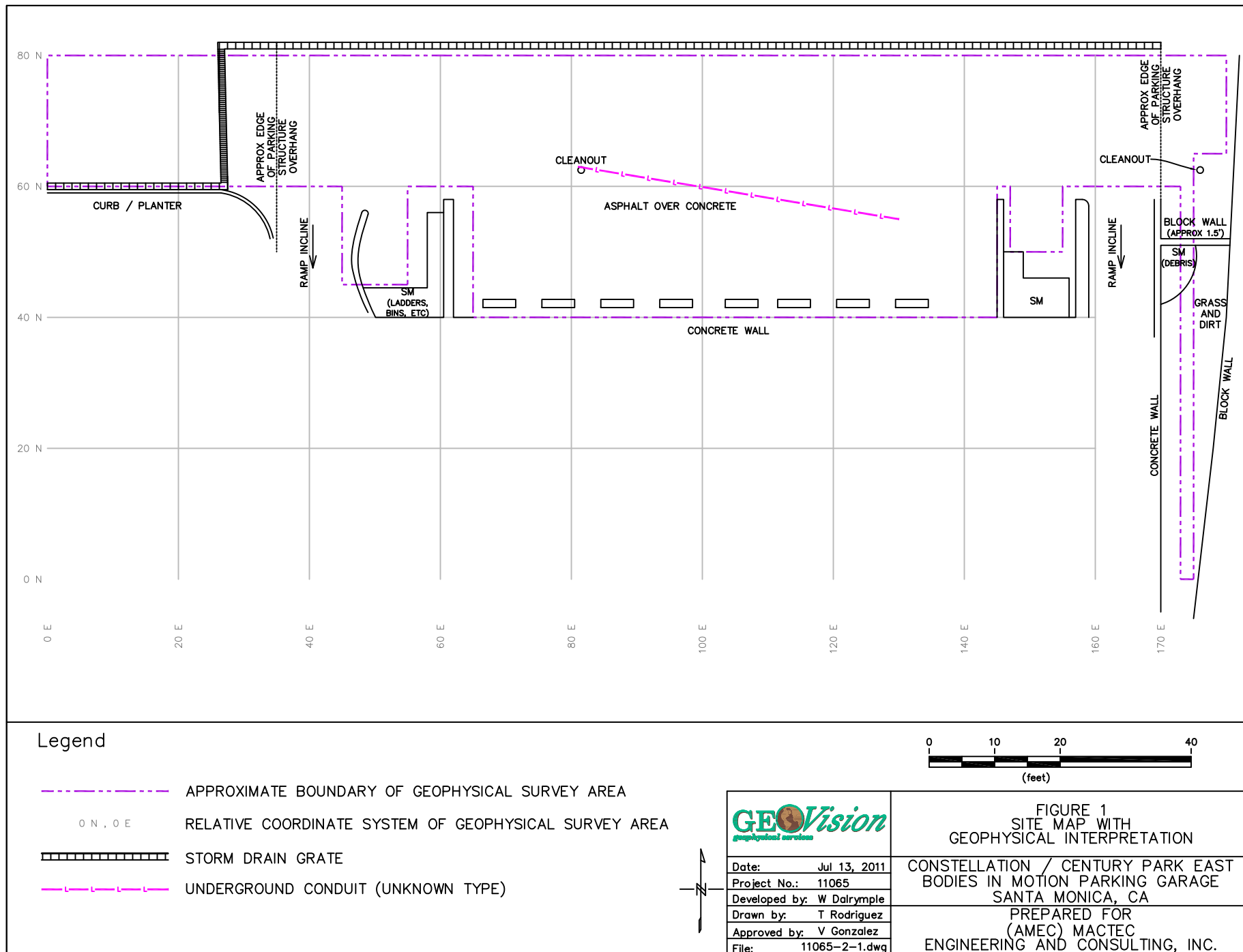
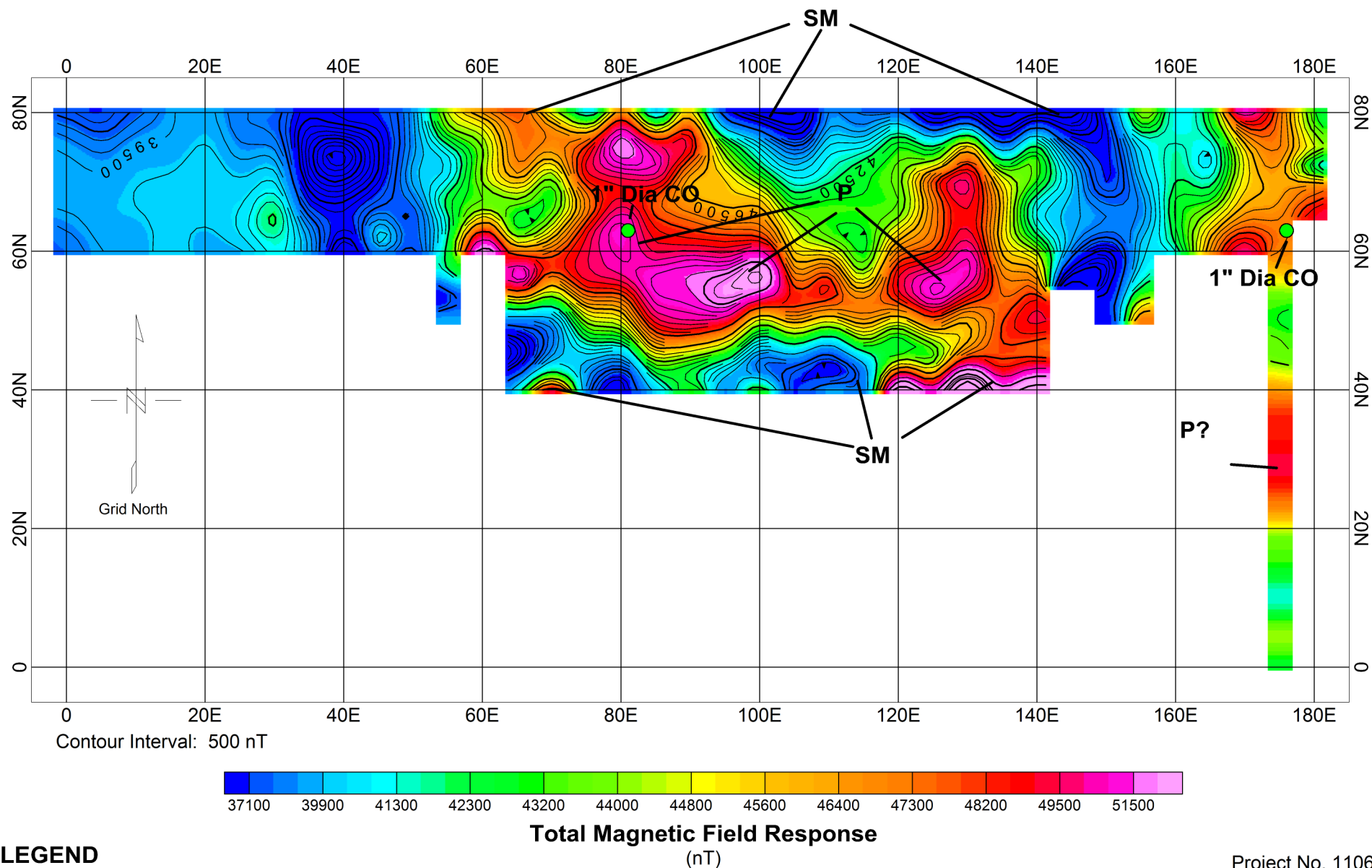


Figure F-2.39



LEGEND

- SM** Surface Metallic Object
- P** Interpreted Underground Utility/Pipe
or other Linear Feature



Note: A DOGGR well location was not marked preceding this survey.

Project No. 11065

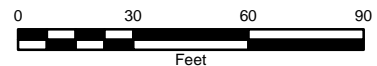
	Figure 2
	Bodies in Motion Parking Garage Total Magnetic Field Data
	Near Constellation Blvd and Century Park E Santa Monica, California
	Prepared for Amec Mactec

Figure F-2.40



Legend

- Approximate Boundary of Geophysical Survey Area
- DOGGR Oil Well Location with API No.
- Possible Oil Well Locations



NOTES:

1. CALIFORNIA STATE PLANE COORDINATE SYSTEM, NAD 83 ZONE V (0405) US FEET
2. Image Source: ESRI, i-cubed, USDA FSA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGP



Date:	7/14/2011
GV Project:	11065-2
Developed by:	W Dalrymple
Drawn by:	T Rodriguez
Approved by:	V Gonzalez
File Name:	11065-2-3.MXD

**FIGURE 3
SITE MAP**

**CONSTELLATION / AVE OF THE STARS
SANTA MONICA, CA**

**PREPARED FOR
(AMEC) MACTEC
ENGINEERING AND CONSULTING, INC.**

Figure F-2.41

- ## APPENDICES

MAGNETIC METHOD



The magnetic method involves the measurement of the earth's magnetic field intensity. Typically the total magnetic field and/or vertical magnetic gradient is measured. Measurements of the horizontal or vertical component or horizontal gradient of the magnetic field may also be made.

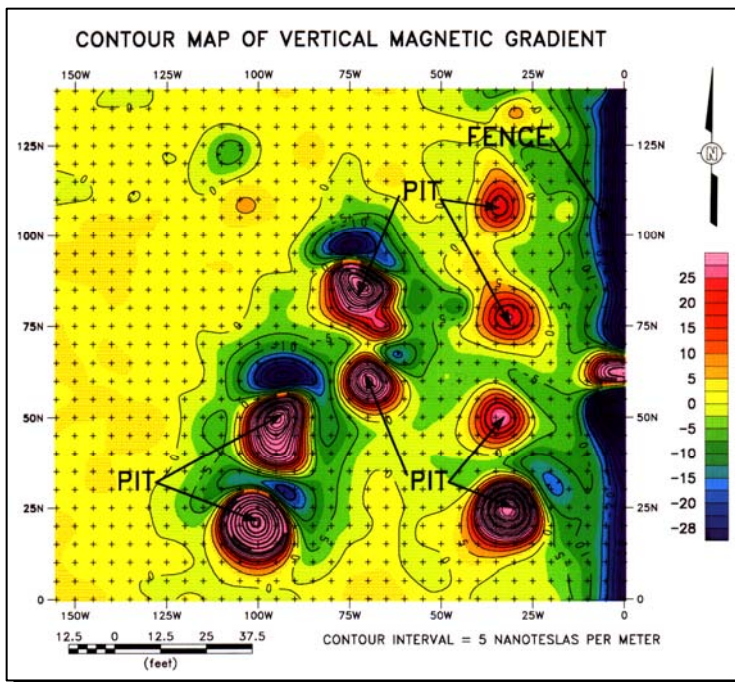
Anomalies in the earth's magnetic field are caused by induced or remanent magnetism. Induced magnetic anomalies are the result of secondary magnetization induced in a ferrous body by the earth's magnetic field. The shape, dimensions, and amplitude of an induced magnetic anomaly is a function of the orientation, geometry, size, depth, and magnetic susceptibility of the body as well as the intensity and inclination of the earth's magnetic field in the survey area. Buried ferrous metallic objects, such as pipes, drums, tanks, and debris generally give rise to dipolar anomalies with a positive response south and a negative response north of the object. The magnetic method is an effective way to search for small metallic objects because magnetic anomalies have spatial dimensions much larger than those of the objects. An oil well typically gives rise to a monopolar anomaly with a very high amplitude, positive peak several feet south of the well and a low amplitude, broad negative response to the north. The magnetic anomaly over a buried oil well often has a diameter of over 50 feet and amplitude of several thousand nanoteslas, depending on depth and casing characteristics. Magnetometers can typically locate an abandoned oil well to depths of over 20 feet providing that background noise levels are not too high and the well casing is not significantly corroded. Magnetometers are not able to detect nonferrous metals such as aluminum and brass.



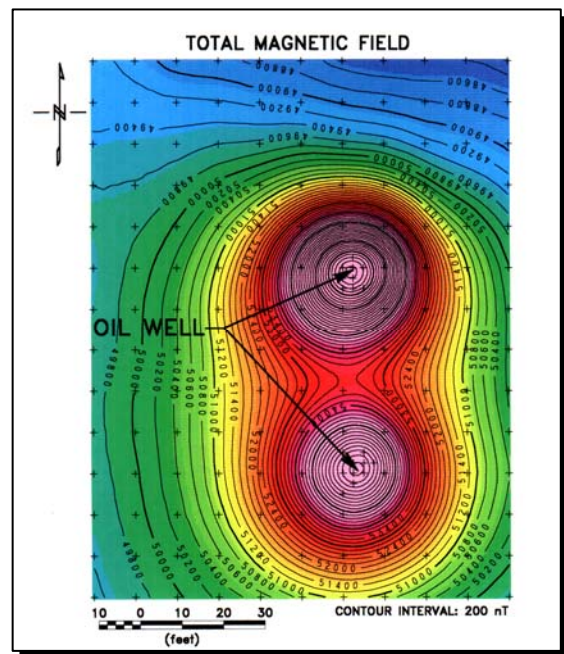
Geometrics G-858 Magnetometer

The magnetic method is typically used to:

- Locate abandoned steel well casings
- Locate buried tanks and pipes
- Locate pits and trenches containing buried metallic debris
- Detect buried unexploded ordnance (UXO)
- Map old waste sites and landfill boundaries
- Clear drilling locations
- Map basement faults and geology
- Investigate archaeological sites



Magnetic Survey to Locate Pits Containing Buried Metallic Containers



Magnetic Survey to Locate Abandoned Oil Wells

1124 Olympic Drive, Corona, California 92881, ph. 951-549-1234, fx. 951-549-1236, www.geovision.com

APPENDIX G PRESSUREMETER TEST REPORTS

Appendix G

Figure G-1: Pressuremeter Test Reports (PE and Adv. PE Phase)



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-131
 Test date: 04/26/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 33.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	DR/R ₀ %
0	0.0	15	0.0	0.00
3	9.9	15	9.9	4.48
4	14.9	16	14.8	6.65
5	19.6	17	19.5	8.67
7	22.0	19	21.9	9.69
12	24.4	23	24.4	10.72
17	26.9	28	26.8	11.73
22	29.3	33	29.2	12.72
30	31.9	42	31.8	13.75
42	34.2	53	34.1	14.69
52	36.6	63	36.5	15.65
59	39.1	69	38.9	16.63
65	41.6	75	41.4	17.61
69	43.9	79	43.7	18.52
73	46.4	83	46.2	19.49
76	48.8	86	48.6	20.41
80	51.5	90	51.2	21.43
83	53.7	93	53.4	22.26

Test Results	
Pressiometric modulus E:	1,551 psi
Ultimate pressure P _L :	165 psi
Ratio E / P _L :	9.41
Yield pressure P _F :	63 psi
Ratio P _L / P _F :	2.61

Calibration Sheet Reference

Remarks

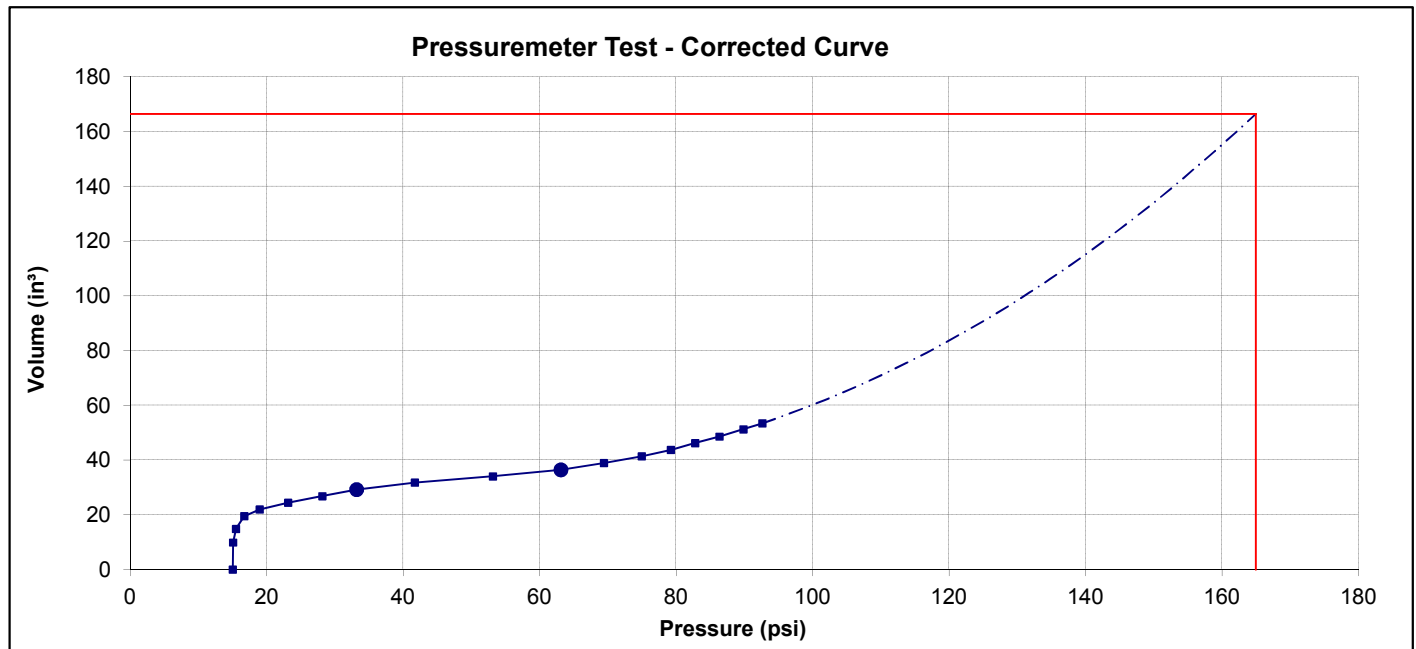


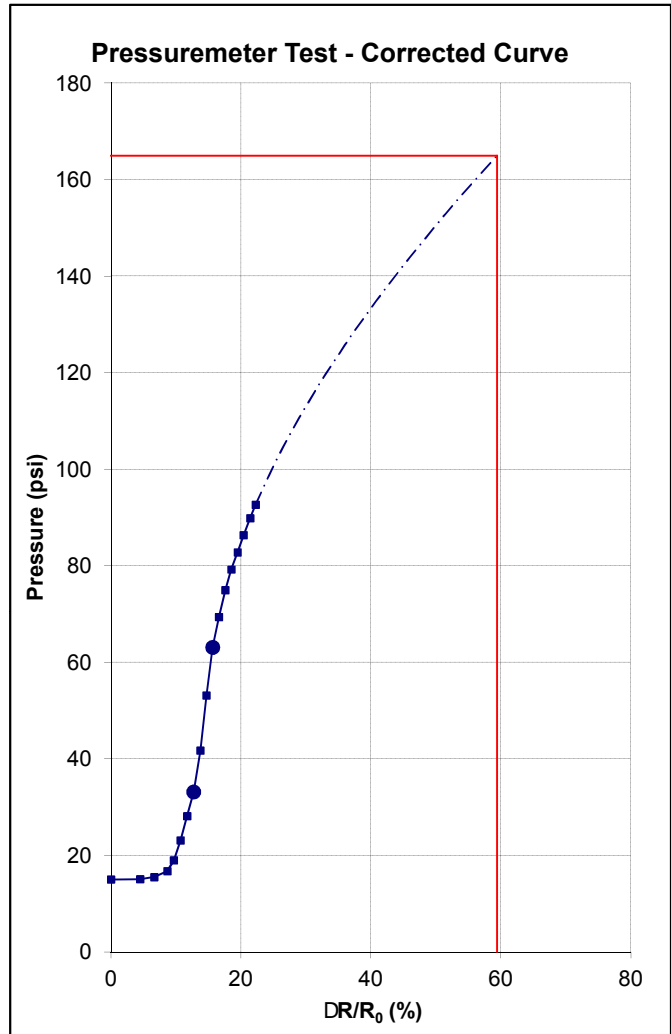
Figure G-1.1

TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-131
 Test date: (mm/dd/yyyy) 04/26/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 33.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	DR/R ₀ %
0	0.0	15	0.0	0.00
3	9.9	15	9.9	4.48
4	14.9	16	14.8	6.65
5	19.6	17	19.5	8.67
7	22.0	19	21.9	9.69
12	24.4	23	24.4	10.72
17	26.9	28	26.8	11.73
22	29.3	33	29.2	12.72
30	31.9	42	31.8	13.75
42	34.2	53	34.1	14.69
52	36.6	63	36.5	15.65
59	39.1	69	38.9	16.63
65	41.6	75	41.4	17.61
69	43.9	79	43.7	18.52
73	46.4	83	46.2	19.49
76	48.8	86	48.6	20.41
80	51.5	90	51.2	21.43
83	53.7	93	53.4	22.26



Calibration Sheet Reference

Test Results

Pressiometric modulus E: 1,551 psi
 Ultimate pressure P_L: 165 psi
 Ratio E / P_L: 9.41
 Yield pressure P_F: 63 psi
 Ratio P_L / P_F: 2.61

Remarks



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-131
 Test date: 04/26/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 43.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	DR/R ₀ %
0	0.0	19	0.0	0.00
3	4.9	20	4.9	2.23
6	9.9	23	9.9	4.47
8	14.7	24	14.6	6.56
10	17.1	26	17.1	7.61
13	19.7	29	19.7	8.73
17	22.0	33	21.9	9.68
23	24.4	39	24.3	10.70
29	26.9	45	26.8	11.71
40	29.4	56	29.2	12.72
51	31.7	67	31.6	13.68
67	34.2	82	34.0	14.67
77	36.7	92	36.4	15.64
86	39.1	101	38.8	16.58
95	41.5	110	41.2	17.54
104	44.0	118	43.7	18.50
110	46.4	125	46.0	19.42
117	48.8	131	48.4	20.35
123	51.3	137	50.9	21.28
127	53.7	141	53.3	22.21
131	56.2	145	55.8	23.14
137	58.9	151	58.4	24.13

Test Results	
Pressiometric modulus E:	1,880 psi
Ultimate pressure P _L :	242 psi
Ratio E / P _L :	7.78
Yield pressure P _F :	82 psi
Ratio P _L / P _F :	2.94

Calibration Sheet Reference

Remarks

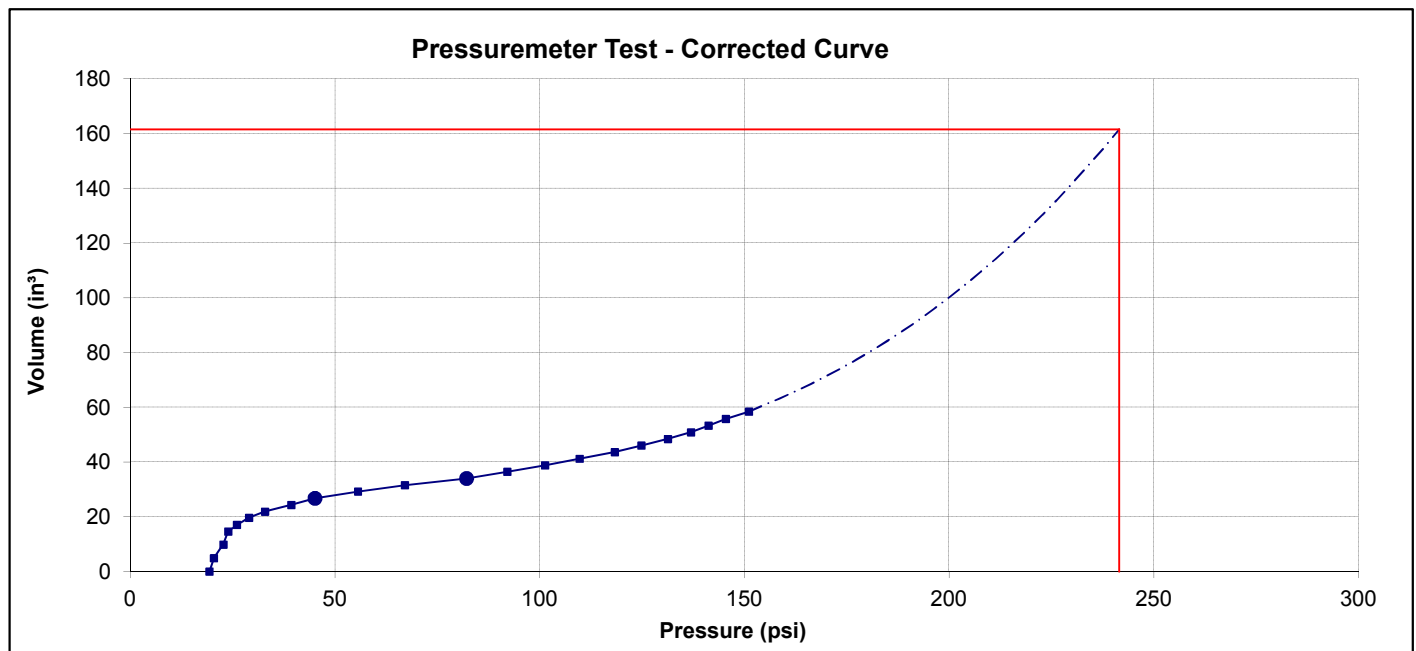


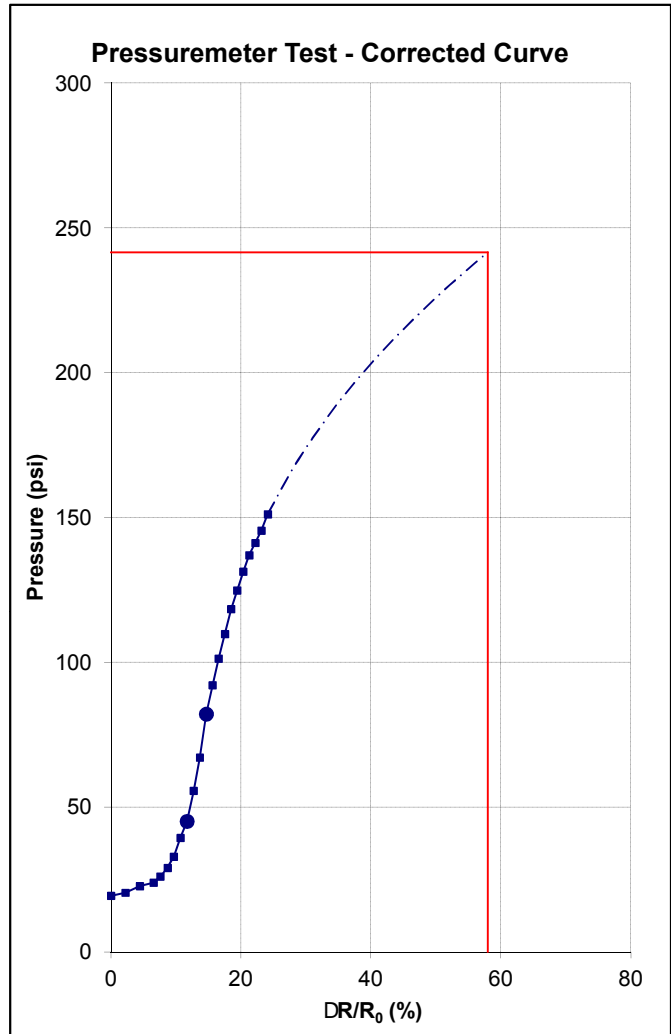
Figure G-1.3

TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-131
 Test date: (mm/dd/yyyy) 04/26/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 43.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	DR/R ₀ %
0	0.0	19	0.0	0.00
3	4.9	20	4.9	2.23
6	9.9	23	9.9	4.47
8	14.7	24	14.6	6.56
10	17.1	26	17.1	7.61
13	19.7	29	19.7	8.73
17	22.0	33	21.9	9.68
23	24.4	39	24.3	10.70
29	26.9	45	26.8	11.71
40	29.4	56	29.2	12.72
51	31.7	67	31.6	13.68
67	34.2	82	34.0	14.67
77	36.7	92	36.4	15.64
86	39.1	101	38.8	16.58
95	41.5	110	41.2	17.54
104	44.0	118	43.7	18.50
110	46.4	125	46.0	19.42
117	48.8	131	48.4	20.35
123	51.3	137	50.9	21.28
127	53.7	141	53.3	22.21
131	56.2	145	55.8	23.14
137	58.9	151	58.4	24.13



Calibration Sheet Reference

Test Results

Pressiometric modulus E: 1,880 psi
 Ultimate pressure P_L: 242 psi
 Ratio E / P_L: 7.78
 Yield pressure P_F: 82 psi
 Ratio P_L / P_F: 2.94

Remarks



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-144
 Test date: 05/31/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 23.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	11	0.0	0.00
1	2.3	11	2.3	1.07
1	4.8	11	4.8	2.19
2	7.2	11	7.2	3.28
3	9.7	11	9.7	4.38
5	12.1	13	12.1	5.44
9	14.5	17	14.5	6.50
13	17.0	21	16.9	7.56
19	19.4	27	19.4	8.59
30	22.0	38	21.9	9.68
47	24.3	55	24.1	10.60
68	26.8	76	26.5	11.60
19	24.3	27	24.2	10.65
62	26.7	70	26.5	11.60
87	29.2	94	28.9	12.58
102	31.6	108	31.2	13.54
112	34.1	118	33.7	14.52
120	36.5	127	36.0	15.49
129	38.9	135	38.5	16.45
136	41.4	143	40.9	17.41
144	43.8	150	43.3	18.36
149	46.3	156	45.7	19.31
154	48.7	160	48.1	20.24
160	51.2	166	50.5	21.16

Test Results	
Pressiometric modulus E:	2,845 psi
Ultimate pressure P_L :	246 psi
Ratio E / P_L :	11.56
Yield pressure P_F :	94 psi
Ratio P_L / P_F :	2.62

Calibration Sheet Reference

Remarks

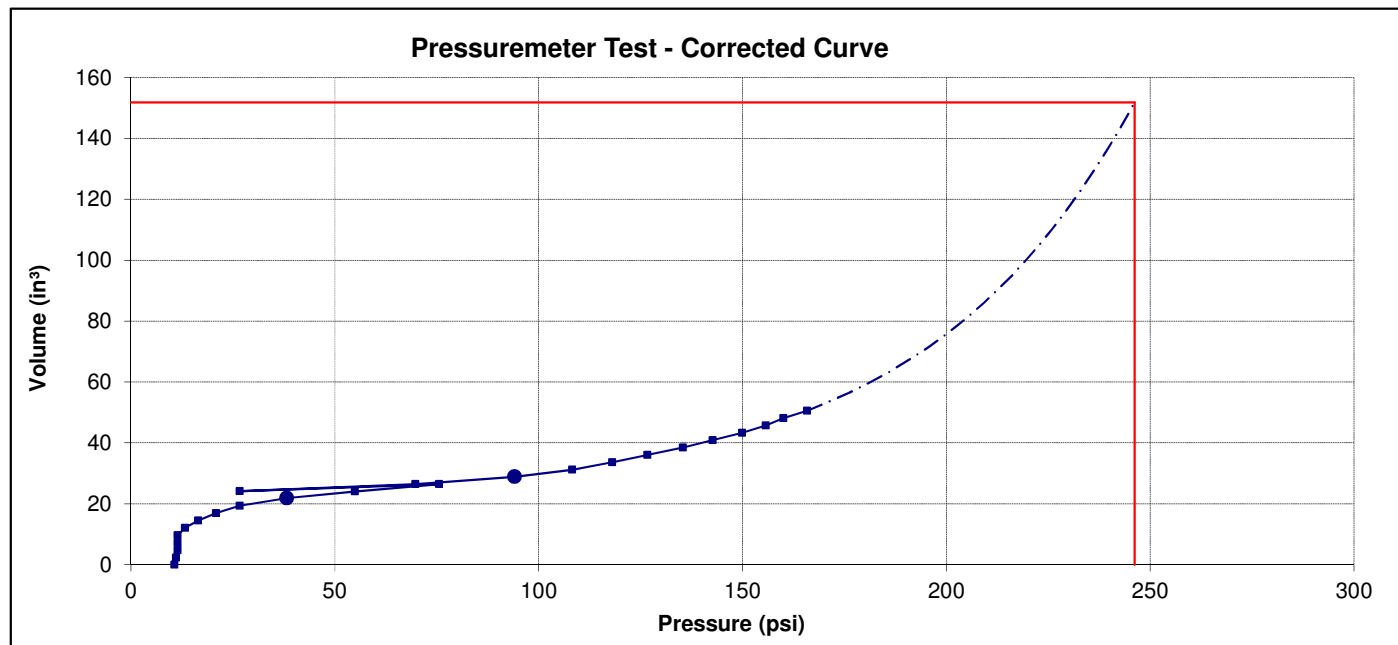


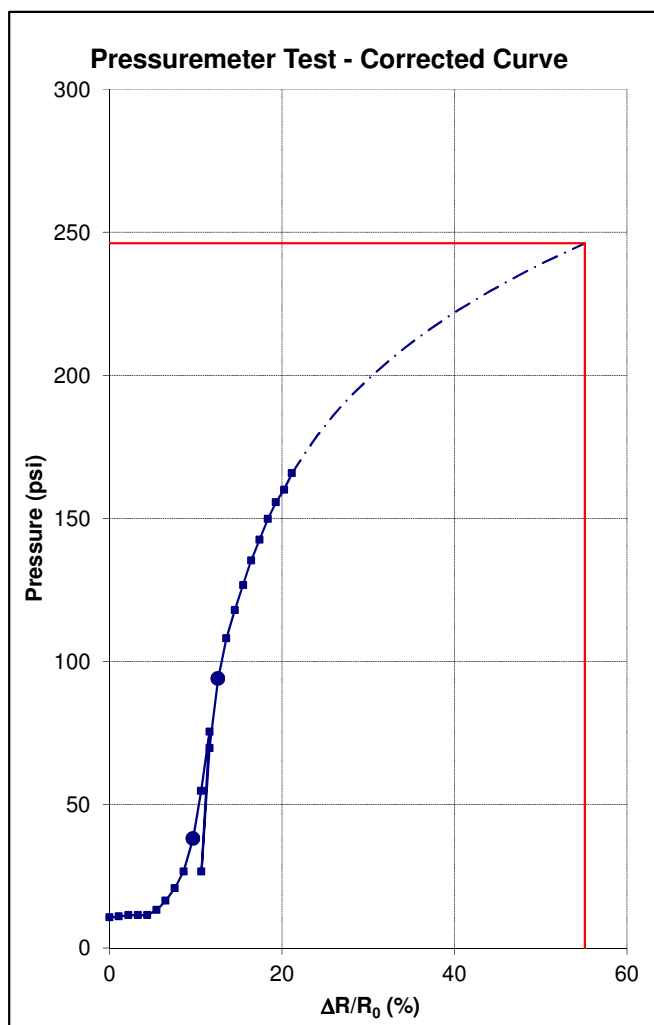
Figure G-1.5

TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-144
 Test date: (mm/dd/yyyy) 05/31/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 23.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	11	0.0	0.00
1	2.3	11	2.3	1.07
1	4.8	11	4.8	2.19
2	7.2	11	7.2	3.28
3	9.7	11	9.7	4.38
5	12.1	13	12.1	5.44
9	14.5	17	14.5	6.50
13	17.0	21	16.9	7.56
19	19.4	27	19.4	8.59
30	22.0	38	21.9	9.68
47	24.3	55	24.1	10.60
68	26.8	76	26.5	11.60
19	24.3	27	24.2	10.65
62	26.7	70	26.5	11.60
87	29.2	94	28.9	12.58
102	31.6	108	31.2	13.54
112	34.1	118	33.7	14.52
120	36.5	127	36.0	15.49
129	38.9	135	38.5	16.45
136	41.4	143	40.9	17.41
144	43.8	150	43.3	18.36
149	46.3	156	45.7	19.31
154	48.7	160	48.1	20.24
160	51.2	166	50.5	21.16



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 2,845 psi
 Ultimate pressure P_L : 246 psi
 Ratio E / P_L : 11.56
 Yield pressure P_F : 94 psi
 Ratio P_L / P_F : 2.62



Use of a slotted casing:	No
Test depth:	53.00 ft
Manometer height above ground:	1.64 ft
Poisson's coefficient:	0.33
Fluid density:	1.000

[illegible]

Test Results	
Pressiometric modulus E:	2,509 psi
Ultimate pressure P_L :	167 psi
Ratio E / P_L :	15.07
Yield pressure P_F :	81 psi
Ratio P_L / P_F :	2.05

Calibration Sheet Reference

Remarks	

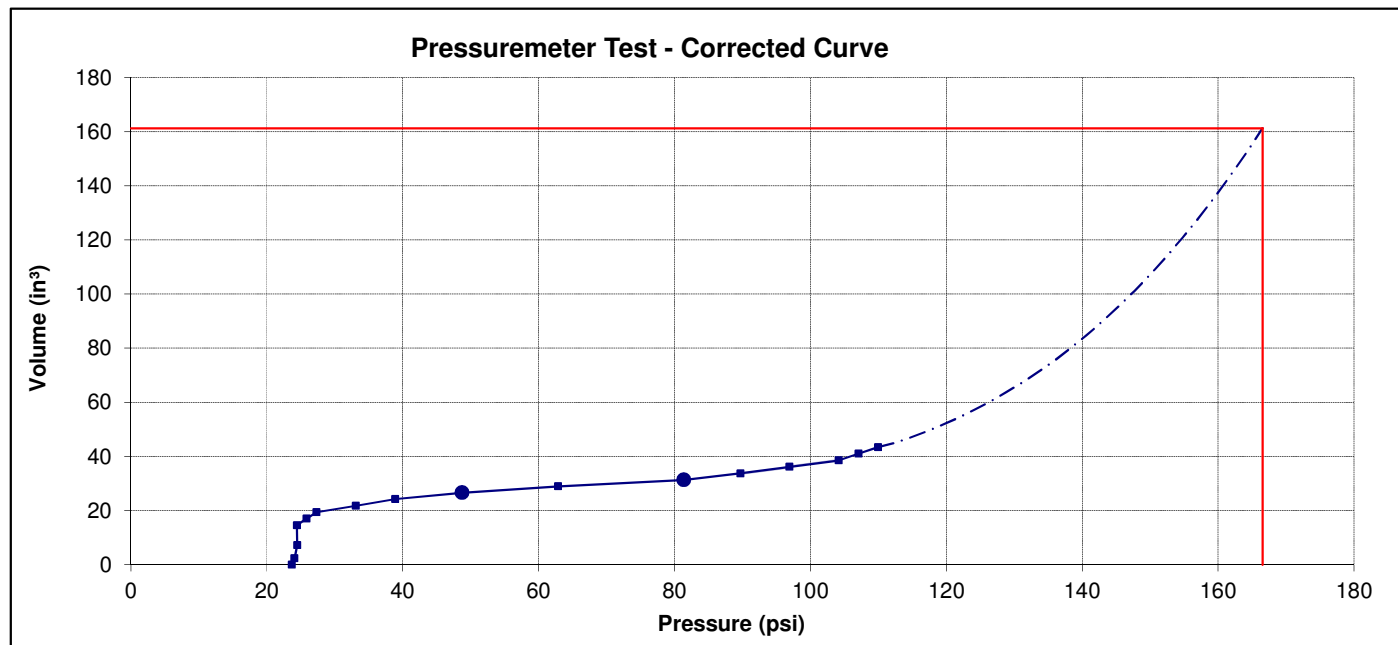


Figure G-1.7



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-144
 Test date: 06/01/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 63.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	28	0.0	0.00
1	2.4	29	2.4	1.12
3	4.9	30	4.9	2.22
4	7.3	31	7.3	3.33
6	9.8	32	9.7	4.41
7	12.2	33	12.2	5.48
12	14.7	37	14.6	6.56
20	17.1	45	17.0	7.59
42	19.5	67	19.4	8.59
78	22.0	103	21.6	9.56
116	24.4	141	23.9	10.53
154	26.9	179	26.2	11.49
186	29.3	210	28.5	12.44
212	31.7	236	30.9	13.39
231	34.2	254	33.3	14.36
248	36.6	272	35.6	15.31
263	39.1	286	38.0	16.27
274	41.5	298	40.4	17.21
284	43.9	308	42.8	18.16
293	46.4	317	45.2	19.09
300	48.8	324	47.6	20.03
307	51.2	331	50.0	20.95
313	53.7	337	52.5	21.89

Test Results	
Pressiometric modulus E:	5,622 psi
Ultimate pressure P_L :	442 psi
Ratio E / P_L :	12.71
Yield pressure P_F :	179 psi
Ratio P_L / P_F :	2.48

Calibration Sheet Reference

Remarks

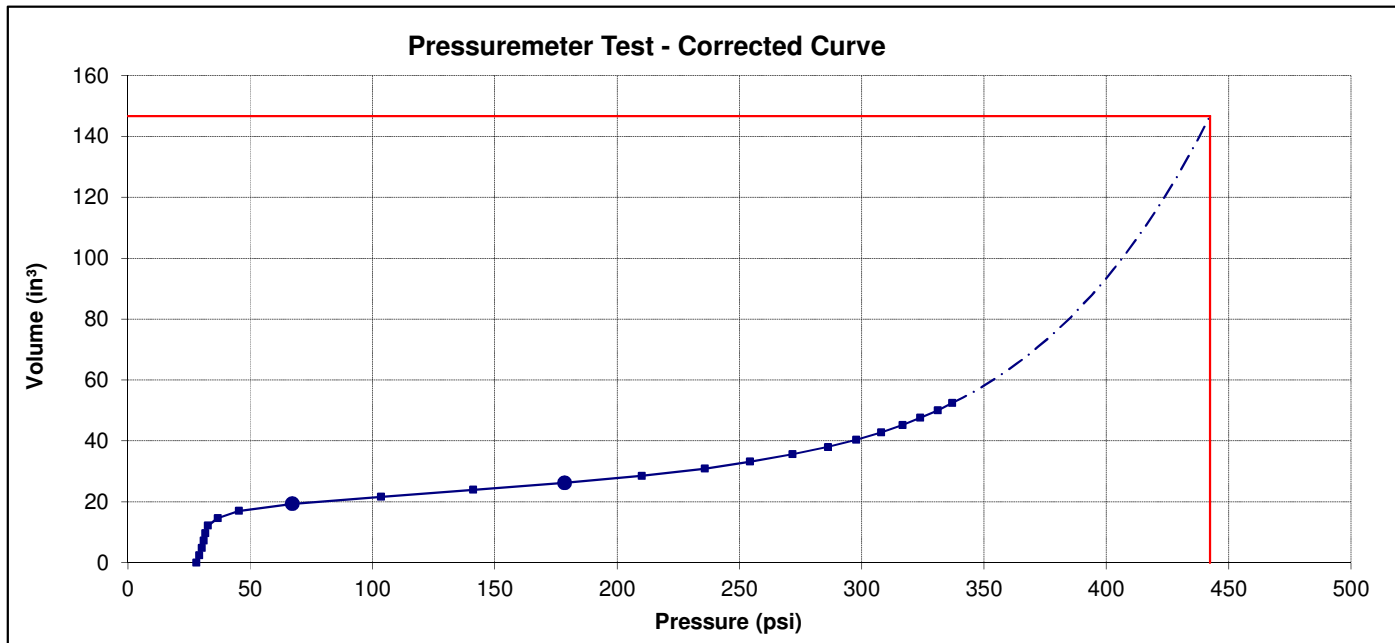


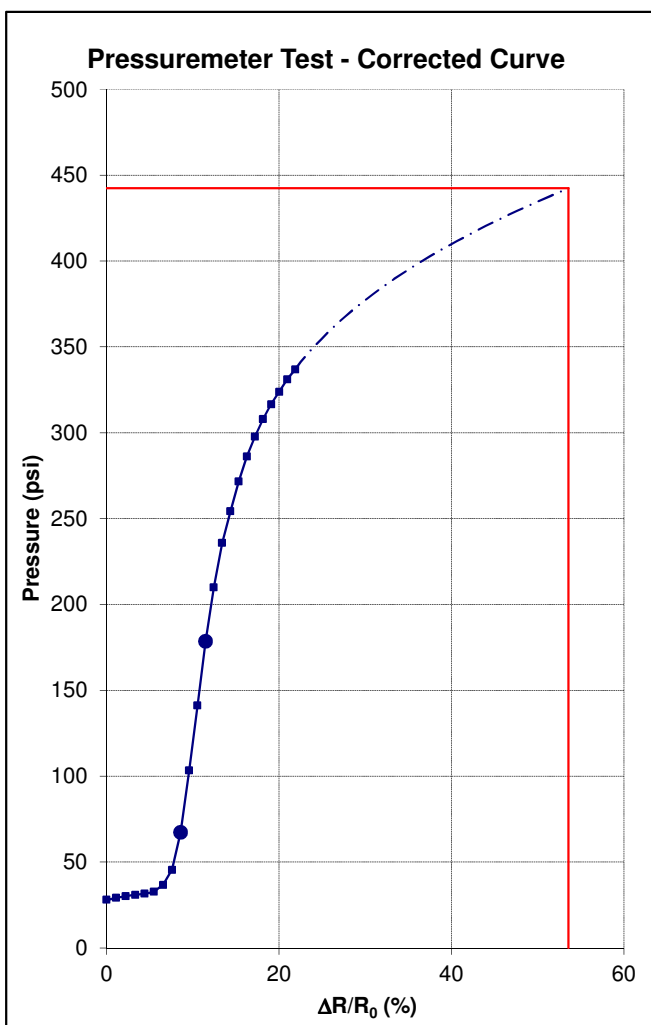
Figure G-1.9

TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-144
 Test date: (mm/dd/yyyy) 06/01/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 63.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	28	0.0	0.00
1	2.4	29	2.4	1.12
3	4.9	30	4.9	2.22
4	7.3	31	7.3	3.33
6	9.8	32	9.7	4.41
7	12.2	33	12.2	5.48
12	14.7	37	14.6	6.56
20	17.1	45	17.0	7.59
42	19.5	67	19.4	8.59
78	22.0	103	21.6	9.56
116	24.4	141	23.9	10.53
154	26.9	179	26.2	11.49
186	29.3	210	28.5	12.44
212	31.7	236	30.9	13.39
231	34.2	254	33.3	14.36
248	36.6	272	35.6	15.31
263	39.1	286	38.0	16.27
274	41.5	298	40.4	17.21
284	43.9	308	42.8	18.16
293	46.4	317	45.2	19.09
300	48.8	324	47.6	20.03
307	51.2	331	50.0	20.95
313	53.7	337	52.5	21.89



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 5,622 psi
 Ultimate pressure P_L : 442 psi
 Ratio E / P_L : 12.71
 Yield pressure P_F : 179 psi
 Ratio P_L / P_F : 2.48



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: B-150
 Test date: 02/01/2011
 Test number: 1
 Probe size: N

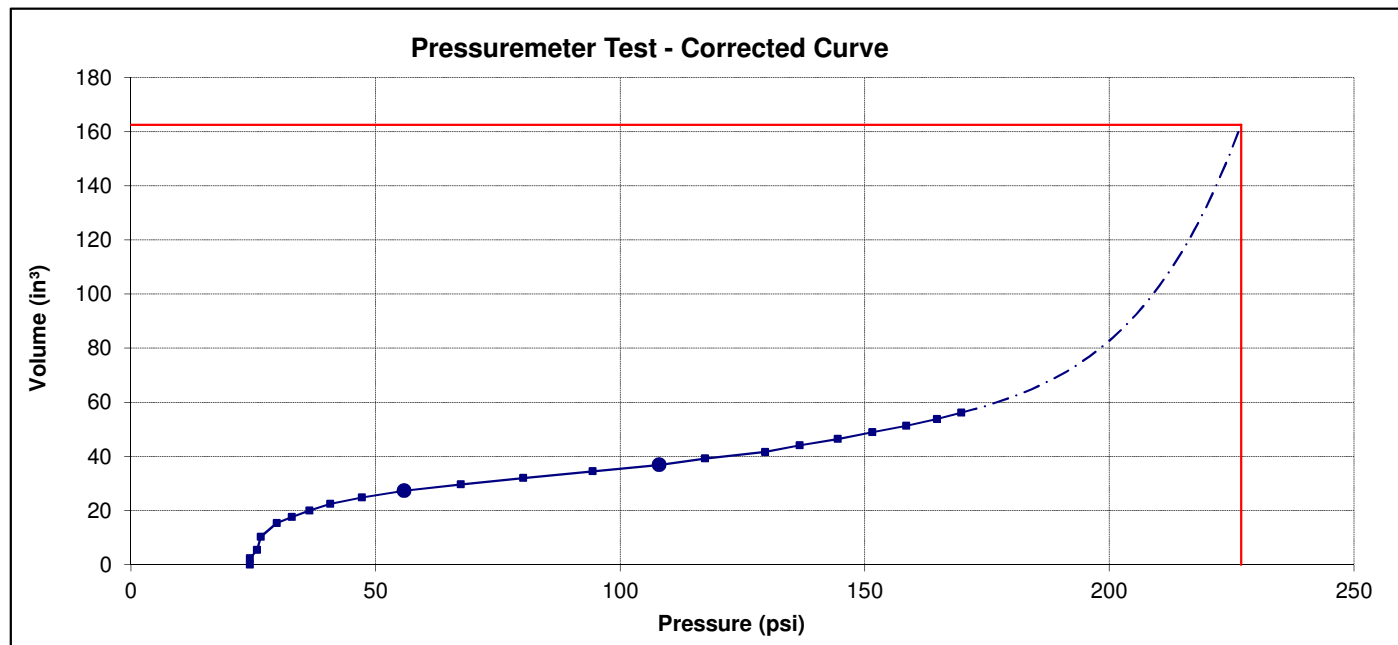
Use of a slotted casing: No
 Test depth: 54.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	24	0.0	0.00
0	2.4	24	2.4	1.10
2	5.4	26	5.4	2.48
4	10.3	27	10.3	4.66
8	15.4	30	15.4	6.89
11	17.6	33	17.6	7.84
15	20.1	36	20.0	8.88
19	22.5	41	22.5	9.90
25	25.0	47	24.9	10.92
34	27.4	56	27.3	11.92
46	29.8	67	29.7	12.91
59	32.3	80	32.1	13.89
73	34.8	94	34.6	14.89
87	37.2	108	36.9	15.82
96	39.6	117	39.3	16.78
109	42.0	130	41.7	17.73
116	44.5	137	44.1	18.67
124	46.9	145	46.5	19.61
131	49.4	152	48.9	20.54
139	51.8	158	51.4	21.47
145	54.3	165	53.8	22.39
150	56.7	170	56.2	23.30

Test Results	
Pressiometric modulus E:	2,026 psi
Ultimate pressure P_L :	227 psi
Ratio E / P_L :	8.93
Yield pressure P_F :	108 psi
Ratio P_L / P_F :	2.10

Calibration Sheet Reference

Remarks

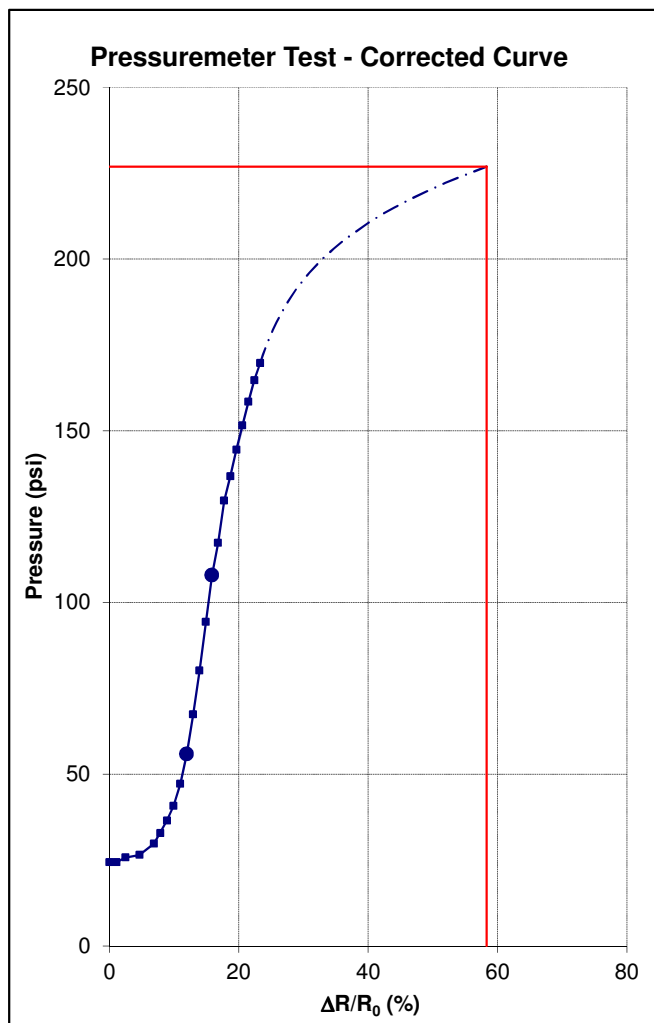


TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: B-150
 Test date: (mm/dd/yyyy) 02/01/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 54.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	24	0.0	0.00
0	2.4	24	2.4	1.10
2	5.4	26	5.4	2.48
4	10.3	27	10.3	4.66
8	15.4	30	15.4	6.89
11	17.6	33	17.6	7.84
15	20.1	36	20.0	8.88
19	22.5	41	22.5	9.90
25	25.0	47	24.9	10.92
34	27.4	56	27.3	11.92
46	29.8	67	29.7	12.91
59	32.3	80	32.1	13.89
73	34.8	94	34.6	14.89
87	37.2	108	36.9	15.82
96	39.6	117	39.3	16.78
109	42.0	130	41.7	17.73
116	44.5	137	44.1	18.67
124	46.9	145	46.5	19.61
131	49.4	152	48.9	20.54
139	51.8	158	51.4	21.47
145	54.3	165	53.8	22.39
150	56.7	170	56.2	23.30



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 2,026 psi
 Ultimate pressure P_L : 227 psi
 Ratio E / P_L : 8.93
 Yield pressure P_F : 108 psi
 Ratio P_L / P_F : 2.10



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: B-150
 Test date: 02/01/2011
 Test number: 1
 Probe size: N

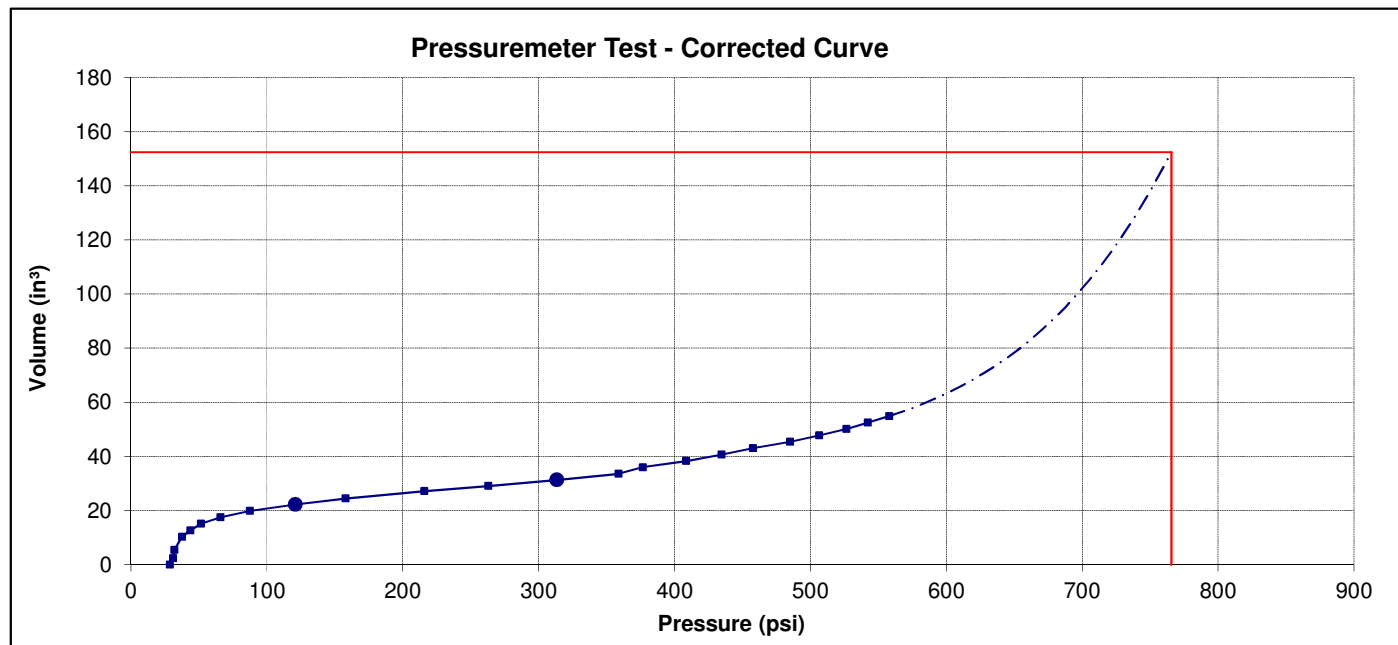
Use of a slotted casing: No
 Test depth: 64.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	29	0.0	0.00
3	2.4	31	2.4	1.09
4	5.4	32	5.4	2.48
11	10.3	38	10.3	4.65
17	12.8	44	12.7	5.71
25	15.2	52	15.1	6.77
40	17.6	66	17.5	7.80
61	20.1	88	19.9	8.81
95	22.5	121	22.2	9.80
132	25.0	158	24.5	10.78
190	27.8	216	27.2	11.87
237	29.8	263	29.1	12.65
288	32.3	313	31.3	13.59
333	34.7	359	33.6	14.51
351	37.2	377	36.0	15.48
383	39.6	409	38.3	16.41
409	42.0	435	40.7	17.34
433	44.5	458	43.1	18.27
460	46.9	485	45.4	19.19
482	49.4	507	47.8	20.10
502	51.8	527	50.2	21.01
518	54.3	542	52.6	21.92
534	56.7	558	54.9	22.83

Test Results	
Pressiometric modulus E:	7,551 psi
Ultimate pressure P_L :	766 psi
Ratio E / P_L :	9.86
Yield pressure P_F :	313 psi
Ratio P_L / P_F :	2.44

Calibration Sheet Reference

Remarks

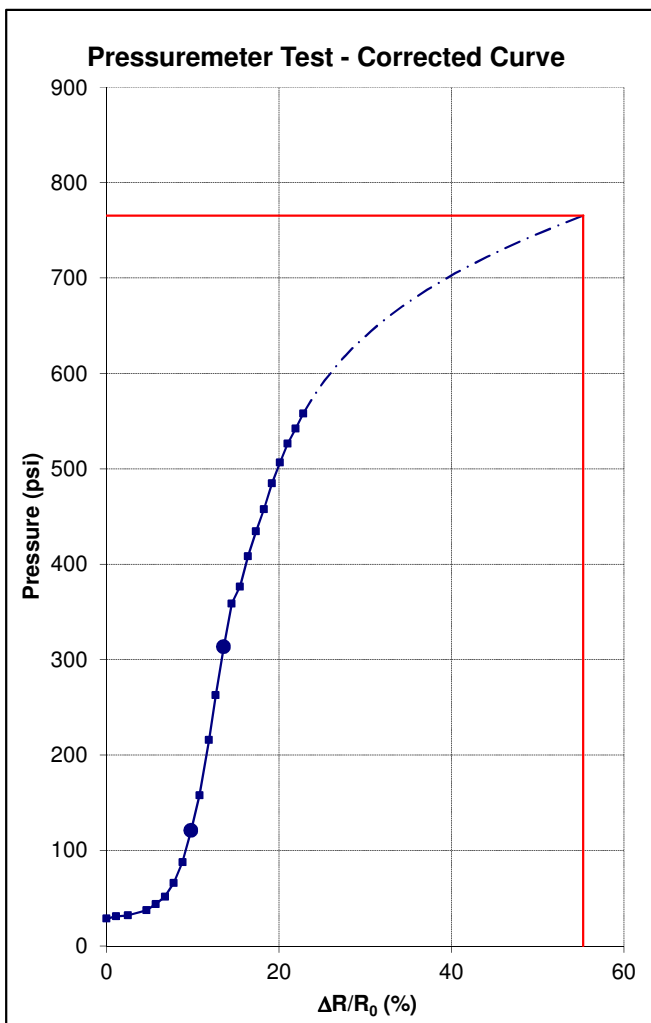


TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: B-150
 Test date: (mm/dd/yyyy) 02/01/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 64.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	29	0.0	0.00
3	2.4	31	2.4	1.09
4	5.4	32	5.4	2.48
11	10.3	38	10.3	4.65
17	12.8	44	12.7	5.71
25	15.2	52	15.1	6.77
40	17.6	66	17.5	7.80
61	20.1	88	19.9	8.81
95	22.5	121	22.2	9.80
132	25.0	158	24.5	10.78
190	27.8	216	27.2	11.87
237	29.8	263	29.1	12.65
288	32.3	313	31.3	13.59
333	34.7	359	33.6	14.51
351	37.2	377	36.0	15.48
383	39.6	409	38.3	16.41
409	42.0	435	40.7	17.34
433	44.5	458	43.1	18.27
460	46.9	485	45.4	19.19
482	49.4	507	47.8	20.10
502	51.8	527	50.2	21.01
518	54.3	542	52.6	21.92
534	56.7	558	54.9	22.83



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 7,551 psi
 Ultimate pressure P_L : 766 psi
 Ratio E / P_L : 9.86
 Yield pressure P_F : 313 psi
 Ratio P_L / P_F : 2.44



TEXAM Pressuremeter Test

Project name: Westside Subway Extension
 Borehole name: B-150
 Test date: 02/02/2011
 Test number: 3
 Probe size: N

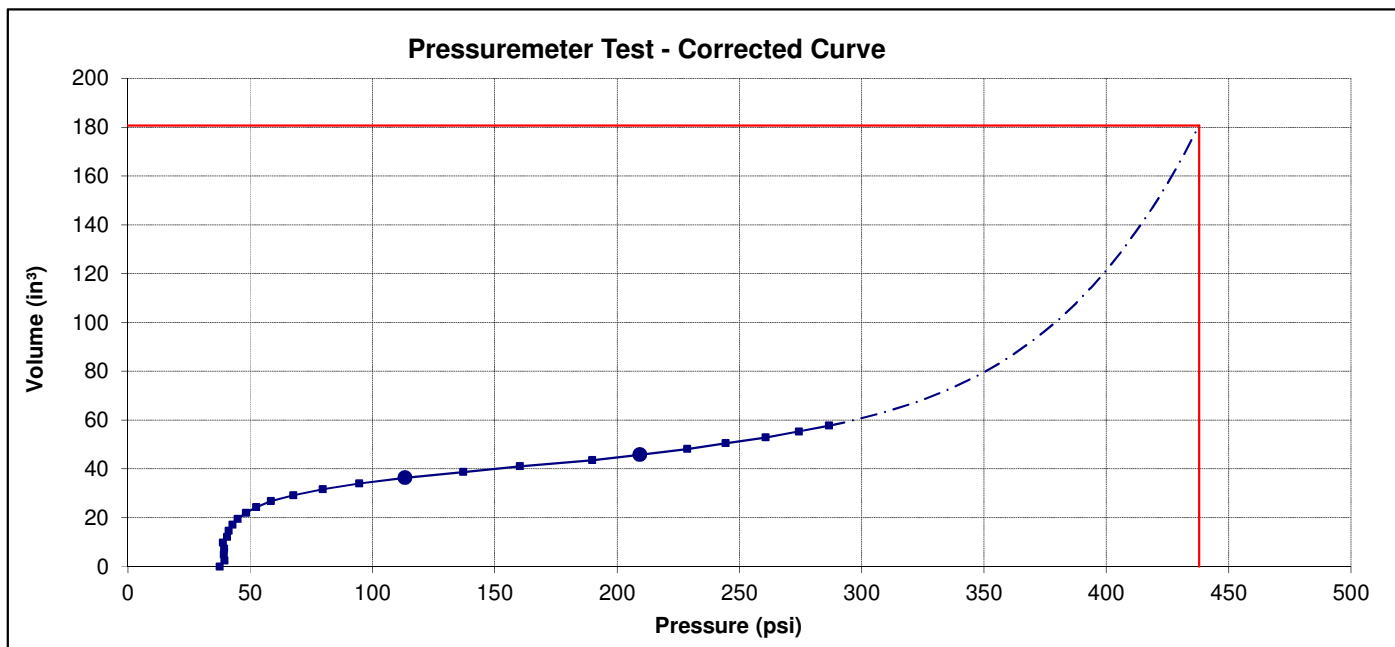
Use of a slotted casing: No
 Test depth: 85.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	38	0.0	0.00
2	2.4	39	2.4	1.12
2	4.9	39	4.9	2.23
3	7.3	39	7.3	3.33
3	9.8	39	9.8	4.42
5	12.2	41	12.2	5.49
6	14.7	41	14.6	6.56
8	17.2	43	17.1	7.64
10	19.5	45	19.5	8.65
13	22.0	48	21.9	9.68
17	24.4	52	24.4	10.71
23	26.9	59	26.8	11.71
33	29.3	68	29.2	12.71
45	31.9	80	31.7	13.74
60	34.2	95	34.0	14.66
79	36.6	113	36.4	15.61
103	39.1	137	38.7	16.56
126	41.5	160	41.1	17.49
156	44.1	190	43.6	18.47
175	46.4	209	45.8	19.33
195	48.8	229	48.2	20.25
211	51.3	244	50.6	21.17
228	53.7	261	53.0	22.08
241	56.1	274	55.4	22.98
254	58.6	287	57.8	23.88

Test Results	
Pressiometric modulus E:	4,033 psi
Ultimate pressure P_L :	438 psi
Ratio E / P_L :	9.21
Yield pressure P_F :	209 psi
Ratio P_L / P_F :	2.09

Calibration Sheet Reference

Remarks

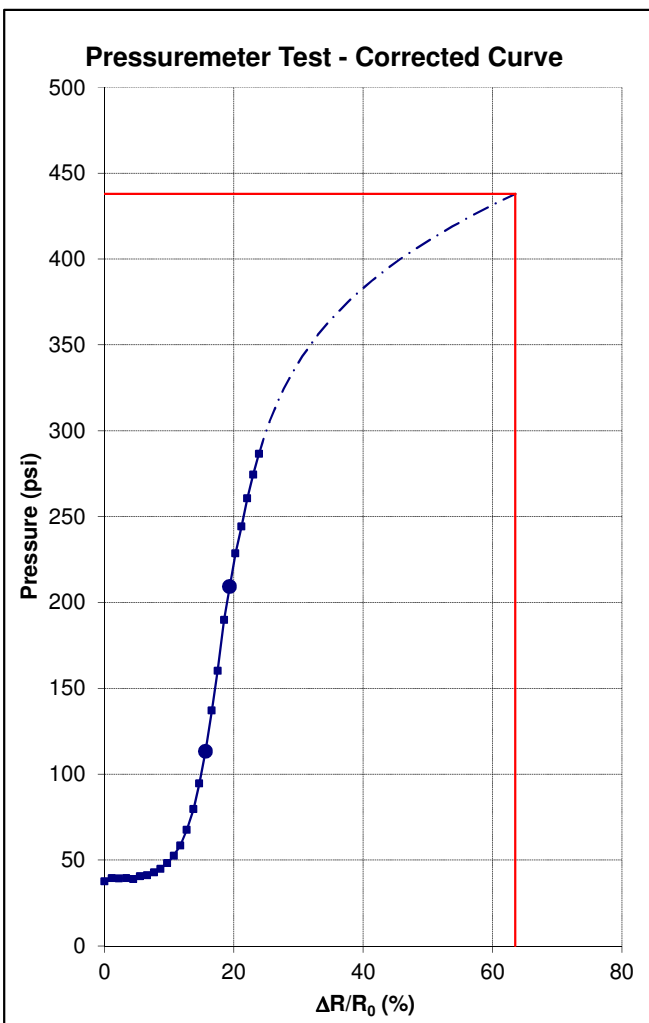


TEXAM Pressuremeter Test

Project name: Westside Subway Extension
 Borehole name: B-150
 Test date: (mm/dd/yyyy) 02/02/2011
 Test number: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 85.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	38	0.0	0.00
2	2.4	39	2.4	1.12
2	4.9	39	4.9	2.23
3	7.3	39	7.3	3.33
3	9.8	39	9.8	4.42
5	12.2	41	12.2	5.49
6	14.7	41	14.6	6.56
8	17.2	43	17.1	7.64
10	19.5	45	19.5	8.65
13	22.0	48	21.9	9.68
17	24.4	52	24.4	10.71
23	26.9	59	26.8	11.71
33	29.3	68	29.2	12.71
45	31.9	80	31.7	13.74
60	34.2	95	34.0	14.66
79	36.6	113	36.4	15.61
103	39.1	137	38.7	16.56
126	41.5	160	41.1	17.49
156	44.1	190	43.6	18.47
175	46.4	209	45.8	19.33
195	48.8	229	48.2	20.25
211	51.3	244	50.6	21.17
228	53.7	261	53.0	22.08
241	56.1	274	55.4	22.98
254	58.6	287	57.8	23.88



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 4,033 psi
 Ultimate pressure P_L : 438 psi
 Ratio E / P_L : 9.21
 Yield pressure P_F : 209 psi
 Ratio P_L / P_F : 2.09



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: B-162
 Test date: 01/27/2011
 Test number: 1
 Probe size: N

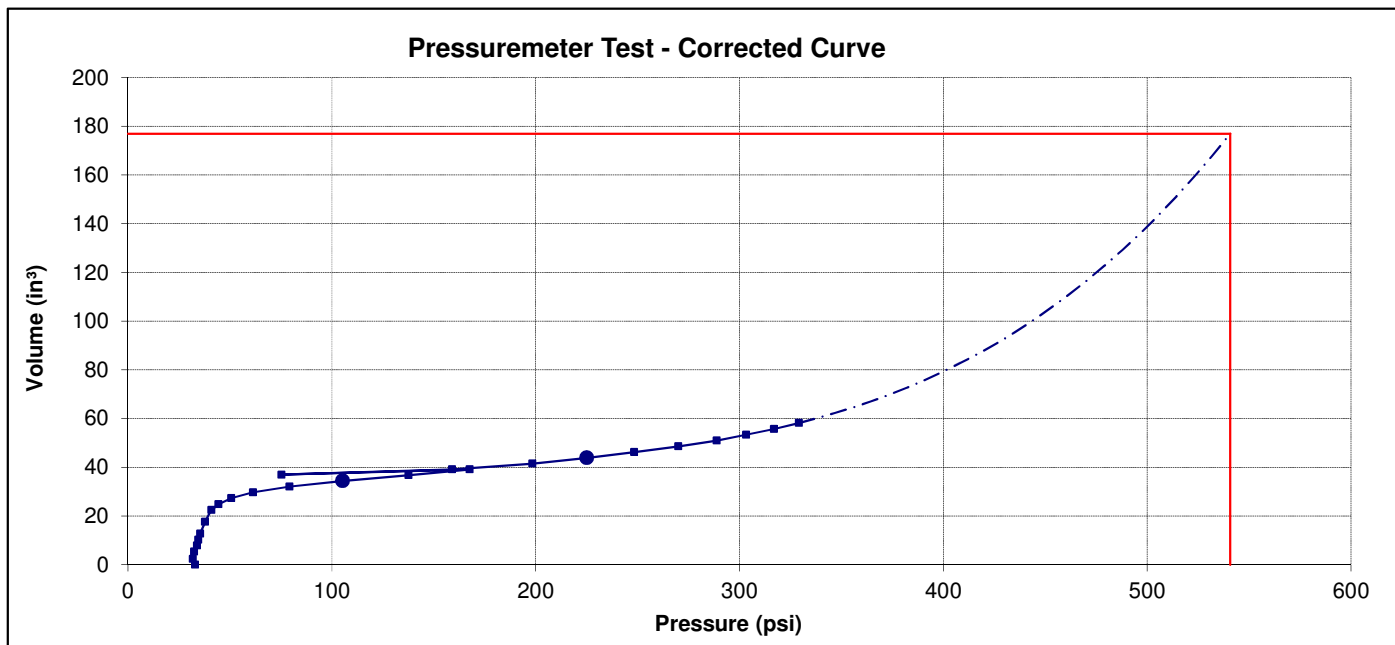
Use of a slotted casing: No
 Test depth: 74.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	33	0.0	0.00
0	2.4	32	2.4	1.09
1	5.4	32	5.4	2.47
3	7.9	34	7.9	3.59
4	10.3	34	10.3	4.65
5	12.7	35	12.7	5.72
7	17.6	38	17.6	7.84
11	22.5	41	22.5	9.92
15	24.9	44	24.9	10.93
21	27.4	51	27.3	11.93
32	29.8	61	29.7	12.92
50	32.3	79	32.1	13.90
76	34.7	105	34.5	14.85
109	37.2	138	36.8	15.79
139	39.6	168	39.1	16.72
46	37.1	75	37.0	15.87
131	39.6	159	39.2	16.74
170	42.0	198	41.5	17.65
197	44.5	225	43.8	18.57
220	46.9	248	46.2	19.49
242	49.3	270	48.6	20.41
261	51.8	289	51.0	21.32
276	54.2	303	53.4	22.23
289	56.7	317	55.8	23.13
302	59.1	329	58.2	24.03

Test Results	
Pressiometric modulus E:	5,000 psi
Ultimate pressure P_L :	541 psi
Ratio E / P_L :	9.25
Yield pressure P_F :	225 psi
Ratio P_L / P_F :	2.40

Calibration Sheet Reference

Remarks

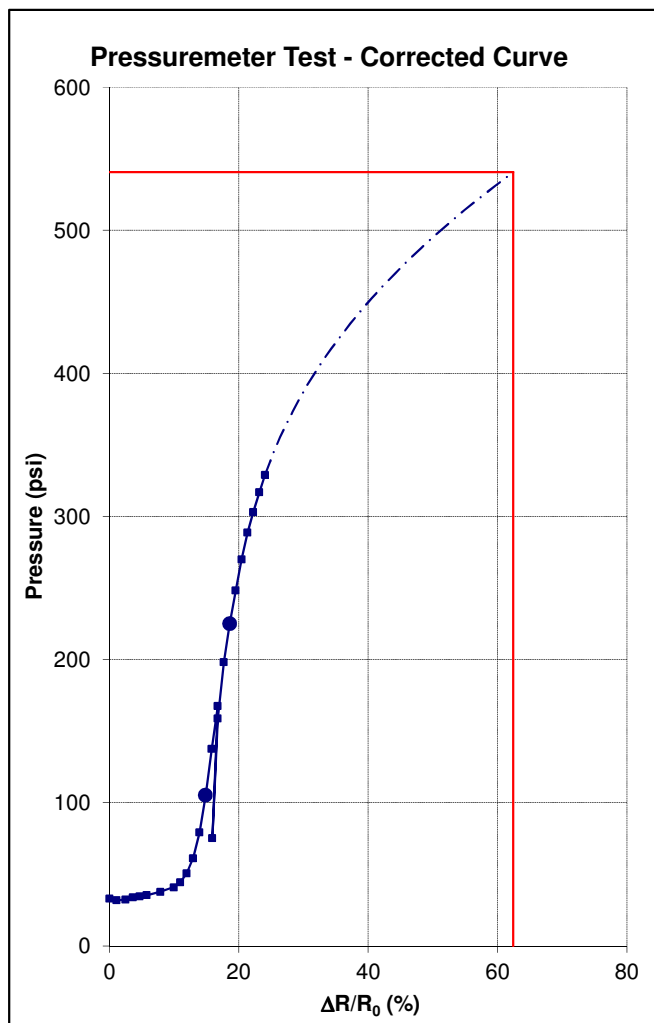


TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: B-162
 Test date: (mm/dd/yyyy) 01/27/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 74.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	33	0.0	0.00
0	2.4	32	2.4	1.09
1	5.4	32	5.4	2.47
3	7.9	34	7.9	3.59
4	10.3	34	10.3	4.65
5	12.7	35	12.7	5.72
7	17.6	38	17.6	7.84
11	22.5	41	22.5	9.92
15	24.9	44	24.9	10.93
21	27.4	51	27.3	11.93
32	29.8	61	29.7	12.92
50	32.3	79	32.1	13.90
76	34.7	105	34.5	14.85
109	37.2	138	36.8	15.79
139	39.6	168	39.1	16.72
46	37.1	75	37.0	15.87
131	39.6	159	39.2	16.74
170	42.0	198	41.5	17.65
197	44.5	225	43.8	18.57
220	46.9	248	46.2	19.49
242	49.3	270	48.6	20.41
261	51.8	289	51.0	21.32
276	54.2	303	53.4	22.23
289	56.7	317	55.8	23.13
302	59.1	329	58.2	24.03



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 5,000 psi
 Ultimate pressure P_L : 541 psi
 Ratio E / P_L : 9.25
 Yield pressure P_F : 225 psi
 Ratio P_L / P_F : 2.40



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: B-162
 Test date: 01/27/2011
 Test number: 1
 Probe size: N

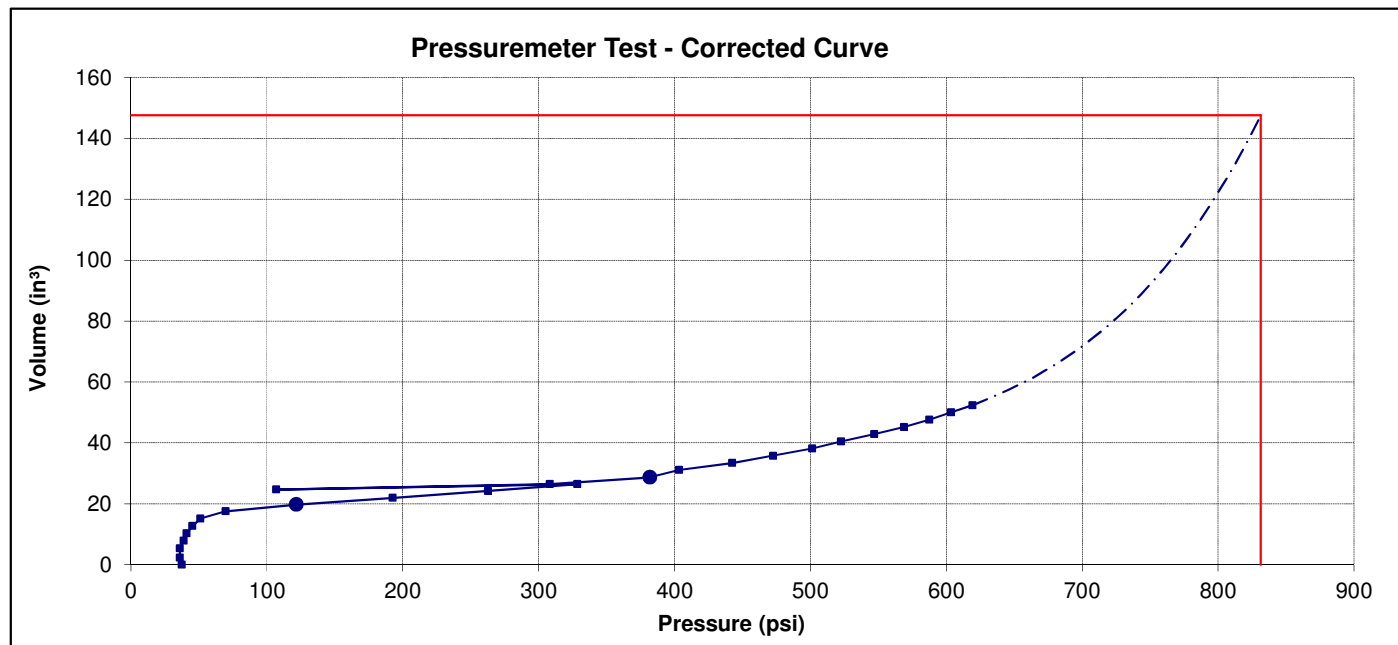
Use of a slotted casing: No
 Test depth: 84.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	37	0.0	0.00
0	2.4	36	2.4	1.10
1	5.4	36	5.4	2.48
4	7.9	39	7.9	3.57
6	10.3	41	10.3	4.66
10	12.8	45	12.7	5.73
16	15.2	51	15.1	6.78
35	17.6	70	17.5	7.81
87	20.1	122	19.8	8.78
158	22.5	193	22.0	9.72
228	25.0	263	24.2	10.65
294	27.4	328	26.5	11.58
73	25.0	107	24.7	10.86
274	27.4	308	26.5	11.61
348	29.8	382	28.7	12.52
370	32.3	403	31.1	13.49
409	34.7	442	33.4	14.43
439	37.2	473	35.8	15.39
468	39.6	501	38.1	16.32
490	42.0	522	40.5	17.26
515	44.5	547	42.9	18.19
537	46.9	569	45.2	19.11
555	49.4	588	47.6	20.03
571	51.8	603	50.0	20.95
587	54.3	619	52.4	21.86

Test Results	
Pressiometric modulus E:	10,238 psi
Ultimate pressure P_L :	831 psi
Ratio E / P_L :	12.31
Yield pressure P_F :	382 psi
Ratio P_L / P_F :	2.18

Calibration Sheet Reference

Remarks

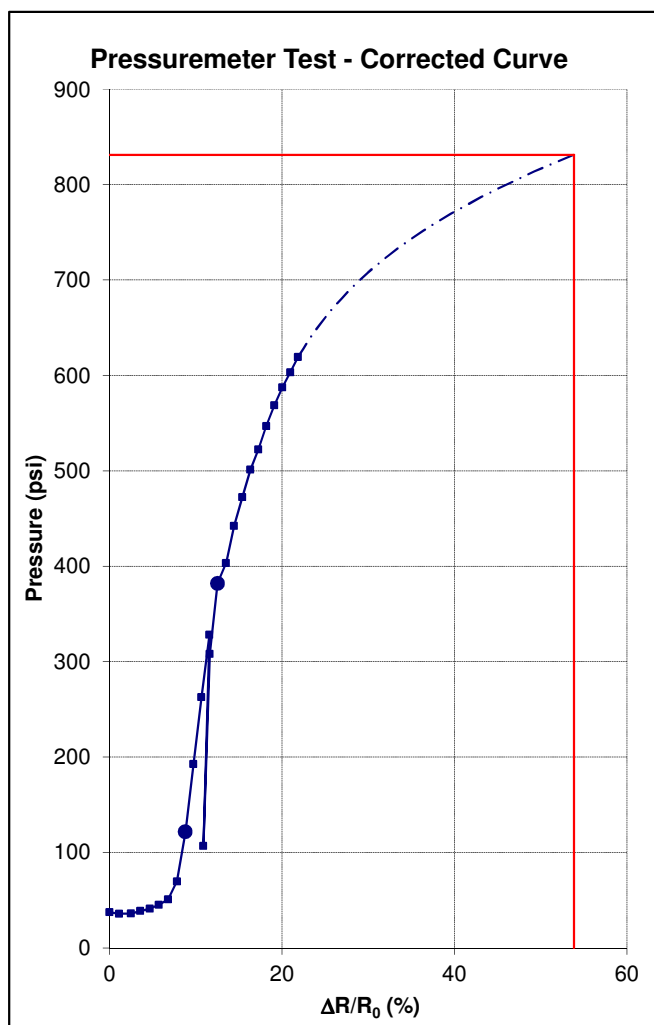


TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: B-162
 Test date: (mm/dd/yyyy) 01/27/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 84.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	37	0.0	0.00
0	2.4	36	2.4	1.10
1	5.4	36	5.4	2.48
4	7.9	39	7.9	3.57
6	10.3	41	10.3	4.66
10	12.8	45	12.7	5.73
16	15.2	51	15.1	6.78
35	17.6	70	17.5	7.81
87	20.1	122	19.8	8.78
158	22.5	193	22.0	9.72
228	25.0	263	24.2	10.65
294	27.4	328	26.5	11.58
73	25.0	107	24.7	10.86
274	27.4	308	26.5	11.61
348	29.8	382	28.7	12.52
370	32.3	403	31.1	13.49
409	34.7	442	33.4	14.43
439	37.2	473	35.8	15.39
468	39.6	501	38.1	16.32
490	42.0	522	40.5	17.26
515	44.5	547	42.9	18.19
537	46.9	569	45.2	19.11
555	49.4	588	47.6	20.03
571	51.8	603	50.0	20.95
587	54.3	619	52.4	21.86



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 10,238 psi
 Ultimate pressure P_L : 831 psi
 Ratio E / P_L : 12.31
 Yield pressure P_F : 382 psi
 Ratio P_L / P_F : 2.18



TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-166
 Test date: 03/19/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 70.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	31	0.0	0.00
1	4.2	30	4.2	1.93
1	9.2	30	9.2	4.16
2	14.0	30	14.0	6.27
4	18.9	31	18.8	8.37
6	23.8	33	23.7	10.45
8	28.6	35	28.6	12.46
11	32.7	38	32.7	14.13
15	35.9	42	35.9	15.42
19	38.4	45	38.3	16.40
24	40.8	50	40.7	17.35
36	43.3	62	43.1	18.29
58	45.7	84	45.5	19.21
95	48.1	121	47.8	20.10
128	50.6	153	50.1	20.99
151	53.0	176	52.4	21.88
171	55.5	196	54.8	22.78
95	53.0	120	52.7	21.96
162	55.5	188	54.8	22.79
182	57.9	207	57.2	23.68
197	60.3	221	59.6	24.57
205	62.8	230	62.0	25.46
215	65.2	240	64.4	26.35
229	70.1	254	69.2	28.11
236	72.6	261	71.7	28.97

Test Results	
Pressiometric modulus E:	6,231 psi
Ultimate pressure P_L :	355 psi
Ratio E / P_L :	17.55
Yield pressure P_F :	153 psi
Ratio P_L / P_F :	2.32

Calibration Sheet Reference

Remarks

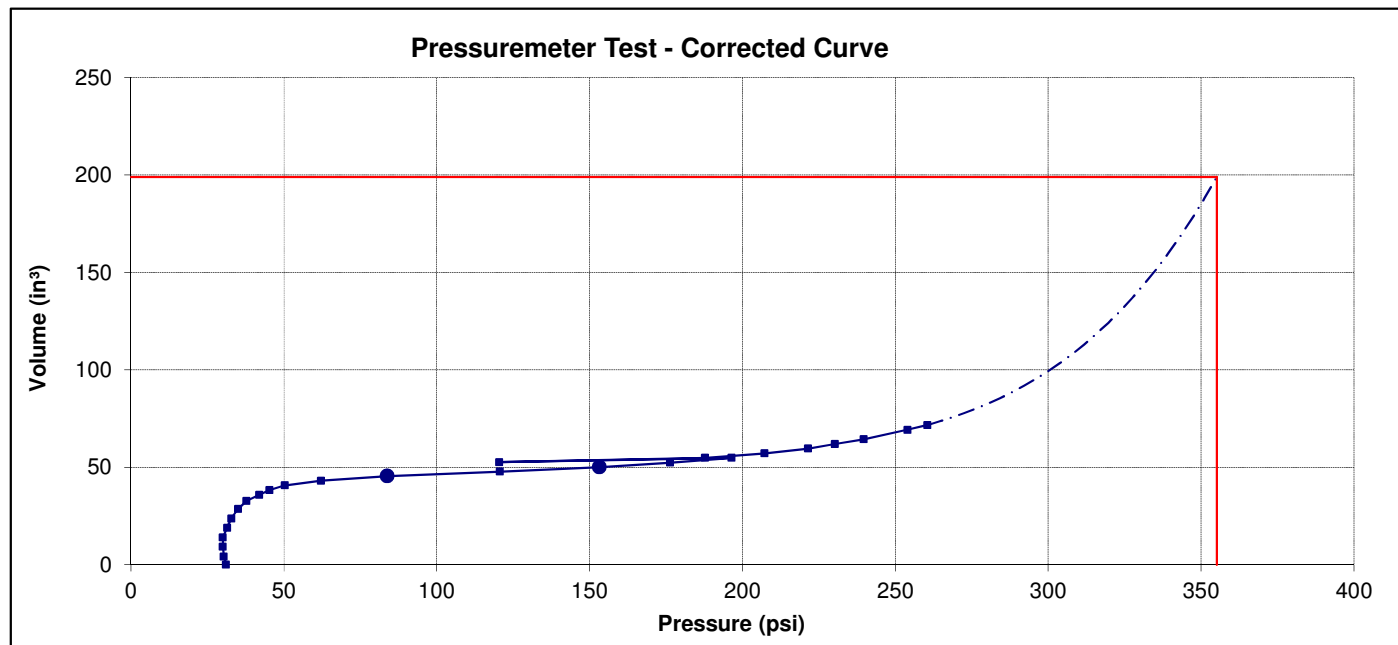


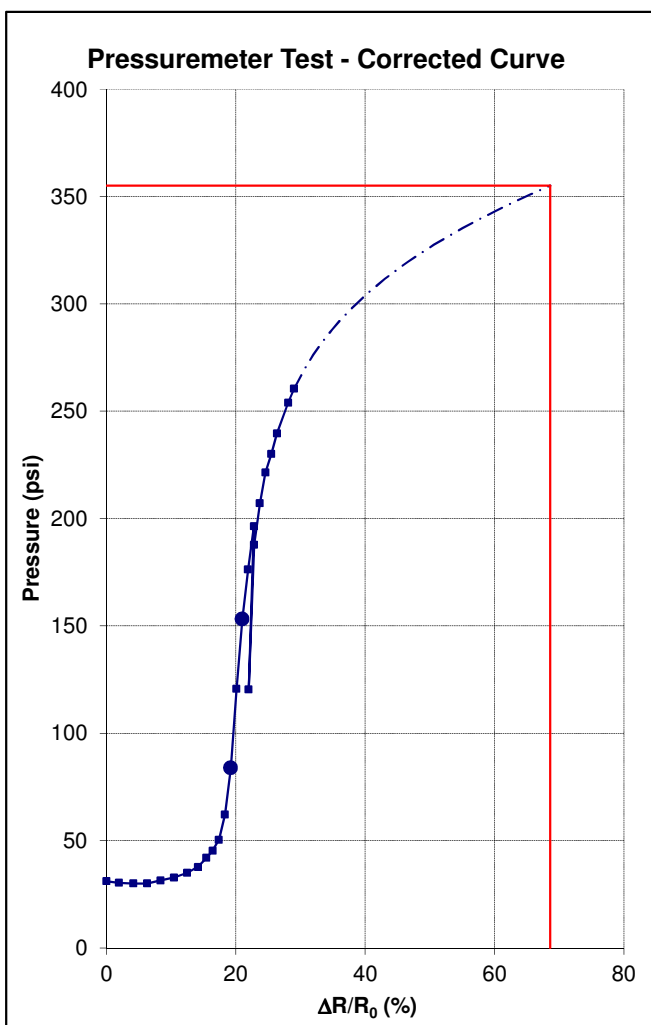
Figure G-1.21

TEXAM Pressuremeter Test

Project name: Westside Extension
 Borehole name: G-166
 Test date: (mm/dd/yyyy) 03/19/2011
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 70.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	31	0.0	0.00
1	4.2	30	4.2	1.93
1	9.2	30	9.2	4.16
2	14.0	30	14.0	6.27
4	18.9	31	18.8	8.37
6	23.8	33	23.7	10.45
8	28.6	35	28.6	12.46
11	32.7	38	32.7	14.13
15	35.9	42	35.9	15.42
19	38.4	45	38.3	16.40
24	40.8	50	40.7	17.35
36	43.3	62	43.1	18.29
58	45.7	84	45.5	19.21
95	48.1	121	47.8	20.10
128	50.6	153	50.1	20.99
151	53.0	176	52.4	21.88
171	55.5	196	54.8	22.78
95	53.0	120	52.7	21.96
162	55.5	188	54.8	22.79
182	57.9	207	57.2	23.68
197	60.3	221	59.6	24.57
205	62.8	230	62.0	25.46
215	65.2	240	64.4	26.35
229	70.1	254	69.2	28.11
236	72.6	261	71.7	28.97



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 6,231 psi
 Ultimate pressure P_L : 355 psi
 Ratio E / P_L : 17.55
 Yield pressure P_F : 153 psi
 Ratio P_L / P_F : 2.32



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-408
 Test date: 09/19/2015
 Probe #: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 13.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	6	0.0	0.00
1	2.4	7	2.4	1.12
2	4.9	7	4.9	2.23
2	7.2	7	7.2	3.29
3	9.8	7	9.8	4.42
5	12.2	8	12.2	5.49
6	14.6	9	14.6	6.55
9	17.1	12	17.1	7.62
11	19.5	14	19.5	8.64
17	22.0	19	21.9	9.67
24	24.4	27	24.3	10.67
33	26.9	35	26.7	11.67
13	24.4	16	24.4	10.70
32	26.9	34	26.7	11.67
39	29.3	41	29.1	12.67
43	31.8	45	31.5	13.67
45	34.2	47	33.9	14.64
47	36.6	49	36.4	15.62
49	39.1	51	38.8	16.59
51	41.5	53	41.3	17.57
52	44.0	54	43.7	18.51
54	46.4	55	46.1	19.45

Test Results	
Pressiometric modulus E:	1,107 psi
Ultimate pressure P_L :	76 psi
Ratio E / P_L :	14.56
Yield pressure P_F :	34 psi
Ratio P_L / P_F :	2.22

Calibration Sheet Reference

Remarks

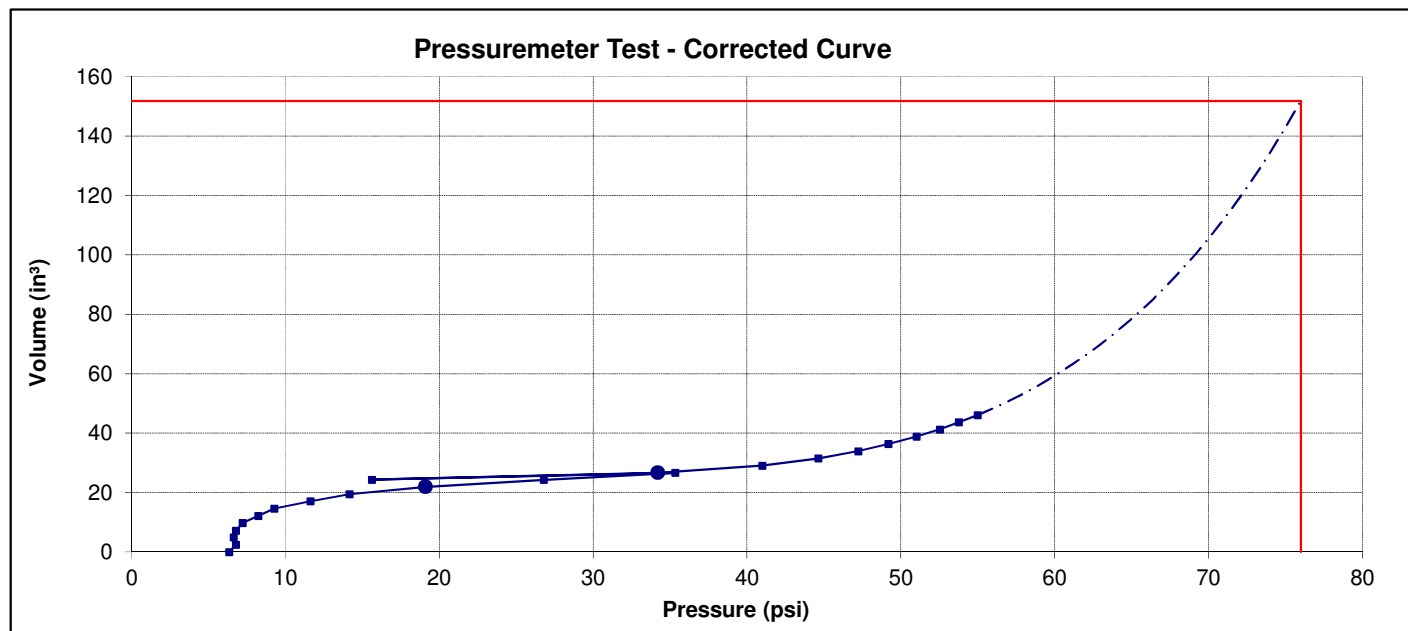


Figure G-1.23

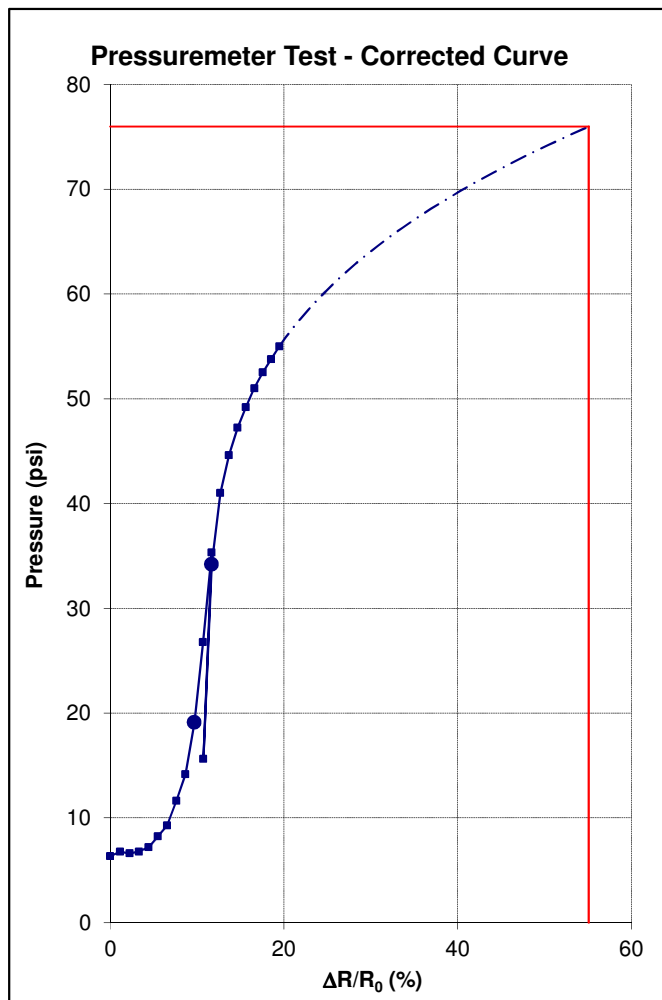


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-408
 Test date: (mm/dd/yyyy) 09/19/2015
 Probe #: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 13.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	6	0.0	0.00
1	2.4	7	2.4	1.12
2	4.9	7	4.9	2.23
2	7.2	7	7.2	3.29
3	9.8	7	9.8	4.42
5	12.2	8	12.2	5.49
6	14.6	9	14.6	6.55
9	17.1	12	17.1	7.62
11	19.5	14	19.5	8.64
17	22.0	19	21.9	9.67
24	24.4	27	24.3	10.67
33	26.9	35	26.7	11.67
13	24.4	16	24.4	10.70
32	26.9	34	26.7	11.67
39	29.3	41	29.1	12.67
43	31.8	45	31.5	13.67
45	34.2	47	33.9	14.64
47	36.6	49	36.4	15.62
49	39.1	51	38.8	16.59
51	41.5	53	41.3	17.57
52	44.0	54	43.7	18.51
54	46.4	55	46.1	19.45



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 1,107 psi
 Ultimate pressure P_L : 76 psi
 Ratio E / P_L : 14.56
 Yield pressure P_F : 34 psi
 Ratio P_L / P_F : 2.22



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-408
 Test date: 09/19/2015
 Probe #: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 28.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	13	0.0	0.00
2	2.5	14	2.5	1.15
2	4.9	14	4.9	2.23
3	7.3	14	7.3	3.33
4	9.8	15	9.8	4.45
5	12.3	15	12.3	5.53
7	14.7	16	14.7	6.57
9	17.1	18	17.0	7.60
11	19.5	21	19.5	8.64
15	22.0	24	21.9	9.67
22	24.4	31	24.3	10.68
34	26.9	43	26.7	11.69
47	29.3	56	29.1	12.66
63	31.8	72	31.5	13.63
77	34.2	86	33.8	14.58
24	31.7	33	31.6	13.70
71	34.2	80	33.8	14.59
88	36.6	96	36.2	15.55
96	39.1	104	38.6	16.52
103	41.7	111	41.2	17.52
108	43.9	116	43.4	18.39
113	46.4	121	45.8	19.33
117	48.8	125	48.2	20.27

Test Results	
Pressiometric modulus E:	2,220 psi
Ultimate pressure P_L :	184 psi
Ratio E / P_L :	12.07
Yield pressure P_F :	86 psi
Ratio P_L / P_F :	2.15

Calibration Sheet Reference

Remarks

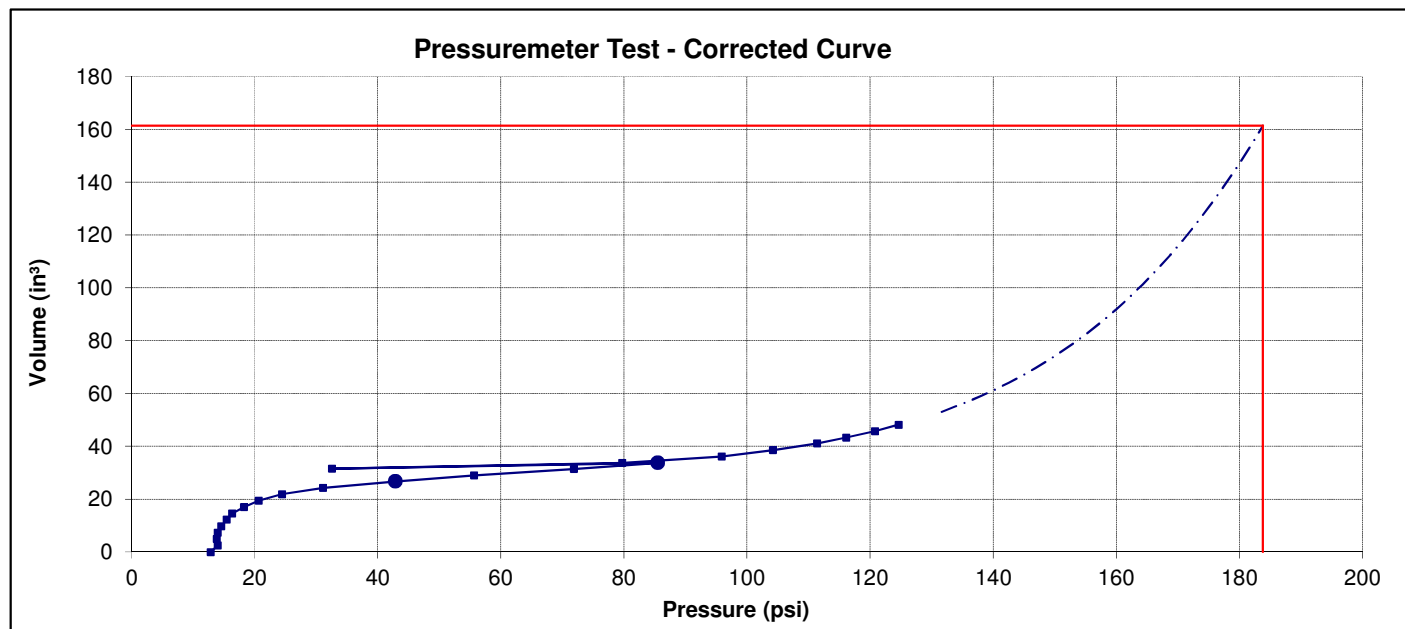


Figure G-1.25

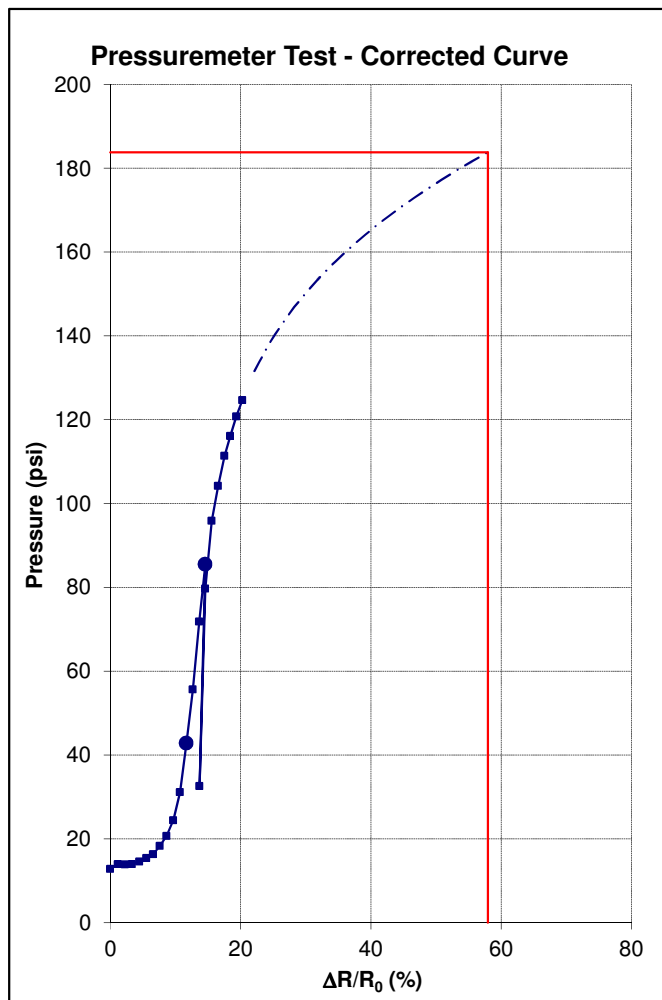


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-408
 Test date: (mm/dd/yyyy) 09/19/2015
 Probe #: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 28.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	13	0.0	0.00
2	2.5	14	2.5	1.15
2	4.9	14	4.9	2.23
3	7.3	14	7.3	3.33
4	9.8	15	9.8	4.45
5	12.3	15	12.3	5.53
7	14.7	16	14.7	6.57
9	17.1	18	17.0	7.60
11	19.5	21	19.5	8.64
15	22.0	24	21.9	9.67
22	24.4	31	24.3	10.68
34	26.9	43	26.7	11.69
47	29.3	56	29.1	12.66
63	31.8	72	31.5	13.63
77	34.2	86	33.8	14.58
24	31.7	33	31.6	13.70
71	34.2	80	33.8	14.59
88	36.6	96	36.2	15.55
96	39.1	104	38.6	16.52
103	41.7	111	41.2	17.52
108	43.9	116	43.4	18.39
113	46.4	121	45.8	19.33
117	48.8	125	48.2	20.27



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 2,220 psi
 Ultimate pressure P_L : 184 psi
 Ratio E / P_L : 12.07
 Yield pressure P_F : 86 psi
 Ratio P_L / P_F : 2.15



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-408
 Test date: 09/19/2015
 Probe #: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 48.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	22	0.0	0.00
0	2.5	21	2.5	1.14
1	4.9	21	4.9	2.25
1	7.4	21	7.4	3.35
2	9.8	21	9.8	4.42
3	12.2	22	12.2	5.50
5	14.7	24	14.6	6.56
8	17.2	26	17.1	7.63
11	19.6	29	19.5	8.66
16	22.0	34	21.9	9.67
27	24.4	44	24.3	10.67
44	26.9	62	26.7	11.66
71	29.3	88	28.9	12.60
97	31.7	114	31.2	13.55
118	34.2	135	33.6	14.49
134	36.6	151	35.9	15.44
45	34.2	62	34.0	14.65
128	36.6	145	36.0	15.46
148	39.1	165	38.3	16.39
158	41.5	175	40.7	17.34
167	44.0	184	43.1	18.29
175	46.4	192	45.5	19.21
180	48.8	197	47.9	20.15

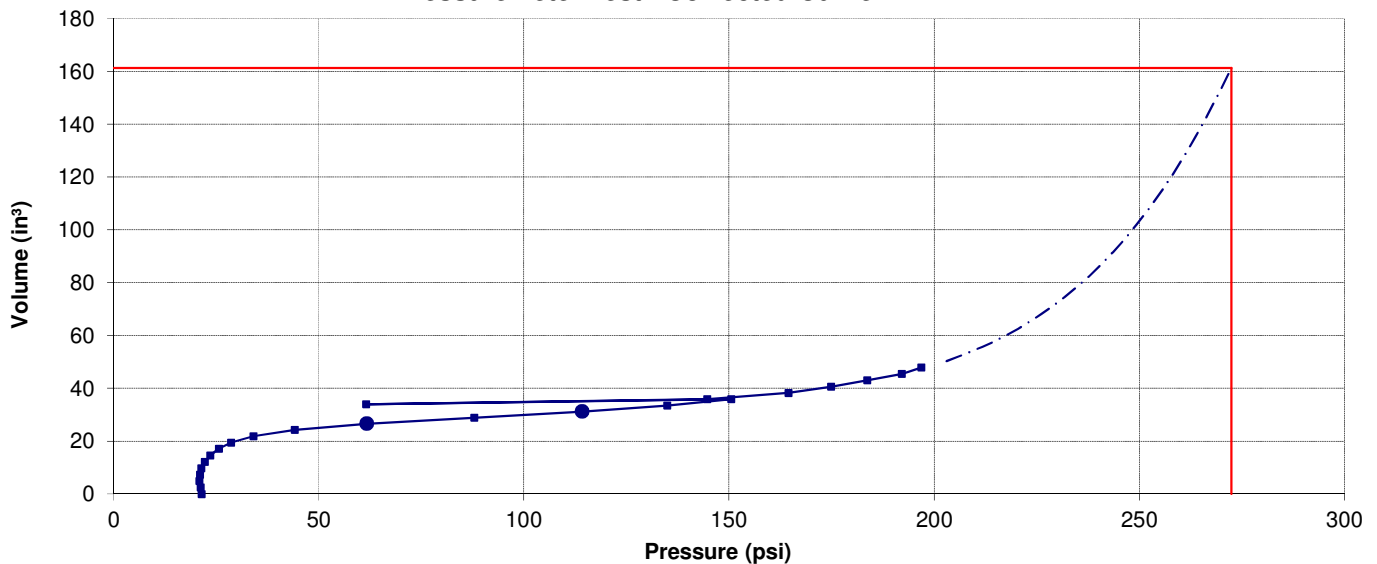
Test Results

Pressiometric modulus E: 4,170 psi
 Ultimate pressure P_L : 272 psi
 Ratio E / P_L : 15.30
 Yield pressure P_F : 114 psi
 Ratio P_L / P_F : 2.39

Calibration Sheet Reference

Remarks

Pressuremeter Test - Corrected Curve



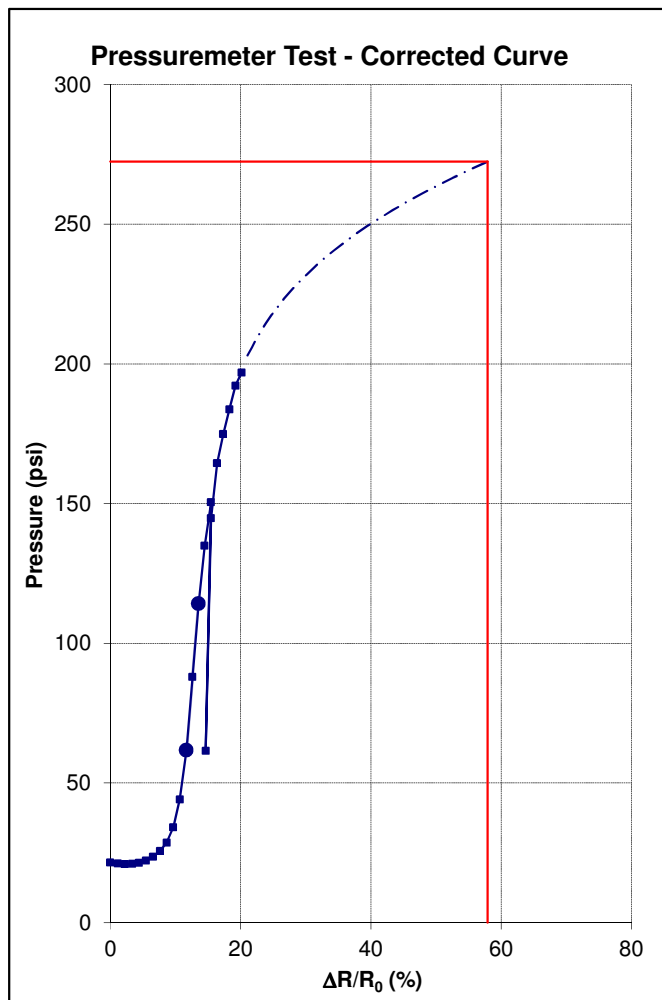


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-408
 Test date: (mm/dd/yyyy) 09/19/2015
 Probe #: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 48.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	22	0.0	0.00
0	2.5	21	2.5	1.14
1	4.9	21	4.9	2.25
1	7.4	21	7.4	3.35
2	9.8	21	9.8	4.42
3	12.2	22	12.2	5.50
5	14.7	24	14.6	6.56
8	17.2	26	17.1	7.63
11	19.6	29	19.5	8.66
16	22.0	34	21.9	9.67
27	24.4	44	24.3	10.67
44	26.9	62	26.7	11.66
71	29.3	88	28.9	12.60
97	31.7	114	31.2	13.55
118	34.2	135	33.6	14.49
134	36.6	151	35.9	15.44
45	34.2	62	34.0	14.65
128	36.6	145	36.0	15.46
148	39.1	165	38.3	16.39
158	41.5	175	40.7	17.34
167	44.0	184	43.1	18.29
175	46.4	192	45.5	19.21
180	48.8	197	47.9	20.15



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 4,170 psi
 Ultimate pressure P_L : 272 psi
 Ratio E / P_L : 15.30
 Yield pressure P_F : 114 psi
 Ratio P_L / P_F : 2.39



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-408
 Test date: 09/19/2015
 Probe #: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 70.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	31	0.0	0.00
1	2.5	31	2.5	1.14
1	4.9	31	4.9	2.23
2	7.4	31	7.4	3.35
2	9.8	31	9.8	4.44
3	12.3	31	12.2	5.52
3	14.7	31	14.7	6.57
5	19.6	33	19.6	8.67
8	24.4	35	24.4	10.71
10	26.9	37	26.8	11.73
12	29.3	39	29.2	12.73
15	31.7	42	31.7	13.72
20	34.2	47	34.1	14.71
26	36.6	53	36.5	15.67
35	39.1	62	38.9	16.62
49	41.6	76	41.3	17.57
69	44.0	96	43.6	18.48
99	46.4	125	45.9	19.36
130	48.8	156	48.2	20.25
49	46.4	75	46.1	19.45
119	48.8	145	48.2	20.26
154	51.3	180	50.5	21.13
174	53.7	200	52.8	22.03

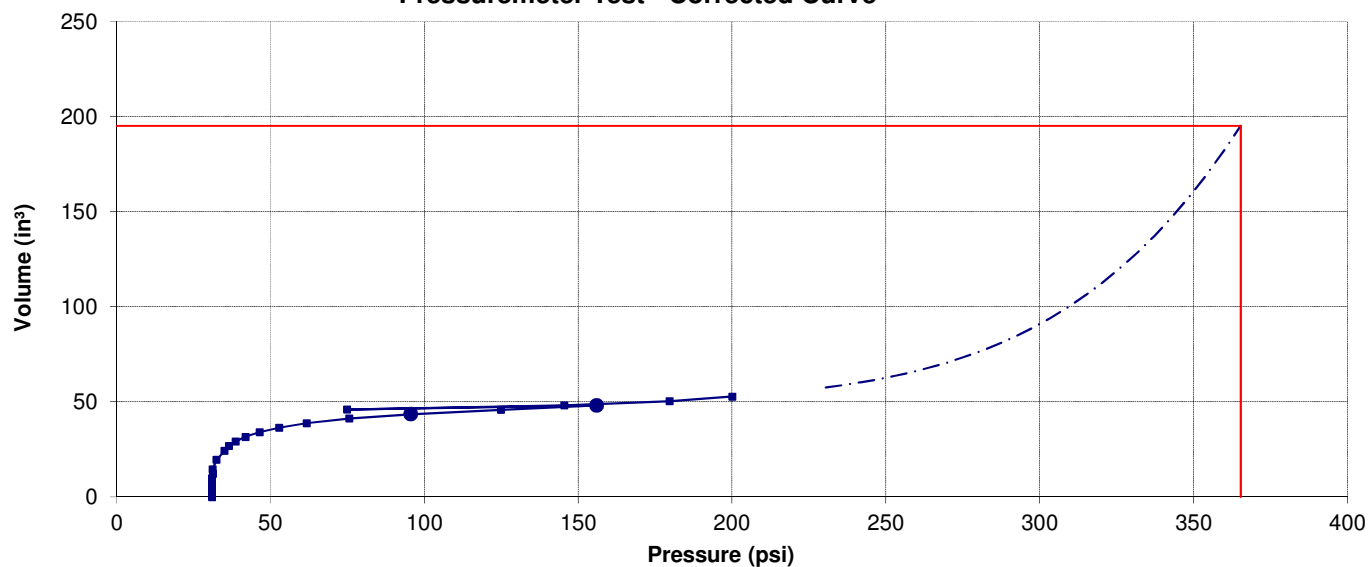
Test Results

Pressiometric modulus E: 5,423 psi
 Ultimate pressure P_L : 365 psi
 Ratio E / P_L : 14.84
 Yield pressure P_F : 156 psi
 Ratio P_L / P_F : 2.34

Calibration Sheet Reference

Remarks

Pressuremeter Test - Corrected Curve



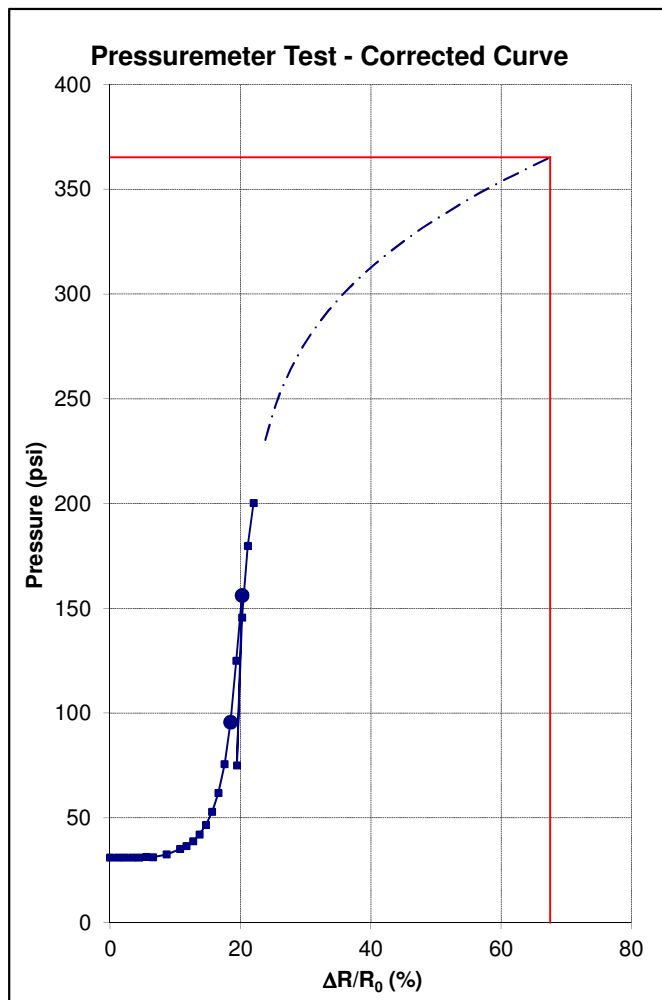


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-408
 Test date: (mm/dd/yyyy) 09/19/2015
 Probe #: 3
 Probe size: N

Use of a slotted casing: No
 Test depth: 70.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	31	0.0	0.00
1	2.5	31	2.5	1.14
1	4.9	31	4.9	2.23
2	7.4	31	7.4	3.35
2	9.8	31	9.8	4.44
3	12.3	31	12.2	5.52
3	14.7	31	14.7	6.57
5	19.6	33	19.6	8.67
8	24.4	35	24.4	10.71
10	26.9	37	26.8	11.73
12	29.3	39	29.2	12.73
15	31.7	42	31.7	13.72
20	34.2	47	34.1	14.71
26	36.6	53	36.5	15.67
35	39.1	62	38.9	16.62
49	41.6	76	41.3	17.57
69	44.0	96	43.6	18.48
99	46.4	125	45.9	19.36
130	48.8	156	48.2	20.25
49	46.4	75	46.1	19.45
119	48.8	145	48.2	20.26
154	51.3	180	50.5	21.13
174	53.7	200	52.8	22.03



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 5,423 psi
 Ultimate pressure P_L : 365 psi
 Ratio E / P_L : 14.84
 Yield pressure P_F : 156 psi
 Ratio P_L / P_F : 2.34



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-409
 Test date: 09/22/2015
 Probe #: 2
 Probe size: N

Use of a slotted casing: No
 Test depth: 93.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	41	0.0	0.00
2	2.4	42	2.4	1.12
3	4.9	42	4.9	2.23
3	7.3	42	7.3	3.33
3	9.8	42	9.7	4.41
4	12.2	42	12.2	5.49
4	14.6	42	14.6	6.55
5	17.1	42	17.1	7.61
6	19.5	43	19.5	8.65
8	22.0	45	21.9	9.68
11	24.4	48	24.3	10.70
18	26.9	54	26.8	11.70
29	29.3	65	29.1	12.68
57	31.7	93	31.4	13.62
24	29.3	60	29.2	12.69
49	31.7	85	31.5	13.64
86	34.2	121	33.7	14.54
113	36.7	148	36.1	15.51
140	39.1	175	38.3	16.40
162	41.5	197	40.6	17.31
180	43.9	215	43.0	18.22

Test Results	
Pressiometric modulus E:	5,136 psi
Ultimate pressure P_L :	704 psi
Ratio E / P_L :	7.30
Yield pressure P_F :	148 psi
Ratio P_L / P_F :	4.74

Calibration Sheet Reference

Remarks

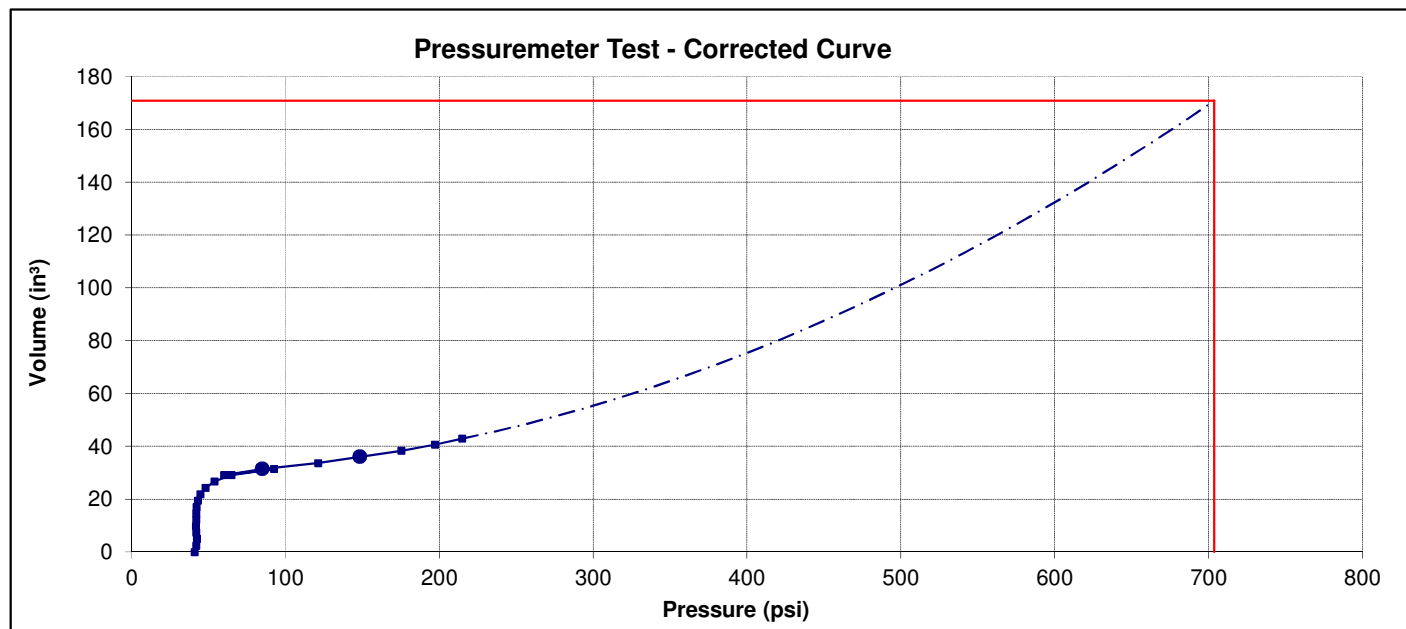


Figure G-1.31

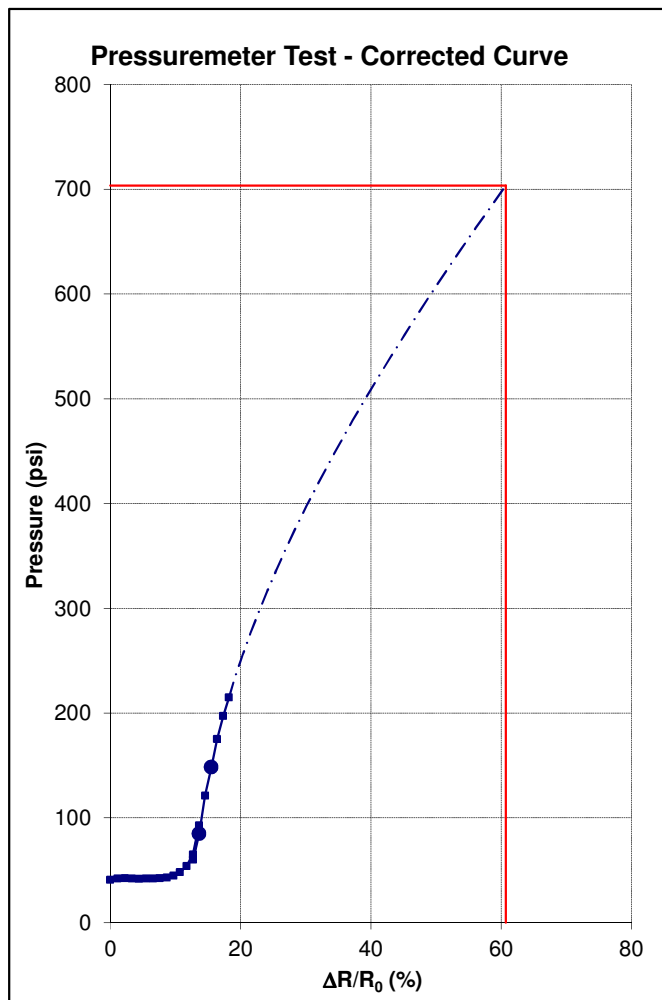


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-409
 Test date: (mm/dd/yyyy) 09/22/2015
 Probe #: 2
 Probe size: N

Use of a slotted casing: No
 Test depth: 93.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	41	0.0	0.00
2	2.4	42	2.4	1.12
3	4.9	42	4.9	2.23
3	7.3	42	7.3	3.33
3	9.8	42	9.7	4.41
4	12.2	42	12.2	5.49
4	14.6	42	14.6	6.55
5	17.1	42	17.1	7.61
6	19.5	43	19.5	8.65
8	22.0	45	21.9	9.68
11	24.4	48	24.3	10.70
18	26.9	54	26.8	11.70
29	29.3	65	29.1	12.68
57	31.7	93	31.4	13.62
24	29.3	60	29.2	12.69
49	31.7	85	31.5	13.64
86	34.2	121	33.7	14.54
113	36.7	148	36.1	15.51
140	39.1	175	38.3	16.40
162	41.5	197	40.6	17.31
180	43.9	215	43.0	18.22



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 5,136 psi
 Ultimate pressure P_L : 704 psi
 Ratio E / P_L : 7.30
 Yield pressure P_F : 148 psi
 Ratio P_L / P_F : 4.74



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-409
 Test date: 09/23/2015
 Probe #: 2
 Probe size: N

Use of a slotted casing: No
 Test depth: 103.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	45	0.0	0.00
1	2.5	45	2.5	1.14
1	4.9	46	4.9	2.23
2	7.4	46	7.3	3.34
3	9.8	46	9.7	4.41
4	12.2	47	12.2	5.49
6	14.7	48	14.6	6.55
8	17.1	50	17.0	7.60
11	19.6	53	19.5	8.66
16	22.0	57	21.9	9.66
23	24.4	64	24.3	10.68
38	26.9	79	26.6	11.65
72	29.4	112	29.0	12.62
15	26.9	55	26.8	11.71
63	29.4	103	29.0	12.64
102	31.7	142	31.2	13.52
133	34.2	173	33.4	14.44
160	36.6	200	35.7	15.36

Test Results	
Pressiometric modulus E:	5,134 psi
Ultimate pressure P_L :	331 psi
Ratio E / P_L :	15.51
Yield pressure P_F :	112 psi
Ratio P_L / P_F :	2.95

Calibration Sheet Reference

Remarks

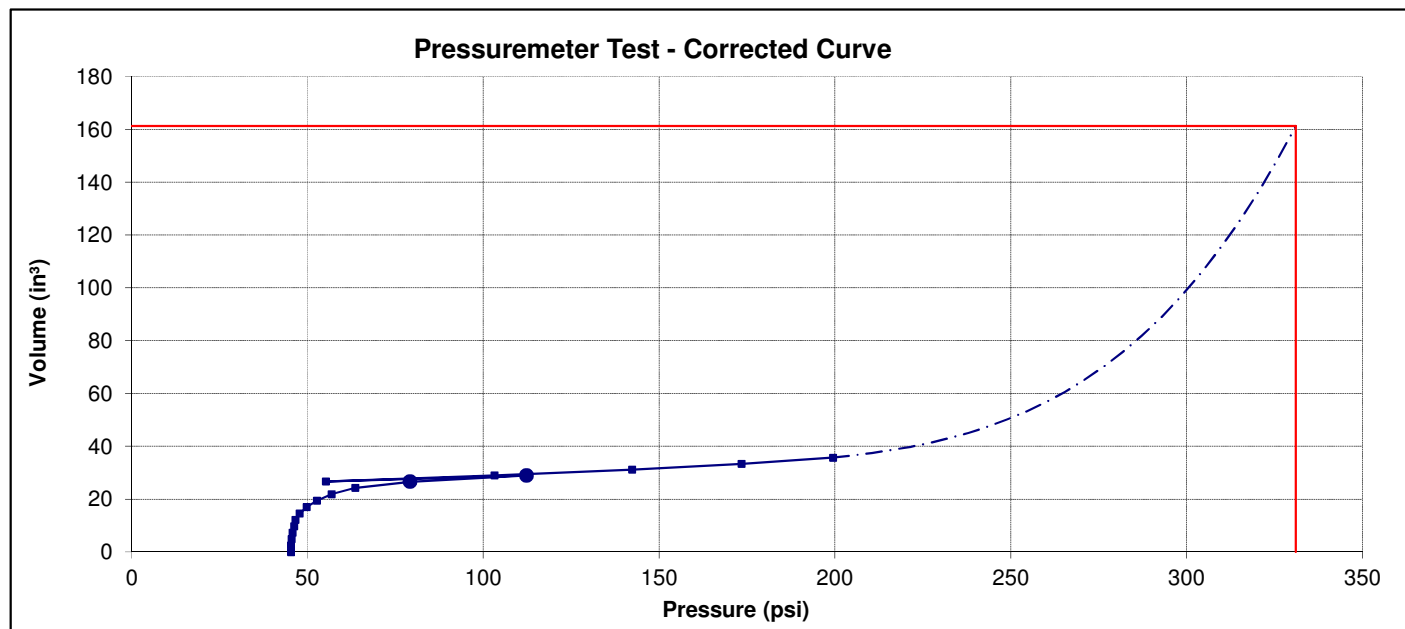


Figure G-1.33

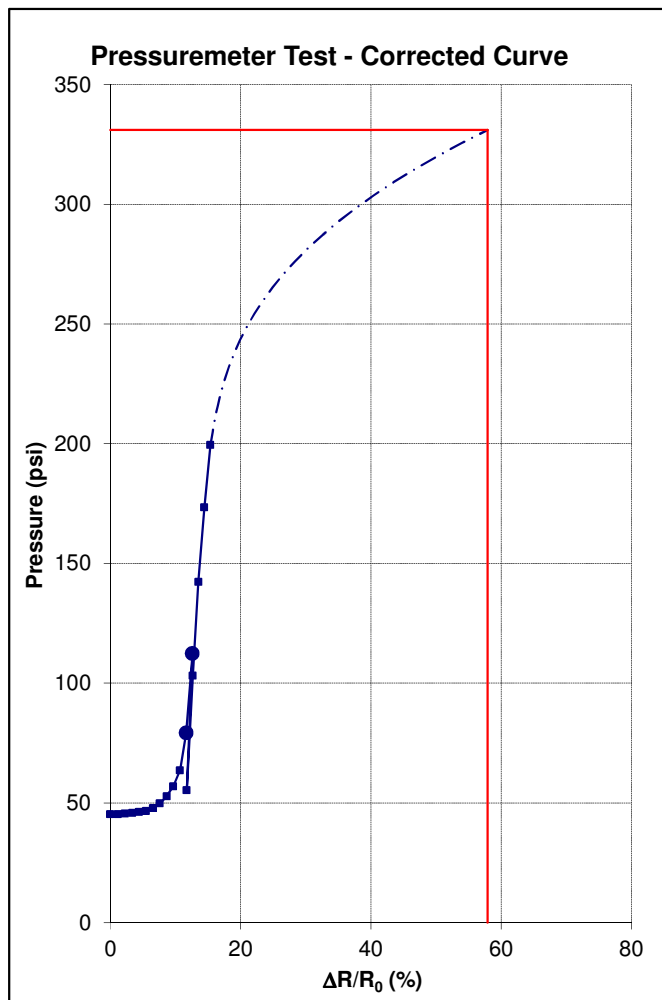


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-409
 Test date: (mm/dd/yyyy) 09/23/2015
 Probe #: 2
 Probe size: N

Use of a slotted casing: No
 Test depth: 103.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	45	0.0	0.00
1	2.5	45	2.5	1.14
1	4.9	46	4.9	2.23
2	7.4	46	7.3	3.34
3	9.8	46	9.7	4.41
4	12.2	47	12.2	5.49
6	14.7	48	14.6	6.55
8	17.1	50	17.0	7.60
11	19.6	53	19.5	8.66
16	22.0	57	21.9	9.66
23	24.4	64	24.3	10.68
38	26.9	79	26.6	11.65
72	29.4	112	29.0	12.62
15	26.9	55	26.8	11.71
63	29.4	103	29.0	12.64
102	31.7	142	31.2	13.52
133	34.2	173	33.4	14.44
160	36.6	200	35.7	15.36



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 5,134 psi
 Ultimate pressure P_L : 331 psi
 Ratio E / P_L : 15.51
 Yield pressure P_F : 112 psi
 Ratio P_L / P_F : 2.95



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-409
 Test date: 09/24/2015
 Probe #: 2
 Probe size: N

Use of a slotted casing: No
 Test depth: 123.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	54	0.0	0.00
0	2.4	54	2.4	1.13
1	4.9	54	4.9	2.23
2	7.3	55	7.3	3.33
3	9.8	55	9.7	4.41
4	12.2	56	12.2	5.50
6	14.7	57	14.6	6.56
8	17.2	59	17.1	7.63
11	19.5	62	19.5	8.64
17	22.0	67	21.9	9.66
30	24.4	79	24.2	10.66
56	26.9	106	26.5	11.61
104	29.3	154	28.7	12.51
153	31.7	202	30.9	13.40
35	29.3	84	29.1	12.67
142	31.7	191	31.0	13.43
193	34.2	242	33.1	14.31
222	36.6	270	35.4	15.23
247	39.1	296	37.7	16.15
266	41.5	315	40.0	17.08

Test Results	
Pressiometric modulus E:	8,048 psi
Ultimate pressure P_L :	496 psi
Ratio E / P_L :	16.21
Yield pressure P_F :	202 psi
Ratio P_L / P_F :	2.46

Calibration Sheet Reference

Remarks

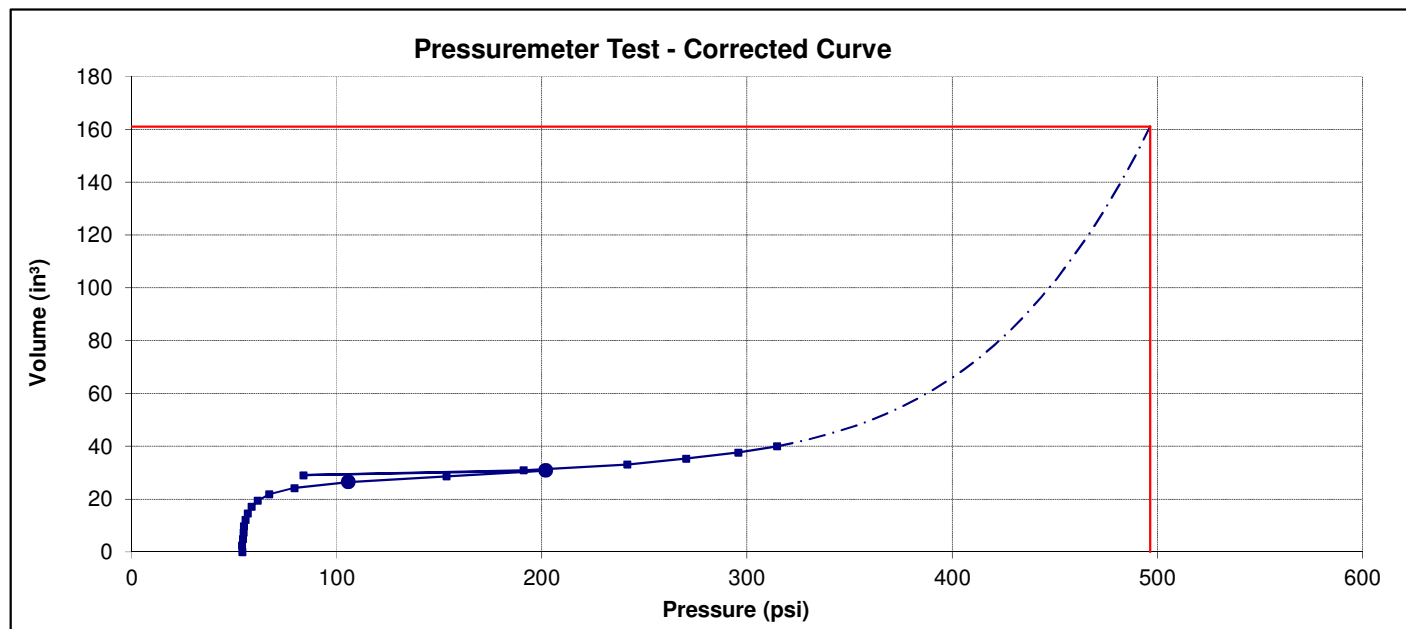


Figure G-1.35

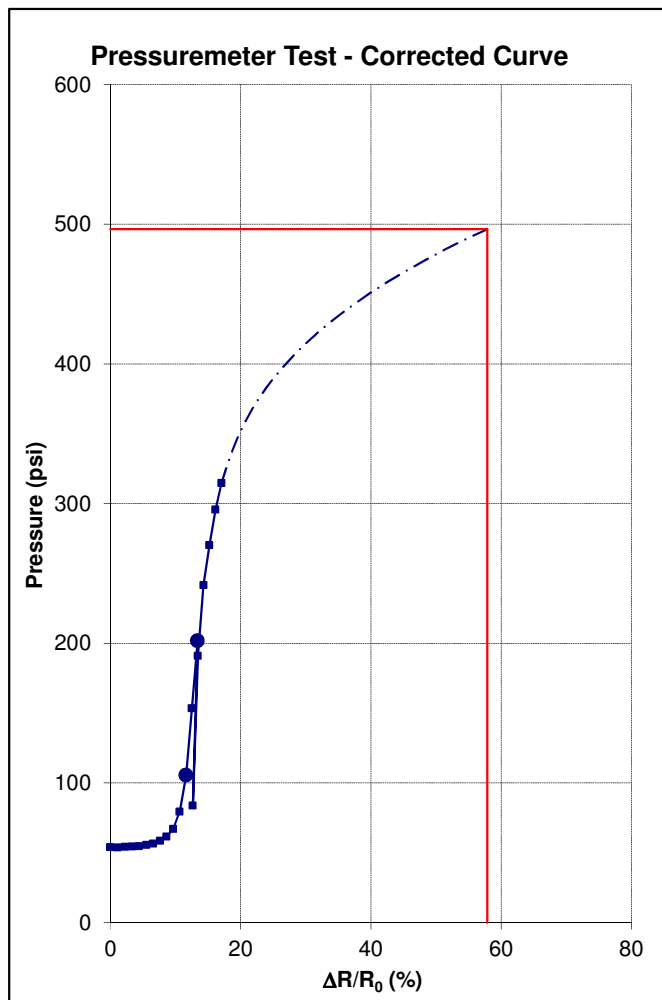


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-409
 Test date: (mm/dd/yyyy) 09/24/2015
 Probe #: 2
 Probe size: N

Use of a slotted casing: No
 Test depth: 123.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	54	0.0	0.00
0	2.4	54	2.4	1.13
1	4.9	54	4.9	2.23
2	7.3	55	7.3	3.33
3	9.8	55	9.7	4.41
4	12.2	56	12.2	5.50
6	14.7	57	14.6	6.56
8	17.2	59	17.1	7.63
11	19.5	62	19.5	8.64
17	22.0	67	21.9	9.66
30	24.4	79	24.2	10.66
56	26.9	106	26.5	11.61
104	29.3	154	28.7	12.51
153	31.7	202	30.9	13.40
35	29.3	84	29.1	12.67
142	31.7	191	31.0	13.43
193	34.2	242	33.1	14.31
222	36.6	270	35.4	15.23
247	39.1	296	37.7	16.15
266	41.5	315	40.0	17.08



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E : 8,048 psi
 Ultimate pressure P_L : 496 psi
 Ratio E / P_L : 16.21
 Yield pressure P_F : 202 psi
 Ratio P_L / P_F : 2.46



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-409
 Test date: 09/24/2015
 Probe #: 2
 Probe size: N

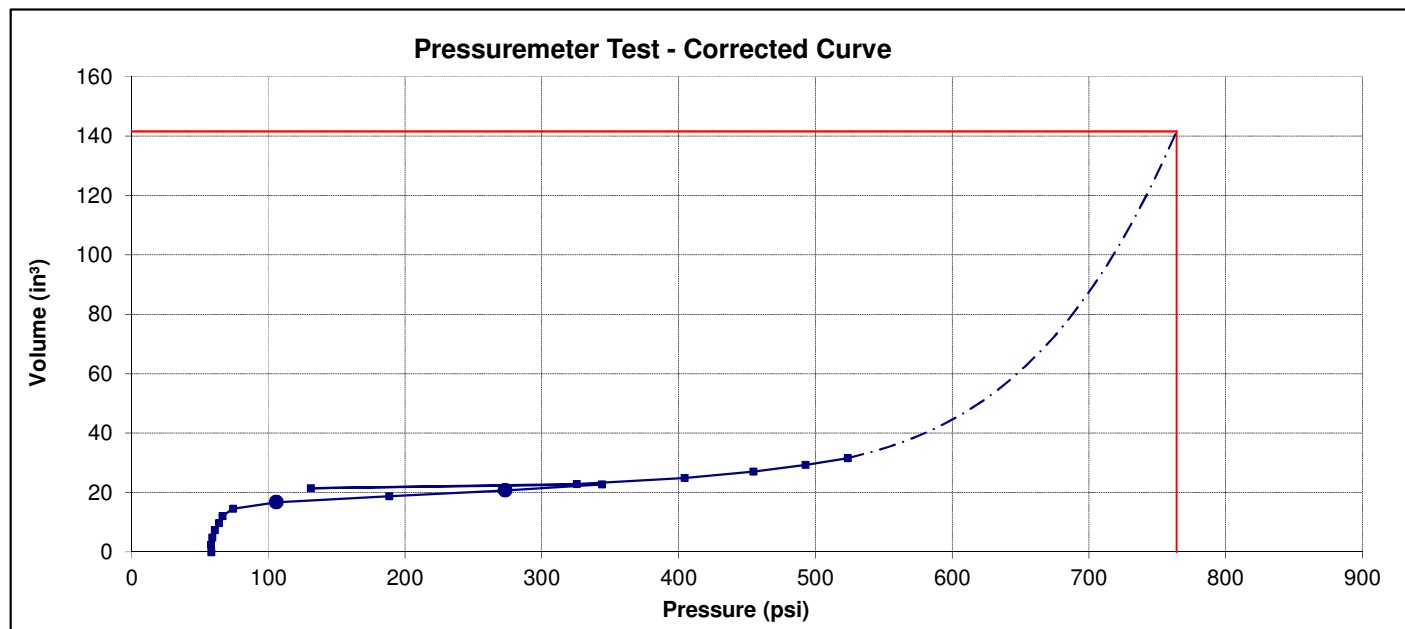
Use of a slotted casing: No
 Test depth: 133.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	58	0.0	0.00
0	2.4	58	2.4	1.12
2	4.9	59	4.9	2.23
4	7.4	61	7.4	3.36
8	9.8	64	9.7	4.41
11	12.2	67	12.1	5.47
19	14.7	74	14.6	6.53
51	17.1	106	16.8	7.50
134	19.5	188	18.8	8.35
219	22.0	273	20.8	9.19
290	24.4	344	22.8	10.06
77	22.0	131	21.5	9.52
272	24.4	326	22.9	10.10
351	26.9	404	25.0	10.96
401	29.3	455	27.1	11.84
439	31.7	493	29.3	12.76
471	34.2	524	31.6	13.69

Test Results	
Pressiometric modulus E:	14,247 psi
Ultimate pressure P_L :	764 psi
Ratio E / P_L :	18.65
Yield pressure P_F :	273 psi
Ratio P_L / P_F :	2.80

Calibration Sheet Reference

Remarks



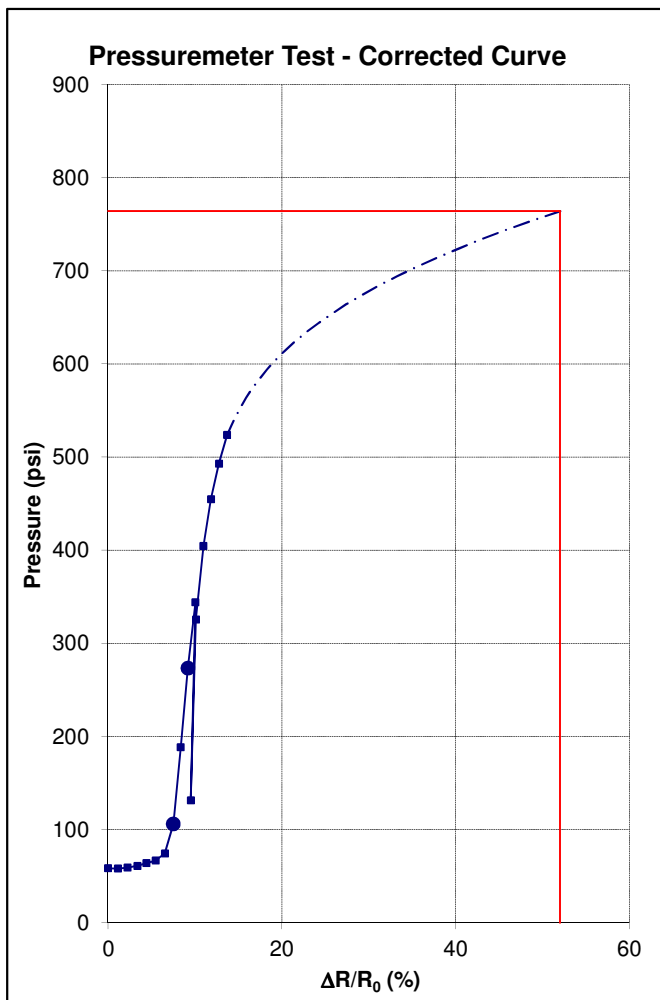


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-409
 Test date: (mm/dd/yyyy) 09/24/2015
 Probe #: 2
 Probe size: N

Use of a slotted casing: No
 Test depth: 133.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	58	0.0	0.00
0	2.4	58	2.4	1.12
2	4.9	59	4.9	2.23
4	7.4	61	7.4	3.36
8	9.8	64	9.7	4.41
11	12.2	67	12.1	5.47
19	14.7	74	14.6	6.53
51	17.1	106	16.8	7.50
134	19.5	188	18.8	8.35
219	22.0	273	20.8	9.19
290	24.4	344	22.8	10.06
77	22.0	131	21.5	9.52
272	24.4	326	22.9	10.10
351	26.9	404	25.0	10.96
401	29.3	455	27.1	11.84
439	31.7	493	29.3	12.76
471	34.2	524	31.6	13.69



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 14,247 psi
 Ultimate pressure P_L : 764 psi
 Ratio E / P_L : 18.65
 Yield pressure P_F : 273 psi
 Ratio P_L / P_F : 2.80



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-411
 Test date: 09/29/2015
 Probe #: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 82.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	36	0.0	0.00
0	2.5	36	2.5	1.13
0	4.9	36	4.9	2.23
2	7.4	37	7.4	3.37
2	9.8	37	9.8	4.42
3	12.2	37	12.2	5.49
3	14.6	37	14.6	6.56
5	17.2	38	17.2	7.66
6	19.5	39	19.5	8.65
8	22.0	41	22.0	9.69
10	24.4	43	24.4	10.70
14	26.9	47	26.8	11.71
20	29.3	52	29.2	12.70
29	31.7	62	31.6	13.68
45	34.2	78	33.9	14.64
71	36.6	103	36.2	15.56
19	34.2	52	34.1	14.69
66	36.6	98	36.3	15.57
108	39.1	140	38.5	16.45
160	41.5	192	40.7	17.32
203	43.9	235	42.8	18.17
236	46.4	268	45.1	19.05
267	48.8	299	47.4	19.94

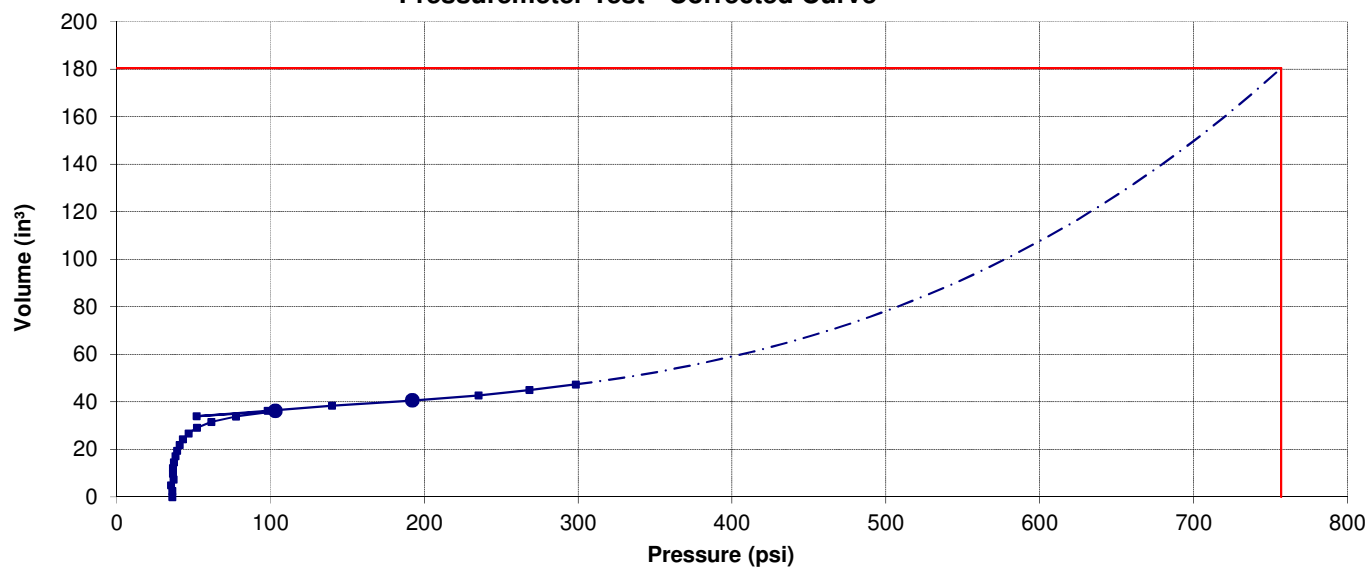
Test Results

Pressiometric modulus E: 7,800 psi
 Ultimate pressure P_L : 757 psi
 Ratio E / P_L : 10.31
 Yield pressure P_F : 192 psi
 Ratio P_L / P_F : 3.94

Calibration Sheet Reference

Remarks

Pressuremeter Test - Corrected Curve



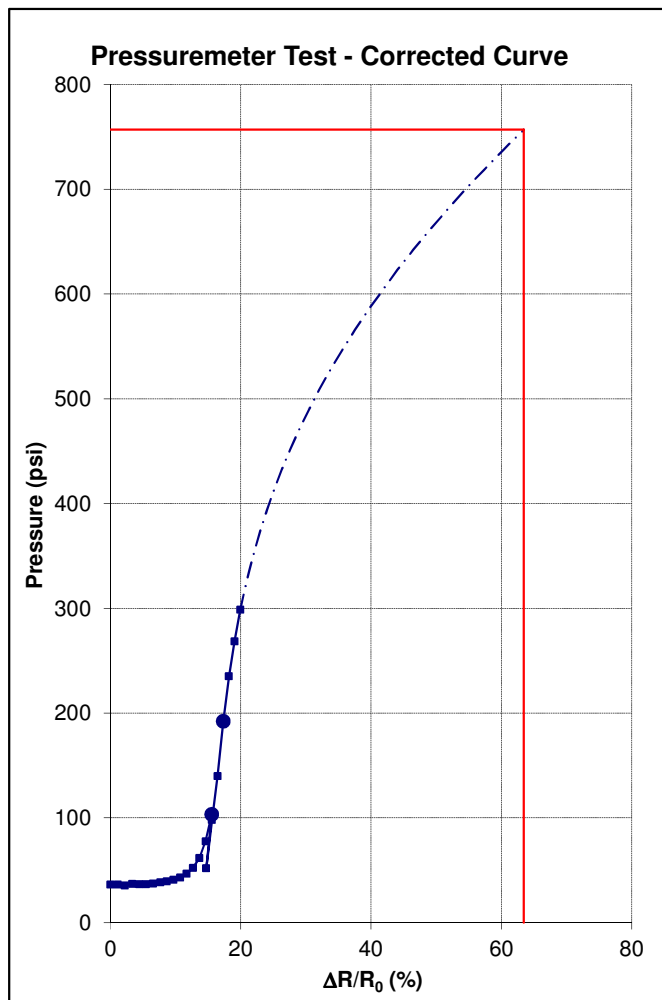


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-411
 Test date: (mm/dd/yyyy) 09/29/2015
 Probe #: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 82.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	36	0.0	0.00
0	2.5	36	2.5	1.13
0	4.9	36	4.9	2.23
2	7.4	37	7.4	3.37
2	9.8	37	9.8	4.42
3	12.2	37	12.2	5.49
3	14.6	37	14.6	6.56
5	17.2	38	17.2	7.66
6	19.5	39	19.5	8.65
8	22.0	41	22.0	9.69
10	24.4	43	24.4	10.70
14	26.9	47	26.8	11.71
20	29.3	52	29.2	12.70
29	31.7	62	31.6	13.68
45	34.2	78	33.9	14.64
71	36.6	103	36.2	15.56
19	34.2	52	34.1	14.69
66	36.6	98	36.3	15.57
108	39.1	140	38.5	16.45
160	41.5	192	40.7	17.32
203	43.9	235	42.8	18.17
236	46.4	268	45.1	19.05
267	48.8	299	47.4	19.94



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 7,800 psi
 Ultimate pressure P_L : 757 psi
 Ratio E / P_L : 10.31
 Yield pressure P_F : 192 psi
 Ratio P_L / P_F : 3.94



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-411
 Test date: 09/30/2015
 Probe #: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 105.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	46	0.0	0.00
1	2.5	47	2.4	1.13
3	4.9	48	4.9	2.23
5	7.3	50	7.3	3.32
9	9.8	53	9.8	4.43
20	12.2	64	12.1	5.45
48	14.6	91	14.4	6.45
114	17.1	157	16.5	7.35
15	14.6	59	14.6	6.53
107	17.1	151	16.5	7.37
226	19.5	269	18.3	8.14
362	22.0	405	20.0	8.86
450	24.4	493	21.9	9.69
534	26.9	577	23.9	10.52
603	29.3	646	26.0	11.38
662	31.7	704	28.1	12.25
712	34.2	754	30.3	13.14
752	36.6	795	32.5	14.05

Test Results	
Pressiometric modulus E:	20,936 psi
Ultimate pressure P_L :	1,121 psi
Ratio E / P_L :	18.68
Yield pressure P_F :	493 psi
Ratio P_L / P_F :	2.27

Calibration Sheet Reference

Remarks

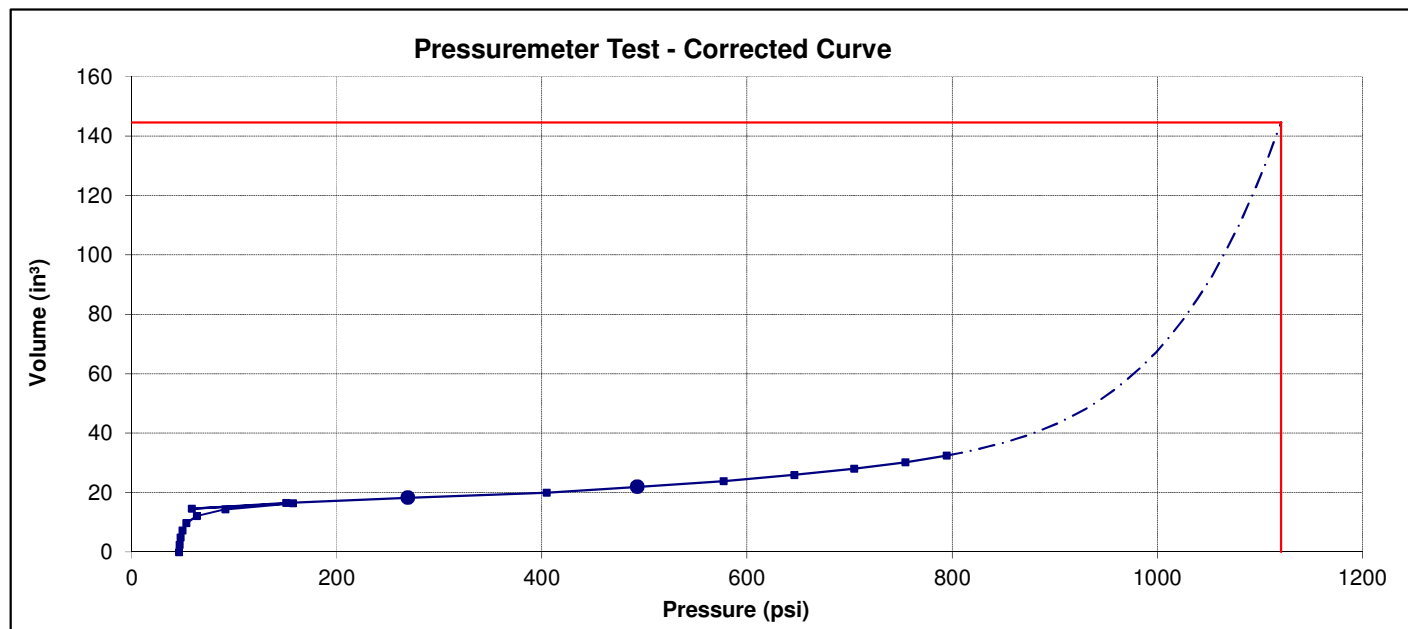


Figure G-1.41

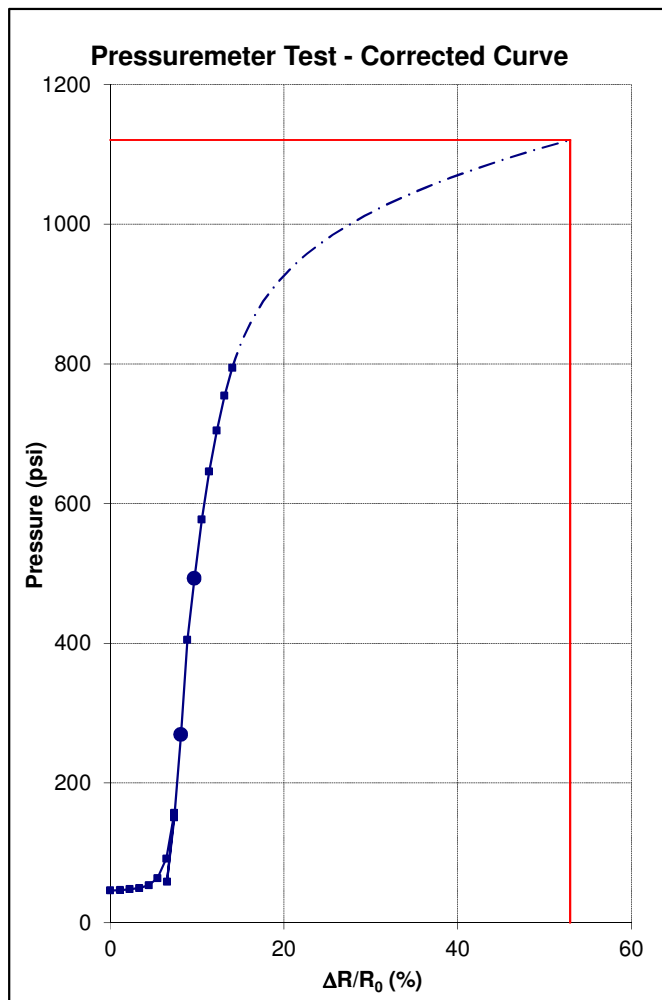


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-411
 Test date: (mm/dd/yyyy) 09/30/2015
 Probe #: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 105.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	46	0.0	0.00
1	2.5	47	2.4	1.13
3	4.9	48	4.9	2.23
5	7.3	50	7.3	3.32
9	9.8	53	9.8	4.43
20	12.2	64	12.1	5.45
48	14.6	91	14.4	6.45
114	17.1	157	16.5	7.35
15	14.6	59	14.6	6.53
107	17.1	151	16.5	7.37
226	19.5	269	18.3	8.14
362	22.0	405	20.0	8.86
450	24.4	493	21.9	9.69
534	26.9	577	23.9	10.52
603	29.3	646	26.0	11.38
662	31.7	704	28.1	12.25
712	34.2	754	30.3	13.14
752	36.6	795	32.5	14.05



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 20,936 psi
 Ultimate pressure P_L : 1,121 psi
 Ratio E / P_L : 18.68
 Yield pressure P_F : 493 psi
 Ratio P_L / P_F : 2.27



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-413
Test date: 04/02/2015
Test number: 2
Probe size: N

Use of a slotted casing: No
Test depth: 27.50 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	13	0.0	0.00
1	2.4	12	2.4	1.13
1	4.9	12	4.9	2.24
2	7.3	12	7.3	3.34
2	9.8	12	9.8	4.42
3	12.2	12	12.2	5.49
4	14.6	13	14.6	6.56
5	17.3	14	17.3	7.70
7	19.5	15	19.5	8.66
10	22.0	18	21.9	9.68
13	24.4	21	24.3	10.70
19	26.9	27	26.8	11.70
30	29.3	37	29.1	12.69
47	31.7	54	31.5	13.65
15	29.3	22	29.2	12.72
44	31.7	51	31.5	13.65
72	34.2	78	33.8	14.59
86	36.6	93	36.2	15.54

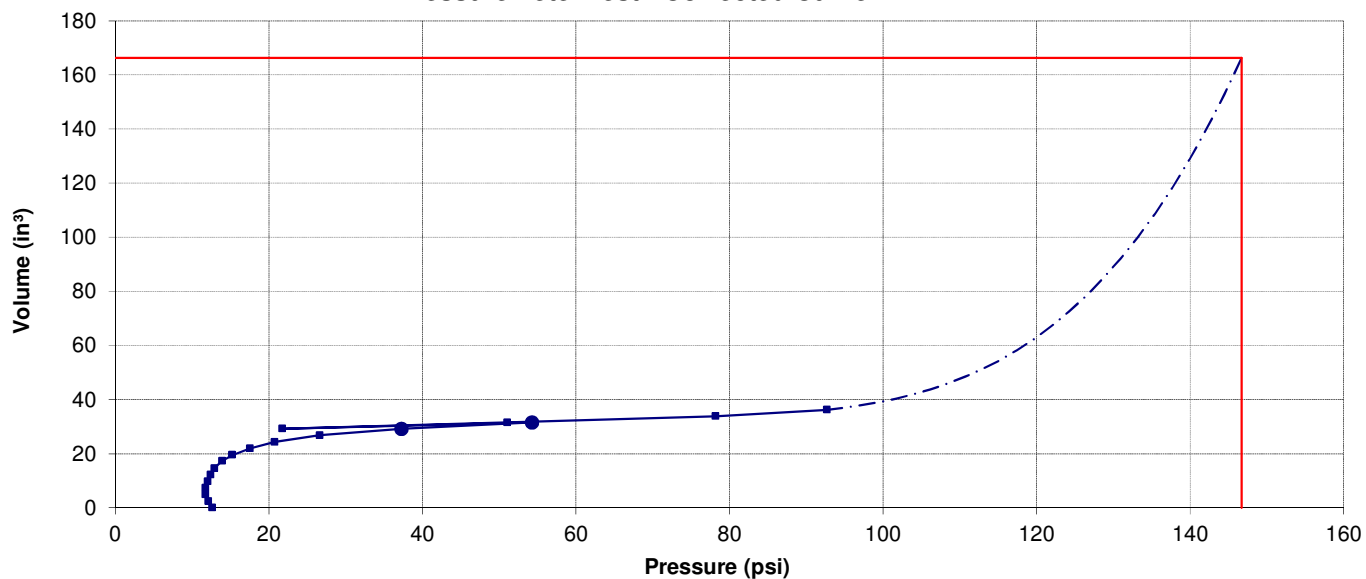
Test Results

Pressiometric modulus E: 2,652 psi
Ultimate pressure P_L : 147 psi
Ratio E / P_L : 18.08
Yield pressure P_F : 54 psi
Ratio P_L / P_F : 2.70

Calibration Sheet Reference

Remarks

Pressuremeter Test - Corrected Curve



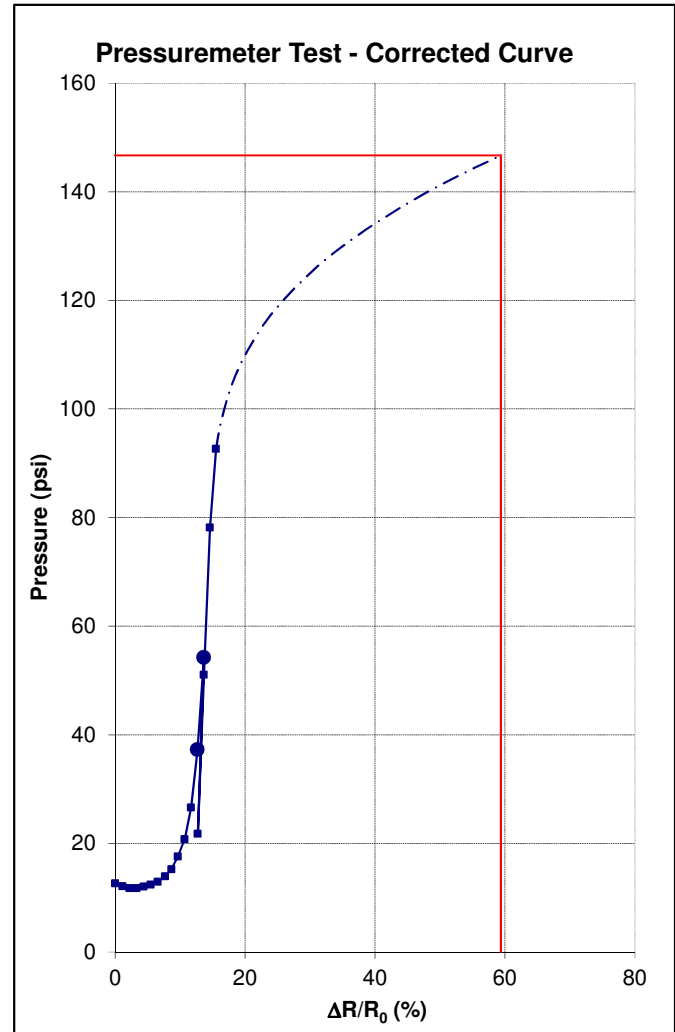


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-413
Test date: (mm/dd/yyyy) 04/02/2015
Test number: 2
Probe size: N

Use of a slotted casing: No
Test depth: 27.50 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	13	0.0	0.00
1	2.4	12	2.4	1.13
1	4.9	12	4.9	2.24
2	7.3	12	7.3	3.34
2	9.8	12	9.8	4.42
3	12.2	12	12.2	5.49
4	14.6	13	14.6	6.56
5	17.3	14	17.3	7.70
7	19.5	15	19.5	8.66
10	22.0	18	21.9	9.68
13	24.4	21	24.3	10.70
19	26.9	27	26.8	11.70
30	29.3	37	29.1	12.69
47	31.7	54	31.5	13.65
15	29.3	22	29.2	12.72
44	31.7	51	31.5	13.65
72	34.2	78	33.8	14.59
86	36.6	93	36.2	15.54



Calibration Sheet Reference

Test Results

Pressiometric modulus E: 2,652 psi
Ultimate pressure P_L : 147 psi
Ratio E / P_L : 18.08
Yield pressure P_F : 54 psi
Ratio P_L / P_F : 2.70

Remarks

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-413
 Test date: 04/02/2015
 Test number: 1
 Probe size: N

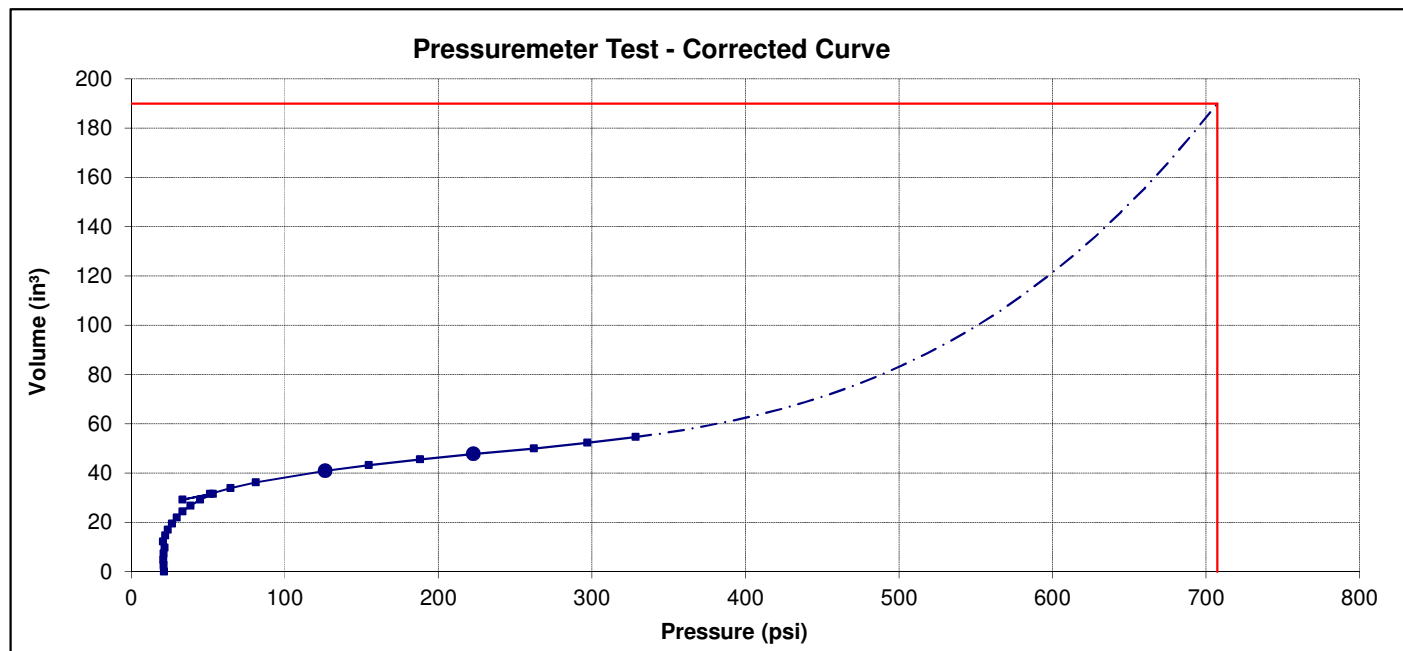
Use of a slotted casing: No
 Test depth: 47.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	21	0.0	0.00
1	2.6	21	2.6	1.21
1	4.9	21	4.9	2.23
2	7.4	21	7.4	3.37
3	9.8	22	9.7	4.42
4	12.2	21	12.2	5.49
6	14.7	22	14.7	6.57
7	17.1	24	17.1	7.61
10	19.5	26	19.5	8.64
13	22.0	30	21.9	9.67
17	24.5	33	24.5	10.75
22	26.9	39	26.7	11.70
28	29.3	45	29.2	12.70
37	31.8	53	31.6	13.69
17	29.3	33	29.2	12.72
35	31.7	51	31.6	13.68
48	34.2	65	33.9	14.64
65	36.6	81	36.3	15.59
110	41.5	126	41.0	17.44
138	43.9	155	43.3	18.35
172	46.4	188	45.5	19.23
206	48.8	223	47.8	20.11
246	51.3	262	50.1	20.98
281	53.7	297	52.3	21.85
312	56.2	328	54.6	22.72

Test Results	
Pressiometric modulus E:	5,701 psi
Ultimate pressure P_L :	707 psi
Ratio E / P_L :	8.06
Yield pressure P_F :	223 psi
Ratio P_L / P_F :	3.17

Calibration Sheet Reference

Remarks



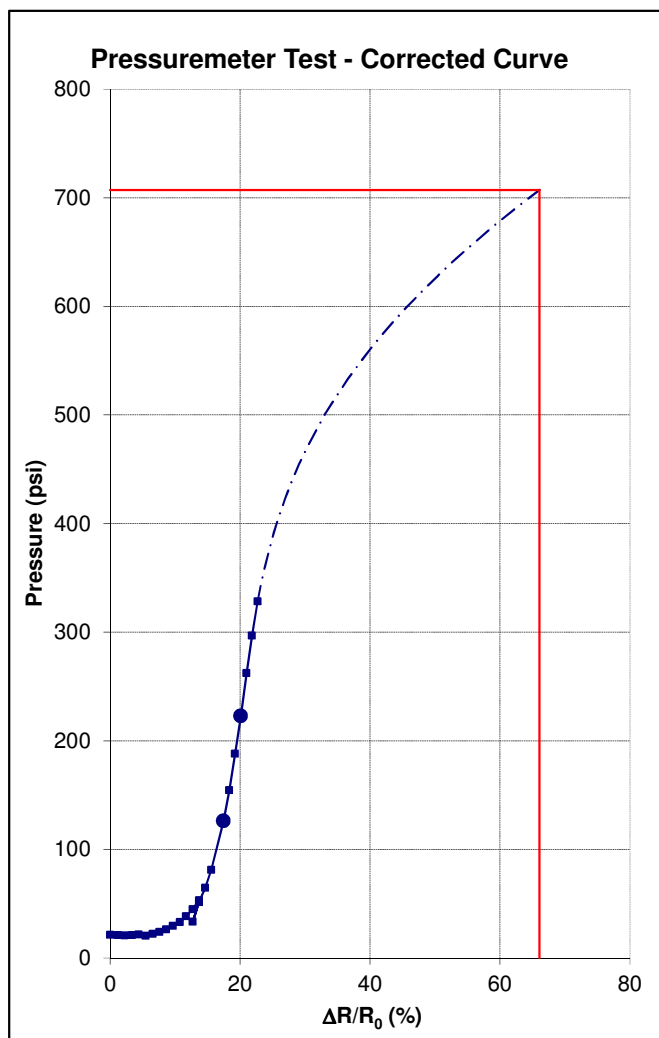


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-413
 Test date: (mm/dd/yyyy) 04/02/2015
 Test number: 1
 Probe size: N

Use of a slotted casing: No
 Test depth: 47.50 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	21	0.0	0.00
1	2.6	21	2.6	1.21
1	4.9	21	4.9	2.23
2	7.4	21	7.4	3.37
3	9.8	22	9.7	4.42
4	12.2	21	12.2	5.49
6	14.7	22	14.7	6.57
7	17.1	24	17.1	7.61
10	19.5	26	19.5	8.64
13	22.0	30	21.9	9.67
17	24.5	33	24.5	10.75
22	26.9	39	26.7	11.70
28	29.3	45	29.2	12.70
37	31.8	53	31.6	13.69
17	29.3	33	29.2	12.72
35	31.7	51	31.6	13.68
48	34.2	65	33.9	14.64
65	36.6	81	36.3	15.59
110	41.5	126	41.0	17.44
138	43.9	155	43.3	18.35
172	46.4	188	45.5	19.23
206	48.8	223	47.8	20.11
246	51.3	262	50.1	20.98
281	53.7	297	52.3	21.85
312	56.2	328	54.6	22.72



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E : 5,701 psi
 Ultimate pressure P_L : 707 psi
 Ratio E / P_L : 8.06
 Yield pressure P_F : 223 psi
 Ratio P_L / P_F : 3.17



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-413
Test date: 04/02/2015
Test number: 1
Probe size: N

Use of a slotted casing: No
Test depth: 67.50 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	30	0.0	0.00
1	2.5	30	2.5	1.16
2	4.9	30	4.9	2.23
3	7.3	30	7.3	3.33
4	9.8	31	9.7	4.41
5	12.2	32	12.2	5.49
8	14.6	35	14.6	6.55
12	17.1	39	17.1	7.62
20	19.7	47	19.6	8.69
64	22.1	91	21.8	9.62
8	19.5	34	19.5	8.65
50	22.0	76	21.8	9.63
102	24.4	128	23.9	10.52
144	26.9	170	26.2	11.45
185	29.3	211	28.4	12.38
222	31.7	247	30.7	13.31
254	34.3	280	33.0	14.27
280	36.6	305	35.3	15.17

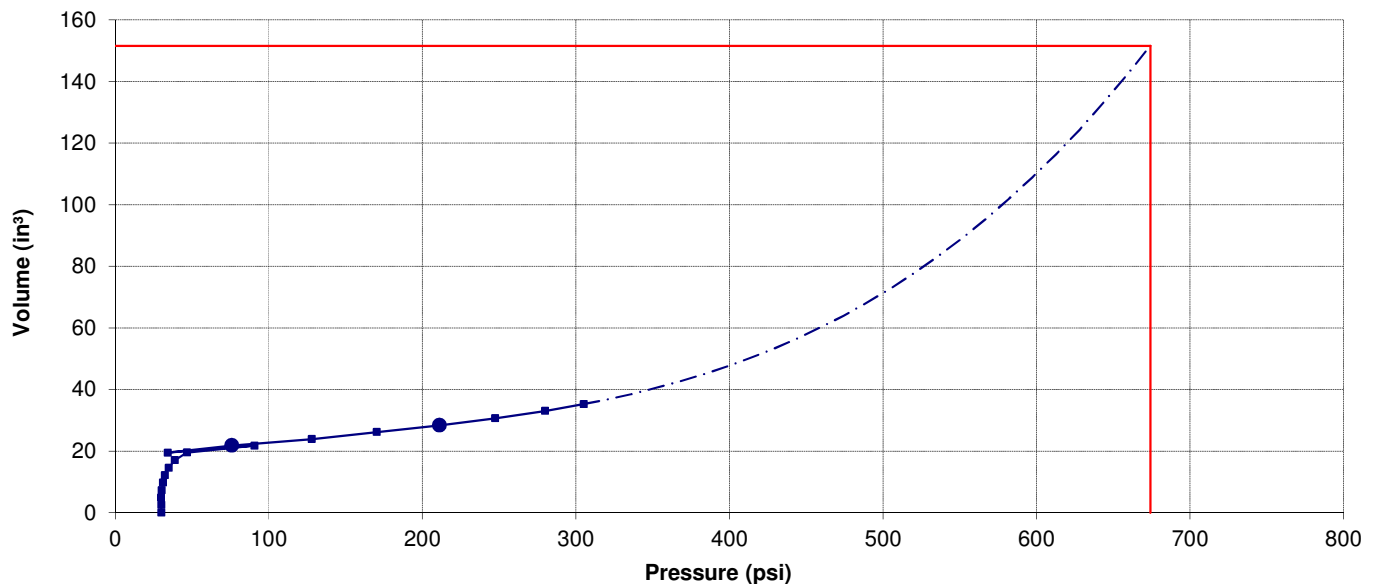
Test Results

Pressiometric modulus E: 7,252 psi
Ultimate pressure P_L : 674 psi
Ratio E / P_L : 10.76
Yield pressure P_F : 211 psi
Ratio P_L / P_F : 3.19

Calibration Sheet Reference

Remarks

Pressuremeter Test - Corrected Curve



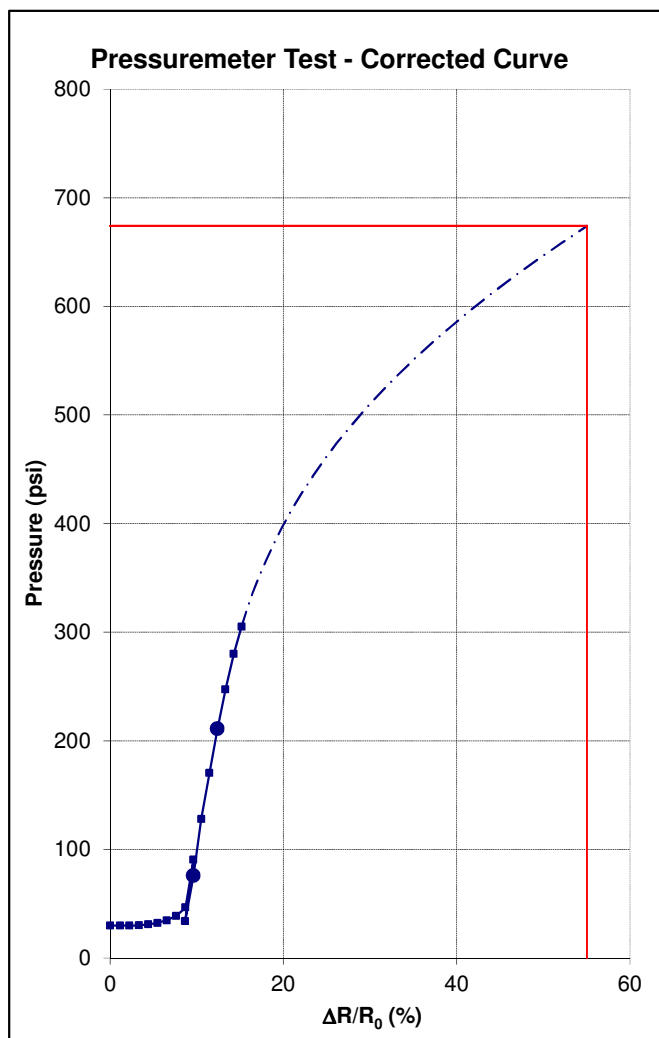


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-413
Test date: (mm/dd/yyyy) 04/02/2015
Test number: 1
Probe size: N

Use of a slotted casing: No
Test depth: 67.50 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	30	0.0	0.00
1	2.5	30	2.5	1.16
2	4.9	30	4.9	2.23
3	7.3	30	7.3	3.33
4	9.8	31	9.7	4.41
5	12.2	32	12.2	5.49
8	14.6	35	14.6	6.55
12	17.1	39	17.1	7.62
20	19.7	47	19.6	8.69
64	22.1	91	21.8	9.62
8	19.5	34	19.5	8.65
50	22.0	76	21.8	9.63
102	24.4	128	23.9	10.52
144	26.9	170	26.2	11.45
185	29.3	211	28.4	12.38
222	31.7	247	30.7	13.31
254	34.3	280	33.0	14.27
280	36.6	305	35.3	15.17



Calibration Sheet Reference

Test Results

Pressiometric modulus E: 7,252 psi
Ultimate pressure P_L : 674 psi
Ratio E / P_L : 10.76
Yield pressure P_F : 211 psi
Ratio P_L / P_F : 3.19

Remarks



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-413
Test date: 04/03/2015
Test number: 1
Probe size: N

Use of a slotted casing: No
Test depth: 83.00 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	37	0.0	0.00
1	2.5	37	2.4	1.13
2	4.9	37	4.9	2.25
3	7.3	38	7.3	3.33
6	9.8	40	9.8	4.43
9	12.2	41	12.2	5.49
14	14.7	46	14.6	6.54
21	17.1	53	17.0	7.57
7	14.6	39	14.6	6.55
20	17.1	52	17.0	7.58
35	19.5	67	19.4	8.59
60	22.0	92	21.7	9.58
99	24.4	131	23.9	10.53
167	26.9	199	26.1	11.42
234	29.3	266	28.2	12.28
299	31.7	331	30.3	13.15
356	34.2	388	32.5	14.04
410	36.6	442	34.6	14.92

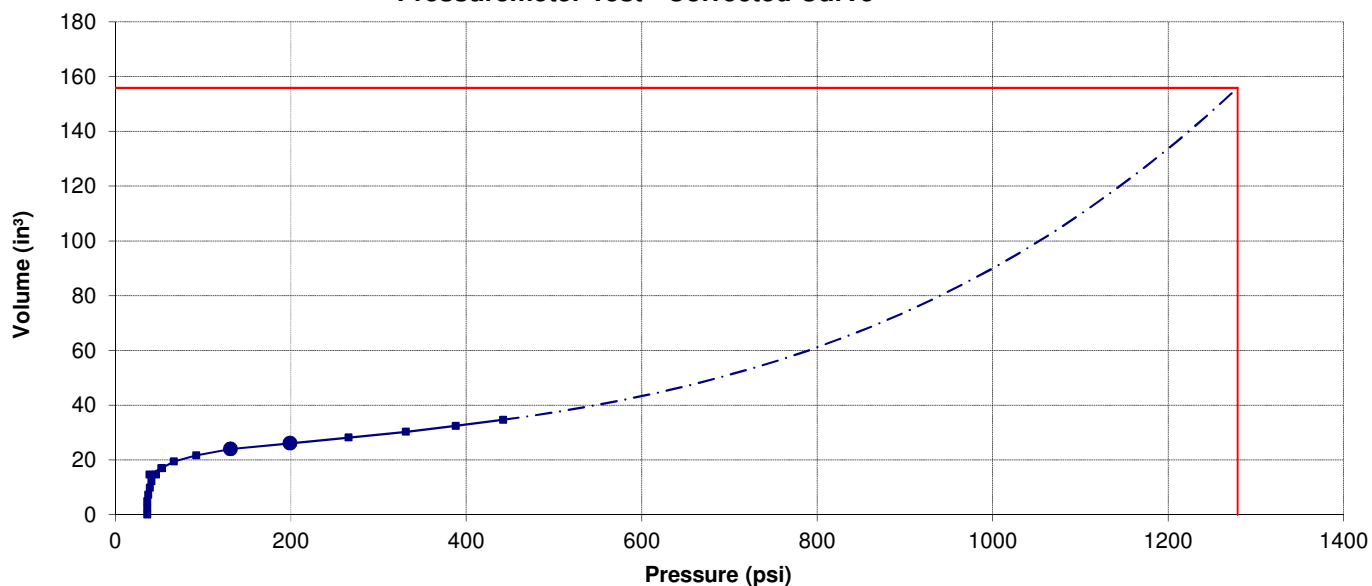
Test Results

Pressiometric modulus E: 11,182 psi
Ultimate pressure P_L : 1,279 psi
Ratio E / P_L : 8.74
Yield pressure P_F : 199 psi
Ratio P_L / P_F : 6.43

Calibration Sheet Reference

Remarks

Pressuremeter Test - Corrected Curve



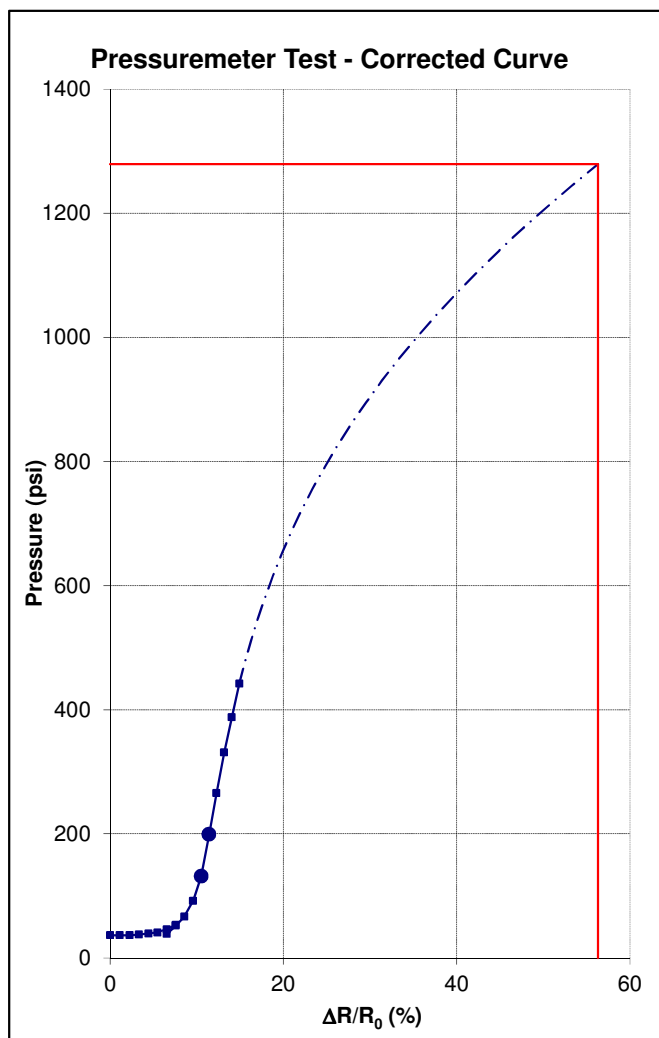


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-413
Test date: (mm/dd/yyyy) 04/03/2015
Test number: 1
Probe size: N

Use of a slotted casing: No
Test depth: 83.00 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	37	0.0	0.00
1	2.5	37	2.4	1.13
2	4.9	37	4.9	2.25
3	7.3	38	7.3	3.33
6	9.8	40	9.8	4.43
9	12.2	41	12.2	5.49
14	14.7	46	14.6	6.54
21	17.1	53	17.0	7.57
7	14.6	39	14.6	6.55
20	17.1	52	17.0	7.58
35	19.5	67	19.4	8.59
60	22.0	92	21.7	9.58
99	24.4	131	23.9	10.53
167	26.9	199	26.1	11.42
234	29.3	266	28.2	12.28
299	31.7	331	30.3	13.15
356	34.2	388	32.5	14.04
410	36.6	442	34.6	14.92



Calibration Sheet Reference

Test Results

Pressiometric modulus E: 11,182 psi
Ultimate pressure P_L : 1,279 psi
Ratio E / P_L : 8.74
Yield pressure P_F : 199 psi
Ratio P_L / P_F : 6.43

Remarks

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-415
 Test date: 03/30/2015
 Test number: 2
 Probe size: N

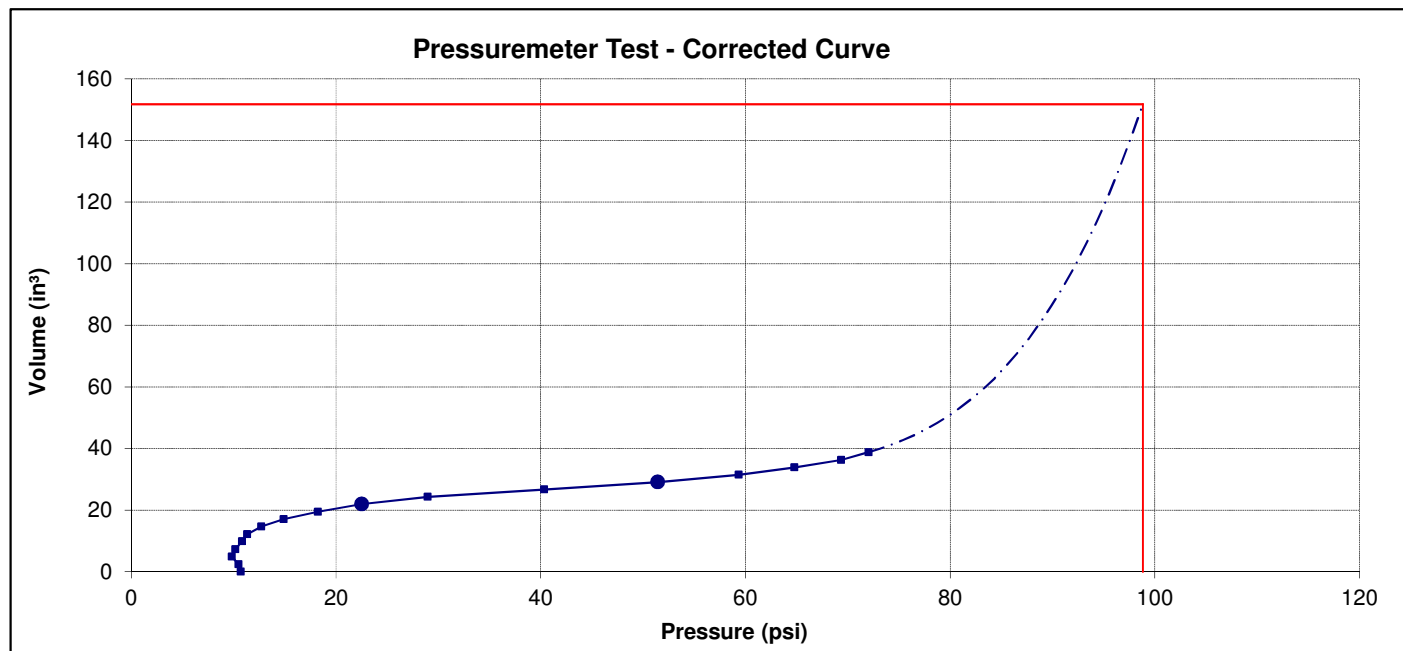
Use of a slotted casing: No
 Test depth: 23.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	11	0.0	0.00
1	2.4	10	2.4	1.12
1	4.9	10	4.9	2.23
2	7.3	10	7.3	3.33
3	9.8	11	9.8	4.45
4	12.2	11	12.2	5.49
5	14.7	13	14.6	6.56
8	17.1	15	17.1	7.61
11	19.5	18	19.5	8.64
16	22.0	23	21.9	9.67
23	24.4	29	24.3	10.68
34	26.9	40	26.7	11.67
46	29.3	51	29.1	12.65
54	31.7	59	31.5	13.64
59	34.2	65	33.9	14.62
64	36.6	69	36.3	15.59
67	39.1	72	38.8	16.59

Test Results	
Pressiometric modulus E:	1,433 psi
Ultimate pressure P_L :	99 psi
Ratio E / P_L :	14.50
Yield pressure P_F :	51 psi
Ratio P_L / P_F :	1.92

Calibration Sheet Reference

Remarks



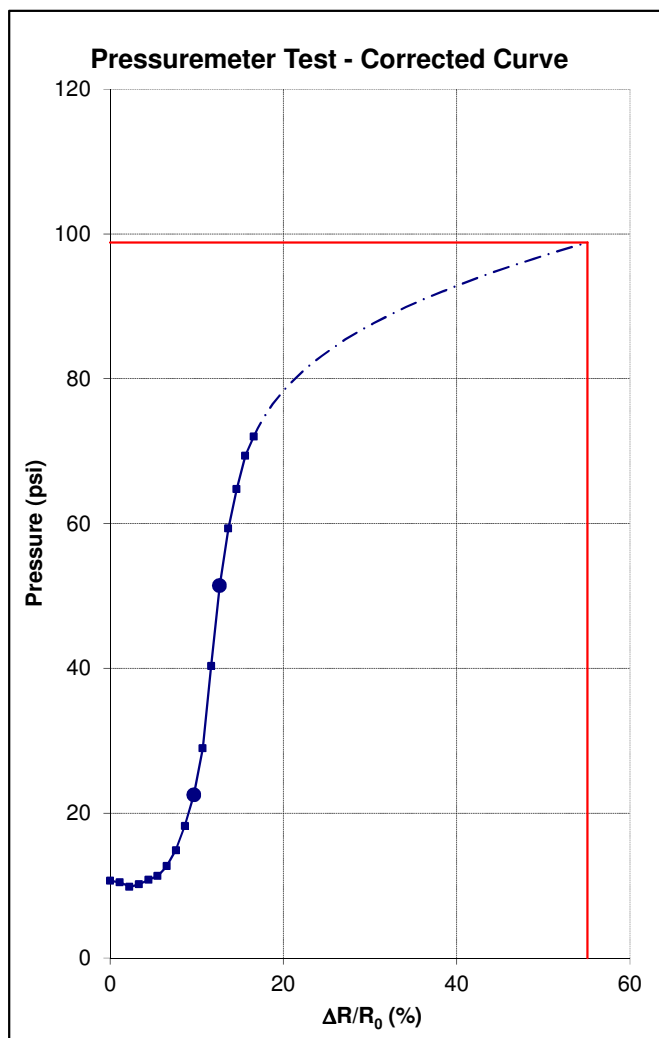


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-415
Test date: (mm/dd/yyyy) 03/30/2015
Test number: 2
Probe size: N

Use of a slotted casing: No
Test depth: 23.00 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	11	0.0	0.00
1	2.4	10	2.4	1.12
1	4.9	10	4.9	2.23
2	7.3	10	7.3	3.33
3	9.8	11	9.8	4.45
4	12.2	11	12.2	5.49
5	14.7	13	14.6	6.56
8	17.1	15	17.1	7.61
11	19.5	18	19.5	8.64
16	22.0	23	21.9	9.67
23	24.4	29	24.3	10.68
34	26.9	40	26.7	11.67
46	29.3	51	29.1	12.65
54	31.7	59	31.5	13.64
59	34.2	65	33.9	14.62
64	36.6	69	36.3	15.59
67	39.1	72	38.8	16.59



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E : 1,433 psi
Ultimate pressure P_L : 99 psi
Ratio E / P_L : 14.50
Yield pressure P_F : 51 psi
Ratio P_L / P_F : 1.92



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-415
Test date: 03/30/2015
Test number: 3
Probe size: N

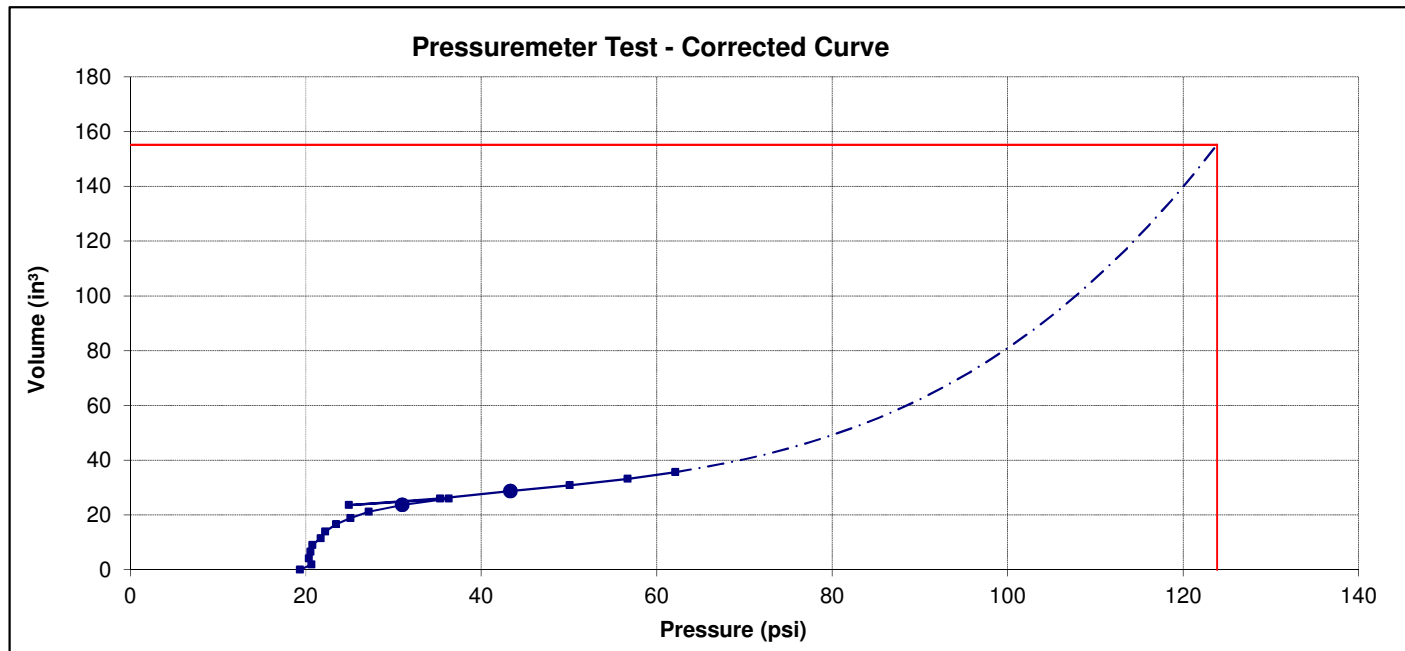
Use of a slotted casing: No
Test depth: 43.00 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	19	0.0	0.00
2	1.9	21	1.9	0.86
3	4.1	20	4.1	1.90
3	6.6	21	6.6	3.01
4	9.1	21	9.1	4.11
5	11.5	22	11.4	5.17
6	13.9	22	13.9	6.23
8	16.6	23	16.6	7.39
10	18.8	25	18.8	8.35
12	21.2	27	21.2	9.36
16	23.7	31	23.6	10.39
21	26.1	36	26.0	11.39
10	23.7	25	23.6	10.40
20	26.1	35	26.0	11.40
29	28.9	43	28.7	12.51
36	31.0	50	30.8	13.37
42	33.4	57	33.2	14.36
48	35.9	62	35.6	15.33
0				

Test Results	
Pressiometric modulus E:	862 psi
Ultimate pressure P_L :	124 psi
Ratio E / P_L :	6.96
Yield pressure P_F :	43 psi
Ratio P_L / P_F :	2.86

Calibration Sheet Reference

Remarks



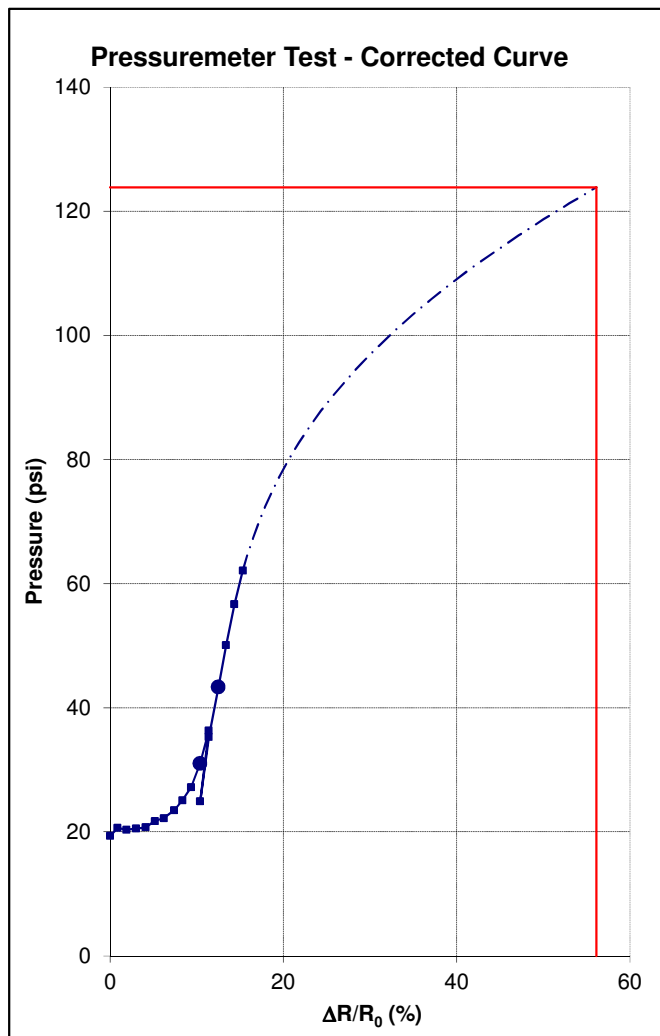


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-415
Test date: (mm/dd/yyyy) 03/30/2015
Test number: 3
Probe size: N

Use of a slotted casing: No
Test depth: 43.00 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	19	0.0	0.00
2	1.9	21	1.9	0.86
3	4.1	20	4.1	1.90
3	6.6	21	6.6	3.01
4	9.1	21	9.1	4.11
5	11.5	22	11.4	5.17
6	13.9	22	13.9	6.23
8	16.6	23	16.6	7.39
10	18.8	25	18.8	8.35
12	21.2	27	21.2	9.36
16	23.7	31	23.6	10.39
21	26.1	36	26.0	11.39
10	23.7	25	23.6	10.40
20	26.1	35	26.0	11.40
29	28.9	43	28.7	12.51
36	31.0	50	30.8	13.37
42	33.4	57	33.2	14.36
48	35.9	62	35.6	15.33
0				



Calibration Sheet Reference

Test Results

Pressiometric modulus E : 862 psi
Ultimate pressure P_L : 124 psi
Ratio E / P_L : 6.96
Yield pressure P_F : 43 psi
Ratio P_L / P_F : 2.86

Remarks



TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-415
 Test date: 03/30/2015
 Test number: 4
 Probe size: N

Use of a slotted casing: No
 Test depth: 63.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	28	0.0	0.00
1	2.6	28	2.5	1.17
2	4.9	28	4.9	2.23
2	7.4	28	7.3	3.34
3	9.8	29	9.7	4.42
5	12.3	30	12.3	5.53
6	14.6	31	14.6	6.55
8	17.1	33	17.0	7.60
11	19.5	35	19.5	8.64
16	22.0	39	21.9	9.67
22	24.4	45	24.3	10.68
33	26.9	56	26.7	11.67
48	29.3	71	29.1	12.67
68	31.7	91	31.4	13.61
89	34.2	112	33.7	14.56
30	31.7	53	31.6	13.68
85	34.2	108	33.8	14.57
109	36.6	132	36.1	15.50
163	46.4	185	45.6	19.25
172	48.8	194	48.0	20.17
181	51.4	203	50.5	21.14

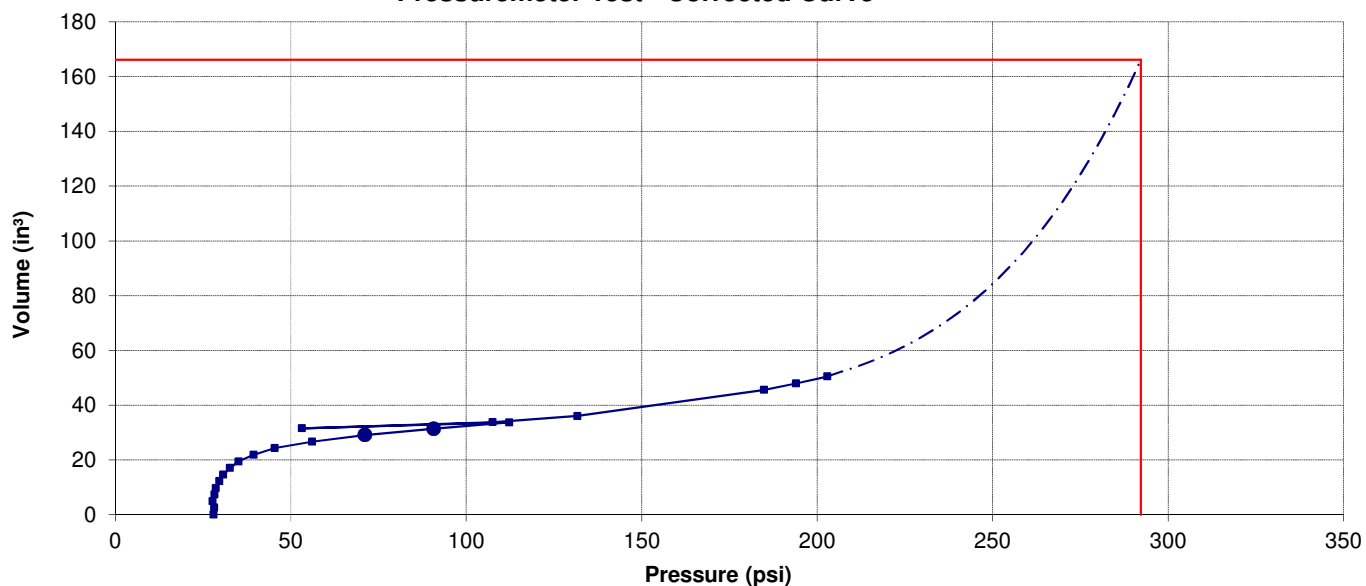
Test Results

Pressiometric modulus E: 3,134 psi
 Ultimate pressure P_L : 292 psi
 Ratio E / P_L : 10.73
 Yield pressure P_F : 91 psi
 Ratio P_L / P_F : 3.22

Calibration Sheet Reference

Remarks

Pressuremeter Test - Corrected Curve



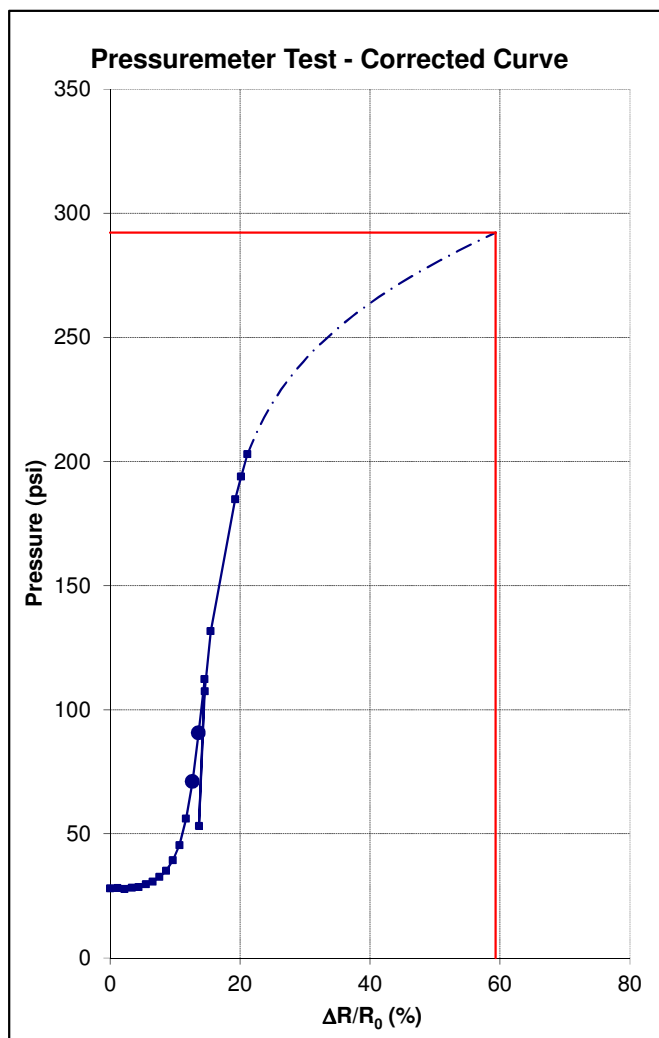


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-415
Test date: (mm/dd/yyyy) 03/30/2015
Test number: 4
Probe size: N

Use of a slotted casing: No
Test depth: 63.00 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	28	0.0	0.00
1	2.6	28	2.5	1.17
2	4.9	28	4.9	2.23
2	7.4	28	7.3	3.34
3	9.8	29	9.7	4.42
5	12.3	30	12.3	5.53
6	14.6	31	14.6	6.55
8	17.1	33	17.0	7.60
11	19.5	35	19.5	8.64
16	22.0	39	21.9	9.67
22	24.4	45	24.3	10.68
33	26.9	56	26.7	11.67
48	29.3	71	29.1	12.67
68	31.7	91	31.4	13.61
89	34.2	112	33.7	14.56
30	31.7	53	31.6	13.68
85	34.2	108	33.8	14.57
109	36.6	132	36.1	15.50
163	46.4	185	45.6	19.25
172	48.8	194	48.0	20.17
181	51.4	203	50.5	21.14



Calibration Sheet Reference

Test Results

Pressiometric modulus E: 3,134 psi
Ultimate pressure P_L : 292 psi
Ratio E / P_L : 10.73
Yield pressure P_F : 91 psi
Ratio P_L / P_F : 3.22

Remarks

TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
 Borehole name: G-415
 Test date: 03/31/2015
 Test number: 5
 Probe size: N

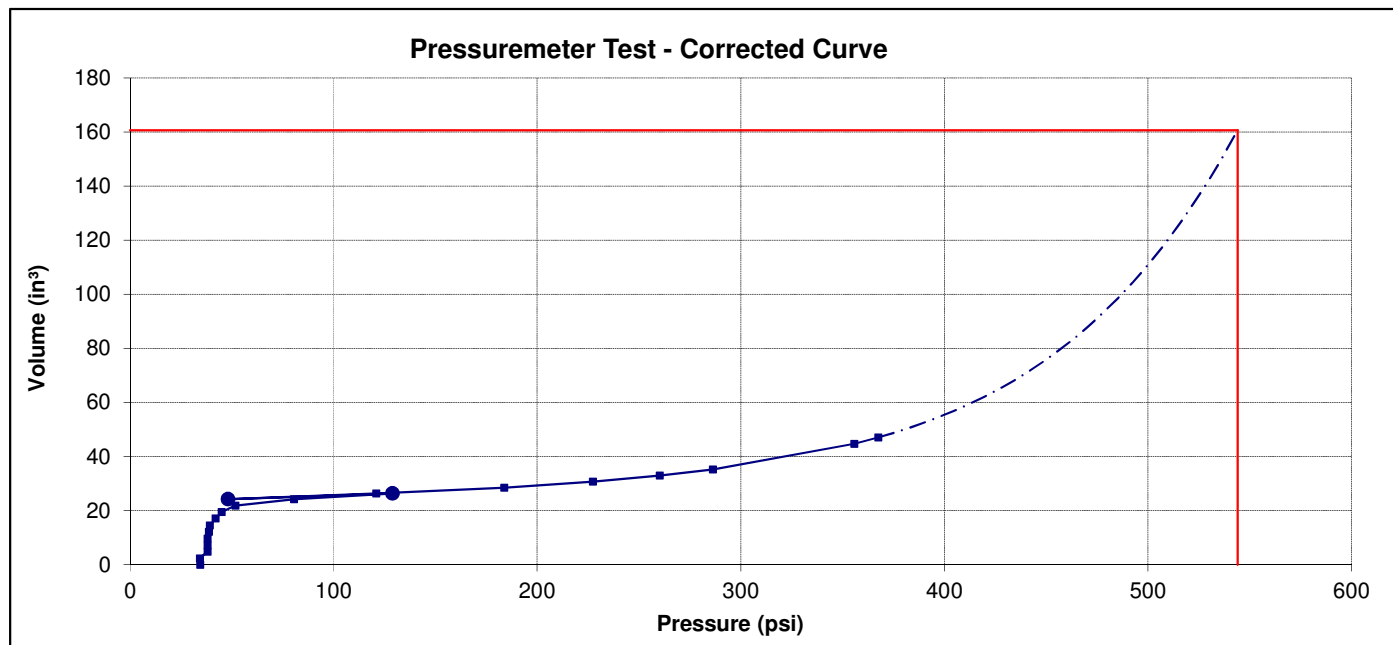
Use of a slotted casing: No
 Test depth: 78.00 ft
 Manometer height above ground: 1.64 ft
 Poisson's coefficient: 0.33
 Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	35	0.0	0.00
1	2.4	34	2.4	1.12
6	4.9	38	4.9	2.22
6	7.3	38	7.3	3.32
7	9.8	38	9.7	4.41
8	12.2	39	12.2	5.48
8	14.6	39	14.6	6.55
12	17.2	42	17.2	7.65
15	19.6	45	19.5	8.66
22	22.0	52	21.9	9.65
51	24.5	81	24.3	10.67
100	26.9	129	26.4	11.53
19	24.4	48	24.3	10.69
92	26.9	121	26.4	11.55
155	29.3	184	28.5	12.43
199	31.7	227	30.7	13.34
232	34.2	260	33.0	14.27
258	36.6	286	35.3	15.20
327	46.4	356	44.7	18.92
339	48.8	368	47.1	19.84

Test Results	
Pressiometric modulus E:	14,132 psi
Ultimate pressure P_L :	544 psi
Ratio E / P_L :	25.98
Yield pressure P_F :	48 psi
Ratio P_L / P_F :	11.30

Calibration Sheet Reference

Remarks



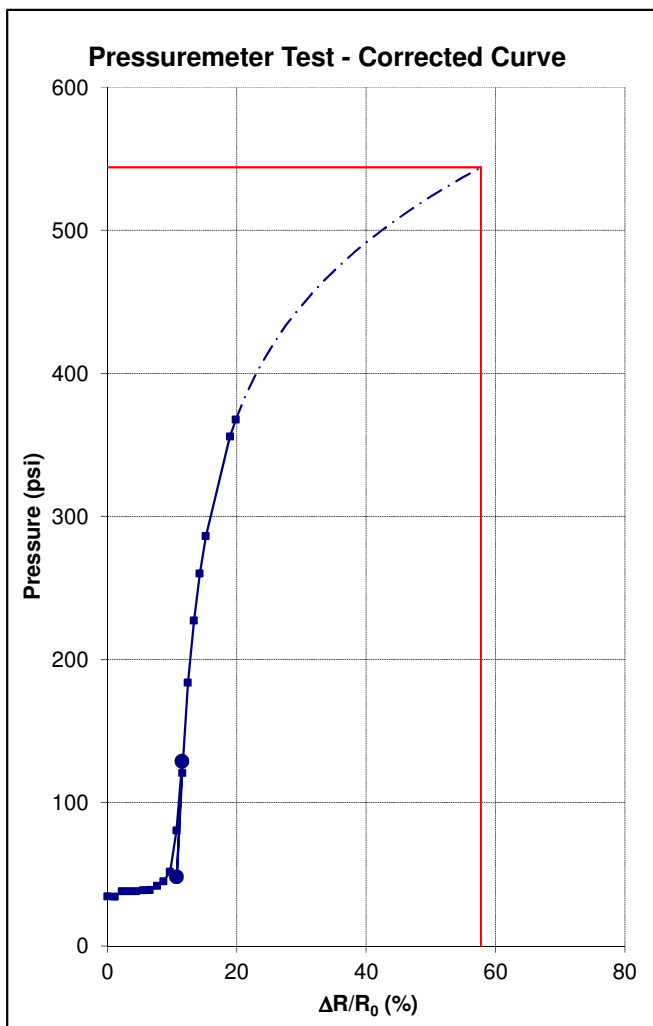


TEXAM Pressuremeter Test

Project name: MTA WESTSIDE EXTENSION
Borehole name: G-415
Test date: (mm/dd/yyyy) 03/31/2015
Test number: 5
Probe size: N

Use of a slotted casing: No
Test depth: 78.00 ft
Manometer height above ground: 1.64 ft
Poisson's coefficient: 0.33
Fluid density: 1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in ³	Pressure psi	Volume in ³	$\Delta R/R_0$ %
0	0.0	35	0.0	0.00
1	2.4	34	2.4	1.12
6	4.9	38	4.9	2.22
6	7.3	38	7.3	3.32
7	9.8	38	9.7	4.41
8	12.2	39	12.2	5.48
8	14.6	39	14.6	6.55
12	17.2	42	17.2	7.65
15	19.6	45	19.5	8.66
22	22.0	52	21.9	9.65
51	24.5	81	24.3	10.67
100	26.9	129	26.4	11.53
19	24.4	48	24.3	10.69
92	26.9	121	26.4	11.55
155	29.3	184	28.5	12.43
199	31.7	227	30.7	13.34
232	34.2	260	33.0	14.27
258	36.6	286	35.3	15.20
327	46.4	356	44.7	18.92
339	48.8	368	47.1	19.84



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E: 14,132 psi
Ultimate pressure P_L : 544 psi
Ratio E / P_L : 25.98
Yield pressure P_F : 48 psi
Ratio P_L / P_F : 11.30

PLATES

