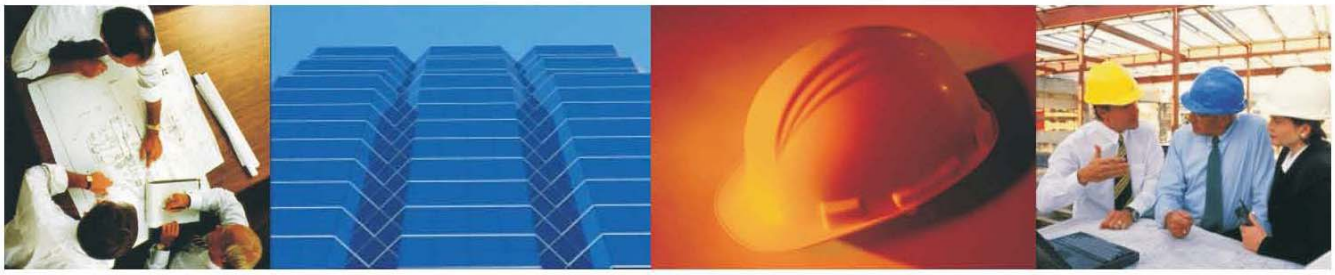

**GEOTECHNICAL ENGINEERING INVESTIGATION**

**FOR**

**PROPOSED TWO-STORY BUILDING**

**VA PSYCHOSOCIAL REHABILITATION AND RECOVERY CENTER (PRRC)**

**150 MUIR ROAD**

**MARTINEZ, CALIFORNIA**

**PROJECT NO. 612-503**

**PREPARED FOR**


**Ms. Charmian Maybury**
**Architectural Design**
**Advance Design Consultants, Inc.**
998 Park Avenue
San Jose, CA 95126

**By**

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**Senior Engineering Manager**
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**Project No. 2549**
**November 20, 2015**

MatriScope
Engineering Laboratories, Inc.

MatriScope
Engineering Laboratories, Inc.

**November 20, 2015** **MEL File No. 2549**

**Ms. Charmian Maybury**
**Architectural Design**
**Advance Design Consultants, Inc.**
998 Park Avenue
San Jose, CA 95126

**Subject:** **Geotechnical Engineering Investigation**
**Proposed Two-Story Building**
**VA Psychosocial Rehabilitation and Recovery Center (PRRC)**
**150 Muir Road**
**Martinez, CA**
**Project No. 612-503**

**Dear Ms. Maybury:**

In accordance with your authorization, MatriScope Engineering Laboratories, Inc. (MatriScope) has performed a geotechnical engineering investigation for the proposed VA Psychosocial Rehabilitation and Recovery Center (PRRC) located at 150 Muir Road in Martinez, California. The purpose of our investigation was to explore and evaluate the subsurface conditions at various locations at the site in order to develop geotechnical engineering recommendations for use in the project design and construction.

It is imperative that MatriScope be provided the opportunity to review, in advance of construction, the civil and foundation plans related to grading and building construction to assure the recommendations contained herein are appropriate for the proposed development.

The attached report presents the results of our data review, field exploration, laboratory testing, and engineering analysis. Based on our investigation, it is our professional opinion the proposed project may be constructed at the subject site provided the recommendations contained in the attached report are implemented into project design and construction.

Recommendations provided herein are contingent on the provisions outlined in the ADDITIONAL SERVICES and LIMITATIONS sections of this report. The project Client and Owner should become familiar with these provisions in order to assess further involvement by MatriScope and other potential impacts to the proposed project.

Thank you for the opportunity of providing our services for this project. If you have questions regarding this report or if we may be of further assistance, please contact our office.

**Respectfully Submitted,**
**MatriScope Engineering Laboratories, Inc.**

**Ying-Chi Liao, C.E., G.E.**
**Senior Engineering Manager**

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# GEOTECHNICAL ENGINEERING INVESTIGATION

# PROPOSED TWO-STORY BUILDING
# VA PSYCHOSOCIAL REHABILITATION AND RECOVERY CENTER
# 150 MUIR ROAD
# MARTINEZ, CA

## 1. INTRODUCTION

### 1.1 GENERAL

The proposed VA Psychosocial Rehabilitation and Recovery Center (PRRC) site is located at 150 Muir Road in Martinez, California. This report contains the results of our geotechnical engineering investigation for the proposed development. The site location relative to the vicinity of the site is shown on Plate 1.

This report includes recommendations related to the geotechnical aspects of project design and construction. Conclusions and recommendations presented in this report are based on the subsurface conditions encountered at the locations of our field exploration and the provisions and requirements outlined in the ADDITIONAL SERVICES and LIMITATIONS sections of this report. Recommendations presented herein should not be extrapolated to other areas or used for other projects without prior review by MatriScope Engineering Laboratories, Inc. (MatriScope).

### 1.2 PROPOSED CONSTRUCTION

The proposed site development includes a new two-story building at the site. Grading plans were not available at the time this report was prepared; however, as site topography is relatively level, no major earthwork cuts and fills are expected to achieve level building pad and provide positive surface drainage.

### 1.3 PURPOSE AND SCOPE OF SERVICES

Our field investigation was performed to explore and evaluate subsurface conditions at various locations at the site in order to develop recommendations related to the geotechnical aspects of project design and construction. This report summarizes the results of our services including:

- A description of the proposed project
- A description of the site surface, subsurface and groundwater conditions observed during our field investigation
- Recommendations related to the geotechnical aspects of:
  - Site preparation and earthwork construction
  - Utility trench excavations and backfill
  - Spread footing design and construction
  - 2013 CBC seismic design coefficients for use in structural analysis
  - Concrete slab-on-grade
  - Concrete sidewalks/flatwork
  - Surface drainage and moisture protection

## 2. SITE REVIEW

### 2.1 RECONNAISSANCE

An initial site reconnaissance was performed on October 14, 2015 to observe surface conditions that may affect the geotechnical aspects of the project and to note areas of obvious geotechnical concerns. Two (2) boring locations were staked at the project site.

### 2.2 SUBSURFACE EXPLORATION

A subsurface exploration at the site was performed to investigate and sample soils beneath the site. Two (2) exploratory borings (B1 and B2) were advanced to approximate depths of 10.5 feet below the existing ground on November 7, 2015. “Refusal” (an indication of very firm soils) was

encountered at the bottoms of both borings. The borings were drilled with a truck-mounted drill rig equipped with hollow stem augers and hollow stem augers. Approximate locations of exploratory borings are shown on Plate 2.

After completion of drilling, the bore holes were backfilled with cement grout. The obtained soil samples were sealed and transported to our Sacramento laboratory for visual examination and testing.

### 2.3 LABORATORY TESTING

Laboratory tests were performed on selected samples to aid in soil classification and to evaluate physical properties of the soils which may affect the geotechnical aspects of project design and construction. Moisture content, dry density, compaction, and soil corrosivity parameters tests were performed in general accordance with ASTM and Caltrans test methods. Results of the moisture content and dry density are presented in the Log of Boring. Laboratory test reports (compaction testing and soil corrosivity) are attached to this report.

## 3. SITE CONDITIONS

### 3.1 SURFACE AND SUBSURFACE CONDITIONS

The project site is currently occupied by portable buildings with trees at the center of the site as shown in Plate 2. The site is bounded on northwest and southwest by retaining walls and northeast and southeast by parking lots.

The site soils are mainly weathered sandstone to the maximum explored depth of 10.5 feet below the existing ground surface. The exception is that the top 12 inches of surficial soils are relatively loose sand.

### 3.2 GROUNDWATER

At the time of our field investigation, no groundwater was encountered in any of our borings. It should be noted that soil moisture conditions within the site will vary depending on rainfall, and/or runoff conditions not apparent at the time of our field investigation. It is common that the soil moisture conditions will change seasonally.

Detailed descriptions of the subsurface conditions encountered during our field investigation are presented on the Log of Boring Plates A-2 and A-3.

## 4. CONCLUSIONS AND RECOMMENDATIONS

### 4.1 GENERAL

It is our professional opinion the proposed building may be supported on compacted engineered fill or undisturbed bedrock (sandstone) provided the recommendations contained in the attached report are implemented into project design and construction.

### 4.2 EXPANSIVE SOILS

Based on the visual examination of the soil samples obtained at the subject site, the site soils are mainly sandy materials which are considered as having very low expansion potential.

### 4.3 SOIL CORROSIVITY

Laboratory tests were performed for soil corrosivity parameters (minimum resistivity, pH, chloride and sulfate content) on one selected soil sample obtained from the site. Based on the minimum resistivity test result (6,030 ohm-cm), soils are not considered to be corrosive to buried metallic improvements. Results of pH (7.31), chloride (8.4 ppm) and sulfate (24.3 ppm) content tests do not indicate a significant corrosive potential to buried concrete structures and, therefore, Type II

cement may be used. All underground utility lines should be corrosion-protected per recommendations of a corrosion engineer, if required.

We have provided the above preliminary corrosion test results. These test results are only indicator parameters of potential soil corrosivity for the sample tested. Other soils found on the site may be more, less, or of a similar corrosive nature.

## 4.4 SITE PREPARATION

### 4.4.1 Stripping and Grubbing

Prior to general site grading, existing vegetation, organic topsoil, and any debris should be stripped and disposed of outside the construction limits. We anticipate stripping operations may include the upper 6 to 12 inches of existing soils. MatriScope recommends the topsoil (less any debris) to be stripped and be stockpiled and reused for landscape purposes; however, this material should not be incorporated into any engineered fill.

### 4.4.2 Existing Utilities, Foundations, and/or Trees

The existing concrete slab and foundation and possibly abandoned utility lines within the area of construction should be removed and disposed of off-site. Existing utility pipelines that extend beyond the limits of the proposed construction and that are to be abandoned in-place should be plugged with cement grout to prevent migration of soil and/or water.

Tree removal should include the entire root system and all surface roots larger than ½-inch in diameter. All excavations resulting from removal of these items should be cleaned of loose or disturbed material (including all previously-placed backfill) and dish-shaped (with sides sloped 3 (h): 1(v) or flatter) to permit access for compaction equipment.

4.4.3 Removal, Scarification and Compaction

Preparation of the subgrade exposed by excavation and requirements for engineered fill should be in accordance with recommendations provided below (see section ENGINEERED FILL). The bottom of removal areas should be observed and approved by the geotechnical engineer or his representative prior to scarification and compaction.

Bedrock was encountered at approximately 12 inches below the ground surface in the soil borings. However, it is expected that tree removal may result in excavation much deeper than 12 inches. In order to provide a uniform support, following site stripping and any required grubbing, removal and/or over-excavation, we recommend the a blanket of at least 18 inches of engineered fill should be provided beneath the proposed building pad and concrete sidewalk/flatwork areas. Over-excavation in bedrock and re-compaction may be required within the bedrock/soil transition areas.

The exposed excavation bottom should be scarified to a depth of at least 8 inches, uniformly moisture-conditioned and compacted as required in the ENGINEERED FILL section prior to subsequent placement of engineered backfill to the design subgrade elevation. The removal and re-compaction of the site soils/bedrock should extend to a horizontal distance of at least 5 feet and 2 feet beyond the outer edges of foundations / concrete sidewalk/flatwork, respectively.

## 4.5 TEMPORARY EXCAVATION

The site soils should be excavatable with conventional equipment. Foundation excavations and shallow trenches less than five feet in depth for utilities should stand vertically for the short period of time required for construction under favorable weather conditions. All excavations must comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the information below solely as a service to our client. Under no circumstances should the information provided be interpreted to mean that MatriScope

is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

During wet weather, earthen berms or other methods should be used to prevent runoff water from entering all excavations. All runoff water and/or groundwater encountered within the excavation(s) should be collected and disposed of outside the construction limits.

## 4.6 ENGINEERED FILL

### 4.6.1 Materials

All engineered fill soils (on-site and imported soils) should be nearly-free of organic, rubble, rubbish, deleterious debris, clay with high plasticity, or contaminated materials, and less than 3 inches in maximum dimension.

On-Site Soils

In general, near-surface, on-site soils similar to those encountered in our borings may be used in engineered fills provided they are free of deleterious debris, clays with high plasticity, organics and adequately moisture-conditioned during placement as recommended in the COMPACTION CRITERIA section. The existing concrete and asphalt concrete debris may be removed offsite.

Imported Soils

All imported fill materials to be used for engineered fill should be sampled and tested by the project Geotechnical Engineer prior to being transported to the site. As a minimum, all imported fill should be free of contamination and be granular with a 3-inch maximum particle size, a Plasticity Index less than 15 and less than 30 percent passing the number 200 sieve; essentially non-plastic. Imported gravel fill should be, as a minimum, washed gravel, free from vegetation and debris, with a 1-inch maximum particle size and less than 5 percent passing the number 200 sieve.

### 4.6.2 Compaction Criteria

Soils scarified and material to be used for engineered fill should be uniformly moisture-conditioned to near the optimum moisture content, placed in horizontal lifts less than 8 inches in loose thickness, and compacted to at least 90 percent relative compaction as determined by the current ASTM (American Society for Testing and Materials) Test Method D 1557. The aggregate base materials should be compacted to a minimum of 95 percent relative compaction.

Should site grading be performed during or subsequent to wet weather, near-surface site soils may be significantly above the optimum moisture content. Additionally, it is common to encounter wet, unstable soils upon removal of site pavements or flatwork as a result of subsurface moisture becoming trapped above relatively impervious hardpan or beneath asphalt concrete or Portland cement concrete surfaces. This condition could hamper equipment maneuverability and efforts to compact site soils to the recommended compaction criteria. Disking to aerate, chemical treatment, replacement with drier material, stabilization with a geotextile fabric or grid, or other methods may be required to reduce excessive soil moisture and facilitate earthwork operations.

## 4.7 TRENCH PREPARATION AND BACKFILL

### 4.7.1 Subgrade Preparation

Prior to placement of utility bedding, the exposed subgrade at the bottom of trench excavations should be examined to detect soft, loose, or unstable areas. Loose materials at trench bottoms resulting from excavation disturbance should be removed to firm material. If soft or unstable areas are encountered, these areas should be over-excavated to a depth of at least 2 feet or to a firm base and be replaced with additional bedding material. Where excavations cross the existing trench backfill materials, the need for and extent of over-excavation or stabilization measures should be evaluated by the Geotechnical Engineer on a case-by-case basis.

### 4.7.2 Backfill Materials

Pipe zone backfill (i.e., material beneath and in the immediate vicinity of the pipe) should consist of clean washed sand and/or crushed rock. If crushed rock is used for pipe zone backfill, we recommend it should have a maximum particle size less 1 inch and have less than 5 percent passing No. 200 U.S. sieve. Where crushed rock is used, the material should be completely surrounded by a non-woven filter fabric such as Mirafi 140N or equivalent. Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local codes and/or bedding requirements for specific types of pipes. We recommend the project Civil Engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of native soil and approved imported fill material that meets the requirements provided above for engineered fill.

### 4.7.3 Compaction Criteria

All trench backfill should be placed and compacted in accordance with recommendations provided above for engineered fill. Mechanical compaction is recommended; ponding or jetting should not be allowed, especially in areas supporting structural loads or beneath concrete slabs supported-on-grade, pavements, or other improvements.

## 4.8 SPREAD FOUNDATIONS

### 4.8.1 International Building Code Seismic Design Parameters

Structures should be designed for lateral force requirements as set forth in Chapter 16 of the 2015 International Building Code (IBC). We recommend the following parameters:

**Table 1**
**2015 IBC Seismic Design Parameters**

| Seismic Design Parameter | Symbol | Recommended Value |
|---|---|---|
| Mapped Spectral Acceleration at Short Period | Ss | **1.590g** |
| Mapped Spectral Acceleration at 1-Second Period | $S_1$ | **0.600g** |
| Site Class | A-F | **C** |
| Site Coefficient at Short Period | $F_a$ | **1.000** |
| Site Coefficient at 1-Second Period | $F_v$ | **1.300** |
| Spectral Response Accelerations | $S_{MS}$ | **1.590g** |
| | $S_{M1}$ | **0.780g** |
| Design Spectral Response Accelerations | $S_{DS}$ | **1.060g** |
| | $S_{D1}$ | **0.520g** |
| Site coordinates: Latitude 37.99269 degrees North<br>Longitude 122.11506 degrees West | | |

4.8.2 Allowable Bearing Pressures

We recommend spread footings constructed of reinforced concrete and founded on undisturbed competent bedrock or newly constructed engineered fills as recommended in the SITE PREPARATION section of this report be used for support of the proposed service building. Footings should be a minimum of 12 inches wide and embedded a minimum of 18 inches below the lowest final adjacent subgrade. The structural engineer should evaluate the need for reinforcement of foundation based on the anticipated loads. As a minimum, continuous foundations should be reinforced with a minimum of four No. 4 reinforcing bars, placed two each near the top and bottom, to provide structural continuity and allow the foundations to span isolated soil irregularities.

An allowable bearing pressure of 3,500 pounds per square foot (psf) may be used for spread foundations with the above minimum dimensions. The allowable bearing pressure provided above is a net value; therefore, the weight of the foundation (which extends below grade) may be neglected when computing dead loads. The allowable bearing pressure applies to dead plus live loads, includes a calculated factor of safety of 2, and may be increased by 1/3 for short-term loading due to wind or seismic forces.

### 4.8.3 Estimated Settlements

Total settlement of an individual foundation will vary depending on the plan dimensions of the foundation and the actual load supported. Based on anticipated foundation dimensions and loads, we estimate maximum settlement of foundations designed and constructed in accordance with the preceding recommendations to be less than one inch. Differential settlement between similarly loaded, adjacent footings is expected to be less than ½ inch. Settlement of all foundations is expected to occur rapidly and should be essentially complete shortly after initial application of the loads.

### 4.8.4 Lateral Resistance

Resistance to lateral loads (including those due to wind or seismic forces) may be provided by frictional resistance between the bottom of concrete foundations and the underlying soils, and by passive soil pressure against the sides of the foundations. A coefficient of friction of 0.3 may be used between cast-in-place concrete foundations and the underlying soil/bedrock. Additional allowable passive pressure available in engineered fill or undisturbed native soil may be taken as equivalent to the pressure exerted by a fluid weighing 300 pounds per cubic foot (pcf). These two modes of resistance should not be added unless the frictional component is reduced by 50 percent, since full mobilization of the passive resistance requires some horizontal movement, which significantly diminishes the frictional resistance.

### 4.8.5 Construction Considerations

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose or soft soil, and water. All footing excavations should be observed by the project Geotechnical Engineer just prior to placing steel or concrete to verify the recommendations contained herein are implemented during construction.

## 4.9 CONCRETE SLABS-ON-GRADE

Conventional concrete slab-on-grade floors are suitable for building pads provided excavations and subgrades are prepared as recommended in section titled SITE PREPARATION. Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. However, slabs should be at least 4 inches thick and reinforced with No. 3 reinforcing bars on 18 inches or No. 4 bars on 24 inches center-to-center spacing each way, placed at mid-slab depth. Proper and consistent location of the reinforcement at mid-slab is essential to its performance. The risk of uncontrolled shrinkage cracking is increased if the reinforcement is not properly located within the slab.

### 4.9.1 Subgrade Preparation

Prior to constructing interior concrete slabs supported-on-grade, surficial soils should be processed as recommended in the SITE PREPARATION and ENGINEERED FILL sections of this report.

### 4.9.2 Rock Capillary Break

In order to provide enhanced subgrade support, we recommend the compacted subgrade be overlain with a minimum 4-inch thickness of compacted crushed rock. If this layer is desired to also serve as a capillary break, there should be less than 5 percent by weight passing the No. 4 sieve size. A capillary break may reduce the potential for soil moisture migrating upwards toward the slab.

### 4.9.3 Construction Considerations

Subsurface moisture and moisture vapor naturally migrate upward through the soil and, where the soil is covered by a building or pavement, this subsurface moisture will collect. To reduce the impact of this subsurface moisture and the potential impact of introduced moisture (such as landscape irrigation or plumbing leaks) the current industry standard is to place a vapor retarder on the compacted crushed rock layer (described above). This membrane typically consists of visquene or polyvinyl plastic sheeting at least ten (10) mil in thickness. The plastic sheet membrane should meet or exceed the minimum specifications for plastic water vapor retarders as outlined in ASTM E1745.

It should be noted that although capillary break and vapor barrier systems are currently the industry standard, this system may not be completely effective in preventing floor slab moisture problems. These systems will not "moisture proof" the floor slab nor will it assure floor slab moisture transmission rates will meet floor-covering manufacturer standards. The design and construction of such systems are dependent on the proposed use and design of the proposed building and all elements of building design and function should be considered in the slab-on-grade floor design. Building design and construction may have a greater role in perceived moisture problems since sealed buildings/rooms or inadequate ventilation may result in excessive moisture in a building and affect indoor air quality.

Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking, or curling in the slabs. High water-cement ratio and/or improper curing also greatly increase the water vapor permeability of concrete. We recommend that all concrete placement and curing operations be performed in accordance with the current edition of American Concrete Institute (ACI) Manual.

## 4.10 CONCRETE SIDEWALKS AND FLATWORK

Concrete sidewalks and flatwork should be a minimum of 4 inches thick and may be underlain by compacted engineered fills as recommended in the SITE PREPARATION and ENGINEERED FILL sections of this report.

## 4.11 RETAINING WALLS

### 4.11.1 Lateral Earth Pressures

Retaining walls should be deigned to resist the lateral earth pressures exerted by the retained, compacted backfill. Retaining walls that are not restrained at the top and with level backfill may be designed for an active earth pressure developed by an equivalent fluid weighing 35 pcf.

Thirty-five (35) percent of any uniform surcharge may be assumed to act as a uniform horizontal pressure over the entire height of the wall. Seismic lateral earth pressure of 38 pcf, equivalent fluid pressure, reverse triangularly distributed over the entire height of the wall may be added in the design for walls supporting more than 6 feet of soil backfill.

### 4.11.2 Wall Drainage

The above-recommended values do not include lateral pressures due to hydrostatic forces. Therefore, wall backfill should be free draining and provisions should be made to collect and dispose of excess water that may accumulate behind earth retaining structures.

Wall drainage may be provided by free-draining gravel surrounded by synthetic filter fabric or by prefabricated, synthetic drain panels. In either case, drainage should be collected by perforated pipes and directed to a sump, storm drain, weep hole(s), or other suitable location for disposal. We recommend drain rock consist of durable stone having 100 percent passing the 1-inch sieve and less than 5 percent passing the No. 4 sieve. Synthetic filter fabric should have an equivalent opening size (EOS), U.S. Standard Sieve, of between 40 and 70, a permeability of at least 0.02 centimeters per second, a minimum flow rate of 50 gallons per minute per square foot of fabric, and minimum puncture strength of 50 pounds.

### 4.11.3 Backfill Placement

All backfill should be placed and compacted in accordance with recommendations provided above for Engineered Fill. Light equipment should be used during backfill compaction to minimize possible overstressing of the wall.

### 4.11.4 Construction Considerations

Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning may be required to provide structural stability and to protect personnel working within the excavation. Shoring, bracing, or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of California.

Properly compacted retaining wall backfill may experience some settlement or deflection after construction. This is a result of normal deflection of the wall and settling of relatively deep engineered fills. This post-construction "settling in period" will vary with wall type, size, and construction and should be taken into account in overall site design.

## 4.12 SITE DRAINAGE AND MOISTURE PROTECTION

Foundation and slab performance depends greatly on how well runoff waters drain from the site. This drainage should be maintained both during construction and over the entire life of the project. The ground surface around structures should be graded so that water flows rapidly away from structures and slopes without ponding. The surface gradient needed to do this depends on the landscaping type. In general, pavement and lawns within five feet of buildings should slope away at gradients of at least two percent. Densely vegetated areas should have minimum gradients of 5 percent away from buildings in the first five feet if it is practical to do so.

Planters should be built so that water exiting from them will not seep into the foundation areas or beneath slabs and pavement. In general, the elevation of exterior grades should not be higher than the elevation of the subgrade beneath the slab to help prevent water intrusion beneath slabs.

In any event, maintenance personnel should be instructed to limit irrigation to the minimum actually necessary to properly sustain landscaping plants. Should excessive irrigation, waterline breaks, or unusually high rainfall occur, saturated zones and "perched" groundwater may develop. Consequently, the site should be graded so that water drains away readily without saturating the foundation or landscaped areas. Potential sources of water, such as water pipes, drains, garden sprinklers, and the like, should be frequently examined for signs of leakage or damage. Any such leakage or damage should be promptly repaired.

All utility trenches should be backfilled with compacted non-pervious fill material. Special care should be taken during installation of sub-floor water and sewer lines to reduce the possibility of leaks.

## 5. ADDITIONAL SERVICES

### 5.1 PLANS AND SPECIFICATIONS REVIEW

We recommend that grading plans and specifications should be reviewed by MatriScope in order to assure that our earthwork and foundation recommendations have been properly interpreted and implemented during design. In addition, prior to construction, the building structural design plans and specifications should be reviewed by MatriScope to verify the recommendations provided in this report are in compliance with the proposed design.

In the event MatriScope is not retained to perform this recommended review, we will assume no responsibility for misinterpretation of our recommendations.

### 5.2 CONSTRUCTION OBSERVATION AND TESTING

We recommend that all earthworks during construction be monitored by a representative from MatriScope, including site preparation, placement of all engineered fill, trench backfill and wall backfill, construction of slab and roadway subgrade, and all foundation excavations. It is essential that the finished subgrade and footing excavation in all areas to receive engineered fill or to be

used for the future support of structures, concrete slabs-on-grade or pavement sections be observed and approved by the Project Geotechnical Engineer or a representative from MatriScope PRIOR TO PLACEMENT OF ENGINEERED FILL OR CONCRETE POURING FOR BUILDING PAD AND SLAB-ON-GRADE.

The purpose of these services would be to provide MatriScope the opportunity to observe the soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

## 6. LIMITATIONS

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil conditions could vary between or beyond the points explored. If soil conditions are encountered during construction which differ from those described herein, we should be notified immediately in order that a review may be made and any supplemental recommendations provided. If the scope of the proposed site development changes from that described in this report, our recommendations should also be reviewed.

We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty is expressed or implied. The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by MatriScope or other qualified geotechnical professionals during the construction phase in order to evaluate compliance with our recommendations. Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the author of this report, are only mentioned in the given standard; they are not incorporated into it or “included by reference”, as that latter term is used relative to contracts or other matters of law.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify MatriScope of such intended use. Based on the intended use of the report, MatriScope may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release MatriScope from any liability resulting from the use of this report by any unauthorized party.


# Site Vicinity Map

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| | |
|---|---|
| Project No.: | 2549 |
| Project Name: | VA Psychosocial Rehabilitation and Recovery Center |
| Location: | 150 Muir Road, Martinez, California |
| Date: | 11/20/2015 |

**Plate** 1


# Boring Location Map

MatriScope
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**Plate**
2

# APPENDIX A

# FIELD INVESTIGATION AND LABORATORY TESTING

## FIELD INVESTIGATION

### General

The subsurface conditions at the site were explored on November 7, 2015 by drilling 2 borings to a maximum depth of 10.5 feet below existing ground surface. Borings were drilled using truck-mounted drill rig CME 75 equipped with 8-inch-diameter flight augers. The locations of borings performed for this investigation are shown on Plate 2 of the report.

Borings were located in the field by visual sighting and/or pacing from existing site features. Therefore, the location of borings shown on Plate 2 should be considered approximate and may vary from that indicated on the plate. Prior to our soil boring operation, drilling permit was obtained from Contra Costa County, Environmental Health Division. After completion of drilling, the boreholes were backfilled with cement grout following the requirements of Contra Costa County, Environmental Health Division.

Our representative maintained logs of the borings, visually classified soils encountered according to the Unified Soil Classification System (see Plate A1), and obtained relatively undisturbed and bulk samples of the subsurface materials. Logs of Borings are presented on Plates A-2 and A-3.

### Sampling Procedures

Soil samples were obtained from the borings using either a Modified California Sampler driven 18 inches (unless otherwise noted) into undisturbed soil using a 30-inch drop of a 140-pound hammer. Blow counts were recorded at 6-inch intervals for each sample attempt and are reported on the logs in terms of blows-per-foot for the last foot of penetration. Soil samples obtained from the borings were packaged and sealed in the field to reduce moisture loss and disturbance, and returned to our laboratory for further testing.

## LABORATORY TESTING

### General

Laboratory tests were performed on selected samples to aid in soil classification and to evaluate physical properties of the soils which may affect the geotechnical aspects of project design and construction. A description of the laboratory testing program is presented below.

### Moisture Content and Dry Unit Weight

Moisture content and dry unit weight tests were performed to evaluate moisture-conditioning requirements during site preparation and earthwork grading; soil overburden, and active and passive earth pressures; and relative soil strength and compressibility. Moisture content was evaluated in general accordance with ASTM Test Method D2216; dry unit weight was evaluated using procedures similar to ASTM Test Method D2937. Results of these tests are presented on the logs of Borings.

### Compaction

Compaction test was performed on one near-surface bulk soil sample to evaluate maximum dry density and optimum moisture content. Test procedures were in general accordance with ASTM Test Method D1557. Results of this test are presented in Table A1. Laboratory test report is included in this appendix.

**Table A1**
**Summary of Compaction Test Results**

| Boring No. | Sample Depth (feet) | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| B1 | 0-2 | 117.6 | 10.1 |

## Soil Corrosivity

One sample of the near-surface soils encountered at the site was subjected to chemical analysis for the purpose of corrosion assessment. The sample was tested for pH, minimum resistivity, soluble sulfates, and soluble chlorides. The sample was tested in general accordance with California Test Methods 643, 422, and 417 for pH and minimum resistivity, soluble chlorides, and soluble sulfates, respectively. The test results are presented in Table A2 and attached in this appendix.

**Table A2**
**Summary of Corrosivity Test Results**

| Boring No. | Sample Depth (feet) | Minimum Resistivity (Ohm-Cm) | pH | Water Soluble Sulfates (ppm) | Water Soluble Chlorides (ppm) |
|---|---|---|---|---|---|
| B1 | 0-2 | 6,030 | 7.31 | 24.3 | 8.4 |

The 2003 California Department of Transportation (Caltrans) Corrosion Guidelines considers a site to be corrosive if water-soluble chloride content is 500 ppm or greater, sulfate concentration is 2,000 ppm or greater, or pH is 5.5 or less.

The Corrosion Guidelines indicates resistivity serves only as an indicator parameter for the possible presence of soluble salts and is not used by Caltrans to define a corrosive area. With the exception of Mechanically Stabilized Embankment (MSE) walls, soil and water are not tested by Caltrans for chlorides and sulfates if the minimum resistivity is greater than 1,000 ohm-cm because a minimum resistivity greater than 1,000 ohm-cm indicates that the chloride and sulfate contents are low (i.e. low corrosion potential).

We have provided the above preliminary corrosion test results. These test results are only indicator parameters of potential soil corrosivity for the sample tested. Other soils found on the site may be more, less, or of a similar corrosive nature.

## LIST OF ATTACHMENTS

The following plates are attached and complete this appendix.

Soil Boring Permit

| | |
|---|---|
| Plate A-1 | Unified Soil Classification System |
| Plates A-2 and A-3 | Log of Boring B-1 and B-2 |

Compaction Test Report

Corrosivity Test Summary

CONTRA COSTA HEALTH SERVICES

**CONTRA COSTA COUNTY**
**ENVIRONMENTAL HEALTH DIVISION**
2120 DIAMOND BOULEVARD, SUITE 200
CONCORD CA 94520
Phone (925) 692-2500 Fax (925) 692-2504 www.cchealth.org/eh

# SOIL BORING PERMIT APPLICATION

ONE APPLICATION PER PARCEL & TYPE OF WORK

TYPE OF WORK:

- ☒ Soil Boring (01)
- ☐ Soil Boring 11+ (03)
- ☐ CPT (53)
- ☐ CPT 11+ (55)
- ☐ Inclinometer (52)
- ☐ Soil Vapor Probe (02)
- ☐ Soil Vapor Probe 11+ (04)
- ☐ Piezometer w/o casing (66)
- ☐ Piezometer w/o casing 11+ (76)

PLEASE PRINT CLEARLY. * REQUIRED FIELD MUST BE COMPLETED. INCOMPLETE APPLICATIONS WILL BE REJECTED.
THE APPLICATION IS NOT THE PERMIT. ALLOW 5-7 WORKING DAYS FOR PROCESSING.

**LEGAL OWNER INFORMATION**

| | | |
|---|---|---|
| *Legal Property Owner/Responsible Party: United States Department of Veterans Affairs | | |
| *Address: 150 Muir Rd | | Phone Number: (925)-372-2295 |
| *City: Martinez | State: CA | Zip code: 94553 |
| *Legal Property Owner (if different from Responsible Party): | Address/City/State/Zip Code: | |
| * Site Address (if different from owner address): | | |
| *Assessor's Parcel Number: | Subdivision/Minor Subdivision #: | Lot/Parcel Number: |
| *On-site Contact Name: Javier Nazario-Santiago | *On-site Contact Cell Number: (925)-260-7809 | |

**LICENSED DRILLER INFORMATION**

| | | |
|---|---|---|
| *Business Name: Exploration Geoservices | *Contact Name: John Collins | *Business Phone: 408-280-6822 |
| *Mailing Address: 1535 Industrial Ave, San Jose 95112 | *C-57 License Number: 484288 | Email Address: john@explorationgeo.com |

**CONSULTANT/ENGINEER INFORMATION**

| | | |
|---|---|---|
| *Business Name: Matriscope Engineering | *Contact Name: Tim Peel | *Business Phone: 916 375 6700 |
| *Mailing Address: 601 Bercut Dr, Sacramento 95811 | Email Address: tpeel@matriscope.com | |

***CONSTRUCTION/DESTRUCTION SPECIFICATIONS***

| | | | |
|---|---|---|---|
| Number of Borings: 2 | Borehole Diameter: 6" | Boring Depth: (b.g.s): 20 | Method of Drilling/Destruction/Other: Hollow Stem |

Type of Material for annular seal/destruction (specify mix or product):
☐ Bentonite ☐ Concrete ☐ Cement **(Bentonite chips for transition seal only)**

☒ PLOT MAP ☒ HEALTH & SAFETY PLAN ☐ ENCROACHMENT PERMIT (If in right of way) ☐ RIGHT OF ACCESS AGREEMENT

PERFORMANCE BOND REQUIREMENT. Contra Costa County Ordinance, Title 4 Health and Safety, Article 414-4.10, Section 414-4.1023(a) Prior to the issuance of a permit, the applicant shall post with the health officer a cash deposit or bond guaranteeing compliance with the terms of this chapter and the applicable permit, such bond to be in an amount deemed necessary by the health officer to remedy improper work but not in excess of five thousand dollars.
I hereby certify that the above information and submitted plans are true and correct and that the proposed work will comply with all permit conditions and applicable laws and regulations. I agree to obtain all required inspections, maintain a copy of the approved permit and plans at the job site until final approval, and obtain written authorization prior to deviating from the approved permit or plans, or placing the well in service. The issuance of this permit by Contra Costa Environmental Health Division does not guarantee a satisfactory and an indefinite operation of any well system.

Signature of C-57 Licensed Driller

10/07/15
Date

**FOR OFFICE USE ONLY**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FA #: | PR #: | Permit #: | P/E: 43 | WP #: | DATE RECEIVED: | REHS: | SUPERVISOR: |
| AMOUNT DUE: $ | AMOUNT PAID: $ | | CHECK #: | | CASH CREDIT CARD: ☐MC ☐VISA | | XR |
| INITIAL: | DATE APPROVED: | ☐ CONDITIONS | | | | | |

CONTRA COSTA
HEALTH SERVICES

**ENVIRONMENTAL HEALTH DIVISION**
2120 Diamond Blvd., Suite 200
Concord, CA 94520
Phone: (925) 692-2500
Fax: (925) 692-2502
www.cchealth.org/eh/

# SITE HEALTH AND SAFETY PLAN

Complete all the following information. If providing a different Site Health and Safety plan, the following information must be included:

## GENERAL SITE INFORMATION

| | |
|---|---|
| NAME: VA Martinez | |
| SITE ADDRESS: 150 Muir Road, Martinez CA 94553 | |
| CONTACT PERSON: Tim Peel | PHONE #: 916 375 6700 |
| SITE IDENTIFICATION #: 162-270-003 | PROPOSED DATE(S) OF SITE WORK: |

## DESCRIPTION OF INSPECTION ACTIVITY

| Purpose of Activity | Type of Site |
|---|---|
| D Monitoring well installation | D Industrial |
| D Domestic well installation | D Gas Station |
| D Gas Extraction well installation | D Landfill |
| D Agricultural well installation | D Parcel |
| ☒ Other Soil Boring | ☒ Other Hospital |

Provide a brief description of the proposed activities: 2 x 20' soil borings

Investigation derived material disposal: ☒ Soil D Water D Other _____

## POTENTIAL HEALTH AND SAFETY HAZARDS

Anticipated physical hazards. Check all that apply:

| | |
|---|---|
| D Heat (high ambient temperature) | ☒ Heavy Equipment |
| D Cold | D Physical injury/trauma (resulting from moving machinery) |
| D Noise | D General construction |
| D Oxygen depletion | D Physical injury and trauma |
| D Asphyxiation | D Electrical hazards |
| D Excavation | D Cave-ins |
| ☒ Falls, trips, slipping | D Ignition/Explosive |
| D Other (specify): | |

## HAZARD EVALUATION

| Parameter | TLV (ppm) | IDLH (ppm) | LEL (%) skin eyes | Health |
|---|---|---|---|---|
| | | | | |
| N/A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**SPECIAL PRECAUTIONS:** _____

_____

_____

## PERSONAL PROTECTIVE EQUIPMENT

Check all applicable items:

| | |
|---|---|
| ☒ Hardhat | ☒ Safety glasses / goggles |
| ☒ Steel-toed / shank shoes or boots | ☒ Clothing protection / safety vest |
| D Hearing protection | D Other (specify): |

**Personal Protection**

Level of Protection: D A D B D C ☒ D

Modifications: _____

Surveillance equipment and materials:

_____ Instrument: _____

_____ Action

Level: _____

First Aid: _____

## TEAM COMPOSITION

| TEAM MEMBER | RESPONSIBILITY |
|---|---|
| John Collins | Driller |
| Tim Peel | Helper |
| Derek Bays | Helper |

## EMERGENCY INFORMATION

| LOCAL RESOURCES | PHONE NUMBER |
|---|---|
| AMBULANCE | ( ) 911 |
| HOSPITAL EMERGENCY ROOM | (925) 372-3000 |
| POISON CONTROL CENTER | (800) 222-1222 |
| POLICE | ( ) 911 |
| FIRE DEPARTMENT | ( ) 911 |
| EXPLOSIVES UNIT | ( ) N/A |
| AGENCY CONTACT | ( ) |

| SITE RESOURCES | AVAILABILITY |
|---|---|
| WATER SUPPLY | |
| TELEPHONE | Yes |
| RADIO | |
| OTHER | |

## EMERGENCY CONTACT

Name: Ying-Chi Liao Phone #: 916-375-6700

**Emergency Route** (List road or other directions: attach map(s)

Hospital: VA Martinez (projectsite)

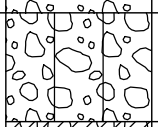
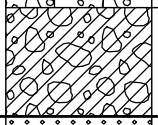
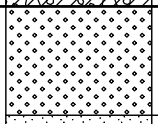
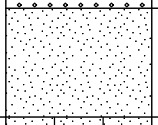
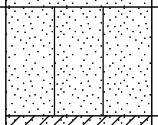
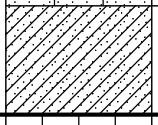
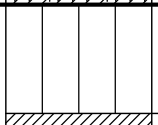
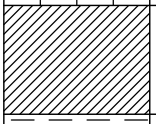
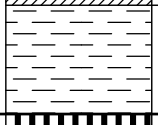
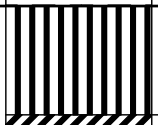
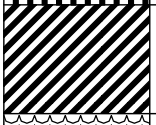
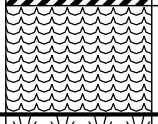
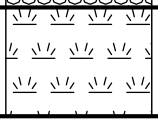
Other:

| SIGNATURES | DATE |
|---|---|
| | 10/12/15 |
| | 10/12/15 |
| | |

**NOTE: A signed copy of this plan must be kept on-site at all times.**

# SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

| MAJOR DIVISIONS | | | SYMBOLS | | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|
| | | | GRAPH | LETTER | |
| COARSE GRAINED SOILS | GRAVEL AND GRAVELLY SOILS | CLEAN GRAVELS |  | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | (LITTLE OR NO FINES) |  | GP | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | GRAVELS WITH FINES |  | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES |
| | | (APPRECIABLE AMOUNT OF FINES) |  | GC | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES |
| MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | SAND AND SANDY SOILS | CLEAN SANDS |  | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE | (LITTLE OR NO FINES) |  | SP | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES |
| | | SANDS WITH FINES |  | SM | SILTY SANDS, SAND - SILT MIXTURES |
| | | (APPRECIABLE AMOUNT OF FINES) |  | SC | CLAYEY SANDS, SAND - CLAY MIXTURES |
| FINE GRAINED SOILS | SILTS AND CLAYS | LIQUID LIMIT LESS THAN 50 |  | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| | | |  | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | |  | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | SILTS AND CLAYS | LIQUID LIMIT GREATER THAN 50 |  | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS |
| | | |  | CH | INORGANIC CLAYS OF HIGH PLASTICITY |
| | | |  | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| HIGHLY ORGANIC SOILS | | |  | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS |

MatriScope Engineering Laboratories, Inc.

601 Bercut Drive
Sacramento, CA 95811
Phone: (916) 375-6700
Fax: (916) 447-6702

**PLATE**

A-1

# LOG OF BORING

| | | | |
|---|---|---|---|
| PROJECT: VA Psychosocial REhabilitation and Recovery Center | | SHEET NO.: 1 of 1 | HOLE NUMBER: B1 |
| SITE: 150 Muir Road, Martinez, CA | PROJECT NUMBER: 2549 | LOGGED BY: Derek B. | CHECKED BY: YL |
| STARTED: 11/7/15 / COMPLETED: 11/7/15 | DRILLER: Exploration Geoservices | BORING DIA.: 8" | TOTAL DEPTH: 10.5 ft. |
| DRILL METHOD: Hollow Stem Auger | DRILL EQUIPMENT: CME 75 | GROUND ELEV. | DEPTH/*ELEV.* GROUND WATER: ▽ N/A / *na* ▼ |
| SAMPLE TYPE: California Modified Sampler | NOTES | | |

| SAMPLE NUMBER | BLOWS/FT | MOISTURE (%) | DRY DENSITY (pcf) | PENETROMETER (tsf) | DEPTH (feet) | GRAPHIC LOG | SAMPLE TYPE | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SAND (SP), light brown, loose, sl. moist |
| MC-1-1 | 50/5" | 4 | | | | | | WEATHERED BEDROCK<br>SANDSTONE, light brown, very dense, sl. moist |
| MC-1-2 | 50/5" | 9 | | | 5 | | | |
| MC-1-3 | 50/4" | | | | 10 | | | Boring Was Ended at 10.5 Feet. No Groundwater Was Encountered. |
| | | | | | 15 | | | |

MatriScope
Engineering Laboratories, Inc.
601 Bercut Drive
Sacramento, CA 95811
Phone: (916) 375-6700
Fax: (916) 447-6702

PLATE
A2

LOG OF BORING 2549 VA MARTINEZ PRRC.GPJ MATRISCP.GDT 11/17/15

# LOG OF BORING

| | | | |
|---|---|---|---|
| PROJECT: VA Psychosocial REhabilitation and Recovery Center | | SHEET NO.: 1 of 1 | HOLE NUMBER: B2 |
| SITE: 150 Muir Road, Martinez, CA | PROJECT NUMBER: 2549 | LOGGED BY: Derek B. | CHECKED BY: YL |
| STARTED: 11/7/15 / COMPLETED: 11/7/15 | DRILLER: Exploration Geoservices | BORING DIA.: 8" | TOTAL DEPTH: 10.5 ft. |
| DRILL METHOD: Hollow Stem Auger | DRILL EQUIPMENT: CME 75 | GROUND ELEV.: | DEPTH/*ELEV.* GROUND WATER: ▽ N/A / *na* |
| SAMPLE TYPE: California Modified Sampler | NOTES: | | |

| SAMPLE NUMBER | BLOWS/FT | MOISTURE (%) | DRY DENSITY (pcf) | PENETROMETER (tsf) | DEPTH (feet) | GRAPHIC LOG | SAMPLE TYPE | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SAND (SP), light brown, loose, sl. moist |
| MC-2-1 | 50/4" | 9 | | | | | | WEATHERED BEDROCK<br>SANDSTONE, light brown, very dense, sl. moist |
| MC-2-2 | 50/3.5" | | | | 5 | | | |
| MC-2-3 | 50/6" | 5 | | | 10 | | | Boring Was Ended at 10.5 Feet. No Groundwater Was Encountered. |
| | | | | | 15 | | | |

MatriScope
Engineering Laboratories, Inc.
601 Bercut Drive
Sacramento, CA 95811
Phone: (916) 375-6700
Fax: (916) 447-6702

PLATE
A3

LOG OF BORING 2549 VA MARTINEZ PRRC.GPJ MATRISCP.GDT 11/17/15

MatriScope
Engineering Laboratories, Inc.

# COMPACTION CHARACTERISTICS OF SOIL
# (ASTM D1557)

601 Bercut Drive
Sacramento, CA 95811
Ph: 916-375-6700 fax: 916-447-6702
www.matriscope.com

## LABORATORY COMPACTION TEST

| JOB NO. | LAB ID. | DSA/LEA NO. | DSA FILE NO. | DSA APPLICATION NO. | REPORT DATE |
|---|---|---|---|---|---|
| 2549 | 16417 | | | | 11/20/2015 |

| PROJECT | MATERIAL DESCRIPTION |
|---|---|
| VA Psychosocial Rehabilitation and Recovery Center | Light Brown Sand |

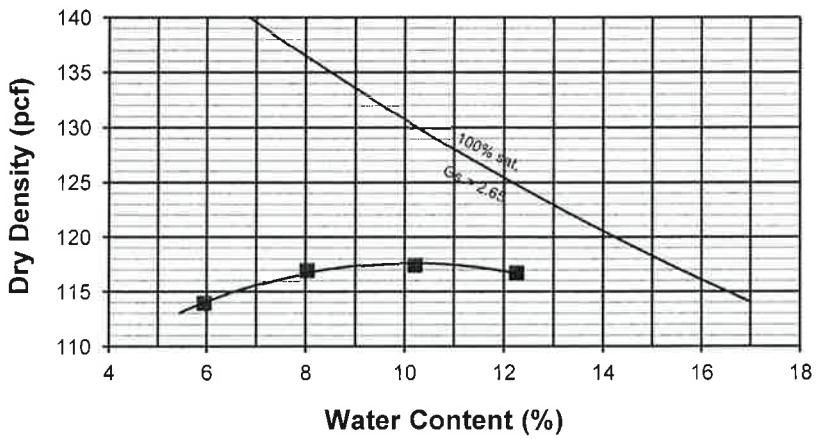
| ADDRESS | PROCEDURE | SIEVE_Oversize | OVERSIZE < 5 % |
|---|---|---|---|
| 150 Muir Road, Martinez, CA | A | | Yes |

| TOTAL WT. *(g)* USED IN PROCESSING | WT. *(g)* Oversize | DRY *(g)* Oversize | DRY *(g)* Finer | TOTAL % Oversize | TOTAL % Finer | SG_Oversize |
|---|---|---|---|---|---|---|
| | | | | | | |

| SAMPLING LOCATION | SAMPLE DATE | DIA. OF MOLD (in.) | LAYERS | BLOWS / LAYER | HAND TAMPER / MECHANICAL TAMPER |
|---|---|---|---|---|---|
| B1 at 0-2' | 11/7/15 | 4 | 5 | 25 | ☐ HAND TAMPER ☑ MECHANICAL TAMPER |

| | | | | | | |
|---|---|---|---|---|---|---|
| **A.** WATER ADDED *(CC)* | **50** | **100** | **150** | **200** | **Finer** | **Oversize** |
| **B.** MOLD NUMBER | | | | | | |
| **C.** WT. OF WET SOIL + MOLD *(gm)* | 3822.7 | 3907.3 | 3954.3 | 3978.6 | | |
| **D.** WT. OF MOLD *(gm)* | 1999.8 | 1999.8 | 1999.8 | 1999.8 | | |
| **E.** WT. OF WET SOIL *(gm)* | 1822.9 | 1907.5 | 1954.5 | 1978.8 | | |
| **F.** VOLUME OF MOLD *($ft^3$)* | 0.033 | 0.033 | 0.033 | 0.033 | | |
| **G.** WET DENSITY *(pcf)* | 120.7 | 126.3 | 129.4 | 131.0 | | |
| **H.** CONTAINER NO. | **62** | **p17** | **p1** | **p6** | | |
| **I.** WT. OF WET SOIL + TARE *(gm)* | 828.6 | 606.8 | 749.6 | 748.5 | | |
| **J.** WT. OF DRY SOIL + TARE *(gm)* | 794.8 | 573.1 | 694.4 | 683.3 | | |
| **K.** WT. OF TARE *(gm)* | 226.9 | 153.6 | 153.7 | 151.3 | | |
| **L.** WT. LOSS *(gm)* | 33.8 | 33.7 | 55.2 | 65.2 | | |
| **M.** WT. OF DRY SOIL *(gm)* | 567.9 | 419.5 | 540.7 | 532.0 | | |
| **N.** MOISTURE *(%)* | **6.0** | **8.0** | **10.2** | **12.3** | | |
| **O.** DRY DENSITY *(pcf)* | **113.9** | **116.9** | **117.4** | **116.7** | | |

### Compaction Curve




| TEST RESULTS | |
|---|---|
| OPTIMUM WATER CONTENT % | **10.1** |
| MAXIMUM DRY DENSITY pcf | **117.6** |

| ROCK CORRECTED TEST RESULTS | |
|---|---|
| OPTIMUM WATER CONTENT % | |
| MAXIMUM DRY DENSITY pcf | |

**REMARKS:**

| Technician | Soussan | Professional Engineer | Ying-Chi Liao |
|---|---|---|---|

**Sunland Analytical**
**11419 Sunrise Gold Cir.#10**
**Rancho Cordova, CA 95742**
**(916) 852-8557**

Date Reported 11/13/15
Date Submitted 11/10/15

To: Steve Lee
MatriScope, Inc.
601 Bercut
Sacramento, CA, 95811

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following:
Location : PROJECT NO. 2549 Site ID: B1-BULK
Thank you for your business.

* For future reference to this analysis please use SUN # 70819 - 147783

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EVALUATION FOR SOIL CORROSION

| | | | |
|---|---|---|---|
| Soil pH | 7.31 | | |
| Minimum Resistivity | 6.03 | ohm-cm (x1000) | |
| Chloride | 8.4 ppm | 0.0008 | % |
| Sulfate-S | 24.3 ppm | 0.0024 | % |

METHODS:
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422