3.04 BOND TESTING FOR RESILIENT FLOORING

A. General: After cleaning of slab surfaces, and before beginning application of resilient flooring adhesive, resilient flooring contractor(s) shall test adhesive bonding to slab.

B. Testing Procedures:
   1. Using the flooring material and the proposed adhesives, install 3 foot by 3 foot panels spaced approximately 50 feet apart throughout the subfloor area. Select areas next to walls, columns or other light traffic areas.
   2. Tape edges of panels to prevent edge drying of adhesive.
   3. After 72 hours, check panels in presence of Architect and General Contractor's Superintendent.

C. Acceptable Test Results: Test will be considered satisfactory if flooring material is found, in the opinion of the Architect, to be securely bonded such that an unusual amount of force is required to lift it from the subfloor.

D. Slabs failing bond test shall receive additional treatment as specified herein until further testing demonstrates satisfactory bond. Additional treatment may consist of mechanical or chemical cleaning to remove contaminants or vapor emission control treatment of excessively moist concrete subfloor.

3.05 PATCHING AND LEVELING

A. Verification of Conditions: Examine substrate for unevenness which would prevent execution and quality of flooring as specified. Report unsatisfactory conditions to the General Contractor with copy to Architect.
   1. Examine subfloors prior to installation to determine that surfaces are free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
   2. Levelness: As required by manufacturer of finish flooring material to be installed. In absence of specific criteria from manufacturer, verify subfloor to be level within 3/16 inches in 10 feet.
   3. Surface Profile: Verify surface to be smooth troweled finish.

B. Patching: Thoroughly clean concrete floors before applying floor coverings. Remove rough spots and any foreign matter that might be evident through the floor covering. Patch minor rough areas, voids and defects with compatible leveling compound. .

C. Leveling: Level major uneven concrete floor joints or other irregularities by bush hammering or grinding and filling with latex type underlayment. Leveled areas shall be sanded to provide a surface level plus-or-minus 3/16-inch in 10 feet unless flooring manufacturer stipulates stricter criterion. Leveled areas shall be inspected by the Architect before flooring work may proceed.

3.06 VAPOR EMISSION CONTROL TREATMENT

A. General:
   1. Floor Slabs-on-Grade: All floor slabs-on-grade shall receive specified vapor emission control treatment unless testing demonstrates to Owner’s satisfaction that treatment may be waived.
   2. Structural Concrete Floor Slabs: Slab areas failing moisture testing shall receive specified vapor emission control treatment. Slab areas still failing test after treatment shall receive further treatment as recommended by vapor emission control treatment manufacturer until further testing demonstrates slab meets specified vapor emission limitation and slab surface is accepted for warrantable installation by finish flooring manufacturer(s).

B. Protection: Mask and protect walls and equipment before beginning scarification and application.

C. Surface Preparation: Shot blast concrete surface to expose uncontaminated, absorptive, and sound concrete. Do not acid etch concrete surface. Grind near wall base and clean all joints for treatment application. Broom-sweep and vacuum slab surfaces to remove dust and debris. Do not use clean sweeping agents.
   1. Fill all cracks, control joints, construction joints, and surface irregularities with resin and cementitious filling materials in accordance with system manufacturer’s recommendations.

D. Installation: Manufacturer's personnel or manufacturer-certified applicator shall treat slab surfaces in accordance with manufacturer's standard procedures for system and special instructions for specific test results and slab conditions encountered at this Project.

E. Finishing: Apply primer and cementitious underlayment over treated slabs, using methods recommended by underlayment and treatment manufacturer.

F. Vapor Emission Retesting: After application of vapor emission treatment, retest directly over treatment using calcium chloride method.

3.07 ALKALINITY NEUTRALIZATION TREATMENT

A. General:
   1. Comply with finish flooring manufacturer’s instructions. Treat slab surfaces with high measured pH using methods acceptable to finish flooring manufacturer only, and that will in no way void or compromise finish flooring warranty.
   2. Coordinate with MVER testing and relative humidity testing. If high pH is measured in concert with high MVER and/or relative humidity, follow procedures specified for slabs failing moisture testing, including, if required, vapor emission control treatment. Neutralization treatment procedures specified in this Article apply only to slabs with acceptable measured moisture vapor emission and relative humidity, but excessive pH at surface.

B. Water Rinsing: Initial treatment shall consist of neutralizing the slab by rinsing with clean neutral water, using following procedure.
   1. Start with a clean, porous concrete.
   2. Spray a small area with clean neutral water, rinsing the slab. If in doubt about the water take a pH paper and test the water.
   3. Immediately after the application of the water, thoroughly wet vacuum the area rinsed to remove any excess water.
   4. Allow it to dry for 24 hours and retest to verify the slab is neutralized.
   5. Test pH of neutralized slab again after 7 days to verify pH has not returned to high levels before proceeding with finish flooring installation.

C. Acid Washing: If water rinsing fails to neutralize slab surface to acceptable pH level, subject to acceptance of finish flooring manufacturer, neutralize slab surface by washing with mild carbonic acid, using following procedure.
   1. Spray mild carbonic acid onto the surface of the concrete.
   2. Wet vacuum the excess.
   3. Immediately rinse the acid with clean neutral water. Do not allow it to dry on the concrete.
   4. Wet vacuum the excess water and allow it to dry 24 hours.
   5. Test the surface to be verify the pH is neutralized.
   6. Test pH of neutralized slab again after 7 days to verify pH has not returned to high levels before proceeding with finish flooring installation.

3.08 CLEANING

A. Before beginning installation of finish flooring materials and floor coatings, floor slabs shall be cleaned of dirt debris, contaminants and other deleterious materials on slab surfaces.

B. Curing Compound Membranes and Other Coatings:
   1. Remove residual curing compound membrane, paint, oils and similar contaminants using shotblasting or other acceptable mechanical cleaning method, or by specified chemical cleaner and stripper in accordance with manufacturer's instructions.

C. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring.

3.09 PROTECTION

A. During and after flooring preparation, and until commencement of finish flooring installation, protect subfloor slab surfaces from staining, cracking, chipping, and other damage.

B. Protect freshly placed slabs from weather damage.

C. Protect slabs from mortar leakage from placing of slabs above.

D. Take precautions to protect slabs from exposure to significant excess moisture after end of curing period, during drying period, and until commencement of finish flooring installation.
   1. Promptly remove snow and standing water from floor slabs.
   2. Do not wash construction tools or materials over floor slabs.

E. Do not permit construction activities such as pipe cutting which could damage or stain floor slabs.

F. Do not store materials on floor slabs that could expose concrete to oil contamination.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

A. Work Results:
   1. New metal stud and gypsum board partitions.
   2. Gypsum board inside finish on structural metal studs.
   3. Shaftwall systems.
   4. Suspended gypsum board ceiling and soffit assemblies.
   5. Gypsum board ceilings and coves on metal ceiling joist framing.
   6. Gypsum board and metal stud wall opening infill.
   7. Furred gypsum board assemblies.
   8. Sound wall assemblies.

B. Products Installed But Not Supplied Under This Section:
   1. Access Doors and Panels: Section 08 31 00.
   2. Acoustical Blanket Insulation: Section 09 81 16.

C. Related Requirements:
   1. Cold-Formed Framing for Exterior Walls, Structural Metal Stud Framing and Cold-Formed Metal Joist Framing: Section 05 40 00 Cold-Formed Metal Framing.
   2. Gypsum Sheathing: Section 06 16 43.
   3. Fire Safing Material for Deflection Channels: Section 07 84 00 Firestopping.
   4. Acoustical Sealants: Section 07 92 00 Joint Sealants.
   5. Painting: Section 09 91 23 Interior Painting.
   6. Lead Lining for Gypsum Board Partitions: Section 13 49 00 Radiation Protection.

1.02 REFERENCES

A. General Requirements: Refer to Section 01 42 00.

B. Definitions: Meaning of the following terms as used in these Specifications.
   1. Gypsum Board Construction Terminology: Refer to ASTM C11 for definitions of terms for gypsum board construction not otherwise defined in this Section or in referenced standards.
   2. Drywall: Gypsum board.

C. Reference Standards: Comply with the following except as otherwise specified in this Project Manual.
   1. ANSI/AISI Standards:
      a. AISI S200-12 – North American Standard for Cold-Formed Steel Framing – General Provisions, 2012 Edition.
      b. AISI S201-12 – North American Standard for Cold-Formed Steel Framing – Product Data, 2012 Edition.
      c. AISI S212-07 (2012) – North American Standard for Cold-Formed Steel Framing – Header Design, 2007 Edition (Reaffirmed 2012).
      d. AISI S220-15 – North American Standard for Cold-Formed Steel Framing – Nonstructural Members, 2015 Edition.
   2. ASTM International Standards: www.astm.org.
      a. ASTM C645-14e1 – Standard Specification for Nonstructural Steel Framing Members.

b. ASTM C754-15 –Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
c. ASTM C840-16 - Standard Specification for Application and Finishing of Gypsum Board.
d. ASTM C1396 / C1396M-14a – Standard Specification for Gypsum Board.
3. Gypsum Association Standards: www.gypsum.org.
a. GA-216-2016 – Application and Finishing of Gypsum Panel Products.

D. Guide References and Standard Practices: Follow recommendations of the following:
1. Gypsum Association Publications: www.gypsum.org.
a. GA-214-2015 – Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panels.

1.03 AMBIENT CONDITIONS

A. Comply with ASTM C840 and Manufacturer’s recommendations.

PA%RT 2 PRODUCTS

2.01 ASSEMBLIES

A. Partitions: See Drawings for detailed assembly requirements.
1. Gypsum Board Panels: Unless indicated otherwise, provide panels 5/8 inch thick by 48 inch wide by vertical length to allow for vertical installation without cross joints.
a. Water Resistant Type: Use at toilet rooms, Kitchen, locker rooms, janitor rooms, and elsewhere as indicated.
b. Flexible Type: Use for curved surfaces unless otherwise indicated.
2. Layers: Provide multiple layer gypsum board as indicated.
3. Radiation Shielded Partitions: Comply with Section 13 49 00.

B. Ceilings and Interior Soffits:
1. Gypsum Board Panels: Provide panels 5/8-inch thick unless specifically indicated otherwise, by 48 inches wide by length to minimize cross joints.
2. Seismic Suspension System Bracing: Ceiling system and connections shall be designed and constructed in accordance with requirements of ICC Evaluation Service Report for ceiling suspension systems in Seismic Design Category adopted by local code.

C. Fire Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
1. Gypsum Board Partitions: Partitions listed and labeled for fire protective ratings where indicated.
2. Where UL design numbers are referenced on Drawings, assemblies shall comply with the requirements listed by the referenced UL design, in addition to requirements of applicable specification sections. See Drawings and Sections 01 42 00. Products shall be one of those listed in referenced UL assembly.
3. All gypsum board ceilings that are part of a rated roof/ceiling assembly shall comply with all requirements of that assembly.
4. Gypsum board ceilings and soffits that are suspended below rated assemblies are unrated.
5. Vertical Shaftwall System: UL fire rated assemblies as indicated on Drawings with components as follows.
a. Studs: 2-1/2-inch C-H studs as indicated. Not less than 20 gage.
b. Faceboards: ASTM C1396/C1396M, Type X. 5/8-inch fire rated gypsum board bearing UL Certification marking. One or more layers as indicated..

c. Liner Board: ASTM C1396/C1396M, Type X. 1 inch gypsum shaftwall liner bearing UL Certification marking.

D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.02 GYPSUM BOARD AND JOINT FINISHING MATERIALS

A. General:
1. Reference Standard: Each type of gypsum board shall be as defined by, and shall comply with requirements of, ASTM C1396/C1396M.
2. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
3. All gypsum board and gypsum board finishing materials shall be formaldehyde-free and asbestos-free.

B. Type X Gypsum Board: For all locations not specified otherwise.
1. Core: Type X.
2. Surfaces: Paper.
3. Thickness: 5/8-inch.
4. Edge: Tapered.
5. UL Classified as to fire resistance, surface-burning characteristics and noncombustibility.

C. Type X Moisture-Resistant, Mold-Resistant Gypsum Board: For high humidity applications.
1. Core: Type X, moisture-resistant.
2. Surfaces: Moisture resistant and mold-resistant paper on front, back, and long edges.
3. Thickness: 5/8-inch.
4. Edge: Tapered.
5. Mold Resistance: ASTM D3273, score of 10, and ASTM G21, score of 0.
6. Moisture Resistance: ASTM C473, less than 5 percent water absorption.
7. UL Classified as to fire resistance, surface-burning characteristics and noncombustibility.

D. Type C Gypsum Board: For fire rated construction and all locations not specified otherwise.
1. Core: Type C or Type X.
2. Surfaces: Paper.
3. Thickness: 5/8-inch.
4. Edge: Tapered.
5. UL Classified as to fire resistance, surface-burning characteristics and noncombustibility.

E. Abuse Resistant Gypsum Board:
1. Core: Type X, abuse-resistant.
2. Surfaces: Heavy abrasion-resistant paper.
3. Thickness: 5/8-inch.
4. Edge: Tapered.
5. Abrasion Resistance: ASTM C1629, Level 3.
6. Indentation Resistance: ASTM C1629, minimum Level 1.
7. Soft Body Impact Resistance: ASTM C1629, Level 2.
8. UL Classified as to fire resistance, surface-burning characteristics and noncombustibility.

F. Impact Resistant Gypsum Board:
1. Core: Type X, fiberglass reinforced.
2. Surfaces: Heavy abrasion-resistant paper.
3. Thickness: 5/8-inch.
4. Edge: Tapered.

5. Abrasion Resistance: ASTM C1629, minimum Level 2.
6. Indentation Resistance: ASTM C1629, minimum Level 1.
7. Soft Body Impact Resistance: ASTM C1629, Level 3.
8. Hard Body Impact Resistance: ASTM C1629, Level 3.
8. UL Classified as to fire resistance, surface-burning characteristics and noncombustibility.

G. Gypsum Shaftliner Board: ASTM C 1396/C 1396M; Type X. Manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.
   1. Manufacturer: As listed in referenced UL shaft system.

2.03 NON-LOAD-BEARING METAL PARTITION STUDS AND RUNNERS

A. Finish for Studs, Runners, Bracing and Accessories: Corrosion resistant galvanized coating conforming to ASTM A653, G40 minimum.

2.04 CEILING AND SOFFIT FRAMING

A. Non-Accessible Ceiling and Soffit Framing: 16 gauge studs, sizes as indicated, 16 inches on center unless otherwise indicated on Drawings.
   1. Spans Greater Than 8 Feet: Joist framing to comply with Section 05 40 00.

B. Accessible Ceiling and Soffit Framing: Joist framing to comply with Section 05 40 00.

2.05 CEILING SUSPENSION SYSTEMS

A. Hangers: Steel wire or rods, sizes to comply with requirements of ASTM C754 for ceiling or soffit area and loads to be supported.
   1. Wire: ASTM A641, minimum No. 9 gage, soft, Class 1 galvanized.
   2. Rods and Flats: Mild steel components.

B. Suspended Framing System Description: Framing system for gypsum board panels consisting of cold-rolled steel members conforming to ASTM C635, including main tees, furring cross channels, furring cross tees, and cross tees.
   1. Main Runners: Cold rolled, "C" shaped steel channels, 16 gauge minimum.
      a. Form to required radius at curved ceilings.
   2. Cross Furring: Hat shaped steel furring channels, ASTM C645, 7/8 inch high, 25 gauge, galvanized.
   3. Finish: Hot dipped galvanized finish, ASTM A653, Type G30 or better.
   4. Provide compression posts and other accessories as required to comply with seismic requirements.

2.06 ACOUSTIC INSULATION AND SEALANTS

A. Sound Attenuation Blankets: See Section 09 81 16.

B. Acoustical Sealant: See Section 07 92 00.

2.07 ACCESSORIES

A. Fasteners: ASTM C1002.
   1. Fastening to Metal: One-inch Type S gypsum board screws. Use proper type for gage of stud.

B. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints that comply with ASTM C1047 and requirements indicated below:
   1. Material: Formed metal, or metal combined with paper:

PART 3 EXECUTION

3.01 ERECTION OF NON-LOAD-BEARING METAL STUD PARTITIONS

A. Reference Standard: Erect steel framing in accordance with ASTM C754.

3.02 CEILING SUSPENSION INSTALLATION

A. General: Install suspension system in accordance with ASTM C754 and manufacturer's instructions and as required to comply with seismic requirements..

B. Hangers: Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to cast in concrete inserts or other anchorage devices or fasteners as indicated. Install wire hangers spaced not over 48 inches on center in direction of 1-1/2-inch main runner channels and within 6 inches of ends of main runners or interruptions of ceiling continuity. Hang from structure above. Install hangers 24 inches on center at gypsum drywall ceilings supporting wood or metal ceilings or other secondary ceiling systems.
   1. Where spacing of structural members, or width of ducts or other equipment, prevents regular spacing of hangers, provide supplemental hangers and suspension members and reinforce nearest affected hangers to span extra distance.
   2. Attach directly to structural elements only. Do not connect or suspend steel framing from ducts, pipes or conduit. Loop hangers and wire tie directly or provide anchors or inserts.
   3. Keep hangers and braces 2 inches clear of ducts, pipes and conduits.

C. At light troffers or other openings, reinforce framing with 3/4-inch cold rolled channels wired atop and parallel to main runner channels.

D. Provide all necessary framing and suspension for offsets, verticals and decorative recesses, etc. Use drywall studs where indicated or required.

E. Install 1-1/2 inch main runner channels 24 inches on center. at ceilings supporting wood or metal ceilings or other secondary ceiling systems.

F. Seismic Braced System:
   1. Install compression posts, splay wires and other accessories as required to comply with seismic requirements.
   2. Extend runners to within 6 inches of walls.
   3. Wire tie or clip furring members to main runners and to other structural supports indicated. In fire resistance rated assemblies, wire tie furring members; do not clip.
   4. Do not permit furring or runners to contact masonry or concrete walls.
   5. Provide 1 inch clearance between furring or runners and abutting walls and partitions.

G. Installation Tolerances:
   1. Do not exceed 1/8 inch in 8-foot variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
   2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
   3. Shim as required to comply with specified tolerances.

3.03 INSTALLATION OF GYPSUM BOARD, GENERAL

A. Reference Standards: Apply and finish gypsum board in accordance with GA-216 and ASTM C840.

B. Tolerances: Gypsum board surface plane within plus-or-minus 1/8-inch in 10 feet.

3.04 FINISHING

A. General: Finish gypsum board in accordance with ASTM C840. Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Joint Finishing: Apply joint treatment at side and end joints, corner bead, trim, penetrations and fastener dimples as recommended by manufacturer.
   1. Finish panels to following finish levels as defined by ASTM C840 and as recommended by GA-214 where not otherwise specified.
      a. Level 0: Limited to temporary construction. No taping, finishing or accessories required.
      b. Level 1: Limited to ceiling plenums and similar concealed areas. Apply tape embedded in joint compound to all joints and interior angles. Excess joint compound, tool marks and ridges are acceptable.
      c. Level 2: Minimum finish level for gypsum board to receive interior adhered masonry veneer, or bonded acoustical ceiling tile. All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Cover all fastener heads and accessories with one coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
      d. Level 3: Minimum finish level for gypsum board to receive ceramic, stone, or glass tile, FRP or other protective wall covering, fixed acoustical panels, or heavy- or medium-texture finishes before final painting. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Cover fastener heads and accessories with two separate coats of joint compound as required by ANSI A108.01-2013 for gypsum board to receive tile. The surface shall be smooth and free of tool marks and ridges.
      e. Level 4: Minimum finish level for gypsum board to receive light texture, wallcoverings, and for all gypsum board that will be exposed to view but not specified to receive Level 5 finishing. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Apply two separate coats of joint compound over all flat joints and one separate coat over interior angles. Cover fastener heads and accessories with three separate coats of joint compound. The surface shall be smooth and free of tool marks and ridges.

f. Level 5:
   1) Finish gypsum board to Level 5 where so noted on the Drawings and for following applications:
      a) Gypsum board to receive semigloss or gloss paint or other glossy decorative finish.
      b) Gypsum board to receive dark or deep tone paint application.
   2) Finish joints as specified for Level 4.
   3) Apply a skim coat over the entire exposed surface.

2. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.
3. Apply joint tape at joints between gypsum boards except at trim accessories.
4. Joint Compound: Sand smooth between coats and after last coat.
   a. Embedding and first coat: Setting-type joint compound.
   b. Fill coat: Setting-type joint compound.
   c. Finish coat: Ready-mix drying-type all-purpose or topping compound.

C. Skim Coat Application. Skim coat to be troweled on to straight plumb finish prior to final wall painting application or other finish as shown on Drawings.
   1. Required for Level 5 finishing.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 SUMMARY

A. Work Results:
   1. Acoustical grid and suspension system for CBC seismic Category D.
   2. Lay-in panels.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with the following.
   1. ASTM International References:
      a. ASTM C635/C635M-13a - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
      b. ASTM C636/C636M-13 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
      c. ASTM E580/E580M-14 – Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
      d. ASTM E1264-14 - Standard Classification for Acoustical Ceiling Products.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Seismic Design Compliance: Metal suspension systems and lay-in panel ceilings provided under this Section shall meet the requirements of the CBC for Seismic Design Category D. Systems shall be designed and installed in accordance with ASTM C635, ASTM C636, and ASTM E580, Section 4 – Seismic Design Category D.
   1. Systems with a current ICC-ES report recognizing the system as a code-compliant alternative method for installation in Seismic Design Category D construction will be deemed to meet this requirement. Comply with all stipulations and conditions of use stated in the ICC-ESR.

2.02 PERFORMANCE

A. Acoustical Performance:
   1. Lay-in panels shall have a minimum noise reduction coefficient (NRC) as of .55 in accordance with ASTM C423 and a CAC rating of the ceiling assembly of 35 in accordance with ASTM E1414.

B. Fire Resistance:
   1. Flame Spread: Do not exceed flame spread classifications in CBC Table 803.9.
   2. System fire rating not required.

2.03 SUSPENSION SYSTEMS

A. Basis of Design Manufacturer and System: See Finish Legend on Drawings
   1. Armstrong World Industries; www.armstrong.com – Seismic RX.
      a. Grid Style: Armstrong Suprafine XL.

b. Provide with Beam End Retaining Clips (BERC) in accordance with ICC-ESR in lieu of spacer bars.

B. Narrow Front Ceiling Suspension System: Intermediate Duty.
   1. Exposed Grid Face: 9/16-inch.
   2. Color: White.

C. Edge Molding: Standard angle molding for specified seismic suspension system, color to match grid.
   1. Minimum Horizontal Flange Dimension: 7/8-inch.
   2. Minimum Vertical Flange Dimension: 7/8-inch.

D. Spacer Bars: Provide system as required to prevent perimeter components from spreading apart.

E. Suspension Wire: Minimum No. 12 gauge galvanized, soft-annealed, mild steel wire.

PART 3 EXECUTION

3.01 INSTALLATION OF SUSPENSION SYSTEMS

A. General: Install suspension systems in accordance with Drawings, ASTM C636, ASTM E580, and manufacturer's instructions.

3.02 INSTALLATION OF LAY-IN PANELS

A. Panels: Install panels in accordance with manufacturer's instructions and recommendations. Where required, cut units to fit.

3.04 SITE QUALITY CONTROL

A. Special Inspection: Special inspection is required for the suspension system, anchoring and bracing of the system. See Section 01 45 20.

3.05 FINAL APPEARANCE

A. On completion, acoustical panels shall be free from defects, clean and lying flat in metal grid.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Vinyl composition tile flooring (VCT).
   2. Sheet vinyl flooring with integral base.
   3. Rubber base.
   4. Transition moldings.

B. Related Requirements:
   1. Concrete Floor Slab Moisture Testing: Section 09 05 61 Common Work Results for Flooring Preparation.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00.
   1. ASTM International (ASTM):
      a. ASTM F1869-16 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
      b. ASTM F1303-04(2014) - Standard Specification for Sheet Vinyl Floor Covering with Backing.
      c. ASTM F1861-08 - Resilient Wall Base.
      d. ASTM F2170-16a - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
   2. Resilient Floor Covering Institute (RFCI):
      a. RFCI Standard Slab Moisture Test Method (Calcium Chloride Method).

B. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.
   1. ASTM International Standard Practices:
      a. ASTM F710-11 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

1.02 COORDINATION

A. Concrete Subfloor Vapor Emission, Alkalinity and Bond Testing and Acceptance: Coordinate with Section 09 05 61.
   1. Notwithstanding testing by others, it is the responsibility of the flooring installer to determine whether the subfloor is sufficiently dry for covering.

PART 2 PRODUCTS

2.01 VINYL COMPOSITION FLOOR TILE

A. Tile (VCT) Material: ASTM F1066. Homogenous tile.

B. Size: 12-inches by 12-inches by 1/8-inch

C. Colors: As selected.

D. Vinyl Edging: Furnish at exposed edges of resilient floor tile, vinyl edging 1-inch wide, 1/8-inch thick. Colors as selected.

2.02 SHEET VINYL FLOORING (SV) MATERIALS

A. Heterogeneous Sheet Vinyl Flooring With Backing: ASTM F1303, Type 2, Grade 1, Class A.
   1. Gauge:
      a. Overall Nominal Thickness: 0.080 inch
      b. Wearlayer Thickness: 0.080 inch.

B. Performance:
   1. HUD/FHA Requirements: Exceed.
   2. Flooring Radiant Panel Test (ASTM-E648): 0.45 watts/ cm2, Pass - Class 1.
   3. N.B.S. Smoke Chamber Test (ASTM-E-662): Less than 450 – Pass.
   4. Fire Resistance:
      a. Flame Spread: Do not exceed flame spread classifications in CBC Table 803.9.

2.03 RESILIENT BASE

A. Rubber Cove Base: ASTM F1861, Group 1. Type TS, thermoset vulcanized extruded rubber cove.

B. Provide pre-formed external corners. Job-formed internal corners may be used at Contractor's option.

C. Fire Resistance:
   1. Flame Spread: Do not exceed flame spread classifications in CBC Table 803.9.

2.03 ADHESIVE

A. Adhesive: As recommended by the manufacturer of the material being installed. Adhesive shall be a type not affected by heat.
   1. Low-Emitting Material Requirements: Use adhesives that comply with the limits for VOC content of SCAQMD Rule #1168:

PART 3 EXECUTION

3.03 INSTALLATION

B. Sheet Vinyl Flooring: Install according to manufacturer's recommendations. Rout seams with a hand router or electric router and heat weld seams using matching vinyl welding thread. Install fillet cove filler at all walls. Turn sheet flooring up wall to form integral cove base and install aluminum trim at exposed top edge.

C. Rubber Base: Tightly cement base to wall with butt joints 1/16-inch or less in width.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.01 SUMMARY

A. Work Results:
   1. Modular tile carpeting.

B. Related Requirements:
   1. Concrete Floor Slab Finishing: Section 03 35 00 Concrete Finishing.
   2. Concrete Floor Slab Curing: Section 03 39 00 Concrete Curing.
   3. Concrete Floor Slab Moisture Testing: Section 09 05 61 Common Work Results for Flooring Preparation.

1.02 REFERENCES

A. General Requirements: Refer to Section 01 42 00.

B. Reference Standards: Comply with the following except as otherwise specified in this Project Manual.
   1. Carpet and Rug Institute (CRI); www.carpet-rug.org:
      a. CRI 104 – Sept 2015 - Standard for Installation of Commercial Carpet.

1.03 SITE CONDITIONS

A. Subfloor Moisture Conditions: Refer to the manufacturer's written instructions for guidelines regarding allowable moisture and pH limits for their products. Moisture emission rate shall be not more than 3 pounds per 1000 sq. ft. in 24 hours when tested by calcium chloride moisture test in compliance with CRI 104, 6.2, with subfloor temperatures not less than 55 degrees F.

1.04 WARRANTY

A. Warranty: Submit in accordance with Section 01 78 00. Warranty shall be executed by carpet manufacturer and installer agreeing to repair and replace carpet that does not meet requirements within the special warranty period.
   1. Special Warranty Period: 15 years, non-prorated.
   2. Include coverage against excessive wear, delamination, edge ravel, zippering, loss of resiliency, and static.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Carpet for all public areas and for all other areas as required by law, shall be flameproofed.
   1. Flame Spread: Do not exceed flame spread classifications in CBC Table 803.9.

B. Comply with the following.
   1. NFPA 253: Class I for flooring radiant panel test.
   2. ASTM D2859: Pass surface flammability ignition test.

2.02 MATERIALS

A. Provide low-emitting materials. Carpet systems must meet or exceed the Carpet and Rug Institute Green Label Indoor Air Quality Test Program.

2.03 ACCESSORIES

A. Adhesive: Type recommended by carpet manufacturer to suit application and expected service.
   1. Adhesive for Carpet Tile: Releasable type.
   2. Low-Emitting Material Requirements: For interior applications use sealants that comply with the following limits for VOC content when calculated according to SCAQMD Rule #1168:
      a. Carpet Adhesives: 50g/L.

PART 3 EXECUTION

3.01 PREPARATION

A. Subfloor Surface Preparation: Level subfloor within 1/8 inch in 10 feet, noncumulative, in all directions.
   1. Use approved cementitious filler to patch and repair cracks, small holes and rough areas. Fill in depressions.
   2. All hard surface material transitioning to carpet shall be level and flush in finish surface height. Prepare subfloor to accommodate transitions. Feather out in a 3 foot radius so as not to create a bump or ramp effect under the materials.

B. Cleaning:
   1. Clean floors of dust, dirt solvents, oil, grease, paint and other substances which would be detrimental to the proper performance of adhesive and carpet. Allow floors to dry thoroughly.
   2. Vacuum clean subfloors to be carpeted.

3.02 CARPET TILE INSTALLATION

A. General: Install in accordance with CRI 104 and the recommendations and specifications of the carpet tile manufacturer.

B. Layout: Work out patterns for each floor area and cuts against walls so cuts on opposite sides of the area are of same width. In order to eliminate small cuts against walls, layout each area to determine whether pattern should start with a joint or center of a tile on the center line of the area each direction.
   1. Directional Pattern: Where tile with a directional pattern is used, verify direction of pattern with Architect before beginning installation.

C. Entire carpet tile installation is to be laid tight and flat to subfloor well fastened at edges and is to present a uniform pleasing appearance. Ensure monolithic color, pattern and texture match within any one area.

D. Install edging strips where carpet tile terminates at other floor coverings. Where splicing cannot be avoided, butt ends tight and flush. Omit edge strips where carpet tile abuts sheet carpet.

END OF SECTION

SECTION 09 81 16

ACOUSTIC BLANKET INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Acoustical insulation in partitions as indicated.
   2. Acoustical insulation over ceilings as indicated.

B. Related Requirements:
   1. Acoustical Joint Sealants: Section 07 92 00 Joint Sealants.

PART 2 PRODUCTS

2.01 FIBER GLASS ACOUSTICAL BLANKET INSULATION

A. Sound Control Blankets for Partitions: ASTM C665, Type 1, unfaced.
   1. Material: Formaldehyde-free inorganic fiber glass bonded with thermoset resin.
   2. Thickness: 3½ inches thick unless otherwise indicated.
   3. Width: 16 inches or 24 inches to match partition wall stud spacing or joist spacing as applicable and as indicated.
   4. Surface Burning Characteristics: ASTM E84.
      a. Flame Spread: Maximum 25.
      b. Smoke Developed: Maximum 50.

B. Acoustical Batts for Ceilings: ASTM C665, Type 1, unfaced.
   1. Size: Sized to fit 2 foot by 4 foot ceiling panel system.
   2. Thickness: 6¼ inches.
   3. Surface Burning Characteristics: ASTM E84.
      a. Flame Spread: Maximum 10.
      b. Smoke Developed: Maximum 10.

PART 3 EXECUTION

3.01 ACOUSTICAL BLANKET INSTALLATION IN PARTITIONS

A. Batts: Friction-fit in place until interior finish is applied. Install batts to fill entire stud cavity. Place in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within partitions and tight to items passing through partitions.
   1. Stud Cavity Heights Up To 8 Feet: Cut lengths to friction-fit against floor and ceiling tracks or plates.
   2. Stud Cavity Heights Greater Than 8 Feet: Provide supplemental support as required to hold batts in place until the interior finish is applied.

3.02 ACOUSTICAL BLANKET INSULATION INSTALLATION OVER CEILINGS

A. Sound Attenuation Blankets Over Ceilings:
   1. Cover ceiling panels for 2 feet each side of acoustically insulated partitions.

B. Sound Attenuation Blankets Over Acoustical Ceilings: Lay batts on top of the ceiling panel and suspension system between tees. Fit batts tightly together.

1. Blankets at Light Fixtures: Comply with National Electrical Code. Do not install insulation over or within 3 inches (76 mm) of recessed light fixtures, unless approved insulated ceiling (IC) lighting fixtures are used.

END OF SECTION

SECTION 09 91 13

EXTERIOR PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior paints.
   1. Includes:
      a. Surface preparation, priming and field application of finish coat(s) to all exterior surfaces not specifically excluded.

B. Exclusions: In addition to material obviously not requiring paint such as glass, floor, tile, etc. do not paint or finish:
   1. Factory finished surfaces unless otherwise specified.
   2. Integrally colored masonry and stucco.
   3. Exterior insulation and finish system.
   4. Brick.
   5. Concealed surfaces.
   6. Operating parts.
   7. Labels.
   8. Existing surfaces not included in the Work.

1.02 REFERENCES

A. Definitions:
   1. Terminology: ASTM D16-12 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.
   2. Coat: An application of paint or coating that is allowed to dry prior to subsequent application.
   3. Sheen Terms:
      a. Flat: Lusterless or matte finish with a gloss range below 15 when measured at an a85-degree meter.
      b. Eggshell: Low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
      c. Semigloss: Medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
      d. Full Gloss: High-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
   4. Measurement of Dry Film Coating Thickness on Steel: SSPC-PA2 – Procedure for Determining Conformance to Dry Coating Thickness Requirements.

1.03 AMBIENT CONDITIONS

A. Apply coating under following conditions only.
   1. Temperature of Air: Between 50 and 100 degrees F.
   2. Temperature of Substrate: Between 50 and 100 degrees F and above dew point.
   3. Exterior Work:
      a. Do not finish outside surfaces in foggy, or damp weather.
      B. Exterior painting shall not be allowed while dust is blowing.
   4. Lighting: Maintain 80 foot candles minimum on surfaces to be finished.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Product shall be certified to meet the following.
   1. Volatile Organic Content (VOC): Paint and coating materials shall not exceed VOC content limitations of all applicable regulations, when thinned to manufacturer's maximum recommendation.

2.02 MATERIALS

A. Quality: All products not specified by name shall be "best grade" or "first line" products or acceptable manufacturers. See Part 3 Execution for materials required for this Project. Where possible, materials shall be of a single manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

A. Metals:
   1. Ferrous Metal: Remove foreign material, rust and mill scale from unprimed metal.
      a. Wire brush or sand damaged or rusted areas to bright metal.
      b. Remove grease and other foreign materials with mineral spirits.
      c. Dust clean.
   2. Shop Primed Metals: Touch-up shop primed metals with a primer similar to the existing. Sand shop primer on hollow metal work immediately before painting to remove grease and dirt film from surfaces.
   3. Zinc Coated Metal (Galvanized Surfaces): Solvent clean with mineral spirits or other acceptable solvent in accordance with SSPC-SP1 to remove all residue oil, grease or other contamination. Prime as specified.
   4. Non-ferrous Metals: Clean with lacquer thinner.

3.02 APPLICATION

A. Painting, General: Apply primer and two finish coats unless otherwise noted.
   1. The application of the first coat does not relieve the applicator of responsibility for the base.
   2. Do not apply any coats on either damp or wet surfaces and in no case until the preceding coat is dry and hard.

B. Primer: Apply as many coats as necessary to produce a uniform substrate appearance. Do not exceed manufacturer's recommended coverage rate.
   1. Tint primers to match finish coat.
   2. Allow to dry prior to application of subsequent coats.
   3. Sand primer with 100 grit or finer sandpaper. Remove dust.
   4. Primer on Gypsum Board: If sprayed, backroll.

C. Application of Finish Coats: Spread materials evenly without runs or sagging of materials and thoroughly brush out.
   1. Second and third coats shall not be applied until preceding coat is dry.
   2. Sand work between coats.
   3. Colors: Each finish coat shall be color as selected by Architect.

D. Roller Application: Where paint or enamel is rolled on, use fine nap roller so nearly flat or orange peel texture is obtained.

E. Spray Application: Apply paint to all metals by spray application method.

3.03 CLEANING AND WASTE MANAGEMENT

A. Waste Management: Collect and manage unused architectural paints in accordance with requirements of PaintCare program as approved by the State of California.

3.04 EXTERIOR PAINTING AND COATING SCHEDULE

A. General:
   1. Paint and coating systems shall meet following scheduled requirements as a minimum.
   2. Delete primer when re-coating existing surfaces.

B. Metal Doors, Frames and Ferrous Metals - Painted:

First Coat	Factory Prime Coat or Suitable Primer
Second Coat	Alkyd Semi-Gloss Enamel, Exterior
Third Coat	Alkyd Semi-Gloss Enamel, Exterior

C. Zinc Coated Metal (Galvanized) - Painted:

First Coat	All-Surface Acrylic Latex Primer
Second Coat	Acrylic Latex Semi-Gloss Enamel, Exterior
Third Coat	Acrylic Latex Semi-Gloss Enamel, Exterior

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Paint all new or patched interior surfaces.
   2. Interior painting.
   3. Touch up painting of existing surfaces abraded or otherwise damaged by construction operations.
   4. Includes:
      a. Surface preparation, priming and field application of finish coat(s) to all exterior surfaces not specifically excluded.
      b. Surface preparation, priming and field application of finish coat(s) to all interior surfaces not specifically excluded.
      c. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

B. Exclusions: In addition to material obviously not requiring paint such as glass, floor, tile, etc. do not paint or finish:
   1. Surfaces indicated by the Finish Schedule to remain unfinished.
   2. Factory finished surfaces unless otherwise specified.
   3. Concealed surfaces.
   4. Operating parts.
   5. Labels.
   6. Existing surfaces not included in the Work.

C. Related Requirements:
   1. Primer for Metal Fabrications: Section 05 50 00 Metal Fabrications.
   2. Piping Identification: Section 22 05 53 Identification For Plumbing Piping And Equipment.

1.02 REFERENCES

A. Definitions:
   1. Terminology: ASTM D16-12 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.
   2. Coat: An application of paint or coating that is allowed to dry prior to subsequent application.
   3. Sheen Terms:
      a. Flat: Lusterless or matte finish with a gloss range below 15 when measured at an a85-degree meter.
      b. Eggshell: Low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
      c. Semigloss: Medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
      d. Full Gloss: High-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Product shall be certified to meet the following.
   1. Volatile Organic Content (VOC): Paint and coating materials shall not exceed VOC content limitations of all applicable regulations, when thinned to manufacturer's maximum recommendation.

2.02 MATERIALS

A. Quality: All products not specified by name shall be "best grade" or "first line" products or acceptable manufacturers. See Part 3 Execution for materials required for this Project. Where possible, materials shall be of a single manufacturer.

B. Volatile Organic Content (VOC): In addition to meeting all applicable regulations, paint and coating materials shall be certified to not exceed following VOC content limitations when thinned to manufacturer's maximum recommendation.
   1. Architectural Paints, Coatings, and Primers Applied to Interior Walls and Ceilings:
      a. Flat: VOC content less than 50 grams/liter.
      b. Non-Flats: VOC content less than 150 grams/liter.
      c. Eggshell Interior Finish Coat: VOC content less than 150 grams/liter.
   2. Anti-Corrosive and Anti Rust Paints Applied to Interior Ferrous Metal Substrates: VOC content less than 250 grams/liter.
   3. Epoxy: Waterborne epoxy; maximum VOC content 200 grams/liter.
   4. Clear Wood Finishes, Floor Coatings, Stains, Sealers, and Shellacs Applied to Interior Elements:
      a. Clear Wood Finishes: Varnish VOC content less than 350 grams/liter; lacquer VOC content less than 550 grams/liter.
      b. Floor Coatings: VOC content less than 100 grams/liter.
      c. Sealers: Waterproofing sealers VOC content less than 250 grams/liter; sanding sealers VOC content less than 275 grams/liter; all other sealers VOC content less than 200 grams/liter.
      d. Stains: VOC content less than 250 grams/liter.
   5. Paint Strippers – Low-Emitting: Shall not contain methylene chloride. Avoid products containing methanol and trichloroethane.

PART 3 EXECUTION

3.01 APPLICATION

A. Painting and Staining, General: Apply primer and two finish coats unless otherwise noted.
   1. The application of the first coat does not relieve the applicator of responsibility for the base.
   2. Do not apply any coats on either damp or wet surfaces and in no case until the preceding coat is dry and hard.

B. Primer: Apply as many coats as necessary to produce a uniform substrate appearance. Do not exceed manufacturer's recommended coverage rate.
   1. Tint primers to match finish coat.
   2. Allow to dry prior to application of subsequent coats.
   3. Sand primer with 100 grit or finer sandpaper. Remove dust.

C. Application of Finish Coats: Spread materials evenly without runs or sagging of materials and thoroughly brush out.
   1. Second and third coats shall not be applied until preceding coat is dry.
   2. Sand work between coats.
   3. Colors: Each finish coat shall be color as selected by Architect.

D. Roller Application: Where paint or enamel is rolled on, use fine nap roller so nearly flat or orange peel texture is obtained.
   1. Painting Existing Acoustical Ceiling Suspension Grid: Paint exposed surfaces of grid by spray, brush or roll coating. If necessary to achieve complete hiding and finish, apply in two coats.

E. Spray Application:
   1. Metals: Apply paint to all metals by spray application method.
   2. Acoustical Tiles and Panels: Apply paint to acoustical tiles and panels by spray application.
      a. Existing Surfaces: Do not apply any coats on either damp or wet surfaces and in no case until the preceding coat is dry and hard.
      b. Apply paint with a stream directed perpendicularly to the surface of the material. Apply to produce uniform coating that does not close the perforations or fissures in the material.
      c. Apply in single coat unless second coat is required to hide stains. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

3.02 COATING SYSTEM - INTERIOR

A. General:
   1. Paint and coating systems shall meet following scheduled requirements as a minimum.
   2. Delete primer when re-coating existing surfaces.

B. Ferrous, Zinc Coated or Factory-Primed Metals - Painted:

First Coat	Factory Primer Coat or Suitable Primer
Second Coat	Enamel Undercoat
Third Coat	Semi-Gloss Enamel

C. Hollow Metal Frames - Painted:

First Coat	Factory-Prime Coat (Sanded)
Second Coat	Enamel Undercoat
Third Coat	Semi-Gloss Enamel

D. Gypsum Board Walls - Painted:

First Coat	Suitable Primer
Second Coat	Latex Enamel, Eggshell
Third Coat	Latex Enamel, Eggshell

E. Gypsum Board Ceilings and Soffits - Painted:

First Coat	Suitable Primer
Second Coat	Latex Enamel, Flat
Third Coat	Latex Enamel, Flat

END OF SECTION

DIVISION 10 – SPECIALTIES

SECTION 10 21 23

CUBICLE CURTAINS AND TRACK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Privacy curtain track as indicated.
   2. Privacy curtain.

1.02 WARRANTY

A. Provide manufacturer’s standard lifetime warranty against material and manufacturing defects.

PART 2 PRODUCTS

2.01 CUBICLE CURTAIN

A. Provide "Firewall Cloth", UL- rated as "Non-Combustible."

B. Provide curtain materials colorfast, sanitized, and free from odors, noxious gases or otherwise dangerous fumes when subjected to open flame.

C. Provide all seams turned in and securely sewed.

D. Provide flexible, sewn, reinforced eyelets spaced 6 inches on center. Use in lieu of metal grommets.

E. Provide curtain width at least 10 percent greater than track length. Hang to within 15 inches of floor.

2.02 CUBICLE TRACK AND HARDWARE

A. Track:
   1. Provide track of anodized extruded aluminum box channel 1-3/8 inch o.d. by 3/4-inch o.d. slotted on the underside to receive two wheel carriers.
   2. For L-shaped cubicles, with legs 6'-0" and over, form track of one continuous piece of track with integral 90 degree bend on a 12 inch radius.
   3. Where layout precludes one piece construction, use an external, extruded aluminum connector, with a finish matching the track at each joint.

B. End Closers: Use at both ends of the cubicle with a removable section at one end to permit easy entry and removal of curtains.

C. Curtain Carriers: Formed of rustproof wire and bead chain riding on a carrier with nylon wheels. Quantity of carriers shall be computed at 2.2 carriers per foot of track.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of Cubicle Tracking Systems:
   1. Install cubicle track, secure, rigid, and true to ceiling line.
   2. Secure or suspend track to ceiling system. Install with mechanical fasteners or clips.
   3. Slide carriers onto the track.
   4. Install end cap or stop device.

B. Curtains: Install curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 10 26 13

CORNER GUARDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Vinyl corner guards.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Manufacturer and Product:
   1. Manufacturer: Construction Specialties, Inc. (C/S).
   2. Model: Acrovyn SSM-25 Series.

2.02 CORNER GUARDS

A. Description: Snap-on covers of Class 1 fire-rated resilient material, minimum 0.078 inch thick, free-floated over continuous retainer, surface-mounted and anchored to wall at 20 inches on center maximum; molded end caps color matched to covers.

B. Size: 2-inches by 2-inches by 4 feet high.

2.03 FABRICATION

A. Fabricate components with tight joints, corners, and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.04 ACCESSORIES

A. Provide attachment accessories as recommended by corner guard manufacturer.

B. Fasteners: Bugle head screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install over corners in accordance with manufacturer's published instructions, square and plumb, secured rigidly in position.

B. Butt bottom of corner guard to top of base; top of corner guard 4 feet above finish floor.

END OF SECTION

SECTION 10 26 16.11

CRASH RAILS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Crash rails for corridor wall protection.

B. Related Requirements:
   1. Corner Guards: Section 10 26 13.
   2. Protective Wall Covering: Section 10 26 23.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Manufacturer and Products:
   1. Manufacturer: Construction Specialties, Inc.; www.c-sgroup.com.
   2. Product: Acrovyn 4000 Model SCR-50N.

2.02 REGULATORY REQUIREMENTS

A. Product shall comply with California 01350 specification for low VOC.

2.03 DESCRIPTION

A. Engineered PETG Crash Rail Assembly: Surface mounted assembly consisting of standard aluminum clips with snap-on PETG cover and continuous integral shock absorbing cushions.
   1. End Caps and Corners:
      a. Mechanically fastened with concealed fasteners.
      b. Color matched.
      c. Removable.
   2. Height: 5 inches.
   3. Wall Offset: 1-1/16 inches.
   4. Maximum Length: 20 feet.
   5. Assembly to mount to wall with 1-inch wide aluminum mounting clips.

B. Texture: Shadowgrain.

2.04 PERFORMANCE

A. Fire Performance Characteristics: Provide engineered wall protection system components with UL label indicating that they are identical to those tested in accordance with ASTM E84 for Class A/1 characteristics listed below:
   1. Flame Spread: 25 or less.
   2. Smoke Developed: 450 or less.

B. Impact Strength: Provide wall protection units that have been tested in accordance with the applicable provisions of ASTM F476 and ASTM B221.

C. Chemical and Stain Resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.

2.05 MATERIALS

A. Extruded PETG Component Material: High-impact polyethylene terephthalate glycol-modified, nominal 0.078 inch thickness.

B. Absorption Cushion: Regrind PETG, PVC-free.

C. Extruded Aluminum: 6063-T6 alloy, nominal 0.075 inch thickness. Minimum strength and durability properties as specified in ASTM B221.

2.06 FABRICATION

A. Factory form radius for installation on curved walls where indicated.

2.07 ACCESSORIES

A. Attachment hardware shall be appropriate for wall conditions.

B. Fasteners: All fasteners to be non-corrosive and compatible with aluminum components.
   1. All necessary fasteners to be supplied by the manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's published instructions and recommendations.

B. Use only approved mounting hardware.

C. Locate all components firmly into position, level and plumb.

D. Adjust installed end caps as necessary to ensure tight seams.

END OF SECTION

SECTION 10 26 23

PROTECTIVE WALL COVERING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Plastic, impact-resistant, wall protection panels for wainscot.

B. Related Requirements:
   1. Corner Guards: Section 10 26 13.

1.07 DELIVERY, STORAGE, AND HANDLING

A. General Requirements: Comply with Section 01 60 00.

B. Delivery: Deliver sheets in cartons. Deliver adhesive in sealed containers.

C. Storage: Store products in original packaging in climate controlled area away from direct sunlight.

D. Handling: Protect surface of panels during handling and installation.

1.08 SITE CONDITIONS

A. Ambient Conditions: During installation and for not less than 48 hours before installation, maintain room temperature required for adhesive being used.

B. Protection: Provide ventilation to disperse fumes during application of adhesive. Allow no containers of adhesive to be opened until all potential sources of flame or spark have been shut down or extinguished and until warning signs have been posted.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Manufacturer and Product:
   1. Construction Specialties, Inc. – Acrovyn.

2.02 REGULATORY REQUIREMENTS

A. Fire Performance: Wall panels shall meet requirements for NFPA Class A fire rating.

B. Wall Panels: UL labeled.

2.03 MATERIALS

A. Wall Protection Panels: Vinyl/acrylic panels of gage indicated on Finish Legend.
   1. Size: Height as indicated by length required in one piece.

B. Adhesive: Contact type as recommended by the manufacturer and complying with Southern California VOC regulations.

C. Accessories and Trim: Manufacturer's standard vinyl/acrylic alloy moldings and trim.

PART 3 EXECUTION

3.01 INSTALLATION

A. Adhesive: Comply with manufacturer's instructions regarding method of application, spread rate, drying time, open time and temperature and humidity limitations.

B. Panels: Align and plumb the first sheet before allowing the glue lines to come together, then apply the sheet slowly from one side to the other to expel air. Roll uniformly with hard rubber roller.

C. Install rigid sheets beveled at seams and chemically sealed. Butt adjoining panels tight, in straight, even line. Install panels without top cap, vertical divider bars, inside corner trim, or other joint accessories and trim unless otherwise detailed on Interior Design Drawings.

D. Trim: Install trim at all exposed edges and outside corners.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Toilet room accessories as indicated and specified.

1.02 REFERENCES

A. Reference Standards: Comply with the following as applicable:
   1. United States Department of Justice – 2010 ADA Standards for Accessible Design, September 15, 2010; available at www.ada.gov/ADAStandards_index.htm.

PART 2 PRODUCTS

2.01 TOILET ACCESSORIES

A. Manufacturer and Products: Bobrick Washroom Equipment, Inc.; www.bobrick.com.
   1. Recessed Sanitary Napkin Dispensers: Model B-353.
   2. Recessed Paper Towel Dispenser and Waste Receptor: Model B-38034. 600 C-Fold.
   3. Angle Frame Mirror with 5-Inch Shelf: Model B-166 2436.
   4. Recessed Seat Cover Dispenser, Napkin Dispenser, Tissue Dispenser: Model B-3574.
   5. Recessed Seat Cover Dispenser: Model B-3474.
   6. Grab Bar with Concealed Mounting: Model B-6806x36.
   7. Recessed Multi-Roll Toilet Tissue Dispenser: Model B-3888.
   8. Recessed Paper Towel Dispenser and Waste Receptor: Model B-4369. 300 C-Fold.
   9. Clothes Hook and Bumper: Model B-212.
   10. Grab Bar with Concealed Mounting: Model B-6806x42.

B. Toilet Accessory Types Required: See TCMC RFP Typical Room Data Sheets.

C. Owner-Furnished Accessories for Installation by Contractor:
   1. Surface Mounted Soap Dispenser: Model B-155.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fasten accessories rigidly and securely to walls using methods and materials recommended by manufacturer.

B. Locate and mount at heights complying with local, state and ADA Standards.

3.02 ADJUSTMENT

A. Before final inspection, inspect each accessory installation for rigid and secure installation. Take action necessary for rigid and secure installations.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fire extinguisher cabinets.
   2. Fire extinguishers.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with the following.
   1. NFPA 10 – Standard for Portable Fire Extinguishers, 2010 Edition.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHER CABINETS

A. Description: Vertical Duo-panel door style with semi-recessed 18 gage steel box.
   1. Pull handle to open door.
   2. Provide fire rated cabinets where located in fire rated partitions.

B. Factory Finish: Powder coat, white.

2.02 FIRE EXTINGUISHERS

A. Type and Capacity: 10 pound Multi-Purpose A-B-C type with pressure gage.

B. Accessories:
   1. Furnish wall bracket for wall hung extinguishers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cabinets: Install cabinets according to manufacturer's instructions.
   1. Provide necessary wood blocking.
   2. Field locate as directed by fire department and Architect.

B. Extinguishers: Install in cabinets or on wall brackets and leave fully charged.

END OF SECTION

DIVISION 11 – EQUIPMENT

SECTION 11 13 00

LOADING DOCK EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Dock bumpers.
   2. Dock levelers.

B. Related Requirements:
   1. Dock Leveler Pit Construction: Division 03 Concrete.

1.02 REFERENCES

A. Dock Leveler Standard: Comply with applicable requirements of ANSI MH 14.1 for construction and operation of dock levelers.

1.03 COORDINATION

A. Dock Leveler Pit: Coordinate with work under Division 03 to ensure proper pit dimensions and embedments.
   1. Coordinate forming of pit to receive dock leveler to ensure that recess is adequate to accommodate leveler in proper relationship to loading platform.
   2. Pit Floor Slope: Minimum 1/2 inch, back to front.
   3. Manufacturer of leveler to provide pit curbing and anchors, rough-in sizes and templates to appropriate trade for installation into pit.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit operation and maintenance and service data for installed equipment.
   1. Include address and telephone number of nearest authorized service representative.

B. Warranties: Submit specified warranties.

1.05 WARRANTY

A. Hydraulic Dock Leveler Special Warranty: Manufacturer's standard 1-year parts and labor warranty plus additional 4-year parts only warranty for hydraulic power unit and cylinder.
   1. Include following parts:
      a. Lip, lip hinge, and shaft.
      b. Deck plate and beams.
      c. Rear frame and rear hinges.
   2. Provide Manufacturer's standard prorated ten-year warranty for structural components upon approval of written application. If not available, submit letter stating reason.

PART 2 PRODUCTS

2.01 DOCK BUMPERS

A. Laminated Tread Bumpers: Provide dock bumper units fabricated of multiple plies cut from fabric-reinforced rubber truck tires to a uniform thickness.
   1 Shape of Bumpers: Rectangular.
   2. Thickness: Minimum 4 inches.
   3. Rubber pads laminated between structural steel angles and secured with 3/4-inch steel tie rods.
      a. Bumpers for Use with Dock Levelers: Flat steel plate in lieu of steel angles.

B. Finish for Exposed Metal Components: Black shop primer.

2.02 HYDRAULIC DOCK LEVELERS

A. Regulatory Requirements: Comply with ANSI MH14.1 and the safety and labeling requirements of ANSI MH30.1-2007.

B. Operation:
   1. Hydraulics: Platform raised by hydraulic cylinder.
   2. Electrical: 3/4 HP motor rated at 115/230 Volts, 60 Hz, single phase.
   3. Controls: Dual push button control box.
   4. Lip hydraulically extends and locks at top of upward ramp movement.
   5. Full operating range yellow toe guards.

C. Materials:
   1. Galvanized ramp, lip and frame.
   2. Heavy-duty laminated rubber bumpers.

D. Performance and Design Criteria:
   1. Design Requirements: Provide fixed-in-place adjustable loading and unloading platform for difference in height and gap between truck bed and building loading dock.
   2. Provide loading dock equipment, which has been manufactured, fabricated, and installed to withstand loads specified and to maintain performance criteria stated by manufacturer without defects or failure.
   3. Comply with ANSI MH14.1.

E. Fabrication:
   1. Welded base frame construction.
   2. Unit to be supplied completely assembled, ready for use.

F. Finishes:
   1. Dock Equipment Finish:
      a. Preparation: Clean surfaces free from slag and splatter, loose mill scale, oil, grease, or rust.
      b. Dock Leveler: Factory apply manufacturer's standard DTM (Direct to Metal) Water based Paint with built in rust inhibitors.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's detailed instructions in installing loading dock equipment.

3.02 SITE QUALITY CONTROL

A. Upon completion of installation of dock levelers conduct tests to ensure proper construction and operation of dock levelers.

3.03 ADJUSTING

A. Make necessary adjustments for safe, efficient, and balanced operation of loading dock equipment.

B. After installation, restore marred or abraded surfaces to original condition.

C. Repair or replace damaged products.

3.04 TRAINING

A. Instruct Owner's personnel in operation and maintenance of installed units. Provide bound copy of manufacturer's operation and maintenance manual at time of instruction.

END OF SECTION

SECTION 11 70 00

HEALTHCARE EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Products Installed But Not Furnished Under This Section:
   1. Contractor shall install Owner-furnished equipment.

B. Related Requirements:
   1. Plumbing Connections: Division 22 Plumbing.
   2. Electrical Connections: Division 26 Electrical.

1.02 PRE-INSTALLATION CONFERENCE

A. Convene pre-installation conference one week prior to commencing work of this Section when specified under product description.

B. Attendance Required: Contractor, manufacturer’s representative, and installer.

C. Agenda: Discuss and agree upon acceptable substrate and mounting conditions, preparatory work, utility connections, and methods of installation.

1.03 SEQUENCING

A. Prior to fabrication of mounting plates, furnish mounting plate templates to trades installing structure to support mounting plates.

B. Install mounting plates to structural supports prior to covering-up by subsequent construction operations.

1.04 DATA TO BE FURNISHED BY SEPARATE VENDORS FOR COORDINATION

A. Product Data: Equipment Cut Sheets.
   1. Include data to indicate standard mounting and utility connection details.
   2. Include information for factory finishes, hardware, glass, sealants, accessories and other required components.
   3. Include wiring diagrams and rough-in requirements for items requiring electrical connections.

B. Shop Drawings: Furnished by Owner for non-standard custom-fabricated items to be installed by Contractor.
   1. Will indicate typical layout including dimensions, mounting locations and sizes, service accesses, utility connections, mounting sequences, and division of installation responsibilities.
   2. Will include detail drawings of non-standard mounting details and utility connections.
   3. Will include detail drawings of special accessory components not included in manufacturer’s product data.

C. Informational Submittals: Submit following packaged separately from other submittals:
   1. Manufacturer’s Instructions: Manufacturer’s printed installation instructions will be furnished by Owner.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Manufacturer's printed, recommended operation and maintenance data when furnished with equipment.

PART 2 PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

A. To be determined.

2.02 CFCI EQUIPMENT

A. To be determined.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine conditions in accordance with Section 01 73 19.
    1. Verify utility connections are installed.
    2. Verify mounting brackets, plates, and supports are installed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Install equipment plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction.

C. Refer to Drawings for:
    1. Mounting heights.
    2. Mounting and anchoring details.

3.03 ADJUSTING

A. Adjust parts for smooth, uniform operation.

B. Touch-up minor surface coating damaged during installation; replace damaged units as directed by Architect.

END OF SECTION

DIVISION 12 – FURNISHINGS

SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Sunscreen roller shades.

1.02 CLOSEOUT SUBMITTALS

A. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

B. Operating instructions.

C. Warranties.

1.03 WARRANTY

A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Standard Shadecloth: Manufacturer's standard twenty-five year warranty.

C. Roller Shade Installation: One year from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Basis of Design Manufacturer and Products:
   1. Manufacturer: MechoShade Systems, Inc.; www.mechoshade.com.
   2. Shadecloth Product: ThermoVeil 1010. Light Grey.
   3. Drive Bracket: Model Mecho/5.

2.02 DESCRIPTION

A. Roller Shade Operation: Manual.

B. Mounting: Surface mounted with fascia.

C. Configuration: Single solar shadecloth. Separate section in each window section.

D. Hardware: Provide all operating hardware and support brackets.
   1. Access Requirements:
      a. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
      b. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

2.03 PERFORMANCE

A. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

B. Anti-Microbial Characteristics: 'No Growth' per ASTM G21 results for fungi.

2.04 OPERATING HARDWARE

A. Manual Operated Chain Drive Hardware and Brackets:
   1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
   2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.

2.05 SOLAR SHADECLOTH MATERIAL

A. Shadecloth: Single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl.
   1. 2 to 3 percent open.
   2. Color: See Finish Legend on Drawings.

2.06 FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.02 CLOSEOUT ACTIVITIES

A. Training: Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

END OF SECTION

SECTION 12 36 61

SIMULATED STONE COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Solid surfacing for countertops.
   2. Integral sinks.

B. Related Requirements:
   1. Steel Supports: Section 05 50 00 Metal Fabrications.
   2. Plywood Subtops, Custom Cabinet and Countertop Construction: Section 06 41 00 Architectural Casework.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Comply with following:
   1. Woodwork Institute (WI) Standards:
      a. North American Architectural Woodwork Standards – 3.0 (NAAWS), July 1, 2016.
         1) Comply with Custom Grade if not otherwise specified.
         2) Seismic Installation Requirements: Annex 10E.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance Data: Submit for countertop surfacing materials. Include cleaning instructions, scratch removal procedures and materials harmful to facing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Solid Surfacing Material: Solid, nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment with through body colors meeting ANSI Z124.3 or ANSI Z124.6.
   1. Size: As indicated.
   2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Solid Surfacing, General: Cut to size, seamed and installed with moisture-insensitive adhesive in accordance with Manufacturer's recommendations and as indicated on accepted shop drawings.
   1. Set with 1/8-inch joints between interior units.
   2. Minimize joints and pieces less than one half size.
   3. Job Cutting: Cut to size, seamed in accordance with Manufacturer's recommendations and as indicated on accepted shop drawings.
      a. Employ skilled fitters for necessary cutting as the work progresses.

b. Locate cuts to be inconspicuous.
c. Fit units around projections and at perimeter.
d. Smooth and clean cut edges.
e. Ensure that trim will completely cover cut edges.

4. Adjustments: Sound surfacing after setting. Replace hollow sounding units.

B. Counters: Construct supports for counters as indicated. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data. Securely attach counters to walls and casework, plumb and level.

1. Provide product in the largest pieces available.
2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
   a. Exposed joints/seams shall not be allowed.
3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
4. Cut and finish component edges with clean, sharp returns.
5. Rout radii and contours to template.
6. Anchor securely to base cabinets or other supports.
7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.

C. Coved backsplashes and applied sidesplashes:

1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

END OF SECTION

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13 49 00

RADIATION PROTECTION

PART 1 GENERAL

1.01 SUMMARY

A. Work Results: In Radiology Areas.
   1. Lead-laminated gypsum board on walls.
   2. Lead-laminated gypsum board on ceiling.
   3. Lead lined hollow metal door frames.
   4. Lead lined wood doors.
   5. Radiation-shielded doors.
   6. Control window.
   6. Lead-lined view window frames.
   7. Radiation shielding leaded glass.

1.02 REFERENCES

A. General Requirements: Refer to Section 01 42 00.

B. Definitions:
   1. Lead Equivalence: Thickness of lead that provides same attenuation (reduction of radiation passing through) as material in question under specified conditions. Lead equivalence specified for materials used in diagnostic X-Ray rooms is measured at 150 kV unless indicated otherwise.

C. Reference Standards: Comply with the following:
   1. American National Standards Institute (ANSI) Standards; www.ansi.org.
      a. ANSI Z97.1-2015 – Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
   2. ASTM International Standards; www.astm.org:
      a. ASTM B749-14 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
      b. ASTM C1036-11e1 - Standard Specification for Flat Glass.
      c. ASTM C1172-14 - Standard Specification for Laminated Architectural Flat Glass.
   3. Consumer Product Safety Council (CPSC):
      a. CPSC 16 CFR Part 1201, CAT II - Safety Standard for Architectural Glazing Materials.
   4. National Council on Radiation Protection and Measurements (NCRP) Standards and Report Requirements; www.ncrppublications.org:
      a. Radiation Protection Work: Comply with National Council of Radiation Protection (NCRP) Report No. 049 – Structural Shielding Design and Evaluation for Medical Use of X-Rays and Gamma Rays of Energies up to 10 MeV.
         1) Comply with requirements of local regulatory agencies where local standards and criteria exceed requirements of NCRP Report No. 049.
   5. National Fire Protection Association (NFPA):
      a. NFPA 80 - Standard for Fire Doors and Other Opening Protectives, 2013 Edition.
   6. Steel Door Institute (SDI) www.steeldoor.org.
      a. ANSI/SDI A250.8-2014 –Specifications for Standard Steel Doors and Frames (SDI 100).
      b. ANSI/SDI A250.10-2011 – Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

D. Guide References and Standard Practices: Comply with recommendations of the following except as otherwise specified in this Project Manual.
   1. Glazing Association of North America (GANA); www.glasswebsite.com:
      a. GANA Laminated Glazing Reference Manual, 2009 edition.
   2. Hollow Metal Manufacturers Association (HMMA), a division of the National Association of Architectural Metal Manufacturers (NAAMM):
      a. ANSI/HMMA 840-07 –Installation and Storage of Hollow Metal Doors and Frames.
      b. ANSI/NAAMM HMMA 861-14 – Guide Specifications for Commercial Hollow Metal Doors and Frames.
   3. National Council on Radiation Protection and Measurements (NCRP); www.ncrppublications.org:
      a. Report No. 147 - Structural Shielding Design for Medical X-Ray Imaging Facilities.

1.03 INFORMATIONAL SUBMITTALS

A. Certificates:
   1. Submit certificate from radiation protection subcontractor indicating that all materials and installation are in accordance with system design requirements for radiation equipment to be installed.
   2. Certificate of Compliance: Manufacturer shall provide certificate of compliance indicating that lead glass provided for this Project has been produced in accordance with requirements specified herein and the radiation physicist shielding report.

B. Test Report: Submit field report for field-testing required under Article “Site Quality Control.”

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
   1. A&L Shielding; www.alshielding.com.
   2. Mayco Industries; www.maycoindustries.com.
   3. Nelco Worldwide; www.nelcoworldwide.com.
   4. Radiation Protection Products, Inc.; www.radiationproducts.com.
   5. Ray-Bar Engineering Corporation; www.raybar.com.

B. Single Source Responsibility: Obtain radiation protection materials and accessories produced as standard products from single manufacturer regularly engaged in production of X-Ray shielding materials, equipment, and accessories.

2.02 REGULATORY REQUIREMENTS

A. Comply with California Code of Regulations, Title 17.

2.03 PERFORMANCE

A. The radiation protection installation shall achieve a completely sealed radiation protection envelope including doors, windows, door and window frames and all penetrations such as pipe, conduit, outlet boxes, film viewers, fasteners and hardware installation in conformance with reference standards.

B. Provide lead equivalence not less than that indicated in the Radiation Shielding Schedule on Drawings and by the Physicist’s Report.

2.04 DESIGN CRITERIA

A. The radiation shielding shall be designed by the radiation protection subcontractor according to the recommendations of the National Council on Radiation Protection and shall be consistent with the rules and regulations of the State of California. The shielding shall be designed to limit personnel exposure to no more than 10 millirems per week in all adjacent areas.
   1. Employ physicist knowledgeable in radiation protection for medical facilities to determine thicknesses and configurations of lead-lined materials.

B. The shielding shall be designed for the specific equipment, occupancy and application described by the using agency. Any change in the equipment, applications or occupancy of adjacent areas may result in a change in the shielding requirements. All such changes shall be reviewed by a qualified physicist to determine the need for any adjustments in shielding. Shielding materials shall not be changed or substituted without a review of the adequacy of the substituted shielding materials.

C. Provide materials and workmanship, including joints and fasteners, that maintain continuity of radiation protection at all points and all directions equivalent to materials specified in thicknesses and locations indicated.

D. Lead-Lined Assemblies: Provide lead thickness in door frames, window frames, and other items located in lead-lined assemblies, not less than that indicated for assemblies in which they are installed unless indicated otherwise.

E. Lead Glazing: Provide lead equivalence not less than that indicated for assembly in which glazing is installed unless indicated otherwise.

2.04 LEAD SHEET AND PLATE

A. Lead Sheets: 99.9 percent pure unpierced virgin lead, free from dross, oxide inclusions, scale, laminations, blisters, and cracks.
   1. Sheet lead shall meet or exceed the Federal Specification QQL-201 F Grade C and ASTM B749.
   2. Thickness: As determined by Physicist's Report.

B. Lead Plate: 99.9 percent pure virgin lead, free from dross, oxide inclusions, scale, laminations, blisters, and cracks.
   1. Lead plate shall meet or exceed the Federal Specification QQL-201 F Grade C and ASTM B749.
   2. Thickness: As determined by Physicist's Report.

2.05 LEAD-LAMINATED GYPSUM BOARD

A. Description: Single unpierced layer of sheet lead laminated to back of gypsum board, ASTM C1396/1396M; gypsum core wall panel with additives to enhance fire resistance of core and surfaced with paper on front, back, and long edges; Type X, UL rated.
   1. Size: 48 inch (1219 mm) wide gypsum board sheets by height indicated.
   2. Thickness: 5/8-inch gypsum board with 1/16-inch or 1/32-inch (as scheduled) sheet lead factory laminated to back.

B. Lead Strips for Wallboard Joints:
   1. 1/16-inch or 1/32-inch as scheduled. 2-inch wide strips for joint treatment. Sheet lead for doorframes and "tenting" of wall penetrations.
   2. Provide 5/16-inch diameter lead fastener covers.

C. Accessories: Provide 2-inch wide strip lead, lead plugs, and cement.

2.06 CONTROL WINDOW

A. Description: Telescopic steel control window. Size as indicated on the Drawings. Pre-glaze with leaded glass as required.

2.07 RADIATION-SHIELDED WOOD DOORS

A. Description: 1-3/4-inch thickness lead lined wood door. Lead lining to comply with design criteria.
   1. Flush veneered construction using single layer of sheet lead in center of door. Laminate wood cores under hydraulic pressure on each side of lead.
   2. Extend sheet lead lining to door edges providing X-Ray absorption equal to partition in which door occurs.
   3. Edge Strips: Minimum thickness of 2 inches (51 mm) each edges of door.
      a. Species: Same as wood face veneer.
      b. Glue strips to cores before face veneer is applied.
      c. Extend vertical edge strips full height of door and bevel 1/8 inch (3 mm) for each 2 inches (51 mm) of door thickness.
   4. Face Veneer: Comply with Section 08 14 16 Flush Wood Doors.

B. Glazing: Secure glass with hardwood stops of same species as face veneer. Secure frame to door with wood screws.

2.08 LEAD-LINED HOLLOW METAL DOORS

A. Material: ASTM A366 cold rolled steel.

B. Fabrication: Fabricated doors to comply with requirements of ANSI/SDI A250.8, Level 2, Heavy-Duty Doors, Model 3, Seamless.
   1. Fabricate doors from cold rolled steel with a stretcher level degree of flatness.
   2. Form door face sheets from one sheet of 18 gage material with either 16 gage or 14 gage steel available as an option. No seams are allowed on the door face and no visible seams are allowed on the vertical edge.
   3. Close the top and bottom of the door with a recessed channel end closure or a flush end closure treatment. End closures are to be not less than 18 gage steel.
   4. Lead Lining: Provide a continuous lead sheet of specified thickness, meeting Federal Spec QQL201F, Grade C, which is 99.9 percent pure lead, and free from dross, oxide inclusions, laminations, scale blisters or cracks. Extend to all edges of the door. Locate lead in the center of the door using steel stiffeners as support.
   5. Face sheets and sheet lead core shall be stiffened by vertical steel stiffeners. Stiffeners shall be formed from not less than 18 gage steel, spaced not more than 6 inches on center. Lead shall be fastened to stiffeners with adhesive to control movement and noise.

C. Fire Label: UL, 45 minutes.

D. Lite Openings: Supply a lead lined metal lite frame kit and lead glass assembly for the size and label requirements of this Project. Double glaze with either labeled wire glass or ceramic glazing and lead glass where required by local and national fire codes. Meet all local codes.

E. Finish: ANSI/SDI A250.10. After fabrication, clean and dip or spray all exposed surfaces of the door with a coat of rust inhibiting primer, either air dried or baked on.

2.09 LEAD-LINED HOLLOW METAL DOOR FRAMES

A. Description: 16 gage (1.5 mm) welded steel frames with 4-7/8 inch (124 mm) throat and 2-inch (51 mm) face.

B. Provide angle iron spot welded at 6 inches (152 mm) on center and anchor bolts to secure frame if lead thickness is 1/8 inch (3 mm) or greater. If lead lining is less than 1/8 inch (3 mm) thick, provide 6 universal clips to attach frame to studs.
   1. Door Frame Supports: 2-1/4 inch (57 mm) steel angle iron unless indicated otherwise.

C. Design lead-lined door frames to accommodate lead lining up to 1/2 inch (13 mm) thick.

2.10 LEAD-LINED VIEW WINDOW FRAMES

A. Description: 16 gage (1.5 mm) welded steel frames adjustable from 4-1/4 inch (108 mm) to 6 inch (152 mm) wall thickness.

B. Design window frames to accept any thickness of radiation shielding leaded glass, or radiation shielding X-Ray safety glass.

C. Provide radiation protection equivalent to that provided by sheet lead in partition in which view window is installed.

D. Provide 1/2 inch (13 mm) removable stops.

2.11 RADIATION SHIELDING GLASS

A. Radiation Shielding Leaded Glass: Clear leaded, annealed, high density flat glass manufactured to specified glazing industry standards with both glass surfaces mirror polished, and containing lead oxide and barium for radiation shielding. Thickness as scheduled and as required to provide radiation protection equivalent to that provided by sheet lead of thickness or weight indicated in the Radiation Shielding Schedule on Drawings and by the Physicist's Report.

B. Radiation Shielding Leaded Laminated Safety Glass: Clear leaded glass manufactured to specified glazing industry standards and containing lead oxide and barium for radiation shielding, laminated to clear float glass using a PVB interlayer, to comply with safety glass requirements of State statutes and ANSI Z97.1. Both outside glass surfaces mirror polished.

C. Annealed Float Glass: ASTM C1036, Type 1, Class 1, clear, Quality q3.

D. Laminated Glass: Laminated glass shall consist of one layer of clear leaded glass bonded to one layer of Type I transparent float glass, Class 1-clear Quality q3 - glazing select, conforming to ASTM C1036. Glass shall be bonded together with PVB interlayer under pressure and conform to requirements of 16 CFR 1201 and ASTM C1172.

E. Color: Clear with yellow hue due to radiation protective oxide contents.

2.12 CASSETTE TRANSFER CABINETS

A. Complete with rough-in frame, support brackets, opposing wall trim, and manual interlock.

B. Provide radiation protection equivalent to that provided by sheet lead in partition in which view window is installed.

2.13 ACCESSORIES

A. Screw Fasteners: Type S Bugle Head, length as required.

B. Lead Strips: 2 inches (51 mm) wide, unless indicated otherwise, by same thickness as sheet lead laminated on gypsum board.

C. Lead Discs: 3/8 inch (9.5 mm) diameter lead discs for use with screw heads.

D. Adhesive: Acceptable to radiation protection product manufacturer and capable of adhering lead sheets where required.

E. Glazing Accessories: Obtain compatible glazing sealant or glazing tape, setting blocks and edge blocking material.
   1. Setting Blocks, Shims and Spacers: Size and type as recommended by glass manufacturer.
      a. Setting Blocks: Neoprene, EPDM, silicone, or other compatible elastomeric material.
   2. Glazing Tape: Preformed, butyl-polyisobutylene rubber with 100 percent solids contained in extruded tape roll form and complying with AAMA 804.1; coiled on release paper; of sizes required for proper glazing.

PART 3 EXECUTION

3.01 INSTALLATION OF LEAD-LAMINATED GYPSUM BOARD

A. General: Installation shall be in conformance with the manufacturer's approved shop drawings.
   1. Where lead thickness exceeds 1/8-inch, install lead angles per manufacturer's recommendations.

B. Refer to [Section 09 21 16] [Section 09 29 00] for standards regarding gypsum board installation as they apply to lead insulated gypsum board.
   1. Install lead-laminated gypsum board on framing with screws spaced not more than 8 inches (203 mm) on center along edges of board and 12 inches (305 mm) on center in field of board.

C. Install lead-laminated panels to a minimum height of 7'-0" above finished floor.

D. Adhere lead strips on face of studs at joints in lead-laminated gypsum board, including inside and outside corners. Use 2 inches (50 mm) wide strips by same thickness as sheet lead laminated on gypsum board walls and ceiling.

E. Edges of wallboard shall be butt jointed and fastened to studs and ceiling framing with standard drywall fasteners.

F. Fastener Protection and Finishing:
   1. Adhere lead discs to fastener heads. In each case, use method that provides continuous radiation shielding.
   2. Where lead-laminated gypsum board is final substrate, after completion of fastener protection, finish joints in lead-laminated wallboard as specified in Section 09 21 16.

G. Where second layer of gypsum board occurs over lead-laminated gypsum board, comply with Section 09 21 16 for application of second layer.

3.03 DOOR AND DOOR FRAME INSTALLATION

A. General: Field install sheet lead in steel door frames as required to maintain integrity of radiation shielding system. Install doors and frames according to requirements of Section 08 11 13 and Section 08 14 16. Comply with NAAMM HMMA 840 unless otherwise indicated.

B. Frames: Set frames accurately in position, plumb, and braced securely until permanent anchors are set.
   1. Secure door frames with steel stud anchors if lead lining is below 1/8 inch (3 mm) thick.
   2. Lap lead lining of frames over lining in walls at least 1 inch (25 mm).
   3. Lead Lining of Frames: Line inside of frames with lead of thickness not less than that required in doors and walls in which frames are used. Form lead to match frame contour, continuous in each jamb and across head, lapping stops. Form lead shields around areas prepared to receive hardware. Lap lining over lining in walls at least 1 inch (25 mm).

C. Hardware: Line covers, escutcheons, and plates to provide effective shielding at cutouts and penetrations of frames. See Section 08 71 00 Door Hardware for other installations requirements.

D. Touch up damaged finishes with compatible coating after sanding smooth.

3.04 CONTROL WINDOW AND FILM PASS THRU INSTALLATION

A. : Install according to manufacturer's instructions and accepted shop drawings.

3.05 INSTALLATION OF WINDOW FRAMES

A. Set unleaded side of frame plumb and square in wall opening on control room side of wall with shims.

B. Set leaded side of frame plumb and square in wall opening on X-Ray side of wall.

C. Compress sides together against faces of wall.

D. Install setting blocks, shims, and glazing tape in glazing channel to prevent galls from touching steel frame.

E. Install radiation resistant glazing in telescopic frame.

F. Place steel stops in position and mark location of stop and frame retaining holes on steel frame.

G. Remove glazing and drill holes in steel frame.

H. Place glazing and stops and hand drive setting screws.

3.06 INSTALLATION OF CASSETTE TRANSFER CABINETS

A. Install double rough-in frames plumb and square in wall opening.

B. Secure rough-in frames with equal spaced screws through each jamb.

C. Set transfer cabinet inside rough-in frame and X-Ray side of wall and anchor to rough-in frame at face of wall.

D. Install opposing wall flange in position and screw to rough-in frame.

3.07 INSTALLATION OF PENETRATING ITEMS

A. At penetrations of lead linings; provide lead shields to maintain continuity of protection.

B. Provide lead linings, sleeves, shields, and other protection in thickness not less than that required in assembly being penetrated.

C. Cut wall penetration covers from lead sheet of equal or greater thickness than backing on adjacent wall panels. Cut wall penetration covers to size required to cover wall penetrations with laps 1 inch (25 mm) minimum wide as indicated on penetration detail drawings.

D. Adhesive-apply lead sheet penetration covers on penetrating boxes and raceways and return penetration covers to backside of lead-backed wall panels with 1 inch (25 mm) minimum laps.
   1. Do not use penetrating fasteners unless indicated otherwise.

E. Outlet Boxes and Conduit: Install between studs using steel telescoping mounting brackets. Cover or line with lead sheet lapped over adjacent lead lining at least 1 inch (25 mm). Wrap conduit with lead sheet for 10 inches (250 mm) in from box.

3.08 INSTALLATION OF WALL PENETRATION COVERS

A. Duct Penetrations With 8 PSF or Less Lead Sheet:
   1. Wrap ducts with wall penetration covers, lapping lead joints 1 inch (25 mm) minimum.
   2. Secure lead sheet in place with 1 inch (25 mm) minimum width steel bands spaced not more than 12 inches (305 mm) on center.
   3. Do not cut into lead sheet with tightening steel bands.

B. Duct Penetrations With Greater Than 8 PSF Lead Sheet and Where Duct Shielding Exceeds 24 Inches (610 Mm) in Width:
   1. Laminate wall penetration covers to plywood or other similar structural panels conforming to shape of duct, lapping lead joints 1 inch (25 mm) minimum.
   2. Secure lead laminated panels to ducts with mechanical fasteners located at duct seams and corners.
   3. Where necessary to prevent lead laminated panels from overloading duct supports, independently suspend panels from hangers secured to overhead building structure.
   4. Cover fastener heads with lead sheet matching thickness of adjacent lead.

C. Piping: Unless indicated otherwise, wrap piping with lead sheet for 10 inches (250 mm) from point of penetration.

3.09 ACCESSORY INSTALLATION

A. General: Comply with manufacturer's recommendations.

B. Wherever lead protection is penetrated, cut, or punctured, assure continuity of shielding by use of sheet lead, lead plugs or other approved method.

C. Install sheet lead lining within steel door frames to provide radiation protection to levels indicated or levels required to match adjacent wall protection.

D. Wrap electrical outlet boxes, view window frames, and other penetrations through lead barrier material with sheet lead to provide radiation protection to levels indicated or levels required to match adjacent wall protection.

3.10 SITE QUALITY CONTROL

A. Field Inspection: Owner will engage qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Correct deficiencies in, or remove and replace, radiation protection that inspection reports indicate does not comply with specified requirements.

C. Tests: After the radiation equipment is installed and operational, a radiation protection survey shall be carried out at the expense of the radiation protection subcontractor to ensure that the shielding complies with design requirements.
   1. Employ registered X-Ray physicist, certified by American Board of Radiology, for testing specified radiation protective Work and to conduct radiation protection survey of facility after radiation shielding materials are installed.
   2. Take radiation measurements and indicate evaluation of measurements in report. Submit report to Architect and Owner upon completion of report.
   3. Take radiation measurements in locations indicated by Architect.

E. The radiation protection survey under this contract shall be scheduled on the same day as the acceptance testing.

F. Correct deficiencies in, or remove and replace, radiation protection that testing indicates does not comply with specified requirements, including finishes and other Work covering defective Work.

3.11 ADJUSTING

A. Check and readjust operating hardware items, leaving doors and frames undamaged and in proper operating condition.

3.12 CLEANING

A. Remove excess materials from site and leave Work areas broom clean.

B. Leave exposed surfaces ready for site finishing.

3.13 PROTECTION

A. Lock radiation-protected rooms once door hardware is installed. Limit access to only those persons performing Work in radiation-protected rooms or as directed by Owner.

B. Tape temporary paper signs on radiation-resistant walls with the following text: "Do not mount equipment on this wall without covering penetrating fasteners with lead sheet of thickness required by Contract Documents".

END OF SECTION

SECTION 23 00 00
MECHANICAL GENERAL SPECIFICATIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. The general provisions specified in this section shall apply to all mechanical specifications and work.

1.02 INTENT

A. Requirements specified herein shall govern applicable portions of heating, ventilation, and air conditioning, plumbing and fire protection sections hereinafter referred to as mechanical; whether so stated therein or not.

B. It is the intent of this specification to describe and indicate the manufacturer, erection and installation of the equipment and connection to same specified herein and shown on the drawings. It is not intended that the specifications and drawings describe and indicate each piece of equipment required for installation and are considered to be the accepted practice of the trade, they shall be considered to be both specified and indicated.

C. It shall be understood that the contractor as hereinafter mentioned shall be the design/build contractor unless specifically noted otherwise.

D. The contractor shall furnish all design, labor and material necessary for the complete and satisfactory installation of all mechanical work for this contract. The contractor shall accomplish a complete and operating system.

E. The contractor shall assume the entire responsibility for the materials, workmanship and satisfactory operation of the various mechanical systems and other work as specified herein and/or shown on the drawings.

F. The contractor shall schedule and coordinate all work in close cooperation with all trades working on this project.

1.03 DEFINITIONS

A. Following definitions of terms and expressions used in this section are in addition to listing given in supplementary conditions:
1. Provide shall mean design, furnish and install unless otherwise indicated.
2. Herein shall mean the contents of a particular section where this term appears.
3. Indicated shall mean indicated on contract drawings.
4. Concealed, where used in connection with insulation and painting of piping, ducts and accessories, shall mean that they are hidden from sight, as in trenches, chases, furred spaces, pipe shafts or hung ceilings.
5. Exposed, where used in conjunction with insulation and painting of pipe, ducts and accessories shall mean that they are not concealed as defined herein above.
6. Piping includes, in addition to pipe: fittings, valves, hangers, and other accessories which comprise a system.
7. Singular number - in all cases where a device part of the equipment or system is herein referred to in the singular number (such as pump or heating system), it is intended that such reference shall apply to as many such items are required to complete the installation.
8. Three-valve-bypass includes one ball valve for throttling, two ball valves for shutoff, pipe and fittings.

B. Contractor’s Responsibility

1. The owner shall review all plans and specifications to verify that design and materials are in accordance with these specifications and other contract requirements. Contractor shall make revisions to design documents as required to comply with the contract without cost to the owner.
2. The contractor shall be responsible for establishing grades and elevations, and checking of all interferences and shall verify all dimensions and locations in the field.
3. Prepare drawings for mechanical work suitable for permitting and construction. Drawings and specifications shall convey the scope of work and indicate general arrangement of equipment, ducts, piping and approximate sizes and locations of equipment outlets. Mechanical trades shall follow these drawings in layout of their work, consult general construction, exisiting conditions, structural and electrical drawings to familiarize themselves with all conditions affecting their work, and shall verify spaces in which their work will be installed.
4. All trades shall cooperate and confer with each other as to locations of their materials and equipment before erecting work, so as to avoid interference as much as possible, and in such a manner that will in no way retard progress of construction.
5. Where job conditions require reasonable changes to indicated locations and arrangement, make such changes without extra cost to owner.
6. Intent of contract document and preparation is for contractor to provide a complete and operable system. Contractor shall provide all necessary ancillary devices and components necessary to meet intent.
7. Perform all work in accordance with codes, OSHPD requirements, local fire marshalls, local codes, OSHA and NFPA Codes, rules The Rules and Regulations of all local town, State and Federal Authorities having jurisdiction. Provide owner with certificates of inspection.
8. This contractor shall coordinate with, and make G.C. Aware of all necessary cutting and patching. G.C. Will be responsible for all cutting and patching.
9. Provide controls for all systems to obtain the requirements as noted in the contract documents. Control work shall include all control panels, actuators, electrical work, thermostats, sensors, relays, control wiring, controllers, etc.
10. Testing, adjusting, balancing, and placing into service all systems and equipment installed.
11. Balancing of all air systems.
12. Factory-trained start-up and commissioning of all hvac equipment.
13. Contractor shall provide all need support for the commissioning agent.
14. All hvac control wiring shall be installed per nfpa national electric code and installed within conduit where subjected to physical damage and else where as exposed up to 10’-0"± aff.
15. Provide access doors in ductwork to provide access for all smoke detectors, fire dampers, volume dampers, etc., that require service and/or inspection.
16. Provide flexible connections in all ductwork systems (supply, return and exhaust) connected to roof top units, fans, and other equipment. Provide flexible pipe connections to all vibration-isolated equipment. Flexible connections shall be provided at the point of connection to the equipment unless otherwise indicated.

C. Codes and Standards

1. Reference is to the latest edition of the code or standard, as required by the authority having jurisdiction, unless otherwise noted.
2. The codes and standards referred to are minimum standards. Where the requirements of these specifications exceed those of the codes and standards, the specifications shall be followed.
3. The installation shall comply with all applicable state and local codes and ASHRAE 90.1 energy code in effect.

D. Visit to Site

1. Before submitting a proposal, bidders shall visit and examine carefully the areas affected by this work to become familiar with existing conditions and with the difficulties that will attend the execution of this work. Submission of a proposal will be construed as evidence that such

an examination has been made; later claims will not be recognized for extra labor, equipment or materials required because of difficulties encountered which could have been foreseen has such examination been made.

E. Permits
1. Obtain all permits required for the installation of the work and pay all fees in connection therewith.
2. Provide insurance and bonding as required by the building owner.

F. Drawings
1. Except where dimensions are shown, the drawings are diagrammatic and shall not be scaled. Exact location of fixtures, apparatus, duct work and piping shall be determined by dimensions on the site and from architectural drawings.

G. Job Conditions
1. The drawings indicate the locations of apparatus, fixtures, and piping shall be followed as closely as possible. If before the installation it is found necessary to change the location to accommodate conditions at the building, such changes shall be made at no additional cost to the owner, and as approved by the engineer.
2. Equipment requiring operation, service or maintenance during the life of the system shall be made easily accessible.
3. Ductwork or piping shall not be run within 42" of switchboards, panel boards or motor control centers.
4. Use of open-flame devices in work shall be accompanied by fire extinguishing apparatus within 25 feet of work location.

H. As-Built Drawings
1. Maintain accurate records on a set of contract drawings of all deviations made during the progress of the work. The completed set of drawings, with the nature and extent of all deviations clearly shown, shall be submitted to the owner upon completion and acceptance of the work. The as-built drawings shall be forwarded to the owner in autocad release 14 or higher.

I. Protection of Work During Construction
1. Protective covers, skids, plugs, caps, and coatings shall be provided to protect equipment materials from damage during construction.
2. All equipment and material shall be stored under cover and off the ground.
3. For outdoor storage, protective covers or sheet plastic shall be provided. Covers shall be of gauge required for the area involved and shall be reinforced to withstand wind, rain, sleet and snow. Equipment and material shall be set on skids or platforms of sufficient height to avoid deterioration from spattering and ground water.
4. Plug open ends of pipes when work is stopped to prevent debris from entering the pipes.

J. Reference to Other Divisions
1. The following work is specified under other divisions unless otherwise noted or specified hereafter:
   a. Electrical power, electrical specifications.
   b. Installation of starters, contactors, thermal overload switches and remote push buttons, electrical specifications.

K. Material Substitutions
1. Material substitutions shall be allowed only where "or equal" is stated.
2. Material substitution submittals shall include complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance, test data and evidence that the proposed manufacturer or his established

representative maintains a qualified service organization including spare parts and is available for competent service on short notice.

3. Each bidder by submitting his bid represents that the proposal of such article, device, product, material, fixture, form or type of construction by name, make, catalog number of manufacturer which varies with the equipment specified shall be incorporated into the project without claims against the owner for additional cost. The bidder shall be responsible for all additional costs incurred by others due to the substitutions.
4. The owner shall have the final approval of all submitted substitutions.

L. Layout Basis

1. The contractor may use the equipment of any manufacturer whose name is approved for substitution on that item of equipment after he had ascertained that all provisions of "material substitutions" will be complied with and that all required service connections will be made at no additional cost to the owner.
2. Should shop drawings disclose that the above-mentioned requirements cannot be met with the proposed substitute equipment, then the owner may require that equipment as specified for "layout basis" be provided.

M. Shop Drawings

1. All submittals shall bear a stamp or notation indicating that the contractor has reviewed and approved the submittals.
2. All submittals shall bear sufficient notations to clearly indicate the specific make, model number, accessories, options, and reference specification paragraph. Vibration isolators shall include operating weight and load distribution at each mounting point.
3. All submittals indicate complete compliance with all performance and specification requirements as herein specified, or shall specifically list the exceptions. The contractor agrees that failure of manufacturer's submittal to conform to the above will result in a manufacturer's disqualification on this project.

N. Operation and Maintenance Manuals

1. Submit to the owner for approval three manuals covering details of operation maintenance for all apparatus requiring service including:
   a. Service telephone number of the installing contractor.
   b. Manufacturer’s operating and maintenance manuals, including parts lists, for each piece of equipment and accessory requiring service or maintenance, the guarantee period and the name, address and phone number of the nearest sales and service organization for each item.
   c. Step-by-step procedure for starting and stopping each system.
   d. Cross out options that are not used on equipment sheets, highlight options selected.
   e. Copies of inspection certificates provided by the city, county, state and insurance companies.
   f. Provide separate operation and maintenance manuals covering the temperature control system.

O. Cleaning

1. All stickers, rust, stains, labels, and temporary covers shall be removed before final acceptance.
2. Foreign matter shall be blown, vacuumed or flushed out of piping, pumps, fans, motors, devices, switches, panels, duct work and equipment.
3. Identification plates on equipment shall be free of excess paint and shall be polished.

P. Guarantee

1. The entire installation shall be guaranteed from defects in equipment and workmanship for a period of one year from date of final acceptance. The contractor shall provide all labor and material to repair defects that appear.

Q. Operating Instructions
1. The contractor shall arrange formal instruction sessions for the owner's operating personnel to cover the following:
    a. General familiarization and operating procedures for the entire mechanical installation.
    b. Routine maintenance procedures for all mechanical equipment.
    c. Operating and routine maintenance procedures for the automatic temperature controls system.
2. The instruction period shall be a minimum of 16 hours of classroom and field sessions. This instruction period shall be in addition to the controls and other vendor equipment, and shall cover all of the building non-control systems.
3. Obtain written statements from the owner's representative acknowledging completion of each item of instructions.

R. Painting and Finishing
1. All mechanical equipment shall have a factory applied prime and finish coat of paint. Galvanized surfaces shall be considered as finished surfaces for equipment rooms and items concealed from view. Plastic products shall be acceptable without a finish coat of paint. All items of equipment marred or rusted, even though factory finished, shall be touched up.

S. Identification
1. Piping system
    a. All piping systems shall be identified by the name of contents and the direction of flow in accordance with ANSI A13.1. Identify all new piping systems.
    b. Name of contents and directional arrows shall be placed near each valve, on both sides of pipes passing through walls, on long pipe runs at 30 foot intervals. Bunting stamp co. Is an acceptable manufacturer.
    c. Names of contents and directional arrows shall be laminated in plastic and wrap-around pipe markers as manufactured by Seton Nameplate Co., New Haven, Connecticut, or approved equal.

T. Electrical
1. Power wiring
    a. For the purpose of this specification, power wiring shall be defined as follows: a) all wiring from the power source panelboards (or switchboard) to the disconnect switch or disconnect switch and starter, including wiring from these switches to the equipment, and final connection to the equipment; b) all wiring to control panels as indicated in the electrical drawings. (all control panels not indicated on the electrical drawings as receiving power shall do so by jumpers from other control panels, this wiring shall be considered control wiring as defined below.)
    b. All power wiring from the power source to the above noted switches, and wiring from these switches to the equipment, including final connection to same, shall be provided under the electrical division.
2. Control Wiring
    a. All other wiring required, whether line voltage or low voltage, internal or external to provide for the operation of the equipment shall be considered as control wiring.
3. The mechanical division contractor shall provide all necessary controls all electrically operated equipment furnished by this contractor. The mechanical division shall provide all required componets necessary for the complete installation and satisfactory operation of the mechanical systems. Starting equipment of each motor shall be of the proper voltage and hp rated for the motor it is to serve. All starters shall be of the enclosed type; NEMA type 1, for general purpose enclosures; NEMA type 4 for watertight enclosures, and NEMA type 12 for the dust-tight enclosures. Location of motor shall determine type of enclosure to be used.
4. Manual motor starters for single phase motors shall be one or two poles as required, consisting of a snap switch combined with a thermal overload device. It shall be impossible for the switch to be held in a closed position under a sustained motor overload. For resetting

the overload mechanism, the switch lever shall be of a design where it has to be moved to the 'off' position. Starter shall be enclosed in type of enclosure for area in which it is to be used.

5. The contractor shall be completely responsible for the coordination of automatic temperature control system with control interlocks between various items of mechanical equipment.
6. All motors 25 hp and smaller shall be of the high efficiency type. Motors shall be gould plus, westinghouse mac 11, or approved equal.
7. All HVAC control wiring shall be installed per NFPA National Electric Code and installed within conduit where subjected to physical damage and else where as exposed up to 10’-0"± aff.
8. All HVAC control wiring shall be installed per NFPA National Electric Code and installed within conduit where subjected to physical damage and else where as exposed up to 10’-0"± aff.

U. Firestop Penetration Protection Sealing System

1. Where pipes or ducts pass through boiler room, mechanical room and rated walls, install a firestop that provides an effective barrier against the spread of fire, smoke, gases or water. Fire-stopping material shall be packed tight, and completely fill clearances between pipe or duct, sleeves and structure. All crack voids or holes (up to 4” diameter) shall be sealed using 3m brand fire barrier caulk CP25 or putty 303 or an approved equal. Larger diameter or square holes, 3M system 7902, 7904, 7902R or 7904R or approved equal shall be in accordance with manufacturer's instructions.
2. Fire-stopping material shall maintain its integrity while preventing the passage of flame, smoke, gases or water. Fire-stopping material shall be a one-part, intumescent elastomer noncombustible, non-corrosive and compatible with synthetic cable jackets as defined by ASTM E814 (ul1479); and in addition for insulation materials, melting points shall be a minimum of 1700 degress f for one-hour protection and 1850 degrees f for 2-hour protection.

V. Suspension Support for Ducts, Pipes, Equipment

1. All pipes and equipment that are suspended shall be connected directly to the building steel. Where hangers are required between building steel points, supplementary steel members shall be added by the contractor as required to adequately support the load.
2. The contractor shall furnish and install all necessary hangers, inserts, supports supplementary steel, etc., to properly support all equipment, ductwork and piping in an approved manner and in full accordance with the manufacturers recommendations.
3. Pipes shall not be supported from other pipes, ducts, or equipment.
4. Hangers from joists shall be attached at the panel points. Pipes with weights of 50 pound per foot (total for single or multiple runs) routed parallel with bar joists shall be supported from a minimum of 3 joists at each hanger point (channel members between joists.) This contractor shallcoordinate with the structural engineer for trapeese hanger for multi-pipe support systems.

W. Cutting and Patching

1. The contractor shall provide all wall cuts as required for piping penetrations of existing construction.
2. Piping holes through concrete and masonary shall be made by core drilling.
3. This contractor shall coordinate with, and make G.C. Aware of all necessary cutting and patching. G.C. Will be responsible for all cutting and patching.

PART 2   GENERAL NOTES

A Unless specifically noted otherwise, the contractor shall provide all housekeeping pads and miscellaneous structural steel or lintels as required to perform work indicated. All work shall be performed by skilled workers of trades involved.

B Install all work in a professional and workmanlike manner using mechanics skilled in the trade involved. All details of the installation shall be mechanically correct.

C The drawings indicate the locations of equipment, ductwork, equipment, etc. And shall be followed as closely as possible. If before the installation it is found necessary to change the location too accommodate conditions at the building, such changes shall be made at no additional cost to the owner, and as approved by the engineer.

D All HVAC control wiring shall be installed per NFPA National Electric Code and installed within conduit where subjected to physical damage and else where as exposed up to 10'-0"± AFF.

E Provide access doors in ductwork to provide access for all smoke detectors, fire dampers, volume dampers, etc., that require service and/or inspection.

F Provide flexible connections in all ductwork systems (supply, return and exhaust) connected to roof top units, fans, and other equipment. Flexible connections shall be provided at the point of connection to the equipment unless otherwise indicated.

Ductwork:

A General: HVAC supply and return system ductwork shall be galvanized steel constructed and installed in strict accordance with the latest edition of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA). " duct construction standards" latest edition.

B Flexible ducts: vinyl impregnated fiberglass fabric supported by helically wound spring steel wire rated to 2 inches wg positive and 1.5 inches wg negative for low pressure ducts and 4 inches wg positive for medium high pressure ducts.

C Insulated flexible ducts: flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket, maximum 0.23 'k' value at 75 degrees F.

Ductwork Accessories:

A Sheet Metal Materials:

1. Reinforcement shapes and plates: galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
2. Tie rods: galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

B Dampers:

1. Backdraft dampers: multiple-blade, parallel and action gravity balanced, with blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure. Blade seals: neoprene, blade axles: nonferrous, tie bars and brackets: aluminum, return spring: adjustable tension.
2. Volume dampers: factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class, standard volume dampers shall be multiple (or single-blade, for round duct 12"∅ and smaller and rectangular duct 12"x12" and smaller) parallel- or opposed-blade design as indicated, standard leakage rating, and suitable for horizontal or vertical applications.
3. Motorized control dampers: AMCA-rated, (parallel 12"x12" or 12"∅ and smaller) opposed-blade design, galvanized-steel frames with holes for duct mounting; galvanized-steel damper blades with maximum blade width of 8 inches, provide parallel- or opposed-blade design with replaceable rubber seals, rated for leakage at less than 10 CFM per Sq. Ft. Of damper area, at

differential pressure of 4-inch wg when damper is being held by torque of 50 in. X lbf ; when tested according to AMCA 500d.

4. Fire dampers: fire dampers shall be labeled according to UL 555, with 1-1/2 fire rating, curtain type with blades outside air stream, fusible links replaceable, 165 deg f rated. Mounting orientation: vertical or horizontal as indicated. Dampers shall be static rated as per ul-555 or latest.
5. Turning vanes: fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane double-vane, curved blades of galvanized sheet steel set 3/4 inch runners shall automatically align vanes. Fabricate 1-1/2-inch- width, O.C.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.
6. Duct-mounting access doors: fabricate doors airtight and suitable for duct pressure class, door: double wall duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include 1-by-1-inch butt or piano hinge and cam latches. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
7. Flexible connectors: flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, class 1. Provide weatherproof, UV resistant connector fabric for outdoor applications and connectors with chemical resistant coating for corrosive applications. Metal-edged connectors: factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch, galvanized sheet steel or aluminum sheets. Select metal compatible with ducts 1.9 flexible ducts.

C Flexible Ducts

1. Insulated-duct connectors: ul 181, class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film. Max .23k@ 75° with pressure rating B. Equal to ductwork.
2. Flexible duct clamps: stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action.

D Duct Accessory Hardware:

1. Instrument test holes: cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.
2. Adhesives: high strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

E Application and Installation:

1. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal duct.
2. Install back draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
3. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.
4. Provide test holes at fan inlets and outlets and elsewhere as indicated.
5. Install fire dampers, with fusible links, according to manufacturer's ul-approved written instructions.
6. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
7. Connect diffusers to low pressure duct with maximum 60-inch lengths of flexible duct clamped or strapped in place.

8. Connect flexible ducts to metal ducts with draw bands.
9. Install duct test holes where indicatead and required for testing and balancing purposes.

Insulation:

A General:

1. Insulation shall be applied by experienced personnel in accordance with best trade practices and guided by manufacturer's printed installation directions. Insulation shall be installed by a qualified insulation contractor.
2. All insulation, jackets, or facings, and adhesives used to adhere jacket or facing to the insulation, including fittings and butt strips, shall have non-combustible fire and smoke hazard system rating and label as tested by ASTME E-84, NFPA 255 and UL 723 not exceeding flame spread 25. Smoke developed 50. All products shall be low VOC. All products shall be as manufactured by foste division, miracle adhesive corporation or an approved equal.
3. Insulation for all systems shall conform to the standards outlined in the latest version of the International Energy Conservation Code (IECC).

B Ductwork:

1. All interior supply & return ductwork shall have a minimum R-5 (installed R-value) insulation. Outdoor supply & return ductwork shall have a minimum R-8 (installed R-value) insulation. Exterior insulation shall have stainless steel or canvas jacketing.

C Piping:

1. Insulate refrigerant suction lines within 2" flexible elastomeric type material provide UV protection on exterior pipe insulation.
2. Insulate condensate piping with 1" fiberglass insulation with ASJ. Maintain vapor barrier.

Louvers:

A. Louvers meeting the following specifications shall be furnished and installed where shown on the plans and/or described in schedules. Louvers shall be stationary type with drainable blades in a 4 in louver frame. Each stationary blade shall incorporate an integral drain gutter and each jamb shall incorporate an integral downspout so water drains to blade end, then down the downspouts and out at the louver sill rather than cascading from blade to blade.

B. Each factory-assembled louver section shall be designed to withstand wind loadings of 25 psi (100.0 mph wind equivalent). Louver frames, mullions, and section joints shall be adequately supported from the building structure to withstand this same wind loading.

C. Louvers performance data shall be licensed under the certified ratings program and shall bear the amca certified ratings seal. This certified performance data shall include airflow pressure loss and water penetration, and shall demonstrate performance equal to or better than the Greenheck model specified.

D. Louvers shall be Greenheck Model ESD-403 drainable type fabricated from 6063t5 aluminum extrusions of 0.081 in nominal wall thickness. Blades shall be positioned at 37° and 45° angles approximately on 4 in centers. Each louver shall be equipped with a framed, removable rear-mounted screen of 0.75 in x 0.51 in expanded, flattened aluminum.

E. Louvers shall be supplied with a kynar finish applied following a thorough cleaning and pretreatment of the metal surface. Dry film thickness of the kynar shall be approximately 1.2 mils after baking at 450 F. Color shall be specified by architect.

Diffusers, Registers and Grilles:

A Source Quality Control:

1. Verification of performance: rate diffusers, registers, and grilles according to ashrae 70, “method of testing for rating the performance of air outlets and inlets.”

B Installation:

1. Install diffusers, registers, and grilles level and plumb.
2. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

C Adjusting:

1. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

Piping & Specialties:

A General:

1. All welding shall be done in accordance with the welding procedures of the national certified pipe welding bureau or other approved procedure conforming to the requirements of ASME boiler and pressure vessel code & ANSI 31.1 code for power piping. All welders shall be certified.
2. Provide brass dielectric fitting at dissimilar metals.
3. Provide 20 gauge galvanized pipe sleeve at all wall penetrations. Caulk weather tight and fire-proof tight as required by building construction.
4. Hangers for piping to be grinnell type 65 or equal, adj clevis w/ hanger rods & jamb nuts. Size to clear insulation & provide 12" long GALV. Steel shield between hanger & insulation jacket. Support piping at 8'-0" intervals. Support piping at floor penetrations with grinnell type 261 riser clamp or approved equal.
5. Provide wells & taps in piping for installation of control devices. Coordinate location & sizes w/ control contractor.
6. Provide manual air vents at all high points & as required to purge air in the system.
7. Pipes shall not be supported from other pipes, ducts or equipment.

B Condensate Piping:

1. Condensate drain piping: copper tubing, ASTM b88, Type I hard drawn
   Wrought copper fittings: ASME B16.22, cast brass
2. Solder joints: ASTM b32, solder grade 95TA. provide dielectric unions or nipples as connections of dissimilar metals.
3. Maintain code approved air gaps at condensate discharge.

C Refrigerant Piping:

1. Refrigerant piping: copper tubing, ASTM B280, type l, seamless acr hard drawn; wrought copper fittings & unions: ASME B16.22; bronze filler metals: AWS A5.8, classification bag-1 silver run dry nitrogen thru pipe while brazing joints. Pitch piping 1/2” per 10' in direction of flow. Pressure test system with dry nitrogen to 200 psig, hold for 30 minutes. Evacuate to 27 inches vacuum before charging provide refrigerant to compensate for long line runs.
2. Refrigerant valves: forged brass body, 500 psi at 225 degrees F, backseating, diaphragm for liquid service, wing cap and packed for gas service.

Rooftop Exhaust Fans:

A. Spun aluminum exhaust fans shall be belt drive type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure and birdscreen.
B. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Drive frame assembly shall be constructed of heavy gauge steel. Motors and drives shall be mounted on vibration isolators, out of airstream.
C. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (l10) life in excess of 100,000 hours at a maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the cast type, keyed and securely attached to the wheel and motor shafts.
D. Motor pulleys shall be adjustable for final system balancing. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment for ease of electrical wiring.
E. All fans shall bear the AMCA certified ratings seal for sound and air performance.
F. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number for future identification.
G. Fans shall be model GB or GB-HP as manufactured by Greenheck or equal.
H. Warranty: provide one (1) year material warranty
I. Accessories: roof curb, factory mounted & wired disconnect switch, damper.

Commissioning:

A. Deliverables:

1. Perform pre-functional start-up per .
2. Perform Functional Performance Test (FPT).
3. Provide commissioning plan.
4. Provide final commissioning report.

B. Equipment Startup

Equipment startup for HVAC equipment (e.g. air handlers, ductless split systems, exhaust fans, make up air units, etc.) Shall be the responsibility of the mechanical contractor and shall utilize the manufacturer's factory personnel. A written report shall be turned over to the owner for verification.

C. Commissioning

The HVAC system startup and operational commissioning shall be the responsibility of the mechanical contractor and shall utilize the manufacturer’s factory personnel. All system shall be run tested to verify that the sequence of operation is met. A written report shall be turned over to the owner for verification. A minimum 16 hours of training shall be given to the building operational personnel on proper operation and maintenance of each system and system component. The mechanical contractor shall provide the owner with complete documentation including all submittals, O&M Manuals, warranties, as-builds, and air & water balance reports, etc.

Testing, Adjusting and Balancing:

A. All air systems shall be balanced to the quantities indicated on the drawings (±10%). Lock all balancing devices and permanently mark all settings after final balance.
B. The balancing contractor shall be a 3rd party, and certified AABC or NEBB member unless otherwise approved.
C. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

D. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual sections have been performed.
E. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
F. Report deficiencies discovered before and during performance of tab procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.
G. Complete air balance must be accomplished before actual water balance begins.
H. Provide a certified testing and balance report for review and inclusion in turnover package to owner. Forms shall be formatted in accordance with AABC or NEBB Standards.

Demolition

A. Perform all demolition or interface work required in the existing builnig for the removal of, or interface with, existing mechanical equipment, ductwork, tubing or piping. Relocate or modify the existing piping, tubing, and ductwork as required by an general construction alterations or by the installation of new ductwork, tubing or piping in the existing building.

B. For items that remain the proper of the owner, refer to the drawings. In coordination with the owner's representatives, these materials shall be made available for their inspection and decision as to whether the owner will retain possession. Items selected for retention shall be delievered to a location on the premises selected by the owner and turned over to them. Take reasonable care to avoid damage to this material. All material not selected for retention by the owner and debris shall be disposed of by the contractor.

C. If pipe or equipment ito remain is damaged or disturbed, remove damaged portions and install new product of equal capacity and quality.

D. Work abandoned in place: cute and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.

E. Reuse of materials: reuse of materials is prohibited unless specifically inidcated or approved by architect. Notify architect in discovery of any hazardous materials.

F. Temporary disconnection: remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

END OF SECTION

SECTION 23 11 13

FACILITY FUEL-OIL PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Scope Includes:
   1. Fuel-oil pipes, tubes, and fittings.
   2. Double-containment piping and fittings.
   3. Piping specialties.
   4. Joining materials.
   5. Specialty valves.
   6. Mechanical leak-detection valves.
   7. Leak detection and monitoring system.
   8. Labels and identification.

B. Shop Drawings: For fuel-oil piping.
   1. Include plans, elevations sections, hangers, and supports for multiple pipes.
   2. Include details of location of anchors, alignment guides, and expansion joints and loops.

C. Delegated-Design Submittal: For fuel-oil piping indicated to comply with performance requirements and design criteria.
   1. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Detail fabrication and assembly of anchors and seismic restraints.
   3. Design Calculations: Calculate requirements for selecting seismic restraints.
   4. Detail fabrication and assembly of pipe anchors, hangers, supports for multiple pipes, and attachments of the same to building structure.
   5. Plans and details, drawn to scale, on which fuel-oil piping is shown and coordinated with other installations, using input from installers of the items involved.
   6. Site Survey: Plans, drawn to scale, on which fuel-oil piping and tanks are shown and coordinated with other services and utilities.

1.02 QUALITY ASSURANCE

A. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding Qualifications: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code.

1.03 FIELD CONDITIONS

A. Interruption of Existing Fuel-Oil Service: Do not interrupt fuel-oil service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fuel-oil supply according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of fuel-oil service.
   2. Do not proceed with interruption of fuel-oil service without Owner's written permission.

1.04 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of flexible, double-containment piping and related equipment that fail in materials or workmanship within specified warranty period.
   1. Failures due to defective materials or workmanship for materials including piping, dispenser sumps, water-tight sump entry boots, terminations, and other end fittings.
   2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with ASME B31.9, "Building Services Piping," for fuel-oil piping materials, installation, testing, and inspecting.

C. Fuel-Oil Valves: Comply with UL 842 and have service mark initials "WOG" permanently marked on valve body.

2.02 FUEL-OIL PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
   1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
   2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M, for butt and socket welding.
   3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
   4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150.
   5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.03 DOUBLE-CONTAINMENT PIPE AND FITTINGS

A. Flexible, Nonmetallic, Double-Containment Piping: Comply with UL 971.
   1. Pipe Materials: PVDF complying with ASTM D 3222 for carrier pipe with mechanical couplings to seal carrier, and PE pipe complying with ASTM D 4976 for containment piping.
   2. Watertight sump entry boots, pipe adapters with test ports and tubes, coaxial fittings, and couplings.

3. Plastic to Steel Pipe Transition Fittings: Factory-fabricated fittings with plastic end matching or compatible with carrier piping, and steel pipe end complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
4. Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

B. Rigid, Double-Containment Piping: Comply with UL 971.
1. RTRP: ASTM D 2996 or ASTM D 2997 carrier and containment piping and mechanical couplings to seal carrier and containment piping or individually bonded joints.
2. Leak-Detection System: Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

2.04 LEAK-DETECTION AND MONITORING SYSTEM

A. Cable and Sensor System: Comply with UL 1238.
1. Calibrated leak-detection and monitoring system with probes and other sensors and remote alarm panel for fuel-oil piping.
2. Include fittings and devices required for testing.
3. Provide tank level monitoring and leak detection. Provide alarms at remote location.

B. Inspect and test fuel-oil piping according to NFPA 31, "Tests of Piping" Paragraph; and according to requirements of authorities having jurisdiction. Test leak-detection and monitoring system for accuracy by manually operating sensors and checking against alarm panel indication.

END OF SECTION

SECTION 231123

FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
  1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
  2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
  3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
  4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150.
  5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

1.02 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

1.03 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110. Body: Bronze, complying with ASTM B 584.

D. Bronze Plug Valves: MSS SP-78. Body: Bronze, complying with ASTM B 584.

E. Cast-Iron, Lubricated Plug Valves: MSS SP-78. Body: Cast iron, complying with ASTM A 126, Class B.

1.02 PIPING JOINT CONSTRUCTION

A. Threaded Joints: Thread pipe with tapered pipe threads complying with ASME B1.20.1.

B. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.

C. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

1.03 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.

B. Aboveground natural-gas piping shall be steel pipe with malleable-iron fittings and threaded joints or steel pipe with wrought-steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

1.04 INDOOR PIPING SCHEDULE

A. Aboveground, distribution piping shall be steel pipe with malleable-iron fittings and threaded joints, or steel pipe with wrought-steel fittings and welded joints.

END OF SECTION

SECTION 232113

HYDRONIC PIPING

PART 1 GENERAL

1.01 COPPER PIPE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Grooved, Mechanical-Joint, Wrought-Copper Fittings: ASME B16.22.
   1. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.

C. Copper or Bronze Pressure-Seal Fittings: Not allowed.

D. Copper, Mechanically Formed Tee Option: Not allowed.

E. Wrought-Copper Unions: ASME B16.22.

1.02 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53, black steel with plain ends; welded and seamless, Grade B.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 .

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced.

F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5

H. Grooved Mechanical-Joint Fittings and Couplings:
   1. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
   2. Couplings: Ductile- or malleable-iron housing and EPDM gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

1.03 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless otherwise indicated. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12.

D. Solvent Cements for CPVC Piping: ASTM F 493.

1.04 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Standard: ASSE 1079.

C. Dielectric Flanges:
   1. Standard: ASSE 1079.

PART 2 EXECUTION

2.01 PIPING APPLICATIONS

A. Hot-water heating piping and chilled-water pipping aboveground:
   1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
   2. Schedule 40, Grade B, steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

B. Chilled-water piping installed belowground and within slabs shall be:
   1. Type K (Type A), annealed-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.

C. Condenser-water piping, aboveground, , shall be any of the following:
   1. Steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
   2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
   3. Schedule 80 CPVC plastic pipe and fittings and solvent-welded joints.

D. Condenser-water piping installed belowground and within slabs shall be Schedule 80 CPVC plastic pipe and fittings and solvent-welded joints.

1.02 CHEMICAL TREATMENT

A. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain the following water characteristics:

B. Install bypass chemical feeders in each hydronic system.

1.03 FIELD QUALITY CONTROL

A. Install and test hydronic piping according to ASME B31.9.

END OF SECTION

SECTION 232216

STEAM AND CONDENSATE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products. For an explanation of options and Contractor's product selection procedures, see Section 016000 "Product Requirements."

1.02 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:
   1. Insert minimum working pressure for systems in "HP Steam Piping" and "LP Steam Piping" subparagraphs below.
   2. Steam Piping: 125 psig.
   3. Condensate Piping: 100 psig at 250 deg F

1.03 GENERAL

A. Provide stop-check valves, strainers, trap, pressure reducing stations, vacuum breakers, flash tanks, and air vents per industry standard and suitable for the listed pressure and temperature.

1.04 PRESSURE-REDUCING VALVES

A. ASME labeled.

B. Description: Pilot-actuated, diaphragm type, with adjustable pressure range and positive shutoff.

C. Trim: Hardened stainless steel.

D. Head and Seat: Replaceable, main head stem guide fitted with flushing and pressure-arresting device cover over pilot diaphragm.

1.05 STEAM TRAPS

A. Spirax-Sarco, or equal

1.06 THERMOSTATIC AIR VENTS AND VACUUM BREAKERS

A. Thermostatic Air Vents:
   1. Body: Cast iron, bronze, or stainless steel.

2. End Connections: Threaded.
3. Thermostatic Element: Phosphor bronze bellows in a stainless-steel cage.

B. Vacuum Breakers:
   1. Body: Cast iron, bronze, or stainless steel.

1.07 STEAM METERS

A. Meters shall have a microprocessor to display and transmit totalizer flow, flow rate, temperature, pressure, time, and date; alarms for high and low flow rate and temperature.

B. Sensor: Venturi, of stainless-steel construction, for insertion in pipeline between flanges. At least 10:1 turndown with plus or minus 1 percent accuracy over full-flow range.

C. Sensor: Vortex type with stainless-steel wetted parts; and with a piezoelectric sensor removable and serviceable without shutting down the process. At least 10:1 turndown with plus or minus 1 percent accuracy over full-flow range.

1.08 CONDENSATE METERS

A. Body: Cast iron, bronze, or brass.

B. Turbine: Copper, brass, or stainless steel.

C. Totalizer: Meters shall have a microprocessor to display and transmit flow, flow rate, time, and date; alarms for high and low flow rate, pressure, and temperature.

D. Pressure Rating: Atmospheric.

PART 2 - EXECUTION

NOT USED

END OF SECTION

SECTION 23 52 33

WATER-TUBE BOILERS

PART 1 PRODUCTS

1.01 PERFORMANCE REQUIREMENTS

A. Fuel-to-steam efficiency indicated shall be based on the following:
   1. Efficiency Testing Method: ASME Performance Test Code (PTC) 4, Input-Output method.

B. Gas-Fired Boiler Emissions: Not to exceed allowable ambient-air quality standards in governing jurisdiction.

C. Multiple Boiler Operation: Equip individual boilers in multiple boiler applications with integral controls to provide multiple boiler operation for optimum system performance, energy efficiency, and the following:
   1. Equalize runtime of boilers in service.
   2. Operate multiple boilers hot to minimize disruption of service in the event of single boiler failure.
   3. Configure controls so any boiler can be taken out of service with power disconnected and not impact multiple boiler operation.

D. Steam Quality: 99.5 percent dry and saturated.

E. Operation Following Loss of Normal Power:
   1. Equipment, associated factory- and field-installed controls, and associated electrical equipment and power supply connected to back-up power system shall automatically return equipment and associated controls to the operating state occurring immediately before loss of normal power without need for manual intervention by an operator when power is restored either through a back-up power source or through normal power if restored before back-up power is brought online.

F. ASME Compliance: Fabricate and label boilers to comply with 2010 ASME Boiler and Pressure Vessel Code.

G. ASHRAE/IES 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

H. DOE Compliance: Minimum efficiency for boilers with capacity of 300,000 Btu/h (87.9 kW) shall comply with 10 CFR 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers."

I. UL Compliance: Test boilers for compliance with UL 726 and UL 795. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

1.02 STEEL OR FLEXIBLE WATER-TUBE BOILERS

A. Description: Factory-fabricated water-tube boiler, with heat exchanger sealed pressure tight, and built on a steel base; including insulated jacket, flue-gas vent, supply and return connections, and controls, forced-draft gas burner, and forced-draft combination gas and oil burner.

B. Flue-Gas Recirculation System: Equip boiler with packaged flue-gas recirculation system if required to satisfy emission requirements.
   1. Chemical Injection Assembly: Factory-installed, duty-rated injection quill with ball check valve and isolation valve compatible with dispensed chemical.
   2. Sample Cooler: Factory furnished for field installation constructed of 316 stainless steel.

C. Controls:
   1. Pressure Control for Steam Boilers: Operating-Pressure Control: Factory wired and mounted to control boiler to maintain boiler at constant pressure within 2 percent of set point.
   2. Multiple Boiler Operation: Include automatic, alternating-firing sequence for multiple boilers to ensure maximum system efficiency throughout the load range and to provide equal runtime for boilers.
   3. Combustion-Air Controls: Factory equipped with motor-operated combustion-air damper and blower control to regulate burner fire according to load demand.
      a. Provide oxygen trim system to continuously monitor and display oxygen concentrations in boiler flue gas and adjust fuel and airflow to maintain an adjustable oxygen-level set point.
      b. System shall compensate for changes in ambient temperature, barometric pressure, humidity, and variations in fuel characteristics.
   4. Surface Blowdown Control: Provide a conductivity sensor and control circuitry to operate an automatic control valve in surface blowdown piping to maintain total dissolved solids (TDS) within boiler manufacturer's prescribed level.

1.03 CAPACITIES AND CHARACTERISTICS

A. Heating Medium: Steam.

B. Design Pressure Rating: 150 psig.

C. Steam Operating Pressure: 125 psig.

D. Minimum Efficiency AFUE: 82 percent.

1.02 SOURCE QUALITY CONTROL

A. Factory tests are an additional-cost item.

B. Test and inspect factory-assembled boilers, before shipping, according to 2010 ASME Boiler and Pressure Vessel Code.

C. Performance Tests:
   1. Perform field-performance tests to determine the capacity and efficiency of the boilers. Test for boiler efficiency at 30, 60, 90 percent of full capacity. Determine and document efficiency at each test point.
   2. For boilers equipped with automatic oxygen trim control, conduct tests with automatic oxygen trim control on manual at zero trim and record performance. Repeat tests with automatic oxygen trim control under automatic control and record performance.

END OF SECTION

SECTION 23 64 16

CENTRIFUGAL WATER CHILLERS

PART 1 - GENERAL

1.01 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Centrifugal chillers shall be provided with OSHPD-accepted seismic certification.
   1. Component Importance Factor: **1.5**.

B. Condenser-Fluid Temperature Performance:
   1. Startup Condenser-Fluid Temperature: Chiller shall be capable of starting with an entering condenser-fluid temperature of 40 deg F and providing stable operation until the system temperature is elevated to the minimum operating entering condenser-fluid temperature.
   2. Make factory modifications to standard chiller design if necessary to comply with performance indicated.

C. ASME Compliance: Fabricate and label chillers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, as applicable to chiller design. For chillers charged with R-134a refrigerant, include an ASME U-stamp and nameplate certifying compliance.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with requirements of Underwriters Laboratories Inc., and include label by a qualified testing agency showing compliance.

F. Operation Following Loss of Normal Power:
   1. Equipment, associated factory- and field-installed controls, and associated electrical equipment and power supply connected to backup power system shall automatically return equipment and associated controls to the operating state occurring immediately before loss of normal power without need for manual intervention by an operator when power is restored either through a backup power source, or through normal power if restored before backup power is brought online.

1.02 MANUFACTURERS

A. Carrier

B. Daikin

C. Trane

D. York / JCI

E. Arctic Chill

1.03 MANUFACTURED UNIT

A. Description: Factory-assembled and -tested chiller complete with compressor, compressor motor, compressor motor controller, evaporator, condenser, controls, interconnecting unit piping and wiring, and indicated accessories. Consider benefit of heat-reclaim condenser.
   1. Dual-Compressor Chillers: For chillers with dual compressors, provide each compressor with a dedicated motor and motor controller, and provide for continued operation when either compressor-drive assembly fails.
   2. Overspeed Test: At least 20 percent above design operating speed.
   3. Vibration Limits: Velocities not to exceed 0.15 inches/s and 0.8 mils peak to peak on all axes.

B. Capacity Control: Modulating, variable-speed drive. Modulate compressor speed with variable-inlet, guide-vane control to achieve optimum energy efficiency.
   1. Maintain stable operation that is free of surge, cavitation, and vibration throughout range of operation. Configure to achieve most energy-efficient operation possible.

1.04 EVAPORATOR

A. Tubes: Individually replaceable from either end and without damage to tube sheets and other tubes.

1.05 CONDENSER

A. Designed to prevent direct impingement of high-velocity hot gas from compressor discharge on tubes.

B. Tubes: Individually replaceable from either end and without damage to tube sheets and other tubes.

1.06 Variable Frequency Drive Operating Requirements:

   1. Input AC Voltage Tolerance: 460-V ac, plus 10 percent.
   2. Input frequency tolerance of 60 Hz, plus or minus 2 Hz.
   3. Capable of driving full load, without derating, under the following conditions:
      a. Ambient Temperature: 50 deg F to 120 deg F.
   4. Minimum Efficiency: 96 percent at 60 Hz, full load.

B. Chiller Capacity Control Interface: Equip chiller with adaptive control logic to automatically adjust the compressor motor speed and the compressor pre-rotation inlet vane position independently to achieve maximum part-load efficiency in response to sensor inputs that are integral to the chiller controls.

C. BAS Interface: Factory install hardware and software to enable system to monitor, control, and display chiller status and alarms.

D. Quick-Start Feature:
   1. Automatically restore chiller operation up to 100 percent capacity within five minutes after a 15-second power interruption.
   2. Quick-start feature shall ensure guide vanes remain open following a power interruption event and quick ramp-up speed logic is employed to facilitate shortest time to deliver chilled water at set-point temperature.

3. Chiller manufacturer shall provide integral UPS unit(s) with chiller controls if required to keep chiller integral controls operational to comply with requirement.
4. Chiller manufacturer shall demonstrate chiller start time with the quick-start feature enabled while simulating power fault, power service return, restart time, and capacity control, to produce desired chilled-water temperature at load indicated.

E. Full-Load Efficiency:
   1. Power Input/Cooling Output: maximum 0.50 kW/ton.

F. Part-Load Efficiency:
   1. IPLV: maximum 0.35.

1.07 SOURCE QUALITY CONTROL

A. Perform functional tests of chillers before shipping.

1.08 PIPING CONNECTIONS

A. Evaporator-Fluid Connections:
   1. Connect to evaporator inlet with shutoff valve, flexible connector, thermometer, and plugged tee with pressure gage.
   2. Connect to evaporator outlet with shutoff valve, flexible connector, thermometer, plugged tee with shutoff valve and pressure gage, flow meter, and drain connection with valve.

B. Condenser-Fluid Connections:
   1. Connect to condenser inlet with shutoff valve, flexible connector, thermometer, and plugged tee with pressure gage.
   2. Connect to condenser outlet with shutoff valve, balancing valve, flexible connector, thermometer, plugged tee with shutoff valve and pressure gage, flow meter, and drain connection with valve.

END OF SECTION

SECTION 23 65 13.13

OPEN-CIRCUIT, FORCED-DRAFT COOLING TOWERS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes factory-assembled, open-circuit, forced-draft cooling towers.

1.02 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by CTI.

B. CTI Certification: Cooling tower thermal performance according to CTI STD 201RS.

C. FM Global: Approval and listing in the latest edition of FM Global's "Approval Guide."

1.03 WARRANTY

A. When warranties are required, verify with Owner's counsel that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

B. Special Warranty: Manufacturer agrees to repair or replace the following components of cooling towers that fail in materials or workmanship within specified warranty period:

1. All components of cooling tower.
2. Faan assembly, including fan, drive, and motor.
3. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Baltimore Aircoil Company

B. Evapco, Inc.

C. Marley Cooling Technologies

2.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Cooling tower and support structure shall withstand the effects of loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

B. Seismic Performance: Cooling towers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

E. Vibration:
   1. Rotating assemblies shall be dynamically balanced to achieve a balance level of "good" while complying with industry-standard requirements for cooling towers.
   2. Critical speed shall be at least 115 percent of design speed.

2.03 CASING AND FRAME

A. Casing Material: galvanized steel, galvanized steel, ASTM A 653/A 653M, G235 (Z700) coating.

B. Frame Material: galvanized steel, ASTM A 653/A 653M, G235 (Z700) coating].

2.04 COLLECTION BASIN

A. Factory-Assembled Collection Basin:
   1. Material: Stainless steel, Grade 304
   2. Removable stainless-steel strainer with openings smaller than nozzle orifices.
   3. If Project has a multiple-cell cooling tower or multiple cooling towers, retain one of first two subparagraphs below.
   4. Removable equalization flume plate between adjacent cells of multiple-cell towers.
   5. Equalizer connection for field-installed equalizer piping configured to mate to ASME B16.5, Class 150 flange.
   6. Basin Sweeper Distribution Piping and Nozzles.

2.05 FAN AND DRIVE ASSEMBLY

A. Axial Fans: Factory balanced.
   1. Blade Material: Aluminum.
   2. Fan Shaft Bearings: Self-aligning ball or roller bearings with moisture-proof seals and premium, moisture-resistant grease suitable for temperatures between. Bearings designed for an L-10 life of 100,000 hours.
   3. Bearing Grease Fittings: Extended lubrication lines to an easily accessible location.

B. Belt Drives:
   1. Service Factor: 1.5 based on motor nameplate horsepower.

C. Direct Drives: Fan hub directly connected, and properly secured, to motor shaft.

D. Fan Motors:
   1. Comply with NEMA MG 1.
   2. Retaining "Totally enclosed" option in "Motor Enclosure" Subparagraph below is less restrictive and allows manufacturer to choose "TEAO" or "TEFC" option. "And with epoxy or polyurethane finish" option may achieve added corrosion protection.
   3. Motor Enclosure: totally enclosed fan cooled (TEFC) and with epoxy or polyurethane finish.
   4. Energy Efficiency: Comply with ASHRAE/IES 90.1, NEMA Premium Efficiency.
   5. Service Factor: 1.15.

6. Insulation: Class H.
7. Variable-Speed Motors: Inverter-duty rated according to NEMA MG 1, Section IV, "Performance Standard Applying to All Machines," Part 31, "Definite-Purpose, Inverter-Fed, Polyphase Motors."

2.06 ELECTRICAL POWER

A. Factory Furnish for Field Installation: A variable-frequency controller for each fan motor.

B. Variable-Frequency Controllers:
1. Description: NEMA ICS 2; arranged to achieve motor variable speed by adjusting output voltage and frequency.
2. Enclosure: Unit mounted, NEMA 250, Type 4X, with hinged full-front access door with lock and key.
3. Minimum SCCR: As required by electrical power distribution system, but not less than 65,000A.
a. Minimum Efficiency: 96 percent at 60 Hz, full load.
b. Overload Capability: 1.05 times the full-load current for seven seconds.

2.07 CONTROLS

A. Vibration Switch: For each fan drive.

2.08 WATER TREATMENT

B. Chemical-Free Water Treatment System: Complete factory-installed system.

2.09 SOURCE QUALITY CONTROL

A. Performance Test: Factory test and certify cooling tower performance according to CTI STD 201RS.

B. Seismic Performance Testing: Shake table tested by an independent or a factory-certified laboratory to certify performance complies with seismic requirements indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Equipment Mounting: Install cooling towers on cast-in-place concrete equipment bases.

3.02 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Prepare a written startup report that records the results of tests and inspections.

END OF SECTION

SECTION 23 73 13

MODULAR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Variable-air-volume, single-zone air-handling units.

1.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design vibration isolation and seismic-restraint details, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Casing panels shall be self-supporting and capable of withstanding 133 percent of internal static pressures indicated, without panel joints exceeding a deflection of L/200 where "L" is the unsupported span length within completed casings.

C. Seismic Performance: Air-handling units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

E. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

F. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Energy Labs

B. Temtrol

C. ClimateCraft

D. Haakin

E. Scott-Springfield

F. Approved equal

2.02 PERFORMANCE

A. Limit air velocity through filters and coils to 400 feet per minute.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.03 COMPONENTS

A. Air handlers shall consist of the following components:
1. Fan-wall style return fan with variable frequency drive.
2. Economizer.
3. Pre-filter.
4. Cooling coil.
5. Fan-wall style supply fan with variable frequency drive.
6. Final filter.
7. Internal vibration isolation.
8. Double-wall, insulated casing, epoxy-coated.
9. Premium-efficiency motors.
10. Belimo damper and valve actuators.
11. Variable frequency drives in conditioned enclosures.
12. Stainless steel condensate drain pan.

2.04 VARIABLE FREQUENCY CONTROLLERS

A. Description: NEMA ICS 2, IGBT, PWM, VFC; listed and labeled as a complete unit and arranged to provide variable speed of an NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.

B. Unit Operating Requirements:
1. Input frequency tolerance of 06/11 Hz, plus or minus 6 percent.
2. Minimum Efficiency: 96 percent at 60 Hz, full load.
3. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.
4. Starting Torque: 100 percent of rated torque or as indicated.
5. Speed Regulation: Plus or minus 1 percent.

C. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.

2.05 COIL SECTION

A. General Requirements for Coil Section:
   1. Comply with ARI 410.
   2. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).

2.06 DAMPERS

A. General Requirements for Dampers: Leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm face velocity through damper and 4-inch wg pressure differential.

B. Electronic Damper Operators:
   1. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
   2. Electronic damper position indicator shall have visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
   3. Operator Motors

2.07 CHARACTERISTICS

A. Casing:
   1. Outside Casing: Galvanized steel, minimum 0.064 inch thick.
   2. Inside Casing: Galvanized steel, solid or perforated, minimum 0.064 inch thick.
   3. Floor Plate: Galvanized steel, minimum 0.079 inch thick.
   4. Insulation Thickness: 1-1/2 inches.
   5. Static-Pressure Classifications for Unit Sections before Fans: 2-inch wg
   6. Static-Pressure Classifications for Unit Sections after Fans: 6-inch wg.

2.08 SOURCE QUALITY CONTROL

A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

C. Water Coils: Factory tested to 300 psig according to ARI 410 and ASHRAE 33.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SUMMARY

A. Scope Of Work
   1. Comply with the General Conditions of this contract. The requirements of this specification are in addition to the requirements of the General Conditions.
   2. Unless otherwise noted, provide demolition of existing power receptacles, light fixtures, raceways, wiring, voice/data outlets and voice/data cabling. Demolish fire alarm devices and wiring where in conflict with new work.
   3. Provide all labor and material necessary to accomplish the work specified herein and as shown on the drawings.
   4. Coordinate work with all other trades.
   5. Visiting the site and verifying existing conditions prior to submitting bid is encouraged. Refer to the Request for Bid Advertisements for the pre-bid walkthrough date.
   6. Remove all waste and rubbish from the site on a daily basis.

B. Warranty: Workmanship and materials shall be guaranteed for a period of one year from the date of final acceptance by the Owner. Provide additional warranty for voice/data system as noted elsewhere.

C. Regulations
   1. Electrical work shall comply with the following codes as presently applicable:
      a. 2016 California Electrical Code (CEC); Part 3, Title 24, California Code of Regulations
      b. 2016 California Building Code (CBC); Part 2, Title 24, California Code of Regulations
   2. Permits: Obtain and pay for all required permits.
   3. Safety Measures: Provide a safe environment to protect employees and all others from injury. Comply with "Safety and Health Regulations for Construction," Volume.

D. Submittal And Shop Drawings:
   1. Prior to installation, submit catalog data for automatic transfer switches, panelboards, light fixtures, transformers, generators, and wiring devices in accordance with Division 1.

E. Operations And Maintenance Manuals:
   1. Provide maintenance and operations data for all electrical equipment and signal and communications systems in accordance with Division 1.

F. Record Drawings:
   1. Corrections and changes made during the progress of the work shall be neatly recorded as actually installed for as-built records. Submit to the Architect upon project completion.

G. Certificates Of Inspection:
   1. Submit signed-off permits from the Code Enforcing Agencies to the Owner upon project completion.

H. Product Listing Or Labeling:
  1. All electrical equipment shall be listed and labeled by Underwriters' Laboratories, Inc.

I. Material And Equipment:
  1. All materials and equipment shall be new unless noted otherwise. Protect all materials and equipment from damage or corrosion.

J. Cutting And Patching:
  1. Provide all required cutting and patching for the electrical work.

K. Existing Conditions
  1. General: Specific scope of demolition work and operating conditions to be encountered shall be verified by on-site review prior to submitting bid. Demolition work in general is noted or shown on the documents based upon available "drawings of record" and may not show the actual conditions as they presently exist.
  2. Owner-Retained Equipment: The Owner may wish to retain certain specific items scheduled for demolition. The Contractor shall carefully remove these items, provide protection and packaging as may be required to protect the equipment and turnover said equipment to the Owner at a place designated on the jobsite. Any equipment that the Owner does not desire to retain shall become the property of the Contractor and be removed from the site.
  3. Unused Conduit and Wiring: All unused conductors resulting from this project shall be removed. All unused conduit shall be removed except where located in or above existing construction which is not being altered and would require removal and replacement of the existing construction.
  4. Existing Tel/Data Cables and Outlets: Provide demolition of existing voice data outlets except where otherwise shown. Verify extent of work prior to submitting bid. Properly support and maintain in service any remaining voice/data system wiring installed exposed above suspended ceilings within the project area. Secure cables to structure above using tie wraps secured to independent tie wires suspended from structure above.
  5. Existing Raceways: Properly support all existing raceways above suspended ceilings where work is taking place. Verify extent of work prior to submitting bid.

L. Continuity Of Service:
  1. Permanently reroute or relocate existing wiring and/or equipment which is in conflict with existing building alterations and which is required to be maintained in use.

M. Demolition
  1. Coordinate scope of electrical demolition with architectural, mechanical, and plumbing drawings.
  2. Unless otherwise noted, remove all electrical luminaires, equipment, systems, devices, outlets, switches, pull boxes, junction boxes, etc. As required to completely take out the electrical items within scope or shown to be removed. Disconnect and remove all electrical provisions to equipment being removed. Remove all wiring, conduit, raceways, outlet boxes, etc. Supporting or serving the items removed.
  3. Remove branch circuit wiring and conductors back to panelboard or to last outlet or junction box that will remain in service. Where complete circuits are demolished, remove wiring and raceway back to the branch circuit panelboard. Revise the panelboard schedule to indicate that the demolished circuit's breaker is “spare”.
  4. Remove all conductors, wiring, and conduit (where present) including, but not limited to, fire alarm, power, voice/data, security, nurse call, intercom, and paging in demolition area that are no longer in use or already abandoned. No conductors or cables shall be abandoned in place. Remove existing wiring and conduit back to source.
  5. Concealed conduit that cannot be removed due to inaccessibility may be abandoned. Conductors shall be removed and conduit cut flush with surface

6. Outlet boxes that cannot be removed due to flush mounting in partitions not being removed shall be provided with a blank device plate unless noted to be filled and finished flush with wall.
7. Maintain continuity of all feeders, systems control wiring, miscellaneous auxiliary systems, etc. That pass through the renovated space at all times. Any damage, disruption or disconnection to these systems shall be repaired immediately, replaced and/or re-routed as required to maintain continuity of the systems. Provide wiring and raceway necessary to maintain continuity of electrical service to existing outlets that remain when power to such outlets is interrupted because of demolition of other devices on the same circuit.
8. Seal openings in fire rated partitions created by the removal of electrical equipment. Maintain fire rating of wall or partition.
9. See specifications for disposition of salvaged materials and equipment. All items noted to be reused shall be removed from their existing location, cleaned, and installed at their new location with the proper circuit connections and installation supports.
10. Symbols shown are typical and locations are approximate and they are not intended to limit the amount of demolition. Coordinate with existing conditions and these notes and remove all applicable systems and components conflicting with finished design intent.
11. Existing branch wiring shown is diagrammatical only and is based on existing as-built drawings and casual (non-destructive) field observation. Coordinate with actual existing conditions for number of conductors per conduit and exact locations of conduit runs.

N. Phase Rotation:
1. Check connections to all new and existing three-phase equipment for proper phase rotation. Disconnect all devices that could be damaged by the application of voltage or reversed phase sequence.

O. Removal And Replacement Of Existing Accessible Ceiling Panels, Lighting Fixtures And Speakers:
1. Remove and reinstall all necessary ceiling panels, lighting fixtures, speakers and other existing equipment in existing accessible ceilings as required to install the electrical work.

P. Anchorage And Bracing:
1. Provide complete seismic anchorage and bracing for the lateral and vertical support of conduit and electrical equipment as required by the Uniform Building Code.

Q. Firestopping:
1. Provide fire stopping for all penetration in rated walls, ceilings and floors.

R. Painting:
1. Paint all exposed raceways, except SMR, in finished areas to match adjacent surfaces.

S. Instruction:
1. Contractor shall instruct the Owner in the use and operation of all systems installed under the scope of this contract.

T. Owner-Furnished Equipment:
1. Provide complete electrical service and connection to all Owner-furnished equipment.

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

A. Wire And Cable:
1. Branch Circuits: Armored cable, Type AC, Type MC with ground wire, HCF rated. (healthcare)
   a. Neutral: #12 AWG
   b. Ground: #12 AWG
   c. Phase Conductors (more than six in a raceway): #10 AWG
   d. Phase Conductors (six or less in a raceway): #12 AWG

2. Feeders: Feeders shall be sized as shown on the drawings and color-coded in accordance with list below. Make no splices unless shown on the plans.

3. Color Coding Requirements: 120/208 Volt, 3-Phase, 4-Wire Systems
   a. Phase A: Black
   b. Phase B: Red
   c. Phase C: Blue
   d. Neutral: White
   e. Ground: Green
   f. Travelers: Yellow (For 3- And 4-Way Switching)
   g. Controls: Black With Wire Numbers On Each Conductor

4. Color Coding Requirements: 277/480 Volt, 3-Phase, 4-Wire Systems:
   a. Phase A: Brown
   b. Phase B: Orange
   c. Phase C: Yellow
   d. Neutral: Gray
   e. Ground: Green
   f. Travelers: Lavender (For 3- And 4-Way Switching)
   g. Controls: Black With Numbers On Each Conductor

5. Splices and Terminations: Lighting and receptacle branch circuit conductors up to No. 10 AWG shall be spliced with Wing Nut type connectors.

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

A. General:
   1. Provide through the entire electrical system. A separate green equipment grounding conductor shall be provided in all lighting and power raceways.

B. Bonding:
   1. Insulated grounding bushings shall be installed to bond all feeder conduits to the switchboard ground bus or panel ground bus at both ends of feeder raceways. Insulated grounding bushings shall be installed to bond all feeder conduits to the ground bus or panel enclosures at both ends of the runs.

C. Neutral Grounding:
   1. The neutral point of all transformers shall be solidly grounded to the grounding system and transformer enclosure with code size ground conductors. The neutral bus in each panelboard shall be isolated from ground. The neutral shall be grounded only at a single point at the main switchboard or at separately derived system transformers.

D. Receptacle Grounding:
   1. Connect the ground terminal of all receptacles by utilizing a separate grounding conductor between the receptacle grounding screw and the ground conductor provided in the branch circuit. Integral mounting straps within the receptacle connected to the device mounting straps are not approved as a grounding method.

E. Flexible Conduit Grounding:
   1. Provide a separate grounding conductor in all flexible conduit runs including watertight flexible conduit with integral grounding straps. Install ground conductor inside conduit with ungrounded conductors.

F. Ground Connections:
   1. Ground connections to building steel, ground rods and cable taps shall utilize an exothermic welding process. Cadweld, Erico Products, Inc., or approved equal.

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

(NOT USED)

PART 2 PRODUCTS

A. Raceways:
   1. Rigid metallic conduit: Zinc-coated steel with full threaded connections.
   2. Electrical metallic tubing (EMT): Zinc-coated steel.
   3. Rigid nonmetallic conduit: Rigid PVC, schedule 40, UL listed for direct burial or concrete encasement.
   4. Flexible metallic conduit: Helically wound galvanized steel, securely interlocked, RWS (reduced wall steel) type.
   5. Liquidtight flexible metallic conduit: Helically wound, galvanized steel, interlocked, with integral ground conductor and overall PVC jacket.

B. Fittings
   1. Rigid metallic conduit:
      a. Couplings: Threaded-metallic type of the same material as the conduit.
      b. Locknuts: Steel up to 2"inches, malleable iron for 2-1/2 inches and larger.
      c. Bushings: Bakelite or plastic up to 2", malleable iron with insulating collar for 2-1/2 inches and larger.
      d. Unions: Zinc-plated malleable iron, three piece conduit coupling.
      e. Electrical Metallic Tubing (EMT): Steel set-screw type. Fittings 2" and larger shall be steel and may be setscrew type containing dual setscrews on each side of coupling.
   2. Rigid nonmetallic conduit: Slip-on, non-threaded type of same material as conduit.
   3. Flexible metallic conduit: Steel, one- or two-screw clamp type.
   4. Liquidtight flexible metallic conduit: Galvanized steel, compression type.
   5. Conduit Straps: Heavy duty, two-hole pressed steel.

C. Outlet And Devices Boxes
   1. Interior Surface-Mounted in Unfinished Areas: One-piece pressed steel, electro-galvanized, size and depth required by Code, except 4-inch square or 4-inch octagonal minimum.
   2. Interior Flush-Mounted: Same as above except provide plaster ring extension to finished surface.

D. Junction And Pull Boxes:
   1. Interior Areas, steel, screw cover, code gauge and size. Large junction and pull boxes shall be fabricated sheet steel with baked enamel finish and return flange with screw retained cover.

E. EXECUTION
   1. General:
      a. Coordination: The Contractor shall review all drawings, details and elevations prior to rough-in. Where equipment is furnished by others, the Contractor shall ascertain the proper voltage, load and connection requirements prior to rough-in.
      b. Materials: All materials of a specific type shall be provided by the same manufacturer throughout the project.

2. Raceway Types: Install raceway types and sizes as listed below:
   a. Rigid Metallic Conduit: In concrete and masonry and exposed exteriors.
   b. Electrical Metallic Tubing (EMT): All areas other than above. May be used for feeders with integral green ground conductor.
   c. Rigid Nonmetallic Conduit: Exterior underground installations. 90 degree elbows to be galvanized rigid steel.
   d. Flexible Metallic Conduit: Recessed fixture connections, interior concealed equipment connections, expansion joints and sound control. Not to be used exposed installations within the building.
   e. Liquidtight Flexible Metallic Conduit: Exterior equipment connections.
   f. Minimum raceway size shall be 3/4 inch.
3. Raceway Installation:
   a. Concealment: All raceways shall be concealed in finished areas. Where existing wall surfaces are inaccessible, surface metal raceways for these exceptions may be provided when approved.
   b. Exposed Raceways: Install exposed raceways as high as possible, above ductwork, parallel or at right angles to building lines.
   c. Expansion and Earthquake Joints: Raceways shall not be installed in concrete slab or wall construction when passing through an expansion or earthquake joint. Raceways shall be installed in furred or suspended ceiling spaces with a minimum of 24 inches of flexible conduit crossing the expansion or earthquake joints.
   d. Routing: All raceways shall be installed parallel or at right angles to the building construction unless prohibited by a physical obstruction.
   e. Raceway Supports: Raceways shall be supported with heavy-duty, one-hole, pressed steel straps on interior surfaces. Support pendant-mounted raceways on 3/8-inch rod with pear-shaped hanger or trapeze-type hanger with 3/8-inch rod (minimum) and 1-5/8-inch square preformed channel and pipe clamps. Parallel, surface-mounted raceways shall be supported from 1-5/8-inch square preformed channel and pipe clamps. All fittings and supports shall be hot-dip galvanized in exterior areas.
   f. Independent Support: Conduits shall not be supported from the ceiling suspension system, ducts, pipes or other systems foreign to the electrical installation. The entire electrical installation shall be kept independent from any other trade.
   g. Pull boxes with Covers: Shall be provided as shown on the drawings or as required by Code. All pull boxes shall be located so as to be accessible.
   h. Flexible Conduit: Shall be used only for lighting fixture pigtails in accessible ceilings, flush-mounted speaker pigtails in accessible ceilings, sound control, motor connections and at building expansion joints as specified. Any other proposed use of flexible conduit must be approved prior to installation.
   i. Penetrations: Raceways which pass through building roof, exterior walls of building above or below grade and floor slabs on grade shall be sealed on the interior side of the building using non-hardening sealing compound after all conductors have been installed in the raceway. Sealing material shall be specifically designed for electrical wiring systems.
   j. Conduit Passing Through Building Roof: Provide a 4 lb. lead plumbing vent flashing with a counter flashing attached above using a galvanized steel clamp.
   k. Conduit Penetrating Membranes: All conduits penetrating walls or slabs with membranes shall be installed with approved membrane clamping devices in order to provide necessary seal.
   l. Exterior Walls: Conduits passing through exterior walls below grade and/or bridging an area which was previously excavated and backfilled shall be rigidly supported by a structurally reinforced concrete duct bank spanning between the building wall and a bearing surface on undisturbed earth.
   m. Empty Raceways: Provide a nylon pull string in all empty raceways.
4. Boxes and Fittings:

a. General: Boxes shall be supported securely and independently. Mount boxes on building surfaces or support with trapeze hanger as described in Raceway Installation. Junction boxes shall not be used unless the number of bends, pulling length, or circuit requirements necessitates their installation. Junction or pull box openings must be accessible.

b. Sound Control: Where boxes are mounted in a common wall, they shall wherever possible, be offset horizontally so that they are not mounted back-to-back. Connect offset boxes with flexible conduit not to exceed 18 inches in length.

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

A. General:
   1. Label all junction boxes, terminal cabinets, etc., with the circuit number or low-voltage system contained within.

B. Equipment Nameplates:
   1. Shall be engraved in 1/16 inch thick phenolic letters a minimum of 3/16 inch high. Coloring shall be white letters on black background for normal equipment and white letters on red background for emergency equipment.

C. Switchgear, Switchboards, ATS, Panel Boards and Transformers shall have include Name, Voltage, Amperage/KVA, Number of wires, number of phases, Feed from (with room board/transformer is in), and Load severed(with room board/transformer is in).

SECTION 26 08 00

COMMISSIONING

A. General:
   1. Contractor shall provide personnel and equipment to commission the electrical systems as outlined in the commissioning plan, as specified herein, and as directed by the Commissioning Agent.

B. The following systems shall be functionally tested as part of the commissioning process:
   1. Generators
   2. Automatic Transfer Switches (Ats)
   3. Uninterruptible Power Supplies (Ups)
   4. Lighting Controls

C. Pre-Functional Checklist
   1. Contractor shall complete pre-functional checklists for each panelboard, transformer, and equipment listed above installed on the project. The pre-functional test scripts are to be provided by the contractor and reviewed by the Commissioning Agent. Completed pre-functional checklists shall be submitted to the Commissioning Agent.

D. Functional Test Scripts
   1. Contractor, at the direction of the Commissioning Agent, shall complete functional testing of the electrical equipment according to functional test scripts developed by the Commissioning Agent. Prior to functional testing, the contractor shall provide a Certificate of Readiness stating the specific equipment is ready for functional testing and any require prerequisites have been completed. The functional test scripts shall be completed by the Commissioning Agent.
   2. The contractor shall have a factory-authorized field technician present during functional testing of the electrical equipment unless otherwise noted by the Commissioning Agent.

E. Field Test And Start-Up Reports
   1. The contractor shall submit field test reports for circuit breakers, feeder megger tests, ground resistance tests, and tests as identified in the commissioning equipment matrix.
   2. The contractor shall submit all vendor start-up reports to the Commissioning Agent, CxA to review these reports for completeness.

SECTION 26 08 00

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

A. General:
   1. Contractor shall provide a short circuit study, protective device coordination study, and arc-flash hazard analysis per the requirements of NFPA 70E for all new equipment provided under this project.

B. Description Of Work:
   1. The studies shall include all portions of the electrical distribution system from the normal to emergency power source or sources down to and including the smallest adjustable trip circuit breaker in the distribution system

C. Short Circuit Study:
   1. The system short circuit study shall be based on available fault current stated by the utility provider at the point of service. The contractor shall coordinate with the utility provider and be responsible for obtaining an available fault current letter from the utility.

D. Coordination Study:
   1. A protective device coordination study shall be performed to provide the necessary, protective relay characteristics and settings, ratios and characteristics of associated current transformers, ground fault relays and low voltage breaker trip characteristics and settings. Provide time-current curves for devices and recommended settings in tabulated form.

E. Arc-Flash Hazard Analysis:
   1. Perform an arc flash hazard analysis study per the requirements set forth in NFPA 70 E – Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70e-2012, Annex D. Provide a summary of the results including incident energy and flash protection boundaries in tabulated form.

F. Report:
   1. The results of the studies shall be summarized in a final report and submitted in accordance with Division 1.

G. Labels:
   1. Labels shall be self-adhesive, have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the information taken directly from the arc-flash hazard analysis. Install labels on all new electrical distribution equipment.

SECTION 26 09 23

LIGHTING CONTROL DEVICES

A. Toggle Switches
   1. Approved Manufacturers: Cooper, Hubbell, P & S or Leviton. All part numbers refer to Hubbell.
   2. Switches, 120/277V, 20A
      a. Single Pole: HBL1221
      b. Three Way: HBL1223
      c. Four Way: HBL1224

B. Dimmer Switches
   1. Approved Manufacturers: Lutron, Leviton, Wattstopper, or approved equal.
   2. Modular, full-wave, solid-state units with integral, quiet on-off, with audible frequency and EMI/RFI suppression filters.
   3. Continuously adjustable slider with single-pole or three-way switching.
   4. Fluorescent and LED Lamp Dimmer Switches: Modular, compatible with dimmer ballasts and drivers.

C. DEVICE PLATES: Brushed Stainless Steel, &S/Sierra Or Approved Equal.
   1. General: Install devices level, plumb and square with building lines.

D. Indoor Occupancy Sensors
   1. Approved Manufacturers: Cooper, Hubbell, Leviton, Acuity, Lutron, Watt Stopper or approved equal.
   2. Switch-Box Occupancy Sensors: Dual Technology type using both PIR and ultrasonic monitoring. Single pole, field selectable automatic on or manual on, automatic off with field adjustable off time delay 0-30 minutes.
   3. Ceiling Occupancy Sensors: Dual Technology type using both PIR and ultrasonic monitoring.

SECTION 26 22 00

LOW VOLTAGE TRANSFORMERS

A. General:
   1. Dry-type 480V delta to 208Y/120V wye three-phase transformers with non-aging silicon steel cores with continuous copper windings.

B. Enclosure:
   1. Where transformers are to be installed indoors provide NEMA 1 ventilated enclosure and where they are to be installed outdoors provide NEMA 3R ventilated enclosure.

C. Insulation Rating:
   1. 220 deg C with a maximum of 150 deg C rise above 40 deg C ambient temperature.

D. Energy Efficiency:
   1. Standard efficiency complying with NEMA TP 1

E. Taps:
   1. Provide a minimum of two 2.5 percent taps below and two 2.5 percent taps above normal full capacity.

SECTION 26 24 16

PANELBOARDS

A. Rating:
   1. 120/208-volt, 3-phase, 4-wire, copper bus bolt-on molded case, thermal magnetic type circuit breakers having a minimum interrupting rating of 10,000 amperes for 120/208-volt panels and 14,000 amperes for 277/480-volt panels.

B. Enclosure:
   1. Where panelboards are to be installed indoors provide NEMA 1 enclosure and where they are to be installed outdoors provide NEMA 3R enclosure.

C. Mounting:
   1. Where panelboards are to be installed against plasterboard walls, provide separate support channels secured to blocking between steel studs. Coordinate blocking work with the gypsum wallboard contractor. Panels shall not be secured directly to gypsum wallboard material.

D. Existing Panelboards:
   1. Provide new branch circuit breakers, including associated mounting hardware to serve new loads.

SECTION 26 27 26

WIRING DEVICES

A. Wiring Devices
   1. Approved Manufacturers: Cooper, Hubbell, P & S or Leviton. All part numbers refer to Hubbell.
   2. Receptacle Color: White for normal power, red for emergency power. Gray for UPS power.
   3. Receptacle Orientation:
      a. Install receptacles vertically.
      b. Install receptacles with the ground pin up.

B. Receptacles
   1. Duplex Receptacles: Specification-grade, 20-ampere, 125-volt, grounded type, HBL5352 series.
   2. Double Duplex Receptacles: Specification-grade, 20-ampere, 125-volt, grounded type, HBL5352 series.
   3. Ground Fault Interruption Receptacles: Specification-grade, 20-ampere, 125-volt, Class A, 5-milliampere sensitivity, GF5352 series.
   4. Weather/Tamper-Resistant Receptacles: Specification-grade, 20-ampere, 125-volt, grounded type, GFR5362TR series.
   5. Duplex Receptacles: Hospital-grade, 20-ampere, 125-volt, grounded type, HBL8300H series.
   6. Double Duplex Receptacles: Hospital-grade, 20-ampere, 125-volt, grounded type, HBL8300H series.
   7. Ground Fault Interruption Receptacles: Hospital-grade, 20-ampere, 120-volt, Class A, 5-milliampere sensitivity, GFR8300H series.
   8. Weather/Tamper-Resistant Duplex Receptacles: Hospital-grade, 20-ampere, 125-volt, grounded type with spring-loaded plastic shutters that open only when a two or three bladed plug is inserted, GFR8300HTR series.

C. Combination Receptacles/Usb Chargers
   1. Duplex Receptacles: Specification-grade, 20-ampere, 125-volt, grounded type, with two USB ports rated for 2A minimum at 5V. HBL USB20X2 series.
   2. Double Duplex Receptacles: Specification-grade, 20-ampere, 125-volt, grounded type, with two USB ports rated for 2A minimum at 5V. HBL USB20X2 series.
   3. Duplex Receptacles: Hospital-grade, 20-ampere, 125-volt, grounded type, with two USB ports rated for 2A minimum at 5V. HBL USB8300 series.
   4. Double Duplex Receptacles: Hospital-grade, 20-ampere, 125-volt, grounded type, with two USB ports rated for 2A minimum at 5V. HBL USB8300 series.

D. Flush Floor-Box Power Fittings:
   1. Flush in-floor mounting with fire rating equal to the floor. One duplex 20-ampere power receptacle with separate wiring connection and one communications plate.

E. Device Plates: Brushed Stainless Steel, P&S/Sierra Or Approved Equal.
   1. General:
      a. Install devices level, plumb and square with building lines.

   2. Receptacle Mounting Height: +18" to the centerline of the box unless otherwise noted.

SECTION 26 28 13

FUSES

A. Manufactures:
   1. Bussman, Ferrez Shawmut or Littlefuse.

B. Provide 200,0-00 AIC, current limiting, UL time delay fuses as follows:
   1. Feeders 600 Amps and Less: Class RK-1, LPN-RK for 250-volt, dual element; Class RK-1, LPS-RK for 600-volt, dual element.
   2. Motor Circuit 600 Volts and Below: Class RK-1 or Class J sized at 125 percent FLC of motor.

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

A. Approved Manufacturer's:
   1. General Electric, Siemens, Cutler-Hammer or Square D.

B. Single-Phase Motor:
   1. Motors 1/3 HP or less provide with toggle-type, 20-amp, 120-volt rating, specification-grade disconnect switches.

C. Three-Phase Motor:
   1. Motors 1/2 HP and larger provide with horsepower-rated, heavy-duty, 30 ampere minimum, 3-pole disconnect switches.

D. Equipment Disconnects:
   1. Shall be fused or non-fused as required by the equipment manufacturer, rated at 125 percent of full load nameplate amperage or rated horsepower, heavy-duty type.

E. Disconnects:
   1. Provide disconnects at all motors and other equipment items unless the equipment has a self-contained, Code approved disconnecting method. Equipment disconnects shall be fused or non-fused as required by the Equipment manufacturer.

SECTION 26 29 00

LOW VOLTAGE CONTROLLERS

A. Motor Controls
   1. Approved Manufacturers:
      a. General Electric, Siemens or Square D.

   2. Manual Starters:
      a. Toggle type, lockable in the off position, overload protection, pilot light and NEMA 1 enclosure.

   3. Magnetic Starters:
      a. Full voltage, non-reversing, or multi-speed where shown, NEMA 1 (minimum), 3-leg overload protection, 120-volt control, red and green pilot lights and hand-off-automatic switch on cover, control transformer, 2-N.O. and 2-N.C. auxiliary contacts and solid-state overload protection.

   4. Combination Starters:
      a. Full voltage, non-reversing as specific above with integral fused disconnect switch and dual element time delay fuses.

B. Motor Controls And Equipment Connections:
   1. General:
      a. Provide all line voltage wiring and connections to equipment and motors as shown on the plans, diagrams or specified herein. Obtain all necessary electrical and physical information from the trade providing the equipment, prior to rough-in and adjust installation requirements as necessary for a complete and operable system.

   2. Motor Controls, Separately Mounted:
      a. Provide separately mounted motor starting equipment as shown or noted. Coordinate location and interlocking with Temperature Controls Contractor. Verify motor horsepower size or full-load amperage prior to ordering overload heaters and size units in accordance with the National Electrical Code.

   3. Isolation:
      a. All rotating and air handling equipment shall be connected with flexible conduit to provide sound and vibration isolation.

   4. Testing:
      a. After all wiring to each unit is complete, cooperate with Mechanical Contractor in testing equipment for proper operation; shall correct wiring as required for proper operation.

SECTION 26 32 13

PACKAGED ENGINE GENERATOR SYSTEMS

A. Regulatory Requirements
   1. Conform to the requirements of the following publications:
      a. NFPA 110 Standard for Emergency and Standby Power Systems
      b. UL 2200 UL Standard for Safety for Stationary Engine Generator Assemblies

   2. Conform to current environmental protection agency (EPA) applicable emission regulations.
   3. Conform to requirements of fire marshal for flammable/combustible liquids. Obtain and pay for related permit(s).

B. System Description
   1. UL 2200 engine generator system to provide source of standby power.
   2. System Capacity: As indicated on the drawings. Ratings are valid at elevation of 500 feet above sea level, and ambient temperature 110 degrees F; continuous standby rating using engine-mounted radiator.
   3. Installation: Indoor packaged assembly with integral fuel tank, batteries, charger, block heater, exhaust, and locking sound attenuated weather protective housing.

C. Submittals
   1. Submit product data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, and sub-base fuel tank.
   2. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rates at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.

D. Operation And Maintenance Data
   1. Submit data in operation and maintenance manuals.
   2. Include instructions for normal operation, routine maintenance requirements, service manuals for engine and day tank, and emergency maintenance procedures.
   3. Include documentation from system start up.

E. Warranty
   1. Provide five-year warranty on engine-generator packaged unit.

F. Acceptable Manufacturers:
   1. Equipment shall be supplied by one of the manufacturers listed below:
      a. Cummins as supplied by Local Vendor
      b. Caterpillar as supplied by Local Vendor

   2. Only (factory direct or first tier) distributors shall be acceptable, (second tier) dealers are not approved, to supply the approved manufacturers.
   3. Only approved local distributors shall supply equipment provided under this contract. Equipment by nonlocal distributors shall not be acceptable.
   4. The distributor shall be the authorized engine distributor for the prime mover.
   5. The local representative shall have represented the manufacturer for a minimum of 10 years.
   6. On request, they shall provide a reference list of five similar projects, no older than two years with site contact information.

7. They shall have a field service group dedicated to generator repair and maintenance that has no fewer than 10 technicians with dedicated service vehicles with parts and tooling needed for common repairs.
8. They shall provide service within four hours of a request for service or warranty.
9. Field service technicians shall have a minimum of two years of generator field experience on the product being supplied and shall be factory trained and certified.
10. Bidders will not be considered unless there is a local office and stocking warehouse within 150 miles of the project site.
11. Shall have a stocked warehouse space a minimum of 15,000 square feet within 150 miles of the job site.
12. Shall provide formal classroom training for service and maintenance on generators and transfer switches on a regular basis. The schedule and pricing for this training shall be available on request.
13. Warranty shall be by this distributor; not off set to either an engine manufacturer, alternator manufacturer, or a first-tier distributor.

G. Engine

1. Type: water-cooled inline or v-type, four stroke cycle, compression ignition diesel internal combustion engine.
2. Rating: Sufficient to operate at 10 percent overload for one hour at specified elevation and ambient limits when prime power rating is specified.
3. Fuel System: No. 2 fuel oil.
4. EPA emissions: engine shall be certified by the environmental protection agency to conform to Tier Three non-road emissions regulations.
5. Engine Speed: 1800 rpm.
6. Governor: Electronic isochronous type or mechanical type.
7. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine over crank. Limits as selected by manufacturer.
8. Engine starting: Two-wire dc starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with manual-off-remote selector switch on engine-generator control panel.
9. Engine block heater: thermostatically controlled water jacket heater, sized to maintain 90 degrees F. Ambient, and rated for 208 volt.
10. Radiator: Unit mounted, with duct flange, using glycol coolant, with engine driven blower type fan, sized to maintain safe engine temperature in 122 degrees F ambient and against static air flow restriction of 0.5 inches of water.
11. Diesel engine accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear driven water pump.
12. Mounting: Mount unit on structural steel base using suitable vibration isolators.

H. Generator

1. Generator: ANSI/NEMA mg 1; four pole, re-connectable brushless synchronous generator with brushless exciter.
2. Rating: comply with kW rating and voltage configuration indicated on plans, 60 Hz at 1800 rpm.
3. Insulation: ANSI/NEMA mg 1; class H minimum.
4. Temperature Rise: 105 degrees C continuous, 130 degrees C standby.
5. Enclosure: ANSI/NEMA mg 1; open drip proof.
6. Voltage regulation: include generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation +/- one percent from no load to full load. Include manual controls to adjust voltage drop +/- 5 percent voltage level, and voltage gain.

I. Accessories

1. Fuel Tank: Double wall, UL 142 listed, sub-base tank unit with fuel lines, low fuel level alarm switch and tank rupture alarm switch. Provide 72 hour minimum fuel capacity at full load.
2. Exhaust silencer: Residential-type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized in accordance with engine manufacturer's instructions.
3. Batteries, Diesel Engine: Heavy-duty, diesel starting type lead-acid storage batteries, 170 ampere-hours minimum capacity controlled 120 volt plug-in blanket heaters. Include necessary cables and clamps.
4. Battery Tray: Plastic-coated metal or structural plastic, constructed to contain spillage of electrolyte.
5. Battery Charger: Dual rate type designed to provide a trickle charger rate of 80 to 500 milliamperes, or steady current output of 2 amperes minimum to maintain a fully-charged condition, at a constant battery voltage without danger of overcharging. Include overload protection. Provide base-mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements.
6. Line Circuit Breaker: Provide NEMA AB 1 molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole; number and rating as indicated. Mount unit in enclosure to meet ANSI/NEMA 250, Type 1 requirements.
7. Engine-generator Control Panel: ANSI/NEMA 250, Type 1 generator-mounted control panel enclosure with engine and generator controls, shut downs and indicators meeting requirements of NFPA 110, Level 2 installation. In addition, include the following equipment and features:
   a. Frequency meter
   b. AC output voltmeter
   c. AC output ammeter
   d. Output voltage adjustment
   e. Engine running time meter
   f. Oil pressure gauge
   g. Water temperature gauge
   h. Auxiliary relay, 3pdt
   i. Audible alarm rated 90 dB at 10 feet
   j. Sub-base tank rupture alarm

8. Locking Sound Attenuated Weather Protective Housing (With Enclosed Exhaust Silencer): With a reduction to 71 dBA at 23 feet. Reinforced steel construction with rust inhibiting primer and enamel finish inside and out, stainless steel hardware, locking access panels, fixed ventilation louvers for full load operation with access panels closed.

J. Installation

1. Install in accordance with manufacturer's instructions and approved shop drawings.
2. Provide water, glycol antifreeze, and lubricants required for start-up, testing and adjustment. Fuel shall be furnished by owner.
3. Provide all field wiring and interface cabling for generator remote annunciation and control according to approved shop drawings. Provide emergency shutdown station, located adjacent to the transfer switch.
4. Secure generator set to foundation. Obtain anchoring plans from equipment manufacturer indicating size and location of anchors suitable for Seismic Zone 3. Secure equipment with corrosion proof 1/2 inch -13 SAE Grade 5 wedge anchors having a minimum embedded depth of 3-1/2 inches unless otherwise approved or recommended by manufacturer.
5. Provide equipment pad for outdoor packaged systems. Pad shall be concrete slab foundation, eight inches thick reinforced with six-by-six inch No. 6 welded steel fabric

uniformly centered in slab and placed on a well compacted nine-inch deep gravel sub-base so that the top is three inches above grade. All edges shall have 1/2" chamfer. Pad dimensions shall allow at least six inches of free space on all sides of the equipment. Conduit entrance dimensions and location shall comply with equipment manufacturer's recommendations. Secure equipment to pad with corrosion-proof anchors.

K. Testing And Adjustments
1. Field start-up, testing and adjustment shall be performed under the supervision of a factory-trained manufacturer's representative.
2. Provide full load test utilizing portable test bank for one hour minimum. Simulate power failure including operation of transfer switch, and return to normal.
3. During test, record the following at 20 minute intervals:
   a. Kilowatts
   b. Amperes
   c. Voltage
   d. Temperature
   e. Frequency
   f. Oil pressure

4. Test alarm and shut-down circuits.
5. Adjust generator output and engine speed.

L. Demonstration And Instructions
1. Demonstrate operation and maintenance of system to Owner's personnel prior to contract closeout. Allow one two-hour session scheduled at convenience of Owner.
2. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
3. Demonstrate operation, control, trouble shooting, maintenance and testing of system.

SECTION 26 33 53

STATIC UNINTERRUPTIBLE POWER SUPPLY

A. Submittals
   1. Submit product data for static uninterruptible power supplies (UPSs) showing overall dimensions, electrical connections, electrical ratings, and environmental requirements.
   2. Submit shop drawings showing complete factory wiring diagrams and field wiring requirements for equipment installation.

B. Operation And Maintenance Data
   1. Submit data in Operations and Maintenance (O&M) Manuals.

C. Acceptable Manufacturers
   1. Eaton
   2. Mitsubishi 9900A
   3. Liebert
   4. Or hospital approved equal.

D. Summary
   1. Static uninterruptible power supply (UPS) is intended to provide power conditioning and continuous backup power for information technology loads. The UPS shall consist of a dual-conversion, static-type online UPS module, external maintenance bypass cabinet, and battery energy storage.
   2. The UPS shall be certified by Underwriters Laboratories in accordance with UL 1778.
   3. Warranty – provide manufacturer's standard warranty
   4. Bypass cabinet: 3 breaker with solenoid release and key interlocks.
   5. Rating: The UPS shall be rated at the KVA and KW shown on the drawings for a load power factor range of 0.8 lagging to 0.9 leading.
   6. Batteries – Valve-regulated, lead-acid units, factory assembled in an isolated compartment of the UPS cabinet and complete with battery disconnect switch.
   7. The UPS shall supply power from the batteries for a minimum of 10 minutes at full load. If this results in the battery electrolyte exceeding 50 gallons, then provide the following in compliance with CFC 608:
      a. Batteries with self-rescaling flame-arresting caps CFC 608.2.2
      b. Thermal runaway management CFC 608.3
      c. Neutralization kit CFC 608.5.2
      d. Warning sign CFC 608.7

   8. Seismic: The UPS shall be rated for the seismic zone it will be installed in.

E. Accessories
   1. Battery monitoring system – provide an advanced individual cell conditioning (BACS) battery monitoring system.
   2. BMS interface card – provide an interface card to allow the building's BMS to monitor the UPS status and alarms via Modbus .

F. Installation
   1. Install in accordance with manufacturer's instructions.
   2. Engage a factory-authorized service representative to perform factory standard startup services and to assist the commissioning agent with field testing.

SECTION 26 36 00

TRANSFER SWITCHES

A. Submittals
   1. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, and environmental requirements.
   2. Submit shop drawings showing complete factory wiring diagrams and field wiring requirements for equipment installation. Include manufacturer recommended initial settings for adjustable time delays and sensors.

B. Operation And Maintenance Data
   1. Submit data in Operation and Maintenance (O&M) Manuals.
   2. Include record of final settings for adjustable and factory time delays and sensors from system start up.

C. Acceptable Manufacturers
   1. Cummins
   2. Asco
   3. Russelelectric

D. Automatic Transfer Switch
   1. Description: UL 1008, NEMA ICS 2; automatic transfer switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
   2. Switches using molded-case switches or circuit breakers, or insulated case circuit breaker components are not acceptable.
   3. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.
   4. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
   5. Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.
   6. The transfer switch operation shall include the ability to switch to an open position (both sources disconnected) for the purpose of load shedding from the generator set.
   7. The power transfer mechanism shall include provisions for manual operation under load with the enclosure door closed. Manual operation may be electromechanical or mechanical, but must be coordinated with control function.
   8. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
   9. The transfer switch shall include the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation with motor loads shall be as is recommended in NEMA MG1.
   10. Configuration: Electrically-operated, mechanically-held transfer switch.
   11. Ratings: UL 1008, NEMA ICS 2, as follows:
       a. Voltage: 120/208 [and/or 277/480-volt] volts, three phase, four wire, 60 Hz.
       b. Switched poles: Four
       c. Load inrush rating: Combination tungsten lamp, electric discharge lamp, resistive load, and motor load.
       d. Continuous rating: As designed.
       e. Withstand current rating: Three-cycle rated as follows

   12. Control: solid state circuitry; separately adjustable voltage and frequency sensing of normal and alternate sources, all phases.

E. Automatic Sequence Of Operation
   1. Initiate time delay to start standby source engine generator: Upon initiation by normal source monitor.
   2. Time delay to start standby source engine generator: 0 to 6 seconds, adjustable.
   3. Initiate transfer load to standby source: Upon initiation by normal source monitor and permission by alternate source monitor.
   4. Time delay before transfer to standby power source: 0 to 60 seconds, adjustable.
   5. Initiate retransfer load to normal source: upon permission by normal source monitor.
   6. Time delay before transfer to normal power: 0 to 30 minutes, adjustable; bypass time delay in event of alternate source failure.
   7. Time delay before engine shut down: 0 to 5 minutes, adjustable, of unloaded operation.
   8. Engine exerciser: programmable, set for engine start every 30 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period. Provide load/no-load selector switch.

F. Enclosure
   1. Enclosure: ICS 6; Type 1 for dry locations, Type 3R for damp or outdoor locations; 30-inch maximum width. Provide hinged door with locking handle latch and gasketed jambs.

G. Accessories
   1. Indicating Lights: Mount in cover of enclosure to indicate normal source available, alternate source available and switch position.
   2. Key-Operated Selector Switch: Mount in cover of enclosure for test-auto-off-engine start.
   3. Transfer Switch Auxiliary Contacts: One normally open; one normally closed.

H. Installation
   1. Install in accordance with manufacturer's instructions and approved shop drawings.
   2. Provide all field wiring and interface cabling for transfer switch operation and control according to approved shop drawings.
   3. Nameplates: Comply with Section 260533.

I. Testing And Adjustments
   1. Comply with Section 263213.
   2. Comply with NFPA requirements for optional standby systems.
   3. Make initial and final settings for adjustable time delays and sensors.

J. Demonstration And Instructions
   1. Comply with Section 263213 - Packaged Engine Generator Systems as related work.

DIVISION 27 – COMMUNICATIONS

SECTION 27 05 00

COMMON WORK RESULTS FOR COMMUNICATIONS

A. Provide provisions only (conduit, backbox, pullstring) for communications and data devices shown on the plans. Cabling and faceplates shall be provided by others.

B. All signal and communications cabling shall be plenum rated. Cabling shall be run open above the ceiling via junction-hooks in accessible locations.

C. Provide metallic raceways for cables installed in walls, above inaccessible ceilings, exposed or where subject to physical damage. Raceway fill shall not exceed 40 percent. Raceway size shall be 1 inch minimum.

D. Provide STI EZ-PATH or equivalent fire rated pathway where cabling pathways cross fire-rated walls.

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

SECTION 280000
ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.01 SUMMARY

A. The security system(s) will include an integrated access control and alarm monitoring system (IACBS), intercom system, closed circuit television (CCTV) system, panic alarm system, and security call system. Systems must be seamlessly integrated. Card readers, alarm points, cameras, intercom stations and supporting infrastructure will be located throughout the facilities. Systems will be located as shown on the Drawings, or as otherwise indicated.

B. New security system components and elements must be integrated or an extension of the Owner's existing system.

1.02 RELATED SECTIONS

A. SECTION 280000 – Electronic Safety and Security

B. SECTION 281300 – Access Control

C. SECTION 282300 – Video Surveillance

1.03 GENERAL REQUIREMENTS

A. General provisions of the Contract, including Contract Requirements and Division 1 Specification Sections, apply to this Section.

B. All drawings, conditions, Division 1 Sections, and Instructions to Bidders apply to this specification section and related sections.

C. The contractor is responsible for quantities and is urged to do a complete review for all counts.

D. The contractor shall familiarize himself with the local conditions under which the work is to be performed, and its relationship to other trades, and any obstructions that may affect the proper execution and completion of the work. It is the contractor responsibility to ascertain any and all conditions, failure to understand or discover any condition that will result in a change order that increases the contract amount; that should have been discovered in the due diligence of reviewing the site and contract documents may result in denial of the change order.

E. Any discrepancies found shall be submitted in writing prior to proceeding with the work.

F. The Contractor shall attend all job progress meetings as required by the owner and the engineer as soon as notice to proceed is given. The Contractor shall furnish to owner a list of his employees, all subcontractors' key personnel and the project representative.

G. After the award of contract, the Contractor shall prepare a detailed schedule using "Microsoft Project" software or equivalent. It shall be prepared in the time scaled precedence diagram format. The Contractor Project Schedule (CPS) shall indicate detailed activities for the projected life of the project. The CPS shall consist of detailed activities and their restraining relationships. It will also detail manpower usage throughout the project.

H. The Security Contractor shall furnish and install complete system components as described within these Drawings and Specifications to form a complete operating security system.

1. This includes all necessary items and labor not specified but necessary for a complete and working system.

I. Work shall be complete, certified, tested, and ready for operation.

J. Contractor shall be responsible for repair of any base building structure or finishes that are damaged by the installation of any work specified in this section.

K. No cutting or patching of existing work shall be permitted without prior written consent of the owner. Request for permission to do cutting, drilling or chipping shall include explicit details and description of work, the proposed schedule, and shall not under any circumstances diminish the structural integrity, functional capabilities, or aesthetic appearance of the building components or systems.

L. Except where the Architect, Engineer or manufacturer has specifically indicated dimensions, drawings are diagrammatic and shall not be scaled. Visit project site, survey existing conditions, and coordinate work to comply with documents.

M. The Contractor shall coordinate with other trades to form a complete system. The Security Contractor is responsible for cabling, system components, devices, cores, miscellaneous conduits, sleeves, junction boxes, and all other peripherals not provided by others to form a complete security system.

N. The Contractor shall strictly adhere to the latest version of all local, national and international codes.

O. The Contractor is responsible for providing all necessary permits and scheduling all necessary permits and inspections in a timely matter and as directed by the Owner’s Project Manager (OPM).

P. It is the Contractor's responsibility to protect and maintain all existing base building work and finishes that occur within the area of this scope.

Q. It is the Contractor's responsibility to protect building finishes that the Contractor may come in contact with that is not visibly confined to the work area.

R. Any questions and/or concerns about the work to be performed shall be addressed prior to the start of that work. Otherwise the Contractor shall be the responsible party once that work has started.

S. The Contractor shall include all necessary labor, tools, equipment, and ancillary materials required to furnish and install a complete and operational security system.

T. The Contractor is to leave an area in the condition it was found in after completing their work. The Contractor shall patch, repaint, clean, adjust, reapply, or refurbish any existing area or surface that is affected as a result of the work

1.04 REFERENCE STANDARDS

A. In addition to those referenced in Division 1, all work shall conform to the following standards and codes (most current edition, revisions, and addenda), where applicable. When a conflict occurs, follow the most stringent requirements:
   1. National Fire Protection Association
      a. NFPA 70, National Electrical Code
      b. NFPA 72
      c. NFPA 101
      d. Telecommunication Industry Association (TIA)
         1) Including, but not limited to
         2) TIA 568
         3) TIA 569
         4) TIA 598
         5) TIA 606
         6) TIA 607
         7) TIA 758
      e. American National Standard Institute (ANSI)
      f. American Society for Testing and Materials (ASTM)
      g. Underwriters Laboratories, Inc. (UL)
      h. BICSI
         1) Telecommunication Distribution Methods Manual
         2) Information Transport Systems Installation Manual
         3) Customer-Owned Outside Plant Manual
         4) Network Design Reference Manual
      i. Joint Commission on Accreditation of Healthcare Organizations (JCAHO)
      j. All local and state regulations
      k. UL Listed to Standard 1409
      l. CSA Certified to Standard C22.2 No. 1 M90.
      m. FCC Rules Subpart J of Part 15 for a Class B computing device.

1.05 CONTRACTOR QUALIFICATIONS

A. Must be factory/manufacturer certified in system being proposed.
   1. Provide written notification by manufacture indicating contractor is certified.

B. Must be properly licensed, including technicians for installing systems as outline in the specifications and drawings.

C. Performed installation on same size and nature in scope of work.
   1. Provide 3 references of same size or larger in same scope of work.

D. Provide project manager with experience in same size and nature of work.
   1. Submit resume of project manager.

E. Have personnel trained in the installation and testing of systems.
   1. Submit qualifications of technicians, including any licenses, classes or prior work performed that qualifies them for this project.

1.06 SUBMITTALS

A. General
   1. Submit Shop Drawings, supplemental data, for all materials, equipment in all Sections of this Division as required by individual sections of this specification and in accordance with the requirements of Division 1

2. Support all submittals with descriptive materials, i.e., catalog sheets, product data sheets, diagrams, performance curves, and charts published by the manufacturer. These materials shall show conformance to specification and drawing requirements. Model view shall contain all information to indicate compliance with equipment specified.
3. Where multiple products are listed on a single cut-sheet, circle or highlight the one being proposed.
4. Within 15 days after award of this contract, the Contractor shall submit to the Architect for approval five (5) copies of material list showing type and manufacturer of conduit, wire, boxes, telecommunications equipment, and all major equipment. Submittals shall include all datasheets for equipment that is to be installed on the project; partial submittals will not be reviewed as contractor's intent may not be obvious on incomplete submittals.
5. No later than 30 days after award of the contract, the Contractor shall submit to the Architect for approval five (5) copies of shop drawings in accordance with the plans and specifications. The drawings shall be in the form of blueline prints, drawn to scale, and shall be completely dimensioned and show front and rear elevations, together with such sections as required to show construction and all necessary wiring diagrams to show electrical and communications characteristics. Drawings shall be submitted in quintuple for review.
6. All submittals shall be neatly bound in folders and have a summary sheet at the front of all equipment, complete with catalog numbers. Where equipment pertains to more than one building, submittals shall clearly indicate at which locations equipment is to be installed. Submittals may be submitted in electronic format using *.PDF files in which case a single copy is required for submittal.
7. All shop drawings submitted for review shall be reviewed by the Contractor prior to submission and appropriately stamped for conformity to contract requirements. Failure of the Contractor to make this review and stamp the submittals will be considered by the Architect as being incomplete, will be returned without review and resubmittals will be required.
8. In addition to those shop drawings requested, Contractor shall turn over to the Owner's representative on the job, three bound sets of complete approved shop drawings.
9. The Architect shall review any submittal no more than two (2) times. Any subsequent reviews of materials shall be billed to the Contractor at the hourly rate of the reviewing personnel, at the Contractor's expense.

B. Shop drawings submittal and review is to show compliance with the design intent. Specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or rejected on the submittal. Deviations not so identified and approved shall not relieve the Contractor from the requirements of the Contract Documents.

C. Shop drawings shall contain job title and reference to the applicable drawing and/or specification number and OSHPD number.

D. Submit details and calculations for support and anchors that are not specifically detailed on the drawings. Once these details and calculations have been reviewed by the Architect, submit them to OSHPD and obtain their approval.
   1. Where pre-approved bracing will be employed,
      a. System component brochure describing components used and detailed installation instructions.
      b. Loads to be transmitted to the structure at anchor points
   2. Where anchorage, support and bracing are not detailed on the drawings and pre-approved systems are not used, submit details and calculations of proposed systems. Include:
      a. Detailed drawings showing system to be installed, stamped by a Structural Engineer registered in the State of California.
      b. Calculations, stamped by a Structural Engineer registered in the State of California.

3. Anchorage and supports:
    a. Where equipment substitutions change the weight, size, configuration or other aspects of the systems and equipment that will affect the performance of anchorages and/or supports, submit calculations for proposed anchors and supports and install them as shown in these calculations. These calculations shall include the same certification and engineer's stamp as required above for seismic bracing. Obtain OSHPD approval for the proposed substitutions.
    b. Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.

E. "As-builts": Upon completion of installation, the Contractor shall prepare "as-built" drawings of the system. These drawings shall show all device locations, details, wiring information, device and cable labeling information's and additional information deemed necessary for the proper documentation of the system. These "as-builts" shall include (5 sets) blueline/blackline drawings of each floor plan indicating exact device locations, panel termination's, cable routes and wire numbers as tagged and color coded on the cable tag.
1. Additionally, final point-to-point wiring diagrams of each type of device (on 30" x 42" format) shall be included in the "as-builts."
2. "As-builts" shall be submitted to the OPM for approval prior to the final system acceptance walk-through.
3. "As-built" drawings shall be generated using AutoCAD 2000 or higher. The AutoCAD drawing border and format must be approved by the Owner before submittal of any as-built documentation.
4. Contractor shall provide four hard copies (bluelines/blacklines) and one soft copy (documents on diskette) of approved as-built documentation to OPM at least (7) days before final Security System Installation Close-out.
    a. Operation and maintenance manuals: Two (2) sets of operating manuals shall be provided explaining the operation and maintenance of the system.

1.07 SUBSTITUTION OF MATERIALS

A. Submit base bid on equipment, products and materials specified or approved. Equipment, products and/or materials by manufacturers not specified but performing the same function will be acceptable if:
1. Submitted for approval along with base price and alternate price for submitted items;
2. Engineer considers the item equivalent to that specified;
3. Engineer issues an addendum accepting the item;
4. The substitution does not void or downgrade the manufacturer's Total Solution Warranty.

B. Contractor assumes responsibility for all changes in cable or equipment capacity caused by substitution of materials. The Contractor shall assume all expenses for all additional design and construction due to such substitutions.

C. The Contractor assumes the responsibility of all costs of design and construction resulting from any modifications required to any building equipment or system due to substitution of low-voltage/technology systems materials.

1.08 CODES AND PERMITS

A. Provide all necessary permits and schedule all inspections in a timely manner, so that the low-voltage cabling system is ready for operation on a date directed by the Owner.

1.09 WARRANTY

A. Provide a one-year warranty on all parts, material, equipment, wiring and labor for the complete security system. The warranty period will start the day after Owner's final acceptance.

B. System Service
   1. The Contractor shall provide emergency repair service for the system at no cost to the Owner, within 24 hours of a request for such service by the Owner during both the installation and warranty periods. This service shall be provided on a 24 hour per day, seven days per week basis.
   2. The Contractor shall provide normal service for the system at no cost to the Owner within one business day after receipt of the call.

C. Maintain an on-site service log. Coordinate with Owner.

1.10 TRAINING

A. Provide a total of 24 hours of on-site training and orientation for the security system to the Owner’s personnel. Training will support the installed systems. Training personnel must be factory trained and authorized to train on the provided systems. Training by non-qualified personnel will not be recognized as part of the training time specified herein.

B. Provide one hard copy and one soft copy (documents on CD/DVD) of operator instruction manuals for the entire system. Operator instruction manuals shall be structured to provide an operator training mechanism for new system operators. Training session(s) shall be recorded for use by future employees or as a refresher for trained employees.

C. Provide detailed training agenda and schedule for approval prior to commencement of formal training. Training shall begin at least two weeks prior to system startup. Training shall include orientation for clinical and other staff in the operation intercom and video functions that impact their area. Security Contractor shall coordinate with Owner and Others to clearly define the training requirements for all staff.

PART 2 PRODUCTS

2.01 GENERAL

A. All material shall be new and UL listed and free from damage or defects. The Contractor shall furnish all materials as required. The Contractor is responsible for furnishing any appropriate material needed for proper installation of the systems. Refer to the Drawings for further information and requirements.

PART 3 EXECUTION

3.01 EXECUTION AND INSTALLATION

A. The Contractor shall provide qualified and skilled workmanship throughout the scope of this project. All installation work shall be of the highest quality using proper installation methods and according to manufacturer's instructions and recommendations.

B. The Contractor shall install a complete and functional security system as described with these Specifications and Drawings. The systems shall be installed utilizing good wiring and grounding practices according to local, national, and international codes and be acceptable to the Owner, Engineer and OPM. Life safety and fire codes shall be strictly followed where applicable.

C. The Contractor shall provide on the job site, a factory trained supervisor to direct, assist and advise in the installation of all systems.

D. The Contractor shall coordinate work and requirements with the OPM, General Contractor(s), Electrical Contractor(s), Low Voltage Contractor and other applicable trades to ensure all coordination requirements are met.

E. All cable is to be installed above the lay-in ceiling where possible. It is to be installed in conduit when routed in walls or above gypsum board or inaccessible ceilings. Cable shall be installed in conduit in exposed areas, such as the roof, stairwells, maintenance areas, parking garage, etc.

F. Route all system cabling in conduit where conduit has been provided by others. Provide insulated bushings in conduit where not placed by others. Provide conduit where required due to building conditions, or inaccessible ceilings. Provide conduit sleeves around cables whenever they pass through a fire rated or full height partition. Provide UL rated fire systems at these points.

G. The Contractor is responsible for providing all fire proofing material and conduit sleeves, unless otherwise indicated. The Contractor shall seal around all conduit and wiring whenever it passes through a floor or through fire rated partitions. All fireproofing systems shall be UL rated for the application.

H. Rated cable shall be furnished and installed in all spaces. All cable installed in underground conduits must be rated for direct burial use. Cable shall meet equipment manufacturer recommendations for type, size and usage.

I. All cabling unless otherwise noted is to be concealed above lay-in ceilings in finished areas and in conduit, or wire ways as indicated on the Drawings. The Contractor shall provide "J-hooks" to properly support the cable. Individual cables above the ceiling space shall be independently supported using hangers or J-hooks secured to the building structure. All cable is to maintain a minimum of 12" from the other building equipment or appurtenances. Some of the cable tray and J-hooks will be provided as part of the Low Voltage cable contractor scope of work; Coordinate requirements and pathways with the Low Voltage contractor.

J. Do not damage the outside jacket of any cable. Cables shall not be spliced.

K. Where backboards are not furnished, provide plywood backboard painted with two coats of white fireproofing paint. Paint color shall match the existing wall color. Provide where system components shall be mounted or cabling needs to be supported.

L. The Contractor shall support all cable throughout the system. Cables shall be routed in groups of similar types. All cables being pulled shall not exceed the manufacturers recommended pulling tensions or bending radii. Cables shall be supported horizontally above lay-in ceiling on J-hooks. J-hooks shall be installed at 5'-0" intervals. J-hook rows shall be installed in straight rows above corridors and hallways. Support cable routed vertically (where conduit is not provided) using "d-rings" on 2'-0" intervals. Provide bundling and tie-wrapping to "d-rings". Provide plywood backboard where "d-rings" are required when not furnished by others. All cables shall be routed neat, straight and parallel or perpendicular to the building structure.

M. The Contractor shall provide proper terminations and connectors for all cabling throughout the systems. Terminal wiring blocks shall be used in all cabinets, backboards and panels. The

Security Contractor shall coordinate this with the system manufacturer's requirements. The Security Contractor shall install the wiring onto the proper terminals per the system manufacturers wiring diagram furnished with the components and system shop drawings. All terminals shall be labeled and shall be reflected on the "as-built" drawings.

N. The Contractor shall furnish and install vinyl labels installed on plastic holders and adhered to each end of each cable of the system at the components. The labels shall contain to and from information on each cable. This cable number is to be marked on an as-built single line diagram that is furnished by the Security Contractor at the completion of the project.

O. Provide labeling for all system components. Labeling shall show component type and number as assigned to the shop drawings. Label all terminal blocks.

P. Testing of the systems shall be the sole responsibility of the Security Contractor. The Security Contractor shall fully test all wiring and system components for proper system operation. Testing shall include, but not be limited to; short circuit, open circuit, under voltage, false detection. After the Security Contractor has thoroughly checked out the total system, the Security Contractor shall submit in writing a request for an acceptance test. Include the last punch list with request for acceptance test. It is the Contractor's responsibility at this time to demonstrate the total system to the Owner, Project Engineer, and OPM.

Q. Refer to the Drawings for further installation notes and requirements.

3.02 PROJECT RECORD DOCUMENTS (AS BUILTS)

A. Throughout progress of the Work, maintain an accurate record of changes in Contract Documents. Upon completion of Work, transfer recorded changes to a set of Project Record Documents.

B. The attached communication drawings shall be marked in pen to include the following:
   1. Cable routing
   2. Conduit locations
   3. Cable labeling number

C. Submit Project Record Documents to the engineer.

3.03 PROJECT CLOSE-OUT

A. Prior to final inspection and acceptance of the work, remove all debris, rubbish, waste material, tools, construction equipment, machinery and surplus materials from the project site and thoroughly clean the work area.

B. Before the Project Closeout date, the Contractor shall submit:
   1. Operation and Maintenance Data.
   2. Certification and Warranties.
   3. Deliver evidence of compliance with requirements of governing authorities.
   4. Certificates of Inspection:
      a. Low Voltage
      b. Test Data Reports. Deliver test data in electronic format.
      c. Service Contracts.
      d. Project Record Documents.

C. Project Closeout: Contractor shall submit written notice that:
   1. Contract Documents have been reviewed.

2. Project has been inspected for compliance with Contract.
3. Work has been completed in accordance with the Contract.

D. The Engineer will make final inspection after receipt of notice.

SECTION 28 31 11

DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEMS

A. Provide a complete design/build fire alarm package in accordance with all codes, regulations and local AHJ. For existing fire alarm systems to remain provide a complete design/build package for the extension of the existing fire alarm system in the project area. The existing fire alarm system must remain in operation at all times. Provide a “fire watch” if the existing fire alarm must be taken out of service.

B. Interim Life Safety Measures (In Area Of Work): In all areas of the existing building that are within the scope of the construction work:

1. Maintain the existing fire alarm system in continuous operation at all times. Where it is necessary to remove existing fire alarm system components and wiring to accommodate demolition work, provide temporary systems. Temporary systems shall include fire alarm pull stations at exits from the existing building at each floor, heat detectors in construction or permanent corridors, notification devices within the area, and addressable interface modules and power supplies. Temporary fire alarm provisions shall be monitored by the existing fire alarm system. Maintain temporary systems in operation until permanent fire alarm equipment is installed and connected to the existing system and placed into operation.

C. Interim Life Safety Measures (In Newly Constructed Areas):

1. At such time that a physical connection is made between existing and new construction whereby the new construction becomes part of the existing building or when the fire separation between existing and new construction is removed, provide a temporary fire alarm system similar to that described above including pull stations, notification devices, heat detectors, monitor modules and power supplies. Temporary fire alarm provisions shall be monitored by the existing fire alarm system. Maintain temporary systems in operation until permanent fire alarm equipment is installed, connected to the existing system, and placed into operation.
2. Fire alarm conductors and cables shall be enclosed in metal conduit. Fire alarm conduit shall be identified by red paint.
3. Audible notification appliances shall generate private mode sound pressure levels unless otherwise noted.
4. Refer to mechanical, plumbing and fire protection drawings for duct detectors, smoke dampers, tamper switches, flow switches, pre-action or dry-type sprinkler systems required to be monitored or controlled by the fire alarm system.
5. Provide duct-mounted smoke detectors as indicated on the mechanical documents. Provide ceiling mounted remote indicator at each duct detector.
6. Smoke dampers in corridor walls shall close upon signal from corridor smoke detectors in accordance with IBC 715.3.2.1, method 4. Smoke dampers in non-corridor walls shall close upon signal from duct mounted smoke detectors in accordance with IBC 715.3.2.1 method 1. See mechanical documents for locations of dampers and duct mounted smoke detectors.
7. Provide fire alarm connections to HVAC system controls and devices for proper operation, including shutdown. See mechanical documents for quantities, locations, and additional requirements. Upon detection of fire in any area of the building (smoke, heat, or sprinkler flow) the fire alarm system shall cause the air handler or air handlers serving the smoke compartment where the alarm initiated to shutdown, the exhaust fans associated with that smoke compartment to shut down, and all smoke dampers associated with those fans to close. Refer to architectural plans for the boundaries of smoke compartments, and refer to mechanical duct plans for which fans serve each space. See specifications for additional requirements for the sequence of operation of the fire alarm system.

8. Fire alarm control and monitoring, including air handler shutdown and damper closure shall be accomplished using supervised fire alarm wiring to within three feet of the device being controlled or monitored. For the purpose of this measurement on air handlers, the motor starter or VFD is the device being controlled. For the purpose of this measurement on dampers, the damper power circuit is the device being controlled, provided the dampers are self closing and held open electrically. Control signals shall also be sent to the building control system (bas), but this does not satisfy the requirement for supervised fire alarm control of the devices.
9. Provide fire alarm system connection to security lock systems to unlock egress doors under alarm conditions.
10. Visual notification device mounting height shall be to center of lamp.
11. Coordinate locations of ceiling mounted smoke detectors with mechanical systems. Detectors shall not be in direct air flow or within 3 feet of supply diffusers.
12. Provide fire alarm connections to automatic operated doors to disable auto door opening under alarm conditions, except for main vestibule doors or unless otherwise noted.

DIVISION 31 – EARTHWORK

SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Grading.
   2. Excavation and backfill for building foundations.
   3. Compaction of fill and backfill.

1.02 PRICE AND PAYMENT PROCEDURES

A. Unclassified Excavation: Unclassified excavation is considered normal excavation and no extra will be allowed.
   1. All soil excavation is considered as unclassified and is defined as removal of all material encountered, regardless of soil type.

B. Unmarked Existing Utilities: If visual signs of the presence of an unmarked and unknown utility are encountered during excavation, stop excavation and hand dig until the utility is exposed. Protect from damage any and all sewer, water, gas, electric, phone and other pipe lines or conduits uncovered during work and that are not shown on the Drawings until they have been examined by Owner.
   1. If such lines are found to be abandoned and not in use, remove sections within the zone of excavation without extra cost.
   2. If such lines are found to be in use, carefully protect and carry on work around them. If Owner deems it advisable to move such lines, Owner will pay cost of moving.

1.03 REFERENCES

A. Guide References and Standard Practices: Comply with the recommendations of the following.
   1. Common Ground Alliance – Excavation Best Practices 6.0; www.CommonGroundAlliance.com.

PART 2 PRODUCTS

2.01 FILL AND BACKFILL MATERIAL

A. Fill, Structural Fill, and Backfill Material: Clean on-site excavated soils free of organic materials, rubble, debris and other deleterious material, or imported non-expansive fill, as approved by Geotechnical Engineer.

B. Damaged Earth: Earth that has been rendered unfit to receive planting due to concrete water, mortar or lime water dumped on it shall not be used in areas to receive plantings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Visit: Visit and inspect site and take into consideration known or reasonably inferable conditions affecting work. Failure to visit site will not relieve Contractor of furnishing materials or performing work required.

B. Demolition: Verify removal of existing structures and site improvements designated for demolition before beginning grading, excavation and fill for addition.

C. Site Clearing: Verify removal of all topsoil, debris and vegetation in building areas before beginning grading, excavation and fill.

D. Excavation Support: Verify excavation support system is in place before beginning excavation adjacent to existing buildings, critical utilities, or property line.

3.02 PREPARATION

A. Field Engineering: See Section 01 71 23 for bench marks, monuments, batter boards, reference points and layout and checking of the work.

B. Locating Underground Facilities: Comply with applicable state law and regulations and with the Common Ground Alliance Excavation Best Practices.
   1. Unless otherwise specified in state law, call the One Call Center for facility location at least two working days, not to include the day of notice, and no more than ten working days prior to beginning excavation.
      a. Underground Service Alert Southern California: 800/227-2600; www.digalert.org.
   2. Prior to excavation, verify locate markings and check for evidence of unmarked utilities.
   3. Underground Facility Avoidance: Plan excavations to avoid damage to and minimize interference with existing underground facilities in or near the work area.
   4. Marking Preservation: Protect and preserve staking, marking, and other designations for underground facilities until no longer required for proper and safe excavation.

3.03 ROUGH GRADING

A. Cut and Fill, General: Excavate site and place compacted fill as required to provide grades indicated on Drawings.
   1. Tolerance: ($\pm$) 0.1-foot (1-1/4-inch).

B. Remove all organic materials, debris, and loose or disturbed soils, if any, remaining in the building and paving areas after site clearing.

3.04 EXCAVATION

A. Regulatory Requirements: In no case shall slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in applicable local, state, and federal safety regulations, including, but not necessarily limited to, the following.
   1. Comply with applicable ordinances and regulations of the City of Oceanside.
   2. OSHA Construction Standards for Excavations, 29 CFR, part 1926, Subpart P.
      a. Contractor's Responsible Person, as defined in 29 CFR, part 1926, shall evaluate the soil exposed in the excavations.

B. Footing Excavations, Utility Trenching, and Area Excavations: Excavate site as required for walls, foundations, piers, area pits, utilities, etc. to depths indicated on Drawings.
   1. Trenches: Bottoms of full width required. If through error, trenches are carried deeper than required, fill excess depth with compacted fill as directed at Contractor's expense.
   2. If areas of low density soil, debris, or loose or excessively moist areas are found at bottom of any excavation, immediately report condition to Geotechnical Engineer and Architect who will determine if corrective work is necessary.
   3. Slope or shore excavations in accordance with local and federal regulations, including OSHA excavation and trench safety standards.
   4. Spoil piles from excavations and construction equipment shall be kept away from the sides of trenches.

D. Drainage: Provide and maintain slopes, crowns and ditches in excavation to ensure satisfactory surface drainage at all times. Provide temporary drainage facilities to prevent water from draining into excavations. When work is completed, restore temporary ditches or cuts to original grade or finish grade as indicated.
   1. Bailing or Pumping: Immediately pump or bail out water found in excavations, whether rain or seepage. Excavations shall be kept free from water at all times. Take measures and furnish equipment and labor necessary to control the flow, drainage and accumulation of water as required to permit completion of the work under this section to avoid damage to the work. Excavate saturated soils as specified above.

E. Underground Facility Protection:
   1. When excavation operations approach estimated location of underground facilities, determine exact location of facilities by safe methods, including hand excavation if required.
   2. While excavation is open, protect and support any and all exposed sewer, water, gas, electric, phone and other pipe lines or conduits. Do not cut lines or interrupt services unless specifically noted on Drawings.

3.05 FILLING AND COMPACTION

A. General: Fill and compact to levels required to complete the work indicated.
   1. Filling may require soil material in excess of quantity of suitable material available from required grading and excavations even though not indicated on the Drawings. Such material shall be imported at earthwork contractor's expense.
   2. Placement Method: Obtain the Geotechnical Engineer's approval of method of placing and compacting before starting compacted fill or backfill placement.

B. Moisture Conditioning of Fill and Backfill Materials: Fill soils shall be watered, dried back, blended, and/or mixed as necessary to attain a relatively uniform moisture content.
   1. Maintain moisture content and compaction of subgrade soils to receive flatwork or pavement until slab or pavement is constructed.

C. Backfilling: Fill and compact temporary holes and excavation around interior walls, grade beams, piers, trenches, on inside of building and excavation around exterior foundation walls.
   1. Backfill Adjacent to Walls: Compact with hand-operated tampers or other lightweight compactors on thin loose lifts of soil.

3.06 FINE GRADING

A. General: Cut and fill all areas to elevations and tolerances specified. Leave graded surface clean, free from rubbish and large clods and reasonably smooth.

B. Subgrade Under Building: Fine grade to smooth, even, well compacted surface at densities specified under Article 3.09 to elevations indicated.
   1. Slab-on-Grade Tolerance: Plus-or-minus 0.02-foot (1/4-inch).

C. Subgrade Under Concrete Paving, Sidewalk, and Curb and Gutter: Fine grade to bearing surface as required.
   1. Tolerance: Plus-or-minus 0.04-foot (1/2-inch).

D. Subgrade Under Asphalt Paving: Fine grade to bottom of asphalt section.
   1. Tolerance: Plus-or-minus 0.04-foot (1/2-inch).

E. Subgrade Under All Other Areas: Fine grade to grades indicated.
   1. Tolerance: Plus-or-minus 0.1-foot (1-1/4-inch).

3.07 SITE QUALITY CONTROL

A. General: See Section 01 45 00 Quality Control.
   1. Inspection: Materials and operations under this section shall be executed under observation of Geotechnical Engineer employed by Owner who will place qualified personnel on site during earthwork operations as necessary.
   2. Field Testing: Soil testing during construction will be conducted by acceptable testing laboratory. Make sufficient tests to enable Geotechnical Engineer to develop professional opinion regarding compliance with these Specifications.
      a. Test reports of soils testing during construction specified under Field Quality Control will be distributed by the testing laboratory in accordance with Section 01 45 00.
   3. Layout and Elevation Controls: Establish lines, levels and locations by instrumentation. See Section 01 71 23 Field Engineering.
      a. Instrument Operator: Qualified and experienced in use of surveying instruments.

B. Density and Moisture Content Testing: The density and moisture content of recompacted subgrade, where required, and of each layer of compacted fill and backfill will be determined by the Geotechnical Engineer in accordance with ASTM D1556 or D6938.
   1. Testing Frequency: Tests will be made at not less than the following minimum frequencies. Additional individual tests and more frequent testing may be made if so directed by Geotechnical Engineer.
      a. Fill and Backfill in Building Pads: 1 test per 2,500 square feet, per lift.
      b. Pavement Areas: 1 test per 5,000 square feet, per lift.
      c. Utility Trench Backfill: 1 test per 300 lineal feet, per lift.
      d. Roadway Subgrade: 1 lest per 300 lineal feet, per lift.
   2. Obtain written approval of the completed compacted fill and backfill from the Geotechnical Engineer.

C. Non-Conforming Work:
   1. Any material found not to comply with the minimum specified density shall be recompacted until the required density is obtained.
   2. If, because of unsatisfactory test results it is necessary to retest after corrective works, cost of tests other than initial tests shall be paid by subcontractor.

3.08 CONSTRUCTION WASTE MANAGEMENT

A. Excess or Unusable Material: Remove from site for offsite disposal in accordance with local laws and regulations.

B. Dumping or indiscriminate spilling of hazardous waste, including refined petroleum products, onto the ground shall not be allowed.

3.09 REPAIRS

A. Fill and Backfill: Correct settlement in backfill, fill, or in structures built over backfill or fill, which may occur within one year correction period. Restore any structures damaged by settlement to their original condition at no cost to Owner.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 12 00

FLEXIBLE PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes New Asphalt Paving For:
   1. Parking areas.
   2. Driveways.

1.02 QUALITY ASSURANCE

A. Reference Standards: Comply with CALTRANS Standard Specifications, Dept. of Transportation, Business and Transportation Agency, State of California, which shall be made a part of these specifications by reference.

PART 2 PRODUCTS

2.01 BASE COURSE MATERIAL

A. Aggregate Base Course: Comply with one of the following:
   1. In accordance with Standard Specifications for Public Works Construction; or
   2. Caltrans Class2 aggregate base standards, minimum R-value of 78..

2.02 ASPHALTIC CONCRETE MIXTURE

A. The bituminous surfacing shall be dense graded, central plant mix, asphalt concrete conforming to the referenced standard specifications. The mineral aggregate grading and percent asphalt binder shall be based on a job mix formula determined by the Marshall Method of Mix Design (AASHTO T245-13) and tests of the materials intended for use.

2.03 SOIL STERILIZER

A. Acceptable Products: Elanco Treflan Liquid Sterilizer or approved equal. Mix 4 gallons sterilizer with 46 gallons water.

PART 3 EXECUTION

3.01 PAVEMENT DESIGN

A. Design pavement section thicknesses, including aggregate base course and asphalt surface courses.

3.02 PREPARATION OF SUBGRADE

A. Cut and Fill: Earthwork subcontractor shall perform all cut and fill work required to bring the grade to the correct level to receive base course material.

B. Proof Rolling: Before beginning subgrade preparation, asphalt paving subcontractor shall proof roll subgrade with heavily loaded pneumatic tired vehicles. Areas which deform under proof rolling shall be reported to the Architect before proceeding.

C. Compaction of Subgrade:
   1. Asphalt paving contractor shall plow or scarify all subgrade to a depth of 6 inches and recompact near optimum moisture to a minimum of 95 percent of maximum dry Density according to ASTM D1557.
   2. Proctor Density tests will be taken by the Soils Engineer and his written approval obtained before proceeding.

3.03 SOIL STERILIZATION

A. Immediately prior to application to aggregate base course material apply soil sterilizer to subgrade. Treat surface with 50 gallons of water/sterilizer per acre uniformly distributed. Apply as recommended by the manufacturer taking extreme care not to sterilize the adjacent area.

3.04 PLACEMENT OF BASE COURSE

A. Hauling and Placing:
   1. Exercise care in the hauling and placing of base course so as to avoid segregation of the course and fine materials. Place base course material on the previously prepared subgrade in sufficient quantity to conform to the thickness specified. The material shall be mixed and watered to obtain a uniform mixture at optimum moisture.
   2. Place and compact within 2 percent of optimum moisture. Continue compaction until the base course has a density of not less than 95 percent of Modified Proctor Density, ASTM D1557.

B. Surface and Thickness Tolerances: The subgrade of the prepared base course material shall be free from depressions exceeding 3/16-inch in 10 feet when measured with a straightedge. The surface shall be smooth and true to the established crown and grade. Any areas not complying with these tolerances shall be reworked to conform.

3.05 PRIME COAT

A. Apply prime coat to completed base course if required by Standard Specifications.

3.06 TACK COAT

A. Apply tack coat of emulsified asphalt to edge of curb and all other concrete surfaces or existing asphalt adjoining new asphalt paving.

3.07 PLACEMENT OF ASPHALTIC CONCRETE

A. General: Comply with requirements of Standard Specifications listed in Paragraph 1.03 C.

B. Lift Placement: Number of lifts and lift thickness shall comply with Article 3.01.
   1. Maximum Lift Thickness: 3 inches.

C. Second, third and fourth lifts must be placed within 48 hours of preceding lift or a tack coat will be required.

D. Compaction: Minimum of 95 percent of relative compaction based on the ASTM D1561 and D2726 laboratory standards.

E. Seal coating of new asphalt is not required.

3.08 FIELD QUALITY CONTROL

A. Testing: Testing of base course compaction and sampling and testing of asphalt concrete mixtures for quality control during paving operation will be done by the testing laboratory using applicable ASTM and AASHTO testing procedures.

B. Record of Work: A record shall be kept by the Contractor listing the time and date of placement of all asphalt work. Retain all records until the completion of the Project and make available to the Architect for examination at any time.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Concrete drives and vehicular paving.
      a. Subgrade preparation.
      b. Reinforcement.
      c. Concrete placement, finishing and curing.
      d. Joint treatment.

1.02 REFERENCE STANDARDS

A. Comply with CALTRANS Standard Specifications, Dept. of Transportation, Business and Transportation Agency, State of California, which shall be made a part of these specifications by reference.

PART 2 PRODUCTS

2.01 MATERIALS

a. Concrete: Supplied under Section 03 30 00.
   1. Use ready mixed concrete conforming with ASTM C94. On-site mixed concrete will not be allowed.

2.02 ACCESSORIES

A. Poured Joint Sealer: Hot applied, single component asphaltic rubber crack and joint sealant which meets all requirements of ASTM D6690-07 Type I, AASHTO M173, and Federal Specifications SSS-S-164.

PART 3 EXECUTION

3.01 PREPARATION

A. Subgrade: Perform minor cut and fill required to bring grade to correct level to receive concrete work. Fine grade and recompact to comply with Section 31 00 00

B. Existing Asphalt: Where new concrete paving abuts existing asphalt paving, cut asphalt to straight line and place concrete against asphalt to avoid necessity of patching asphalt.

3.02 PAVING

A. General: Construct paving in accordance with Drawings, and in conformance with applicable local codes and ordinances.

B. Finish: Broom or belt finish unless otherwise indicated with final surface finish as directed by Architect.
   1. Finish edges with slightly rounded edging tool.
   2. Broom finish perpendicular to direction of travel as indicated.

C. Slope: Slope pavement next to building away from building unless otherwise indicated.

3.03 FIELD QUALITY CONTROL

A. Concrete Testing: Comply with testing requirements specified in Section 03 30 00.

B. Record of Work: Keep record listing time and date of placement of concrete. Keep record until completion of Project and make available to Architect for examination at any time.

END OF SECTION

DIVISION 33 – UTILITIES

SECTION 33 00 00

UTILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Water and sanitary sewer to 5 feet outside line of buildings.

1.02 REFERENCES

A. Reference Standards: See Section 01 42 00. Utility work shall comply with following.
   1. City of San Diego Public Works Standards.

END OF SECTION

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EUCALYPTUS
CANARY ISLAND PINE
STONE PINE
JACARANDA
TIPUANA
PALM
CHAMPHOR
ORNAMENTAL PEAR
PROPERTY LINE

TRI-CITY MEDICAL CENTER
EXISTING TREE SURVEY-SURROUNDING

SPURLOCK POIRIER
LANDSCAPE ARCHITECTS

TRI-CITY MEDICAL CENTER
EXISTING TREE SURVEY-CAMPUS

TRI-CITY MEDICAL CENTER
LANDSCAPE CONCEPT

SPURLOCK POIRIER
LANDSCAPE ARCHITECTS

TRI-CITY MEDICAL CENTER

TREE DIAGRAM

SPURLOCK POIRIER
LANDSCAPE ARCHITECTS

9/21/2017

ARRIVAL CORE TREE

CHARACTER: FORMAL, STRUCTURAL, COLOR INTEREST

PHOENIX DACTYLIFERA MEDJOOL
DATE PALM
40'H X 20'-25'W

ACACIA CULTRIFORMIS
KNIFELEAF ACACIA
10'-15'H X 10'-15'W

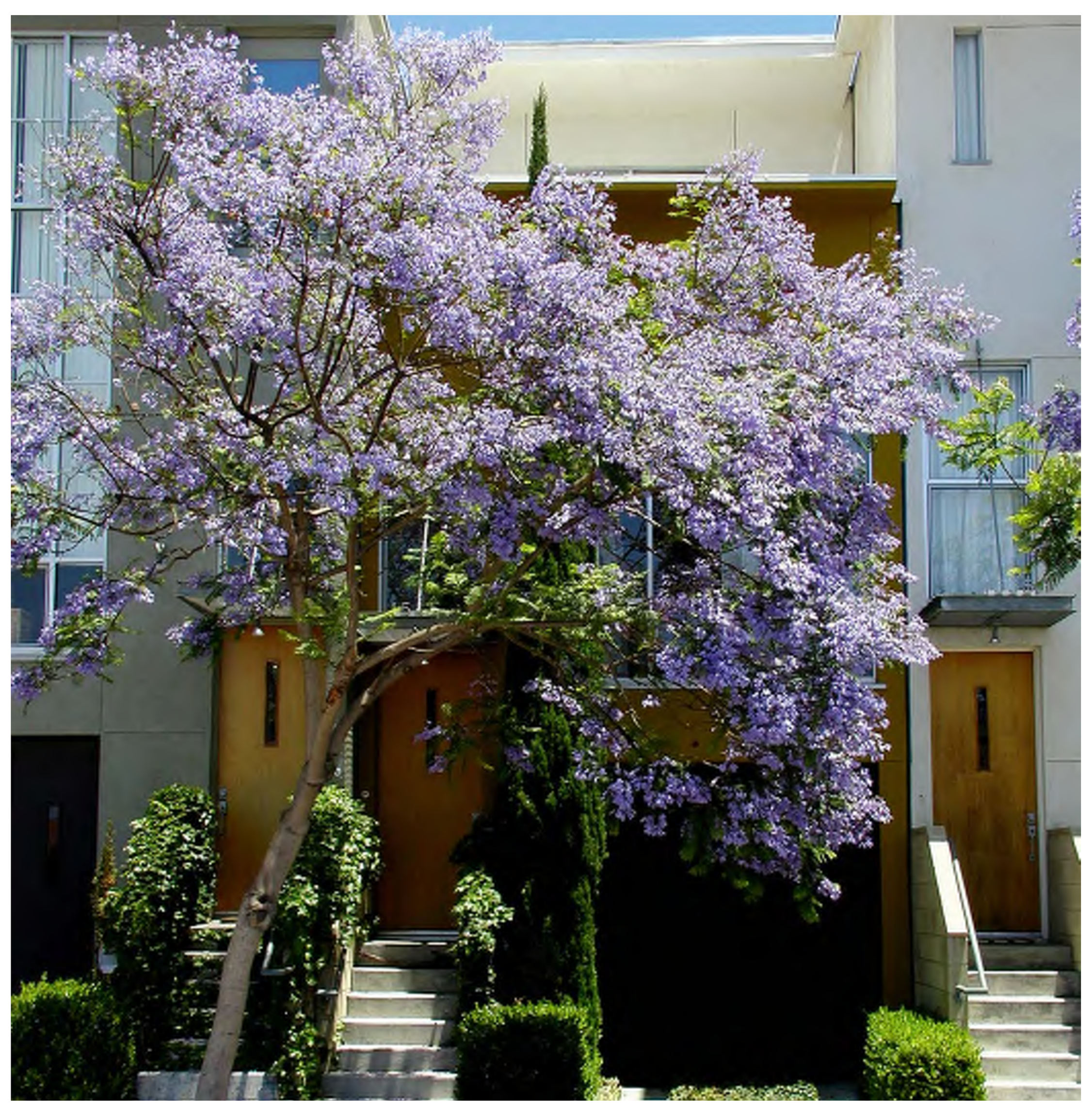
CERCIDIUM X 'DESERT MUSEUM'
DESERT MUSEUM THORNLESS PALO VERDE
25'H X 25'W

OLEA EUROPAEA 'WILSONI'
FRUITLESS OLIVE
25'-30'H X 25'-30'W

ACCENT TREE

CHARACTER: FLOWERING, COLOR INTEREST, SENSORIAL EXPERIENCE

ERYTHRINA CORALLOIDES
NAKED CORAL TREE
20'-30'H X 20'-30'W



JACARANDA MIMOSIFOLIA
BLUE JACARANDA
25'-40'H X 15'-30'W

CERCIS OCCIDENTALIS
WESTERN REDBUD
12'-20'H X 10'-15'W

BRAHEA ARMATA
BLUE HESPER PALM
25'-40'H X 6'-8'W

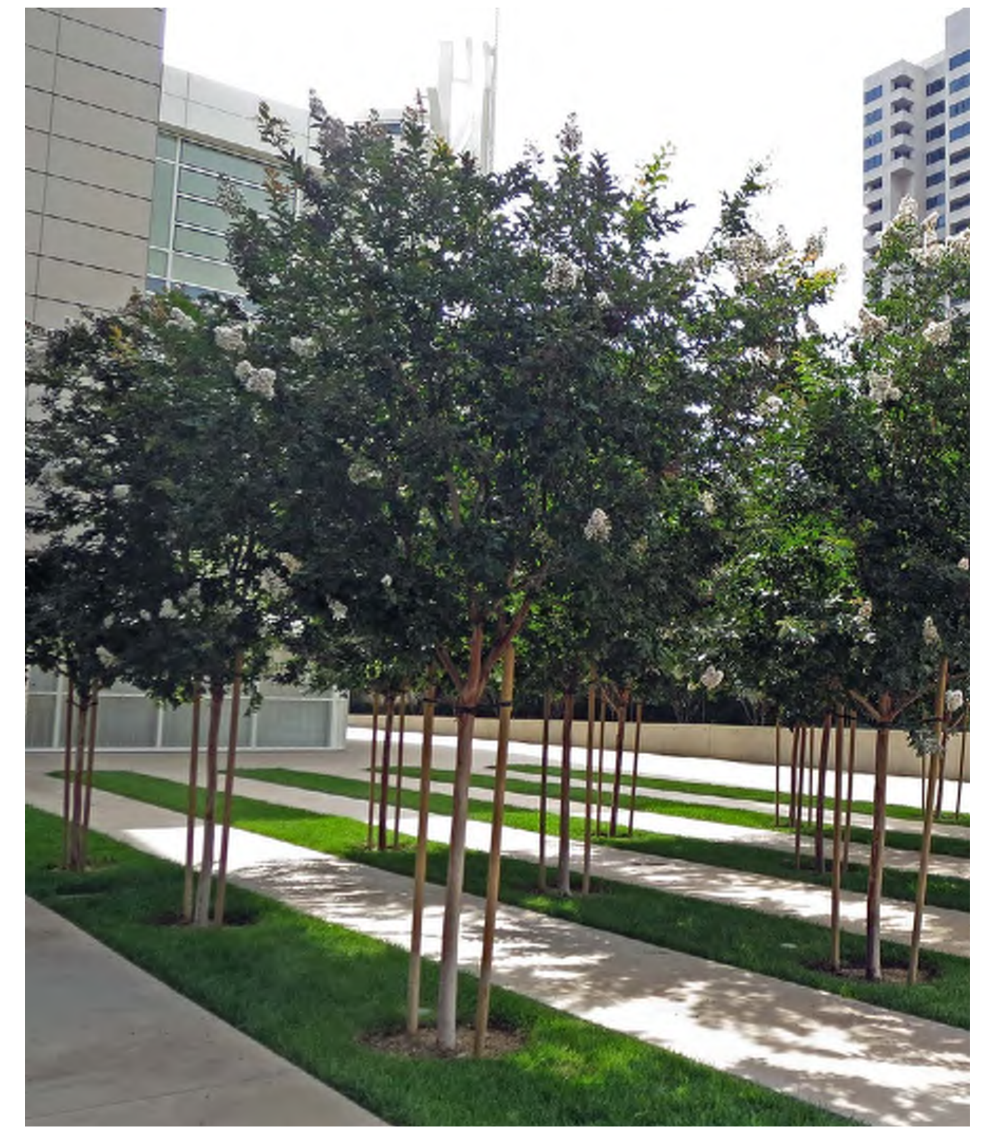
COURTYARD TREE

CHARACTER: SAMLLER SCALE, TEXTURE INTEREST, SENSORIAL EXPERIENCE

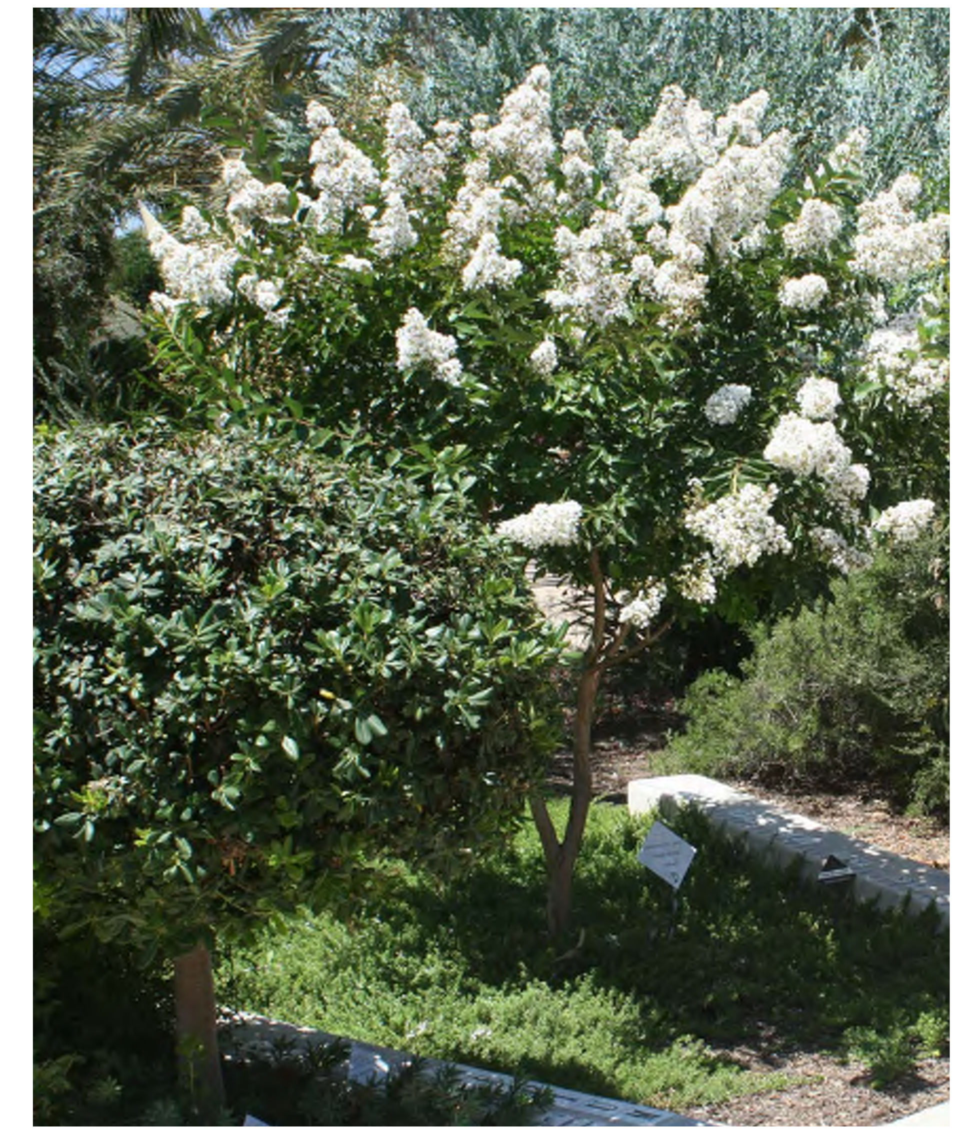
CERCIS CANADENSIS
FOREST PANSY
12'-20'H X 15'-25'W

CHAMAEROPS HUMILIS
MEDITERRANEAN FAN PALM
8'-1'H X 10'-15'W

CHITALPA TASHKENTENSIS 'PINK DAWN'
CHITALPA
15'-25'H X 15'-25'W



LAGERSTROEMIA INDICA
CRAPE MYRTLE
15'-30'H X 15'-30'W



LAGERSTROEMIA INDICA
CRAPE MYRTLE-MULTI
15'-30'H X 15'-30'W

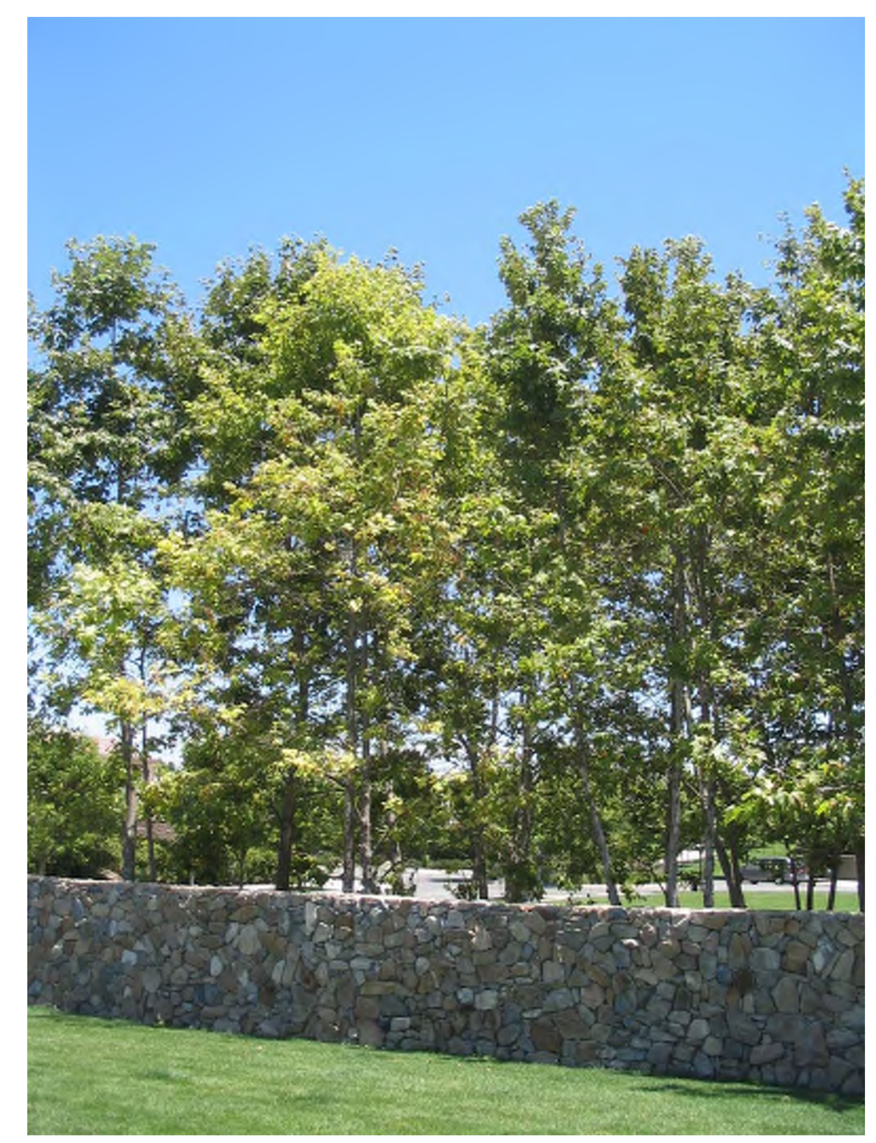
DECIDUOUS TREE

CHARACTER: OPEN, AIRY, SEASONAL INTEREST

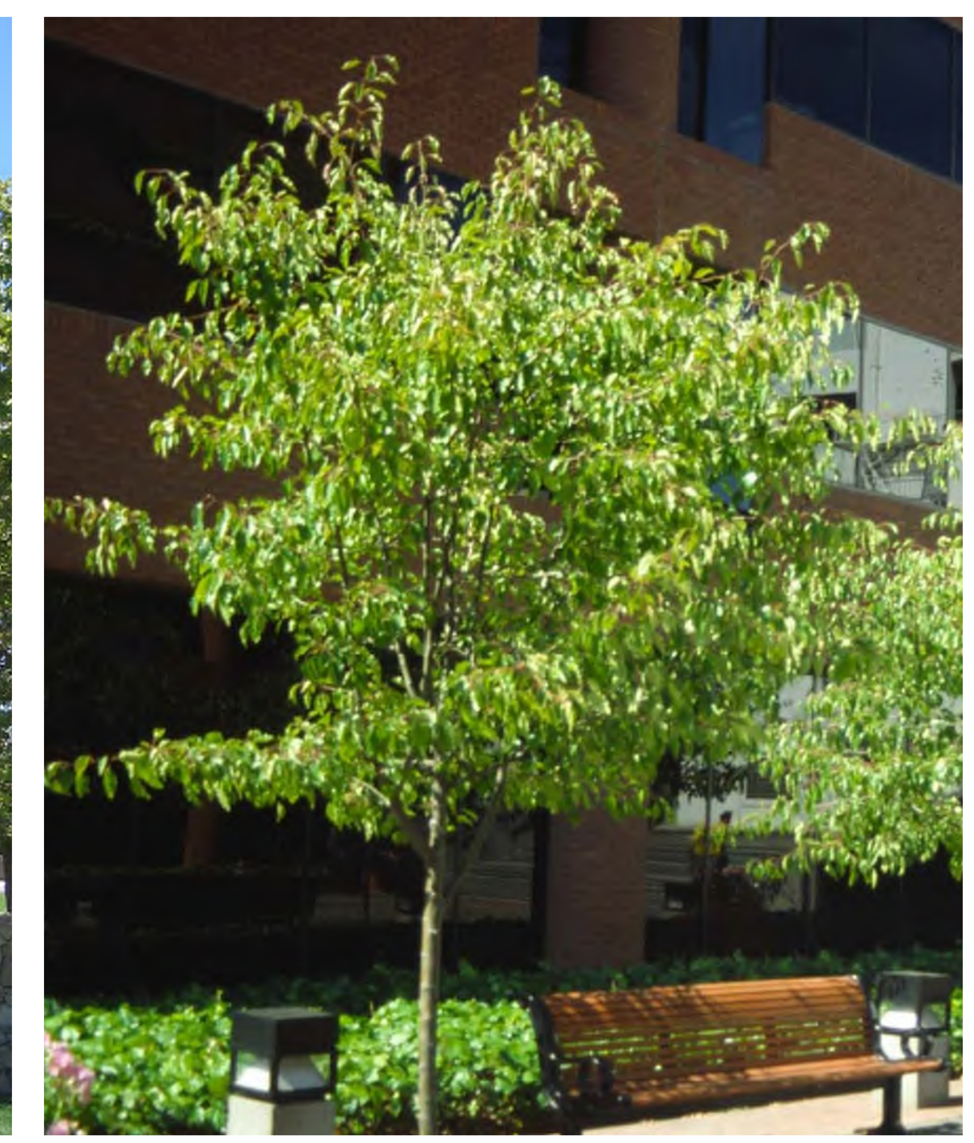
TIPUANA TIPU
TIPU TREE
20'-30'H X 20'-30'W

ARBUTUS 'MARINA'
MARINA STRAWBERRY TREE
40'-50'H X 25'-40'W

KOELREUTERIA PANICULATA
GOLDEN RAIN TREE
20'-30'H X 25'-35'W



PLATANUS RACEMOSA
CALIFORNIA SYCAMORE
30'-70'H X 25'-45'W



PYRUS CALLERYANA ARISTOCRAT
ORNAMENTAL PEAR
15'-20'H X 12'-16'W

EVERGREEN TREE

CHARACTER: DENSE, WOODY

PINUS BRUTIA
AFGHANISTAN PINE
30'-50'H X 25'-30'W

PINUS CANARIENSIS
CANARY ISLAND PINE
50'-80'H X 30'W

QUERCUS ILEX
HOLLY OAK
30'-60'H X 30'-60'W

ARBUTUS UNEDO
STRAWBERRY TREE
10'-15'H X 10'-15'W

LOPHOSTEMON CONFERTUS
BRISBANE BOX
40'-60'H X 20'-30'W

METROSIDEROS EXCELSA
NEW ZEALAND CHRISTMAS TREE
20'-30'H X 10'-15'W

	ARRIVAL/ACCENT PLANTING
	COURTYARD/FLOWERING PLANTING
	GRASSY MEADOW
	PERIMETER PARKING PLANTING
	TALL SCREENING PLANTING

TRI-CITY MEDICAL CENTER
UNDERSTORY PLANTING DIAGRAM

SPURLOCK POIRIER
LANDSCAPE ARCHITECTS

9/21/2017

ARRIVAL PLANTING

-COLOR MASSINGS HIGHLIGHTING KEY AREAS
-ADDITIONAL SENSORIAL EXPERIENCE

Plant massings such as:

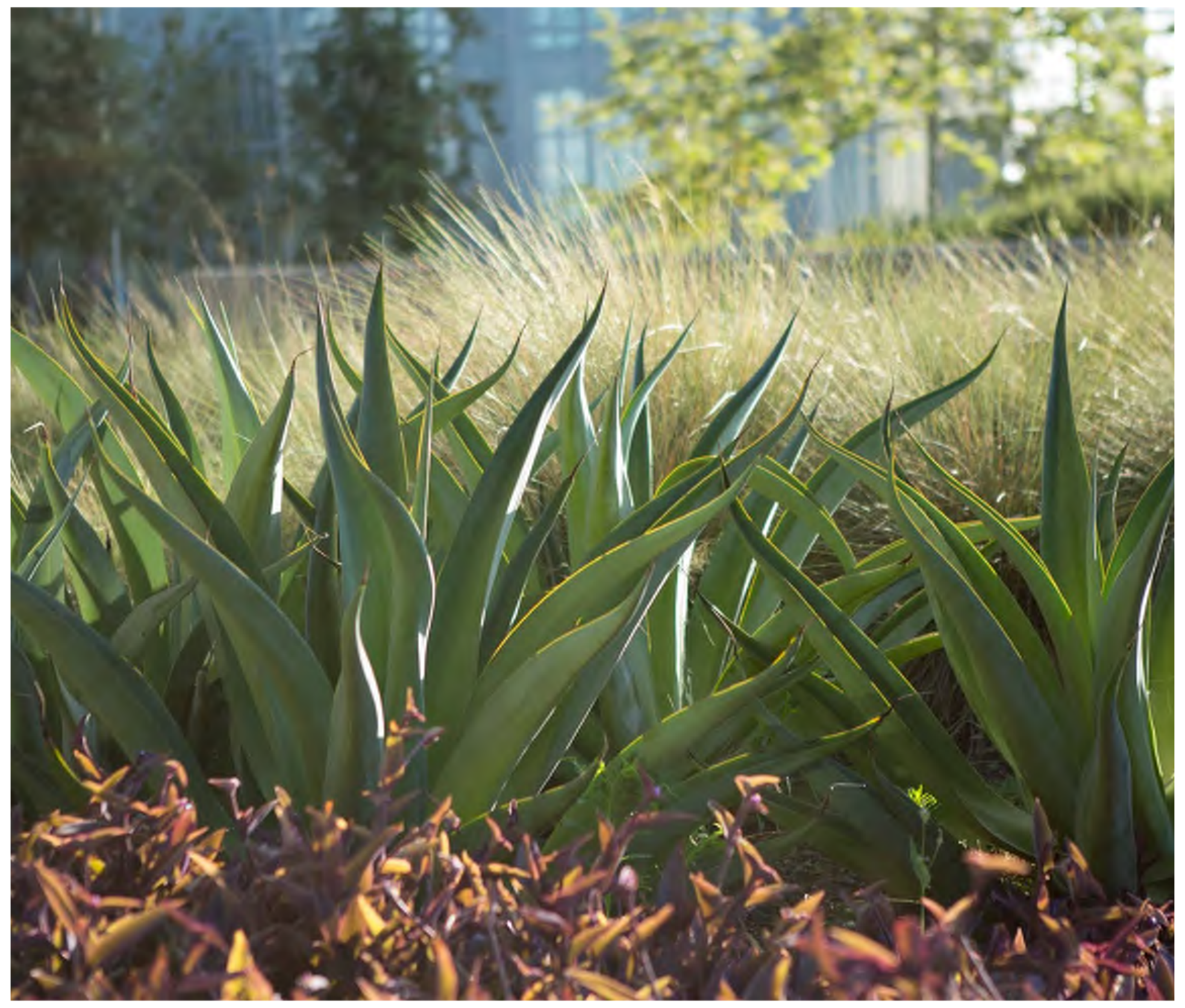
Rosa Iceberg
Calandrinia grandiflora
Anigozanthos sp
Salvia sp
Lavandula sp
Aloe striata
Agave sp.










ARRIVAL PLANTING

-MEDIUM AND TALL SHRUB
-PROVIDE BACKGROUND INTEREST
-PROVIDE SCREENING WHERE APPROPRIATE
-CREATE SOCIAL SPACES & PROVIDE OPPORTUNITIES FOR RESPITE

Plant massings such as:

Woodwardia fimbriata
Polysticum sp.
Camelia sp.
Metrosideros sp
Arbutus unedo 'compacta'
Rhamnus californica
Rosemary sp.

COURTYARD PLANTING

-SHADE PLANTINGS
-ACCENT COLOR AND TEXTURE MASSINGS
-SENSORIAL EXPERIENCE (TACTILE, AROMATIC)

Plant massings such as:
Trachelospermum jasminoides
Liriope spicata
Vinca minor
Ribes viburnifolium
Woodwardia fimbriata
Dietes grandiflora 'variegated'
Polystichum
Carex tumilicola
Dianella tasmanica 'variegated'

GRASSY MEADOW

-GRASSES
-NATIVE GRASS MASSINGS FOR TEXTURE ACCENTS

Plant massings such as:
Muhlenbergia rigens
Carex tumilicola
Festuca mairei
Sesleria autumnalis
Leymus condensatus

PERIMETER PLANTING

-GROUNDCOVER + LOW SHRUB
-SILVER TO LIGHT GREEN PALETTE
-AIRY PLANT MASSINGS, TYPICALLY 2'-4' HEIGHT

groundcover massings such as:

Baccharis pilularis 'pigeon point'
Artemisia california 'canyon gray'

Low shrub massings such as:

Artemisia 'powis castle'
Cotoneaster glaucophyllus
Agave sp
Salvia varieties
Viguiera laciniata
Leymus condensatus

TALL SCREENING PLANTING

-TALL SHRUB
-EVERGREEN SHRUB MASSINGS, TYPICALLY 3'-6'+ HEIGHT
-PROVIDE BACKGROUND STRUCTURE
-SOME SEASONAL INTEREST

Plant massings such as:

Artemisia tridentata
Ceanothus sp.
Cotoneaster lacteus
Heteromeles arbutifolia 'Davis Gold'
Rhus integrifolia
Rhamnus californica
Rhaphiolepis umbellata
Pittosporum tobira & crassifolium



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G. TCMC STRATEGIC PLANNING DATA

1. Emergency Department

The existing Emergency Department currently sees a high volume of visits to the 1988 addition, with an overloaded and difficult check-in and wait time, and an overcrowded waiting room, and the need for an ED clinical decision unit.

Existing:	**Projected:**
72,000 Annual Visits	90,000 Annual Visits
47 Beds	60 Beds
1,531 Visits / Bed / Year	1,500 Visits / Bed / Year

8

TITLE NOTES

1. COVENANTS, CONDITIONS, AND RESTRICTIONS AS SET FORTH IN INSTRUMENT RECORDED MARCH 6, 1959, IN BOOK 7534, PAGE 233, OFFICIAL RECORDS, BUT OMITTED ANY COVENANT, CONDITION OR RESTRICTION, IF ANY, BASED ON RACE, COLOR, RELIGION, SEX, HANDICAP, FAMILIAL STATUS OR NATIONAL ORIGIN UNLESS AND ONLY TO THE EXTENT THAT THE COVENANT, CONDITION OR RESTRICTION; (A) IS EXEMPT UNDER TITLE 42 OF THE UNITED STATES CODE; OR (B) RELATES TO HANDICAP, BUT DOES NOT DISCRIMINATE AGAINST HANDICAPPED PERSONS. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

   NOTE: SECTION 12956.1 OF THE GOVERNMENT CODE PROVIDES THE FOLLOWING: IF THIS DOCUMENT CONTAINS ANY RESTRICTIONS BASED ON RACE, COLOR, RELIGION, SEX, FAMILIAL STATUS, MARITAL STATUS, DISABILITY, NATIONAL ORIGIN, OR ANCESTRY, THAT RESTRICTION VIOLATES STATE AND FEDERAL FAIR HOUSING LAWS AND IS VOID, AND MAY BE REMOVED PURSUANT TO SECTION 12956.1 OF THE GOVERNMENT CODE. LAWFUL RESTRICTIONS UNDER STATE AND FEDERAL LAW ON THE AGE OF OCCUPANTS IN SENIOR HOUSING OR FOR OLDER PERSONS SHALL NOT BE CONSTRUED AS RESTRICTIONS BASED ON FAMILIAL STATUS.

2. THE EFFECTS OF AN EASEMENT FOR ROAD AND RIGHTS INCIDENTAL THERETO IN FAVOR OF VISTA IRRIGATION DISTRICT AS SET FORTH IN A DOCUMENT RECORDED OCTOBER 20, 1960, AS INSTRUMENT NO. 209061, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

3. THE EFFECTS OF AN EASEMENT FOR PUBLIC UTILITIES, APPURTENANCES, INGRESS, EGRESS AND RIGHTS INCIDENTAL THERETO IN FAVOR OF THE SAN DIEGO GAS AND ELECTRIC COMPANY AS SET FORTH IN A DOCUMENT RECORDED JANUARY 17, 1962, AS INSTRUMENT NO. 9485, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

4. THE EFFECTS OF AN EASEMENT FOR PUBLIC HIGHWAY AND RIGHTS INCIDENTAL THERETO IN FAVOR OF CITY OF OCEANSIDE, A MUNICIPAL CORPORATION AS SET FORTH IN A DOCUMENT RECORDED MAY 1, 1962, AS INSTRUMENT NO. 85675, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

5. THE EFFECTS OF THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM A PUBLIC STREET OR HIGHWAY ABUTTING SAID LAND, SUCH RIGHTS HAVING BEEN SEVERED FROM SAID LAND BY THE DOCUMENT RECORDED APRIL 28, 1964, AS INSTRUMENT NO. 76266, OF OFFICIAL RECORDS, WHICH AFFECTS HIGHWAY 78. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

11. AN EASEMENT FOR PUBLIC UTILITIES, APPURTENANCES, INGRESS, EGRESS AND RIGHTS INCIDENTAL THERETO IN FAVOR OF THE SAN DIEGO GAS AND ELECTRIC COMPANY AS SET FORTH IN A DOCUMENT RECORDED MAY 2, 1984 AS INSTRUMENT NO. 84–161886, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT IS NON–PLOTTABLE DUE TO ITS LACK OF A RETRACTABLE LEGAL DESCRIPTION AND HAS NOT BEEN SHOWN HEREON.

12. THE EFFECTS OF COVENANTS, CONDITIONS, AND RESTRICTIONS AS SET FORTH IN INSTRUMENT RECORDED JULY 31, 1989 AS INSTRUMENT NO. 89–405056, OFFICIAL RECORDS, BUT OMITTED ANY COVENANT, CONDITION OR RESTRICTION, IF ANY, BASED ON RACE, COLOR, RELIGION, SEX, HANDICAP, FAMILIAL STATUS OR NATIONAL ORIGIN UNLESS AND ONLY TO THE EXTENT THAT THE COVENANT, CONDITION OR RESTRICTION; (A) IS EXEMPT UNDER TITLE 42 OF THE UNITED STATES CODE; OR (B) RELATES TO HANDICAP, BUT DOES NOT DISCRIMINATE AGAINST HANDICAPPED PERSONS. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS.

    NOTE: SECTION 12956.1 OF THE GOVERNMENT CODE PROVIDES THE FOLLOWING: IF THIS DOCUMENT CONTAINS ANY RESTRICTIONS BASED ON RACE, COLOR, RELIGION, SEX, FAMILIAL STATUS, MARITAL STATUS, DISABILITY, NATIONAL ORIGIN, OR ANCESTRY, THAT RESTRICTION VIOLATES STATE AND FEDERAL FAIR HOUSING LAWS AND IS VOID, AND MAY BE REMOVED PURSUANT TO SECTION 12956.1 OF THE GOVERNMENT CODE. LAWFUL RESTRICTIONS UNDER STATE AND FEDERAL LAW ON THE AGE OF OCCUPANTS IN SENIOR HOUSING OR FOR OLDER PERSONS SHALL NOT BE CONSTRUED AS RESTRICTIONS BASED ON FAMILIAL STATUS.

13. THE EFFECTS OF AN IRREVOCABLE OFFER TO DEDICATE REAL PROPERTY RECORDED SEPTEMBER 18, 1989 AS INSTRUMENT NO. 89–502431, OF OFFICIAL RECORDS, WHEREIN A PORTION OF SAID LAND WAS OFFERED FOR DEDICATION TO PUBLIC USE FOR VEHICULAR ACCESS TO VISTA WAY AND THUNDER DRIVE PURPOSES, WHICH AFFECTS SAID LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

14. THE EFFECTS OF THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM A PUBLIC STREET OR HIGHWAY ABUTTING SAID LAND, SUCH RIGHTS HAVING BEEN SEVERED FROM SAID LAND BY THE DOCUMENT RECORDED SEPTEMBER 18, 1989 AS INSTRUMENT NO. 89–502431, WHICH AFFECTS VISTA WAY AND THUNDER DRIVE, EXCEPT AT ACCESS OPENING NOS. 1, 2, 3 AND 4 AS DESCRIBED IN SAID DOCUMENT. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

15. THE EFFECTS OF AN EASEMENT FOR OPEN SPACE AND RIGHTS INCIDENTAL THERETO IN FAVOR OF TRI–MEDICAL GROUP, A CALIFORNIA GENERAL PARTNERSHIP AS SET FORTH IN A DOCUMENT RECORDED NOVEMBER 7, 1989 AS INSTRUMENT NO. 89–606796, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

16. THE EFFECTS OF AN EASEMENT FOR PUBLIC UTILITIES, APPURTENANCES, INGRESS, EGRESS AND RIGHTS INCIDENTAL THERETO IN FAVOR OF THE SAN DIEGO GAS AND ELECTRIC COMPANY AS SET FORTH IN A DOCUMENT RECORDED NOVEMBER 17, 1989 AS INSTRUMENT NO. 89–626283, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT IS NON–PLOTTABLE DUE TO ITS LACK OF A RETRACTABLE LEGAL DESCRIPTION AND HAS NOT BEEN SHOWN HEREON.

17. THE EFFECTS OF AN EASEMENT FOR WATER LINE AND RIGHTS INCIDENTAL THERETO IN FAVOR OF THE CITY OF OCEANSIDE, A MUNICIPAL CORPORATION AS SET FORTH IN A DOCUMENT RECORDED DECEMBER 27, 1989 AS INSTRUMENT NO. 89–699953, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

18. THE EFFECT, IF ANY, OF RECORD OF SURVEY MAP NO. 12610 WHICH SETS FORTH, OR PURPORTS TO SET FORTH CERTAIN DIMENSIONS AND BEARINGS OF THE HEREIN DESCRIBED PROPERTY. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS.

19. THE EFFECTS OF AN EASEMENT FOR PUBLIC UTILITIES, APPURTENANCES, INGRESS, EGRESS AND RIGHTS INCIDENTAL THERETO IN FAVOR OF THE SAN DIEGO GAS AND ELECTRIC COMPANY AS SET FORTH IN A DOCUMENT RECORDED JUNE 29, 1990 AS INSTRUMENT NO. 90–355141, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT IS NON–PLOTTABLE DUE TO ITS LACK OF A RETRACTABLE LEGAL DESCRIPTION AND HAS NOT BEEN SHOWN HEREON.

21. THE EFFECTS OF THE MATTERS CONTAINED IN AN INSTRUMENT ENTITLED "EASEMENT FOR PEDESTRIAN BRIDGE AND AGREEMENT FOR USE" DATED MARCH 20, 1990, BY AND BETWEEN TRI–CITY HOSPITAL DISTRICT, A LOCAL HOSPITAL DISTRICT, ORGANIZED AND EXISTING UNDER THE LOCAL HOSPITAL DISTRICT LAW OF THE STATE OF CALIFORNIA AND TRI–CITY MEDICAL GROUP, A CALIFORNIA GENERAL PARTNERSHIP UPON THE TERMS THEREIN PROVIDED RECORDED NOVEMBER 29, 1990 AS INSTRUMENT NO. 90–636494, OF OFFICIAL RECORDS.REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

22. THE EFFECTS OF COVENANTS, CONDITIONS, AND RESTRICTIONS AS SET FORTH IN INSTRUMENT RECORDED DECEMBER 10, 1990 AS INSTRUMENT NO. 90–656153, OFFICIAL RECORDS, BUT OMITTED ANY COVENANT, CONDITION OR RESTRICTION, IF ANY, BASED ON RACE, COLOR, RELIGION, SEX, HANDICAP, FAMILIAL STATUS OR NATIONAL ORIGIN UNLESS AND ONLY TO THE EXTENT THAT THE COVENANT, CONDITION OR RESTRICTION; (A) IS EXEMPT UNDER TITLE 42 OF THE UNITED STATES CODE; OR (B) RELATES TO HANDICAP, BUT DOES NOT DISCRIMINATE AGAINST HANDICAPPED PERSONS. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS.

    NOTE: SECTION 12956.1 OF THE GOVERNMENT CODE PROVIDES THE FOLLOWING: IF THIS DOCUMENT CONTAINS ANY RESTRICTIONS BASED ON RACE, COLOR, RELIGION, SEX, FAMILIAL STATUS, MARITAL STATUS, DISABILITY, NATIONAL ORIGIN, OR ANCESTRY, THAT RESTRICTION VIOLATES STATE AND FEDERAL FAIR HOUSING LAWS AND IS VOID, AND MAY BE REMOVED PURSUANT TO SECTION 12956.1 OF THE GOVERNMENT CODE. LAWFUL RESTRICTIONS UNDER STATE AND FEDERAL LAW ON THE AGE OF OCCUPANTS IN SENIOR HOUSING OR FOR OLDER PERSONS SHALL NOT BE CONSTRUED AS RESTRICTIONS BASED ON FAMILIAL STATUS.

    AMONG OTHER THINGS, SAID DOCUMENT PROVIDES FOR DEVELOPMENT PLAN NO. D–49–88 (AMENDMENT) AND CONDITIONAL USE PERMIT C–38–88 (AMENDMENT), APPROVED BY THE CITY OF OCEANSIDE PURSUANT TO VARIANCE NO. V–14–90, ADOPTED BY THE PLANNING COMMISSION OF THE CITY OF OCEANSIDE ON MAY 29, 1990 (HEREINAFTER REFERRED TO AS THE "RESOLUTION"), FOR THE ADDITION OF A MAGNETIC RESONANCE IMAGING (MRI) FACILITY ON THE PROPERTY.

23. THE EFFECTS OF AN EASEMENT FOR PUBLIC UTILITIES, APPURTENANCES, INGRESS, EGRESS AND RIGHTS INCIDENTAL THERETO IN FAVOR OF THE SAN DIEGO GAS AND ELECTRIC COMPANY AS SET FORTH IN A DOCUMENT RECORDED MAY 6, 1992 AS INSTRUMENT NO. 1992–0272658, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

24. THE EFFECTS OF AN EASEMENT FOR CABLE TELEVISION FACILITIES AND RIGHTS INCIDENTAL THERETO IN FAVOR OF TIMES MIRROR CABLE TELEVISION OF SAN DIEGO COUNTY, INC. AS SET FORTH IN A DOCUMENT RECORDED MAY 9, 1994 AS INSTRUMENT NO. 1994–0305815, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT IS NON–PLOTTABLE DUE TO ITS LACK OF A RETRACTABLE LEGAL DESCRIPTION AND HAS NOT BEEN SHOWN HEREON.

25. THE EFFECTS OF AN EASEMENT FOR PUBLIC UTILITIES, APPURTENANCES, INGRESS, EGRESS AND RIGHTS INCIDENTAL THERETO IN FAVOR OF THE SAN DIEGO GAS AND ELECTRIC COMPANY AS SET FORTH IN A DOCUMENT RECORDED JULY 21, 2000 AS INSTRUMENT NO. 2000–0385366, OF OFFICIAL RECORDS, AFFECTS A PORTION OF THE HEREIN DESCRIBED LAND. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT IS NON–PLOTTABLE DUE TO ITS LACK OF A RETRACTABLE LEGAL DESCRIPTION AND HAS NOT BEEN SHOWN HEREON.

26. THE EFFECTS OF THE MATTERS CONTAINED IN AN INSTRUMENT ENTITLED "STORMWATER FACILITIES MAINTENANCE AGREEMENT WITH EASEMENT AND COVENANTS (ADP–3–03, GRADING PERMIT NO. 2333)" DATED AUGUST 26, 2004, BY AND BETWEEN TRI–CITY MEDICAL AND CITY OF OCEANSIDE UPON THE TERMS THEREIN PROVIDED RECORDED OCTOBER 18, 2004 AS INSTRUMENT NO. 2004–0984761, OF OFFICIAL RECORDS. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT IS NON–PLOTTABLE DUE TO ITS LACK OF A RETRACTABLE LEGAL DESCRIPTION AND HAS NOT BEEN SHOWN HEREON.

28. THE EFFECTS OF THE MATTERS CONTAINED IN AN INSTRUMENT ENTITLED "RECIPROCAL EASEMENT AGREEMENT" DATED MAY 12, 2006, BY AND BETWEEN 4000 VISTA WAY LLC, A CALIFORNIA LIMITED LIABILITY COMPANY AND TRI–CITY HEALTHCARE DISTRICT, A CALIFORNIA PUBLIC AGENCY UPON THE TERMS THEREIN PROVIDED RECORDED JUNE 1, 2006 AS INSTRUMENT NO. 2006–0388959, OF OFFICIAL RECORDS. REFERENCE IS MADE TO THE SUBJECT DOCUMENT FOR FULL PARTICULARS. EASEMENT HAS BEEN SHOWN HEREON.

NOTE SPECIFIC RESTRICTIONS SUCH AS "THE RIGHT TO KEEP SAID EASEMENT FREE FROM AND TO PREVENT ANY PERSON, INCLUDING THE GRANTOR, FROM CHANGING GRADE, ERECTING ANY STRUCTURES, OBJECTS, OR EARTH FILLS/CUTS OR OTHER OBSTRUCTIONS, EXCEPT WALLS AND FENCES."

UTILITY NOTE

THE LOCATIONS OF UNDERGROUND UTILITIES AS SHOWN HEREON ARE BASED ON VISIBLE ABOVE GROUND STRUCTURES AND RECORD DRAWINGS PROVIDED TO THE SURVEYOR. THE DEPICTED LOCATIONS, SIZES AND TYPES OF UNDERGROUND UTILITIES/STRUCTURES MAY VARY FROM THE RECORD DRAWINGS AND/OR ACTUAL AS–BUILT LOCATIONS. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED. NO EXCAVATIONS WERE MADE DURING THE PROGRESS OF THIS SURVEY TO LOCATE BURIED UTILITIES/STRUCTURES.

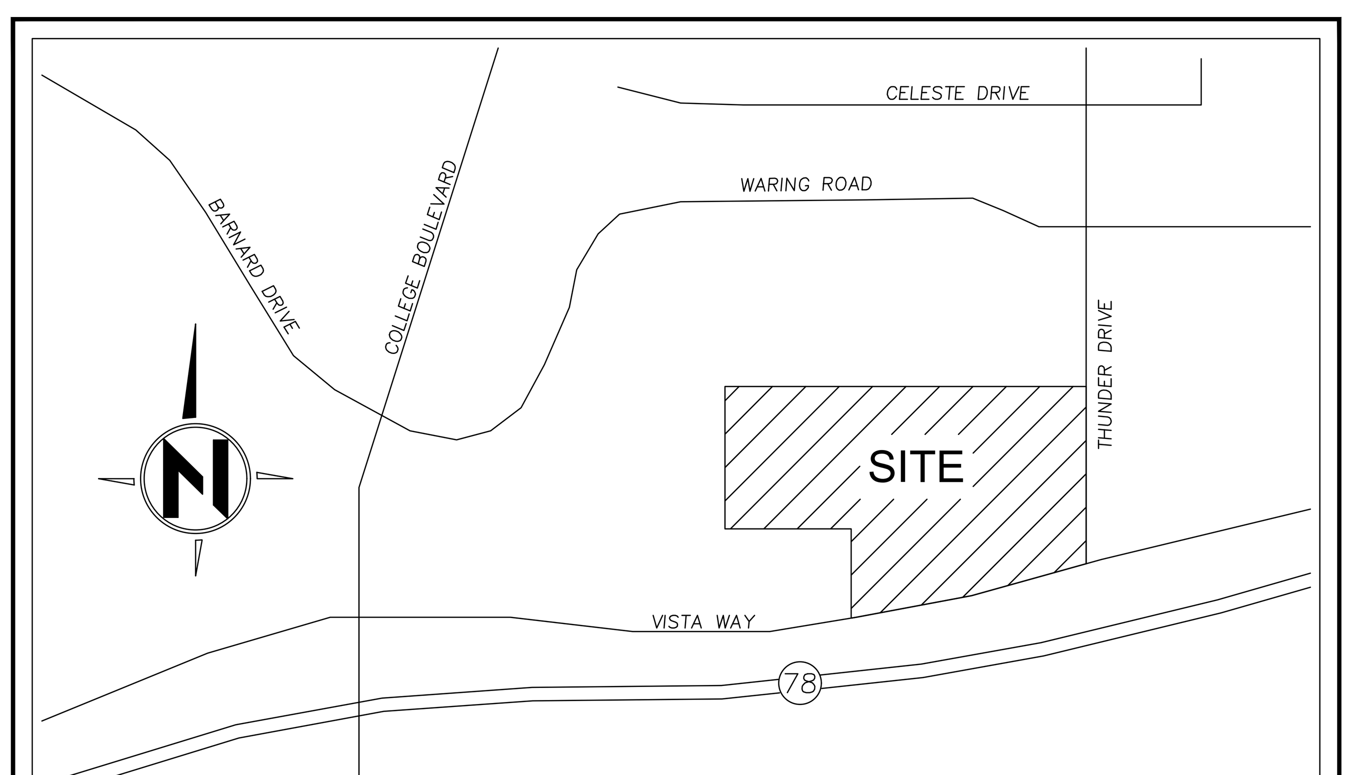
BWE AND THE UNDERSIGNED LAND SURVEYOR MAKE NO CLAIM AS TO THE ACCURACY OF UNDERGROUND UTILITIES SHOWN HEREON. THE USER OF THIS SURVEY IS RECOMMENDED TO CONDUCT INDEPENDENT PHYSICAL INSPECTION OF EACH UNDERGROUND UTILITY PRIOR TO EXCAVATION OR CONSTRUCTION.

REFERENCE DRAWINGS

THE FOLLOWING IS A LIST OF REFERENCE DRAWINGS USED IN THE PREPARATION OF THIS SURVEY AND ITS DEPICTION OF ANY UNDERGROUND OR SURFACE EVIDENT UTILITY:

1. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "TRI–CITY MEDICAL CENTER, OCEANSIDE, CALIFORNIA, CENTRAL PLANT INCREMENTAL SUBMITTAL # 1 OF 2" DRAWING NO. 1372, INCREMENT 1. APPROVAL DATE: 10/30/1989.
2. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED " PRECISE GRADING AND PRIVATE IMPROVEMENT PLANS FOR: TRI–CITY HOSPITAL SITE UTILITIES" DRAWING NO. 1390. APPROVAL DATE: 11/17/1989.
3. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "TRI–CITY MEDICAL CENTER, OCEANSIDE, CALIFORNIA, CENTRAL PLANT INCREMENTAL SUBMITTAL # 2 OF 2", DRAWING NO. 1372, INCREMENT 2. APPROVAL DATE: 1/25/1989.
4. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "PRECISE GRADING & PRIVATE IMPROVEMENT PLANS FOR TRI–CITY HOSPITAL SITE UTILITIES", DRAWING NO. 1390. APPROVAL DATE: 11/17/1989.
5. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "PRECISE GRADING & PRIVATE IMPROVEMENT PLANS FOR TRI–CITY HOSPITAL CENTRAL PLANT" DRAWING NO. 1372. APPROVAL DATE: 1/25/1990.
6. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "TRI–CITY MEDICAL CENTER, OCEANSIDE, CALIFORNIA, CENTRAL PLANT INCREMENTAL SUBMITTAL # 2 OF 2" PROJECT NO. 87–4030, INCREMENT 2. APPROVAL DATE: 6/27/1990.
7. PRIVATE IMPROVEMENT PLANS ENTITLED "TRI–CITY HOSPITAL MASTER WATER MAIN MAP", DATED: 7/27/1992.
8. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "PRECISE GRADING & PRIVATE IMPROVEMENT PLANS FOR TRI–CITY HOSPITAL MEDICAL CENTER OFFICE BUILDING", DRAWING NO. G11–00029. APPROVAL DATE: 1/5/2012.
9. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "PRECISE GRADING & PRIVATE IMPROVEMENT PLANS FOR TRI–CITY HOSPITAL WAREHOUSE–OFFICE BUILDING", DRAWING NO. 1344. APPROVAL DATE: 6/22/1989.
10. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "PRECISE GRADING & PRIVATE IMPROVEMENT PLANS FOR TRI–CITY HOSPITAL SURGICAL ADDITION", DRAWING NO. 1511. APPROVAL DATE: 11/7/1991.
11. CITY OF OCEANSIDE IMPROVEMENT PLANS ENTITLED "PRECISE GRADING & PRIVATE IMPROVEMENT PLANS FOR TRI–CITY HOSPITAL WOMEN'S CENTER", DRAWING NO. 1545. APPROVAL DATE: 5/15/1992.
12. AT&T UTILITY DRAWING NO(s). BIS1943, BIS1944 & BIS1945, PROCESSED DATE: 9/14/2016.
13. SDG&E ELECTRIC ASSET MAP NO. 15502–120460, 15502–120465, 15502–120470, 15510–120460, 15510–120465, 15510–120470, 15517–120460, 15517–120465 & 15517–120470, PRINTED DATE: 10/21/2016.
14. SDG&E GAS ASSET MAP NO. 15510–120460, 15517–120460, 15517–120465 & 15517–120470, PRINTED DATE: 11/7/2016.

ANY USER OF THIS SURVEY IS HEREBY CAUTIONED TO THE FACT THE ABOVE LIST MAY NOT BE A COMPLETE LIST OF ALL AVAILABLE REFERENCE DRAWINGS, RECORD DRAWINGS, UTILITY DRAWINGS OR OTHER SOURCES OF INFORMATION. IN THE EVENT A REFERENCE DRAWINGS, RECORD DRAWINGS, UTILITY DRAWINGS OR OTHER SOURCES OF INFORMATION IS DISCOVERED, PROVIDED OR PRODUCED BY ANY OWNER, ENGINEER, SURVEYOR, CONTRACTOR, OR OTHER USER OF THIS SURVEY PRODUCT, THE UNDERSIGNED SURVEYOR RESERVES THE RIGHT TO PERFORM REVISIONS, CORRECTIONS OR AMENDMENTS TO THIS SURVEY WITHOUT ANY USER OR OWNER LITIGIOUS ACTION.



VICINITY MAP
NO SCALE

SURVEYORS CERTIFICATE

TO: TRI–CITY HOSPITAL DISTRICT, A CALIFORNIA LOCAL HOSPITAL DISTRICT, ORGANIZED AND EXISTING UNDER LOCAL HOSPITAL DISTRICT LAW OF THE ESTATE OF CALIFORNIA, TOGETHER WITH ITS SUCCESSORS AND/OR ASSIGNS AS THEIR INTERESTS MAY APPEAR, AND STEWART TITLE COMPANY:

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 1, 2, 3, 4, 6a, 6b, 7a, 8, 9, 10a, 10b, 11b, 12, 13, 16, 17, 18, 19, AND 20a OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON JUNE 30, 2016.

DATE OF PLAT OR MAP: 11/8/2016.

CASEY R. LYNCH, P.LS.
LICENSE NO. L.S. 8380

OWNERS

TRI–CITY HOSPITAL DISTRICT, A CALIFORNIA LOCAL HOSPITAL DISTRICT, ORGANIZED AND EXISTING UNDER LOCAL HOSPITAL DISTRICT LAW OF THE ESTATE OF CALIFORNIA

LEGAL DESCRIPTION

PARCEL 3 OF PARCEL MAP NO. 5632, IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, MARCH 2, 1977 AS INSTRUMENT NO. 77–077587, OF OFFICIAL RECORDS.

(APN: 166–010–31)

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS MAP IS NORTH 89°56'08" WEST, BETWEEN FOUND MONUMENTS AS SHOWN ON THAT CERTAIN MAP, PARCEL MAP NO. 19566.

BENCH MARK

THE BASIS OF ELEVATION FOR THIS SURVEY IS THE CITY OF VISTA POINT STATION NO. "V2024" PER R.O.S. 14023. BEING A 2" ALUMINUM CAP ON 5/8" REBAR, FLUSH WITH AC PAVEMENT, STAMPED "HUNSAKER & ASSOC. G.P.S. CONTROL POINT 2024". LOCATED AT THE INTERSECTION OF THUNDER DRIVE AND GENIE DRIVE.

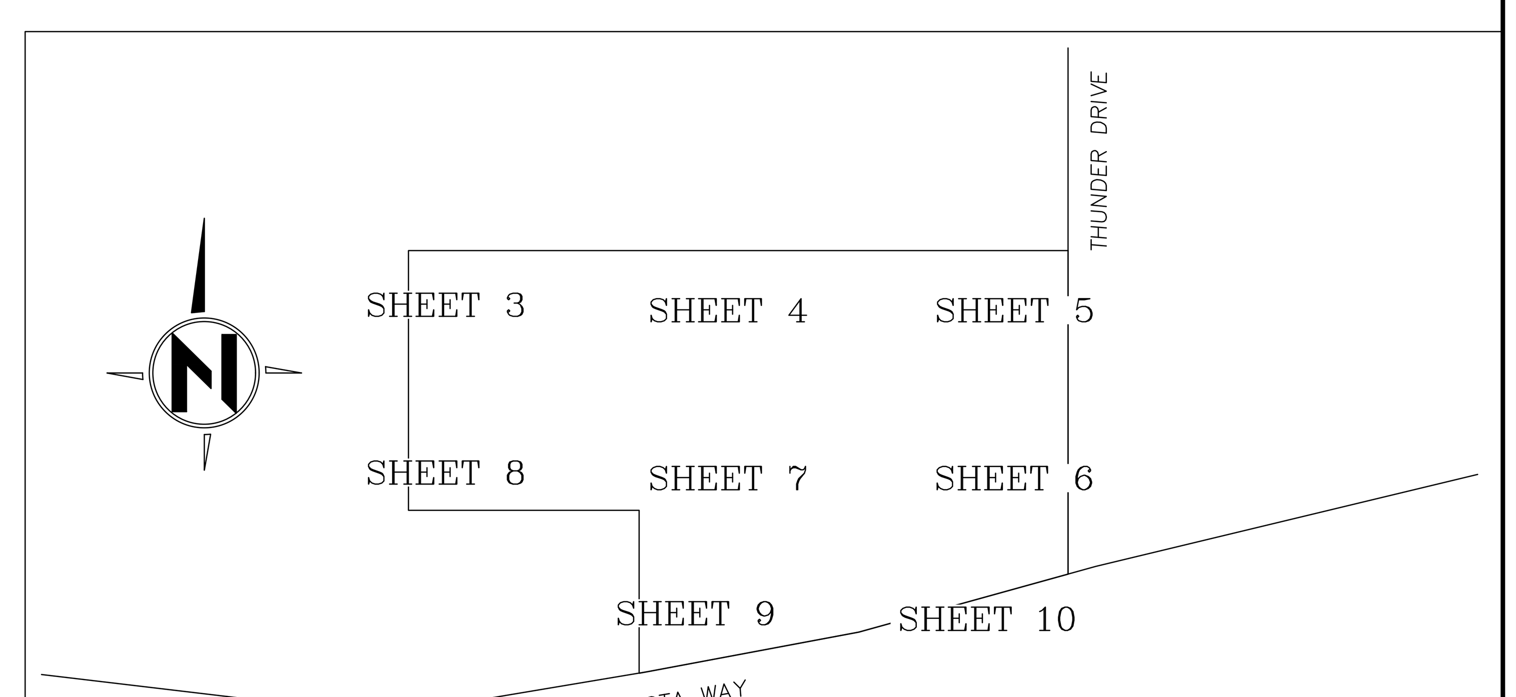
CALIFORNIA COORDINATE INDEX: 380–1700
ELEVATION = 306.79 (NGVD29)

TITLE REPORT

PRELIMINARY TITLE REPORT PROVIDED TO THE UNDERSIGNED SURVEYOR BY STEWART TITLE, ORDER(S) NO. 01180–239322, DATED SEPTEMBER 8, 2016.

NOTES

1. TITLE DATA SHOWN ON THIS SURVEY CORRESPOND TO THE PRELIMINARY TITLE REPORT PREPARED BY STEWART TITLE , ORDER NO. 01180–239322, EFFECTIVE DATE OF SEPTEMBER 8 2016. ITEMS SUCH AS TAXES, TAX LIENS AND LEASES ARE NOT CONSIDERED SURVEY RELATED. THESE INCLUDE ITEM(S) A, B & C, ALONG WITH ITEM No's 6 THROUGH 10, 27, 29, AND 30.
2. THIS A.L.T.A. SURVEY WAS PREPARED AT THE REQUEST OFTRI–CITY HOSPITAL DISTRICT.
3. AREA OF PROPERTY: 1,336,517 SQUARE FEET (30.68 ACRES).
4. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS.
5. FLOOD ZONE: ZONE "X"; AREAS DETERMINED TO BE OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOODPLAIN; AS SHOWN ON THE FLOOD INSURANCE RATE MAP PANEL 0766 OF 2375 MAP NUMBER 06073C0766G, DATED MAY 16, 2012.
6. INFORMATION REGARDING PROPOSED CHANGES IN STREET RIGHT OF WAY LINES IS NOT AVAILABLE FROM THE CONTROLLING JURISDICTION.
7. AT THE TIME OF THE FIELD SURVEY THERE WAS NO OBSERVED EVIDENCE OF THE SITE USE AS A SOLID WASTE DUMP, SUMP OR SANITARY LANDFILL.
8. AT THE TIME OF THE FIELD SURVEY THERE WAS NO OBSERVED EVIDENCE OF CURRENT EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS.
9. AT THE TIME OF THE FIELD SURVEY THERE WAS NO OBSERVED EVIDENCE OF THE SITE BEING USED AS A SOLID WASTE DUMP, SUMP OF SANITARY LANDFILL..
10. AT THE TIME OF THE FIELD SURVEY THERE WAS NO OBSERVED EVIDENCE OF ANY WETLANDS ON THE SITE..
11. ZONING INFORMATION IN ACCORDANCE WITH TABLE A, ITEM 6b HAS NOT BEEN PROVIDED TO THE UNDERSIGNED SURVEYOR BY THE INSURER AT THE TIME OF THIS SURVEY.
12. PARKING SPACES: TOTAL PARKING = 1141 REGULAR SPACES , 47 HANDICAPPED SPACE
    1188 TOTAL PARKING SPACES
13. SITE CONDITIONS SHOWN ON THIS SURVEY ARE THE RESULT OF A GROUND SURVEY BY: BWE ON MARCH & APRIL, 2016. DATE OF LAST SITE INSPECTION: JUNE 30, 2016.
14. BUILDING ADDRESS: 4004 VISTA WAY, OCEANSIDE, CA.



KEY MAP
NO SCALE

BWE

NO.:	DATE	DESCRIPTION	BY:

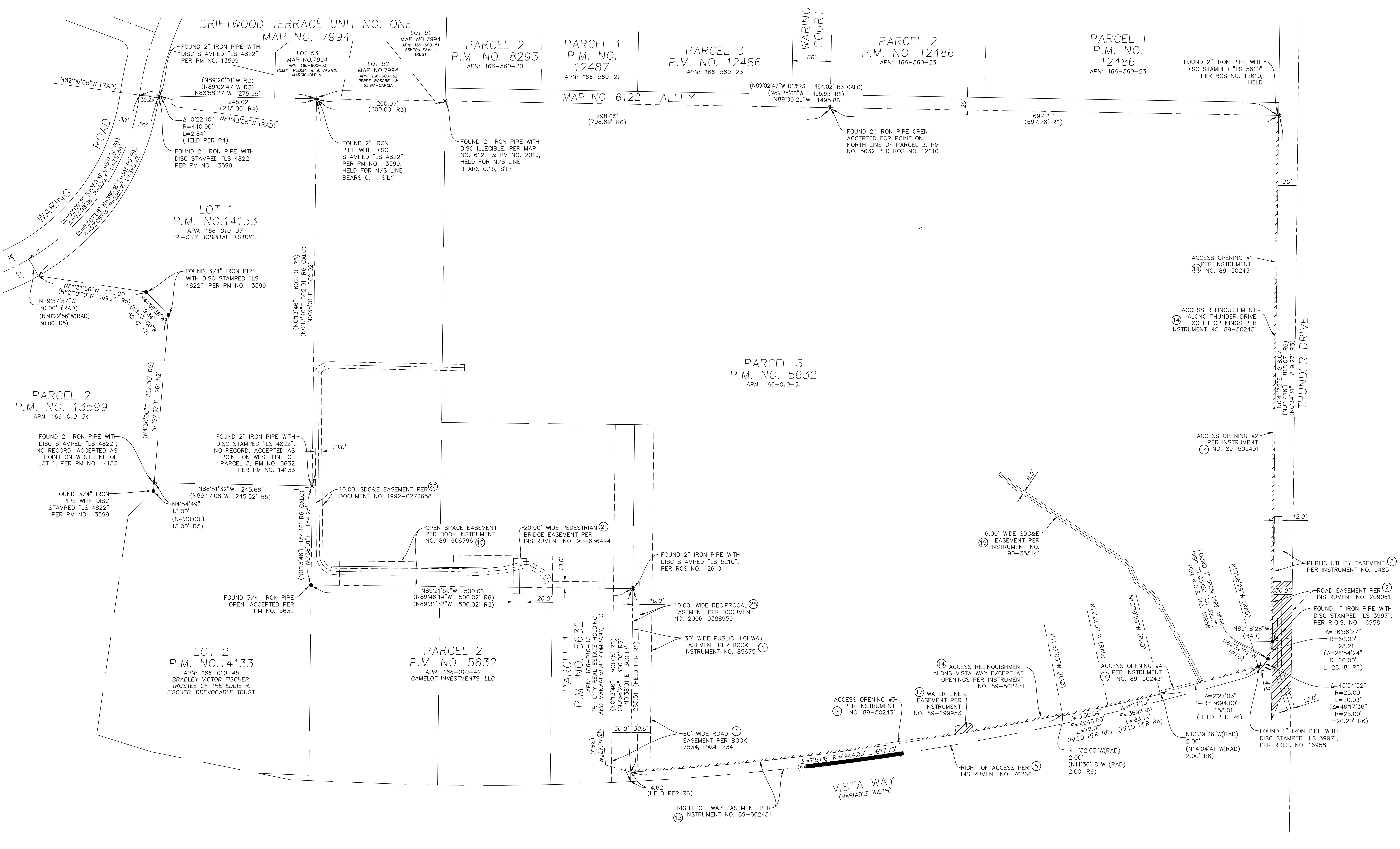
SHEET TITLE:
ALTA/ACSM LAND TITLE SURVEY
PARCEL 3 OF PARCEL MAP NO. 5632
4004 VISTA WAY
OCEANSIDE, CALIFORNIA 92056

BWE STRUCTURAL ENGINEERING - CIVIL ENGINEERING - SURVEYING - LAND PLANNING, 9449 Balboa Avenue, Suite 270, San Diego, CA 92123; Phone (619) 299-5550

DATE: 11/8/2016
DRAWN BY: DPR
PROJECT NO: 12524s
SCALE: N/A

SHEET NO.
1 of 10

PROCED□RE OF S□RVEY AND EASEMENTS



LEGEND

UTILITIES

- TRAFFIC SIGNAL — TS
- STREET LIGHT — SL
- LIGHT POLE — LP
- ELECTRIC PULL BOX — EPB
- ELECTRIC METER — EM
- ELECTRIC VAULT — EV
- ELECTRIC TRANSFORMER — ET
- ELECTRIC CABINET — EC
- ELECTRIC RISER — ER
- STORM DRAIN MANHOLE — SDMH
- STORM DRAIN CURB INLET — SDCI
- STORM DRAIN CLEAN-OUT — SDCO
- STORM DRAIN DROP INLET — SDDI
- CATCH BASIN — CB
- WATER RISER — WR
- WATER METER — WM
- WATER VALVE — WV
- FIRE HYDRANT — FH
- FIRE SERVICE — FS
- POST INDICATOR VALVE — PIV
- IRRIGATION CONTROL BOX — ICB
- IRRIGATION CONTROL VALVE — ICV
- AIR RELEASE VALVE — ARV
- BACKFLOW PREVENTER — BFP
- WATER LINE — W
- CHILLED WATER SERVICE — CW
- CHILLED WATER RETURN — CR
- RECLAIMED WATER CONTROL VALVE — ICV
- COMMUNICATION BOX — CB
- COMMUNICATION VAULT — CV
- COMMUNICATION PULL BOX — CBP
- COMMUNICATION LINE — COM
- TELEPHONE RISER — TR
- TELEPHONE PULL BOX — TBP
- TELEPHONE MANHOLE — TMH
- TELEPHONE VAULT — TV
- TELEPHONE LINE — T
- GAS METER — GM
- GAS VALVE — GV
- GAS RISER — GR
- GAS LINE — G
- GAS LINE — MA
- SEWER MANHOLE — SMH
- SEWER CLEAN OUT — SCO
- SEWER LINE — S

LANDSCAPING

- DECIDUOUS TREE
- TREE CANOPY/SCHRUBS

PROPERTY DATA

- PROPERTY LINE
- RIGHT-OF-WAY LINE
- LOT LINE
- CENTER LINE
- ABUTTER'S RIGHTS
- EASEMENT LINE
- COMMITMENT REPORT ITEM NO. ①
- TIE TO BUILDING CORNER, PERPENDICULAR OR RADIAL TO PROPERTY LINE — 65.5'

MONUMENTS

- INDICATES FOUND MONUMENT AS NOTED

MAP REFERENCES

(R1) INDICATES RECORD DATA PER R.O.S. MAP NO. 6033
(R2) INDICATES RECORD DATA PER MAP NO. 7994
(R3) INDICATES RECORD DATA PER PARCEL MAP NO. 5632
(R4) INDICATES RECORD DATA PER PARCEL MAP NO. 13599
(R5) INDICATES RECORD DATA PER PARCEL MAP NO. 14133
(R6) INDICATES RECORD DATA PER R.O.S. MAP NO. 12610

IMPROVEMENTS

- CHAIN LINK FENCE
- WALL
- CONCRETE — CONC./C
- AC PAVING — ASPH./AC
- CURB & GUTTER
- BUILDING FOOTPRINT
- GUARD POST — GP
- SIGN
- VEHICULAR/PEDESTRIAN SITE ACCESS POINT
- LOCATION FOR BUILDING HEIGHT DETERMINATION
- FLAG POLE — FP
- PARKING COUNT

ABBREVIATIONS

SIDEWALK	SWK
HANDICAPPED RAMP	HCR
NORTH	N
NORTHEAST	NE
SOUTH	S
SOUTHEAST	SE
EAST	E
SOUTHWEST	SW
WEST	W
NORTHWEST	NW
NORTHEASTERLY	NELY
SOUTHEASTERLY	SELY
SOUTHWESTERLY	SWLY
NORTHWESTERLY	NWLY
HANDICAPPED	HC
TRASH ENCLOSURE	TE
WROUGHT IRON	W.I.
BUILDING HEIGHT	B.H.
COLUMN	CLM
DRIVEWAY	DWY
CONTROL	CTRL
CENTER	CTR
ENCLOSURE	ENCL
BACK OF WALL	BW
MECHANICAL	MECH
PROPERTY LINE	PL
PROPERTY CORNER	PC
RADIAL BEARING	(RAD)
DELTA ANGLE	Δ=
RADIUS	R=
LENGTH	L=
MOTORCYCLE	M.C.
FLAG POLE	FP
PLANTER	PNTR
UNKNOWN MANHOLE	UMH
UNKNOWN RISER	UR
UNKNOW CONTROL BOX	UCB
UNKNOW CLEAN OUT	UCO
UNKNOWN VAULT	UVT
RECORD OF SURVEY	R.O.S.
PARCEL MAP	P.M.

60 30 0 60 120 180
SCALE IN FEET
1 INCH = 60 FT.

BWE

STRUCTURAL ENGINEERING - CIVIL ENGINEERING - SURVEYING - LAND PLANNING, 9449 Balboa Avenue, Suite 270, San Diego, CA 92123; Phone (619) 299-5550

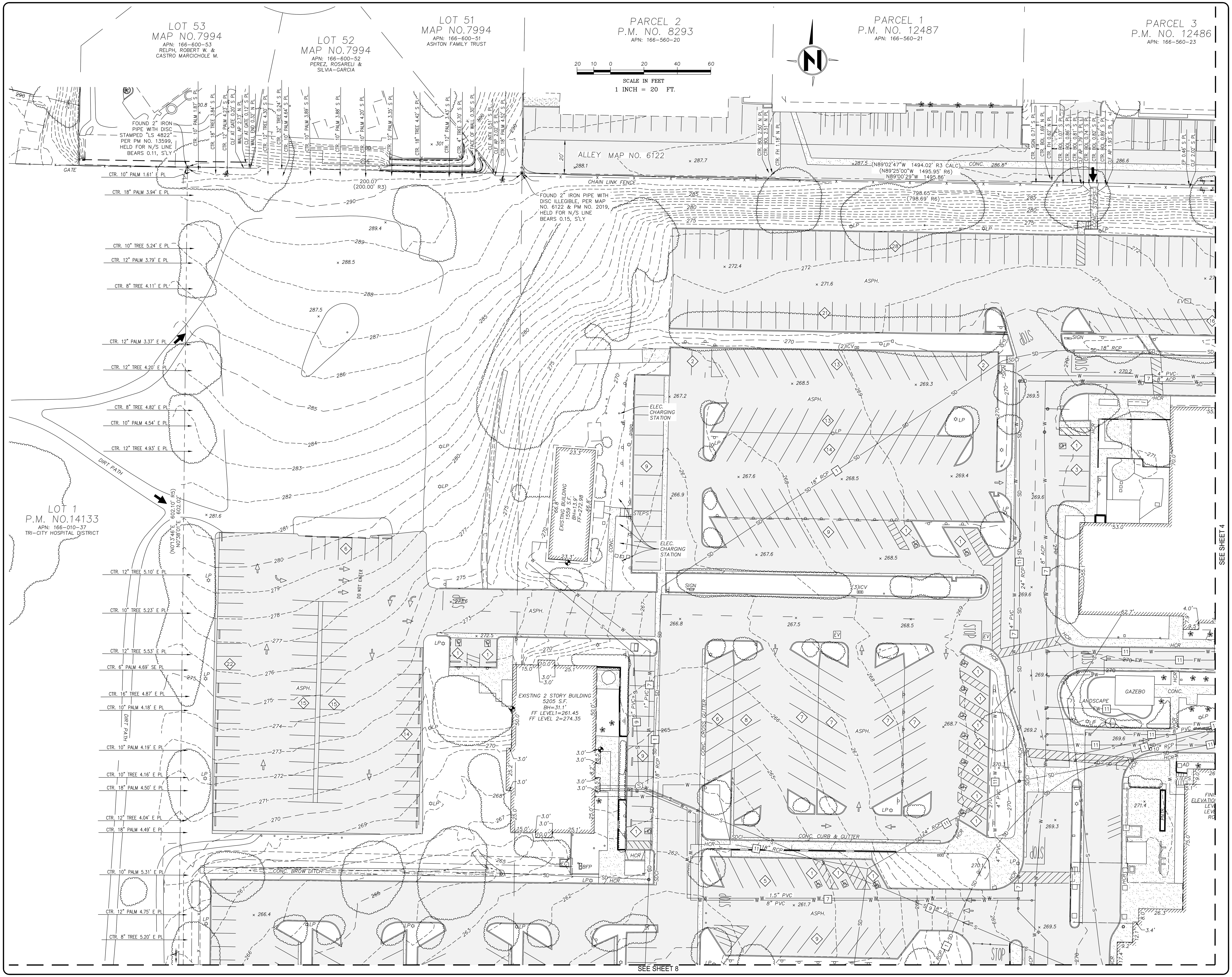
NO.:	DATE	DESCRIPTION	BY:

SHEET TITLE:

ALTA/ACSM LAND TITLE SURVEY

PARCEL 3 OF PARCEL MAP NO. 5632
4004 VISTA WAY
OCEANSIDE, CALIFORNIA 92056

DATE: 11/8/2016
DRAWN BY: DPR
PROJECT NO: 12524s
SCALE: 1" = 60'



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PARCEL 3 OF PARCEL MAP NO. 5632

4004 VISTA WAY

OCEANSIDE, CALIFORNIA 92056

DATE: 11/8/2016

DRAWN BY: DPR

PROJECT NO: 12524s

SCALE: 1" = 20'

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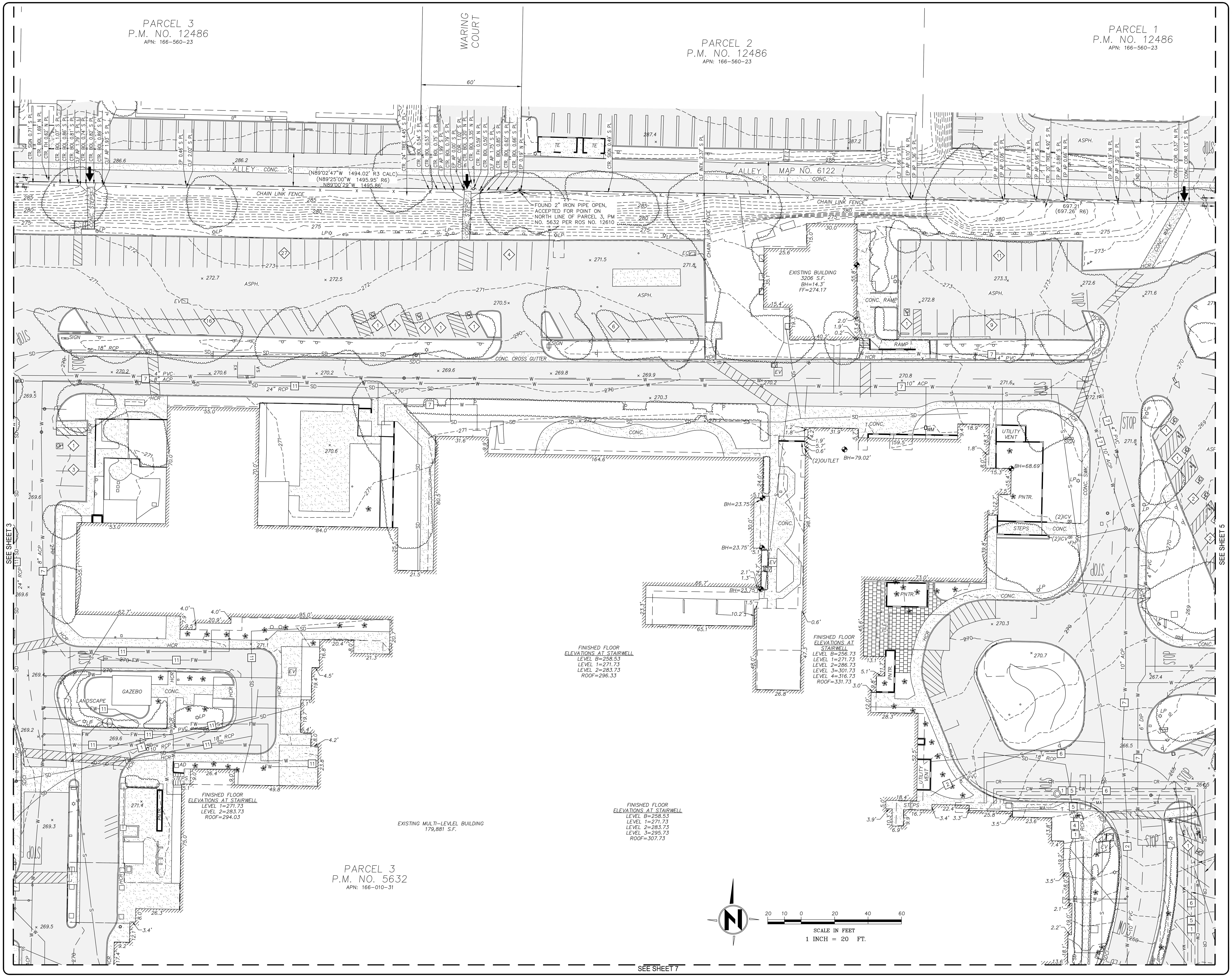

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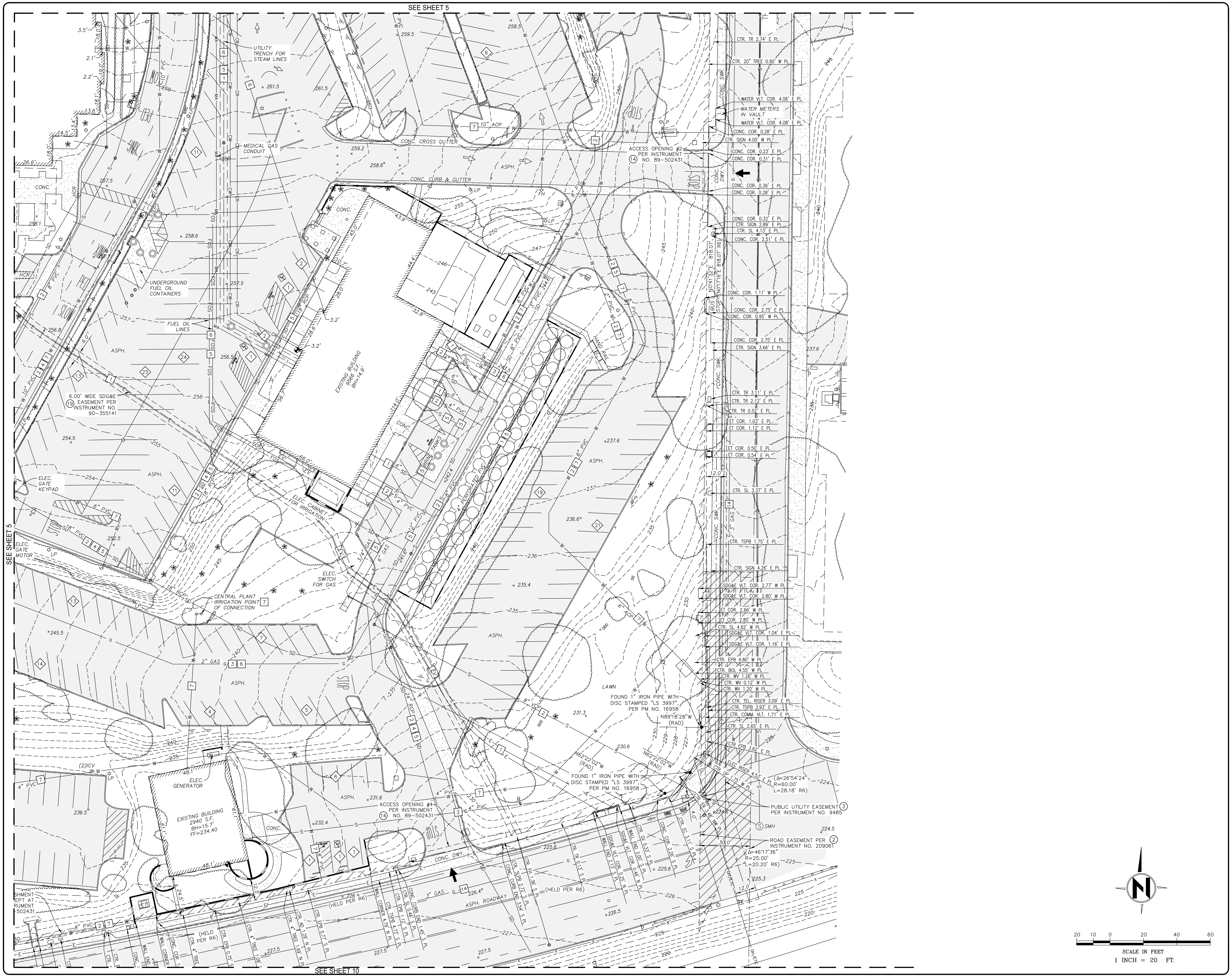

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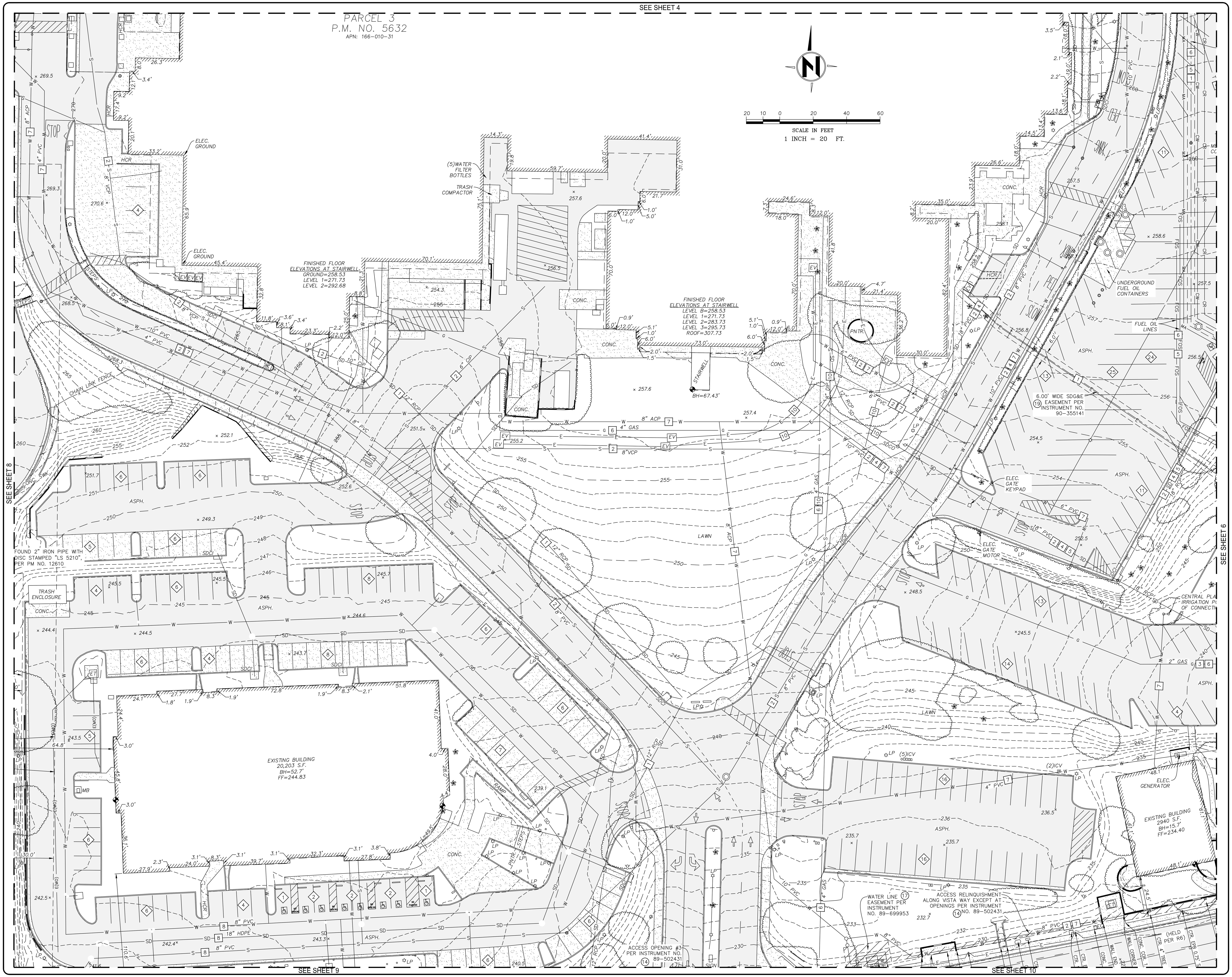

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ALTA/ACSM LAND TITLE SURVEY

PARCEL 3 OF PARCEL MAP NO. 5632

4004 VISTA WAY

OCEANSIDE, CALIFORNIA 92056

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DATE: 11/8/2016

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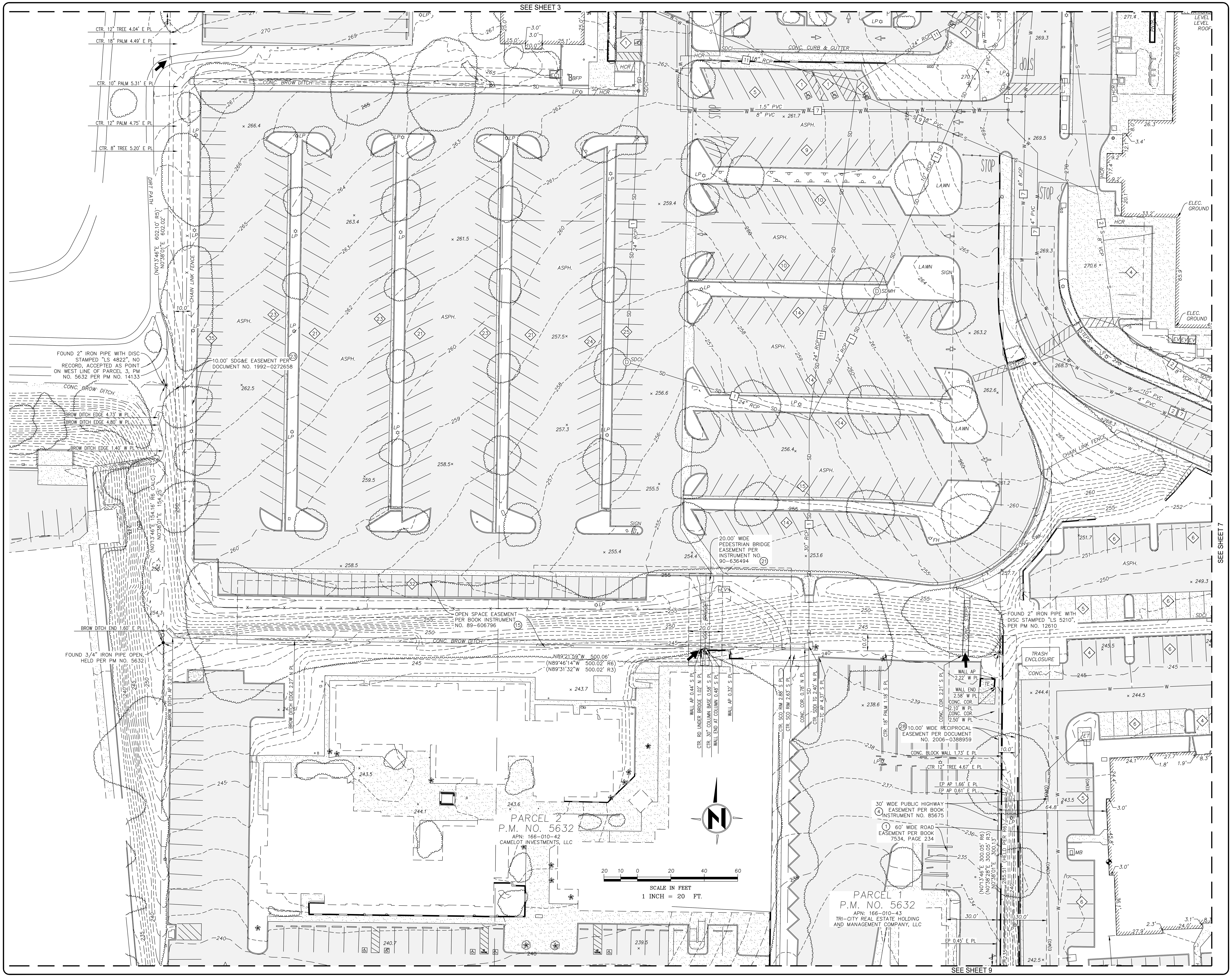
SCALE: 1" = 20'

SHEET NO.

7 of 10

BWE STRUCTURAL ENGINEERING - CIVIL ENGINEERING - SURVEYING - LAND PLANNING, 9449 Balboa Avenue, Suite 270, San Diego, CA 92123; Phone (619) 299-5550

SEE SHEET 3



SEE SHEET 7

SEE SHEET 9

BWE

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ALTA/ACSM LAND TITLE SURVEY

PARCEL 3 OF PARCEL MAP NO. 5632

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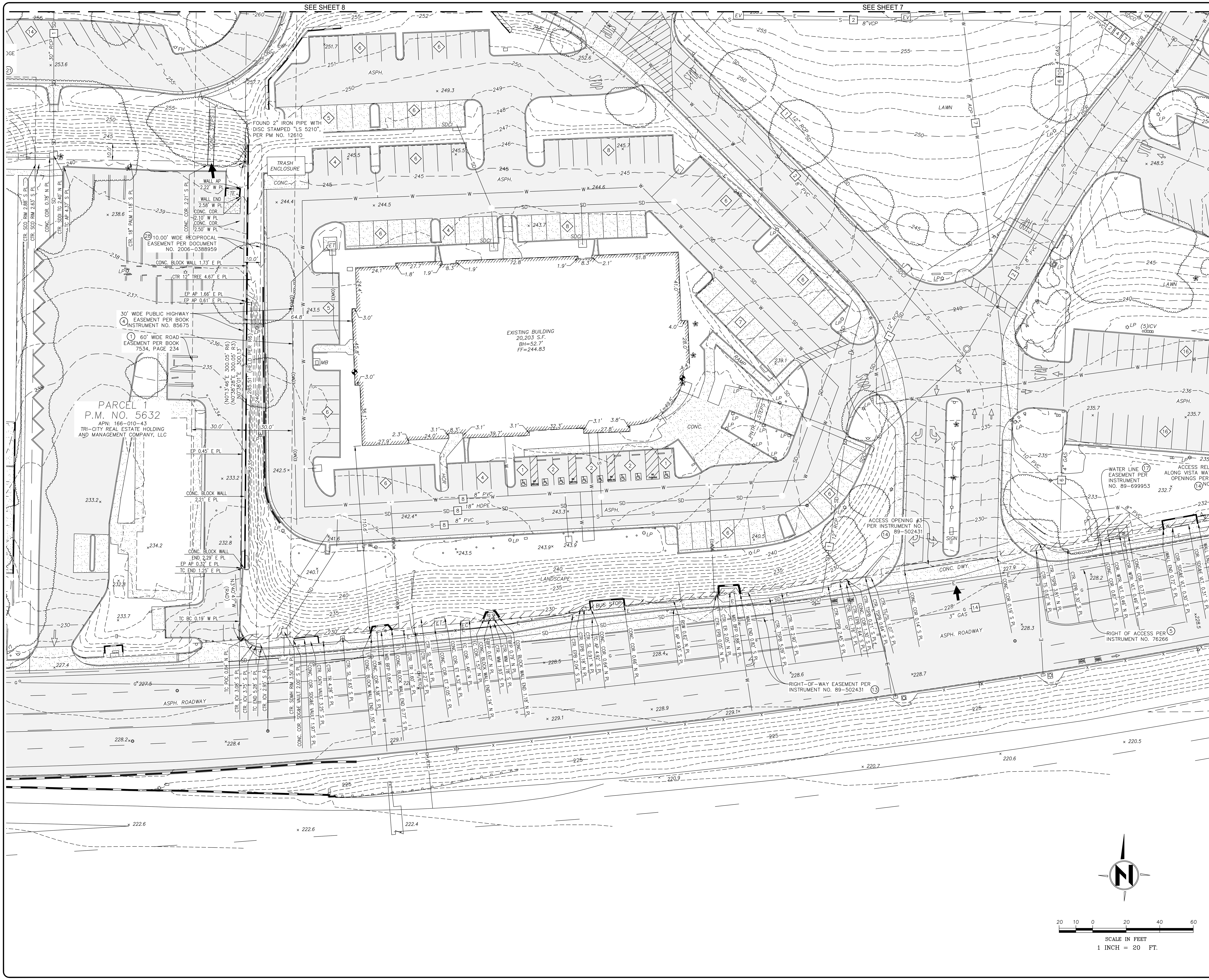

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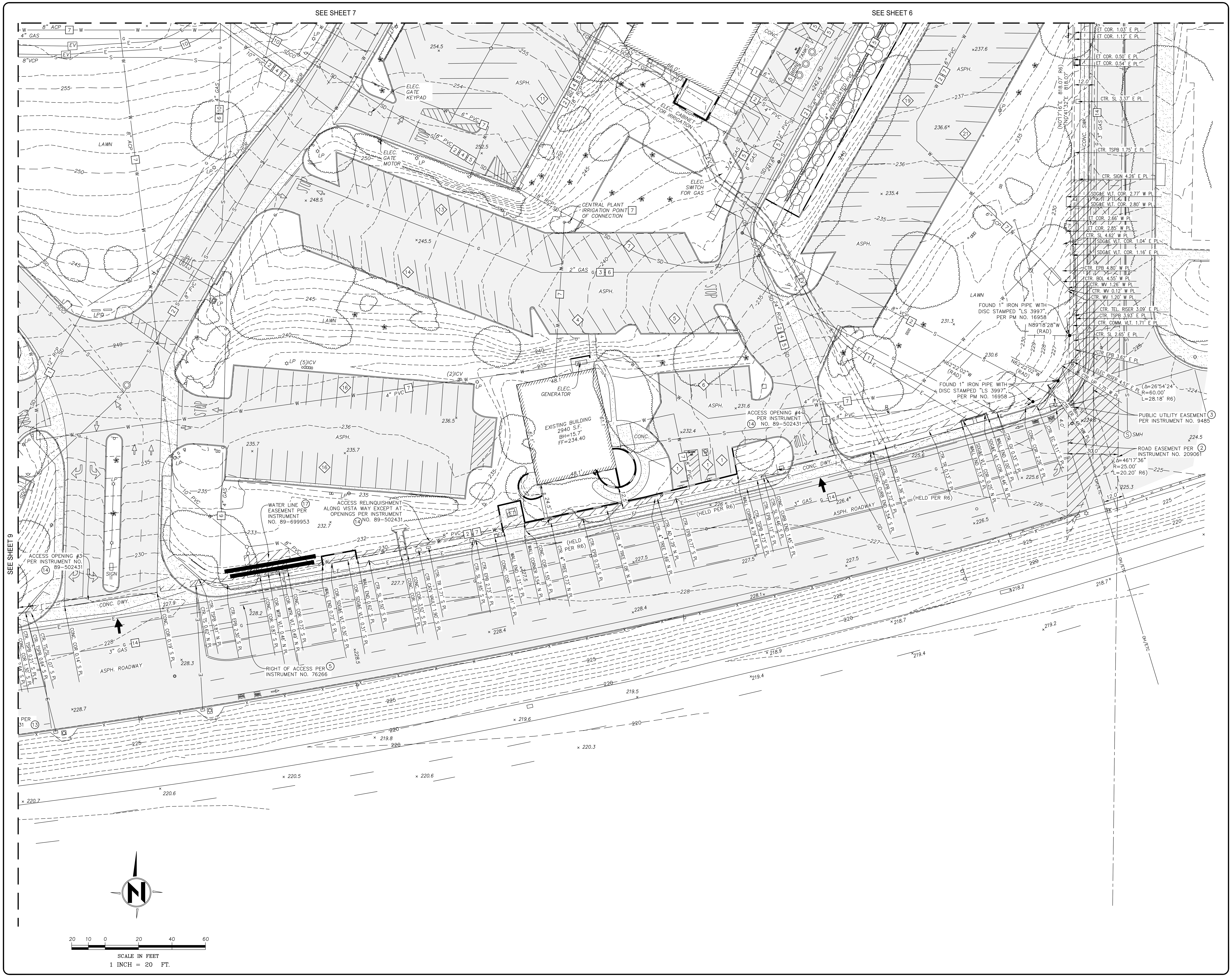

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SCALE: 1" = 20'

SHEET NO.

10 of 10

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9

Construction Testing & Engineering, Inc.
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED TRI-CITY MEDICAL CENTER EXPANSION
4002 VISTA WAY
OCEANSIDE, CALIFORNIA

Prepared by:

CONSTRUCTION TESTING & ENGINEERING, INC.
1441 MONTIEL ROAD, SUITE 115
ESCONDIDO, CALIFORNIA 92026

CTE JOB NO.: 10-13000G

September 29, 2016

TABLE OF CONTENTS

FIGURES

PLATES

APPENDICES

1.0 INTRODUCTION AND SCOPE OF SERVICES

1.1 Introduction

This report presents the results of the geotechnical investigation, performed by Construction Testing and Engineering, Inc. (CTE), and provides conclusions and preliminary recommendations for the proposed various expansions currently planned at the existing Tri-City Medical Center campus in Oceanside, California. This investigation was performed to supplement previous field investigations performed by Soil Testing Lab (1968), Baseline Consultants (1988), Geotechnical Professionals (2006), Leighton Consulting (2008), and an environmental site assessment report prepared by Global Hydrology (2013). The applicable boring logs and geophysical survey data from the previous studies are incorporated into this report and are attached in Appendix B. This investigation was performed in general accordance with the terms of CTE proposal G-3715, dated February 5, 2016.

While detailed plans were not available at the time the recent investigation and preparation of this report, CTE understands that the currently proposed improvements are to consist of the following:

1. Central Plant Emergency Upgrade
2. New West Side Surface Parking
3. New Entry Road & Signage
4. New Parking Structure
5. Relocation of Receiving Dock
6. Relocation of Utilities & Re-Grading of Building Pad
7. South Tower SPC-4D Upgrade
8. New Phase I Tower
9. New Bridge & Elevator to Medical Office Building (MOB)
10. Central Plant Expansion
11. New Main Lobby & Dining & MOB Expansion
12. North Wing Conversion to Forensic
13. Relocation of Main Electrical Service to Central

14. New Phase II Tower
15. SPC Separation of Central Tower
16. NPC Upgrade of Existing Buildings

CTE's understanding of the proposed improvements is based upon conceptual plans that do not include topography and detailed elevations and/or specific building locations. Furthermore, the exploration locations are based upon extrapolation from the conceptual plans. As such, CTE should review additional project plans as they are developed, and the information provided herein could require updating or modification based on current proposed improvement plans.

Attached appendices include:

Appendix A, References
Appendix B, Boring Logs
Appendix C, Laboratory Test Results
Appendix D, Standard Specifications for Grading
Appendix E, Site Specific Ground Motion Study
Appendix F, Geophysical Survey

1.2 Scope of Services

The scope of services provided included:

- Review of referenced geologic and soils reports.
- Coordination of utility mark-out and location for Underground Services Alert (USA) and a private utility locating company.
- Obtaining a San Diego County Department of Environmental Health (DEH) Boring Permit.
- Exploration of subsurface conditions utilizing a truck mounted CME-75 drill rig and limited-access manually advanced equipment, as well as a 30-ton Cone Penetration Test (CPT) rig.
- Laboratory testing of selected soil samples.
- Percolation testing in accordance with local guidelines for infiltration purposes.
- Description of the geology and evaluation of potential geologic hazards.
- Engineering and geologic analysis.
- Preparation of this summary report.

2.0 SITE DESCRIPTION

The site is located at 4002 Vista Way within the existing Tri-City Medical Center Complex in Oceanside, California (Figure 1). The improvement area is bounded to the south by Vista Way, to the east by Thunder Drive, to the north by medical facilities, and to the west by commercial businesses. The general layout of the site and currently proposed improvements is shown on Figure 2. The majority of the proposed improvements are to be constructed throughout the southern portion of the existing medical center that currently supports portions of the existing medical facility, parking lots, drive areas, utilities, landscaping, and other ancillary structures. We also understand that improvements are proposed adjacent to the existing facility buildings, the parking structure is proposed on the western portion of the existing parking lot, and surface parking is proposed on the undeveloped building pad to the west.

Based on the recent reconnaissance, investigation, and review of area topography, the improvement areas are located on terrain that generally descends to the southwest. Improvement area elevations range from approximately 290 feet above mean sea level (msl) in the northern portion of the site to approximately 230 feet above msl in the southwestern portion of the site.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

3.1 Field Investigation

Previous site investigations were performed by others between 1968 and 2013. These previous investigations included the use of truck-mounted drill rigs equipped with hollow-stem augers to collect soil samples, drill rigs equipped with 18-inch diameter bucket augers to enable down-hole logging, backhoe-excavated test pits for the purpose of shallow direct observation, and geophysical equipment to obtain shear wave data and further characterize subsurface characteristics. The recent investigation, performed by CTE from July 12 through 15, 2016, consisted of visual reconnaissance and excavation of 31 exploratory borings, 13 CPT advancements, and six percolation tests. The borings were excavated with a CME-75 truck-mounted drill rig equipped with eight-inch-diameter, hollow-stem augers that extended to a maximum depth of approximately 50.5 feet below the ground surface (bgs) in Boring B-18. Due to limited access, explorations B-41 and B-42 were excavated utilizing a manually operated three-inch diameter auger to depths of approximately 6.5 and 5.0 feet bgs, respectively. Bulk and relatively undisturbed samples were collected from the cuttings, and by driving Standard Penetration Test (SPT) and Modified California samplers.

The CPT advancements were performed with a 30-ton Cone Penetration Test (CPT) rig to further evaluate the density and geologic strata underling the site. The CPT explorations were advanced to a maximum depth of approximately 44.5 feet bgs in CPT-30.

The percolation test holes were advanced with a truck-mounted drill rig where feasible and a six-inch diameter hand auger where access was limited. As a result, only percolation test hole I-3 was advanced with the drill rig and all others were advanced with the manually operated hand auger.

The soils were logged in the field by a CTE Certified Engineering Geologist and were visually classified in general accordance with the Unified Soil Classification System. The field descriptions have been modified, where appropriate, to reflect laboratory test results. Boring logs, including descriptions of the soils encountered, are included in Appendix B. The approximate locations of the explorations by CTE and others are presented on Figure 2.

3.2 Laboratory Testing

Laboratory tests were conducted on selected soil samples for classification purposes, and to evaluate physical properties and engineering characteristics. Laboratory tests included: Expansion Index (EI), Grain Size Distribution, Atterberg Limits, Direct Shear, Consolidation, Resistance "R"-Value, and select Chemical Characteristics. Test descriptions and laboratory test results for the selected soils are included in Appendix C.

3.3 Percolation Testing

As requested, six percolation tests were performed throughout the site for the purpose of designing bioretention basins and permeable pavements for storm water BMPs or similar. These tests were performed in general accordance with the County of San Diego Department of Environmental Health (SD DEH) procedures. The percolation test holes were excavated on July 12 and 14, 2016 to depths ranging from approximately 3.9 to 5.0 feet below existing grades. The tests were performed in accordance with SD DEH Case I and III methods. Case I method is performed when the presoak water remains in the hole overnight and Case III method is performed when the presoak water fully percolates through the hole overnight. The approximate percolation test locations are presented on Figure 2. The percolation test results are presented in the table below. The infiltration rates indicated below have been calculated without a factor of safety applied.

TABLE 3.3					
Test Location	Soil Type	San Diego County Percolation Procedure	Depth (ft)	Percolation Rate (minutes/inch)	Infiltration Rate (inches per hour)
I-1	Tsa	Case III	4.7	160	0.060
I-2	Residual Soil	Case I	5.1	Did Not Percolate	-
I-3	Qppf	Case III	4.8	120	0.10
I-4	Qppf	Case III	4.7	480	0.020
I-5	Tsa	Case III	4.9	160	0.060
I-6	Qppf	Case III	5.0	240	0.040

Tsa = Tertiary Santiago Formation
Qppf = Quaternary Previously Placed Fill

The percolation test results were obtained in accordance with City and County standards and performed with the standard of care utilized by other professionals practicing in the area. However, percolation test results can vary significantly laterally and vertically due to slight changes in soil type, degree of weathering, secondary mineralization, and other physical and chemical variabilities. As such, the test results are considered to be an estimate of percolation and converted infiltration rates for design purposes. No guarantee is made based on the percolation testing related to the actual functionality or longevity of associated infiltration basins or other storm water BMP devices designed from the presented infiltration rates.

4.0 GEOLOGY

4.1 General Setting

Oceanside is located within the Peninsular Ranges physiographic province that is characterized by northwest-trending mountain ranges, intervening valleys, and predominantly northwest trending regional faults. The San Diego Region can be subdivided into the coastal plain area, central mountain–valley area and eastern mountain valley area. The project site is located within the coastal plain area that is characterized by Cretaceous, Tertiary, and Quaternary sedimentary deposits that onlap an eroded basement surface consisting of Jurassic and Cretaceous crystalline rocks.

4.2 Geologic Conditions

Based on the regional geologic map prepared by Kennedy and Tan (2005), the near surface geologic unit underlying the site consists of the Tertiary Santiago Formation (Figure 3). Based on recent site explorations Quaternary Previously Placed Fill, Alluvium, and Residual Soil are also present at the site. Descriptions of the geologic units observed during the recent investigation are presented below. Surficial geologic materials are depicted on Figure 2, and generalized geologic cross-sections are presented on Plates 1 and 2.

4.2.1 Quaternary Previously Placed Fill

Quaternary Previously Placed Fill was encountered throughout the site. Where encountered, this unit was observed to generally consist of loose to medium dense, brown to olive brown, silty to clayey fine to medium grained sand and sandy clay. This unit was found to thicken at the southern portion of the existing building pads. Isolated areas with deeper fill may also be encountered during grading and construction. The time and conditions of fill placement are unknown and as-graded documentation has not been obtained for this soil unit. Therefore, for the purposes of this report this fill is considered to be undocumented. As such, it is recommended that the Undocumented Fill be overexcavated and properly processed and compacted beneath proposed improvement areas, if shallow spread foundations are to be utilized for structure support. However, this material, where competent and undisturbed, may be suitable for support of improvements, if proper observation and compaction testing documentation become available. Limited overexcavation and recompaction to a depth of two to three feet below existing or proposed grades, or to the depth of competent materials (whichever is deeper) is anticipated to be adequate for support of proposed minor or shallow surface improvements such as pavements and flatwork.

4.2.2 Quaternary Alluvium

Quaternary Alluvium was encountered in Boring B-43 in the eastern portion of the site. Where encountered, this unit was observed to generally consist of loose to medium dense, grayish brown, poorly graded fine grained sand. This unit is anticipated to thicken down-gradient to the southeast. Alluvium may also be encountered at the base of the infilled north-south drainage in the central portion of the site. These materials are not anticipated to be suitable for support of proposed structures or significant additional fill materials.

4.2.4 Residual Soil

Residual Soil was encountered throughout the site. Where encountered, this unit was observed to generally consist of medium dense or very stiff, olive brown, silty to clayey fine grained sand sandy clay. This unit is a relatively thin layer that has developed on the underlying Santiago formation. These materials are not anticipated to be suitable for support of proposed structures or significant additional fill materials.

4.2.5 Santiago Formation

The Santiago Formation comprises the geologic unit underlying the entire site. Where encountered, this unit was found to consist of hard or very dense, light gray to olive, silty to clayey fine grained sandstone and sandy claystone. These materials are anticipated to be suitable for support of proposed structures upon deep foundations, where utilized, and significant additional fill materials.

4.3 Groundwater Conditions

Groundwater seepage was encountered in Boring B-34 at a depth of approximately 14 feet. During the previous investigations groundwater was encountered at depths ranging from approximately 19 to 20 feet (Western Soil and Foundation Engineering, 1996) and 14.5 to 15.9 (Global Hydrogeology, 2013). Groundwater was only encountered on the eastern portion of the site during the subsurface investigations; however, groundwater may be encountered within the drainage in the central portion of the site. Groundwater conditions are anticipated to vary, especially during and after periods of sustained precipitation or irrigation. Therefore, subsurface water may impact deeper excavations on the eastern portion of the site or other areas at lower elevations. During earthwork for the proposed development, removal of collected water from excavations and drying of site soils may be necessary. Installation of typical subdrains during grading is not generally anticipated to be necessary or overly beneficial, but cannot be completely precluded.

Site drainage should be designed, installed, and maintained as per the recommendations of the project civil engineer. However, once detailed grading and/or improvement plans have been developed, CTE could potentially recommend conceptual subsurface cutoff, blanket, and/or subdrains, but actual locations and elevations would likely be determined in the field during grading and construction, as necessary.

4.4 Geologic Hazards

Geologic hazards that were considered to have potential impacts to site development were evaluated based on field observations, literature review, and laboratory test results. It appears that geologic hazards at the site are primarily limited to those caused by shaking from earthquake-generated ground motions. The following paragraphs discuss the geologic hazards considered and their potential risk to the site.

4.4.1 Surface Fault Rupture

Based on the site reconnaissance and review of referenced literature, the site is not within a State of California-designated Alquist-Priolo Earthquake Fault Studies Zone or Local Special Studies Zone and no known active fault traces underlie or project toward the site. According to the California Division of Mines and Geology, a fault is active if it displays evidence of activity in the last 11,000 years (Hart and Bryant, revised 2007). Therefore, the potential for surface rupture from displacement or fault movement beneath the proposed improvements is considered to be low.

4.4.2 Local and Regional Faulting

The California Geological Survey (CGS) and the United States Geological Survey (USGS) broadly group faults as “Class A” or “Class B” (Cao, 2003; Frankel et al., 2002). Class A faults are generally identified based upon relatively well-defined paleoseismic activity, and a fault-slip rate of more than 5 millimeters per year (mm/yr). In contrast, Class B faults have comparatively less defined paleoseismic activity and are considered to have a fault-slip rate less than 5 mm/yr. The nearest known Class B fault is the Newport-Inglewood Fault, which is approximately 13.7 kilometers west of the site (Blake, T.F., 2000). The nearest known Class A fault is the Temecula segment of the Elsinore Fault, which is located approximately 33.4 kilometers northeast of the site. The following Table 4.4.2 presents the known faults nearest to the site, including estimated magnitude and fault classification. The attached Figure 4 shows regional faults and seismicity with respect to the site.

TABLE 4.4.2
NEAR-SITE FAULT PARAMETERS

FAULT NAME	APPROXIMATE DISTANCE FROM SITE (KM)	MAXIMUM ESTIMATED EARTHQUAKE MAGNITUDE	CLASSIFICATION
Newport-Inglewood	13.6	7.1	B
Rose Canyon	13.7	7.2	B
Elsinore-Temecula	33.4	6.8	A
Elsinore-Julian	33.6	7.1	A
Coronado Bank	39.5	7.6	B
Elsinore-Glen Ivy	51.3	6.8	A

The site could be subjected to significant shaking in the event of a major earthquake on any of the faults listed above or other faults in the southern California or northern Baja California area.

4.4.3 Historic Seismicity

The level of seismicity within recent history (last 50 years) of the San Diego area is relatively low compared to other areas of southern California and northwestern Baja California. Only a few small to moderate earthquakes have been reported in the greater San Diego area during the period of instrumental recordings, which began in the early 1900s. Most of the high seismic activity in the region is associated with the Elsinore Fault Zone and the San Jacinto Fault Zone, located approximately 29 and 65 kilometers northeast of the site respectively. In the western portion of San Diego County a series of small-to-moderate earthquakes in July 1985 were reportedly associated with the Rose Canyon Fault Zone (Reichle, 1985). The largest event in that series was M4.7, which was centered within San Diego Bay. A similar series of earthquakes in coastal San Diego occurred in 1964 (Simons, 1979).

Based on review of the USGS Earthquake Archives (http://earthquake.usgs.gov/earthquakes/search/) significant earthquakes within 100 kilometers of the site with magnitudes greater than M5.5 are provided in Table 4.4.3.

TABLE 4.4.3
Regional Earthquake History

EARTHQUAKE DATE (yr-mo-day)	EARTHQUAKE TIME (UTC)	MAGNITUDE	ESTIMATED DEPTH (km)	GENERAL LOCATION
1918-04-21	22:32:29	6.7	10.0	Southern California
1933-03-11	01:54:09	6.4	6.0	WNW Newport Beach
1937-03-25	16:49:02	6.0	6.0	WSW of Oasis
1951-12-26	00:46:54	5.8	6.0	NNE of San Clemente Island

4.4.4 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands or silts lose their physical strengths during earthquake-induced shaking and behave as a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with water level, soil type, material gradation, relative density, and probable intensity and duration of ground shaking. Seismic settlement can occur with or without liquefaction; it results from densification of loose soils.

The site is underlain by relatively well compacted fill above groundwater levels and at relatively shallow depths by the very dense Santiago Formation. Therefore, the potential for liquefaction or significant seismic settlement at the site is considered to be low.

4.4.5 Tsunamis and Seiche Evaluation

According to State of California Emergency Management Agency mapping, the site is not located within a tsunami inundation zone based on distance from the coastline and elevation above sea level. Damage resulting from oscillatory waves (seiches) is considered unlikely due to the absence of nearby confined bodies of water.

4.4.6 Flooding

Based on Federal Emergency Management Agency mapping (FEMA 2012), site improvement areas are located within Zone X, which is defined as: “Areas determined to be outside of the 0.2% annual chance floodplain”.

4.4.7 Landsliding

According to mapping by Tan (1995), the site is considered “Generally Susceptible” to landsliding. However, no landslides are mapped in the site area and no evidence of landsliding was encountered during the recent field exploration. Therefore, based on the site conditions and investigation findings, landsliding is not anticipated to be a significant geologic hazard within the subject site.

4.4.8 Compressible and Expansive Soils

Based on observations and testing, the disturbed near surface, Previously Placed Fill, Alluvium and Residual Soil are considered to be potentially compressible in their current condition. Therefore, it is recommended that these soils be overexcavated to the depth of competent underlying natural materials, and properly compacted as recommended herein where they will support structures using shallow spread footings (as opposed to deep foundations that extend through these materials and into the underlying competent formational materials). Based on the site observations and testing, the underlying Santiago

Formation is not anticipated to be subject to significant compressibility under the proposed loads or significant additional compacted fill, if proposed.

Based on observation and laboratory testing, soils at the site are generally anticipated to exhibit a Very Low to High expansion potential (Expansion Index of 130 or less). Recommendations presented herein are intended to reduce the potential adverse impacts of highly expansive soils. Additional evaluation of potential expansive soil conditions should be conducted during grading to confirm that the soils encountered or placed as compacted fill are as anticipated.

4.4.9 Corrosive Soils

Chemical testing was performed to evaluate the potential effects that site soils may have on concrete foundations and various types of buried metallic utilities. Soil environments detrimental to concrete generally have elevated levels of soluble sulfates and/or pH levels less than 5.5. According to American Concrete Institute (ACI) Table 318 4.3.1, specific guidelines have been provided for concrete where concentrations of soluble sulfate (SO_4) in soil exceed 0.1 percent by weight. These guidelines include low water: cement ratios, increased compressive strength, and specific cement type requirements.

Based on the results of the Sulfate testing performed, onsite soils are anticipated to generally have a moderate corrosion potential to Portland cement concrete improvements. As such, Type II Portland cement, minimum compressive strength of 4,000 psi, and maximum water to cement ratio of 0.50 are generally anticipated to be appropriate for proposed improvements, subject to the review and determination of the project Structural Engineer(s) and/or or Architect(s).

A minimum resistivity value less than approximately 5,000 ohm-cm, and/or soluble chloride levels in excess of 200 ppm generally indicate a corrosive environment to buried metallic utilities and untreated conduits. Based on the obtained resistivity values ranging from 2,030 to 4,790 ohm-cm and soluble chloride levels ranging from 39.9 to 107.3 ppm, onsite soils are locally anticipated to have a moderate corrosion potential for buried uncoated/unprotected metallic conduits. Based on these results, at a minimum, the use of buried plastic piping or conduits would appear beneficial, where feasible.

The results of the chemical tests performed are presented in the attached Appendix C. CTE does not practice corrosion engineering. Therefore, a corrosion engineer or other qualified consultant could be contacted if site specific corrosivity issues are of concern.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 General

Although significant details are not available at this time, the proposed improvements at the site are anticipated to be feasible from CTE's geotechnical standpoint, provided the preliminary recommendations in this report are incorporated into the design and construction of the proposed projects. Preliminary recommendations for the proposed earthwork and improvements are included in the following sections and Appendix D. However, recommendations in the text of this report supersede those presented in Appendix D, should variations exist. These preliminary recommendations should be further evaluated as project grading, shoring, and/or foundation plans are further developed.

5.2 Site Preparation

Although this report does not pertain to site environmental conditions, it is anticipated that an appropriate soil management plan and associated documents could be required due to impacted soils that have been previously documented for the subject site. Prior to grading, the site should be cleared of any existing building materials or improvements that are not to remain. Objectionable materials, such as construction debris and vegetation, not suitable for structural backfill should be properly disposed of offsite. Site preparation will likely be dependent upon specific siting of proposed structures with respect to geotechnical conditions as follows.

5.2.1 Shallow Formation Areas

Distress sensitive structures that will utilize shallow spread foundations (as opposed to deep foundations that extend into formational materials for full support) with shallow underlying (generally less than five feet) Santiago Formation, should be overexcavated to a depth of at least 24 inches below proposed foundation depths or to the depth of suitable formation materials, whichever is greater. Overexcavation should extend at least five feet beyond the building perimeter, or the distance resulting from a 1:1 (horizontal: vertical) extended from the bottom edge of the footings, whichever is greater and where feasible with respect to existing improvements that are to remain.

Utility corridors in dense formational materials/areas should be overexcavated to at least one foot below invert elevation so as to utilize heavy duty equipment in an more open or unobstructed environment. Alternatively, utility corridors may be founded in formational materials, but more difficult excavation and potential for perched groundwater or seepage should be anticipated.

It is not generally necessary to overexcavate below subgrade for pavements and hardscape in competent formation material areas. However, rising water or seepage areas could require overexcavation, as necessary, to place cutoff, blanket, and/or subdrains to control and convey collected water to an appropriate dispersal area.

5.2.2 Undocumented Fill Soil and Residual Soil Areas

Undocumented fill soils should be overexcavated to the depth of suitable native soils in areas of distress-sensitive structures or facilities that will utilize shallow spread foundations (as opposed to deep foundations that develop support entirely within the competent underlying formational materials). Overexcavation for distress-sensitive structures or facilities located entirely on residual soils should extend to a depth of at least two feet below rough pad grade. However, structures supported on shallow foundations and located across transitions between residual soil and formational materials, should also be overexcavated to a depth of five feet below pad grade to allow more uniform soil conditions below foundations. Such overexcavation should extend at least five feet beyond the improvement limits, where feasible.

For other proposed improvements, such as pavement and hardscape areas, existing soils should be excavated to the depth of competent materials, or to a minimum of 24 inches below proposed subgrade elevation, whichever is deeper and subject to recommendations by CTE during grading. Subdrainage devices may be recommended should rising water or seepage be encountered during excavation or should it be considered likely to occur based on the exposed conditions observed.

5.2.3 Structures to be Supported by Deep Foundations

Proposed structure areas that will be supported entirely upon deep foundations extended well into competent formational materials should be overexcavated to a minimum depth of three feet below existing or proposed grades, and to reasonably competent materials, whichever is deepest, in order to provide a suitable building pad for minor to moderate additional compacted fill or proposed building improvements. Reasonably competent materials are anticipated to consist of previously placed fill or formational materials that are firm enough to support placement of additional compacted fill materials.

5.2.4 General

Exposed subgrades should be scarified, moisture conditioned, and properly compacted, as described below, prior to placement of compacted fill. Overexcavations adjacent to existing structures should generally not extend below a 1:1 plane extended down from the bottom outer edge of the existing building footings that are to remain or as recommended during grading based on the exposed conditions. Depending on the depth and proximity of existing building footings to remain, alternating slot excavations could be recommended during earthwork.

Existing below-ground utilities should be redirected around proposed structures. Existing utilities at an elevation to extend through the proposed footings should generally be sleeved and caulked to minimize the potential for moisture migration below the building slabs. Abandoned pipes exposed by grading should be securely capped or filled with minimum two-sack cement/sand slurry to help prevent moisture from migrating beneath foundation and slab soils.

An engineer or geologist from CTE should observe the exposed bottom of overexcavations prior to placement of compacted fill or improvements. Overexcavation should extend to a depth of suitable competent soil as observed by a CTE representative. Deeper excavations or overexcavations may be necessary depending upon encountered conditions.

5.3 Site Excavation

Generally, excavation of site materials may be accomplished with heavy-duty construction equipment under normal conditions; however the underlying Tertiary Santiago Formation will become increasingly difficult to excavate with depth.

5.4 Fill Placement and Compaction

Following recommended removals of loose or disturbed soils, the areas to receive fills should be scarified a minimum of nine inches, moisture conditioned, and properly compacted. Fill soils should be compacted to a relative compaction of at least 90 percent as evaluated by ASTM D 1557 at moisture contents at least three percent above optimum. In pavement areas, granular soils within one foot of subgrade and all aggregate base materials should be compacted to at least 95 percent compaction relative to maximum dry density.

The optimum lift thickness for fill soil will depend on the type of compaction equipment used. Generally, backfill should be placed in uniform, horizontal lifts not exceeding eight inches in loose thickness. Fill placement and compaction should be conducted in conformance with local ordinances.

5.5 Fill Materials

Properly moisture-conditioned very low to high expansion potential soils derived from the on-site excavations are considered suitable for reuse as compacted fill on the site if prepared and placed as recommended herein. However, moderately and highly expansive soils should be placed at depths greater than five feet below proposed grades, or thoroughly blended with very low to low expansion potential soils to create materials with Expansion Index generally less than 50. Soils should also be screened of organics and materials generally greater than three inches in maximum dimension, as recommended. Irreducible materials greater than three inches in maximum dimension generally should not be used in shallow fills (within three feet of proposed grades). In utility trenches, adequate bedding should surround pipes.

Imported fill beneath structures and flatwork should have an Expansion Index of 20 or less (ASTM D 4829) with less than 30 percent passing the No. 200 sieve. Proposed fill soils for use in structural or slope areas should be evaluated by CTE before being imported to the site. It is anticipated that imported soils will be screened, sampled, and tested in accordance with applicable guidelines. Although this report does not pertain to site environmental conditions, it is anticipated that an appropriate soil management plan and associated documents could be required due to the presence of impacted soils that have been previously documented for the subject site. Laboratory screen testing of proposed import soils could require more than one week to complete, depending on the testing that is determined to be necessary.

Retaining wall backfill located within a 45-degree wedge extending up from the heel of the wall should consist of soil having an Expansion Index of 20 or less (ASTM D 4829) with less than 30 percent passing the No. 200 sieve. On site soil gradation and Atterberg Limit laboratory tests indicate that localized site soils may not meet these recommendations. As such selective grading and/or import of select soil could be necessary. The upper 12 to 18 inches of wall backfill could consist of lower permeability soils, in order to reduce surface water infiltration behind walls. The project structural engineer and/or architect should detail proper wall backdrains, including gravel drain zones, fills, filter fabric and perforated drain pipes. A conceptual wall backdrain detail that may be appropriate for specific proposed retaining walls is provided in Figure 5.

5.6 Temporary Construction Slopes

The following recommended temporary slopes should be relatively stable against deep-seated failure, but may experience localized sloughing. On-site soils are considered Type B and Type C soils with recommended slope ratios as set forth in Table 5.6.

TABLE 5.6 RECOMMENDED TEMPORARY SLOPE RATIOS		
SOIL TYPE	SLOPE RATIO (Horizontal: vertical)	MAXIMUM HEIGHT
B (Tertiary Santiago Formation)	1:1 (OR FLATTER)	20 Feet
C (Previously Placed Fill, Alluvium and Residual Soil)	1.5:1 (OR FLATTER)	10 Feet

The above noted temporary slopes are generally anticipated to be appropriate above a maximum four foot vertical excavation. However, actual field conditions and soil type designations must be verified by a "competent person" while excavations exist, according to Cal-OSHA regulations. In addition, the above sloping recommendations do not allow for surcharge loading at the top of slopes by vehicular traffic, equipment or materials. Joints and fractures in all temporary and cut slopes should be evaluated for stability by CTE, and could modify temporary slope ratios shown on Table 5.6. Appropriate surcharge setbacks must be maintained from the top of all unshored slopes.

5.7 Construction Shoring

Deep excavations for below grade levels are anticipated for at least some of the proposed improvements/buildings at the site. Therefore, temporary construction shoring recommendations are provided. Groundwater/dewatering is not generally anticipated, but cannot be precluded. Although not generally expected, localized perched groundwater may also be encountered during construction of the shoring, especially if depths greater than 15 feet are anticipated to be exceeded. Disposal of collected water should be performed in accordance with pertinent regulatory requirements. The shoring designer and contractor should also anticipate locally saturated and/or cohesionless materials subject to sloughing. Tiebacks could also locally encounter low cohesion soils, or very hard cemented sands, gravel and cobbles, and installation may become difficult.

Typical soldier beam and lagging shoring systems are anticipated to be suitable for use at the subject site. However, other shoring systems may also be feasible. Therefore, it is recommended that the project coordinators contact a qualified shoring contractor to discuss the most feasible and economic shoring and/or underpinning system(s). Active or at-rest pressures provided herein may be used for design of permanent shoring. Temporary shoring design may be based on the active or at-rest pressures provided herein, but may be reduced by 30 percent as they are not for permanent use.

Typically, underpinning of adjacent existing improvements or structures could be required where the foundations of these improvements impinge upon the active wedge, which can be defined by a 1.25:1 (horizontal: vertical) plane from the bottom of the deepest proposed excavation. If necessary, underpinning can obtain allowable end bearing loads on the order of 15,000 pounds per square foot (psf), with additional allowable skin friction on the order of 800 psf, both for the portions of the underpinning element located more than 10 feet into competent dense to very dense formational materials.

For conventional soldier beam and lagging shoring systems, soldier beams, spaced at least three diameters on center, may be designed using an allowable passive pressure of 500 psf per foot of depth, up to a maximum of 5,000 psf, for the portion of the soldier beam embedded in competent dense to very dense formational materials below the proposed bottom of excavation. Provisions should be made to assure firm contact between the beam and the surrounding soils. Concrete placed in soldier beams below the proposed excavation should have adequate strength to transfer the imposed pressures. A lean concrete mix may be used in the soldier pile above the base of the proposed excavation. Soldier beam installations should be observed by CTE.

Continuous timber or precast concrete lagging between soldier beams is recommended. Lagging should be designed for the recommended earth pressures, but may be limited to a maximum pressure of 400 psf due to arching in the soils. Voids created behind lagging by sloughing of locally cohesionless soil layers shall be grouted or slurry filled, as feasible. In addition, generally the upper two to four feet of lagging shall be grouted or slurry-filled to assist in diverting surface water from migrating behind the shoring walls. Adequate surface protection from drainage should be maintained at all times.

For design purposes, it may be estimated that drilled friction anchors will develop an average friction of 3,000 psf for the portion of the anchor extending beyond the active wedge and embedded in the effective zone. However, additional capacities may be developed based on the installation technique. Friction anchors should extend a minimum of 20 feet beyond the active wedge. However, greater depths may be required to develop the desired capacities. The active wedge can be defined by a 1.25:1 (horizontal: vertical) plane from the bottom of the deepest proposed excavation.

Friction anchors may generally be installed at angles of 15 through 40 degrees below horizontal. Anchors should be filled from the tip outward to the approximate plane where the active wedge begins. The portion of anchor in the active wedge should not be filled with concrete or should remain unbonded. Localized caving of cohesionless soils may occur during tieback drilling and the contractor should have adequate means for mitigation.

To verify the friction value used in design, all of the anchors should be load tested to at least 133% of the design load in accordance with the Post Tensioning Institute (PTI). Performance testing shall also be performed as per PTI recommendations. CTE should observe the installation of the anchors and all load testing. The shoring contractor should supply information on the hydraulic jacks verifying that they have been recently calibrated before their use.

It is likely that the City will require that temporary construction shoring tieback anchors extending into the upper 20 feet of the public right-of-way be disengaged or removed following construction of the proposed improvements. Disengaging temporary shoring tieback anchors should have no adverse effects on proposed or existing improvements, provided proposed permanent improvements are designed in accordance with the recommendations contained in this report. In addition, the geotechnical consultant shall observe the disengaging or removal of tieback anchors in order to provide the necessary certification at the completion of the project.

Monitoring of settlement and horizontal movement of the shoring system and adjacent improvements should generally occur on a weekly basis during installation and excavation in order to confirm that actual movements are within tolerable limits. The number and location of monitoring points shall be indicated on the shoring plans; CTE will review such locations and the proposed monitoring schedule once prepared and provided by the shoring contractor.

Additional shoring and underpinning recommendations can be provided in an update geotechnical report(s), to be submitted under separate cover as structural plans develop. Hydrostatic hold-down or similar anchors are not anticipated to be required. However, should they become necessary or desired, our office should be contacted for additional design recommendations.

5.8 Foundations and Slab Recommendations

The following recommendations are for preliminary design purposes only. These foundation recommendations should be re-evaluated after review of the project grading, shoring, and/or foundation plans, and after completion of rough grading of the building pad areas. During completion of rough pad grading, Expansion Index of near surface soils should be evaluated, and recommendations updated, as necessary. Lightly loaded upright structures such as flagpoles and other supports may be designed in accordance with the current California Building Code, or applicable standards assuming code minimum design values or as per the recommendations provided herein.

Preliminary recommendations are provided herein for shallow spread foundations, mat foundations, and deep foundations. It is anticipated the shallow spread foundations and/or mat foundations would be suitable for support of proposed improvements that are founded either entirely upon proposed compacted fill materials or entirely upon competent dense formational materials. It is anticipated that deep foundations would be suitable for support of proposed improvements that are to be constructed in areas where existing deep previously placed fill areas without proper documentation are present or where heavier loads or uplift loads will be present.

Although additional deep foundation types are feasible for the subject site, we anticipate that traditional drilled piers or caissons, or auger cast piles will likely be the most economical. It is further anticipated that driven piles will not be feasible at the subject site due to the disruptive noise and vibration that would result to the active hospital site. Similarly, ground modification via aggregate piers, Geopiers, Stone Columns, or similar are anticipated to be unacceptably disruptive to the adjacent active hospital site.

5.8.1 Shallow Spread & Mat Foundations

Preliminary foundation recommendations presented herein are based on the anticipated very low to medium expansion potential of near surface site soils following preparatory grading or appropriate formational materials (Expansion Index generally less than 50).

Following the recommended preparatory grading, continuous and isolated spread or mat foundations are anticipated to be suitable for use at this site. It is anticipated that the proposed footings will be founded entirely in properly engineered fill or formational materials as recommended herein. Footings should not straddle cut-fill interfaces; in these cases the cut grade areas should be overexcavated and a compacted fill placed as previously detailed herein. Foundations for structures in dense formational terrain should be placed entirely on cut materials.

Foundation dimensions and reinforcement should be based on a net dead plus live load bearing value of 2,500 pounds per square foot for footings founded in suitable compacted fill or formational materials and embedded a minimum of 24 inches below the lowest adjacent rough subgrade elevation. If utilized, continuous footings should be at least 15 inches wide. Isolated footings should be at least 24 inches in least dimension.

The above bearing values may be increased by 250 psf for each additional six inches of width or embedment beyond the minimums recommended, for an additional increase of up to 2,000 psf. The above bearing values may also be increased by one third for short duration loading which includes the effects of wind or seismic forces. Since the bearing values are net values, the weight of concrete in the foundations can be taken as 50 pcf, and the weight of any soil backfill on foundations can be neglected. If elastic foundation is designed, an uncorrected subgrade modulus of 145 pci is anticipated to be appropriate.

Minimum footing reinforcement for continuous footings should consist of four No. 6 reinforcing bars; two placed near the top and two placed near the bottom, or as per the project structural engineer. However, the project structural engineer should design and detail all footing reinforcement. Footing excavations in fill areas should be maintained at, or be brought to, a minimum moisture content of 120 percent of the optimum moisture content just prior to concrete placement.

5.8.2 Foundation Settlement

The maximum total static settlement is expected to be on the order of one inch and the maximum differential static settlement is expected to be on the order of 0.7 inch over a distance of approximately 50 feet. Due to the absence of a shallow and uniformly distributed groundwater table and the dense to very dense nature of underlying materials, dynamic settlement is not expected to adversely affect the proposed improvements.

5.8.3 Foundation Setback

Footings for structures should be designed such that the horizontal distance from the face of adjacent slopes to the outer edge of footings is at least 15 feet. In addition, footings should be founded beneath a 1:1 plane extended up from the nearest bottom edge of adjacent trenches and/or excavations generally within approximately 15 lateral feet. Deepening of affected footings may be a suitable means of attaining the prescribed setbacks.

5.8.4 Lateral Resistance

Lateral loads acting against structures may be resisted by friction between the footings and the supporting compacted fill soil or passive pressure acting against structures. If frictional resistance is used, an allowable coefficient of friction of 0.28 (total frictional resistance equals the coefficient of friction multiplied by the dead load) is recommended for concrete cast directly against compacted fill. A design passive resistance value of 250 pounds per square foot per foot of depth (with a maximum value of 3,500 pounds per square foot) may be used. The allowable lateral resistance can be taken as the sum of the frictional resistance and the passive resistance without reduction.

5.8.5 Interior Slabs-On-Grade

Concrete slabs should be designed based on the anticipated loading, but measure at least 5.5 inches thick due to the anticipated soil conditions. Slab reinforcement should at least consist of No. 4 reinforcing bars, placed on maximum 16-inch centers, each way, at or above mid-slab height, but with proper concrete cover.

Slabs subjected to heavier loads may require thicker slab sections and/or increased reinforcement. A 125-pci subgrade modulus is considered suitable for elastic design of minimally embedded improvements such as slabs-on-grade. Slab on grade areas should be maintained at a minimum 120 percent of the optimum moisture content or be brought to such moisture contents just prior to placement of slab underlayments or concrete.

In moisture-sensitive floor areas, a suitable vapor retarder of at least 15-mil thickness (with all laps or penetrations sealed or taped) overlying a four-inch layer of consolidated crushed aggregate or gravel (with SE of 30 or more) should be installed, as per the 2013 or 2016 CBC/Green Building Code. An optional maximum two-inch layer of similar material could be placed above the vapor retarder to help protect the membrane during steel and concrete placement. However, per ACI guidelines, better protection from moisture intrusion would be expected from the concrete being placed directly upon the vapor retarder. This recommended protection is generally considered typical in the industry. If proposed floor areas or coverings are considered especially sensitive to moisture emissions, additional recommendations from a specialty consultant could be obtained. CTE is not an expert at preventing moisture penetration through slabs. Therefore, a qualified architect or other experienced professional should be contacted if moisture penetration is a more significant concern.

5.8.6 Auger Cast Pile Deep Foundations

As indicated herein, deep foundations are suitable for support of proposed building improvements. Loads on deep foundations for the proposed building improvements are anticipated to be large. Therefore, we anticipate auger pressure grouted (APG) piles are suitable to be utilized as needed or as desired.

APG piles should be designed and constructed with tip elevations extending a minimum ten feet into competent dense formational materials and a minimum ten feet below proposed rough grades. Prior to in-situ testing, preliminary auger cast pile design should be completed by a qualified design build specialty contractor based on allowable end bearings on the order of 15,000 psf and 800 psf skin friction for the portion of the APG in competent dense formational materials. A one third increase in the capacities is considered appropriate for evaluation of short-duration loads such as those resulting from wind or seismic forces. A load testing program is also to be designed and detailed by the pile installation contractor. However, the pile testing program should be reviewed and approved by CTE prior construction.

Fixed or free head lateral capacities for auger cast piles are anticipated to be on the order of 10 or five kips per pile, respectively, depending on the structural capacities of the piles themselves. If more precise design parameters are required, CTE can perform lateral pile analyses on piles, once rough cross-sections have been determined.

5.8.7 Caisson and Grade Beam Foundation System

Deep drilled pier or caisson foundation systems are also anticipated to be suitable for support of proposed improvements at the subject site. Minimum 18-inch diameter caissons should be embedded a minimum of 10 feet below grade and 10 feet into competent dense formational materials. Caissons shall be spaced a minimum of three diameters, center to center.

For preliminary planning purposes, caissons should be designed for an allowable end bearing pressure of 13,000 psf plus 500-psf skin friction for the portion of the caisson in competent formational materials. A one-third increase for short duration load evaluation may also be used. Uplift capacity should be equal to the weight of the caisson itself and skin friction. The weight of the concrete may be ignored when determining downward capacity.

All caisson excavations should be inspected by the geotechnical representative to verify material competency and proper embedment depth. The bottom of each caisson should be devoid of any loose debris, slough or water prior to steel cage placement and should remain clean until placement of the concrete. Excessive caving of caisson drill holes during drilling is not generally anticipated, but cannot be precluded; therefore, the use of a slip liner or alternative drilling techniques could also be required.

Load testing of an indicator or production caisson should be anticipated. The test caisson should be embedded to similar depths as the proposed production caissons, but could be of lesser diameter in order to reduce the actual test load that will be required.

Grade beams may be installed to distribute structure loads or resist lateral loads as necessary. Grade beam reinforcement should be designed as per the structural engineer. Grade beams may be depended upon for bearing and lateral support of imposed loads in accordance with the design parameters previously provided for shallow spread foundations *only* if the building pad has been prepared in accordance with the recommendations herein for shallow formation areas or if the building pad is entirely in competent cut materials.

To provide resistance for design lateral loads, we recommend using an equivalent passive fluid weight of 250 pounds per cubic foot, up to a maximum pressure of 4,000 psf, for caissons placed against competent compacted fill or formational materials. Due to arching in soils against a round foundation element, the effective width for lateral caisson resistance calculations can be assumed to be twice the caisson diameter. These values assume a horizontal surface for the soil mass extending at least 15 feet.

5.8.8 General for Deep Foundations

Total and differential static settlement of deep foundations is anticipated to be well less than 1.0 and 0.5 inches, respectively.

Design and detailing of all deep foundations, grade beams, and concrete slab reinforcement should be provided by the project structural or specialty engineer(s); especially where deep foundation supported buildings will abut or connect to existing buildings. However, in general, more robust structural connections are recommended at critical pathways and building connections.

5.9 Code Derived Seismic Design Criteria

The seismic ground motion values listed in the table below were derived in accordance with the ASCE 7-10 Standard and the 2013 and 2016 CBC for and Essential Facility. This was further accomplished by establishing the Site Class based on the soil properties at the site, and then calculating the site coefficients and parameters using the United States Geological Survey Seismic Design Maps application using the site coordinates of 33.1849 degrees latitude and -117.2902 degrees longitude. These values are intended for the design of structures to resist the effects of earthquake generated ground motions.

TABLE 5.9 SEISMIC GROUND MOTION VALUES		
PARAMETER	VALUE	CBC REFERENCE (2013)
Site Class	C	ASCE 7, Chapter 20
Mapped Spectral Response Acceleration Parameter, S_S	1.057g	Figure 1613.3.1 (1)
Mapped Spectral Response Acceleration Parameter, S_1	0.411g	Figure 1613.3.1 (2)
Seismic Coefficient, F_a	1.000	Table 1613.3.3 (1)
Seismic Coefficient, F_v	1.389	Table 1613.3.3 (2)
MCE Spectral Response Acceleration Parameter, S_{MS}	1.057g	Section 1613.3.3
MCE Spectral Response Acceleration Parameter, S_{M1}	0.570g	Section 1613.3.3
Design Spectral Response Acceleration, Parameter S_{DS}	0.705g	Section 1613.3.4
Design Spectral Response Acceleration, Parameter S_{D1}	0.380g	Section 1613.3.4
PGA_M	0.401g	ASCE 7, Equation 11.8-1

5.10 Site Specific Ground Motion Study

A site specific risk-targeted maximum considered earthquake (MCE_R) ground motion hazard analysis was performed in accordance with Chapter 21 of ASCE/SEI 7-10, Section 1613 of the California Building Code (CBC), and the 2008 USGS Ground Acceleration Maps. The software package EZ-FRISK (version 7.65) was used to facilitate the analysis. The seismic ground motion values listed in Table 5.10 below were derived in accordance with the site-specific ground motion analysis. Response spectra, output data, and a description of the ground motion study are provided in Appendix E.

TABLE 5.10 SITE-SPECIFIC DESIGN ACCELERATION PARAMETERS (EZFRISK)	
PARAMETER	ACCELERATION VALUE
S_{MS}	1.120g
S_{M1}	0.510g
S_{DS}	0.747g
S_{D1}	0.340g

5.11 Earth Pressures

Retaining walls up to approximately 20 feet high and backfilled using granular soils may be designed using the equivalent fluid weights given below. As indicated and/or implied, some onsite soils will not be suitable for use as wall backfill due to expansion potential and/or fine grained soil contents. As such, importing of select granular materials is anticipated to be required for traditional excavation and backfill retaining walls.

TABLE 5.11 EQUIVALENT FLUID UNIT WEIGHTS (pounds per cubic foot)		
WALL TYPE	LEVEL BACKFILL	SLOPE BACKFILL 2:1 (HORIZONTAL: VERTICAL)
CANTILEVER WALL (YIELDING)	30	50
RESTRAINED WALL	60	80

Lateral pressures on cantilever retaining walls (yielding walls) due to earthquake motions may be calculated based on work by Seed and Whitman (1970). The total lateral thrust against a properly drained and backfilled cantilever retaining wall above the groundwater level can be expressed as:

$$P_{AE} = P_A + \Delta P_{AE}$$

For non-yielding (or "restrained") walls, the total lateral thrust may be similarly calculated based on work by Wood (1973):

$$P_{KE} = P_K + \Delta P_{KE}$$

Where P_A = Static Active Thrust (determined via Table 5.11)
P_K = Static Restrained Wall Thrust (determined via Table 5.11)
ΔP_{AE} = Dynamic Active Thrust Increment = (3/8) $k_h \gamma H^2$
ΔP_{KE} = Dynamic Restrained Thrust Increment = $k_h \gamma H^2$
k_h = 2/3 Peak Ground Acceleration = 2/3(PGA_M)
H = Total Height of the Wall
γ = Total Unit Weight of Soil ≈ 130 pounds per cubic foot

The increment of dynamic thrust may be distributed triangularly with a line of action located at H/3 above the bottom of the wall (SEAOC, 2013).

These values assume non-expansive backfill and free-draining conditions. The majority of the onsite soils may not be suitable for use as wall backfill. Measures should be taken to prevent moisture buildup behind all retaining walls. Figure 5 attached herewith shows a conceptual wall backdrain that may be suitable for use at the subject site depending on the specifics of the proposed retaining wall(s). Waterproofing should be as specified by the project architect or specialty design consultant(s).

In addition to the recommended earth pressure, subterranean structure walls adjacent to the streets or other traffic loads should be designed to resist a uniform lateral pressure of 100 psf. This is the result of an assumed 300-psf surcharge behind the walls due to normal street traffic. If the traffic is kept back at least 10 feet or a distance equal to the retained soil height from the subject walls, whichever is less, the traffic surcharge may be neglected. The project architect or structural engineer should determine the necessity of waterproofing the subterranean structure walls to reduce moisture infiltration.

5.12 Exterior Flatwork

To reduce the potential for cracking in exterior flatwork caused by minor movement of subgrade soils and typical concrete shrinkage, it is recommended that such flatwork be installed with crack-control joints at appropriate spacing as designed by the project architect, and measure a minimum 4.5 inches in thickness. Additionally, it is recommended that flatwork be installed with at least number 3 reinforcing bars on maximum 18-inch centers, each way, at above mid-height of slab but with proper concrete cover. Flatwork, which should be installed with crack control joints, includes driveways, sidewalks, and architectural features. Doweling of flatwork joints at critical pathways or similar could also be beneficial in resisting minor subgrade movements.

Before concrete placement, all subgrade preparation and soil moisture conditioning should be conducted according to the earthwork recommendations previously provided. Positive drainage should be established and maintained next to all flatwork. Subgrade materials shall be maintained at, or be elevated to a minimum 130 percent of the optimum moisture content prior to concrete placement.

While the flatwork recommendations presented herein are anticipated to perform adequately, the City of Oceanside (should this site be under their authority) will typically require a minimum six-inch thick layer of Class 2 Aggregate Base under all concrete site work.

5.13 Vehicular Pavements

The proposed improvements include paved vehicle drive and parking areas. Presented in Table 5.12 are preliminary minimum pavement sections utilizing laboratory determined "R"-Value and estimated Traffic Index Values.

TABLE 5.13
RECOMMENDED PAVEMENT THICKNESS

Traffic Area	Assumed Traffic Index	Preliminary Subgrade "R"-Value	Asphalt Pavements		Portland Cement Concrete Pavements On Subgrade Soils (inches)
			AC Thickness (inches)	Aggregate Base Thickness (inches)	
Moderate Drive Areas & Fire Lanes	6.0	10+	5.0	10.0	8.5
Parking & Light Drive Areas	5.0	10+	4.0	8.0	7.5

1 Caltrans class 2 aggregate base or "Greenbook" Processed Miscellaneous Base
2 Concrete should have a modulus of rupture of at least 600 psi
3 Alternative asphalt concrete sections can generally be proposed by substituting 0.5 inches of asphalt for 1.0 inch of aggregate base, if desired.
4 PCC pavement sections may be decreased by 0.5 inches if six inches of aggregate base is used to underlie these pavements.
5 If permeable pavers are used in either of the above traffic areas, they should be underlain by a relatively impermeable liner, a perforated drain pipe to suitable outlet, and Class 2 Permeable Material with thicknesses equal to 20% greater than the above Class 2 Aggregate Base.

Following rough site grading, CTE recommends laboratory testing of representative at-grade soils for as-graded "R"-Value as laboratory testing of collected samples can indicate a variation of "R" value results. The local public agency, as applicable, should be involved in the design and construction of any improvements within their respective rights-of-way, and for onsite pavements as required.

All subgrade and aggregate base materials beneath pavement areas should be compacted to 95% relative compaction in accordance with ASTM D1557, at a minimum of two percent above optimum moisture content.

Asphalt paved areas should be designed, constructed, and maintained in accordance with the recommendations of the Asphalt Institute or other widely recognized authority. Concrete paved areas should be designed and constructed in accordance with the recommendations of the American Concrete Institute or other widely recognized authority, particularly with regard to thickened edges, joints, and drainage. The Standard Specifications for Public Works construction ("Greenbook") or Caltrans Standard Specifications may be referenced for pavement materials specifications.

5.14 Drainage

Surface runoff should be collected and directed away from improvements by means of appropriate erosion-reducing devices and positive drainage should be established around the proposed improvements. Positive drainage should be directed away from improvements and slope areas at a gradient of at least two percent for a distance of at least five feet. However, the project civil engineers should evaluate the on-site drainage and make necessary provisions to keep surface water from affecting the site.

Generally, CTE recommends against allowing water to infiltrate building pads or adjacent to slopes and improvements. However, we understand that some agencies are encouraging the use of storm-water cleansing devices. Therefore, if storm water cleansing devices must be used, it is generally recommended that they be underlain by an impervious barrier and that the infiltrate be collected via subsurface piping and discharged off site.

5.15 Slopes

Based on anticipated soil strength characteristics, fill and cut slopes should be constructed at slope ratios of 2:1 (horizontal: vertical) or flatter. These fill slope inclinations should exhibit factors of safety greater than 1.5.

Although properly constructed slopes on this site should be grossly stable, the soils will be somewhat erodible. Therefore, runoff water should not be permitted to drain over the edges of slopes unless that water is confined to properly designed and constructed drainage facilities. Erosion-resistant vegetation should be maintained on the face of all slopes. Typically, soils along the top portion of a fill slope face will creep laterally. CTE recommends against building distress-sensitive hardscape improvements within five feet of slope crests.

As indicated, site slopes are generally considered to be stable provided site drainage is implemented as described herein and is constructed and maintained in accordance with the recommendations of the project Civil Engineer

5.16 Plan Review

CTE should be authorized to review the project grading, shoring, and foundation plans, and the grading or earthwork specifications (as applicable), prior to commencement of earthwork. Recommendations contained herein may be modified depending upon development plans.

5.17 Construction Observation

The recommendations provided in this report are based on conceptual design information for the proposed construction and the subsurface conditions observed in the explorations performed by CTE and previously by others. The interpolated subsurface conditions should be checked in the field during construction. Foundation and pavement recommendations may be revised upon review of development plans and completion of grading and as-built laboratory test results.

6.0 LIMITATIONS OF INVESTIGATION

The field evaluation, laboratory testing, and geotechnical analysis presented in this report have been conducted according to current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during construction.

The recommendations presented herein have been developed in order to reduce the potential adverse impacts of differential bearing, previously placed fills, and expansive soil conditions associated with the subject site. However, even with the design and construction precautions herein, some differential movement and associated distress can occur and should be anticipated. In addition, observation, evaluation, and update recommendations provided once project specific plans are developed and during grading or construction are absolutely essential and CTE cannot accept responsibility for plans not reviewed or conditions not observed during grading or construction if such services are provided by others.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

CTE's conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered, this office should be notified and additional recommendations, if required, will be provided.

This report is prepared for the project client as described. It is not applicable to any other site. No other party can rely on this report without the express permission of CTE.

The opportunity to be of service on this project is appreciated. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Respectfully submitted,

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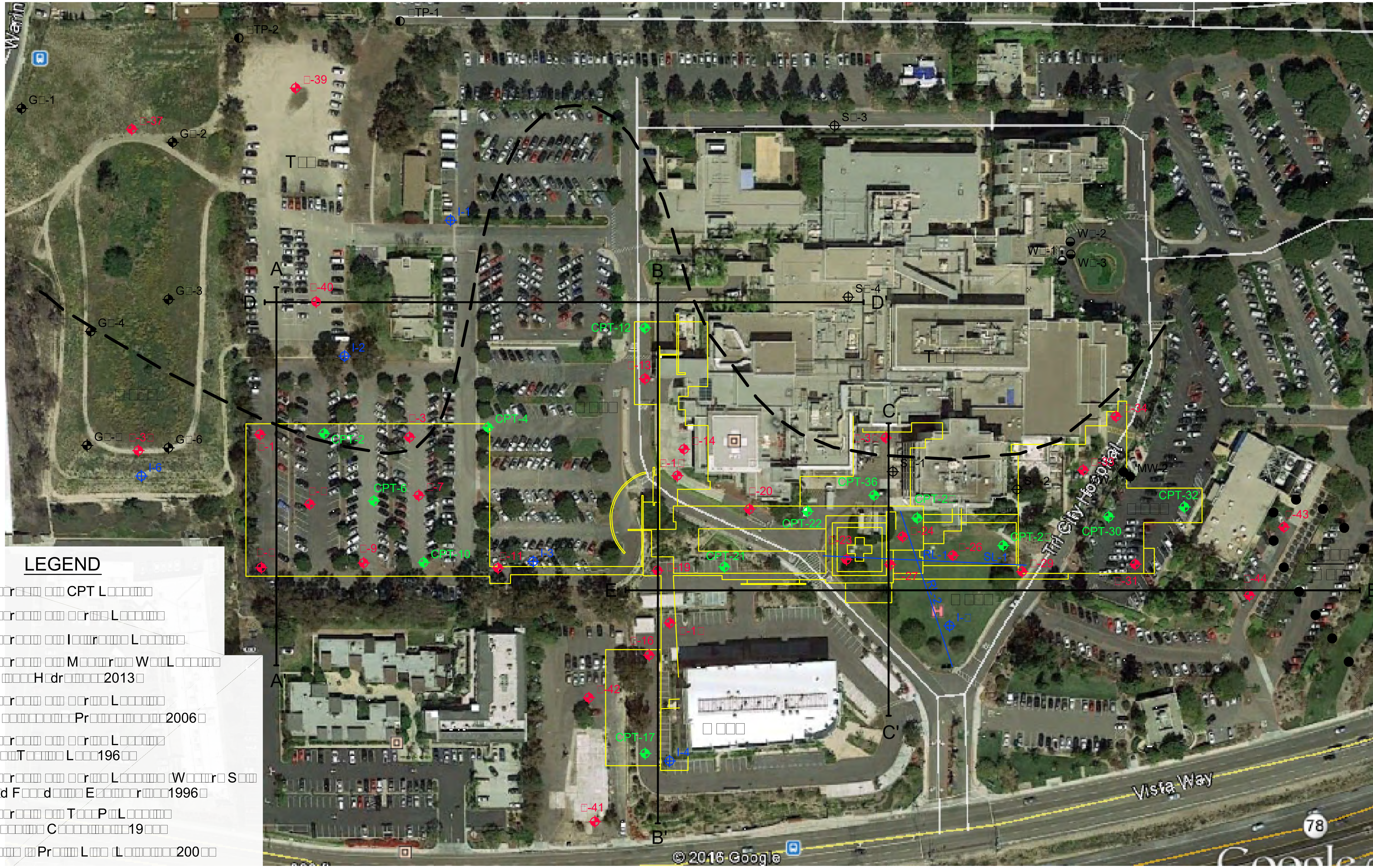
SITE INDEX MAP PROPOSED TRI-CITY MEDICAL CENTER EXPANSION 4002 VISTA WAY OCEANSIDE, CALIFORNIA	SCALE: AS SHOWN	DATE: 8/16
	CTE JOB NO.: 10-13000G	FIGURE: 1



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I-6	A□□r□□□ □□□ I□□□r□□□□ L□□□□□□
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SL-1 RL-1	S□□□ □□Pr□□□□ L□□□ □L□□□□□□□200□□
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120' 0 60' 120'

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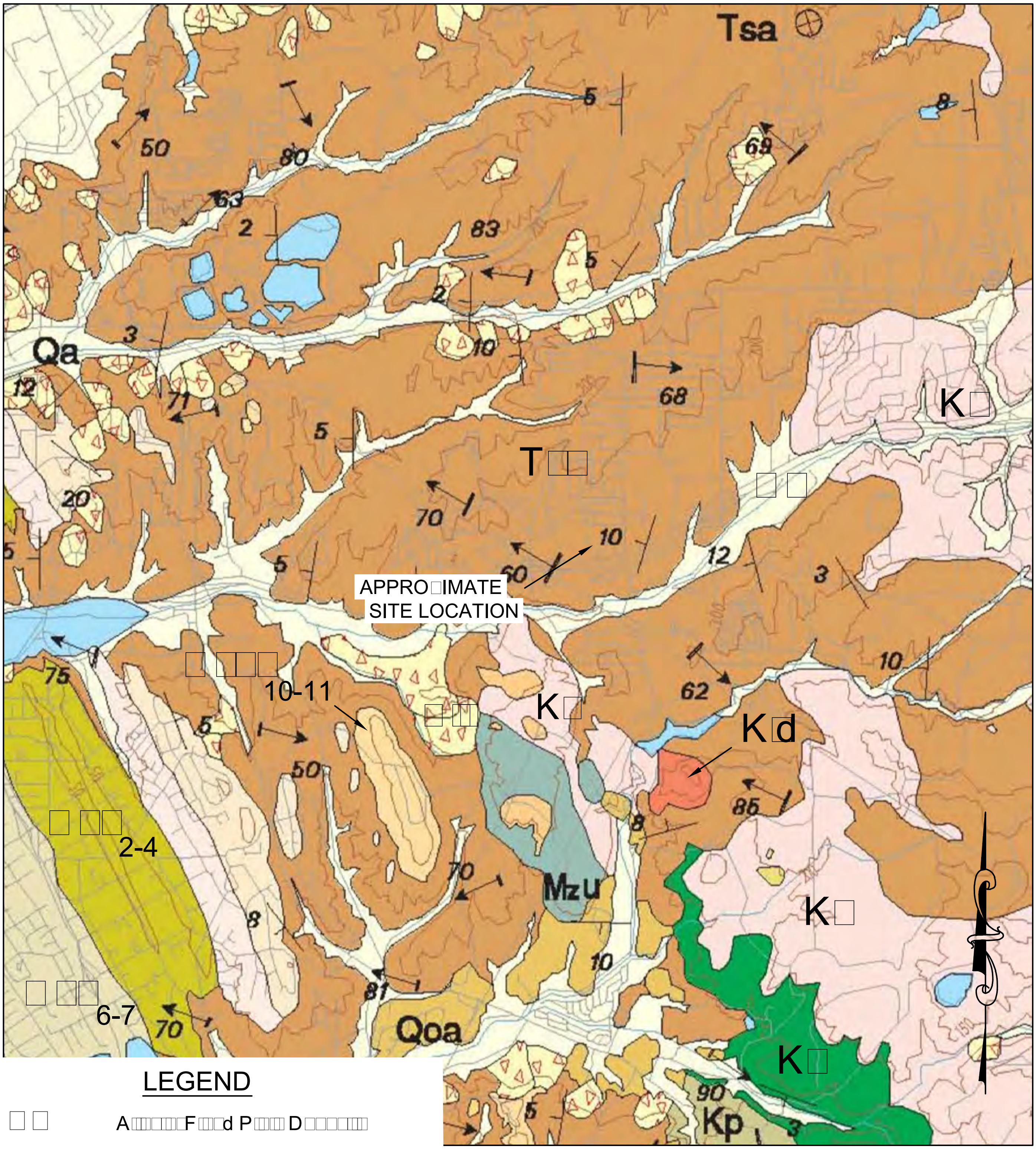
GEOLOGIC/EXPLORATION LOCATION MAP
PROPOSED TRI-CITY MEDICAL CENTER EXPANSION
4002 VISTA WAY
OCEANSIDE, CALIFORNIA

CTE JOB NO:	10-13000G
SCALE:	1" = 120'
DATE: 9/16	FIGURE: 2



LEGEND

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K□	T□□□□□□
M□□	M□□□□□d□□ □□□□r□ □□d M□□□□□□□□□□ R□□□

NOTE: □□□□M□□ □□K□□□□d□ □□d T□□□200□□G□□□□□□M□□ □□□□□ O□□□□□□d□30' □60' □ □□dr□□□□□C□□□□r□□.

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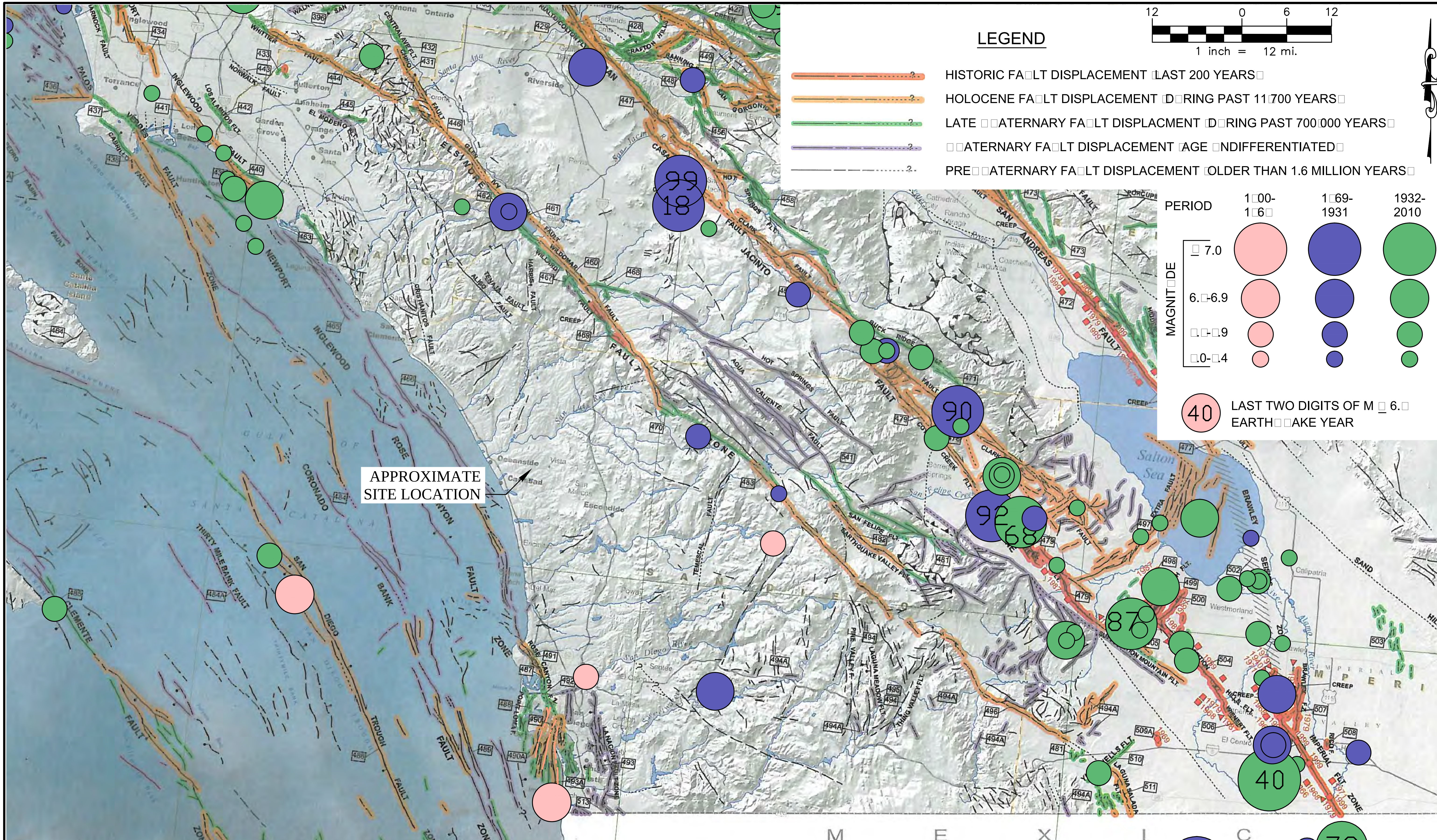
REGIONAL GEOLOGIC MAP
PROPOSED PALOMAR COLLEGE EXPANSION
1140 WEST MISSION ROAD
SAN MARCOS, CALIFORNIA

SCALE:	DATE:
1"~4,000'	9/16
CTE JOB NO.:	FIGURE:
10-13000G	3

\\Esc_server\projects\10-13000G\Figure 3 (Geo Map).dwg



NOTES: FAULT ACTIVITY MAP OF CALIFORNIA, 2010, CALIFORNIA GEOLOGIC DATA MAP SERIES MAP NO. 6;
EPICENTERS OF AND AREAS DAMAGED BY M≥5 CALIFORNIA EARTHQUAKES, 1800-1999 ADAPTED AFTER TOPPOZADA, BRANUM, PETERSEN, HALLSTORM, CRAMER, AND REICHLE, 2000, CDMG MAP SHEET 49
REFERENCE FOR ADDITIONAL EXPLANATION; MODIFIED WITH CISN AND USGS SEISMIC MAPS

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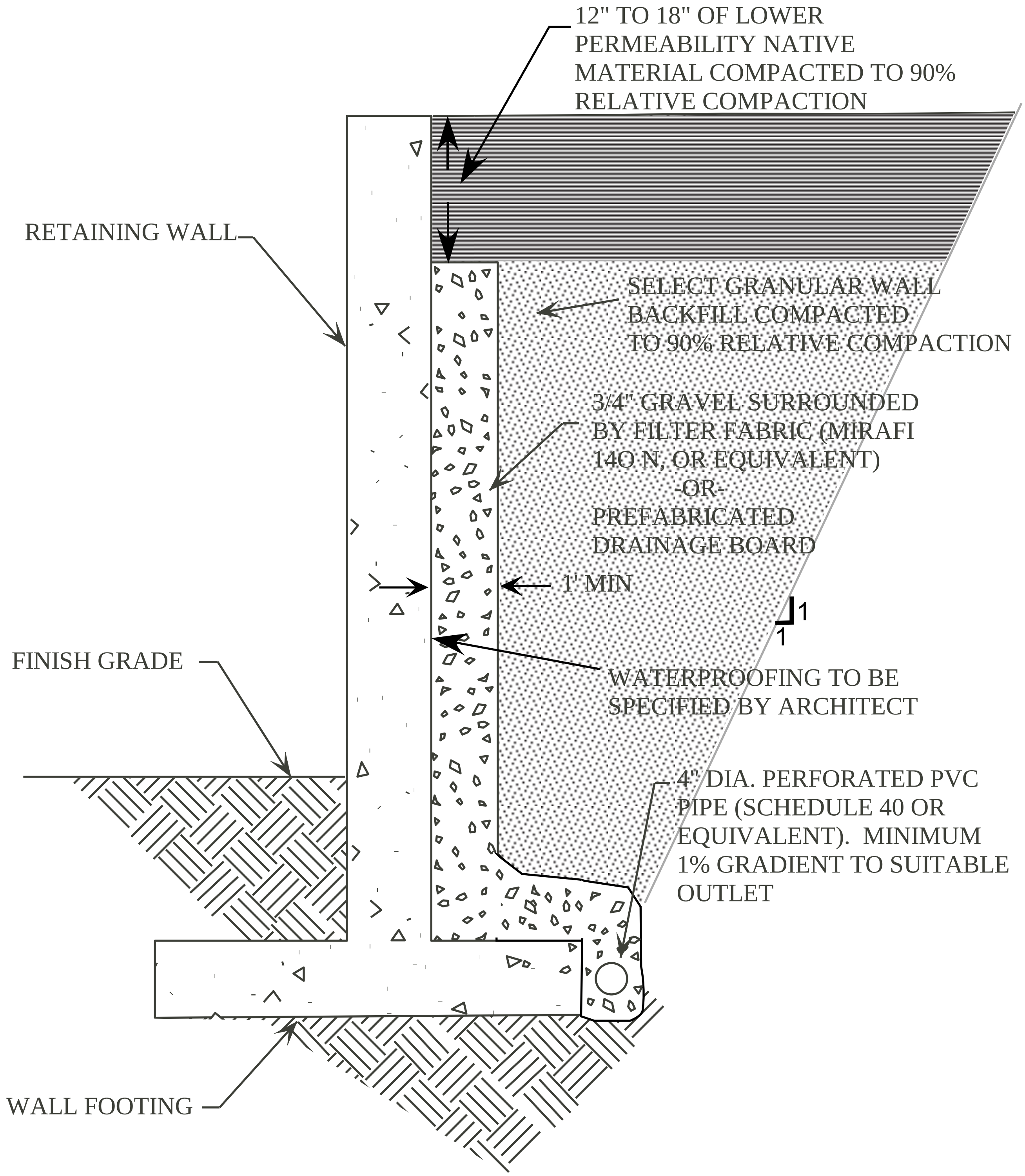
REGIONAL FAULT AND SEISMICITY MAP
PROPOSED TRI-CITY MEDICAL CENTER EXPANSION
4002 VISTA WAY
OCEANSIDE, CALIFORNIA

CTE JOB NO:	10-13000G
SCALE:	1 inch = 12 miles
DATE: 9/16	FIGURE: 4



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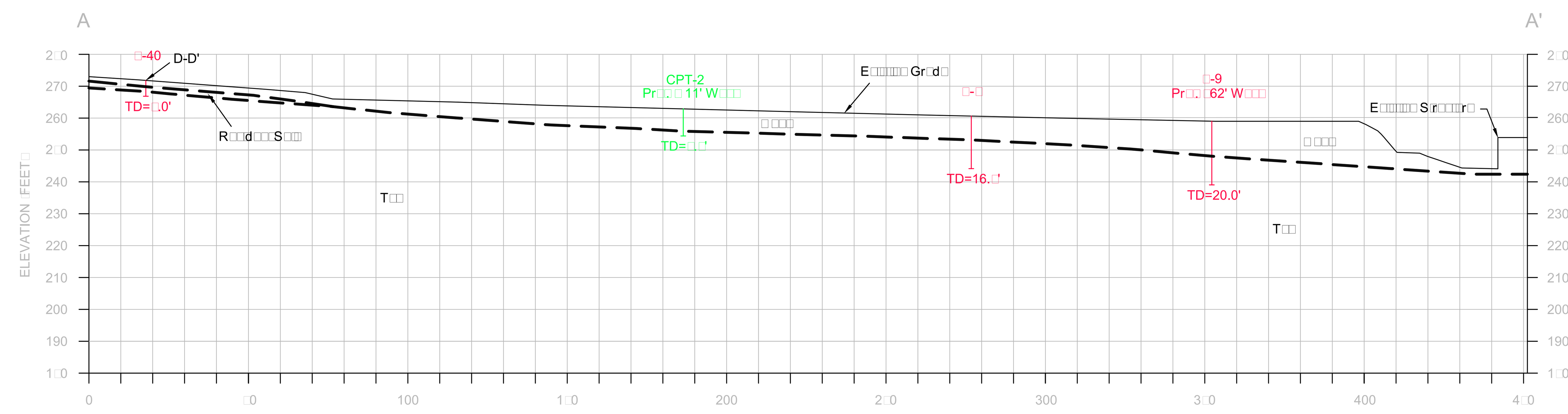
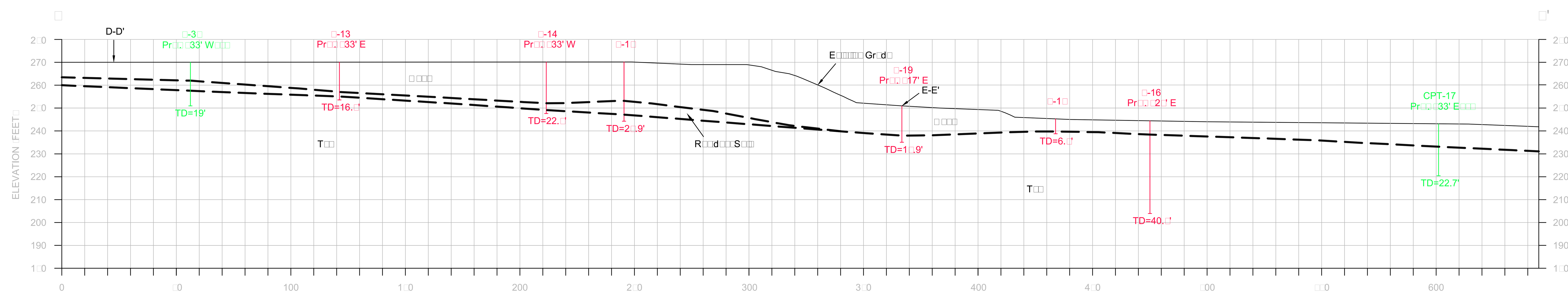
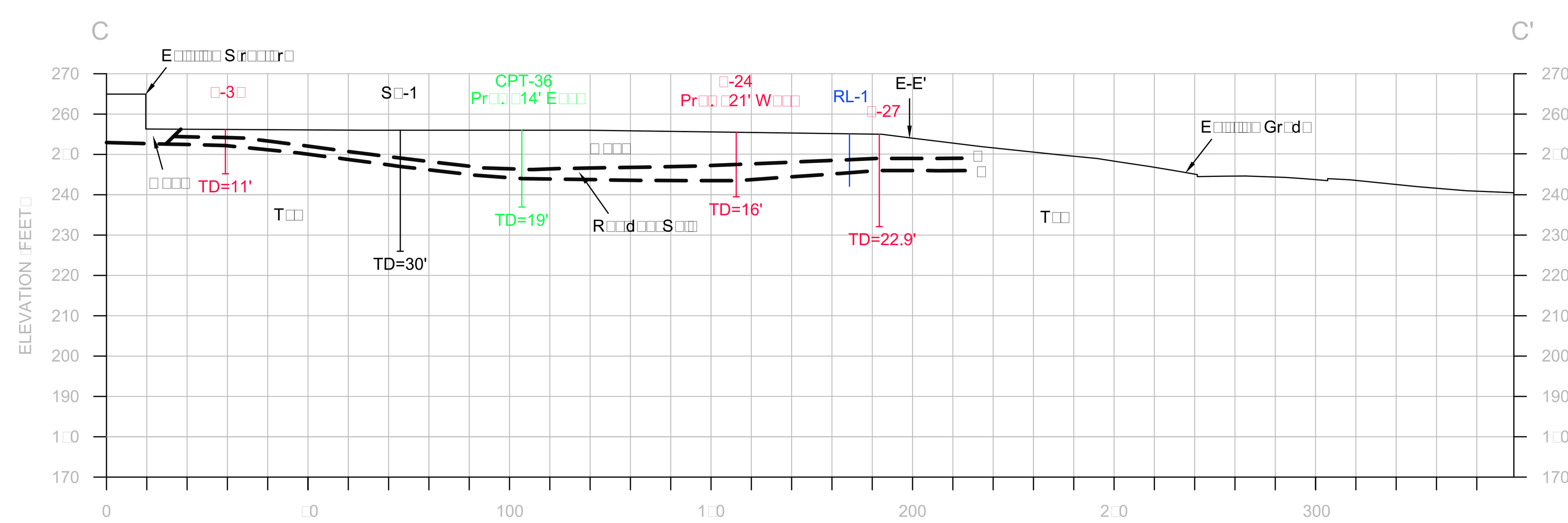
RETAINING WALL DRAINAGE DETAIL	CTE JOB NO: 10-13000G	
	SCALE: NO SCALE	
	DATE: 09/16	FIGURE: 5



CROSS SECTION A-A'



CROSS SECTION □-□'



CROSS SECTION C-C'

LEGEND

□□□□ □□ATERNARY PREVIO□SLY PLACED FILL

T□□ TERTIARY SANTIAGO FORMATION

□ □□ □□ATERNARY ALL□VI□M

APPRO□IMATE GEOLOGIC CONTACT

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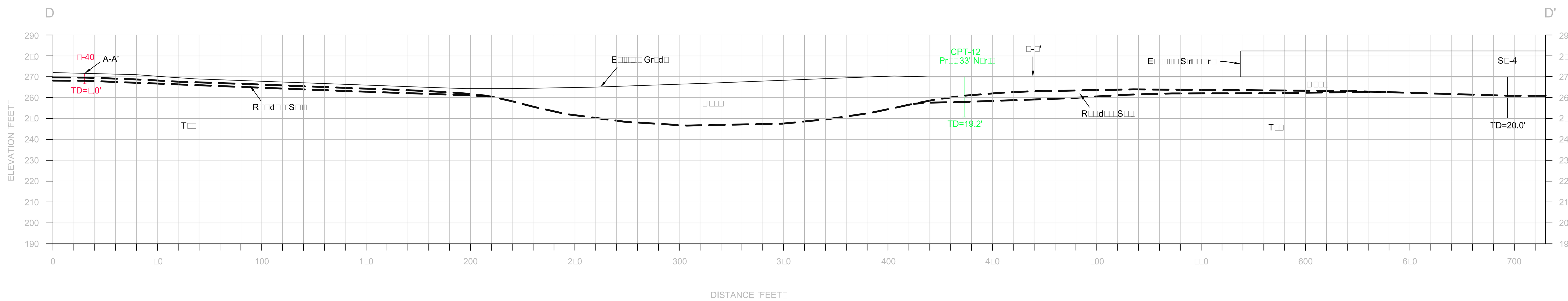
CROSS SECTIONS A-A', B-B' and C-C'

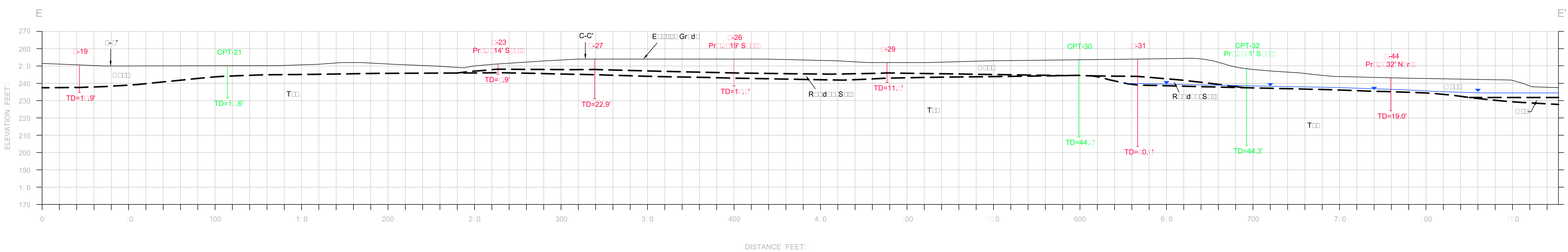
PROPOSED TRI-CITY MEDICAL CENTER EXPANSION
4002 VISTA WAY
SAN DIEGO, CALIFORNIA

SCALE: 1"=30'	DATE: 9/16
CTE Job No.: 10-13000G	PLATE: 1

\\Esc_server\projects\10-13000G\Plates 1 and 2 (Cross Sections).dwg



CROSS SECTION D-D'



CROSS SECTION E-E'

LEGEND

- QUATERNARY PREVIOUSLY PLACED FILL
- Tsa TERTIARY SANTIAGO FORMATION
- QUATERNARY ALLUVIUM
- APPROXIMATE GEOLOGIC CONTACT
- APPROXIMATE GROUNDWATER ELEVATION

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CROSS SECTIONS D-D and E-E'
PROPOSED TRI-CITY MEDICAL CENTER EXPANSION
4002 VISTA WAY
SAN DIEGO, CALIFORNIA

SCALE: 1"=30'	DATE: 9/16
CTE Job No.: 10-13000G	PLATE: 2

\\Esc_server\projects\10-13000G\Plates 1 and 2 (Cross Sections).dwg

APPENDIX A

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REFERENCES

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APPENDIX B

EXPLORATION LOGS

CTE BORING LOGS
CURRENT SITE INVESTIGATION

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DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	**GRAVELS** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS < 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OF NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS < 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	**SILTS AND CLAYS** LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, SLIGHTLY PLASTIC CLAYEY SILTS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, SILTS OR LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTY CLAYS
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

BOULDERS	COBBLES	GRAVEL		SAND			SILTS AND CLAYS
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" 4 10 40 200

CLEAR SQUARE SIEVE OPENING U.S. STANDARD SIEVE SIZE

ADDITIONAL TESTS

(OTHER THAN TEST PIT AND BORING LOG COLUMN HEADINGS)

MAX- Maximum Dry Density
GS- Grain Size Distribution
SE- Sand Equivalent
EI- Expansion Index
CHM- Sulfate and Chloride Content , pH, Resistivity
COR - Corrosivity
SD- Sample Disturbed

PM- Permeability
SG- Specific Gravity
HA- Hydrometer Analysis
AL- Atterberg Limits
RV- R-Value
CN- Consolidation
CP- Collapse Potential
HC- Hydrocollapse
REM- Remolded

PP- Pocket Penetrometer
WA- Wash Analysis
DS- Direct Shear
UC- Unconfined Compression
MD- Moisture/Density
M- Moisture
SC- Swell Compression
OI- Organic Impurities

FIGURE: BL1

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PROJECT:	DRILLER:	SHEET: of
CTE JOB NO:	DRILL METHOD:	DRILLING DATE:
LOGGED BY:	SAMPLE METHOD:	ELEVATION:

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	BORING LEGEND DESCRIPTION	Laboratory Tests
0								Block or Chunk Sample	
								Bulk Sample	
5									
								Standard Penetration Test	
10								Modified Split-Barrel Drive Sampler (Cal Sampler)	
								Thin Walled Army Corp. of Engineers Sample	
15								Groundwater Table	
								Soil Type or Classification Change	
20								? —— ? —— ? —— ? —— ? —— ? —— ? —	
								Formation Change [(Approximate boundaries queried (?)]	
25						"SM"		Quotes are placed around classifications where the soils exist in situ as bedrock	

FIGURE: BL2

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~268 FEET

BORING: B-1

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Asphalt: 0-3" Base Material: 3-6" **<u>QUATERNARY PREVIOUSLY PLACED FILL</u>:** Medium dense, dry to slightly moist, brown, clayey fine grained SAND.	
5		Ring	22 50/5"			"SM"		**<u>TERTIARY SANTIAGO FORMATION</u>:** Very dense, slightly moist, reddish gray, silty fine grained SANDSTONE, oxidized mottling, massive. Becomes less oxidized	
10		SPT	50/6"						DS
								Total Depth: 10.5' No Groundwater Encountered	
15									
20									
25									

B-1

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~264 FEET

BORING: B-3

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		Asphalt: 0-3" Base Material: 3-6" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, brown, clayey fine grained SAND.	CHM
	X					CL		**RESIDUAL SOIL:** Very stiff, moist, olive brown, fine grained sandy CLAY, oxidized.	
5						"SC"		**TERTIARY SANTIAGO FORMATION:** Very dense, slightly moist, light olive gray, clayey fine grained SANDSTONE, oxidized mottling, massive.	
			50/5"						
10								Total Depth: 8.5' No Groundwater Encountered	
15									
20									
25									

B-3

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~264 FEET

BORING: B-5

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						CL		Asphalt: 0-3" Base Material: 3-6" **<u>QUATERNARY PREVIOUSLY PLACED FILL</u>:** Stiff, moist, brown, fine grained sandy CLAY.	EI
5			13 12 18						CN
						"SM"		**<u>TERTIARY SANTIAGO FORMATION</u>:** Very dense, slightly moist, light gray, silty fine grained SANDSTONE, oxidized nodules, massive.	
10			18 36 50/5"						
15			24 50/4"						
								Total Depth: 16.5' No Groundwater Encountered	
20									
25									

B-5

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~260 FEET

BORING: B-7

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Asphalt: 0-3" Base Material: 3-8" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, olive brown, clayey fine grained SAND.	
5		SPT	6 12 14						CN
						"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light gray, silty fine grained SANDSTONE, oxidized mottling, massive.	
10		Ring	17 27 50/5"						GS
								Total Depth: 11.5' No Groundwater Encountered	
15									
20									
25									

B-7

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 2
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~262 FEET

BORING: B-8

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		Asphalt: 0-3" Base Material: 3-8" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, brown, clayey fine grained SAND.	
5		SPT	20 27 50/6"						
						"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, slightly moist, light gray, silty fine grained SANDSTONE with trace clay, oxidized blebs, massive.	
10		Ring	15 35 50/4"						
15		SPT	50/6"						
20		Ring	18 32 50/4"						
25									

B-8

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~262 FEET

BORING: B-8

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25						"SM"		Very dense, slightly moist, light gray, silty fine grained SANDSTONE with trace clay, oxidized blebs, massive.	
30			19 50/5"						
35									
								Becomes less oxidized	
40			19 50/2"						
45									
								Total Depth: 50.2' No Groundwater Encountered Backfilled with Bentonite Grout Capped with Chips and Concrete	
50			50/2"						

B-8

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~258 FEET

BORING: B-9

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Asphalt: 0-2" Base Material: 2-5" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, brown, clayey fine grained SAND.	
5			10 13 14						
						CL		Very stiff, moist, olive brown, fine grained sandy CLAY, trace roots.	
10			12 18 48						
						"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light gray, silty fine grained SANDSTONE, oxidized mottling, massive.	
15			18 50/6"						
20								Total Depth: 20.0' No Groundwater Encountered	
25									

B-9

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~254 FEET

BORING: B-11

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Asphalt: 0-6" Base Material: 6-10" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, slightly moist, light brown, clayey fine grained SAND.	
						SM		Medium dense, moist, light gray, silty fine grained SAND.	
5			10 12 13						
						CL		Stiff, moist, olive, fine grained sandy CLAY.	
10			8 11 18			CL		**RESIDUAL SOIL:** Stiff, moist, olive, fine grained sandy CLAY.	CN
						"SC"		**TERTIARY SANTIAGO FORMATION:** Very dense, slightly moist, light olive gray, clayey fine grained SANDSTONE, oxidized mottling, massive.	
15			26 50/5"						
								Total Depth: 15.9' No Groundwater Encountered	
20									
25									

B-11

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~267 FEET

BORING: B-13

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Asphalt: 0-3" Base Material: 3-24" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, slightly moist, olive brown, clayey fine grained SAND.	
5			6 8 11						
10			9 12 10						CN
						CL		**RESIDUAL SOIL:** Stiff, moist, olive, fine grained sandy CLAY, oxidized mottling, massive.	
15			16 27 50/6"			"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, slightly moist, light gray, silty fine grained SANDSTONE, oxidized mottling, massive.	
								Total Depth: 16.5' No Groundwater Encountered	
20									
25									

B-13

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~264 FEET

BORING: B-14

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						CL		Concrete: 0-8" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, olive brown, fine grained sandy CLAY.	
5									
10									
15									
						CL		**RESIDUAL SOIL:** Stiff, moist, olive, fine grained sandy CLAY, oxidized mottling.	
20									
			15 25 50/5"			"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light gray, silty fine grained SANDSTONE, oxidized mottling, massive.	
								Total Depth: 22.5' No Groundwater Encountered Backfilled with Bentonite Chipps Capped with Concrete	
25									

B-14

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~246 FEET

BORING: B-15

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						CL		Asphalt: 0-4" Base Material: 4-9" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, dark olive, fine grained sandy CLAY.	
5			7 25 50/5"			"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light gray, silty fine grained SANDSTONE, oxidized blebs, massive.	
								Total Depth: 6.5' No Groundwater Encountered	
10									
15									
20									
25									

B-15

Construction Testing & Engineering, Inc.
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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 2
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~242 FEET

BORING: B-16

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		Asphalt: 0-4" Base Material: 4-9" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, dark olive, fine grained sandy CLAY.	EI
5		SPT	8 14 32						
						"SC"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light gray, clayey fine grained SANDSTONE with trace clay, oxidized mottling, massive.	
						"SM"		Very dense, moist, light reddish gray, silty fine grained SANDSTONE, oxidized mottling, massive.	
10		Ring	18 50/5"						
								Becomes more oxidized	
15									
						"SC"		Very dense, moist, light gray, clayey fine grained SANDSTONE with trace clay, oxidized blebs, massive.	
20		Ring	17 50/5"						
25									

B-16

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~242 FEET

BORING: B-16

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25						"SC"		Very dense, slightly moist, light gray, clayey fine grained SANDSTONE with trace clay, oxidized mottling, massive.	
30									
								Seepage	
35									
40		▯	50/6"						
								Total Depth: 40.5' Seepage Encountered at Approximately 32' Backfilled with Bentonite Grout Capped with Chips and Concrete	
45									
50									

B-16

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 2
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~263 FEET

BORING: B-18

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Concrete: 0-8" Base Material: 8-18" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, olive brown, clayey fine grained SAND with trace gravel.	
						CL		Stiff, moist, olive brown, fine grained sandy CLAY.	
5									
10			6 7 7					Asphalt	CN
15									
						CL		**RESIDUAL SOIL:** Stiff, moist, olive, fine grained sandy CLAY, oxidized mottling. carbonate blebs.	
20			5 5 7						GS
						"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light gray, silty fine grained SANDSTONE, massive.	
25			25						

B-18

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~263 FEET

BORING: B-18

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25						"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light gray, silty fine grained SANDSTONE, massive.	
								Total Depth: 25.9' No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
30									
35									
40									
45									
50									

B-18

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~254 FEET

BORING: B-19

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X (0-5)					SC		Asphalt: 0-3" Base Material: 3-7" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, olive brown, clayey fine grained SAND.	
5		Ring	5 5 9						
						CL		Stiff, moist, olive, fine grained sandy CLAY.	
10		SPT	7 15 17						
						SC		Medium dense, moist, light gray, clayey fine grained SAND.	CN
						"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, slightly moist, light gray, silty fine grained SANDSTONE, oxidized blebs, massive.	
15		Ring	20 50/5"						
								Total Depth: 15.9' No Groundwater Encountered	
20									
25									

B-19

Construction Testing & Engineering, Inc.
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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/13/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~258 FEET

BORING: B-20

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		Asphalt: 0-3" Base Material: 3-9" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, olive brown, fine grained sandy CLAY.	
4						SC		Medium dense, moist, olive, clayey fine grained SAND.	
5		SPT	11 12 13						
7						CL		Roots Very stiff, moist, brown, fine grained sandy CLAY, trace gravel.	
10		Ring	8 9 13			SC		Medium dense, moist, light grayish brown, clayey fine grained SAND.	
14						CL		Very stiff, moist, olive brown, fine grained sandy CLAY.	
15		SPT	7 13 16						
19		Ring	22 27 50/6"			"SC/SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, slightly moist, light gray, silty to clayey fine grained SANDSTONE, oxidized mottling.	AL
20								Total Depth: 20.0' No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
25									

B-20

Construction Testing & Engineering, Inc.
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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~256 FEET

BORING: B-23

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						CL		**QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, slightly moist, light olive brown, fine grained sandy CLAY.	
						SM		**RESIDUAL SOIL:** Medium dense, moist, olive brown, silty fine grained SAND.	
						CL		Very stiff, moist, olive, fine grained sandy CLAY.	
5			26 50/4"			"SC"		**TERTIARY SANTIAGO FORMATION:** Very dense, slightly moist, light gray, silty fine to medium grained SANDSTONE, massive.	
								Total Depth: 5.9' No Groundwater Encountered	
10									
15									
20									
25									

B-23

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~259 FEET

BORING: B-24

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, slightly moist, light olive gray, clayey fine grained SAND.	
						CL		Stiff, moist, dark brown, fine grained sandy CLAY.	
5			5 6 7						AL
						SM		**RESIDUAL SOIL:** Medium dense, moist, olive, silty fine grained SAND.	
10			8 8 9			SC		Medium dense, moist, olive, clayey fine grained SAND.	CN
						"CL"		**TERTIARY SANTIAGO FORMATION:** Hard, moist, olive, fine grained sandy CLAYSTONE, oxidized mottling.	EI
15			20 50/6"			"SC"		Very dense, moist, light olive, clayey fine grained SANDSTONE, oxidized mottling, massive.	
								Total Depth: 16.0' No Groundwater Encountered	
20									
25									

B-24

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~257 FEET

BORING: B-26

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist,olive brown, clayey fine grained SAND.	
						SM		Medium dense, moist, gray to dark olive, silty fine grained SAND.	
5			18 18 21						CN
						CL		**RESIDUAL SOIL:** Stiff, moist, dark brown, fine grained sandy CLAY.	
10			8 13 20			"SC"		**TERTIARY SANTIAGO FORMATION:** Dense, moist, olive, clayey fine grained SAND. mottling. Becomes very dense	
15			50/6"						
								Total Depth: 15.5' No Groundwater Encountered	
20									
25									

B-26

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~257 FEET

BORING: B-27

Depth (Feet)	Sample Type (Bulk / Driven)	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	Bulk (0–5)				SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, slightly moist, light yellowish brown, clayey fine grained SAND.	CHM
5	Driven	7, 11, 12						GS
					SM		**RESIDUAL SOIL:** Medium dense, moist, dark grayish brown, silty fine grained SAND, oxidized mottling.	
					CL		Very stiff, moist, dark olive gray, fine grained sandy CLAY, oxidized mottling.	
					"CL"		**TERTIARY SANTIAGO FORMATION:** Hard, moist, olive, fine grained sandy CLAYSTONE, oxidized mottling.	
10	Driven	12, 16, 19						GS
					"SC"		Very dense, slightly moist, light olive, clayey fine grained SANDSTONE, oxidized mottling.	
15	Driven	34, 50/6"					Increased density	
20								
	Driven	26, 50/6"						
25							Total Depth: 22.9' (Refusal in Dense Sandstone) No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	

B-27

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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~251 FEET

BORING: B-29

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, brown, clayey fine grained SAND.	
						CL		Stiff, moist, brown, fine grained sandy CLAY.	
5			7 8 7						
						SM		**RESIDUAL SOIL:** Medium dense, moist, olive, silty fine grained SAND.	
						CL		Very stiff, moist, olive, fine grained sandy CLAY.	
						"SC"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light olive gray, clayey fine grained SANDSTONE, massive.	
10			20 24 50/6"						
								Total Depth: 11.5' No Groundwater Encountered	
15									
20									
25									

B-29

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 2
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/15/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~258 FEET

BORING: B-31

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		Asphalt: 0-3" Base Material: 3-8" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, olive, fine grained sandy CLAY.	EI
5		X	9 9 9						
10		X	1 2 4			SM		**RESIDUAL SOIL:** Loose, very moist, light gray, silty fine grained SAND.	
						CL		Stiff, moist, light olive, fine grained sandy CLAY.	
15		X	14 17 31			"SC"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light olive, clayey fine grained SANDSTONE, oxidized mottling, massive.	
20		X	17 50/5"						
						"SC/CL"		Very dense or hard, moist, light olive, clayey fine grained SANDSTONE/ sandy CLAYSTONE, oxidized mottling, massive.	
25									

B-31

CTE INC. Construction Testing & Engineering, Inc.
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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/15/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~258 FEET

BORING: B-31

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25						"SC/CL"		Very dense or hard, moist, light olive, clayey fine grained SANDSTONE/ sandy CLAYSTONE, oxidized mottling, massive.	
30		ring	19 50/5"					Becomes interbedded clayey SANDSTONE and sandy CLAYSTONE.	
35									
						"ML"		Hard, slightly moist, olive, fine grained SILTSTONE with trace clay, oxidized mottling.	
40		ring	17 20 39						AL
45									
								Total Depth: 50.5' No Groundwater Encountered Backfilled with Bentonite Grout Capped with Chips and Concrete	
50		ring	50/6"						AL

B-31

CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~260 FEET

BORING: B-33

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	DESCRIPTION	Laboratory Tests
0						CL	Asphalt: 0-4" Base Material: 4-8" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, dark brown, fine grained sandy CLAY.	
5			2 2 3					
						SM	**RESIDUAL SOIL:** Loose to medium dense, very moist, dark grayish brown, silty fine grained SAND.	
						CL	Very stiff, moist, brown, fine grained sandy CLAY.	
						"CL"	**TERTIARY SANTIAGO FORMATION:** Hard, moist, olive, fine grained sandy CLAYSTONE, oxidized mottling, massive.	
10			50/6"			"SC"	Very dense, moist, light olive gray, clayey fine to medium grained SANDSTONE, oxidized mottling, massive.	DS
							Total Depth: 10.5' No Groundwater Encountered	
15								
20								
25								

B-33

Construction Testing & Engineering, Inc.
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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~261 FEET

BORING: B-34

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						CL/SC		Asphalt: 0-3" Base Material: 3-7" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff or medium dense, moist, brown, fine grained sandy CLAY/ clayey SAND.	
5			5 5 6			CL		Stiff, moist, brown, fine grained sandy CLAY.	
10			6 9 11						
						SP		Medium dense, moist, dark brown, poorly graded fine grained SAND. Odorius soil Seepage	
						"CL"		**TERTIARY SANTIAGO FORMATION:** Hard, moist, olive, fine grained sandy CLAYSTONE, oxidized mottling.	
15			11 17 44			"SM"		Very dense, moist, light olive gray, silty fine grained SANDSTONE, massive.	
								Total Depth: 16.5' Seepage Encountered at Approximately 14 feet Backfilled with Bentonite Chips Capped with Concrete	
20									
25									

B-34

Construction Testing & Engineering, Inc.
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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/14/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~263 FEET

BORING: B-35

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		Asphalt: 0-4" Base Material: 4-7" **<u>QUATERNARY PREVIOUSLY PLACED FILL</u>:** Stiff, moist, olive brown, fine grained sandy CLAY.	
	X					CL		**<u>RESIDUAL SOIL</u>:** Very stiff, moist, reddish olive, fine grained sandy CLAY, oxidized.	
	X					"SM/SC"		**<u>TERTIARY SANTIAGO FORMATION</u>:** Very dense, slightly moist, light olive, silty to clayey fine grained SANDSTONE, oxidized mottling, massive.	
5		SPT	15 50/6"						
10		Ring	16 50/6"						
15								Total Depth: 11.0' No Groundwater Encountered	
20									
25									

B-35

Construction Testing & Engineering, Inc.
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PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~283 FEET

BORING: B-37

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		**RESIDUAL SOIL:** Very stiff, dry to slightly moist, brown, fine grained sandy CLAY, oxidized.	
	X					"SC"		**TERTIARY SANTIAGO FORMATION:** Very dense, slightly moist, gray, clayey fine grained SANDSTONE, massive. Increased oxidation	RV
5								Total Depth: 5.0' No Groundwater Encountered	
10									
15									
20									
25									

B-37

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~273 FEET

BORING: B-38

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0–5	X					SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, olive brown, clayey fine grained SAND with trace gravel and concrete.	
						CL		Stiff, moist, brown, fine grained sandy CLAY.	
10						"SC"		**RESIDUAL SOIL:** Medium dense to dense, moist, olive gray, clayey fine grained SAND.	
						"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light gray, silty to clayey fine grained SANDSTONE, oxidized mottling, massive.	
15								Total Depth: 14.0' No Groundwater Encountered	
20									
25									

B-38

CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~287 FEET

BORING: B-39

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		**RESIDUAL SOIL:** Very stiff, dry to slightly moist, brown to dark brown, fine grained sandy CLAY, oxidized.	
	X					"SC"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, olive gray, clayey fine grained SANDSTONE, oxidized, massive.	
5								Total Depth: 5.0' No Groundwater Encountered	
10									
15									
20									
25									

B-39

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~272 FEET

BORING: B-40

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		Asphalt: 0-3" Base Material: 3-6" **<u>QUATERNARY PREVIOUSLY PLACED FILL</u>:** Medium dense, moist, dark brown, clayey fine grained SAND.	
	X					CL		**<u>RESIDUAL SOIL</u>:** Very stiff, moist, brown, fine grained sandy CLAY.	RV
	X					"SC"		**<u>TERTIARY SANTIAGO FORMATION</u>:** Very dense, moist, olive gray, clayey fine grained SANDSTONE, oxidized, massive.	
5								Total Depth: 5.0' No Groundwater Encountered	
10									
15									
20									
25									

B-40

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HAND AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~232 FEET

BORING: B-41

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, slightly moist, light brown, clayey fine grained SAND.	
5						"SM"		**RESIDUAL SOIL:** Medium dense to dense, moist, dark olive gray, silty fine grained SAND, oxidized nodules.	
								Total Depth: 6.5' No Groundwater Encountered	
10									
15									
20									
25									

B-41

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HAND AUGER	DRILLING DATE:	7/12/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~237 FEET

BORING: B-42

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		Asphalt: 0-3" Base Material: 3-6" **QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, dry to slightly moist, brown, clayey fine grained SAND.	
	X					"SM"		**TERTIARY SANTIAGO FORMATION:** Very dense, moist, light reddish gray, silty fine grained SANDSTONE, massive.	RV
5								Total Depth: 5.0' No Groundwater Encountered	
10									
15									
20									
25									

B-42

CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/15/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~244 FEET

BORING: B-43

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		Asphalt: 0-3" Base Material: 3-7" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, olive brown, fine grained sandy CLAY.	EI, CHM
5		SPT	6 7 8			SP		**QUATERNARY ALLUVIUM:** Medium dense, moist, grayish brown, poorly graded fine grained SAND, micaceous, friable.	
10		Ring	11 15 18			"CL"		**TERTIARY SANTIAGO FORMATION:** Hard, moist, olive, fine grained sandy CLAYSTONE, oxidized mottling.	
15		Ring	18 26 50/5"						
						"SM"		Very dense, slightly moist, light olive, silty fine grained SANDSTONE, massive.	
		Ring	23 50/5"						
20								Total Depth: 18.9' No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
25									

B-43

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

PROJECT:	TRI-CITY MEDICAL CTR. EXPANSION	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-13000G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	7/15/2016
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~237 FEET

BORING: B-44

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		Asphalt: 0-3" Base Material: 3-7" **QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, brown, clayey fine grained SAND.	
						SM		Medium dense, moist, brown, silty fine grained SAND.	
						CL		Stiff, moist, brown, fine grained sandy CLAY.	
						SC		Medium dense, moist, reddish olive, clayey fine grained SAND.	
5			3 3 3						
						"CL"		**TERTIARY SANTIAGO FORMATION:** Hard, moist, olive, fine grained sandy CLAYSTONE, oxidized mottling.	
10			47 50/4"			"SC"		Very dense, moist, light olive, clayey fine grained SANDSTONE, oxidized mottling, massive.	
						"SM"		Very dense, slightly moist, light olive, silty fine grained SANDSTONE, massive.	
15			17 50/6"						
								Total Depth: 19.0' No Groundwater Encountered	
20									
25									

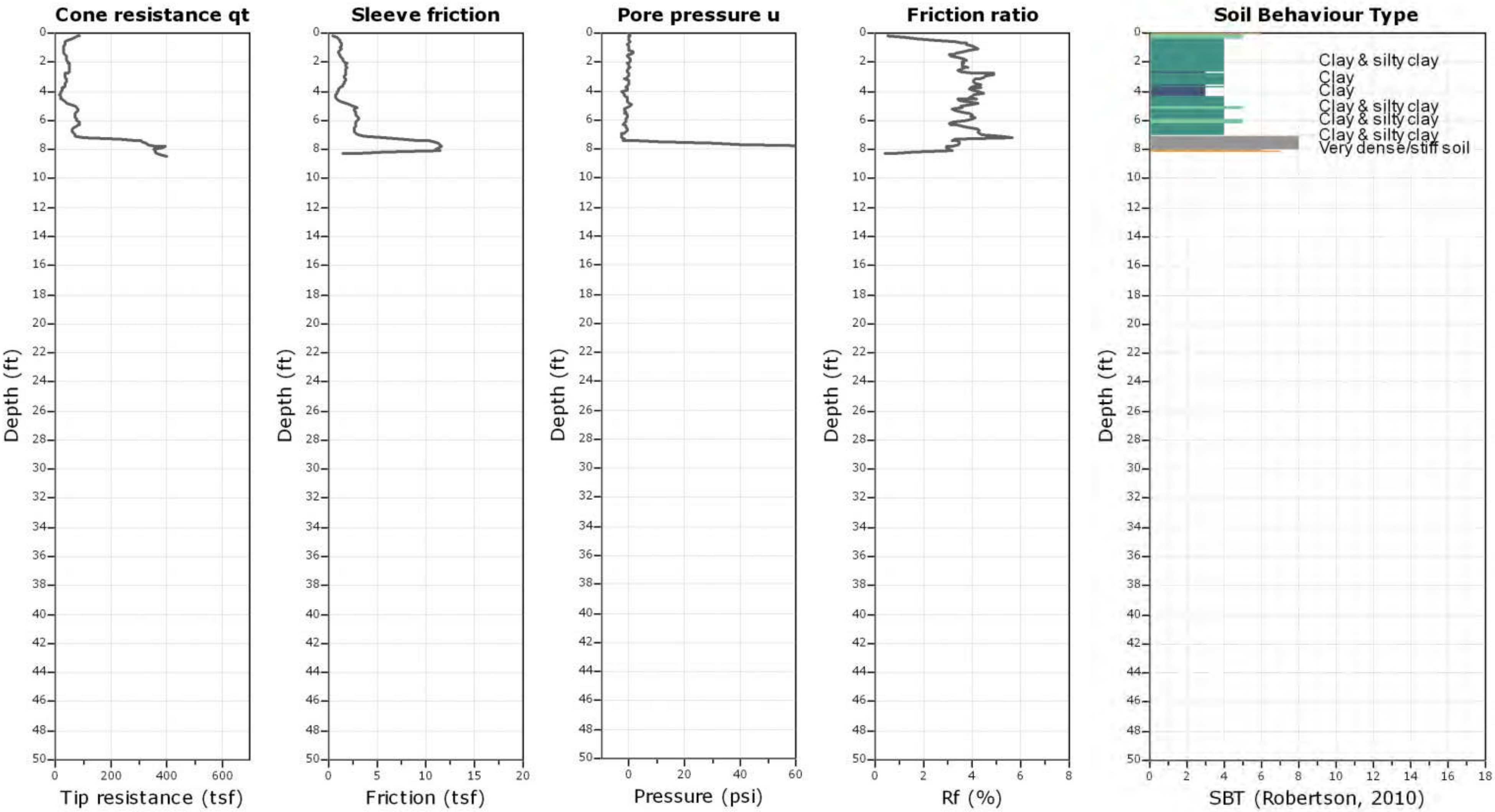
B-44

Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-2

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Total depth: 8.48 ft, Date: 7/13/2016

Location: **4002 Vista Way Oceanside, CA**
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
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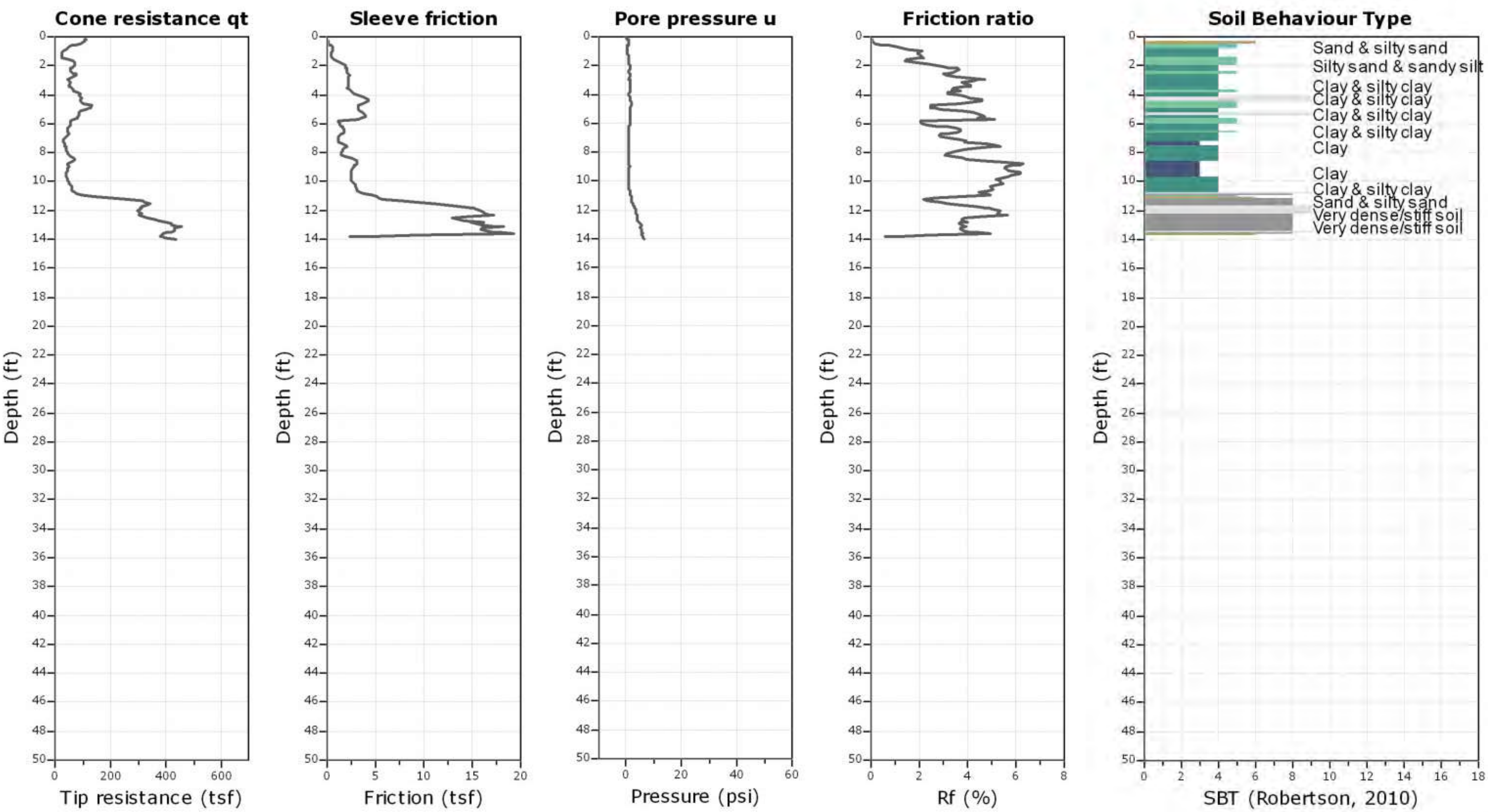
www.kehoetesting.com

CPT: CPT-4

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Location: **4002 Vista Way Oceanside, CA**

Total depth: 13.99 ft, Date: 7/13/2016
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
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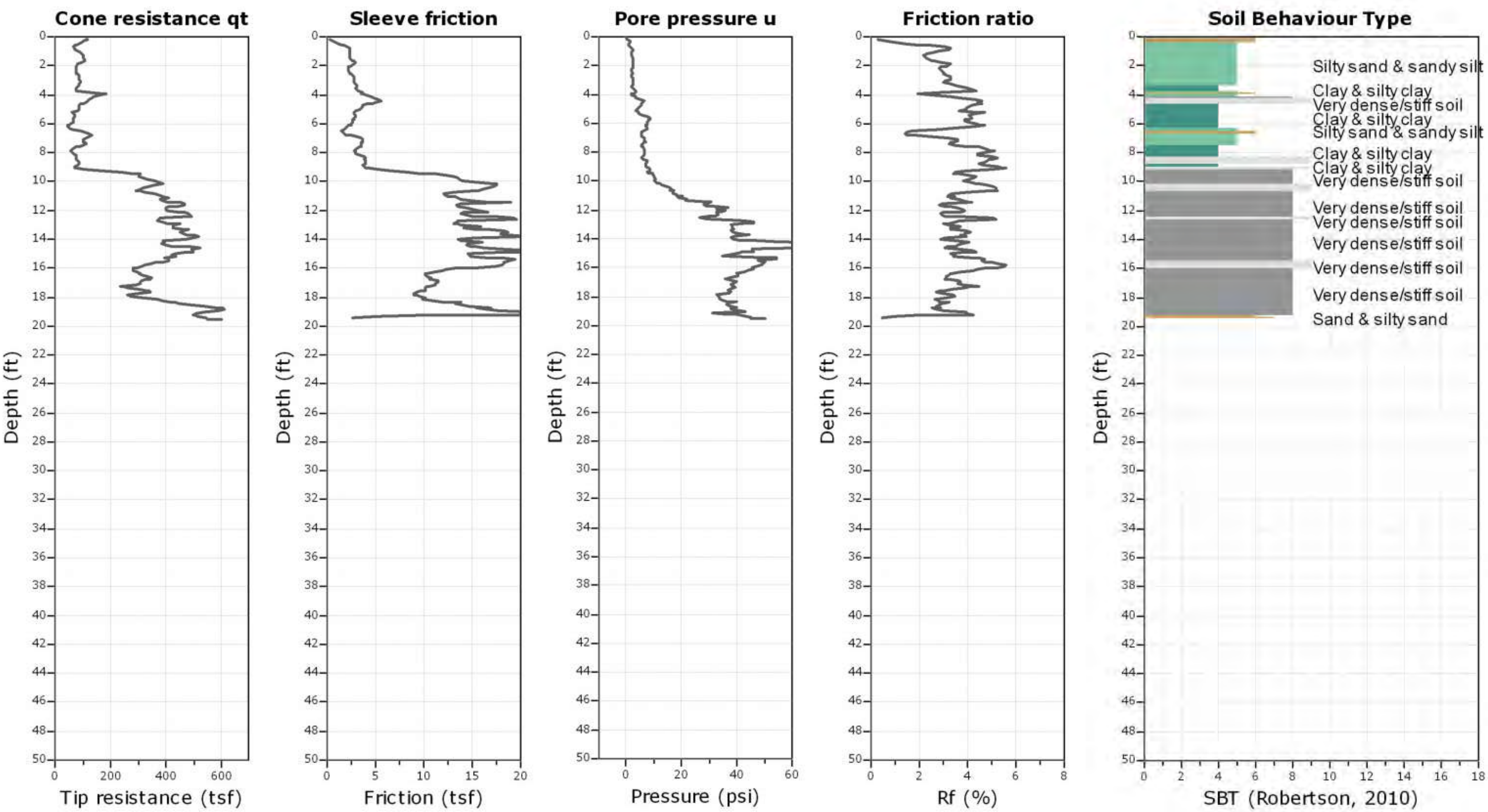
CPT: CPT-6

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Location: **4002 Vista Way Oceanside, CA**

Total depth: 19.56 ft, Date: 7/13/2016
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
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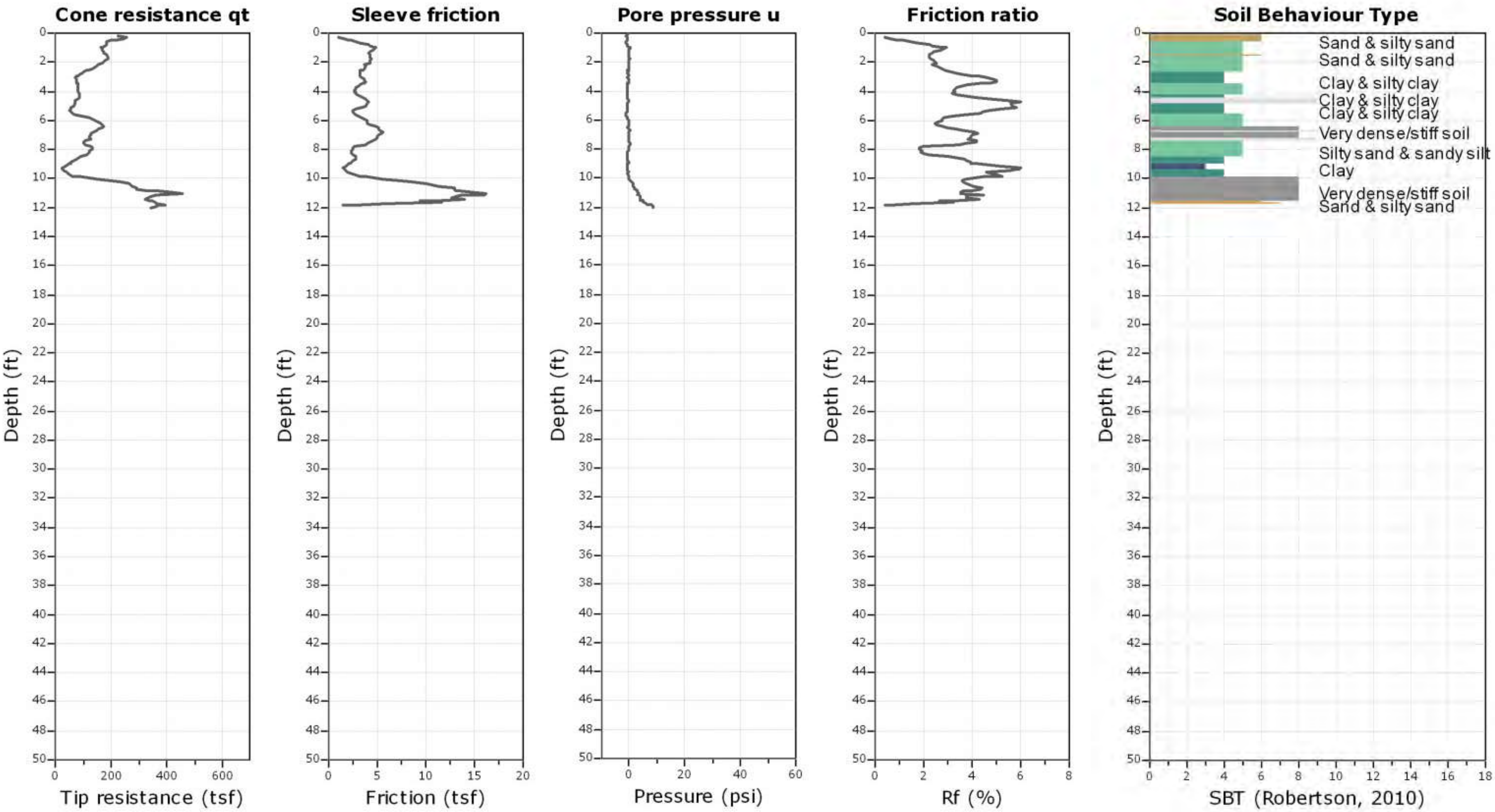
CPT: CPT-10

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Total depth: 12.04 ft, Date: 7/13/2016

Location: **4002 Vista Way Oceanside, CA**
Cone Type: Vertek



CPeT-IT v.1.7.6.42 - CPTU data presentation & interpretation software - Report created on: 7/18/2016, 10:14:59 AM
Project file: C:\CTEOceanside7-16\CPeT Data\Plots.cpt

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714-901-7270
rich@kehoetesting.com
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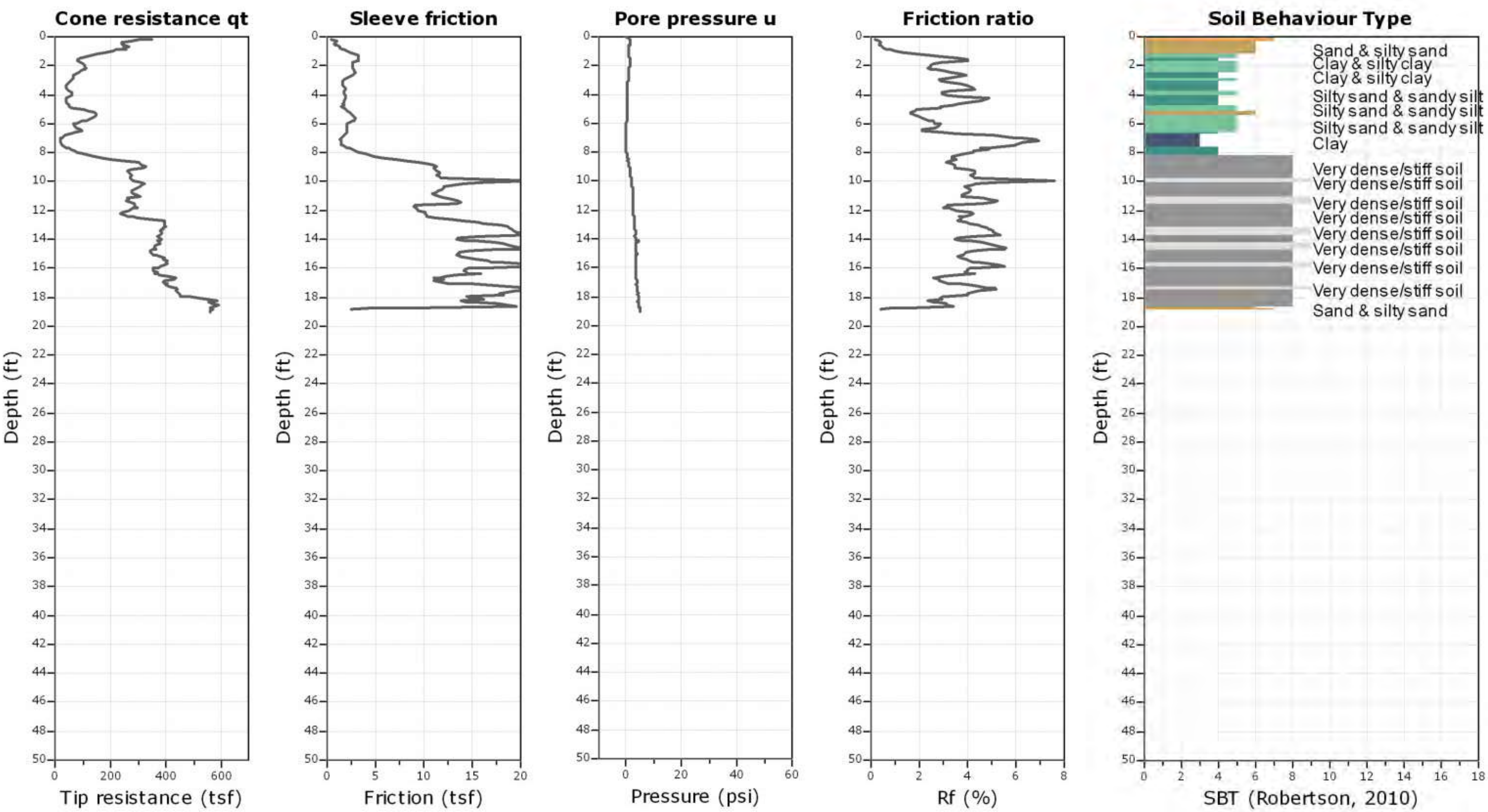
CPT: CPT-12

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Total depth: 19.02 ft, Date: 7/13/2016

Location: **4002 Vista Way Oceanside, CA**
Cone Type: Vertek



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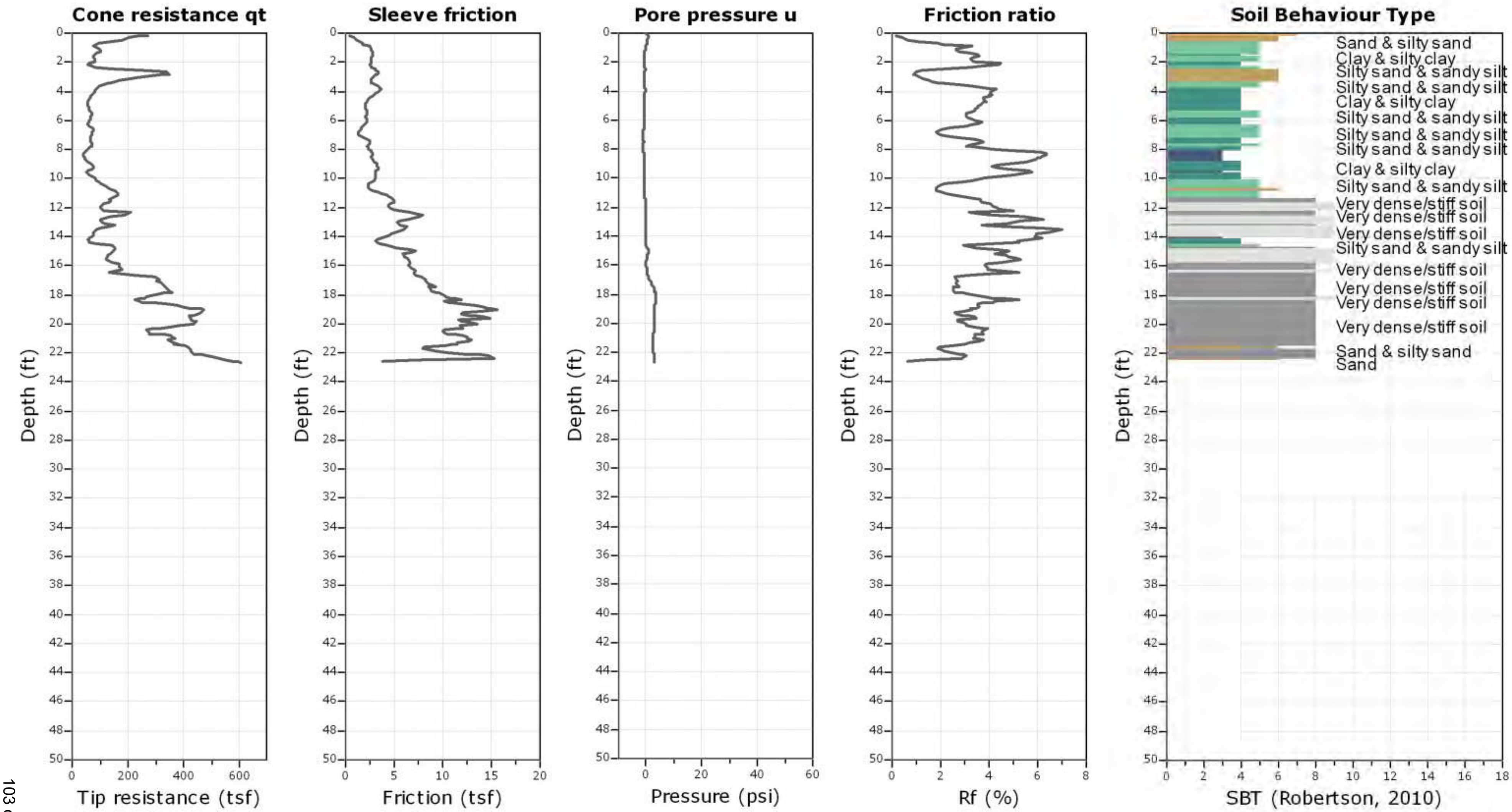
www.kehoetesting.com

CPT: CPT-17

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Location: **4002 Vista Way Oceanside, CA**

Total depth: 22.70 ft, Date: 7/13/2016
Cone Type: Vertek



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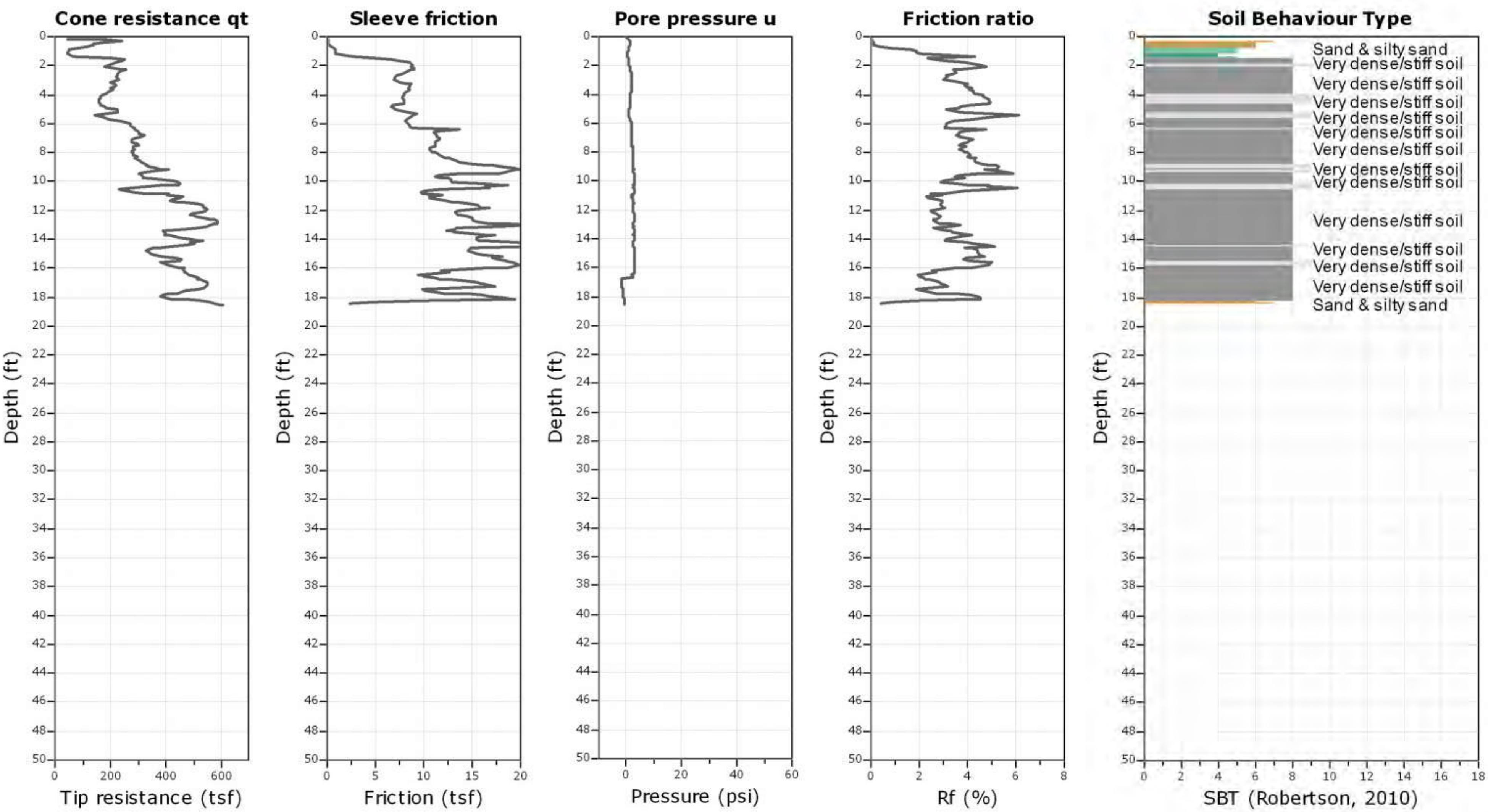
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-21

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Total depth: 18.59 ft, Date: 7/13/2016

Location: **4002 Vista Way Oceanside, CA**
Cone Type: Vertek



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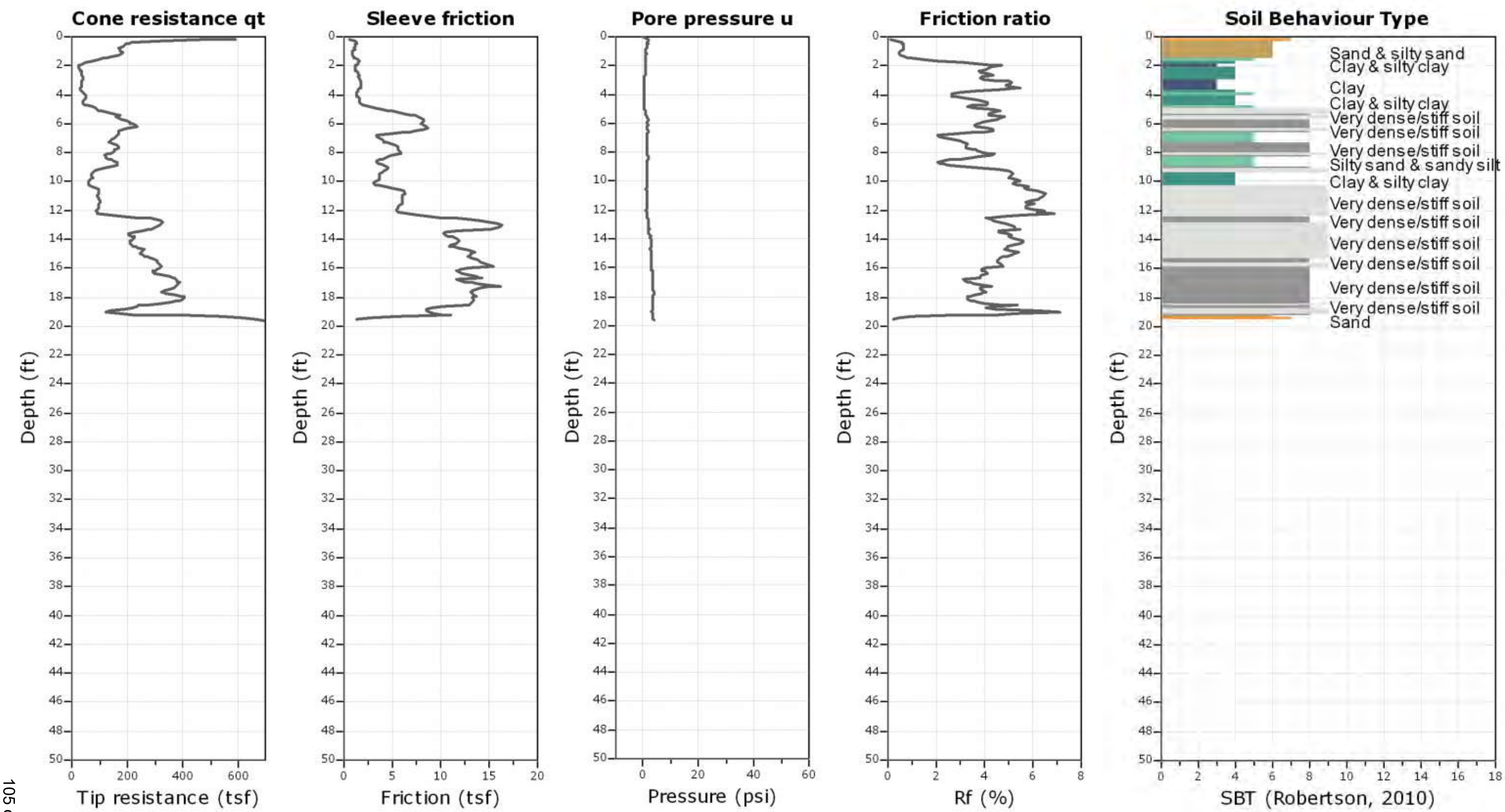
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-22

Total depth: 19.67 ft, Date: 7/13/2016
Cone Type: Vertek

Project: CTE (Construction Testing & Eng.)/Tri-City Medical Center
Location: 4002 Vista Way Oceanside, CA



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714-901-7270
rich@kehoetesting.com
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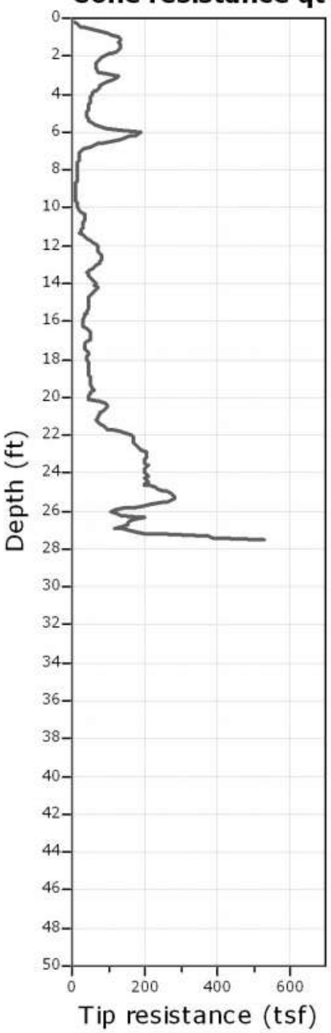
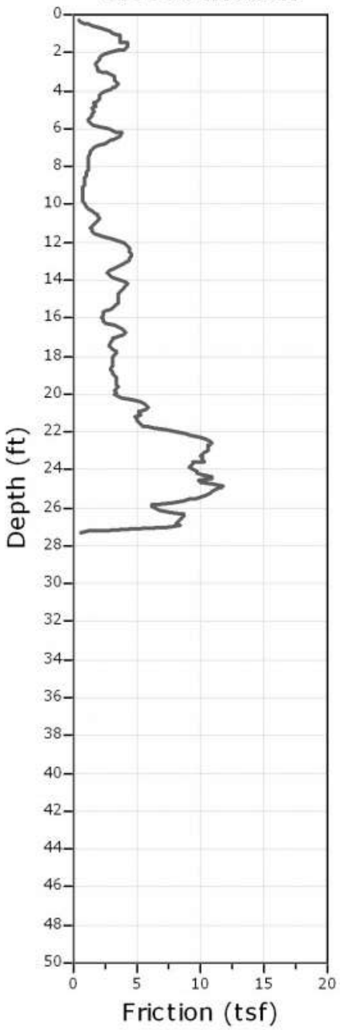
CPT: CPT-25
Total depth: 27.49 ft, Date: 7/13/2016
Cone Type: Vertek

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Location: **4002 Vista Way Oceanside, CA**

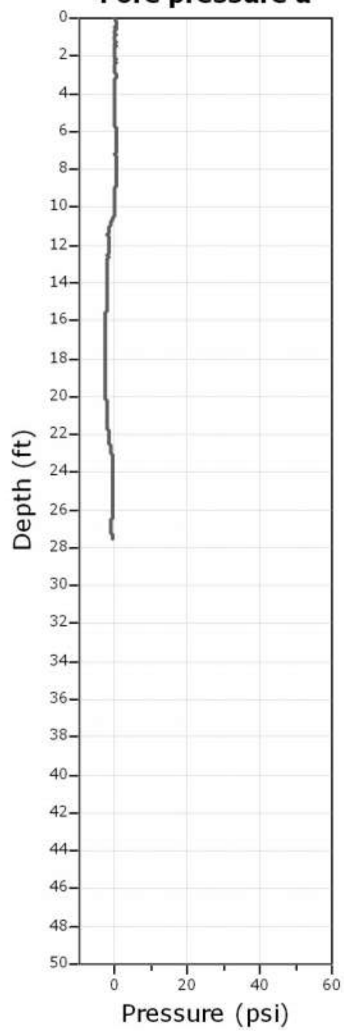
Cone resistance qt



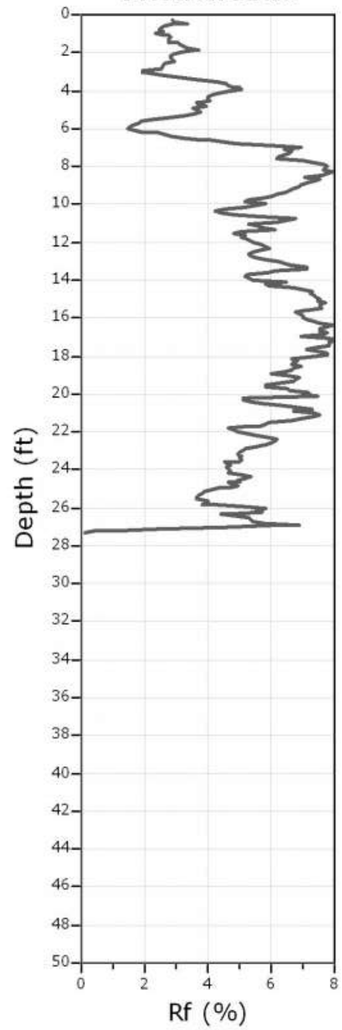
Sleeve friction



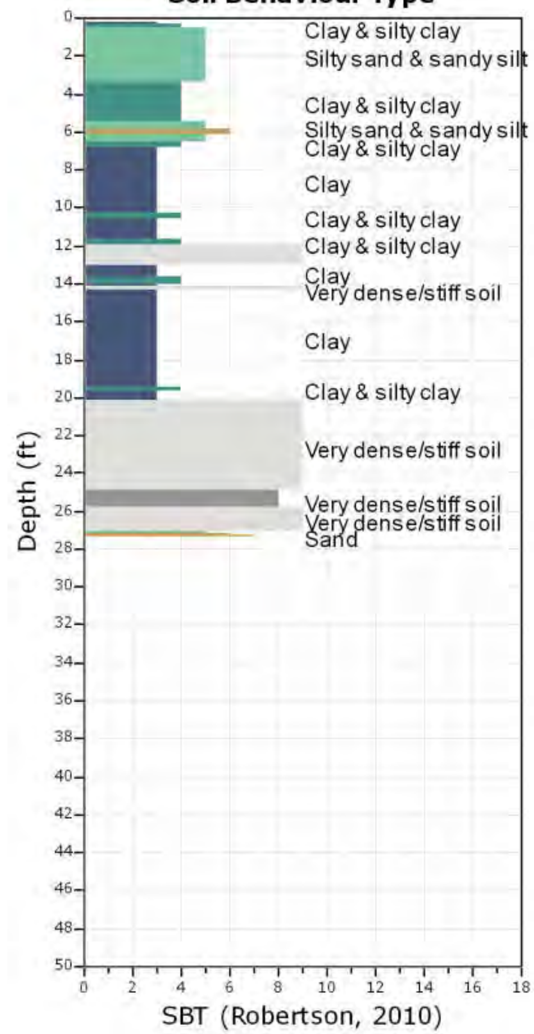
Pore pressure u



Friction ratio



Soil Behaviour Type

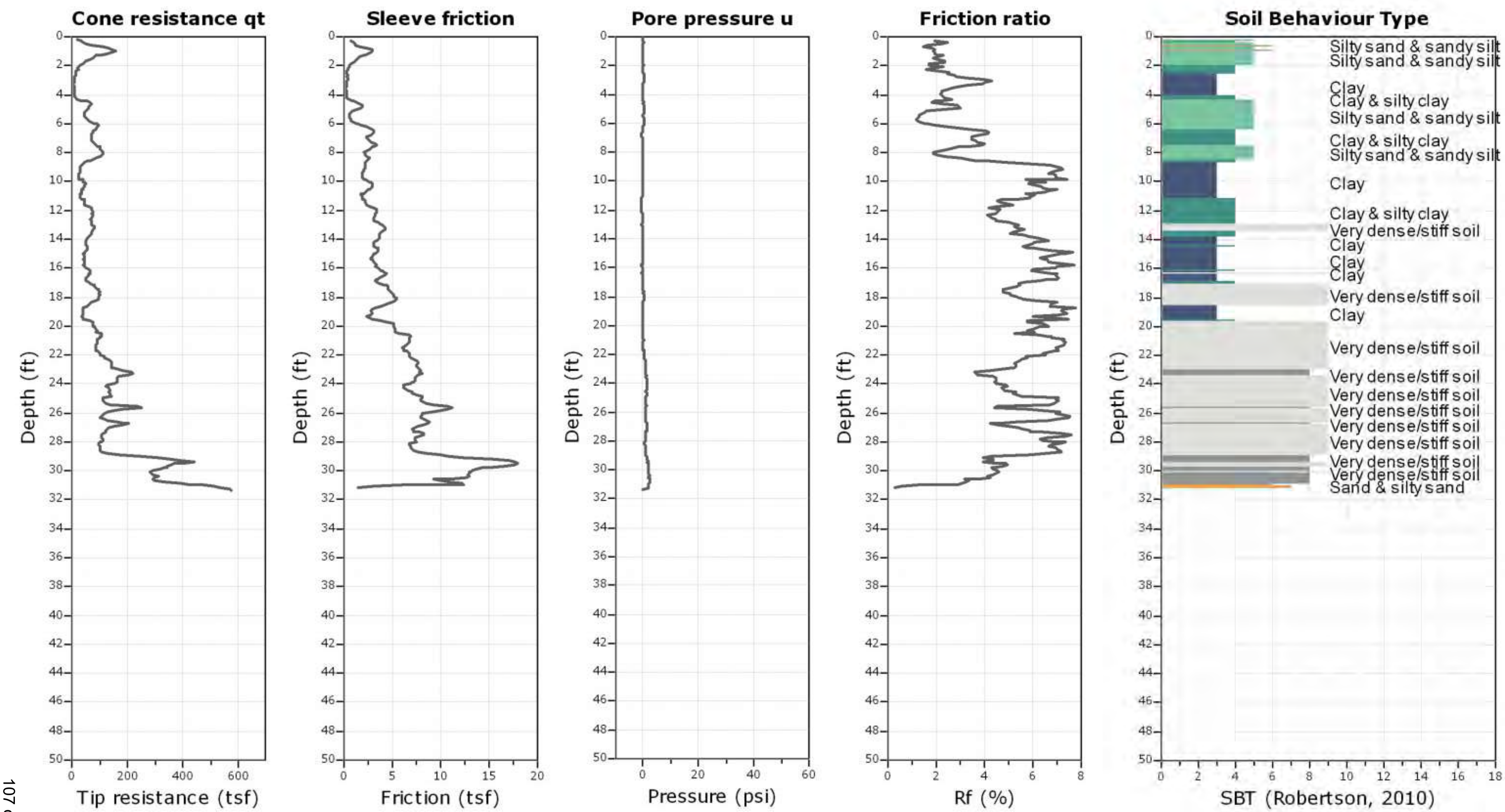


Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-28

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Location: **4002 Vista Way Oceanside, CA**

Total depth: 31.32 ft, Date: 7/13/2016
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
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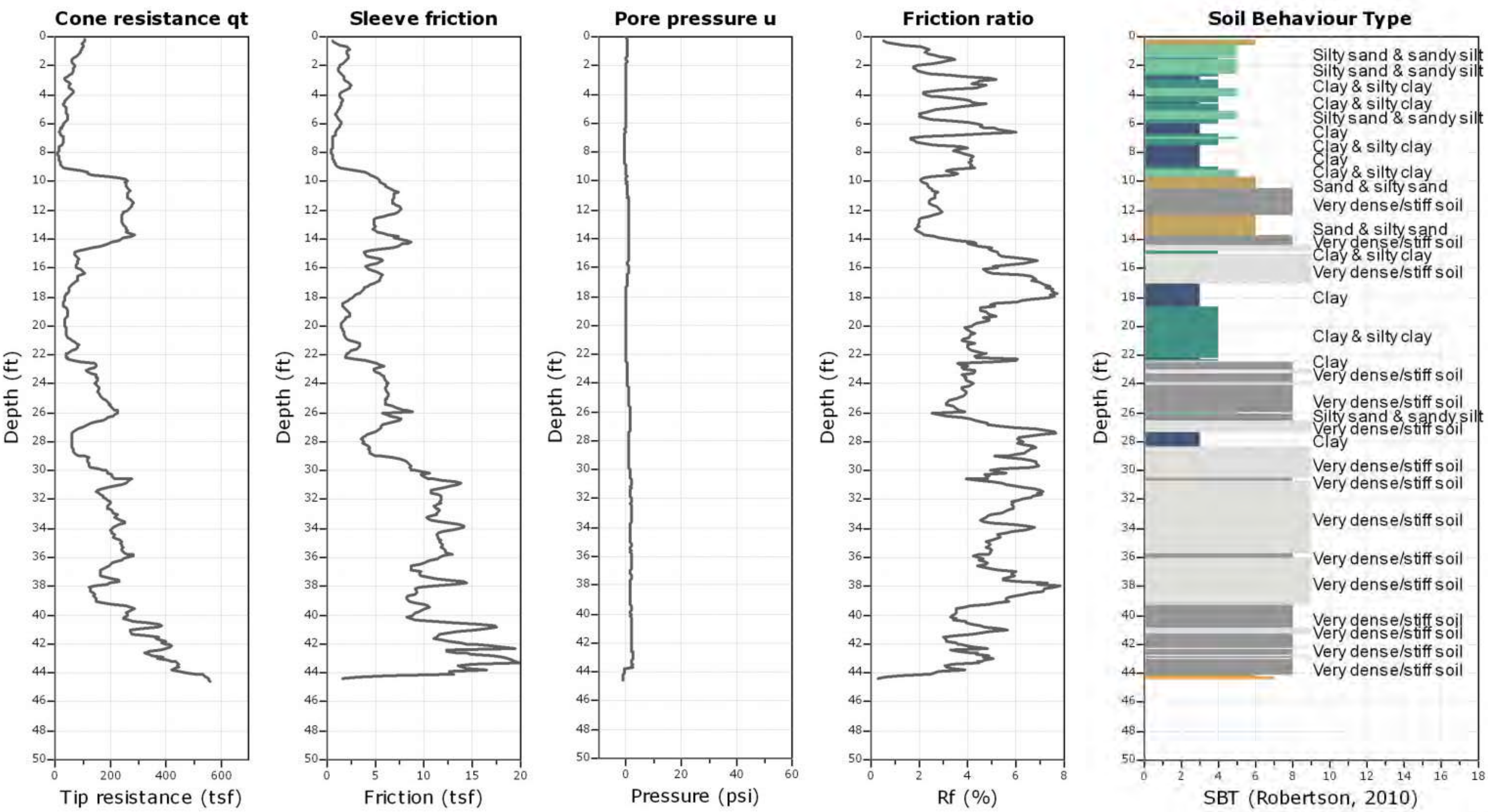
www.kehoetesting.com

CPT: CPT-30

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Total depth: 44.53 ft, Date: 7/13/2016

Location: **4002 Vista Way Oceanside, CA**
Cone Type: Vertek



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714-901-7270
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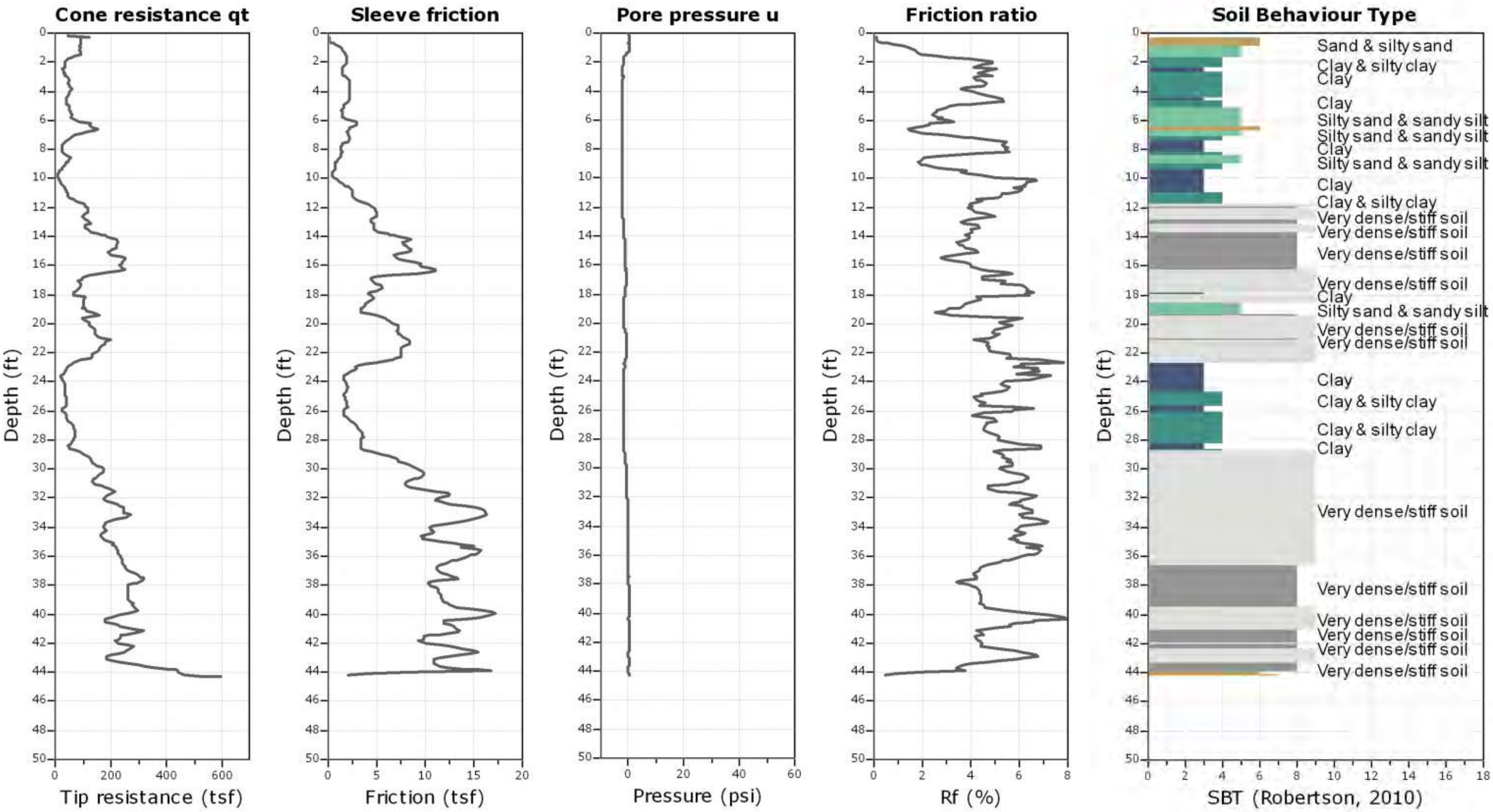
CPT: CPT-32

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Total depth: 44.33 ft, Date: 7/13/2016

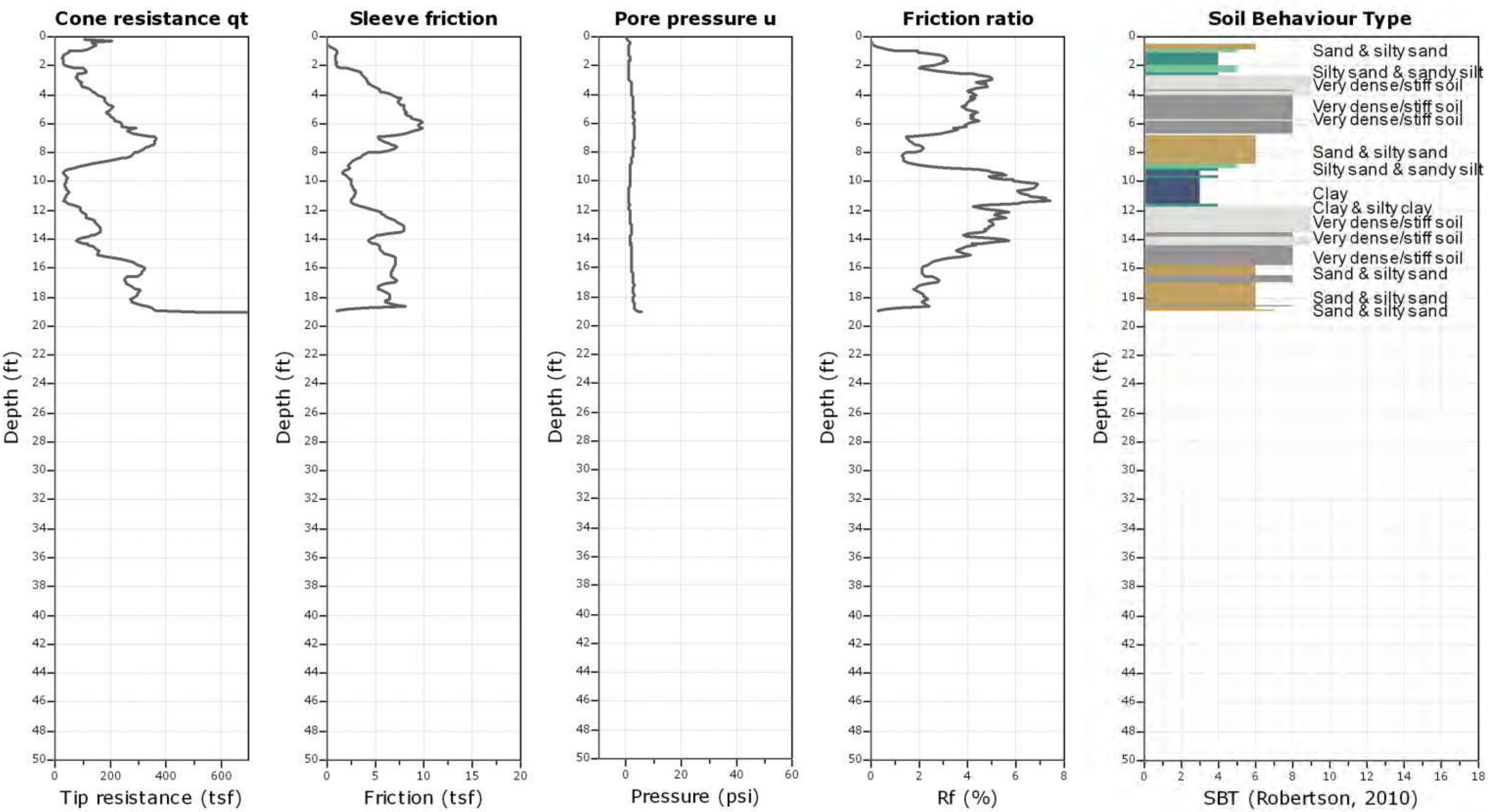
Location: **4002 Vista Way Oceanside, CA**
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-36
Total depth: 19.06 ft, Date: 7/13/2016
Cone Type: Vertek

Project: **CTE (Construction Testing & Eng.)/Tri-City Medical Center**
Location: **4002 Vista Way Oceanside, CA**



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Project file: C:\CTEOceanside7-16\CPeT Data\Plots.cpt

GLOBAL HYDROLOGY BORING LOGS
FROM 2013 ENVIRONMENTAL SITE ASSESSMENT

GLOBAL HYDROGEOLOGY LOG OF TEST BORING

BORING NO.	PROJECT NO.	PROJECT	SHEET
MW-1	TCMC	TCMC Monitoring Well	1 OF 3

MFG. DESIGNATION OF DRILL: CME 85 HSA

LOCATION: 4002 Vista Way, Oceanside, CA ~6' E. of curb & 10' S. of Tank Concrete PAD

TYPE OF BIT: 10" HSA — HAMMER DATA: WT. 140 LBS. DROP 30* INCHES — ELEV. TOC 256.90 — TOTAL DEPTH OF HOLE 47'

DATE — STARTED: 10:45 8 Oct '11 — COMPLETED: 1700 8 Oct '11 — BACKFILLED: MW

DRILLING AGENCY: ABC Liovin

INSPECTOR: R. HARRIS — CREW: Conrad, Mark, Jesse

GROUNDWATER DEPTH / TIME: ~20 enc — 11:50 8 Oct; 19.61 TOC — 14:45 "; SWL = -0.30; 16.02 TOC — 14:05 15 Oct

SURFACE CONDITIONS: Flat asphalt parking lot w/ sl. slope to east & sl. more slope to S.

*downhole hammer on sand line

DIST. FROM SURF.	LEGEND	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL	PID/FID ppm	% LEL
							ambient PID = 0.1 ppm		
0–1	G					Asphalt / GP	Asphalt; Base, gravel ½–3/4 w/ sand, dense, moist, no odor. FILL		
3							ambient		
5–6	G	CA mod	TCMC [illegible] 11:10	0 / 0 / 6	5 / 6 / 11	SM	Silty Sand, fn, lt olive brn 2.5Y 5/3, loose, moist, v. sl calc, no odor	0.2	
10–11.5		CA mod	[illegible] 11:25	6 / 6 / 6	7 / 14 / 17	SC		0.4	
11.5–14	G					CL / SM	Silty Clay w/ trace lt fn snd, drk gry brn 2.5Y 4/2, m st. ff, moist, v sl calc in rare areas, no odor; Silty Sand w/ trace clay	2.2	
15–19		CA mod	TCMC MW2-16 11:35	3 / 6 / 6	7 / 10 / 12	SM/SS	Santiago Fm; Silty Sand / Sandstone, fn pale yl 5Y 8/3, mdns, moist, no calc, no odor, abund orange Fe staining, wthrd color change & harder, white 5Y 8/1, dense, moist, non-calc, no odor	0.3	
19.6							▽	19.6	
20–21.5		CA	TCMC MW2-21 11:50	4 / 6 / 6	12 / 15 / 17	SS	▽ ~ enc 20'; Sandstone, fn w/ trace med,	6.9	

GLOBAL HYDROGEOLOGY LOG OF TEST BORING

BORING NO.	PROJECT NO.	PROJECT	SHEET 2 OF 3
mw-1	Tcmc	Monitoring Wells	

DIST. FROM SURF.	LEGEND	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL	PID/FID ppm	% LEL
22									
25	G	skip sample					Skip to attempt get thru upper H2O zone more quickly & shutoff upper zone; grab only	0.5	
30		CA	Tcmc MW1-30 12:15	6"	6/50"	Sltst	Siltstone w/ ltl clay & trace fn snd, pale olive 5Y 6/3, v dns but poorly indur, moist-wet, not sat, non calc, no odor abund orange Fe staining 10-15%	2.0	
35			Tcmc MW1-35 1230	6	6/50	SS	Silty Sandstone, fn, lt gray 5Y 7/2, v dns, w/ compacted but v.p. indur, moist-wet, not sat no free H2O, non calc, no odor	2.6	
40			TCMC MW1-40 12:40	6	5/50	SS	Silty Sandstone, fn w/ 10-15% silt, lt gen gray, 10Y 8/1, v. dns, v.p. indur, moist, non calc, no odor; v. sl. wthrd, rare Fe micro staining	19.4	
45			Tcmc MW1-45 1300	6	6/50	SS	Sandstone, fn w/ trace silt, lt greenish gray 5GY 7/1 v. dns v.p. ind, moist, non calc no odor, sl. wthrd, rare micro Fe staining - only visible w/ hnd lens	4.4	
						TD 47'			

113 of 205

GLOBAL HYDROGEOLOGY LOG OF TEST BORING

BORING NO.	PROJECT NO.	PROJECT	SHEET 3 OF 3
MW-1	TCMC	TCMC Monitoring Wells	

DIST. FROM SURF.	LEGEND	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL	PID/FID ppm	% LEL
							Well Construction		
							Screen casing susp. in hole @ 45		
							47-45 Sand #2/12 100# (2)		
							45-35 Screen 0.020, 4" PVC		
							w/ cap		
							35 — Surf Blank Casing, 4"Ø, F.T PVC		
							45 - 33 Sand #2/12 silica 700# (14)		
							33 - 30.5 Bentonite Pellets 100# (2)		
							30.5 - 3' Bentonite Grout 30 gal		
							3 - 0 Concrete Pad 3'Ø x 0.3'		
							add 0.3' pup to well head		
							Total csg + screen 45.0 + 0.28 + 0.3		
							= 45.58		
							w/ SU = 0.30'		

GLOBAL HYDROGEOLOGY — LOG OF TEST BORING

BORING NO.	PROJECT NO.	PROJECT	SHEET 1 OF 2
MW-2	TCMC-II	MONITORING WELLS	SHEET 1 OF 2

MFG. DESIGNATION OF DRILL	LOCATION
CME 85 HSA	Facilities Mngmt Bldg Park Lot 4002 Vista Way Oceanside.

TYPE OF BIT	HAMMER DATA	ELEV. TOC	TOTAL DEPTH OF HOLE
10" HSA	WT. 140 LBS. DROP 30' * INCHES	256.64	10' (TTD) 27½

DATE			
STARTED 0800 29Sept11	DRILLING AGENCY ABC Liquin DRLG		
COMPLETED 1600 8Oct11	INSPECTOR R HARRIS	GROUNDWATER DEPTH	TIME
BACKFILLED M.W.	CREW Conrad, Mark, Jesse	enc 20' gs	0910 8Oct
		15.22 TOC @14:30 16Oct / 20.3 gs	0930 6Oct 27½
		19.6 TOC	1730 8Oct

SURFACE CONDITIONS Asphalt Park Lot; Flat; slopes sl. So. & v. sl. to E. 10' S/o conc. Pad edge *sand line hammer su = -0.45

DIST. FROM SURF.	LEGEND	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL	PID/FID ppm	% LEL
							mod CA Sampler 2" SS sleeves		
							asphalt 0.3' H.A. to 5½'		
1	G					GP	subgrade 3/4" gravel w/sand		
							Fill		
2						SP	Sand w/ ltl-some silt, fn, pale	0.5	
							yl 2.5Y 8/4, loose, damp-moist,		
							non-calc, no odor		
3	G					SM	Silty Sand w/trace clay, fn,		
4							lt olv brn 2.5Y 5/3, loose,	0.3	
							damp-moist, non-calc, no odor		
5	G							0.2	
6	G					SC	Clayey Silty Sand, fn, drk olive		
							brn, 2.5Y 3/3, m dns, moist,		
7							non calc, no odor		
8									
9							STOP @10', 29Sept11 - breakdown		
10	G					CL	restart 8Oct		
		CA		3	7		Sandy Silty Clay, fn, ~20:30:50		
11		Mod	TCMC	5	12			0.5	
		2"	MW-2-11	6	14		Sandy Clayey Silt, fn, lt olive		
12			08:55			ML	gray, 5Y 6/2, m. st. - ff, moist,		
							non-calc, no odor		
13									
14									
15							Santiago Fm		
		CA		4	8	SM	Silty Sand, fn 10% silt, lt gray		
16		mod	TCMC-MW2-16	6	9		5Y 7/1, m dns, moist-wet, non	5.5	
			0900	6	12		calc, sl-m diesel odor		
17									
18									
19									
20		CA		4	10	SP	Sand w/ trace silt, fn,		
21		mod	TCMC	6	14		pale yl. 5Y 8/2, m dns, sat,	0.7	
			MW-2-21	6	16		free H2O on core barrel, non-		
			09:10				calc, no odor		

GLOBAL HYDROGEOLOGY LOG OF TEST BORING

BORING NO.	PROJECT NO.	PROJECT	SHEET
MW-2	TCMC-II	Monitoring Wells	1 OF 2

MFG. DESIGNATION OF DRILL	LOCATION
CME 85 HSA	Facilities Mngmt Bldg Park Lot 4002 Vista Way Oceanside

TYPE OF BIT 10" HSA	HAMMER DATA: WT. 140 LBS. DROP 30" * INCHES	ELEV. TOC 256.6#	TOTAL DEPTH OF HOLE 10' (TTD) 27½
DATE STARTED 0800 29Sept11	DRILLING AGENCY ABC Liovin Drlg		
DATE COMPLETED 1600 8Oct11	INSPECTOR R HARRIS	GROUNDWATER DEPTH 15.22 TOC @14:30 16Oct; enc 20' bgs; 20.3 bgs; 19.6 TOC	TIME 0910 8Oct; 0930 8Oct 27½; 1730 8Oct
BACKFILLED M.W.	CREW Conrad, Mark, Jesse		

SURFACE CONDITIONS Asphalt Park Lot; Flat; slopes sl So. & v. sl. to E. 10'5% conc. paledge *sand line hammer su=-0.45

DIST. FROM SURF.	LEGEND	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL	PID/FID ppm	% LEL
							mod CA Sampler 2" SS sleeves		
							asphalt 0.3' H.A. to 5½'		
1	G					GP	sub grade 3/4" gravel w/sand Fill		
2						SP	Sand w/ lt-some silt, fn, pale yl 2.5Y 8/4, loose, damp-moist, non-calc, no odor	0.5	
3	G					SM	Silty Sand w/trace clay, fn, lt olv brn 2.5Y 5/3, loose, damp-moist, non-calc, no odor	0.3	
5	G							0.2	
6	G					SC	Clayey Silty Sand, fn, drk olive brn, 2.5Y 3/3, m dns, moist, non calc, no odor		
9							STOP @10', 29Sept11-break down		
10	G					CL	restart 8Oct		
		CA		3	7		Sandy Silty Clay, fn, ~20:30:50		
11		Mod	TCMC	5	12			0.5	
		2"	MW-2-11 08:55	6	14	ML	Sandy Clayey Silt, fn, olive gray, 5Y 6/2, m. st. fc, moist, non-calc, no odor		
15							Santiago Fm		
		CA		4	8	SM	Silt Sand, fn 10% silt, lt gray 5Y 7/1, m dns, moist-wet, non calc, sl-m diesel odor		
16		Mod	TCMC-MW2-16 0900	6	9			5.5	
		2"		6	12				
20		CA		4	10	SP	Sand w/ trace silt, fn, pale yl 5Y 8/2, m dns, sat, free H2O on core barrel, non-calc, no odor		
21		mod	TCMC MW-2-21 09:10	6	14			0.7	
		2"		6	16				

GLOBAL HYDROGEOLOGY LOG OF TEST BORING

BORING NO.	PROJECT NO.	PROJECT	SHEET
MW-2	TCMC	TCMC Mont wells	2 OF 2

DIST. FROM SURF.	LEGEND	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL	PID/ FID ppm	% LEL
22									
			TCMC-, *				/sandstone		
25	I		MW-2-25	6"	50/5"	SP/SS	Sand w/ trace silt, fn, white	0.6	
							5Y 8/1, v dns, sat, free H2O		
			09:20				on top of recov tube, sl-m cuttings		
							v sl. diesel odor; mod-v calc		
	G						on Fe stained sand	0.5	
						TD	Suspend casing & screen @ 25'		
						27½	backfill w/ #2/12 sand (50# sks)		
							27-25 Sand 2/12 silica 100# (2)		
							25-15 Screen 0.020, 4" PVC w/ F. CAP		
							15 - surf Blank Csg 4" PVC F.T.		
							25 - 13 Sand 2/12 silica 650# (13)		
							13 - 8 Bentonite pellets med, hydrate		
							8 - 3 Bentonite grout		
							3 - 0 Concrete seal & pad		
							36" Ø x 0.3' pad w/		
							12" Ø Emco well vault		
							cut 0.45' pup for well head		
							∴ Total casing length is		
							25.0 + 28 + 0.45 = 25.73'		
							w/ -0.67 S.U.		
							* overdrill by 1' to get full 6" tube		

GEOTECHNICAL PROFESSIONALS BORING LOGS
FROM 2006 SITE INVESTIGATION

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)		*DESCRIPTION OF SUBSURFACE MATERIALS* This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
				0		Fill (Qf):	275
			B			**SANDY CLAY (CL)** brown, slightly moist, soft, asphalt concrete and rock fragments	
						Residual Soils (Qr):	
11.6	112	5	D	5		**SANDY CLAY (CL)** brown, slightly moist, soft	270
						Total Depth 5 feet	

SAMPLE TYPES
- [C] Rock Core
- [S] Standard Split Spoon
- [D] Drive Sample
- [B] Bulk Sample
- [T] Tube Sample

DATE DRILLED:
4-19-06

EQUIPMENT USED:
18" Bucket Auger

GROUNDWATER LEVEL (ft):
Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-1

FIGURE A-1

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
					0	Fill (Qf): **SANDY CLAY (CL)** brown, slightly moist, soft, asphalt concrete and rock fragments	
				B			
	8.4	111	5	D		Residual Soils (Qr): **SANDY CLAY (CL)** brown, slightly moist, soft	275
					5	Total Depth 5 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED:
4-19-06

EQUIPMENT USED:
18" Bucket Auger

GROUNDWATER LEVEL (ft):
Not Encountered

GPI

PROJECT NO.: 2098.I

TRI-CITY MEDICAL

LOG OF BORING NO. B-2

FIGURE A-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	Fill (Qf):	
9.5	114		B		SILTY SAND (SM) brown, moist, loose, asphalt concrete and rock fragments	
14.9	112	Push	D		@ 3 feet, trace clay	275
18.6	104	6/8"	D	5		
					Santiago Formation (Tsa):	
9.8	102	8/11"	D		SANDSTONE (SP) tan, moist, very dense	270
7.5	110	8/11"	D	10		
						265
8.5	109	8/10"	D	15		
						260
6.1	108	8/10"	D	20	Total Depth 20 feet	

Backfilled and tamped:
0-5 ft cuttings
5-10 ft cuttings mixed with 25 bags bentonite
10-18 ft cuttings mixed with 5 bags bentonite
18-20 ft 10 bags bentonite

SAMPLE TYPES
C Rock Core
S Standard Split Spoon
D Drive Sample
B Bulk Sample
T Tube Sample

DATE DRILLED: 4-19-06
EQUIPMENT USED: 18" Bucket Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-3

FIGURE A-3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	Fill (Qf):	
			B		**CLAYEY SAND (SC)** brown, moist to very moist, very loose, asphalt concrete and rock fragments	275
15.8	108	Push	D			
23.5	97	Push	D	5	Residual Soils (Qr): **SANDY CLAY (CL)** brown, very moist, soft	270
12.8	114	5	D		Santiago Formation (Tsa): **SANDSTONE (SP)** tan, moist, dense	
10.3	115	9	D	10	@ 10 feet, very dense	265
8.8	109	6	D	15		260
8.9	116	9/11"	D	20		255
8.9	107	9	D	25	Total Depth 25 feet	

Backfilled and tamped:
0-5 ft cuttings
5-10 ft cuttings mixed with 25 bags bentonite
10-19 ft cuttings
19-20 ft cuttings mixed with 5 bags bentonite
20-23 ft cuttings
23-25 feet 10 bags bentonite

This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 4-19-06
EQUIPMENT USED: 18" Bucket Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-4

FIGURE A-4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	Fill (Qf): **SILTY SAND (SM)** brown, moist to very moist, loose, trace clay, asphalt concrete and rock fragments	
13.3	105	1	D			
						270
11.7	111	2	D	5	@ 5 feet, medium dense	
12.0	113	3	D		@ 7 feet, dark brown/grey	
						265
25.8	96	2/6"	D	10	Residual Soils (Qr): **SILTY SAND (SM)** light brown, moist, fine grained, with clay	
					Santiago Formation (Tsa): **SANDSTONE (SP)** tan, moist, very dense, massive	260
		8/10"	D	15	@ 14.5 feet, fracture, calcium filled. F: N30E, 81SE B: N60E, 6SE	
						255
7.6	114	8/10"	D	20	@ 20 feet, golden red	
					@ 23 feet, 3-inch thick, gray and brown laminated silt and sand	250
11.9	119	8/10"	D	25	B: N60W, 8NE @ 24.5 ft B:N60W, 6-8NE	
						245
7.7	113	15/11"	D	30	Total Depth 30 feet No water or caving *Backfilled and tamped:* *0-5 ft cuttings* *5-10 ft cuttings mixed with 25 bags bentonite* *19-20 ft cuttings mixed with 5 bags bentonite* *20-24 ft cuttings* *24-25 ft cuttings mixed with 5 bags bentonite* *25-28 ft cuttings* *28-30 ft 10 bags bentonite*	

SAMPLE TYPES
- [C] Rock Core
- [S] Standard Split Spoon
- [D] Drive Sample
- [B] Bulk Sample
- [T] Tube Sample

DATE DRILLED: 4-18-06
EQUIPMENT USED: 18" Bucket Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-5

FIGURE A-5

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
				0	Fill (Qf): **SANDY CLAY (CL)** brown, slightly moist, soft, asphalt concrete and rock fragments	275
			B			
					Residual Soils (Qr): **SANDY CLAY (CL)** brown, slightly moist, soft	
11.6	112	5	D	5	Total Depth 5 feet	270

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED:
4-19-06

EQUIPMENT USED:
18" Bucket Auger

GROUNDWATER LEVEL (ft):
Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-1

FIGURE A-1

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
					0		
				B		Fill (Qf): **SANDY CLAY (CL)** brown, slightly moist, soft, asphalt concrete and rock fragments	
	8.4	111	5	D		Residual Soils (Qr): **SANDY CLAY (CL)** brown, slightly moist, soft	275
					5	Total Depth 5 feet	

SAMPLE TYPES
- [C] Rock Core
- [S] Standard Split Spoon
- [D] Drive Sample
- [B] Bulk Sample
- [T] Tube Sample

DATE DRILLED:
4-19-06

EQUIPMENT USED:
18" Bucket Auger

GROUNDWATER LEVEL (ft):
Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-2

FIGURE A-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	**Fill (Qf):** SILTY SAND (SM) brown, moist, loose, asphalt concrete and rock fragments	
9.5	114		B			
		Push	D			
14.9	112				@ 3 feet, trace clay	275
18.6	104	6/8"	D	5		
					Santiago Formation (Tsa): SANDSTONE (SP) tan, moist, very dense	
9.8	102	8/11"	D			270
7.5	110	8/11"	D	10		
						265
8.5	109	8/10"	D	15		
						260
6.1	108	8/10"	D	20	Total Depth 20 feet	

This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Backfilled and tamped:
0-5 ft cuttings
5-10 ft cuttings mixed with 25 bags bentonite
10-18 ft cuttings mixed with 5 bags bentonite
18-20 ft 10 bags bentonite

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 4-19-06
EQUIPMENT USED: 18" Bucket Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-3

FIGURE A-3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	Fill (Qf):	
			B		**CLAYEY SAND (SC)** brown, moist to very moist, very loose, asphalt concrete and rock fragments	275
15.8	108	Push	D			
23.5	97	Push	D	5	Residual Soils (Qr):	
					SANDY CLAY (CL) brown, very moist, soft	270
12.8	114	5	D		Santiago Formation (Tsa):	
					SANDSTONE (SP) tan, moist, dense	
10.3	115	9	D	10	@ 10 feet, very dense	
						265
8.8	109	6	D	15		
						260
8.9	116	9/11"	D	20		
						255
8.9	107	9	D	25	Total Depth 25 feet	

Backfilled and tamped:
0-5 ft cuttings
5-10 ft cuttings mixed with 25 bags bentonite
10-19 ft cuttings
19-20 ft cuttings mixed with 5 bags bentonite
20-23 ft cuttings
23-25 feet 10 bags bentonite

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 4-19-06
EQUIPMENT USED: 18" Bucket Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-4

FIGURE A-4

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
					0	Fill (Qf): **SILTY SAND (SM)** brown, moist to very moist, loose, trace clay, asphalt concrete and rock fragments	
	13.3	105	1	D			
							270
	11.7	111	2	D	5	@ 5 feet, medium dense	
	12.0	113	3	D		@ 7 feet, dark brown/grey	
							265
	25.8	96	2/6"	D	10	Residual Soils (Qr): **SILTY SAND (SM)** light brown, moist, fine grained, with clay	
						Santiago Formation (Tsa): **SANDSTONE (SP)** tan, moist, very dense, massive	260
			8/10"	D	15	@ 14.5 feet, fracture, calcium filled. F: N30E, 81SE B: N60E, 6SE	
							255
	7.6	114	8/10"	D	20	@ 20 feet, golden red	
						@ 23 feet, 3-inch thick, gray and brown laminated silt and sand	250
	11.9	119	8/10"	D	25	B: N60W, 8NE @ 24.5 ft B:N60W, 6-8NE	
	7.7	113	15/11"	D			245
					30	Total Depth 30 feet No water or caving *Backfilled and tamped:* *0-5 ft cuttings* *5-10 ft cuttings mixed with 25 bags bentonite* *19-20 ft cuttings mixed with 5 bags bentonite* *20-24 ft cuttings* *24-25 ft cuttings mixed with 5 bags bentonite* *25-28 ft cuttings* *28-30 ft 10 bags bentonite*	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 4-18-06
EQUIPMENT USED: 18" Bucket Auger
GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2098.I
TRI-CITY MEDICAL

LOG OF BORING NO. B-5

FIGURE A-5

WESERN SOIL AND FOUNDATION ENGINEERING BORING LOGS
FROM 1996 SITE INVESTIGATION

BORING NO. B - 1
ELEVATION 270
SAMPLING METHOD 8 INCH DIAMETER AUGER

DEPTH (FEET)	SAMPLE TYPE	SOIL CLASSIFICATION	DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION %
0–1			4" ASPHALT PAVEMENT - OVER 6" DECOMPOSED GRANITE					
2	R	CH	FILL - Brown, Sandy Clay	Very Moist	Stiff	108.4	11.7	CAL 16/12
3–6	B	SP	SANTIAGO FORMATION - Pale Yellow, Slightly Silty, Fine Grained to Medium Grained Sandstone	Moist	Dense			
			grades to					
8	R	SM	Very Pale Green, Silty, Fine Grained Sandstone	Moist	Dense	96.4	15.0	CAL 53/6
10–15	R, B	ML	SANTIAGO FORMATION - Dark Green, Sandy Siltstone, Fissile, Thinly Laminated	Very Moist	Hard			SPT 55/12
15–20	R	SP	SANTIAGO FORMATION - White, Slightly Silty, Medium Grained Sandstone	Very Moist	Very Dense	117.7	14.0	CAL 50/4
20			GROUNDWATER SEEPAGE @ 20.0 FEET	▽				
21	R	ML	SANTIAGO FORMATION - Grayish-Brown, Siltstone	Very Moist	Hard	103.6	17.3	CAL 50/6
			grades to					
25			Green, Sandy Siltstone	Very Moist	Hard			SPT 93/12

BOTTOM OF BORING @ 25 FEET

SAMPLE LEGEND

B = Bulk Sample
R = Ring Sample
SPT = Standard Penetration
CAL = California Sampler

JOB NUMBER		DATE LOGGED	LOGGED BY
96-18A	LOBBY EXPANSION TRI-CITY MEDICAL CENTER	6-27-96	V.G.

SUBSURFACE EXPLORATION LOG

DEPTH (FEET)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NO. B - 2 ELEVATION 268 SAMPLING METHOD 8 INCH DIAMETER AUGER DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION %
0-1			3" ASPHALT PAVEMENT - OVER 6" DECOMPOSED GRANITE					
1-4		CH	FILL - Dark Brown, Sandy Clay	Very Moist	Medium Stiff		17.3	SPT - 7/12
4-6	R	SC	SANTIAGO FORMATION - Pale Gray, Clayey, Fine Grained Sandstone grades to	Very Moist	Stiff		16.3	SPT 93/10-
7-8	B	SM	Pale Green, Silty, Fine Grained Sandstone grades to	Moist	Very Dense		16.6	SPT 77/12-
9-10.5			Pale Gray, Very Silty, Very Fine Grained Sandstone, localized cementation	Very Moist	Very Dense			
10.5-15	B	ML	SANTIAGO FORMATION - Dark Lavender with Green Mottling, Sandy Siltstone, Fissile, Thinly Laminated grades to	Very Moist	Hard		16.6	SPT 78/12
15-19.5	B	ML	Dark Green, Slightly Sandy, Siltstone, Thinly Laminated	Very Moist	Very Stiff		25.7	SPT 32/12
			GROUNDWATER @ 19.0 FEET					
20	R	SP	SANTIAGO FORMATION - Pale Gray, Medium to Coarse Grained Sandstone	Very Moist	Very Dense			CAL - 54/6
25	R					114.8	14.6	CAL 56/6 -
28-30	R	ML	SANTIAGO FORMATION - Brownish-Red, Slightly Sandy, Siltstone	Very Moist	Hard	109.3	21.8	CAL 50/4
			BOTTOM OF BORING @ 30.0 FEET					

JOB NUMBER		DATE LOGGED	LOGGED BY
96-18A	LOBBY EXPANSION TRI-CITY MEDICAL CENTER	6-27-96	V.G.

SUBSURFACE EXPLORATION LOG

DEPTH (FEET)	SAMPLE TYPE	SOIL CLASSIFICATION	BORING NO. B - 3 ELEVATION 269 SAMPLING METHOD 8 INCH DIAMETER AUGER DESCRIPTION	APPARENT MOISTURE	APPARENT CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION %
2	R	SC	FILL - Dark Brown, Clayey Sand	Very Moist	Loose			
4		CH	Very Dark Brownish-Gray, Sandy Clay	Very Moist	Soft			CAL - 9/12
6	R	ML	SANTIAGO FORMATION - Pale Greenish-Gray, Silty, Very Fine to Fine Grained Sandstone	Moist	Very Dense		16.3	CAL 93/0
8			grades to					
10	R	SM	Dark Green, Very Silty, Fine Grained Sandstone	Very Moist	Very Dense	106.4	15.0	CAL - 64/6
		ML	SANTIAGO FORMATION - Dark Brownish-Lavender, Sandy Siltstone	Very Moist	Hard			
15	R	SP	SANTIAGO FORMATION - Pale Yellow, Medium to Coarse Grained Sandstone	Very Moist	Very Dense			CAL - 64/6
			BOTTOM OF BORING @ 16.0 FEET					
20								
25								
30								
35								

JOB NUMBER		DATE LOGGED	LOGGED BY
96-18A	LOBBY EXPANSION TRI-CITY MEDICAL CENTER	6-27-96	V.G.

SUBSURFACE EXPLORATION LOG

BASELINE CONSULTANTS TEST PIT LOGS
FROM 1988 SITE INVESTIGATION

SUMMARY OF TEST PIT № 1

Elev. 281

DEPTH	Samples	Dry Density	Field Moisture	Consist-ency	Color		DESCRIPTION
		105	18.9	Fm/Hard	Brown		TOPSOIL: SAND - fine to medium, clayey
							BEDROCK - SANDSTONE
		102	10.1		Tan		
5		108	10.5		Yellow Tan		
		103	11.5	Very Hard	Yellow		Refusal @ 7 feet No Caving No Water
10							

SUMMARY OF TEST PIT № 2

Elev. 281

DEPTH	Samples	Dry Density	Field Moisture	Consist-ency	Color		DESCRIPTION
		109	14.8	Firm	Brown		SAND - fine to medium, clayey
		105	9.6	Hard	Tan		
5		106	9.1		Yellow Tan		BEDROCK - SANDSTONE
		105	8.7	Very Hard			Refusal @ 7 feet No Caving No Water
10							

Proposed Day Care Center
Tri-City Medical Center
4002 West Vista Way
Oceanside, California

JOB № 789-127

PLATE — 3

BASELINE CONSULTANTS

SUMMARY OF TEST PIT № 3

Elev. 280

DEPTH	Samples	Dry Density	Field Moisture	Consist-ency	Color		DESCRIPTION
				Soft			FILL: SAND, CLAY - roots and wood chips
	■	115	13.8	Firm	Brown		SAND - fine to medium, clayey
	■	103	12.1	Hard to Very Hard	Tan		BEDROCK - SANDSTONE
5							
	■	99	9.6		Yellow Tan		Refusal @ 6 feet No caving No WAter
10							

SUMMARY OF TEST PIT № 4

Elev. 275

DEPTH	Samples	Dry Density	Field Moisture	Consist-ency	Color		DESCRIPTION
	■						FILL: Mix with Native Soil
		107	12.9	Firm	Brown		RESIDUAL SOIL: SAND -fine to medium, clayey
	■	108	9.8	Hard	Yellow Tan		BEDROCK - SANDSTONE
5							
	■	100	5.2	Very Hard	Yellow Tan		Refusal @ 7 feet No Caving No Water
10							

Proposed Day Care Center
Tri-City Medical Center
4002 West Vista Way
Oceanside, California

JOB № 789-127

PLATE — 4

BASELINE CONSULTANTS

SOIL TESTING LAB BORING LOGS
FROM 1968 SITE INVESTIGATION

LOGS OF BORINGS

BORING NO 1

ELEVATION 255'$\pm$

DEPTH IN FEET	SAMPLE NO.		SOIL CLASSIFICATION	FIELD MOIST. % DRY WT.	DRY DENSITY LBS./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	Drive Ener Ft Kips/Ft
0–9		Light grey, silty fine sand. Moist. Firm.					
9–10		Grey sandstone, Very Firm.					
10–24.5	1	White, silty fine sand. Moist. Firm.		11.7	118.0		56.
24.5–30	2	Grey sandy silt. Moist. Very Firm.		16.4	110.1		132.1
30		End of Boring					

Date:	11-29-67	TRI-CITY HOSPITAL OCEANSIDE, CALIFORNIA	Job No.	67-120
By:	RRE		Plate No.	2

SOIL TESTING LABORATORY
OF NORTH COUNTY INC.

LOGS OF BORINGS

BORING NO 2

ELEVATION 256'+

DEPTH IN FEET	SAMPLE NO.		SOIL CLASSIFICATION	FIELD MOIST. % DRY WT.	DRY DENSITY LBS./CU. FT.	SHEAR RESISTANCE KIPS SQ. FT.	Drive Ener
0–2		Grey, clayey fine sand. Moist. Firm. (Fill material)					
2–6	1	Brown fine sandy silt. Moist. Loose. (Fill material)		8.7	100.4		6.
6–7		Grey-blue sandy clay. Very moist. Soft.					
7–12	2	Light brown silty fine sand. Very Moist. Firm.		16.9	104.6	2.15	24.
12–14	3	Grey clayey fine sand with thin lenses red-brown sand. Moist. Firm.		19.4	107.8	2.65	59.
14–22	4	Grey, Clayey fine sand. Moist. Very Firm.		15.9	108.2		87.
22–23		Purple siltstone. Very Firm.					
23–30	5	Grey silty fine sand. Firm.		8.5	122.6	3.04	67.
30–31	6	White fine to coarse silica sand. Moist. Very Firm.		10.5	116.1		83.0

End of Boring

Date: 11-28-67	TRI-CITY HOSPITAL	Job No.	67-120
By: J & RRE	OCEANSIDE, CALIFORNIA	Plate No.	3

SOIL TESTING LABORATORY
OF NORTH COUNTY INC.

LOGS OF BORINGS

BORING NO 3

ELEVATION 280'±

DEPTH IN FEET	SAMPLE NO.	DESCRIPTION	SOIL CLASSIFICATION	FIELD MOIST. % DRY WT.	DRY DENSITY LBS./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	Drive Energy Ft. Kips/Ft.
0–13		Light grey, silty fine sand. Moist. Very Firm.					
6	1			8.8	110.7	3.42	108.
13–18	2	Yellow silty fine sand with thin lenses of grey siltstone. Moist. Very Firm.		7.7	113.7		67.5
18–20		Light grey, silty fine sand. Moist. Very firm,					
20		End of Boring					

Date: 11-29-67	TRI-CITY HOSPITAL	Job No.	67-120
By: RRE	OCEANSIDE, CALIFORNIA	Plate No.	4

SOIL TESTING LABORATORY
OF NORTH COUNTY INC.

LOGS OF BORINGS

BORING NO 4

ELEVATION 271.3'±

Depth in Feet	Sample No.	Description	Soil Classification	Field Moist. % Dry Wt.	Dry Density Lbs./Cu. Ft.	Shear Resistance Kips/Sq. Ft.	Drive Ener Ft Kips/F
0		A. C. Pavement/ Grey silty fine sand.					
2		Yellowish-brown silty fine sand. Very Firm.					
4	1			8.4	111.6	3.32	110.
6	2	Light brownish grey silty fine sand. Very firm.		8.4	117.5		
8							
10	3	Tan silty fine sand with lenses of purple siltstone. Moist. Very Firm.		14.6	112.7	2.95	203.
12	4			14.7	113.3		
14							
16	5	Light brown silt with thin strata of siltstone. Moist. Very Firm.		20.7	101.1	2.56	81.0
18							
20		End of Boring					

Date: 11-29-67	TRI-CITY HOSPITAL	Job No. 67-120
By: RRE	OCEANSIDE, CALIFORNIA	Plate No. 5

SOIL TESTING LABORATORY
OF NORTH COUNTY INC.

APPENDIX C

LABORATORY METHODS AND RESULTS

APPENDIX C
LABORATORY METHODS AND RESULTS

Laboratory Testing Program

Laboratory tests were performed on representative soil samples to detect their relative engineering properties. Tests were performed following test methods of the American Society for Testing Materials or other accepted standards. The following presents a brief description of the various test methods used.

Classification

Soils were classified visually according to the Unified Soil Classification System. Visual classifications were supplemented by laboratory testing of selected samples according to ASTM D2487. The soil classifications are shown on the Exploration Logs in Appendix B.

Expansion Index

Expansion testing was performed on selected samples of the matrix of the on-site soils according to ASTM D 4829.

Particle-Size Analysis

Particle-size analyses were performed on selected representative samples according to ASTM D 422.

Atterberg Limits

The procedure of ASTM D4518-84 was used to measure the liquid limit, plastic limit and plasticity index of representative samples.

Direct Shear

Direct shear tests were performed on either samples direct from the field or on samples recompacted to a specific density. Direct shear testing was performed in accordance with ASTM D 3080. The samples were inundated during shearing to represent adverse field conditions.

Consolidation

To assess their compressibility and volume change behavior when loaded and wetted, relatively undisturbed samples of representative samples from the investigation were subject to consolidation tests in accordance with ASTM D 2435.

Resistance “R” Value

The resistance “R”-value was measured by the California Test. 301. The graphically determined “R” value at an exudation pressure of 300 pounds per square inch is the value used for pavement section calculation.

Chemical Analysis

Soil materials were collected with sterile sampling equipment and tested for Sulfate and Chloride content, pH, Corrosivity, and Resistivity.

EXPANSION INDEX TEST

ASTM D 4829

LOCATION	DEPTH (feet)	EXPANSION INDEX	EXPANSION POTENTIAL
B-31	0-5	28	LOW
B-16	0-5	22	LOW
B-24	12-15	98	HIGH
B-43	0-5	8	VERY LOW
B-5	0-5	65	MEDIUM

IN-PLACE MOISTURE AND DENSITY

LOCATION	DEPTH (feet)	% MOISTURE	DRY DENSITY
B-1	10	7.5	109.2
B-5	5	14.0	108.6
B-11	10	14.7	111.7
B-13	10	10.4	103.2
B-33	10	13.3	111.9
B-18	10	12.2	108.9
B-19	10	15.8	111.5
B-26	5	10.3	113.5

RESISTANCE "R"-VALUE

CALTEST 301

LOCATION	DEPTH (feet)	R-VALUE
B-40	0-5	7
B-42	0-5	16

SULFATE

CALIFORNIA TEST 417

LOCATION	DEPTH (feet)	RESULTS ppm
B-3	0-5	280.2
B-27	0-5	402.6
B-43	0-5	187.8

CHLORIDE

CALIFORNIA TEST 422

LOCATION	DEPTH (feet)	RESULTS ppm
B-3	0-5	107.3
B-27	0-5	69.3
B-43	0-5	39.9

p.H.

CALIFORNIA TEST 643

LOCATION	DEPTH (feet)	RESULTS
B-3	0-5	8.09
B-27	0-5	7.61
B-43	0-5	8.78

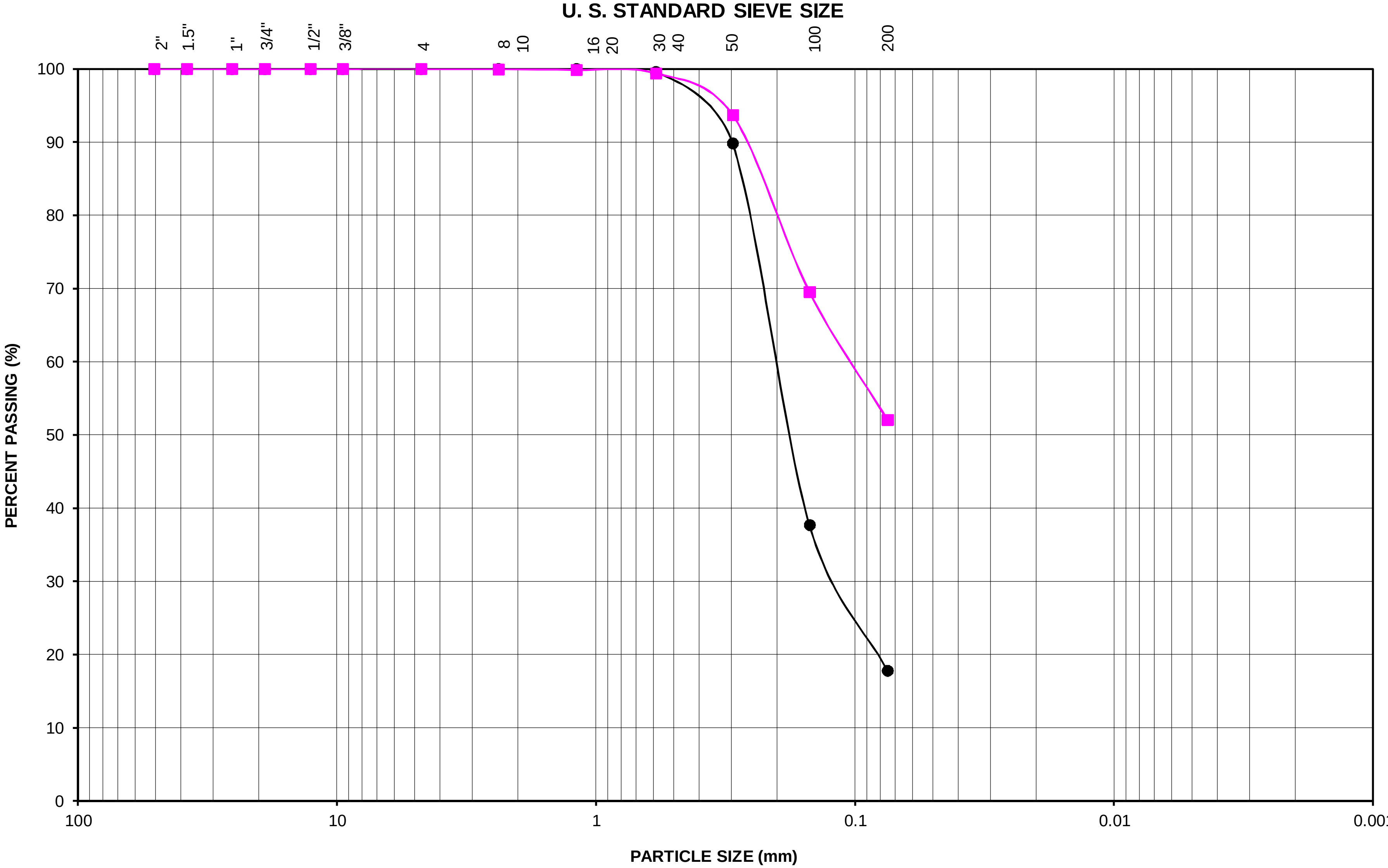
RESISTIVITY

CALIFORNIA TEST 643

LOCATION	DEPTH (feet)	RESULTS ohms-cm
B-3	0-5	2030
B-27	0-5	2180
B-43	0-5	4790

ATTERBERG LIMITS

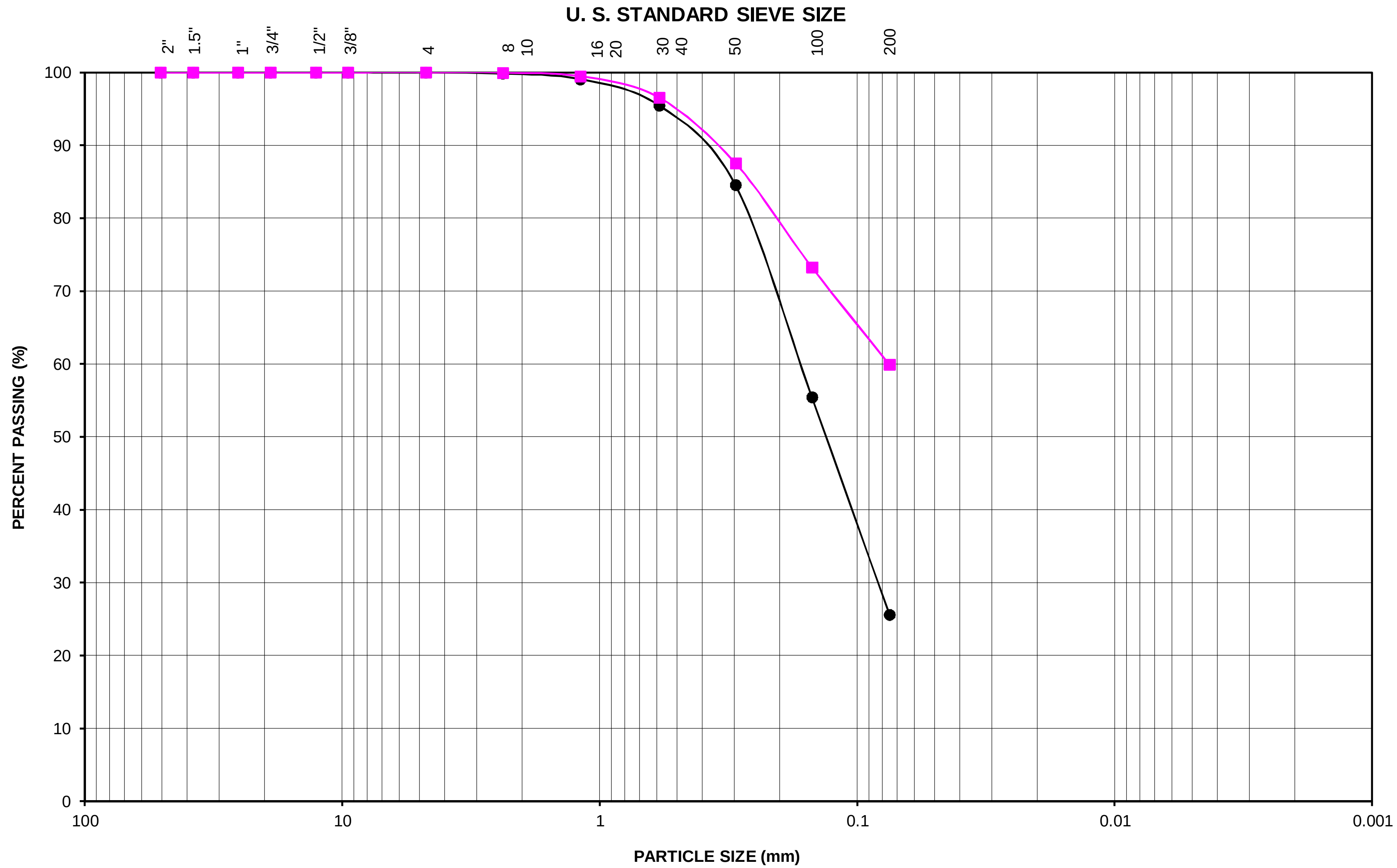
LOCATION	DEPTH (feet)	LIQUID LIMIT	PLASTICITY INDEX	CLASSIFICATION
B-18	20	31	16	CL
B-20	20	24	7	CL-ML
B-24	5	26	12	CL
B-31	40	50	24	CL
B-31	50	NP	NP	Non-Plastic



PARTICLE SIZE ANALYSIS

CTE INC.
Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

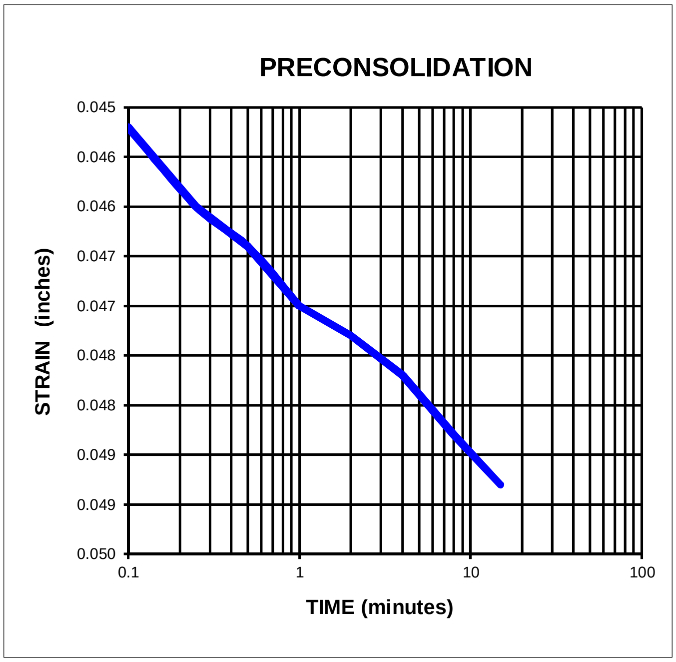
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-7	10	●	-	-	SM
B-18	20	■	-	-	SC/CL
CTE JOB NUMBER:		10-13000G		FIGURE:	C-1

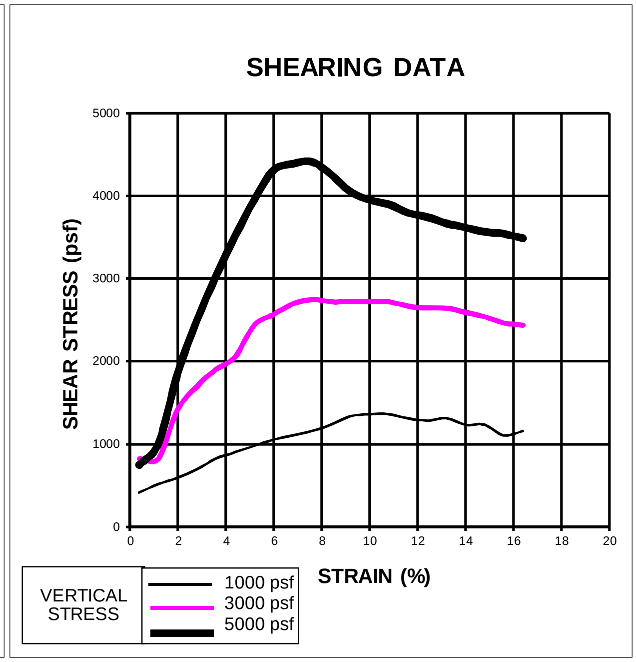


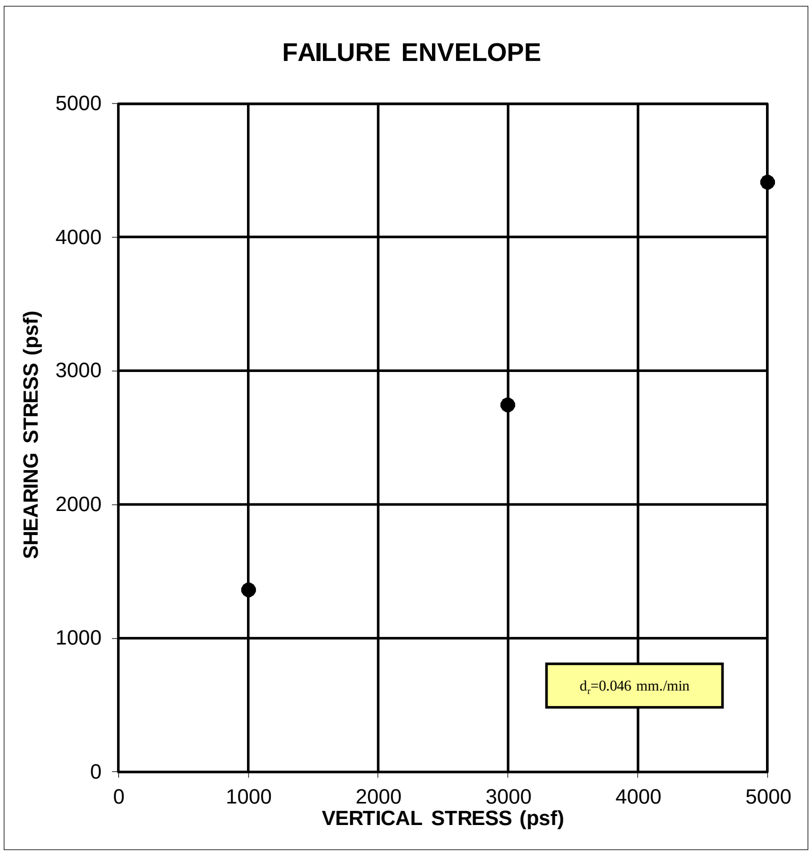
PARTICLE SIZE ANALYSIS

CTE INC. Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-27	5	●	-	-	SC/SM
B-27	10	■	-	-	CL
CTE JOB NUMBER:		10-13000G		FIGURE:	C-2

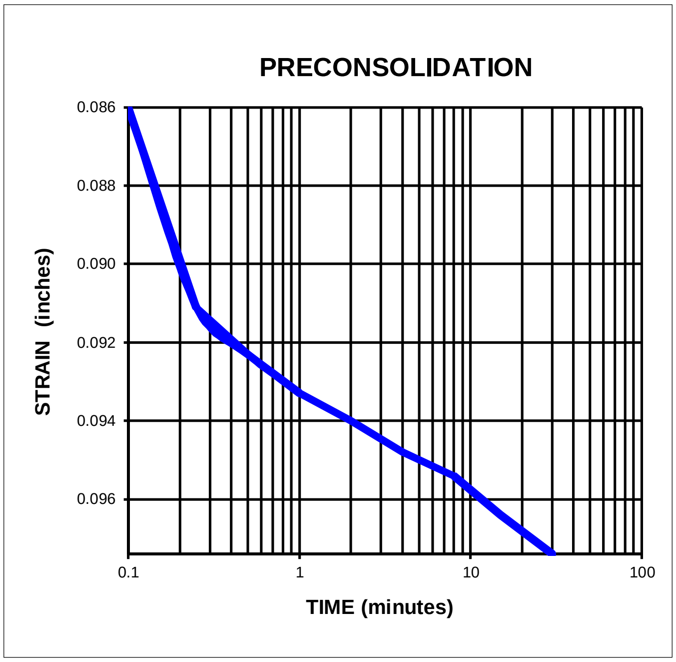


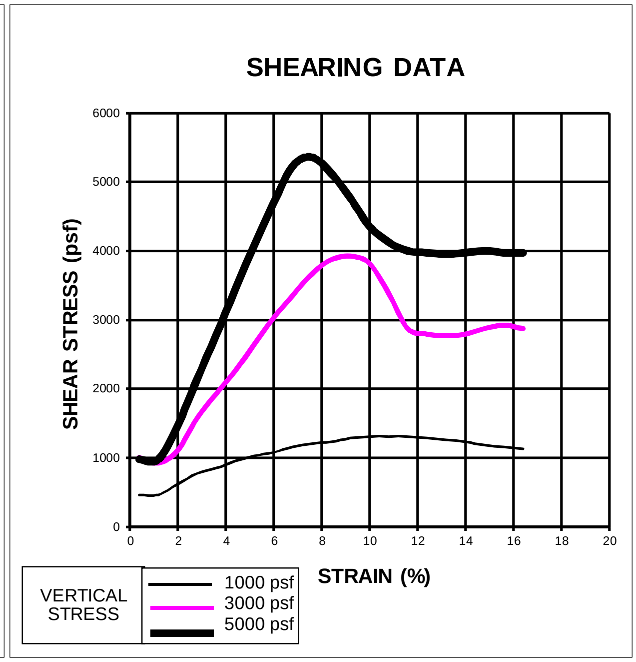


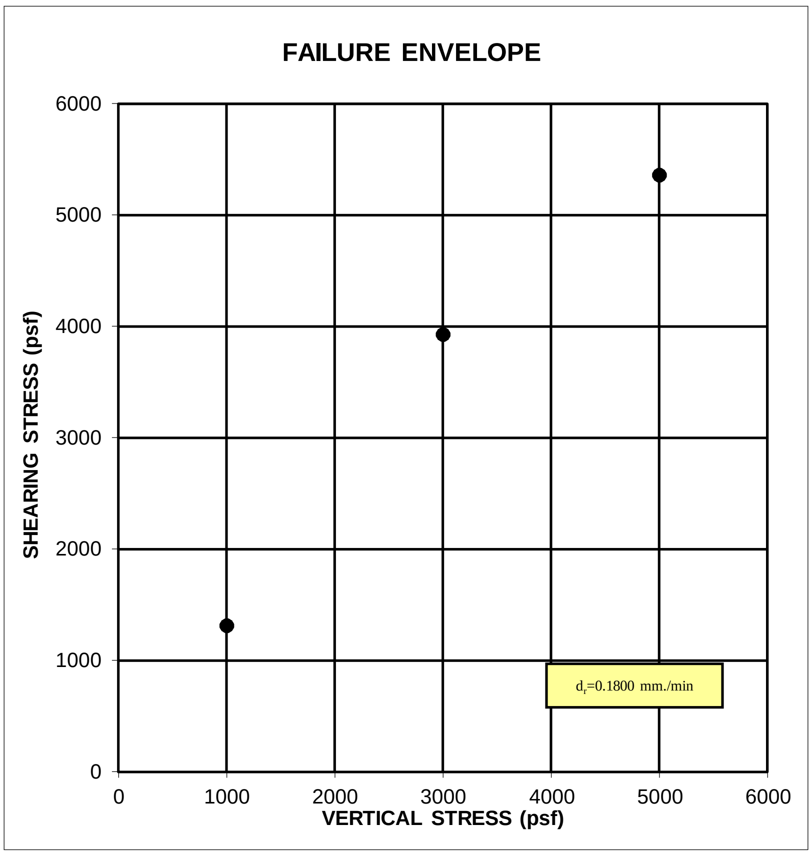


SHEAR STRENGTH TEST - ASTM D3080

Job Name:	Tri-City Medical Center			Initial Dry Density (pcf):	109.2
Project Number:	10-13000G	Sample Date:	7/12/2016	Initial Moisture (%):	7.5
Lab Number:	26462	Test Date:	7/29/2016	Final Moisture (%):	27.4
Sample Location:	B-1 @ 10'	Tested by:	Julian Carmona	Cohesion:	550 psf
Sample Description:	Greyish White SM			Angle Of Friction:	37.3







SHEAR STRENGTH TEST - ASTM D3080

Job Name:	Tri-City			Initial Dry Density (pcf):	111.9
Project Number:	10-13000G	Sample Date:	7/15/2016	Initial Moisture (%):	13.3
Lab Number:	26462	Test Date:	8/9/2016	Final Moisture (%):	17.2
Sample Location:	B-33 @ 10'	Tested by:	Julian C.	Cohesion:	490 psf
Sample Description:	Light gray SP-SM			Angle Of Friction:	45.3

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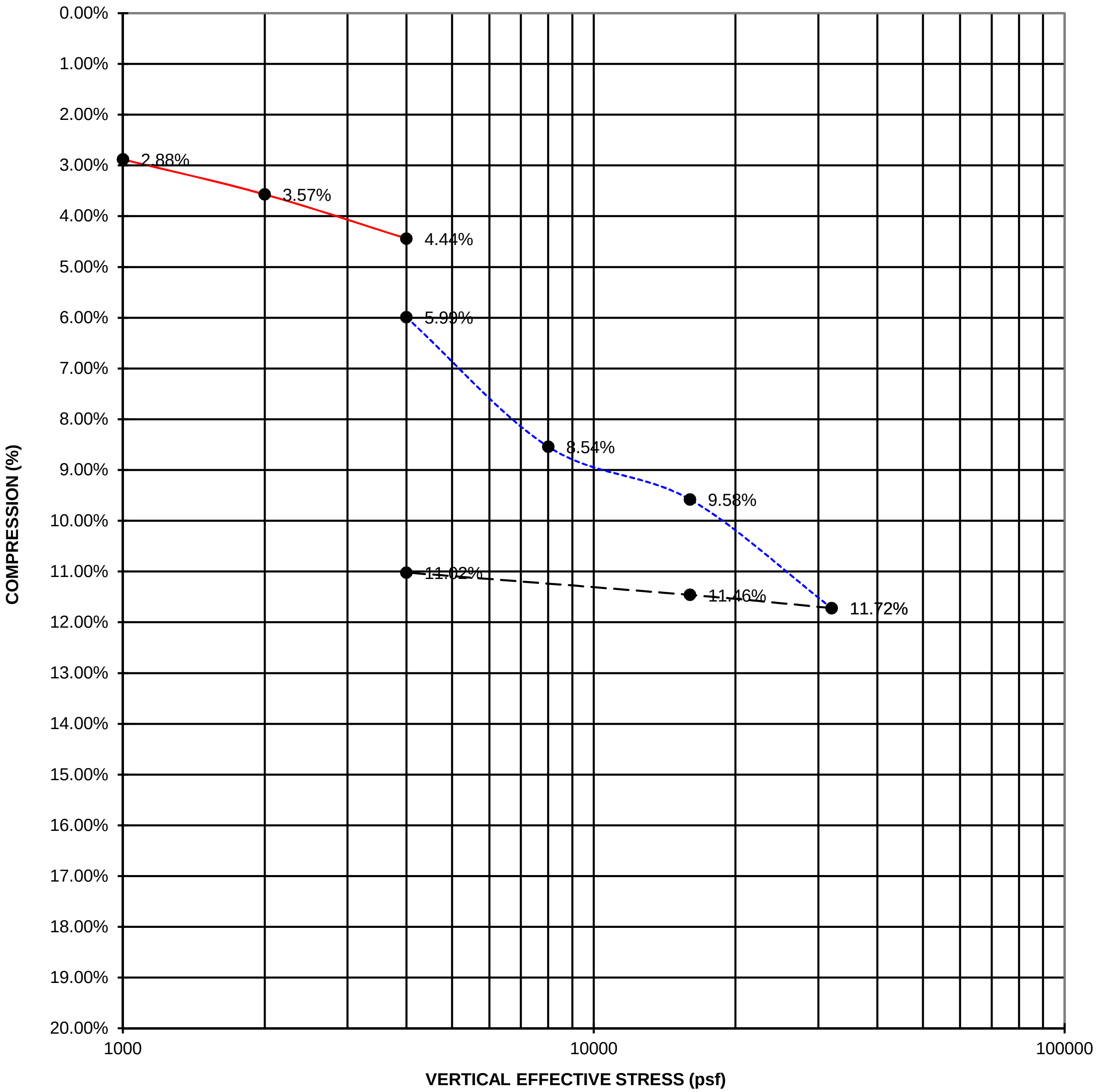
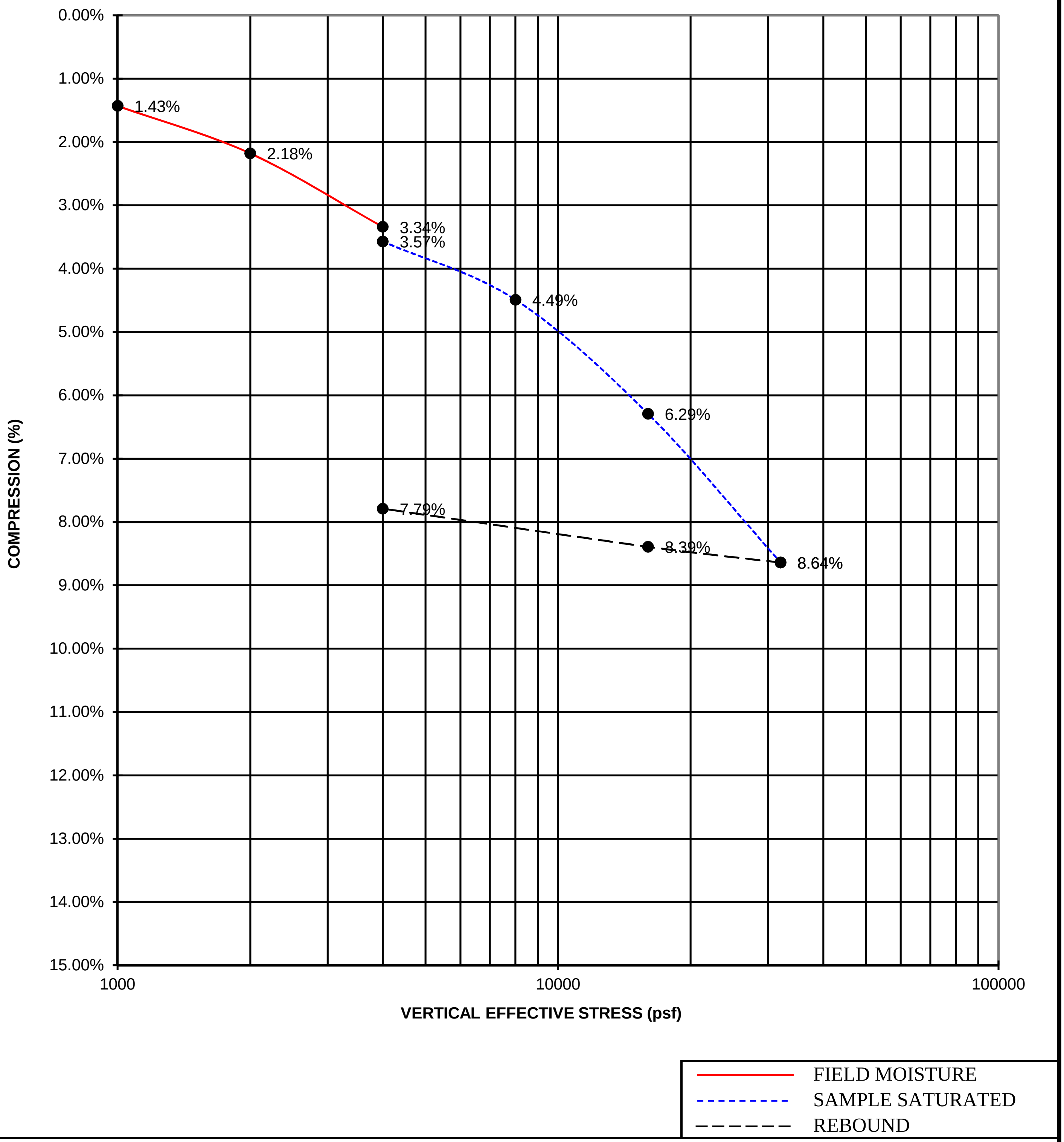


Swell/Consolidation Test ASTM D2435

Project Name:	Tri-City Medical Center				
Project Number:	10-13000G	Sample Date:	7/12/2016	Initial Moisture (%):	10.4
Lab Number:	26462	Test Date:	8/8/2016	Final Moisture (%):	18.5
Sample Location:	B-13 @ 10'	Tested By:	Chase Velarde	Initial Dry Density (PCF):	103.2
Sample Description:	Gray SC			Final Dry Density (PCF):	108.0

Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



Swell/Consolidation Test ASTM D2435

Project Name:	Tri-City Medical Center				
Project Number:	10-13000G	Sample Date:	7/12/2016	Initial Moisture (%):	14.7
Lab Number:	26462	Test Date:	8/8/2016	Final Moisture (%):	14.0
Sample Location:	B-11 @ 10'	Tested By:	Chase Velarde	Initial Dry Density (PCF):	111.7
Sample Description:	Grey SC			Final Dry Density (PCF):	121.9

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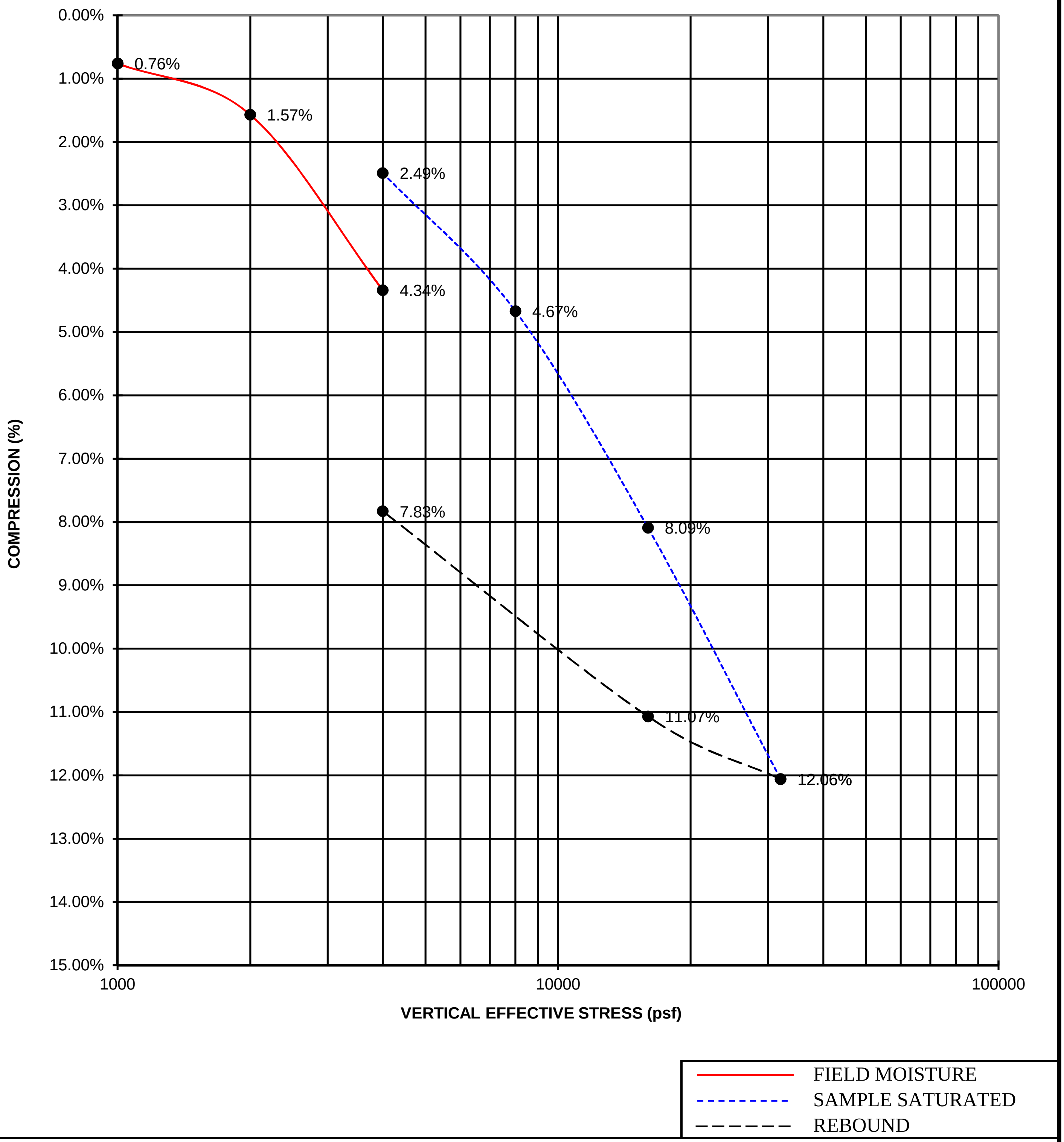

Swell/Consolidation Test ASTM D2435

Project Name:	Tri-City				
Project Number:	10-13000G	Sample Date:	7/12/2016	Initial Moisture (%):	14.8
Lab Number:	26462	Test Date:	9/6/2016	Final Moisture (%):	24.4
Sample Location:	B-24 @ 10'	Tested By:	JC	Initial Dry Density (PCF):	103.3
Sample Description:	Olive-gray CL			Final Dry Density (PCF):	112.1

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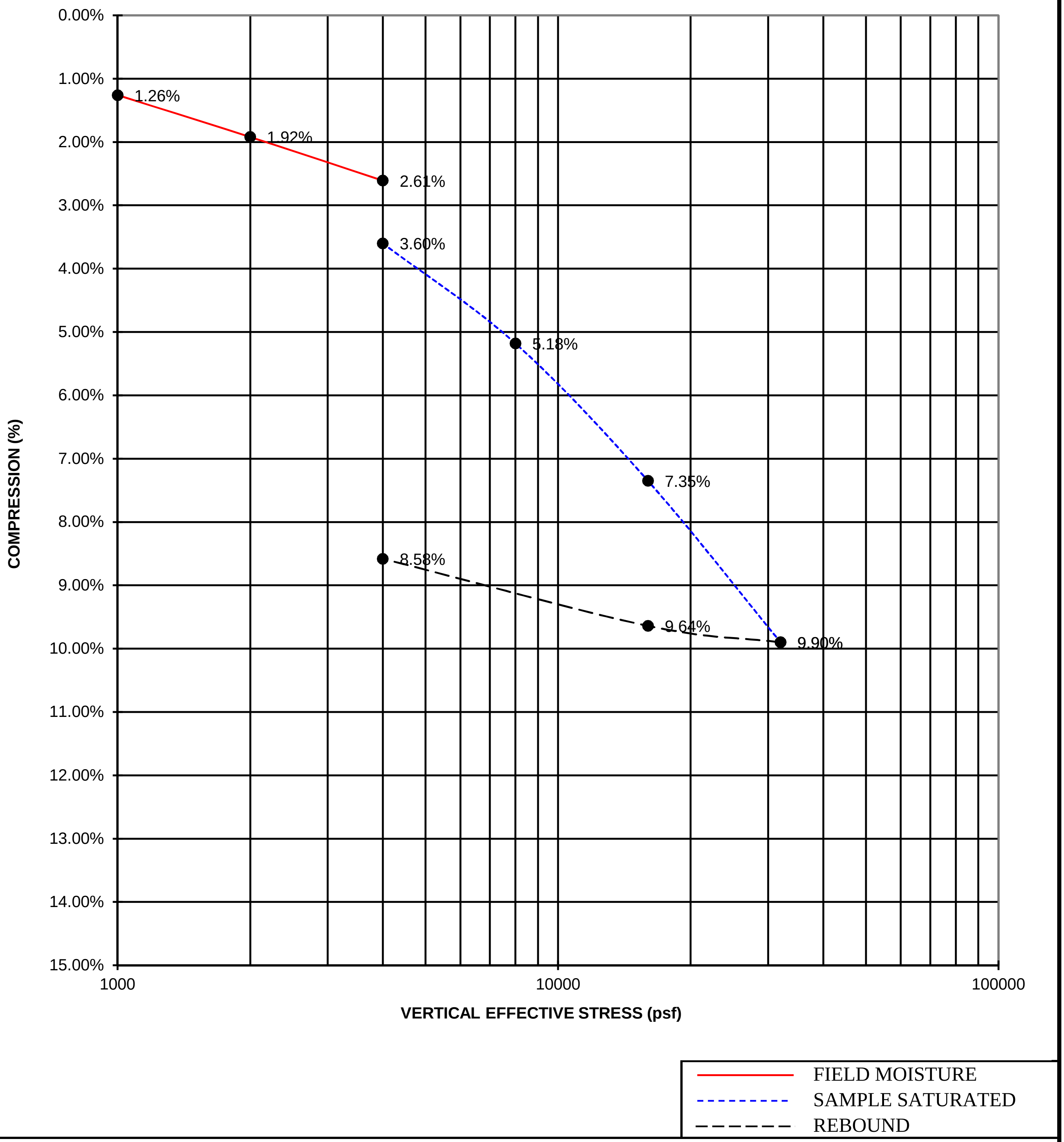

Swell/Consolidation Test ASTM D2435

Project Name:	Tri-City Medical Center				
Project Number:	10-13000G	Sample Date:	7/12/2016	Initial Moisture (%):	14.0
Lab Number:	26462	Test Date:	8/1/2016	Final Moisture (%):	15.0
Sample Location:	B-5 @ 5'	Tested By:	Julian Carmona	Initial Dry Density (PCF):	108.6
Sample Description:	Light Grey SC			Final Dry Density (PCF):	117.8

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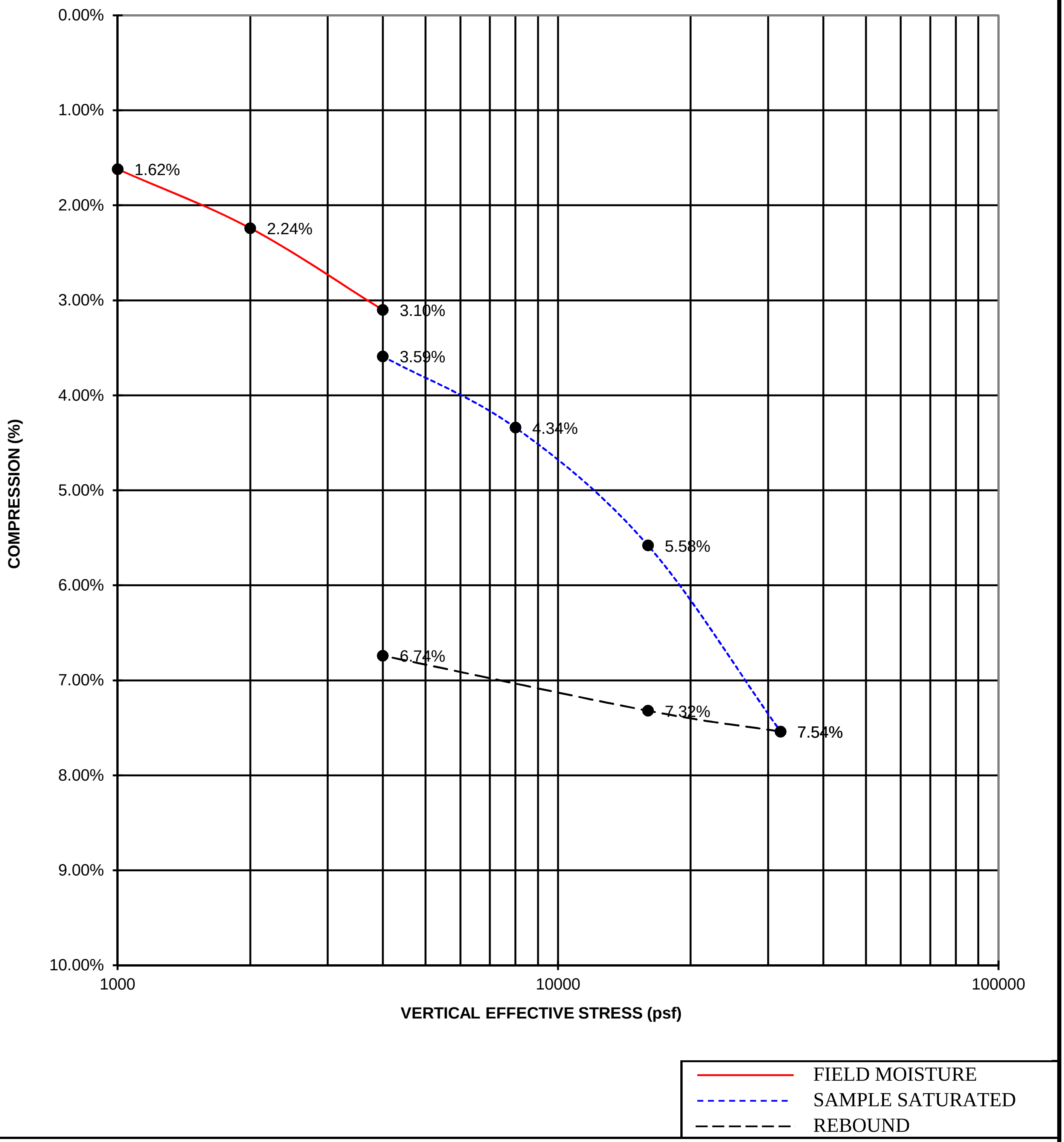
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



Swell/Consolidation Test ASTM D2435

Project Name:	Tri-City Medical Center				
Project Number:	10-13000G	Sample Date:	7/12/2016	Initial Moisture (%):	12.2
Lab Number:	26516	Test Date:	8/17/2016	Final Moisture (%):	13.1
Sample Location:	B-18 @ 10'	Tested By:	Chase V.	Initial Dry Density (PCF):	108.9
Sample Description:	Moderate Gray SC			Final Dry Density (PCF):	115.8

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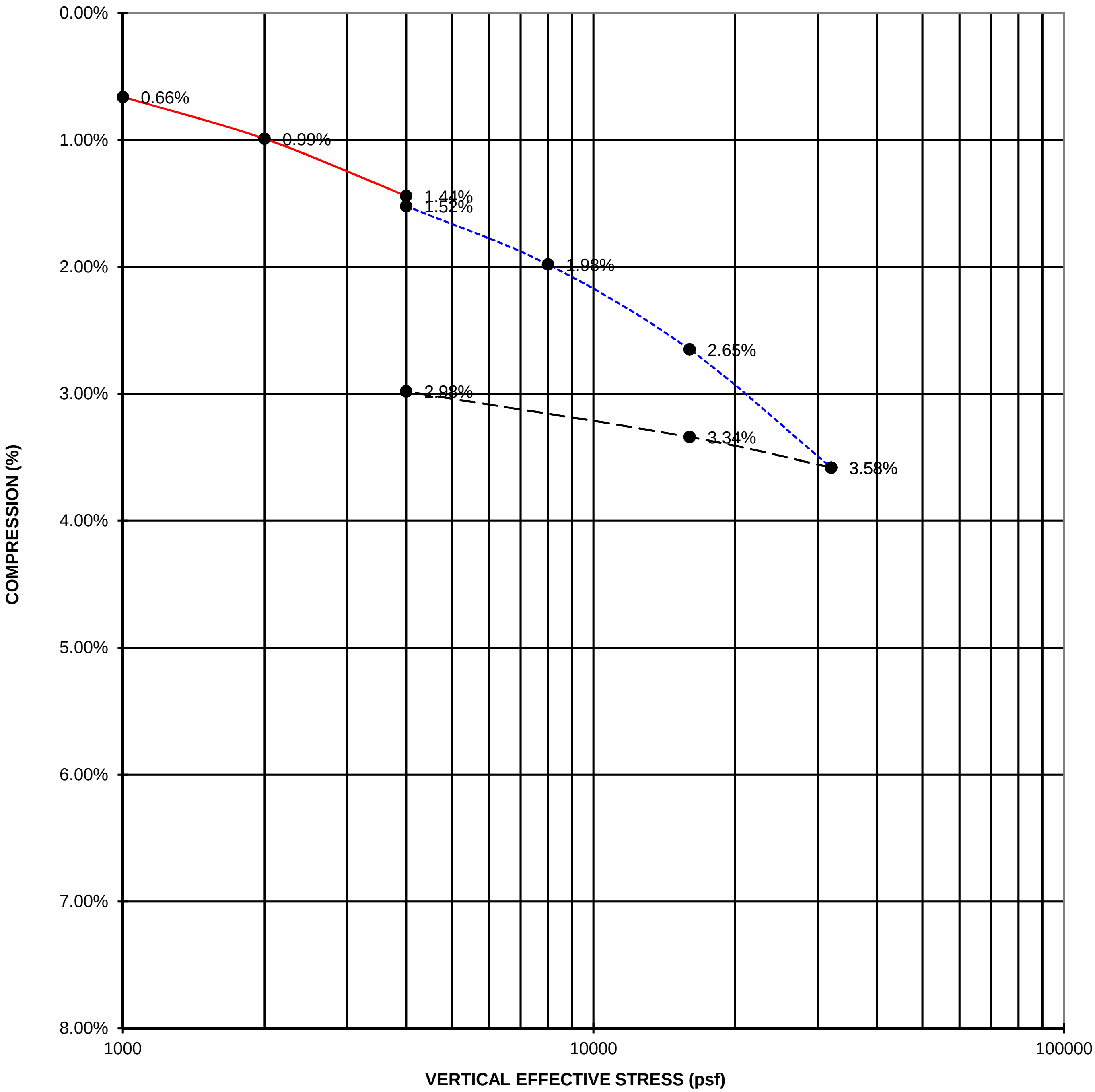
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

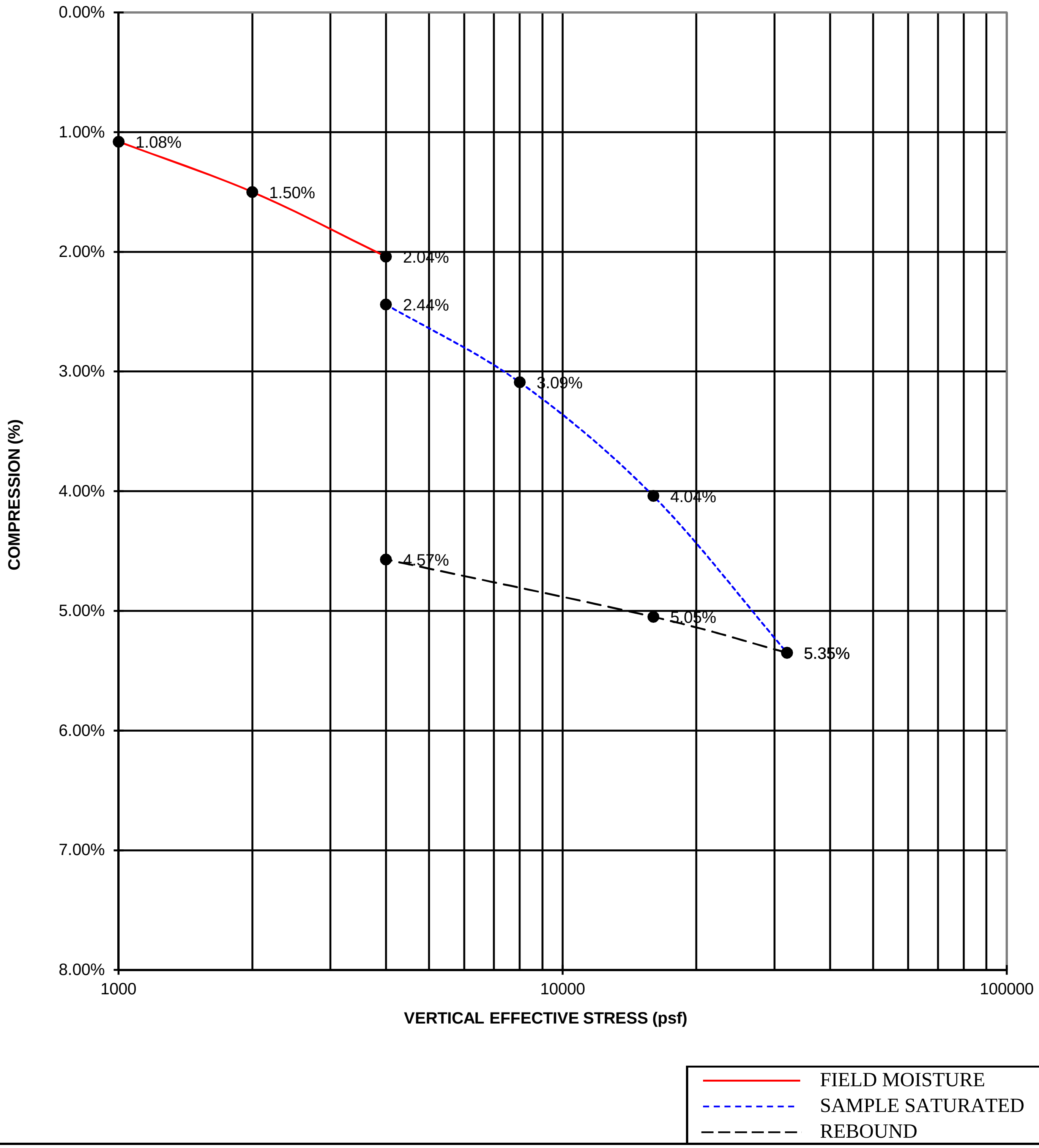


Swell/Consolidation Test ASTM D2435

Project Name:	Tri-City Medical Center				
Project Number:	10-13000G	Sample Date:	7/12/2016	Initial Moisture (%):	15.8
Lab Number:	26516	Test Date:	8/17/2016	Final Moisture (%):	13.4
Sample Location:	B-19 @ 10'	Tested By:	Chase V.	Initial Dry Density (PCF):	111.5
Sample Description:	Light Gray SM			Final Dry Density (PCF):	117.3

Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



Swell/Consolidation Test ASTM D2435

Project Name:	Tri-City Medical Center				
Project Number:	10-13000G	Sample Date:	7/12/2016	Initial Moisture (%):	10.3
Lab Number:	26516	Test Date:	8/17/2016	Final Moisture (%):	11.7
Sample Location:	B-26 @ 5'	Tested By:	Chase V.	Initial Dry Density (PCF):	113.5
Sample Description:	Light Gray SM			Final Dry Density (PCF):	117.4

APPENDIX D

STANDARD SPECIFICATIONS FOR GRADING

Section 1 - General

Construction Testing & Engineering, Inc. presents the following standard recommendations for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications. Recommendations contained in the body of the previously presented soils report shall supersede the recommendations and or requirements as specified herein. The project geotechnical consultant shall interpret disputes arising out of interpretation of the recommendations contained in the soils report or specifications contained herein.

Section 2 - Responsibilities of Project Personnel

The geotechnical consultant should provide observation and testing services sufficient to general conformance with project specifications and standard grading practices. The geotechnical consultant should report any deviations to the client or his authorized representative.

The Client should be chiefly responsible for all aspects of the project. He or his authorized representative has the responsibility of reviewing the findings and recommendations of the geotechnical consultant. He shall authorize or cause to have authorized the Contractor and/or other consultants to perform work and/or provide services. During grading the Client or his authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

The Contractor is responsible for the safety of the project and satisfactory completion of all grading and other associated operations on construction projects, including, but not limited to, earth work in accordance with the project plans, specifications and controlling agency requirements.

Section 3 - Preconstruction Meeting

A preconstruction site meeting should be arranged by the owner and/or client and should include the grading contractor, design engineer, geotechnical consultant, owner's representative and representatives of the appropriate governing authorities.

Section 4 - Site Preparation

The client or contractor should obtain the required approvals from the controlling authorities for the project prior, during and/or after demolition, site preparation and removals, etc. The appropriate approvals should be obtained prior to proceeding with grading operations.

Clearing and grubbing should consist of the removal of vegetation such as brush, grass, woods, stumps, trees, root of trees and otherwise deleterious natural materials from the areas to be graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

Demolition should include removal of buildings, structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, mining shafts, tunnels, etc.) and other man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or rerouting pipelines at the project perimeter and cutoff and capping of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

Trees, plants or man-made improvements not planned to be removed or demolished should be protected by the contractor from damage or injury.

Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed off-site. Clearing, grubbing and demolition operations should be performed under the observation of the geotechnical consultant.

Section 5 - Site Protection

Protection of the site during the period of grading should be the responsibility of the contractor. Unless other provisions are made in writing and agreed upon among the concerned parties, completion of a portion of the project should not be considered to preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete as identified by the geotechnical consultant, the client and the regulating agencies.

Precautions should be taken during the performance of site clearing, excavations and grading to protect the work site from flooding, ponding or inundation by poor or improper surface drainage. Temporary provisions should be made during the rainy season to adequately direct surface drainage away from and off the work site. Where low areas cannot be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.

Rain related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions as determined by the geotechnical consultant. Soil adversely affected should be classified as unsuitable materials and should be subject to overexcavation and replacement with compacted fill or other remedial grading as recommended by the geotechnical consultant.

The contractor should be responsible for the stability of all temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations (e.g., backcuts) are made in consideration of stability of the completed project and, therefore, should not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant should not be considered to preclude requirements that are more restrictive by the regulating agencies. The contractor should provide during periods of extensive rainfall plastic sheeting to prevent unprotected slopes from becoming saturated and unstable. When deemed appropriate by the geotechnical consultant or governing agencies the contractor shall install checkdams, desilting basins, sand bags or other drainage control measures.

In relatively level areas and/or slope areas, where saturated soil and/or erosion gullies exist to depths of greater than 1.0 foot; they should be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where affected materials exist to depths of 1.0 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place, followed by thorough recompaction in accordance with the applicable grading guidelines herein may be attempted. If the desired results are not achieved, all affected materials should be overexcavated and replaced as compacted fill in accordance with the slope repair recommendations herein. If field conditions dictate, the geotechnical consultant may recommend other slope repair procedures.

Section 6 - Excavations

6.1 Unsuitable Materials

Materials that are unsuitable should be excavated under observation and recommendations of the geotechnical consultant. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic compressible natural soils and fractured, weathered, soft bedrock and nonengineered or otherwise deleterious fill materials.

Material identified by the geotechnical consultant as unsatisfactory due to its moisture conditions should be overexcavated; moisture conditioned as needed, to a uniform at or above optimum moisture condition before placement as compacted fill.

If during the course of grading adverse geotechnical conditions are exposed which were not anticipated in the preliminary soil report as determined by the geotechnical consultant additional exploration, analysis, and treatment of these problems may be recommended.

6.2 Cut Slopes
Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent cut slopes should not be steeper than 2:1 (horizontal: vertical).

The geotechnical consultant should observe cut slope excavation and if these excavations expose loose cohesionless, significantly fractured or otherwise unsuitable material, the materials should be overexcavated and replaced with a compacted stabilization fill. If encountered specific cross section details should be obtained from the Geotechnical Consultant.

When extensive cut slopes are excavated or these cut slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top of the slope.

6.3 Pad Areas
All lot pad areas, including side yard terrace containing both cut and fill materials, transitions, located less than 3 feet deep should be overexcavated to a depth of 3 feet and replaced with a uniform compacted fill blanket of 3 feet. Actual depth of overexcavation may vary and should be delineated by the geotechnical consultant during grading, especially where deep or drastic transitions are present.

For pad areas created above cut or natural slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm drainage swale and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slopes of 2 percent or greater is recommended.

Section 7 - Compacted Fill

All fill materials should have fill quality, placement, conditioning and compaction as specified below or as approved by the geotechnical consultant.

7.1 Fill Material Quality
Excavated on-site or import materials which are acceptable to the geotechnical consultant may be utilized as compacted fill, provided trash, vegetation and other deleterious materials are removed prior to placement. All import materials anticipated for use on-site should be sampled tested and approved prior to and placement is in conformance with the requirements outlined.

Rocks 12 inches in maximum and smaller may be utilized within compacted fill provided sufficient fill material is placed and thoroughly compacted over and around all rock to effectively fill rock voids. The amount of rock should not exceed 40 percent by dry weight passing the 3/4-inch sieve. The geotechnical consultant may vary those requirements as field conditions dictate.

Where rocks greater than 12 inches but less than four feet of maximum dimension are generated during grading, or otherwise desired to be placed within an engineered fill, special handling in accordance with the recommendations below. Rocks greater than four feet should be broken down or disposed off-site.

7.2 Placement of Fill

Prior to placement of fill material, the geotechnical consultant should observe and approve the area to receive fill. After observation and approval, the exposed ground surface should be scarified to a depth of 6 to 8 inches. The scarified material should be conditioned (i.e. moisture added or air dried by continued discing) to achieve a moisture content at or slightly above optimum moisture conditions and compacted to a minimum of 90 percent of the maximum density or as otherwise recommended in the soils report or by appropriate government agencies.

Compacted fill should then be placed in thin horizontal lifts not exceeding eight inches in loose thickness prior to compaction. Each lift should be moisture conditioned as needed, thoroughly blended to achieve a consistent moisture content at or slightly above optimum and thoroughly compacted by mechanical methods to a minimum of 90 percent of laboratory maximum dry density. Each lift should be treated in a like manner until the desired finished grades are achieved.

The contractor should have suitable and sufficient mechanical compaction equipment and watering apparatus on the job site to handle the amount of fill being placed in consideration of moisture retention properties of the materials and weather conditions.

When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Keying and benching should be sufficient to provide at least six-foot wide benches and a minimum of four feet of vertical bench height within the firm natural ground, firm bedrock or engineered compacted fill. No compacted fill should be placed in an area after keying and benching until the geotechnical consultant has reviewed the area. Material generated by the benching operation should be moved sufficiently away from the bench area to allow for the recommended review of the horizontal bench prior to placement of fill.

Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a false slope, benching should be conducted in the same manner as above described. At least a 3-foot vertical bench should be established within the firm core of adjacent approved compacted fill prior to placement of additional fill. Benching should proceed in at least 3-foot vertical increments until the desired finished grades are achieved.

Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface or previously compacted fill should be processed by scarification, moisture conditioning as needed to at or slightly above optimum moisture content, thoroughly blended and recompacted to a minimum of 90 percent of laboratory maximum dry density. Where unsuitable materials exist to depths of greater than one foot, the unsuitable materials should be over-excavated.

Following a period of flooding, rainfall or overwatering by other means, no additional fill should be placed until damage assessments have been made and remedial grading performed as described herein.

Rocks 12 inch in maximum dimension and smaller may be utilized in the compacted fill provided the fill is placed and thoroughly compacted over and around all rock. No oversize material should be used within 3 feet of finished pad grade and within 1 foot of other compacted fill areas. Rocks 12 inches up to four feet maximum dimension should be placed below the upper 10 feet of any fill and should not be closer than 15 feet to any slope face. These recommendations could vary as locations of improvements dictate. Where practical, oversized material should not be placed below areas where structures or deep utilities are proposed. Oversized material should be placed in windrows on a clean, overexcavated or unyielding compacted fill or firm natural ground surface. Select native or imported granular soil (S.E. 30 or higher) should be placed and thoroughly flooded over and around all windrowed rock, such that voids are filled. Windrows of oversized material should be staggered so those successive strata of oversized material are not in the same vertical plane.

It may be possible to dispose of individual larger rock as field conditions dictate and as recommended by the geotechnical consultant at the time of placement.

The contractor should assist the geotechnical consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill. The contractor should provide this work at no additional cost to the owner or contractor's client.

Fill should be tested by the geotechnical consultant for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Test D 1556-00, D 2922-04. Tests should be conducted at a minimum of approximately two vertical feet or approximately 1,000 to 2,000 cubic yards of fill placed. Actual test intervals may vary as field conditions dictate. Fill found not to be in conformance with the grading recommendations should be removed or otherwise handled as recommended by the geotechnical consultant.

7.3 Fill Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent fill slopes should not be steeper than 2:1 (horizontal: vertical).

Except as specifically recommended in these grading guidelines compacted fill slopes should be over-built two to five feet and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes should be overexcavated and reconstructed under the guidelines of the geotechnical consultant. The degree of overbuilding shall be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface.

At the discretion of the geotechnical consultant, slope face compaction may be attempted by conventional construction procedures including backrolling. The procedure must create a firmly compacted material throughout the entire depth of the slope face to the surface of the previously compacted firm fill intercore.

During grading operations, care should be taken to extend compactive effort to the outer edge of the slope. Each lift should extend horizontally to the desired finished slope surface or more as needed to ultimately established desired grades. Grade during construction should not be allowed to roll off at the edge of the slope. It may be helpful to elevate slightly the outer edge of the slope. Slough resulting from the placement of individual lifts should not be allowed to drift down over previous lifts. At intervals not exceeding four feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly dozer trackrolled.

For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished using a berm and pad gradient of at least two percent.

Section 8 - Trench Backfill

Utility and/or other excavation of trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 90 percent of the laboratory maximum density.

Within slab areas, but outside the influence of foundations, trenches up to one foot wide and two feet deep may be backfilled with sand and consolidated by jetting, flooding or by mechanical means. If on-site materials are utilized, they should be wheel-rolled, tamped or otherwise compacted to a firm condition. For minor interior trenches, density testing may be deleted or spot testing may be elected if deemed necessary, based on review of backfill operations during construction.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, the contractor may elect the utilization of light weight mechanical compaction equipment and/or shading of the conduit with clean, granular material, which should be thoroughly jetted in-place above the conduit, prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review of the geotechnical consultant at the time of construction.

In cases where clean granular materials are proposed for use in lieu of native materials or where flooding or jetting is proposed, the procedures should be considered subject to review by the geotechnical consultant. Clean granular backfill and/or bedding are not recommended in slope areas.

Section 9 - Drainage

Where deemed appropriate by the geotechnical consultant, canyon subdrain systems should be installed in accordance with CTE’s recommendations during grading.

Typical subdrains for compacted fill buttresses, slope stabilization or sidehill masses, should be installed in accordance with the specifications.

Roof, pad and slope drainage should be directed away from slopes and areas of structures to suitable disposal areas via non-erodible devices (i.e., gutters, downspouts, and concrete swales).

For drainage in extensively landscaped areas near structures, (i.e., within four feet) a minimum of 5 percent gradient away from the structure should be maintained. Pad drainage of at least 2 percent should be maintained over the remainder of the site.

Drainage patterns established at the time of fine grading should be maintained throughout the life of the project. Property owners should be made aware that altering drainage patterns could be detrimental to slope stability and foundation performance.

Section 10 - Slope Maintenance

10.1 - Landscape Plants

To enhance surficial slope stability, slope planting should be accomplished at the completion of grading. Slope planting should consist of deep-rooting vegetation requiring little watering. Plants native to the southern California area and plants relative to native plants are generally desirable. Plants native to other semi-arid and arid areas may also be appropriate. A Landscape Architect should be the best party to consult regarding actual types of plants and planting configuration.

10.2 - Irrigation

Irrigation pipes should be anchored to slope faces, not placed in trenches excavated into slope faces.

Slope irrigation should be minimized. If automatic timing devices are utilized on irrigation systems, provisions should be made for interrupting normal irrigation during periods of rainfall.

10.3 - Repair

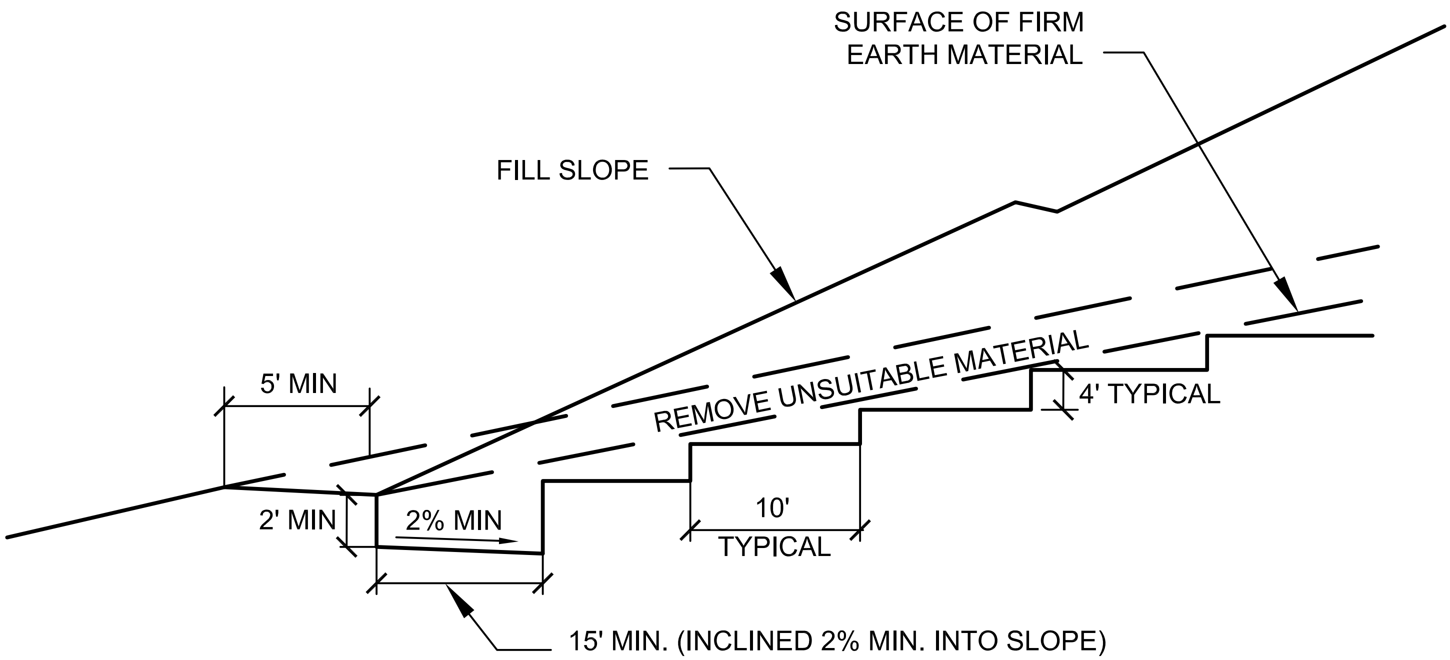
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

If slope failures occur, the geotechnical consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.

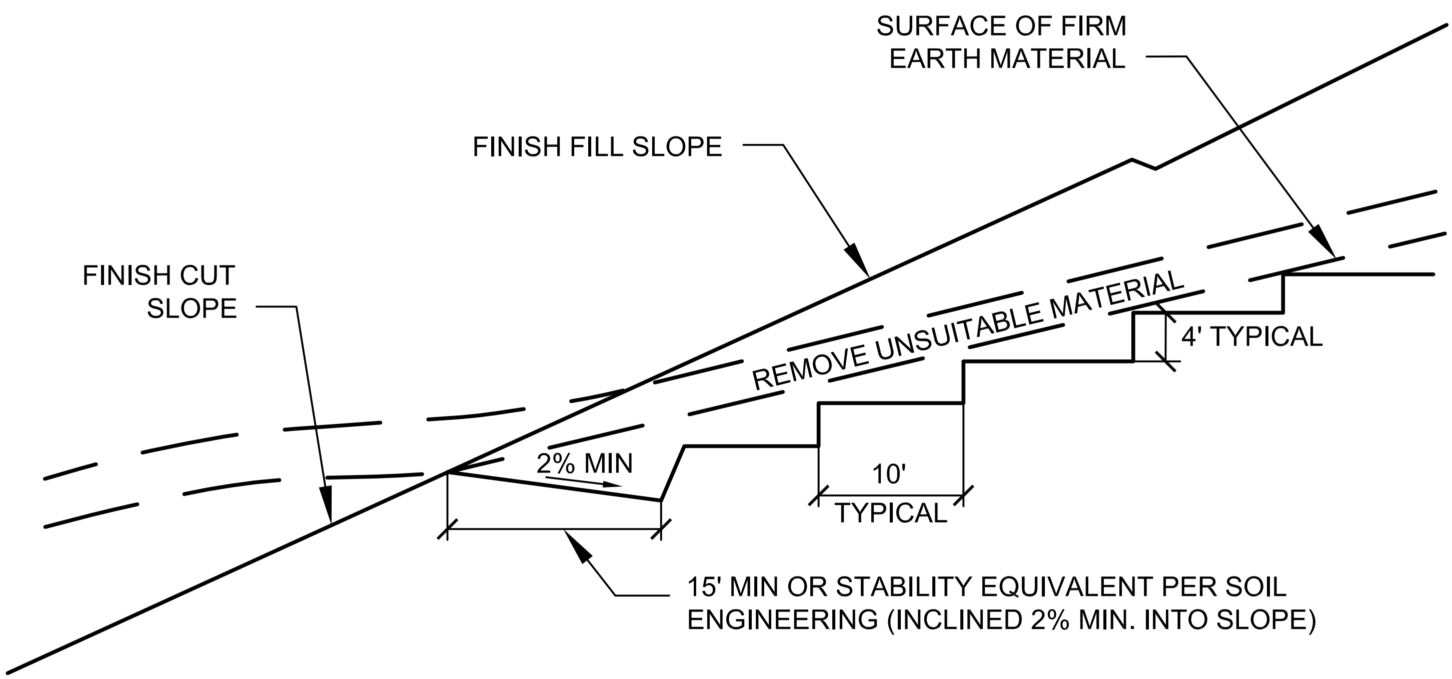
If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

In the accompanying Standard Details, appropriate repair procedures are illustrated for superficial slope failures (i.e., occurring typically within the outer one foot to three feet of a slope face).

BENCHING FILL OVER NATURAL

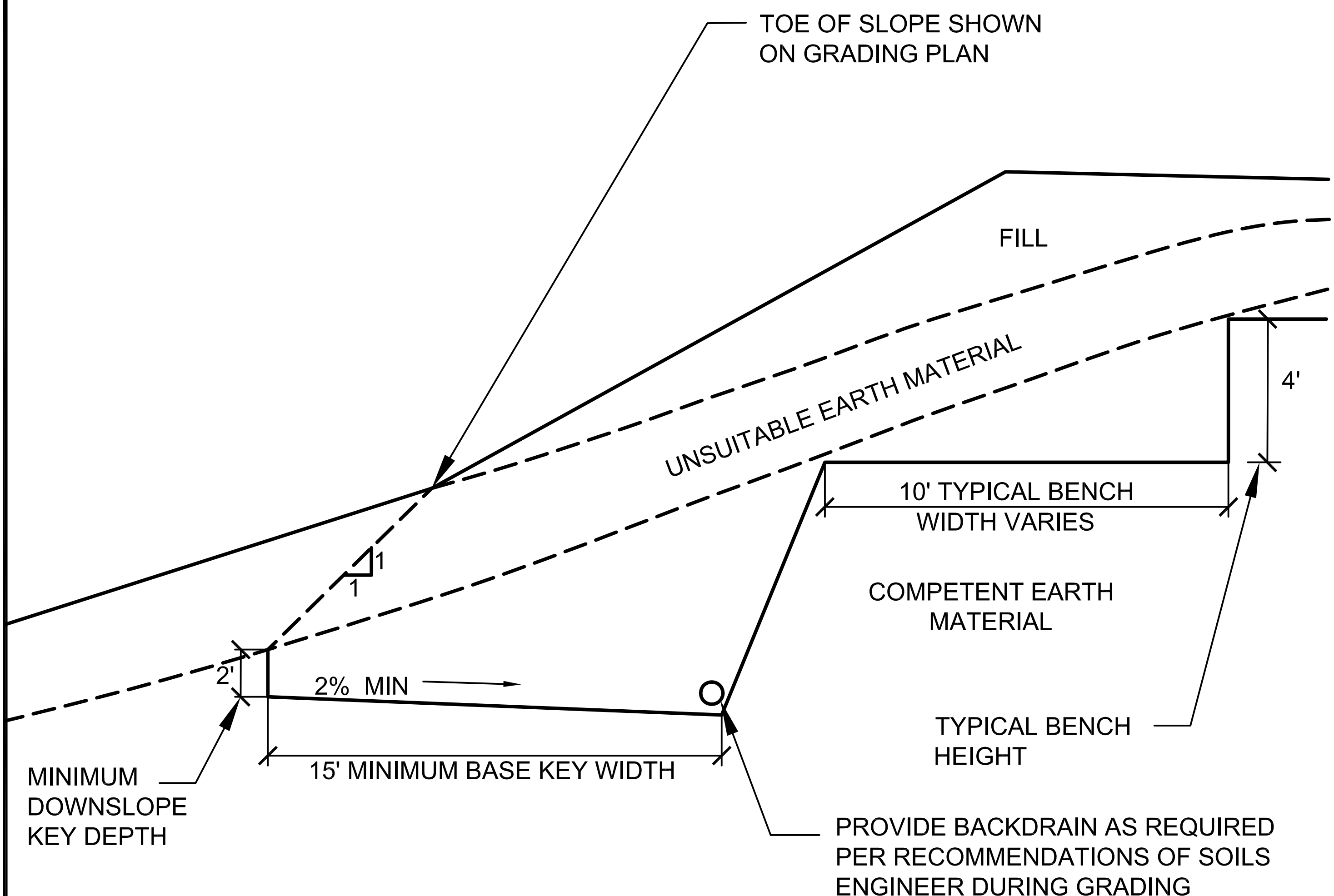


BENCHING FILL OVER CUT



NOT TO SCALE

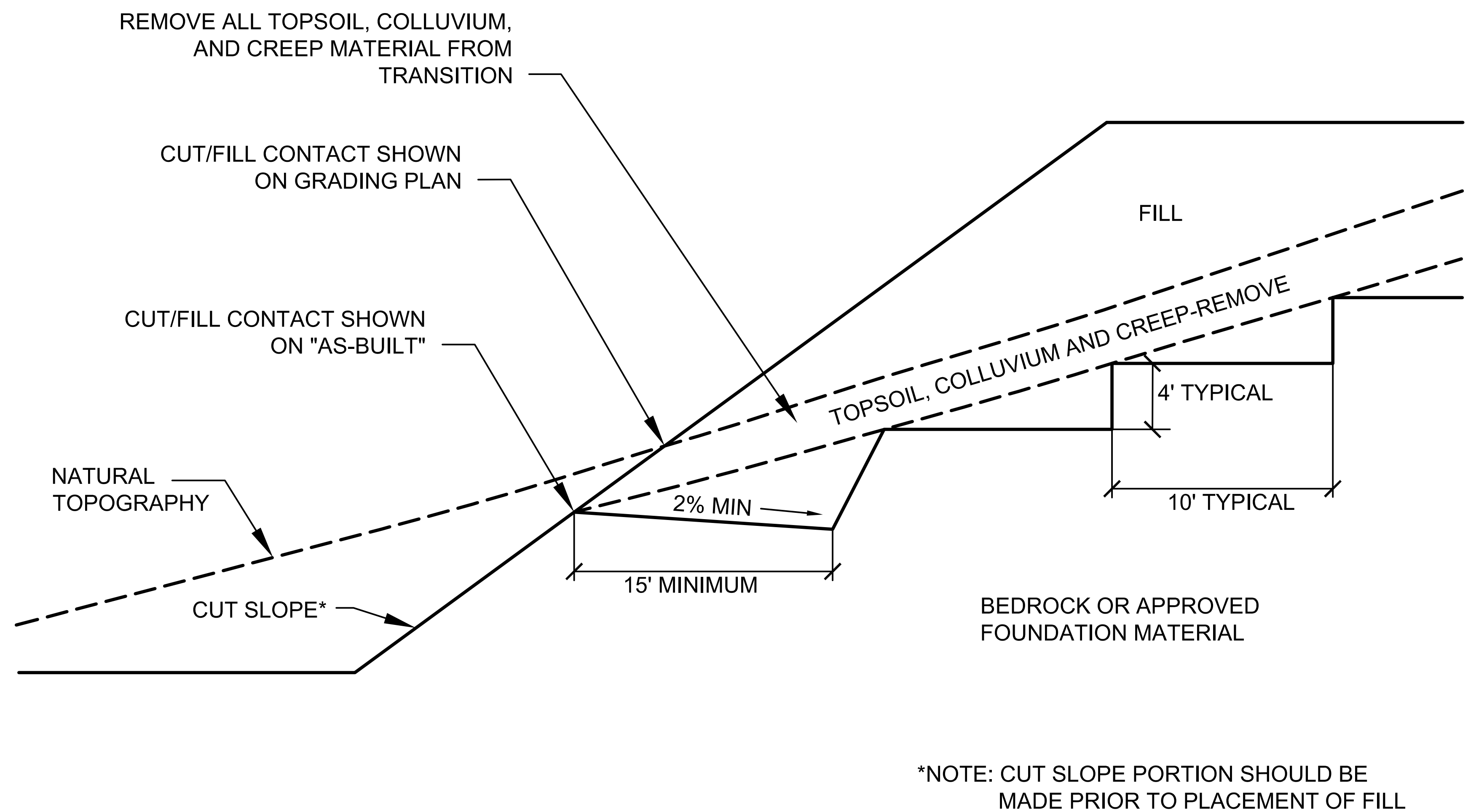
BENCHING FOR COMPACTED FILL DETAIL



WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

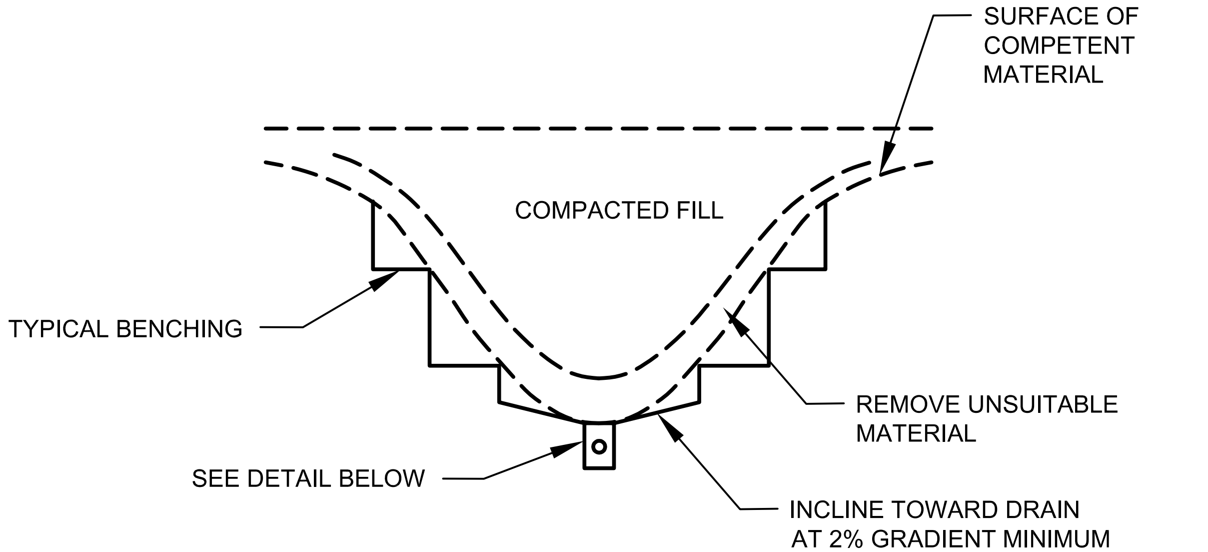
NOT TO SCALE

FILL SLOPE ABOVE NATURAL GROUND DETAIL

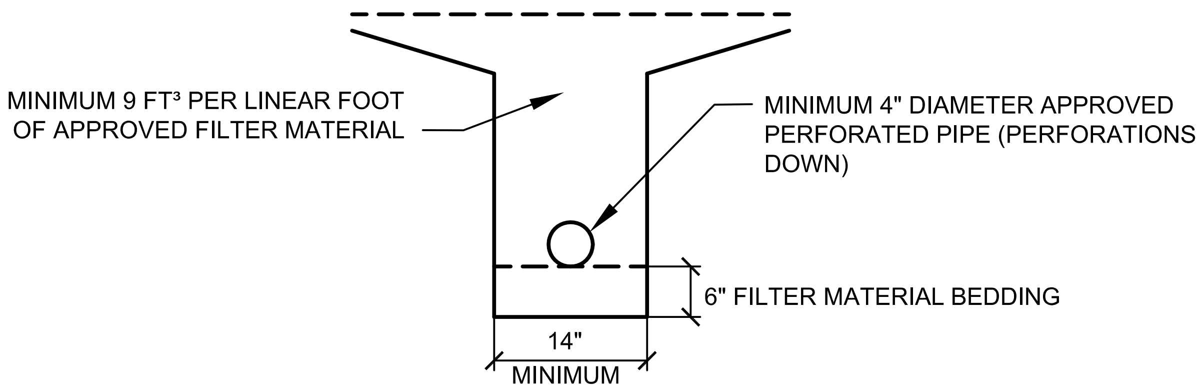


NOT TO SCALE

FILL SLOPE ABOVE CUT SLOPE DETAIL



DETAIL



CALTRANS CLASS 2 PERMEABLE MATERIAL
FILTER MATERIAL TO MEET FOLLOWING
SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYL-CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 psi

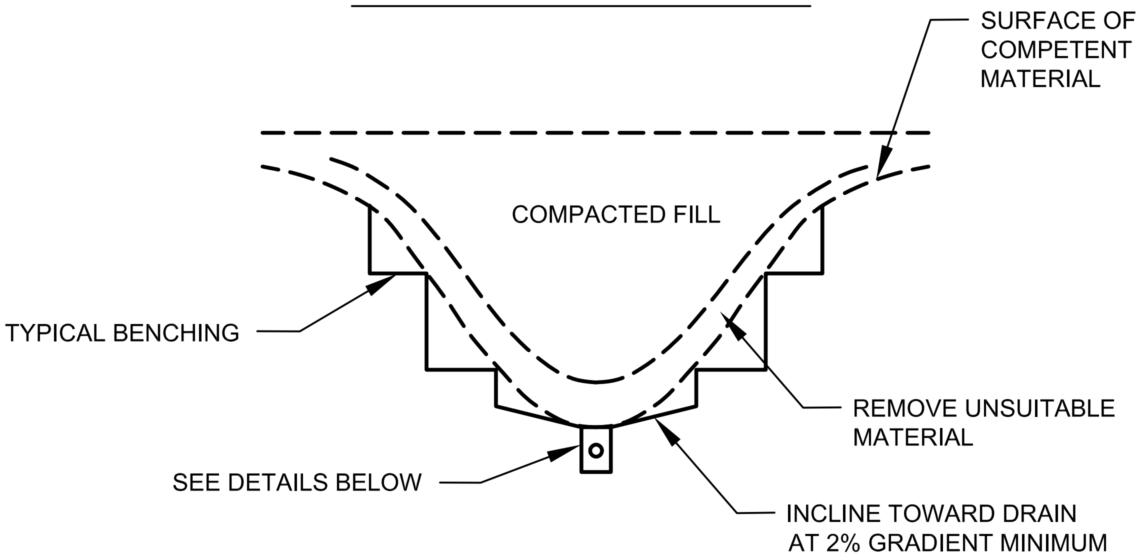
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

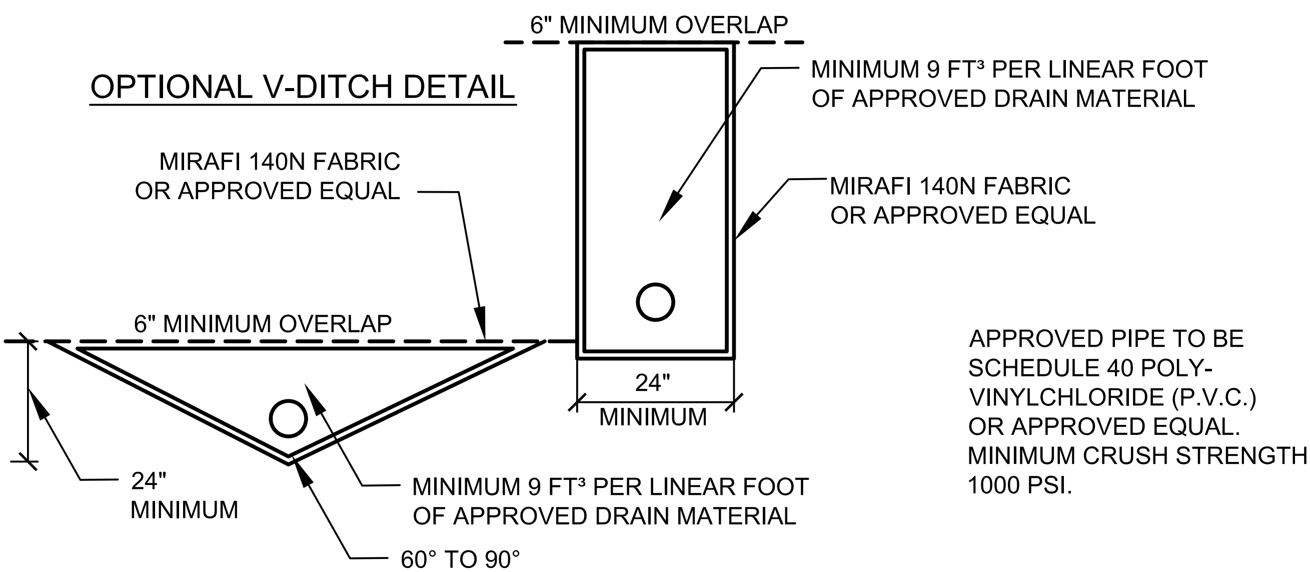
NOT TO SCALE

TYPICAL CANYON SUBDRAIN DETAIL

CANYON SUBDRAIN DETAILS



TRENCH DETAILS



DRAIN MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	88-100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

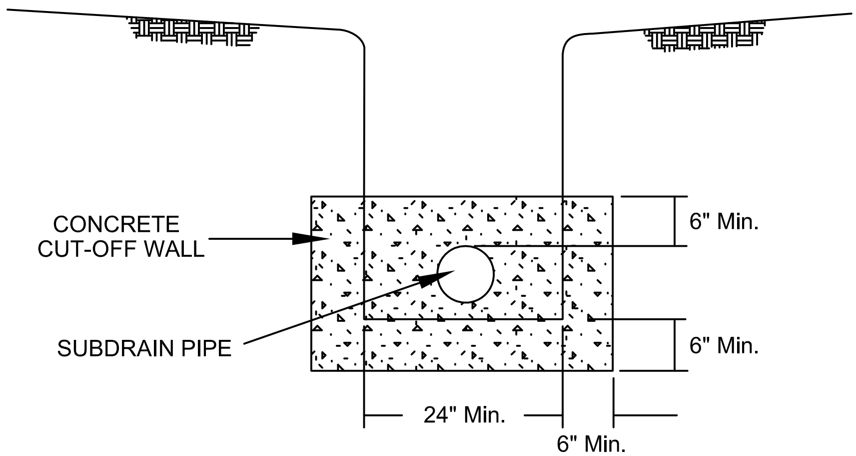
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

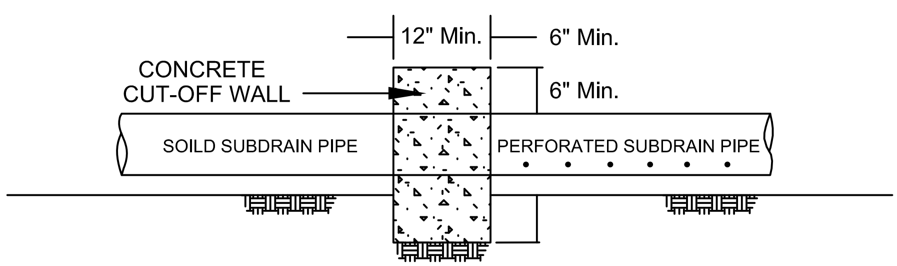
NOT TO SCALE

GEOFABRIC SUBDRAIN

FRONT VIEW



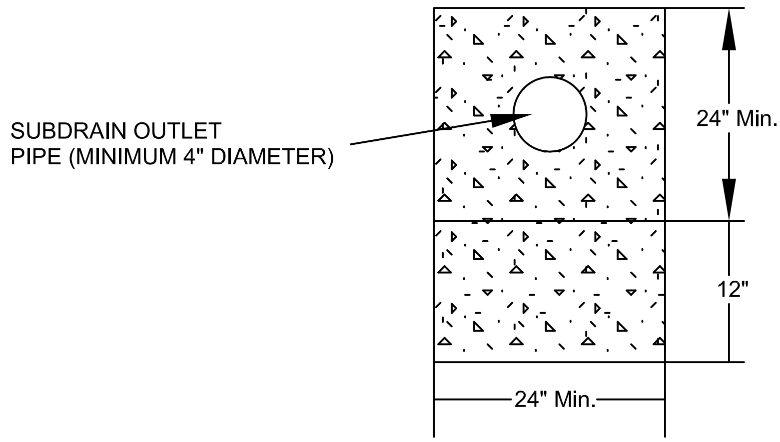
SIDE VIEW



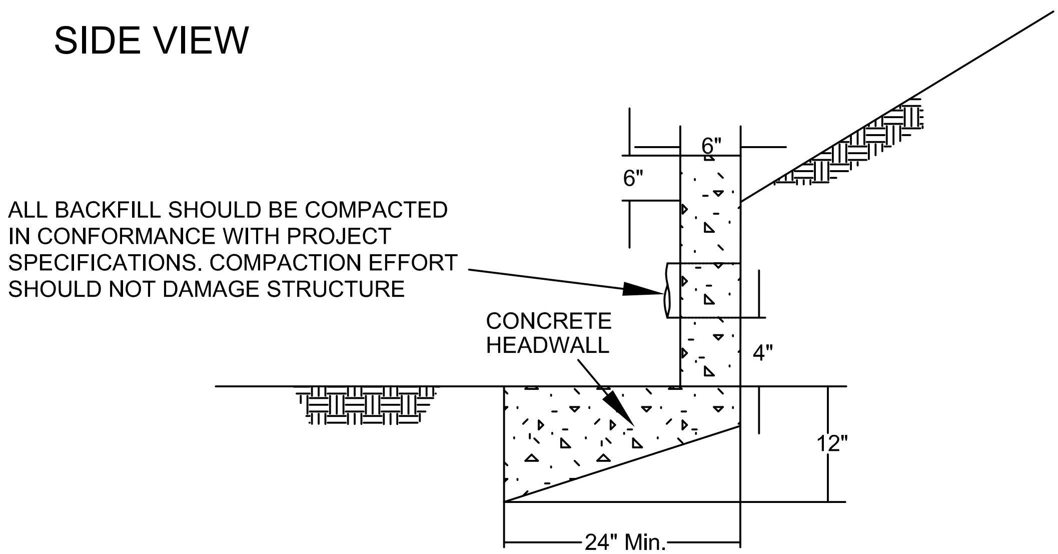
NOT TO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

FRONT VIEW



SIDE VIEW



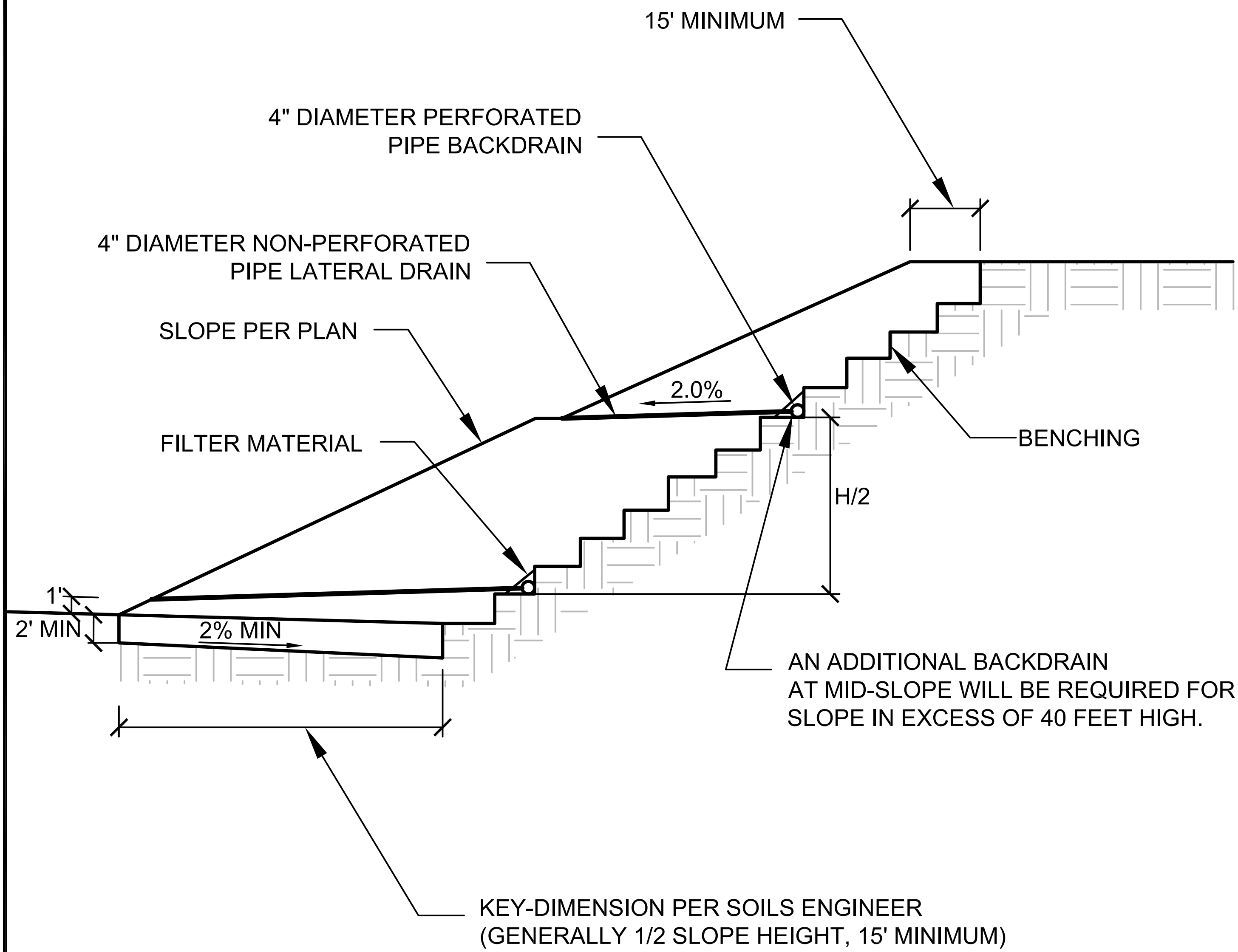
NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

ALL DISCHARGE SHOULD BE CONTROLLED

THIS DETAIL IS A MINIMUM DESIGN AND MAY BE MODIFIED DEPENDING UPON ENCOUNTERED CONDITIONS AND LOCAL REQUIREMENTS

NOT TO SCALE

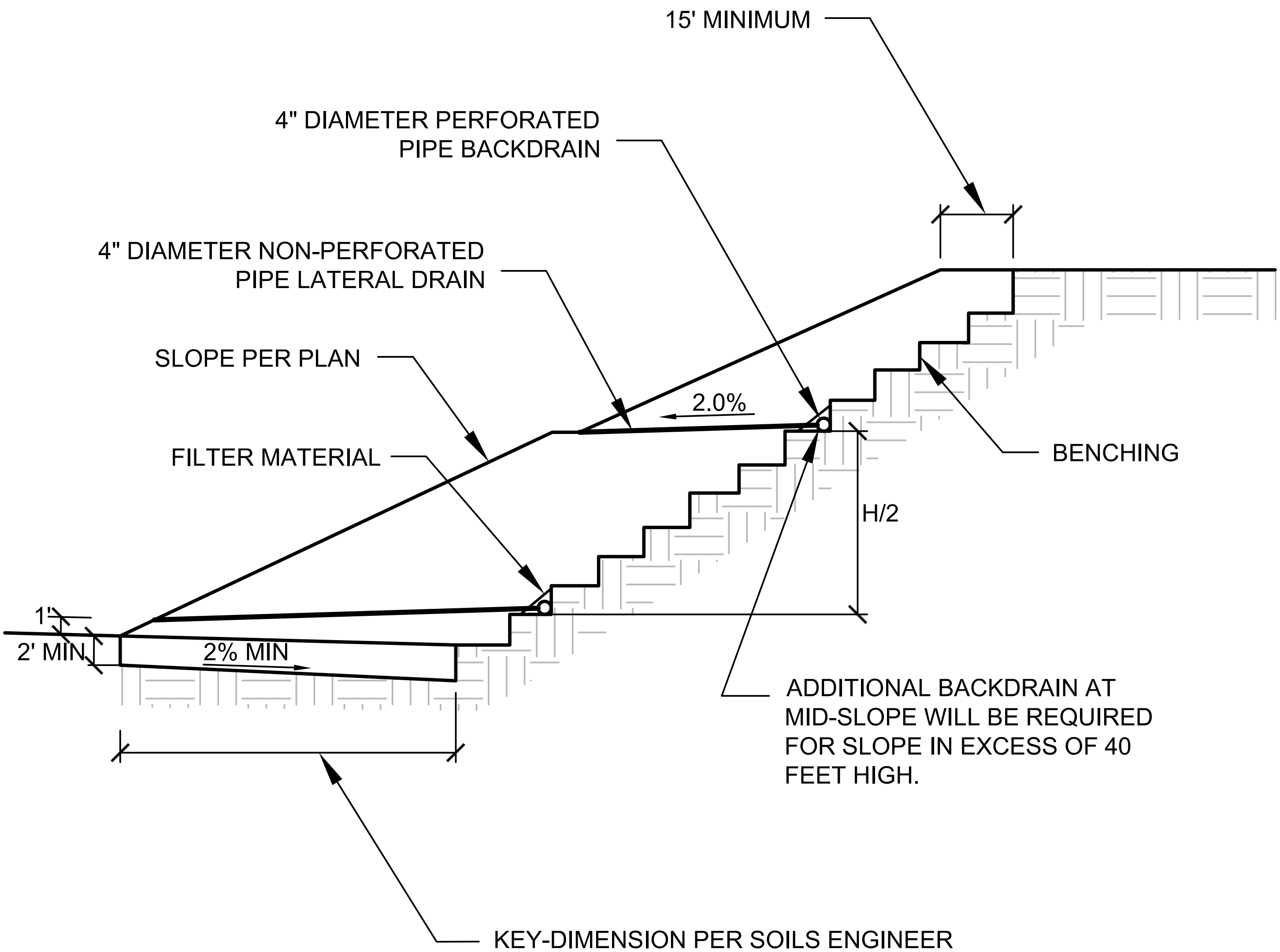
TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

NOT TO SCALE

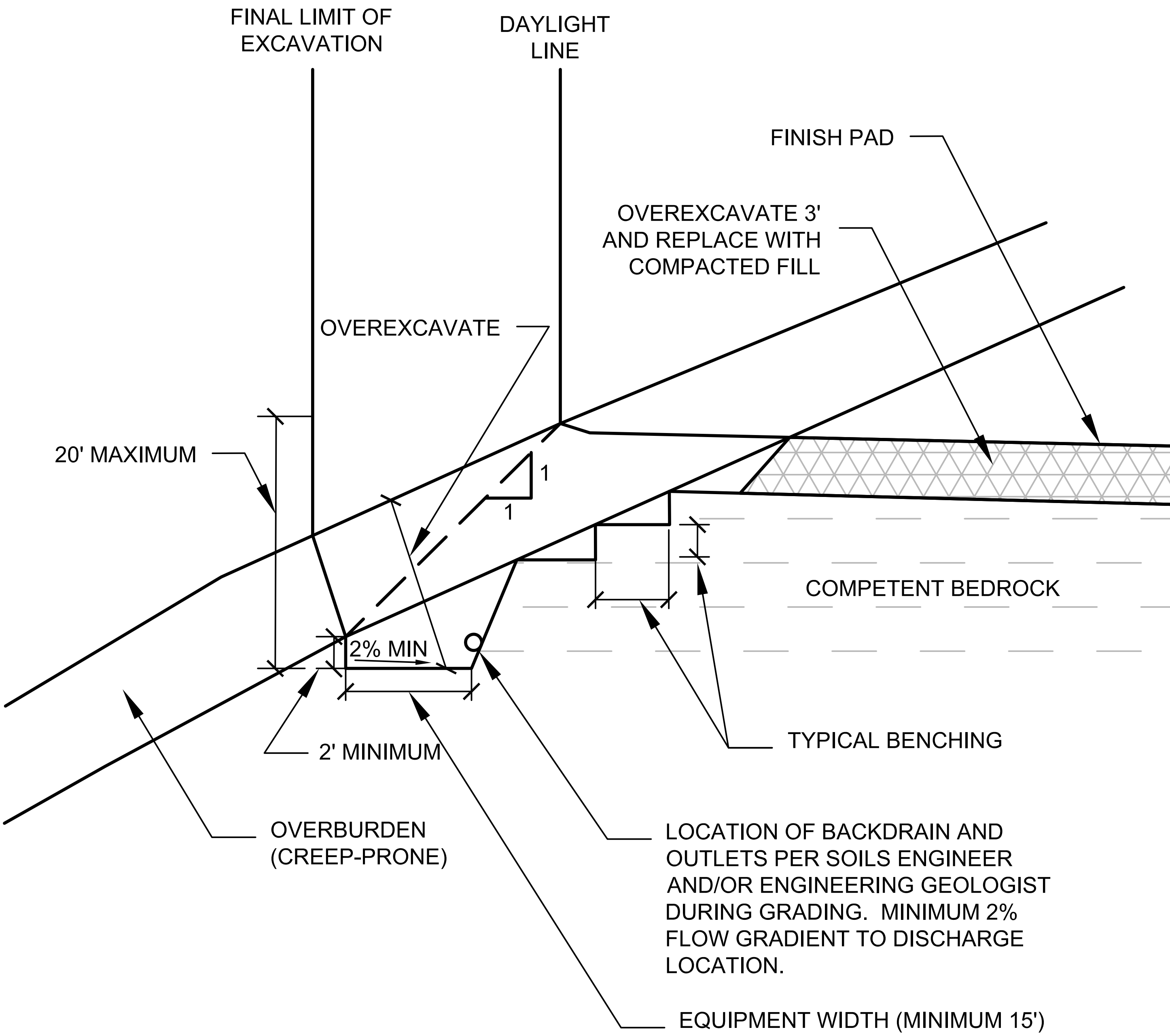
TYPICAL SLOPE STABILIZATION FILL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

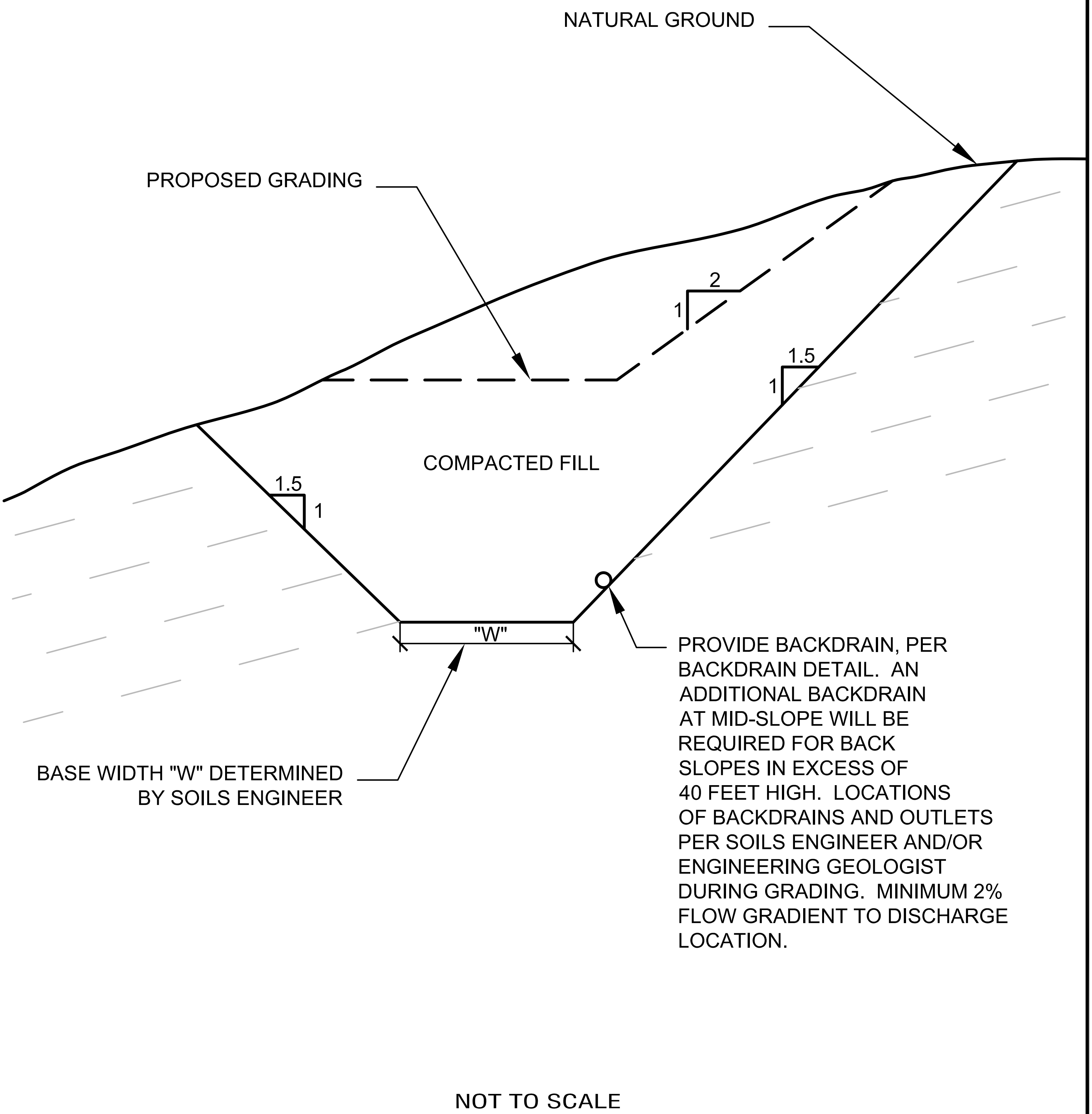
NOT TO SCALE

TYPICAL BUTTRESS FILL DETAIL

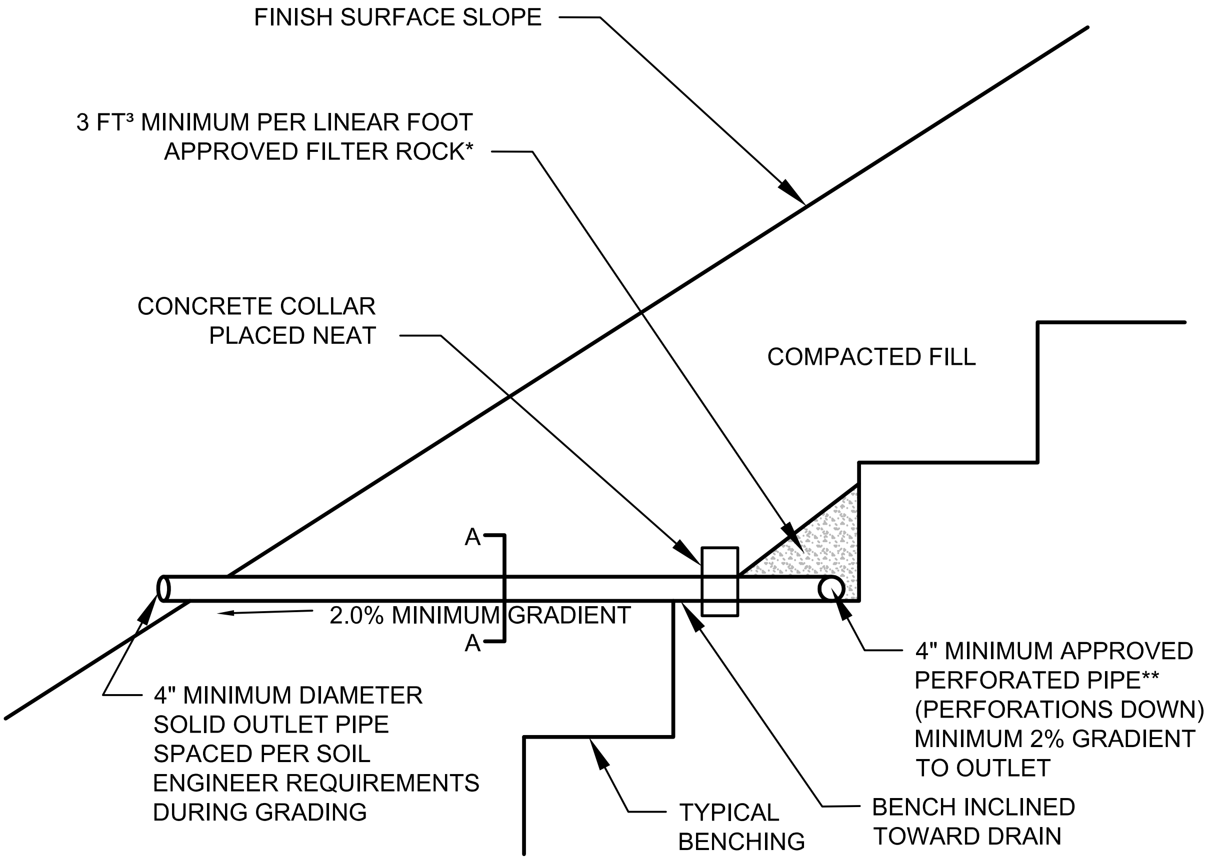


NOT TO SCALE

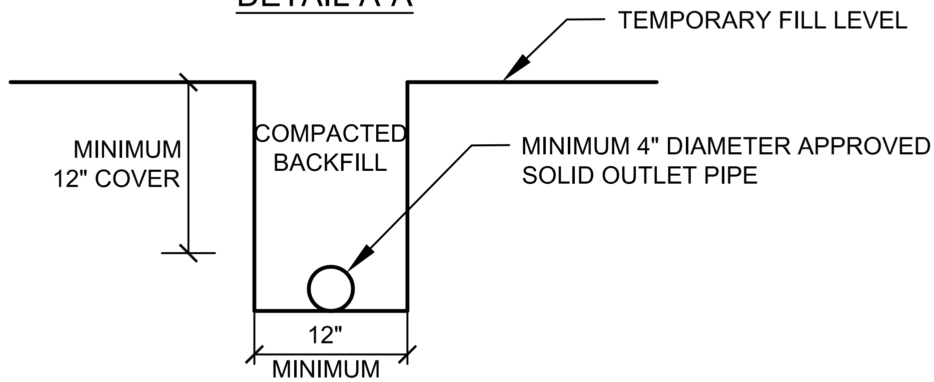
DAYLIGHT SHEAR KEY DETAIL



TYPICAL SHEAR KEY DETAIL



DETAIL A-A



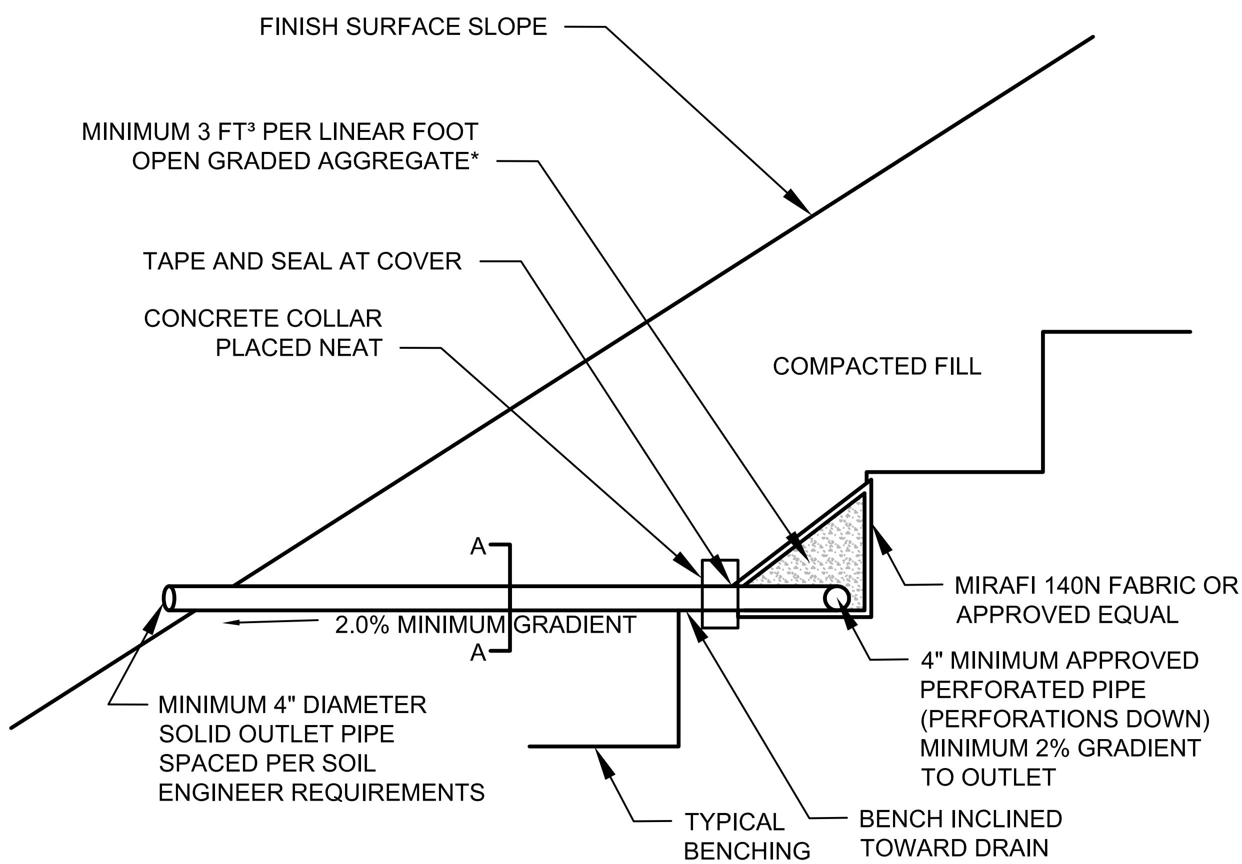
**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE
(P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

*FILTER ROCK TO MEET FOLLOWING
SPECIFICATIONS OR APPROVED EQUAL:

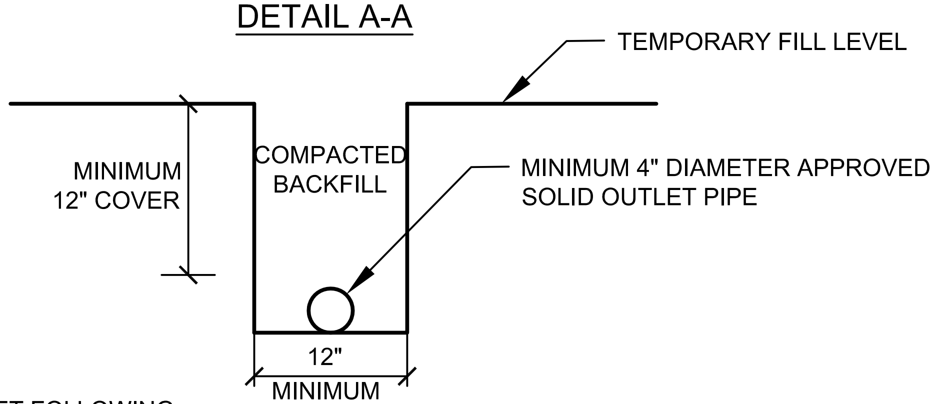
SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

NOT TO SCALE

TYPICAL BACKDRAIN DETAIL



DETAIL A-A

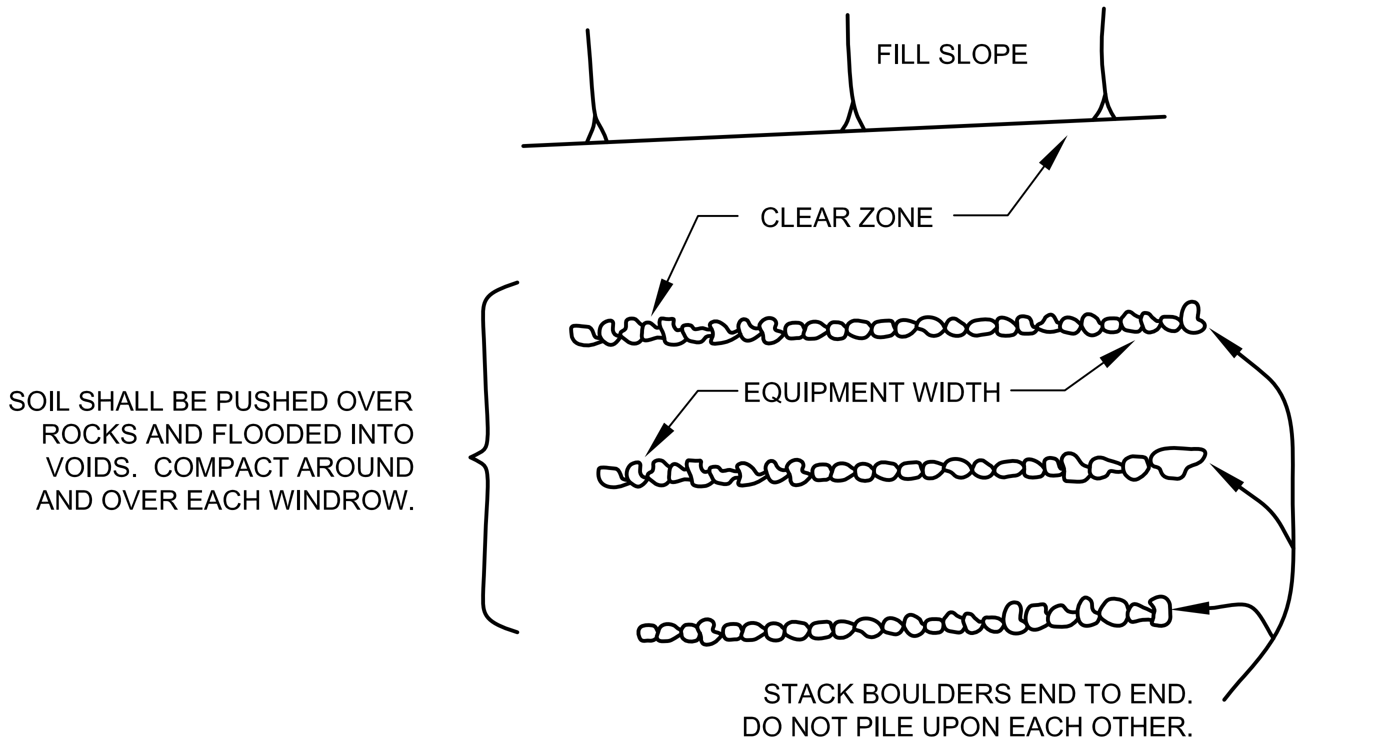


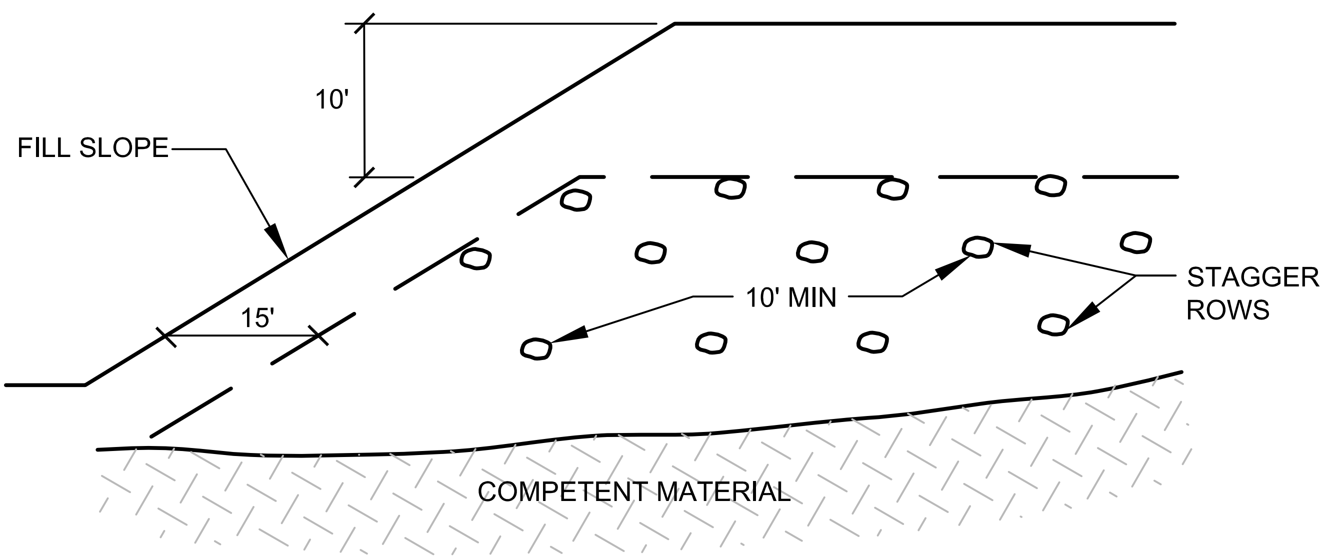
*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

NOT TO SCALE

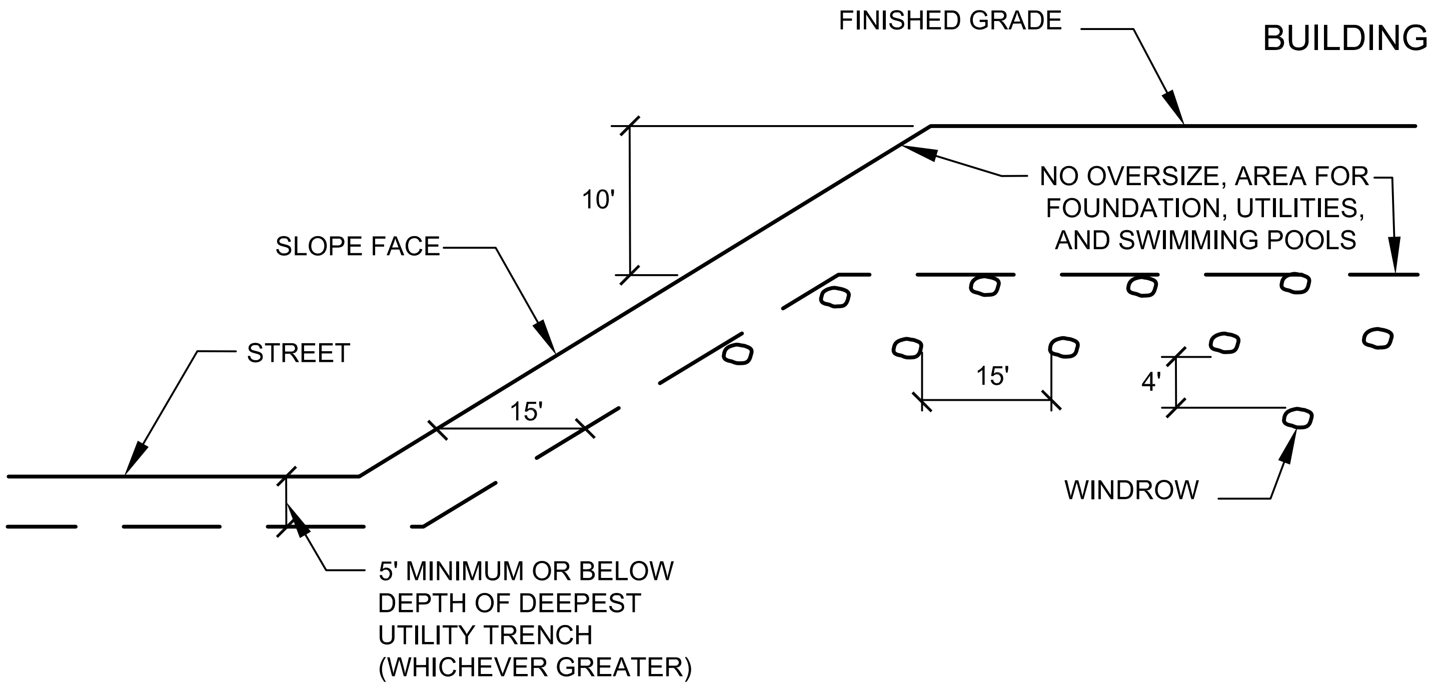
BACKDRAIN DETAIL (GEOFRABIC)



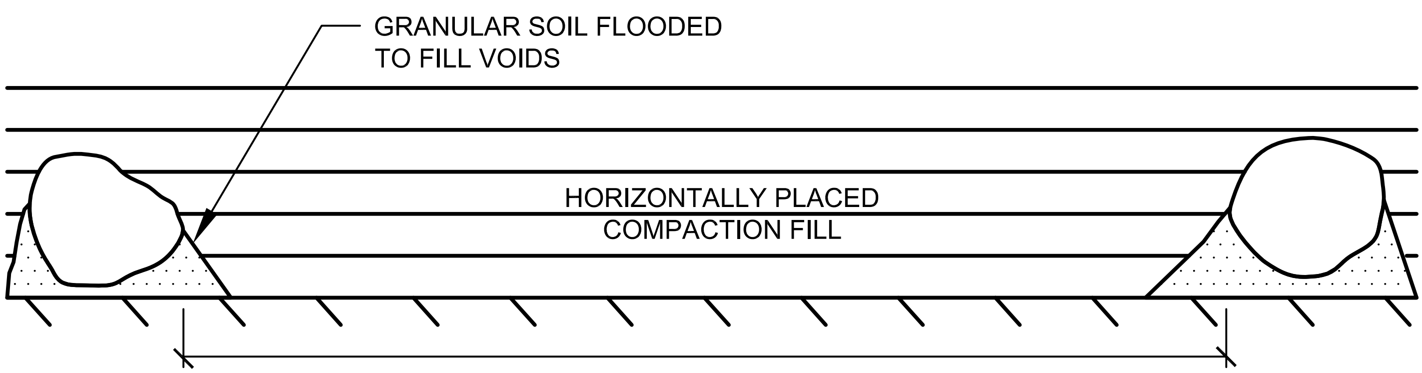


NOT TO SCALE

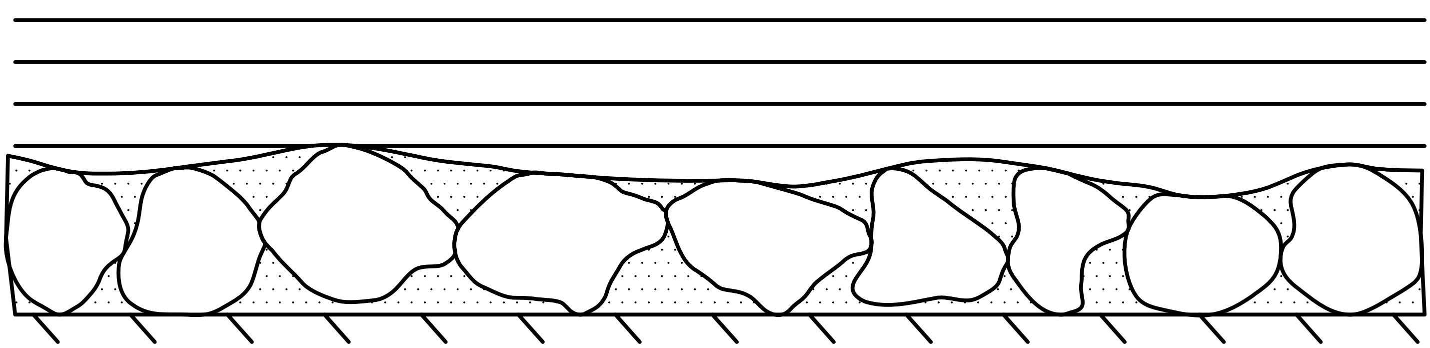
ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (EDGE VIEW)



PROFILE VIEW

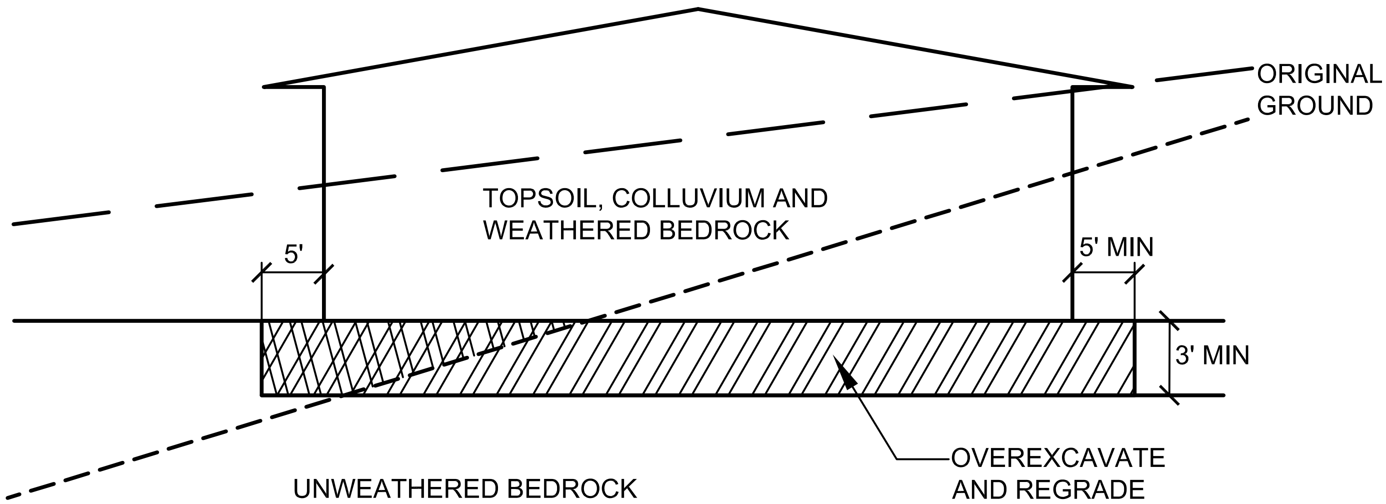


NOT TO SCALE

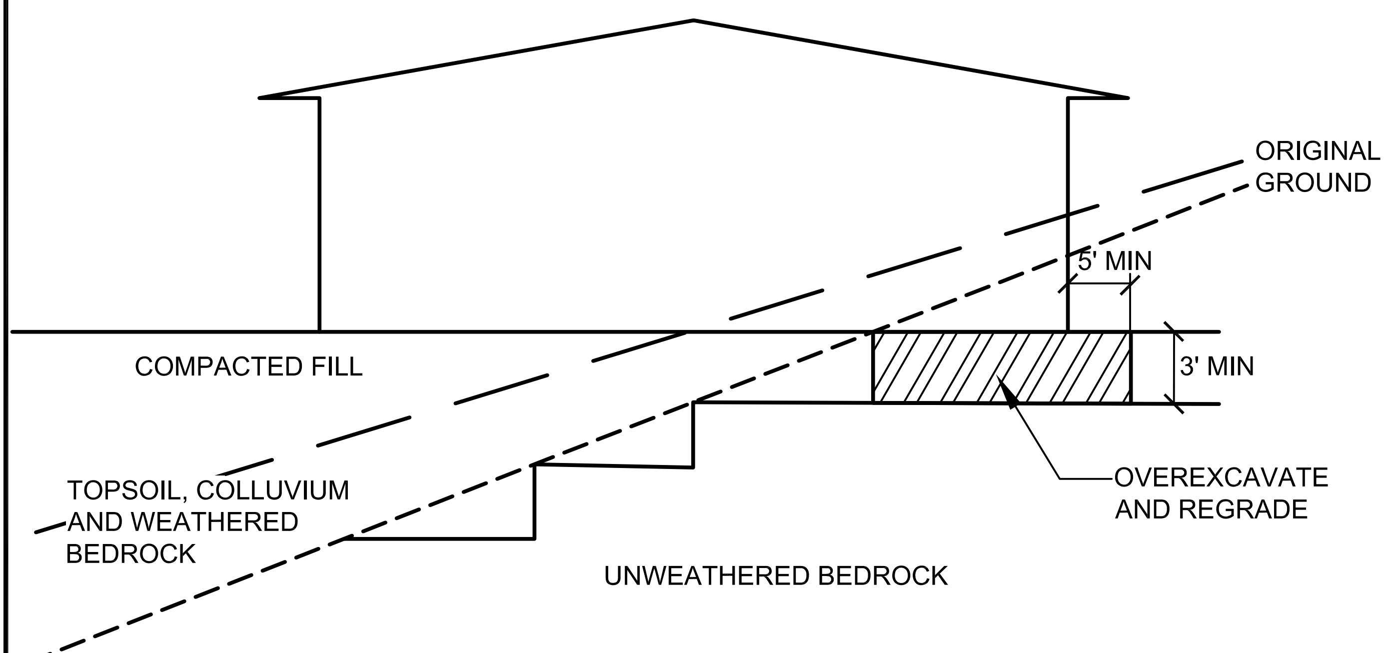
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSITION)



NOT TO SCALE

TRANSITION LOT DETAIL

APPENDIX E

SITE SPECIFIC GROUND MOTION STUDY

SITE-SPECIFIC SEISMIC GROUND MOTION STUDY
TRI-CITY MEDICAL CENTER EXPANSION
OCEANSIDE, CALIFORNIA

CTE has conducted a site-specific ground motion analysis for the proposed Expansion of the Tri-City Medical Center in accordance with Chapter 21 of ASCE/SEI 7-10, Section 1613 of the 2013 California Building Code (CBC), and the 2008 USGS Ground Acceleration Maps.

The software package EZ-FRISK (version 7.65) was used to facilitate the seismic response analysis. This software enabled the use of all seismic sources within 200 kilometers of the site, as cataloged by the United States Geological Survey (USGS) 2008 National Seismic Hazard Map source model. Each seismic source is characterized by its location, fault mechanism, geometry, probability of activity, magnitude recurrence distribution, and deterministic magnitude. The maximum rotated component of ground motion was used in the site-specific probabilistic and deterministic analyses that incorporate the selected Next Generation Attenuation (NGA) relationships.

Equally weighted NGA relationships by Abrahamson and Silva (2008), Atkinson and Boore (2008), Campbell and Bozorgnia (2008), and Chiou and Youngs (2008) were used for the analysis. The resulting site specific spectral accelerations calculated from these NGA relationships were averaged for both the probabilistic and deterministic analyses. As required, the 84^{th}-percentile spectral acceleration values were averaged to conservatively calculate the deterministic spectral accelerations (in lieu of 150 percent of the median spectral accelerations). Deterministic maximum considered earthquake (MCE) lower limit spectral response acceleration values have been determined from ASCE 7 Figure 21.2-1. The probabilistic analysis data represent a two-percent probability of exceedance in fifty years.

Each of the NGA relationships used for the response analysis account for site-specific soil affects using V_{S30}, the shear wave velocity averaged over the upper 30 meters. The site shear wave velocity value was obtained from regional and site resistance data. For the Campbell and Bozorgnia NGA, the depth to rock having a shear wave velocity of at least 2.5 kilometers per second ($Z_{2.5}$) was estimated. Using regional geologic map relationships, $Z_{2.5}$ appears to be on the order of 0.35 kilometers. The Abrahamson and Silva, and Chiou and Youngs NGA relationships require a similar parameter, $Z_{1.0}$, which is anticipated to be on the order of 60 meters. Based on soil conditions beneath the site area, and shear wave velocity of 490 meters per second, Site Class C is considered to be appropriate for evaluation.

The site specific MCE spectral response acceleration at any period is taken as the lesser of the spectral response accelerations from the probabilistic MCE and the deterministic MCE. The design spectral response acceleration at any period is calculated as 2/3 of the corresponding ordinate from the site-specific MCE, which should not be less than 80 percent of the spectral response acceleration from the design response spectrum determined in accordance with ASCE 7 Section 11.4.5.

The probabilistic MCE, risk coefficient, and adjusted probabilistic spectral acceleration ordinates are shown on Figure E1. The site specific risk-based probabilistic MCE_R representing 1% probability of collapse in 50 years was calculated using ASCE 7-10 Section 21.2.1.1 Method 1: (C_R) (S_a 2% PE in 50 years). The deterministic MCE, and the deterministic lower limit on MCE response spectra are shown on Figure E2. The site-specific MCE response spectrum, 2/3 of site-specific MCE response spectrum and 80 percent of NEHRP/ASCE design response spectrum are shown on Figure E3. The site-specific design response spectrum is presented on Figure E4 and a summary of spectral acceleration data is shown on Figure E5.

In Accordance with section 21.4 of ASCE/SEI 7-10, the resulting site specific acceleration parameters are shown below. ASCE Section 21.4 requires that the parameter S_{DS} not be taken less than 90 percent of the peak spectral acceleration, S_a, at any period larger that 0.2s. In this case the value at 0.2s (0.747g) exceeded the 90 percent values at larger periods. In addition, Section 21.4 requires that S_{D1} be taken as the greater of the design spectral acceleration, S_a, at a period of 1 second (0.339g), or two times the spectral acceleration, S_a, at a period of 2 seconds (0.340g). In this case, the value representing two times the spectral acceleration, S_a, at a period of 2 seconds was greater than the design spectral acceleration value at a period of 1 second.

Site-specific parameters are provided below.

Site-Specific Ground Motion Values	Code-Based Seismic Values (ASCE 7-10)
S_{DS} = 0.747g	S_{DS} = 0.705g
S_{D1} = 0.340g	S_{D1} = 0.380g
S_{MS} =1.120g	S_{MS} = 1.058g
S_{M1} =0.510g	S_{M1} = 0.571g

Attachments:

Figure E1	Probabilistic MCE Response Spectra
Figure E2	Deterministic MCE and Lower Limit Spectra
Figure E3	Site-Specific MCE Response Spectra
Figure E4	Design Response Spectrum
Figure E5	Table of Spectral Acceleration Values”

Tri-City Medical Center Expansion

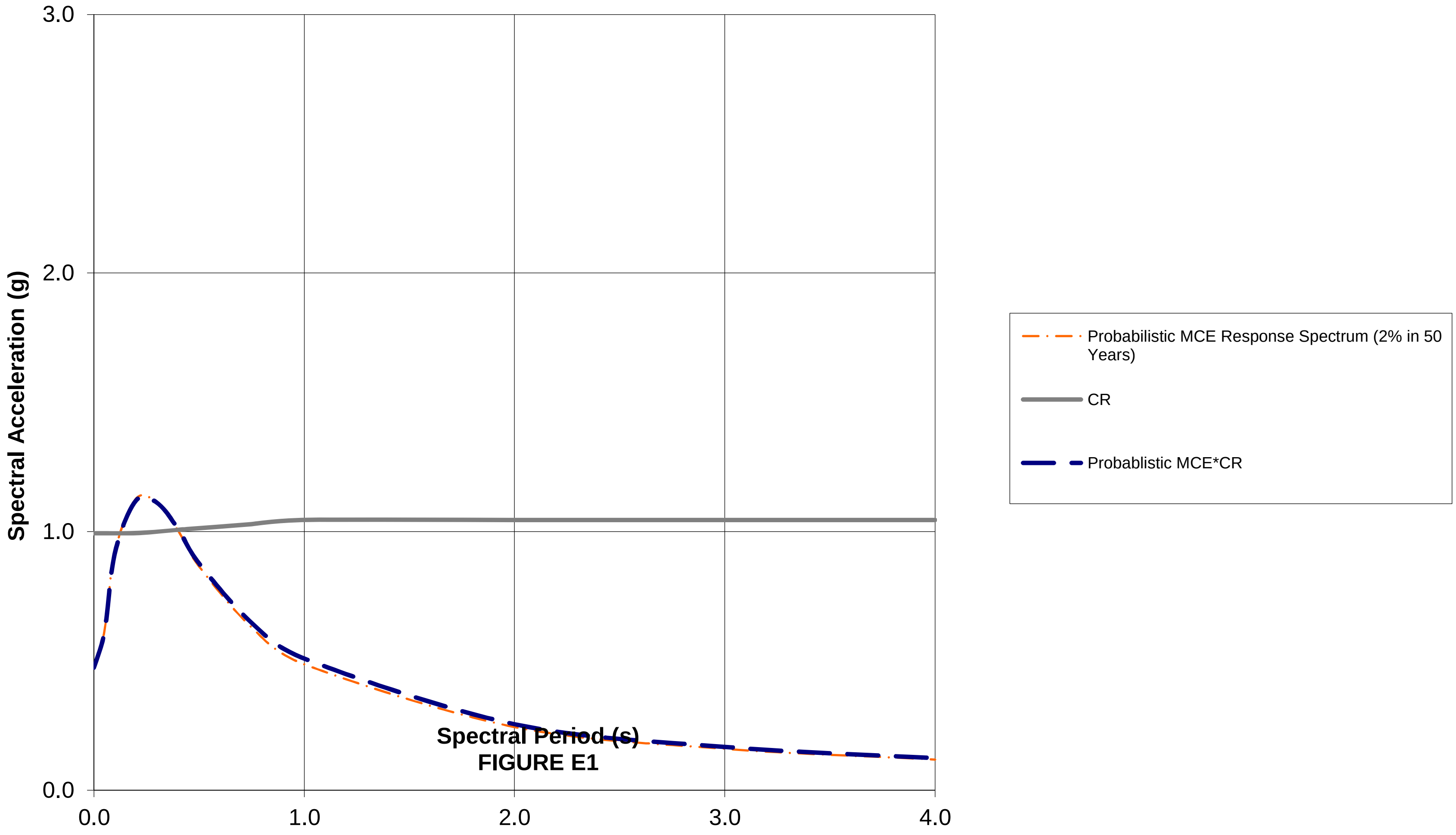
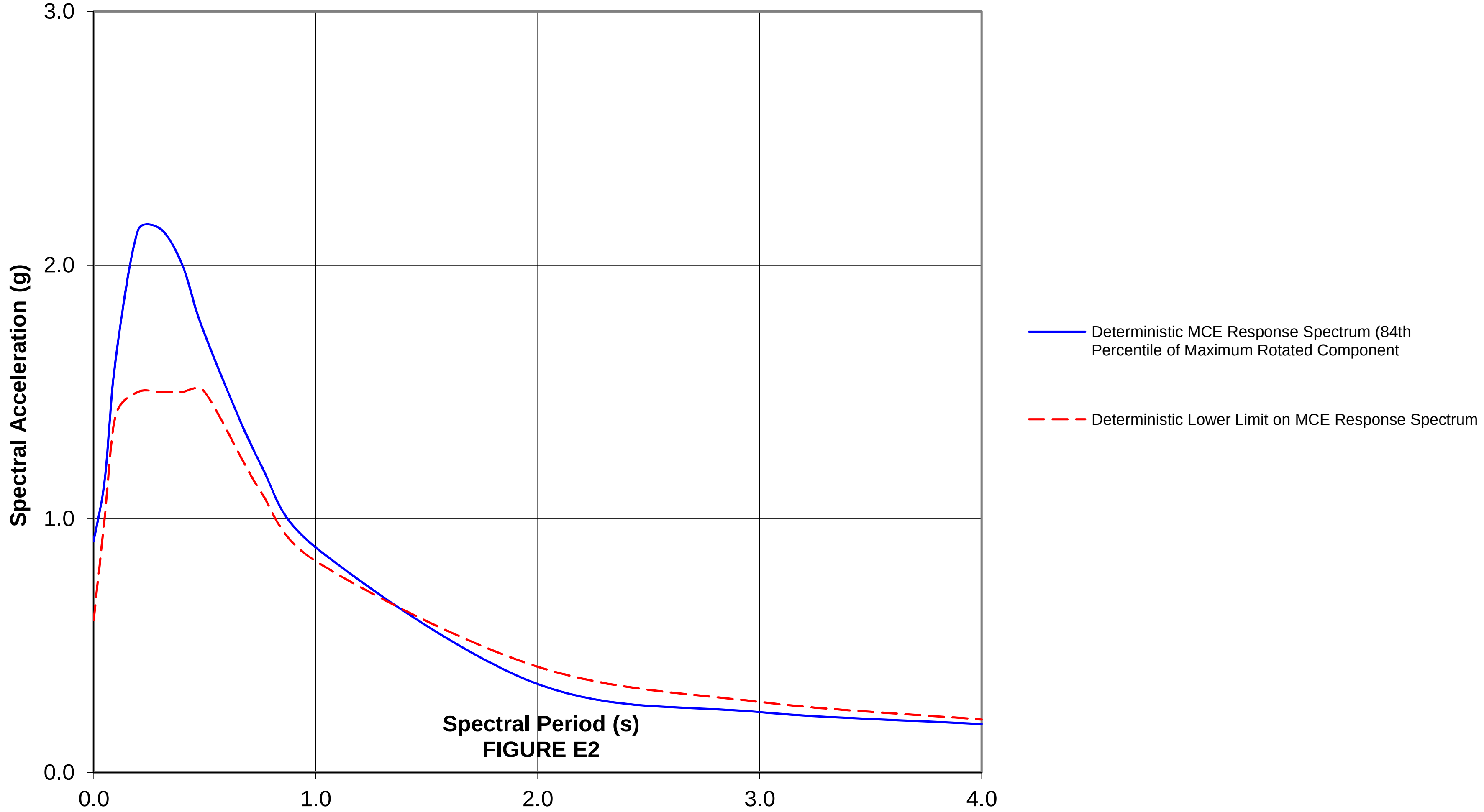


FIGURE E1

Tri-City Medical Center Expansion



Tri-City Medical Center Expansion

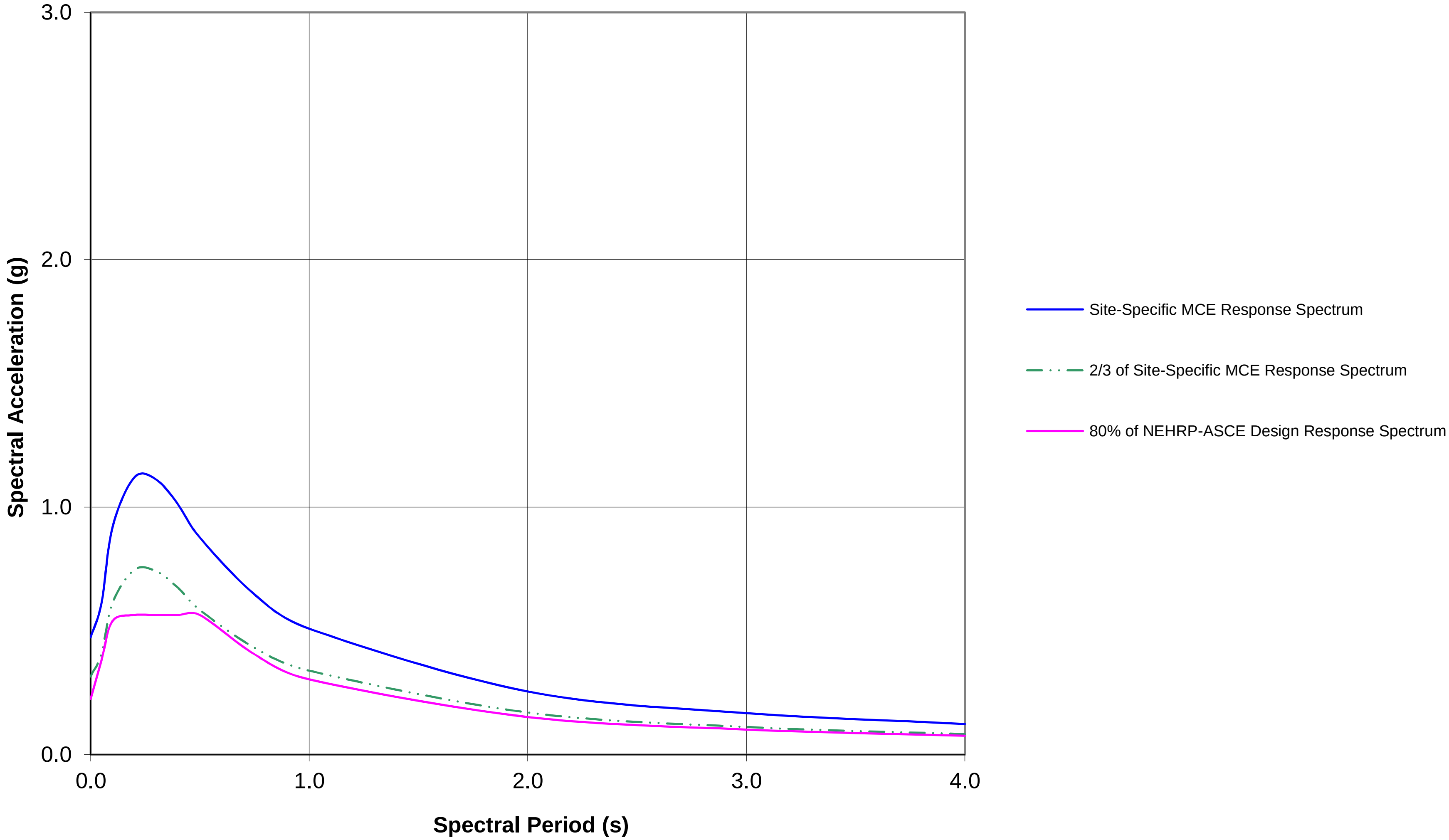


FIGURE E3

Tri-City Medical Center Expansion

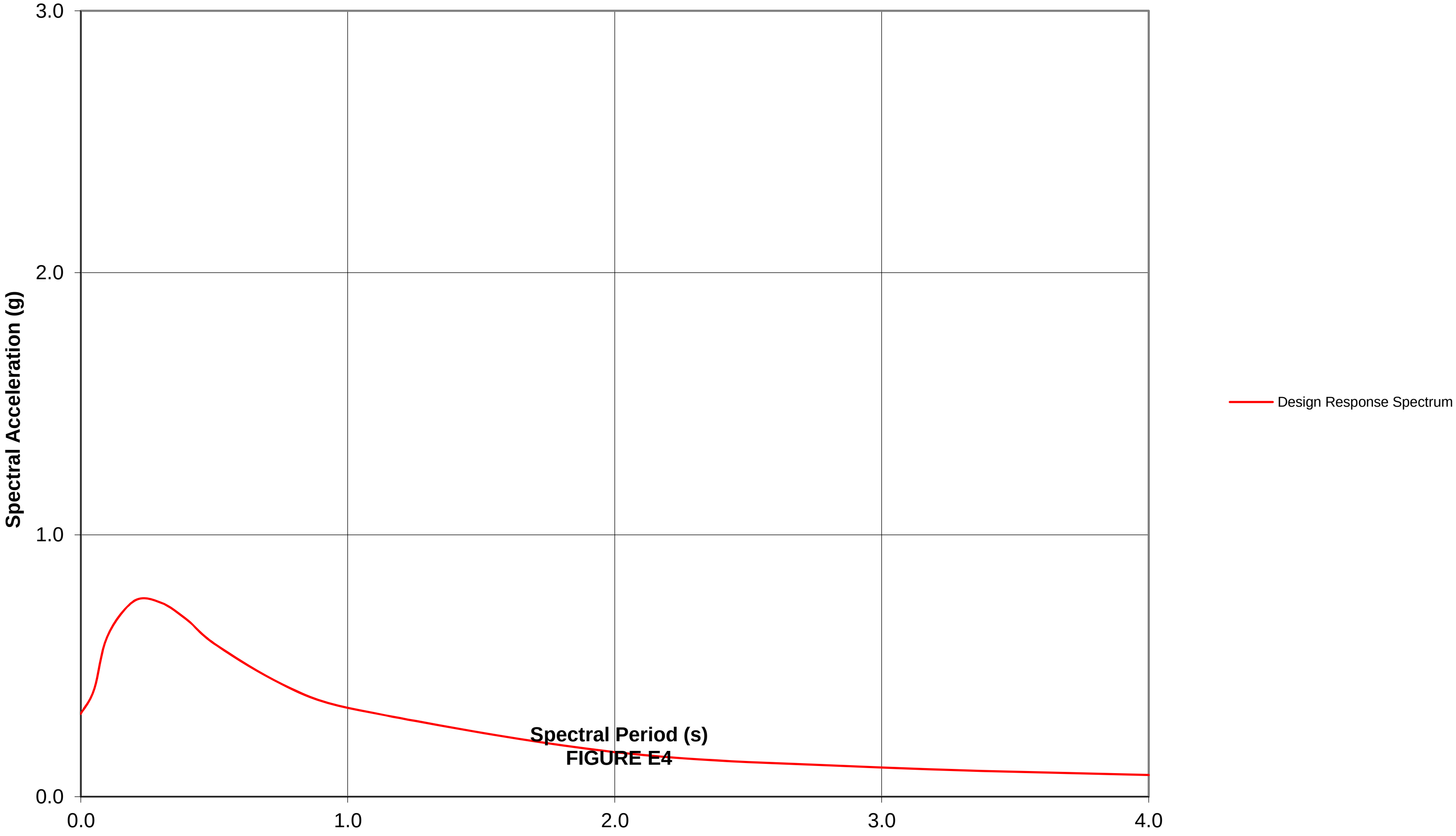


FIGURE E4

Spectral Period (sec)	Spectral Acceleration (g)										
	Probabilistic MCE Response Spectrum (2% in 50 Years)	C_R	Probablistic MCE*C_R	Deterministic MCE Response Spectrum (84th Percentile of Maximum Rotated Component	Deterministic Lower Limit on MCE Response Spectrum	Site-Specific MCE Response Spectrum	2/3 of Site-Specific MCE Response Spectrum	NEHRP-ASCE Design Response Spectrum	80% of NEHRP-ASCE Design Response Spectrum	Design Response Spectrum	0.9*DRS
0.000	0.477	0.994	0.474	0.911	0.600	0.474	0.316	0.282	0.226	0.316	
0.050	0.616	0.994	0.612	1.155	1.005	0.612	0.408	0.478	0.383	0.408	
0.100	0.924	0.994	0.918	1.636	1.410	0.918	0.612	0.674	0.540	0.612	
0.200	1.127	0.994	1.120	2.138	1.500	1.120	0.747	0.705	0.564	0.747	
0.300	1.111	1.000	1.111	2.144	1.500	1.111	0.741	0.705	0.564	0.741	0.667
0.400	1.004	1.007	1.011	2.000	1.500	1.011	0.674	0.705	0.564	0.674	0.606
0.500	0.865	1.013	0.877	1.728	1.500	0.877	0.585	0.705	0.564	0.585	0.526
0.750	0.629	1.029	0.647	1.219	1.111	0.647	0.432	0.507	0.405	0.432	0.388
1.000	0.487	1.045	0.509	0.888	0.833	0.509	0.339	0.380	0.304	0.339	0.305
2.000	0.244	1.045	0.255	0.349	0.417	0.255	0.170	0.190	0.152	0.170	0.153
3.000	0.160	1.045	0.167	0.238	0.278	0.167	0.112	0.127	0.101	0.112	0.100
4.000	0.119	1.045	0.124	0.190	0.208	0.124	0.083	0.095	0.076	0.083	0.074

Figure E5

APPENDIX F

PREVIOUS GEOPHYSICAL SURVEY

GEOPHYSICAL SURVEY
4002 VISTA WAY
OCEANSIDE, CALIFORNIA

PREPARED FOR:
Leighton Consulting, Inc.
3934 Murphy Canyon Road, Suite B205
San Diego, CA 92123

PREPARED BY:
Southwest Geophysics, Inc.
7438 Trade Street
San Diego, California 92121

February 29, 2008
Project No. 108036

SOUTHWEST
GEOPHYSICS, INC.
YOUR SUBSURFACE SOLUTION

February 29, 2008
Project No. 108036

Mr. Sean Colorado
Leighton Consulting, Inc.
3934 Murphy Canyon Road, Suite B205
San Diego, CA 92123

Subject: Geophysical Survey
4002 Vista Way
Oceanside, California

Dear Mr. Colorado:

In accordance with your authorization, we have performed a geophysical evaluation of a portion of the Tri-City Medical Center property located at 4002 Vista Way in Oceanside, California. Specifically, our survey consisted of performing one seismic P-wave refraction profile and two refraction microtremor (ReMi) profiles at the site. The purpose of the study was to characterize the subsurface conditions and develop a velocity profile of the project site.

We appreciate the opportunity to be of service on this project. Should you have any questions related to this report, please contact the undersigned at your convenience.

Sincerely,
SOUTHWEST GEOPHYSICS, INC.

Patrick Lehrmann, P.G., R.Gp.
Principal Geologist/Geophysicist

Hans van de Vrugt, C.E.G., R.Gp.
Principal Geologist/Geophysicist

SEW/HV/PFL/hv
Distribution: Addressee (electronic)

7438 Trade Street • San Diego • California 92121 • Telephone 858-527-0849 • Fax 858-527-0851

TABLE OF CONTENTS

1. INTRODUCTION

In accordance with your authorization, we have performed a geophysical evaluation of a portion of the Tri-City Medical Center property located at 4002 Vista Way in Oceanside, California (Figure 1). Specifically, our survey consisted of performing one seismic P-wave refraction profile and two refraction microtremor (ReMi) profiles at the project site. The purpose of the study was to characterize the subsurface conditions and develop a velocity profile of the project site.

2. SCOPE OF SERVICES

Our scope of services included:

- Performance of a seismic P-wave refraction profile.
- Performance of two ReMi profiles.
- Compilation and analysis of the data collected.
- Preparation of this report presenting our findings and conclusions.

3. SITE AND PROJECT DESCRIPTION

The subject property is located along the north side of Vista Way, east of College Boulevard in Oceanside, California. The specific study area was located in an open grass area just south of the Tri-City Medical Center tower. The site is currently occupied by grass and trees (Figure 3). Several utility vaults and signs are also present in the study area. Terrain at the site is generally flat, with a slight gradient to the north.

4. SURVEY METHODOLOGY

As previously indicated, the purpose of our services was to develop a velocity profile of the study area. The following sections provide an overview of the methodologies used during our study.

4.1. Seismic P-wave Refraction Survey

A seismic P-wave (compression wave) refraction traverse (SL-1) was conducted at the site to evaluate the general characteristics of the subsurface materials. The location of the line is depicted on Figure 2. The line was approximately 240 feet long and shot points were conducted at each end of the line and at the midpoint. Shots consisted of impacting an aluminum plate, placed on the ground surface, with a 16-pound hammer in order to generate a seismic P-wave.

The seismic refraction method uses first-arrival times of refracted seismic waves to estimate the thicknesses and seismic velocities of subsurface layers. Seismic P-waves generated at the surface are refracted at boundaries separating materials of contrasting velocities. These refracted seismic waves are then detected by a series of surface vertical component geophones, and recorded with a 24-channel Geometrics StrataView seismograph. The travel times of the seismic P-waves are used in conjunction with the shot-to-geophone distances to obtain thicknesses and velocities of the subsurface materials. It should be noted that the refraction method requires that subsurface velocities increase with depth. Therefore, a layer having a velocity lower than that of the layer above will not be detectable by the seismic refraction method.

4.2. ReMi Survey

Two near perpendicular ReMi traverses were conducted at the site (RL-1 & RL-2). The locations of the lines are illustrated on Figure 2. RL-1 was approximately 230 feet long and was located along SL-1. RL-2 was approximately 207 feet long and crossed RL-1 near its center. Fifteen records, 24 seconds long, were recorded for each line. The data were downloaded to a laptop computer and later processed using the SeisOpt® ReMi™ software (© Optim LLC, 2005), which uses the refraction microtremor method (Louie, 2001). The refraction microtremor technique uses the recorded surface waves (specifically Rayleigh waves) which are contained in the background noise to develop a shear wave velocity profile of the site down to a depth, in this case, of approximately 100 feet. It should be noted that the ReMi method does not require that subsurface velocities increase with depth. Therefore, low velocity layers can be detected with this method.

5. RESULTS

The following is a summary of our findings:

- The results of the P-wave refraction survey indicate that the site is underlain by approximately 5 to 15 feet of relatively low velocity material over a layer of higher velocity material (Figure 4). The P-wave velocity for layer one is roughly 1,200 feet/second and the velocity for layer 2 is approximately 3,750 feet/second.

- As depicted on Figures 5a and 5b, the results of the ReMi survey reveal the presence of alternating layers of low and high velocity materials in the upper 100 feet. The shear wave velocity of Layer 1 ranges from 500 to 550 feet/second and extends to a depth of roughly 10 feet. Layer 2 extends to a depth ranging from 30 to 40 feet and has a shear wave velocity ranging from 1,900 to 2,200 feet/second. Beneath Layer 2 is a “low velocity” layer (Layer 3) which extends to a depth on the order of 55 to 60 feet. The shear wave velocity of Layer 3 ranges from roughly 1,000 to 1,250 feet/second. Layer 3 is underlain by a material with a shear wave velocity of roughly 2,200 to 2,500 feet/second.

6. FINDINGS AND CONCLUSIONS

As previously discussed, the purpose of our study was to develop a velocity profile of the site to be used in the design and construction of proposed site improvements. Based on our discussions with you and the results of our seismic study, the subsurface geology consists of alternating layers of low and high velocity materials. The uppermost layer (Layer 1) likely represents fill/alluvium. The deeper layers likely represent beds within the Santiago Formation. In general, the results from the P-wave and ReMi surveys are consistent, with the exception of the low velocity layer which is not detectable with the P-wave refraction method. Some variations in layer depth and velocity were noted between the RL-1 and RL-2. These variations are attributed to lateral variations in the subsurface geology (please note that RL-1 and RL-2 were near perpendicular to each other).

The results of the ReMi surveys indicate that per IBC (International Building Code, 2000) the Vs100 calculated for RL-1 is 1,617 feet/second and 1,263 feet/second for RL-2. Both results equate to a Site Class C. It should be noted that the variability of the ReMi method is typically on the order of 5 percent, but may be as high as 10 percent.

7. LIMITATIONS

The field evaluation and geophysical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be present. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface surveying will be performed upon request.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Southwest Geophysics, Inc. should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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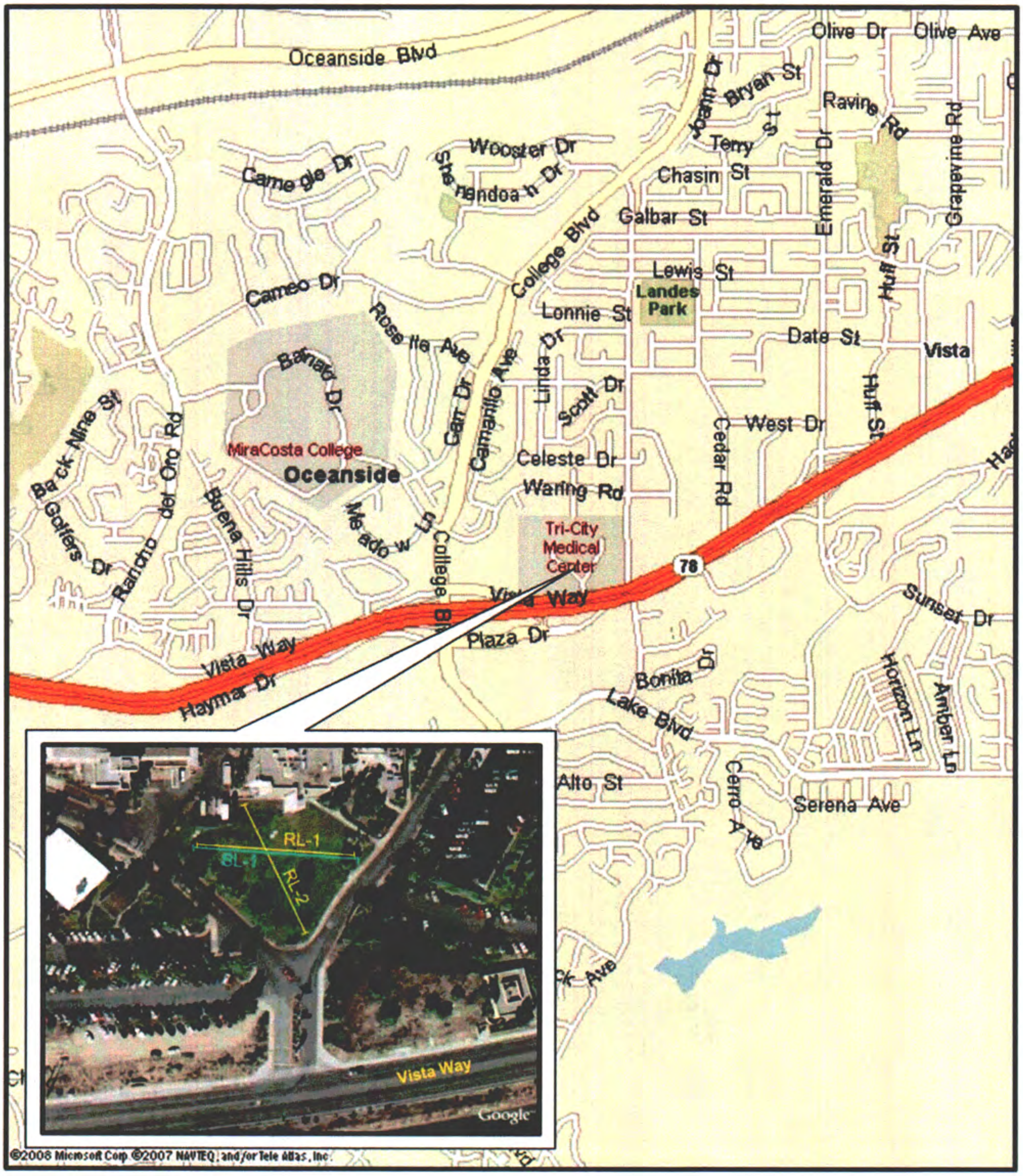
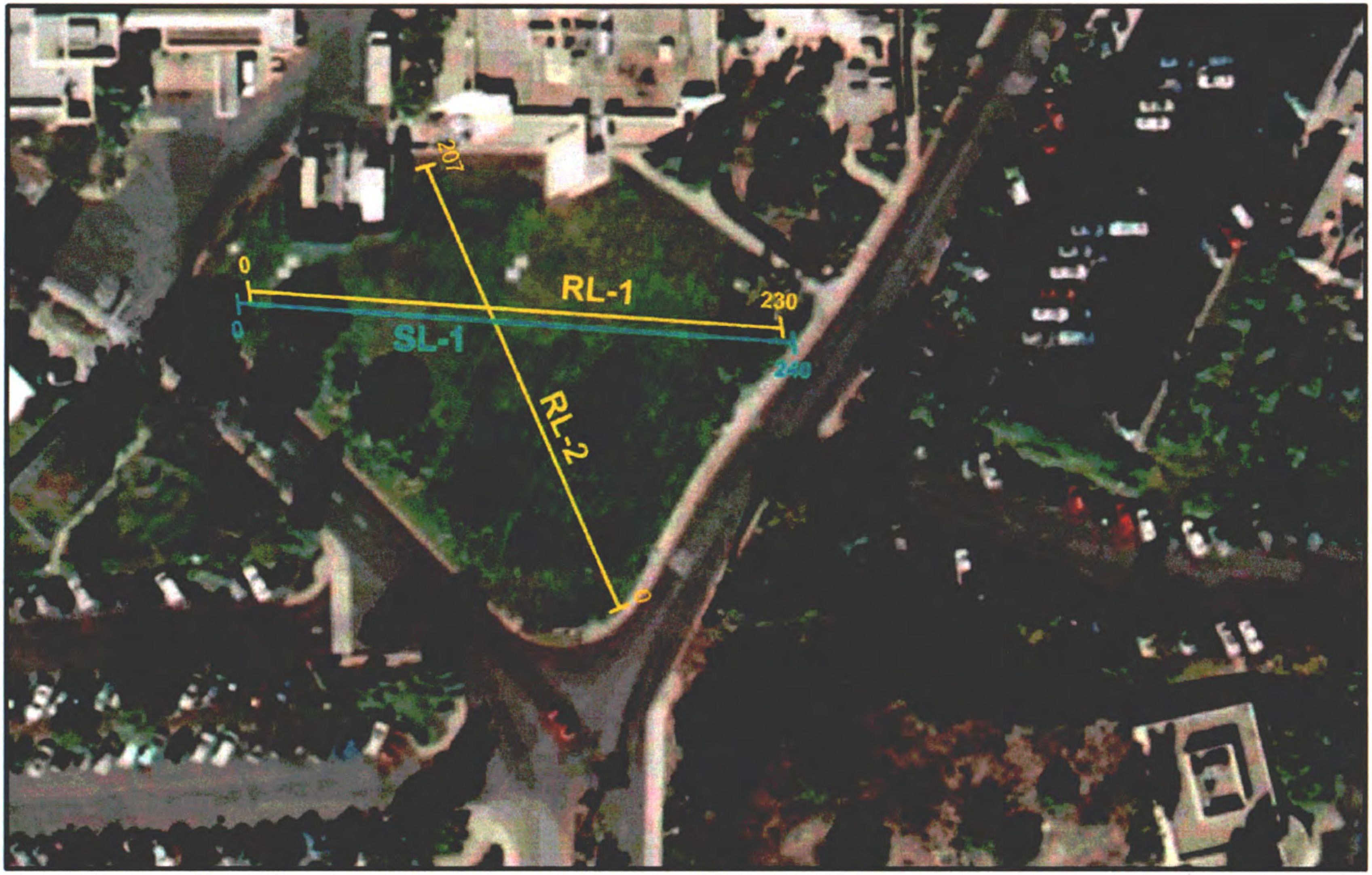


SITE LOCATION MAP	N	4002 Vista Way Oceanside, California	SOUTHWEST GEOPHYSICS INC.
		Project No.: 108036 — Date: 02/08	Figure 1



LEGEND

Seismic Line SL-1 ReMi Line RL-1

SEISMIC LINE LOCATION MAP

N

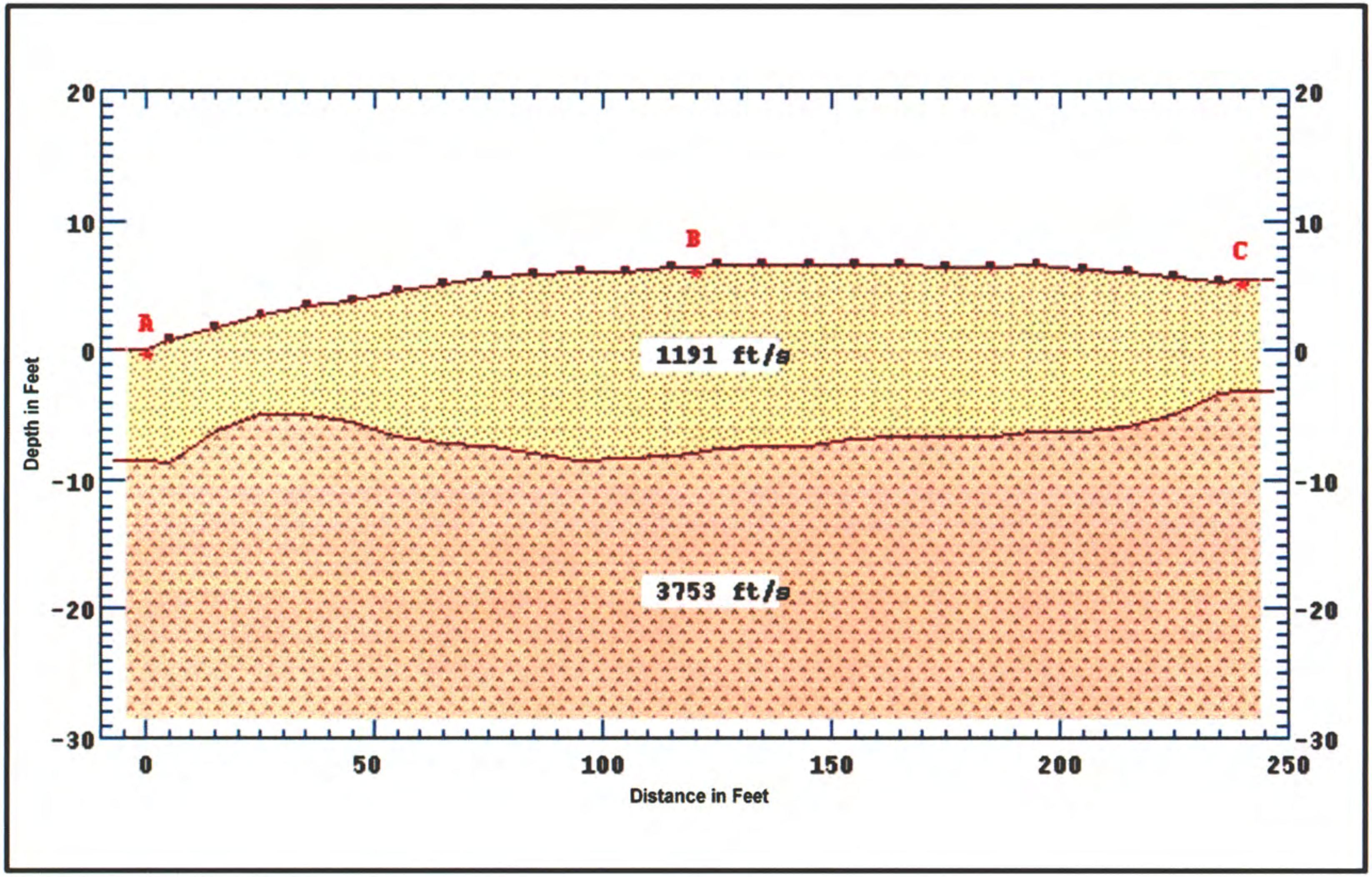
4002 Vista Way
Oceanside, California

Project No.: 108036 Date: 02/08

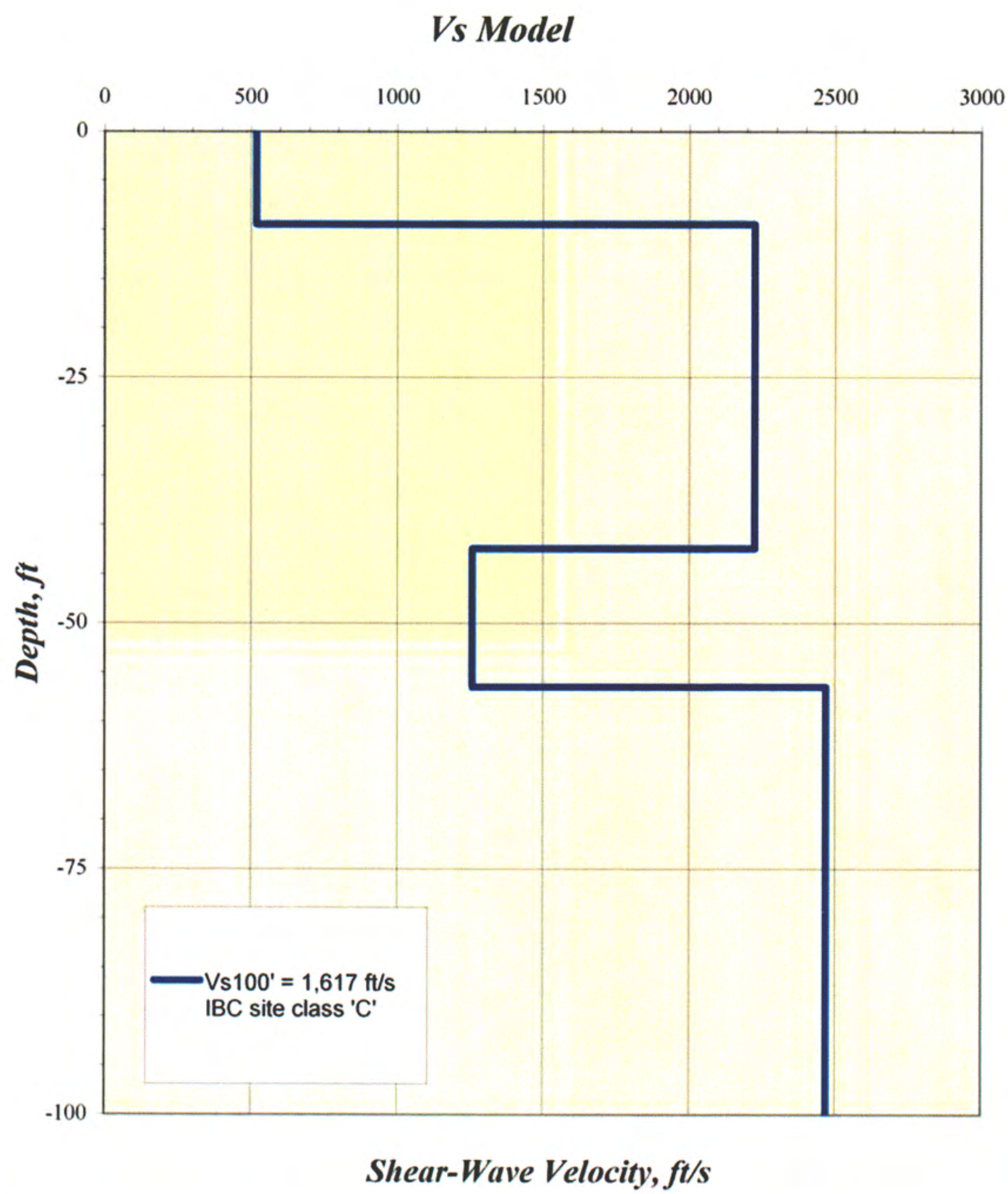
SOUTHWEST GEOPHYSICS INC

Figure 2

SITE PHOTOGRAPHS	4002 Vista Way Oceanside, California Project No.: 108036 · Date: 02/08	SOUTHWEST GEOPHYSICS INC. Figure 3



SEISMIC PROFILE, SL-1	4002 Vista Way Oceanside, California	SOUTHWEST GEOPHYSICS INC
	Project No.: 108036 — Date: 02/08	Figure 4



ReMi Results, RL-1

4002 Vista Way
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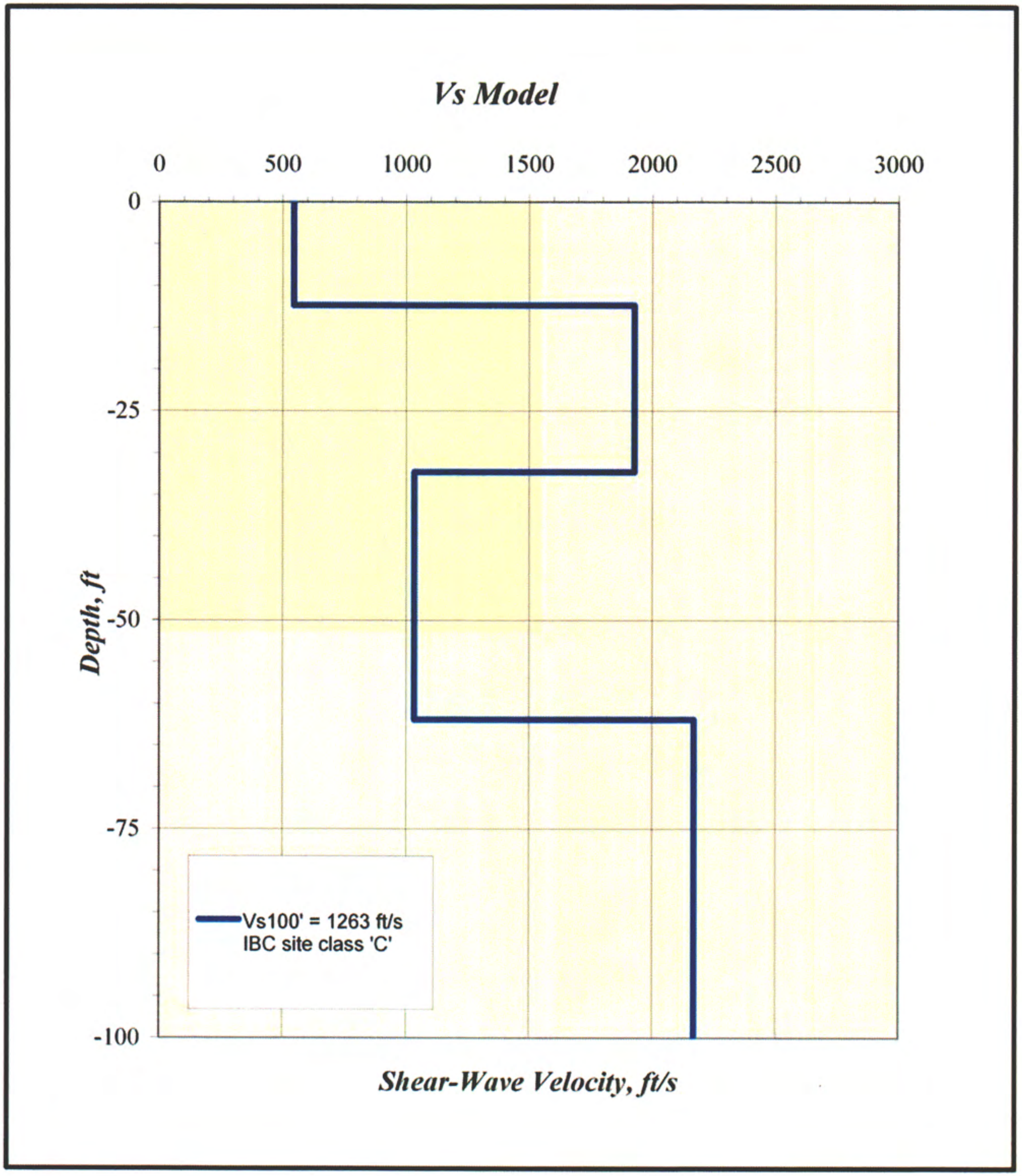
Figure 5a



ReMi Results, RL-2

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Figure 5b

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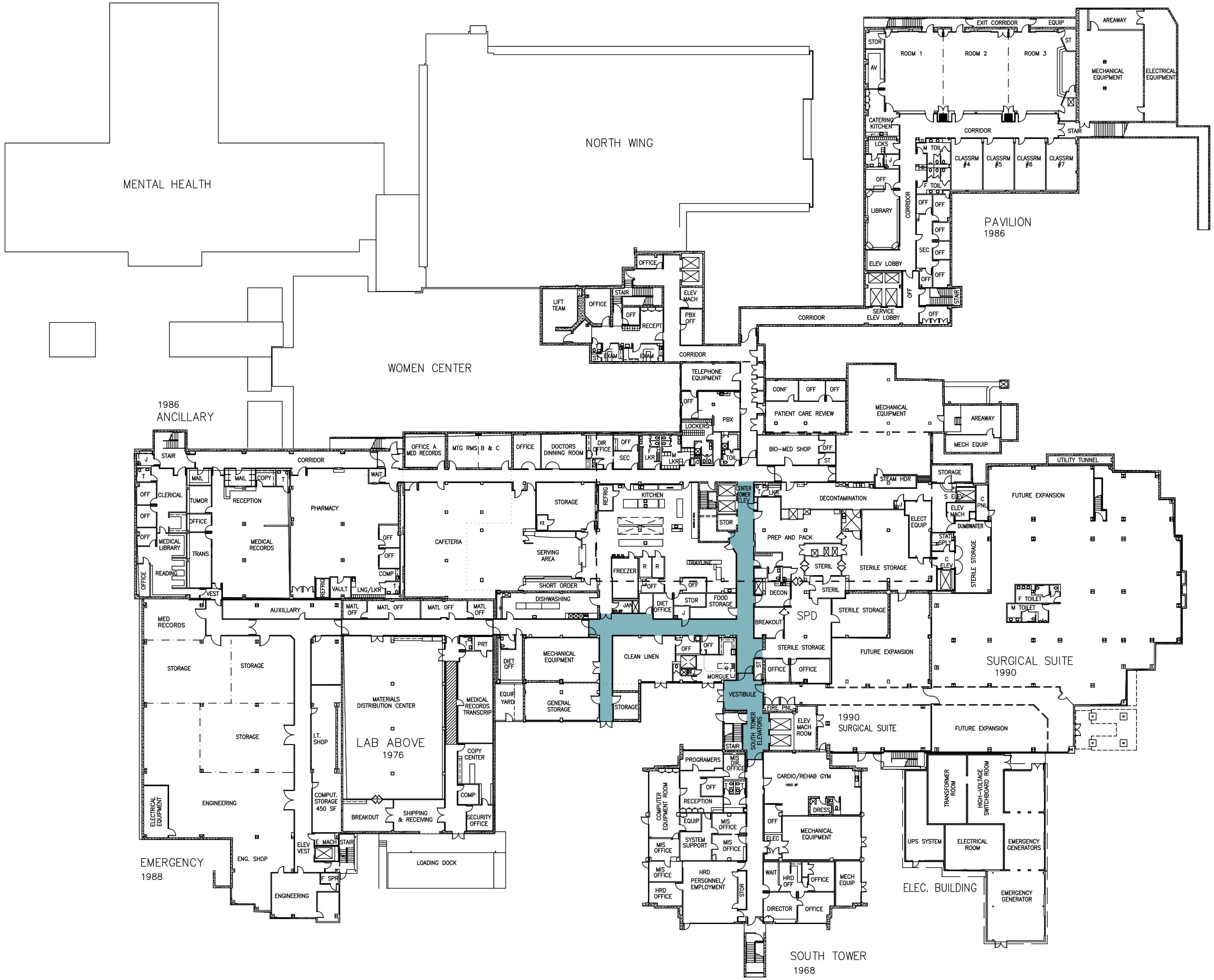

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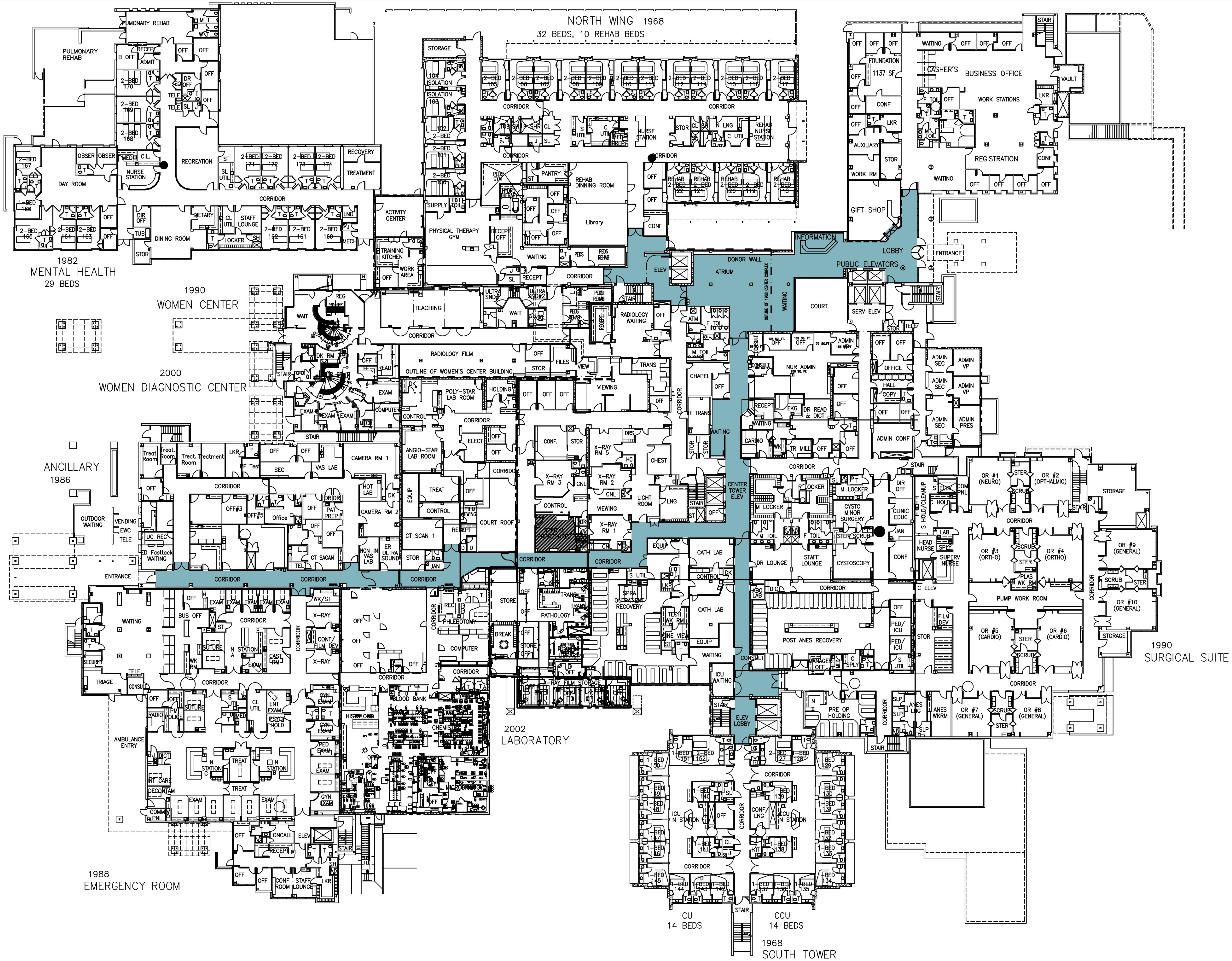
SFEIR ARCHITECTS



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SCALE: NTS PAGE 2 of 2

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