

# VERDURA<sup>®</sup> SEGMENTAL WALL DRAWINGS

## PART 1: GENERAL

### 1.01 DESCRIPTION

- WORK SHALL CONSIST OF FURNISHING AND CONSTRUCTING A VERDURA SEGMENTAL RETAINING WALL SYSTEM IN ACCORDANCE WITH THESE SPECIFICATIONS AND IN REASONABLY CLOSE CONFORMITY WITH THE LINES, GRADES, DESIGN AND DIMENSIONS SHOWN ON THESE PLANS.
- WORK INCLUDES PREPARING FOUNDATION SOIL, FURNISHING AND INSTALLING LEVELING PAD (IF REQUIRED), PLANTABLE SOIL UNIT FILL, AND BACKFILL TO THE LINES AND GRADES SHOWN ON THE CONSTRUCTION DRAWINGS.
- WORK INCLUDES FURNISHING AND INSTALLING GEOSYNTHETIC SOIL REINFORCEMENT OF THE TYPE, SIZE, LOCATION, STRENGTH AND LENGTHS DESIGNATED ON THE CONSTRUCTION DRAWINGS.
- WORK INCLUDES FURNISHING AND INSTALLING FOUNDATION DRAIN, SUBDRAIN AND OTHER WALL-RELATED DRAINAGE SYSTEMS THAT MAY BE SHOWN ON THE CONSTRUCTION DRAWINGS.
- CALCULATIONS ADDRESSING INTERNAL AND EXTERNAL STABILITY PROVIDED IN DOCUMENTATION AS NOTED IN TABLE 1.

### 1.02 REFERENCE DOCUMENTS

- AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
  - ASTM C-1372—SPECIFICATION FOR SEGMENTAL RETAINING WALL UNITS
  - ASTM D-3080—DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS
  - ASTM D-1557—LABORATORY COMPACTION CHARACTERISTICS OF SOIL MODIFIED PROCTOR
  - ASTM D-4318—LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS
  - ASTM D-4595—TENSILE PRIORITIES OF GEOTEXTILES - WIDE WIDTH STRIP
  - ASTM D-5262—UNCONFINED TENSION CREEP BEHAVIOR OF GEOSYNTHETICS
  - ASTM D-3034—POLYVINYL CHLORIDE PIPE (PVC)
  - ASTM D-4829—EXPANSION INDEX OF SOILS
  - ASTM C-140—STD. SPEC. FOR SAMPLING AND TESTING CONCRETE MASONRY UNITS
  - ASTM C-145—STD. SPEC. FOR SOLID LOAD BEARING CONCRETE MASONRY UNITS
- GEOSYNTHETIC RESEARCH INSTITUTE (GRI)
  - GRI-604—DETERMINATION OF LONG TERM DESIGN STRENGTH OF GEOTEXTILES
  - GRI-605—DETERMINATION OF GEOTEXTILE (SOIL) PULLOUT
- NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)
  - NCMA SRWU-1—TEST METHOD FOR DETERMINING CONNECTION STRENGTH OF SRW UNITS
  - NCMA SRWU-2—TEST METHOD FOR DETERMINING SHEAR STRENGTH OF SRW UNITS
  - "DESIGN MANUAL FOR SEGMENTAL RETAINING WALLS, 2ND EDITION," (1997)
- ICC EVALUATION SERVICES, INC.
  - ICC ES-5515—VERDURA AND CANDURA SEGMENTAL RETAINING WALL SYSTEMS.

### 1.03 SUBMITTALS/CERTIFICATION

- CONTRACTOR SHALL SUBMIT A MANUFACTURER'S CERTIFICATION PRIOR TO START OF WORK THAT THE RETAINING WALL SYSTEM COMPONENTS MEET THE REQUIREMENTS OF THESE SPECIFICATION AND STRUCTURE DESIGN PLANS.
- CONTRACTOR SHALL SUBMIT A TEST REPORT DOCUMENTING STRENGTH OF SPECIFIC MODULAR CONCRETE UNIT AND GEOSYNTHETIC REINFORCEMENT CONNECTION TO VERDURA BLOCKS. THE MAXIMUM DESIGN TENSILE LOAD OF THE GEOSYNTHETIC-FACING UNIT CONNECTION AT A MAXIMUM NORMAL FORCE AS IS APPROPRIATE FOR THE VERTICAL LOCATION OF REINFORCEMENT UNDER CONSIDERATION. THE CONNECTION STRENGTH EVALUATION SHALL BE PERFORMED IN ACCORDANCE WITH NCMA TEST METHOD SRWU-1.

### 1.04 QUALITY ASSURANCE

- CONTRACTOR SHALL SUBMIT CERTIFICATION, PRIOR TO START OF WORK, THAT THE RETAINING WALL SYSTEM (MODULAR CONCRETE UNITS AND SPECIFIC GEOSYNTHETICS):
  - HAS BEEN SUCCESSFULLY UTILIZED ON A MINIMUM OF FIVE (5) SIMILAR PROJECTS, I.E., HEIGHT, SOIL FILL TYPES, ERECTION TOLERANCES, ETC., AND
  - HAS BEEN SUCCESSFULLY INSTALLED ON A MINIMUM OF 1 MILLION SQUARE FEET (93,000 M<sup>2</sup>) OF RETAINING WALLS.
- CONTRACTOR SHALL SUBMIT A LIST OF FIVE (5) PREVIOUSLY CONSTRUCTED PROJECTS OF SIMILAR SIZE AND MAGNITUDE BY THE WALL INSTALLER WHERE THE SPECIFIC RETAINING WALL SYSTEM HAS BEEN CONSTRUCTED SUCCESSFULLY. CONTACT NAMES AND TELEPHONE NUMBERS SHALL BE LISTED FOR EACH PROJECT.
- CONTRACTOR SHALL PROVIDE EVIDENCE THAT THE DESIGN ENGINEER HAS A MINIMUM OF FIVE YEARS OF DOCUMENTABLE EXPERIENCE IN THE DESIGN OF REINFORCED SOIL STRUCTURES.
- OWNER SHALL PROVIDE SOIL TESTING AND QUALITY ASSURANCE DURING EARTHWORK AND WALL CONSTRUCTION OPERATION. OWNER'S QUALITY ASSURANCE PROGRAM DOES NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR WALL PERFORMANCE.

### 1.05 DELIVERY, STORAGE AND HANDLING

- CONTRACTOR SHALL CHECK ALL MATERIALS UPON DELIVERY TO ASSURE THAT THE PROPER TYPE, GRADE, AND CERTIFICATION HAVE BEEN RECEIVED.
- CONTRACTOR SHALL PROTECT ALL MATERIALS FROM DAMAGE DUE TO JOBSITE CONDITIONS AND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. DAMAGED MATERIALS SHALL NOT BE INCORPORATED INTO THE WORK.

## PART 2: PRODUCTS

### 2.01 MODULAR CONCRETE RETAINING WALL UNITS

- MODULAR CONCRETE UNITS SHALL BE VERDURA, AS INDICATED IN TABLE 2.
- MODULAR CONCRETE MATERIALS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-1372 - STANDARD SPECIFICATIONS FOR SRW UNITS.
- MODULAR CONCRETE UNITS SHALL CONFORM TO THE FOLLOWING STRUCTURAL AND GEOMETRIC REQUIREMENTS MEASURED IN ACCORDANCE WITH SECTION 1.03 AND OTHER APPROPRIATE REFERENCES:
  - COMPRESSIBLE STRENGTH = 4000 PSI (27,000 KPA) MINIMUM AT 28 DAYS;
  - MOISTURE ABSORPTION = 8% MAXIMUM FOR STANDARD WEIGHT AGGREGATES;
  - BATTER = AS INDICATED IN TABLE 2.
  - DIMENSIONAL TOLERANCES = ±1/8" (3MM) FROM NOMINAL UNIT DIMENSIONS (NOT INCLUDING EXPOSED AGGREGATE FACE TEXTURE), ±1/8" (3 MM) UNIT HEIGHT - TOP AND BOTTOM PLANES.

### 2.02 GEOSYNTHETIC-CONCRETE BLOCK CONNECTORS

- CONNECTORS SHALL BE 1 INCH (2.5 CM) DIAMETER OR GREATER SCHEDULE 80 PIPE OR EQUIVALENT AND MUST BE CAPABLE OF PROVIDING POSITIVE MECHANICAL INTERLOCK BETWEEN GEOSYNTHETIC SOIL REINFORCEMENT MATERIAL (GEOTEXTILE OR GEGRID) AND BLOCK.
- CONNECTORS SHALL BE CAPABLE OF HOLDING THE GEOSYNTHETIC SOIL REINFORCEMENT IN THE PROPER DESIGN POSITION DURING GEOSYNTHETIC PRE-TENSIONING AND BACKFILLING PROCEDURES.

### 2.03 UNIT FILL

- UNIT FILL SHALL CONSIST OF SOILS USED FOR WALL BACKFILL OR AS SPECIFIED BY THE PROJECT LANDSCAPE ARCHITECT.

### 2.04 SOIL FILL

- SELECT ENGINEERED FILL FOR THE REINFORCED/INFILL SOIL AND RETAINED/BACKFILL SOIL. SOIL ZONES SHALL BE ON-SITE OR IMPORTED SOILS ACCEPTED BY THE GEOTECHNICAL ENGINEER OF RECORD AND HAVING THE SOIL STRENGTH PROPERTIES AS NOTED TABLE 3 WHEN COMPACTED TO 90% RELATIVE COMPACTION PER ASTM D-1557.
- ENGINEERED FILL MATERIALS FOR THE UPPER ONE (1) FOOT IMMEDIATELY BEHIND THE TOPMOST BLOCK AND ABOVE THE ZONE OF SELECTED SOIL MATERIALS AS SHOWN ON THE TYPICAL SECTION SHALL BE COMPROMISED OF MORE IMPERVIOUS ON-SITE SOILS.
- MATERIALS CAN BE SITE-EXCAVATED SOILS WHERE THE ABOVE REQUIREMENTS CAN BE MET. UNSUITABLE SOILS (HIGH PLASTIC CLAYS OR ORGANIC SOILS) SHALL NOT BE USED.
- SOIL WITHIN 6 INCHES OF A GEGRID LAYER SHALL NOT CONTAIN PARTICLES LARGER THAN 6 INCHES.
- GEOTECHNICAL-ENGINEER-OF-RECORD SHALL PERFORM LABORATORY TESTS ON THE SOIL MATERIAL PROPOSED FOR USE TO ENSURE COMPLIANCE WITH REQUIREMENTS STATED IN SECTION 2.04, ITEM A AS OUTLINED ABOVE PRIOR TO THE PLACEMENT OF THE MATERIALS FOR THE SELECT BACKFILL/REINFORCED SOIL ZONE.

### 2.05 GEGRID SOIL REINFORCEMENT

- GEOSYNTHETIC REINFORCEMENT SHALL BE OF THE TYPE SHOWN ON THESE DESIGN PLANS. THE CONTRACTOR, OR THE SUPPLIER AS HIS AGENT, SHALL FURNISH THE GEOTECHNICAL ENGINEER OF RECORD WITH A CERTIFICATE OF COMPLIANCE CERTIFYING THAT THE GEOSYNTHETIC REINFORCEMENT COMPLIES WITH THIS SECTION OF THE SPECIFICATIONS, THE DRAWINGS AND THE DESIGN CALCULATIONS.

### 2.06 DRAINAGE PIPE

- PROVIDE A PERFORATED AND SOLID PIPING SYSTEM CONSISTING OF 4-INCH-DIAMETER SCHEDULE 40 PVC PIPE AS SHOWN ON THESE PLANS.

### 2.07 FILTER FABRIC

- PROVIDE FILTER FABRIC CONSISTING OF MIRAFI 140N OR EQUIVALENT AS SPECIFIED BY THE GEOTECHNICAL ENGINEER OF RECORD.

## PART 3: EXECUTION

### 3.01 SURFACE CONDITIONS

- PRIOR TO WORK, CAREFULLY INSPECT PREVIOUS GRADING WORK, VERIFY THAT ALL SUCH WORK IS COMPLETE TO THE POINT WHERE THIS INSTALLATION MAY PROPERLY COMMENCE.
- VERIFY THAT WORK OF THIS SECTION MAY BE INSTALLED IN STRICT ACCORDANCE WITH THE ORIGINAL DESIGN, ALL PERTINENT CODES AND REGULATIONS.
- VERIFY WALL DRAINAGE SYSTEM IS COORDINATED WITH POINTS OF CONNECTION TO STORM DRAINAGE SYSTEM OR OTHER PROPER DRAINAGE DEVICE.
- IN THE EVENT OF DISCREPANCY, IMMEDIATELY NOTIFY THE PROJECT COORDINATOR. DO NOT PROCEED WITH INSTALLATION UNTIL ALL SUCH DISCREPANCIES HAVE BEEN RESOLVED.

### 3.02 LAYOUT

- VERIFY ALL STAKING AND FIELD ENGINEERING REQUIRED TO IMPLEMENT THE WORK AS SHOWN ON THE DRAWINGS.
- PROTECT ALL STAKES AND BENCHMARKS. REPLACE ALL STAKES AND BENCHMARKS DAMAGED DURING THE COURSE OF CONSTRUCTION AT NO COST TO OWNER.
- SET GRADE STAKES USING INSTRUMENT TECHNOLOGY AT 50-FOOT GRID INTERVALS AT AREAS WHERE GRADIENTS ARE LESS THAN 2 PERCENT. SET GRADE STAKES USING INSTRUMENT TECHNOLOGY, 65-FOOT INTERVALS AT AREAS WHERE GRADES ARE GREATER THAN 2 PERCENT.
- HAND TRIM EXCAVATIONS TO REQUIRED ELEVATIONS. CORRECT OVER-EXCAVATION WITH FILL MATERIALS APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD.
- REMOVE LARGE STONES OR OTHER HARD MATTER WHICH WOULD DAMAGE PIPES OR IMPEDE CONSISTENT BACKFILLING OR COMPACTION.
- PROVIDE ALL EQUIPMENT OF SUCH TYPE, FUNCTION, AND DESIGN AS REQUIRED TO ACHIEVE SPECIFIC VALUES, WHERE NECESSARY, PROVIDE RUBBER-TIRED AND VIBRATORY SHEEPSFOOT COMPACTION EQUIPMENT.

### 3.03 SUBSURFACE DRAINAGE SYSTEM INSTALLATION

- EXCAVATE TRENCHES FOR DRAINAGE PIPING SHOWN ON DRAWINGS.
- LAY FILTER FABRIC IN BOTTOM OF EXCAVATION PRIOR TO PLACING PERMEABLE FILL. PLACE MINIMUM 4-INCH-THICK BED OF PERMEABLE FILL OVER FABRIC.
- INSTALL AND JOIN PIPE AND PIPE FITTINGS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. INSTALL DRAINAGE PIPING WITH PERFORATIONS DOWN, JOIN PIPE ENDS AND SOLVENT ENDS.
- LAY PIPE TO SLOPE GRADIENTS NOTED ON DRAWINGS, WITH MAXIMUM VARIATION FROM TRUE SLOPE OF 1/8" INCH IN 10 FEET.
- BACKFILL PIPE USING FILTER AGGREGATE.
- WRAP FILTER FABRIC AROUND AGGREGATE COVER AND TUCK LOOSE EDGE BETWEEN AGGREGATE COVER AND TUCK LOOSE EDGE BETWEEN AGGREGATE AND SOIL.
- INSTALL BACKFILL IN ACCORDANCE WITH THE PROVISIONS OF THIS SECTION. DO NOT DISPLACE OR DAMAGE PIPE WHEN COMPACTING.
- EXTEND NON-PERFORATED PIPING TO DRAINAGE PIPING AS SHOWN ON DRAWINGS. PROVIDE TRENCHING, BEDDING, AND BACKFILL AS REQUIRED.

### 3.04 EXCAVATION

- CONTRACTOR SHALL EXCAVATE TO THE LINES AND GRADES SHOWN ON THE CONSTRUCTION DRAWINGS. OWNER'S REPRESENTATIVE SHALL INSPECT THE EXCAVATION AND APPROVE PRIOR TO PLACEMENT OF LEVELING MATERIAL OR FILL SOILS. PROOF ROLL FOUNDATION AREA AS DIRECTED BY THE GEOTECHNICAL ENGINEER OF RECORD TO DETERMINE IF REMEDIAL WORK IS REQUIRED.
- OVER-EXCAVATION AND REPLACEMENT OF UNSUITABLE FOUNDATION SOILS AND REPLACEMENT WITH APPROVED COMPACTED FILL WILL BE COMPENSATED AS AGREED UPON WITH THE OWNER.

### 3.05 MODULAR UNIT INSTALLATION

- FIRST COURSE OF UNITS SHALL BE PLACED ON THE FOUNDATION SOILS OR LEVELING PAD, AS DIRECTED BY THE GEOTECHNICAL ENGINEER OF RECORD, AT THE APPROPRIATE LINES AND GRADES. MOLDED SURFACE OF MODULAR UNITS SHALL BE USED FOR ALIGNMENT. ALIGNMENT AND LEVEL SHALL BE CHECKED IN ALL DIRECTIONS AND ENSURE THAT ALL UNITS ARE IN FULL CONTACT WITH THE BASE AND PROPERLY SEATED.
- UNITS SHALL BE PLACED ON THE FOUNDATION SOILS WITH A MAXIMUM DISTANCE OF 9 INCHES (23 CM) BETWEEN ADJACENT UNITS. THE SPACING BETWEEN UNITS INSTALLED IN CURVED REGIONS (CONCAVE OR CONVEX) MUST BE ADJUSTED ACCORDINGLY AND SUCH THAT THE RUNNING BOND LAYOUT IS MAINTAINED. VERTICALLY ADJACENT UNITS SHALL BE CENTERED ON UNITS ABOVE AND BELOW. ALL BLOCK LAYOUT AND PLACEMENT SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- MODULAR UNITS MAY BE INSTALLED HORIZONTALLY WITH RESPECT TO THE PROFILE WALL ALIGNMENT OR MAY BE MADE TO FOLLOW THE BOTTOM OF WALL CONTOURS ("RUN WITH THE GRADE"), WHERE BOTTOM OF WALL CONTOURS ARE USED TO SET THE FIRST ROW OF MODULAR BLOCKS, GRADES MAY NOT SLOPE MORE THAN 15% WITH RESPECT TO THE WALL PROFILE BASE.
- PLACE AND COMPACT FILL BEHIND WALL UNITS. AFTER UNIT FILL IS COMPACTED EXCESS UNIT FILL MUST BE SCREEDED (ROD-BOARDED) OFF TO DEVELOP A FLAT BASE UPON WHICH SUBSEQUENT UNITS CAN BE POSITIONED. PLACE AND COMPACT BACKFILL SOIL BEHIND UNITS. FOLLOW WALL ERECTION AND UNIT FILL CLOSELY WITH STRUCTURE BACKFILL.
- MAXIMUM STACKED VERTICAL HEIGHT OF WALL UNITS PRIOR TO UNIT FILL AND BACKFILL PLACEMENT AND COMPACTION SHALL NOT EXCEED ONE COURSE.

### 3.06 GEOSYNTHETIC SOIL REINFORCEMENT INSTALLATION

- GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE ORIENTED WITH THE HIGHEST STRENGTH AXIS PERPENDICULAR TO THE WALL ALIGNMENT.
- GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE PLACED AT THE STRENGTHS, LENGTHS, AND ELEVATIONS SHOWN ON THESE DRAWINGS. WHERE GEOSYNTHETIC PLACEMENT ELEVATIONS VARY FROM FACING UNIT INCREMENTS, GEOSYNTHETIC ELEVATIONS MAY BE ADJUSTED UP OR DOWN BY 4 INCHES MAXIMUM.
- THE GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE Laid HORIZONTALLY ON COMPACTED BACKFILL AND ATTACHED TO THE MODULAR WALL UNITS IN ACCORDANCE WITH THE DETAILS OF THESE PLANS AND SPECIFICATIONS. A TOLERANCE FROM FACE TO TAIL OF REINFORCEMENT OF 6" IN 10' IS ACCEPTABLE RELATIVE TO HORIZONTAL GEOSYNTHETIC ORIENTATION. PLACE THE NEXT COURSE OF MODULAR CONCRETE UNITS OVER THE GEOSYNTHETIC SOIL REINFORCEMENT. THE GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE Laid FLAT PRIOR TO BACKFILL PLACEMENT ON THE GEOSYNTHETIC SOIL REINFORCEMENT.
- GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE CONTINUOUS THROUGHOUT THE LENGTH OF EMBEDMENT. SPLICED CONNECTORS BETWEEN SHORTER PIECES OF GEOSYNTHETIC SOIL REINFORCEMENT WILL NOT BE PERMITTED.

### 3.07 REINFORCED BACKFILL PLACEMENT

- REINFORCED BACKFILL SHALL BE PLACED, SPREAD AND COMPACTED IN SUCH A MANNER THAT MINIMIZES THE DEVELOPMENT OF SLACK IN THE GEOSYNTHETIC SOIL REINFORCEMENT AND INSTALLATION DAMAGE.
- REINFORCED SOIL BACKFILL SHALL BE PLACED AND COMPACTED IN LIFTS NOT TO EXCEED THE "TRAIL HEIGHT" OF THE UNITS BEING PLACED. LIFT THICKNESSES SHALL BE DECREASED TO ACHIEVE THE REQUIRED DENSITY AS REQUIRED.
- REINFORCED BACKFILL SHALL BE COMPACTED TO 90% RELATIVE COMPACTION AS DETERMINED BY ASTM D-1557. THE MOISTURE CONTENT OF THE BACKFILL MATERIAL PRIOR TO AND DURING COMPACTION SHALL BE UNIFORMLY DISTRIBUTED THROUGHOUT EACH LAYER.
- ONLY LIGHTWEIGHT HAND-OPERATED EQUIPMENT SHALL BE ALLOWED WITHIN 1 FOOT (0.3 METERS) FROM THE BACK OF THE MODULAR CONCRETE UNIT.
- TRACKED CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY UPON THE GEOSYNTHETIC SOIL REINFORCEMENT. A MINIMUM FILL THICKNESS OF 6 INCHES (15 CM) IS REQUIRED PRIOR TO OPERATION OF TRACKED VEHICLES OVER THE GEOSYNTHETIC SOIL REINFORCEMENT. TRACKED VEHICLE TURNING SHOULD BE KEPT TO A MINIMUM TO PREVENT TRACKS FROM DISPLACING THE FILL AND DAMAGING THE GEOSYNTHETIC SOIL REINFORCEMENT.
- RUBBER Tired EQUIPMENT SHALL PASS OVER GEOSYNTHETIC SOIL REINFORCEMENT AT SLOW SPEEDS, LESS THAN 10 MPH (16 KPH). SUDDEN BRAKING AND SHARP TURNING SHALL BE AVOIDED.
- AT THE END OF EACH DAY'S OPERATION, THE CONTRACTOR SHALL SLOPE THE LAST LIFT OF REINFORCED BACKFILL AWAY FROM THE WALL UNITS TO DIRECT RUNOFF AWAY FROM THE WALL FACE. THE CONTRACTOR SHALL NOT ALLOW SURFACE RUN-OFF FROM ADJACENT AREAS TO ENTER THE WALL CONSTRUCTION SITE.
- CARE SHOULD BE TAKEN DURING EXCAVATION FOR AND CONSTRUCTION OF THE V-DITCH AND ALL OTHER TYPE OF WALL STRUCTURE NOT TO DAMAGE THE UPPER GEGRID LAYER. IF THE GEGRID LAYERS ARE DAMAGED, THEY NEED TO BE PROPERLY REPLACED.

### 3.08 EROSION CONTROL

- PROVIDE DUST AND EROSION CONTROL PROTECTION PLAN IN ACCORDANCE WITH CONTACT DOCUMENTS.

### 3.9 AS-BUILT CONSTRUCTION TOLERANCES

- VERTICAL ALIGNMENT: ±1.5 INCHES (37 MM) OVER ANY 10 FT (3 M) DISTANCE.
- WALL BATTER: WITHIN 2 DEGREES OF DESIGN BATTER.
- HORIZONTAL ALIGNMENT: ±1.5 INCHES (37 MM) OVER ANY 10 FT (3 M) DISTANCE.
- CORNERS, BENDS, CURVES: ±1 FT (0.3 M) TO DESIGN LOCATIONS.
- MAXIMUM HORIZONTAL GAP BETWEEN ERRECTED UNITS SHALL BE 9 INCHES (23 CM).

### 3.10 FIELD QUALITY CONTROL

- THE OWNER SHALL ENGAGE INSPECTION AND TESTING SERVICES, INCLUDING INDEPENDENT LABORATORIES, TO PROVIDE QUALITY ASSURANCE AND TESTING SERVICES DURING CONSTRUCTION. THIS DOES NOT RELIEVE THE CONTRACTOR FROM SECURING THE NECESSARY CONSTRUCTION CONTROL, TESTING DURING CONSTRUCTION.
- QUALIFIED AND EXPERIENCED TESTERS AND ENGINEERS SHALL PERFORM TESTING AND INSPECTION SERVICES.
- AS A MINIMUM, QUALITY ASSURANCE TESTING SHOULD INCLUDE FOUNDATION SOIL INSPECTION, SOIL AND BACKFILL TESTING, VERIFICATION OF DESIGN PARAMETERS, AND OBSERVATION OF CONSTRUCTION FOR GENERAL COMPLIANCE WITH DESIGN DRAWINGS AND SPECIFICATIONS.
- FIELD INSPECTION AND TESTING SHALL BE PERFORMED BY THE GEOTECHNICAL ENGINEER OF RECORD.

### 3.11 SPECIAL INSPECTIONS

- SPECIAL INSPECTIONS DURING INSTALLATION MUST BE PERFORMED IN ACCORDANCE WITH SECTION 1704 OF THE 2010 CBC. THE SPECIAL INSPECTOR MUST BE QUALIFIED BY THE BUILDING OFFICIAL IN ACCORDANCE WITH SECTION 1704 OF THE CBC. THE INSPECTOR'S RESPONSIBILITIES INCLUDE VERIFYING THE FOLLOWING AS DESCRIBED PREVIOUSLY:
  - FOUNDATION PREPARATION
  - UNIT PLACEMENT, INCLUDING ALIGNMENT AND INCLINATION
  - GEOSYNTHETIC REINFORCEMENT LENGTH, STRENGTH, AND PLACEMENT WITH RESPECT TO ELEVATION AND ORIENTATION
  - BACKFILL SOIL STRUCTURAL PROPERTIES
  - BACKFILL PLACEMENT AND COMPACTION

## TABLE 1 - REFERENCED DOCUMENTATION:

1. TENTATIVE TRACT MAP 17300, PREPARED BY HUNSAKER AND ASSOCIATES, DATED 04/27/2012.
2. GEOTECHNICAL INVESTIGATION, PORTOLA CENTER NORTH, TENTATIVE TRACT NO. 17300, LAKE FOREST, CA PROJECT NUMBER: 01218-52, PREPARED BY GECCON, INC. DATED JUNE 29, 2012.
3. VERDURA 40/60 RETAINING WALL FEASIBILITY DESIGN AND RESPONSE TO PLAN REVIEW COMMENTS FROM CITY OF LAKE FOREST, PORTOLA CENTER PROJECT (NORTH PARCEL), TTM 17300 LAKE FOREST, CA PROJECT NUMBER: 0704-0348 PREPARED BY SOIL RETENTION DESIGNS, DATED 09/10/2012.

## TABLE 2 - VERDURA BLOCK PROPERTIES

Unit Type	Verdura	V30	V40	V50	V60
Unit Size	36" (914mm)	36" (914mm)	36" (914mm)	36" (914mm)	36" (914mm)
Unit Size, Height, in (mm)	8 1/4" (210)	8 1/4" (210)	8 1/4" (210)	8 1/4" (210)	8 1/4" (210)
Unit Size, Crown Height, in (mm)	9 3/4" (248)	10 7/8" (278)	9 3/4" (248)	10 7/8" (278)	
Unit Size, Width, in (mm)	18 1/2" (467)	18 1/2" (467)	18 1/2" (467)	18 1/2" (467)	
Unit Size, Depth, in (mm)	18 3/8" (469)	18 3/8" (469)	18 1/2" (467)	18 1/2" (467)	
Height (Type) [in (mm)]	20 (508)	20 (508)	20 (508)	20 (508)	
Batter = (degrees from vertical)	20	14	20	14	

## TABLE 3 - SOIL STRENGTH REQUIREMENTS

MATERIAL	SHEAR STRENGTH		UNIT WEIGHT (pcf)
	Friction Angle	Cohesion (psf)	
Reinforced/Infill Soil*	32	0	120
Retained/Backfill Soil	20	500	120
Foundation Soil	20	500	120
Stoniness	20g		

- \* REINFORCED/INFILL SOIL SHALL HAVE MAXIMUM FINE SOIL FRACTION (% PASSING #200 SIEVE) OF 35%. THE MAXIMUM PLASTICITY INDEX (PI) OF THE FINE SOIL FRACTION SHALL BE 20.

## TABLE 4 - GEOSYNTHETIC REINFORCEMENT PROPERTIES

	Miragrid				
	Test Method Used	5XT	8XT	10XT	20XT
Tensile Strength (at ultimate)	6000 (lb/ft)	81.4 (267)	81.9 (268)	121.1 (368)	152.2 (468)
Long Term Allowable Design Load	280 (lb/ft)	35.3 (108)	45.0 (138)	65.0 (198)	82.0 (249)

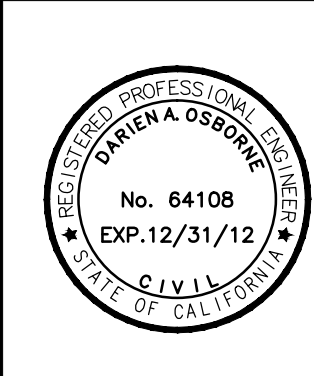
NOTE:  
ACTUAL GEGRID STRENGTHS EXCEED THESE DESIGN VALUES.

NOTE:  
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE STRUCTURAL DESIGN HEREIN. IN THE EVENT OF DISCREPANCIES AFTER JURISDICTIONAL APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.



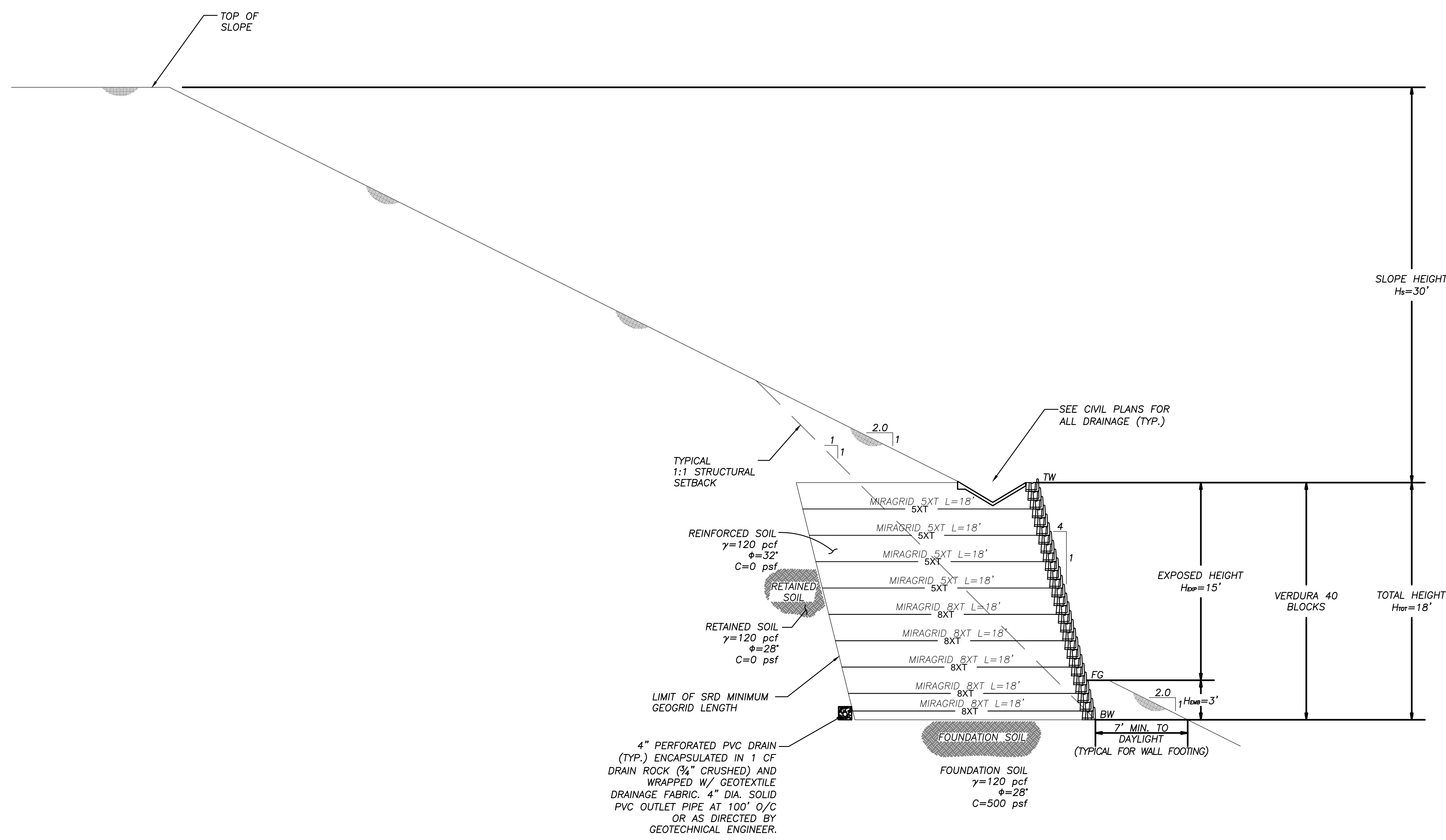
I HEREBY CERTIFY THAT THESE PLANS HAVE BEEN PREPARED UNDER MY SUPERVISION.  
ENGINEER: DAREN A. OSBORNE R.C.E. 64108 DATE



REFERENCES:  
1. TENTATIVE TRACT MAP 17300, PREPARED BY HUNSAKER AND ASSOCIATES, DATED 04/27/2012.  
2. GEOTECHNICAL INVESTIGATION, PORTOLA CENTER NORTH, TENTATIVE TRACT NO. 17300, LAKE FOREST, CA PROJECT NUMBER: 01218-52, PREPARED BY GECCON, INC. DATED JUNE 29, 2012.  
3. VERDURA 40/60 RETAINING WALL FEASIBILITY DESIGN AND RESPONSE TO PLAN REVIEW COMMENTS FROM CITY OF LAKE FOREST, PORTOLA CENTER PROJECT (NORTH PARCEL), TTM 17300 LAKE FOREST, CA PROJECT NUMBER: 0704-0348 PREPARED BY SOIL RETENTION DESIGNS, DATED 09/10/2012.  
DESIGNED BY: DAO  
DRAWN BY: CU  
CHECKED BY: DAO

VERDURA<sup>®</sup> SEGMENTAL WALL DRAWINGS  
TTM 17300 NORTH PARCEL  
LAKE FOREST, CA  
GENERAL NOTES  
1  
of 7 SHEETS

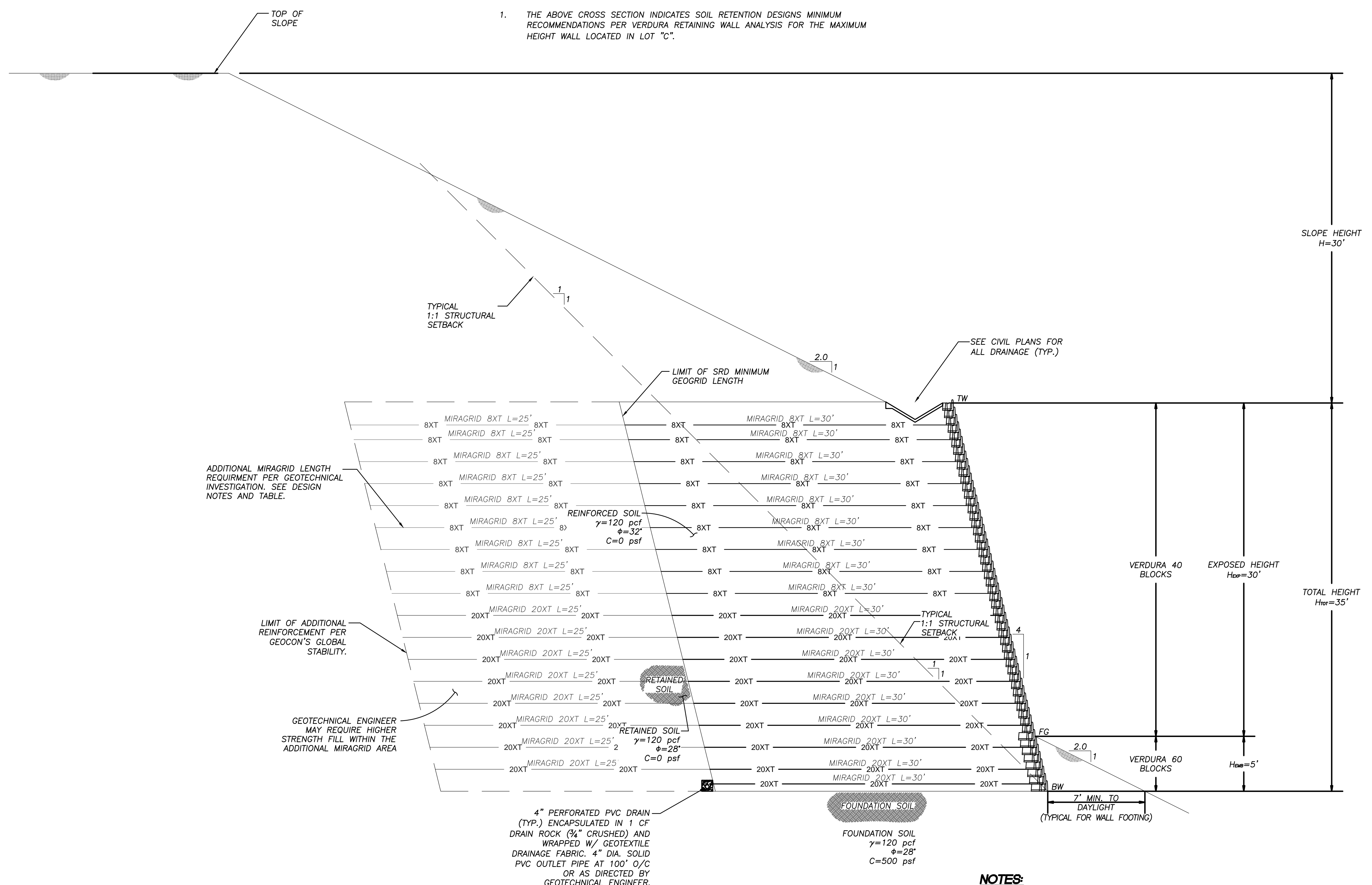
PLAN DATE: 08/10/2012



**MAXIMUM CROSS SECTION - DESIGN 1, H<sub>tot</sub> = 18'**  
SCALE: 1"=5'

**NOTES:**

1. THE ABOVE CROSS SECTION INDICATES SOIL RETENTION DESIGNS MINIMUM RECOMMENDATIONS PER VERDURA RETAINING WALL ANALYSIS FOR THE MAXIMUM HEIGHT WALL LOCATED IN LOT "C".



**MAXIMUM CROSS SECTION - DESIGN 2, H<sub>tot</sub> = 35'**  
SCALE: 1"=5'

**NOTES:**

1. THE ABOVE CROSS SECTION INDICATES SOIL RETENTION DESIGNS MINIMUM RECOMMENDATIONS PER VERDURA RETAINING WALL ANALYSIS FOR THE MAXIMUM HEIGHT WALL LOCATED IN LOT "C".
2. THE ABOVE CROSS SECTION ALSO SHOWS GEOCON'S GLOBAL STABILITY RECOMMENDATION FOR ADDITIONAL MIRAGRID REINFORCEMENT BASED ON SECTION J-J.

**LEGEND**

- XT- GEOSYNTHETIC REINFORCEMENT
- H<sub>tot</sub> OVERALL WALL HEIGHT
- H<sub>exp</sub> EXPOSED WALL HEIGHT
- H<sub>emb</sub> WALL EMBEDMENT
- H<sub>s</sub> SLOPE HEIGHT
- FG FINISH GRADE
- TW TOP OF WALL
- BW BOTTOM OF WALL
- L LENGTH OF REINFORCEMENT
- ① GEGRID PLACEMENT TO BEGIN BEHIND TERRACE DRAIN BENCH

**DESIGN NOTES:**

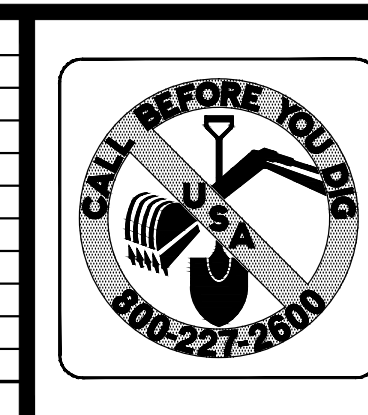
1. MINIMUM MIRAGRID REINFORCEMENT LENGTHS REQUIRED PER GLOBAL STABILITY WITHIN GEOCON'S GEOTECHNICAL INVESTIGATION DATED JUNE 29, 2012.
2. WALL DESIGN 1 IS FOR THE MAXIMUM HEIGHT CROSS SECTION FOR THE WALL LOCATED WITHIN LOT "C" ON THE TENTATIVE TRACT MAP NO. 17300.
3. WALL DESIGN 2 IS FOR THE MAXIMUM HEIGHT CROSS SECTION FOR THE WALL LOCATED WITHIN LOT "C" ON THE TENTATIVE TRACT MAP NO. 17300.
4. SOIL RETENTION DESIGNS MIRAGRID LENGTHS ARE TO BE FOLLOWED UNLESS GEOCON'S RECOMMENDATIONS CALL FOR ADDITIONAL LENGTHS.
5. SEE DESIGN TABLE BELOW FOR GEOCON'S RECOMMENDATIONS FOR MINIMUM MIRAGRID REINFORCEMENT LENGTHS.

DESIGN TABLE - DESIGN 1		
LOCATION	CROSS SECTION	MINIMUM GLOBAL STABILITY RECOMMENDATIONS
LOT "C"	Y-Y'	NO WALL DESIGN RECOMMENDATIONS WERE PROVIDED
LOT "C"	Z-Z'	NO WALL DESIGN RECOMMENDATIONS WERE PROVIDED

DESIGN TABLE - DESIGN 2		
LOCATION	CROSS SECTION	MINIMUM GLOBAL STABILITY RECOMMENDATIONS
LOT "C"	B-B'	2 FT INTERVAL FOR ENTIRE WALL, LENGTH = 45'
LOT "C"	J-J'	2 FT INTERVAL FOR ENTIRE WALL, LENGTH = 55'

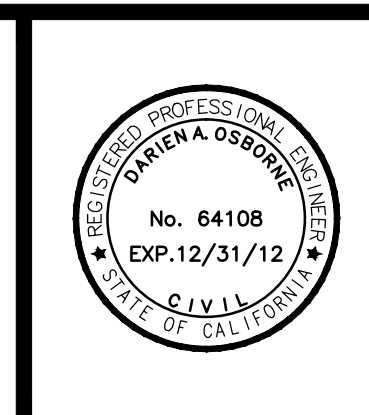
**NOTE:**  
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE STRUCTURAL DESIGN HEREIN, IN THE EVENT OF DISCREPANCIES AMONG JURISDICTIONAL APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.



I HEREBY CERTIFY THAT THESE PLANS HAVE BEEN PREPARED UNDER MY SUPERVISION.

**SOIL RETENTION DESIGNS INC.**  
2501 STATE STREET, CARLSBAD, CA 92008 800-346-7995

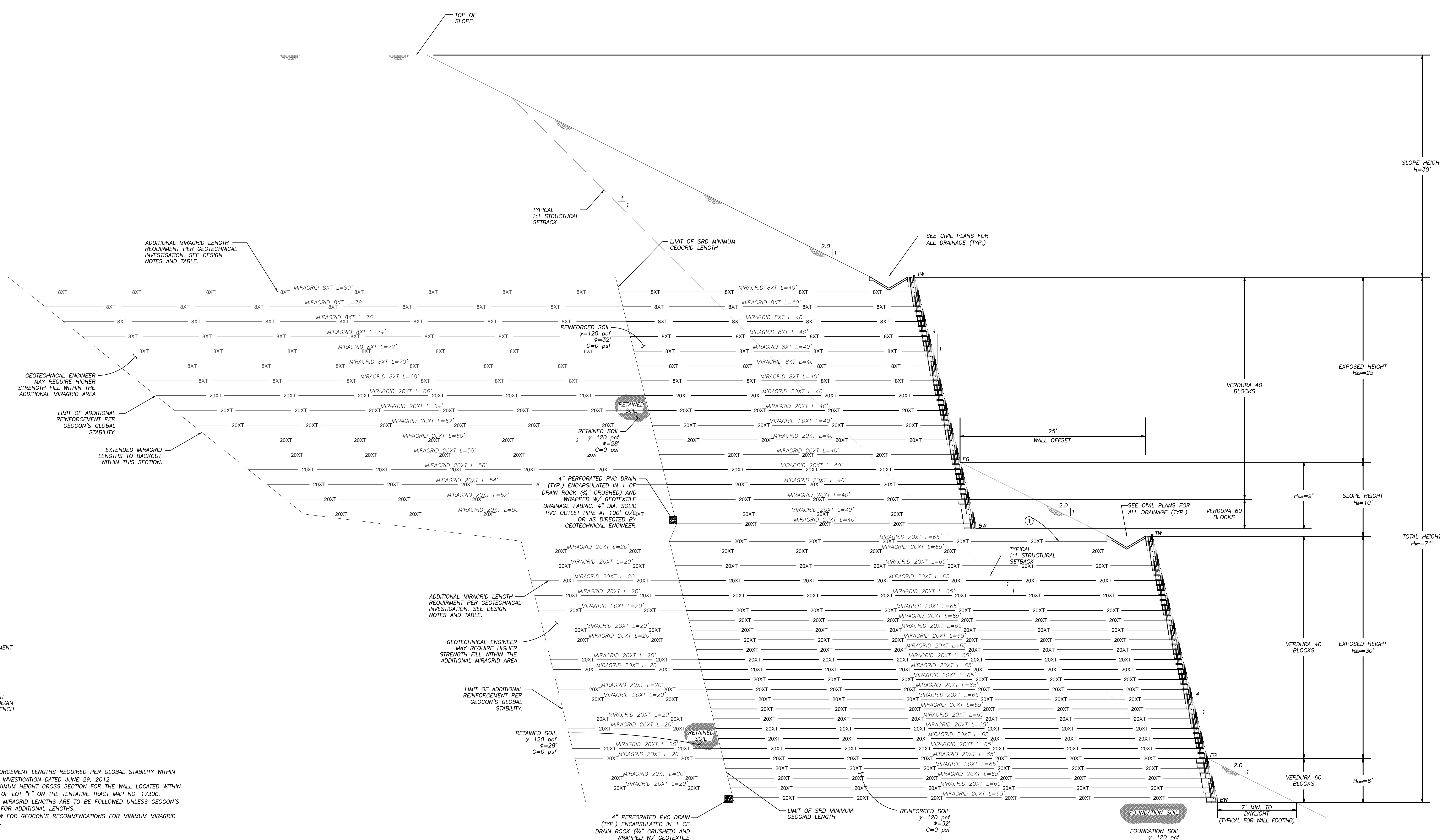


**REFERENCES:**  
1. TENTATIVE TRACT MAP 17300, PREPARED BY HANWYER AND ASSOCIATES, DATED 04/27/2012.  
2. GEOTECHNICAL INVESTIGATION, PORTOLA CENTER NORTH, TENTATIVE TRACT NO. 17300, LAKE FOREST, CA PROJECT NUMBER 1210-28-01, PREPARED BY GEOCON, INC. DATED JUNE 29, 2012.  
3. VERDURA 40/60 RETAINING WALL PRODUCT DESIGN AND RESPONSE TO PLAIN REVIEW COMMENTS FROM CITY OF LAKE FOREST, PORTOLA CENTER PROJECT DESIGN PROCESS, TTM 17300 LAKE FOREST, CA PROJECT NUMBER 1210-28-01, PREPARED BY SOIL RETENTION DESIGNS, DATED 08/10/2012.

DESIGNED BY: DAO  
DRAWN BY: CU  
CHECKED BY: DAO

PLAN DATE: 08/10/2012

**VERDURA SEGMENTAL WALL DRAWINGS**  
PORTOLA CENTER  
TTM 17300 NORTH PARCEL  
LAKE FOREST, CA  
**WALL CROSS SECTIONS**  
DESIGN 1 & 2, H<sub>tot</sub> = 18' & 35'



**LEGEND**

-XT- GEOSYNTHETIC REINFORCEMENT  
 H<sub>ov</sub> OVERALL WALL HEIGHT  
 H<sub>ex</sub> EXPOSED WALL HEIGHT  
 H<sub>em</sub> WALL EMBEDMENT  
 H<sub>s</sub> SLOPE HEIGHT  
 TW TOP OF WALL  
 FG FINISH GRADE  
 BW BOTTOM OF WALL  
 L LENGTH OF REINFORCEMENT  
 (1) GEORGRID PLACEMENT TO BEGIN BEHIND TERRACE DRAIN BENCH

- DESIGN NOTES:**
- MINIMUM MIRAGRID REINFORCEMENT LENGTHS REQUIRED PER GLOBAL STABILITY WITHIN GEOCON'S GEOTECHNICAL INVESTIGATION DATED JUNE 29, 2012.
  - WALL DESIGN IS FOR MAXIMUM HEIGHT CROSS SECTION FOR THE WALL LOCATED WITHIN THE NORTHERN PORTION OF LOT 77 ON THE TENTATIVE TRACT MAP NO. 17300.
  - SOIL RETENTION DESIGNS MIRAGRID LENGTHS ARE TO BE FOLLOWED UNLESS GEOCON'S RECOMMENDATIONS CALL FOR ADDITIONAL LENGTHS.
  - SEE DESIGN TABLE BELOW FOR GEOCON'S RECOMMENDATIONS FOR MINIMUM MIRAGRID REINFORCEMENT LENGTHS.

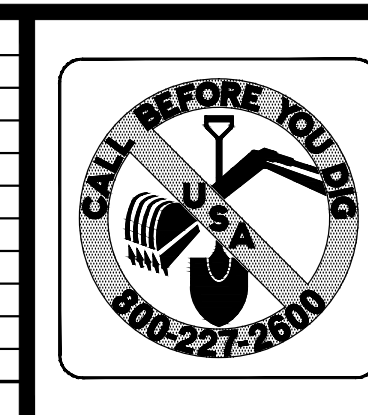
DESIGN TABLE - DESIGN 3		
LOCATION	CROSS SECTION	MINIMUM GLOBAL STABILITY RECOMMENDATIONS
LOT 77	B-B'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 20' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 70'
LOT 77	C-C'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 20' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 75'
LOT 77	D-D'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 90' TO 120' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 85'
LOT 77	G-G'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 20' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 70'
LOT 77	U-U'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 10' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 70'

**MAXIMUM CROSS SECTION - DESIGN 3, H<sub>tot</sub> = 71'**  
SCALE: 1"=5'

- NOTES:**
- THE ABOVE CROSS SECTION INDICATES SOIL RETENTION DESIGNS MINIMUM RECOMMENDATIONS PER VERDURA RETAINING WALL ANALYSIS FOR THE MAXIMUM HEIGHT WALL LOCATED IN THE NORTHERN PORTION OF LOT 77.
  - THE ABOVE CROSS SECTION ALSO SHOWS GEOCON'S RECOMMENDATION FOR ADDITIONAL MIRAGRID REINFORCEMENT BASED ON SECTION D-D'.

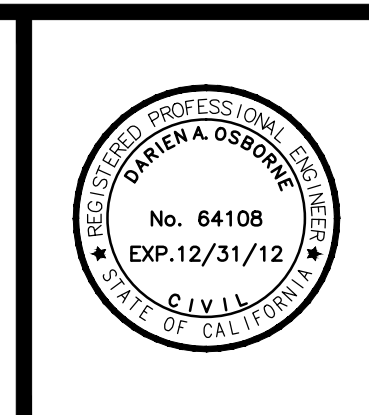
**NOTE:**  
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE STRUCTURAL DESIGN HEREIN, IN THE EVENT OF DISCREPANCIES AFTER JURISDICTIONAL APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.



I HEREBY CERTIFY THAT THESE PLANS HAVE BEEN PREPARED UNDER MY SUPERVISION.

**SOIL RETENTION DESIGNS INC.**  
2501 STATE STREET, CARLSBAD, CA 92008 800-346-7995



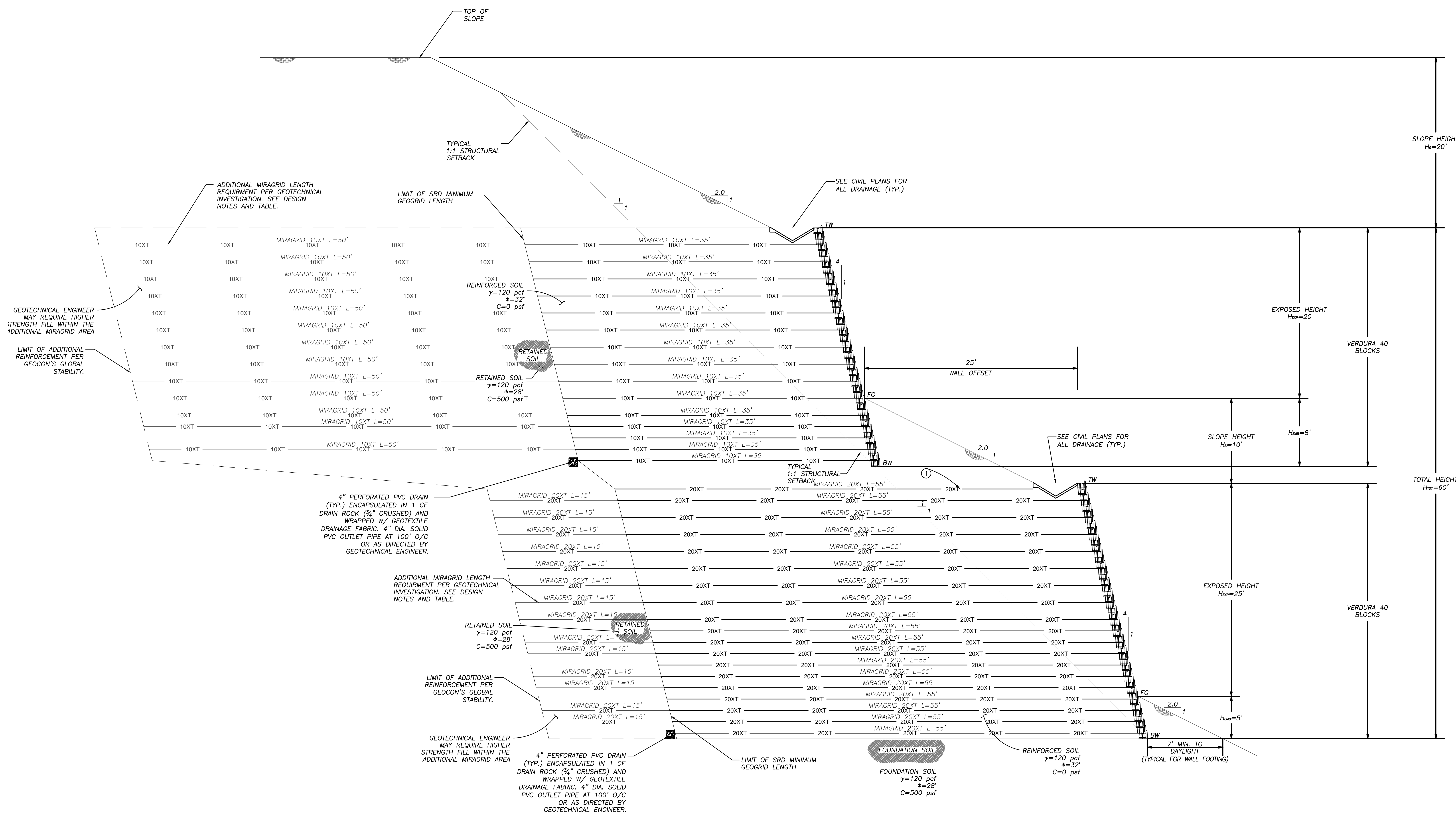
**REFERENCES:**

- TENTATIVE TRACT MAP 17300, PREPARED BY HANSHWER AND ASSOCIATES, DATED 04/27/2012.
- GEOTECHNICAL INVESTIGATION, PORTOLA CENTER NORTH, TENTATIVE TRACT NO. 17300, LANE DESIGN, CA PROJECT NUMBER 0219-24-01, PREPARED BY GEOCON, INC. DATED JUNE 29, 2012.
- VERDURA 40 AND 60 RETAINING WALL PRODUCT DESIGN AND RESPONSE TO PLAIN REVIEW COMMENTS FROM CITY OF LAKE FOREST, PORTOLA CENTER PROJECT (PORTAL CENTER), 17300 LANE PROJECT, CA PROJECT NUMBER 0219-24-01, SOIL RETENTION DESIGNS, DATED 06/10/2012.

PLAN DATE: 08/10/2012  
 DESIGNED BY: DAO  
 DRAWN BY: CJ  
 CHECKED BY: DAO

**VERDURA SEGMENTAL WALL DRAWINGS**  
 PORTOLA CENTER  
 TTM 17300 NORTH PARCEL  
 LAKE FOREST, CA  
**WALL CROSS SECTIONS**  
 DESIGN 3, H<sub>tot</sub> = 71'

3 of 7 SHEETS



**LEGEND**

10XT - GEOSYNTHETIC REINFORCEMENT  
H<sub>tot</sub> - OVERALL WALL HEIGHT  
H<sub>exp</sub> - EXPOSED WALL HEIGHT  
H<sub>emb</sub> - WALL EMBEDMENT  
H<sub>s</sub> - SLOPE HEIGHT  
FG - FINISH GRADE  
TW - TOP OF WALL  
BW - BOTTOM OF WALL  
L - LENGTH OF REINFORCEMENT  
S - GEORIGID PLACEMENT TO BEGIN BEHIND TERRACE DRAIN BENCH

- DESIGN NOTES:**
- MINIMUM MIRAGRID REINFORCEMENT LENGTHS REQUIRED PER GLOBAL STABILITY WITHIN GEOCON'S GEOTECHNICAL INVESTIGATION DATED JUNE 29, 2012.
  - WALL DESIGN IS FOR MAXIMUM HEIGHT CROSS SECTION FOR THE WALL LOCATED WITHIN THE SOUTHERN PORTION OF LOT "F" ON THE TENTATIVE TRACT MAP NO. 17300.
  - SOIL RETENTION DESIGNS MIRAGRID LENGTHS ARE TO BE FOLLOWED UNLESS GEOCON'S RECOMMENDATIONS CALL FOR ADDITIONAL LENGTHS.
  - SEE DESIGN TABLE BELOW FOR GEOCON'S RECOMMENDATIONS FOR MINIMUM MIRAGRID REINFORCEMENT LENGTHS.

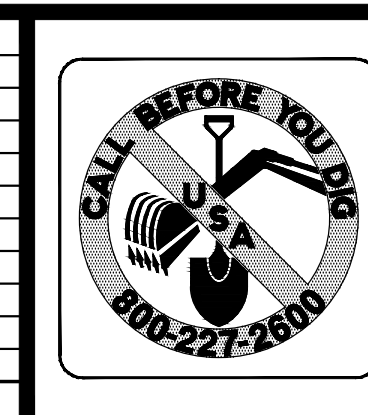
DESIGN TABLE - DESIGN 4		
LOCATION	CROSS SECTION	MINIMUM GLOBAL STABILITY RECOMMENDATIONS
LOT "F"	C-C'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 20' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 60'
LOT "F"	U-U'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 85' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 30'
LOT "F"	V-V'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 10' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 70'

**MAXIMUM CROSS SECTION - DESIGN 4, H<sub>tot</sub> = 60"**  
SCALE: 1"=5'

- NOTES:**
- THE ABOVE CROSS SECTION INDICATES SOIL RETENTION DESIGNS MINIMUM RECOMMENDATIONS PER VERDURA RETAINING WALL ANALYSIS FOR THE MAXIMUM HEIGHT WALL LOCATED IN SOUTHERN PORTION OF LOT "F".
  - THE ABOVE CROSS SECTION ALSO SHOWS GEOCON'S GLOBAL STABILITY RECOMMENDATION FOR ADDITIONAL MIRAGRID REINFORCEMENT BASED ON SECTION U-U' & V-V'.

**NOTE:**  
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE STRUCTURAL DESIGN HEREIN, IN THE EVENT OF DISCREPANCIES AFTER JURISDICTIONAL APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.



**SOIL RETENTION DESIGNS INC.**  
2501 STATE STREET, CARLSBAD, CA 92008 800-346-7995

I HEREBY CERTIFY THAT THESE PLANS HAVE BEEN PREPARED UNDER MY SUPERVISION.

ENGINEER: DARLEN A. OSBORNE R.C.E. 64108 DATE

**REFERENCES:**

- TENTATIVE TRACT MAP 17300, PREPARED BY HANOVER AND ASSOCIATES, DATED 04/27/2012.
- GEOTECHNICAL INVESTIGATION, PORTOLA CENTER NORTH, TENTATIVE TRACT NO. 17300, NORTH PARCEL, PROJECT NUMBER 0219-24-01, PREPARED BY GEOCON, INC. DATED JUNE 29, 2012.
- VERDURA SEGMENTAL WALL PRELIMINARY DESIGN AND RESPONSE TO PLAN REVIEW COMMENTS FROM CITY OF LAKE FOREST, PORTOLA CENTER PROJECT (PORTO CENTER), THE 17300 LAKE FOREST, CA PROJECT NUMBER 0219-24-01.

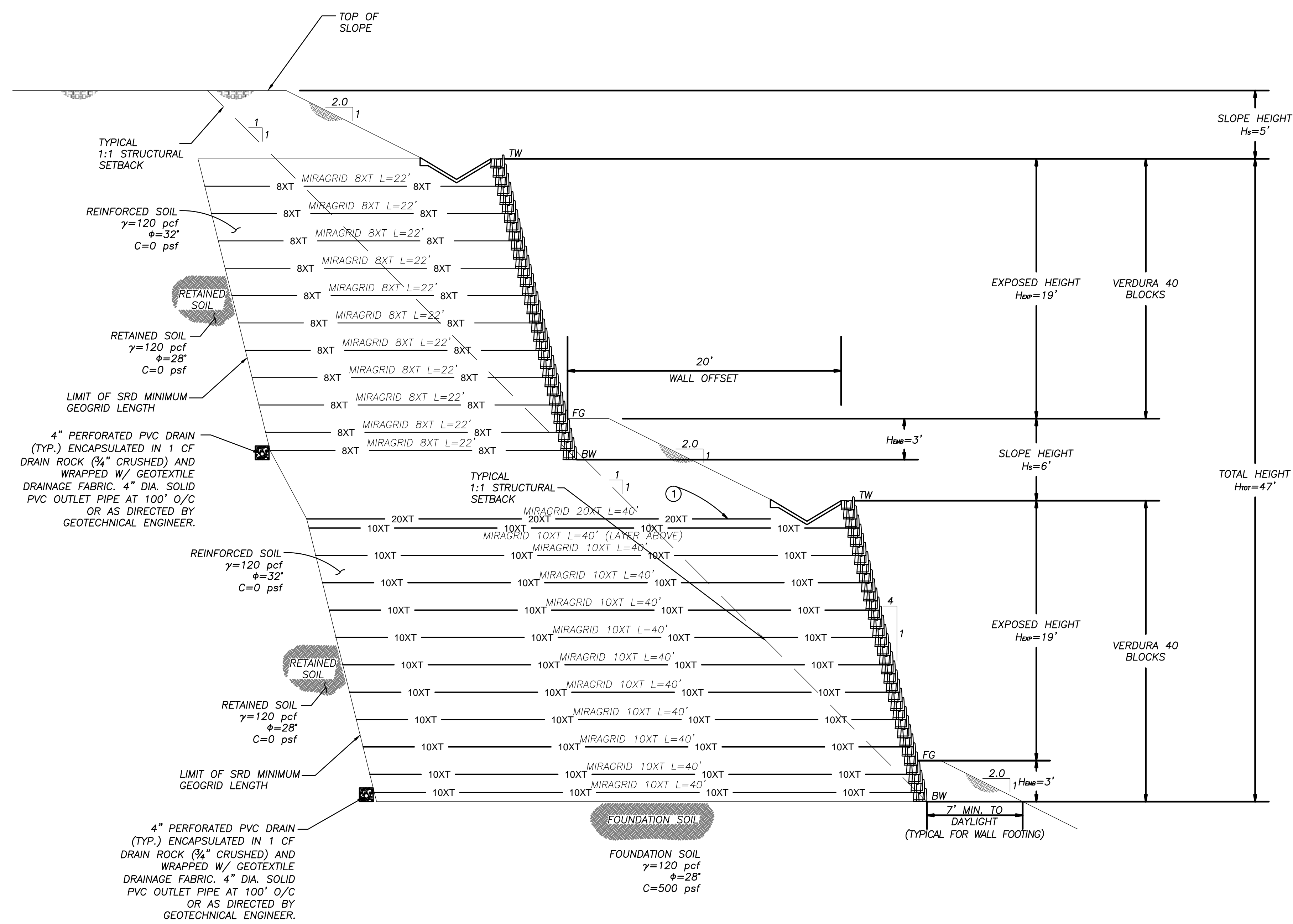
PLAN DATE: 08/10/2012

DESIGNED BY: DAO  
DRAWN BY: CU  
CHECKED BY: DAO

**VERDURA SEGMENTAL WALL DRAWINGS**

PORTOLA CENTER  
TTM 17300 NORTH PARCEL  
LAKE FOREST, CA  
**WALL CROSS SECTIONS**  
**DESIGN 4, H<sub>tot</sub> = 60"**

4  
of 7 SHEETS



**MAXIMUM CROSS SECTION - DESIGN 5, H<sub>tot</sub> = 47'**  
SCALE: 1"=5'

**NOTES:**

1. THE ABOVE CROSS SECTION INDICATES SOIL RETENTION DESIGNS MINIMUM RECOMMENDATIONS PER VERDURA RETAINING WALL ANALYSIS FOR THE MAXIMUM HEIGHT TIERED WALL LOCATED IN LOT "G".

**LEGEND**

- XT- GEOSYNTHETIC REINFORCEMENT
- H<sub>ov</sub> OVERALL WALL HEIGHT
- H<sub>ew</sub> EXPOSED WALL HEIGHT
- H<sub>em</sub> WALL EMBEDMENT
- H<sub>s</sub> SLOPE HEIGHT
- FG FINISH GRADE
- TW TOP OF WALL
- BW BOTTOM OF WALL
- L LENGTH OF REINFORCEMENT
- ① GEGRID PLACEMENT TO BEGIN BEHIND TERRACE DRAIN BENCH

**DESIGN NOTES:**

1. MINIMUM MIRAGRID REINFORCEMENT LENGTHS REQUIRED PER GLOBAL STABILITY WITHIN GEOCON'S GEOTECHNICAL INVESTIGATION DATED JUNE 29, 2012.
2. WALL DESIGN IS FOR MAXIMUM HEIGHT CROSS SECTION FOR THE SOUTH WALL LOCATED WITHIN LOT "G" ON THE TENTATIVE TRACT MAP NO. 17300.
3. SOIL RETENTION DESIGNS MIRAGRID LENGTHS ARE TO BE FOLLOWED UNLESS GEOCON'S RECOMMENDATIONS CALL FOR ADDITIONAL LENGTHS.
4. SEE DESIGN TABLE BELOW FOR GEOCON'S RECOMMENDATIONS FOR MINIMUM MIRAGRID REINFORCEMENT LENGTHS.

DESIGN TABLE - DESIGN 1		
LOCATION	CROSS SECTION	MINIMUM GLOBAL STABILITY RECOMMENDATIONS
LOT "G"	N/A	NO WALL DESIGN RECOMMENDATIONS WERE PROVIDED

**NOTE:**  
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE STRUCTURAL DESIGN HEREIN. IN THE EVENT OF DISCREPANCIES AFTER JURISDICTIONAL APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.

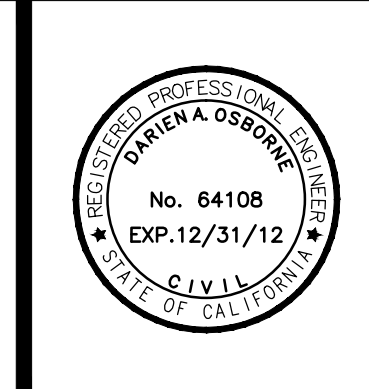
DATE	
CITY	



I HEREBY CERTIFY THAT THESE PLANS HAVE BEEN PREPARED UNDER MY SUPERVISION.

**SOIL RETENTION DESIGNS INC.**  
2501 STATE STREET, CARLSBAD, CA 92008 800-346-7995

ENGINEER: DARLEN A. OSBORNE R.C.E. 64108 DATE

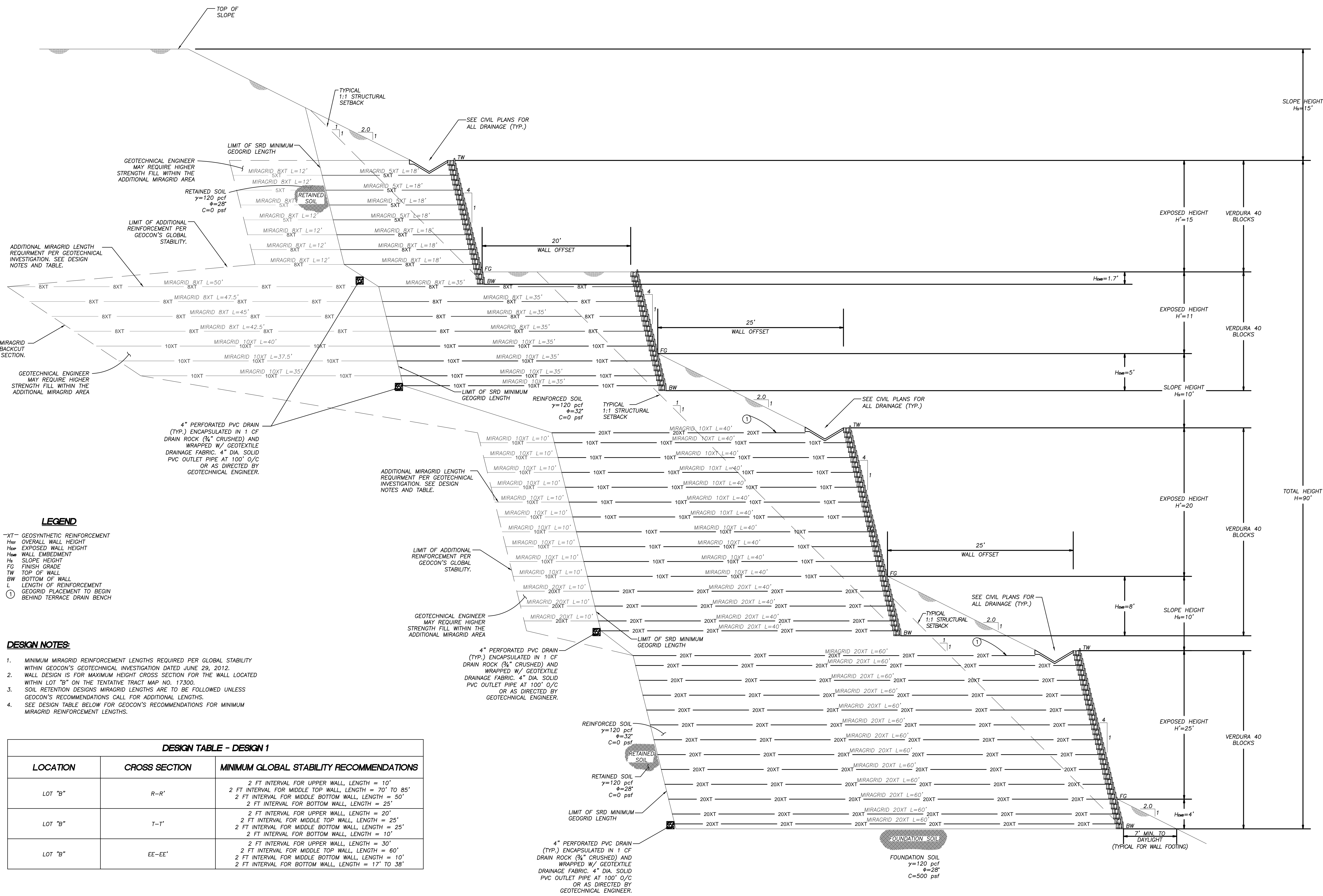


**REFERENCES:**

1. TENTATIVE TRACT MAP 17300, PREPARED BY HANOVER AND ASSOCIATES, DATED 04/27/2012.
2. GEOTECHNICAL INVESTIGATION, PORTOLA CENTER NORTH, TENTATIVE TRACT NO. 17300, LAKE FOREST, CA PROJECT NUMBER 1219-24-01, PREPARED BY GEOCON, INC. DATED JUNE 29, 2012.
3. VERDURA 40 RETAINING WALL GEOTECHNICAL DESIGN AND RESPONSE TO PLAN REVIEW COMMENTS FROM CITY OF LAKE FOREST, PORTOLA CENTER PROJECT, PROJECT NUMBER, TTM 17300 LAKE FOREST, CA PROJECT NUMBER: 0704-0348

DESIGNED BY: DAO  
DRAWN BY: CU  
CHECKED BY: DAO  
PLAN DATE: 08/10/2012

**VERDURA SEGMENTAL WALL DRAWINGS**  
PORTOLA CENTER  
TTM 17300 NORTH PARCEL  
LAKE FOREST, CA  
**WALL CROSS SECTIONS**  
DESIGN 5, H<sub>tot</sub> = 47'



**LEGEND**

- XT- GEOSYNTHETIC REINFORCEMENT
- H<sub>tot</sub> OVERALL WALL HEIGHT
- H<sub>exp</sub> EXPOSED WALL HEIGHT
- H<sub>emb</sub> WALL EMBELEMMENT
- H<sub>s</sub> SLOPE HEIGHT
- FG FINISH GRADE
- TW TOP OF WALL
- BW BOTTOM OF WALL
- L LENGTH OF REINFORCEMENT
- ⓪ GEOGRID PLACEMENT TO BEGIN BEHIND TERRACE DRAIN BENCH

**DESIGN NOTES:**

1. MINIMUM MIRAGRID REINFORCEMENT LENGTHS REQUIRED PER GLOBAL STABILITY WITHIN GEOCON'S GEOTECHNICAL INVESTIGATION DATED JUNE 29, 2012.
2. WALL DESIGN IS FOR MAXIMUM HEIGHT CROSS SECTION FOR THE WALL LOCATED WITHIN LOT 'B' ON THE TENTATIVE TRACT MAP NO. 17300.
3. SOIL RETENTION DESIGN MIRAGRID LENGTHS ARE TO BE FOLLOWED UNLESS GEOCON'S RECOMMENDATIONS CALL FOR ADDITIONAL LENGTHS.
4. SEE DESIGN TABLE BELOW FOR GEOCON'S RECOMMENDATIONS FOR MINIMUM MIRAGRID REINFORCEMENT LENGTHS.

**DESIGN TABLE - DESIGN 1**

LOCATION	CROSS SECTION	MINIMUM GLOBAL STABILITY RECOMMENDATIONS
LOT 'B'	R-R'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 10' 2 FT INTERVAL FOR MIDDLE TOP WALL, LENGTH = 70' TO 85' 2 FT INTERVAL FOR MIDDLE BOTTOM WALL, LENGTH = 50' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 25'
LOT 'B'	T-T'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 20' 2 FT INTERVAL FOR MIDDLE TOP WALL, LENGTH = 25' 2 FT INTERVAL FOR MIDDLE BOTTOM WALL, LENGTH = 25' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 10'
LOT 'B'	EE-EE'	2 FT INTERVAL FOR UPPER WALL, LENGTH = 30' 2 FT INTERVAL FOR MIDDLE TOP WALL, LENGTH = 60' 2 FT INTERVAL FOR MIDDLE BOTTOM WALL, LENGTH = 10' 2 FT INTERVAL FOR BOTTOM WALL, LENGTH = 17' TO 38'

**MAXIMUM CROSS SECTION - DESIGN 6, 7, AND 8, H<sub>tot</sub> = 90'**  
SCALE: 1"=5'

**NOTES:**

1. THE ABOVE CROSS SECTION INDICATES SOIL RETENTION DESIGN'S MINIMUM RECOMMENDATIONS PER VERDURA RETAINING WALL ANALYSIS FOR THE MAXIMUM HEIGHT WALL LOCATED IN LOT 'B'.
2. THE ABOVE CROSS SECTION ALSO SHOWS GEOCON'S GLOBAL STABILITY RECOMMENDATION FOR ADDITIONAL MIRAGRID REINFORCEMENT BASED ON SECTION R-R'.

**NOTE:**  
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

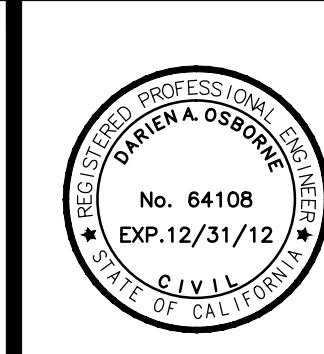
THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE STRUCTURAL DESIGN HEREIN. IN THE EVENT OF DISCREPANCIES AMONG JURISDICTIONAL APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.



I HEREBY CERTIFY THAT THESE PLANS HAVE BEEN PREPARED UNDER MY SUPERVISION.

**SOIL RETENTION DESIGNS INC.**  
2501 STATE STREET, CARLSBAD, CA 92008 800-346-7995

ENGINEER: DARLEN A. OSBORNE R.C.E. 64108 DATE

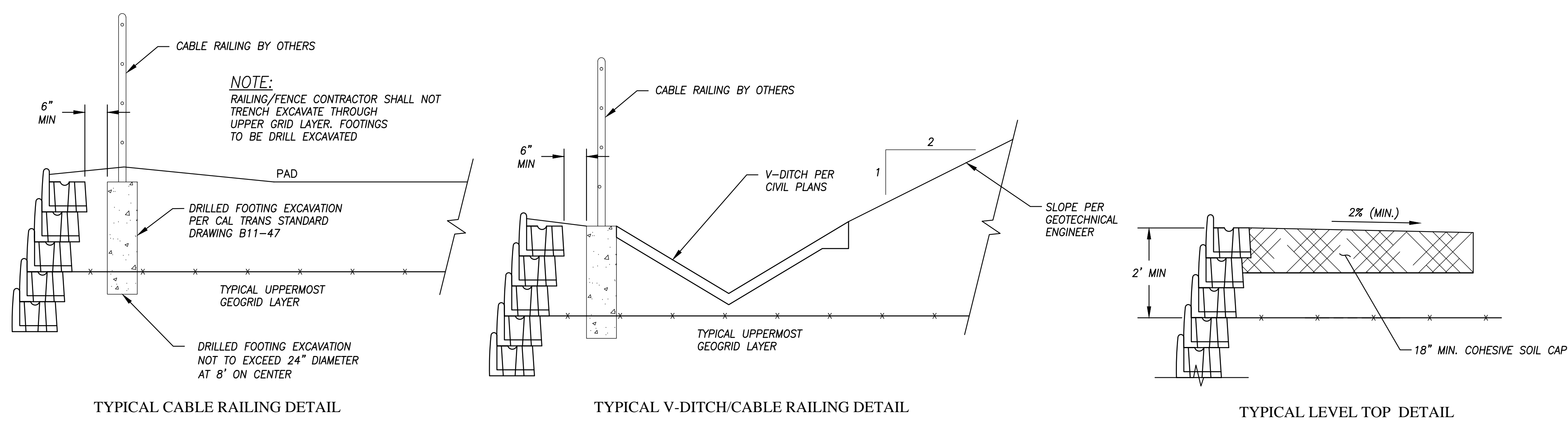


**REFERENCES:**

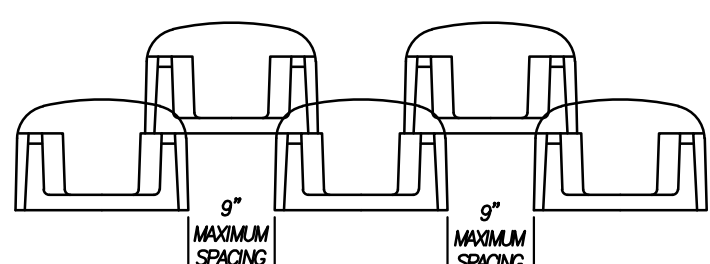
1. TENTATIVE TRACT MAP 17300, PREPARED BY HANOVER AND ASSOCIATES, DATED 04/27/2012.
2. GEOTECHNICAL INVESTIGATION, PORTOLA CENTER NORTH, TENTATIVE TRACT NO. 17300, LAKE FOREST, CA PROJECT NUMBER 0219-24-01, PREPARED BY GEOCON, INC. DATED JUNE 29, 2012.
3. VERDURA RETAINING WALL DESIGN SYSTEM AND RESPONSE TO PLAN REVIEW COMMENTS FROM CITY OF LAKE FOREST, PORTOLA CENTER PROJECT (PORTAL CENTER), THE 17300 LAKE FOREST, CA PROJECT.

PLAN DATE: 08/10/2012  
DESIGNED BY: DAO  
DRAWN BY: CU  
CHECKED BY: DAO

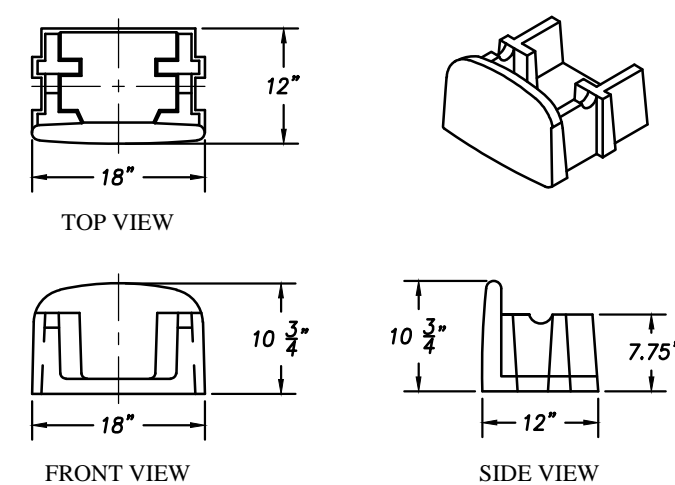
**VERDURA SEGMENTAL WALL DRAWINGS**  
PORTOLA CENTER  
TTM 17300 NORTH PARCEL  
LAKE FOREST, CA  
**WALL CROSS SECTIONS**  
DESIGN 6, 7 & 8, H<sub>tot</sub> = 90'



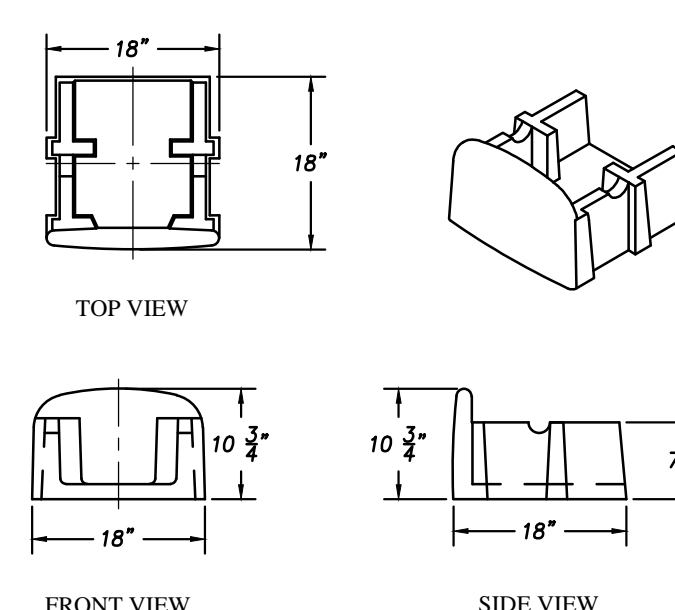
**TOP OF WALL DETAILS**  
 SCALE: 1"=20'



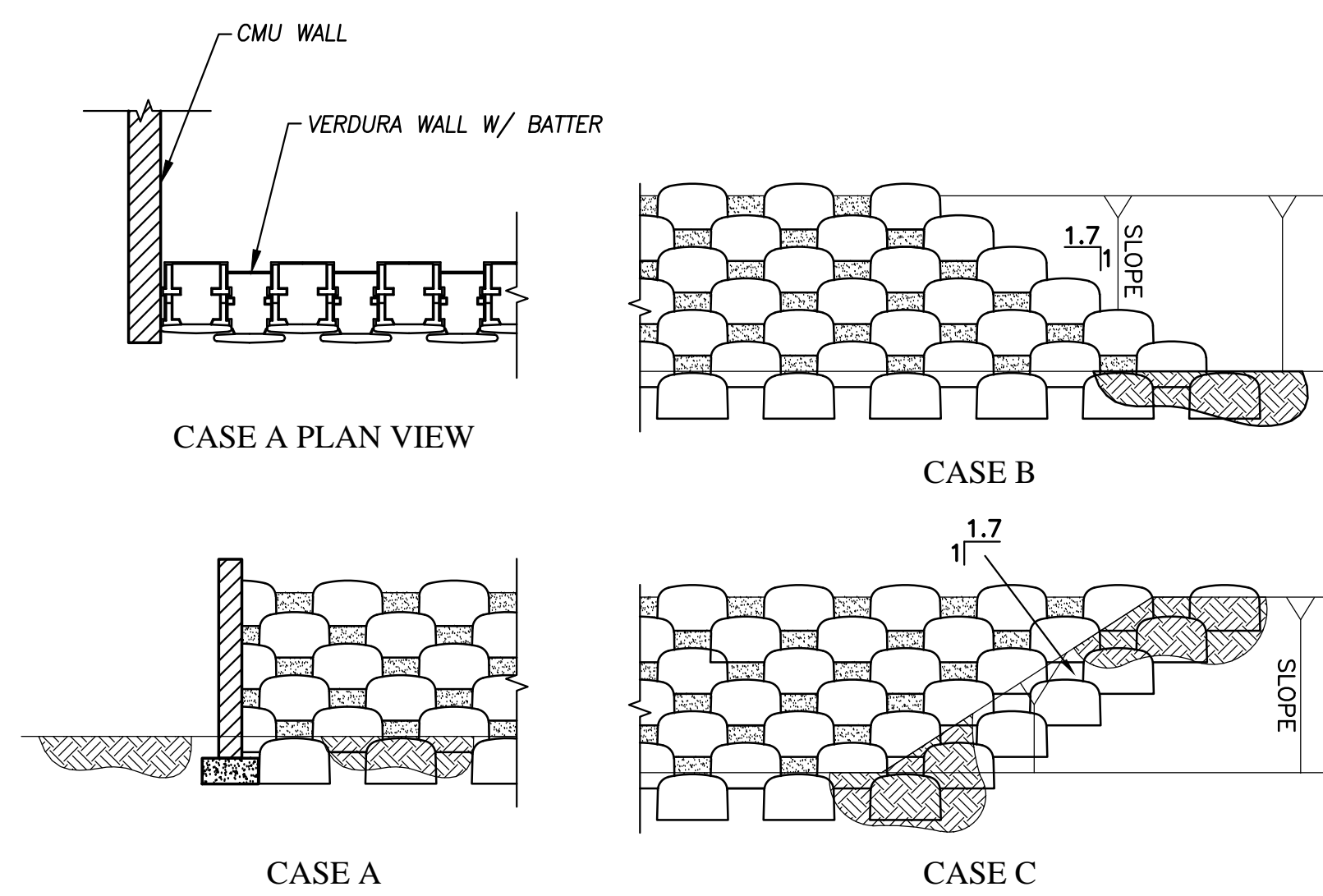
**BLOCK SPACING DETAIL**  
 SCALE: 1"=20'



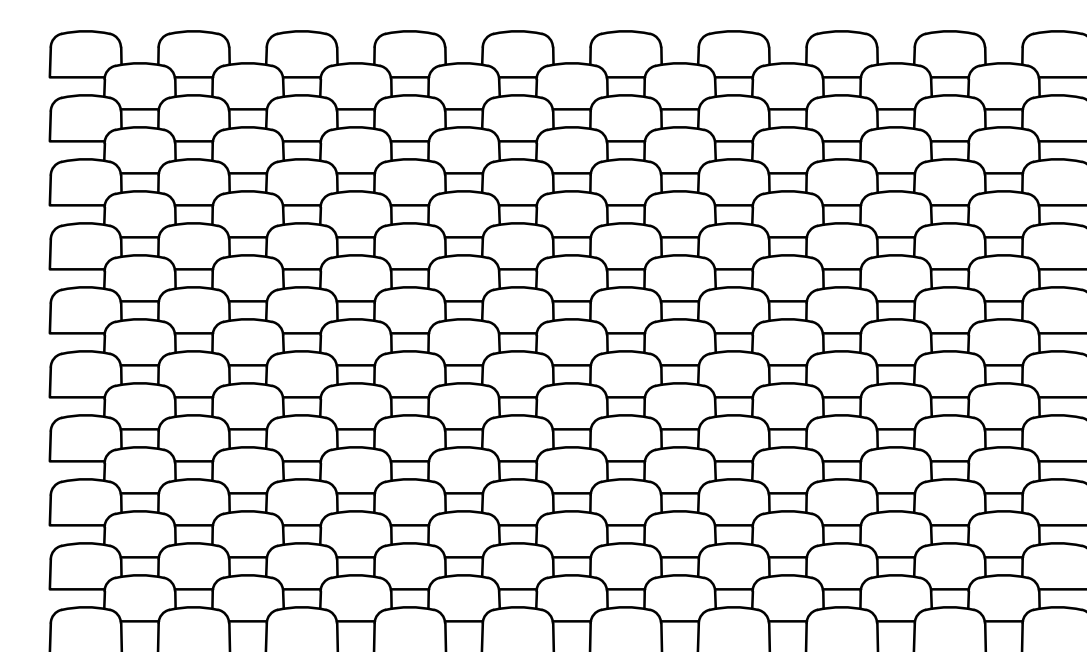
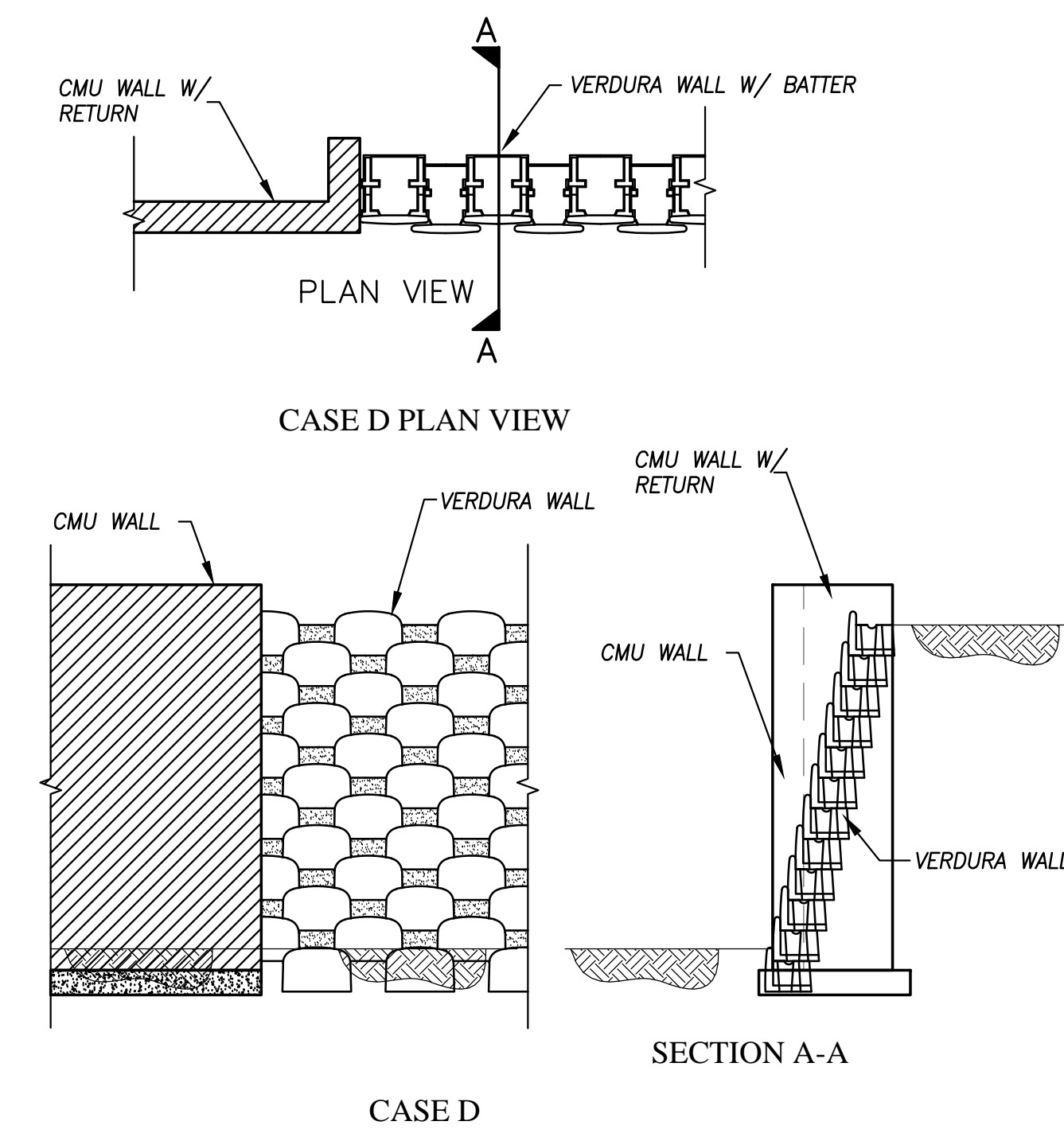
**VERDURA 40 BLOCK DETAIL**  
 SCALE: 1"=20'



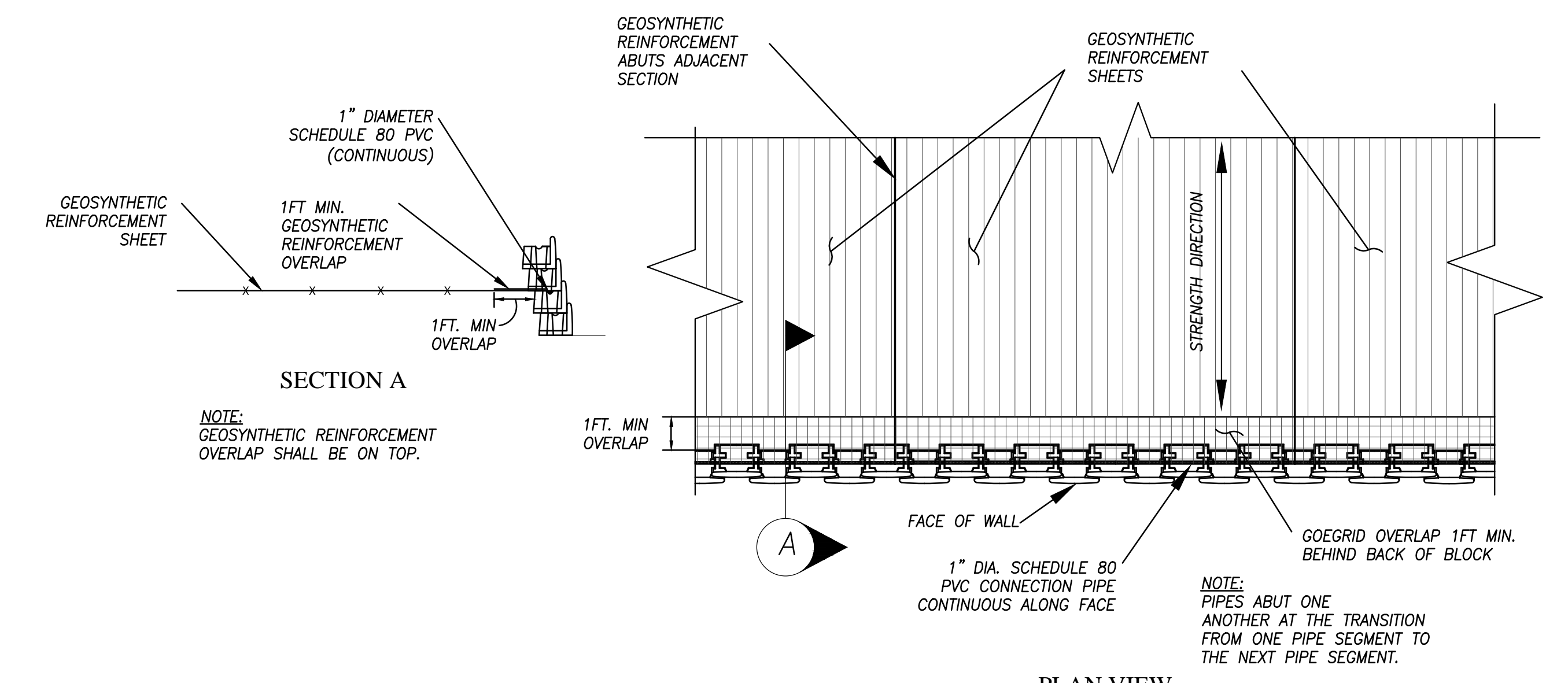
**VERDURA 60 BLOCK DETAIL**  
 SCALE: 1"=20'



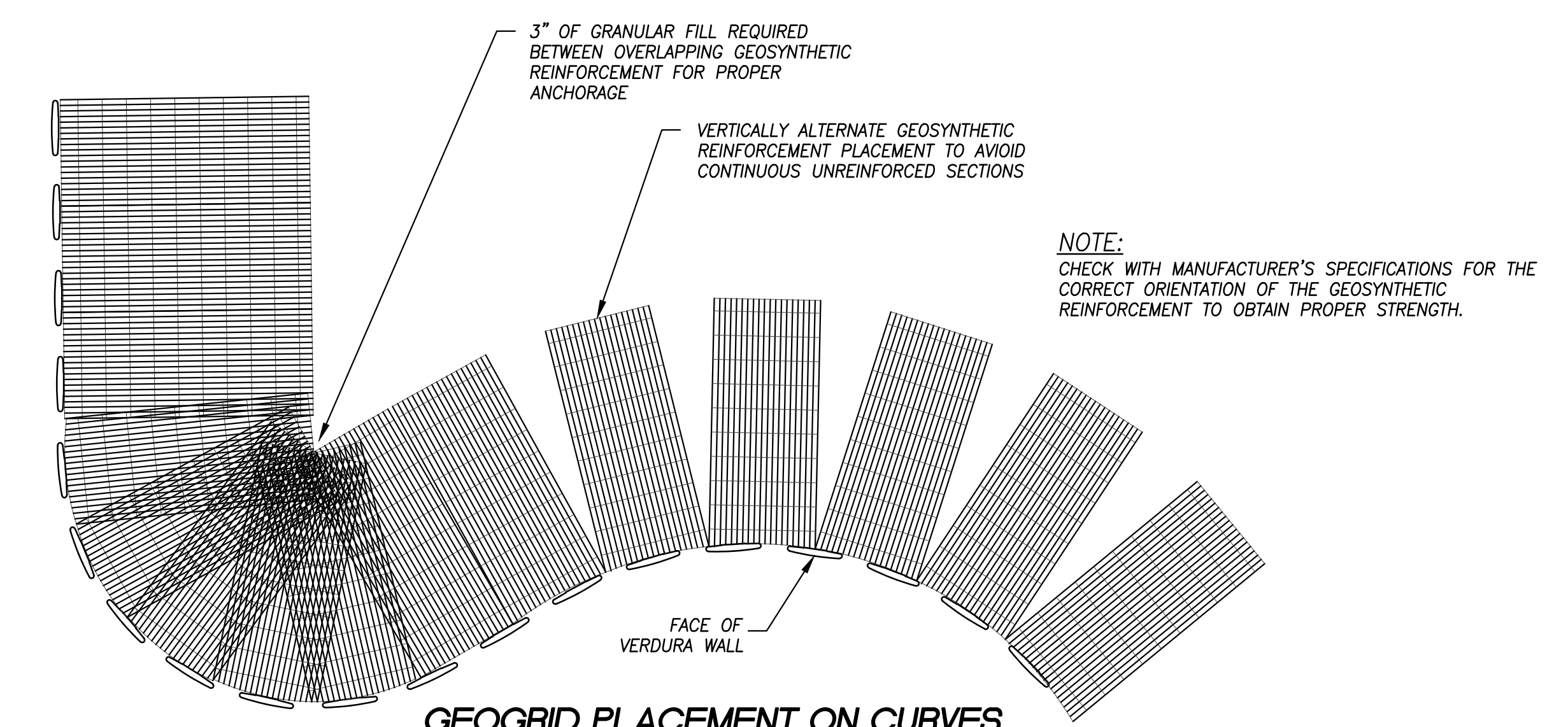
**END OF WALL TRANSITION DETAILS**  
 SCALE: 1"=40'



**FRONT WALL ELEVATION VIEW**  
 SCALE: 1"=4'



**GEOGRID CONNECTION DETAIL**  
 SCALE: 1"=40'



**GEOGRID PLACEMENT ON CURVES**  
 SCALE: 1"=40'

**NOTE:**  
 WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

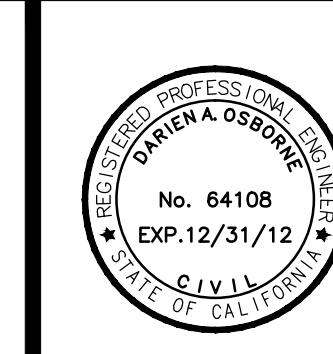
THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE STRUCTURAL DESIGN HEREIN. IN THE EVENT OF DISCREPANCIES AFTER JURISDICTIONAL APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.



I HEREBY CERTIFY THAT THESE PLANS HAVE BEEN PREPARED UNDER MY SUPERVISION.

**SOIL RETENTION DESIGNS INC.**  
 2501 STATE STREET, CARLSBAD, CA 92008 800-346-7995

ENGINEER: DARION A. OSBORNE R.C.E. 64108 DATE



**REFERENCES:**  
 1. TIDWANE TRACT MAP 17300, PREPARED BY HANSHWER AND ASSOCIATES, DATED 04/27/2012.  
 2. GEOTECHNICAL INVESTIGATION, PORTOLA CENTER NORTH, TIDWANE TRACT NO. 17300, LAKE FOREST, CA PROJECT NUMBER 0219-26-01, PREPARED BY GEOTECH, INC. DATED JUNE 28, 2012.  
 3. VERDURA 40/60 PRECAST WALL GEOTECHNICAL DESIGN AND RESPONSE TO PLAIN REVIEW COMMENTS FROM CITY OF LAKE FOREST, PORTOLA CENTER PROJECT (PORTY PROJECT), TTM 17300 LAKE FOREST, CA PROJECT NUMBER 0704-0404.  
 HANSHWER AND ASSOCIATES, INC. PREPARED BY SOIL RETENTION DESIGNS, DATED 08/10/2012.  
 DESIGNED BY: DAO  
 DRAWN BY: CU  
 CHECKED BY: DAO  
 PLAN DATE: 08/10/2012

**VERDURA SEGMENTAL WALL DRAWINGS**  
 PORTOLA CENTER  
 TTM 17300 NORTH PARCEL  
 LAKE FOREST, CA  
 STANDARD DETAILS

Z

of 7 SHEETS

COUNTY: FILE NO: