

NASSPA STEEL SHEET PILING SYMPOSIUM

PRESENTS:

ALTERNATE, ANCHORED, STEEL SHEET PILE
BULKHEAD PROVIDES TIME AND COST SAVINGS

BY:

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HISTORICAL PROGRESSION OF RETAINING WALL SYSTEMS

- Masonry walls (stone, brick, or block)
- Concrete walls
- Steel sheet pile walls
- Mechanically Stabilized Earth Walls (RECO)
- Diaphragm/Slurry Walls
- Precast Concrete Gravity Walls
- Tiedback Soldier Beam Walls
- Tangent/Secant Pile Walls
- Soil Nail/Shotcrete Walls
- Segmental Block/Geogrid Walls (SRW)
- Next new wall system?

WALL SELECTION CONSIDERATIONS

- Cut or fill situation
- Performance
- Cost
- Availability
- Durability
- Construction ease and speed
- Aesthetics

PROJECT BACKGROUND

- Construct 5 level, luxury, residential condo complex in Horsham, Pennsylvania
- Proposed site plan included a detention basin and lake area
- Provide adequate residential living area in picturesque setting
- At-grade parking area under elevated podium slab with 4 stories dedicated to 250 residential units



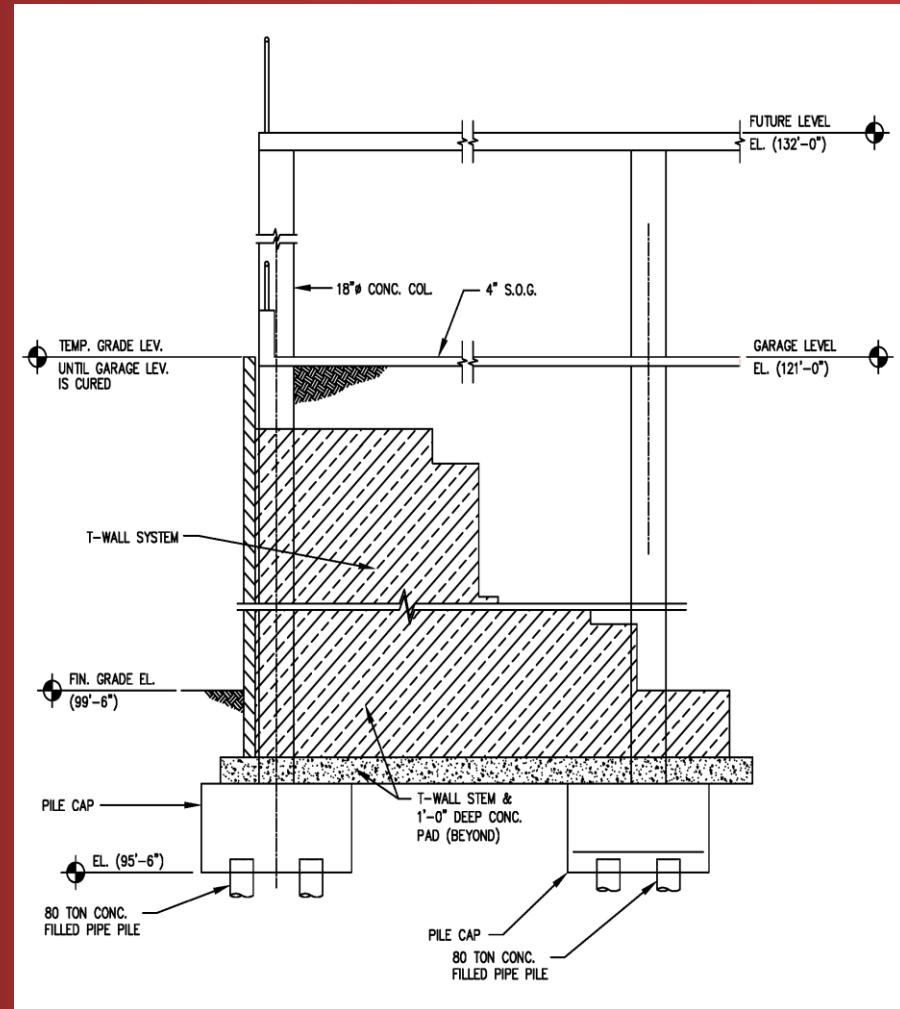
PROJECT CHALLENGES

- 75% of site situated below 100 year flood plain of Pennypack Creek and adjacent tributary
- Plan required retaining wall around 80% of site with significant cut, fill, and dewatering
- Horseshoe footprint



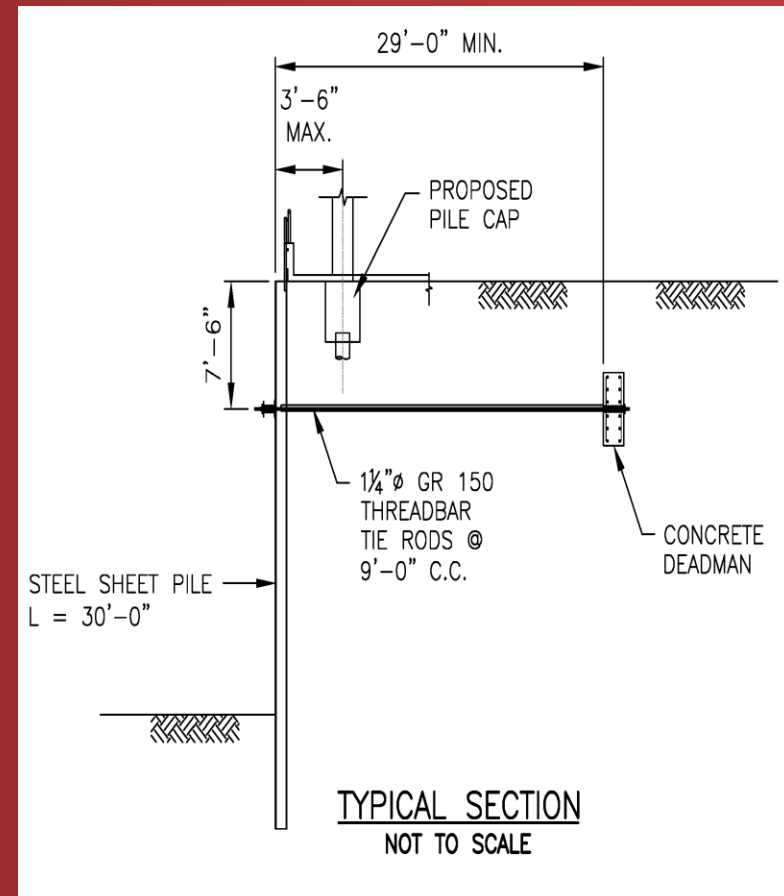
ORIGINAL DESIGN CONCEPT

- T-Wall Retaining Wall System to accommodate grade changes required by basin/lake area & at-grade parking
- Requiring excavation, dewatering, crushed stone borrow backfill & temporary earthen berm
- Project over budget
- Cancel project?
- Cost saving options?

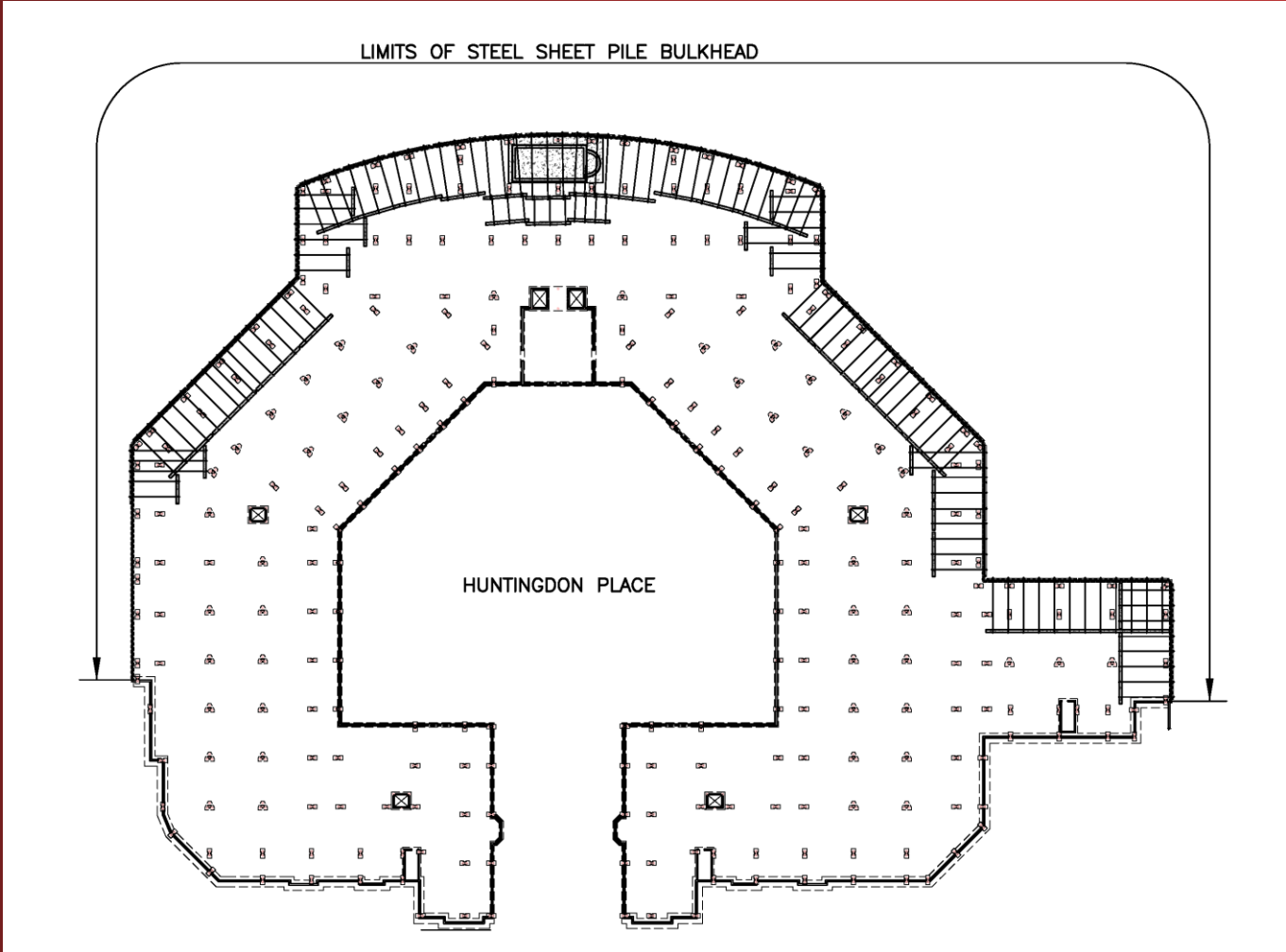


ALTERNATE WALL CONCEPT

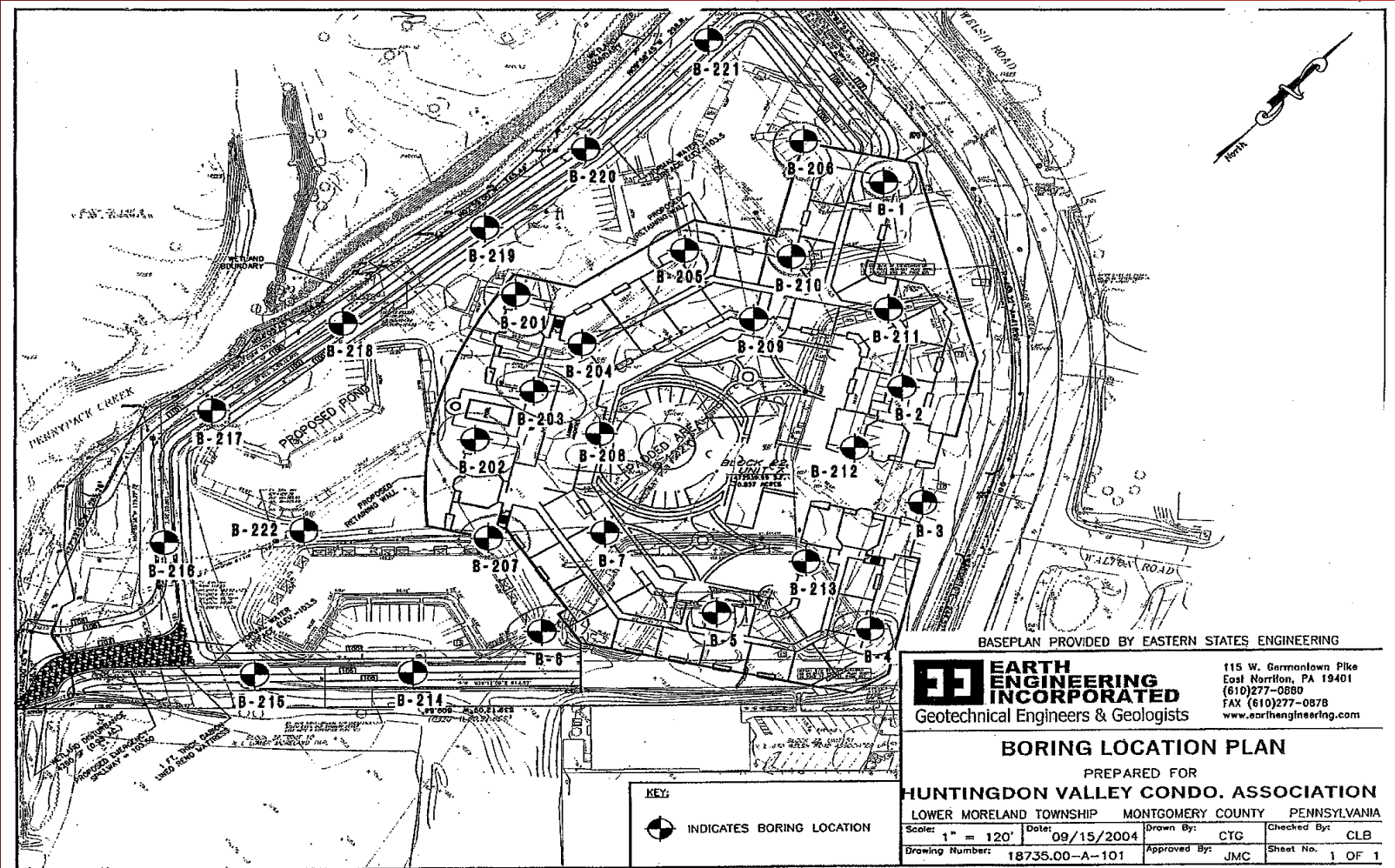
- Critical components driving costs and schedule
 - Flood area
 - In-situ soils
 - Wall excavation and pile foundation
 - 40,000 cy clean stone borrow for T-Wall backfill
- SSP wall tied back to a reinforced concrete deadman
- Eliminate dewatering, stone borrow, and temporary berm or sheeting wall
- 1400 lf, 21 ft exposed above mud line
- Time and cost savings
- Project given “Green Light”



BULKHEAD LAYOUT



SOIL CONDITIONS



BASEPLAN PROVIDED BY EASTERN STATES ENGINEERING

EARTH ENGINEERING INCORPORATED
 Geotechnical Engineers & Geologists

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 East Norriton, PA 19401
 (610)277-0880
 FAX (610)277-0878
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BORING LOCATION PLAN

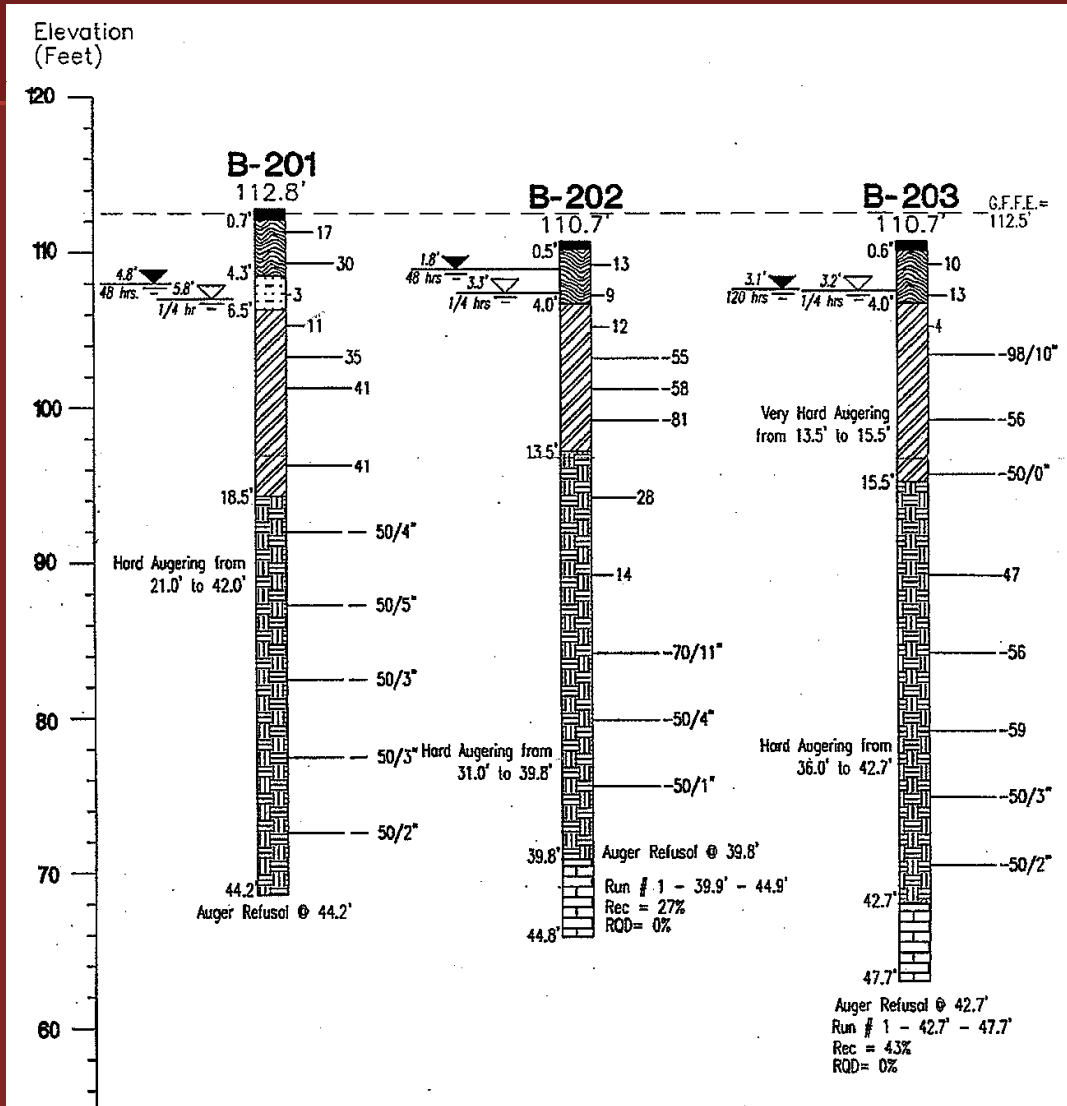
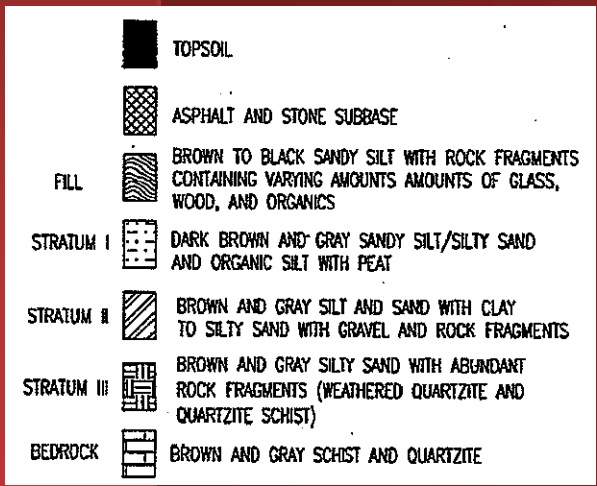
PREPARED FOR
HUNTINGDON VALLEY CONDO. ASSOCIATION

LOWER MORELAND TOWNSHIP MONTGOMERY COUNTY PENNSYLVANIA

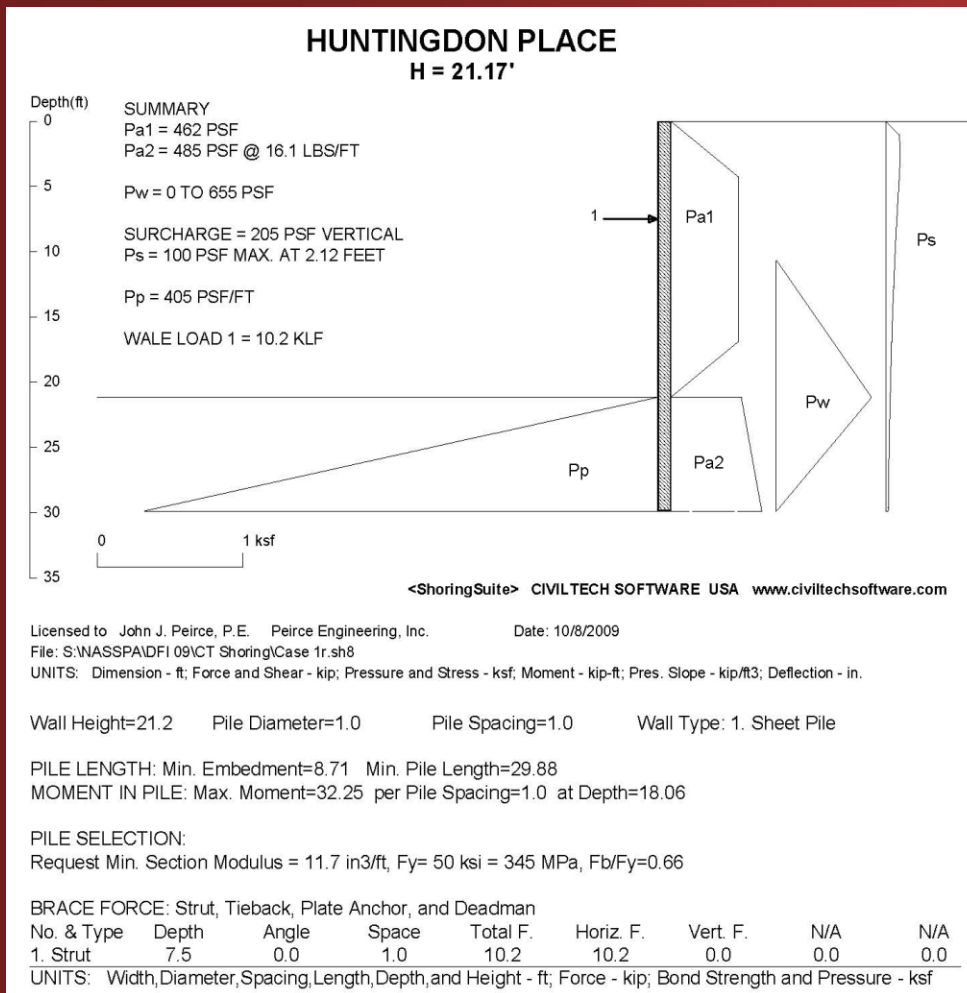
Scale: 1" = 120' Date: 09/15/2004 Drawn By: CTG Checked By: CLB

Drawing Number: 18735.00-A-101 Approved By: JMC Sheet No. 1 OF 1

SOIL CONDITIONS



BULKHEAD DESIGN



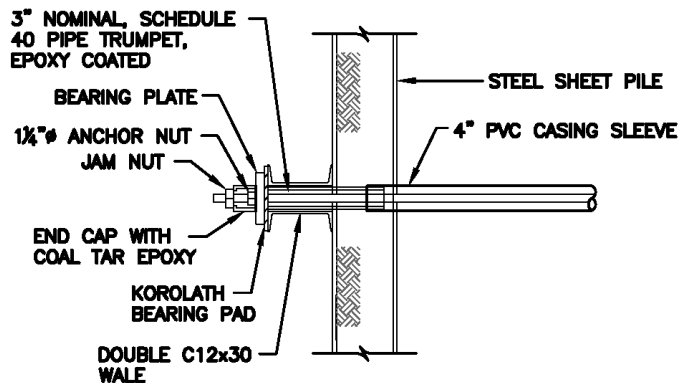
- Shoring Suite Plus, Version 7.3
- Single tier, braced system with a trapezoidal earth pressure distribution

DESIGN RESULTS

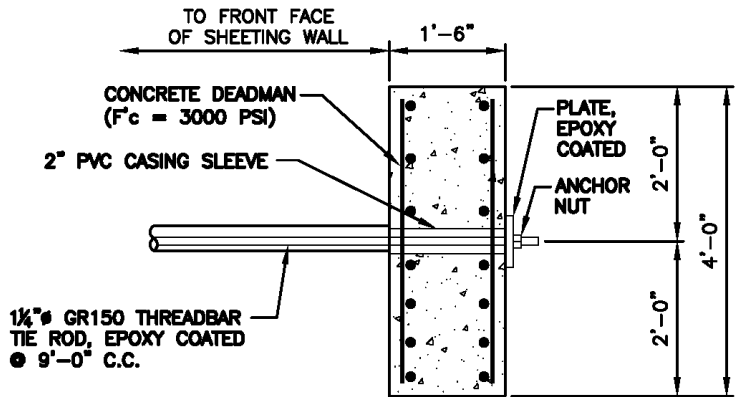
- Required SSP Section Modulus = $11.7 \text{ in}^3/\text{ft}$, $F_y = 50 \text{ ksi}$
- Braced SSP length = 30 ft min., Cantilevered SSP length = 20 ft min.
- Wale load = 10.2 klf
- C12X30 wales w/ $1\frac{1}{4}$ in. diameter, Grade 150, epoxy coated threadbar tie rods
- Reinforced concrete deadmen



TIE ROD AND DEADMAN DETAILS



TIE ROD WALE DETAIL



DEADMAN DETAIL

CORROSION PROTECTION

- Fresh water and clean on-site soils
- Non-aggressive corrosion conditions
- Coal tar epoxy coated to 5 feet below finished grade
- Coal tar epoxy coated tie rods, wales, & bearing plates
- Electrical isolation pad
- Anchor head caps & trumpets



SSP INSTALLATION

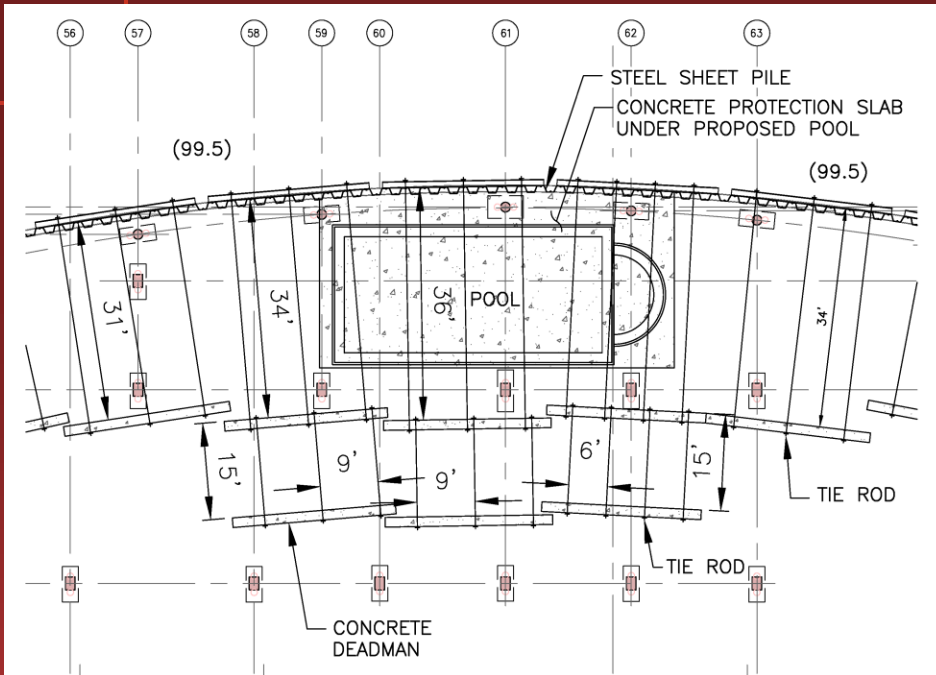


CONSTRUCTION ISSUES

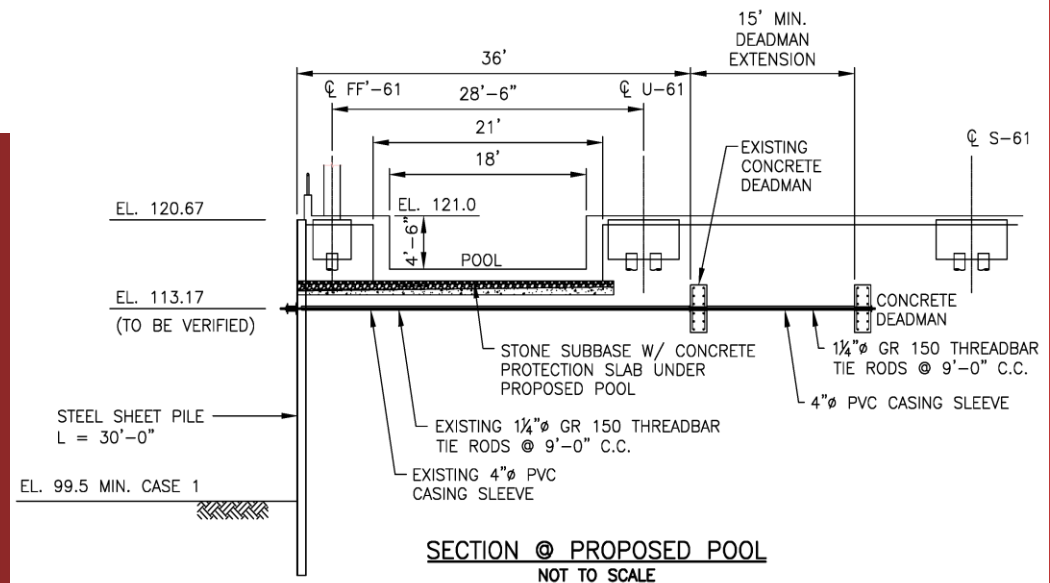
- Install tie rods and deadmen around driven foundation piles
- Multiple construction operations performed simultaneously
- SSP wall alignment



CONSTRUCTION ISSUES



- After SSP wall construction, install indoor swimming pool within parking level, under podium slab, overlooking lake
- Pool interference with tie rods & concrete deadmen



COMPLETED INDOOR POOL



COMPLETED SSP BULKHEAD AND BASIN/LAKE



PROJECT BENEFITS

- Reduced earthwork package
- Eliminated stone borrow
- Eliminated costly dewatering
- Four month schedule reduction
- \$3 Million cost savings
- Swimming pool



HUNTINGDON PLACE



THANK YOU

Peirce Engineering, Inc.

Civil ~ Construction Engineering

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