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# ENCE 461

## Foundation Analysis and Design



Overview of Design Project

# Design Project Goals

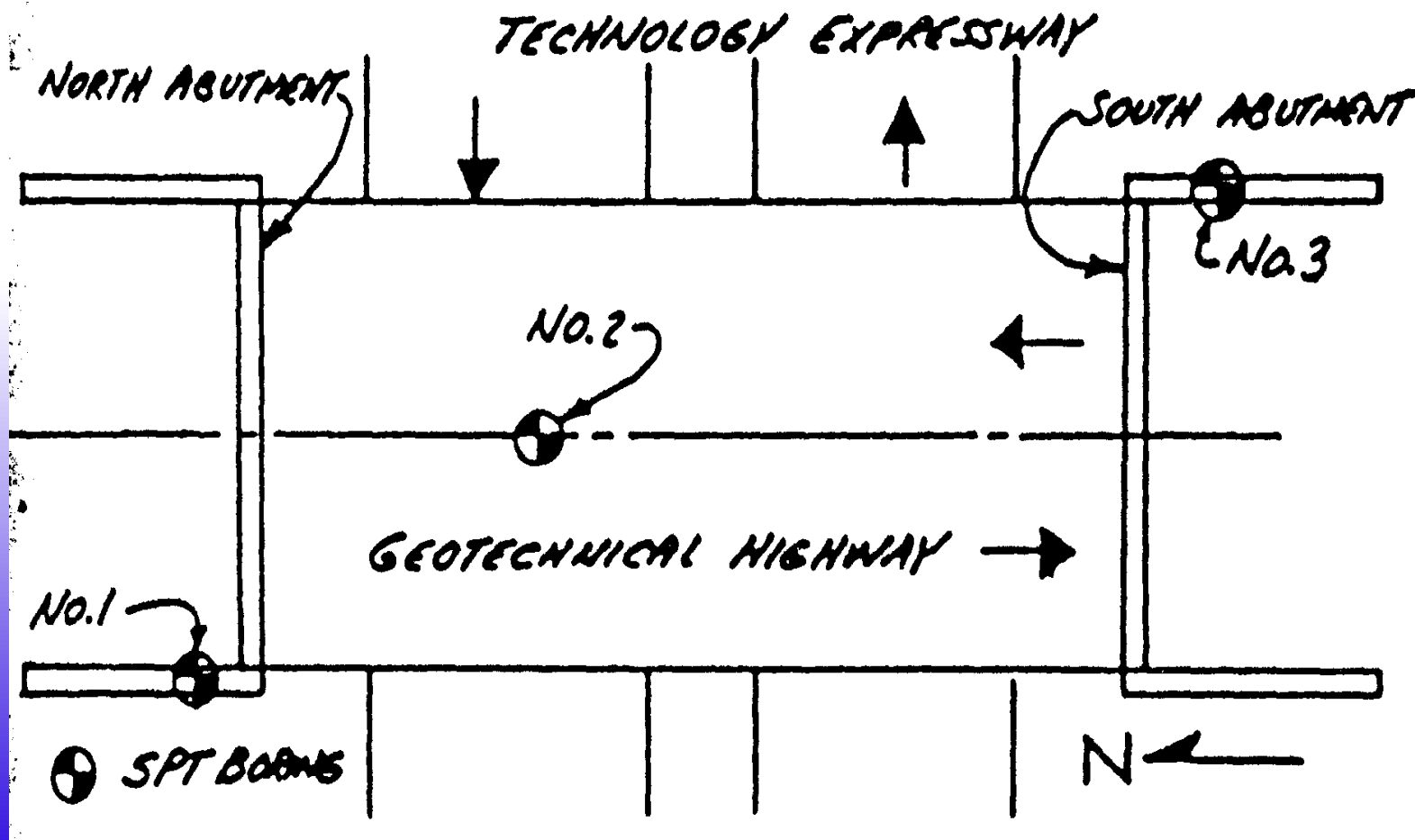
- Basic Task
  - To design a foundation for a structure, or
  - To analyse an existing foundation design and confirm its ability to withstand the loads, both geotechnically and structurally, or to propose an alternative to the existing design
- Reporting
  - Written Report
  - Presentation in front of class
- Project and Presentations due week of 15 April 2002

# Topic Selection

- "Default" topics
  - Option 1: Design of pile foundation for bridge abutments for overpass
  - Option 2: Sheet pile design for marine bulkhead
- Student selected topics
  - Must be a substantial foundation design project
  - Subject to instructor approval
  - Due date for student selected topics: 4 March 2002

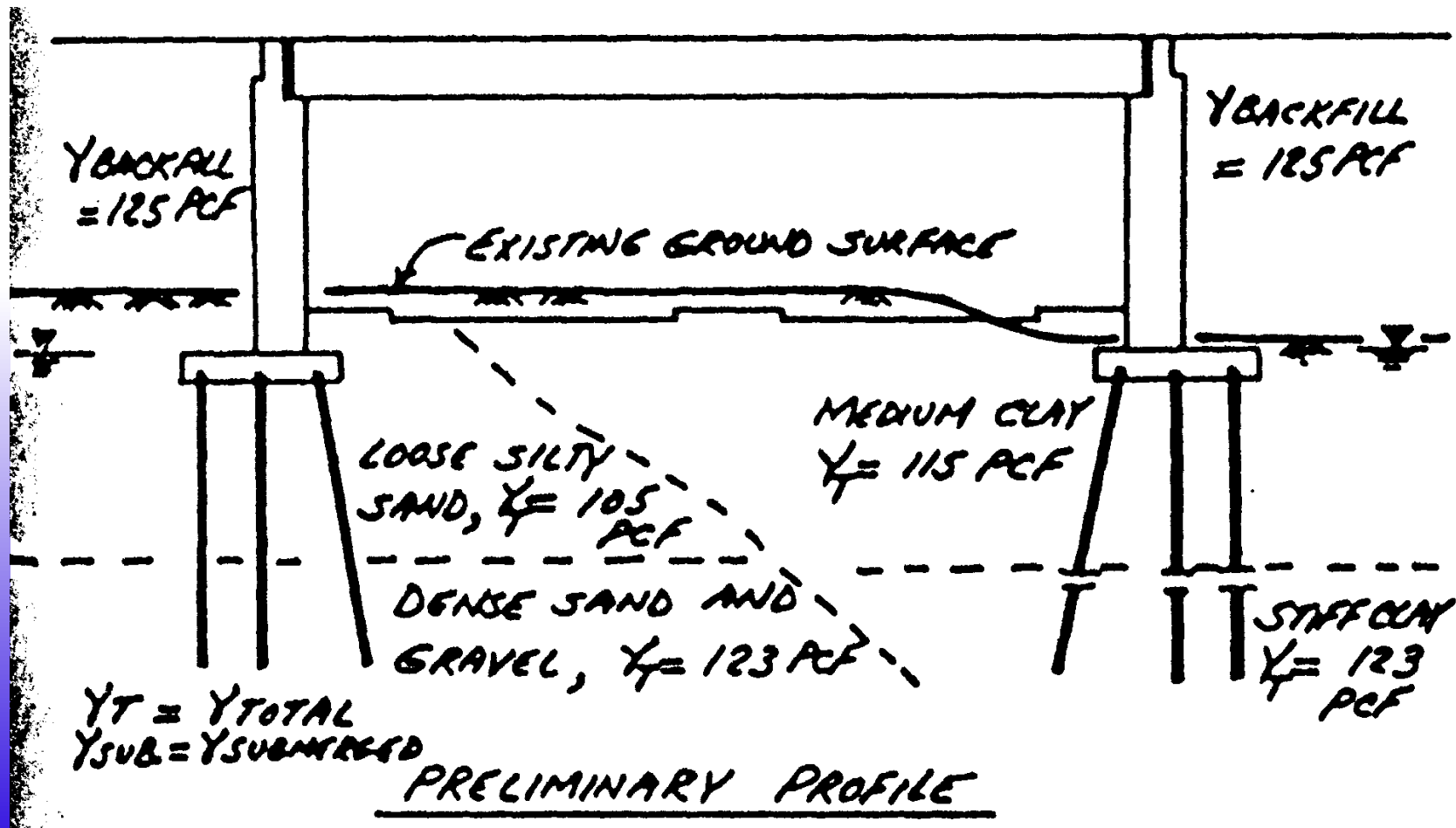
# Pile Design Project

- Bridge Overpass as shown (plan view)



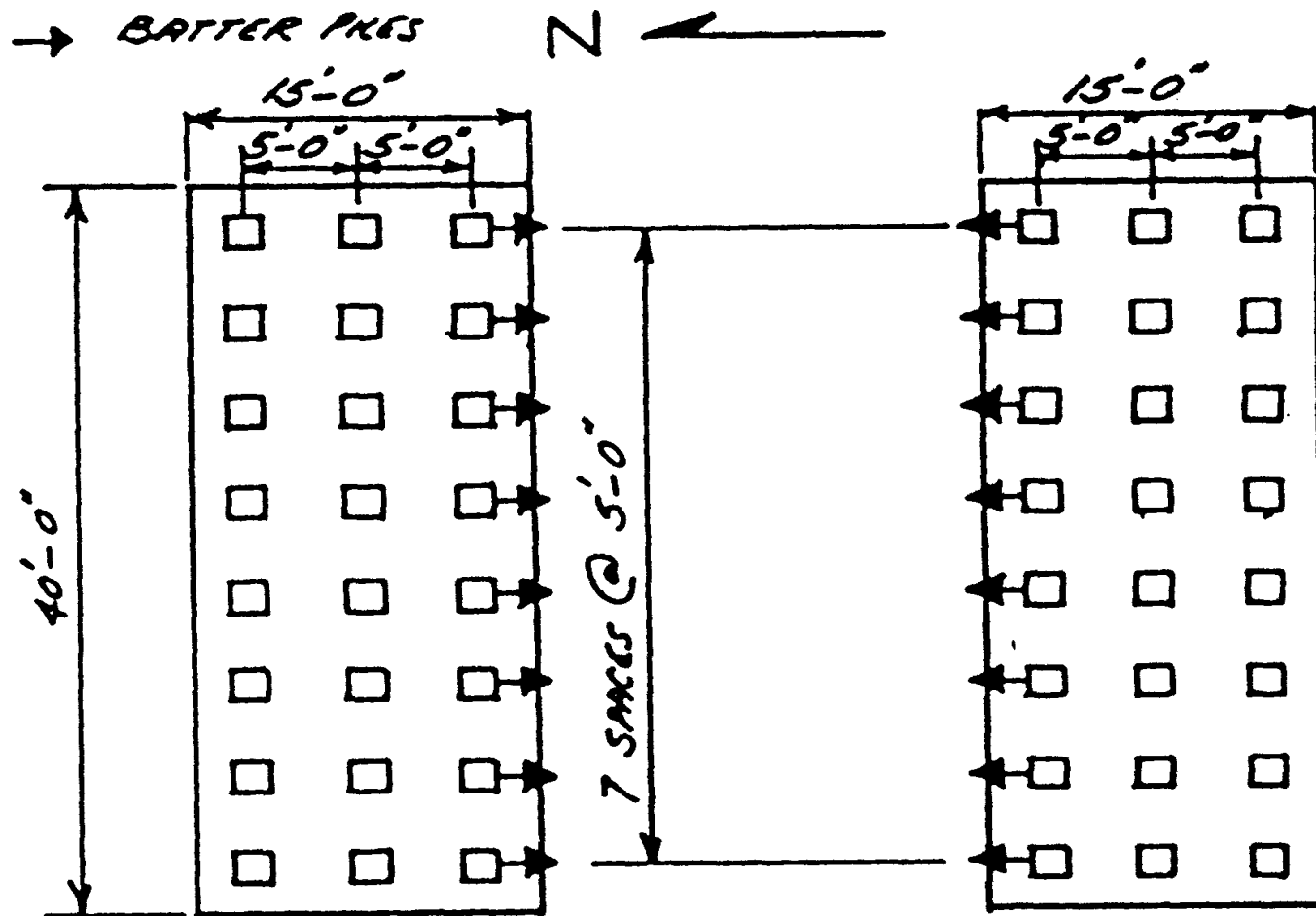
# Pile Design Project

- Bridge overpass as shown (elevation view)



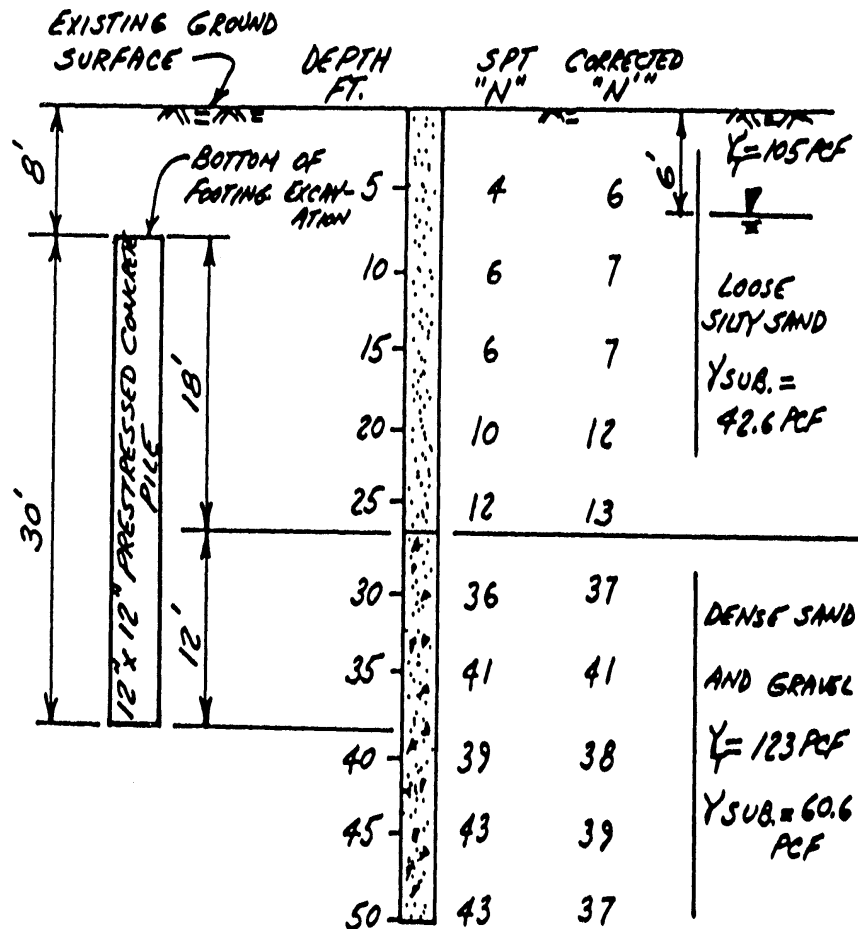
# Pile Design Project

- Preliminary Pile Layout (North Abutment, Boring #1)
- Preliminary Pile Layout (South Abutment, Boring #3)

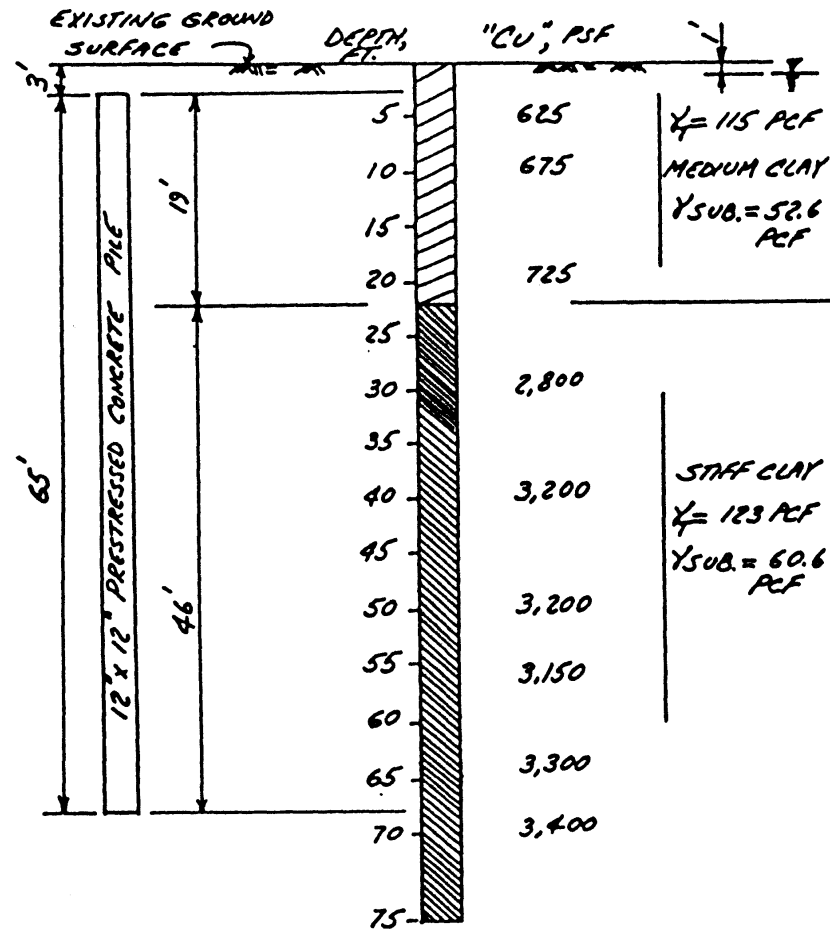


# Pile Design Project

- Typical Soil Profile (North Abutment, Boring #1)



- Typical Soil Profile (South Abutment, Boring #3)





# Pile Design Project

- Notes on pile configuration
  - All piles are 12" x 12" square prestressed concrete piles
  - Trial pile lengths
    - North abutment: 30'
    - South abutment: 45'
  - Total Design Load on each group: 850 tons (1700 kips)
  - Maximum preliminary design load on each pile: 60 tons (120 kips)
    - Front piles are assumed to carry more of the load than middle and rear piles

# Pile Design Project

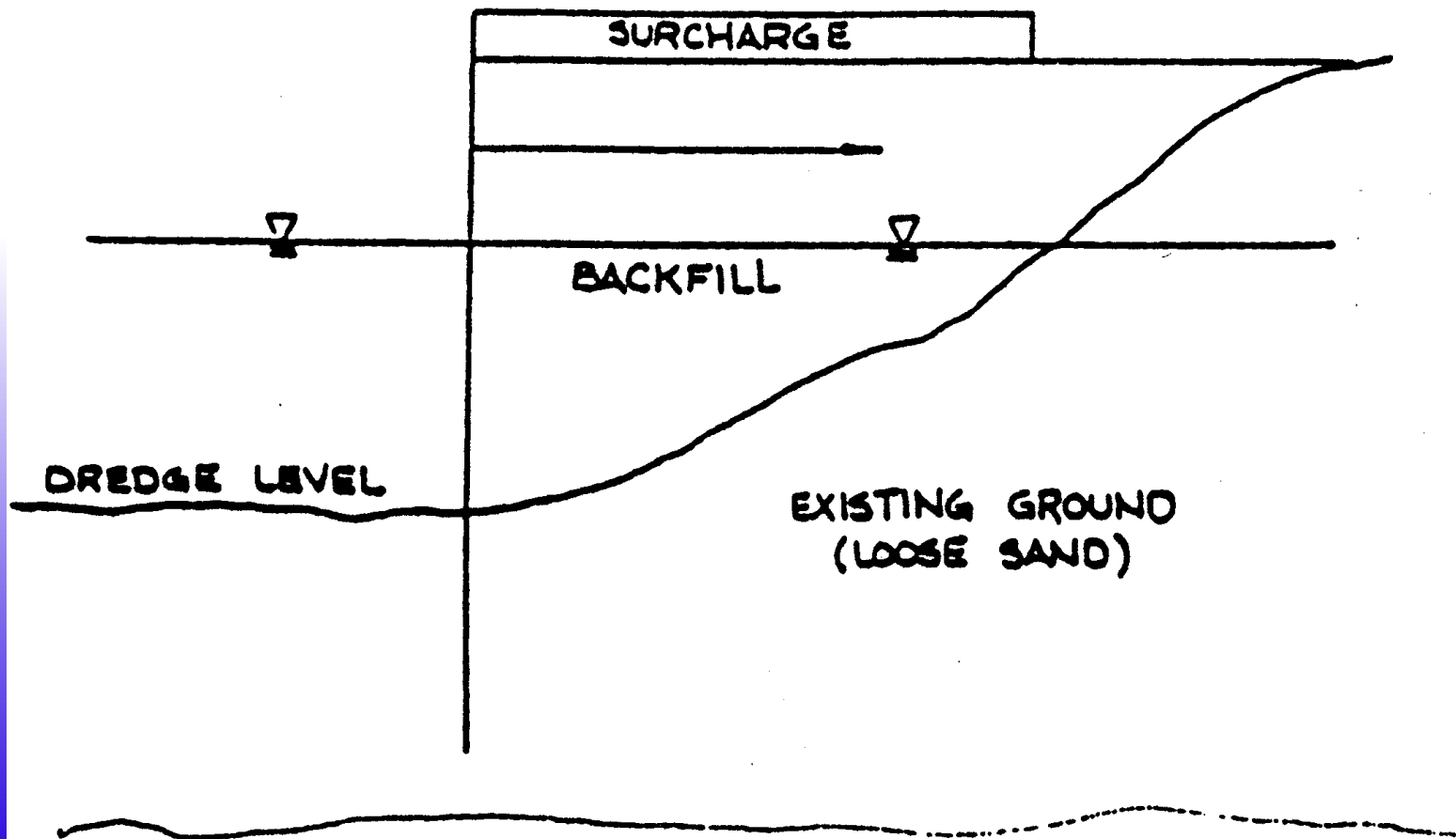
- Objectives of Pile Design Project
  - Determine structural integrity of piles
  - Determine Pile Individual Vertical Load Capacity
  - Determine Pile Group Vertical Load Capacity
    - Analyse for block failure if necessary
  - Determine Pile Individual and Group Settlements
  - Perform Dynamic Analysis (wave equation) and recommend suitable hammer for driving the pile

# Pile Design Project

- Alternative Designs
  - Alternative designs are encouraged and can include different driven pile configurations, drilled piles or shallow foundations
  - Analysis of alternative design must be complete and include all considerations shown for driven piles (see previous slide)
- Computer tools available for analysis
  - DRIVEN (FHWA program; available on website)
  - IHCWAVE (given out in class)
- Should perform at least one manual check on pile capacity

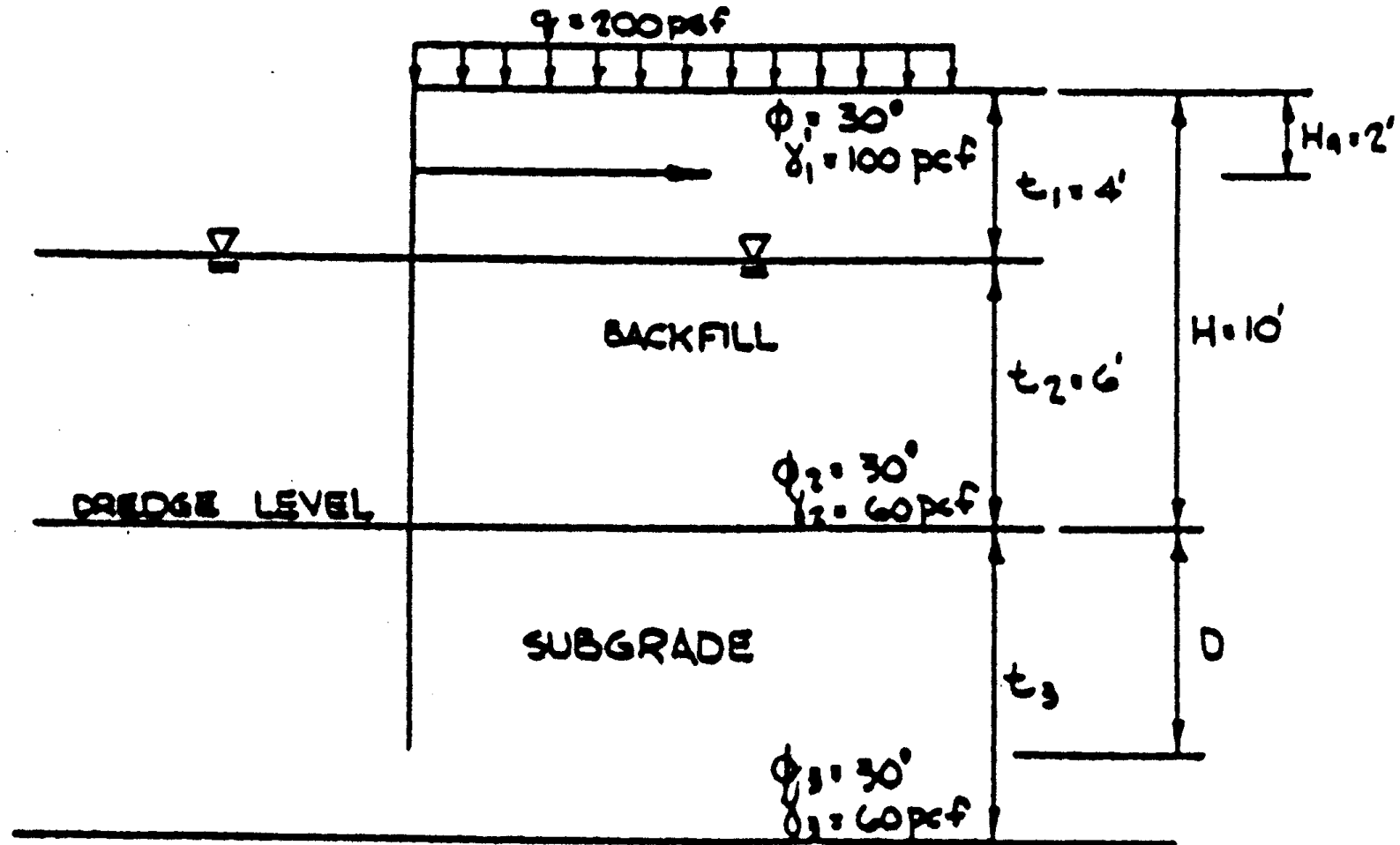
# Sheet Pile Bulkhead Design Project

- Original Profile and Proposed Sheeting Wall



# Sheet Pile Bulkhead Design Project

- Simplified profile and soil data



# Sheet Pile Bulkhead Design Project

- Project objectives
  - Determine necessary penetration depth of sheet piling
  - Determine maximum bending moment
  - Select a suitable sheet pile for the application
  - Determine total anchor load per foot of wall, tie rod spacing and pull; make preliminary proposal on tie rod design
- Optional objectives
  - Consider cantilever wall design (without tiebacks)
  - Consider use of pultruded fiberglass sheeting
  - Consider use of non-sheeting type wall

# Sheet Pile Bulkhead Design Project

- Analysis tools available
  - SPW 911 v. 2.0 (given in class)
    - FAQ's concerning SPW 911 can be found at <http://www.pilingsoftware.com>
- Reference materials available
  - *Pile Buck Steel Sheet Pile Design Manual* (given in class)
  - Pultruded sheet pile design guide and other information can be found at <http://www.compositez.com>

# General Report Outline

- Letter of transmittal
- Title Page
- Table of Contents
- Purpose and Scope
- Background or Introduction
- Discussion
- Conclusions
- Recommendations
- Appendix
- Other Report Requirements
  - To be turned in when presentation is made
  - Report must meet the "Guidelines and Requirements for Reports and Presentations" (on website)

# Presentation Format

- Presentation graphics can be either with presentation graphics or with view graphs
- Presentations should be fifteen (15) minutes in length
  - Ten (10) minutes for the presentation
  - Five (5) minutes for questions
- Other requirements are contained in the "Guidelines and Requirements for Reports and Presentations" (downloadable off of the website)

**Questions?**

