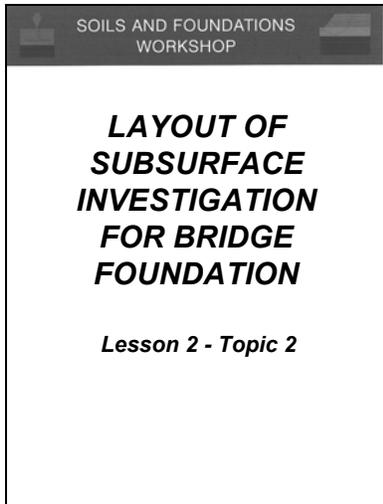


LESSON 2

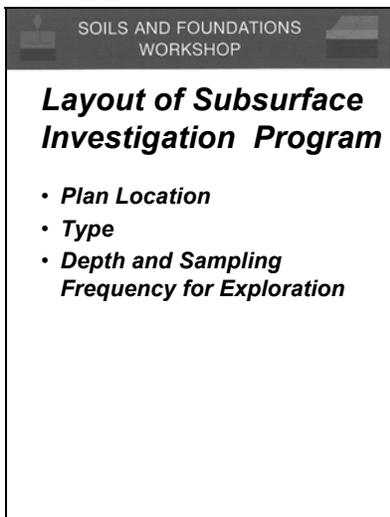
TOPIC 2

Layout of Subsurface Investigation for Bridge Foundation



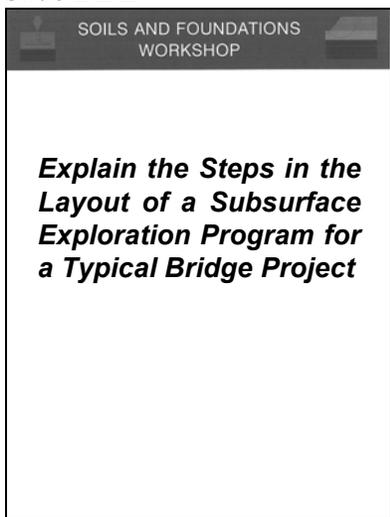
Slide 2-2-1

Instructor introduces the Apple Freeway problem and explains concept of the serialized Apple Freeway problem is to tie geotechnical concepts in each lesson into a project design. The students will help the instructor design the Apple Freeway by providing pertinent information which was learned in the lesson. The first step in the project is the site investigation.



Ask the students to recall the guidelines for these items which we just went over in the lesson. Ask the group what information would be used from a plan location to establish a site investigation; ask similar questions for type and depth and sampling frequency.

Slide 2-2-2



Ask the students this question which should evoke the response that we use terrain reconnaissance information, site inspection information and preliminary information about the design to plan exploration layout.

Slide 2-2-3

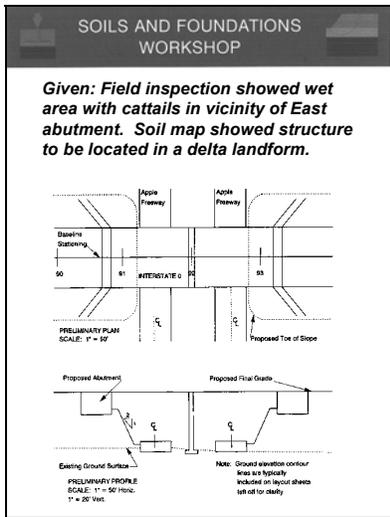
NHI Course 132102 – Soils and Foundations Workshop

SOILS AND FOUNDATIONS WORKSHOP	
Site Exploration	Terrain Reconnaissance
	Site Inspection
Basic Soil Properties	Subsurface Borings
Laboratory Testing	
Slope Stability	
Embankment Settlement	
Spread Footing Design	
Pile Design	
Construction Aspects	

Then show the introductory overhead which will be used to track the progress of the Apple Freeway design. Ask the group to apply their site investigation knowledge to layout a subsurface exploration program for the project shown on the next overhead.

This is the first test of learning and should be done by the group rather than by asking individuals.

Slide 2-2-4

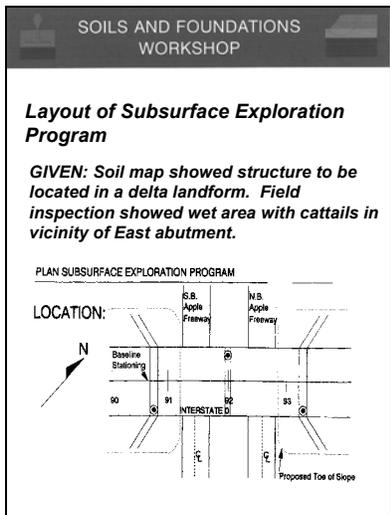


Display this overhead, read the given information and ask the students to plan the exploration program.

The instructor should begin use of the flip chart at this point to record group answers. Draw the plan view roughly at the top of the flip chart sheet prior to asking and recording answers below the plan. Do this neatly as you will want the student team to later record neatly and explain answers to subsequent exercises on flip chart sheet.

After recording the information, post the sheet on the wall of the room in such a location that later sheets of exercises can be placed sequentially to build the project design.

Slide 2-2-5



After the student responses are listed, ask the students to open the reference manual to the Apple Freeway site exploration problem at the end of Chapter 2. Summarize how you used the concepts in your thought process to arrive at the solution shown here. Compare the results here to the student solution and add any important items left out to the flip chart sheet. Then walk the students through the other pages of the reference manual which complete the problem. Use the following overheads to make important points.

Please refer to the end of the lesson for a full size version of this slide.

Slide 2-2-6

Please refer to the end of the lesson for a full size version of this slide.

SOILS AND FOUNDATIONS WORKSHOP

Layout of Subsurface Exploration Program (cont'd)
TYPE: Disturbed SPT sample boring
 Hand Auger holes in wet area within East approach fill limits
DEPTH: SPT holes to depth where N average equals 20 for 20' depth or 10' into bedrock whichever depth is less.
SAMPLING: Pier footing: Continuous SPT samples to depth of 15', Then 5' Intervals. East and West abutments: Disturbed SPT every 5'.
REMARKS: Since area a delta landform, granular deposits overlying clay may be encountered. If so, an undisturbed drill hole (UDH) will be required. The location, depth, and sampling details will be selected based on the results of the three SPT borings. Notify the drillers of possibility of UDH and vane shear so necessary equipment can be taken to site. Long term water level readings should be taken in one hole.

Slide 2-2-7

SOILS AND FOUNDATIONS WORKSHOP

REGION 3	SUBSURFACE EXPLORATION LOG	HOLE	BAF-1
COUNTY Orange		LINE	Bayview
PROJECT Interstate 5		STA.	20017
DATE START 5/2/92	SURFACE ELEVATION 100	DEPTH TO WATER	15'
DATE FINISH 5/2/92	NUMBER FALL-CASING 18"	OFFSET	1000.1
CASING O.D. 2 1/4"	NUMBER FALL-CASING 18"	STA.	20017
SAMPLER O.D. 2 1/4"	WEIGHT OF WANNER-SAMPLER 185	DEPTH TO WATER	15'
RIG TYPE Asker 8-50			
CORE BARREL Double Tube			

DEPTH (ft)	DEPTH (in)	DESCRIPTION OF SOIL AND ROCK	SPT
0	0		
1	1		
2	2		
3	3		
4	4		
5	5		
6	6		
7	7		
8	8		
9	9		
10	10		
11	11		
12	12		
13	13		
14	14		
15	15		
16	16		
17	17		
18	18		
19	19		
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58	58		
59	59		
60	60		

THE SUBSURFACE INFORMATION SHOWN HEREIN WAS OBTAINED FROM TESTS CONDUCTED AND ESTIMATE PROVIDED BY THE DRILLER. THIS INFORMATION IS NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES WITHOUT THE APPROVAL OF THE DRILLER. THIS INFORMATION IS NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES WITHOUT THE APPROVAL OF THE DRILLER. THIS INFORMATION IS NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES WITHOUT THE APPROVAL OF THE DRILLER.

DRILL RIG OPERATOR: K11111111
 SOIL & ROCK DESIGN: 11111111
 REGIONAL SOIL ENGINEER: 11111111
 DATE: 5/2/92
 STRUCTURE NAME: Apple Freeway #2
 CONTRACTOR: 11111111
 HOLE: BAF-1

Slide 2-2-8

SOILS AND FOUNDATIONS WORKSHOP

REGION 3	SUBSURFACE EXPLORATION LOG	HOLE	BAF-1
COUNTY Orange		LINE	Bayview
PROJECT Interstate 5		STA.	20017
DATE START 5/2/92	SURFACE ELEVATION 100	DEPTH TO WATER	15'
DATE FINISH 5/2/92	NUMBER FALL-CASING 18"	OFFSET	1000.1
CASING O.D. 2 1/4"	NUMBER FALL-CASING 18"	STA.	20017
SAMPLER O.D. 2 1/4"	WEIGHT OF WANNER-SAMPLER 185	DEPTH TO WATER	15'
RIG TYPE Asker 8-50			
CORE BARREL Double Tube			

DEPTH (ft)	DEPTH (in)	DESCRIPTION OF SOIL AND ROCK	SPT
0	0		
1	1		
2	2		
3	3		
4	4		
5	5		
6	6		
7	7		
8	8		
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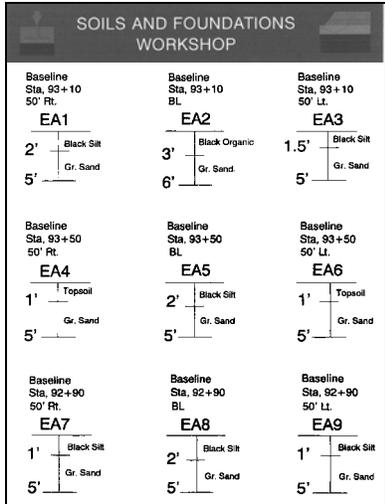
THE SUBSURFACE INFORMATION SHOWN HEREIN WAS OBTAINED FROM TESTS CONDUCTED AND ESTIMATE PROVIDED BY THE DRILLER. THIS INFORMATION IS NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES WITHOUT THE APPROVAL OF THE DRILLER. THIS INFORMATION IS NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES WITHOUT THE APPROVAL OF THE DRILLER. THIS INFORMATION IS NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES WITHOUT THE APPROVAL OF THE DRILLER.

DRILL RIG OPERATOR: K11111111
 SOIL & ROCK DESIGN: 11111111
 REGIONAL SOIL ENGINEER: 11111111
 DATE: 5/2/92
 STRUCTURE NAME: Apple Freeway #2
 CONTRACTOR: 11111111
 HOLE: BAF-1

Slide 2-2-9

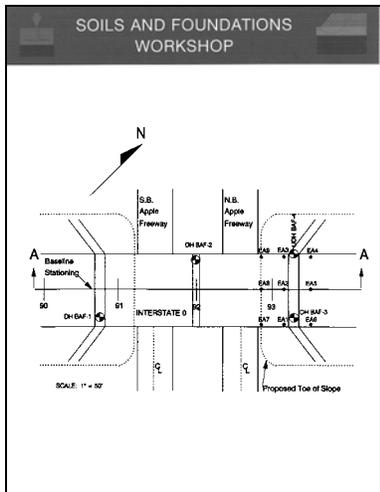
After describing the make-up of the log form (location, elevation, water table, penetration data, visual data, etc.) ask the group to give you the SPT N value for one of the samples. Ask what the change in the SPT value would be if the sampler had been driven 24" and we had 4-6" blow counts instead of 3-6" counts. Impress on the students again that the definition of N is the number of blows to advance the sampler from a penetration of 6" to a penetration of 18". Also mention that the field moisture contents shown here are not common but can be taken by the Speedy method.

Continue with the log description of sheet 2 and summarize the soil profile at the Apple Freeway site (sand over clay over till over rock). Note that the other borings showed the same profile. Also ask the students to turn to the last boring log, BAF-4, note that boring was taken as an undisturbed sample hole and point out the vane shear test locations on the log sheet.



Slide 2-2-10

Ask the group how a designer would use the results from auger borings for this project site. Then explain how auger results are used to estimate quantity of unsuitable removal by the designer and then plotted on the highway cross-sections for the field inspector to use to control excavation limits.



Slide 2-2-11

Show the final boring plan which should be transmitted to the designer with the final logs as soon as possible.

SOILS AND FOUNDATIONS WORKSHOP

Site Exploration

- **Terrain Reconnaissance**
 - Delta Landform - Possible Clay Deposit Buried
- **Site Inspection**
 - Unsuitable Soils Near East Approach Embankment
- **Subsurface Borings**
 - Auger Hole Define Limits and Depth of Unsuitable Organic Deposit
 - SPT Drill Holes Show Sand Over Clay Over Gravel and Rock
 - Undisturbed Samples and Vane Shear Tests Taken in Clay

Slide 2-2-12

Close this session with a summary of the results of the Apple Freeway design. Note that we will provide this summary at the end of every Apple Freeway section to track the progress of the design.

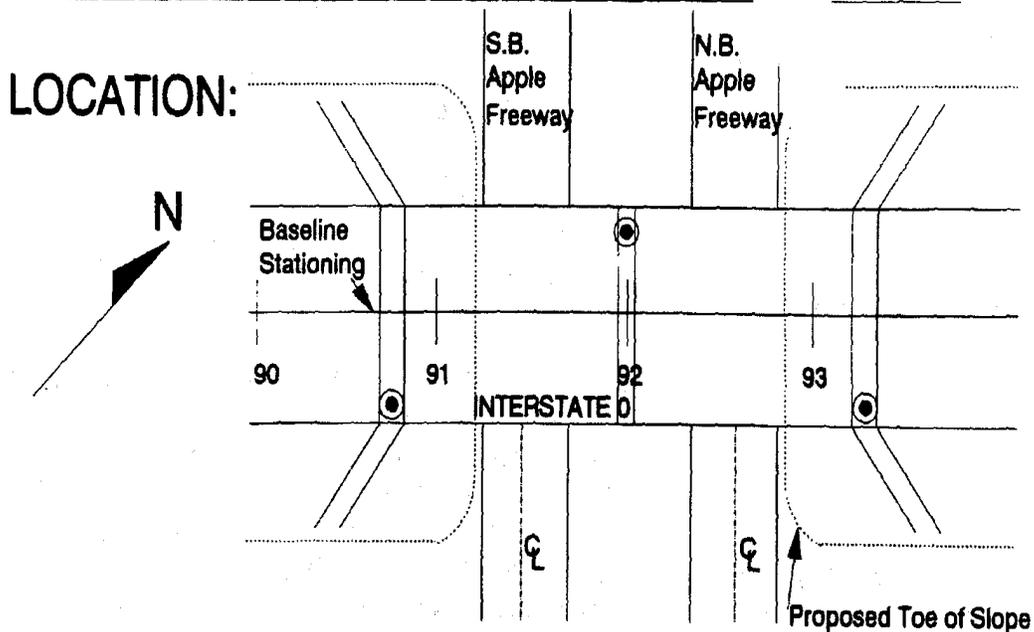
Instructor should promote the NHI Subsurface Investigations course at this point.

SOILS AND FOUNDATIONS WORKSHOP

Layout of Subsurface Exploration Program

GIVEN: Soil map showed structure to be located in a delta landform. Field inspection showed wet area with cattails in vicinity of East abutment.

PLAN SUBSURFACE EXPLORATION PROGRAM



SOILS AND FOUNDATIONS WORKSHOP

Layout of Subsurface Exploration Program (cont'd)

***TYPE: Disturbed SPT sample boring
Hand Auger holes in wet area within
East approach fill limits***

***DEPTH: SPT holes to depth where N average
equals 20 for 20' depth or 10' into
bedrock whichever depth is less.***

***SAMPLING: Pier footing: Continuous SPT
samples to depth of 15', Then 5'
Intervals. East and West abutments:
Disturbed SPT every 5'.***

***REMARKS: Since area a delta landform,
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selected based on the results of the three
SPT borings. Notify the drillers of
possibility of UDH and vane shear so
necessary equipment can be taken to
site. Long term water level readings
should be taken in one hole.***