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Chapter 1 - Linear Soil Survey Analysis

A Linear Soil Survey Analysis is conducted for roadways that are to be improved, reconstructed or realigned. The object of this analysis is to get a good representation of the soils, soil properties, groundwater conditions, and any other pertinent surface or subsurface information regarding the roadway embankment. The information shall be compiled and studied to generate a report to be used in the design and construction of the roadway. This study may lead to a more detailed and extensive study based on its findings.

1.1 Investigation

- Research the proposed project area.
- Conduct an onsite evaluation of the roadway with the lead man from the maintenance section and any other pertinent staff to identify any maintenance areas that may be a subgrade issue.
- Conduct an onsite review to determine any other possible geotechnical issues that need study.
- Conduct borings at the specified interval in Table 1 longitudinally along the roadway located within a 12' offset of the roadway centerline and also at any identified maintenance areas that appear to be possible subgrade problem areas. If the existing roadway is concrete with asphalt shoulders it is acceptable to conduct the borings in the asphalt shoulder.

Table 1 - Boring Intervals

Project Scope	Boring Interval	
	Urban	Rural
Preventive Maintenance	Identified Areas ^a	Identified Areas ^a
Minor Rehabilitation	Identified Areas ^a	Identified Areas ^a
Structural Improvement	Identified Areas ^a	Identified Areas ^a
Major Rehabilitation	250 feet	500 feet ^b
Reconstruction	250 feet	500 feet ^b
New	250 feet	250 feet

^aThese areas will be distress areas that are identified by the District Maintenance Forces, District Engineering Staff or the Geotechnical Engineer working on the project that appear to be possible subgrade problem areas.

^bThis interval may be modified to 1,000 feet if there is a sufficient amount of information available from recent studies or there is insufficient time to conduct the study.

- Borings shall be conducted with a solid stem auger to the depth specified in Table 2. These depths are based on depth below the proposed pavement.

Table 2 - Boring Depths

Project Scope	Boring Depth	
	Urban	Rural
Preventive Maintenance	5 feet	5 feet
Minor Rehabilitation	5 feet	5 feet
Structural Improvement	5 feet	5 feet
Major Rehabilitation	5 feet	5 feet
Reconstruction	5 feet	5 feet
New	10 feet ¹	10 feet ¹

¹This depth is a minimum. A sufficient depth shall be chosen by the Geotechnical Engineer based on field conditions.

- Measure and record the depth of the existing surfacing layers and base layers to the nearest 0.25 inch.
- Collect samples for determination of field moisture contents at 1 foot intervals beginning 2 feet below the surface.
- Collect bag samples from each of the borings near the proposed subgrade depths. Multiple bag samples may be required if there is an extreme change in soils. Each bag sample shall be a minimum of 10 pounds.
- Observe the water levels or where water bearing soils are encountered.

1.2 Laboratory Work

The following tests shall be run per boring or sample:

- Moisture Content (AASHTO T-265) – 1 per foot of boring
- Proctor Test (AASHTO T-99 or T-180) – 1 per bag sample
- Atterberg Limits (AASHTO T-89 & 90) – 1 per bag sample
- Particle Size Analysis (AASHTO T-88) – 1 per bag sample

1.3 Report and Recommendations

Create a final report and recommendations with the following:

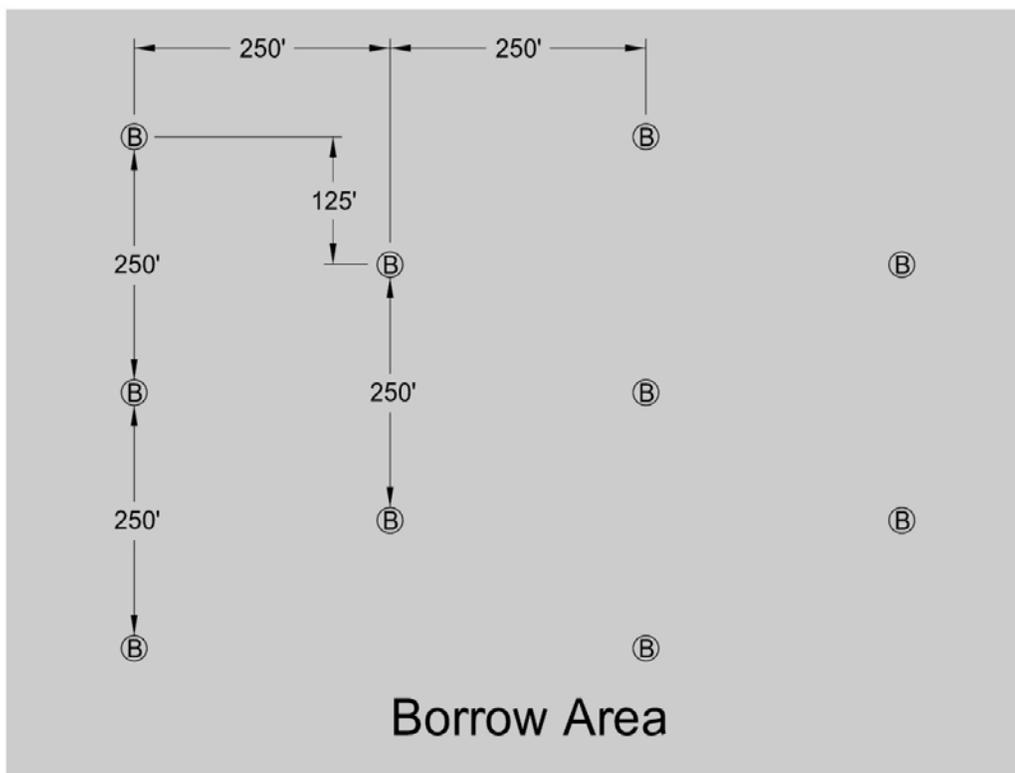
- Summary of Site Conditions
- Summary of drilling and laboratory testing methods
- Summary of findings (AASHTO Classifications)
- Recommendations
 - Subgrade Preparation (Length, Depth, Compaction Control)
 - Subcutting (Length, Depth, Backfilling)
 - Subgrade Drainage
 - Unsuitable Materials
 - Special Construction Methods or Directions
 - Any other observations and recommendations

Chapter 2 - Borrow Investigations

The goal of the borrow investigation is to get a representation of the material that is within the borrow area. Once a Material Source Certificate of Approval (COA) for the Optioned area(s), the geotechnical investigation will include conducting soil borings in order to obtain and analyze samples. A Borrow Area Report will be generated from the data obtained detailing what was found and if it is suitable for the intended use. The milestone actual end date represents the date that the Borrow Area Report has been approved and sent out.

2.1 Investigation

- Research the proposed project area.
- Conduct borings in a grid pattern as shown in Figure 1. This is a general guide for locations of borings. Good judgment in the field shall be used to make sure that a good representation of the borrow material is obtained.



Ⓟ = Boring Location

Figure 1 - Boring Locations

- Borings shall be conducted with a solid stem auger. The depth of the boring shall be determined based on the quantity of material that is proposed to be excavated from the borrow area. The Geotechnical Engineer shall consult with the designer and Borrow Agreements to determine appropriate depths.
- Collect samples for moisture contents at 1 foot intervals beginning 2 feet below the surface.

- Collect bag samples from each of the borings. Multiple bag samples may be required if there is an extreme change in soils. Each bag sample shall be a minimum of 10 pounds.

2.2 Laboratory Work

The following shall be run per boring:

- Moisture Content (AASHTO T-265) – 1 per foot of boring
- Proctor Test (AASHTO T-99 or T-180) – 1 per bag sample
- Atterberg Limits (AASHTO T-89 & 90) – 1 per bag sample
- Particle Size Analysis (AASHTO T-88) – 1 per bag sample

2.3 Report and Recommendations

Create a final report and recommendations with the following:

- Legal description of the borrow area
- Boring locations
- Topographic features
- Summary of site conditions
- Summary of drilling and laboratory testing methods
- Summary of findings (AASHTO Classifications)
- Recommendations