1.0 PURPOSE

This standard outlines the minimum requirements for soil surveys used in the design and assessment of highway embankments and pavements. The specific objectives are:

- To provide a standard for the collection of high quality information in a consistent manner for engineering tasks including pavement design, embankment design, borrow evaluation and assessment activities; and
- To provide standard reporting format for ease of use and storage of data.

2.0 SCOPE

This standard covers the methodology for Soil Survey projects conducted for highway embankment design and construction, and for pavement structural design or assessment. It includes the requirements for: coring pavements; drilling boreholes; collecting samples of soils and granular materials; identification of soils and granular materials in the field; laboratory testing; and reporting the results.

This standard does not cover investigations for more complex geotechnical problems and studies such as: failures of highway embankments and side slopes, groundwater related issues, and the design large embankments and culverts. Nor does the standard apply to geotechnical investigations conducted by Water Engineering and Operations for large culverts, bridges, water control structures, drains and channels, etc. or to investigations of potential granular material and bedrock sources.

The standard outlines the department's minimum requirements for a number of soil survey types. The specific requirements of each project should be reviewed and confirmed with the engineer responsible for the analyses, designs, or assessments for which the soil survey will be used. It is also important that those conducting the soil survey and testing inform the engineer of any unforeseen site, soil or pavement conditions and issues so that any required changes to the investigation and testing can be made.

Soil survey is a valuable investment when the information is accurate, contains well-defined location descriptions, and the information is easy to access and use. The Soil Survey Supervisor should recognize these needs and conduct their activities in a competent technical manner.

3.0 REFERENCE STANDARDS

ASTM Standards

C117 Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.

C136 Method for Sieve Analysis of Fine and Coarse Aggregates.
D421 Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
D422 Method for Particle-Size Analysis of Soils.
D2216 Test Method for Laboratory Determination of Water Content of Soil and Rock.
D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures).
D4318 Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

AASHTO Standards

M145 The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
T267 Determination of Organic Content in Soils by Loss on Ignition

4.0 SOIL SURVEY METHODOLOGY

The activities under this Standard Practice consists of distinct phases as follows:

- Borehole drilling
- Sampling
- Layer/material identification in the field
- Preparation of borehole logs
- Laboratory testing
- Reporting

4.1 Borehole Drilling

4.1.1 General Requirements

Core and Borehole Diameters

Core holes through the pavement layer shall be between 150 and 200 mm in diameter. Boreholes into the pavement base layers, subgrade and natural ground shall be 112 to 150 mm in diameter. On partial depth reconstruction and rehabilitation projects, additional cores of the pavement (100 mm in diameter) shall be drilled at random locations on pavement cracks throughout project area.

Core and Borehole Locations

Prairie and gravel road reconstruction: transverse locations of holes shall be the middle of the proposed traffic lane.

Paved roads reconstruction or rehabilitation: core and boreholes shall be located along the outer wheel paths areas.

Boreholes shall be spread out onto adjacent lanes of the existing alignment or onto the proposed prairie grade of the existing alignment, as applicable to the project.

The longitudinal location of each shoulder borehole shall closely match with the adjacent borehole on the main lane. The transverse locations shall be in the middle of the shoulder.

Spacing and Depth

Borehole spacing and depth shall meet the requirements as specified in Table 1.

4.1.2 Borehole Coverage for Preliminary Grade- Nominal Requirements

One borehole shall be drilled every 100 m longitudinally with the location of successive borehole staggered laterally from each borehole up and down chainage in the following manner:

- First borehole at 15 m left of centerline,
- Second borehole at 100 m longitudinally up chainage from first bore hole and on centerline,
- Third borehole at 100 m longitudinally up chainage from second borehole and 15 m right of centerline,
- Fourth borehole at 100 m longitudinally up chainage from third borehole and on centerline, and
- Repeat above sequence for the remaining bore holes at 100 m longitudinal spacing.

The nominal depth of each borehole shall be 1.5 m below existing ground.

In cut areas, the borehole depth shall extend a minimum of 2.0 m below the design top of subgrade.

Table 1: Borehole Spacing and Depth - General Requirements

Survey Type	Maximum Spacing[1, 2,3]	Minimum Depth [4,5]	Purpose
Preliminary Grade Survey	Refer to Section 4.1.2	Refer to Section 4.1.2	To determine subsurface soil types and conditions on a proposed new alignment. Information to be used to estimate sub-cut, topsoil and waste excavations, and to calculate shrinkage factors and provide preliminary designs.
Prairie Survey	200 m	1.50 m	To determine soil types and conditions along an existing roadway alignment for grade widening to add a new lane or widen the existing shoulder. Information will be used for preliminary design, estimate topsoil excavation and shrinkage factors.
Borrow Pit Survey[6]	As Required	As Required	To determine soil types, their suitability and shrinkage factors for embankment construction.
Final Grade Survey	200 m	1.50 m	To determine subsurface soil types and contents in an existing or newly constructed grade with no subbase, base and/or surface layers in place. To be used to provide intermediate/final pavement design.
Existing Pavement-Full Depth Survey	200 m	2.50 m	To determine pavement layer thicknesses, layer materials types and subsurface soil types and contents. To be used to provide pavement design for full depth pavement reconstruction with removal of existing surface, base and subbase layers.
Existing Pavement-Partial Depth Survey	200 m	1.80 m	To determine pavement layer thicknesses, layer materials types and subsurface soil types and contents. To be used to provide pavement design for partial depth pavement reconstruction with mill and relay of chip seal (AST), pulverize and relay of bituminous, full depth reclamation of bituminous, rubblization of concrete, etc. and pavement rehabilitation with new chip seal, bituminous overlay, mill and overlay, cold in-place recycle and overlay, etc..
Existing Pavement-Shoulder Survey	400 m	1.5 m	To determine layer thicknesses, layer materials types and subsurface soil types and contents. To be used for selecting the shoulder treatment types and the required base for shoulder paving or repaving.
Bedrock and Peat soils	Refer to Sections 4.1.3 and 4.1.4	Refer to Sections 4.1.3 and 4.1.4	To investigate overburden soils, define the bedrock surface topography, and determine the thickness and distribution of peat soils (i.e., muskeg, bogs and swamps).
Special Survey	As Required	As Required	To investigate localized pavement failures, base course depths, frost heave or swelling issues, subgrade moisture issues, feasibility of subgrade stabilization, etc.

[1] Additional boreholes at closer spacing shall be drilled if significant variations in subsurface conditions (such as changes layer thickness, soil types or consistency, swamp areas, springs, high water table, etc.) are encountered in two adjacent boreholes to identify the location and extent of the change in conditions.

[2] The borehole pattern and depth should be revised where there is evidence of changes subsurface conditions such as at ridges, ravines, sloughs, creeks, etc.

[3] For a short section or small study area, the investigation plan shall be reviewed with the Highway Design Branch to determine the minimum number and distribution of boreholes.

[4] Unless otherwise instructed, boreholes will be terminated where bedrock is encountered above the specified minimum depth. A ground survey to investigate bedrock topography may be required.

[5] When unsuitable soil or material (e.g., peat or wet silt) is encountered at the bottom of the nominal bore depth, the borehole shall be drilled to a depth of 1.5 m (minimum) below the layer of unsuitable soil or material.

[6] The spacing and number of boreholes to investigate potential embankment fill material shall be determined on a project specific basis. In general about five (5) boreholes should be drilled for every hectare of borrow area. All bore holes shall be drilled to the potential depth of the borrow pit.

4.1.3 Borehole Coverage in Areas of Bedrock

Ground surveys in areas of shallow or exposed bedrock shall be conducted with the objective of obtaining representative models of the bedrock surface topography. This information is critical for the planning of vertical road profiles and for accurately estimating volumes of costly bedrock excavation on projects in bedrock terrain. In some cases, investigations of bedrock topography can be effectively conducted using an excavator or backhoe to supplement the borehole drilling.

Soil surveys in areas of bedrock should be considered supplemental to the ground surveys for these projects. Ground surveys must accurately and completely record all locations of exposed bedrock to eliminate ambiguity between areas where bedrock is, and is not, exposed.

The following standard methodology may need be supplemented with additional boreholes where needed to obtain overburden thicknesses at a sufficient number of points to define the bedrock surface in sufficient detail:

- The borehole locations and frequency set out in *Section 4.1.2* above shall be followed until the first borehole encounters bedrock at a depth shallower than the specified borehole depth. This location is called the *Initial Rock Chainage*. The following pattern of borehole locations shall be followed in areas of shallow and exposed bedrock:

    - At the Initial Rock Chainage, a set of three boreholes shall be drilled (centerline, and 15 m left and 15 m right of centerline).
    - Sets of supplemental boreholes shall be drilled at 25 m longitudinal intervals both up and down chainage from the Initial Rock Chainage until bedrock is not encountered in any of the three boreholes at depths shallower than the specified borehole depth.

- Where bedrock is visibly exposed at the surface, topographic survey shots (recorded as bedrock surface) shall be taken at a sufficient density to accurately define the bedrock surface.

- Where bedrock is no longer encountered at depths shallower than the specified depth, the borehole locations and frequency set out in section 4.1.2 shall be followed (i.e., 100 m longitudinal intervals).

4.1.4 Borehole Coverage in Areas of Peat Soils

The borehole pattern outlined in Section 4.1.2 “Borehole Coverage for Preliminary Grade- Nominal Requirements” shall be used in areas containing muskeg.

The limits of peat soils (i.e., limits of peat bogs) shall be accurately delimited in the site topographic survey.

Boreholes shall be drilled to a depth of 1.0 m (minimum) below the bottom of the peat.

It may be necessary to extend test holes into soft compressible weak soils (such as soft wet clay or silt) present below the peat. If such conditions are encountered, the site conditions should be reviewed with the project Geotechnical Engineer to determine the test drilling and sampling requirements for the project.

4.2 Sampling

Samples from each granular material (base and subbase) type shall be collected at one (1) km interval with a minimum of two representative samples in smaller areas for laboratory testing, where applicable. Additional samples shall be required where the existing granular material change within the project area.

A minimum of one (1) soil sample shall be obtained from each test hole. In addition, a sample shall be obtained for each change in soil layer encountered including changes soil type, consistency, color or moisture content. Samples shall be a minimum one kilogram (1 kg) of material for each sample type. A larger quantity of materials from various representative soils (and granular base and subbase, if applicable) shall be collected to determine the maximum dry density (MDD), optimum moisture content (OMC) and soaked California Bearing Ratio (CBR) values at the specified frequency and/or based on the specified number of tests (refer to Section 4.5).

Samples shall be obtained from all organic layers in including peat. When an organic layer is thicker than 0.60 m, a sample shall be obtained at least every 0.60 m depth.

Additional boreholes used only to confirm the extent of rock, depth to bedrock or depth of peat do not necessarily need to be sampled. However, samples should be obtained where changes in soils or other conditions warrant.

Any variation of soils in shoulders from the main lanes shall be recorded. Representative samples of the varying soils shall be collected and tested in the laboratory.

Each sample shall be double bagged to ensure no loss in moisture and sample tag with sample identification information shall be placed between two bags. Each sample tag shall contain the following information:

- Highway number, identification of borrow pit,
- Control section (C.S.) number or borrow pit location,
- Borehole number,
- Field Sample Number, and
- Depth (from……..m to…….m)

Each sample bag shall be marked with a brief identification (e.g. C.S. number, borehole number and depth). Samples that appear to contain excessive moisture contents shall be flagged, with orange survey ribbon, for immediate determination of moisture in the laboratory.

4.3 Layer Identification in the Field

The Soil Survey Supervisor shall record the layer material type on the Standard Template for *Soil Survey Field Log (Borehole Log)* as shown in Appendix A. Additional notes shall be added to the log to indicate anomalies (coring through pavement crack, crack type, crack widths and progression, stripping, layer delamination, topography changes, etc.).

Soil identification shall be performed in accordance with *ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)* and recorded on the Standard Template for *Soil Survey Field Log (Borehole Log),* which include the following:

- Soil visual classification
- Appearance/colour
- Layer density/consistency (hard, stiff, soft, etc.)
- Soil moisture condition (dry, damp, wet, etc.)
- Soil contents (organics, cobbles, rock, etc.)

4.4 Preparation of Borehole Log

The following information shall be logged with applicable description on the MI Standard Template for *Soil Survey Field Log* (Borehole Log) as shown in Appendix A:

- Borehole identification number

- Lane
- Distance (km) from start of Control Section and project chainage, if available
- Centreline offset (m)
- UTM coordinates shall be obtained of all boreholes and core locations. A hand held GPS unit maybe used for locations on existing pavements. All boreholes not drilled on existing roads, such boreholes for preliminary and prairie surveys, shall be surveyed with survey grade equipment and shall include ground elevations. The field logs shall be accompanied by the UTM coordinates of the borehole and core locations in shape files (ArcGIS) and a KML file (Google).
- Each layer depth (m)
- Each layer thickness (m)
- Field sample number
- Layer material or soil description

When coring through pavement cracks, measurements of the crack width shall be taken at the top, middle and bottom of each surface layer from the extracted cores and recorded.

Pavement surface, base and subbase depths shall be reported to the nearest 0.01 m, where applicable, and the soil layer depths shall be recorded to the nearest 0.05 m.

4.5 Laboratory Testing Requirements

Unless specified otherwise in the project Request For Proposal (RFP), Request For Quotation (RFQ) or Terms of Reference (TOR), approximately 30% of soil samples collected from boreholes shall be tested in the laboratory for the following (ensure that representative samples are selected), except for the organic contents. Test for organic contents shall be done on approximately 10% of soil samples collected from boreholes, unless specified otherwise in the project RFP, RFQ or TOR.

The MDD and OMC testing on representative soil samples shall be conducted in accordance to ASTM D698 *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort*. The soaked CBR testing on the same (that are used for proctor testing) representative samples shall be conducted in accordance to ASTM D1883 *Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soil* at the OMC and 95% of the MDD. The frequency or number of these tests will be specified in the in the project RFP, RFQ or TOR.

Table 2: Required Laboratory Testing of Soils

Property	Test Method
Grain size distribution (sieve or hydrometer analysis)	ASTM C136/ ASTM C117/ASTM D421/ASTM D 422
Atterberg limits	ASTM D4318
Classification by AASHTO	AASTHO M145
Classification by ASTM	ASTM D2487
Organic content	AASHTO T267
Moisture content [1]	ASTM D2216

[1] Test shall be conducted during the sampling or as soon as the samples are delivered to the laboratory, preferably within 48 hours of sampling.

Representative samples of granular material (base and subbase) shall be tested for various properties as listed in Table 3. All testing shall be done on the same representative samples. The frequency or number of these tests will be specified in the in the project RFP or TOR.

Table 3: Required Laboratory Testing of Base and Subbase Materials

Property	Test Method
Gradation	ASTM C136/ASTM C117
Plasticity	ASTM D4318
Moisture content [1]	ASTM D2216
Classification/Type	Material Specification for Aggregate- Granular Course: MI Specs. 901(I)/ 900
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1883	Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils

[1] Test shall be conducted during the sampling or as soon as the samples are delivered to the laboratory, preferably within 24 hours of sampling.

4.6 Report

The borehole log and results of laboratory tests shall be presented in the *Standard Soil Survey Summary Report* and submitted in digital (pdf and MS Excel) formats, as shown in Appendices B1 and B2. Other test results can be presented in separate table(s) or added to Table shown in Appendix B. Details of all testing shall also be included in the soil survey report.

Appendix A: Standard Template for Soil Survey Field Log (Borehole Log)

MANITOBA INFRASTRUCTURE
ENGINEERING SERVICES

Manitoba

SOIL SURVEY FIELD LOG (BOREHOLE LOG)

Client/Region:	R1	**From (Survey Start):**	PR...	**Survey Purpose:**	Pavement Rehabilitation
Hwy/Sub-Div. No.:	PTH 1	**To (Survey End):**	PTH...	**Driller's Name:**	M. Scharnik
Control Section No.:	01001xxxHA	**Survey Location/Type:**	Existing Pavement	**Supervisor's Name:**	J. Halldorson
Project No.:	C 2038	**UTM Coordinates Recorded (Yes/No):**	Yes	**Survey Date:**	June 11, 2020

Borehole No.	Lane	C.S. Km/ Chainage/	C/L Offset (m)	Layer Depth From (m)	Layer Depth To (m)	Layer Thickness (m)	Field Sample No.	Layer Material or Soil Descriptions
1	WBTL	0.20	2.9R	0.000	0.125	0.125	FS-001	Bituminous layer, soft, severe moisture damage; transverse crack
1	WBTL	0.20	2.9R	0.125	0.425	0.300	FS-002	Granular A base, limestone, moist
1	WBTL	0.20	2.9R	0.425	0.600	0.175	FS-003	Gray clay with trace silt and sand, very soft, wet, some organics
1	WBTL	0.20	2.9R	0.600	1.100	0.500	FS-004	Brown silty clay with trace sand and gravel, soft, wet, trace organics
1	WBTL	0.20	2.9R	1.100	1.900	0.800	FS-005	Brown clay with trace silt, sand and gravel, stiff, moist
1	WBTL	0.20	2.9R	1.900	2.500	0.600	FS-006	Brown silt and sand with trace gravel, stiff
2	WBPL	0.40	2.9L	0.000	0.125	0.125	FS-007	Bituminous layer, soft, severe moisture damage; transverse crack
2	WBPL	0.40	2.9L	0.125	0.425	0.300	FS-008	Granular A base, limestone, moist
2	WBPL	0.40	2.9L	0.425	0.600	0.175	FS-009	Gray clay with trace silt and sand, very soft, wet, some organics
2	WBPL	0.40	2.9L	0.600	1.100	0.500	FS-010	Brown silty clay with trace sand and gravel, soft, wet, trace organics
2	WBPL	0.40	2.9L	1.100	1.900	0.800	FS-011	Brown clay with trace silt, sand and gravel, stiff, moist
2	WBPL	0.40	2.9L	1.900	2.500	0.600	FS-012	Brown silt and sand with trace gravel, stiff
3	WBTL	0.60	2.9R	0.000	0.125	0.125	FS-013	Bituminous layer, soft, severe moisture damage; transverse crack
3	WBTL	0.60	2.9R	0.125	0.425	0.300	FS-014	Granular A base, limestone, moist
3	WBTL	0.60	2.9R	0.425	0.600	0.175	FS-015	Gray clay with trace silt and sand, very soft, wet, some organics
3	WBTL	0.60	2.9R	0.600	1.100	0.500	FS-016	Brown silty clay with trace sand and gravel, soft, wet, trace organics
3	WBTL	0.60	2.9R	1.100	1.900	0.800	FS-017	Brown clay with trace silt, sand and gravel, stiff, moist
3	WBTL	0.60	2.9R	1.900	2.500	0.600	FS-018	Brown silt and sand with trace gravel, stiff
4	WBPL	0.80	2.9L	0.000	0.125	0.125	FS-019	Bituminous layer, soft, severe moisture damage; transverse crack
4	WBPL	0.80	2.9L	0.125	0.425	0.300	FS-020	Granular A base, limestone, moist
4	WBPL	0.80	2.9L	0.425	0.600	0.175	FS-021	Gray clay with trace silt and sand, very soft, wet, some organics
4	WBPL	0.80	2.9L	0.600	1.100	0.500	FS-022	Brown silty clay with trace sand and gravel, soft, wet, trace organics
4	WBPL	0.80	2.9L	1.100	1.900	0.800	FS-023	Brown clay with trace silt, sand and gravel, stiff, moist
4	WBPL	0.80	2.9L	1.900	2.500	0.600	FS-024	Brown silt and sand with trace gravel, stiff
5	WBTL	1.00	2.9R	0.000	0.125	0.125	FS-025	Bituminous layer, soft, severe moisture damage; transverse crack
5	WBTL	1.00	2.9R	0.125	0.425	0.300	FS-026	Granular A base, limestone, moist
5	WBTL	1.00	2.9R	0.425	0.600	0.175	FS-027	Gray clay with trace silt and sand, very soft, wet, some organics
5	WBTL	1.00	2.9R	0.600	1.100	0.500	FS-028	Brown silty clay with trace sand and gravel, soft, wet, trace organics
5	WBTL	1.00	2.9R	1.100	2.500	1.400	FS-029	Brown clay with trace silt, sand and gravel, stiff, moist

General Description of Site Condition:

Appendix B1: Standard Soil Summary Survey Report (Cover Page)

MANITOBA INFRASTRUCTURE

ENGINEERING SERVICES

SOIL SURVEY SUMMARY REPORT

Manitoba

Field Book No.:	G2020-001		
Client/Region:	R1	**From:**	PR…
Highway/Subdiv. No.:	PTH 1	**To:**	PTH…
Control Section:	01001xxxHA	**Survey Location/Type:**	Existing Pavement
Project No.:	C 2038	**Survey Purpose:**	Pavement Rehabilitation
Soil Survey No.:	SS2020-001	**Driller's Name:**	M. Scharnik
Internal Order No.:	1232456789	**Supervisor's Name:**	J. Halldorson
Contract No.:	SS2020-P001	**Dated Sampled:**	June 11, 2020

Field Book Notes:

Appendix B2: Standard Soil Summary Survey Report (Survey and Testing Data Sheet)

MANITOBA INFRASTRUCTURE
ENGINEERING SERVICES

Manitoba

SOIL SURVEY SUMMARY REPORT (Survey and Testing Data Sheet)

Field Book No.:	G2020-001	From:	PR...	Report To:	
Client/Region:	R1	To:	PTH...	Date Requisitioned:	
Highway/Sub-div. No.:	PTH 1	Contract No.:	SS2020-P001	Date Reported:	
Control Section:	01001xxxHA	Survey Location/Type:	Existing Pavement	Tested By:	
Project No.:	C 2038	Survey Purpose:	Pavement Rehabilitation	Reviewed By:	
Soil Survey No.:	SS2020-001	Supervisor's Name:	J. Halldorson		
Internal Order No.:	1232456789	Date Sampled:	June 11, 2020	Is Files With UTM Coordinates Available (Yes/No)?:	Yes

Note: Particle Size Analysis is Based on Passing 75 mm Material

Oversize (Ret. on 75mm) Particles (%):

Sheet No.: 1 of 4

Sample Data										Particle Size Analysis of Minus 75mm Material, % Passing or Smaller											Soil Index Properties and Classification							Other Physical Properties				
Borehole No.	Lane	C.S. km/ Station	Centerline Offset (m)	From Depth(m)	To Depth(m)	Layer Thickness (m)	Field Sample No.	Field Description	Lab. Sample Number	19.0mm	9.5mm	4.75mm	2.00mm	0.425mm	0.180mm	0.075mm	0.05mm	0.02mm	0.005mm	0.002mm	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	AASHTO Group Index	AASHTO Class	Unified (ASTM) Class	Soil Class Description as per Unified System	Moisture Content (%)	Frost Susceptibility Class	Organic Content (%)	Maximum Density (kg/m^3)	Optimum Moisture (%)
1	WBTL	0.20	2.9R	0.000	0.125	0.125	FS-001	Bituminous layer, soft, severe moisture damage; transverse crack	WGT185534																							
1	WBTL	0.20	2.9R	0.125	0.425	0.300	FS-002	Granular A base, limestone, moist	WGT185535																							
1	WBTL	0.20	2.9R	0.425	0.600	0.175	FS-003	Gray clay with trace silt and sand, very soft, wet, some organics	WGT185536																							
1	WBTL	0.20	2.9R	0.600	1.100	0.500	FS-004	Brown silty clay with trace sand and gravel, soft, wet, trace organic	WGT185537																							
1	WBTL	0.20	2.9R	1.100	1.900	0.800	FS-005	Brown clay with trace silt, sand and gravel, stiff, moist	WGT185538																							
1	WBTL	0.20	2.9R	1.900	2.500	0.600	FS-006	Brown silt and sand with trace gravel, stiff	WGT185539																							
2	WBPL	0.40	2.9L	0.000	0.125	0.125	FS-007	Bituminous layer, soft, severe moisture damage; transverse crack	WGT185540																							
2	WBPL	0.40	2.9L	0.125	0.425	0.300	FS-008	Granular A base, limestone, moist	WGT185541																							
2	WBPL	0.40	2.9L	0.425	0.600	0.175	FS-009	Gray clay with trace silt and sand, very soft, wet, some organics	WGT185542																							
2	WBPL	0.40	2.9L	0.600	1.100	0.500	FS-010	Brown silty clay with trace sand and gravel, soft, wet, trace organic	WGT185543																							
2	WBPL	0.40	2.9L	1.100	1.900	0.800	FS-011	Brown clay with trace silt, sand and gravel, stiff, moist	WGT185544																							
2	WBPL	0.40	2.9L	1.900	2.500	0.600	FS-012	Brown silt and sand with trace gravel, stiff	WGT185545																							
3	WBTL	0.60	2.9R	0.000	0.125	0.125	FS-013	Bituminous layer, soft, severe moisture damage; transverse crack	WGT185546																							
3	WBTL	0.60	2.9R	0.125	0.425	0.300	FS-014	Granular A base, limestone, moist	WGT185547																							
3	WBTL	0.60	2.9R	0.425	0.600	0.175	FS-015	Gray clay with trace silt and sand, very soft, wet, some organics	WGT185548																							
3	WBTL	0.60	2.9R	0.600	1.100	0.500	FS-016	Brown silty clay with trace sand and gravel, soft, wet, trace organic	WGT185549																							
3	WBTL	0.60	2.9R	1.100	1.900	0.800	FS-017	Brown clay with trace silt, sand and gravel, stiff, moist	WGT185550																							
3	WBTL	0.60	2.9R	1.900	2.500	0.600	FS-018	Brown silt and sand with trace gravel, stiff	WGT185551																							
4	WBPL	0.80	2.9L	0.000	0.125	0.125	FS-019	Bituminous layer, soft, severe moisture damage; transverse crack	WGT185552																							
4	WBPL	0.80	2.9L	0.125	0.425	0.300	FS-020	Granular A base, limestone, moist	WGT185553																							
4	WBPL	0.80	2.9L	0.425	0.600	0.175	FS-021	Gray clay with trace silt and sand, very soft, wet, some organics	WGT185554																							
4	WBPL	0.80	2.9L	0.600	1.100	0.500	FS-022	Brown silty clay with trace sand and gravel, soft, wet, trace organic	WGT185555																							
4	WBPL	0.80	2.9L	1.100	1.900	0.800	FS-023	Brown clay with trace silt, sand and gravel, stiff, moist	WGT185556																							
4	WBPL	0.80	2.9L	1.900	2.500	0.600	FS-024	Brown silt and sand with trace gravel, stiff	WGT185557																							
5	WBTL	1.00	2.9R	0.000	0.125	0.125	FS-025	Bituminous layer, soft, severe moisture damage; transverse crack	WGT185558																							
5	WBTL	1.00	2.9R	0.125	0.425	0.300	FS-026	Granular A base, limestone, moist	WGT185559																							
5	WBTL	1.00	2.9R	0.425	0.600	0.175	FS-027	Gray clay with trace silt and sand, very soft, wet, some organics	WGT185560																							
5	WBTL	1.00	2.9R	0.600	1.100	0.500	FS-028	Brown silty clay with trace sand and gravel, soft, wet, trace organic	WGT185561																							
5	WBTL	1.00	2.9R	1.100	2.500	1.400	FS-029	Brown clay with trace silt, sand and gravel, stiff, moist	WGT185562																							

Field Book information is represented by the shaded area NS - Not Sampled NT - Not Tested (Not Applicable)