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DRAINAGE REPORT

FOR

BRONX RD. IMPROVEMENTS

[PRELIMINARY, FOR REVIEW]

Prepared: February 27, 2026 **By: Ryan Zimmerman, P.E.**

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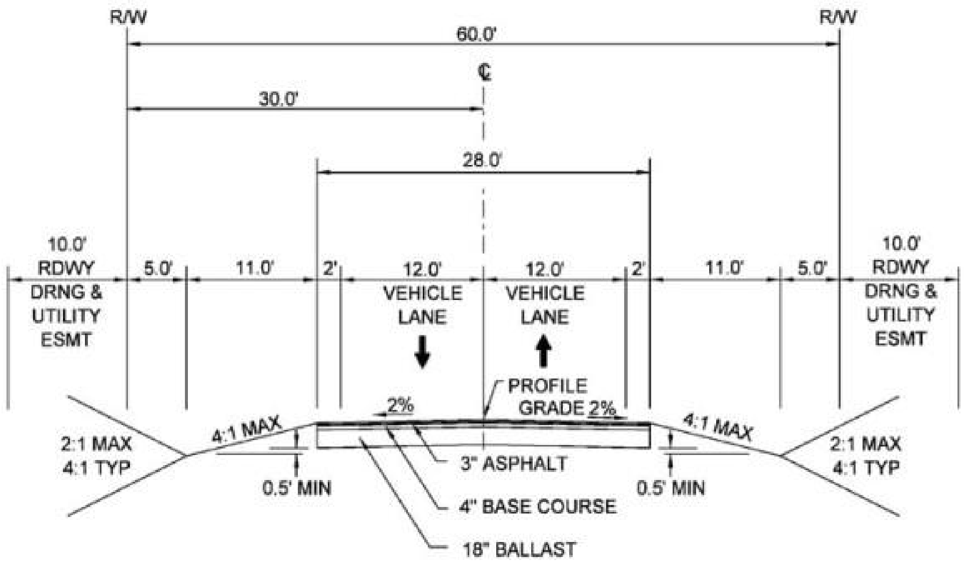
DRAINAGE REPORT
FOR
BRONX ROAD IMPROVEMENTS

Project Description:

The proposed project consists of the improvements of Bronx Road, located in north of the City Center of Ponderay and west of State Highway 95 in Bonner County Idaho. The roadway currently consists of a gravel surface, approximately 24-feet wide with small conveyance ditches or fill slopes located on both sides of the roadway.

Proposed improvements consist of placing hot-mix asphalt on the roadway between the east boundary of the State Highway 95 right-of-way, east for approximately 1,500 feet to immediately east of the intersection of Craig Court. The proposed cross section of the road is based on City of Ponderay Figure 7-K: Collector 2-LD Typical Section', as shown in Figure 1:



COLLECTOR 2-LD

As shown in the above figure and expanded on in the project plans, the proposed hot-mix asphalt section is 28-feet wide total, split by a crown on the centerline. Conveyance ditches are provided on each side of the road with a 4:1 slope. Further details of the runoff characteristics are described in applicable sections of this narrative and appendices of this report.

Topographic Data:

As introduced above, the project site consist of a crowned gravel vehicular surface, approximately 24-feet wide with small conveyance ditches on fill slopes in each side of the road. There is an existing high point (crest vertical curve) on the east portion of the project area, approximately 300-feet east of the intersection of Craig Court. The existing runoff that is captured travels from the roadway, to the conveyance ditches and west or east from the high point to the ditch and culvert system of abutting roadways. The longitudinal slope of existing Bronx Road ranges from 0% (at the high point) to 1%. This project proposes no significant alterations to the longitudinal slope of Bronx Road.

Rainfall Data:

Rainfall intensity was derived from Appendix B of the ITD Roadway Design Manual. Figure B-7 was used to determine this project falls within 'Zone C' for rainfall intensity. Figure B-9 (Sheet 3 of 9) was then used to determine the rainfall intensity for the design storm(s) used in this analysis:

- 10-year return frequency: 2.3 in/hr
- 100-year return frequency: 4.0 in/hr

A time of concentration of 5 minutes was assumed for treatment and disposal, which is the worst-case scenario. The rational method was used to determine volumetric runoff from the site and is further described in applicable sections of this narrative and appendices of this report.

Soils and Geotechnical Data:

Soils are classified as follows in accordance with the Natural Resources Conservation Service (NRCS) web soil survey from the USDA Natural Resources Conservation Service web page:

31	Mission Silt Loam, 0 to 2 percent slopes, Hydrologic Soil Group: Type D.

A copy of the NRCS soils survey is included in Appendix "B".

Allwest conducted a geotechnical exploration for the project in 2026 and is included in Appendix "D". (5) tests pits were taken across the site to determine soil characteristics and depth of existing base rock on the gravel road. with fines content ranging from 34% to 85% and bedrock encountered in some locations.

Post-Developed Basins:

There are (4) proposed drainage basins (Basin 1 - Basin 4) that were analyzed to determine the capacity of the proposed roadside ditches and culverts for design storm of both 10- and 100-year return frequencies. Conveyance for all basins connect to existing down-gradient roadside ditches and continue to run offsite. See Appendix "A" for a figure of the developed condition. A more detailed description of the basins is provided below.

Basin 1 is 46,628 SF in size and contains the surface area within the subject project that lies west of the longitudinal high point of Bronx Road and north of the proposed defined centerline crown. The outfall for Basin 1 connects to the existing ditch at the northeast quadrant of State Highway 95 and Bronx Road.

Basin 2 is 28,156 SF in size and contains the surface area within the subject project that lies west of the longitudinal high point of Bronx Road and south of the proposed defined centerline crown. The outfall for Basin 2 connects to the existing ditch at the southeast quadrant of State Highway 95 and Bronx Road.

Basin 3 is 8,818 SF in size and contains the surface area within the subject project that lies east of the longitudinal high point of Bronx Road and north of the proposed defined centerline crown. The outfall for Basin 3 connects to the existing ditch at the north side of Bronx Road at the easterly project limits.

Basin 4 is 11,040 SF in size and contains the surface area within the subject project that lies east of the longitudinal high point of Bronx Road and south of the proposed defined centerline crown. The outfall for Basin 4 connects to the existing ditch at the south side of Bronx Road at the easterly project limits.

Provided below is a summary of the post development basin characteristics.

Table 1 –Post Development Basin Characteristics

Basin	HMA Surface (PGIS)	Gravel Surface (PGIS)	Pervious Surface (Non-PGIS)	Total
1	23,593 S.F.	598 S.F.	22,437 S.F.	46,628 S.F.
2	15,749 S.F.	1,045 S.F.	11,365 S.F.	28,156 S.F.
3	4,433 S.F.	1,234 S.F.	3,151 S.F.	8,818 S.F.
4	4,979 S.F.	1,503 S.F.	4,558 S.F.	11,040 S.F.

Water Quality Treatment Methodology:

Water quality treatment will be provided for all Pollutant Generating Impervious Surfaces (PGIS) on the site were analyzed in accordance with Section 3 of the *Idaho Catalog of Storm Water Best Management Practices.* Use of Vegetated Filter Strips (BMP 11) will be utilized along the roadway as there will not be any concentrated flows and all runoff will be in sheet flow form. The length of the flowpath (from the pavement to the ditch line) is 10-feet minimum, exceeding the requirements pictured in Figure 27 of the *Idaho Catalog of Storm Water Best Management Practices.*

Volume and Disposal Methodology:

The relevant subsections contained within Section 3 of the *Idaho Catalog of Storm Water Best Management Practices* were followed to determine the stormwater disposal facilities necessary for the proposed construction. The rational method was used for all basins with the 10-year and 100-year storm analyzed to ensure proposed ditch and pipe capacities are sufficient to convey the design storm runoff. A 5 minute time of concentration was used for the basin evaluation because this models the worst case scenario.

As noted in the Collector 2-LD section displayed in the Project Description section above, the flowline of the ditch shall be 0.5-feet below the bottom of the underlying base section. Per the Geotechnical Report, TP-02 is located on the westerly portion of the site and indicates the existing gravel base ranges to 1.5-feet below existing grade. TP-04 is located on the easterly portion of the site and indicates the existing gravel base ranges to 1.0-feet below existing grade. The pavement design section calls for an addition of 0.25-feet of gravel base onto the existing grade and 0.25-feet of HMA, adding 0.50-feet to the grade. Additionally considering the Collector 2-LD requirement of the flowline of the ditch to be 0.5-feet below the gravel base section, the design depths of the ditches for the west and east portion of the site are 2.5-feet and 2.0-feet below the elevation of the HMA shoulder respectively.

To achieve the runoff goal of keeping the ditch flow elevation below the gravel base elevation, the maximum depth of flow permitted in the ditches is 0.5-feet (6-inches). The design flow for the entire basin and the minimum longitudinal slope of the roadside ditches has been modeled as a conservative approach. A summary of these characteristics are shown in Table 2 below, displayed on the Basin Map in Appendix ‘A’, and further detailed in Appendix ‘C’:

Table 2 – Ditch Flow Depth Summary

Ditch	Design Storm	Post-Developed Flow (CFS)	Maximum Flow Depth (inches)
1	10-year	1.37	4.9
2	10-year	0.90	4.2
3	10-year	0.28	3.1
4	10-year	0.32	2.9
1	100-year	2.39	6.0
2	100-year	1.56	5.1
3	100-year	0.48	3.8
4	100-year	0.56	3.6

Pipe Calculations:

Three culverts are proposed in this project. Two of the culverts fall within the proposed ditch line for Basin 1, under the planned adjacent Avista Substation approaches and one under the approaches for the cross road intersection of Craig Court within Basin 4.

All culverts are proposed to be 12-inches in diameter and made of ductile iron pipe. Flowmaster was used to determine the pipe capacities against the 10- and 100-year design storms. Only the downstream culvert for Basin 1 was analyzed as it has the lesser slope of the (2) culverts in Basin 1. In all cases, the design flow rate for the entire basin was modeled as a conservative approach. A summary of the pipe capacities are shown in Table 3 below, displayed on the Basin Map in Appendix ‘A’, and further detailed in Appendix ‘C’:

Table 3 – Pipe Capacities

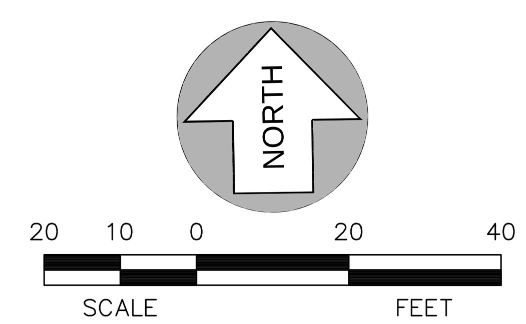
Culvert	Design Storm	Post-Developed Flow (CFS)	Percent Full
1	10-year	1.37	41.2%
4	10-year	0.32	23.1%
1	100-year	2.39	56.9%
4	100-year	0.56	30.7%

Remarks:

The above described system of stormwater controls will provide the necessary quantity and quality controls, as outlined in the “Idaho Catalog of Storm Water Best Management Practices”, for the Bronx Road Improvements Project.

BASIN MAP

A PORTION OF SECTION 36, T.58N., R.2W. and SECTION 02, T.57N., R.2W., W.M.



BASIN MAP LEGEND

- HOT MIX ASPHALT SURFACING (PGIS)
- 3/4" TYPE B UNTREATED BASE COURSE (PGIS)
- OVERALL BASIN BOUNDARY

BASIN DATA

BASIN	HMA AREA	GRAVEL AREA	PERV. SURFACE AREA	TOTAL AREA
1	23,593 SF	598 SF	22,628 SF	46,628 SF
2	15,746 SF	1,045 SF	11,365 SF	28,156 SF
3	4,433 SF	1,234 SF	3,151 SF	8,818 SF
4	4,979 SF	1,503 SF	4,558 SF	11,040 SF

CULVERT CAPACITY (10-YR.)

CULV.	LENGTH	GRADE	DES. 'Q'	% FULL
1	60.00'	0.010	1.37 CFS	41.2%
4	37.00'	0.005	0.32 CFS	23.1%

CULVERT CAPACITY (100-YR.)

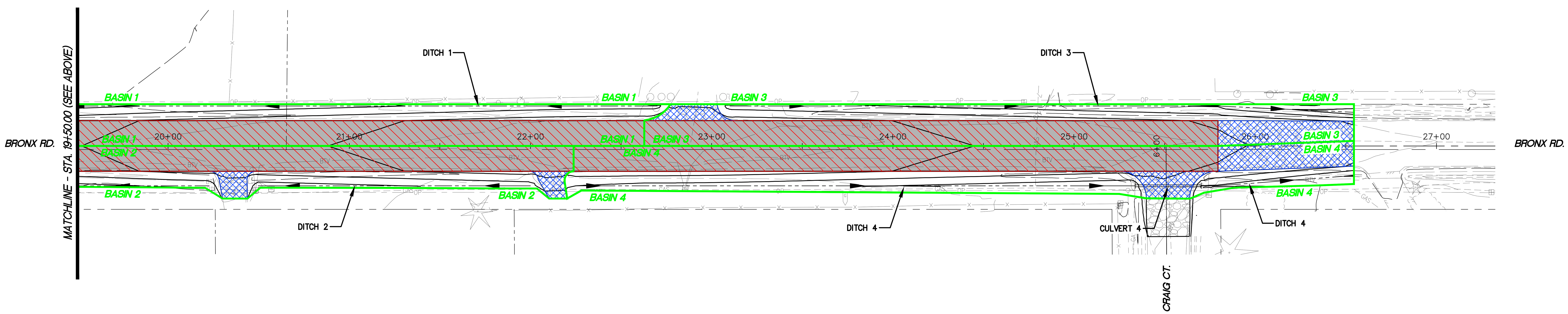
CULV.	LENGTH	GRADE	DES. 'Q'	% FULL
1	60.00'	0.010	2.39 CFS	56.9%
4	37.00'	0.005	0.56 CFS	30.7%

DITCH CAPACITY (10-YR.)

DITCH	SLOPE	DES. 'Q'	DEPTH
1	0.66%	1.37 CFS	4.9 IN.
2	0.66%	0.90 CFS	4.2 IN.
3	0.61%	0.28 CFS	3.1 IN.
4	0.61%	0.32 CFS	2.9 IN.

DITCH CAPACITY (100-YR.)

DITCH	SLOPE	DES. 'Q'	DEPTH
1	0.66%	2.39 CFS	6.0 IN.
2	0.66%	1.56 CFS	5.1 IN.
3	0.61%	0.48 CFS	3.8 IN.
4	0.61%	0.56 CFS	3.6 IN.



No.	Date	By	Ckd.	Appr.	Revisions

	Drawn	Date
Drawn	RRZ	02/2026
Designed	RRZ	02/2026
Checked		02/2026

PRELIMINARY DESIGN 2/2026

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AVISTA® Corp.

HORIZONTAL DATUM:
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LINE IS ONE INCH ON ORIGINAL DRAWING
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CONTRACT NUMBER R-00042546

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VERT. N/A

DWG. NAME 2867-066-XRER-basin.dwg

BRONX ROAD IMPROVEMENTS

BASIN MAP

STORM SHEET 1

NRCS SOIL CONDITIONS

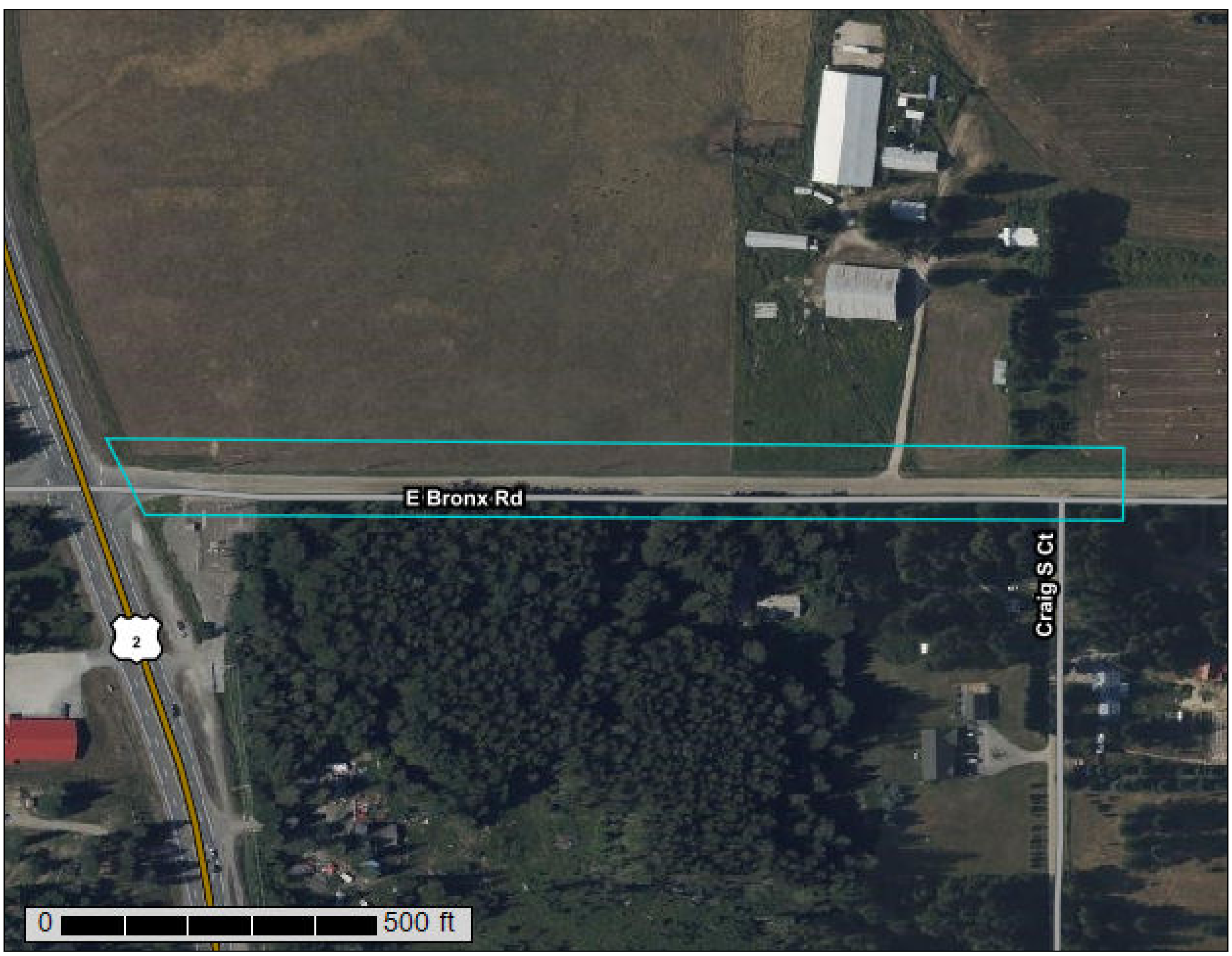
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Bonner County Area, Idaho, Parts of Bonner and Boundary Counties



February 27, 2026

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:2,700 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 40, 80, 160, 240

Feet: 0, 100, 200, 400, 600

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bonner County Area, Idaho, Parts of Bonner and Boundary Counties
Survey Area Data: Version 21, Aug 27, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 14, 2023—Aug 13, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
31	Mission silt loam, 0 to 2 percent slopes	4.3	100.0%
Totals for Area of Interest		**4.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Bonner County Area, Idaho, Parts of Bonner and Boundary Counties

31—Mission silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 5462
Landscape: Foothills
Elevation: 2,000 to 2,800 feet
Mean annual precipitation: 25 to 38 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Mission and similar soils: 75 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mission

Setting

Landscape: Foothills
Landform: Glacial lake terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and loess over silty glaciolacustrine deposits

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: silt loam
Bw - 3 to 12 inches: silt loam
2Btx - 12 to 21 inches: silt loam
2E - 21 to 33 inches: silt
2Bt - 33 to 48 inches: silt loam
3C - 48 to 67 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 10 to 20 inches to fragipan
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: F043AY527WA - Warm-Frigid, Udic, Loamy Foothills/Valleys, high water table (western redcedar, moist herb) Thuja plicata / Clintonia uniflora

Other vegetative classification: western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Minor Components

Hoodoo

Percent of map unit: 3 percent
Landscape: Foothills
Landform: Drainageways, Flood plains
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Odenson

Percent of map unit: 2 percent
Landscape: Foothills
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

BOWSTRING & CAPACITIES

Parametrix
835 N. Post St.
Spokane, WA. 99201

RATIONAL METHOD - SRSM
10 YEAR RETURN FREQUENCY
SPOKANE, WA

PROJECT: **Bronx Road Imp.**

BASIN: **1**
Design Storm: 10
Designed: RRZ

Date: 27-Feb-26

TYPE OF SURFACE	(2) SQUARE FOOTAGE	(3) RUNOFF COEFF.	(4) (2 x 3)
HMA Surface (PGIS)	23,593.00	0.90	21,233.70
Gravel Surface (PGIS)	598.00	0.50	299.00
Pervious Surface (Non-PGIS)	22,437.00	0.20	4,487.40
TOTALS	46,628.00		26,020.10

TOTAL AREA (AC): **1.07**

DEVELOPED "C" = **0.56**

TIME OF CONCENTRATION (MIN.) **5**

RAINFALL INTENSITY (IN/HR):(i) **2.3**

MAXIMUM RUNOFF RATE(CFS) (Q = CiA)

DESIGN FLOW RAT **1.37** C.F.S.

Worksheet for Ditch 1 (10yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020
Channel Slope	0.007 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	1.37 cfs

Results

Normal Depth	4.9 in
Flow Area	0.7 ft²
Wetted Perimeter	3.4 ft
Hydraulic Radius	2.4 in
Top Width	3.27 ft
Critical Depth	4.5 in
Critical Slope	0.011 ft/ft
Velocity	2.05 ft/s
Velocity Head	0.07 ft
Specific Energy	0.47 ft
Froude Number	0.800
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.9 in
Critical Depth	4.5 in
Channel Slope	0.007 ft/ft
Critical Slope	0.011 ft/ft

Worksheet for Culvert 1 (10yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012
Channel Slope	0.010 ft/ft
Diameter	12.0 in
Discharge	1.37 cfs

Results

Normal Depth	4.9 in
Flow Area	0.3 ft²
Wetted Perimeter	1.4 ft
Hydraulic Radius	2.6 in
Top Width	0.98 ft
Critical Depth	5.9 in
Percent Full	41.2 %
Critical Slope	0.005 ft/ft
Velocity	4.49 ft/s
Velocity Head	0.31 ft
Specific Energy	0.73 ft
Froude Number	1.423
Maximum Discharge	4.15 cfs
Discharge Full	3.86 cfs
Slope Full	0.001 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	41.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.9 in
Critical Depth	5.9 in
Channel Slope	0.010 ft/ft
Critical Slope	0.005 ft/ft

Parametrix
835 N. Post St.
Spokane, WA. 99201

RATIONAL METHOD - SRSM
10 YEAR RETURN FREQUENCY
SPOKANE, WA

PROJECT: **Bronx Road Imp.**

BASIN: **2**
Design Storm: 10
Designed: RRZ

Date: 27-Feb-26

TYPE OF SURFACE	(2) SQUARE FOOTAGE	(3) RUNOFF COEFF.	(4) (2 x 3)
HMA Surface (PGIS)	15,746.00	0.90	14,171.40
Gravel Surface (PGIS)	1,045.00	0.50	522.50
Pervious Surface (Non-PGIS)	11,365.00	0.20	2,273.00
TOTALS	28,156.00		16,966.90

TOTAL AREA (AC): **0.65**

DEVELOPED "C" = **0.60**

TIME OF CONCENTRATION (MIN.) **5**

RAINFALL INTENSITY (IN/HR):(i) **2.3**

MAXIMUM RUNOFF RATE(CFS) (Q = CiA)

DESIGN FLOW RAT **0.90** C.F.S.

Worksheet for Ditch 2 (10yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020
Channel Slope	0.007 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	0.90 cfs

Results

Normal Depth	4.2 in
Flow Area	0.5 ft²
Wetted Perimeter	2.9 ft
Hydraulic Radius	2.0 in
Top Width	2.79 ft
Critical Depth	3.8 in
Critical Slope	0.011 ft/ft
Velocity	1.85 ft/s
Velocity Head	0.05 ft
Specific Energy	0.40 ft
Froude Number	0.780
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.2 in
Critical Depth	3.8 in
Channel Slope	0.007 ft/ft
Critical Slope	0.011 ft/ft

Parametrix
835 N. Post St.
Spokane, WA. 99201

RATIONAL METHOD - SRSM
10 YEAR RETURN FREQUENCY
SPOKANE, WA

PROJECT: **Bronx Road Imp.**

BASIN: **3**
Design Storm: 10
Designed: RRZ

Date: 27-Feb-26

TYPE OF SURFACE	(2) SQUARE FOOTAGE	(3) RUNOFF COEFF.	(4) (2 x 3)
HMA Surface (PGIS)	4,433.00	0.90	3,989.70
Gravel Surface (PGIS)	1,234.00	0.50	617.00
Pervious Surface (Non-PGIS)	3,151.00	0.20	630.20
TOTALS	8,818.00		5,236.90

TOTAL AREA (AC): **0.20**

DEVELOPED "C" = **0.59**

TIME OF CONCENTRATION (MIN.) **5**

RAINFALL INTENSITY (IN/HR):(i) **2.3**

MAXIMUM RUNOFF RATE(CFS) (Q = CiA)

DESIGN FLOW RAT **0.28** C.F.S.

Worksheet for Ditch 3 (10yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020
Channel Slope	0.006 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	2.000 H:V
Discharge	0.28 cfs

Results

Normal Depth	3.1 in
Flow Area	0.2 ft²
Wetted Perimeter	1.6 ft
Hydraulic Radius	1.5 in
Top Width	1.54 ft
Critical Depth	2.7 in
Critical Slope	0.013 ft/ft
Velocity	1.42 ft/s
Velocity Head	0.03 ft
Specific Energy	0.29 ft
Froude Number	0.699
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.1 in
Critical Depth	2.7 in
Channel Slope	0.006 ft/ft
Critical Slope	0.013 ft/ft

Parametrix
835 N. Post St.
Spokane, WA. 99201

RATIONAL METHOD - SRSM
10 YEAR RETURN FREQUENCY
SPOKANE, WA

PROJECT: **Bronx Road Imp.**

BASIN: **4**
Design Storm: 10
Designed: RRZ

Date: 27-Feb-26

TYPE OF SURFACE	(2) SQUARE FOOTAGE	(3) RUNOFF COEFF.	(4) (2 x 3)
HMA Surface (PGIS)	4,979.00	0.90	4,481.10
Gravel Surface (PGIS)	1,503.00	0.50	751.50
Pervious Surface (Non-PGIS)	4,558.00	0.20	911.60
TOTALS	11,040.00		6,144.20

TOTAL AREA (AC): **0.25**

DEVELOPED "C" = **0.56**

TIME OF CONCENTRATION (MIN.) **5**

RAINFALL INTENSITY (IN/HR):(i) **2.3**

MAXIMUM RUNOFF RATE(CFS) (Q = CiA)

DESIGN FLOW RAT **0.32** C.F.S.

Worksheet for Ditch 4 (10yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020
Channel Slope	0.006 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	0.32 cfs

Results

Normal Depth	2.9 in
Flow Area	0.2 ft²
Wetted Perimeter	2.0 ft
Hydraulic Radius	1.4 in
Top Width	1.92 ft
Critical Depth	2.5 in
Critical Slope	0.013 ft/ft
Velocity	1.39 ft/s
Velocity Head	0.03 ft
Specific Energy	0.27 ft
Froude Number	0.705
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.9 in
Critical Depth	2.5 in
Channel Slope	0.006 ft/ft
Critical Slope	0.013 ft/ft

Worksheet for Culvert 4 (10yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012
Channel Slope	0.005 ft/ft
Diameter	12.0 in
Discharge	0.32 cfs

Results

Normal Depth	2.8 in
Flow Area	0.1 ft²
Wetted Perimeter	1.0 ft
Hydraulic Radius	1.6 in
Top Width	0.84 ft
Critical Depth	2.8 in
Percent Full	23.1 %
Critical Slope	0.005 ft/ft
Velocity	2.32 ft/s
Velocity Head	0.08 ft
Specific Energy	0.32 ft
Froude Number	1.015
Maximum Discharge	2.94 cfs
Discharge Full	2.73 cfs
Slope Full	0.000 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	23.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.8 in
Critical Depth	2.8 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

Parametrix
835 N. Post St.
Spokane, WA. 99201

RATIONAL METHOD - SRSM
100 YEAR RETURN FREQUENCY
SPOKANE, WA

PROJECT: **Bronx Road Imp.**

BASIN: **1**
Design Storm: 100
Designed: RRZ

Date: 27-Feb-26

TYPE OF SURFACE	(2) SQUARE FOOTAGE	(3) RUNOFF COEFF.	(4) (2 x 3)
HMA Surface (PGIS)	23,593.00	0.90	21,233.70
Gravel Surface (PGIS)	598.00	0.50	299.00
Pervious Surface (Non-PGIS)	22,437.00	0.20	4,487.40
TOTALS	46,628.00		26,020.10

TOTAL AREA (AC): **1.07**

DEVELOPED "C" = **0.56**

TIME OF CONCENTRATION (MIN.) **5**

RAINFALL INTENSITY (IN/HR):(i) **4.0**

MAXIMUM RUNOFF RATE(CFS) (Q = CiA)

DESIGN FLOW RAT **2.39** C.F.S.

Worksheet for Ditch 1 (100yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020
Channel Slope	0.007 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	2.39 cfs

Results

Normal Depth	6.0 in
Flow Area	1.0 ft²
Wetted Perimeter	4.1 ft
Hydraulic Radius	2.9 in
Top Width	4.03 ft
Critical Depth	5.6 in
Critical Slope	0.010 ft/ft
Velocity	2.36 ft/s
Velocity Head	0.09 ft
Specific Energy	0.59 ft
Froude Number	0.830
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	5.6 in
Channel Slope	0.007 ft/ft
Critical Slope	0.010 ft/ft

Worksheet for Culvert 1 (100yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012
Channel Slope	0.010 ft/ft
Diameter	12.0 in
Discharge	2.39 cfs

Results

Normal Depth	6.8 in
Flow Area	0.5 ft²
Wetted Perimeter	1.7 ft
Hydraulic Radius	3.2 in
Top Width	0.99 ft
Critical Depth	7.9 in
Percent Full	56.9 %
Critical Slope	0.006 ft/ft
Velocity	5.17 ft/s
Velocity Head	0.42 ft
Specific Energy	0.99 ft
Froude Number	1.336
Maximum Discharge	4.15 cfs
Discharge Full	3.86 cfs
Slope Full	0.004 ft/ft
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	56.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.8 in
Critical Depth	7.9 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Parametrix
835 N. Post St.
Spokane, WA. 99201

RATIONAL METHOD - SRSM
100 YEAR RETURN FREQUENCY
SPOKANE, WA

PROJECT: **Bronx Road Imp.**

BASIN: **2**
Design Storm: 100
Designed: RRZ

Date: 27-Feb-26

TYPE OF SURFACE	(2) SQUARE FOOTAGE	(3) RUNOFF COEFF.	(4) (2 x 3)
HMA Surface (PGIS)	15,746.00	0.90	14,171.40
Gravel Surface (PGIS)	1,045.00	0.50	522.50
Pervious Surface (Non-PGIS)	11,365.00	0.20	2,273.00
TOTALS	28,156.00		16,966.90

TOTAL AREA (AC): **0.65**

DEVELOPED "C" = **0.60**

TIME OF CONCENTRATION (MIN.) **5**

RAINFALL INTENSITY (IN/HR):(i) **4.0**

MAXIMUM RUNOFF RATE(CFS) (Q = CiA)

DESIGN FLOW RAT **1.56** C.F.S.

Worksheet for Ditch 2 (100yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020
Channel Slope	0.007 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	1.56 cfs

Results

Normal Depth	5.1 in
Flow Area	0.7 ft²
Wetted Perimeter	3.5 ft
Hydraulic Radius	2.5 in
Top Width	3.43 ft
Critical Depth	4.7 in
Critical Slope	0.010 ft/ft
Velocity	2.12 ft/s
Velocity Head	0.07 ft
Specific Energy	0.50 ft
Froude Number	0.807
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.1 in
Critical Depth	4.7 in
Channel Slope	0.007 ft/ft
Critical Slope	0.010 ft/ft

Parametrix
835 N. Post St.
Spokane, WA. 99201

RATIONAL METHOD - SRSM
100 YEAR RETURN FREQUENCY
SPOKANE, WA

PROJECT: **Bronx Road Imp.**

BASIN: **3**
Design Storm: 100
Designed: RRZ

Date: 27-Feb-26

TYPE OF SURFACE	(2) SQUARE FOOTAGE	(3) RUNOFF COEFF.	(4) (2 x 3)
HMA Surface (PGIS)	4,433.00	0.90	3,989.70
Gravel Surface (PGIS)	1,234.00	0.50	617.00
Pervious Surface (Non-PGIS)	3,151.00	0.20	630.20
TOTALS	8,818.00		5,236.90

TOTAL AREA (AC): **0.20**

DEVELOPED "C" = **0.59**

TIME OF CONCENTRATION (MIN.) **5**

RAINFALL INTENSITY (IN/HR):(i) **4.0**

MAXIMUM RUNOFF RATE(CFS) (Q = CiA)

DESIGN FLOW RAT **0.48** C.F.S.

Worksheet for Ditch 3 (100yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020
Channel Slope	0.006 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	2.000 H:V
Discharge	0.48 cfs

Results

Normal Depth	3.8 in
Flow Area	0.3 ft²
Wetted Perimeter	2.0 ft
Hydraulic Radius	1.8 in
Top Width	1.88 ft
Critical Depth	3.3 in
Critical Slope	0.012 ft/ft
Velocity	1.62 ft/s
Velocity Head	0.04 ft
Specific Energy	0.35 ft
Froude Number	0.723
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.8 in
Critical Depth	3.3 in
Channel Slope	0.006 ft/ft
Critical Slope	0.012 ft/ft

Parametrix
835 N. Post St.
Spokane, WA. 99201

RATIONAL METHOD - SRSM
100 YEAR RETURN FREQUENCY
SPOKANE, WA

PROJECT: **Bronx Road Imp.**

BASIN: **4**
Design Storm: 100
Designed: RRZ

Date: 27-Feb-26

TYPE OF SURFACE	**(2) SQUARE FOOTAGE**	**(3) RUNOFF COEFF.**	**(4) (2 x 3)**
HMA Surface (PGIS)	4,979.00	0.90	4,481.10
Gravel Surface (PGIS)	1,503.00	0.50	751.50
Pervious Surface (Non-PGIS)	4,558.00	0.20	911.60
TOTALS	11,040.00		6,144.20

TOTAL AREA (AC): **0.25**

DEVELOPED "C" = **0.56**

TIME OF CONCENTRATION (MIN.) **5**

RAINFALL INTENSITY (IN/HR):(i) **4.0**

MAXIMUM RUNOFF RATE(CFS) (Q = CiA)

DESIGN FLOW RAT **0.56** C.F.S.

Worksheet for Ditch 4 (100yr)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020
Channel Slope	0.006 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	0.56 cfs

Results

Normal Depth	3.6 in
Flow Area	0.4 ft²
Wetted Perimeter	2.4 ft
Hydraulic Radius	1.7 in
Top Width	2.37 ft
Critical Depth	3.1 in
Critical Slope	0.012 ft/ft
Velocity	1.59 ft/s
Velocity Head	0.04 ft
Specific Energy	0.34 ft
Froude Number	0.729
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.6 in
Critical Depth	3.1 in
Channel Slope	0.006 ft/ft
Critical Slope	0.012 ft/ft

Worksheet for Culvert 4 (100yr)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.012
Channel Slope	0.005 ft/ft
Diameter	12.0 in
Discharge	0.56 cfs

Results	
Normal Depth	3.7 in
Flow Area	0.2 ft²
Wetted Perimeter	1.2 ft
Hydraulic Radius	2.1 in
Top Width	0.92 ft
Critical Depth	3.7 in
Percent Full	30.7 %
Critical Slope	0.005 ft/ft
Velocity	2.73 ft/s
Velocity Head	0.12 ft
Specific Energy	0.42 ft
Froude Number	1.022
Maximum Discharge	2.94 cfs
Discharge Full	2.73 cfs
Slope Full	0.000 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	30.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.7 in
Critical Depth	3.7 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

GEOTECHNICAL REPORT

January 27, 2026

Avista Corporation
1411 East Mission, MSC-032
Spokane, Washington 99202

ATTENTION: Adorah Lester (O'Brien)

RE: Pavement Evaluation Letter
Ponderay Avista Substation Bronx Road Improvements
327 East Bronx Road
Ponderay, Idaho
ALLWEST Project Number: 225-181G1

Adorah Lester (O'Brien),

ALLWEST has completed this Pavement Evaluation Letter for the proposed Ponderay Avista Substation Bronx Road Improvements to be located at 327 East Bronx Road in Ponderay, Idaho. The purpose of our services is to provide recommendations regarding pavement section thicknesses and subgrade preparation options.

SUBSURFACE EXPLORATION

ALLWEST observed the excavation of five test pits on January 13, 2026. The subsurface soils observed at the toe of the fill slope for the existing roadway prism consisted of topsoil overlying silt and clay soils. The subsurface soils observed within the road were observed to be undocumented fill which included base coarse overlying subbase overlying pit run overlying native silt and clay material.

Subsurface Exploration Program

We observed the excavation of 5 test pits at the site on January 13, 2026, utilizing a CAT 305.5E mini track-mounted excavator with a 24-inch toothed excavation bucket. The approximate locations of the test pits are shown on Figure A-2, Site and Exploration Map. The soil conditions observed in the test pits were visually described and classified in general accordance with ASTM D 2487 and we logged the subsurface profiles. Grab or bulk samples were collected from the base or sidewall of test pits or excavation spoil piles.

Test pits excavated within the road prism (Test pits TP-2 and TP-4) were backfilled and compacted with a diesel plate compactor to a firm and unyielding condition.

LABORATORY TESTING

We performed laboratory testing to supplement field classifications and to assess some of the soil engineering properties and parameters. The laboratory testing included are presented in *Table 1*. The laboratory test results, included in Appendix C of this report. Some results are also summarized on the exploration logs attached to this report in Appendix B.

Table 1 - Laboratory Tests Performed

Test Performed	Information Acquired
Natural Water Content (ASTM D 2216)	Water content representative of soil conditions at the time and location samples were collected.
Fines Content (ASTM D 1140)	Effects of varying water content on the consistency of fine-grained soils present in a particular sample.
California Bearing Ratio (CBR) (ASTM D1883)	A penetration test that measures the strength of the subgrade soils and base course materials.
Modified Proctor (ASTM D1557)	Test method used to determine the maximum dry density and optimum moisture content for soil compaction.

SUBGRADE PREPARATION

Once temporary erosion and sediment control (TESC) measures are installed, and if the roadway is to be widened, we expect site preparation to continue with clearing and grubbing brush and stripping of organic-rich topsoil. Based on our explorations, the observed topsoil thickness is estimated to be approximately 1.5 feet. Clearing and stripping debris should be wasted off-site or used for topsoil within non-structural/landscape areas.

We recommend the upper 3 inches of the new base course consist of imported virgin crushed rock meeting ¾" base course per materials section of this report. The existing ¾" untreated base should be scarified a minimum of 6 inches, properly moisture conditioned, and compacted to at least 95 percent of the modified Proctor maximum dry density as established by ASTM D 1557.

We recommend the moisture content and density of the top 12 inches of the subgrade be proof-rolled for evaluation by qualified personnel within two days of commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed during site construction activities and to areas where backfilled trenches are located. Areas where unsuitable conditions persist should be repaired by removing and replacing the materials with properly compacted structural fill.

Subgrade Stabilization: In the event the exposed subgrade becomes unstable, yielding, or unable to be compacted due to high moisture conditions or construction traffic, we recommend that the materials be removed to a sufficient depth to develop stable subgrade soil. ALLWEST should be consulted to provide cost-effective recommendations to achieve a stable subgrade. The following paragraphs describe some of the typical methods used.

The subgrade may be stabilized using either fractured, angular cobble or with geosynthetics in conjunction with imported structural fill. The required thickness of crushed cobble or structural fill (used in conjunction with geosynthetic reinforcement) will depend on the construction traffic loads which are unknown at the time of this report. Therefore, a certain degree of trial and error may be needed to verify the recommended stabilization section thicknesses.

If fractured, angular cobble is selected to stabilize the subgrade, it should have a maximum particle size of 8 inches and should be relatively free of sand, silt, and clay. The first layer of cobble should be placed in a minimum 24-inch-thick loose lift and trafficked with tracked-construction and vibratory drum compaction equipment until it is observed to densify. If vibratory compaction destabilizes the subgrade, it should be discontinued. If the cobble is placed in a confined excavation, it should be mechanically densified from outside the excavation with vibratory compaction equipment.

If geosynthetic reinforcement is selected, it should consist of Tensar NX750, BX 1200, or Mirafi Rs380i, or approved equivalent. Alternatives should be approved by the geotechnical engineer prior to use on site. The following recommendations are provided for subgrade stabilization using geosynthetic reinforcement.

- Geosynthetic reinforcement materials should be placed on a properly prepared subgrade with a smooth surface. Loose and disturbed soil should be removed prior to placement of geosynthetic reinforcement materials.
- A woven geotextile filter fabric, such as Mirafi 140N, or approved equivalent, should be placed on the properly prepared subgrade. The geosynthetic reinforcement should be placed on the filter fabric. The filter fabric and geosynthetic reinforcement should be unrolled in the primary direction of fill placement and should be over-lapped at least 3 feet. The geosynthetic materials should be pulled taut to remove slack and pinned in place. If the material does not remain taut during fill placement, its effectiveness will be reduced.
- Construction equipment should not be operated directly on the geosynthetic materials. Fill should be placed from outside the excavation to create a pad on which equipment may be operated. We recommend a minimum of 12 inches of structural fill be placed over the geosynthetic reinforcement before operating construction equipment on the fill. Low pressure, track-mounted equipment should be used to place fill over the geosynthetic reinforcement.
- Fill placed directly over the geosynthetic reinforcement should be properly moisture conditioned prior to placement and should meet the following gradation presented in *Table 2*.

Table 2 - Structural Fill Recommendations for Use in Conjunction with Geosynthetic Reinforcement

Sieve Size	Percent Passing
1 ½ inch	100
¾ inch	50 – 100
#4	25 – 50
#40	10 – 20
#100	5 – 15
#200	≤ 10

- The fill material should be properly compacted. Care should be taken with the use of vibratory compaction equipment. Vibration should be discontinued if it reduces the subgrade stability.

MATERIALS

We recommend specifying crushed aggregate base meeting the requirements of the ITD Standard Specification 703.04 for ¾-inch Type B untreated base course. We recommend the asphalt concrete pavement meet the requirements of ITD Standard Specifications 702 and 703 for plant mix asphalt concrete pavements.

We recommend the crushed aggregate base be compacted to a minimum of 95 percent of the maximum dry density established by ASTM D1557 (modified Proctor). We recommend the asphaltic concrete surface be compacted to minimum of 92 percent of the Rice density.

It is our opinion that the on-site granular undocumented fill could be reused as structural fill provided deleterious and organic material and material with particle sizes greater than eight inches in diameter are removed. The topsoil and silt is not suitable for reuse as structural fill.

DRAINAGE

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. Additionally, the pavement subgrade should be graded to provide positive drainage within the crushed aggregate base section.

ASPHALT PAVEMENT

DESIGN PARAMETERS

Table 3 below presents some of the key design parameters used in the development of this pavement design. These values were either measured, estimated, or assumed. It is critical that these values are reviewed and accepted by the design team.

Table 3. Pavement Design Parameters

Design Parameter	Values
Subgrade California Bearing Ratio (CBR)	47.9%
Estimated Equivalent Single-Axle Loads (ESALs)	75,000
Assumed Pavement Reliability	85%
Assumed Pavement Design Life	20-year

PAVEMENT SECTION

Table 4 and 5 presents our recommended pavement section designs based on the parameters presented in Table 3. The CBR value of 47.9 percent is much higher than the anticipated CBR value of the silt soil. Thus, a CBR value of 3 percent was used for the design provided below in Table 5. If actual traffic loading varies from that stated in Table 3, we should be notified so we may re-evaluate our recommendations.

Table 4. Recommended Flexible Pavement Section Within Existing Roadway Prism

Minimum Pavement Section		
HMA Pavement Section		
Asphalt (in)	**Base Course (in)**	**Total (in)**
3	3	6

Table 5. Recommended Flexible Pavement Section Outside of Existing Prism

Minimum Pavement Section			
HMA Pavement			
Asphalt (in)	**Base Course (in)**	**Structural Fill (in)**	**Total (in)**
3	6	24	33

MAINTENANCE

The pavement sections provided in this report represent minimum recommended thicknesses. Preventive maintenance should be planned and provided for with an on-going pavement management program. Preventive maintenance is intended to slow the rate of pavement deterioration and preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g., crack, and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements

REPORT LIMITATIONS

This report has been prepared to assist the design of pavement sections for the Ponderay Avista Substation Bronx Road Improvements project located at 327 East Bronx Road in Ponderay, Idaho. Reliance by any other party is prohibited without the written authorization of ALLWEST. Our services consist of professional opinions and conclusions made in accordance with generally accepted geotechnical engineering principles and practices in the local area at the time this report was prepared. This acknowledgement is in lieu of all warranties, express or implied.

We appreciate the opportunity to provide services to you for this project. We are available to answer questions you may have regarding this report or to provide additional services as needed. If you have any questions or need additional information, please call.

Sincerely,

ALLWEST

Prepared by:

Kenneth Rukavina, G.I.T.
Project Manager

Reviewed by:

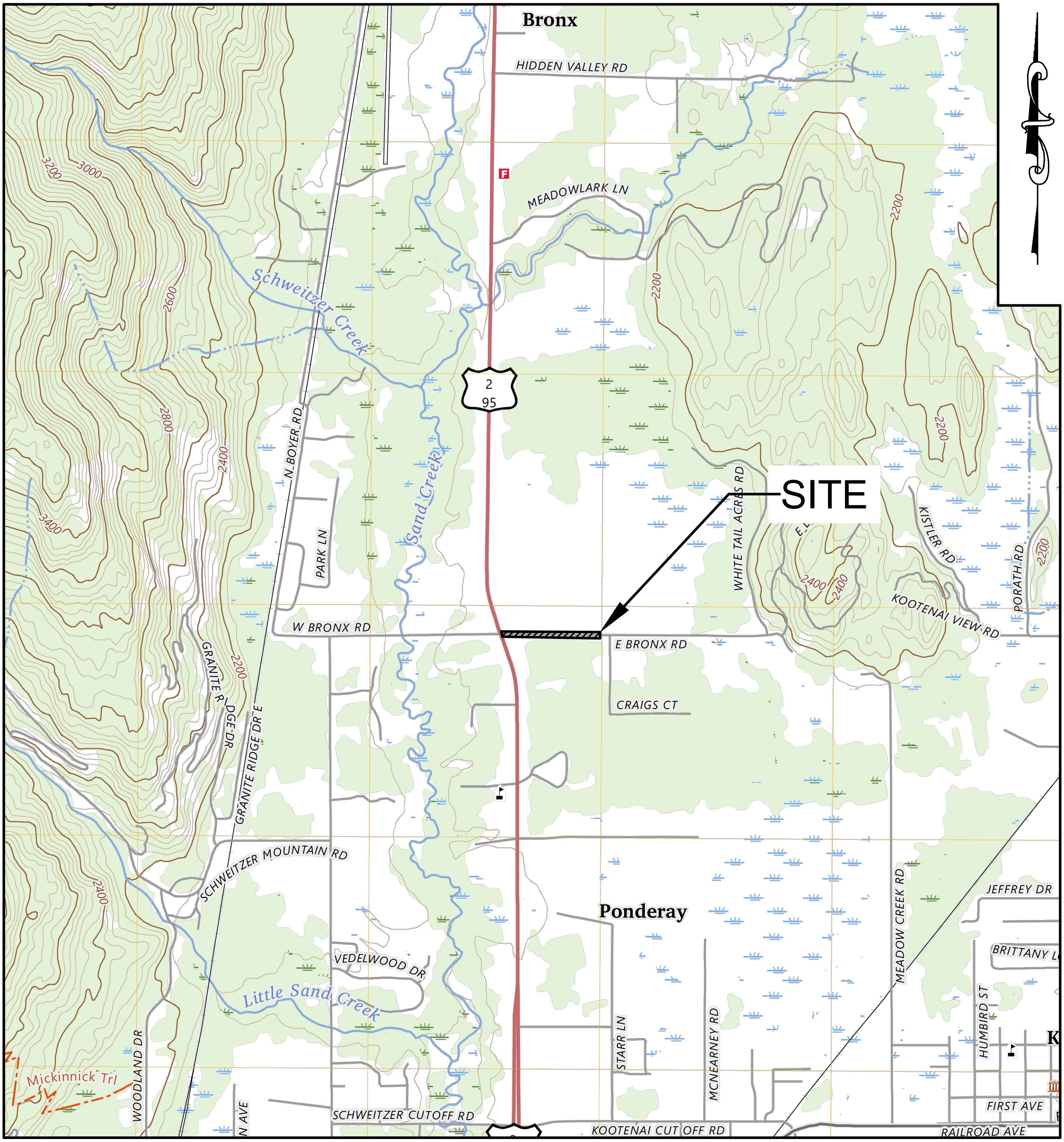
Scott Fraser, P.E.
Senior Geotechnical Engineer

PROFESSIONAL ENGINEER
LICENSED
19566
STATE OF IDAHO
SCOTT M FRASER
1/27/2026

ATTACHMENTS

The following attachments complete this addendum:

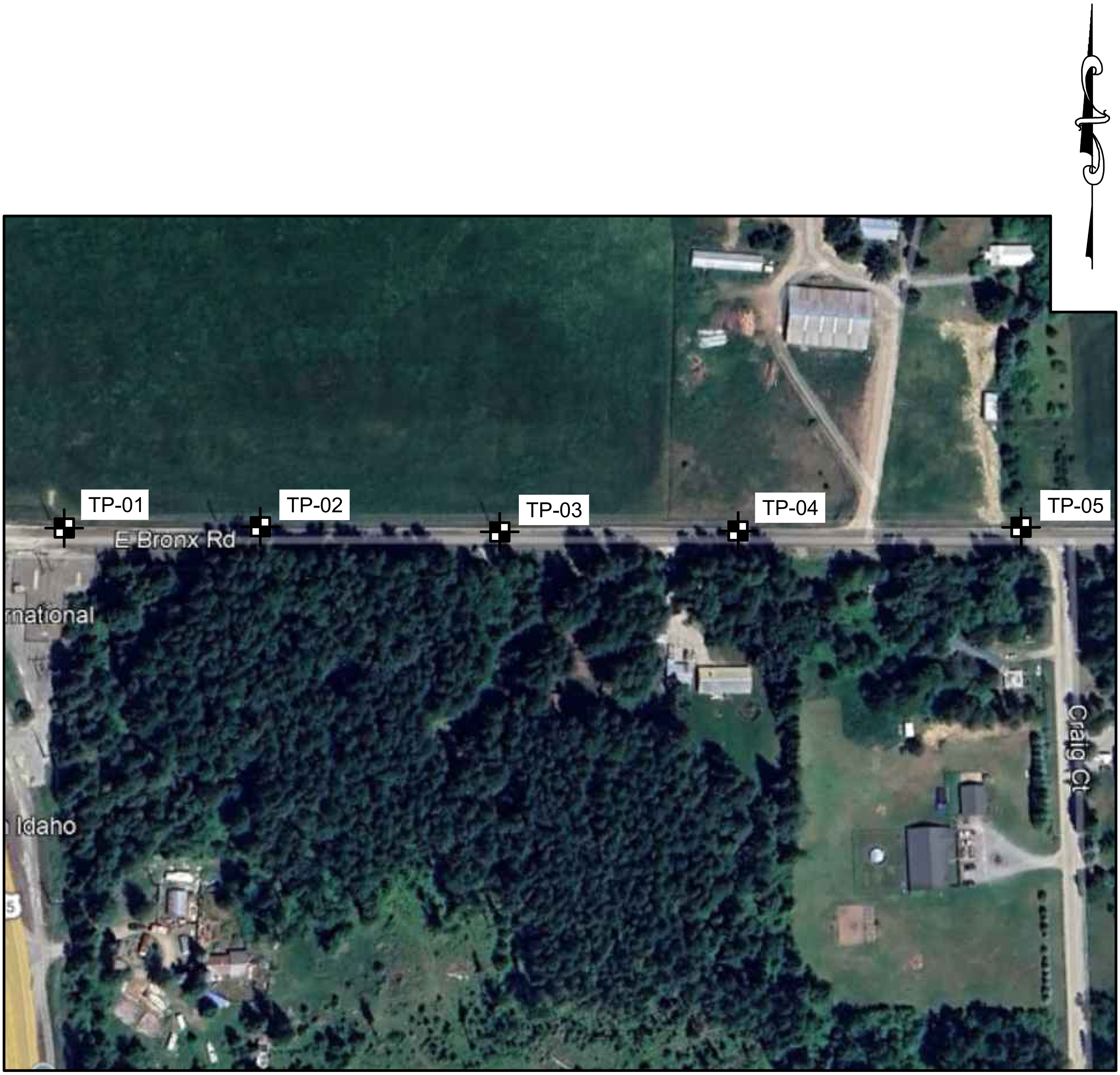
- Figure A-1 Vicinity Map
- Figure A-2 Exploration Map
- Laboratory Test Results



BASEMAP SOURCE: USGS TOPOGRAPHIC MAP, SANDPOINT QUADRANGLE
IDAHO-BONNER COUNTY, 7.5-MINUTE SERIES, DATED 2024.

ALLWEST
16617 E. Euclid Ave., Bldg A
Spokane Valley, Washington
(509) 534-4411
www.allwesttesting.com

FIGURE A-1: VICINITY MAP			
PROJECT:	225-181G1 BRONX ROAD IMPROVEMENTS		
LOCATION:	237 E BRONX RD, PONDERAY, IDAHO		
CLIENT:	AVISTA CORPORATION		
DATE:	JANUARY 2026	SCALE:	1-IN = 2,000 FT



BASEMAP SOURCES: GOOGLE EARTH IMAGERY ACCESSED ON JANUARY 20, 2026.

LEGEND:

TP-# TEST PIT NUMBER AND APPROXIMATE LOCATION

ALLWEST
16617 E. Euclid Ave., Bldg A
Spokane Valley, Washington
(509) 534-4411
www.allwesttesting.com

FIGURE A-2: EXPLORATION LOCATION MAP

PROJECT:	225-181G1 BRONX ROAD IMPROVEMENTS		
LOCATION:	237 E BRONX RD, PONDERAY, IDAHO		
CLIENT:	AVISTA CORPORATION		
DATE:	JANUARY 2026	SCALE:	NOT TO SCALE

Soil Boring

Ponderay Avista Substation Bronx Road Improvements

140 W Selle Rd, Ponderay, ID 83852, USA

TP-01

Project No.:	225-181G1	Date:	01/13/2026	Groundwater Observations:
Contractor:	Dave's Bobcat Service	Completion Depth:	5' bgs	
Equipment:	CAT 305.5E	V. Datum:	-	
Operator:	Dave	Elevation:	N/A	
Logged By:	Chad Peterson	Location:	48.3282°, -116.5463°	

Depth (ft)	Soil Description and Remarks	Graphic Log	Samples: Sample Type	Lab: % Gravel	Lab: % Sand	Lab: % Fines
0–1.5	TOPSOIL, SILT (ML), loose, dark brown					
1.5–5	SILT with SAND (ML), medium stiff, moist, fine, brown to gray					
5	Test pit terminated. No groundwater observed. No caving observed.					

Notes: -

Soil Boring

Ponderay Avista Substation Bronx Road Improvements

140 W Selle Rd, Ponderay, ID 83852, USA

TP-02

Project No.:	225-181G1	Date:	01/13/2026	Groundwater Observations:
Contractor:	Dave's Bobcat Service	Completion Depth:	5' bgs	
Equipment:	CAT 305.5E	V. Datum:	-	
Operator:	Dave	Elevation:	N/A	
Logged By:	Chad Peterson	Location:	48.3282°, -116.5452°	

Depth (ft)	Soil Description and Remarks	Graphic Log	Samples: Sample Type	Lab: Sample Specimen ID	Lab: Dry Density (PCF)	Lab: % Gravel	Lab: % Sand	Lab: % Fines
0–0.5	UNDOCUMENTED FILL, Poorly graded GRAVEL with silt and sand (GP-GM), 3/4" crush, dense, moist, fine to coarse, angular, gray							
0.5–1.5	UNDOCUMENTED FILL, poorly graded GRAVEL with silt and sand (GP-GM), subbase (1 1/2" minus), dense, moist, fine to coarse, angular, brown		Grab	S226-0004		37	46	17
1.5–4	UNDOCUMENTED FILL, Well-graded GRAVEL with silt and sand (GW-GM), pit run, medium dense, moist, fine to coarse, angular, brown		Bulk	S226-0005	146.4			
4–5	SILT with SAND (ML), medium stiff, moist, fine, light brown							

Test pit terminated. No groundwater observed. No caving observed.

Notes: -

Soil Boring

Ponderay Avista Substation Bronx Road Improvements

140 W Selle Rd, Ponderay, ID 83852, USA

TP-03

Page 1 of 1

Project No.:	225-181G1	Date:	01/13/2026
Contractor:	Dave's Bobcat Service	Completion Depth:	4.5' bgs
Equipment:	CAT 305.5E	V. Datum:	-
Operator:	Dave	Elevation:	N/A
Logged By:	Chad Peterson	Location:	48.3282°, -116.5439°

Groundwater Observations:

Depth (ft)	Soil Description and Remarks	Graphic Log	Samples: Sample Type	Lab: Sample Specimen ID	Lab: % Gravel	Lab: % Sand	Lab: % Fines
0–1.25	TOPSOIL, SILT (ML), loose, dark brown						
1.25–4.5	LEAN CLAY (CL), medium stiff, moist, fine, brown to gray						
2–3			Grab	S226-0006		5	95
4.5	Test pit terminated. No groundwater observed. No caving observed.						

Notes: -

Soil Boring

Ponderay Avista Substation Bronx Road Improvements

140 W Selle Rd, Ponderay, ID 83852, USA

TP-04

Project No.:	225-181G1	Date:	01/13/2026	Groundwater Observations:
Contractor:	Dave's Bobcat Service	Completion Depth:	4.5' bgs	
Equipment:	CAT 305.5E	V. Datum:	-	
Operator:	Dave	Elevation:	N/A	
Logged By:	Chad Peterson	Location:	48.3282°, -116.5426°	

Depth (ft)	Soil Description and Remarks	Graphic Log	Samples: Sample Type	Lab: % Gravel	Lab: % Sand	Lab: % Fines
0–0.5	UNDOCUMENTED FILL, Poorly graded GRAVEL with silt and sand (GP-GM), 3/4" crush, dense, moist, fine to coarse, angular, gray					
0.5–1	UNDOCUMENTED FILL, poorly graded GRAVEL with silt and sand (GP-GM), subbase (1 1/2" minus), dense, moist, fine to coarse, angular, brown					
1–2.5	UNDOCUMENTED FILL, Well-graded GRAVEL with silt and sand (GW-GM), pit run, trace cobbles, medium dense, moist, fine to coarse, angular, brown					
2.5–4.5	SILT with SAND (ML), medium stiff, moist, fine, light brown					

Test pit terminated. No groundwater observed. No caving observed.

Notes: -

Soil Boring

Ponderay Avista Substation Bronx Road Improvements

140 W Selle Rd, Ponderay, ID 83852, USA

TP-05

Project No.:	225-181G1	Date:	01/13/2026
Contractor:	Dave's Bobcat Service	Completion Depth:	5' bgs
Equipment:	CAT 305.5E	V. Datum:	-
Operator:	Dave	Elevation:	N/A
Logged By:	Chad Peterson	Location:	48.3282°, -116.5410°

Groundwater Observations:

Depth (ft)	Soil Description and Remarks	Graphic Log	Samples: Sample Type	Lab: % Gravel	Lab: % Sand	Lab: % Fines
0–1.5	TOPSOIL, SILT (ML), loose, dark brown					
1.5–5	SILT with SAND (ML), medium stiff, moist, fine, brown to gray					

Test pit terminated. No groundwater observed. No caving observed.

Notes: -

SOIL CLASSIFICATION CHART (ASTM D2487 & D2488)

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL SOIL NAMES
COARSE-GRAINED SOILS (>50% is retained on the #200 sieve)	GRAVEL	GW	Well-graded gravel, gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravel, gravel-sand mixtures, little or no fines.
		GM	Silty gravel, gravel-sand-silt mixtures.
		GC	Clayey gravel, gravel-sand-silt-clay mixtures.
	SAND	SW	Well-graded sand, gravelly sand, little or no fines.
		SP	Poorly-graded sand, gravelly sand, little or no fines.
		SM	Silty sand, sand-silt mixtures.
		SC	Clayey sand, sand-clay mixtures.
FINE-GRAINED SOILS (>50% passes through the #200 sieve)	SILT AND CLAY (Liquid Limit <50)	ML	Inorganic silt, non-plastic to low plasticity, gravelly silt, sandy silt, clayey silt.
		CL	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay, silty clay (CL-ML), lean clay.
		OL	Organic silt and organic silty clay of low plasticity.
	SILT AND CLAY (Liquid Limit >50)	MH	Inorganic silt, micaceous or diatomaceous fine sandy or silty soils, elastic silt.
		CH	Inorganic clay of high plasticity, fat clay.
		OH	Organic clay of medium to high plasticity.
ORGANIC SOILS		PT	Peat and other highly organic soils.
MOISTURE		Dry	Absence of moisture in sample. Dusty, dry to the touch.
		Slightly Moist	Moisture in sample is below the optimum moisture content. Grains adhere slightly though surface tension.
		Moist	Moisture in sample is at or near optimum moisture content. No free water is visible.
		Wet	Moisture in sample is above the optimum moisture content. Free water is visible in sample.
CEMENTATION		Weak	Crumbles or breaks with handling or slight finger pressure.
		Moderate	Crumbles or breaks with considerable finger pressure.
		Strong	Will not crumble or break with finger pressure.

TYPICAL SOIL DESCRIPTORS

Description	SPT Blow Counts
Very loose	less than 4
Loose	4 to 10
Medium dense	11 to 29
Dense	30 to 50
Very dense	greater than 50

Material	Sieve Sizes
Boulders	greater than 12"
Cobbles	3" to <12"
Coarse gravel	3/4" to <3"
Fine gravel	#4 to <3/4"
Coarse sand	<#4 to #10
Medium sand	<#10 to #40
Fine sand	<#40 to #200
Silt or clay	less than #200

Sieve Number	Aperture
#4	4.76 mm (0.187 in)
#10	2.00 mm (0.0787 in)
#40	0.42 mm (0.0165 in)
#200	0.074 mm (0.00291 in)

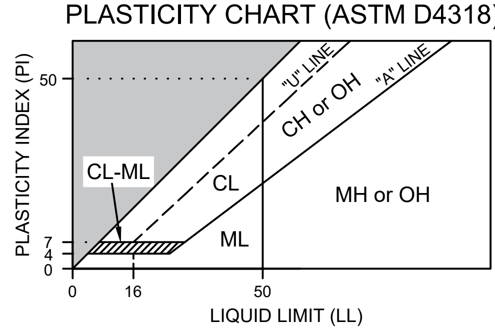
Description	SPT Blow Counts
Very soft	less than 2
Soft	2 to 3
Medium stiff	4 to 8
Stiff	9 to 15
Very stiff	16 to 29
Hard	30 to 50
Very Hard	greater than 50

Plasticity	Soil Characteristics
Non-plastic	Cannot be rolled at any water content.
Low	A thread can barely be rolled while moist.
Medium	A thread can be rolled easily but cannot be rerolled after reaching the plastic limit.
High	A thread can be rolled and re-rolled several times after reaching the plastic limit.

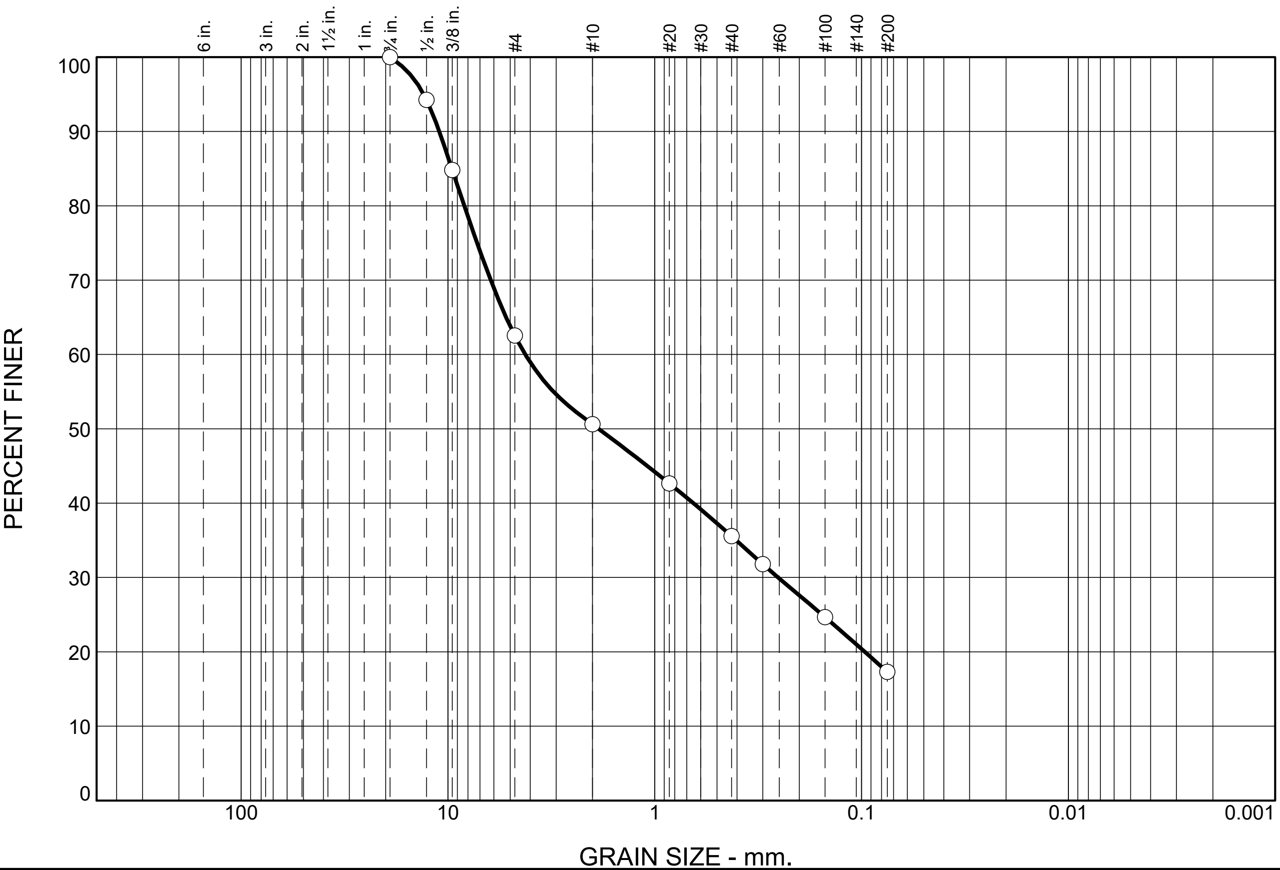
Definitions

Liquid Limit (LL)	Moisture content at which soil changes state from plastic to liquid.
Plastic Limit (PL)	Moisture content at which soil changes state from semi-solid to plastic.
Plasticity Index (PI)	Range of moisture contents at which a soil behaves plastically (LL-PL=PI).

PLASTICITY CHART (ASTM D4318)



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	37	12	15	19	17	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
1/2"	94		
3/8"	85		
#4	63		
#10	51		
#20	43		
#40	36		
#50	32		
#100	25		
#200	17		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= - LL= - PI= -

Coefficients

D_{90}= 11.0165 D_{85}= 9.5723 D_{60}= 4.2272
D_{50}= 1.8691 D_{30}= 0.2530 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= - AASHTO= -

Remarks

C. Peterson sampled 1/13/26

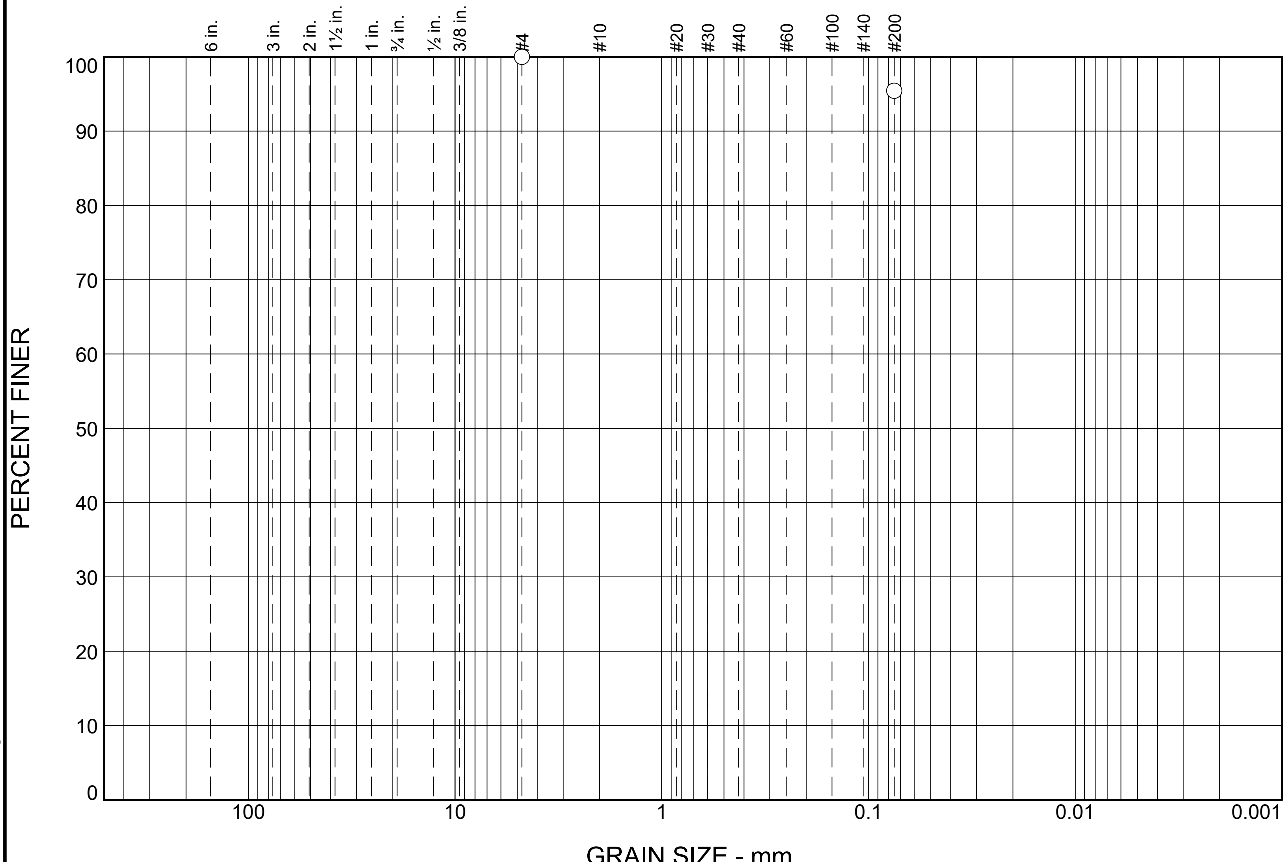
Location: TP-02
Sample Number: S226-0004 **Depth:** @ 6" **Date:** 1/26/26

ALLWEST

Client: Avista Corporation - Spokane
Project: Ponderay Avista Substation Phase 1
Project No: 225-181G

Tested By: K. Fadde **Checked By:** D. Schmitz

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.0	1.7	1.9	95.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#200	95.4		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= - LL= - PI= -

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= - AASHTO= -

Remarks

Moisture content; 21.6%
C. Peterson sampled 1/13/26

Location: TP-03
Sample Number: S226-0006 **Depth:** @ 2-3' **Date:** 1/26/26

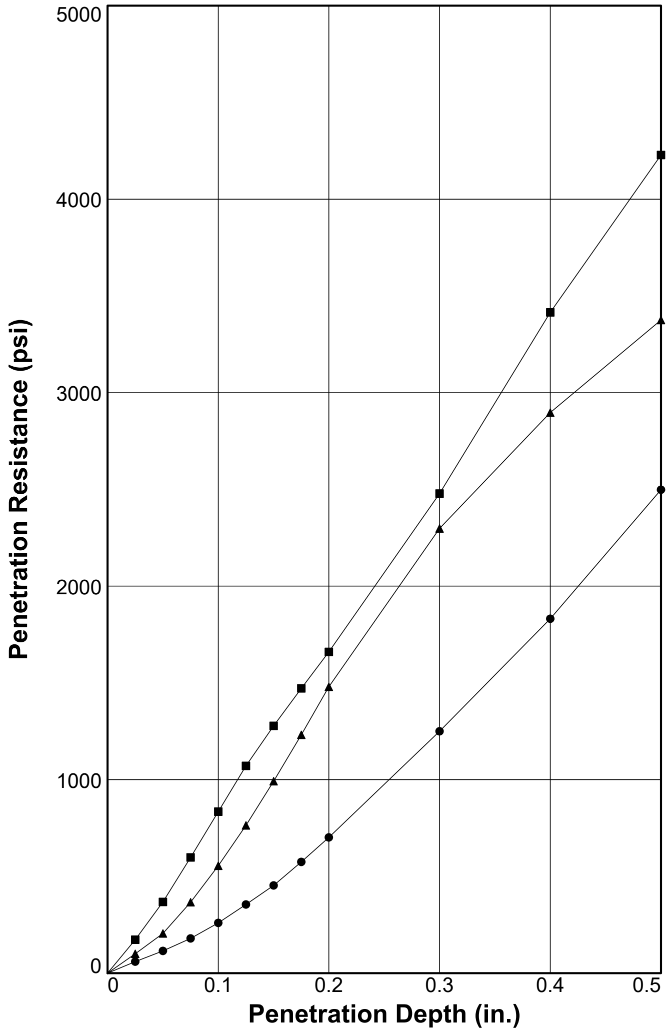
ALLWEST

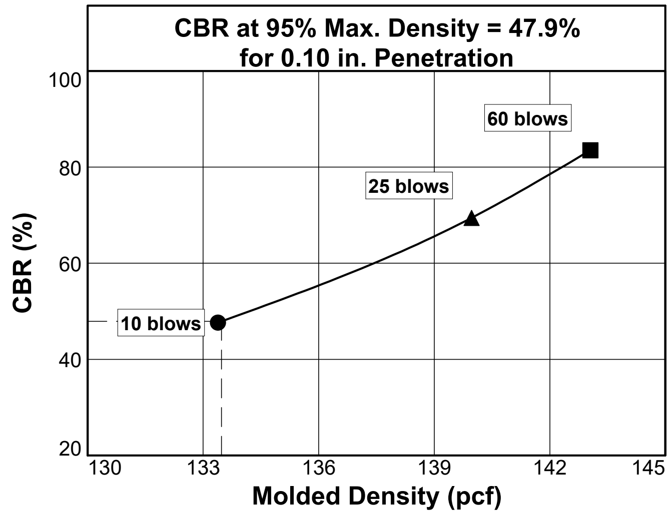
Client: Avista Corporation - Spokane
Project: Ponderay Avista Substation Phase 1

Project No: 225-181G

Tested By: K. Fadde **Checked By:** D. Schmitz

BEARING RATIO TEST REPORT
ASTM D1883-16





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	133.4	94.9	6.5	133.4	94.9	7.0	47.6	66.8	0.055	10	0
2 △	140.0	99.6	6.1	140.0	99.6	6.3	69.4	107.8	0.017	10	0
3 □	143.1	101.9	5.9	143.1	101.8	6.3	83.5	110.7	0.000	10	0

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Poorly graded gravel with silt, sand and cobbles	-	140.5	6.1	-	-

Project No: 225-181G

Project: Ponderay Avista Substation Phase 1

Location: TP-02

Sample Number: S226-0005 **Depth:** @ 2-3'

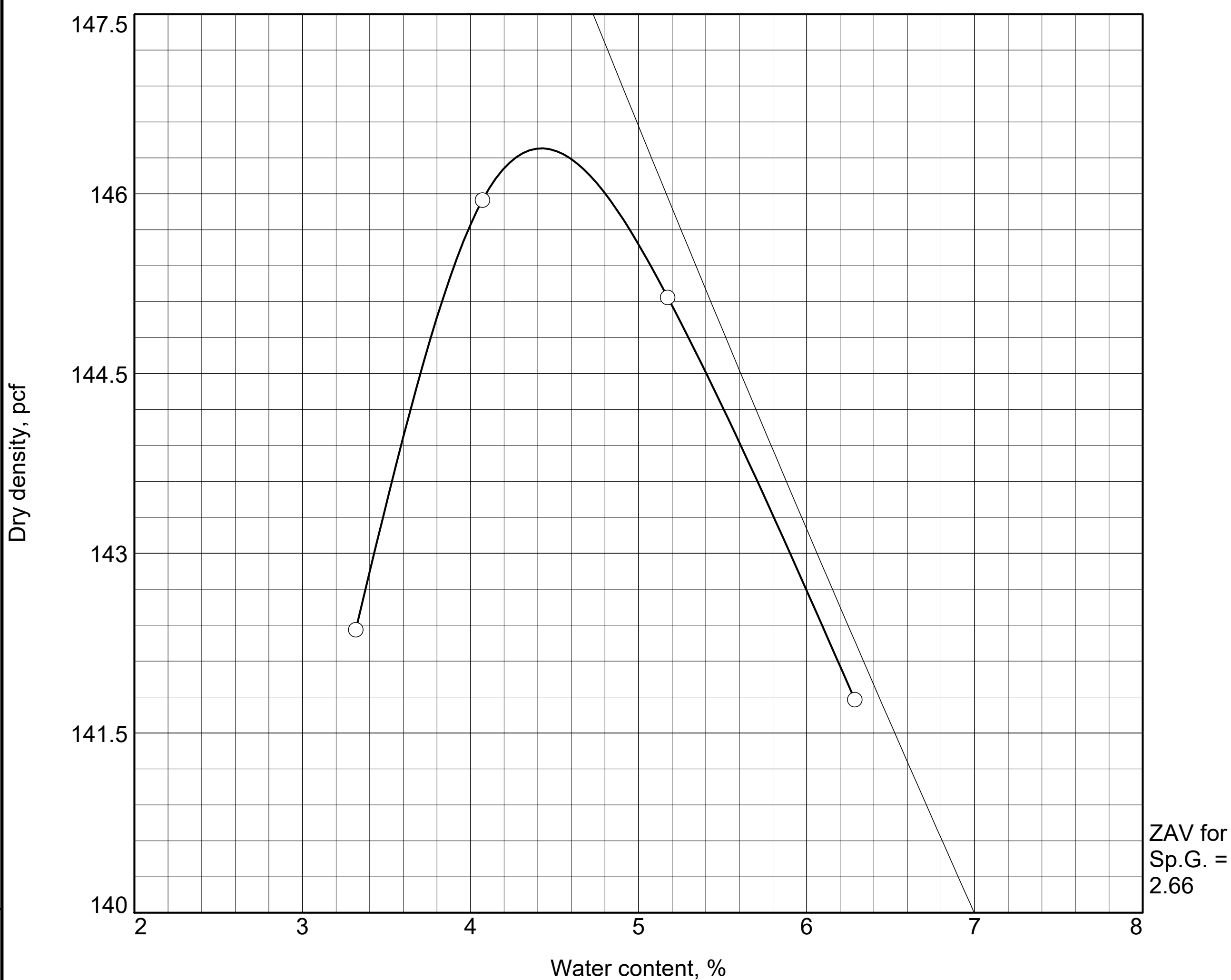
Date: 1/26/26

ALLWEST

Test Description/Remarks:

C. Peterson sampled 1/13/26

Moisture Density Curve



Test specification: ASTM D 1557-12 Method C Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
@ 2-3'	-	-	-	-	-	-	30	-

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 146.4 pcf	140.5 pcf	Poorly graded gravel with silt, sand and cobbles
Optimum moisture = 4.4 %	6.1 %	

Project No. 225-181G **Client:** Avista Corporation - Spokane
Project: Ponderay Avista Substation Phase 1
○ **Location:** TP-02 **Sample Number:** S226-0005

ALLWEST

Remarks:
Actual +3/4" 38%; Corrected +3/4" 30%
C. Peterson sampled 1/13/26

Tested By: D. Schmitz **Checked By:** K. Rukavina