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Mr. Karl Shrum
Rural Road Assessment No. 3
44400 Baker Road
Ontario, OR 97914
208-739-8761

Re: Limited Borrow Source Investigation Report
White Property Gravel Quantity Assessment
533 Ontario Heights Road
Ontario, OR

Dear Mr. Shrum:

In compliance with your instructions, MTI has conducted a limited soils exploration and gravel quantity assessment for the above referenced development. Fieldwork for this investigation was conducted on 17 and 18 June 2019. The proposed development is northwest of the City of Ontario, Malheur County, OR, and occupies a portion of the S½SW¼ and NW¼SW¼ of Section 19, Township 17 South, Range 47 East, Willamette Meridian. The project will consist of a gravel borrow source roughly 77.9 acres in size. It is MTI's understanding that the maximum excavation depth for the proposed borrow source will be roughly 45 feet below existing ground surface. This investigation is limited to assessment of the quantity of gravel on the site. Quality assessment of the gravel for source approval is outside of MTI's scope of work. If source approval testing on the onsite gravel is needed, additional exploration and laboratory analysis will be required.

Authorization

Authorization to perform this exploration and analysis was given in the form of a written authorization to proceed from Mr. Karl Shrum of Rural Road Assessment No. 3 to Jacob Schlador of Materials Testing and Inspection (MTI), on 28 May 2019. Said authorization is subject to terms, conditions, and limitations described in the Professional Services Contract entered into between Rural Road Assessment No. 3 and MTI. Our scope of services for the proposed development has been provided in our proposal dated 16 May 2019 and repeated below.

Scope of Investigation

The scope of this investigation included review of geologic literature and existing available geotechnical studies of the area, visual site reconnaissance of the immediate site, subsurface exploration of the site, field and laboratory testing of materials collected, and assessment of gravel quantity on the site. Our scope of work did not include laboratory testing of material for suitability to Oregon Department of Transportation and/or other standards.

Regional Geology

The subject site is located within the Western Snake River Flood Plain. Within this region, this geomorphological feature consists of a broad, deeply floored, thick sequence of alluvial silts, clays, sands and gravel. These sediments typically have been deposited on Miocene (24 to 5 million years ago) basalt flows and tuffaceous sediments of the eastern region of the Columbia Plateau. This thick sequence of generally fine-grained sediments, predominately derived from the Idaho Batholith, contains minor intercalated tuffs and basalt flows within the earliest deposits. Most of these sediments were placed during the latter part of the Miocene and are predominately of lacustrine origin. Lakes were created within this area as a result of basalt flow impoundments formed to the west along the ancestral Columbia River. Many of the fossil leaf forms uncovered in these lacustrine plain sediments indicate the presence of a wet tropical climate that prevailed at this time. Early Quaternary age (1.6 million years ago to present) sediments deposited on top of the lacustrine plain were apparently deposited during a time of extremely dry climatic conditions in which little water was present for removal, sorting, and deposition of the debris. With a gradual return to a wetter climate, the surrounding hills again began to erode to their present form. Locally within the City of Ontario, soils generally consist of interbedded clay, silt, sand and gravel. Geologic data for the area indicates bedrock may be encountered at depths of 750 feet or more beneath the soil surface.

General Site Characteristics

This proposed development consists of approximately 77.9 acres of gently sloping and hilly terrain. The site is bounded to the north by Canyon No 1. A gently east-west trending grade break is present in the northern portion of the site. On the north side of the grade break, the surface slopes gently downwards towards Canyon No 1. To the south of the grade break, the surface slopes gently downwards. In the central portion of the site there is an abrupt east-west trending grade break where the surface slopes downwards to the south at roughly 2 feet horizontal to 1 foot vertical (2:1). In the southern portion of the site, the surface slopes gently downwards to the north. Throughout the majority of the site, surficial soils consist of lean clays. Vegetation primarily consists of agricultural crops with some mature trees and brush along the northern and eastern perimeter.

Local drainage is north and east toward the Malheur and Snake Rivers via Canyon No 1. Stormwater drainage for the site is achieved by both sheet runoff and percolation through surficial soils. Runoff predominates for the steeper slopes while percolation prevails across the gently sloping and near level areas. The site is situated so that it is unlikely that it will receive any stormwater drainage from off-site sources. Stormwater drainage collection and retention systems are not in place on the project site and do not currently exist within the vicinity of the project site.

Exploration and Sampling Procedures

Field exploration conducted to determine engineering characteristics of subsurface materials included a reconnaissance of the project site and investigation by soil boring. Boring locations were selected by Mr. Karl Shrum of Rural Road Assessment No. 3 and provided to MTI via a site map. Actual borings were located in the field by means of a Global Positioning System (GPS) device and are reportedly accurate to within fifteen feet. Borings were advanced by means of a truck-mounted drilling rig equipped with continuous flight hollow-stem augers.

At specified depths, samples were obtained using a standard split-spoon sampler, and Standard Penetration Test (SPT) blow counts were recorded. Uncorrected SPT blow counts are provided on logs, which can be found in the **Appendix**. Delayed water level observations were made in open borings to evaluate groundwater levels. At completion of exploration, borings were backfilled with loose excavated materials and bentonite holeplug.

Samples have been visually classified in the field by professional staff, identified according to boring number and depth, placed in sealed containers, and transported to our laboratory for additional testing. Subsurface materials have been described in detail on logs provided in the **Enclosures** section. Results of field and laboratory tests are also presented in the **Enclosures** section. MTI recommends that these logs **not** be used to estimate fill material quantities.

Laboratory Testing Program

Along with our field investigation, a supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of subsurface materials necessary in an analysis of anticipated behavior of the proposed structures. Laboratory tests were conducted in accordance with current applicable American Society for Testing and Materials (ASTM) specifications, and results of these tests are to be found on the accompanying logs located in the **Enclosures** section. The laboratory testing program for this report included: Atterberg Limits Testing – ASTM D4318 and Grain Size Analysis – ASTM C117/C136.

Soil and Sediment Profile

The profile below represents a generalized interpretation for the project site. Note that on site soils strata, encountered between boring locations, may vary from the individual soil profiles presented in the logs, which can be found in the **Enclosures** section.

Lean clay soils were found at ground surface. These soils were brown, dry to slightly moist, and soft to medium stiff. Silt soils were observed beneath lean clays. These soils were brown to light brown, dry to slightly moist, and very stiff to hard. Intermittent weak to strong calcium carbonate cementation was encountered within the lower portion of this horizon. Silty sand sediments were observed beneath silt soils in boring 5. These sediments were brown, slightly moist, and medium dense, with fine to medium-grained sand.

Poorly graded gravel with silt and sand sediments were found within the silt soils in boring 1 from 7 to 12.5 feet bgs and underlying silt/silty sand soils in borings 2 and 5. These sediments were grayish-light brown or brown, dry to slightly moist, and very dense, with fine to coarse-grained sand and fine to coarse gravel. Varying layers of poorly graded gravel with sand and poorly graded sand with gravel sediments were encountered beneath the silts/poorly graded gravels with silt and sand. These sediments were gray-brown, brown, or light brown, dry to saturated, and very dense, with fine to coarse-grained sand, fine to coarse gravel, and 5-inch-minus cobbles. A second layer of silt soils were encountered at depth in borings 1, 5, and 6. These soils were brown, saturated, and hard, with fine to medium-grained sand.

Boring sidewalls were generally stable. However, moisture contents will affect wall competency with saturated soils having a tendency to readily slough when under load and unsupported.

Groundwater

During this field investigation, groundwater was encountered in borings at depths ranging from 25.8 to 36.2 feet bgs. Soil moistures in the borings were generally dry to slightly moist within surficial soils. Within the poorly graded gravels with sand and poorly graded sands with gravel, soil moistures graded from dry to saturated as the water table was approached and penetrated. In the vicinity of the project site, groundwater levels are controlled in large part by agricultural irrigation activity and leakage from nearby canals. Maximum groundwater elevations likely occur during the later portion of the irrigation season. According to Oregon Department of Water Resources well reports within approximately ½-mile of the project site, groundwater was measured at depths ranging from 30 to 54 feet bgs.

Based on evidence of this investigation and background knowledge of the area, MTI estimates groundwater depths to remain greater than approximately 25 feet bgs throughout the year. This depth can be confirmed through long-term groundwater monitoring.

Gravel Quantity Assessment

MTI obtained surface elevations for the boring locations using Light Detection and Ranging (LiDAR) data from the Oregon Department of Geology and Mineral Industries. The depths where gravels were encountered was converted to elevations for analysis of the volume of gravel on the site. The subsurface soil data from the borings were imported into the Rockworks 17 software by Rockware to create a 3-dimensional model of the subsurface stratigraphy. Based on the model that was created, a bank volume of 1,984,930 cubic yards of gravel present on the site from existing ground surface to the maximum excavation depth of 45 feet bgs. However, approximately 908,200 cubic yards of the gravel present is below the groundwater elevation at the time of the borings. These volumes are estimates as variations within the subsurface soil layers may be present.

Warranty and Limiting Conditions

MTI warrants that findings and conclusions contained herein have been formulated in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology only for the site and project described in this report. These engineering methods have been developed to provide the client with information regarding apparent or potential engineering conditions relating to the site within the scope cited above and are necessarily limited to conditions observed at the time of the site visit and research. Field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for the purposes cited above.

Exclusive Use

This report was prepared for exclusive use of the property owner(s), at the time of the report, and their retained design consultants (“Client”). Conclusions and recommendations presented in this report are based on the agreed-upon scope of work outlined in this report together with the Contract for Professional Services between the Client and Materials Testing and Inspection (“Consultant”). Use or misuse of this report, or reliance upon findings hereof, by parties other than the Client is at their own risk. Neither Client nor Consultant make representation of warranty to such other parties as to accuracy or completeness of this report or suitability of its use by such other parties for purposes whatsoever, known or unknown, to Client or Consultant. Neither Client nor Consultant shall have liability to indemnify or hold harmless third parties for losses incurred by actual or purported use or misuse of this report. No other warranties are implied or expressed.

Report Recommendations are Limited and Subject to Misinterpretation

There is a distinct possibility that conditions may exist that could not be identified within the scope of the investigation or that were not apparent during our site investigation. Findings of this report are limited to data collected from noted explorations advanced and do not account for unidentified fill zones, unsuitable soil types or conditions, and variability in soil moisture and groundwater conditions. To avoid possible misinterpretations of findings, conclusions, and implications of this report, MTI should be retained to explain the report contents to other design professionals as well as construction professionals.

Since actual subsurface conditions on the site can only be verified by earthwork, note that construction recommendations are based on general assumptions from selective observations and selective field exploratory sampling. Upon commencement of construction, such conditions may be identified that require corrective actions, and these required corrective actions may impact the project budget. Therefore, construction recommendations in this report should be considered preliminary, and MTI should be retained to observe actual subsurface conditions during earthwork construction activities to provide additional construction recommendations as needed.

Since geotechnical reports are subject to misinterpretation, **do not** separate the soil logs from the report. Rather, provide a copy of, or authorize for their use, the complete report to other design professionals or contractors. Locations of exploratory sites referenced within this report should be considered approximate locations only. For more accurate locations, services of a professional land surveyor are recommended.

This report is also limited to information available at the time it was prepared. In the event additional information is provided to MTI following publication of our report, it will be forwarded to the client for evaluation in the form received.

Environmental Concerns

Comments in this report concerning either onsite conditions or observations, including soil appearances and odors, are provided as general information. These comments are not intended to describe, quantify, or evaluate environmental concerns or situations. Since personnel, skills, procedures, standards, and equipment differ, a geotechnical investigation report is not intended to substitute for a geoenvironmental investigation or a Phase II/III Environmental Site Assessment. If environmental services are needed, MTI can provide, via a separate contract, those personnel who are trained to investigate and delineate soil and water contamination.

Environmental Services Geotechnical Engineering Construction Materials Testing Special Inspections

MTI appreciates this opportunity to be of service to you and looks forward to working with you in the future. If you have questions, please call (208) 376-4748.

Respectfully Submitted,
Materials Testing & Inspection

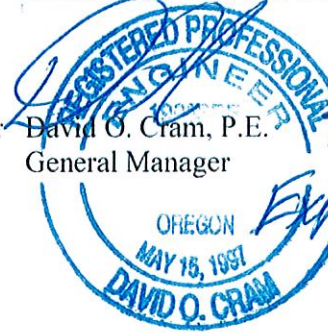


Clint Wyllie, G.I.T.
Staff Geologist



Reviewed by: Elizabeth Brown, P.E.
Geotechnical Services Manager

Reviewed by: David O. Cram, P.E.
General Manager



7-3-19

EVA-12-31-19

Enclosures:
Geotechnical General Notes
Geotechnical Investigation Boring Logs
Vicinity Map
Site Map

GEOTECHNICAL GENERAL NOTES

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION			
Coarse-Grained Soils	SPT Blow Counts (N)	Fine-Grained Soils	SPT Blow Counts (N)
Very Loose:	< 4	Very Soft:	< 2
Loose:	4-10	Soft:	2-4
Medium Dense:	10-30	Medium Stiff:	4-8
Dense:	30-50	Stiff:	8-15
Very Dense:	>50	Very Stiff:	15-30
		Hard:	>30

Moisture Content	
Description	Field Test
Dry	Absence of moisture, dusty, dry to touch
Moist	Damp but not visible moisture
Wet	Visible free water, usually soil is below water table

Cementation	
Description	Field Test
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or beaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

PARTICLE SIZE					
Boulders:	>12 in.	Coarse-Grained Sand:	5 to 0.6 mm	Silts:	0.075 to 0.005 mm
Cobbles:	12 to 3 in.	Medium-Grained Sand:	0.6 to 0.2 mm	Clays:	<0.005 mm
Gravel:	3 in. to 5 mm	Fine-Grained Sand:	0.2 to 0.075 mm		

UNIFIED SOIL CLASSIFICATION SYSTEM			
Major Divisions		Symbol	Soil Descriptions
Coarse-Grained Soils <50% passes No.200 sieve	Gravel & Gravelly Soils <50% coarse fraction passes No.4 sieve	GW	Well-graded gravels; gravel/sand mixtures with little or no fines
		GP	Poorly-graded gravels; gravel/sand mixtures with little or no fines
		GM	Silty gravels; poorly-graded gravel/sand/silt mixtures
		GC	Clayey gravels; poorly-graded gravel/sand/clay mixtures
	Sand & Sandy Soils >50% coarse fraction passes No.4 sieve	SW	Well-graded sands; gravelly sands with little or no fines
		SP	Poorly-graded sands; gravelly sands with little or no fines
		SM	Silty sands; poorly-graded sand/gravel/silt mixtures
		SC	Clayey sands; poorly-graded sand/gravel/clay mixtures
Fine Grained Soils >50% passes No.200 sieve	Silts & Clays LL < 50	ML	Inorganic silts; sandy, gravelly or clayey silts
		CL	Lean clays; inorganic, gravelly, sandy, or silty, low to medium-plasticity clays
		OL	Organic, low-plasticity clays and silts
	Silts & Clays LL > 50	MH	Inorganic, elastic silts; sandy, gravelly or clayey elastic silts
		CH	Fat clays; high-plasticity, inorganic clays
		OH	Organic, medium to high-plasticity clays and silts
Highly Organic Soils		PT	Peat, humus, hydric soils with high organic content



**MATERIALS
TESTING &
INSPECTION**

FIELD BOREHOLE LOG

BOREHOLE NO.: B-I

TOTAL DEPTH: 46.5'

PROJECT INFORMATION

DRILLING INFORMATION

PROJECT: White Property Gravel Assessment

DRILLING CO.: Haztech Drilling, Inc.

LOCATION: 533 Ontario Heights Road

METHOD OF DRILLING: 6' Hollow Stem Auger

Ontario, OR

SAMPLING METHODS: Split Spoon

JOB NO.: B190984g

DATES DRILLED: 18 June 2019

LOGGED BY: Nick Stevens, G.I.T.

LATITUDE/LONGITUDE: 44.07249, -117.02413



Water level during drilling



Standard Split Spoon



Auger Sample



California Sampler

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0		LEAN CLAY (CL): Brown, dry to slightly moist, medium stiff.							
5		SILT (ML): Light brown, dry to slightly moist, hard. --Intermittent weak to moderate calcium carbonate cementation noted from 5.5 to 7.0 feet bgs.					▲	6,15,39	0
10		POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM): Grayish-light brown, dry to slightly moist, very dense, with fine to coarse-grained sand and fine to coarse gravel.					▲	17,40,31	0
15		SILT (ML): Brown, slightly moist, hard.					▲	10,50 for 5"	0
20		POORLY GRADED GRAVEL WITH SAND (GP): Grayish-brown, dry to saturated, very dense, with fine to coarse-grained sand and fine to coarse gravel.	2.7	NP	52	5.7	▲	20,43,46	0
25							▲	15,40,50 for 2"	0
30							▲	35,50 for 3"	0
32.4		Groundwater encountered at 32.4 feet bgs.							
35							▲	12,50 for 3"	0
40		SILT (ML): Brown, saturated, hard.					▲	12,22,35	0
45							▲	10,19,37	0



**MATERIALS
TESTING &
INSPECTION**

FIELD BOREHOLE LOG

BOREHOLE NO.: B-2

TOTAL DEPTH: 46.5'

PROJECT INFORMATION

DRILLING INFORMATION

PROJECT: White Gravel Quantity Assessment
LOCATION: 533 Ontario Heights Road
 Ontario, OR
JOB NO.: B190984g
LOGGED BY: Maren Tanberg, E.I.T., G.I.T.

DRILLING CO.: Haztech Drilling, Inc.
METHOD OF DRILLING: 6" Hollow Stem Auger
SAMPLING METHODS: Split Spoon
DATES DRILLED: 17 June 2016
LATITUDE/LONGITUDE: 44.071093, -117.018755

Water level during drilling
 Standard Split Spoon
 Auger Sample
 California Sampler

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0 - 5	LEAN CLAY (CL)	Brown, dry to slightly moist, soft.					1, 2, 2		
5 - 11	SILT (ML)	Brown, slightly moist, very stiff to hard. --Intermittent weak to moderate calcium carbonate cementation noted from 5.0 to 11.0 feet bgs.					10, 16, 15		
11 - 25	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)	Brown, dry to moist, very dense, with fine to coarse-grained sand and fine to coarse gravel.					7, 10, 11	0	30
25 - 26							8, 10, 18		
26 - 27							18, 28, 50 for 4"	0	30
27 - 28							50 for 5.5"	0	30
28 - 29							50 for 5.5"	0	30
29 - 30							50 for 5.5"	0	30
30 - 31	POORLY GRADED SAND WITH GRAVEL (SP)	Brown, slightly moist to saturated, very dense, with fine to coarse-grained sand and fine to coarse gravel. Groundwater encountered at 25.8 feet bgs.					14, 38, 36	0	30
31 - 32							45, 50 for 2"	0	30
32 - 33							15, 50 for 4"	0	30
33 - 34							15, 34, 50 for 5"	0	30
34 - 35							48, 50 for 4"	0	30
35 - 36									
36 - 37									
37 - 38									
38 - 39									
39 - 40									
40 - 41									
41 - 42									
42 - 43									
43 - 44									
44 - 45									
45 - 46									



**MATERIALS
TESTING &
INSPECTION**

FIELD BOREHOLE LOG

BOREHOLE NO.: B-3

TOTAL DEPTH: 46.5'

PROJECT INFORMATION

DRILLING INFORMATION

PROJECT: White Property Gravel Assessment

DRILLING CO.: Haztech Drilling, Inc.

LOCATION: 533 Ontario Heights Road

METHOD OF DRILLING: 6" Hollow Stem Auger

Ontario, OR

SAMPLING METHODS: Split Spoon

JOB NO.: B190984g

DATES DRILLED: 18 June 2019

LOGGED BY: Nick Stevens, G.I.T.

LATITUDE/LONGITUDE: 44.07241, -117.02109

 Water level during drilling
  Standard Split Spoon
  Auger Sample
  California Sampler

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0	LEAN CLAY (CL)	Brown, dry to slightly moist, medium stiff.							
5	SILT (ML)	Light brown, dry to slightly moist, hard. --Intermittent weak calcium carbonate cementation noted from 6.2 to 10.0 feet bgs.					12,16,19	0	30
10							7,18,29	0	30
15	POORLY GRADED GRAVEL WITH SAND (GP)	Grayish-brown, dry to saturated, very dense, with fine to coarse-grained sand and 5-inch minus cobbles.					24,50 for 5.5"	0	30
20							24,50 for 4"	0	30
25							50 for 5"	0	30
30							43,50 for 3"	0	30
35		Groundwater encountered at 34.6 feet bgs.					10,50 for 5"	0	30
40							25,50 for 5.5"	0	30
45	SILT (ML)	Brown, saturated, hard.					12,27,50 for 5"	0	30



**MATERIALS
TESTING &
INSPECTION**

FIELD BOREHOLE LOG

BOREHOLE NO.: B-4
TOTAL DEPTH: 46.5'

PROJECT INFORMATION

DRILLING INFORMATION

PROJECT: White Property Gravel Assessment
LOCATION: 533 Ontario Heights Road
Ontario, OR
JOB NO.: B190984g
LOGGED BY: Nick Stevens, G.I.T.

DRILLING CO.: Haztech Drilling, Inc.
METHOD OF DRILLING: 6" Hollow Stem Auger
SAMPLING METHODS: Split Spoon
DATES DRILLED: 18 June 2019
LATITUDE/LONGITUDE: 44.06981, -117.02416

Water level during drilling
 Standard Split Spoon
 Auger Sample
 California Sampler

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0	LEAN CLAY (CL)	Brown, dry to slightly moist, soft.							
5	SILT (ML)	Light brown, dry to slightly moist, stiff to hard. --Intermittent weak to strong calcium carbonate cementation noted from 5.0 to 9.5 feet bgs. --Some fine-grained sand noted from 21.0 to 22.5 feet bgs.					14,24,50 for 5.5"	0	30 60
10							8,16,12	0	30 60
15							4,5,7	0	30 60
20							6,7,11	0	30 60
25	POORLY GRADED GRAVEL WITH SAND (GP)	Grayish-brown, dry to saturated, very dense, with fine to coarse-grained sand and 4-inch minus cobbles.					16,50 for 5.5"	0	30 60
30							12,45,50 for 3"	0	30 60
35							28,50 for 4"	0	30 60
36.2		Groundwater encountered at 36.2 feet bgs.							
40							17,46,50 for 3"	0	30 60
45							6,18,42	0	30 60



**MATERIALS
TESTING &
INSPECTION**

FIELD BOREHOLE LOG

BOREHOLE NO.: B-5
TOTAL DEPTH: 46.5'

PROJECT INFORMATION

DRILLING INFORMATION

PROJECT: White Property Gravel Assessment
LOCATION: 533 Ontario Heights Road
Ontario, OR
JOB NO.: B190984g
LOGGED BY: Maren Tanberg, E.I.T., G.I.T.

DRILLING CO.: Haztech Drilling, Inc.
METHOD OF DRILLING: 6" Hollow Stem Auger
SAMPLING METHODS: Split Spoon
DATES DRILLED: 17 June 2016
LATITUDE/LONGITUDE: 44.069237, -117.021610

 Water level during drilling
  Standard Split Spoon
  Auger Sample
  California Sampler

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0	LEAN CLAY (CL)	Brown, dry to slightly moist, medium stiff.					3, 2, 3		
5	SILT (ML)	Brown, dry to slightly moist, very stiff to hard. --Intermittent weak to moderate calcium carbonate cementation noted from 7.5 to 11.5 feet bgs.					10, 15, 18		
10							7, 11, 14	0	30
15							50 for 2.5"		
20	SILTY SAND (SM)	Brown, slightly moist, medium dense, with fine to medium-grained sand.					20, 13, 6	0	30
25	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)	Brown to gray-brown, dry to slightly moist, very dense, with fine to coarse-grained sand and fine to coarse gravel.					10, 13, 14	0	30
30	POORLY GRADED GRAVEL WITH SAND (GP)	Gray-brown, dry to saturated, very dense, with fine to coarse-grained sand and fine to coarse gravel.					16, 42, 50 for 3.5"	0	30
35		Groundwater encountered at 34.1 feet bgs.					20, 43, 50 for 3"	0	30
40	SILT (ML)	Brown, saturated, hard, with fine to medium-grained sand.					26, 50 for 5.5"	0	30
45							13, 42, 50 for 5"	0	30
							15, 28, 50 for 4"	0	30
							17, 31, 50	0	30



**MATERIALS
TESTING &
INSPECTION**

FIELD BOREHOLE LOG

BOREHOLE NO.: B-6

TOTAL DEPTH: 46.5'

PROJECT INFORMATION

DRILLING INFORMATION

PROJECT: White Property Gravel Assessment

DRILLING CO.: Haztech Drilling, Inc.

**LOCATION: 533 Ontario Heights Road
Ontario, OR**

METHOD OF DRILLING: 6" Hollow Stem Auger

JOB NO.: B190984g













SAMPLING METHODS: Split Spoon

DATES DRILLED: 17 June 2016

LOGGED BY: Maren Tanberg, E.I.T., G.I.T.

LATITUDE/LONGITUDE: 44.068968, -117.018726

 Water level during drilling
  Standard Split Spoon
  Auger Sample
  California Sampler

DEPTH	SOIL TYPE	DESCRIPTION	MOISTURE (%)	LL/PI	% < #4	% < #200	SAMPLE	BLOWS	BLOWS PER FOOT (N)
0									
0 - 5	LEAN CLAY (CL)	Brown, dry to slightly moist, medium stiff.						4, 4, 3	
5 - 15	SILT (ML)	Brown, dry to slightly moist, very stiff to hard. --Intermittent weak calcium carbonate cementation noted from 7.5 to 15.0 feet bgs.						3, 8, 15	
10								10, 12, 12	0
15								14, 11, 8	
20								6, 7, 14	0
15 - 20	POORLY GRADED SAND WITH GRAVEL (SP)	Brown, dry to slightly moist, very dense, with fine to medium-grained sand and fine to coarse gravel.						24, 35, 24	0
20 - 25								15, 32, 50 for 2"	0
25 - 30								38, 50 for 3"	0
30 - 35								43, 50 for 3"	0
35 - 40	POORLY GRADED GRAVEL WITH SAND (GP)	Gray-brown to light brown, slightly moist to saturated, very dense, with fine to coarse-grained sand. Groundwater encountered at 32.8 feet bgs.						10, 24, 40	0
40 - 45								8, 50 for 4"	0
45	SILT (ML)	Brown, slightly moist, hard, with fine to medium-grained sand.						17, 32, 50	0

MAP NOTES:

- DeLorme Street Atlas
- Not to Scale

LEGEND

Approximate Site Location



White Property Gravel Quantity Assessment

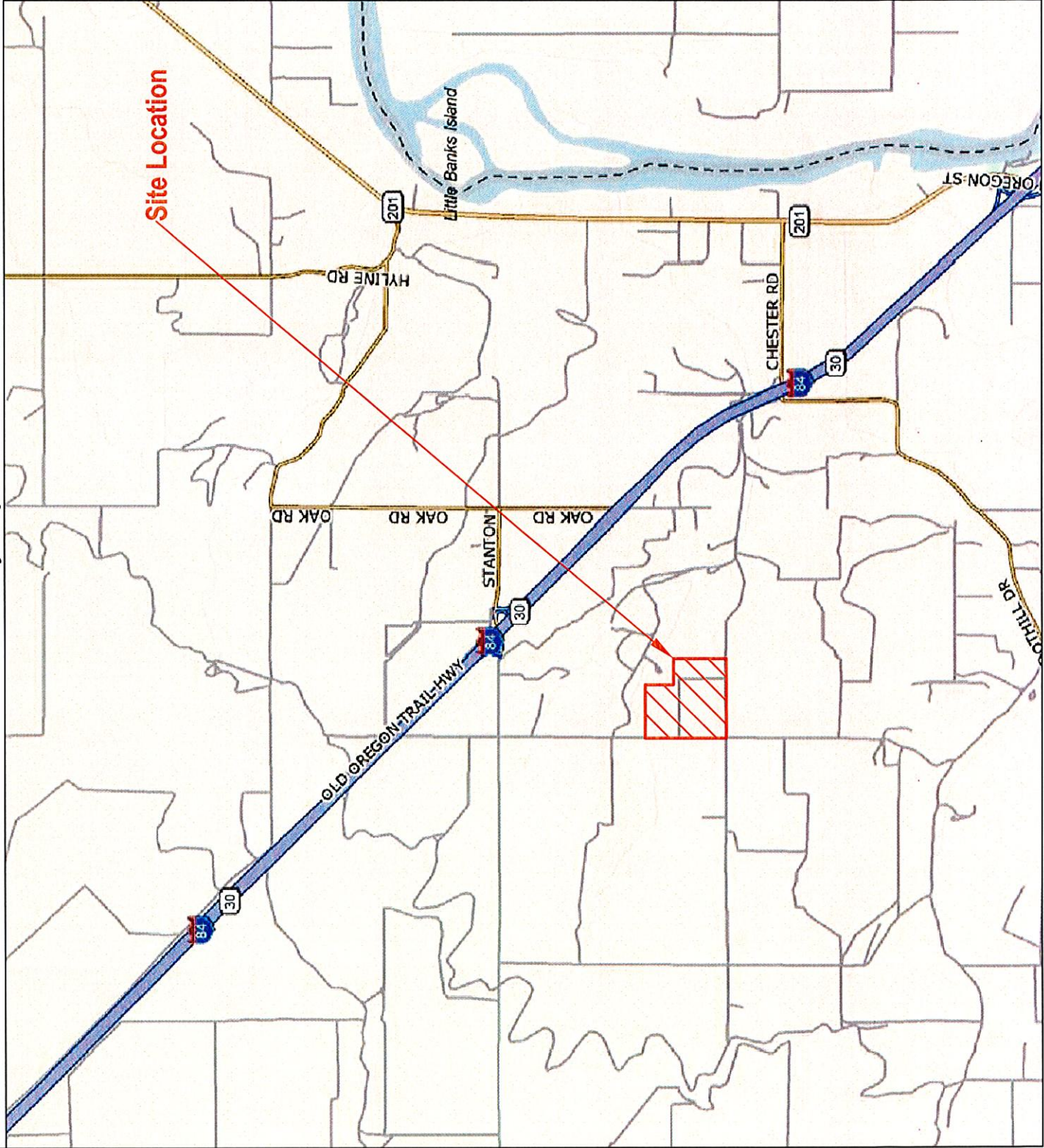
533 Ontario Heights Road
Ontario, OR

Modified from DeLorme by: CCW
1 July 2019
Drawing: B190984g



AN ATLAS COMPANY

2791 S. Victory View Way Phone: 208.376-4748
Boise, ID 83709-2835 Fax: 208.322-6515
E-mail: mti@mti-id.com





NOTES:

- Not to Scale
- Photo by ESRI World Imagery Service

LEGEND

- Approximate Site Boundary
- Approximate MTI Boring Location



White Property Gravel Quantity Assessment

533 Ontario Heights Road
Ontario, OR

Modified by: CCW
1 July 2019
Drawing: B190984g



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ONTARIO HEIGHTS ROAD

COMMUNITY ROAD

CANYON NO 1

B-1

B-3

B-2

B-4

B-5

B-6

Mr. Karl Shrum
Rural Road Assessment No. 3
44400 Baker Road
Ontario, OR 97914
208-739-8761

Re: Addendum #1 – Additional Laboratory Testing
White Property Gravel Quantity Assessment
533 Ontario Heights Road
Ontario, OR

Dear Mr. Shrum:

This addendum report presents laboratory test results not requested at the time of the previously issued MTI Geotechnical Engineering Report (B190984g). Descriptions of general site characteristics and the proposed project are available in the previous report. Unless otherwise noted in this addendum, all initial recommendations, limitations, and warranties expressed in the previous report must be adhered to.

Additional Testing

It was requested by Mr. Karl Shrum that additional laboratory testing be conducted for the development of the project site as a gravel pit. The test samples were reportedly obtained by Mr. Karl Shrum from three different locations on the site. Samples were obtained from the vicinity of boring 1, boring 2, and boring 6, via test pits advanced 5 plus feet into the gravel deposits (see Site Map for boring locations). Laboratory tests were conducted in accordance with current applicable Oregon Department of Transportation (ODOT) and American Association of State Highway and Transportation Officials (AASHTO) specifications, and results of these tests are located in the **Enclosures** section of this report. The laboratory testing program for this report included: Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine Testing – AASHTO T 96, Soundness of Aggregate by Use of Sodium Sulfate – AASHTO T 104, and Oregon Air Aggregate Degradation – ODOT TM 208.

Based on the reported test pit/sample locations, the test samples can be expected to be generally representative of the aggregates at the overall site and associated subsurface conditions. Test results, included with this report, of the samples indicate that the materials appear to meet the requirements of Oregon Standard Specifications for Construction, 2018, Base Aggregate, 02630.1 (c) Durability section.

Environmental Services Geotechnical Engineering Construction Materials Testing Special Inspections

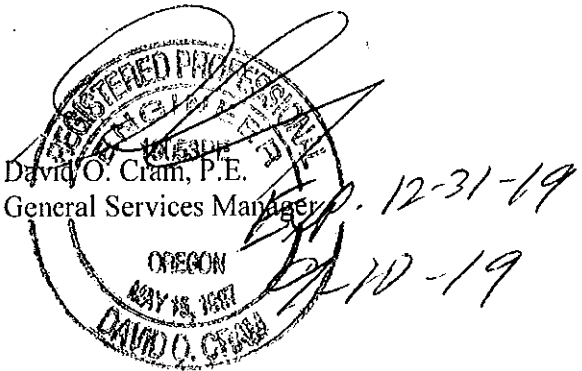
The findings, test data, and opinions within this report limited to the conditions described, samples submitted, and test results. Additional and/or alternate information may require revisions to this report, and therefore must be brought to the immediate attention of this engineer. At that time, revisions to this report may be required.

MTI appreciates this opportunity to be of service to you and looks forward to working with you in the future. If you have questions, please call (208) 376-4748.

Respectfully Submitted,
Materials Testing & Inspection

Jacob Schlador
Jacob Schlador, P.E. (ID)
Geotechnical Engineer

Reviewed by: David O. Clam, P.E.
General Services Manager



Enclosures:
Abrasion Test Results – AASHTO T 96
Soundness Test Results – AASHTO T 108
Oregon Air Aggregate Degradation – ODOT TM 208

ABRASION TEST RESULTS – AASHTO T 96

Source:	Test Pit #1 – Vicinity of Boring 2							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C535:		AASHTO T96:	X				

Nominal Maximum Size of Aggregate	2.5"
Grading Designation	2
Loss by Abrasion (%)	24

Specification: 35% maximum

Source:	Test Pit #2 - Vicinity of Boring 6							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C535:		AASHTO T96:	X				

Nominal Maximum Size of Aggregate	2.5"
Grading Designation	2
Loss by Abrasion (%)	20

Specification: 35% maximum

Source:	Test Pit #3 - Vicinity of Boring 1							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C535:		AASHTO T96:	X				

Nominal Maximum Size of Aggregate	2.5"
Grading Designation	2
Loss by Abrasion (%)	24

Specification: 35% maximum

SOUNDNESS TEST RESULTS – AASHTO T 104

Source:	Test Pit #1 - Vicinity of Boring 2							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C88:		AASHTO T104:	X				
Solution:	Sodium:	X	Magnesium:		Fresh Prepared:	X	Previously Used:	

Coarse Aggregate

Sieve Size		Weight of Test Fraction Before Test	% Passing Designated Sieve After Test	Weighted % Loss
Passing	Retained			
2.5"	2.0"	2842.7	0.3	0.1
2.0"	1.5"	1831.1		
1.5"	1.0"	966.0	1.0	0.3
1.0"	¾"	492.7		
¾"	½"	669.8	3.2	0.5
½"	3/8"	331.9		
3/8"	#4	300.8	5.5	0.6
			Total	1.5

Specification: 12% maximum
Coarse Aggregate Examination

Sieve Size		Splitting		Crumbling		Cracking		Flaking		No. of Particles Before Test
Passing	Retained	No.	%	No.	%	No.	%	No.	%	
2.5"	1.5"	1	4.5							22
1.5"	¾"	1	2.7							37

SOUNDNESS TEST RESULTS – AASHTO T 104

Source:	Test Pit #2 - Vicinity of Boring 6							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C88:		AASHTO T104:	X				
Solution:	Sodium:	X	Magnesium:		Fresh Prepared:	X	Previously Used:	

Coarse Aggregate

Sieve Size		Weight of Test Fraction Before Test	% Passing Designated Sieve After Test	Weighted % Loss
Passing	Retained			
2.5"	2.0"	2876.9	0.3	0.1
2.0"	1.5"	1848.0		
1.5"	1.0"	983.4	0.2	0.1
1.0"	¾"	500.3		
¾"	½"	670.2	2.6	0.5
½"	3/8"	330.7		
3/8"	#4	329.8	3.5	0.4
			Total	1.1

Specification: 12% maximum
Coarse Aggregate Examination

Sieve Size		Splitting		Crumbling		Cracking		Flaking		No. of Particles Before Test
Passing	Retained	No.	%	No.	%	No.	%	No.	%	
2.5"	1.5"					2	10.5			19
1.5"	¾"									40

SOUNDNESS TEST RESULTS – AASHTO T 104

Source:	Test Pit #3 - Vicinity of Boring 1							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C88:		AASHTO T104:	X				
Solution:	Sodium:	X	Magnesium:		Fresh Prepared:	X	Previously Used:	

Coarse Aggregate

Sieve Size		Weight of Test Fraction Before Test	% Passing Designated Sieve After Test	Weighted % Loss
Passing	Retained			
2.5"	2.0"	2943.9	0.5	0.3
2.0"	1.5"	1964.0		
1.5"	1.0"	970.1	2.8	0.8
1.0"	¾"	484.6		
¾"	½"	660.2	8.2	1.0
½"	3/8"	325.9		
3/8"	#4	299.4	8.0	0.8
			Total	2.9

Specification: 12% maximum
Coarse Aggregate Examination

Sieve Size		Splitting		Crumbling		Cracking		Flaking		No. of Particles Before Test
Passing	Retained	No.	%	No.	%	No.	%	No.	%	
2.5"	1.5"	1	4.2							24
1.5"	¾"	2	4.9							41

OREGON AIR AGGREGATE DEGRADATION – ODOT TM 208

Source:	Test Pit #1 - Vicinity of Boring 2							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ODOT TM 208-15:	X						

No. 20 Sieve	Percent Passing	2.9
Sand Equivalent	Sediment Height	0.2"

Specification: 30% maximum passing, and 3" maximum

Source:	Test Pit #2 - Vicinity of Boring 6							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ODOT TM 208-15:	X						

No. 20 Sieve	Percent Passing	1.9
Sand Equivalent	Sediment Height	0.1"

Specification: 30% maximum passing, and 3" maximum

Source:	Test Pit #3 - Vicinity of Boring 1							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ODOT TM 208-15:	X						

No. 20 Sieve	Percent Passing	2.1
Sand Equivalent	Sediment Height	0.2"

Specification: 30% maximum passing, and 3" maximum

Mr. Karl Shrum
Rural Road Assessment No. 3
44400 Baker Road
Ontario, OR 97914
208-739-8761

**Re: Addendum #1 – Additional Laboratory Testing
White Property Gravel Quantity Assessment
533 Ontario Heights Road
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Additional Testing

It was requested by Mr. Karl Shrum that additional laboratory testing be conducted for the development of the project site as a gravel pit. The test samples were reportedly obtained by Mr. Karl Shrum from three different locations on the site. Samples were obtained from the vicinity of boring 1, boring 2, and boring 6, via test pits advanced 5 plus feet into the gravel deposits (see Site Map for boring locations). Laboratory tests were conducted in accordance with current applicable Oregon Department of Transportation (ODOT) and American Association of State Highway and Transportation Officials (AASHTO) specifications, and results of these tests are located in the **Enclosures** section of this report. The laboratory testing program for this report included: Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine Testing – AASHTO T 96, Soundness of Aggregate by Use of Sodium Sulfate – AASHTO T 104, and Oregon Air Aggregate Degradation – ODOT TM 208.

Based on the reported test pit/sample locations, the test samples can be expected to be generally representative of the aggregates at the overall site and associated subsurface conditions. Test results, included with this report, of the samples indicate that the materials appear to meet the requirements of Oregon Standard Specifications for Construction, 2018, Base Aggregate, 02630.1 (c) Durability section.

Resized Aggregate Area

MTI was informed by Mr. Karl Shrum, that at this time a smaller area was planned on being mined for aggregate base. This area can be seen on the **Site Map** that can be seen in the **Enclosures** section of this report. MTI obtained surface elevations for the boring locations using Light Detection and Ranging (LiDAR) data from the Oregon Department of Geology and Mineral Industries. The subsurface soil data from the borings were imported into the Rockworks 17 software by Rockware to create a 3-dimensional model of the subsurface stratigraphy. Based on the model that was created, a bank volume of approximately 390,597 bank cubic yards of poorly graded gravel sediments are within this area to the maximum excavation depth of 45 feet bgs. Based on laboratory analysis on the poorly graded gravel sediments, MTI determined that this material had a unit weight of 121 pounds per cubic foot. Using this information, MTI was able to calculate that there was approximately 638,000 tons of poorly graded gravel sediments in the area of interest.

The findings, test data, and opinions within this report limited to the conditions described, samples submitted, and test results. Additional and/or alternate information may require revisions to this report, and therefore must be brought to the immediate attention of this engineer. At that time, revisions to this report may be required.

MTI appreciates this opportunity to be of service to you and looks forward to working with you in the future. If you have questions, please call (208) 376-4748.

Respectfully Submitted,
Materials Testing & Inspection


Jacob Schlador, P.E. (ID)
Geotechnical Engineer

Reviewed by: David O. Cram, P.E.
General Services Manager



17-19
12-31-19

Enclosures:
Abrasion Test Results – AASHTO T 96
Soundness Test Results – AASHTO T 108
Oregon Air Aggregate Degradation – ODOT TM 208
Site Map

ABRASION TEST RESULTS – AASHTO T 96

Source:	Test Pit #1 – Vicinity of Boring 2							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C535:		AASHTO T96:	X				

Nominal Maximum Size of Aggregate	2.5"
Grading Designation	2
Loss by Abrasion (%)	24

Specification: 35% maximum

Source:	Test Pit #2 - Vicinity of Boring 6							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C535:		AASHTO T96:	X				

Nominal Maximum Size of Aggregate	2.5"
Grading Designation	2
Loss by Abrasion (%)	20

Specification: 35% maximum

Source:	Test Pit #3 - Vicinity of Boring 1							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C535:		AASHTO T96:	X				

Nominal Maximum Size of Aggregate	2.5"
Grading Designation	2
Loss by Abrasion (%)	24

Specification: 35% maximum

SOUNDNESS TEST RESULTS – AASHTO T 104

Source:	Test Pit #1 - Vicinity of Boring 2							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C88:		AASHTO T104:	X				
Solution:	Sodium:	X	Magnesium:		Fresh Prepared:	X	Previously Used:	

Coarse Aggregate

Sieve Size		Weight of Test Fraction Before Test	% Passing Designated Sieve After Test	Weighted % Loss
Passing	Retained			
2.5"	2.0"	2842.7	0.3	0.1
2.0"	1.5"	1831.1		
1.5"	1.0"	966.0	1.0	0.3
1.0"	¾"	492.7		
¾"	½"	669.8	3.2	0.5
½"	3/8"	331.9		
3/8"	#4	300.8	5.5	0.6
			Total	1.5

Specification: 12% maximum

Coarse Aggregate Examination

Sieve Size		Splitting		Crumbling		Cracking		Flaking		No. of Particles Before Test
Passing	Retained	No.	%	No.	%	No.	%	No.	%	
2.5"	1.5"	1	4.5							22
1.5"	¾"	1	2.7							37

SOUNDNESS TEST RESULTS – AASHTO T 104

Source:	Test Pit #2 - Vicinity of Boring 6							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C88:		AASHTO T104:	X				
Solution:	Sodium:	X	Magnesium:		Fresh Prepared:	X	Previously Used:	

Coarse Aggregate

Sieve Size		Weight of Test Fraction Before Test	% Passing Designated Sieve After Test	Weighted % Loss
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¾"	½"	670.2		
½"	3/8"	330.7		
3/8"	#4	329.8	3.5	0.4
			Total	1.1

Specification: 12% maximum

Coarse Aggregate Examination

Sieve Size		Splitting		Crumbling		Cracking		Flaking		No. of Particles Before Test
Passing	Retained	No.	%	No.	%	No.	%	No.	%	
2.5"	1.5"					2	10.5			19
1.5"	¾"									40

SOUNDNESS TEST RESULTS – AASHTO T 104

Source:	Test Pit #3 - Vicinity of Boring 1							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ASTM C88:		AASHTO T104:	X				
Solution:	Sodium:	X	Magnesium:		Fresh Prepared:	X	Previously Used:	

Coarse Aggregate

Sieve Size		Weight of Test Fraction Before Test	% Passing Designated Sieve After Test	Weighted % Loss
Passing	Retained			
2.5"	2.0"	2943.9	0.5	0.3
2.0"	1.5"	1964.0		
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Coarse Aggregate Examination

Sieve Size		Splitting		Crumbling		Cracking		Flaking		No. of Particles Before Test
Passing	Retained	No.	%	No.	%	No.	%	No.	%	
2.5"	1.5"	1	4.2							24
1.5"	¾"	2	4.9							41

OREGON AIR AGGREGATE DEGRADATION – ODOT TM 208

Source:	Test Pit #1 - Vicinity of Boring 2							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ODOT TM 208-15:	X						

No. 20 Sieve	Percent Passing	2.9
Sand Equivalent	Sediment Height	0.2"

Specification: 30% maximum passing, and 3" maximum

Source:	Test Pit #2 - Vicinity of Boring 6							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ODOT TM 208-15:	X						

No. 20 Sieve	Percent Passing	1.9
Sand Equivalent	Sediment Height	0.1"

Specification: 30% maximum passing, and 3" maximum

Source:	Test Pit #3 - Vicinity of Boring 1							
Date Obtained:	The Sample was Obtained and Delivered by the Client on July 31, 2019.							
Sample ID:	19-5241							
Sampling and Preparation:	ASTM D75:		AASHTO T2:		ASTM D421:		AASHTO T87:	X
Test Standard:	ODOT TM 208-15:	X						

No. 20 Sieve	Percent Passing	2.1
Sand Equivalent	Sediment Height	0.2"




Specification: 30% maximum passing, and 3" maximum



NOTES:

- Not to Scale
- Photo by ESRI World Imagery Service

LEGEND

- Approximate Site Boundary 
- Approximate Revised Boundary of Mining Operations 
- Approximate MTI Boring Location 



White Property Gravel Quantity Assessment

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17 September 2019
Drawing: B190984g



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