

August 25, 2023

Orcas Recycling Services – General Services 2023

3398 Orcas Rd
Eastsound, WA 98245

Re: Glass Cullet and Aggregate Testing

As requested, GeoTest is pleased to submit the following materials testing data and conclusions for the glass cullet and aggregate testing. As requested, testing was performed on the glass cullet material from Orcas Island Recycling and on aggregates provided from Island Excavating.

Gradation, sand equivalent, deleterious materials, odor, flat/elongate particles, and environmental testing were performed on the provided glass cullet. This material was found to meet the requirements of WSDOT 9-03.21(1)D and AASHTO M318. See Pages 2-9 of this document for the test results for the glass cullet.

Gradation, maximum density/optimum moisture, sand equivalent, and percent fracture were performed on the provided aggregate samples and aggregate/glass cullet blend. The Sand and Glass Cullet/Sand (20%/80%) materials met the requirements of both WSDOT 9-03.10 Aggregate for Gravel Base and WSDOT 9-03.14(2) Select Borrow. Comparing the materials, the glass cullet/sand blend has more medium sand and a higher sand equivalent. See Pages 10-12 of this document for the test results for the glass cullet.

Gradation, maximum density/optimum moisture, sand equivalent, and percent fracture were performed on the provided 5/8" Minus material and a glass cullet (20%) / 5/8" Minus (80%) blend. Both materials met the requirements of WSDOT 9-03.14(2) Select Borrow. The blended material met the requirements of WSDOT 9-03.9(3) Crushed Surfacing Top Course while the 5/8" Minus without glass did not meet the requirements. Comparing the materials, the glass cullet/5/8" minus blend has more coarse/medium sand and a higher sand equivalent. See Pages 13-15 of this document for the test results for the glass cullet.

If you have any questions or if we can provide you with additional information, please feel free to contact us.

Respectfully Submitted,



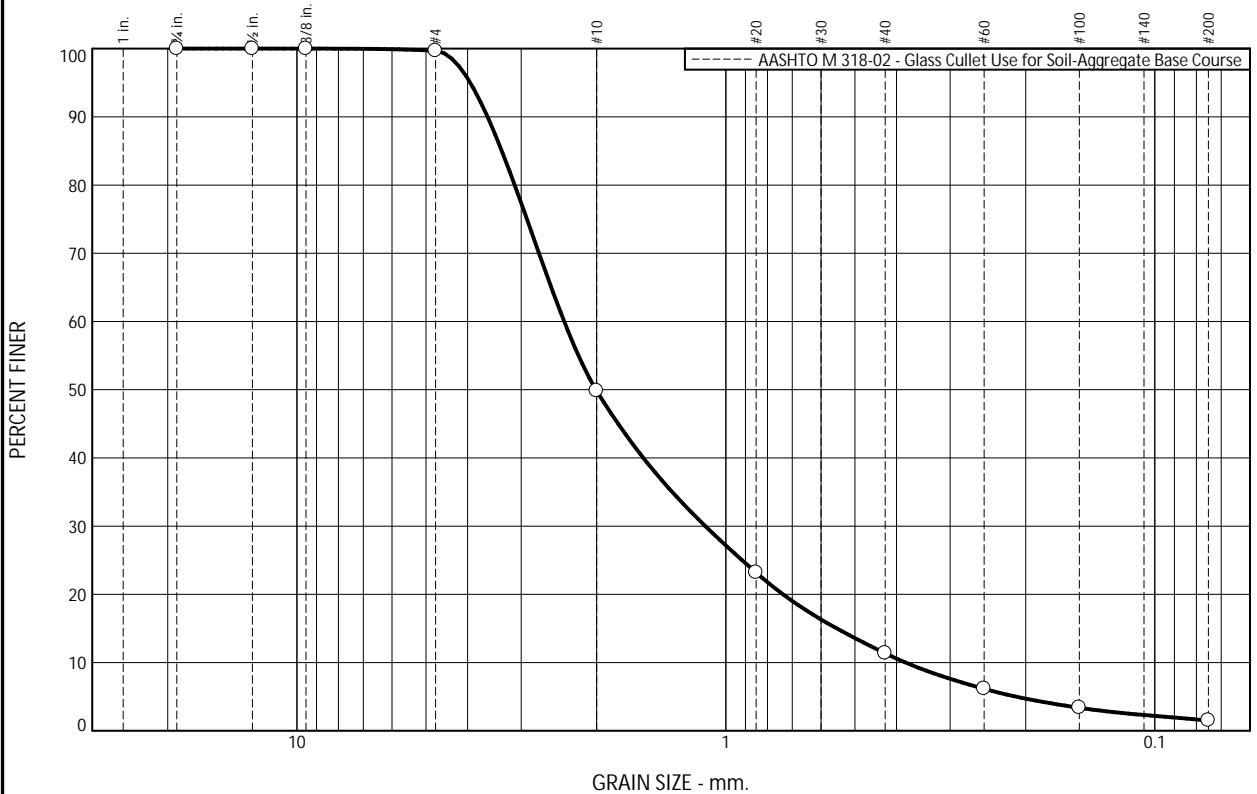
Benjamin F. Fox
8/25/23

Benjamin F. Fox

**Benjamin Fox, LG,
Project Manager/Laboratory Supervisor**

Sieve Analysis Test Report

AASHTO T 27 & T 11



% Gravel		% Sand			% Fines
Coarse	Fine	Coarse	Medium	Fine	
0	0	50	39	10	1

Test Results (AASHTO T 27 & T 11)				
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
3/4"	100	100		
1/2"	100			
3/8"	100			
#4	100			
#10	50			
#20	23			
#40	11			
#60	6			
#100	3			
#200	1.5			

Material Description		
Glass Cullet		
Atterberg Limits		
PL=	LL=	PI=
Coefficients		
D ₉₀ = 3.5930	D ₈₅ = 3.3289	D ₆₀ = 2.3817
D ₅₀ = 2.0081	D ₃₀ = 1.1165	D ₁₅ = 0.5513
D ₁₀ = 0.3811	C _u = 6.25	C _c = 1.37
Classification		
USCS= SW	AASHTO=	
Test Remarks		
T176 Sand Equivalent: 92		
Deleterious Material: 0.01% (Spec: 1% max, 0.05% paper)		
Free of Odor		
Shard Like Particles: 0.02% (Spec: 1% max)		

* AASHTO M 318-02 - Glass Cullet Use for Soil-Aggregate Base Course

Location: Orcas Recycling Services - Sample provided by client
 Sample Number: 6637A

Sample Date: 7/17/23



Client: Orcas Recycling Services
 Project: Orcas Recycling Services - General Services 2023
 3398 Orcas Road, Eastsound, WA 98245

Project No: 23-2191

Figure 6637A

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Tested By: CD/BF

Checked By: BF



August 21, 2023

Mr. Ben Fox
Geotest Services, Inc.
741 Marine Dr.
Bellingham, WA 98225

Dear Mr. Fox,

On August 17th, 5 samples were received by our laboratory and assigned our laboratory project number EV23080073. The project was identified as your 23-2191. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rob Greer
Laboratory Director



CERTIFICATE OF ANALYSIS

CLIENT: Geotest Services, Inc. DATE: 8/21/2023
741 Marine Dr. ALS JOB#: EV23080073
Bellingham, WA 98225 ALS SAMPLE#: EV23080073-01
CLIENT CONTACT: Ben Fox DATE RECEIVED: 08/17/2023
CLIENT PROJECT: 23-2191 COLLECTION DATE: 8/16/2023 11:00:00 AM
CLIENT SAMPLE ID: GS-1 WDOE ACCREDITATION: C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Lead	EPA-6020	0.28	0.10	1	MG/KG	08/20/2023	RAL



CERTIFICATE OF ANALYSIS

CLIENT: Geotest Services, Inc. DATE: 8/21/2023
741 Marine Dr. ALS JOB#: EV23080073
Bellingham, WA 98225 ALS SAMPLE#: EV23080073-02
CLIENT CONTACT: Ben Fox DATE RECEIVED: 08/17/2023
CLIENT PROJECT: 23-2191 COLLECTION DATE: 8/16/2023 11:00:00 AM
CLIENT SAMPLE ID: GS-2 WDOE ACCREDITATION: C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Lead	EPA-6020	0.26	0.10	1	MG/KG	08/20/2023	RAL



CERTIFICATE OF ANALYSIS

CLIENT: Geotest Services, Inc. DATE: 8/21/2023
741 Marine Dr. ALS JOB#: EV23080073
Bellingham, WA 98225 ALS SAMPLE#: EV23080073-03
CLIENT CONTACT: Ben Fox DATE RECEIVED: 08/17/2023
CLIENT PROJECT: 23-2191 COLLECTION DATE: 8/16/2023 11:00:00 AM
CLIENT SAMPLE ID GS-3 WDOE ACCREDITATION: C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Lead	EPA-6020	5.6	0.10	1	MG/KG	08/20/2023	RAL



CERTIFICATE OF ANALYSIS

CLIENT: Geotest Services, Inc. DATE: 8/21/2023
741 Marine Dr. ALS JOB#: EV23080073
Bellingham, WA 98225 ALS SAMPLE#: EV23080073-04
CLIENT CONTACT: Ben Fox DATE RECEIVED: 08/17/2023
CLIENT PROJECT: 23-2191 COLLECTION DATE: 8/16/2023 11:00:00 AM
CLIENT SAMPLE ID: GS-4 WDOE ACCREDITATION: C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Lead	EPA-6020	0.25	0.10	1	MG/KG	08/20/2023	RAL



CERTIFICATE OF ANALYSIS

CLIENT: Geotest Services, Inc. DATE: 8/21/2023
741 Marine Dr. ALS JOB#: EV23080073
Bellingham, WA 98225 ALS SAMPLE#: EV23080073-05
CLIENT CONTACT: Ben Fox DATE RECEIVED: 08/17/2023
CLIENT PROJECT: 23-2191 COLLECTION DATE: 8/16/2023 11:00:00 AM
CLIENT SAMPLE ID GS-5 WDOE ACCREDITATION: C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Lead	EPA-6020	0.44	0.10	1	MG/KG	08/20/2023	RAL



CERTIFICATE OF ANALYSIS

CLIENT: Geotest Services, Inc.
741 Marine Dr.
Bellingham, WA 98225

DATE: 8/21/2023
ALS SDG#: EV23080073
WDOE ACCREDITATION: C601

CLIENT CONTACT: Ben Fox
CLIENT PROJECT: 23-2191

LABORATORY BLANK RESULTS

MB-081823S - Batch 199244 - Soil by EPA-6020

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Lead	EPA-6020	U	MG/KG	0.10	08/20/2023	RAL

U - Analyte analyzed for but not detected at level above reporting limit.



CERTIFICATE OF ANALYSIS

CLIENT: Geotest Services, Inc.
741 Marine Dr.
Bellingham, WA 98225

DATE: 8/21/2023
ALS SDG#: EV23080073
WDOE ACCREDITATION: C601

CLIENT CONTACT: Ben Fox
CLIENT PROJECT: 23-2191

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: 199244 - Soil by EPA-6020

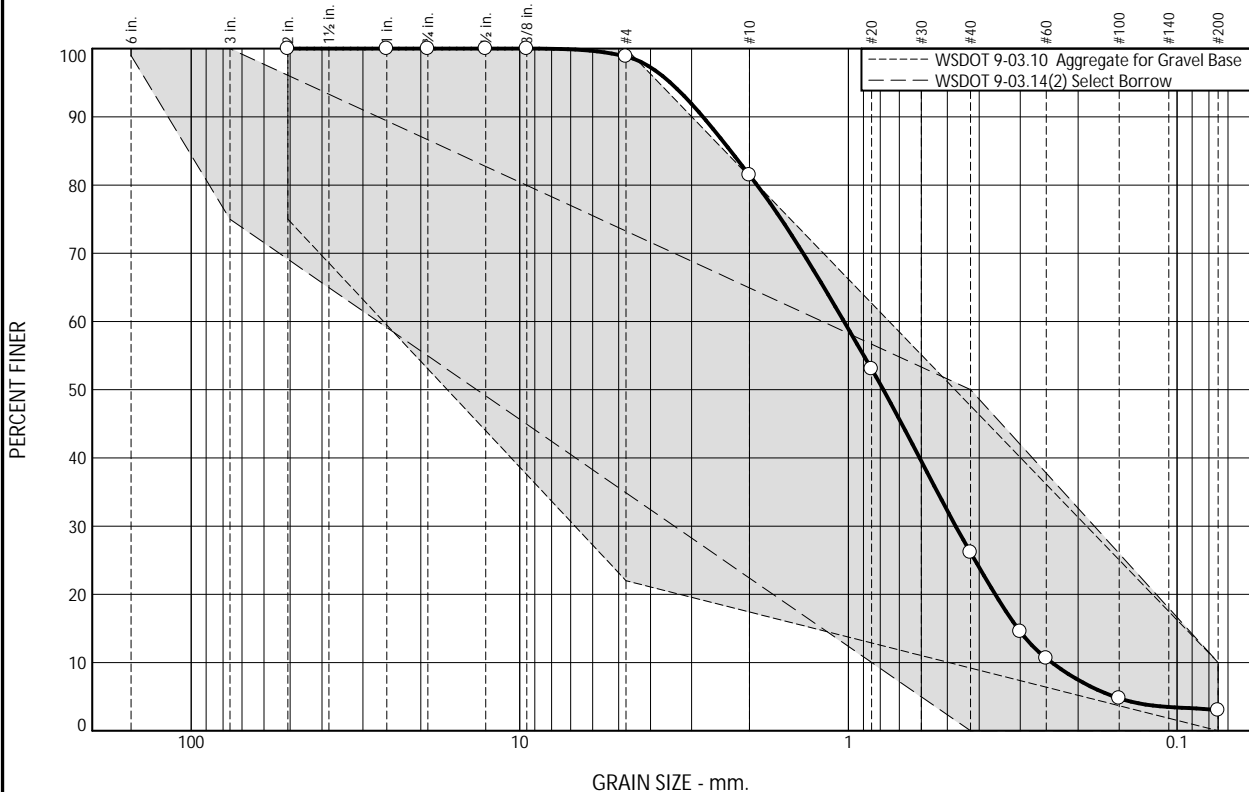
Table with columns: SPIKED COMPOUND, METHOD, %REC, RPD, QUAL, LIMITS (MIN, MAX), ANALYSIS DATE, ANALYSIS BY. Rows include Lead - BS and Lead - BSD.

APPROVED BY

Rob Greer
Laboratory Director

Sieve Analysis Test Report

AASHTO T 27 & T 11



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	1	18	55	23	3

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
2"	100	75-100		
1"	100			
3/4"	100			
1/2"	100			
3/8"	100			
#4	99	22-100		
#10	81			
#20	53			
#40	26			
#50	15			
#60	11			
#100	5			
#200	3.0	0-10		

Material Description

Sand
poorly graded sand

Atterberg Limits
 PL= NP LL= NV PI=

Coefficients
 D₉₀= 2.7703 D₈₅= 2.2831 D₆₀= 1.0314
 D₅₀= 0.7831 D₃₀= 0.4717 D₁₅= 0.3051
 D₁₀= 0.2405 C_u= 4.29 C_c= 0.90

Classification
 USCS= SP AASHTO= A-1-b

Test Remarks
 T176 Sand Equivalent: 68 (Spec: 30 min)
 Dust Ratio: 11.6 (Spec: 2/3 max)

* WSDOT 9-03.10 Aggregate for Gravel Base

Location: Island Excavating - Sample provided by client
 Sample Number: 6732A

Sample Date: 7/17/23

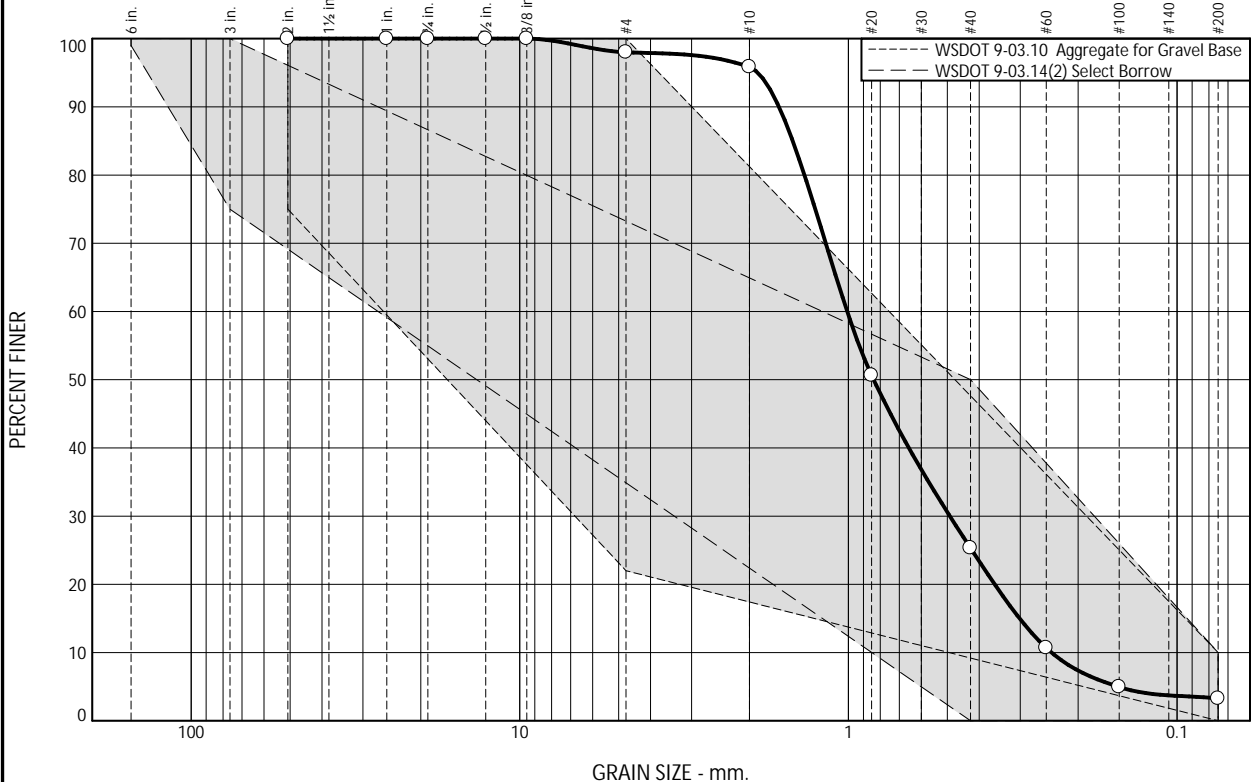
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<p>1.888.251.5276 Bellingham Arlington Oak Harbor www.geotest-inc.com</p>	Client: Orcas Recycling Services Project: Orcas Recycling Services - General Services 2023 3398 Orcas Road, Eastsound, WA 98245
	Project No: 23-2191 Figure 6732A

Tested By: CD/BF Checked By: BF

Sieve Analysis Test Report

AASHTO T 27 & T 11



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	2	2	71	22	3

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
2"	100	75-100		
1"	100			
3/4"	100			
1/2"	100			
3/8"	100			
#4	98	22-100		98
#10	96			52
#20	51			26
#40	25			11
#60	11			5
#100	5	0-10		3.3
#200	3.3			

Material Description
20% Glass Cullet / 80% Sand
poorly graded sand

Atterberg Limits
PL= NP LL= NV PI=

Coefficients
D₉₀= 1.6266 D₈₅= 1.4773 D₆₀= 1.0083
D₅₀= 0.8380 D₃₀= 0.4912 D₁₅= 0.3013
D₁₀= 0.2410 C_u= 4.18 C_c= 0.99

Classification
USCS= SP AASHTO= A-1-b

Test Remarks
T176 Sand Equivalent: 78 (Spec: 30 min)
Dust Ratio: 13.2 (Spec: 2/3 max)

* WSDOT 9-03.10 Aggregate for Gravel Base

Location: Orcas Recycling Services/Island Excavating - Sample provided by client
Sample Number: 6734A

Sample Date: 8/25/23



Client: Orcas Recycling Services
Project: Orcas Recycling Services - General Services 2023
3398 Orcas Road, Eastsound, WA 98245

Project No: 23-2191

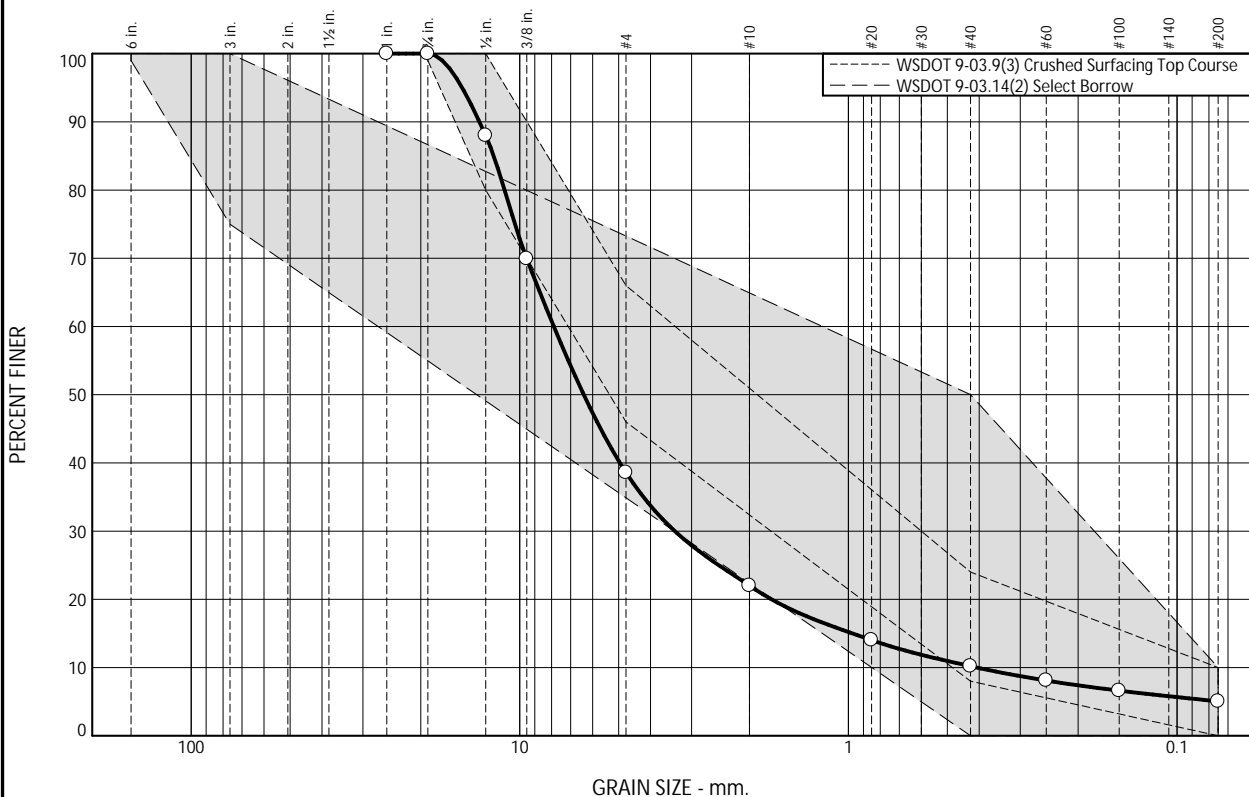
Figure 6734A

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Tested By: CD Checked By: CD

Sieve Analysis Test Report

AASHTO T 27 & T 11



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	61	17	12	5	5

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1"	100			
3/4"	100	99-100		
1/2"	88	80-100		
3/8"	70			
#4	39	46-66	-7	
#10	22			
#20	14			
#40	10	8-24		
#60	8			
#100	7			
#200	5.0	0-10		

Material Description
5/8" Minus
poorly graded gravel with silt and sand

Atterberg Limits
PL= NP LL= NV PI= NP

Coefficients
D₉₀= 13.2699 D₈₅= 12.0077 D₆₀= 7.8791
D₅₀= 6.3857 D₃₀= 3.3747 D₁₅= 0.9711
D₁₀= 0.4072 C_u= 19.35 C_c= 3.55

Classification
USCS= GP-GM AASHTO= A-1-a

Test Remarks
T176 Sand Equivalent: 30 (Spec: 40 min)
T335 Percent Fracture (1 Face): 100% (Spec: 75% min)

* WSDOT 9-03.9(3) Crushed Surfacing Top Course

Location: Island Excavating - Sample provided by client
Sample Number: 6733A

Sample Date: 7/17/23

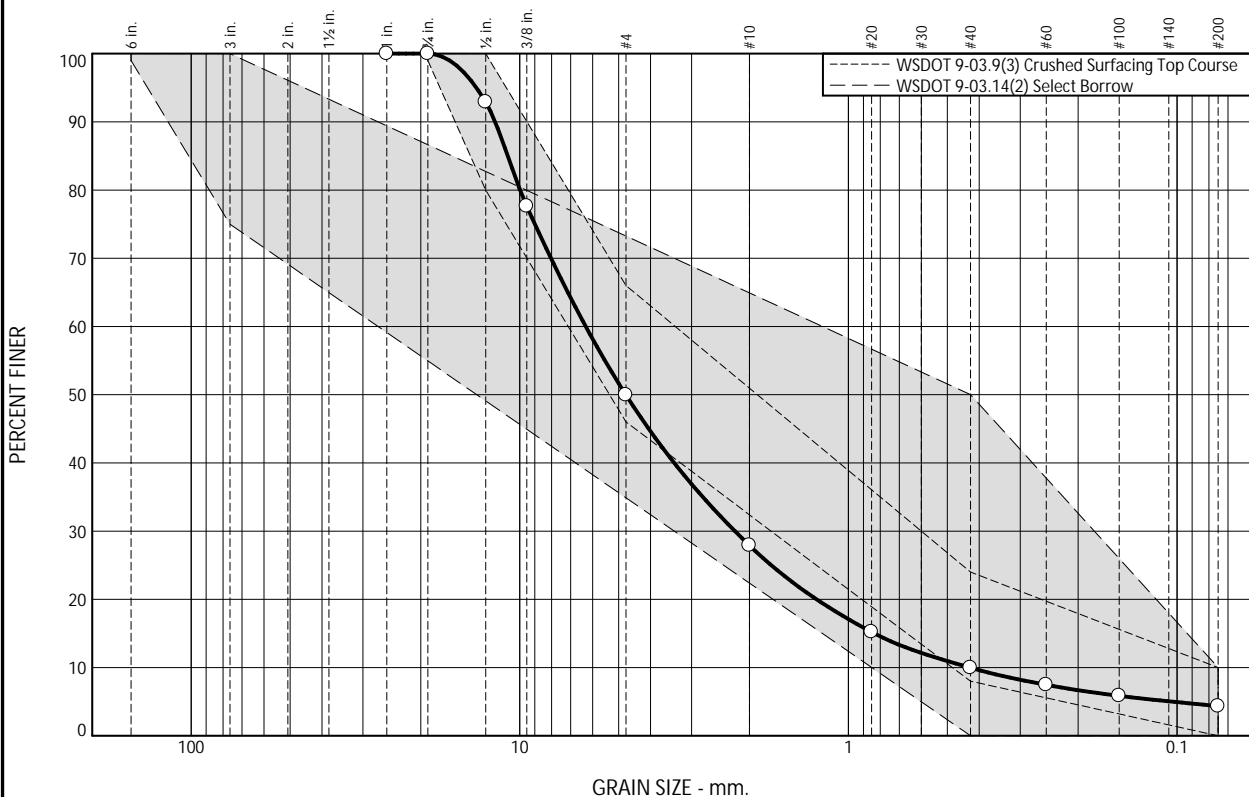
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	Project No: 23-2191 Figure 6733A

Tested By: CD Checked By: BF

Sieve Analysis Test Report

AASHTO T 27 & T 11



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0	0	50	22	18	6	4

Test Results (AASHTO T 27 & T 11)				
Sieve Size or Diam. (mm.)	Finer (%)	Spec. * (%)	Out of Spec. (%)	Pct. of Fines
1"	100			
3/4"	100	99-100		
1/2"	93	80-100		
3/8"	78			
#4	50	46-66		
#10	28			56
#20	15			30
#40	10	8-24		20
#60	7			15
#100	6			12
#200	4.3	0-10		8.7

Material Description
20% Glass Cullet / 80% 5/8" Minus well-graded gravel with sand

Atterberg Limits
PL= LL= NV PI=

Coefficients
D₉₀= 11.8868 D₈₅= 10.8766 D₆₀= 6.2982
D₅₀= 4.7595 D₃₀= 2.2153 D₁₅= 0.8338
D₁₀= 0.4271 C_u= 14.75 C_c= 1.82

Classification
USCS= GW AASHTO=

Test Remarks
T176 Sand Equivalent: 42 (Spec: 40 min)
T335 Percent Fracture (1 Face): 100% (Spec: 75% min)

* WSDOT 9-03.9(3) Crushed Surfacing Top Course

Location: Orcas Recycling Services/Island Excavating - Sample provided by client
Sample Number: 6735A

Sample Date: 7/17/23



Client: Orcas Recycling Services
Project: Orcas Recycling Services - General Services 2023
3398 Orcas Road, Eastsound, WA 98245

Project No: 23-2191

Figure 6735A

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