November 6, 2018



Asphalt Specialties Company, Inc. 10100 Dallas Street Henderson, Colorado 80640

Attn: Mr. Gary Stillmunkes (GaryS@asphaltspecialties.com)

Re: Construction Observation and Testing – *Submittal No. 5* Turnpike – Mine Backfill Process & Operations Highway 52 and Weld County Road 1 Weld County, Colorado EEC Project No. 1174016

Mr. Stillmunkes:

As requested, on October 20, 2017, Earth Engineering Consultants, LLC (EEC) personnel provided construction observation and testing services for the referenced project. The Turnpike Reservoir property is located northeast of the intersection of County Line Road/Weld County Road 1 and Highway 52 in Erie, Weld County, Colorado. More particularly the site is located within Section 31 and the South ½ of Section 30, Township 2 North, Range 68 West of 6th PM. The services completed were provided on a part-time, on-call/as-needed basis and included field density testing of "processed shale/siltstone bedrock" fill material placed and compacted to develop site grades within the backfill zones as presented herein. EEC personnel also obtained a representative processed shale/siltstone bedrock fill sample by means of hand-driving a "Shelby-tube" device into the compacted layer. The retrieved bedrock sample was then set up for a flex-wall Permeameter procedure: "*Hydraulic conductivity testing in general accordance with ASTM Specification D5084*" as per the agreed upon *Contractor's Quality Control/Quality Assurance Plan (CQC/QA) Plan* dated March 12, 2013. Results of the field density services completed by EEC personnel during the referenced period as well as the flex-wall Permeameter laboratory test results are provided with this report.

Field Density Testing

On October 24, 2018, EEC personnel performed field density tests on shale/siltstone bedrock fill materials that had been placed and compacted prior to our site visit. Asphalt Specialties Company, Inc. (ASCI) has been using their own resources and personnel for the on-site stockpiled shale/bedrock material during the backfill operations at the Turnpike Sand & Gravel Pit. Their resources include personnel, heavy highway equipment such as Dozers, Front End Loaders, Self-propel Compacter,

ASCI – Turnpike Reservoir – Erie, Colorado EEC Project No. 1174016 November 6, 2018 Page 2

Water Truck and 30 Yard Haul Trucks to place uniform lifts not to exceed 2 to 3-foot lifts. The equipment, especially the dozer and compactor, simulate the compaction efforts needed. Each lift is tested for percent compaction along with a Flex-Wall permeability testing procedure; with field density Flex Wall Permeameter test results presented herein.

The field density tests were completed at random locations and elevations in the embankment fill zone as noted herein and were performed in general accordance with ASTM Specification D6938. The results of the field density tests completed by EEC personnel during the referenced period are shown on the attached summary sheets. The field density test results, at the locations as described herein, conformed to the minimum project compaction requirements of at least 90% of standard Proctor maximum dry density (ASTM Specification D698) and were within the allotted moisture content range of 7% to 18% of the material's optimum moisture content, as per the agreed upon CQC/QA plan dated March 12, 2013.

Laboratory Testing

As per the CQC/QA plan, EEC personnel obtained a relatively undisturbed sample on October 24, 2018, of the previously placed and compacted shale/siltstone bedrock material by hand driving a "Shelby-tube" device approximately 12 inches into the compacted zone. This was performed to obtain a relative "*in-tact sample*" for hydraulic conductivity testing in general accordance with ASTM D 5084 Specifications. The samples were obtained at the general location of EEC Field Density Test No. 6 (10-24-18). Laboratory testing performed on the retrieved hydraulic conductivity sample included a remolded "Flex-Wall Permeameter" test in general accordance with ASTM Specification D 5084 Method A; results are shown below and are also included on the attached summary sheet.

Hydraulic Conductivity Test Results										
Hydraulic Conductivity	Laboratory Testing - Soil Classification									
Sample ID	In-Situ Moisture, %	In-Situ Dry Density, PCF	Final Moisture Content, %	Final Dry Density, PCF	Hydraulic Conductivity, cm/sec					
10-24-18	13.5	115.3	16.8	114.5	2.17 x 10 ⁻⁶					

Based on the reported field density test results and the laboratory test results as presented herein, this lift within this phase of the placed and compacted shale/siltstone bedrock material generally conforms to the project specifications and the CQC/QA plan dated March 12, 2013.

ASCI – Turnpike Reservoir – Erie, Colorado EEC Project No. 1174016 November 6, 2018 Page 3

We appreciate the opportunity to work with you on this project. If you have any questions concerning this report, or if we can be of further service to you in any other way, please do not hesitate to contact us.

Very truly yours, Earth Engineering Consultants, LLC



David A. Richer, P.E. Senior Geotechnical Engineer

cc: Asphalt Specialties Company

Mr. Dan Hunt (<u>dan@asphaltspecialties.com</u>) Mr. Rob Laird (<u>RobL@asphaltspecialties.com</u>)

EARTH ENGINEERING CONSULTANTS, LLC SUMMARY OF FIELD DENSITY TESTS



Project Name:	Turnpike Reservoir - Gra	avel Pit Backfill	_	Project No:	1174016
Location:	Erie, Colorado		_	Date:	October 2018
Proctor Designation	n	A			
Maximum Dry Den	sity (pcf)	112.0			
Optimum Moisture	Content (%)	15.5%			
Required Moisture	Variance	7% to 18%			
Required Percent (Compaction	90-108%			
Laboratory Method		ASTM D-698			

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umb	te	Tes ber						ture	ent actic	Projec	t Specs
Conse Test N	Da	Daily Num	Approximate Test Location / Notes	Elev. / Lift No.	Material (Proctor)	Percent Moisture	Dry Density	Mois Varia	Pero Compa	Moisture (Pass / Fail)	%Comp. (Pass / Fail)
25	10/24	1	Fill - See Diagram	-10.0	А	13.8%	119.1	-1.7%	106%	Pass	Pass
26	10/24	2	Fill - See Diagram	-10.0	А	14.8%	117.6	-0.7%	105%	Pass	Pass
27	10/24	3	Fill - See Diagram	-10.0	А	15.8%	116.0	0.3%	104%	Pass	Pass
				1							



North Not to Scale Field Density Test Location Diagram Turnpike Reservoir - Gravel Pit Backfill - Erie, Colorado EEC Project #: 1174016 Fill, Subgrade, & Aggregate Base

EARTH ENGINEERING CONSULTANTS, LLC

Summary of Laboratory Permeability Testing (ASTM Specification D5084)

				Test Meth	ıod			
Metho	od			Descripti	on			Used
ASTM D5084		Measureme	nt of Hydra	aulic Condu	ctivity at	Saturated Porous	М	ethod A
		Mat	erials Using	g a Flexible	Wall Per	rmeameter		
			C-					
Sample	Info		Sa	mple Desci	ription		T	Pagulte
Sample ID	IIIIO					Tumpile Decemen	I Intest Cor	$\frac{10.24.18}{10.24.18}$
Sample ID						Tumpike Reservo	II. Intact Sal	Grav
Sample Color	ntion						Drogosod	Clay Shala/Siltatona
Liquid Liquit	puon						riocesseu	
Diagtigity Index								37
Plasticity index	X 0/)							22 85 0
Passing #200 (%) 	、 、						83.0 2.650
Specific Gravit	ty (assumed)						2.030
			Spe	cimen Info	rmation			
Propert	ties					Initial		Final
Height (in)						3.12		3.12
Diameter (in)						2.86		2.86
Area (in ²)						6.42		6.42
Volume (in ³)						20.01		20.01
Water Content	(%)					13.5		16.8
Dry Density (p	cf)					115.3		114.5
B Value (%)						0.98		
			T (T		())			
Test	+		Test I	nformation	n / Result	ts	ſ	Deculte
Pormount Lload	1						т. То	n Water
Magnitude of F	I Back Pressu	re (nci)					10	35
Effortivo Stron	o (poi)	ie (psi)						3.0
Litective Sites	s (psi)							12
Magguramont 1	I Undroulio	Conductivity	(am/s)				2	79E 06
Maguramant 2) Uvdroulio	Conductivity	(cm/s)				2	26E 06
Measurement 2	2 Hydraulia	Conductivity	(cm/s)				1	20E-00 86E-06
Measurement 2	1 Undroulie	Conductivity	(cm/s)				1	76E 06
A vorage Hydr	+ Hydraulic	Collductivity	(CIII/S)				2	17E-06
Average flyur			5)				20	1712-00
			Hydraulic	Conductiv	ity ys Ti	me		
	4 05 05							
່ ວ	1.0E-05							
/se								
5								
(K)	Ļ	•						
vity								
cti	1.0E-06							
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aul								
vdr								
#	1.0E-07	+ +		1	-			

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Project:Turnpike Reservoir - Gravel Pit Backfill CMT ServicesLocation:Erie, ColoradoProject No1174016Date:October 2018

5

10

15

20

Time (hours)

January 21, 2019

EARTH ENGINEERING CONSULTANTS, LLC

Asphalt Specialties Company, Inc. 10100 Dallas Street Henderson, Colorado 80640

Attn: Mr. Greg Geras (<u>GregG@asphaltspecialties.com</u>)

 Re: Construction Observation and Testing – Submittal No. 6 Turnpike – Mine Backfill Process & Operations Highway 52 and Weld County Road 1 Weld County, Colorado EEC Project No. 1174016

Mr. Geras:

As requested, on January 10, 2019, Earth Engineering Consultants, LLC (EEC) personnel provided construction observation and testing services for the referenced project. The Turnpike Reservoir property is located northeast of the intersection of County Line Road/Weld County Road 1 and Highway 52 in Erie, Weld County, Colorado. More particularly the site is located within Section 31 and the South ¹/₂ of Section 30, Township 2 North, Range 68 West of 6th PM. The services completed were provided on a part-time, on-call/as-needed basis and included field density testing of overburden fill material placed and compacted to develop site grades within the backfill zones as presented herein. EEC personnel also obtained a representative overburden subsoil sample by means of hand-driving a "Shelby-tube" device into the compacted layer. The retrieved compacted overburden sample was then set up for a flex-wall Permeameter procedure: "Hydraulic conductivity testing in general accordance with ASTM Specification D5084" as per the agreed upon Contractor's Quality Control/Quality Assurance Plan (CQC/QA) Plan dated March 12, 2013. It should be noted that previous construction observation and testing reports prepared by EEC personnel were of the processed siltstone/shale bedrock material, and for this "round of testing services" ASCI provided us a copy of their standard Proctor density (ASTM Specification D698) test results for the overburden subsoils on-site. Results of the field density services completed by EEC personnel during the referenced period as well as the flexwall Permeameter laboratory test results are provided with this report.

Field Density Testing

On January 10, 2018, EEC personnel performed field density tests on placed and compacted overburden subsoils in lieu of processed shale/siltstone bedrock fill materials that had been placed and compacted prior to our site visit. Asphalt Specialties Company, Inc. (ASCI) has been using their own

4396 GREENFIELD DRIVE WINDSOR, COLORADO 80550 (970) 545-3908 (FAX) 663-0282 ASCI – Turnpike Reservoir – Erie, Colorado EEC Project No. 1174016 January 21, 2019 Page 2

resources and personnel for the on-site overburden material during the backfill operations at the Turnpike Sand & Gravel Pit. Their resources include personnel, heavy highway equipment such as Dozers, Front End Loaders, Self-propel Compacter, Water Truck and 30 Yard Haul Trucks to place uniform lifts not to exceed 2 to 3-foot lifts. The equipment, especially the dozer and compactor, simulate the compaction efforts needed. Each lift is tested for percent compaction along with a Flex-Wall permeability testing procedure; with field density Flex Wall Permeameter test results presented herein.

The field density tests were completed at random locations and elevations in the embankment fill zone as noted herein and were performed in general accordance with ASTM Specification D6938. The results of the field density tests completed by EEC personnel during the referenced period are shown on the attached summary sheets. The field density test results, at the locations as described herein, conformed to the minimum project compaction requirements of at least 90% of standard Proctor maximum dry density (ASTM Specification D698) and were within the allotted moisture content range of 7% to 18% of the material's optimum moisture content, as per the agreed upon CQC/QA plan dated March 12, 2013.

Laboratory Testing

As per the CQC/QA plan, EEC personnel obtained a relatively undisturbed sample on January 10, 2019 of the previously placed and compacted overburden subsoil material by hand driving a "Shelby-tube" device approximately 12 inches into the compacted zone. This was performed to obtain a relative "*in-tact sample*" for hydraulic conductivity testing in general accordance with ASTM D 5084 Specifications. The sample was obtained at the general location of EEC Field Density Test No. 28 (1-10-19). Laboratory testing performed on the retrieved hydraulic conductivity sample included a remolded "Flex-Wall Permeameter" test in general accordance with ASTM Specification D 5084 Method A; results are shown below and are also included on the attached summary sheet.

Hydraulic Conductivity Test Results										
Hydraulic Conductivity	Laboratory Testing - Soil Classification									
Sample ID	In-Situ Moisture, %	In-Situ Dry Density, PCF	Final Moisture Content, %	Final Dry Density, PCF	Hydraulic Conductivity, cm/sec					
1-10-19	14.4	117.7	17.3	119.0	7.46 x 10 ⁻⁷					

ASCI – Turnpike Reservoir – Erie, Colorado EEC Project No. 1174016 January 21, 2019 Page 3

Based on the reported field density test results and the laboratory test results as presented herein, this lift within this phase of the placed and compacted overburden subsoil zone, generally conforms to the project specifications and the CQC/QA plan dated March 12, 2013.

We appreciate the opportunity to work with you on this project. If you have any questions concerning this report, or if we can be of further service to you in any other way, please do not hesitate to contact us.

Very truly yours, Earth Engineering Consultants, LLC



David A. Richer, P.E. Senior Geotechnical Engineer

cc: Asphalt Specialties Company

Dan Hunt (<u>dan@asphaltspecialties.com</u>) David King (<u>davidk@asphaltspecialties.com</u>)

EARTH ENGINEERING CONSULTANTS, LLC SUMMARY OF FIELD DENSITY TESTS



Project Name:	Turnpike Reservoir - Gra	vel Pit Backfill		Project N	No:	1174016	
Location:	Erie, Colorado			Date:		January 2019	
Proctor Designation		A	ASCI				
Maximum Dry Densit	ty (pcf)	112.0	110.0				
Optimum Moisture C	ontent (%)	15.5%	16.0%				
Required Moisture Va	ariance	7% to 18%	7-18%				
Required Percent Co	ompaction	90%	90%	•			
Laboratory Method		ASTM D-698	ASTM D-698	•			

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utiv	ø	Tes ber						ture	ent actic	Projec	t Specs
Consec Test Nu	Dat	Daily Num	Approximate Test Location / Notes	Elev. / Lift No.	Material (Proctor)	Percent Moisture	Dry Density	Moist Varia	Perc	Moisture (Pass / Fail)	%Comp. (Pass / Fail)
28	1/10	1	Fill - See Diagram	FG	ASCI	8.8%	119.9	-7.2%	109%	Pass	Pass
29	1/10	2	Fill - See Diagram	FG	ASCI	9.5%	118.0	-6.5%	107%	Pass	Pass
30	1/10	3	Fill - See Diagram	FG	ASCI	11.9%	114.2	-4.1%	104%	Pass	Pass
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Field Density Test Location Diagram Turnpike Reservoir - Gravel Pit Backfill - Erie, Colorado EEC Project #: 1174016 Fill, Subgrade, & Aggregate Base SPECIALTIES CO.

Proctor Test

Plant Product	ASCI AC Misc Ag	GGREGATE PITS-4000 gregate Samples-CH-001	25036711						
		Tes	t Information						
	Test Number	3540020		Sample No	25036711				
	Date Started	1/7/2019 11:58:00 AM		Date Sampled	01/07/2019 11:58				
D	ate Completed	01/07/2019 11:58							
	Tested By	SCOTT CONNER							
	Procedure	Т 99							
	Lab								
			<u>Results</u>	<u>Targets</u>	Specifications				
		Opt Moisture (Proctor-Std) %	16						
	M	ax Dry Density (Proctor-Std) lb/ft3	110						
	Ма	ax Wet Density (Proctor-Std) lb/ft3	128						



EARTH ENGINEERING CONSULTANTS, LLC

Summary of Laboratory Permeability Testing (ASTM Specification D5084)

Method Description Used SITM D5084 Measurement of Hydraulii Conductivity at Saturated Porous Method A Sample Info Results Results ample Info Results Results ample Info Results Intat Sample Tompike Reservoir (1-10) ample Description Overburden - Lean Clay w/ Sand (CI ample Description Not Provided stassing #200 (%) Not Provided peopretics Initial Properties Initial Final Final Valer Control (%) 2.650 Summed (n) 2.45 Valer Control (%) 1.4.4 Valer Control (%) 1.4.4 Valer Control (%) 1.4.4 Valer Control (%) 1.4.4 Valer Control (%) 1.17.7 Valer Control (%) 3.8 Year Control (%) 3.8 Streact (n) 3.8 Year Control (%) 3.8 Year Control (%) 3.8 Year Control (%) 7.38 Ye		Test Method	
SSTM D5084 Measurement of Hydraulic Conductivity at Saturated Porous Materials Using a Flexible Wall Permeameter Sample Info Sample Info Sample Info Sample ID anaple Description Coreburden - Lean Clay w/ Sand (CI Jappie Color Jappie Color Jappie Color Jappie Color Jappie Color Jappie Color Jappie Color Jappie Color Jappie Color Jassing 200 (%) Joseffie Gravity (assumed) 2.650 Specimen Information Properties Initial Properties Properties Properties Not Provided Jassing 200 (%) Jappie Color Jappie Color Jappi	Method	Description	Used
Sample Description Sample Info	ASTM D5084	Measurement of Hydraulic Conductivity at Saturated Por Materials Using a Flexible Wall Permeameter	rous Method A
Sample Info Results iample ID Intact Sample: Tumpike Reservoir (1-10 simple Color iample ID Intact Sample: Tumpike Reservoir (1-10 simple Description iample ID Overburded iample ID Not Provided laticity Index Not Provided pecific Gravity (assumed) 2.650 Properties Initial Properties Initial Properties Initial Properties 10144 iameter (in) 2.85 2.85 2.85 trea (in) 6.38 Outnet (in') 2.197 Value (%) 0.95 Value (%) 0.95 Test Results Test Results Test Results Test Results Test Results Test Tage Water Againtude of Back Pressure (psi) 38 affective Stress (psi) 30 Updraulic Conductivity (cm/s) 7.6E-07 teasurement 1 Hydraulic Conductivity (cm/s) 6.30E-07 teasurement 2 Hydraulic Conductivity (cm/s) 7.24E-07 teasurement 2 Hydraulic Conductivity (cm/s) 7.24E-07 teasurement 3 Hydraulic Conductivity (cm/s) 7.24E-07		Sample Description	
ample D ample Colo ample Description ample Description Austicity Index vasing #200 (%) Properties Propertie	Sample Info		Results
iample Color iample Description iample Description iample Description iample Description isasing #200 (%) Not Provided pecific Gravity (assumed) Section 110 Properties Pr	Sample ID		Intact Sample: Turnpike Reservoir (1-10-1
iangle Description Overburden - Lean Clay with Studi (Cl. Wolf Provided iaquid Limit Not Provided tassing #200 (%) Not Provided 2.650 Properties Information Properties Infutial Final Iaquid Limit 0 3.44 3.44 ibaneter (in) 3.44 3.44 3.44 ibaneter (in) 3.44 3.44 3.44 ivaneter (in) 3.44 3.44 3.44 ivaneter (in) 3.44 3.41 ivaneter (in) 3.44 1.7.3 ry Density (pcf) 117.7 119.0 iValue (%) 0.95 Test Information / Results Test Results Test Results Tap Water Test Results Tap Water Tap Water Test Results Tap Water Test Results Tap Water Tap Water Tap Water Test Results Tap Water Tap Water 10 Resurrement 1 Hydraulic Conductivity (cm/s) Tap Water 10 Tap Water 10 10 10 10 10 10 10 10	Sample Color		Brown
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hassing #200 (%) Not Provided 2.650 Specinic Gravity (assumed) Properties Network (assumed) P	Plasticity Index		Not Provided
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Specimen InformationPropertiesInitialFinalleight (in)3.443.44Jameter (in)2.852.85Vrea (in ²)6.386.38/olume (in ³)21.9721.97Vater Content (%)14.417.3hy Density (pcf)117.7119.0is Value (%)0.95Test Information / ResultsTest Information / ResultsTermeant UsedTap WaterAgnitude of Back Pressure (psi)3.0lydraulic Conductivity (cm/s)8.06E-07deasurement 1 Hydraulic Conductivity (cm/s)7.63E-07deasurement 1 Hydraulic Conductivity (cm/s)7.63E-07deasurement 2 Hydraulic Conductivity (cm/s)6.90E-07varage Hydraulic Conductivity (cm/s)7.46E-07varage Hydraulic Conductivity (cm/s)7.46E-07var	Specific Gravity (assume	ed)	2.650
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Value (in3) 21.97 21.97 $Value Content (%) 14.4 17.3$ $Value (%) 0.95$ $Value (%) 0.$	Area (in ²)	6.38	6.38
Vater Content (%) 14.4 17.3 Ty Density (pcf) 117.7 119.0 3 Value (%) 0.95 Test Information / Results Test Mesults Test Nerseure (psi) 10 10 10 10 10 10 10 10 10 10	$V_{\text{olume}}(\text{in}^3)$	21.97	21.97
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Project:Turnpike ReservoirLocation:ASCI - Overburden Subsoils (Standard PROCTOR Density results provided by ASCI)Project No: 1174016January 2019



February 27, 2019

EARTH ENGINEERING CONSULTANTS, LLC

Asphalt Specialties Company, Inc. 10100 Dallas Street Henderson, Colorado 80640

Attn: Mr. Greg Geras (<u>GregG@asphaltspecialties.com</u>)

 Re: Construction Observation and Testing – Submittal No. 7 Turnpike – Mine Backfill Process & Operations Highway 52 and Weld County Road 1 Weld County, Colorado EEC Project No. 1174016

Mr. Geras:

As requested, on February 13, 2019, Earth Engineering Consultants, LLC (EEC) personnel provided construction observation and testing services for the referenced project. The Turnpike Reservoir property is located northeast of the intersection of County Line Road/Weld County Road 1 and Highway 52 in Erie, Weld County, Colorado. More particularly the site is located within Section 31 and the South ¹/₂ of Section 30, Township 2 North, Range 68 West of 6th PM. The services completed were provided on a part-time, on-call/as-needed basis and included field density testing of overburden fill material placed and compacted to develop site grades within the backfill zones as presented herein. EEC personnel also obtained a representative overburden subsoil sample by means of hand-driving a "Shelby-tube" device into the compacted layer. The retrieved compacted overburden sample was then set up for a flex-wall Permeameter procedure: "Hydraulic conductivity testing in general accordance with ASTM Specification D5084" as per the agreed upon Contractor's Quality Control/Quality Assurance Plan (CQC/QA) Plan dated March 12, 2013. It should be noted that previous construction observation and testing reports prepared by EEC personnel were of the processed siltstone/shale bedrock material, and for this "round of testing services" ASCI provided us a copy of their standard Proctor density (ASTM Specification D698) test results for the overburden subsoils on-site. Results of the field density services completed by EEC personnel during the referenced period as well as the flexwall Permeameter laboratory test results are provided with this report.

Field Density Testing

On February 13, 2019, EEC personnel performed field density tests on placed and compacted overburden subsoils in lieu of processed shale/siltstone bedrock fill materials that had been placed and compacted prior to our site visit. Asphalt Specialties Company, Inc. (ASCI) has been using their own

4396 GREENFIELD DRIVE WINDSOR, COLORADO 80550 (970) 545-3908 (FAX) 663-0282 ASCI – Turnpike Reservoir – Erie, Colorado EEC Project No. 1174016 February 27, 2019 Page 2

resources and personnel for the on-site overburden material during the backfill operations at the Turnpike Sand & Gravel Pit. Their resources include personnel, heavy highway equipment such as Dozers, Front End Loaders, Self-propel Compacter, Water Truck and 30 Yard Haul Trucks to place uniform lifts not to exceed 2 to 3-foot lifts. The equipment, especially the dozer and compactor, simulate the compaction efforts needed. Each lift is tested for percent compaction along with a Flex-Wall permeability testing procedure; with field density Flex Wall Permeameter test results presented herein.

The field density tests were completed at random locations and elevations in the embankment fill zone as noted herein and were performed in general accordance with ASTM Specification D6938. The results of the field density tests completed by EEC personnel during the referenced period are shown on the attached summary sheets. The field density test results, at the locations as described herein, conformed to the minimum project compaction requirements of at least 90% of standard Proctor maximum dry density (ASTM Specification D698) and were within the allotted moisture content range of 7% to 18% of the material's optimum moisture content, as per the agreed upon CQC/QA plan dated March 12, 2013.

Laboratory Testing

As per the CQC/QA plan, EEC personnel obtained a relatively undisturbed sample on February 13, 2019 of the previously placed and compacted overburden subsoil material by hand driving a "Shelby-tube" device approximately 12 inches into the compacted zone. This was performed to obtain a relative "*in-tact sample*" for hydraulic conductivity testing in general accordance with ASTM D 5084 Specifications. The sample was obtained at the general location of EEC Field Density Test No. 33 (2-13-19). Laboratory testing performed on the retrieved hydraulic conductivity sample included a remolded "Flex-Wall Permeameter" test in general accordance with ASTM Specification D 5084 Method A; results are shown below and are also included on the attached summary sheet.

Hydraulic Conductivity Test Results										
Hydraulic Conductivity		Laboratory Testing - Soil Classification								
Sample ID	In-Situ Moisture, %	In-Situ Dry Density, PCF	Final Moisture Content, %	Final Dry Density, PCF	Hydraulic Conductivity, cm/sec					
2-13-19	12.5	114.3	17.3	118.8	7.36 x 10 ⁻⁷					

ASCI – Turnpike Reservoir – Erie, Colorado EEC Project No. 1174016 February 27, 2019 Page 3

Based on the reported field density test results and the laboratory test results as presented herein, this lift within this phase of the placed and compacted overburden subsoil zone, generally conforms to the project specifications and the CQC/QA plan dated March 12, 2013.

We appreciate the opportunity to work with you on this project. If you have any questions concerning this report, or if we can be of further service to you in any other way, please do not hesitate to contact us.

Very truly yours, Earth Engineering Consultants, LLC



David A. Richer, P.E. Senior Geotechnical Engineer

cc: Asphalt Specialties Company

Dan Hunt (<u>dan@asphaltspecialties.com</u>) David King (<u>davidk@asphaltspecialties.com</u>)

EARTH ENGINEERING CONSULTANTS, LLC SUMMARY OF FIELD DENSITY TESTS



Project Name: Turnpike Reservoir -	Gravel Pit Backfill	Pr	oject No:	1174016
Location: Erie, Colorado		Da	ate:	February 2019
Proctor Designation	A			
Maximum Dry Density (pcf)	112.0			
Optimum Moisture Content (%)	15.5%			
Required Moisture Variance	7% to 18%			
Required Percent Compaction	90%			
Laboratory Method	ASTM D-698			

r st ber		. 			Field Tes	st Results			ы	Compliance with	
ecuti	ate	, Tes	Approvimate Test Location / Notes		1			sture ance	cent	Projec	t Specs
Conse Test N	Ğ	Daily Nun	Approximate rest Location / Notes	Elev. / Lift No.	Material (Proctor)	Percent Moisture	Dry Density	Mois Vari	Per Comp	Moisture (Pass / Fail)	%Comp. (Pass / Fail)
31	2/13	1	Fill - See Diagram	1492.0	А	13.8%	111.3	-1.7%	99%	Pass	Pass
32	2/13	2	Fill - See Diagram	1491.0	А	13.6%	113.4	-1.9%	101%	Pass	Pass
33	2/13	3	Fill - See Diagram	1480.0	А	12.5%	114.3	-3.0%	102%	Pass	Pass
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North Not to Scale Field Density Test Location Diagram Turnpike Reservoir - Gravel Pit Backfill - Erie, Colorado EEC Project #: 1174016 Fill, Subgrade, & Aggregate Base

EARTH ENGINEERING CONSULTANTS, LLC

Summary of Laboratory Permeability Testing (ASTM Specification D5084)

		Test Method		
Method	Descrip	ption	Used	
ASTM D5084	Measurement of Hydraulic Con Materials Using a Flexi	Method A		
		Sample Description		
Sample Info		r r	Results	
Sample ID			Intact Sample: Turnpike Rese	ervoir (2-13-19)
Sample Color			Brown	
Sample Description			Remolded Overburden - Lean C	Clay w/ Sand (CL)
Liquid Limit			Not Provided	•
Plasticity Index			Not Provided	
Passing #200 (%)			Not Provided	
Specific Gravity (ass	sumed)		2.650	
	2	naciman Information		
Properties	5	Initial	Final	
Height (in)		3.45	3.45	
Diameter (in)		2.85	2.85	
Area (in^2)		6.38	6.38	
Volume (in^3)		22.01		
Water Content (%)		17.3		
Dry Density (pcf)		118.8		
B Value (%)		0.95		
Test	Tes	t Information / Results	Results	
Permeant Used Tap Wate				
Magnitude of Back Pressure (psi)			38	
Effective Stress (psi)		3.0		
Hydraulic Gradient		10		
Measurement 1 Hydraulic Conductivity (cm/s) 7.90E-07				
Measurement 1 Hydraulic Conductivity (cm/s) 7.49E-07				
Measurement 2 Hydraulic Conductivity (cm/s) 7.00E-07				
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Time (days)				



