

**REPORT ON SUBGRADE
INVESTIGATION**

DESIGNATION: Cinder Lake Landfill
South Borrow Pit

LOCATION: Cinder Lake Landfill

CLIENT: City of Flagstaff

PROJECT NO: 121372SF

DRAFT DATE: December 31, 2012

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APPENDIX

1.0 INTRODUCTION

This report presents the results of a subsoil investigation carried out at the Cinder Lake Landfill located at 6770 E. Landfill Road northeast of Flagstaff, Arizona. The investigation was performed in Cell D (aka South Borrow Pit) within the existing landfill boundary. The purpose of this investigation was to provide data regarding excavation for expansion of the landfill along with rock properties. The information in this report will be used as part of a feasibility study regarding the use of excavated basalt as a source of commercial aggregate. The feasibility study will be performed by others.

1.1 Purpose and Scope of Report

Preliminary information indicates that the south borrow pit will be used for waste disposal as part of expanding the capacity of the existing landfill. It is anticipated that the bottom of the disposal pit will be at an elevation somewhere on the order of 6560 feet above mean sea level (msl) elevation. This will result in cuts on the order of 40 to 65 feet below the existing pit elevations. Previous investigations conducted by others at the Cinder Lake Landfill have revealed a basalt flow beneath the soil overburden. The depth to basalt was reported to be between elevations 6608 and 6615 above msl in 4 of the 5 borings conducted by Woodward-Clyde in 1997. The fifth boring indicated basalt at 6583 feet above msl elevation; however, the physical characteristics/properties of the basalt were unknown prior to this investigation. Since preliminary information indicated that 40 feet or more of rock excavation was possible, the City of Flagstaff decided to investigate the possibility of using the excavated rock as an aggregate base product and possible source for mineral aggregate for asphaltic concrete products.

The scope of this report was to observe and log the geologic conditions encountered during excavation of borings conducted by others. Samples would be obtained during the exploration for laboratory testing. Laboratory testing was to be limited to typical tests required for compliance with ADOT, City of Flagstaff and M.A.G. Specifications for aggregate base materials. Tests typically required for acceptance for use as mineral aggregates in asphaltic concrete production would also be performed. Laboratory tests that could vary as a result of excavation/blasting techniques such as gradation, fractured face or flakiness index were not performed at this time.

1.2 Site Background

The subject site is located in Township 22 North, Range 8 East, of the Gila and Salt River Base Line and Meridian, Gila County, Arizona. Elevations surrounding the landfill generally range from approximately 6640 feet to 6690 feet above msl elevation with drainage surrounding the existing landfill generally towards the south. Actual elevations within the south borrow pit are on the order of 6600 to 6625 feet above msl with drainage currently retained within the borrow pit itself. The South Borrow Pit is in the southeast corner of the existing landfill boundaries. The site has been used as a fill source for cover material at previous disposal cells. Removal of fill in this borrow pit has ceased as the equipment operators have indicated difficult excavation conditions using excavation equipment currently available as part of the active landfill operations.

1.3 Field and Laboratory Investigation

From October 31 to November 20, 2012, a total of 15 borings were excavated at the approximate locations shown on the attached Boring Location Plan. Boring locations and elevations were provided by the City of Flagstaff. All exploration work was carried out under the full-time supervision of SDB Contracting. A registered geologist from Speedie & Associates recorded subsurface conditions and obtained samples for laboratory testing.

The borings were drilled with a truck mounted CME75 drill rig. Due to difficulty in advancing standard hollow stem augers thru the unconsolidated overburden material, the borings were advanced using ODEX casing system prior to encountering basalt. The ODEX casing was typically advanced into the basalt until it was competent enough to proceed with NX Rock Coring tools. The borings were advanced to a final elevation of 6560 feet above msl, with the exception of B-901 which was terminated at 6570 feet above msl elevation which was the maximum depth possible with the ODEX casing available on site. This was the only location that basalt was not encountered. Detailed information regarding the test borings and samples obtained can be found on an individual log prepared for each location, located in the appendix of this report.

Laboratory testing consisted of rock compressive strength, specific gravity of course aggregate, L.A. Abrasion, and percent carbonates of selected core samples. Four composite samples were selected for L.A. abrasion and % carbonates that represent the different weathered/physical characteristics of the basalt encountered. L.A. Abrasion could not be performed on one of the samples selected due to the decomposed nature of the material. Sufficient course material was not produced during crushing.

2.0 SUBSURFACE CONDITIONS

2.1 Regional Geology

Physiographically, the project area is located in the southwest corner of the Colorado Plateau Province. The Colorado Plateau is often described as relatively stable with relatively little rock deformation from faults or faulting. Distinguishing features of the Colorado Plateau from contiguous provinces include the horizontal nature of the rocks and relatively high altitude. The province is made up of several fault separated plateaus of relatively flat-lying sedimentary rocks. The province is not without steep slopes but, with the exception of relatively recent volcanic structures, the steep slopes are a result of erosion through the horizontal sedimentary layers. Abrupt topography with resistant sandstone and limestone escarpments are common.

The margins of the Colorado Plateau are marked by igneous structures. The two basic igneous features of the Colorado Plateau consist of intrusive laccoliths and extrusive volcanics. The volcanics on the plateau were deposited as recent as 900 and 6 million years ago.

2.2 Site Specific Geology

The site is located in the San Francisco Volcanic Field, east of the San Francisco Peaks, south of Sunset Crater Cinder Cone. Lava flows and pyroclastic materials are present throughout the site. The number of volcanic eruptions/lava flows associated with the San Francisco Volcanic Field is in excess of 600.

Stratovolcanoes, lava domes, basalt cinder cones create a landscape of low to moderately steep slopes consisting of andesite, rhyolite, basalt flows, cinders (scoria) and volcanic bombs.

Previous geologic investigations have been performed on site by others, including a study performed by Woodward-Clyde (1997) that involved 5 borings located in the south borrow pit. Woodward-Clyde identified two generic geologic units and referred to them as the Cinder Unit and Basalt Unit. Although identification of which volcanic eruptions deposited material on site has little engineering significance, it would appear that the Cinder Unit is actually a result of at least two distinctive volcanic eruptions consisting of black cinders and reddish brown cinders. Underlying the Cinder Unit is the Basalt Unit identified by Woodward-Clyde. Although conclusions developed by Woodward-Clyde may not be 100% supported by the data obtained from this investigation, for consistency purposes, the units will be identified in this report as the Cinder Unit and Basalt Unit. Refer to the Soil Legend and Rock Terminology located in the appendix of this report for definitions and terminology used below.

As indicated above, the Cinder Unit appears to be a result of at least two volcanic events identified by black and reddish brown cinders. The Cinder Unit was present from existing ground surface to elevations ranging from 6570 feet to 6608 feet above msl elevation. Within the cinder unit, materials consist of scoria (cinders), volcanic bombs and possibly thin basalt flows that do not appear to be laterally extensive or more than a few feet in thickness. The cinders, scoria and volcanic bombs are often fused together creating an undulating surface of variable hardness, thickness and extent that may also contribute to the appearance of basalt flows within the Cinder Unit. The method of drilling through the Cinder Unit did not provide adequate data to determine if the more resistant layers are thin basalt flows, volcanic bombs or fused scoria. Sampling of the Cinder Unit was conducted using split spoon samplers. When samples were obtained, they consisted of relatively homogeneous cinders. However, sample refusal was encountered in the harder material resulting in no recovery. Using the Unified Soil Classification system, the Cinder Unit is generally classified as poorly graded sand with some gravel, trace silt and occasional boulders. Relative density is loose to medium dense with the exception of encountering volcanic bombs, thin basalt flows and fused material resulting in a very dense classification.

The Basalt Unit was encountered between 6572 and 6608 feet above msl elevation with the exception of Boring B-901 discussed in more detail below. The Basalt Unit extends to the depths investigated; roughly 6560 feet above msl elevation. The upper portion of the Basalt Unit was generally weathered to a predominately decomposed state and was very soft to medium hard. Rock coring techniques were generally used after the predominately decomposed surface was penetrated. The weathered surface was typically 1 to 5 feet in thickness. Once rock coring techniques were utilized, 99.9 percent of the rock was generally recovered. Rock Quality Designation (RQD) is presented as a percentage that represents the sum of rock pieces recovered that are greater than 4 inches in length, divided by the run length and then multiplied by 100. The RQD's generally increased with depth and ranged from 10 to 100 percent with an average value of 70 percent. Below the surficial weathering the basalt was classified as slightly weathered to fresh and hard to very hard. Vesicles are present in the basalt but typically represent less than 3% of the mass. One void, approximate 8 inches in length was encountered in Boring B-902 at a depth of 34.9 feet (9578.9 msl). This could be the result of a large gas pocket or lava tube that was developed during cooling. Fractures within the basalt are spaced close to moderately close. The fractures are generally closed and contain some minor surficial iron oxide staining. A few of the fractures show calcium carbonate deposition indicating that water does flow through the fractures of the Basalt Unit. This is further substantiated from the loss of drilling fluid while coring the rock in the majority of the borings.

Laboratory testing was limited to unconfined compressive strength, L.A. Abrasion, specific gravity of course aggregate and percent carbonates. Unconfined compressive strength and specific gravity tests (unit weight) were conducted to provide information regarding excavation techniques and shrink/swell factors. L.A. Abrasion, specific gravity and percent carbonates are required to determine compliance for use as either an aggregate base or mineral aggregate. In order to perform the required compliance testing, four composite samples of the rock core representing decomposed basalt, predominately decomposed basalt, and slightly weathered to fresh basalt of both competent and highly fractured zones were selected for testing. The composite samples were crushed under laboratory control in a “Chipmunk” jaw crusher to provide the correct gradation required. The L.A. Abrasion was not performed on the decomposed basalt sample as it disintegrated during the crushing process. L.A. Abrasion results for the other three samples ranged from 3% to 5% loss for 100 revolutions and 15% to 21% for 500 revolutions. The samples exhibited 0 to 1 percent carbonates. Unconfined compressive strength and specific gravity testing was performed on 42 samples. The following table summarizes the results of the tests performed on intact rock core specimens:

Summary of Intact Rock Core Test Results				
Test Performed	Minimum	Maximum	Average	Typical Specification
Unconfined Compressive Strength (psi)	4,478	30,112	16,822	N/A
Specific Gravity	2.715	2.987	2.844	2.350 to 2.850
Unit Weight (lbs/ft ³)	168.3	185.2	176.3	N/A
Absorption, %	0.18	3.97	1.08	0 to 2.5
Note: Approximately 75% of the compressive strength results are between 10,000 psi and 25,000 psi. Only one absorption value was > 2%. The sample exhibiting 3.97 was performed on the predominately decomposed basalt that could not be tested for L.A. Abrasion.				

3.0 ANALYSIS AND RECOMMENDATIONS

Based on the field and laboratory data, the Basalt Unit should be an excellent source for material capable of meeting local municipality/governmental agencies requirements for aggregate base. In addition, with the high specific gravity, the material would be suitable for use as rip-rap material. The test results conducted for mineral aggregate for use in asphaltic concrete products may be considered marginal. The material has no problem meeting typical specifications regarding L.A. Abrasion, % carbonates or % absorption. Local specifications typically have a maximum L.A. Abrasion loss of 9% and 40% for the 100 and 500 revolutions respectively. Percent carbonates must be less than 20% and absorption values less than 2.5%. However, the maximum specific gravity for mineral aggregate is 2.85. Of the samples tested, 30% had a specific gravity greater than 2.85. The average specific gravity was 2.844.

Samples obtained of the Cinder Unit were not tested as part of this report. It has been indicated that this material will be used for cover material at the landfill. Currently, equipment operators have reported difficult excavation due to the presence of “rock”. Based on the drilling results and observations made during exploration, the “rock” is most likely attributed to volcanic bombs, fused scoria, thin intermediate basalt flows or filled vents and conduits that have created dike like structures as part of the extensive chain of cinder cones in the area. The random nature of these occurrences will make excavation more challenging. Some localized blasting may be required to remove the dike like structures, thin flows or to reduce large boulders to a manageable size. Although not specifically tested, some of this material may be suitable for use as one of the aggregate products indicated above. However, in determining feasibility, it is not recommended to include any

of the Cinder Unit as part of the material that will produce acceptable aggregates. It should be noted that although the Cinder Unit is to be used as cover material within the landfill, cinder based products are used locally and there may be some monetary benefit to using the cinders commercially.

The basalt is weathered at the contact of the Cinder Unit. Although an L.A. Abrasion could not be performed on this weathered material, the results of the crushing of the material indicate that the material would not pass the L.A. Abrasion specifications. The upper 1 to 5 feet will most likely not be suitable for use as a mineral aggregate, but may be able to be utilized as part of the sand fraction of an aggregate base. If used, the upper weathered material may need to be blended with some of the underlying slightly weathered/fresh basalt. For the purposes of this investigation, it is recommended that an average of 20 feet of basalt above elevation 6560 be considered acceptable for use as a commercial aggregate. The high compressive strength of the slightly weathered to fresh basalt and fracture pattern will, in our opinion, require blasting for cost effective excavation. Crushing operations to produce a final product should be rather straight forward, although the high compressive strength may result in premature wear of equipment.

Earthwork factors will be dependent upon excavation techniques, product produced and produced waste. A shrinkage factor of 10% to 20% should be used for the Cinder Unit assuming it is used on site and compacted to 85%. Additional shrinkage will occur if used for commercial purposes. Within the Basalt Unit, for raw material used for aggregate base, from a banked to compacted condition, 25% to 30% swell would not be uncommon for this material when compacted to 95% to 100%. An additional 10% increase should be anticipated in a loose or trucked condition.

A site specific slope stability analysis for quarry operations was not part of the scope of this project. A slope stability analysis should be performed once excavation operations are begun. However, for the feasibility study, it should be assumed that the cut slope within the Cinder Unit will require a 2:1 (h:v) lay back. Although a vertical to near vertical cut slope may be possible in the Basalt Unit, a ¼:1 (h:v) slope is recommended for this study.

4.0 CONCLUSION

The scope of this investigation and report does not include regional considerations such as ground fissures resulting from subsidence due to groundwater withdrawal, nor any considerations of hazardous releases or toxic contamination of any type.

Our analysis of data and the recommendations presented herein are based on the assumption that soil/rock conditions do not vary significantly from those found at specific sample locations. Our work has been performed in accordance with generally accepted engineering principles and practice; this warranty is in lieu of all other warranties expressed or implied.

Respectfully submitted,
SPEEDIE & ASSOCIATES, INC.

Clay W. Spencer, R.G.

Gregg A. Creaser, P.E.

APPENDIX

SOIL BORING LOCATION PLANS

SOIL LEGEND

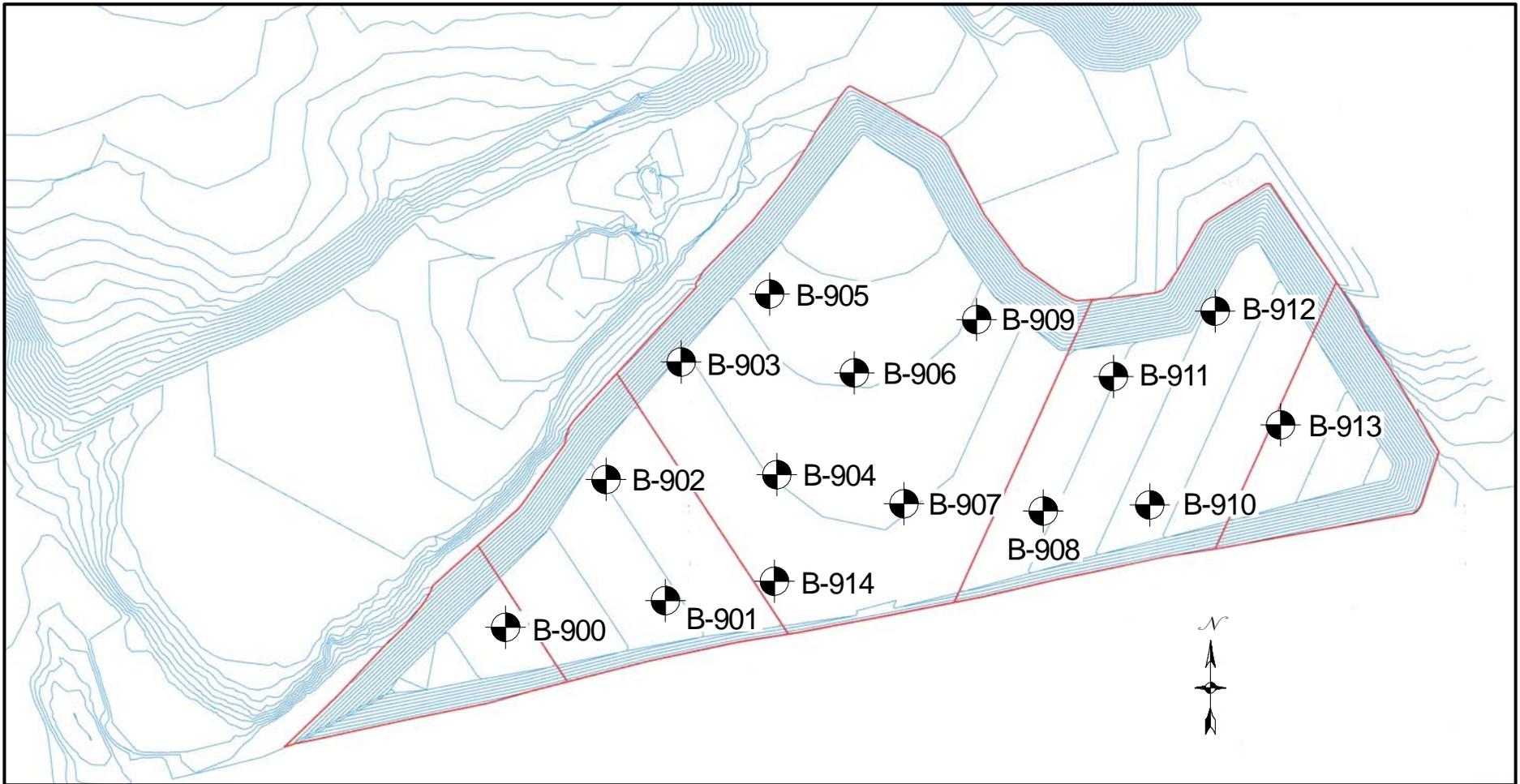
ROCK TERMINOLOGY

LOG OF TEST BORINGS

GEOLOGIC CROSS SECTIONS

UNIT WEIGHT & COMPRESSIVE STRENGTH TEST RESULTS

ROCK CORE PHOTOGRAPHS



 - APPROXIMATE SOIL BORING LOCATIONS

Drawing Courtesy of: City of Flagstaff

SOIL BORING LOCATION PLAN

Cinder Lake Landfill-South Borrow Pit
 Cinder Lake Landfill
 Flagstaff, Arizona

**SPEEDIE
 AND ASSOCIATES**

 GEOTECHNICAL/ENVIRONMENTAL/MATERIALS ENGINEERS
 4025 E. HUNTINGTON, SUITE 140 FLAGSTAFF, ARIZONA 86004

TMPLT_2000.CAD 10/23/00

DR:AAR	CHK:CWS	REV:	DATE: 12-28-12	PROJECT NO. 121372SF
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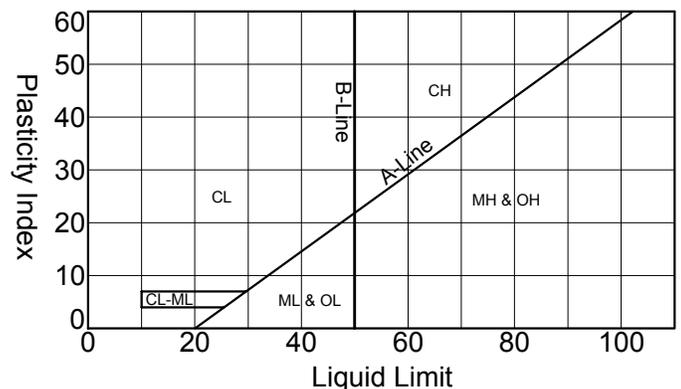
SOIL LEGEND

SAMPLE DESIGNATION	DESCRIPTION	
AS	Auger Sample	A grab sample taken directly from auger flights.
BS	Large Bulk Sample	A grab sample taken from auger spoils or from bucket of backhoe.
S	Spoon Sample	Standard Penetration Test (ASTM D-1586) Driving a 2.0 inch outside diameter split spoon sampler into undisturbed soil for three successive 6-inch increments by means of a 140 lb. weight free falling through a distance of 30 inches. The cumulative number of blows for the final 12 inches of penetration is the Standard Penetration Resistance.
RS	Ring Sample	Driving a 3.0 inch outside diameter spoon equipped with a series of 2.42-inch inside diameter, 1-inch long brass rings, into undisturbed soil for one 12-inch increment by the same means of the Spoon Sample. The blows required for the 12 inches of penetration are recorded.
LS	Liner Sample	Standard Penetration Test driving a 2.0-inch outside diameter split spoon equipped with two 3-inch long, 3/8-inch inside diameter brass liners, separated by a 1-inch long spacer, into undisturbed soil by the same means of the Spoon Sample.
ST	Shelby Tube	A 3.0-inch outside diameter thin-walled tube continuously pushed into the undisturbed soil by a rapid motion, without impact or twisting (ASTM D-1587).
--	Continuous Penetration Resistance	Driving a 2.0-inch outside diameter "Bullnose Penetrometer" continuously into undisturbed soil by the same means of the spoon sample. The blows for each successive 12-inch increment are recorded.

CONSISTENCY			RELATIVE DENSITY	
Clays & Silts	Blows/Foot	Strength (tons/sq ft)	Sands & Gravels	Blows/Foot
Very Soft	0 - 2	0 - 0.25	Very Loose	0 - 4
Soft	2 - 4	0.25 - 0.5	Loose	5 - 10
Firm	5 - 8	0.5 - 1.0	Medium Dense	11 - 30
Stiff	9 - 15	1 - 2	Dense	31 - 50
Very Stiff	16 - 30	2 - 4	Very Dense	> 50
Hard	> 30	> 4		

MAJOR DIVISIONS		SYMBOLS		TYPICAL DESCRIPTIONS	
		GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS <small>(LITTLE OR NO FINES)</small>		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
			GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 40 SIEVE <small>(APPRECIABLE AMOUNT OF FINES)</small>		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
			SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
			SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES	
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS <small>(LITTLE OR NO FINES)</small>		SM	SILTY SANDS, SAND - SILT MIXTURES	
			SC	CLAYEY SANDS, SAND - CLAY MIXTURES	
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 40 SIEVE <small>(APPRECIABLE AMOUNT OF FINES)</small>	SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>			
FINE GRAINED SOILS	SILTS AND CLAYS <small>LIQUID LIMIT LESS THAN 50</small>		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS <small>LIQUID LIMIT GREATER THAN 50</small>		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

MATERIAL SIZE	PARTICLE SIZE				
	Lower Limit		Upper Limit		
	mm	Sieve Size ♦	mm	Sieve Size ♦	
SANDS	Fine	0.075	#200	0.42	#40
	Medium	0.420	#40	2.00	#10
	Coarse	2.000	#10	4.75	#4
GRAVELS	Fine	4.75	#4	19	0.75" x
	Coarse	19	0.75" x	75	3" x
COBBLES	75	3" x	300	12" x	
BOULDERS	300	12" x	900	36" x	
♦U.S. Standard		*Clear Square Openings			



NOTE: DUAL OR MODIFIED SYMBOLS MAY BE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS OR TO PROVIDE A BETTER GRAPHICAL PRESENTATION OF THE SOIL

ROCK TERMINOLOGY

SCALE OF RELATIVE HARDNESS	
Term	Field Identification
Extremely Soft	Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.
Very Soft	Crumbles under firm blows with point of a geology pick. Can be peeled by a pocketknife. Scratched with fingernail.
Soft	Can be peeled by a pocketknife with difficulty. Cannot be scratched with fingernail. Shallow indentation made by firm blow of a geology pick.
Medium Hard	Can be scratched by knife or pick. Specimen can be fractured with a single firm blow of hammer/geology pick.
Hard	Can be scratched with knife or pick only with difficulty. Several hard hammer blows required to fracture specimen.
Very Hard	Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.

STRATIFICATION TERMS	
Term	Characteristics
Laminations	Thin beds (<1/2 inch)
Fissile	Tendency to break along laminations.
Parting	Tendency to break parallel to bedding, any scale.
Foliation	Non-depositional, e.g., segregation and layering of minerals in metamorphic rocks.

ROCK TERMINOLOGY

SCALE OF RELATIVE ROCK WEATHERING	
Term	Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric. Decomposition extends up to 1 inch into rock.
Moderately Weathered	Rock mass is decomposed 50% or less. Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Predominantly Decomposed	Rock mass is more than 50% decomposed. Rock can be excavated with a geologists pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock fabric may be evident. May be reduced to soil with hand pressure.

JOINT AND BEDDING/FOLIATION SPACING TERMS		
Spacing	Joint Spacing Terms	Bedding/Foliation Spacing Terms
<2 in.	Very Close	Very Thin (Laminated)
2 in. to 1 ft.	Close	Thin
1 ft. to 3 ft.	Moderately Close	Medium
3 ft. to 10 ft.	Wide	Thick
>10 ft.	Very Wide	Very Thick (Massive)

GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF DATE: 11-13-12 GEOL/TECH: C. Spencer
 PROJECT NAME: Cinder Lake Landfill S Borrow Pit DRILLER: G. Henner
 LOCATION: Cinder Lake Landfill CONTRACTOR: Enviro-Drill, Inc.
 BORING NO.: 900 STATION: N/A
 RIG TYPE: CME-75 ELEVATION: 6600.7

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
5			8-16-23				Loose Reddish Brown <u>CINDER SAND (SCORIA)</u> (SW-Dry) with Gravel and Cobble
				Diminished Advance @ 7.5'			7.5
10			50/0"	Begin Coring			<u>BASALT</u> Reddish Brown to Gray; Predominantly Decomposed; Soft to Medium Hard; Aphanitic; Very Close Fractures;
				Lost Circulation			10.6
15	100	31			2.0		<u>BASALT</u> Gray with Some Red Mottling; Slightly to Moderately Weathered; Medium Hard; Very Close to Close Fractures; Joints and Fractures Rehealed
20							
25	100	29			4.0		
30	100	51			3.0		
35							At 35' Contains 5-10% Vesicles
40	100	91			2.0		At 38' Contains <5% Vesicles
							40.5
							End of Boring
45							

_SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
<i>Free Water was Not Encountered</i>		



GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF

DATE: 11-13-12

GEOL/TECH: C. Spencer

PROJECT NAME: Cinder Lake Landfill S Borrow Pit

DRILLER: G. Henner

LOCATION: Cinder Lake Landfill

CONTRACTOR: Enviro-Drill, Inc.

BORING NO.: 901

STATION: N/A

RIG TYPE: CME-75

ELEVATION: 6621.5

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
5			8-18-11				Medium Dense Black <u>CINDER SAND (SCORIA)</u> (SW-Dry) with Gravel
10			9-8-8				
15			5-6-8				
20			3-5-7				At 20': Decrease in Gravel
25			7-8-11				
30			28/50-6"				30.0
35							33.5
40			5-5-15				38.0
45	100	22		Begin Coring No Circulation @ 45'			41.0
							45.2

— SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
Free Water was Not Encountered		

Continued on Next Page

GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF

DATE: 11-13-12

GEOL/TECH: C. Spencer

PROJECT NAME: Cinder Lake Landfill S Borrow Pit

DRILLER: G. Henner

LOCATION: Cinder Lake Landfill

CONTRACTOR: Enviro-Drill, Inc.

BORING NO.: 901

STATION: N/A

RIG TYPE: CME-75

ELEVATION: 6621.5

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
	7	0	28/50-3"				Medium Dense to Dense Black <u>CINDER SAND (SCORIA) (SP-Dry) with Gravel</u> ----- 51.8
55							
60							
65							
70							
75							
80							
85							
90							
95							

_SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
<i>Free Water was Not Encountered</i>		



GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF DATE: 11-13-12 GEOL/TECH: C. Spencer
 PROJECT NAME: Cinder Lake Landfill S Borrow Pit DRILLER: G. Henner
 LOCATION: Cinder Lake Landfill CONTRACTOR: Enviro-Drill, Inc.
 BORING NO.: 902 STATION: N/A
 RIG TYPE: CME-75 ELEVATION: 6613.8

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS	
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)			
5			4-1-1				Very Loose to Medium Dense Black <u>CINDER SAND (SCORIA)</u>	
10			8-11-4				At 8': with Cobble At 9.5': Medium Dense with Gravel	
15			22-13-8				From 16.5' to 19': Possible Boulder or Thin Basalt Flow	
20			2-3-17				20.0	<u>BASALT</u> Reddish Brown to Gray Predominantly Decomposed to Moderately Weathered;
25							24.5	<u>BASALT</u> Gray; Slightly Weathered; Medium Hard to Hard; Aphanitic; Close to Moderately Close Fractures; Approx 7% Vesicles; Occasional Large Vesicles (1" or Larger); Iron Oxide Staining
30	100	68			2.0			From 30.5' to 31.4': Very Close Fractures From 31.4' to 34.9': 3-5% Vesicles
35							34.9	From 34.9' to 35.6': Void
40	91	85					35.6	<u>BASALT</u> Gray; Fresh; Hard; Moderately Close Fractures; 3% Vesicles; Large Vesicles (0.5" to 1")
45								From 41.4' to 51.4': Close to Moderately Close Fractures

_SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
Free Water was Not Encountered		

Continued on Next Page



GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF

DATE: 11-20-12

GEOL/TECH: C. Spencer

PROJECT NAME: Cinder Lake Landfill S Borrow Pit

DRILLER: G. Henner

LOCATION: Cinder Lake Landfill

CONTRACTOR: Enviro-Drill, Inc.

BORING NO.: 903

STATION: N/A

RIG TYPE: CME-75

ELEVATION: 6612.3

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
5			2-2-20			•••••	Loose Reddish Brown to Black <u>CINDER SAND (SCORIA)</u> (SP-Dry) with Gravel
10						+ + +	<u>BASALT</u> Gray; Predominantly Decomposed; Medium Hard; Aphanitic; Close Fractures;
15						+ + +	<u>VESICULAR BASALT</u> Gray; Slightly Weathered; Medium Hard; Aphanitic; Close Fractures;
20	94	70				+ + +	<u>BASALT</u> Gray; Slightly Weathered to Fresh Hard; Aphanitic; Close Fractures; <2% Vesicles
25	100	51				+ + +	<u>VESICULAR BASALT</u> Gray; Moderately Weathered; Medium Hard; Aphanitic; Very Close Fractures;
30						+ + +	<u>BASALT</u> Gray; Slightly Weathered to Fresh Hard to Very Hard Aphanitic; Close to Moderately Close Fractures ~ 7% Vesicles
35	97	94				+ + +	
40	100	78				+ + +	
45						+ + +	

Speedie Rock 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
Free Water was Not Encountered		

Continued on Next Page



GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF

DATE: 11-16-12

GEOL/TECH: C. Spencer/A. Griffiths

PROJECT NAME: Cinder Lake Landfill S Borrow Pit

DRILLER: G. Henner

LOCATION: Cinder Lake Landfill

CONTRACTOR: Enviro-Drill, Inc.

BORING NO.: 904

STATION: N/A

RIG TYPE: CME-75

ELEVATION: 6613.1

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS	
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)			
5			20/50-5"				Medium Dense Reddish Brown to Black <u>CINDER SAND (SCORIA)</u> (SW-Dry) with Gravel, Cobble, and Boulders	
10			5-5-15				9.5	Medium Dense Reddish Brown <u>CINDER SAND (SCORIA)</u> (SW-Dry) with Gravel
15			8-5-11					
20			50-3"					
25			3-3-4					
30							27.5	<u>BASALT</u> Reddish Brown to Gray; Predominantly Decomposed to Moderately Weathered; Medium Hard;
35							30.0	<u>BASALT</u> Gray to Black; Slightly Weathered; Medium Hard to Hard; Aphanitic; Close to Moderately Close Fractures; Few Vesicles
40	98	81		No Circulation	2.6			
45								
	96	79			1.9		From 48.3' to 48.7': Very Close Fractures	

_SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
Free Water was Not Encountered		



Continued on Next Page

GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF

DATE: 11-16-12

GEOL/TECH: C. Spencer/A. Griffiths

PROJECT NAME: Cinder Lake Landfill S Borrow Pit

DRILLER: G. Henner

LOCATION: Cinder Lake Landfill

CONTRACTOR: Enviro-Drill, Inc.

BORING NO.: 904

STATION: N/A

RIG TYPE: CME-75

ELEVATION: 6613.1

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
100	100	74			3.0	+ + + + + + + + +	<p><u>BASALT</u> Gray to Black; Slightly Weathered; Medium Hard to Hard; Aphanitic; Close to Moderately Close Fractures; Few Vesicles</p> <p style="text-align: right;">53.3</p> <p style="text-align: center;">End of Boring</p>
55							
60							
65							
70							
75							
80							
85							
90							
95							

_SPEEDIE ROCK 121372SF.GPJ GENGE0.GDT 12/31/12

Depth	Hour	Date
<i>Free Water was Not Encountered</i>		



GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF DATE: 11-13-12 GEOL/TECH: C. Spencer
 PROJECT NAME: Cinder Lake Landfill S Borrow Pit DRILLER: G. Henner
 LOCATION: Cinder Lake Landfill CONTRACTOR: Enviro-Drill, Inc.
 BORING NO.: 906 STATION: N/A
 RIG TYPE: CME-75 ELEVATION: 6610.8

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
5			9-7-4				Medium Dense Black <u>CINDER SAND (SCORIA)</u> with Little Gravel
10			4-5-4				At 10': Reddish Brown to Black
15			50/0"				From 14.5' to 19': Heavy Boulder/Cobble Zone or Fused Cinders
20			50/0"				19.0
25							26.5
30	100	63			1.5		<u>BASALT</u> Gray; Moderately Weathered; Medium Hard; Aphanitic;
35							<u>BASALT</u> Gray; Slightly Weathered; Hard; Close Fractures; Fractures are Open; ~3% Vesicles
40	100	81			1.25		From 31.3' to 41.3': Close to Moderately Close Fractures
45	100	88			1.8		From 41.3' to 47.2': Close High-Angle Fractures
							From 47.2' to 50.1': Moderately Close Fractures
						50.1	

— SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

No Circulation

Depth	Hour	Date
Free Water was Not Encountered		

Continued on Next Page



GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF

DATE: 11-7-12

GEOL/TECH: C. Spencer

PROJECT NAME: Cinder Lake Landfill S Borrow Pit

DRILLER: G. Henner

LOCATION: Cinder Lake Landfill

CONTRACTOR: Enviro-Drill, Inc.

BORING NO.: 908

STATION: N/A

RIG TYPE: CME-75

ELEVATION: 6614.2

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
5			8-6-8				Medium Dense Reddish Brown <u>CINDER SAND (SCORIA)</u> (SW-Dry) with Gravel
10			5-6-4				
15			5-7-8				
20			50/0"				19.0 BASALT BOULDER or Thin BASALT FLOW Gray/Reddish Brown Predominately Decomposed to Moderately Weathered
25							
30	43	17					
35							26.4 Loose to Medium Dense Black <u>CINDER SAND (SCORIA)</u> (SW-Dry) with Gravel
40							
45							
				2			40.0 41.5 BASALT Reddish Brown to Gray Predominantly Decomposed; BASALT Gray; Slightly Weathered; Hard; Aphanitic; Close High Angle Fractures; 45.5' to 47.5' Very Close Fracture Spacing
				2.5			

_SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
Free Water was Not Encountered		



Continued on Next Page

GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF

DATE: 11-8-12

GEOL/TECH: C. Spencer

PROJECT NAME: Cinder Lake Landfill S Borrow Pit

DRILLER: G. Henner

LOCATION: Cinder Lake Landfill

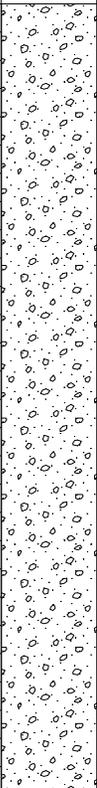
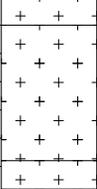
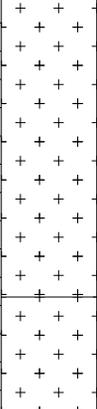
CONTRACTOR: Enviro-Drill, Inc.

BORING NO.: 909

STATION: N/A

RIG TYPE: CME-75

ELEVATION: 6618.9

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
5			12-10-9				Medium Dense Reddish Brown <u>CINDER SAND (SCORIA)</u> (SW-Dry) with Gravel
10			5-7-4				At 10': Moist
15			6-5-12				
20			7-8-10				
25			6-10-10				
30			50/0"				28.0 <u>BASALT</u> Gray; Predominantly Decomposed; 29.0 <u>BASALT</u> Gray; Slightly Weathered; Medium Hard to Hard; Aphanitic; Close Fractures; Minor Staining along Fractures
35	100	49		Good Circulation	2.0		33.8 <u>VESICULAR BASALT</u> Gray; Moderately Weathered; Soft to Medium Hard; Close Fractures; 34.8 <u>BASALT</u> Gray; Slightly Weathered to Fresh; Medium Hard to Hard; Moderately Close Fractures;
45	100	70		Good Circulation	2.0		45.7 <u>BASALT</u> Gray; Fresh; Moderately Close to Wide Fractures;

— SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
Free Water was Not Encountered		

Continued on Next Page

GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF DATE: 11-6-12 GEOL/TECH: C. Spencer
 PROJECT NAME: Cinder Lake Landfill S Borrow Pit DRILLER: G. Henner
 LOCATION: Cinder Lake Landfill CONTRACTOR: Enviro-Drill, Inc.
 BORING NO.: 910 STATION: N/A
 RIG TYPE: CME-75 ELEVATION: 6614.6

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
							Brown <u>SILTY SAND</u> with Gravel 1.0
							Medium Dense Black <u>CINDER SAND (SCORIA)</u> with Gravel and Occasional Cobbles
5			12-23-13				
10			4-5-5				At 9.5': Reddish Black
15			9-9-16				At 14.5': Reddish Brown
20			3-4-12				
25			5-28-8				At 24.5': Reddish Brown to Gray
30			5-3-2				At 29.5': Loose
35			13-16-21				At 34.5': Dense
							36.6
							<u>BASALT</u> Gray; Predominantly Decomposed; Soft; Aphanitic; Moderately Close Fractures; 37.8
40							<u>BASALT</u> Gray; Slightly Weathered to Fresh; Hard; Aphanitic; Moderately Close Fractures;
							From 42.7' to 42.8': Vesicular
45	100	87			1.75		~1% Vesicles

_SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Begin Coring at 39.3'

Depth	Hour	Date
Free Water was Not Encountered		



Continued on Next Page

GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF	DATE: 11-1-12	GEOL/TECH: C. Spencer
PROJECT NAME: Cinder Lake Landfill S Borrow Pit		DRILLER: G. Henner
LOCATION: Cinder Lake Landfill	CONTRACTOR: Enviro-Drill, Inc.	
BORING NO.: 911	STATION: N/A	
RIG TYPE: CME-75	ELEVATION: 6612.8	

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
5			5-5-6			[Graph: Dotted pattern]	FILL: Medium Dense Brown <u>SILTY SAND</u> with Gravel and Cobble
10			3-3-5			[Graph: Dotted pattern]	Medium Dense Reddish Brown <u>CINDER SAND (SCORIA)</u> with Gravel, Cobble, and Boulders At 9.5': Loose to Medium Dense
15			10-12-3			[Graph: Dotted pattern]	At 14.5': High Blow Counts on Cobble/Boulder
20			23-23-50/1"	Began Odex at 20'		[Graph: Dotted pattern]	
30				Begin Coring at 29.8'		[Graph: Plus signs]	<u>BASALT</u> Gray; Slightly Weathered; Medium Hard to Hard; Aphanitic; Close Fractures; <5% Vesicles
35	100	68				[Graph: Plus signs]	
40	100	46			2.0	[Graph: Plus signs]	From 39.5' to 43.3': Increase in Fractures
45	100	40			2.0	[Graph: Plus signs]	<1% Vesicles
	100	94			1.8	[Graph: Plus signs]	From 47.3' to 52.3': Decrease in Fractures

Speedie Rock 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
Free Water was Not Encountered		

Continued on Next Page

GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF

DATE: 11-1-12

GEOL/TECH: C. Spencer

PROJECT NAME: Cinder Lake Landfill S Borrow Pit

DRILLER: G. Henner

LOCATION: Cinder Lake Landfill

CONTRACTOR: Enviro-Drill, Inc.

BORING NO.: 911

STATION: N/A

RIG TYPE: CME-75

ELEVATION: 6612.8

DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
55	98	82		From 50.3' to 52.3': Had to re-enter hole to obtain last 2' of core. Last part of core fractured and not representative.	1.5	+ + + + + + + + + + + + + + +	<u>BASALT</u> Gray; Slightly Weathered; Medium Hard to Hard; Aphanitic; Close Fractures; <1% Vesicles End of Boring
60							
65							
70							
75							
80							
85							
90							
95							

_SPEEDIE ROCK 121372SF.GPJ GENGE0.GDT 12/31/12

Depth	Hour	Date
<i>Free Water was Not Encountered</i>		



GEOTECHNICAL SERVICES EXPLORATION LOG

PROJECT NO.: 121372SF DATE: 11-15-12 GEOL/TECH: C. Spencer
 PROJECT NAME: Cinder Lake Landfill S Borrow Pit DRILLER: G. Henner
 LOCATION: Cinder Lake Landfill CONTRACTOR: Enviro-Drill, Inc.
 BORING NO.: 914 STATION: N/A
 RIG TYPE: CME-75 ELEVATION: 6606.4

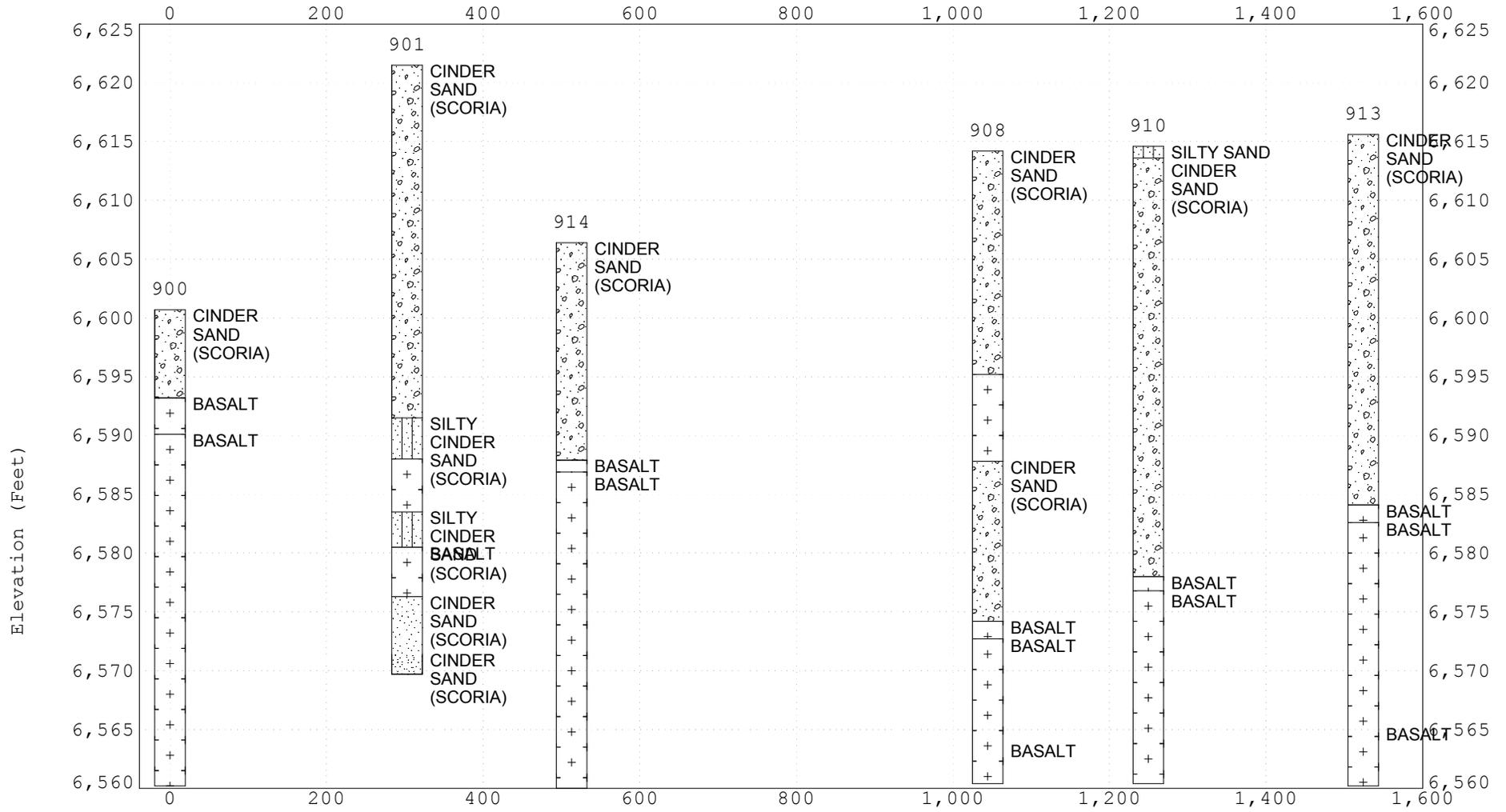
DEPTH IN FEET	NQ CORING DATA		SPT BLOWS/12"	DRILLING DATA		GRAPH	VISUAL CLASSIFICATION & REMARKS
	%RECOVERY	%RQD		NOTES	AVERAGE RATE (Min/Ft)		
5			6-7-8				Medium Dense Black <u>CINDER SAND (SCORIA)</u> Coarse with Gravel
10			2-3-4				At 9.5': Loose
15			50/0"				From 13' to 18': Boulder or Thin Flow
18.5							From 18' to 18.5': Softer Zone Assumed to be Cinders
19.5							<u>BASALT</u> Gray; Predominantly Decomposed;
19.5							<u>BASALT</u> Gray; Fresh; Hard; Aphanitic; Moderately Close Fractures; <5% Vesicles
25	100	88			2.0		Loosing ~40% Circulation
30							
33.7							Lost Circulation at 33.7'
35	100	95			2.0		Hard to Very Hard; <3% Vesicles
40						At 38': High Angle Fracture	
45	100	65				Very Close Fractures	
46.4						End of Boring	

_SPEEDIE ROCK 121372SF.GPJ GENGEQ.GDT 12/31/12

Depth	Hour	Date
Free Water was Not Encountered		



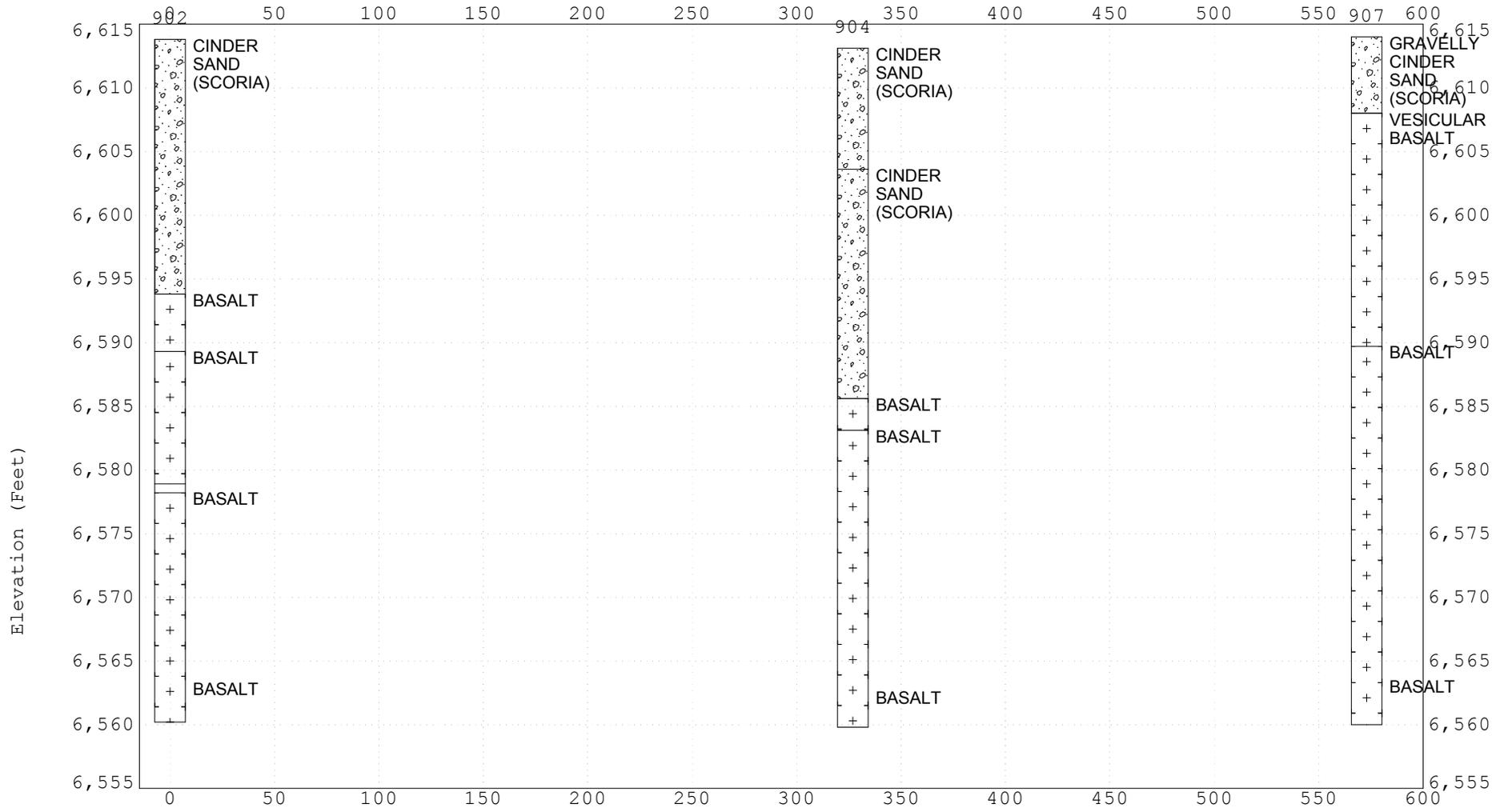
GEOLOGIC CROSS-SECTION



Cinder Lake Landfill S Borrow Pit
 Cinder Lake Landfill
 Flagstaff, Arizona
 Project No.: 121372SF



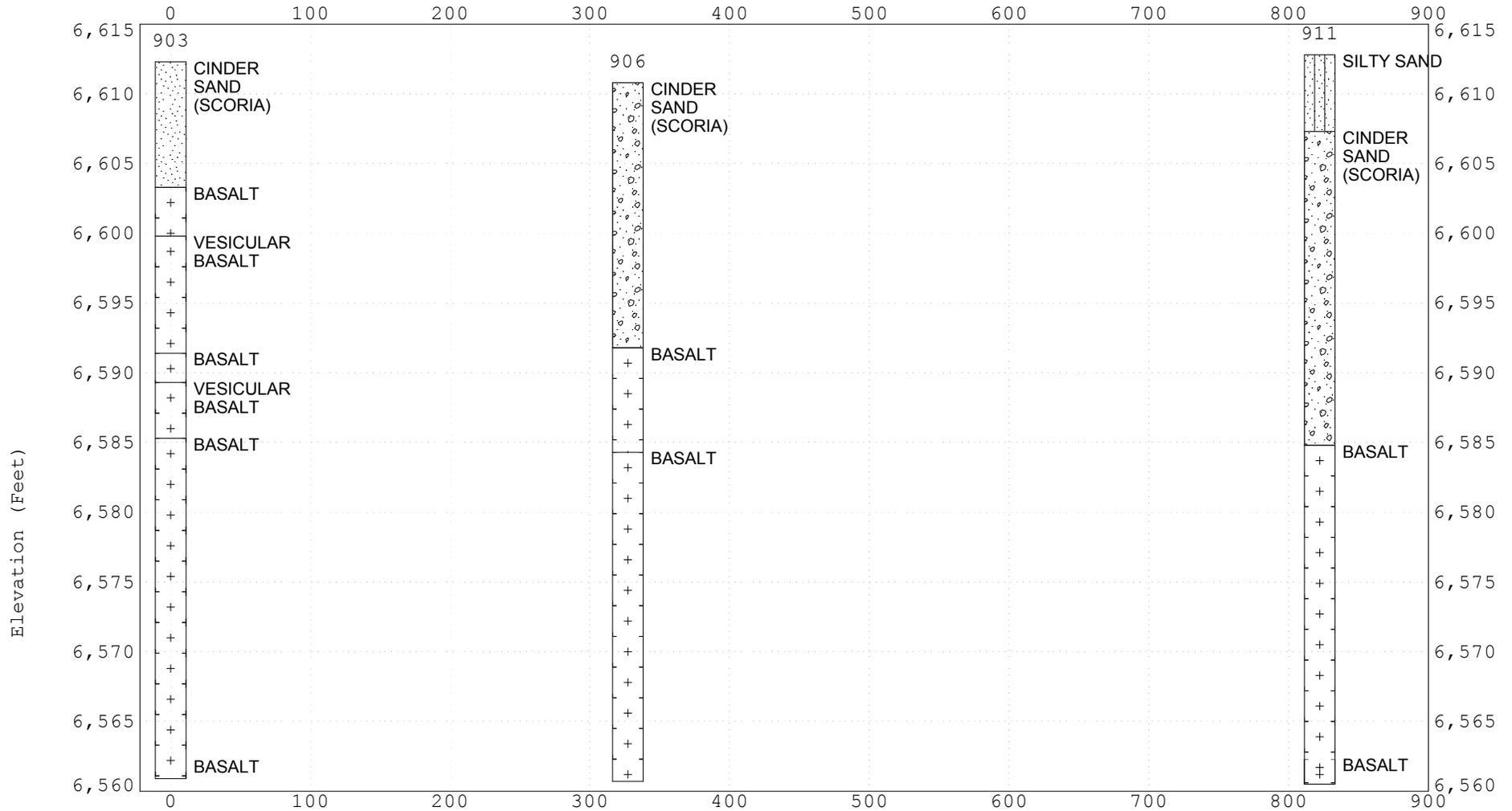
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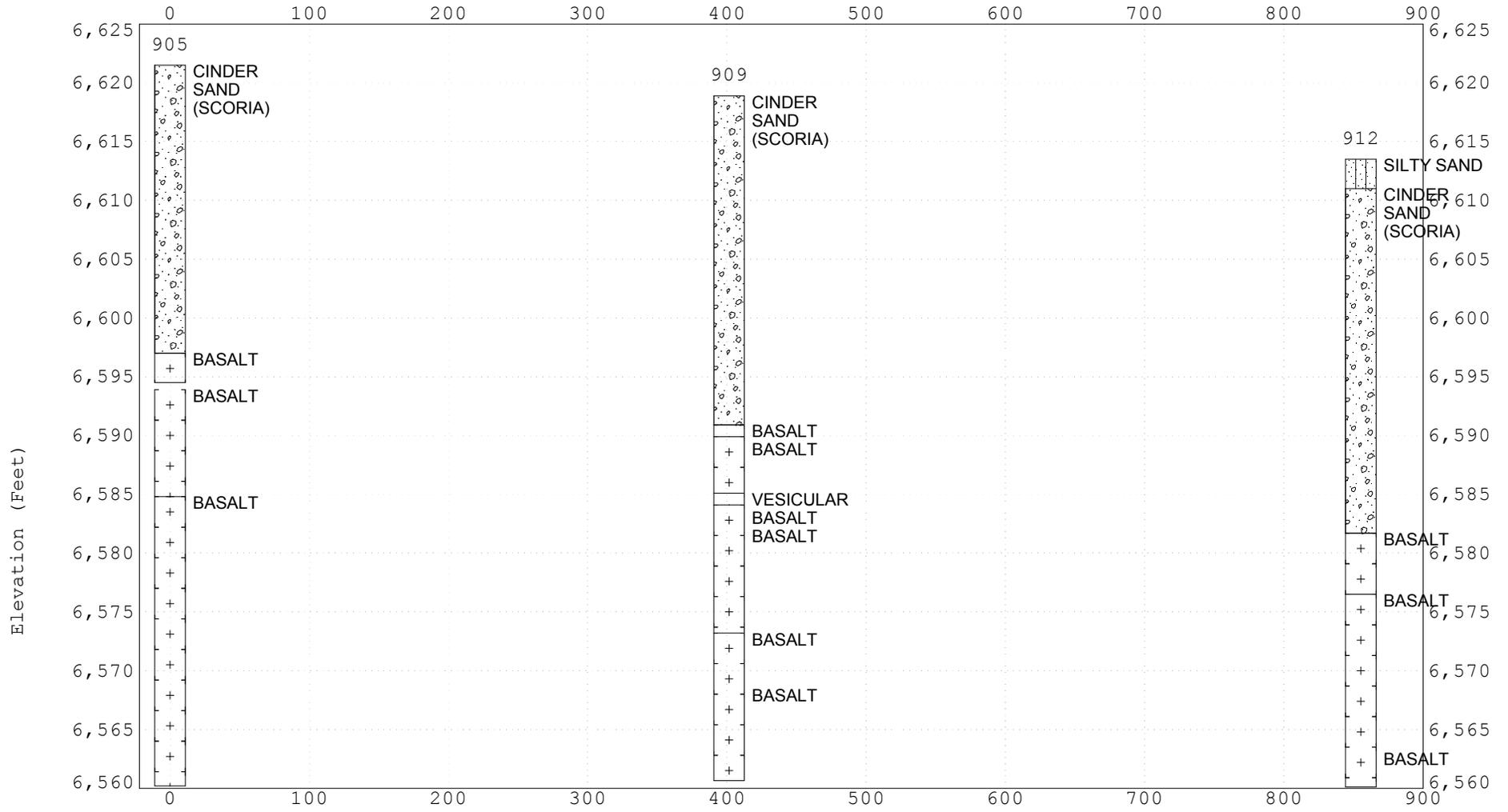
Cinder Lake Landfill S Borrow Pit
 Cinder Lake Landfill
 Flagstaff, Arizona
 Project No.: 121372SF



GEOLOGIC CROSS-SECTION



GEOLOGIC CROSS-SECTION



Cinder Lake Landfill S Borrow Pit
 Cinder Lake Landfill
 Flagstaff, Arizona
 Project No.: 121372SF



SPEEDIE AND ASSOCIATES

Geotechnical ▪ Environmental ▪ Materials Engineers
4025 E. HUNTINGTON DR., STE.140, FLAGSTAFF, AZ 86004 ■ O: 928-526-6681 F: 928-526-6685

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/24/2012
REMARKS:	

SAMPLE NUMBER:	KT724	KT725	KT726	KT727
CORE LOCATION:	B-900, 13'	B-900, 23'	B-900, 38'	B-902, 25'
DATE TESTED:	12/24/2012	12/24/2012	12/24/2012	12/24/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.78	3.93	3.97	3.88
CAPPED LENGTH (in.)	4.01	4.02	4.12	4.20
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	9:30	9:32	9:34	9:35
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	38,340	35,120	59,090	47,480
TYPE OF FRACTURE	1	3	3	3
COMPRESSIVE STRENGTH (psi)	13,891	12,725	21,409	17,203
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	13,891	12,725	21,409	17,203
SPECIFIC GRAVITY OF SAMPLE	2.774	2.92	2.831	2.776
UNIT WEIGHT (pcf)	173.1	182.2	176.7	173.2

DATE REQUESTED: 12/17/2012	REQUESTED BY: City of Flagstaff
DATE SAMPLED: _____	SAMPLED BY: CWS
DATE OBTAINED: _____	SUBMITTED BY: CWS
DATE MOLDED: _____	REVIEWED BY: CWS

SPEEDIE AND ASSOCIATES

Geotechnical ▪ Environmental ▪ Materials Engineers
4025 E. HUNTINGTON DR., STE. 140, FLAGSTAFF, AZ 86004 ■ O: 928-526-6681 F: 928-526-6685

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/24/2012
REMARKS:	

SAMPLE NUMBER:	KT728	KT729	KT730	KT731
CORE LOCATION:	B-902, 35.6'	B-902, 50'	B-903, 15'	B-903, 30'
DATE TESTED:	12/24/2012	12/24/2012	12/24/2012	12/24/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.98	3.96	4.03	3.86
CAPPED LENGTH (in.)	4.15	4.15	4.22	4.09
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	9:37	9:39	9:41	9:43
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	51,420	51,150	25,050	44,260
TYPE OF FRACTURE	4	4	3	3
COMPRESSIVE STRENGTH (psi)	18,630	18,533	9,076	16,036
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	18,630	18,533	9,076	16,036
SPECIFIC GRAVITY OF SAMPLE	2.733	2.849	2.741	2.785
UNIT WEIGHT (pcf)	170.5	177.8	171.0	173.8

DATE REQUESTED:	12/17/2012	REQUESTED BY:	City of Flagstaff
DATE SAMPLED:	_____	SAMPLED BY:	CWS
DATE OBTAINED:	_____	SUBMITTED BY:	CWS
DATE MOLDED:	_____	REVIEWED BY:	CWS

SPEEDIE AND ASSOCIATES

Geotechnical ▪ Environmental ▪ Materials Engineers
4025 E. HUNTINGTON DR., STE. 140, FLAGSTAFF, AZ 86004 ■ O: 928-526-6681 F: 928-526-6685

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/24/2012
REMARKS:	

SAMPLE NUMBER:	KT732	KT733	KT734	KT735
CORE LOCATION:	B-903, 42'	B-904, 36'	B-904, 43'	B-903, 49'
DATE TESTED:	12/24/2012	12/24/2012	12/24/2012	12/24/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.98	4.13	3.99	4.07
CAPPED LENGTH (in.)	4.12	4.28	4.18	4.21
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	9:44	9:45	9:47	9:49
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	40,130	22,520	61,020	24,810
TYPE OF FRACTURE	4	4	4	4
COMPRESSIVE STRENGTH (psi)	14,540	8,159	22,109	8,989
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	14,540	8,159	22,109	8,989
SPECIFIC GRAVITY OF SAMPLE	2.859	2.833	2.892	2.827
UNIT WEIGHT (pcf)	178.4	176.8	180.5	176.4

DATE REQUESTED:	12/17/2012	REQUESTED BY:	City of Flagstaff
DATE SAMPLED:	_____	SAMPLED BY:	CWS
DATE OBTAINED:	_____	SUBMITTED BY:	CWS
DATE MOLDED:	_____	REVIEWED BY:	CWS

SPEEDIE AND ASSOCIATES

Geotechnical ▪ Environmental ▪ Materials Engineers
4025 E. HUNTINGTON DR., STE. 140, FLAGSTAFF, AZ 86004 ■ O: 928-526-6681 F: 928-526-6685

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/24/2012
REMARKS:	

SAMPLE NUMBER:	KT736	KT737	KT738	KT739
CORE LOCATION:	B-905, 38'	B-905, 48'	B-905, 60'	B-906, 27'
DATE TESTED:	12/24/2012	12/24/2012	12/24/2012	12/24/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.99	4.02	4.00	4.12
CAPPED LENGTH (in.)	4.18	4.19	4.19	4.33
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	9:50	9:51	9:54	9:56
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	12,360	13,050	14,790	51,200
TYPE OF FRACTURE	4	4	4	1
COMPRESSIVE STRENGTH (psi)	4,478	4,728	5,359	18,551
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	4,478	4,728	5,359	18,551
SPECIFIC GRAVITY OF SAMPLE	2.914	2.902	2.895	2.829
UNIT WEIGHT (pcf)	181.8	181.1	180.6	176.5

DATE REQUESTED:	12/17/2012	REQUESTED BY:	City of Flagstaff
DATE SAMPLED:	_____	SAMPLED BY:	CWS
DATE OBTAINED:	_____	SUBMITTED BY:	CWS
DATE MOLDED:	_____	REVIEWED BY:	CWS

SPEEDIE AND ASSOCIATES

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4025 E. HUNTINGTON DR., STE. 140, FLAGSTAFF, AZ 86004 ■ O: 928-526-6681 F: 928-526-6685

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/24/2012-12/26/2012
REMARKS:	

SAMPLE NUMBER:	KT740	KT741	KT742	KT743
CORE LOCATION:	B-906, 38'	B-906, 49'	B-907, 27'	B-907, 41'
DATE TESTED:	12/24/2012	12/24/2012	12/24/2012	12/26/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.91	3.96	3.99	3.99
CAPPED LENGTH (in.)	4.05	4.10	4.15	4.18
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	9:58	10:01	10:03	12:50
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	66,550	75,080	83,110	56,050
TYPE OF FRACTURE	4	3	1	1
COMPRESSIVE STRENGTH (psi)	24,112	27,203	30,112	20,308
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	24,112	27,203	30,112	20,308
SPECIFIC GRAVITY OF SAMPLE	2.798	2.844	2.837	2.831
UNIT WEIGHT (pcf)	174.6	177.5	177.0	176.7

DATE REQUESTED: 12/17/2012	REQUESTED BY: City of Flagstaff
DATE SAMPLED: _____	SAMPLED BY: CWS
DATE OBTAINED: _____	SUBMITTED BY: CWS
DATE MOLDED: _____	REVIEWED BY: CWS

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UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit LOCATION: Flagstaff CLIENT: City of Flagstaff	PROJECT NUMBER: 121372SF LAB NUMBER: Various SOURCE:
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TYPE OF SAMPLE: Rock Core NO. OF SAMPLES: 4 SAMPLE LOCATION: REMARKS:	DATE SAMPLED: Nov-2012 DATE SUBMITTED: 12/17/2012 DATE TESTED: 12/26/2012
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SAMPLE NUMBER:	KT744	KT745	KT476	KT747
CORE LOCATION:	B-907, 51'	B-908, 25'	B908, 42'	B-908, 50'
DATE TESTED:	12/26/2012	12/26/2012	12/26/2012	12/26/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.98	4.00	4.02	3.92
CAPPED LENGTH (in.)	4.11	4.17	4.26	4.08
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	12:52	12:54	10:56	10:58
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	36,230	27,340	46,970	56,680
TYPE OF FRACTURE	4	3	4	4
COMPRESSIVE STRENGTH (psi)	13,127	9,906	17,018	20,536
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	13,127	9,906	17,018	20,536
SPECIFIC GRAVITY OF SAMPLE	2.825	2.87	2.987	2.888
UNIT WEIGHT (pcf)	176.3	179.1	186.4	180.2

DATE REQUESTED:	12/17/2012	REQUESTED BY:	City of Flagstaff
DATE SAMPLED:		SAMPLED BY:	CWS
DATE OBTAINED:		SUBMITTED BY:	CWS
DATE MOLDED:		REVIEWED BY:	CWS

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UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/26/2012
REMARKS:	

SAMPLE NUMBER:	KT748	KT749	KT750	KT751
CORE LOCATION:	B-909, 33'	B-909, 46'	B-909, 54'	B-910, 39'
DATE TESTED:	12/26/2012	12/26/2012	12/26/2012	12/26/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.90	3.89	4.03	3.96
CAPPED LENGTH (in.)	4.09	4.04	4.20	4.11
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	13:00	13:02	13:04	13:06
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	38,930	73,160	69,680	72,070
TYPE OF FRACTURE	4	4	4	4
COMPRESSIVE STRENGTH (psi)	14,105	26,507	25,246	26,112
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	14,105	26,507	25,246	26,112
SPECIFIC GRAVITY OF SAMPLE	2.715	2.926	2.89	2.826
UNIT WEIGHT (pcf)	169.4	182.6	180.3	176.3

DATE REQUESTED: 12/17/2012	REQUESTED BY: City of Flagstaff
DATE SAMPLED: _____	SAMPLED BY: CWS
DATE OBTAINED: _____	SUBMITTED BY: CWS
DATE MOLDED: _____	REVIEWED BY: CWS

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4025 E. HUNTINGTON DR., STE. 140, FLAGSTAFF, AZ 86004 ■ O: 928-526-6681 F: 928-526-6685

UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/26/2012
REMARKS:	

SAMPLE NUMBER:	KT752	KT753	KT754	KT755
CORE LOCATION:	B-910, 47'	B-910, 53'	B-911, 32'	B-911, 42'
DATE TESTED:	12/26/2012	12/26/2012	12/26/2012	12/26/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.88	3.81	4.03	3.96
CAPPED LENGTH (in.)	4.13	4.02	4.20	4.11
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	13:09	13:11	13:13	13:15
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	58,450	56,260	65,520	62,240
TYPE OF FRACTURE	4	4	4	4
COMPRESSIVE STRENGTH (psi)	21,178	20,384	23,739	22,551
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	21,178	20,384	23,739	22,551
SPECIFIC GRAVITY OF SAMPLE	2.863	2.822	2.86	2.779
UNIT WEIGHT (pcf)	178.7	176.1	178.5	173.4

DATE REQUESTED: 12/17/2012	REQUESTED BY: City of Flagstaff
DATE SAMPLED: _____	SAMPLED BY: CWS
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UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/26/2012
REMARKS:	

SAMPLE NUMBER:	KT756	KT757	KT758	KT759
CORE LOCATION:	B-911, 48'	B-912, 35'	B-912, 40'	B-912, 51'
DATE TESTED:	12/26/2012	12/26/2012	12/26/2012	12/26/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	4.02	3.99	3.90	3.94
CAPPED LENGTH (in.)	4.16	4.05	4.20	4.09
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	13:18	13:20	13:22	13:25
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	45,480	36,320	49,280	35,480
TYPE OF FRACTURE	3	4	1	4
COMPRESSIVE STRENGTH (psi)	16,478	13,159	17,855	12,855
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	16,478	13,159	17,855	12,855
SPECIFIC GRAVITY OF SAMPLE	2.86	2.953	2.856	2.806
UNIT WEIGHT (pcf)	178.5	184.3	178.2	175.1

DATE REQUESTED: 12/17/2012	REQUESTED BY: City of Flagstaff
DATE SAMPLED: _____	SAMPLED BY: CWS
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DATE MOLDED: _____	REVIEWED BY: CWS

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UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/26/2012
REMARKS:	

SAMPLE NUMBER:	KT760	KT761	KT762	KT763
CORE LOCATION:	B-913, 35'	B-913, 44'	B-913, 53'	B-914, 20'
DATE TESTED:	12/26/2012	12/26/2012	12/26/2012	12/26/2012
SAMPLE DIAMETER (in.)	1.87	1.87	1.87	1.87
SAMPLE LENGTH (in.)	3.93	3.94	3.94	3.95
CAPPED LENGTH (in.)	4.10	4.12	4.08	4.10
SPECIMEN AREA (sq.in.)	2.76	2.76	2.76	2.76
TIME OF TEST	13:27	13:30	13:32	13:34
LAB TECH ID	CPJ	CPJ	CPJ	CPJ
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	36,870	31,680	54,790	28,790
TYPE OF FRACTURE	4	4	4	4
COMPRESSIVE STRENGTH (psi)	13,359	11,478	19,851	10,431
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	13,359	11,478	19,851	10,431
SPECIFIC GRAVITY OF SAMPLE	2.875	2.845	2.866	2.821
UNIT WEIGHT (pcf)	179.4	177.5	178.8	176.0

DATE REQUESTED: 12/17/2012	REQUESTED BY: City of Flagstaff
DATE SAMPLED: _____	SAMPLED BY: CWS
DATE OBTAINED: _____	SUBMITTED BY: CWS
DATE MOLDED: _____	REVIEWED BY: CWS

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UNCONFINED COMPRESSIVE STRENGTH OF INTACT ROCK CORE SPECIMENS (ASTM D2938)

PROJECT: Cinder Lake Landfill - S. Borrow Pit	PROJECT NUMBER: 121372SF
LOCATION: Flagstaff	LAB NUMBER: Various
CLIENT: City of Flagstaff	SOURCE:

TYPE OF SAMPLE: Rock Core	DATE SAMPLED: Nov-2012
NO. OF SAMPLES: 4	DATE SUBMITTED: 12/17/2012
SAMPLE LOCATION:	DATE TESTED: 12/26/2012
REMARKS:	

SAMPLE NUMBER:	KT764	KT765		
CORE LOCATION:	B-914, 28.5'	B-914, 40'		
DATE TESTED:	12/24/2012	12/24/2012		
SAMPLE DIAMETER (in.)	1.87	1.87		
SAMPLE LENGTH (in.)	3.96	4.01		
CAPPED LENGTH (in.)	4.11	4.17		
SPECIMEN AREA (sq.in.)	2.76	2.76		
TIME OF TEST	1:36	1:38		
LAB TECH ID	CPJ	CPJ		
MOISTURE CONDITION	Dry	Dry	Dry	Dry
ORIENTATION OF CORE TO SOURCE	Perpendicular	Perpendicular	Perpendicular	Perpendicular
TOTAL LOAD (lb.)	36,460	58,830		
TYPE OF FRACTURE	4	4		
COMPRESSIVE STRENGTH (psi)	13,210	21,315		
LENGTH TO DIAMETER CORRECTION	1.00	1.00	1.00	1.00
CORRECTED COMPRESSIVE STRENGTH (psi)	13,210	21,315	#VALUE!	#VALUE!
SPECIFIC GRAVITY OF SAMPLE	2.811	2.813		
UNIT WEIGHT (pcf)	175.4	175.5	0.0	0.0

DATE REQUESTED: 12/17/2012	REQUESTED BY: City of Flagstaff
DATE SAMPLED: _____	SAMPLED BY: CWS
DATE OBTAINED: _____	SUBMITTED BY: CWS
DATE MOLDED: _____	REVIEWED BY: CWS

**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-900**

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-901**

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-902**

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-903**

11.27.2012



Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-904

11.27.2012



Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-905

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-906**

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-907**

11.27.2012





42.1

11

51.0

51.0

54.0

THIS SIDE

**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-908**

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-909**

11.27.2012



Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-910

11.27.2012



Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-911

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-912**

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-913**

11.27.2012



**Cinder Lake Landfill
South Borrow Pit
Speedie and Associates
Project No. 121372SF
Boring B-914**

11.27.2012

