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CORRECTIVE ACTION AND STORM WATER CONTROL PLAN VOLUME 1 FINAL COVER CORRECTIVE MEASURES WORKPLAN

SUNRISE MOUNTAIN LANDFILL CLARK COUNTY, NEVADA TASK 4.1 REVISION 3, JULY 2011

Prepared for:



Prepared by:



July 1, 2011 093-9743611

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ACRONYMS AND ABBREVIATIONS

Apex Republic Services Apex Regional Landfill

ASTM ASTM International

CQAP Construction Quality Assurance Plan

CQC Contractor Quality Control

EPA United States Environmental Protection Agency FCCMW Final Cover Corrective Measures Workplan

QA Quality Assurance

RSSN Republic Dumpco, Inc. and Republic Silver State Disposal, Inc., d/b/a - Republic

Services of Southern Nevada

Site Sunrise Mountain Landfill

SOW Appendix A, "Scope of Work," to the Consent Decree and Settlement Agreement,

United States v. Republic Dumpco, Inc., Civ Action No. 2:08-CV-01024-PMP-PAC

(D. Nev. entered September 26, 2008).

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to present this Final Cover Corrective Measures Workplan (FCCMW) for the Sunrise Mountain Landfill ("Site") as stipulated in Appendix A, "Scope of Work," (SOW) to the Consent Decree and Settlement Agreement, <u>United States v. Republic Dumpco, Inc.</u>, Civ Action No. 2:08-CV-01024-PMP-PAC (D. Nev. entered September 26, 2008). Republic Dumpco, Inc. and Republic Silver State Disposal, Inc., d/b/a - Republic Services of Southern Nevada (collectively "RSSN"), with its consultants, has prepared this FCCMW.

This FCCMW includes work required by Tasks 4.1.1 through 4.1.10 of the SOW. This FCCMW includes design criteria and is being submitted with plans and specifications that will be used during the final cover construction process.

This FCCMW also includes a discussion of the data and results of the compaction test pad that was used to develop the performance specification for the in-place compaction for the slope greater than 10 percent erosion layer material as required in Task 4.1.6.1. A minimum acceptable operating procedure has been developed for compacting the erosion layer material and is included in the construction specifications.

1.2 Site Location

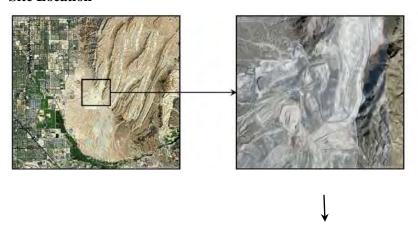
The Site is located approximately 3 miles east of Las Vegas, in Clark County, Nevada on the eastern edge of Las Vegas Valley, immediately southeast of Frenchman Mountain (Figure 1, "Site Location"). The Site includes the closed Sunrise Mountain Landfill, which lies on a 720-acre parcel of land that is leased to Clark County by the Bureau of Land Management; and three adjacent areas known as the Northeast Canyon Area (an 80-acre parcel), the Eastern Perimeter Area (a 240-acre parcel), and the Western Burn Pit Area (a 20-acre parcel). The uppermost portion of the landfill area is located within the canyon directly east of Frenchman Mountain. However, the majority of the landfill is located on a large alluvial fan that originates at the mouth of the canyon and spreads out into the adjacent valley. Elevation on the Site ranges from 1,900 to 2,275 feet above mean sea level.

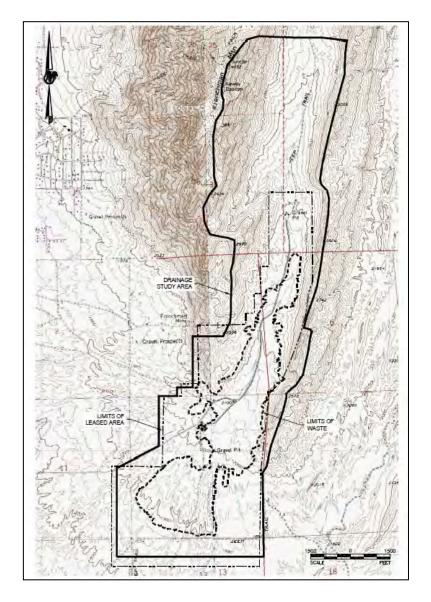
1.3 Task 4.1.1 – Final Cover Design Criteria

The final cover has been designed as a non-vegetated soil cover consisting of a soil barrier layer and an armored surface element (erosion layer) to enhance evapotranspiration and minimize erosion. The final cover will be constructed with a total cover thickness of at least 3.5 feet, comprised of a soil barrier layer and an erosion layer meeting the requirements specified in Tasks 4.1.3 and 4.1.4 of the SOW. The 2.5 feet thick soil barrier layer requirement is for total depth above waste, and the existing cover will be used to meet all or part of this 2.5 feet requirement. On-site borrow sources will be used to generate construction materials used in the cover layers.

The design criteria are generally summarized in Tables 5.1 and 5.2 and Task 4.1 of the SOW. Tables 5.1 and 5.2 are included in Appendix A, "Scope of Work Tables 5.1 and 5.2." Design criteria were compared to the Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual (the Manual) minimum criteria (1999). Surface water control features were designed in accordance with the Manual if those design standards were more stringent.

Figure 1 **Site Location**





2.0 TASK 4.1.2 – FINAL COVER DESIGN REQUIREMENTS

The final cover design summarized in the following sections is presented in detail in the Construction Drawings and Specifications submitted as separate documents. References to both the Construction Drawings and Specifications are made throughout the following sections.

2.1 Task 4.1.3 – Soil Barrier Layer

2.1.1 Grading of Existing Barrier Layer Surface

2.1.1.1 Existing Berms, Roads, and Drainage Channels

Existing berms, roads, and drainage ditches will be graded according to the requirements of Part 3.04, Section 02220 of the Construction Specifications to provide a smooth surface prior to placement of barrier layer soils. The filling of existing drainage channels, where necessary, will be treated in the same manner as other areas where supplemental soil barrier layer soils are placed. Placement will meet the requirements of Part 2.02 (A-G) and Part 3.03 (A), Section 02224 of the Construction Specifications. Existing landfill conditions are shown on Sheet A-1, "Existing Conditions and Site Plan," of the Construction Drawings.

2.1.1.2 Task 4.1.5 – Existing Cracks

Prior to placement of soil barrier or erosion layer soils, the existing landfill surface will be inspected for significant cracks. If observed, significant cracks will be repaired by over excavating the cover soil until the crack is removed. The excavations will be filled in 6 inch lifts with soil meeting the specifications of Section 02224 of the Construction Specifications.

2.1.1.3 *Task* 4.1.8.1 – *Landfill Gas System*

The piping for the landfill gas collection and control system will be buried in the soil barrier layer prior to placement of the erosion layer. The piping will be buried in accordance with the requirements of Section 02233 of the Construction Specifications. The gas lines will be marked with buried marker tape along the length of the pipe and vertical surface markers spaced at 100 feet on centers for the duration of construction activities associated with final cover material placement. The

landfill gas system is shown on Sheet LFG-1, "Proposed LFG Collection System Modification," of the Construction Drawings.

2.1.2 Minimum Thickness

The Final Cover is designed with a soil barrier layer, which is a minimum of 2.5 feet thick, above all waste. Cover soil thickness measurements documented in the "Shallow Boring and Geotechnical Sampling Report" (SCS, 2001) were used to determine where the existing cover is less than 2.5 feet thick. Supplemental barrier layer soils will be placed over existing cover soils so that the total combined thickness is a minimum of 2.5 feet in these areas. Areas that need additional soil barrier layer soils are shown on Sheet-SB-1, "Soil Barrier Layer Grading Overall Site Plan," of the Construction Drawings. Additional details of the grading plan can be seen on the area enlargements included as Sheets SB-2 through SB-7 of the Construction Drawings.

2.1.3 Soil Properties

Supplemental soil barrier layer material characteristics will meet the requirements of Part 2.02 (A- F), Section 02224 of the Construction Specifications.

The existing in-place soil barrier soils will be considered an acceptable final soil barrier provided that the soils meet the requirements of Part 2.02 (G), Section 02224 of the Construction Specifications.

2.2 Task 4.1.4 – Erosion Layer Thicknesses and Soil Properties

The method used to determine the proposed erosion layer thicknesses and gradations is set forth in Task 4.1.4 of the SOW. As stated in the SOW, the method is based on modifications to the method described by Steve Abt and Terry Johnson in "Riprap Design for Overtopping Flow" (American Society of Civil Engineers, 1991). A 200-year event runoff rate of 245 millimeters per hour is prescribed for the cover design. The modified gravel-soil erosion layer calculation method was prepared specifically for this project by Cliff Anderson of Anderson-Hydro, a consultant to the EPA. This calculation method is used to devise a single gravel-soil erosion layer thickness instead of a riprap layer underlain by a granular filter layer.

Based on the method set forth in Task 4.1.4.1 of the SOW, slopes greater than or equal to 10 percent will have a minimum erosion layer thickness of 14 inches. Based on the method set forth in Task

4.1.4.2 of the SOW, the areas with slopes less than 10 percent will have a minimum erosion layer thickness of 13 inches.

2.2.1 Task 4.1.4.1 – Minimum Thicknesses and Soil Properties for Slopes Greater than or Equal to 10 Percent

For areas with slopes greater than or equal to 10 percent, the erosion layer has been designed in accordance with the layer thicknesses shown in Attachment 7 of the SOW. Attachment 7 is included as Appendix B, "Scope of Work Attachment 7." A 14-inch erosion layer will be placed on slopes greater than or equal to 10 percent. The erosion layer thickness is based on the slope versus drainage length provided in Attachment 7g. The erosion layer material will be generated on site to the specifications included in Part 2.02 (F), Section 02222 of the Construction Specifications.

2.2.2 Task 4.1.4.2 – Minimum Thicknesses and Soil Properties for Slopes Less than 10 Percent

For areas with slopes less than 10 percent, the erosion layer has been designed in accordance with the layer thicknesses shown on Golder Table 3 and 4 included in Appendix B. A 13-inch erosion layer will be placed on slopes less than 10 percent. The proposed erosion layer thickness is based on the slope versus drainage length provided in Golder Table 3. The erosion layer material will be generated on site to the specifications included in Part 2.02 (G), Section 02222 of the Construction Specifications.

2.3 Task 4.1.4.4 – Soil Sampling and Analysis

2.3.1 Task 4.1.4.4.1 – Borrow Study

A borrow study was conducted to determine if on-site soils are suitable for use as materials for the soil barrier layer. The borrow study methods and results, and resulting volume calculations are included in Appendix C, "Borrow Study Report." Proposed borrow area soils were evaluated using test method ASTM International (ASTM) Standard D422 to determine the particle size distributions; the Atterberg Limits test, ASTM Standard D4318 to determine the plasticity indexes and liquid limits; and the Standard Test Method for Dispersive Characteristics of Clay Soil by Double Hydrometer, ASTM Standard D4221-99 (2005) to determine the dispersive characteristics of the clay within the soils.

Geotechnical samples were collected from excavated test pit material from three on-site borrow areas and one imported material stockpile. The three natural locations are shown on Figures 1 and 2 within Appendix C. The Terrace Borrow Source and Colluvium Borrow Source are located in and along the north/northeastern area of the Site and borrow materials are designated for dam construction. The third area, the T-Wash Borrow Source, is located in the southern portion of the property and will be used to supply barrier soil material. The imported material consists of approximately 275,000 cubic yards of soils that the landfill accepted as clean fill from a housing development construction project in North Las Vegas. This material, staged adjacent to the site trailer, is known as the Beazer Soils.

Based on the results of the borrow study, approximately 350,000 cubic yards of material are available from the Terrace Borrow Source and Colluvium Borrow Source for construction of the detention dam and approximately 770,000 cubic yards of material are available from the T-Wash Borrow Source for construction of the soil barrier layer. The Beazer Soils may be incorporated into the soil barrier layer material as appropriate to adjust the material characteristics.

2.3.2 Task 4.1.4.4 – Soil Sampling and Analysis

Compliance with plans and specifications will be determined through the use of the Construction Quality Assurance Plan (CQAP) which was submitted as required by Task 3.3 of the SOW. The CQAP presents the measures to be taken to determine compliance with the construction plans and specifications through tests and systems of inspection during construction of the final cover and storm water controls. Material testing and characteristics requirements are included in the CQAP.

As required in the SOW, RSSN will retain a third party to monitor construction and to serve as a Quality Assurance (QA) Consultant. The QA Consultant will work as an independent party to ensure project conformance by the Contractor to the Contractor Quality Control (CQC) standards established in the CQAP. Following the Contractor's acceptable completion of work, the QA Consultant will certify that the installation of the final cover system and storm water features were constructed in accordance with the approved construction plans and specifications.

2.4 Task 4.1.7 – Top Deck Surface

2.4.1 Task 4.1.7.1 – Grades

The proposed design includes regrading of the surface of the Top Deck area to a minimum 3 percent slope consistent with Attachment 6 of the SOW (Appendix B). Proposed final Top Deck grades are shown on Sheet A-2, "Overall Channel Layout," of the Constructions Drawings.

2.4.2 Task 4.1.7.2 – Waste

Landfill waste material, if encountered during construction, will be removed from the footprint of the detention dam in the Northeast Canyon and from footprints of the channels, and will be placed, in accordance with Task 4.1.7.2 of the SOW (Appendix B), on the Top Deck. The relocated waste will be covered by the required 2.5-foot thick soil barrier layer and the 13-inch erosion layer. Standard landfill practices will be followed during the excavation, transportation, placement, and covering of the relocated waste. Daily cover will be used in areas of exposed waste during the relocation operations. Relocation operations will be conducted in accordance with Section 02228 of the Construction Specifications.

2.5 Task 4.1.6 – Final Cover Construction and Compaction Methods

2.5.1 Soil Barrier Layer

Soil barrier layer soils will be placed and compacted in accordance with Part 3.03, Section 02224 of the Construction Specifications. This compaction requirement applies to all new soil barrier layer soils and any replacement of excavated existing cover soils.

2.5.2 Erosion Layer

Erosion layer soils will be placed and compacted in accordance with Part 3.04, Section 02224 of the Construction Specifications. There is no ASTM standard for in-place compaction testing for large diameter crushed aggregate; therefore, a site-specific performance specification was developed for the soil erosion layer on slopes greater than or equal to 10 percent. RSSN and their consultants constructed a test pad to develop the erosion layer compaction performance specification. The test pad methods and results, and the proposed performance specification are summarized in the letter

report included in Appendix D, "In-Place Compaction Testing for Large Diameter Crushed Aggregate."

To adequately develop the performance specification, a test pad was constructed on a slope of approximately 30 percent (as determined from a site topographic map) at the Republic Services Apex Regional Landfill (Apex), located in Las Vegas, Nevada. The test pad was constructed at Apex due to its similar geographical and climate disposition and soil characteristics. In addition, material and equipment to build the pad was readily available, and there was a sufficient area with a slope greater than 10 percent on which to construct it.

The test pad was constructed from material that meets the gradation requirements set forth in Attachment 7a of the SOW (Appendix B). Attachment 7a was chosen as the governing gradation for this test pad because it represented the material needed to construct an 18-inch-thick erosion layer on a slope greater than 10 percent (worst case scenario). Material meeting the gradation was taken from a stockpile of crushed aggregate resulting from the excavation activities associated with active cell construction at Apex. In order to confirm that the material met the gradation requirements of Attachment 7a, a bulk sample of the material (approximately 830 pounds) was taken and analyzed in accordance with ASTM D5519, Test Procedure A.

Based on the compaction test results, the 14-inch thick erosion layer material will be placed on slopes of greater than or equal to 10 percent and will be compacted in accordance with Part 3.04 (A,B,C,D and E), Section 02224 of the Construction Specifications.

Thirteen-inch thick erosion layer material will be placed on slopes less than 10 percent and will be compacted in accordance with the requirements of Part 3.04 (A,B,C,D and F), Section 02224 of the Construction Specifications.

2.6 Task 4.1.8 – Requirements Specific to All Areas

Design requirements and final design features associated with the surface water control features, perimeter drainage berms, diversion berms, pipe and channel inlet structures, and down drains are included in the companion *Volume 4*, *Task 4.4—Storm Water Control Workplan / Technical Drainage Study*, and in the Construction Drawings and Specifications.

2.7 Task 4.1.9 – Requirements Specific to Settling Basins, Road Surfaces, and Black Lagoons

Design requirements and final design features associated with the settling basins, road surfaces, and the black lagoons are included in the companion *Volume 4, Task 4.4—Storm Water Control Workplan / Technical Drainage Study*, and in the Construction Drawings and Specifications.

2.8 Task 4.1.8.7 – Construction Drawings and Specifications

Construction drawings, including grading plans that illustrate the layout and details of all cover materials and surface water control features to be placed at the Site are included in the Construction Drawings and Specifications being submitted under separate cover. The design drawing package provides plan view drawings of the surface water conveyance structures, erosion layer construction, modified surfaces, modified side slope areas, and the Northeast Canyon Area with landfill waste removal areas. The construction drawings also include details of the various cover design features including the soil barrier layer and soil erosion layer components; surface water control features including diversion berms, perimeter channels, perimeter drainage conveyances, inlet structures, terrace drains, hardened surfaces, and down drains; and landfill gas collection and control system pipe alignments. Site areas with slopes less than 10 percent, existing surface grades, and proposed surface grades are described by 1 foot contour interval mapping. Site areas with slopes equal to or greater than 10 percent are described by a 5 foot (maximum) contour interval. Final plans for the surface control features are of sufficient detail to allow their construction by an independent construction company. The design computations for storm water conveyances include the area and topography of the contributing watershed, land surface features, and methodology for determining precipitation losses and runoff rates and volumes.

2.9 Implementation

Following EPA approval of this FCCMW, the Construction Drawings and Specifications, and the companion *Volume 4, Task 4.4—Storm Water Control Workplan / Technical Drainage Study*, this FCCMW will be implemented in accordance with the approved Overall Project Schedule.

3.0 CERTIFICATION

I certify under penalty of law that I have examined and am familiar with the information submitted in this document and all attachments and that this document and its attachments were prepared either by me personally or under my direction or supervision in a manner designed to ensure that qualified and knowledgeable personnel properly gather and present the information contained therein. I further certify, based on my personal knowledge or on my inquiry of those individuals immediately responsible for obtaining the information, that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowingly and willfully submitting a materially false statement.

RSSN Representative	Date
Title	

4.0 REFERENCES

- American Society of Civil Engineers, 1991, "Riprap Design for Overtopping Flow," *Journal of Hydraulic Engineering*, Vol. 117, No. 8, pp. 959-972, August.
- ASTM International, C127 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate, formerly American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- ASTM International, C535 or C131 Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine, formerly American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- ASTM International, D422-63(2002) Standard Test Method for Particle-Size Analysis of Soils, formerly American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- ASTM International, D4221-99 (2005) Standard Test Method for Dispersive Characters of Clay Soil by Double Hydrometer, formerly American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- ASTM International, D4318-00 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, formerly American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- ASTM International, D5519 Standard Test Methods for Particle Size Analysis of Natural and Man-Made Riprap Materials, formerly American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- ASTM International, D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort, formerly American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- ASTM International, D6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis, formerly American Society for Testing and Materials, West Conshohocken, Pennsylvania.
- Clark County Regional Flood Control District, 1999, Clark County Regional Flood Control District, Hydrologic Criteria and Drainage Design Manual, Las Vegas, Nevada, August 12.
- SCS Engineers, 2001, *Shallow Boring and Geotechnical Sampling Report*, prepared on behalf of Republic DUMPCo, Inc., November 13.

APPENDIX A

SCOPE OF WORK TABLES 5.1 AND 5.2

Table 5.1 Final Cover - Design Criteria

Design Requirements	Design Specifications
Cover Repair Methods:	
- Fill local depressions	Use same soil and construction specifications as for barrier layer soil.
- Repair significant cracks in existing cover soil prior to placement of erosion layer.	The excavation shall be replaced in six-inch lifts with soil meeting the specifications detailed in Tasks 4.1.3 and 4.1.6.
Cover Grades:	
- Top deck, Area D Slope	3% minimum slope
- All other areas	No required changes to existing grades
Cover Thickness: [for all areas including side slopes and Northeast Canyon]	
- Total thickness	3 feet minimum
- Soil barrier layer	2.5 feet minimum thickness
- Erosion layer - slopes less than 10%	6 inches minimum thickness (varies with slope, slope length, and soil gradation). See Attachments 7, 7d, 7e, and 7f.
- Erosion layer – slopes greater than or equal to 10%	Varies based on drainage area slope, slope length, and soil gradation applied. See Attachments 7, 7a, 7b, and 7c.
Cover Soil Properties:	
- Soil added to soil barrier layers	Supplemental soil as described in Section 4.1.3.
- Erosion layer - slopes less than 10%	Gravel-soil layer meeting gradations specified in Attachments 7d, 7e, and 7f.
- Erosion layer – slopes greater than or equal to 10%	Gravel-soil layer meeting gradations specified in Attachments 7a, 7b, and 7c.

Sunrise Mountain Landfill - Scope of Work for Consent Decree - U.S. v. Republic Dumpco Inc., et al

Cover Construction Methods: Greater Than or Equal to 10% Erosion Layer	
- Acceptable compaction range	Performance Specification - I.E number of passes with specified equipment to achieve desired compaction. A test fill/erosion layer which will be constructed to establish the ≥ 10% erosion layer compaction performance specification.
- Lift thickness	Lift thicknesses for each drainage area will match erosion layer thicknesses detailed on Attachment 7 and subsequent construction drawings.
Cover Construction Methods: Barrier Layer Soils, less than 10% Erosion Layers, and Replacement of Excavated Cover Soils	
- Acceptable compaction range	At Least 90% of Standard Proctor
- Lift thickness	Lifts up to 1 ft thick as described in Section 4.1.6.
- Moisture content	Drier than optimum moisture conditions.

Table 5.2 Final Cover Surface Water Control Features - Design Criteria

Surface Water Control Requirements	Design Specifications
Perimeter drainage diversions/berms	Locations: all top slope areas that drain to slopes greater than or equal to 10% Capacity: runoff from Design Storm Event plus freeboard
Diversion berms	Capacity: runoff from Design Storm Event plus freeboard Spacing: according to appropriate sections of Appendix A and Attachments.
Pipe and channel inlet structures	Capacity: runoff from Design Storm Event plus freeboard
Down drains	Capacity: runoff from Design Storm Event
Road surfaces used to transport flow	Minimum 3inch thick gravel surfacing. Ditches lined with riprap or paved. Capacity: runoff from Design Storm Event
Management of gas collection pipes	Cover LF gas pipe with soil that complies with specifications in this SOW
Settling basins	Capacity: - runoff from Design Storm Event

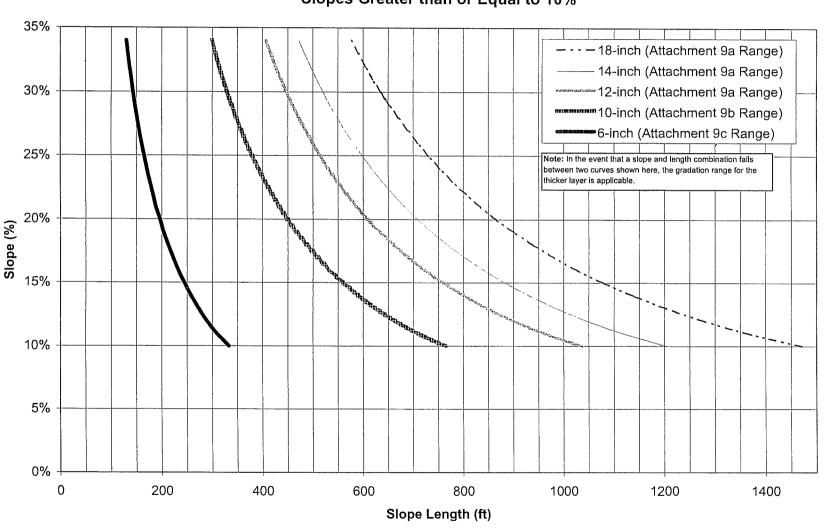
APPENDIX B

SCOPE OF WORK ATTACHMENTS 7G AND 7A

GOLDER TABLES 3 AND 4

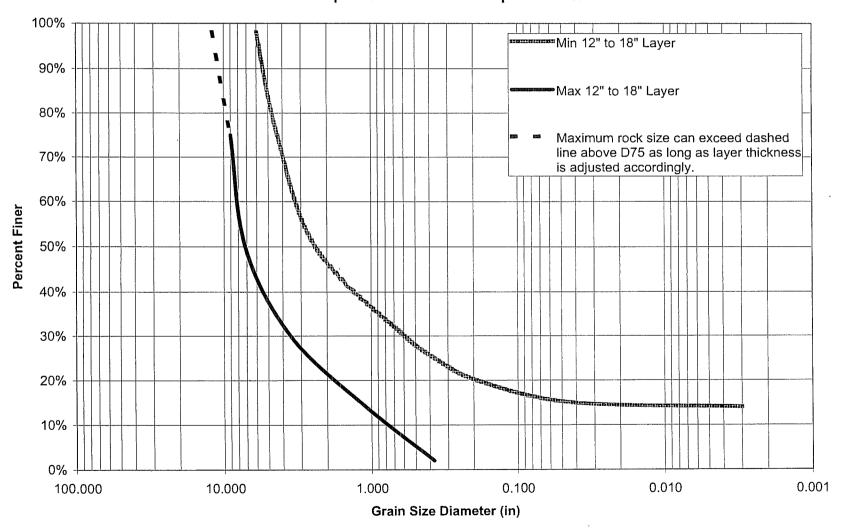
Attachment 7g

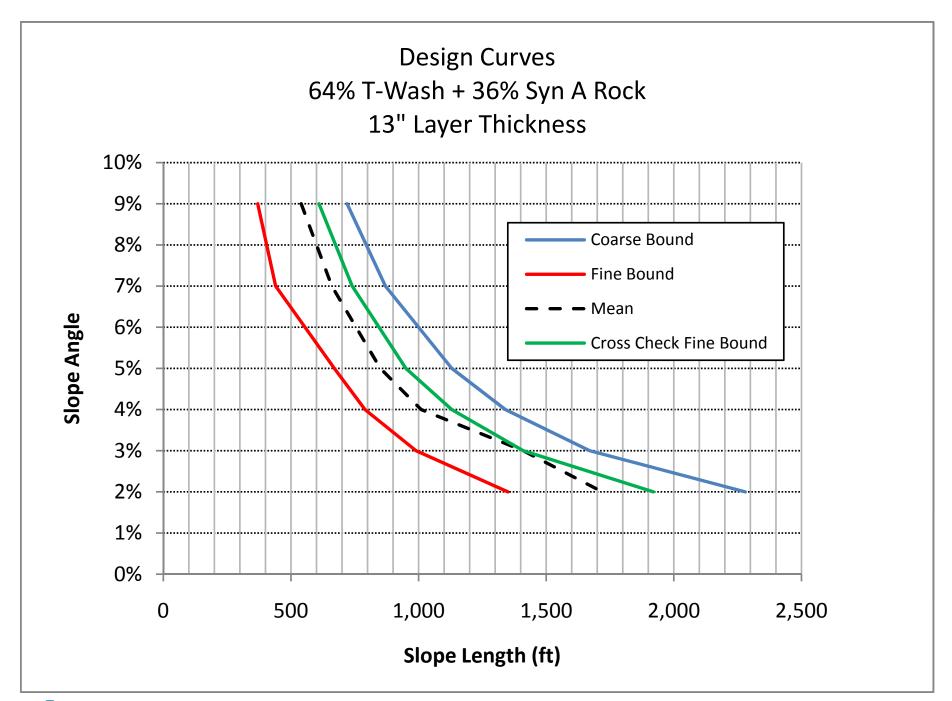
Slope and Length Combinations for Gradation Ranges for Slopes Greater than or Equal to 10%



Attachment 7a

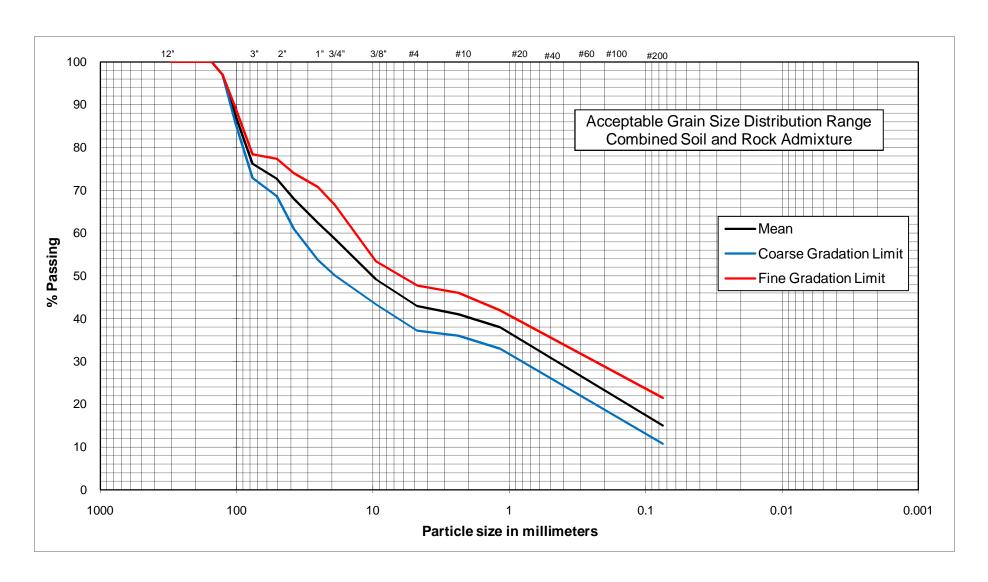
Gradation Range for 12-, 14-, and 18-inch Layer Thickness and
Slopes Greater than or Equal to 10%







January 2011 093-97436





APPENDIX C

BORROW STUDY REPORT

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BORROW STUDY REPORT Sunrise Mountain Landfill Clark County, Nevada

January 2009

Prepared for:



Republic Services of Southern Nevada 770 East Sahara Avenue Las Vegas, Nevada 89104

Submitted by:

Shaw Shaw Environmental, Inc. 13 British American Boulevard Latham, NY 12110-1405

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Appendix A Figures Appendix B Test Pit Logs Appendix C Soil Volumes Appendix D Geotechnical Laboratory Data

Acronyms and Abbreviations

bgs below ground surface
CBS Colluvium Borrow Source
cm/sec centimeters per second

CY cubic yards

GM silty gravel with sand lb/cf pound(s) per cubic feet

Shaw The Shaw Group Inc.'s Environmental & Infrastructure Group

SM silty sand

TBS Terrace Borrow Source
TWBS T-Wash Borrow Source

1.0 Introduction

The Shaw Group Inc.'s Environmental & Infrastructure Group (Shaw) collected geotechnical samples of excavated test pit material from several on-site borrow areas in support of ongoing work at Sunrise Mountain Landfill located in Las Vegas, Nevada. The purpose of the investigation was to classify and quantify existing on-site soils in three natural borrow areas and one stockpile of imported material located within the property boundary of the landfill. The three natural locations are shown in on Figures 1 and 2 within **Appendix A**. The Terrace Borrow Source (TBS) and Colluvium Borrow Source (CBS) are located in and along the north/northeastern area of the property and are designated for dam construction. The third area, the T-Wash Borrow Source (TWBS) is located in the southern portion of the property and will be used to supply barrier soil material. The imported material consists of approximately 275,000 CY of soils that the landfill accepted as clean fill from a housing development construction project in North Las Vegas. This material is located adjacent to the site trailer and is known as the Beazer Soils.

The investigation began on October 17, 2008 and was finished October 22, 2008. This investigation was preceded by a preliminary investigation of the TWBS, which occurred during spring of 2008.

During this investigation, 29 test pits were excavated to bedrock or to refusal of the construction equipment. There were a total of 13 samples taken for geotechnical analysis. Based on site and material conditions, samples were composited producing a total of five samples to be analyzed. The following information summarizes the results of the test pit investigation and soil analyses for the three areas.

2.0 Terrace Borrow Source Area

The TBS is located in the northern portion of the site and encompasses an area of approximately 8.3 acres. A site map showing the TBS area and the location of the excavated test pits is included as Figure 1 in Appendix A. Exact coordinates of the test pits are shown in Table 1 of Appendix B.

Test pits were excavated using a 330 B Caterpillar tracked excavator and each test pit was excavated to bedrock or to refusal. Field test pit logs giving a general description of the site conditions, characteristics and trench pit cross sections for all TBS trench pits are located in Appendix B. Test pit depths ranged from 5.5 to 15 feet below ground surface (bgs).

The volume of material was calculated based on the estimated area of the TBS and test pit excavation depths. Each test pit was assigned an area based on a polygon method using midpoint distances to the next test pit. The surfaces of the test pit area were assumed to be flat at both the existing ground surface and at the depth to bedrock or caliche. Each area was assumed to have straight cut walls from existing ground surface to the depth of bedrock or caliche. The total available borrow material from the TBS area is estimated to be approximately 171,700 cubic yards (CY). Volume calculations are shown in Appendix C.

Geotechnical lab data for all TBS samples are shown in Appendix D. . Samples analyzed from the TBS area included TBS-01, TBS-02, TBS-04, TBS-07, TBS-08 and TBS-11. Tests on samples included, grain size analysis/hydrometer, modified proctor, permeability, direct shear, Atterberg limits and soil classification. The soils in this area were determined to be Silty Sand (SM) to a Silty Gravel with Sand (GM) (see

Table 2-1, "TBS Geotechnical Properties"). Permeability of the soil was analyzed using the Constant Head Method (ASTM D 2434) and values ranged from 2.96 E⁻⁵ centimeters/second (cm/sec) to 5.94 E⁻³ cm/sec. See Appendix D for all other geotechnical test results.

Table 2-1
TBS Geotechnical Properties

Sample ID	Classification	Modified Proctor (Dry Density)(lb/cf)	Permeability k (cm/sec)
TBS-1 & 2	SM	113	2.96 E ⁻⁰⁵
TBS-4 & 7	GM	133	5.94 E ⁻⁰³
TBS- 8 & 11	GM	131	6.71 E ⁻⁰⁵

lb/cf denotes pound(s) per cubic feet

3.0 Colluvium Borrow Source Area

The CBS is located in the northern portion of the site and encompasses an area of approximately 7.8 acres. A site map showing the CBS area and the location of the excavated test pits is included as Figure 1 of Appendix A. Exact coordinates of the test pits are shown in Table 1 of Appendix B.

Test pits were excavated using a 330 B Caterpillar tracked excavator and each test pit was excavated to bedrock or to refusal Field test pit logs giving a general description of the site conditions, characteristics and trench pit cross sections for all TBS trench pits are located in Appendix B. Tests pit depths ranged from 9 to 18 feet bgs.

The total amount of available volume was calculated based on the method described in Section 2.0. The total available borrow material available from the CBS area is estimated to be approximately 179,500 CY. Volume calculations are shown in Appendix C.

Geotechnical lab data for all CBS samples are shown in Appendix D. Samples analyzed from the CBS area included, CBS-01, CBS-03, CBS-04, CBS-06 and CSB-08. Tests on samples included grain size analysis/hydrometer, modified proctor, permeability, direct shear, Atterberg limits and soil classification. Soils from the area were determined to be GM (see Table 3-1, "CBS Geotechnical Properties"). Permeability of the soil was analyzed using the Constant Head Method (ASTM D 2434) and values ranged from 3.80 E⁻³ cm/sec to 2.70 E⁻³ cm/sec. See Appendix D for all other geotechnical test results.

Table 3-1 CBS Geotechnical Properties

Sample ID	Classification	Modified Proctor (Dry Density)(lb/cf)	Permeability k (cm/sec)
CBS- 1, 03 & 04	GM	134	2.71 E ⁻⁰³
CBS- 06 & 08	GM	140	3.80 E ⁻⁰³

4.0 T-Wash Borrow Source Area

The TWBS is located in the southern portion of the site and encompasses an area of approximately 46 acres. A site map showing the location of the TWBS area and the location of the excavated test pits is included as Figure 2 in Appendix A. Exact coordinates of the (TW) test pits are shown in Table 1 of Appendix B.

The preliminary investigation was conducted on March 3, 2008 using a Case 550 backhoe. Eight test pits were excavated to a depth of 8 feet bgs and samples taken for gradation analysis. During the excavation, approximately 6080 CY of red bagged waste was discovered from 4 to 8 feet below ground surface. Geotechnical analyses of the eight test pits are summarized in Appendix D. In October of 2008, eight additional test pits were excavated to bedrock or refusal using a 330 B Caterpillar tracked excavator. Tests pit depths ranged from 8 to 22 feet bgs. No additional geotechnical samples were taken during this investigation. More red bag waste was located at the base of test Pit TW-1 at a depth of 12 feet. Because of the depth of waste, it was not delineated further.

Field test pit logs giving a general description of the site conditions, characteristics and trench pit cross sections for all TWBS trench pits completed in October 2008 are located in Appendix B

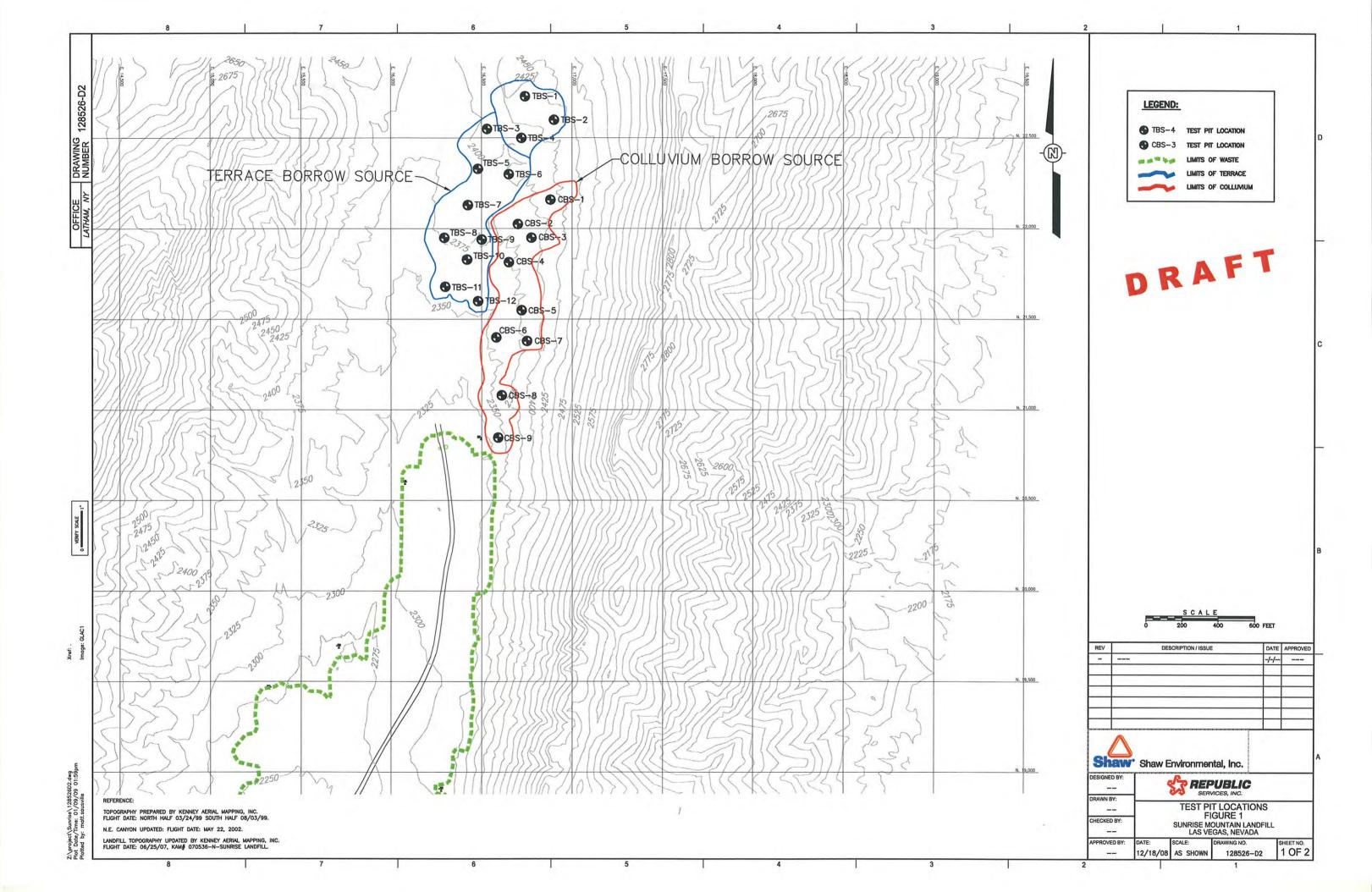
The total amount of available volume was calculated based on the method described in Section 2.0 The total available borrow material available from the TWBS area is estimated to be approximately 766,800 cubic yards (CY). Volume calculations are shown in Appendix C.

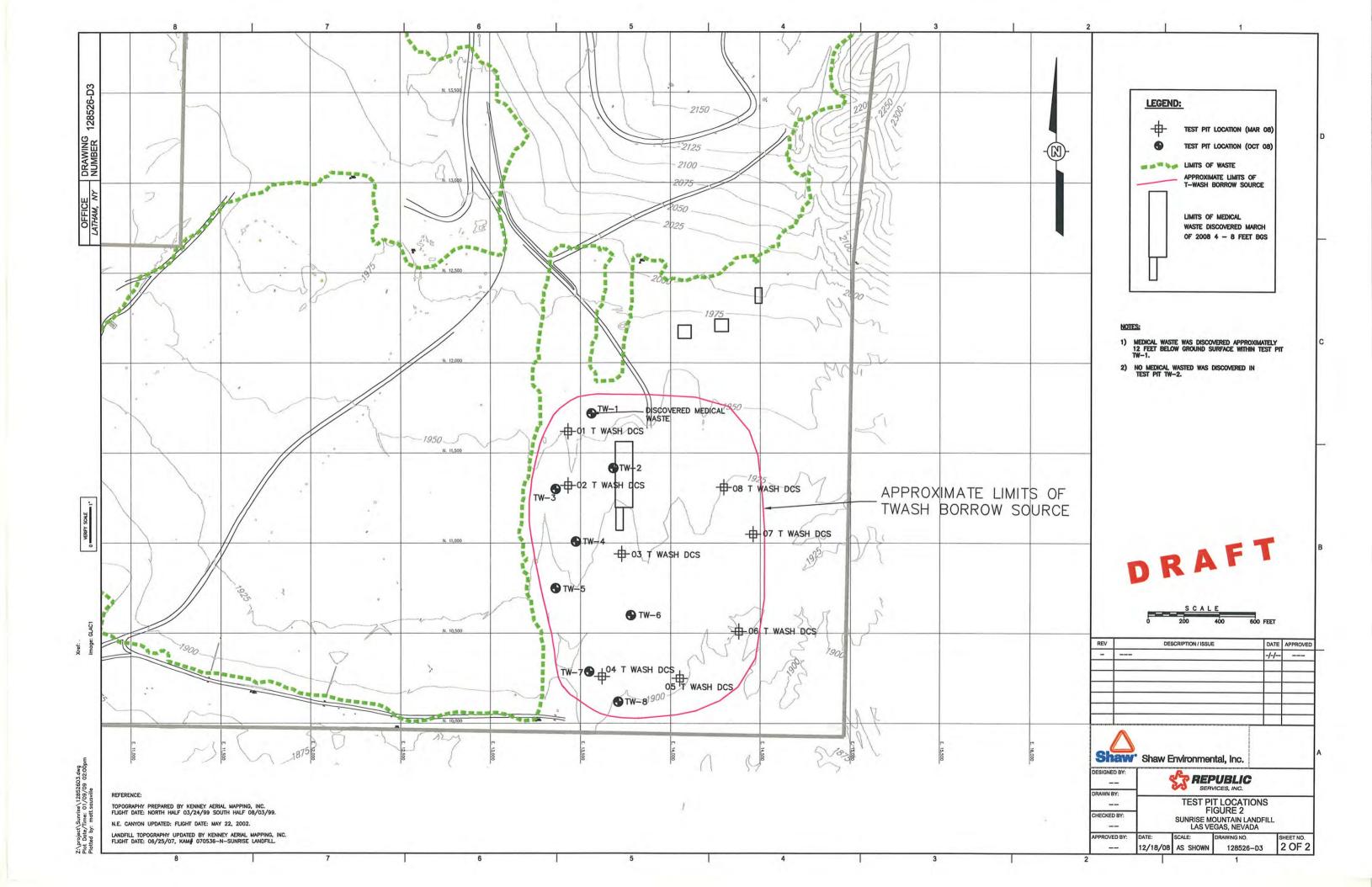
5.0 Beazer Soils

Approximately 275,000 CY of soils are stockpiled for use as soil barrier layer material during the closure activities. Three samples were taken and analyzed for grain size analysis/hydrometer and Atterberg Limits. The soils were classified as clayey gravel (GC) with sand. Geotechnical analyses of the Beazer soils are summarized in **Appendix D**.

Appendix A Figures

US EPA ARCHIVE DOCUMENT





Appendix B
Test Pit Logs

US EPA ARCHIVE DOCUMENT

		1-TEST PIT COORE	DINATES
ID	Point 1	Point 2	Comment
TEI	RRACE BORROW		
	Northing	Easting	
TBS-1	22730	16740	
TBS-2	22600	16900	
TBS-3	22550	16530	
TBS-4	22500	16720	
TBS-5	22330	16480	
TBS-6	22300	16650	
TBS-7	22130	16425	
TBS-8	21950	16295	
TBS-9	21940	16500	
TBS-10	21830	16420	
TBS-11	21680	16300	
TBS-12	21600	16480	
COL	LUVIUM BORRO		
	Northing	Easting	
CBS-1	22160	16880	
CBS-2	22025	16700	
CBS-3	21950	16775	
CBS-4	21815	16650	
CBS-5	21550	16720	
CBS-6	21400	16580	
CBS-7	21380	16750	
CBS-8	21080	16610	
CBS-9	20847	16590	
т,	WASH BORROW	SOURCE	
'-	Northing	Easting	
TW-1	11720	13560	
TW-2	11416	13682	
TW-3	11300	13360	
TW-4	11009	13473	
TW-5	10750	13360	
TW-6	10600	13780	
TW-7	10287	13548	
TW-8	10120	13710	
1 4 4 - 0	10120	13/10	

Trench N	Number	TBS-1	<u> </u>	Date of Excavation	Friday October 17th 2	2008	Ву.	MJS
General	Descripti	on:			evel with significant fines			
SCS JSCS	Colluviu	escription ım Borrow S	ource area requirements samples TI	3S-1 and TBS-2 were	combined.	Sample: Yes/No Yes	Analyses Atterberg Limits Gradation Hydromente Direct Shea Modified Procto Permeability	n D422 r D4221 r D3080 r D1557
	Cross Secti		'					
5			HOMGENEOUS SAN HAD REDDISH T	NDY GRAVEL WITH FINT (HIGH IRON CO				7 FEET TO BEDROCK
0								BEDROCK
5	۰			BEDROCK				
20								
25								ı
			ITH FINES WITH FINES					

Trench N	lumber	TBS-2	_	Date of Excavation	Friday October 17th 20	800	Ву:	<u>MJS</u>
Seneral	Descript	ion:						
	·				vel with significant fines. as the amount and size o			
SCS JSCS	Lithic E Colluvi	scription: Description um Borrow So				Sample: Yes/No Yes	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor	D422 D4221 D3080 D1557
	e to labor Cross Sect		requirements samples TI	BS-1 and TBS-2 were	combined.	l .		
;				NDY GRAVEL WITH F FINT (HIGH IRON COI				6 FEET TC BEDROCK
0 5	п			BEDROCK				BEBROOM
0	п							
25								
		Y GRAVEL W ELLY SAND V DCK						

Trench N	Number <u>TBS-3</u>	Date of Excavation	Friday October 17th 2008	Ву:	<u>MJS</u>
General		sisted of a homogeneous gravelly s a sandy gravel vs gravelly sand wa			
Stratigra SCS USCS	Eaphic Description: Lithic Description Colluvium Borrow Source area		Sample Yes/No Yes	Analyses	D422 D4221 D3080 D1557
	ue to laboratory volume requiremen Cross Section	ts samples TBS-4 and TBS-7 were	combined.		
5 10	НОМ	GENEOUS GRAVELLY SAND WIT	ΓΗ FINES		10 FEET TO BEDROCK
15		BEDROCK			
20					
25					
	SANDY GRAVEL WITH FINES GRAVELLY SAND WITH FINES BEDROCK	8			

Trench N	umber <u>TBS-4</u>	Date of Excavation	Friday October 17th 2	800	Ву:	MJS
General I	Description:					
		ed of a homogeneous gravelly s sandy gravel vs gravelly sand wa				
	between a s	salidy gravel vs gravelly salid wa	as the amount and size of	T THE TOCKS	/stories in the mate	ilai.
Stratigra	phic Description:			Sample:		
SCS	Lithic Description			Yes/No	Analyses	
USCS	Colluvium Borrow Source area			Yes	Atterberg Limits	
					Gradation Hydromenter	
					Direct Shear	
					Modified Proctor	
N . 5		. TD0 4 . ITD0 7			Permeability	D2434
	e to laboratory volume requirements ross Section	samples TBS-4 and TBS-7 were	combined.			
TIETICIT C	TOSS SECTION					
5		NEOUS GRAVELLY SAND WIT				8 FEET TO
	EXHIBI	TED HIGHER IRON (REDDISH	COLOR)			BEDROCK
10						
		555564				
15		BEDROCK				
20						
O.E.						
25						
	SANDY GRAVEL WITH FINES					
	GRAVELLY SAND WITH FINES					
	BEDROCK					

Trench Number	TBS-5	_	Date of Excavation	Friday October 17th 20	800	Ву:	<u>MJS</u>
General Descrip	tion:			vel with significant fines. s the amount and size o			
USCS Terrac	Description ce Borrow Sourd	ce area			Sample: Yes/No No	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
Trench Cross Sec	ction	SANDY G	RAVEL WITH FINES				5.5 FEET T BEDROCK
10							BEDIOCI
15			BEDROCK				
20							
25							
	Y GRAVEL WI' ELLY SAND W						

Trench N	Number	TBS-6	_	Date of Excavation	Friday October 17th 2	800	Ву:	<u>MJS</u>
General	l Descriptic	on:			vel with significant fines. as the amount and size o			
SCS USCS	Terrace	escription Borrow Sourd	ce area			Sample: Yes/No No	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
Trench () 5 10	Cross Section	on	SANDY	GRAVEL WITH FINES				15 FEET TC
20 25			Bl	EDROCK - RED				BEDROCK
		GRAVEL WI LLY SAND W CK						

Trench N	Number TBS-7	Date of Excavation	Friday October 17th 2008	By: MJS
General	Description:	Soil consisted of a non-homogeneous soil was distinguished by the rocks/stones in the material.		
SCS USCS	aphic Description: Lithic Description Terrace Borrow Soul		Sample: Yes/No Yes	Analyses Atterberg Limits D4318 Gradation D422 Hydromenter D4221 Direct Shear D3080 Modified Proctor D1557 Permeability D2434
	ue to laboratory volume Cross Section	requirements samples TBS-4 and TBS-7 were	combined.	
5		GRAVELLY SAND WITH FINES		0 - 6 FEET
		SANDY GRAVEL WITH FINES - REDDIS	H COLOR	
10				9 FEET TO BEDROCK
15		BEDROCK - RED		
20				
25				
	SANDY GRAVEL W GRAVELLY SAND V BEDROCK			

Trench Number	TBS-8	_	Date of Excavation	Monday October 20th	2008		Ву:	<u>MJS</u>
General Descriptio	n:			elly sand/sandy gravel v s gravelly sand was the				
	escription Borrow Sourc	ce area equirements samples TE	3S-8 and TBS-11 wer	e combined	Sample: Yes/No Yes	Hydron Direct Modified P	dation nenter Shear roctor	D422 D4221 D3080
Trench Cross Section		oquiremento samples 12	oo o ana 150 11 wel	e combined.				
5		GRAVELL	Y SAND WITH FINE:	S				0 - 5 FEET
10		SANDY G	RAVEL WITH FINES	3				15 FEET TO
20		BE	DROCK - RED					BEDROCK
25								
	GRAVEL WIT LLY SAND W CK							

Trench N	lumber	TBS-9	_	Date of Excavation	Monday October 20th	2008	Ву:	MJS
General	Description	on:			and with significant fines as the amount and size o			
Stratigra SCS USCS		cription: escription Borrow Soul	ce area			Sample: Yes/No No	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
Trench C	Cross Secti	on						
5			HOMGENEOUS G	GRAVELLY SAND WIT	TH FINES			
10								14 FEET TO
15								BEDROCK
20			BEDROCI	K - (VERY STIFF SOIL	-)			
25								
		GRAVEL WILLY SAND V						

Trench N	lumber	TBS-10	_	Date of Excavation	Monday October 20th	2008	Ву:	<u>MJS</u>
General	Description	on:		<u> </u>				
	•				and with significant fines s the amount and size o			
Stratigra SCS USCS		eription: escription Borrow Sour	ce area			Sample: Yes/No No	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
Trench C	Cross Section	on						
5			HOMGENEOUS (GRAVELLY SAND WIT	H FINES			
10								14 FEET TO
15								BEDROCK
20			BEDROCI	K - (VERY STIFF SOII	.)			
25								
		GRAVEL WI LLY SAND W CK						

Trench No	umber <u>TE</u>	3S-11		Date of Excavation	Monday October 20th	2008	Ву: _	MJS_
General i	Description:							
	,				vel with significant fines. s the amount and size o			
Stratigra SCS USCS	phic Description Lithic Description Terrace Borro	tion	area			Sample: Yes/No Yes	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
	e to laboratory vortes	olume requ	irements samples TE	SS-8 and TBS-11 were	e combined.			
5		ı	HOMGENEOUS REI	D SANDY GRAVEL W	/ITH FINES			10 FEET TO BEDROCK
15 20				BEDROCK				
25		•				•		
	SANDY GRAV GRAVELLY S BEDROCK							

Trench N	Number <u>TBS-12</u>	Date of Excavation	Monday October 20th 2008	By: MJS
General	Description:	Soil consisted of a non-homogeneous sandy distinguished between a sandy gravel vs gramaterial.		
Stratigra SCS USCS	aphic Description: Lithic Description Terrace Borrow Sou	rce area	Sample: Yes/No No	Analyses Atterberg Limits D4318 Gradation D422 Hydromenter D4221 Direct Shear D3080 Modified Proctor D1557 Permeability D2434
Trench C	Cross Section			
5 10		HOMGENEOUS SANDY GRAVEL WIT	TH FINES	0 - 10 FEET
		RED SANDY GRAVEL		13 FEET TO
15 20		BEDROCK		BEDROCK
25				
	SANDY GRAVEL W GRAVELLY SAND V BEDROCK			

Trench N	Number	CBS-1		Date of Excavation	Friday October 17th	2008	Ву:	MJS
General	l Descript	ion:			vel with significant fines			
SCS USCS	Colluvi	Description um Borrow So				Sample: Yes/No Yes	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
	ue to labor Cross Sect		requirements samples C	BS-1 and CBS-3/CBS	-4 were combined.			
5 10			HOMGENEOUS	SANDY GRAVEL WIT	H FINES			0 - 18 FEE ⁻
15								
20		DID N	OT HIT BEDROCK - BE	CAME EXTREMLY D	FFICULT TO DIG ON	ANGLED SI	LOPE	
25								
		Y GRAVEL W ELLY SAND V DCK						

Trench N	Number CBS-2	_	Date of Excavation	Monday October 20th	2008	Ву:	<u>MJS</u>
General	Description:			vel with significant fines. s the amount and size o			
Stratigra SCS USCS	aphic Description: Lithic Description Colluvium Borrow So	urce area			Sample: Yes/No No	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
Trench C	Cross Section						
5 10			ease in a reddish colo ntinued below 10 feet	r as the bgs)			0 - 16 FEET
15							
20	DID N	OT HIT BEDROCK - BEG	CAME EXTREMLY D	FFICULT TO DIG ON A	NGLED SI	LOPE	
25							
	SANDY GRAVEL WI GRAVELLY SAND W BEDROCK						

Trench No	umber	CBS-3	_	Date of Excavation	Monday October 20th 2	2008	Ву:	<u>MJS</u>
General I	Descripti	on:						
General I	Descripti	on.			vel with significant fines. is the amount and size of			
SCS USCS Note: 1) A	Colluviu	escription um Borrow Sol	s taken between test pits			Sample: Yes/No Yes	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
	Due to lab		e requirements samples	CBS-1 and CBS-3/C	BS-4 were combined.			
5			SANDY G	RAVEL WITH FINES				0 - 6 FEET
			RED SANDY	GRAVEL WITH FIN	ES			HIT BEDROCK
10								AT 9 FEET
15								
20				BEDROCK				
25								
		GRAVEL WIELLY SAND WOCK						

Trench Nui	mber <u>CBS-4</u>	_	Date of Excavation	Monday October 20th	2008	Ву:	MJS
General D	escription:			vel with significant fines. s the amount and size of			
SCS	<i>hic Description:</i> Lithic Description Colluvium Borrow Sou	urce area			Sample: Yes/No YES	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
		s taken between test pits e requirements samples		BS-4 were combined.			
Trench Cro	ss Section						
5		SANDY G	GRAVEL WITH FINES				0 - 10 FEET
10		RED SANDY	GRAVEL WITH FINI	ES			10 - 15 FEET
20		DID NOT HIT BEDROO	CK - STIFF SOIL DIF	FICULT TO DIG			
25	SANDY GRAVEL WIT	ΓH FINES					
	GRAVELLY SAND W BEDROCK	ITH FINES					

Trench N	Number CBS-5		Date of Excavation	Monday October 20th	2008	Ву:	<u>MJS</u>
General	Description:			and with significant fines. avelly sand was the amo			
Stratigra SCS USCS	aphic Description: Lithic Description Colluvium Borrow So	ource area			Sample: Yes/No No	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
Trench (Cross Section						
5 10		GRAVEL	LY SAND WITH FINES	5			0 - 11 FEET
15							HIT BEDROCK AT 11 FEET
20			BEDROCK				
25							
	SANDY GRAVEL W GRAVELLY SAND V BEDROCK						

Trench No	umber <u>C</u>	BS-6		Date of Excavation	Monday October 20th	า 2008	Ву	: <u>MJS</u>
General I	Description:				vel with significant fines is the amount and size			
SCS USCS	Lithic Description Colluvium Bo	otion rrow Sourc	e area uirements samples CB	S-6 and CRS-8 were	combined	Sample: Yes/No Yes	Analyses Atterberg Limit Gradatio Hydromente Direct Shea Modified Procto Permeabilit	n D422 er D4221 er D3080 er D1557
	ross Section	olume requ	illements samples CE	3-0 and CB3-6 were	combined.	1		_
5			SANDY G	RAVEL WITH FINES				0 - 15.5 FEET
15								
20			AFTER EXTENSIVE EXTREMELY SLOW REA					DID NOT HIT BEDROCK
25								
	SANDY GRA GRAVELLY S BEDROCK							

Trench N	Number	CBS-7		Date of Excavation	Tuesday October 21s	st 2008	Ву	: <u>MJS</u>
General	Description:		ished between		gravel with significant avelly sand was the amo		-	
Stratigra SCS USCS	aphic Descrip e Lithic Descr Colluvium B					Sample: Yes/No No	Analyses Atterberg Limit Gradatio Hydromente Direct Shea Modified Procto Permeabilit	n D422 er D4221 er D3080 er D1557
Trench (Cross Section							
5			SANDY (GRAVEL WITH FINES				0 - 10 FEE
10			RED RO	CK SANDY GRAVEL				HIT
15 20				BEDROCK				BEDROCK AT 13 FEE
25								
		AVEL WITH FINES SAND WITH FINE						

Trench N	lumber	CBS-8	_	Date of Excavation	Tuesday October 21st	2008	Ву:	<u>MJS</u>
General	Description	on:						
	-				vel with significant fines. s the amount and size o			
SCS USCS	Colluviu	escription m Borrow So				Sample: Yes/No Yes	Analyses Atterberg Limits Gradation Hydromenter Direct Shear Modified Proctor Permeability	D422 D4221 D3080 D1557
	e to labora ross Secti	_	equirements samples CE	SS-6 and CBS-8 were	combined.			
5 10			SANDY G	RAVEL WITH FINES				0 - 15 FEET
15 20			DIGGING BECAME	E VERY SLOW/MACH				DID NOT HI BEDROCK
25			DITTIOGETT DIGOIN	O DEEL EN HIMM TO				
		GRAVEL WI LLY SAND W						

Sunrise Mtn Landfill Colluvium Borrow Area Trench Excavation Log

Trench Nu	ımber	CBS-9	_	Date of Excavation	Tuesday October 21s	t 2008	Ву	MJS
General D	Description	:			and with significant fines s the amount and size o			
SCS USCS		cription Borrow Sou				Sample: Yes/No Yes	Analyses Atterberg Limits Gradation Hydromente Direct Shea Modified Procto	n D422 r D4221 r D3080
	oss Section		equirements sample CE	55-9 Shall not conduct	a permeability test.			
5 10 15			GRAVELL	Y SAND WITH FINES	5			0 - 16 FEET
20			DIGGING BECAME DIFFICULTY DIGGIN	E VERY SLOW/MACH IG DEEPER THAN 15				DID NOT HIT BEDROCK
25		RAVEL WIT Y SAND W						

Trench Nu	ımber <u>TW-1</u>	_	Date of Excavation	Tuesday October 22nd	d 2008	_	By: MJS
General L	Description:			vel with significant fines. as the amount and size o			
Stratigrap SCS USCS	ohic Description: Lithic Description T-Wash Borrow Sour	rce area			Sample: Yes/No NO	Analyses N	one
Trench Cr	oss Section				•		
5		SANDY GF	RAVEL WITH FINES				
10		AUT MEDIC	ALWASTE - DEPTH	APPROXIMATELY 10	15 FT BG	S	0 - 22 FEET
15							
20							
25		DIGGING BECAME DIFFICULTY DIGGIN	EVERY SLOW/MACH G DEEPER THAN 22				DID NOT HIT BEDROCK
	HIT MEDICAL WAST GRAVELLY SAND W SANDY GRAVEL WI BEDROCK	VITH FINES					

Trench Nu	mber TW-2	_	Date of Excavation	Tuesday October 22n	d 2008	_	Ву:	<u>MJS</u>
General D	Description:			vel with significant fines s the amount and size o				
Stratigrap SCS USCS	Phic Description: Lithic Description T-Wash Borrow Sou	rce area			Sample: Yes/No NO	Analyses	None	
Trench Cro	oss Section							
5 10		SAN	NDY GRAVEL WITH F	INES				0 - 13 FEET
15		DIGGING RECAME	E VERY SLOW/MACH	IINE HAD				DID NOT HIT BEDROCK
20		DIFFICULTY DIGGIN						
25								
	SANDY GRAVEL W GRAVELLY SAND V BEDROCK							

Trench Nu	ımber <u>TW-3</u>		Date of Excavation	Tuesday October 22n	d 2008		Ву:	<u>MJS</u>
General D	Description:			vel with significant fines as the amount and size o				
Stratigrap SCS USCS	Dhic Description: Lithic Description T-Wash Borrow S				Sample: Yes/No NO	Analyses	None	
Trench Cr	oss Section				•			
5 10		SA	ANDY GRAVEL WITH I	FINES				0 - 10 FEET
15			ME VERY SLOW/MACH NG DEEPER THAN 10					DID NOT HIT BEDROCK
20								
25								
	SANDY GRAVEL GRAVELLY SAN BEDROCK							

Trench Nu	ımber	TW-4	_	Date of Excavation	Tuesday October 22n	d 2008	By: MJS
General D	Description:				vel with significant fines. as the amount and size o		difference that was distinguisher/stones in the material.
Stratigrap SCS USCS	Dhic Descrip Lithic Desc T-Wash Bo	ription	rce area			Sample: Yes/No YES	Analyses Permeability D2434
Trench Cro	oss Section		SAN	NDY GRAVEL WITH F	FINES		0 - 13.5 FE
15 20				E VERY SLOW/MACH			DID NOT I BEDROC
25		Y SAND V	ITH FINES VITH FINES				

Trench Nu	umber	TW-5	_	Date of Excavation	Tuesday October 22n	d 2008	_	Ву:	<u>MJS</u>
General L	Descriptio	on:			vel with significant fines as the amount and size o				
Stratigrap SCS USCS	Lithic De	eription: escription Borrow Sou	rce area			Sample: Yes/No NO	Analyses	None	
Trench Cr	ro <u>ss Secti</u>	on				•			
5			SAN	NDY GRAVEL WITH I	FINES				0 - 12 FEET
15 20			DIGGING BECAME DIFFICULTY DIGGIN	E VERY SLOW/MACH IG DEEPER THAN 12					DID NOT HIT BEDROCK
25									
			ITH FINES VITH FINES						

Trench N	lumber	TW-6	_	Date of Excavation	Tuesday October 22r	d 2008		Ву:	MJS
General	Description	on:			vel with significant fines				
Stratigra SCS USCS		eription: escription Borrow Soul	ce area			Sample: Yes/No NO	Analyses	None	
Trench C	ross Section	on							
5 10			SAI	NDY GRAVEL WITH F	FINES				0 - 15 FEET
15									
20				E VERY SLOW/MACH					DID NOT HIT BEDROCK
25		GRAVEL WI							

Trench Nu	mber	TW-7	_	Date of Excavation	Tuesday October 22r	nd 2008		Ву:	MJS
General D	escription	:			vel with significant fines as the amount and size				
Stratigrap SCS USCS	hic Descri Lithic Desc T-Wash Bo	cription	rce area			Sample: Yes/No NO	Analyses	None	
Trench Cro	ss Section								
5			SAN	NDY GRAVEL WITH F	FINES				0 - 8 FEET
10			DIGGING BECAME DIFFICULTY DIGGIN	E VERY SLOW/MACH NG DEEPER THAN 8					DID NOT HIT BEDROCK
15									
20									
25									
	SANDY G GRAVELL BEDROCK	Y SAND W	TH FINES /ITH FINES						

Trench Nu	ımber	TW-8	_	Date of Excavation	Tuesday October 22r	nd 2008		Ву:	<u>MJS</u>
General D	Description	1:			vel with significant fines				
Stratigrap SCS USCS	Dhic Descr i Lithic Des T-Wash B		ce area			Sample: Yes/No NO	Analyses	None	
Trench Cro	o <u>ss Sectior</u>	1							
5 10			SAN	NDY GRAVEL WITH F	FINES				0 - 10 FEET
15			DIGGING BECAME DIFFICULTY DIGGIN	E VERY SLOW/MACH G DEEPER THAN 10					DID NOT HIT BEDROCK
20									
25									
			TH FINES /ITH FINES						

Appendix C Soil Volumes

StoughtonTP
Project No. 131904

Borrow Study Report
January 2009

US EPA ARCHIVE DOCUMENT

StoughtonTP
Project No. 131904

Borrow Study Report
January 2009

Republic Services Sunrise Landfill Colluvium and Terrace Borrow Source Volumes (12/19/2008)

Boring ID	Borrow Source	Area (sf)	Depth to Bedrock (ft)	Volume (CY)
TBS-1	Terrace	48299	7	12522
TBS-2	Terrace	31066	6	6904
TBS-3	Terrace	33496	10	12406
TBS-4	Terrace	40542	8	12013
TBS-5	Terrace	29711	5.5	6052
TBS-6	Terrace	52700	15	29278
TBS-7	Terrace	53986	9	17995
TBS-8	Terrace	39992	15	22218
TBS-9	Terrace	22551	14	11693
TBS-10	Terrace	37619	14	19506
TBS-11	Terrace	26685	10	9883
TBS-12	Terrace	23296	13	11217
CBS-1	Colluvium	35142	18	23428
CBS-2	Colluvium	36132	16	21411
CBS-3	Colluvium	30882	9	10294
CBS-4	Colluvium	48090	15	26717
CBS-5	Colluvium	54019	11	22008
CBS-6	Colluvium	36501	15.5	20954
CBS-7	Colluvium	27037	13	13018
CBS-8	Colluvium	45910	15	25506
CBS-9	Colluvium	27202	16	16120
				351142
Volume	Volume			
Colluvium	Terrace			
(CY)	(CY)			
179455	171687			
179500	171700			351000

Volume Assumptions:

- 1) Flat square footage area was determined per test pit using polygon method
- 2) Calculated based on straight cut walls from surface to depth

Republic Services Sunrise Landfill **T-WASH Borrow Source Volumes** (12/31/2008)

Boring ID	Borrow Source	Area (sf)	Area (acre)	Depth to Bedrock (ft)	Volume (CY)	Comment
TW-1	T-WASH	130192	3	10	48219	Hit medical waste @ approximately 10-15' bgs (Actual Depth fo Bedrock=22'bgs)
TW-2	T-WASH	113606	3	13	54699	Subtracted out Volume of Discovered Med Waste from March 2008
TW-3	T-WASH	115069	3	10	42618	
TW-4	T-WASH	188229	4	13.5	94114	Subtracted out Volume of Discovered Med Waste from March 2008
TW-5	T-WASH	97521	2	12	43343	
TW-6	T-WASH	147974	3	15	82208	
TW-7	T-WASH	103859	2	8	30773	
TW-8	T-WASH	104441	2	10	38682	
01 T WASH DCS	T-WASH	NA	NA	9	NA	included in TW-1
02 T WASH DCS	T-WASH	NA	NA	9	NA	Included in TW-3
03 T WASH DCS	T-WASH	NA	NA	9	NA	included in TW-4
04 T WASH DCS	T-WASH	NA	NA	9	NA	Included in TW-7
05 T WASH DCS	T-WASH	142313	3	9	47438	
06 T WASH DCS	T-WASH	194241	4	9	64747	
07 T WASH DCS	T-WASH	247526	6	9	82509	
08 T WASH DCS	T-WASH	412218	9	9	137406	
Volume T-WASH (CY) 766756	Area-T- WASH (acre) 46					
					766800	

Volume Assumptions:

- Flat square footage area was determined per test pit using polygon method
 Calculated based on straight cut walls from surface to depth

Appendix D Geotechnical Laboratory Data

SloughtonTP
Project No. 131904

Borrow Sludy Report
January 2009

US EPA ARCHIVE DOCUMENT

StoughtonTP
Project No. 131904

Borrow Study Report
January 2009



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

SIEVE ANALYSIS & HYDROMETER ASTM D 422

\$52500000000000000000000000000000000000	
Project No.	8787
Client:	Republic Services
Project Name:	Sunrise Landfill
Date:	10/24/2008
Sample Desc:	TBS-1 & 2
GeoTek Lab No:	97393

S	07	
(mm)	(inch -#)	% passing 100.0 94.7 94.7 93.7 93.2 92.6 91.5 87.4 86.4 83.7 80.9 79.5 77.7 71.5 35.4 12.4
75	3 in	100.0
50	2 in	94.7
37.5	1.5 in	94.7
25	1 in	93.7
19	3/4 in	93.2
9.5	3/8 in	92.6
4.75	No. 4	91.5
2.38	No. 8	87.4
2	No. 10	86.4
1.19	No. 16	83.7
0.595	No. 30	80.9
0.42	No. 40	79.5
0.297	No. 50	77.7
0.149	No. 100	71.5
0.074	No. 200	35.4
0.0358	-	
0.0228	**	11.5
0.0134	**	8.9
0.0095		8.0
0.0078	••	7.1
0.0068	-	6.7
0.0055	-	6.7
0.0034		6.2
0.0014	-	4.4

Reviewed By:	Date: // Z.J08
--------------	----------------



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

Project No.

Client:

8787 Republic Services

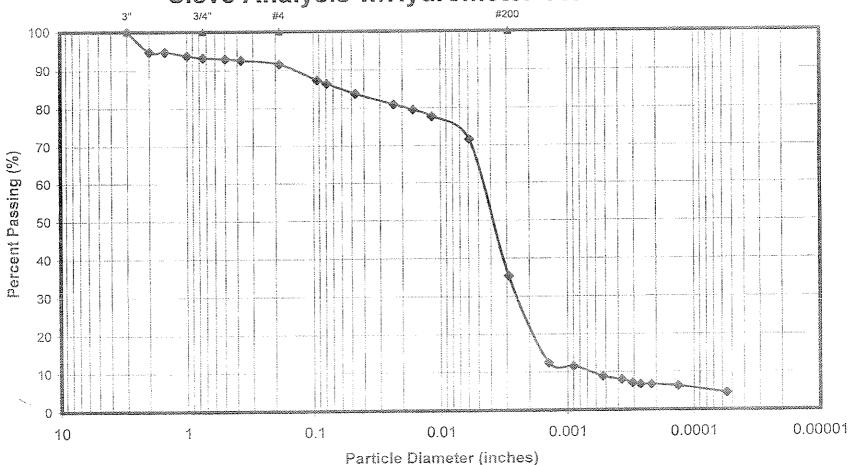
Project Name: Date: Sunrise Landfill 10/24/2008

Sample Desc:

TBS-1 & 2

97393 GeoTek Lab No:

Sieve Analysis w/Hydrometer ASTM D422



Reviewed By:

Date: 1/-21-08



Geo Tek, Inc.

6835 S. Escondido Street, Suite A. Las Vegas, Nevada 89119-3828

Telephone (702) 897 1424

SampleID: LNS08/97393 Report No: MAT:LNS08/97393 Issue No: 1

AASHTO T 27, AASHTO 1 11

% Passing

This report replaces all previous issues of report to "MAT+ MS08/97393"

Method:

Drying by:

Sieve Size

This laboratory is accredited by AASHTO The fest(s) reported have been performed in accordance with its terms of accordance.

Date Issued: 11/14/2008 Signed: 11/14/2008

Particle Size Distribution

Limits

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/97393

Field Sample ID:

Date Sampled:

10/24/2008

Source: Material:

Specification:

Hyrom

Sampling Method:

Location:

TBS-1 & 2

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neter Sieve	s de la companya de l	

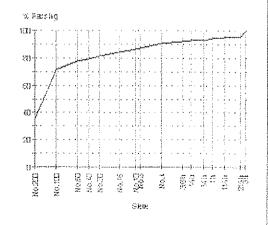
3in (75.0mm)	100
2½in (63.0mm)	95
1½in (37.5mm)	95
1in (25.0mm)	94
¼in (19,0mm)	93
1/sin (12.5mm)	93
3/8in (9.5mm)	92
No.4 (4.75mm)	91
No.8 (2.36mm)	87
No.10 (2.0mm)	86
No.16 (1.18mm)	84
No.30 (600µm)	81
No.40 (425µm)	79
No.50 (300µm)	78
No.100 (150µm)	71

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	113.0	
Optimum Moisture Content (%)		10.0	
Oversize Sieve	No.4	(4.75mm)	
Oversize Material (%)			
Oversize Sieve 2	3/41	n (19mm)	
Oversize Material (%)		5	
Liquid Limit (%)	AASHTO T89/T90	NO	
Method			
Plastic Limit (%)		NO	
Plasticity Index (%)		NP	
Sample History			
Preparation			
Bulk Specific Gravity	AASHTO T 85	2.44	
Bulk Specific Gravity SSD		2.53	
Apparent Specific Gravity		2.68	
Absorption (%)		3.7	
Additional Notes			
Group Symbol	ASTM D 2487	SM	
Group Name		Silty sand	
The state of the s			

Chart

No.200 (75µm)



35

Comments

NO - Not Obtainable NP = Non Plastic



Geo Tek, Inc.

6835 S. Escondido Street, Suite A. Las Vegas, Nevada 89119-3628

Telephone: (702) 897 1424

SampleID: LNS08/97393 Report No: MDD:LNS08/97393 Issue No: 1

This report replaces all previous issues of report no MODENSORON 393



This laboratory is accredited by AASHTO The test(s) reported have been performed in accordance with its terms of accredation.

Éfries C. Anstis

Date Issued: 11/14/2008

on (Promond Nasada Labourou Errocey) Signed: 11/14/2008

Proctor - Modified [AASHTO T 180]Test Report

Client

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID: LNS08/97393

Field Sample:

Date Sampled: 10/24/2008

Source: Material:

Specification: Hyrometer Sleve Location: TBS-1 & 2

Sampled From:

Maximum Dry Density

Method:

AASHTO T 180

Description: Determination of the dry density/moisture content

relation of a soil using modified compactive effort.

Test Results

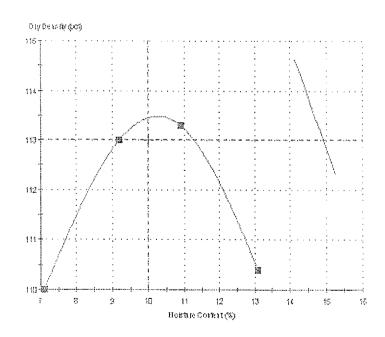
Description	Result
Maximum Dry Density (lb/ft*)	113
Optimum Moisture Content (%)	10
Oversize Sieve 1 (mm)	4.8
Oversize Material (%)	
Method Used	Ð
Bulk Specific Gravity	2.440
Oversize Sieve 2 (mm)	19.0
Oversize Material 2 (%)	5.1

Soil Classification

Symbol Name

Method ASTM D 2487

Chart



Comments

N//A



GeoTek, Inc.
6835 South Escendide Street Su
Las Vegas, Nevada 89119-3832
(702) 897-1424 (702) 8
www.geotekusa.com 6835 South Escandido Street Suite A (702) 897-2213

Constant Head Permeability

Q= Quantity of Flow, taken as an average of Inflow and Outflow, ft3 L= Length of Specimen along Path of Flow. ft

A= Cross-Sectional area of Specimen, ft2

t= Interval of Time, over which the Flow Q occurs, min

h= Difference in Hydraulic Head across the Specimen, ft of water

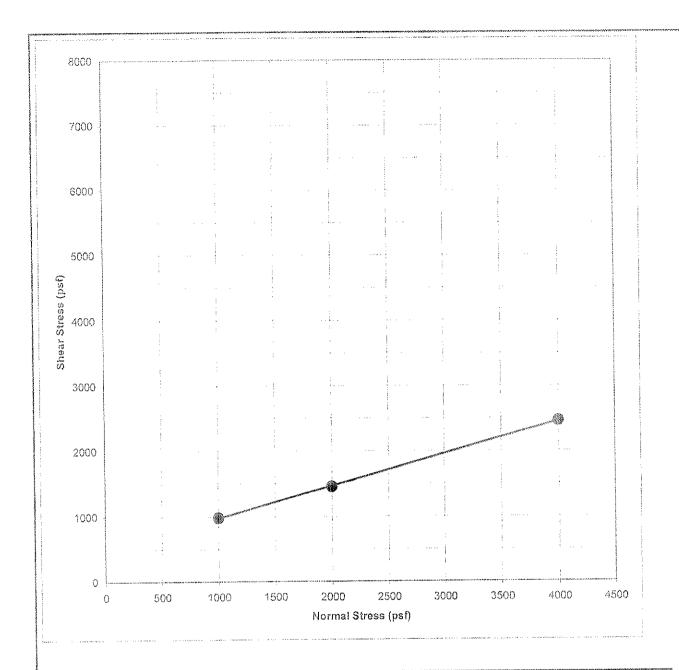
k= Hyraulic Conductivity, ft/min

Input

	Hours	Minutes	Seconds	
Start Time	11	6	0	
End Time	12	53	0	
Water Output during test			1000	cc = m!
Height of specimen			4.63	in
Diameter of mold			6.00	in
H = top of water to output tube			133.50	in

Output	k=QL/(Ath)		
Q=	1000 cm3	3.53E-02	ft ³
[=	11.75 cm	0.39	ft
A=	182.4147 cm2	0.1963	ft ²
t =	6420 sec	107.00	min
h=	339.09 cm	11.13	ft
k (ft/min)=		5.82E-05	ft/min
k (cm/s)=		2.96E-05	cm/sec

a Baran a tada garangga dadan ya tada a a a a a a a a a a a a a a a a a	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
Project No	8787 -LV1
Client:	Republic Services
Project:	Sunrise Landfill
Date:	10/24/2008
Sample:	TBS-1&2
GTI Lab#:	97393



Symbol	Lab#	Location	Depth	Classification	DD (pcf)	MC%	Frc. Angle	Cohesion
8	97393	T8S 1&2	0	Silty Sand	101.7	10	26	471
10							***************************************	***************************************
A								***



Geo Tek, Inc.
6835 South Escondido Street Suite A
Las Vegas, Nevada 89119-3832
(702) 897-1424 (702) 897-2213
www.geotekusa.com

Prepared For: Republic Services

Work Order:

8787 -LVT

DIRECT SHEAR TEST RESULTS

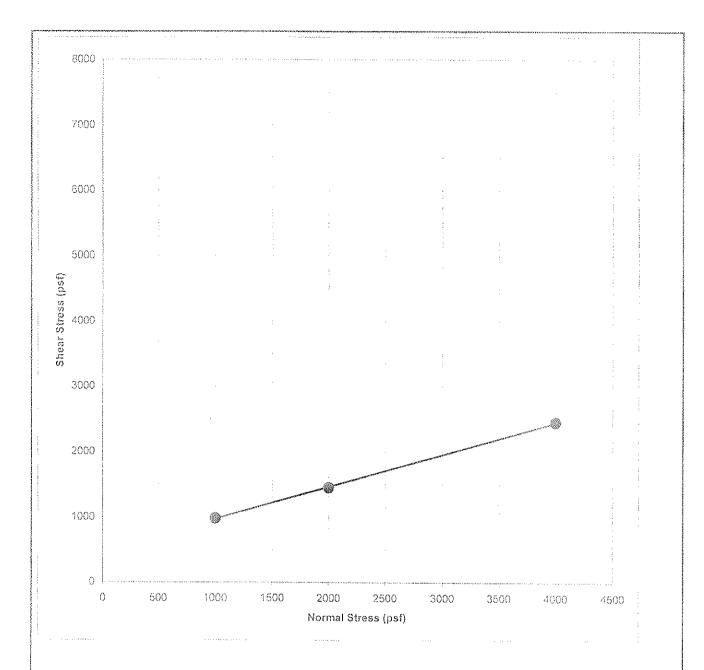
Sunrise Landfill

Clark County, Nevada

Date:

Moy. 2008

OROTECHNICAL ENVIRORMENTAL MATERIALS



Symbol	Lab#	Location	Depth	Classification	DD (pcf)		Frc. Angle	
9	97393	TBS 1&2	0	0	0	0	26	471
3			`					
A								



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(702) 897-2213

. www.geotekusa.com

DIRECT SHEAR TEST RESULTS

Sunrise Landfill

Clark County, Nevada Prepared For: Republic Services

OPER, CONKING TENNESSONESSON, STATEMACK

Work Order:

8787 -LVI

Date:

Nov. 2008



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

SIEVE ANALYSIS & HYDROMETER ASTM D 422

Project No.	8787
Client:	Republic Services
Project Name:	Sunrise Landfill
Date:	10/24/2008
Sample Desc:	TBS - 4 & 7
GeoTek Lab No:	97394

S	The same of the sa	
(mm)	(inch - #)	% passing
75	3 in	100.0
50	2 in	91.2
37.5	1.5 in	87.9
25	1 in	77.2
19	3/4 in	70.3
9.5	3/8 in	53.7
4.75	No. 4	44.6
2.38	No. 8	40.2
2	No. 10	39.4
1.19	No. 16	37.4
0.595	No. 30	35,6
0.42	No. 40	34.8
0.297	No. 50	33.8
0.149	No. 100	30.5
0.074	No. 200	21.9
0.0307	~	11.2
0.0203	-	8.5
0.0120	-	7.3
0.0086		6.2
0.0071	-	5.8
0.0062	-	5.4
0.0051	-	5.0
0.0031	~	4.2
0.0013		3.5

Reviewed By:	are consisted to the second	Date:



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

Project No.

Client:

8787 Republic Services

Project Name:

Sunrise Landfill

Date:

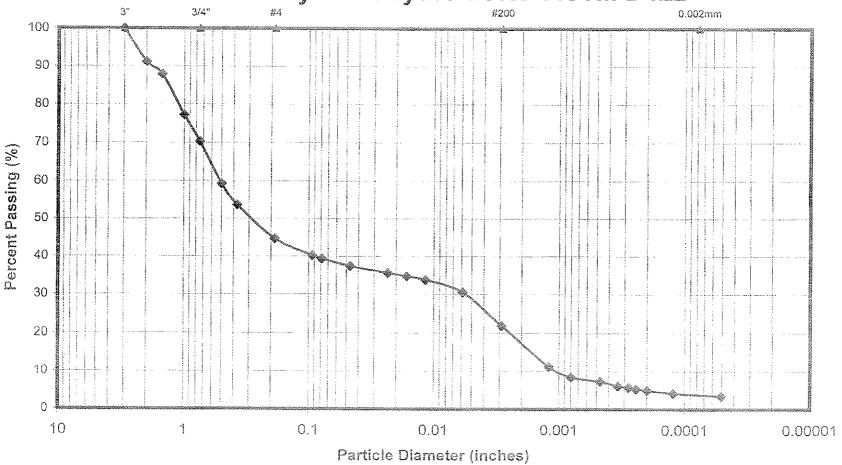
10/24/2008 TBS - 4 & 7

GeoTek Lab No:

Sample Desc:

97394

Sieve Analysis w/Hydrometer ASTM D422



Reviewed By:

Date: 1/2/-04-



Geo Tek, inc.

6835 S. Escondido Street, Suite A. Las Vegas, Nevada 89119-3828

Telephone (702) 897 1424

SampleID: LNS08/97394 Report No: MAT:LNS08/97394

Issue No: 1 this report replaces all previous visues of import no MATT MORROTED I

This laboratory is accredited by AASHTO. The tost(s) reported have been performed in accordance with its terms of accredation

Gest Courties

Date Issued: 11/14/2008

Signed: 11/14/2008

Limits

Aggregate/Soil Test Report

Client:

REPUBLIC SURVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/97394

Field Sample ID:

Date Sampled:

10/24/2008

Source: Material:

Specification:

Hyrometer Sieve

Sampling Method:

Location:

TBS -4 & 7

Particle Size Distribution

Method: Drying by:

Sieve Size

21/sin (63.0mm) 1%in (37.5mm)

1in (25,0mm)

%in (19.0mm)

½in (12.5mm)

3/8in (9.5mm)

AASHTO T 27, AASHTO T 11

% Passing

88

77

70

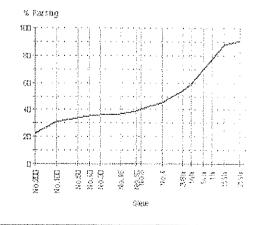
59

Other	Test	Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	133.0	
Optimum Moisture Content (%)		7.0	
Oversize Sieve	No.4	(4.75mm)	
Oversize Material (%)			
Oversize Sieve 2	3/4	in (19mm)	
Oversize Material (%)		27	
Liquid Limit (%)	AASHTO T89/T90	NO	
Method			
Plastic Limit (%)		NO	
Plasticity Index (%)		NP	
Sample History			
Preparation			
Bulk Specific Gravity	AASHTO T 85	2.60	
Bulk Specific Gravity SSD		2.63	
Apparent Specific Gravity		2.69	
Absorption (%)		1.2	
Additional Notes			
Group Symbol	ASTM D 2467	GM	
Group Name Silty gravel with sai			

No.4 (4.75mm)	45
No.8 (2.36mm)	40
No.10 (2.0mm)	39
No.16 (1.18mm)	37
No.30 (600µm)	36
No.40 (425µm)	35
No.50 (300µm)	34
No.100 (150µm)	31
No.200 (75µm)	22

Chart



Comments

NO = Not Obtainable NP = Non Plastic



Geo Tek, Inc.

8835 S. Escondido Street, Suita A. Las Vegas, Nevada 89119-3828

Telephone: (702) 897-1424

SampleID: LNS08/97394 Report No: MDD:LNS08/97394

This report replaces all provious issues of report no WOD UNSCRIPTOR

Issue No: 1

This laboratory is accredited by AASHTO The test(s) reported have been performed in accordance with its terms of accremation

Date Issued: 11/14/2008

signod; 17714/2008

Proctor - Modified [AASHTO T 180]Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

LNS08/97394 Sample ID:

Field Sample:

Date Sampled: 10/24/2008

Source:

Material:

Specification: Hyrometer Sieve

Location: TBS -4 & 7

Sampled From:

Maximum Dry Density

Method:

AASHTO T 180

Description:

Determination of the dry density/moisture content

relation of a soil using modified compactive effort.

Test Results

Description	(C)
Description	Result
Maximum Dry Density (lb/it³)	133
Optimum Moisture Content (%)	7
Oversize Sieve 1 (mm)	4.8
Oversize Material (%)	
Method Used	CI
Bulk Specific Gravity	2.600
Oversize Sieve 2 (mm)	19.0
Oversize Material 2 (%)	26.9

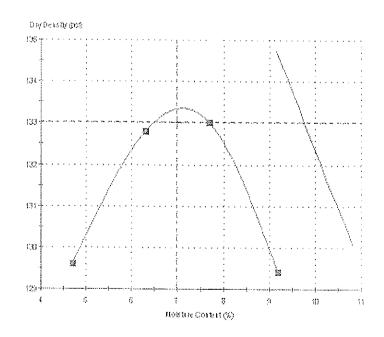
Soil Classification

Symbol GM

Name Silty gravel with sand

Method ASTM D 2487

Chart



Comments

N/A



GeoTek, Inc. 6835 South Escondido Street Sinte A Las Vegas, Nevada 89119-3832 (702) 897-1424 (702) 897-2213 www.geotekusa.com

Constant Head Permeability

Q= Quantity of Flow, taken as an average of Inflow and Outflow, ft³

L= Length of Specimen along Path of Flow, ft

A= Cross-Sectional area of Specimen. ft2

t= Interval of Time, over which the Flow Q occurs, min

h= Difference in Hydraulic Head across the Specimen, ft of water

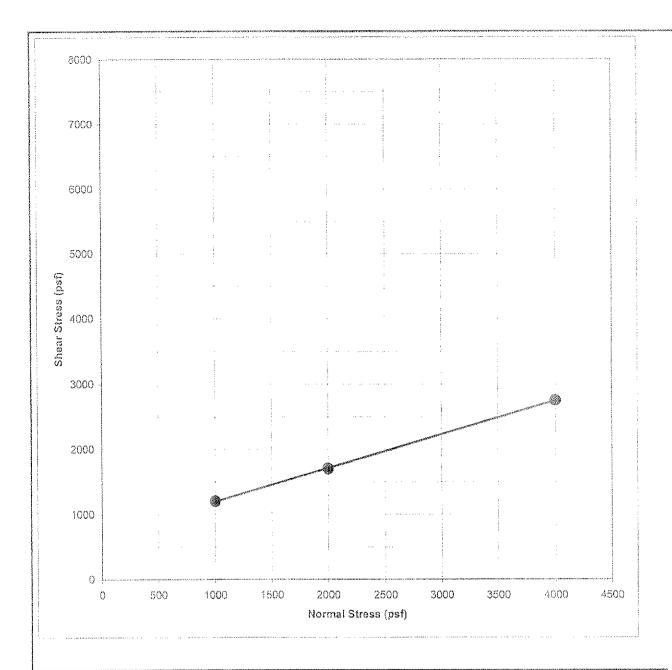
k= Hyraulic Conductivity, ft/min

Input

•	Hours	Minutes	Seconds	
Start Time	0	0	0	
End Time	0	1	4	
Water Outr	out during te	st	2000	cc = ml
Height of s	pecimen		4.63	in
Diameter o	f mold		6.00	in
H = top of	water to out	out tube	133.50	in

Output	k=QL/(Ath)		
Q=	2000 cm3	7.06E-02	ft ³
La	11.75 cm	0.39	ft
A=	182,4147 cm2	0.1963	ft ²
t=	64 sec	1.07	min
h=	339.09 cm	11.13	ft
k (ft/min)=	and the second s	1.17E-02	ft/min
k (cm/s)=		5.94E-03	cm/sec

	a service of the contract of t
	•
Project No	8787 -LV1
Client:	Republic Services
Project:	Sunrise Landfill
Date:	10/24/2008
Sample:	TBS-4&7
GTI Lab#:	97394



Symbol	Lab#	Location	Depth	Classification	DD (pcf)	MC%	Frc. Angle	Cohesion
9	97394	TBS 4&7	0	Silty Gravel w/sand	119.7	7	27	713
29								
A	1							



GeoTek, Inc.
6835 South Escondido Street Suite A
Las Vegas, Nevada 89119-3832
(702) 897-1424 (702) 897-2213
www.geotekusa.com

GROTECHNICAL ENVIRONALES EAL MATERIALS

DIRECT SHEAR TEST RESULTS

Sunrise Landfill

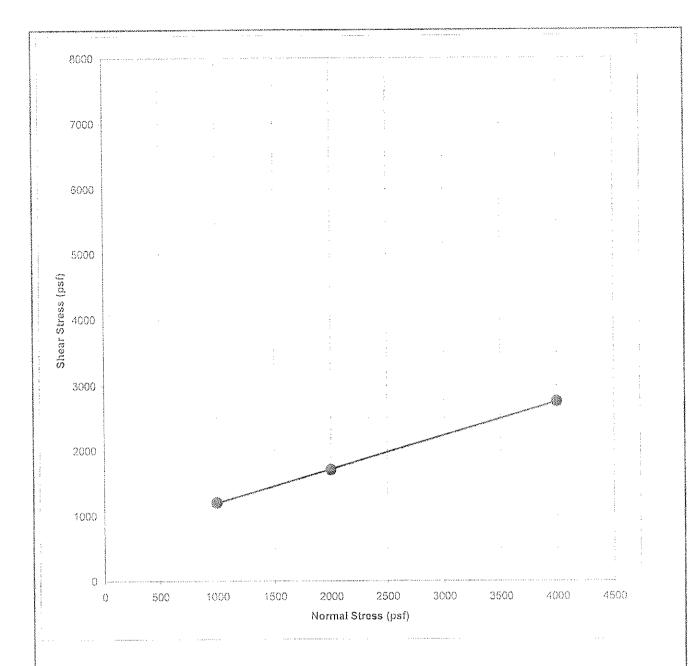
Clark County, Nevada Prepared For: Republic Services

Work Order:

8787 -LVI

Date:

Nov. 2008



Symbol	Lab#	Location	Depth	Classification	DD (pcf)	MC %	Frc. Angle	Cohesion
8	97394	TBS 4&7	0	Silty Sand	0	0	2.7	713
Na .						,,,,,		
A								



GeoTek, Inc. 6835 South Escondido Street State A Las Vegas, Nevada 89119-3832 (702) 897-1424 (702) 897-2213 www.geotekusa.com

GROTECTINICAL ENVIRONMENTAL MATERIALS

DIRECT SHEAR TEST RESULTS

Sunrise Landfill

Clark County, Nevada Prepared For: Republic Services

Work Order:

8787 -LVI

Oate:

Nov. 2008



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

SIEVE ANALYSIS & HYDROMETER ASTM D 422

\$555000.0000000000000000000000000000000	THE RESERVE OF THE PROPERTY OF
Project No.	8787-LV1
Client:	Republic Services
Project Name:	Sunrise Landfill
Date:	10/24/2008
Sample Desc:	TBS - 8 & 11
GeoTek Lab No:	97397

S	9/ 22.22	
(mm)	(inch -#)	% passing
75	3 in	100.0
50	2 in	94.3
37.5	1.5 in	93.0
25	1 in	88.7
19	3/4 in	82.6
9,5	3/8 in	71.5
4.75	No. 4	63.4
2.38	No. 8	59.6
2	No. 10	59.6
1.19	No. 16	55.8
0.595	No. 30	52.0
0.42	No. 40	50.1
0.297	No. 50	50.1
0.149	No. 100	44.4
0.074	No. 200	28.6
0.0335	**	15.6
0.0219		12.6
0.0129	-	10.8
0.0092		10.2
0.0076		9.0
0.0066		9.0
0.0054		7.8
0.0034	~	6.6
0.0014		5.4

Reviewed By:

Date: //-2/08

/



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

Project No.

Client:

8787-LV1 Republic Services Sunrise Landfill

Project Name:

10/24/2008 Date:

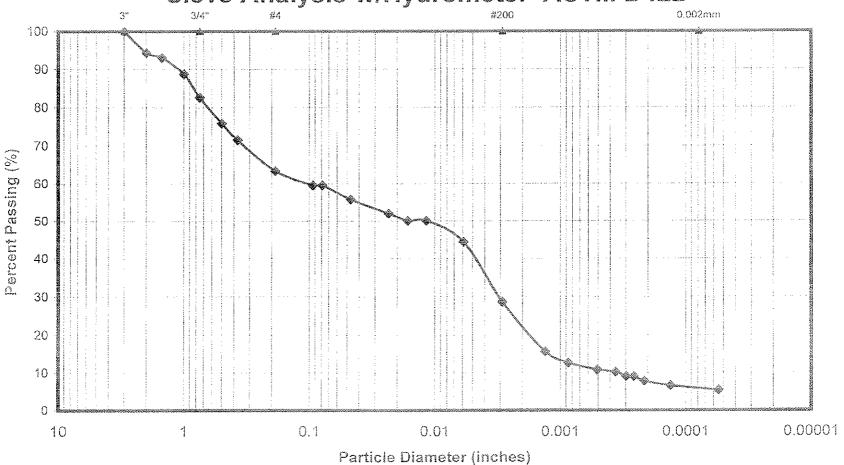
Sample Desc:

TBS - 8 & 11

GeoTek Lab No:

97397

Sieve Analysis w/Hydrometer ASTM D422



Reviewed By:

Date: //- 21-04



Client:

Geo Tek, Inc.

6835 S. Escorado Sizot, Suite A. Las Vegas, Nevada 89119-3628

felephone (702) 897-1424

SampleID: LNS08/97397 Report No: MAT:LNS68/97397

This report rapidities of provious results of report no MAT LNS08-9739 σ

jedi ila

This laboratory is accredited by AASH10. The test(s) reported have been performed in accombined with 4s terms of accredation.

Stud Carin

erangan Date issued: 11/54/2008 Bigned: 117/4/2008

Limits

Project: 8787-LV1

SUNRISE LANDFILL

Aggregate/Soil Test Report

Sample Details

Sample ID:

LNS08/97397

REPUBLIC SERVICES OF SOUTHERN NEVADA

Field Sample ID:

Date Sampled:

10/24/2008

Source:

Material:

Specification:

Hyrometer Sieve

Sampling Method:

Location: TB

TBS - 8 & 11

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	131.0	
Optimum Moisture Content (%)		8.0	
Oversize Sieve	No.4	(4.75mm)	
Oversize Material (%)			
Oversize Sieve 2	3/2	iin (19mm)	
Oversize Material (%)		17	
Liquid Limit (%)	AASHTO T89/190	NO	
Method		One Point	
Plastic Limit (%)		ОИ	
Plasticity Index (%)		NP	
Sample History			
Preparation			
Bulk Specific Gravity	AASHTO T 85	2.61	
Bulk Specific Gravity SSD		2.65	
Apparent Specific Gravity		2.71	
Absorption (%)		1.4	
Additional Notes			
Group Symbol	ASTM D 2487	GM	
Group Name	Silty grave	with sand	

Particle Size Distribution

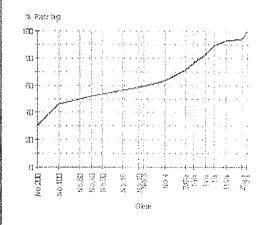
Method:

AASHTO 1 27, AASHTO 1 11

Drying by:

Sieve Size	% Passing
3in (75.0mm)	100
21⁄ain (63 0mm)	94
11/3in (37 5mm)	93
1in (25.0mm)	89
¼in (19.0mm)	83
1/sin (12.5mm)	76
3/8in (9.5mm)	71
No.4 (4.75mm)	63
No.8 (2.36mm)	59
No.10 (2 0mm)	58
No.16 (1 18mm)	56
No.30 (600µm)	53
No.40 (425µm)	52
No.50 (300µm)	50
No.100 (150µm)	46
No.200 (75um)	30

Chart



Comments

NO - Not Obtainable

NP = Non Plastic



Geo Tek, Inc.

8835 S. Escondisto Street, Suite A Las Vegas, Nevada 89119-3828

Tolephone (702) 897-1424

SampleID: LNS08/97397 Report No: MDD:LNS08/97397

This report replaces all previous assess of report no WIDD INS08/97/97

This lationatory is occidented by AASHTO The test(s) reported have been performed in accompance with its terms of accredation

** November | 1975/2008 Date Issued: 11/14/2608

Proctor - Modified [AASHTO T 180]Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/97397

Field Sample:

Date Sampled: 10/24/2008

Source:

Material:

Specification:

Hyrometer Sieve

Location:

TBS - 8 & 11

Sampled From:

Maximum Dry Density

Method:

AASHTO T 180

Description:

Determination of the dry density/moisture content

relation of a soil using modified compactive effort.

Test Results

Description	Result
Maximum Dry Density (lb/ft ^a)	131
Optimum Moisture Content (%)	8
Oversize Sieve 1 (mm)	4.8
Oversize Material (%)	
Method Used	()
Bulk Specific Gravity	2.610
Oversize Sieve 2 (mm)	19.0
Oversize Material 2 (%)	16.9

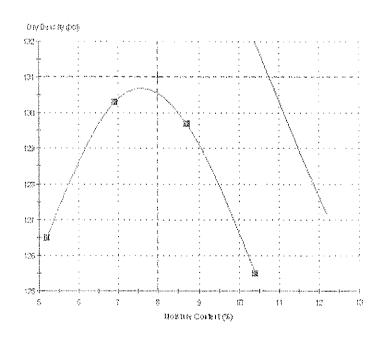
Soil Classification

Symbol

Name

Method ASTM D 2487

Chart



Comments

MIA



GeoTek, Inc. 6835 South Escondido Street Suite A Las Vegas, Novada 89119-3832 (702) 897-1424 (702) 897-2213 www.geotekusa.com

Constant Head Permeability

Q= Quantity of Flow, taken as an average of Inflow and Outflow, ft³ L= Length of Specimen along Path of Flow, ft A= Cross-Sectional area of Specimen, ft²

t= Interval of Time, over which the Flow Q occurs, min h= Difference in Hydraulic Head across the Specimen, ft of water

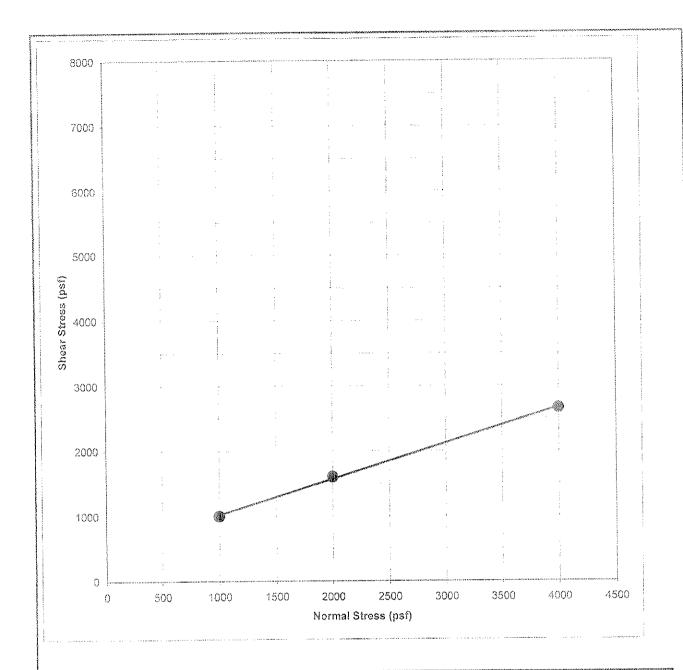
k= Hyraulic Conductivity, ft/min

Input

•	Hours	Minutes	Seconds	
Start Time	7	57	0	
End Time	9	8	40	
Water Outp	out during te	1520	cc = ml	
Height of specimen			4.63	in
Diameter of mold			6.00	in
H = top of water to output tube			133.50	in

Output	k=QL/(Ath)		
Q=	1520 cm3	5.37E-02	ft ³
L=	11.75 cm	0.39	ft
A=	182.4147 cm2	0.1963	ft ²
t=	4300 sec	71.67	min
h=	339.09 cm	11.13	ft
k (ft/min)=		1.32E-04	f∀min
k (cm/s)=		6.71E-05	cm/sec

Project No	8787 -LV1
Client:	Republic Services
Project:	Sunrise Landfill
Date:	10/25/2008
Sample:	TBS 8 & 11
GTI Lab#:	97397



Symbol	Lab#	Location	Depth	Classification	DD (pcf)	MC%	Frc. Angle	Cohesion
8	97397	T'BS-8&11	0	Silty Gravel w/sand	117.9	8	28	485
8							A Marketing of the Control of the Co	anno haganahay suuruuduusuun joh haada dakkaana
A							673-044-0-7-7-10-1-4-4-10-3-11-11-11-11-11-11-11-11-11-11-11-11-1	



Geo Tek, Inc. 6835 South Escondido Street Suite A Las Vogas, Nevada 89119-3832 (702) 897-1424 (702) 897-2213 www.geotekusa.com

GEOTUCHNICAL ENVIRONMENTAL MATERIALS

DIRECT SHEAR TEST RESULTS

Sunrise Landfill

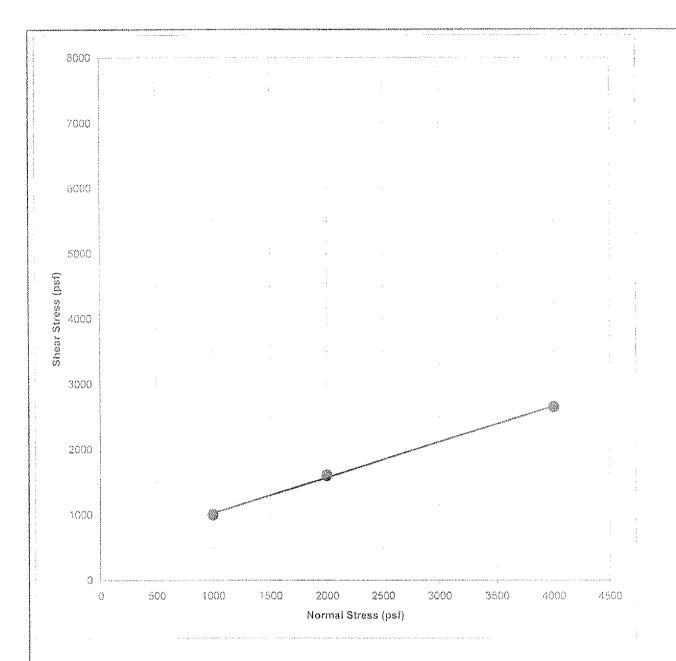
Clark County, Nevada Prepared For: Republic Services

Work Order:

8787 -LVI

Oxes

Nov. 2008



Symbol	Lab#	Location	Depth	Classification	DD (pcf)	MC%	Frc. Angle	Cohesion
-	97397	TBS-8&11	0	Silty Sand	0	0	28	485
₽3								
A								



GeoTek, Inc.6835 South Escondido Street Suite A
Las Vegas, Novada 89119-3832.
(702) 897-1424 (702) 897-2213
www.geotekusi.com

GROW, ROMENDAME - CAN ROMANDAM AND DEATHER ST

DIRECT SHEAR TEST RESULTS

Sunrise Landfill

Clark County, Nevada Prepared For: Republic Services

Work Order:

8787 -LVI

(Date:

Nov. 2008



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

SIEVE ANALYSIS & HYDROMETER ASTM D 422

Project No.	8787
Client:	Republic Services
Project Name:	Sunrise Landfill
Date:	10/24/2008
Sample Desc:	CBS - 1 -03 & 04
GeoTek Lab No:	97395

S	% passing	
(mm)	(inch - #)	70 passing
75	3 in	94.8
50	2 in	94.8
37.5	1.5 in	92.7
25	1 in	84.8
19	3/4 in	76.5
9.5	3/8 in	59.3
4.75	No. 4	49.8
2.38	No. 8	45.9
2	No. 10	45.0
1.19	No. 16	42.8
0.595	No. 30	40.5
0.42	No. 40	39.4
0.297	No. 50	38.2
0.149	No. 100	34.7
0.074	No. 200	24.4
0.0328		13.4
0.0217		10.2
0.0128	**	8.8
0.0092	·-	7.8
0.0075		7.4
0.0066		6.9
0.0054	**	5.5
0.0034		3.7
0.0014		2.3

Reviewed By:	ANN MARCO	Date: //-2/-08
	Sul Med >	Date: 7/ 64 € 8



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

Project No.

Client:

Date:

8787 Republic Services

Project Name:

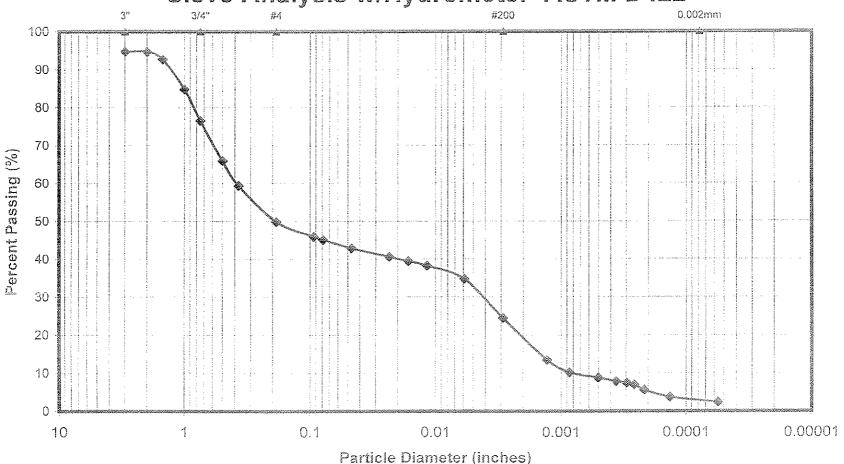
Sunrise Landfill 10/24/2008

Sample Desc:

CBS - 1 -03 & 04

GeoTek Lab No: 97395

Sieve Analysis w/Hydrometer ASTM D422



Reviewed By:

Date: //-2/-08



6835 S. Escondido Street, Sala: A. Las Vogas, Nevaga 89118-3826

Tolephone: (702) 897-1424

SampleID: LNS08/97395 Report No: MAT:LNS08/97395 Issue No: 1

This report replaces all previous issues of report no WATE MS0697395.

First laboratory is accredited by AASH10. The testfol reported have been performed a according to with its terms of accreding to

Start Com

AND 48

Date Issued, 11/14/2008

estlement means lacers. Signed: 11/14/2008

Limits

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/97395

Field Sample ID:

Date Sampled:

10/24/2008

Source: Material:

Specification:

Hyrometer Sieve

Sampling Method:

Location:

CBS -1 -03 & 04

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	134.0	
Optimum Moisture Content (%)		7.0	
Oversize Sieve	No.4	(4.75mm)	
Oversize Material (%)			
Oversize Sieve 2	3/4	in (19mm)	
Oversize Material (%)		20	
Liquid Limit (%)	AASHTO T89/T 90	NO	The state of the s
Method		One Point	
Plastic Limit (%)		NO	
Plasticity Index (%)		NP	
Sample History			
Preparation			
Bulk Specific Gravity	AASHTO T 85	2.55	
Bulk Specific Gravity SSD		2.60	
Apparent Specific Gravity		2.68	
Absorption (%)		1.9	
Additional Notes			
Group Symbol	ASTM D 2487	GM	
Group Name	Silty gravel	with sand	

Particle Size Distribution

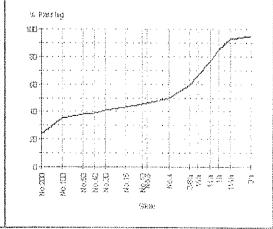
Method:

AASHTO 1 27, AASHTO 1 11

Drying by:

Sieve Size	% Passing
3in (75.0mm)	95
11/sin (37.5mm)	93
1in (25.0mm)	85
%in (19.0mm)	76
12.5mm)	96
3/8in (9.5mm)	59
No.4 (4.75mm)	50
No.8 (2.36mm)	46
No.10 (2.0mm)	45
No.16 (1.18mm)	43
No.30 (600µm)	41
No.40 (425µm)	39
No.50 (300µm)	38
No.100 (150µm)	35
No.200 (75µm)	24

Chart



Comments

NO Not Obtainable NP = Non Plastic



Client:

Project

Geo Tek, Inc.

6835 S. Escondido Street, Suito A. Las Vegos, Nevada 89119-3828

Telephone (702) 897 1424

SampleID: LNS08/97395 Report No: MDD:LNS08/97395 Issue No: 1

This report replaces of previous issues of report no \$4000 CASCISM/305

This laboratory is accredited by AASH(O The test(s) reported have been performed in accordance with its forms of accredation

History Castion

em Malego Lorestey (1984) Signed: 1974/2008 Date Issued: 11/14/2008

SUNRISE LANDFILL

Sample Details

Sample ID: LNS08/97395

8787-LV1

Field Sample:

Date Sampled: 10/24/2008

Source: Material:

Specification:

Hyrometer Sieve Location: CBS-1-03 & 04

Sampled From:

Maximum Dry Density

Method:

AASHTO T 180

Description:

Determination of the dry density/moisture content relation of a soil using modified compactive effort.

Proctor - Modified [AASHTO T 180]Test Report

REPUBLIC SERVICES OF SOUTHERN NEVADA

Test Results

Description	Result
Maximum Dry Density (lb/ft²)	134
Optimum Moisture Content (%)	7
Oversize Sieve 1 (mm)	4.8
Oversize Material (%)	
Method Used	O
Bulk Specific Gravity	2.550
Oversize Sieve 2 (mm)	19.0
Oversize Material 2 (%)	20.2

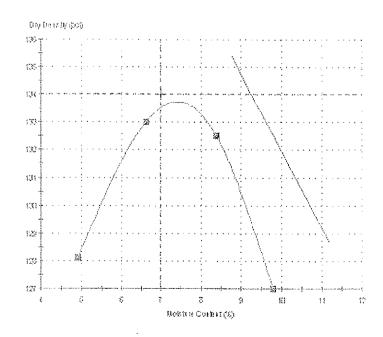
Soil Classification

Symbol GM

Name Silty gravel with sand

Method ASTM D 2487

Chart



Comments

N/A



GeoTek, Inc. 6835 South Escandido Street Suite A 633 30tth Escandiso Street 30 Lns Vegas, Nevada 89119-3832 (702) 897-1424 (702) 8 (702) 897-2213 www.geotekesa.com

Constant Head Permeability

Q= Quantity of Flow, taken as an average of Inflow and Outflow, ft3

L= Length of Specimen along Path of Flow, ft

A= Cross-Sectional area of Specimen, ft2

t= Interval of Time, over which the Flow Q occurs, min

h= Difference in Hydraulic Head across the Specimen, ft of water

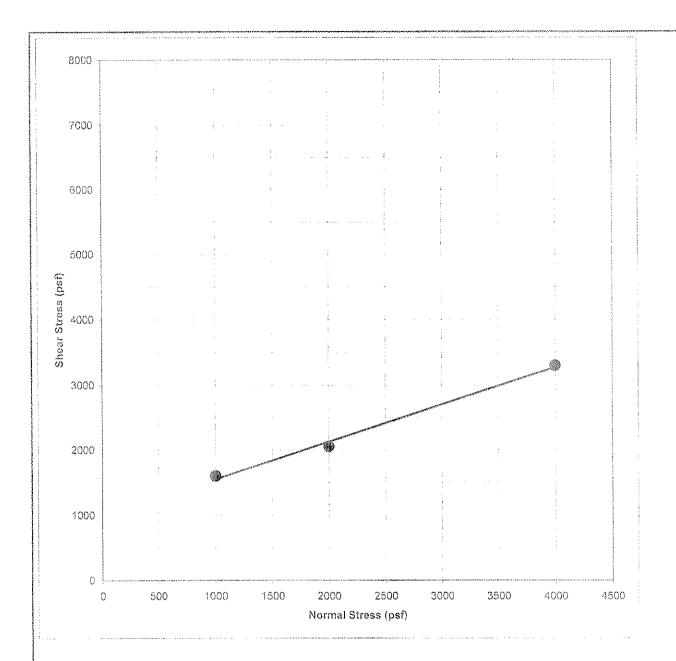
k= Hyraulic Conductivity, ft/min

Input

	Hours	Minutes	Seconds	
Start Time	0	0	0	*
End Time	0	2	20	
Water Output during test			2000	cc = ml
Height of specimen			4.63	in
Diameter of mold			6.00	in
H = top of water to output tube			133.50	in

Output	k=QL/(Ath))		
Q=	2000	cm3	7.06E-02	ft³
L=	11.75	cm	0.39	fi
A=	182,4147	cm2	0.1963	ft ²
† =	140	sec	2.33	min
h=	339.09	cm	11.13	ft
k (ft/min)=			5.34E-03	ft/min
k (cm/s)=			2.71E-03	cm/sec

	100 mg 1 m
Project No	8787 -LV1
Client:	Republic Services
Project:	Sunrise Landfill
Date:	10/24/2008
Sample:	CBS - 1 - 03 & 04
GTI Lab#:	97395



Symbol	Lab #	Location	Depth	Classification	DD (pcf)	MC%	Frc. Angle	Cohesion
9	97395	CBS-1-03-04	0	Silty Gravel w/sand	120.6	7	31	884
100								
À								



GeoTek, Inc.
6835 South Escondido Street Suite A
Las Vegas, Nevada 89119-3832
(702) 897-1424 (702) 897-2213
www.georekusa.com

GROTECENE M. PAVERONARNIAS, MATERIALS

DIRECT SHEAR TEST RESULTS

Sunrise Landfill

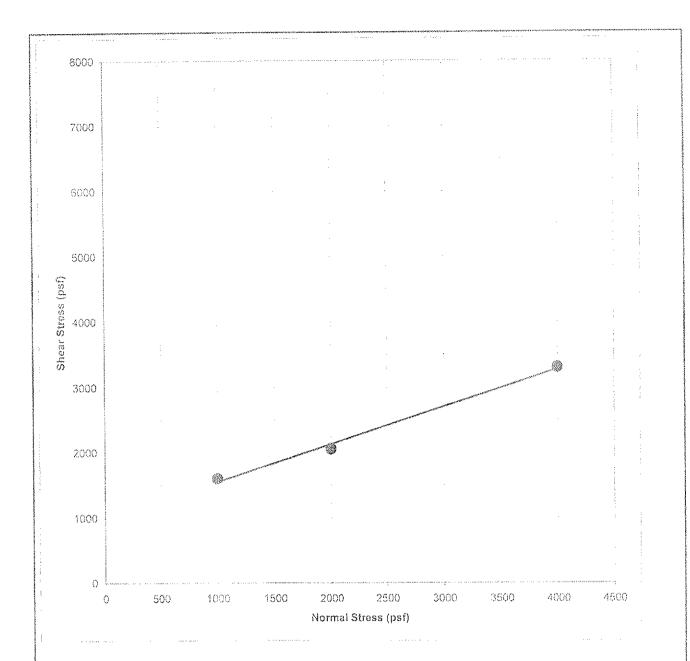
Clark County, Nevada Prepared For: Republic Services

Work Order:

8787 -LVI

Datei

Mov. 2008



Symbol	3	Location	Classification	DD (pcf)		Frc. Angle	
0	1	CBS-1-03-04	Silty Sand	0	0	31	884
M							
A							



GeoTek, Inc. 6835 South Eucondido Street Suite A Las Vigas, Noveda 89119-3832 (702) 897-1424 (702) 897-2213 www.geotekusa.com **DIRECT SHEAR TEST RESULTS**

Sunrise Landfill

Clark County, Nevada Prepared For: Republic Services

Work Order:

8787 -LVI

Date:

May, 2008

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6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax

SIEVE ANALYSIS & HYDROMETER ASTM D 422

Project No.	8787
Client:	Republic Services
Project Name:	Sunrise Landfill
Date:	10/24/2008
Sample Desc:	CBS - 06 & 08
GeoTek Lab No:	97396

5	9/ proping	
(mm)	(inch - #)	% passing
75	3 in	100.0
50	2 in	92.1
37.5	1.5 in	87.5
25	1 in	74.8
19	3/4 in	65.8
9.5	3/8 in	49.2
4.75	No. 4	39.2
2.38	No. 8	34.1
2	No. 10	33.2
1.19	No. 16	31.0
0.595	No. 30	29.1
0.42	No. 40	28.2
0.297	No. 50	29.1 28.2 27.3 21.9 13.4
0.149	No. 100	21.9
0.074	No. 200	13.4
0.0342	_	7.6
0.0217		7.3
0.0128	-	6.3
0.0092	~	5.6
0.0076		5.0
0.0066	-	4.3
0.0054	-	4.0
0.0034	444	2.0
0.0014		1.7

Reviewed By: Date

Date: //-//-//8



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax Project No.

Sample Desc:

Client: Republic Services

Project Name: St

Sunrise Landfill

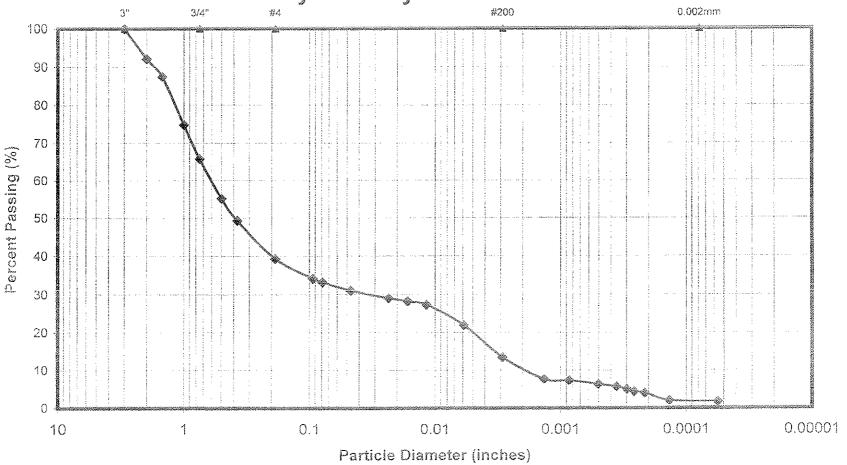
8787

Date: 10/24/2008

CBS - 06 & 08

GeoTek Lab No: 97396

Sieve Analysis w/Hydrometer ASTM D422



, , ,

Reviewed By: "

Date: //- 3/-08



6835 S. Escondido Stron, Salte A. Las Vecas, Neveda 69119-3828

Tolephene (702) 807 1424

SampleID: LNS08/97396 Report No: MAT:LNS08/97396

155 ue No. 1 This report replaces all provious issues of report no MATT INSORGY398

This laboratory is accordited by AASHTO The test(s) reported have been parformed in accordance with its forms of accordation

Clissof Bushing

Date Issued: 11/14/2008

Signed: 1774/2008

Limits

Aggregate/Soil Test Report

Client

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project

3787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/97396

Field Sample ID:

Date Sampled:

10/24/2008

Source: Material:

Specification:

Hyrometer Sieve

Sampling Method:

Location:

CBS - 06 & 08

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft ^a)	AASHTO T 180	140.0	
Optimum Moisture Content (%)		5.0	
Oversize Sieve	No.4	(4.75mm)	
Oversize Material (%)		, ,,	
Oversize Sieve 2	3/4	n (19mm)	
Oversize Material (%)		27	
Liquid Limit (%)	AASHTO T89/190	NO	
Method		One Point	
Plastic Limit (%)		NO	
Plasticity Index (%)		NP	
Sample History			
Preparation			
Bulk Specific Gravity	AASHTO T 85	2.60	
Bulk Specific Gravity SSD		2.64	
Apparent Specific Gravity		2.70	
Absorption (%)		1.4	
Additional Notes		.,.	
Group Symbol	ASTM D 2487	GM	***************************************
Group Name	Silty gravel	with sand	
The contract of the contract o			

Particle Size Distribution

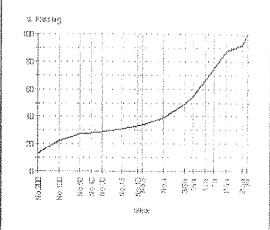
Method:

AASHTO T 27, AASHTO T 11

Drying by:

-	Sieve Size	% Passing
	3in (75.0mm)	100
	21/sin (63.0mm)	92
	1½in (37.5mm)	87
	1in (25.0mm)	75
	%іп (19.0mm)	66
	1/3in (12.5mm)	55
4	3/8in (9,5mm)	49
	No.4 (4.75mm)	39
	No.8 (2.36mm)	34
1	No.10 (2.0mm)	33
	No.16 (1.18mm)	31
1	No.30 (600µm)	29
	No.40 (425µm)	28
1	No.50 (300µm)	27
1	No.100 (150µm)	22
1	No.200 (75µm)	13

Chart



Comments

MO - Not Obtainable NP = Non Ptastic



6835 S. Escondido Sireet, Suita A. Las Vegas, Nevada 89119 3828

Tetophone (702) 897 3424

SampleID: LNS08/97398 Report No: MDD:LNS08/97396 issue No: 1

Trus report replaces all previous issues of report on 1990 (NS08/9739)

This laboratory is accredited by AASHTO The fest(s) reported have been performed in secondance with its teams of acceptation.

Coline of Guessi

Date Issued: 11/14/2008

Signed: 11/14/2008

Proctor - Modified [AASHTO T 180] Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID: LNS08/97396 Field Sample:

Date Sampled: 10/24/2008

Source: Material:

Specification: Hyrometer Sieve CBS - 06 & 08 Location:

Sampled From:

Maximum Dry Density

Method:

AASHTO T 180

Description:

Determination of the dry density/moisture content relation of a soil using modified compactive effort.

Test Results

Description	Result
Maximum Dry Density (lb/ft³)	140
Optimum Moisture Content (%)	5
Oversize Sieve 1 (mm)	4.8
Oversize Material (%)	
Method Used	D
Bulk Specific Gravity	2.600
Oversize Sieve 2 (mm)	19.0
Oversize Material 2 (%)	26.6

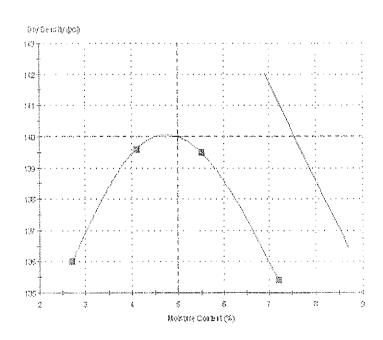
Soil Classification

Symbol GiVI

Name Silty gravel with sand

Method ASTM D 2487

Chart



Comments

WA



GeoTek, Inc. 6835 South Escondido Street Suite A Las Vegas, Nevada 89119-3832 (702) 897-1424 (702) 897-2213 www.geotekusa.com

Constant Head Permeability

Q= Quantity of Flow, taken as an average of Inflow and Outflow, ft³
L= Length of Specimen along Path of Flow, ft
A= Cross-Sectional area of Specimen, ft²
t= Interval of Time, over which the Flow Q occurs, min
h= Difference in Hydraulic Head across the Specimen, ft of water

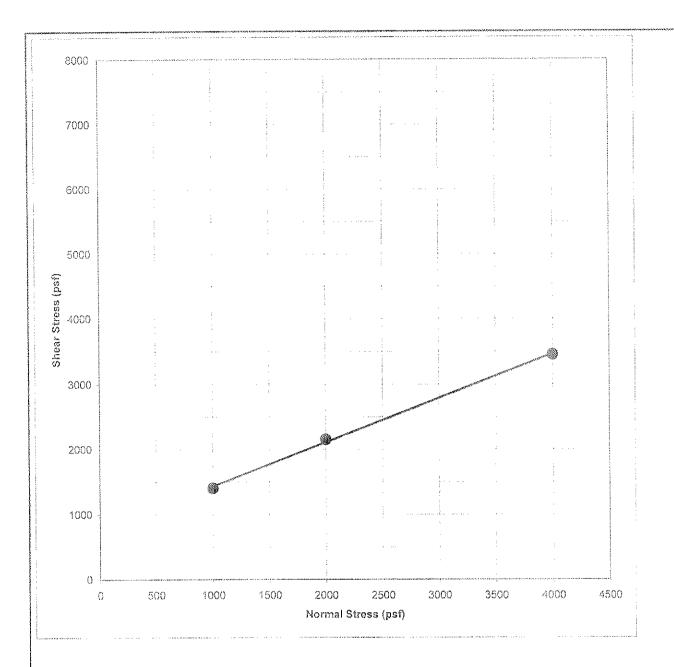
k= Hyraulic Conductivity, ft/min

input

	Hours	Minutes	Seconds	
Start Time	13	8	0	
End Time	13	9	40	
Water Outp	out during te	2000	cc = ml	
Height of s	pecimen		4.63	in
Diameter o	f mold		6.00	lin
H = top of v	water to outp	out tube	133.50	in

Output	k=QL/(Ath)		
Q=	2000 cm3	7.06E-02	ft ³
L=	11.75 cm	0.39	ft
A=	182.4147 cm2	0.1963	ft ²
t=	100 sec	1.67	min
h=	339.09 cm	11.13	ft
k (ft/min)	=	7.48E-03	ft/min
k (cm/s)=		3.80E-03	cm/sec

g haliga da sak dada daha dahagayidada Pish a g Pantas a Ro Was da Hole	
Project No	8787 -LV1
Client:	Republic Services
Project:	Sunrise Landfill
Date:	10/25/2008
Sample:	CBS - 06 & 08
GTI Lab#:	97396



	Lab#	Location	Depth	Classification		MC%	Frc. Angle	
0	97396	C8S-06&08	0	Silty Gravel w/sand	126	5	34	742
8								
A							and control of the co	



GeoTek, Inc.
6835 South Escondido Street Suite A
Las Vegas, Nevada 89119-3832
(702) 897-1424 (702) 897-2213
www.gaotekusa.com

GEOTECTERICAL ENVIRONMENTAL MATERIALS

DIRECT SHEAR TEST RESULTS

Sunrise Landfill

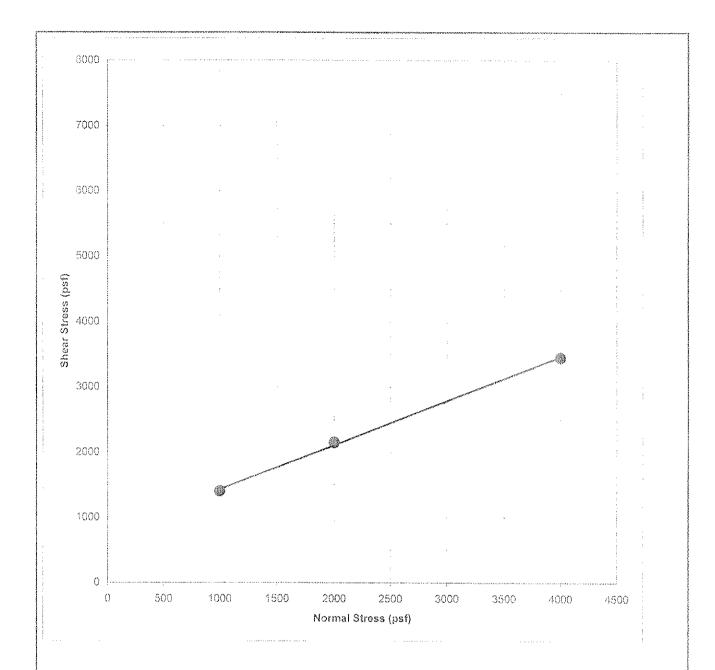
Clark County, Nevada Prepared For: Republic Services

Work Orden

8787 -LVI

Date:

Nov. 2008



Symbol	Lab#	Location	Depth	Classification	DD (pcf)	MC%	Frc. Angle	Cohesion
	97396	CBS-06&08	0	0	0	0	34	742
E	1 mary 1							
۵								



GeoTek, Inc.
6835 South Escondido Street Suite A
Las Vegas, Nevada 89119-3832
(702) 897-1424 (702) 897-2213
www.seotekusa.com

DIRECT SHEAR TEST RESULTS

Sunrise Landfill

Clark County, Nevada Prepared For: Republic Services

GEO DO HISTORIO DI SVERONAISMENT AL MARTILLO S

Work Order:

8787 -LVI

Dage:

Nov. 2008

GeoTek Laboratory Testing Request Form

																									Da	te	Sa	mţ	ole	d:		<u> </u>	40	28
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WO #·	REPublic Suasias	7-60	1									0501	4,30-	en tage	N/A									Pr	oje	cŧ	Ma	ne	ge	r;		i .	5	
Client:	0-0-0-	<u> </u>		: al 1	100	 مسور [*]																	\mathbb{R}	epe	ort	R	est	ilts	; B	у:				
Project:	- Refer for distributed to the later	- in a share of the state of th	<u>Line Sandani di</u> Line Sandani di Sandani Line Sandani di Sandani	<u>ζ</u>																													18	
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95472 95473 95474	Activity C Activity C OCATION OCATIO	DCS DCS DCS DCS DCS DCS	Location: Sample Depth	Sample Type: (LB - SB - RG)	STISOS	Moisture Content	XXXX Atterburg Limits	XXXXXX Sieve w Zuu wash	X X X Hydrometer Consolidation (in eith)	modern	lilon - Remoid			Remold	an canadaman (vi	tor)		em. Sodium Sulfate			iity-Falling Head	R-Value	Swell (in-situ)	Swell Remoid	Expansion Index	Organic Impurities	Moist./Dens. (in-situ)	Unconfined Compression	Particle Size Analysis	Егееде/Тћаw	Chlorides	Corosivity	X I A W. EAR MORE THAN 14 AG ST CON IN	X.I.
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Comments	 Special Instructio	ns:	January	. Insperience and the second	a.E.mour	.l	Lagrances	en meden		l.		on many							_,		mana da		ARMACHANIA A	otoceen 3m	man meneral s	·/manager	***************************************		uzeuzear		menusia berek	and the second		
Seekaka sa	nennekkinnelektrologiska y trigt ette appropriatelisen schelerströmeliselisen Antibilität (t. 1994).		White	- Lab	***************************************	*/10/14*7,2*1**	Yell	ow.	- Bi	Ilin	g	4/400/67		************	,	minopolyteline	Pin	k -	Pro	jec	t Ma	ana	ger		SEAS HOME	i erestrafes brit	Go	lde	nro	cl -	Tec	shn	iciar	1

White - Lab



6835 S. Escondido Street, Suite A. Las Vegas, Nevada 89119 3828

Telephone: (702) 897 1424

SampleID: LNS08/95470 Report No: MAT:LNS08/95470

issue No: 2

This report replaces all previous issues of report no WAT I NS08/05/70"



This laboratory is accredited by AASHTO The test(s) reported have been performed in accordance with its terms of accredation.

Date Issued: 4/10/2008

Signed: 4/10/2008

Limits

Aggregate/Soil Test Report

Project:

REPUBLIC SERVICES OF SOUTHERN NEVADA

SUNRISE LANDFILL Sample Details

8787-LV1

Sample ID:

LNS08/95470

Field Sample ID:

Date Sampled:

03/04/2008

Source: Material:

Specification:

Hyrometer Sieve -1

Sampling Method:

Location:

01 T Wash DCS

Particle Size Distribution ASTM C 136, ASTM C 117

Method:

% Passing

Drying by:

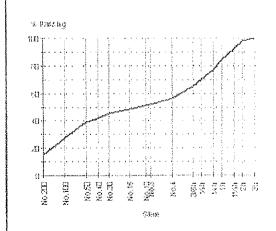
Sieve Size

3in (75.0mm)	100	
2in (50.0mm)	98	
 11/sin (37.5mm)	92	
1in (25.0mm)	84	
%in (19.0mm)	77	
15in (12 5mm)	70	
3/8in (9.5mm)	65	
No.4 (4.75mm)	56	
No.8 (2.36mm)	52	
No.10 (2.0mm)	51	
No.16 (1.18mm)	48	
No.30 (600µm)	45	
No.40 (425µm)	42	
No.50 (300µm)	39	
No.100 (150µm)	27	
No.200 (75µm)	15	

Other Test Results

Description	Method	Result	Limits			
Liquid Limit (%)	ASTM D 4316	ON	, o			
Method		One Point				
Plastic Limit (%)		NO				
Plasticity Index (%)		NP				
Sample History						
Preparation						
Group Symbol	ASTM D 2487	GM				
Group Name Silty gravel with sand						

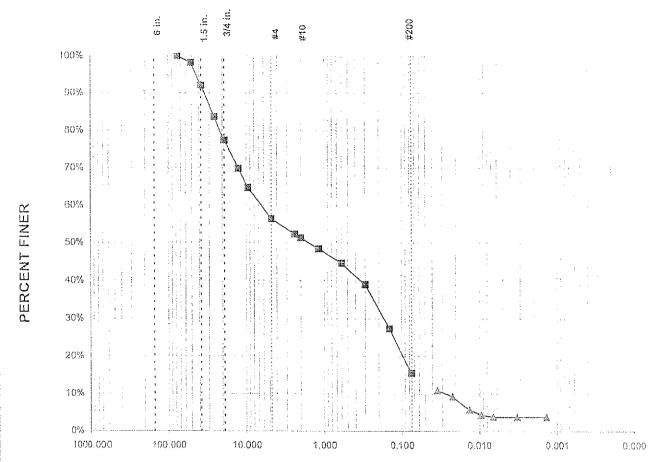
Chart



Comments

NO = Not Obtainable NP = Non Plastic





GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

% GRAVEL =	44%	$D_{85} = 27.3$	D ₁₅ =
% SAND =	41%	$D_{60} = 6.5$	D ₁₀ =
% SILT & CLAY =	15%	$D_{50} = 1.6$	C _U =
		$D_{1} = 0.2$	C -

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 04-Mar-08 Boring No.: 01 T Wash DCS

Sample No.: 95470

Material Description: Silty Gravel with Sand

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





0835 S. Fiscondado Street, State A. Fes Vegas, Nevada 89119-3828

Telephone (702) 897 1424

SampleID: LNS08/95471 Report No: MAT:LNS08/95471

Issue No: 1

This report replaces all previous assues of report no MAT ENSOR/2017 (1)

This laboratory is accordited by AASHTO The test(s) reported have been performed at accordance with its terms of accordance.

Ofworthere

estada estades. Antificial

Date Issued: 4/10/2008

Signed: 4/10/2008

Limits

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Sample Details

8787-LV1

SUNRISE LANDFILL

Sample ID:

Project:

LNS08/95471

Field Sample ID:

Date Sampled:

03/04/2008

Source: Material:

Specification:

Hyrometer Sieve -1

Sampling Method:

Location: 02 T Wash DCS

Particle Size	Distribution
---------------	--------------

Method:

ASTM C 136, ASTM C 117

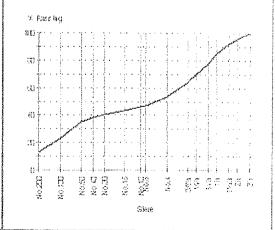
Drying by:

Other	Tact	Regulto	

Description	Method	Result	Limits
Liquid Limit (%)	ASTM D 4318	NO	
Method		One Point	
Plastic Limit (%)		NO	
Plasticity Index (%)		NP	
Sample History			
Preparation			
Bulk Specific Gravity	ASTM C 127	2.64	
Bulk Specific Gravity SSD		2,66	
Apparent Specific Gravity		2.68	
Absorption (%)		0.6	
Additional Notes			
Group Symbol	ASTM D 2487	GM	· · · · · · · · · · · · · · · · · · ·
Group Name	Silty grave	ol with sand	
Los Angeles Value (%)	ASTM C 131	27	
Test Grading		3	

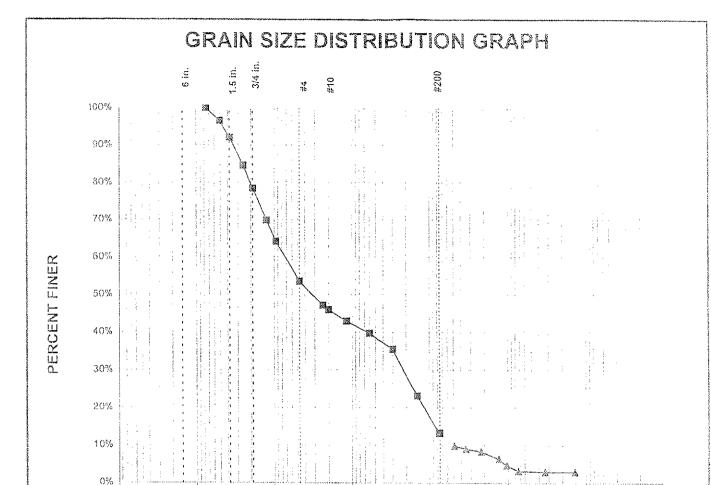
Sieve Size	% Passing
3in (75.0mm)	100
2in (50.0mm)	96
1½in (37.5mm)	92
1in (25.0mm)	85
%in (19.0mm)	78
Иin (12.5mm)	70
3/8in (9.5mm)	64
No.4 (4.75mm)	53
No.8 (2.36mm)	47
No.10 (2.0mm)	46
No.16 (1.18mm)	43
No.30 (600µm)	40
No.40 (425µm)	38
No.50 (300µm)	35
No.100 (150µm)	23
No.200 (75µm)	13

Chart



Comments

NO = No: Obtainable NP = Non Plastic



GRAIN SIZE - mm

1.000

HYDROMETER TEST SUMMARY

% GRAVEL =

100,000

47%

10.000

 $D_{85} = 26.1$

0.100

 $D_{15} = 0.1$

0.010

% SAND =

40%

 $D_{so} = 7.3$

 $D_{10} =$

% SILT & CLAY =

1000.000

13%

 $D_{50} = 3.2$

C_U =

 $D_{30} = 0.2$

 $C_{\rm C} =$

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 04-Mar-08 Boring No.: 02 T Wash DCS

Sample No.:

95471

Material Description: Silty gravel with sand

0.001

0.000

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER



6835 S. Escondido Street, Suite A. Las Vegas. Nevido 89319-3628

Telephone (702) 897 1424

SampleID: LNS08/95472 Report No: MAT:LNS08/95472

Issue No: 2

This report replaces all promoes issues of report no WALL(NS08/9547)!

This laboratory is accordited by AASH10. The test(s) reported have been performed in accordance with its terms of accordance.

Spired Earlie

Date Issued: 4/10/2008

Signed: 4/10/2008

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/95472

Field Sample ID:

Date Sampled:

03/04/2008

Source: Material:

Specification:

Hyrometer Sieve -1

Sampling Method:

Location:

03 T Wash DCS

Other Test Results

Description	Method	Result	Limits
Liquid Limit (%)	ASTM D 4318	NO	to the second second second
Method		One Point	
Plastic Limit (%)		NO	
Plasticity Index (%)		NP	
Sample History			
Preparation			
Group Symbol	ASTM D 2487	GM	·······
Group Name	Silty grave	el with sand	w

Particle Size Distribution

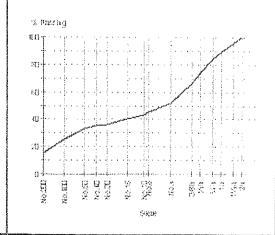
Method:

ASTM C 136, ASTM C 117

Drying by:

Sieve Size	% Passing	Limits
2in (50.0mm)	100	
1½in (37.5mm)	96	
1in (25.0mm)	89	
%in (19.0mm)	84	
½in (12.5mm)	74	
3/8in (9.5mm)	66	
No.4 (4.75mm)	52	
No.8 (2.36mm)	45	
No.10 (2.0mm)	43	
No.16 (1.18mm)	40	
No.30 (600µm)	36	
No.40 (425µm)	35	
No.50 (300µm)	33	
No.100 (150µm)	25	
No 200 (75um)	15	

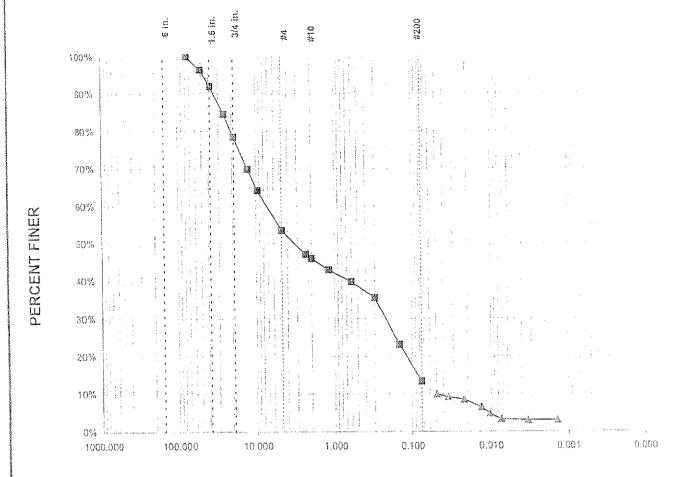
Chart



Comments

NO = Not Obtainable NP = Non Plastic





GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

% GRAVEL = 47% $D_{85} = 26.1$ $D_{15} = 0.1$ % SAND = 40% $D_{60} = 7.3$ $D_{10} =$ % SILT & CLAY = 13% $D_{50} = 3.2$ $C_U =$ $D_{30} = 0.2$ $C_C =$

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 04-Mar-08 Boring No.: 03 T Wash DCS Sample No.: 95472

Material Description: Silty gravel with sand

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





0835 S. Liscondido Street, Suite A. Las Vegas, Nevado 89119-3828

Telephone: (702) 897-1424

SampleID: LNS08/95473 Report No: MAT:LNS08/95473

Issue No: 2

This report replaces all previous issues of report no "MAT-LIVSD#795X73".

This laboratory is accredited by AASHTO The test(s) reported have been performed in accordance with its forms of accredation.

Spirit Guille

402H) F#

Date issued: 4/19/2008

Signed: 4/10/2008

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/95473

Field Sample ID:

Date Sampled:

03/04/2008

Source: Material:

Location:

Specification:

Hyrometer Sieve -1

Sampling Method:

04 T Wash DCS

Other Test Results

Description	Method	Result	Limits
Liquid Limit (%)	ASTM 0 4318	NO	
Method	0	ne Point	
Plastic Limit (%)		NO	
Plasticity index (%)		NP	
Sample History			
Preparation			
Group Symbol	ASTM 0 2487	SM	* ***
Group Name	Silty sand wit	h gravel	· · · · ·

Particle Size Distribution

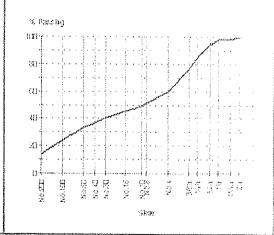
Method:

ASTM C 136, ASTM C 117

Drying by:

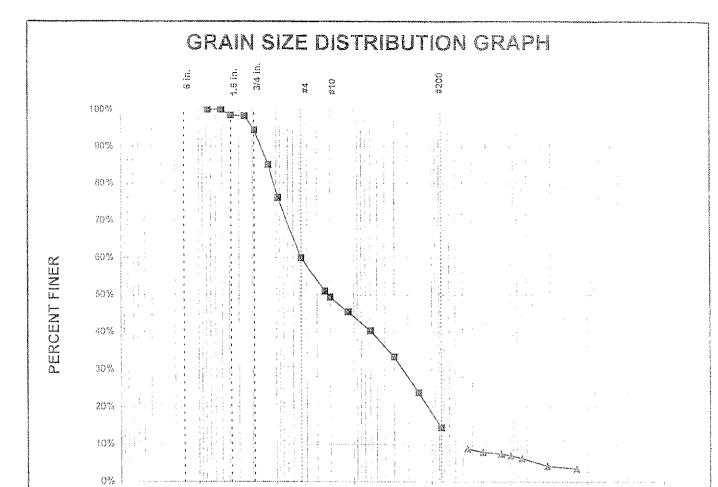
Sieve Size	% Passing	Limits
2in (50.0mm)	100	
11/2in (37.5mm)	98	
1in (25.0mm)	98	
¾in (19.0mm)	94	
⅓in (12.5mm)	85	
3/8in (9.5mm)	76	
No.4 (4.75mm)	60	
No.8 (2.36mm)	51	
No.10 (2.0mm)	49	
No.16 (1.18mm)	45	
No.30 (600µm)	40	
No.40 (425µm)	37	
No.50 (300µm)	33	
No.100 (150µm)	24	
No.200 (75um)	14	

Chart



Comments

NO = Not Obtainable NP - Non Plastic



GRAIN SIZE - mm

0.100

0.010

0.001

0.000

1.000

HYDROMETER TEST SUMMARY

% GRAVEL = 40% $D_{85} = 12.7$ $D_{15} = 0.1$

% SAND = 45% $D_{60} = 4.8$ $D_{10} =$

% SILT & CLAY = 14% $D_{50} = 2.1$ $C_U =$

 $D_{30} = 0.2$ $C_{C} =$

Project No.: Republic Service of Nevada

10.000

Project Name: Sunrise Landfill Date: 04-Mar-08

1000.000

100,000

Boring No.: 04 T Wash DCS Sample No.: 95473

Material Description: Silty sand with gravel

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





6835 S. Escondido Street State A. Las Vegas, Nevada 89119 3828

Telephone (702) 897-1424

SampleID: LNS08/95474 Report No: MAT:LNS08/95474

Issue Not 2

Limits

Tirs report replaces of previous usuas of report as WATENSORSEATA

This laboratory is accredited by AASHTO. The test(s) reported have been performed in accordance with its terms of accreaistion.

Austral Buston

Signed: 4/10/2008 Date Issued: 4/19/2008

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/95474

Field Sample ID:

Date Sampled:

03/04/2008

Source:

Material: Specification:

Hyrometer Sieve -1

Sampling Method:

Location:

05 I Wash DCS

Other 1	est	Rest	ilts
---------	-----	------	------

Description	Method	Result	Limits
Liquid Limit (%)	ASTM D 4318	NO	
Method		One Point	
Plastic Limit (%)		NO	
Plasticity Index (%)		NP	
Sample History			
Preparation			
Bulk Specific Gravity	AS TM C 127	2.58	
Bulk Specific Gravity SSD		2.61	
Apparent Specific Gravity		2.67	
Absorption (%)		1.3	
Additional Notes			
Group Symbol	• ASTM 0 2487	GP-GM	*
Group Name	Poorly graded gravel w	ith silt and sand	
Los Angeles Value (%)	ASTM C 131	24	
Test Grading		3	

Particle Size Distribution

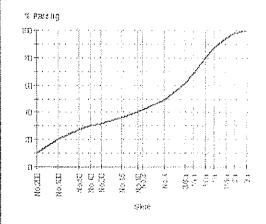
Method:

ASTMIC 136, ASTMIC 117

Drying by:

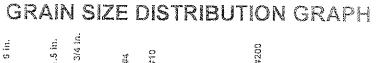
Sieve Size	% Passing
3in (75.0mm)	100
2in (50.0mm)	98
1%in (37.5mm)	94
1in (25.0mm)	87
3/4in (19.0mm)	80
1/sin (12.5mm)	68
3/8in (9.5mm)	61
No.4 (4.75mm)	49
No.8 (2,36nim)	42
No.10 (2.0mm)	40
No.15 (1.18mm)	36
No.30 (600µm)	32
No.40 (425μm)	30
No.50 (300µm)	27
No.100 (150µm)	20
No.200 (75µm)	10

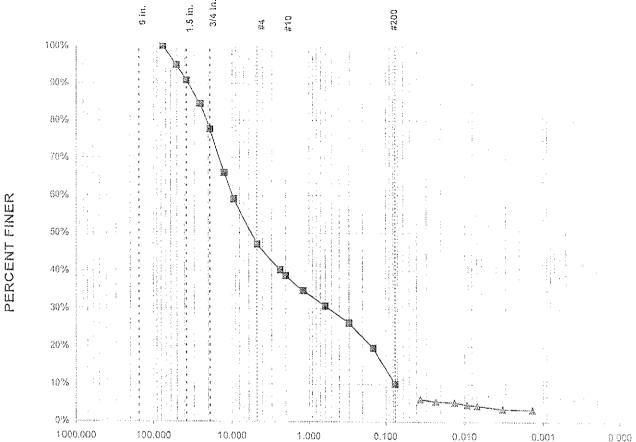
Chart



Comments

NO = Not Obtainable NP = Non Plastic





GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

% GRAVEL =

53%

 $D_{85} = 26.4$

 $D_{15} = 0.1$

% SAND = % SILT & CLAY = 37% 10% $D_{60} = 9.9$ $D_{50} = 5.7$ $D_{10} =$ C11 =

 $D_{30} = 0.5$

 $C_{c} =$

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 04-Mar-08 Boring No.: 05 T Wash DCS 95474

Sample No.:

Material Description: Poorly graded gravel with silt and sand

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





6836 S. Escondido Street, Suite A. Las Vegas, Novada 89119-3828

Telephone (702) 897 1424

SampleID: LNS08/95475 Report No: MAT:LNS08/95475

Issue Nor 2

This report replaces of previous issues of report no MATT NISOBRESTAN

This laboratory is accredited by AASHTO The test(s) reported have been performed in accordance with its terms of accordance.

Coffiered Austra

Date Issued: 4/10/2008

Signed: 4/10/2008

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

87874.V1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/95475

Field Sample ID: Date Sampled:

03/04/2008

Source:

Material: Specification:

Hyrometer Sieve -1

Sampling Method:

Location:

06 T Wash DCS

Other Test Results

Description	Method	Result	Limits	
Liquid Limit (%)	ASTM 0 4318	NO		
Method		One Point		
Plastic Limit (%)		NO		
Plasticity Index (%)		NP		
Sample History				
Preparation				
Moisture Content (%)	ASTM D 2216	7.3		
Group Symbol	ASTM D 2487	SM		
Group Name	Slity sand with gravel			

Particle Size Distribution

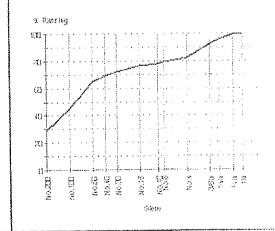
Method:

ASTMIC 136, ASTMIC 117

Drying by:

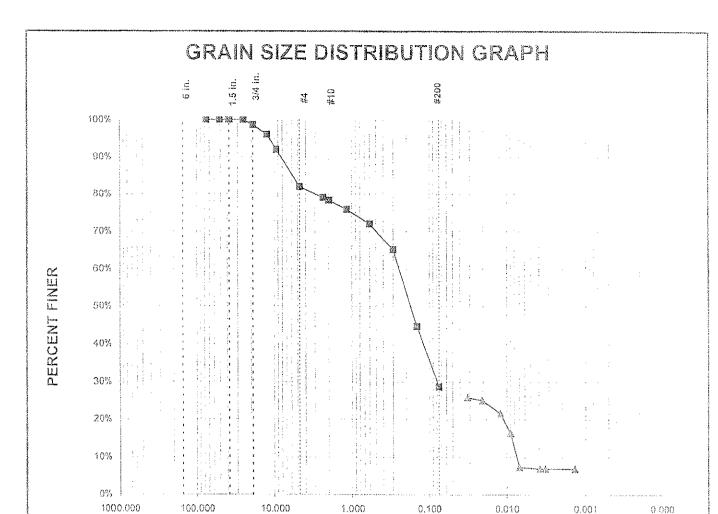
Sieve Size	% Passing	Limits
1in (25.0mm)	100	
%in (19.0mm)	99	
Win (12,5mm)	96	
3/8in (9.5mm)	92	
No.4 (4.75mm)	82	
No.8 (2,36mm)	79	
No.10 (2.0mm)	78	
No.16 (1.18mm)	76	
No.30 (600µm)	72	
No.40 (425µm)	69	
No.50 (300µm)	65	
No.100 (150µm)	45	
No.200 (75µm)	29	

Chart



Comments

NO = Not Obtainable NP = Non Plastic



GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

D ₁₅ =	$D_{85} = 5.9$	18%	% GRAVEL =
D ₁₀ =	$D_{60} = 0.3$	53%	% SAND =
C _U =	$D_{50} = 0.2$	29%	% SILT & CLAY =
Co=	$D_{20} = 0.1$		

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 04-Mar-08 Boring No.: 06 T Wash DCS Sample No.: 95475

Material Description: Silty sand with gravel

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





6835 S. Fiscondado Street, Suite A. Las Vegas, Novade 89119-3828

Telephone (702) 897 1424

SamploID: LNS08/95476

Report No: MAT:LNS08/95476

issue No: 2

This report replaces all previous insues of report or 1560 (1996) 95475

This laboratory in accredited by AASH (). The leaf(s) reported have been perferned in accordance with its terms of econociation.

Chied and

Billio Fis

Date Issued: 4/10/2008

Signed: 4/16/2003

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787 IV1

SUMRISE LANDFILL

Sample Details

Sample ID:

LNS08/95476

Field Sample ID:

Date Sampled:

03/04/2008

Source: Material:

Specification:

Hyrometer Siove -1

Sampling Method:

Location:

07 T Wash DCS

Other Test Results

Description	Method	Result	Limits	
Liquid Limit (%)	ASTM D 4318	NO	and the second second	
Method		One Point		
Plastic Limit (%)		NO		
Plasticity Index (%)		NP		
Sample History				
Preparation				
Group Symbol	ASTM D 2487	SM		
Group Name	Silty sand with gravel			

Particle Size Distribution

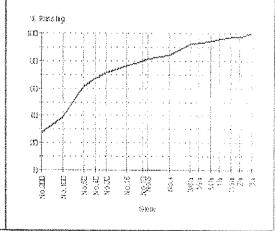
Method:

ASTM C 136, ASTM C 117

Drying by:

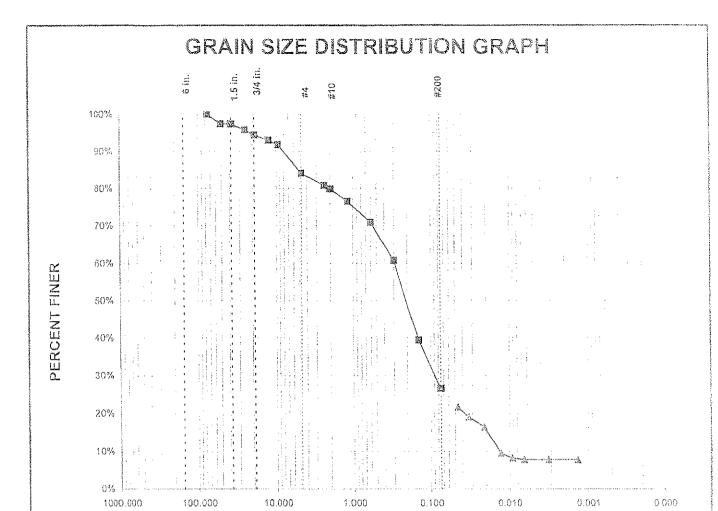
Sieve Size	% Passing	Limits
3in (75.0mm)	100	
2in (50.0mm)	97	
1½in (37.5mm)	97	
1in (25.0mm)	96	
¼in (19.0mm)	94	
1/3in (12.5mm)	93	
3/8in (9.5mm)	92	
No.4 (4.75mm)	84	
No.8 (2.36mm)	81	
No.10 (2.0mm)	80	
No.16 (1.18mm)	76	
No.30 (600µm)	71	
No.40 (425µm)	67	
No.50 (300µm)	61	
No.100 (150µm)	39	
No.200 (75µm)	27	

Chart



Comments

NO = Not Obtainable NP = Non Plastic



GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

% GRAVEL =	16%	$D_{85} = 5.2$	D ₁₅ =
% SAND =	57%	$D_{60} = 0.3$	D ₁₀ =
% SILT & CLAY =	27%	$D_{50} = 0.2$	C _U =
		$D_{30} = 0.1$	C _c =

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 04-Mar-08

Boring No.: 07 T Wash DCS

Sample No.:

95476

Material Description: Silty sand with gravel

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





Client:

Geo Tek, Inc.

6835 S. Escondido Street, State A. Las Vogas, Neveda 89119 3828

Telephone (702) 897-1424

SampleID: LNS08/95477

Issue No: 2

Report No: MAT:LNS08/95477

This report replaces all previous issues of report ne WAT CASUR/95477



This laboratory is accredited by AASHTO. The test(s) reported have been performed as accordance with its terms of accredition.

Aug Car.

Date Issued: 4/10/2008

Signed: 4/10/2008

Project: 8787 LV1

SUNRISE LANDFILL

Aggregate/Soil Test Report

Sample Details

Sample ID:

LNS08/95477

Field Sample ID:

Date Sampled:

03/04/2008

Source: Material:

Location:

Specification:

Hyrometer Sieve -1

REPUBLIC SERVICES OF SOUTHERN NEVADA

Sampling Method:

08 T Wash DCS

Other Test Results

Description	Method	Result	Limits	
Liquid Limit (%)	ASTM D 4318	NO		
Method		One Point		
Plastic Limit (%)		NO		
Plasticity Index (%)		NP		
Sample History				
Preparation				
Group Symbol	ASTM 0 2487	SM		
Group Name	Silty sand with gravel			

Particle Size Distribution

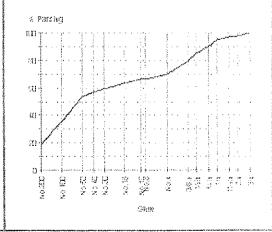
Method:

ASTM C 136, ASTM C 117

Drying by:

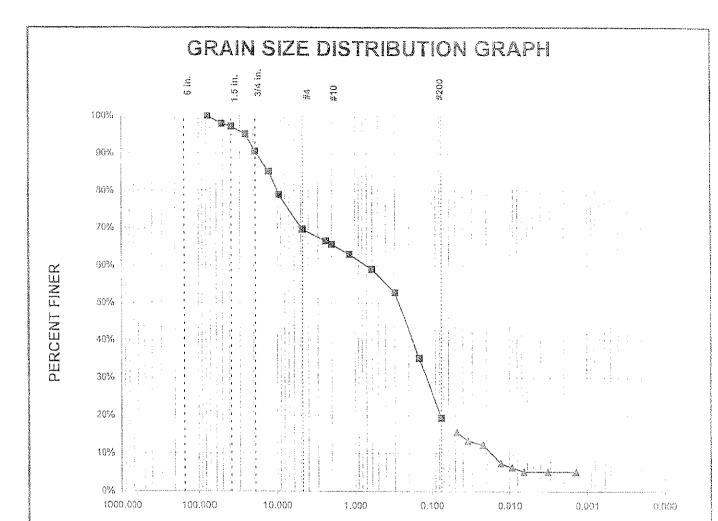
Sieve Size	% Passing	Limits
3in (75.0mm)	100	
2in (50.0mm)	98	
1½in (37.5mm)	97	
1in (25.0mm)	95	
%in (19.0mm)	90	
がin (12.5mm)	85	
3/8in (9.5mm)	79	
No.4 (4.75mm)	70	
No.8 (2.36mm)	66	
No.10 (2.0mm)	66	
No.16 (1.18mm)	63	
No.30 (600µm)	59	
No.40 (425µm)	57	
No.50 (300µm)	53	
No.100 (150µm)	35	
No.200 (75µm)	19	

Chart



Comments

NO - Not Obtamable NP = Non Plastic



GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

% GRAVEL =	30%	$D_{85} = 12.6$	D ₁₅ =
% SAND =	50%	$D_{60} = 0.7$	D ₁₀ =
% SILT & CLAY =	19%	$D_{50} = 0.3$	C ⁰ =
		$D_{**} = 0.1$	C. =

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 04-Mar-08

Boring No.: 08 T Wash DCS

Sample No.:

95477

Material Description: Silty sand with gravel

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





CRUMB TEST FOR DISPERSIBILITY OF CLAYEY SOILS

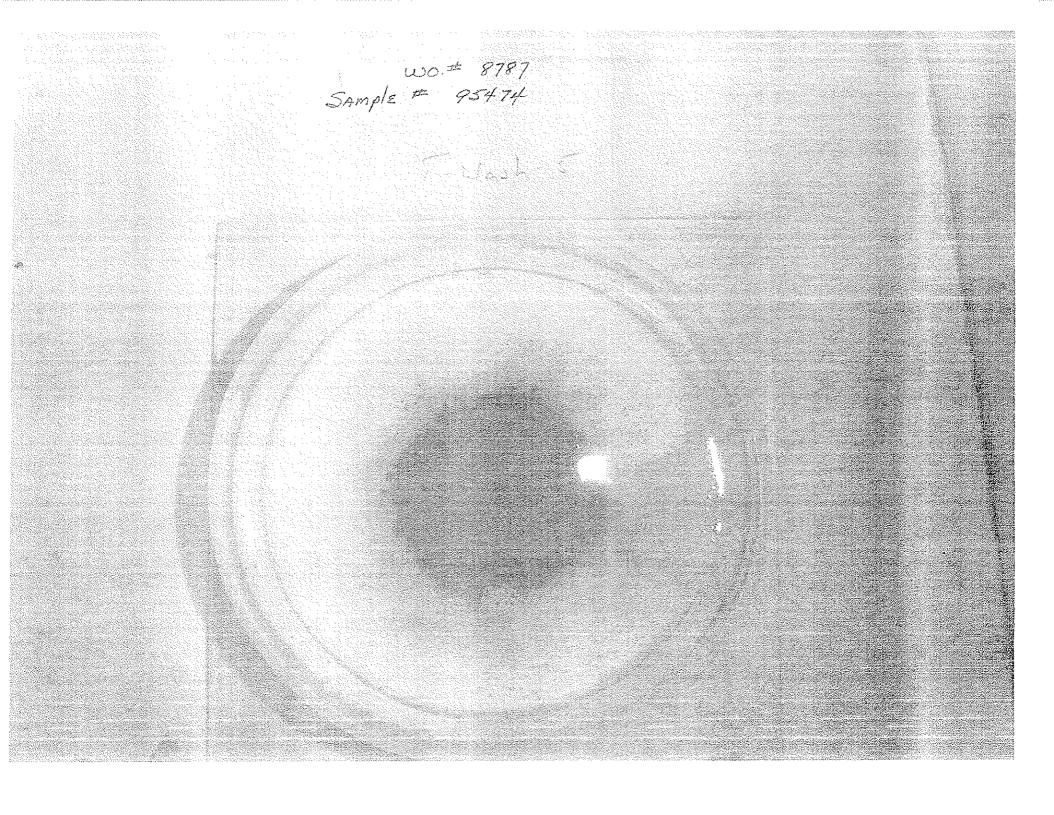
SEOTEK			ASTM D6	<u>572</u>			
Sample No.	95471 & 95474	WO#	8787		Location	ı	
Drill hole no.		- Depth		and the state of t	om oft	× Disturbed	= Undisturbe
Color		<u>.</u>	Natural Mo	sisture Conte	 ent(as received)		%
Specimen Type:	Natural irregular	rly shaped cru					····
Moisture Content:	🛪 Natural Moisture	a Air dried	l 🐇 Distilled	l water added	d to remold spe	cimen	
	0				 Distilled an 		ed
	ater temperature	•	°C		ginning of test		
Tested by:			Date tested:				· ·
Specimen Number	Dish Number	2 mii	nutes		hour	6 h	OUTS
pecanen Number	Dish Number	Grade	°C	Grade	°C	Grade	°C.
95471			21.9		20.4	The State of the S	19.1
95474			71.9	l	20.4	ì	19.1
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	isir i varriser	Grade	°C	Grade	°C	Grade	°C
95471			21.9		20.4	**************************************	i 9, i
95474		ļ	21.9	l	20.4	1	19.1

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WO# 8787 SAMPLE # 95471



GeoTek Laboratory Testing Request Form

WO#: 8787-LV/ Client: <u>KERUBIC SERVICES</u> Project: SUNRISE LANDEIUL SOIL

Date Sampled: 3-5-08
Sampled By: CLIENT
Project Manager: TUSTIN S.

Goldenrod - Technician

Зу:

	Location:							LV	DEL MISSION E	erresensi.		NV	in Market State of the State of	nga kanalahang G		CC				Administration of	HE	أسبهمونهن	at photometer	********	ant's londer 3 kg	OT	HE	R.	20111000		george - c	ومرودة والمرادة والمرادة	والمعينية المار والمان
	Activity Codes	500/94-8588861-8-0004-195-01773	an an teacher and a label of the second and a label of the second and a label of the second and a label of the	t e a de la constitue de la co	S 1	33	Š	55	Se	SER	52	83	SBR	88	310	S11	512	513	\$7.4	315	316	S. S	S13R	\$23	524	325	828	SZB	828	830	334	yppar.ma.nla-	
Laboratory ID#	ample ID & Location of Boring/Fest Pit #	Location: Sample Depth	Sample Type: (LB - SB - RG)	SOILS	Moisture Content	Atterburg Limits	Sieve w/ 200 Wash			Consolidation - Remold			Direct Shear - Remold	Proctor Cun/e	Check Pt. (Proctor)	Specific Gravity	Ohem. Sodium Sulfate	μd	Resistivity	Permeability-Falling Head	R-Value	Swell (in-situ)	Swell Remold	Expansion Index	Organic Impurities	Moist./Dens. (in-situ)	Unconfined Compression	Particle Size Analysis	Freeze/Thaw	Chlorides	Corosivity	CRUMB DEST 2	
75489	BEAZER-1 BEAZER-Z- BEAZER-Z- BEAZER-Z-3 BEAZER-Y		23	o constant		《	(45) (4)				ZZ	4777.30	ž2.										_,,,							<u> </u>			
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USE = 10 F 40 Save

Yellow - Billing

White - Lab

Pink - Project Manager



Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Geo Tek, Inc.

6835 S. Esconcado Street, Susta A. Las Vegas, Neveda 89119-3828

Telephone (702) 897-1424

SampleID: LNS08/85489

Report No: MAT:LNS88/95489

ISSUE NO: 1
This reput replaces all previous resures of respect no 2611_EMS@Relb-189:



This laboratory is accredited by AASTITO. The test(s) reported have been performed in accordance with its terms of accredation

Chirch Cons

Date Issued: 3/11/2003

Limits

Sample Details

Sample ID:

LNS08/95489

Field Sample ID: Date Sampled:

03/05/2008

Source:

Material: Specification:

Hyrometer Sieve - 1

Sampling Method:

Location:

Beazer - 1

Particle Size Distribution

Method:

ASTMIC 136, ASTMIC 117

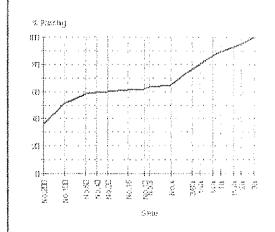
Drying by:

	Sieve Size	% Passing
	3in (75.0mm)	100
	2in (50,0mm)	95
	1½in (37.5mm)	93
1	1in (25.0mm)	89
	%in (19.0mm)	88
	1/3 (12,5mm)	80
1	3/8in (9.5mm)	76
	No.4 (4.75mm)	65
	No.8 (2.36mm)	63
	No.10 (2.0mm)	62
i	No.16 (1.18mm)	61
	No.30 (600µm)	60
	No.40 (425µm)	59
	No.50 (300µm)	53
	No.100 (150µm)	51

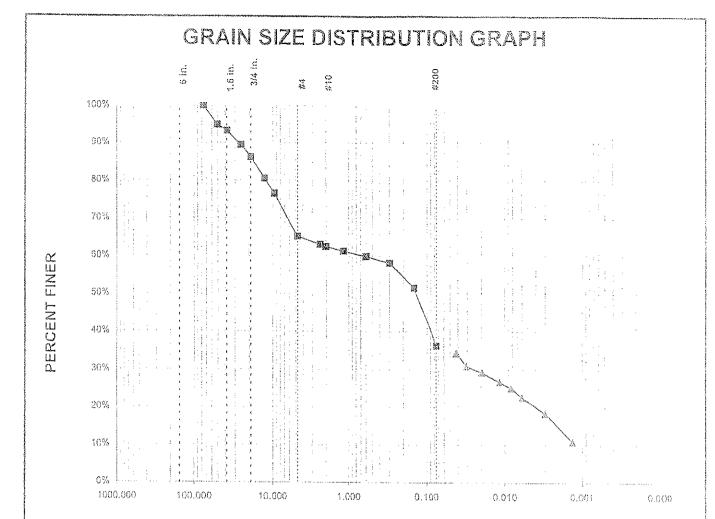
Other Test Results

2					teresur formund
	Description	Method	Result	Limits	No.4 (4.75mm)
	Liquid Limit (%)	ASTM D 4318	34		No.8 (2.36mm)
	Method		One Point		No.10 (2.0mm)
A. C.	Plastic Limit (%)		19		No.16 (1.18mm)
	Plasticity Index (%)		15		No.30 (600µm)
	Sample History				No.40 (425µm)
	Preparation				No.50 (300µm)
	Group Symbol	ASTM D 2467	GC		No.100 (150µm)
	Group Name	Clayey grave	l with sand		No.200 (75µm)
- 3					4

Chart



Comments



GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

% GRAVEL = 38

35%

 $D_{85} = 17.5$

 $D_{4\pi} =$

% SAND =

29%

 $D_{60} = 0.7$

 $D_{10} =$

% SILT & CLAY =

36%

 $D_{50} = 0.1$

C11 ==

 $D_{30} =$

 $C_{\rm G} =$

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 05-Mar-08 Boring No.: Beazer 1

Sample No.:

95489

Material Description: Clayey gravel with sand

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





Geo Tek, Inc.

6835 S. Escodido Street, Sulla A. Les Vegas, Nevada 89119-3828

Telephone: (702) 897-1424

SampleID: LNS08/95490 Report No: MAT:LNS08/95490

Issue No: 1

This report replaces all previous issues of report no MALL INSIGNATION

This laboratory is accredited by AASHTO The test(s) reported have been periorized a accordance with its terms of accordance

Office of Energy

Date Issued: 3/11/2008

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/95490

Field Sample ID: Date Sampled:

03/05/2008

Source:

Material:

Beazer - 2

Specification:

Sampling Method:

Location:

				-			
-	y	r	Þί	7	ietei	r Sievo	-1

Other Test Results

Description	Method	Result	Limits
Liquid Limit (%)	ÁSTM D 4318	33	
Method		One Point	
Plastic Limit (%)		18	
Plasticity Index (%)		15	
Sample History			
Proparation			
Group Symbol	ASTM D 2487	GC	
Group Name	Clayey grav	el with sand	

Particle Size Distribution

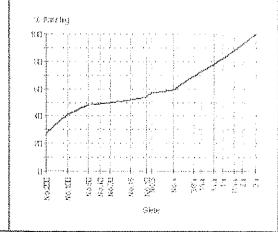
Method:

ASTM C 136, ASTM C 117

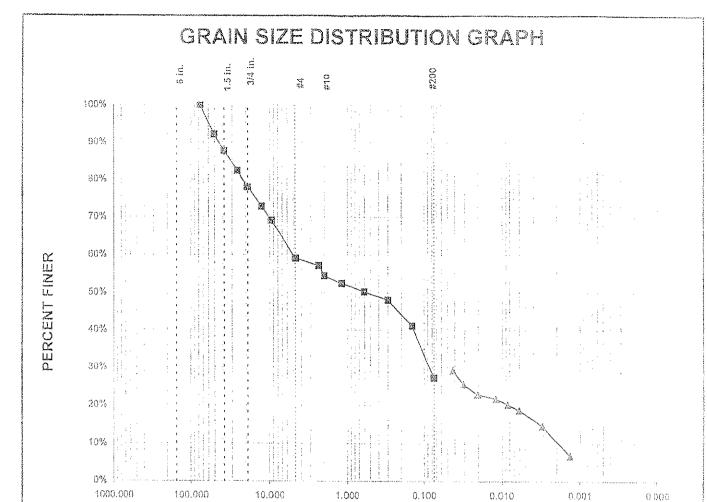
Drying by:

	Sieve Size	% Passing	Limits
	3in (75.0mm)	100	
	2in (50.0mm)	92	
	1%in (37.5mm)	88	
	1in (25.0mm)	82	
	%in (19.0mm)	78	
	½in (12.5mm)	73	
-	3/8in (9.5mm)	69	
	No.4 (4.75mm)	59	
	No.8 (2.36mm)	57	
	No.10 (2.0mm)	54	
	No.16 (1.18mm)	52	
	No.30 (600µm)	50	
	No.40 (425µm)	49	
	No.50 (300µm)	48	
	No.100 (150µm)	41	
	No.200 (75µm)	27	

Chart



Comments



GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

% GRAVEL = 41% $D_{36} = 31.0$ $D_{16} =$ % SAND = 32% $D_{60} = 5.1$ $D_{10} =$ % SILT & CLAY = 27% $D_{50} = 0.6$ $C_{U} =$ $D_{30} = 0.1$ $C_{C} =$

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 05-Mar-08 Boring No.: Beazer 2 Sample No.: 95490

Material Description: Clayey gravel with sand

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





Geo Tek, Inc.

9835 S. Escondido Street, Suite A. Las Vegas, Novado 89119-3828

Telephone: (702) 897-1424

SampleID: LNS08/95491 Report No: MAT:LNS08/95491

This report replaces all provious usues of report no MATLNS08/8540 Γ

issue No: 1

This laboratory is accredited by AASHTO The test(s) reported have been performed in accordance with its turns of accredation

Date Issued: 3/11/2008

Signed: 3/11/2008

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/95491

Field Sample ID:

Date Sampled:

03/05/2008

Source: Material:

Specification:

Hyrometer Sieve -1

Sampling Method:

Location:

Beazer - 3

Other Test Results

Description	Method	Result	Limits
Liquid Limit (%)	ASTM 0 4318	35	
Method		One Point	
Plastic Limit (%)		20	
Plasticity Index (%)		15	
Sample History			
Preparation			
Group Symbol	ASTM 0 2487	GC	
Group Name	Glayey grave	el with sand	

Particle Size Distribution

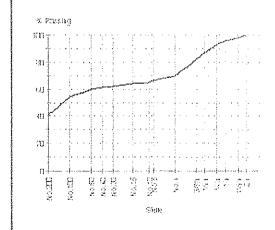
Method:

ASTM C 136, ASTM C 117

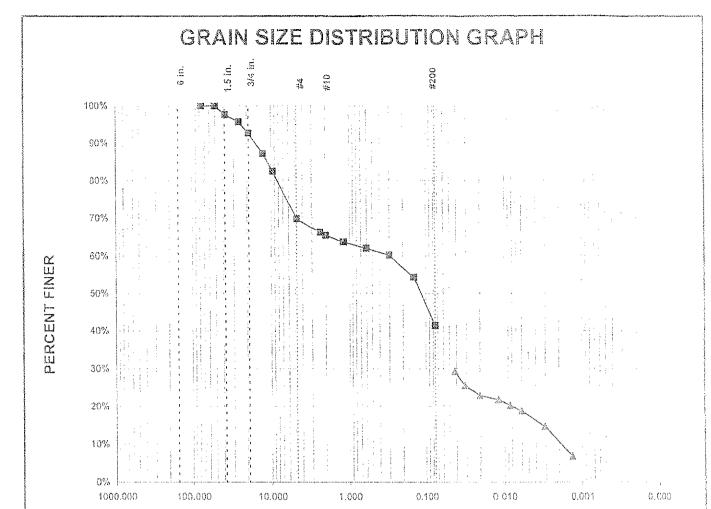
Drying by:

	Sieve Size	% Passing	Limits
	2in (50.0mm)	100	
	11/sin (37.5mm)	98	
	1in (25.0mm)	96	
	¼in (19 0mm)	93	
	1/2 (12.5mm)	87	
	3/8in (9.5mm)	82	
	No.4 (4.75mm)	70	
	No.8 (2.36mm)	66	
•	No.10 (2.0mm)	65	
	No.16 (1.18mm)	64	
	No.30 (600µm)	62	
	No.40 (425µm)	61	
	No.50 (300µm)	60	
	No.100 (150µm)	54	
•	No.200 (75µm)	41	

Chart



Comments



GRAIN SIZE - min

HYDROMETER TEST SUMMARY

% GRAVEL = 30%

 $D_{85} = 11.1$ $D_{15} =$

% SAND = 28%

 $D_{80} = 0.3$

 $D_{10} =$

% SILT & CLAY = 41%

 $D_{50} = 0.1$

C₁₁ ==

D₃₀ =

 $C_C =$

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 05-Mar-08 Boring No.: Beazer 3

Sample No.: 95490

Material Description: Clayey gravel with sand

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER





Geo Tek, Inc. 6836 S. Escondido Street, Sune A. Las Vegas, Nevaria 89119-3828

Telephone (702) 897 1424

SampleID: LNS08/95492 Report No: MAT:LNS08/95492

issue No: 1

This report replaces all previous issues of report no "FAT 4.1809/20-90".

This laboratory is accredited by AASHTO The test(s) reported have been performed in accordance with its terms of accreciation

Date Issued: 3/11/2008

-4 7. april 2. april 2002. Signed: 3/11/2002

Aggregate/Soil Test Report

Client:

REPUBLIC SERVICES OF SOUTHERN NEVADA

Project:

8787-LV1

SUNRISE LANDFILL

Sample Details

Sample ID:

LNS08/95492

Field Sample ID:

Date Sampled:

03/05/2008

Source: Material:

Specification:

Hyrometer Sieve -1

Sampling Method:

Location:

Beazer - 4

Particle Size Distribution ASTMIC 136, ASTMIC 117 Wethod:

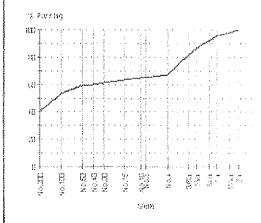
Drying by:

Oth	02	Test	\mathfrak{D}_{α}	end	l÷e
\mathbf{v}_{HI}	e.	1651	ಗಟ	Sul	เเร

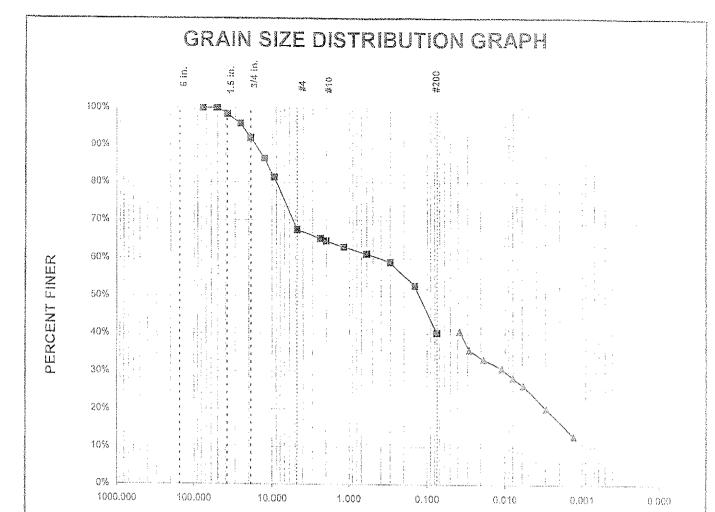
Description	Method	Result	Limits
Liquid Limit (%)	ASTM D 4318	39	
Method		One Point	
Plastic Limit (%)		19	
Plasticity Index (%)		20	
Sample History			
Preparation			
Group Symbol	ASTM D 2487	ĞĊ	
Group Name	Clayey grave	d with sand	

	Sieve Size	% Passing	Limits
	2in (50.0mm)	100	
1	1%in (37.5mm)	98	
1	1in (25.0mm)	96	
	%in (19 0mm)	92	
,	½in (12.5mm)	86	
	3/8in (9.5mm)	81	
1	No.4 (4.75mm)	67	
	No.8 (2.36mm)	65	
	No.10 (2.0mm)	65	
	No.16 (1.18mm)	63	
	No.30 (600µm)	61	
-	No.40 (425µm)	60	
	No.50 (300µm)	59	
	No.100 (150µm)	53	
	No.200 (75µm)	40	

Chart



Comments



GRAIN SIZE - mm

HYDROMETER TEST SUMMARY

% GRAVEL = 33% D_8 % SAND = 27% D_6

 $D_{85} = 11.8$ D_{45}

% SILT & CLAY = 40%

 $D_{60} = 0.4$ $D_{10} = 0.1$ $C_{U} = 0.1$

 $D_{30} = C_C =$

Project No.: Republic Service of Nevada

Project Name: Sunrise Landfill

Date: 05-Mar-08
Boring No.: Beazer 4
Sample No.: 95491

Material Description: Clayey gravel with sand

GRAIN SIZE DISTRIBUTION TEST REPORT with HYDROMETER



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G	27	\circ	***	2	54	

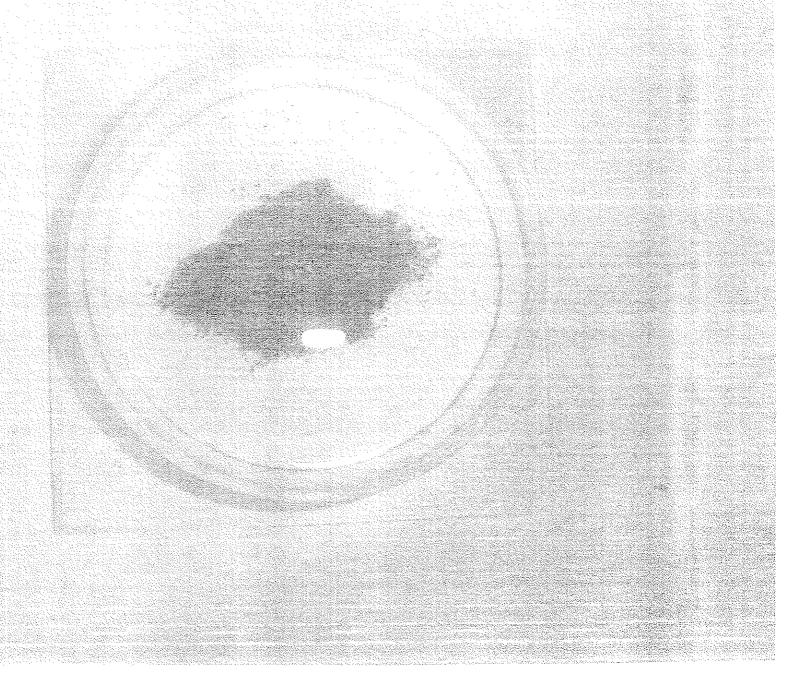
CRUMB TEST FOR DISPERSIBILITY OF CLAYEY SOILS

SEOTEK			ASTM D6	572			
Sample No.	95490	WO#	8787		Location		
Drill hole no.		Depth			om oft	= Disturbed	□ Undisturbed
Color	**************************************	-	Natural Mo	isture Contei	- nt(as received)		%
Specimen Type:	Natural irregular	Hy shaped crui	mb = Remo	olded crumb	cube		· ·
Moisture Content:	a Natural Moisture	a Air dried	a Distilled	water added	to remold spe	cimen	
Curing time	0	min	Water used	□ Distilled	c Distilled an	d demineraliz	æd
Initial v	vater temperature	21.9	°C	Time at beg	ginning of test	7:00	am pm
Tested by:	Fred Gillett		Date tested:	4/9/2008		-	
	printer and the second	2 mir	nutes	And suppressed more services constitutes and c	nour	6 h	OTIL2
Specimen Number	Dish Number	Grade	°C	Grade	°C	Grade	°C
95490	Charles have be more have been present the company and produced by the best and an emitter have been dependently and produced by the best of the company and produced by the best of the company and the compa	i i	21.9	!	20,4	}	19.1
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Specimen Number	Dish Number	2 minutes		l h	our	6 hours	
	Man Maniber	Grade	°C	Grade	°C	Grade	°C
95490	the first of the control was transported the company of the first of the control	į.	21.9	!	20,4	,	[9.1

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WO. # 8787 SAMPLE # 95490



APPENDIX D

IN-PLACE COMPACTION TESTING FOR LARGE DIAMETER CRUSHED AGGREGATE

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Appendix D
In-Place Compaction Testing for Large Diameter Crushed
Aggregate

StoughtonTP Final Corrective Measures Workplan
Project No. 131906 Final Corrective Measures Workplan
January 2009

StoughtonTP Final Corrective Measures Workplan
Project No. 131906 Final Corrective Measures Workplan
January 2009

13 British American Boulevard Latham, NY 12110-1405 PHONE: 518-783-1996

FAX: 518-783-8397

January 24, 2009

Via: e-mail

To: Mr. Steve Wall

Sunrise project Coordinator

U.S. Environmental Protection Agency, Region 9

75 Hawthorne Street (WST-7) San Francisco, CA 94105-3901

cc: Ann Murphy

Sandra Doty Cliff Anderson Mike Moran Ed Glick Alan Pinkerton

Subject: In-Place Compaction Testing for Large Diameter Crushed Aggregate

Task 4.1.6.1, Appendix A, Scope of Work for Sunrise Mountain Landfill

Sunrise Landfill Consent Decree

Las Vegas, Nevada

Dear Mr. Wall:

This letter report summarizes the in-place compaction testing that occurred on September 15, 2008, at Republic Dumpco, Inc. and Republic Silver State Disposal, Inc., d/b/a - Republic Services of Southern Nevada (RSSN) Service's Apex Regional Landfill in Las Vegas, Nevada. RSSN personnel, along with several members of RSSN's Sunrise Landfill Team, performed a field test to develop a performance specification for the erosion layer material (large diameter crushed aggregate) as required in Task 4.1.6.1 of the Scope of Work (SOW) for Sunrise Landfill. The following sections detail those activities.

Test Pad Construction

To adequately develop the performance specification, a test pad was constructed at the RSSN Services Apex Regional Landfill (Apex), located in Las Vegas, Nevada. The test pad was constructed at Apex because material and equipment to build the pad was readily available, and there was a sufficient area with a slope greater than 10 percent on which to construct it.

The test pad was constructed from material that meets the gradation requirements set forth in Attachment 7a of the U.S. Environmental Protection Agency's (EPA) SOW (Attachment 1 to this report). Attachment 7a was chosen as the governing gradation for this test pad because it represented the material needed to construct an 18-inch-thick erosion layer on a slope greater than 10 percent (worse case scenario). Material meeting the gradation was taken from a stockpile of crushed aggregate resulting from the excavation activities associated with active cell construction at Apex. In order to confirm that the material met the gradation requirements of Attachment 7a, a bulk sample of the material (approximately 830 pounds) was taken and analyzed in accordance with ASTM D5519 Test Procedure A. The results are presented in Attachment 2. The gradation

of the aggregate was compared to the required gradation range and it was determined that the material met the requirements (Attachment 3).

Approximately 120 tons of material were transferred via 6-wheeled articulated dump trucks and deposited on a slope of approximately 25 percent in Apex Cell MA 10. Photographs of the test pad are included in Attachment 4. Photographs 1 and 2 show the deposited material. Using a D8 Bulldozer, RSSN personnel constructed a test pad, approximately 18 inches thick by 40 feet wide by 80 feet long (Photograph 3). Grade stakes were placed along the perimeter of the pad to verify that the final thickness was 18 inches.

Compaction

Once the erosion layer was spread to the required thickness, the D8 bulldozer, which generates approximately 15.3 pounds per square inch (psi) of ground pressure, travelled back and forth over the material "tracking it in" (Photograph 4). After the first pass of the bulldozer, the material did not exhibit any additional consolidation as the machine passed over it successive times. After four passes of the bulldozer, several trenches were excavated through the erosion layer to inspect the matrix of the aggregate (Photographs 5 and 6). Upon inspection, the smaller particles were evenly distributed and the resulting aggregate matrix did not appear to have appreciable size separation. The matrix appeared uniform and stable, with no appreciable voids.

Issues Observed & Reported

Based on the results of the compactive effort of the D8 bulldozer, the erosion layer will be adequately compacted by a minimum of four passes of a tracked vehicle that generates a minimum ground pressure of 15.3 psi.

We propose including this performance specification in the plans and specifications for the construction of the Sunrise final cover. If you require additional information or would like to discuss the in-place testing, please contact us.

SHAW ENVIRONMENTAL, INC.

Mark A. Bergeon

Sunrise Project Coordinator

Mark Bergern

Attachments: Attachment 1 – SOW Attachment 7a

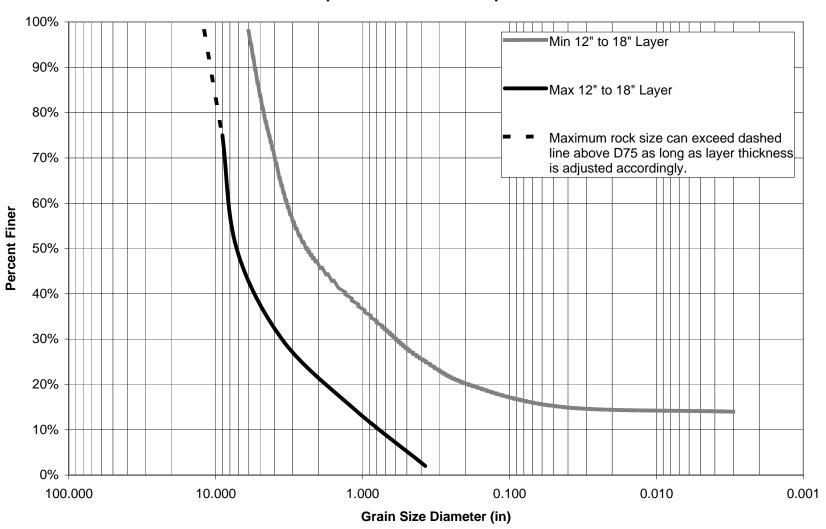
Attachment 2 - Large Diameter Aggregate Gradation Curve

Attachment 3 – Aggregate Gradation Data Plotted on Attachment 7a

Attachment 4 – Photographic Log

Attachment 1 SOW Attachment 7a

Attachment 7a
Gradation Range for 12-, 14-, and 18-inch Layer Thickness and
Slopes Greater than or Equal to 10%



Attachment 2 Large Diameter Aggregate Gradation Curve



6835 South Escondido Street Las Vegas, NV 89119 (702) 897-1424 (702) 897-2213 fax Project No. 8787-LV1

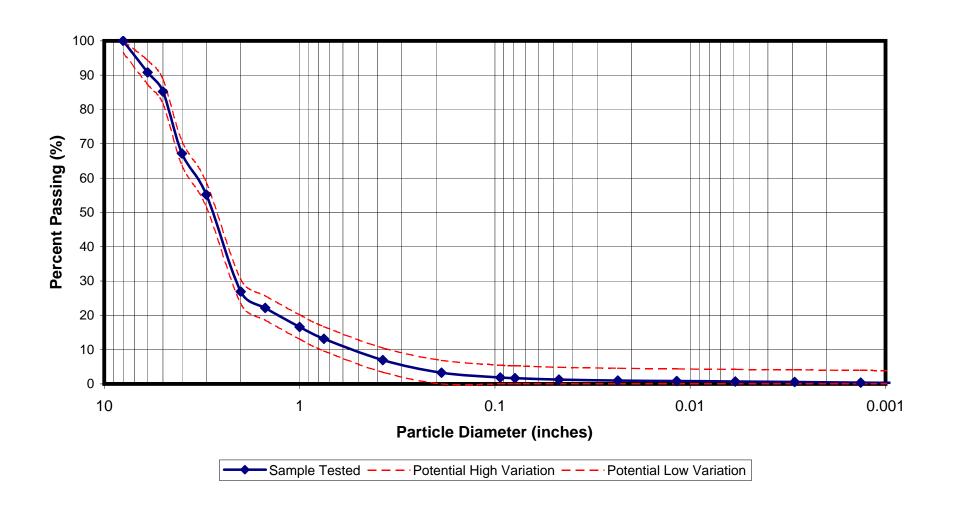
Client: Republic Services

Project Name: Sunrise Landfill

Date: 10/24/2008

Sample Desc: Stock Pile GeoTek Lab No: 97290

Sieve Analysis w/Hydrometer ASTM D422

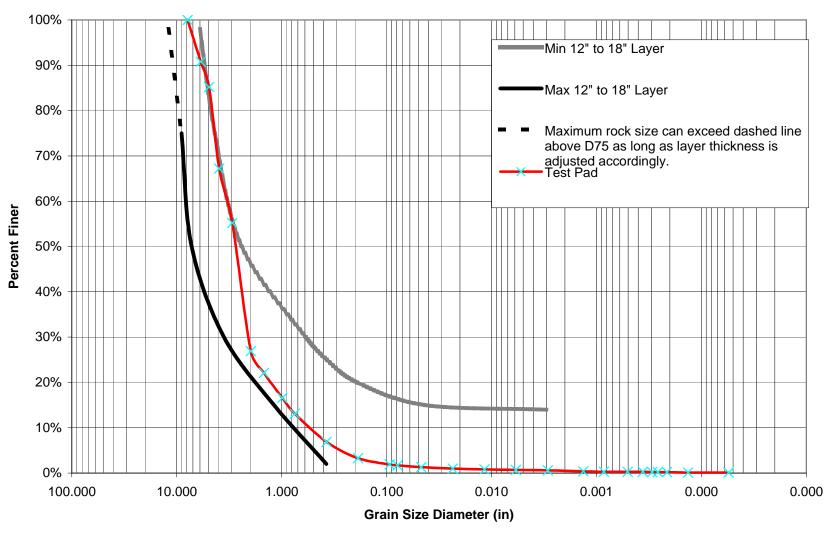


Attachment 3 Aggregate Gradation Data Plotted on Attachment 7a

Test Pad Gradation

Gradation Range for 12-, 14-, and 18-inch Layer Thickness and

Slopes Greater than or Equal to 10%



Attachment 4 Photographic Log



Photo 1
Erosion Layer Material Prior to Placement



Photo 2 Erosion Layer Material



Photo 3
Spreading Erosion Layer Material to 18" thickness



Photo 4
Compacting with Tracked Bulldozer



Photo 5
Sidewall of Trench Cut through Erosion Layer.
Note the Well Graded Matrix



Photo 6 Sidewall of Trench Cut through Erosion Layer



Photo 7 Finished Test Pad 18" Compacted Thickness