SOLID WASTE FACILITY PERMIT

Facility Number: **26-AA-0002**

1. Name and Street Address of Facility:	2. Name and Mailing Address of Operator:	3. Name and Mailing Address of Owner:
Bridgeport Landfill 50 Garbage Pit Rd. Bridgeport, CA 931517	Mono Co. Dept. of Public Works P.O. Box 457 Bridgeport, CA 93517	Mono Co. Dept. of Public Works P.O. Box 457 Bridgeport, CA 93517

4. Specifications:
a. Operation: Closed Solid Waste Disposal Site
b. Permitted Area (in acres) Total: 38.5 Disposal: 11.5

The attached permit findings and conditions are integral parts of this permit and supersede the conditions of any previously issued solid waste facility permit.

5. Approval: Jill Kearney, REHS

Approving Officer Signature

6. Enforcement Agency Name and Address:

Mono County Health Department
P.O. Box 476
Bridgeport, CA 93517

7. Permit Issued Date: 6-13-2018

8. Permit Review Due Date: 6-13-2023

9. Legal Description of Facility: The legal description of this facility is contained in the final closure plan and includes Assessor's Parcel Number(s) E1/2, NW 1/4, NE1/4, and the W 1/2, NE 1/4, NE 1/4 of S28, T. 5 N., R. 25 E., MDB&M, APN 008-060-066-000.

10. Findings:

- **a.** This permit is consistent with the standards adopted by the California Integrated Waste Management Board..
- **b.** The closure and postclosure maintenance of the disposal site is consistent with the State Minimum Standards for Solid Waste Handling and Disposal as determined by the Enforcement Agency.
- **c.** A (type of CEQA document) was filed with the State Clearinghouse (SCH #2000012122) and certified by the (Mono County Board of Supevisors) on (4/18/2000). A Notice of Determination was filed with the State Clearinghouse on (4/18/2000).

11. Prohibitions: Disposal of solid waste at this site is prohibited.

12. The following documents describe and/or restrict the closure and postclosure maintenance of this site:

Waste Discharge Requirements Order No. R6T-2009-0019	5-14-2009	APCD Permit to Operate #	n/a
Land Use and/or Conditional Use Permit	n/a		

13. Self Monitoring: The owner/operator shall submit the results of all self-monitoring programs to the Enforcement Agency in accordance with the most recently approved postclosure maintenance plan.

14. Enforcement Agency (EA) Conditions:

- **a.** The owner/operator shall comply with all applicable standards as specified in Title 27, California Code of Regulations (27 CCR) including all appropriate financial assurance requirements.
- **b.** Additional information concerning the disposal site shall be furnished upon request within the time frame specified by the EA.
- **c.** The owner/operator shall comply with the most recently approved Closure Plan and the most recently approved Postclosure Maintenance Plan.
- **d.** All proposed changes, including postclosure land uses, that would cause the design or maintenance of the disposal site to be modified shall be documented in revised closure and/or postclosure maintenance plans and may be implemented only upon approval of the revised plan(s).
- **e.** The EA shall be notified of a change in ownership during closure or postclosure maintenance in accordance with 27 CCR 21200.
- **f.**

MONO COUNTY
DEPARTMENT OF PUBLIC WORKS

FINAL CLOSURE AND POSTCLOSURE MAINTENANCE PLAN

BRIDGEPORT LANDFILL
SWIS# 26-AA-0002
WDID# 6B260004000

Mono County, California

Prepared by:

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and

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Bridgeport, California 93517
(760) 932-5440
(760) 932-5441 (Fax)

February 2008
Revised August 2008
Revised September 2008
Revised April 2009
Revised January 2016

OWNER'S CERTIFICATION

I certify under penalty of law that the January 2016 update to this document, including all attachments and supplemental information, were prepared under my direction and supervision and the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

1.4.16

Tony Dublino — Date
Solid Waste Superintendent

ENGINEER'S CERTIFICATION

The January 2016 update to this Final Closure and Postclosure Maintenance Plan was prepared pursuant to Title 27 of the California Code of Regulations under the direct supervision of the undersigned civil engineer and in accordance with generally-accepted engineering principles and practices applicable at the time of its preparation. I certify that the information contained in this report is, to the best of my knowledge, true and correct.

______________________________ Date: 2016 Jan 04

Paul Roten, PE Civil 56891
Associate Civil Engineer III
Mono County Public Works

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1.0 INTRODUCTION

On behalf of the Mono County Department of Public Works (County), SRK Consulting has prepared this Final Closure and Postclosure Maintenance Plan (FCPMP) for the Bridgeport Landfill for review and approval by the California Integrated Waste Management Board (CIWMB), the Lahontan Regional Water Quality Control Board (LRWQCB), and the Great Basin Unified Air Pollution Control District (GBUAPCD). This plan has been prepared in accordance with California Code of Regulations (CCR) Sections 21769(c), 21780, 21800 and 21830.

As stipulated in CCR, Sections 21769(c)(1), 21770 and 21800(a), the purpose of an FCPMP is to:

- Ensure the landfill is closed in a manner that protects public health, safety, and the environment;
- Provide a detailed list of the actions necessary to carry out closure and postclosure maintenance;
- Provide a basis for establishing a reasonable and accurate cost estimate for carrying out closure and postclosure maintenance for the first 30 years; and
- Provide an enforceable list and schedule of actions necessary for providing water quality protection at the unit for closure and postclosure maintenance.

This FCPMP addresses the final closure and postclosure requirements for the Bridgeport Landfill and satisfies the combined requirements of CIWMB and the State Water Resources Control Board (SWRCB), as defined in Title 27 CCR.

Mono County submitted a Preliminary Closure and Postclosure Maintenance Plan (PCPMP) prepared by Vector Engineering, Inc., in October 1995. The 1995 PCPMP was revised in April 1998 and again in February 2001. This Final Closure and Postclosure Maintenance Plan presents updated versions of relevant sections of the preliminary plans, together with revised design drawings and accompanying calculations. Design drawings are included in reduced format in Appendix A for ease of reference, while full-sized drawings are included in Appendix N. The following sections describe the Bridgeport Landfill and its closure in accordance with applicable regulations.

2.0 FACILITY AND SITE DESCRIPTION

2.1 Facility Description

The Bridgeport Landfill is a Class III municipal solid waste landfill operated by the Mono County Department of Public Works and located approximately one mile northeast of the community of Bridgeport in northern Mono County, California. The site is located on 38.5 acres of land owned by the County of Mono. The site is situated at latitude 38°16'N and longitude 119°13'W, as shown on Drawing 1 in Appendices A and N. Access to the landfill is from State Highway 182, 1.1 miles north of its junction with U.S. Highway 395. The landfill property, as described by the Public Land Survey System, occupies the E ½, NW ¼, NE ¼, and the W ½, NE ¼, NE ¼ of Section 28, Township 5 North, Range 25 East, Mount Diablo Baseline and Meridian. The property boundaries are shown on Drawing 2 in Appendices A and N.

The Bridgeport Landfill was established in 1972 to replace an open dump at the site. The landfill received municipal solid waste from the community of Bridgeport and other nearby communities for burial in a series of relatively shallow trenches (~15 feet deep) and above-grade area fills. Since 1998, Mono County operated the facility as a combined transfer station and Class III landfill. Only a small portion of the total service area waste stream, limited to construction and demolition waste, was buried on-site since 1998. In anticipation of final closure construction of the landfill portion of the site, the County stopped accepting waste for on-site burial on January 1, 2007. Municipal solid waste received at the site is currently transferred through the on-site transfer station to the County's regional landfill, the Benton Crossing Landfill. Based on available data, it is estimated that only approximately 70,000 cubic yards of waste and cover soil are actually buried at the site.

The site was granted Very Small Landfill status (as defined by Federal Subtitle D) by the LRWQCB based on a demonstration by Mono County. Pursuant to Section 20260 of Title 27, California Code of Regulations (CCR), the landfill is classified as a California Class III waste management unit.

The limits of final waste placement encompass approximately 11.5 acres of the 38.5-acre site. The footprint was recently redefined based on a test pit program completed in July 2008 with Local Enforcement Agency (LEA), CIWMB, and LRWQCB oversight and approval. The surveyed locations of backhoe trenches and the presence or absence of waste in each trench is noted on Figure B.1-1 in Appendix B.1. Remaining site areas are occupied by site access roads, borrow source excavation, environmental monitoring wells, drainage facilities, transfer station operations, and stockpiling and/or storage of recyclable materials. The revised waste footprint is depicted on Drawing 2 in Appendices A and N.

2.2 Facility Ownership and Address

The Bridgeport Landfill is owned by the County of Mono, California, and operated by the Mono County Department of Public Works. The landfill's address is 50 Garbage Pit Road, Bridgeport, California 93517. The following person can be contacted for information about the landfill during the closure and postclosure period:

Mr. Tony Dublino, Solid Waste Superintendent
Mono County Department of Public Works
Post Office Box 457
Bridgeport, California 93517
(760) 932-5440

In the event of a change of ownership, the Mono County Department of Public Works will notify the Local Enforcement Agency (LEA) within 30 days in accordance with Title 27 CCR Section 21200.

2.3 Permits and Approvals for Closure and Postclosure Maintenance

Existing permits maintained for the operation of the Bridgeport Landfill include the following:

- Solid Waste Facility Permit No. 26-AA-0002; and
- Waste Discharge Requirements No. 6-01-37.

The Preliminary Closure and Postclosure Maintenance Plan for the Bridgeport Landfill (Vector, 1995, revised 1998 and 2001) was previously approved by CIWMB and LRWQCB. Copies of the current Solid Waste Facilities Permit (SWFP) and Waste Discharge Requirements (WDR) are included in Appendices B.2 and B.3, respectively.

2.4 Climate, Geologic, and Hydrogeologic Conditions

The elevation of the Bridgeport Landfill varies from approximately 6,450 to 6,600 feet above mean sea level (amsl). Slopes on the site vary from relatively flat to 2H:1V cut slopes near the transfer station. Slopes within the waste footprint generally vary from 4 or 5 percent on the top to 4H:1V on the covered fill sideslopes. There are two ephemeral drainages that cross the site both north and south of the filled area. Native vegetation in the area consists of typical high-desert sagebrush with grass understory. The following descriptions of the climate, geology and hydrogeology of the Bridgeport Landfill vicinity include excerpts from the 1995 PCPMP (Vector, 1995) and the Calderon Water Quality Solid Waste Assessment Test Final Report (SWAT Report) (TTI, 1990).

2.4.1 Climate

Climatic conditions at the site are represented by data from the Bridgeport meteorological data station (Station ID No. 041072), which is located approximately 1.6 miles south of the Bridgeport Landfill. The period of recorded data available for the Bridgeport station spans 59 years from 1948 through 2007. Data for the Bridgeport

Station was obtained from the Western Regional Climate Center website (www.wrcc.dri.edu).

Based on the available data, the climate is semi-arid with an average annual precipitation of approximately 9 inches. Average daily temperatures at the Bridgeport station range from a high of 83 degrees Fahrenheit (ºF) in July to a low of 9ºF in January. Recorded daily temperatures at the station range from a high of 98ºF in July 1994 to a low of -31ºF in January 1982. Average monthly temperature and precipitation for the period of record at the Bridgeport station are summarized in Table 2.1.

According to figures reported in the Waste Discharge Requirements for the site, average annual evaporation in the area is approximately 60 inches. This agrees with monthly evaporation data obtained from the Topaz Lake, California meteorological station, selected as the closest and most representative site with available evaporation data. Measured average annual pan evaporation at the Topaz Lake station is 69 inches for the period of record from 1957 to 2005. The Topaz Lake station is situated at an elevation of approximately 5,200 feet amsl, similar to the elevation at the Bridgeport Landfill (~6,450 feet amsl).

Average monthly climatic data are summarized in Table 2.1.

TABLE 2.1. Summary of Climatic Conditions in Bridgeport, California

	Temperature (degrees F)[1]			**Precipitation[1]**	**Evaporation[2]**
Month	**Avg.**	**Max.**	**Min.**	**(inches)**	**(inches)**
January	25.7	42.4	9	1.39	0.0
February	28.9	45.5	12.2	1.49	0.0
March	34.9	51.3	18.4	0.91	0.0
April	40.6	58.7	22.5	0.42	7.2
May	48.2	67.1	29.4	0.49	9.1
June	56	75.9	36.1	0.53	10.9
July	61.7	83.3	40.1	0.5	12.7
August	60.2	82.2	38.3	0.46	11.6
September	53.3	75.9	30.8	0.46	8.8
October	44.7	67.1	22.4	0.28	5.9
November	34.9	53.2	16.5	0.93	2.8
December	27	44.3	10.1	1.13	0.0
TOTAL				**8.99**	**69.0**
Period of Record	1948-2007			1948-2007	1957-2005
NOTES	[1] Temperature and precipitation data from Bridgeport meteorological data station. [2] Evaporation data from Topaz Lake at elev. 5200 ft amsl.				

2.4.2 Regional Geology

The Bridgeport Landfill is situated on the eastern edge of the Bridgeport Valley alluvial basin. The basin is bordered on the north, west and south by the glaciated valleys and moraines of the Sierra Nevada, and on the east by the volcanic rocks of the Bodie Hills and Sweetwater Mountains. The alluvium which forms the valley floor and underlies the landfill varies in thickness from approximately 50 to 125 feet and is comprised of sand and gravelly loams characteristic of alluvial deposition.

The landfill is also located within the Eastern California Shear Zone, a broad zone of approximate north-trending strike-slip and normal faults distributed across the Owens Valley, the Mohave Desert, western Nevada, and northeastern California (Petersen et al., 1996). Siddharthan et al. (1993) identified a relatively wide fault zone west of the landfill as the Bridgeport Valley Fault Zone. The largest fault within this zone was identified by Jennings (1994) as the Robinson Creek Fault and is more than one mile west of the landfill site. According to Jennings (1994), the fault zone is considered to have been active in Holocene time.

2.4.3 Local Geology

The Bridgeport Landfill is situated on an alluvial plain of gravel, sand, silt, and clay, which slopes westerly toward the Bridgeport Reservoir. Surface and subsurface soils at the site consist of clayey gravel and gravelly sand with cobbles. Geologic logging completed during two episodes of monitoring well installation indicate alternating layers of clayey gravel, gravelly sand with cobbles, silty sand, and gravelly clay and silt to at least 112 feet below ground surface. Monitoring well construction logs are included in Appendix C.1, together with laboratory test results of on-site and nearby soil borrow sources in Appendix C.2.

2.4.4 Hydrogeology and Hydrology

Groundwater beneath the Bridgeport Landfill is found in unconsolidated sediments at approximately 45 to 50 feet below ground surface (bgs, based on quarterly reporting of ground water levels). Water levels encountered during quarterly monitoring indicate depths to groundwater below ground surface of 35.2, 23.6 and 55.1 feet bgs in monitoring wells MW-1, MW-2 and MW-3, respectively. By drawing a cross section between the wells and taking into account the existing landfill topography, there are 30 to 39 feet between the base of the waste and groundwater, assuming a burial depth of 15 to 20 feet bgs. Refer to Appendix C3 for a schematic cross section of the landfill showing the estimated separation between waste and groundwater using groundwater depth data from the 2008 Annual Evaluation Monitoring Program Report.

Groundwater levels fluctuate seasonally in response to precipitation levels and the level of the Bridgeport Reservoir. Groundwater beneath the site flows generally from east to west toward the Bridgeport Reservoir at a hydraulic gradient of approximately 0.040 feet per foot. Highly permeable deposits provide lateral hydraulic continuity between the site and adjoining areas (LRWQCB, 2001). Drawing 2 in Appendices A and N shows the locations of the monitoring wells relative to the landfill boundary.

There are no perennial surface waters in the landfill vicinity. Two ephemeral drainages cut across the alluvial fan north and south of the waste footprint. The nearest perennial surface waters are the Bridgeport Reservoir located across Highway 182 to the west of the site and Aurora Canyon Drainage (a tributary of the East Walker River) approximately one-half mile to the southeast. The Bridgeport Reservoir impounds all of the surface water flow of the East Walker River and its tributaries, which have a watershed area of greater than 360 square miles (Metcalf & Eddy, 1990).

The Federal Emergency Management Agency has not prepared a Flood Insurance Rate Map for the landfill vicinity. These maps typically define the boundary of the 100-year floodplain. Mono County Public Works has developed a map using the County's GIS database that shows the 100-year flood level for the Bridgeport Reservoir. Note that the flood level is controlled by the outlet structure at the reservoir's dam, and is therefore a maximum level independent of storm intensity and duration. A copy of the floodplain map developed by Public Works is included in Appendix C.4 for reference.

2.5 Control and Monitoring Systems

Mono County currently operates monitoring and control systems at the Bridgeport Landfill which must be maintained throughout closure and the postclosure maintenance period. The following sections describe each of the monitoring and control systems in effect at the landfill site at the time this plan was prepared.

2.5.1 Drainage Control

Drainage control features at the site currently consist of various diversion berms and drainage channels installed to protect filled and active areas of the site. The closure design presented in the Final Closure Plan in Section 3.0 calls for the construction of an upgradient run-on diversion channel and internal runoff control channels designed to collect and control runoff resulting from a 100-year, 24-hour storm event. Stormwater best management practices (BMPs) will be employed until the establishment of vegetation to prevent the off-site migration of sediment–laden stormwater flows. A detailed description of the system design is included in Section 3.4.6, with supporting design documentation in Appendix D.

2.5.2 Landfill Gas Monitoring

Since the site has been granted Very Small Landfill status by the LRWQCB (2001), subsurface landfill gas monitoring was not required during the operational life of the landfill. To facilitate landfill gas monitoring during closure and postclosure of the waste management unit, a network of gas probes were installed around the site perimeter in October 2007. Six gas monitoring wells with single or multiple probes (GW-1 through GW-6) were installed around the waste footprint and along the southern property boundary. GW-3 returned consistent and uncharacteristic methane readings, and was thought to be installed very near waste. A replacement well, GW-3R was installed in October 2011 and returned similar readings. Following coordination with CalRecycle, GW-7 was installed in the BLM easement to the east of the site to serve as a new compliance point with a reasonable buffer to waste. Landfill gas well construction logs are included in Appendix C.1. Well locations are shown on Drawing 3 in Appendices A and N. The gas monitoring system was designed by a registered civil engineer and approved by the CIWMB.

Gas monitoring during the postclosure maintenance period will involve quarterly gas surveys to detect the presence of methane in the monitoring probes. At the compliance point wells GW-1, GW-2, GW-4, GW-5, GW-6, and GW-7, the concentration of methane gas will be monitored and will not exceed five percent by volume in air. Sampling for trace gases is not proposed at this time, but may be recommended should high levels of methane be detected or at the direction of the LEA, CIWMB, LRWQCB, or GBUAPCD. Monitoring of the probes will continue on a quarterly basis throughout the postclosure maintenance period. Sampling frequency may increase if methane is detected at levels greater than five percent at the property boundary. A decrease in the monitoring frequency may be proposed by Mono County if methane is not detected for an extended time during the postclosure maintenance period.

The design of the gas monitoring system is discussed in further detail in Section 3.8.2, and procedures for the postclosure landfill gas monitoring program are discussed in detail in Section 4.3.2.

2.5.3 Groundwater Monitoring Program

The Bridgeport Landfill currently has five wells for monitoring groundwater quality (wells MW-1 through MW-5). Up-gradient well MW-3 monitors groundwater that flows into the landfill area from the hydraulically higher portion of the drainage basin, and therefore provides background chemistry for constituents of concern. The down-gradient wells (MW-1, MW-2, MW-4, and MW-5) monitor groundwater that has passed beneath the waste footprint, providing an early warning in the event of a contaminant release from the landfill. Monitoring wells MW-1, MW-2 and MW-3 were installed in July 1989 under the supervision of Toxic Technology, Inc. Wells MW-4 and MW-5 were installed in October 2007 under the supervision of SRK Consulting.

In November 1996, a sampling and analysis plan (Vector, 1996) was submitted to the California Water Quality Control Board, Lahontan Region (LRWQCB) and, in January 1997, Water Quality Protection Standards (WQPS), including concentration limits for the Constituents of Concern (COC) and Monitoring Parameters specified in the amended WDRs, were established for the facility (Vector, 1997b). Subsequently, in March 1997, an Evaluation Monitoring Program (EMP) was developed for the Bridgeport Landfill (Vector, 1997a) in response to low, yet quantifiable, concentrations of dichlorodifluoromethane (Freon-12) detected in compliance wells MW-1 and MW-2.

The EMP for the Bridgeport Landfill is comprised of three phases. Phase I consisted of intensified ground water quality monitoring during a two-year evaluation period. During the evaluation period, ground water samples were collected from facility monitoring wells (then MW-1, MW-2 and MW-3) on a quarterly basis. The samples were analyzed for five indicator parameters (pH, total dissolved solids, chloride, nitrate, and sulfate) and for the 75 VOCs listed in Appendix II of 40 CFR (Appendix II). In the event that continued evidence of leachate release was detected during this monitoring period, Phase II and possibly Phase III of the EMP could be implemented at the direction of the Lahontan Board. Phase II would entail establishing a new point of compliance that has not been impacted down-gradient from the facility. Phase III would consist of the development and implementation of corrective measures to mitigate and/or remediate landfill-related impacts to ground water.

Ground water samples collected in December 1998 represented the culmination of the initial phase of the two-year EMP process. The 1998 annual ground water monitoring report (Vector, 1999) contained a discussion of the results of the initial phase and recommended a one-year extension to the EMP (through the end of 1999). Subsequent annual reports (Mono County, 2000, 2001, 2002, 2003, 2004, 2005, 2006 and 2007), citing very low levels of contamination and overall hydrologic stability, recommended further one-year extensions of Phase I (cumulatively through the end of calendar year 2007).

Groundwater sampling and testing are currently being performed on a quarterly basis in accordance with the 2001 Waste Discharge Requirements (Board Order Number 6-01-37) established by the LRWQCB and Title 23 CCR Chapter 15, Section 2581(c)(3). LRWQCB proposes that groundwater monitoring activities continue throughout the postclosure period on a quarterly basis unless the results of groundwater monitoring indicate that the site has stabilized, and either a reduced monitoring frequency or a shortened postclosure maintenance period is approved by the appropriate governing agencies.

2.5.4 Leachate Monitoring Program

Landfill design and construction did not incorporate a leachate collection and recovery system. As a result, leachate monitoring is not possible and will not be performed as part of postclosure monitoring of the facility.

2.6 Land Use

The County of Mono owns the property upon which the Bridgeport Landfill is situated. The property has a land use designation of PF, for public or quasi-public facilities. This designation allows development for a number of public uses, including landfill disposal. The land use designations in the vicinity of the landfill are illustrated on the land use zoning map presented as Figure 21 in the Land Use Element of the October 2007 Mono County General Plan. A copy of the map is included in Appendix E.

The land in the vicinity of the disposal site is a combination of private property, Native American-owned land, and publicly-owned land administered by the BLM. Private property includes residences and commercial establishments in the community of

Bridgeport. The Bridgeport Indian Colony land is owned by the Paiute-Washoe Tribe. The BLM lands in the region are zoned as RM, or resource management, and are used predominately for recreation, livestock grazing, and open space. Much of the land outside of the community of Bridgeport is zoned as OS or AG, for open space or agricultural, respectively. A portion of the town of Bridgeport is located within one mile of the landfill and is zoned LR, or "low density residential." Several residences, Bryant Field Airport, sewage disposal ponds, baseball fields, and a cemetery are located within one mile of the landfill.

Postclosure use of the landfill property is anticipated to include the continued operation of the transfer station in its current location, in addition to the use of the area adjacent to the transfer structure for temporary stockpiling and management of diverted waste. Specific postclosure land use has not been proposed over any filled areas. It is anticipated that the remainder of the landfill site will remain as open space, but will retain the PF land use designation during and following the postclosure period.

The final cover will be constructed to blend with the surrounding topography and will be seeded with native vegetative species. Any future planning change for postclosure land use of the property will be implemented in accordance with Title 27 CCR, or applicable regulations in effect at that time.

3.0 FINAL CLOSURE PLAN

3.1 General

This Final Closure Plan for the Bridgeport Landfill has been prepared to address federal and state design standards and Final Closure Plan requirements for Class III Landfills. Design requirements are stipulated in Section 258.60 of Federal Subtitle D and Sections 20950 through 21200 of Title 27 CCR. Final Closure Plan requirements are stipulated in Section 258.61 of Federal Subtitle D and Sections 21769 and 21800 of Title 27 CCR.

Sections 1 and 2 provided a description of the Bridgeport Landfill and presented some of the requirements of a Final Closure Plan. Specific closure issues addressed in this section include the following:

- The maximum extent of the landfill requiring closure;
- Closure activities and schedule;
- Closure design;
- Monitoring systems; and
- Closure cost estimate.

3.2 Maximum Extent Requiring Closure

The existing 11.5-acre waste footprint is the maximum extent of the landfill that will require closure construction. The horizontal limits of waste fill are illustrated on Drawings 2 and 3 in Appendices A and N. Final proposed site grades are presented on Drawing 3.

3.3 Closure Activities and Schedule

Current plans call for the completion of closure construction at the Bridgeport Landfill by the end of 2008. Gas monitoring well installation was completed in October 2007. During and after closure construction, waste will continue to be accepted at the site via the transfer station. Landfill customers have been previously notified of the County's intention to cease landfill operations and permanently close the landfill portion of the facility. In anticipation of this, Mono County stopped accepting was for on-site burial as of January 1, 2007. A sign notifying the public has been posted at the site entrance consistent with regulatory requirements. The sign, which states the date of landfill closure and the alternate waste disposal point (the transfer station), will remain in place for the duration of closure construction. A notification of site closure has been advertised in the local newspaper in anticipation of the initiation of final closure activities. Notices have also been mailed to solid waste account-holders who use the facility, and handed out to customers at the gatehouse.

Site closure activities will include the following:

- Repair and/or relocate, where required, existing barbed-wire perimeter fencing to control access to the landfill and transfer station during the postclosure period;
- Posting a sign providing a phone number to call in case of an emergency and stating the location where a copy of the final closure and postclosure maintenance plan may be reviewed and/or obtained;
- Removal of all structures, stockpiles, and appurtenances that will not be used as part of the transfer station operation;
- Construction of an upgradient run-on diversion channel;
- Regrading the existing covered landfill surface, including moisture conditioning and compaction to specifications;
- Placement of the final cover system to the minimum final cover layer thickness and specifications;
- Installation of internal runoff control drainage channels;
- Verification of final cover thickness;
- Installation of survey monuments and final cover vents;
- Seeding the final landfill surface;
- Placement of 1 to 3 inches of wood chips to provide erosion protection; and
- Completion of a final as-built topographic survey of the landfill.

At the conclusion of closure construction, an as-built report will be prepared and submitted to CIWMB, LRWQCB and GBUAPCD to certify that the construction was completed in accordance with the approved closure plan.

3.4 Closure Design

The primary design components of closure construction for the Bridgeport Landfill include final grading, final cover construction, and run-on and runoff control system construction. The following sections address specific design considerations for each of these components.

3.4.1 Final Grading Plan

The final grading plan of the landfill is designed to accommodate the predicted future settlement of the landfill and to minimize potential stormwater runoff flow velocities over the final surface of the landfill and in the runoff control channels. The closure design is illustrated on Drawings 3, 4 and 5 in Appendices A and N. The existing site topography depicted on Drawing 2 will be smoothed and regraded as shown on Drawing 3. Regrading will extend beyond the existing waste footprint to blend with surrounding topography while maintaining a minimum grade of three percent on all slopes. Low-lying areas will be filled and the existing interim cover layer will be scarified to a minimum depth of 12 inches, moisture conditioned, and recompacted. An additional 12 inches of native soil will be placed in loose lifts not exceeding 8 inches in thickness and compacted over the recompacted interim cover layer to form the minimum 24-inch foundation layer for the final cover required by 27 CCR Section 21090(a)(1). Both the upper 12 inches of the existing interim cover layer and the additional 12 inches required to form the foundation layer will be compacted to a minimum of 90 percent of maximum dry density at ±2 percent of optimum moisture content as determined by modified Proctor testing (ASTM D1557).

As illustrated on Drawing 3, the final grading plan incorporates smooth slopes without angular slope transitions, gently sloping internal drainage control channels, an upgradient run-on diversion channel and internal access roads to facilitate postclosure access to all areas of the final cover and environmental monitoring systems. The final regraded landfill surface will generally slope downward from northeast to southwest.

3.4.2 Final Cover System

Mono County originally proposed the use of a GCL in the PCPMP due to a general lack of low-permeability soil material suitable for infiltration layer construction. In addition, Mono County previously considered the use of a monolayer soil cover, but discarded the idea due to the large proportion of annual precipitation occurring as snow and the inability of available soils to limit vertical migration during spring snow melt.

During the final closure design process, Mono County identified four potential soil borrow sources for construction of the native soil layer both over and under the GCL. The “Pit Behind Shop” sample was obtained from a borrow pit near the County’s road shop on Jack Sawyer Road south of the landfill. The “Green Pit” and “108 Pit” samples were obtained from borrow pits located off U.S. Highway 395 approximately six miles south and 17 miles north of Bridgeport, respectively. The fourth potential borrow source is located on the landfill property immediately north of the transfer station as depicted on Drawing 3 in Appendices A and N. Soil samples from each site were tested for grain size distribution, Atterberg limits, and GCL chemical compatibility. Laboratory test reports are included in Appendix C.2.

With respect to GCL compatibility, a recent study by Meer and Benson (2004) provides a comprehensive look at the effects of wet-dry cycles on GCL performance, and has become the benchmark for the industry. The results of the study indicate a relationship between wet-dry cycling and soil chemistry, in particular the RMD factor, defined as the ratio of monovalent cations to divalent cations. The RMD factor is effectively a measure of the potential for cation exchange between the soil and the GCL. Soils with an RMD of less than $0.5M^{1/2}$ are much more likely to result in a decrease in GCL performance due to the combined effects of cation exchange and wet-dry cycles. GCLs in contact with soils with an RMD greater than $0.5M^{1/2}$ are not affected by wet-dry cycles. RMD values for each of the four identified potential borrow soils were less than $0.5M^{1/2}$, indicating they could contribute to a reduction in GCL performance after repeated wet-dry cycles. Laboratory test results are included in Appendix C.2.

Based on the results of GCL compatibility testing, Mono County decided to abandon the original final cover design proposed in the PCPMP and, based on the lack of available low-permeability soils in the vicinity, decided to pursue the development of a geosynthetic final cover layer. Based on available information and the current state of the art in geomembranes, Mono County proposes to employ a final cover layer comprised of 60 mil linear low-density polyethylene (LLDPE) Agru Super Gripnet ®

overlain by 8 ounce-per-square-yard geotextile for drainage. Super Gripnet ® is a three-dimensional geomembrane with studs on one side to promote drainage and spikes on the other to increase friction at the soil interface. Product information is included in Appendix F for reference. The geotextile will be heat-burnished to increase rigidity and placed over the studded side of the Super Gripnet ® to provide for drainage of the overlying soil layer. The overlying soil layer will be comprised of a minimum of 18 inches of compacted native soil placed in loose lifts not exceeding 12 inches in thickness and compacted to a minimum of 85 percent of maximum dry density at optimum moisture content (per ASTM D1557).

Following final cover placement and finish grading, the cover layer will be lightly scarified and seeded with a native seed mix recommended by the Bureau of Land Management and designed to limit rooting depth to an average of 18 inches or less. The final cover area will then be covered by one to three inches of wood chips generated and stockpiled through on-site waste diversion activities performed at the Bridgeport Landfill and other Mono County landfills. The wood chip layer will serve to protect the final cover from the effects of wind and water erosion and rain drop impact while allowing seed germination and plant growth. Mono County has successfully used wood chips for erosion protection at several of their existing landfill and transfer station sites. In all cases, the feedstock for wood chips to be used in final cover construction will be clean green material generated through shredding trees, tree limbs, brush, or clean unpainted, untreated lumber. In no case will painted, treated or any wood products that contain glues or adhesives be used as feedstock during wood chip processing.

The effectiveness of wood chips in this application will be routinely evaluated and documented during the postclosure maintenance period to ensure the requirements of 27 CCR 21090(a)(3) are satisfied. Should this method prove to be ineffective in preventing erosion during the establishment of vegetation, an alternative approach will be developed and submitted for regulatory approval.

The proposed final cover design is illustrated on Drawing 5 in Appendices A and N.

3.4.3 Erosion

Erosion analyses were completed and added to the 1995 PCPMP in 1998 (Vector, 1995) to evaluate the suitability of the proposed final cover layer. While the exact configuration of the final cover layer has changed since the preparation of those calculations, the final surface soils considered then and now are the same. Erosion calculations are included in Appendix G.

The 1998 estimate of potential soil loss during the closure construction phase and the postclosure maintenance period was computed using the Universal Soil Loss Equation (USLE) to determine soil loss due to rainfall. Wind erosion was estimated using a calculation developed by the U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS). Both analyses considered a native soil cover as the final landfill surface.

Soil loss on the side slopes was primarily due to rainfall and surface water sheet flow, while soil loss on the top deck final cover was caused primarily by wind erosion. The results of the analysis projected a total soil loss from the combined effects of wind and rain of 4.5 tons per acre from the top surface and 20.5 tons per acre from sideslopes in the initial year of construction, assuming full site exposure without the benefit of a tree wind break. These estimates translate to the erosion of 0.5 inches of soil from the landfill surface during the first five years of postclosure, and potentially as much as 2.8 inches during the entire 30-year maintenance period. These estimates are conservative and are expected to reduce by half following establishment of vegetation on landfill surfaces and application of wood chips on the surface.

Based on the results of the 1998 erosion analysis, Mono County will place one to three inches of wood chips over the proposed alternative final cover layer to minimize surface erosion caused by wind and water until revegetation efforts can be established (as described above in Section 3.4.2). It is anticipated that the use of the wood chip layer will reduce surface erosion to only a fraction of the 1998 estimates in the PCPMP. The reduced landfill footprint and elimination of sideslopes, as described above, mean that the 1998 estimates overstate the erosion potential. The original soil erosion calculations thus serve as a conservative baseline for surface erosion and are included in Appendix G for reference and described briefly below.

3.4.4 Settlement

A prediction of the total waste settlement was performed for preparation of the original PCPMP and was based on a study by Edil, et al. (1990), entitled "Settlement of Municipal Refuse". The study was initially presented at Geotechnics of Waste Fills-Theory and Practice (ASTM Special Technical Publication 1070, 1990) in Philadelphia, Pennsylvania in 1990. A copy of this article has been included with the revised settlement predictions presented in Appendix H. The study analyzed two mathematical models for determination of settlement within four municipal solid waste landfills located in Wisconsin, Michigan, and Connecticut. The Power Creep Law, used extensively in modeling the transient creep behavior of engineering materials, was found to effectively represent actual waste settlement in the field and was utilized for this analysis. Waste input parameters for the model were taken from average data for the four sites examined in the study. Because the Bridgeport Landfill is located in a relatively arid climate and would therefore be less susceptible to biological and chemical decay processes than the landfills examined by Edil, et al. (1990), it can be expected that the input parameters used in the settlement prediction will yield conservative results, and that the actual settlement may be considerably less than the predicted.

The original settlement calculations [Appendix G of the *Preliminary Closure and Postclosure Maintenance Plan* (Vector, 1995), added to the PCPMP in March 1998] indicated that the proposed vertical expansion would settle an estimated 1.9 feet during the 30-year postclosure period. Revised calculations were completed based on the revised site closure design without the previously-planned vertical expansion. New settlement estimates are on the order of 1.4 foot for a maximum waste height of 25 feet

(15 feet below grade and 10 feet above grade). Revised settlement calculations are included in Appendix H.

With proper maintenance, the predicted magnitude of settlement will not significantly affect the ability of the landfill slopes to promote stormwater from the surface of the landfill. In order to effectively monitor the settlement of the waste mass during the postclosure period, permanent settlement monuments will be installed on the final landfill surface following closure construction. The proposed settlement monument locations are depicted on Drawing 3 in Appendices A and N. The installation of settlement monuments is discussed in further detail later in this section.

3.4.5 Infiltration

Infiltration will be significantly inhibited by the proposed geomembrane component of the final cover layer. Geomembranes typically exhibit hydraulic conductivities in the range of 10^{-9} or 10^{-10} centimeters per second.

3.4.6 Stormwater Control

Proposed drainage control features at the site include an upgradient run-on diversion channel, internal runoff control channels, and a detention basin. The drainage control systems for final site closure have been designed to accommodate the anticipated volume of precipitation and peak run-on and runoff generated by the 100-year, 24-hour precipitation event falling within the landfill property and the upgradient catchment.

A hydrologic analysis was performed to estimate the peak flow rates for runoff from the closed landfill surface using the Natural Resource Conservation Service's WinTR-55 method (version 1.0.08, USDA, 2005). The predicted peak flows were then used in conjunction with the FlowMaster computer program (Haestad, 2005) to design and size a system of channels to route runoff from the site. Run-on flow from the east will be diverted around the site in a proposed 24-inch deep trapezoidal diversion channel and re-directed through a detention basin and into a natural drainage channel south and west of the site. Run-on flow from the north will be collected by a one-foot-deep v-ditch and re-directed around the site into a natural drainage channel west of the site. Drawings 3 and 5 in Appendices A and N show the individual channel alignments and configurations, while Figures D-1 and D-2 in Appendix D illustrate the on-site and off-site drainage sub-areas used in the hydraulic analyses. The output results of the WinTR-55 and FlowMaster modeling are described in the Drainage Control System Design Report in Appendix D. Certain drainage channel segments and intersections with natural drainages will be lined with riprap as specified on Drawings 3 and 5.

Drainage facilities at the landfill will be installed using appropriate personnel and equipment by a licensed contractor or the Mono County Department of Public Works. As part of the closure construction, appropriate quality control procedures will be implemented to ensure that the final drainage system is constructed according to the approved closure plan. All drainage channels constructed to divert water from the landfill will be inspected and repaired quarterly to ensure that areas of surface water ponding do not develop. Sedimentation in the channels will be periodically removed and areas of erosion repaired to maintain the effectiveness of the drainage system. Best management practices will be utilized until vegetation establishment and may include straw bales or wattles along regraded slope toes and around channel discharge aprons.

3.4.7 Stability

A detailed stability analysis was completed in March of 2000 and considered the final grading plan presented in the 1995 PCPMP. An additional stability analysis was completed on the revised final cover design presented herein using critical section D-D' (refer to Drawing 4), the same material properties as the earlier study (except for the liner interface shear strength) and the newer analytical method proposed by Bray et al. (1998). Laboratory testing of three soil and geomembrane/geotextile interface configurations was conducted to determine the most critical interface for use in slope stability analyses. Detailed calculations, output sheets from the computer program SLIDE, results of interface shear testing, and a copy of Bray et al. (1998) are included in Appendix I.

The Bray et al. (1998) study was accomplished using empirical observations at landfills and recorded acceleration data from recent earthquakes to develop equivalent yield accelerations. According to the last paragraph on page 217 in Bray et al. (1998), "Use of the equivalent acceleration allows for the seismic response of the deformable potential sliding mass to be represented in the Newmark rigid sliding block procedure (Makdisi and Seed, 1978)."

Equivalent accelerations were calculated based on the simplified procedure described in Section 3.3 (page 224) of Bray et al. (1998). Using the predicted yield accelerations from the block failure analysis of the final cover, equivalent accelerations were calculated and entered into Figures 11 and 12 in Bray et al. (1998). Displacements were predicted for 16 percent and median probabilities, as documented in the calculations included in Appendix I. The highest predicted displacement of 11.2 inches occurs along the sideslope crest and is within acceptable limits based on the material properties of the proposed geomembrane liner component of the final cover (300 percent elongation prior to break).

3.5 Construction Documents and CQA

Technical Specifications and a Construction Quality Assurance Manual were prepared to guide closure in accordance with this plan. Both documents were prepared under the direct supervision of a California-registered civil engineer.

Closure construction for most elements of the closure design will be performed by a licensed contractor. It is anticipated that the contractor will use wheel loaders, dump trucks, belly dumps, a sheepsfoot and/or vibrating roller compactor, water truck, and motor grader to complete closure activities. It is also anticipated that the contractor will furnish his own equipment. All equipment will be operated by experienced personnel.

Only areas which require grading and covering will be disturbed and a water truck will be used at all times to aid in compaction and minimize the generation of fugitive dust. If necessary, commercial dust suppressants will be employed in the dust control operations.

During the construction of the final cover layer, a survey crew will verify that the cover has been constructed to the prescribed elevations and dimensions in accordance with the approved plans and specifications. The Department of Public Works has completed preliminary grading to smooth out the landfill surface and complete initial preparation of the subgrade. Prior to contractor mobilization, the surveyor will establish grade stakes on a 100-foot by 100-foot grid throughout the site to be used for vertical control during cover construction.

Technical Specifications are included in Appendix J, while the Construction Quality Assurance Plan is presented in Appendix K. The CQA plan will be implemented by an independent third party during closure construction to verify that construction complies with approved construction drawings, specifications, and the CQA Plan. CQA activities will be completed under the supervision of a registered Civil Engineer or certified Engineering Geologist in the State of California. All CQA documentation will be presented in the final As-Built Report for the site.

3.6 Recording

Upon completion of closure construction at the Bridgeport Landfill, the Mono County Department of Public Works will file the following with the County Recorder's Office, the LEA, LRWQCB, and CIWMB in accordance with Section 21170 of Title 27 CCR:

- A description of the closed unit that includes the date closure was completed;
- The boundaries, height, and approximate depth of the Bridgeport Landfill;
- A copy of the as-closed topographic map;
- The location where the FCPMP may be obtained; and
- A statement that future site use is restricted in accordance with the Final Postclosure Maintenance Plan.

3.7 Discharges of Liquids to the Cover System

No liquids will be discharged to the cover system following closure. The final surface of the landfill will be covered with 1 to 3 inches of wood chips to minimize erosion and will not receive irrigation water.

3.8 Monitoring Systems

Monitoring systems to be employed at the Bridgeport Landfill during the postclosure period will include individual networks of groundwater monitoring and landfill gas monitoring wells. Groundwater monitoring will continue in accordance with the approved Waste Discharge Requirements for the facility. Landfill gas monitoring in the recently-installed landfill gas monitoring well network will be initiated upon completion of final closure construction activities and will continue through the postclosure period or until such time as Mono County can demonstrate that landfill gas generation has stabilized or significantly decreased and no longer requires monitoring. The following sections describe the existing components of both monitoring systems.

3.8.1 Groundwater

The Bridgeport Landfill currently has five wells for monitoring groundwater quality (wells MW-1 through MW-5). Up-gradient well MW-3 monitors groundwater that flows into the landfill area from the hydraulically higher portion of the drainage basin, and therefore provides background chemistry for constituents of concern. The down-gradient wells (MW-1, MW-2, MW-4, and MW-5) monitor groundwater that has passed beneath the waste footprint, providing an early warning in the event of a contaminant release from the landfill. Monitoring wells MW-1, MW-2 and MW-3 were installed in July 1989 under the supervision of Toxic Technology, Inc. Wells MW-4 and MW-5 were installed in October 2007 under the supervision of SRK Consulting.

In March 1997, an Evaluation Monitoring Program (EMP) was developed for the Bridgeport Landfill (Vector, 1997a) in response to low, yet quantifiable, concentrations of dichlorodifluoromethane (Freon-12) detected in compliance wells MW-1 and MW-2. Phase 1 of the EMP includes analysis for five indicator parameters (pH, total dissolved solids, chloride, nitrate, and sulfate) and for the 75 VOCs listed in Appendix II of 40 CFR (Appendix II). Groundwater sampling and testing are currently being performed on a quarterly basis in accordance with the 2001 Waste Discharge Requirements (Board Order Number 6-01-37) established by the LRWQCB and Title 23 CCR Chapter 15, Section 2581(c)(3). LRWQCB proposes that groundwater monitoring activities continue throughout the postclosure period on a quarterly basis unless the results of groundwater monitoring indicate that the site has stabilized, and either a reduced monitoring frequency or a shortened postclosure maintenance period is approved by the appropriate governing agencies.

3.8.2 Landfill Gas

To facilitate landfill gas monitoring during the postclosure maintenance period of the Bridgeport Landfill, a network of landfill gas monitoring wells has been installed around the site perimeter, as shown on Drawing 3. This network is comprised of eight gas monitoring wells with a total of 20 probes varying in depth from 10 to 88 feet below ground surface (bgs). Each well is constructed with gas probes of ¾-inch diameter, schedule 40 PVC pipe with a minimum of one five-foot-long, 0.02-inch machine-slotted screened interval per probe. The location of each screened interval was determined based on the total depth and geology of the borehole and the lowest elevation of the waste mass within 1,000 feet of the well. One gas probe was installed in each well between approximately 5 and 10 feet bgs. In all wells except GW-4, the lowest waste elevation (6500 feet amsl) is more than 15 feet bgs, so a second probe was installed with a screened interval at approximately 20 to 30 feet bgs (40-45 feet bgs in GW-2). The lowest waste elevation at wells GW-2, GW-3 and GW-6 was deep enough to require a third probe. Well GW-3 was initially installed just east of the existing property boundary, but was abandoned in place and relocated in July 2008 to a location just inside the eastern property boundary, which has closed waste trenches nearby.. Note that the estimated lowest waste elevation (6500 feet amsl or approximately 57 feet bgs) could not be reached due to the presence of groundwater or perched water at approximately 41 feet bgs at this location. GW-3 returned consistent and uncharacteristic methane readings, and was thought to be installed very near waste. A replacement well, GW-3R was installed in October 2011 along the same boundary line, and returned similar readings. Following coordination with CalRecycle, GW-7 was installed near the original location, in the BLM easement to the east of the site to serve as a new compliance point with a reasonable buffer to waste. It now serves as one of the compliance points along the eastern boundary.

Each gas probe pipe section has flush-joint, machine-threaded ends – glue was not used. The annular space between the slotted screen section and borehole walls was backfilled with clean 3/8-inch pea gravel to 12 inches above the screened interval. A minimum five-foot bentonite seal was placed on top of each pea gravel layer and hydrated. The remaining annular space above the uppermost bentonite seal was backfilled to within 3 feet of the surface with native soil, followed by a concrete surface plug and pad. Well head protection was installed in the form of locking aluminum or steel surface casings set into a three-foot by three-foot concrete pad.

The number and placement of probe completions per well are consistent with 27 CCR 20925(c), and are based on the lowest elevation of waste within 1,000 feet of the well. Detailed gas monitoring well construction logs are included in Appendix C.1.

3.8.3 Settlement

Following the completion of closure construction, eight permanent settlement monuments will be installed in the cover layer within the waste footprint to monitor settlement of the waste mass in accordance with Title 27, CCR, Section 21090(e). Two additional survey control monuments will be installed in native soil near the topographic high northeast of the waste footprint and just west of the transfer station to provide horizontal and vertical control points during postclosure surveying. The approximate locations of survey and settlement monuments are illustrated on Drawing 3 in Appendices A and N. All monuments will be installed by or under the supervision of a licensed land surveyor or a registered civil engineer. The monuments will provide reference points from which the location and elevation of the waste and monitoring facilities can be determined by ground surveys throughout the postclosure maintenance period.

An aerial topographic survey of the final regraded and covered landfill surface will be performed following the completion of construction activities. The survey will also include a baseline survey of installed survey monuments. A ground survey of the settlement monuments will be performed every five years to evaluate the potential differential settlement of the waste mass. From this data, iso-settlement maps will be generated and compared to the baseline survey. Because the waste mass is relatively shallow (~25 feet deep) and contains a significant amount of soil (1:1 waste to soil ratio), total settlement is not anticipated to be significant.

3.9 Closure and Postclosure Costs and Financial Assurance

Title 27 CCR Section 21820 requires the development of a detailed estimate of the cost of hiring a third party contractor to perform closure construction in accordance with the closure plan. A detailed Eastin cost estimate was included in the 1998 revision of the PCPMP (Vector, 1995) and presented estimated closure construction at $693,600. Postclosure costs were estimated at $596,000 for the 30-year postclosure maintenance period. Closure and postclosure costs have subsequently been revised to reflect the implementation of the proposed final closure plan. Revised closure and postclosure cost estimates are included in Appendix L.

The revised estimated cost of closure construction is $1,042,400. The annual postclosure maintenance cost has been revised upward to $44,000, resulting in a total estimated cost of $1,320,000 for the 30-year postclosure period. Table 3.1, below, presents an estimated disbursement schedule for closure and postclosure funding, based on the intended completion of closure construction during the 2008 construction season.

Mono County has established financial assurance mechanisms for closure construction and postclosure maintenance as required by 27 CCR, sections 22205, 22207, 22210, and 22212. On August 14, 1990, the Mono County Board of Supervisors adopted Resolution No. 90-63, which pledged that revenues generated by various solid waste fees in effect at that time were to be deposited in the previously-established Solid Waste Enterprise Trust Fund to finance the requirements for closure and postclosure funding. Subsequent resolutions have amended the Enterprise Fund, the charges and fees for solid waste services within Mono County, and the administration of revenues generated by those charges and fees.

Currently, Mono County has established special revenue accounts within its Solid Waste Enterprise Fund to deposit annual closure funds for each of its landfills, consistent with 27 CCR 22241. Further, Mono County has a Pledge of Revenue fund agreement with the CIWMB for postclosure maintenance in accordance with 27 CCR Section 22245. To that end, the Mono County Board of Supervisors adopted Resolution No. 97-67 authorizing the agreement between Mono County and the CIWMB, and subsequently executed a pledge of revenue agreement for financial assurance. Copies of the resolution and agreement are included in Appendix L, together with an updated summary of the 2007 financial assurance contributions to Mono County's financial assurance fund for the Bridgeport Landfill.

The anticipated disbursement schedule for closure funds will include one disbursement for closure work following the completion of closure construction, followed by annual disbursements during the postclosure period for postclosure monitoring and maintenance. An estimated schedule for disbursement of closure and postclosure funds is presented in Table 3.1.

TABLE 3.1. Estimated Closure and Postclosure Fund Disbursements

Expense	Estimated Amount	Date
Closure Construction	$1,042,400	Following closure construction – est. late 2009
Postclosure Care	$44,000	Annually through 2039

Mono County recognizes that Waste Discharge Requirements updated for closure will require the development of a Corrective Action Plan for a Known or Reasonably Foreseeable Release, and provision of the associated Corrective Action Financial Assurance. Mono County anticipates further amendment to the existing pledge of revenue agreement to accommodate these additional financial assurance requirements.

4.0 FINAL POSTCLOSURE MAINTENANCE PLAN

Once the certification of closure is approved by the LEA, RWQCB, and CIWMB, the approved Final Postclosure Maintenance Plan will become the enforcement document for the Bridgeport Landfill. This section describes the postclosure maintenance program that will be implemented throughout the 30-year postclosure maintenance period.

This Final Postclosure Maintenance Plan addresses the requirements of Sections 21090, 21769, 21770, and 21830 of Title 27 CCR. Specific elements addressed in this section include the following:

- Identify emergency response procedures and responsible people in charge of postclosure maintenance;
- Describe monitoring and control systems operating during the postclosure maintenance period;
- Describe and develop the inspection and maintenance procedures for the closed landfill;
- Report the results of monitoring and collection;
- Describe the postclosure land use; and
- Estimate postclosure maintenance costs.

Postclosure maintenance of the Bridgeport Landfill will be performed in accordance with Title 27 CCR, Section 21180. Postclosure activities will consist of perimeter fence repair, access road repair, environmental control systems (landfill gas monitoring, groundwater monitoring, stormwater run-on diversion channel repairs and stormwater runoff collection system repairs), the inspection of the final cover system and gas vents, cover repair, settlement monument survey, and final cover revegetation. Postclosure monitoring and maintenance will occur for a period of at least 30 years unless a reduced monitoring frequency is approved by all applicable regulatory agencies.

4.1 Responsibility and Emergency Response

The Mono County Department of Public Works will be responsible for implementing postclosure maintenance and monitoring activities. Relevant contact information is summarized below:

Owner and Operator:	Mono County Department of Public Works
Address:	Post Office Box 457 Bridgeport, California 93517
Telephone:	(760) 932-5440

A number of unforeseen or unpredictable events may occur during the landfill postclosure maintenance period. The Emergency Response Plan included in Appendix M describes emergency response procedures, coordination agreements, and reporting requirements. The plan addresses events such as vandalism, fires, earthquakes, hazardous substance discovery or spill, medical emergency, propane gas leak, slope failure, and vehicle or equipment accident.

The plan will be amended in the event that it does not provide an adequate response to a failure or release, or changes occur in the postclosure land use or on-site structures which are not addressed in the plan. A copy of any plan amendments will be submitted to the LEA.

4.2 Site Inspection and Maintenance

Postclosure maintenance of the Bridgeport Landfill will be performed in accordance with Title 27 CCR, Section 21180. Postclosure inspection and maintenance activities will focus on perimeter fence and access road repair, environmental control systems (landfill gas monitoring, groundwater monitoring, stormwater run-on diversion channel repairs and stormwater runoff collection system repairs), inspection and repair of the final cover, revegetation, and maintenance of the wood chip layer. Postclosure monitoring and maintenance will occur on a quarterly basis during the postclosure period unless a reduced monitoring frequency is subsequently approved by all applicable regulatory agencies. The Mono County Department of Public Works will be responsible for implementing postclosure inspection and maintenance activities.

4.2.1 Final Cover System

The final cover will be inspected quarterly to ensure that the final cover continues to function as a barrier to significant infiltration. Visual inspections will be performed for the following:

- **Final Cover Integrity**. Qualified personnel will inspect the final cover for signs of settlement and subsidence, erosion, cracking, rodent burrowing, or other items that adversely affect the integrity and effectiveness of the final cover. Any area requiring corrective action will be repaired within two weeks of its identification.

- **Wood Chip Cover**. Qualified personnel will inspect the wood chip layer for exposed soil or areas where the wood chips are noticeably thin and evidence of erosion is prevalent. Areas requiring corrective action to minimize surface erosion will be addressed within two weeks of the inspection. Remediation will involve the application of additional wood chips to areas with inadequate coverage.

- **Vegetation**. Qualified personnel will inspect the vegetation growth over the final landfill surface for areas where revegetation success is inadequate. Areas requiring corrective action will be addressed during the fall of the year of inspection, or sooner if climatic conditions are suitable. Remediation may involve reseeding the area in the fall of the year of inspection to take advantage of the wetter winter months.

- **Leak Search**. In addition to the above-mentioned regular inspections of the final cover, Mono County will perform a leak search once per year during the postclosure period in accordance with 27 CCR Section 21090(a)(4)(A). The leak search will consist of walking the closed surface of the landfill in a regularly spaced grid pattern across the closed landfill surface while using the hand-held gas detection monitor (Heath Gasurveyor Model 442) to search for the presence of methane. The leak search will be performed at a time when winds are calm to maximize the possibility of methane detection. As with ambient air monitoring around the landfill perimeter, the gas detection monitor will be held at waist height and remain in continuous measuring mode while the inspector slowly walks the landfill. Methane readings will be recorded and plotted on a map of the landfill using GPS coordinates, and areas of methane concentration, if present, will be closely inspected for evidence of damage to the final cover layer. The results of the leak inspection will be incorporated into the postclosure landfill gas monitoring reports. If the results of the leak search indicate an area of the final cover may require repair, the area will be repaired and the repair documented and test in accordance with the original Construction Quality Assurance Plan (Appendix K).

4.2.2 Drainage System

Stormwater drainage control channels will be inspected following each significant storm event and on a quarterly basis throughout the postclosure period for any evidence of damage, excessive erosion, settlement, and obstruction by debris. The effectiveness of the surface water drainage ditches will be maintained by keeping the ditches clear of debris, excess soils and vegetation. Repairs to the structures will be made as necessary to ensure the proper functioning of the system as designed.

4.2.3 Environmental Controls

During quarterly sampling events, groundwater and landfill gas monitoring wells will be inspected for damage. Locks, caps, sampling ports and or tubes that appear damaged will be identified and replaced.

4.2.4 Site Security

All locks, gates, signs, and fences for the Bridgeport Landfill will be inspected on a quarterly basis throughout the postclosure period, unless a reduced schedule is subsequently approved by all applicable regulatory agencies. Any damage to the security system due to vandalism, trespassing, or natural wear and tear will be immediately repaired and/or replaced. Signs will be repainted or replaced on an as-needed basis in order to maintain their visibility and legibility and to update information as necessary.

4.3 Monitoring

Postclosure monitoring will include monitoring groundwater quality, monitoring for the presence of landfill gas, and monitoring landfill settlement via the settlement monuments to be installed in the final cover layer. Each of these is discussed below.

4.3.1 Groundwater Monitoring

The existing evaluation monitoring program includes analysis for five indicator parameters (pH, total dissolved solids, chloride, nitrate, and sulfate) and for the 75 VOCs listed in Appendix II of 40 CFR (Appendix II). Groundwater sampling, testing, and reporting are currently being performed on a quarterly basis in accordance with the 2001 Waste Discharge Requirements (Board Order Number 6-01-37) established by the LRWQCB and Title 23 CCR Chapter 15, Section 2581(c)(3).

Existing groundwater monitoring activities will continue throughout the postclosure period for the same five indicator parameters (pH, total dissolved solids, chloride, nitrate, and sulfate) and for the 75 VOCs listed in Appendix II of 40 CFR (Appendix II). If the results of groundwater monitoring indicate that the groundwater chemistry at the site has stabilized, Mono County may request approval of a reduced monitoring frequency or a shortened postclosure maintenance period.

4.3.2 Landfill Gas Monitoring

Landfill gas monitoring is currently performed in on-site structures and in ambient air around the landfill perimeter. Ambient air monitoring will continue during the postclosure period, but will be augmented by subsurface monitoring in the recently-installed network of perimeter landfill gas monitoring wells. Postclosure ambient air and subsurface landfill gas well monitoring activities are described in the following sections.

<u>AMBIENT AIR MONITORING</u> - A Heath Gasurveyor Model 442 is currently used to monitor on a quarterly basis for the presence of methane in ambient air at the landfill perimeter and in site structures, including the transfer station scalehouse. Some structures are portable and constructed on skids, so the base of each is elevated above the surrounding grade to allow the free circulation of air between the floor frame and ground surface. The Gasurveyor samples air continuously and electronically records results in an internal memory that can be downloaded to a personal computer. The Gasurveyor Model 442 is capable of measuring methane concentrations from zero to 1,000 ppm and the lower explosive limit (LEL) for methane from zero to 100 percent. For structure monitoring, the Heath Gasurveyor sampling tube is slowly moved throughout the interior of each structure at both floor and ceiling height. Monitored locations include areas where gas may potentially accumulate, and include two household hazardous waste storage lockers and the gatehouse.

During ambient air monitoring around the landfill perimeter, a technician holds the Gasurveyor sampling tube at waist height and walks the landfill perimeter. The results of structure and perimeter monitoring are reported as a percentage of the LEL for methane in quarterly reports to the Mono County Environmental Health Department. To date, methane has not been detected in ambient air at the Bridgeport Landfill.

<u>SUBSURFACE GAS MONITORING</u> - The network of landfill gas monitoring wells (GW-1-2, GW-4-7) will be monitored on a quarterly basis for methane concentrations using the Gasurveyor. Gas monitoring well locations are illustrated on Drawing 3. The

Gasurveyor's sampling pump inlet tube will be connected to a valve at the top of each gas probe and the sampling pump and monitor set to continuous monitoring mode. The variation of gas concentrations over time will be recorded until the concentrations of all gases (CO_2, O_2 and CH_4) do not fluctuate more than 0.5 percent.

REPORTING - Results of gas monitoring, including the initial and steady state concentrations of methane, will be submitted to the Mono County Environmental Health Department within 90 days of sampling. Monitoring reports will include:

- the concentration of methane measured at each monitoring location;
- date, time, barometric pressure, atmospheric temperature, and weather conditions;
- the name(s) of sampling personnel, equipment utilized, and a brief description of the methods used; and,
- a numbering system to correlate monitoring results to a corresponding probe location.

If the concentration of methane exceeds the compliance levels described above, Mono County personnel will immediately take all steps necessary to protect public health and safety and the environment. The Mono County Environmental Health Department will be notified in writing within five working days of learning that compliance levels have been exceeded. Environmental Health Department notification will include a description of the actions taken or proposed to be taken to resolve the problem.

Within 10 working days, Mono County will submit correspondence to the Environmental Health Department describing the nature and extent of the problem, and any immediate corrective actions necessary to protect public health and safety and the environment. If the nature of the problem requires the development of a remediation plan and landfill gas control system, a plan and control system design will be prepared in accordance with 27 CCR Section 20937(b-g). Approval will be obtained from the Environmental Health Department prior to plan implementation. Following approval, Mono County will enter the plan in the facility's operating record, implement the plan, and notify the Environmental Health Department when the plan has been implemented.

4.3.3 Settlement Monitoring

A detailed topographic survey of the final regraded and covered landfill surface will be performed following the completion of construction activities. The survey will also include a baseline survey of installed survey monuments. An aerial photographic survey or an approved alternative survey (as required by Title 27, California Code of Regulations (27 CCR), Section 21090(e)) will be performed every five years to evaluate the potential differential settlement of the waste mass. From this data, iso-settlement maps will be generated and compared to the baseline survey. Because the waste mass is relatively shallow (~25 feet deep) and contains a significant amount of soil (1:1 waste to soil ratio), total settlement is not anticipated to be significant.

The final cover will be repaired and maintained based on the visual inspections described in Section 4.2.1 and the information acquired during the settlement surveys.

Continual maintenance will be performed to prevent ponding on, and promote drainage away from, the landfill surface. All topographic mapping and iso-settlement maps will be produced with a contour interval of not more than one foot. If only very small amounts of settlement are indicated from the first postclosure settlement survey (five years after closure), additional iso-settlement maps may be discontinued pending regulatory approval.

4.4 Erosion and Cover System Repair

The final cover design with a surficial wood chip component should minimize erosion and the need for maintenance and repair. However, it is anticipated that occasional maintenance and repair will be required for surface erosion and areas of subsidence, as described below.

- **Reseeding**. It is anticipated that annual reseeding of at least 15 percent of the final cover surface may be required each year during postclosure to fully establish vegetation on the closed landfill surface.

- **Wood Chip Layer**. It is anticipated that the wood chip component of the final cover design will require annual maintenance. Mono County will inspect the wood chip layer each year and will identify and repair areas which show signs of erosion by wind or water. If replenishment becomes necessary, wood chips will be available either on-site or from another County stockpile.

- **Erosion Rills**. If erosion rills are identified, they will be filled, graded smooth, compacted to final cover layer specifications, and covered with a minimum of one to three inches of wood chips. This type of repair would be completed with a small backhoe. Efforts will be made to identify and mitigate the cause of the erosion rills.

- **Subsidence**. Localized areas of differential settlement may result in ponding on the cover. Should settlement cause ponding on landfill surfaces, additional cover material will be added and the final surface reconstructed to provide positive grades. Construction procedures and CQA methods will follow the applicable requirements of the final closure documents.

Repairs to the cover system will be made promptly. It is anticipated that significant repairs requiring the use of heavy equipment will be made in the dry season during or following the inspection that noted the need for the repairs. If permanent repairs are delayed until the dry season, interim measures will be implemented to stabilize the area requiring repair.

4.5 Postclosure Land Use

The Bridgeport Landfill property will be maintained under Mono County control and ownership during the postclosure period and into the foreseeable future and will be used for the existing solid waste transfer station with peripheral areas used for materials storage, processing and sorting (in the Transfer Operations Area, see Drawings 2 and 3), as is currently the practice. No structures or other facilities will be constructed over the waste footprint.

The only structures anticipated to remain on-site during the postclosure maintenance period are those associated with transfer station operations, including concrete footings, slabs, and retaining walls associated with the transfer station and truck scale, scalehouse, toilet, used oil storage tank, and household hazardous waste storage sheds. All but the transfer station concrete work are portable and constructed on skids, so the base of each is elevated above the surrounding grade to allow the free circulation of air between the floor frame and ground surface. Additional facilities within the transfer station operating area will include roll-off bins for waste transfer and temporary storage of old corrugated cardboard (OCC), recyclable beverage containers, and scrap metal and appliances. The only other function remaining on-site may be stockpiles of clean wood waste and the resulting wood chips. None of the preceding structures or functions will be located on or near the waste footprint.

In accordance with the requirements of Title 27, CCR, Section 21170, and prior to completion of closure activities, the Mono County Department of Public Works will place in the deed to the site, or some other instrument that is normally examined during a title search, information notifying potential purchasers of the property that the site has been used as a landfill. In addition, the deed will be modified to state that the use of the parcel is restricted in accordance with the postclosure land uses set forth in the Final Postclosure Maintenance Plan and Waste Discharge Requirements for the landfill, and that the property owner will be responsible for carrying out postclosure maintenance and any corrective action necessary to address a release. The CIWMB, LEA and LRWQCB will be provided with a copy of the modified deed once it has been completed.

4.6 Postclosure Cost Estimates and Financial Assurance

Closure and postclosure costs, financial assurance, and disbursements are discussed in detail in Section 3.9 above.

5.0 REFERENCES

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Vector Engineering, 1997a, *Evaluation Monitoring Program for the Bridgeport Landfill, Mono County, California*, unpublished report prepared for the Mono County Department of Public Works, Vector Engineering, Inc., Carson City, Nevada, March 3, 1997.

Vector Engineering, 1997b, *Water Quality Protection Standards and Statistical Methods for the Bridgeport Landfill, Mono County, California*, unpublished report prepared for the Mono County Department of Public Works, Vector Engineering, Inc., Carson City, Nevada, January 1997.

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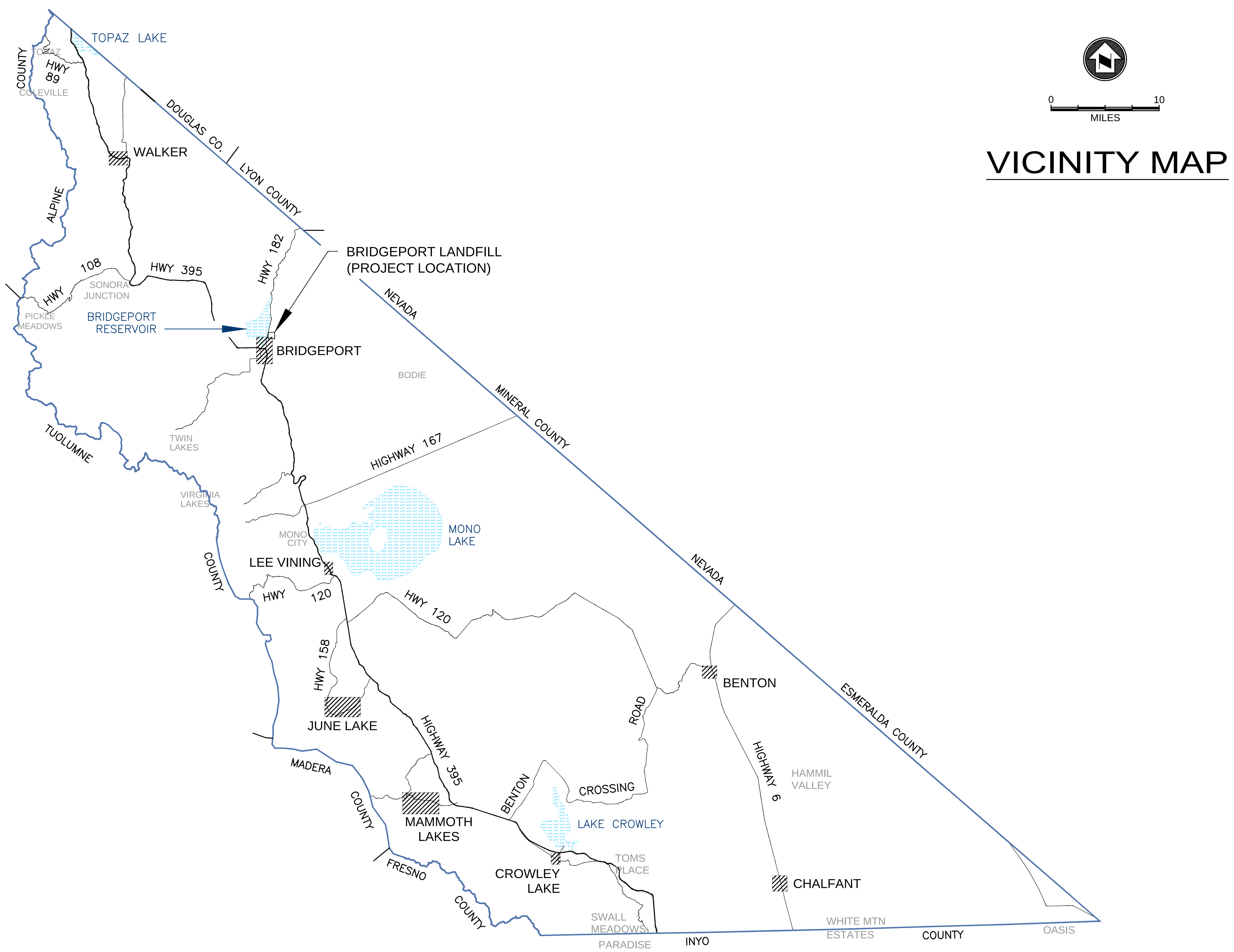
APPENDIX A

REDUCED DRAWING SET

FINAL CLOSURE CONSTRUCTION

BRIDGEPORT LANDFILL

MONO COUNTY, CALIFORNIA



VICINITY MAP

LOCATION MAP

DRAWING INDEX

NO.	DRAWING NAME
1	TITLE SHEET & LOCATION MAP
2	EXISTING TOPOGRAPHY AND FACILITIES
3	GRADING PLAN
4	CROSS-SECTIONS
5	DETAILS

SYMBOLS

× 6930.4	EXISTING SURFACE ELEVATION
6930	EXISTING 10' CONTOUR GRADE
6930	PROPOSED FINAL GRADE CONTOURS
GW-1	LANDFILL GAS MONITORING WELL
MW-1	GROUND WATER MONITORING WELL
S-1	PROPOSED SETTLEMENT MONUMENT
	PROPERTY BOUNDARY
	GRAVEL ROAD / SITE ACCESS ROAD
A	CROSS-SECTION LOCATION
A	DETAIL DESIGNATION
7	REFERENCE PAGE

PREPARED BY:

SRK Consulting
Engineers and Scientists
5250 Neil Road, Suite 300
Reno, NV 89502
775-828-6800

DRAWING No.: 146907-101

SHEET No. 1 OF 5

REVISION D

SCALE: AS SHOWN

PROJECT No.: 146907

DRAWING NAME 146907-101RevD

PREPARED FOR:

FINAL CLOSURE CONSTRUCTION
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA

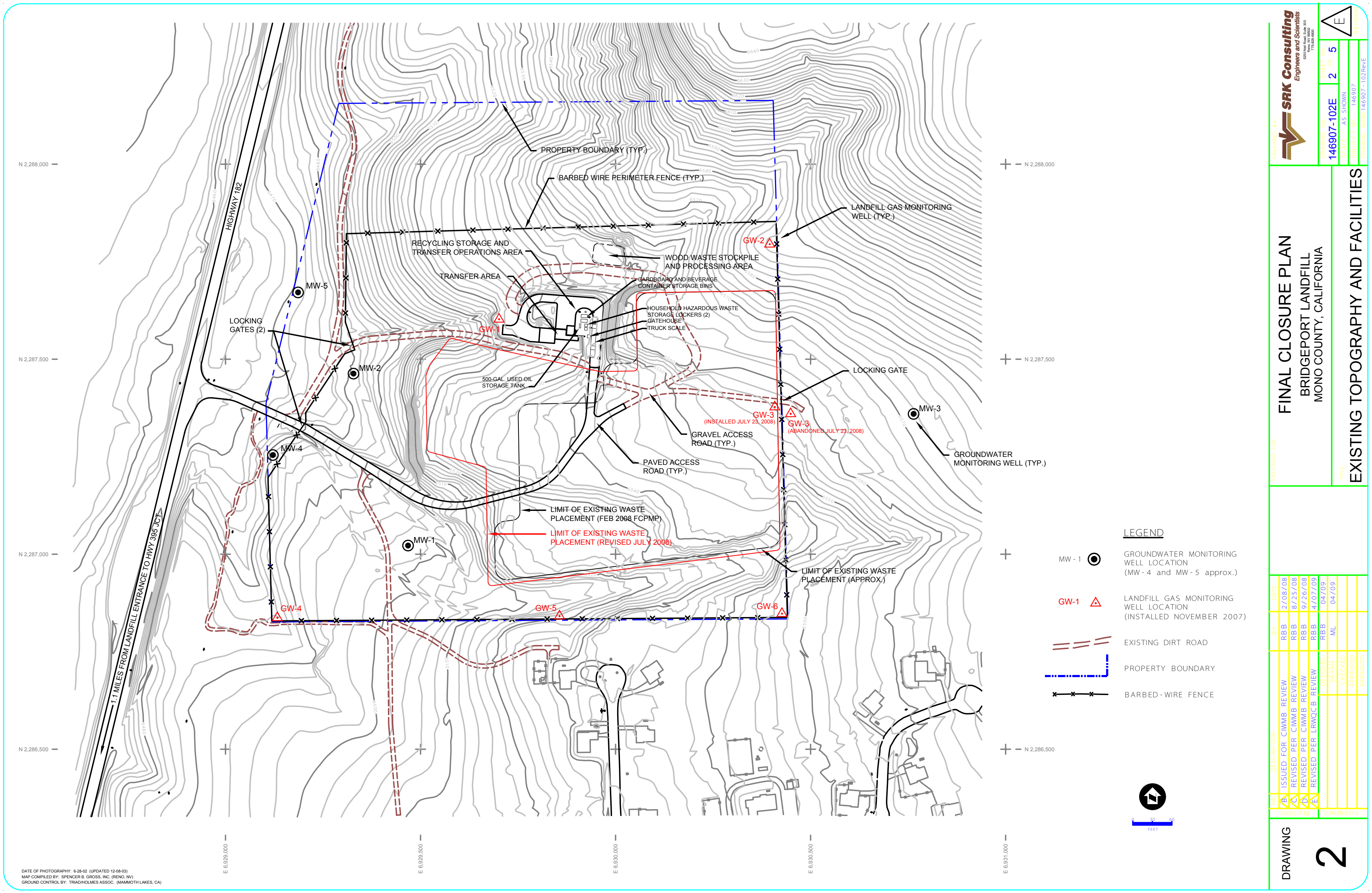
TITLE: TITLE SHEET AND LOCATION MAP

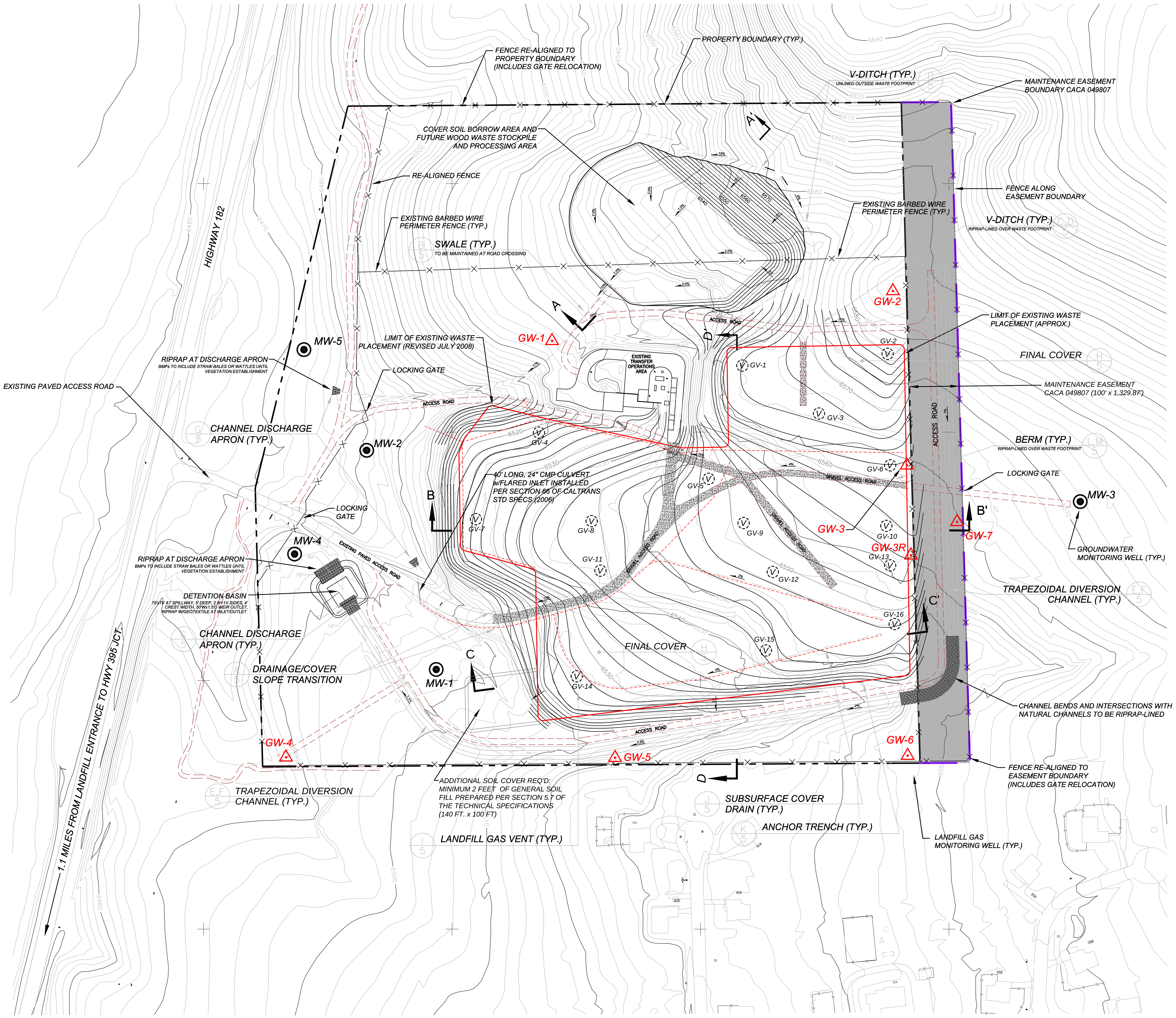
No.	DESCRIPTION	BY	DATE
A	DRAFT ISSUED FOR CIWMB REVIEW	RBB	2/05/08
B	FINAL ISSUED FOR CIWMB REVIEW	RBB	2/08/08
C	REVISED PER CIWMB REVIEW	RBB	8/25/08
D	REVISED PER LRWQCB REVIEW	RBB	4/07/09
	DESIGNED	RBB	04/09
	DRAWN	ML	04/09
	CHECKED		
	APPROVED		
	APPROVED		

REVISIONS

REFERENCE

DRAWING 1


PROPERTY BOUNDARY (TYP.)
BARBED WIRE PERIMETER FENCE (TYP.)
HIGHWAY 182
LANDFILL GAS MONITORING WELL (TYP.)
RECYCLING STORAGE AND TRANSFER OPERATIONS AREA
WOOD WASTE STOCKPILE AND PROCESSING AREA
TRANSFER AREA
CARDBOARD AND BEVERAGE CONTAINER STORAGE BINS
HOUSEHOLD HAZARDOUS WASTE STORAGE LOCKERS (2)
GATEHOUSE
TRUCK SCALE
MW-5
LOCKING GATES (2)
GW-1
GW-2
MW-2
500 GAL. USED OIL STORAGE TANK
LOCKING GATE
MW-3
GW-3 (INSTALLED JULY 23, 2008)
GW-3 (ABANDONED JULY 23, 2008)
GRAVEL ACCESS ROAD (TYP.)
GROUNDWATER MONITORING WELL (TYP.)
MW-4
PAVED ACCESS ROAD (TYP.)
LIMIT OF EXISTING WASTE PLACEMENT (FEB 2008 FCPMP)
LIMIT OF EXISTING WASTE PLACEMENT (REVISED JULY 2008)
MW-1
LIMIT OF EXISTING WASTE PLACEMENT (APPROX.)
GW-4
GW-5
GW-6
1.1 MILES FROM LANDFILL ENTRANCE TO HWY 395 JCT.
N 2,288,000
N 2,287,500
N 2,287,000
N 2,286,500
E 6,929,000
E 6,929,500
E 6,930,000
E 6,930,500
E 6,931,000
LEGEND
MW - 1 GROUNDWATER MONITORING WELL LOCATION (MW-4 and MW-5 approx.)
GW-1 LANDFILL GAS MONITORING WELL LOCATION (INSTALLED NOVEMBER 2007)
EXISTING DIRT ROAD
PROPERTY BOUNDARY
BARBED-WIRE FENCE
DATE OF PHOTOGRAPHY: 6-28-02 (UPDATED 12-08-03)
MAP COMPILED BY: SPENCER B. GROSS, INC. (RENO, NV)
GROUND CONTROL BY: TRIAD/HOLMES ASSOC. (MAMMOTH LAKES, CA)
SRK Consulting
Engineers and Scientists
FINAL CLOSURE PLAN
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA
EXISTING TOPOGRAPHY AND FACILITIES
146907-102E
2
5
E
AS SHOWN
146907
146907-102RevE
No. DESCRIPTION BY DATE
B ISSUED FOR CIWMB REVIEW RBB 2/08/08
C REVISED PER CIWMB REVIEW RBB 8/25/08
D REVISED PER CIWMB REVIEW RBB 9/26/08
E REVISED PER LRWQCB REVIEW RBB 4/07/09
REVISIONS
DESIGNED RBB 04/09
DRAWN ML 04/09
CHECKED
APPROVED
APPROVED
REFERENCE
DRAWING
2



LEGEND :

MW-1	EXISTING GROUNDWATER MONITORING WELL (MW-4 and MW-5 approx.)
GW-1	EXISTING LANDFILL GAS MONITORING WELL (INSTALLED NOVEMBER 2007)
GV-3	LANDFILL GAS VENT
	EXISTING DIRT ROAD
	PROPOSED DIRT ACCESS ROAD
	PROPOSED GRAVEL ACCESS ROAD (4"-THICK CLASS 2 AGGREGATE BASE)
	PROPERTY BOUNDARY
	MAINTENANCE EASEMENT & BOUNDARY BLM RIGHT OF WAY CACA 049807 FOR DRAINAGE AND MONITORING PURPOSES. BLM NOT RESPONSIBLE PARTY FOR LANDFILL FACILITY.
	LIMIT OF WASTE PLACEMENT REVISED AUGUST 2008
	SURFACE DIVERSION BERM (OVER FINAL COVER) OR V-DITCH (IN NATIVE SOIL)
	SUBSURFACE COVER LAYER DRAIN
	BARBED-WIRE FENCE
B'	CROSS SECTION LOCATION (refer to Drawing 4)

0 50 100
FEET

DATE OF PHOTOGRAPHY: 6-28-02 (UPDATED 12-08-03)
MAP COMPILED BY: SPENCER B. GROSS, INC. (RENO, NV)
GROUND CONTROL BY: TRIAD/HOLMES ASSOC. (MAMMOTH LAKES, CA)
U:\Proten\15 Trash\146907-103RevE.dwg

PREPARED BY: SRK Consulting Engineers and Scientists

PREPARED FOR:

FINAL CLOSURE CONSTRUCTION
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA

TITLE: FINAL GRADING PLAN

DRAWING No.	146907-103F
SHEET No.	3 OF 5
SCALE	AS SHOWN
PROJECT No.	146907
DRAWING NAME	146907-103RevF
REVISION	F

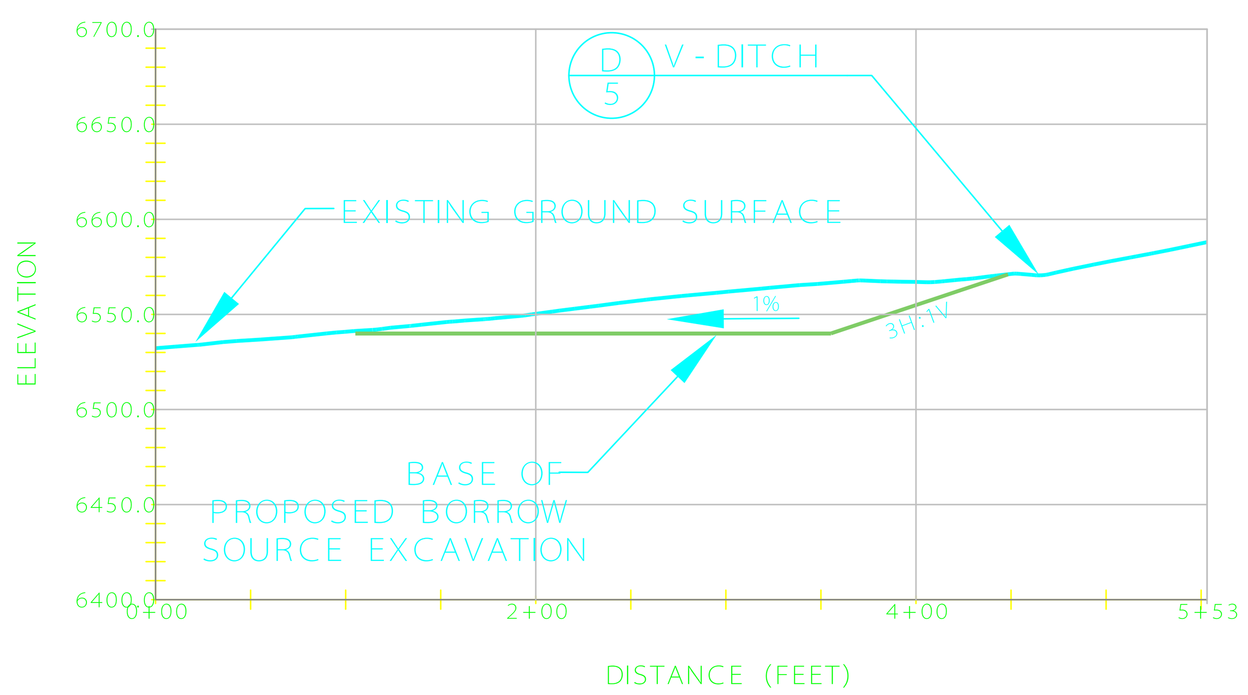
REVISIONS

No.	DESCRIPTION	BY	DATE
C	REVISED PER CIWMB REVIEW	RBB	2/08/08
D	REVISED PER CIWMB REVIEW	RBB	8/25/08
E	REVISED PER LRWQCB REVIEW	RBB	9/29/08
F	REVISED Added GW-7	PER	12/15/15
	DESIGNED	RBB	04/09
	DRAWN	ML	04/09
	CHECKED		
	APPROVED		

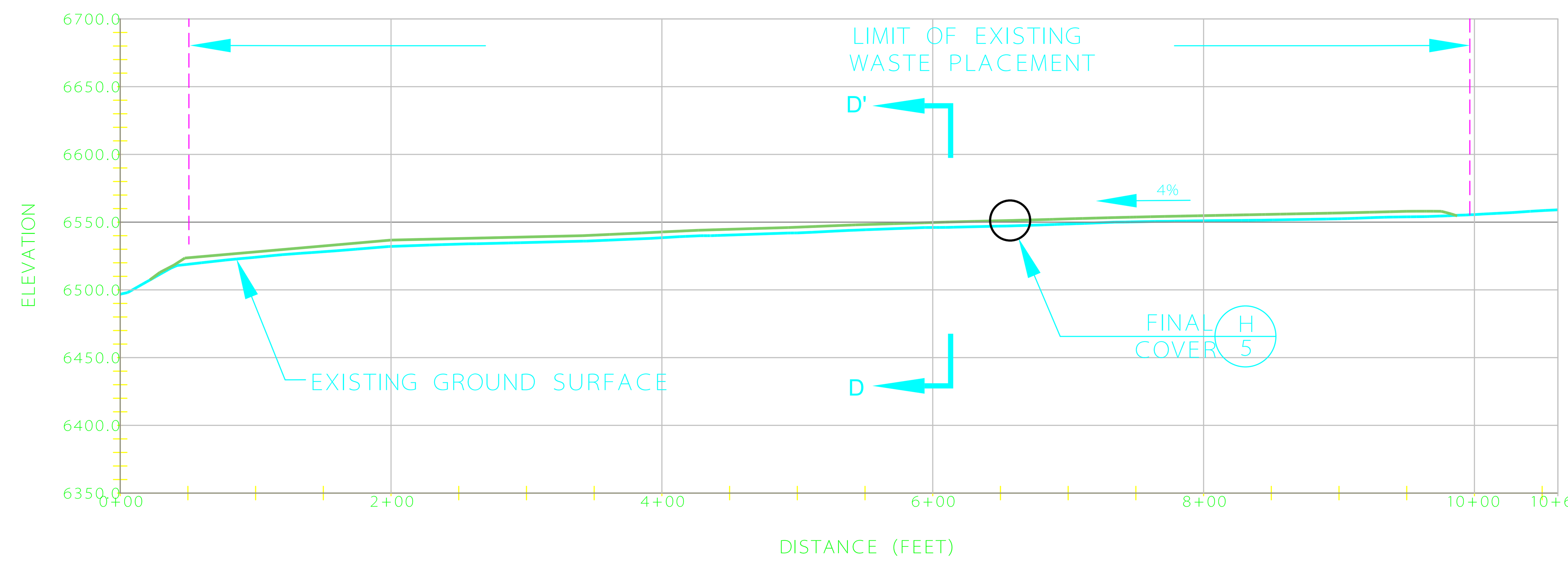
REFERENCE

DRAWING 3

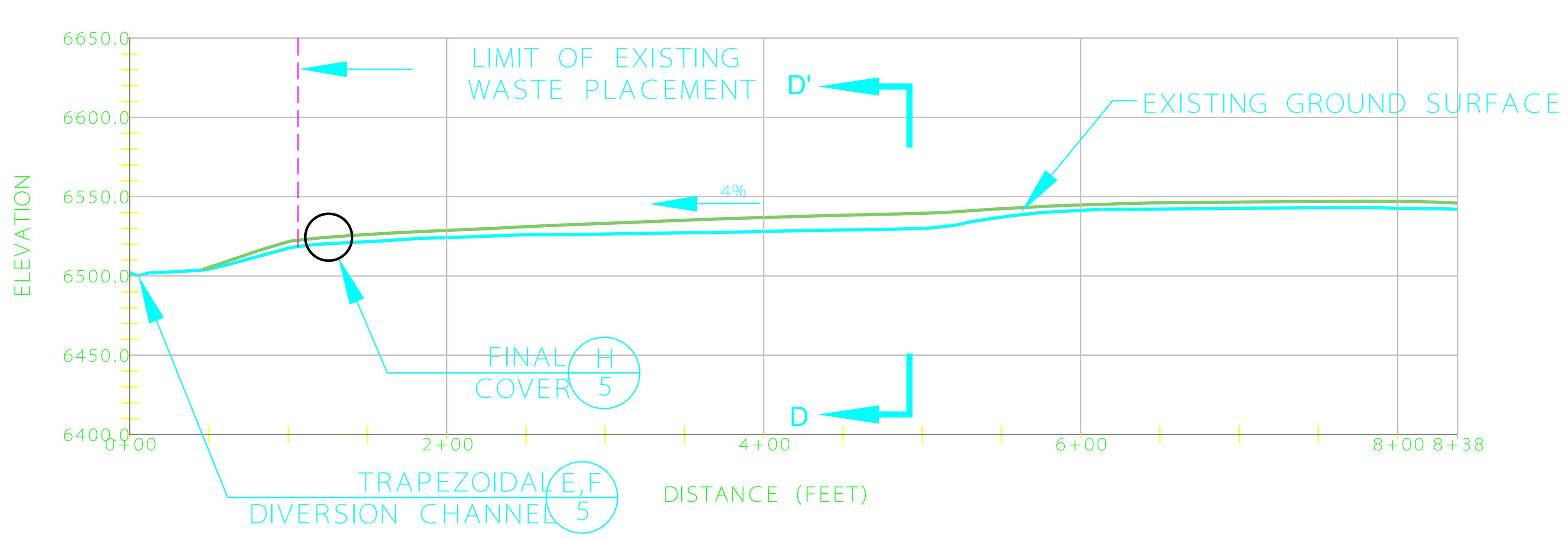
SECTION A - A'



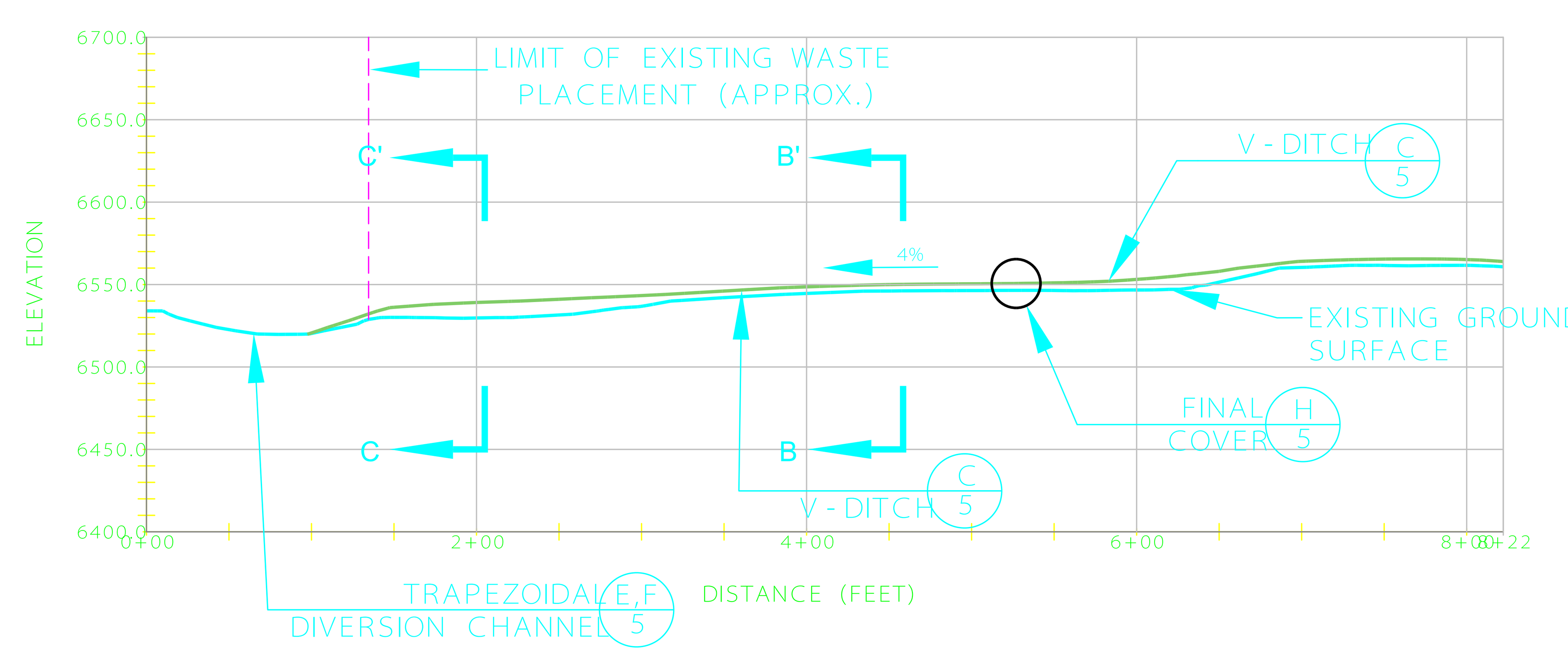
SECTION B - B'



SECTION C - C'



SECTION D - D'



PREPARED BY:

SRK Consulting
Engineers and Scientists

DRAWING No.: 146907-104

SHEET No. 4 OF 5

REVISION D

SCALE: AS SHOWN

PROJECT No.: 146907

DRAWING NAME 146907-104RevD

PREPARED FOR:

TITLE:

FINAL CLOSURE PLAN
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA
CROSS SECTIONS

REVISIONS

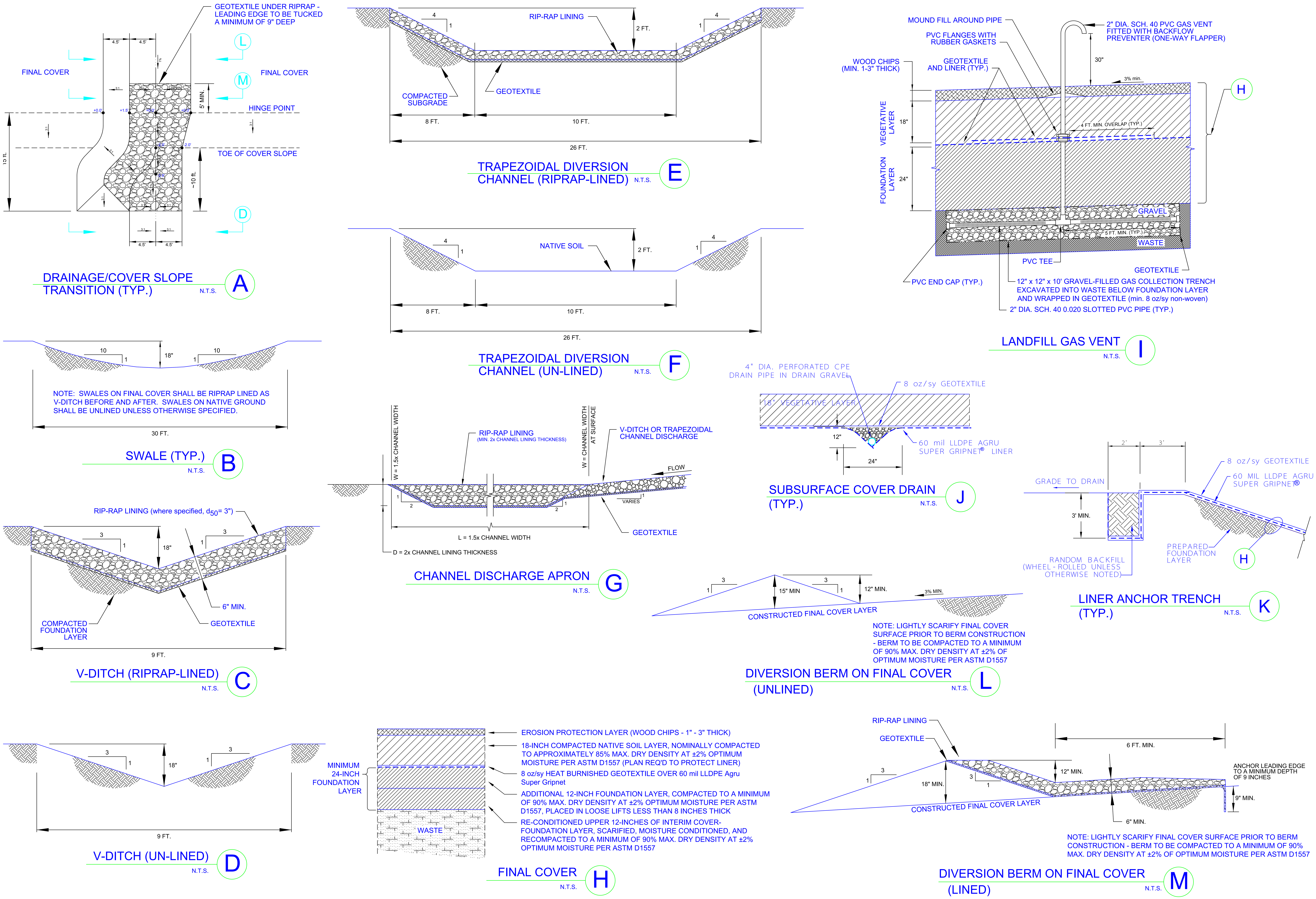
No.	DESCRIPTION	BY	DATE
A	DRAFT ISSUED FOR MCPWD REVIEW	RBB	2/01/08
B	FINAL ISSUED FOR CIWMB REVIEW	RBB	2/08/08
C	REVISED PER CIWMB REVIEW	RBB	8/25/08
D	REVISED PER LRWQCB REVIEW	RBB	4/07/09

REFERENCE

	DESIGNED	RBB	04/09
	DRAWN	ML	04/09
	CHECKED		
	APPROVED		
	APPROVED		

DRAWING

4



SRK Consulting
Engineers and Scientists

146907-105E

5 of 5

FINAL CLOSURE CONSTRUCTION

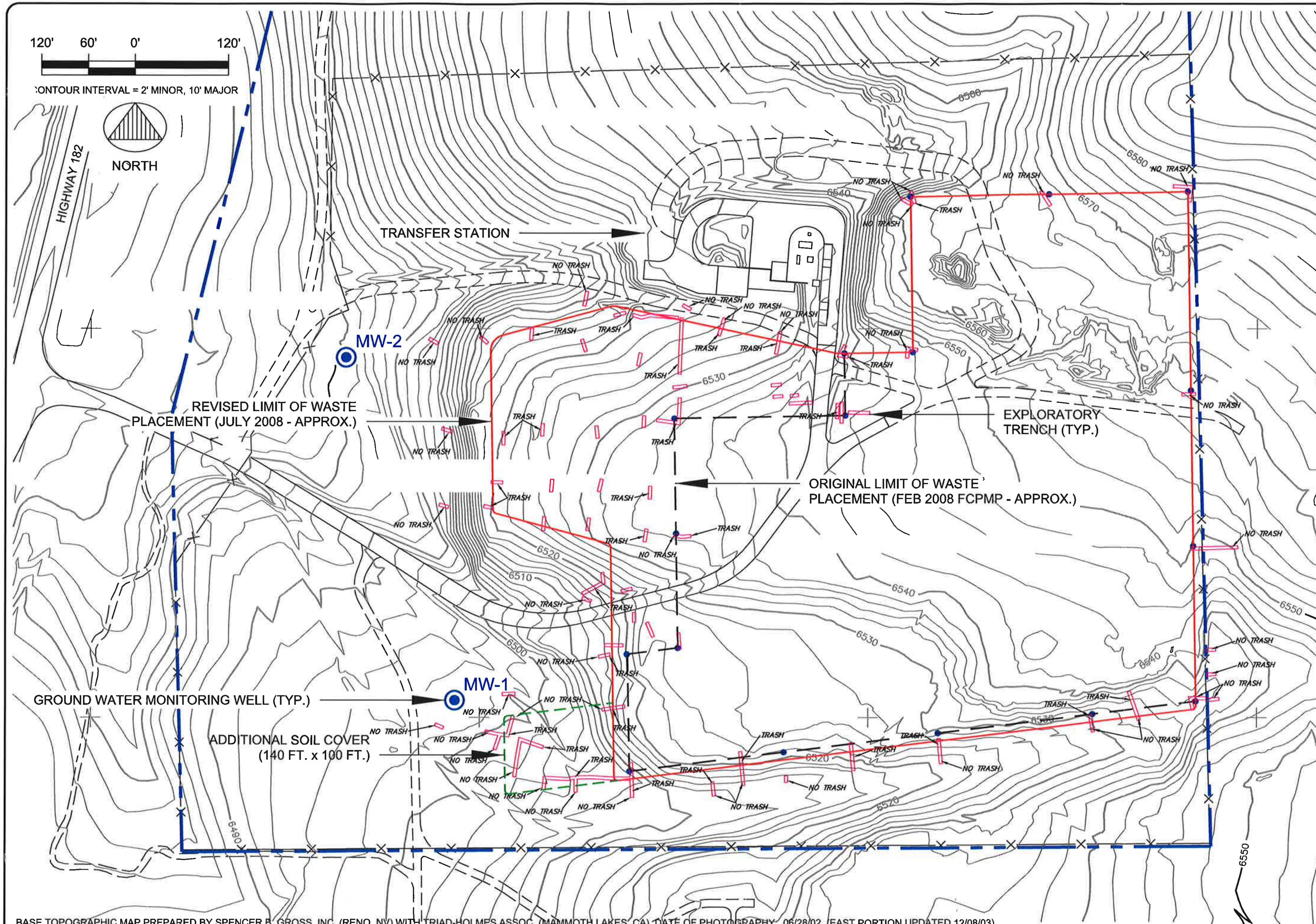
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA

B	FINAL ISSUED FOR CIWMB REVIEW	RBB	2/08/08
C	REVISED PER CIWMB REVIEW	RBB	8/25/08
D	REVISED PER LRWQCB REVIEW	RBB	4/07/09
E	REVISED WITH CORRECTIONS	RBB	4/24/09
		RBB	04/09
		ML	04/09

DRAWING 5

APPENDIX B.1

FIGURE B.1-1 – JULY 2008 WASTE FOOTPRINT DELINEATION



MONO COUNTY PUBLIC WORKS DEPARTMENT

Rev.#	Date	Revision

Drawing Date: 08.12.08
Prepared By: E. Nikirk, PE
Checked By: E. Nikirk, PE
Approved By: E. Nikirk, PE

FINAL CLOSURE CONSTRUCTION
BRIDGEPORT LANDFILL
Mono County, California

REVISED WASTE FOOTPRINT - JULY 2008

Figure
B.1-1

Appendix B.2

Landfill Permit

SOLID WASTE FACILITY PERMIT

Facility Number: 26-AA-0002

1. Name and Street Address of Facility:	**2. Name and Mailing Address of Operator:**	**3. Name and Mailing Address of Owner:**
Bridgeport Landfill 50 Garbage Pit Rd. Bridgeport, CA 931517	Mono Co. Dept. of Public Works P.O. Box 457 Bridgeport, CA 93517	Mono Co. Dept. of Public Works P.O. Box 457 Bridgeport, CA 93517

4. Specifications: **a.** Operation: Closed Solid Waste Disposal Site
b. Permitted Area (in acres) Total: 38.5 Disposal: 11.5

The attached permit findings and conditions are integral parts of this permit and supersede the conditions of any previously issued solid waste facility permit.

5. Approval: Jill Kearney, REHS

Jill Kerny

Approving Officer Signature

6. Enforcement Agency Name and Address:

Mono County Health Department
P.O. Box 476
Bridgeport, CA 93517

7. Permit Issued Date: 6-17-2013

8. Permit Review Due Date: 6-17-2018

9. Legal Description of Facility: The legal description of this facility is contained in the final closure plan and includes Assessor's Parcel Number(s) E1/2, NW 1/4, NE1/4, and the W 1/2, NE 1/4, NE 1/4 of S28, T. 5 N., R. 25 E., MDB&M, APN 008-060-066-000.

10. Findings:

a. This permit is consistent with the standards adopted by the California Integrated Waste Management Board..
b. The closure and postclosure maintenance of the disposal site is consistent with the State Minimum Standards for Solid Waste Handling and Disposal as determined by the Enforcement Agency.
c. A (type of CEQA document) was filed with the State Clearinghouse (SCH #2000012122) and certified by the (Mono County Board of Supevisors) on (4/18/2000). A Notice of Determination was filed with the State Clearinghouse on (4/18/2000).

11. Prohibitions: Disposal of solid waste at this site is prohibited.

12. The following documents describe and/or restrict the closure and postclosure maintenance of this site:

Waste Discharge Requirements Order No. R6T-2009-0019	5-14-2009	APCD Permit to Operate #	n/a
Land Use and/or Conditional Use Permit	n/a		

13. Self Monitoring: The owner/operator shall submit the results of all self-monitoring programs to the Enforcement Agency in accordance with the most recently approved postclosure maintenance plan.

14. Enforcement Agency (EA) Conditions:

a. The owner/operator shall comply with all applicable standards as specified in Title 27, California Code of Regulations (27 CCR) including all appropriate financial assurance requirements.
b. Additional information concerning the disposal site shall be furnished upon request within the time frame specified by the EA.
c. The owner/operator shall comply with the most recently approved Closure Plan and the most recently approved Postclosure Maintenance Plan.
d. All proposed changes, including postclosure land uses, that would cause the design or maintenance of the disposal site to be modified shall be documented in revised closure and/or postclosure maintenance plans and may be implemented only upon approval of the revised plan(s).
e. The EA shall be notified of a change in ownership during closure or postclosure maintenance in accordance with 27 CCR 21200.
f.

APPENDIX B.3

WASTE DISCHARGE REQUIREMENTS

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

BOARD ORDER NO. 6-01-37
WDID NO. 6B260004000

REVISED WASTE DISCHARGE REQUIREMENTS
FOR

MONO COUNTY DEPARTMENT OF PUBLIC WORKS
BRIDGEPORT CLASS III LANDFILL

Mono County

The California Regional Water Quality Control Board, Lahontan Region (Regional Board) finds:

1. Dischargers

On March 27, 2001, the County of Mono submitted information that constitutes a complete revised Report of Waste Discharge (RWD) in accordance with Title 27, California Code of Regulations (CCR) for the active Bridgeport Class III Landfill. The revised RWD contains updated information of the operation of the Facility. For the purposes of this Regional Board Order (Order) the County of Mono (Operator and landowner) are referred to as the "Discharger."

2. Facility

For the purposes of this Order, the Bridgeport Class III Landfill is referred to as the "Facility." The Facility is an active waste management unit located approximately one mile north of the Community of Bridgeport within the NE/4 of Section 28, T5N, R25E, MDB&M as shown on Attachment "A," which is made a part of this Order.

3. Order History

The Regional Board previously adopted Waste Discharge Requirements (WDRs) for the Facility in Board Order No. 6-72-61, which was adopted on October 12, 1972. Board Order No. 6-93-10026 was adopted on September 9, 1993, and amended the WDRs to incorporate the requirements of Title 40, Code of Federal Regulations, Parts 257 and 258 (Subtitle D) as implemented in California under State Water Resources Control Board (SWRCB) Resolution No. 93-62. Board Order No. 6-72-61A1 amended (Subtitle D requirement) Board Order No. 6-72-61 and was adopted on September 14, 1995.

4. Reason For Action

The Regional Board is revising these WDRs as part of a process to periodically review and update requirements, to incorporate additional ground water monitoring points and to achieve compliance with requirements of Title 27, CCR.

5. Description of Facility

The existing Facility is an unlined landfill, which receives approximately one ton of waste per day as of January 2001. The Facility maintains a waste load checking program as required by Section 20008 of Title 27, CCR Based on the quantity of waste received per day, the Facility is a Very Small Landfill as defined in Federal Subtitle D. As such, Subtitle D requirements became effective for this Facility on April 9, 1994. Regional Board staff reviewed information submitted by the Discharger which illustrates the existing footprint of waste discharged. The footprint documents the limits of waste which are exempt from Subtitle D requirements for composite liners, and is shown as Attachment "B" of this Order. All new future expansion areas will be required to be lined and otherwise be designed and operated to comply with Subtitle D liner requirements as well as Title 27, CCR. The existing unlined area will continue to receive waste until final grade elevations are attainted. When the grade elevations are attainted, then the Facility is proposed to be closed in accordance with an approved final closure plan. A final closure plan must be submitted at least 180 days, for approval, prior to beginning closure activity.

6. Authorized Disposal Sites

The footprint of waste shown in Attachment "B" is the only authorized Landfill disposal site. A revised Report of Waste Discharge is required if the Discharger proposes to discharge municipal solid waste or non-hazardous solid waste outside the Landfill footprint area.

7. Landfill Waste Classification

The Facility receives waste from the Community of Bridgeport and nearby communities. The waste received at the Facility is defined in Sections 20220 and 20230 of Title 27, CCR as non-hazardous solid and inert waste, respectively, and is defined as municipal solid waste in Subtitle D.

8. Waste Management Unit (Landfill) Classification

Pursuant to Section 20260 of Title 27, CCR the Landfill is classified as a Class III waste management unit.

9. Subtitle D Compliance Status

Board Order No. 6-93-10026 required the submittal of several items in order for the Landfill to comply with Subtitle D. The Discharger submitted complete information regarding the acceptance of liquids, the existing waste footprint, the distance from the Facility to the nearest drinking water source, and whether the Facility is located in a 100 year floodplain or a wetlands. The above listed items submitted in accordance with Order No. 6-93-10026 fulfilling the submittal requirements of Subtitle D as implemented by SWRCB Resolution No. 93-62.

10. Water Quality Protection Standard (WQPS)

The WQPS requirements of Title 27, CCR consist of constituents of concern (including monitoring parameters), concentration limits, monitoring points, and the point of compliance. The standard applies over the active life of the Facility, the closure and post-closure maintenance period, and the compliance period. The constituents of concern, monitoring points, and point of compliance are described in the Monitoring and Reporting Program (MRP), which is attached to and made part of this Order.

11. Statistical Methods

Statistical analysis of monitoring data is necessary for the earliest possible detection of a statistically significant release of waste from the Facility. Section 20415, Title 27, CCR and Subtitle D regulations require statistical data analysis. The attached Monitoring and Reporting Program includes general methods for statistical data analysis.

12. Detection Monitoring

The Discharger has implemented a Detection Monitoring Program (DMP). Due to intermittent, low concentration detected of VOC's in ground water Monitoring wells. The Discharger has proposed an Evaluation Monitoring Program (EMP) to evaluate the extent of the impact to water quality.

13. Evaluation Monitoring

Regional Board under Chapter 15, Title 23, California Code of Regulations, is requiring an EMP for the Facility. The evaluation program will consist of quarterly monitoring of the EMP ground water monitoring wells. A corrective action plan (CAP) will be implemented if appropriate.

Section 20405, Title 27, CCR requires an EMP which includes:

A sufficient number of monitoring points installed at appropriate locations and depths to yield ground water samples from the uppermost aquifer that represent the quality of ground water passing the Point of Compliance and at other locations in the uppermost aquifer to provide the data needed to evaluate changes in water quality due to the release from the Unit.

14. EMP Review

A review of the EMP currently being used at the Landfill has revealed the following:

a. between downgradient monitoring points MW-1 and MW-2 there is approximately 475-feet of unmonitored waste footprint;

b. north of downgradient monitoring point MW-2 there is approximately 175-feet of unmonitored waste footprint.

This Order includes a time schedule to submit a work plan for the installation of monitoring points which will sufficiently yield data for the evaluation of the release for the unmonitored portion of the waste foot print.

15. Corrective Action

A corrective action program (CAP) to remediate released wastes from the Landfill may be required pursuant to Section 20430 of Title 27, CCR should results of an EMP warrant a CAP.

16. Site Geology

The Facility is located on an alluvial plain of gravel, sand, silt, and clay, which slopes westerly toward the Bridgeport reservoir. Intermittent facies of clay and silt inter finger with sands and gravel beneath the Facility. Boring logs indicates highly permeable sand and gravel deposits approximately 40-feet below the ground surface (bgs).

17. Site Hydrogeology

Ground water beneath the Facility is found in unconsolidated materials ranging in depth from approximately 18 to 54 feet below ground surface (bgs). Ground water beneath the Facility flows generally westerly toward the Bridgeport reservoir at a slope of 0.041 ft/ft. Highly permeable deposits provide lateral hydraulic continuity between the site and adjoining areas.

18. Site Surface Hydrology and Storm Water Runoff

The Bridgeport reservoir is approximately 1/4 mile northwest and approximately 30-feet in elevation lower then the Facility. There are no surface waters with hydrological connections from the Facility to the reservoir. All storm water from the Facility is to remain on site and is regulated under the State Amended General Industrial Activities Storm Water Permit.

19. Site Topography

The land generally slopes to the west toward the Bridgeport Reservior. Site topography is shown on Attachment "B," which is made a part of this Order.

20. Climatology

The average precipitation in the area of the Facility is approximately 9.07 inches annually. The evaporation rate is approximately 60 inches annually.

22. Land Uses

The land uses at and surrounding the Facility consists of the following:

a. various maintained residences, and commercial buildings in the Community of Bridgeport and the Bridgeport Indian Colony of the Paiute-Washoe Tribe;
b. open high desert land;
c. agricultural and grazing uses; and
d. recreational uses.

23. Closure and Post-Closure Maintenance

The Discharger has submitted a Preliminary Closure and Post-Closure Monitoring Plan (PCPCMP) in April of 1998 by Vector Engineering, Inc. The plan generally proposes in-place closure of the waste and an extended period of site monitoring. The plan was deemed complete and technically adequate by Board staff. This Order provides Regional Board approval of the PCPCMP. This Order requires that the Discharger review the PCPCMP annually to determine if significant changes in the operation of the Facility warrant an update of the plan. A final closure plan must be submitted at least 180 days, for approval, prior to beginning closure activities.

24. Financial Assurance

The Discharger has provided documentation that a financial assurance fund has been developed for closure, post-closure maintenance, and potential corrective action requirements. The California Integrated Waste Management Board (CIWMB) determined as of January 2001 the requirements of the financial assurance Section's 22241 and 22245 of Title 27 CCR where meet. This Order requires that the Discharger demonstrate in an annual report that the amount of financial assurance (for Closure, Post-Closure and Corrective Action) is adequate, or increase the amount of financial assurance.

25. Receiving Waters

The receiving waters are the ground waters of the Bridgeport Reservoir Hydrological Area (Department of Water Resources East Walker River Hydrologic Unit).

26. Lahontan Basin Plan

The Regional Board adopted a Water Quality Control Plan for the Lahontan Region (Basin Plan) which became effective on March 31, 1995. This Order implements the Basin Plan.

27. Beneficial Uses

The present beneficial uses of the ground waters of the Bridgeport Reservoir Hydrological Area (Department of Water Resources East Walker River Hydrologic Unit) as set forth and defined in the Basin Plan are:

a. municipal and domestic supply (MUN)
b. freshwater replenishment (FRSH)
c. agricultural supply (AGR)
d. industrial supply (IND)

28. California Environmental Quality Act Compliance

These WDRs govern an existing Facility that the Discharger is currently operating. The project consists only of the continued operation of the Landfill and is exempt from the provisions of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.) in accordance with Section 15301 of the CEQA Guidelines.

29. Notification of Interested Parties

The Regional Board has notified the Discharger and all known interested agencies and persons of its intent to adopt revised WDRs for the project.

30. Consideration of Interested Parties

The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that the Discharger shall comply with the following:

I. DISCHARGE SPECIFICATIONS

A. Receiving Water Limitations

This discharge shall not cause a violation of any applicable water quality standard for receiving water adopted by the Regional Board or the State Water Resources Control Board (SWRCB) as required by the Federal Water Pollution Control Act, the California Water Code and regulations adopted thereunder. The discharge of waste shall not cause the presence of the following substances or conditions in ground waters of the Bridgeport Reservoir Hydrologic Area (Department of Water Resources East Walker River Hydrologic Unit).

1. Nondegradation

SWRCB Resolution No. 68-16 "Statement of Policy With Respect to Maintaining High Quality of Waters In California", known as the Nondegradation objective, requires maintenance of existing high quality in surface waters, ground waters, or wetlands. Whenever the existing quality of water is better than the quality of water established in the Basin Plan, such existing quality shall be maintained unless appropriate findings are made under Resolution No. 68-16.

2. Ground Waters

a. Bacteria - Waters shall not contain concentrations of coliform organisms attributable to human wastes. The median concentration of coliform organisms, over any seven-day period, shall be less than 1.1/100 ml in ground waters.

b. Chemical Constituents

Ground waters designated as MUN shall not contain concentrations of chemical constituents in excess of the maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) based upon drinking water standards specified in the following provisions of Title 22 of the CCR: Table 64431-A of Section 64431 (Inorganic Chemicals), Table 64431-B of Section 64431 (Fluoride), Table 6444-A of Section 64444 (Organic Chemicals), Table 64449-A of Section 64449 (SMCLs-Consumer Acceptance Limits), and Table 64449-B of Section 64449 (SMCLs-Ranges). This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

c. Chemicals - Waters shall not contain concentrations of chemical constituents that adversely affect the water for beneficial uses.

d. Radioactivity - Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life, or that result in the accumulation of radionuclides in the food chain to an extent that it presents a hazard to human, plant, animal, or aquatic life. Waters shall not contain concentrations of radionuclides in excess of limits specified in the CCR, Title 22, Chapter 15, Article 5, Section 64443.

e. Taste and Odors - Ground waters shall not contain taste or odor-producing substances in concentrations that cause nuisance or that adversely affect beneficial uses. For ground waters designated as MUN, at a minimum, concentrations shall not exceed adopted secondary maximum contaminant levels specified in Table 64449-A of Section 64449 (Secondary Maximum Contaminant Levels-Ranges), and Table 64449-B of Section 64449 (Secondary Maximum Contaminant Levels-Ranges) of Title 22 of the CCR, including future changes as the changes take effect.

II. REQUIREMENTS AND PROHIBITIONS

A. General

1. The discharge shall not cause a pollution as defined in Section 13050 of the California Water Code, or a threatened pollution.

2. The discharge shall not cause a nuisance as defined in Section 13050 of the California Water Code.

3. The discharge of solid wastes, leachate, or any other deleterious material to the ground waters of the Bridgeport Reservoir Hydrologic Area (Department of Water Resources East Walker River Hydrologic Unit).

4. The discharge of waste except to the authorized disposal sites is prohibited.

5. The disposal sites shall be protected from inundation, washout, or erosion of wastes and erosion of covering materials resulting from a storm or a flood having recurrence interval of once in 100 years.

6. Surface drainage from tributary areas, and internal site drainage from surface or subsurface sources shall not contact or percolate through solid wastes discharged at the site.

7. The exterior surfaces of the disposal sites shall be graded to promote lateral runoff of precipitation and to prevent ponding. Lateral runoff shall be contained on site.

8. Water used for dust control during disposal site operations shall be limited to a minimal amount. A "minimal amount" is defined as that amount which will not result in runoff.

9. Wastes shall not be placed in ponded water from any source whatsoever.

10. The discharge of wastes in a manner that does not maintain a five-foot soil separation between the wastes and the seasonal high ground water elevation is prohibited.

11. Waste discharged to the Landfill shall have solids content of 50 percent or greater.

12. The Discharger shall remove and relocate any waste, which is or has been discharged at the disposal sites in violation of these requirements. The waste shall be relocated to a site, which is permitted to receive such wastes. All removal and relocation projects shall be coordinated with regulatory agencies, including the County of Mono.

13. During periods of precipitation, the disposal activity shall be confined to the smallest area possible based on the anticipated quantity of wastes and operation procedures.

14. At closure, all facilities must be closed in accordance with a final CPCMP approved by the Regional Board.

15. The concentration limit for each constituent of concern shall be determined pursuant to Section 20400, Title 27, CCR.

B. Detection Monitoring Program

The Discharger shall re-establish a DMP as required in Section 20385, Title 27, CCR for those monitoring points not under an EMP or Corrective action.

C. Evaluation Monitoring Program

1. The Discharger shall maintain an EMP as required in Section 20425 of Title 27, CCR.

2. State regulations (Section 13750-13755 California Water Code) require that a Well Completion Report be provided to the Department of Water Resources for every well drilled, reconstructed, or destroyed. The regulations require that a licensed contractor drills the well and that the report be completely and accurately filled out. A registered geologist should record all well logs. Reports for wells drilled after September 11, 1951 are confidential.

D. Corrective Action Program

The Discharger shall institute a CAP when required pursuant to Section 20430 of Title 27, CCR.

III. DATA ANALYSIS

A. Statistical Analysis

Statistical analysis of ground water and unsaturated zone DMP data shall be conducted. Analysis shall be conducted in accordance with statistical methods detailed in Monitoring and Reporting Program No. 01-37.

B. Nonstatistical Analysis

The Discharger shall determine whether there is significant physical evidence of a release from the Facility. Significant physical evidence may include unexplained volumetric changes in the Landfill, unexplained stress in biological communities, unexplained changes in soil characteristics, visible signs of leachate migration, and unexplained water table mounding beneath or adjacent to the Facility, or any other change in the environment that could be reasonably be expected to be the result of a release from the Facility.

C. Verification Procedures

1. The Discharger shall immediately initiate verification procedures as specified below whenever there is a determination by the Discharger or Executive Officer that there is statistical or non-statistical evidence of a release. If the Discharger declines the opportunity to conduct verification procedures, the Discharger shall submit a technical report as described below under the heading Technical Report Without Verification Procedures.

2. The verification procedure shall only be performed for the constituent(s) that has shown evidence of a release, and shall be performed for those monitoring points at which a release is indicated.

3. The Discharger shall either conduct a composite retest using data from the initial sampling event with all data obtained from the resampling event or shall conduct a discrete retest in which only data obtained from the resampling event shall be analyzed in order to verify evidence of a release.

4. The Discharger shall report to the Regional Board by certified mail the results of the verification procedure, as well as all concentration data collected for use in the retest within seven days of the last laboratory analysis.

5. The Discharger shall determine, within 45 days after completion of sampling, whether there is statistically significant evidence of a release from the Landfill at each monitoring point. If there is evidence of a release, the Discharger shall immediately notify the Regional Board by certified mail. The Executive Officer may make an independent finding that there is evidence of a release.

6. If the Discharger or Executive Officer verifies evidence of a release, the Discharger is required to submit, within 90 days of a determination that there is or was a release, a technical report pursuant to Section 13267(b) of the California Water Code. The report shall propose a revised EMP **OR** make a demonstration to the Regional Board that there is a source other than the Facility that caused evidence of a release.

D. Technical Report Without Verification Procedures

If the Discharger chooses not to initiate verification procedures, a technical report shall be submitted pursuant to Section 13267(b) of the California Water Code. The report shall propose an EMP, **OR**, attempt to demonstrate that the release did not originate from the Facility.

IV. PROVISIONS

A. Rescission of Waste Discharge Requirements

Board Order Nos. 6-72-61, 6-72-61A1, and Board Order No. 6-93-10026, are hereby rescinded.

B. Standard Provisions

The Discharger shall comply with the "Standard Provisions for Waste Discharge Requirements," dated September 1, 1994, which, attached to and made part of this Order.

C. Monitoring and Reporting

1. Pursuant to the California Water Code Section 13267(b), the Discharger shall comply with the Monitoring and Reporting Program No. 01-37 as specified by the Executive Officer.

2. The Discharger shall comply with the "General Provisions for Monitoring and Reporting," dated September 1, 1994, which is attached to and made part of the Monitoring and Reporting Program. The Monitoring and Reporting Program is attached to the WDRs and is a part of this Order.

D. Closure and Post-Closure Monitoring

This Order provides Regional Board approval of the PCPCMP. The PCPCMP shall be updated if there is a substantial change in operations. A report shall be submitted annually indicating conformance with existing operations. To comply with Title 27, CCR, a final CPCMP shall be submitted at least 180 days prior to beginning any partial or final closure activities or at least 120 days prior to discontinuing the use of the site for waste treatment, storage or disposal, whichever is greater. The CIWMB, pursuant to Title 27, CCR, requires the submittal of a final closure plan a minimum of two years prior to closure. Information shall be submitted annually indicating conformance with the existing operations. The Regional Board must approve the Final CPCMP.

E. Financial Assurance

The Discharger shall submit a report annually providing evidence that adequate financial assurance pursuant to the requirements of the WDRs has been provided for closure, post- closure, and for potential releases. Evidence shall include the total amount of money available in the fund developed by the Discharger. In addition, the Discharger shall either provide evidence that the amount of financial assurance is still adequate or increase the amount of financial assurance by the appropriate amount. An increase may be necessary due to inflation, a change in regulatory requirements, and a change in the approved closure plan, or other unforeseen events.

F. Modifications to the Landfill

If the Discharger intends to expand the capacity of the Facility, a report shall be filed no later than 90 days after the total quantity of waste discharged at this site equals 75 percent of the reported capacity of the site. The report shall contain an estimate of the remaining life of the existing Facility and a detailed plan for site expansion. This plan shall include, but is not limited to, a time schedule for studies design, and other steps needed to provide additional capacity. If site expansion is not undertaken prior to the site reaching the reported capacity, the total quantity discharged shall be limited to the reported capacity.

V. TIME SCHEDULE

1. Monitoring Points

By **September 28, 2001,** the Discharger shall submit a work plan for the installation of new monitoring points.

2. By **June 30, 2002,** the Discharger shall install the additional monitoring points.

I, Harold J. Singer, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by California Regional Water Quality Control Board, Lahontan Region, on June 13, 2001.

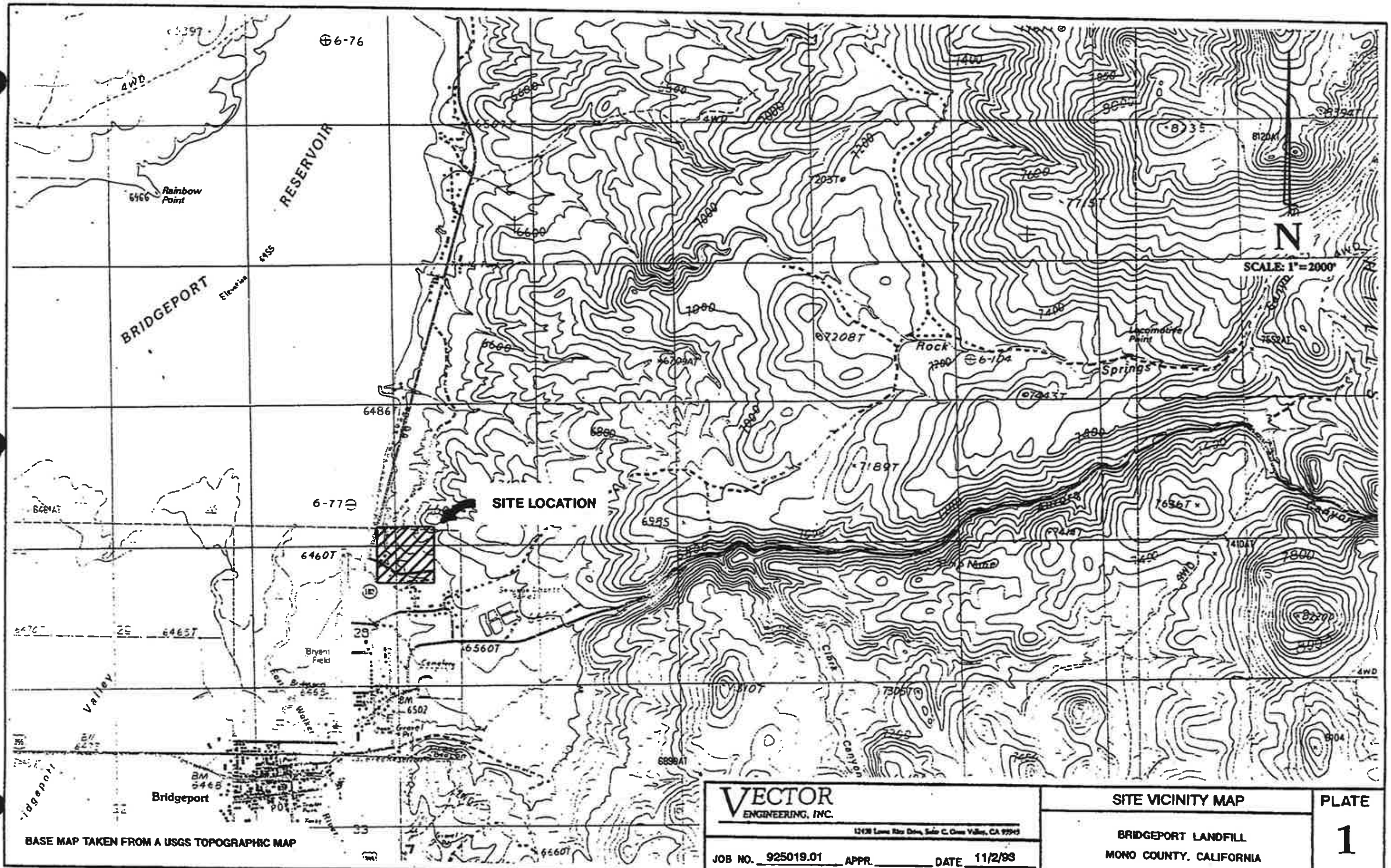
Harold J. Singer

HAROLD J. SINGER
EXECUTIVE OFFICER

Attachments:
A. Location Map
B. Landfill Footprint of Waste and Topography
C. Standard Provisions for Waste Discharge Requirements

6/2001 #2 BRIDGEPORT wdr DF/rp

Attachment A



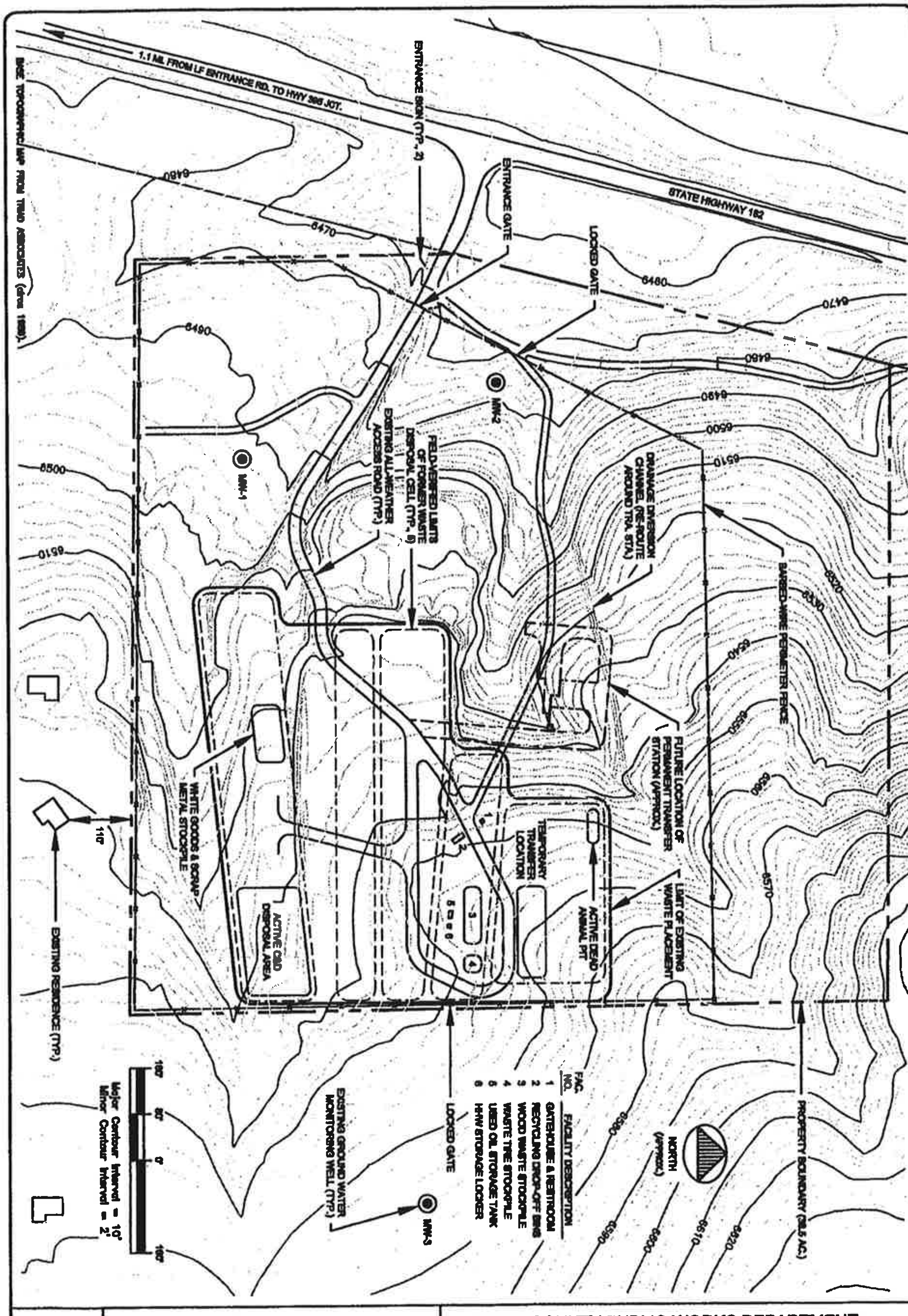


Figure 1	BRIDGEPORT LANDFILL 2001 WASTE DISCHARGE REQUIREMENTS Mono County, California	MONO COUNTY PUBLIC WORKS DEPARTMENT			
		Drawing Date: 6/13/01	Rev.#	Date	Revision
		Prepared By: E. Nikirk, P.E.			
		Checked By: E. Nikirk, P.E.			
	EXISTING TOPOGRAPHY & FACILITIES	Approved By: R. Boardman			

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

REVISED MONITORING AND REPORTING PROGRAM NO. 01-37
WDID NO. 6B260004000
FOR

MONO COUNTY DEPARTMENT OF PUBLIC WORKS
BRIDGEPORT CLASS III LANDFILL

Mono County

I. WATER QUALITY PROTECTION STANDARD

A Water Quality Protection Standard is required by Title 27, California Code of Regulations (CCR) to assure the earliest possible detection of a release from the Bridgeport Class III Facility (Landfill) to the underlying soil and/or ground water. A release has already been detected and an Evaluation Monitoring Program (EMP) was established (April 1997) for some constituents of concern. This Monitoring and Reporting Program maintains the EMP for the existing Facility.

A. Evaluation Monitoring Program

The County of Mono (Discharger) has developed an EMP for evaluation of releases from the existing Facility area to the ground water beneath and in the vicinity of the Facility. The EMP consists of three monitoring wells, two down gradient and one up gradient. The locations of the ground water monitoring wells are illustrated on Attachment "B." The EMP shall be as follows:

1. Ground Water

a. Monitoring Parameters

The monitoring parameters are the metal surrogate's chloride, sulfate, nitrate as nitrogen, total dissolved solids, and volatile organic constituents as defined by Appendix I of 40 CFR, Part 258.

b. Concentration Limits

i. The Discharger is allowed, under Section 20400(a)(2), Title 27, CCR to derive anew, as needed, using a formula-based system, the concentration limits for each monitoring parameter and constituent of concern, which will equal the background value of that constituent as determined pursuant to Section 20415(e)(10)(B), Title 27, CCR.

ii. The concentration limits for each man-made organic constituent, which is not proven to have originated from a source other than the Facility is laboratory detection limit for that constituent.

Table No.1

Parameters	Units	Sampling Frequency
Monitoring Parameters		
Total Dissolved Solids	mg/L	Quarterly
Chloride	mg/L	Quarterly
Nitrate as Nitrogen	mg/L	Quarterly
Sulfate	mg/L	Quarterly
Volatile Organic Compounds (Appendix I of 40 CFR, Part 258)	µg/L	Quarterly
Appendix II of 40 CFR, Part 258	µg/L	5-year

The monitoring parameters listed in Table 1 above shall be measured and reported in graphic and tabular form.

II. MONITORING

A. Discharge

The following shall be reported semi-annually:

1. The volume of solid waste (in-place compacted volume in cubic yards) discharged to the Landfill.

2. The percent of the total landfill volume used for solid waste disposal, including waste disposed this monitoring period.

3. Comments describing effectiveness of the load checking program for the landfill.

4. Water quality monitoring data collected in accordance with this Board Order, including actual values of constituents and parameters, shall be maintained in the Facility operating record and reported semi-annually.

B. Evaluation Monitoring

The Discharger as required by Section 20425 of Title 27, CCR has developed an EMP. Monitoring shall be completed as follows:

1. Ground Water

a. Monitoring Points

Wells MW-1 and MW-2 are utilized as monitoring points for evaluation monitoring at the point of compliance. Well MW-3 is utilized for background water quality monitoring. The ground water monitoring well locations are shown in Attachment "A" of this Monitoring and Reporting Program.

Additional monitoring points shall be added to the Facility as approved by Regional Board.

b. Monitoring Parameters

EMP has been initiated, ground water samples are be collected and submitted for laboratory analysis at all monitoring points quarterly for the monitoring parameters listed in Table No. 1 of this Monitoring and Reporting Program.

c. Constituents of Concern

EMP has been initiated, ground water samples shall be collected and submitted for laboratory analysis at all monitoring points for constituents of concern listed in Table No. 1 of this Monitoring and Reporting Program.

d. Aquifer Characteristics

EMP has been initiated, the aquifer characteristics listed in Table 2 shall be calculated and reported in graphic and tabular form quarterly.

Table No. 2

Ground Water Field Measurements

Parameter	**Units**
Depth to Ground Water	feet bgs
Static Water Level	feet above mean sea level
Electrical Conductivity	micromhos/cm
pH	pH Units
Temperature	deg. F or C
Turbidity	NTUs

Ground Water Calculations

Slope of Ground Water Gradient	ft/mile
Direction of Ground Water Gradient	degrees
Velocity of Ground Water Flow	feet/year

III. DATA ANALYSIS

A. General Nonstatistical Data Analysis Method

In order to determine if any new release have occurred from the Landfill, evaluation of data will be conducted using non-statistical methods. Non-statistical analysis shall be as fellows:

1. Physical Evidence

   Physical evidence can include vegetation loss, unexplained volumetric changes in the Landfill, ground water mounding, or soil discoloration. Each quarterly report shall comments on these physical elements.

2. Time Series Plots

   Each Annual report shall include a time series plot for each constituent detected during the last year. Evidence of a release may include trends of increasing concentrations of one or more constituents over time.

B. General Statistical Analysis Method

The report titled "Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities" (U.S. EPA, 1989), shall be used to select the statistical test to use for comparing evaluation monitoring well data to background monitoring data. If more than 50 percent of the observations in the evaluation monitoring wells are below the detection limit, then the Test of Proportions will be used. If more than 50 percent are above the detection limit, then a One-Way Analysis of Variance (ANOVA) will be used (i.e., Bartlett's Test for Equality of Variances). For multiple well computations the computed F Statistic will be compared to the tabulated F Statistic at the five (5) percent significance level. If the calculated F value exceeds the tabulated value, then the hypothesis of equal means will be rejected. The Bonferroni t-Statistics will be computed to determine if the significant F is due to differences between background and compliance wells at the five (5) percent significance level.

IV. REPORTING REQUIREMENTS

A. Scheduled Reports To Be Filed With The Regional Board

The following periodic reports shall be submitted to the Regional Board as specified below.

Semi-Annual Evaluation Monitoring Reports

1. Results of quarterly sampling and laboratory analysis of ground water.

2. A letter transmitting the essential points in each report shall accompany each report. The letter shall include a discussion of any requirement violations found since the last report was submitted, and shall describe actions taken or planned for correcting those violations.

3. If the Discharger has previously submitted a detailed time schedule for correcting requirement violations, a reference to the correspondence transmitting this schedule will be satisfactory. If no violations have occurred since the last submittal, this shall be stated in the letter of transmittal.

4. For each monitored ground water body, a description and graphical presentation of the velocity and direction of ground water flow under/around the Unit, based upon water level elevations taken during the collection of the water quality data submitted in the report.

5. A map or aerial photograph showing the locations of vadoze zone and ground water monitoring points.

B. Unscheduled Reports To Be Filed With The Regional Board

1. Notice of Tentative Release

   Should the appropriate statistical or non-statistical data analysis indicate, for a given constituent of concern, that a release is tentatively identified, Discharger shall:

   a. Immediately notify the Regional Board verbally as to the monitoring point(s) and constituent(s) or parameter(s) involved;

   b. Provide written notification by certified mail within seven days of such determination (Section 20420, Title 27, CCR). The notification should indicate the Dischargers intent to conduct verification sampling, initiate evaluation monitoring procedures, or demonstrate that a source other than the Facility is responsible of the release.

c. If the Discharger chooses to attempt to demonstrate that a source other than the Landfill is responsible for the release, the Discharger shall submit a supporting technical report within 90 days of detection of the release.

2. Engineering Feasibility Study Report

The Discharger shall, within 180 days of verifying the release, submit an Engineering Feasibility Study (Section 20420, Title 27) to preliminarily propose methods for corrective action.

C. General Provisions

The Discharger shall comply with the "General Provisions for Monitoring and Reporting," dated September 1, 1994, which is attached to and made part of this Monitoring and Reporting Program.

D. Submittal Periods

Quarterly monitoring reports shall be submitted to the Regional Board semi-annually on the last day of the month following the semester.

E. Annual Report

On or before **March 1, 2002**, and before **March 1** every year thereafter, the Discharger shall submit an annual report to the Regional Board. This report shall include the previous monitoring year; items described in the General Provisions for Monitoring and Reporting and Title 27 of the CCR. The annual report should include, but is not limited to the following:

a. Graphical presentation of analytical data from the first month release was detected;
b. all monitoring analytical data obtained during the previous two six-month reporting periods, presented in tabular form;
c. compliance record discussion;
d. waste allocation map and percent of remaining space for waste disposal; and
e. summary of changes along with financial review.

Ordered by: Harold J. Singer Dated: June 13, 2001
HAROLD J. SINGER
EXECUTIVE OFFICER

Attachments: A. Location of Ground Water Monitoring Points
B. General Provisions for Monitoring and Reporting

6/2001#2 BRIDGEPORT mrp DF/rp

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

Attachment B

GENERAL PROVISIONS
FOR MONITORING AND REPORTING

1. SAMPLING AND ANALYSIS

   a. All analyses shall be performed in accordance with the current edition(s) of the following documents:

      i. Standard Methods for the Examination of Water and Wastewater
      ii. Methods for Chemical Analysis of Water and Wastes, EPA

   b. All analyses shall be performed in a laboratory certified to perform such analyses by the California State Department of Health Services or a laboratory approved by the Regional Board. Specific methods of analysis must be identified on each laboratory report.

   c. Any modifications to the above methods to eliminate known interferences shall be reported with the sample results. The method used shall also be reported. If methods other than USEPA approved methods or Standard Methods are used, the exact methodology must be submitted for review and must be approved by the Regional Board prior to use.

   d. The Discharger shall establish chain-of-custody procedures to ensure that specific individuals are responsible for sample integrity from commencement of sample collection through delivery to an approved laboratory. Sample collection, storage and analysis shall be conducted in accordance with an approved Sampling and Analysis Plan (SAP). The most recent version of the approved SAP shall be kept at the facility.

   e. The Discharger shall calibrate and perform maintenance procedures on all monitoring instruments and equipment to ensure accuracy of measurements, or shall ensure that both activities will be conducted. The calibration of any wastewater flow measuring device shall be recorded and maintained in the permanent log book described in 2.b, below.

   f. A grab sample is defined as an individual sample collected in fewer than 15 minutes.

   g. A composite sample is defined as a combination of no fewer than eight individual samples obtained over the specified sampling period at equal intervals. The volume of each individual sample shall be proportional to the discharge flow rate at the time of sampling. The sampling period shall equal the discharge period, or 24 hours, whichever period is shorter.

2. OPERATIONAL REQUIREMENTS

a. Sample Results

Pursuant to California Water Code Section 13267(b), the Discharger shall maintain all sampling and analytical results including: strip charts; date, exact place, and time of sampling; date analyses were performed; sample collector's name; analyst's name; analytical techniques used; and results of all analyses. Such records shall be obtained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the Regional Board.

b. Operational Log

Pursuant to California Water Code Section 13267(b), an operation and maintenance log shall be maintained at the facility. All monitoring and reporting data shall be recorded in a permanent log book.

3. REPORTING

a. For every item where the requirements are not met, the Discharger shall submit a statement of the actions undertaken or proposed which will bring the discharge into full compliance with requirements at the earliest time and submit a timetable for correction.

b. Pursuant to California Water Code Section 13267(b), all sampling shall be made available to the Regional Board upon request. Results shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the Regional Board.

c. The Discharger shall provide a brief summary of any operational problems and maintenance activities to the Regional Board with each monitoring report. Any modifications or additions to, or any major maintenance conducted on, or any major problems occurring to the wastewater conveyance system, treatment facilities, or disposal facilities shall be included in this summary.

d. Monitoring reports shall be signed by:

i. In the case of a corporation, by a principal executive officer at least of the level of vice-president or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge originates;

ii. In the case of a partnership, by a general partner;

iii. In the case of a sole proprietorship, by the proprietor;

iv. In the case of a municipal, state or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

e. Monitoring reports are to include the following:

i. Name and telephone number of individual who can answer questions about the report.

ii. The Monitoring and Reporting Program Number.

iii. WDID Number.

f. Modifications

This Monitoring and Reporting Program may be modified at the discretion of the Regional Board Executive Officer.

4. NONCOMPLIANCE

Under Section 13268 of the Water Code, any person failing or refusing to furnish technical or monitoring reports or falsifying any information provided therein, is guilty of a misdemeanor and may be liable civilly in an amount of up to one thousand dollars ($1,000) for each day of violation under Section 13268 of the Water Code.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

STANDARD PROVISIONS
FOR WASTE DISCHARGE REQUIREMENTS

ATTACHMENT C

1. Inspection and Entry

The Discharger shall permit Regional Board staff:

a. to enter upon premises in which an effluent source is located or in which any required records are kept;

b. to copy any records relating to the discharge or relating to compliance with the Waste Discharge Requirements;

c. to inspect monitoring equipment or records; and

d. to sample any discharge.

2. Reporting Requirements

a. Pursuant to California Water Code 13267(b), the Discharger shall immediately notify the Regional Board by telephone whenever an adverse condition occurred as a result of this discharge; written confirmation shall follow within two weeks. An adverse condition includes, but is not limited to, spills of petroleum products or toxic chemicals, or damage to control facilities that could affect compliance.

b. Pursuant to California Water Code Section 13260(c), any proposed material change in the character of the waste, manner or method of treatment or disposal, increase of discharge, or location of discharge, shall be reported to the Regional Board at least 120 days in advance of implementation of any such proposal. This shall include, but not limited to, all significant soil disturbances.

c. The Owners/Discharger of property subject to Waste Discharge Requirements shall be considered to have a continuing responsibility for ensuring compliance with applicable Waste Discharge Requirements in the operations or use of the owned property. Pursuant to California Water Code Section 13260(c), any change in the ownership and/or operation of property subject to the Waste Discharge Requirements shall be reported to the Regional Board. Notification of applicable Waste Discharge Requirements shall be furnished in writing to the new owners and/or operators and a copy of such notification shall be sent to the Regional Board.

d. If a Discharger becomes aware that any information submitted to the Regional Board is incorrect, the Discharger shall immediately notify the Regional Board, in writing and correct that information.

e. Reports required by the Waste Discharge Requirements, and other information requested by the Regional Board, must be signed by a duly authorized representative of the Discharger. Under Section 13268 of the California Water Code, any person failing or refusing to furnisl technical or monitoring reports, or falsifying any information provided therein, is guilty of a misdemeanor and may be liable civilly in an amount of up to one thousand dollars ($1,000) for each day of violation.

f. If the Discharger becomes aware that their Waste Discharge Requirements (or permit) is no longer needed (because the project will not be built or the discharge will cease) the Discharger shall notify the Regional Board in writing and request that their Waste Discharge Requirements (or permit) be rescinded.

3. Right to Revise Waste Discharge Requirements

The Regional Board reserves the privilege of changing all or any portion of the Waste Discharge Requirements upon legal notice to and after opportunity to be heard is given to all concerned parties.

4. Duty to Comply

Failure to comply with the Waste Discharge Requirements may constitute a violation of the California Water Code and is grounds for enforcement action or for permit termination, revocation and reissuance, or modification.

5. Duty to Mitigate

The Discharger shall take all reasonable steps to minimize or prevent any discharge in violation of the Waste Discharge Requirements which has a reasonable likelihood of adversely affecting human health or the environment.

6. Proper Operation and Maintenance

The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the Discharger to achieve compliance with the Waste Discharge Requirements. Proper operation and maintenance includes adequate laboratory control, where appropriate, and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by the Discharger, when necessary to achieve compliance with the conditions of the Waste Discharge Requirements.

7. Waste Discharge Requirement Actions

The Waste Discharge Requirements may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for waste discharge requirement modification, revocation and reissuance, termination, or a notification of planned changes or anticipated noncompliance, does not stay any of the Waste Discharge Requirements conditions.

8. Property Rights

The Waste Discharge Requirements do not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

9. Enforcement

The California Water Code provides for civil liability and criminal penalties for violations or threatened violations of the Waste Discharge Requirements including imposition of civil liability or referral to the Attorney General.

10. Availability

A copy of the Waste Discharge Requirements shall kept and maintained by the Discharger and be available at all times to operating personnel.

11. Severability

Provisions of the Waste Discharge Requirements are severable. If any provision of the requirements is found invalid, the remainder of the requirements shall not be affected.

12. Public Access

General public access shall be effectively excluded from disposal/treatment facilities.

13. Transfers

Providing there is no material change in the operation of the facility, this Order may be transferred to a new owner or operator. The owner/operator must request the transfer in writing and receive written approval from the Regional Board's Executive Officer.

14. Definitions

a. "Surface waters" as used in this Order, include, but are not limited to, live streams, either perennial or ephemeral, which flow in natural or artificial water courses and natural lakes and artificial impoundments of waters. "Surface waters" does not include artificial water courses or impoundments used exclusively for wastewater disposal.

b. "Ground waters" as used in this Order, include, but are not limited to, all subsurface waters being above atmospheric pressure and the capillary fringe of these waters.

15. Storm Protection

a. All facilities used for collection, transport, treatment, storage, or disposal of waste shall be adequately protected against overflow, washout, inundation, structural damage or a significant reduction in efficiency resulting from a storm or flood having a recurrence interval of once in 100 years.

APPENDIX C.1

MONITORING WELL CONSTRUCTION LOGS

BORING BL-1
MW-1

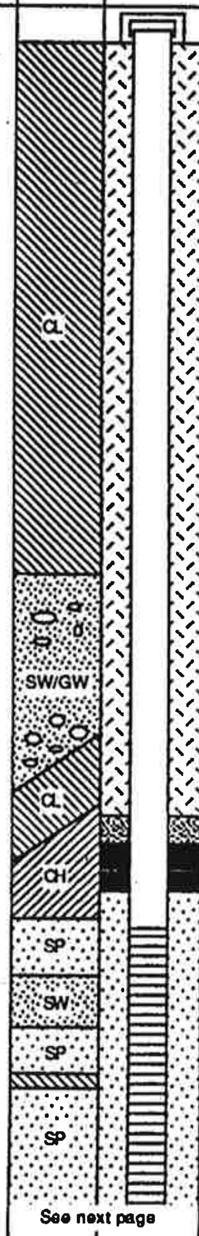
JOB NUMBER	CLIENT:	PAGE 1 OF 2
4953	T.T.I.	

DRILLING METHOD: TH-100 AIR ROTARY CASING HAMMER, 350 CFM COMPRESSOR

LOCATION: BRIDGEPORT LANDFILL

START DATE: 07-11-1989 **TIME:** 1000
FINISH DATE: 07-11-1989 **TIME:** 1820

Elevation 6493.01 feet Top of Monument



DEPTH (FEET)	SAMPLE DEPTH	SAMPLE DATE/TIME	SAMPLE TYPE	RECOVERY IN INCHES	ORGANIC VAPOR MONITORING OF SAMPLE BY F.I.D. (PPM)	TENSIOMETER READING (CENTIBARS)	DESCRIPTION
0		1000					Dry loose clayey gravel, sage brush.
10							No sampling 0-20'.
20	20-20.25	1430	PC	3	0	--	Dry grey brown sandy fine gravelly clay, subrounded. Rhyolitic composition black-red fragments.
25	25-27	1500	PC	24	0	--	Moist brown silty sand and gravel, very dense.
30	30-32	1540	PC	26	0	--	Moist brown silty sand and gravel, very dense, angular clasts, quartz obsidian abundant. Thin clay streaks.
35	35-38	1555	PC		1.0	50	Moist to wet brown fine to coarse sandy clay grading to moist grey dense clay.
38							Moisture content increases.
40	40-42.5	1630	PC	30	10	5.0	Lost circulation at 40'. Wet brown fine sand (rhyolite). Wet fine to coarse sand in shoe.
43.5							▽ Sounded water at 43.5' below ground at time of drilling (1700 7-11-89).
45	45-47.5	1650	PC	30	15	--	Outside of sampler wet (45-50'). Wet to saturated medium to coarse rhyolitic sand. 2" grey clay zone at 47'. Water has risen to 39.5' below ground surface (1755 7-11-89).
50	50-52	1730	PC	24	5	--	Occasional 3/4" gravel in top 2". Saturated brown fine sand grading to coarse sand.

KEY: PC=CHRISTENSEN "PUNCH CORE" SYSTEM: 5 FOOT LONG, 2-INCH I.D. SPLIT-BARREL SAMPLER WITH 6" LONG STEEL INSERTS. CONTACTS DASHED WHERE INFERRED.

M&E

BORING BL-1

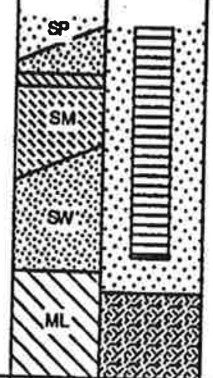
MW-1

JOB NUMBER	CLIENT:	PAGE 2 OF 2
4953	T.T.I.	

DRILLING METHOD:	LOCATION:
TH-100 AIR ROTARY CASING HAMMER, 350 CFM COMPRESSOR	BRIDGEPORT LANDFILL

START DATE: 07-11-1989 TIME: 1000
FINISH DATE: 07-11-1989 TIME: 1820

DEPTH (FEET)	SAMPLE DEPTH	SAMPLE DATE/TIME	SAMPLE TYPE	RECOVERY IN INCHES	ORGANIC VAPOR MONITORING OF SAMPLE BY F.I.D. (PPM)	TENSIOMETER READING (CENTIBARS)	SOIL GRAPH	WELL CONSTRUCTION	DESCRIPTION
50	50-52	1730	PC	24	5	--	SP		Occasional 3/4" gravel in top 2". Saturated brown fine sand grading to coarse sand.
51									
52									Slightly fine sandy silty clay at 51.75'.
53									
54									
55	55-57	1800	PC	24	10	--	SM		Saturated silty fine sand grading to a medium to coarse sand.
56									
57									
58									
59							SW		
60	60-62	1820	PC	24	1	--			
61									
62									
63							ML		
64									
65									
66									



Total depth = 66' below existing grade.

Water encountered at 43.5'.

Hole caved to 62'.

KEY: PC=CHRISTENSEN "PUNCH CORE" SYSTEM: 5 FOOT LONG, 2-INCH I.D. SPLIT-BARREL SAMPLER WITH 6" LONG STEEL INSERTS. CONTACTS DASHED WHERE INFERRED.

M&E

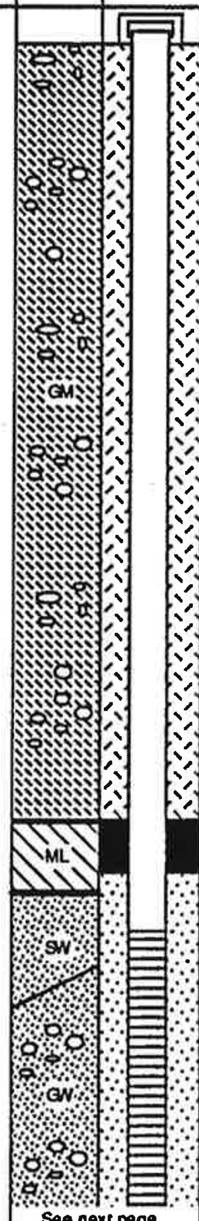
BORING BL-2
MW-2

JOB NUMBER	CLIENT:	PAGE 1 OF 2
4953	T.T.I.	

DRILLING METHOD:	LOCATION:
TH-100 AIR ROTARY CASING HAMMER, 350 CFM COMPRESSOR	BRIDGEPORT LANDFILL

START DATE: 07-13-1989 TIME: 0730
FINISH DATE: 07-14-1989 TIME: 1500

Elevation 6476.32 feet Top of Monument



DEPTH (FEET)	SAMPLE DEPTH	SAMPLE DATE/TIME	SAMPLE TYPE	RECOVERY IN INCHES	ORGANIC VAPOR MONITORING OF SAMPLE BY F.I.D. (PPM)	TENSIOMETER READING (CENTIBARS)	DESCRIPTION
0							Dry gravelly sand, sage brush.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							No sampling 0-20'.
11							
12							
13							
14							
15							
16							
17							
18							
19							
20	20-25	0840	PC	0	--	--	No sample recovered. Cuttings: moist brown silty sandy gravel. Drilling resistance increased from medium to hard from 20-25'. Cobbles.
21							
22							
23							
24							
25	25.5-28	0855	PC	2	--	--	Moist brown clayey sandy angular gravel, saturated. Large boulder at 25'. 2" Andesite rock core in shoe, prismatic crystals. 1" broken rock fragments at 26'. Wet to saturated in shoe.
26							
27		0915		9	--	--	
28							
29							
30	30-35	0934	PC	18	--	--	Brick red weathered volcanic. Weathered granite biotite, hornblend, andesite. Cobbles at 32-32.5'.
31							
32							
33							Water encountered at 33.5'.
34							
35	35-38	0950	PC	36	--	65	Moist to damp olive brown silt with some sand.
36							
37							
38							
39							
40	40-42	1010	PC	24	1	--	Saturated brown gravelly coarse sand graded, very gravelly sand, angular andesitic and rhyolitic fragments. Color changes to grey at 42'.
41							
42							
43							
44							Inner core barrel quad-latch fingers broken, no core samples below 42'.
45							
46							
47							
48							
49							
50							

KEY: PC=CHRISTENSEN "PUNCH CORE" SYSTEM: 5 FOOT LONG, 2-INCH I.D. SPLIT-BARREL SAMPLER WITH 6" LONG STEEL INSERTS. CONTACTS DASHED WHERE INFERRED.

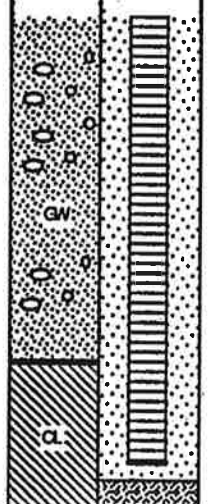
M&E

BORING BL-2
MW-2

JOB NUMBER	CLIENT:	PAGE 2 OF 2
4953	T.T.I.	

DRILLING METHOD:	LOCATION:
TH-100 AIR ROTARY CASING HAMMER, 350 CFM COMPRESSOR	BRIDGEPORT LANDFILL

START DATE: 07-13-1989 TIME: 0730
FINISH DATE: 07-14-1989 TIME: 1500



DEPTH (FEET)	SAMPLE DEPTH	SAMPLE DATE/TIME	SAMPLE TYPE	RECOVERY IN INCHES	ORGANIC VAPOR MONITORING OF SAMPLE BY F.I.D. (PPM)	TENSIOMETER READING (CENTIBARS)	SOIL GRAPH	WELL CONSTRUCTION	DESCRIPTION
50		7-14							
51		1200							Cuttings: 2"-3" subrounded gravel.
52									Cuttings: saturated coarse 1"-2" gravel and sand, subangular, volcanic.
53									
54									
55									
56									
57									
58									No samples.
59							GW		
60									
61									
62									
63									
64									
65									
66									Cuttings: saturated brown sandy clay.
67									
68									
69							CL		
70									
71		1500							
72									

KEY: PC=CHRISTENSEN "PUNCH CORE" SYSTEM: 5 FOOT LONG, 2-INCH I.D. SPLIT-BARREL SAMPLER WITH 6" LONG STEEL INSERTS. CONTACTS DASHED WHERE INFERRED.

M&E

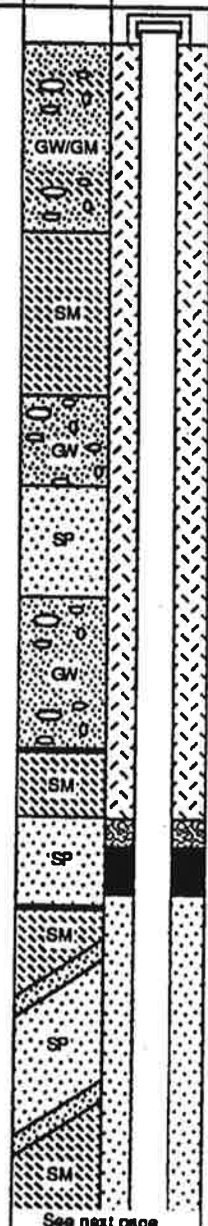
BORING BL-3
MW-3

JOB NUMBER	CLIENT:	PAGE 1 OF 3
4953	T.T.I.	

DRILLING METHOD:	LOCATION:
TH-100 AIR ROTARY CASING HAMMER, 350 CFM COMPRESSOR	BRIDGEPORT LANDFILL

START DATE: 07-15-1989 TIME: 1100
FINISH DATE: 07-17-1989 TIME: 1730

Elevation 6567.49 feet Top of Monument



DEPTH (FEET)	SAMPLE DEPTH	SAMPLE DATE/TIME	SAMPLE TYPE	RECOVERY IN INCHES	ORGANIC VAPOR MONITORING OF SAMPLE BY F.I.D. (PPM)	TENSIOMETER READING (CENTIBARS)	DESCRIPTION
0		7-15					
1		1100					Dry sand/clay/cobble mix, obsidian fragments.
5							Cuttings: dry to moist sand/clay, cobbles up to 1".
10							Cuttings: moist to wet very clayey coarse sand.
15							Cuttings: boulders.
19		7-16					
20	20-20.5	0800	PC	3	--	--	Grey limestone, 2" cobble. Moist fine sand in shoe.
25	25-26	0830	PC	9	0	--	Moist fine brown sand with some gravel. Decomposed granite in shoe. Coring resistance high at 25'.
29							Boulders
30	30-31.25	1015	PC	15	0	--	Dry grey silty sand coarse rounded gravel.
35	35-35.5	1045	PC	6	0	--	Cuttings.
38							Dry light tan very fine sand. No odor or staining.
40	40-41.5	1100	PC	18	300	--	Cemented dry to damp very silty sand and fine gravel in shoe.
42							Cuttings: dry tan fine sand.
47							Cuttings: Interbedded dry grey sand grading to moist brown clayey sand.
50							

See next page

KEY: PC=CHRISTENSEN "PUNCH CORE" SYSTEM: 5 FOOT LONG, 2-INCH I.D. SPLIT-BARREL SAMPLER WITH 6" LONG STEEL INSERTS. CONTACTS DASHED WHERE INFERRED.

M&E

BORING BL-3
MW-3

JOB NUMBER	CLIENT:	PAGE 2 OF 3
4953	T.T.I.	

DRILLING METHOD: TH-100 AIR ROTARY CASING HAMMER, 350 CFM COMPRESSOR

LOCATION: BRIDGEPORT LANDFILL

START DATE: 07-15-1989 TIME: 1100
FINISH DATE: 07-17-1989 TIME: 1730

DEPTH (FEET)	SAMPLE DEPTH	SAMPLE DATE/TIME	SAMPLE TYPE	RECOVERY IN INCHES	ORGANIC VAPOR MONITORING OF SAMPLE BY F.I.D. (PPM)	TENSIOMETER READING (CENTIBARS)	SOIL GRAPH	WELL CONSTRUCTION	DESCRIPTION
50									Cuttings: moist brown clayey sand.
51									
52									Casing driven to 53.5'
53							SM		
54									
55	55-	1000	PC	24	9	--			Moist to wet brown clayey gravel
56	57						GM		
57									Saturated gravelly coarse sand.
58									
59							SW		
60	60-	1020	PC	30	1	15			
61	62.5								Moist grey clay with some rusty inclusions of weathered clasts at 62'.
62									
63									
64							CL		
65	65-	1100	PC	30	1	22			
66	67								Moist brown silty clay grading at 66.75' to very fine sandy silt.
67									
68									
69									
70	70-	1120	PC	36	0	--			
71	73						ML		
72									Moist brown to light brown silt grading to medium plastic silty clay.
73									
74									
75	75-	1200	PC	30	0	60			
76	77.5						CL		
77									
78									Moist grey-brown clay grading at 76.0' to very sandy silt.
79									
80	80-	1500	PC	6	--	--			
81	80.5								Weathered granite cobble in shoe at 77.25'.
82									
83									Saturated sandy fine gravel and cobbles at 81'. High drilling resistance.
84									
85									
86									
87									
88									Cuttings: subangular coarse gravel at 88'.
89									
90							GW		
91									
92									
93									
94									
95									
96									
97									
98									
99									
100									

See next page

KEY: PC=CHRISTENSEN "PUNCH CORE" SYSTEM: 5 FOOT LONG, 2-INCH I.D. SPLIT-BARREL SAMPLER WITH 6" LONG STEEL INSERTS. CONTACTS DASHED WHERE INFERRED.

M&E

BORING BL-3

JOB NUMBER	CLIENT:	PAGE 3 OF 3
4953	T.T.I.	

DRILLING METHOD: TH-100 AIR ROTARY CASING HAMMER, 350 CFM COMPRESSOR

LOCATION: BRIDGEPORT LANDFILL

START DATE: 07-15-1989 TIME: 1100
FINISH DATE: 07-17-1989 TIME: 1730

DEPTH (FEET)	SAMPLE DEPTH	SAMPLE DATE/TIME	SAMPLE TYPE	RECOVERY IN INCHES	ORGANIC VAPOR MONITORING OF SAMPLE BY F.I.D. (PPM)	TENSIOMETER READING (CENTIBARS)	SOIL GRAPH	WELL CONSTRUCTION	DESCRIPTION
100									
101									Saturated sandy fine gravel and cobbles.
102									
103									
104									
105									
106									Cuttings: Subangular coarse gravel.
107									
108									
109									
110									
111									
112									Total depth = 112' below existing grade.

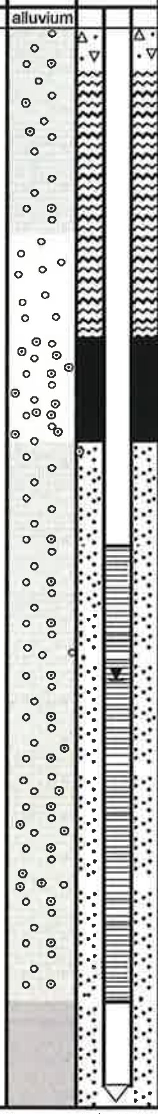
KEY: PC=CHRISTENSEN "PUNCH CORE" SYSTEM: 5 FOOT LONG, 2-INCH I.D. SPLIT-BARREL SAMPLER WITH 6" LONG STEEL INSERTS. CONTACTS DASHED WHERE INFERRED.

M&E

SRK CONSULTING
Engineers and Scientists

WELL DRILLING LOG

PROJECT NAME:	Mono Co.2007 Landfill Well Installations (Bridgeport)	**HOLE MW - 4**	Location: To Be Surveyed
SRK PROJECT NO:	146906		
LOGGED BY:	M. Banta	SURFACE ELEVATION: * 6481 ft amsl	GWL DEPTH: 36 ft bgs (Enctrd)
APPROVED BY:	B. Burnley		GWL DEPTH: 29.5 Ft TOC (Static)
DRILLED BY:	WESTEX	HOLE DIA: 10.75" / FLUID USED: None	DATE START: Oct. 3, 2007
METHOD:	Air Rotary and Casing Hammer		DATE FINISH: Oct. 4, 2007



DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	UNIFIED SOIL CLASSIFICATION AND LITHO LOGY DESCRIPTION
0				
5	0-5	fast	fair	**SC** Clayey Sand with Gravel Damp, light brown, lean clay with sorted to well sorted sand and gravel. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite.
10	5-10	fast	good	**SC** Clayey Sand with Gravel Moist, brown, sorted to well sorted sand with clay and well graded gravel. Sands and gravels consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite.
15	15-Oct	fast	good	**SM** Silty Sand Moist, brown, sitly fine sand. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite.
20	15-20	fast	good	**SM** Silty Sand with Gravel Moist, brown, silt with cemented sand and gravel. Silt and sand cemented. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite.
25	20-25	fast	good	**SW-SC** Sandy Clay Moist, brown, well graded sandy lean clay. Sands consisted of subangular fragments of rhyolite, obsidian, quartzite, and granodiorite.
30	25-30	fast	good	**SC** Clayey Sand with Gravel Moist, brown, well graded sand with clay and gravel. Some mottling noted in the clay. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite, obsidian, granodiorite, and quartz.
35	30-35	fast	good	**SC** Clayey Sand with Gravel Wet, brown, well graded sand with clay and gravel. Some mottling noted in the clay. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite, and obsidian.
40	35-40	fast	good	**GC** Clayey Gravel with Sand Wet, brown, well graded gravel with clay and sand. Some mottling noted in the clay. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite, obsidian, granodiorite, and quartzite.
45	40-45	fast	good	**GC** Clayey Gravel with Sand Same as above
50	45-50	slow	poor	**CH** Fat Clay Wet, grayish brown, fat clay. Note that the steel drill casing sealed off the hole from incoming water. A water level was recorded at 29.5 feet bgs from the top of the drill casing after it was removed five feet to 45 ft bgs.

GROUND WATER ENCOUNTERED: 36 ft bgs	**SCREEN** MATERIAL: Sch.40 PVC 2" 0.02" machine slots; SYMBOL: ; 25- 45 ft bgs	**Well Construction and Annular Materials** MATERIAL: Sch.40 PVC 2"; SYMBOL: ; 0- 20, 45-50	**OVERDRILL/BACKFILL** MATERIAL: Bentonite chips; SYMBOL: ; N/A
GROUND WATER STATIC: 12:25 8-Oct-07 29.5 feet bgs	**FILTER** MATERIAL: # 3 Monterey Sand; SYMBOL: ; 20 - 50 ft bgs	**GROUT** MATERIAL: Bentonite grout; SYMBOL: ; 2 -15 ft bgs	**WELL HEAD PROTECTION** MATERIAL: Steel monument; HEIGHT: * 3.5 feet above ground
TOTAL DEPTH DRILLED: 50.0 ft bgs	**SURF. PLUG** MATERIAL: Neat cement; SYMBOL: ; 0-2 ft bgs	**SEAL** MATERIAL: Bentonite chips; SYMBOL: ; 15 -20 ft bgs	**WELL CASING DETAILS** MATERIAL: PVC; HEIGHT: * 2.5 feet above ground

* Approximate values only.
Feet (ft) below ground surface (bgs).

silt media clay media sand gravel cobble

SRK CONSULTING
Engineers and Scientists

WELL DRILLING LOG

PROJECT NAME:	Mono Co.2007 Landfill Well Installations (Bridgeport)	HOLE	MW - 5	Location: To Be Surveyed	
SRK PROJECT NO:	146906				
LOGGED BY:	M. Banta	SURFACE ELEVATION:	* 6471 ft amsl	GWL DEPTH: 37 ft bgs	(Enctrd)
APPROVED BY:	B. Burnley			GWL DEPTH: 17.55 ft bgs	(Static)
DRILLED BY:	WESTEX	HOLE DIA: 10.75"	FLUID USED: None	DATE START:	5-Oct-07
METHOD:	Air Rotary and Casing Hammer			DATE FINISH:	5-Oct-07

DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	GRAPHIC LOG	WELL COMPLETION	DEPTH (feet)	UNIFIED SOIL CLASSIFICATION AND LITHOLOGY DESCRIPTION
0				alluvium		+2.5	
5	0-5	fast	fair			1–5	**SM** Silty Sand Moist, brown, silty fine sand. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite.
10	5-10	fast	good			6–10	**SW-SM** Sandy Silt Damp, light brown, well graded sandy silt. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite.
15	15-Oct	fast	good			11–15	**SM** Silty Sand with Gravel Moist, brown, sand with silt and gravel. Silt and sand cemented. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of well graded rounded rhyolite.
20	15-20	fast	good			16–20	**SC** Clayey Sand with Gravel 16' Moist, brown, well graded gravelly sand with clay lenses. Sands and gravels consisted of angular to subrounded fragments of rhyolite, obsidian, quartzite, and granodiorite. Some basalt noted in the sand fragments.
25	20-25	fast	good			21–25	**SC** Clayey Sand with Gravel Same as above to 24'. Water content increases in the return.
30	25-30	fast	good			26–30	**GW** Gravel with Sand Wet, brown, well graded gravel with sand. Gravels and Sands consisted of angular to subrounded fragments of rhyolite, obsidian, quartzite, and granodiorite. Some basalt noted in the sand fragments.
35	30-35	fast	good			31–35	**GW** Gravel with Sand Wet, dark brown to black, well graded gravel with sand. Gravels and Sands consisted of angular to subrounded fragments of rhyolite, basalt, and obsidian.
37						36–37	**CH** Fat Clay Wet, grayish brown, fat clay.

GROUND WATER ENCOUNTERED: 20 ft bgs	**SCREEN MATERIAL:** Sch.40 PVC 2" 0.02" machine slots **SYMBOL:** 27-37 ft bgs	**Well Construction and Annular Materials** **MATERIAL:** Sch.40 PVC 2" **SYMBOL:** 0- 27	**OVERDRILL/BACKFILL** **MATERIAL:** Bentonite chips **SYMBOL:** N/A
GROUND WATER STATIC: 10:00 8-Oct-07 17.55 feet bgs	**FILTER MATERIAL:** # 3 Monterey Sand **SYMBOL:** 20-37 ft bgs	**GROUT MATERIAL:** Bentonite grout **SYMBOL:** 2-15 ft bgs	**WELL HEAD PROTECTION** **MATERIAL:** Steel monument **HEIGHT:** * 3.5 feet above ground
TOTAL DEPTH DRILLED: 37.0 ft bgs	**SURF. PLUG MATERIAL:** Neat cement **SYMBOL:** 0-2 ft bgs	**SEAL MATERIAL:** Bentonite chips **SYMBOL:** 15 -20 ft bgs	**WELL CASING DETAILS** **MATERIAL:** PVC **HEIGHT:** * 2.5 feet above ground

* Approximate values only.
Feet (ft) below ground surface (bgs).

silt media clay media sand gravel cobble

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WELL DRILLING LOG

PROJECT NAME:	Mono Co.2007 Landfill Well Installations (Bridgeport)	**HOLE GW - 1**	Location: To Be Surveyed
SRK PROJECT NO:	146906		
LOGGED BY:	M. Banta	SURFACE ELEVATION: * 6522 ft amsl	GWL DEPTH: NA
APPROVED BY:	B. Burnley		GWL DEPTH: NA
DRILLED BY:	WESTEX	HOLE DIA: 10.75" / FLUID USED: None	DATE START: Oct. 12, 2007
METHOD:	Air Rotary and Casing Hammer		DATE FINISH: Oct. 12, 2007

DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	DEPTH (feet)	UNIFIED SOIL CLASSIFICATION AND LITHOLOGY DESCRIPTION
0				+2.5	
5	0-5	slow	good	1–5	**SC** Clayey Sand with Gravel Dry, buff, clayey, well graded sand with gravel. Sands and gravels consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt. At 4' gravel content increases with the presence of cobbles.
10	5-10	fast	good	6–10	**Cobble** Sandy Cobble with Clay and Gravel 5' to 8' Dry, grayish brown, well graded sandy cobble with lean clay and well graded gravel. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt. Cobbles consist of obsidian, rhyolite, and basalt. At 8' to 10' a moist, brown, well graded sandy lean clay appears.
15	10-15	fast	good	11–15	**CL** Sandy Lean Clay with Cobble Moist, brown, well graded sandy lean clay with cobble. Sand and cobble consist of rounded to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Cobbles consist of obsidian, rhyolite, and basalt.
20	15-20	fast	good	16–20	**GW-GC** Gravel with Clay and Sand Moist, brown, well graded gravel with lean clay, and well graded sand. Sands consisted of rounded to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt.
25	20-25	fast	good	21–25	**GW-GC** Gravel with Clay and Sand Same as above. Clay content increases at 20'.
30	25-30	fast	good	26–30	**GW-GC** Gravel with Clay and Sand Same as above.

GROUND WATER ENCOUNTERED: NA	**SCREEN** **MATERIAL:** Sch.40 PVC 2" 0.02" machine slots **SYMBOL:** 5-10 ft bgs 25-30 ft bgs	**Well Construction and Annular Materials** **MATERIAL:** Sch.40 PVC 2" **SYMBOL:** 0-5 ft bgs 0-30 ft bgs	**OVERDRILL/BACKFILL** **MATERIAL:** Bentonite chips **SYMBOL:** NA
GROUND WATER STATIC: NA	**FILTER** **MATERIAL:** 3/8" Pea Gravel **SYMBOL:** 4-11 ft bgs 20-30 ft bgs	**GROUT** **MATERIAL:** Bentonite grout **SYMBOL:** None	**WELL HEAD PROTECTION** **MATERIAL:** Steel monument **HEIGHT:** * 3.5 feet above ground
TOTAL DEPTH DRILLED: 30.0 ft bgs	**SURF. PLUG** **MATERIAL:** Neat cement **SYMBOL:** 0-1 ft bgs	**SEAL** **MATERIAL:** Bentonite chips **SYMBOL:** 1-4 ft bgs 11-20 ft bgs	**WELL CASING DETAILS** **MATERIAL:** PVC **HEIGHT:** * 2.5 feet above ground

* Approximate values only.
Feet (ft) below ground surface (bgs).

silt media clay media sand gravel cobble

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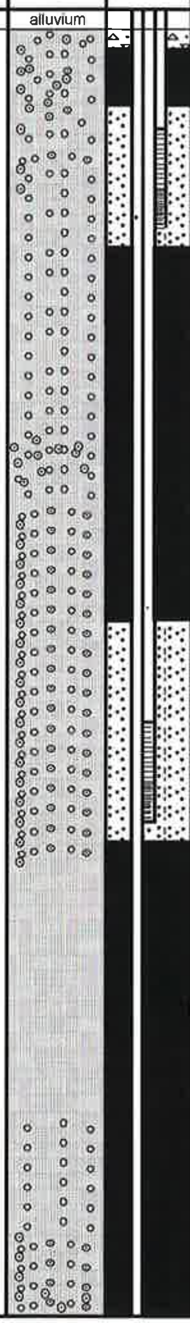
WELL DRILLING LOG

2 pages

PROJECT NAME:	Mono Co.2007 Landfill Well Installations (Bridgeport)	**HOLE GW - 2**	Location: To Be Surveyed
SRK PROJECT NO:	146906		
LOGGED BY:	M. Banta	SURFACE ELEVATION: * 6588 ft amsl	GWL DEPTH: NA
APPROVED BY:	B. Burnley		GWL DEPTH: NA
DRILLED BY:	WESTEX	HOLE DIA: 10.75" — FLUID USED: None	DATE START: Oct. 10, 2007
METHOD:	Air Rotary and Casing Hammer		DATE FINISH: Oct. 12, 2007



DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	UNIFIED SOIL CLASSIFICATION AND LITHOLOGY DESCRIPTION
0–5	0-5	fast	fair	**GC** Clayey Gravel with Sand Damp, buff, clayey, well graded gravel and sand. Sands and gravels consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt.
10	5-10	fast	good	**SC** Clayey Sand with Gravel Moist, brown, clayey well graded sand and gravel. Sands and gravels consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt.
15	10-15	fast	good	**CL** Sandy Lean Clay Moist, brown, well sorted sandy lean clay. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt.
20	3 15-20	fast	good	**CL** Sandy Lean Clay Same as above.
25	20-25	fast	good	**CL** Sandy Lean Clay Gravel content increases from 21' to 22.5'. Where at 22.5' to 25' a damp, greenish brown, well graded, sandy lean clay appears. Same sand content as above.
30	25-30	fast	good	**SC** Clayey Sand with Gravel Moist to very moist, brown, clayey, well graded sand and gravel. Sands and gravels consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt.
35	30-35	fast	good	**SC** Clayey Sand with Gravel Same as above.
40	35-40	fast	good	**SC** Clayey Sand with Gravel Same as above.
45	40-45	slow	good	**CL** Lean Clay Moist, buff, lean clay increases in moisture at 42'.
50	45-50	slow	good	**CL** Lean Clay Same as above.
55	50-55	slow	good	**CL** Lean Clay Same as above.
60	55-60	slow	good	**CL** Lean Clay with Sand Moist, buff, lean clay with well sorted angular to subrounded sand. Sands consisted of fragments of rhyolite, obsidian, quartzite, and granodiorite.
65	60-65	slow	good	**SC** Clayey Sand with Gravel 61' Moist, brown, brown, clayey well graded sand and gravel. Sands and gravels consisted of rounded to subangular fragments of rhyolite, quartzite, and granodiorite. Gravels consisted of rounded rhyolite and brick red basalt.

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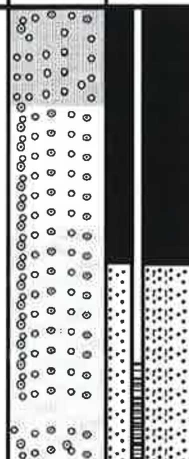
WELL DRILLING LOG

2 pages

PROJECT NAME:	Mono Co.2007 Landfill Well Installations (Bridgeport)	**HOLE** **GW - 2**	Location: To Be Surveyed
SRK PROJECT NO:	146906		
LOGGED BY:	M. Banta	SURFACE ELEVATION: * 6588 ft amsl	GWL DEPTH: NA
APPROVED BY:	B. Burnley		GWL DEPTH: NA
DRILLED BY:	WESTEX	HOLE DIA: 10.75" / FLUID USED: None	DATE START: Oct. 10, 2007
METHOD:	Air Rotary and Casing Hammer		DATE FINISH: Oct. 12, 2007



DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	DEPTH (feet)	UNIFIED SOIL CLASSIFICATION AND LITHOLOGY DESCRIPTION
70	65-70	slow	good	66-70	**CL** Sandy Lean Clay Moist, brown, lean clay, with well graded, angular to subrounded sands. Sands consist of the same fragments as noted above.
75	70-75	slow	good	71-75	**SP** Sand with Gravel Moist, brown, poorly graded, fine sand with gravel. Sands and gravels consist of consisted of fragments of rhyolite, obsidian, quartzite, and granodiorite.
80	75-80	slow	good	76-80	**SW-SM** Sand with Silt and Gravel 76' Moist, brown, silty, well graded sand with gravel. Sands and gravels consist of fragments of rhyolite, obsidian, quartzite, and granodiorite.
85	80-85	slow	good	81-85	**SW-SM** Sand with Silt and Gravel Same as above. At 85' dry, brown, silt layer to 86'.
	85-88	fast	good	86-88	**SW-SM** Sand with Silt and Gravel Same as above.

GROUND WATER ENCOUNTERED: NA	**SCREEN** MATERIAL: Sch.40 PVC 2" 0.02" machine slots SYMBOL: 5-10 ft bgs 35-40 ft bgs 83-88 ft bgs	**Well Construction and Annular Materials** MATERIAL: Sch.40 PVC 2" SYMBOL: 0-5 ft bgs 0-35 ft bgs 0-83 ft bgs	**OVERDRILL/BACKFILL** MATERIAL: Bentonite chips SYMBOL: 38-42 ft bgs
GROUND WATER STATIC: NA	**FILTER** MATERIAL: 3/8" Pea Gravel SYMBOL: 4-11 ft bgs 30-40 ft bgs 78-88 ft bgs	**GROUT** MATERIAL: Bentonite grout SYMBOL: None	**WELL HEAD PROTECTION** MATERIAL: Steel monument HEIGHT: * 3.5 feet above ground
TOTAL DEPTH DRILLED: 88.0 ft bgs	**SURF. PLUG** MATERIAL: Neat cement SYMBOL: 0-1 ft bgs	**SEAL** MATERIAL: Bentonite chips SYMBOL: 1-4 ft bgs 11-30 ft bgs 42-78 ft bgs	**WELL CASING DETAILS** MATERIAL: PVC HEIGHT: * 2.5 feet above ground

* Approximate values only.
Feet (ft) below ground surface (bgs).

silt media | clay media | sand | gravel | cobble

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WELL DRILLING LOG

PROJECT NAME:	Mono Co.2008 Landfill Gas Well Replacement (Bridgeport)	HOLE	GW - 3 (RELOCATED)		Location: To Be Surveyed
SRK PROJECT NO:	146906				
LOGGED BY:	M. Banta	SURFACE ELEVATION:	* 6558 ft amsl		GWL DEPTH:NA
APPROVED BY:	B. Burnley				GWL DEPTH: NA
DRILLED BY:	WESTEX	HOLE DIA: 10.75"	FLUID USED:	None	DATE START: July 23, 2008
METHOD:	Air Rotery and Casing Hammer				DATE FINISH: July 23, 2008

DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	GRAPHIC LOG	WELL COMPLETION	DEPTH (feet)	UNIFIED SOIL CLASSIFICATION AND LITHOLOGY DESCRIPTION
0				alluvium		+2.5	
	0-5	fast	fair			1-4	**GW** Sandy Gravel 0-18 feet - Moist, dark brown, well graded sandy gravel with clay interbeds. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of well graded rounded rhyolite and brick red basalt.
5	5-10	fast	good			5-9	
10	10-15	fast	good			10-14	
15	15-20	fast	good			15-19	**SP-SC** Sand with Clay and Gravel Moist, dark brown, fine sand with lean clay interbeds and gravel. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of graded to well graded rounded rhyolite and brick red basalt.
20	20-25	fast	good			20-24	
25	25-30	fast	good			25-29	
30	30-35	fast	good			30-34	**CL** Sandy Lean Clay 29 to 31 feet - Moist, yellowish brown, well graded sandy lean clay. Sands consisted of rounded to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite **SW-SC** Sand with Clay and Gravel 31 - 41 feet - Moist, buff, well graded sand with interbeds of lean clay and gravel. Sands and gravels consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt.
35	35-40	fast	good			35-39	
40	40-45	fast	good			40-44	**SP** Sand with Gravel 41 - 47 feet - Wet, yellow, fine sand with gravel.
45						45-46	
47		fast	good			47	

GROUND WATER ENCOUNTERED: 43 ft bgs	**SCREEN MATERIAL:** Sch.40 PVC 2" 0.02" machine slots **SYMBOL:** 5-10 ft bgs 20-25 ft bgs 40-35 ft bgs	**Well Construction and Annular Materials** **MATERIAL:** Sch.40 PVC 2" **SYMBOL:** 0-5 ft bgs 0-20 ft bgs 0-35 ft bgs	**OVERDRILL/BACKFILL** **MATERIAL:** Bentonite chips **SYMBOL:** 40-47 ft bgs
GROUND WATER STATIC: ~ 43 ft bgs 12:00 23-Jul-08	**FILTER MATERIAL:** 3/8" Pea Gravel **SYMBOL:** 4-11 ft bgs 18-26 ft bgs 33-40 ft bgs	**GROUT MATERIAL:** Bentonite grout **SYMBOL:** None	**WELL HEAD PROTECTION** **MATERIAL:** Steel monument **HEIGHT:** * 3.30 feet above ground
TOTAL DEPTH DRILLED: 47.0 ft bgs	**SURF. PLUG MATERIAL:** Neat cement **SYMBOL:** 0-1 ft bgs	**SEAL MATERIAL:** Bentonite chips **SYMBOL:** 1-4 ft bgs 11-18 ft bgs 26-33 ft bgs	**WELL CASING DETAILS** **MATERIAL:** PVC **HEIGHT:** * 3.25 feet above ground

* Approximate values only.
Feet (ft) below ground surface (bgs).

silt media clay media sand gravel cobble

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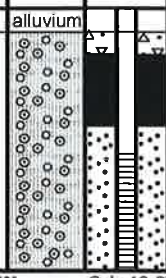
WELL DRILLING LOG

PROJECT NAME:	Mono Co.2007 Landfill Well Installations (Bridgeport)	**HOLE GW - 4**	Location: To Be Surveyed
SRK PROJECT NO:	146906		
LOGGED BY:	M. Banta	SURFACE ELEVATION: * 6484 ft amsl	GWL DEPTH: NA
APPROVED BY:	B. Burnley		GWL DEPTH: NA
DRILLED BY:	WESTEX	HOLE DIA: 10.75" / FLUID USED: None	DATE START: Oct. 8, 2007
METHOD:	Air Rotery and Casing Hammer		DATE FINISH: Oct. 8, 2007

DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	GRAPHIC LOG	WELL COMPLETION	DEPTH (feet)	UNIFIED SOIL CLASSIFICATION AND LITHOLOGY DESCRIPTION
0				alluvium		+2.5	
5	0-5	fast	fair			1 2 3 4 5	**SM** Silty Sand with Gravel Damp, light brown, silty well graded sand with subrounded gravel. Sands and Gravels consisted of angular to subrounded fragments of rhyolite, obsidian, quartzite, and granodiorite. Some basalt noted in the sand fragments.
10	5-10	fast	good			6 7 8 9 10	**SM** Silty Sand with Gravel Same as above



GROUND WATER ENCOUNTERED: NA	**SCREEN** **MATERIAL:** Sch.40 PVC 2" 0.02" machine slots **SYMBOL:** 5-10 ft bgs	**Well Construction and Annular Materials** **MATERIAL:** Sch.40 PVC 2" **SYMBOL:** 0-5 ft bgs	**OVERDRILL/BACKFILL** **MATERIAL:** Bentonite chips **SYMBOL:** N/A
GROUND WATER STATIC: NA	**FILTER** **MATERIAL:** 3/8" Pea Gravel **SYMBOL:** 4-10 ft bgs	**GROUT** **MATERIAL:** Bentonite grout **SYMBOL:** None	**WELL HEAD PROTECTION** **MATERIAL:** Steel monument **HEIGHT:** * 3.5 feet above ground
TOTAL DEPTH DRILLED: 10.0 ft bgs	**SURF. PLUG** **MATERIAL:** Neat cement **SYMBOL:** 0-1 ft bgs	**SEAL** **MATERIAL:** Bentonite chips **SYMBOL:** 1-4 ft bgs	**WELL CASING DETAILS** **MATERIAL:** PVC **HEIGHT:** * 2.5 feet above ground

* Approximate values only.
Feet (ft) below ground surface (bgs).

silt media clay media sand gravel cobble

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WELL DRILLING LOG

PROJECT NAME:	Mono Co.2007 Landfill Well Installations (Bridgeport)	**HOLE GW - 5**	Location: To Be Surveyed
SRK PROJECT NO:	146906		
LOGGED BY:	M. Banta	SURFACE ELEVATION: *6518 ft amsl	GWL DEPTH: NA
APPROVED BY:	B. Burnley		GWL DEPTH: NA
DRILLED BY:	WESTEX	HOLE DIA: 10.75"	FLUID USED: None	DATE START: Oct. 8, 2007
METHOD:	Air Rotary and Casing Hammer		DATE FINISH: Oct. 9, 2007

DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	GRAPHIC LOG	WELL COMPLETION	DEPTH (feet)	UNIFIED SOIL CLASSIFICATION AND LITHOLOGY DESCRIPTION
0				alluvium		+2.5	
5	0-5	slow	good			1–5	**Cobble** Sandy Cobble with Gravel Dry, yellowish brown, sandy cobble with gravel. Some cemented partially altered interbeds of clay.
10	5-10	fast	good			6–10	**Cobble** Sandy Cobble with Gravel Same as above to 11'.
15	10-15	fast	good			11–15	**MH** Elastic Silt with Sand Damp, grayish brown, elastic silt with traces of fine sand.
20	15-20	fast	good			16–20	**MH** Elastic Silt with Sand
						21	**MH** Elastic Silt with Sand

GROUND WATER ENCOUNTERED: NA	**SCREEN** Sch.40 PVC 2" **MATERIAL:** 0.02" machine slots **SYMBOL:** 5-10 ft bgs 16-21 ft bgs	**Well Construction and Annular Materials** **MATERIAL:** Sch.40 PVC 2" **SYMBOL:** 0-5 ft bgs 0-21 ft bgs	**OVERDRILL/BACKFILL** **MATERIAL:** Bentonite chips **SYMBOL:** NA
GROUND WATER STATIC: NA	**FILTER** **MATERIAL:** 3/8" Pea Gravel **SYMBOL:** 4-10 ft bgs 15-21 ft bgs	**GROUT** **MATERIAL:** Bentonite grout **SYMBOL:** None	**WELL HEAD PROTECTION** **MATERIAL:** Steel monument **HEIGHT:** * 3.5 feet above ground
TOTAL DEPTH DRILLED: 21.0 ft bgs	**SURF. PLUG** **MATERIAL:** Neat cement **SYMBOL:** 0-1 ft bgs	**SEAL** **MATERIAL:** Bentonite chips **SYMBOL:** 1-4 ft bgs 10-15 ft bgs	**WELL CASING DETAILS** **MATERIAL:** PVC **HEIGHT:** * 2.5 feet above ground

* Approximate values only.
Feet (ft) below ground surface (bgs).

silt media clay media MH media sand gravel cobble

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WELL DRILLING LOG

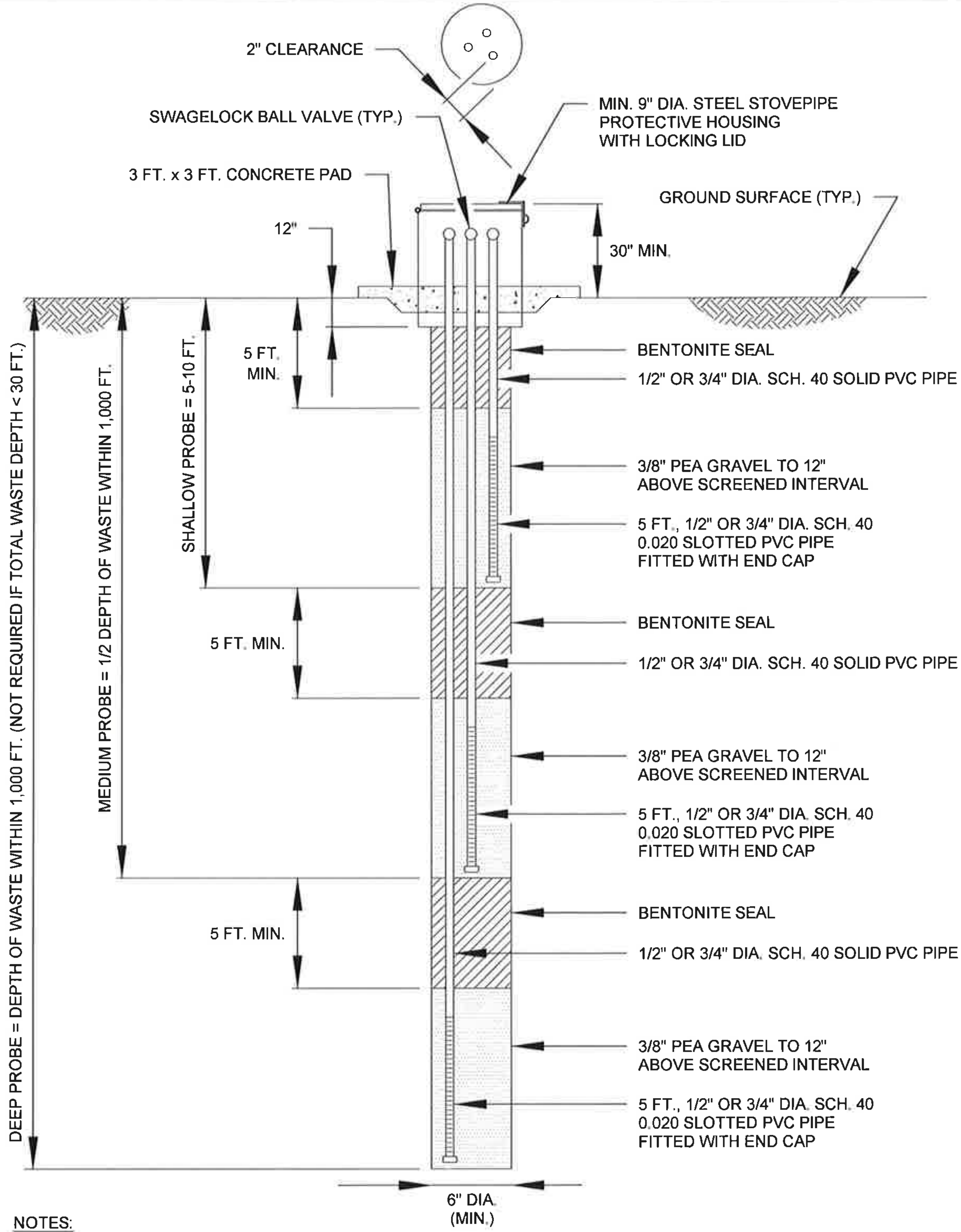
PROJECT NAME:	Mono Co.2007 Landfill Well Installations (Bridgeport)	HOLE GW - 6	Location:To Be Surveyed
SRK PROJECT NO:	146906		
LOGGED BY:	M. Banta	SURFACE ELEVATION: * 6547 ft amsl	GWL DEPTH:30 ft bgs (Enctrd)
APPROVED BY:	B. Burnley		GWL DEPTH:32.1 ft bgs (Static)
DRILLED BY:	WESTEX	HOLE DIA: 10.75"	FLUID USED: None	DATE START: Oct. 9, 2007
METHOD:	Air Rotary and Casing Hammer		DATE FINISH: Oct. 9, 2007

DEPTH (Feet)	SAMPLE INTERVAL	PENETRATION	RECOVERY	GRAPHIC LOG	WELL COMPLETION	DEPTH (feet)	UNIFIED SOIL CLASSIFICATION AND LITHOLOGY DESCRIPTION
0				alluvium		+2.5	
5	0-5	fast	good			1–5	**GW-GC** Gravel with Sand and Clay Damp, grayish brown, well graded gravel with sand and cemented clay. Gravels and sands consist of rounded to subrounded fragments of rhyolite, obsidian, quartzite, and granodiorite. 5% brick red basalt noted in the cobble fragments.
10	5-10	fast	good			6–10	**GW-GC** Gravel with Sand and Clay Same as above but color changes at 6' to light brown.
15	10-15	fast	good			11–15	**SW-SC** Sand with Clay and Gravel Moist, yellow brown well graded sand with clay and gravel. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt.
20	15-20	fast	good			16–20	**SW-SC** Sand with Clay and Gravel Same as above.
25	20-25	fast	good			21–25	**SW-SC** Sand with Clay and Gravel Same as above. Gravel content increases 21' to 25'.
30	25-30	fast	good			26–30	**CL** Lean Clay Moist, green lean clay from 26' to 27'.
35	30-35	fast	good			31–35	**SW-SC** Sand with Clay and Gravel Wet, yellow brown well graded sand with clay and gravel. Sands consisted of angular to subangular fragments of rhyolite, obsidian, quartzite, and granodiorite. Gravels consisted of segregated rounded rhyolite and brick red basalt.
37						36–37	**SW-SC** Sand with Clay and Gravel Same as above. Gravel content increases 35' to 37'.

GROUND WATER ENCOUNTERED: 30 ft bgs	**SCREEN** Sch.40 PVC 2" **MATERIAL:** 0.02" machine slots **SYMBOL:** 5-10 ft bgs 20-25 ft bgs	**Well Construction and Annular Materials** **MATERIAL:** Sch.40 PVC 2" **SYMBOL:** 0-5 ft bgs 0-20 ft bgs	**OVERDRILL/BACKFILL** **MATERIAL:** Bentonite chips **SYMBOL:** 25-37
GROUND WATER STATIC: 32.1 ft bgs 12:25 8-Oct-07	**FILTER** **MATERIAL:** 3/8" Pea Gravel **SYMBOL:** 4-10 ft bgs 15-25 ft bgs	**GROUT** **MATERIAL:** Bentonite grout **SYMBOL:** None	**WELL HEAD PROTECTION** **MATERIAL:** Steel monument **HEIGHT:** * 3.5 feet above ground
TOTAL DEPTH DRILLED: 37.0 ft bgs	**SURF. PLUG** **MATERIAL:** Neat cement **SYMBOL:** 0-1 ft bgs	**SEAL** **MATERIAL:** Bentonite chips **SYMBOL:** 1-4 ft bgs 10-15 ft bgs	**WELL CASING DETAILS** **MATERIAL:** PVC **HEIGHT:** * 2.5 feet above ground

* Approximate values only.
Feet (ft) below ground surface (bgs).

silt media clay media sand gravel cobble



NOTES:

1. THE MAXIMUM DEPTH OF FORMER DISPOSAL TRENCHES IS APPROX. 15 FEET.
2. ALTHOUGH SITE SOILS CONSIST OF SANDS AND GRAVELS OVER THE FULL DEPTH OF WELL CONSTRUCTION, FIELD VERIFY THAT SCREENED SECTION IS ALIGNED WITH STRATIGRAPHY THAT IS CONDUCIVE TO GAS FLOW.
3. EACH PROBE SHOULD BE CLEARLY LABELED BY DEPTH AND COLOR-CODED TO INDICATE UPPER, INTERMEDIATE, OR LOWER PROBE.
4. ALL JOINTS TO BE FLUSH-THREADED. PVC GLUE SHALL NOT BE USED.

Prepared For:

COUNTY OF MONO
DEPARTMENT OF PUBLIC WORKS

Project:

SRK Consulting
Engineers and Scientists
5250 Neil Road, Suite 300
Reno, NV 89502
775-828-6800

TYPICAL GAS MONITORING WELL CONSTRUCTION
MONO COUNTY, CALIFORNIA

Revision Date: 8/25/08	Sheet No. 1 of 1	Figure No.: 1
Scale: AS SHOWN		
Project Number: 146907		
Drawing Name: 146907 - Typical Gas Well.dwg		

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Reno, Nevada 89502

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reno@srk.com
www.srk.com

November 23, 2011
Project 146900.100

Mr. Matt Carter
Solid Waste Superintendent
Mono County Department of Public Works
74 North School Street
Bridgeport, California 93517

**Re: As-Built Report for Landfill Gas Monitoring Well Installations
Bridgeport, Pumice Valley, and Walker Landfills**

Dear Matt,

This report has been prepared by SRK Consulting (U.S.), Inc. (SRK) to provide as-built construction information and certification of as-built compliance with the approved design for the installation of landfill gas monitoring wells at the Bridgeport, Pumice Valley, and Walker landfills. This report summarizes well construction with the following:

1. A summary of the quality control procedures which were carried out during construction;
2. Figures presenting typical construction details and estimated as-built locations of each well (surveyed locations unavailable at the time of report preparation);
3. Summary tables providing screened interval depths for each probe;
4. Well construction logs for each well installation; and,
5. Photographs documenting construction methods and as-built surface completions.

The information provided in this report documents compliance with the requirements of Section 20925(d) of Title 27, California Code of Regulations (27 CCR 20925(d)). The following sections summarize the specifics of well design, bidding, and construction, and provide a description of variations to the proposed design and a summary of well completions.

1. Design Documentation

The proposed design and location of landfill gas monitoring wells were provided to the Local Enforcement Agency in September 2009 with the *Landfill Gas Monitoring and Control Plan* prepared for the Pumice Valley and Walker landfills. The plans detailed proposed well locations, construction methodology, probe quantities and depths at each location, and sampling port construction.

Based on the approved *Landfill Gas Monitoring and Control Plan*, seven new wells containing a total of 12 probes and a total well depth of 126 feet were required at the Pumice Valley Landfill. Four new wells containing a total of nine probes and a total well depth of 155 feet were required at the Walker Landfill. Monitoring well locations and design were developed in accordance with the requirements of 27 CCR 20925.

In addition, a new landfill gas monitoring well was proposed at the closed Bridgeport Landfill to replace an existing well located near the east access gate. It is believed that the existing well GW-3 was installed between two former waste disposal trenches; while not directly installed in waste, its close proximity has resulted in detections of landfill gas generation. Therefore, a replacement well was proposed to be installed in native soil along the eastern property boundary to determine whether landfill gas is migrating off-site. The replacement well was designed to replicate the number and depths of probes at the existing GW-3.

2. Project Development

SRK prepared a bid package with figures, special provisions, and technical specifications suitable for permitting, bidding, and construction. The resulting bid package included the *Project Plans and Specifications*, dated July 26, 2011, which was prepared under the direct supervision of a California-licensed civil engineer. The documents were issued for bidding and provided guidance for the drilling contractor and field personnel during construction. Further, SRK prepared permit applications for each monitoring location, including the completion of application forms for each site and summary tables specifying borehole and probe depths for each well. Once the drilling contractor was selected by Mono County, the permit application package was forwarded for signature; the completed applications with signatures by County and driller representatives should be on file with the Mono County Environmental Health Department.

3. Construction Quality Assurance

Mono County contracted with ABC Liovin Drilling, Inc., for construction of landfill gas monitoring wells at the Bridgeport, Pumice Valley, and Walker landfills. The contractor, based in Signal Hill, California, is a California-licensed C-57 well driller (license number 422904).

The contractor mobilized a truck-mounted hollow-stem auger rig and two support trucks to the Walker Landfill on October 3, 2011. A project kick-off meeting was conducted that morning with SRK and driller field personnel; well locations and access conditions were visually inspected and notable design criteria were reviewed at the meeting. Following well installations at the Walker Landfill, the contractor proceeded to the Bridgeport and Pumice Valley landfills, completing the project on October 7, 2011. Project locations are shown on **Figure 1-1** in **Attachment 1** to this report.

A civil engineer operating under the direct supervision of SRK's California-licensed civil engineer visually classified soils and logged each borehole in accordance with accepted practices and 27 CCR 20925(d). Well construction logs that graphically describe subsurface soil conditions, probe depths and screened intervals, location of bentonite seals, and construction materials were prepared from field logs; the completed logs are grouped by individual landfill in **Attachments 2-4**.

SRK's field personnel monitored the installation of each probe and construction of each well to ensure compliance with the approved design and 27 CCR 20925(d), including placement of a protective well casing and concrete slab. A profile detailing typical as-built construction materials is presented in **Figure 1-2** in **Attachment 1**. Photographs showing typical construction materials and methods are also presented in **Attachment 1**.

Position readings were made at each completed monitoring location by hand-held global positioning system (GPS) device. GPS locations of existing wells were also recorded at the same time so the new wells could be tied into the existing monitoring network. The approximate locations of each new well are shown relative to site boundaries and existing site conditions in **Figures 2-1**, **3-1**, and **4-1** for the Walker, Bridgeport, and Pumice Valley landfills, respectively. At the time of preparation of this report, the new well locations had not been verified on the ground by land survey.

4. Modifications to Original Design and/or Specifications

The monitoring wells and probes were constructed in general accordance with the approved design and locations. Based on conditions encountered in the field, however, some modifications were necessary, as summarized below.

Walker Landfill – Borehole advancement at GW-1 encountered bedrock at a depth of 57 feet below ground surface, where drilling was terminated and the well was completed. This was 14 feet short of the 71-foot design depth based on the estimated lowest waste elevation within 1,000 feet (horizontally). Similarly, three attempted boreholes for GW-4 met refusal at 24 feet below ground surface; the well was completed at this depth, which was 31 feet short of the projected design depth of 55 feet at this location. The total as-built well depth installed at this landfill was 112 feet rather than the projected total of 155 feet.

Landfill gas monitoring well GW-2 was moved approximately 120 feet north of its planned location to improve access and provide a monitoring point in better alignment between waste and the transfer station (i.e., closer to the transfer station). Due to access restricted by heavy tree cover and surface rocks, monitoring location GW-3 was moved approximately 50 feet north of its original position.

Bridgeport Landfill – Borehole advancement for replacement well GW-3R encountered ground water at 38 feet below ground surface. A bentonite seal was placed between 38 (base of the hole) and 35 feet below ground surface and the screen was installed at a depth of 30 to 35 feet. This was five feet shallower than the 40-foot design depth intended to replicate the existing GW-3. Given its location downhill from GW-3, however, a shallower depth was not unexpected.

Existing monitoring location GW-3 was not abandoned at this time, but will be done at the time replacement wells are contracted for the Benton Crossing, which is anticipated to take place during the 2012 construction season.

Pumice Valley Landfill – Monitoring well locations were consistent with the approved design, but borehole depths varied based on surface elevation GPS readings and the estimated waste depth within 1,000 feet (horizontally). The total as-built well depth installed at this landfill was 197 feet rather than the projected total of 126 feet.

5. As-Built Information

Detailed as-built information comprised of site maps, summary tables, well construction logs, and photographs are included in Attachments 1 through 4. The locations of project sites in the context of state and county boundaries are presented in **Figure 1-1** in **Attachment 1**, together with a typical well construction detail and photographs of typical construction materials and methods. The remaining attachments provide as-built information grouped by individual landfill, each consisting of a site map with well locations, a summary table of well coordinates, elevations, and probe depths, well construction logs, and site photographs. Arranged from north to south, **Attachment 2** provides as-built information for the Walker Landfill, **Attachment 3** provides the same for the Bridgeport Landfill, and **Attachment 4** addresses project details for the Pumice Valley Landfill.

Please contact me at 775.284.2218 or by email at enikirk@srk.com should you have any questions or comments regarding this as-built documentation.

Yours sincerely,

SRK Consulting (U.S.) Inc.

Evan Nikirk, PE
Principal Engineer

Cc: Jill Kearney, Mono County Environmental Health Department (LEA)
Zane Poulson, Inspection and Enforcement Agency, CalRecycle (MS10A-17)
Christine Karl, Permitting and Assistance Branch, CalRecycle (MS10A-15)
Michael Wochnick, Closure and Engineering Support Section, CalRecycle (MS 10A-18)
Don McGhie, Real Estate & Resource Section, Los Angeles Department of Water and Power

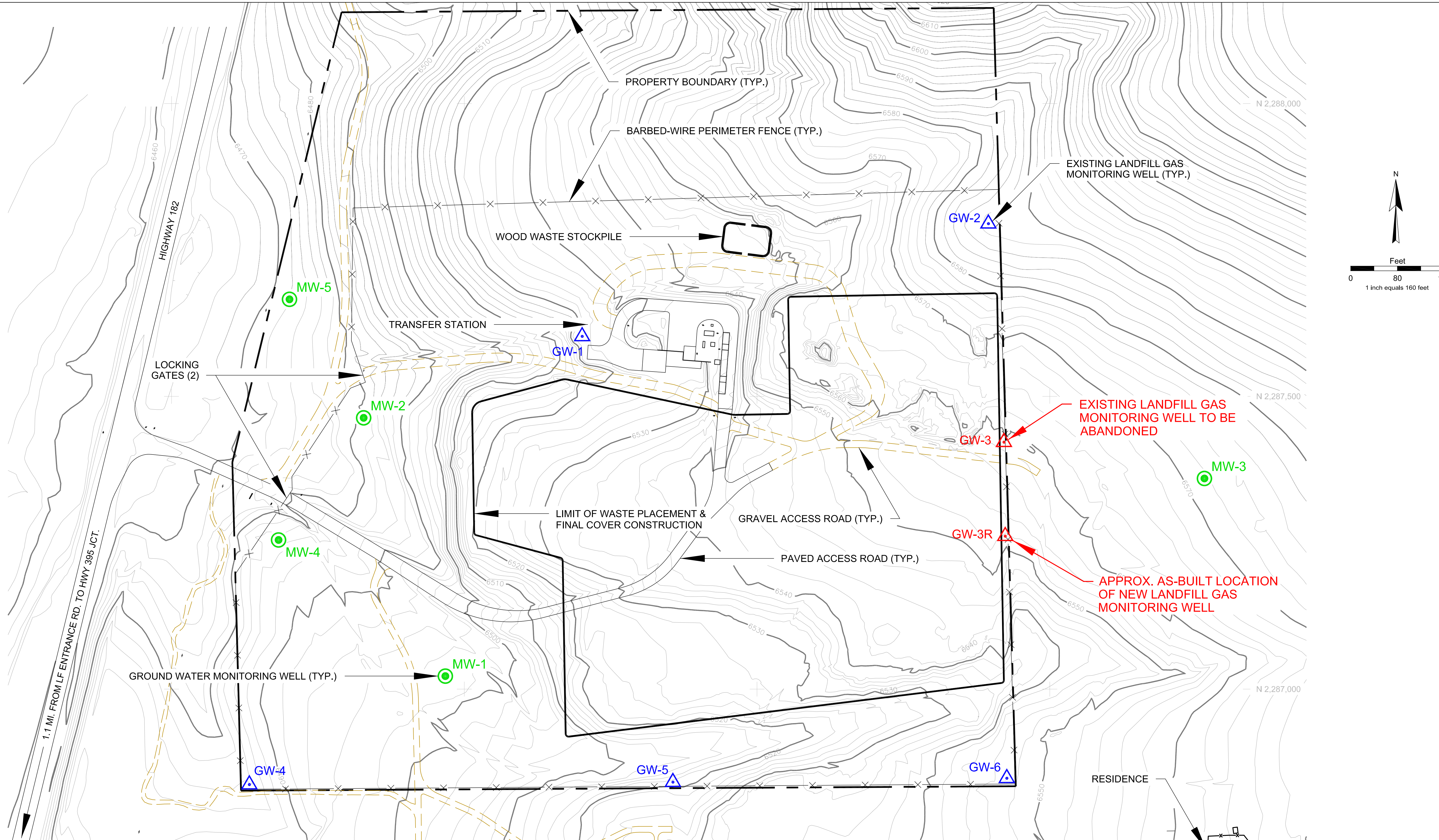
Attachments:

Attachment 1 – General Construction Information
Attachment 2 – Walker Landfill As-Built Information
Attachment 3 – Bridgeport Landfill As-Built Information
Attachment 4 – Pumice Valley Landfill As-Built Information

ATTACHMENT 3

BRIDGEPORT LANDFILL
AS-BUILT INFORMATION

- SITE MAP
- SUMMARY TABLE
- WELL CONSTRUCTION LOGS
- SITE PHOTOGRAPHS



BASE TOPOGRAPHIC MAP PREPARED BY SPENCER B. GROSS, INC. (RENO, NV) WITH TRIAD-HOLMES ASSOCIATES (MAMMOTH LAKES, CA). DATE OF PHOTOGRAPHY: 06/28/02 (EAST PORTION UPDATED 12/08/03). CONTOUR INTERVAL: 2' MINOR, 10' MAJOR.

srk consulting

PREPARED FOR: MONO COUNTY DEPARTMENT OF PUBLIC WORKS

DRAWING TITLE: LFG MONITORING WELL AS-BUILT LOCATIONS BRIDGEPORT LANDFILL

DESIGN: EN	DRAWN: BH	REVIEWED: RBB
CHECKED: ---	APPROVED: EN	DATE: 11.21.11

FILE NAME: LFG_Wells_Fig3-1_BPLF_As-Built_146900.100_2011121_bh.dwg

LANDFILL GAS MONITORING WELL INSTALLATION PROJECT
Mono County, California

DRAWING NO. **FIGURE 3-1**

SRK JOB NO. 146900.100

REVISION NO. **A**

H:\Mono County\146900.100_LFG Well Permitting & Oversight\040_Drafting\LFG_Wells_Fig3-1_BPLF_As-Built_146900.100_2011121_bh.dwg

As-Built Landfill Gas Monitoring Well Construction

Bridgeport Landfill

WELL / PROBE	GW-3R
Well Construction	
Northing (hddd.ddddd deg) [1]	38.26954
Easting (hddd.ddddd deg) [1]	119.21553
Ground Elevation (est., ft amsl) [1,2]	6,547
Lowest Waste Elevation (est., ft amsl) [3]	6,500
Well Depth (ft bgs) [4]	35
Well Depth (elev, ft amsl)	6,512
Probe 1	
Sealing Zone from (ft bgs)	0
Sealing Zone to (ft bgs)	4.5
Screened from (ft bgs)	5
Screened to (ft bgs)	10
Screened from (elev., ft amsl)	6,542
Screened to (elev., ft amsl)	6,537
Probe 2	
Sealing Zone from (ft bgs)	12
Sealing Zone to (ft bgs)	17
Screened from (ft bgs)	18
Screened to (ft bgs)	23
Screened from (elev., ft amsl)	6,529
Screened to (elev., ft amsl)	6,524
Probe 3	
Sealing Zone from (ft bgs)	25
Sealing Zone to (ft bgs)	29
Screened from (ft bgs)	30
Screened to (ft bgs)	35
Screened from (elev., ft amsl)	6,517
Screened to (elev., ft amsl)	6,512

NOTES:
1. Well location and elevation data estimated from GPS readings in the field (NAD 1983 UTM Zone 15N).
2. Estimated ground elevations are the GPS field measurement less 4 feet, because measurements were made at chest height.
3. Estimated base elevation of former waste disposal trenches within 1,000 feet, based on former disposal practices.
4. Ground water encountered, which limited construction depth.

GRAPHIC LOG OF BOREHOLE GW-3R

srk consulting

PROJECT: Landfill Gas Well Construction - Bridgeport LF

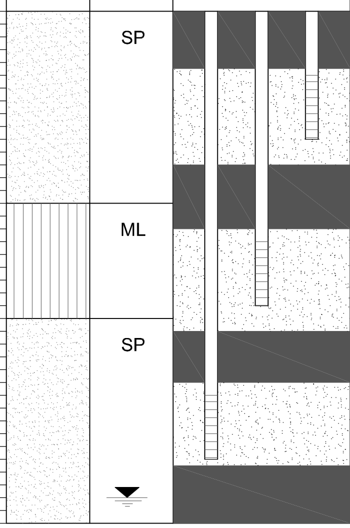
PROJECT NO.: 146900.100

TOTAL DEPTH: 40'

LOGGED BY	Brian Bass	GROUND CONDITION	Native Ground	COORDINATES OF LOCATION	38.2695°N, 119.2155°E
DATE	10.05.11			GROUND ELEVATION	6,547 ft amsl (est. by GPS)
EQUIPMENT	8" Hollow-stem Auger				
DRILLER	ABC Liovin Drilling, Inc.				

DEPTH (FEET)	USCS SOIL CLASS	DESCRIPTION OF MATERIAL
0 – 15	SP	Poorly-graded silty fine SAND (SP) with trace pebbles and trace gravel; brown; loose; moist; non-plastic Some gravel and pebbles; dry @ 5' Brownish-gray @ 8'
15 – 24	ML	Clayey SILT (ML) with fine sand and little gravel; grayish-brown; moist; medium dense; slight plasticity Some gravel and pebbles @ 18'
24 – 40	SP	Poorly-graded silty fine SAND (SP) with trace pebbles and trace gravel; brown; loose; moist; non-plastic Brownish-gray @ 30' No pebbles and no gravel; some medium sand; gray; wet @ 35' Wet / saturated @ 38'; static ground water measured @ 38'

GRAPHIC LOG / WELL COMPLETION



GROUND WATER ENCOUNTERED: 38 ft bgs	**SCREEN** 3/4" Sch. 40 PVC MATERIAL: 0.020" machine slots SYMBOL: 5 - 10 ft bgs 18 - 23 ft bgs 30 - 35 ft bgs	**WELL CONSTRUCTION** MATERIAL: Blank PVC SYMBOL: 0 - 5 ft bgs 0 - 18 ft bgs 0 - 30 ft bgs	**BACKFILL** MATERIAL: Cuttings SYMBOL: n/a
GROUND WATER STATIC: 38 ft bgs	**FILTER** MATERIAL: ⅜" rock SYMBOL: 4.5 - 12 ft bgs 17 - 25 ft bgs 29 - 35.5 ft bgs	**GROUT** MATERIAL: n/a SYMBOL:	**WELL HEAD PROTECTION** MATERIAL: 10" dia. steel monument HEIGHT: n/a
TOTAL DEPTH DRILLED: 40 ft bgs	**SURFACE PLUG** MATERIAL: n/a SYMBOL:	**SEAL** MATERIAL: Bentonite chips SYMBOL: 0 - 4.5 ft bgs 12 - 17 ft bgs 25 - 29 ft bgs 35.5 - 40 ft bgs	**WELL CASING DETAILS** MATERIAL: PVC HEIGHT: 24" - 36" above ground

Feet (ft) below ground surface (bgs)

Plate 3-1. Landfill gas monitoring well GW-3R with LFG vent in final cover to right (view south).

Plate 3-2. Landfill gas monitoring well GW-3R with GW-3 in background just to right (view north).

October 19, 2015 Project No. 3.30469.1

Mono County Public Works
PO Box 457
Bridgeport, CA 93517

Attention: Mr. Tony Dublino

Subject: **GAS MONITORING WELL INSTALLATION RESULTS**
No. GW7
Bridgeport Landfill
Mono County, California

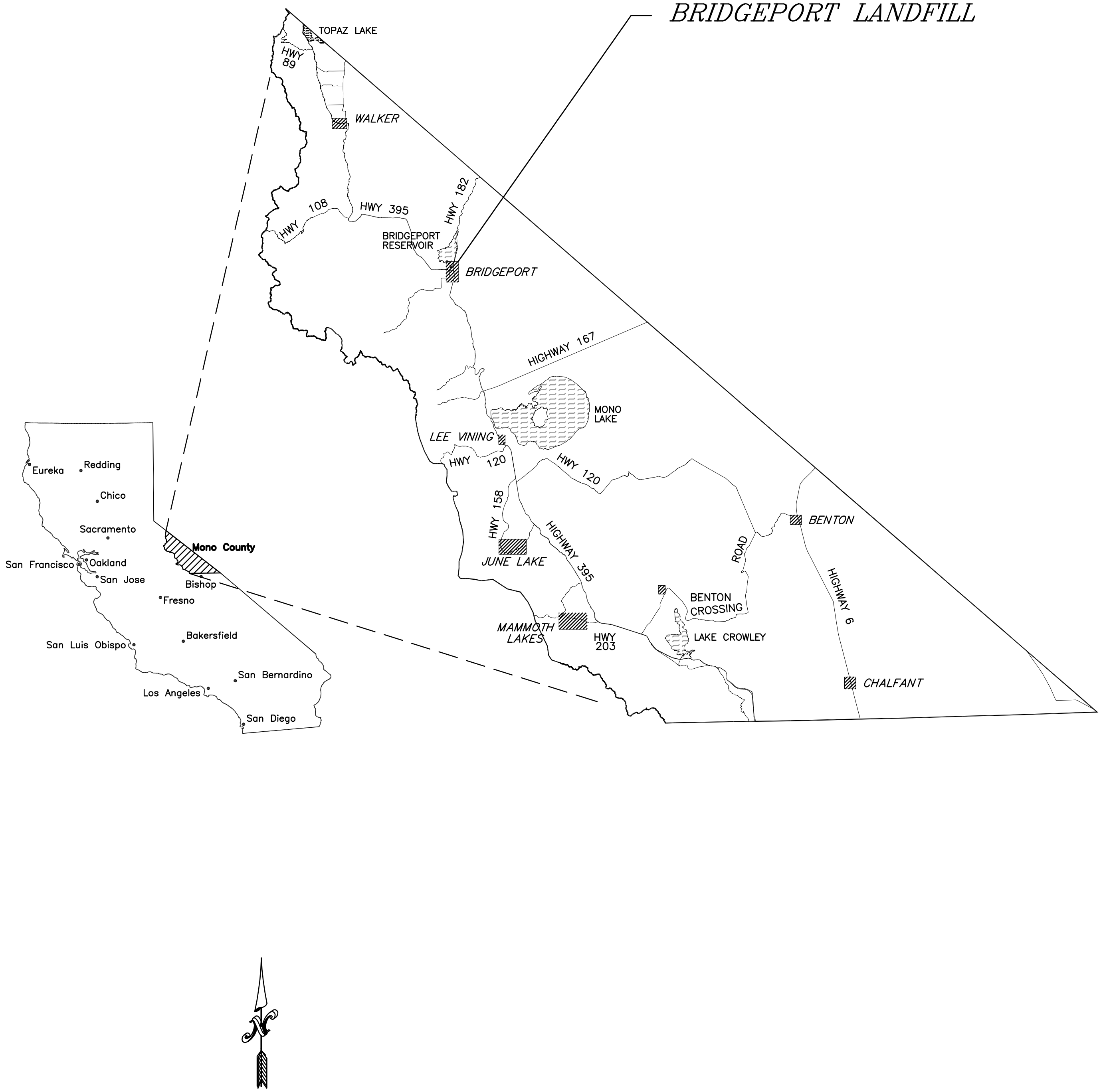
Reference: **Project Plans and Specifications for Landfill Gas Monitoring Well Installations at Mono County Landfills**
SRK Consulting (U.S.), Inc., 146900.100, July 28, 2011

Dear Mr. Dublino:

In accordance with your request, we herein submit our results for work performed at the subject site. Sierra Geotechnical Services Inc. (SGS) was contracted to provide the following services:

- Oversee and log the drilling and installation of gas monitoring Well GW7 at the Bridgeport Landfill.
- Preparation of this letter which includes a written account of the installation procedures, well log, and well detail.

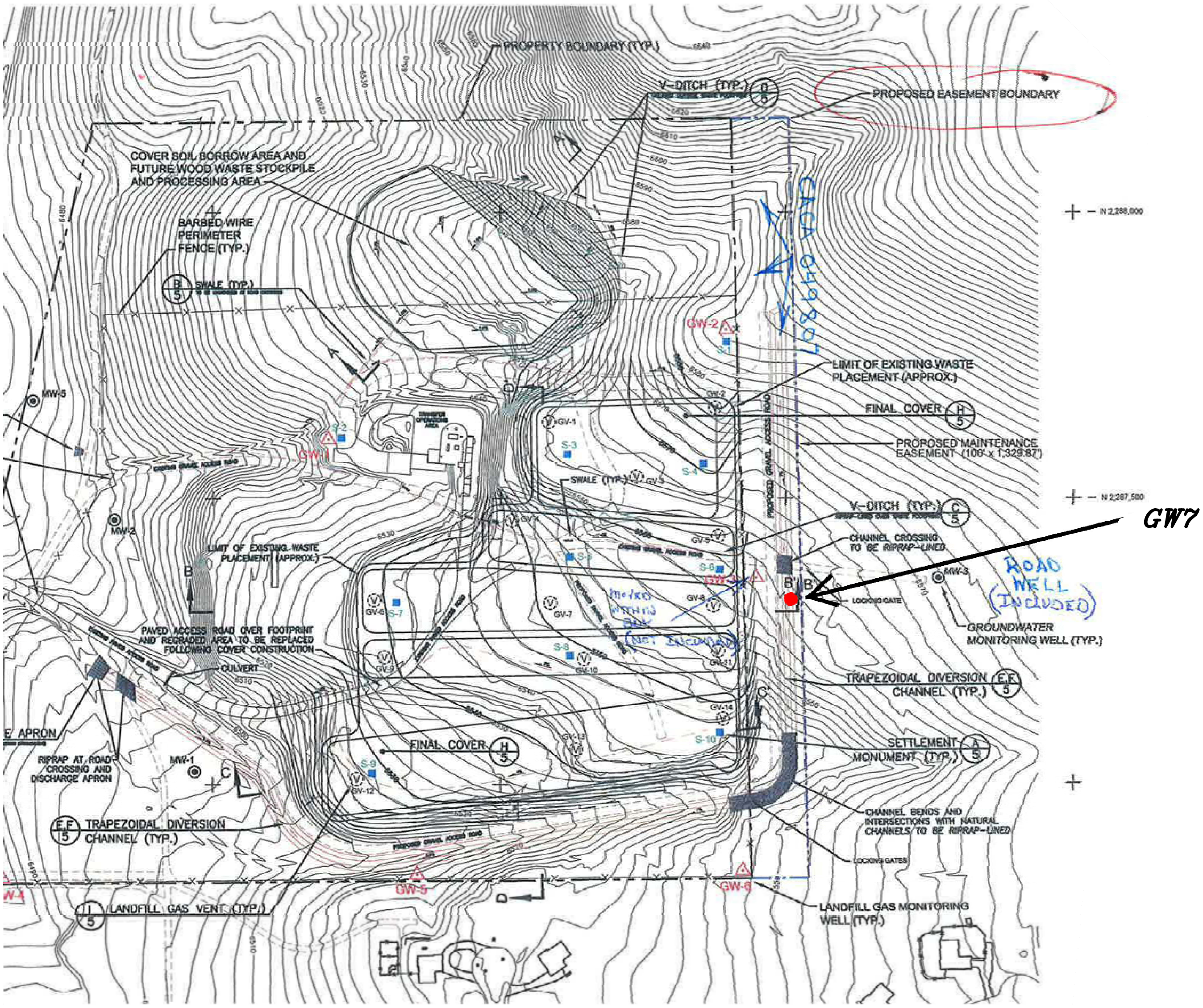
The Bridgeport Landfill is located off State Highway 182, approximately 1.1 miles north of its junction with State Highway 395 in the community of Bridgeport, California, in northern Mono County (Figure 1). One gas monitoring well (GW7) was installed by J & H Drilling Company, Incorporated, at the landfill to facilitate Mono County's soil-gas monitoring in the vadose zone. GW7 is a replacement for wells GW3 and GW3R, which were abandoned. The well location for GW7 was predetermined by Mono County and is shown on Figure 2.



NOT TO SCALE

SGS
SIERRA GEOTECHNICAL SERVICES, INC.

PROJECT: **REGIONAL MAP** BRIDGEPORT LANDFILL	
SCALE: NTS	DATE: 10/2015
DRAWING: FIG1.DWG	DRAWN BY: DD
JOB NO.: 3.30469.1	FIGURE: FIGURE 1



1"=60'

PROJECT: **GW7 LOCATION MAP** BRIDGEPORT LANDFILL	
SCALE: AS SHOWN	DATE: 10/2015
DRAWING: FIG2.DWG	DRAWN BY: DD
JOB NO.: 3.30469.1	FIGURE: FIGURE 2

SGS
SIERRA GEOTECHNICAL SERVICES, INC.

GW7 BOREHOLE SUBSURFACE CONDITIONS

One borehole was advanced with a CME 85, 8" hollow stem auger rig, by J & H Drilling Company on October 8th, 2015. Soils consisted of massive native deposits which were light grayish-brown to brown very dense cobble conglomerate with gravels underlain by damp to moist, silty, very fine to medium sands (Unified Soil Classification Symbol: SM). Drill rates were very slow through the conglomerate and very rapid through the sand. The upper 26 feet of the hole took approximately 90 minutes to bore, and the underlying sand took 40 minutes to bore to a total depth of 40 feet bgs in accordance with the above referenced specifications. The borehole measures 70 feet south of the southern gate post belonging to the eastern landfill entrance. The borehole log is included in Appendix A.

GW7 WELL CONSTRUCTION

GW7 was constructed by a two man crew on October 8th, 2015. The well was constructed in accordance with the above referenced specifications. Well construction included the placement of three ¾" diameter SCH 40 PVC gas probes into the open boring. Probe lengths were 10, 25, and 40 feet. The base of each probe was constructed with a 5-foot long, 0.020-inch machine-slotted screen section with end cap flush jointed to a solid riser. Screened sections were set at 5-10 feet, 20-25 feet, and 35-40 feet in the boring. The annular space between the slotted screen sections and the borehole wall was backfilled with a 3/8-inch pea gravel filter to one foot above each screened interval. A minimum 10-foot thick bentonite seal was placed on top of each deep gravel filter. The well was completed at the surface with a minimum 5-foot thick plug seal consisting of 4½-feet of bentonite and a 6-inch thick concrete surface with an embedded steel well head monument for protection. The as-built construction of GW7 showing the screened sections and respective thicknesses of the well pack(s) are noted on the enclosed As-Built Well Log (Appendix A).

We appreciate the opportunity to be of service to you. Should you have any questions regarding this report, please do not hesitate to contact us.

Respectfully,
SIERRA GEOTECHNICAL SERVICES, INC.

PROFESSIONAL GEOLOGIST
H. DEAN DOUGHERTY, III
No. 6497
8/18/15
STATE OF CALIFORNIA

Dean Dougherty
Owner, Vice President

APPENDIX A

WELL LOG FOR GW7

LANDFILL WELL LOG - GW7

SIERRA GEOTECHNICAL SERVICES, INC.

Project Name: Bridgeport Landfill — **Date:** 10/8/2015
Boring No: GW7 — **Project No:** 3.30469.1
Drill Rig Type: CME 85 with 8" dia. Hollow Stem Auger — **Logged By:** DD
Driller: J & H Drilling Company, Inc. — **Elev:** 6558' msl
Boring Loc: See Figure 2

Depth (ft.)	Rate	USCS	Graphic Log		DESCRIPTION
0					**Alluvial Tallus:**
1		GP			Light to medium brown, damp, fine sand to course cobble conglomerate. Cemented, very dense, pooly sorted.
2					
3					
4					
5	**17 min**				
6					
7					
8					
9		GP			
10	**22 min**				
11					
12					
13					
14					
15	**13 min**	GP			
16					
17					
18					
19					
20	**24 min**				
21					

SIERRA GEOTECHNICAL SERVICES, INC.

LANDFILL WELL LOG - GW7

Project Name: Bridgeport Landfill
Boring No: GW7
Drill Rig Type: CME 85 with 8" dia. Hollow Stem Auger
Driller: J & H Drilling Company, Inc.
Boring Loc: See Figure 2

Date: 10/8/2015
Project No: 3.30469.1
Logged By: DD
Elev: 6558' msl

Depth (ft.)	Rate	USCS	Graphic Log	Sample No	DESCRIPTION
20					
21		GP		Bulk 1	**Alluvial Tallus (cont.)**
22					
23		SM		Bulk 2	**Alluvium:** Medium grayish-brown to brown, damp, silty, very fine to fine SAND.
24					
25	10 min			SPT (50/6)	
26					
27					
28					
29		SM			
30	15 min				
31					
32					
33					
34					
35	7 min				
36		SM			
37					
38					
39					
40	5 min				
		CL-ML		Bulk	Light grayish brown silty CLAY.

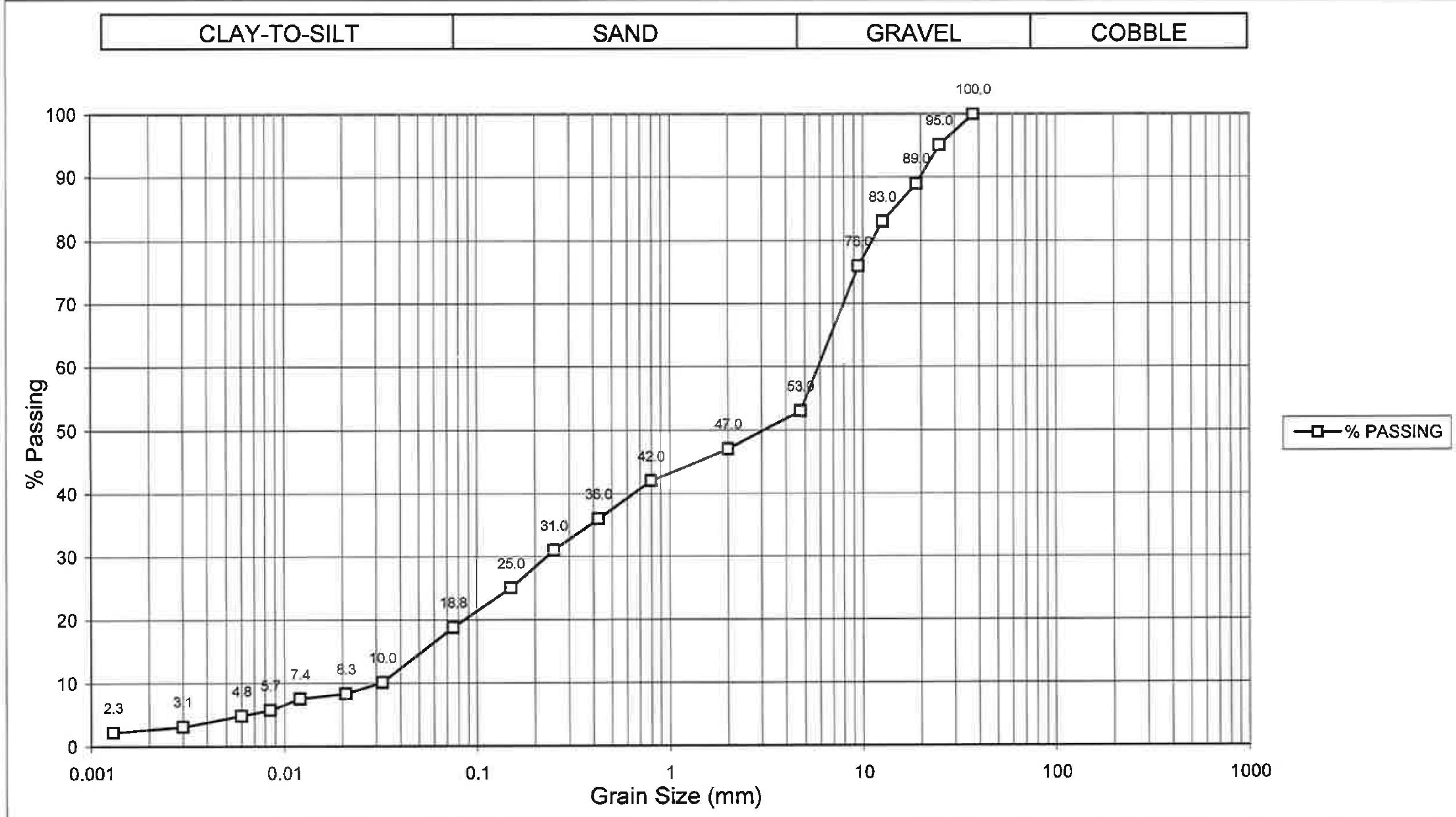
Total Depth = 40'6". No Groundwater encountered. Three 3/4" dia probes set. Screened: 5-10', 20-25' and 35-40'. Backfill 3/8" gravel from 4' - 11', 19' - 25' and 34'-40' with bentonite between each gravel layer.

APPENDIX C.2

SOIL LABORATORY TESTING RESULTS

Geocon Consultants, Inc. **GRAIN SIZE DISTRIBUTION**

Project:	SRK #146907 Bridgeport LF Borrow Source	Date:	2/28/08
Client:	SRK	Project #:	R8527-06-01
Source/Location:	Bridgeport LF Borrow Source	Lab # :	CC238
Material Description:	Gravelly Sand w/ Clay	Date Tested:	2/22/08



Reported By G.Luce

March 17, 2008

CETCO
LINING TECHNOLOGIES
800.527.9948 www.cetco.com

Breese Burnley
SRK Consulting, Inc.
1755 East Plumb Lane
Suite 241
Reno, Nevada 89502

Re: Bridgeport Landfill Cover Soil #2
GCL Compatibility Testing Results

Dear Mr. Burnley:

During the week of March 3, 2008, we received a soil sample from the Bridgeport Landfill site. We understand that this sample is representative of the soil that will likely be used to cover the GCL at the site. To evaluate the compatibility of the proposed cover soil with GCLs, CETCO performed the following testing:

- Compatibility Testing (ASTM D6141) – The soil sample was mixed at a 2:1 ratio with deionized water, and then filtered to obtain a "synthetic leachate" sample, intended to be representative of soil porewater.

- Fluid Loss (ASTM D5890) – Sodium bentonite was tested for fluid loss, using the synthetic leachate.

- Free Swell (ASTM D5891) – Sodium bentonite was tested for free swell, using the synthetic leachate.

- Chemistry (ICP) – The synthetic leachate was analyzed for major dissolved cations, specifically, calcium, magnesium, sodium, and potassium.

Bentonite Index Testing

The results of the bentonite free swell and fluid loss testing are attached. The synthetic site porewater had a neutral pH (6.47) and low specific conductance (108 µS/cm). After coming into contact with the synthetic leachate, sodium bentonite exhibited no increase in fluid loss (less than 18 mL) and no decrease in swell index (24 mL/2g), indicating that the soils are likely compatible with sodium bentonite. However, please note that one of the limitations of the ASTM D6141 test method is that it cannot replicate certain site conditions, such as increased confining pressure, prehydration with clean water, and repeated wet-dry cycling. Unfortunately, GCLs used alone in landfill covers may be more prone to desiccation and wet-dry cycling. Wet-dry cycling is an important consideration when evaluating GCL chemical compatibility, as discussed below.

Effect of Wet-Dry Cycling

As discussed in Meer and Benson (2004), certain calcium solutions which do not normally pose bentonite compatibility issues can increase a GCL's hydraulic conductivity over time if the GCL is subjected to numerous wet-dry cycles. Meer and Benson evaluated the combined effects of cation exchange and wet-dry cycling by repeatedly drying and wetting GCLs with solutions of varying ionic strengths and RMD values. RMD is defined as the ratio of monovalent to divalent cations dissolved in a solution:

$$RMD = \frac{[Na^{+}]+[K^{+}]}{\sqrt{[Ca^{2+}]+[Mg^{2+}]}}$$

To best evaluate how a GCL would respond to repeated wet-dry cycling in this particular application, the synthetic porewater generated from the cover soil sample was analyzed for major cations, including calcium, magnesium, sodium, and potassium. The analytical results are summarized in Table 1. These results were used to calculate ionic strength and RMD values, which were then compared to previous findings in the literature, as discussed below.

Figure 1 is an excerpt from the Meer and Benson study, which shows that GCLs exposed to solutions with a high RMD (0.5 $M^{1/2}$) maintained a low long-term hydraulic conductivity, even after 10 wet-dry cycles. Conversely, GCLs exposed to solutions with lower RMD values (0.005 $M^{1/2}$) experienced an increase in hydraulic conductivity after repeated wet-dry cycling. The synthetic porewater sample from the Bridgeport Landfill site had a low ionic strength (0.002 M) and low RMD (0.02 $M^{1/2}$). When comparing these combinations to the Meer and Benson results in Figure 1, the Bridgeport ionic strength-RMD combination appears to correspond most closely (although, not exactly) with the low RMD results, which saw an increase in GCL hydraulic conductivity after 6 wet-dry cycles.

Recommendations

Based on the test results presented above, CETCO recommends one of the following alternatives for minimizing the combined effects of cation exchange and repeated wet-dry cycling:

- Use a plastic-laminated GCL (Bentomat CL, installed with the plastic side facing up), or a composite liner system (a GCL with a separate overlying geomembrane). The membrane components of these systems will serve to deter both desiccation and ion exchange.
- Increase the RMD of the porewater solution. This may possibly be accomplished by amending the cover soil with a sodium-rich, slightly-soluble material, such as soda ash. In the Meer and Benson study mentioned previously, solutions with RMD values of 0.5 $M^{1/2}$ or higher did not result in any change in GCL permeability, even after 10 wet-dry cycles; one could reasonably conclude that by adding soda ash to the cover soil, the amount of dissolved sodium in the porewater will increase, thus increasing the RMD. The higher RMD will reduce the potential for cation exchange in the GCL, allowing repeated wet-dry cycling to occur, without impacting GCL hydraulic conductivity. The appropriate amount of soda ash needed to raise and maintain a high long-term RMD is a site-specific consideration which would require additional laboratory testing.

CETCO appreciates the opportunity to provide this information. Please call me at 847-818-7945 (office) or 847-323-8750 (mobile) if you have questions or need additional information.

Sincerely,

Chris Athanassopoulos, P.E.
Technical Support Engineer

TABLE 1
BRIDGEPORT LANDFILL - COVER SOIL POREWATER CONCENTRATIONS

Parameter	Mar-08 soil sample
Major Cations (mg/L)	
Ca^{2+}	18.52
Mg^{2+}	6.564
K^{+}	5.865
Na^{+}	8.856
pH	6.47
Specific Conductance (uS/cm)	108
I (M)[A]	**0.002**
RMD ($M^{1/2}$)[B]	**0.020**

(A) Calculated from specific conductance, using Snoe
(B) Calculated using Kolstad et al (2004).

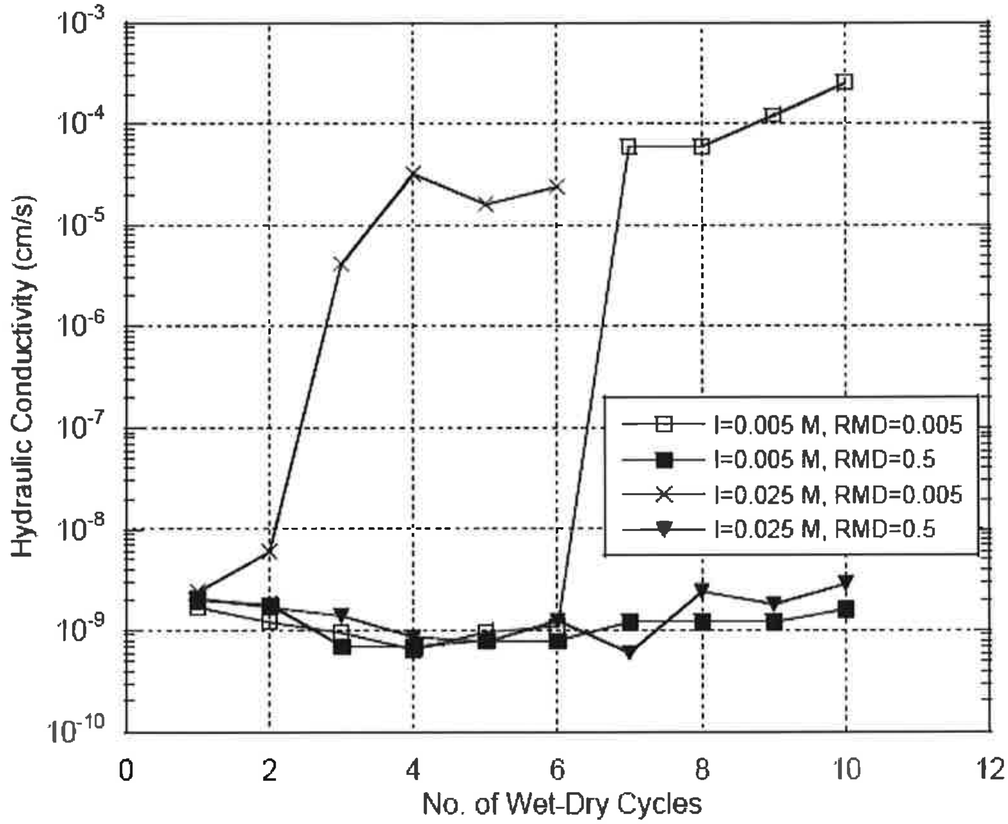


FIGURE 1 – HYDRAULIC CONDUCTIVITY OF GCL SAMPLES AS A FUNCTION OF WATER CHEMISTY AND NUMBER OF WET-DRY CYCLES

Source: Meer and Benson (2004), "In-Service Hydraulic Conductivity of GCLs Used in Landfill Covers — Laboratory and Field Studies," Geo Engineering Report No. 04-17, University of Wisconsin-Madison.

1350 WEST SHURE DRIVE | ARLINGTON HEIGHTS, ILLINOIS | 60004 | U.S.A. | TEL 847.392.5800 | FAX 847.506.6195

CETCO **Laboratory Services Report**

VOLCLAY COMPATIBILITY ANALYSIS

ASTM D6141-97

Project: **Bridgeport LF**

Project No. 08-045

Sample ID: C08-044 = Soil Sample

Date: 3/12/2008

CETCO Request: Chris Athanassopoulos

Test Results:

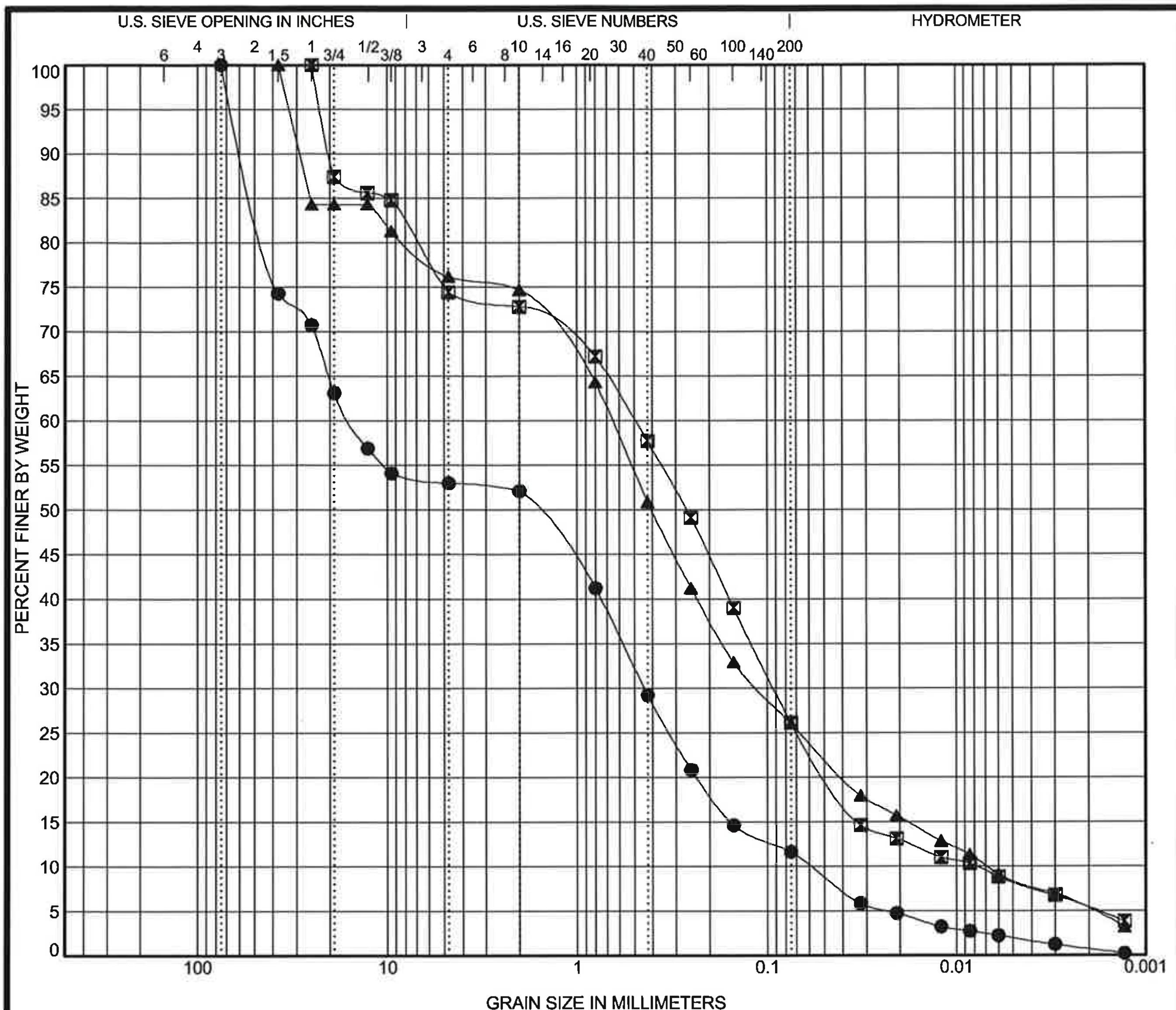
General Water Quality Parameters		
Conductivity	108	µmhos/cm
pH	6.47	

Compatibility Parameter	Test Liquid	Standard Bentonite
Fluid Loss (mL)	DI Water Site Water WCI	18 17.56 3%
Free Swell (mL/2 g)	DI Water Site Water WCI	24 24 0%

Comments: The sample of the soil was mixed at a 2:1 ratio with deionized water, and then filtered to obtain a water sample for testing. WCI represents the percent loss of swell of Volclay CG-50 in the site water sample (SW) submitted relative to deionized water (DI).

File Name: 08-045

Analyst: NJP



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	108 Pit	0.5	**Gravelly Sand with Silt [SP-SM] - Non Plastic**				0.21	260.95
⊠	Bridgeport Rd	0.5	**Gravelly Silty Sand with Clay[SM] - Non Plastic**				2.18	62.48
▲	Green Creek	0.5	**Gravelly Silty Sand with Clay [SM]**	23	18	5	2.78	94.39

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	108 Pit	0.5	75	15.513	0.443	0.059	47.0	41.4	9.7	1.9
⊠	Bridgeport Rd	0.5	25	0.495	0.092	0.008	25.6	48.3	17.9	8.2
▲	Green Creek	0.5	37.5	0.653	0.112	0.007	23.8	50.2	17.5	8.5

GEOCON

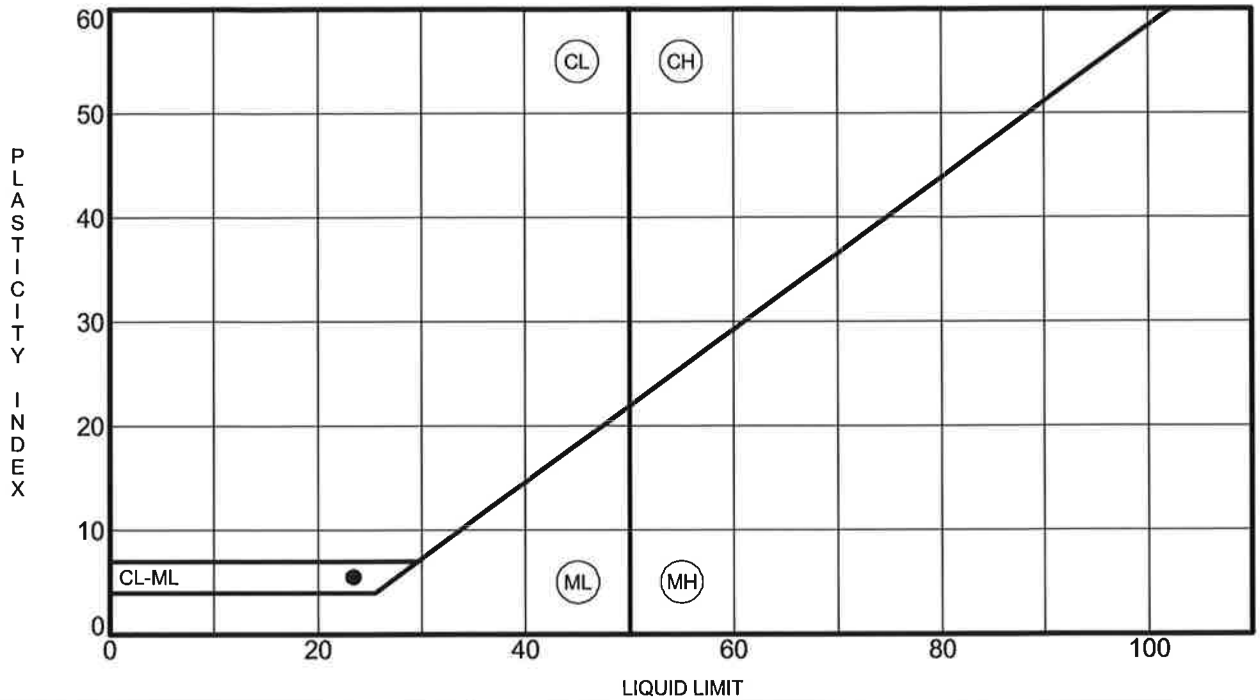
Geocon
4010 Technology Way, Suite D
89706
Telephone: 775.888.9900
Fax: 775.888.9904

GRAIN SIZE DISTRIBUTION

Project: SRK

Location: Mono County, CA

Number: R8527-06-01



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**Green Creek**	**0.5**	**23**	**18**	**5**	**26**	**Gravelly Silty Sand with Clay [SM]**

GEOCON
Geocon
4010 Technology Way, Suite D
89706
Telephone: 775.888.9900
Fax: 775.888.9904

ATTERBERG LIMITS' RESULTS

Project: SRK

Location: Mono County, CA

Number: R8527-06-01

Vector Engineering Inc.

12438 Loma Rica, Grass Valley, CA, 530-272-2448

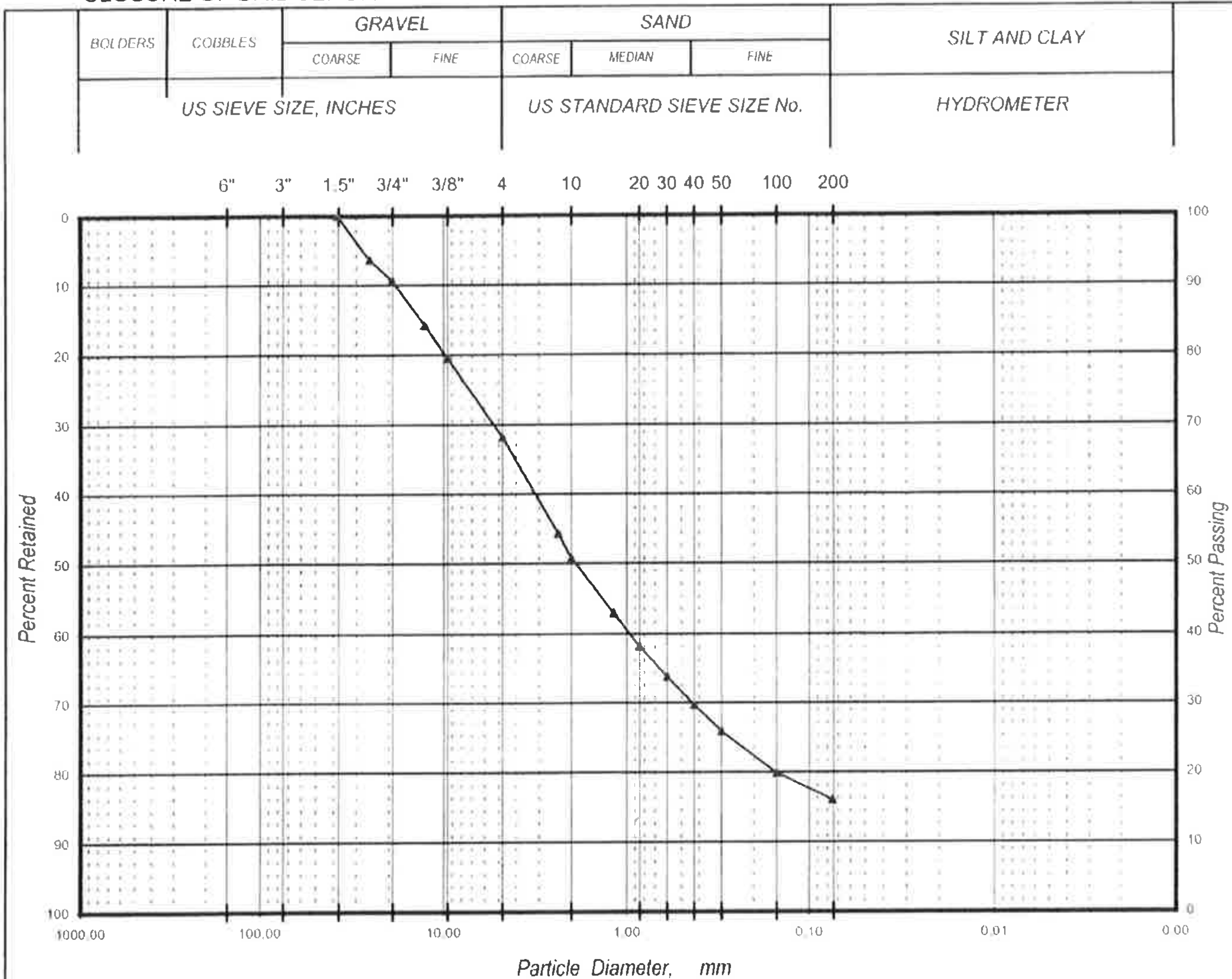
LABORATORY SERVICES

PARTICLE SIZE ANALYSIS

TEST REPORT

ASTM D-422

Client: LEWIS ENGINEERING	Project No: 021713.00	Lab Sample No: 829C	
Project Name: CLOSURE OF BRIDGEPORT LANDFILL-MONO COUNTY		Report Date: 1/7/03	



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	Bridgeport Foundation Soil (rec'd 12/18/02)	Clayey Sand w/ Gravel	31.8	52.1	16.1

L : Labexcel \ Projects \ 2002 \ 021713 \ 829C-MA | Print Date: 01/08/03 | Reviewed By: | LSN: **829C**

DCN: MA-rp (rev. 02/15/01)

Vector Engineering Inc.

12438 Loma Rica, Grass Valley, CA, 530-272-2448
LABORATORY SERVICES

PARTICLE SIZE ANALYSIS

TEST REPORT

ASTM D-422

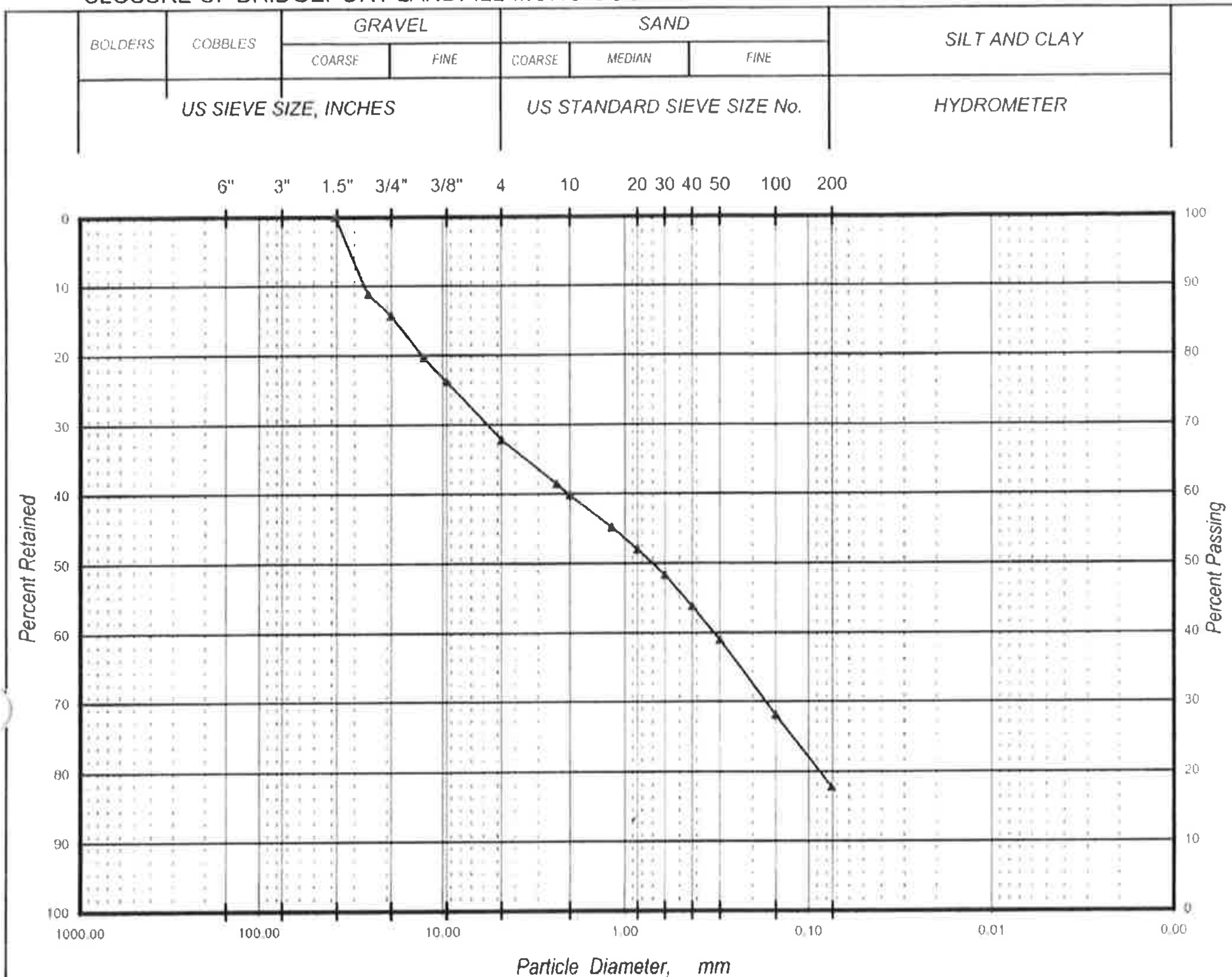
Client: LEWIS ENGINEERING

Project No: 021713.00

Lab Sample No: 829A

Project Name: CLOSURE OF BRIDGEPORT LANDFILL-MONO COUNTY

Report Date: 1/7/03



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	Bridgeport Vegetative Soil (rec'd 12/18/02)	Clayey Sand w/ Gravel	32.2	50.1	17.7

L : Labexcel \ Projects \ 2002 \ 021713 \ 829A-MA

Print Date: 01/08/03

Reviewed By:

LSN: 829A

DCN: MA-rp (rev. 02/15/01)

Vector Engineering Inc.

12438 Loma Rica, Grass Valley, CA, 530-272-2448

LABORATORY SERVICES

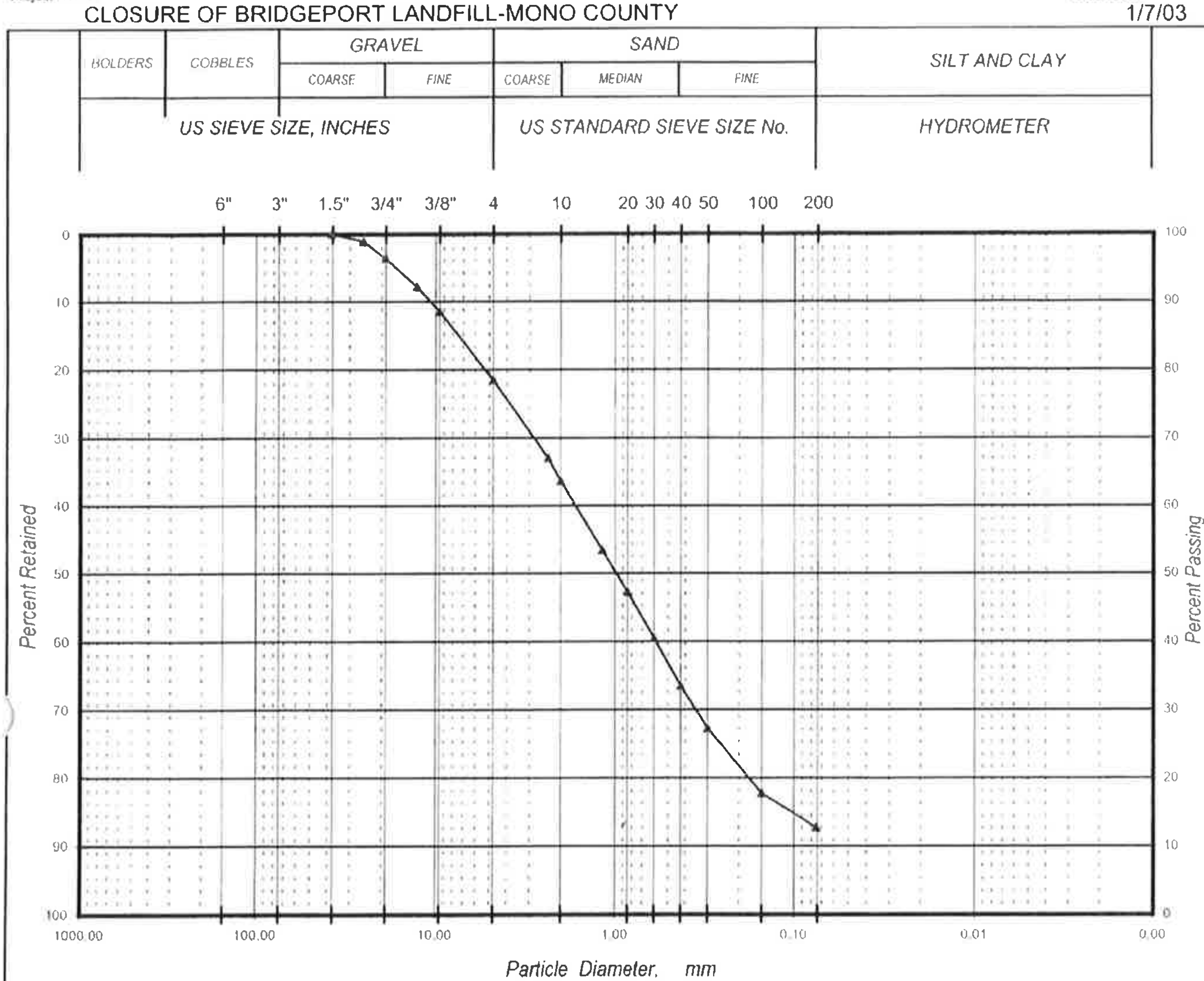
PARTICLE SIZE ANALYSIS

TEST REPORT

ASTM D-422

Client	Project No	Lab Sample No
LEWIS ENGINEERING	021713.00	829B

Project Name	Report Date
CLOSURE OF BRIDGEPORT LANDFILL-MONO COUNTY	1/7/03



Symbol	Sample ID	Description	% Gravel	% Sand	% Silt - Clay
▲	Bridgeport Borrow Site (rec'd 12/18/02)	Clayey Sand w/ Gravel	21.5	65.8	12.7

L : Laboxcel \ Projects \ 2002 \ 021713 \ 829B-MA | Print Date: 01/08/03 | Reviewed By: | LSN: 829B

DCN: MA-rp (rev. 02/15/01)

February 7, 2008

CETCO
LINING TECHNOLOGIES
800.527.9948 www.cetco.com

Breese Burnley
SRK Consulting, Inc.
1755 East Plumb Lane
Suite 241
Reno, Nevada 89502

Re: Bridgeport Landfill Cover Soil
GCL Compatibility Testing Results

Dear Mr. Burnley:

During the week of January 28, 2008, we received three soil samples labeled, "Pit Behind Shop", "Green Pit" and "108 Pit". Based on our conversations, CETCO understands that these samples are representative of the soils that could be used to cover the GCL at the Bridgeport Landfill site. To evaluate the compatibility of the proposed cover soils with GCLs, CETCO performed the following testing:

- Compatibility Testing (ASTM D6141) – The soil samples were mixed at a 2:1 ratio with deionized water, and then filtered to obtain "synthetic leachate" samples, intended to be representative of soil porewater.
- Fluid Loss (ASTM D5890) – Sodium bentonite was tested for fluid loss, using the synthetic leachates.
- Free Swell (ASTM D5891) – Sodium bentonite was tested for free swell, using the synthetic leachates.
- Chemistry (ICP) – The synthetic leachates were analyzed for major dissolved cations, specifically, calcium, magnesium, sodium, and potassium.

Bentonite Index Testing

The results of the bentonite free swell and fluid loss testing are attached. The synthetic site porewaters had an acidic pH (ranging from 4.73 to 5.34) and low specific conductance (ranging from 60 to 75 µS/cm). After coming into contact with the synthetic leachates, sodium bentonite exhibited no increase in fluid loss (less than 18 mL) and no decrease in swell index (24 mL/2g), indicating that the soils are likely compatible with sodium bentonite. However, please note that one of the limitations of the ASTM D6141 test method is that it cannot replicate certain site conditions, such as increased confining pressure, prehydration with clean water, and repeated wet-dry cycling. Unfortunately, GCLs used alone in landfill covers may be more prone to desiccation and wet-dry cycling. Wet-dry cycling is an important consideration when evaluating GCL chemical compatibility, as discussed below.

Effect of Wet-Dry Cycling

As discussed in Meer and Benson (2004), certain dilute calcium solutions which do not normally pose bentonite compatibility issues can increase a GCL's hydraulic conductivity over time if the GCL is subjected to numerous wet-dry cycles. Meer and Benson evaluated the combined effects of cation exchange and wet-dry cycling by repeatedly drying and wetting GCLs with solutions of varying ionic strengths and RMD values. RMD defined as the ratio of monovalent to divalent cations dissolved in a solution:

$$RMD = \frac{[Na^+]+[K^+]}{\sqrt{[Ca^{2+}]+[Mg^{2+}]}}$$

To best evaluate how a GCL would respond to repeated wet-dry cycling in this particular application, the synthetic porewaters generated from the three cover soil samples were analyzed for major cations, including calcium, magnesium, sodium, and potassium. The analytical results are summarized in Table 1. These results were used to calculate ionic strength and RMD values, which were then compared to previous findings in the literature, as discussed below.

Figure 1 is an excerpt from the Meer and Benson study, which shows that GCLs exposed to solutions with a high RMD (0.5 $M^{1/2}$) maintained a low long-term hydraulic conductivity, even after 10 wet-dry cycles. Conversely, GCLs exposed to solutions with lower RMD values (0.005 $M^{1/2}$) experienced an increase in hydraulic conductivity after repeated wet-dry cycling. The synthetic porewater samples from the Bridgeport Landfill site had a low ionic strength (0.001 M) and low RMDs (ranging from 0.015 to 0.027 $M^{1/2}$). When comparing these combinations to the Meer and Benson results in Figure 1, the Bridgeport ionic strength-RMD combinations appear to correspond most closely (although, not exactly) with the low RMD results, which saw an increase in GCL hydraulic conductivity after 6 wet-dry cycles.

Recommendations

Based on the test results presented above, CETCO recommends one of the following alternatives for minimizing the combined effects of cation exchange and repeated wet-dry cycling:

- Use a plastic-laminated GCL (Bentomat CL, installed with the plastic side facing up), or a composite liner system (a GCL with a separate overlying geomembrane). The membrane components of these systems will serve to deter both desiccation and ion exchange.
- Increase the RMD of the porewater solution. This may possibly be accomplished by amending the cover soil with a sodium-rich, slightly-soluble material, such as soda ash. In the Meer and Benson study mentioned previously, solutions with RMD values of 0.5 $M^{1/2}$ or higher did not result in any change in GCL permeability, even after 10 wet-dry cycles; one could reasonably conclude that by adding a small quantity of soda ash to the cover soil, the amount of dissolved sodium in the porewater will increase, thus increasing the RMD. The higher RMD will reduce the potential for cation exchange in

the GCL, allowing repeated wet-dry cycling to occur, without impacting GCL hydraulic conductivity. The appropriate amount of soda ash needed to raise the RMD is a site-specific consideration which would require additional laboratory testing prior to construction.

CETCO appreciates the opportunity to provide this information. Please call me at 847-818-7945 (office) or 847-323-8750 (mobile) if you have questions or need additional information.

Sincerely,

Chris Athanassopoulos, P.E.
Technical Support Engineer

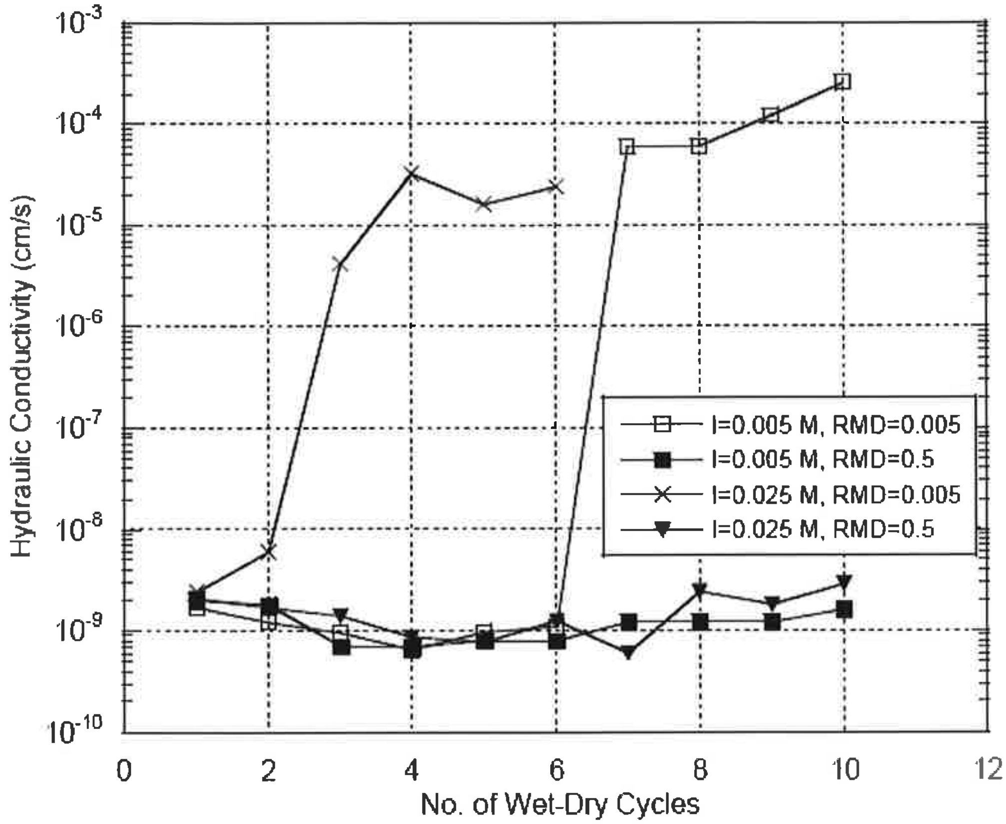


FIGURE 1 – HYDRAULIC CONDUCTIVITY OF GCL SAMPLES AS A FUNCTION OF WATER CHEMISTY AND NUMBER OF WET-DRY CYCLES

Source: Meer and Benson (2004), "In-Service Hydraulic Conductivity of GCLs Used in Landfill Covers — Laboratory and Field Studies," Geo Engineering Report No. 04-17, University of Wisconsin-Madison.

TABLE 1
BRIDGEPORT LANDFILL - COVER SOIL POREWATER CONCENTRATIONS

Parameter	Pit Behind Shop	Green Pit	108 Pit
Major Cations (mg/L)			
Ca^{2+}	43.56	24.84	25.57
Mg^{2+}	22.02	17.54	11.35
K^{+}	18.37	12.49	7.649
Na^{+}	17.27	9.366	6.93
pH	5.34	5.27	4.73
Specific Conductance (uS/cm)	72	60	75
I (M)[A]	**0.001**	**0.001**	**0.001**
RMD ($M^{1/2}$)[B]	**0.027**	**0.020**	**0.015**

(A) Calculated from specific conductance, using Snoeyink and Jenkins (1980).
(B) Calculated using Kolstad et al (2004).

1350 WEST SHURE DRIVE | ARLINGTON HEIGHTS, ILLINOIS | 60004 | U.S.A. | TEL 847.392.5800 | FAX 847.506.6195

CETCO **Laboratory Services Report**

VOLCLAY COMPATIBILITY ANALYSIS

ASTM D6141-97

Project:	**Bridgeport LF**	Project No.	08-025
Sample ID:	C08-024 = Soil Samples	Date:	2/5/2008
		CETCO Request:	Chris Athanassopoulos

Test Results:

General Water Quality Parameters				
	Pit Behind Shop	**Green Pit**	**108 Pit**	
Conductivity	72	60	75	µmhos/cm
pH	5.34	5.27	4.73	

Compatibility Parameter	Test Liquid	Pit Behind Shop	Green Pit	108 Pit
Fluid Loss (mL)	DI Water Site Water WCI	18 15.90 12%	18 16.44 9%	18 16.70 8%
Free Swell (mL/2 g)	DI Water Site Water WCI	24 24 0%	24 24 0%	24 24 0%

Comments: The sample of the soil was mixed at a 2:1 ratio with deionized water, and then filtered to obtain a water sample for testing. WCI represents the percent loss of swell of Volclay CG-50 in the site water sample (SW) submitted relative to deionized water (DI).

File Name: 08-025

Analyst: NJP

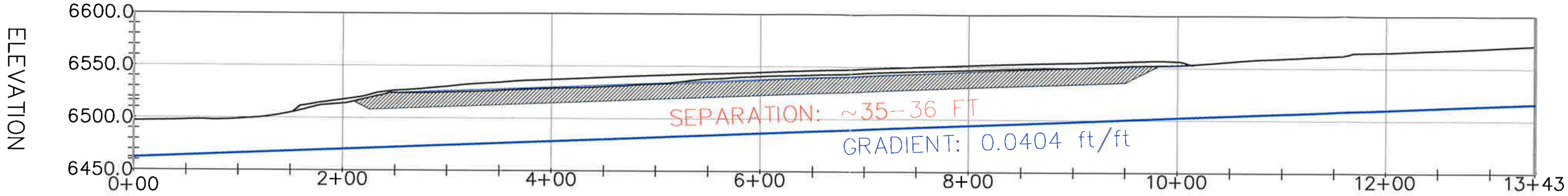
APPENDIX C.3

BRIDGEPORT LANDFILL SCHEMATIC SECTIONS

GROUND: 6497.4
WATER: 6462.2
MW–1

Section MW–1 to MW–3

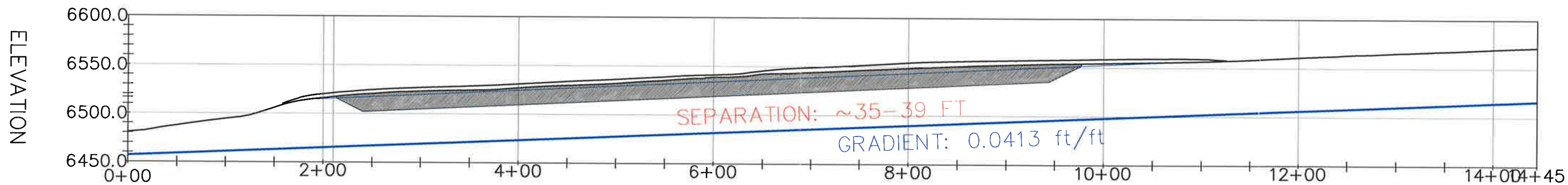
GROUND: 6571.6
WATER: 6516.5
MW–3



GROUND: 6480.5
WATER: 6456.9
MW–2

Section MW–2 to MW–3

GROUND: 6571.6
WATER: 6516.5
MW–3



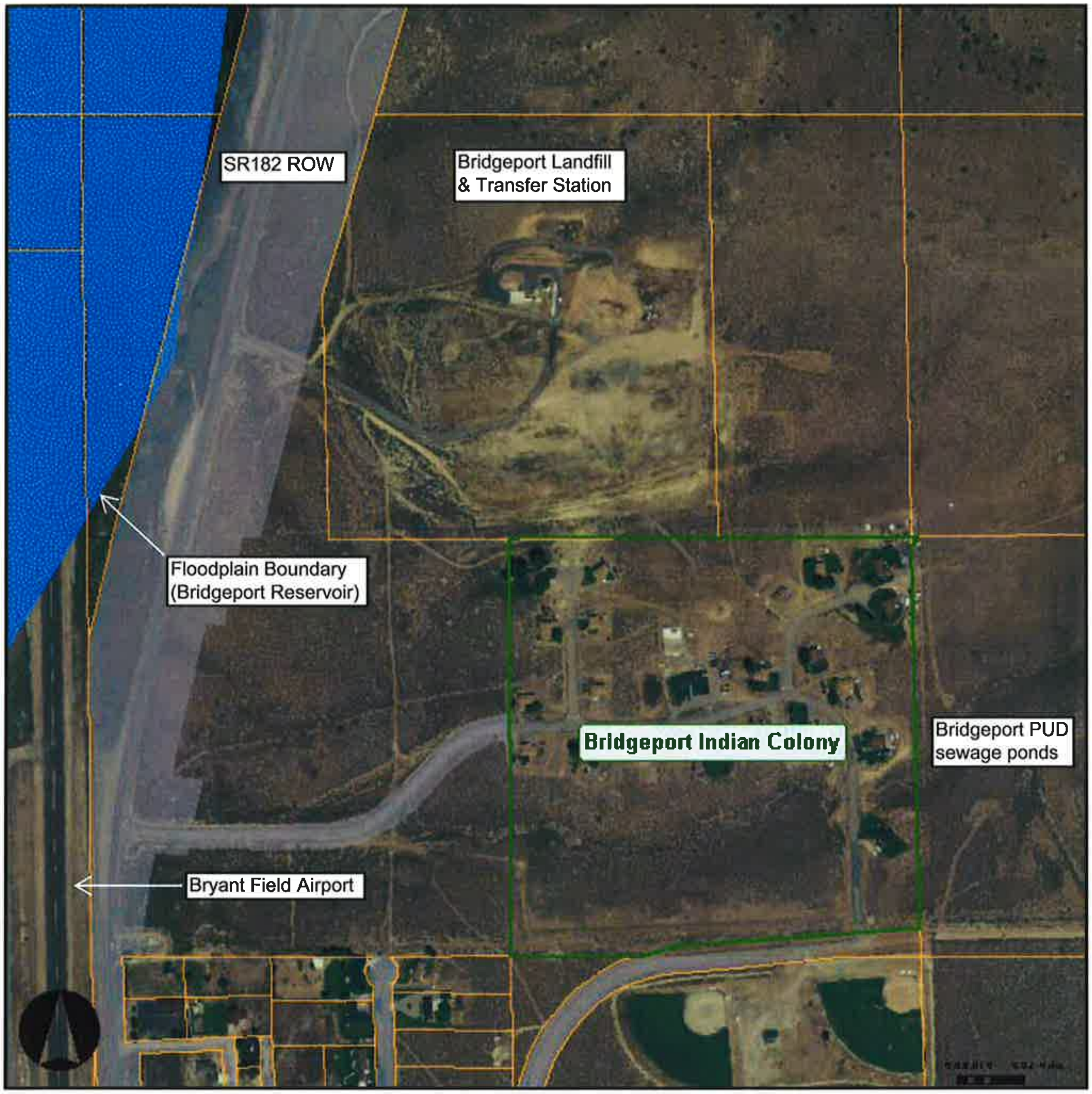
Bridgeport Landfill – Schematic Sections

Ground and Water Elevations from 2008 Annual EMP Report

APPENDIX C.4

FLOODPLAIN MAP

Bridgeport LF Floodplain



Development_Overlay

Parcels

Right of Ways

Delineated Flood Areas

Aerial Photos - Mono West

Red: Band_1

Green: Band_2

Blue: Band_3

APPENDIX D

STORMWATER CONTROL SYSTEM DESIGN

MONO COUNTY
DEPARTMENT OF PUBLIC WORKS

DRAINAGE CONTROL SYSTEM DESIGN REPORT

BRIDGEPORT LANDFILL FINAL CLOSURE CONSTRUCTION

SWIS# 26-AA-0002
WDID# 6B260004000

Mono County, California

Prepared by:

SRK Consulting
Engineers and Scientists
5250 Neil Road, Suite 300
Reno, Nevada 89502
(775) 828-6800
(775) 828-6820 (Fax)

and

Mono County Department of Public Works
Post Office Box 457
Bridgeport, California 93517
(760) 932-5440
(760) 932-5441 (Fax)

February 2008
Revised April 2009

TABLE OF CONTENTS

ATTACHMENTS

ENGINEER'S CERTIFICATION

This Drainage Control System Design Report was prepared pursuant to Title 27 of the California Code of Regulations under the direct supervision of the undersigned civil engineer and in accordance with generally-accepted engineering principles and practices applicable at the time of its preparation. I certify that the information contained in this report is, to the best of my knowledge, true and correct.

REGISTERED PROFESSIONAL ENGINEER
R. BREESE BURNLEY
NO. C 60507
EXP 9.30.10
CIVIL
STATE OF CALIFORNIA

4.07.09

R. Breese Burnley, R.C.E. No. C60507
Principal Engineer
SRK Consulting (U.S.), Inc.

1.0 INTRODUCTION

The following drainage facility design report has been prepared as supporting documentation to the *Final Closure and Postclosure Maintenance Plan* for the Bridgeport Landfill. This report, which is included as Appendix D to the aforementioned plan, has been prepared to meet current state solid waste permitting requirements and to achieve the general standards of care for civil engineering practice. The purpose of this drainage report is to present the methods used to determine the appropriate drainage configurations necessary to collect and control surface water run-off resulting from a 100-year, 24-hour storm event at the Bridgeport Landfill. The drainage system design described in the following sections addresses facilities that are proposed to be constructed during closure activities. Drainage facilities expected to be in-place following site closure and maintained throughout the postclosure period are delineated on Drawing 3 in Appendices A and N of the *Final Closure and Postclosure Maintenance Plan*. Details of those collection facilities are presented on Drawing 5, also enclosed in Appendices A and N.

2.0 SYSTEM DESIGN

The drainage control system described in this report has been designed to route stormwater run-off away from closed landfill areas to eliminate any potential impact to the final cover layer and minimize erosion of surface soils. Stormwater generated on-site will be routed via open channels off site to the west, while stormwater generated in the upgradient catchment will be routed around the closed landfill footprint.

The final site plan is illustrated on Drawing 3, Final Grading Plan, enclosed in Appendices A and N of the *Final Closure and Postclosure Maintenance Plan*. In addition, drainage areas considered in the stormwater analyses are illustrated on Figures D-1 and D-2 in this appendix. Proposed drainage channels are designed as v-ditches and diversion berms (run-off control) or trapezoidal channels (run-on diversion).

Riprap-lined diversion berms will be constructed on the gently sloping closed surface of the landfill and down the steeper sideslopes. The berms will transition into v-ditches off of the final cover - segments routed over native soil will generally be unlined and maintained by the Mono County Department of Public Works. V-ditch intersections with on-site access roads will be constructed as swales to maintain vehicle access to the closed landfill. Channel intersections and bends will be lined where required with geotextile and riprap. If scouring is observed at locations other than those shown on the design drawings, channel lining will also be installed at these locations. Diversion berm and v-ditch sideslopes will be configured at 3H:1V and flowline depths will vary up to 24 inches.

A trapezoidal diversion channel will be constructed along the eastern and southern landfill boundary to divert flows from the off-site, upgradient watersheds around the final closed landfill. The channel has been designed as a relatively wide (10-foot base width) and shallow (24-inch-deep) channel with 4H:1V sideslopes to better blend with the surrounding gently-sloping topography. The channel will be unlined except at intersections with natural and man-made (v-ditch) channels, road crossings and at the channel discharge into the detention basin, where a discharge apron will be installed at the upstream inlet, and a broad-crested weir will be constructed at the basin outlet. Channel lining at intersections, aprons and at the wier outlet to the detention basin will consist of riprap underlain by geotextile to minimize scouring. If scouring is observed at locations not receiving riprap lining, channel lining will be installed as necessary by the County.

One culvert consisting of approximately 40 feet of 24-inch diameter corrugated metal pipe (CMP) culvert is specified under the main access road. Culvert installation will meet the specifications of Section 66 of Caltrans Standard Specifications (2006).

The final destination of stormwater collected from the site will be existing natural drainage channels west of the landfill property.

3.0 METHODOLOGY

Drainage analyses were performed using the site plan and grading depicted on Drawing 3, enclosed in Appendices A and N of the FCPMP. The final site configuration was divided into drainage sub-areas based on the final destination of run-off in a particular area. The final closed configuration of the landfill was divided into three sub-areas (Sub-areas 1, 2, and 4). Two off-site upgradient watersheds were delineated (Sub-area 3 and 5). Sub-area delineations are illustrated on Figures D-1 and D-2 in this appendix. The watershed sub-areas were delineated using available site topography by Triad/Holmes Associates of Mammoth Lakes, California with two-foot contour intervals, and available topography from the USGS Bridgeport Valley, California 7.5 Minute Quadrangle with a 40-foot contour interval.

The United States Department of Agriculture, Natural Resources Conservation Service (NRCS) WinTR-55 methodology (USDA, 2002) was used to calculate peak flood hydrographs for each drainage area. The rainfall distribution in eastern California is synthetically approximated by the NRCS as a Type II pattern, which represents an intense, short-duration storm event. The 100-year, 24-hour storm depth used in the analyses was 5.12 inches, based on rainfall frequency data from the National Oceanic and Atmospheric Administration (NOAA) National Weather Service online database (NOAA, 2008). A two-year, 24-hour storm depth of 1.68 inches was used for determination of sheet flows.

Surface conditions for each sub-area were analyzed individually, and curve numbers were developed based on the type of ground cover and surface soil. Landfilled areas receiving final cover and other adjacent on-site areas were assigned a ground cover of "poor" and hydrologic soil group "D", resulting in a curve number of 85 for all landfill catchments. Natural ground upgradient and downgradient from the site was assigned a cover designation of “fair” and hydrologic soil group “C”, resulting in a curve number of 65 for all natural catchments.

Information presented in Section 39 of the *Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas* (USDA, 1975) was used to determine the appropriate size (d_{50}) of riprap for each lined channel segment, depending upon its flow rate, slope, and geometry. Methodology from Section 38 of the same reference (USDA, 1975) was used to determine the size of riprap and dimensions of discharge aprons proposed for the inlet culverts in the retention basins. Riprap lining was not specified for the run-on diversion channel along the north and east landfill boundaries, except where the channel intersects natural drainages or access roads. This was based on a lack of observed flows from the upgradient watershed, the conservative nature of the stormwater analysis and watershed delineation, and the fact that the channel does not traverse the waste footprint. The diversion channel will be inspected following each significant storm event to determine if additional riprap lining is warranted.

4.0 RESULTS

The attached output files from the WinTR-55 computer program illustrate the results of the hydrologic analyses for the proposed site design. An analysis of the proposed final landfill configuration, using the input parameters described above, resulted in predicted peak storm flows and hydrographs for Sub-areas 1 through 5. Attached Table D-1 summarizes the input for each sub-area and the resulting peak discharge that is generated.

Drainage channels were sized using the FlowMaster computer program (Haestad, 2005). The resulting flow depths and velocities in each on-site channel, as determined by the FlowMaster hydraulic analysis, are summarized in the attached Table D-2. In addition, Table D-2 presents design information, including lengths, slopes, and construction materials of site channel segments.

The run-off control system was designed to collect and control the peak flows resulting from a 100-year, 24-hour storm event. WinTR-55 calculations predict a maximum surface flow of 31.7 cubic feet per second (cfs) will develop in any particular on-site drainage sub-area which could directly impact the final cover. The upgradient sub-area is predicted to generate a maximum of 127 cfs at its western discharge during a 100-year storm event.

The detention basin was sized at 5 feet deep with interior slope crest dimensions of 75 feet by 75 feet (at the spillway) to allow for settling of the larger particle sizes before discharge off site. Analysis of the storm hydrograph relative to the storage characteristics of the basin indicate the capacity of the basin will be reached before the peak flow arrives (refer to Table D-3). The basin was therefore designed with an outlet structured configured as a 50-foot wide broad-crested weir. The peak flow in this weir configuration will result in a calculated maximum flow depth of 0.94 feet. The weir will therefore be constructed to a depth of 18 inches and will be lined with ripap and geotextile to prevent erosion.

5.0 CONCLUSIONS

The results of the FlowMaster calculations attached with this report indicate that the proposed berms, and channels have been appropriately sized to collect and control surface water run-off resulting from a 100-year, 24-hour storm event. Based on the predicted flow velocities from the FlowMaster output files, riprap/geotextile lining is recommended in all channels that cross the proposed final landfill cover, and in critical segments of the remaining channels routed over native soil.

6.0 REFERENCES

Haestad Methods, Inc., 2005, *FlowMaster:* Haestad Methods, Inc., Waterbury, Connecticut.

NOAA, 2008, National Weather Service, Hydrometeorological Design Studies Center Precipitation Frequency Data Server available on-line at http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html.

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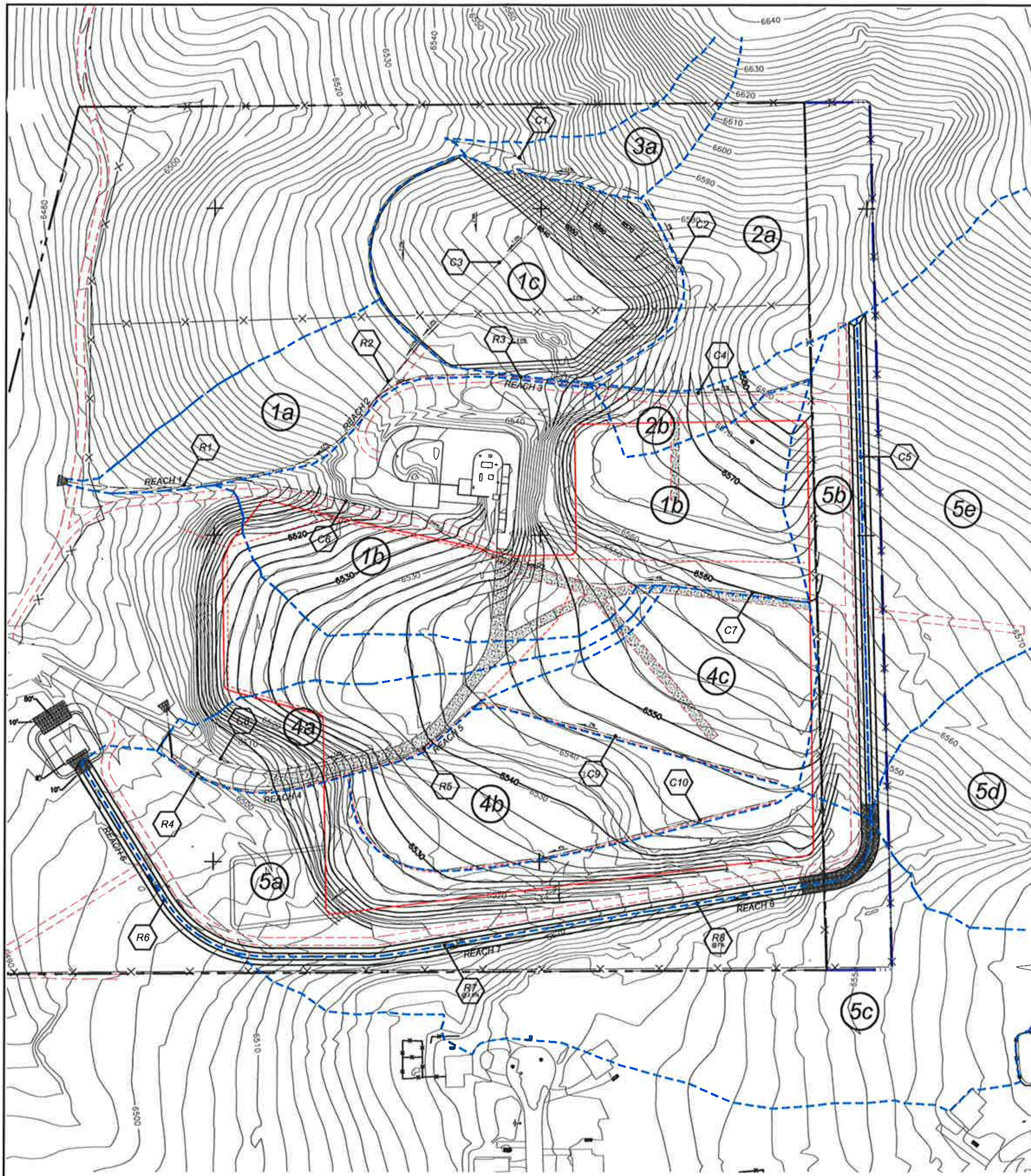
USDA, 2005, WinTR-55, version 1.0.08 by the Natural Resources Conservation Service, available on the web at http://www.wcc.nrcs.usda.gov/hydro/hydro-tools-models-wintr55.html.

USDA, 2002, United States Department of Agriculture, Natural Resources Conservation Service. WinTR-55: User Documentation.

Vector, 1995, *Preliminary Closure and Postclosure Maintenance Plan for the Bridgeport Landfill*, unpublished report prepared by Vector Engineering, Inc., for the Mono County Department of Public Works, October 1995 (revised March 1998).

FIGURES D-1 AND D-2



LEGEND

C5

5e

0 100 200

FEET

Prepared For:

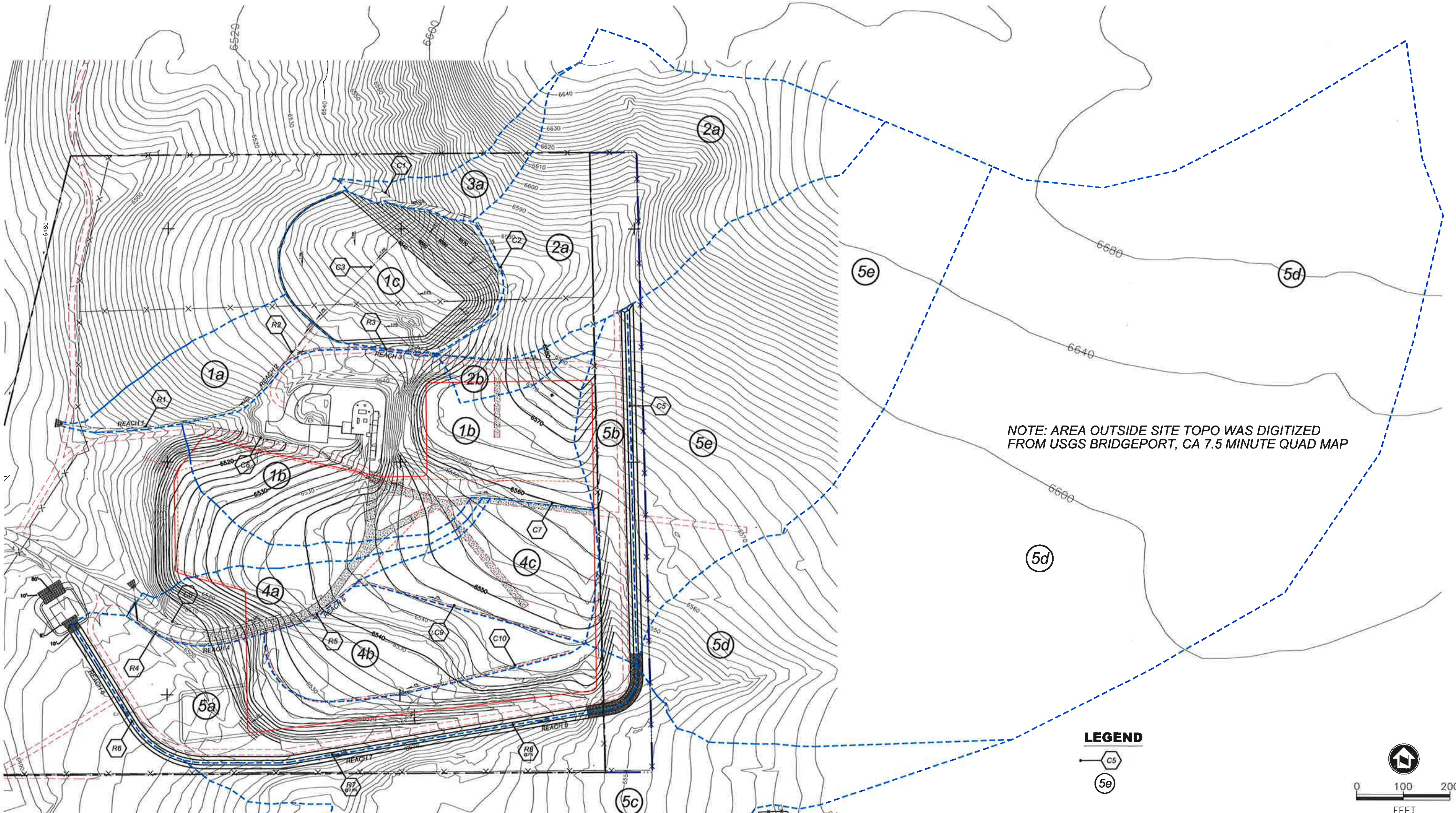
COUNTY OF MONO
DEPARTMENT OF PUBLIC WORKS

Project:

SRK Consulting
Engineers and Scientists
5250 Neil Road, Suite 300
Reno, NV 89502
775-828-6800

BRIDGEPORT LANDFILL
ON-SITE SUB-AREA DELINEATION
MONO COUNTY, CALIFORNIA

Revision Date: **3/11/09**	Sheet No. **1 of 1**	Figure No.: **D-1**
Scale: **AS SHOWN**		
Project Number: **146907**		
Drawing Name: Figure0-1-2.rbk.20090309.dwg		



Prepared For: **COUNTY OF MONO DEPARTMENT OF PUBLIC WORKS**	Project: **SRK Consulting** Engineers and Scientists 5250 Neil Road, Suite 300 Reno, NV 89502 775-828-6800		
BRIDGEPORT LANDFILL OFF-SITE SUB-AREA DELINEATION MONO COUNTY, CALIFORNIA	Revision Date: 3/11/09	Sheet No. 1 of 1	Figure No.: D-2
	Scale: AS SHOWN		
	Project Number: 146907		
	Drawing Name: FigureD-1-2.rbb.20090309.dwg		

SUMMARY OF HYDROLOGIC ANALYSES

Table D-1
SUMMARY OF HYDROLOGIC ANALYSES[1]

Storm Event: 100-Year, 24-Hour
Precipitation: 5.12
Distribution: Type II
Curve No.: 65-85

Watershed Sub-Area[2]	Summary of Input		Summary of Results	
	Area (acres)	Tc, Time of Conc'n (hours)	Peak Discharge (cfs)	Time to Peak[3] (hour)
1 & 2	18.2	~0.12	73	11.96
3	0.87	0.10	2.03	11.94
4	6.00	0.10	31.6	11.93
5 (upgradient)	54.70	0.1-0.19	127.15	12.02
--	---	---	--	---

Notes:

1. See attached WinTR-55 data sheets for complete input and output details.
2. See Figures D-1 and D-2 for sub-area designations.
3. Time elapsed since beginning of storm event.

Table D-2
SUMMARY OF OPEN CHANNEL DESIGN (100-YR STORM CONDITIONS)

Channel[1]	Description	Lining Material[2]	Contributing Sub-Areas[1]	Peak Flow[3] (cfs)	Avg. Slope	Channel Length (feet)	Flow Depth (feet)	Velocity (fps)	Froude No.[4]	Design Depth (feet)
Run-On Diversion Channel - Flattest Slope	Trap. Channel	Native	5	125.0	7.0%	2,200	1.25	**7.97**	1.37	2.0
Run-On Diversion Channel - Flattest Slope w/Riprap	Trap. Channel	Riprap	5	125.0	7.0%	2,200	1.53	**6.24**	0.99	2.0
R1 - Reach 1	V-Ditch	Riprap	1&2	73.0	15.0%	200	1.40	**12.49**	2.64	2.0
R2 - Reach 2	V-Ditch	Riprap	1&2	64.7	15.0%	400	1.33	**12.12**	2.62	2.0
R3 - Reach 3	V-Ditch	Native	2	33.9	5.0%	250	1.29	**6.83**	1.50	2.0
R4 - Reach 4	V-Ditch	Riprap	4	23.7	15.0%	275	0.92	**9.43**	2.46	1.5
R5 - Reach 5	V-Ditch	Riprap	4	23.7	12.0%	200	1.09	**6.64**	1.58	1.5
C1	V-Ditch	Native	3a	2.0	15.0%	300	0.36	**5.10**	2.11	1.5
C2	V-Ditch	Native	2a	16.4	9.0%	350	0.88	**7.10**	1.89	1.5
C3	V-Ditch	Native	1c	14.8	1.0%	300	1.27	3.04	0.67	1.5
C4	V-Ditch	Native	2b	2.8	11.0%	375	0.44	**4.92**	1.86	1.5
C5	Trap. Channel	Native	5f, 5c	30.3	7.0%	750	0.45	**6.18**	1.69	2.0
C5	Trap. Channel	Riprap	5f, 5c	30.3	7.0%	750	0.55	**4.92**	1.22	2.0
C6	V-Ditch	Native	1b	31.7	10.0%	450	1.10	**8.71**	2.07	1.5
C7	Berm	Riprap	1b	31.7	4.0%	500	2.06	**4.91**	0.85	2.0
C8	V-Ditch	Native	4a	7.9	15.0%	350	0.61	**7.16**	2.29	1.5
C9	Berm	Riprap	4c	11.6	2.0%	500	1.61	2.95	0.58	2.0
C10	Berm	Riprap	4b	12.1	4.0%	800	1.04	**3.72**	0.91	1.5

Notes:

1. Refer to Figures D-1 and D-2 for channel and sub-area designations and locations.
2. Channels over landfill final cover shall have rip-rap lining overlying filter fabric, channels over native ground will be unlined and maintained by DPW
3. See attached Table D-1 for summary of peak flows and WinTR-55 data sheets for detailed calculations
4. A Froude number of 1.0 (dimensionless) or greater indicates critical / supercritical flow velocity

Table D-3
STORM ROUTING - SEDIMENT RETENTION BASIN

Retention Basin Design Parameters

	BASE	TOP[1]
Elevation:	6485 ft.	6490 ft.
Width:	45 ft.	75 ft.
Length:	45 ft.	75 ft.
Volume:	0 cf	19,100 cf

Contributing Sub-Areas: 5 (a-e) Sideslopes (h:v) = 3 :1

Time Elapsed[2] (hrs)	Inflow Rate[3] (cfs)	Inflow Volume (cu. ft.)	Cumulative Inflow (cu. ft.)	Water Depth (feet)	Surface Elevation (feet)	Cumulative Outflow (cu.ft.)[4]	Outflow Level[5] (ft)
7.093	0.07	6	6	0.00	6485.00	0	0
7.137	0.07	11	17	0.00	6485.00	0	0
7.181	0.07	11	28	0.01	6485.01	0	0
7.226	0.07	11	39	0.01	6485.01	0	0
7.27	0.07	11	50	0.01	6485.01	0	0
7.314	0.08	13	63	0.02	6485.02	0	0
7.358	0.08	13	76	0.02	6485.02	0	0
7.403	0.08	13	88	0.02	6485.02	0	0
7.447	0.08	13	101	0.03	6485.03	0	0
7.491	0.08	13	114	0.03	6485.03	0	0
7.535	0.09	14	128	0.03	6485.03	0	0
7.579	0.09	14	142	0.04	6485.04	0	0
7.624	0.09	14	157	0.04	6485.04	0	0
7.668	0.09	14	171	0.04	6485.04	0	0
7.712	0.1	16	187	0.05	6485.05	0	0
7.756	0.1	16	203	0.05	6485.05	0	0
7.8	0.1	16	219	0.06	6485.06	0	0
7.845	0.1	16	235	0.06	6485.06	0	0
7.889	0.1	16	251	0.07	6485.07	0	0
7.933	0.11	17	268	0.07	6485.07	0	0
7.977	0.11	17	286	0.07	6485.07	0	0
8.021	0.11	18	303	0.08	6485.08	0	0
8.066	0.11	18	321	0.08	6485.08	0	0
8.11	0.12	19	340	0.09	6485.09	0	0
8.154	0.12	19	359	0.09	6485.09	0	0
8.198	0.13	21	380	0.10	6485.10	0	0
8.243	0.13	21	400	0.10	6485.10	0	0
8.287	0.13	21	421	0.11	6485.11	0	0
8.331	0.14	22	443	0.12	6485.12	0	0
8.375	0.14	22	465	0.12	6485.12	0	0
8.419	0.15	24	489	0.13	6485.13	0	0
8.464	0.15	24	513	0.13	6485.13	0	0
8.508	0.16	25	539	0.14	6485.14	0	0
8.552	0.16	25	564	0.15	6485.15	0	0
8.596	0.17	27	591	0.15	6485.15	0	0
8.64	0.26	42	633	0.17	6485.17	0	0
8.685	0.24	38	671	0.18	6485.18	0	0
8.729	0.25	40	711	0.19	6485.19	0	0
8.773	0.26	41	752	0.20	6485.20	0	0
8.817	0.27	43	795	0.21	6485.21	0	0
8.861	0.28	45	840	0.22	6485.22	0	0
8.906	0.28	45	884	0.23	6485.23	0	0
8.95	0.29	46	930	0.24	6485.24	0	0
8.994	0.3	48	978	0.26	6485.26	0	0

Time Elapsed[2] (hrs)	Inflow Rate[3] (cfs)	Inflow Volume (cu. ft.)	Cumulative Inflow (cu. ft.)	Water Depth (feet)	Surface Elevation (feet)	Cumulative Outflow (cu.ft.)[4]	Outflow Level[5] (ft)
9.038	0.31	50	1,028	0.27	6485.27	0	0
9.083	0.31	50	1,077	0.28	6485.28	0	0
9.127	0.32	51	1,128	0.30	6485.30	0	0
9.171	0.32	51	1,179	0.31	6485.31	0	0
9.215	0.33	52	1,231	0.32	6485.32	0	0
9.259	0.33	53	1,284	0.34	6485.34	0	0
9.304	0.33	53	1,337	0.35	6485.35	0	0
9.348	0.34	54	1,390	0.36	6485.36	0	0
9.392	0.34	54	1,444	0.38	6485.38	0	0
9.436	0.35	55	1,500	0.39	6485.39	0	0
9.48	0.35	56	1,556	0.41	6485.41	0	0
9.525	0.35	56	1,612	0.42	6485.42	0	0
9.569	0.36	57	1,669	0.44	6485.44	0	0
9.613	0.37	59	1,728	0.45	6485.45	0	0
9.657	0.38	60	1,788	0.47	6485.47	0	0
9.701	0.39	62	1,850	0.48	6485.48	0	0
9.746	0.41	66	1,916	0.50	6485.50	0	0
9.79	0.42	67	1,982	0.52	6485.52	0	0
9.834	0.43	68	2,051	0.54	6485.54	0	0
9.878	0.44	70	2,121	0.56	6485.56	0	0
9.923	0.46	74	2,195	0.57	6485.57	0	0
9.967	0.47	74	2,269	0.59	6485.59	0	0
10.011	0.48	76	2,345	0.61	6485.61	0	0
10.055	0.5	79	2,424	0.63	6485.63	0	0
10.099	0.52	83	2,508	0.66	6485.66	0	0
10.144	0.54	87	2,594	0.68	6485.68	0	0
10.188	0.55	87	2,681	0.70	6485.70	0	0
10.232	0.57	90	2,772	0.73	6485.73	0	0
10.276	0.59	93	2,865	0.75	6485.75	0	0
10.32	0.61	98	2,963	0.78	6485.78	0	0
10.365	0.64	103	3,065	0.80	6485.80	0	0
10.409	0.65	103	3,168	0.83	6485.83	0	0
10.453	0.68	108	3,276	0.86	6485.86	0	0
10.497	0.7	111	3,387	0.89	6485.89	0	0
10.541	0.73	117	3,504	0.92	6485.92	0	0
10.586	0.75	120	3,624	0.95	6485.95	0	0
10.63	0.78	124	3,748	0.98	6485.98	0	0
10.674	0.82	130	3,877	1.02	6486.02	0	0
10.718	0.85	136	4,014	1.05	6486.05	0	0
10.763	0.89	143	4,156	1.09	6486.09	0	0
10.807	0.92	146	4,302	1.13	6486.13	0	0
10.851	0.96	152	4,454	1.17	6486.17	0	0
10.895	0.99	157	4,611	1.21	6486.21	0	0
10.939	1.03	165	4,776	1.25	6486.25	0	0
10.984	1.07	171	4,947	1.30	6486.30	0	0
11.028	1.12	177	5,125	1.34	6486.34	0	0
11.072	1.2	190	5,315	1.39	6486.39	0	0
11.116	1.34	212	5,527	1.45	6486.45	0	0
11.16	1.57	252	5,778	1.51	6486.51	0	0
11.205	1.8	288	6,067	1.59	6486.59	0	0
11.249	2.04	323	6,390	1.67	6486.67	0	0
11.293	2.29	363	6,753	1.77	6486.77	0	0
11.337	2.56	406	7,158	1.87	6486.87	0	0
11.381	2.86	458	7,616	1.99	6486.99	0	0
11.426	3.17	508	8,124	2.13	6487.13	0	0
11.47	3.53	559	8,683	2.27	6487.27	0	0

Time Elapsed[2] (hrs)	Inflow Rate[3] (cfs)	Inflow Volume (cu. ft.)	Cumulative Inflow (cu. ft.)	Water Depth (feet)	Surface Elevation (feet)	Cumulative Outflow (cu.ft.)[4]	Outflow Level[5] (ft)
11.514	4.12	653	9,336	2.44	6487.44	0	0
11.558	5.67	908	10,244	2.68	6487.68	0	0
11.603	7.77	1,245	11,489	3.01	6488.01	0	0
11.647	11.62	1,841	13,330	3.49	6488.49	0	0
11.691	16.98	2,690	16,019	4.19	6489.19	0	0
11.735	24.39	3,863	19,883	5.20	6490.20	0	0
11.779	34.75	5,567	25,450	6.66	6490.39	-6,350	0.39
11.824	49	7,850	33,299	8.72	6490.50	-39,649	0.50
11.868	72.12	11,424	44,723	11.71	6490.64	-84,372	0.64
11.912	100	15,840	60,563	15.85	6490.80	-144,935	0.80
11.956	120.17	19,035	79,598	20.84	6490.90	-224,533	0.90
12	127.15	20,369	99,968	26.17	6490.94	-324,501	0.94
12.045	118.32	18,955	118,922	31.13	6490.89	-443,423	0.89
12.089	93.65	14,834	133,757	35.01	6490.76	-577,180	0.76
12.133	65.97	10,450	144,206	37.75	6490.61	-721,386	0.61
12.177	46.27	7,329	151,535	39.67	6490.48	-872,922	0.48
12.221	35.93	5,756	157,291	41.18	6490.40	-1,030,213	0.40
12.266	29.97	4,801	162,093	42.43	6490.36	-1,192,306	0.36
12.31	26.29	4,164	166,257	43.52	6490.33	-1,358,563	0.33
12.354	23.71	3,756	170,013	44.51	6490.31	-1,528,575	0.31
12.398	21.67	3,472	173,484	45.41	6490.29	-1,702,059	0.29
12.443	19.94	3,194	176,678	46.25	6490.27	-1,878,738	0.27
12.487	18.31	2,900	179,579	47.01	6490.26	-2,058,317	0.26
12.531	16.88	2,674	182,253	47.71	6490.24	-2,240,569	0.24
12.575	15.64	2,477	184,730	48.36	6490.23	-2,425,299	0.23
12.619	14.63	2,344	187,074	48.97	6490.22	-2,612,373	0.22
12.664	13.85	2,219	189,292	49.55	6490.21	-2,801,665	0.21
12.708	13.29	2,105	191,398	50.10	6490.21	-2,993,063	0.21
12.752	12.85	2,035	193,433	50.64	6490.20	-3,186,496	0.20
12.796	12.47	1,975	195,408	51.15	6490.20	-3,381,904	0.20
12.84	12.11	1,940	197,348	51.66	6490.20	-3,579,252	0.20
12.885	11.76	1,884	199,232	52.16	6490.19	-3,778,485	0.19
12.929	11.43	1,811	201,043	52.63	6490.19	-3,979,527	0.19
12.973	11.08	1,755	202,798	53.09	6490.18	-4,182,325	0.18
13.017	10.75						

Notes:

1. Spillway crest (i.e., retained volume) is set approximately at flowline elevation of inlet channel.
2. Time elapsed since beginning of storm event, in hours.
3. See WinTR-55 data sheets for input and output details.
4. Assumes inflow rate = outflow rate when storage capacity reached
5. Total volume entering basin exceeds storage capacity, so outlet structure is required.

WinTR-55 Results – Final Site Conditions

WinTR-55 Current Data Description

--- Identification Data ---

User:	RBB	Date:	2/12/2008
Project:	Bridgeport Landfill	Units:	English
SubTitle:	Stormwater Control System Design	Areal Units:	Acres
State:	California		
County:	Mono		

Filename: H:\Mono County Landfills\Bridgeport LF Closure\Stormwater\BP TR55 Subareas land 2.w55

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
1a		Outlet	1.64	85	.124
1b		Reach 1	6	85	0.1
1c		Reach 2	2.9	85	.12
2a		Reach 3	7.1	63	.105
2b		Reach 3	0.53	85	0.1

Total area: 18.17 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.68	.0	.0	.0	.0	5.12	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.68	.0	.0	.0	.0	5.12	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
1a	Sagebrush (w/ grass understory)	(poor)	D	1.64	85
	Total Area / Weighted Curve Number			1.64 ====	85 ==
1b	Sagebrush (w/ grass understory)	(poor)	D	6	85
	Total Area / Weighted Curve Number			6 =	85 ==
1c	Sagebrush (w/ grass understory)	(poor)	D	2.9	85
	Total Area / Weighted Curve Number			2.9 ===	85 ==
2a	Sagebrush (w/ grass understory)	(fair)	C	7.1	63
	Total Area / Weighted Curve Number			7.1 ===	63 ==
2b	Sagebrush (w/ grass understory)	(poor)	D	.53	85
	Total Area / Weighted Curve Number			.53 ===	85 ==

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
1a							
SHEET	100	0.1100	0.130				0.102
SHALLOW	250	0.1100	0.050				0.013
CHANNEL	250	0.0800	0.035	36.75	69.52	7.716	0.009
					Time of Concentration		.124
1b							
SHEET	100	0.0700	0.050				0.057
SHALLOW	200	0.0700	0.050				0.013
CHANNEL	650	0.1000	0.035	6.75	9.50	10.621	0.017
					Time of Concentration		0.1
1c							
SHEET	100	0.0200	0.050				0.094
SHALLOW	150	0.0200	0.050				0.018
CHANNEL	100	0.0100	0.035	6.75	9.50	3.472	0.008
					Time of Concentration		.12
2a							
SHEET	100	0.2000	0.130				0.080
SHALLOW	400	0.2000	0.050				0.015
CHANNEL	350	0.0900	0.035	6.75	9.50	9.722	0.010
					Time of Concentration		.105
2b							
SHEET	100	0.1100	0.050				0.047
SHALLOW	275	0.1100	0.050				0.014
					Time of Concentration		0.1

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
1a	1.64	0.124	85	Outlet	
1b	6.00	0.100	85	Reach 1	
1c	2.90	0.120	85	Reach 2	
2a	7.10	0.105	63	Reach 3	
2b	.53	0.100	85	Reach 3	

Total Area: 18.17 (ac)

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 100-Yr (cfs) (hr)
SUBAREAS	
1a	8.30
	11.94
1b	31.71
	11.93
1c	14.79
	11.94
2a	16.40
	11.95
2b	2.81
	11.93
REACHES	
Reach 1	64.73
	11.94
Down	64.71
	11.95
Reach 2	33.86
	11.95
Down	33.85
	11.96
Reach 3	19.14
	11.94
Down	19.13
	11.96
OUTLET	73.00

WinTR-55 Current Data Description

--- Identification Data ---

User:	RBB	Date:	2/12/2008
Project:	Bridgeport Landfill	Units:	English
SubTitle:	Stormwater Control System Design	Areal Units:	Acres
State:	California		
County:	Mono		
Filename:	<new file>		

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
3a		Outlet	0.87	63	0.1

Total area: .87 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.68	.0	.0	.0	.0	5.12	.0

Storm Data Source:	User-provided custom storm data
Rainfall Distribution Type:	Type II
Dimensionless Unit Hydrograph:	<standard>

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.68	.0	.0	.0	.0	5.12	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
3a	Sagebrush (w/ grass understory)	(fair)	C	.87	63
	Total Area / Weighted Curve Number			.87	63
				===	==

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
3a							
SHEET	100	0.2000	0.130				0.080
SHALLOW	250	0.2000	1.68				0.010
CHANNEL	300	0.1500	0.035	6.75	9.50	13.889	0.006
					Time of Concentration		0.1

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
3a	.87	0.100	63	Outlet	

Total Area: .87 (ac)

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 100-Yr (cfs) (hr)
SUBAREAS	
3a	2.03 11.94
REACHES	
OUTLET	2.03

WinTR-55 Current Data Description

--- Identification Data ---

User:	RBB	Date:	2/12/2008
Project:	Bridgeport Landfill	Units:	English
SubTitle:	Stormwater Control System Design	Areal Units:	Acres
State:	California		
County:	Mono		
Filename:	<new file>		

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
4a		Outlet	1.5	85	0.1
4b		Reach 4	2.3	85	0.1
4c		Reach 5	2.2	85	.101

Total area: 6 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.68	.0	.0	.0	.0	5.12	.0

Storm Data Source:	User-provided custom storm data
Rainfall Distribution Type:	Type II
Dimensionless Unit Hydrograph:	<standard>

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.68	.0	.0	.0	.0	5.12	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
4a	Sagebrush (w/ grass understory)	(poor)	D	1.5	85
	Total Area / Weighted Curve Number			1.5	85
				===	==
4b	Sagebrush (w/ grass understory)	(poor)	D	2.3	85
	Total Area / Weighted Curve Number			2.3	85
				===	==
4c	Sagebrush (w/ grass understory)	(poor)	D	2.2	85
	Total Area / Weighted Curve Number			2.2	85
				===	==

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
4a							
SHEET	100	0.0500	0.050				0.065
SHALLOW	200	0.1200	1.68				0.010
CHANNEL	100	0.1200	0.035	6.75	9.50	13.889	0.002
				Time of Concentration			0.1
4b							
SHEET	100	0.0500	0.050				0.065
SHALLOW	100	0.0500	1.68				0.008
CHANNEL	350	0.0400	0.035	6.75	9.50	6.944	0.014
				Time of Concentration			0.1
4c							
SHEET	100	0.0500	0.050				0.065
SHALLOW	175	0.0500	1.68				0.013
CHANNEL	400	0.0200	0.035	6.75	9.50	4.831	0.023
				Time of Concentration			.101

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
4a	1.50	0.100	85	Outlet	
4b	2.30	0.100	85	Reach 4	
4c	2.20	0.101	85	Reach 5	

Total Area: 6 (ac)

RBB

Bridgeport Landfill
Stormwater Control System Design
Mono County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 100-Yr (cfs) (hr)
SUBAREAS	
4a	7.91
	11.93
4b	12.14
	11.93
4c	11.61
	11.93
REACHES	
Reach 4	23.71
	11.93
Down	23.71
	11.94
Reach 5	11.61
	11.93
Down	11.60
	11.94
OUTLET	31.60

WinTR-55 Current Data Description

--- Identification Data ---

User:	RBB	Date:	3/12/2009
Project:	Bridgeport Landfill	Units:	English
SubTitle:	Stromwater Diversion System Design	Areal Units:	Acres
State:	California		
County:	Mono		

Filename: C:\Documents and Settings\bburnley\Application Data\WinTR-55\BP TR55 Subarea 5 Rev031209.

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
5a		Outlet	4.08	85	0.1
5b		Reach 8	1.54	85	0.1
5c		Reach 6	6.88	63	.186
5d		Reach 8	32	63	.173
5e		Reach 8	10.2	63	.153

Total area: 54.70 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.68	.0	.0	.0	.0	5.12	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

RBB

Bridgeport Landfill
Stromwater Diversion System Design
Mono County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
5a	Sagebrush (w/ grass understory)	(poor)	D	4.08	85
	Total Area / Weighted Curve Number			4.08	85
				====	==
5b	Sagebrush (w/ grass understory)	(poor)	D	1.54	85
	Total Area / Weighted Curve Number			1.54	85
				====	==
5c	Sagebrush (w/ grass understory)	(fair)	C	6.88	63
	Total Area / Weighted Curve Number			6.88	63
				====	==
5d	Sagebrush (w/ grass understory)	(fair)	C	32	63
	Total Area / Weighted Curve Number			32	63
				==	==
5e	Sagebrush (w/ grass understory)	(fair)	C	10.2	63
	Total Area / Weighted Curve Number			10.2	63
				====	==

RBB

Bridgeport Landfill
Stromwater Diversion System Design
Mono County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
5a							
SHEET	50	0.3300	0.050				0.018
CHANNEL	600	0.0700	0.035	28.00	18.90	15.152	0.011
CHANNEL	300	0.0350	0.035	28.00	18.90	10.417	0.008
				Time of Concentration			0.1
5b							
SHEET	50	0.1000	0.050				0.028
CHANNEL	750	0.0700	0.035	28.00	18.90	14.881	0.014
				Time of Concentration			0.1
5c							
SHEET	100	0.0640	0.130				0.126
SHALLOW	600	0.0640	0.050				0.041
CHANNEL	600	0.0700	0.035	28.00	18.90	15.152	0.011
CHANNEL	300	0.0350	0.035	28.00	18.90	10.417	0.008
				Time of Concentration			.186
5d							
SHEET	100	0.1600	0.130				0.087
SHALLOW	2000	0.1600	0.050				0.086
				Time of Concentration			.173
5e							
SHEET	100	0.1000	0.130				0.106
SHALLOW	600	0.1000	0.050				0.033
CHANNEL	750	0.0700	0.035	28.00	18.90	14.881	0.014
				Time of Concentration			.153

RBB

Bridgeport Landfill
Stromwater Diversion System Design
Mono County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 100-Yr (cfs) (hr)
SUBAREAS	
5a	21.57
	11.93
5b	8.15
	11.93
5c	14.33
	12.02
5d	67.73
	12.01
5e	22.11
	12.00
REACHES	
Reach 6	110.76
	12.03
Down	110.72
	12.04
Reach 7	96.48
	12.02
Down	96.47
	12.03
Reach 8	96.56
	12.01
Down	96.48
	12.02
OUTLET	127.15

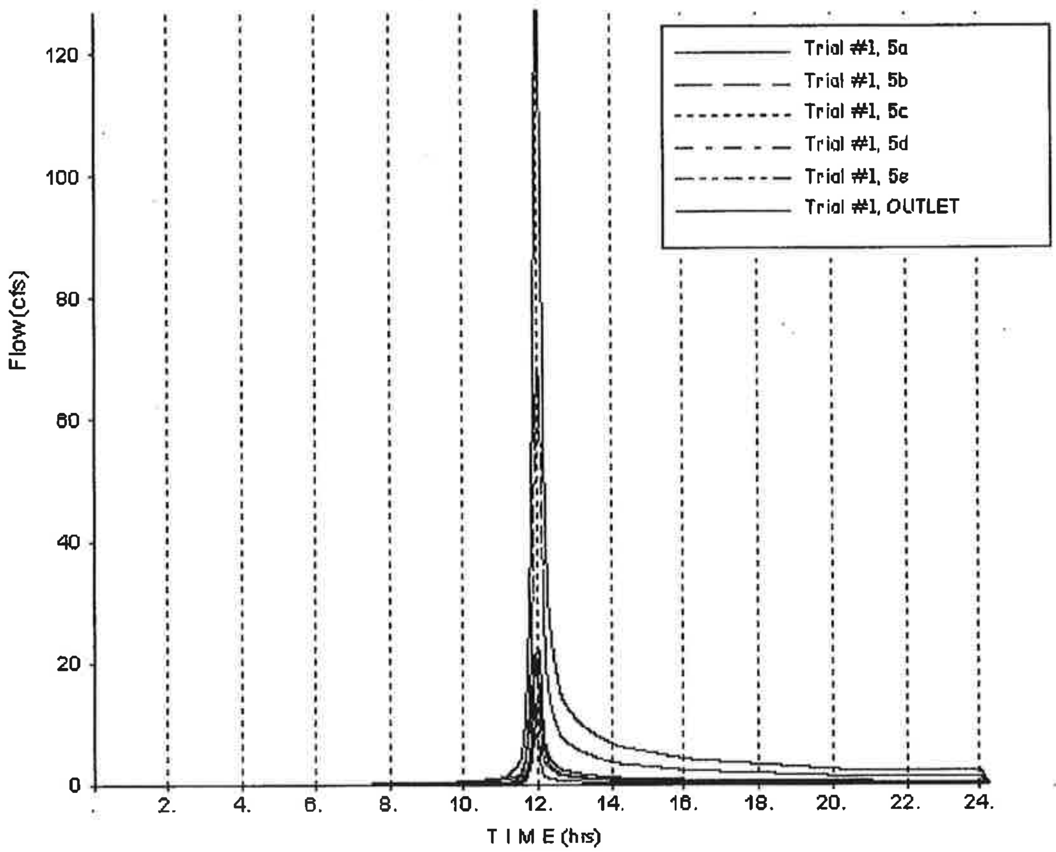
WinTR-55 Output Hydrograph

Project: Bridgeport Landfill

3/12/2009

Subareas: (5a, 5b, 5c, 5d, 5e, Outlet) Storm: 100-Yr

C:\Documents and Settings\bburnley\Application Data\WinTR-55\BP TR55 Subarea 5 Rev031209.w55



Precipitation Frequency Data Output

NOAA Atlas 2
California 38.2767?N 119.2167?W
Site-specific Estimates

Map	Precipitation (inches)	Precipitation Intensity (in/hr)
2-year 6-hour	0.83	0.14
2-year 24-hour	1.68	0.07
100-year 6-hour	2.00	0.33
100-year 24-hour	5.12	0.21

Hydrometeorological Design Studies Center - NOAA/National Weather Service
1325 East-West Highway - Silver Spring, MD 20910 - (301) 713-1669
Mon Jan 7 14:07:40 2008

FLOWMASTER RESULTS – FINAL SITE CONDITIONS

Run-On Diversion Channel - Flattest Slope

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.03500	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	125.04	ft³/s

Results

Normal Depth	1.25	ft
Flow Area	15.69	ft²
Wetted Perimeter	15.61	ft
Top Width	15.02	ft
Critical Depth	1.52	ft
Critical Slope	0.01764	ft/ft
Velocity	7.97	ft/s
Velocity Head	0.99	ft
Specific Energy	2.24	ft
Froude Number	1.37	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.25	ft
Critical Depth	1.52	ft
Channel Slope	0.03500	ft/ft
Critical Slope	0.01764	ft/ft

Run-On Diversion Channel - Flattest Slope w/Riprap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.03500	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	125.04	ft³/s

Results

Normal Depth	1.53	ft
Flow Area	20.04	ft²
Wetted Perimeter	16.86	ft
Top Width	16.14	ft
Critical Depth	1.52	ft
Critical Slope	0.03600	ft/ft
Velocity	6.24	ft/s
Velocity Head	0.60	ft
Specific Energy	2.14	ft
Froude Number	0.99	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.53	ft
Critical Depth	1.52	ft
Channel Slope	0.03500	ft/ft
Critical Slope	0.03600	ft/ft

Reach 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.15000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	73.00	ft³/s

Results

Normal Depth	1.40	ft
Flow Area	5.84	ft²
Wetted Perimeter	8.83	ft
Top Width	8.37	ft
Critical Depth	2.06	ft
Critical Slope	0.01897	ft/ft
Velocity	12.49	ft/s
Velocity Head	2.43	ft
Specific Energy	3.82	ft
Froude Number	2.64	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.40	ft
Critical Depth	2.06	ft
Channel Slope	0.15000	ft/ft
Critical Slope	0.01897	ft/ft

Reach 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.15000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	64.70	ft^3/s

Results

Normal Depth	1.33	ft
Flow Area	5.34	ft^2
Wetted Perimeter	8.44	ft
Top Width	8.00	ft
Critical Depth	1.96	ft
Critical Slope	0.01928	ft/ft
Velocity	12.12	ft/s
Velocity Head	2.28	ft
Specific Energy	3.62	ft
Froude Number	2.62	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.33	ft
Critical Depth	1.96	ft
Channel Slope	0.15000	ft/ft
Critical Slope	0.01928	ft/ft

Reach 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.05000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	33.90	ft³/s

Results

Normal Depth	1.29	ft
Flow Area	4.96	ft²
Wetted Perimeter	8.14	ft
Top Width	7.72	ft
Critical Depth	1.51	ft
Critical Slope	0.02101	ft/ft
Velocity	6.83	ft/s
Velocity Head	0.72	ft
Specific Energy	2.01	ft
Froude Number	1.50	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.29	ft
Critical Depth	1.51	ft
Channel Slope	0.05000	ft/ft
Critical Slope	0.02101	ft/ft

Reach 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.15000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	23.70	ft^3/s

Results

Normal Depth	0.92	ft
Flow Area	2.51	ft^2
Wetted Perimeter	5.79	ft
Top Width	5.49	ft
Critical Depth	1.31	ft
Critical Slope	0.02204	ft/ft
Velocity	9.43	ft/s
Velocity Head	1.38	ft
Specific Energy	2.30	ft
Froude Number	2.46	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.92	ft
Critical Depth	1.31	ft
Channel Slope	0.15000	ft/ft
Critical Slope	0.02204	ft/ft

Reach 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.12000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	23.70	ft^3/s

Results

Normal Depth	0.95	ft
Flow Area	2.73	ft^2
Wetted Perimeter	6.04	ft
Top Width	5.73	ft
Critical Depth	1.31	ft
Critical Slope	0.02204	ft/ft
Velocity	8.67	ft/s
Velocity Head	1.17	ft
Specific Energy	2.12	ft
Froude Number	2.21	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.95	ft
Critical Depth	1.31	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.02204	ft/ft

Reach 5 w/Riprap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.12000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	23.70	ft³/s

Results

Normal Depth	1.09	ft
Flow Area	3.57	ft²
Wetted Perimeter	6.90	ft
Top Width	6.55	ft
Critical Depth	1.31	ft
Critical Slope	0.04498	ft/ft
Velocity	6.64	ft/s
Velocity Head	0.68	ft
Specific Energy	1.78	ft
Froude Number	1.58	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.09	ft
Critical Depth	1.31	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.04498	ft/ft

Channel C1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.15000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	2.03	ft^3/s

Results

Normal Depth	0.36	ft
Flow Area	0.40	ft^2
Wetted Perimeter	2.30	ft
Top Width	2.19	ft
Critical Depth	0.49	ft
Critical Slope	0.03059	ft/ft
Velocity	5.10	ft/s
Velocity Head	0.40	ft
Specific Energy	0.77	ft
Froude Number	2.11	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.36	ft
Critical Depth	0.49	ft
Channel Slope	0.15000	ft/ft
Critical Slope	0.03059	ft/ft

Channel C2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.09000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	16.40	ft³/s

Results

Normal Depth	0.88	ft
Flow Area	2.31	ft²
Wetted Perimeter	5.55	ft
Top Width	5.26	ft
Critical Depth	1.13	ft
Critical Slope	0.02315	ft/ft
Velocity	7.10	ft/s
Velocity Head	0.78	ft
Specific Energy	1.66	ft
Froude Number	1.89	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.88	ft
Critical Depth	1.13	ft
Channel Slope	0.09000	ft/ft
Critical Slope	0.02315	ft/ft

Channel C3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	14.80	ft^3/s

Results

Normal Depth	1.27	ft
Flow Area	4.88	ft^2
Wetted Perimeter	8.06	ft
Top Width	7.65	ft
Critical Depth	1.09	ft
Critical Slope	0.02347	ft/ft
Velocity	3.04	ft/s
Velocity Head	0.14	ft
Specific Energy	1.42	ft
Froude Number	0.67	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.27	ft
Critical Depth	1.09	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.02347	ft/ft

Channel C4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.11000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	2.80	ft^3/s

Results

Normal Depth	0.44	ft
Flow Area	0.57	ft^2
Wetted Perimeter	2.75	ft
Top Width	2.61	ft
Critical Depth	0.56	ft
Critical Slope	0.02930	ft/ft
Velocity	4.92	ft/s
Velocity Head	0.38	ft
Specific Energy	0.81	ft
Froude Number	1.86	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.44	ft
Critical Depth	0.56	ft
Channel Slope	0.11000	ft/ft
Critical Slope	0.02930	ft/ft

Channel C5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.07000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	30.30	ft^3/s

Results

Normal Depth	0.45	ft
Flow Area	4.91	ft^2
Wetted Perimeter	12.01	ft
Top Width	11.80	ft
Critical Depth	0.63	ft
Critical Slope	0.02226	ft/ft
Velocity	6.18	ft/s
Velocity Head	0.59	ft
Specific Energy	1.04	ft
Froude Number	1.69	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.45	ft
Critical Depth	0.63	ft
Channel Slope	0.07000	ft/ft
Critical Slope	0.02226	ft/ft

Channel C5 w/Riprap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.07000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	30.30	ft^3/s

Results

Normal Depth	0.55	ft
Flow Area	6.16	ft^2
Wetted Perimeter	12.48	ft
Top Width	12.22	ft
Critical Depth	0.63	ft
Critical Slope	0.04542	ft/ft
Velocity	4.92	ft/s
Velocity Head	0.38	ft
Specific Energy	0.93	ft
Froude Number	1.22	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.55	ft
Critical Depth	0.63	ft
Channel Slope	0.07000	ft/ft
Critical Slope	0.04542	ft/ft

Channel C6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.10000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	31.70	ft^3/s

Results

Normal Depth	1.10	ft
Flow Area	3.64	ft^2
Wetted Perimeter	6.97	ft
Top Width	6.61	ft
Critical Depth	1.47	ft
Critical Slope	0.02120	ft/ft
Velocity	8.71	ft/s
Velocity Head	1.18	ft
Specific Energy	2.28	ft
Froude Number	2.07	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.10	ft
Critical Depth	1.47	ft
Channel Slope	0.10000	ft/ft
Critical Slope	0.02120	ft/ft

Diversion Berm C-7 w/ Riprap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.04000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	0.03	ft/ft (H:V)
Discharge	31.70	ft³/s

Results

Normal Depth	2.06	ft
Flow Area	6.45	ft²
Wetted Perimeter	8.59	ft
Hydraulic Radius	0.75	ft
Top Width	6.25	ft
Critical Depth	1.94	ft
Critical Slope	0.05624	ft/ft
Velocity	4.91	ft/s
Velocity Head	0.37	ft
Specific Energy	2.44	ft
Froude Number	0.85	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.06	ft
Critical Depth	1.94	ft
Channel Slope	0.04000	ft/ft
Critical Slope	0.05624	ft/ft

Channel C8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.15000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	7.90	ft^3/s

Results

Normal Depth	0.61	ft
Flow Area	1.10	ft^2
Wetted Perimeter	3.84	ft
Top Width	3.64	ft
Critical Depth	0.85	ft
Critical Slope	0.02552	ft/ft
Velocity	7.16	ft/s
Velocity Head	0.80	ft
Specific Energy	1.40	ft
Froude Number	2.29	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.61	ft
Critical Depth	0.85	ft
Channel Slope	0.15000	ft/ft
Critical Slope	0.02552	ft/ft

Diversion Berm C-9 w/ Riprap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.02000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	0.03	ft/ft (H:V)
Discharge	11.60	ft³/s

Results

Normal Depth	1.61	ft
Flow Area	3.94	ft²
Wetted Perimeter	6.71	ft
Hydraulic Radius	0.59	ft
Top Width	4.89	ft
Critical Depth	1.30	ft
Critical Slope	0.06431	ft/ft
Velocity	2.95	ft/s
Velocity Head	0.13	ft
Specific Energy	1.75	ft
Froude Number	0.58	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.61	ft
Critical Depth	1.30	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.06431	ft/ft

Diversion Berm C-10 w/ Riprap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	0.04000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	0.03	ft/ft (H:V)
Discharge	12.10	ft^3/s

Results

Normal Depth	1.44	ft
Flow Area	3.13	ft^2
Wetted Perimeter	5.99	ft
Hydraulic Radius	0.52	ft
Top Width	4.36	ft
Critical Depth	1.32	ft
Critical Slope	0.06395	ft/ft
Velocity	3.86	ft/s
Velocity Head	0.23	ft
Specific Energy	1.67	ft
Froude Number	0.80	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.44	ft
Critical Depth	1.32	ft
Channel Slope	0.04000	ft/ft
Critical Slope	0.06395	ft/ft

Detention Basin Outflow - Broad Crested Weir

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	127.15	ft^3/s
Crest Elevation	5.00	ft
Tailwater Elevation	0.00	ft
Crest Surface Type	Gravel	
Crest Breadth	4.00	ft
Crest Length	50.00	ft

Results

Headwater Elevation	5.88	ft
Headwater Height Above Crest	0.88	ft
Tailwater Height Above Crest	-4.00	ft
Weir Coefficient	3.03	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	3.03	US
Flow Area	44.00	ft^2
Velocity	2.84	ft/s
Wetted Perimeter	51.76	ft
Top Width	50.00	ft

Trapezoidal Channels (USDA-SCS, 1975)

MANUALLY INPUT DATA				CALCULATED VALUES					
Q	P	A	S_b	R	D_{50}	Manning's Coefficient			
Flow Rate (cfs)	Wetted Perimeter	Flow Area	Channel Slope	Hydraulic Radius	(in, SCS)	SCS	Abt et al.(steep)	Avg *n*	Channel Description
125	18.9	28	0.07	1.48	20.1	0.065	0.0481	0.057	Run-On Diversion Channel outlet
30.3	18.9	28	0.07	1.48	11.4	0.059	0.0440	0.052	Run-On Diversion Channel East Side

Triangular Channels (USDA-SCS, 1975)

MANUALLY INPUT DATA			CALCULATED VALUES				
Q	z	S_b	D_{50}	Manning's Coefficient *n*			
Flow Rate (cfs)	Sideslope z:1	Channel Slope	(in, SCS)	SCS	Abt et al. (steep)	Avg *n*	Channel Description
23.7	3	0.12	22.2	0.066	0.0533	0.060	Reach 5
31.7	3	0.04	9.6	0.058	0.0392	0.048	Channel C7
11.6	3	0.02	3.5	0.049	0.0299	0.039	Channel C9
12.1	3	0.04	6.5	0.054	0.0368	0.045	Channel C10

Mannings Roughness Coefficient (n)

USDA-SCS (1975) method

$$n = 0.0395(D_{50})^{0.1667}$$

Abt et al. (1988) for steep channels

$$n = 0.0456(D_{50}*S)^{0.159}$$

Riprap Specification (AASHTO, 1991)

D_{50} =	6
Size (in)	% Smaller
9.6	100
7.8	85
6.45	50
3	15

D_{50} =	8
Size (in)	% Smaller
12.8	100
10.4	85
8.6	50
4	15

D_{50} =	12
Size (in)	% Smaller
19.2	100
15.6	85
12.9	50
6	15

References

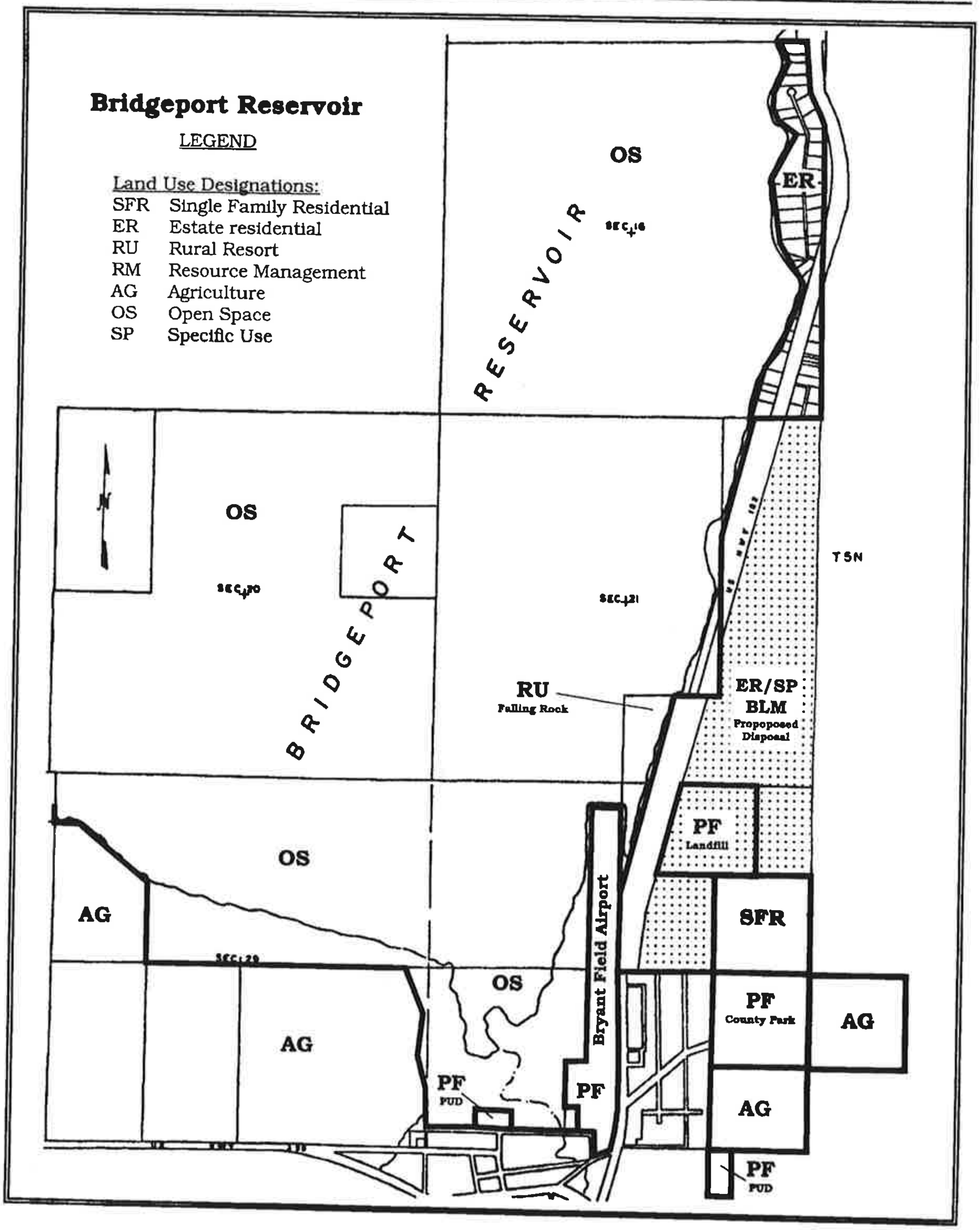
American Association of State Highway and Transportation Officials (AASHTO), 1991, Model Highway Drainage Manual, Washington D.C.

Abt, S.R., Wittler, R.J., Ruff, J.F., LaGrone, D.L., Khattak, M.S., Nelson, J.D., Hinkle, N.E., and D.W. Lee, 1988. Development of Riprap Design Criteria by Riprap Testing in Flumes: Phase II. U.S. Nuclear Regulatory Commission, NUREG/CR-4651, Washington, DC., May 113.

United States Department of Agriculture, Soil Conservation Service (USDA-SCS), 1975, Standards and specifications for soil erosion and sediment control in developing areas, College Park, Maryland.

APPENDIX E

LAND USE ZONING MAP



November 2000

FIGURE 21

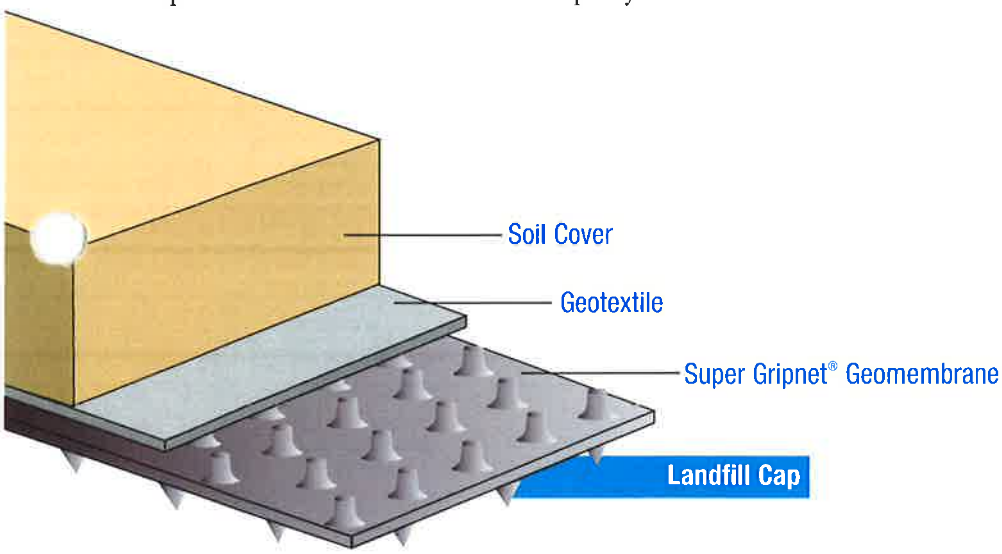
APPENDIX F

GEOMEMBRANE DOCUMENTATION

Super Gripnet® Geomembrane

Applications for HDPE and LLDPE Agru Super Gripnet® include projects where drainage and high interface friction as well as cost savings are critical i.e. landfill caps, landfill slopes and mining reclamation projects. Recent bids for installations have indicated cost savings of over $3,000.00 per acre with the use of Super Gripnet® as a replacement for traditional geocomposite overlying a textured geomembrane.

Agru America's structured geomembranes are manufactured on state-of-the-art manufacturing equipment using a flat cast extrusion manufacturing process as opposed to blown film extrusion. Agru America uses only the highest grade of HDPE and LLDPE resins manufactured in North America. The structured geomembrane is manufactured by a continuous horizontal flat die extrusion into profile rollers. The machined rollers give the product the final structured surface with drainage studs and spikes which are an integral (homogenous) part of the liner and have a smooth edge for on site welding. This process provides a consistent core thickness resulting in higher sheet tensile strength, consistent high profile texturing resulting in higher interface friction capabilities as well as consistent drain capacity.



Interface Shear – Cap Loading Conditions ASTM D 5321

Soil/Grip Liner Surface	P	LD
Coarse Sand	35°	31°
Glacial Till	38°	34°
Silty Sand	28°	26°
Non Woven GT	31°	26°
Soil/Drain Liner Surface with GT		
Coarse Sand	30°	30°

Note: The above values are representative friction angles only. It is recommended that site specific conformance testing be carried out using the actual soils, geosynthetics and loading conditions for a specific project.

P = Maximum or Peak Interface Shear Value in degrees
LD = Large Displacement Interface Shear Value in degrees
GT = Geotextile

Super Gripnet® Geomembrane

- Combines Drainage with Shear Resistance
- High Water Flow Rate on Top Side
- Spike/Texture Bottom
- Consistent Drain and Structure Pattern
- Combine with Smooth
- Combine with Fabric

US Patent - No. 5.258.217

The machine rollers provide the final structured surface with a 3.6 mm (0.145 in.) high studded drain surface on the top side and 4.4 mm (0.175 in.) high spiked friction surface on the bottom side. The 7 m (23 ft.) wide rolls of finished product include a smooth edge on both sides of the roll for ease of thermal welding in the field. Due to the molded structure, core thickness does not vary as with blown film textured sheet, thus mechanical properties of the sheet are not affected. In addition, the consistent high profile texture insures optimum interface friction characteristics at any point on the sheet surface.

The top surface integral drain structure consists of 3.2 mm (0.13 in.) diameter studs 3.6 mm (0.145 in.) in height and spaced on a diamond pattern of 12.5 mm (0.5 in.) spacing. A filter/protection geotextile is required to be placed on the drain profile. The geotextile is heat set on one side (placed against the drain structure) to reduce intrusion into the drain. Large-scale flow rate testing with this configuration, overlying soils and expected normal loads resulted in high planar flow rates.

The bottom spiked friction surface with 4.4 mm (0.175 in.) high spikes and patterned texture provides maximum interface friction and high factor of safety against sliding.

Thus, the Super Gripnet® Liner is a synthetic drainage media which has decided advantages over conventional geocomposites:

- ***Cost Savings*** – The drain media and liner are one and installed as one panel
  – No waste due to fitting of geocomposite sections or discarding roll ends
- ***Improved Planar Flow*** – Less reduction for chemical/biological clogging considerations
- ***Consistent Material*** – Studs and spikes (drainage and friction) totally integrated with the geomembrane
- ***High Interface Shear*** – Exceptional shear resistance between soil & geotextile components allows flexibility and stability during protective cover material placement
- ***Meets/exceeds Project Requirements*** – Excellent fluid barrier
  – Excellent drainage medium
  – Excellent friction characteristics

Agru's Super Gripnet® geomembrane is a high performance liner system with integrated top surface drainage supplying the functional needs for any project with the added benefit of substantial cost savings.

Why specify or use anything else!

Agru has over 20 years experience with Geomembranes and 50 years experience with Thermoplastic Extrusion
Agru offers a wide range of concrete protective liners (Sure Grip), pipe fittings and semi-finished materials.

Executive Offices: 500 Garrison Road, Georgetown, SC 29440 843-546-0600 800-321-1379 Fax: 843-546-0516
Sales Office: 700 Rockmead, Suite 150, Kingwood, TX 77339 281-358-4741 800-373-2478 Fax: 281-358-5297
email: salesmkg@agruamerica.com www.agruamerica.com

Linear Low Density Polyethylene Super Gripnet® Liner

Product Data

Property	Test Method	Values			
Thickness (min. ave.), mil (mm)	ASTM D5994*	50 (1.25)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (lowest indiv.), mil (mm)	ASTM D5994*	50 (1.25)	54 (1.35)	72 (1.8)	90 (2.25)
*The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)					
Drainage Stud Height (min. ave.), mil (mm)	GRI GM12	145 (3.68)	145 (3.68)	145 (3.68)	145 (3.68)
Friction Spike Height (min. ave.), mil (mm)	GRI GM12	175 (4.45)	175 (4.45)	175 (4.45)	175 (4.45)
Density, g/cc, maximum	ASTM D792, Method B	0.939	0.939	0.939	0.939
Tensile Properties (ave. both directions)	ASTM D6693, Type IV				
Strength @ Break (min. ave.), lb/in width (N/mm)	2 in/minute	105 (18.4)	126 (22.1)	168 (29.4)	210 (36.8)
Elongation @ Break (min. ave.), % (GL=2.0in)	5 specimens in each direction	300	300	300	300
Tear Resistance (min. ave.), lbs. (N)	ASTM D1004	30 (133)	40 (178)	53 (236)	67 (298)
Puncture Resistance (min. ave.), lbs. (N)	ASTM D4833	55 (245)	70 (311)	90 (400)	110 (489)
Carbon Black Content (range in %)	ASTM D4218	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3			
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	≥100	≥100	≥100	≥100
Melt Flow Index, g/10 minutes	ASTM D1238, 190°C, 2.16kg	≤1.0	≤1.0	≤1.0	≤1.0
Oven Aging	ASTM D5721	60	60	60	60
with HP OIT, (% retained after 90 days)	ASTM D5885, 150°C, 500psi O_2				
UV Resistance	GRI GM11	20hr. Cycle @ 75°C/4 hr. dark condensation @ 60°C			
with HP OIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O_2	35	35	35	35
2% Secant Modulus (max.), lb/in. (N/mm)	ASTM D5323	3000 (520)	3600 (630)	4800 (840)	6000 (1050)
Axi-Symmetric Break Resistance Strain, % (min.)	ASTM D5617	30	30	30	30

These product specifications meet or exceed GRI's GM17

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area (approx.)		Weight (average)	
mil	mm	ft	m	ft	m	ft^2	m^2	lbs	kg
50	1.25	23	7	280.2	85.4	6,435	598	2,750	1,248
60	1.5	23	7	280.2	85.4	6,435	598	2,800	1,270
80	2.0	23	7	280.2	85.4	6,435	598	3,550	1,610
100	2.5	23	7	164	50	3,768	350	2,418	1,096

Notes:

All rolls are supplied with two slings. All rolls are wound on a 6 inch core. Special roll lengths are available on request.

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the users responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru/America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

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APPENDIX G

EROSION CALCULATIONS

SOIL LOSS CALCULATIONS

Bridgeport Landfill

Universal Soil Loss Equation

A = (R)(K)(LS)(CP)

where:

A = quantity of soil loss (tons/acre/year)
R = rainfall index (R-unit)
K = soil erodibility factor (tons/acre/R-unit)
LS = length slope factor (dimensionless)
C = vegetative cover factor (dimensionless)
P = erosion control practice factor (dimensionless)

Rainfall Index, R

$$\mathbf{R = (27)(P)^{2.17}},$$

where:

R = rainfall index (R-unit)
P = 2-year, 6-hour precipitation event.

For Bridgeport Landfill, P = 0.9 inches. Therefore,

$$\mathbf{R = (27)(0.9)^{2.17} = 21.5\ R\ units}$$

Soil Erodibility Factor, K

Site soils have been assumed, based on field observations, to be a poorly graded sand with the following characteristics:

Sand	Silt	Clay
73%	24%	3%

From Chart B-4 of USDA (1985), attached, K is estimated at **0.29 tons per acre per R-unit**.

Length Slope Factor, LS

Due to the large difference between slope angles on the top deck and landfill sideslopes, this soil loss analysis addresses both areas individually. As a result, a length slope factor has been determined for each area based on the final site design presented on Drawing 3, Final Grading Plan. Because the site is located in LS Area 2 (see attached), the length slope factor is calculated as follows:

$$LS = (65.41 \sin^2(\tan^{-1}s) + 4.56 \sin(\tan^{-1}s) + 0.065) \bullet ((L / 72.6) \cos(\tan^{-1}s))^m$$

where:

s = slope, in ft/ft (or, percent/100)
L = slope length, in feet
m = 0.3 for 0.01 < s < 0.035
m = 0.4 for 0.036 < s < 0.045
m = 0.5 for s > 0.045

The resulting LS factors for the two conditions being examined at the site are as follows:

	Slope Length, L	Slope, s (ft/ft)	m	LS Factor
Top Deck:	780 ft.	0.04	0.4	0.91
Sideslopes:	80 ft.	0.33	0.5	8.44

Vegetative Cover and Erosion Control Practice Factors, CP

To determine the CP factor for the first year, including construction and the initial stages of natural vegetation growth, a weighted average was calculated based on the length of time the closure surface will be under construction, and the initial stages of natural vegetation growth. The CP factor values are separated into one factor for the first year, and another factor for each year thereafter. CP factor values were obtained from Table 1 and Table 4, attached.

Year One

Activity	% of year	C value	P value	weighted CP
Final Cover Construction (2 mo.)	16.7	1.00	0.90	15.03
Natural Vegetative Growth	83.3	0.25	0.90	18.74
			Total =	33.77
			CP value =	0.34

Each Year After

Natural Vegetative Growth	CP value = (0.25)(0.9) =	0.23

SOIL LOSS CALCULATION

As discussed above, the soil loss analysis considers the flatter top deck areas separately from the steeper sideslope areas of the landfill.

TOP DECK (Slope = 0.04)

Year One

A = (R)(K)(LS)(CP) = (21.5 R-units)(0.29 tons/acre/R-unit)(0.91)(0.34) = 1.93 tons/acre

Each Year After

A = (R)(K)(LS)(CP) = (21.5 R-units)(0.29 tons/acre/R-unit)(0.91)(0.23) = 1.31 tons/acre

Assuming a unit weight of 120 pounds per cubic foot for topsoil, the depth of soil lost from the surface of the landfill can be calculated as follows:

	Soil Loss (tons/acre)	Soil Loss (ft^3/acre)	Depth (ft)	Cumulative Depth (ft)	Cumulative Depth (in)
Year 1	1.93	32.17	0.00074	0.00074	0.00888
Year 2	1.31	21.83	0.00050	0.00124	0.01488
Year 3	1.31	21.83	0.00050	0.00174	0.02088
Year 4	1.31	21.83	0.00050	0.00224	0.02688
Year 5	1.31	21.83	0.00050	0.00274	0.03288

SIDESLOPES (Slope = 0.33)

Year One

A = (R)(K)(LS)(CP) = (21.5 R-units)(0.29 tons/acre/R-unit)(8.44)(0.34) = 17.89 tons/acre

Each Year After

A = (R)(K)(LS)(CP) = (21.5 R-units)(0.29 tons/acre/R-unit)(8.44)(0.23) = 12.10 tons/acre

	Soil Loss (tons/acre)	Soil Loss (ft^3/acre)	Depth (ft)	Cumulative Depth (ft)	Cumulative Depth (in)
Year 1	17.89	298.17	0.00685	0.00685	0.08220
Year 2	12.10	201.67	0.00463	0.01148	0.13776
Year 3	12.10	201.67	0.00463	0.01611	0.19332
Year 4	12.10	201.67	0.00463	0.02074	0.24888
Year 5	12.10	201.67	0.00463	0.02537	0.30444

WIND EROSION CALCULATIONS

Bridgeport Landfill

Wind Erosion Equation

The wind erosion equation was developed to estimate the erosion of soil from agricultural land in the mid-west. Currently it is the most widely-used method for assessing average annual soil loss by wind from agricultural fields. The equation is now widely used by the U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS) to predict annual soil loss in the western United States. The equation expressed in the function form is:

E = f(IKCLV)

where:

- E = potential average annual soil loss (tons/acre/year)
- I = soil erodibility index (tons/acre/year)
- K = soil ridge roughness factor (dimensionless)
- C = climate factor (dimensionless)
- L = unsheltered distance across field (dimensionless)
- V = equivalent vegetative cover factor (dimensionless)

Due to the complex computational nature of the equation, the NRCS has developed a set of standard tables which take into account all the factors listed above. The appropriate tables have been attached for the current site.

Soil Erodibility Index, I

The soil erodibility index is based on classifications developed by the NRCS. It should be noted that surface armoring by non-erodible gravel is not usually addressed in the "I" factor.

The Bridgeport Landfill is located in an area that has not been surveyed by the USDA. Due to the lack of information an estimated of the "I" value was made by the NRCS Gardnerville Field Office based on the soils testing results presented in Appendix E.

Therefore;

$$I \approx 48$$

Soil Ridge Roughness Factor, K

The soil ridge roughness factor takes into account any cross wind ridges that are present. This value ranges from 0.5 to 1.0 depending on the height, frequency, and angle to the prevailing wind. The higher value indicating that more erosion will occur.

A conservative assumption of a smooth landfill cap results in;

$$K = 1.0$$

Climate Factor, C

The climate factor characterizes climate erosivity, specifically windspeed and surface soil moisture. The factor for any given locality is expressed as percentage of the C factor for Garden City, Kansas, which has a value of 100.

According to the Mono County Annual Wind Erosion Climatic Factor Map provided by the NRCS, the Bridgeport Landfill is in a zone where;

$$C = 20$$

Unsheltered Distance, L

The unsheltered distance is the distance along the prevailing wind erosion direction across the field or area to be evaluated. At the Bridgeport Landfill the prevailing wind direction is east and west. Based on the proposed landfill closure design, the unsheltered horizontal distance is;

$$L \approx 1{,}000 \text{ ft.}$$

Equivalent Vegetative Cover Factor, V

The vegetative cover factor, considers the type, amount, and orientation of vegetation on the surface. Vegetative cover is expressed in pounds per acre of a flat small-grain residue equivalent.

According to site observations, location and information provided by the NRCS Gardnerville, Nevada field office, the following vegetative parameters can be used for undisturbed surfaces:

Types of vegetation:	Sagebrush and cheatgrass.
Density of Vegetation:	400 pounds per acre.

Tables 1 and 2 in the NRCS National Agronomy Manual (190-V-NAM, 1991) convert the type of rangeland vegetation and density to the appropriate flat small-grain equivalent value for use in the wind erosion equation. The following assumptions and V-factors are listed below for the first year and following years:

Year One

Assumptions:

- Final cover seeded with native plants, such as cheatgrass;
- Bare soil for the first six months;
- Establishment of native plants in the second six months; and,
- Average density can be estimated as 200 pounds per acre.

Therefore;

V = 500

Each Year After

Assumptions:

- Established undisturbed native plant colony, such as cheatgrass;
- Average density can be estimated as 400 pounds per acre.

Therefore;

V = 1,000

Wind Erosion Calculation, E

According to the assumptions made, the calculated values for each factor and the wind erosion equation tables attached, the following potential annual wind erosion values have been calculated. Please note that some interpolation between table values was required.

Year One

E = 2.6 tons/acre/year

Each Year After

E = 0.5 tons/acre/year

Note:

These values were developed based on a methodology used for determining wind erosion on agricultural land that is constantly being disturbed. Upon final cover installation at the site, surface soils

PROJECT SUMMARY

PROJECT NAME : Bridgeport Landfill

RAINFALL : BRIDGE

UNIT HYDROGRAPH

1	Sub-Area A Type CURVILINEAR UH	Peak flow	146.111	cfs	Peak time	13.087	min
2	Sub-Area B Type CURVILINEAR UH	Peak flow	40.846	cfs	Peak time	11.053	min
3	Sub-Area C Type CURVILINEAR UH	Peak flow	11.741	cfs	Peak time	5.333	min
4	Sub-Area D Type CURVILINEAR UH	Peak flow	7.125	cfs	Peak time	7.960	min
5	Sub-area E Type CURVILINEAR UH	Peak flow	18.377	cfs	Peak time	5.333	min
6	Sub-Area F Type CURVILINEAR UH	Peak flow	13.953	cfs	Peak time	5.333	min
7	Sub-area G Type CURVILINEAR UH	Peak flow	20.265	cfs	Peak time	14.487	min
8	Sub-Area H Type CURVILINEAR UH	Peak flow	6.976	cfs	Peak time	5.333	min
9	Sub-Area I Type CURVILINEAR UH	Peak flow	8.338	cfs	Peak time	5.333	min

HYDROGRAPH

1	Sub-Area A Type COMPUTED FLOOD Unit hydrograph 1 Sub-Area A	Peak flow	35.472	cfs	Peak time	482.000	min
2	Sub-Area B Type COMPUTED FLOOD Unit hydrograph 2 Sub-Area B	Peak flow	8.325	cfs	Peak time	482.000	min
3	Sub-Area C Type COMPUTED FLOOD Unit hydrograph 3 Sub-Area C	Peak flow	1.193	cfs	Peak time	476.000	min
4	Sub-Area D Type COMPUTED FLOOD Unit hydrograph 4 Sub-Area D	Peak flow	1.063	cfs	Peak time	480.000	min
5	Sub-Area E Type COMPUTED FLOOD Unit hydrograph 5 Sub-area E	Peak flow	1.869	cfs	Peak time	476.000	min
6	Sub-Area F Type COMPUTED FLOOD Unit hydrograph 6 Sub-Area F	Peak flow	1.418	cfs	Peak time	476.000	min

RESERVOIR

No reservoirs exist at the site.

OUTLET STRUCTURE

No outlet structures exist at the site.

UNIT HYDROGRAPH REPORT

RECORD NUMBER : 1
TYPE : CURVILINEAR UH
DESCRIPTION : Sub-Area A

[UNIT HYDROGRAPH INFORMATION]

Peak Discharge............................	=	146.11	(cfs)
Time Interval.............................	=	2.00	(min)
Time to Peak..............................	=	13.09	(min)
Time of Base..............................	=	65.43	(min)
Rainfall Excess...........................	=	1.00	(in)
Storm Duration............................	=	2.61	(min)
Basin Lag Time............................	=	11.78	(min)
Shape Factor..............................	=	484.00	

[BASIN DESCRIPTION]

Watershed Area............................	=	42.14	(ac)
Curve Number..............................	=	86	

[Unit Hydrograph Flow Values Time vs. Flow]
(The time interval is %.1lf min)

TIME INTV	TIME (min)	FLOW (cfs)
14	28.00	33.47
15	30.00	26.19
16	32.00	20.16
17	34.00	15.69
18	36.00	12.33
19	38.00	9.58
20	40.00	7.42
21	42.00	5.77
22	44.00	4.54
23	46.00	3.56
24	48.00	2.77
25	50.00	2.13
26	52.00	1.68
27	54.00	1.39
28	56.00	1.12
29	58.00	0.85
30	60.00	0.61
31	62.00	0.38
32	64.00	0.16
33	65.43	0.00

[TIME CONCENTRATION -- TR-55]

SHEET FLOW

Manning's Roughness Coef. (n).............	=	0.13000	
Flow Length (L)...........................	=	300.00	(ft)
2-yr 24-hr Rainfall (R).................	=	2.50	(in)
Land Slope (S)............................	=	0.13000	
Travel Time of Sheet Flow.................	=	11.26	(min)

SHALLOW FLOW

K_Coef (surface description) (K)..........	=	1.00000	
Watercourse Slope (S).....................	=	0.07000	
Velocity (V)..............................	=	2.65	(ft/s)
Flow Length (L)...........................	=	540.00	(ft)
Travel Time of Shallow Flow...............	=	3.40	(min)

CHANNEL FLOW

Hydraulic Radius (R)......................	=	0.50	(ft)
Channel Slope (S).........................	=	0.06000	
Manning's Roughness Coef. (n).............	=	0.04000	
Channel Velocity (V)......................	=	5.75	(ft/s)
Flow Length (L)...........................	=	660.00	(ft)
Travel Time of Shallow Flow...............	=	1.91	(min)

TIME OF CONCENTRATION

Time of Concentration.....................	=	16.58	(min)

[Unit Hydrograph Flow Values Time vs. Flow]
(The time interval is %.1lf min)

TIME INTV	TIME (min)	FLOW (cfs)
0	0.00	0.00
1	2.00	3.54
2	4.00	10.79
3	6.00	22.52
4	8.00	34.56
5	10.00	40.46
6	12.00	40.50
7	14.00	36.08
8	16.00	29.92
9	18.00	21.71
10	20.00	15.70
11	22.00	11.63
12	24.00	8.88
13	26.00	6.59

UNIT HYDROGRAPH REPORT

RECORD NUMBER : 3
TYPE : CURVILINEAR UH
DESCRIPTION : Sub-Area C

[UNIT HYDROGRAPH INFORMATION]

Peak Discharge	=	11.74	(cfs)
Time Interval	=	2.00	(min)
Time to Peak	=	5.33	(min)
Time of Base	=	26.67	(min)
Rainfall Excess	=	1.00	(in)
Storm Duration	=	1.06	(min)
Basin Lag Time	=	4.80	(min)
Shape Factor	=	484.00	

[BASIN DESCRIPTION]

Watershed Area	=	1.38	(ac)
Curve Number	=	85	

[TIME CONCENTRATION -- USER DEFINED]

Time of Concentration	=	8.00	(min)

[Unit Hydrograph Flow Values Time vs. Flow]
(The time interval is %.1lf min)

TIME INTV	TIME (min)	FLOW (cfs)
0	0.00	0.00
1	2.00	3.29
2	4.00	10.27
3	6.00	11.45
4	8.00	7.98
5	10.00	4.05
6	12.00	2.25
7	14.00	1.21
8	16.00	0.65
9	18.00	0.36
10	20.00	0.19
11	22.00	0.11
12	24.00	0.06
13	26.00	0.01
14	26.67	0.00

[TIME CONCENTRATION -- TR-55]

SHEET FLOW

Manning's Roughness Coef. (n).............	=	0.13000	
Flow Length (L)...........................	=	163.00	(ft)
2-yr 24-hr Rainfall (R).................	=	2.50	(in)
Land Slope (S)............................	=	0.05000	
Travel Time of Sheet Flow.................	=	10.13	(min)

SHALLOW FLOW

K_Coef (surface description) (K)..........	=	1.00000	
Watercourse Slope (S).....................	=	0.00000	
Velocity (V)..............................	=	0.00	(ft/s)
Flow Length (L)...........................	=	0.00	(ft)
Travel Time of Shallow Flow...............	=	0.00	(min)

CHANNEL FLOW

Hydraulic Radius (R)......................	=	1.70	(ft)
Channel Slope (S).........................	=	0.05000	
Manning's Roughness Coef. (n).............	=	0.04000	
Channel Velocity (V)......................	=	11.86	(ft/s)
Flow Length (L)...........................	=	1290.00	(ft)
Travel Time of Shallow Flow...............	=	1.81	(min)

TIME OF CONCENTRATION

Time of Concentration.....................	=	11.94	(min)

[Unit Hydrograph Flow Values Time vs. Flow]
(The time interval is %.1lf min)

TIME INTV	TIME (min)	FLOW (cfs)
0	0.00	0.00
1	2.00	1.04
2	4.00	3.38
3	6.00	6.26
4	8.00	7.12
5	10.00	6.35
6	12.00	4.78
7	14.00	2.98
8	16.00	1.97
9	18.00	1.34
10	20.00	0.89
11	22.00	0.59
12	24.00	0.38
13	26.00	0.26

UNIT HYDROGRAPH REPORT

RECORD NUMBER : 5
TYPE : CURVILINEAR UH
DESCRIPTION : Sub-area E

[UNIT HYDROGRAPH INFORMATION]

Peak Discharge	=	18.38 (cfs)
Time Interval	=	2.00 (min)
Time to Peak	=	5.33 (min)
Time of Base	=	26.67 (min)
Rainfall Excess	=	1.00 (in)
Storm Duration	=	1.06 (min)
Basin Lag Time	=	4.80 (min)
Shape Factor	=	484.00

[BASIN DESCRIPTION]

Watershed Area	=	2.16 (ac)
Curve Number	=	85

[TIME CONCENTRATION -- USER DEFINED]

Time of Concentration	=	8.00 (min)

[Unit Hydrograph Flow Values Time vs. Flow]
(The time interval is %.1lf min)

TIME INTV	TIME (min)	FLOW (cfs)
0	0.00	0.00
1	2.00	5.15
2	4.00	16.08
3	6.00	17.92
4	8.00	12.50
5	10.00	6.34
6	12.00	3.53
7	14.00	1.90
8	16.00	1.01
9	18.00	0.56
10	20.00	0.30
11	22.00	0.17
12	24.00	0.09
13	26.00	0.02
14	26.67	0.00

UNIT HYDROGRAPH REPORT

RECORD NUMBER : 7
TYPE : CURVILINEAR UH
DESCRIPTION : Sub-area G

[UNIT HYDROGRAPH INFORMATION]

Peak Discharge............................	=	20.27	(cfs)
Time Interval.............................	=	2.00	(min)
Time to Peak..............................	=	14.49	(min)
Time of Base..............................	=	72.43	(min)
Rainfall Excess...........................	=	1.00	(in)
Storm Duration............................	=	2.89	(min)
Basin Lag Time............................	=	13.04	(min)
Shape Factor..............................	=	484.00	

[BASIN DESCRIPTION]

Watershed Area............................	=	6.47	(ac)
Curve Number..............................	=	85	

[Unit Hydrograph Flow Values Time vs. Flow]
(The time interval is %.1lf min)

TIME INTV	TIME (min)	FLOW (cfs)
14	28.00	6.36
15	30.00	5.15
16	32.00	4.14
17	34.00	3.30
18	36.00	2.63
19	38.00	2.10
20	40.00	1.68
21	42.00	1.34
22	44.00	1.06
23	46.00	0.85
24	48.00	0.68
25	50.00	0.55
26	52.00	0.43
27	54.00	0.35
28	56.00	0.28
29	58.00	0.22
30	60.00	0.19
31	62.00	0.15
32	64.00	0.12
33	66.00	0.09
34	68.00	0.06
35	70.00	0.03
36	72.00	0.01
37	72.43	0.00

UNIT HYDROGRAPH REPORT

RECORD NUMBER : 9
TYPE : CURVILINEAR UH
DESCRIPTION : Sub-Area I

[UNIT HYDROGRAPH INFORMATION]

Peak Discharge............................	=	8.34	(cfs)
Time Interval.............................	=	2.00	(min)
Time to Peak..............................	=	5.33	(min)
Time of Base..............................	=	26.67	(min)
Rainfall Excess...........................	=	1.00	(in)
Storm Duration............................	=	1.06	(min)
Basin Lag Time............................	=	4.80	(min)
Shape Factor..............................	=	484.00	

[BASIN DESCRIPTION]

Watershed Area............................	=	0.98	(ac)
Curve Number..............................	=	85	

[TIME CONCENTRATION -- USER DEFINED]

Time of Concentration.....................	=	8.00	(min)

[Unit Hydrograph Flow Values Time vs. Flow]
(The time interval is %.1lf min)

TIME INTV	TIME (min)	FLOW (cfs)
0	0.00	0.00
1	2.00	2.33
2	4.00	7.30
3	6.00	8.13
4	8.00	5.67
5	10.00	2.88
6	12.00	1.60
7	14.00	0.86
8	16.00	0.46
9	18.00	0.25
10	20.00	0.14
11	22.00	0.08
12	24.00	0.04
13	26.00	0.01
14	26.67	0.00

[TIME CONCENTRATION -- TR-55]

SHEET FLOW

Manning's Roughness Coef. (n).............	=	0.13000	
Flow Length (L)...........................	=	300.00	(ft)
2-yr 24-hr Rainfall (R).................	=	2.50	(in)
Land Slope (S)............................	=	0.13000	
Travel Time of Sheet Flow.................	=	11.26	(min)

SHALLOW FLOW

K_Coef (surface description) (K)..........	=	1.00000	
Watercourse Slope (S).....................	=	0.08000	
Velocity (V)..............................	=	2.83	(ft/s)
Flow Length (L)...........................	=	740.00	(ft)
Travel Time of Shallow Flow...............	=	4.36	(min)

CHANNEL FLOW

Hydraulic Radius (R)......................	=	0.70	(ft)
Channel Slope (S).........................	=	0.05000	
Manning's Roughness Coef. (n).............	=	0.04000	
Channel Velocity (V)......................	=	6.57	(ft/s)
Flow Length (L)...........................	=	1580.00	(ft)
Travel Time of Shallow Flow...............	=	4.01	(min)

TIME OF CONCENTRATION

Time of Concentration.....................	=	19.63	(min)

[RAINFALL DESCRIPTION]

Distribution Type.........................	=	SCS IA	
Total Precipitation.......................	=	5.00	(in)
Return Period.............................	=	100	(yr)
Storm Duration............................	=	24.00	(hr)

[TIME CONCENTRATION -- TR-55]

SHEET FLOW

Manning's Roughness Coef. (n)............	=	0.13000	
Flow Length (L)...........................	=	300.00	(ft)
2-yr 24-hr Rainfall (R).................	=	2.50	(in)
Land Slope (S)............................	=	0.13000	
Travel Time of Sheet Flow.................	=	11.26	(min)

SHALLOW FLOW

K Coef (surface description) (K)..........	=	1.00000	
Watercourse Slope (S).....................	=	0.07000	
Velocity (V)..............................	=	2.65	(ft/s)
Flow Length (L)...........................	=	540.00	(ft)
Travel Time of Shallow Flow...............	=	3.40	(min)

CHANNEL FLOW

Hydraulic Radius (R)......................	=	0.50	(ft)
Channel Slope (S).........................	=	0.06000	
Manning's Roughness Coef. (n)............	=	0.04000	
Channel Velocity (V)......................	=	5.75	(ft/s)
Flow Length (L)...........................	=	660.00	(ft)
Travel Time of Shallow Flow...............	=	1.91	(min)

TIME OF CONCENTRATION

Time of Concentration.....................	=	16.58	(min)

[RAINFALL DESCRIPTION]

Distribution Type.........................	=	SCS IA	
Total Precipitation.......................	=	5.00	(in)
Return Period.............................	=	100	(yr)
Storm Duration............................	=	24.00	(hr)

HYDROGRAPH REPORT

RECORD NUMBER : 4
TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area D

[HYDROGRAPH INFORMATION]

Peak Discharge............................	=	1.06 (cfs)
Volume....................................	=	0.35 (acft)
Time Interval.............................	=	2.00 (min)
Time to Peak..............................	=	480.00 (min)
Time of Base..............................	=	1478.55 (min)
Multiplication factor.....................	=	1.00

[UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #.........................	=	4
Unit hydrograph type......................	=	CURVILINEAR UH
Peak Discharge............................	=	7.13 (cfs)
Shape Factor..............................	=	484.00
Time Interval.............................	=	2.00 (min)
Time to Peak..............................	=	7.96 (min)
Time of Base..............................	=	39.80 (min)
Rainfall Excess...........................	=	1.00 (in)
Basin Lag Time............................	=	7.16 (min)

[BASIN DESCRIPTION]

Watershed Area............................	=	1.25 (ac)
Curve Number..............................	=	85

HYDROGRAPH REPORT

RECORD NUMBER : 5
TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area E

[HYDROGRAPH INFORMATION]

Peak Discharge............................	=	1.87 (cfs)
Volume....................................	=	0.60 (acft)
Time Interval.............................	=	2.00 (min)
Time to Peak..............................	=	476.00 (min)
Time of Base..............................	=	1466.26 (min)
Multiplication factor.....................	=	1.00

[UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #.........................	=	5
Unit hydrograph type......................	=	CURVILINEAR UH
Peak Discharge............................	=	18.38 (cfs)
Shape Factor..............................	=	484.00
Time Interval.............................	=	2.00 (min)
Time to Peak..............................	=	5.33 (min)
Time of Base..............................	=	26.67 (min)
Rainfall Excess...........................	=	1.00 (in)
Basin Lag Time............................	=	4.80 (min)

[BASIN DESCRIPTION]

Watershed Area............................	=	2.16 (ac)
Curve Number..............................	=	85

[TIME CONCENTRATION -- USER DEFINED]

Time of Concentration.....................	=	8.00 (min)

[RAINFALL DESCRIPTION]

Distribution Type.........................	=	SCS IA
Total Precipitation.......................	=	5.00 (in)
Return Period.............................	=	100 (yr)
Storm Duration............................	=	24.00 (hr)

HYDROGRAPH REPORT

RECORD NUMBER : 7
TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area G

[HYDROGRAPH INFORMATION]

Peak Discharge............................	=	5.19 (cfs)
Volume....................................	=	1.82 (acft)
Time Interval.............................	=	2.00 (min)
Time to Peak..............................	=	484.00 (min)
Time of Base..............................	=	1511.70 (min)
Multiplication factor.....................	=	1.00

[UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #.........................	=	7
Unit hydrograph type......................	=	CURVILINEAR UH
Peak Discharge............................	=	20.27 (cfs)
Shape Factor..............................	=	484.00
Time Interval.............................	=	2.00 (min)
Time to Peak..............................	=	14.49 (min)
Time of Base..............................	=	72.43 (min)
Rainfall Excess...........................	=	1.00 (in)
Basin Lag Time............................	=	13.04 (min)

[BASIN DESCRIPTION]

Watershed Area............................	=	6.47 (ac)
Curve Number..............................	=	85

HYDROGRAPH REPORT

RECORD NUMBER : 8
TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area H

[HYDROGRAPH INFORMATION]

Peak Discharge............................	=	0.71 (cfs)
Volume....................................	=	0.23 (acft)
Time Interval.............................	=	2.00 (min)
Time to Peak..............................	=	476.00 (min)
Time of Base..............................	=	1466.26 (min)
Multiplication factor.....................	=	1.00

[UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #.........................	=	8
Unit hydrograph type......................	=	CURVILINEAR UH
Peak Discharge............................	=	6.98 (cfs)
Shape Factor..............................	=	484.00
Time Interval.............................	=	2.00 (min)
Time to Peak..............................	=	5.33 (min)
Time of Base..............................	=	26.67 (min)
Rainfall Excess...........................	=	1.00 (in)
Basin Lag Time............................	=	4.80 (min)

[BASIN DESCRIPTION]

Watershed Area............................	=	0.82 (ac)
Curve Number..............................	=	85

[TIME CONCENTRATION -- USER DEFINED]

Time of Concentration.....................	=	8.00 (min)

[RAINFALL DESCRIPTION]

Distribution Type.........................	=	SCS IA
Total Precipitation.......................	=	5.00 (in)
Return Period.............................	=	100 (yr)
Storm Duration............................	=	24.00 (hr)

HYDROGRAPH REPORT

RECORD NUMBER : 10
TYPE : COMBINE
DESCRIPTION : Combined D and E

[HYDROGRAPH INFORMATION]

Peak Discharge	=	2.93 (cfs)
Volume	=	0.95 (acft)
Time Interval	=	2.00 (min)
Time to Peak	=	478.00 (min)
Time of Base	=	1460.00 (min)

[COMBINE HYDROGRAPH RECORD #]

HYDROGRAPH # 4 TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area D

Peak Discharge	=	1.06 (cfs)
Time to Peak	=	480.00 (min)
Time Interval	=	2.00 (min)

HYDROGRAPH # 5 TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area E

Peak Discharge	=	1.87 (cfs)
Time to Peak	=	476.00 (min)
Time Interval	=	2.00 (min)

HYDROGRAPH REPORT

RECORD NUMBER : 12
TYPE : COMBINE
DESCRIPTION : Combined B, C, F, and G

[HYDROGRAPH INFORMATION]

Peak Discharge.............................	=	15.97	(cfs)
Volume.....................................	=	5.46	(acft)
Time Interval..............................	=	2.00	(min)
Time to Peak...............................	=	482.00	(min)
Time of Base...............................	=	1492.00	(min)

[COMBINE HYDROGRAPH RECORD #]

HYDROGRAPH # 3 TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area C
Peak Discharge........................ = 1.19 (cfs)
Time to Peak.......................... = 476.00 (min)
Time Interval......................... = 2.00 (min)
HYDROGRAPH # 11 TYPE : COMBINE
DESCRIPTION : Combined F and G
Peak Discharge........................ = 6.50 (cfs)
Time to Peak.......................... = 482.00 (min)
Time Interval......................... = 2.00 (min)
HYDROGRAPH # 2 TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area B
Peak Discharge........................ = 8.32 (cfs)
Time to Peak.......................... = 482.00 (min)
Time Interval......................... = 2.00 (min)

HYDROGRAPH REPORT

RECORD NUMBER : 16
TYPE : COMBINE
DESCRIPTION : Combined B, C, D, E, F, G, H, and I

[HYDROGRAPH INFORMATION]

Peak Discharge................................	=	20.34	(cfs)
Volume..	=	6.91	(acft)
Time Interval..................................	=	2.00	(min)
Time to Peak...................................	=	480.00	(min)
Time of Base...................................	=	1492.00	(min)

[COMBINE HYDROGRAPH RECORD #]

HYDROGRAPH # 13 TYPE : COMBINE
DESCRIPTION : Combine D, E and I

Peak Discharge........................	=	3.77	(cfs)
Time to Peak............................	=	476.00	(min)
Time Interval...........................	=	2.00	(min)

HYDROGRAPH # 14 TYPE : COMBINE
DESCRIPTION : Combined B, C, F, G, and H

Peak Discharge........................	=	16.65	(cfs)
Time to Peak............................	=	482.00	(min)
Time Interval...........................	=	2.00	(min)

HYDROGRAPH REPORT

RECORD NUMBER : 14
TYPE : COMBINE
DESCRIPTION : Combined B, C, F, G, and H

[HYDROGRAPH INFORMATION]

Peak Discharge............................	=	16.65	(cfs)
Volume....................................	=	5.69	(acft)
Time Interval.............................	=	2.00	(min)
Time to Peak..............................	=	482.00	(min)
Time of Base..............................	=	1492.00	(min)

[COMBINE HYDROGRAPH RECORD #]

HYDROGRAPH # 12 TYPE : COMBINE
DESCRIPTION : Combined B, C, F, and G

Peak Discharge.......................	=	15.97	(cfs)
Time to Peak.........................	=	482.00	(min)
Time Interval........................	=	2.00	(min)

HYDROGRAPH # 8 TYPE : COMPUTED FLOOD
DESCRIPTION : Sub-Area H

Peak Discharge.......................	=	0.71	(cfs)
Time to Peak.........................	=	476.00	(min)
Time Interval........................	=	2.00	(min)

will be left virtually undisturbed. Soil surfaces in the arid environment, if left alone, will develop a surface gradation referred to as "Desert Pavement." Desert Pavement inhibits the wind erosion process by armoring the surface with larger particles. Therefore, annual erosion at the site will potentially be less than predicted by the wind erosion equation.

POTENTIAL SOIL LOSS DUE TO WATER AND WIND EROSION

Bridgeport Landfill

The following summarizes the potential soil loss during the first five years after construction of the final cover.

Assuming a unit weight of 120 pounds per cubic foot for topsoil, the depth of soil lost from the surface of the landfill can be calculated as follows:

TOP DECK (Slope = 0.04)

	Soil Loss (tons/acre)	Soil Loss (ft^3/acre)	Depth (ft)	Cumulative Depth (ft)	Cumulative Depth (in)
Year 1	4.5	75.0	0.0017	0.0017	0.0204
Year 2	1.8	30.0	0.0007	0.0024	0.0288
Year 3	1.8	30.0	0.0007	0.0031	0.0372
Year 4	1.8	30.0	0.0007	0.0038	0.0456
Year 5	1.8	30.0	0.0007	0.0045	0.0540
Year 30	1.8	30.0	0.0007	0.0220	0.2640

SIDESLOPES (Slope = 0.33)

	Soil Loss (tons/acre)	Soil Loss (ft^3/acre)	Depth (ft)	Cumulative Depth (ft)	Cumulative Depth (in)
Year 1	20.5	341.7	0.0078	0.0078	0.0936
Year 2	12.6	210.0	0.0048	0.0126	0.1512
Year 3	12.6	210.0	0.0048	0.0174	0.2088
Year 4	12.6	210.0	0.0048	0.0222	0.2664
Year 5	12.6	210.0	0.0048	0.0270	0.3240
Year 30	12.6	210.0	0.0048	0.1470	1.7640

The following summarizes the potential soil loss in a year if trees are planted as a wind break perpendicular to the preferential wind pattern, and adjacent to the footprint. According to the NRCS a wind break is effective to a distance of ten times its height, therefore reducing "L", the unsheltered distance across a field. The calculations assume all other values remain constant with V = 1,000.

Wind Break Height (feet)	L (feet)	Wind Erosion (tons/acre/year)	Combined Erosion (tons/acre/year)	Annual Depth (ft)	Cumulative Depth @ Year 30(ft)
20	800	0.4	12.5	0.0048	0.1440
40	600	0	12.1	0.0046	0.1380

Chart B–4: Textural Triangular Nomograph for Soil Erodibility (Reproduced from Reference B–2)

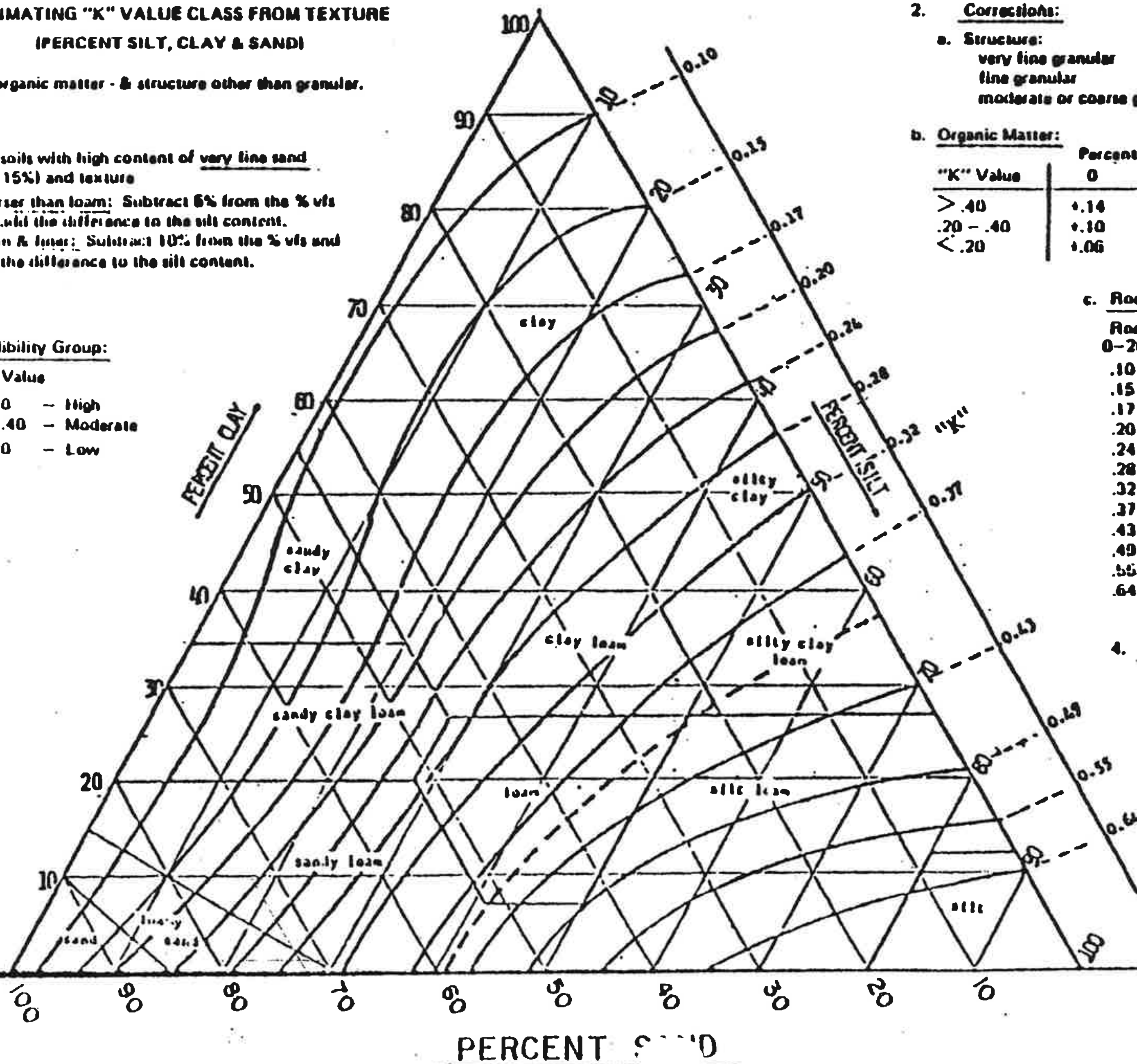
ESTIMATING "K" VALUE CLASS FROM TEXTURE (PERCENT SILT, CLAY & SAND)

2% organic matter - & structure other than granular.

1. For soils with high content of very fine sand (> 15%) and texture
   a. Coarser than loam: Subtract 6% from the % vfs and add the difference to the silt content.
   b. Loam & finer: Subtract 10% from the % vfs and add the difference to the silt content.

Erodibility Group:

"K" Value	
> .40	– High
.20–.40	– Moderate
< .20	– Low



2. Corrections:

a. Structure:

very fine granular	–.09
fine granular	–.06
moderate or coarse granular	–.03

b. Organic Matter:

"K" Value	Percent O.M. 0	1	2	3	4
> .40	+.14	+.07	0	–.07	–.14
.20 – .40	+.10	+.05	0	–.05	–.10
< .20	+.06	+.03	0	–.03	–.06

c. Rock Fragments (by Volume)

Rock Fragment Content – (Percent) 0–20	20–35	35–50	50–70
.10	.10	.10	.10
.15	.15	.10	.10
.17	.15	.10	.10
.20	.17	.15	.10
.24	.20	.17	.15
.28	.24	.20	.17
.32	.28	.24	.20
.37	.32	.28	.24
.43	.37	.32	.28
.49	.41	.37	.32
.55	.49	.43	.37
.64	.55	.49	.43

4. Permeability

Compact soil or pH > 9.0	+.03
Many medium or coarse pores	–.03

DETERMINING "R" VALUES

California is divided into three zones for determining "R" values. Figure A-1 shows their general boundaries and they are defined by Major Land Resource Area (MLRA) as follows:

Frozen Soil Area	includes MLRAs 21 and 23
R Zone 1	includes MLRAs 14, 15, 16, 17, 18, 19, 20, and 22
R Zone 2	includes MLRAs 4, 5, 26, 29, 30, and 31

R values in the Frozen Soil Area are based on the equation

$$R = -58.282 + 8.735P - 0.149P^2$$

where P = average annual precipitation in inches

R values in R Zone 1 are based on the equation

$$R = 16.55P^{2.17}$$

where P = the 2 year 6 hour precipitation value for the desired location as shown in NOAA Atlas 2 "Precipitation Frequency Atlas of the Western United States, Volume XI California."

R values in R Zone 2 are based on the equation

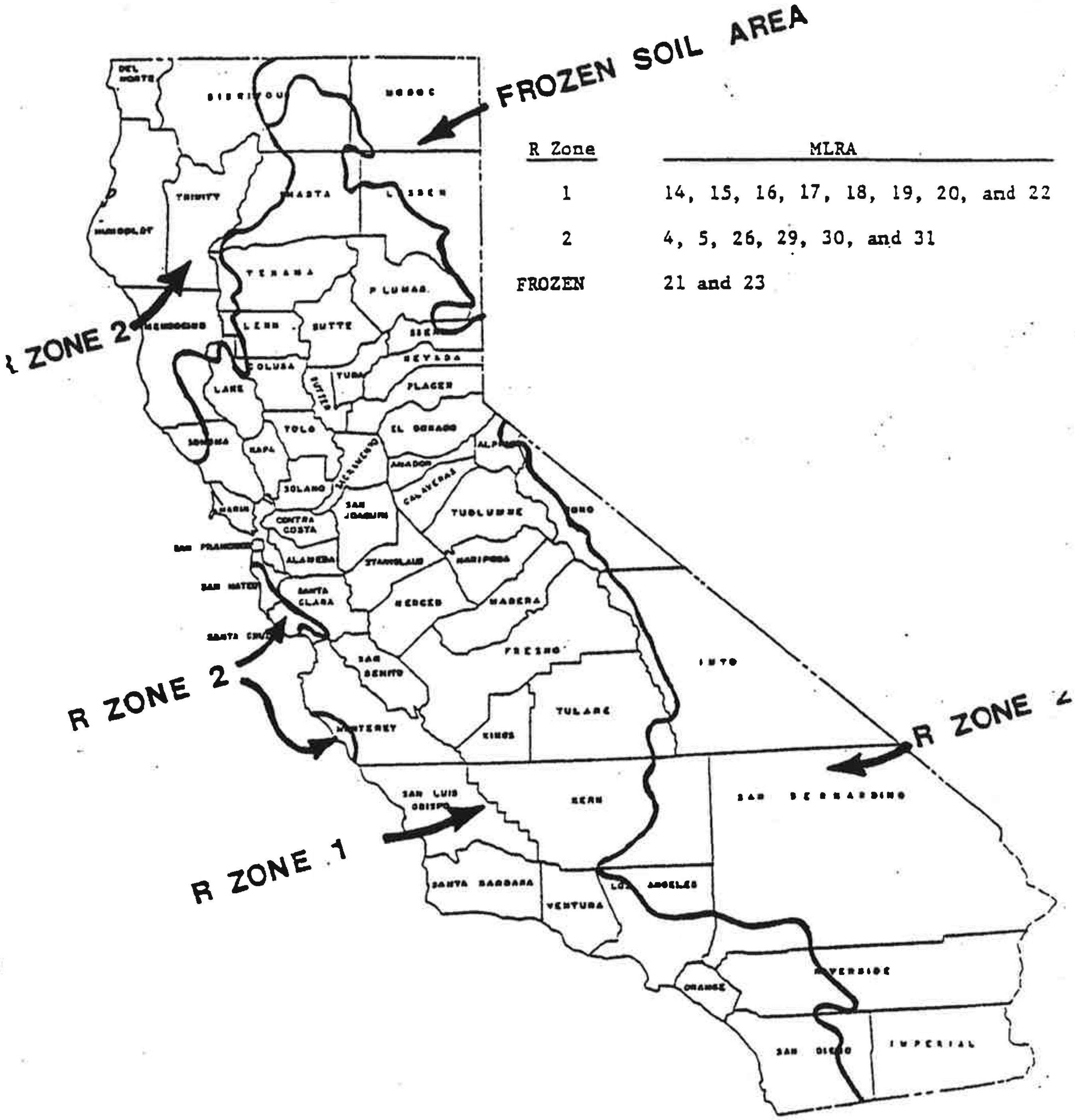
$$R = 27P^{2.17}$$

where P = the 2 year 6 hour precipitation value

R values in California will be obtained using the appropriate part of Table A-1 or an R factor map based on Table A-1.

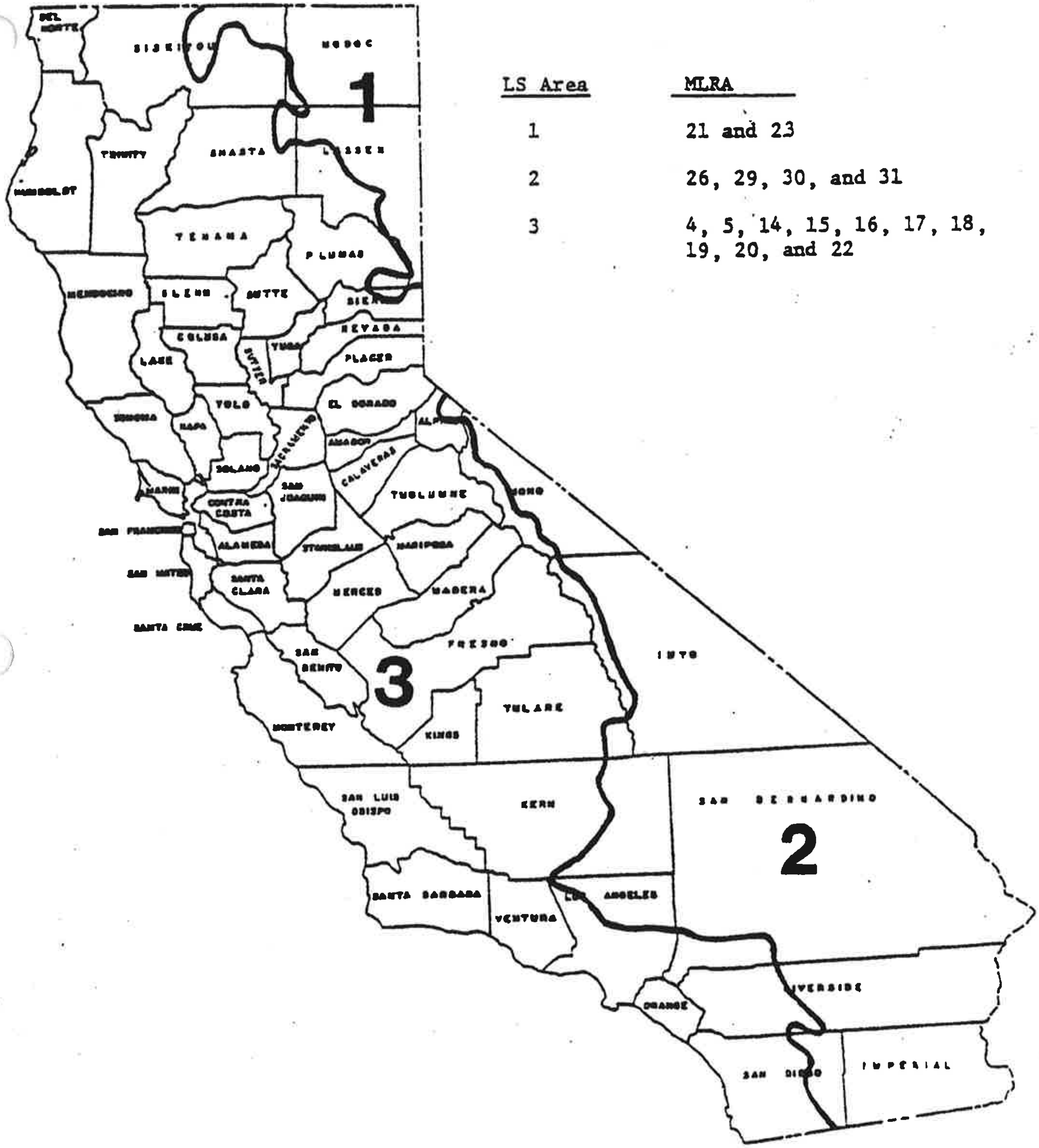
R values will be rounded to the nearest 5 units and lowest R value will be 10.

Figure A-1. R Factor Zones in California



R Zone	MLRA
1	14, 15, 16, 17, 18, 19, 20, and 22
2	4, 5, 26, 29, 30, and 31
FROZEN	21 and 23

Figure 1: LS Areas in California.



LS Area	MLRA
1	21 and 23
2	26, 29, 30, and 31
3	4, 5, 14, 15, 16, 17, 18, 19, 20, and 22

Soil Loss Equation "C" Factors for California Cropping Systems

It is not intended that the tables following include all cropping systems in California. The cropping systems and "C" factors listed are to provid examples for helping conservationists make accurate estimates of "C" values for cropping systems within their work areas.

Table 1, below, provides criteria that should enable most conservationist to make "Average Annual C" estimates for a cropping system with fair accuracy once they know the tillage and crop residue practices for the system and relate these to the periods of precipitation causing erosion.

TABLE 1

Soil Management Practice	Estimated "C"
* 1. Continuous clean tilled fallow (Research plots)	1.00
2. Continuous tilled fallow, 1000 lb. straw per acre maintained on soil surface	0.50
3. Continuous bare soil surface - untilled	0.50
4. Orchard Cover Crop - spring disked	0.25
5. Orchard strip Cover Crop, untilled, mowed	0.10
6. Continuous annual grass or legume pasture or hay (100% cover)	0.01
7. Continuous perennial grass (100% cover)	0.003

* Item 1 represents a condition induced by continuous loose fallow over a period of several years. Thus, for practical purposes, Average Annual "C" on agricultural land would always be less than 1.00.

In general, erosion from rainfall in California occurs during the 6 month period between November 1 and April 30. Thus "C" values in the state relate almost entirely to condition of the soil surface during these winter months. Bare tilled soil surface will give "C" values approaching 1.0. Non-tillage of bare surface, or light surface mulches on a tilled surface will reduce erosion and "C" values to about half (0.5). A complete cover of annual grasses and weeds during the winter months will reduce soil losses to about one-tenth on tilled cropland as compared to clean tilled fallow, giving a "C" value of 0.1.

Excepting non-tilled orchards with cover crop, California cropping systems will usually have average annual "C" values between 0.1 and 0.5 with high crop yield stubble mulch systems producing low values and clean-tilled low crop yield systems the higher values.

"P" Erosion Control Practice Factor

Practices most commonly used for this purpose are contour tillage, cross-slope farming, and contour stripcropping. They are support practices that will slow the runoff water and thus reduce the amount of soil it can carry. Stripcropping is alternate strips of a sod crop and cultivated crop with all strips of equal width. An alternate sod strip narrower than the cultivated strip or alternate strips of small grain and summer fallow will not qualify as stripcropping. Such operations qualify only for contouring when performed on the contour.

Values of "P" for the above three erosion control practices appear in table 4 below:

Table 4 "P" Factors For Erosion Control Practices

Slope (%)	Up & Down Hill	Cross Slope Farming Without Strips	Contour Tillage	Cross Slope Farming With Strips	Contour Stripcropping
2.0- 7	1.0	.75	.50	.37	.25
7.1-12	1.0	.80	.60	.45	.30
12.1-18	1.0	.90	.80	.60	.40
18.1-24	1.0	.95	.90	.67	.45

The full benefits of contouring are obtained only on fields relatively free from gullies and depressions other than grassed waterways. The effectiveness of this practice is reduced if a field contains numerous small gullies and rills that are not obliterated by normal tillage operations. In such instances, land smoothing should be considered before contouring. Otherwise, a judgement value greater than shown in table 1 should be used when computing the benefits for contouring.

There are also certain limits on the lengths of slopes in contour tilling beyond which the values of "P" in table 1 are not valid. Although observations point to a dependence of length limits to slope steepness the data available is not sufficient to support a firm relationship. ~~Suggested values are shown in table 2 below, but due to their speculative nature they should be used with caution.~~ See Tables 13 and 14 in A.H. 537.

~~Table 2~~ ~~Length Limits For Contouring~~

~~Slope (%)~~	~~Maximum Slope Length Feet~~
~~2~~	~~400~~
~~4 to 5~~	~~300~~
~~8~~	~~200~~
~~10~~	~~100~~
~~12~~	~~80~~
~~14 to 24~~	~~60~~

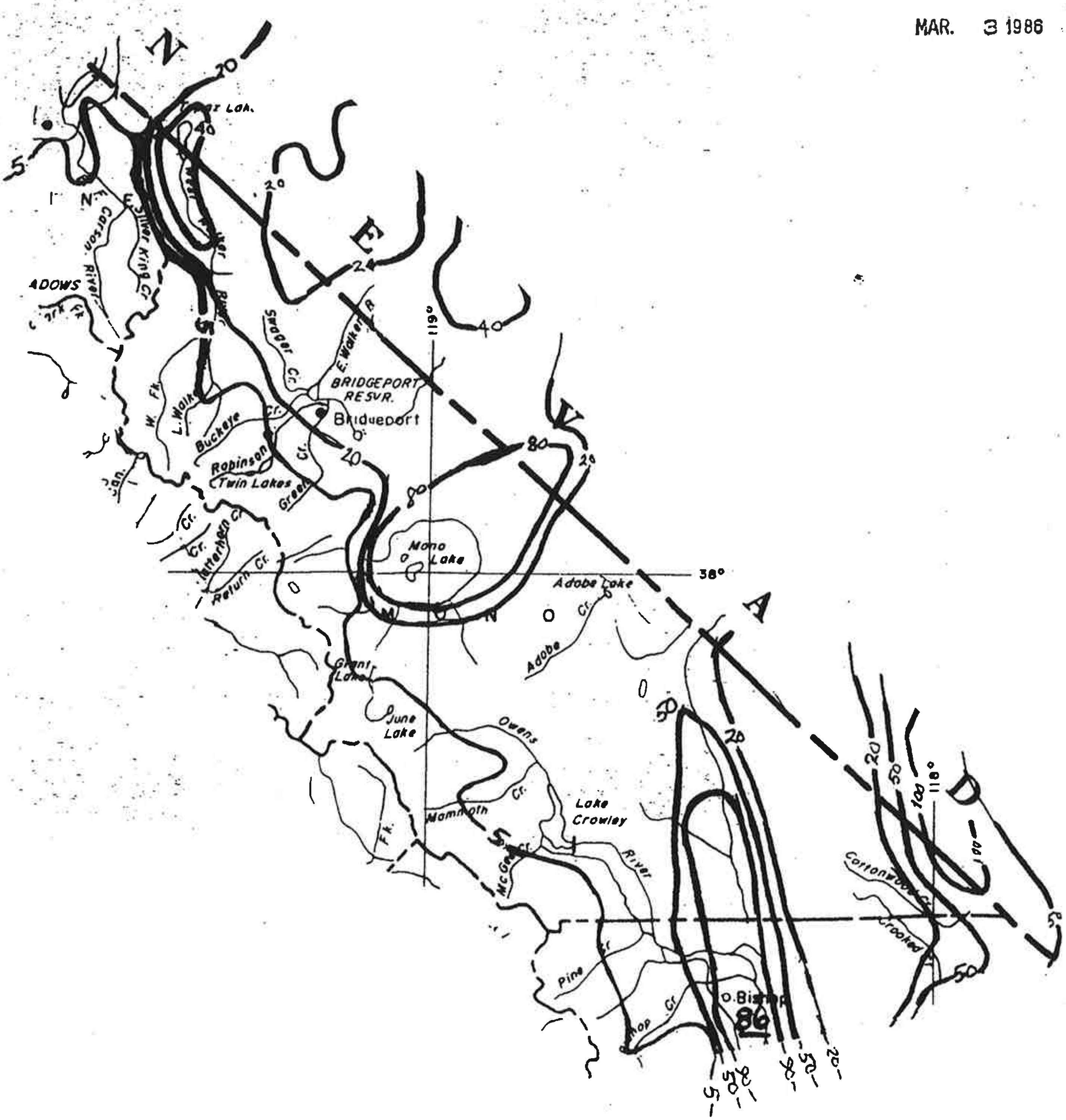
August 1983

Table-3 (2)

PRACTICE FACTOR P_c OR SURFACE CONDITION FOR CONSTRUCTION SITES

SURFACE CONDITION WITH NO COVER	FACTOR P_c*
Compact and smooth, scraped with bulldozer or scraper up and down hill	1.3
Same condition except raked with bulldozer root rake up and down hill	1.2
Compact and smooth, scraped with bulldozer or scraper across the slope	1.2
Same condition except raked with bulldozer root rake across the slope	0.9
Loose as a disced plow layer	1.0
Rough irregular surface equipment tracks in all directions	0.9
Loose with rough surface greater than 12" depth	0.8
Loose with smooth surface greater than 12" depth	0.9

*Values based on estimates



MONO COUNTY
ANNUAL WIND EROSION CLIMATIC FACTOR C (PERCENT)
USDA - SOIL CONSERVATION SERVICE
1986 INTERIM MAP

TABLE 1.--GUIDE FOR CONVERTING RANGE VEGETATION TO FLAT SMALL GRAIN EQUIVALENT FOR PROPERLY GRAZED RANGELAND

GRASS PLANTS	Pounds per acre of Range Vegetation										
	50	100	200	300	400	500	600	700	800	900	1000
* Buffalograss, Burrograss, Inland saltgrass	300	690	1550	2500	3500						
* Big bluestem	50	110	280	450	650	900	1200	1400	1600	1900	2200
* Western wheatgrass, Creeping wildrye	140	325	700	1200	1600	2100	2550	3100	3500	4000	
* Little bluestem, Sideoats grama	50	100	260	480	690	940	1250	1500	1800	2100	2500
* Blue grama	110	230	500	780	1100	1300	1700	2000	2500		
Threadleaf sedge, Perennial threeawn	110	200	400	650	950	1200	1600	1900			
Galleta, Tobosa	150	300	800	1200	1700	2600					
* Bottlebrush squirreltail, Needleandthread, Thurber needlegrass	70	150	300	600	800	1100	1500				
Alkali sacaton	110	230	500	780	1400	2200	2800	3600			
Bluebunch wheatgrass	50	120	300	550	850	1150	1500	1900	2300	2600	3000
Idaho fescue	100	200	400	900	1500	2300					
Indian ricegrass	50	110	260	460	660	900	1300	1700			
Crested wheatgrass	140	320	650	1100	1500	2000	2500	3000	3600		
Cheatgrass	110	225	500	750	1000	1300	1500	1800	2200	2500	2800

* Lyles, Leon and Bruce E. Allison. "Range Grasses and Their Small Grain Equivalents for Wind Erosion Control." Journal of Range Management, Vol. 33, No. 2, March 1980, pp. 143-146.

NOTE: Other grass species equivalents were estimated by comparing the growth characteristics with the tested species.

TABLE 2.--GUIDE FOR CONVERTING RANGE VEGETATION TO FLAT SMALL GRAIN EQUIVALENT FOR PROPERLY GRAZED RANGELAND

	Pounds per acre of Range Vegetation										
	50	100	200	300	400	500	600	700	800	900	1000
FORBS											
Perennial forbs	50	100	300	500	750	1000					
Annual forbs	50	100	200	300	500	800	1000				

Litter - use a direct ratio of litter to FSGe.

SHRUBS - (Figure in () are approximate % of canopy cover) *	50	100	200	300	400	500	600	700	800	900	1000
Big sagebrush	30(5)	70(10)	250(20)	450(25)	600(30)	900(40)	1200(50)	1600(60)	2000(65)	2500(70)	
Sand sagebrush **	30	70	205	365	550	750	980	1220			
Low sagebrush	50(5)	100(10)	300(20)	500(30)	800(40)	1300(50)	1800(60)	2500(70)			
Greasewood, Fourwing saltbush	20(<5)	60(5)	100(10)	300(20)	450(25)	600(30)	900(40)	1200(45)	1500(50)		
Rabbitbrush, Snakeweed	30(5)	70(10)	250(20)	450(25)	700(30)	1000(40)	1300(50)	1700(60)	2200(65)		
Shadscale	30(5)	50(10)	200(20)	350(30)	700(40)	1100(50)					
Creosotebush	20(5)	70(10)	250(20)	400(25)	600(30)	800(40)	1000(50)	1400(60)			
Mesquite	20(5)	50(10)	200(20)	300(25)	400(30)	500(35)	600(40)	800(45)	1200(50)	1800(60)	2400(70)
Juniper	40(<5)	90(5)	150(10)	250(20)	450(30)	800(40)	950(45)	1400(50)	2000(55)	2700(60)	3600(70)
Cholla	0(5)	20(10)	50(20)	150(30)	250(35)	350(40)	550(45)	800(50)	1000(60)		
Shinnery	150(10)	400(20)	900(30)	1200(40)	1500(50)	1800(60)	2100(70)	2400(80)	2700(90)	3000(100)	
Shrub Oak	100(10)	300(20)	600(30)	1200(40)	1800(50)	3000(60)	4200(70)				
Yucca **	20	50	145	250	325	500	650	800	1000	1150	
Winterfat	40(5)	100(10)	300(20)	500(30)	800(40)	1400(50)	1800(60)	2300(70)	3000(80)		
Desert Pavement (% cover only)	0(10)	200(20)	400(30)	600(40)	1000(50)	1400(60)	1800(70)	2400(80)	3000(90)	3600(100)	

* % canopy cover of shrubs can be converted to small grain equivalent with this table. i.e., big sagebrush with a 25% canopy cover will convert to 450 lbs. of flat small grain; a 50% canopy converts to 1,200 lbs. of flat small grain.

For deciduous shrubs, estimate foliage production at time of wind erosion hazard.

Forb and shrub small grain equivalents are personal judgement only. Research data is available only for sand sagebrush and Yucca.

** Unpublished data of Hagen and Lyles. These values are based on windtunnel tests using small plants (≤ 17 inches) total above ground biomass

TABLE 7 (E) SOIL LOSS FROM WIND EROSION IN TONS PER ACRE PER YEAR

C = 20
I = 48

SURFACE - K = 1.

(V)- FLAT SMALL GRAIN RESIDUE IN POUNDS PER ACRE

(L) UNSHELTERED DISTANCE IN FEET	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
10000	9.6	8.3	6.2	4.4	2.7	1.3	0.5							
8000	9.6	8.3	6.2	4.4	2.7	1.3	0.5							
6000	9.6	8.3	6.2	4.4	2.7	1.3	0.5							
4000	8.9	7.6	5.7	4.0	2.4	1.1	0.4							
3000	8.3	7.1	5.3	3.7	2.2	0.9								
2000	7.3	6.2	4.6	3.2	1.9	0.8								
1000	5.1	4.3	3.1	2.1	1.2	0.5								
800	4.6	3.9	2.8	1.9	1.1	0.4								
600	3.9	3.3	2.4	1.6	0.7									
400	3.1	2.6	1.8	1.2	0.6									
300	2.4	2.0	1.4	0.9	0.4									
200	1.7	1.4	1.0	0.5										
150	1.2	1.0	0.7	0.3										
100	0.9	0.6	0.2											
80	0.7	0.5	0.2											
60														
50														
40														
30														
20														
10														

(E) SOIL LOSS FROM WIND EROSION IN TONS PER ACRE PER YEAR

C = 20
I = 48

SURFACE - K = .75

(V)- FLAT SMALL GRAIN RESIDUE IN POUNDS PER ACRE

(L) UNSHELTERED DISTANCE IN FEET	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
10000	7.2	6.2	4.6	3.2	1.9	0.7								
8000	7.2	6.2	4.6	3.2	1.9	0.7								
6000	6.9	5.9	4.4	3.1	1.8	0.7								
4000	5.9	5.0	3.7	2.8	1.5	0.6								
3000	5.3	4.5	3.3	2.2	1.3	0.5								
2000	4.7	4.0	2.9	1.9	1.1	0.4								
1000	3.5	3.0	2.1	1.4	0.7									
800	3.2	2.7	1.9	1.2	0.6									
600	2.5	2.1	1.4	0.9	0.4									
400	1.8	1.5	1.0	0.5										
300	1.5	1.3	0.9	0.4										
200	1.0	0.7	0.2											
150	0.7	0.5	0.2											
100														
80														
60														
50														
40														
30														
20														
10														

(E) SOIL LOSS FROM WIND EROSION IN TONS PER ACRE PER YEAR

C = 20
I = 48

SURFACE - K = .5

(V)- FLAT SMALL GRAIN RESIDUE IN POUNDS PER ACRE

(L) UNSHELTERED DISTANCE IN FEET	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
10000	4.8	4.1	3.0	2.0	1.1	0.5								
8000	4.8	4.1	3.0	2.0	1.1	0.5								
6000	4.6	3.9	2.8	1.9	1.1	0.4								
4000	4.2	3.5	2.5	1.7	1.0	0.4								
3000	3.7	3.1	2.2	1.5	0.7									
2000	3.2	2.7	1.9	1.3	0.6									
1000	2.0	1.6	1.1	0.5										
800	1.8	1.5	1.0	0.5										
600	1.4	1.1	0.8	0.4										
400	1.0	0.7	0.2											
300	0.7	0.5	0.2											
200														
150														
100														
80														
60														
50														
40														
30														
20														
10														

NOTE SOIL LOSS OF LESS THAN 0.1 TON/ACRE/YEAR IS NOT RECORDED

APPENDIX H

SETTLEMENT CALCULATIONS

SETTLEMENT CALCULATIONS
Bridgeport Landfill

INPUT PARAMETERS	
Compressibility - old waste (m):	7.85E-07 1/kPa
Rate of Compression - old waste (n):	0.779 (dimesionless)
Reference Time (t_r):	1 day(s)
Initial Total Height (H): (above and below grade refuse + cover)	25 ft
Final Cover Soil Thickness:	3 ft
Unit Weight of Final Cover (pcf):	115 pcf
Unit Weight of Daily Cover (pcf):	85 pcf
Unit Weight of Municpal Waste (pcf):	29.6 pcf at 800pcy
Waste to Soil Ratio (by volume):	1 :1
Average Unit Weight of Waste: (includes waste and cover soil)	57 pcf
Average Stress in Refuse Layer: (at midpoint of waste fill)	1061 psf or 50.8 kPa

CALCULATIONS

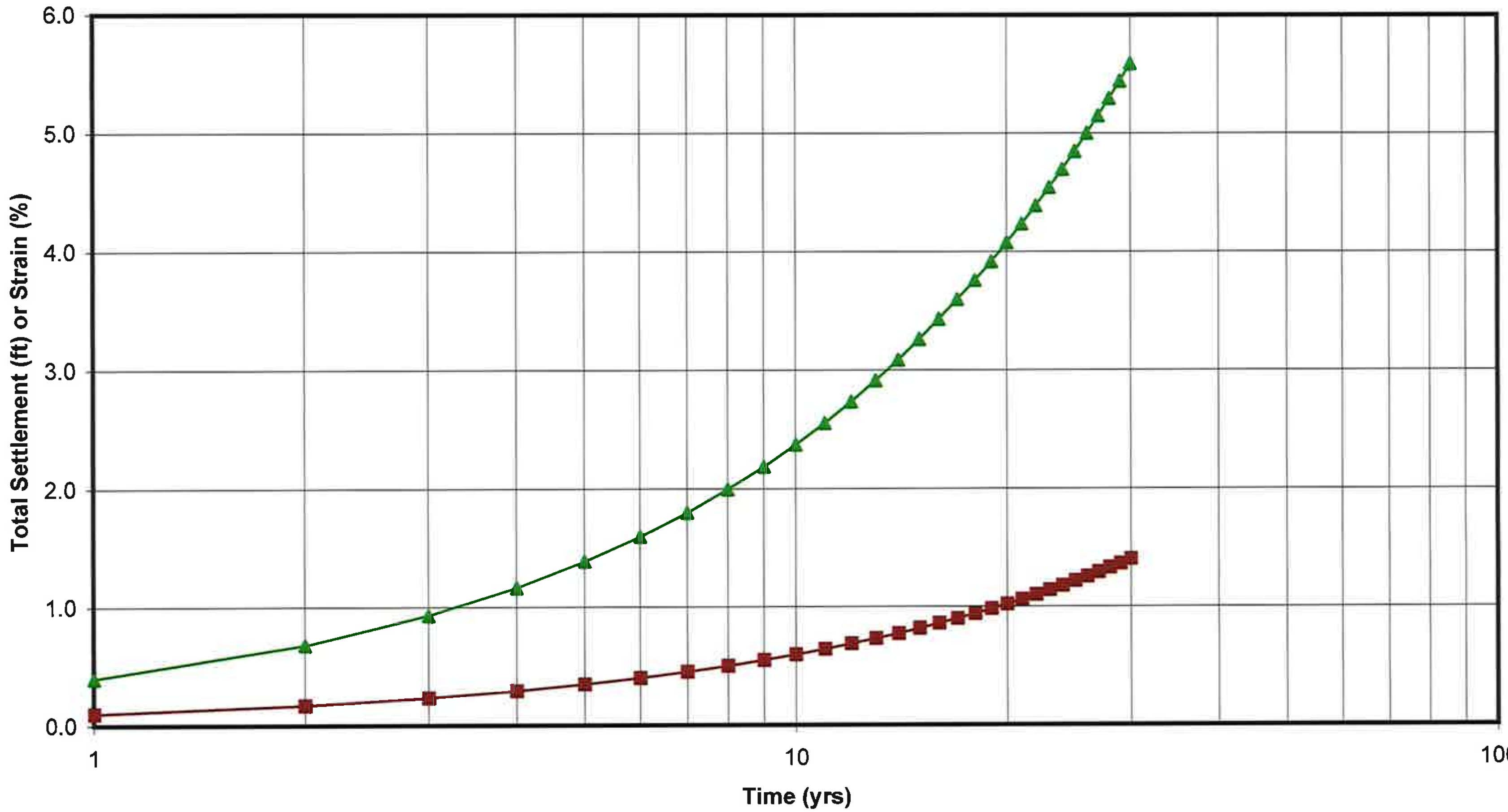
TIME (yrs)	TIME (days)	SETTLEMENT (ft)	STRAIN (%)
1	365	0.1	0.40
2	730	0.2	0.68
3	1095	0.2	0.93
4	1460	0.3	1.16
5	1825	0.3	1.39
6	2190	0.4	1.60
7	2555	0.5	1.80
8	2920	0.5	2.00
9	3285	0.5	2.19
10	3650	0.6	2.38
11	4015	0.6	2.56
12	4380	0.7	2.74
13	4745	0.7	2.92
14	5110	0.8	3.09
15	5475	0.8	3.26
16	5840	0.9	3.43
17	6205	0.9	3.59
18	6570	0.9	3.76
19	6935	1.0	3.92
20	7300	1.0	4.08
21	7665	1.1	4.24
22	8030	1.1	4.39
23	8395	1.1	4.55
24	8760	1.2	4.70
25	9125	1.2	4.85
26	9490	1.3	5.00
27	9855	1.3	5.15
28	10220	1.3	5.30
29	10585	1.4	5.45
30	10950	1.4	5.59

NOTE: Calculation based on the article "Settlement of Municipal Refuse", by Edil, et. al. (1990), in *Geotechnics of Waste Fill*, by A. Landva and G.D. Knowles, 1990, ASTM Special Technical Publication 1070, October 1990.

BRIDGEPORT LANDFILL

Predicted Settlement Through Time

[based on "Settlement of Municipal Refuse", by Edil, et. al. (1990)]



CONCLUSIONS

The results of the investigation of the 1988 slope stability failure at the Kettleman Hills Class I hazardous waste repository teach valuable lessons about the safe design and construction of lined waste landfills. These include:

(1) Multi-layer liner systems which have been devised for the safe containment and removal of landfill leachate may contain liner interfaces with low shear strength, including friction angles as low as 8 degrees or less.

(2) Simple direct shear tests can be used to determine reliable values for interface strength properties.

(3) Because of the variability in interface strengths that is associated with different geosynthetic liner system components and compacted clays used in composite double liner systems, values of interface strength should be determined specifically for each project using samples of the actual materials and representative placement, loading, and wetting conditions.

(4) In situations involving low shear strengths such as may occur in liner systems, three-dimensional effects may be important in evaluating stability.

(5) The repository filling operations should be planned in such a way that an adequate factor of safety can be maintained at all times and for all fill heights. This can be done by means of systematic analyses of stability for different fill geometries.

(6) While the concept embodied in (5) is simple in principle, it is presently difficult in detail owing to (1) the lack of a suitable generalized method for doing three-dimensional stability analyses, and (2) uncertainties about the effects of seismic loadings on the response and stability of lined landfills. Both of these issues need further study.

ACKNOWLEDGMENTS

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SETTLEMENT OF MUNICIPAL REFUSE

REFERENCE: Edil, T. B., Ranguette, V. J., and Wuellner, W. W., "Settlement of Municipal Refuse," Geotechnics of Waste Fills - Thoery and Practice, ASTM STP 1070, Arvid Landva and G. David Knowles, Eds., American Society for Testing and Materials, Philadelphia, 1990.

ABSTRACT: Refuse settlement in sanitary landfills is a complex process, which is dominated by secondary compression. Two mathematical models are used to model refuse settlement at four different sites. A data bank of empirical parameters was obtained and the trends observed.

KEYWORDS: refuse, settlement, settlement model, empirical settlement parameters, compression, rate of compression, landfill

INTRODUCTION

Refuse settlement in sanitary landfills, though frequently a troublesome and unpredictable problem offers at the same time a significant opportunity to the landfill operator for increasing the potential disposal capacity. Although filled to design grades, after closure landfill surfaces rapidly settle below the approved final grades. While this phenomenon is understood, a suitable model to predict this behavior has not been available or generally accepted. Consequently, valuable air space (volume), previously approved by regulatory agencies, may not be fully used. More accurate prediction of this settlement may permit a range of opportunities including better estimates of the remaining life of existing landfills, and improved predictability of surficial refuse movement and its impact on cover integrity, future vertical expansions, and ultimate use of the landfill surface.

The mechanics of compression of refuse are many and complex. Settlement-time curves from sanitary landfills differ from those for typical clay settlement curves; however, they are similar to those from organic soils and peats. This paper outlines an analysis approach using two different mathematical functions for the refuse settlement-time relationship. These relationships, which have previously been used to predict peat and soil settlement incorporate the significant factors controlling refuse settlement.

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The mathematical models were applied to the settlement data obtained from four different landfills and the parameters characterizing the compression of refuse were calculated. The dependency of the refuse settlement parameters on the stress level and the strain rate was evaluated for a range of conditions such as age of refuse, active filling or post-closure and leachate extraction. The limited data preclude broad generalization of the models for a variety of conditions; however, their versatility and utility as a tool for estimating the settlement of refuse, especially during active filling or post-closure, are demonstrated.

MECHANICS OF REFUSE SETTLEMENT

The mechanics of refuse settlement are many and complex, even more so than for a soil due to the extreme heterogeneity of, and large voids present in, the refuse fill. The main mechanisms involved in refuse settlement are the following:

1. Mechanical (distortion, bending, crushing and reorientation; similar to consolidation of organic soils);
2. Ravelling (movement of fines into large voids);
3. Physical-chemical change (corrosion, oxidation and combustion); and
4. Bio-chemical decomposition (fermentation and decay, both aerobic and anaerobic processes).

The factors affecting the magnitude of settlement are many and are influenced by each other. These factors include: 1) initial refuse density or void ratio; 2) content of the decomposable materials in the refuse; 3) fill height; 4) stress history; 5) leachate level and fluctuations thereof; and 6) environmental factors (such as moisture content, temperature and gases present or generated within the landfill).

It should be noted that refuse settles substantially both under its own self weight as well as under the weight of a new load (for example, the placement of new refuse over existing refuse). A factor complicating the computation of stress changes due to these weights is the introduction of cover soil to refuse fill. The addition of cover soil makes the measurement and interpretation of unit weight values more difficult. As a result, two types of refuse unit weight can be defined: 1) Actual refuse unit weight (weight of refuse per unit volume of refuse); and 2) Effective refuse unit weight (weight of refuse plus cover per unit volume of landfill), [1].

In themselves, actual refuse unit weights are highly erratic. Within a landfill, refuse unit weights typically vary from 5 to 11 kN/cu m. Moisture contents typically range from 10 to 50 percent, on a percent of dry weight basis [1-3].

Settlement of refuse fill is characteristically irregular. Initially, there is a large settlement within one or two months of completing construction, followed by a substantial amount of secondary compression over an extended period of time. The magnitude of settlement decreases over time and with increasing depth below the surface of the fill. Under its own weight, refuse settlement typically ranges from 5 to 30 percent of the original thickness, with most of the settlement occurring in the first year or two.

PREVIOUS REFUSE SETTLEMENT STUDIES

Various methods of analysis and prediction of post-construction refuse fill settlement are reported by several investigators [2-5]. Settlement due to compression of refuse fill under external surface load can be plotted in terms of strain (ratio of settlement to initial fill height) versus the logarithm of effective stress (pressure). Settlement magnitude can be predicted based on the settlement coefficient, the slope of the straight line connecting two selected stresses [2, 4]. The problems with this method include: 1) for older fills, the initial fill height is usually unknown; 2) effective stress is a function of refuse density, which usually cannot be determined accurately; and 3) the strain-log stress relationship is not a straight-line relationship; therefore, the settlement coefficient, which is proportional to settlement magnitude, varies as the stresses (pressures) within the fill change.

Another approach, is to calculate settlement rate as settlement magnitude per unit time interval. Yen and Scanlon [5] collected settlement platform data from several landfill sites and calculated settlement rate as the ratio of change in platform elevation to elapsed time between surveys. Since the settlement platform data for these sites covered periods of up to nine years following the end of construction, they were able to plot settlement rate versus log time and determine the best-fit linear relationship by the least-squares method.

Yen and Scanlon compared their data with Sowers' field observations and noted that the rate of settlement decreases with time logarithmically [5]. Sowers noted the time-dependent secondary compression of refuse and reported values of the coefficient of secondary compression, α (based on Buisman's definition for soils) for some sanitary landfills. Sowers noted that the α values for refuse were comparable to those of peat and organic soils and dependent on how favorable the conditions were for decomposition [2, 3].

PROPOSED REFUSE SETTLEMENT MODELS USED

The conventional approach to soil compression requires a separation of primary and secondary compression and treatment of each with different mathematical expressions. In the long term, secondary compression of refuse is larger than other compression, and it is often difficult to make a distinction between primary and secondary compression. Therefore, a simple model combining all stages of compression is needed. Two such models are investigated in this study.

Gibson and Lo Model

The rheological model proposed by Gibson and Lo [6] for the long-term (secondary) compression of soils was found to be rather useful in predicting the settlement of peats [7]. Peat, like refuse, involves mechanisms of compression different than those in inorganic clays. Both peat and refuse have relatively large void spaces that compress quickly during initial and primary settlement, but by far the largest compression is due to the slow and continuous process of secondary settlement, where the particle structures begins to break down. Encouraged by the simplicity and usefulness of the rheological model proposed by Gibson and Lo we decided to apply the same model to field refuse settlement records.

This rheological model is shown in Fig. 1a, and it represents the average compression characteristics in the one-dimensional compression of the refuse fill shown in Fig. 1b. The applied increment of stress can be either the self-weight of the refuse or it may be imposed on the refuse surface.

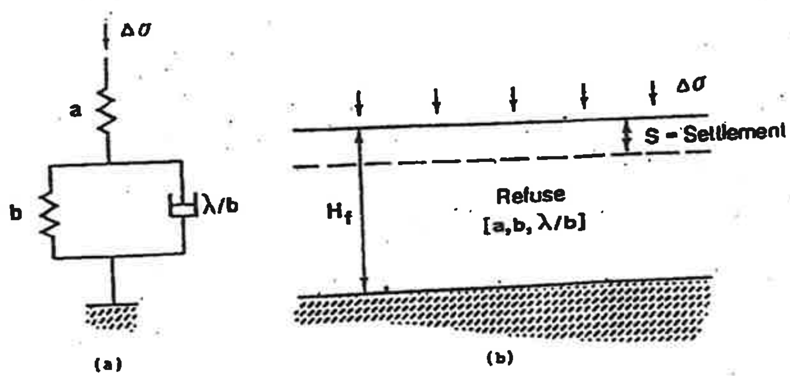

Figure 1 Rheological Model

When a stress increment, $\Delta\sigma$, acts on the model, the Hookean spring, with a spring constant of a, compresses instantaneously. This is analogous to primary compression. The compression of the Kelvin element, with a spring (spring constant of b) parallel to a dashpot (viscosity of λ/b) is retarded by the Newtonian (linear) dashpot. This is similar to the continuous process of secondary compression under sustained effective stress. The sustained load is transferred progressively to the Hookean spring from the Newtonian dashpot. After a long time, (i.e., in the secondary compression range), the full effective stress will be taken by the two springs, thus the dashpot will sustain no load. The time-dependent settlement can be expressed as:

$$S(t) = H\,\epsilon(t) = H\,\Delta\sigma\,\{a + b(1 - \exp[-(\lambda/b)\,t]\} \qquad (1)$$

where
- S = settlement
- H = initial height of refuse
- ϵ = strain (settlement divided by the layer thickness, i.e., S/H)
- $\Delta\sigma$ = compressive stress
- a = primary compressibility parameter
- b = secondary compressibility parameter
- λ/b = rate of secondary compression
- t = time since load application

Power Creep Law

One of the simplest forms of a relation for time-dependent deformation under constant stress and one that has been extensively used in representing the transient creep behavior of many engineering materials is the power creep law. According to this law, the time-dependent settlement can be expressed as:

$$S\,(t) = H\,\epsilon(t) = H\,\Delta\sigma\,m(t/t_r)^n \qquad (2)$$

where
- m = reference compressibility
- n = rate of compression
- t_r = reference time introduced into the equation to make time dimensionless (t_r = 1 day in this study)

Other terms are as defined before.

Determination of Model Parameters

An interactive spread sheet program was developed at the University of Wisconsin-Madison on a personal computer in fitting Eqs 1 and 2 to the settlement-time records from various fills. The program uses the method of the logarithm of strain rate ($\Delta\epsilon/\Delta t$) versus time in determining the parameters, a, b, and λ [7, 8] and the method of the logarithm of strain (ϵ) versus logarithm of time in determining parameters m and n from the settlement-time record.

Accordingly, the settlement-time record is incrementalized and the operator chooses the range over which these functions give a linear plot. From this portion of the plots, model parameters are calculated. The program provides a plot of the actual strain versus time, along with the calculated strain (from the calculated model parameters) versus time so that the quality of curve-fitting can be visually evaluated.

SITES MODELED

Data from four different existing refuse fills were analyzed. All four of these sites are municipal landfills. It was assumed that the refuse in each of these four sites is about the same composition. The sites are in northern climates, thus there is sufficient rainfall to promote the degradation of the refuse which affects settlement. Table 1 summarizes the known values of refuse thickness, settlement, data collection duration, and refuse placement conditions.

Site A

This refuse site is in southeastern Wisconsin. Placement of the refuse fill at this site began in the early 1970's. The settlement data was collected using settlement platforms surveyed periodically from 1984 to 1986. The age of the refuse fill below each platform varied but was estimated to be between 0 to 4 years at the time the data were obtained. The data collection at this site continued for approximately 1.8 years. For this study two categories of loading conditions were considered. The first category is called "minimal filling". This category represents a condition of settlement under essentially self weight during data collection. The second category is called "active filling", since additional refuse and daily cover were added during data collection. Thus, the second category represents a condition of settlement under both self weight and the placement of additional fill above the platforms [9]. The leachate level was about 7.6 m above the base of the landfill during data collection. Near Platforms 7 and 9, there was occasional leachate extraction.

Site B

This refuse site is in southern Michigan. The refuse fill has been placed in the landfill since 1969. In 1985 an expansion area was constructed on top of the existing fill. The settlement data collection began in 1985, during placement of the additional fill in the expansion area. Again, two differing conditions existed during this 1.2 year study. The first was the old refuse that was already in place below the settlement platform. After the placement of new refuse, settlement was monitored at varying hor[illegible]l distances of between 50 to 250 feet from the expansion

TABLE 1 — REFUSE SETTLEMENT DATA

Platform Number	Refuse Thickness (m)	Settlement (m)	Time Duration (yr)	Placement Condition
SITE A				
1	13.73	0.52	1.6	Fresh Refuse: No filling
2	8.01	0.59	1.6	Fresh Refuse: No filling
3	9.25	1.11	1.6	Fresh Refuse: No filling
4	9.84	1.19	1.8	Fresh Refuse: No filling
15	26.74	0.37	1.5	Fresh Refuse: Minimal filling < 1m
16	25.15	0.43	1.3	Fresh Refuse: Minimal filling < 1m
7	36.28	1.09	1.7	Fresh Refuse: Minimal filling < 1m
9	34.72	1.12	1.5	Fresh Refuse: Minimal filling < 1m
8	38.75	3.20	1.5	Fresh Refuse: Active filling > 6m
10	37.38	2.99	1.7	Fresh Refuse: Active filling < 6m
11	19.66	2.10	1.4	Fresh Refuse: Active filling < 6m
12	27.94	1.94	0.7	Fresh Refuse: Active filling < 6m
13	23.46	0.72	1.1	Fresh Refuse: Active filling > 6m
14	19.06	1.62	1.3	Fresh Refuse: Active filling > 6m
17	22.28	2.74	1.1	Fresh Refuse: Active filling > 6m
SITE B				
S-4	15.24	0.09	1.2	Old Refuse: No filling
S-5	15.24	0.21	1.2	Old Refuse: No filling
S-6	15.24	0.94	1.2	Fresh Refuse: Active filling
SITE C				
84-2	10.06	0.65	4.0	Old Refuse: Relocated/Compacted
84-3	10.06	0.58	4.0	Old Refuse: Relocated/Compacted
84-4	11.58	0.60	4.1	Old Refuse: Relocated/Compacted
84-5	5.49	0.33	4.1	Old Refuse: Relocated/Compacted
84-6	10.06	0.61	3.9	Old Refuse: Relocated/Compacted
84-7	11.58	0.52	3.3	Old Refuse: Relocated/Compacted
SITE D				
SP1	3.05	0.38	0.9	Old Refuse: Surcharge
SP2	3.05	0.64	0.9	Old Refuse: Surcharge
SP3	3.05	0.44	0.9	Old Refuse: Surcharge

area. The second condition was the active filling of fresh refuse directly above the settlement platform [10].

Site C

This refuse site is in western Connecticut. A 40 to 50 year old "town dump" was excavated and relocated at a new site. This site was monitored for 5 years. The only settlement that occurred was due to the self weight of the compacted refuse [11].

Site D

Site D consisted of (a) experimental cells that were constructed to monitor settlement and (b) an area of old refuse below the settlement platform when an embankment load was added. The duration for this study was 1 year [12].

MODELING

The settlement platforms were placed as shown in Fig. 2. The refuse thickness (H_0) is the initial thickness of the refuse below the settlement plate. Additional refuse was placed above the settlement platform (h). The times of placement of the additional refuse above the platforms were unavailable for the four sites. It was assumed that the additional refuse above the platform was placed at time zero, when the data collection was started. The average applied stress ($\Delta\sigma$) in the layer of refuse below the platform was calculated as follows:

$$\Delta\sigma = \gamma h + 1/2(\gamma H_0) - 1/2(\gamma + \gamma_w - \gamma_{sat})(H_w^2/H_0) \quad (3)$$

where:

$\Delta\sigma$ = average applied stress
γ = moist unit weight of refuse
γ_{sat} = saturated unit weight of refuse
γ_w = unit weight of leachate (water)
H_0 = initial height of refuse below platform
h = height of refuse above platform
H_w = height of leachate above base liner

A moist unit weight of 10.7 kN/m^3 and a saturated unit weight of 14.6 kN/m^3 were used in computing the average applied stress at each of the sites.

The programs that were used to model the Gibson and Lo model and the power creep law plotted predicted strain versus log time, along with the actual strain versus log time for the data that was input. Emphasis was placed on the later portion of the curve in the case of the Gibson and Lo model, where secondary compression occurs, and there is a constant effective stress. In the case of the power creep law, the whole range of the data was considered in

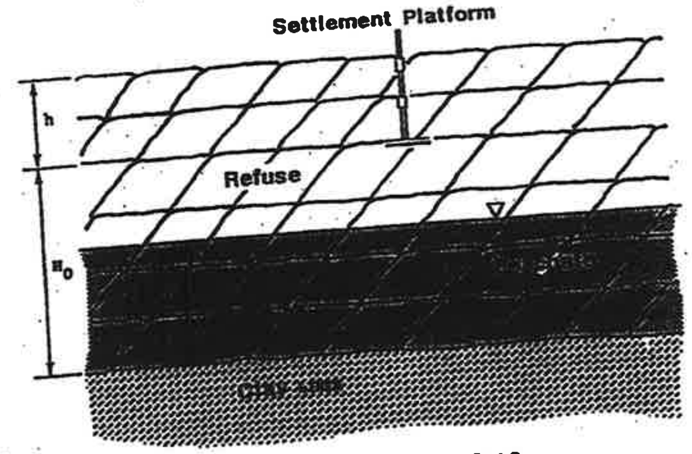

Figure 2 Typical Settlement Platform

curve-fitting.The curve fitting predictions were generally accurate, with a few exceptions of the early data not fitting the computed curve, especially for the Gibson and Lo model. Fig. 3 shows typical curves fitted to the data using the two methods.

A few of the settlement records could not be analyzed with these models. It is believed that these records violated the assumption of constant stress change. Overall, the power creep law gave a better representation of the data in 65% of the cases than the Gibson and Lo model. For the remaining 35% of the cases, it was comparable to the Gibson and Lo model, except only one case.

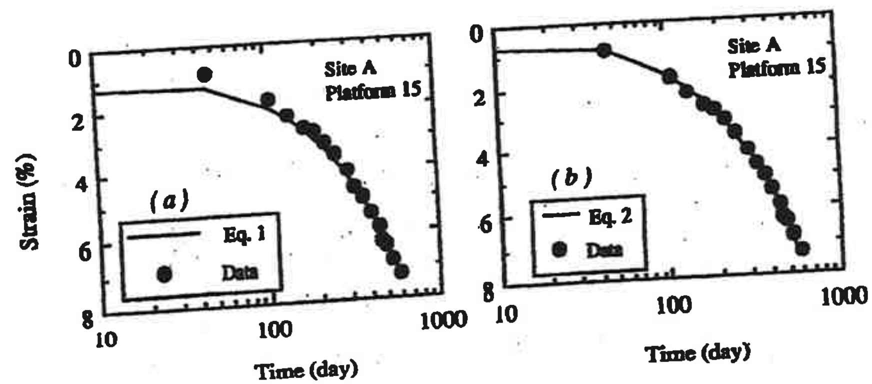

Figure 3 Strain-time curves by a) the rheological model and b) the power creep law fitted to the measured data

REFUSE COMPRESSION MODEL PARAMETERS

Gibson and Lo Model Parameters

The three empirical parameters of the Gibson and Lo model derived for the four sites are summarized in Table 2 and plotted in Figs. 4, 5 and 6. The curves in these figures are trends not actual relations. Fig. 4 plots a, the primary compressibility as a function of stress. The amount of primary compression decreases with an increase in stress. For the "active" filling in Site A, a higher value was obtained indicating more primary settlement was occurring during placement of the fresh refuse. In Fig. 5 the secondary compressibility, b, is shown to decrease with increasing stress. Generally, the "active" filling sites show lower amounts of secondary settlement than for the "minimal" filling sites. This is due to the fact that the "active" filling cases were still experiencing substantial primary settlement. Undisturbed old refuse from sites B and C has a lower secondary compressibility compared to fresh refuse or old refuse recently surcharged (Sites A and D and Platform S6 from Site B). The rate of secondary compression, λ/b, as a function of average strain rate is illustrated in Fig. 6. Average strain rate is defined as total strain divided by elapsed time during data collection. As expected, as the average strain rate increases, so does the rate of secondary compression. This behavior was also observed for peat soils [7] and indicates that the dashpot is essentially nonlinear in the model. The implification of this is that the parameters obtained from a fill must be extrapolated with care to another fill with different refuse thickness and applied stress even if the composition and location are similar. There was not any observable effect of leachate extraction on the parameters, perhaps because of its limited scope.

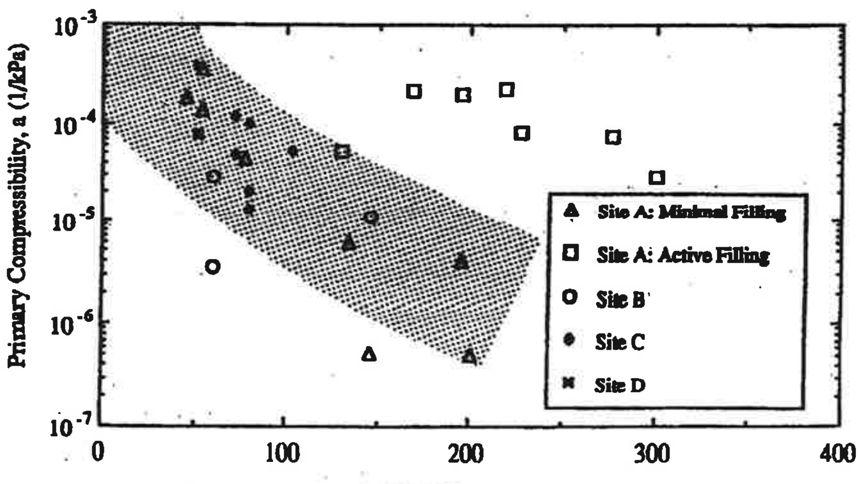

Figure 4 Primary compressibility verus applied stress

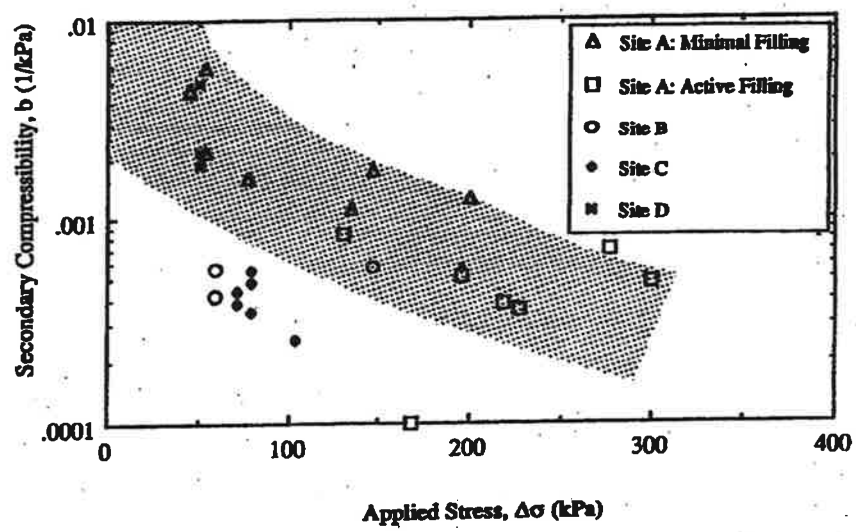

Figure 5 Secondary compressibility versus applied stress

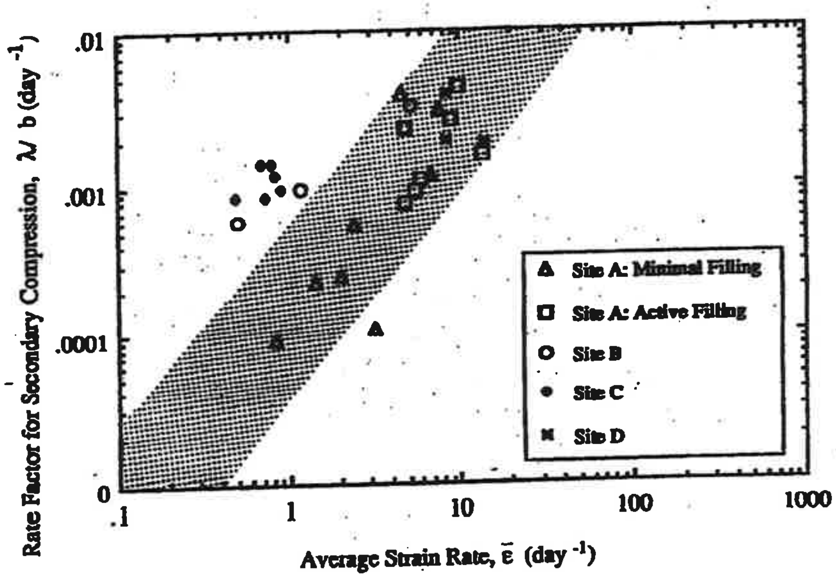

Figure 6 Rate of secondary compression versus average strain rate

TABLE 2 -- EMPIRICAL MODEL PARAMETERS

Platform Number	Applied Stress (kPa)	Average Strain (%/yr)	Gibson & Lo a (1/kPa)	Gibson & Lo b (1/kPa)	Gibson & Lo λ/b (1/day)	Power Creep m (1/kPa)	Power Creep n (t_r = 1 day)
SITE A							
1	77.21	2.37	4.42e-5	1.62e-3	5.60e-4	5.48e-6	0.702
2	54.09	4.59	1.40e-4	5.87e-3	4.00e-3	5.75e-6	0.862
3	53.58	7.51	3.52e-4	2.10e-3	3.10e-3	1.38e-4	0.438
4	45.00	6.81	1.78e-4	4.58e-3	1.20e-3	1.10e-5	0.850
15	146.27	0.83	5.32e-7	1.77e-3	9.20e-5	7.52e-8	1.131
16	134.12	1.42	6.11e-6	1.13e-3	2.30e-4	9.00e-8	1.170
7	195.65	3.14	4.10e-6	5.49e-4	1.10e-4	1.61e-6	0.804
9	200.16	2.01	5.11e-7	1.24e-3	2.50e-4	3.15e-7	0.980
8	276.40	5.50	7.76e-5	6.01e-4	9.40e-4	3.10e-6	0.744
10	227.76	4.84	8.35e-5	3.54e-4	2.40e-3	3.40e-6	0.746
11	168.01	13.58	2.12e-4	1.00e-4	1.60e-3	1.67e-5	0.619
12	195.32	4.74	1.99e-4	5.05e-4	7.70e-4	5.48e-5	0.297
13	219.07	5.89	2.30e-4	3.75e-4	1.10e-3	5.89e-5	0.302
14	130.12	8.98	5.34e-5	8.40e-4	2.70e-3	1.30e-5	0.870
17	300.29	9.82	2.86e-5	4.74e-4	4.30e-3	1.16e-6	1.005
SITE B							
S-4	59.88	0.50	3.60e-6	4.10e-4	6.00e-4	7.85e-7	0.779
S-5	59.88	1.17	2.80e-5	5.60e-4	9.70e-4	2.25e-6	0.759
S-6	146.10	5.17	1.10e-5	5.70e-4	3.30e-3	8.83e-6	0.648
SITE C							
84-2	79.42	0.90	1.00e-4	4.70e-4	9.70e-4	6.48e-5	0.264
84-3	79.42	0.48	1.30e-5	3.50e-4	8.40e-4	1.10e-5	0.409
84-4	71.66	0.83	1.20e-4	4.30e-4	1.20e-3	5.14e-5	0.304
84-5	102.79	0.68	5.20e-5	2.50e-4	1.40e-3	2.75e-5	0.314
84-6	79.42	0.72	2.00e-5	5.40e-4	8.40e-4	1.40e-5	0.465
84-7	71.66	0.79	4.90e-5	3.80e-4	1.40e-3	1.67e-5	0.443
SITE D							
SP1	50.97	8.33	7.50e-5	1.90e-3	4.00e-3	4.69e-5	0.593
SP2	50.97	14.00	8.00e-5	4.90e-3	1.90e-3	4.85e-5	0.666
SP3	50.97	8.44	3.80e-4	2.20e-3	2.00e-3	8.57e-5	0.486

Power Creep Law Parameters

The two empirical parameters of the power creep law derived for the four sites are given in Table 2. These parameters did not indicate any discernible trends with the respect to applied stress or average strain in each site within the range of variation of these factors. Reference compressibility, m has an average value of about 2.5 x 10^{-5} 1/kPa and it is about 1.7 times higher for old refuse (3.4 x 10^{-5} 1/kPa) than fresh refuse (2.0 x 10^{-5} 1/kPa). It shows no discernible patterns with respect to placement conditions of the refuse. However, it is quite variable, especially in Sites A and B. Rate of compression, n has an average of 0.65 and indicates some patterns with respect to age and placement conditions of the refuse. For instance, old relocated refuse from Site C that was compacted during placement had the lowest average n = 0.37 and, in general, fresh refuse had an average n value of nearly 1.5 times as that of old refuse. The variability of n is not as great as that of m; however, it is more variable in Site A than the other three sites.

COMPARISON OF THE MODELS

For Site A, the first year of data obtained was used to predict the amount of settlement that could be expected at the end of the data collection period which was about two years. The results obtained using both models are compared with the actual measurements in Table 3. The Gibson and Lo model predicted the amount of settlement at the end of two years within 2 to 18% of the actual settlement that occurred for minimal filling and 4 to 21% for active filling. The power creep law predictions for the same conditions were 0 to 6% and 0 to 14%, respectively.

TABLE 3 -- COMPARISON OF PREDICTED SETTLEMENT

Platform Number	Settlement (m) Actual	Settlement (m) Gibson & Lo	Settlement (m) Power Creep	Percent Diviation (%) Gibson & Lo	Percent Diviation (%) Power Creep
Minimal Filling					
1	0.52	0.43	0.53	-17	2
2	0.59	0.59	0.59	0	0
3	1.11	1.09	1.06	-2	-4
4	1.19	1.23	1.24	4	5
7	1.88	1.54	2.00	-18	6
Active Filling					
8	3.34	3.19	3.38	-4	1
10	2.99	2.93	3.18	-2	6
12	1.94	1.91	1.94	-1	0
13	2.03	2.00	1.97	-2	-3
14	2.95	2.32	2.53	-21	-14

CONCLUSIONS

From the limited data, the following conclusions can be made:

1. Refuse settlement can be modeled satisfactorily with either a rheological model as presented in the Gibson and Lo theory or the power creep law.

2. Power creep law provides a better representation of the settlement data than the rheological model. However, the rheological model has parameters that can be assigned physical meaning and reflect the effects of certain refuse placement conditions.

3. While active filling is ongoing, primary compression is significant compared to secondary compression; and

4. Once filling has stopped, secondary compression is more evident.

Further landfill sites need to be instrumented for data collection and analyzed to develop a data bank of ranges for the empirical parameters for different stages of the landfill life.

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[9] Edil, T. B., Ranguette, V. J. and Otzelberger D. G, "Comparison of Refuse Settlement Prediction Models," Proceedings of the Twelfth Annual Madison Waste Conference, Madison, Wisconsin, 1989.

[10] Dodt, M. E., Sweatman, M. B. and Bergstom, W. R. "Field Measurement of Landfill Surface Settlements," Geotechnical Practice for Waste Disposal '87, A.S.C.E Geotechnical Special Publication No. 13, 1987.

[11] Keene, P. F., "Sanitary Landfill Treatment, Interstate Highway 84", Geotechnical Practice for Disposal of Solid Waste Materials, A.S.C.E., Geotechnical Engineering Division, 1977.

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APPENDIX I

STABILITY ANALYSIS AND SUPPORTING DOCUMENTATION

SRK Consulting	SUBJECT: Slope Stability and Deformation Analysis – Bridgeport Landfill Closure		
	Job No: 146907 Reference:	Made by: SHY Checked: Reviewed:	Date: 8/28/2008 Sheet 1 of 2 Revised:

Assumptions:

1. The critical section is D-D' cross-section shown on Drawings 3 and 4.

2. The final cover system consists of the following components from top to bottom:

   - 18-inch vegetative layer;
   - Geomembrane/geotextile Liner; and
   - 24-inch foundation layer.

3. For slope stability analyses, on-site soils, either underlying the waste mass or within the final cover layer, were considered to be medium dense with a density of approximately 120 pcf, a friction angle of 32 degrees, with no cohesive strength.

4. Assuming a waste to soil ratio of 3:1, a compacted in-place waste density of 800 pounds per cubic yard (pcf), and a compacted cover soil density of 120 pcf, a weighted waste/cover soil density of 52.2 pcf was calculated for use in the stability analyses. The waste mass was represented in the stability analyses with a friction angle of 30 degrees and no cohesive strength.

5. Based on the direct shear test, the friction angle of 31.9 degrees and cohesion of 0 psf between the geomembrane liner and the soil was adopted.

6. For analysis purpose, the liner layer was assigned the same parameters as the interface friction and cohesion between liner and soil (i.g., friction angle = 31.9 degrees and cohesion =0). Refer to attached results of large scale direct shear testing on liner interface components.

7. A search within the USGS Internet database returned a 10%-in-50-years peak acceleration (PGA) value of 0.37g. The PGA was reduced to 0.25g (65 percent of the PGA). The vertical acceleration is assumed to 2/3 of the horizontal acceleration.

8. The closest fault is Robinson Creek, which is less than 5 miles from the site with a historic maximum magnitude of 6.4.

SRK Consulting	SUBJECT: Slope Stability and Deformation Analysis – Bridgeport Landfill Closure		
	Job No: 146907 Reference:	Made by: SHY Checked: Reviewed:	Date: 8/28/2008 Sheet 2 of 2 Revised:

Conclusions:

1. Slope stability analysis is summarized in the following table:

Failure Mode	Horizontal Acceleration	Vertical Acceleration (2/3 PHA)	Factor of Safety
Circular	Static	Static	2.31
	0.25g	0.168g	1.04
Block (Failure along the interface between soil cover and liner)	Static	Static	2.39
	0.25g	0.168g	1.03

2. Deformation Analysis using ky from Slide

Sliding Mode	Probability of Exceedence	Yield Coefficient (ky, g)	Calculated Equivalent Acceleration (kmax, g)	ky/kmax	Estimated Displacement *U* at Mw 6.4 (inches)
Entire Cover Sliding	16%	0.26	0.4	0.65	0.85
	50%		0.31	0.84	0.09
Localized Cover Sliding	16%	0.26	0.77	0.34	**9.18**
	50%		0.6	0.43	1.74

3. Deformation Analysis using ky from Equation 1

Slope angle for (3:1slope) =	18.4	
Friction angle =	31.9	
ky=	0.24	by Equation 1

Sliding Mode	Probability of Exceedence	Yield Coefficient (ky, g)	Calculated Equivalent Acceleration (kmax, g)	ky/kmax	Estimated Displacement *U* at Mw 6.4 (inches)
Entire Cover Sliding	16%	0.24	0.4	0.60	1.24
	50%		0.31	0.77	0.14
Localized Cover Sliding	16%	0.24	0.77	0.31	**11.2**
	50%		0.6	0.40	2.24

Bray Method (1998)

For seismic loading of the entire cover slope

Mw =	6.4	<---- input	
Distance =	8 km	<---- input	

Refuse mass:	ky =	0.24 (g)	<---- input	
Refuse Height	40.0 ft =		12.19 m	<---- input
Coefficient used in the Cover Liner =			0.65	<---- input

MHA_{Rock} =	0.33 g	(Figure 2(a))
T_m =	0.46 s	(Figure 2(b))
$D_{5\text{-}95}$ =	9.2 s	(Figure 2(c))
V_s =	201 m/s	when the height of refuse is 12.19 m. (Figure3)
$T_s = 4H/V_s$ =	0.24 s	
T_s/T_m =	0.53	
NRF =	1.06	when MHA_Rock is 0.33g. (Figure 6)

Using Median Value

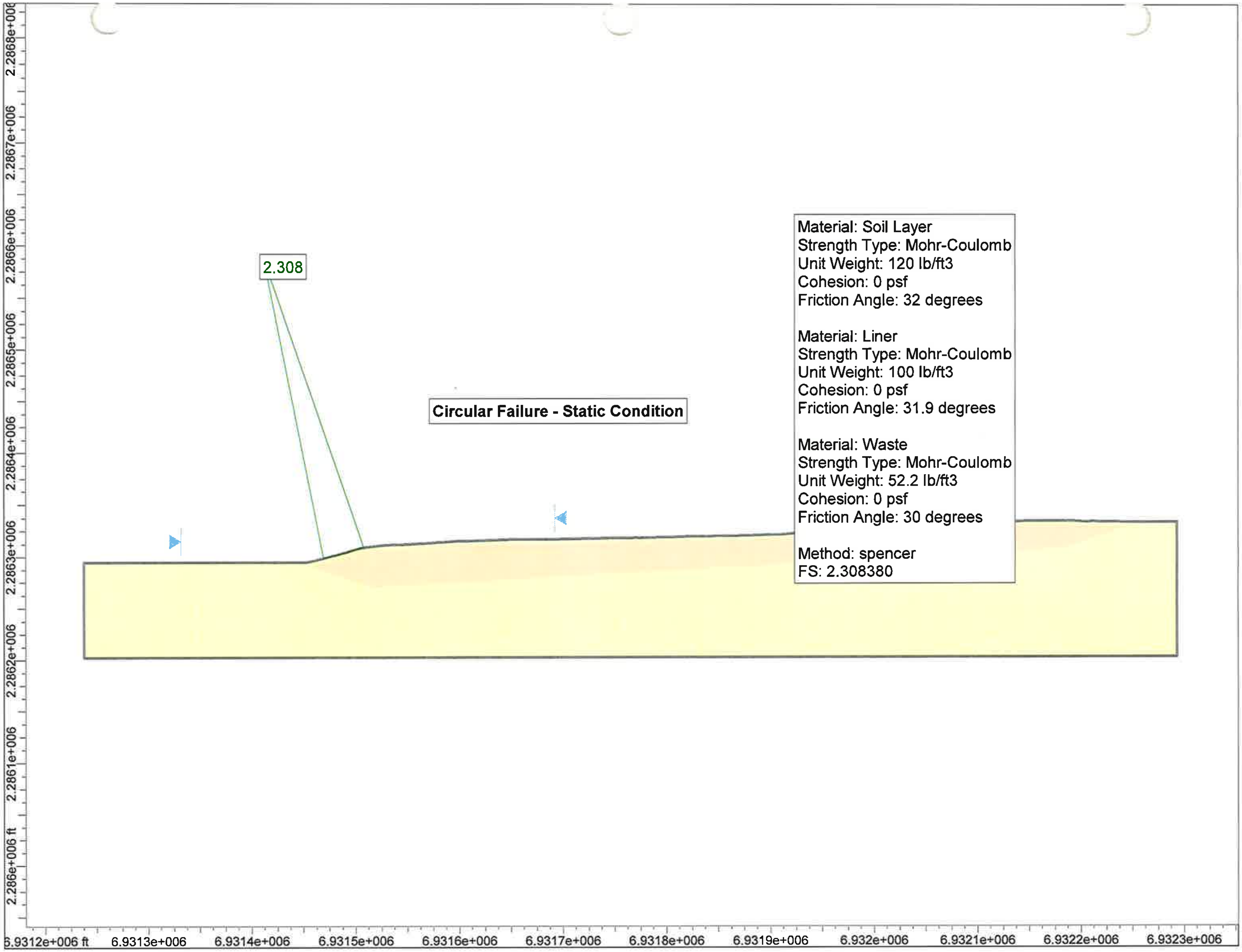
Cover Sliding

$MHA_{Top}/[(MHA_{Rock})(NRF)]$ =		1.37	when Ts/Tm is 0.53. (Figure 8)
MHA_{Top} =	0.48 g		
$MHEA_{Cover}$ =	0.31 g when the coefficient of 0.65 is used.		
$k_{max} = MHEA_{Cover}/g$ =	0.31		
k_y/k_{max} =	0.77		
U =	3.54 mm=	0.14 inch	when ky/kmax is 0.77. (Figure 12)

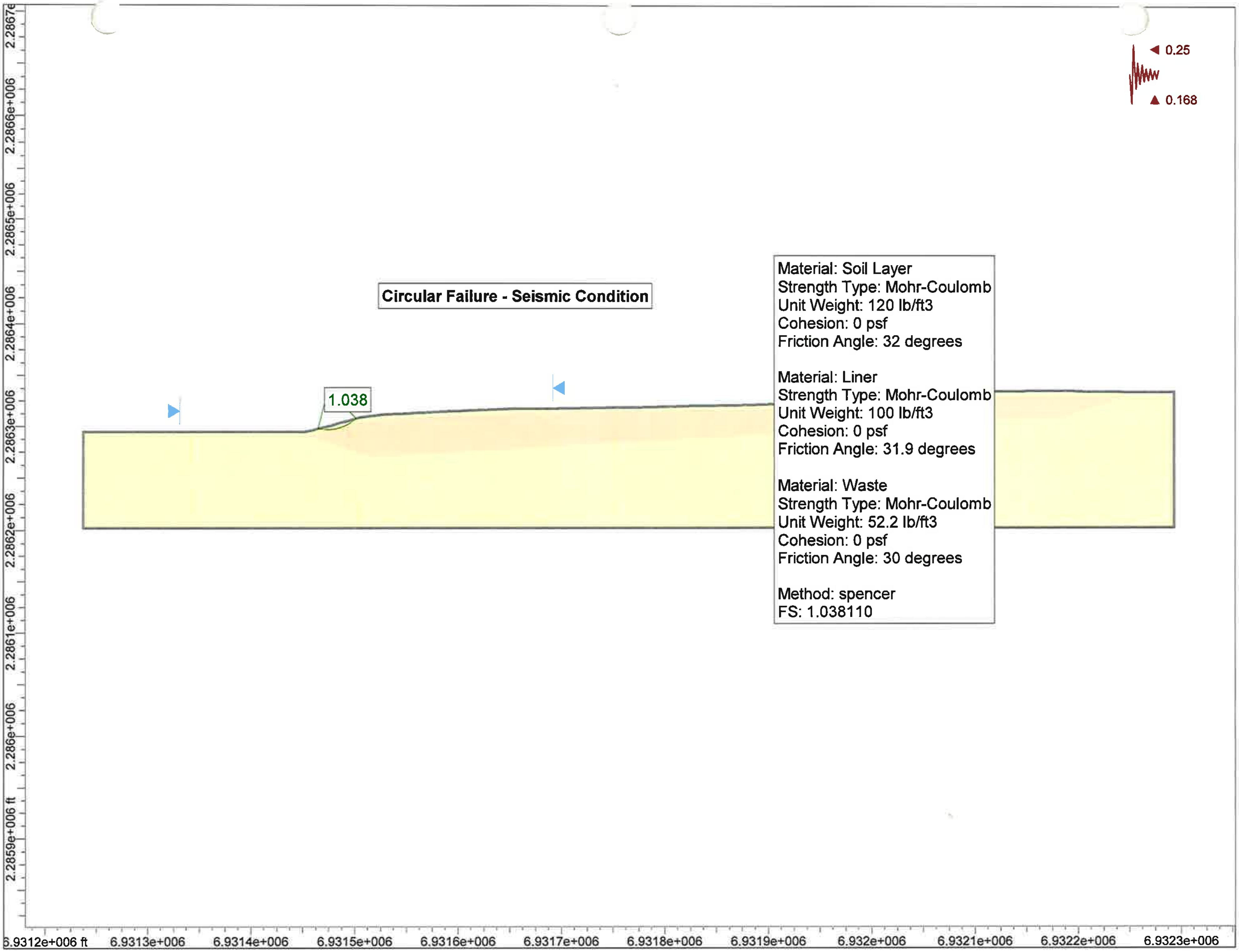
Using 16% Exceedance Value

Cover Sliding

$MHA_{Top}/[(MHA_{Rock})(NRF)]$ =		1.74	when Ts/Tm is 0.53. (Figure 8)
MHA_{Top} =	0.61 g		
$MHEA_{Cover}$ =	0.40 g when coefficient of 0.65 is used.		
$k_{max} = MHEA_{Cover}/g$ =	0.40		
k_y/k_{max} =	0.60		
U =	32 mm=	1.24 inch	when ky/kmax is 0.6. (Figure 12)



2.308
Circular Failure - Static Condition
Material: Soil Layer
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees
Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 31.9 degrees
Material: Waste
Strength Type: Mohr-Coulomb
Unit Weight: 52.2 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Method: spencer
FS: 2.308380
2.2868e+006
2.2867e+006
2.2866e+006
2.2865e+006
2.2864e+006
2.2863e+006
2.2862e+006
2.2861e+006
2.286e+006 ft
6.9312e+006 ft
6.9313e+006
6.9314e+006
6.9315e+006
6.9316e+006
6.9317e+006
6.9318e+006
6.9319e+006
6.932e+006
6.9321e+006
6.9322e+006
6.9323e+006


0.25
0.168
Circular Failure - Seismic Condition
1.038
Material: Soil Layer
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees
Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 31.9 degrees
Material: Waste
Strength Type: Mohr-Coulomb
Unit Weight: 52.2 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Method: spencer
FS: 1.038110
6.9312e+006 ft
6.9313e+006
6.9314e+006
6.9315e+006
6.9316e+006
6.9317e+006
6.9318e+006
6.9319e+006
6.932e+006
6.9321e+006
6.9322e+006
6.9323e+006
2.2859e+006 ft
2.286e+006
2.2861e+006
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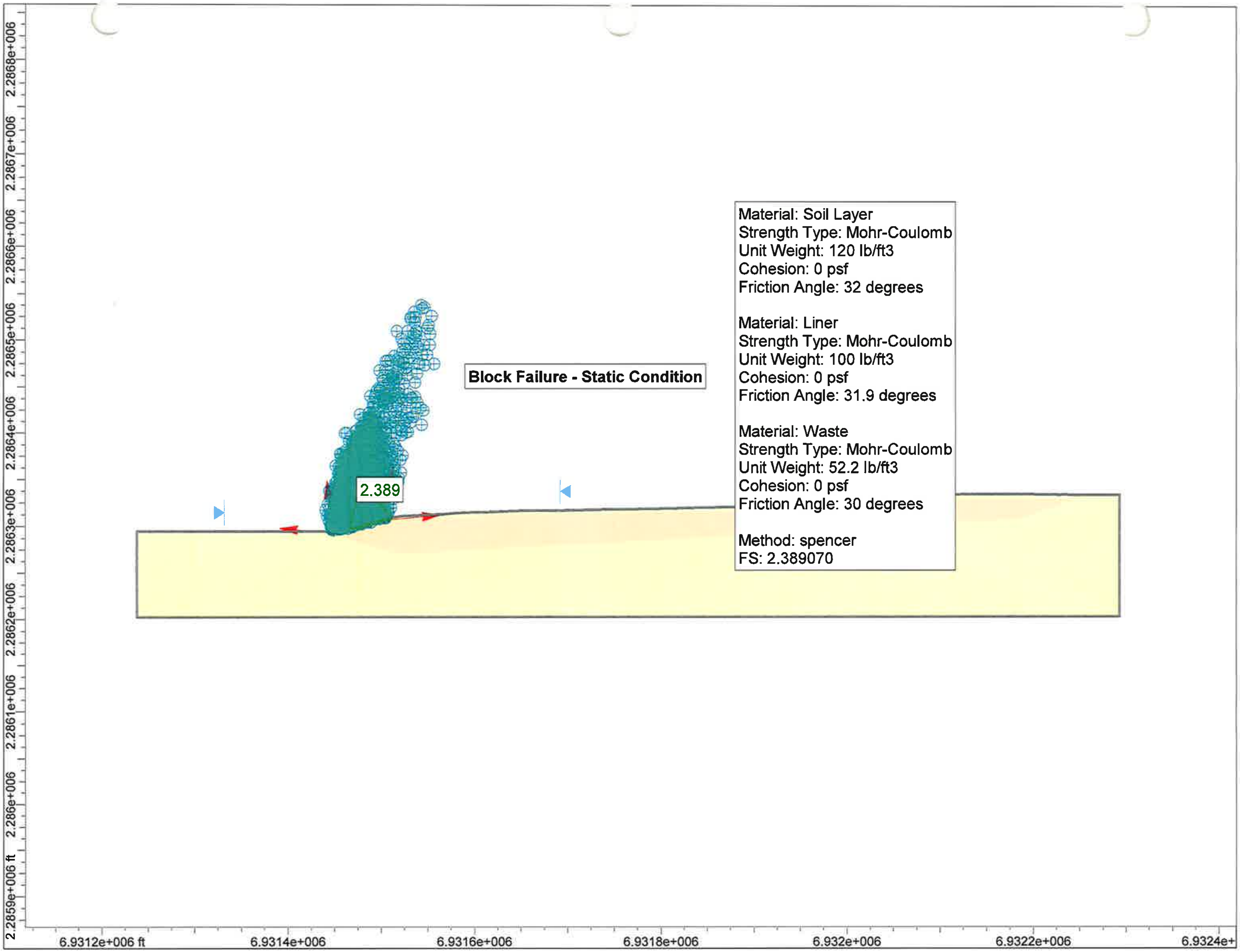
2.2863e+006
2.2864e+006
2.2865e+006
2.2866e+006
2.2867e



Block Failure - Static Condition
Material: Soil Layer
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees
Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 31.9 degrees
Material: Waste
Strength Type: Mohr-Coulomb
Unit Weight: 52.2 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Method: spencer
FS: 2.389070
2.389
6.9312e+006 ft
6.9314e+006
6.9316e+006
6.9318e+006
6.932e+006
6.9322e+006
6.9324e+
2.2859e+006 ft
2.286e+006
2.2861e+006
2.2862e+006
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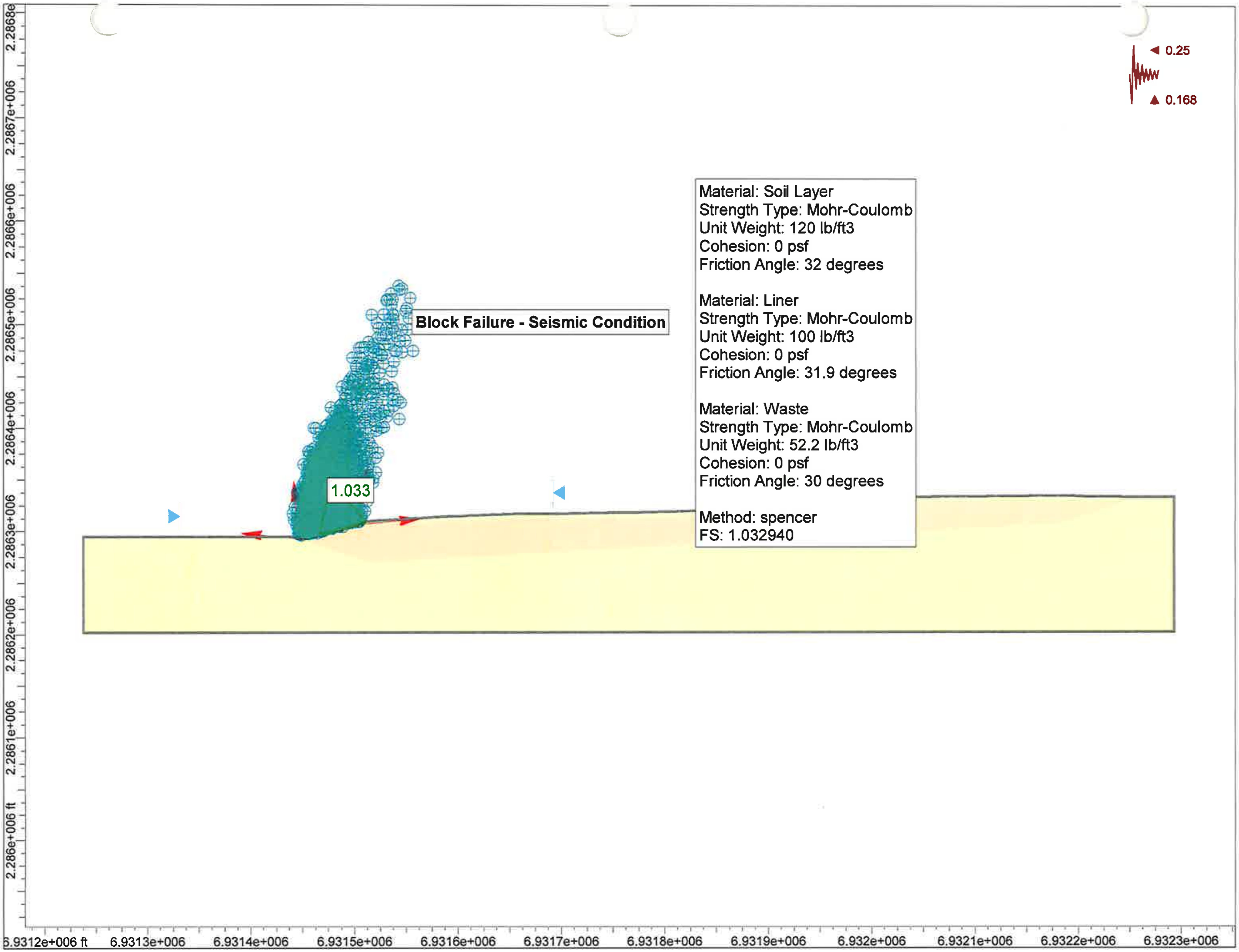
2.2866e+006
2.2867e+006
2.2868e+006



Block Failure - Seismic Condition
Material: Soil Layer
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees
Material: Liner
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 31.9 degrees
Material: Waste
Strength Type: Mohr-Coulomb
Unit Weight: 52.2 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Method: spencer
FS: 1.032940
1.033
0.25
0.168
6.9312e+006 ft
6.9313e+006
6.9314e+006
6.9315e+006
6.9316e+006
6.9317e+006
6.9318e+006
6.9319e+006
6.932e+006
6.9321e+006
6.9322e+006
6.9323e+006
2.286e+006 ft
2.2861e+006
2.2862e+006
2.2863e+006
2.2864e+006
2.2865e+006
2.2866e+006
2.2867e+006
2.2868e

FINAL REPORT
LARGE SCALE INTERFACE DIRECT SHEAR TESTING

Prepared for:

SRK Consulting
5250 Neil Road, Suite 300
Reno, NV 89502

Prepared by:

Advanced Terra Testing, Inc.
833 Parfet Street, Unit A
Lakewood, Colorado 80215

Project No. 2030-83

July 24, 2008

SRFI0708.doc

This laboratory test program report is for the exclusive use of SRK Consulting and consists of three Large Scale Interface Direct Shear Test Series consisting of three separate points each, performed on cover soil, select Agru Super Grip 60 mil LLDPE Spikes, Studs and Geotextile materials supplied to Advanced Terra Testing, Inc. (ATT) by Agru America and cover soil supplied by SRK. The test series was performed at three normal stress levels ranging from 288 to 1440 psf, as required by SRK Consulting.

The Large Scale Interface Direct Shear Tests were run in general accordance with ASTM D 5321, "Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method." The testing was conducted on ATT's Large Scale Direct box which utilizes a 12 inch x 12 inch upper (stationary) box and a 12 inch x 16 inch lower (traveling) box.

GEOSYNTHETIC AND SOIL MATERIAL

- One roll of Agru Super Grip Spike and Stud 60 mil LLDPE
- One roll of 8 ounce/yard Non-Woven Geotextile
- Eight buckets of Cover Soil Material (Combined)

INTERFACE DIRECT SHEAR TEST

The Direct Shear Test as requested by SRK Consulting was configured as follows:

Direct Shear Test Series 1: Cover Soil vs. Agru Super Grip Spikes

For this test series, the Cover Soil material was compacted to 90% of the maximum dry density of 130.2 pounds per cubic foot (pcf), and at 10.4% moisture content (optimum moisture content). The 60 mil LLDPE Agru Super Grip Spikes was placed spike side down bolted to the top (stationary)and placed over the compacted cover soil material. Prior to shearing, the samples were inundated and allowed to consolidate for not less than fifteen minutes at normal loads of 288, 720 and 1440 psf. Shear tests were conducted at a rate of 0.04 inches per minute. Shear displacement and shear load data were collected by a computer during shear testing.

Direct Shear Test Series 2: Cover Soil vs. Geotextile, Agru Super Grip Studs

For this test series, the Cover Soil material was compacted to 85% of the maximum dry density of 130.2 pounds per cubic foot (pcf), and at 10.4% moisture content (optimum moisture content). The non-woven Geotextile Heat Set down and 60 mil LLDPE Agru Super Grip Studs was placed stud side down bolted to the top (stationary) and placed over the compacted cover soil material. Prior to shearing, the samples were inundated and allowed to consolidate for not less than fifteen minutes at normal loads of 288, 720 and 1440 psf. Shear tests were conducted at a rate of 0.04 inches per minute. Shear displacement and shear load data were collected by a computer during shear testing.

Direct Shear Test Series 3: Cover Soil, Geotextile vs. Agru Super Grip Studs

For this test series, the Cover Soil material was compacted to 85% of the maximum dry density of 130.2 pounds per cubic foot (pcf), and at 10.4% moisture content (optimum moisture content). The non-woven Geotextile Heat Set down was bolted to the bottom (traveling box) and the 60 mil LLDPE Agru Super Grip Studs was placed stud side down bolted to the top (stationary) and placed over the Geotextile and compacted cover soil material. Prior to shearing, the samples were inundated and allowed to consolidate for not less than fifteen minutes at normal loads of 288, 720 and 1440 psf. Shear tests were conducted at a rate of 0.04 inches per minute. Shear displacement and shear load data were collected by a computer during shear testing.

The ATT Large Scale Direct Shear box design included a lower (traveling) box with a larger surface area than the upper (stationary) box, and thus all tests are performed using a constant effective sample area requiring no area corrections when computing normal and shear stresses.

For each test in this Direct Shear Test Series, fresh geosynthetic and soil specimens were prepared for each normal stress condition. With the exception of Direct Shear Test Series 2, cover soil had to be re-used for normal stressed of 720 and 1440 psf. No noticeable break down of the material.

The Direct Shear resistance for the test series was evaluated for each applied normal stress. The actual test data, a schematic of the configuration and the Compaction Test are presented in Appendix A. The test data were plotted on a graph of Shear Stress versus Shear Displacement for each configuration. Normal Stress vs. Peak Shear Stress and Normal Stress vs. Post – Peak Shear Stress graphs depict Normal and Corresponding Shear Loads only. The Cohesion (psf) and the Best Fit Line drawn through the three normal loads are not presented in the instance of DS-2 and DS-3 due to the data suggested negative cohesion intercept therefore, no values are reported.

OBERVATIONS

It was noticed that on all three Direct Shear Test Series sets and that the cover soil on all normal stresses began to plow.

This concludes our report for Large Scale Interface Direct Shear Testing performed as requested by SRK Consulting. The results reported apply only to the materials supplied and do not apply to other materials or test conditions for SRK project #146907.

APPENDIX A

INTERFACE DIRECT SHEAR TEST DATA

SCHEMATICS of the CONFIGURATIONS

and

COMPACTION TEST
ASTM D 1557/B

ATTERBERG LIMITS TEST
ASTM D 4318

GRAIN SIZE ANYLSAS
-3 inch to #200 Sieve
ASTM6913

LARGE SCALE INTERFACE DIRECT SHEAR TEST DATA

ASTM D 5321 - 12" x 12" Box

Client:	SRK Consulting	Date:	07/24/2008
Project No:	2030-83	Test Date:	07-14,15-08
Project:	#146907	Technician:	WAR
Interface:	Compacted Subgrade vs. Agru Super Grip Spikes	Shear Rate:	0.04"/min
Special conditions:	Inundated, 90% MDD @ Optimum MC of 10.4%	Test Series:	DS-1

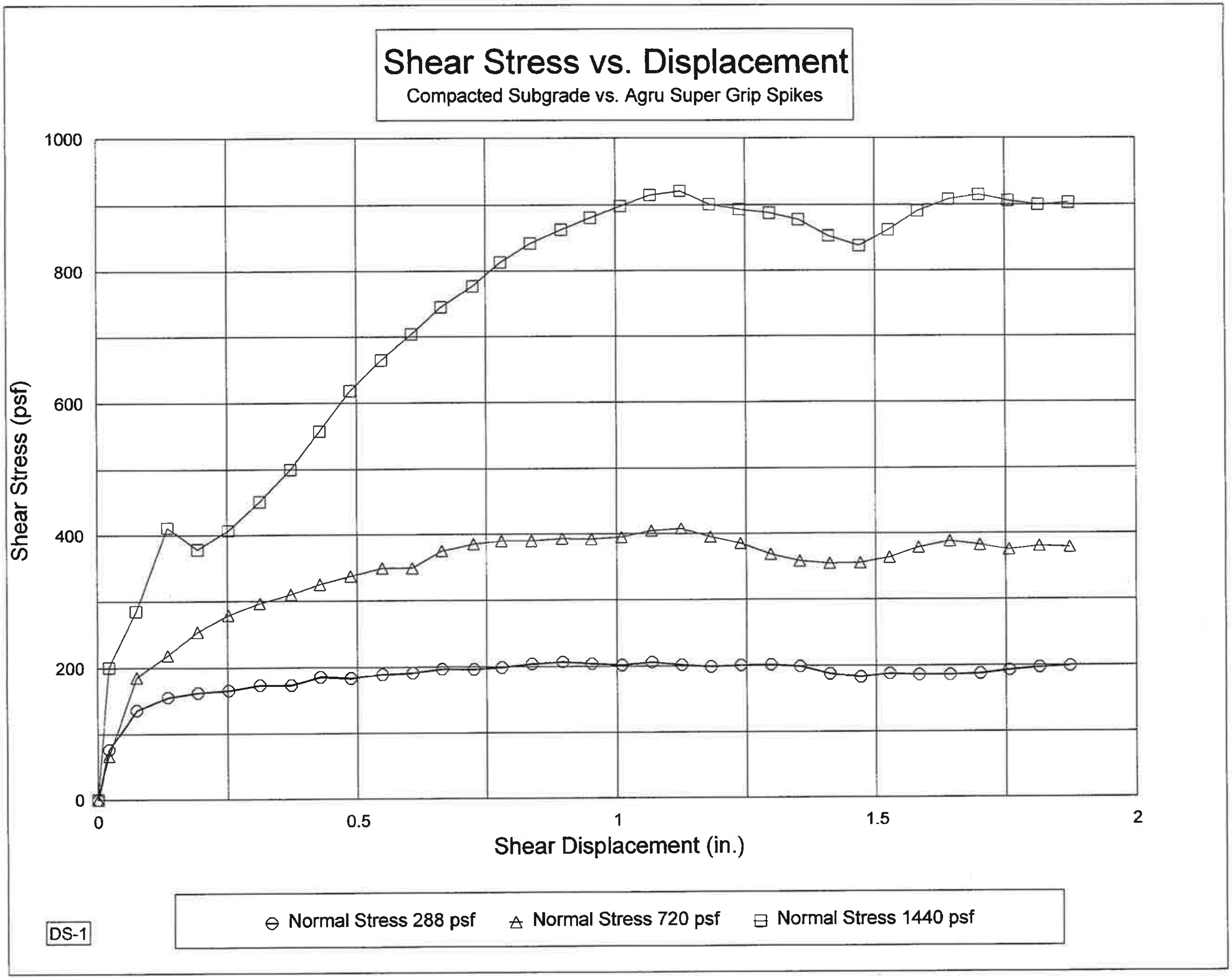
Displacement (inches)	Normal Stress 288 psf Shear Stress (psf)	Normal Stress 720 psf Shear Stress (psf)	Normal Stress 1440 psf Shear Stress (psf)
0	0	0	0
0.022	76	66	201
0.075	136	186	285
0.136	156	219	412
0.193	163	254	378
0.252	166	279	407
0.313	174	297	451
0.373	174	310	500
0.429	186	325	558
0.488	184	337	618
0.549	189	349	664
0.607	191	349	704
0.664	197	375	745
0.725	196	385	777
0.779	199	390	813
0.837	204	390	842
0.896	207	393	863
0.952	204	392	881
1.01	202	395	898
1.068	206	405	915
1.125	202	408	921
1.181	199	395	901
1.239	201	385	893
1.297	202	368	888
1.353	199	358	878
1.411	188	354	853
1.47	183	355	838
1.527	188	363	862
1.583	186	378	890
1.643	186	388	908
1.701	188	382	915
1.757	193	375	906
1.815	197	380	900
1.873	199	378	903

Data Entered By: SR　　Date: 07/24/2008

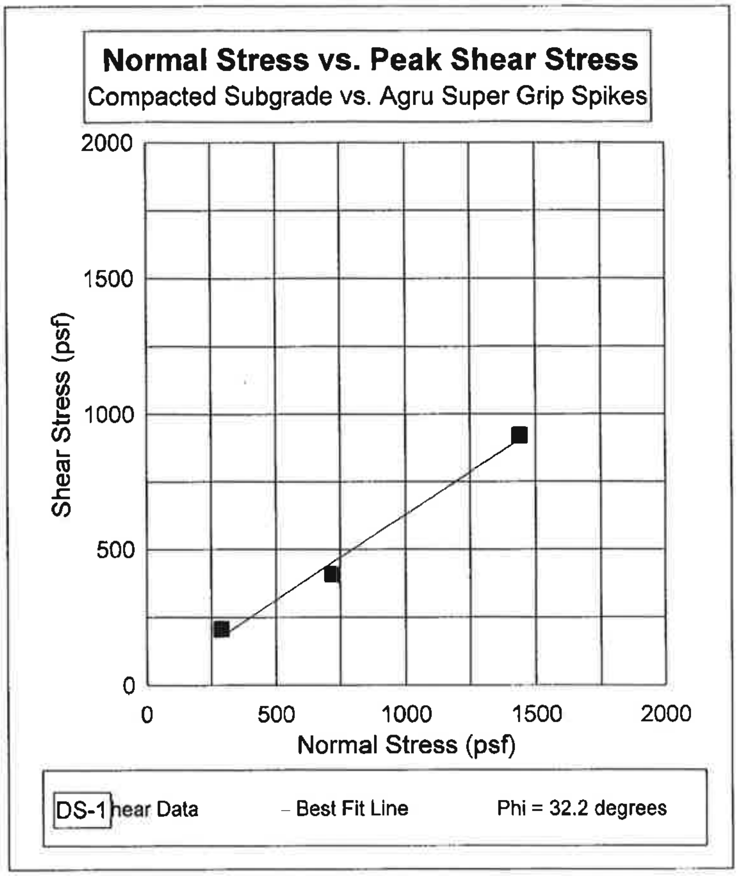
Data Checked By: WAR　　Date: 7/24/08

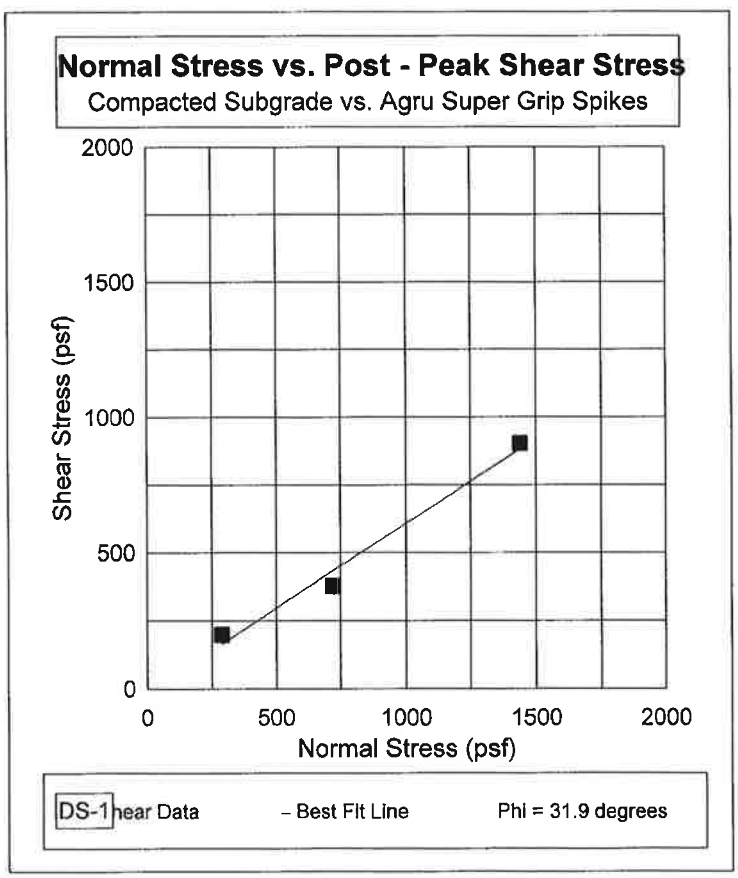
File Name: SRDSDS1

ADVANCED TERRA TESTING, INC. ATT



Shear Stress vs. Displacement
Compacted Subgrade vs. Agru Super Grip Spikes
Shear Stress (psf)
1000
800
600
400
200
0
0
0.5
1
1.5
2
Shear Displacement (in.)
Normal Stress 288 psf
Normal Stress 720 psf
Normal Stress 1440 psf
DS-1

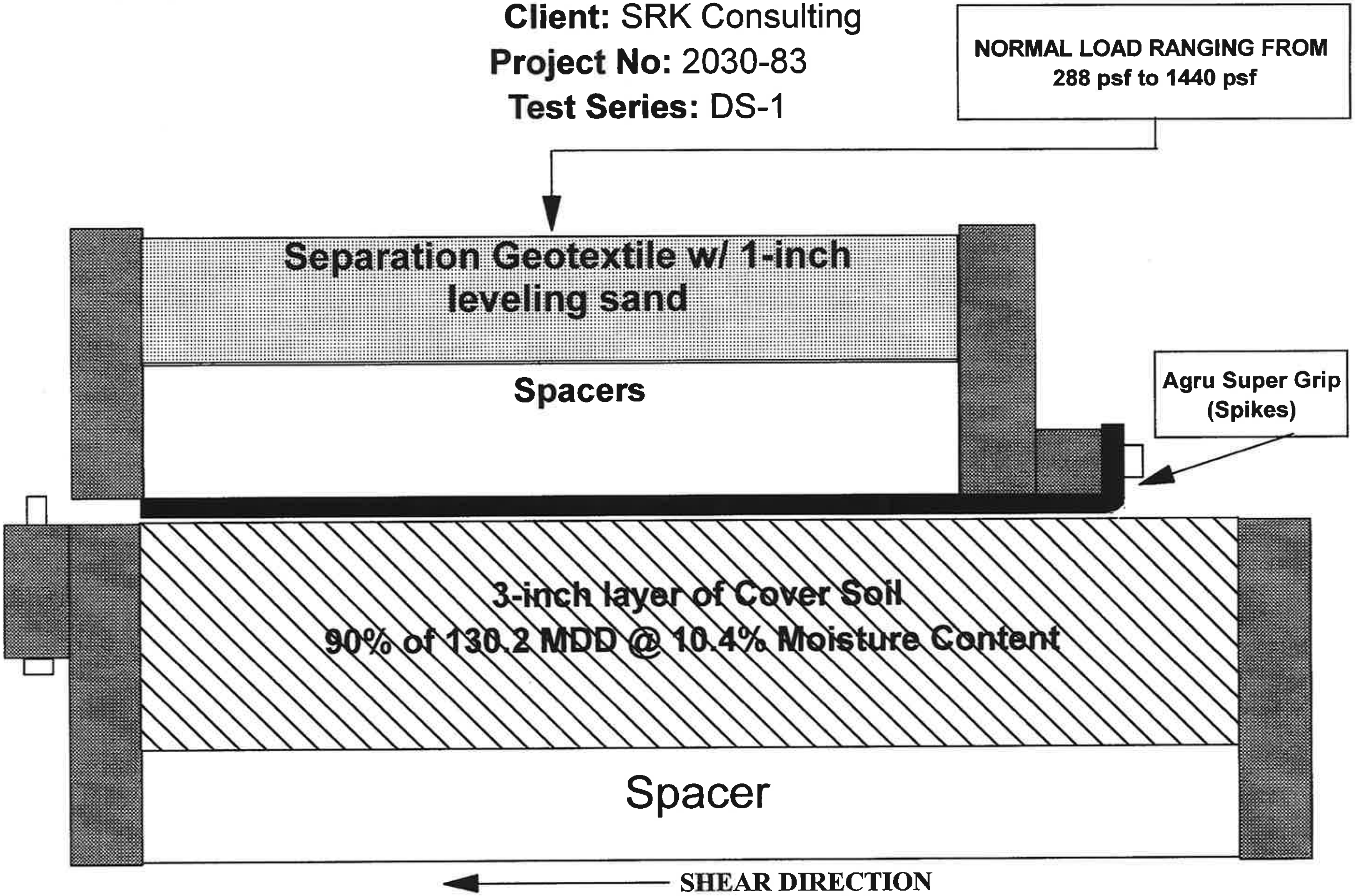




Data suggested negative cohesion intercept on Peak and Post-Peak Shear Stress Graph. No cohesion values are reported.

LARGE SCALE INTERFACE DIRECT SHEAR
ASTM D 5321 - 12" X 12" Box

Client: SRK Consulting
Project No: 2030-83
Test Series: DS-1



K:\SR2030\SRDSFIG1.pre

Advanced Terra Testing Inc.

LARGE SCALE INTERFACE DIRECT SHEAR TEST DATA

ASTM D 5321 - 12" x 12" Box

Client:	SRK Consultants	Date:	07/22/2008
Project No:	2030-83	Test Date:	07-17,18-08
Project:	#146907	Technician:	WAR
Interface:	Cover Soil vs. Geotextile, Agru Super Grip Studs	Shear Rate:	0.04"/min
Special conditions:	Inundate, 85% MDD @ Optimum MC of 10.4%	Test Series:	DS-2

Displacement (inches)	Normal Stress 288 psf Shear Stress (psf)	Normal Stress 720 psf Shear Stress (psf)	Normal Stress 1440 psf Shear Stress (psf)
0	0	0	0
0.021	98	120	173
0.077	151	201	307
0.137	173	243	460
0.196	186	279	568
0.253	198	307	636
0.316	199	329	696
0.373	201	344	737
0.43	203	356	772
0.49	198	362	797
0.549	199	367	810
0.605	199	370	825
0.664	196	370	840
0.724	198	369	847
0.781	199	372	855
0.839	198	374	863
0.897	199	374	870
0.955	198	370	872
1.012	194	374	867
1.072	193	377	865
1.13	193	380	873
1.185	194	385	883
1.241	193	385	888
1.3	194	387	898
1.354	193	389	903
1.413	191	387	903
1.47	193	387	902
1.527	198	387	910
1.585	199	384	920
1.643	204	377	928
1.701	211	372	937
1.757	209	370	945
1.816	214	382	956
1.873	216	394	966

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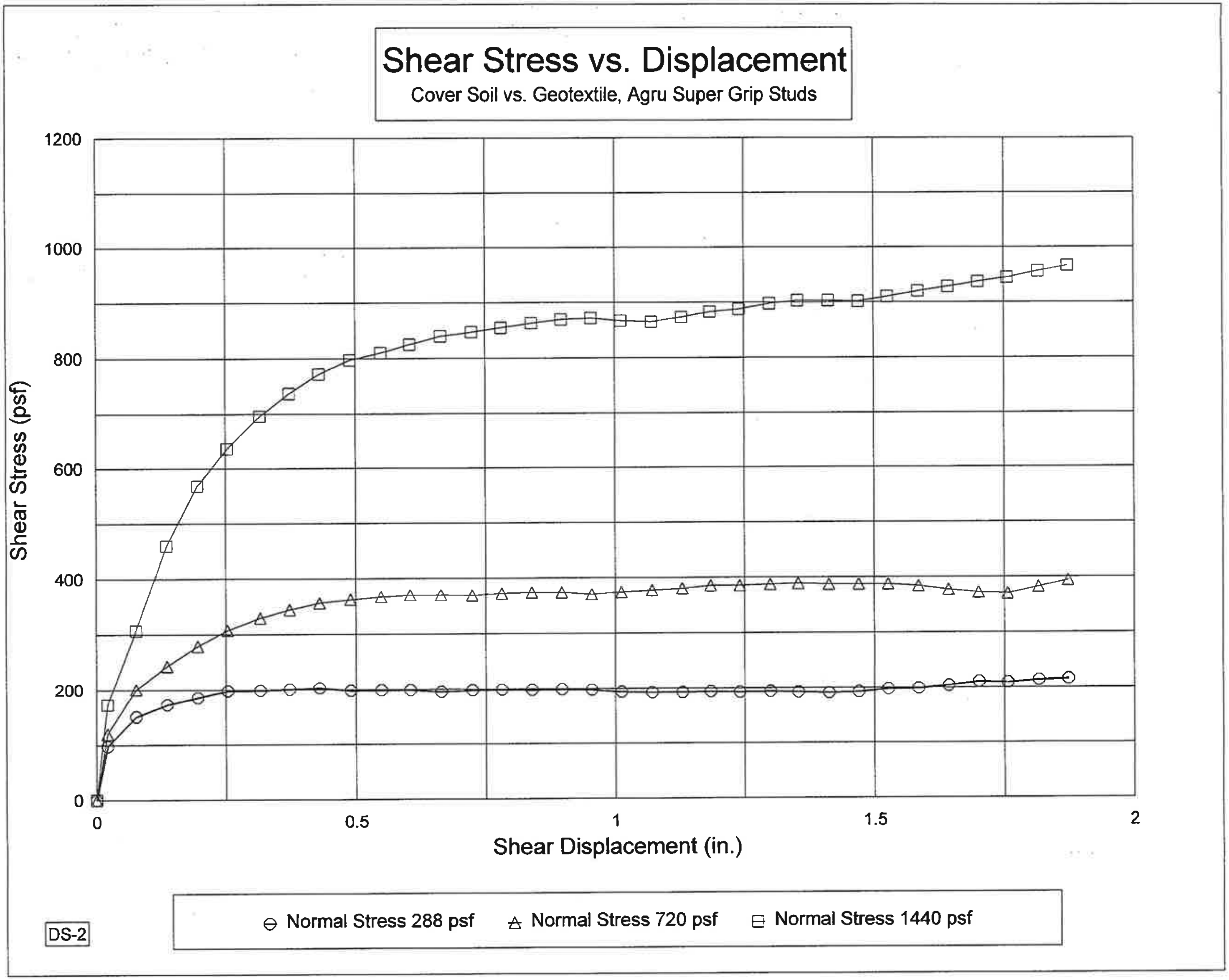
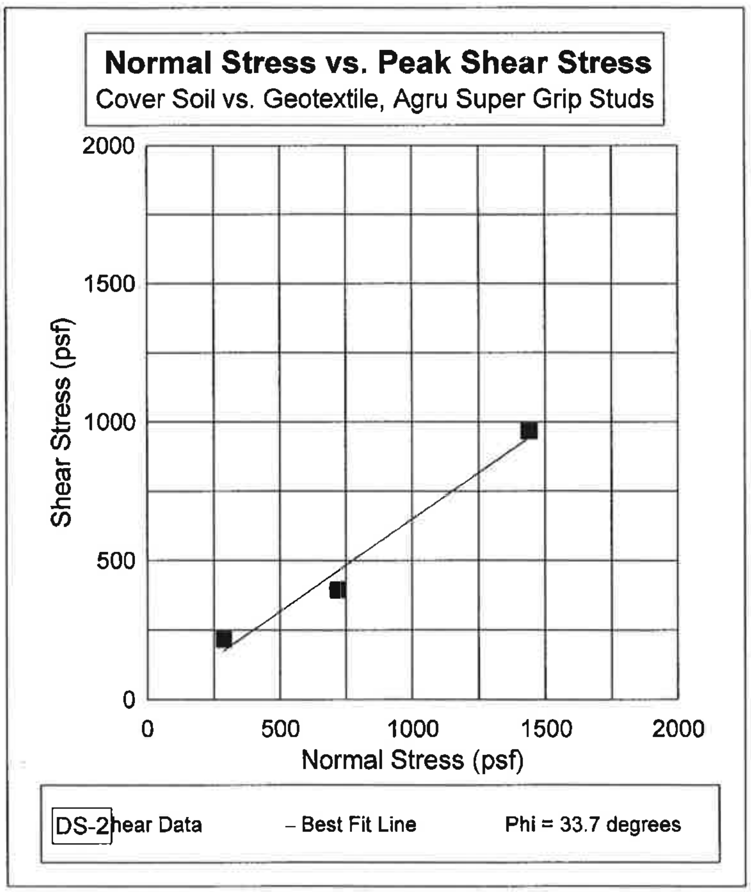
Data Checked By: WAR Date: 7/22/08
File Name: SRDSDS2

ADVANCED TERRA TESTING, INC. ATT

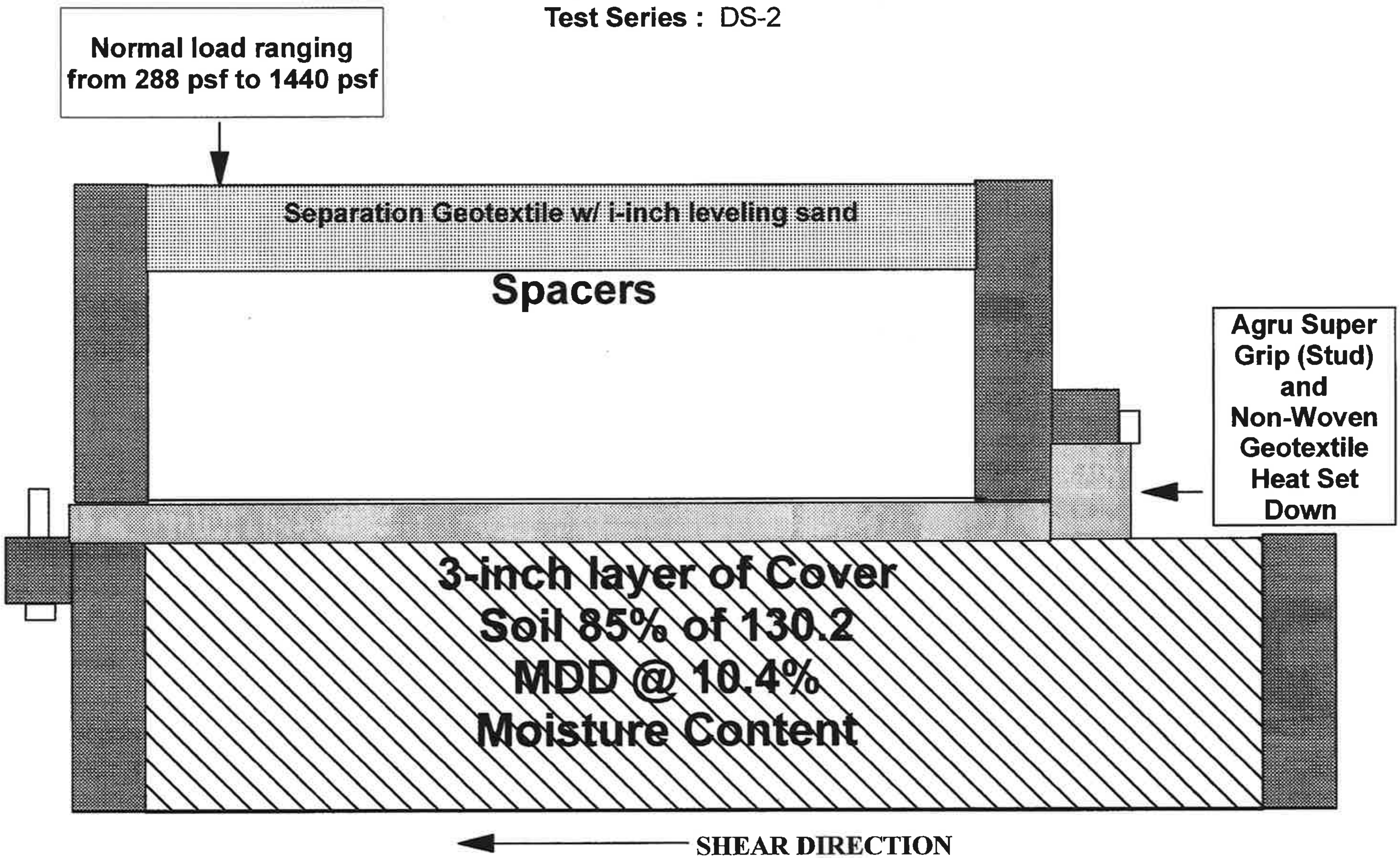

Shear Stress vs. Displacement
Cover Soil vs. Geotextile, Agru Super Grip Studs
Shear Stress (psf)
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
Shear Displacement (in.)
Normal Stress 288 psf
Normal Stress 720 psf
Normal Stress 1440 psf
DS-2



Data suggested negative cohesion intercept on Peak and Ultimate Shear Stress Graph. No cohesion values are reported.

LARGE SCALE INTER ACE DIRECT SHEAR
ASTM D 5321 - 12" X 12" Box

Client : SRK Consulting
Project No : 2030-83
Test Series : DS-2



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Advanced Terra Testing Inc.

LARGE SCALE INTERFACE DIRECT SHEAR TEST DATA

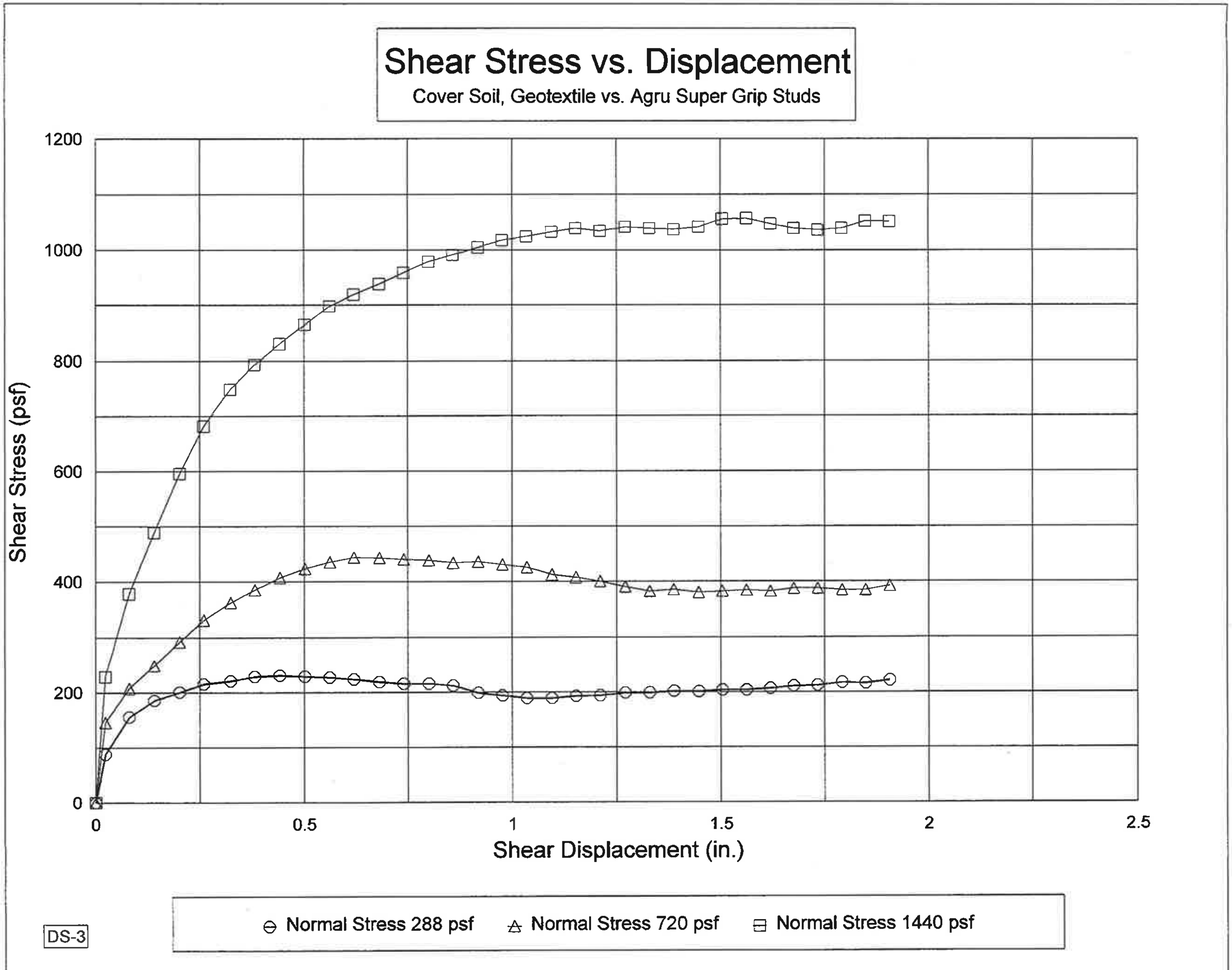
ASTM D 5321 - 12" x 12" Box

Client:	SRK Consulting	Date:	07/24/2008
Project No:	2030-83	Test Date:	07-18,21,22-08
Project:	#146907	Technician:	WAR
Interface:	Cover Soil, Geotextile vs. Agru Super Grip Studs	Shear Rate:	0.04"/min
Special conditions:	Inundate 85% MDD @ Optimum MC 10.4%	Test Series:	DS-3

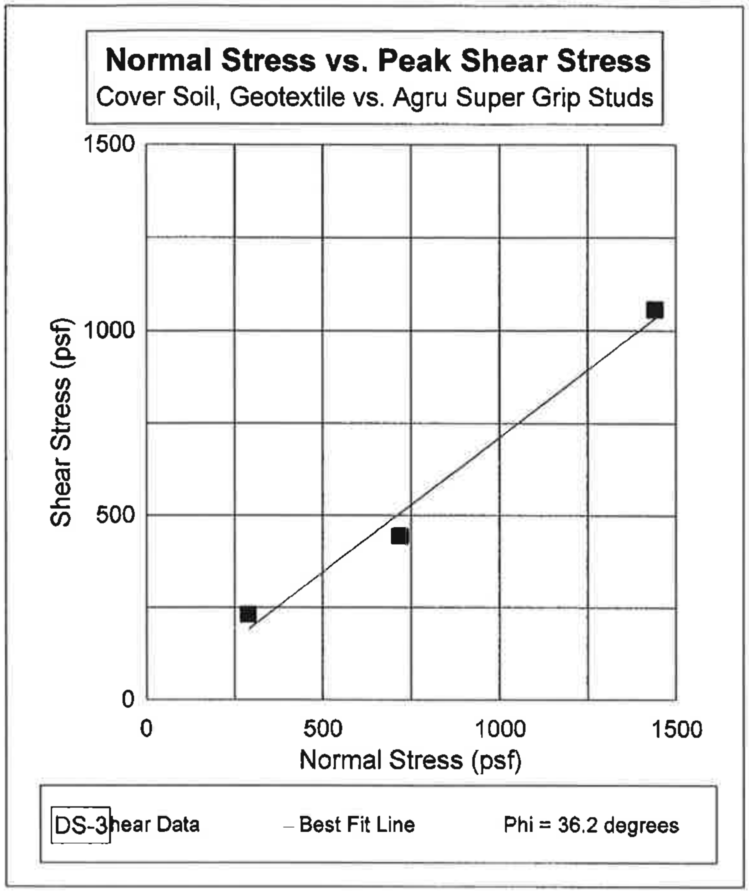
Displacement (inches)	Normal Stress 288 psf Shear Stress (psf)	Normal Stress 720 psf Shear Stress (psf)	Normal Stress 1440 psf Shear Stress (psf)
0	0	0	0
0.023	88	146	229
0.08	156	208	378
0.14	186	249	488
0.201	201	292	596
0.259	216	331	682
0.324	221	362	748
0.382	229	385	793
0.442	231	407	830
0.502	229	423	865
0.562	227	435	898
0.62	224	443	919
0.681	219	442	938
0.74	216	440	958
0.8	216	438	978
0.858	212	433	991
0.918	199	435	1004
0.976	194	430	1017
1.035	189	425	1024
1.095	189	412	1032
1.152	193	407	1039
1.211	194	400	1034
1.271	199	390	1041
1.33	199	382	1039
1.388	202	385	1037
1.447	201	380	1041
1.504	204	382	1056
1.562	204	384	1057
1.619	207	382	1047
1.676	211	387	1039
1.733	212	387	1036
1.791	217	384	1039
1.848	216	384	1052
1.906	221	392	1051

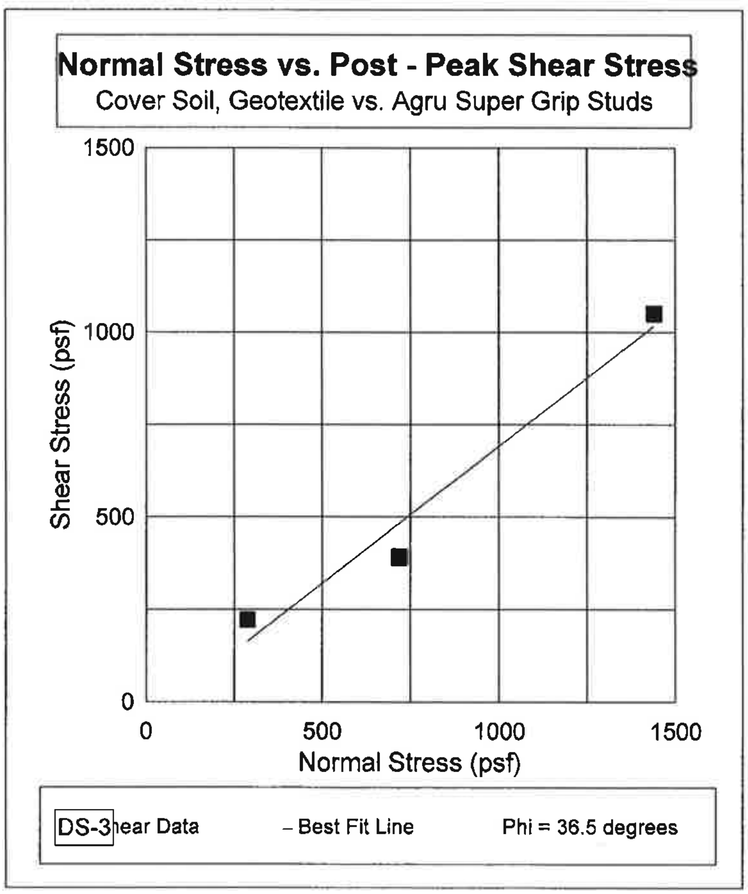
Data Entered By: SR   Date: 07/24/2008
Data Checked By: WAR   Date: 7/24/08
File Name: SRDSDS3

ADVANCED TERRA TESTING, INC. ATT


Shear Stress vs. Displacement
Cover Soil, Geotextile vs. Agru Super Grip Studs
Shear Stress (psf)
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
2.5
Shear Displacement (in.)
Normal Stress 288 psf
Normal Stress 720 psf
Normal Stress 1440 psf

DS-3


Normal Stress vs. Peak Shear Stress
Cover Soil, Geotextile vs. Agru Super Grip Studs
1500
1000
500
0
0
500
1000
1500
Shear Stress (psf)
Normal Stress (psf)
DS-3 Shear Data
Best Fit Line
Phi = 36.2 degrees


Normal Stress vs. Post - Peak Shear Stress
Cover Soil, Geotextile vs. Agru Super Grip Studs
1500
1000
500
0
0
500
1000
1500
Shear Stress (psf)
Normal Stress (psf)
DS-3 Shear Data
Best Fit Line
Phi = 36.5 degrees

LARGE SCALE INTERFACE DIRECT SHEAR TEST DATA

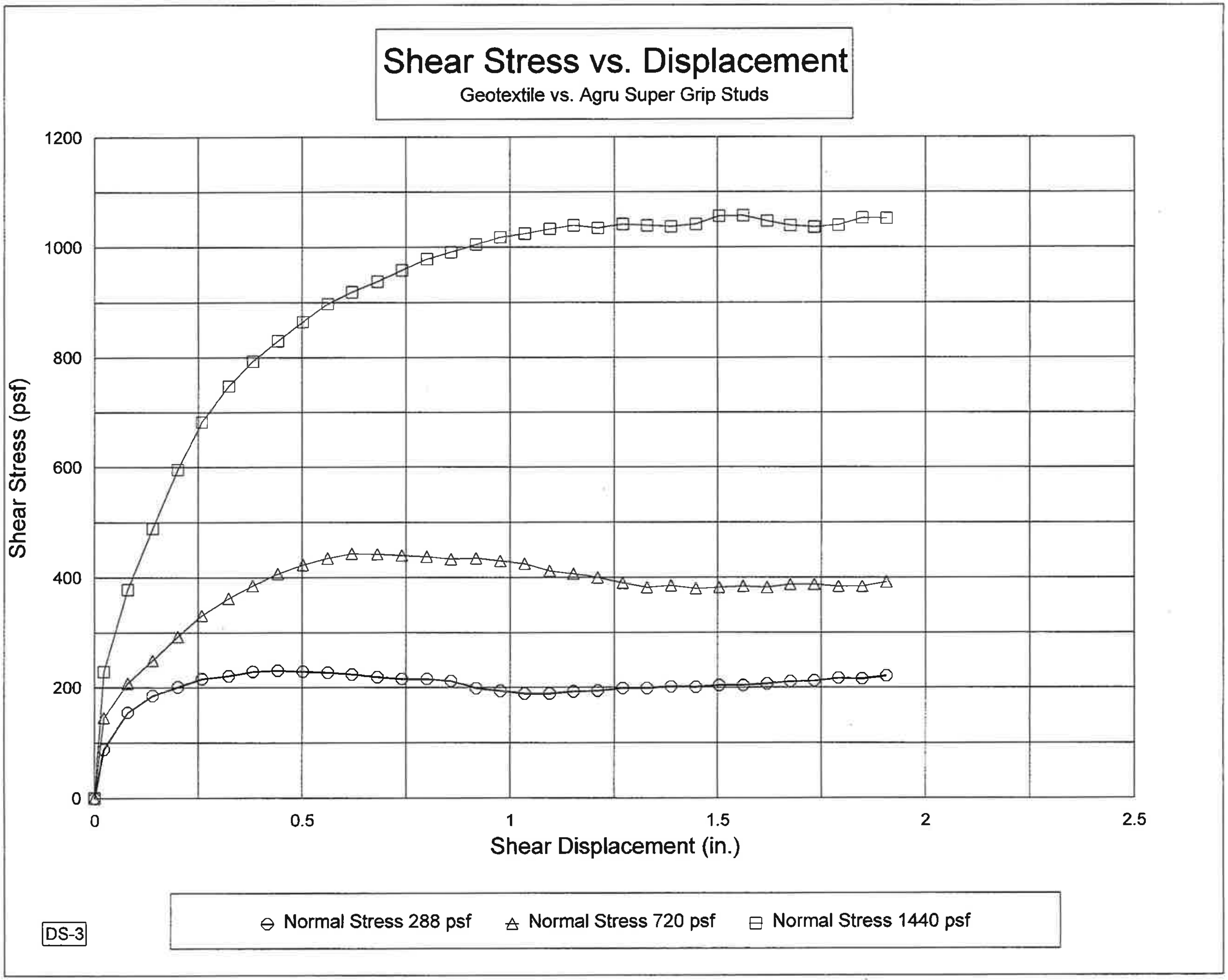
ASTM D 5321 - 12" x 12" Box

Client:	SRK Consulting	Date:	07/22/2008
Project No:	2030-83	Test Date:	07-18,21,22-08
Project:	#146907 GEOTEXTILE	Technician:	WAR
Interface:	Geotextile vs. Agru Super Grip Studs	Shear Rate:	0.04"/min
Special conditions:	Inundate 85% MDD @ Optimum MC 10.4%	Test Series:	DS-3

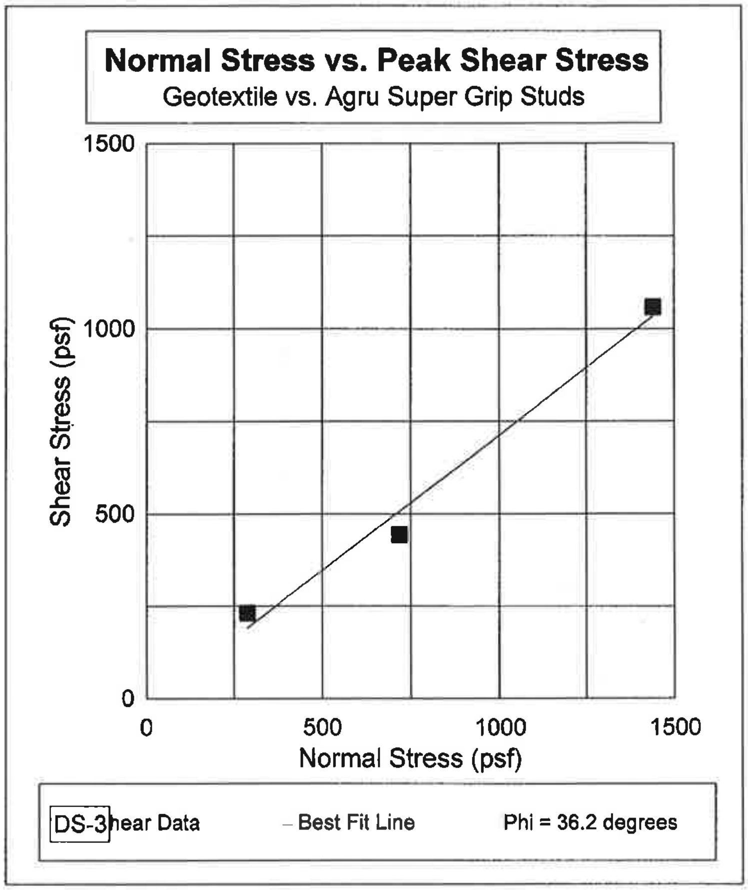
Displacement (inches)	Normal Stress 288 psf Shear Stress (psf)	Normal Stress 720 psf Shear Stress (psf)	Normal Stress 1440 psf Shear Stress (psf)
0	0	0	0
0.023	88	146	229
0.08	156	208	378
0.14	186	249	488
0.201	201	292	596
0.259	216	331	682
0.324	221	362	748
0.382	229	385	793
0.442	231	407	830
0.502	229	423	865
0.562	227	435	898
0.62	224	443	919
0.681	219	442	938
0.74	216	440	958
0.8	216	438	978
0.858	212	433	991
0.918	199	435	1004
0.976	194	430	1017
1.035	189	425	1024
1.095	189	412	1032
1.152	193	407	1039
1.211	194	400	1034
1.271	199	390	1041
1.33	199	382	1039
1.388	202	385	1037
1.447	201	380	1041
1.504	204	382	1056
1.562	204	384	1057
1.619	207	382	1047
1.676	211	387	1039
1.733	212	387	1036
1.791	217	384	1039
1.848	216	384	1052
1.906	221	392	1051

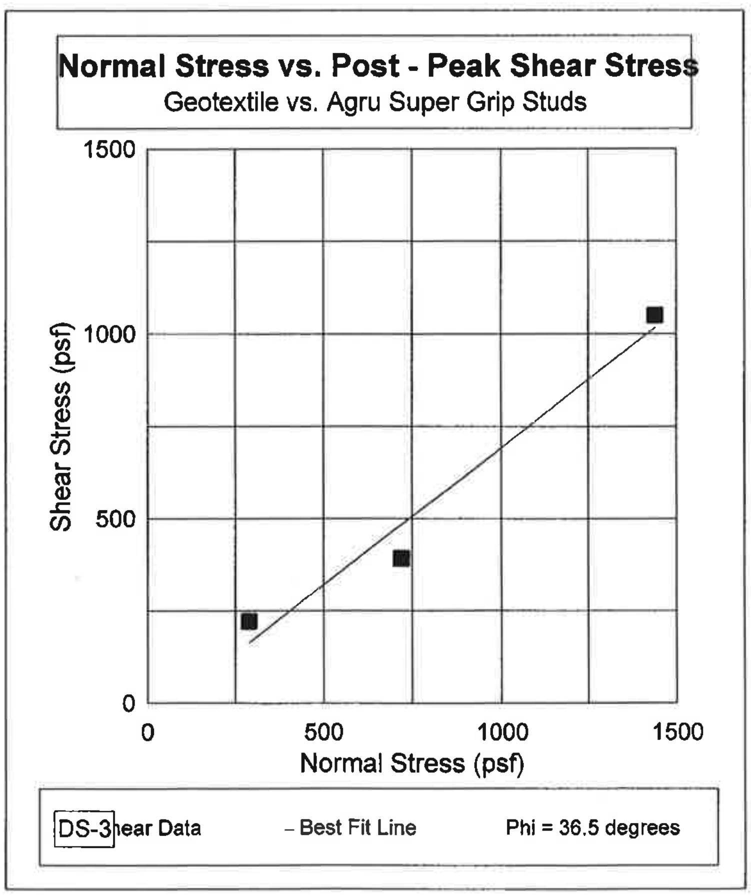
Data Entered By: SR Date: 07/22/2008
Data Checked By: WAR Date: 7/22/08
File Name: SRDSDS3

ADVANCED TERRA TESTING, INC. ATT



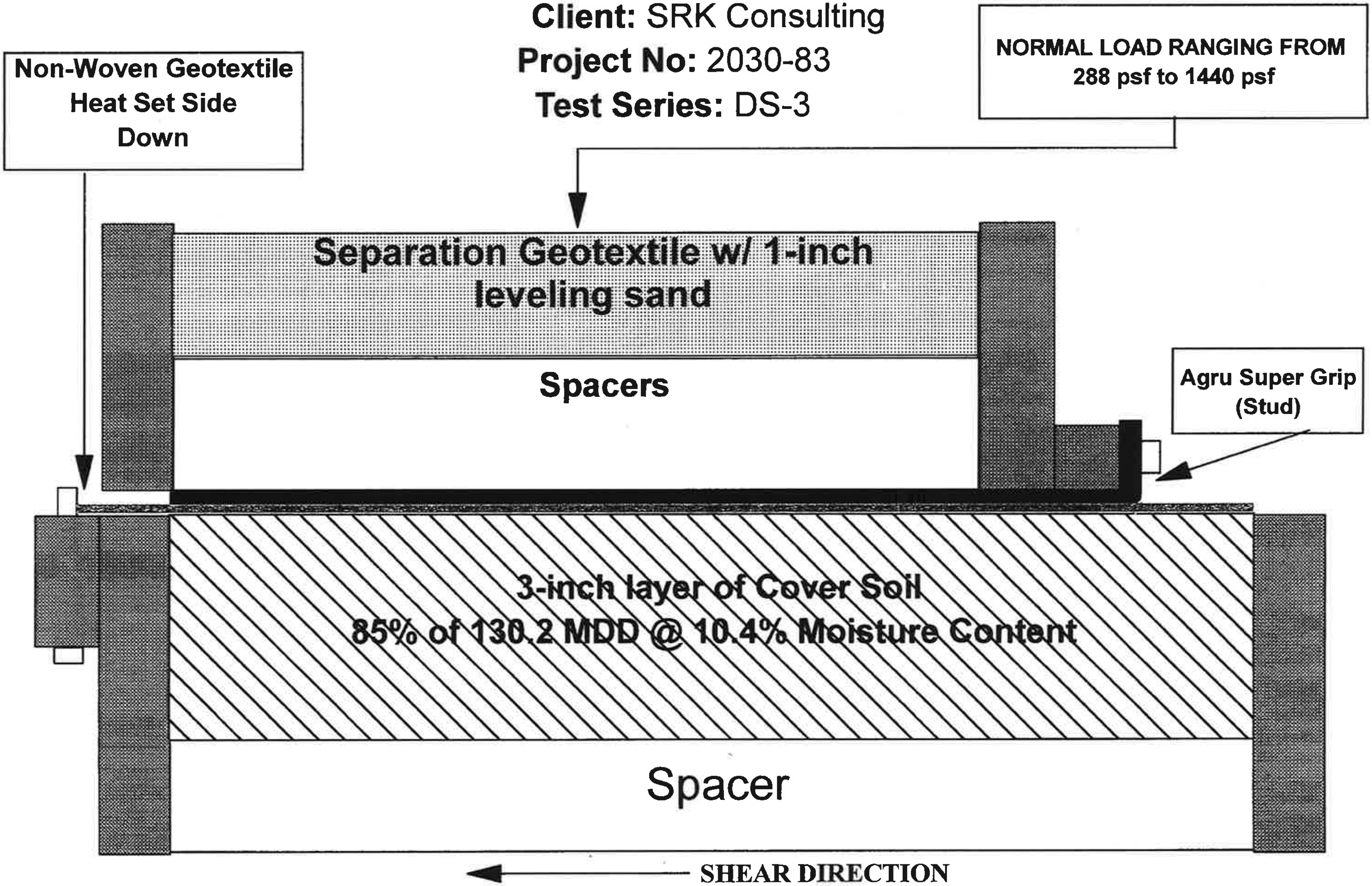
Shear Stress vs. Displacement
Geotextile vs. Agru Super Grip Studs
Shear Stress (psf)
1200
1000
800
600
400
200
0
0
0.5
1
1.5
2
2.5
Shear Displacement (in.)
Normal Stress 288 psf
Normal Stress 720 psf
Normal Stress 1440 psf
DS-3


Normal Stress vs. Peak Shear Stress
Geotextile vs. Agru Super Grip Studs
Shear Stress (psf)
Normal Stress (psf)
0
500
1000
1500
DS-3 Shear Data
Best Fit Line
Phi = 36.2 degrees


Normal Stress vs. Post - Peak Shear Stress
Geotextile vs. Agru Super Grip Studs
Shear Stress (psf)
Normal Stress (psf)
0
500
1000
1500
DS-3 Shear Data
Best Fit Line
Phi = 36.5 degrees

LARGE SCALE INTERFACE DIRECT SHEAR
ASTM D 5321 - 12" X 12" Box

Client: SRK Consulting
Project No: 2030-83
Test Series: DS-3



K:\SR2030\SPDSFIG3.pre

Advanced Terra Testing In

PROCTOR COMPACTION - MODIFIED
ASTM D 1557

COMPACTION TEST
ASTM D 1557 B

CLIENT: SRK Consulting JOB NO. 2030-83

BORING NO.		DATE SAMPLED	
DEPTH		DATE TESTED	07/08/2008
SAMPLE NO.		LOCATION	
SOIL DESCR.	146907		

Moisture Determination

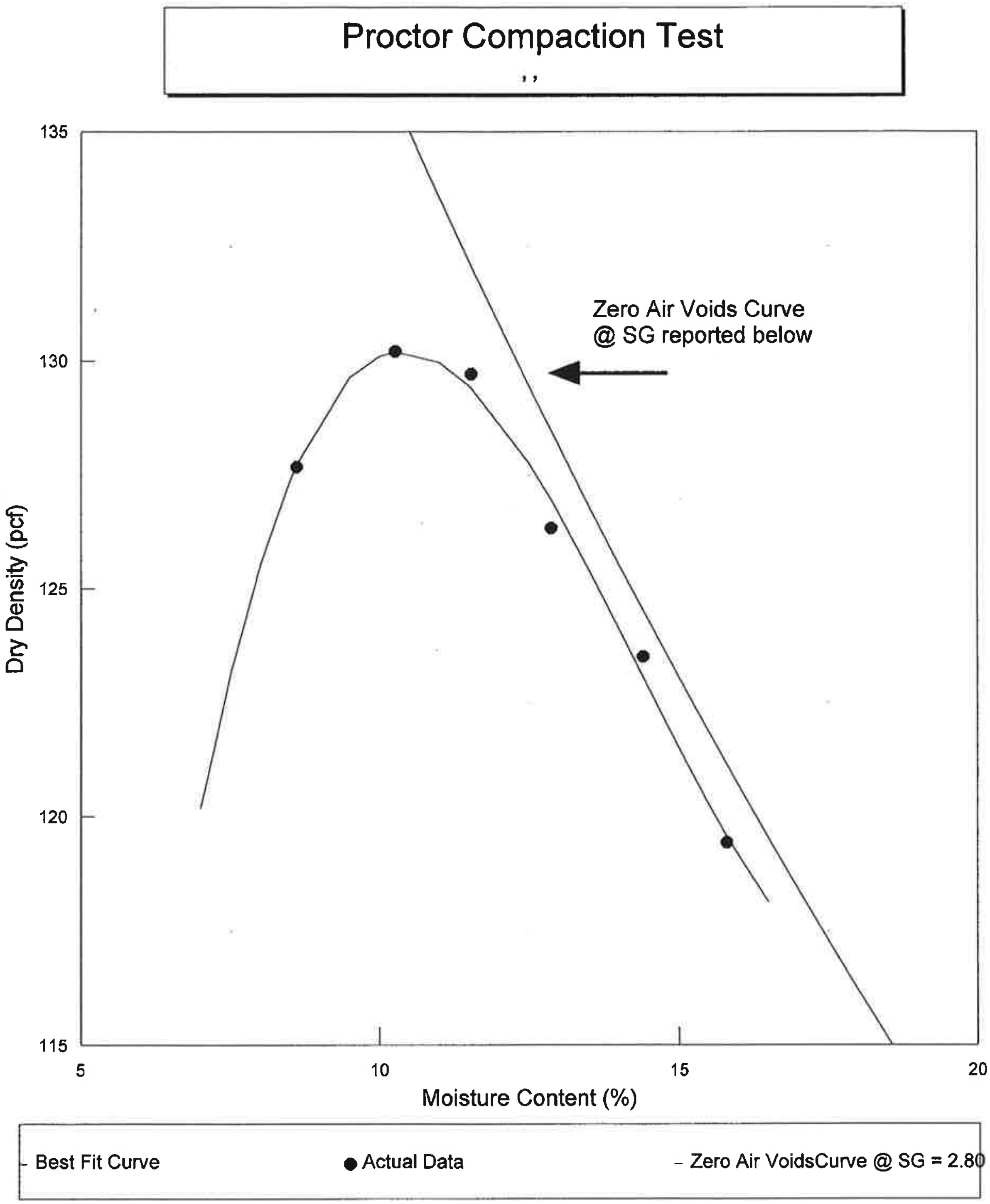
	1	2	3	4	5	6
Wt of Moisture added (ml)	0.00	40.00	80.00	120.00	160.00	200.00
Wt. of soil & dish (g)	487.04	670.26	623.21	464.59	587.03	546.64
Dry wt. soil & dish (g)	438.00	591.10	541.77	398.27	494.41	453.57
Net loss of moisture (g)	49.04	79.16	81.44	66.32	92.62	93.07
Wt. of dish (g)	6.70	8.26	8.11	8.45	8.39	8.39
Net wt. of dry soil (g)	431.30	582.84	533.66	389.82	486.02	445.18
Moisture Content (%)	11.37	13.58	15.26	17.01	19.06	20.91
Corrected Moisture Content	8.61	10.27	11.54	12.86	14.41	15.80

Density determination

	1	2	3	4	5	6
Wt of soil & mold (lb)	13.65	13.82	13.85	13.76	13.70	13.58
Wt. of mold (lb)	9.40	9.40	9.40	9.40	9.40	9.40
Net wt. of wet soil (lb)	4.25	4.42	4.45	4.36	4.30	4.18
Net wt of dry soil (lb)	3.91	4.01	3.99	3.86	3.76	3.61
Dry Density, (pcf)	117.40	120.25	119.69	115.89	112.76	108.29
Corrected Dry Density (pcf)	127.67	130.20	129.71	126.33	123.50	119.43
Volume Factor	30	30	30	30	30	30

Data entered by: TMR Date: 07/09/2008
Data checked by: WMK Date: 7/9/08
FileName: SRPR83MD

ADVANCED TERRA TESTING, INC.
ATT



OPTIMUM MOISTURE CONTENT = 10.4 MAXIMUM DRY DENSITY = 130.2
ASTM D 1557 B, Rock correction applied? Y

ATTERBERG LIMITS
ASTM D 4318

ATTERBERG LIMITS TEST
ASTM D 4318

CLIENT	SRK Consulting	JOB NO.	2030-83
BORING NO.		DATE SAMPLED	
DEPTH		DATE TESTED	07/08/08 MLM
SAMPLE NO.	Cover Soil		
SOIL DESCR.	Proj. #146907		
LOCATION			

Plastic Limit Determination

	1	2	3
Wt Dish & Wet Soil	12.70	11.39	13.66
Wt Dish & Dry Soil	10.94	9.82	11.72
Wt of Moisture	1.76	1.57	1.94
Wt of Dish	1.14	1.16	1.12
Wt of Dry Soil	9.80	8.66	10.60
Moisture Content	17.96	18.13	18.30

Liquid Limit Determination   Device Number   0966

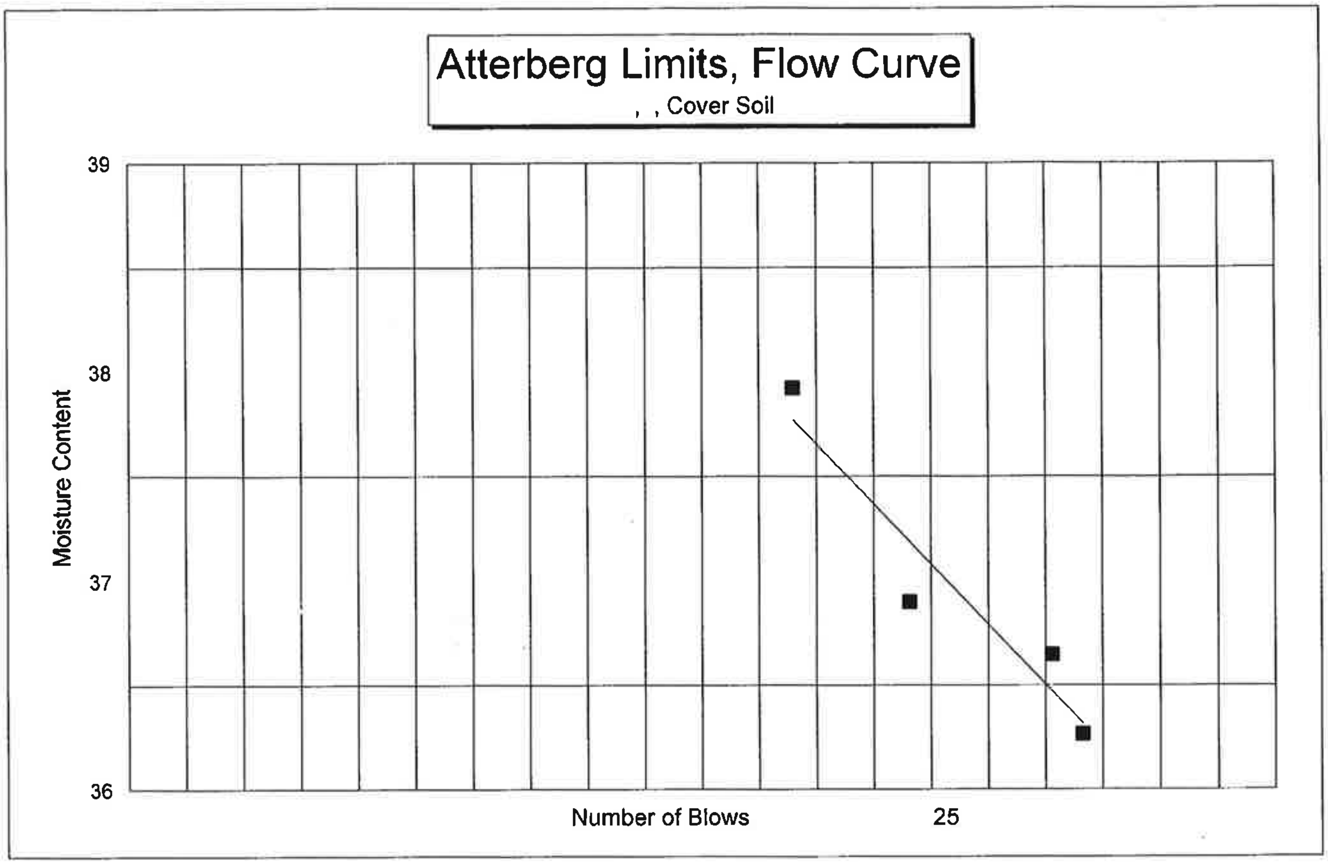
	1	2	3	4
Number of Blows	24	34	19	32
Wt Dish & Wet Soil	13.93	12.74	12.17	13.34
Wt Dish & Dry Soil	10.48	9.65	9.14	10.06
Wt of Moisture	3.45	3.09	3.03	3.28
Wt of Dish	1.13	1.13	1.15	1.11
Wt of Dry Soil	9.35	8.52	7.99	8.95
Moisture Content	36.90	36.27	37.92	36.65

Liquid Limit 37.1
Plastic Limit 18.1
Plasticity Index 19.0

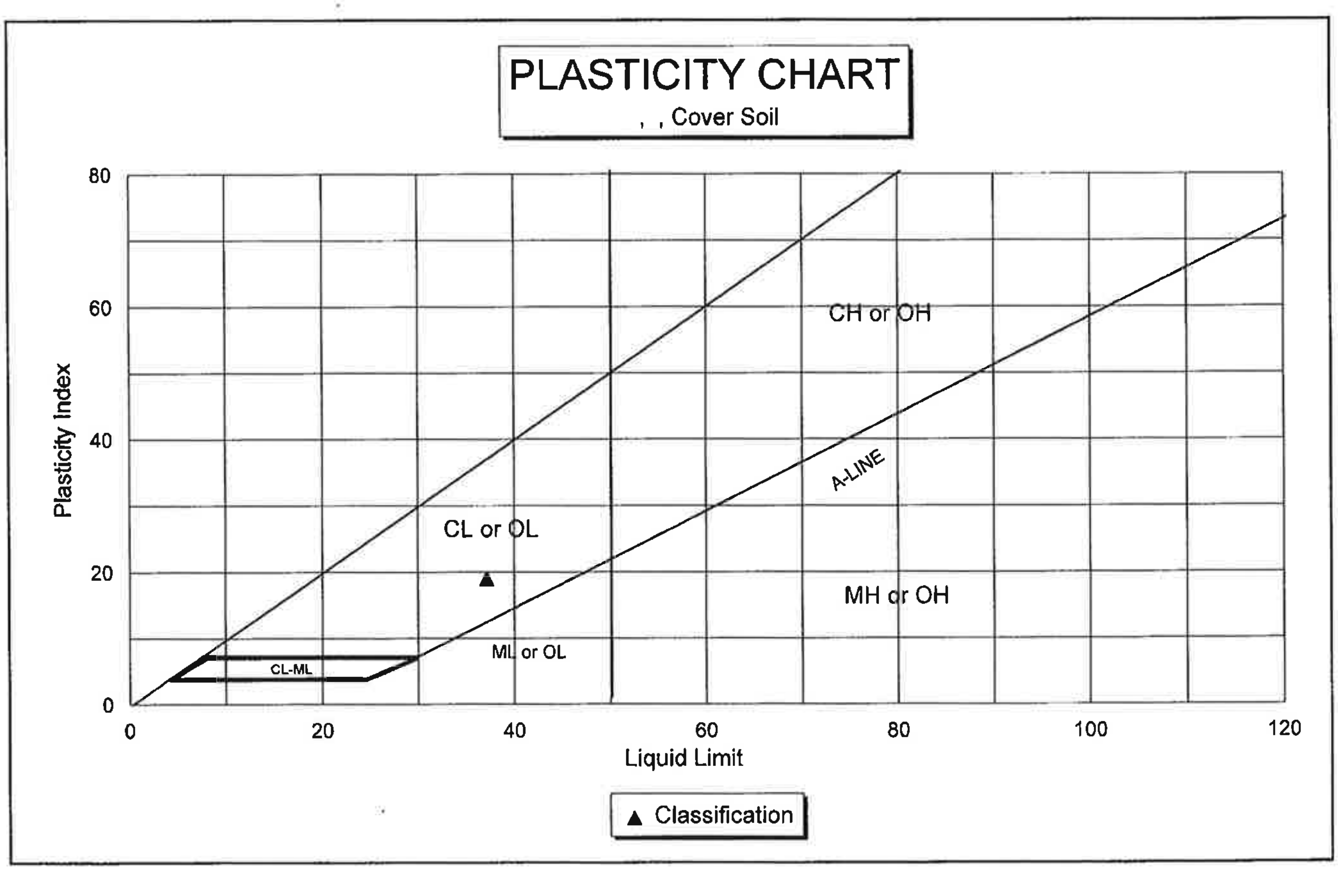
Atterberg Classification CL

Data entry by: DPM Date: 07/09/2008
Checked by: WAR Date: 7/11/08
FileName: SRG0COSO

ADVANCED TERRA TESTING, Inc. ATT



Atterberg Limits, Flow Curve
, , Cover Soil
39
38
37
36
Moisture Content
Number of Blows
25



PLASTICITY CHART
, , Cover Soil
80
60
40
20
0
Plasticity Index
CH or OH
A-LINE
CL or OL
MH or OH
ML or OL
CL-ML
0
20
40
60
80
100
120
Liquid Limit
▲ Classification

MECHANICAL ANALYSIS
ASTM D 6913

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 6913

CLIENT	SRK Consulting	JOB NO.	2030-83
BORING NO.		SAMPLED	
DEPTH		DATE+#4 WASHED	07/08/08 TMR
SAMPLE NO.	Cover Soil	DATE -#4 WASHED	07/08/08 TMR
SOIL DESCR.	Proj. #146907	WASH SIEVE	Yes
LOCATION		DRY SIEVE	No

MOISTURE DATA

HYGROSCOPIC	Yes
NATURAL	No

Wt. Wet Soil & Pan (g)	413.68
Wt. Dry Soil & Pan (g)	369.56
Wt. Lost Moisture (g)	44.12
Wt. of Pan Only (g)	6.82
Wt. of Dry Soil (g)	362.74
Moisture Content %	12.2
Wt. Partial -#4 Sample Wet (g)	273.01
Wt. Partial Sample Dry (g)	243.40

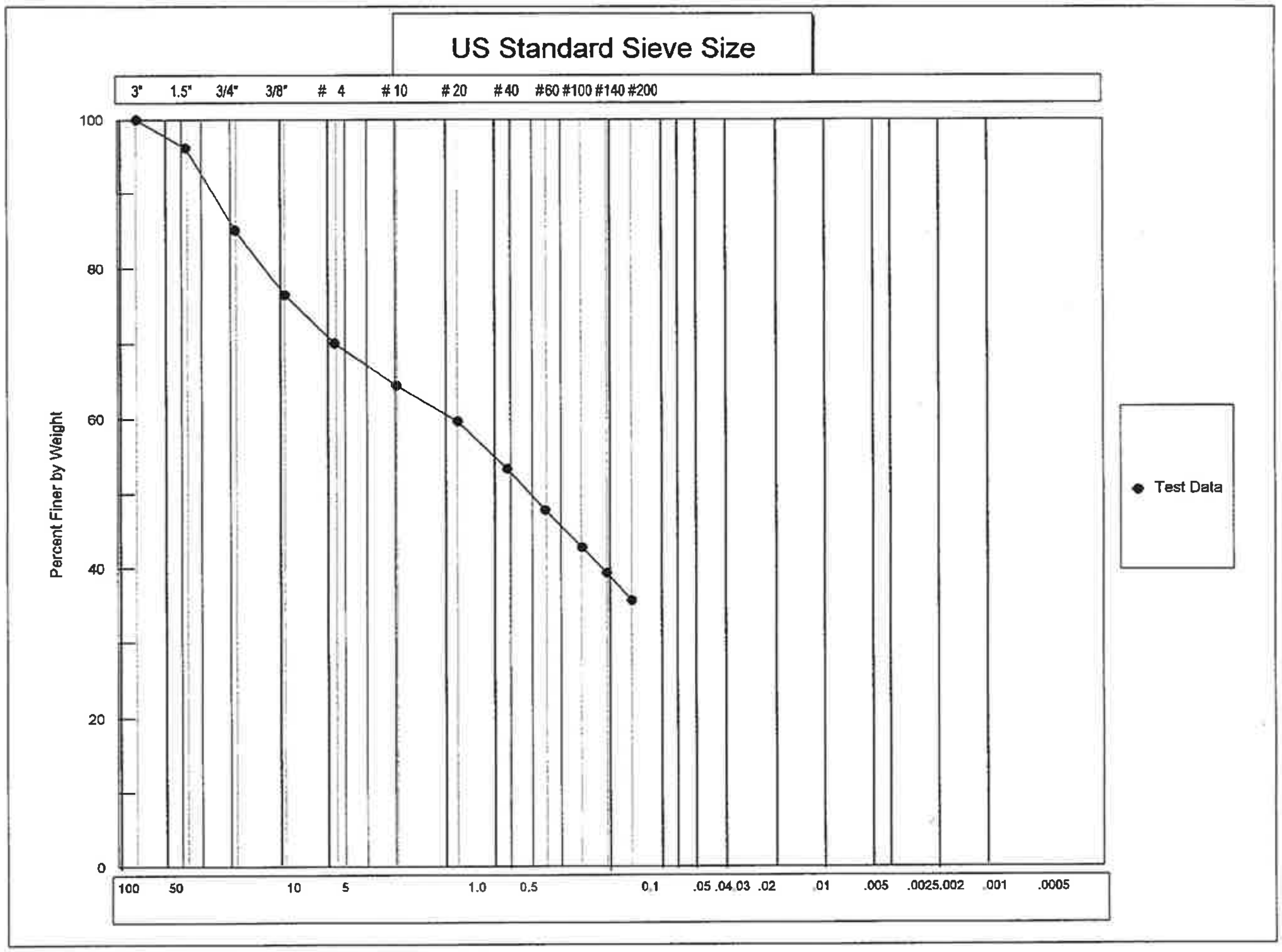
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	10272.30
Weight of + #4 Before Washing (g)	3163.30
Weight of + #4 After Washing (g)	2836.71
Weight of - #4 Wet (g)	7109.00
Weight of - #4 Dry (g)	6629.27
Wt. Total Sample Dry (g)	9465.98
Calc. Wt. "W" (g)	347.56
Calc. Mass + #4	104.15

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	358.45	358.45	358.45	3.8	96.2
3/4"	0.00	1048.34	1048.34	1406.79	14.9	85.1
3/8"	0.00	818.88	818.88	2225.67	23.5	76.5
#4	0.00	611.04	611.04	2836.71	30.0	70.0
#10	3.11	22.47	19.36	19.36	35.5	64.5
#20	3.25	20.05	16.80	36.16	40.4	59.6
#40	3.22	25.40	22.18	58.34	46.8	53.2
#60	3.25	22.30	19.05	77.39	52.2	47.8
#100	3.20	20.79	17.59	94.98	57.3	42.7
#140	3.23	15.27	12.04	107.02	60.8	39.2
#200	3.60	16.42	12.82	119.84	64.4	35.6

Data entered by: DPM Date: 07/11/2008
Data checked by: WAR Date: 7/11/08
FileName: SRM0COSO

ADVANCED TERRA TESTING, INC. ATT



COBBLES	GRAVEL		SAND			SILT OR CLAY	USCS
	COARSE	FINE	CRS	MEDIUM	FINE		

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY	WENTWORTH
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE			

Client: SRK Consulting
Job Number: 2030-83
Classification: **Classification Not Performed**

Boring No.:
Depth:

Sample No.: Cover Soil

APPENDIX J

TECHNICAL SPECIFICATIONS

MONO COUNTY
DEPARTMENT OF PUBLIC WORKS

TECHNICAL SPECIFICATIONS

BRIDGEPORT LANDFILL
FINAL CLOSURE CONSTRUCTION

SWIS# 26-AA-0002
WDID# 6B260004000

Mono County, California

Prepared by:

SRK Consulting
Engineers and Scientists
5250 Neil Road, Suite 300
Reno, Nevada 89502
(775) 828-6800
(775) 828-6820 (Fax)

and the

Mono County Department of Public Works
Post Office Box 457
Bridgeport, California 93517
(760) 932-5440
(760) 932-5441 (Fax)

February 2008
Revised August 2008

TABLE OF CONTENTS

BRIDGEPORT LANDFILL
TECHNICAL SPECIFICATIONS
Final Closure Construction

1.0 DEFINITIONS

1. "Owner" is defined as an authorized representative of Mono County Department of Public Works (County).
2. "Engineer" is defined as a representative appointed and authorized by the Owner. The Engineer shall be a registered Professional Engineer in the State of California, or a designated site representative under his/her supervision during construction.
3. "Quality Assurance Team" is defined as the individuals working under the direction of the Engineer to perform on-site Quality Assurance (QA) tasks for the Owner.
4. "Contractor" is defined as the party that has executed a contract agreement for the specified work with the Owner.
5. "Specifications" is defined as this document of Technical Specifications prepared by SRK Consulting (SRK), for the County.
6. "Drawings" is defined as the design Drawings entitled *Final Closure Plan, Bridgeport Landfill.*
7. "Modifications" are defined as changes made to the Specifications or the Drawings that are approved by the Owner and Engineer in writing after the Specifications and the Drawings have been finalized.
8. "On-site Material" is defined as borrow soils obtained from within required facility excavations.
9. "Off-site Material" is defined as material obtained from sources other than on-site.
10. All slopes are described in terms of horizontal distance to vertical distance (i.e., 2H:1V shall be read as 2 horizontal to 1 vertical).
11. "Work" is defined as the entire completed construction, or the various separately identifiable parts thereof, required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.
12. "Contract Documents" are defined as the Agreement, Addenda (which pertain to the Contract Documents), Contractor's Bid (including documentation accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Bonds, these General Conditions, the Supplementary Conditions, the Technical Specifications, the Drawings, together with all Modifications issued after the execution of the Agreement.

2.0 CONTRACTOR'S RESPONSIBILITIES

2.1 General

The Contractor shall comply with the following:

- Maintain applicable Workman's Compensation Insurance and provide evidence of such to the Owner.
- Be responsible for the safety of his employees and subcontractors. Provide any document(s) as requested to fulfill safety or Owner Policies.

- Become familiar with the relevant regional and site-specific conditions and existing facilities that may have an impact upon the Work.
- Be responsible for making his own measurements and installing his work to fit the conditions encountered.
- Before proceeding with the Work, examine all Drawings and report to the Engineer any apparent discrepancies or interferences. The Engineer shall have the privilege of making minor alterations to the Drawings. All alterations shall be issued under a covering work order signed by the Owner prior to the start of alteration, if the alteration will affect the terms of Contract.
- All materials and workmanship furnished by the Contractor under this Specification shall be guaranteed by the Contractor against failure due to defective materials and improper installation for a period of one (1) year from the date of final acceptance, or as noted otherwise in these Specifications. Upon receipt of written notice of failure of guaranteed workmanship or materials during the guarantee period, the Contractor shall promptly furnish and install new materials and/or furnish the labor necessary to correct the failure at the expense of the Contractor.
- Comply with all federal, state, and local laws and regulations.

2.2 Construction Water

The Contractor shall comply with the following:

- Water for dust control on haul roads, moisture conditioning of borrow material to be placed as fill, and for maintaining in-place fill soils shall be obtained by the Contractor. The Contractor must supply all the pumps and tanks necessary to provide an adequate supply of water to fulfill the conditions of the Work. Water may also be obtained from the Owner following proper notification and arrangements.

2.3 Fugitive Dust Control

The Contractor shall comply with the following:

- During the performance of the Work defined by these Specifications or any operations appurtenant thereto, whether on right-of-way provided by the Owner or elsewhere, the Contractor shall furnish all labor, equipment, materials, and means required to perform proper and efficient measures to eliminate fugitive dust. If the Contractor fails to prevent fugitive dust generation from the Work that results in damages to land, vegetation, or dwellings or which causes a nuisance to persons, the Contractor is solely responsible for damages.

2.4 Surface Water Control and Protection of the Work

The Contractor shall comply with the following:

- Install ditches and/or channels and construct facilities to control surface water resulting from precipitation.
- Provide temporary erosion protection for prepared surfaces or other potential erosion areas, or as directed by the Engineer, until all such portions of the Work have been accepted by the Owner.
- If precipitation or runoff damage occurs prior to acceptance of the Owner, repair the damaged Work in accordance with these Specifications at the Contractor's expense.

- All temporary and final design storm water diversion berms, ditches and/or channels shall be installed prior to site grading.

2.5 Work Limits

The Contractor shall comply with the following:

- Do not construct any staging areas, temporary facilities, haul roads, or access roads without the approval of the Owner. The Owner will provide access to the site.
- Confine apparatus, equipment, the storage of materials, and the operation of workmen to the limits indicated by the law, ordinances, permits or as directed by the Owner.
- Avoid unreasonably encumbering the premises with materials or equipment.
- Avoid interfering with the Owner's operations.
- Do not present a hazard to the Owner's personnel and equipment or to the public.
- Use existing roads whenever possible.
- Minimize construction of new roads.
- Keep the site neat, tidy, and free of waste materials or rubbish.
- Store and dispense fuel, lubricating oils, and chemicals in such a manner as to prevent or contain spills and prevent said materials from reaching local streams or groundwater according to applicable regulatory requirements.
- Dispose of waste in accordance with State and Local regulations.
- Keep Material Safety Data Sheets (MSDS) on file at the site and provide copies of such sheets to the Owner for all hazardous materials used on or stored at the site.
- Avoid damage to monitoring wells, piezometers, or any other instrumentation used at the site.
- Notify Owner if existing facilities, monitoring wells, piezometers or instrumentation is in conflict with the Work prior to construction.

2.6 Traffic Control/Road Use

The Contractor shall comply with the following:

- Any public or private roads that become damaged by the Contractor shall be repaired at the Contractor's expense.

2.7 Safety

The work shall conform to applicable, Federal, State, county, and local laws and regulations and Owner safety policies including, but not limited to, the following:

- Occupational Safety and Health Administration, General Industry and Health Standards – OSHA 2206.

2.8 Setting Out and Survey

The Owner shall provide appropriate survey control points to set out and control the Work. The Contractor shall be responsible for providing a qualified land surveyor, registered in the State of California, to set out the Work, ensure location accuracy and dimensional correctness, and perform excavation/fill measurements. The Contractor shall provide surveying as necessary to accurately maintain slopes and grades for control of the Work. The Contractor shall notify the Owner and Engineer of any discrepancies discovered in the control surveying, layout, or design presented on the construction Drawings prior to initiating the Work.

The Contractor shall be responsible for accurately surveying the locations and elevations, and where applicable, the type, thickness, and geometry of any and all berms, channels, ditches, breaks in fill or cut slopes, general grading, change in fill, and any other aspect of the Work for which the design quantity is measured and paid by volume as defined in the Schedule of Quantities.

The Contractor shall provide an accurate and detailed as-built survey following completion of the Work. The as-built survey shall depict the geometry of any and all berms, channels, ditches, breaks in fill or cut slopes, and general site grading at a scale of not more than 1 inch to 100 feet, and a contour interval of not more than 2 feet. The as-built survey shall be submitted within **two (2) weeks** of project acceptance by submitting to the Engineer one (1) reproducible copy and one digital copy in AutoCad or other compatible format.

3.0 MEASUREMENT AND PAYMENT

Estimated construction quantities and units of measurement are provided in the SCHEDULE OF QUANTITIES. The Contractor is to provide unit rates and totals for each line item. The specified quantities denote the final, in-place number of units to be paid for under the terms of the contract. They are based upon the original design data available prior to advertising the project. Original design data include the available survey information, design assumptions, calculations, Drawings, and the presentation of the Contract. Changes in the number of units SHOWN in the SCHEDULE OF QUANTITIES may be authorized under any of the following conditions:

1. As a result of changes in the work authorized by the Owner.
2. As a result of the Owner determining that errors exist in the original design data used to determine designed quantities that cause a pay item to change by 15 percent or more.
3. As a result of the Contractor submitting to the Owner a written request showing evidence of errors in the original design data used to determine design quantities that cause a pay item total to change by 15 percent or more. The evidence must be verifiable and consist of calculations, Drawings, or other data that show how the design quantity is believed to be in error.

Facility locations, grades, and elevations are limited to the accuracy of the available topography. Where discrepancies are found to exist that might affect construction as depicted herein, the County or the Engineer shall be consulted to modify construction as necessary.

3.1 Mobilization, Running Costs and Demobilization

Mobilization, demobilization and running costs (including but not limited to construction support, construction surveying, final as-built surveying, maintenance and testing required for performance of the workscope, and clean-up) will be paid on a Lump Sum Basis for the mobilization/running costs/demobilization items with up to 50 percent of the items paid under the first monthly pay estimate, and up to 90 percent payable at Notice of Substantial Completion.

3.2 General Fill

The unit of measurement for general fill placement is the cubic yard (yd^3) of in-place fill material based on survey prior to and after placement. The rate for embankment fill must include excavation, loading, placement, removal of oversize or deleterious material, and compaction as specified.

3.3 Regrading and Sub-Grade Preparation

The unit of measurement for cut-to-fill regrading and sub-grade preparation is either the net cubic yard (yd^3) of in-place fill material based on survey prior to and after placement, or the surface area in square feet (ft^2) of the surface requiring preparation. The rate for cut-to-fill must include loading and placement as specified.

3.4 Excavation

The unit of measurement for excavation is the cubic yard (yd^3), based on the dimensions, elevations and grades provided on the Drawings, and survey prior to and after excavation. The rate for excavation must include excavation and spoil management as specified.

3.5 Geotextile and Geomembrane

The unit of measurement for geotextile and geomembrane is surface area in square feet (ft^2). The rate for both must include purchase, shipping, handling, placement/installation according to manufacturer's specifications, and the contractor's responsibilities with respect to testing per the specifications and construction quality assurance plan.

3.6 Riprap

The unit of measurement for riprap is the cubic yard (yd^3) of material in place based on survey prior to and after placement. The rate for riprap must include purchase and/or acquisition, processing, loading, hauling, placement, and shaping to grades and dimensions shown on Drawings.

4.0 EXISTING FACILITIES

Existing facilities within the Work area include, but are not limited to, the following:

- Overhead power lines, power poles, and guy wires;
- Chain-link, barbed-wire, and ranch fencing;
- Access roads to and around the landfill.

5.0 TECHNICAL SPECIFICATIONS

5.1 Temporary Excavations

Excavations in surficial soils for drainage channels can likely be made with conventional earth-moving equipment, such as backhoes. Should any excavation exceed 4 feet below ground surface (bgs), OSHA regulations may require shoring or other stabilization. Appropriate regulations should be reviewed and considered during planning.

5.2 Allowable Slopes

Any permanent open slopes required for the project shall not exceed 3H:1V (horizontal to vertical). Temporary cut slopes in native granular materials may be as steep as 1.5H:1V, but such steeper slopes should be inspected by a qualified engineer to verify adequate stability.

5.3 Erosion Control

The faces of cut and fill slopes shall be prepared and maintained to control against erosion. In most cases, the granular nature of the soil materials should provide adequate resistance to erosion.

5.4 Site Drainage and Moisture Protection

Positive site drainage shall be provided during construction and maintained thereafter. Free drainage shall be afforded for storm run-off in the vicinity of building foundations and retaining wall. In no case shall long-term ponding of water be allowed near the footings as this condition could cause unanticipated foundation settlement.

5.5 Construction Considerations and Quality Assurance

All excavations shall be inspected by a qualified geotechnical engineer to verify the competency of bearing soils and adequacy of foundation preparation. Fill material's base shall be tested to determine their suitability for use. Quality assurance observations and testing shall be provided by the Owner and shall be performed during all phases of construction. It is the Contractor's responsibility to ensure that the Engineer is aware of the construction schedule and that all elements of the design are inspected prior to covering.

5.6 Site Grading and Preparation

Upon completion of regrading activities, the upper 12 inches of exposed interim cover shall be scarified, moisture conditioned and compacted to at least 90 percent of maximum dry density at ±2 percent of optimum moisture content as determined by ASTM D1557.

5.7 General Soil Fill

General soil fill will be used for foundation layer construction and in the final cover over the LLDPE-geotextile liner. Material used in cover construction shall be entirely derived from on-site or other approved borrow sources. The suitability of all fill materials intended for use shall be subject to approval by the Engineer. General soil fill shall be free of brush, roots, sod, or other deleterious or unsuitable materials. The contractor shall provide all necessary labor and equipment to remove such materials from borrow and fill areas.

Prior to fill placement, the upper 12 inches of the interim cover layer shall be scarified, moisture conditioned, and recompacted to at least 90 percent of maximum dry density at ±2 percent of optimum moisture content as determined by ASTM D1557. An additional twelve inches of foundation soil will be placed and compacted to the same specifications, and shall be placed in loose lifts not exceeding 8 inches in thickness. Following placement of the LLDPE-geotextile liner, general fill material shall be moisture-conditioned, placed in loose lifts not exceeding 12 inches in thickness, and nominally compacted to approximately 85 percent of maximum dry density at ±2 percent of optimum moisture content as determined by ASTM D1557. Fill shall be placed and compacted over the LLDPE-geotextile liner using low-ground-pressure equipment and in such a manner as to protect the LLDPE-geotextile liner from potential damage. The Contractor shall present a plan for cover soil placement to the Engineer for approval prior to implementation.

5.8 Geomembrane (60 mil Agru Super Gripnet® LLDPE)

The geomembrane liner shall consist of 60 mil linear low-density polyethylene Agru Super Gripnet® liner. The geomembrane shall be manufactured, installed and inspected in accordance with the manufacturer's recommendations and these specifications.

5.8.1 General

5.8.1.1 Performance Requirements

A. The Contractor shall furnish and install the FML and all miscellaneous materials incidental to the liner system installation in accordance with these Specifications and with the Drawings.

B. The alignment, lengths, and areas for FML placement are shown on the Drawings. Exact locations and lengths may be varied to suit conditions encountered in the field only as approved by the Engineer.

C. The Contractor will furnish sufficient material to provide the finished FML's shown on the Drawings; including material for all seams, laps, anchors, and pipe boots. The Contractor shall balance the actual project FML requirements, as determined from the Contractor's quantity take-offs, against those shown on the Drawings.

5.8.1.2 Submittals

A. This section describes the material required to be submitted by the resin supplier, FML manufacturer, and the Contractor. Some items are required to be submitted with the bid documents, other items are required to be submitted after contract award prior to FML installation. The after contract award submittals must be received by the Engineer a minimum of fourteen (14) days prior to commencing with FML installation.

B. The submittals detailed below shall be in accordance with Section 01300.

C. Resin Supplier for LLDPE:

1. Shall submit the following with bid documents:
    a. The resin trade name.
    b. The resin identification number.
    c. The range in specific gravity as per ASTM D 792, Method A.
    d. The range in melt index as per ASTM D 1238.
    e. The range in carbon black content, if applicable, as per ASTM D 1603 or D 4218.
    f. Copy of a typical quality control certificate for the resin to be supplied for this project.
    g. A listing of individual tests performed, and their frequency, during production of the specified resin.

2. After contract award:

   a. The submittals included with the bid documents will be subject to approval by the Engineer for inclusion into the Contract.

3. During supply for manufacture, shall:

   a. Certify each batch of resin for the following properties:

      1. Specific Gravity - ASTM D 792, Method A
      2. Melt Index - ASTM D 1238
      3. Carbon Black Content - ASTM D 1603 or D 4218

D. FML Manufacturer:

1. Shall submit the following with bid documents:

   a. Information on factory size, equipment, personnel, number of shifts per day, and capacity per shift.

   b. List of material properties (minimum roll) as specified in the Table in Section 2.02 below.

   c. Quality control program and manual which must include the specific testing proposed to be performed and frequency which the tests will be performed.

   d. Details of the laboratory that will perform the quality control testing during manufacture, including the name and telephone number of the contact that can discuss the project.

   e. List documenting a minimum of ten (10) completed facilities totaling a minimum of 5,000,000 square feet of the specified FML. Each entry in the list shall contain as a minimum the name and purpose of the facility, the name of the owner of the facility, the location of the facility, date of installation, name of the Contractor, the type(s), thickness and total(s) square footage of the FML installed at the facility, and the name of the designer.

2. Shall submit the following after contract award:

   a. Copies of all quality control certificates issued by the Resin Supplier. There shall be a quality control certificate for each batch, or rail car, of resin used to manufacture FML for this project.

   b. Statement of production date or dates of the resin.

   c. Statement of the production date of each roll of FML supplied to this project.

   d. Copy of the quality control certificates in conformance with Section 2.02 of these Specifications.

E. Contractor:

1. Shall submit with bid documents:

a. Resumes of the Installation Supervisor and the Master Seamer that will work on this project.

b. Installation schedule.

c. Contractor's quality control manual and documentation.

d. Information on equipment and personnel.

e. Samples of field welds of the same type of FML specified for this project from each type of weld proposed to be seamed at this project.

f. A list of at least ten (10) completed facilities, totaling a minimum of 5,000,000 square feet for which the Contractor has installed the same type(s) of FML specified for this project. For each installation listed the following information shall be provided as a minimum: name and purpose of the facility, the location of the facility, the date of the installation, the name of the owner, the name of the FML manufacturer, the type, thickness and total surface area of FML installed, type of seaming, patching and CQC (Contractor Quality Control) testing used during the installation.

2. Shall submit after contract award:

a. Deployment plan showing the panel layout and the location of field seams. Once approved, this deployment plan will be used for panel placement in the field. Any deviations from the approved deployment plan must be approved in writing by the Engineer prior to implementation.

b. Equipment list stating quantity, types and which pieces of equipment are proposed to come in contact with the FML.

c. Certification that any extrudate used on this project is in conformance with these Specifications.

d. Resumes of installation welders, superintendents, and foremen that will work on this project.

3. Shall submit during installation:

a. Quality control documentation prior to deployment of the FML as outlined in Section 2.02 and Part 3 of these Specifications.

b. A certificate of acceptance of the soil subgrade, as outlined in Section 3.01, prior to deployment of the FML.

4. Shall submit after completion of installation:

a. Certification that the FML was installed in accordance with the Project Specifications with a listing of changes and Engineer's written approval of such, where applicable.

b. Manufacturer's materials warranty and the installation Subcontractor's installation warranty.

c. Drawing depicting the locations of panels, seams, patches, and destructive sample locations, including numbering associated with said locations.

5.8.1.3 Qualifications

A. Resin Supplier:

1. The resin supplier shall be proven, through the FML manufacturer, to provide the production capacity required for the project size and scheduling requirements while providing first-rate quality material with consistent properties.

B. Manufacturer:

The manufacturer shall:

1. Have a minimum of five (5) years continuous experience in the manufacture of the specified FML rolls.
2. Have experience totaling at least 10,000,000 square feet of manufactured FML of the same type as the specified material.
3. Demonstrate experience in producing first-rate quality material with consistent properties for the quantities, and within the schedule, required for this project.
4. Demonstrate adequate quality control facilities and procedures. The quality control facilities and procedures will at all times be subject to approval of the Engineer.

C. Contractor:

The Contractor:

1. Must specialize, or have a specialty branch, in the installation of FML.
2. Must be subject to approval by the FML manufacturer.
3. Shall be a licensed contractor in Nevada, authorized to perform the Work contained in this Specification or demonstrate that the Work contained in this Specification is exempt from Nevada Contractor's regulations.
4. Provide an installation supervisor that has installed or supervised the installation and seaming of at least 5,000,000 square feet of the specified FML. The installation supervisor shall have experience in the installation of FML's with pipe boots.
5. Shall provide a master seamer who has seamed a minimum of 5,000,000 square feet of the specified FML using the same type of seaming equipment and techniques approved for the project.

5.8.1.4 Delivery, Storage, and Handling

A. Transportation:

The FML shall be packaged and shipped in such a manner that the material is not damaged or exposed to damaging substances. Transportation shall be the responsibility of the Contractor unless agreed to by the manufacturer and the Owner, in writing, prior to the initiation of shipment of FML to the project site.

B. Off-Loading:

Off-loading of the FML is the responsibility of the Contractor. No off-loading of FML shall be performed unless the Owner's representative is present. Any damage to the rolls during off-loading shall be documented by the Owner's representative and the Contractor. All damaged rolls must be stored separate from the undamaged rolls. The rolls shall be unrolled to determine the extent of the damage. The use of the roll or portions of the damaged roll shall be only at the approval of the Engineer. The cost of evaluating, replacing or repairing rolls damaged during off-loading shall be the sole responsibility of the Contractor.

C. Storage:

1. The FML shall be stored such that it is protected from UV rays, puncture, dirt, grease, gasoline, diesel fuel, water, moisture, mud, mechanical abrasion, excessive heat, and other causes of damage to the FML material.
2. The rolls shall be stored on a prepared surface. Storage on wooden pallets or other surfaces that may damage the FML material shall not be permitted. The rolls shall not be stacked more than two high and shall be stacked in such a manner that the roll number of each roll is easily visible.
3. Rolls without the proper documentation shall be stored separately until all the required documentation is received and approval given for deployment by the Engineer.

5.8.1.5 Warranty

All workmanship furnished by the Contractor under this Specification shall be guaranteed by the Contractor against failure due to improper installation for a period of not less than five (5) years. All permanent LDPE materials furnished by the Contractor under this Specification shall be guaranteed by the Contractor and the FML manufacturer for a period of not less than twenty (20) years.

Upon written notice that the material fails to meet the original intent of the design, or of failure of guaranteed materials or workmanship during the guarantee period the Contractor shall promptly furnish and install new materials and/or furnish the workmanship necessary to correct the failure at the expense of the Contractor. The Installation Subcontractor shall bear all costs for labor and materials associated with repair of guaranteed work.

5.8.2 Products

5.8.2.1 Materials

A. Resin:

The LLDPE FMLs shall be manufactured of new, first-quality resin produced in the United States or Canada and shall be compounded and manufactured specifically for the purpose of liquid containment in hydraulic structures. The FML shall be manufactured from only the approved resin type. The use of a different resin type for the manufacture of FML for this project shall only be done with prior written approval. The blending of different resin types will not be permitted.

B. FML Sheet:

The surface of the FML shall be free of striations, holes, blisters, undispersed raw materials, or any contamination by foreign matter. FML exhibiting any imperfections may only be used upon written approval by the engineer, if it is felt the blemishes will not adversely affect the performance of the FML, and only after sufficient laboratory testing has been performed to support such acceptance.

C. LLDPE FML's Processing Aids, Antioxidants, or Other Additives:

The Contractor shall identify each additive used and its percentage by weight. Additives are subject to approval. Additives used during manufacture that were not previously identified will be grounds for rejection of the FML.

D. The FML supplied for this project shall meet or exceed the minimum (unless otherwise noted) roll or panel values shown in the following tables.

E. LLDPE Extrudate Used for Extrusion Welding:

Compounded new, first-quality resin conforming to the same properties as the resin used in the manufacture of the FML sheet.

5.8.2.2 Quality Control During Manufacture

A. LLDPE FML Resin:

The FML manufacturer shall perform the following tests at the specified frequencies on the resin used to produce FML for this project:

1. Specific Gravity - ASTM D 792, Method A: 1 per batch.
2. Melt Index - ASTM D 1238: 1 per batch.
3. Carbon Black Content - ASTM D 1603: 1 per batch.
4. Report results in such a manner that they can be traced to the specific rolls that were manufactured from the resin tested and to the Resin Supplier certificate.

B. FML Sheet:

The FML manufacturer shall perform the following tests at the specified frequencies, on the finished sheet of LDPE where appropriate:

1. Thickness - ASTM D 5199 and D 5994: 25 micrometer readings per roll minimum.
2. Carbon Black Content - ASTM D 4218: 1 per 50,000 sq. ft.
3. Carbon Black Dispersion - ASTM D 5596: 1 per 50,000 sq. ft.
4. Tensile Properties:
    a. Strength at Yield - ASTM D 6693: 1 per 50,000 sq. ft.
    b. Strength at Break - ASTM D 6693: 1 per 50,000 sq. ft.
    c. Elongation at Yield - ASTM D 6693: 1 per 50,000 sq. ft.
    d. Elongation at Break - ASTM D 6693: 1 per 50,000 sq. ft.
    e. Breaking Factor - ASTM D 6693: 1 per 50,000 sq. ft.
    f. Modulus at 100 Percent Elongation - ASTM D 6693: 1 per 50,000 sq. ft.
5. Density - ASTM D 792: 1 per 50,000 sq. ft.
6. Tear Resistance - ASTM D 1004: 1 per 25,000 sq. ft.
7. Puncture Resistance - ASTM D 4833: 1 per 25,000 sq. ft.
8. Coefficient of Dimensional Stability - ASTM D 1204: 1 per resin batch
9. Melt Index - ASTM D 1238E: 1 per resin batch
10. Low Temperature Impact - ASTM D 1790: 1 per 50,000 sq. ft.
11. Volatile Loss - ASTM D 1203: 1 per 50,000 sq. ft.
12. Water Extraction - ASTM D 3083: 1 per 50,000 sq. ft.
13. Low Temperature Flexibility - ASTM D 2136: 1 per 50,000 sq. ft.
14. Water Absorption - ASTM D 471: 1 per 50,000 sq. ft.
15. Trapezoidal Tear - ASTM D 2263: 1 per 50,000 sq. ft.
16. Coefficient of Thermal Expansion/Contraction - ASTM E 228: 1 per 50,000 sq. ft.
17. The results of the tests performed shall be reported in such a manner that each test performed can be easily traced to the time in the production run that it was performed and which specific rolls that the particular test is intended to represent.
18. The FML manufacturer shall maintain a production log recording roll number, total rolls manufactured for this project, total square footage manufactured for this project, and the test results of the required quality

control tests. A current production log shall be submitted with each set of FML quality control/assurance certificates submitted.

C. The following properties shall be certified by the Manufacturer:

1. Resistance to Soil Burial - ASTM D 3083.
2. Low Temperature Brittleness - ASTM D 746.
3. Hydrostatic Resistance - ASTM D 751.

D. Marking and Identification:

1. Indelible markings or labels on each roll shall identify the type of material, thickness, length, width, manufacturer lot number, and roll number.
2. Each roll of LLDPE shall be identified by a unique roll or panel number. The rolls or panels shall be marked such that the roll or panel number is easily read while the roll or panel is rolled or folded up in storage prior to deployment and after the roll or panel has been unrolled or unfolded and deployed. With each roll number the QA/QC Team shall be able to easily determine which resin tests are representative of the resin used to manufacture that particular roll and which quality control tests performed by the manufacturer are representative of that particular roll.

E. Conformance Testing:

1. All rolls or panels of liner delivered will be accompanied by a quality control certificate supplied by the manufacturer. Upon receipt of the first rolls or panels of liner, the two (2) rolls or panels with the poorest physical qualities reported on the quality control certificate will have a 3 foot wide sample cut from them for shipping to an independent laboratory for conformance testing. No rolls or panels will be deployed until the results from the independent laboratory have been reviewed by the Owner and Engineer. Conformance testing will be paid for by the Owner.
2. Additional conformance testing shall be performed on a randomly selected roll or panel for every million square feet of liner deployed. A 3 foot wide sample shall be cut from this roll or panel and sent to an independent laboratory for testing. If this roll or panel does not conform to the specifications in Part 2 of this Section, the roll or panel will not be deployed to the site, and additional conformance testing will be performed on another randomly selected roll or panel.
3. The conformance testing performed on the LLDPE material by the independent laboratory shall include:
   a. Thickness - ASTM D 5994.
   b. Density - ASTM D 792.
   c. Tensile Properties - ASTM D 6693 Type IV (2 inches per minute).
   d. Tear Resistance - ASTM D 1004, Die C.
   e. Puncture Resistance - ASTM D 4833.

f. Carbon Black Content - ASTM D 4218.

g. Carbon Black Dispersion - ASTM D 5596.

h. Melt Flow Index - ASTM D 1238, Condition 190/2.16.

Agru 60 mil LLDPE Super Gripnet® MATERIAL PROPERTIES		
Property	**Test Method**	**Test Values**
Gauge (nominal)	ASTM D 5994	60-mil, LLDPE Drain Liner ®
Thickness (minimum)	ASTM D 1593	54-mil
Density (minimum compounded)	ASTM D 792	0.94 g/cc min.
STRENGTH:	ASTM D 6693, Type IV, dumbbell at 2 in/min	
Tensile (minimum)	@ Break	126 lbs/in width
Elongation (minimum)	@ Break	300%
Tear Resistance (minimum)	ASTM D 1004, Die C	40 lbs
Puncture Resistance (minimum)	FTMS 101C Method 2065	70 lbs
Carbon Black Content	ASTM D 4218	2% - 3%

5.8.3 Execution

5.8.3.1 Subgrade Acceptance

A. The Installation Subcontractor is responsible for accepting the condition of the subgrade for FML placement, which he shall certify in writing to the Owner.

B. The Installation Subcontractor may, at the Subcontractor's option, accept the subgrade on an incremental basis.

C. It is the Installation Subcontractor's responsibility to inform the Owner and the Engineer of any change, due to natural or other causes, to an area of subgrade that has been accepted that may require repair work.

5.8.3.2 Supervision

A. Installation shall be performed under the constant supervision of the approved installation supervisor. The installation supervisor shall be in responsible charge of the project and shall be on-site full time during any activity of the Installation Contractor including, but not limited to, deployment, seaming, patching, testing, and repair work.

B. Seaming shall be performed under the constant presence of the approved master seamer. The master seamer shall be on-site during all activity of the Installation

Subcontractor requiring seaming including, but not limited to, seaming, patching and repairing.

5.8.3.3 Deployment

A. Prior to the deployment of a FML roll or panel the following documentation must be reviewed and approved:

1. The visible roll or panel number on the roll or panel prior to unrolling or unfolding.
2. Liner certification sheet with all the tests required in Section 2.02 of these Specifications.
3. Production Log, as specified in Section 2.02 of these Specifications, which includes that particular roll or panel number.
4. The resin certificate, as specified in Section 2.02 of these Specifications, for the resin that was used to manufacture that particular roll of FML.

B. No roll of liner will be deployed without the review and acceptance by the Engineer of the required documentation. The Installation Subcontractor shall be solely responsible for expenses incurred for replacing rolls without the required documentation, replacing rolls that are rejected upon review of the required documentation, delays in deployment while waiting for the required documentation, and expenses incurred due to excessive amounts of time spent by the Owner's representative reviewing incomplete documentation.

C. Handling of FML During Deployment:

1. The Installation Subcontractor shall use equipment that will not damage the FML during moving and deployment.
2. The Installation Subcontractor shall not use equipment or methods that damage the subgrade during deployment.
3. The Engineer will be the final authority regarding damage to the FML or to the subgrade. Items that will be considered as damage to the FML will include, but not be limited to, abrasions, tears, punctures, gas, oil or fuel spills, and creases. Items that will be considered as damage to the subgrade will include, but not be limited to, ruts, pumping, segregation, loose rocks or clods on the surface, gas, oil or fuel spills, or any abrupt projection that may damage the FML. Construction methods that crease the liner will not be permitted.
4. Dragging the FML across the ground will not be permitted.
5. Methods that are found to consistently damage the liner or the subgrade, as determined by the Owner and Engineer, will be terminated immediately upon written notice to the Installation Subcontractor.
6. Damage to the FML or to the subgrade, during handling and deployment of the FML shall be repaired at the sole expense of the Installation Subcontractor.

D. Deployment Pattern:

1. The deployment pattern used shall be according to the deployment plan submitted as required by the Owner. Any deviation from the approved deployment pattern must be approved, in writing, by the Engineer prior to implementation.
2. The individual panels shall be numbered in a logical sequence and in accordance with the approved deployment plan.
3. The deployment pattern shall be such that seams are oriented parallel to any slopes. No horizontal seams shall be placed along a slope. Overlap seams shall be placed in a downhill direction.
4. No base or T-seams shall be placed within 5 feet from the toe of the slope.
5. To the extent possible, the number of field seams shall be minimized.

E. Tension and Excess Material:

1. The FML shall be installed in a relaxed condition and shall be free of tension or stress on completion of the installation.
2. Stretching of the liner to fit will not be allowed.
3. The installation shall contain slack material sufficient to allow for shrink and wrinkles as per the FML manufacturer's recommendations. Individual wrinkles shall take the form of undulations of the FML material and shall not be enough to allow the material to fold back over itself. Corrective measures will depend upon the cause and severity and will be determined by the Owner.

F. Daily Deployment:

1. No more FML shall be deployed than can be seamed during that day's shift.
2. FML that is deployed and not welded during that day will be inspected prior to seaming for damage and moisture. If it is determined that the FML has been damaged, it shall be repaired or removed. If it is determined that the FML has become wet or moist it shall be dried prior to seaming to the satisfaction of the Engineer.

G. Weather Conditions:

1. No FML shall be deployed during periods of precipitation, high winds, in the presence of excessive moisture, or in areas of excessive moisture in the subgrade.
2. No FML shall be deployed while the ambient air temperature is below 40°F or over frozen ground until the test weld procedures have verified that seaming can be performed according to these Specifications and approval has been received from the Engineer.

H. Ballast Against Wind Uplift:

1. Adequate loading shall be placed on the FML to prevent uplift due to winds. Loading may be temporarily achieved through the use of sand bags filled with clean sand and securely tied. The bags shall not be tied with any type of material that will potentially damage the FML. The removal of spilled sand bag contents will be the responsibility of the Installation Subcontractor.
2. Permanent liner ballast will be supplied through the installation of 8-inch-diamter sand-filled ballast tubes as shown on the drawings. All temporary sand bag ballast will be removed and properly managed following the installation of permanent ballast.
3. Loose piles of material will not be allowed for use as ballast.
4. Sand bags shall not be thrown on top of or allowed to slide down slopes on top of the FML.

5.8.3.4 General Workmanship

A. The Installation Subcontractor shall perform all installation Work to conform to the best recognized practice to achieve a neat and functional installation.

B. The Installation Subcontractor shall exercise proper precaution to verify all measurements before laying out the work. He will be held responsible for any errors that otherwise might have been avoided. He shall carry on the Work systematically and so manage it at all times as to secure substantial progress.

C. The Installation Subcontractor shall at all times work in such a manner as to not damage the FML.

D. No equipment will be allowed upon the FML that has not been previously approved. Additional equipment shall only be placed upon the FML with the prior written approval of the Engineer.

E. Splash pads shall be placed beneath any type of equipment that may leak or splash gasoline, diesel fuel, oil or grease upon the FML. The splash pad shall be large enough to contain any splash or leak. Prior to placing the splash pad the FML shall be swept clean of any material that may puncture or abrade the FML.

F. Rub sheets shall be placed beneath any piece of equipment that comes in contact with the FML. The rub sheet shall be large enough to fully protect the FML. Prior to placing the rub sheet, the FML shall be swept clean of any material that may puncture or abrade the FML.

G. All hoses or cords that are used upon the liner shall be handled such that they will not damage the FML. Hoses and cords shall not be dragged across material that may abrade the FML.

H. If tired equipment is approved for use upon the FML, the tired equipment shall be moved with extreme care. The tired equipment shall be lifted over berms and wrinkles in the FML.

I. There shall be no smoking on the FML.

J. There shall be no hard objects allowed to come in contact with the FML without the use of a rub sheet.

K. The liner shall be swept clean in high traffic areas. These include, but are not limited to, areas that are being seamed, areas that are being tested, and areas that are being repaired.

5.8.3.5 Survey Control

A. It shall be the responsibility of the Contractor and Installation Subcontractor to secure proper horizontal and vertical control such that the locations of the FML material conform to the dimensions shown on the Drawings.

B. The dimensions shown on the Drawings shall hold precedence over scaled measurements.

C. If necessary dimensions are not shown on the Drawings, no work affected thereby shall be performed until the required dimensions have been obtained from the Owner.

D. The Owner will provide surveying control (three points) for the project in the form of monuments, bench marks and reference points. The Installation Subcontractor shall be responsible for the proper preservation of the above mentioned points with respect to the Subcontractor's activities. If, in the opinion of the Owner, any surveying control has been carelessly or willfully disturbed or destroyed by the Installation Subcontractor or the Contractor's employees, the cost of replacing such control points shall be incurred by the Contractor.

5.8.3.6 Seaming

A. Welding and Related Equipment:

Only welding equipment that is on the equipment list and has been approved shall be used to seam the FML. As a minimum the welding and related equipment shall meet the following requirements:

1. The welding equipment shall be equipped with a means of measuring and displaying the temperature within the apparatus and at the nozzle for extrusion welders and hot air welders, and at the wedge(s) for fusion welders.
2. The power source shall be capable of providing a constant voltage under varying line loads.

B. Start Up and Test Seams:

1. Each seamer shall perform trial seams at the beginning of each day prior to beginning seaming of permanent materials. No seamer shall perform production seaming until the start up seams have been performed, tested and approval given by the Engineer.
2. Test seams shall be performed a minimum of once during the middle of the shift. More frequent test seams shall be performed at times as is deemed

necessary, such as during cold weather or if the seams are observed to be of questionable quality. The criteria for a passing test seam will be the same as the criteria for a passing start-up seam.

3. All start-up and test seams shall be performed in a designated area. The start-up and test seams shall be performed in contact with the same subgrade conditions and under the same environmental conditions that production seaming will be performed under. Performing start-up or test seams upon rub sheets will not be permitted unless approved, and rub sheets are used during all production seaming.

4. Each start-up or test seam shall consist of seaming two (2) pieces of FML together of the same type and thickness that the seamer will be seaming during production. The start-up or test seam shall be a minimum of 24 inches long and 12 inches wide with the seam centered lengthwise.

5. Four (4) 1-inch-wide strips shall be cut, two (2) each from each end of the trial seam. Two (2) of the strips shall be tested in shear and two (2) shall be tested in peel in accordance with ASTM D 4437.

6. A tensiometer with a calibrated load measuring device and means to apply the required loading rate shall be used to test the start up and test seams at the project site, where appropriate. The width of each of the strips shall be measured to within one-hundredth (0.01) of an inch and recorded. The temperature at the time of the test shall be recorded.

7. Where chemical welds are used, a cure time between seven (7) and thirty (30) days is required. This time may be accelerated using oven aging in accordance with ASTM standards

8. The results of the start-up and test seams shall include the load at failure, the load at failure in pounds per inch (ppi) determined by dividing the total load at failure by the measured width of the strip, and type of failure in terms of Film Tearing Bond (FTB) or Non-Film Tearing Bond (Non-FTB) as shown in Appendix N of EPA/600/2-88/052.

9. A start-up or test seam will be considered as passing only if the load at failure meets or exceeds the minimum values specified in this section for all samples in peel and shear, and all samples achieve a FTB at failure.

10. In the event that a particular seamer fails a start-up or test seam, the entire procedure shall be repeated. If the particular seamer fails the start-up or test seam the second time, that particular seamer shall not be used until the cause of failure has been identified, corrected, and a passing start-up or test seam achieved.

C. Overlap:

1. Panels shall overlap a minimum of 5 inches unless otherwise approved in writing. The overlap shall be measured and marked on the underlying panel.

2. If trimming of the FML is required to maintain the overlap, the underlying panel shall be trimmed and remarked. Trimming of the overlying panel will not be allowed.

D. Marking of Seams and Welds:

The seamer or welder shall write upon the FML, in permanent marker, the following information at the beginning and end of each seam:

1. Seam or weld number.
2. Seamer's or Welder's name.
3. Temperature of the wedge(s) for fusion welders, or temperatures of the inside of the welder and at the tip for extrusion welders associated with LLDPE liner installation.
4. The date.
5. The time.

E. Welding Procedures for LDPE:

Welding shall only be performed when the FML is clean and free of dust, dirt, grease, oil, other foreign substances, and dry. Solvents or adhesives shall not be used unless the specific product is approved, in writing, by the Engineer.

1. Extrusion Welding:
   a. Surface of FML to be extrusion welded shall be ground.
   b. Grind surface no more than thirty (30) minutes prior to seaming.
   c. Grind such that surface oxidation is removed, no more than 5 percent of the liner thickness is removed, and the ground area shall extend no more than 1/4 inch beyond the edge of the extruded bead.
   d. Extruded bead shall be placed over excess grinder marks.
   e. Grinder marks shall be perpendicular to the seam.
   f. The edge of the overlying panel shall be beveled.
   g. The two pieces to be seamed together shall be tack bonded together such that they will be held in place during seaming, there is no damage to the FML, seaming operations can be effectively performed, and construction quality control CQC testing can be effectively performed.
   h. Extrudate shall be extruded from the welder to expose fresh extrudate prior to welding.
2. Restarting Procedures:
   a. Overlap existing weld a minimum of 2 inches.
   b. Grind existing weld prior to initiating welding.
   c. Resume welding where the grinding starts.

d. Resuming seaming operations on any weld that is over five (5) minutes old shall be considered a restart.

3. Reseaming Procedures:

a. Grind existing seam prior to rewelding.

b. Beveling shall be performed during grinding.

c. No seam shall be re-seamed without grinding prior to initiating reseaming operations.

F. T-Welds:

No T- welds will be allowed and all intersections of liner that form a T or + shall be capped with no exceptions.

G. Fish-Mouths and Wrinkles:

Fish-mouths and excessive wrinkles shall be cut and overlapped a minimum of 5 inches and seamed. Where the 5-inch overlap cannot be achieved, a cap shall be seamed in-place extending a minimum of 6 inches beyond the cut.

5.8.3.7 Construction Quality Assurance and Quality Control Testing

A. Construction Quality Control testing shall consist of:

1. The Contractor's observation of the unrolled sheet and marking for repair or rejection if necessary.
2. The Contractor's destructive sample testing.
3. The Contractor's non-destructive testing.

B. Construction Quality Assurance shall consist of the following activities by the Quality Assurance Team:

1. Review of required documentation.
2. Approval of rolls of FML for deployment.
3. Review of compliance testing as required.
4. Observation of the unrolled panels for holes, blisters, undispersed raw materials, and marking for repair or rejection.
5. Observation of CQC testing.
6. Location of destructive sample locations.
7. Observation of random destructive testing.
8. General observation of materials and workmanship.

C. Engineer has final authority for the CQA of the project.

D. Compliance Testing:

1. At the option of the Engineer, compliance testing may be performed at any time prior to, during or after the installation.

2. The cost of the compliance testing shall be negotiated between the Owner and Contractor.

3. The tests performed during compliance testing shall be determined by the Engineer.

4. Compliance testing shall not include any tests that are not listed in these Specifications as a basis for evaluating compliance of the FML to these Specifications.

5. Sampling for Compliance Testing:

   a. Samples shall be obtained by the Engineer.

   b. The sample for a roll shall be 3 feet long and cut across the entire width of the roll.

   c. Taken as close to the middle of the roll as practical but shall, as a minimum, be sampled no closer than 3 feet to the end of a roll.

6. The sample shall be labeled by the Engineer, in permanent marker, with the following information:

   a. Roll number.

   b. Machine direction.

   c. Date sampled.

   d. Name of individual that sampled the material.

E. Start-up and Test Seams:

1. Each welder and piece of welding equipment that will be seaming FML shall perform start up welds at the beginning of each day prior to beginning seaming of permanent materials.

2. No welder or piece of welding equipment shall perform production seaming until the start-up seams have been performed, tested, and approval given by the Engineer.

3. Each welder shall perform a test seam a minimum of once during the middle of the shift.

4. More frequent test seams shall be performed at the request of the Engineer at times as is deemed necessary, such as during cold weather or if the seams are observed to be of questionable quality.

5. The criteria for a passing test seam will be the same as the criteria for a passing start-up seam.

6. Procedure for Start-up and Test Seams:

   a. Start-up and test seams shall be performed in an area designated by the Engineer.

b. Start-up and test seams shall be performed in contact with the same subgrade conditions and under the same environmental conditions that production seaming will be performed under.

c. Performing start-up or test seams upon rub sheets will not be permitted unless approved by the Engineer and, rub sheets are used during all production seaming.

d. Each start-up or test seam shall consist of seaming two pieces of FML together of the same type and thickness that the welding equipment and welder will be seaming during production.

e. Start-up or test seam pieces shall be a minimum of 24 inches long and 12 inches wide with the seam centered lengthwise.

7. Testing Procedures for Start-up and Test Seams:

a. Four (4) 1-inch-wide strips shall be cut, two (2) each from each end of the trial seam.

b. Two (2) of the strips shall be tested in shear and two (2) shall be tested in peel in accordance with ASTM D 4437.

c. A tensiometer with a calibrated load measuring device and means to apply the required loading rate shall be used to test the start up and test seams at the project site.

d. The width of each of the strips shall be measured to within one-hundredth (0.01) of an inch and recorded.

e. The temperature at the time of the test shall be recorded.

f. Results of the start-up and test seams shall include the load at failure, the load at failure in pounds per inch (ppi) determined by dividing the total load at failure by the measured width of the strip, and the type of failure in terms of Film Tearing Bond (FTB) or Non-Film Tearing Bond (Non-FTB) as shown in Appendix N of EPA/600/2-88/052.

8. Pass or Failure Criteria for Start-up and Test Seams:

a. A start-up or test seam will be considered as passing only if the load at failure meets or exceeds the minimum values specified in Part 2 of this Section for all samples in peel and shear, and, all samples achieve a FTB at failure.

9. Failing Start-up or Test Seams:

a. In the event that a particular piece of welding equipment or welder fails a start-up or test seam, the entire procedure shall be repeated.

b. If the particular piece of welding equipment or welder fails the start-up or test seam the second time, that particular welder or piece of welding equipment shall not be used until the cause of the failure has been identified, corrected and a passing start-up or test weld achieved.

F. Non-Destructive Testing for LDPE:

1. Contractor shall perform non-destructive testing on 100 percent of all seams for this project.
2. Non-destructive testing for LLDPE shall consist of air channel testing for double wedge fusion welds or vacuum box testing on extrusion welds.
3. Other types of non-destructive testing will be performed only upon written approval for the Engineer.
4. No areas of the FML installation will be approved and finalized that have not been non-destructively tested with passing results, or that have not been repaired and retested.
5. Air Channel Testing:
    a. Air channel testing consists of sealing both ends of the seam, pressurizing the channel, and monitoring the pressure with time.
    b. The Engineer shall observe 100 percent of all air channel testing.
    c. Testing performed without the observation of the Engineer will be required to be retested.
    d. Tests that are terminated prior to the specified time interval shall be retested.
    e. Propane torches will not be allowed to fuse the ends of the seam closed.
    f. Equipment that is used to fuse the ends of the seam closed shall be used with extreme care to avoid damaging the FML.
    g. Areas that are damaged shall be marked for repair.
    h. The Engineer shall affirm that the entire air channel under test is clear by observing air flowing out of the end of the channel opposite the end with the pressure gauge, prior to the test being performed.
    i. All penetrations into the FML, including including those made by the device used to apply the air pressure, shall be repaired by patching as described in these Specifications.
    j. Modifications to the Specifications for air channel testing shall not be made without prior written approval.
    k. Air Channel Testing Procedure:
        1) One end of the air channel shall be fused shut.
        2) A device capable of applying air pressure to the channel without leaking shall be installed.
        3) The device used to apply the air pressure shall also have a 60 pounds per square inch (psi) capacity pressure gauge, capable of being read to 1 psi, attached to it with a leak free connection.

4) Pressurized air shall be applied to the channel to verify an open channel. If the channel is determined to be blocked, the obstruction shall be located and the test performed to that location. If an open channel is verified, the other end of the channel under test shall be fused shut.

5) A pressure of 40 psi gauge shall be applied to the channel and held for five (5) minutes.

6) A drop in pressure of 5 psi or less within a five (5) minute test period will constitute a passing test.

7) If the pressure drops more than 5 psi within the five (5) minute test interval, the seam under test will be considered as failing.

l. Failing Air Channel Tests:

Seams that fail the air channel test shall be repaired or remediated in one or more of the following manners:

1) The cause of the leak shall be determined.

2) The leak shall be repaired and retested.

3) The entire seam will be extrusion welded and vacuum tested.

4) The entire seam shall be capped and vacuum tested.

5) If the seam is to be extrusion welded, the unattached portion of the overlying FML shall be tack bonded to the underlying liner prior to extrusion welding.

6) The extrusion weld shall be performed in accordance with these Specifications.

6. Vacuum Box Testing:

a. Vacuum box testing shall be performed on 100 percent of all extrusion welded seams and patches.

b. Engineer shall observe 100 percent of all vacuum box testing.

c. Testing performed without the observation of the Engineer shall be required to be retested at the sole expense of the Contractor.

d. The Engineer shall be the final authority on determining the presence of a leak as indicated by the vacuum box method.

e. If the vacuum box is moved too quickly, not evacuated to the required vacuum, or if the site glass is too dirty to allow effective testing, the seam or patch shall be retested.

f. Vacuum Box Testing Procedures:

1) A soapy solution shall be applied to the section of seam to be tested.

2) Excess FML shall be trimmed prior to vacuum testing. A rub sheet and extreme care shall be used while trimming excess FML for vacuum box testing. Nicks made in the installed FML while trimming shall be repaired as determined by the Engineer.

3) The vacuum box shall be placed over the seam and adjusted so that an effective seal against the FML is achieved.

4) A minimum vacuum of 5 psi (gauge) shall be applied and held for a minimum of fifteen (15) seconds.

5) The seam shall be observed through the site glass for the presence of bubbles indicating a leak.

6) Sections of the seam that indicate a leak for repair shall be marked.

g. Failing Vacuum Box Tests:

1) Areas failing vacuum box testing shall be ground and rewelded or repatched as determined by the Engineer and retested until a passing result is achieved.

7. Seams Unable to be Non-Destructively Tested:

a. If the seam is accessible for testing prior to final installation such as with prefabricated appurtenances, the seam shall be tested prior to final installation.

b. If the seam cannot be tested prior to final installation, it shall be seamed under the constant observation of the Engineer.

c. The seam may be required to be cap stripped as determined by the Engineer.

G. Destructive Testing:

1. Destructive samples shall be taken a minimum of every 500 lineal feet of seam or one (1) sample per seaming crew per day, whichever is greater.

2. More frequent samples may be taken as appropriate.

3. Destructive sample locations shall be determined by the Engineer, and shall not be revealed to the Installation Contractor prior to actual sampling.

4. Sampling times shall be determined by the Engineer.

5. The installation Contractor shall obtain all destructive samples.

6. The Engineer shall observe the obtainment of all destructive samples.

7. Destructive sample testing shall consist of peel and shear testing per ASTM D 413, ASTM D 3083, and ASTM D 4437, as appropriate.

8. Peel testing shall be performed on both seams of double wedge welds unless otherwise approved, in writing.

9. Seams that are not able to be tested in peel shall be cap stripped.

10. All penetrations into the FML during destructive sampling shall be repaired by the Installation Contractor by patching as specified in these Specifications and non-destructively tested as specified in these Specifications.
11. Samples shall be obtained and tested as the installation proceeds.
12. No areas of the FML installation shall be approved and finalized prior to the results of all destructive samples being reviewed by the Engineer.
13. No areas of the FML installation shall be approved and finalized that incorporate failing destructive sample results that have not been repaired and retested as required.
14. No areas of FML shall be approved and finalized that incorporate a set of destructive samples that have not been randomly tested by the Engineer with passing results.
15. No areas of the FML installation shall be approved and finalized that have not been patched as required in these Specifications and non-destructively tested as required in these Specifications, with passing results.
16. Destructive Sampling Procedures:
    a. The destructive samples shall be a minimum of 12 inches wide by 42 inches long with the seam centrally located.
    b. The destructive sample shall be distributed as follows:
        1) A 12-inch by 12-inch sample to the Installation Subcontractor.
        2) A 12-inch by 18-inch sample to the Engineer.
        3) A 12-inch by 12-inch sample to the Engineer.
    c. If the Installation Subcontractor requires more sample to perform the specified testing, he shall inform the Owner and the Engineer of the Contractor's requirements and sample accordingly.
    d. Each sample shall be legibly marked by the Installation Subcontractor, in permanent marker, with the following:
        1) Destructive sample number.
        2) Date sampled.
        3) Name of individual who obtained the sample.
        4) Seam number.
17. Installation Subcontractor's Destructive Sample Testing:
    a. The Installation Subcontractor shall test in peel and shear 100 percent of the destructive samples obtained in accordance with the procedures specified in these Specifications.
    b. Results shall be submitted, in writing, to the Owner and Engineer.

18. Owner's Representative Destructive Sample Testing:

    a. The Owner's representative shall test 100 percent of the destructive samples obtained from FML installations in the process ponds.

    b. The Owner's representative may randomly select up to 100 percent of the destructive samples for testing from the FML installation in other areas.

    c. Test procedures shall be according to those specified in these Specifications.

19. Destructive Sample Test Procedures:

    a. Destructive samples shall be tested in accordance with ASTM D 413, ASTM D 3083, and ASTM D 4437, as appropriate.

    b. Five (5) specimens from each coupon shall be tested in both shear and peel. The specimens used as peel and shear test specimens shall alternate as the specimens are cut from the sample.

    c. A tensiometer with a calibrated load measuring device and means to apply the required loading rate shall be used to test the specimens.

    d. The width of each of the specimens shall be measured to within one-hundredth (0.01) of an inch and recorded.

    e. The temperature at the time of the test shall be recorded.

    f. Results of the destructive sample tests shall include the load at failure in pounds, the load at failure in ppi determined by dividing the total load at failure by the measured width of the strip, and the type of failure in terms of Film Tearing Bond (FTB) or Non-Film Tearing Bond (Non-FTB) as shown in Appendix N of EPA /600/2-88/052.

20. Pass or Failure Criteria For Destructive Samples:

    a. Destructive sample will be considered as passing only if all of the following criteria are met:

        1) The minimum strength specified in these Specifications is met or exceeded in at least four (4) of the specimens tested in peel and these same four (4) specimens achieve a film tearing bond as shown in Appendix N of EPA/600/2-88/052; and

        2) The minimum strength specified in these Specifications is met or exceeded in at least four (4) of the specimens tested in shear and these same four (4) specimens achieve a film tearing bond as shown in Appendix N of EPA/600/2-88/052.

    b. If either the Installation Subcontractor's or the Owner's representative destructive sample test fails, the seam will be considered as failing.

21. Failing Destructive Sample Tests:

a. In the event that a destructive sample fails the Installation Subcontractor shall either:

1) Reconstruct the seam between any two passing test locations.

2) Obtain small samples a minimum of 50 feet on either side of the failing sample for field testing by the Installation Subcontractor. When the Installation Subcontractor determines that a passing result has been achieved on both sides of the failing test location, the Installation Subcontractor shall then sample according to these Specifications. The Owner's representative shall then test both samples. If both samples tested by the Owner's representative pass, the seam shall be reconstructed between the two (2) passing test locations. If one or both of the samples fail, additional samples shall be obtained until passing results are achieved and the seam shall be capped between the passing test locations.

b. Consideration shall be given to the particular piece of welding equipment and welder that welded the particular seam that failed. Additional destructive samples may be obtained as appropriate.

c. Reconstruction of the seam shall include cutting out the failed seam, repositioning the panels and reseaming, or capping the entire failed seam, or in the case of fusion welds, extrusion welding the entire seam as specified in these Specifications.

d. After reconstruction, destructive samples of the reconstructed seam shall be obtained at locations determined by the Owner's representative. These samples will be tested and evaluated as described in Specifications.

e. Caps shall be non-destructively tested. Caps may require destructive testing.

5.8.3.8 Defects and Repairs

A. The FML sheet and the seams shall be observed by the Engineer and Installation Subcontractor for holes, creases, underlying projections, blisters, undispersed raw materials, contamination by foreign material, and other damage.

B. If installed FML becomes covered or too dirty for effective inspection, the Installation Subcontractor shall clean the FML such that effective inspection can be made.

C. Repairs made due to damage resulting from the Installation Subcontractor's activities shall be at the sole expense of the Installation Subcontractor.

D. Areas of the FML installation that cannot be effectively repaired, shall be capped or the damaged FML removed and replaced, as determined by the Engineer.

E. Areas of LLDPE FML requiring repair shall be ground prior to welding as required in these Specifications.

F. All FML surfaces shall be clean and dry prior to repairing.

G. All LDPE patches and caps shall be ground, beveled, extend at least 6 inches beyond the cut or defect, and have rounded corners.

H. Repair methods are listed below for specific types of damage. Types of damage that are not covered in these Specifications shall be repaired as determined by the Owner.

1. Small Holes:

   A hole or defect smaller than 1/4-inch in diameter in its largest dimension shall be considered a small hole. Small holes shall be repaired by grinding and extruding a bead for LDPE. The repair shall be non-destructively tested.

2. Large Holes:

   A hole or defect larger than 1/4-inch in its smallest dimension shall be considered a large hole. Large holes shall be repaired by patching. The repair shall be non-destructively tested. For large patches, the repair may be destructively tested.

3. Projections Under the FML:

   Projections under the FML shall be removed by making as small a cut as possible. The cut shall be patched. The repair shall be non-destructively tested.

4. Abrasions and Nicks:

   Abrasions and cuts requiring repair shall be determined by the Engineer, and will include grinding and extruding a bead for LDPE.

5. Creases:

   Creases requiring repair shall be determined by the Engineer, and will include grinding and extruding a bead for LDPE.

6. Bridging of the FML:

   Excessive bridging (trampolining) of the FML will not be allowed. The degree of excessive bridging will be determined during cool morning weather. Excessive bridging of the FML liner will be determined by the weight of a 180-pound man standing on the bridged FML. If the imposed weight does not force the liner to the underlying subgrade during the coolest site conditions encountered during construction, bridging must be removed. The installation Contractor will take steps to remove excessive bridging without cutting and patching the FML, unless approved by the Owner. Such steps will include temporarily sandbagging the toe of the slopes over a period of a day or more, and/or temporarily removing material from anchor trenches to allow adjustment.

5.9 Geotextile (8 oz/sy heat burnished)

Geotextile shall be minimum 8-ounce-per-square-yard (oz/sy) heat-burnished, non-woven, needle-punched geotextile. Geotextile shall be installed on the studded side of the 60 mil LLDPE in accordance with manufacturer's specifications, with minimum overlaps, and with the heat burnished side to the studded side of the 60 mil LLDPE.

5.10 Riprap

Riprap shall be placed as channel protection in v-ditches constructed over the final cover, near intersections with natural drainage channels and where the potential for channel erosion is considered significant. Riprap shall be placed to the specified thickness shown on the Drawings. Riprap shall be durable rock resistant to degradation by weathering and abrasion and meeting the size gradation specifications as described below.

Channel base and sideslopes shall be compacted to a non-yielding surface subject to Engineer's approval prior to geotextile and riprap placement. Do not place riprap on soft or yielding surfaces unless approved by the Engineer.

V-ditches constructed on the final cover with slopes generally less than 4 percent shall be lined with a minimum of 6 inches of riprap meeting the specifications in Table 5.1. Steeper channel segments in v-ditches constructed over the final cover and in specific areas identified in the upgradient diversion channels shall meet the specifications in Table 5.2. Segments of the trapezoidal channel identified on the drawings shall be lined with riprap meeting the specifications in Table 5.3.

Table 5.1. Riprap D_{50} = 3 inches

Riprap Lining Thickness	Rock Size (inches)	Percent Finer
4½ - 6 inches	5	100
	4	85
	3	50
	1.5	15

Table 5.2. Riprap D_{50} = 6 inches

Riprap Lining Thickness	Rock Size (inches)	Percent Finer
9 inches	10	100
	8	85
	6	50
	3	15

Table 5.3. Riprap D_{50} = 8 inches

Riprap Lining Thickness	Rock Size (inches)	Percent Finer
12 inches	9	100
	8	85
	6	50
	3	15

6.0 BORROW AREAS

Borrow material shall be derived from on-site excavation or other locations as approved by the Engineer. If stockpiling of salvaged soil or borrow material is performed, materials shall be stockpiled at locations designated by the Owner or Engineer. Any unused stockpiled material shall be returned to borrow area. After use, borrow areas shall be final graded to prevent freestanding surface water at maximum slopes of 3H:1V. Borrow areas shall be left in a clean and neat condition.

APPENDIX K

CONSTRUCTION QUALITY ASSURANCE PLAN

MONO COUNTY
DEPARTMENT OF PUBLIC WORKS

CONSTRUCTION QUALITY ASSURANCE PLAN

BRIDGEPORT LANDFILL FINAL CLOSURE CONSTRUCTION

SWIS# 26-AA-0002
WDID# 6B260004000

Mono County, California

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1.0 INTRODUCTION

1.1 General

This Construction Quality Assurance (CQA) Manual has been prepared for the Mono County Department of Public Works (Mono County) in accordance with Title 27 of the California Code of Regulations (CCR), Division 2, Sections 20323 and 20324. This manual was prepared by a registered civil engineer and describes construction quality assurance procedures to be followed in testing and documenting the construction of the alternative final cover layer at the Bridgeport Landfill. This manual outlines the specific field and laboratory testing and monitoring procedures required to demonstrate that the final cover is constructed in accordance with the approved Final Closure and Postclosure Maintenance Plan (FCPMP).

Execution of this CQA plan shall be supervised by a registered civil engineer or certified engineering geologist who shall act as the designated CQA officer. Following the completion of the work, the CQA officer shall prepare a Final CQA Report. The Final CQA Report will provide a detailed description of the level of experience and training for the contractor, the work crew, and CQA inspectors for every major phase of construction in order to ensure that the installation methods and procedures required in the containment system design have been properly implemented.

1.2 Facility Description

The Bridgeport Landfill is a Class III municipal solid waste landfill operated by the Mono County Department of Public Works and located approximately one mile northeast of the community of Bridgeport in northern Mono County, California. The site is located on 38.5 acres of land leased from the Bureau of Land Management (BLM). The site is situated at latitude 38°16'N and longitude 119°13'W, as shown on Drawing 1 in the FCPMP. Access to the landfill is from State Highway 182, 1.1 miles north of the junction with U.S. Highway 395. The landfill property, as described by the Public Land Survey System, occupies the E ½, NW ¼, NE ¼, and the W ½, NE ¼, NE ¼ of Section 28, Township 5 North, Range 25 East, Mount Diablo Baseline and Meridian. The property boundaries are shown on Drawing 2 in the FCPMP.

The Bridgeport Landfill was established in 1972 to replace an open dump at the site. The landfill receives municipal solid waste from the community of Bridgeport and other nearby communities. Since 1998, Mono County has operated the facility as a combined transfer station and Class III landfill. Only a small portion of the total service area waste stream, limited to construction and demolition waste, is currently buried on-site. Municipal solid waste received at the site is currently transferred through the on-site transfer station to the County's regional landfill, the Benton Crossing Landfill. Based on available data, it is estimated that only approximately 70,000 cubic yards of waste and cover soil are actually buried at the site.

The limits of final waste placement encompass approximately 9.0 acres of the 38.5-acre site. Remaining site areas are occupied by site access roads, borrow source excavation, environmental monitoring wells, drainage facilities, transfer station operations, equipment storage and stockpiling and/or storage of recyclable materials. The existing waste footprint is depicted on Drawing 2 in the FCPMP.

The Bridgeport Landfill is owned by Mono County, California, and operated by the Mono County Department of Public Works. The landfill's address is 50 Garbage Pit Road, Bridgeport, California 93517. The following person can be contacted for information about the landfill during the closure and postclosure period:

Mr. Evan Nikirk, P.E., Director
Mono County Department of Public Works
Post Office Box 457
Bridgeport, California 93517
(760) 932-5440

In the event of a change of ownership, Mono County Department of Public Works will notify the Local Enforcement Agency (LEA) within 30 days in accordance with Title 27 CCR Section 21200.

2.0 CHAIN OF COMMAND AND RESPONSIBILITIES

The Owner will appoint a Construction Manager, who shall oversee the Contractor, track the Contractor's progress with respect to an agreed-upon construction schedule, and review the Contractor's invoices. Prior to winning the project, the Contractor shall provide documentation demonstrating his/her experience and capability to construct the project components in accordance with the specifications and approved design, in addition to providing evidence of his/her license to contract within the State of California. The

Contractor shall have a minimum of five years of experience conducting construction projects with similar components.

The Owner will also provide a third-party construction quality assurance team, consisting of a CQA Manager and CQA Inspectors. CQA shall be performed by a third party in accordance with this Construction Quality Assurance Plan and subsequent addenda. The CQA Manager shall have formal academic training in engineering, engineering geology, or a closely-related discipline and will be a civil engineer or certified engineering geologist registered in the State of California. The CQA Manager will oversee the CQA Inspectors and all aspects of CQA execution and will review and approve all CQA test reports and documentation.

CQA inspection personnel will have formal training, certification and practical experience in inspecting and testing construction work, including conducting and recording inspection activities, preparing daily reports, and performing field testing. In addition, knowledge of applicable codes and regulations governing material handling, observation of testing procedure, equipment, and reporting procedures will be required. CQA inspection personnel will perform various tests and observations during construction, such as:

- Ensuring that all testing equipment is properly calibrated on a regular basis and that the calibration is documented.
- Verifying earthwork locations, dimensions and specifications, coordination of field survey and construction scheduling.
- Accurately recording all test data and organizing them in a manner that allows easy reference.
- Evaluating the Contractor's construction quality control plan to ensure that it meets or exceeds the CQA Manual requirements.
- Reporting observations and test results as the work progresses.

3.0 MEETINGS

Meetings will be an essential component of the CQA process. The CQA Manager will begin duties by coordinating a pre-construction meeting with the Owner, the Construction Manager, the Contractor, and the Design Engineer. The purpose of the meeting will be to provide all parties with pertinent documents, establish chain of command and lines of communication, review the CQA Manual, specifications, testing procedures and equipment, establish a meeting schedule, and conduct a site tour.

Daily progress meetings will be held so the Contractor and CQA personnel can discuss test results, discuss and resolve issues, and review the Contractor's equipment and manpower assignments for the day.

Weekly progress meetings will include the Construction Manager, the CQA Manager, and potentially the Owner and Design Engineer and will be used to review project progress and discuss problems, schedule, changes, test data and any other issues requiring discussion or resolution..

4.0 DOCUMENTATION

In accordance with 27 CCR 20324(d), CQA documentation will include at a minimum "...reports bearing unique identifying sheet numbers for cross-referencing and document control, the date, project name, location, descriptive remarks, the data sheets, inspection activities, and signature of the designated authorities with the concurrence of the CQA officer."

Construction quality assurance documentation shall include, at a minimum, Daily Summary Reports, Acceptance Reports, and a final Documentation Report. Daily Summary reports shall be prepared in such a manner as to provide a chronological framework documenting construction activities and will form the basis of all other reporting. Daily Summary reports will document all laboratory and field testing and all changes to the scope of work. Any problems that arise and their resolutions will be recorded in the Daily Summary reports.

Acceptance reports will verify that materials and construction methods comply with the technical specifications and design. Acceptance reports will include inspection summary reports and data sheets, and documentation of problem or non-compliance identification and resolution.

The final Documentation Report will bring all lesser reports together into a comprehensive document which demonstrates compliance with the approved design and design specifications. Final copies of the Documentation Report will be provided for review and approval to the LEA, the CIWMB and the RWQCB and be prepared by, or under the direct supervision of, the CQA manager.

5.0 SUMMARY OF CONSTRUCTION AND CQA

Construction components of the project include the following:

- Coordination of field survey by Contractor;
- Verification/modification of design elevations and grades;
- Excavation and construction of stormwater diversion channels around the north and west perimeter to route the off-site run-off flow;
- Placement of geotextile under all riprap per design and manufacturer's specifications;
- Placement of riprap in stormwater diversion channel;
- Clearing and grubbing the interim cover as necessary to facilitate reconditioning in accordance with the specifications;
- Scarification, moisture conditioning, and recompaction of the upper 12 inches of the interim cover layer (surface preparation);
- Placement of geosynthetic clay liner over prepared interim cover layer;
- Placement and nominal compaction of final cover layer to a total combined compacted minimum thickness of 24 inches;
- Placement of 1- to 3-inch layer of wood chips;
- Reseeding the final closed surface; and
- Verification of as-built elevations and grades.

5.1 Field Survey

Quality assurance personnel will coordinate with the Contractor to ensure the completion of an initial site survey. The survey will encompass all areas to be filled or regraded to verify existing topography and lay out design grades for construction. The Contractor will be responsible for survey completion.

5.2 Design Verification/Modification

The proposed design will be evaluated with respect to the results of the initial field survey. Design modifications will be made by the Engineer, as necessary, to ensure project goals are accomplished. Revised design drawings will be issued if necessary following the evaluation of initial survey data.

In accordance with 27 CCR 21890, "The operator shall adhere to the final closure and postclosure maintenance plans approved pursuant to Section 21860. Significant changes to the Final Closure and Postclosure Maintenance Plans shall depend on concurrence with the

Engineer and the LEA and shall be approved by the CIWMB, and the RWQCB." For the purposes of this requirement, "the operator" includes the Engineer and Contractor.

For significant changes to the approved plan, the Engineer or Construction Manager shall contact the LEA, CIWMB and RWQCB via telephone or e-mail for approval prior to implementation in the field. The following contact information was active at the time of report preparation.

Scott S. Humpert, P.E.
CIWMB - CA Integrated Waste Management Board
shumpert@CIWMB.ca.gov
916-341-6359

Douglas E. Feay, R.G.
LRWQCB - Lahontan Regional Water Quality Control Board
DFeay@waterboards.ca.gov
760-241-7353

Jim Goodloe
LEA – Local Enforcement Agency - Mono County Health Department
jgoodloe@mono.ca.gov
760-932-5591

5.3 CQA Activity and Documentation

CQA activity and documentation will include documentation of interim cover layer preparation, final cover layer placement, riprap production and placement, and geotextile placement as summarized in Table 5.1. Laboratory testing will be conducted with suitable equipment calibrated in accordance with manufacturer's recommendations and applicable laboratory licensing authorities. Field testing will primarily involve relative density and moisture content testing using a nuclear density gage. Nuclear density gages will be calibrated in accordance with manufacturer's specifications at least twice per day during use.

TABLE 5.1. CQA ACTIVITY, DOCUMENTATION AND FREQUENCY

ITEM	CQA ACTIVITY	CQA DOCUMENTATION	FREQUENCY
Interim Cover Layer	Standard Classification – Visual/Manual Method - per ASTM D2488-93	Field Test Summary Sheets	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Particle Size Analysis per ASTM D422-63	Lab and Summary Sheets	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Atterberg Limits per ASTM D4318-93	Lab and Summary Sheets	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Standard Classification for Engineering Purposes per ASTM D2487-93	Lab and Summary Sheets	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Modified Proctor Testing per ASTM D1557-91	Daily Field Report	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Compacted Thickness – Visual	Daily Field Report	Daily Field Report
	Placed Density and Moisture – Nuclear Density Gauge per ASTM D6938	Field Test Summary Sheets & Daily Field Report	Once per Every 250 cy placed, at least 4 times per day
	Oversize Material – Visual	Daily Field Report	Daily Field Report
Final Cover Layer	Standard Classification – Visual/Manual Method - per ASTM D2488-93	Field Test Summary Sheets	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Particle Size Analysis per ASTM D422-63	Lab and Summary Sheets	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Atterberg Limits per ASTM D4318-93	Lab and Summary Sheets	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Standard Classification for Engineering Purposes per ASTM D2487-93	Lab and Summary Sheets	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Modified Proctor Testing per ASTM D1557-91	Daily Field Report	Once per Material Type, Once Per Week, or Once per 5,000 cy, whichever is greater
	Compacted Thickness – Visual	Daily Field Report	Daily Field Report
	Placed Density and Moisture – Nuclear Density Gauge per ASTM D6938	Field Test Summary Sheets & Daily Field Report	Once per Every 250 cy placed, at least 4 times per day
	Oversize Material – Visual	Daily Field Report	Daily Field Report
Riprap	Placed Thickness – Visual	Daily Field Report	Daily Field Report
	Particle Size Distribution - Visual	Daily Field Report	Daily Field Report
	Oversize Material – Visual	Daily Field Report	Daily Field Report
Geotextile	Review of material certification	Daily Field Report	Daily Field Report
	Observation of deployment and overlaps	Daily Field Report	Daily Field Report

TABLE 5.1 (cont.). CQA ACTIVITY, DOCUMENTATION AND FREQUENCY

ITEM	CQA ACTIVITY	CQA DOCUMENTATION	FREQUENCY
60 mil LLDPE Agru Super Gripnet®	Review of roll certification	Daily Field Report	Daily Field Report
	Observation of deployment	Deployment Record	Deployment Record
	Observation of welding	Welding Record	Welding Record
	Observation of Contractor's quality control	Seam Test Record	Seam Test Record
	Marking of repairs	Repair Record	Repair Record
	Verification of repairs	Repair Record	Repair Record
	Location of Destructive Samples and review of results	Destructive Sample Log and Daily Field Report	Destructive Sample Log and Daily Field Report

6.0 INTERIM COVER LAYER (SURFACE PREPARATION AND GENERAL FILL)

Material will be placed or scarified and recompacted in place to form the prepared interim cover surface. Fill material to form the additional 12 inches of material placed above the existing interim cover or, where required, to bring the existing grade to a minimum surface grade of 3 percent, will be borrow materials derived from the interim cover layer itself or from an approved borrow source.

6.1 General

The CQA program for interim cover layer preparation via fill placement or in place conditioning shall include:

- Visual/manual classification;
- Particle size analysis;
- Plasticity index testing (Atterberg limits);
- Engineering classification;
- Laboratory compaction testing (modified Proctor);
- General observation of placement procedures;
- Observation of lift/compacted layer thickness;
- Field compaction and moisture testing (nuclear density testing); and
- Detection and removal of oversize material.

6.2 Interim Cover Specifications

The specifications of interim cover layer preparation and conditioning are as follows:

- Gradation --

U.S. Standard Sieve Size	Percent Passing By Dry Weight
3 inch	100
¾ inch	70-100
No.10	40-70
No. 200	10-40

- Plasticity Index: ≤15
- Maximum Loose Lift Thickness for fill placement – 8 inches ;
- Minimum scarification and recompaction depth for existing surfaces – 12 inches; and
- Minimum Compaction - 90 percent of maximum dry density at ±2 percent of optimum moisture content as determined by modified Proctor testing (ASTM D 1557).

6.3 Observations of Lift Thickness/Scarification Depth

The uncompacted lift thickness shall be monitored during placement of fill, and the depth of scarification shall be monitored during reworking of in-place materials. The thickness of the uncompacted lifts and depth of scarification shall be noted on the daily field report for each day of fill placement.

6.4 General Observation of Surface Preparation Procedures

The Quality Assurance Team shall observe the fill placement or in-place conditioning to verify that the material is moisture conditioned as necessary such that the required compaction is achieved. The Quality Assurance Team shall visually inspect the material as it is being placed and spread for over-size material. The Quality Assurance Team shall observe the traffic patterns of the compaction equipment to verify that all areas of the fill are receiving the effort required to achieve the minimum specified compaction. Areas that appear to receive less effort shall be tested independently of the frequency criteria described in Section 5.3. As the fill is being placed, the Quality Assurance Team shall confirm that a laboratory compaction curve is available for the material being placed. If a representative sample of the material being placed has not been tested for laboratory compaction, a sample shall be obtained and tested. Any material that is obtained from a physical location that is separate from or different from the location of the previous material shall be considered a different material type and shall require separate sampling, testing, and reporting, in accordance with Table 1, Section 5.3.

6.5 Field Testing Locations and Failed Tests

Field density test locations should be established based on a grid pattern, with random locations interspersed. The CQA inspector should ensure that the CQA Technicians are searching out areas that look like they may fail, rather than looking for well compacted areas to test. Compaction tests should not be done on wheel tracks, access roads or areas where there is repeated vehicle traffic.

When a field compaction test indicates the compaction achieved does not meet the minimum criteria established in Section 6.2, two additional tests will be performed within approximately 5 feet of the original failing test. If both secondary tests pass, the original test can be ignored. If either of the secondary tests fails, the area must be scarified, moisture conditioned, and recompacted to meet the minimum compaction specifications.

6.6 Index Testing and Classification

Material intended for use in interim cover layer construction shall be initially classified according to the visual/manual method per ASTM D2488-93. Particle size distribution (ASTM D422-63) and plasticity index testing (ASTM D4318-93) shall be performed at least once per day, once per material type, or once per 5,000 cubic yards placed, whichever is greater. The tests shall be performed on the same sample obtained for laboratory compaction testing. Once completed, the results of the particle size and plasticity testing shall be utilized to classify the material for engineering purposes in accordance with ASTM D2487-93.

6.7 Laboratory Compaction

A laboratory compaction (modified Proctor ASTM D1557) test shall be performed at least once per day during material placement, once per material type, or once per 5,000 cubic yards placed, whichever is greater.

6.8 Nuclear Density Tests

Nuclear density testing shall be performed for fill placed or conditioned in place within the cover footprint at least once per every 250 cubic yards of material placed and at least four times per day during material placement activities. The nuclear density tests will be used to determine the materials in-place dry density and moisture content. The dry density shall be compared to the appropriate laboratory compaction curve and the relative compaction determined.

6.9 Documentation

Documentation in the Daily Summary Report shall include the uncompacted lift thickness or scarification depth, method of moisture conditioning, and the equipment used to place, moisture condition, and compact the fill material. Documentation of the field and laboratory testing shall be summarized on the appropriate summary sheets.

7.0 FINAL COVER SOIL (GENERAL FILL)

The fill material will be borrow materials derived from regrading the interim cover layer or from an approved borrow source.

7.1 General

The CQA program for cover soil placement shall include:

- Visual/manual classification;
- Particle size analysis;
- Plasticity index testing (Atterberg limits);
- Engineering classification;
- Laboratory compaction testing (modified Proctor);
- General observation of placement procedures;
- Observation of lift/compacted layer thickness;
- Field compaction and moisture testing (nuclear density testing); and
- Detection and removal of oversize material.

7.2 Final Cover Specifications

The specifications of the final cover layer fill material and placement are as follows:

- Gradation –

U.S. Standard Sieve Size	Percent Passing By Dry Weight
3 inch	100
¾ inch	40 - 100
No.10	40 - 70
No. 200	0-40

- Plasticity Index: ≤ 15
- Mainimum Lift Thickness - 12 inches loose; and
- Nominal Compaction – 85 to 90 percent of maximum dry density at ±2 percent of optimum moisture content as determined by modified Proctor testing (ASTM D 1557).

7.3 Observations of Lift Thickness

The uncompacted lift thickness shall be monitored during placement of fill. The thickness of the uncompacted lifts shall be noted on the Daily Field Report for each day of fill placement. The lift thickness will not be less than 12 inches to protect the geomembrane. Cover soil will be placed using low-ground-pressure equipment approved by the Engineer.

7.4 General Observation of Placement Procedures

Only low-ground pressure equipment shall be used to place and compact the cover soil/vegetative layer. All care shall be taken to protect the integrity of the geomembrane liner following installation.

The Quality Assurance Team shall observe the fill placement to verify that the material is moisture conditioned as necessary such that the required compaction is achieved. The Quality Assurance Team shall visually inspect the material as it is being placed and spread for over-size material. The Quality Assurance Team shall observe the traffic patterns of the compaction equipment to verify that all areas of the fill are receiving the effort required to achieve the minimum specified compaction. Areas that appear to receive less effort shall be tested independently of the frequency criteria described in Section 5.3. As the fill is being placed, the Quality Assurance Team shall confirm that a laboratory compaction curve is available for the material being placed. If a representative sample of the material being placed has not been tested for laboratory compaction, a sample shall be obtained and tested. Any material that is obtained from a physical location that is separate from or different from the location of the previous material shall be considered a different material type and shall require separate sampling, testing, and reporting, in accordance with Table 1, Section 5.3.

7.5 Field Testing Locations and Failed Tests

Field density test locations should be established based on a grid pattern, with random locations interspersed. The CQA inspector should ensure that the CQA Technicians are searching out areas that look like they may fail, rather than looking for well compacted areas to test. Compaction tests should not be done on wheel tracks, access roads or areas where there is repeated vehicle traffic.

When a field compaction test indicates the compaction achieved does not meet the minimum criteria established in Section 7.2, two additional tests will be performed within approximately 5 feet of the original failing test. If both secondary tests pass, the original test can be ignored. If either of the secondary tests fails, the area must be scarified, moisture conditioned, and recompacted to meet the minimum compaction specifications.

7.6 Index Testing and Classification

Material intended for use in final cover layer construction shall be initially classified according to the visual/manual method per ASTM D2488-93. Particle size distribution (ASTM D422-63) and plasticity index testing (ASTM D4318-93) shall be performed at least once per day, once per material type, or once per 5,000 cubic yards placed, whichever is greater. The tests shall be performed on the same sample obtained for laboratory compaction testing. Once completed, the results of the particle size and plasticity testing shall be utilized to classify the material for engineering purposes in accordance with ASTM D2487-93.

7.7 Laboratory Compaction

A laboratory compaction (modified Proctor ASTM D1557) test shall be performed at least once per day during material placement, once per material type, or once per 5,000 cubic yards placed, whichever is greater.

7.8 Nuclear Density Tests

Nuclear density testing shall be performed for fill placed or conditioned in place within the cover footprint at least once per every 250 cubic yards of material placed and at least four times per day during material placement activities. The nuclear density tests will be used to determine the materials in-place dry density and moisture content. The dry density shall be compared to the appropriate laboratory compaction curve and the relative compaction determined.

7.9 Documentation

Documentation in the Daily Field Report shall include the uncompacted lift thickness, method of moisture conditioning, and the equipment used to place, moisture condition, and compact the fill material. Documentation of the field and laboratory testing shall be summarized on the appropriate summary sheets.

8.0 GEOTEXTILE

Geotextile will be minimum 12 ounces per square yard, non-woven, needle-punched geotextile installed in accordance with manufacturer's specifications. Quality assurance personnel will ensure that geotextile is properly pinned, overlapped and oriented in the correct direction relative to the flow direction and in accordance with manufacturer's recommendations.

9.0 FLEIXBLE MEMBRANE LINER

9.1 General

A 60 mil linear low-density polyethylene (LLDPE) liner system (60 mil Agru Super Gripnet®) will be installed to the final regraded landfill surface. The CQA plan includes:

- Review of Roll Certification;
- Observation of Deployment including placement of texturing;
- Observation of Welding;
- Observation of Contractor's Quality Control (QC);
- Marking of Repairs;
- Verification of Repairs;
- Location of Destructive Samples;
- Sending Destructive Sample to the third party testing laboratory; and
- Review of Destructive Test results.

9.2 Specifications

The LLDPE liner shall conform to the minimum average roll values shown in Technical Specifications. The Quality Assurance Team shall study the specifications in detail and perform the CQA accordingly.

9.3 Review of Roll Certification

The Quality Assurance Team or Engineer shall obtain and review a copy of the roll and resin certifications for each and every roll of liner material before it is approved for deployment. The results of the QC testing on the roll certificates shall be carefully reviewed to verify that:

- All of the testing required by the Technical Specifications has been performed by the manufacturer; and
- All of the test results meet or exceed the specified requirements.

Rolls that are approved for deployment shall be stored separately from rolls that are not approved for deployment.

9.4 Observation of Deployment

The Quality Assurance Team shall observe the liner material as it is deployed, noting and marking liner defects due to manufacturing or handling. A log shall be maintained (deployment log) recording each day's deployment.

9.5 Observation of Welding

The Quality Assurance Team shall observe the seam welding as it progresses. With regard to the start up welds, the Quality Assurance Team shall observe 100 percent of all start up welding and testing performed on the start up weld seams to verify that they are being performed according to the Specifications. Specifically, the start up welds must be performed on the same supporting surface (subgrade) as the production welds will be made and with the same materials.

No welder or piece of welding equipment will be approved for production welding until the Quality Assurance Team has observed and accepted the start up process. If at any time a welder or piece of welding equipment fails two consecutive start up weld test seams, neither the welder nor the welding equipment will be approved for production welding until the problem has been identified and rectified to the Quality Assurance Team's satisfaction.

9.6 Observation of Contractor's QC

The Quality Assurance Team shall observe 100 percent of the Contractor's non-destructive (pressure and vacuum) testing. The Quality Assurance Team shall observe and record the pressures and times applied. It is the Quality Assurance Team's observations of times and pressures during non-destructive seam testing that will be used for quality assurance testing. Any non-destructive testing performed without the observation of the Quality Assurance Team will not be accepted.

If destructive samples are tested at the site, the Quality Assurance team shall observe the equipment and procedures used for the first series of tests. If the Quality Assurance Team determines that the testing is being performed according to the project Specifications and spot checking will be sufficient, it will notify the Engineer as such. If the Quality Assurance Team determines that the equipment and procedures are not meeting the project Specifications, it will immediately issue a non-compliance report and notify the Engineer.

9.7 Marking of Repairs

The Quality Assurance Team shall walk all panels and seams looking for objects under the liner, holes, creases, and other damage to the liner, mark and record them for repairs. It is extremely important that all required repairs are logged and repaired, tested and checked off on the log.

The Quality Assurance Team shall include on the repair log all required repairs as determined from the non-destructive testing and patches due to destructive sampling.

9.8 Verification of Repairs

The Quality Assurance Team shall observe all repairs and testing associated with repairs that are logged. The Quality Assurance Team shall also observe the repairs and testing associated with repairs that the Contractor has marked prior to the final walk through.

9.9 Location of Destructive Samples

The Quality Assurance Team shall mark the locations from which the destructive samples will be taken. The Contractor shall not be informed of the locations while the installation of that area is in progress nor will the contractor be allowed to influence the Quality Assurance Team in any way as to the location from which the destructive samples will be taken.

The specifications require that destructive samples be obtained at a maximum spacing of 500 lineal feet of seam. The Quality Assurance Team shall take more samples if it is suspect of specific areas, i.e. seams over interior berms, etc. The samples shall be marked with the sample number, the date welded, the machine and welder I.D. and the seam number.

9.10 Sending Destructive Samples to the Third Party Testing Laboratory

The destructive samples shall be sent to the third party testing laboratory on the same day the samples are obtained. The destructive samples shall be sent via the most expedient delivery service. The third party testing laboratory will have the results of their testing within 24-hours of receipt of the samples. The Quality Assurance Team shall record the reported results of testing on the destructive sample log to maintain a field summary of all testing.

10.0 RIPRAP

10.1 General

The CQA program for riprap placement shall include:

- Inspection of surfaces to be riprap lined;
- Sieve analysis testing or visual/manual evaluation of gradation;
- Observation of placed thickness and lateral extent relative to drawings; and
- General observation of placement procedures.

10.2 Specifications

Contractor shall obtain material that conforms to the following specification from processing and/or crushing of on-site material, or from another approved borrow source. Riprap material must be competent, screened or crushed stone meeting the requirements defined below. All material borrow sources are subject to approval by the Engineer. The specifications for riprap material and placement are as follows.

V-ditches constructed on the final cover with slopes generally less than 4 percent shall be lined with a minimum of 6 inches of riprap meeting the specifications in Table 10.1. Steeper channel segments in v-ditches constructed over the final cover and in specific areas identified in the upgradient diversion channels shall meet the specifications in Table 10.2. Segments of the trapezoidal channel identified on the drawings shall be lined with riprap meeting the specifications in Table 10.3.

Table 10.1. Riprap D_{50} = 3 inches

Riprap Lining Thickness	Rock Size (inches)	Percent Finer
4½ - 6 inches	5	100
	4	85
	3	50
	1.5	15

Table 10.2. Riprap D_{50} = 6 inches

Riprap Lining Thickness	Rock Size (inches)	Percent Finer
9 inches	10	100
	8	85
	6	50
	3	15

Table 10.3. Riprap D_{50} = 8 inches

Riprap Lining Thickness	Rock Size (inches)	Percent Finer
12 inches	9	100
	8	85
	6	50
	3	15

10.3 General Observation of Placement Procedures

The Quality Assurance Team shall observe the placement of riprap to verify conformance with the material thickness and dimensions shown on the drawings. The Quality Assurance Team shall visually inspect the material as it is being placed and spread for over- or under-size material. Visual observation and field measurement shall be utilized to confirm adherence to the gradation specification in Section 10.2.

10.4 Documentation

Documentation in the Daily Field Report shall include the equipment or method used to place the riprap and the placed riprap layer thickness. Documentation of the field testing shall be summarized on the appropriate summary sheets.

11.0 QA/QC PROJECT DELIVERABLES

QA/QC project deliverables will include initial and as-built surveys of the Work areas to be performed and will be provided by the Contractor. The as-built survey will have a maximum contour interval of 2 feet and be provided in AutoCad or other approved digital format. CQA personnel will document field activities as detailed above. A final as-built report encompassing all required documentation will be prepared for submittal to regulatory agencies within 30 days of project completion.

APPENDIX L

REVISED CLOSURE AND POSTCLOSURE COST ESTIMATES AND FINANCIAL ASSURANCE DOCUMENTATION

CalRecycle

DEPARTMENT OF RESOURCES RECYCLING AND RECOVERY

1001 I STREET, SACRAMENTO, CALIFORNIA 95814 • WWW.CALRECYCLE.CA.GOV • (916) 322-4027
P.O. BOX 4025, SACRAMENTO, CALIFORNIA 95812

November 4, 2015

Mr. Tony Dublino
County of Mono
Department of Public Works, Solid Waste Division
P.O. Box 457
Bridgeport, California 93517

**BRIDGEPORT LANDFILL, MONO COUNTY (26-AA-0002)
UPDATED POSTCLOSURE MAINTENANCE PLAN
APPROVAL**

Dear Mr. Dublino:

Department of Resources Recycling and Recovery (CalRecycle), Engineering Support Branch (ESB), Closure and Technical Support Section (Closure) staff previously reviewed the updated postclosure maintenance plan (Plan) for the Bridgeport Landfill. The documents reviewed were:

- *Engineer's Certification of No Necessary Postclosure Maintenance Plan Revision;* dated February 7, 2013; prepared by Mono County Department of Public Works
- *Revised Postclosure Maintenance Cost Estimate*; dated January 7, 2014; prepared by SWT Engineering.

In our August 21, 2014, letter ESB staff found that the submitted Plan was technically adequate in meeting the requirements of Title 27, California Code of Regulations (27 CCR). Furthermore, both the Lahontan Regional Water Quality Control Board and the Mono County Health Department, Environmental Health Division, acted as the Solid Waste Local Enforcement Agency, had approved the Plan. However, the Plan could not be formally approved until the financial assurance inadequacy was resolved.

In a November 4, 2015, memorandum CalRecycle's Financial Assurances Unit has indicated that Mono County is in compliance with financial assurance requirements. Therefore, the Plan is approved.

Please note that it is the operator's obligation to submit plans that are in compliance with the aforementioned requirements. ESB staff's determination that the Plan meets these requirements is not intended nor should be construed to preclude ESB from seeking revisions to the Plan to the extent it is subsequently determined that any part thereof is not in compliance.

Should you have any questions or comments concerning the above matter, please contact Diane Nordstrom-Lamkin or Michael Wochnick at (916) 341-6448 or (916) 341-6289, respectively. Alternatively, Closure staff may be reached by email at diane.nordstrom-lamkin@calrecyle.ca.gov or michael.wochnick@calrecycle.ca.gov.

Sincerely,

Wes Mindermann, P.E., Manager
Engineering Support Branch

cc: Jill Kearney, Mono County Health Department, Environmental Health Division
Alan Miller, Lahontan Regional Water Quality Control Board, South Lake Tahoe

SWT Civil & Environmental ENGINEERING
www.swteng.com

January 7, 2014

Jill Kearney
County Health Department, Environmental Health
437 Old Mammoth Road #Q
Post Office Box 3329
Mammoth Lakes, Ca 93546

RE: POST-CLOSURE COST ESTIMATE FOR THE BRIDGEPORT LANDFILL (SWIS NO. 26-AA-0002)

Dear Ms. Kearney:

Enclosed you will find an updated post-closure cost estimate table (Table 6) for the Final Closure/Post-Closure Maintenance Plan for Bridgeport Landfill (SWIS No. 26-AA-0002). In accordance with the California Code of Regulations, Title 27 (27 CCR), Sections 21815, 21830, and 21840, this post-closure cost estimate has been prepared by a registered civil engineer (Michael Cullinane, R.C.E. No. 41981).

If you should have any questions regarding this submittal, please advise.

Respectfully submitted,

REGISTERED PROFESSIONAL ENGINEER
MICHAEL A. CULLINANE
No. C41981
Exp. 3/31/10
CIVIL
STATE OF CALIFORNIA

Michael A. Cullinane
R.C.E. No. 41981
Principal, SWT

c: Tony Dublino, Mono County DPW
Tom Browne, RWQCB, Lahontan Region
JoAnne Byrne, CalRecycle Financial Assurances Unit

TABLE 6
POST-CLOSURE COST ESTIMATE
Bridgeport Landfill

ANNUAL POST-CLOSURE MAINTENANCE COSTS

			Comments
1.0 SITE SECURITY AND APPURTENANT FACILITIES			
1.1 Entrance Gate Repair	n/a	$0	Not anticipated to require repairs.
1.2 Perimeter Fence Repair	$2 / ft. =	$900	Assumed repair: 10%/yr, for 4,500' boundary. (*Barbed Wire Fence)
1.3 Perimeter Access Rd Repair	$1,000 / day =	$1,000	Assume one days' work annually for grading.
Subtotal, Access Road Construction		$1,900	*Note: Fence type aquired from Mono County
1.4 Contingency @ 20%		$400	Rounded to nearest $100.
TOTAL, SITE SECURITY AND APPURTENANCES		**$2,300**	Annual Post-Closure Maintenance Costs.
2.0 ENVIRONMENTAL CONTROL SYSTEMS			
2.1 Landfill Gas Monitoring			Quarterly monitoring of 6 gas wells.
Gas Probe Sampling	$840 / event =	$3,360	Assume 8 hrs. at $105/hr each event (4 events per year)
Direct Expenses	$200 / event =	$800	Vehicle, equipment, shipping, at $25/hr. each event
Report Preparation	$263 / event =	$1,050	Assume 2.5 hrs. at $105/hr each event (4 events per year)
Project Management	$68 / event =	$270	Assume 1/2 hr. per event at $135/hr. (4 events per year)
Subtotal, Landfill Gas Monitoring		$5,480	
2.2 Ground Water Monitoring			Quarterly monitoring of 5 gw wells.
Monitoring Well Sampling	$1,392 / event =	$5,568	* $1,392 per event (4 sampling events per year)
Lab Test Analysis	$625 / event =	$2,500	* $125 per lab test (20 lab tests per year)
Report Preparation	$2,016 / event =	$4,032	* $2,016 per report (2 reports per year)
Project Management	$68 / event =	$270	Assume 1/2 hr. per event at $135/hr. (4 events per year)
Subtotal, Ground Water Monitoring		$12,370	*Note: Actual costs were obtained from Mono County
2.3 Leachate Collection System Monitoring		$0	Not applicable; no LCRS is proposed at site.
2.4 Storm Water Run-On Diversion Channel			
Channel Repairs	$650 / day =	$650	Assume one days' work annually for repairs.
2.5 Storm Water Retention Basins			
Basin Repairs	$650 / day =	$0	Included in channel repairs.
2.6 Storm Water Run-Off Collection System			
System Repairs	$650 / day =	$650	Assume one days' work annually for repairs.
Subtotal, Environmental Control Systems		$19,200	Rounded to nearest $100.
Contingency	20%	$3,800	Rounded to nearest $100.
TOTAL, ENVIRONMENTAL CONTROL SYSTEMS		**$23,000**	Annual Post-Closure Maintenance Costs.
3.0 FINAL COVER SYSTEM			Repair soil obtained from on-site stockpiles.
Final Cover Inspection/Reporting	$496 / event =	$496	8 hrs, $62/hr: travel, inspect, report, & exp.
Final Cover Repairs	$1,000 / day =	$1,000	Assume one days' work annually for repairs.
Settlement Survey/Reporting	$1,600 / event =	$1,600	Annual survey, travel, prep., reporting.
Final Cover Revegetation	$2,175 / ac. =	$1,088	Assumes 1/2 acre of cover area/per year would require reveg
Subtotal, Environmental Control Systems		$4,200	Rounded to nearest $100.
Contingency	20%	$800	Rounded to nearest $100.
TOTAL, FINAL COVER SYSTEM		**$5,000**	Annual Post-Closure Maintenance Costs.
TOTAL, POST CLOSURE MAINTENANCE COST		**$30,300**	

PLEDGE OF REVENUE AGREEMENT FOR CORRECTIVE ACTION AT THE BENTON, CHALFANT, PUMICE VALLEY, BRIDGEPORT AND WALKER LANDFILLS IN MONO COUNTY

This agreement establishes a Pledge of Revenue to assure that adequate funds are available to carry out Corrective Action at the Benton, Chalfant, Pumice Valley, Bridgeport and Walker Landfills within Mono County.

This Agreement shall become effective immediately, and is made and entered into by and between the County of Mono and the California Department of Resources Recycling and Recovery (CalRecycle).

WHEREAS, Public Resources Code. sections 43500 through 43610.1 and Title 27, California Code of Regulations (Regulations), Division 2, Subdivision I, Chapter 6, require operators of solid waste landfills to demonstrate the availability of financial resources to conduct corrective action activities; and

WHEREAS, sections 22228 and 22245 of the Regulations specify a Pledge of Revenue as an acceptable mechanism to demonstrate financial responsibility corrective action costs of a solid waste landfill; and

WHEREAS, the County of Mono operates the above landfills in conformance with the findings, conditions, prohibitions and requirements contained in Solid Waste Facilities Permits No. 26-AA-0001, 26-AA-0002, 26-AA-0003, 26-AA-0005 and 26-AA-0006 issued by Mono County serving as Local Enforcement Agency for CalRecycle; and

WHEREAS, the County of Mono is pledging revenues from the Mono County Solid Waste Fee Program and deposited into the Mono County Solid Waste Enterprise Fund; and

WHEREAS, the County of Mono has determined that projected net revenues of the Mono County Solid Waste Fee Program during the corrective action period shall, during each year of this period, be greater than the yearly corrective action costs contained in the most recent Cost Estimates for the above landfills, which have been submitted to CalRecycle in accordance with sections 22100 - 22103 of the Regulations.

NOW THEREFORE, the County of Mono and CalRecycle do agree as follows;

1. The County of Mono hereby establishes a pledge of revenue to demonstrate financial responsibility for corrective action costs of the Benton Crossing Landfill in accordance with sections 22228 and 22245 of the Regulations.

2. The County of Mono agrees to pledge net revenues Mono County Solid Waste Fee Program as described herein.

3. The amount of the pledged revenue shall be equal to $54,809 per year for the 30 year estimated length of the corrective action period, representing the most recent corrective action cost estimate for the sites. It is agreed that the amount of this pledge may increase or decrease to match any adjustment to the identified cost estimate, which is mutually agreed to by the County of Mono and CalRecycle.

4. The Public Works Director or his designee is directed to produce an Annual Certification Report (form Cal Recycle 114) as required by Section 22234(b)(4)(B) of the Regulations to demonstrate that the pledged revenue continues to be available when needed and will cover the cost estimates identified in the updated Annual Inflation Report required by Section 22236 of the Regulations. It is understood that copies of the Resolution and Pledge of Revenue Agreement are not required annually, unless amended.

5. If the County of Mono ceases at any time to retain control of its ability to allocate the pledged revenue as identified herein to pay corrective action costs, the County of Mono shall notify CalRecycle and the local enforcement agency and shall obtain alternate coverage within sixty (60) days after the control of funds lapses, pursuant to section 22245 of the Regulations.

6. In the event that CalRecycle, RWQCB, or LEA staff determine that the County of Mono has failed, or is failing, to perform corrective actions as required by law, CalRecycle, RWQCB and/or LEA staff shall confer with the County of Mono and attempt to resolve the alleged violation. If no agreement is reached, the matter shall be presented to CalRecycle which shall give reasonable notice, hold a public hearing, and consider the testimony and documentation submitted by CalRecycle and/or LEA staff. The County of Mono, and any interested parties, prior to making a determination in the matter. In the event CalRecycle then determines that the County of Mono has failed, or is failing, to perform corrective action as required by law, CalRecycle may direct the Auditor-Controller to pay the Public Works Director from the pledged revenues sufficient funds to ensure corrective action. who then shall be obligated to use such funds for corrective action in accordance with the directives of CalRecycle and RWQCB.

IN WITNESS HEREOF, the parties have executed this agreement on the date as set forth below.

By County this ___________day of __________________, 2015

By CalRecycle this ________day of__________________, 2015

STATE OF CALIFORNIA California Department of Resources Recycling and Recovery (CalRecycle)	COUNTY OF MONO
By:___________________________	By: Lynda Salcido
Authorized Officer of the CalRecycle	Lynda Salcido, Interim CAO

APPROVED AS TO FORM
AND PROCEDURE:

By:______________________________

Authorized Counsel of the CalRecycle

APPROVED AS TO FORM
AND PROCEDURE:

By: ______________________________

County Counsel

PLEDGE OF REVENUE AGREEMENT BETWEEN THE CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD AND MONO COUNTY ESTABLISHING FINANCIAL ASSURANCE FOR POSTCLOSURE MAINTENANCE OF BENTON, CHALFANT, BENTON CROSSING, PUMICE VALLEY, BRIDGEPORT AND WALKER LANDFILLS

This agreement establishes a Pledge of Revenue to assure that adequate funds are available to carry out the Postclosure Maintenance of the following Mono County Sanitary Landfills:

Solid Waste Landfill	Facility Permit No.
Walker Sanitary Landfill	26-AA-0001
Bridgeport Sanitary Landfill	26-AA-0002
Pumice Valley Sanitary Landfill	26-AA-0003
Benton Crossing Sanitary Landfill	26-AA-0004
Chalfant Sanitary Landfill	26-AA-0005
Benton Sanitary Landfill	26-AA-0006

This Agreement shall become effective immediately, and is made and entered into by and between the County of Mono and the California Integrated Waste Management Board (CIWMB).

WHEREAS, Public Resources Code, sections 43500 through 43610.1 and sections of Title 27, California Code of Regulations (Regulations), Division 2, Subdivision 1, Chapter 6, require operators of solid waste landfills to demonstrate the availability of financial resources to conduct closure and postclosure maintenance; and

WHEREAS, sections 22228 and 22245 of the Regulations specify a Pledge of Revenue as an acceptable mechanism to demonstrate financial responsibility for postclosure maintenance of a solid waste landfill; and

WHEREAS, the County of Mono operates the solid waste landfills identified above, in conformance with the findings, conditions, prohibitions and requirements contained in Solid Waste Facilities Permits issued by Mono County Health Department, serving as Local Enforcement Agency, for the CIWMB; and

WHEREAS, the County of Mono is pledging revenues from the Board of Supervisors, County of Mono, Ordinance No. 97-03, extending and re-establishing the Mono County Solid Waste Fee Program and deposited with the Auditor-Controller, property tax billing system; and

WHEREAS, the County of Mono has determined that projected net revenues from the Mono County Solid Waste Fee Program during the thirty (30) year period of postclosure maintenance, shall, during each year of this period, be greater than the yearly monitoring and postclosure maintenance costs contained in the most recent Cost Estimates for the total of the Mono County solid waste landfills identified, which have been submitted to the CIWMB in accordance with-section 21840 the Regulations.

NOW THEREFORE, the County of Mono and the CIWMB do agree as follows;

1. The County of Mono hereby establishes a "Pledge of Revenue" to demonstrate financial responsibility for postclosure maintenance of the Mono County solid waste landfills identified above in accordance with sections 22228 and 22245 of the Regulations.

2. The County of Mono agrees to pledge net revenues from the Mono County Solid Waste Fee Program as described herein.

3. The amount of the pledged revenue shall be equal to $ 139,912.00 per year for the 30 year period of postclosure maintenance, representing the total of the most recent monitoring and postclosure maintenance cost estimates for each of the identified Mono County solid waste landfills. It is agreed that the amount of this pledge may increase or decrease to match any adjustment to the identified cost estimates which are mutually agreed to by the County of Mono and the CIWMB.

4. If the County of Mono ceases at any time to retain control of its ability to allocate the pledged revenue as identified herein to pay postclosure maintenance costs, the County of Mono shall notify the CIWMB and the local enforcement agency and shall obtain alternate coverage within sixty (60) days after the control of funds lapses, pursuant to section 22245 of the Regulations.

5. In the event that the CIWMB determines that the County of Mono has failed, or is failing, to perform postclosure maintenance as required by law, the CIWMB may direct the Auditor Controller to pay to the Public Works Director from the pledged revenues sufficient funds to ensure postclosure maintenance, who shall then be obligated to use such funds for postclosure maintenance in accordance with the directives of the CIWMB.

IN WITNESS HEREOF, the parties have executed this agreement on the date as set forth below.

RECEIVED

By County of Mono this 26 day of January, 1998

By CIWMB this 6 day of February, 1998

STATE OF CALIFORNIA California Integrated Waste Management Board	COUNTY OF MONO
By: Dorothy Rice 3/5/98 Authorized Officer of the CIWMB	By: Richard Boardman 1/26/98 Richard Boardman Director of Public Works
APPROVED AS TO FORM AND PROCEDURE:	APPROVED AS TO FORM
By: Kathryn J. Tobias 2/6/98 Authorized Counsel of the CIWMB	By: [illegible] Marshall Rudolph County Counsel

RECEIVED

APPENDIX M

EMERGENCY RESPONSE PLAN

MONO COUNTY
DEPARTMENT OF PUBLIC WORKS

EMERGENCY RESPONSE PLAN

BRIDGEPORT LANDFILL
SWIS# 26-AA-0002
WDID# 6B260004000

Mono County, California

Prepared by:

SRK Consulting
Engineers and Scientists
5250 Neil Road, Suite 300
Reno, Nevada 89502
(775) 828-6800
(775) 828-6820 (Fax)

and

Mono County Department of Public Works
Post Office Box 457
Bridgeport, California 93517
(760) 932-5440
(760) 932-5441 (Fax)

February 2008

TABLE OF CONTENTS

BRIDGEPORT LANDFILL
EMERGENCY RESPONSE PLAN

1.0 ARMED INTRUDER

ACTION CHECKLIST:

Actions By The First Person Involved:

______Do not make any sudden movements.

______Remain calm (breath deeply).

______Be cooperative with the intruder. Do not try to resist. **Do not be a hero**.

______Call 911 or contact County dispatch as soon as possible.

______In case of any shooting, immediately get down on the floor or ground and stay there.

Actions by Other Personnel:

______Evaluate the situation.

______Immediately call 911, then notify the Public Works office.

______Arrange reception for arriving off-site emergency services on Garbage Pit Road outside facility gates.

______Do not attempt to interact with the intruder. **Do not be a hero**.

______Quietly evacuate employees, customers, and contractors from the affected area to a secure area just outside the facility entrance gates on Garbage Pit Road. Prevent additional customers from accessing the site, but DO NOT lock entrance gate.

______Contact Site Supervisor and verify that all areas are secure.

______In case anyone is injured, qualified and willing individuals should administer First Aid and/or CPR when it is safe to do so, then assist emergency medical professionals when they arrive.

______Follow the instructions of local law enforcement when they arrive.

______Site Supervisor completes and files incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the Local Emergency Authority and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

2.0 DANGER POSED BY A DISTRAUGHT PERSON

ACTION CHECKLIST:

Actions By First Person Involved:

______Stay away from any commotion and call 911 or otherwise contact local law enforcement.

______If you are unable to avoid the situation or call for help, talk calmly to the person and try to keep him or her as calm as possible.

Actions by Other Personnel:

______Isolate the site and evacuate as many people as possible.

______Contact local law enforcement for assistance. Tell them whether the distraught person is armed, how many people are involved in the situation, and if anyone is injured.

______Arrange reception for arriving off-site emergency services.

______Notify the Public Works office.

______Implement plans for immediate response to injury caused by distraught person. Respond only when it is safe to do so.

______Site Supervisor shall complete and file an incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the Local Emergency Authority (LEA) and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

3.0 EARTHQUAKE

(Moderate to Large Magnitude)

NOTE: Overhead power lines and telephone lines are not present on-site, so references commonly made to actions related to them are not made in this Plan.

ACTION CHECKLIST:

______Remain calm.

______In any earthquake, immediately "Duck, Cover and Hold." If indoors, get under a sturdy desk, table or doorway. Hold onto something so you can stay under cover while things are shaking. Move away from windows and avoid falling debris, such as light fixtures, heavy objects on office shelves, computers, etc.

______If in a building, do not attempt to leave the floor. If outside, move away from slopes and embankments and equipment or facilities that may topple.

______After the initial shaking has subsided, if in an on-site building and able to, evacuate to a safe place outside away from buildings, windows, slopes, embankments, and equipment that may topple.

______If unable to evacuate on-site buildings, move to an area of relative security on the floor and be prepared for aftershocks.

______If qualified, treat injuries with First Aid and/or CPR as needed. Do not move injured people unless they are in danger by remaining where they are.

______Extinguish any small fires.

______Close valves or otherwise isolate lines (being careful not to cause any sparks) to fuel and propane storage tanks until it can be verified that they are operating properly. If it is safe to do so, turn off the power generator if it is on. In the vicinity where fumes may be ignited, do not allow any open flames or the use of anything that may create a spark, such as matches, cigarette lighters, candles, or electrical switches. Do not use flashlights, battery-operated radios, or anything electrical, unless the item is safe to use in a hazardous situation.

______Avoid areas where the building may be damaged. Wait in a safe place for instructions; you could be there for several hours.

______After the earthquake, wait for instructions from the Site Supervisor or a responding agency.

______If the earthquake was serious, off-site emergency responders may be delayed for long periods of time because of blocked roads, communications failures, and/or an overload of requests for their services. If qualified, administer First Aid and/or CPR to any injured until they can be attended by trained medical professionals or transported to a hospital for treatment.

______Try to account for all employees, customers, contractors, visitors, etc., who are thought to have been at the site at the time of the earthquake.

______Arrange reception for arriving off-site emergency services.

______Notify Public Works and Health Department offices.

______Implement plans for immediate response to injury caused by earthquake. Respond only when it is safe to do so.

______Coordinate communication with the Public Works office and Road Districts, as needed.

______When the situation has been stabilized, complete a detailed inspection of containment structures at the site to determine the effects of the earthquake on the integrity of the landfill, the landfill cover, and secondary containment structures. Repair as necessary to prevent a release of solid waste or contaminants to the environment.

______Site Supervisor shall complete and file an incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the LEA and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

4.0 FIRE (VEHICLE OR STRUCTURE)

NOTE: All fires, no matter how small, must be reported immediately upon discovery. Many small fires get out of control because of a delayed alarm.

ACTION CHECKLIST:

______Assess the situation. Call **911** and report the location, type and size of fire.

______Fire suppression is the responsibility of off-site fire departments. However, all buildings and vehicles are equipped with hand-held fire extinguishers for first-response use on small fires. Before attempting to extinguish a fire, make certain that you or someone else has done the following:

1. Transmit a fire alarm to site personnel via radio, bullhorn, or telephone.
2. Call 911 and notify the Public Works office.
3. Evacuate the fire area.
4. Isolate all power, gas, or electrical lines to the area.

______Arrange reception for arriving off-site emergency services. Contact fire response if fire is suppressed prior to arrival of response crew.

______Maintain plans for immediate response to injury caused by incident.

______Notify the Public Works office.

______Site Supervisor or designee shall complete and file an incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary, Public Works office will notify the LEA and other agencies, as may be appropriate, as to the nature and final disposition of the incident.

TIPS ON EXTINGUISHING A FIRE

1. Stand 5 to 7 feet from fire when attempting to extinguish (8 to 10 feet if dealing with flammable liquids).
2. Locate an escape route before attempting to extinguish fire (keep back to an exit).
3. Hold extinguisher in upright position.
4. Remove pin.
5. Squeeze lever together with carrying handle.
6. Direct discharge at base of flames near edge of fire.
7. Discharge with side-to-side to sweep flames off burning surface; gradually progress forward.
8. Continue to extinguish for several moments after flames appear to be extinguished to avoid a refresh off a hot surface.

5.0 FIRE (WASTE OR STOCKPILE)

NOTE: All fires, no matter how small, must be reported immediately upon discovery. Many small fires get out of control because of a delayed alarm.

ACTION CHECKLIST:

______Assess the situation. Call **911** and report the location, type and size of fire.

______For trash fires, if personnel safety can be assured and there is no risk of an explosion, carefully cover burning or smoldering waste with loads of cover soil to remove oxygen supply to fire. Begin by dumping soil at closest edge of fire and progressively dumping loads across burning or smoldering area such that the equipment used to spread soil does not at any time come into contact with burning waste. For fire within the waste mass, do not drive equipment over smoldering or burning waste due to the possibility of subsidence within the waste mass. Use fire extinguisher or water truck as supplemental suppression methods.

______For stockpile fires, and ONLY if personnel safety can be assured and if adequate personnel and heavy equipment are available, carefully remove stockpiled materials from the area opposite the fire and move it a safe distance away such that will reduce the potential spread of fire.

______Arrange reception for arriving off-site emergency services. Contact fire response if fire is suppressed prior to arrival of response crew.

______Implement plans for immediate response to injury caused by incident.

______Notify the Public Works office.

______Site Supervisor shall complete and file an incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the LEA and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

6.0 HAZARDOUS SUBSTANCE DISCOVERY OR SPILL

(Petroleum and Chemical)

NOTE: Although water does dilute many chemicals, it can create a greater volume of hazardous waste.

ACTION CHECKLIST:

______Assess the situation. If trained as a first responder operations level, and if it is safe to do so, stop any on-going spill or leak by shutting valves or righting drums. Call **911** if necessary.

______If spill or incident is the result of a customer's load, detain customer (if available) and question as to the nature and source of the load's contents. Try to ascertain the name and quantity of the material causing the incident.

______Make sure no one is smoking or has an open flame in the affected area.

______If there is any danger of fire or explosion, evacuate everyone from the area and restrict access into the area.

______If you know an explosive or toxic chemical is involved, or if you are not sure, evacuate everyone from the area and block all entries to the area. Move to a safe vantage point.

______If a chemical is involved, determine its name(s) and report to responding agency.

______For spills, and ONLY if it is safe to do so, use what equipment is available to build soil berms to contain it from spreading and attempt to stop the leak; use spill response materials such as "socks" and "pads" from the on-site spill kit.

______Contact the Public Works and Health Department offices.

______Arrange reception for arriving off-site emergency services.

______Implement plans for immediate response to fires or injury resulting from incident.

______Coordinate communication with the Public Works office and Road Districts.

______Site Supervisor shall complete and file an incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the LEA and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

7.0 INJURY OR MEDICAL EMERGENCY

NOTE: Information should be available in the employee personnel file as to blood type and special medical conditions.

ACTION CHECKLIST:

______Assess the scene to ensure it is safe to assist the injured or downed person, and safe to enter the area where the injured person is located. DO NOT ASSIST if unidentified chemicals or gases are observed or suspected. DO NOT TOUCH the person if they appear to be physically connected to live electrical components or wiring.

______If the person is accessible, attempt to communicate with them by speaking to them. If they do not respond, assess the person for consciousness, airway, breathing, and circulation if you are qualified to do so. Perform CPR and/or First Aid if you are qualified to do so.

______If unable to assist person, and for serious injury, call 911 immediately.

______If possible, do not leave patient but have someone call 911. If you are alone, leave the person while calling 911.

______Stay with person until more qualified help arrives and releases you from the location.

______Arrange reception for arriving off-site emergency services. Post somebody to direct rescuers to the correct location.

______Notify the Public Works office.

______Ensure that no continuing dangers exist.

______Site Supervisor completes and files incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the LEA and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

If there are any fatalities:

Notification of any fatalities will be the responsibility of the Public Works Director or his designee.

8.0 PROPANE GAS LEAK

ACTION CHECKLIST:

First on Scene Actions:

______If safe to do so, and if you are knowledgeable, shut off supply valve. DO NOT ATTEMPT TO PUT OUT ANY FIRE UNTIL THE SUPPLY IS SHUT OFF.

______Call 911 if unable to put out fire or if unable to stop gas leak, or if someone has been injured or overcome by gas vapors.

______Immediately call **Turner Propane** at **760-872-1314** or **Amerigas** at **760-873-6371.**

______Evacuate area until declared safe to re-enter.

______If propane leak is stopped, have qualified person check the area to ensure it is safe for employees to return to area.

______If propane leak has not stopped, evacuate any area where propane gas can travel, shut off all ignition sources.

______Implement plans for immediate response to fires or injury caused by incident.

______Arrange reception for arriving off-site responders, provide them with all relevant details and follow their instructions.

______Notify the Public Works office.

______Site Supervisor completes and files incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the LEA and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

9.0 SLOPE FAILURE

ACTION CHECKLIST:

______Stop all operations in the area until it is safe to resume. Large equipment should only be used if it does not endanger anyone. Evacuate the affected area.

______Notify Public Works and the County Health Department.

______Have a knowledgeable employee assess the situation.

______Have all personnel, customer, contractors, or visitors working in the area assemble at a safe location.

______If individuals are missing, call 911 for an off-site rescue team.

______Do not endanger rescuers. Beware of possible additional movement of material. A qualified individual must make a careful inspection of the area prior rescue team entry.

______If the approximate location of possible victims is known, have the area marked by spreading ribbon flagging, so that the area may be easily identified if additional material falls.

______Have road blocks established on all roads leading to the top and bottom of the failure area. Make sure to block off any unstable slopes that have not yet fallen.

______Arrange reception for arriving off-site emergency services, and coordinate their contributions.

______Summon other specialists to the scene as required by the circumstances.

______Implement plans for immediate response to fires or injury caused by incident.

______Maintain plans for immediate response to injury caused by incident.

______Site Supervisor completes and files incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the LEA and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

10.0 VEHICLE OR EQUIPMENT ACCIDENT

ACTION CHECKLIST:

______Notify the Public Works office, and if serious injury occurred, call 911.

______If safe to do so, and if qualified, assist injured persons, perform First Aid and/or CPR.

______Have someone block access to involved vehicles to all except emergency personnel.

______Remain at location until authorized to leave by responding agency.

______Arrange reception for arriving off-site emergency services, and coordinate their contributions.

______Ensure that a designated employee accompanies the injured to the hospital.

______Maintain plans for immediate response to fires caused by explosion.

______Site Supervisor completes and files incident report with Public Works office and Risk Manager within 72 hours of stabilization of the situation.

______If necessary or appropriate, Public Works office will notify the LEA and other regulatory agencies in writing within 72 hours of incident stabilization as to the nature and final disposition of the incident.

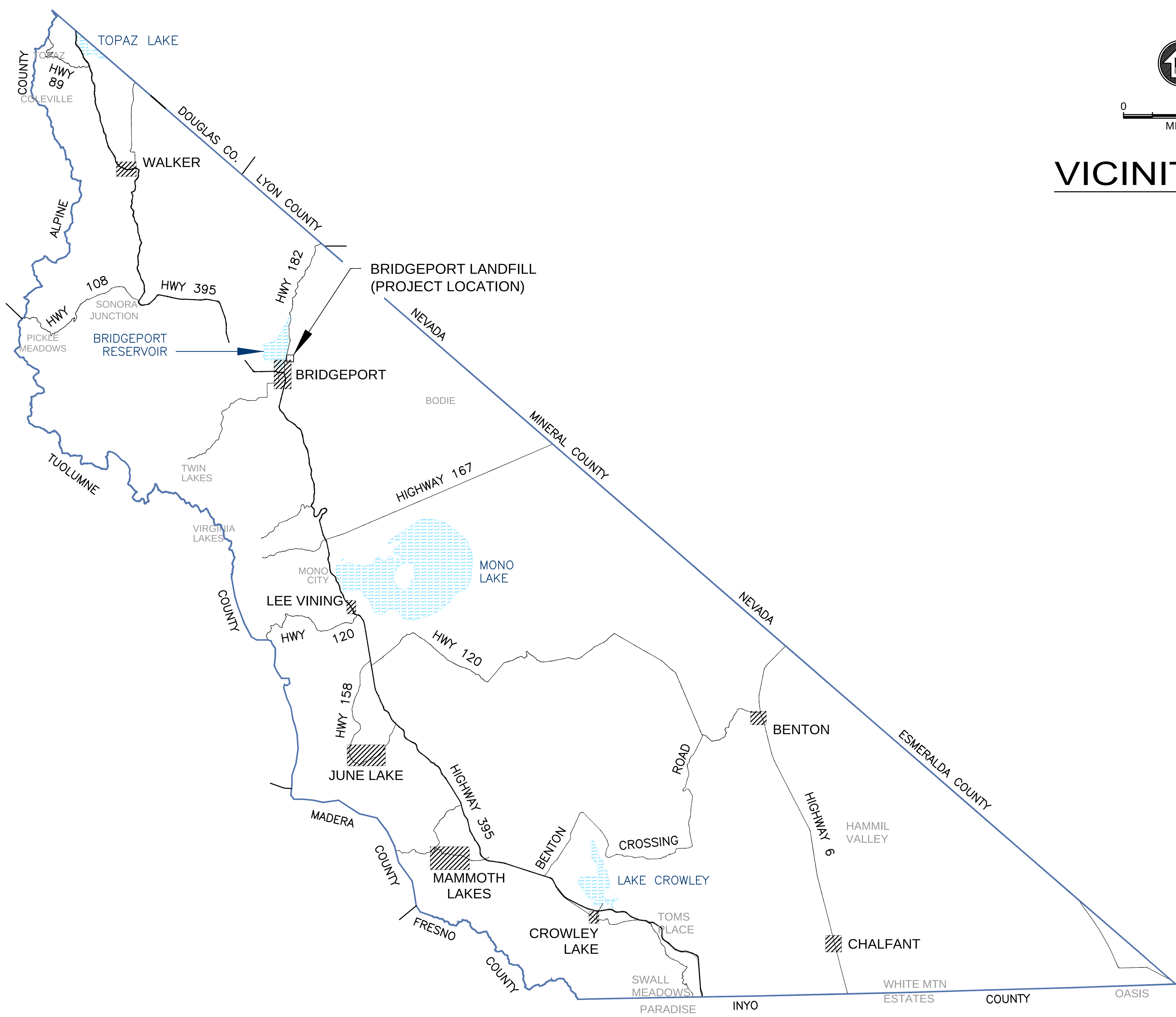
APPENDIX N

DESIGN DRAWING SET

FINAL CLOSURE CONSTRUCTION

BRIDGEPORT LANDFILL

MONO COUNTY, CALIFORNIA



VICINITY MAP

LOCATION MAP

DRAWING INDEX

NO.	DRAWING NAME
1	TITLE SHEET & LOCATION MAP
2	EXISTING TOPOGRAPHY AND FACILITIES
3	GRADING PLAN
4	CROSS-SECTIONS
5	DETAILS

SYMBOLS

× 6930.4	EXISTING SURFACE ELEVATION
6930	EXISTING 10' CONTOUR GRADE
6930	PROPOSED FINAL GRADE CONTOURS
GW-1	LANDFILL GAS MONITORING WELL
MW-1	GROUND WATER MONITORING WELL
S-1	PROPOSED SETTLEMENT MONUMENT
	PROPERTY BOUNDARY
	GRAVEL ROAD / SITE ACCESS ROAD
A	CROSS-SECTION LOCATION
A	DETAIL DESIGNATION
7	REFERENCE PAGE

PREPARED BY: SRK Consulting Engineers and Scientists

DRAWING No.: 146907-101
SHEET No. 1 OF 5
REVISION D
SCALE: AS SHOWN
PROJECT No.: 146907
DRAWING NAME 146907-101RevD

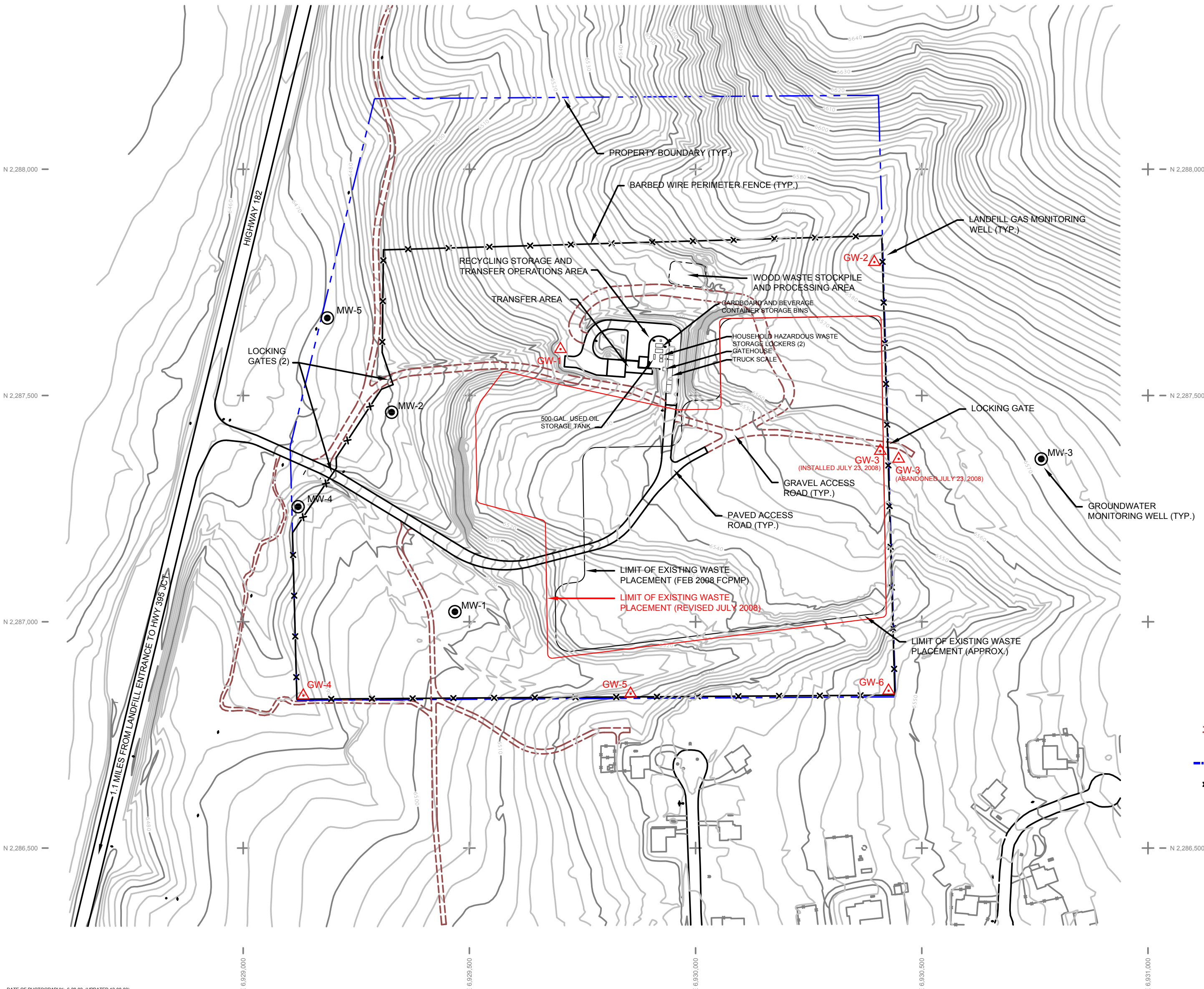
PREPARED FOR: FINAL CLOSURE CONSTRUCTION
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA

TITLE: TITLE SHEET AND LOCATION MAP

No.	DESCRIPTION	BY	DATE
A	DRAFT ISSUED FOR CIWMB REVIEW	RBB	2/05/08
B	FINAL ISSUED FOR CIWMB REVIEW	RBB	2/08/08
C	REVISED PER CIWMB REVIEW	RBB	8/25/08
D	REVISED PER LRWQCB REVIEW	RBB	4/07/09
	DESIGNED	RBB	04/09
	DRAWN	ML	04/09
	CHECKED		
	APPROVED		
	APPROVED		

REVISIONS
REFERENCE

DRAWING 1



DATE OF PHOTOGRAPHY: 6-28-02 (UPDATED 12-08-03)
MAP COMPILED BY: SPENCER B. GROSS, INC. (RENO, NV)
GROUND CONTROL BY: TRIAD/HOLMES ASSOC. (MAMMOTH LAKES, CA)

LEGEND

MW - 1 — GROUNDWATER MONITORING WELL LOCATION (MW - 4 and MW - 5 approx.)

GW-1 — LANDFILL GAS MONITORING WELL LOCATION (INSTALLED NOVEMBER 2007)

EXISTING DIRT ROAD

PROPERTY BOUNDARY

BARBED - WIRE FENCE

PREPARED FOR:

FINAL CLOSURE PLAN

BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA

TITLE:

EXISTING TOPOGRAPHY AND FACILITIES

PREPARED BY:

SRK Consulting
Engineers and Scientists
5250 Neil Road, Suite 300
Reno, NV 89502
775-828-6800

DRAWING No.: 146907-102E
SHEET No. 2 OF 5
SCALE: AS SHOWN
PROJECT No.: 146907
DRAWING NAME 146907 - 102RevE
REVISION E

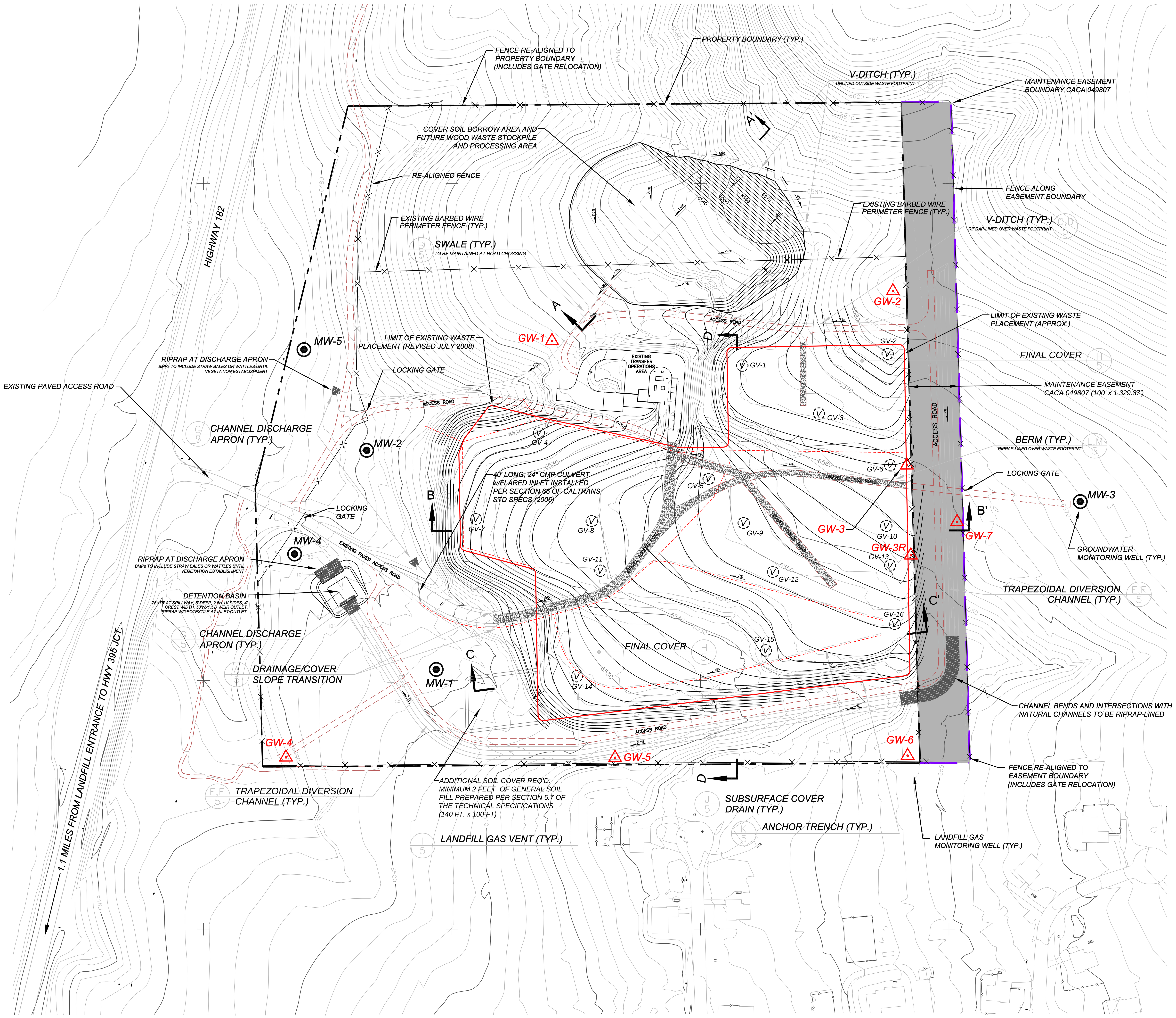
REVISIONS

No.	DESCRIPTION	BY	DATE
B	ISSUED FOR CIWMB REVIEW	RBB	2/08/08
C	REVISED PER CIWMB REVIEW	RBB	8/25/08
D	REVISED PER CIWMB REVIEW	RBB	9/26/08
E	REVISED PER LRWQCB REVIEW	RBB	4/07/09

REFERENCE

DESIGNED	RBB	04/09
DRAWN	ML	04/09
CHECKED		
APPROVED		
APPROVED		

DRAWING 2



LEGEND :

MW-1	EXISTING GROUNDWATER MONITORING WELL (MW-4 and MW-5 approx.)
GW-1	EXISTING LANDFILL GAS MONITORING WELL (INSTALLED NOVEMBER 2007)
GV-3	LANDFILL GAS VENT
	EXISTING DIRT ROAD
	PROPOSED DIRT ACCESS ROAD
	PROPOSED GRAVEL ACCESS ROAD (4"-THICK CLASS 2 AGGREGATE BASE)
	PROPERTY BOUNDARY
	MAINTENANCE EASEMENT & BOUNDARY BLM RIGHT OF WAY CACA 049807 FOR DRAINAGE AND MONITORING PURPOSES. BLM NOT RESPONSIBLE PARTY FOR LANDFILL FACILITY.
	LIMIT OF WASTE PLACEMENT REVISED AUGUST 2008
	SURFACE DIVERSION BERM (OVER FINAL COVER) OR V-DITCH (IN NATIVE SOIL)
	SUBSURFACE COVER LAYER DRAIN
	BARBED-WIRE FENCE
B'	CROSS SECTION LOCATION (refer to Drawing 4)

0 50 100
FEET

DATE OF PHOTOGRAPHY: 6-28-02 (UPDATED 12-08-03)
MAP COMPILED BY: SPENCER B. GROSS, INC. (RENO, NV)
GROUND CONTROL BY: TRIAD/HOLMES ASSOC. (MAMMOTH LAKES, CA)
U:\Proten\15 Trash\146907-103RevE.dwg

PREPARED BY:
SRK Consulting
Engineers and Scientists

PREPARED FOR:

FINAL CLOSURE CONSTRUCTION
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA

TITLE:
FINAL GRADING PLAN

DRAWING No.	146907-103F
SHEET No.	3 OF 5
REVISION	F
SCALE:	AS SHOWN
PROJECT No.	146907
DRAWING NAME	146907-103RevF

No.	DESCRIPTION	BY	DATE
C	REVISED PER CIWMB REVIEW	RBB	2/08/08
D	REVISED PER CIWMB REVIEW	RBB	8/25/08
E	REVISED PER LRWQCB REVIEW	RBB	9/29/08
F	REVISED Added GW-7	PER	12/15/15

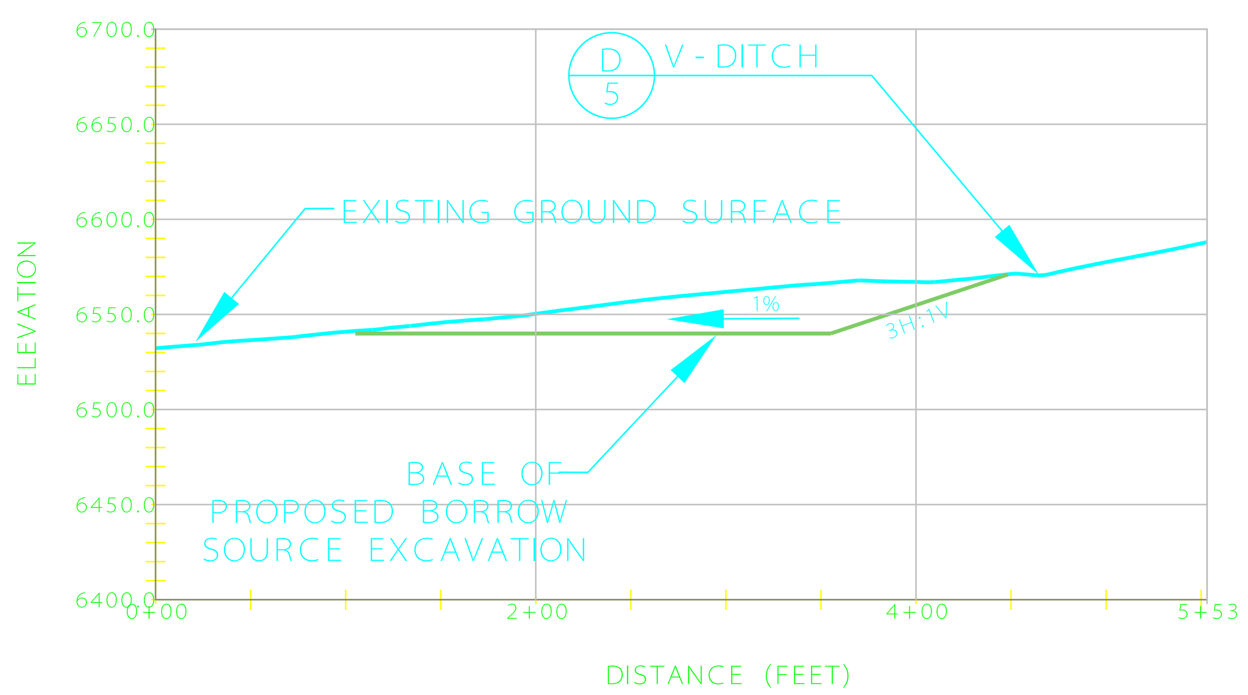
REVISIONS

DESIGNED	RBB	04/09
DRAWN	ML	04/09
CHECKED		
APPROVED		

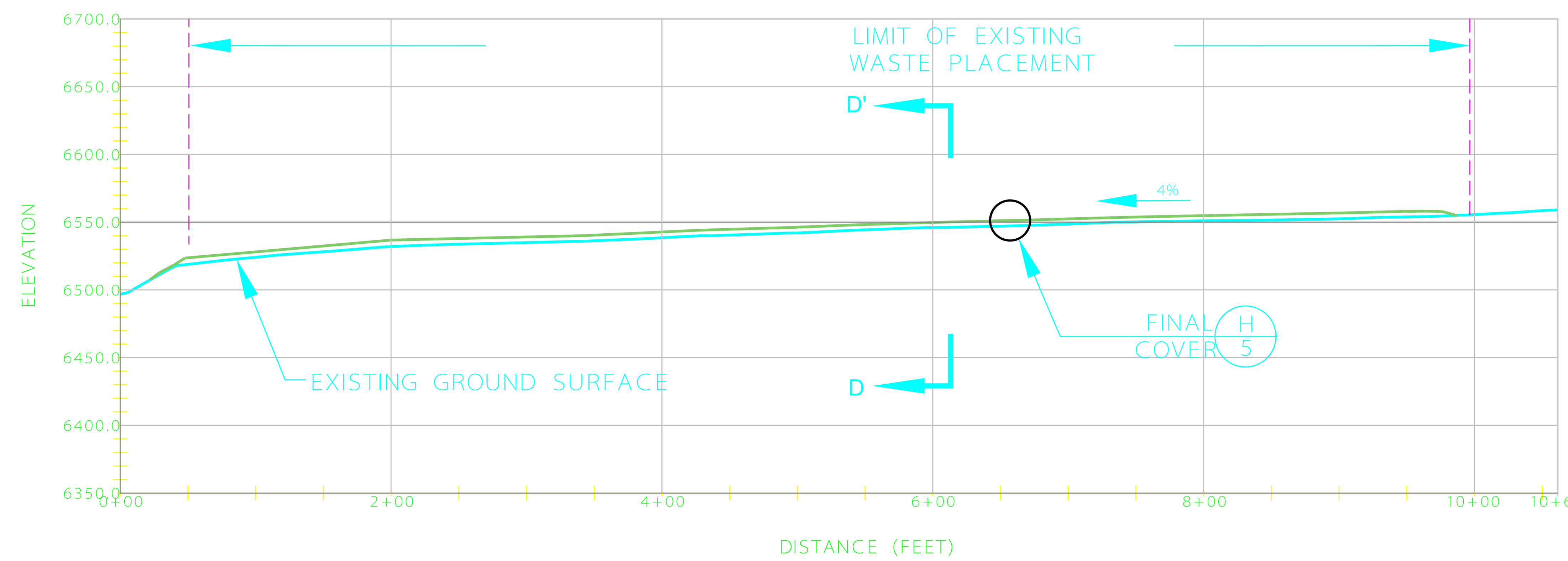
REFERENCE

DRAWING
3

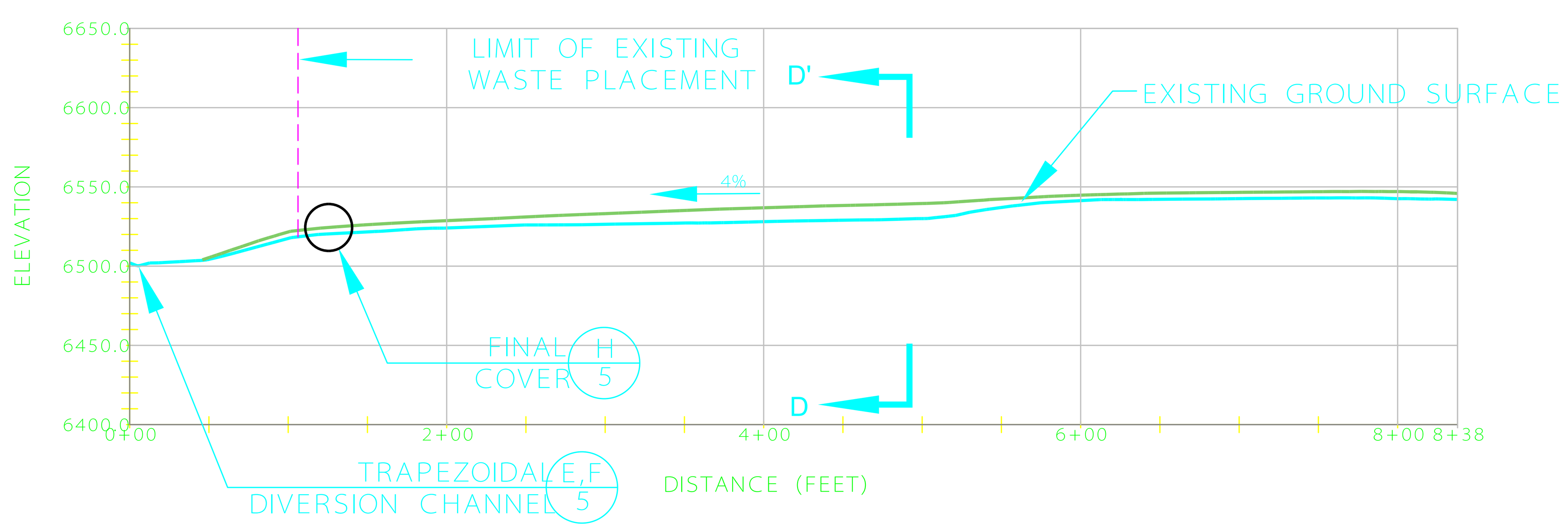
SECTION A - A'



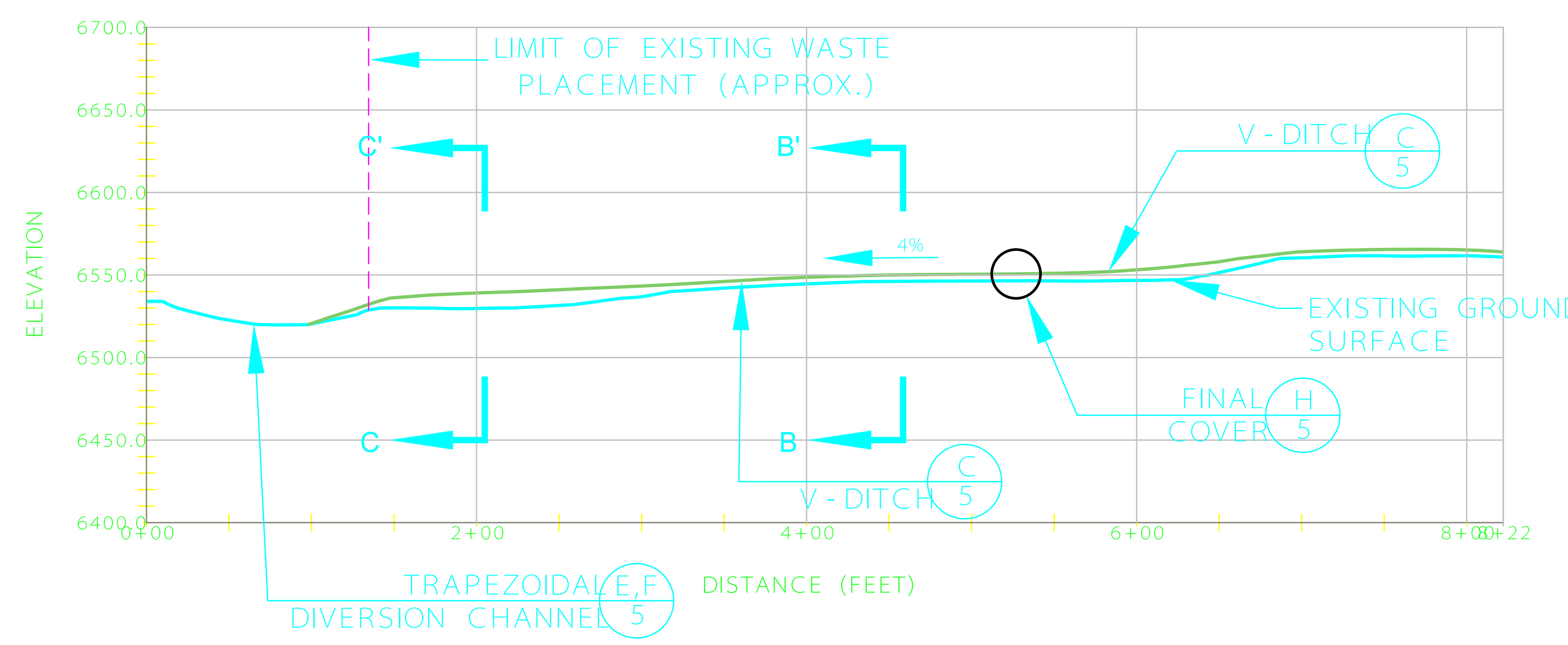
SECTION B - B'



SECTION C - C'



SECTION D - D'



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Reno, NV 89502
775-828-6800

REVISION D

SHEET No. 4 OF 5

DRAWING No.: 146907-104

SCALE: AS SHOWN

PROJECT No.: 146907

DRAWING NAME 146907-104RevD

PREPARED FOR:

FINAL CLOSURE PLAN
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA

TITLE:

CROSS SECTIONS

REVISIONS

No.	DESCRIPTION	BY	DATE
A	DRAFT ISSUED FOR MCPWD REVIEW	RBB	2/01/08
B	FINAL ISSUED FOR CIWMB REVIEW	RBB	2/08/08
C	REVISED PER CIWMB REVIEW	RBB	8/25/08
D	REVISED PER LRWQCB REVIEW	RBB	4/07/09

REFERENCE

	DESIGNED	RBB	04/09
	DRAWN	ML	04/09
	CHECKED		
	APPROVED		
	APPROVED		

DRAWING

4


GEOTEXTILE UNDER RIPRAP - LEADING EDGE TO BE TUCKED A MINIMUM OF 9" DEEP
FINAL COVER
FINAL COVER
HINGE POINT
TOE OF COVER SLOPE
5' MIN.
~10 ft.
15 ft.
4.5'
DRAINAGE/COVER SLOPE TRANSITION (TYP.)
N.T.S.
A
RIP-RAP LINING
2 FT.
COMPACTED SUBGRADE
GEOTEXTILE
8 FT.
10 FT.
26 FT.
TRAPEZOIDAL DIVERSION CHANNEL (RIPRAP-LINED)
N.T.S.
E
NATIVE SOIL
2 FT.
8 FT.
10 FT.
26 FT.
TRAPEZOIDAL DIVERSION CHANNEL (UN-LINED)
N.T.S.
F
10
18"
30 FT.
NOTE: SWALES ON FINAL COVER SHALL BE RIPRAP LINED AS V-DITCH BEFORE AND AFTER. SWALES ON NATIVE GROUND SHALL BE UNLINED UNLESS OTHERWISE SPECIFIED.
SWALE (TYP.)
N.T.S.
B
RIP-RAP LINING (where specified, d50= 3")
18"
6" MIN.
COMPACTED FOUNDATION LAYER
GEOTEXTILE
9 FT.
V-DITCH (RIPRAP-LINED)
N.T.S.
C
18"
9 FT.
V-DITCH (UN-LINED)
N.T.S.
D
W = 1.5x CHANNEL WIDTH
RIP-RAP LINING
(MIN. 2x CHANNEL LINING THICKNESS)
W = CHANNEL WIDTH AT SURFACE
V-DITCH OR TRAPEZOIDAL CHANNEL DISCHARGE
FLOW
VARIES
GEOTEXTILE
L = 1.5x CHANNEL WIDTH
D = 2x CHANNEL LINING THICKNESS
CHANNEL DISCHARGE APRON
N.T.S.
G
EROSION PROTECTION LAYER (WOOD CHIPS - 1" - 3" THICK)
18-INCH COMPACTED NATIVE SOIL LAYER, NOMINALLY COMPACTED TO APPROXIMATELY 85% MAX. DRY DENSITY AT ±2% OPTIMUM MOISTURE PER ASTM D1557 (PLAN REQ'D TO PROTECT LINER)
8 oz/sy HEAT BURNISHED GEOTEXTILE OVER 60 mil LLDPE Agru Super Gripnet
MINIMUM 24-INCH FOUNDATION LAYER
ADDITIONAL 12-INCH FOUNDATION LAYER, COMPACTED TO A MINIMUM OF 90% MAX. DRY DENSITY AT ±2% OPTIMUM MOISTURE PER ASTM D1557, PLACED IN LOOSE LIFTS LESS THAN 8 INCHES THICK
RE-CONDITIONED UPPER 12-INCHES OF INTERIM COVER-FOUNDATION LAYER, SCARIFIED, MOISTURE CONDITIONED, AND RECOMPACTED TO A MINIMUM OF 90% MAX. DRY DENSITY AT ±2% OPTIMUM MOISTURE PER ASTM D1557
WASTE
FINAL COVER
N.T.S.
H
MOUND FILL AROUND PIPE
PVC FLANGES WITH RUBBER GASKETS
WOOD CHIPS (MIN. 1-3" THICK)
GEOTEXTILE AND LINER (TYP.)
2" DIA. SCH. 40 PVC GAS VENT FITTED WITH BACKFLOW PREVENTER (ONE-WAY FLAPPER)
30"
3% min.
VEGETATIVE LAYER
18"
4 FT. MIN. OVERLAP (TYP.)
FOUNDATION LAYER
24"
GRAVEL
5 FT. MIN. (TYP.)
WASTE
PVC TEE
GEOTEXTILE
PVC END CAP (TYP.)
12" x 12" x 10' GRAVEL-FILLED GAS COLLECTION TRENCH EXCAVATED INTO WASTE BELOW FOUNDATION LAYER AND WRAPPED IN GEOTEXTILE (min. 8 oz/sy non-woven)
2" DIA. SCH. 40 0.020 SLOTTED PVC PIPE (TYP.)
LANDFILL GAS VENT
N.T.S.
I
4" DIA. PERFORATED CPE DRAIN PIPE IN DRAIN GRAVEL
8 oz/sy GEOTEXTILE
18" VEGETATIVE LAYER
12"
60 mil LLDPE AGRU SUPER GRIPNET® LINER
24"
SUBSURFACE COVER DRAIN (TYP.)
N.T.S.
J
GRADE TO DRAIN
3' MIN.
8 oz/sy GEOTEXTILE
60 MIL LLDPE AGRU SUPER GRIPNET®
RANDOM BACKFILL (WHEEL - ROLLED UNLESS OTHERWISE NOTED)
PREPARED FOUNDATION LAYER
LINER ANCHOR TRENCH (TYP.)
N.T.S.
K
15" MIN
12" MIN.
3% MIN.
CONSTRUCTED FINAL COVER LAYER
NOTE: LIGHTLY SCARIFY FINAL COVER SURFACE PRIOR TO BERM CONSTRUCTION - BERM TO BE COMPACTED TO A MINIMUM OF 90% MAX. DRY DENSITY AT ±2% OF OPTIMUM MOISTURE PER ASTM D1557
DIVERSION BERM ON FINAL COVER (UNLINED)
N.T.S.
L
RIP-RAP LINING
GEOTEXTILE
6 FT. MIN.
18" MIN.
12" MIN.
ANCHOR LEADING EDGE TO A MINIMUM DEPTH OF 9 INCHES
9" MIN.
6" MIN.
CONSTRUCTED FINAL COVER LAYER
NOTE: LIGHTLY SCARIFY FINAL COVER SURFACE PRIOR TO BERM CONSTRUCTION - BERM TO BE COMPACTED TO A MINIMUM OF 90% MAX. DRY DENSITY AT ±2% OF OPTIMUM MOISTURE PER ASTM D1557
DIVERSION BERM ON FINAL COVER (LINED)
N.T.S.
M
SRK Consulting
Engineers and Scientists
146907-105E
FINAL CLOSURE CONSTRUCTION
BRIDGEPORT LANDFILL
MONO COUNTY, CALIFORNIA
B FINAL ISSUED FOR CIWMB REVIEW RBB 2/08/08
C REVISED PER CIWMB REVIEW RBB 8/25/08
D REVISED PER LRWQCB REVIEW RBB 4/07/09
E REVISED WITH CORRECTIONS RBB 4/24/09
ML 04/09
RAWING
5