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ATTACHMENT VI-2

FINAL CLOSURE PLAN

FOR

CELLS 4 and 5

GRASSY MOUNTAIN FACILTY
TOOELE COUNTY, UTAH

June 21, 2010
(Revision 2)

FINAL CLOSURE PLAN

FOR

CELL 4

GRASSY MOUNTAIN FACILTY
TOOELE COUNTY, UTAH

June 21, 2010
(Revision 2)

CLOSURE PLAN FOR RCRA CELL 4

Table of Contents

List of Appendices

1.0 INTRODUCTION

Grassy Mountain currently has four active hazardous waste landfill disposal cells approved for operation**:** Cells 4, 5, 7, and B/6. Attachment II-7 of the State of Utah issued Grassy Mountain Facility RCRA Part B Permit requires that unit specific final closure design engineering reports be submitted at the time of closure for each cell in accordance with the facility permit (Module VI.C) and Sections Utah Admin. Code R315-8-7 and Utah Admin. Code R315-8-14.5 of the Utah Division of Solid and Hazardous Waste (UDSHW) rules. This closure plan also incorporates a previously approved Geosynthetic Clay Layer (GCL) in the closure design. The construction Quality Assurance (CQA) Plan has been revised to reflect updated test standards and the state of the art practice. In addition, the closure drawings have been prepared based on the settlement history.

2.0 GENERAL DESCRIPTION

Design of RCRA Landfill Cell 4 was completed and presented in a design engineering report dated May 1989 with an original design capacity of 317,230 cubic yards. Construction of Cell 4 was completed and construction documentation was submitted in May 1990. Revisions to closure design grades were made in 1993 to the height of cap by 2.5 feet and replace the compacted clay cover with a GCL which increased the waste disposal capacity to 403,010 cubic yards. Subsequently, revisions to the closure design grades were again made in 1998 to raise the closure cap height by 10 feet from the original design (7.5 feet above the 1993 design) resulting in the current permitted capacity of 535,500 cubic yards.

3.0 CLOSURE PERFORMANCE STANDARDS

The general closure performance standard for hazardous waste management facilities is specified in the RCRA regulations and requires that the facility owner/operator must close the facility in a manner which:

- Minimizes the need for further maintenance; and
- Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground water, or surface waters, or to the atmosphere.

The final design is performed by Hansen, Allen and Luce Engineering (HA&L Engineering), a reputable consulting firm, to meet the closure requirements of UDSHW and EPA 40 CFR, section 264.310. The closure design performed by HA&L Engineering meets the following performance criteria:

- Provide Long term minimization of migration of liquids through the closed landfill;
- Function with minimum maintenance;
- Promote drainage and minimize erosion or abrasion of the cover;
- Accommodate settling and subsidence so that the cover's integrity is maintained; and
- Have a permeability less than or equal to the permeability of any bottom liner system.

HA&L Engineering has performed engineering analyses in 1998 to verify that the final cover system will meet or exceed the performance criteria required in the UDSHW regulation. The final cover design report was previously submitted to UDSHW in support of a Class 3 Permit Modification to increase the waste height in Cells 4, 5 and Z, requested on September 25, 1998.

4.0 FINAL CLOSURE DESIGN REPORT

Final closure design was previously performed by HA&L Engineering in support of a Class 3 Permit Modification to increase the waste disposal capacity volume for Cell 4. The design report titled "*Grassy Mountain Facility Landfill Cells 4, 5, and Z potential for raising closure caps*" dated June 1998 consisted of the following analyses:

- Leachate Collection Systems;
- Leachate Pipe Withdrawal;
- High Density Polyethylene (HDPE)
- Liner Integrity Analysis;
- Exterior Erosion Protection,
- Slope Stability; and
- Settlement Analysis.

Closure drawings were also submitted as a part of the 1998 document titled "*Grassy Mountain Facility Landfill Cells 4, 5, and Z potential for raising closure caps*", which is the basis for preparation of this closure plan.

4.1 Closure Components

The closure cap of Cell 4 will consist of a GCL, a HDPE geomembrane liner with a drainage system above the liner, a protective cover over the liner and drainage system, and gravel armor plating over the protective cover for erosion protection. The closure cap will be constructed in the general shape of a "hipped roof or elongated pyramid, with the cap surface sloping toward the outer edges of the cap at maximum slope of approximately 5 percent. Grading the closure cap will assist in accommodating settlement and subsidence so that the cover's integrity is maintained. At the proposed slopes of five percent, the cap could settle or subside an additional two feet over a horizontal distance of 100 feet and still maintain a slope of approximately three percent, thus, promoting drainage off the surface of the cap. Downspout pipes will be located at each of the four corners of the closure cap to convey precipitation runoff from the closure cap down the exterior slopes of the cell to drainage conveyance ditches and to retention ponds.

Typical cross-sections of the closure cap are illustrated in the Closure drawings. The closure cap will consist of the following from bottom to top (see Sheet C4-4):

On the top of 5% slopes

- Six inches (minimum) of sand cushion. The sand cushion layer will act as a buffer between the waste and GCL and will prevent the GCL from damage due to accidental puncture.
- A GCL, which has equivalent permeability values to the two feet of compacted clay.
- A 60-mil HDPE geomembrane liner. Since the cap will consist of a geomembrane liner, it will have a permeability that is less than or equal to the permeability of the bottom liner system in the cell.
- A lateral drainage layer consisting of drainage net with overlying geotextile filter fabric (i.e.; single sided geocomposite). The drainage layer will convey water off the underlying geomembrane liner, which infiltrates through the overlying armor plating and soil cover. The drainage net will be placed on a slope, which parallels the surface of the closure cap. The edge of the drainage net will extend into the more permeable erosion protective cover material on the 2H: 1V exterior slopes around the perimeter of the cap to allow water that enters the drainage net to drain freely onto the exterior gravel armor. The drainage net will have a transmissivity value of 5×10^{-4} m^2/sec with a

confining pressure of 500 pounds per square foot, and a five percent hydraulic gradient.

- A 2-foot protective soil cover that will provide frost protection for the liner and that will be compatible with the GCL. It is well documented that GCL is less susceptible to frost damage than that of clay liner. The regional depth of frost penetration is about 21-inches at the Grassy Mountain Facility. The protective cover and gravel armor plating thickness should, therefore, provide adequate frost protection.
- Erosion protective cover consisting of four inches of gravel armor plating material over the entire cap. Gravel will be used instead of vegetation due to the sparse nature of local vegetation. Annual rainfall is quite low and will not support vegetation thick enough to prevent erosion of the cap. Native vegetation will begin to grow by itself in the gravel layer as verified by the growth of native vegetation in the gravel armor plating that has previously been placed as erosion protection on the slopes and closure caps of the other landfill cells at the facility. Due to the aridity of the region, no deep-rooted vegetation is expected to develop which might penetrate the HDPE liner. Gravel armor plating shall meet the gradation requirement specified in Table 1 of the CQA document.
- Berms, ditches, downspout pipes, storm drainage pipes and other drainage features to control and convey runoff from the cap. Berms will be constructed around the perimeter of the cap, which will form ditches around the perimeter on top of the cap. The ditches will be graded on a slope of about 0.7 percent toward the four comers of the closure cap. The ditches will collect precipitation runoff from the surface and convey the runoff toward corrugated polyethylene pipe downspouts located at the corners of the cap. The cell down-spouts and existing manhole drainage systems located at the corners of the cap will convey runoff to drainage ditches at the base of the landfill and to drainage ditches that lead to the storm water retention pond.

<u>On the perimeter 2H:1V slopes</u>

- Compacted Clay Liner consisting of suitable clay classified as CL, CH, CL-ML, ML or MH in accordance with USCS with a maximum particle size of 1-inch and hydraulic conductivity of $1X10^{-7}$ cm/sec.
- A 60-mil HDPE geomembrane liner. The 60-mil HDPE shall be deployed on the top of 2 to 1 surface and shall be anchored in a dedicated anchor trench. Since the cap will consist of a geomembrane liner, it will have a permeability that is less than or equal to the permeability of the bottom liner system in the cell.
- A 2-foot protective soil cover that will provide frost protection for the liner and that will be compatible with the GCL. The protective soil over shall provide adequate protection of HDPE from mechanical damage.

- Erosion protective cover consisting of four inches of gravel armor plating material over the entire cap. Gravel will be used instead of vegetation due to the sparse nature of local vegetation. Annual rainfall is quite low and will not support vegetation thick enough to prevent erosion of the cap. Native vegetation will begin to grow by itself in the gravel layer as verified by the growth of native vegetation in the gravel armor plating that has previously been placed as erosion protection on the slopes and closure caps of the other landfill cells at the facility. Due to the aridity of the region, no deep-rooted vegetation is expected to develop which might penetrate the HDPE liner. Gravel armor plating shall meet the gradation requirement specified in Table 1 of the CQA document.

4.2 Settlement Adjustments

Cell 4 has experienced settlement since it was placed in service. Settlement survey was performed on a regular basis to record the magnitude and the rate of settlement. HA&L Engineers has evaluated the settlement data for cell 4 and adjusted the elevations of the embankment and the final closure grade in order to maintain the prescribed final cover slope and waste disposal capacity of the landfill. The settlement evaluation report titled *"Landfill Cells 4, 5 and Z Closure Construction"* prepared by HA&L Engineering is presented in Appendix C. It should be noted that the closure drawings for the final cover construction have been adjusted for settlement by HA&L Engineering. The closure drawings are presented in Appendix B.

5.0 CLOSURE ACTIVITIES

5.1 Preparation of the Waste Mound and Sand Cushion Layer

The waste surface at the top of the cell must be amenable for closure. Proper selection, compaction, slope and grading of the waste are necessary to ensure the integrity of the cap design. The final surface of waste shall be free of sharp objects and debris in order to protect the overlying GCL and HDPE liner from accidental puncture. The cell will be shaped and contoured to conform to the attached drawing C4-1 titled "*Waste Grade Plan"*. The cap will be graded at a maximum slope of approximately 5 percent. The contouring of the waste will reduce the subsequent need for additional fill material, facilitate grading of the cap, and reduce the possible formation of depressions that could pond water.

Six inches of sand cushion layer shall be placed above the top of final waste surface (top deck only) and graded to meet the design grade prior to placement of GCL. The sand cushion layer will act as a buffer between the waste and GCL and will prevent the GCL from damage due to accidental puncture. The sand layer shall be free from foreign objects and deleterious material that can damage the GCL. Sand stockpiled within the

footprint of Cell A has been tested and determined to be chemically compatible with GCL and will be the primary source for the 6-inch sand cushion layer. Other offsite source or IWC-3 sand may be used as sand cushion layer provided it is chemically compatible with GCL and will not adversely affect the properties of GCL. Other sand sources must be tested and approved before use. The test must demonstrate that the Swell Index (ASTM D5890), Fluid Loss (ASTM D5891) and Hydraulic Conductivity (ASTM D5084) of GCL is not affected by the liquid generated from the proposed borrow source.

5.2 Compacted Clay Liner and Geosynthetic Clay Liner (GCL)

Compacted clay liner will be placed on the side slope in horizontal lifts as shown in Figure C4-4. Clay liner shall be compacted to at least 95 percent of the maximum dry density as determined by ASTM D698. Compacted clay shall have maximum in-place saturated hydraulic conductivity of 1×10^{-7} cm/sec. Test fills were previously performed during Cell 7's construction to establish construction specification and methodology. Construction specifications include the type of construction equipment, moisture content range, number of compactor passes, lift depth and addition of the deflocculating agent. The clay borrow source is located outside the fenced areas. The location of clay borrow source and the test fill results were previously submitted to UDSHW as a part of Cell 7 construction documentation report. EPA technical guidance document titled "Quality Assurance and Quality Control of Waste Containment Facilities" dated September 1993 states that a *test pad need not be constructed if results are already available for a particular soil and construction methodology*. Clean Harbors plans to use the same clay borrow source and construction methodology established during previous test fill construction. However, Clean Harbors shall construct a new test fill in accordance with the CQA Plan if there is a change in material, source or construction methodology. Further, a new test fill shall be constructed prior to the placing of the clay liner of a new landfill cell. Final surface of the compacted clay liner will be graded in accordance with the attached drawing C4-2 titled *"Liner Surface Plan".* Placement of the GCL will be initiated and will progress such that runoff from the closure cap and from the adjacent waste material will be away from the GCL. The HDPE liner will immediately be placed above the GCL to prevent moisture resulting from precipitation from coming into contact with the GCL.

5.3 HDPE Liner

A 60-mil HDPE liner will be installed above the compacted clay or GCL. The HDPE liner in conjunction with the underlying compacted clay or GCL will provide for the long-term minimization of liquid migration through the closed cell. HDPE geomembrane shall be placed into an anchor trench near the existing anchor trench as shown in Figure C4-4.

5.4 Drainage Net and Filter Fabric

Drainage net will be placed on top of the HDPE liner to function as a lateral drainage media for water that infiltrates the soil cover. A layer of geotextile filter fabric will be installed directly above the drainage net to prevent clogging of the drainage net by the overlying soil. The drainage net and the filter fabric will be installed at the same time as the protective cover. A single-sided geocomposite may be installed in lieu of drainage net and a geotextile provided the geocomposite meets the project specification. The drainage net will be placed on a 5 percent slope, which parallels the surface of the final cover. The edge of the drainage net will extend through the soil cover around the edges of the cap to allow discharge from the drainage net to drain freely. The drainage layer shall have transimissivity values of 5×10^{-4} m^2 /sec or greater.

5.5 Protective Soil Cover

A 2-foot thick soil protective cover layer will be placed over the drainage layer. It is anticipated that the protective cover meeting the Unified Soil Classification designations ML, CL, SM, SC or combinations thereof may be obtained from borrow sources near the Grassy Mountain Facility. A perimeter berm will be constructed as a part of the protective cover construction as shown in Figure C4-4. Perimeter berm will prevent stormwater run-off from flowing into the side slope and cause excessive erosion. Stormwater collected in the drainage ditch is designed to flow to the corner of the cells and exit towards the retention pond via controlled storm water outlets and downspouts. Soil samples of the proposed protective soil cover were obtained outside the fenced area and submitted to CETCO laboratory for chemical compatibility testing. The protective soil cover will be approved based on passing the chemical compatibility with GCL. UDSHW will be notified of the approved protective soil cover as soon as the test results become available.

5.6 Armor Plating

Exterior erosion protection for Cell 4 consist of a 4-inch layer of rock armor plating referred to as "gravel armor plating" in the 1998 design engineering reports. Armor plating shall be graded to the required specification and placed to the lines and grade shown in the attached Figure C4-3 titled *"Final Closure Plan"*. Gravel armor plating shall meet the gradation requirement specified in Table 1 of the CQA document. Gravel armor plating may be obtained from the gravel pit located 4 miles east of the facility at the base of the Gray Back Mountains (Section 24CP62744).

6.0 CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

Clean Harbors is proposing revisions to the CQA Plan. The revisions represent "State of the Art" technology and may be regarded as industry standard and an overall improvement of the CQA Plan. This CQA Plan reflects the requirements of the Hazardous and Solid Waste Amendments of 1984 to the Resource Conservation and Recovery Act (RCRA), and is consistent with the Technical Guidance Documents titled, "Construction Quality Assurance for Hazardous Waste land Disposal Facilities", EPA/530-SW-86-031, October 1986; and "Quality Assurance and Quality Control for Waste Containment Facilities", EPA/600/R-93/182, October 1993.

The original CQA Plan was prepared based on the material properties and standard test methods typically employed at the time of preparation of specification in 1997. Material properties and test methods for goesynthetics have improved over the past 12 years due to technological advancements. In addition, new test methods have been adopted by American Society for Testing Material (ASTM) and Geosynthetic Research Institute (GRI). As a result, some of the material properties specified in the original CQA Plan are either obsolete or no longer applicable and requires revision to accommodate the recent test standards or technological advancements. The modifications to the CQA plans are made based on the following criteria:

a) The modification will in no way affect the performance standard or the original intent of the plans and specifications approved by the UDSHW.

b) The modifications in no way reduce the effectiveness of the QA/QC effort used to ensure the quality and consistency of the materials and workmanship used to meet the performance standards in the plans and specifications approved by UDSHW.

The CQA Plan has been signed and sealed by a registered professional engineer licensed to practice in the state of Utah. The updated CQA Plan is presented in Appendix A.

7.0 CLOSURE DRAWINGS

Engineering drawings have been prepared by HA&L Engineering for the closure of Cell 4. The closure drawings (see Appendix B) have been prepared in accordance with the design and analyses previously performed in 1998. The design engineer has reviewed all measured settlement data's for Cell 4 since it was placed in operation and adjusted the control elevations of the embankment and final cover to accurately account for settlement. The drawings have been signed and sealed by a registered professional engineer licensed to practice in the state of Utah. Construction stake-out drawings will be prepared from the attached design drawings prior to construction based on the control points, lines and grades. Construction drawings will be submitted with the closure certification report.

8.0 CLOSURE NOTIFICATION

Clean Harbors will notify the UDSHW in writing at least 60 days prior to the date on which Clean Harbors expects to begin closure of the landfill cell in accordance with 40 CFR §264.112(d).

9.0 CLOSURE CERTIFICATION

Clean Harbors will submit certification of proper construction of the final cover in accordance with this closure plan within 60 days of completion of closure. The certification will be accompanied by a certification report which contains the results of all tests performed to verify proper construction. Clean Harbors will conduct whatever tests, inspections, or measurements are necessary in the judgment of the professional engineer for the engineer to certify that the landfill final cover has been constructed in conformance with the design and construction specifications of this permit. The certification report will, at a minimum, contain the following engineering plans and test results:

a) Scaled plan view of the final waste and soil cover and armor plating layer which accurately depict the area boundaries and dimensions of the cover; surrounding natural ground surface elevations; minimum, maximum, and representative elevations and final covers thickness, extent, and materials of component parts of the cover system.

b) For the compacted clay liner, all tests required and at the frequency specified for constructed soil liners in accordance with the CQA Plan.

c) For the HDPE liner all tests required as specified in the CQA Plan including manufacturer quality control (MQC) testing, conformance testing, destructive and non-destructive testing, panel placement, calibration certificates, pre-weld trial test logs and as-built record drawing.

d) As-built record drawings of top of waste, soil cover and armor plating layer.

10.0 SURVEY PLAT

After the submission of the closure certification report for Cell 4, Clean Harbors will file with Tooele County and submit to UDSHW a survey plat indicating the location and dimensions of the closed landfill cell with respect to permanently surveyed benchmarks. The plat will be prepared and certified by a professional land surveyor. The plat must be submitted to Tooele County with a note prominently displayed on the plat, which states the owner's or operator's obligation to restrict disturbance of hazardous waste disposal unit in accordance with the applicable post-closure requirement.

FINAL CLOSURE PLAN

FOR

CELL 5

GRASSY MOUNTAIN FACILTY
TOOELE COUNTY, UTAH

June 21, 2010
(Revision 2)

CLOSURE PLAN FOR RCRA CELL 5

Table of Contents

List of Appendices

1.0 INTRODUCTION

Grassy Mountain currently has four active hazardous waste landfill disposal cells approved for operation**:** Cells 4, 5, 7, and B/6. Attachment II-7 of the State of Utah issued Grassy Mountain Facility RCRA Part B Permit requires that unit specific final closure design engineering reports be submitted at the time of closure for each cell in accordance with the facility permit (Module VI.C) and Sections R315-8-7 and R315-8-14.5 of the Utah Division of Solid and Hazardous Waste (UDSHW) rules. This closure plan also incorporates a previously approved Geosynthetic Clay Layer (GCL) in the closure design. The construction Quality Assurance (CQA) Plan has been revised to reflect updated test standards and the state of the art practice. In addition, the closure drawings have been prepared based on the settlement history.

2.0 GENERAL DESCRIPTION

Design of RCRA Landfill Cell 5 was completed and presented in a design engineering report dated April 1990 with an original design capacity of 315,700 cubic yards. Construction of Cell 5 was completed and construction documentation was submitted sometime between late 1991 and early 1992. Revisions to closure design grades were made in 1993 to the height of cap by 2.5 feet and replace the compacted clay cover with a GCL which increased the waste disposal capacity to 387,700 cubic yards. Subsequently, revisions to the closure design grades were again made in 1998 to raise the closure cap height by 10 feet from the original design (7.5 feet above the 1993 design) resulting in the current permitted capacity of 510,300 cubic yards.

3.0 CLOSURE PERFORMANCE STANDARDS

The general closure performance standard for hazardous waste management facilities is specified in the RCRA regulations and requires that the facility owner/operator must close the facility in a manner which:

- Minimizes the need for further maintenance; and
- Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground water, or surface waters, or to the atmosphere.

The final design is performed by Hansen, Allen and Luce Engineering (HA&L Engineering), a reputable consulting firm, to meet the closure requirements of UDSHW

and EPA 40 CFR, section 264.310. The closure design performed by HA&L Engineering meets the following performance criteria:

- Provide Long term minimization of migration of liquids through the closed landfill;
- Function with minimum maintenance;
- Promote drainage and minimize erosion or abrasion of the cover;
- Accommodate settling and subsidence so that the cover's integrity is maintained; and
- Have a permeability less than or equal to the permeability of any bottom liner system.

HA&L Engineering has performed engineering analyses in 1998 to verify that the final cover system will meet or exceed the performance criteria required in the UDSHW regulation. The final cover design report was previously submitted to UDSHW in support of a Class 3 Permit Modification to increase the waste height in Cells 4, 5 and Z, requested on September 25, 1998.

4.0 FINAL CLOSURE DESIGN REPORT

Final closure design was previously performed by HA&L Engineering in support of a Class 3 Permit Modification to increase the waste disposal capacity volume for Cell 5. The design report titled "*Grassy Mountain Facility Landfill Cells 4, 5, and Z potential for raising closure caps*" dated June 1998 consisted of the following analyses:

- Leachate Collection Systems;
- Leachate Pipe Withdrawal;
- High Density Polyethylene (HDPE)
- Liner Integrity Analysis;
- Exterior Erosion Protection,
- Slope Stability; and
- Settlement Analysis.

Closure drawings were also submitted as a part of the 1998 document titled "*Grassy Mountain Facility Landfill Cells 4, 5, and Z potential for raising closure caps*", which is the basis for preparation of this closure plan.

4.1 Closure Components

The closure cap of Cell 5 will consist of a GCL, a HDPE geomembrane liner with a drainage system above the liner, a protective cover over the liner and drainage system, and gravel armor plating over the protective cover for erosion protection. The closure cap will be constructed in the general shape of a "hipped roof or elongated pyramid, with the cap surface sloping toward the outer edges of the cap at maximum slope of approximately 5 percent. Grading the closure cap will assist in accommodating settlement and subsidence so that the cover's integrity is maintained. At the proposed slopes of five percent, the cap could settle or subside an additional two feet over a horizontal distance of 100 feet and still maintain a slope of approximately three percent, thus, promoting drainage off the surface of the cap. Downspout pipes will be located at each of the four corners of the closure cap to convey precipitation runoff from the closure cap down the exterior slopes of the cell to drainage conveyance ditches and to retention ponds.

Typical cross-sections of the closure cap are illustrated in the Closure drawings. The closure cap will consist of the following from bottom to top (see Sheet C5-4):

<u>On the top of 5% slopes</u>

- Six inches (minimum) of sand cushion. The sand cushion layer will act as a buffer between the waste and GCL and will prevent the GCL from damage due to accidental puncture.
- A GCL, which has equivalent permeability values to the two feet of compacted clay.
- A 60-mil HDPE geomembrane liner. Since the cap will consist of a geomembrane liner, it will have a permeability that is less than or equal to the permeability of the bottom liner system in the cell.
- A lateral drainage layer consisting of drainage net with overlying geotextile filter fabric (i.e.; single sided geocomposite). The drainage layer will convey water off the underlying geomembrane liner, which infiltrates through the overlying armor plating and soil cover. The drainage net will be placed on a slope, which parallels the surface of the closure cap. The edge of the drainage net will extend into the more permeable erosion protective cover material on the 2H: 1V exterior slopes around the perimeter of the cap to allow water that enters the drainage net to drain freely onto the exterior gravel armor. The drainage net will have a transmissivity value of 5×10^{-4} m^2/sec with a confining pressure of 500 pounds per square foot, and a five percent hydraulic gradient.
- A 2-foot protective soil cover that will provide frost protection for the liner and that will be compatible with the GCL. It is well documented that GCL is less susceptible to frost damage than that of clay liner. The regional depth of

frost penetration is about 21-inches at the Grassy Mountain Facility. The protective cover and gravel armor plating thickness should, therefore, provide adequate frost protection.

- Erosion protective cover consisting of four inches of gravel armor plating material over the entire cap. Gravel will be used instead of vegetation due to the sparse nature of local vegetation. Annual rainfall is quite low and will not support vegetation thick enough to prevent erosion of the cap. Native vegetation will begin to grow by itself in the gravel layer as verified by the growth of native vegetation in the gravel armor plating that has previously been placed as erosion protection on the slopes and closure caps of the other landfill cells at the facility. Due to the aridity of the region, no deep-rooted vegetation is expected to develop which might penetrate the HDPE liner. Gravel armor plating shall meet the gradation requirement specified in Table 1 of the CQA document.
- Berms, ditches, downspout pipes, storm drainage pipes and other drainage features to control and convey runoff from the cap. Berms will be constructed around the perimeter of the cap, which will form ditches around the perimeter on top of the cap. The ditches will be graded on a slope of about 0.7 percent toward the four comers of the closure cap. The ditches will collect precipitation runoff from the surface and convey the runoff toward corrugated polyethylene pipe downspouts located at the corners of the cap. The cell down-spouts and existing manhole drainage systems located at the corners of the cap will convey runoff to drainage ditches at the base of the landfill and to drainage ditches that lead to the storm water retention pond.

<u>On the perimeter 2H:1V slopes</u>

- Compacted Clay Liner consisting of suitable clay classified as CL, CH, CL-ML, ML or MH in accordance with USCS with a maximum particle size of 1-inch and hydraulic conductivity of $1X10^{-7}$ cm/sec.
- A 60-mil HDPE geomembrane liner. The 60-mil HDPE shall be deployed on the top of 2 to 1 surface and shall be anchored in a dedicated anchor trench. Since the cap will consist of a geomembrane liner, it will have a permeability that is less than or equal to the permeability of the bottom liner system in the cell.
- A 2-foot protective soil cover that will provide frost protection for the liner and that will be compatible with the GCL. The protective soil over shall provide adequate protection of HDPE from mechanical damage.
- Erosion protective cover consisting of four inches of gravel armor plating material over the entire cap. Gravel will be used instead of vegetation due to the sparse nature of local vegetation. Annual rainfall is quite low and will not support vegetation thick enough to prevent erosion of the cap. Native vegetation will begin to grow by itself in the gravel layer as verified by the

growth of native vegetation in the gravel armor plating that has previously been placed as erosion protection on the slopes and closure caps of the other landfill cells at the facility. Due to the aridity of the region, no deep-rooted vegetation is expected to develop which might penetrate the HDPE liner. Gravel armor plating shall meet the gradation requirement specified in Table 1 of the CQA document.

4.2 Settlement Adjustments

Cell 5 has experienced settlement since it was placed in service. Settlement survey was performed on a regular basis to record the magnitude and the rate of settlement. HA&L Engineers has evaluated the settlement data for Cell 5 and adjusted the elevations of the embankment and the final closure grade in order to maintain the prescribed final cover slope and waste disposal capacity of the landfill. The settlement evaluation report titled *"Landfill Cells 4, 5 and Z Closure Construction"* prepared by HA&L Engineering is presented in Appendix C. It should be noted that the closure drawings for the final cover construction have been adjusted for settlement by HA&L Engineering. The closure drawings are presented in Appendix B.

5.0 CLOSURE ACTIVITIES

5.1 Preparation of the Waste Mound and Sand Cushion Layer

The waste surface at the top of the cell must be amenable for closure. Proper selection, compaction, slope and grading of the waste are necessary to ensure the integrity of the cap design. The final surface of waste shall be free of sharp objects and debris in order to protect the overlying GCL and HDPE liner from accidental puncture. The cell will be shaped and contoured to conform to the attached drawing C4-1 titled "*Waste Grade Plan".* The cap will be graded at a maximum slope of approximately 5 percent. The contouring of the waste will reduce the subsequent need for additional fill material, facilitate grading of the cap, and reduce the possible formation of depressions that could pond water.

Six inches of sand cushion layer shall be placed above the top of final waste surface (top deck only) and graded to meet the design grade prior to placement of GCL. The sand cushion layer will act as a buffer between the waste and GCL and will prevent the GCL from damage due to accidental puncture. The sand layer shall be free from foreign objects and deleterious material that can damage the GCL. Sand stockpiled within the footprint of Cell A has been tested and determined to be chemically compatible with

GCL and will be the primary source for the 6-inch sand cushion layer. Other offsite source or IWC-3 sand may be used as sand cushion layer provided it is chemically compatible with GCL and will not adversely affect the properties of GCL. Other sand sources must be tested and approved before use. The test must demonstrate that the Swell Index (ASTM D5890), Fluid Loss (ASTM D5891) and Hydraulic Conductivity (ASTM D5084) of GCL is not affected by the liquid generated from the proposed borrow source.

5.2 Compacted Clay Liner and Geosynthetic Clay Liner (GCL)

Compacted clay liner will be placed on the side slope in horizontal lifts as shown in Figure C4-4. Clay liner shall be compacted to at least 95 percent of the maximum dry density as determined by ASTM D698. Compacted clay shall have maximum in-place saturated hydraulic conductivity of 1×10^{-7} cm/sec. Test fills were previously performed during Cells 7 construction to establish construction specification and methodology. Construction specifications included the type of construction equipment, moisture content range, number of compactor passes, lift depth and addition of the deflocculating agent. The clay borrow source is located outside the fenced areas. The location of clay borrow source and the test fill results were previously submitted to UDSHW as a part of Cell 7 construction documentation report. EPA technical guidance document titled "Quality Assurance and Quality Control of Waste Containment Facilities" dated September 1993 states that a *test pad need not be constructed if results are already available for a particular soil and construction methodology*. Clean Harbors plans to use the same clay borrow source and construction methodology established during previous test fill construction.. However, Clean Harbors shall construct a new test fill in accordance with the CQA Plan if the material, source or the construction methodology changes. Final surface of the compacted clay liner will be graded in accordance with the attached drawing C4-2 titled *"Liner Surface Plan"*. Placement of the GCL will be initiated and will progress such that runoff from the closure cap and from the adjacent waste material will be away from the GCL. The HDPE liner will immediately be placed above the GCL to prevent moisture resulting from precipitation from coming into contact with the GCL.

5.3 HDPE Liner

A 60-mil HDPE liner will be installed above the compacted clay or GCL. The HDPE liner in conjunction with the underlying compacted clay or GCL will provide for the long-term minimization of liquid migration through the closed cell. HDPE geomembrane shall be placed into an anchor trench near the existing anchor trench as shown in Figure C4-4.

5.4 Drainage Net and Filter Fabric

Drainage net will be placed on top of the HDPE liner to function as a lateral drainage media for water that infiltrates the soil cover. A layer of geotextile filter fabric will be installed directly above the drainage net to prevent clogging of the drainage net by the overlying soil. The drainage net and the filter fabric will be installed at the same time as the protective cover. A single-sided geocomposite may be installed in lieu of drainage net and a geotextile provided the geocomposite meets the project specification. The drainage net will be placed on a 5 percent slope, which parallels the surface of the final cover. The edge of the drainage net will extend through the soil cover around the edges of the cap to allow discharge from the drainage net to drain freely. The drainage layer shall have transimissivity values of 5×10^{-4} m^2 /sec or greater.

5.5 Protective Soil Cover

A 2-foot thick soil protective cover layer will be placed over the drainage layer. It is anticipated that the protective cover meeting the Unified Soil Classification designations ML, CL, SM, SC or combinations thereof may be obtained from borrow sources near the Grassy Mountain Facility. A perimeter berm will be constructed as a part of the protective cover construction as shown in Figure C4-4. Perimeter berm will prevent stormwater run-off from flowing into the side slope and cause excessive erosion. Stormwater collected in the drainage ditch is designed to flow to the corner of the cells and exit towards the retention pond via controlled storm water outlets and downspouts. Soil samples of the proposed protective soil cover were obtained outside the fenced area and submitted to CETCO laboratory for chemical compatibility testing. The protective soil cover will be approved based on passing the chemical compatibility with GCL. UDEQ will be notified of the approved protective soil cover as soon as the test results become available.

5.6 Armor Plating

Exterior erosion protection for Cell 5 consist of a 4-inch layer of rock armor plating referred to as "gravel armor plating" in the 1998 design engineering reports. Armor plating shall be graded to the required specification and placed to the lines and grade shown in the attached Figure C4-3 titled *"Final Closure Plan"*. Gravel armor plating shall meet the gradation requirement specified in Table 1 of the CQA document. Gravel armor plating may be obtained from the gravel pit located 4 miles east of the facility at the base of the Gray Back mountains (Section 24CP62744).

6.0 CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

Clean Harbors is proposing revisions to the CQA Plan. The revisions represent "State of the Art" technology and may be regarded as industry standard and an overall

improvement of the CQA Plan. This CQA Plan reflects the requirements of the Hazardous and Solid Waste Amendments of 1984 to the Resource Conservation and Recovery Act (RCRA), and is consistent with the Technical Guidance Documents titled, "Construction Quality Assurance for Hazardous Waste land Disposal Facilities", EPA/530-SW-86-031, October 1986; and "Quality Assurance and Quality Control for Waste Containment Facilities", EPA/600/R-93/182, October 1993.

The original CQA Plan was prepared based on the material properties and standard test methods typically employed at the time of preparation of specification in 1997. Material properties and test methods for goesynthetics have improved over the past 12 years due to technological advancements. In addition, new test methods have been adopted by American Society for Testing Material (ASTM) and Geosynthetic Research Institute (GRI). As a result, some of the material properties specified in the original CQA Plan are either obsolete or no longer applicable and requires revision to accommodate the recent test standards or technological advancements. The modifications to the CQA plans are made based on the following criteria:

a) The modification will in no way affect the performance standard or the original intent of the plans and specifications approved by the UDSHW.

b) The modifications in no way reduce the effectiveness of the QA/QC effort used to ensure the quality and consistency of the materials and workmanship used to meet the performance standards in the plans and specifications approved by UDSHW.

The CQA Plan has been signed and sealed by a registered professional engineer licensed to practice in the state of Utah. The updated CQA Plan is presented in Appendix A.

7.0 CLOSURE DRAWINGS

Engineering drawings have been prepared by HA&L Engineering for the closure of Cell 5. The closure drawings (see Appendix B) have been prepared in accordance with the design and analyses previously performed in 1998. The design engineer has reviewed all measured settlement data's for Cell 5 since it was placed in operation and adjusted the control elevations of the embankment and final cover to accurately account for settlement. The drawings have been signed and sealed by a registered professional engineer licensed to practice in the state of Utah. Construction stake-out drawings will be prepared from the attached design drawings prior to construction based on the control points, lines and grades. Construction drawings will be submitted with the closure certification report.

8.0 CLOSURE NOTIFICATION

Clean Harbors will notify the UDSHW in writing at least 60 days prior to the date on which Clean Harbors expects to begin closure of the landfill cell in accordance with 40 CFR §264.112(d).

9.0 CLOSURE CERTIFICATION

Clean Harbors will submit certification of proper construction of the final cover in accordance with this closure plan within 60 days of completion of closure. The certification will be accompanied by a certification report which contains the results of all tests performed to verify proper construction. Clean Harbors will conduct whatever tests, inspections, or measurements are necessary in the judgment of the professional engineer for the engineer to certify that the landfill final cover has been constructed in conformance with the design and construction specifications of this permit. The certification report will, at a minimum, contain the following engineering plans and test results:

a) Scaled plan view of the final waste and soil cover and armor plating layer which accurately depict the area boundaries and dimensions of the cover; surrounding natural ground surface elevations; minimum, maximum, and representative elevations and final covers thickness, extent, and materials of component parts of the cover system.

b) For the compacted clay liner, all tests required and at the frequency specified for constructed soil liners in accordance with the CQA Plan.

c) For the HDPE liner all tests required as specified in the CQA Plan including manufacturer quality control (MQC) testing, conformance testing, destructive and non-destructive testing, panel placement, calibration certificates, pre-weld trial test logs and as-built record drawing.

d) As-built record drawings of top of waste, soil cover and armor plating layer.

10.0 SURVEY PLAT

After the submission of the closure certification report for Cell 5, Clean Harbors will file with Tooele County and submit to UDSHW a survey plat indicating the location and dimensions of the closed landfill cell with respect to permanently surveyed benchmarks. The plat will be prepared and certified by a professional land surveyor. The plat must be submitted to Tooele County with a note prominently displayed on the plat, which states the owner's or operator's obligation to restrict disturbance of hazardous waste disposal unit in accordance with the applicable post-closure requirement.