

**DIVISION OF WASTE MANAGEMENT
AND RADIATION CONTROL
CLASS 1 SOLID WASTE LANDFILL PERMIT**

Klondike Landfill

Pursuant to the provision of the Utah Solid and Hazardous Waste Act, Title 19, Chapter 6, Part 1, Utah Code Annotated (Utah Code Ann.) (the Act) and the Utah Solid Waste Permitting and Management Rules, R315-301 through 320 of the Utah Administrative Code adopted thereunder, a Permit is issued to:

Grand County Solid Waste Management Special Service District #1,
as owner and operator, (Permittee),

to own, construct, and operate the Klondike Landfill located in S ½ of the NW ¼ of Section 14, Township 23 S, Range 19 E, Salt Lake Base and Meridian, Grand County, Utah as shown in the permit renewal application that was determined complete on December 15, 2015. (DSHW-2015-007778).

The Permittee is subject to the requirements of R315-301 through 320 of the Utah Administrative Code and the requirements set forth herein.

All references to R315-301 through 320 of the Utah Administrative Code are to regulations that are in effect on the date that this permit becomes effective.

This Permit shall become effective _____.

This Permit shall expire at midnight _____.

Closure Cost Revision Date: _____.

Signed this _____ day of _____, 2016.

Scott T. Anderson, Director
Utah Division of Waste Management and Radiation Control

FACILITY OWNER/OPERATOR INFORMATION

LANDFILL NAME: Klondike Landfill

OWNER NAME: Solid Waste Management Special Service District
#1

OWNER ADDRESS: 1000 East Sand Flats Road
P.O. Box 980
Moab, Utah 84532

OWNER PHONE NO.: (435) 259-3867

OPERATOR NAME: same as owner

TYPE OF PERMIT: Class I Landfill

PERMIT NUMBER: 9509R2

LOCATION: Landfill site is located in Township 23 S, Range 19
E, Section 14, SLMB; Grand County, Lat. 38° 48'
47", Long. 109° 47' 34" Approximately 1.2 miles
west of Highway 191, 20 miles north of Moab

PERMIT HISTORY Permit renewal **insert date signed**

The term, "Permit," as used in this document is defined in R315-301-2(55) of the Utah Administrative Code. The term, "Director," as used throughout this permit, refers to the Director of the Division of Waste Management and Radiation Control.

Attachments to this permit are hereby incorporated into this Solid Waste Permit. All representation made in the attachments are part of this Permit and are enforceable under R315-301-5(2) of the Utah Administrative Code. Where differences in wording exist between this Permit and the attachments, the wording of this Permit supersedes that of the attachments.

Compliance with this Permit does not constitute a defense to actions brought under any other local, state, or federal laws. This Permit does not exempt the Permittee from obtaining any other local, state or federal approvals required for the facility operation.

The issuance of this Permit does not convey any property rights, other than the rights inherent in this Permit, in either real or personal property, or any exclusive privileges other than those inherent in this Permit. Nor does this Permit authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations, including zoning

ordinances.

The provisions of this Permit are severable. If any provision of this Permit is held invalid for any reason, the remaining provisions shall remain in full force and effect. If the application of any provision of this Permit to any circumstance is held invalid, its application to other circumstances shall not be affected.

By this Permit, the Permittee is subject to the following conditions.

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PERMIT REQUIREMENTS

I. GENERAL COMPLIANCE RESPONSIBILITIES

I.A. General Operation

I.A.1. The Permittee shall operate the landfill in accordance with all applicable requirements of R315-301 through 320 of the Utah Administrative Code, for a Class I landfill, that are in effect as of the date of this Permit unless otherwise noted in this Permit. Any permit noncompliance or noncompliance with any applicable portions of Utah Code Ann. § 19-6-101 through 125 and applicable portions of R315-301 through 320 of the Utah Administrative Code constitutes a violation of the Permit or applicable statute or rule and is grounds for appropriate enforcement action, permit revocation, modification, or denial of a permit renewal application.

I.B. Acceptable Waste

I.B.1. This Permit is for the disposal of non-hazardous solid waste that may include:

I.B.1.a Municipal solid waste as defined by R315-301-2(47) of the Utah Administrative Code;

I.B.1.b Commercial waste as defined by R315-302-2(14) of the Utah Administrative Code;

I.B.1.c Industrial waste as defined by R315-302-2(35) of the Utah Administrative Code;

I.B.1.d Construction/demolition waste as defined by 19-6-102(4), Utah Code Annotated;

I.B.1.e Special waste as allowed by R315-315 of the Utah Administrative Code and authorized in section III-I of this Permit and limited by this section;

I.B.1.f Conditionally exempt small quantity generator hazardous waste as specified in R315-303-4(7)(a)(i)(B) of the Utah Administrative Code; and

I.B.1.g PCB's as specified by R315-315-7(2) of the Utah Administrative Code.

I.C. Prohibited Waste

I.C.1. Disposal of the following wastes at the Klondike Landfill is prohibited:

I.C.1.a Hazardous waste as defined by R315-1 and R315-2 of the Utah Administrative Code except as allowed in permit condition I-B6 (Acceptable Waste) above;

I.C.1.b Containers larger than household size (five gallons) holding any liquid; non-containerized material containing free liquids; or any waste containing free liquids in containers larger than five gallons;

I.C.1.c PCB's as defined by R315-301-2 of the Utah Administrative Code, except as allowed in Section I-B (Acceptable Waste) of this Permit; and

I.C.1.d Regulated asbestos-containing material.

I.C.2. Any prohibited waste received and accepted for treatment, storage, or disposal at the facility shall constitute a violation of this Permit, of Utah Code Ann. § 19-6-101 through 123 and of R315-301 through 320 of the Utah Administrative Code.

I.D. Inspections and Inspection Access

I.D.1. The Permittee shall allow the Director or an authorized representative, or representatives from the Southeastern Utah District Health Department, to enter at reasonable times and:

I.D.1.a Inspect the landfill or other premises, practices or operations regulated or required under the terms and conditions of this Permit or R315-301 through 320 of the Utah Administrative Code;

I.D.1.b Have access to and copy any records required to be kept under the terms and conditions of this Permit or R315-301 through 320 of the Utah Administrative Code;

I.D.1.c Inspect any loads of waste, treatment facilities or processes, pollution management facilities or processes, or control facilities or processes required under this Permit or regulated under R315-301 through 320 of the Utah Administrative Code; and

I.D.1.d Create a record of any inspection by photographic, video, electronic, or any other reasonable means.

I.E. Noncompliance

I.E.1. If monitoring, inspection, or testing indicates that any permit condition or any applicable rule under R315-301 through 320 of the Utah Administrative Code may be or is being violated, the Permittee shall promptly make corrections to the operation or other activities to bring the facility into compliance with all permit conditions or rules.

I.E.2. In the event of noncompliance with any permit condition or violation of an applicable rule, the Permittee shall promptly take any action reasonably necessary to correct the noncompliance or violation and mitigate any risk to the human health or the environment. Actions may include eliminating the activity causing the noncompliance or violation and containment of any waste or contamination using barriers or access restrictions, placing of warning signs, or permanently closing areas of the facility.

I.E.3. The Permittee shall:

I.E.3.a Document the noncompliance or violation in the daily operating record on the day the event occurred or the day it was discovered;

I.E.3.b Notify the Director by telephone within 24 hours, or the next business day following documentation of the event; and

I.E.3.c Provide written notice of the noncompliance or violation and a description of measures taken to protect human health and the environment within seven days after notification of the Director.

I.E.4. Within 30 days after documenting the event, the Permittee shall submit to the Director a written report describing the nature and extent of the noncompliance or violation and a complete description of all of the remedial measures taken or to be taken to protect human health and the environment and to eliminate the noncompliance or violation. Upon receipt and review of the assessment report, the Director may order the Permittee to perform additional appropriate remedial measures including development of a site remediation plan for approval by the Director.

I.E.5. In an enforcement action, the Permittee/s may not claim as a defense that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with R315-301 through 320 of the Utah Administrative Code and this Permit.

I.F. Revocation

I.F.1. This Permit is subject to revocation if the Permittee fails to comply with any condition of the Permit. The Director will notify the Permittee in writing prior to any proposed revocation action and such action shall be subject to all applicable hearing procedures established under R305-7 of the Utah Administrative Code and the Utah Administrative Procedures Act.

I.G. Attachment Incorporation

I.G.1. Attachments to this Permit are incorporated by reference into this Permit and are enforceable conditions of this Permit, as are documents incorporated by reference into the attachments. Language in this Permit supersedes any conflicting language in the attachments or documents incorporated into the attachments.

II. DESIGN AND CONSTRUCTION

II.A. Design and Construction

II.A.1. The Permittee shall construct any landfill cell, sub-cell, run-on diversion system, runoff containment system, waste treatment facility, leachate handling system, or final cover in accordance with the alternative design submitted in accordance with R315-301 thru 320 of the Utah Administrative Code and Attachment 1.

II.A.2. If ground water is encountered during excavation of the landfill, the Director shall be notified immediately, and the Permittee shall develop and submit an alternative construction design for approval.

II.A.3. The Permittee shall notify the Director upon completion of construction of any landfill cell, sub-cell, engineered control system, or any feature where Director approval is required. No landfill cell or engineered control system may be used until as-built documents are submitted and construction is approved by the Director and this permit has been modified to reflect the changes.

- II.A.4. The Permittee shall notify the Director of any proposed incremental closure, placement of any part of the final cover, or placement of the full final cover. Design approval shall be received from the Director and this permit modified prior to construction. The design shall be accompanied by a Construction Quality Control and Construction Quality Assurance (CQC/CQA) Plan, for each construction season where incremental or final closure is performed.
- II.A.5. A qualified party, independent of the owner and the construction contractor shall perform the quality assurance function on cover components and other testing as required by the approved CQC/CQA Plan. The results shall be submitted as part of the as-built drawings to the Director.
- II.A.6. All engineering drawings submitted to the Director shall be stamped and approved by a professional engineer with a current registration in Utah.

II.B. Run-On Control

- II.B.1. The Permittee shall construct drainage channels and diversions as specified in the Permit Application and shall maintain them at all times to effectively prevent runoff from the surrounding area from entering the landfill.

II.C. Alternative Design

- II.C.1. The Permittee has demonstrated through geologic, hydrogeologic, climatic, waste stream information, and other factors that the landfill will not contaminate ground water and is approved for the alternative design as outlined in the Permit Application. Any contamination of ground water resulting from operation of the landfill may result in the revocation of this alternative design approval.

III. III.LANDFILL OPERATION

III.A. Operations Plan

- III.A.1. The Permittee shall keep the Operations Plan included in Attachment 2 on site at the landfill or at the location designated in section III-H of this Permit. The Permittee shall operate the landfill in accordance with the operations plan. If necessary, the Permittee may modify the Operations Plan, provided that the modification meets all of the requirements of R315-301 through 320 of the Utah Administrative Code, is as protective of human health and the environment as the Operations Plan approved as part of this Permit, and is approved by the Director as a permit modification under R315-311-2(1) of the Utah Administrative Code. The Permittee shall note any modification to the Operations Plan in the daily operating record.
- III.A.2. The Permittee shall submit any modification to the Operations Plan to the Director for approval.

III.B. Security

- III.B.1. The Permittee shall operate the Landfill so that unauthorized entry to the facility is restricted. The Permittee shall:

III.B.1.a Lock all facility gates and other access routes during the time the landfill is closed.

III.B.1.b Have at least one person employed by the Permittee at the landfill during all hours that the landfill is open.

III.B.2. Construct all fencing and any other access controls as shown in Attachment 1 to prevent access by persons or livestock by other routes.

III.C. Training

III.C.1. The Permittee shall provide training for on-site personnel in landfill operation, including waste load inspection, hazardous waste identification, and personal safety and protection.

III.D. Burning of Waste

III.D.1. Intentional burning of solid waste is prohibited and is a violation of R315-303-4(2)(b) of the Utah Administrative Code.

III.D.2. The Permittee shall extinguish all accidental fires as soon as reasonably possible.

III.E. Daily Cover

III.E.1. The Permittee shall completely cover the solid waste received at the landfill at the end of each working day with a minimum of six inches of earthen material.

III.E.2. The Permittee may use an alternative daily cover material when the material and the application of the alternative daily cover meets the requirements of R315-303-4(4)(b) through (e) of the Utah Administrative Code.

III.F. Ground Water Monitoring

III.F.1. The ground water monitoring requirement for the Klondike Landfill has been waived in accordance with R315-308-1(3) of the Utah Administrative Code. Any contamination of ground water resulting from operation of the landfill shall result in the revocation of this waiver.

III.G. Gas Monitoring

III.G.1. The Permittee shall monitor explosive gases at the landfill in accordance with the Gas Monitoring Plan contained in Attachment 2 and shall otherwise meet the requirements of R315-303-3(5) of the Utah Administrative Code. If necessary, the Permittee may modify the Gas Monitoring Plan, provided that the modification meets all of the requirements of R315-301 through 320 of the Utah Administrative Code and is as protective of human health and the environment as that approved in Attachment 2, and is approved by the Director as a minor modification under R315-311-2(1) of the Utah Administrative Code. The Permittee shall note any modification to the Gas Monitoring Plan in the daily operating record.

- III.G.2. If the concentrations of explosive gases at any of the facility structures, at the property boundary, or beyond the property boundary ever exceed the standards set in R315-303-2(2)(a) of the Utah Administrative Code, the Permittee shall:
- III.G.2.a Immediately take all necessary steps to ensure protection of human health and notify the Director;
 - III.G.2.b Within seven days of detection, place in the daily operating record the explosive gas levels detected and a description of the immediate steps taken to protect human health;
 - III.G.2.c Implement a remediation plan that meets the requirements of R315-303-3(5)(b) of the Utah Administrative Code; and
 - III.G.2.d Submit the plan to, and receive approval from, the Director prior to implementation.
- III.H. Waste Inspections
- III.H.1. The Permittee shall visually inspect incoming waste loads to verify that no wastes other than those allowed by this permit are disposed in the landfill. The Permittee shall conduct a complete waste inspection at a minimum frequency of 1% of incoming loads. The Permittee shall select the loads to be inspected on a random basis.
 - III.H.2. The Permittee shall inspect all loads suspected or known to have one or more containers capable of holding more than five gallons of liquid to ensure that each container is empty.
 - III.H.3. The Permittee shall inspect all loads that the Permittee suspects may contain a waste not allowed for disposal at the landfill.
 - III.H.4. The Permittee shall conduct complete random inspections as follows:
 - III.H.4.a The Permittee shall conduct the random waste inspection at the working face or an area designated by the Permittee.
 - III.H.4.b The Permittee shall direct that loads subjected to complete inspection be unloaded at the designated area;
 - III.H.4.c Loads shall be spread by equipment or by hand tools;
 - III.H.4.d Personnel trained in hazardous waste recognition and recognition of other unacceptable waste shall conduct a visual inspection of the waste; and
 - III.H.4.e The personnel conducting the inspection shall record the results of the inspection on a waste inspection form as found in Attachment 2. The Permittee shall place the form in the daily operating record at the end of the operating day.
 - III.H.4.f The Permittee or the waste transporter shall properly dispose of any waste found that is not acceptable at the facility at an approved disposal site for the waste type and handle the waste according to the rules covering the waste type.
- III.I. Disposal of Special Wastes

III.I.1. If a load of incinerator ash is accepted for disposal, the Permittee shall transport it to the place of disposal in such a manner as to prevent leakage or the release of fugitive dust. The Permittee shall completely cover the ash with a minimum of six inches of material, or the Permittee shall use other methods or material, if necessary, to control fugitive dust. The Permittee may use ash for daily cover when its use does not create a human health or environmental hazard.

III.I.2. The Permittee may dispose of animal carcasses in the landfill working face and shall cover them with other solid waste or earth by the end of the operating day in which the carcasses are received. Alternatively, the Permittee may dispose of animal carcasses in a special trench or pit prepared for the acceptance of dead animals. If a special trench is used, the Permittee shall cover animals placed in the trench with six inches of earth by the end of each operating day.

III.J. Self Inspections

III.J.1. The Permittee shall inspect the facility to prevent malfunctions and deterioration, operator errors, and discharges that may cause or lead to the release of wastes or contaminated materials to the environment or create a threat to human health or the environment. The Permittee shall complete these general inspections no less than quarterly and shall cover the following areas: Waste placement, compaction, cover, fences and access controls, roads, run-on/run-off controls, final and intermediate cover, litter controls, and records. The Permittee shall place a record of the inspections in the daily operating record on the day of the inspection. The Permittee shall correct the problems identified in the inspections in a timely manner and document the corrective actions in the daily operating record.

III.K. Recordkeeping

III.K.1. The Permittee shall maintain and keep on file, at the District office, a daily operating record and other general records of landfill operation as required by R315-302-2(3) of the Utah Administrative Code. The landfill operator, or other designated personnel, shall date and sign the daily operating record at the end of each operating day. Each record to be kept shall be signed and dated by the appropriate operator or personnel. The Daily operating record shall consist of the following two types of documents:

III.K.1.a Records related to the daily landfill operation or periodic events including:

III.K.1.a.(1) The number of loads of waste and the weights or estimates of weights or volume of waste received each day of operation and recorded at the end of each operating day;

III.K.1.a.(2) Major deviations from the approved plan of operation, recorded at the end of the operating day the deviation occurred;

III.K.1.a.(3) Results of monitoring required by this Permit, recorded in the daily operating record on the day of the event or the day the information is received;

III.K.1.a.(4) Records of all inspections conducted by the Permittee, results of the inspections, and corrective actions taken, recorded in the record on the day of the event.

- III.K.1.b Records of a general nature including:
 - III.K.1.b.(1) A copy of this Permit, including all Attachments;
 - III.K.1.b.(2) Results of inspections conducted by representatives of the Director, and of representatives of the local Health Department, when forwarded to the Permittee;
 - III.K.1.b.(3) Closure and Post-closure care plans; and
 - III.K.1.b.(4) Records of employee training.

III.L. Reporting

III.L.1. The Permittee shall prepare and submit to the Director an Annual Report as required by R315-302-2(4) of the Utah Administrative Code. The Annual Report shall include: the period covered by the report, the annual quantity of waste received, an annual update of the financial assurance mechanism, a re-application for approval of the financial assurance mechanism, the results of gas monitoring, and all training programs completed.

III.M. Roads

III.M.1. The Permittee shall improve and maintain all access roads within the landfill boundary that are used for transporting waste to the landfill for disposal shall be improved and maintained as necessary to assure safe and reliable all-weather access to the disposal area.

III.N. Litter Control

III.N.1. Litter resulting from operations of the landfill shall be minimized. In addition to the litter control plans found in Attachment 2, the Permittee shall implement the following procedures when high wind conditions are present:

- III.N.1.a Reduce the size of the tipping face;
- III.N.1.b Reduce the number of vehicles allowed to discharge at the tipping face at one time;
- III.N.1.c Orient vehicles to reduce wind effects on unloading and waste compaction;
- III.N.1.d Reconfigure tipping face to reduce wind effect;
- III.N.1.e Use portable and permanent wind fencing as needed; and
- III.N.1.f Should high winds present a situation that the windblown litter cannot be controlled, the Permittee shall cease operations of the landfill until the winds diminish.

IV. IV. CLOSURE REQUIREMENTS

IV.A. Closure

- IV.A.1. The Permittee shall install final cover of the landfill as shown in Attachment 3. The final cover shall meet, at a minimum, the standard design for closure as specified in the R315-303-3(4) of the Utah Administrative Code plus sufficient cover soil or equivalent material to protect the low permeability layer from the effects of frost, desiccation, and root penetration. The Permittee shall submit to the Director a quality assurance plan for construction of the final landfill cover, and approval of the plan shall be received from the Director prior to construction of any part of the final cover at the landfill. A qualified person not affiliated with the Permittee or the construction contractor shall perform permeability testing on recompacted clay placed as part of the final cover.
- IV.A.2. This Permittee has demonstrated through geologic, hydrogeologic, climatic, waste stream, cover material properties, infiltration factors, and other factors that the landfill will not contaminate ground water and is approved for the alternative cover design as outlined Attachment 3. Upon finding by the Director of any contamination of ground water resulting from the landfill, the Director may revoke this alternative cover design approval and the Director may require placement of a cover meeting the requirements of R315-303-3(4)(a) of the Utah Administrative Code or other remedial action.
- IV.B. Title Recording
- IV.B.1. The Permittee shall meet the requirements of R315-302-2(6) of the Utah Administrative Code by recording a notice with the Grand County Recorder as part of the record of title that the property has been used as a landfill. The notice shall include waste disposal locations and types of waste disposed. The Permittee shall provide the Director the notice as recorded.
- IV.C. Post-Closure Care
- IV.C.1. The Permittee shall perform post-closure care at the closed landfill in accordance with the Post-Closure Care Plan contained in Attachment 3. Post-closure care shall continue until all waste disposal sites at the landfill has stabilized and the finding of R315-302-3(7)(c) of the Utah Administrative Code is made.
- IV.D. Financial Assurance
- IV.D.1. The Permittee shall keep in effect and active the currently approved financial assurance mechanism or another approved mechanism that meets the requirements of R315-309 of the Utah Administrative Code and is approved by the Director to cover the costs of closure and post-closure care at the landfill. The Permittee shall maintain the financial assurance mechanism to provide for the cost of closure at any stage or phase or any time during the life of the landfill or the permit life, whichever is shorter.
- IV.E. Financial Assurance Annual Update
- IV.E.1. The Permittee shall submit an annual revision of closure and post-closure costs for inflation and financial assurance funding as required by R315-309-2(2) of the Utah Administrative Code, to the Director as part of the annual report. The Permittee shall submit the information as required in R315-309-8 of the Utah Administrative Code and shall meet the qualifications for the "Local Government Financial Test" each year.

IV.F. Closure Cost and Post-Closure Cost Revision

IV.F.1. The Permittee shall submit a complete revision of the closure and post-closure cost estimates by the Closure Cost Revision Date listed on the signature page of this Permit and any time the facility is expanded, any time a new cell is constructed, or any time a cell is expanded.

V. **ADMINISTRATIVE REQUIREMENTS**

V.A. Permit Modification

V.A.1. Modifications to this Permit may be made upon application by the Permittee or by the Director following the procedures specified in R315-310-11-2 of the Utah Administrative Code. The Permittee shall be given written notice of any permit modification initiated by the Director.

V.B. Permit Transfer

V.B.1. This Permit may be transferred to a new permittee or new permittees by complying with the permit transfer provisions specified in R315-310-11 of the Utah Administrative Code.

V.C. Expansion

V.C.1. Any expansion of the current footprint designated in the description contained in Attachment 1, but within the property boundaries designated in Attachment 1, shall require submittal of plans and specifications to the Director. The plans and specifications shall be approved by the Director prior to construction.

V.C.2. Any expansion of the landfill facility beyond the property boundaries designated in the description contained in Attachment 1 shall require submittal of a new permit application in accordance with the requirements of R315-310 of the Utah Administrative Code.

V.C.3. Any addition to the acceptable wastes described in Section I-B shall require submittal of all necessary information to the Director and the approval of the Director. Acceptance for PCB bulk product waste under R315-315-7(3)(b) of the Utah Administrative Code can only be done after submittal of the required information to the Director and modification of Section I-C of this Permit.

V.D. Expiration

V.D.1. If the Permittee desires to continue operating this landfill after the expiration date of this Permit, the Permittee shall submit an application for permit renewal at least six months prior to the expiration date, as shown on the signature (cover) page of this Permit. If the Permittee timely submits a permit renewal application and the permit renewal is not complete by the expiration date, this Permit shall continue in force until renewal is completed or denied.

Attachments

Attachment 1 – Ground Water Monitoring and Liner Exemption

Attachment 2 – Landfill Design and Construction Plans

Attachment 3 – Plan of Operation

Attachment 4 – Closure and Post-Closure

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Attachment 1

Klondike Landfill Ground Water Monitoring and Liner Exemption Statement of Basis

Klondike Landfill, owned and operated by Grand County Solid Waste Management Special Service District #1, has applied for a renewal of its solid waste permit to construct and operate the Klondike Landfill on 80 acres of land owned by the District located approximately 20 miles north of Moab, Utah west of Highway 191. The permit application includes a request for exemption to the requirements for a Class I landfill to be constructed with a bottom liner and to conduct ground water monitoring at the site, as well as an alternative final cover design consisting of an evaporation-transpiration cap. The information provided in support of the exemption request has been reviewed and has been determined to qualify for the exemption. This exemption is based on the following factors:

The climate in the area is very dry, with average annual precipitation of between 6.5 and 8.5 inches and evaporation of 55 to 60 inches. There is therefore an annual water deficit exceeding 45 inches per year.

Depth to ground water is greater than 500 feet below the site, and possibly as deep as 1,000 feet or more.

The site is underlain by Mancos Shale, a highly impermeable dark gray marine shale. The Mancos Shale is approximately 1,200 feet thick below the site. It is weathered near the surface, but rapidly grades with depth to a competent shale. Permeability values for the Mancos Shale are in the range of 10⁻⁷ to 10⁻¹³ cm/s. No evidence of significant vertical fracturing was observed during construction of the first cells at the landfill site.

The ground water in aquifers below the site is of very poor quality. Sampling of a well located approximately 0.25 mile east of the site indicates that the groundwater is highly mineralized, extremely alkaline (i.e. pH greater than 10), and brackish (i.e. TDS greater than 2,600 mg/l). Regional studies of the deep aquifers in the region indicate ground water TDS values range from 500 to 14,000 mg/l.

Modeling of open and closed landfill cells shows minimal amounts moisture infiltration through the bottom of the landfill, on the order of hundredths to thousandths of an inch per year. Modeling of leachate migration in the Mancos shale predicts that it would take more than 10,000 years for any leachate to reach the uppermost aquifer. The majority of precipitation is lost through evaporation.

The final cover on the landfill will minimize infiltration. An unsaturated flow model was used to compare the evaporation-transpiration cap to the standard final cover described in the solid waste rules. The alternative final cover, consisting of 30 inches of on-site material, was found to provide and equivalent reduction in infiltration as the standard final cover.