PART II - GENERAL REPORT

1 Introduction

This document constitutes an application for a) renewal of existing Solid Waste Landfill Permit 93-05R2 for the Class I municipal solid waste disposal and existing Class IVb construction/demolition waste disposal cells at the San Juan County Landfill. The San Juan County Landfill is designated as a Class I landfill based on an incoming municipal waste stream of more than 20 tons per day (based on an annual average) and the fact that the landfill is a county-owned facility. All proceeds generated by landfill operations are maintained in an enterprise fund for use in solid waste management and recycling programs throughout the county.

This application has been prepared in accordance with R315-310-4 and R315-310-5 of the Utah Administrative Code (UAC), and consists of a Plan of Operation, Geohydrological Assessment, Engineering Report, Closure Plan, Post-Closure Care Plan, and Financial Assurance documentation. The information presented in this application satisfies the requirements for both Class I and Class IVb permit applications, and is separated into three parts in accordance with the Utah Department of Environmental Quality's (UDEQ) recommended application format. Part I presents general facility information, such as site location and property ownership, and includes a certification of submitted information. Part II comprises the general report and presents a detailed description of the facility, site ownership, and zoning information, and presents the Plan of Operation for the facility. This part also presents relevant information regarding the operation of the facility's Class IV disposal cell, enabling UDEQ to permit the Class IV waste disposal cell separately from the municipal disposal cell. Part III is the technical report and presents general vicinity and site design maps, a geohydrological assessment of the site, the Engineering Report, the Closure Plan, the Post-Closure Care Plan, and Financial Assurance documentation. For ease of reference during document review, a reduced-size design drawing set has been included in Appendix A; the full-size design drawing set is included at the end of the application in Appendix M.

The facility was first permitted by the Utah Department of Environmental Quality (UDEQ) on February 15, 1994 under Class I Solid Waste Landfill Permit 93-05. The permit was subsequently modified on May 2, 1995 to change the name of the facility and broaden the service area. A copy of the original permit and subsequent modifications and related correspondence are included in Appendix B. In December 1997, San Juan County submitted the *Request for a Suspension of Composite Liner and Ground Water Monitoring Requirements at the San Juan County Landfill, San Juan County, Utah* (Vector, 1997) to UDEQ for consideration. A subsequent addendum to the original request was submitted in April 1998 in response to a Request for Additional Information from UDEQ (dated February 26, 1998). Final approval of the regulatory suspension is documented in UDEQ's letter dated June 22, 1998, and signifies approval for continued operation of the San Juan County Landfill without the installation of a ground water monitoring or composite liner system. The suspension request and subsequent correspondence are included with this application in Appendices C and D. These documents are considered integral components of this application, providing the majority of the information required of a Geohydrological Assessment (UAC R315-310-4(2)(b)).

An *Application for Renewal, Solid Waste Landfill Permit 93-05* was submitted in June 1999. UDEQ completed the technical review and requested additional information in a letter dated December 9, 1999. San Juan County issued its response to UDEQ's comments in a letter from SRK Consulting dated January 18, 2000. Permit 93-05R was subsequently issued on August 1, 2000. Copies of Permit 93-05, 93-05R and related correspondence are included in Appendix B.

The Latest *Application for Renewal, Solid Waste Landfill Permit 93-05R2* was submitted in May 2005 and became effective on September 30, 2007. A copy of Permit 93-05R2 is included in Appendix B.

In granting approval of the suspension request and the subsequent permit renewal applications, UDEQ concurred with the County's assertion that the continued operation of the landfill without a ground water monitoring or composite liner system does not pose a threat to human health and safety or the environment. UDEQ's approval of the suspension request is considered to supersede earlier permit requirements for bottom liner and leachate collection systems. Therefore, this permit renewal application is submitted without provisions for ground water monitoring, composite liner construction, or a leachate collection system.

The existing San Juan County Landfill includes Class I municipal solid waste disposal cells, a Class IVb construction/demolition waste disposal cell, and a dead animal disposal pit. A small transfer station is provided within the facility for disposal of municipal solid waste away from the active face. Additional on-site facilities include an emergency municipal disposal cell, a gatehouse and weigh scales, a maintenance shop, a storage shed, a pit toilet, perimeter fencing, storage tanks for gasoline and diesel fuel, storage tanks for waste automotive and cooking oil, and a water supply well. Existing site facilities are illustrated on Drawing 203, Appendices A and M.

1.1 Types of Waste Received

The San Juan County Landfill accepted an average of approximately 34 tons of waste per day between 2001 and 2016, based on annual averages, and is therefore considered a Class I facility as defined by the Utah Solid Waste Permitting and Management Rules (UAC R513-301-2). The construction/demolition waste disposal cell has received only inert waste since the first receipt of waste in January 1996 and is therefore classified as an existing Class IVb disposal facility according to UAC R315-305-3(2,3). The San Juan County Landfill accepts the following types of waste for disposal or recycling:

- Household waste (excluding bulk liquids)
- Non-hazardous industrial waste
- Commercial waste
- White goods and scrap metal
- Tires
- Yard wastes
- Household hazardous wastes
- Red-bagged medical waste
- Non-friable asbestos waste
- Waste automotive and cooking oil
- Construction/demolition waste
- Petroleum contaminated soils

The following types of waste are prohibited from disposal at the San Juan County Landfill:

- Liquid waste
- Hazardous and polychlorinated bi-phenyl (PCB) wastes
- Friable asbestos wastes

The procedures for receipt, disposal, and/or handling of the various types of waste either accepted or prohibited are described in Section 2.3 of this report.

1.2 County Solid Waste Management Plan

The San Juan County Landfill is the only Class I municipal solid waste disposal facility operating in San Juan County. The facility serves all of San Juan County, portions of Grand County to the north and the Navajo Nation to the south, as well as parts of southwestern Colorado. The operation of the San Juan County Landfill is an integral component of the implementation of the San Juan County Solid Waste Management Plan, which in 1993 recommended the construction and use of a regional facility to serve San Juan County (Beehive Engineering, 1993).

1.3 Property Description and Ownership

The San Juan County Landfill is located approximately 11 miles south of the City of Blanding in San Juan County, Utah, just southwest of the intersection of U.S. Route 191 and State Route 262. The latitude and longitude of the facility's entrance gate are approximately 37º25'30" and -109º28'30", respectively. As described by the Public Land Survey system and illustrated on Drawing 201 (Appendices A and M), the landfill occupies the following portions of Township 39 South, Range 22 East, Salt Lake Baseline and Meridian:

- SW¼ SW¼ and S½ SE¼ SW¼, section 3;
- S½ SE¼, section 4;
- NE¼, section 9; and
- W½ NE¼, W½ NE¼ NW¼, NW¼ SW¼ NW¼, section 10.

The landfill property was acquired from the United States Bureau of Land Management (BLM) through the Recreation and Public Purposes Act on July 3, 1995. San Juan County also holds a right-of-way grant for the landfill access road. Copies of the land patent document and the right-of-way grant are included with this document in Appendix E.

The land use designation of the landfill property was modified by action of the San Juan County Commission on September 12, 1994 from A-10 to CDI, or Controlled District Industrial, to accommodate the use of the County's property for solid waste disposal. A copy of the meeting minutes is included in Appendix F.

All land in the vicinity of the landfill property is zoned MU-40 for multiple uses including recreation, agriculture, and grazing. Maps obtained from the San Juan County Recorder's Office (included in Appendix F) illustrate the property ownership of the surrounding land. Site location and vicinity maps are included in Appendices A and M.

2 Plan of Operation

This Plan of Operation has been prepared by San Juan County to reflect the operation of the San Juan County Landfill in compliance with the Utah Solid Waste Permitting and Management Rules, R315-301 through 320 of the UAC. This Plan of Operation is an integral part of this application for a permit renewal to operate a Class I facility as set forth in UAC R315-310-4, and is submitted to UDEQ as the solid waste management authority for San Juan County.

The San Juan County Landfill is owned and operated by San Juan County. County offices are located at 117 South Main Street in Monticello, Utah. The original Plan of Operation shall be retained at the San Juan County Landfill offices; a copy of the Plan will be maintained at the landfill gatehouse. All components of the landfill's operating record will be provided to UDEQ upon request for review. Responsibility for compliance with the Plan shall be that of the Landfill Manager. The plan will be available for review by employees involved in the daily operations of the facility, as well as to other parties and regulatory agencies, as requested. Landfill "attendant," as used in this document, refers to the Landfill Manager or his/her authorized representative.

If permitted operational procedures require modification, San Juan County will review applicable solid waste regulations to ensure that new or modified procedures satisfy regulatory criteria. San Juan County will provide UDEQ with a description of major revisions to approved waste management practices for review and approval prior to implementation at the landfill. Major revisions may include an expansion of disposal services or redefinition of the facility's service area or population. Approved modifications will be incorporated into the Plan of Operation and operating record for the facility.

2.1 Hours of Operation

The San Juan County Landfill is open Monday through Friday from 7:00 am to 5:00 pm. A landfill attendant is on site at all times during operating hours. The landfill is closed on all major holidays.

2.2 Schedule of Construction

The existing site layout and facilities are depicted on Drawings 203 and 204, while the site development plan is presented on Drawing 206. Design drawings are included with this document in Appendices A and M. The current plan for site development calls for continuous expansion of the existing municipal disposal cell in a counterclockwise direction around the knob abutting the northeast property boundary (Drawing 206). The cut and fill method will be used to expand the excavation in this direction while providing a continuous supply of daily cover material. Municipal waste disposal will continue in lifts approximately 15 feet thick within the active area. Cell excavation and expansion is an ongoing process with no specific start or stop date.

Municipal waste disposal has occurred since the last permit renewal (September 2007) within Cells 1-4 (Drawing 206). The Municipal Cell has expanded northward, as planned to fill in the area between it and the C&D Disposal Cell. This previously-approved expansion of the Municipal Cell maximizes available disposal capacity between the Municipal and C&D Disposal Cells. The Municipal Cell is also expanding southward within the planned areas using the cut and fill method. The Municipal Cell has reached design height within Cells 1 and 2, so that waste and foundation cover are placed and ready for the additional cover layers and grading required for closure. Cells 3 and 4 will continue to serve the incoming waste stream during this process, with excavation in Cells 5 and 6 providing the daily cover material.

Disposal operations are currently occurring in the C&D Cell, which has expanded westward in the planned footprint, as well as southward against the existing Municipal Cell. Based on this expansion southward, the Final Grading Plan shape (Drawing 205) was adjusted to accommodate placed material and provide for additional C&D waste capacity without changing the previously permitted waste footprint. This adjusted shape allows for better final design drainage and simplified closure construction, as well as needed C&D capacity until the future C&D Disposal Area to the northwest (called out on Drawings 203 and 205) can be permitted and prepared.

Loading rate calculations, discussed in detail in Section 4.3, indicate that the proposed final design of the site will provide disposal capacity for approximately 41 years. Minor modifications to the sequence of site development illustrated on Drawing 206 may be made to increase operational efficiency. Major modifications to the proposed disposal method will be submitted for review and approval by UDEQ prior to implementation.

2.3 Waste Handling Procedures

All incoming vehicles are stopped by the landfill attendant at the gate. Commercial vehicles are weighed before and after discharging waste loads. Private haul vehicle loads are either weighed (in and out) and sent to the active disposal face or are not weighed and sent directly to the transfer station bin, the weights for which are collected at a later date. The date, time, vehicle owner, actual

or estimated weight of waste, type of waste, and origin of the waste are recorded on the "Daily Entry Report" form for every incoming load; a copy of the form is included in Appendix G. A receipt is generated/issued for every incoming load.

Each private load is inspected at the Scale House for the presence of prohibited wastes. An "Inspection Log" form (Appendix G) is completed for all refused loads, and for accepted loads on a random basis. Inspection records are maintained in the landfill office. Inspection procedures are further discussed in Sections 2.3.12 and 2.3.13.

Landfill signs are positioned to direct incoming traffic to the appropriate disposal area. Private haulers are directed to discharge their loads in a public discharge area near the base or top of the active face, depending on the configuration of the access road to the disposal area. Commercial haulers dump directly at the active disposal face.

The following equipment is dedicated to the landfill for waste and soil handling site operations:

- 1995 Caterpillar 816B landfill compactor
- Caterpillar 623F paddle-wheel scraper
- Caterpillar 140H grader
- Caterpillar D-6N track dozer
- Case 580 Super L backhoe
- 2001 Volvo cable lift tilt deck truck
- 2010 Kenworth tilt deck truck
- 3,000-gallon skid-mounted water tank
- 1970 white semi pumper truck with 4,000-gallon water tank
- Two diesel-powered generators

Additional heavy equipment is available from San Juan County on an as-needed basis. Minor vehicle maintenance is performed on-site by landfill personnel. Major repairs are performed either at the County Road Department facilities or by a contractor.

2.3.1 Household and Commercial Wastes

Household waste is defined as any solid waste (excluding bulk liquids), including trash, garbage, and septic waste which passes the paint filter test (EPA Method 9095) derived from single or multiple-family dwellings, bunkhouses, ranger stations, campgrounds, picnic grounds, and public recreation areas. Commercial wastes include solid waste generated by stores, offices, restaurants, hotels, motels, trailer courts, warehouses, and other non-manufacturing activities, but exclude residential and industrial wastes.

Residential collection is mandatory in the incorporated cities of San Juan County. Private contractors provide residential collection services in most of these areas, while the City of Monticello provides its own waste collection services to its residents. The County maintains several transfer stations in outlying rural areas and provides for regular waste pickup and disposal at the landfill. Most of the waste generated in the County is municipal solid waste. Incoming waste from commercial and private haulers is discharged at or near the active disposal face. Landfill personnel move discharged loads from the unloading area to the active face. The waste is spread in layers not exceeding two feet in thickness, and compacted using multiple passes of a Caterpillar 816B steel-wheeled landfill compactor.

Incoming waste from small volume residential haulers is directed to the transfer station near the entrance facilities. The transfer station is located in a separate fenced area adjacent to the facility gates to accommodate daily, small volume disposal of municipal waste away from the active face.

The residential transfer station consists of an access ramp, a concrete retaining wall, and a 40-cubic-yard disposal bin. Once the transfer station bin is full, the bin is weighed and the contents are dumped at the active disposal face. The location of the transfer facility is shown on Drawing 203.

2.3.2 Industrial Wastes

The San Juan County Landfill does not currently accept industrial waste. However, the facility will accept non-hazardous solid waste generated by industrial sources, provided sufficient documentation is submitted to verify the non-hazardous nature of the material.

2.3.3 Dead Animals

The San Juan County accepts dead animals for disposal in a separate monofill within the landfill facility. All received dead animals are covered at the end of the working day with a minimum of six inches of soil.

2.3.4 White Goods and Scrap Metal

White goods and scrap metal are stockpiled in a designated area. A metal recycling service is contracted annually to remove at least half of the stockpile approximately once per year.

2.3.5 Tires

Tires are currently stockpiled in a designated area until a sufficient amount is accumulated. The number of tires received are logged on the Used Tire Report form included in Appendix G. The total number of tires received, tires shipped, number of tire piles, and the number of tires in each pile are also maintained. The State of Utah is periodically contacted and arrangements are made for tire pickup through the state-funded tire recycling program. Tire storage and stockpiling procedures will be conducted at all times in accordance with UAC R315-314-3. Tire piles will be maintained at least 40 feet from the property boundary and 50 feet from site buildings. Although it is anticipated that only a small amount of waste tires will be stockpiled at any given time, tire piles will be maintained at less than 10 feet high and will comprise less than 50,000 cubic feet. Fire lanes will be provided between tire piles and will be no less than 40 feet wide. If necessary, San Juan County will institute a vector control program to prevent breeding of mosquitoes and other insects within waste tires. San Juan County will obtain approval from the local fire department, if required, and will stockpile cover soil near the tire pile to provide for on-site fire abatement. Because the tire storage area will be an integral component of the landfill operation, financial assurance already provided for the landfill will be sufficient to provide for final tire pile closure.

2.3.6 Yard Wastes

Yard waste is vegetative matter generated from landscaping, lawn maintenance, and land clearing operations and may include tree and brush trimmings, grass clippings, and other discarded material from yards, gardens, and parks. Yard waste does not include garbage, paper, plastic, sludge, septage, or manure. Loads containing only stumps, branches, tree clippings, and/or grass clippings are directed to a designated yard waste stockpile (Drawing 203). The stockpile is periodically burned after the appropriate permits or approvals are obtained from the County Fire Marshal.

2.3.7 Household Hazardous Wastes

San Juan County does not have an established program for household hazardous waste collection or management. The majority of household hazardous wastes are managed as part of the municipal waste stream. Automobile batteries are pulled from the waste stream and stockpiled on pallets in a secure area until transported to local retailers for recycling.

2.3.8 Medical Waste

The San Juan County Landfill accepts properly packaged and containerized medical and infectious wastes. Properly transported and packaged medical waste accepted for disposal is placed at the base of the active disposal face and covered with a minimum of 12 inches of earth or waste material which does not contain infectious waste at the end of each work day. Medical waste containers are not compacted until they are covered as described above.

2.3.9 Asbestos Wastes

The landfill currently accepts only non-friable asbestos waste for disposal. Although not currently planned, friable asbestos wastes may be accepted if the conditions of UAC R315-315-2 are satisfied as follows:

- The asbestos waste is adequately wetted and properly containerized by double bagging and sealing in 6 mil or thicker plastic bags to prevent fiber release
- The asbestos waste containers are appropriately labeled with the name of the waste generator, the location where the waste was generated, and tagged with a warning label that conforms to the requirements of 40 CFR Part 61.149(2)

If properly transported and packaged asbestos waste which meets these criteria is received at the landfill, the operator will:

- Verify the quantities of waste received, sign off on the waste shipment record, and send a copy of the waste shipment record to the generator within 30 days;
- Require vehicles that have transported asbestos waste to be marked with warning signs as specified in 40 CFR Part 61.149(d)(1)(iii);
- Inspect the load to verify that the asbestos waste is properly contained in leak-proof containers and properly labeled;
- Place asbestos containers at the bottom of the active face with sufficient care to avoid breaking the containers;
- Cover the waste at the end of the working day, but not more than 18 hours after disposal, with a minimum of six inches of material that does not contain asbestos;
- Provide barriers to limit public access to the asbestos disposal area until the waste has been covered with six inches of material which does not contain asbestos; and
- Place warning signs at the entrance and around the perimeter of the asbestos disposal area which comply with 40 CFR 61.154(b).

The landfill attendant will inspect the incoming loads to verify that the asbestos waste is properly containerized in leak-proof containers and appropriately labeled. If the attendant believes the condition of an incoming asbestos load is such that significant amounts of fiber may be released during disposal, the attendant will notify the local and regional health departments and the Director. If the wastes are not properly containerized, and the landfill operator inadvertently accepts the load, the operator shall thoroughly soak the asbestos material with a water spray prior to unloading, rinse out the haul truck, dispose of the waste near the base of the active face, and immediately cover the waste prior to compaction with six inches of non-asbestos material in a manner sufficient to prevent fiber release.

2.3.10 Waste Automotive and Cooking Oil

The San Juan County Landfill accepts waste automotive and cooking oil in waste oil storage tanks located near the landfill gatehouse. Waste automotive oil is collected in a tank located near the gatehouse and is periodically removed through the State of Utah's waste oil recycling program. The tank is situated within a large concrete enclosure with four-foot-high walls on all sides, and is thus

provided with adequate secondary containment. Cooking oil and grease trap wastes are collected in a container located behind the gatehouse. Cooking oil and grease trap wastes are periodically removed by a commercial ranch for use in the production of livestock feed.

2.3.11 Construction/Demolition (C&D) Wastes

UAC 315-301-2(16) defines construction/demolition (C&D) waste as waste from building materials, packaging, and rubble resulting from construction, remodeling, repair, and demolition operations on pavements, houses, commercial buildings, and other structures. Typical C&D waste includes bricks, concrete or other masonry materials, soil, rock, untreated lumber, rebar, and tree stumps. C&D waste does not include asbestos, petroleum contaminated soils or tanks resulting from remediation or clean up at any release or spill, waste paints, solvents, sealers, adhesives, or similar hazardous or potentially hazardous materials. C&D waste is deposited in a monofill located north of the municipal disposal cell, as illustrated on Drawings 203 and 204. C&D waste is covered with soil as often as is necessary, typically every 30 days, to reduce the potential for fires and vector harborage. Timbers, wood, and other combustible waste are covered with a minimum of six inches of soil as needed to avoid fire hazard. The majority of the required components of a Class IVb facility permit application overlap with the requirements for permitting the Class I disposal cell at the San Juan County Landfill, and are thus provided throughout this document. Closure and post-closure costs presented in Appendix I include estimates to close and monitor the Class IVb disposal cell, in addition to the Class I municipal landfill.

2.3.12 Petroleum-Contaminated Soils (PCS)

In accordance with UAC R315-315-8, non-hazardous petroleum contaminated soils will be accepted in the Class I Municipal Cell only.

2.3.13 Liquid Waste Exclusion Program

The San Juan County Landfill currently employs a liquid waste management program to prevent the uncontrolled disposal of bulk liquid wastes in either the Municipal or C&D waste disposal cells. In accordance with UAC R315-303-3(1)(b) and R315-315-5(1), containerized liquids larger than household size, non-containerized liquid, and sewage sludge, septic tank pumpings, or raw sewage which contain free liquids are not accepted at the facility. Only those materials which do not possess free liquids are allowed for disposal. The presence of free liquids is determined through the application of EPA Method 9095, Paint Filter Test. The Paint Filter Test is performed by placing a 100-millimeter sample of waste in a conical, 400-micron paint filter. The waste is considered a liquid and unacceptable for disposal if it passes through the filter within five minutes. To qualify for acceptance, liquid-filled containers must be part of the household waste stream, small, and similar in size to a container which would normally be found in household waste (five gallons or less). Acceptable liquid containers must be designed to hold liquids for uses other than storage.

The liquid waste exclusion program relies heavily on the inspection of each load at the Scale House or at the active disposal face. Privately hauled loads are visually inspected at the landfill Scale House for obvious signs of liquid waste in the load. Commercial and contract waste haulers are responsible for the initial inspection during waste collection. When the waste load reaches the landfill, the landfill attendant is responsible for final inspection and determination of a particular load's suitability for disposal. Final inspection is performed when the waste is spread out at the active disposal area. The landfill manager has been trained in waste screening and identification of prohibited wastes, including the recognition of liquid-filled containers which may require segregation from the waste stream. Training documentation is included in Appendix H. The landfill manager is responsible for training other landfill employees.

In the event that a suspect container is observed at the landfill, the landfill attendant will determine whether or not the container is empty. Empty and properly vented containers that do not contain liquids or hazardous materials are accepted for disposal. In order to dispose of suspect containers or materials, the generator must be able to provide documentation of a non-hazardous designation upon request. Attendants are instructed not to open closed containers without first checking with the landfill manager.

Containers that do not meet acceptable criteria will be removed from the waste stream and returned to the generator. If the generator is unknown and the container is not empty, it will be stored in a designated fenced area until trained personnel can perform a hazardous waste determination. If the contents are determined to be non-hazardous, they will be mixed with soil and the soil and container will be disposed of on-site. If the contents are determined to be a hazardous waste, the landfill manager will make arrangements with a licensed transport and disposal facility to remove the container from the landfill premises. Notations will be made in the operating record that include a complete description of the actions taken and the final decision to accept or reject a suspect load. The record will also contain a complete description of the generator, if available, including name and vehicle description. If the suspect material is determined to be a hazardous material, the Utah Division of Solid and Hazardous Waste will be contacted.

2.3.14 Hazardous/PCB Waste Exclusion Program

According to UAC R315-303-4(7), an owner or operator shall not knowingly dispose, treat, store, or handle hazardous waste or waste containing PCBs. As part of a facility's Plan of Operation, all municipal solid waste landfill owners and operators must implement a program for detecting and preventing the disposal of regulated hazardous waste. The hazardous waste exclusion program must also be designed to prevent the disposal of PCB wastes as defined in UAC R315-315-7. This Plan of Operation defines procedures that are employed at the San Juan County Landfill to prevent the receipt and disposal of hazardous waste or waste containing PCBs. The following sections describe load inspection, record keeping, training, and handling procedures employed at the San Juan County Landfill.

Inspection of Incoming Loads

As previously mentioned, all incoming loads are visually inspected at or near the active disposal area. Private haul vehicles are also inspected at the gate for the presence of prohibited materials. The landfill manager is properly trained and certified to identify regulated hazardous or PCB wastes. Training documentation is contained in Appendix H. Landfill employees are trained by the landfill manager in proper screening and identification of hazardous and PCB wastes. Loads which are suspected of containing a high liquid content in accordance with the procedures described in Section 2.3.13 will be tested on-site by EPA Method 9095, Paint Filter Test. Any loads failing the test will be rejected. The details of EPA Method 9095A are included in employee training sessions; a description of the test method is included in Appendix H.

Procedures which will be employed to determine whether a material suspected of being hazardous can be accepted for disposal are described below.

- Private haulers are required to wait at the gate until the contents of their loads are verified by visual inspection.
- Commercial loads are weighed and hauler information is recorded at the landfill gatehouse. Each commercial load is inspected after discharging at the active face. Because detailed records are kept, suspect or prohibited wastes which are discharged from haul vehicles can usually be traced back to the hauler.
- Large loads are carefully spread for observation using the landfill compactor.

- Containers with contents that are not easily identifiable, such as unmarked 55-gallon drums, will be separated if a visual inspection determines that such movement will not cause the container to rupture, and will be opened and inspected only by properly trained personnel.
- If suspect waste in private haul vehicles, commercial haul vehicles, or County haul vehicles is determined to be acceptable, it may be transferred to the working face for disposal. If suspect waste from private haul vehicles is determined to be unacceptable for disposal, the hauler will be refused at the landfill entrance. If prohibited waste is discharged by a commercial hauler, it will be handled as a hazardous material and returned to the hauler for proper management. If unacceptable waste is received in a County haul vehicle, the County will provide for proper management and disposal.

Wastes that are suspected of being hazardous will be handled and stored as a hazardous waste until proven otherwise. Tests for hazardous characteristics may be performed and typically include the Toxicity Characteristic Leaching Procedure (TCLP) and tests for corrosiveness, flammability, and reactivity. If wastes temporarily stored at the site are determined to be hazardous and the origin of the waste is unknown, the operator will immediately contact San Juan County Fire and Emergency Services (435-587-3225, 435-459-1807) who will then be responsible for proper management of the wastes. If hazardous wastes are to be transported from the facility, they must be:

- Stored at the landfill in accordance with the requirements of a hazardous waste generator;
- Properly manifested;
- Removed by a licensed transporter; and
- Disposed of at a permitted treatment, storage, or disposal (TSD) facility.

UDEQ will be notified of the waste characterization of any rejected loads. In addition, UDEQ will be contacted to provide guidance on the proper procedures for notifying the waste generator and instructions for proper disposal.

Records of Inspection

Random, detailed inspections are performed approximately every 15 to 20 loads per commercial hauler. Records of each random inspection are maintained in the facility's operating record at the landfill gatehouse, and are available to UDEQ upon request. A copy of the random inspection form is included in Appendix G. Inspection records include the following data:

- Date and time waste loads were received and inspected;
- Weather conditions during inspection;
- Name(s) of inspector(s);
- Contents of the inspected load;
- Load origin;
- Vehicle owner;
- Vehicle driver;
- Observations made by the inspector;
- Description of rejected loads; and
- Rationale for rejection.

Training of Facility Personnel

The landfill manager is trained in the identification of containers and labels typically used for hazardous and PCB wastes, and is responsible for training landfill attendants. Training for hazardous material screening procedures addresses hazardous waste handling, safety precautions, and record keeping requirements. Documentation of the landfill manager's training is included with the operating

record for the facility. Copies of training certificates are included in Appendix H. The training of facility personnel is an on-going process of on-the-job, in-house and external training.

Handling Procedures for Hazardous or PCB Wastes

In the event that landfill inspection procedures indicate the presence of regulated quantities of hazardous or PCB wastes on incoming haul vehicles, the landfill manager or his/her designee will refuse to accept the load and UDEQ will be notified. If regulated quantities of hazardous or PCB wastes are identified at the working disposal face, San Juan County Fire and Emergency Services (435-587-3225, 435-459-1807) will be called. Fire and Emergency Services will act as the first responder for hazardous materials, and will implement their Hazardous Materials Response Plan. Fire and Emergency Services will manage any subsequent activities related to the waste load, including transportation, storage, and containment. Landfill personnel will participate only as directed by the first responders. Following notification, it will be the responsibility of San Juan County Fire and Emergency Services to ensure that the hazardous materials are handled, stored, or transported in accordance with applicable federal and state regulations.

In accordance with 40 CFR 262.34, wastes that are determined to be hazardous may be stored at the San Juan County Landfill for up to 180 days. To satisfy this section of the federal regulations, Fire and Emergency Services personnel will perform the following tasks:

- Waste will be placed in tanks or 55-gallon containers;
- The containers will be clearly labeled with the date of packaging;
- The containers will be clearly marked with the words "Hazardous Waste"; and
- The name and telephone number of the emergency response coordinator will be clearly marked on the container.

If waste is transported off-site by a hazardous waste disposal company, a provisional or one-time U.S. Environmental Protection Agency (EPA) identification number will be obtained, the waste will be packaged according to applicable Department of Transportation regulations, and the container will be properly transported and manifested to its point of destination. Proper chain of custody and manifest documents will be obtained from the hazardous materials disposal facility in order to maintain compliance with all applicable Federal and State regulations.

PCB wastes will be properly stored and disposed of in accordance with 40 CFR Part 761. At a minimum, the following actions will be taken:

- An EPA PCB identification number will be obtained;
- An EPA PCB identification number will be obtained;
- The container will be properly marked with the words "Caution: Contains PCBs"; and
- The container will be manifested for shipment to a permitted disposal facility.

Notification

Personnel at the San Juan County Landfill will notify UDEQ within 24 hours if suspected hazardous or PCB wastes are discovered during landfill operations. A record will be submitted to UDEQ which identifies the date and time of discovery, type of material (if possible without analytical testing), probable hauler, waste quantity, and actions proposed for the removal of the material from the area of discovery. The record of notification will be entered into the facility's operating record.

2.4 Monitoring and Self Inspections

The landfill manager performs a daily inspection of the active operations area of the landfill, and a more thorough quarterly inspection of the entire landfill property. Daily inspections are informal and are performed to look for defects in the run-on/run-off control systems, scattered litter, breaches in the integrity of closed and/or covered fill areas, and any conditions which may pose a threat to public

health and safety and the environment. The landfill manager immediately provides for mitigating steps to correct any unsatisfactory conditions.

The landfill manager or his/her designee performs detailed quarterly inspections. Any conditions that do not meet with the approval of the inspector are noted in writing. It is then the responsibility of the landfill manager to oversee the correction of unsatisfactory conditions. Records of quarterly inspections will be maintained with the Plan of Operation and will include, at a minimum, the date and time of inspection, the printed name and handwritten signature of the inspector, a notation of observations made, and the date and nature of any repairs or corrective action. A copy of the quarterly inspection form is included in Appendix G. Inspection logs are maintained with the operating record for a minimum of three years from the date of inspection.

Landfill gas monitoring is performed by the UDEQ District Engineer for the Southeast Utah District on a quarterly basis using a hand-held Gas Alert Max XT II atmospheric monitoring instrument. Landfill gas monitoring is currently performed at the locations indicated on Drawing 205 (Appendices A and M) which currently exist. As landfill development progresses and additional monitoring points are created where shown on the design drawings, these points will be added to the quarterly monitoring routine. Specific gas monitoring procedures are described in Section 2.5.3. Landfill gas monitoring results are reported in each annual report to UDEQ.

2.5 Contingency Plans

Contingency plans have been developed to describe organized, coordinated, and technically and financially feasible courses of action to be followed in the event of fires or explosions, a release of hazardous materials, a release of landfill gas, failure of the run-off control system, equipment breakdown, or any incident which results in the necessity to implement alternative waste handling procedures. The plans have been developed in accordance with UAC R315-302-2(d,f,j).

San Juan County developed a general emergency operations plan (including a hazardous materials response plan) to be implemented under the direction of San Juan County Fire and Emergency Services (435-587-3225 or 435-459-1807). It is anticipated that this plan will be invoked in the event that an incident at the landfill requires the assistance of an emergency response team.

2.5.1 Contingency for Fire or Explosion

San Juan County Landfill personnel are prepared to provide immediate fire suppression activities in the event of a structure fire or a fire at the active disposal face. Landfill heavy equipment and County trucks are equipped with fire extinguishers. In addition, there are fire extinguishers in the gatehouse and the maintenance shop. The landfill manager maintains a two-way radio in his County truck, enabling communication with the County dispatch center, and there is a landline telephone in the landfill gatehouse. In the event of a structure fire that is too large to handle with fire extinguishers, the landfill manager or attendant will contact San Juan County Fire and Emergency Services (435-587-3225 or 435-459-1807).

If a fire breaks out at the active face or within the waste mass, a bulldozer will be used to push nearby stockpiled soil over the smoldering or burning area. Water will be applied to waste fires as a last resort only. If the waste fire is too large to be contained with on-site resources, the landfill manager or attendant will contact San Juan County Fire and Emergency Services (435-587-3225 or 435-459-1807). Access to the critical area will be restricted until danger to public health has been eliminated. San Juan County Fire and Emergency Services will probably notify the Bluff Volunteer Fire Department, located in Bluff, Utah, approximately 15 miles south of the landfill. Estimated response time is 15 to 20 minutes. The responding fire department will assume responsibility for continued fire abatement upon arrival.

2.5.2 Release of Hazardous or Toxic Materials

San Juan County Fire and Emergency Services (435-587-3225 or 435-459-1807) will be contacted immediately in the event of a hazardous or toxic materials release at the landfill. Upon arrival at the site, Fire and Emergency Services will assume responsibility for material handling, containment, and transport off-site of the discharged material. Landfill personnel will not handle hazardous materials incidents. The landfill manager will serve as the landfill staff liaison with the emergency response team, and will ensure the safe evacuation of all employees and landfill customers. It is the responsibility of the landfill manager to define emergency escape routes, and to regularly inform landfill personnel of the established primary and secondary escape routes.

2.5.3 Landfill Gas

Landfill gas monitoring is performed by the UDEQ District Engineer for the Southeast Utah District on a quarterly basis using a hand-held Gas Alert Max XT II atmospheric monitoring instrument. If landfill gas is discovered in facility structures at concentrations in excess of 25 percent of the lower explosive limit (LEL) for explosive gases, or at the landfill boundary at concentrations in excess of the LEL, all operations will be halted, the Director will be notified within 24 hours, and necessary steps will be taken to protect public health and safety. Within seven days of the detection of gas levels in excess of the described thresholds, the detected methane level and a description of the steps taken to protect human health will be noted in the operating record. Within 60 days of detection, San Juan County will develop a remediation plan and obtain approval from the Director. Following approval, San Juan County will implement the remediation plan, enter it in the facility's operating record, and notify the Director that the plan has been implemented.

2.5.4 Failure of Run-off Control System

The San Juan County Landfill is operated as an area fill, whereby waste is placed within an excavated disposal cell. In areas where disposal is occurring below ground surface, precipitation and run-off flows which may contact waste at the active disposal face are contained within the disposal cell, and are not allowed to enter the facilities drainage control system and exit the site. When disposal occurs above existing ground surface, berms are constructed around the active disposal area to prevent potential contact waters from exiting the disposal cell. Site run-off from areas other than the active disposal cell is currently directed through a series of ditches and channels to informal settling and evaporation basins west and down-slope of the disposal areas. Additional ditches and channels will be constructed around the facility's perimeter as part of the operational procedures to accommodate future expansion of the Class I disposal cell. All drainage controls will be inspected after significant precipitation events for areas of excessive erosion or failure. Problem areas will be repaired in a timely manner. Based on the method of disposal within an excavated cell, either above or below existing ground surface, potential contact waters will be contained within the active cell and will not be discharged from the site. Contained contact waters will be mixed with cover soil to prevent infiltration.

2.5.5 Equipment Breakdown

The San Juan County Landfill utilizes a Caterpillar 816B waste compactor and a Caterpillar D7G track dozer for most landfill duties. In the event that one of these breaks down, the other can be used for waste spreading and compaction. In the event of a total loss of landfill equipment, additional equipment is available from the County Road Department on an as-needed basis. Minor equipment repairs are performed by landfill staff on-site in the maintenance shop. Major repairs are performed at the County Road Department facility or by outside contractors.

2.5.6 Alternative Waste Handling

In the event that the San Juan County Landfill is no longer able to accept waste from the service population, waste will be transferred or direct-hauled to either the Grand County Landfill in Moab, Utah or the Montezuma County Landfill in Cortez, Colorado. If absolutely necessary, waste may be stockpiled for a very short time on county property near the landfill, or waste collection services may be temporarily suspended, provided the duration of the emergency situation is relatively short, on a scale of days rather than weeks. In the event of a temporary emergency that only affects disposal within the municipal disposal cell, incoming waste will be diverted to the emergency disposal area just inside the existing disposal cell (Drawing 203).

2.6 Corrective Action Plan

Based on the information contained in the *Request for a Suspension of Composite Liner and Ground Water Monitoring Requirements at the San Juan County Landfill, San Juan County, Utah* (Vector, 1997) and a subsequent addendum (Vector, 1998), it is unlikely that ground water will be impacted by the operation of the San Juan County Landfill. Therefore, a corrective action plan has not been developed to account for the possibility of contaminating ground water beneath the landfill. In the event that ground water contamination is detected in the vicinity of the site or within a reasonable distance down-gradient from the site, and provided the landfill is identified as a feasible source for the contamination, San Juan County will develop and implement a corrective action program to protect public health and safety and the environment.

2.7 Fugitive Dust Abatement

The landfill access road surface is constructed of compacted re-ground asphalt from Highway 191 to the landfill entrance. Internal landfill access roads are constructed of compacted sand and gravel. Fugitive dust generation from the access road and internal site roads is minimal. Internal access roads are watered as necessary to prevent excessive generation of fugitive dust. Water is readily obtained from the County's water supply well located near the site entrance. Water trucks are available on site to aid in dust control as required.

2.8 Maintenance of Installed Equipment

Based on the suspension of composite liner and ground water monitoring requirements granted by UDEQ, the design of the San Juan County Landfill does not include provisions for leachate collection or treatment, or a ground water monitoring system. Drainage channels, downdrains, and culverts installed under access roads and site drainage facilities will be inspected at least quarterly and after all significant precipitation events for blockages and will be cleared as needed. Any additional equipment installed at the site will be inspected during quarterly monitoring events.

2.9 Vector Control

San Juan County employs several operational procedures designed to control vector generation and propagation at the landfill. Waste at the active face is compacted and graded on a daily basis and covered with a minimum of six inches of soil. Daily cover reduces vector access into, and harborage in, the waste mass. The application of cover soil also eliminates food sources and nesting areas. Dead animals are covered at the end of the day received to prevent the attraction of insects and other animals. In addition, proper surface grading is employed to promote drainage and prevent ponding, as well as liquid waste disposal restrictions, thereby minimizing the presence of standing water and potential insect breeding areas. Potential breeding areas will be addressed when discovered.

2.10 Plans for Closure and Post-Closure Care, Financial Assurance

Plans for closure and post-closure care, in addition to their respective cost estimates, are described in Sections 5.0 and 6.0, respectively. Worksheets detailing these cost estimates are included in Appendix I. Financial assurance is discussed in Section 7.0 below.

2.11 Training and Safety Plan

The landfill manager has attended several landfill courses sponsored by the Solid Waste Association of North America (SWANA) and other agencies. The landfill manager is responsible for disseminating his knowledge regarding landfill operation to other landfill employees. Documentation of employee training is included in Appendix H.

Communications at the site are facilitated by two-way radios in each county vehicle and a landline telephone in the landfill gatehouse. As a result, communication capabilities are sufficient to enable contact with Fire and Emergency Services to protect the safety of staff and users of the site. County vehicles and the landfill gatehouse are equipped with first aid kits. The landfill manager and the Director of Fire and Emergency Services will be notified (435-587-3225 or435-459-1807) in the case of severe injuries to landfill employees or visitors, and will be responsible for ensuring the availability of proper medical care. If an emergency response team is called to the facility, landfill personnel will complete an incident report and record the date, time, type of injury, actions taken, response time of the emergency management team, and the time at which the individual was evacuated from the site.

2.12 Daily Cover and Compaction

By the end of each operating day, all municipal waste received for disposal is spread in thin layers not exceeding 24 inches in thickness, and compacted using three or more passes of the landfill compactor. Compacted waste is then covered by a minimum of six inches of uncompacted soil. Construction/demolition waste is regularly compacted and covered with soil as needed, but not less than once every 30 days, to reduce the danger of fire and prevent vector harborage.

2.13 Record Keeping

San Juan County maintains an operating record for the landfill at the landfill gatehouse. Inspection records are maintained at the landfill gatehouse as well. The operating record for the facility includes, at a minimum, the following information:

- Haul vehicle information including owner’s name;
- Type and weights of waste received;
- Training and notification procedures;
- Results of required quarterly gas monitoring;
- Inspection log or summary;
- Incident reports;
- Deviations from the approved plan of operation; and
- This application document.

The information and documents described above comprise the operating record for the site. Any additional information which is pertinent to the operation of the landfill, or information which is required by the Director, will also be entered into the facility’s operating record. Examples of record keeping forms used at the landfill are included in Appendix G.

2.14 Recycling Program

San Juan County does not currently operate a coordinated recycling program. Waste automotive and cooking oils are accepted in separate storage tanks at the landfill and periodically removed by outside entities. Waste automotive batteries are pulled from the waste stream, stored in a secure area until a significant number are collected, and then delivered to local retailers for recycling. Scrap metal, appliances, and tires are separated from the waste stream and stockpiled for eventual removal and recycling by approved salvage contractors. Until such time as a regional market is established for other recyclable materials, San Juan County will promote recycling through public education.

2.15 Additional Operational Procedures

Additional standards for landfill maintenance and operation are required by UAC R315-303-4, and are briefly discussed below. It is the responsibility of the landfill manager to ensure that the facility complies with the standards of this regulation.

- Open Burning - Open burning is prohibited at the San Juan County Landfill. Stockpiled tree clippings and yard waste is occasionally burned after a burn permit or approval is obtained from the County Fire Marshal.
- Litter Prevention - Portable litter fences are used in wind-prone areas around the active disposal cell. In addition, landfill personnel pick up litter from the site and surrounding area on a daily basis.
- Scavenging - Scavenging is prohibited at the San Juan County Landfill, as indicated by signs at the landfill entrance.
- Reclamation - On-site reclamation will be conducted in an orderly, sanitary manner, and will not interfere with site operations. Reclamation is an on-going process at the facility, and includes general site grading over old fill areas and eventual revegetation of cut and fill slopes around the perimeter of the waste disposal cell.
- Landfill Attendant – In accordance with R315-303-4(2)(f)(i), there is at least one person on duty at all times during normal operating hours.
- Vector Control - Vector control is described in Section 2.9 above.
- Reserve Equipment - The San Juan County Landfill is owned and operated by San Juan County and is therefore able to utilize equipment from other county departments in the event of an equipment breakdown. Contingency plans to be implemented in the event of an equipment breakdown are described in Section 2.5.4.
- Boundary Posts - The entire permitted area is encompassed by a four-strand barbed-wire fence. The entrance to the landfill is clearly marked.
- Compaction and Daily Cover - Methods for the compaction of waste and the application of daily cover are described in Section 2.12.
- Monitoring Systems - Ground water monitoring systems are not included as part of the site design pursuant to the technical justification presented in the request for a suspension of composite liner and ground water monitoring requirements (Appendix C). The gas monitoring program is defined in Section 4.7 of this report.
- Recycling – Limited recycling of select materials is performed at the San Juan County Landfill as described in Section 2.14. Currently, there is no feasible market in the area for common recyclable materials. When a market develops for additional recyclables, containers will be provided throughout the county and at the landfill in accordance with UAC R315-303-4(6).
- Hazardous Waste – Disposal of hazardous waste at the San Juan County Landfill is prohibited. San Juan County employs a hazardous waste exclusion program, as described in Section 2.3.13 of this application, to prevent the disposal of hazardous materials with the municipal waste stream.

PART III – TECHNICAL DATA

3 GEOHYDROLOGICAL ASSESSMENT

The majority of the required components of a geohydrological assessment detailed by UAC R315-310-4(2)(b) are addressed in the *Request for a Suspension of Composite Liner and Ground Water Monitoring Requirements at the San Juan County Landfill, San Juan County, Utah* (Vector, 1997), submitted to UDEQ in December, 1997, and subsequent related correspondence. These documents are included in Appendix C, and are considered integral parts of this permit application that address the following elements of a geohydrological assessment, as defined by UAC R315-310-4(2)(b):

- Faults, local and regional geology and hydrology;
- Evaluation of soil types and properties, including permeability rates;
- Depths to ground water or aquifers;
- Direction off ground water flow; and,
- Calculation of site water balance using HELP model.

The documents in Appendix C present detailed information regarding these elements of the geohydrological assessment. The remaining requirements are addressed below and include the following:

- Unstable slopes, and subsidence areas on-site;
- Quantity, location, and construction of any private and public wells on the site and within a 2,000 foot radius of the site;
- Tabulation of all water rights for ground and surface water on the site and within a 2,000 foot radius of the site;
- Identification and description of all surface waters on the site and within a one-mile radius of the site;
- Background ground and surface water quality assessment; and,
- Conceptual design of ground and surface water monitoring systems.

3.1 Subsidence Areas and Unstable Slopes

A detailed field investigation was performed during the development of the monitoring suspension request (Vector, 1997, Appendix C) that included a subsurface drilling and sampling program and laboratory testing and characterization of on-site soils. Information resulting from the investigation indicates that the soils beneath the landfill property are characterized by a near-surface silty sand, underlain by moderately to well-indurated lacustrine mudstones and siltstones, in turn underlain by interbedded shale and sandstone. Relatively hard, cemented layers are encountered near or at the surface at the western boundary of the Class IVb disposal cell and west of the existing municipal disposal cell. The surficial silty sand thickens to the east within the landfill footprint to more than 19 feet along the eastern property boundary.

An expansive fat clay was identified during Vector's (1997) field investigation at approximately 10 feet below the site access road near the southwest corner of the existing municipal disposal cell. Based on the design of the landfill with its base below existing ground surface, in addition to the depth of occurrence near the predicted shallowest area of future excavation, it is not anticipated that this clay layer will create stability problems for future landfill development.

Subsidence has not been observed in old fill areas, either by subgrade settlement beneath the filled areas due to the overlying waste load or due to settlement within the waste mass itself. None of the

following problem soil or rock types are known to exist anywhere within the landfill property: collapsible soil; gypsiferous soil or rock; limestone (karst); soils susceptible to piping; or areas that contain active dunes. The sandstone knob immediately north and east of the landfill is not exceedingly steep or high, and although there is a minimal potential for an occasional dislodged rock to roll down the slope toward the landfill, the potential for mass wasting is considered minimal. During post-closure, rocks which may roll down the slope will most likely be intercepted by the perimeter access road or run-on diversion channel (Drawing 205) and removed, if encountered, as a result of regular site inspections. Based on this information, the operation of the San Juan County Landfill is not likely to be affected by problems of settlement or unstable slopes or soils.

3.2 Wells, Water Rights, and Surface Water

On August 7, 2002, San Juan County completed construction of a non-production well near the landfill entrance gate (refer to Drawings 203 and 205). The well will be used for fire and fugitive dust suppression, emergency service activities, and road maintenance. Details of well completion and subsurface geology encountered during drilling are discussed in Section 3.3. San Juan County obtained water rights for this well through application to the State of Utah Division of Water Rights. A computer database search through the State of Utah Division of Water Rights website did not indicate the presence of any water rights or existing or abandoned wells within a 2,000-foot radius of the landfill site, except for the County's well at the landfill. Copies of the results of the web-based water rights search, San Juan County's well installation and water appropriation documentation, and well construction logs are included in Appendix F.

Several ephemeral drainages transect the landfill property and are currently redirected around the active disposal area through the use of diversion berms, soil stockpiles, and diversion channels. Ephemeral drainages, by definition, carry water only during heavy precipitation events and times of high run-off, and then only for short durations. Based on available mapping of the area, the nearest perennial surface water is Recapture Creek, located approximately two miles east of the site.

Disposal operations employ the area fill method within an excavated cell. Any contact water resulting from precipitation falling on refuse will be confined within the current active disposal area by the limits of the excavated area and effective surface grading maintained by the landfill operator. The potential for contact water to enter nearby ephemeral drainages is negligible. Based on this, the operation of the landfill in its current location is unlikely to cause contamination to a surface water body.

3.3 Ground and Surface Water Quality

As described above, there is no perennial surface water within the vicinity of the landfill. Ground water was encountered during San Juan County's 2002 installation of a non-production well just inside the landfill entrance (Drawings 203 and 205) at a depth of 580 feet below ground surface in interbedded shale and sandstone. The depth to ground water at the southwest corner of the existing disposal cell was previously determined through a 1997 drilling investigation to be approximately 770 feet below ground surface (Vector, 1997). Although there are no wells within one mile of the landfill, there are several wells scattered throughout the region. The closest well, identified as (D-38-22)17bab by Avery (1986), is located approximately 2.5 miles southwest of the landfill. Additional wells for which published data exist are located approximately 3.3 miles north on the Ute Indian Reservation and along State Highway 262 more than 6 miles southeast of the landfill. While the information is not specific to the landfill property, it provides a reasonable estimation of local ground water chemistry. The chemistry data for each of these wells are summarized in Table 3.1, and are derived from published data by Avery (1986). Water samples collected from the County's well near the landfill entrance were tested following well installation only for the presence of absence of fecal or coliform bacteria. Test results included in Appendix F indicate there are no fecal or coliform bacteria present in the water.

Table 3.1: Available Groundwater Chemistry Data

Well Number	1	2	3	4	5	6
Well Location						
Township	39	40	40	38	39	39
Range	24	23	23	22	22	22
Locator (section/quarter section)	13dac	4bbc	12bad	23acb	17bab	17cbd
Distance to SJC Landfill (miles)	13	6.4	9.3	3.3	2.5	2.9
Aquifer	M	M	M	N	N	N
Date of Sample	Aug-60	May-56	Apr-73	May-80	Sep-82	Jun-82
Temperature (°C)	--	--	--	--	18.0	19.0
Specific Conductance (µS/cm)	598	--	--	360	370	400
pH (units)	7.9	--	8.8	7.6	7.8	8.0
BiCarbonate (mg/L as HCO_3)	--	380	547	--	--	--
Solids (sum of constituents, dissolved, mg/L)	--	2035	1144	--	--	--
Hardness (mg/L as $CaCO_3$)	--	354	15	--	--	--
Hardness (noncarbonate, mg/L as $CaCO_3$)	--	42	0	--	--	--
Arsenic (dissolved, µg/L as As)	--	--	--	<20	--	--
Boron (dissolved, µg/L as B)	240	--	690	--	--	--
Bromide (dissolved, µg/L as Br)	--	--	--	--	--	--
Calcium (dissolved, µg/L as Ca)	--	71	6	--	--	--
Chloride (dissolved, mg/L as Cl)	--	374	35	--	--	--
Iron (dissolved, µg/L as Fe)	--	--	30	0	--	--
Magnesium (dissolved, µg/L as Mg)	--	43	--	--	--	--
Selenium (dissolved, µg/L as Se)	--	--	--	<10	--	--
Na + K (dissolved, mg/L as Na)	--	591	--	--	--	--
Sulfate (dissolved, mg/L as SO_4)	--	769	378	--	--	--
Aluminum (total recoverable, µg/L as Al)	--	--	--	--	160	--
Antimony (total, µg/L as Sb)	--	--	--	--	<1	--
Arsenic (total, µg/L as As)	--	--	--	--	16	12
Barium (total recoverable, µg/L as Ba)	--	--	--	--	200	--
Beryllium (total recoverable, µg/L as Be)	--	--	--	--	<10	--
Cadmium (total recoverable, µg/L as Cd)	--	--	--	--	<1	--
Chromium (total recoverable, µg/L as Cr)	--	--	--	--	<10	--
Cobalt (total recoverable, µg/L as Co)	--	--	--	--	<1	--
Copper (total recoverable, µg/L as Cu)	--	--	--	--	2	--
Iron (total recoverable, µg/L as Fe)	180	--	--	--	230	--
Lead (total recoverable, µg/L as Pb)	--	--	--	--	1	--
Lithium (total recoverable, µg/L as Li)	--	--	--	--	40	--
Manganese (total recov., µg/L as Mn)	--	--	--	--	40	--
Molybdenum (total recov., µg/L as Mo)	--	--	--	--	4	--
Nickel (total recoverable, µg/L as Ni)	--	--	--	--	7	--
Selenium (total, µg/L as Se)	--	--	--	--	--	<1
Silver (total recoverable, µg/L as Ag)	--	--	--	--	<1	--
Strontium (total recoverable, µg/L as Sr)	--	--	--	--	1300	--
Zinc (total recoverable, µg/L as Zn)	--	--	--	--	20	--

NOTE: Data derived from *Bedrock Aquifers of Eastern San Juan County, Utah* (Avery, 1986)

3.4 Ground and Surface Water Monitoring Systems

UAC R315-310-4(2)(b) requires a conceptual design of ground and surface water monitoring systems, including proposed installation methods and a vadose zone monitoring plan, where required. This permit application is submitted without provisions for a ground water, surface water, or vadose zone monitoring system. The exclusion of these provisions is supported by a technical justification previously submitted to UDEQ (Vector, 1997) as part of a request for a suspension of composite liner and ground water monitoring requirements and UDEQ's subsequent approval and issuance of permit 93-05R, included with related documentation in Appendix C of this application.

4 ENGINEERING REPORT

This engineering report has been prepared in accordance with R315-310-4(2)(c) of the Utah Administrative Code (UAC). This section of the permit application includes brief descriptions of the maps, drawings, and specifications included in Appendices A and M, a description of the compliance of the site with respect to the location restrictions defined in UAC R315-302-1, and a discussion of the design and operation of the landfill. In addition, ground water monitoring, leachate collection and treatment systems, the control and monitoring of landfill gas, drainage system design and construction, and closure and post-closure design and construction are also addressed.

4.1 Maps, Drawings, and Specifications

The maps and drawings required by UAC R315-310-4(2) (a and c) are included in Appendices A and M of this permit application. Drawing 201, Title Sheet and General Project Location Map, illustrates the location of the San Juan County Landfill within the State of Utah and relative to the boundary of San Juan County and nearby landmarks. Drawing 202 is a spliced copy of the United States Geological Survey No Man's Island, Utah and Big Bench, Utah (1989) 7.5 minute topographic quadrangle maps. The maps have been modified to show the landfill boundary, the zoning and land use designation of the landfill property and surrounding area, a ¼-mile radius around the landfill property, and the prevailing wind direction. There are no existing utilities or structures within ¼-mile of the site. Drawings 203 and 204 illustrate the existing topography of the site and the locations of existing disposal areas and site facilities. The topographic base map was generated from an aerial survey performed by Olympus Aerial Surveys, Inc., of Salt Lake City on October 9, 1998. The topography of the disposal area was updated using a ground survey completed by San Juan County in 2016. Drawing 204 presents a side-by-side comparison of the original 1998 topography, the revised 2004 topography, and the 2016 revised topography. Drawing 205 presents the proposed final grading plan for the San Juan County Landfill. Drawing 206 provides a generalized illustration of the proposed fill sequencing of the site. Drawing 207 presents three cross sections, A-A', B-B', and C-C'; the location of each cross section is indicated on Drawing 205. Drawing 208 presents details of components of the proposed conceptual landfill design. Drawing 209, in addition to Figure J-1 in Appendix J, illustrates the hydrologic sub-area layout used in the design of the surface water drainage system for the site.

4.2 Location Standards

According to UAC R315-302-1, all applicable solid waste facilities must satisfy a number of criteria regarding the location of the facility. The San Juan County Landfill is considered an existing facility by the Utah Department of Environmental Quality (UDEQ), and is therefore subject to location restrictions pertaining to airports, floodplains, and unstable areas in accordance with UAC R315-302-1(3). However, because this renewal application details a vertical expansion of the existing site, the landfill is also subject to the remaining location restrictions regarding land use compatibility, geology, surface water, and ground water. The compatibility of the location of the San Juan County Landfill with respect to these restrictions is discussed below.

4.2.1 Land Use Compatibility

The San Juan County Landfill is not located with ¼-quarter mile of any of the following (refer to Drawing 202):

- National, state or county park, monument, or recreation area;
- Designated wilderness or wilderness study area;
- Wild and scenic river area;
- Existing permanent dwellings, residential areas, or other incompatible structures such as schools, churches; or
- Historic structures or properties listed or eligible to be listed in the State of National Register of Historic Places.

The landfill is not located within farmland designated as “prime,” “unique,” or “of statewide importance,” as demonstrated by correspondence from the United States Department of Agriculture Natural Resources Conservation Service (NRCS), included in Appendix F.

The landfill is located within a region identified as potential habitat for the Black-footed Ferret, an endangered species. However, a determination of the presence of endangered species is required as part of BLM’s Environmental Assessment (EA) process for public land transfers, as is a site survey for archaeological or cultural artifacts. During the County’s acquisition of the property from BLM in 1995, BLM surveyed a total of 880 acres of land containing the current 390-acre landfill property. As a result of the site survey and recommendations from the State Historic Preservation Office and the Division of Wildlife Resources, the landfill property was subsequently cleared for transfer of ownership to San Juan County.

The San Juan County Landfill is not located within ten thousand feet of any airport runway end. The nearest airport is located more than 11 miles north of the site near Blanding, Utah.

Based on the information presented above, the location of the San Juan County Landfill satisfies the general land use compatibility restrictions specified in UAC R315-302-1(2)(a).

4.2.2 Geology

The San Juan County Landfill is not located in an area prone to subsidence, a dam flood area, above an underground mine, above a salt dome, above a salt bed, or on or adjacent to geologic features which could compromise the structural integrity of the facility. The following sections describe the compliance of the landfill site with respect to Holocene faulting, seismic impact zones, and unstable areas.

- Holocene Faulting - The nearest fault to the landfill was identified by Vector (1997) as approximately 40 miles north of the landfill in the Paradox Basin. Therefore, the site satisfies the location criteria with respect to offset from Holocene faults.
- Seismic Impact Zone - Utah solid waste rules require that a landfill not be located in a seismic impact zone unless the owner or operator demonstrates that all containment structures, including liners, leachate collections systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site. A site is considered to be in a seismic impact zone if there is a 10 percent or greater probability that the maximum horizontal acceleration will exceed 0.10g in 250 years. Maps within the U.S.G.S. Open File Report 82-1033 entitled Probabilistic Earthquake Acceleration and Velocity Maps for the United States and Puerto Rico (Algermissen, 1990) indicate that the San Juan County Landfill is located within an area with a 10 percent probability of exceeding a horizontal ground acceleration of 0.08g in 250 years. As a result, the site is not located within a seismic impact zone.

- Unstable Areas - A detailed field investigation was performed by Vector (1997, in Appendix C) during the development of the monitoring suspension request and included a subsurface drilling and sampling program and laboratory testing and characterization of on-site soils. Information resulting from the investigation indicates that the soils beneath the landfill property are characterized by a near-surface silty sand, underlain by moderately to well-indurated lacustrine mudstones and siltstones, in turn underlain by interbedded shale and sandstone. Relatively hard, cemented layers are encountered near or at the surface at the western boundary of the Class IVb disposal cell and west of the municipal disposal cell. The surficial silty sand thickens to the east within the landfill footprint to more than 19 feet along the eastern property boundary. Drill logs from the 2002 water well installation described in Section 3.2 support the vertical geologic section described in Vector (1997).

An expansive clay was identified during Vector's (1997) field investigation at approximately 10 feet below the site access road near the southwest corner of the existing municipal disposal cell. Based on the design of the landfill with its excavated base below existing ground surface, and based on the depth of the clay layer near the predicted shallowest area of future excavation, it is not anticipated that this clay layer will create stability problems for future landfill development.

Subsidence has not been observed in old fill areas, either by soil settlement beneath the filled areas due to the overlying waste load, or due to settlement within the waste mass itself. None of the following problem soil or rock types are known to exist anywhere within the landfill property: collapsible soil; gypsiferous soil or rock; limestone (karst); soils susceptible to piping; and areas that contain active dunes. A sandstone knob immediately north and east of the landfill is not excessively steep or high relative to the landfill, and although there is a minimal potential for an occasional dislodged rock to roll down the slope toward the landfill, the potential for mass wasting is considered minimal. Large soil stockpiles between the knob and the active disposal area (as high as 10 feet above existing ground surface) will protect the landfill during the operational life. Based on this information, the San Juan County Landfill is not located within an unstable area.

4.2.3 Surface Water

The following sections describe the compliance of the San Juan County Landfill with location restrictions pertaining to surface water.

- Surface Water - The land surrounding the San Juan County Landfill is not used by a public water system for watershed control or municipal drinking water purposes. Several small ephemeral drainages pass through and around the landfill. These drainages, by definition, carry water only during heavy precipitation events, and then only for short durations. All potential surface water, whether confined to ephemeral drainages or occurring as sheet flow, will be redirected around the landfill property as described in Section 4.9 of this report. Any waters that are redirected around the site will not be allowed to come into contact with any possible contaminants resulting from the operation of the landfill. Run-off from active disposal areas is contained within the immediate area by temporary berms and selective grading and is not allowed to exit the landfill property. As a result, the location of the landfill is unlikely to cause contamination to a lake, reservoir, or pond, and therefore satisfies the requirements imposed by UAC R315-302-1(2) (c) (i).
- Floodplains - All land within San Juan County has been designated as flood hazard Zone C by the Federal Insurance Administration. Areas designated as Zone C are defined as areas of minimal flooding. Documentation from the National Insurance Administration is included in Appendix F. The San Juan County Landfill is not located within a 100-year floodplain and satisfies the floodplain location restriction mandated by UAC R315-302-1(2)(c)(ii)
- Wetlands - The San Juan County Landfill is not located in an area which is inundated or saturated by surface or ground water at a frequency and duration sufficient to support under

normal conditions a prevalence of vegetation typically adapted for life in saturated soil conditions. In addition, a site investigation of the landfill property has indicated that unsaturated conditions exist in the subsurface to depths of at least 580 feet. Drill logs are presented in Vector (1997), and included with this permit application in Appendices C and F. The landfill property does not meet the definition of a wetland specified in UAC R315-301-2(81), and therefore satisfies the location restriction pertaining to wetlands mandated by UAC R315-302-1(2)(d).

4.2.4 Ground Water

Depth to ground water below the base of the landfill has been documented to be at least 580 feet (Appendix F). Based on the depth to ground water and UDEQ approval for a suspension of ground water monitoring requirements, the ground water location restrictions defined in UAC Section R315-302-1(2)(e) do not apply to the San Juan County Landfill.

4.3 Site Life Calculations

In order to estimate the expected remaining active life of the site, the following assumptions were made:

- The final waste footprint covers a composite total (municipal and C&D waste) of approximately 27.4 acres, as delineated on Drawing 205;
- The future waste stream growth rate is the same as the predicted average annual growth rate for San Juan County for 2000-2060, as defined by the Utah Governor's Office of Planning and Budget;
- Waste is compacted using a landfill compactor to approximately 1,100 lbs/yd3 (from the Caterpillar Handbook for an 816B landfill compactor);
- Waste to soil ratio is 3:1; and
- Depth of excavation averages approximately 15 feet over the entire waste footprint.

Loading rate calculations based on these assumptions are included in Appendix K. Based on the final landfill design as presented on Drawing 205 (Appendices A and M), the remaining capacity of the site as designed is approximately 1,276,000 cubic yards of waste and cover soil. Assuming a waste to soil ratio of three waste to one soil (3:1), the remaining disposal capacity of the site will accommodate approximately 957,000 cubic yards of waste (526,000 tons) and 319,000 cubic yards of cover soil. Based on the remaining site capacity and the loading rate calculations (Appendix K), the revised designed will provide for approximately 41 additional years of disposal capacity, through the year 2058.

Loading rate calculations presented in the May 2005 permit renewal application predicted a site life of 51 years through the year 2055. These earlier calculations also used predicted population growth rates from the Office of Planning and Budget and started with an annual waste generation rate based on an average of total annual waste received for the years 2001 through 2004, or 12,337 tons. The revised calculations presented herein reflect a slight decrease in total annual waste received after 2005, and start with an average of waste received between 2012 and 2015, or 12,333 tons. This change is due to updated predicted population growth from the Office of Planning and Budget. As a result of this population prediction adjustment and the increased disposal capacity from adjusting the Final Grading Plan shape (Drawing 205) to accommodate placed material and provide for additional C&D waste capacity, the predicted site life is approximately 3 years longer than previously predicted. Actual reported annual waste tonnages received at the San Juan County Landfill are illustrated in Figure 4.1.

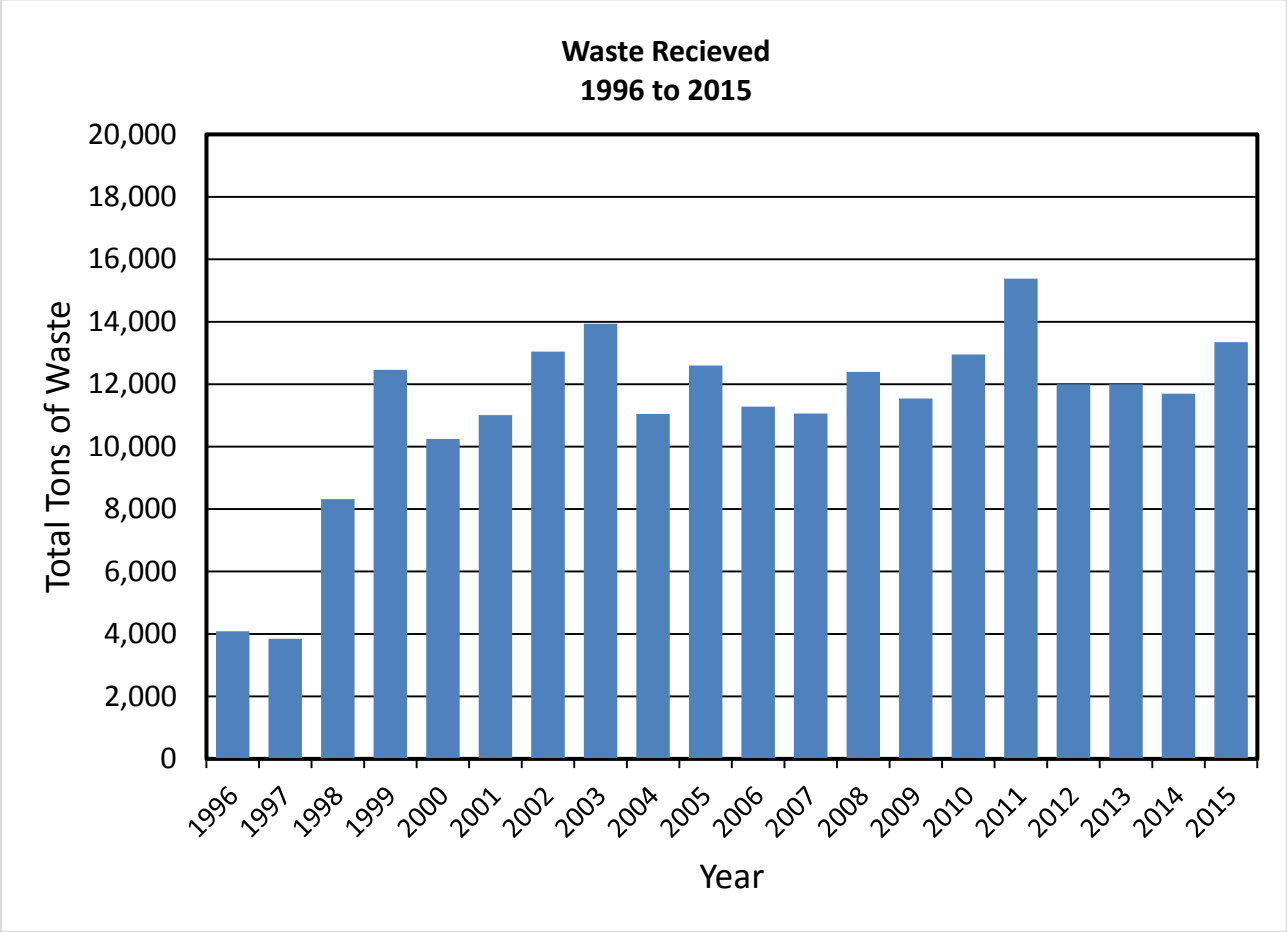

Figure 4.1: Reported Annual Waste Tonnages Received

4.4 Design and Operation

The San Juan County Landfill began disposal operations in January 1996 in a pre-excavated disposal cell as defined on Drawing 204. The initial disposal cell was approximately 600 by 600 feet, roughly two-thirds of which had already been utilized. As illustrated on Drawing 205 (Appendices A and M), the landfill closure design consists of a series of ridges and swales across the top surface of the waste mass. Landfill sideslopes are configured at a maximum grade of 3:1, horizontal to vertical, while top deck slopes range from 4 to 6 percent, considerably steeper than the minimum requirement of 2 percent. As designed, the landfill should accommodate future settlement and consolidation within the waste mass.

As illustrated on Drawings 203 and 204, the existing limit of waste placement in the municipal disposal cell covers approximately 10.5 acres, while the existing limit of waste placement in the C&D disposal cell covers approximate 2.5 acres. The proposed final limit of waste placement includes approximately 24.5 acres for the Class I municipal waste disposal facility, and approximately 2.9 acres for the Class IVb construction/demolition waste disposal facility. Current operating plans include the expansion of the existing municipal cell to the south as was previously permitted. As the southern edge of the waste mass approaches the southern boundary of the excavated cell (Drawing 203), the cut and fill method will continue to be employed to efficiently expand the disposal area further to the south and eventually east, as illustrated on the fill sequencing plan presented on Drawing 206.

The configuration of the Class IV disposal area has been revised in this permit renewal application to accommodate variations in operation from original plans. The original design included an access road and drainage channel separating the Class I disposal area from the Class IV disposal area. The revised design extends the Class IV area over this area and against the slope of the municipal waste. The final closure grading plan has been revised to show the C&D area incorporated into the final grading plan for the Class I disposal area configuration. The revised configuration provides approximately 45,000 cubic yards of additional capacity for C&D waste disposal. Revised stormwater control system calculations taking into account the new configuration are included in Appendix J. Future C&D waste disposal will be accommodated in the existing emergency waste disposal area just west of the existing C&D disposal area (refer to Drawing 205). Stormwater controls in the future C&D disposal area will be accomplished through development of a series of temporary berms and channels to route flows around the waste and into natural drainage channels south and east of the disposal cell.

The landfill will generally be constructed in lifts of 10 to 15 feet in total thickness. At the end of each operating day, municipal waste is spread and compacted in thin layers not exceeding two feet in thickness. Daily cover material is obtained from the migrating cell excavation wall and spread over the compacted waste to a minimum depth of six inches. Cover soil will be applied to exposed or combustible construction and demolition waste on an as-needed basis to avoid a fire hazard.

The final cover will be constructed in accordance with UAC R315-303-3(4), and will consist of an 18-inch low permeability infiltration layer and an 18-inch erosion layer. The infiltration layer will have a permeability equal to $1x10^{-5}$ centimeters per second (cm/sec). The construction of the final cover layer is detailed in Sections 5.1 and 5.2. The erosion layer will consist of native soils capable of sustaining vegetation common to the area. The final cover layer will be revegetated according to a plan developed or recommended by the Natural Resources Conservation Service or Bureau of Land Management. The final cover will be graded to prevent ponding and minimize infiltration of precipitation.

The proposed closure design, including final cover elevations and the locations of all proposed site facilities are illustrated on Drawing 205 (Appendices A and M). It is anticipated that closure construction will occur on the order of once every ten years. The largest area that will require closure at any given time during the life of the site will be the sum of the C&D disposal area at approximately 2.9 acres plus the largest cell, in this case Cell 7 at approximately 4.2 acres.

4.4 Equipment

All site operations except occasional dust suppression activity are performed with on-site equipment, including the following:

- 2004 Dodge Dakota pickup;
- 2005 Dodge Ram pickup;
- 2017 Dodge Dakota pickup;
- 1995 Caterpillar 816B landfill compactor;
- Caterpillar 623F paddle-wheel scraper;
- Caterpillar 140H grader;
- Caterpillar D-6N track dozer;
- Case 580 Super L backhoe;
- 2001 Volvo cable lift, tilt frame truck;
- 2010 Kenworth tilt frame truck;
- 1970 White semi pumper truck with 4,000-gallon water tank;

- 3,000-gallon skid-mounted water tank; and
- Two diesel-powered generators/

Additional heavy equipment is available from San Juan County on an as-needed basis. Minor vehicle and equipment maintenance is performed on-site by landfill personnel. Major repairs are performed either at the County Road Department facilities or by a contractor.

4.5 Borrow Sources

Borrow material for daily and final cover is currently derived from excavation of the adjacent cell. As the southern edge of the waste mass approaches the southern boundary of the current excavated cell, the cut and fill method will be employed to efficiently expand the disposal area. This method involves the excavation of daily cover soil from one side of the excavation while waste deposition occurs on the other side. In this way, daily cover soils are only handled once, and haul distances are minimized. Future cover requirements may necessitate the development of a soil borrow area in the southwestern or southeastern part of the landfill property.

4.6 Ground Water Monitoring and Leachate Collection

UDEQ granted approval for a suspension of composite liner and ground water monitoring requirements based on San Juan County's submittal of the Request for a Suspension of Composite Liner and Ground Water Monitoring Requirements at the San Juan County Landfill, San Juan County, Utah (Vector, 1997). As required by both Sections R315-303-3 and R315-308-1, the technical justification presented in that report (Vector, 1997) demonstrates that, based on site-specific physical and operational characteristics, operation of this site without a composite liner system or a ground water monitoring system is consistent with the protection of public health and the environment, and the protection of waters of the state from degradation by pollutants or contaminants. The suspension request demonstrated that the San Juan County Landfill is unlikely to produce a significant amount of leachate or pollute or degrade waters of the state, and therefore will not require monitoring of ground water or the installation of a liner system. As a result, the landfill design does not include provisions for a ground water monitoring or leachate collection, treatment, and disposal system.

The facility was originally permitted with a compacted clay liner and leachate collection system, both of which were installed beneath the 1998 waste footprint. The sump was originally at the western extent of the waste footprint, as illustrated on Drawing 204. Regular inspection and monitoring of the leachate collection sump since the first receipt of waste did not result in evidence of leachate generation within the waste mass. In its 1999 renewal permit application, San Juan County indicated its intention to continue to regularly monitor the leachate collection sump until such time as the lateral progression of waste deposition prevents further monitoring. San Juan County subsequently abandoned the leachate collection sump and extended the waste fill over the area. In accordance with UDEQ's previous approval of the suspension of liner requirements (Appendix C), San Juan County has not provided for future leachate generation monitoring.

4.7 Landfill Gas Control and Monitoring

Landfill gas monitoring is performed at the site on a quarterly basis. Because of the relatively low permeability and transmissivity of the soils that immediately underlie the site, gas monitoring wells have not been proposed. Instead, specified locations around the site are analyzed utilizing a hand-held detector that is capable of detecting the concentration of landfill gases in air. The instrument is capable of determining if landfill gas has exceeded 25 percent of its lower explosive limit at each measuring point. If landfill gas monitoring indicates a concentration in excess of 25 percent of the lower explosive limit (LEL) in facility structures or 100 percent of the LEL at the site boundary, the contingency plan described in 2.5.3 will be initiated. Gas monitoring locations are illustrated on

Drawing 205 and include monitoring points around the site perimeter, near the active face, around old and new fill areas, and inside the gatehouse and maintenance building. Monitoring points which do not currently exist as delineated on Drawing 205 will be added to the active monitoring list as the facility expands.

4.8 Run-on/Run-off Control Systems

The stormwater control system proposed for the facility was designed to accommodate predicted run-on and run-off flows resulting from a 100-year, 24-hour storm event. The design criteria established in the UAC R315-303-3(1)(c) and (d) requires accommodation of the 25-year, 24-hour storm. The 100-year storm was used as the design basis to provide additional protection and minimize maintenance requirements during the post-closure period. The calculations show either no sizing difference in stormwater management structures, or require very small increases in the size of several design elements to accommodate the larger design storm. A detailed discussion of site hydrology and hydraulics is included in the updated Drainage Report presented in Appendix J. Details and schematic cross sections of site drainage controls are included on Drawing 208 (Appendices A and M).

Surface run-off within each top-deck drainage basin is routed to a central swale and then to a headwall diversion berm near the downstream slope crest. The diversion berms route flows into overside downdrain culverts which direct flows to the perimeter drainage channel below. Top-deck ridge sideslopes vary from 4.5 percent to 6 percent, while central swale grades vary from 4.0 percent to 6 percent. Run-off flows originating from the top-deck are combined in the perimeter channels with sideslope run-off and routed through any of a number of drop inlet and culvert combinations to natural drainages outside the waste footprint.

Five culverts will be installed in strategic locations around the southern and western perimeter of the landfill to direct run-off from the closed surface of the landfill away from the site. All culverts and overside drains are specified with a minimum diameter of 18 inches to facilitate long term maintenance. Each of the perimeter culverts routes run-off flows under the perimeter access road and into existing natural drainages. The relatively high number of storm flow exit points (5 culverts) distributing stormwater generated within the facility's footprint after closure minimizes the effect of the facility on the overall drainage pattern and sediment generation characteristics of the area. As a result, sedimentation basins are not proposed.

An exterior drainage diversion channel will be constructed up-gradient from the landfill and will intercept and redirect potential run-on flows to either side of the landfill and into existing natural drainages downstream of the facility. Current off-site flows are directed around the disposal cell by the presence of large soil stockpiles and a temporary diversion channel located up-gradient from the landfill.

5 CLOSURE PLAN

This Closure Plan for the San Juan County Landfill was developed in accordance with Utah Administrative Code Section R315-302-3. Landfill closure activities will be completed in accordance with the schedule and requirements of this plan following approval by UDEQ. Closure activities will be performed in such a way as to facilitate the accomplishment of the following goals:

- Minimize the need for further maintenance;
- Minimize or eliminate threats to human health and the environment from post-closure escape of solid waste constituents, leachate, landfill gases, contaminated run-off or waste decomposition products to the ground, ground water, surface water, or the atmosphere; and,
- Adequately prepare the facility for the post-closure period.

This Closure Plan and documentation of any future modifications of this plan will be maintained in the landfill operating record at the landfill office; an additional copy will be maintained in the San Juan County offices in Monticello, Utah.

5.1 Elements of Closure

Closure activities will be initiated when a particular cell within the proposed landfill footprint (Drawing 206) reaches design height and comprises a sufficient surface area to make final cover installation feasible and economical. The size of each closed cell will cover approximately one-seventh of the proposed final landfill footprint, or approximately 3.4 acres, while the largest cell, Cell 7, would cover approximately 4.2 acres. All equipment which will not be used on-site during the post-closure period will be removed. Structures which remain at the site after the final receipt of waste, and which will not be an integral part of post-closure site maintenance, will be dismantled and removed from the site. Any soil contamination remaining after the final receipt of waste will be removed, treated, or disposed of according to applicable regulations. Following the final receipt of waste, any remaining stockpiles of recyclable or other stored materials will be removed from the site.

Rough contouring will be performed throughout the life of the site as a normal function of daily operations. Following the general site cleanup described above, final contouring will be performed using native soils to establish a suitable foundation for final cover construction. The combined interim cover and foundation layer thickness is estimated to be a minimum of 12 inches of compacted native soils available on-site. Most of the construction of the interim cover/foundation layer will be completed during the operating life of each cell, and is therefore not considered to be a closure activity. Once a suitable foundation has been established for final cover construction, the area to be closed will be surveyed to establish base elevations for final cover layer construction.

An 18-inch infiltration barrier layer will be installed over the foundation layer in accordance with UAC R315-303-3(4)(a). Due to the presence of a compacted clay liner under the first disposal cell at the site, UAC R315-303-3(4)(a)(ii) requires that the final cover infiltration barrier over the lined area be constructed to achieve a permeability equal to or less than the permeability of the compacted clay liner, or approximately 1x10-7 centimeters per second (cm/sec). However, the original EPA rule upon which UAC R315-303-3(4)(a)(ii) is based was intended to prevent the “bathtub effect,” which results in the collection of fluid within the landfill by allowing more infiltration through the final cover than the bottom liner of a landfill. Because the clay bottom liner will not be extended and future expansion areas will be constructed without a bottom liner system, the presence of a small section of lower-permeability liner within the much larger waste footprint will not result in the formation of a “bathtub”. In addition, landfill personnel monitored the leachate collection sump constructed as part of the clay liner system from the beginning of disposal operations at the site until the sump was covered by disposal activities. Leachate was never observed in the leachate collection system. Based on these facts, San Juan County plans to install the infiltration barrier layer with a less-restrictive maximum permeability of 1x10-5 cm/sec.

Following placement and compaction of the low permeability layer, the area undergoing closure construction will again be surveyed to verify a minimum infiltration barrier layer thickness of 18 inches, and final slope grades in accordance with the approved closure design. The hydraulic conductivity of the low permeability layer will be field-tested and certified to be within acceptable limits.

All materials and performance testing will be performed as part of a Construction Quality Assurance (CQA) closure certification program. Laboratory soil testing will be used to establish the field test criteria based on available soil stockpiles prior to closure construction. The Closure Certification Report will include the material characteristics for the soil used as the low permeability layer, as well as the procedures and results of the field methods used during the CQA Program. Field observations

and laboratory analyses presented in Vector (1997, Appendix C) indicate that a sufficient volume of low permeability material exists on-site to construct the infiltration barrier layer.

Following the construction and certification of an approved infiltration barrier layer, a minimum of 18 inches of native soil will be placed over the infiltration barrier layer in accordance with UAC R315-303-3(4)(b). The thickness of the erosion layer was determined based on frost penetration depth calculations which utilize a method developed by the U.S. Army and Air Force for cold region engineering (U.S. Army, 1988). The method is also used by the Utah Department of Transportation in highway design within the state of Utah. Calculations were performed for a range of soil moisture values from 10 to 20 percent by weight using daily average temperature data for Blanding obtained from the Western Regional Climate Center web site. A maximum frost penetration depth of 19 inches was predicted for the lowest moisture content (10%). However, because the San Juan County Landfill is situated at a lower elevation than Blanding, it is likely that the average daily temperatures at the landfill will be higher than those recorded for Blanding, and that the actual frost penetration at the landfill will therefore be less than predicted using Blanding temperature data. Based on these data, the erosion layer has been designed with a total thickness of 18 inches. Frost penetration depth calculations have been included in Appendix K.

The erosion layer will be capable of sustaining native plant growth and preventing excessive amounts of erosion. The layer will be broadcast, drill-seeded or hydroseeded with a seed mixture designed or recommended by United States Department of Agriculture Natural Resource Conservation Service (NRCS) or Bureau of Land Management (BLM).

After placement of the final cover layer, markers or other benchmarks will be installed to indicate the thickness of the final cover in accordance with UAC R315-303-3(4)(b)(i). These markers will be part of the quarterly inspection to ensure the minimum required cover thickness is maintained during the post-closure period.

All drainage channels will be constructed as illustrated on Drawings 205, 208, and 209 (Appendices A and M). The drainage channels will collect and control potential surface water run-on and run-off, thereby contributing to the maintenance of final cover integrity and preventing a washout of waste due to uncontrolled run-off during precipitation events. A final cover constructed in accordance with the design standards set forth in UAC R315-303-4, presented in Section 5.2 of this report and illustrated on Drawing 208, will be sufficient to minimize the infiltration of surface waters through the underlying waste mass.

5.2 Closure Design

The final cover will be constructed in accordance with UAC R315-303-3(4), and will consist of an 18-inch low permeability infiltration layer and an 18-inch erosion layer. As described above, the infiltration layer will have a maximum permeability of approximately $1x10^{-5}$ cm/sec. The erosion layer will consist of native soils capable of sustaining vegetation common to the area. The final cover layer will be revegetated according to a plan developed or recommended by the NRCS or BLM. The final cover will be graded to prevent ponding and minimize infiltration of precipitation.

The proposed closure design is illustrated on Drawing 205 (Appendices A and M). The closure plan covers a proposed final waste footprint encompassing approximately 27.4 acres of the landfill property. The largest area that will require closure at any given time during the life of the site will be the sum of the C&D disposal area at approximately 2.9 acres plus the largest cell, in this case Cell 7 at approximately 4.2 acres. The final topography of the closed landfill was designed to blend with the surrounding topography and provide for a minimum final grade of two percent on all slopes. As illustrated on Drawing 205 (Appendices A and M), the design consists of a series of ridges and swales across the top surface of the waste mass. Landfill sideslopes are configured at a maximum grade of 3:1, horizontal to vertical. The design slope grades are considerably steeper than the minimum requirement of two percent, and should accommodate future settlement and consolidation

within the waste mass. The post-closure configuration of the run-on and run-off control system is described in Section 4.9 of this report.

5.3 Site Capacity

The San Juan County Landfill began disposal operations in January 1996 in a pre-excavated disposal cell as defined on Drawing 204. The initial disposal cell was approximately 600 by 600 feet.

Currently, the Municipal Cell is expanding southward within the planned disposal area. Disposal operations will continue within the existing cell for several more years. As the southern edge of the waste mass approaches the southern boundary of the excavated cell, the cut and fill method will be employed to efficiently expand the disposal area to the south and eventually east, as illustrated on Drawing 206.

Based on the assumptions and calculations presented in Section 4.3 of this report, the remaining capacity of the site provides for approximately 1,276,000 cubic yards of waste and cover soil. Assuming a waste to soil ratio of three waste to one soil (3:1), the remaining disposal capacity of the site will accommodate approximately 957,000 cubic yards of waste (526,000 tons) and 319,000 cubic yards of cover soil. Based on the remaining site capacity and the loading rate calculations (Appendix K), the proposed designed will provide for approximately 41 additional years of disposal capacity, through the year 2058.

5.4 Closure Schedule

In the development of closure and post-closure schedules and costs, San Juan County anticipated that landfill cells would be closed on average once every 10 years such that only one cell would require closure at a time. Using this schedule, one filled and half of one new cell could be open at any given time, or an average of approximately 6 acres (average cell area = ~3.5 acres) would remain open and could require closure at any given time. The cell-by-cell development of the landfill at this time has not progressed as linearly as was originally anticipated, so there are two cells currently nearing final surface design grades, Cells 1 and 2, with a total surface area of approximately 6.6 acres, while disposal operations continue in Cells 3 and 4, with a combined surface area of approximately 6 acres. San Juan County is currently developing plans to generate funding and complete final cover construction over Cells 1 and 2 to ensure that the open area of the landfill can continue to be covered by the financial assurance costs set aside for closure. San Juan County will notify the Director once the funding mechanism and construction schedule is determined.

With regard to future cell closure, San Juan County will notify the Director of the intent to close any portion of the landfill and implement the approved closure plan a minimum of 60 days prior to the projected final receipt of waste in that portion. Within thirty (30) days after the final receipt of waste, San Juan County will begin implementing the closure plan, and will complete closure activities within 180 days of initiation. Following the completion of closure activities, San Juan County will submit to the Director a set of as-built drawings of final closure construction signed by a professional engineer registered in the State of Utah. San Juan County will also provide certification of the compliance of final closure construction with the approved closure plan. The certification will be signed by a County representative and certified by a professional engineer registered in the State of Utah.

5.5 Closure Costs

The closure cost estimate has been prepared and updated in accordance with the requirements of UAC R315-309-2 of the Utah Solid Waste Permitting and Management Rules. The cost estimate presents detailed costs to perform closure construction for the estimated largest area that will require closure during the projected life of the site. Given the projected remaining 41-year life of the site and the final design configuration, it is anticipated that closure construction will occur on average

approximately once every 10 years. Disposal Cell 7 on Drawing 206 (Appendices A and M) is the largest municipal disposal cell at about 4.2 acres that could require closure, while the average cell is about 3.5 acres. The area of Cell 7 plus half of an average cell (1.75 acres), plus the area of the C&D disposal cell (2.9 acres), is the largest municipal disposal area that could require final closure during the remaining life of the site (8.9 acres).

The cost estimate has been prepared using reasonable estimates of unit costs from local and regional contractors and actual construction bids costs for similar earthworks and heavy construction projects. The cost estimate projects a total cost to close Cell 7, half of an average cell, and the existing C&D cell as designed of $410,900, or approximately $100,000 more than calculated in the 2005 revision. A 10 percent contingency has been built into the final estimate to account for variances in unit costs and unforeseen circumstances. The cost estimate and inflation adjustments are presented in detail in Appendix I.

Table 5.1: Closure Construction Cost Summary

Item	Cost
1.0 Site Security and Facilities – Existing or Installed During Site Life	$ 0
2.0 Environmental Control Systems – Drainage System Construction	$ 54,200
3.0 Final Cover Construction – MSW Disposal Cell	$ 274,600
4.0 Final Cover Construction – Construction/Demolition Disposal Cell	$ 82,100
TOTAL	**$ 410,900**
See Appendix I for detailed cost estimates.	

5.6 Final Inspection

A final report will be prepared following the completion of each closure construction episode and after final closure. The reports will be certified by an engineer registered in the State of Utah, and will present laboratory and field test data which support the conformance of the final cover installation and closure activities with the Utah solid waste management regulations and the approved Closure Plan. The reports will also include final closure drawings certified by a Utah-registered professional engineer which represent the final, as-built closure condition of the site. The Director will be notified of the completion of closure activities and arrangements will be made for a final inspection by UDEQ. Following final approval by UDEQ, the post-closure maintenance plan will be initiated pursuant to the approved Post-Closure Plan, outlined in Section 6.0 of this permit application.

6 POST-CLOSURE PLAN

This Post-Closure Plan has been developed to detail post-closure maintenance and monitoring activities for the San Juan County Landfill in accordance with UAC R315-302-3. All post-closure maintenance and monitoring will be performed in accordance with this plan and any future approved modifications to this plan. Based on the approval of the Request for a Suspension of Composite Liner and Ground Water Monitoring Requirements at the San Juan County Landfill, San Juan County, Utah (Vector, 1997), the design of the San Juan County Landfill does not include provisions for a ground water monitoring or leachate collection or detection system. Accordingly, this post-closure plan does not address ground water monitoring or leachate collection or detection system monitoring.

San Juan County can be contacted during the period of post-closure regarding issues that concern the landfill at the following address.

San Juan County Offices
117 South Main Street, #202
Monticello, Utah 84535
(435) 587-3225

6.1 Monitoring and Maintenance Activities

As described above, this application is submitted without provisions for ground water monitoring or leachate collection or treatment systems. Landfill gas will be monitored on a quarterly basis during the active life of the landfill, as discussed in Section 4.7 of this document. The monitoring frequency will be continued on a quarterly basis during the post-closure period at all monitoring points established throughout the life of the facility. If continued monitoring at the facility indicates that the waste mass has stabilized and does not pose a threat to human health or the environment, San Juan County may petition the Director for a decrease in the length of the post-closure monitoring period, or a decrease in the frequency of monitoring events.

During the post-closure period, the general condition of the final cover, the site-wide drainage control system, and the perimeter fencing will be inspected on a semi-annual basis and after every major precipitation event for evidence of the effects or erosion, settlement or subsidence causing damage to the drainage conveyance system or a breach of the integrity of the final cover layer. Erosion channels deeper than 10% of the total cover thickness will be repaired as soon as possible following their discovery. Any other necessary repairs will be made as soon as is practicable.

6.2 Post-Closure Schedule

The post-closure maintenance period will begin immediately following the completion of the closure activities described in Section 5.0 of this application. Post-closure activities will continue for a period of 30 years or an alternative period established by the Director. If, during the post-closure period, monitoring activities indicate that the site has stabilized and does not pose a threat to human health or the environment, San Juan County may petition the Director for a decrease in the length of the post-closure monitoring period.

Following completion of the post-closure monitoring period as determined by the Director, San Juan County will submit to the Director a certification, signed by a representative of the County and a Utah registered professional engineer, which states why post-closure monitoring activities are no longer necessary. After obtaining final approval from the Director, post-closure monitoring activities will be discontinued.

6.3 Record Modifications

Plats and a statement of fact concerning the locations of all waste disposal cells at the site will be recorded on the landfill property's record of title with the San Juan County Recorder within 60 days after the completion of all closure activities. The notation will serve to inform any potential purchaser of the property that the land has been used as a landfill, and that its future use may be restricted by local land use or zoning regulations. San Juan County will notify the Director when the deed notation has been recorded.

6.4 Post-Closure Costs

A detailed post-closure cost estimate was prepared in accordance with the requirements of UAC R315-309-2 of the Utah State Solid Waste Permitting and Management Rules. Several assumptions

were necessary to project post-closure maintenance costs. These included semi-annual inspections of the integrity of the final cover and general site condition, and quarterly monitoring for landfill gas. In addition, the cost estimate was calculated assuming a third party would be hired to perform the inspections and monitoring. The cost estimate for annual post-closure care is summarized in Table 6.1 below. The cost estimate and inflation adjustments are presented in detail in Appendix I. A 10 percent contingency has been built into the cost estimate. Projected fund withdrawals to support post-closure activities are discussed in Section 7.0.

Table 6.1: Post-Closure Monitoring and Maintenance Cost Summary

Item	Cost
1.0 Site Facilities – Fence and Access Road Repairs	$ 1,760
2.0 Environmental Control Systems – Gas Monitoring & Drainage System Repair	$ 5,110
3.0 Final Cover System – Inspection and Repair	$ 3,320
TOTAL	**$ 10,190**
TOTAL for 30-year POST-CLOSURE PERIOD	**$305,700**
See Appendix I for detailed cost estimates.	

7 FINANCIAL ASSURANCE

In providing for financial assurance, solid waste regulations require the consideration of third-party closure construction and post-closure monitoring costs for the largest area of the landfill that will require closure at any given time during the life of the landfill. As detailed in the Closure Plan, it is anticipated that closure construction will occur on average approximately once every 10 years. According to the proposed Closure Plan, the largest area requiring closure at any time will be the area of the largest municipal disposal Cell 7 (4.2 acres) plus half of an average cell area (~1.75 acres), plus the existing C&D waste disposal cell (~2.9 acres). These areas comprise approximately 8.9 acres, or just under one-third of the total 27.4-acre waste footprint.

Detailed closure and post-closure cost estimates are presented in Appendix I. Total closure construction costs for Cell 4, an average cell, and the C&D cell are estimated to be approximately $410,900 in 2017 dollars. Annual post-closure maintenance costs are estimated to be approximately $10,190 per year or a total of $305,700 for the 30-year post-closure period. According to UAC R315-309-1, the total amount of required financial assurance must include the closure construction and post-closure costs depicted in Sections 5.5 and 6.4, or a grand total of $716,600. In addition, UAC R315-309-3(3)(c)(i) requires that these funds be available within five years of permit approval.

San Juan County established a closure/post-closure account through the State of Utah Public Treasurers' Investment Fund (PTIF) to provide for closure construction and post-closure maintenance in accordance with the original landfill design and permit 93-05. Subsequent deposits were made in 2000 and periodically since that time to maintain compliance with required funding. The current balance in the account is approximately $706,372; average annual earnings range from approximately 2 to 7 percent (based on information obtained from the Utah State Treasurer's Office). In accordance with the requirements of UAC R315-309, San Juan County maintains its fund contribution schedule to ensure that the full amount of financial assurance is available at the end of each permit life.

Assuming an annual return on investment on the low end of the reported range (2.0 percent) for the PTIF and no inflation, San Juan County, without any payments into the fund, will have more than