NM1 - __54___

PART 36 PERMIT APPLICATION

April 22, 2013

Jones, Brad A., EMNRD

From: Grant Jackson <GJackson@naismith-engineering.com>
Sent: Monday, April 22, 2013 7:24 AM
To: Jones, Brad A., EMNRD
Cc: Zach Davis; Clayton McDonald
Subject: R360 Avalon Transfer Facility
Attachments: Part 36 Checklist 2012_1004-Completed.pdf; Part 36 Checklist 2012_1004-Completed.xlsx

Brad,
As referenced in my e-mail on Friday, attached is my attempt at completing the checklist. The hard copy of the application should be arriving this morning. There is a flash drive in the front cover with an electronic copy of the application. Please contact me if you have any questions.

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PART 1 19.15.36.8 NMAC - SURFACE WASTE MANAGEMENT FACILITY PERMITS AND APPLICATION REQUIREMENTS:		
Permit Application Requirements	***OCD Comments***	**Location in Application**
36.8C. Application requirements for new facilities, major modifications and permit renewals. 'An applicant or operator shall file an application, **form C-137**, for a permit for a new surface waste management facility, to modify an existing surface waste management facility or for permit renewal with the environmental bureau in the division's Santa Fe office. **The application shall include:**		Form C-137 included after cover letter
(1) the names and addresses of the **applicant and principal officers and owners** of 25 percent or more of the applicant;		Attachment 7
(2) a plat and topographic map showing the surface waste management facility's location in relation to governmental surveys (quarter-quarter section, township and range); highways or roads giving access to the surface waste management facility site; watercourses; fresh water sources, including wells and springs; and inhabited buildings within one mile of the site's perimeter;	Topographic Map: Landfill: 36.13.B(1-6) Landfarm: 36.13.B(1-6) Ponds/Pits: 36.13.B(1-6) Plat: Landfill: 36.13.C Landfarm: 36.13.C Ponds/Pits: 36.13.C	Attachment 8, Appendix 8-2
(3) the names and addresses of the **surface owners** of the real property on which the surface waste management facility is sited and **surface owners** of the real property **within one mile** of the site's perimeter;	Landfill: 36.13.C Landfarm: 36.13.C Ponds/Pits: 36.13.C	Attachment 9
(4) a **description** of the surface waste management facility with a **diagram** indicating the location of **fences and cattle guards**, and **detailed construction/installation diagrams of pits, liners, dikes, piping, sprayers, tanks, roads, fences, gates, berms, pipelines** crossing the surface waste management facility, **buildings** and **chemical storage areas**;	**Written Description:** **Map/Diagram:** 36.13.I fencing; **Construction/Installation Diagrams:** Landfill: 36.13.I fencing; 36.14.C(10) external piping Landfarm: 36.13.I fencing; 36.15.C(1) berms; Ponds/Pits: 36.13.I fencing; 36.17.A dike protection and integrity and fluid collection and removal system; 36.17.C(3) fencing and netting;	Attachment 10, with Appendices 10-1 & 10-2
(5) engineering designs, certified by a registered professional engineer, including **technical data on the design elements** of each applicable treatment, remediation and disposal method and **detailed designs of surface impoundments;**	**Engineered Drawings:** Landfill: 36.14.C; D; E; F; Landfarm: 36.15.C(1) berms; 36.15.C(10) Ponds/Pits: 36.17.A design plan, leak detection system; 36.17.B(1-12); 36.17.B(4); 36.17.C(4) spray system; 36.17.C(5) skimmer pit or tank; 36.17.D; **Technical Data/Specifications:** Landfill: 36.14.C; D; E; F; Landfarm: 36.15.C(10) Ponds/Pits: 36.17.A leak detection system, liner specifications; 36.17.B(1-12); 36.17.B(4); 36.17.C(4) spray system; 36.17.C(5) skimmer pit or tank; 36.17.D;	Attachment 11

(6) a **plan for management** of approved oil field wastes that complies with the **applicable requirements** contained in 19.15.36.13 NMAC **(Siting and Operational Requirements – See Part 2 below)**, 19.15.36.14 NMAC **(Landfills – See Part 3 below),** 19.15.36.15 NMAC **(Landfarms – See Part 4 below),** and 19.15.36.17 NMAC **(Ponds – See Part 5 below);**	**Waste Management Plan:** Landfill: 36.13.D; E; F; G; H; 36.14.A; Landfarm: 36.13.D; E; F; G; H; 36.15.A; B; C(1-10); D; E; F; G; H; Ponds/Pits: 36.13.D; F; G; H; 36.17.A waste streams and chemical analysis; 36.17.C(5) skimmer pit or tank;	Attachment 12, Attachment 21
(7) an **inspection and maintenance plan** that complies with the requirements contained in **Subsection L of 19.15.36.13** NMAC; ***36.13L.*** *Each operator shall have an that includes the following:* *(1)* ***monthly inspection*** *of leak detection sumps including sampling if fluids are present with analyses of fluid samples furnished to the division; and maintenance of records of inspection dates, the inspector and the leak detection system's status;* *(2)* ***semi-annual inspection and sampling of monitoring wells*** *as required, with analyses of ground water furnished to the division; and maintenance of records of inspection dates, the inspector and ground water monitoring wells' status; and* *(3)* ***inspections of the berms*** *and the* ***outside walls of pond levees quarterly*** *and after a major rainfall or windstorm, and maintenance of berms in such a manner as to prevent erosion.*	**Inspection and Maintenance Plan;** Landfill: 36.14.B; 36.14.G.(7); Landfarm: 36.15.C(1) berms Ponds/Pits: 36.17.A freeboard and overtopping, monitoring and inspection plan; and erosion control; 36.17.C(1-2) *36.8C(7) adopts 36.13L (items 1 -3 in italics).*	Attachment 13
(8) a **hydrogen sulfide prevention and contingency plan** that complies with those provisions of **19.15.11** NMAC that apply to surface waste management facilities;	**Hydrogen Sulfide Prevention and Contingency Plan:** 19.15.11.2; 19.15.11.9-10; 19.15.11.12-14; 19.15.11.16 *36.8C(8) requires Operator to Comply with Part 11 (H2S).. Does not apply unless Operators tests for >100 ppm H2S.*	Attachment 14
(9) a **closure and post closure plan**, including a responsible third party contractor's **cost estimate**, sufficient to close the surface waste management facility in a manner that will protect fresh water, public health, safety and the environment (the closure and post closure plan shall comply with the requirements contained in **Subsection D of 19.15.36.18 NMAC); (See Part 6 below).**	**Closure and Post Closure Plan:** Landfill: 36.13.O; 36.14.A.(8); 36.18.A; 36.18.D(2-3); 36.18.G; Landfarm: 36.13.N; 36.15.F; G; H; 36.18.A; 36.18.D(4); 36.18.F; 36.18.G; Ponds/Pits: 36.13.N; 36.17.A closure plan; 36.17.E; 36.18.A; 36.18.E; 36.18.F; 36.18.G; Oil Treating Plant: 36.18.A; 36.18.D(1); 36.18.G; *36.8C(9) adopts 36.18. See Part 6 below.*	Attachment 15
(10) a **contingency plan** that complies with the requirements of **Subsection N of 19.15.36.13** NMAC and with NMSA 1978, Sections 12-12-1 through 12-12-30, as amended;	**Contingency Plan:** Landfill: 36.13.N Landfarm: 36.13.N Ponds/Pits: 36.13.N; 36.17.A emergency response plan; *36.8C(10) adopts 36.13N. See Part 2 below.*	Attachment 16
(11) a **plan to control run-on water onto the site and run-off water** from the site that complies with the requirements of **Subsection M of 19.15.36.13** NMAC;	**Stormwater Run-on/off Control Plan:** Landfill: 36.13.M; Landfarm: 36.13.M; 36.15.C(1); Ponds/Pits: 36.13.M; *36.8C(11) adopts 36.13M. See Part 2 below.*	Attachment 17

(12) in the case of an application to permit a **new or expanded landfill**, a **leachate management plan** that describes the anticipated amount of leachate that will be generated and the leachate's handling, storage, treatment and disposal, including final post closure options;	**Leachate Collection/Management Plan:** Landfill: 36.18.D(3)(a); *36.8C(12) adopts 36.14C(5), (6), & (10) and 36.14F . See Part 3 below.*	N/A
(13) in the case of an application to permit a new or **expanded landfill**, a **gas safety management plan** that complies with the requirements of **Subsection O of 19.15.36.13** NMAC;	**Landfill Gas Safety Management Plan:** Landfill: 36.13.O; 36.14.G; H; *36.8C(13) adopts 36.13O. See Part 2 below.*	N/A
(14) a **best management practice plan** to ensure protection of fresh water, public health, safety and the environment;		Attachment 20
(15) geological/hydrological data including:	Ponds/Pits: 36.17.A hydrologic report	Attachment 22
(a) a map showing names and location of streams, springs or other watercourses, and water wells within one mile of the site;	Landfill: 36.13.B(1-2); Landfarm: 36.13. B(1-2); Ponds/Pits: 36.13. B(1-2);	Attachment 8, Appendix 8-2
(b) laboratory analyses, performed by an independent commercial laboratory, for major cations and anions; BTEX; RCRA metals; and TDS of ground water samples of the shallowest fresh water aquifer beneath the proposed site;		Attachment 22, Appendix D
(c) depth to, formation name, type and thickness of the shallowest fresh water aquifer;	Landfill: 36.13.A.(1); Landfarm: 36.13.A.(2); 36.13.A.(3); Ponds/Pits: 36.13.A.(5);	Attachment 22, Section 3
(d) soil types beneath the proposed surface waste management facility, including a lithologic description of soil and rock members from ground surface down to the top of the shallowest fresh water aquifer;		Attachment 10, Section 2.8, Attachment 22, Section 2.3
(e) geologic cross-sections;		Attachment 22, Figures 6 & 7
(f) potentiometric maps for the shallowest fresh water aquifer; and		Attachment 22
(g) porosity, permeability, conductivity, compaction ratios and swelling characteristics for the sediments on which the contaminated soils will be placed;		Attachment 22, Appendix C
(16) certification by the applicant that information submitted in the application is true, accurate and complete to the best of the applicant's knowledge, after reasonable inquiry; and		Form C-137 included after cover letter
(17) other information that the division may require to demonstrate that the surface waste management facility's operation will not adversely impact fresh water, public health, safety or the environment and that the surface waste management facility will comply with division rules and orders.		No additional information requested at this time
PART 2 **19.15.36.13 NMAC - SITING AND OPERATIONAL REQUIREMENTS APPLICABLE TO ALL PERMITTED SURFACE WASTE MANAGEMENT FACILITIES:**		

36.13 A. Depth to ground water. (1) No landfill shall be located where ground water is less than 100 feet below the lowest elevation of the design depth at which the operator will place oil field waste. (2) No landfarm that accepts soil or drill cuttings with a chloride concentration that exceeds 500 mg/kg shall be located where ground water is less than 100 feet below the lowest elevation at which the operator will place oil field waste. See Subsection A of 19.15.36.15 NMAC for oil field waste acceptance criteria. (3) No landfarm that accepts soil or drill cuttings with a chloride concentration that is 500 mg/kg or less shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste. (4) No small landfarm shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste. (5) No other surface waste management facility shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste.	**19.15.36.8.C(15)(c)** depth to, formation name, type and thickness of the shallowest fresh water aquifer;	Attachments 21 and 22
36.13 B. Siting Requirements: No surface waste management facility shall be located: (1) within 200 feet of a watercourse, lakebed, sinkhole or playa lake; (2) within an existing wellhead protection area or 100-year floodplain; (3) within, or within 500 feet of, a wetland; (4) within the area overlying a subsurface mine; (5) within 500 feet from the nearest permanent residence, school, hospital, institution or church in existence at the time of initial application; or (6) within an unstable area, unless the operator demonstrates that engineering measures have been incorporated into the surface waste management facility design to ensure that the surface waste management facility's integrity will not be compromised.	**19.15.36.8.C(2)** topographic map **19.15.36.8.C(15)(a)** a map showing names and location of streams, springs or other watercourses, and water wells within one mile of the site;	Attachment 21
36.13 C. Size: No surface waste management facility shall exceed **500 acres.**	**19.15.36.8.C(2)** plat	Attachment 21
36.13 D. **Form C-133:** The operator shall not accept oil field wastes transported by motor vehicle at the surface waste management facility unless the transporter has a **form C-133**, authorization to move liquid waste, approved by the division.	**19.15.36.8.C(6)** waste management plan	Attachment 12
36.13 E. The operator shall not place oil field waste containing free liquids in a landfill or landfarm cell. The operator shall use the **paint filter test**, as prescribed by the EPA (EPA SW-846, method 9095) to determine conformance of the oil field waste to this criterion.	**19.15.36.8.C(6)** waste management plan	N/A
36.13 F. Surface waste management facilities shall **accept only exempt or non-hazardous waste**, except as provided in Paragraph (3) of Subsection F of 19.15.36.13 NMAC. The operator shall not accept hazardous waste at a surface waste management facility. The operator shall not accept wastes containing NORM at a surface waste management facility except as provided in 19.15.35 NMAC.	**19.15.36.8.C(6)** waste management plan	Attachment 12

(1) Exempt oil field wastes. The operator shall require a certification on **form C-138**, signed by the generator or the generator's authorized agent, that represents and warrants that the oil field wastes are generated from oil and gas exploration and production operations, are exempt waste and are not mixed with non-exempt waste. The operator shall have the option to accept such certifications on a monthly, weekly or per load basis. The operator shall maintain and shall make the certificates available for the division's inspection.		Attachment 12
(2) Non-exempt, non-hazardous, oil field wastes. The operator shall require a form **C-138**, oil field waste document, signed by the generator or its authorized agent. This form shall be accompanied by acceptable documentation to determine that the oil field waste is non-hazardous.		Attachment 12
(3) Emergency non-oil field wastes. The operator may accept non-hazardous, non-oil field wastes in an emergency if ordered by the department of public safety. The operator shall complete a **form C-138**, oil field waste document, describing the waste, and maintain the same, accompanied by the department of public safety order, subject to division inspection.		Attachment 12
36.13 G. Records: The operator of a commercial facility shall **maintain records** reflecting the generator, the location of origin, the location of disposal within the commercial facility, the volume and type of oil field waste, the date of disposal and the hauling company for each load or category of oil field waste accepted at the commercial facility. The operator shall maintain such records for a period of not less than **five years** after the commercial facility's closure, subject to division inspection.	**19.15.36.8.C(6)** waste management plan	Attachment 12
36.13 H. Disposal at a commercial facility shall occur only when an **attendant is on duty** unless loads can be monitored or otherwise isolated for inspection before disposal. The surface waste management facility shall be secured to prevent unauthorized disposal.		Attachment 12
36.13 I. To protect migratory birds, **tanks exceeding eight feet in diameter, and exposed pits and ponds shall be screened, netted or covered.** Surface waste management facilities shall be **fenced** in a manner approved by the division.		Attachments 11 and 12
36.13 J. Sign: Surface waste management facilities shall have a **sign**, readable from a distance of 50 feet and containing the operator's name; surface waste management facility permit or order number; surface waste management facility location by unit letter, section, township and range; and emergency telephone numbers.		Attachment 12
36.13 K. The operators shall comply with the **spill reporting and corrective action** provisions of 19.15.30 NMAC or 19.15.29 NMAC.		Attachment 12

36.13 L. Each operator shall have an **inspection and maintenance plan** that includes the following: (1) **monthly inspection** of leak detection sumps including sampling if fluids are present with analyses of fluid samples furnished to the division; and maintenance of records of inspection dates, the inspector and the leak detection system's status; (2) **semi-annual inspection and sampling of monitoring wells** as required, with analyses of ground water furnished to the division; and maintenance of records of inspection dates, the inspector and ground water monitoring wells' status; and (3) **inspections of the berms** and the **outside walls of pond levees quarterly** and after a major rainfall or windstorm, and maintenance of berms in such a manner as to prevent erosion.	**19.15.36.8.C(7)** inspection and maintenance plan *This requirement is duplicative of C7 above.*	Attachment 13
36.13 M. Each operator shall have a **plan to control run-on water** onto the site and **run-off water** from the site, such that: (1) the run-on and run-off control system shall prevent flow onto the surface waste management facility's active portion during the peak discharge from a **25-year storm**; and (2) **run-off** from the surface waste management facility's active portion shall not be allowed to discharge a pollutant to the waters of the state or United States that violates state water quality standards.	**19.15.36.8.C(11)** stormwater run on/off management plan	Attachment 17
36.13 N. Contingency plan. Each operator shall have a contingency plan. .... The contingency plan for emergencies shall:	**19.15.36.8.C(10)** contingency plan *For Admin Completeness Determination (ACD), accept any attachment labeled Contingency Plan. Details will be part of Technical Review.*	Attachment 16
(1) **describe the actions** surface waste management facility personnel shall take in response to fires, explosions or releases to air, soil, surface water or ground water of contaminants or oil field waste containing constituents that could threaten fresh water, public health, safety or the environment;		Attachment 16
(2) **describe arrangements with local police departments, fire departments, hospitals, contractors and state and local emergency response teams to coordinate emergency services;**		Attachment 16
(3) list the **emergency coordinator's name;** address; and office, home and mobile phone numbers (where more than one person is listed, one shall be named as the primary emergency coordinator);		Attachment 16
(4) include a list, which shall be kept current, of **emergency equipment** ... containing a physical description of each item on the list and a brief outline of its capabilities;		Attachment 16
(5) include an **evacuation plan**		Attachment 16
(6) include an evaluation of **expected contaminants, expected media**		Attachment 16
(7) list where copies of the contingency plan will be kept, which shall include the surface waste management facility; local police departments, fire departments and hospitals; and state and local emergency response teams;		Attachment 16

(8) indicate when the **contingency plan will be amended,** which shall be within five working days whenever: (a) the surface waste management facility permit is revised or modified; (b) the plan fails in an emergency; (c) the surface waste management facility changes design, construction, operation, maintenance or other circumstances in a way that increases the potential for fires, explosions or releases of oil field waste constituents that could threaten fresh water, public health, safety or the environment or change the response necessary in an emergency; (d) the list of emergency coordinators or their contact information changes; or (e) the list of emergency equipment changes;		Attachment 16
(9) **describe how the emergency coordinator** or the coordinator's designee, whenever there is an imminent or actual emergency situation, will immediately; (a) **activate** internal surface waste management facility **alarms or communication systems**, where applicable, to notify surface waste management facility personnel; and (b) **notify appropriate state and local agencies** with designated response roles if their assistance is needed;		Attachment 16
(10) **describe how** the emergency coordinator, whenever there is a release, fire or explosion, will immediately **identify** the character, exact source, amount and extent of released materials and describe how the emergency coordinator will concurrently assess possible hazards to fresh water, public health, safety or the environment that may result from the release, fire or explosion;		Attachment 16
(11) **describe how**, if the surface waste management facility stops operations in response to fire, explosion or release, the emergency coordinator **will monitor** for leaks, pressure buildup, gas generation or rupture in valves, pipes or the equipment, wherever this is appropriate;		Attachment 16
(12) **describe how** the emergency coordinator, immediately after an emergency, will provide for **treating, storing or disposing of recovered oil field waste**, or other material that results from a release, fire or explosion at a surface waste management facility;		Attachment 16
(13) **describe how** the emergency coordinator will ensure that no oil field waste, which may be incompatible with the released material, is **treated, stored or disposed of** until cleanup procedures are complete; and		Attachment 16
(14) provide that the emergency coordinator **may amend the plan** during an emergency as necessary to protect fresh water, public health, safety or the environment.		Attachment 16
36.13 O. Gas safety management plan. Each operator ... a **landfill** shall have a **gas safety management plan....** The plan shall also **include final post closure monitoring and control options.**	**19.15.36.8.C(13)** gas safety management plan *For ACD, accept any attachment labeled Gas Safety Management Plan.*	N/A
36.13 P. Training program. Each operator shall conduct an **annual training program** for key personnel that includes general operations, permit conditions, emergencies proper sampling methods and identification of exempt and non-exempt waste and hazardous waste. The operator shall maintain records of such training, subject to division inspection, for five years.	*For ACD, accept any attachment labeled Training Program*	Attachment 12
PART 3 **19.15.36.14 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO LANDFILLS**		
36.14A. General operating requirements.		

(1) The operator shall **confine the landfill's working face** to the smallest practical area and compact the oil field waste to the smallest practical volume. The operator shall not use equipment that may damage the integrity of the liner system in direct contact with a geosynthetic liner.		N/A
(2) The operator shall **prevent unauthorized access** by the public and entry by large animals to the landfill's active portion through the use of fences, gates, locks or other means that attain equivalent protection.		N/A
~~(3) The operator shall prevent and extinguish fires.~~	*These are Permit Conditions, but not required to be ACD.*	
~~(4) The operator shall control litter and odors.~~		
~~(5) The operator shall not excavate a closed cell or allow others to excavate a closed cell except as approved by the division.~~		
(6) The operator shall provide **adequate cover** for the landfill's active face as needed to control dust, debris, odors or other nuisances, or as otherwise required by the division.		N/A
(7) For areas of the landfill that will not receive additional oil field waste for one month or more, but have not reached the final waste elevation, the operator shall provide **intermediate cover**....		N/A
(8) Landfill cell closure: When the operator has filled a landfill cell, the operator shall **close it** pursuant to the conditions contained in the surface waste management facility permit and the requirements of Paragraph (2) of Subsection D of 19.15.36.18 NMAC. The operator shall notify the division's environmental bureau at least three working days prior to a landfill cell's closure.		N/A
36.14B. Ground water monitoring program. the operator shall .... establish a ground water monitoring program ... which shall include a ground water monitoring **work plan**, a **sampling and analysis plan**, a **ground water monitoring system** and a plan for **reporting** ground water monitoring results. The ground water monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and depths, to yield ground water samples from the uppermost aquifer that: (1) represent the quality of background ground water that leakage from a landfill has not affected; and (2) represent the quality of ground water passing beneath and down gradient of the surface waste management facility.	**19.15.36.8.C(7)** inspection and maintenance plan	N/A
36.14C. Landfill design specification. New landfill design systems shall include **a base layer and a lower geomembrane liner (e.g., composite liner), a leak detection system, an upper geomembrane liner, a leachate collection and removal system, a leachate collection and removal system protective layer, an oil field waste zone and a top landfill cover.**	**19.15.36.8.C(5)** technical data and design drawings *For ACD, accept any plan that refers to Landfill Design that has all of the required elements shown in bold. Details will be part of Technical Review. This is duplicative of 36.8C(xx) above.*	N/A
(1) Base layer: The **base layer** shall, at a minimum, consist of two feet of clay soil compacted to a minimum **90 percent standard proctor density** (ASTM D-698) with a hydraulic conductivity of 1 x 10-7 cm/sec or less. In areas where no ground water is present, the operator may propose an alternative base layer design, subject to division approval.		N/A
(2) **Lower geomembrane liner:** The **lower geomembrane liner** shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division.		N/A

(3) **Leak detection system:** The operator shall place the **leak detection system**, which shall consist of two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-5 cm/sec or greater, between the lower and upper geomembrane liners. The leak detection system shall consist of a drainage and collection system placed no more than six inches above the lower geomembrane liner in depressions and sloped so as to facilitate the earliest possible leak detection at designated collection points. Drainage piping shall be designed to withstand chemical attack from oil field waste and leachate and structural loading and other stresses and disturbances from overlying oil field waste, cover materials, equipment operation, expansion or contraction, and to facilitate clean-out maintenance. The material placed between the pipes and laterals shall be sufficiently permeable to allow the transport of fluids to the drainage pipe. The slope of the landfill sub-grade and drainage pipes and laterals shall be at least two percent grade; i.e., two feet of vertical drop per 100 horizontal feet. The piping collection network shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of schedule 80. The operator shall seal a solid drainage pipe to convey collected liquids to a corrosion-proof sump or sumps located outside the landfill's perimeter for observation, storage, treatment or disposal. The operator may install alternative designs as approved by the division.		N/A
(4) The operator shall place the **upper geomembrane liner**, which shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division, over the leak detection system.		N/A
(5) The operator shall place the **leachate collection and removal system**, which shall consist of at least two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater, over the upper geomembrane liner to facilitate drainage. The leachate collection and removal system shall consist of a drainage and collection and removal system placed no more than six inches above the upper geomembrane liner in depressions and sloped so as to facilitate the maximum leachate collection. Piping shall be designed to withstand chemical attack from oil field waste or leachate and structural loading and other stresses and disturbances from overlying oil field waste, cover materials, equipment operation, expansion or contraction and to facilitate clean-out maintenance. The material placed between the pipes and laterals shall be sufficiently permeable to allow the transport of fluids to the drainage pipe. The slope of the upper geomembrane liner and drainage lines and laterals shall be at least two percent grade; i.e., two feet of vertical drop per 100 horizontal feet. The piping collection network shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of schedule 80. The operator shall seal a solid drainage pipe to convey collected fluids outside the landfill's perimeter for storage, treatment and disposal. The operator may install alternative designs as approved by the division.		N/A
(6) The operator shall place the **leachate collection and removal system protection layer**, which shall consist of a soil layer at least one foot thick with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater, over the leachate collection and removal system.		N/A

(7) The operator shall **place oil field waste** over the leachate collection and removal system protective layer.		N/A
(8) The top landfill cover design shall consist of the following layers (top to bottom): a **soil erosion layer** composed of at least 12 inches of fertile topsoil re-vegetated in accordance with the post closure provisions of Subparagraph (b) of Paragraph (2) of Subsection D of 19.15.36.18 NMAC; a **protection or frost protection layer** composed of 12 to 30 inches of native soil; a **drainage layer** composed of at least 12 inches of sand or gravel with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater and a minimum bottom slope of four percent, **a hydraulic barrier-layer-geomembrane** (minimum of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division); and a **gas vent or foundation layer** composed of at least 12 inches of sand or gravel above oil field waste with soils compacted to the minimum 80 percent Standard Proctor Density. The operator shall **install the top landfill cover** within one year of achieving the final landfill cell waste elevation. ...		N/A
(9) **Alternatively**, the operator may propose a performance-based landfill design system using geosynthetics or geocomposites, including geogrids, geonets, geosynthetic clay liners, composite liner systems, etc., when supported by EPA's "hydrologic evaluation of landfill performance" (HELP) model or other division-approved model. The operator shall design the landfill to prevent the "bathtub effect". The bathtub effect occurs when a more permeable cover is placed over a less permeable bottom liner or natural subsoil.		N/A
(10) External piping, e.g., leachate collection, leak detection and sump removal systems shall be designed for installation of a **sidewall riser pipe.** Pipes shall not penetrate the liner with the exception of gas vent or collection wells where the operator shall install a flexible clamped pipe riser through the top landfill cover liner that will accommodate oil field waste settling and will prevent tears.		N/A
36.14 D. Liner specifications and requirements.	**19.15.36.8.C(5)** technical data and design drawings *For ACD, accept any plan that refers to Liner Specs. Details will be part of Technical Review.*	N/A

(1) General requirements. (a) Geomembrane liner specifications. Geomembrane liners shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division. Geomembrane liners shall have a **hydraulic conductivity** no greater than 1 x 10-9 cm/sec. **Geomembrane liners** shall be composed of impervious, **geosynthetic material** that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. Liners shall also be **resistant to ultraviolet light**, or the operator shall make provisions to protect the material from sunlight. Liner compatibility shall comply with EPA SW-846 **method 9090A**. (b) Liners shall be able to withstand projected loading stresses, settling and disturbances from overlying oil field waste, cover materials and equipment operations. (c) The operator shall construct liners with a minimum of **two percent slope** to promote positive drainage and to facilitate leachate collection and leak detection.		N/A
(2) Additional requirements for geomembranes. (a) Geomembranes shall be **compatible** with the oil field waste to be disposed. Geomembranes shall be resistant to chemical attack from the oil field waste or leachate. **The operator shall demonstrate this** by means of the manufacturer's test reports, laboratory analyses or other division-approved method. (b) Geosynthetic material the operator installs on a **slope greater than 25 percent** shall be designed to withstand the calculated tensile forces acting upon the material. The design shall consider the maximum friction angle of the geosynthetic with regard to a soil-geosynthetic or geosynthetic-geosynthetic interface and shall ensure that overall slope stability is maintained. (c) The operator shall **thermally seal (hot wedge) field seams** in geosynthetic material with a double track weld to create an air pocket for non-destructive air channel testing. In areas where double-track welding cannot be achieved, the operator may propose alternative thermal seaming methods. A stabilized air pressure of 35psi, plus or minus one percent, shall be maintained for at least five minutes. The operator shall overlap liners four to six inches before seaming, and shall orient seams parallel to the line of maximum slope; i.e., oriented along, not across, the slope. The operator shall minimize the number of field seams in corners and irregularly shaped areas. The operator shall use factory seams whenever possible. The operator shall not install horizontal seams within five feet of the slope's toe. Qualified personnel shall perform all field seaming.		N/A

36.14E. Requirements for the soil component of composite liners. (1) The operator shall place and compact the **base layer** to 90 percent standard proctor density on a prepared sub-grade. (2) The **soil surface** upon which the operator installs a geosynthetic shall be free of stones greater than one half inch in any dimension, organic matter, local irregularities, protrusions, loose soil and abrupt changes in grade that could damage the geosynthetic. (3) The operator shall compact a clay soil component of a composite liner to a minimum of **90 percent standard proctor density**, which shall have, unless otherwise approved by the division, a **plasticity index** greater than 10 percent, a **liquid limit** between 25 and 50 percent, a portion of material passing the **no. 200 sieve** (0.074 mm and less fraction) greater than 40 percent by weight; and a **clay content** greater than 18 percent by weight.	**19.15.36.8.C(5)** technical data and design drawings *For ACD, accept any plan that refers to Soil component of Composite Liners. Details will be part of Technical Review.*	N/A
36.14F. The leachate collection and removal system protective layer and the soil component of the leak detection system shall consist of soil materials that shall be free of organic matter, shall have a portion of material passing **the no. 200 sieve** no greater than five percent by weight and shall have a uniformity coefficient (Cu) less than 6, where Cu is defined as D60/D10. Geosynthetic materials or geocomposites including geonets and geotextiles, if used as components of the leachate collection and removal or leak detection system, shall have a **hydraulic conductivity, transmissivity and chemical and physical qualities** that oil field waste placement, equipment operation or leachate generation will not adversely affect. These geosynthetics or geocomposites, if used in conjunction with the soil protective cover for liners, shall have a hydraulic conductivity designed to ensure that the liner's hydraulic head never exceeds one foot.	**19.15.36.8.C(5)** technical data and design drawings *For ACD, accept any plan that refers to Leachate Collection and removal system protective layer. Details will be part of Technical Review.*	N/A
36.14G. Landfill gas control systems. If the gas safety management plan or requirements of other federal, state or local agencies require the installation of a gas control system at a landfill, the operator shall **submit a plan for division approval**, which shall include the following:	**19.15.36.8.C(13)** gas safety management plan	N/A
(1) the **system's design**, indicating the location and design of vents, barriers, collection piping and manifolds and other control measures that the operator will install (gas vent or collection wells shall incorporate a clamped and seamed pipe riser design through the top cover liner);	*For ACD, accept any plan that refers to Landfill Gas Control System. Details will be part of Technical Review.*	N/A
(2) if **gas recovery is proposed**, the **design of the proposed gas recovery system** and the system's major on-site components, including storage, transportation, processing, treatment or disposal measures required in the management of generated gases, condensates or other residues;		N/A
(3) if gas processing is proposed, a **processing plan** designed in a manner that does not interfere or conflict with the activities on the site or required control measures or create or cause danger to persons or property;		N/A
(4) if gas disposal is proposed, a **disposal plan** designed: (a) in a manner that does not interfere or conflict with the activities on the site or with required control measures; (b) so as not to create or cause danger to persons or property; and (c) with active forced ventilation, using vents located at least one foot above the landfill surface at each gas vent's location;		N/A
(5) **physical and chemical characterization** of condensates or residues that are generated and a **plan for their disposal**;		N/A

(6) means that the operator will implement to **prevent gas generation** and lateral migration such that (a) the concentration of the gases the landfill generates does not exceed 25 percent of the lower explosive limit for gases in surface waste management facility structures (excluding gas control or recovery system components); and (b) the concentration of gases does not exceed the lower explosive limit for gases at the surface waste management facility boundary; and		N/A
(7) a **routine gas monitoring program** providing for monitoring at least quarterly; the specific type and frequency of monitoring to be determined based on the following: (a) soil conditions; (b) the hydrogeologic and hydraulic conditions surrounding the surface waste management facility; and (c) the location of surface waste management facility structures and property lines.		N/A
36.14H. Landfill gas response. If gas levels exceed the limits specified in Paragraph (6) of Subsection G of19.15.36.14 NMAC, the operator shall:	**19.15.36.8.C(13)** gas safety management plan	N/A
(1) immediately take all necessary steps to ensure protection of fresh water, public health, safety and the environment and notify the division;	*For ACD, accept any plan that refers to Landfill Gas Response. Details will be part of Technical Review.*	N/A
(2) within seven days of detection, record gas levels detected and a description of the steps taken to protect fresh water, public health, safety and the environment;		N/A
(3) within 30 days of detection, submit a remediation plan for gas releases that describes the problem's nature and extent and the proposed remedy; and		N/A
(4) within 60 days after division approval, implement the remediation plan and notify the division that the plan has been implemented.		N/A
PART 4 **19.15.36.15 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO LANDFARMS**		
36.15A. Oil field waste acceptance criteria. Only soils and drill cuttings predominantly contaminated by petroleum hydrocarbons shall be placed in a landfarm. The division may approve placement of **tank bottoms** in a landfarm if the operator demonstrates that the tank bottoms do not contain economically recoverable petroleum hydrocarbons. Soils and drill cuttings placed in a landfarm shall be sufficiently free of liquid content to **pass the paint filter test**, and shall not have a **chloride concentration** exceeding 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or exceeding 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste. The person tendering oil field waste for treatment at a landfarm shall certify, on **form C-138**, that representative samples of the oil field waste have been subjected to the paint filter test and tested for chloride content, and that the samples have been found to conform to these requirements. The landfarm's operator shall not accept oil field waste for landfarm treatment unless accompanied by this certification.	**19.15.36.8.C(6)** waste management plan *36.15A is mostly Permit Conditions. Check for commitments to meet these requirements.*	N/A

36.15B. Background testing. Prior to beginning operation of a new landfarm or to opening a new cell at an existing landfarm at which the operator has not already established background, the operator shall take, at a minimum, 12 composite background soil samples, with each consisting of 16 discrete samples from areas that previous operations have not impacted at least six inches below the original ground surface, to establish background soil concentrations for the entire surface waste management facility. The operator shall analyze the background soil samples for TPH, as determined by EPA method 418.1 or other EPA method approved by the division; BTEX, as determined by EPA SW-846 method 8021B or 8260B; chlorides; and other constituents listed in Subsections A and B of 20.6.2.3103 NMAC, using approved EPA methods.		N/A
36.15C. Operation and oil field waste treatment.		N/A
(1) The operator shall **berm** each landfarm cell to prevent rainwater run-on and run-off.	**19.15.36.8.C(6)** waste management plan **19.15.36.8.C(11)** stormwater run on/off management plan **19.15.36.8.C(4)** detailed construction/ installation diagrams	N/A
(2) The operator shall not place contaminated soils received after the effective date of 19.15.36 NMAC within 100 feet of the surface waste management facility's boundary.	**19.15.36.8.C(6)** waste management plan	N/A
(3) The operator shall not place contaminated soils received at a landfarm after the effective date of 19.15.36 NMAC within 20 feet of a pipeline crossing the landfarm.	**19.15.36.8.C(6)** waste management plan	N/A
(4) With **72 hours after receipt**, the operator shall spread and disk contaminated soils in eight-inch or less lifts or approximately 1000 cubic yards per acre per eight-inch lift or biopile.	**19.15.36.8.C(6)** waste management plan	N/A
(5) The operator shall ensure that soils are **disked biweekly and biopiles are turned at least monthly.**	**19.15.36.8.C(6)** waste management plan	N/A
(6) The operator shall add moisture, as necessary, to enhance bioremediation and to control blowing dust.	**19.15.36.8.C(6)** waste management plan	N/A
(7) The **application of microbes** for the purposes of enhancing bioremediation requires prior division approval.	**19.15.36.8.C(6)** waste management plan	N/A
(8) Pooling of liquids in the landfarm is prohibited. The **operator shall remove** freestanding water within 24 hours.		N/A
(9) The operator shall maintain records of the landfarm's remediation activities in a form readily accessible for division inspection.		N/A
(10) The division's environmental bureau may approve other treatment procedures if the operator demonstrates that they provide equivalent protection for fresh water, public health, safety and the environment.	**19.15.36.8.C(6)** waste management plan **19.15.36.8.C(5)** technical data and design drawings	N/A

36.15D. Treatment zone monitoring. The operator shall **spread contaminated soils** on the surface in eight- inch or less lifts or approximately 1000 cubic yards per acre per eight-inch lift. The operator shall conduct **treatment zone monitoring** to ensure that prior to adding an additional lift the TPH concentration of each lift, as determined by EPA SW-846 method 8015M or EPA method 418.1 or other EPA method approved by the division, does not exceed 2500 mg/kg and that the chloride concentration, as determined by EPA method 300.1, does not exceed 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste. The operator shall collect and **analyze at least one composite soil sample**, consisting of four discrete samples, from the treatment zone at least **semi-annually** using the methods specified below for TPH and chlorides. The **maximum thickness** of treated soils in a landfarm cell shall not exceed two feet or approximately 3000 cubic yards per acre. When that thickness is reached, the operator shall not place additional oil field waste in the landfarm cell until it has **demonstrated by monitoring** the treatment zone at least semi-annually that the contaminated soil has been treated to the standards specified in Subsection F of 19.15.36.15 NMAC or the contaminated soils have been removed to a division approved surface waste management facility.	**19.15.36.8.C(6)** waste management plan	N/A
36.15E. Vadose zone monitoring.	*Permit condition, but not needed for ACD.*	N/A
(1) Sampling. The operator shall monitor the vadose zone beneath the treatment zone in each landfarm cell. The operator shall take the vadose zone samples from soils between three and four feet below the cell's original ground surface.		N/A
(2) Semi-annual monitoring program. The operator shall collect and analyze a minimum of four randomly selected, independent samples from the vadose zone at least semi-annually using the methods specified below for TPH, BTEX and chlorides and shall compare each result to the higher of the PQL or the background soil concentrations to determine whether a release has occurred.		N/A
(3) Five year monitoring program. The operator shall collect and analyze a minimum of four randomly selected, independent samples from the vadose zone, using the methods specified below for the constituents listed in Subsections A and B of 20.6.2.3103 NMAC at least every five years and shall compare each result to the higher of the PQL or the background soil concentrations to determine whether a release has occurred.		N/A
(4) Record keeping. The operator shall maintain a copy of the monitoring reports in a form readily accessible for division inspection.		N/A
(5) Release response. If vadose zone sampling results show that the concentrations of TPH, BTEX or chlorides exceed the higher of the PQL or the background soil concentrations, then the operator shall notify the division's environmental bureau of the exceedance, and shall immediately collect and analyze a minimum of four randomly selected, independent samples for TPH, BTEX, chlorides and the constituents listed in Subsections A and B of 20.6.2.3103 NMAC. The operator shall submit the results of the re-sampling event and a response action plan for the division's approval within 45 days of the initial notification. The response action plan shall address changes in the landfarm's operation to prevent further contamination and, if necessary, a plan for remediating existing contamination.		N/A

36.15F. Treatment zone closure performance standards. After the operator has filled a landfarm cell to the **maximum thickness of two feet or approximately 3000 cubic yards per acre**, the operator shall **continue treatment** until the contaminated soil has been remediated to the higher of the background concentrations or the following closure performance standards. The operator shall demonstrate compliance with the closure performance standards by collecting and analyzing a minimum of **one composite soil sample, consisting of four discrete samples.**	**19.15.36.8.C(9)** closure and post-closure care plan *Permit condition, but not needed for ACD*	N/A
(1) Benzene, as determined by EPA SW-846 method 8021B or 8260B, shall not exceed 0.2 mg/kg.		N/A
(2) Total BTEX, as determined by EPA SW-846 method 8021B or 8260B, shall not exceed 50 mg/kg.		N/A
(3) The GRO and DRO combined fractions, as determined by EPA SW-846 method 8015M, shall not exceed 500 mg/kg. TPH, as determined by EPA method 418.1 or other EPA method approved by the division, shall not exceed 2500 mg/kg.		N/A
(4) Chlorides, as determined by EPA method 300.1, shall not exceed 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste.		N/A
(5) The concentration of constituents listed in Subsections A and B of 20.6.2.3103 NMAC shall be determined by EPA SW-846 methods 6010B or 6020 or other methods approved by the division. If the concentration of those constituents exceed the PQL or background concentration, the operator shall either perform a site specific risk assessment using EPA approved methods and shall propose closure standards based upon individual site conditions that protect fresh water, public health, safety and the environment, which shall be subject to division approval or remove pursuant to Paragraph (2) of Subsection G of 19.15.36.15 NMAC.	.	N/A
36.15G. Disposition of treated soils.	**19.15.36.8.C(6)** waste management plan **19.15.36.8.C(9)** closure and post-closure care plan	N/A
(1) If the operator achieves the closure performance standards specified in **Subsection F** of 19.15.36.15 NMAC, then the operator may either leave the treated soils in place, or, with prior division approval, dispose or reuse of the treated soils in an alternative manner.	*Permit condition, but not needed for ACD.*	N/A
(2) If the operator cannot achieve the closure performance standards specified in Subsection F of 19.15.36.15 NMAC within five years or as extended by the division, then the operator shall remove contaminated soils from the landfarm cell and properly dispose of it at a division-permitted landfill, or reuse or recycle it in a manner approved by the division.		N/A
(3) If the operator cannot achieve the closure performance standards specified in Subsection F of 19.15.36.15 NMAC within five years or as extended by the division, then the division may review the adequacy of the operator's financial assurance, as provided in Subsection G of 19.15.36.11 NMAC. In that event, the division may require the operator to modify its financial assurance to provide for the appropriate disposition of contaminated soil in a manner acceptable to the division.		N/A
(4) The operator may request approval of an alternative soil closure standard from the division, provided that the operator shall give division-approved public notice of an application for alternative soil closure standards in the manner provided in 19.15.36.9 NMAC. The division may grant the request administratively if no person files an objection thereto within 30 days after publication of noticc; otherwise the division shall set the matter for hearing.		N/A

36.15H. Environmentally acceptable bioremediation endpoint approach.	**19.15.36.8.C(6)** waste management plan **19.15.36.8.C(9)** closure and post-closure care plan	N/A
(1) A landfarm operator may use an **environmentally acceptable bioremediation endpoint** approach to landfarm management in lieu of compliance with the requirements of Paragraph (3) of Subsection F of 19.15.36.15 NMAC....	*Permit condition, but not needed for ACD.*	N/A
(2) In addition to the requirements specified in Subsection C of 19.15.36.8 NMAC, **an operator who plans to use** an environmentally acceptable bioremediation endpoint approach shall submit for the division's review and approval a **detailed landfarm operation plan** for those landfarm cells exclusively dedicated to the use of the environmentally acceptable bioremediation endpoint approach. At a minimum, the operations plan shall include detailed information on the native soils, procedures to characterize each lift of contaminated soil, operating procedures and management procedures that the operator shall follow.		N/A
(3) In addition to other operational requirements specified in 19.15.36.15 NMAC, the operator using an environmentally acceptable bioremediation endpoint approach shall comply with the following. (a) **Native soil information required.** The operator shall submit detailed information on the soil conditions present for each of its landfarm cells immediately prior to the application of the petroleum hydrocarbon- contaminated soils, including: treatment cell size, soil porosity, soil bulk density, soil pH, moisture content, field capacity, organic matter concentration, soil structure, SAR, EC, soil composition, soil temperature, soil nutrient (C:N:P) (calcium, nitrogen and phosphate) concentrations and oxygen content. (b) **Characterization of contaminated soil.** The operator shall submit a description of the procedures that it will follow to characterize each lift of contaminated soil or drill cuttings, prior to treating each lift of contaminated soil or drill cuttings, for petroleum hydrocarbon loading factor, TPH, BTEX, chlorides, constituents listed in Subsections A and B of 20.6.2.3103 NMAC, contaminated soil moisture, contaminated soil pH and API gravity of the petroleum hydrocarbons. (c) **Operating procedures.** The operator shall submit a description of the procedures, including a schedule, that it shall follow to properly monitor and amend each lift of contaminated soil in order to maximize bioremediation, including tilling procedures and schedule; procedures to limit petroleum hydrocarbon loading to less than five percent; procedures to maintain pH between six and eight; procedures to monitor and apply proper nutrients; procedures to monitor, apply and maintain moisture to 60 to 80 percent of field capacity; and procedures to monitor TPH concentrations. (d) **Management procedures.** The operator shall submit a description of the management procedures that it shall follow to properly schedule landfarming operations, including modifications during cold weather, record keeping, sampling and analysis, statistical procedures, routine reporting, determination and reporting of achievement of the environmentally acceptable bioremediation endpoint and closure and post-closure plans.		N/A
PART 5 **19.15.36.17 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO EVAPORATION, STORAGE, TREATMENT AND SKIMMER PONDS:**		

36.17A. Engineering design plan. An applicant for a surface waste management facility permit or modification requesting inclusion of a **skimmer pit; an evaporation, storage or treatment pond; or a below-grade tank** shall submit ... a **detailed engineering design plan, certified by a registered profession engineer,** including **operating and maintenance procedures;** **19.15.36.8.C(5)** technical data and design drawings a **closure plan; 19.15.36.8.C(9)** closure and post-closure care plan and a **hydrologic report** that provides sufficient information and detail on the site's topography, soils, geology, surface hydrology and ground water hydrology to enable the division to evaluate the actual and potential effects on soils, surface water and ground water. **19.15.36.8.C(15)** geological/ hydrological data The plan shall include detailed information on **dike protection and structural integrity;** **leak detection,** including an adequate **fluid collection and removal system;** **19.15.36.8.C(5)** technical data and design drawings **liner specifications** and compatibility; **19.15.36.8.C(5)** technical data and design drawings **freeboard and overtopping prevention;** **19.15.36.8.C(7)** inspection and maintenance plan prevention of nuisance and hazardous **odors** such as **H2S;** **19.15.36.8.C(8)** hydrogen sulfide prevention and contingency plan; **19.15.36.8.C(7)** inspection and maintenance plan an **emergency response plan,** unless the pit is part of a surface waste management facility that has an integrated contingency plan; **19.15.36.8.C(10)** contingency plan **type** of oil field **waste stream,** including **chemical analysis;** **19.15.36.8.C(6)** waste management plan	*For ACD, accept any plan that refers to Engineering Design Plan and that has all of the required elements shown in bold. Details will be part of Technical Review.*	N/A
36.17B. Construction, standards.	**19.15.36.8.C(5)** technical data and design drawings	N/A
(1) In general. The operator shall ensure each pit, pond and below-grade tank is designed, constructed and operated so as to contain liquids and solids in a manner that will protect fresh water, public health, safety and the environment.	*For ACD, accept any plan that refers to Construction Standards and that has all of the required elements shown in bold. Details will be part of Technical Review*	N/A
(2) Liners required. Each pit or pond shall contain, at a minimum, a **primary (upper) liner** and a **secondary (lower) liner** with a **leak detection system** appropriate to the site's conditions.		N/A
(3) Liner specifications. Liners shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division. Synthetic (geomembrane) liners shall have a **hydraulic conductivity** no greater than 1 x 10-9 cm/sec. Geomembrane liners shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. Liner materials shall be resistant to ultraviolet light, or the operator shall make provisions to protect the material from sunlight. Liner compatibility shall comply with EPA **SW-846 method 9090A.**		N/A
(4) Alternative liner media. The division may approve other liner media if the operator demonstrates to the division's satisfaction that the alternative liner protects fresh water, public health, safety and the environment as effectively as the specified media.	***Optional*** **19.15.36.8.C(5)** technical data and design drawings	N/A

(5) Each pit or pond shall have a properly constructed **foundation** or firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities, in order to prevent rupture or tear of the liner and an **adequate anchor trench**; and shall be constructed so that the **inside grade** of the levee is no steeper than **2H:1V**. Levees shall have an **outside grade** no steeper than **3H:1V.** The levees' tops shall be wide enough to install an **anchor trench** and provide adequate room for inspection and maintenance. The operator shall **minimize liner seams** and **orient them up and down**, not across a slope. The operator shall use factory seams where possible. The operator shall ensure **field seams** in geosynthetic material are **thermally seamed (hot wedge)** with a **double track weld** to create an air pocket for non-destructive air channel testing. A stabilized air pressure of 35 psi, plus or minus one percent, shall be maintained for at least five minutes. The operator shall **overlap liners four to six inches** before seaming, and orient seams parallel to the line of maximum slope, i.e., oriented along, not across, the slope. The operator shall minimize the number of field seams in corners and irregularly shaped areas. There shall be **no horizontal seams** within five feet of the slope's toe. **Qualified personnel** shall perform field seaming.		N/A
(6) At a point of discharge into or suction from the lined pit, the liner shall be protected from excessive hydrostatic force or mechanical damage, and external discharge lines shall not penetrate the liner.		N/A
(7) Primary liners shall be constructed of a **synthetic material.**		N/A
(8) A **secondary liner** may be a **synthetic liner or an alternative liner** approved by the division. Secondary liners constructed with **compacted soil membranes**, i.e., natural or processed clay and other soils, shall be at least three feet thick, placed in six-inch lifts and compacted to 95 percent of the material's standard proctor density, or equivalent. Compacted soil membranes used in a liner shall undergo permeability testing in conformity with ASTM standards and methods approved by the division before and after construction. Compacted soil membranes shall have a **hydraulic conductivity** of no greater than 1 x 10-8 cm/sec. The operator shall submit results of **pre-construction testing** to the division for approval prior to construction.		N/A

(9) Leak detection system: The operator shall place a **leak detection system** between the lower and upper geomembrane liners that consists of two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-5 cm/sec or greater to facilitate drainage. The leak detection system shall consist of a properly designed **drainage and collection and removal system** placed above the lower geomembrane liner in depressions and sloped so as to facilitate the earliest possible leak detection. **Piping** used shall be designed to withstand chemical attack from oil field waste or leachate; **structural loading** from stresses and disturbances from overlying oil field waste, cover materials, equipment operation or expansion or contraction; and to **facilitate clean-out maintenance**. The **material** placed between the pipes and laterals shall be sufficiently **permeable** to allow the transport of fluids to the drainage pipe. The **slope** of the interior sub-grade and of drainage lines and laterals shall be at least a **two percent grade**, i.e., two feet vertical drop per 100 horizontal feet. The **piping collection system** shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of **schedule 80**. The operator shall seal a **solid sidewall riser pipe** to convey collected fluids to a **collection, observation and disposal system** located outside the perimeter of the pit or pond. The operator may install alternative methods as approved by the division.		N/A
~~(10) The operator shall notify the division at least 72 hours prior to the primary liner's installation so that a division representative may inspect the leak detection system before it is covered.~~	*Permit Condition, not ACD. Note if included in application.*	N/A
(11) The operator shall construct pits and ponds in a manner that prevents overtopping due to wave action or rainfall, and maintain a **three foot freeboard** at all times.		N/A
(12) The maximum size of an evaporation or storage pond shall not exceed **10 acre-feet.**	**19.15.36.8.C(5)** technical data and design drawings	N/A
36.17C. Operating standards.	**19.15.36.8.C(7)** inspection and maintenance plan *Permit Condition, not ACD. Note if included in application.*	N/A
(1) The operator shall ensure that only produced fluids or non-hazardous waste are discharged into or stored in a pit or pond; and that **no measurable or visible oil layer** is allowed to accumulate or remain anywhere on a pit's surface except an approved skimmer pit.	**19.15.36.8.C(7)** inspection and maintenance plan	N/A
(2) The operator shall **monitor leak detection systems** pursuant to the approved surface waste management facility permit conditions, maintain monitoring records in a form readily accessible for division inspection and report discovery of liquids in the leak detection system to the division within 24 hours.		N/A
(3) **Fencing and netting.** The operator shall fence or enclose pits or ponds to prevent unauthorized access and maintain fences in good repair. Fences are not required if there is an adequate perimeter fence surrounding the surface waste management facility. The operator shall screen, net, cover or otherwise render non- hazardous to migratory birds tanks exceeding eight feet in diameter and exposed pits and ponds. Upon written application, the division may grant an exception to screening, netting or covering requirements upon the operator's showing that an alternative method will adequately protect migratory birds or that the tank or pit is not hazardous to migratory birds.		N/A

(4) **Spray systems:** The division may approve **spray systems** to enhance natural evaporation. The operator shall submit engineering designs for spray systems to the division's environmental bureau for approval prior to installation. The operator shall ensure that spray evaporation systems are operated so that spray-borne suspended or dissolved solids remain within the perimeter of the pond's lined portion.	**19.15.36.8.C(5)** technical data and design drawings	N/A
(5) Skimmer Pits Or Tanks: The operator shall use skimmer pits or tanks to **separate oil from produced water** prior to water discharge into a pond. The operator shall install a trap device in connected ponds to prevent solids and oils from transferring from one pond to another unless approved in the surface waste management facility permit.	***Depending on the design, this may be an application requirement.*** **19.15.36.8.C(6)** waste management plan **19.15.36.8.C(5)** technical data and design drawings	N/A
36.17D. Below-grade tanks and sumps.		N/A
(1) **Secondary containment and leak detection:** The operator shall construct below-grade tanks with **secondary containment and leak detection**. The operator shall not allow below-grade tanks to overflow. The operator shall install only below-grade tanks of materials resistant to the tank's particular contents and to damage from sunlight.	**19.15.36.8.C(5)** technical data and design drawings	N/A
(2) The operator shall **test sumps' integrity annually**, and shall promptly repair or replace a sump that does not demonstrate integrity. The operator may test sumps that can be removed from their emplacements by visual inspection. The operator shall test other sumps by appropriate mechanical means. The operator shall maintain records of sump inspection and testing and make such records available for division inspection.		N/A
E. Closure required. The operator shall properly close pits, ponds and below-grade tanks within six months after cessation of use.	**19.15.36.8.C(9)** closure and post-closure care plan	N/A
PART 6 **19.15.36.18 NMAC - CLOSURE AND POST CLOSURE:**		
36.18A. Surface waste management facility closure by operator.	**19.15.36.8.C(9)** closure and post-closure care plan	
(1) The operator shall **notify** the division's environmental bureau at least **60 days prior** to cessation of operations at the surface waste management facility and provide a proposed schedule for closure. Upon receipt of such notice and proposed schedule, the division shall review the current closure plan for adequacy and inspect the surface waste management facility.		Attachment 15
~~(2) The division shall notify the operator within 60 days after the date of cessation of operations specified in the operator's closure notice of modifications of the closure plan and proposed schedule or additional requirements that it determines are necessary for the protection of fresh water, public health, safety or the environment.~~	*A(2) through A(5) are permit conditions or regulatory requirements, but not application requirements.*	
~~(3) If the division does not notify the operator of additional closure requirements within 60 days as provided, the operator may proceed with closure in accordance with the approved closure plan; provided that the director may, for good cause, extend the time for the division's response for an additional period not to exceed 60 days by written notice to the operator.~~		
~~(4) The operator shall be entitled to a hearing concerning a modification or additional requirement the division seeks to impose if it files an application for a hearing within 10 days after receipt of written notice of the proposed modifications or additional requirements.~~		
~~(5) Closure shall proceed in accordance with the approved closure plan and schedule and modifications or additional requirements the division imposes. During closure operations the operator shall maintain the surface waste management facility to protect fresh water, public health, safety and the environment.~~		

(6) Re-vegetate: Upon completion of closure, the operator shall **re-vegetate** the site unless the division has approved an alternative site use plan as provided in Subsection G of 19.15.36.18 NMAC. Re-vegetation, except for landfill cells, shall consist of establishment of a **vegetative cover** equal to 70 percent of the native perennial vegetative cover (un-impacted by overgrazing, fire or other intrusion damaging to native vegetation) or scientifically documented ecological description consisting of at least three native plant species, including at least one grass, but not including noxious weeds, and maintenance of that cover through two successive growing seasons.		Attachment 15
36.18D. Surface waste management facility and cell closure and post closure standards. The following minimum standards shall apply to closure and post closure of the installations indicated, whether the entire surface waste management facility is being closed or only a part of the surface waste management facility.		Attachment 15
(1) Oil treating plant closure. The operator shall ensure that: (a) **tanks and equipment** used for oil treatment are cleaned and oil field waste is **disposed** of at a division-approved surface waste management facility (the operator shall reuse, recycle or remove tanks and equipment from the site within 90 days of closure); (b) the **site is sampled**, in accordance with the procedures specified in chapter nine of EPA publication SW-846, test methods for evaluating solid waste, physical/chemical methods, for TPH, BTEX, major cations and anions and RCRA metals, in accordance with a gridded plat of the site containing at least four equal sections that the division has approved; and (c) **sample results** are submitted to the environmental bureau in the division's Santa Fe office.		Attachment 15
(2) Landfill cell closure. (a) The operator shall properly close landfill cells, covering the cell with a **top cover** pursuant to Paragraph (8) of Subsection C of 19.15.36.14 NMAC, with soil contoured to promote drainage of precipitation; **side slopes** shall not exceed a 25 percent grade (four feet horizontal to one foot vertical), such that the final cover of the landfill's top portion has a gradient of two percent to five percent, and the slopes are sufficient to prevent the ponding of water and erosion of the cover material. (b) The operator shall **re-vegetate** the area overlying the cell with native grass covering at least 70 percent of the landfill cover and surrounding areas, consisting of at least two grasses and not including noxious weeds or deep rooted shrubs or trees, and maintain that cover through the post closure period.		N/A
(3) Landfill post closure. Following landfill closure, the post closure care period for a landfill shall be **30 years.** (a) A **post closure care and monitoring plan** shall include maintenance of cover integrity, maintenance and operation of a leak detection system and leachate collection and removal system and operation of gas and ground water monitoring systems. (b) The operator or other responsible entity shall **sample existing ground water monitoring wells annually** and submit reports of monitoring performance and data collected within 45 days after the end of each calendar year. The operator shall report any exceedance of a ground water standard that it discovers during monitoring pursuant to 19.15.29 NMAC.		N/A

(4) **Landfarm closure.** The operator shall ensure that: (a) **disking** and addition of bioremediation enhancing materials continues until soils within the cells are remediated to the standards provided in Subsection F of 19.15.36.15 NMAC, or as otherwise approved by the division; (b) soils remediated to the foregoing standards and left in place are **re-vegetated** in accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC; (c) **landfarmed soils** that have not been or cannot be remediated to the standards in Subsection F of 19.15.36.15 NMAC are **removed** to a division-approved surface waste management facility and the landfarm remediation area is **filled in with native soil** and **re-vegetated** in accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC; (d) if treated soils are removed, the **cell is filled in with native soils and re-vegetated** in accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC; (e) **berms are removed**; (f) **buildings, fences, roads and equipment are removed**, the site cleaned-up and tests conducted on the soils for contamination; (g) **annual reports** of vadose zone and treatment zone sampling are submitted to the division's environmental bureau until the division has approved the surface waste management facility's **final closure**; and (h) for an operator who chooses to use the **landfarm methods** specified in Subsection H of 19.15.36.15 NMAC, that the soil has an ECs of less than or equal to 4.0 mmhos/cm (dS/m) and a SAR of less than or equal to 13.0		N/A
36.18E. Pond and pit closure. The operator shall ensure that:		N/A
(1) **liquids in the ponds or pits are removed** and disposed of in a division-approved surface waste management facility;		N/A
(2) **liners are disposed of** in a division-approved surface waste management facility;		N/A
(3) **equipment** associated with the surface waste management facility **is removed**;		N/A
(4) the **site is sampled**, in accordance with the procedures specified in chapter nine of EPA publication SW-846, test methods for evaluating solid waste, physical/chemical methods for TPH, BTEX, metals and other inorganics listed in Subsections A and B of 20.6.2.3103 NMAC, in accordance with a gridded plat of the site containing at least four equal sections that the division has approved; and		N/A
(5) **sample results are submitted** to the environmental bureau in the division's Santa Fe office.		N/A
36.18F. Landfarm and pond and pit post closure. The **post-closure care period** for a landfarm or pond or pit shall be three years if the operator has achieved **clean closure**. During that period the operator or other responsible entity shall regularly **inspect and maintain required re-vegetation**. If there has been a release to the vadose zone or to ground water, then the operator shall comply with the applicable requirements of 19.15.30 NMAC and 19.15.29 NMAC.		N/A
G. Alternatives to re-vegetation. If the landowner contemplates use of the land where a cell or surface waste management facility is located for purposes inconsistent with re-vegetation, the landowner may, with division approval, implement an **alternative surface treatment** appropriate for the contemplated use, provided that the alternative treatment will effectively **prevent erosion**. ~~If the division approves an alternative to re-vegetation, it shall not release the portion of the operator's financial assurance reserved for post-closure until the landowner has obtained necessary regulatory approvals and begun implementation of such alternative use.~~		N/A

PART 1 19.15.36.8 NMAC - SURFACE WASTE MANAGEMENT FACILITY PERMITS AND APPLICATION REQUIREMENTS:	
Permit Application Requirements	**Location in Application** **OCD Comments**
36.8C. Application requirements for new facilities, major modifications and permit renewals.	
An applicant or operator shall file an application, **form C-137**, for a permit for a new surface waste management facility, to modify an existing surface waste management facility or for permit renewal with the environmental bureau in the division's Santa Fe office.	**Behind Cover Letter**
The application shall include:	
(1) the names and addresses of the **applicant and principal officers and owners** of 25 percent or more of the applicant;	
(2) a plat and topographic map showing the surface waste management facility's location in relation to governmental surveys (quarter-quarter section, township and range);	**Topographic Map: [Appendix 8-2]**
• **highways or roads** giving access to the surface waste management facility site;	Landfill: 36.13.B(1-6)
• **watercourses**;	Landfarm: 36.13.B(1-6)
• **fresh water sources**, including wells and springs;	Ponds/Pits: 36.13.B(1-6)
• and **inhabited buildings** within one mile of the site's perimeter;	**Plat: [Appendix 8-1, 9-1, 10-1]**
	Landfill: 36.13.C
	Landfarm: 36.13.C
	Ponds/Pits: 36.13.C
(3) the names and addresses of the **surface owners** of the real property on which the surface waste management facility is sited and **surface owners** of the real property **within one mile** of the site's perimeter;	Landfill: 36.13.C [Attachment 9]
	Landfarm: 36.13.C
	Ponds/Pits: 36.13.C
(4) a **description** of the surface waste management facility with a **diagram** indicating the location of **fences and cattle guards**, and **detailed construction/installation diagrams of pits, liners, dikes, piping, sprayers, tanks, roads, fences, gates, berms, pipelines** crossing the surface waste management facility, **buildings** and **chemical storage areas**;	**Written Description: [Attachment 10]**
	Map/Diagram: [Appendices 10-1 & 10-2]
	36.13.I fencing;
	Construction/Installation Diagrams: [Appendices 10-1 & 10-2]
	Landfill: 36.13.I fencing; 36.14.C(10) external piping
	Landfarm: 36.13.I fencing; 36.15.C(1) berms;
	Ponds/Pits: 36.13.I fencing; 36.17.A dike protection and integrity and fluid collection and removal system; 36.17.C(3) fencing and netting;
(5) engineering designs, certified by a registered professional engineer, including **technical data on the design elements** of each applicable treatment, remediation and disposal method and **detailed designs of surface impoundments;**	**Engineered Drawings: [Appendices 10-1 & 10-2]**
	Landfill: 36.14.C; D; E; F;
	Landfarm: 36.15.C(1) berms; 36.15.C(10)
	Ponds/Pits: 36.17.A design plan, leak detection system; 36.17.B(1-12); 36.17.B(4); 36.17.C(4) spray system; 36.17.C(5) skimmer pit or tank; 36.17.D;
	Technical Data/Specifications: [Attachment 11]
	Landfill: 36.14.C; D; E; F; [N/A]
	Landfarm: 36.15.C(10)
	Ponds/Pits: 36.17.A leak detection system, liner specifications; 36.17.B(1-12); 36.17.B(4); 36.17.C(4) spray system; 36.17.C(5) skimmer pit or tank; 36.17.D;
(6) a plan for management of approved oil field wastes that complies with the **applicable requirements** contained in	**Waste Management Plan: [Attachment 12]**
• 19.15.36.13 NMAC (**Siting and Operational Requirements – See Part 2 below**),	Landfill: 36.13.D; E; F; G; H; 36.14.A;
• 19.15.36.14 NMAC **(Landfills – See Part 3 below),**	Landfarm: 36.13.D; E; F; G; H; 36.15.A; B; C(1-10); D; E; F; G; H;
• 19.15.36.15 NMAC **(Landfarms – See Part 4 below),**	Ponds/Pits: 36.13.D; F; G; H; 36.17.A waste streams and chemical analysis; 36.17.C(5) skimmer pit or tank;
• and 19.15.36.17 NMAC **(Ponds – See Part 5 below);**	
(7) an **inspection and maintenance plan** that complies with the requirements contained in **Subsection L of 19.15.36.13** NMAC;	**Inspection and Maintenance Plan; [Attachment 13]**
	Landfill: 36.14.B; 36.14.G.(7);
36.13L. *Each operator shall have an that includes the following:*	Landfarm: 36.15.C(1) berms

(1) ***monthly inspection*** *of leak detection sumps including sampling if fluids are present with analyses of fluid samples furnished to the division; and maintenance of records of inspection dates, the inspector and the leak detection system's status;*	Ponds/Pits: 36.17.A freeboard and overtopping, monitoring and inspection plan; and erosion control; 36.17.C(1-2)
(2) ***semi-annual inspection and sampling of monitoring wells*** *as required, with analyses of ground water furnished to the division; and maintenance of records of inspection dates, the inspector and ground water monitoring wells' status; and*	
(3) ***inspections of the berms*** *and the* ***outside walls of pond levees quarterly*** *and after a major rainfall or windstorm, and maintenance of berms in such a manner as to prevent erosion.*	
	36.8C(7) adopts 36.13L (items 1 -3 in italics).
(8) a hydrogen sulfide prevention and contingency plan that complies with those provisions of **19.15.11** NMAC that apply to surface waste management facilities;	**Hydrogen Sulfide Prevention and Contingency Plan:** 19.15.11.2; 19.15.11.9-10; 19.15.11.12-14; 19.15.11.16 [Attachment 14]
	36.8C(8) requires Operator to Comply with Part 11 (H2S).. Does not apply unless Operators tests for >100 ppm H2S.
(9) a closure and post closure plan, including a responsible third party contractor's **cost estimate**, sufficient to close the surface waste management facility in a manner that will protect fresh water, public health, safety and the environment (the closure and post closure plan shall comply with the requirements contained in **Subsection D of 19.15.36.18 NMAC); (See Part 6**	**Closure and Post Closure Plan: [Attachment 15]**
	Landfill: 36.13.O; 36.14.A.(8); 36.18.A; 36.18.D(2-3); 36.18.G;
	Landfarm: 36.13.N; 36.15.F; G; H; 36.18.A; 36.18.D(4); 36.18.F; 36.18.G;
	Ponds/Pits: 36.13.N; 36.17.A closure plan; 36.17.E; 36.18.A; 36.18.E; 36.18.F; 36.18.G;
	Oil Treating Plant: 36.18.A; 36.18.D(1); 36.18.G;
	36.8C(9) adopts 36.18. See Part 6 below.
(10) a contingency plan that complies with the requirements of **Subsection N of 19.15.36.13** NMAC and with NMSA 1978, Sections 12-12-1 through 12-12-30, as amended;	**Contingency Plan: [Attachment 16]**
	Landfill: 36.13.N
	Landfarm: 36.13.N
	Ponds/Pits: 36.13.N; 36.17.A emergency response plan;
	36.8C(10) adopts 36.13N. See Part 2 below.
(11) a plan to control run-on water onto the site and run-off water from the site that complies with the requirements of **Subsection M of 19.15.36.13** NMAC;	**Stormwater Run-on/off Control Plan: [Attachment 17]**
	Landfill: 36.13.M;
	Landfarm: 36.13.M; 36.15.C(1);
	Ponds/Pits: 36.13.M;
	36.8C(11) adopts 36.13M. See Part 2 below.
(12) in the case of an application to permit a **new or expanded landfill**, a **leachate management plan** that describes the anticipated amount of leachate that will be generated and the leachate's handling, storage, treatment and disposal, including final post closure options;	**Leachate Collection/Management Plan: [N/A]**
	Landfill: 36.18.D(3)(a);
	36.8C(12) adopts 36.14C(5), (6), & (10) and 36.14F. See Part 3 below.
(13) in the case of an application to permit a new or **expanded landfill, a gas safety management plan** that complies with the requirements of **Subsection O of 19.15.36.13** NMAC;	**Landfill Gas Safety Management Plan: [N/A]**
	Landfill: 36.13.O; 36.14.G; H;
	36.8C(13) adopts 36.13O. See Part 2 below.
(14) a **best management practice plan** to ensure protection of fresh water, public health, safety and the environment;	**Attachment 20**
(15) geological/hydrological data including:	Ponds/Pits: 36.17.A hydrologic report [Attachment 22]
(a) a map showing names and location of streams, springs or other watercourses, and water wells within one mile of the site;	Landfill: 36.13.B(1-2): [Appendix 8-2]
	Landfarm: 36.13. B(1-2);
	Ponds/Pits: 36.13. B(1-2);
(b) laboratory analyses, performed by an independent commercial laboratory, for major cations and anions; BTEX; RCRA metals; and TDS of ground water samples of the shallowest fresh water aquifer beneath the proposed site;	**[Attachment 22]**
(c) depth to, formation name, type and thickness of the shallowest fresh water aquifer;	Landfill: 36.13.A.(1);
	Landfarm: 36.13.A.(2); 36.13.A.(3);
	Ponds/Pits: 36.13.A.(5);

(d) soil types beneath the proposed surface waste management facility, including a lithologic description of soil and rock members from ground surface down to the top of the shallowest fresh water aquifer;	**[Attachment 10, Section 2.8; Attachment 22]**
(e) geologic cross-sections;	**[Attachment 22]**
(f) potentiometric maps for the shallowest fresh water aquifer; and	
(g) porosity, permeability, conductivity, compaction ratios and swelling characteristics for the sediments on which the contaminated soils will be placed;	**[Attachment 22]**
(16) certification by the applicant that information submitted in the application is true, accurate and complete to the best of the applicant's knowledge, after reasonable inquiry; and	**Form C-137**
(17) other information that the division may require to demonstrate that the surface waste management facility's operation will not adversely impact fresh water, public health, safety or the environment and that the surface waste management facility will comply with division rules and orders.	**None Requested**
PART 2	
19.15.36.13 NMAC - SITING AND OPERATIONAL REQUIREMENTS APPLICABLE	
TO ALL PERMITTED SURFACE WASTE MANAGEMENT FACILITIES:	
36.13 A. Depth to ground water.	**19.15.36.8.C(15)(c)** depth to, formation name, type and thickness of the shallowest fresh water aquifer;
(1) No landfill shall be located where ground water is less than 100 feet below the lowest elevation of the design depth at which the operator will place oil field waste.	[N/A]
(2) No landfarm that accepts soil or drill cuttings with a chloride concentration that exceeds 500 mg/kg shall be located where ground water is less than 100 feet below the lowest elevation at which the operator will place oil field waste. See Subsection A of 19.15.36.15 NMAC for oil field waste acceptance criteria.	[N/A]
(3) No landfarm that accepts soil or drill cuttings with a chloride concentration that is 500 mg/kg or less shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste.	[N/A]
(4) No small landfarm shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste.	[N/A]
(5) No other surface waste management facility shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste.	**[Attachment 21, Attachment 22]**
36.13 B. Siting Requirements: No surface waste management facility shall be located:	**19.15.36.8.C(2)** topographic map [Appendix 8-2, Attachment 21]
(1) within 200 feet of a watercourse, lakebed, sinkhole or playa lake;	[Attachment 21]
(2) within an existing wellhead protection area or 100-year floodplain;	**19.15.36.8.C(15)(a)** a map showing names and location of streams, springs or other watercourses, and water wells within one mile of the site; [Attachment 21]
(3) within, or within 500 feet of, a wetland;	[Attachment 21]
(4) within the area overlying a subsurface mine;	[Attachment 21]
(5) within 500 feet from the nearest permanent residence, school, hospital, institution or church in existence at the time of initial application; or	[Attachment 21]
(6) within an unstable area, unless the operator demonstrates that engineering measures have been incorporated into the surface waste management facility design to ensure that the surface waste management facility's integrity will not be compromised.	[Attachment 21]
36.13 C. Size: No surface waste management facility shall exceed **500 acres.**	**19.15.36.8.C(2)** plat [Attachment 10, Attachment 21]
36.13 D. **Form C-133:** The operator shall not accept oil field wastes transported by motor vehicle at the surface waste management facility unless the transporter has a **form C-133**, authorization to move liquid waste, approved by the division.	**19.15.36.8.C(6)** waste management plan [Attachment 12]
36.13 E. The operator shall not place oil field waste containing free liquids in a landfill or landfarm cell. The operator shall use the **paint filter test**, as prescribed by the EPA (EPA SW-846, method 9095) to determine conformance of the oil field waste to this criterion.	**19.15.36.8.C(6)** waste management plan [N/A]
36.13 F. Surface waste management facilities shall **accept only exempt or non-hazardous waste**, except as provided in Paragraph (3) of Subsection F of 19.15.36.13 NMAC.	**19.15.36.8.C(6) waste management plan [Attachment 12]**
• The operator shall not accept hazardous waste at a surface waste management facility.	**[Attachment 12]**
• The operator shall not accept wastes containing NORM at a surface waste management facility except as provided in 19.15.35 NMAC.	**[Attachment 12]**
(1) Exempt oil field wastes.	

• The operator shall require a certification on **form C-138**, signed by the generator or the generator's authorized agent, that represents and warrants that the oil field wastes are generated from oil and gas exploration and production operations, are exempt waste and are not mixed with non-exempt waste.	**[Attachment 12]**
• The operator shall have the option to accept such certifications on a monthly, weekly or per load basis. The operator shall maintain and shall make the certificates available for the division's inspection.	**[Attachment 12]**
(2) Non-exempt, non-hazardous, oil field wastes.	
• The operator shall require a form **C-138**, oil field waste document, signed by the generator or its authorized agent.	**[Attachment 12]**
• This form shall be accompanied by acceptable documentation to determine that the oil field waste is non-hazardous.	**[Attachment 12]**
(3) Emergency non-oil field wastes. The operator may accept non-hazardous, non-oil field wastes in an emergency if ordered by the department of public safety.	**[Attachment 12]**
• The operator shall complete a **form C-138**, oil field waste document, describing the waste, and maintain the same, accompanied by the department of public safety order, subject to division inspection.	**[Attachment 12]**
36.13 G. Records:	**19.15.36.8.C(6)** waste management plan
• The operator of a commercial facility shall **maintain records** reflecting the generator, the location of origin, the location of disposal within the commercial facility, the volume and type of oil field waste, the date of disposal and the hauling company for each load or category of oil field waste accepted at the commercial facility.	**[Attachment 12]**
• The operator shall maintain such records for a period of not less than **five years** after the commercial facility's closure, subject to division inspection.	**[Attachment 12]**
36.13 H. Disposal at a commercial facility shall occur only when an **attendant is on duty** unless loads can be monitored or otherwise isolated for inspection before disposal.	**[N/A]**
• The surface waste management facility shall be secured to prevent unauthorized disposal.	**[Attachment 12]**
36.13 I. To protect migratory birds, **tanks exceeding eight feet in diameter, and exposed pits and ponds shall be screened, netted or covered.**	**[Attachment 12]**
• Surface waste management facilities shall be **fenced** in a manner approved by the division.	**[Attachment10, Attachment 12]**
36.13 J. Sign: Surface waste management facilities shall have a **sign**, readable from a distance of 50 feet and containing the operator's name; surface waste management facility permit or order number; surface waste management facility location by unit letter, section, township and range; and emergency telephone numbers.	**[Attachment 12]**
36.13 K. The operators shall comply with the **spill reporting and corrective action** provisions of 19.15.30 NMAC or 19.15.29 NMAC.	**[Attachment 12]**
L. Each operator shall have an **inspection and maintenance plan** that includes the following:	**19.15.36.8.C(7)** inspection and maintenance plan [Attachment 13]
(1) **monthly inspection** of leak detection sumps including sampling if fluids are present with analyses of fluid samples furnished to the division; and maintenance of records of inspection dates, the inspector and the leak detection system's status;	[N/A]
(2) **semi-annual inspection and sampling of monitoring wells** as required, with analyses of ground water furnished to the division; and maintenance of records of inspection dates, the inspector and ground water monitoring wells' status; and	*This requirement is duplicative of C7 above.[N/A]*
(3) **inspections of the berms** and the **outside walls of pond levees quarterly** and after a major rainfall or windstorm, and maintenance of berms in such a manner as to prevent erosion.	**[Attachment 13, Sections 2.1 and 3.4]**
36.13 M. Each operator shall have a **plan to control run-on water** onto the site and **run-off water** from the site, such that:	**19.15.36.8.C(11)** stormwater run on/off management plan [Attachment 17]
(1) the run-on and run-off control system shall prevent flow onto the surface waste management facility's active portion during the peak discharge from a **25-year storm**; and	**[Attachment 17, Attachment 11]**
(2) **run-off** from the surface waste management facility's active portion shall not be allowed to discharge a pollutant to the waters of the state or United States that violates state water quality standards.	**[Attachment 17, Attachment 11]**
36.13 N. Contingency plan. Each operator shall have a contingency plan. .... The contingency plan for emergencies shall:	**19.15.36.8.C(10)** contingency plan **[Attachment 16]**
	For Admin Completeness Determination (ACD), accept any attachment labeled Contingency Plan. Details will be part of Technical Review.
(1) **describe the actions** surface waste management facility personnel shall take in response to fires, explosions or releases to air, soil, surface water or ground water of contaminants or oil field waste containing constituents that could threaten fresh water, public health, safety or the environment;	**[Attachment 16]**

(2) **describe arrangements with local police departments, fire departments, hospitals, contractors and state and local emergency response teams to coordinate emergency services;**	**[Attachment 16]**
(3) list the **emergency coordinator's name;** address; and office, home and mobile phone numbers (where more than one person is listed, one shall be named as the primary emergency coordinator);	**[Attachment 16]**
(4) include a list, which shall be kept current, of **emergency equipment** ... containing a physical description of each item on the list and a brief outline of its capabilities;	**[Attachment 16]**
(5) include an **evacuation plan**	**[Attachment 16]**
(6) include an evaluation of **expected contaminants, expected media**	**[Attachment 16]**
(7) list where copies of the contingency plan will be kept, which shall include the surface waste management facility; local police departments, fire departments and hospitals; and state and local emergency response teams;	**[Attachment 16]**
(8) indicate when the **contingency plan will be amended,** which shall be within five working days whenever:	**[Attachment 16]**
(a) the surface waste management facility permit is revised or modified;	**[Attachment 16]**
(b) the plan fails in an emergency;	**[Attachment 16]**
(c) the surface waste management facility changes design, construction, operation, maintenance or other circumstances in a way that increases the potential for fires, explosions or releases of oil field waste constituents that could threaten fresh water, public health, safety or the environment or change the response necessary in an emergency;	**[Attachment 16]**
(d) the list of emergency coordinators or their contact information changes; or	**[Attachment 16]**
(e) the list of emergency equipment changes;	**[Attachment 16]**
(9) **describe how the emergency coordinator** or the coordinator's designee, whenever there is an imminent or actual emergency situation, will immediately;	**[Attachment 16]**
(a) **activate** internal surface waste management facility **alarms or communication systems**, where applicable, to notify surface waste management facility personnel; and	**[Attachment 16]**
(b) **notify appropriate state and local agencies** with designated response roles if their assistance is needed;	**[Attachment 16]**
(10) **describe how** the emergency coordinator, whenever there is a release, fire or explosion, will immediately **identify** the character, exact source, amount and extent of released materials and describe how the emergency coordinator will concurrently assess possible hazards to fresh water, public health, safety or the environment that may result from the release, fire or explosion;	**[Attachment 16]**
(11) **describe how**, if the surface waste management facility stops operations in response to fire, explosion or release, the emergency coordinator **will monitor** for leaks, pressure buildup, gas generation or rupture in valves, pipes or the equipment, wherever this is appropriate;	**[Attachment 16]**
(12) **describe how** the emergency coordinator, immediately after an emergency, will provide for **treating, storing or disposing of recovered oil field waste**, or other material that results from a release, fire or explosion at a surface waste management facility;	**[Attachment 16]**
(13) **describe how** the emergency coordinator will ensure that no oil field waste, which may be incompatible with the released material, is **treated, stored or disposed of** until cleanup procedures are complete; and	**[Attachment 16]**
(14) provide that the emergency coordinator **may amend the plan** during an emergency as necessary to protect fresh water, public health, safety or the environment.	**[Attachment 16]**
36.13 O. Gas safety management plan.	**19.15.36.8.C(13)** gas safety management plan [N/A]
Each operator ... a **landfill** shall have a **gas safety management plan....** The plan shall also **include final post closure monitoring and control options.**	
	For ACD, accept any attachment labeled Gas Safety Management Plan.
36.13 P. Training program.	*For ACD, accept any attachment labeled Training Program*
Each operator shall conduct an **annual training program** for key personnel that includes general operations, permit conditions, emergencies proper sampling methods and identification of exempt and non-exempt waste and hazardous waste. The operator shall maintain records of such training, subject to division inspection, for five years.	**[Attachment 12]**
PART 3	
19.15.36.14 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO LANDFILLS	**[N/A - All of Part 3]**
36.14A. General operating requirements.	
(1) The operator shall **confine the landfill's working face** to the smallest practical area and compact the oil field waste to the smallest practical volume. The operator shall not use equipment that may damage the integrity of the liner system in direct contact with a geosynthetic liner.	

(2) The operator shall **prevent unauthorized access** by the public and entry by large animals to the landfill's active portion through the use of fences, gates, locks or other means that attain equivalent protection.	
~~(3) The operator shall prevent and extinguish fires.~~	*These are Permit Conditions, but not required to be ACD.*
~~(4) The operator shall control litter and odors.~~	
~~(5) The operator shall not excavate a closed cell or allow others to excavate a closed cell except as approved by the division.~~	
(6) The operator shall provide **adequate cover** for the landfill's active face as needed to control dust, debris, odors or other nuisances, or as otherwise required by the division.	
(7) For areas of the landfill that will not receive additional oil field waste for one month or more, but have not reached the final waste elevation, the operator shall provide **intermediate cover**....	
(8) Landfill cell closure: When the operator has filled a landfill cell, the operator shall **close it** pursuant to the conditions contained in the surface waste management facility permit and the requirements of Paragraph (2) of Subsection D of 19.15.36.18 NMAC. The operator shall notify the division's environmental bureau at least three working days prior to a landfill cell's closure.	
36.14B. Ground water monitoring program.	**19.15.36.8.C(7)** inspection and maintenance plan
• the operator shall .... establish a ground water monitoring program ... which shall include a ground water monitoring **work plan**, a **sampling and analysis plan**, a **ground water monitoring system** and a plan for **reporting** ground water monitoring results.	
• The ground water monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and depths, to yield ground water samples from the uppermost aquifer that:	
(1) represent the quality of background ground water that leakage from a landfill has not affected; and	
(2) represent the quality of ground water passing beneath and down gradient of the surface waste management facility.	
36.14C. Landfill design specification.	**19.15.36.8.C(5)** technical data and design drawings
New landfill design systems shall include **a base layer and a lower geomembrane liner (e.g., composite liner), a leak detection system, an upper geomembrane liner, a leachate collection and removal system, a leachate collection and removal system protective layer, an oil field waste zone and a top landfill cover.**	
	For ACD, accept any plan that refers to Landfill Design that has all of the required elements shown in bold. Details will be part of Technical Review. This is duplicative of 36.8C(xx) above.
(1) Base layer:	
• The **base layer** shall, at a minimum, consist of two feet of clay soil compacted to a minimum **90 percent standard proctor density** (ASTM D-698) with a hydraulic conductivity of 1 x 10-7 cm/sec or less.	
• In areas where no ground water is present, the operator may propose an alternative base layer design, subject to division approval.	
(2) **Lower geomembrane liner:**	
• The **lower geomembrane liner** shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division.	
(3) **Leak detection system:**	
• The operator shall place the **leak detection system**, which shall consist of two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-5 cm/sec or greater, between the lower and upper geomembrane liners.	
• The leak detection system shall consist of a drainage and collection system placed no more than six inches above the lower geomembrane liner in depressions and sloped so as to facilitate the earliest possible leak detection at designated collection points.	
• Drainage piping shall be designed to withstand chemical attack from oil field waste and leachate and structural loading and other stresses and disturbances from overlying oil field waste, cover materials, equipment operation, expansion or contraction, and to facilitate clean-out maintenance.	
• The material placed between the pipes and laterals shall be sufficiently permeable to allow the transport of fluids to the drainage pipe.	
• The slope of the landfill sub-grade and drainage pipes and laterals shall be at least two percent grade; i.e., two feet of vertical drop per 100 horizontal feet.	
• The piping collection network shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of schedule 80.	

• The operator shall seal a solid drainage pipe to convey collected liquids to a corrosion-proof sump or sumps located outside the landfill's perimeter for observation, storage, treatment or disposal.	
• The operator may install alternative designs as approved by the division.	
(4) The operator shall place the **upper geomembrane liner**, which shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division, over the leak detection system.	
(5) The operator shall place the **leachate collection and removal system**, which shall consist of at least two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater, over the upper geomembrane liner to facilitate drainage.	
• The leachate collection and removal system shall consist of a drainage and collection and removal system placed no more than six inches above the upper geomembrane liner in depressions and sloped so as to facilitate the maximum leachate collection.	
• Piping shall be designed to withstand chemical attack from oil field waste or leachate and structural loading and other stresses and disturbances from overlying oil field waste, cover materials, equipment operation, expansion or contraction and to facilitate clean-out maintenance.	
• The material placed between the pipes and laterals shall be sufficiently permeable to allow the transport of fluids to the drainage pipe.	
• The slope of the upper geomembrane liner and drainage lines and laterals shall be at least two percent grade; i.e., two feet of vertical drop per 100 horizontal feet.	
• The piping collection network shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of schedule 80.	
• The operator shall seal a solid drainage pipe to convey collected fluids outside the landfill's perimeter for storage, treatment and disposal.	
• The operator may install alternative designs as approved by the division.	
(6) The operator shall place the **leachate collection and removal system protection layer**, which shall consist of a soil layer at least one foot thick with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater, over the leachate collection and removal system.	
(7) The operator shall **place oil field waste** over the leachate collection and removal system protective layer.	
(8) The top landfill cover design shall consist of the following layers (top to bottom):	
• a **soil erosion layer** composed of at least 12 inches of fertile topsoil re-vegetated in accordance with the post closure provisions of Subparagraph (b) of Paragraph (2) of Subsection D of 19.15.36.18 NMAC;	
• a **protection or frost protection layer** composed of 12 to 30 inches of native soil;	
• a **drainage layer** composed of at least 12 inches of sand or gravel with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater and a minimum bottom slope of four percent,	
• **a hydraulic barrier-layer-geomembrane** (minimum of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division);	
• and a **gas vent or foundation layer** composed of at least 12 inches of sand or gravel above oil field waste with soils compacted to the minimum 80 percent Standard Proctor Density.	
• The operator shall **install the top landfill cover** within one year of achieving the final landfill cell waste elevation. ...	
(9) **Alternatively**, the operator may propose a performance-based landfill design system using geosynthetics or geocomposites, including geogrids, geonets, geosynthetic clay liners, composite liner systems, etc., when supported by EPA's "hydrologic evaluation of landfill performance" (HELP) model or other division-approved model.	
• The operator shall design the landfill to prevent the "bathtub effect".	
• The bathtub effect occurs when a more permeable cover is placed over a less permeable bottom liner or natural subsoil.	
(10) External piping, e.g., leachate collection, leak detection and sump removal systems shall be designed for installation of a **sidewall riser pipe**.	
• Pipes shall not penetrate the liner with the exception of gas vent or collection wells where the operator shall install a flexible clamped pipe riser through the top landfill cover liner that will accommodate oil field waste settling and will prevent tears.	
36.14 D. Liner specifications and requirements.	**19.15.36.8.C(5)** technical data and design drawings
	For ACD, accept any plan that refers to Liner Specs. Details will be part of Technical Review.
(1) General requirements.	

(a) Geomembrane liner specifications.	
• Geomembrane liners shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division.	
• Geomembrane liners shall have a **hydraulic conductivity** no greater than 1 x 10-9 cm/sec.	
• **Geomembrane liners** shall be composed of impervious, **geosynthetic material** that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions.	
• Liners shall also be **resistant to ultraviolet light**, or the operator shall make provisions to protect the material from sunlight.	
• Liner compatibility shall comply with EPA SW-846 **method 9090A**.	
(b) Liners shall be able to withstand projected loading stresses, settling and disturbances from overlying oil field waste, cover materials and equipment operations.	
(c) The operator shall construct liners with a minimum of **two percent slope** to promote positive drainage and to facilitate leachate collection and leak detection.	
(2) Additional requirements for geomembranes.	
(a) Geomembranes shall be **compatible** with the oil field waste to be disposed.	
• Geomembranes shall be resistant to chemical attack from the oil field waste or leachate.	
• **The operator shall demonstrate this** by means of the manufacturer's test reports, laboratory analyses or other division-approved method.	
(b) Geosynthetic material the operator installs on a **slope greater than 25 percent** shall be designed to withstand the calculated tensile forces acting upon the material.	
• The design shall consider the maximum friction angle of the geosynthetic with regard to a soil-geosynthetic or geosynthetic-geosynthetic interface and shall ensure that overall slope stability is maintained.	
(c) The operator shall **thermally seal (hot wedge) field seams** in geosynthetic material with a double track weld to create an air pocket for non-destructive air channel testing. In areas where double-track welding cannot be achieved, the operator may propose alternative thermal seaming methods.	
• A stabilized air pressure of 35psi, plus or minus one percent, shall be maintained for at least five minutes.	
• The operator shall overlap liners four to six inches before seaming, and shall orient seams parallel to the line of maximum slope; i.e., oriented along, not across, the slope.	
• The operator shall minimize the number of field seams in corners and irregularly shaped areas.	
• The operator shall use factory seams whenever possible.	
• The operator shall not install horizontal seams within five feet of the slope's toe. Qualified personnel shall perform all field seaming.	
36.14E. Requirements for the soil component of composite liners.	**19.15.36.8.C(5)** technical data and design drawings
(1) The operator shall place and compact the **base layer** to 90 percent standard proctor density on a prepared sub-grade.	
(2) The **soil surface** upon which the operator installs a geosynthetic shall be free of stones greater than one half inch in any dimension, organic matter, local irregularities, protrusions, loose soil and abrupt changes in grade that could damage the geosynthetic.	*For ACD, accept any plan that refers to Soil component of Composite Liners. Details will be part of Technical Review.*
(3) The operator shall compact a clay soil component of a composite liner to a minimum of **90 percent standard proctor density**, which shall have, unless otherwise approved by the division, a **plasticity index** greater than 10 percent, a **liquid limit** between 25 and 50 percent, a portion of material passing the **no. 200 sieve** (0.074 mm and less fraction) greater than 40 percent by weight; and a **clay content** greater than 18 percent by weight.	
36.14F. The leachate collection and removal system protective layer and the soil component of the leak detection system shall consist of soil materials that shall be free of organic matter, shall have a portion of material passing **the no. 200 sieve** no greater than five percent by weight and shall have a uniformity coefficient (Cu) less than 6, where Cu is defined as D60/D10.	**19.15.36.8.C(5)** technical data and design drawings
• Geosynthetic materials or geocomposites including geonets and geotextiles, if used as components of the leachate collection and removal or leak detection system, shall have a **hydraulic conductivity, transmissivity and chemical and physical qualities** that oil field waste placement, equipment operation or leachate generation will not adversely affect.	
• These geosynthetics or geocomposites, if used in conjunction with the soil protective cover for liners, shall have a hydraulic conductivity designed to ensure that the liner's hydraulic head never exceeds one foot.	*For ACD, accept any plan that refers to Leachate Collection and removal system protective layer. Details will be part of Technical Review.*
36.14G. Landfill gas control systems. If the gas safety management plan or requirements of other federal, state or local agencies require the installation of a gas control system at a landfill, the operator shall **submit a plan for division approval**, which shall include the following:	**19.15.36.8.C(13)** gas safety management plan

(1) the **system's design**, indicating the location and design of vents, barriers, collection piping and manifolds and other control measures that the operator will install (gas vent or collection wells shall incorporate a clamped and seamed pipe riser design through the top cover liner);	*For ACD, accept any plan that refers to Landfill Gas Control System. Details will be part of Technical Review.*
(2) if **gas recovery is proposed**, the **design of the proposed gas recovery system** and the system's major on-site components, including storage, transportation, processing, treatment or disposal measures required in the management of generated gases, condensates or other residues;	
(3) if gas processing is proposed, a **processing plan** designed in a manner that does not interfere or conflict with the activities on the site or required control measures or create or cause danger to persons or property;	
(4) if gas disposal is proposed, **a disposal plan** designed:	
(a) in a manner that does not interfere or conflict with the activities on the site or with required control measures;	
(b) so as not to create or cause danger to persons or property; and	
(c) with active forced ventilation, using vents located at least one foot above the landfill surface at each gas vent's location;	
(5) **physical and chemical characterization** of condensates or residues that are generated and a **plan for their disposal**;	
(6) means that the operator will implement to **prevent gas generation** and lateral migration such that	
(a) the concentration of the gases the landfill generates does not exceed 25 percent of the lower explosive limit for gases in surface waste management facility structures (excluding gas control or recovery system components); and	
(b) the concentration of gases does not exceed the lower explosive limit for gases at the surface waste management facility boundary; and	
(7) a **routine gas monitoring program** providing for monitoring at least quarterly; the specific type and frequency of monitoring to be determined based on the following:	
(a) soil conditions;	
(b) the hydrogeologic and hydraulic conditions surrounding the surface waste management facility; and	
(c) the location of surface waste management facility structures and property lines.	
36.14H. Landfill gas response. If gas levels exceed the limits specified in Paragraph (6) of Subsection G of19.15.36.14 NMAC, the operator shall:	**19.15.36.8.C(13)** gas safety management plan
(1) immediately take all necessary steps to ensure protection of fresh water, public health, safety and the environment and notify the division;	*For ACD, accept any plan that refers to Landfill Gas Response. Details will be part of Technical Review.*
(2) within seven days of detection, record gas levels detected and a description of the steps taken to protect fresh water, public health, safety and the environment;	
(3) within 30 days of detection, submit a remediation plan for gas releases that describes the problem's nature and extent and the proposed remedy; and	
(4) within 60 days after division approval, implement the remediation plan and notify the division that the plan has been implemented.	
PART 4	
19.15.36.15 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO LANDFARMS	**[N/A - All of Part 4]**
36.15A. Oil field waste acceptance criteria. Only soils and drill cuttings predominantly contaminated by petroleum hydrocarbons shall be placed in a landfarm.	**19.15.36.8.C(6)** waste management plan
• The division may approve placement of **tank bottoms** in a landfarm if the operator demonstrates that the tank bottoms do not contain economically recoverable petroleum hydrocarbons.	
• Soils and drill cuttings placed in a landfarm shall be sufficiently free of liquid content to **pass the paint filter test**, and shall not have a **chloride concentration** exceeding 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or exceeding 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste.	*36.15A is mostly Permit Conditions. Check for commitments to meet these requirements.*
• The person tendering oil field waste for treatment at a landfarm shall certify, **on form C-138**, that representative samples of the oil field waste have been subjected to the paint filter test and tested for chloride content, and that the samples have been found to conform to these requirements.	
• The landfarm's operator shall not accept oil field waste for landfarm treatment unless accompanied by this certification.	
36.15B. Background testing.	

• Prior to beginning operation of a new landfarm or to opening a new cell at an existing landfarm at which the operator has not already established background, the operator shall take, at a minimum, 12 composite background soil samples, with each consisting of 16 discrete samples from areas that previous operations have not impacted at least six inches below the original ground surface, to establish background soil concentrations for the entire surface waste management facility. The operator shall analyze the background soil samples for TPH, as determined by EPA method 418.1 or other EPA method approved by the division; BTEX, as determined by EPA SW-846 method 8021B or 8260B; chlorides; and other constituents listed in Subsections A and B of 20.6.2.3103 NMAC, using approved EPA methods.	
36.15C. Operation and oil field waste treatment.	
(1) The operator shall **berm** each landfarm cell to prevent rainwater run-on and run-off.	**19.15.36.8.C(6)** waste management plan
	19.15.36.8.C(11) stormwater run on/off management plan
	19.15.36.8.C(4) detailed construction/ installation diagrams
(2) The operator shall not place contaminated soils received after the effective date of 19.15.36 NMAC within 100 feet of the surface waste management facility's boundary.	**19.15.36.8.C(6)** waste management plan
(3) The operator shall not place contaminated soils received at a landfarm after the effective date of 19.15.36 NMAC within 20 feet of a pipeline crossing the landfarm.	**19.15.36.8.C(6)** waste management plan
(4) With **72 hours after receipt**, the operator shall spread and disk contaminated soils in eight-inch or less lifts or approximately 1000 cubic yards per acre per eight-inch lift or biopile.	**19.15.36.8.C(6)** waste management plan
(5) The operator shall ensure that soils are **disked biweekly and biopiles are turned at least monthly.**	**19.15.36.8.C(6)** waste management plan
(6) The operator shall add moisture, as necessary, to enhance bioremediation and to control blowing dust.	**19.15.36.8.C(6)** waste management plan
(7) The **application of microbes** for the purposes of enhancing bioremediation requires prior division approval.	**19.15.36.8.C(6)** waste management plan
(8) Pooling of liquids in the landfarm is prohibited. The **operator shall remove** freestanding water within 24 hours.	
(9) The operator shall maintain records of the landfarm's remediation activities in a form readily accessible for division inspection.	
(10) The division's environmental bureau may approve other treatment procedures if the operator demonstrates that they provide equivalent protection for fresh water, public health, safety and the environment.	**19.15.36.8.C(6)** waste management plan
	19.15.36.8.C(5) technical data and design drawings
36.15D. Treatment zone monitoring.	**19.15.36.8.C(6)** waste management plan
• The operator shall **spread contaminated soils** on the surface in eight-inch or less lifts or approximately 1000 cubic yards per acre per eight-inch lift.	
• The operator shall conduct **treatment zone monitoring** to ensure that prior to adding an additional lift the TPH concentration of each lift, as determined by EPA SW-846 method 8015M or EPA method 418.1 or other EPA method approved by the division, does not exceed 2500 mg/kg and that the chloride concentration, as determined by EPA method 300.1, does not exceed 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste.	
• The operator shall collect and **analyze at least one composite soil sample**, consisting of four discrete samples, from the treatment zone at least **semi-annually** using the methods specified below for TPH and chlorides.	
• The **maximum thickness** of treated soils in a landfarm cell shall not exceed two feet or approximately 3000 cubic yards per acre.	
• When that thickness is reached, the operator shall not place additional oil field waste in the landfarm cell until it has **demonstrated by monitoring** the treatment zone at least semi-annually that the contaminated soil has been treated to the standards specified in Subsection F of 19.15.36.15 NMAC or the contaminated soils have been removed to a division approved surface waste management facility.	
36.15E. Vadose zone monitoring.	*Permit condition, but not needed for ACD.*

(1) Sampling. The operator shall monitor the vadose zone beneath the treatment zone in each landfarm cell. The operator shall take the vadose zone samples from soils between three and four feet below the cell's original ground surface.	
(2) Semi-annual monitoring program. The operator shall collect and analyze a minimum of four randomly selected, independent samples from the vadose zone at least semi-annually using the methods specified below for TPH, BTEX and chlorides and shall compare each result to the higher of the PQL or the background soil concentrations to determine whether a release has occurred.	
(3) Five year monitoring program. The operator shall collect and analyze a minimum of four randomly selected, independent samples from the vadose zone, using the methods specified below for the constituents listed in Subsections A and B of 20.6.2.3103 NMAC at least every five years and shall compare each result to the higher of the PQL or the background soil concentrations to determine whether a release has occurred.	
(4) Record keeping. The operator shall maintain a copy of the monitoring reports in a form readily accessible for division inspection.	
(5) Release response.	
• If vadose zone sampling results show that the concentrations of TPH, BTEX or chlorides exceed the higher of the PQL or the background soil concentrations, then the operator shall notify the division's environmental bureau of the exceedance, and shall immediately collect and analyze a minimum of four randomly selected, independent samples for TPH, BTEX, chlorides and the constituents listed in Subsections A and B of 20.6.2.3103 NMAC.	
• The operator shall submit the results of the re-sampling event and a response action plan for the division's approval within 45 days of the initial notification. The response action plan shall address changes in the landfarm's operation to prevent further contamination and, if necessary, a plan for remediating existing contamination.	
36.15F. Treatment zone closure performance standards. After the operator has filled a landfarm cell to the **maximum thickness of two feet or approximately 3000 cubic yards per acre**, the operator shall **continue treatment** until the contaminated soil has been remediated to the higher of the background concentrations or the following closure performance standards. The operator shall demonstrate compliance with the closure performance standards by collecting and analyzing a minimum of **one composite soil sample, consisting of four discrete samples.**	**19.15.36.8.C(9)** closure and post-closure care plan
	Permit condition, but not needed for ACD
(1) Benzene, as determined by EPA SW-846 method 8021B or 8260B, shall not exceed 0.2 mg/kg.	
(2) Total BTEX, as determined by EPA SW-846 method 8021B or 8260B, shall not exceed 50 mg/kg.	
(3) The GRO and DRO combined fractions, as determined by EPA SW-846 method 8015M, shall not exceed 500 mg/kg. TPH, as determined by EPA method 418.1 or other EPA method approved by the division, shall not exceed 2500 mg/kg.	
(4) Chlorides, as determined by EPA method 300.1, shall not exceed 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste.	
(5) The concentration of constituents listed in Subsections A and B of 20.6.2.3103 NMAC shall be determined by EPA SW-846 methods 6010B or 6020 or other methods approved by the division. If the concentration of those constituents exceed the PQL or background concentration, the operator shall either perform a site specific risk assessment using EPA approved methods and shall propose closure standards based upon individual site conditions that protect fresh water, public health, safety and the environment, which shall be subject to division approval or remove pursuant to Paragraph (2) of Subsection G of 19.15.36.15 NMAC.	
36.15G. Disposition of treated soils.	**19.15.36.8.C(6)** waste management plan
	19.15.36.8.C(9) closure and post-closure care plan
(1) If the operator achieves the closure performance standards specified in **Subsection F** of 19.15.36.15 NMAC, then the operator may either leave the treated soils in place, or, with prior division approval, dispose or reuse of the treated soils in an alternative manner.	*Permit condition, but not needed for ACD.*
(2) If the operator cannot achieve the closure performance standards specified in Subsection F of 19.15.36.15 NMAC within five years or as extended by the division, then the operator shall remove contaminated soils from the landfarm cell and properly dispose of it at a division-permitted landfill, or reuse or recycle it in a manner approved by the division.	

(3) If the operator cannot achieve the closure performance standards specified in Subsection F of 19.15.36.15 NMAC within five years or as extended by the division, then the division may review the adequacy of the operator's financial assurance, as provided in Subsection G of 19.15.36.11 NMAC. In that event, the division may require the operator to modify its financial assurance to provide for the appropriate disposition of contaminated soil in a manner acceptable to the division.	
(4) The operator may request approval of an alternative soil closure standard from the division, provided that the operator shall give division-approved public notice of an application for alternative soil closure standards in the manner provided in 19.15.36.9 NMAC. The division may grant the request administratively if no person files an objection thereto within 30 days after publication of notice; otherwise the division shall set the matter for hearing.	
36.15H. Environmentally acceptable bioremediation endpoint approach.	**19.15.36.8.C(6)** waste management plan
	19.15.36.8.C(9) closure and post-closure care plan
(1) A landfarm operator may use an **environmentally acceptable bioremediation endpoint** approach to landfarm management in lieu of compliance with the requirements of Paragraph (3) of Subsection F of 19.15.36.15 NMAC....	*Permit condition, but not needed for ACD.*
(2) In addition to the requirements specified in Subsection C of 19.15.36.8 NMAC, **an operator who plans to use** an environmentally acceptable bioremediation endpoint approach shall submit for the division's review and approval a **detailed landfarm operation plan** for those landfarm cells exclusively dedicated to the use of the environmentally acceptable bioremediation endpoint approach. At a minimum, the operations plan shall include detailed information on the native soils, procedures to characterize each lift of contaminated soil, operating procedures and management procedures that the operator shall follow.	
(3) In addition to other operational requirements specified in 19.15.36.15 NMAC, the operator using an environmentally acceptable bioremediation endpoint approach shall comply with the following.	
(a) **Native soil information required.** The operator shall submit detailed information on the soil conditions present for each of its landfarm cells immediately prior to the application of the petroleum hydrocarbon- contaminated soils, including: treatment cell size, soil porosity, soil bulk density, soil pH, moisture content, field capacity, organic matter concentration, soil structure, SAR, EC, soil composition, soil temperature, soil nutrient (C:N:P) (calcium, nitrogen and phosphate) concentrations and oxygen content.	
(b) **Characterization of contaminated soil.** The operator shall submit a description of the procedures that it will follow to characterize each lift of contaminated soil or drill cuttings, prior to treating each lift of contaminated soil or drill cuttings, for petroleum hydrocarbon loading factor, TPH, BTEX, chlorides, constituents listed in Subsections A and B of 20.6.2.3103 NMAC, contaminated soil moisture, contaminated soil pH and API gravity of the petroleum hydrocarbons.	
(c) **Operating procedures.** The operator shall submit a description of the procedures, including a schedule, that it shall follow to properly monitor and amend each lift of contaminated soil in order to maximize bioremediation, including tilling procedures and schedule; procedures to limit petroleum hydrocarbon loading to less than five percent; procedures to maintain pH between six and eight; procedures to monitor and apply proper nutrients; procedures to monitor, apply and maintain moisture to 60 to 80 percent of field capacity; and procedures to monitor TPH concentrations.	
(d) **Management procedures.** The operator shall submit a description of the management procedures that it shall follow to properly schedule landfarming operations, including modifications during cold weather, record keeping, sampling and analysis, statistical procedures, routine reporting, determination and reporting of achievement of the environmentally acceptable bioremediation endpoint and closure and post-closure plans.	
PART 5	
19.15.36.17 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO	**[N/A - All of Part 5]**
EVAPORATION, STORAGE, TREATMENT AND SKIMMER PONDS:	
36.17A. Engineering design plan. An applicant for a surface waste management facility permit or modification requesting inclusion of a **skimmer pit; an evaporation, storage or treatment pond; or a below-grade tank** shall submit ...	*For ACD, accept any plan that refers to Engineering Design Plan and that has all of the required elements shown in bold. Details will be part of Technical Review.*
• a **detailed engineering design plan, certified by a registered profession engineer**,	

• including **operating and maintenance procedures**; **19.15.36.8.C(5)** technical data and design drawings	
• a **closure plan**; **19.15.36.8.C(9)** closure and post-closure care plan	
• and a **hydrologic report** that provides sufficient information and detail on the site's topography, soils, geology, surface hydrology and ground water hydrology to enable the division to evaluate the actual and potential effects on soils, surface water and ground water. **19.15.36.8.C(15)** geological/ hydrological data	
• The plan shall include detailed information on **dike protection and structural integrity**; **leak detection**, including an adequate **fluid collection and removal system**; **19.15.36.8.C(5)** technical data and design drawings	
• **liner specifications** and compatibility; **19.15.36.8.C(5)** technical data and design drawings	
• **freeboard and overtopping prevention**; **19.15.36.8.C(7)** inspection and maintenance plan	
• prevention of nuisance and hazardous **odors** such as **H2S**; **19.15.36.8.C(8)** hydrogen sulfide prevention and contingency plan: **19.15.36.8.C(7)** inspection and maintenance plan	
• an **emergency response plan**, unless the pit is part of a surface waste management facility that has an integrated contingency plan; **19.15.36.8.C(10)** contingency plan	
• **type** of oil field **waste stream**, including **chemical analysis**; **19.15.36.8.C(6)** waste management plan	
• **climatological factors**, including freeze-thaw cycles;	
• a **monitoring and inspection plan**; **19.15.36.8.C(7)** inspection and maintenance plan	
• erosion **control**; **19.15.36.8.C(7)** inspection and maintenance plan	
• and other pertinent information the division requests.	
36.17B. Construction, standards.	**19.15.36.8.C(5)** technical data and design drawings
(1) In general. The operator shall ensure each pit, pond and below-grade tank is designed, constructed and operated so as to contain liquids and solids in a manner that will protect fresh water, public health, safety and the environment.	*For ACD, accept any plan that refers to Construction Standards and that has all of the required elements shown in bold. Details will be part of Technical Review*
(2) Liners required. Each pit or pond shall contain, at a minimum, a **primary (upper) liner** and a **secondary (lower) liner** with a **leak detection system** appropriate to the site's conditions.	
(3) Liner specifications.	
• Liners shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division.	
• Synthetic (geomembrane) liners shall have a **hydraulic conductivity** no greater than 1 x 10-9 cm/sec.	
• Geomembrane liners shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions.	
• Liner materials shall be resistant to ultraviolet light, or the operator shall make provisions to protect the material from sunlight.	
• Liner compatibility shall comply with EPA **SW-846 method 9090A.**	
(4) Alternative liner media.	***Optional***
The division may approve other liner media if the operator demonstrates to the division's satisfaction that the alternative liner protects fresh water, public health, safety and the environment as effectively as the specified media.	**19.15.36.8.C(5)** technical data and design drawings
(5) Each pit or pond shall have a properly constructed **foundation** or firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities, in order to prevent rupture or tear of the liner and an **adequate anchor trench**; and shall be constructed so that the **inside grade** of the levee is no steeper than **2H:1V**. Levees shall have an **outside grade** no steeper than **3H:1V.**	
• The levees' tops shall be wide enough to install an **anchor trench** and provide adequate room for inspection and maintenance.	
• The operator shall **minimize liner seams** and **orient them up and down**, not across a slope. The operator shall use factory seams where possible.	
• The operator shall ensure **field seams** in geosynthetic material are **thermally seamed (hot wedge)** with a **double track weld** to create an air pocket for non-destructive air channel testing.	
• A stabilized air pressure of 35 psi, plus or minus one percent, shall be maintained for at least five minutes.	
• The operator shall **overlap liners four to six inches** before seaming, and orient seams parallel to the line of maximum slope, i.e., oriented along, not across, the slope.	
• The operator shall minimize the number of field seams in corners and irregularly shaped areas.	
• There shall be **no horizontal seams** within five feet of the slope's toe.	

• **Qualified personnel** shall perform field seaming.	
(6) At a point of discharge into or suction from the lined pit, the liner shall be protected from excessive hydrostatic force or mechanical damage, and external discharge lines shall not penetrate the liner.	
(7) Primary liners shall be constructed of a **synthetic material.**	
(8) A **secondary liner** may be a **synthetic liner or an alternative liner** approved by the division.	
• Secondary liners constructed with **compacted soil membranes**, i.e., natural or processed clay and other soils, shall be at least three feet thick, placed in six-inch lifts and compacted to 95 percent of the material's standard proctor density, or equivalent. Compacted soil membranes used in a liner shall undergo permeability testing in conformity with ASTM standards and methods approved by the division before and after construction.	
• Compacted soil membranes shall have a **hydraulic conductivity** of no greater than 1 x 10-8 cm/sec.	
• The operator shall submit results of **pre-construction testing** to the division for approval prior to construction.	
(9) Leak detection system: The operator shall place a **leak detection system** between the lower and upper geomembrane liners that consists of two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-5 cm/sec or greater to facilitate drainage.	
• The leak detection system shall consist of a properly designed **drainage and collection and removal system** placed above the lower geomembrane liner in depressions and sloped so as to facilitate the earliest possible leak detection.	
• **Piping** used shall be designed to withstand chemical attack from oil field waste or leachate;	
• **structural loading** from stresses and disturbances from overlying oil field waste, cover materials, equipment operation or expansion or contraction;	
• and to **facilitate clean-out maintenance**.	
• The **material** placed between the pipes and laterals shall be sufficiently **permeable** to allow the transport of fluids to the drainage pipe.	
• The **slope** of the interior sub-grade and of drainage lines and laterals shall be at least a **two percent grade**, i.e., two feet vertical drop per 100 horizontal feet.	
• The **piping collection system** shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of **schedule 80**.	
• The operator shall seal a **solid sidewall riser pipe** to convey collected fluids to a **collection, observation and disposal system** located outside the perimeter of the pit or pond.	
• The operator may install alternative methods as approved by the division.	
~~(10) The operator shall notify the division at least 72 hours prior to the primary liner's installation so that a division representative may inspect the leak detection system before it is covered.~~	*Permit Condition, not ACD. Note if included in application.*
(11) The operator shall construct pits and ponds in a manner that prevents overtopping due to wave action or rainfall, and maintain a **three foot freeboard** at all times.	
(12) The maximum size of an evaporation or storage pond shall not exceed **10 acre-feet.**	**19.15.36.8.C(5)** technical data and design drawings
36.17C. Operating standards.	**19.15.36.8.C(7)** inspection and maintenance plan
	Permit Condition, not ACD. Note if included in application.
(1) The operator shall ensure that only produced fluids or non-hazardous waste are discharged into or stored in a pit or pond;	**19.15.36.8.C(7)** inspection and maintenance plan
and that **no measurable or visible oil layer** is allowed to accumulate or remain anywhere on a pit's surface except an approved skimmer pit.	
(2) The operator shall **monitor leak detection systems** pursuant to the approved surface waste management facility permit conditions, maintain monitoring records in a form readily accessible for division inspection and report discovery of liquids in the leak detection system to the division within 24 hours.	
(3) **Fencing and netting.**	
• The operator shall fence or enclose pits or ponds to prevent unauthorized access and maintain fences in good repair.	
• Fences are not required if there is an adequate perimeter fence surrounding the surface waste management facility.	

• The operator shall screen, net, cover or otherwise render non- hazardous to migratory birds tanks exceeding eight feet in diameter and exposed pits and ponds.	
• Upon written application, the division may grant an exception to screening, netting or covering requirements upon the operator's showing that an alternative method will adequately protect migratory birds or that the tank or pit is not hazardous to migratory birds.	
• (4) **Spray systems:**	**19.15.36.8.C(5)** technical data and design drawings
• The division may approve **spray systems** to enhance natural evaporation.	
• The operator shall submit engineering designs for spray systems to the division's environmental bureau for approval prior to installation.	
• The operator shall ensure that spray evaporation systems are operated so that spray-borne suspended or dissolved solids remain within the perimeter of the pond's lined portion.	
(5) Skimmer Pits Or Tanks:	***Depending on the design, this may be an application requirement.***
• The operator shall use skimmer pits or tanks to **separate oil from produced water** prior to water discharge into a pond.	**19.15.36.8.C(6)** waste management plan
• The operator shall install a trap device in connected ponds to prevent solids and oils from transferring from one pond to another unless approved in the surface waste management facility permit.	**19.15.36.8.C(5)** technical data and design drawings
36.17D. Below-grade tanks and sumps.	
(1) **Secondary containment and leak detection:**	**19.15.36.8.C(5)** technical data and design drawings
• The operator shall construct below-grade tanks with **secondary containment and leak detection**.	
• The operator shall not allow below-grade tanks to overflow.	
• The operator shall install only below-grade tanks of materials resistant to the tank's particular contents and to damage from sunlight.	
(2) The operator shall **test sumps' integrity annually**, and shall promptly repair or replace a sump that does not demonstrate integrity.	
• The operator may test sumps that can be removed from their emplacements by visual inspection.	
• The operator shall test other sumps by appropriate mechanical means.	
• The operator shall maintain records of sump inspection and testing and make such records available for division inspection.	
E. Closure required. The operator shall properly close pits, ponds and below-grade tanks within six months after cessation of use.	**19.15.36.8.C(9)** closure and post-closure care plan
PART 6	
19.15.36.18 NMAC - CLOSURE AND POST CLOSURE:	
36.18A. Surface waste management facility closure by operator.	**19.15.36.8.C(9)** closure and post-closure care plan [Attachment 15]
(1) The operator shall **notify** the division's environmental bureau at least **60 days prior** to cessation of operations at the surface waste management facility and provide a proposed schedule for closure. Upon receipt of such notice and proposed schedule, the division shall review the current closure plan for adequacy and inspect the surface waste management facility.	**[Attachment 15, Section 2.4]**
~~(2) The division shall notify the operator within 60 days after the date of cessation of operations specified in the operator's closure notice of modifications of the closure plan and proposed schedule or additional requirements that it determines are necessary for the protection of fresh water, public health, safety or the environment.~~	*A(2) through A(5) are permit conditions or regulatory requirements, but not application requirements.*
~~(3) If the division does not notify the operator of additional closure requirements within 60 days as provided, the operator may proceed with closure in accordance with the approved closure plan, provided that the director may, for good cause, extend the time for the division's response for an additional period not to exceed 60 days by written notice to the operator.~~	
~~(4) The operator shall be entitled to a hearing concerning a modification or additional requirement the division seeks to impose if it files an application for a hearing within 10 days after receipt of written notice of the proposed modifications or additional requirements.~~	
~~(5) Closure shall proceed in accordance with the approved closure plan and schedule and modifications or additional requirements the division imposes. During closure operations the operator shall maintain the surface waste management facility to protect fresh water, public health, safety and the environment.~~	
(6) Re-vegetate: Upon completion of closure, the operator shall **re-vegetate** the site unless the division has approved an alternative site use plan as provided in Subsection G of 19.15.36.18 NMAC.	**[Attachment 15, Section 2.2]**

Re-vegetation, except for landfill cells, shall consist of establishment of a **vegetative cover** equal to 70 percent of the native perennial vegetative cover (un-impacted by overgrazing, fire or other intrusion damaging to native vegetation) or scientifically documented ecological description consisting of at least three native plant species, including at least one grass, but not including noxious weeds, and maintenance of that cover through two successive growing seasons.	**[N/A]**
36.18D. Surface waste management facility and cell closure and post closure standards.	**[Attachment 15, Section 2.3]**
The following minimum standards shall apply to closure and post closure of the installations indicated, whether the entire surface waste management facility is being closed or only a part of the surface waste management facility.	
(1) Oil treating plant closure. The operator shall ensure that:	**[Attachment 15, Section 2.3 As equivalent]**
(a) **tanks and equipment** used for oil treatment are cleaned and oil field waste is **disposed** of at a division-approved surface waste management facility (the operator shall reuse, recycle or remove tanks and equipment from the site within 90 days of closure);	**[Attachment 15, Section 2.3]**
(b) the **site is sampled**, in accordance with the procedures specified in chapter nine of EPA publication SW-846, test methods for evaluating solid waste, physical/chemical methods, for TPH, BTEX, major cations and anions and RCRA metals, in accordance with a gridded plat of the site containing at least four equal sections that the division has approved; and	**[Attachment 15, Section 2.3]**
(c) **sample results** are submitted to the environmental bureau in the division's Santa Fe office.	**[Attachment 15, Section 2.3]**
(2) Landfill cell closure.	
(a) The operator shall properly close landfill cells, covering the cell with a **top cover** pursuant to Paragraph (8) of Subsection C of 19.15.36.14 NMAC, with soil contoured to promote drainage of precipitation; **side slopes** shall not exceed a 25 percent grade (four feet horizontal to one foot vertical), such that the final cover of the landfill's top portion has a gradient of two percent to five percent, and the slopes are sufficient to prevent the ponding of water and erosion of the cover material.	**[N/A]**
(b) The operator shall **re-vegetate** the area overlying the cell with native grass covering at least 70 percent of the landfill cover and surrounding areas, consisting of at least two grasses and not including noxious weeds or deep rooted shrubs or trees, and maintain that cover through the post closure period.	**[N/A]**
(3) Landfill post closure. Following landfill closure, the post closure care period for a landfill shall be **30 years.**	**[N/A]**
(a) A **post closure care and monitoring plan** shall include maintenance of cover integrity, maintenance and operation of a leak detection system and leachate collection and removal system and operation of gas and ground water monitoring systems.	**[Attachment 15, Section 3]**
(b) The operator or other responsible entity shall **sample existing ground water monitoring wells annually** and submit reports of monitoring performance and data collected within 45 days after the end of each calendar year. The operator shall report any exceedance of a ground water standard that it discovers during monitoring pursuant to 19.15.29 NMAC.	**[N/A]**
(4) Landfarm closure. The operator shall ensure that:	**[N/A]**
(a) **disking** and addition of bioremediation enhancing materials continues until soils within the cells are remediated to the standards provided in Subsection F of 19.15.36.15 NMAC, or as otherwise approved by the division;	**[N/A]**
(b) soils remediated to the foregoing standards and left in place are **re-vegetated** in accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC;	**[N/A]**
(c) **landfarmed soils** that have not been or cannot be remediated to the standards in Subsection F of 19.15.36.15 NMAC are **removed** to a division-approved surface waste management facility and the landfarm remediation area is **filled in with native soil** and **re-vegetated** in accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC;	**[N/A]**
(d) if treated soils are removed, the **cell is filled in with native soils and re-vegetated** in	**[N/A]**
accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC;	
(e) **berms are removed**;	**[Attachment 15, Section 2.2]**
(f) **buildings, fences, roads and equipment are removed**, the site cleaned-up and tests conducted on the soils for contamination;	**[Attachment 15, Section 2.2]**
(g) **annual reports** of vadose zone and treatment zone sampling are submitted to the division's environmental bureau until the division has approved the surface waste management facility's **final closure**; and	**[N/A]**
(h) for an operator who chooses to use the **landfarm methods** specified in Subsection H of 19.15.36.15 NMAC, that the soil has an ECs of less than or equal to 4.0 mmhos/cm (dS/m) and a SAR of less than	**[N/A]**
or equal to 13.0.	**[N/A]**
36.18E. Pond and pit closure. The operator shall ensure that:	**[N/A]**

(1) **liquids in the ponds or pits are removed** and disposed of in a division-approved surface waste management facility;	[N/A]
(2) **liners are disposed of** in a division-approved surface waste management facility;	[N/A]
(3) **equipment** associated with the surface waste management facility **is removed**;	[N/A]
(4) the **site is sampled**, in accordance with the procedures specified in chapter nine of EPA publication SW-846, test methods for evaluating solid waste, physical/chemical methods for TPH, BTEX, metals and other inorganics listed in Subsections A and B of 20.6.2.3103 NMAC, in accordance with a gridded plat of the site containing at least four equal sections that the division has approved; and	[N/A]
(5) **sample results are submitted** to the environmental bureau in the division's Santa Fe office.	[N/A]
36.18F. Landfarm and pond and pit post closure.	[N/A]
• The **post-closure care period** for a landfarm or pond or pit shall be three years if the operator has achieved **clean closure**.	[N/A]
• During that period the operator or other responsible entity shall regularly **inspect and maintain required re-vegetation**.	[N/A]
• If there has been a release to the vadose zone or to ground water, then the operator shall comply with the applicable requirements of 19.15.30 NMAC and 19.15.29 NMAC.	[N/A]
G. Alternatives to re-vegetation. If the landowner contemplates use of the land where a cell or surface waste management facility is located for purposes inconsistent with re-vegetation, the landowner may, with division approval, implement an **alternative surface treatment** appropriate for the contemplated use, provided that the alternative treatment will effectively **prevent erosion**. ~~If the division approves an alternative to re-vegetation, it shall not release the portion of the operator's financial assurance reserved for post-closure until the landowner has obtained necessary regulatory approvals and begun implementation of such alternative use.~~	[N/A]

PART 1 19.15.36.8 NMAC - SURFACE WASTE MANAGEMENT FACILITY PERMITS AND APPLICATION REQUIREMENTS:		
Permit Application Requirements	***OCD Comments***	**Location in Application**
36.8C. Application requirements for new facilities, major modifications and permit renewals. 'An applicant or operator shall file an application, **form C-137**, for a permit for a new surface waste management facility, to modify an existing surface waste management facility or for permit renewal with the environmental bureau in the division's Santa Fe office. **The application shall include:**		Form C-137 included after cover letter
(1) the names and addresses of the **applicant and principal officers and owners** of 25 percent or more of the applicant;		Attachment 7
(2) a plat and topographic map showing the surface waste management facility's location in relation to governmental surveys (quarter-quarter section, township and range); highways or roads giving access to the surface waste management facility site; watercourses; fresh water sources, including wells and springs; and inhabited buildings within one mile of the site's perimeter;	Topographic Map: Landfill: 36.13.B(1-6) Landfarm: 36.13.B(1-6) Ponds/Pits: 36.13.B(1-6) Plat: Landfill: 36.13.C Landfarm: 36.13.C Ponds/Pits: 36.13.C	Attachment 8, Appendix 8-2
(3) the names and addresses of the **surface owners** of the real property on which the surface waste management facility is sited and **surface owners** of the real property **within one mile** of the site's perimeter;	Landfill: 36.13.C Landfarm: 36.13.C Ponds/Pits: 36.13.C	Attachment 9
(4) a **description** of the surface waste management facility with a **diagram** indicating the location of **fences and cattle guards**, and **detailed construction/installation diagrams of pits, liners, dikes, piping, sprayers, tanks, roads, fences, gates, berms, pipelines** crossing the surface waste management facility, **buildings** and **chemical storage areas**;	**Written Description:** **Map/Diagram:** 36.13.I fencing; **Construction/Installation Diagrams:** Landfill: 36.13.I fencing; 36.14.C(10) external piping Landfarm: 36.13.I fencing; 36.15.C(1) berms; Ponds/Pits: 36.13.I fencing; 36.17.A dike protection and integrity and fluid collection and removal system; 36.17.C(3) fencing and netting;	Attachment 10, with Appendices 10-1 & 10-2
(5) engineering designs, certified by a registered professional engineer, including **technical data on the design elements** of each applicable treatment, remediation and disposal method and **detailed designs of surface impoundments;**	**Engineered Drawings:** Landfill: 36.14.C; D; E; F; Landfarm: 36.15.C(1) berms; 36.15.C(10) Ponds/Pits: 36.17.A design plan, leak detection system; 36.17.B(1-12); 36.17.B(4); 36.17.C(4) spray system; 36.17.C(5) skimmer pit or tank; 36.17.D; **Technical Data/Specifications:** Landfill: 36.14.C; D; E; F; Landfarm: 36.15.C(10) Ponds/Pits: 36.17.A leak detection system, liner specifications; 36.17.B(1-12); 36.17.B(4); 36.17.C(4) spray system; 36.17.C(5) skimmer pit or tank; 36.17.D;	Attachment 11

(6) a **plan for management** of approved oil field wastes that complies with the **applicable requirements** contained in 19.15.36.13 NMAC **(Siting and Operational Requirements – See Part 2 below)**, 19.15.36.14 NMAC **(Landfills – See Part 3 below),** 19.15.36.15 NMAC **(Landfarms – See Part 4 below)**, and 19.15.36.17 NMAC **(Ponds – See Part 5 below);**	**Waste Management Plan:** Landfill: 36.13.D; E; F; G; H; 36.14.A; Landfarm: 36.13.D; E; F; G; H; 36.15.A; B; C(1-10); D; E; F; G; H; Ponds/Pits: 36.13.D; F; G; H; 36.17.A waste streams and chemical analysis; 36.17.C(5) skimmer pit or tank;	Attachment 12, Attachment 21
(7) an **inspection and maintenance plan** that complies with the requirements contained in **Subsection L of 19.15.36.13** NMAC; ***36.13L.*** *Each operator shall have an that includes the following:* *(1)* ***monthly inspection*** *of leak detection sumps including sampling if fluids are present with analyses of fluid samples furnished to the division; and maintenance of records of inspection dates, the inspector and the leak detection system's status;* *(2)* ***semi-annual inspection and sampling of monitoring wells*** *as required, with analyses of ground water furnished to the division; and maintenance of records of inspection dates, the inspector and ground water monitoring wells' status; and* *(3)* ***inspections of the berms*** *and the* ***outside walls of pond levees quarterly*** *and after a major rainfall or windstorm, and maintenance of berms in such a manner as to prevent erosion.*	**Inspection and Maintenance Plan;** Landfill: 36.14.B; 36.14.G.(7); Landfarm: 36.15.C(1) berms Ponds/Pits: 36.17.A freeboard and overtopping, monitoring and inspection plan; and erosion control; 36.17.C(1-2) *36.8C(7) adopts 36.13L (items 1 -3 in italics).*	Attachment 13
(8) a **hydrogen sulfide prevention and contingency plan** that complies with those provisions of **19.15.11** NMAC that apply to surface waste management facilities;	**Hydrogen Sulfide Prevention and Contingency Plan:** 19.15.11.2; 19.15.11.9-10; 19.15.11.12-14; 19.15.11.16 *36.8C(8) requires Operator to Comply with Part 11 (H2S).. Does not apply unless Operators tests for >100 ppm H2S.*	Attachment 14
(9) a **closure and post closure plan**, including a responsible third party contractor's **cost estimate**, sufficient to close the surface waste management facility in a manner that will protect fresh water, public health, safety and the environment (the closure and post closure plan shall comply with the requirements contained in **Subsection D of 19.15.36.18 NMAC); (See Part 6 below).**	**Closure and Post Closure Plan:** Landfill: 36.13.O; 36.14.A.(8); 36.18.A; 36.18.D(2-3); 36.18.G; Landfarm: 36.13.N; 36.15.F; G; H; 36.18.A; 36.18.D(4); 36.18.F; 36.18.G; Ponds/Pits: 36.13.N; 36.17.A closure plan; 36.17.E; 36.18.A; 36.18.E; 36.18.F; 36.18.G; Oil Treating Plant: 36.18.A; 36.18.D(1); 36.18.G; *36.8C(9) adopts 36.18. See Part 6 below.*	Attachment 15
(10) a **contingency plan** that complies with the requirements of **Subsection N of 19.15.36.13** NMAC and with NMSA 1978, Sections 12-12-1 through 12-12-30, as amended;	**Contingency Plan:** Landfill: 36.13.N Landfarm: 36.13.N Ponds/Pits: 36.13.N; 36.17.A emergency response plan; *36.8C(10) adopts 36.13N. See Part 2 below.*	Attachment 16
(11) a **plan to control run-on water onto the site and run-off water** from the site that complies with the requirements of **Subsection M of 19.15.36.13** NMAC;	**Stormwater Run-on/off Control Plan:** Landfill: 36.13.M; Landfarm: 36.13.M; 36.15.C(1); Ponds/Pits: 36.13.M; *36.8C(11) adopts 36.13M. See Part 2 below.*	Attachment 17

(12) in the case of an application to permit a **new or expanded landfill**, a **leachate management plan** that describes the anticipated amount of leachate that will be generated and the leachate's handling, storage, treatment and disposal, including final post closure options;	**Leachate Collection/Management Plan:** Landfill: 36.18.D(3)(a); *36.8C(12) adopts 36.14C(5), (6), & (10) and 36.14F . See Part 3 below.*	N/A
(13) in the case of an application to permit a new or **expanded landfill**, a **gas safety management plan** that complies with the requirements of **Subsection O of 19.15.36.13** NMAC;	**Landfill Gas Safety Management Plan:** Landfill: 36.13.O; 36.14.G; H; *36.8C(13) adopts 36.13O. See Part 2 below.*	N/A
(14) a **best management practice plan** to ensure protection of fresh water, public health, safety and the environment;		Attachment 20
(15) geological/hydrological data including:	Ponds/Pits: 36.17.A hydrologic report	Attachment 22
(a) a map showing names and location of streams, springs or other watercourses, and water wells within one mile of the site;	Landfill: 36.13.B(1-2); Landfarm: 36.13. B(1-2); Ponds/Pits: 36.13. B(1-2);	Attachment 8, Appendix 8-2
(b) laboratory analyses, performed by an independent commercial laboratory, for major cations and anions; BTEX; RCRA metals; and TDS of ground water samples of the shallowest fresh water aquifer beneath the proposed site;		Attachment 22, Appendix D
(c) depth to, formation name, type and thickness of the shallowest fresh water aquifer;	Landfill: 36.13.A.(1); Landfarm: 36.13.A.(2); 36.13.A.(3); Ponds/Pits: 36.13.A.(5);	Attachment 22, Section 3
(d) soil types beneath the proposed surface waste management facility, including a lithologic description of soil and rock members from ground surface down to the top of the shallowest fresh water aquifer;		Attachment 10, Section 2.8, Attachment 22, Section 2.3
(e) geologic cross-sections;		Attachment 22, Figures 6 & 7
(f) potentiometric maps for the shallowest fresh water aquifer; and		Attachment 22
(g) porosity, permeability, conductivity, compaction ratios and swelling characteristics for the sediments on which the contaminated soils will be placed;		Attachment 22, Appendix C
(16) certification by the applicant that information submitted in the application is true, accurate and complete to the best of the applicant's knowledge, after reasonable inquiry; and		Form C-137 included after cover letter
(17) other information that the division may require to demonstrate that the surface waste management facility's operation will not adversely impact fresh water, public health, safety or the environment and that the surface waste management facility will comply with division rules and orders.		No additional information requested at this time
PART 2 **19.15.36.13 NMAC - SITING AND OPERATIONAL REQUIREMENTS APPLICABLE TO ALL PERMITTED SURFACE WASTE MANAGEMENT FACILITIES:**		

36.13 A. Depth to ground water. (1) No landfill shall be located where ground water is less than 100 feet below the lowest elevation of the design depth at which the operator will place oil field waste. (2) No landfarm that accepts soil or drill cuttings with a chloride concentration that exceeds 500 mg/kg shall be located where ground water is less than 100 feet below the lowest elevation at which the operator will place oil field waste. See Subsection A of 19.15.36.15 NMAC for oil field waste acceptance criteria. (3) No landfarm that accepts soil or drill cuttings with a chloride concentration that is 500 mg/kg or less shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste. (4) No small landfarm shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste. (5) No other surface waste management facility shall be located where ground water is less than 50 feet below the lowest elevation at which the operator will place oil field waste.	**19.15.36.8.C(15)(c)** depth to, formation name, type and thickness of the shallowest fresh water aquifer;	Attachments 21 and 22
36.13 B. Siting Requirements: No surface waste management facility shall be located: (1) within 200 feet of a watercourse, lakebed, sinkhole or playa lake; (2) within an existing wellhead protection area or 100-year floodplain; (3) within, or within 500 feet of, a wetland; (4) within the area overlying a subsurface mine; (5) within 500 feet from the nearest permanent residence, school, hospital, institution or church in existence at the time of initial application; or (6) within an unstable area, unless the operator demonstrates that engineering measures have been incorporated into the surface waste management facility design to ensure that the surface waste management facility's integrity will not be compromised.	**19.15.36.8.C(2)** topographic map **19.15.36.8.C(15)(a)** a map showing names and location of streams, springs or other watercourses, and water wells within one mile of the site;	Attachment 21
36.13 C. Size: No surface waste management facility shall exceed **500 acres.**	**19.15.36.8.C(2)** plat	Attachment 21
36.13 D. **Form C-133:** The operator shall not accept oil field wastes transported by motor vehicle at the surface waste management facility unless the transporter has a **form C-133**, authorization to move liquid waste, approved by the division.	**19.15.36.8.C(6)** waste management plan	Attachment 12
36.13 E. The operator shall not place oil field waste containing free liquids in a landfill or landfarm cell. The operator shall use the **paint filter test**, as prescribed by the EPA (EPA SW-846, method 9095) to determine conformance of the oil field waste to this criterion.	**19.15.36.8.C(6)** waste management plan	N/A
36.13 F. Surface waste management facilities shall **accept only exempt or non-hazardous waste**, except as provided in Paragraph (3) of Subsection F of 19.15.36.13 NMAC. The operator shall not accept hazardous waste at a surface waste management facility. The operator shall not accept wastes containing NORM at a surface waste management facility except as provided in 19.15.35 NMAC.	**19.15.36.8.C(6)** waste management plan	Attachment 12

(1) Exempt oil field wastes. The operator shall require a certification on **form C-138**, signed by the generator or the generator's authorized agent, that represents and warrants that the oil field wastes are generated from oil and gas exploration and production operations, are exempt waste and are not mixed with non-exempt waste. The operator shall have the option to accept such certifications on a monthly, weekly or per load basis. The operator shall maintain and shall make the certificates available for the division's inspection.		Attachment 12
(2) Non-exempt, non-hazardous, oil field wastes. The operator shall require a form **C-138**, oil field waste document, signed by the generator or its authorized agent. This form shall be accompanied by acceptable documentation to determine that the oil field waste is non-hazardous.		Attachment 12
(3) Emergency non-oil field wastes. The operator may accept non-hazardous, non-oil field wastes in an emergency if ordered by the department of public safety. The operator shall complete a **form C-138**, oil field waste document, describing the waste, and maintain the same, accompanied by the department of public safety order, subject to division inspection.		Attachment 12
36.13 G. Records: The operator of a commercial facility shall **maintain records** reflecting the generator, the location of origin, the location of disposal within the commercial facility, the volume and type of oil field waste, the date of disposal and the hauling company for each load or category of oil field waste accepted at the commercial facility. The operator shall maintain such records for a period of not less than **five years** after the commercial facility's closure, subject to division inspection.	**19.15.36.8.C(6)** waste management plan	Attachment 12
36.13 H. Disposal at a commercial facility shall occur only when an **attendant is on duty** unless loads can be monitored or otherwise isolated for inspection before disposal. The surface waste management facility shall be secured to prevent unauthorized disposal.		Attachment 12
36.13 I. To protect migratory birds, **tanks exceeding eight feet in diameter, and exposed pits and ponds shall be screened, netted or covered.** Surface waste management facilities shall be **fenced** in a manner approved by the division.		Attachments 11 and 12
36.13 J. Sign: Surface waste management facilities shall have a **sign**, readable from a distance of 50 feet and containing the operator's name; surface waste management facility permit or order number; surface waste management facility location by unit letter, section, township and range; and emergency telephone numbers.		Attachment 12
36.13 K. The operators shall comply with the **spill reporting and corrective action** provisions of 19.15.30 NMAC or 19.15.29 NMAC.		Attachment 12

36.13 L. Each operator shall have an **inspection and maintenance plan** that includes the following: (1) **monthly inspection** of leak detection sumps including sampling if fluids are present with analyses of fluid samples furnished to the division; and maintenance of records of inspection dates, the inspector and the leak detection system's status; (2) **semi-annual inspection and sampling of monitoring wells** as required, with analyses of ground water furnished to the division; and maintenance of records of inspection dates, the inspector and ground water monitoring wells' status; and (3) **inspections of the berms** and the **outside walls of pond levees quarterly** and after a major rainfall or windstorm, and maintenance of berms in such a manner as to prevent erosion.	**19.15.36.8.C(7)** inspection and maintenance plan *This requirement is duplicative of C7 above.*	Attachment 13
36.13 M. Each operator shall have a **plan to control run-on water** onto the site and **run-off water** from the site, such that: (1) the run-on and run-off control system shall prevent flow onto the surface waste management facility's active portion during the peak discharge from a **25-year storm**; and (2) **run-off** from the surface waste management facility's active portion shall not be allowed to discharge a pollutant to the waters of the state or United States that violates state water quality standards.	**19.15.36.8.C(11)** stormwater run on/off management plan	Attachment 17
36.13 N. Contingency plan. Each operator shall have a contingency plan. .... The contingency plan for emergencies shall:	**19.15.36.8.C(10)** contingency plan *For Admin Completeness Determination (ACD), accept any attachment labeled Contingency Plan. Details will be part of Technical Review.*	Attachment 16
(1) **describe the actions** surface waste management facility personnel shall take in response to fires, explosions or releases to air, soil, surface water or ground water o contaminants or oil field waste containing constituents that could threaten fresh water, public health, safety or the environment;		Attachment 16
(2) **describe arrangements with local police departments, fire departments, hospitals, contractors and state and local emergency response teams to coordinate emergency services;**		Attachment 16
(3) list the **emergency coordinator's name;** address; and office, home and mobile phone numbers (where more than one person is listed, one shall be named as the primary emergency coordinator);		Attachment 16
(4) include a list, which shall be kept current, of **emergency equipment** ... containing a physical description of each item on the list and a brief outline of its capabilities;		Attachment 16
(5) include an **evacuation plan**		Attachment 16
(6) include an evaluation of **expected contaminants, expected media**		Attachment 16
(7) list where copies of the contingency plan will be kept, which shall include the surface waste management facility; local police departments, fire departments and hospitals; and state and local emergency response teams;		Attachment 16
(8) indicate when the **contingency plan will be amended,** which shall be within five working days whenever: (a) the surface waste management facility permit is revised or modified; (b) the plan fails in an emergency; (c) the surface waste management facility changes design, construction, operation, maintenance or other circumstances in a way that increases the potential for fires, explosions or releases of oil field waste constituents that could threaten fresh water, public health, safety or the environment or change the response necessary in an emergency; (d) the list of emergency coordinators or their contact information changes; or (e) the list of emergency equipment changes;		Attachment 16

(9) **describe how the emergency coordinator** or the coordinator's designee, whenever there is an imminent or actual emergency situation, will immediately; (a) **activate** internal surface waste management facility **alarms or communication systems**, where applicable, to notify surface waste management facility personnel; and (b) **notify appropriate state and local agencies** with designated response roles if their assistance is needed;		Attachment 16
(10) **describe how** the emergency coordinator, whenever there is a release, fire or explosion, will immediately **identify** the character, exact source, amount and extent of released materials and describe how the emergency coordinator will concurrently assess possible hazards to fresh water, public health, safety or the environment that may result from the release, fire or explosion;		Attachment 16
(11) **describe how**, if the surface waste management facility stops operations in response to fire, explosion or release, the emergency coordinator **will monitor** for leaks, pressure buildup, gas generation or rupture in valves, pipes or the equipment, wherever this is appropriate;		Attachment 16
(12) **describe how** the emergency coordinator, immediately after an emergency, will provide for **treating, storing or disposing of recovered oil field waste**, or other material that results from a release, fire or explosion at a surface waste management facility;		Attachment 16
(13) **describe how** the emergency coordinator will ensure that no oil field waste, which may be incompatible with the released material, is **treated, stored or disposed of** until cleanup procedures are complete; and		Attachment 16
(14) provide that the emergency coordinator **may amend the plan** during an emergency as necessary to protect fresh water, public health, safety or the environment.		Attachment 16
36.13 O. Gas safety management plan. Each operator ... a **landfill** shall have a **gas safety management plan....** The plan shall also **include final post closure monitoring and control options.**	**19.15.36.8.C(13)** gas safety management plan *For ACD, accept any attachment labeled Gas Safety Management Plan.*	N/A
36.13 P. Training program. Each operator shall conduct an **annual training program** for key personnel that includes general operations, permit conditions, emergencies proper sampling methods and identification of exempt and non-exempt waste and hazardous waste. The operator shall maintain records of such training, subject to division inspection, for five years.	*For ACD, accept any attachment labeled Training Program*	Attachment 12
PART 3 **19.15.36.14 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO LANDFILLS**		
36.14A. General operating requirements.		
(1) The operator shall **confine the landfill's working face** to the smallest practical area and compact the oil field waste to the smallest practical volume. The operator shall not use equipment that may damage the integrity of the liner system in direct contact with a geosynthetic liner.		N/A
(2) The operator shall **prevent unauthorized access** by the public and entry by large animals to the landfill's active portion through the use of fences, gates, locks or other means that attain equivalent protection.		N/A
~~(3) The operator shall prevent and extinguish fires.~~	*These are Permit Conditions, but not required to be ACD.*	
~~(4) The operator shall control litter and odors.~~		

~~(5) The operator shall not excavate a closed cell or allow others to excavate a closed cell except as approved by the division.~~		
(6) The operator shall provide **adequate cover** for the landfill's active face as needed to control dust, debris, odors or other nuisances, or as otherwise required by the division.		N/A
(7) For areas of the landfill that will not receive additional oil field waste for one month or more, but have not reached the final waste elevation, the operator shall provide **intermediate cover**....		N/A
(8) Landfill cell closure: When the operator has filled a landfill cell, the operator shall **close it** pursuant to the conditions contained in the surface waste management facility permit and the requirements of Paragraph (2) of Subsection D of 19.15.36.18 NMAC. The operator shall notify the division's environmental bureau at least three working days prior to a landfill cell's closure.		N/A
36.14B. Ground water monitoring program. the operator shall .... establish a ground water monitoring program ... which shall include a ground water monitoring **work plan**, a **sampling and analysis plan**, a **ground water monitoring system** and a plan for **reporting** ground water monitoring results. The ground water monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and depths, to yield ground water samples from the uppermost aquifer that: (1) represent the quality of background ground water that leakage from a landfill has not affected; and (2) represent the quality of ground water passing beneath and down gradient of the surface waste management facility.	**19.15.36.8.C(7)** inspection and maintenance plan	N/A
36.14C. Landfill design specification. New landfill design systems shall include **a base layer and a lower geomembrane liner (e.g., composite liner), a leak detection system, an upper geomembrane liner, a leachate collection and removal system, a leachate collection and removal system protective layer, an oil field waste zone and a top landfill cover.**	**19.15.36.8.C(5)** technical data and design drawings *For ACD, accept any plan that refers to Landfill Design that has all of the required elements shown in bold. Details will be part of Technical Review. This is duplicative of 36.8C(xx) above.*	N/A
(1) Base layer: The **base layer** shall, at a minimum, consist of two feet of clay soil compacted to a minimum **90 percent standard proctor density** (ASTM D-698) with a hydraulic conductivity of 1 x 10-7 cm/sec or less. In areas where no ground water is present, the operator may propose an alternative base layer design, subject to division approval.		N/A
(2) **Lower geomembrane liner:** The **lower geomembrane liner** shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division.		N/A

(3) **Leak detection system:** The operator shall place the **leak detection system**, which shall consist of two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-5 cm/sec or greater, between the lower and upper geomembrane liners. The leak detection system shall consist of a drainage and collection system placed no more than six inches above the lower geomembrane liner in depressions and sloped so as to facilitate the earliest possible leak detection at designated collection points. Drainage piping shall be designed to withstand chemical attack from oil field waste and leachate and structural loading and other stresses and disturbances from overlying oil field waste, cover materials, equipment operation, expansion or contraction, and to facilitate clean-out maintenance. The material placed between the pipes and laterals shall be sufficiently permeable to allow the transport of fluids to the drainage pipe. The slope of the landfill sub-grade and drainage pipes and laterals shall be at least two percent grade; i.e., two feet of vertical drop per 100 horizontal feet. The piping collection network shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of schedule 80. The operator shall seal a solid drainage pipe to convey collected liquids to a corrosion-proof sump or sumps located outside the landfill's perimeter for observation, storage, treatment or disposal. The operator may install alternative designs as approved by the division.		N/A
(4) The operator shall place the **upper geomembrane liner**, which shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division, over the leak detection system.		N/A
(5) The operator shall place the **leachate collection and removal system**, which shall consist of at least two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater, over the upper geomembrane liner to facilitate drainage. The leachate collection and removal system shall consist of a drainage and collection and removal system placed no more than six inches above the upper geomembrane liner in depressions and sloped so as to facilitate the maximum leachate collection. Piping shall be designed to withstand chemical attack from oil field waste or leachate and structural loading and other stresses and disturbances from overlying oil field waste, cover materials, equipment operation, expansion or contraction and to facilitate clean-out maintenance. The material placed between the pipes and laterals shall be sufficiently permeable to allow the transport of fluids to the drainage pipe. The slope of the upper geomembrane liner and drainage lines and laterals shall be at least two percent grade; i.e., two feet of vertical drop per 100 horizontal feet. The piping collection network shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of schedule 80. The operator shall seal a solid drainage pipe to convey collected fluids outside the landfill's perimeter for storage, treatment and disposal. The operator may install alternative designs as approved by the division.		N/A
(6) The operator shall place the **leachate collection and removal system protection layer**, which shall consist of a soil layer at least one foot thick with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater, over the leachate collection and removal system.		N/A

(7) The operator shall **place oil field waste** over the leachate collection and removal system protective layer.		N/A
(8) The top landfill cover design shall consist of the following layers (top to bottom): a **soil erosion layer** composed of at least 12 inches of fertile topsoil re-vegetated in accordance with the post closure provisions of Subparagraph (b) of Paragraph (2) of Subsection D of 19.15.36.18 NMAC; a **protection or frost protection layer** composed of 12 to 30 inches of native soil; a **drainage layer** composed of at least 12 inches of sand or gravel with a saturated hydraulic conductivity of 1 x 10-2 cm/sec or greater and a minimum bottom slope of four percent, **a hydraulic barrier-layer-geomembrane** (minimum of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division); and a **gas vent or foundation layer** composed of at least 12 inches of sand or gravel above oil field waste with soils compacted to the minimum 80 percent Standard Proctor Density. The operator shall **install the top landfill cover** within one year of achieving the final landfill cell waste elevation. ...		N/A
(9) **Alternatively**, the operator may propose a performance-based landfill design system using geosynthetics or geocomposites, including geogrids, geonets, geosynthetic clay liners, composite liner systems, etc., when supported by EPA's "hydrologic evaluation of landfill performance" (HELP) model or other division-approved model. The operator shall design the landfill to prevent the "bathtub effect". The bathtub effect occurs when a more permeable cover is placed over a less permeable bottom liner or natural subsoil.		N/A
(10) External piping, e.g., leachate collection, leak detection and sump removal systems shall be designed for installation of a **sidewall riser pipe**. Pipes shall not penetrate the liner with the exception of gas vent or collection wells where the operator shall install a flexible clamped pipe riser through the top landfill cover liner that will accommodate oil field waste settling and will prevent tears.		N/A
36.14 D. Liner specifications and requirements.	**19.15.36.8.C(5)** technical data and design drawings *For ACD, accept any plan that refers to Liner Specs. Details will be part of Technical Review.*	N/A
(1) General requirements. (a) Geomembrane liner specifications. Geomembrane liners shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division. Geomembrane liners shall have a **hydraulic conductivity** no greater than 1 x 10-9 cm/sec. **Geomembrane liners** shall be composed of impervious, **geosynthetic material** that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. Liners shall also be **resistant to ultraviolet light,** or the operator shall make provisions to protect the material from sunlight. Liner compatibility shall comply with EPA SW-846 **method 9090A**. (b) Liners shall be able to withstand projected loading stresses, settling and disturbances from overlying oil field waste, cover materials and equipment operations. (c) The operator shall construct liners with a minimum of **two percent slope** to promote positive drainage and to facilitate leachate collection and leak detection.		N/A

(2) Additional requirements for geomembranes. (a) Geomembranes shall be **compatible** with the oil field waste to be disposed. Geomembranes shall be resistant to chemical attack from the oil field waste or leachate. **The operator shall demonstrate this** by means of the manufacturer's test reports, laboratory analyses or other division-approved method. (b) Geosynthetic material the operator installs on a **slope greater than 25 percent** shall be designed to withstand the calculated tensile forces acting upon the material. The design shall consider the maximum friction angle of the geosynthetic with regard to a soil-geosynthetic or geosynthetic-geosynthetic interface and shall ensure that overall slope stability is maintained. (c) The operator shall **thermally seal (hot wedge) field seams** in geosynthetic material with a double track weld to create an air pocket for non-destructive air channel testing. In areas where double-track welding cannot be achieved, the operator may propose alternative thermal seaming methods. A stabilized air pressure of 35psi, plus or minus one percent, shall be maintained for at least five minutes. The operator shall overlap liners four to six inches before seaming, and shall orient seams parallel to the line of maximum slope; i.e., oriented along, not across, the slope. The operator shall minimize the number of field seams in corners and irregularly shaped areas. The operator shall use factory seams whenever possible. The operator shall not install horizontal seams within five feet of the slope's toe. Qualified personnel shall perform all field seaming.		N/A
36.14E. Requirements for the soil component of composite liners. (1) The operator shall place and compact the **base layer** to 90 percent standard proctor density on a prepared sub-grade. (2) The **soil surface** upon which the operator installs a geosynthetic shall be free of stones greater than one half inch in any dimension, organic matter, local irregularities, protrusions, loose soil and abrupt changes in grade that could damage the geosynthetic. (3) The operator shall compact a clay soil component of a composite liner to a minimum of **90 percent standard proctor density**, which shall have, unless otherwise approved by the division, a **plasticity index** greater than 10 percent, a **liquid limit** between 25 and 50 percent, a portion of material passing the **no. 200 sieve** (0.074 mm and less fraction) greater than 40 percent by weight; and a **clay content** greater than 18 percent by weight.	**19.15.36.8.C(5)** technical data and design drawings *For ACD, accept any plan that refers to Soil component of Composite Liners. Details will be part of Technical Review.*	N/A

36.14F. The leachate collection and removal system protective layer and the soil component of the leak detection system shall consist of soil materials that shall be free of organic matter, shall have a portion of material passing **the no. 200 sieve** no greater than five percent by weight and shall have a uniformity coefficient (Cu) less than 6, where Cu is defined as D60/D10. Geosynthetic materials or geocomposites including geonets and geotextiles, if used as components of the leachate collection and removal or leak detection system, shall have a **hydraulic conductivity, transmissivity and chemical and physical qualities** that oil field waste placement, equipment operation or leachate generation will not adversely affect. These geosynthetics or geocomposites, if used in conjunction with the soil protective cover for liners, shall have a hydraulic conductivity designed to ensure that the liner's hydraulic head never exceeds one foot.	**19.15.36.8.C(5)** technical data and design drawings *For ACD, accept any plan that refers to Leachate Collection and removal system protective layer. Details will be part of Technical Review.*	N/A
36.14G. Landfill gas control systems. If the gas safety management plan or requirements of other federal, state or local agencies require the installation of a gas control system at a landfill, the operator shall **submit a plan for division approval**, which shall include the following:	**19.15.36.8.C(13)** gas safety management plan	N/A
(1) the **system's design**, indicating the location and design of vents, barriers, collection piping and manifolds and other control measures that the operator will install (gas vent or collection wells shall incorporate a clamped and seamed pipe riser design through the top cover liner);	*For ACD, accept any plan that refers to Landfill Gas Control System. Details will be part of Technical Review.*	N/A
(2) if **gas recovery is proposed**, the **design of the proposed gas recovery system** and the system's major on-site components, including storage, transportation, processing, treatment or disposal measures required in the management of generated gases, condensates or other residues;		N/A
(3) if gas processing is proposed, a **processing plan** designed in a manner that does not interfere or conflict with the activities on the site or required control measures or create or cause danger to persons or property;		N/A
(4) if gas disposal is proposed, a **disposal plan** designed: (a) in a manner that does not interfere or conflict with the activities on the site or with required control measures; (b) so as not to create or cause danger to persons or property; and (c) with active forced ventilation, using vents located at least one foot above the landfill surface at each gas vent's location;		N/A
(5) **physical and chemical characterization** of condensates or residues that are generated and a **plan for their disposal**;		N/A
(6) means that the operator will implement to **prevent gas generation** and lateral migration such that (a) the concentration of the gases the landfill generates does not exceed 25 percent of the lower explosive limit for gases in surface waste management facility structures (excluding gas control or recovery system components); and (b) the concentration of gases does not exceed the lower explosive limit for gases at the surface waste management facility boundary; and		N/A
(7) a **routine gas monitoring program** providing for monitoring at least quarterly; the specific type and frequency of monitoring to be determined based on the following: (a) soil conditions; (b) the hydrogeologic and hydraulic conditions surrounding the surface waste management facility; and (c) the location of surface waste management facility structures and property lines.		N/A

36.14H. Landfill gas response. If gas levels exceed the limits specified in Paragraph (6) of Subsection G of19.15.36.14 NMAC, the operator shall:	**19.15.36.8.C(13)** gas safety management plan	N/A
(1) immediately take all necessary steps to ensure protection of fresh water, public health, safety and the environment and notify the division;	*For ACD, accept any plan that refers to Landfill Gas Response. Details will be part of Technical Review.*	N/A
(2) within seven days of detection, record gas levels detected and a description of the steps taken to protect fresh water, public health, safety and the environment;		N/A
(3) within 30 days of detection, submit a remediation plan for gas releases that describes the problem's nature and extent and the proposed remedy; and		N/A
(4) within 60 days after division approval, implement the remediation plan and notify the division that the plan has been implemented.		N/A
PART 4 **19.15.36.15 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO LANDFARMS**		
36.15A. Oil field waste acceptance criteria. Only soils and drill cuttings predominantly contaminated by petroleum hydrocarbons shall be placed in a landfarm. The division may approve placement of **tank bottoms** in a landfarm if the operator demonstrates that the tank bottoms do not contain economically recoverable petroleum hydrocarbons. Soils and drill cuttings placed in a landfarm shall be sufficiently free of liquid content to **pass the paint filter test**, and shall not have a **chloride concentration** exceeding 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or exceeding 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste. The person tendering oil field waste for treatment at a landfarm shall certify, on **form C-138**, that representative samples of the oil field waste have been subjected to the paint filter test and tested for chloride content, and that the samples have been found to conform to these requirements. The landfarm's operator shall not accept oil field waste for landfarm treatment unless accompanied by this certification.	**19.15.36.8.C(6)** waste management plan *36.15A is mostly Permit Conditions. Check for commitments to meet these requirements.*	N/A
36.15B. Background testing. Prior to beginning operation of a new landfarm or to opening a new cell at an existing landfarm at which the operator has not already established background, the operator shall take, at a minimum, 12 composite background soil samples, with each consisting of 16 discrete samples from areas that previous operations have not impacted at least six inches below the original ground surface, to establish background soil concentrations for the entire surface waste management facility. The operator shall analyze the background soil samples for TPH, as determined by EPA method 418.1 or other EPA method approved by the division; BTEX, as determined by EPA SW-846 method 8021B or 8260B; chlorides; and other constituents listed in Subsections A and B of 20.6.2.3103 NMAC, using approved EPA methods.		N/A
36.15C. Operation and oil field waste treatment.		N/A
(1) The operator shall **berm** each landfarm cell to prevent rainwater run-on and run-off.	**19.15.36.8.C(6)** waste management plan **19.15.36.8.C(11)** stormwater run on/off management plan **19.15.36.8.C(4)** detailed construction/ installation diagrams	N/A

(2) The operator shall not place contaminated soils received after the effective date of 19.15.36 NMAC within 100 feet of the surface waste management facility's boundary.	**19.15.36.8.C(6)** waste management plan	N/A
(3) The operator shall not place contaminated soils received at a landfarm after the effective date of 19.15.36 NMAC within 20 feet of a pipeline crossing the landfarm.	**19.15.36.8.C(6)** waste management plan	N/A
(4) With **72 hours after receipt**, the operator shall spread and disk contaminated soils in eight-inch or less lifts or approximately 1000 cubic yards per acre per eight-inch lift or biopile.	**19.15.36.8.C(6)** waste management plan	N/A
(5) The operator shall ensure that soils are **disked biweekly and biopiles are turned at least monthly.**	**19.15.36.8.C(6)** waste management plan	N/A
(6) The operator shall add moisture, as necessary, to enhance bioremediation and to control blowing dust.	**19.15.36.8.C(6)** waste management plan	N/A
(7) The **application of microbes** for the purposes of enhancing bioremediation requires prior division approval.	**19.15.36.8.C(6)** waste management plan	N/A
(8) Pooling of liquids in the landfarm is prohibited. The **operator shall remove** freestanding water within 24 hours.		N/A
(9) The operator shall maintain records of the landfarm's remediation activities in a form readily accessible for division inspection.		N/A
(10) The division's environmental bureau may approve other treatment procedures if the operator demonstrates that they provide equivalent protection for fresh water, public health, safety and the environment.	**19.15.36.8.C(6)** waste management plan **19.15.36.8.C(5)** technical data and design drawings	N/A
36.15D. Treatment zone monitoring. The operator shall **spread contaminated soils** on the surface in eight- inch or less lifts or approximately 1000 cubic yards per acre per eight-inch lift. The operator shall conduct **treatment zone monitoring** to ensure that prior to adding an additional lift the TPH concentration of each lift, as determined by EPA SW-846 method 8015M or EPA method 418.1 or other EPA method approved by the division, does not exceed 2500 mg/kg and that the chloride concentration, as determined by EPA method 300.1, does not exceed 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste. The operator shall collect and **analyze at least one composite soil sample**, consisting of four discrete samples, from the treatment zone at least **semi-annually** using the methods specified below for TPH and chlorides. The **maximum thickness** of treated soils in a landfarm cell shall not exceed two feet or approximately 3000 cubic yards per acre. When that thickness is reached, the operator shall not place additional oil field waste in the landfarm cell until it has **demonstrated by monitoring** the treatment zone at least semi-annually that the contaminated soil has been treated to the standards specified in Subsection F of 19.15.36.15 NMAC or the contaminated soils have been removed to a division approved surface waste management facility.	**19.15.36.8.C(6)** waste management plan	N/A
36.15E. Vadose zone monitoring.	*Permit condition, but not needed for ACD.*	N/A
(1) Sampling. The operator shall monitor the vadose zone beneath the treatment zone in each landfarm cell. The operator shall take the vadose zone samples from soils between three and four feet below the cell's original ground surface.		N/A

(2) Semi-annual monitoring program. The operator shall collect and analyze a minimum of four randomly selected, independent samples from the vadose zone at least semi-annually using the methods specified below for TPH, BTEX and chlorides and shall compare each result to the higher of the PQL or the background soil concentrations to determine whether a release has occurred.		N/A
(3) Five year monitoring program. The operator shall collect and analyze a minimum of four randomly selected, independent samples from the vadose zone, using the methods specified below for the constituents listed in Subsections A and B of 20.6.2.3103 NMAC at least every five years and shall compare each result to the higher of the PQL or the background soil concentrations to determine whether a release has occurred.		N/A
(4) Record keeping. The operator shall maintain a copy of the monitoring reports in a form readily accessible for division inspection.		N/A
(5) Release response. If vadose zone sampling results show that the concentrations of TPH, BTEX or chlorides exceed the higher of the PQL or the background soil concentrations, then the operator shall notify the division's environmental bureau of the exceedance, and shall immediately collect and analyze a minimum of four randomly selected, independent samples for TPH, BTEX, chlorides and the constituents listed in Subsections A and B of 20.6.2.3103 NMAC. The operator shall submit the results of the re-sampling event and a response action plan for the division's approval within 45 days of the initial notification. The response action plan shall address changes in the landfarm's operation to prevent further contamination and, if necessary, a plan for remediating existing contamination.		N/A
36.15F. Treatment zone closure performance standards. After the operator has filled a landfarm cell to the **maximum thickness of two feet or approximately 3000 cubic yards per acre**, the operator shall **continue treatment** until the contaminated soil has been remediated to the higher of the background concentrations or the following closure performance standards. The operator shall demonstrate compliance with the closure performance standards by collecting and analyzing a minimum of **one composite soil sample, consisting of four discrete samples.**	**19.15.36.8.C(9)** closure and post-closure care plan *Permit condition, but not needed for ACD*	N/A
(1) Benzene, as determined by EPA SW-846 method 8021B or 8260B, shall not exceed 0.2 mg/kg.		N/A
(2) Total BTEX, as determined by EPA SW-846 method 8021B or 8260B, shall not exceed 50 mg/kg.		N/A
(3) The GRO and DRO combined fractions, as determined by EPA SW-846 method 8015M, shall not exceed 500 mg/kg. TPH, as determined by EPA method 418.1 or other EPA method approved by the division, shall not exceed 2500 mg/kg.		N/A
(4) Chlorides, as determined by EPA method 300.1, shall not exceed 500 mg/kg if the landfarm is located where ground water is less than 100 feet but at least 50 feet below the lowest elevation at which the operator will place oil field waste or 1000 mg/kg if the landfarm is located where ground water is 100 feet or more below the lowest elevation at which the operator will place oil field waste.		N/A
(5) The concentration of constituents listed in Subsections A and B of 20.6.2.3103 NMAC shall be determined by EPA SW-846 methods 6010B or 6020 or other methods approved by the division. If the concentration of those constituents exceed the PQL or background concentration, the operator shall either perform a site specific risk assessment using EPA approved methods and shall propose closure standards based upon individual site conditions that protect fresh water, public health, safety and the environment, which shall be subject to division approval or remove pursuant to Paragraph (2) of Subsection G of 19.15.36.15 NMAC.		N/A

36.15G. Disposition of treated soils.	**19.15.36.8.C(6)** waste management plan **19.15.36.8.C(9)** closure and post-closure care plan	N/A
(1) If the operator achieves the closure performance standards specified in **Subsection F** of 19.15.36.15 NMAC, then the operator may either leave the treated soils in place, or, with prior division approval, dispose or reuse of the treated soils in an alternative manner.	*Permit condition, but not needed for ACD.*	N/A
(2) If the operator cannot achieve the closure performance standards specified in Subsection F of 19.15.36.15 NMAC within five years or as extended by the division, then the operator shall remove contaminated soils from the landfarm cell and properly dispose of it at a division-permitted landfill, or reuse or recycle it in a manner approved by the division.		N/A
(3) If the operator cannot achieve the closure performance standards specified in Subsection F of 19.15.36.15 NMAC within five years or as extended by the division, then the division may review the adequacy of the operator's financial assurance, as provided in Subsection G of 19.15.36.11 NMAC. In that event, the division may require the operator to modify its financial assurance to provide for the appropriate disposition of contaminated soil in a manner acceptable to the division.		N/A
(4) The operator may request approval of an alternative soil closure standard from the division, provided that the operator shall give division-approved public notice of an application for alternative soil closure standards in the manner provided in 19.15.36.9 NMAC. The division may grant the request administratively if no person files an objection thereto within 30 days after publication of notice; otherwise the division shall set the matter for hearing.		N/A
36.15H. Environmentally acceptable bioremediation endpoint approach.	**19.15.36.8.C(6)** waste management plan **19.15.36.8.C(9)** closure and post-closure care plan	N/A
(1) A landfarm operator may use an **environmentally acceptable bioremediation endpoint** approach to landfarm management in lieu of compliance with the requirements of Paragraph (3) of Subsection F of 19.15.36.15 NMAC....	*Permit condition, but not needed for ACD.*	N/A
(2) In addition to the requirements specified in Subsection C of 19.15.36.8 NMAC, **an operator who plans to use** an environmentally acceptable bioremediation endpoint approach shall submit for the division's review and approval a **detailed landfarm operation plan** for those landfarm cells exclusively dedicated to the use of the environmentally acceptable bioremediation endpoint approach. At a minimum, the operations plan shall include detailed information on the native soils, procedures to characterize each lift of contaminated soil, operating procedures and management procedures that the operator shall follow.		N/A

(3) In addition to other operational requirements specified in 19.15.36.15 NMAC, the operator using an environmentally acceptable bioremediation endpoint approach shall comply with the following. (a) **Native soil information required.** The operator shall submit detailed information on the soil conditions present for each of its landfarm cells immediately prior to the application of the petroleum hydrocarbon- contaminated soils, including: treatment cell size, soil porosity, soil bulk density, soil pH, moisture content, field capacity, organic matter concentration, soil structure, SAR, EC, soil composition, soil temperature, soil nutrient (C:N:P) (calcium, nitrogen and phosphate) concentrations and oxygen content. (b) **Characterization of contaminated soil.** The operator shall submit a description of the procedures that it will follow to characterize each lift of contaminated soil or drill cuttings, prior to treating each lift of contaminated soil or drill cuttings, for petroleum hydrocarbon loading factor, TPH, BTEX, chlorides, constituents listed in Subsections A and B of 20.6.2.3103 NMAC, contaminated soil moisture, contaminated soil pH and API gravity of the petroleum hydrocarbons. (c) **Operating procedures.** The operator shall submit a description of the procedures, including a schedule, that it shall follow to properly monitor and amend each lift of contaminated soil in order to maximize bioremediation, including tilling procedures and schedule; procedures to limit petroleum hydrocarbon loading to less than five percent; procedures to maintain pH between six and eight; procedures to monitor and apply proper nutrients; procedures to monitor, apply and maintain moisture to 60 to 80 percent of field capacity; and procedures to monitor TPH concentrations. (d) **Management procedures.** The operator shall submit a description of the management procedures that it shall follow to properly schedule landfarming operations, including modifications during cold weather, record keeping, sampling and analysis, statistical procedures, routine reporting, determination and reporting of achievement of the environmentally acceptable bioremediation endpoint and closure and post-closure plans.		N/A
PART 5 **19.15.36.17 NMAC - SPECIFIC REQUIREMENTS APPLICABLE TO EVAPORATION, STORAGE, TREATMENT AND SKIMMER PONDS:**		

36.17A. Engineering design plan. An applicant for a surface waste management facility permit or modification requesting inclusion of a **skimmer pit; an evaporation, storage or treatment pond; or a below-grade tank** shall submit ... a **detailed engineering design plan**, **certified by a registered profession engineer**, including **operating and maintenance procedures**; **19.15.36.8.C(5)** technical data and design drawings a **closure plan**; **19.15.36.8.C(9)** closure and post-closure care plan and a **hydrologic report** that provides sufficient information and detail on the site's topography, soils, geology, surface hydrology and ground water hydrology to enable the division to evaluate the actual and potential effects on soils, surface water and ground water. **19.15.36.8.C(15)** geological/ hydrological data The plan shall include detailed information on **dike protection and structural integrity**; **leak detection**, including an adequate **fluid collection and removal system**; **19.15.36.8.C(5)** technical data and design drawings **liner specifications** and compatibility; **19.15.36.8.C(5)** technical data and design drawings **freeboard and overtopping prevention**; **19.15.36.8.C(7)** inspection and maintenance plan prevention of nuisance and hazardous **odors** such as **H2S**; **19.15.36.8.C(8)** hydrogen sulfide prevention and contingency plan; **19.15.36.8.C(7)** inspection and maintenance plan an **emergency response plan**, unless the pit is part of a surface waste management facility that has an integrated contingency plan; **19.15.36.8.C(10)** contingency plan **type** of oil field **waste stream**, including **chemical analysis**;	*For ACD, accept any plan that refers to Engineering Design Plan and that has all of the required elements shown in bold. Details will be part of Technical Review.*	N/A
36.17B. Construction, standards.	**19.15.36.8.C(5)** technical data and design drawings	N/A
(1) In general. The operator shall ensure each pit, pond and below-grade tank is designed, constructed and operated so as to contain liquids and solids in a manner that will protect fresh water, public health, safety and the environment.	*For ACD, accept any plan that refers to Construction Standards and that has all of the required elements shown in bold. Details will be part of Technical Review*	N/A
(2) Liners required. Each pit or pond shall contain, at a minimum, a **primary (upper) liner** and a **secondary (lower) liner** with a **leak detection system** appropriate to the site's conditions.		N/A
(3) Liner specifications. Liners shall consist of a 30-mil flexible PVC or 60-mil HDPE liner, or an equivalent liner approved by the division. Synthetic (geomembrane) liners shall have a **hydraulic conductivity** no greater than 1 x 10-9 cm/sec. Geomembrane liners shall be composed of an impervious, synthetic material that is resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. Liner materials shall be resistant to ultraviolet light, or the operator shall make provisions to protect the material from sunlight. Liner compatibility shall comply with EPA **SW-846 method 9090A.**		N/A
(4) Alternative liner media. The division may approve other liner media if the operator demonstrates to the division's satisfaction that the alternative liner protects fresh water, public health, safety and the environment as effectively as the specified media.	***Optional*** **19.15.36.8.C(5)** technical data and design drawings	N/A

(5) Each pit or pond shall have a properly constructed **foundation** or firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities, in order to prevent rupture or tear of the liner and an **adequate anchor trench**; and shall be constructed so that the **inside grade** of the levee is no steeper than **2H:1V**. Levees shall have an **outside grade** no steeper than **3H:1V.** The levees' tops shall be wide enough to install an **anchor trench** and provide adequate room for inspection and maintenance. The operator shall **minimize liner seams** and **orient them up and down**, not across a slope. The operator shall use factory seams where possible. The operator shall ensure **field seams** in geosynthetic material are **thermally seamed (hot wedge)** with a **double track weld** to create an air pocket for non-destructive air channel testing. A stabilized air pressure of 35 psi, plus or minus one percent, shall be maintained for at least five minutes. The operator shall **overlap liners four to six inches** before seaming, and orient seams parallel to the line of maximum slope, i.e., oriented along, not across, the slope. The operator shall minimize the number of field seams in corners and irregularly shaped areas. There shall be **no horizontal seams** within five feet of the slope's toe. **Qualified personnel** shall perform field seaming.		N/A
(6) At a point of discharge into or suction from the lined pit, the liner shall be protected from excessive hydrostatic force or mechanical damage, and external discharge lines shall not penetrate the liner.		N/A
(7) Primary liners shall be constructed of a **synthetic material.**		N/A
(8) A **secondary liner** may be a **synthetic liner or an alternative liner** approved by the division. Secondary liners constructed with **compacted soil membranes**, i.e., natural or processed clay and other soils, shall be at least three feet thick, placed in six-inch lifts and compacted to 95 percent of the material's standard proctor density, or equivalent. Compacted soil membranes used in a liner shall undergo permeability testing in conformity with ASTM standards and methods approved by the division before and after construction. Compacted soil membranes shall have a **hydraulic conductivity** of no greater than 1 x 10-8 cm/sec. The operator shall submit results of **pre-construction testing** to the division for approval prior to construction.		N/A

(9) Leak detection system: The operator shall place a **leak detection system** between the lower and upper geomembrane liners that consists of two feet of compacted soil with a saturated hydraulic conductivity of 1 x 10-5 cm/sec or greater to facilitate drainage. The leak detection system shall consist of a properly designed **drainage and collection and removal system** placed above the lower geomembrane liner in depressions and sloped so as to facilitate the earliest possible leak detection. **Piping** used shall be designed to withstand chemical attack from oil field waste or leachate; **structural loading** from stresses and disturbances from overlying oil field waste, cover materials, equipment operation or expansion or contraction; and to **facilitate clean-out maintenance**. The **material** placed between the pipes and laterals shall be sufficiently **permeable** to allow the transport of fluids to the drainage pipe. The **slope** of the interior sub-grade and of drainage lines and laterals shall be at least a **two percent grade**, i.e., two feet vertical drop per 100 horizontal feet. The **piping collection system** shall be comprised of solid and perforated pipe having a minimum diameter of four inches and a minimum wall thickness of **schedule 80**. The operator shall seal a **solid sidewall riser pipe** to convey collected fluids to a **collection, observation and disposal system** located outside the perimeter of the pit or pond. The operator may install alternative methods as approved by the division.		N/A
~~(10) The operator shall notify the division at least 72 hours prior to the primary liner's installation so that a division representative may inspect the leak detection system before it is covered.~~	*Permit Condition, not ACD. Note if included in application.*	N/A
(11) The operator shall construct pits and ponds in a manner that prevents overtopping due to wave action or rainfall, and maintain a **three foot freeboard** at all times.		N/A
(12) The maximum size of an evaporation or storage pond shall not exceed **10 acre-feet.**	**19.15.36.8.C(5)** technical data and design drawings	N/A
36.17C. Operating standards.	**19.15.36.8.C(7)** inspection and maintenance plan *Permit Condition, not ACD. Note if included in application.*	N/A
(1) The operator shall ensure that only produced fluids or non-hazardous waste are discharged into or stored in a pit or pond; and that **no measurable or visible oil layer** is allowed to accumulate or remain anywhere on a pit's surface except an approved skimmer pit.	**19.15.36.8.C(7)** inspection and maintenance plan	N/A
(2) The operator shall **monitor leak detection systems** pursuant to the approved surface waste management facility permit conditions, maintain monitoring records in a form readily accessible for division inspection and report discovery of liquids in the leak detection system to the division within 24 hours.		N/A
(3) **Fencing and netting.** The operator shall fence or enclose pits or ponds to prevent unauthorized access and maintain fences in good repair. Fences are not required if there is an adequate perimeter fence surrounding the surface waste management facility. The operator shall screen, net, cover or otherwise render non- hazardous to migratory birds tanks exceeding eight feet in diameter and exposed pits and ponds. Upon written application, the division may grant an exception to screening, netting or covering requirements upon the operator's showing that an alternative method will adequately protect migratory birds or that the tank or pit is not hazardous to migratory birds.		N/A

(4) **Spray systems:** The division may approve **spray systems** to enhance natural evaporation. The operator shall submit engineering designs for spray systems to the division's environmental bureau for approval prior to installation. The operator shall ensure that spray evaporation systems are operated so that spray-borne suspended or dissolved solids remain within the perimeter of the pond's lined portion.	**19.15.36.8.C(5)** technical data and design drawings	N/A
(5) Skimmer Pits Or Tanks: The operator shall use skimmer pits or tanks to **separate oil from produced water** prior to water discharge into a pond. The operator shall install a trap device in connected ponds to prevent solids and oils from transferring from one pond to another unless approved in the surface waste management facility permit.	***Depending on the design, this may be an application requirement.*** **19.15.36.8.C(6)** waste management plan **19.15.36.8.C(5)** technical data and design drawings	N/A
36.17D. Below-grade tanks and sumps.		N/A
(1) **Secondary containment and leak detection:** The operator shall construct below-grade tanks with **secondary containment and leak detection**. The operator shall not allow below-grade tanks to overflow. The operator shall install only below-grade tanks of materials resistant to the tank's particular contents and to damage from sunlight.	**19.15.36.8.C(5)** technical data and design drawings	N/A
(2) The operator shall **test sumps' integrity annually,** and shall promptly repair or replace a sump that does not demonstrate integrity. The operator may test sumps that can be removed from their emplacements by visual inspection. The operator shall test other sumps by appropriate mechanical means. The operator shall maintain records of sump inspection and testing and make such records available for division inspection.		N/A
E. Closure required. The operator shall properly close pits, ponds and below-grade tanks within six months after cessation of use.	**19.15.36.8.C(9)** closure and post-closure care plan	N/A
PART 6 **19.15.36.18 NMAC - CLOSURE AND POST CLOSURE:**		
36.18A. Surface waste management facility closure by operator.	**19.15.36.8.C(9)** closure and post-closure care plan	
(1) The operator shall **notify** the division's environmental bureau at least **60 days prior** to cessation of operations at the surface waste management facility and provide a proposed schedule for closure. Upon receipt of such notice and proposed schedule, the division shall review the current closure plan for adequacy and inspect the surface waste management facility.		Attachment 15
~~(2) The division shall notify the operator within 60 days after the date of cessation of operations specified in the operator's closure notice of modifications of the closure plan and proposed schedule or additional requirements that it determines are necessary for the protection of fresh water, public health, safety or the environment.~~	*A(2) through A(5) are permit conditions or regulatory requirements, but not application requirements.*	
~~(3) If the division does not notify the operator of additional closure requirements within 60 days as provided, the operator may proceed with closure in accordance with the approved closure plan; provided that the director may, for good cause, extend the time for the division's response for an additional period not to exceed 60 days by written notice to the operator.~~		
~~(4) The operator shall be entitled to a hearing concerning a modification or additional requirement the division seeks to impose if it files an application for a hearing within 10 days after receipt of written notice of the proposed modifications or additional requirements.~~		

~~(5) Closure shall proceed in accordance with the approved closure plan and schedule and modifications or additional requirements the division imposes. During closure operations the operator shall maintain the surface waste management facility to protect fresh water, public health, safety and the environment.~~		
(6) Re-vegetate: Upon completion of closure, the operator shall **re-vegetate** the site unless the division has approved an alternative site use plan as provided in Subsection G of 19.15.36.18 NMAC. Re-vegetation, except for landfill cells, shall consist of establishment of a **vegetative cover** equal to 70 percent of the native perennial vegetative cover (un-impacted by overgrazing, fire or other intrusion damaging to native vegetation) or scientifically documented ecological description consisting of at least three native plant species, including at least one grass, but not including noxious weeds, and maintenance of that cover through two successive growing seasons.		Attachment 15
36.18D. Surface waste management facility and cell closure and post closure standards. The following minimum standards shall apply to closure and post closure of the installations indicated, whether the entire surface waste management facility is being closed or only a part of the surface waste management facility.		Attachment 15
(1) Oil treating plant closure. The operator shall ensure that: (a) **tanks and equipment** used for oil treatment are cleaned and oil field waste is **disposed** of at a division-approved surface waste management facility (the operator shall reuse, recycle or remove tanks and equipment from the site within 90 days of closure); (b) the **site is sampled**, in accordance with the procedures specified in chapter nine of EPA publication SW-846, test methods for evaluating solid waste, physical/chemical methods, for TPH, BTEX, major cations and anions and RCRA metals, in accordance with a gridded plat of the site containing at least four equal sections that the division has approved; and (c) **sample results** are submitted to the environmental bureau in the division's Santa Fe office.		Attachment 15
(2) Landfill cell closure. (a) The operator shall properly close landfill cells, covering the cell with a **top cover** pursuant to Paragraph (8) of Subsection C of 19.15.36.14 NMAC, with soil contoured to promote drainage of precipitation; **side slopes** shall not exceed a 25 percent grade (four feet horizontal to one foot vertical), such that the final cover of the landfill's top portion has a gradient of two percent to five percent, and the slopes are sufficient to prevent the ponding of water and erosion of the cover material. (b) The operator shall **re-vegetate** the area overlying the cell with native grass covering at least 70 percent of the landfill cover and surrounding areas, consisting of at least two grasses and not including noxious weeds or deep rooted shrubs or trees, and maintain that cover through the post closure period.		N/A
(3) Landfill post closure. Following landfill closure, the post closure care period for a landfill shall be **30 years.** (a) A **post closure care and monitoring plan** shall include maintenance of cover integrity, maintenance and operation of a leak detection system and leachate collection and removal system and operation of gas and ground water monitoring systems. (b) The operator or other responsible entity shall **sample existing ground water monitoring wells annually** and submit reports of monitoring performance and data collected within 45 days after the end of each calendar year. The operator shall report any exceedance of a ground water standard that it discovers during monitoring pursuant to 19.15.29 NMAC.		N/A

(4) Landfarm closure. The operator shall ensure that: (a) **disking** and addition of bioremediation enhancing materials continues until soils within the cells are remediated to the standards provided in Subsection F of 19.15.36.15 NMAC, or as otherwise approved by the division; (b) soils remediated to the foregoing standards and left in place are **re-vegetated** in accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC; (c) **landfarmed soils** that have not been or cannot be remediated to the standards in Subsection F of 19.15.36.15 NMAC are **removed** to a division-approved surface waste management facility and the landfarm remediation area is **filled in with native soil** and **re-vegetated** in accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC; (d) if treated soils are removed, the **cell is filled in with native soils and re-vegetated** in accordance with Paragraph (6) of Subsection A of 19.15.36.18 NMAC; (e) **berms are removed**; (f) **buildings, fences, roads and equipment are removed**, the site cleaned-up and tests conducted on the soils for contamination; (g) **annual reports** of vadose zone and treatment zone sampling are submitted to the division's environmental bureau until the division has approved the surface waste management facility's **final closure**; and (h) for an operator who chooses to use the **landfarm methods** specified in Subsection H of 19.15.36.15 NMAC, that the soil has an ECs of less than or equal to 4.0 mmhos/cm (dS/m) and a SAR of less than or equal to 13.0.		N/A
36.18E. Pond and pit closure. The operator shall ensure that:		N/A
(1) **liquids in the ponds or pits are removed** and disposed of in a division-approved surface waste management facility;		N/A
(2) **liners are disposed of** in a division-approved surface waste management facility;		N/A
(3) **equipment** associated with the surface waste management facility **is removed**;		N/A
(4) the **site is sampled**, in accordance with the procedures specified in chapter nine of EPA publication SW-846, test methods for evaluating solid waste, physical/chemical methods for TPH, BTEX, metals and other inorganics listed in Subsections A and B of 20.6.2.3103 NMAC, in accordance with a gridded plat of the site containing at least four equal sections that the division has approved; and		N/A
(5) **sample results are submitted** to the environmental bureau in the division's Santa Fe office.		N/A
36.18F. Landfarm and pond and pit post closure. The **post-closure care period** for a landfarm or pond or pit shall be three years if the operator has achieved **clean closure**. During that period the operator or other responsible entity shall regularly **inspect and maintain required re-vegetation**. If there has been a release to the vadose zone or to ground water, then the operator shall comply with the applicable requirements of 19.15.30 NMAC and 19.15.29 NMAC.		N/A

G. Alternatives to re-vegetation. If the landowner contemplates use of the land where a cell or surface waste management facility is located for purposes inconsistent with re-vegetation, the landowner may, with division approval, implement an **alternative surface treatment** appropriate for the contemplated use, provided that the alternative treatment will effectively **prevent erosion**. ~~If the division approves an alternative to re-vegetation, it shall not release the portion of the operator's financial assurance reserved for post-closure until the landowner has obtained necessary regulatory approvals and begun implementation of such alternative use.~~		N/A

NaismithEngineering,Inc
ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING
ESTABLISHED 1949

April 19, 2013

TRANSMITTED VIA E-MAIL: brad.a.jones@state.nm.us AND OVERNIGHT EXPRESS

Mr. Brad A. Jones
Environmental Engineer, Environmental Bureau
New Mexico Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505

SUBJECT: Surface Waste Management Facility Application
R360 Permian Basin, LLC
Proposed Avalon, New Mexico Transfer Facility

Dear Mr. Jones:

On behalf of R360 Permian Basin, LLC (R360), Naismith Engineering, Inc. (NEI) is submitting the attached Surface Waste Management Facility Application for your review and approval. The proposed facility will be known as the Avalon Transfer Facility. The facility will be located in Section 36, Township 26 South, Range 31 East, based on the New Mexico Meridian in Eddy County, New Mexico. The Facility will be situated in the West half of the northeast quarter and in the East half of the northwest quarter of the referenced Section 36 and will occupy approximately 36 acres. There is no physical address established for the property, but the center of the site is located at approximately Latitude 32° 00' 18" North, Longitude 103° 43' 53" W.

The Application describes a waste transfer facility that will conduct the following waste management activities:

1. Offloading, storage and transfer of off-site waste in enclosed containers for off-site disposal at an approved facility;
2. Removal of free liquids from enclosed containers, and the aggregation, storage and transfer of those liquids for off-site disposal at an approved facility;
3. Removal, storage and transfer of any spill residues for off-site disposal at an approved facility; and
4. Removal, storage and transfer of contact storm water for off-site disposal at an approved facility.

R360 has elected to limit the scope of the Avalon Transfer Facility application to RCRA exempt waste only.

R360 seeks a permit to construct and operate the Avalon Transfer Facility under NMOCD rules for Surface Waste Management Facilities under New Mexico Administrative Code (NMAC) Title 19, Natural Resources and Wildlife, Chapter 15, Oil and Gas, Part 36, "Surface Waste Management Facilities".

On behalf of R360, we respectfully request your review and approval of the Application and the issuance of a permit to construct and operate the proposed facility. We would welcome the opportunity to discuss the work plan with you. Please contact me if you have any questions or need additional information.

Sincerely,
NAISMITH ENGINEERING, INC.

Grant A Jackson P.E.
Vice-President

Encl.

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District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

For State Use Only:

Form C-137
Revised August 1, 2011

Submit 1 Copy to Santa Fe Office

APPLICATION FOR SURFACE WASTE MANAGEMENT FACILITY

A meeting should be scheduled with the Division's Santa Fe office Environmental Bureau prior to pursuing an application for a surface waste management facility in order to determine if the proposed location is capable of satisfying the siting requirements of Subsections A and B of 19.15.36.13 NMAC for consideration of an application submittal.

1 Application: ☒ New ☐ Modification ☐ Renewal

2. Type: ☐ Evaporation ☐ Injection ☐ Treating Plant ☐ Landfill ☐ Landfarm ☒ Other

3. Facility Status: ☒ Commercial ☐ Centralized

4. Operator: R360 Permian Basin, LLC

Address: 4507 W. Carlsbad Hwy., Hobbs, New Mexico 88240

Contact Person: Zachary Davis Phone: (281) 873-3243

5. Location: W1/2 of NE/4 and E1/2 of NW/4 Section 36 Township 26S Range 31E

6. Is this an existing facility? ☐ Yes ☒ No If yes, provide permit number _____

7. Attach the names and addresses of the applicant and principal officers and owners of 25 percent or more of the applicant. Specify the office held by each officer and identify the individual(s) primary responsible for overseeing management of the facility.

8. Attach a plat and topographic map showing the surface waste management facility's location in relation to governmental surveys (quarter-quarter section, township and range); highways or roads giving access to the surface waste management facility site; watercourses; fresh water sources, including wells and springs; and inhabited buildings within one mile of the site's perimeter.

9. Attach the names and addresses of the surface owners of the real property on which the surface waste management facility is sited and surface owners of the real property within one mile of the site's perimeter.

10. Attach a description of the surface waste management facility with a diagram indicating the location of fences and cattle guards, and detailed construction/installation diagrams of pits, liners, dikes, piping, sprayers, tanks, roads, fences, gates, berms, pipelines crossing the surface waste management facility, buildings and chemical storage areas.

11. Attach engineering designs, certified by a registered professional engineer, including technical data on the design elements of each applicable treatment, remediation and disposal method and detailed designs of surface impoundments.

12. Attach a plan for management of approved oil field wastes that complies with the applicable requirements contained in 19.15.36.13, 19.15.36.14, 19.15.36.15 and 19.15.36.17 NMAC.

13. Attach an inspection and maintenance plan that complies with the requirements contained in Subsection L of 19.15.36.13 NMAC.

14. Attach a hydrogen sulfide prevention and contingency plan that complies with those provisions of 19.15.3.118 NMAC that apply to surface waste management facilities.

15. Attach a closure and post closure plan, including a responsible third party contractor's cost estimate, sufficient to close the surface waste management facility in a manner that will protect fresh water, public health, safety and the environment (the closure and post closure plan shall comply with the requirements contained in Subsection D of 19.15.36.18 NMAC).

16 Attach a contingency plan that complies with the requirements of Subsection N of 19.15.36.13 NMAC and with NMSA 1978, Sections 12-12-1 through 12-12-30, as amended (the Emergency Management Act).

17. Attach a plan to control run-on water onto the site and run-off water from the site that complies with the requirements of Subsection M of 19.15.36.13 NMAC.

18. In the case of an application to permit a new or expanded landfill, attach a leachate management plan that describes the anticipated amount of leachate that will be generated and the leachate's handling, storage, treatment and disposal, including final post closure options.

19. In the case of an application to permit a new or expanded landfill, attach a gas safety management plan that complies with the requirements of Subsection O of 19.15.36.13 NMAC

20. Attach a best management practice plan to ensure protection of fresh water, public health, safety and the environment.

21. Attach a demonstration of compliance with the siting requirements of Subsections A and B of 19.15.36.13 NMAC.

22. Attach geological/hydrological data including:

(a) a map showing names and location of streams, springs or other watercourses, and water wells within one mile of the site;

(b) laboratory analyses, performed by an independent commercial laboratory, for major cations and anions; benzene, toluene, ethyl benzene and xylenes (BTEX); RCRA metals; and total dissolved solids (TDS) of ground water samples of the shallowest fresh water aquifer beneath the proposed site;

(c) depth to, formation name, type and thickness of the shallowest fresh water aquifer;

(d) soil types beneath the proposed surface waste management facility, including a lithologic description of soil and rock members from ground surface down to the top of the shallowest fresh water aquifer;

(e) geologic cross-sections;

(f) potentiometric maps for the shallowest fresh water aquifer; and

(g) porosity, permeability, conductivity, compaction ratios and swelling characteristics for the sediments on which the contaminated soils will be placed.

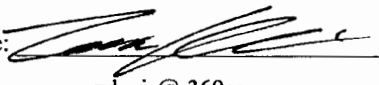
23. In the case of an existing surface waste management facility applying for a minor modification, describe the proposed change and identify information that has changed from the last C-137 filing.

24. The division may require additional information to demonstrate that the surface waste management facility's operation will not adversely impact fresh water, public health, safety or the environment and that the surface waste management facility will comply with division rules and orders

25. CERTIFICATION

I hereby certify that the information submitted with this application is true, accurate and complete to the best of my knowledge and belief.

Name: Zachary Davis Title: Environmental Scientist

Signature:  Date: April 19, 2013

E-mail Address: zdavis@r360es.com

ATTACHMENT 7

Names and Addresses of the Applicant and Principal Officers
and Owners of 25 Percent or More of the Applicant

Attachment for Item 7
Application for Surface Waste Management Facility
R360 Permian Basin, LLC – Avalon Transfer Facility

Applicant Information

R360 Permian Basin, LLC
Greenspoint Plaza 4
16945 Northchase Drive, Suite 2200
Houston, TX 77060
(281) 872-7360

Ownership (Members)

R360 Environmental Solutions, LLC (99% interest)
Greenspoint Plaza 4
16945 Northchase Drive, Suite 2200
Houston, TX 77060
(281) 872-7360

Principal Officers

Name	Office/Position	Address
Ronald J. Mittelstaedt	Chief Executive Officer	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Troy W. Thacker	President	Greenspoint Plaza 4 16945 Northchase Drive, Suite 2200 Houston, TX 77060
Steven F. Bouck	Executive Vice President	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Worthing Jackman	Executive Vice President, Chief Financial Officer, Treasurer and Assistant Secretary	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Darrell W. Chambliss	Executive Vice President and Assistant Secretary	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
David Eddie	Senior Vice President and Chief Accounting Officer	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
David Hall	Senior Vice President – Sales & Marketing	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
James M. Little	Senior Vice President – Engineering and Disposal	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380

Attachment for Item 7
Application for Surface Waste Management Facility
R360 Permian Basin, LLC – Avalon Transfer Facility

Name	Office/Position	Address
Matt Black	Vice President – Chief Tax Officer	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Eric Hansen	Vice President – Chief Information Officer	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Jerri L. Hunt	Vice President – Employee Relations	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Scott Schreiber	Vice President – Disposal Operations	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Patrick Shea	Vice President, General Counsel and Secretary	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Greg Thibodeaux	Vice President – Fleet Maintenance and Management	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Mary Anne Whitney	Vice President – Finance	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Rick Wojahn	Vice President – Business Development	10001 Woodloch Forest Drive Waterway Plaza Two, Suite 400 The Woodlands, TX 77380
Gabriel J. Rio	Executive Vice President, Strategy and Business Development	Greenspoint Plaza 4 16945 Northchase Drive, Suite 2200 Houston, TX 77060
Gary Wallace	Executive Vice President, Sales and Marketing	Greenspoint Plaza 4 16945 Northchase Drive, Suite 2200 Houston, TX 77060

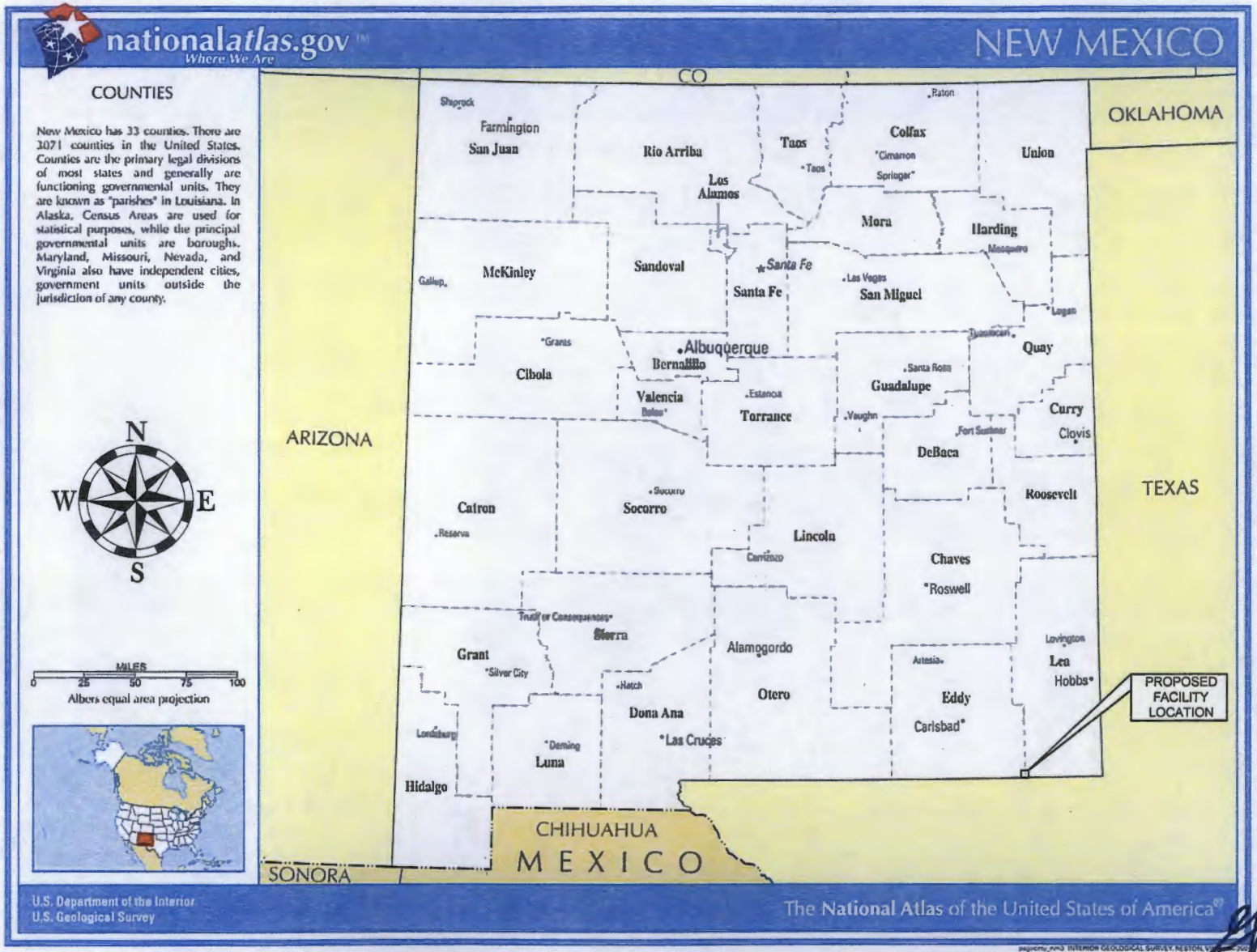
Individual With Primary Responsibility For Overseeing Management of The Facility

Clayton McDonald
Senior Vice President, Operations
4507 West Carlsbad Highway
Hobbs, New Mexico 88241
(575) 393-1079

\\Nei-projects\projects drive\8935-R360-Avalon\Transfer Station\Application\Att07-Applicant_Info\Applicant_Info.docx

ATTACHMENT 8

Plat and Topographic Map



MAPSOURCE: U.S. Geological Survey

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

03/29/2013

Drawn By	: ML
Checked By	: GAJ
Approved By	: GAJ
Project No.	: 8935
Scale	: AS SHOWN
Date	: 1/29/2013
Revision	: 0

R360 ENVIRONMENTAL SOLUTIONS

OFFICE LOCATION :

4501 Gollihar Rd.
Corpus Christi, Texas 78411
P.O. Box 3099
Corpus Christi, Texas 78463
(361)-814-9900

Naismith Engineering Inc
F-385

FACILITY LOCATION MAP

R360 AVALON TRANSFER FACILITY
R360 PERMIAN BASIN, LLC
EDDY COUNTY, NEW MEXICO

Dwg. File:
Attachment 8
8-1
Sheet 1 Of 2

MAP SOURCE: U.S GEOLOGICAL SURVEY
7.5 MINUTE QUADRANGLES: PHANTOM BANKS, PADUCA BREAKS WEST, ORLA NE, AND KYLE RANCH

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER
03/29/2013

REV.	DESCRIPTION	APP'R.	DATE

Drawn By : MAL
Checked By : GAJ
Approved By : GAJ
Project No. : 8835
Scale : AS SHOWN
Date : 3/28/2013
Revision No. :

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Corpus Christi, Texas 78463
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F-385

USGS TOPOGRAPHIC MAP

R360 AVALON TRANSFER FACILITY
R360 PERMIAN BASIN, LLC
EDDY COUNTY, NEW MEXICO

Dwg. File:
Attachment 8
8-2
Sheet 2 Of 2

ATTACHMENT 9

Names and Addresses of the Surface Owners of Real Property

PROPERTY OWNERSHIP INFORMATION

R360 PERMIAN BASIN, LLC - PROPOSED AVALON, NEW MEXICO TRANSFER FACILITY

PROPOSED AVALON FACILITY PROPERTY
Eddy County, New Mexico
Township (T) 26S, Range (R) 31E, Section 36
Parcel ID 4-186-156-268-096
D K Farms, Inc.
2713 Racquet Club Drive
Midland, Texas 79705

Eddy County, New Mexico
T26S, R31E
Section 25 (Parcel ID 4-186-155-267-237)
Section 26 (Parcel ID 4-185-155-267-235)
Section 35 (Parcel ID 4-185-156-266-097)
Lea County, New Mexico
T26S, R32E
Sections 30 and Section 31 (No Parcel ID)
U.S. Bureau of Land Management
Carlsbad Field Office
620 E. Greene St.
Carlsbad, New Mexico 88220

Loving County, Texas
Texas and Pacific Railroad Company (T&PRR),
Block 55, Section 1, N ½ of N ½ of NW ¼
Geo ID 04000-05501-00100-000000
Zane Kiehne
2107 Cactus Street
Pecos, Texas 79772-7101

Loving County, Texas
T&PRR, Block 55, Section 1, S ¾ of NW ¼
Geo ID 04000-05501-00100-000100
Z & T Cattle Company
2107 Cactus Street
Pecos, Texas 79772-7101

Loving County, Texas
T&PRR, Block 55, Sections 2 & 4
Geo ID 04000-05501-00200-000000
Hanging H Ranches, Inc.
P.O. Box 568
Pecos, Texas 79772-0568

Loving County, Texas
T&PRR, Block 55, Sections 3
Geo ID 04000-05501-00300-000000
Texas Pacific Land & Trust
1700 Pacific Avenue, Suite 2770
Dallas, Texas 75201-4661

\\Nei-projects\projects drive\8935-R360-Avalon\Property_Ownership\R360-NM-Avalon-Property_Ownership.doc

April 19, 2013

T26S R31E

T26S R32E

1 MILE RADIUS

Lea County Highway No. 1

EDDY COUNTY, NM

LEA COUNTY, NM

Public Land
(U.S. Bureau of Land Management)

Public Land
(U.S. Bureau of Land Management)

Public Land
(U.S. Bureau of Land Management)

PROPOSED FACILITY

State Line Road

26

25

30

35

36

31

R360 PERMIAN BASIN, LLC

D K Farms, Inc.

Public Land
(U.S. Bureau of Land Management)

Public Land
(U.S. Bureau of Land Management)

NEW MEXICO
TEXAS

LOVING COUNTY, TX

4

3

55

2

1

Zane Kiehne

PROPERTY BOUNDARY

Hanging H Ranches, Inc.

Texas Pacific Land & Trust

Hanging H Ranches, Inc.

Z & T Cattle Company

TEXAS AND PACIFIC RAILROAD DIVISION

Texas Ranch Road 652

LEGEND

PROPOSED FACILITY

PROPERTY BOUNDARY

T26S PUBLIC LAND SURVEY TOWNSHIP

R31E PUBLIC LAND SURVEY RANGE

(36) SURVEY SECTION NO.

[55] SURVEY BLOCK NO.

MAP SOURCE: AERIAL BING

DATASOURCE: EDDY COUNTY, NEW MEXICO ASSESSOR'S OFFICE, LEA COUNTY, NEW MEXICO ASSESSOR'S OFFICE, LOVING COUNTY, TEXAS APPRAISAL DISTRICT

2000 1000 0 2000 4000

GRAPHIC SCALE IN FEET

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

03/29/2013

DESCRIPTION	APPR.	DATE

Drawn by : MAL
Checked by : GAJ
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Project No. : 8935
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P.O. Box 3099
Corpus Christi, Texas 78463
(361)-814-9900

Naismith Engineering Inc
F-385

PROPERTY OWNERSHIP MAP

R360 AVALON TRANSFER FACILITY
R360 PERMIAN BASIN, LLC
EDDY COUNTY, NEW MEXICO

Dwg. File:

Attachment 9
9-1

Sheet 1 Of 1

ATTACHMENT 10

Surface Waste Management Facility Description

FACILITY DESCRIPTION

R360 ENVIRONMENTAL SOLUTIONS

R360 PERMIAN BASIN, LLC

AVALON, EDDY COUNTY, NEW MEXICO

April 19, 2013

For Permit Purposes

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

April 19, 2013

Prepared By

NaismithEngineering,Inc
ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING

NEI PROJECT NO. 8935

TABLE OF CONTENTS

1. GENERAL

1.1. Scope and Purpose

This operational description has been prepared by Naismith Engineering, Inc., (hereafter "NEI") on behalf of R360 Permian Basin, LLC (hereafter "R360") in conjunction with the submittal to the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division (hereafter "NMOCD") of an application to obtain authorization to operate a surface waste management facility in southeastern Eddy County, New Mexico (hereafter "Application"). The proposed facility will be known as the Avalon Transfer Facility (hereafter "Facility").

1.2. Facility Location

The Facility is located in Section 36, Township (hereafter "T") 26 South (hereafter "S"), Range (hereafter "R") 31 East (hereafter "E"), based on the New Mexico Meridian in Eddy County, New Mexico. The Facility will be situated in the West (hereafter "W") half (hereafter "W½") of the northeast quarter (hereafter "NE¼") and in the East half (hereafter "E½") of the northwest quarter (hereafter "NW¼") of the referenced Section 36 and will occupy approximately 36 acres. There is no physical address established for the property, but the center of the site is located at approximately Latitude 32° 00' 18" North (hereafter "N"), Longitude 103° 43' 53" W.

1.3. Overview of Wastes To Be Managed

R360 has developed a Management Plan for Oil Field Wastes, which has been included in Attachment 12 to the Application. This identifies the wastes to be accepted and describes how these wastes will be managed. In general, the Facility will be designed as a waste transfer and storage facility according to NMOCD rule 19.15.36 NMAC for management of Resource Conservation and Recovery Act (hereafter "RCRA") exempt waste.

1.4. Proposed Facility Operations

R360 will generally operate the Facility as a waste transfer and storage facility, but the facility operation will also include several support operations.

1.4.1. Waste Transfer Operations

In general, off-site wastes in enclosed containers will be brought to the facility where they will be offloaded, stored, transferred and then shipped off-site to the R360 Halfway waste management facility (NMOCD Permit No. NM1-6-0). Wastes will be received, stored and shipped off-site in enclosed containers. The Facility will require equipment and waste management units to handle, store and transport waste the waste containers and to transfer the waste materials.

1.4.2. Support Operations

The Facility will also include components and equipment for the following support operations:

- Storage and staging for "on-location" (drilling and work-over rig site) waste management services, including the storage and maintenance of empty waste containers for use at E&P drilling and production facilities.
- Administrative activities in support of the surface waste management Facility and the "on-location" service activities.
- Equipment support activities, including maintenance and repair and fuel storage for both the surface waste management Facility and the "on-location" service activities.

1.4.3. Other Activities Occurring At The Site

The Applicant has previously obtained authorization from the NMOCD to construct and operate a salt water disposal (hereafter "SWD") well under Administrative Order SWD-1346. This authorized SWD well has not yet been constructed, but when completed can manage Underground Injection Control (UIC) Class II liquids

2. SUMMARY OF EXISTING CONDITIONS

The following summary of existing conditions describes the site prior to the development of the Facility:

2.1. Surface Ownership of Real Property

While the Facility is located in Eddy County, New Mexico, its southern boundary is coterminous with the New Mexico/Texas state line, and its eastern boundary is conterminous with the Eddy/Lea Counties New Mexico line. R360 has researched available public records to identify the ownership of the property on which the Facility is sited and the surface owners of the real property within one mile of the site's perimeter. R360 obtained this information from the Eddy County New Mexico Assessors Office, the Lea County New Mexico Assessors Office, and the Loving County, Texas Appraisal District. On the New Mexico side (to the West, North and East) the Facility is surrounded by public land under the management of the U.S. Bureau of Land Management. On the Texas side (South), the Facility is surrounded by land under the private ownership of various parties. The information on specific property ownership adjacent to the Facility has been included in Attachment 9 to the Application.

2.2. Surface Use On The Property and In The Vicinity

The property on which the Facility will be situated is currently undeveloped range land, with some existing oil and gas production activities present. The property occupied by the Facility is not fenced along the West, North and East sides and is subject to open range grazing. On the Texas side (South), the Facility is surrounded by undeveloped range land, with some existing oil and gas production activity present.

2.3. Resource Development On The Property and In The Vicinity

The property on which the Facility will be situated is currently occupied by some existing oil and gas production activities, including two producing wells, a production tank battery, and a number of pipelines. There are also numerous producing wells and tank batteries on the

public lands in New Mexico adjacent to the Facility. Well permit records available from the NMOCD indicate that there are also several wells authorized which have yet to be completed. Although not visible from the Facility, available public records indicate that there are oil and gas exploration and production activities occurring on the private properties in Texas south of the Facility.

A review of public records and a visual inspection of the vicinity indicates there are no other resource development activities occurring in the vicinity of the Facility, including mining, quarrying or timber production.

2.4. Improvements and Infrastructure

With the exception of the oil and gas development, the subject property and adjacent properties are unimproved. In addition to the two (2) active oil wells, there is one (1) oil production tank battery, several steel flow lines, several regulated petroleum transmission pipelines, and one H_2S gas line present on the property.

Three (3) phase electrical power distribution lines exist along the south side of State Line Road, adjacent to the north boundary of the subject property.

There are several gravel roadways on the subject property providing access to the oil and gas activities.

2.5. Topography and Vegetation

The topography in the vicinity of the subject property is rolling terrain. Surface slopes on the subject property generally run from north to south and east to west, with slopes ranging from one (1) to two (2) percent (%). The vegetation is sparse, consisting of various grasses and low mesquite brush.

2.6. Surface Water and Drainage

To assess the current surface water and drainage conditions at the Facility, R360 conducted several site visits and reviewed available public records. Several natural drainage features exist on the property that result from erosional processes associated with rain fall events. There are no natural or artificial water storage features on the property. A review of the U.S. Geologic Survey (hereafter "USGS") topographic map containing the Facility (Paducah Breaks West NM-TX Quadrangle, 7.5 Minute Series) indicates that storm water drainage from the site will be conveyed southward into Texas. A review of the USGS topographic map adjacent to the south indicates that once off-site, storm water would be conveyed to a self-contained playa lake. Additional detailed information on surface water and drainage issues, as they relate to the siting of the Facility has been included in Attachment 21 to the Application.

2.7. Groundwater

To assess the presence of groundwater at the Proposed Facility and in the surrounding vicinity, R360 conducted a series of subsurface investigations. These investigations were conducted by Larson & Associates, Inc. of Midland, Texas and are documented in the report

entitled "Part 36 Investigation Report – Avalon Facility" included in in Attachment 22 to the Application. This investigation included soil borings completed on the property occupied by the Proposed Facility, a literature review and associated laboratory testing. The soil borings completed on the property occupied by the Proposed Facility confirmed that groundwater was absent down to an elevation of 2,945. Inside the perimeter of the Proposed Facility, the completion of SB13 confirmed that groundwater was absent down to an elevation of 3,045 or at least seventy (70) feet beneath the lowest elevation (3,115) of the Proposed Facility.

The literature review conducted in conjunction with the subsurface investigation indicated that the shallowest groundwater beneath the facility occurs in the Ogallala Formation. Records available for a well approximately 150 feet south of the property occupied by the Proposed Facility indicates that the water level in the Ogallala at this location occurs at an approximate elevation of 2,870, or approximately 245 beneath the lowest elevation (3,115) of the Proposed Facility.

A sample of the groundwater from a windmill located approximately one (1) mile east of the Proposed Facility indicated that no parameters exceeded the New Mexico Water Quality Control Commission (WQCC) human health and domestic water quality standards.

2.8. Soils and Geology

The reference subsurface investigation also addressed the soils and geology in the vicinity of the Proposed Facility. The soil borings completed on the property occupied by the Proposed Facility indicated that the subsurface consists of laterally continuous units of silt and fine sands, caliche, gravelly sand, sand gravel/clayey sand/silty sand and sandy clay/clayey sand/sandy gravel, in descending order. An average of about 1.6 feet of silt occurs at the surface, followed by a caliche unit which averages 11.8 feet. Under the caliche is a gravel unit which averages about 17.6 feet and a sand and gravel-rich unit which averages 41.2 feet throughout, which appears to be the top of the Ogallala Formation.

The literature review indicates that the soil profile of the property occupied by the Proposed Facility consists primarily of the Simona-Bippus complex, 0 to 5% slopes (SN) covers approximately 90% of the property (including the Proposed Facility). The Simona-Bippus complex occurs on upland areas and alluvial plains and contains approximately 55% Simona and about 30% Bippus and similar soils. The typical soil profile is gravelly fine sandy loam from 0 to 19 inches and indurated to 23 inches. The soil is non-saline, well drained and not suited for farming. Literature regarding the soils in Eddy County is available from the U.S. Department of Agriculture, Natural Resource Conservation Service (hereafter "NRCS"). A copy of a customized report of the available NRCS data for the property occupied by the Proposed Facility has been included in Appendix 10-3.

3. PROPOSED WASTE MANAGEMENT PROCESSES

The following waste management processes will be used for the various materials received from off-site and materials managed and generated on-site. A Facility Site Plan has been

included with this Description to illustrate the location and interaction of the various activities occurring at the Facility.

3.1. Offloading, Storage and Transfer of Off-Site Waste

Wastes received from off-site will be managed in enclosed containers. Waste shipments arriving at the site will be offloaded in the Waste Container Storage Area (hereafter "WCSA") and stored until transferred off-site. During storage, the waste containers may be opened for inspection, sampling and for evaluation of the presence of free liquids. If free liquids are present, these liquids may be removed as outlined below. Once the waste container is ready for shipment off-site, it will be transported to an authorized facility for further management.

3.2. Removal, Storage and Transfer of Free Liquids

If free liquids are present in an enclosed waste container, these liquids may be removed from the container through gravitational separation, decanting and pumping. The recovered liquids will be transferred through enclosed piping to the Recovered Liquid Storage Tanks for storage. From the tanks, the recovered liquids will be transported to an authorized facility for further management. Once the authorized on-site SWD well (NMOCD Permit No. SWD-1346) has been completed, the recovered liquids may be transferred from the above-ground tankage to the SWD well.

3.3. Removal, Storage and Transfer of Spill Residues

Any spill residues resulting from the storage, transfer and liquids removal operation will be removed and stored in enclosed containers on-site. Once the waste container is ready for shipment off-site, it will be transported to an authorized facility for further management.

3.4. Removal, Storage and Transfer of Contact Storm Water

Contact storm water (storm water coming into contact with waste materials) will be collected and recovered from waste containers or containment areas. The recovered contact storm water will be transferred through enclosed piping to the Recovered Liquid Storage Tanks for storage. Contact storm water may be co-mingled with liquids recovered from the waste containers (as outlined above) and will be managed in the same way.

4. FACILITY DESIGN AND CONSTRUCTION

4.1. Waste Container Storage Area

The Waste Container Storage Area will be a crushed stone or caliche pad constructed with an exterior containment berm. The Waste Container Storage Area will be approximately two (2) acres in size and will hold up to forty eight (48) waste containers with a capacity of up to two hundred barrels each, for a total storage capacity of 9,600 barrels. The exterior containment berm will be constructed of earth and built to a height of at least two (2) feet. Ramps will be provided over the containment berm to allow the containers to be placed and removed. Engineering calculations demonstrating the sufficiency of this containment area have been included in Attachment 11 to the Application.

4.2. Recovered Liquids Storage Tanks

The Recovered Liquids Storage Tanks will consist of two (2) above-grade steel tanks, each with a capacity of 500 barrels. The tanks will be welded steel, manufactured in accordance with American Petroleum Institute (API) Specification 12F, "Specification for Shop Welded Tanks for Storage of Production Liquids". The tanks will be placed in a containment area constructed of earth and built to a height of at least three (3) feet. Engineering calculations demonstrating the sufficiency of this containment area have been included in Attachment 11 to the Application.

4.3. Vehicle Access

The principal public ingress/egress for the Facility will be off of State Line Road. State Line Road provides access to Lea County Highway No. 1 to the north and to Texas Ranch Road 652 to the South. Entry to the site will be gained through a new Facility entrance, to be constructed just east of the existing E&P facilities access road. Access to the interior of the Facility will be via an all-weather gravel road. Transport vehicles will make a loop through the Facility and exit back onto State Line Road.

4.4. Access Control

Access control around the perimeter of the operating portion of the Facility will be protected with fencing to control pedestrian and vehicular traffic. Access into the site will be controlled by Facility personnel when the Facility is manned and by locked gate(s) during off business hours. Cattle guards will be constructed at the entry and exit points along State Line Road to prevent access to the Facility by open range grazing livestock.

A sign identifying the Facility will be posted along State Line Road, near the main entrance, as described in Attachment 12.

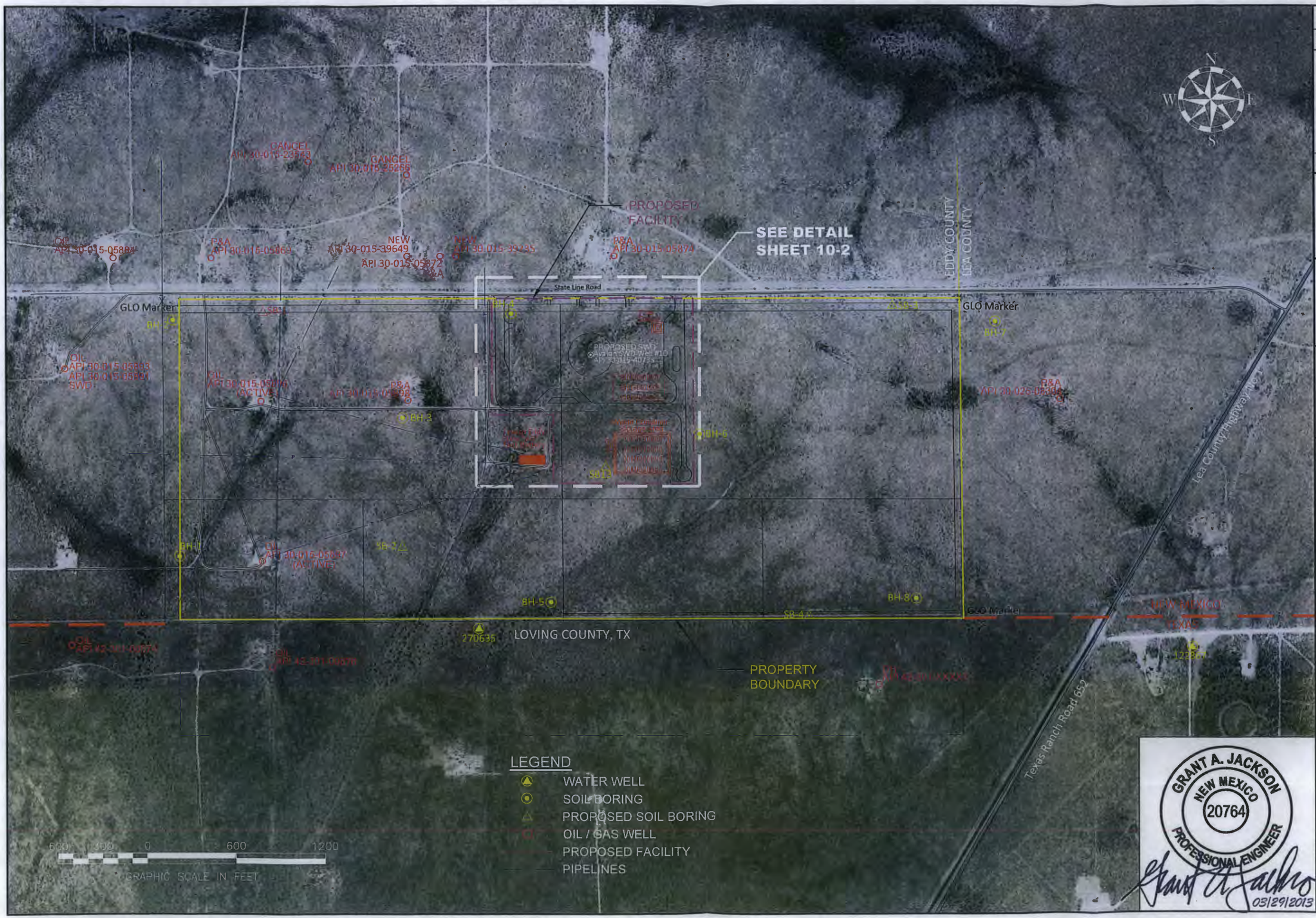
4.5. Support Facilities/Equipment

Facility operations may require certain support facilities/equipment. These may include administrative and maintenance building and a fuel depot. Fuel storage at the facility will comply with Federal Spill Prevention Control and Containment (SPCC) requirements. Engineering calculations demonstrating the sufficiency of the proposed fuel containment have been included in Attachment 11 to the Application.

\\Nei-projects\projects drive\8935-R360-Avalon\Transfer Station\Application\Att10-Description\R360-Avalon-TF-Description.docx

Appendix 10-1

Facility Layout Map



REV.	DESCRIPTION	APPR.	DATE

Drawn By : MAL
Checked By : GAJ
Approved By : GAJ
Project No. : 8035
Scale : AS SHOWN
Date : 3/29/2013
Revision No. :

R360 ENVIRONMENTAL SOLUTIONS

OFFICE LOCATION :
4501 Gollihar Rd.
Corpus Christi, Texas 78411
P.O. Box 3099
Corpus Christi, Texas 78463
(361)-814-9900

Naismith Engineering Inc
P.L.L.C.

FACILITY LAYOUT MAP

R360 AVALON TRANSFER FACILITY
R360 PERMIAN BASIN, LLC
EDDY COUNTY, NEW MEXICO

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER
03/29/2013

Dwg. File:
Attachment 10
10-1
Sheet 1 Of 2

Appendix 10-2

Facility Site Plan

NEW
API 30-015-39649

NEW
API 30-015-39235

P&A
API 30-015-05874

API 30-015-05872
P&A

N
W E
S

Two Way Access to
Lea County Highway 1
and Texas Ranch Road 652

Cattleguard

INGRESS

450'

State Line Road

900'

Cattleguard

EGRESS

3135

BH-4

3135

3140

3145

3150

100' BUFFER
ZONE

3130

800'

3125

Fuel
Depot

One Way
Traffic Flow

Site Area is
Approximatly
36 Acres.

3154.

One Way
Traffic Flow

Avalon SWD Well #1D
API 30-015-40733

3122

Stormwater
Control Berms

Empty Container
Storage Area

200'

3116

3122

3122

One Way
Traffic Flow

1341'

300'

3120

P&A
API 30-015-05898

BH-3

450'

3117

Recovered Liquid
Storage Tanks

Entrance and
Exit Ramp

BH-6

3115

Texaco Eddy
State "AG"
Tank Battery

SB13

3110

3122

3116

3115

3122

3122

100'

Stormwater
Control Berm

100'

900'

Proposed Access
Control Fence

3105

Note: This Plan does not represent a property boundary survey. Distances from property lines are based on the proposed concept plan and are subject to change based on surveyed conditions on the ground.

200 100 0 200 400

GRAPHIC SCALE IN FEET

LEGEND

- Facility Boundary
- Lot / Section Lines
- Oil and Gas Well
- P — Pipelines
- BH-3 Previous soil boring
- x — Access Control Fence
- SB13 Proposed Boring Location
- Drainage Swale
- 3145 — Countour Intervals 1'

Proposed Soil Boring SB13
Proposed Surface Elevation 3128
Proposed Total depth Elevation 3053
Lowest elevation at Facility 3115

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

REV:	DESCRIPTION	APPR:	DATE

Drawn By : MAL-jbs
Checked By : GAJ
Approved By : GAJ
Project No. : 8935
Scale : AS SHOWN
Date : 3/26/2013
Revision No. :

R360 ENVIRONMENTAL SOLUTIONS

OFFICE LOCATION :
4501 Gollihar Rd.
Corpus Christi, Texas 78411
P.O. Box 3038
Corpus Christi, Texas 78463
(361)-814-9900

Naismith Engineering,Inc
F-355

FACILITY SITE PLAN

R360 AVALON TRANSFER FACILITY
R360 PERMIIAN BASIN, LLC
EDDY COUNTY, NEW MEXICO

Dwg. File: 8935-Facilty Map-2k.dwg

Attachment 10
10-2

Sheet 2 Of 2

Appendix 10-3

NRCS Soils Information

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Eddy Area, New Mexico, and Loving and Winkler Counties, Texas

R360 Avalon Transfer Facility

April 11, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,330 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:31,680.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Eddy Area, New Mexico
Survey Area Data: Version 9, Feb 20, 2009

Soil Survey Area: Loving and Winkler Counties, Texas
Survey Area Data: Version 9, Sep 21, 2012

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Eddy Area, New Mexico (NM614)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
SM	Simona-Bippus complex, 0 to 5 percent slopes	110.3	89.2%
SN	Simona and Wink fine sandy loams, 0 to 3 percent slopes, eroded	11.9	9.6%
Subtotals for Soil Survey Area		**122.2**	**98.9%**
Totals for Area of Interest		**123.6**	**100.0%**

Loving and Winkler Counties, Texas (TX615)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
SMB	Splotter-Mentone complex, gently undulating	1.4	1.1%
Subtotals for Soil Survey Area		**1.4**	**1.1%**
Totals for Area of Interest		**123.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially

where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Eddy Area, New Mexico

SM—Simona-Bippus complex, 0 to 5 percent slopes

Map Unit Setting

Landscape: Alluvial plains, uplands
Elevation: 3,000 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 200 to 220 days

Map Unit Composition

Simona and similar soils: 55 percent
Bippus and similar soils: 30 percent

Description of Simona

Setting

Landform: Alluvial fans, plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian sands

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 7 to 20 inches to petrocalcic
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Very low (about 2.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow Sandy (R042XC002NM)

Typical profile

0 to 19 inches: Gravelly fine sandy loam
19 to 23 inches: Indurated

Description of Bippus

Setting

Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Rise, talf
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Mixed alluvium

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Bottomland (R042XC017NM)

Typical profile

0 to 37 inches: Silty clay loam
37 to 60 inches: Clay loam

SN—Simona and Wink fine sandy loams, 0 to 3 percent slopes, eroded

Map Unit Setting

Landscape: Uplands
Elevation: 3,000 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 200 to 220 days

Map Unit Composition

Simona and similar soils: 45 percent
Wink and similar soils: 40 percent

Description of Simona

Setting

Landform: Alluvial fans, plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian sands

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 7 to 20 inches to petrocalcic

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Very low (about 2.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow Sandy (R042XC002NM)

Typical profile

0 to 19 inches: Fine sandy loam
19 to 23 inches: Indurated

Description of Wink

Setting

Landform: Depressions, swales
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mixed alluvium and/or eolian sands

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Low (about 6.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Sandy (R042XC004NM)

Typical profile

0 to 8 inches: Fine sandy loam
8 to 38 inches: Fine sandy loam
38 to 60 inches: Stratified gravelly variable

Loving and Winkler Counties, Texas

SMB—Splotter-Mentone complex, gently undulating

Map Unit Setting

Landscape: Plains
Elevation: 2,500 to 4,200 feet
Mean annual precipitation: 9 to 13 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 200 to 240 days

Map Unit Composition

Splotter and similar soils: 70 percent
Mentone and similar soils: 15 percent
Minor components: 15 percent

Description of Splotter

Setting

Landform: Ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous alluvium

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: 10 to 20 inches to petrocalcic
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water capacity: Very low (about 1.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Shallow Sandy Loam, Desert Grassland (R042XC257TX)

Typical profile

0 to 3 inches: Gravelly fine sandy loam
3 to 11 inches: Very cobbly fine sandy loam
11 to 36 inches: Cemented material
36 to 80 inches: Variable

Description of Mentone

Setting

Landform: Playas
Down-slope shape: Concave

Across-slope shape: Concave
Parent material: Loamy alluvium

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Rare
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 10.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6c
Hydrologic Soil Group: C/D
Ecological site: Lakebed, Desert Grassland (R042XC248TX)

Typical profile

0 to 13 inches: Silty clay loam
13 to 41 inches: Silty clay loam
41 to 60 inches: Silty clay loam

Minor Components

Unnamed, minor components

Percent of map unit: 15 percent

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ATTACHMENT 11

Engineering Design Information

Naismith Engineering, Inc	Project No. 8935	SHEET 1
	Description: Containment Volume Calculations	Date: 04/19/2013
	R360 Permian Basin, LLC – Avalon Transfer Facility – Eddy County, New Mexico	By: GAJ

BACKGROUND INFORMATION

For Permit Purposes

GRANT A. JACKSON NEW MEXICO 20764 PROFESSIONAL ENGINEER

April 19, 2013

4 Pages of Calculations

Requirements

The R360 Permian Basin, LLC (R360) Avalon Transfer Facility (Facility) is subject to the U.S. Environmental Protection Agency (EPA) Spill Prevention Control and Countermeasure (SPCC) regulations as codified under Title 40, Code of Federal Regulations, Part 112. These regulations require secondary containment facilities to have capacity sufficient for "the entire capacity of the largest single container and sufficient freeboard to contain precipitation".

Approach

Based on available information, the required storage volume and the available storage volume for each containment area will be calculated and compared to determine the sufficiency of containment for the purposes of demonstrating compliance with the SPCC regulations.

Assumptions

- No precipitation event is specified in the SPCC regulations; however, standard industry practice utilizes the twenty five (25) year return frequency, twenty four (24) hour duration rainfall event. This event will be used in these calculations.
- The component dimensions and capacities are accurate as reflected on the facility record drawings.

Common Information

- The 25 year, 24 hour precipitation in Eddy County, New Mexico, ranges from approximately 3.5 inches to 4.5 inches, with the 4.5 inches being representative near the project site [Reference: Technical Paper No. 40, Rainfall Frequency Atlas of the United States, Chart 47, "25-Year 24-Hour Rainfall (Inches)" U.S. Weather Bureau]
- One cubic foot is equivalent to 7.48 gallons [Table 3-3, Field Engineer's Manual, McGraw-Hill, Inc.]

LIQUID RECOVERY TANK

Given Information

The interior top of the containment area will measure 60 feet long by 44 feet wide.
The containment walls are earthen with a wall height of 3 feet and side slopes of 3 horizontal to 1 vertical (3:1)
The following tank is located within this containment area:

ID	Description	Contents	Capacity [g (bbls)]	Dia.	Material
T01	Liquids Recovery Receiving Tank	E&P Liquids with Oil	21,000 (500)	12'	Steel
T02	Liquids Recovery Storage Tank	E&P Liquids with Oil	21,000 (500)	12'	Steel

Required Volume

Since T01 and T02 are both the same size and are both the largest tank, the required containment volume is:

V = 21,000 gallons (g) /(7.48 g/cubic foot [cf]) = 2,807 cf

The required precipitation allowance would be:

V = 4.5 inch [in] x 1 ft/12 in x 60 ft x 44 ft = 990 cf

The total required containment volume would be:

V = 2,807 cf + 990 cf = 3,797 cf

Available Volume

The gross area of the top of the containment area would be:

60 ft x 44 ft = 2,640 sf

The gross area of the bottom of the containment area would be:

(60 – 2 x 3 x 3) ft x (44 – 2 x 3 x 3) ft = 1,092 sf

The gross volume of the containment area would be:

V = [(2,640 sf + 1,092 sf) / 2] x 3 = 5,598 cf

The volume displaced by the remaining tank would be:

$V = (\pi/4) \times (12 \text{ ft})^2 \times 3 \text{ ft} = 339 \text{ cf}$

With this displacement, the available storage volume would be:

V = 5,598 cf – 339 cf = 5,259 cf

Sufficiency of Containment

The comparison of available volume to the required volume would be:

V = 5,259 cf – 3,797 cf = 1,462 cf

This indicates that the available volume is sufficient to contain the required volume.

WASTE CONTAINER STORAGE AREA

Given Information

The interior top of the containment area will measure 355 feet long by 265 feet wide.
The containment walls are sloped earthen berms with a height of 2 ft, and sideslopes of 3:1.
There are up to 48 identical containers of waste in the area at any time. Due to weight and hauling limitations, each container will have a maximum capacity of 120 barrels, or 5,040 gallons. The maximum approximate exterior dimensions of the containers will be 8 ft wide by 8 ft tall by 40 ft long.

Required Volume

With all containers presumed to be the same size, the required containment volume is:

V = 5,040 gallons (g) /(7.48 g/cubic foot [cf]) = 674 cf

The required precipitation allowance would be:

V = 4.5 inch [in] x 1 ft/12 in x 355 ft x 265 ft = 35,278 cf

The total required containment volume would be:

V = 674 cf + 35,278 cf = 35,952 cf

Available Volume

The gross area of the top of the containment area would be:

355 ft x 265 ft = 94,075 sf

The gross area of the bottom of the containment area would be:

(355 – 2 x 2 x 3) ft x (265 – 2 x 2 x 3) ft = 343 ft x 253 ft = 86,779 sf

The gross volume of the containment area would be:

V = (94,075 sf + 86,779 sf) / 2 x 2 ft = 180,854 cf

The volume displaced by the remaining 47 containers would be:

V = 47 x 8 ft x 40 ft x 2 ft = 30,080 cf

With this displacement, the available storage volume would be:

V = 180,854 cf – 30,080 cf = 150,774 cf

Sufficiency of Containment

The comparison of available volume to the required volume would be:

V = 150,774 cf – 35,952 cf = 114,822 cf

This indicates that the available volume is sufficient to contain the required volume.

FUEL TANK AREA

Given Information

The exterior of the containment area measures: 24 ft. wide x 64 ft. long
The containment walls are sloped earthen berms with a height of 2 ft, and sideslopes of 3:1.
The following tanks are located within this containment area:

ID	Description	Contents	Capacity [g (bbls)]	Dia.	Material
T03	Gasoline Tank	Gasoline Fuel	1,000 (24)	4'	Welded Steel
T04	Gasoline Tank	Gasoline Fuel	1,000 (24)	4'	Welded Steel
T05	Diesel Tank	On-Road Diesel Fuel	2,000 (48)	5'4"	Welded Steel
T06	Diesel Tank	On-Road Diesel Fuel	4,000 (96)	8'	Welded Steel
T07	Diesel Tank	On-Road Diesel Fuel	4,000 (96)	8'	Welded Steel
T08	Diesel Tank	On-Road Diesel Fuel	4,000 (96)	8'	Welded Steel

Tanks T03, T04 and T05 will be located on a steel support platform above the top of the containment berm.
Tanks T06, T07 and T08 will rest in the bottom of the containment.

Required Volume

Since T06, T07 and T08 are each the largest single tank, the required containment volume for the tank would be:

V = 4,000 gallons (g) /(7.48 g/cubic foot [cf]) = 535 cf

The required precipitation allowance would be:

V = 4.5 inch [in] x 1 ft/12 in x 24 ft x 64 ft = 576 cf

The total required containment volume would be:

V = 535 cf + 576 cf = 1,111 cf

Available Volume

The gross area of the top of the containment area would be:

24 ft x 64 ft = 1,536 sf

The gross area of the bottom of the containment area would be:

(24 – 2 x 2 x 3) ft x (70 – 2 x 2 x 3) ft = 12 ft x 58 ft = 696 sf

The gross volume of the containment area would be:

V = (1,536 sf + 696 sf) / 2 x 2 ft = 2,232 cf

Estimate the volume displaced by the gasoline and diesel tank supports:

V = 3 tanks x 4 supports/tank x 1sf/support x 3 ft = 36 cf

The volume of the displacement by two of the three larger diesel tanks can be estimated based on the area of a partially full pipe section, as indicated in Table 21, "Hydraulic and Excavation Tables", U.S. Department of Interior, Bureau of Reclamation, Eleventh Edition. Based on a tank diameter of 8 feet, and a containment berm height of two feet, the d/D ratio from Table 21 is 2/8 or 0.25. Based on this value, Table 21 provides a value of 0.1535 for A/D^2. Therefore the obstruction area, per foot of length of the tank, would be:

$A = 0.1535 \times 8^2 = 9.82$ sf/ft-length

The volume displaced by two of the three remaining diesel tanks, with a length of 10'6", would be:

V = 2 tanks x 9.82 sf/ft-length x 10.5 ft = 206 cf

With this displacement, the available storage volume would be:

V = 2,232 cf – (36 cf + 206 cf) =1,990 cf

Sufficiency of Containment

The comparison of available volume to the required volume would be:

V = 1,990 cf – 1,111 cf = 879 cf

This indicates that the available volume is currently sufficient to contain the required volume.

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Naismith Engineering, Inc	Project No. 8935	SHEET 1
	Description: Storm Water Calculations	Date: 04/19/2013
	R360 Permian Basin, LLC – Avalon Transfer Facility – Eddy County, New Mexico	By: GAJ

BACKGROUND INFORMATION

For Regulatory Review

GRANT A. JACKSON NEW MEXICO 20764 PROFESSIONAL ENGINEER

April 19, 2013

2 Pages of Calculations

Requirements

The R360 Permian Basin, LLC (R360) Avalon Transfer Facility (Facility) will provide capture volume for the first one-half inch of runoff from the site, in accordance with Center for Watershed Protection (CWP) guidelines for minimizing storm water pollutant runoff.

Approach

Use available data and published equations to:

- Determine the contributing drainage area for the various parts of the site.
- Determine the volume generated from those areas by the first half-inch of rainfall runoff.
- Determine the required capture volume to contain this first half inch of runoff.

Assumptions

- The first one-half (½) inch of runoff is based on surface area only and is independent of site surface characteristics.
- The component dimensions and capacities are accurate as reflected on the facility record drawings.

Common Information

- The 25 year, 24 hour precipitation in Eddy County, New Mexico, ranges from approximately 3.5 inches to 4.5 inches, with the 4.5 inches being representative near the project site [Reference: Technical Paper No. 40, Rainfall Frequency Atlas of the United States, Chart 47, "25-Year 24-Hour Rainfall (Inches)" U.S. Weather Bureau]
- The following unit equivalencies apply to these calculations: [Tables 3-1, 3-2 and 3-3, Field Engineer's Manual, McGraw-Hill, Inc.]
  - One foot (ft) = 12 inches (in)
  - One Ac = 43,560 ft^2
  - One cubic foot (ft^3) = 7.48 g

CALCULATIONS

Contributing Drainage Areas

As reflected on the Area Storm Water Map, the off-site area contributing storm water runoff onto the site in undeveloped conditions is approximately 21.7 Acres.

The total area of the proposed Facility is approximately 1,566,900 square feet, approximately 36.0 Acres.

The north portion of the proposed Facility, generally north of the waste management units is 24.8 Acres, with the south portion of the proposed Facility constituting 11.2 Acres.

Based on the layout presented in the design drawings, storm water capture for the off-site areas and the north portion of the proposed Facility would occur in the southwest corner of the north portion, resulting in a contributing drainage area of: 21.7 + 24.8 = 46.5 Acres.

Based on the layout presented in the design drawings, storm water capture for the south portion of the proposed Facility would occur along the west side of the south portion, resulting in a gross contributing drainage area of 11.2 Acres.

In the south portion of the proposed Facility, there are two waste management containment areas that would not contribute to runoff into the south pond. The surface area captured within the containment and not contributing to runoff would be:

Waste Container Storage Area: 355 ft x 265 ft = 94,075 sf
Recovered Liquids Storage Tanks: 60 ft x 44 ft = 2,640 sf

The net area contributing runoff to the south pond would be:

A = 11.2 Ac – (94,075 sf + 2,640 sf)/43,560 sf/Ac = 9.0 Ac

Required Runoff Volume

For the north drainage area, the required runoff volume would be:

V = 46.5 Ac x 43,560 square feet/Ac x 0.5 in x 1 ft/12 in = 84,398 cf

For the south drainage area, the required runoff volume would be:

V = 9.0 Ac x 43,560 square feet/Ac x 0.5 in x 1 ft/12 in = 16,335 cf

Capture Volume

The excavated walls of the ponds will have side-slopes of 3:1.

North Pond

As reflected on the On-Site Storm Water Features, Attachment 17-2, the north-south dimension of the triangular shaped north pond is 200 feet and the east-west dimension is 300 feet.

At a depth of four (4) feet, the dimensions of the base of the north pond would be:

North-south: 200 – (2 x 3 x 4) = 176 feet
East-west: 300 – (2 x 3 x 4) = 276 feet

The surface area of the top of the north pond would be:

A = ½ x 300 x 200 = 30,000 sf

The surface area of the base of the north pond would be:

A = ½ x 276 x 176 = 24,288 sf

The available volume in the north pond would be:

V = ½ x (30,000 sf + 24,288 sf) x 4 ft = 108,576 cf

The comparison of available volume to the required volume would be:

V = 108,576 cf – 84,398 cf = 24,178 cf

This indicates that the available volume is sufficient to contain the required volume.

South Pond

As reflected on the On-Site Storm Water Features, Attachment 17-2, the south pond is 100 feet square.

At a depth of three (3) feet, the dimensions of the base of the south pond would be:

100 – (2 x 3 x 3) = 82 feet

The surface area of the top of the south pond would be:

A = 100 x 100 = 10,000 sf

The surface area of the base of the south pond would be:

A = 82 x 82 = 6,724 sf

The available volume in the upper pond would be:

V = ½ x (10,000 sf + 6,724 sf) x 3 ft = 25,086 cf

The comparison of available volume to the required volume would be:

V = 25,086 cf – 16,335 cf = 8,751 cf

This indicates that the available volume is sufficient to contain the required volume.

ATTACHMENT 12

Plan for Management of Oil Field Wastes

MAMAGEMENT PLAN FOR OIL FIELD WASTES

R360 ENVIRONMENTAL SOLUTIONS

R360 PERMIAN BASIN, LLC

AVALON, EDDY COUNTY, NEW MEXICO

April 19, 2013

For Permitting Purposes

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

April 19, 2013

Prepared By

NaismithEngineering,Inc
ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING

NEI PROJECT NO. 8935

TABLE OF CONTENTS

1. GENERAL

1.1. Scope and Purpose

This Management Plan for Oil Field Wastes (hereafter "Management Plan") has been prepared by Naismith Engineering, Inc., (hereafter "NEI") on behalf of R360 Permian Basin, LLC (hereafter "R360") for submittal to the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division (hereafter "NMOCD") to obtain authorization to operate a surface waste management facility in southeaster Eddy County, New Mexico. The proposed facility will be known as the Avalon Transfer Facility (hereafter "Facility").

1.2. Facility Description

R360 (or hereafter "Operator") will operate the Facility as a waste storage and transfer facility. A detailed description of the proposed facility is provided in Attachment 10 to the Application.

1.3. Personnel

The Operator will assign certain personnel to operate the Facility in accordance with NMOCD regulations. Supervisory personnel will be experienced in surface waste management facility operations. All personnel will receive instruction on the design and operational standards for the Facility. An organizational chart indicating the chain of command has been included in Appendix 12-1. The following personnel assignments will apply to the Facility:

1.3.1. Operations Superintendent

Operations at the site will be under the direct control of the Operations Superintendent. The Operations Superintendent will be responsible for implementing this provisions of the Facility permit and the various plans required under the permit, for operating the Facility in accordance with the permit and all related attachments, for serving as the emergency coordinator, and for maintaining the required operational records. This person is also responsible for assuring that adequate personnel and equipment are available to provide Facility operation in accordance with the applicable requirements. The minimum qualifications for this individual will include a minimum of three (3) years of surface waste management operational experience.

1.3.2. Regulatory Contact

This person is responsible for assuring proper reporting, notification and coordination with the NMOCD and other applicable regulatory agencies. The minimum qualifications for serving as the regulatory contact shall include a minimum of one (1) year of regulatory coordination experience and effective communication skills.

1.3.3. Operations Personnel

Under the direction of the Operations Superintendent, the Operations Personnel will be responsible for performing inspections and records reviews for the exclusion of prohibited wastes, maintaining documentation, handling waste containers, transferring liquid wastes, managing spill residues and contact storm water, and any other duty required for proper operation of the Facility. The minimum qualifications for this position shall be training by the Operations Superintendent or other qualified individual regarding the operational requirements for the Facility.

2. SITING AND OPERATIONAL REQUIREMENTS [NMAC 19.15.36.13]

2.1. Depth to Groundwater [NMAC 19.15.36.13.A]

R360 has developed a siting verification document for the Facility, which has been included as Attachment 21 to the Application. This document confirms the land for the proposed Facility complies with the depth to groundwater criteria.

2.2. Location Restrictions [NMAC 19.15.36.13.B]

R360 has developed a siting verification document for the Facility, which has been included as Attachment 21 to the Application. This document confirms the land for the proposed Facility complies with the location restriction criteria.

2.3. Size [NMAC 19.15.36.13.C]

The proposed Facility will occupy approximately 36 acres out of a 267.60 acres tract, as identified by the property survey conducted by Melvin R. Pyeatt, Jr., P.S., dated February 10, 2012. The size of the Facility is within the requirement for the maximum surface waste management facility size of 500 acres.

2.4. Transporter Registration [NMAC 19.15.36.13.D]

The Operator will only accept for receipt at the Facility waste transport vehicles for which the transporter furnishes a properly completed NMOCD Form C133, indicating that the transporter is authorized by the NMOCD to transport liquid wastes.

2.5. Placement of Free Liquids [NMAC 19.15.36.13.E]

The proposed Facility will not function as either a landfill or landfarm; therefore the prohibition on placement of free liquids in landfill or landfarm units would do not apply to the Facility.

2.6. Wastes [NMAC 19.15.36.13.F]

2.6.1. Wastes to be Managed at the Facility

Only wastes under the jurisdiction of the NMOCD will be managed at the Facility. The following wastes will be managed at the facility:

- Off-site waste streams falling within the Oil and Gas (O&G) Exploration and Production(E&P) exclusion of §3001(b)(2)(A) of the federal Resource Conservation

and Recovery Act (RCRA), more specifically identified in Title 40, Code of Federal Regulation, Part 261, [40 CFR §261.4(b)(5)] otherwise known as "exempt" waste.

- On-site generated wastes, including spill residues, free liquids recovered from the waste materials during storage and transfer operations, and contact storm water, derived from RCRA exempt wastes.

2.6.2. Wastes to be Excluded at the Facility

The following wastes will be excluded from the Facility:

- Wastes considered hazardous wastes under 40 CFR §261.
- Non-hazardous waste falling outside the exclusion under 40 CFR §261.4(b)(5), otherwise known as non-RCRA exempt wastes.
- Wastes containing Naturally Occurring Radioactive Material (hereafter "NORM") as that term is defined in NMAC 19.15.2.7.N.

2.6.3. Documentation

The Operator will maintain copies of NMOCD Form C-138, signed by the generator or the generator's authorized agent, identifying the regulatory status of all off-site wastes managed at the facility. The Operator will also prepare and maintain copies of NMOCD Form C-138 for all on-site generated wastes transferred off-site for further management.

2.6.4. Waste Management Methods to Be Utilized

The following waste management processes will be used for the various wastes received from off-site and wastes generated on-site. A Facility Site Plan has been included with the Facility Description in Attachment 10 to the Application.

2.6.4.1.Offloading, Storage and Transfer of Off-Site Waste

Wastes received from off-site will be managed in enclosed containers. Waste shipments arriving at the site will be offloaded in the Waste Container Storage Area (hereafter "WCSA") and stored until transferred off-site. During storage, the waste containers may be opened for inspection, sampling and for evaluation of the presence of free liquids. If free liquids are present, these liquids may be removed as outlined below. Once the waste container is ready for shipment off-site, it will be transported to an authorized facility for further management.

The Operator will store enclosed waste containers in the WCSA for a period not to exceed six (6) months.

2.6.4.2.Removal, Storage and Transfer of Free Liquids

If free liquids are present in an enclosed waste container, these liquids may be removed from the container through gravitational separation, decanting and pumping. The recovered liquids will be transferred through enclosed piping to the Recovered Liquid Storage Tanks (hereafter "RLST") for storage. The transfer will follow the General Liquids Transfer Procedures outlined below. Liquid transfers from waste

containers into the RLSTs will only be performed by Operator personnel while the facility is staffed.

The Operator will store recovered liquids in the RLSTs indefinitely and until such time as a sufficient quantity of liquid has been accumulated to meet operational objectives. These operational objectives will include consideration of the quantity of liquid required for a full transport load or the need for available capacity in the RLSTs for future transfers from waste containers.

Once the accumulated recovered liquids are ready for shipment off-site, Operations personnel or a vendor or contractor will transfer the liquids into a suitable transport container. This transfer will also follow the General Liquids Transfer Procedures outlined below. In conjunction with the transfer, the personnel conducting the transfer will also prepare the necessary documentation for off-site shipment of the water liquids. The accumulated recovered liquids will then be transported to an authorized facility for further management. Once the authorized on-site SWD well has been completed, the recovered liquids may be transferred on-site from the RLSTs to the SWD well.

2.6.4.3.Removal, Storage and Transfer of Spill Residues

Any spill residues resulting from the storage, transfer and liquids removal operation will be removed and stored in enclosed containers on-site. Once the waste container is ready for shipment off-site, it will be transported to an authorized facility for further management.

The Operator will store recovered spill residues above-grade enclosed containers indefinitely and until such time as a sufficient quantity of material has been accumulated to facilitate transfer to an authorized facility.

2.6.4.4.Removal, Storage and Transfer of Contact Storm Water

Contact storm water (storm water coming into contact with waste materials) will be collected and recovered from waste containers or containment areas. The recovered contact storm water will be transferred through enclosed piping to the Recovered Liquid Storage Tanks for storage. The transfer will follow the General Liquids Transfer Procedures outlined below. Contact storm water may be co-mingled with liquids recovered from the waste containers (as outlined above) and will be managed in the same way.

The Operator will remove accumulated contact storm water within seven (7) days of the rainfall event. The recovered contact storm water will be stored in the Recovered Liquids Storage Tank indefinitely and until such time as a sufficient quantity of liquid has been accumulated to facilitate transfer to an authorized facility.

2.6.4.5.General Liquids Transfer Procedures

Prior to the transfer of liquids from one container into another, the personnel making the transfer will measure or assess the liquid levels in both the sending and receiving containers to determine the amount of liquid to be transferred and the capacity available to receive the transfer, to ensure that the receiving containers are not over-filled. Piping and/or hoses will be connected and inspected to ensure that all connections and fittings are properly joined and secured. Portable secondary containment pans will be placed under transfer line connections and fittings to collect any leakage. Pumps and/or transfer equipment will be inspected to ensure that they are in proper working order.

All liquid transfer operations will be attended by the personnel responsible for the transfer during the entire duration of the transfer. Contractor or vendor personnel responsible for making liquids transfers will be instructed by Operations personnel on proper transfer procedures and will be periodically observed to ensure they are following proper procedures. Personnel making liquids transfers shall visually observe the transfer operation and immediately discontinue the transfer if a spill or overfill occurs. The volume and rate of material transferred by pump or vacuum truck will be monitored using available equipment to prevent over-filling and/or spills. If the transfer involves a vehicle, the vehicle wheels are to be chocked to keep them from moving until the transfer has been completed. Manual transfers should be performed at a controlled rate, using appropriate flow control devices (e.g. buckets, spouts, funnels, etc) to prevent spills during the transfer.

Any spill which occurs will be promptly cleaned up with the waste and/or residuals managed in accordance with applicable regulatory requirements.

2.6.5. Waste Management Units to Be Utilized

All waste management operations will be conducted on the surface of the Facility on a compacted earthen pad having a crushed stone surface. This pad will include run-on/run-off control berms to prevent off-site storm water from contacting waste materials, and to prevent storm water that may contact waste materials or spill residues from leaving the site.

2.6.5.1.Waste Container Storage Area

The WCSA will be a crushed stone or caliche pad approximately two (2) acres in size and will hold up to forty eight (48) waste containers with a capacity of up to two hundred barrels each, for a total storage capacity of 9,600 barrels. The Waste containers will be placed in the WCSA to allow adequate inspection room between adjacent containers and to allow adequate aisle space between rows of containers so that any container can be access with a truck at any time. Containers may not be placed in a manner where access to the container, either for inspection or relocation, is prevented or obstructed.

The WCSA will have an exterior containment berm constructed of earth and built to a height of at least two (2) feet above the surrounding grade. Ramps will be provided over the containment berm to allow the containers to be placed and removed. Engineering calculations demonstrating the sufficiency of the WCSA containment have been included in Attachment 11 to the Application.

2.6.5.2.Recovered Liquids Storage Tanks

The Recovered Liquids Storage Tanks will consist of two (2) above-grade steel tanks, each with a capacity of 500 barrels. The tanks will be welded steel, manufactured in accordance with American Petroleum Institute (API) Specification 12F, "Specification for Shop Welded Tanks for Storage of Production Liquids". The tanks will be placed in a containment area constructed of earth and built to a height of at least three (3) feet. Engineering calculations demonstrating the sufficiency of this containment area have been included in Attachment 11 to the Application.

2.7. Recordkeeping [NMAC 19.15.36.13.G]

The Operator will maintain a Site Operating Record (SOR) at the Facility. The SOR will serve as the repository for all documents associated with the operation of the Facility.

In the SOR, The Operator will maintain records reflecting the generator, the location of origin, the volume and type of oil field waste and the hauling company for each load or category of oil field waste accepted at the Facility. Since no disposal of waste is to take place at the Facility, the requirements to maintain documentation of the location and date of disposal within the Facility are not applicable.

The SOR will be maintained in a secure location at the Facility in either hard copy or electronic format. The Operator will maintain the SOR for a period of not less than five years after the Facility closes. The SOR will be made available to the NMOCD for inspection upon request.

2.8. Control of Disposal [NMAC 19.15.36.13.H]

Since no disposal of waste is to take place at the Facility, the requirement for THE Facility to have a person on-duty during disposal activities is not applicable. As outlined in the Facility Description, included as Attachment 10 to the Application, access to the Facility will be controlled by fences and gates. When the Facility is not staffed, the gates will be closed and locked to prevent unauthorized access that may result in unauthorized disposal. When the Facility is staffed, the gates will remain open and Facility personnel will be responsible to observe vehicular traffic to prevent unauthorized disposal.

2.9. Protection of Migratory Birds [NMAC 19.15.36.13.I]

Since no management of wastes will occur in pits or ponds, the requirements for such pits or ponds to be screened netted or covered are not applicable to this Facility. Wastes will be managed in two (2) tanks (the Recovered Liquids Storage Tanks) that exceed eight (8) feet in diameter. In accordance with API Specification 12F, the tanks will be covered.

2.10. Site Sign [NMAC 19.15.36.13.J]

The Facility will have a site sign containing the following information:

- Operator's name
- Surface waste management facility permit or order number
- Surface waste management facility location by unit letter, section, township and range
- Emergency telephone numbers

The Federal Highway Administration "Manual on Uniform Traffic Control Devices" design guidelines indicate that signs should have at least one (1) inch of letter height for every forty (40) feet of legibility desired. To ensure that the sign is visible at a distance of fifty (50) feet, the sign will utilize a minimum letter size of two (2) inches. A schematic diagram of the site sign has been included in Appendix 12-1.

2.11. Spill Reporting and Corrective Action [NMAC 19.15.36.13.K]

Operations at the Facility will be subject to release notification requirements of NMAC 19.15.29 and the remediation requirements of NMAC 19.15.30. The release notification and remediation procedures to be used at the Facility are described below:

2.11.1. Release Notification [NMAC 19.15.29]

Unauthorized releases of certain materials at the Facility will be require notification and/or reporting to the NMOCD. The following criteria will be used to establish notification and reporting requirements:

2.11.1.1. Materials Subject to Notification/Reporting Requirements

Any unauthorized release of the following materials may trigger notification/reporting requirements:

- Oil and gas wastes
- Other oil field related chemicals, contaminants or mixtures of those chemicals or contaminants

2.11.1.2. Release Classifications

A Major Release is:

- An unauthorized release of a volume, excluding gases, in excess of 25 barrels;
- An unauthorized release of a volume that (a) results in a fire; (b) will reach a watercourse; (c) may with reasonable probability endanger public health; or (d) results in substantial damage to property or the environment;
- An unauthorized release of gases in excess of 500 MCF; or
- A release of a volume that may with reasonable probability be detrimental to water or exceed the standards in Subsections A and B or C of 19.15.30.9 NMAC.

A Minor Release is an unauthorized release of a volume, greater than five barrels but not more than 25 barrels; or greater than 50 MCF but less than 500 MCF of gases.

An Incidental Release is an unauthorized release of a less than five barrels, excluding gases, or less than 50 MCF of gases.

2.11.1.3.Release Notification and Reporting

Facility Operations Personnel shall report releases to the Operations Superintendent. In the event of a Major Release or Minor Release occurring at the Facility, the Operations Superintendent or his designated alternate will ensure notification or reporting of the release to the NMOCD. A Major Release will trigger an immediate verbal notification within twenty four (24) hours of the incident to the NMOCD Environmental Bureau in Santa Fe via their designated verbal notification procedures. This verbal notification shall include the information required by NMOCD Form C-141. Both Major and Minor Releases shall be subject to a timely written reporting within fifteen (15) days to the applicable NMOCD District Office using NMOCD Form C-141. Written reporting will verify prior verbal notification and provide appropriate additions or corrections to the information contained in the prior verbal notification.

2.11.2. Remediation [NMAC 19.15.30]

Releases at the Facility that result in pollution of surface water will be subject to NMOCD-approved corrective action or remediation. All such corrective action or remediation will comply with the requirements of NMAC 19.15.30 or alternative requirements approved by the NMOCD as authorized under NMAC 19.15.30.

2.12. Inspection and Maintenance Plan [NMAC 19.15.36.13.L]

R360 has developed and will implement an Inspection and Maintenance Plan for the Facility. This Inspection and Maintenance Plan is maintained as a separate document.

2.13. Run-on/Run-off Control Plan [NMAC 19.15.36.13.M]

R360 has developed and will implement a Run-on/Run-off Control Plan for the Facility. This Run-on/Run-off Control Plan is maintained as a separate document.

2.14. Contingency Plan [NMAC 19.15.36.13.N]

R360 has developed and will implement a Contingency Plan for the Facility. This Contingency Plan is maintained as a separate document.

2.15. Gas Safety Management Plan [NMAC 19.15.36.13.O]

The proposed Facility will not function as a landfill; therefore a gas safety management plan is not required for the Facility.

2.16. Training Program [NMAC 19.15.36.13.P]

R360 has developed and will implement a Training Program for key personnel for the Facility. In accordance with 19.15.36.13.P, the training elements used by R360 will cover the following requirements:

- Waste Screening and Acceptance – general waste screening and acceptance, including identification of exempt and non-exempt waste and hazardous waste
- Contingency Plan Implementation – operational control, situation prevention and emergency response procedures
- Documentation and Regulatory Reporting – overview of regulatory documentation and reporting required, including applicable permit conditions
- Waste Management Facility Operations – general operations of surface waste management facilities, including applicable permit conditions and proper sampling methods.

To identify which personnel are to receive specific types of training, R360 has developed a training outline, a copy of which has been included as Appendix 12-3. Records documenting implementation of the training program will be kept available for NMOCD inspection for a period of at least five years.

3. REQUIREMENTS APPLICABLE TO LANDFILLS [NMAC 19.15.36.14]

The Facility will not function as a landfill; therefore the requirements of this section do not apply to the Facility.

4. REQUIREMENTS APPLICABLE TO LANDFARMS [NMAC 19.15.36.15]

The Facility will not function as a landfarm; therefore the requirements of this section do not apply to the Facility.

5. REQUIREMENTS APPLICABLE TO EVAPORATION, STORAGE, TREATMENT AND SKIMMER PONDS AND BELOW-GRADE TANKS [NMAC 19.15.36.17]

The Facility will not utilize evaporation, storage, treatment or skimmer ponds or pits, nor below-grade tanks; therefore the requirements of this section do not apply to the Facility.

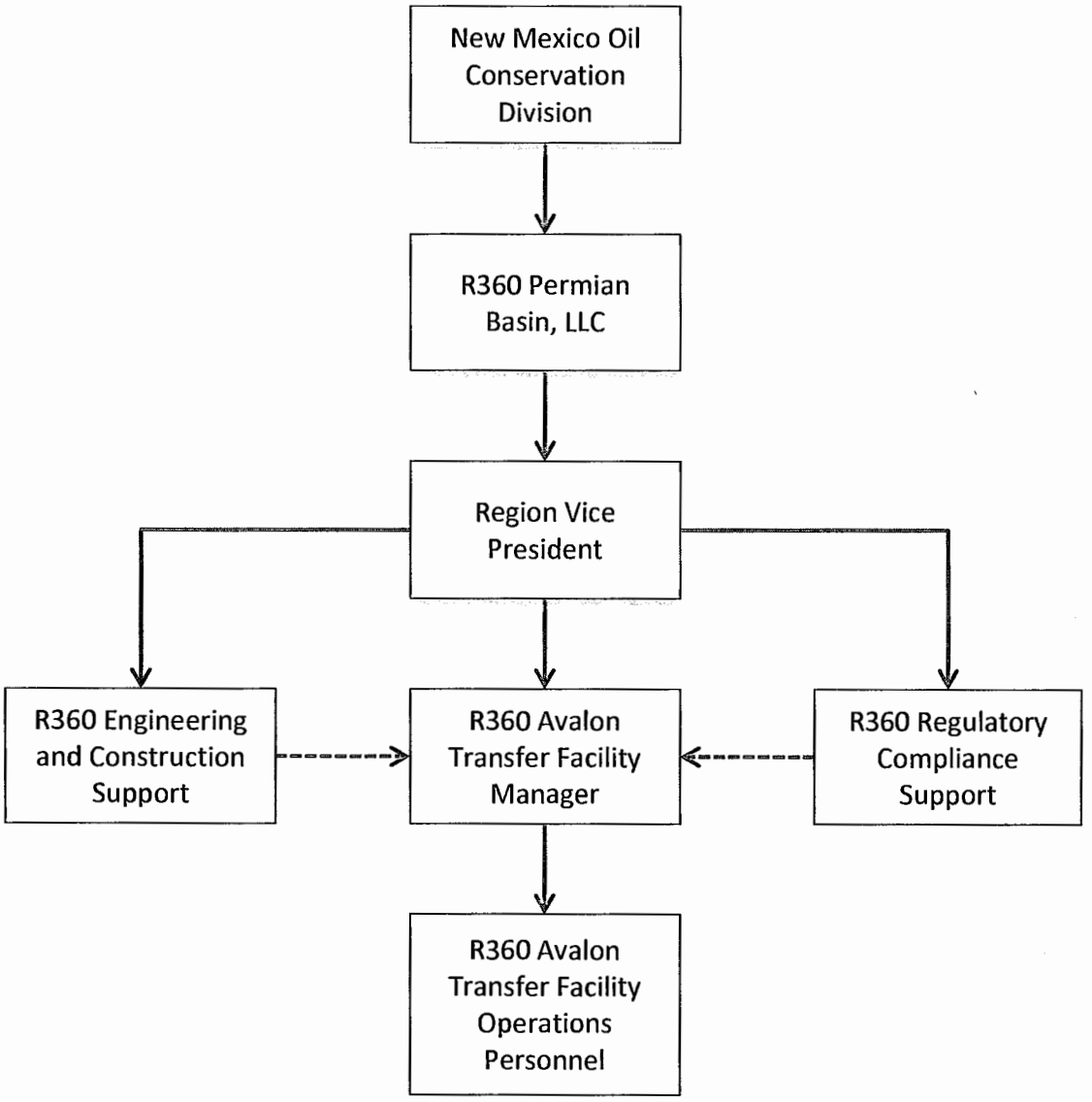
\\Nei-projects\projects drive\8935-R360-Avalon\Transfer Station\Application\Att12-Waste_Management\R360-Avalon-Waste_Management.docx

APPENDIX 12-1

Organizational Chart

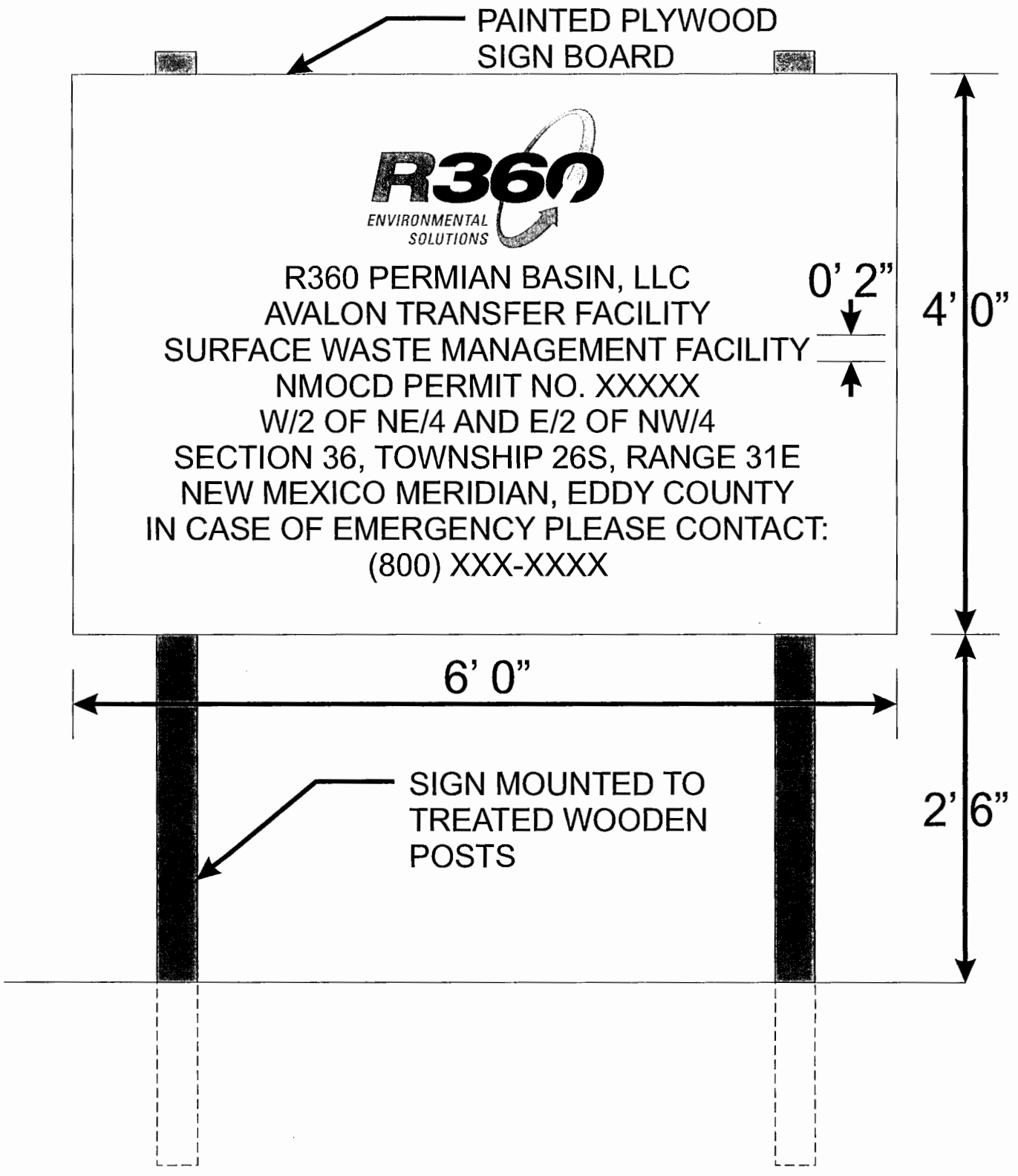
R360 AVALON TRANSFER FACILITY

ORGANIZATIONAL CHART



APPENDIX 12-2

Schematic of Site Sign



ATTACHMENT 12-2 SCHEMATIC OF SITE SIGN
R360 PERMIAN BASIN, LLC
AVALON TRANSFER FACILITY

APPENDIX 12-3

Training Program Outline

R360 Permian Basin, LLC
Avalon Transfer Facility
Training Program Outline
Updated April 2013

Training Subject Matter	Type of Training	Frequency	Verification
Region Vice President			
Waste Screening and Acceptance	Refresher – IH or SEM	Annual	Pre-Assign.
Contingency Plan Implementation	Refresher – IH or SEM	Annual	Pre-Assign.
Documentation and Regulatory Reporting	Refresher – IH or SEM	Annual	Pre-Assign.
Engineering Controls and Siting Requirements	Refresher – IH or SEM	Annual	Pre-Assign.
Waste Management Facility Operations	Refresher – IH or SEM	Annual	Pre-Assign.
Avalon Transfer Facility Manager			
Waste Screening and Acceptance	Refresher – IH or SEM	Annual	Pre-Assign.
Contingency Plan Implementation	Refresher – IH or SEM	Annual	Pre-Assign.
Documentation and Regulatory Reporting	Refresher – IH or SEM	Annual	Pre-Assign.
Engineering Controls and Siting Requirements	Refresher – IH or SEM	Annual	Pre-Assign.
Waste Management Facility Operations	Refresher – IH or SEM	Annual	Pre-Assign.
Waste Management Operations Safety	Refresher – JS	Monthly	None
Engineering and Construction Support			
Engineering Design Credentials	College Degree or Professional Examination	One-time	Pre-Assign.
Engineering Controls and Siting Requirements	Refresher – IH or SEM	Annual	Pre-Assign.
Waste Management Facility Operations	Refresher – IH, SEM, OJT	Annual	Pre-Assign.
Regulatory Compliance Support			
Environmental Science or Engineering Credentials	College Degree, Professional Exam. Or 3rd Party Certification	One-time	Pre-Assign.
Waste Screening and Acceptance	Refresher – IH or SEM	Annual	Pre-Assign.
Contingency Plan Implementation	Refresher – IH or SEM	Annual	Pre-Assign.
Documentation and Regulatory Reporting	Refresher – IH or SEM	Annual	Pre-Assign.
Engineering Controls and Siting Requirements	Refresher – IH or SEM	Annual	Pre-Assign.
Waste Management Facility Operations	Refresher – IH or SEM	Annual	Pre-Assign.
Avalon Transfer Facility Operations Personnel			
Waste Screening and Acceptance	Initial & Refresher – IH, SEM, JS or OJT	One-time + Annual	Pre-Assign.
Contingency Plan Implementation	Initial & Refresher – IH, SEM, JS or OJT	One-time + Annual	Pre-Assign.
Documentation and Regulatory Reporting	Initial & Refresher – IH, SEM, JS or OJT	One-time + Annual	Pre-Assign.
Waste Management Facility Operations	Initial & Refresher – IH, SEM, JS or OJT	Annual	Pre-Assign.
Waste Management Operations Safety	Refresher – JS	Monthly	None

Training Type Codes:
IH – Formal In-house seminars & training sessions
SEM – Formal outside seminars, short-courses and training sessions
JS – Documented jobsite informational presentations
OJT – On-the Job Training, documentation not required

ATTACHMENT 13

Inspection and Maintenance Plan

INSPECTION AND MAINTENANCE PLAN

R360 ENVIRONMENTAL SOLUTIONS

R360 PERMIAN BASIN, LLC

AVALON, EDDY COUNTY, NEW MEXICO

April 19, 2013

For Permit Purposes

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

April 19, 2013

Prepared By

NaismithEngineering,Inc
ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING

NEI PROJECT NO. 8935

TABLE OF CONTENTS

1. GENERAL

1.1. Scope and Purpose

This Inspection and Maintenance Plan has been prepared by Naismith Engineering, Inc., (hereafter "NEI") on behalf of R360 Permian Basin, LLC (hereafter "R360") in conjunction with the submittal to the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division (hereafter "NMOCD") of an application to obtain authorization to operate a surface waste management facility in southeaster Eddy County, New Mexico. The proposed facility will be known as the Avalon Transfer Facility (hereafter "Facility").

1.2. Facility Description

R360 (or hereafter "Operator") will operate the Facility as a waste storage and transfer facility. A detailed description of the proposed facility is provided in Attachment 10 to the Application.

1.3. Facility Components Subject to Plan

The Facility includes the following components that will be subject to this Plan:

- Storm water control berms
- Access controls, including signage, fencing, gates and cattle-guards
- Liquids Recovery Storage Tanks
- Waste Container Storage Area

Since the Facility will not include landfill cells or groundwater monitoring wells, the requirements to inspect and maintain leak detection sumps [under NMAC 19.15.36.13.L(1)] and monitoring wells [under NMAC 19.15.36.13.L(2)] are not applicable.

1.4. Requirements Common to Inspection and Maintenance

Inspections and maintenance conducted under this Plan will be performed and documented by qualified Operations personnel. These personnel will receive training and instruction on proper inspection and work procedures and documentation. The activities covered by this Plan will be conducted throughout the operating life of the Facility and through any post-closure care period.

2. INSPECTION

2.1. Storm Water Control Berms

Storm water control berms will be inspected quarterly and after a major rainfall or windstorm. The purpose of the inspections will be to identify areas where erosion may compromise the integrity of the storm water control berm. Areas of erosion identified during these inspections are to be maintained and repaired as outlined below.

2.2. Access Controls

Facility access control features will be inspected quarterly and after a major rainfall or windstorm. The purpose of the inspections will be to identify areas where wind, water or

mechanical damage may compromise the integrity of the access control features. Any feature or part of a feature identified during these inspections are to be maintained and repaired or replaced as outlined below.

2.3. Liquids Recovery Storage Tanks

The Liquids Recovery Storage Tanks will be inspected quarterly. The purpose of the inspections will be to identify areas where wind, water, mechanical damage or operational activities may compromise the ability of the tanks to provide proper containment of the waste. Tank components to be inspected will include the shell, connections, fittings, vents and monitoring points. Any components identified during these inspections are to be maintained and repaired or replaced as outlined below.

2.4. Waste Container Storage Area

The Waste Container Storage Area will be inspected quarterly. The purpose of the inspections will be to identify areas of spill residue. Any spill residue identified during these inspections is to be removed and the hole backfilled with clean material.

3. MAINTENANCE

3.1. Routine Facility Maintenance

Routine facility maintenance activities will include mowing and painting and watering as required for dust control. These activities will be conducted as required by operational considerations.

3.2. Repair of Damage Occurring During Operations

During the course of Facility operations, certain components, including storm water control berms and access control features may be damaged, resulting in the need to repair and/or replace these components. Damaged Facility operational components that are not integral to waste containment and access control will be repaired based on operational consideration. Damaged Facility components that are integral to waste containment and access control will be repaired and/or replaced promptly.

3.3. Disabled or Damaged Facility Components that Cannot Be Repaired Promptly

Certain Facility components may become disabled or damaged in a manner where they cannot be repaired promptly. This may include instances where replacement components are parts have a long lead time for replacement. In these instances, the Operator will make temporary repairs or provide supplemental temporary construction to restore the intended function of the Facility component.

Where such removal and replacement is required, the replacement construction will restore the storm water control berm to its original function.

3.4. Storm Water Control Berms

Erosion identified in storm water control berms will be repaired to restore the storm water control berm to its original function. Repairs may include placement of earth fill and

reinforcement or armoring, such as concrete rubble. Larger areas of erosion may require removal and replacement of sections of storm water control berms. Where such removal and replacement is required, the replacement construction will restore the storm water control berm to its original function.

3.5. Access Controls

Facility access control features will be inspected quarterly and after a major rainfall or windstorm. The purpose of the inspections will be to identify areas where wind or water damage may compromise the integrity of the access control features. Any feature or part of a feature identified during these inspections are to be maintained and repaired or replaced as outlined below to maintain proper access control.

3.6. Liquids Recovery Storage Tanks

Any components of the Liquids Recovery Storage Tanks identified during the inspections as disabled or damaged are to be maintained and repaired or replaced. In instances where only one tank is identified as disabled or damaged, it may be isolated from the other tank and the maintenance activities deferred based on operational considerations. Tank components shall be repaired or replaced with like materials to restore the original function.

3.7. Waste Container Storage Area

Any spill residue identified during the inspection of the Waste Container Storage Area is to be removed and the hole backfilled with clean material.

4. RECORDKEEPING

Records of the inspections and maintenance activities will be maintained in the Site Operating Record, described in the Management Plan for Oil Field Wastes, included as Attachment 12 to the Application. To facilitate the recordkeeping, the Operator has developed two (2) forms to document the activities required under this Plan. Attachment 13-1 is a Periodic Facility Inspection Form. Appendix 13-2 is a Facility Maintenance Record.

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Appendix 13-1

Periodic Facility Inspection Form

R360 Permian Basin, LLC
Avalon Transfer Facility
Periodic Facility Inspection Form

Date: _____
Prepared by: _____ Signature: _____

Background Information

Purpose for Inspection: □ Routine Quarterly □ Major Rainfall □ Windstorm Event Date:

Assessment

Activities/Areas Inspected	Comments	Recommended Follow Up Action
1. Perimeter Fencing		
2. Perimeter Access Control Points		
3. Site Storm Water Control Berms		
4. Liquids Recovery Storage Tanks		
5. Liquids Recovery Storage Tank Containment Area		
6. Waste Container Storage Area		
7. Waste Container Storage Area Containment		
8. Fuel Storage Tanks		
9. Fuel Storage Tank Containment		
10. Other (Note Location)		

For any areas of damage noted, please identify the cause: Describe: N/A

For any areas requiring repair, please identify the expected time of repair and return to service. Describe: N/A

List any major projects on-going during inspections: Describe: _____

List any activities occurring during inspections: Describe: N/A

Other Notations:

Appendix 13-2

Facility Maintenance Record

R360 Permian Basin, LLC
Avalon Transfer Facility
Facility Maintenance Record

Date: _____

Prepared by: _____ Signature: _____

Maintenance Activities

Facility Component Requiring Maintenance	Identified As A Result Of:	Maintenance Action	Description/Comments for Maintenance Activity	Return to Service
1.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
2.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
3.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
4.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
5.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
6.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
7.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
8.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
9.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____
10.	□ Periodic Inspection □ Operational Activities □ Report □ Other _____	□ Routine Service □ Extended Service □ Repair □ Replacement		□ Estimated _____ □ Actual _____

Outside Services: (Identify any outside services used to perform maintenance, designated by maintenance Item Number)

Other Notations:

ATTACHMENT 14

Hydrogen Sulfide Prevention and Contingency Plan

Professional Opinion:

Hydrogen Sulfide Monitoring Levels
Controlled Recovery, Inc.
Disposal Facility
Lea County, New Mexico

December 15, 2003

RECEIVED
DEC 16 2003
Environmental Bureau
Oil Conservation Division

Prepared for:

Controlled Recovery, Inc.
P.O. Box 388
Hobbs, New Mexico 88240

By:

Safety & Environmental Solutions, Inc.
703 E. Clinton Suite 103
Hobbs, New Mexico 88240
(505) 397-0510

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I. Background

Safety & Environmental Solutions, Inc. (SESI) was asked by Controlled Recovery, Inc. (CRI) of Hobbs, New Mexico for a professional opinion regarding an appropriate monitoring level for Hydrogen Sulfide (H_2S) at their facility located approximately halfway between Hobbs and Carlsbad, New Mexico. The physical location of the property is adjacent to US Highway 62-180 in Section 27, Township 20 South, Range 32 East, Lea County, New Mexico. (Exhibit A) This facility is a Rule 711 facility and the New Mexico Oil Conservation Division (NMOCD) has required CRI to develop a monitoring program for Hydrogen Sulfide with triggering levels of 1 ppm and 10 ppm. Detection of 1 ppm H_2S triggers the notification of the Hobbs NMOCD office immediately and commencement of mitigation operations. Detection of 10 ppm H_2S will trigger additional notifications, area evacuation, public evacuations as well as mitigation operations.

II. Facility and Process Description

The facility configuration is detailed in Exhibit B. Evaporation ponds "B" and "C" are the center of the monitoring issue and are shown in more detail in Exhibit C. The Ponds "B" and "C" measure 290' by 160' and 240' by 160' respectively. Pond "B" is 9' in depth and Pond "C" is 6' in depth. The volumes of the ponds are 69,786 bbls and 38,502 bbls respectively. Produced water is unloaded from trucks into a closed 750 bbl tank # 1 and gravity flows through a second and third closed 750 bbl tanks #2 and #3 into open top 250 bbl tanks #3 and #4 and finally in to the pits for evaporation.

III. Hydrogen Sulfide Regulatory Limits

10 ppm is the OSHA Permissible Exposure Limit. Workers can be exposed to this level for five consecutive 8-hour workdays.

100 ppm is the NIOSH Immediately Dangerous to Life and Health Level.

100 ppm is the NMOCD Rule 118 Action Level.

300 ppm is the OSHA Immediately Dangerous to Life and Health Level.

IV. Worker and Public Protection from Hydrogen Sulfide Exposure

Worker and Public Protection from Hydrogen Sulfide exposure is the primary purpose of NMOCD Rule 118 (Exhibit D) and the Action Limits set forth in Rule 711. Rule 118 establishes a 100-ppm action level for wells, facilities and operations and does not exempt 711 facilities from more stringent requirements.

The facility in question is permitted under Rule 711 and the process in question does not operate under any pressure other than atmospheric pressure. On the other hand, wells, non-Rule 711 facilities, and operations generally have processes that operate under much higher pressures and thus have the potential to release greater volumes of Hydrogen Sulfide over a much larger area. Rule 118 is applied to the wells, facilities, and operations under high pressure. This application enforces the 100-ppm action level, which is more in line with industry practices.

Rule 118 speaks of the Pasquill-Gifford equation (Exhibit E) as a method for the determination of the radius of exposure (ROE) for a specified hydrogen concentration. This equation is used to produce a nomograph, which is commonly used by the industry to determine radius of exposure. Using the nomograph alone for a determination of the 100-ppm radius of exposure at a release volume of 0.01 Mcfd, it yields a ROE of approximately 1.5 feet from the source. This release volume most closely correlates with the expected volumes released from an evaporation pond. In contrast, a release volume of 10 Mcfd yields a 100-ppm ROE of approximately 100 feet. The latter correlates more closely with wells and non-711 facility operations.

Therefore it may be said that a release of Hydrogen Sulfide that is under pressure will cause the ROE that is greater than one that is not under pressure.

It is generally agreed that exposure to 100 ppm of Hydrogen Sulfide by workers or members of the public would cause mild to moderate symptoms of exposure. The symptoms of exposure to 100 ppm for less than one hour are eye, nose and throat irritation. This level of exposure is an excellent action level for notification and mitigation operations as is required by Rule 118. This level of exposure is also most appropriate as an action level for Rule 711 facilities since the primary purpose of the monitoring requirements is the protection of workers and the general public.

V. Sandia National Laboratories Review

In a letter dated October 31, 2003, SESI requested Sandia National Laboratories review the dispersion question of Hydrogen Sulfide at this facility. (Exhibit F) Mr. Mike Hightower of Sandia National Laboratories responded to this request in a letter dated December 10, 2003. (Exhibit G) In his letter, Mr. Hightower details calculations performed employing Gaussian dispersion models using variables most consistent with conditions at the facility in question. The calculations were performed using produced water of saturation of 100% and 50%. In all cases, the calculations were not able to establish a 100-ppm or even 30-ppm ROE beyond the edge of the pond.

VI. Conclusions

The use of the Pasquill-Gifford equation nomograph and the calculations performed by Sandia National Laboratories clearly indicate that the risk of exposure to elevated levels of Hydrogen Sulfide for workers and the general public is minimal. CRI currently monitors the immediate pond area using calibrated hand-held monitors on a daily basis. At no time has any measurable concentrations of Hydrogen Sulfide been detected.

Analysis of the water in the evaporation ponds on October 14, 2003 indicate the water contain a near neutral pH, very high chlorides and TDS, and 243 ppm sulfates. The water sampled is not highly saturated with Hydrogen Sulfide.

It may be concluded that a 100-ppm concentration of Hydrogen Sulfide may be an acceptable action level for this facility. The current 1-ppm action level is very restrictive and compliance is difficult due to the cost of monitoring equipment sufficiently sensitive and reliable to measure such low concentrations. Equipment is readily available that will accurately and reliably detect 100-ppm concentrations.

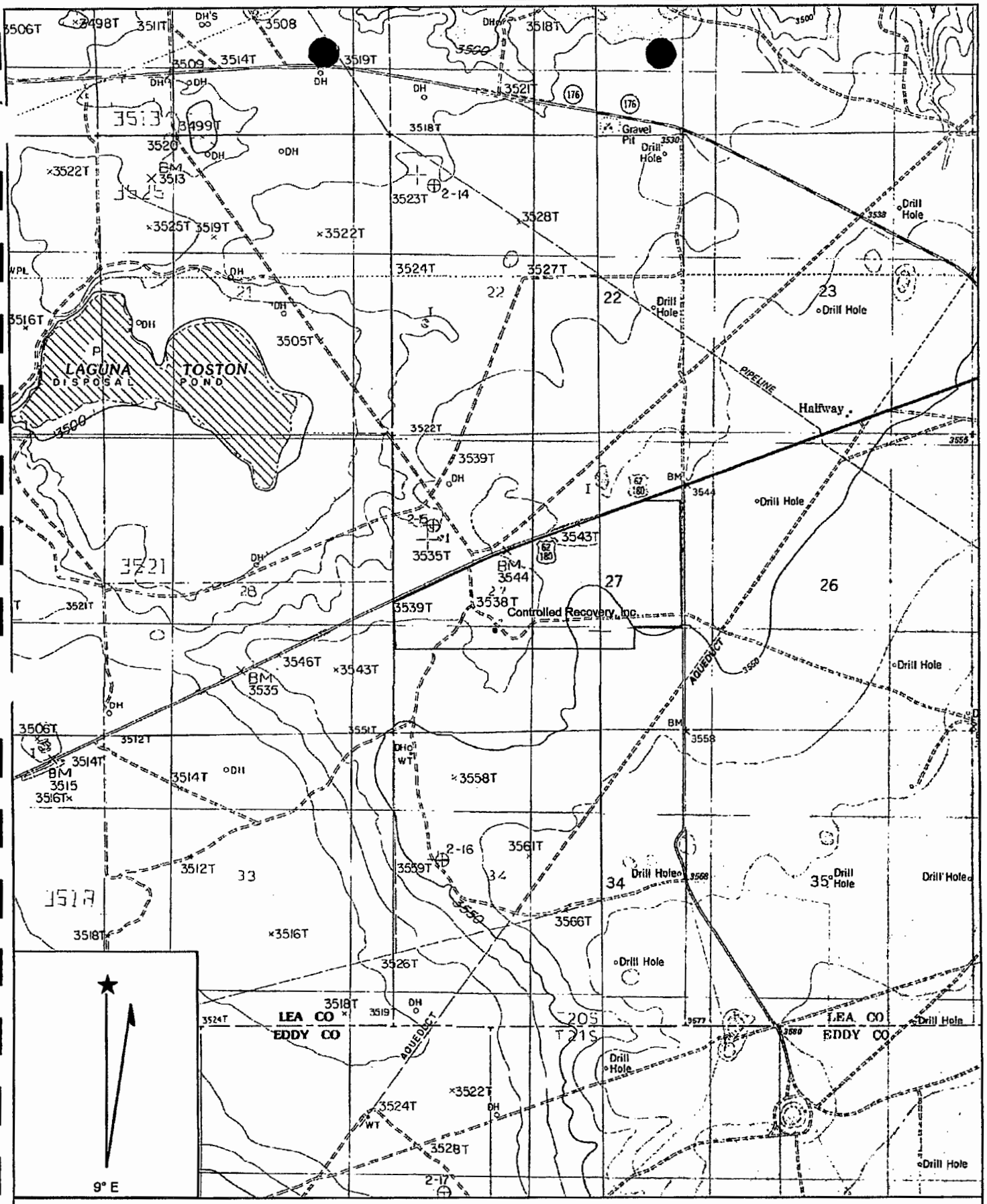
The ponds are located approximately 600' from Highway 62/180, 1166' from the Halfway Bar, 856' to the nearest residence (which houses the facility care takers), and 173' from

the nearest property line. The Pasquill-Gifford equation nomograph and the calculations performed by Sandia National Laboratories clearly indicate that 30-ppm and 100-ppm ROE will not exist beyond the boundaries of the property. Therefore, I feel that a 100-ppm action level for this facility is adequately protective of workers and the public. The risk of a Hydrogen Sulfide release of any consequence from the ponds in question is minimal and the facility should not be held to more restrictive requirements that Rule 118 facilities.

VII. Exhibits

Exhibit A - Vicinity Map
Exhibit B - Site Plan
Exhibit C - Process Map
Exhibit D - NMOCD Rule 118
Exhibit E - Pasquill-Gifford equation and nomograph
Exhibit F - Letter to Sandia National Laboratories
Exhibit G - Sandia National Laboratories Review
Exhibit H - Laboratory Analysis of Produced Water
Exhibit I - Qualifications and Credentials

Exhibit A
Vicinity Map



Name: WILLIAMS SINK
Date: 12/15/2003
Scale: 1 inch equals 2222 feet

Location: 032° 32' 34.6" N 103° 45' 22.0" W
Caption: Exhibit A-Vicinity Map
Controlled Recovery, Inc.
Lea County, New Mexico

Exhibit B
Site Plan

ATTACHMENT 3

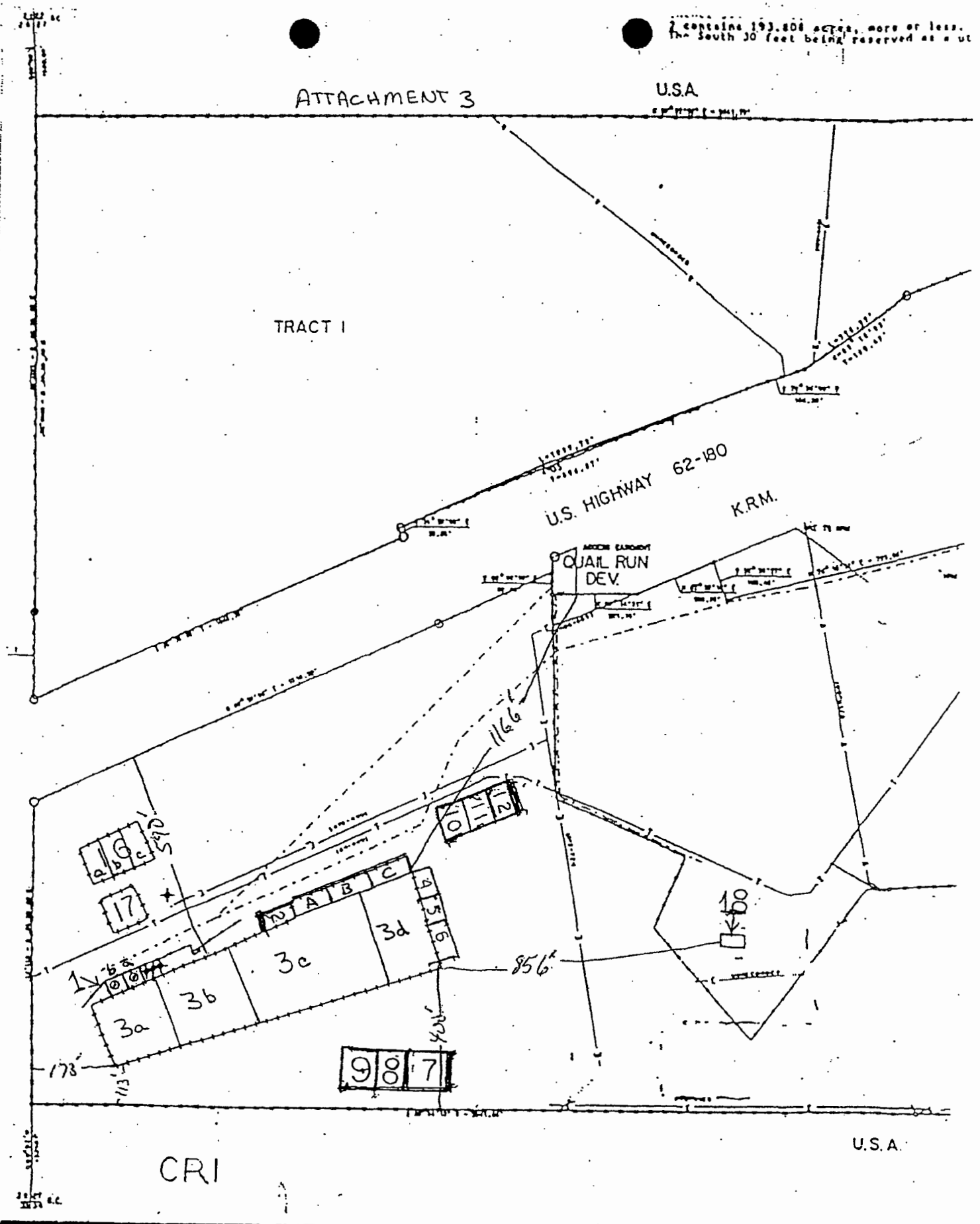
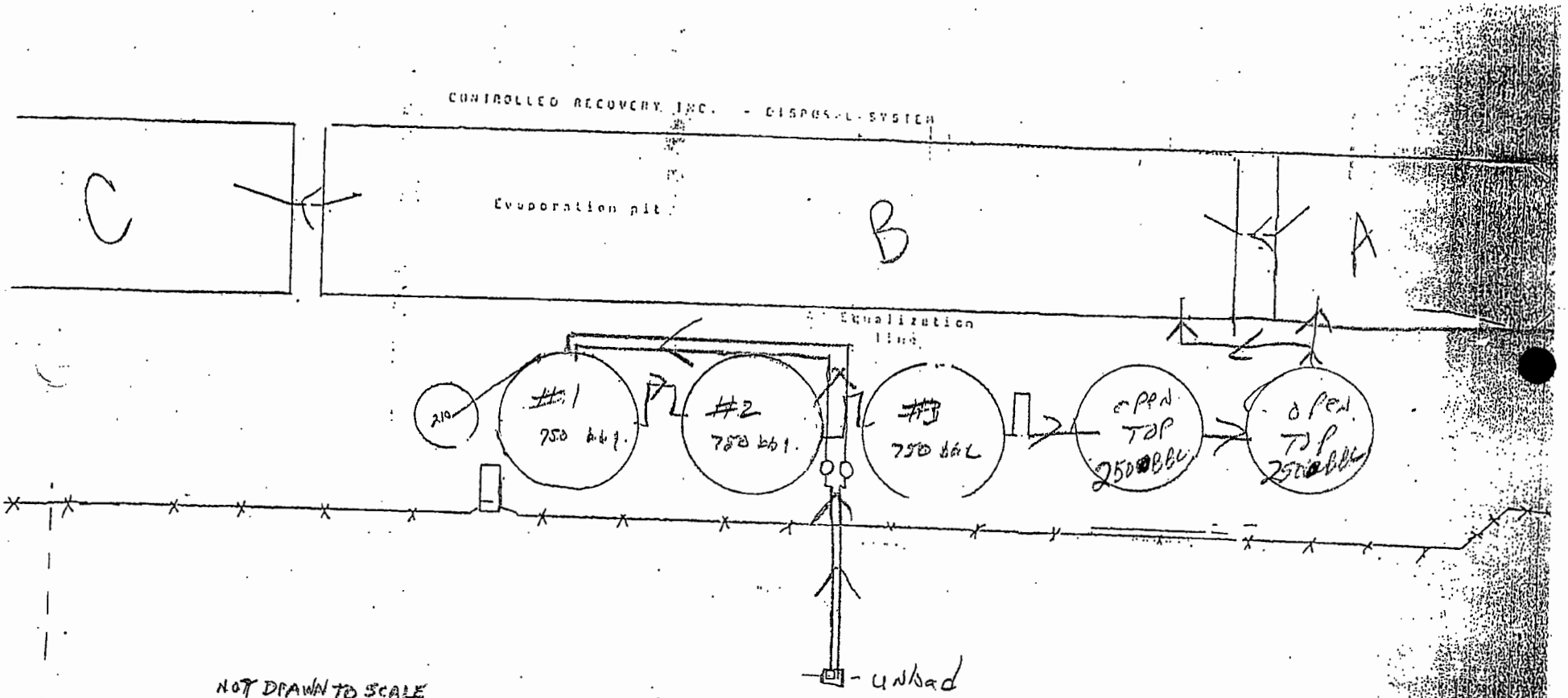


Exhibit C
Process Map



10-27-83

P.W. is unloaded through 4" lines into #1. Gravity flows through 2, 3 + two open tops before being discharged into pit A or B for evaporation.

Exhibit D
NMOCD Rule 118

118 HYDROGEN SULFIDE GAS - PUBLIC SAFETY

118.A. The intent of this rule is to provide for the protection of the public's safety in areas where hydrogen sulfide (H_2S) gas in concentrations greater than 100 parts per million (PPM) may be encountered. [1-1-87...2-1-96]

118.B. Producing operations should be conducted with due consideration and guidance from American Petroleum Institute (API) publication "Conducting Oil and Gas Production Operations Involving Hydrogen Sulfide" (RP-55). The operator of a lease producing, or a gas processing plant handling H_2S or any other related facility where H_2S gas is present in concentrations of 100 PPM or more shall take reasonable measures to forewarn and safeguard persons having occasion to be on or near the property. In addition to training operator's employees in H_2S safety such measures may include, but are not necessarily limited to, posting of warning signs, fencing of surface installations, installation of safety devices and wind direction indicators, and maintaining tanks, thief hatches and gaskets, valves and piping in condition so as to prevent avoidable loss of vapors. Where release of hydrogen sulfide is unavoidable, the operator shall burn or vent the gas stream in such a manner as to avoid endangering human life. [1-1-87...2-1-96]

118.C. Wells drilled in known H_2S gas producing areas, or where there is substantial probability of encountering H_2S gas in concentrations of 100 PPM or more, should be planned and drilled with due regard to and guidance from API RP-49 "Recommended Practices for Safe Drilling of Wells Containing Hydrogen Sulfide", latest edition. Wells completed and serviced by well servicing units where there is substantial probability of encountering H_2S gas in concentrations of 100 PPM or more should be worked on with due regard to the latest industry accepted practices. These practices may include, but are not necessarily limited to, the proper training of personnel in H_2S safety and the use of H_2S safety equipment as listed for safe operations by the American Petroleum Institute draft report for "Land, Oil and Gas Well Servicing and Workover Operations Involving Hydrogen Sulfide."* [1-1-87...2-1-96]

118.D. Within ninety (90) days after completion of the first well on a lease, or within ninety (90) days after H_2S is discovered in a gas stream, each operator shall submit in writing to the Division's district office having jurisdiction, on a form acceptable to the Division, for each lease in each pool in production at that time, the H_2S concentration from an analysis of a representative sample of the gas stream. The analysis shall be performed by an industry-recognized method and procedure. The measurement report shall specify the name of the operator, lease or facility name, pool, testing point, tester, test method, and the measured

H_2S concentration. Tests within the past three (3) years and which are still representative may be utilized for submittal from previously producing leases. NOTE: Owners or operators of existing wells and facilities shall have until July 1, 1987, to come into compliance with this paragraph of these rules. [1-1-87...2-1-96]

118.E. Any well, lease, processing plant or related facility handling H_2S gas with concentration of 500 PPM (0.05%) or more shall have a warning sign at the entrance. The sign, as a minimum, shall be legible from at least fifty (50) feet, and contain the words "poison gas." The use of existing signs will meet the requirements of this section providing they convey the intended safety message. [1-1-87...2-1-96]

(1) Any lease producing gas or related facility having storage tanks containing gas with a H_2S concentration of 1,000 PPM (0.1%) or more shall have, in addition to the sign required in subparagraph E. (1), a sign at the foot of the battery stairway that shall accomplish the requirements of E. (1), plus specify any protective measures that may be necessary. This paragraph does not apply to gas processing plants. [1-1-87...2-1-96]

(2) Any well, lease or processing plant handling gas with H_2S concentration and volume such that the H_2S fraction equates to 10 MCF per day or more of H_2S and which is located within one-fourth (1/4) mile of a dwelling, public place or highway shall install safety devices and maintain them in operable condition or shall establish safety procedures designed to prevent the undetected continuing escape of H_2S. Wind direction indicators shall be installed at least one strategic location at or near the site and shall be readily visible throughout the site. Also, unattended surface facilities or plants within one-fourth (1/4) mile of a dwelling or public meeting place shall be protected from public access by fencing and locking, or other equivalent security means. In addition, the operator shall prepare a contingency plan to be carried out should the public be threatened by a release. The plan shall provide for notification of endangered parties, as well as public safety personnel, for evacuation of threatened parties as warranted, and institution of measures for closing in the flow of gas. Contingency plans shall be available for Division inspection and shall be retained at the location which lends itself best to activation of any such plan. The operator, as an alternative, may utilize Figure 4.1 of API (RP-55) Revised March, 1983 and if the 100 PPM radius of exposure includes a dwelling, public place or highway, the operator must meet the public safety requirements as specified in this section. [1-1-87...2-1-96]

(3) The provisions of this section shall be applicable within 30 days after the filing of sample data showing the existence and concentration of H_2S gas described in Paragraphs E. (1) through E. (3) above. In unusual circumstances guidance on placement and content of signs may be obtained from the supervisor of the appropriate Division District Office. [1-1-87...2-1-96]

118.F. The Director of the Division may administratively grant exceptions or extensions to the requirements of this rule for good cause shown and where such exception will not result in a threat to human life. [1-1-87...2-1-96]

*At such time as the American Petroleum Institute adopts the "Recommended Practice for Land Oil and Gas Well Servicing and Workover Operations on Involving Hydrogen Sulfide", it shall take the place of any previous draft reports. [1-1-87...2-1-96]

Exhibit E
Pasquill-Gifford equation and nomograph

H_2S RELEASE DISPERSION MODELS

When considering application of an H_2S dispersion model, the user should examine the type of H_2S release which might be expected; i.e., will the gas be dense or buoyant; will it be dry or wet; etc. Application of a dispersion model must consider if the release may have a vertical or horizontal plume configuration. The prevailing wind and environmental factors such as humidity and temperature variables will influence the dispersion. Engineering calculations to determine H_2S absolute open-flow rates based on pressure and hole size are necessary to ensure relative accuracy of the dispersion radius of exposure and travel distance.

Historical incidents of H_2S accidental releases have led to the development of computer models to simulate the dispersion of the gas or vapor cloud over a given area. The importance of such modeling becomes apparent in planning for emergency evacuation of the affected population.

The Pasquill-Gifford equation is wide used by the Texas Railroad Commission in the Statewide Rule 36 to address the protection of the general public. This equation can be found in the Texas Rule 36 under Section (c)(2)(A) and (B) and corresponds to a nomograph contained in the Rule to identify a radius-of-exposure for 100 ppm and 500 ppm of H_2S. It is pointed out that for the Rule, public protection begins at 100 ppm.

To utilize the Pasquill-Gifford equation, a computer is not required, but for determining a number of calculations, it is preferred to a calculator. After programming, the radius for different cases may be entered using the H_2S concentration in parts per million (ppm) and the escape rate for a system or facility expressed in cubic feet per day. The oil and gas industry applies this equation to pipelines or facilities within gas processing plants.

The Texas Railroad Commission Rule 36 also requires the use of the Pasquill-Gifford equation during oil and gas well drilling in H_2S producing areas of the state. The "Q" in the equation is the escape rate for a gas well. It should be either the well's adjusted open-flow potential, or if the operator feels this is too high, the well's capacity to flow against a zero back-pressure is acceptable for the calculation. The equation requires the mole fraction of H_2S be used. This is expressed as a percent of the H_2S per 100 standard cubic feet of mixture.

The H_2S concentration will have to be converted to a mole fraction if it is expressed in parts per million or in grains per 100 cubic feet. The "X" in the Pasquill-Gifford equation is the radius of exposure expressed in feet.

The equation as originally formulated, is a three-plane coordinate system. The X axis is that direction in which the wind would be blowing at a continuous rate. The Y axis is the vertical coordinate and the Z axis is the horizontal coordinate. The equation assumes that the emission will be constant such that some distance downstream there is a point at which the 100 ppm concentration will also be constant over the 24-hour period. Normal Gaussian distribution of the Y and Z planes are assumed; that is, there is less concentration in ppm of H_2S on the sides of the release and the highest concentration is in the center. It is also assumed that the emission point will be at or near the ground level. It eliminates a very complex component that is used to determine effective stack height. The Environmental Protection Agency, as well as the Texas Natural Resources Conservation Commission use this equation.

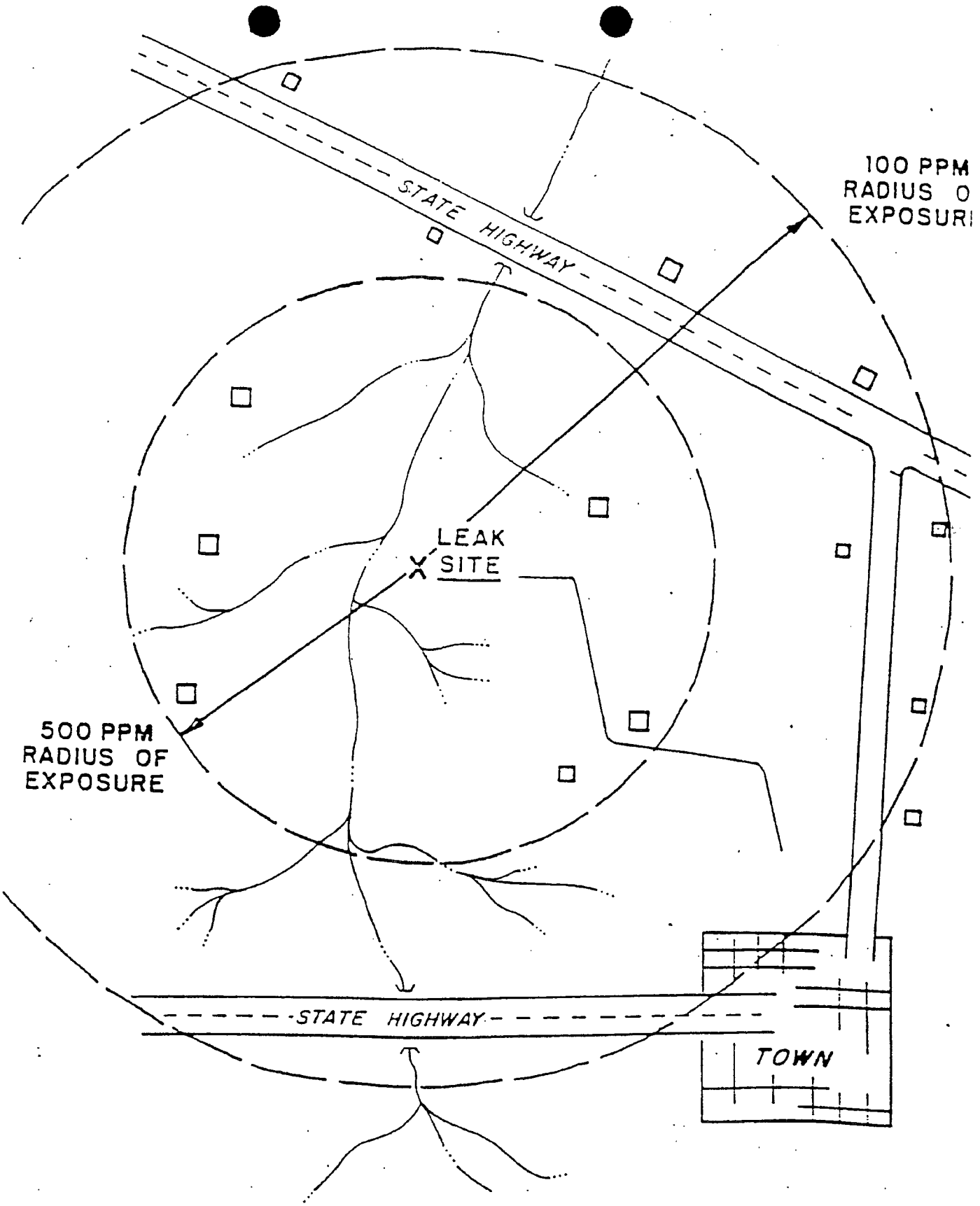
The original Pasquill-Gifford equation took several meteorological parameters into consideration. These parameters are classed into categories A, B, C, D, E and F. Class "A" is the most unstable condition, with stronger wind velocity, more radiation, unlevel terrain, etc. Class "F" is the most stable and is used in the equation to represent the most conservative stability condition. A one mile per hour wind velocity is assumed to represent the least amount of air mixing. This accounts for the equation providing the largest radius of exposure, thus the more conservative approach. The equation is not so accurate that if you calculated a radius of exposure of 1,500 feet, that the gas will not go beyond it; there remains the possibility that it well may do exactly that.

The Pasquill-Gifford method of calculating radius
not infallible. The field data collected by the
Commission on a 10-minute sampling time indicate
level H_2S concentrations, a safety factor of 2 or
The calculation is based on worse-case scenario
maximum radius of exposure. This approach was sele
oil and gas operators with a uniform method of c
should be noted that most states consider this me
and some have adopted it or variations thereof.
population areas, where the radius of exposure i
area, a more sophisticated model that takes into ac
defined parameters should be considered. Approval
state regulatory agencies may be required to appr
of exposure that result from more technically deve
models.

$$100 \text{ ppm ROE} = \left[(1.589)(\text{mole fraction } H_2S)(Q)\right]$$

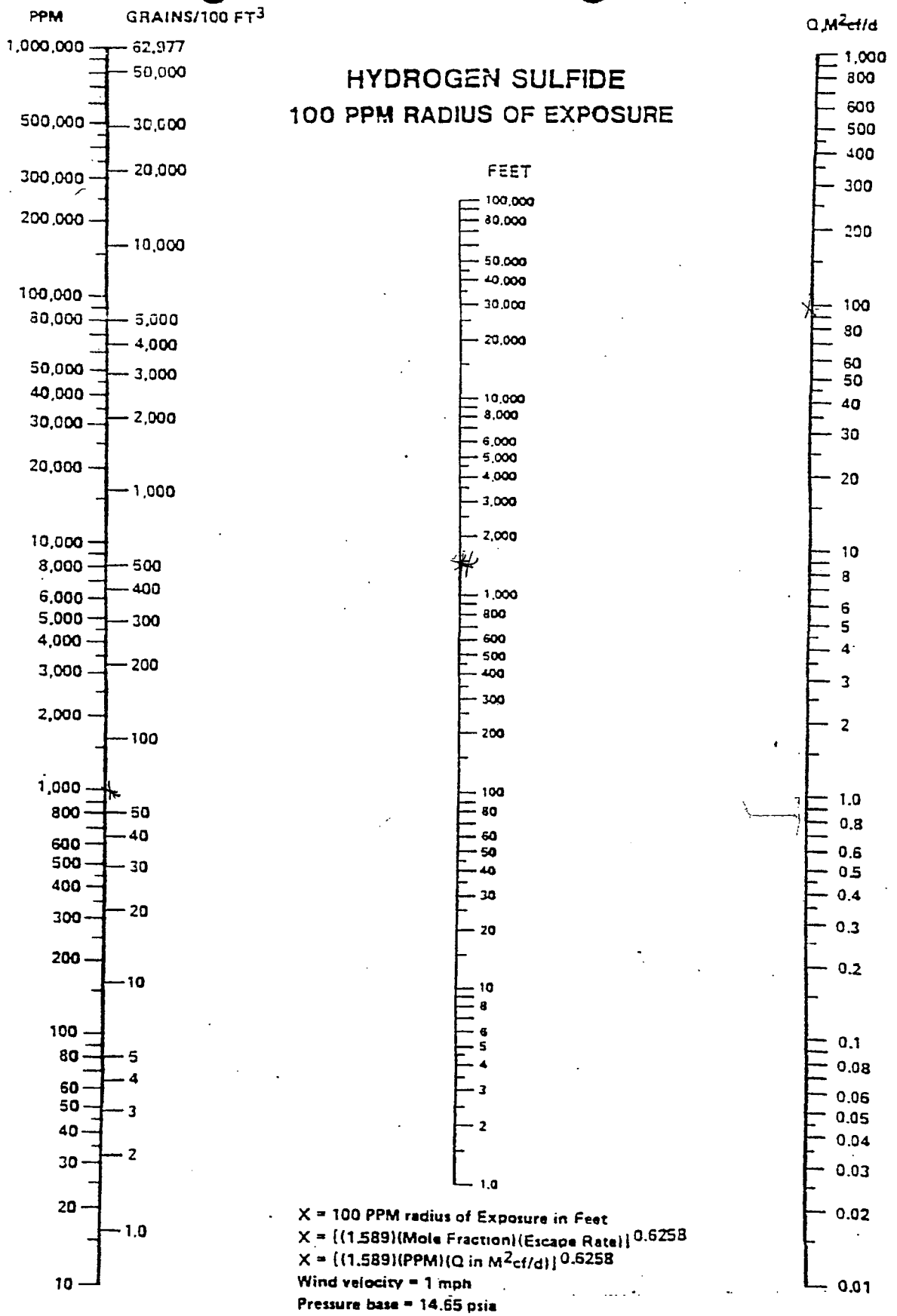
$$500 \text{ ppm ROE} = \left[(0.4546)(\text{mole fraction } H_2S)(Q)\right]^{0.6258}$$

Where: X = radius of exposure in feet
Q = maximum volume determined to be available for escape in cubic feet per day
H_2S = mole fraction of H_2S in the gaseous mixture



EXAMPLES OF
DISPERSION PROBLEMS

HYDROGEN SULFIDE
100 PPM RADIUS OF EXPOSURE



X = 100 PPM radius of Exposure in Feet

$X = [(1.589)(\text{Mole Fraction})(\text{Escape Rate})]^{0.6258}$

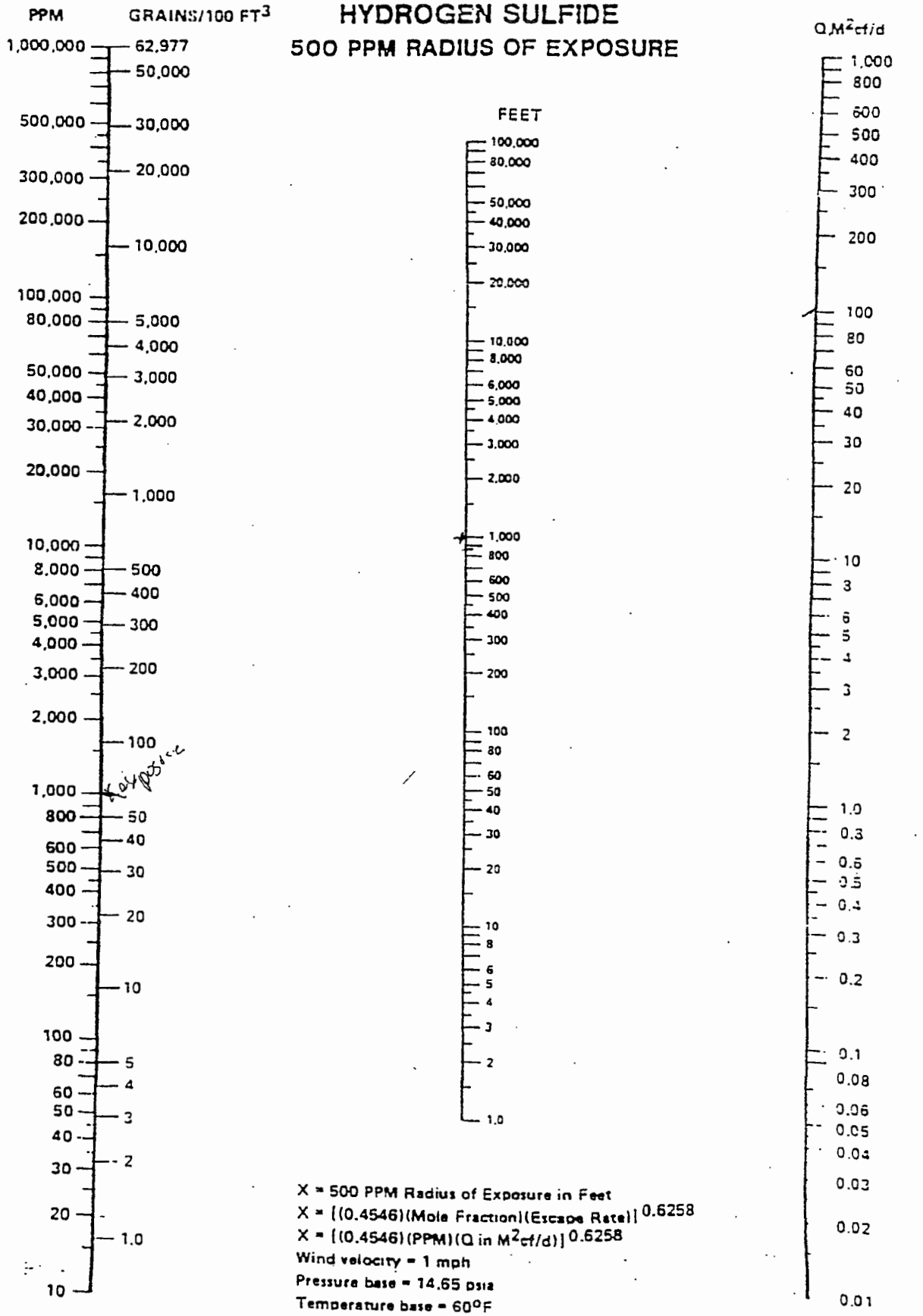
$X = [(1.589)(\text{PPM})(Q \text{ in } M^2\text{cf/d})]^{0.6258}$

Wind velocity = 1 mph

Pressure base = 14.65 psia

Temperature base = 60°F

HYDROGEN SULFIDE
500 PPM RADIUS OF EXPOSURE



X = 500 PPM Radius of Exposure in Feet

$X = [(0.4546)(\text{Mole Fraction})(\text{Escape Rate})]^{0.6258}$

$X = [(0.4546)(\text{PPM})(Q \text{ in } M^2\text{cf/d})]^{0.6258}$

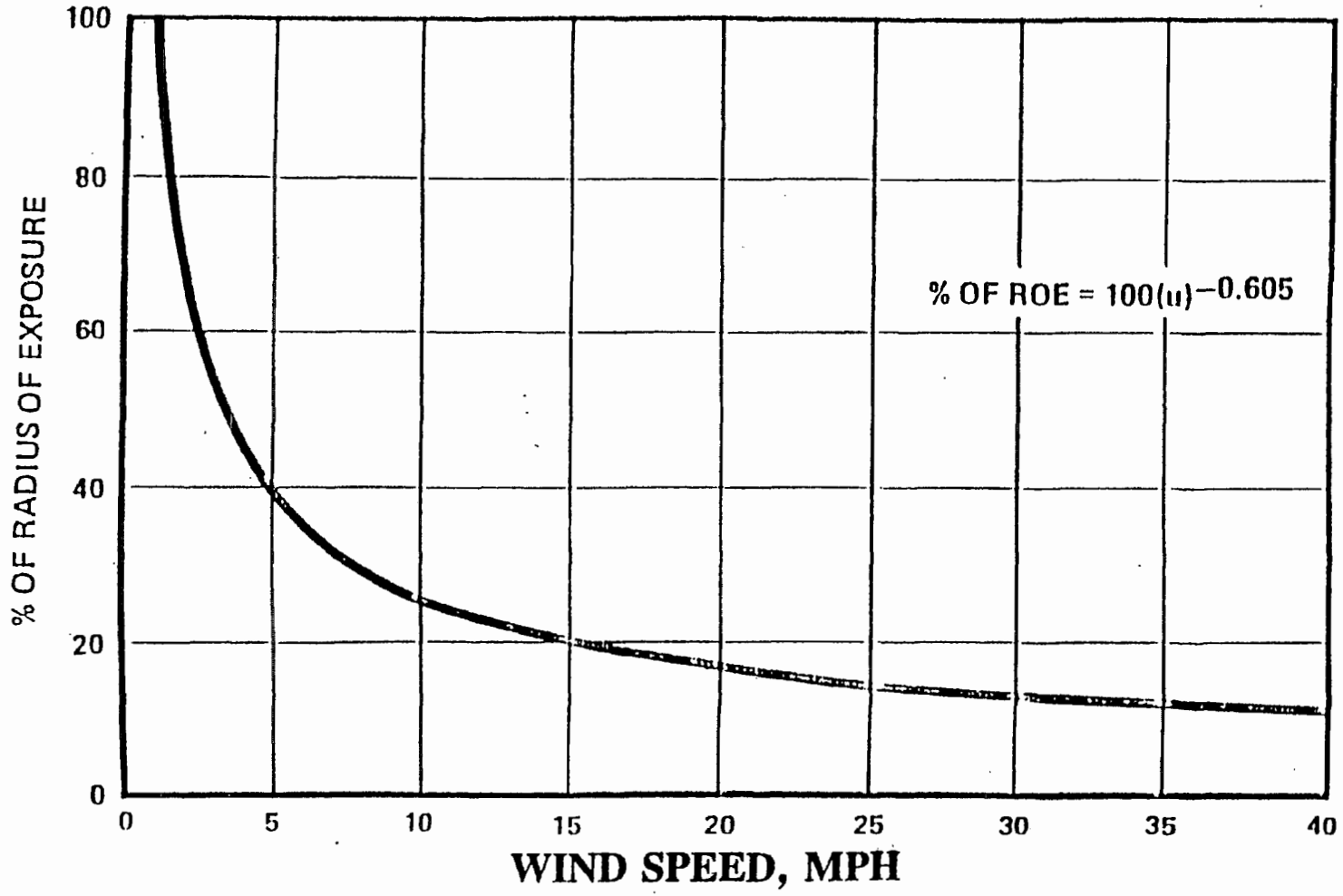
Wind velocity = 1 mph

Pressure base = 14.65 psia

Temperature base = 60°F

% OF RADIUS OF EXPOSURE VS. WIND SPEED

FOR H_2S DISPERSION



The dispersion equations represented by the Radius of Exposure nomographs assume "no wind" conditions. Actually, the effect of wind is to reduce the radius of exposure as the above graph illustrates. The purpose of the graph is to help, in the event of an emergency, to evaluate the potential hazard by enabling an estimate of the effects of the wind. **DO NOT** use the graph for any other purpose.

Exhibit F
Letter to Sandia National Laboratories

P.O. Box 1613
703 E. Clinton Suite 102
Hobbs, New Mexico 88240
505/397-0510
Fax 505/393-4388
www.sesi-nm.com

Safety & Environmental Solutions, Inc.

October 31, 2003

Mr. Mike Hightower
Sandia National Laboratories
P.O. Box 5800, MS 0755
Albuquerque, New Mexico 87185-0755

Dear Mike:

Thank you for taking time to assist me with the H_2S in produced water project, which we discussed on the telephone. As you know, the goal of this project is to provide scientific information supporting the reduction in the H_2S monitoring requirements at my client's disposal facility.

Here are a few facts regarding the process and physical configuration of the facility.

1. Open top pits B and C on the site plan will hold approximately 108,288 barrels of fluid.

2. The Produced water is unloaded from trucks into a closed 750 bbl tank # 1 and gravity flows through a second and third closed 750 bbl tanks #2 and #3 into open top 250 bbl tanks #3 and #4 and finally in to the pits for evaporation.

I have enclosed a recent general water analysis of the fluid in the pits for your information.

The problem statements for this project would be:

1. Given produced water in the pits that is saturated with H_2S, what is the 100 ppm Radius of Exposure?"

2. What saturation level would produce a 100 ppm ROI of 200', 600', 1000', and 1200'?

If you should require further information for your calculations, please let me know and I will do my best to provide it promptly.

Thank you for your assistance in this matter.

Sincerely,

Bob Allen
President

BA/jra

Exhibit G
Sandia National Laboratories Review

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation

Mike Hightower
Distinguished Member Technical Staff

P.O. Box 5800
Albuquerque, NM 87185-0755

Phone: (505) 844-5499
Fax (505) 844-0968
Internet: mmhight@sandia.gov

December 10, 2003

Bob Allen
Safety and Environmental Solutions
703 E. Clinton, Suite 102
Hobbs, New Mexico 88240

Dear Bob:

I have completed a short review of the issues we discussed related to the monitoring of hydrogen sulfide emissions from a produced water disposal facility. The disposal facility includes a series of holding tanks, two of which have open tops, and a series of large evaporation ponds. There are three closed tanks each holding about 750 barrels (bbls) of water and the two open tanks each holding about 250 bbls of water. The two major evaporation ponds hold a total of approximately 108,000 bbls of water. The produced water for disposal is trucked to the site and pumped into the holding tanks, where it is held until the holding tanks overflow into the evaporation ponds. Based on our discussions, the size of the evaporation ponds, and the evaporation rate in the Hobbs area, I based my H2S diffusion and dispersion calculations on the assumed ability of the facility to receive approximately 200-400 bbls of produced water a day.

In cooperation with Wayne Einfeld, one of my coworkers at Sandia who has extensive experience in emission studies, I was able to conduct scoping calculations in an attempt to bound the expected range of hydrogen sulfide emissions at the disposal facility for a common range of operating and atmospheric conditions as well as for some worst case extremes. Hopefully in this way the analysis will provide a concept of the common expected values as well as what might be worst case conditions relative to expected hydrogen sulfide levels at the facility. Table 1 identifies some of the parameters and assumptions used in the analyses.

Table 1. General Parameters used in the Hydrogen Sulfide Dispersion Calculations

Parameter	General Value	Max. Value Used
H2S Solubility	437 ml/100 ml H2O @10° C 186 ml/100ml H2O @30° C	400 ml/100 ml H2O =29 gms/gal H2O =.22 moles/liter of H2O = 8000 ppm
H2S molecular weight	34 gms/mol	Same
H2S density	1.539 gm/l	Same
H2S Diffusion rate from H2O	0.14×10^{-4} cm^2/s	Same

In general, delivery of about 17,000 gal /day (400 bbls/day of produced water) will cause most of the water in the two open 250 bbl storage tanks to drain into the evaporation ponds. This is an average rate of 12 gal/min. This daily volume would fill one of the pits to a depth of only about half an inch. In calculating the diffusion of H2S from the storage tanks, depending on the concentration gradient assumed, about one fourth of the H2S in the water will diffuse from the open tanks each day for the maximum produced water delivery. This of course assumes that all the water delivered for multiple days has the maximum H2S concentration since it takes almost one week for the delivered water to make it to the open holding tanks. Since there is a large holding capacity, it would be more likely that the average produced water H2S concentration as it gets to the final holding tanks and evaporation ponds should be lower because of dilution with other produced water and that the H2S concentration would be less than the maximum saturation. Average saturations of 10-30% in the holding tanks would probably be more likely due to mixing of the produced water from different areas.

For the delivery of 400 bbls/day, much of the H2S dispersion will take place in the evaporation pond. Because of the large surface area of the pond, there is more than enough diffusion and dispersion capacity for all of the H2S delivered each day. Actually the one-acre size ponds provide such a large surface area for diffusion that diffusion is essentially instantaneous from the area around the discharge point. At a rate of 12 gal/min, and assuming the maximum H2S saturation, the produced water going into the ponds will create an average air concentration around the discharge point of approximately 30 ppmv. At an air flow of as little as 0.1 m/s, this concentration would not be expected to be exceeded anywhere outside the pond. If the discharge point includes a water diffuser located near the middle of the evaporation pond, the maximum air concentration at the edge of the pond with a 0.1 m/s wind was calculated to be about 1 ppmv. This assumes that the dispersion takes place during the day where the atmospheric conditions are most beneficial. Because of the high rates of diffusion from the evaporation ponds it is not expected that any major diffusion and dispersion would take place at night. The calculations for these parameters and for dispersion of the H2S for several different saturation levels are presented in Table 2.

In operations where less than the 400 bbls per day are delivered, up to 50% of the diffusion and dispersion of the H2S could take place in the open holding tanks. These tanks therefore could be modeled as a point source with an equivalent stack height equal to the height of the tanks. This minimizes surface concentrations near the facility and provides an effective dispersion mechanism. At this rate of produced water disposal, only half of the H2S is dispersed from the pond and the near surface concentrations are significantly reduced as can be seen in Table 2.

You had asked that we provide contours of 100 ppmv H2S concentrations as a function of saturation. As you can see from Table 2, I do not expect that any concentrations this high would be determined, even at the maximum saturation conditions, except maybe directly at a discharge point within the evaporation pond.

Table 2. General H2S Evaporation Pond Concentration Calculations

H2S Saturation	H2S Concentration in H2O gms/gal	Produced Water Volume gal/day	Flow into Evaporation Ponds gal/min	Max. H2S Air Concentration at Pond Discharge Point ppmv	Estimated* H2S Air Concentration At the Pond Boundary ppmv
100%	29	17,000	12	30	1
50%	14.5	17,000	12	15	0.5
10%	2.9	17,000	12	3	0.1
100%	29	8500	6	10	0.3
50%	14.5	8500	6	5	0.1
10%	2.9	8500	6	1	<0.1

* Uses Gaussian dispersion model and assumes discharge point is in the middle of the evaporation ponds with a diffuser, wind speed of 0.1 m/s, and daytime(high solar radiation) atmospheric conditions.

These analyses were based on a quick evaluation of the expected site facility and operations management as described in your letter. More detailed calculations and assessments can be done to better define the analyses provided here. This would include better incorporation of atmospheric data and validation of the calculated H2S levels with actual produced water concentration data and air concentration data. There are several atmospheric modeling consultants in New Mexico that could help support you with these more detailed calculations and modeling validation. Wayne has worked with several o these companies and has provided a couple of names of well know companies that could expand our preliminary analyses. They include:

Class One Technical Services
3500 G Comanche Rd NE
Albuquerque, NM
505-830-9680

Tetra Tech
6121 Indina School Rd NE
Albuquerque, NM
505-881-3188

I hope this provides the information you needed. If you have any questions, would like to discuss the results or the analytical techniques, or if I can be of help in any other way please give me a call at 505-844-5499.

Sincerely,

Mike Hightower

Exhibit H
Laboratory Analysis of Produced Water

CARDINAL LABORATORIES

PHONE (325) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
SAFETY & ENVIRONMENTAL SOLUTIONS, INC.
ATTN: BOB ALLEN
703 E. CLINTON, #103
HOBBS, NM 88240
FAX TO: (505) 393-4388

Receiving Date: 10/14/03
Reporting Date: 10/17/03
Project Number: NOT GIVEN
Project Name: CRI
Project Location: NOT GIVEN

Sampling Date: 10/14/03
Sample Type: WASTEWATER
Sample Condition: COOL & INTACT
Sample Received By: GP
Analyzed By: AH

LAB NUMBER SAMPLE ID	Na (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Conductivity (mS/cm)	T-Alkalinity ($mgCaCO_3/L$)
ANALYSIS DATE:	10/15/03	10/15/03	10/15/03	10/15/03	10/15/03	10/15/03
H8085-1 PW PIT	45204	11679	3426	727	267924	32
Quality Control	NR	56	59	5.17	1322	NR
True Value QC	NR	50	50	5.00	1413	NR
% Recovery	NR	112	118	103	93.6	NR
Relative Percent Difference	NR	0	0	1	0.7	NR
METHODS:		SM3500-Ca-D	3500-Mg E	8049	120.1	310.1

	Cl^- (mg/L)	SO_4 (mg/L)	CO_3 (mg/L)	HCO_3 (mg/L)	pH (s.u.)	TDS (mg/L)
ANALYSIS DATE:	10/15/03	10/15/03	10/15/03	10/15/03	10/15/03	10/15/03
H8085-1 PW PIT	100969	243	0	39	6.93	201700
Quality Control	1040	53.65	NR	996	6.99	NR
True Value QC	1000	50.00	NR	1000	7.00	NR
% Recovery	104	107	NR	99.6	99.9	NR
Relative Percent Difference	1.0	1.5	NR	0	0.7	12.1
METHODS:	SM4500-Cl-B	375.4	310.1	310.1	150.1	160.1

Amy Hill
Chemist

10/17/03
Date

H8085

CARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240
(915) 673-7001 Fax (915) 673-7020 (505) 393-2326 Fax (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 1 of 1

Company Name: SESI		BILL TO	PO #:
Project Manager:		Company: SAME	
Address: 703 E. CLINTON, #103		Attn:	
City: HOBBS State: NM Zip: 88240		Address:	
Phone #: (505) 397-0510		City:	
Fax #: (505) 393-4388		State: Zip:	
Project #: Project Owner:		Phone #:	
Project Name: CRE		Fax #:	
Project Location:			

ANALYSIS REQUEST: Cations / Anions

FOR LAB USE ONLY LAB I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRES.: ACID:	ICE / COOL	OTHER:	SAMPLING: DATE	TIME	Cations / Anions
H8085-1	PW Pit	C	2		X								10-14	10:30	✓

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% per annum from the original date of invoice, and all costs of collections, including attorney's fees.

Sampler Relinquished: DAVID PARSONS	Date:	Received By:	Phone Result ☐ Yes ☐ No Additional Fax #:
	Time:		Fax Result: ☐ Yes ☐ No
Relinquished By:	Date: 10/14/2003	Received By: (Lab Staff)	REMARKS:
	Time: 3:37P		
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool: ☒ Yes ☐ No Intact: ☒ Yes ☐ No	CHECKED BY: (Initials)	

Cardinal cannot accept verbal changes. Please fax written changes to 915-673

Exhibit I
Qualifications and Credentials

QUALIFICATIONS AND CREDENTIALS
James R. (Bob) Allen ASP, CHMM, REM, CET, CES

Qualifications Summary

James R. (Bob) Allen is a Safety and Environmental Professional with more than 17 years of experience relating to occupational safety and health, hazardous materials, and environmental cleanup and 13 years of experience in finance and management industries.

Mr. Allen enjoyed a successful career as a bank president, and management and safety consultant prior to founding Safety & Environmental Solutions, Inc. in 1995. He continually draws from his finance, management, and regulatory compliance experience in his current position as President of SESI, Inc. Mr. Allen is responsible for the development and implementation of safety and environmental programs for a wide variety of industries such as oil & gas production, petrochemical, and refineries. Mr. Allen has delivered a broad curriculum of safety and environmental training for industrial clients as well as serving as an adjunct professor at New Mexico Junior College, Hobbs, New Mexico. Mr. Allen has served as the senior environmental principal for numerous environmental remedial projects in West Texas and Southeastern New Mexico.

Mr. Allen has many years of practical experience in safety related aspects oilfield operations such as Lock out/Tag out, confined spaces, H_2S operations, excavation, welding and cutting, hoisting and rigging, and job safety analysis.

Mr. Allen has prepared emergency response plans for major oil and gas and service company facilities throughout the Southwest. He prepared the Flood Mitigation Plan for the City of Hobbs, New Mexico to meet the requirements of the Federal Emergency Management Agency's (FEMA) Community Rating System (CRS) in 1999. He is currently engaged in the preparation of the Lea County All Hazard Mitigation Plan as required by the Disaster Mitigation Act of 2000.

Education

B.B.A., New Mexico State University, Las Cruces, New Mexico

Registrations and Affiliations

- Associate Safety Professional- Board of Certified Safety Professionals – A 11841 -2003
- Certified Hazardous Materials Manager, Master Level CHMM #10551 – *Institute of Hazardous Materials Management*
- Registered Environmental Manager REM #7773 - *National Registry of Environmental Professionals*
- Certified Environmental Trainer #94-209 in Occupational Safety and Health and Management and Transportation of Hazardous Materials and Waste -*Natl. Environmental Training Association*
- Registered Environmental Professional, *Texas Registry of Environmental Professionals* - #611
- Certified Environmental Compliance Manager - *Columbia Southern University*
- Certified Environmental Specialist #10583 - *Environmental Assessment Association*
- Professional Member, *American Society of Safety Engineers (ASSE)*
- Past Chairman, SE New Mexico Section, Permian Basin Chapter, *ASSE*

- Member, *International Registry of Environmental Engineers and Compliance Professionals*
- Past Member, Board of Directors, *West Texas Safety Training Center*
- Instructor, Medic First Aid (Basic) - International Registry # 17942, *EMP America*
- Instructor, Medic First Aid (BLS/PRO) - International Registry # 17942, *EMP America*
- Incident Commander, 29 CFR 1910.120
- Licensed Radiation Safety Consultant, *State of New Mexico* #398-6
- Defensive Driving Instructor #45671 - *National Safety Council*
- Judge, International Intercollegiate Environmental Design Contest 2000, *Waste Education Research Consortium (WERC)*

ATTACHMENT 15

Closure and Post-Closure Plan

CLOSURE AND POST-CLOSURE PLAN

R360 ENVIRONMENTAL SOLUTIONS

R360 PERMIAN BASIN, LLC

AVALON, EDDY COUNTY, NEW MEXICO

April 19, 2013

For Permit Purposes

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

April 19, 2013

Prepared By

NEI NaismithEngineering,Inc
ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING

NEI PROJECT NO. 8935

TABLE OF CONTENTS

1. GENERAL

1.1. Scope and Purpose

This Closure and Post-Closure Plan has been prepared by Naismith Engineering, Inc., (hereafter "NEI") on behalf of R360 Permian Basin, LLC (hereafter "R360") in conjunction with the submittal to the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division (hereafter "NMOCD") of an application to obtain authorization to operate a surface waste management facility in southeaster Eddy County, New Mexico. The proposed facility will be known as the Avalon Transfer Facility (hereafter "Facility").

1.2. Facility Description

R360 will operate the Facility as a waste storage and transfer facility. A detailed description of the proposed facility is provided in Attachment 10 to the Application.

2. FACILITY CLOSURE

2.1. Closure Scenarios

Facility Closure would occur under one of two (2) distinct closure scenarios:

- Closure by the Operator
- Closure by a third-party, as overseen by the NMOCD

The following sections address general closure activities common to both scenarios and then present activities specific to each activity.

2.2. Closure Overview

The closure process to be used for the Facility will be to have all waste management units and waste containers removed and a "clean closure" completed. The removal will also address any spill residues associated with the waste management activities.

At the time of closure, enclosed containers of waste material will be sent to an off-site, authorized waste management facility acceptable to the NMOCD. In an instance where a container is damaged or incapable of being safely and properly transported, the waste from this container will be transferred into a suitable container for transport off-site.

Waste storage and handling equipment and related structures will be cleaned and decontaminated and removed from the site. Cleaning residuals will be managed as waste materials. On-site buildings and other structures will either be dismantled and removed, or left on-site for other uses. Gates and fencing will remain in place. All remaining waste materials or residues, any visibly impacted soil material will be removed and managed as waste material. In accordance with NMAC 19.15.36.18.D(1)(a), the removal of existing equipment will be completed within ninety (90) days of closure.

Following the removal of visibly impacted materials in the vicinity of the waste management units, soil samples will be collected and analyzed for closure parameters, and the results of the testing compared to the established closure criteria. In-situ materials with contaminants present above the established closure criteria will be removed and managed

as waste material. Additional sampling and removal, as necessary, shall be completed until all materials impacted by the operation have been confirmed as removed.

Following the confirmation of the removal of any impacted material, storm water control and containment berms will be leveled and graded to drain. Following final grading, vegetation will be established on all disturbed areas, or an alternative surface treatment request will be submitted to the NMOCD.

2.3. Closure Standards for Removal of Waste Management Units

Although the proposed facility is not an oil treating facility, the Applicant believes that the closure performance standards for oil treating facilities would be appropriate to apply to the proposed Facility since it is intended that no wastes will remain at the Facility following closure. As described above, the equipment and waste materials would be cleaned and salvaged or sent off-site for disposal. In accordance with NMAC 19.15.36.18.D(1) for the following parameters:

Parameter	Method
Total Petroleum Hydrocarbons (hereafter "TPH")	418.1
Benzene (hereafter "B"), Toluene (hereafter "T"), Ethyl-benzene (hereafter "E"), Total xylenes (hereafter "X"), total BTEX	SW-846 Methods 8021B or 8260B
Major Cations (Calcium, Magnesium, Sodium and Potassium)	SW-846 Method 6010X or 6020X
Major Anions (Chloride, Sulfate, Bicarbonate and Carbonate)	EPA Methods 130.X and 300.X or equivalent
RCRA Metals (Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver)	SW-846 Method 6010X or 6020X

Samples for these parameters shall be collected in accordance with a gridded plat of the site containing at least four equal sections, as approved by the NMOCD. Samples must demonstrate that these constituents are present

At the completion of the closure activities, a report will be prepared and submitted to the NMOCD Environmental Bureau in Santa Fe, presenting the results of the closure confirmation sampling and documenting re-vegetation activities.

2.4. Closure by the Operator

At the end of the Facility's operating life or at any time the Operator decides to permanently discontinue the operation of the Facility, the Facility will stop receiving wastes and will transfer and dispose, as per normal operations, any remaining waste material. The Operator shall provide at least sixty (60) days notice prior to ceasing operations at the Facility, as required under NMAC 19.15.36.18.A(1) The Operator will then proceed to conduct the general closure activities outlined above. The Operator will conduct closure sampling and will prepare and submit the Site Closure Report. Once the closure activities

have been accepted by the NMOCD, the Operator may request release of financial assurance.

2.5. Third-Party Closure Initiated by the NMOCD

As required by NMOCD rules, the Applicant has prepared a closure scenario description and a corresponding closure cost estimate for closure of the facility by a third party based on this scenario description. The closure scenario description has been included as Appendix 15-1 and the closure cost estimate has been included as Appendix 15-2. This closure scenario is based on oversight by a third-party and assumes that the Operator is unable to participate in the closure activities.

3. FACILITY POST-CLOSURE ACTIVITIES

Since no waste will remain at the facility following closure, post-closure care activities will be limited to ensuring establishment of vegetation on the closed areas. The Operator will have the closed area inspected by a New Mexico licensed professional engineer to assess the effectiveness of the vegetation establishment. These inspections will be conducted for up to one (1) year, as required.

4. FINANCIAL ASSURANCE

Upon the approval of the Application, the Applicant will file satisfactory Financial Assurance documentation with the NMOCD.

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Appendix 15-1

Closure Scenario Description

Naismith Engineering, Inc	Project No. 8935	SHEET 1
	Description: Closure Scenario Description	Date: 04/19/2013
	R360 Permian Basin, LLC Avalon Transfer Facility – Eddy County, New Mexico	By: GAJ

CLOSURE SCENARIO

For Regulatory Review

GRANT A. JACKSON NEW MEXICO 20764 PROFESSIONAL ENGINEER

April 19, 2013

2 Pages of Calculations

Description

This closure scenario is developed for the R360 Permian Basin, LLC (R360) Avalon Transfer Station (Facility) as proposed in an application to the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division (NMOCD) for the facility. The scenario is based on an operating facility that must be closed by a third party.

Given Information

For closure scenario purposes, this document addresses the transfer station facility at full development, which encompasses approximately 36 acres and includes the following:

- One (1) container storage area, encompassing approximately two (2) acres with a storage capacity of approximately 48 containers.
- Two (2) 500 bbl liquids storage tank

Assumptions

The closure scenario is based on the following:

- The costs are based on projected 2013 dollars.
- The closure activities will need to be overseen by a licensed professional engineer.
- The container storage area is at capacity with 48 containers full of waste.
- The liquids storage tanks are full (1,000 bbls).
- Construction quality control must be provided for all activities.

CLOSURE SCOPE ITEMS

Engineering

The following activities will be required for a professional engineer to oversee the closure activities:

- An updated topographic survey of the Transfer Station facility at the site
- Modifying and updating the facility closure plan to reflect current conditions
- Preparing closure bid documents
- Bidding and procurement of closure contractors
- Construction phase engineering during closure, including periodic site visits, review and processing of pay estimates, and coordination with contractor(s)
- On-site observation during closure, for a period of two (3) months
- Soil contaminant analytical testing
- Preparation of a final closure report

Container Storage Area

The following closure activities will be required:

- Transport all waste containers to an offsite disposal facility and dispose of waste (48 units at 40 cubic yards = 1,920 cubic yards)
- Remove and dispose of gravel base material (2 acres x 12 inches = 3,230 cubic yards). Assume material is contaminated
- Push down containment levees and grade area to drain

- Vegetation/Seeding and Watering

Liquids Storage Tank

The following closure activities will be required:

- Offsite disposal of 1,000 bbls of liquid from the liquid storage tanks
- Demolish, remove and dispose of liquids storage tanks
- Remove 1 foot layer of soil from within containment area and haul to offsite disposal facility. Assume containment area is 40' x 80'. (40' x 80' x 1' depth/ 27 cubic feet per cubic yard = 119 cubic yards) Combine with container storage area base material for disposal.
- Push down containment area levees and grade area to drain
- Vegetation/Seeding and Watering

CLOSURE COST

Based on the attached estimate, the estimated closure cost is:

Total Estimated Closure Cost: **$371,450**

\\Nei-projects\projects drive\8935-R360-Avalon\Transfer Station\Application\Att15-Closure\R360-Avalon-Closure-Scenario.docx

Appendix 15-2

Closure Cost Estimate

Closure/Post-Closure Care Cost Estimate
R360 Permian Basin, LLC - Avalon Facility

Item	Quantity	Units	Unit Cost*	Amount
Engineering				
Topographic Survey	36	Acres	$300	$10,800
Modify Closure Plan/Bid Out	1	Lump Sum	$15,000	$15,000
Prepare Closure Bid Documents	1	Lump Sum	$5,000	$5,000
Bidding and Procurement of Contractor	1	Lump Sum	$5,000	$5,000
Construction Phase Engineering	1	Lump Sum	$9,000	$9,000
On-site observation	350	Hours	$90	$31,500
Soils Contaminant Analytical Testing	1	Lump Sum	$3,000	$3,000
Final Closure Report	1	Lump Sum	$5,000	$5,000
Estimated Engineering Costs				**$84,300**
Container Storage Area				
Transport waste containers to disposal facility	1,920	Cubic Yard	$50.00	$96,000
Salvage and remove gravel base material	3,230	Cubic Yard	$50.00	$161,500
Grade area to drain	3	Acres	$2,000.00	$6,000
Vegetation/Seeding/Watering	3	Acres	$400.00	$1,200
Estimated Container Storage Area Closure Costs				**$264,700**
Liquids Storage Tank				
Transport storage tank liquids to offsite disposal	1,000	Barrels	$10.00	$10,000
Demolish/dispose of storage tanks	1	Lump Sum	$5,000.00	$5,000
Excavate 1' layer from containment area & dispose	119	Cubic Yard	$50.00	$5,950
Grade area to drain	1	Lump Sum	$1,000.00	$1,000
Vegetation/Seeding/Watering	1	Lump Sum	$500.00	$500
Estimated Solids/Liquids Receiving Area Closure Costs				**$22,450**
Total Estimated Closure Costs				**$371,450**

Costs presented are estimated as of April 2013.

For Permit Purposes

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

April 19, 2013

ATTACHMENT 16

Contingency Plan

R360 PERMIAN BASIN, LLC

CONTINGENCY PLAN

February 2013

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Purpose

This plan is to serve as a reference in the event of an emergency at an R360 Facility within the Permian Basin. This plan has been developed using Part 36.13(N) of the New Mexico Authoritative Code Title 19 Chapter 15 as a guide for its format. This is to ensure compliance with state regulations.

2. RESPONSE ACTIONS [NMAC 19.15.36.13(N)(1)]

2.1. General Response Actions

1. NOTIFY THE ECs: The employee who first becomes aware of the emergency will immediately notify the Primary EC, and the Alternate EC and On-site EC if necessary, by whatever means of communication necessary. Upon notification of the situation the EC shall inform senior management of the scope and nature of the incident.

2. ASSESS SOURCE, AMOUNT AND EXTENT OF RELEASE: The EC will assess the source, amount, and extent of any spill or release, or released material resulting from an incident, using directions listed in Section 11, to determine possible hazards to the environment. Upon assessment of the situation the EC shall update senior management of the scope and nature of the incident.

3. CONTROL MEASURES OR EVACUATION: Based on the assessment initiate control procedures for either:

    - Fire
    - Explosion
    - Spills
    - Release to Air
    - Evacuation

    Initiate the procedures that are appropriate to the situation.

4. NOTIFICATION OF EMERGENCY AUTHORITIES: If the EC's assessment indicates a need to notify appropriate state and local emergency authorities, notification will be initiated immediately. A list of state and local response agencies with phone numbers is provided as Table 1. Division will be notified as necessary in accordance with Table 2 (Release Notification, NMAC 19.15.29).

5. DIVERT TRAFFIC AND RESTRICT PERSONS FROM AREA: R360 personnel not actively involved in release control operations will be restricted from the area until the area is determined to be safe by the EC and, if appropriate, the on-scene senior emergency authority (i.e., fire, police, hazard or other official). Vehicular traffic will be diverted away from release response activities until the situation is abated.

2.2. Fires

1. S - Sound the alarm: Utilize the internal communication system to notify the facility of a fire. Call 911 to alert the fire department then call and verify the EC is aware of the fire.

2. A - Alert others: Quickly tell others in the area of the fire. Do this in a calm, firm manner. Do not cause a panic. Secure the area for the fire department. Call the EC to give them verification and location of the fire.

3. F - Fight the fire: Do this only in the case of a manageable fire, one that you have the training and experience to fight --for example, a fire in a trashcan. If possible two employees should fight the fire together using two fire extinguishers. If you have any doubt about your ability to fight the fire, then do not attempt to combat it.

4. E - Evacuate the area: If the fire is beyond your capability to fight then EVACUATE.

2.3. Explosions

1. EVACUATE AND NOTIFY EMERGENCY AUTHORITIES: If at any time the threat of an explosion exists the EC will contact the local Fire Department or the WIPP Emergency Line (Table 1) for assistance. All personnel will be instructed to evacuate the area to await response from trained firefighting professionals.

2. INITIATE MITIGATION MEASURES:

    - FROM FIRE/HIGH TEMPRATURES: use fire hoses to cool the vessels in danger of explosion.

    - FROM PRESSURE: open relief valves if safe to do so, do not puncture vessel to relieve pressure.

3. MONITOR SITUATION: The EC will monitor the containers involved from a safe distance. [19.15.36.13.N(11) NMAC].

2.4. Release to Air

1. INITIATE CONTROL: The EC and R360 personnel will initiate response actions within the scope of their training to control or mitigate the release. DO NOT APPROCH THE TANK.

2. EVACUATE AND NOTIFY EMERGENCY AUTHORITIES: The EC will contact the Fire Department or the WIPP Emergency Line (Table 1) for assistance. All personnel will be instructed to evacuate the area.

3. CONTAIN RELEASE: If the release is containable in the judgment of the fire department or WIPP responders allow them to employ containment procedures according to their training/standard operating procedures.

4. SAMPLING: After rendering the area around the site safe and isolating the contaminants and any contaminated media, inspect them to determine if sampling is appropriate. If appropriate, isolate contaminants in the waste inspection or segregation area, or in designated leak-proof containers, until characterization is complete.

5. CLEANUP: After the release has been contained and necessary samples have been obtained, cleanup will be initiated by removing the contaminated materials, sorbent materials, media used for containment, etc.

6. EQUIPMENT MONITORING: Pertinent equipment, including valves and pipes, will be monitored for leaks, pressure buildup, gas generation or rupture as appropriate [19.15.36.13.N(11) NMAC].

7. VERIFICATION SAMPLING: After Cleanup and removal of contaminated media conduct sampling of impacted area to determine the site has been properly remediated.

8. DISPOSAL OR PROCESSING: When visual and/or laboratory characterization is complete, determine appropriate processing or disposal procedures for that waste type. Send residuals for disposal to a facility that is approved for managing that type of waste.

2.5. Release to Soil

1. INITIATE CONTROL: The EC and R360 personnel will initiate response actions within the scope of their training to control or mitigate the spill and only to spills of materials that are classified as Non-Hazardous during the incident assessment, R360 personnel do not respond to Hazardous Materials Spills. If the spill is suspected of being hazardous initiate evacuation procedures.

2. EVACUATE AND NOTIFY EMERGENCY AUTHORITIES: If at any time the scope of the spill is beyond the capabilities of the on-site personnel to contain and/or extinguish it, the EC will contact the Fire Department or the WIPP Emergency Line (Table 1) for assistance. All personnel will be instructed to evacuate the area.

3. REMOVAL OR SEGREGATION: Determine if the material can be safely removed to a designated containment area for further evaluation. If the materials cannot be safely relocated, contain them in place for investigation and sampling using the spill control list. If necessary, shut down operations until safe conditions are restored.

4. CONTAIN SPILL: Attempt to contain the spill to the smallest area possible. Examples of equipment available for spill containment are non-reactive sorbent materials, sand, shovels and heavy equipment. Some Containment strategies include:

Berm construction, underflow dams, trenches, absorbent materials, removal of spilled material into a storage container.

5. SAMPLING: After isolating the contaminants and any contaminated media, inspect them to determine if sampling is appropriate. If appropriate, isolate contaminants in the waste inspection or segregation area, or in designated leak-proof containers, until characterization is complete.

6. CLEANUP: After the release has been contained and necessary samples have been obtained, cleanup will be initiated by removing the spilled materials, sorbent materials, soils used for containment, etc.

7. EQUIPMENT MONITORING: Pertinent equipment, including valves and pipes, will be monitored for leaks, pressure buildup, gas generation or rupture as appropriate [19.15.36.13.N(11) NMAC].

8. VERIFICATION SAMPLING: Dependent on the type of material spilled, the EC will assess requirements for cleanup verification including the collection of samples for appropriate analytical testing.

9. DISPOSAL OR PROCESSING: When visual and/or laboratory characterization is complete, determine appropriate processing or disposal procedures for that waste type. Send residuals for disposal to a facility that is approved for managing that type of waste.

2.6. Release to Ground Water

A release to groundwater, while extremely unlikely would indicate a failure of the liner system[1]. This would be discovered by an exceedance in the Action Leak Rates (ARL) identified in the permit application. In the event of discovering an exceedance of the ARL, R360 management will be notified and R360 Management will notify the Division. After notification to management the following procedures will be implemented for evaporation ponds and landfill cells respectively.

Evaporation Ponds

1. If the ALRs are exceeded, then the leak detection system will be monitored over the next 30 days to assess if the ALR had actually been exceeded.

2. If the 30 day monitoring period reveals that the ALR has been exceeded, then a further action plan will be developed in conjunction with the Division that will outline the next steps, which may include:

[1] The halfway Facility does not utilize engineered liners for some waste management units at the facility. The units were originally permitted to utilize a natural impermeable layer of clay, the "Red Beds" as an impermeable layer for these units.

- Depending on the actual leakage volume, the leak detection layer will be pumped out on a regular basis to remove the leakage from building up on the secondary liner within the leak detection layer.
- The amount pumped out of the leak detection layer will be recorded on a daily basis.
- Water in the ponds may be removed to varying depths or completely to expose the primary liner system for possible repairs, if needed.

Landfill Cells

1. In the case of the landfill cells, the liner system will be buried under the waste materials being placed in the fill, therefore, the liner system will not be accessible for repairs, if needed.

2. If the ALRs are exceeded, then the leak detection system will be monitored over the next 30 days from the first date when the ALR was discovered to be exceeded to assess if the ALR has actually been exceeded.

3. If the 30 day monitoring period reveals that the ALR has been exceeded, then a further action plan will be developed in conjunction with the Division that will outline the next steps, which may include:

    - Depending on the actual leakage volume, the leak detection layer will be pumped out on a regular basis to remove the leakage from building up on the secondary liner within the leak detection layer.
    - The amount pumped out of the leak detection layer will be recorded on a daily basis.

2.7. Release to Surface Water

A release to surface water again would be unlikely since the Permian Basin resides with in the Chihuahuan Desert ecoregion, surface water is rare. Some areas do retain surface water for short periods after a rain event so a release to surface water is possible, however extremely unlikely. A release would occur in one of two ways, either slowly through a leak or migration through a containment system or through a rapid release ("blowout") caused by a complete failure of the containment system.

In the case of the first scenario (slow leak) facility personnel will utilize the *"Release to Soil"* procedures.

In the case of a rapid release or blowout facility personnel will utilize the following procedure.

1. SHUT DOWN THE FACILITY, EVACUATE AND NOTIFY EMERGENCY AUTHORITIES: If at any time the threat of a blowout exists the EC will contact the local Fire Department for assistance. All personnel will be instructed to evacuate the area.

2. MONITOR SITUATION: The EC will monitor the situation from a safe distance making note of the other waste management units that may be damaged from the release and noting where possible repairs may need to be made and where possible contamination has occurred.

3. REMOVAL OR SEGREGATION: Determine if impacted materials can be safely removed to a designated containment area for further evaluation. If the materials cannot be safely relocated, contain them in place for investigation and sampling using the spill control list. If necessary, shut down operations until safe conditions are restored.

4. SAMPLING: After isolating the contaminants and any contaminated media, inspect them to determine if sampling is appropriate. If appropriate, isolate contaminants in the waste inspection or segregation area, or in designated leak-proof containers, until characterization is complete.

5. CLEANUP: After the release has been contained and necessary samples have been obtained, cleanup will be initiated by removing the spilled materials, sorbent materials, soils used for containment, etc.

6. VERIFICATION SAMPLING: Dependent on the type of material spilled, the EC will assess requirements for cleanup verification including the collection of samples for appropriate analytical testing.

7. DISPOSAL OR PROCESSING: When visual and/or laboratory characterization is complete, determine appropriate processing or disposal procedures for that waste type. Send residuals for disposal to a facility that is approved for managing that type of waste.

8. REPAIR AND RECONSTRUCTION: When visual and/or laboratory characterization is complete, being making repairs and/or reconstruction of damaged waste management units.

3. MUTUAL AID [NMAC 19.15.36.13(N)(2)]

A copy of the Contingency Plan is made available to the organizations identified in Table 1. The Contingency Plan serves to familiarize each of the identified organizations with the operations of the facility and types of emergencies and responses that may be required. Each agency will be invited to visit the Facility for purposes of assessing site operations and providing input regarding emergency response procedures annually.

4. EMERGENCY COORDINATOR [NMAC 19.15.36.13(N)(3)]

R360 has designated specific individuals with the responsibility and authority to implement response measures in the event of an emergency which threatens freshwater, public health, public safety or the environment. The Primary, Alternate, and On-site Emergency Coordinators (ECs; Table 3) will be thoroughly familiar with all aspects of this Plan;

operations and activities at the facility; location and characteristics of waste to be managed; the location of all records within the facility; and the facility layout. Table 3 lists the names, designations, titles, home addresses, and office, home, and cellular phone numbers for each EC. The ECs are responsible for coordinating emergency response measures and have the authority to commit the resources required for implementation of this Plan.

A designated EC is available to respond to emergencies 24 hours a day, 7 days a week. Upon arrival at the scene of an emergency, the first EC to arrive will assume responsibility for initiated response measures. If more than one EC responds, authority is given to the Primary EC. In the rare case that an EC cannot be contacted in an emergency, the R360 employee who identifies the situation should make every effort to follow the emergency procedures outlined in this Plan until an EC or emergency authority (local, state, or federal; Table 1) arrives to assist. Duties of the ECs are addressed within this Plan in detail.

5. EMERGENCY EQUIPMENT [NMAC 19.15.36.13(N)(4)]

Emergency equipment is located throughout the facility. A list of emergency response equipment is provided in Table 4. Emergency equipment is inspected at least annually and equipment is replaced or repaired as necessary.

6. EVACUATION PLAN [NMAC 19.15.36.13(N)(5)]

Based upon the type of waste materials received at R360, the likelihood of a facility evacuation is unlikely. However, various circumstances could arise warranting a partial or full facility evacuation. In an emergency situation, the EC is the individual responsible for determining when evacuation of the facility is required. Imminent or actual dangers that constitute a situation that could require evacuation include:

- A generalized fire or threat of fire that cannot be avoided.
- An explosion or the threat of explosion that cannot be averted.
- A major spill or leak that cannot be contained and constitutes a potential threat to human health or the environment.
- Detection of H2S levels at 10 ppm or greater (evacuate the area and remotely monitor downwind levels)
- Detection of H2S levels at 20 ppm or greater at the fence line (evacuate and close the facility)

When conditions warrant immediate evacuation (e.g., H2S ≥20 ppm), on-site persons (e.g., facility personnel, transporters, visitors, vendors, etc.) will be directed to proceed immediately to the Site Office, R360's primary evacuation route. R360 Personnel will exercise good judgment and common sense in using the primary evacuation route to exit the facility, or selecting the most appropriate alternative evacuation route if necessary. Table 11 provides detailed procedures for evacuating the facility. Assembly points, primary and alternative evacuation routes are provided for each site in the Figures Section. Driving directions to the nearest hospital from each site are also included in the Figures Section.

6.1. Evacuation Procedures

When evacuation is required, the following procedures will be followed:

1. Facility personnel will be alerted directly using the facility telephone, cellular telephones, or radios.
2. Vehicles delivering waste will be diverted away from the location of the emergency and routed towards the facility exit.
3. All facility operating equipment will be shut down.
4. Personnel will be directed to proceed to the Site Office, which will be the designated emergency response coordination location. All personnel will be checked against check-in sheets and employee logs. All vehicles and drivers will be instructed to leave the facility and remain in their vehicle until the all clear is given and normal operations are allowed to resume. The EC will identify missing persons at that time.
5. If the emergency involves the Site Office or its immediate environs, the Halfway Bar & Grill will be the secondary assembly point for facility personnel.
6. If the emergency precludes access to both, the Site Office and Halfway store, personnel will evaluate the site via an auxiliary access gate at the east end of the facility. An evacuation map is provided in Figure 2.
7. Once assembled, personnel will stand by to afford assistance, if and as needed, or evacuate through Site Office or Halfway store.

7. H2S MONITORING AND RESPONSE

NMAC 19.15.11 (Appendix 6) requires operations be conducted in a manner that protects the public from expose to Hydrogen Sulfide (H2S) gas. Within the rule NMAC 19.15.11.8 a regulatory threshold is set for oil and gas operations to adhere to the entire rule. Paragraph A subparagraph 1 states:

"Each person shall determine the hydrogen sulfide concentration in the gaseous mixture within wells, facilities or operations either by testing (using a sample from each well, facility or operation); testing a representative sample; or using process knowledge in lieu of testing. If the person uses a representative sample or process knowledge, the concentration derived from the representative sample or process knowledge shall be reasonably representative of the hydrogen sulfide concentration within the well, facility or operation."

R360 has determined though 28 weeks of monitoring at our Halfway Facility in 2003 (already submitted to the state for the facility record) as well as sampling of incoming wastes for H2S concentrations. It was determined that the concentration of H2S at the facility is below the regulatory threshold as stated in 19.15.11.8 Paragraph B;

"Concentrations determined to be below 100 ppm. If the hydrogen sulfide concentration in a given well, facility or operation is less than 100 ppm, the person is not required to take further actions pursuant to 19.15.11 NMAC."

However R360 understands that H2S can be an issue even in low concentrations, so R360 monitors for H2S on a continual basis, by personnel and stationary monitors. Daily Monitoring results are recorded on an inspection report form (Appendix 2) and retained as part of the facility operating record. R360 personnel wear H2S personnel monitors whenever they are working. The monitors issue a visual and audible signal at 10 ppm of H2S in the ambient air that becomes more rapid at 20 ppm.

If H2S is detected above 10 ppm in an inbound load, the load is rejected from the facility.

During normal operations, H2S is typically first detected by odor (<1 ppm). When H2S odor is detected, the EC should be notified immediately. After consultation with the Site Safety Manger, the EC determines whether invoke the H2S procedures.

In the event of an H2S detection onsite of 10 ppm or greater, the alarm will sound and emergency response procedures are implemented.

7.1. H2S Response Procedures

1. EVACUATE AREA AND NOTIFY THE ECs:
    - The employee who first becomes aware of the H2S alarm will immediately evacuate the area and notify his supervisor
    - Begin investigation of the source,
    - If conditions worsen or are unsafe the Supervisor (H2S Alarms Sound) will notify the Primary EC, the Alternate EC and On-site EC if necessary.
    - Notification will be made in person, via telephone, or via radio. The responding EC will assume full authority over the situation.
2. REMAIN UPWIND OF RELEASE: Persons evacuated from the release area should remain away and upwind from the area of the release until a determination of the H2S concentration has reached 0, this can be confirmed as all H2S alarms will cease at a 0 reading.
3. ASSESS THE AMOUNT OF RELEASE: The EC will assess the source, amount, and extent of the alarm. Monitoring equipment will be operated by trained personnel.
4. MONITOR DOWNWIND IF H2S = 10 PPM (First Alarm):
    - Evacuate the area and CRI personnel will monitor the H2S levels along the downwind boundary of the facility via a remote sensor.
    - Do not Enter the area until the H2S reading reaches 0 and the alarm is silenced
5. EVACUATE AND CLOSE THE FACILITY IF H2S ≥20 PPM AT DOWNWIND BOUNDARY (Second Alarm):

- Evacuate and close the facility. Evacuation procedures are covered in Table 11 and a Site Evacuation Plan is provided as Figure 2.

9. NOTIFICATION OF AUTHORITIES:

- Notify the New Mexico State Police, Lea County Sheriff, and Division (Table 1) if concentrations are above 20 ppm at the downwind fence line of the facility.
- Notify, medical authorities if needed or to place on alert.
- Notify Calaway Safety or other safety professional in Hobbs (Table 1) to provide personnel, equipment, and supplies to mitigate the source if necessary.

10. RECORDKEEPING: CRI will log and report to the Division, upon request, all incidences where a reading of 10 ppm H2S or greater is registered at CRI's facility (also see Section 8.0).

8. EVALUATION, INVESTIGATION, CONTAINMENT & REMEDIATION [NMAC 19.15.36.13(N)(6)]

8.1. Expected Contaminates

In the event of a release the following are contaminates that could contaminate expected media in order of likelihood.

1. Hydrocarbons
2. Chlorides
3. Sediments
4. H2S (concentrations below 30ppm)

8.2. Expected Media Contaminated

In the event of a release the following media may be contaminated. The list is sorted by likelihood of contamination.

1. Top Soil
2. Vegetation
3. Air

8.3. Investigation Procedures

Investigation procedures are addressed in Section 11 Emergency Characterization.

8.4. Containment Procedures

Containment procedures are addressed in Section 2 Response Procedures

8.5. Remediation Procedures

Remediation and corrective actions are addressed in Section 13 Corrective Action, Remediation and Wastes.

9. PLAN DISTRIBUTION [NMAC 19.15.36.13(N)(7)]

The Contingency Plan will be distributed internally as to R360 policies and to agencies per the regulations. After major updates a full copy will be distributed and after minor updates only the sections that were updated shall be distributed. Copies of the plan shall be distributed to the following locations:

- Local Fire
- Local Police
- Oil Conservation Division Offices in Santa Fe and Hobbs, NM
- R360 Environmental Solutions HQ
- R360 Office in Hobbs, NM

10. REVIEW & REVISION [NMAC 19.15(N)(8)]

10.1. Review

This plan will be reviewed for accuracy annually and updated accordingly.

10.2. Revision

The Emergency Coordinator (EC) will be responsible for assuring updates to or amendments of the Contingency Plan are made within 5 working days if any of the following occur:

1. The Facility Permit is revised or modified.
2. The Plan fails in an emergency or an improvement to its function is noted
3. Modification to the Facility design, construction, operation, maintenance or other circumstances that changes the potential for fires, explosion, or releases of hazardous oil field waste constituents; or related changes in the appropriate emergency response.
4. The list of ECs changes.
5. The list of emergency equipment changes.

The revised Contingency Plan will be distributed to Division and made available to each of the organizations identified in Table 1 with a cover letter highlighting any substantive changes. Any proposed changes will be in compliance with 19.15.36.13.N NMAC.

11. NOTIFICATIONS [NMAC 19.15.36.13(N)(9)]

11.1. Internal

The R360 employee who identifies an emergency situation will contact an EC directly or via phone. Contact will be attempted with each EC (Primary, Alternate, and the On-site) until communication is achieved (Table 3).

Once contacted the EC will contact senior management and inform them of the situation as best as they know it. The EC will immediately notify on-site persons (facility personnel, visitors, vendors, transporters, etc.) of the emergency via on-site internal communication systems (radio and cellular), as well as notify senior management.

11.2. External

Table 1 provides a list of emergency response agencies and contacts that may need to be notified depending on the type and extent of an emergency situation. Table 1 will be posted as appropriate and near on-site telephones for easy access by R360 personnel. Fire, police, and medical authorities should be contacted as necessary in an emergency situation (Table 1). The small business located at Halfway, NM (adjacent to R360), The Halfway Watering Hole Bar & Grill, should be notified if there is an immediate threat human health and the environment in the area, such as fire, explosion, major H2S release, etc.

Table 2 provides specific information regarding notification of Division in the case of a release, which by definition includes breaks, leaks, spills, releases, fires or blowouts (Table 2). In addition, Table 2 also provides Division definitions for "major" and "minor" releases.

Additional State, Federal, and other local (WIPP) emergency contact numbers are provided and should be used as deemed appropriate to the situation. If the EC determines that the incident could threaten fresh water, human health, public safety or the environment beyond the limits of the facility, the EC will notify the National Response Center and New Mexico Environment Department (NMED) spill emergencies at the following phone numbers (also included on Table 1):

- National Response Center - 24 Hr. Hotline: (800) 424-8802
- NMED Spill Emergencies - 24 Hr. Hotline: (505) 827-9329

In the case of an H2S emergency where H2S concentrations ≥20 ppm are detected at the facility's fence, notification will be provided to the New Mexico State Police, Lea County Sheriff, and Division (also included on Table 1):

- Oil Conservation Division
  - Hobbs, NM (575) 393-6161
  - Emergency Beeper (575) 370-7106
  - Santa Fe, NM (505) 476-3440
- New Mexico State Police 911 or (505) 841-9271
- Lea County Sherriff's Dept. 911 or (575) 393-2515

R360 will also notify Assurance Safety or Calaway Safety in Hobbs (Table 1) (or other local Safety Professional) to provide personnel, equipment, and supplies to mitigate the source if necessary.

The EC's notification to authorities must include all of the following information, as listed on the Emergency Response Record Form:

- name and telephone number of person reporting the incident
- name and address of facility
- time and type of incident (e.g., material release, fire)
- name and quantity of material(s) involved, to the extent known
- extent of injuries, if any
- possible hazards to human health or the environment

12. EMERGENCY CHARACTERIZATION [NMAC 19.15.36.13(N)(10)]

In the event of a spill, release, fire, or explosion the EC will immediately identify the character, source, amount and extent of released materials where feasible as well as assessing the potential impact to fresh water, public health, public safety or the environment. Since each emergency is different in size, scope, hazard level, environmental impact, etc. the EC will assess the incident based on training and experience during the initial assessment and verify that information or fill in any information gaps by conducting a detailed assessment, if it is safe to do so.

12.1. Initial Assessment

In most cases the initial assessment will be based entirely on visual observations and conversations with witnesses. By asking questions like the ones below can aid in gathering enough of the necessary information to make an effective response possible.

- What is the estimated size of the incident?
  - What is the height of the flames or
  - How much area is the spilled material or fire occupying (est. length x width),
- What is the nature of material involved,
  - Is it solid, liquid or gas?
  - Is it from a known hauler? Are they still onsite?
  - Can it be visually identified as an E&P waste?
  - Is there a sound coming from the vessel holding the released material?
- Is the driver available?
  - What does the driver say the materials are?

Also included in the visual assessment, if they exist, are observed possible impacts to the public, observed possible impacts to the environment, or both.

- Is the material moving towards any public areas or lands?

- Are there airborne particles or vapors that could be transported by the wind?
- Can the material be easily soaked into the soil?
- There is not any ground or surface water near the facility, but could the material be transported over the surface to the playa lake bed nearby? How fast is it moving or spreading?

As a safety consideration all visual observations should be taken from a safe vantage point.

12.2. Detailed Assessment

After an initial assessment, if there is information that could not be derived or if some information needs to be verified, and it is safe to do so, physical measurements may be taken to as to the size and nature of the incident. Also the Emergency Coordinator can review any available documentation from the hauler involved, the generator involved, or the equipment involved that could shed some light on the incident. Most of this documentation can be found in the site office and could include MSDSs, C-138s, the manifest from the driver, etc.

The assessment provides the EC with critical data needed to determine whether an evacuation is necessary, whether emergency authorities are needed, and whether R360 should attempt to control the release with on-site personnel and equipment. Division descriptions of "major" and "minor" releases which are useful for as a guide for the assessment are in table 4.

During an emergency, the EC may amend this Plan as necessary to protect fresh water, public health, public safety or the environment. The EC will also determine the responses required to:

- provide notifications to appropriate agencies
- implement appropriate recordkeeping procedures

13. CESSATION OF OPERATIONS [NMAC 19.15.36.13(N)(11)]

In the event of an emergency at an R360 facility personnel will first shut down all pumps as they are evacuating the area by either turning off power or closing the fuel valve. If there is a doubt as to if any pump has not been shut down the facility power can be switched off, locked and tagged at the main power junction for the facility. All equipment that operates at a pressure different from ambient is equipped with a relief valve and all flow lines operate with one way check valves. These components will be able to keep pressures from building up in the systems used. The check valves will also keep liquids contained within the systems. If safe to do so the EC may roam and inspect the various units with the facility to ensure that no rupture or leaks have occurred.

14. CORRECTIVE ACTION, REMEDIATION AND WASTES [NMAC 19.15.36.13(N)(12)]

19.15.29.11 CORRECTIVE ACTION: The responsible person shall complete division-approved corrective action for releases that endanger public health or the environment. The responsible person shall address releases in accordance with a remediation plan submitted to and approved by the division or with an abatement plan submitted in accordance with 19.15.30 NMAC.
[19.15.29.11 NMAC - Rp, 19.15.3.116 NMAC, 12/1/08]

After responding to the incident, the EC will meet with involved personnel to assess the cause of the fire and document the incident. The Incident Report Form (Appendix 3) will reflect the details of any emergency and the resulting actions. The identified causative agent will be removed from the vicinity of the facility if the possibility of re-ignition exists. Appropriate actions (e.g., exclusion from the landfill of the causative agent, more frequent equipment maintenance) to prevent recurrence of fire will be developed and implemented. Personnel involved with the handling, transport, and placement of materials at the facility will be informed of the resultant actions. Significant changes in operating protocol or procedures resulting from this meeting will be documented and added as an amendment to the Plan (see Section 9).

Spilled or otherwise contaminated material approved for disposal will be disposed of in R360's Division landfill in accordance with standard operating practices. All other contaminated spilled materials will be containerized, stored and disposed of in accordance with applicable local, state and federal regulatory requirements. No oil field waste, which may be incompatible with the released material, will be treated, stored, or disposed of until cleanup procedures are complete.

15. INCOMPATIBLE MATERIALS [NMAC 19.15.36.13(N)(13)]

Wastes incoming to an R360 facility are initially screened for incompatibility prior to being delivered. If wastes are encountered before, during or after an emergency the EC will remove the materials, segregate them to prevent other interactions from occurring and then assess the wastes for proper disposal either onsite at another location or at a state approved facility.

16. EMERGENCY REVISIONS [NMAC 19.15.36.13(N)(14)]

During and emergency if the EC determines the plan is inadequate or other actions are more appropriate for the situation that are not outlined with in the plan, the EC may make "in pen" adjustments to the plan. These adjustments will be finalized after the emergency has been contained and it is safe to do so.

TABLES

Table 1 - Emergency Response Agencies and Contacts

(Updated 02/2011)

Agency/Organization	
Fire	
Monument Volunteer Fire Dept.	911 or (575) 393-8690
Carlsbad Fire Department (31 miles)	911 or (575) 885-3125
Police	
Lea County Sheriff's Department (Hobbs Sub-Station)	911 or (575) 393-2515
New Mexico State Police	911 or (505) 841-9271
Medical/Ambulance	
Carlsbad Medical Center 2430 W. Pierce St. Carlsbad, NM 88220	911 or (575) 887-4100
Halfway NM	
Store, Customers and Employees	(575) 887-8112
Safety Supplies	
Assurance Fire, Safety & Training 2239 S. Main Street Lovington NM 88260	(575) 396-6543
Division Emergency Response Contacts	
Oil Conservation Division 1625 North French Dr. Hobbs, NM 88240	(575) 393-6161
Emergency Beeper	(575) 370-7106
Oil Conservation Division 1220 South St. Francis Drive Santa Fe, NM 87505	(505) 476-3440
State Emergency Response Contacts	
New Mexico Environment Department	
Solid Waste Bureau, Santa Fe	(505) 827-0197
Hazardous and Radioactive Materials Bureau, Santa Fe	(505) 827-1557
Spill Emergencies 24 hr. Hotline (NMED)	(505) 827-9329
Other Local Emergency Response Contacts	
WIPP Emergency Line	(575) 234-8111
Federal Emergency Response Contacts	
National Emergency Response Center (U.S. Coast Guard)	(800) 424-8802
Region VI 24 hr. Emergency Response Hotline (USEPA)	(214) 665-2222

Table 2 - Part 29: Release Notification

19.15.29.7 DEFINITIONS:

A. "Major release" means:

(1) an unauthorized release of a volume, excluding gases, in excess of 25 barrels;

(2) an unauthorized release of a volume that:

(a) results in a fire;

(b) will reach a watercourse;

(c) may with reasonable probability endanger public health; or

(d) results in substantial damage to property or the environment;

(3) an unauthorized release of gases in excess of 500 MCF; or

(4) a release of a volume that may with reasonable probability be detrimental to water or exceed the standards in Subsections A and B or C of 19.15.30.9 NMAC.

B. "Minor release" means an unauthorized release of a volume, greater than five barrels but not more than 25 barrels; or greater than 50 MCF but less than 500 MCF of gases. [19.15.29.7 NMAC - Rp, 19.15.3.116 NMAC, 12/1/08]

19.15.29.8 RELEASE NOTIFICATION:

A. The person operating or controlling either the release or the location of the release shall notify the division of unauthorized release occurring during the drilling, producing, storing, disposing, injecting, transporting, servicing or processing of oil, gases, produced water, condensate or oil field waste including regulated NORM, or other oil field related chemicals, contaminants or mixture of the chemicals or contaminants, in accordance with the requirements of 19.15.29 NMAC.

B. The person operating or controlling either the release or the location of the release shall notify the division in accordance with 19.15.29 NMAC with respect to a release from a facility of oil or other water contaminant, in such quantity as may with reasonable probability be detrimental to water or exceed the standards in Subsections A and B or C of 19.15.30.9 NMAC.
[19.15.29.8 NMAC - Rp, 19.15.3.116 NMAC, 12/1/08]

19.15.29.9 REPORTING REQUIREMENTS: The person operating or controlling either the release or the location of the release shall provide notification of releases in 19.15.29.8 NMAC as follows.

A. The person shall report a major release by giving both immediate verbal notice and timely written notice pursuant to Subsections A and B of 19.15.29.10 NMAC.

B. The person shall report a minor release by giving timely written notice pursuant to Subsection B of 19.15.29.10 NMAC.
[19.15.29.9 NMAC - Rp, 19.15.3.116 NMAC, 12/1/08]

19.15.29.10 CONTENTS OF NOTIFICATION:

A. The person operating or controlling either the release or the location of the release shall provide immediate verbal notification within 24 hours of discovery to the division district office for the area within which the release takes place. In addition, the person shall provide immediate verbal notification of a release of a volume that may with reasonable probability be detrimental to water or exceed the standards in Subsections A and B or C of 19.15.30.9 NMAC to the division's environmental bureau chief. The notification shall provide the information required on form C-141.

B. The person operating or controlling either the release or the location of the release shall provide timely written notification within 15 days to the division district office for the area within which the release occurs by completing and filing form C-141. In addition, the person shall provide timely written notification of a release of a volume that may with reasonable probability be detrimental to water or exceed the standards in Subsections A and B or C of 19.15.30.9 NMAC to the division's environmental bureau chief within 15 days after the release is discovered. The written notification shall verify the prior verbal notification and provide appropriate additions or corrections to the information contained in the prior verbal notification.

[19.15.29.10 NMAC - Rp, 19.15.3.116 NMAC, 12/1/08]

Table 3 - List of Emergency Coordinators

(Updated 11/2012)

Primary Emergency Coordinator			
Name:	Clay McDonald	Mobile Phone:	(432) 631-2205
Title:	VP of Operations – Permian Basin	Work Phone:	(575) 393-1079
Address:	4507 W. Carlsbad Hwy. Hobbs, NM 88240		
Alternate Emergency Coordinator*			
Name:	Jesse Dominguez	Mobile Phone:	(575) 393-1079
Title:	Site Manager	Work Phone:	
Address:	4507 W. Carlsbad Hwy Hobbs, NM 88240		
Onsite Emergency Coordinator*			
Name:	Omar Melindez	Mobile Phone:	(575) 605-1766
Title:	Plant - Lead	Work Phone:	
Address:	MM 66 Hwy. 62/180		
Alternate Emergency Contact			
Name:	R360 Dispatch Office	Main Phone:	(575) 393-1089
Title:		Alt. Phone:	(575) 393-1079
Address:	4507 W. Carlsbad Hwy Hobbs, NM 88240		
Safety Emergency Contact			
Name:	Steve Baskin	Office Phone:	(575) 393-1079
Title:	Permian Safety Supervisor	Mobile Phone:	(575) 631-5299
Address:	4507 W. Carlsbad Hwy Hobbs, NM 88240	Fax:	(575) 393-3615

**Or as designated by R360.*

Table 4 - Emergency Response Equipment List

Equipment Description	Quantity	Location	Capabilities
10 lb ABC rated fire extinguisher	3	Site Office	Insipient Firefighting of Class A, B, C fires
10 lb ABC rated fire extinguisher	1/truck	Trucks	Insipient Firefighting of Class A, B, C fires
10 lb ABC rated fire extinguisher	1	Heavy Equipment	Insipient Firefighting of Class A, B, C fires
20 lb ABC rated fire extinguisher	12	Jet Pit Oil Recycling Plant Salt Water Disposal Maintenance Shop	Insipient Firefighting of Class A, B, C fires
Loader	3	Facility	Moving Smothering Fires
Clean fill	NA	Landfill area	Smothering Fires
Caliche Stockpile	NA	North-East corner of facility	Smothering Fires
Tyvek protection suits	One per employee	Site Office Oil Recycling Plant Maintenance Shop	Protective gear for employees for up to Level B protection
Pair leather gloves	One per employee	Assigned to employee	Protective gear for employees for up to Level D protection
Pair safety glasses	One per employee	All employee workstations	Protective gear for employees
Round-point wood handle shovels	4	Site Office Jet Pit Oil Recycling Plant Maintenance Shop	Contain spillage, putting out fires
First Aid Kit	4	Site Office Jet Pit Oil Recycling Plant Maintenance Shop	First Aid
First Aid Kit	One per vehicle	Facility Vehicles	First Aid
Eye Wash Station	3	Oil Recycling Plant Customer Jet Wash R360 Jet Wash	First Aid
Portable 2-way radio	One per employee	Base unit at Site Office	Communications
Cell Phones	4	Site Manager Plant Manager Plant Supervisor Office Supervisor	Communications
Office Phone	1	Site Office	Communications
Mobile pressure washer	1	Mobile	Decontamination equipment

Figures

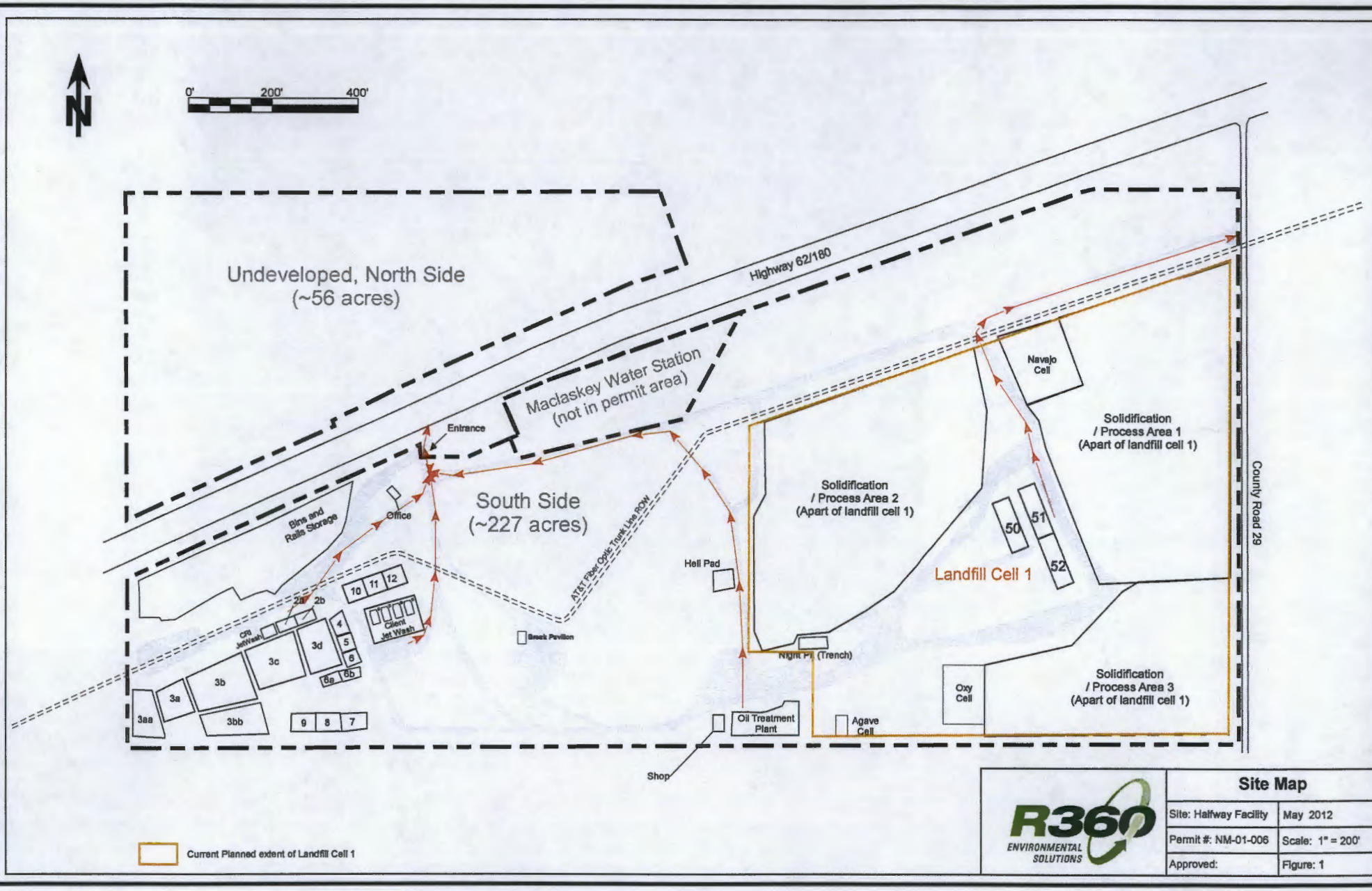
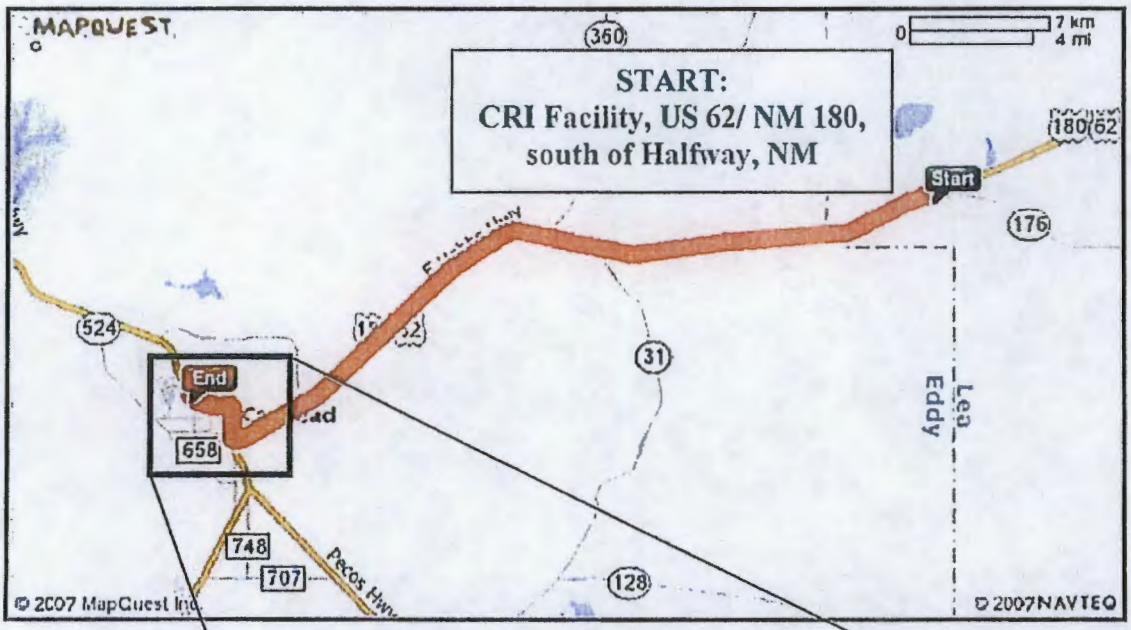

N
0'
200'
400'
Undeveloped, North Side
(~56 acres)
Highway 62/180
Maclaskey Water Station
(not in permit area)
Entrance
South Side
(~227 acres)
Office
Bins and
Rails Storage
AT&T Fiber Optic Trunk Line ROW
Heli Pad
Navajo
Cell
Solidification
/ Process Area 1
(Apart of landfill cell 1)
Solidification
/ Process Area 2
(Apart of landfill cell 1)
50
51
52
Landfill Cell 1
County Road 29
Oxy
Cell
Solidification
/ Process Area 3
(Apart of landfill cell 1)
Agave
Cell
Oil Treatment
Plant
Shop
Night Pit (Trench)
Break Pavilion
Crew
Jet Wash
Client
Jet Wash
2a
2b
10
11
12
4
5
6
6a
6b
3d
3c
3b
3a
3aa
3bb
9
8
7
Current Planned extent of Landfill Cell 1
R360
ENVIRONMENTAL
SOLUTIONS
Site Map
Site: Halfway Facility
May 2012
Permit #: NM-01-006
Scale: 1" = 200'
Approved:
Figure: 1

FIGURE 4
HOSPITAL LOCATION MAP

Sheet 1 of 2



END:
Carlsbad Medical Center,
2430 West Pierce Street,
Carlsbad, NM 88220
Call 911 or (505) 887-4100)

FIGURE 4
HOSPITAL LOCATION
DRIVING DIRECTIONS

Sheet 2 of 2

FROM: CRI, US 62/NM 180, south of Halfway, NM

TO: Carlsbad Medical Center, 2430 West Pierce Street, Carlsbad, NM 88220

STEP	DIRECTIONS	DISTANCE (miles)	TOTAL DISTANCE
1	Turn left (west) onto US 62/NM 180	31.9	31.9
2	Turn right (north) onto South Canal Street/US 285; Continue to follow US 285, it will turn into Pierce Street	3.0	34.9
3	End at Carlsbad Medical Center, 2430 West Pierce Street	.11	35.01
			Estimated Travel Time = 39 minutes

ATTACHMENT 17

Water Run-On and Run-Off Control Plan

STORM WATER RUNON AND RUNOFF CONTROL PLAN

R360 ENVIRONMENTAL SOLUTIONS

R360 PERMIAN BASIN, LLC

AVALON, EDDY COUNTY, NEW MEXICO

April 19, 2013

For Permit Purposes

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

April 19, 2013

Prepared By

NaismithEngineering,Inc
ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING

NEI PROJECT NO. 8935

TABLE OF CONTENTS

1. GENERAL

1.1. Scope and Purpose

This Storm Water Runon and Runoff Control Plan has been prepared by Naismith Engineering, Inc., (hereafter "NEI") on behalf of R360 Permian Basin, LLC (hereafter "R360") in conjunction with the submittal to the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division (hereafter "NMOCD") of an application to obtain authorization to operate a surface waste management facility in southeaster Eddy County, New Mexico. The proposed facility will be known as the Avalon Transfer Facility (hereafter "Facility").

1.2. Facility Description

R360 (or hereafter "Operator") will operate the Facility as a waste storage and transfer facility. A detailed description of the proposed facility is provided in Attachment 10 to the Application.

2. FACILITY COMPONENTS SUBJECT TO PLAN

The Facility includes the following "active portions" that will be addressed in accordance with NMAC 19.15.36.13.M:

- Waste Container Storage Area (hereafter "WCSA")
- Recovered Liquids Storage Tanks (hereafter "RLSTs")
- Facility access roadways

2.1. Waste Container Storage Area

The WCSA will be a crushed stone or caliche pad approximately two (2) acres in size and will hold up to forty eight (48) waste containers with a capacity of up to two hundred barrels each, for a total storage capacity of 9,600 barrels. The WCSA will have an exterior containment berm constructed of earth and built to a height of at least two (2) feet above the surrounding grade. Ramps will be provided over the containment berm to allow the containers to be placed and removed. Engineering calculations demonstrating the sufficiency of the WCSA containment have been included in Attachment 11 to the Application. This berm will be sufficient to prevent both runon and runoff from entering or leaving the WCSA.

2.2. Recovered Liquids Storage Tanks

The RLSTs will consist of two (2) above-grade steel tanks, each with a capacity of 500 barrels. The tanks will be placed in a containment area constructed of earthen berms built to a height of at least three (3) feet. Engineering calculations demonstrating the sufficiency of this containment area have been included in Attachment 11 to the Application. This berm will be sufficient to prevent both runon and runoff from entering or leaving the RLSTs.

2.3. Facility Access Roadways

As indicated on the Facility Site Plan, included as Attachment 10-2 to the Application, several access roads traverse the Facility. A part of the traffic utilizing these access roadways will be waste transport vehicles. It is possible that these access roadways may be subject to incidental spills, which may in turn be transported with the facility storm water. To minimize the potential for off-site transport of spill residue, the Facility has been designed with storm water capture and control ponds. These ponds have been designed to capture and contain the first one-half inch of runoff from the Facility and the contributing off-site areas. The Center for Watershed Protection has indicated that capturing the first one-half inch of storm water runoff (also referred to as the "first flush") would result in capturing approximately ninety percent (90%) of the annual pollutant load. [Reference: "First Flush of Stormwater Pollutants", Article 9, Technical Note #28, *The Practice of Watershed Protection*, Center for Watershed Protection, Ellicott City, Maryland, published 2000.]

The storm water capture ponds will include a north pond and a south pond. The specific location of these ponds is shown on Appendix 10-2. The north pond will be constructed on the north side of the main access roadway and will capture storm water runoff from the off-site areas, including State Line Road and off-site areas including the entrance, exit and fuel depot areas. The south pond will be constructed in the southwest corner of the Facility and will capture storm water runoff from the on-site areas including the access roadway, the WCSA and the RLSTs.

Engineering calculations quantifying the amount of runoff from on-site and off-site areas and the sizing of the storm water capture pond have been included in Attachment 11 to the Application. Appendix 17-1 illustrates the extent of off-site areas contributing flow to the on-site areas.

These ponds will be sufficient to minimize the potential for incidental spill residue to be transported off-site by storm water.

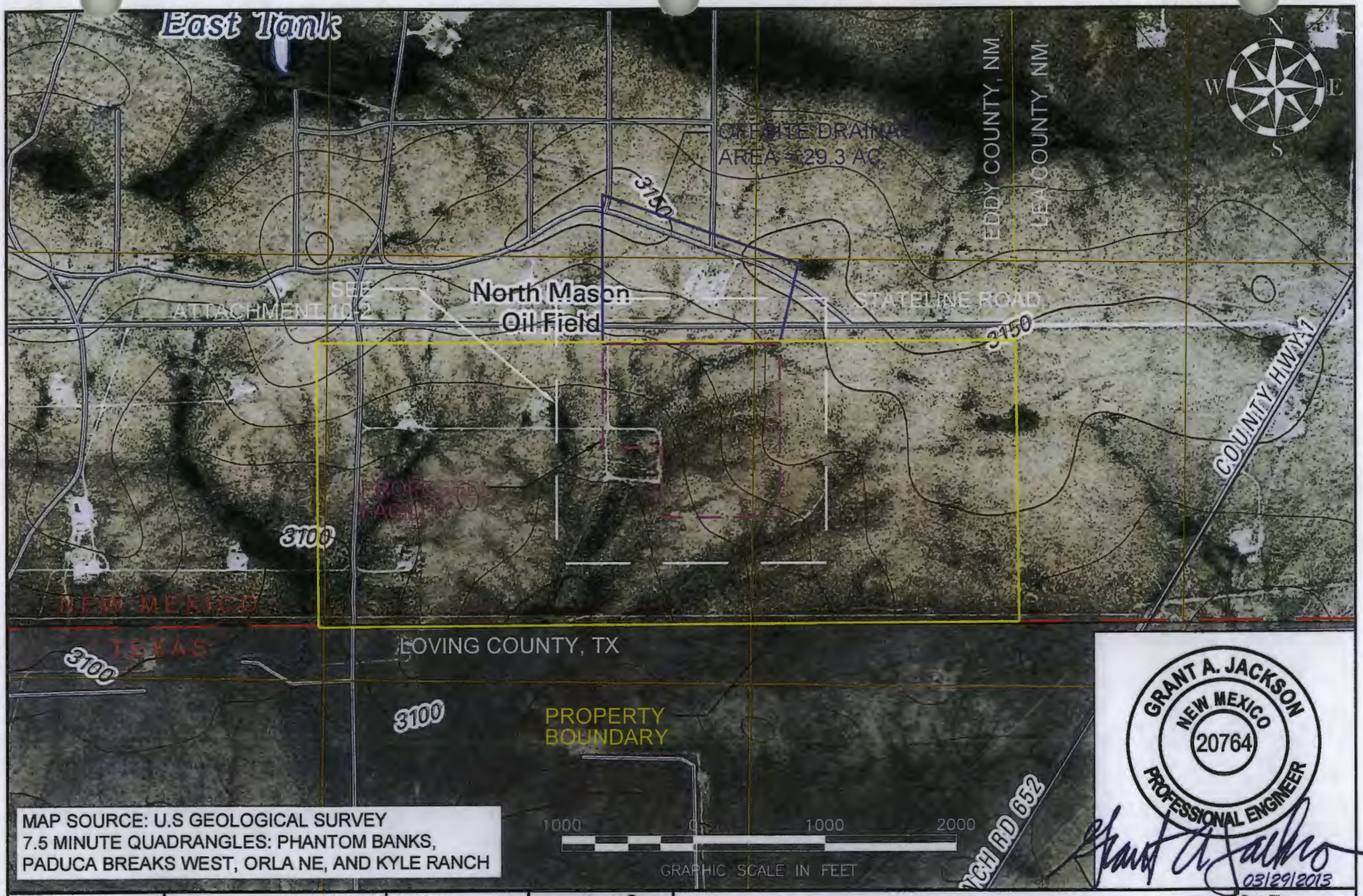
3. OPERATIONS AND MAINTENANCE

As fixed structures, the containment berms providing storm water runon and runoff control for the Facility will not require operation. However, these berms will be subject to the inspection and maintenance requirements for the Facility, as provided in Attachment 13 to the Application.

\\Nei-projects\projects drive\8935-R360-Avalon\Transfer Station\Application\Att17-Runon+Runoff\R360-Avalon-TF-Runon+Runoff-Plan.docx

Appendix 17-1

Area Storm Water Map



MAP SOURCE: U.S GEOLOGICAL SURVEY
7.5 MINUTE QUADRANGLES: PHANTOM BANKS, PADUCA BREAKS WEST, ORLA NE, AND KYLE RANCH

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

03/29/2013

Drawn By	: MAL
Checked By	: GAJ
Approved By	: GAJ
Project No.	: 8935
Scale	: AS SHOWN
Date	: 3/29/2013
Revision	:

R360 ENVIRONMENTAL SOLUTIONS

OFFICE LOCATION :

4501 Gollihar Rd.
Corpus Christi, Texas 78411
P.O. Box 3099
Corpus Christi, Texas 78463
(361)-814-9900

NEI Naismith Engineering Inc
F-355

AREA STORM WATER MAP

R360 AVALON TRANSFER FACILITY
R360 PERMIAN BASIN, LLC
EDDY COUNTY, NEW MEXICO

Dwg. File:

Attachment 17
17-1

Sheet 1 Of 1

ATTACHMENT 18

Leachate Management Plan

(Not Applicable To This Facility – Does Not Include Landfill)

ATTACHMENT 19

Gas Safety Management Plan

(Not Applicable To This Facility – Does Not Include Landfill)

ATTACHMENT 20

Best Management Practice Plan

R360 Permian Basin, LLC
Avalon Transfer Facility
Best Management Practice Plan
Updated April 2013

Best Management Practice	Description of Protection	Location in Application
Compliance with siting requirements	Minimizes the likelihood of releases to the environment	Attachment 12, Section 2.1 to 2.3, Attachment 21, Section 2
Documenting transporter registration	Minimizes the likelihood of accepting improper waste materials	Attachment 12, Section 2.4
Waste screening and acceptance	Minimizes the likelihood of accepting improper waste materials	Attachment 12, Section 2.6
Use of proper waste management methods	Minimizes the likelihood of spills and releases to the environment	Attachment 12, Section 2.6
Use of proper engineering controls, including waste containment	Minimizes the likelihood of spills and releases to the environment	Attachment 12, Section 2.6, Attachment 10, Section 4 Attachment 11
Documentation and regulatory reporting	Minimizes the likelihood of accepting improper waste materials and spills and releases to the environment	Attachment 12, Section 2.7
Properly covered and enclosed tanks	Minimizes the likelihood of harm to migratory birds	Attachment 12, Section 2.9
Maintained and informative site sign	Minimizes the likelihood of accepting improper waste materials	Attachment 12, Section 2.10
Proper spill reporting and clean-up procedures	Minimizes the likelihood of off-site damage from incidental releases on-site	Attachment 12, Section 2.11
Routine inspection and maintenance of Facility Components	Minimizes the likelihood of spills and releases to the environment	Attachment 12, Section 2.12, Attachment 13
An effective Run-on/Run-off Control Plan	Minimizes the likelihood of releases to the environmental from waste operations and off-site damage from incidental release on-site	Attachment 12, Section 2.13, Attachment 17
An effective contingency plan	Minimizes the likelihood of releases to the environmental from waste operations and off-site damage from contingent events	Attachment 12, Section 2.13, Attachment 17
An effective training program	Minimizes the likelihood of accepting improper waste materials and spills and releases to the environment	Attachment 12, Section 2.16
Financial assurance for closure	Minimizes the likelihood of releases to the environment	Attachment 15

ATTACHMENT 21

Demonstration of Compliance With Siting Requirements

DEMONSTRATION OF COMPLIANCE

WITH SITING REQUIREMENTS

R360 PERMIAN BASIN, LLC

AVALON, EDDY COUNTY, NEW MEXICO

April 19, 2013

For Regulatory Review

GRANT A. JACKSON
NEW MEXICO
20764
PROFESSIONAL ENGINEER

April 19, 2013

Prepared By

NaismithEngineering,Inc
ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING

NEI PROJECT NO. 8935

TABLE OF CONTENTS

1. GENERAL

1.1. Scope and Purpose

This demonstration of compliance with siting requirements has been prepared by Naismith Engineering, Inc., (hereafter "NEI") on behalf of R360 Permian Basin, LLC (hereafter "R360") in conjunction with the submittal to the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division (hereafter "NMOCD") of an application to obtain authorization to operate a surface waste management facility in southeastern Eddy County, New Mexico. The proposed facility will be known as the Avalon Transfer Facility (hereafter "Facility").

1.2. Facility Description

R360 (or hereafter "Operator") will operate the Facility as a waste storage and transfer facility. A detailed description of the proposed facility is provided in Attachment 10 to the Application.

2. COMPLIANCE WITH SITING REQUIREMENTS [NMAC 19.15.36.13]

2.1. Depth to Groundwater [NMAC 19.15.36.13.A]

19.15.36.13.A(1) through A(4) contain minimum depths to groundwater for landfill and landfarm facilities. The proposed Facility will not function as either a landfill or a landfarm; therefore the requirements of NMAC 19.15.36.13.A(1) through A(4) do not apply to the Facility.

19.15.36.13.A(5) indicates that surface waste management facilities other than landfills and landfarms must have at least fifty (50) feet of separation from groundwater. To assess the presence of groundwater at the Proposed Facility and in the surrounding vicinity, R360 conducted a series of subsurface investigations. These investigations were conducted by Larson & Associates, Inc. of Midland, Texas and are documented in the report entitled "Part 36 Investigation Report – Avalon Facility" included in Attachment 22 to the Application. This investigation included soil borings completed on the property occupied by the Proposed Facility, a literature review and associated laboratory testing. The soil borings completed on the property occupied by the Proposed Facility confirmed that groundwater was absent down to an elevation of 2,945. Inside the perimeter of the Proposed Facility, the completion of SB13 confirmed that groundwater was absent down to an elevation of 3,045 or at least seventy (70) feet beneath the lowest elevation (3,115) of the Proposed Facility, demonstrating compliance with NMAC 19.15.36.13.A(5).

2.2. Location Restrictions [NMAC 19.15.36.13.B]

2.2.1. Surface Water Features [NMAC 19.15.36.13.B(1)]

19.15.36.13.B(1) prohibits surface waste management facilities from being located within 200 feet of a watercourse, lakebed, sinkhole or playa lake. A review of available mapping and an inspection of the Proposed Facility indicates that there are no watercourses, lakebeds, sinkholes or playa lakes within two hundred (200) feet of the

Proposed Facility. The absence of these features was also confirmed as a part of the subsurface investigation. A topographic map, indicating the absence of these features is included as Appendix 8-2 to Attachment 8 of the Application. The absence of these features demonstrates compliance with NMAC 19.15.36.13.B(1).

2.2.2. Well-head Protection Areas and Floodplains [NMAC 19.15.36.13.B(2)]

19.15.36.13.B(2) prohibits surface waste management facilities from being located within an existing well-head protection area or a 100-Year floodplain. A review of documentation available from the New Mexico Environment Department (hereafter "NMED") indicates that there are no well-head protection areas within one mile of the Proposed Facility. The absence of well-head protection areas was also confirmed as a part of the subsurface investigation.

A review of mapping available from the Federal Emergency Management Agency (hereafter "FEMA") indicates that the Proposed Facility is not subject to inundation during the 100 year flood event. An annotated copy of the FEMA floodplain map has been included as Appendix 21-1. The absence of a floodplain on the Proposed Facility was also confirmed as a part of the subsurface investigation.

The absence of well-head protection areas and flooplains demonstrates compliance with NMAC 19.15.36.13.B(2).

2.2.3. Wetlands [NMAC 19.15.36.13.B(3)]

19.15.36.13.B(3) prohibits surface waste management facilities from being located within or within 500 feet of a wetland. A review of mapping available from the U.S. Fish and Wildlife Serves (hereafter "USFWS") as a part of the National Wetland Inventory (hereafter "NWI") project indicates that there are no mapped wetland features on or within five hundred (500) feet of the Proposed Facility. A copy of the portion of the NWI map, as obtained from the USFWS online Wetlands Mapper, has been included as Appendix 21-2. The absence of wetland features (including hydric soils, inundated or saturated during the growing season, and hydrophytic vegetation) was confirmed during a site inspection and as part of the subsurface investigation. The absence of wetlands demonstrates compliance with NMAC 19.15.36.13.B(3).

2.2.4. Subsurface Mines [NMAC 19.15.36.13.B(4)]

19.15.36.13.B(4) prohibits surface waste management facilities from being located within the area overlying a subsurface mine. A review of the documentation available from the New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division (hereafter "NMMMD") Mine Registration, Reporting and Safeguarding (hereafter "MRRS") Program indicates that there are no active mines on or within one (1) mile of the Facility, with the closest registered mine being approximately nineteen (19) miles to the north. A copy of the Active Mines Inventory, published February, 2012 has been included as Appendix 21-3. A review of documentation available from the U.S. Department of Interior, Bureau of Land Management (hereafter "BLM") Abandoned

Mine Site Inventory indicates that there are no recorded abandoned mines on or within one (1) mile of the Facility. A copy of the portion of the BLM map, as obtained from the Abandoned Mine Site Inventory, has been included as Appendix 21-4. During a site inspection, no surface features were identified that would have been indicative of a subsurface mine. The absence of subsurface mines was also confirmed as a part of the subsurface investigation. This information indicates there are no subsurface mines beneath the Proposed Facility, demonstrating compliance with NMAC 19.15.36.13.B(4)..

2.2.5. Adjacent Land Use [NMAC 19.15.36.13.B(5)]

19.15.36.13.B(5) prohibits surface waste management facilities from being located within 500 feet from the nearest permanent residence, school, hospital, institution or church in existence at the time of initial application. A review of available mapping and an inspection of the Proposed Facility indicates that there are no residences, schools, hospitals, institutions or churches on or within five hundred (500) feet of the Proposed Facility. A topographic map, indicating the absence of these features is included as Appendix 8-2 to Attachment 8 of the Application. The absence of these features demonstrates compliance with NMAC 19.15.36.13.B(5).

The use of the subject property and the adjacent BLM lands on the New Mexico side and the private lands on the Texas side consists of unimproved open range. There is extensive oil and gas development in the vicinity of the subject property, both in New Mexico and Texas. There are two (2) active oil wells on the subject property.

2.2.6. Unstable Areas [NMAC 19.15.36.13.B(6)]

19.15.36.13.B(6) prohibits surface waste management facilities from being located within an unstable area, unless the operator demonstrates that engineering measures have been incorporated into the surface waste management facility design to ensure that the surface waste management facility's integrity will not be compromised. In general, concerns regarding "unstable" sites include the following criteria:

- Subsidence/Settlement
- Karst Features/Sinkholes
- Faulting/Seismicity

Each of these criteria are explored in more detail below:

2.2.6.1. Subsidence/Settlement

A review of the documentation available from the United States Geological Survey (hereafter "USGS") indicates that subsidence/settlement is caused by three (3) primary factors: 1) mining groundwater, 2) draining organic soils, and 3) collapsing cavities (i.e. sinkholes). The concept of sinkholes is addressed in the discussion regarding Karst Features, addressed below.

While there is some groundwater development in the vicinity of the proposed facility, there is not extensive withdrawal of groundwater occurring in the vicinity. The USGS

Fact Sheet on Land Subsidence indicated that subsidence can occur from over-drafting groundwater and subsequent consolidation within the aquifer formation. The subsurface investigation, referenced above and included in Attachment 22 to the Application, indicated that extensive groundwater use that could result in over-drafting of the Ogalalla Formation, was not occurring. Based on the conditions at the site, this method of subsidence is not expected to adversely affect the Proposed Facility.

In conjunction with the previous soils and subsurface investigations at the site, no significant occurrences of organic soils has been noted, and certainly no organic soils at the surface with sufficient in-situ water to drain. Based on the conditions at the site, this method of subsidence is not expected to adversely affect the Proposed Facility.

2.2.6.2.Karst Features/Sinkholes

A review of the documentation available from the USGS indicating Karst Features (and correspondingly, the possibility of sink-holes) in the United States indicates that there are no known Karst Features, but the Proposed Facility is located in an area where "Features Analogous To Karst" may be encountered due to "piping in thick unconsolidated material". Excerpts from this document have been included in Appendix 21-5, annotated with the site location. Observations made during the drilling of soil borings and the geotechnical analysis of soil samples collected as part of the subsurface investigation did not reveal such conditions at the Proposed Facility. During a site inspection, no surface features were identified that would have been indicative of Karst features or sinkholes. Due to the absence of mapped Karst Features and features analogous to Karst, along with the absence of surface expression at the site for these types of features, Karst Features are not expected to adversely affect the Proposed Facility.

Available public records indicate there have been several collapse features recorded in southeastern New Mexico near brine wells where salt is mined for brine water during oil well drilling. The subsurface investigation and literature review indicated that no brine wells are located on or in the vicinity of the Proposed Facility. Due to the absence of brine mining in the vicinity of the Proposed Facility, solutions sinkholes are not expected to adversely affect the Proposed Facility.

2.2.6.3.Faulting/Seismicity

A review of the documentation available from the USGS working in conjunction with NMMMD, indicates that there are no mapped quarternary faults in the vicinity of the Proposed Facility. An annotated copy of the printout from the USGS Geographic Information System (hereafter "GIS") has been included as Appendix 21-6. Documentation available from the USGS (specifically the Seismic-Hazard Maps for the Conterminous United States, 2008) was reviewed. This map indicates that the Proposed Facility is located in an area where there is less than a two percent (2%) probability in a fifty (50) year period with horizontal acceleration exceeding eight percent (8%) of gravitational acceleration. An annotated copy of this map has been

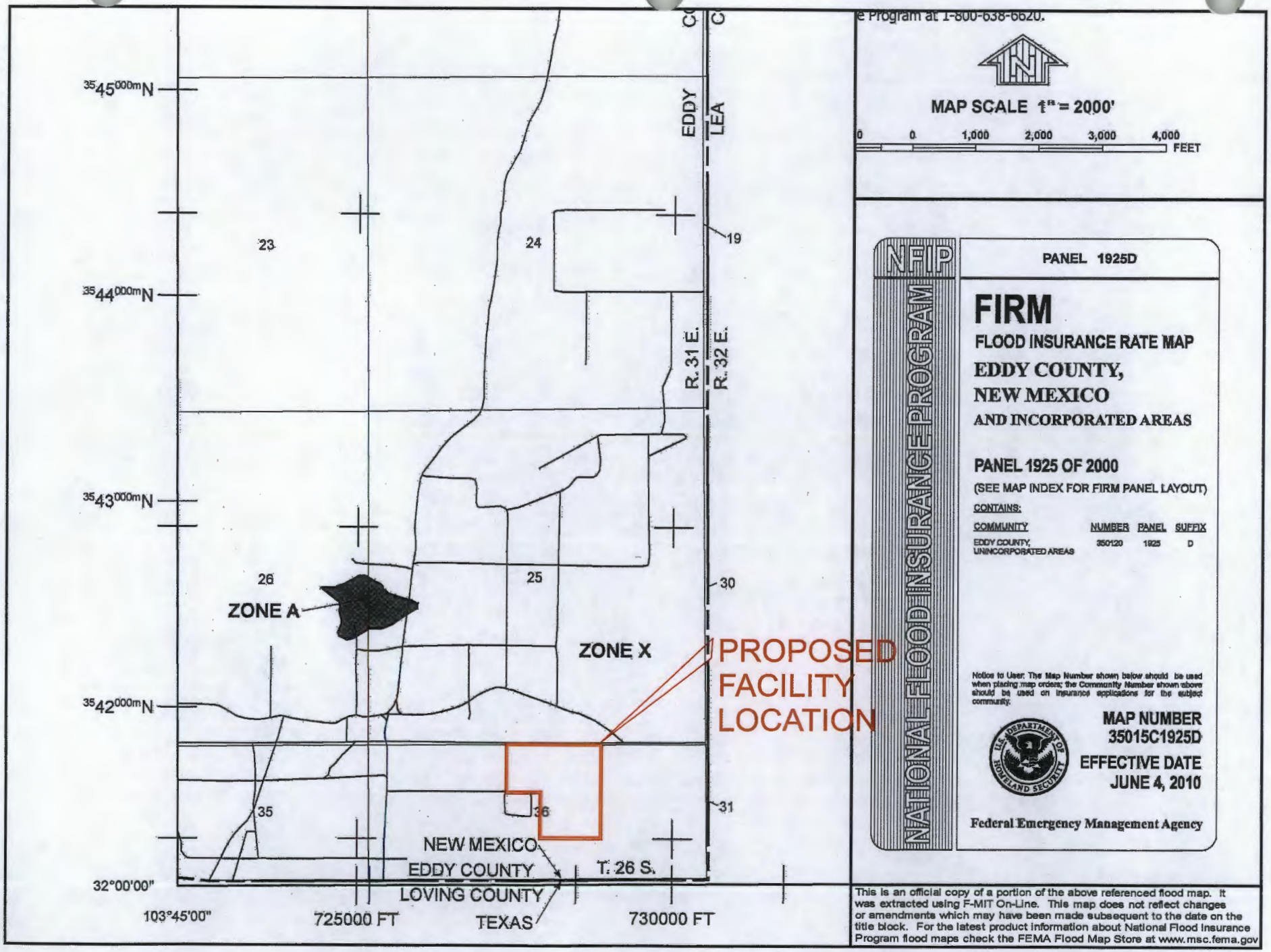
included as Attachment 21-7.The International Building Code generally highlights areas where the expected horizontal acceleration is greater than sixty percent (60%) of gravitational acceleration. Given the relatively low potential for seismic impact, this element of unstable areas is not expected to adversely affect the Proposed Facility.

The lack of adverse impacts by subsidence/settlement, Karst Features/sinkholes and faulting/seismicity indicates that the Proposed Facility is not located in an "unstable area" and therefore is in compliance with NMAC 19.15.36.13.B(6).

\\Nei-projects\projects drive\8935-R360-Avalon\Transfer Station\Application\Att21-Siting\R360-Avalon-TF-Siting.docx

Appendix 21-1

Excerpts from Flood Insurance Rate Map, Eddy County,
New Mexico, Panel 1925 of 2000, Effective June 4, 2010


e Program at 1-800-638-6620.
MAP SCALE 1" = 2000'
0 0 1,000 2,000 3,000 4,000
FEET
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 1925D
FIRM
FLOOD INSURANCE RATE MAP
EDDY COUNTY,
NEW MEXICO
AND INCORPORATED AREAS
PANEL 1925 OF 2000
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
EDDY COUNTY, UNINCORPORATED AREAS 350120 1925 D
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
35015C1925D
EFFECTIVE DATE
JUNE 4, 2010
Federal Emergency Management Agency
35 45 000m N
35 44 000m N
35 43 000m N
35 42 000m N
32°00'00"
103°45'00"
725000 FT
730000 FT
EDDY
LEA
R. 31 E.
R. 32 E.
T. 26 S.
23
24
25
26
35
36
19
30
31
ZONE A
ZONE X
PROPOSED FACILITY LOCATION
NEW MEXICO
EDDY COUNTY
LOVING COUNTY
TEXAS
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Appendix 21-2

Output from Online Wetland Mapper, National Wetlands Inventory

U.S. Fish and Wildlife Service

National Wetlands Inventory

R360 Avalon, NM Facility

Jul 13, 2012

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

Riparian

- Herbaceous
- Forested/Shrub

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

Appendix 21-3

New Mexico MMD Active Mines Inventory

New Mexico Active Mines, Feb 2012

DISCLAIMER: The mining operation information in this document was collected under the authority of NMSA, 1978, Chapter 69, by the Mine Registration, Reporting and Safeguarding (MRRS) Program of the Mining and Minerals Division (MMD). It is the sole responsibility of mine operators to register any mine, mill, smelter, pit, quarry or other mining facility with MRRS prior to the start of operations; to notify MRRS of operational changes; and to accurately and periodically report data as required under the statute and attendant regulation. Information in this portion of MMD's website is based on data that is reported to MMD by mine operators. While MMD reviews the reported data for completeness and accuracy, anyone using this information should be aware that it does not originate with MMD. Additionally, some of the information may not be current because of changes since the last reporting cycle.

Name	County	Commodities	Quads	LatitudeDDNAD83	LongitudeDDNAD83	CoordMeasureMethod	OperatorName	Address	Phone
Constructors Eddy County	Eddy	Aggregate	Carlsbad East	32.39	104.25	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Constructors, Inc.	3001 South Boyd Drive Carlsbad NM 88220 USA	5758858838
Dark Canyon Crusher	Eddy	Aggregate		0.00	0.00		James Hamilton Construction	P.O. Box 1287 Silver City NM 88062 USA	5753881546
Dark Canyon Screen	Eddy	Aggregate	Kitchen Cove	32.30	104.31	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	James Hamilton Construction	P.O. Box 1287 Silver City NM 88062 USA	5753881546
Intrepid East Mill	Eddy	Potash	Livingston Ridge, Williams Sink	32.51	103.78	Aerial Photography	Intrepid Potash NM LLC	P.O. Box 101 Carlsbad NM 88220 USA	5752343690
Intrepid East Mine	Eddy	Potash	Livingston Ridge, Williams Sink	32.50	103.78	Aerial Photography	Intrepid Potash NM LLC	P.O. Box 101 Carlsbad NM 88220 USA	5752343690
Intrepid West Mill	Eddy	Potash	Tower Hill South	32.49	103.94	Aerial Photography	Intrepid Potash NM LLC	P.O. Box 101 Carlsbad NM 88220 USA	5752343690
Intrepid West Mine	Eddy	Potash	Tower Hill North, Tower Hill South	32.49	103.94	Aerial Photography	Intrepid Potash NM LLC	P.O. Box 101 Carlsbad NM 88220 USA	5752343690
Livingston Land Material Pit	Eddy	Aggregate	Hope SE	32.85	104.51	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Livingston Land LLC	P.O. Box 1152 10114 Hope Hwy Artesia NM 88210 USA	5753654772
Loco Hills Borrow Pit	Eddy	Aggregate	Henshaw Tank, Loco Hills	32.88	103.99	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Loco Hills Landfarm, LLC	221 Mallett Rd. P.O. Box 1152 Artesia NM 88210 USA	5053654772
Mosaic Potash Mill	Eddy	Potash	Remuda Basin, Tower Hill South	32.42	103.94	Aerial Photography	Mosaic Potash Carlsbad, Inc.	1361 Potash Mines Rd. Carlsbad NM 88220 USA	5758872871
Mosaic Potash Mine	Eddy	Potash	Bootleg Ridge, Los Medanos, Remuda Basin, Tower Hill South	32.41	103.94	Aerial Photography	Mosaic Potash Carlsbad, Inc.	1361 Potash Mines Rd. Carlsbad NM 88220 USA	5758872871
Nash Draw Mine	Eddy	Potash	Livingston Ridge, Los Medanos, Remuda Basin	32.36	103.88	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Mosaic Potash Carlsbad, Inc.	1361 Potash Mines Rd. Carlsbad NM 88220 USA	5758872871
New Mexico Salt & Minerals Mine	Eddy	Salt	Loving	32.30	104.04	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	New Mexico Salt & Minerals	P.O. Box 2262 Carlsbad NM 88221 USA	5757453658
Slash 46 Pit	Eddy	Aggregate	Bootleg Ridge	32.28	103.76	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Slash 46, Inc.	P.O. Box 1358 Loving NM 88256 USA	5753902779
State Line Pit	Eddy	Aggregate	Grapevine Draw	32.01	104.52	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	James Hamilton Construction	P.O. Box 1287 Silver City NM 88062 USA	5753881546
United Salt Corp. Carlsbad Plant	Eddy	Salt	Tower Hill South	32.41	103.94	Aerial Photography	United Salt Corporation	P.O. Box SS Carlsbad NM 88220 USA	5758852105
United Salt Corp. Lake Mine	Eddy	Salt	Loving	32.32	104.00	Aerial Photography	United Salt Corporation	P.O. Box SS Carlsbad NM 88220 USA	5758852105
Columbus Pit	Lea	Aggregate	Camel Mountain	31.81	107.33	Aerial Photography	Deming Sand & Gravel, Inc.	3660 Blue Quail Rd. SW Deming NM 88030 USA	5055469656
Constructors Lea County	Lea	Aggregate, Caliche, Other	Hobbs West	32.73	103.19	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Constructors, Inc.	3001 South Boyd Drive Carlsbad NM 88220 USA	5758858838
Eunice Pit	Lea	Aggregate, Clay & Shale	Eunice NE	32.45	103.08	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Wallach Concrete, Inc.	P.O. Box 1289 Hobbs NM 88241 USA	5753925204
Hawthorne Pit	Lea	Aggregate, Caliche	Hillburn City	33.01	103.33	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Gandy Corporation	P.O. Box 2140 Lovington NM 88260 USA	5753964948
Intrepid North Compaction Plant	Lea	Potash	Williams Sink	32.57	103.80	Aerial Photography	Intrepid Potash NM LLC	P.O. Box 101 Carlsbad NM 88220 USA	5752343690

Name	County	Commodities	Quads	LatitudeDDNAD83	LongitudeDDNAD83	CoordMeasureMethod	OperatorName	Address	Phone
Lea County Pit & Crusher	Lea	Aggregate	Hillburn City	33.23	103.34	Conversion from US PLSS (Twnshp, Rnge, Sect, Qrtr)	Lea County Road Department	5915 N Lovington Hwy Hobbs NM 88240 USA	5753912940

Appendix 21-4

Output from the Online Abandoned Mine Site Inventory

Search

BLM>More BLM Programs>Abandoned Mine Lands>Abandoned Mine Site Inventory

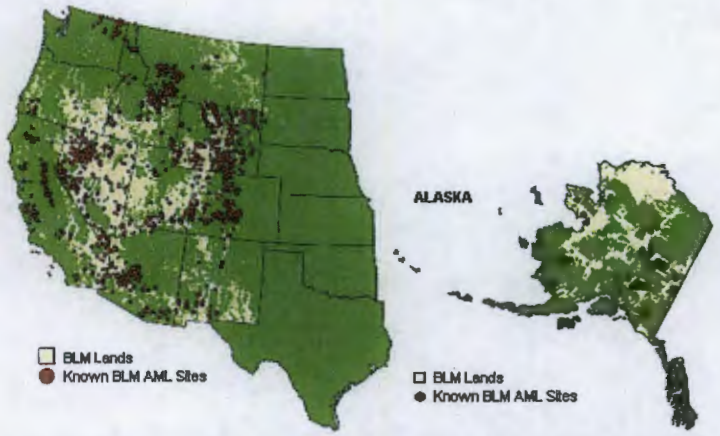
Print Page

Abandoned Mine Site Inventory

National
- What We Do
- Visit Us
- Information Center
- Get Involved
- Our Offices/Centers
- Contact Us

Abandoned Mine Lands
- About AML
- Abandoned Mine Site Inventory
- Frequently Asked Questions
- Safety & Education
- Environment & Water
- AML Publications
- Working with AML
- Contact AML

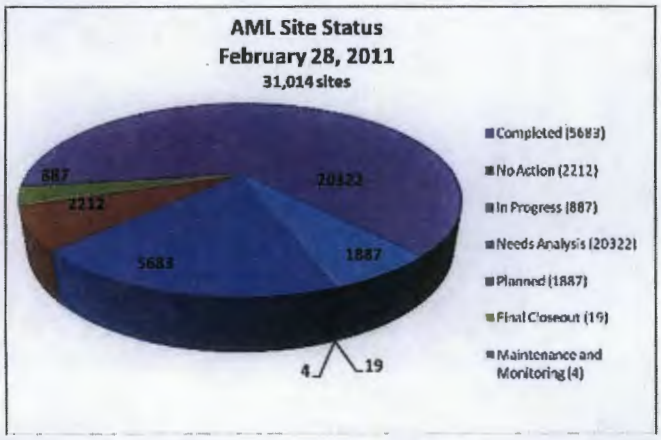
BLM State AML Offices | Partnerships | How BLM AML Projects Work | Frequently Asked Questions | Glossary | Abandoned Mine Site Inventory



BLM maintains an inventory of known abandoned mine lands on public lands. Most of the sites are abandoned hardrock mines. As of February 28, 2011, the **inventory contained nearly 31,000 sites and 65,000 features. Approximately 25% of the sites have either been remediated, have reclamation actions planned or underway, or do not require further action. The remaining 75% require further investigation** and/or remediation.

Abandoned Mine Lands Site Status (02/28/2011)

Geographic State	Completed (A)	No Action (B)	In Progress (C)	Needs Analysis (D)	Planned (E)	Final Closeout (F)	Maintenance and Monitoring (G)	Total:	Remaining Sites (C+D+E+F+G)
Alaska	45	115	19	21	37		1	238	78
Arizona	180	347	22	2538	134	17		3238	2711
California	130	100	46	1319	362			1957	1727
Colorado	665	216	51	2204	163			3299	2418
Idaho	481	259	49	235	218		3	1245	505
Montana	305	224	183	442	43			1197	668
Nevada	1122	39	60	10324	818	2		12365	11204
New Mexico	122	10	15	1560	63			1770	1638
Oregon	118	3	190	140	10			461	340
South Dakota	4							4	
Utah	2483	891	231	466	21			4092	718
Washington	13	1	16	56	8			94	80
Wyoming	10	6	5	1016	7			1044	1028
Others	5	1		1	3			10	4
Total:	**5683**	**2212**	**887**	**20322**	**1887**	**19**	**4**	**31014**	**23119**



Source: BLM's AML inventory database.

*This data should be considered soft because the BLM is currently reviewing and updating its data. In addition, the majority of sites were reported during the initial inventory efforts from various sources, but have not been assessed on the ground by the BLM.

You can view the latest BLM AML spatial data at www.geocommunicator.gov.

Abandoned Mine Site Features Inventory

Abandoned Mine Land Feature Types
As of 01/26/2011
Ranked by %

	Number	%
Other	19998	30.9%
Adit - open	13435	20.8%
Shaft - open	12569	19.4%
Waste dump	11654	18.0%
Highwalls/Pits	3801	5.9%
Adit - caved	693	1.1%
Tailings	545	0.8%
Illegal dump - hazardous waste	497	0.8%
Prospect Pit	323	0.5%
Reserve Pit	308	0.5%
Mine/Mineral Processing	245	0.4%
Shaft - caved	227	0.4%
Illegal dump - solid waste	183	0.3%
Spills (other than pipelines)	62	0.1%
Illegal dump - solid and hazardous waste	41	0.1%
Industrial Facility	32	0.0%
Repository	23	0.0%
Tanks	19	0.0%
Non-BLM facility	9	0.0%
Orphaned Well	6	0.0%
Heap Leach	2	0.0%
Total:	64672	100.0%

Source: BLM's Abandoned Mine Lands/site Cleanup Inventory Database

The BLM has been able to identify the specific feature type for approximately 65% of its feature records. For the undetermined, planned, or in progress sites, data show that the most commonly identified feature types are:

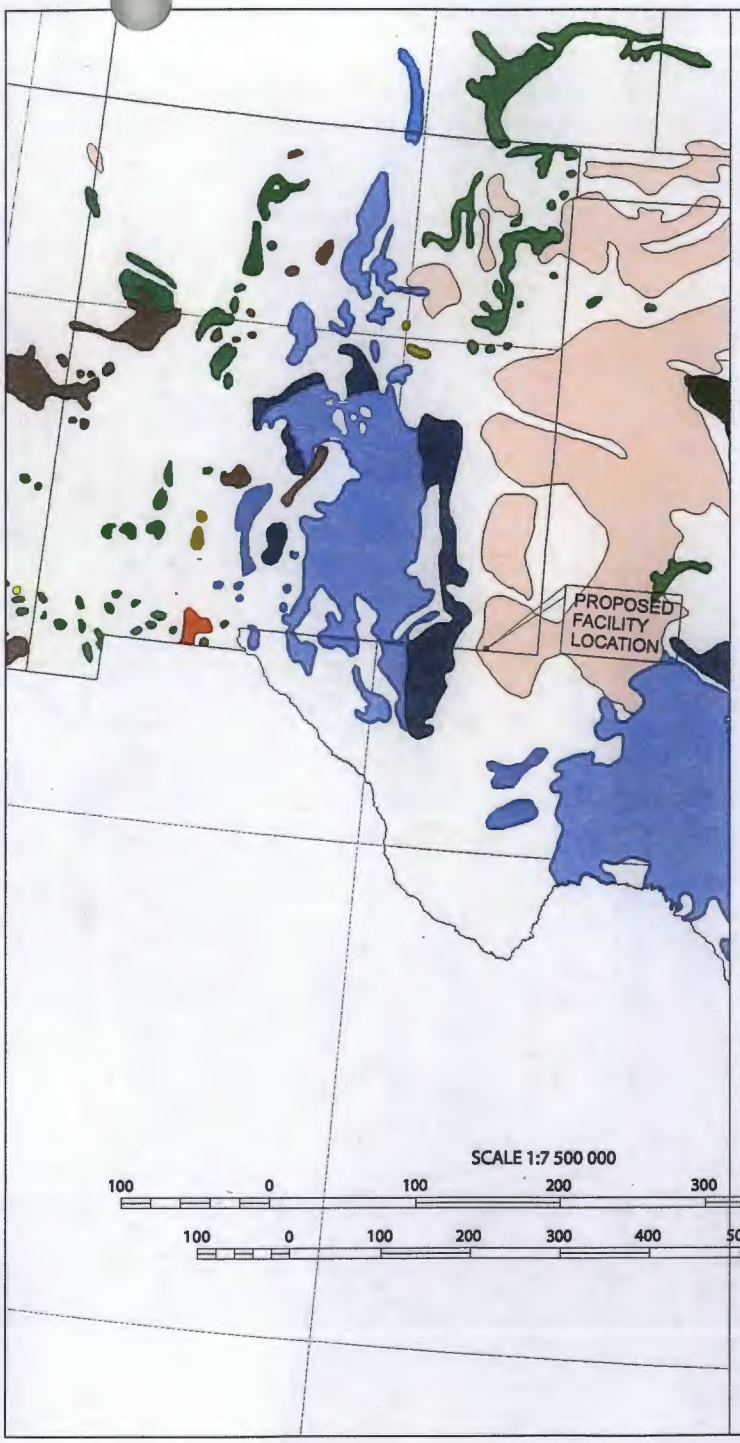
- Open adits and shafts;
- Waste dumps;
- Highwalls and pits; and
- Tailings piles

The remaining 35% of the feature records (19,888, Other) need further data review and/or field validation.

Last updated: 02-28-2011

Appendix 21-5

Excerpts from Digital Engineering Aspects of Karst Map



FISSURES, TUBES, AND CAVES OVER 1,000 FT (300 M) LONG; 50 FT (15 M) TO OVER 250 FT (75 M) VERTICAL EXTENT

- In metamorphosed limestone, dolostone, and marble
- In moderately to steeply dipping beds of carbonate rock
- In gently dipping to flat-lying beds of carbonate rock
- In gently dipping to flat-lying beds of carbonate rock beneath an overburden of noncarbonate material 10 ft (3 m) to 200 ft (60 m) thick
- In moderately to steeply dipping beds of gypsum
- In gently dipping to flat-lying beds of gypsum

FISSURES, TUBES, AND CAVES GENERALLY LESS THAN 1,000 FT (300 M) LONG; 50 FT (15 M) OR LESS VERTICAL EXTENT

- In metamorphosed limestone, dolostone, and marble
- In crystalline, highly siliceous intensely folded carbonate rock
- In moderately to steeply dipping carbonate rock
- In gently dipping to flat-lying carbonate rock
- In gently dipping to flat-lying beds of carbonate rock beneath an overburden of noncarbonate material 10 ft (3 m) to 200 ft (60 m) thick
- In moderately to steeply dipping beds of gypsum
- In gently dipping to flat-lying beds of gypsum
- In gently dipping to flat-lying beds of gypsum beneath and overburden of nonpyriferous material 10 ft (3 m) to 200 ft (60 m) thick
- In carbonate zones in highly calcic granite (Alaska only)
- In moderately to steeply dipping beds of carbonate rock with a thin cover of glacial till and frost-derived residual soil (Alaska only)

FISSURES, TUBES, AND CAVES GENERALLY ABSENT; WHERE PRESENT IN SMALL ISOLATED AREAS, LESS THAN 50 FT (15 M) LONG; LESS THAN 10 FT (3 M) VERTICAL EXTENT

- In crystalline, highly siliceous intensely folded carbonate rock
- In moderately to steeply dipping beds of carbonate rock
- In gently dipping to flat-lying beds of carbonate rock

FEATURES ANALOGOUS TO KARST

- Fissures and voids present to a depth of 250 ft (75 m) or more in areas of subsidence from piping in thick unconsolidated material
- Fissures and voids present to a depth of 50 ft (15 m) in areas of subsidence from piping in thick, unconsolidated material
- Fissures, tubes, and tunnels present to a depth of 250 ft (75 m) or more in lava
- Fissures, tubes, and tunnels present to a depth of 50 ft (15 m) in lava

Areas in which extensive historical subsidence has occurred

SCALE 1:7 500 000

100 0 100 200 300 400 500 MILES

100 0 100 200 300 400 500 600 700 KILOMETERS

Introduction

This data set was converted from a printed map to a digital GIS coverage to provide users with a stable national-scale karst data set to use for graphic and demonstration purposes until new, improved data are developed. These data may be served on the Internet or distributed freely with proper citation. Because it has been converted to GIS format, this data can be easily projected, displayed and queried for multiple uses in GIS. The karst polygons of the original map were scanned from the stable base negatives of the original, vectorized, edited, and then attributed with unit descriptions. All of these processes potentially introduce small errors and distortions to the geography. The original map was produced at a scale of 1:7,500,000; this coverage is not as accurate and should be used for broad scale purposes only. It is not intended for any site-specific studies.

The following text is taken verbatim from the original map, which was printed front and back on a single sheet.

ENGINEERING ASPECTS OF KARST
By
William E. Davies

Distinctive surficial and subterranean features developed by solution of carbonate and other rocks and characterized by closed depressions, sinking streams, and cavern openings are commonly referred to as karst. The term was used first to describe the region of Carso in northeastern Italy and northern Yugoslavia, where solution landscape was studied in the 19th century. Originally the term defined surface features derived by solution of carbonate rocks, but subsequent use has broadened the definition to include sulfates, halides, and other soluble rocks. The term has been expanded also to cover interrelated forms derived by solution on the surface in the subsurface. A further expansion of the concept of karst was the introduction of the term "pseudokarst" to designate landlike terrain produced by processes other than the dissolution of rocks (Bunger and Dubertret, 1975). When used in its broadest sense, the term encompasses many surface and subsurface conditions that give rise to problems in engineering geology. Most of these problems pertain to subterranean karst and pseudokarst features that affect foundations, tunnels, reservoir tightness, and diversion of surface drainage. Environmental aspects of karst lead to additional problems in engineering geology, especially in site selection. Subterranean openings may be the habitat of unique and, in some cases, endangered fauna. The openings are also conduits for water and refuse disposal from the surface or, in caves, for pollutants that can be carried for great distances. Many caves contain features of beauty and scientific interest that can be important esthetic factors in site selection for structures, transportation routes, and impoundments.

Although surface features of karst terrain (primarily sinkholes, solution valleys, and solution-sculptured rock ledges) are significant in engineering geology, they have not been included on this map because of the additional complexity that would occur in classification and portrayal.

The systematic study of karst in the United States started with W. M. Davis' (1930) theory on the origin of caves by deep-seated solution. Bretz (1942) obtained data, from studies in flat-lying carbonate rocks in the Midwestern States that supported Davis' theory. After World War II, studies of karst in the United States became widespread beginning with investigations in the Appalachian Mountains. Based on these studies, many of which were in areas of folded rock, older theories were modified with emphasis on maximum solution activity in a zone directly beneath a uniform water table (Davies, 1960). Since 1948, the exploration of caves and studies of landforms in carbonate terrains have produced a vast amount of data on karst. Reports of these explorations and studies have been primary sources in compiling this map on the subterranean aspects of engineering geology of karst and pseudokarst. In addition, published logs of borings were used. Much of the information on the Eastern United States, principally for the Appalachian Mountains and Piedmont, is from field observations.

The small scale of the map and the limited data on openings, other than caves, in soluble rocks restrict the use of the map in the most general types of planning and as a guide to areas where subterranean karst and pseudokarst features occur. The map cannot be used either for specific site selection or as a substitute for field examination in planning and site development. Because cartographic license was taken to portray the features at the small scale of this map, enlargement can lead to gross errors in location of the data presented.

Subterranean openings in karst range in size from minute voids to large caverns. Most of the openings are formed by solution processes along fractures, joints, and bedding planes. Caves and related solution features are common in most carbonate and gypsum terrains in the United States, except in the area formerly covered by Pleistocene ice sheets (Davies and LeGrand, 1972). The southward advance of these ice sheets covered New England, New York, northeastern and northwestern Pennsylvania, most of the States bordering the Great Lakes, and much of the area north of the Missouri River. Karst features in the formerly glaciated area are covered by glacial drift, and most caves and fissure openings have been eroded away or filled. The caves and open fissures that remain generally have less than 1,000 ft (300 m) each of passages large enough to be traversed by humans.

South of the formerly glaciated area, caves, open joints, fissures, and other subterranean karst features are present in most soluble rocks. In general, both the number and size of solution features increase inversely with latitude. In addition, the number and size also vary according to the age and structure of the soluble rock in which solution features develop. Solution features in folded rocks are subordinate to those in nondeformed rocks; those in rocks older than Mississippian are subordinate to those in Mississippian and younger rocks. There are broad generalizations, and local exceptions exist. However, these generalizations can be used as a basis for estimate of karst conditions.

Most caves consist of a series of passages on one level. Some caves have multiple levels of passages that extend vertically as much as 300 ft (90 m). The levels are generally connected by shafts or large galleries. Most passages are less than 10 ft (3 m) high and less than 10 ft (3 m) wide. Maximum size of passages is about 100 ft (30 m) in height and width. In many caves, passages expand into galleries or rooms that are 30 to 200 ft (9 to 60 m) long and wide and up to 150 ft (45 m) high. The largest known solution opening in the United States is in Carlsbad Caverns, New Mexico, where a T-shaped room is 1,800 ft (550 m) long in one section, 1,100 ft (350 m) long in the other section, 255 ft (77 m) high, and up to 300 ft (90 m) wide.

Shafts are present in multiple-level caves and in some single-level caves. The deepest shafts are about 1,000 ft (300 m) deep, but in most caves they are less than 300 ft (90 m) deep. Most shafts are 30 ft (10 m) or less wide. In multiple-level caves, shafts connect levels; in other caves, the shafts are pits with no apparent connection at the base. Shafts are irregular in shape; some resemble funnels, and others are shaped like cylinders. Dome pits are cylindrical shafts that develop upward from a passage towards the surface of the Earth. Dome pits are up to 50 ft (15 m) wide and extend upward for as much as 150 ft (45 m). Their walls are uniform. Dome pits are capped by a cover of carbonate rocks 10 to 30 ft (3 to 15 m) thick. In many domes, the caps have collapsed and left vertical-sided open pits.

Virginia, West Virginia, Kentucky, Tennessee, Alabama, Missouri, Texas, and New Mexico contain hundreds of caves, each of which has over a mile of passages. At least one cavern system in each of these States has 10 to more than 100 mi (16 to 160 km) of passages. The largest known system is Flint Ridge-Mammoth Cave in Kentucky (Brucker, 1975), with over 200 mi (320 km) of passageways in an area of 362 mi (902 km).

Solution tubes with openings as much as 1 ft (0.3 m) wide and irregular alignment occupy portions of the carbonate bedrock. In some cases, the tubes connect with caves. However, the tubes generally lack the systematic patterns that are common in development of cavern passages. These tubes apparently predate cavern development. Although most tubes are seldom longer than a few hundred feet, they are interconnected and commonly act as conduits for subsurface drainage. During freezing weather, water from tubes can cause large buildups of ice where excavations intersect the tubes. At other times, the tubes lead to flooding of excavations and leaks in reservoirs and contribute to weakening of retaining walls.

Fissures (also referred to as open joints) up to 1 ft (0.3 m) wide result from limited solution along joints, fractures, and bedding planes. Fissures occur in various attitudes from vertical to gently inclined and generally are in repetitive geometrical patterns or sets. Fissures form systems that may extend for several thousand feet horizontally and over 300 ft (90 m) vertically. Some fissures or parts of fissures are filled with consolidated clay-silt and clay-gravel that seal them. The seals, however, are altered in contact with water and can be removed by running water. Fissures are commonly conduits for subterranean streams. In addition, they can cause serious engineering problems, such as reservoir leakage and instability of cuts, bridge abutments, piers, and dam foundations and abutments.

The depth to which solution openings occur depends on relief in an area, thickness of soluble rock, and geologic structure. The configuration and depth of the water table, in some cases, are controlling factors. Ground water in karst terrain generally is found in existing openings that extend into or hundreds of feet below the water table. In the mountainous areas of the Western United States, the known vertical extent of solution openings is as much as 1,100 ft (330 m). In the Eastern United States, where relief is less, the vertical extent is generally less than 400 ft (120 m), with a maximum of 650 ft (200 m). Beneath many broad river valleys, solution features in carbonate rocks are present to a depth of about 100 ft (30 m) in both the Eastern and Western United States.

Surface subsidence (sinkhole development) occurs most commonly in areas where ground-water conditions are altered by excessive pumping or by diversion of surface drainage. Subsidence generally involves weathered bedrock and soil that bridge caverns, subterranean galleries, and dome pits. The collapse is caused by loss of support resulting from the reduction of hydrostatic pressure of ground water, by sapping, and by piping. Most subsidence forms shallow, steep-sided depressions up to 100 ft (30 m) wide and up to 20 ft (6 m) deep. However, in Florida and central Alabama, recent subsidence has resulted in nearly vertical sided sinkholes up to 425 ft (130 m) wide and 150 ft (45 m) deep.

Areas of local subsidence caused by mining operations and regional subsidence caused by withdrawal of ground water and petroleum in thick, unconsolidated sediments have not been included on the map of subterranean aspects of engineering geology of karst and pseudokarst because natural processes are involved only in a subordinate way in development of these phenomena. The problems of these types of subsidence are complex, and the areas involved are so extensive that they are best treated as subjects for another map.

Permian carbonate rocks in central and southern New Mexico contain numerous well-developed karst features. Caves are generally very large and contain miles of passages with a vertical extent of 1,000 ft (300 m) or more. Fissures are of similar size and are interconnected, forming networks that extend for several miles. Closely spaced open joints, enlarged by solution, and numerous small, near-surface solution tubes cause extensive trouble in reservoir tightness throughout this karst area.

The High Plains of western Texas and adjacent States contain numerous depressions, some of which are as much as 3 mi (4.8 km) long and up to 1 mi (1.6 km) wide. They vary from "buffalo wallows," 3 to 10 ft (1 to 3 m) deep, to steep-sided features as much as 250 ft (75 m) deep. The depressions are aligned along a series of major joints and apparently formed by piping and removal of fine-grained material along joint planes at depths greater than 250 ft (75 m). Deep excavations in the depressions encounter weak, unstable soils and are subject to flooding from ground water during occasional periods of high rainfall.

Pseudokarst features in late Cenozoic basalt lava fields are extensive in some regions of the west. The largest regions with this type of pseudokarst are in the Snake River area of Idaho, in part of the Columbia Basalt Plateau in Washington and Oregon, and in the lava fields of northeastern California. Smaller areas are in New Mexico, Arizona, Utah, Nevada, southern California and on the Seward Peninsula in Alaska. The pseudokarst features include lava tubes, fissures, open sinkholes, and caves formed by extension of the still-liquid portion of the lava. Subsurface solution of the bedrock and subsequent collapse are not involved in the formation of these features. Lava tubes, in the form of tunnels, are up to 20 ft (6 m) in diameter, and some extend for several miles. Fissures are common but seldom extend for more than 1,000 ft (300 m). The fissures and lava tubes, in contrast to solution features, are not in geometrical sets but are generally parallel and extend in the direction of the flow of the lava. Fissures and lava tubes are generally near-surface features, but some are as much as 250 ft (75 m) deep. "Sinkholes" in lava generally lack the symmetry of those developed in solution terrain. The lava sinks are commonly less than 100 ft (30 m) wide, but a few large sinks, notably in the Snake River area of Idaho, are as much as 1 mi (1.6 km) or more wide. Most of the lava sinks are irregular in shape and generally are shallow fissures (less than 30 ft (10 m) deep), although some are 150 ft (45 m) or more deep. Many of the sinks have near-vertical sides or overhangs. Lava pseudokarst features present problems in foundations, abutments, and reservoir tightness. In addition, the tubes and related permeable lava often contain large quantities of water that may lead to flooding and slope-stability problems in cuts and excavations.

Appendix 21-5.
Excerpts From:

Digital Engineering Aspects of Karst Map : A GIS version of Davies, W.E., Simpson, J.H., Ohlmacher, G.C., Kirk, W.S., and Newton, E.G., 1984, Engineering aspects of karst: U.S. Geological Survey, National Atlas of the United States of America, scale 1:7,500,000
by Bret D. Tobin and David J. Weary
U.S. Geological Survey Open-File Report 2004-1352

Appendix 21-6

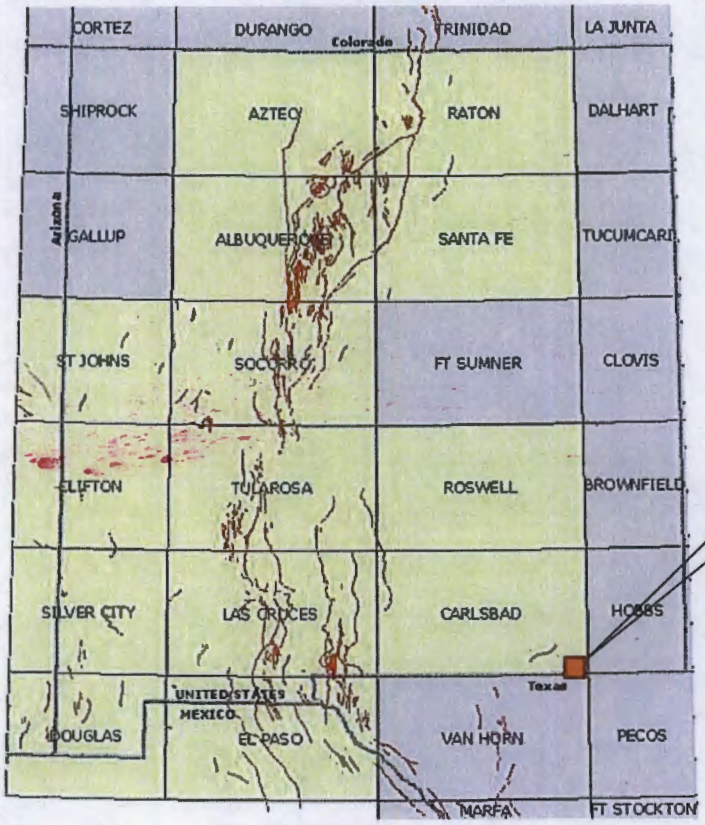
Mapped Quarternary Fault Locations – New Mexico

USGS science for a changing world

Earthquake Hazards Program

New Mexico Quaternary Faults

Cooperator New Mexico Bureau of Mines and Mineral Resources

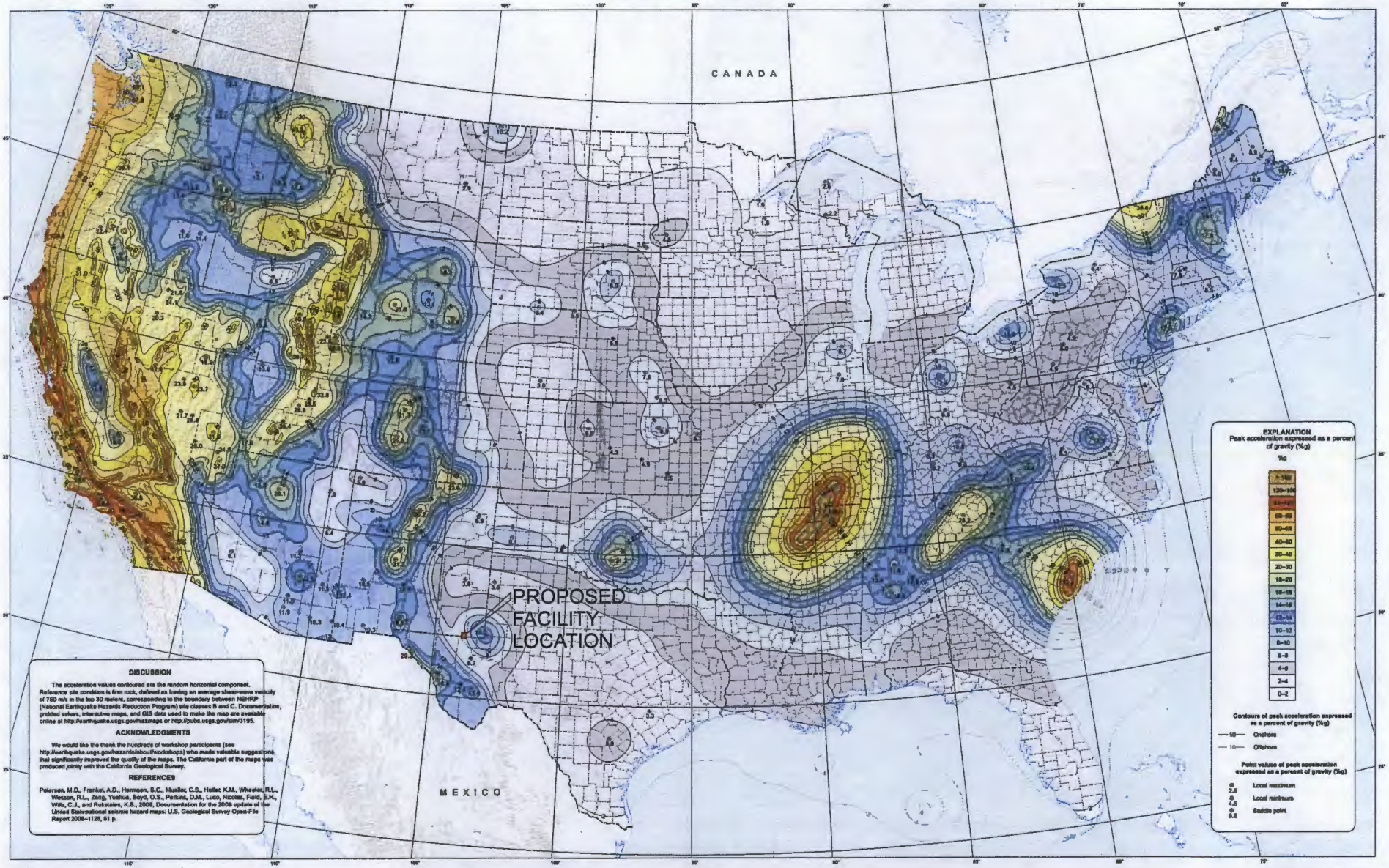


PROPOSED FACILITY LOCATION

Appendix 21-6
Mapped Quarternary
Fault Locations
New Mexico

Appendix 21-7

Annotated Seismic-Hazard Map for the Conterminous United States, 2008



DISCUSSION

The acceleration values contoured are the random horizontal component. Reference site condition is firm rock, defined as having an average shear-wave velocity of 760 m/s in the top 30 meters, corresponding to the boundary between NEHRP (National Earthquake Hazards Reduction Program) site classes B and C. Documentation, gridded values, interactive maps, and GIS data used to make the map are available online at http://earthquake.usgs.gov/hazmaps or http://pubs.usgs.gov/sim/3195.

ACKNOWLEDGMENTS

We would like the thank the hundreds of workshop participants (see http://earthquake.usgs.gov/hazards/about/workshops) who made valuable suggestions that significantly improved the quality of the maps. The California part of the maps was produced jointly with the California Geological Survey.

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Petersen, M.D., Frankel, A.D., Harmsen, S.C., Mueller, C.S., Haller, K.M., Wheeler, R.L., Wesson, R.L., Zeng, Yuehua, Boyd, O.S., Perkins, D.M., Luco, Nicolas, Field, E.H., Wills, C.J., and Rukstales, K.S., 2008, Documentation for the 2008 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2008–1128, 61 p.

Shaded relief base from ESRI, Inc., 2009. Data and maps
All other base map data from ESRI, Inc., 1993, Digital Chart of the World
United States County base map from the U.S. Geological Survey National Atlas, available at http://nationalatlas.gov

Projection: Albers equal-area conic
Standard Parallels 29.5°N and 45.5°N
Central meridian 96°W

SCALE 1:7 000 000

Digital data prepared with ArcGIS 9.3 running under Windows XP

Suggested citation:
Petersen, M.D., Frankel, A.D., Harmsen, S.C., Mueller, C.S., Haller, K.M., Wheeler, R.L., Wesson, R.L., Zeng, Yuehua, Boyd, O.S., Perkins, D.M., Luco, Nicolas, Field, E.H., Wills, C.J., and Rukstales, K.S., 2011, Seismic-hazard maps for the conterminous United States, 2008: U.S. Geological Survey Scientific Investigations Map 3195, 6 sheets, scale 1:7,000,000.

Seismic-Hazard Maps for the Conterminous United States, 2008

Peak Horizontal Acceleration with 2 Percent Probability of Exceedance in 50 Years

Appendix 21-7

By
Mark D. Petersen, Arthur D. Frankel, Stephen C. Harmsen, Charles S. Mueller, Kathleen M. Haller, Russel L. Wheeler, Robert L. Wesson, Yuehua Zeng, Oliver S. Boyd, David M. Perkins, Nicolas Luco, Edward H. Field, Christopher J. Wills, and Kenneth S. Rukstales

2011

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ATTACHMENT 22

Geological/Hydrogeological Data

PART 36 INVESTIGATION REPORT

Avalon Facility
Section 36, Township 26 South, Range 31 East
Eddy County, New Mexico

Project No. 11-0131-04

April 12, 2013

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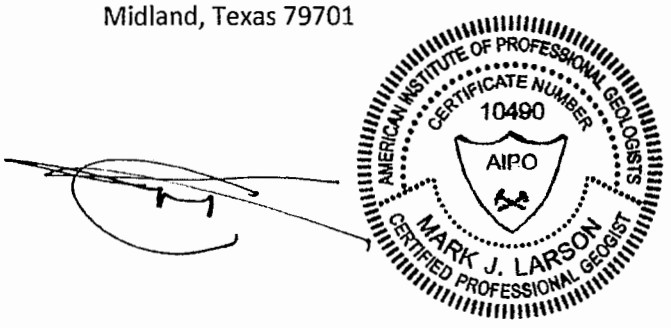

Mark J. Larson, CPG
Certified Professional Geologist No. 10490

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1.0 INTRODUCTION

This report was prepared on behalf of R360 Environmental Solutions, Inc. (R36) by Larson & Associates, Inc. (LAI) to present the results of a subsurface investigation for permitting and constructing a waste facility (Facility) in compliance with New Mexico Oil Conservation Division (NMOCD) rules (NMAC 19.15.36.13). The initial phase will be a transfer station to be located near the center of an approximate 267 acre parcel of land encompassing the north-half and lots 1 through 4 of the south half of Section 36, Township 26 South, Range 31 East, in Eddy County, New Mexico. Figure 1 presents a location and topographic map. Figure 2 presents a site topographic map. Figure 3 presents a detailed topographic map. Figure 4 presents an aerial map. Figure 5 presents a Facility drawing.

1.1 Purpose and Background

The purpose of this investigation is to determine if groundwater is presents beneath the property at depths that would prohibit permitting and constructing a waste management facility according to NMOCD rules (NMAC 19.15.36.13). On August 28, 2012, the NMOCD approved a plan to conduct the investigation. The plan included drilling 4 borings (SB-1 through SB-4) using dry coring methods to identify the presence of groundwater to a depth of at least 100 feet below the lowest elevation of waste placement. The lowest elevation of waste placement was determined by subtracting 100 feet from the lowest elevation of the property plus an additional depth for good measure. The bottom hole elevations were established at 2,945 (SB-1 and SB-2) and 2,970 (SB-3 and SB-4) feet above mean sea level (MSL). The proposed boring depths were 183 (SB-1), 165 (SB-2), 178 (SB-3) and 174 (SB-4) feet below ground surface (bgs).

On January 29, 2013, Naismith Engineering, Inc., on behalf of R360, submitted a boring plan for the proposed transfer station which included drilling an additional boring (SB-13) near the center of the property. The bottom elevation of boring SB-13 is 3,045 feet above MSL or approximately 75 feet bgs. Appendix A presents the boring plan approval.

1.2 Previous Investigation

During October and November 2011, LAI conducted a preliminary investigation that included drilling eight (8) borings (BH-1 through BH-8) between approximately 40 (BH-1, BH-4 and BH-5) and 140 (BH-6) feet bgs. The borings were drilled using an air rotary rig with the addition of water to remove drill cuttings from the borings. The lithology was described from drill cuttings according to the Unified Soil Classification System (ASTM D 2487-83). Groundwater was not observed in the borings which were plugged with bentonite chips following the investigation. The boring locations are shown on Figure 5. Appendix B presents the logs for borings BH-1 through BH-8.

Soil samples were collected from borings BH-6 (35 feet), BH-7 (25 feet) and BH-8 (25 and 50 feet) for geotechnical analysis by ETTL Engineers & Consultants, Inc., located in Tyler, Texas. The samples were tested in accordance with American Society for Testing Materials (ASTM) for USCS soil classification, moisture-density relationship, sieve analysis, Atterberg limits and hydraulic conductivity. Appendix C presents the geotechnical laboratory report.

2.0 SETTING

2.1 Description

The Avalon Facility is bound on the north by State Line Road, on the south by Loving County, Texas, on the east by Lea County, New Mexico, and on the west by U.S. BLM administered land. The property is owned by David Kirk and is undeveloped except for oil and gas production near the center and west side of the property. There are no parks, recreation areas, cultural, historic, or archaeological resources in the vicinity of the property. Road traffic is limited to oilfield lease roads near the west side of the property.

2.2 Topography

The surface topography slopes to the southwest. The highest topographic elevation is approximately 3,156.67 feet above MSL near the northeast corner of the property. The lowest topographic elevation is approximately 3,110.69 feet above MSL near the southwest corner of the property. Figure 3 presents a detailed topographic map with 1-foot contour interval.

2.3 Soil

The Simona-Bippus complex, 0 to 5% slopes (SN) covers approximately 90% of the property including the proposed transfer station. Simona-Bippus complex, 0 to 5% slopes, occurs on upland areas and alluvial plains and contains approximately 55% Simona and about 30% Bippus and similar soils. The typical soil profile is gravelly fine sandy loam from 0 to 19 inches and indurated to 23 inches. The soil is non-saline, well drained and not suited for farming.

The Simona and Wink fine sandy loams, 0 to 3% slopes (SM) is present in the southwest area of the property. The Simona and Wink fine sandy loam, 0 to 3% slopes, is present on upland areas and comprises approximately 45% Simona and 40% Wink and similar soil. The typical soil profile is fine sandy loam from 0 to 19 inches and indurated below 19 inches to 23 inches. The soil is non-saline, well drained and not suited for farming.

2.4 Geology

According to published reports (Hendrickson and Jones, 1952 and Nicholson and Clebsch, 1961) the property is underlain by the Tertiary Ogallala formation and Triassic Chinle formation, in descending order. The Ogallala formation consists of sand which is poorly to well cemented and interbedded with clay, silt and gravel. The Ogallala formation is capped with caliche. The Chinle formation contains red and green claystone with minor amounts of siltstone and fine grained sandstone. Based on the driller's log for a well (#270635) located about 150 feet south of the property the top of the Chinle formation occurs at approximately 2,870 feet above MSL or about 230 feet bgs.

Examination of soil samples and drill cuttings from previous (BH-1 through BH-8) and current borings (SB-1 through SB-4 and SB-13) revealed that the subsurface consists of laterally continuous units of silt and fine sands, caliche, gravelly sand, sand gravel/clayey sand/silty sand and sandy clay/clayey sand/sandy gravel, in descending order. An average of about 1.6 feet of silt occurs at the surface, followed by a caliche unit which averages 11.8 feet. Under the caliche is a gravel unit which averages about 17.6 feet and a sand and gravel-rich unit which averages 41.2 feet throughout. These together

appear to be the Tertiary Ogallala formation due to grain size and lithology. Together, they are thickest near SB-2 (about 109.5 feet) and thinnest near BH-6 (about 34 feet). Beneath these sections lies the Chinle formation, which is differentiated by the smaller grains, clays and silts.

Geological cross sections are presented in Figure 6 and Figure 7. A northwest to southeast trending geological cross-section (A to A') is presented in Figure 6. A south to north trending geological cross section (B to B') is presented in Figure 7.

2.4 Groundwater

A well (#270635) located about 150 feet south of the property was drilled to approximately 240 feet bgs and fully penetrates the Ogallala formation. The groundwater elevation in the Ogallala formation is approximately 2,915 feet above MSL or about 185 feet bgs. The aquifer thickness is about 45 feet.

3.0 SITING INFORMATION

3.1 Drainages, Lakebeds, Sinkholes and Playa Lakes

No lakebeds, sinkholes or playa lakes are present on the property. Five drainages (Drainage 1 through 5) control run-off. The drainages begin and terminate on the property. The drainages were determined to be non-jurisdictional by the Office of the New Mexico State engineer (OSE).

3.2 Wellhead Protection Area and Flood Plain

The property is not located within a municipal wellhead protection area or flood plain.

3.3 Wetlands

Wetlands must exhibit hydric soil during the growing season (i.e., inundated or saturated) and hydrophytic vegetation (i.e., cattail, water lily). No hydric soil or hydrophytic vegetation was observed on the property.

3.4 Subsurface Mines

No subsurface mines are located on the property.

3.5 Permanent Residences

No permanent residences are located within 500 feet of the property. The nearest permanent residence is located approximately 3.75 miles northeast of the property.

3.6 Karst and Unstable Areas

According to published studies criteria for development of karst may include "piping in thick, unconsolidated material". Observations made during drilling of soil borings and geotechnical analysis of soil samples did not reveal such conditions at the property. Collapse features have been recorded near brine wells where salt is mined for brine water during oil well drilling. No brine wells are located on or near the property.

3.7 Water Wells

Four (4) water wells were identified within 1-mile of the property. The nearest well is located about 150 feet south of the Property and used for drilling rig supply. A windmill is located east of the property and is out of service. Two wells are located southeast of the property and supply water to drilling rigs. Figure 5 presents the well locations. Table 1 presents a summary of the water well construction details. Appendix D presents the water well records.

3.8 Groundwater Quality

On November 2, 2011, a groundwater sample was collected from a windmill located east of the property. The well was pumped with an electric submersible pump to remove 3 casing volumes of groundwater. The sample was analyzed for organic (BTEX), dissolved metals (arsenic, cadmium, chromium, lead, mercury, selenium and silver) and general inorganic (chloride, sulfate, nitrate, alkalinity and TDS). Table 2 presents a groundwater analytical data summary. Appendix E presents the laboratory report.

Referring to Table 1, no analytical parameters exceeded the New Mexico Water Quality Control Commission (WQCC) human health and domestic water quality standards.

4.0 PART 36 INVESTIGATION

4.1 Soil Borings

Between February 18, 2013 and March 5, 2013, LAI supervised coring 5 borings (SB-1 through SB-4 and SB-13) to elevations of about 3,045 (SB-13), 2,945 (SB-1 and SB-2) and 2,970 (SB-3 and SB-4) feet above MSL. Precision Sampling Inc. (PSI), located in Albuquerque, New Mexico, used a Central Mine Equipment (CME) truck mounted model 85 rig to drill the borings. Hollowstem augers and continuous air coring methods were used to drill the borings between 75 (SB-13) and 183 (SB-1) feet bgs. Drilling was initiated at each location using 7.5-inch outside diameter (OD) and 4.5-inch inside diameter (ID) hollowstem augers and 4-inch diameter by 5 foot long split-barrel continuous sampler. Wireline coring with air was used once auger refusal was obtained. Hollowstem augers were used entirely to drill boring SB-13 total depth (TD) of 75 feet bgs. Core samples were examined and described according to the Unified Soil Classification System (ASTM D 2487-83). The cores were wrapped in plastic and aluminum foil and placed in core boxes for future reference if needed.

Boring SB-1 is located near the northwest corner of the property and was cored to an elevation of 2,945 feet above MSL or 183 feet bgs. Boring SB-2 is located near the southwest corner of the property and was cored to an elevation of 2,945 feet above MSL or 165 feet bgs. Boring SB-3 is located near the northeast corner of the property and was cored to an elevation of 2,970 feet above MSL or 178 feet bgs. Boring SB-4 is located near the southeast corner of the property and was cored to an elevation of 2,970 feet above MSL or 174 feet bgs. Boring SB-13 is located near the center of the property, at the location of the proposed transfer station, and was cored to an elevation of about 3,045 feet above MSL or approximately 75 feet bgs. The borings were plugged with Portland cement and bentonite slurry that was pumped into the borings through a tremmie pipe. Figure 5 presents the boring locations. Appendix F presents the boring logs.

4.1.1 Boring SB-1

Coring at location SB-1 was initiated on February 18, 2013. Moisture was observed near the contact between gravel and sand between approximately 35 to 40 feet bgs. Drilling was suspended to allow groundwater to migrate into the boring. On February 19 through 21, 2013, boring SB-1 was gauged for groundwater with an electronic water level meter and remained open and dry to approximately 39.4 feet bgs. Coring at location SB-1 resumed on February 21, 2013, with auger refusal occurring at approximately 80 feet bgs. The augers were left in place and groundwater was gauged on February 22, 23 and 24, 2013. Boring SB-1 remained open and dry to 79.9 feet bgs. Coring resumed at SB-1 on February 24, 2013, using the wireline coring procedure described in the approved boring plan. Between February 24 and 26, 2013, boring SB-1 was air cored to 175 feet bgs without encountering moisture or groundwater. On February 26, 2013, circulation in SB-1 was lost due to loose and caving sand which prevented coring to the proposed TD (183 feet bgs). On February 27, 2013, boring SB-1 was gauged for groundwater and was dry and open to 175 feet bgs at which time the outer casing and hollowstem auger were removed from the boring.

4.1.2 Boring SB-2

Coring at location SB-2 was initiated on February 18, 2013 with auger refusal obtained at approximately 80 feet bgs. The hollowstem augers remained in place and coring resumed using the wireline coring method. On February 19, 2013, moisture was observed in the core sample between approximately 95 and 100 feet and coring was suspended to allow groundwater to migrate into the boring. On February 20, 2013, boring SB-2 was gauged for groundwater and was open and dry to 100 feet bgs and air coring resumed to approximately 128 feet bgs. On February 22, 2013, boring SB-2 was gauged for groundwater and was open and dry to approximately 126.4 feet bgs and air coring resumed to approximately 141 feet bgs. On February 23, 2013, boring SB-2 was gauged for groundwater and was open and dry to approximately 135.5 feet bgs and air coring resumed to TD (165 feet bgs). On February 24, 2013, boring SB-2 was gauged for groundwater and was open and dry to 165.7 feet bgs at which time the outer casing and hollowstem auger were removed from the boring.

4.1.3 Boring SB-3

Coring at location SB-3 was initiated on March 2, 2013, with auger refusal obtained at approximately 75 feet bgs. The hollowstem augers remained in place and drilling resumed using the wireline coring method to approximately 125 feet bgs. On March 3, 2013, boring SB-3 was gauged for groundwater and was open and dry to 125.3 feet bgs and air coring resumed to TD (180 feet bgs). On March 4, 2013, boring SB-3 was gauged for groundwater and was open and dry to 183.2 feet bgs at which time the outer casing and hollowstem auger were removed from the boring.

4.1.4 Boring SB-4

Coring at location SB-4 was initiated on February 27, 2013, with hollowstem augers. Moisture was observed near the contact between sand and sandy clay at approximately 63 feet bgs and drilling was suspended to allow groundwater to migrate into the boring. On February 28, 2013, boring SB-4 was gauged for groundwater and was open and dry to 63.75 feet bgs. Auger drilling resumed with refusal occurring at approximately 70 feet bgs. The augers were left in place and coring resumed using the wireline coring method to approximately 145 feet bgs. On March 1, 2013, boring SB-4 was gauged for groundwater and was open and dry to approximately 145.3 feet bgs and air coring resumed to TD (175

feet bgs). On March 2, 2013, boring SB-4 was gauged for groundwater and was open and dry to 175 feet bgs at which time the outer casing and hollowstem auger were removed from the boring.

4.1.5 Boring SB-13

Coring at location SB-13 was initiated on February 19, 2013 with hollowstem augers. On February 20, 2013, drilling resumed with hollowstem augers at SB-13 to approximately 35 feet bgs. On February 21, 2013, boring SB-13 was advanced to 75 feet bgs with hollowstem augers and no moisture or groundwater observed in core samples or boring to TD (75 feet bgs).

4.2 Geotechnical Analysis

Soil samples were collected from boring SB-13 and submitted to ETTL Engineers & Consultants, Inc., located in Tyler, Texas. The laboratory performed for geotechnical analysis in accordance with ASTM for USCS soil classification, moisture-density relationship, sieve analysis, Atterberg limits and hydraulic conductivity. Appendix C presents the geotechnical laboratory report.

5.0 CONCLUSIONS

The result of the investigation has determined that groundwater is not present beneath the property at depths that would preclude permitting and constructing a waste disposal facility in accordance with NMOCD rules (NMAC19.15.36.13).

6.0 REFERENCES

Hendrickson, G.E. and R.S. Jones, 1952. *Geology and Ground-Water Resources of Eddy County, New Mexico: New Mexico Institute of Mining & Technology Ground-Water report 3, 169* p.

Alexander Nicholson, Jr. and Alfred Clebsch, Jr. 1961. *Geology and Ground-Water Resources of Lea County, New Mexico: New Mexico Institute of Mining & Technology Ground-Water report 6, 123* p.

TABLES

Table 1
Water Well Completion and Gauging Summary
R360 Environmental Solutions, Inc. -Avalon Facility
Eddy County, New Mexico
11-0131-02

Well Information									Groundwater Data	
Well ID	Location (Sec/T/R)	Date Drilled	Purpose	Drilled Depth (bgs)	Well Depth from TOC	Well Diameter (inches)	Screen Interval (feet bgs)	Casing Stickup	Date	Depth to Groundwater (feet bgs)
Windmill	31/26S/32E	Unknown	Stock	Unknown	217.65	5	Unknown	1.00	11/02/11	178.00
270635	--	11/2/2011	Rig	240	240.00	6	140 - 240	Unknown	--	--
122867	--	9/14/2007	Stock	393	393	5	373 - 393	Unknown	09/14/07	190.00
270637	--	11/1/2011	Rig	320	320.00	6	200 - 320	Unknown	--	--
275647	--	12/29/2011	Rig	280	280.00	6	180 - 280	Unknown	--	--
274766	--	11/30/2011	Rig	230	230.00	6	100 - 200	Unknown	--	--
270633	--	8/27/1900	Rig	240	240.00	6	100 - 240	Unknown	--	--
274767	--	11/29/2011	Rig	230	230.00	6	100 - 230(?)	Unknown	--	--
276880	--	1/8/2012	Rig	200	200.00	6	100 - 200	Unknown	--	--

Notes: Well locations based on field measurements (windmill) and State of Texas Department of Licensing and Regulation.
All values are in feet, unless otherwise noted.
bgs - below ground surface
TOC - below top of casing

Table 2

Organic and Inorganic Groundwater Analytical Data summary
R360 Environmental solutions, Inc. - Proposed Avalon Landfill
11-0131-02

Location	Date	Benzene	Toluene	Ethylbenzene	Xylene
WQCC Standard:		0.01	0.75	0.75	0.62
Windmill	11/2/2011	<0.0008	<0.002	<0.002	<0.003
Location	Date	Arsenic	Barium	Cadmium	Chromium
WQCC Standard:		0.1	1	0.01	0.05
Windmill	11/2/2011	<0.002	0.178	<0.0003	<0.002
Location	Date	Lead	Mercury	Selenium	Silver
WQCC Standard:		0.05	0.002	0.05	0.05
Windmill	11/2/2011	<0.0003	<0.00008	0.00283	<0.001
Location	Date	Chloride	Nitrate - N	Sulfate	Alkalinity
WQCC Standard:		250	10	600	
Windmill	11/2/2011	35.3	2.71	190	175
Location	Date	TDS			
WQCC Standard:		1000			
Windmill	11/2/2011	589			

Notes

All concentrations are in milligrams per liter (mg/L, parts per million).

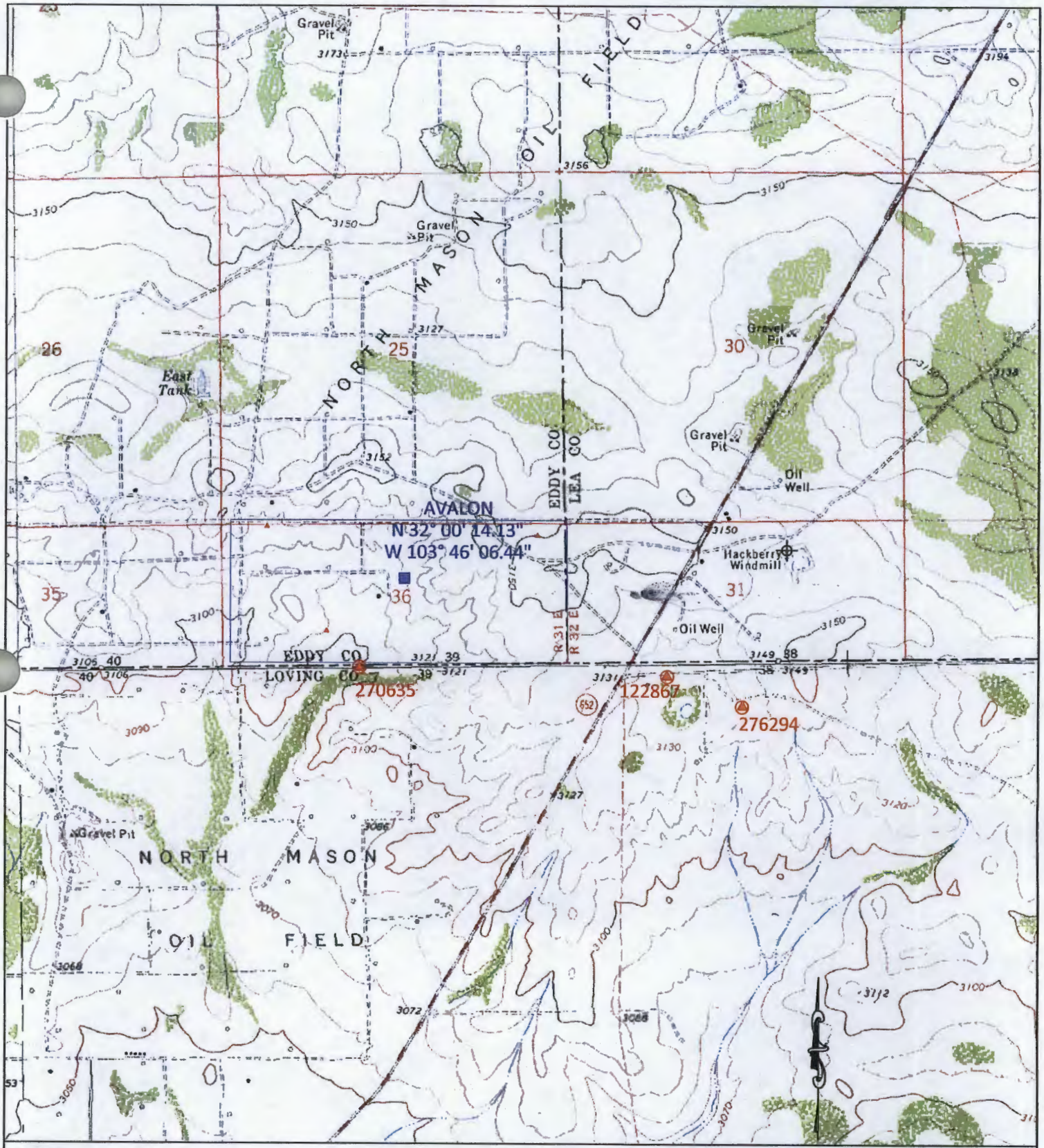
<: Indicates concentration below test method detection limit

Bold indicates analyte was detected.

***Bold and Blue** indicates the value exceeds the Cleanup Level.*

FIGURES

V:\PROJECTS\R360 Environmental\Avalon\R-360 AVALON SITE.dwg, 8/10/2012 3:23:34 PM



Legend

- ✦ - Windmill
- ▲ - Water Well and TDLR Well Number

2000 0 2000

Graphic Scale in Feet

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Figure 1 - Topographic Map

V:\PROJECTS\R360 Environmental\Avalon\R-360 AVALON SITE.dwg, 4/16/2013 11:47:20 AM

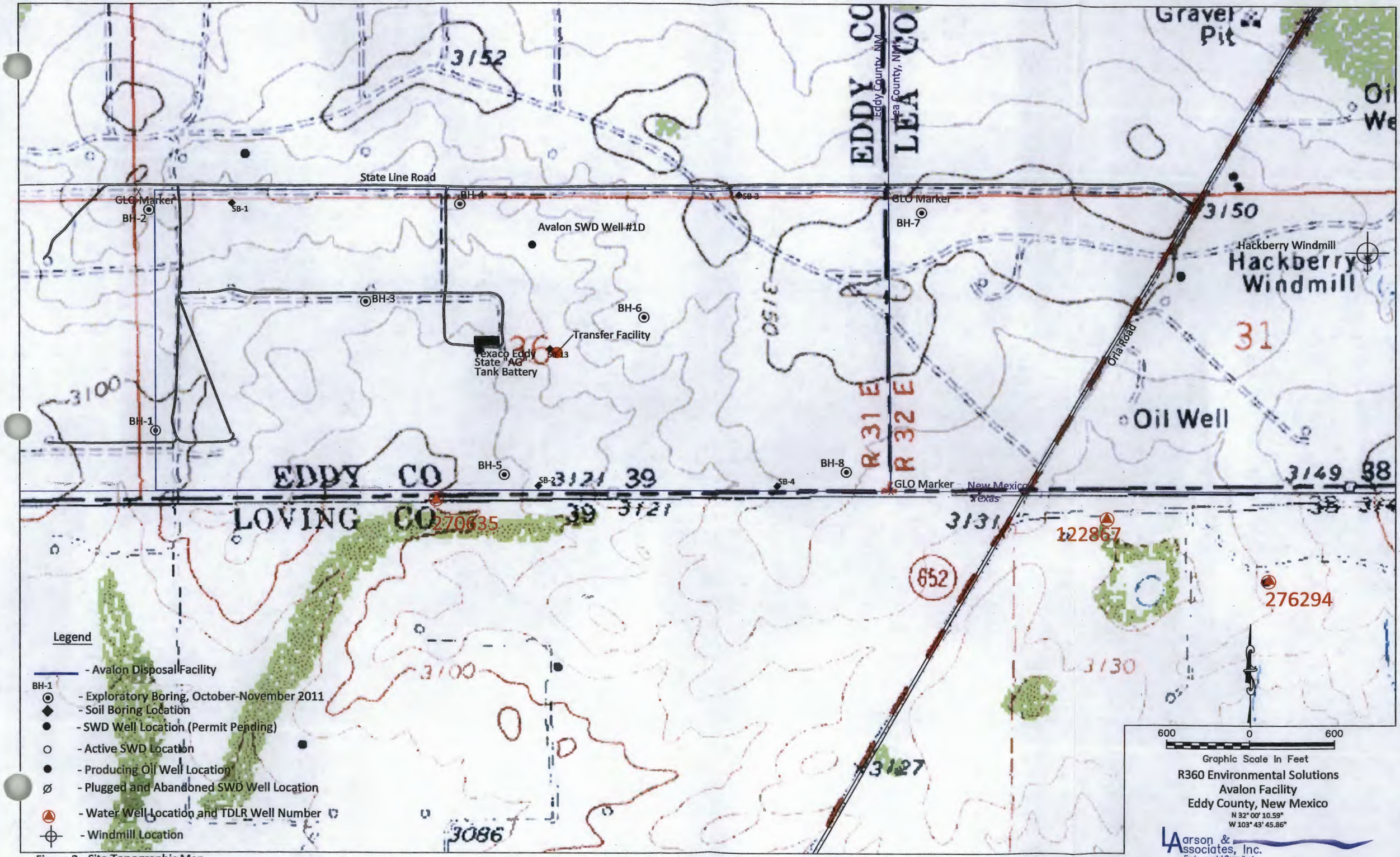
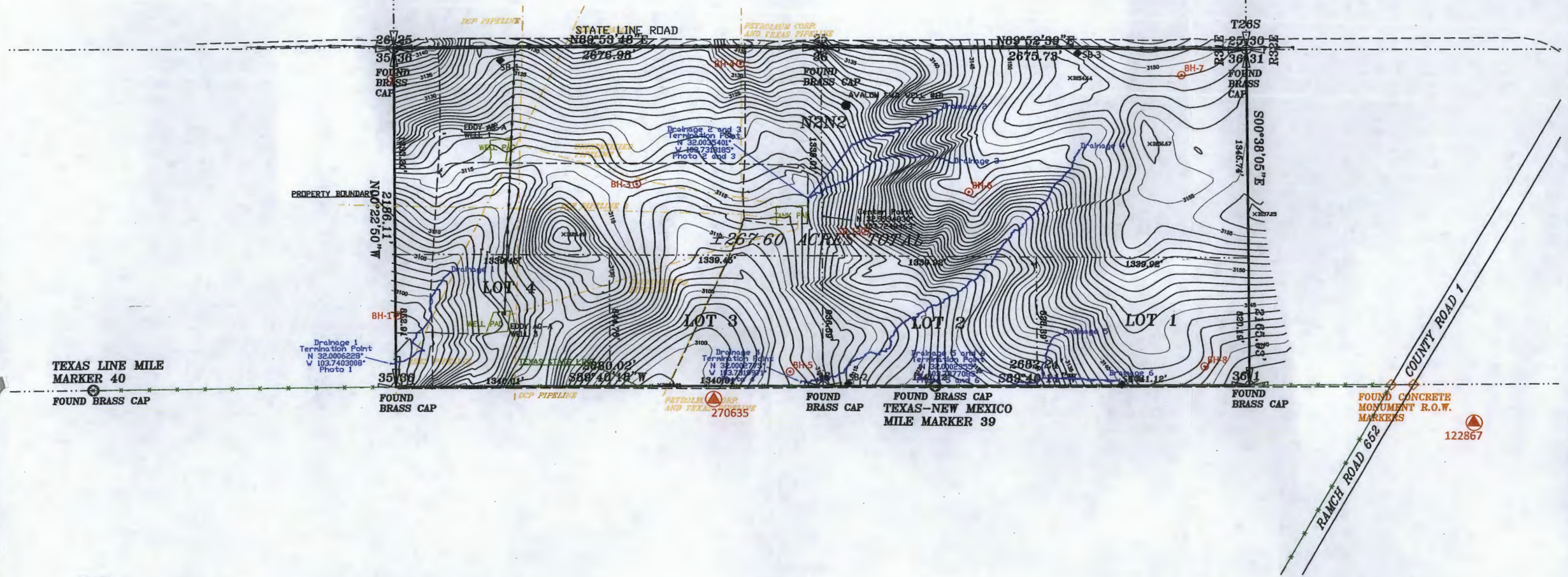


Figure 2 - Site Topographic Map

V:\PROJECTS\R360 Environmental\Avalon\R360BS02062012ORIG.dwg, 4/18/2013 11:04:59 AM

TOPOGRAPHIC SURVEY OF 36-26-31



LEGEND

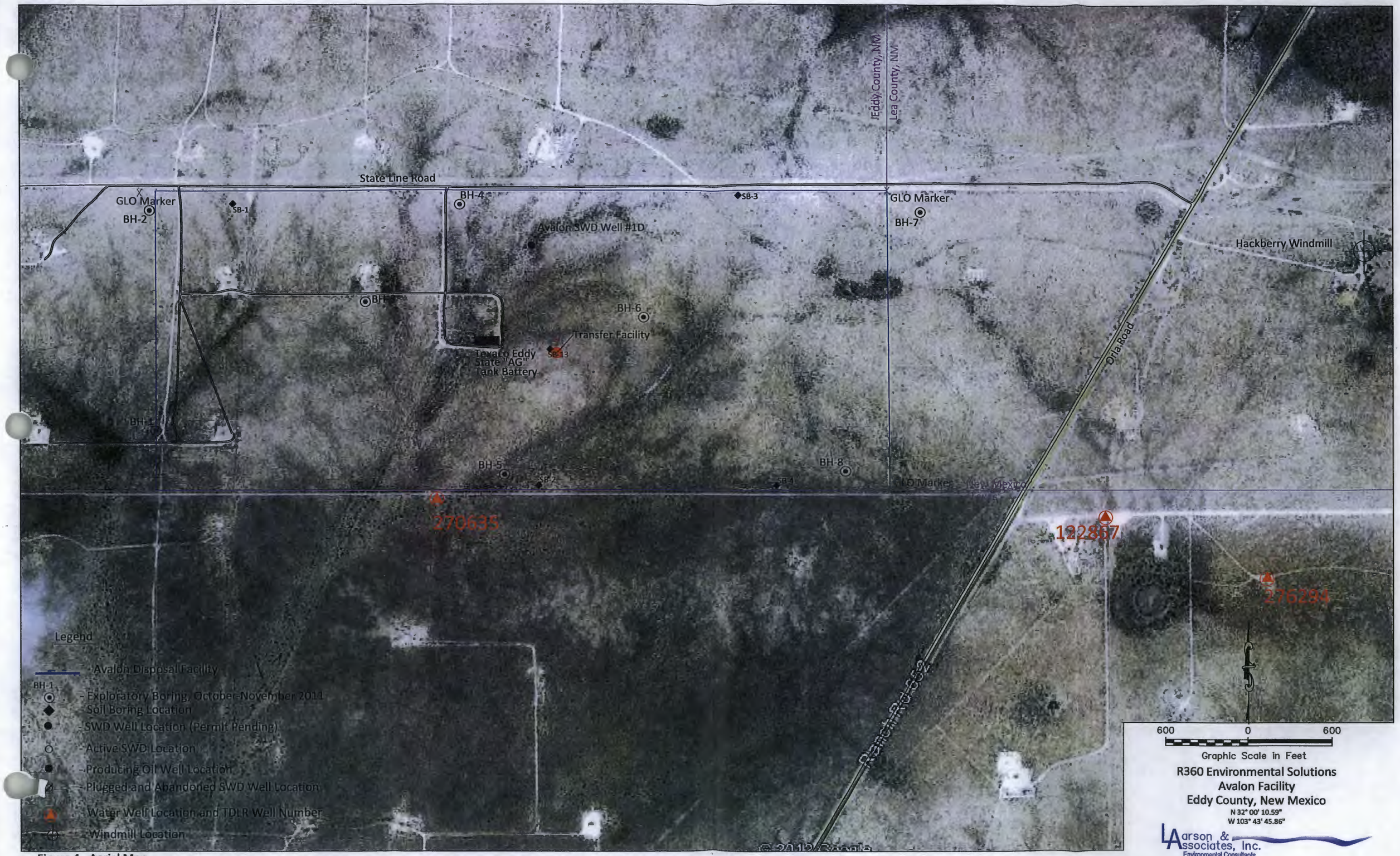
- ● - SWD Well Location (Permit Pending)
- ○ - Active SWD Location
- ● - Producing Oil Well Location
- ⌀ - Plugged and Abandoned SWD Well Location
- ▲ - Water Well Location and TDLR Well Number
- ⊕ - Windmill Location

(Added by Larson and Associates)
——— Water Drainage (Added by Larson and Associates)
(NOT PART OF ORIGINAL DRAWING)

200 0 200 400 600
Scale 1" = 600'

FIGURE 3 – Detailed Topographic Map

V:\PROJECTS\R360 Environmental\Avalon\R-360 AVALON SITE.dwg, 4/16/2013 11:45:34 AM



R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Figure 4 - Aerial Map

Eddy County, NM
Lea County, NM

State Line Road

GLO Marker
BH-2

A
SB-1

BH-4

Avalon SWD Well #1D

SB-3
B'

GLO Marker
BH-7

Hackberry Windmill

BH-3

BH-6

Transfer Facility

Texaco Eddy State "AG" Tank Battery

Orla Road

BH-1

BH-5

SB-2
B

BH-8
A'

SB-4

GLO Marker

New Mexico
Texas

270635

122867

276294

Legend

- Avalon Disposal Facility
- BH-1 - Exploratory Boring, October-November 2011
- Soil Boring Location
- SWD Well Location (Permit Pending)
- Active SWD Location
- Producing Oil Well Location
- Plugged and Abandoned SWD Well Location
- Water Well Location and TDLR Well Number
- Windmill Location

A ——— A' - Line of Geological Cross Section

600 0 600
Graphic Scale in Feet

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Figure 5 - Geological Cross Section Map

V:\PROJECTS\R360 Environmental\Avalon\Cross Section 2013.dwg, 4/16/2013 11:36:59 AM

A (West)

A' (East)

SB-1

BH-3

SB-13

SB-4

BH-8

1387.5'

1387.5'

1875'

487'

3150'

3125'

3100'

3075'

3050'

3025'

3000'

2975'

2950'

2925'

LEGEND

- SILT / FINE SANDS
- CALICHE
- GRAVELLY SAND
- SANDY GRAVEL / CLAYEY SAND / SILTY SAND
- SANDY CLAY / CLAYEY SAND / SANDY GRAVEL

- Bore Hole Location

HORIZONTAL SCALE 1" - 350'
VERTICAL SCALE 1" - 25'
VERTICAL EXAGGERATION : x14

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Figure 6 - A-A' Geological Cross Section

B (SOUTH)

B' (NORTH)

SB-2

SB-13

BH-6

SB-3

975'

750'

1125'

3150'

3125'

3100'

3075'

3050'

3025'

3000'

2975'

2950'

2925'

LEGEND

- SILT / FINE SANDS
- CALICHE
- GRAVELLY SAND
- SANDY GRAVEL / CLAYEY SAND / SILTY SAND
- SANDY CLAY / CLAYEY SAND / SANDY GRAVEL
- Bore Hole Location

HORIZONTAL SCALE 1" - 350'
VERTICAL SCALE 1" - 25'
VERTICAL EXAGGERATION : x14

Figure 7 - B-B' Geological Cross Section

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

APPENDIX A

NMOCD Correspondence

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

John Bemis
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey
Division Director
Oil Conservation Division

August 28, 2012

Mark J. Larson
Larson & Associates, Inc.
507 North Marienfeld, Suite 200
Midland, Texas 79701

RE: Hydrogeologic Investigation Boring Plan
Commercial Surface Waste Management Facility
R360 Permian Basin, LLC – Avalon Surface Waste Management Facility
Facility Location: Section 36, Township 26 South, Range 31 East NMPM
Eddy County, New Mexico

Dear Mr. Larson:

The Oil Conservation Division (OCD) has received WWC Engineering's boring plan proposal, dated August 24, 2012 and submitted on the behalf of R360 Permian Basin, LLC, to investigate and characterize the uppermost aquifer and subsurface geology for a proposed commercial surface waste management facility permit (Avalon Surface Waste Management Facility) located in Section 36, Township 26 South, Range 31 East, NMPM, Eddy County, New Mexico. OCD has completed the review and determined that the proposal is adequate to proceed with the site investigation.

OCD agrees that the proposed four (4) boring/monitoring well locations appear adequate. However, if the hydrogeologic conditions cannot be determined, additional borings or monitoring wells may be needed. It should be understood that if a monitoring well is constructed, it shall be bailed until fully developed.

The OCD appreciates your cooperation in providing a boring plan for review, in order to determine if the submitted application and the proposed site are suitable for consideration of approval. If there are any questions regarding this matter, please do not hesitate to contact me at (505) 476-3487 or brad.a.jones@state.nm.us.

Sincerely,

Brad A. Jones
Environmental Engineer

BAJ/baj
Cc: OCD District II Office, Artesia
Wayne Crawley, R360 Environmental Solutions, Inc., Houston, TX

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

John Bemis
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey
Division Director
Oil Conservation Division

February 5, 2013

Grant Jackson
Naismith Engineering Inc.
P.O. Box 3099
Corpus Christi, Texas 78463-3099

RE: Hydrogeologic Investigation Boring Plan
Commercial Surface Waste Management Facility
R360 Permian Basin, LLC – Avalon Surface Waste Management Facility
Facility Location: W/2 of the NE/4 and E/2 of the NW/4 of Section 36, Township 26 South, Range 31 East, NMPM, Eddy County, New Mexico

Dear Mr. Jackson:

The Oil Conservation Division (OCD) has received Naismith Engineering Inc.'s boring plan proposal, dated February 1, 2013 and submitted on the behalf of R360 Permian Basin, LLC, to investigate and characterize the uppermost aquifer and subsurface geology for a proposed commercial surface waste management transfer station facility permit (Avalon Surface Waste Management Facility) located in the W/2 of the NE/4 and E/2 of the NW/4 of Section 36, Township 26 South, Range 31 East, NMPM, Eddy County, New Mexico. OCD has completed the review and determined that the proposal is adequate to proceed with the site investigation.

OCD agrees that the proposed boring/monitoring well locations appear adequate. However, if the hydrogeologic conditions cannot be determined, additional borings or monitoring wells may be needed. It should be understood that if a monitoring well is constructed, it shall be bailed until fully developed.

The OCD appreciates your cooperation in providing a boring plan for review, in order to determine if the submitted application and the proposed site are suitable for consideration of approval. If there are any questions regarding this matter, please do not hesitate to contact me at (505) 476-3487 or brad.a.jones@state.nm.us.

Sincerely,

Brad A. Jones
Environmental Engineer

BAJ/baj

Cc: OCD District II Office, Artesia
Wayne Crawley, R360 Environmental Solutions, Inc., Houston, TX

APPENDIX B

Boring Logs

(BH-1 through BH-8)

Well Completion Record

Elev. (Feet AMSL)	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
3097.80'	0	Silt: Brown (7.5YR 4/4); very fine grained quartz sand, poorly sorted, loose, dry	ML			Location Data: N 32.001403691 W 103.739875427
3094.80'	3.0	Caliche: Pinkish White to Pinkish Gray (7.5YR 8/2 to 7/2), indurated to thin bedded, moderately hard	Caliche			No Well Completed
3090.80'	7.0	Silty Sand: Pink (5YR 7/3 to 7/4), very fine grained quartz sand, very poorly sorted, moderately dry	SM			
3060.80'	35	Gravel: Gray to Reddish Gray (5YR 5/1 to 5/2), quartzite pebble to >30mm round	GW			
3058.80'						
3057.80'	40	Silty Sand: Pink (5YR 7/3), very fine grained quartz sand	SM			
	45	Total Depth: 40 Feet				

Legend

- Water Table (Time of Boring)

Date Drilled - 10/27/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

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Well Completion Record

Elev. (Feet AMSL)	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
3136.0'	0					Location Data: N 32.005859370 W 103.739982168
3134.0'	2.0	Silt: Brown (7.5YR 4/4), very fine grained quartz sand, loose, dry	ML			No Well Completed
		Gravel: Gray to Reddish Gray (5YR 5/1 to 5/2), quartzite pebbles to >30mm round, moderately cemented	GW			
	5					
	10					
3120.0'	15					
	16.0	Gravelly Sand: Reddish Yellow (7.5YR 6/6), very fine to coarse grained quartz sand and gravel, pebbles to >30mm round, moderately cemented	SM - GW			
	20					
	25					
	30					
3101.0'	35	Sand: Pink (7.5YR 7/4), very fine grained quartz sand, poorly sorted, slightly compacted, dry	SM			
	40					
	45					
	50					
	55					
	60					
	65					

Legend

- Water Table (Time of Boring)

Date Drilled - 10/27/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
3066.0'	70	Sand: Pink (7.5YR 7/4), very fine grained quartz sand, poorly sorted, slightly compacted, dry	SM			
	75					
3056.0'	80	Sand: Light Yellow Orange (10YR 8/3), very fine grained quartz sand, unconsolidated, dry	SM			
	85					
	90					
	95					
3035.0'	100					
	101.0	Total Depth: 101 Feet				
	105					
	110					
	115					
	120					
	125					
	130					
	135					

Legend

- Water Table (Time of Boring)

Date Drilled - 10/27/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
0	Sandy Silt: Grayish Yellow Brown (10YR 6/2), unconsolidated, dense caliche fragments in matrix, dry	ML			Location Data: N 32.003977981 W 103.735001039
5	Caliche: White (5YR 8/1), weathered dense, interbedded with moderately well cemented very fine grained sandstone, dry	Caliche			No Well Completed
10	Caliche: Pale Yellow (2.5YR 8/2), dense weathered, interbedded with moderately well cemented very fine grained sandstone, dry	Caliche			
15	Sandstone: Dull Reddish Brown (5YR 5/4), very fine grained quartz sand, moderately well cemented, interbedded with dense weathered caliche	Sand-Stone			
20	Sandy Gravel: Light Gray (7.5YR 8/2), unconsolidated, interbedded with very fine grained quartz sand, dry	GP			
35	Sand: Pale Yellow (5YR 6/6), very fine grained quartz sand, unconsolidated	Sand			
41.0	Total Depth: 41 Feet				

Legend

- Water Table (Time of Boring)

Date Drilled - 10/28/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - J. Fergerson
Checked By - J. Fergerson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Elev. (Feet AMSL)	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading
3132.50'	0	Sandy Silt: Light Yellow (2.5Y 7/4), unconsolidated, dense, caliche fragments in matrix, dry	SM		
3127.50'	5	Sandy Gravel: Light Gray (2.5Y 8/2), unconsolidated, dry	GP		
3122.50'	10	Gravelly Sand: Light Gray (2.5Y 8/2), very fine grained quartz sand, unconsolidated, dry	SP		
3117.50'	15	Sandy Gravel: Dull Yellow Orange (10YR 7/4), unconsolidated	GP		
3107.50'	25	Gravelly Sand: Orange (7.5YR 6/6), very fine grained quartz sand, unconsolidated	SP		
3100.50'	32.0	Sand: Bright Brown (7.5YR 5/6), very fine grained quartz sand, unconsolidated	SM		
3097.50'	35	Sand: Orange (7.5YR 6/6), very fine grained quartz sand, unconsolidated	SM		
3092.50'	40	Total Depth: 40 Feet			

Well Completion Detail

Location Data:
N 32.005934127
W 103.732807418

No Well Completed

Legend

- Water Table (Time of Boring)

Date Drilled - 10/28/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - J. Fergerson
Checked By - J. Fergerson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

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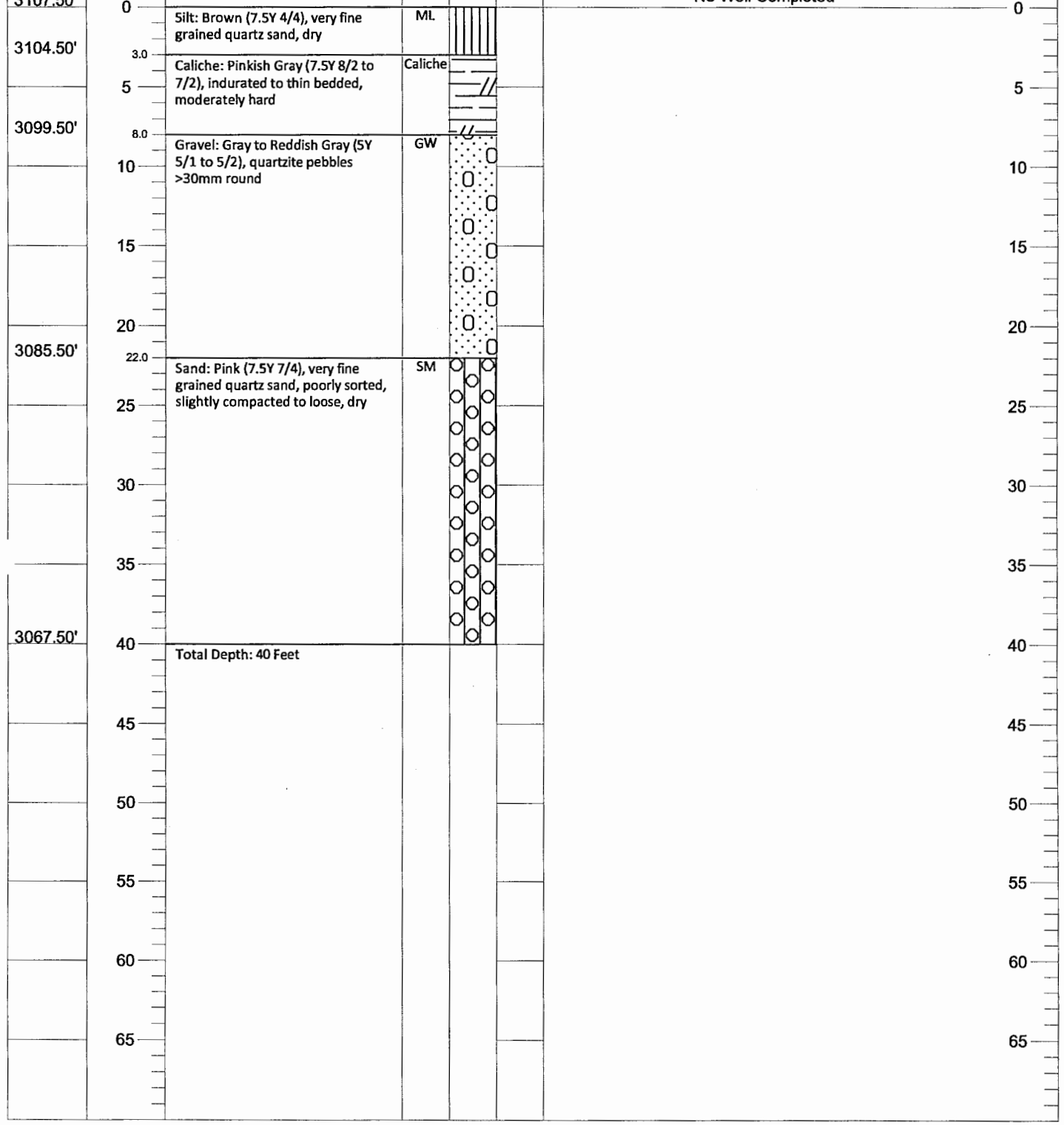
Well Completion Record

Elev. (Feet AMSL)	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
3107.50'	0	Silt: Brown (7.5Y 4/4), very fine grained quartz sand, dry	ML			Location Data: N 32.000480389 W 103.731821840
3104.50'	3.0	Caliche: Pinkish Gray (7.5Y 8/2 to 7/2), indurated to thin bedded, moderately hard	Caliche			No Well Completed
3099.50'	8.0	Gravel: Gray to Reddish Gray (5Y 5/1 to 5/2), quartzite pebbles >30mm round	GW			
3085.50'	22.0	Sand: Pink (7.5Y 7/4), very fine grained quartz sand, poorly sorted, slightly compacted to loose, dry	SM			
3067.50'	40	Total Depth: 40 Feet				



Legend

- Water Table (Time of Boring)

Date Drilled - 10/31/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Elev. (Feet AMSL)	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
3146.00'	0	Silt: Brown (7.5YR 4/4), very fine grained quartz sand, loose, dry	ML			Location Data: N 32.003636368 W 103.728585224
3144.00'	2.0	Caliche: Pinkish Gray (7.5YR 8/2 to 7/2), indurated, moderately hard,	Caliche			No Well Completed
3140.00'	5 6.0	Sandy Gravel: Pinkish Gray to Light Brown (5YR 5/1 to 7.5YR 7/2 to 6/3), very fine to very coarse grained quartz sand, quartzite gravel >30mm round, very poorly sorted	GW			
3140.00'	30	Sand: Pink (7.5YR 7/4), very fine to very coarse grained quartz sand, poorly sorted, dry, some clay between 30-40'	SM			

Legend

- Water Table (Time of Boring)

Date Drilled - 10/31/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	70					
	75					
3066.00'	80	Sand: Reddish Yellow (5YR 4/4), very fine to very coarse grained quartz sand, poorly sorted, loose, dry, poorly cemented, very friable below 90'	SM			
	85					
	90					
	95					
	100					
	105					
	110					
	115					
3026.00'	120	Sand: Reddish Yellow to Reddish Brown (5YR 6/6 to 5/4), very fine to very coarse grained quartz sand, poorly sorted, loose to poorly cemented	SM			
	125					
	130					
	135					
3006.00'		Total Depth: 140 Feet				

Legend

- Water Table (Time of Boring)

Date Drilled - 10/31/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

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Environmental Consultants

Well Completion Record

Elev. (Feet AMSL)	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
3151.00'	0					Location Data: N 32.005730219 W 103.722166427
3150.00'	1.0	Silt: Brown (7.5YR 4/4), very fine grained quartz sand, loose, dry	ML			No Well Completed
		Caliche: Pinkish White to Pinkish Gray (5YR 8/2 to 7/2), indurated moderately hard, sandy, very fine grained quartz sand, dry	Caliche			
	5					
	10					
	15					
	20					
3129.00'	22.0	Sandy Gravel: Pinkish White to Pinkish Gray (5YR 8/2 to 7/2), quartzite pebbles to >30mm, round, very poorly sorted, very fine to coarse grained quartz sand	GW			
	25					
	30					
3116.00'	35	Sand: Pink (7.5YR 7/4),very fine grained quartz sand, poorly sorted, dry	SM			
3111.00'	40	Silty Clay: Yellowish Red (5YR 5/6 to 6/6), very fine grained quartz sand, poorly sorted, massive to thin bedded, firm	CL			
3107.00'	44.0	Total Depth: 44 Feet				
	45					
	50					
	55					
	60					
	65					

Legend

- Water Table (Time of Boring)

Date Drilled - 11/01/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Elev. (Feet AMSL)	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
3142.00'	0					Location Data: N 32.000512441 W 103.723917660
	1.0	Silt: Brown (7.5YR 4/4), very fine grained quartz sand, loose, dry	ML			No Well Completed
		Caliche: Pinkish White to Pinkish Gray (5YR 8/2 to 7/2), indurated, sandy, very fine grained quartz sand, moderately hard, dry	Caliche			
	5					
	10					
	15					
3125.00'	17.0	Sandy Clayey Gravel: Pinkish Gray to Gray (5YR 7/2 to 5/1), very coarse to fine grained quartz sand with quartzite pebbles >30mm, round, interbedded with gypsum at 20', fibrous	ML			
	20					
	25					
	30					
	35					
3105.00'	37.0	Clayey Sand: Reddish Brown (5YR 4/4), very fine grained quartz sand, slightly moist, firm, interbedded with alternating units of sand and silty clay	SM			
	40					
	45					
	50					
	55					
	60					
	65					

Legend

- - - - - Water Table (Time of Boring)

Date Drilled - 11/01/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Elev. (Feet AMSL)	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
3072.00'	70	Clayey Sand: Reddish Brown (5YR 4/4), very fine grained quartz sand, slightly moist, firm, interbedded with alternating units of sand and silty clay	SM			
	75					
	80					
	85					
	90					
	95					
3042.00'	100	Total Depth: 100 Feet				
	105					
	110					
	115					
	120					
	125					
	130					
	135					

Legend

- Water Table (Time of Boring)

Date Drilled - 11/01/2011
Drilling Method - Air Rotary
Drilled By - Scarborough Drilling
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Disposal Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

APPENDIX C

Geotechnical Laboratory Reports

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL

December 20, 2011

Mark Larson
Larson & Associates, Inc.
507 N. Marienfeld Street, Ste. 200
Midland, Texas 79701

SUBJECT: R360-Bvalon LAI Project #:11-0131-01
Geotechnical Laboratory Testing

Dear Mr. Larson:

Enclosed with this letter is the geotechnical laboratory testing for the above referenced project that you requested on samples delivered to ETTL's Tyler lab. If you have any questions feel free to contact us for additional information or testing.

As requested there has been no engineering analysis on the data presented.

Sincerely,
ETTL Engineers & Consultants Inc.

Owen Sanderson
Owen B. Sanderson, E.I.T.
Project Manager

H. Walka
Hermann Walka, P.E.
Laboratory Manager

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ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Laboratory Compaction Characteristics of Soil Using Standard Effort ASTM D 698

Project Information

Project: R360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: Not Given
Job No.: G 3659-11

Sample Information

Boring No: BH-6
Sample No.: Bulk-1 Depth (ft.): 35.0 ft.
Material Origin: New Mexico
Date Sampled: 11/1/2011
Sampling Info. provided By: RUL/JF
Material Description: Light Brown Silty Sand, (SM)
Sampled By: RUL/JF
Technician: Owen Sanderson
Test Date: 12/6/2011

Test Data

Maximum Dry Density:	107.4	(lb./ft^3)
Optimum Moisture Content:	15.0	(%)

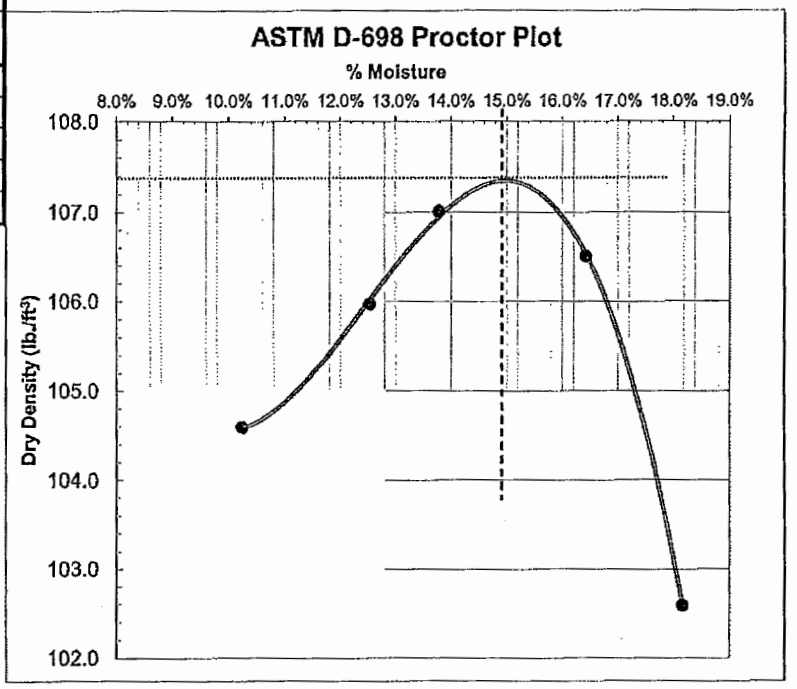
Method
A

Classification
SM

LL	N/P
PL	N/P
PI	N/P

-200 Sieve	21%
+40 Sieve	1%
+4 Sieve	0%

Proctor Data	
% Moisture	Dry Density (lb./ft^3)
16.4%	106.5
10.2%	104.6
12.5%	106.0
13.8%	107.0
18.2%	102.6



Respectfully Submitted

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ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test) ASTM D 5084

Project :	R360-Bvalon LAI Project #: 11-0131-01							
Date:	12/15/2011	Panel Number : P-4						
Project No. :	G 3659-11	Permometer Data						
Boring No.:	BH-6	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3	
Sample:	Bulk-1	a_a =	0.767120 cm^2		Pipet Rp	6.7	cm^3	
Depth (ft):	25'	M_1 =	0.030180	C = 0.000431384	Annulus Ra	1.5	cm^3	
Other Location:	35'	M_2 =	1.040953	T = 0.201511953				
Material Description :	Light Brown Silty Sand, (SM)							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			535.73	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T-23	Tare No.:	T-7
Wet Wt: of Sample :			535.73	g	Wet Wt.+tare:	797.18	Wet Wt.+tare	774.53
Diameter :	2.77	in	7.03	cm^2	Dry Wt.+tare:	705.18	Dry Wt.+tare:	681.17
Length :	2.73	in	6.93	cm	Tare Wt:	140.27	Tare Wt:	221.20
Area:	6.02	in^2	38.85	cm^2	Dry Wt.:	564.91	Dry Wt.:	459.97
Volume :	16.43	in^3	269.30	cm^3	Water Wt.:	92	Water Wt:	93.36
Unit Wt.(wet):	**124.13**	pcf	**1.99**	g/cm^3	% moist.:	**16.3**	% moist.:	**20.3**
Unit Wt.(dry):	**106.75**	pcf	**1.71**	g/cm^3				

Specific Gravity: **2.63** Max Dry Density(pcf) = 107.4 OMC = 15

% of max = 99.4 +/- OMC = 1.29

Calculated % saturation: 99.3 Void ratio (e) = **0.54** Porosity (n)= **0.35**

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 3.0 cm Hydraulic Gradient = 5.48

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft/day)	Reset = *
12/12/2011	2	3.5	1.094783	25	0.889	9.03E-05	2.56E-01	
12/12/2011	4	3	1.594783	25	0.889	8.69E-05	2.46E-01	
12/12/2011	6	2.5	2.094783	25	0.889	8.89E-05	2.52E-01	
12/12/2011	8	2.2	2.394783	25	0.889	8.34E-05	2.36E-01	

SUMMARY

k_a = 8.74E-05 cm/sec Acceptance criteria = 25 %

k_i		Vm		
k1 =	9.03E-05 cm/sec	3.3	%	$Vm = \frac{\lvert k_a - k_i \rvert}{k_a} \times 100$
k2 =	8.69E-05 cm/sec	0.5	%	
k3 =	8.89E-05 cm/sec	1.7	%	
k4 =	8.34E-05 cm/sec	4.5	%	

Hydraulic conductivity	k =	**8.74E-05**	cm/sec	**2.48E-01**	ft/day
Void Ratio	e =	**0.54**			
Porosity	n =	**0.35**			
Bulk Density	γ =	**1.99**	g/cm^3	**124.1**	pcf
Water Content	W =	**0.28**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**8.95E-10**	cm^2	(at 20 deg C)	

Liquid Limit	LL	N/P
Plastic Limit	PL	N/P
Plasticity Index	**PI**	**N/P**
- 200 Sieve		21.1 %
+ No 40 Sieve		1.0 %
+ No 4 Sieve		0.1 %

Respectfully Submitted,

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ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis ASTM D 6913

Method B

Project Information

Project: R 360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: not given
Job No.: G 3659-11

Sample Information

Boring No: **BH-6**
Sample No.: **Bulk-1** Depth: **35.0** ft Date Sampled: 10/31/2011
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Light Brown Silty Sand, (SM)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/29/2011

Test Data

Sieve Number	Sieve Size (mm)	Accumulated Mass Retained (grams)	Sample Retained (%)	Sample Finer (%)
3"	75	0.00	0.0	100
1-1/2"	37.5	0.00	0.0	100
3/4"	19	0.00	0.0	100
1/2"	12.50	0.00	0.0	100
3/8"	9.50	0	0.0	100
No. 4	4.75	0.36	0.1	99.9
No. 10	2.00	0.76	0.3	99.7
No. 40	0.425	3.24	1.1	98.9
No. 60	0.250	29.57	9.9	90.1
No. 100	0.150	139.5	46.6	53.4
No. 140	0.106	209.16	69.9	30.1
No. 200	0.075	237.8	79.5	20.5

Sample Properties

L.L.	P.L.	P.I.
N/P	N/P	N/P

D 10 (mm)=	N/A
D 15 (mm)=	N/A
D 30 (mm)=	0.1056
D 50 (mm)=	0.1426
D 60 (mm)=	0.1645
D 85 (mm)=	0.2328
Cu =	N/A
Cc =	N/A
Shape of Particles:	Rounded
Hardness of Particles:	Hard

Sample Washed over No. 200 Sieve
Starting Dry Weight: 299.24 grams

Respectfully Submitted

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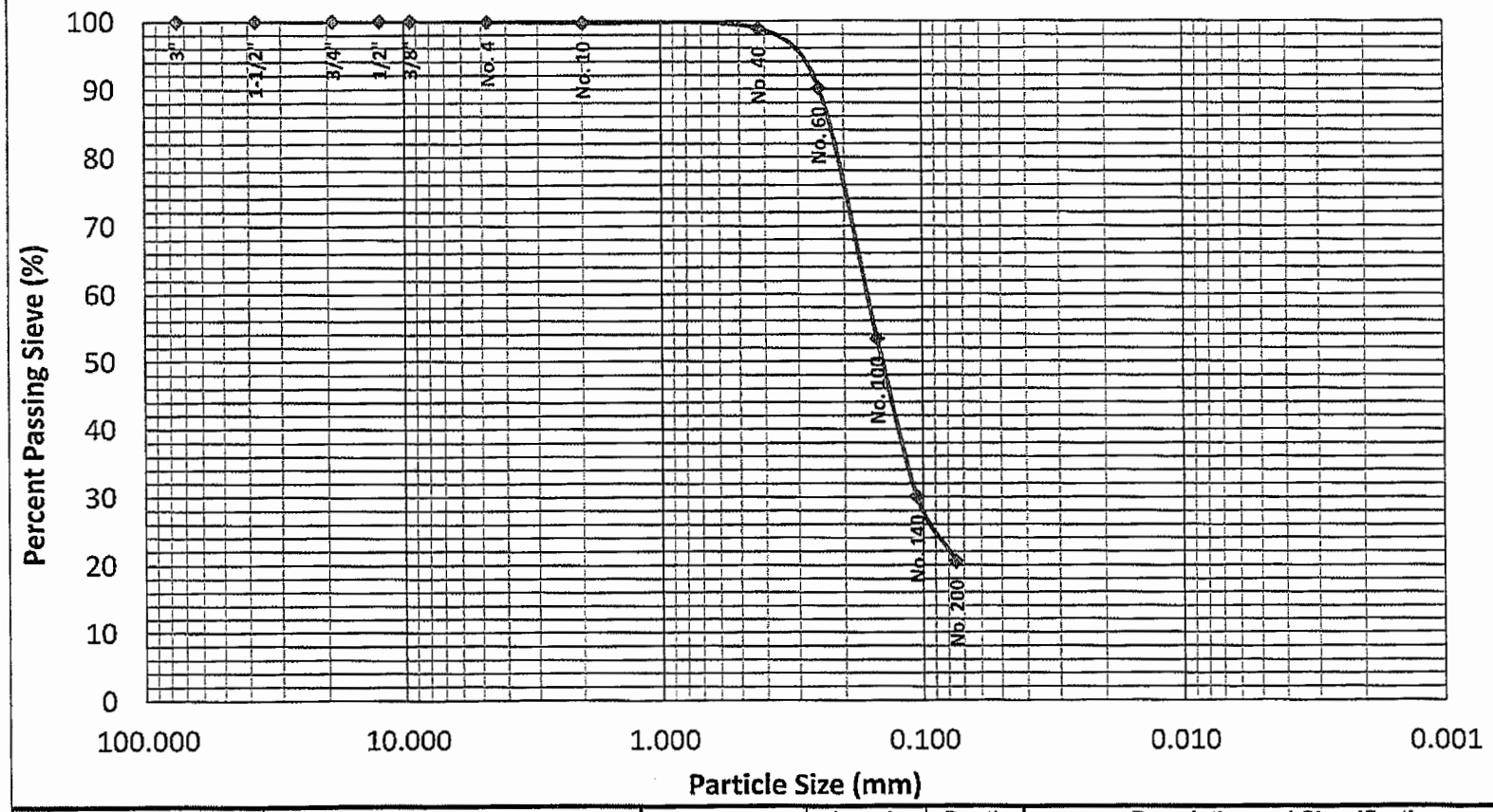
GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle Size Distribution Curve ASTM D 6913



Sieve No.	Dia. (mm)	% Finer
3"	75.000	100
1-1/2"	37.500	100
3/4"	19.000	100
1/2"	12.500	100
3/8"	9.500	100
No. 4	4.750	99.9
No. 10	2.000	99.7
No. 40	0.425	98.9
No. 60	0.250	90.1
No. 100	0.150	53.4
No. 140	0.106	30.1
No. 200	0.075	20.5

Sample Properties	
Shape of Particles	
Rounded	
Hardness of Particles	
Hard	
L.L.	N/P
P.L.	N/P
P.I.	N/P
D_{85}	0.233
D_{60}	0.1645
D_{50}	0.1426
D_{30}	0.1056
D_{15}	N/A
D_{10}	N/A
C_u	N/A
C_c	N/A

PROJECT NAME:	R 360-Bvalon LAI Project #: 11-0131-01	Boring No.	Sample No.	Depth (ft)	Description and Classification	Technician
Client:	Larson & Associates, Inc.				Light Brown Silty Sand, (SM)	Owen Sanderson
ETTL Inc. Job #	G 3659-11	BH-6	Bulk-1	35.0		Date: 11/29/11

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 4546 One-Dimensional Swell or Settlement of Cohesive Soils, Method A/B

Project Information

Project: R360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr: Larson & Associates, Inc.
Contractor: Not Given
Job No: G 3659-11

Sample Information

Boring No: BH-6 Date Sampled: 10/31/2011
Sample No: Bulk-1 Depth: 35 ft
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Light Brown Silty Sand, (SM)
Sampled By: RUL/JF
Preparation Technician: Chris Wall Start Date: 12/14/2011
Technician: Chris Wall Finished Date: 12/19/2011

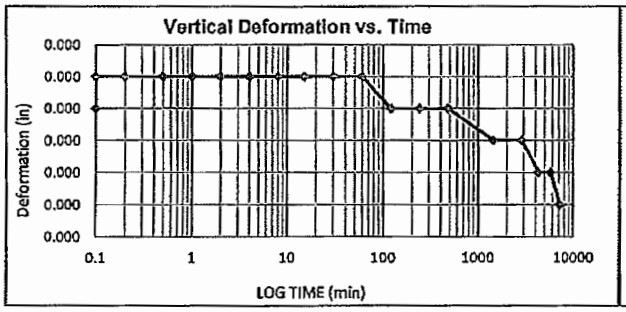
Test Data

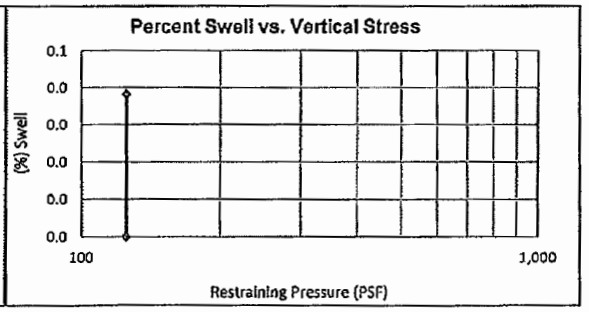
	Initial Sample Data	Final Sample Data	
Wt. of mold + Wet Wt:	176.91	191.99	grams
Wt. of mold:	68.67	68.67	grams
Wet Wt. of sample:	108.24	123.32	grams
Dry Wt. of sample:	100.83	100.83	grams
Height of sample:	0.7850	0.7853	inches
Diameter of sample:	2.5000	2.5000	inches
Area of sample:	4.9088	4.9088	in^2
Volume of sample:	3.8534	3.8548	in^3
Degree of Saturation:	**29.2%**	**88.6%**	
Wet Unit Weight:	107.0	121.9	pcf
Dry Unit Weight:	**99.7**	**99.6**	pcf
Moisture Content:	**7.3%**	**22.3%**	

Percent Swell (%): 0.0 Restraining Pressure (PSF): 125

Atterberg Limits	
L.L.	P.L.
N/P	N/P
P.I.	-200%
N/P	21.1
Hand Penetrometer (TSF)	

Testing Condition
Remolded D-698





* Sample does not represent a potential to swell.

Respectfully Submitted,

Hermann Walka, P.E.

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Specific Gravity of Soils by Water Pycnometer, ASTM D 854

Project Information

Project: R360-Bvalon LAI Project #: 11-031-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: not given
Job No.: G 3659-11

Sample Information

Boring No: BH-6
Sample No.: Bulk-1 Depth: 35.0 ft Date Sampled: 11/1/2011
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Light Brown Silty Sand, (SM)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/30/2011

Test Data

Method: B

(Method A) Moisture Content of Material passing No. 4 Sieve

Pan #	116
Tare mass (g):	30.11
Wet mass + Tare (g):	77.8
Dry mass + Tare (g):	77.29
Moister Content:	1.1%

Sample Split over No. 4 sieve

Starting Sample Mass:	299.24	grams
Mass Retianed on No. 4 Sieve:	0.36	grams
Precent Retained on No. 4 Sieve:	0.1%	

Specific Gravity of Material Passing No. 4 Sieve

Air Dry M_S (grams)	Bottle #	T_t (deg. C)	M_P (grams)	V_P (mL)	$\rho_{w,t}$ (g/mL)	Oven Dry M_S (grams)	$M_{pw,t}$ (grams)	$M_{pws,t}$ (grams)	SG_t
100.00	#4	21.68	185.75	499.33	0.9978	100.00	684.0	745.96	2.629

Respectfully Submitted

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Laboratory Compaction Characteristics of Soil Using Standard Effort ASTM D 698

Project Information

Project: R360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: Not Given
Job No.: G 3659-11

Sample Information

Boring No: BH-7
Sample No.: Bulk-1 Depth (ft.): 25.0 ft.
Material Origin: New Mexico Date Sampled: 11/1/2011
Sampling Info. provided By: RUL/JF
Material Description: Grayish Light Brown Silty Sand, (SM)
Sampled By: RUL/JF
Technician: Todd Sliger Test Date: 12/17/2011

Test Data

Maximum Dry Density:	117.8	(lb./ft^3)
Optimum Moisture Content:	11.3	(%)

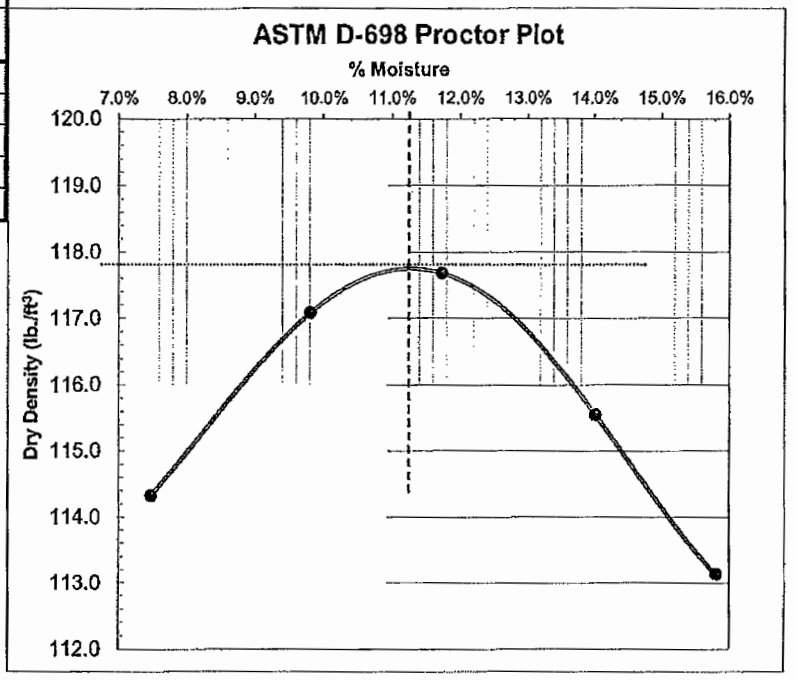
Method
A

Classification
SP-SM

LL	0
PL	0
PI	0

-200 Sieve	20%
+40 Sieve	57%
+4 Sieve	9%

Proctor Data	
% Moisture	Dry Density (lb./ft^3)
7.5%	114.3
9.8%	117.1
11.7%	117.7
14.0%	115.5
15.8%	113.1



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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test) ASTM D 5084

Project :	R360-Bvalon LAI Project #: 11-0131-01							
Date:	12/15/2011	Panel Number :	4					
Project No. :	G 3659-11		Permometer Data					
Boring No.:	BH-7	ap =	0.031416 cm2		Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm3
Sample:	Bulk 1	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	25.00	M1 =	0.030180	C =	0.000436515	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.201511953			
Material Description :	Grayish Light Brown Silty Sand, (SM)							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			598.79	g	Tare No.:	T-20	Tare No.:	T-14
Tare or ring Wt. :			0.0	g	Wet Wt+tare:	723.10	Wet Wt+tare	815.68
Wet Wt. of Sample :			598.79	g	Dry Wt.+tare:	645.84	Dry Wt.+tare:	737.97
Diameter :	2.79	in	7.09	cm2	Tare Wt:	160.25	Tare Wt:	221.16
Length :	2.83	in	7.19	cm	Dry Wt.:	485.59	Dry Wt.:	516.81
Area:	6.12	in^2	39.47	cm2	Water Wt.:	77.26	Water Wt.:	77.71
Volume :	17.33	in^3	283.93	cm3	% moist.:	15.9	% moist.:	15.0
Unit Wt.(wet):	131.60	pcf	2.11	g/cm^3				
Unit Wt.(dry):	113.54	pcf	1.82	g/cm^3				

Specific Gravity:	2.67	Max Dry Density(pcf) =	117.8	OMC =	11.3	
		% of max =	96.4	+/- OMC =	4.61	
ulated % saturation:	85.8	'oid ratio (e) =	0.47	Porosity (n)=	0.32	

EST READINGS

Z1(Mercury Height Difference @ t1): 5.2 cm Hydraulic Gradient = 9.05

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft/day)	Reset = *
12/13/2011	570	5.7	0.962485	25	0.889	1.47E-07	4.16E-04	
12/13/2011	660	5.6	1.062485	25	0.889	1.42E-07	4.02E-04	
12/13/2011	750	5.5	1.162485	25	0.889	1.38E-07	3.92E-04	
12/13/2011	840	5.4	1.262485	25	0.889	1.36E-07	3.85E-04	

SUMMARY

ka =	1.41E-07	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.47E-07	cm/sec	4.4	%	Vm = |ka-ki| / ka x 100
k2 =	1.42E-07	cm/sec	0.8	%	
k3 =	1.38E-07	cm/sec	1.7	%	
k4 =	1.36E-07	cm/sec	3.5	%	

Hydraulic conductivity	k =	1.41E-07	cm/sec	3.98E-04	ft/day
Void Ratio	e =	0.47			
Porosity	n =	0.32			
Bulk Density	γ =	2.11	g/cm3	131.6	pcf
Water Content	W =	0.29	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.44E-12	cm2	(at 20 deg C)	

Liquid Limit LL	N/P	
Plastic Limit PL	N/P	
Plasticity Index PI	N/P	
- 200 Sieve	19.6	%
+ No 40 Sieve	57.2	%
+ No 4 Sieve	8.6	%

Respectfully Submitted,

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis ASTM D 6913

Method B

Project Information

Project: R 360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: not given
Job No.: G 3659-11

Sample Information

Boring No: **BH-7**
Sample No.: **Bulk-1** Depth: **25.0** ft Date Sampled: 11/1/2011
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Grayish Light Brown Silty Sand, (SM)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/29/2011

Test Data

Sieve Number	Sieve Size (mm)	Accumulated Mass Retained (grams)	Sample Retained (%)	Sample Finer (%)
3"	75	0.00	0.0	100
1-1/2"	37.5	0.00	0.0	100
3/4"	19	0.00	0.0	100
1/2"	12.50	0.00	0.0	100
3/8"	9.50	1.15	0.3	99.7
No. 4	4.75	32.39	8.6	91.4
No. 10	2.00	113.79	30.3	69.7
No. 40	0.425	214.78	57.2	42.8
No. 60	0.250	255.48	68.1	31.9
No. 100	0.150	280	74.6	25.4
No. 140	0.106	292.95	78.1	21.9
No. 200	0.075	301.33	80.3	19.7

Sample Properties

L.L.	P.L.	P.I.
N/P	N/P	N/P

D 10 (mm)=	N/A
D 15 (mm)=	N/A
D 30 (mm)=	0.2150
D 50 (mm)=	0.6442
D 60 (mm)=	1.1456
D 85 (mm)=	3.6844
Cu =	N/A
Cc =	N/A
Shape of Particles:	Angular
Hardness of Particles:	Hard

Sample Washed over No. 200 Sieve
Starting Dry Weight: 375.31 grams

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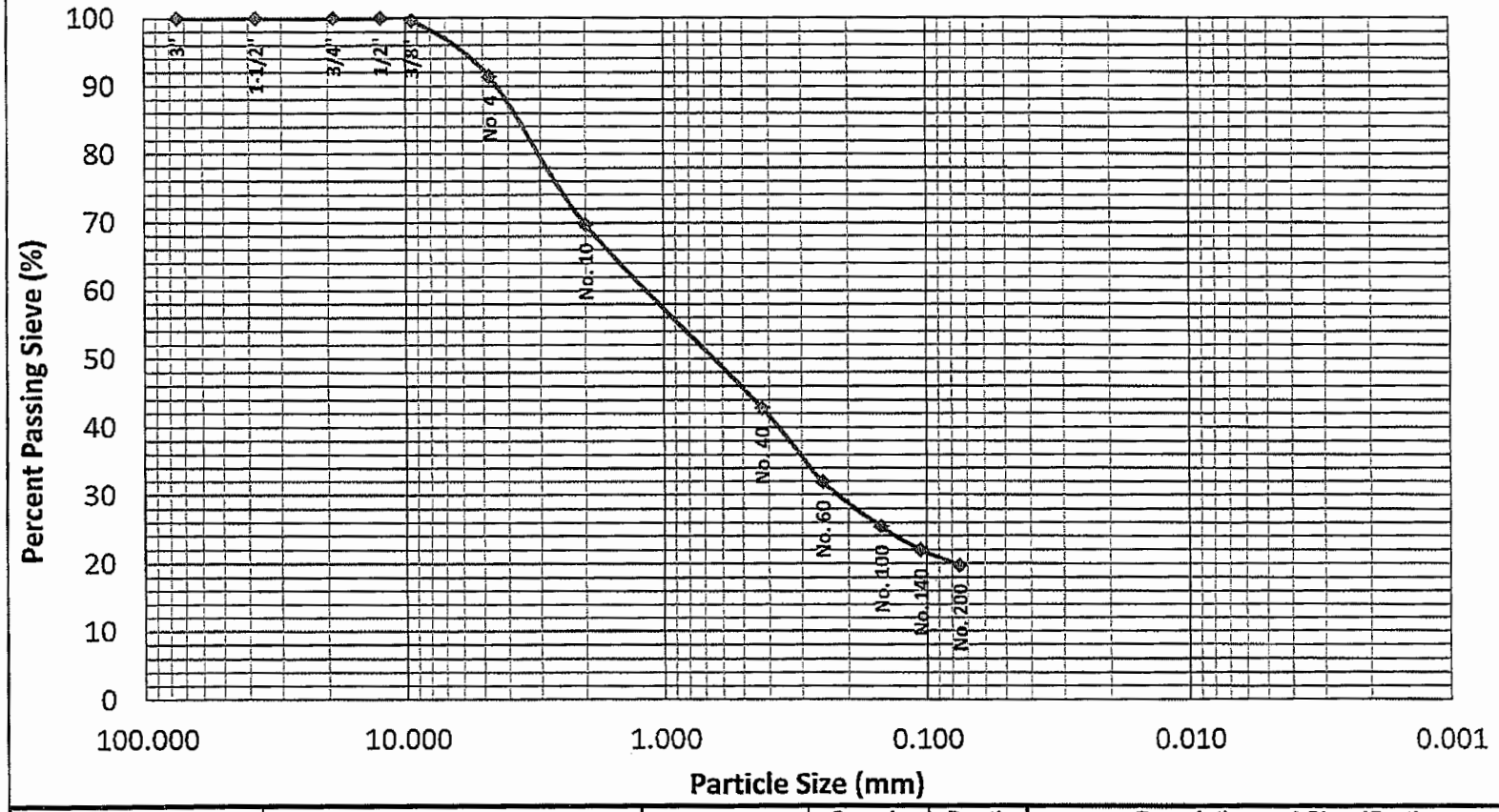
Particle Size Distribution Curve ASTM D 6913



Sieve No.	Dia. (mm)	% Finer
3"	75.000	100
1-1/2"	37.500	100
3/4"	19.000	100
1/2"	12.500	100
3/8"	9.500	99.7
No. 4	4.750	91.4
No. 10	2.000	69.7
No. 40	0.425	42.8
No. 60	0.250	31.9
No. 100	0.150	25.4
No. 140	0.106	21.9
No. 200	0.075	19.7

Sample Properties	
Shape of Particles	
Angular	
Hardness of Particles	
Hard	
L.L.	N/P
P.L.	N/P
P.I.	N/P
D_{85}	3.684
D_{60}	1.1456
D_{50}	0.6442
D_{30}	0.2150
D_{15}	N/A
D_{10}	N/A
C_u	N/A
C_c	N/A

PROJECT NAME:	R 360-Bvalon LAI Project #: 11-0131-01	Boring No.	Sample No.	Depth (ft)	Description and Classification	Technician
Client:	Larson & Associates, Inc.				Grayish Light Brown Silty Sand, (SM)	Owen Sanderson
ETTL Inc. Job #	G 3659-11	BH-7	Bulk-1	25.0		Date: 11/29/11

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 4546 One-Dimensional Swell or Settlement of Cohesive Soils, Method A/B

Project Information

Project: R360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr: Larson & Associates, Inc.
Contractor: Not Given
Job No: G 3659-11

Sample Information

Boring No: BH-7 Date Sampled: 11/1/2011
Sample No: Bulk-1 Depth: 25 ft
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Grayish Light Brown Silty Sand, (SM)
Sampled By: RUL/JF
Preparation Technician: Chris Wall Start Date: 12/14/2011
Technician: Chris Wall Finished Date: 12/19/2011

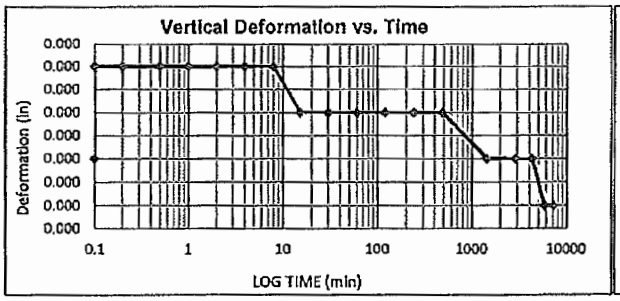
Test Data

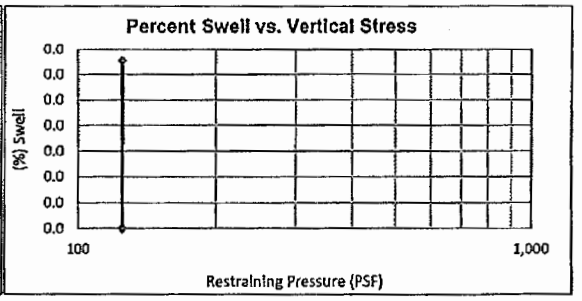
	Initial Sample Data	Final Sample Data	
Wt. of mold + Wet Wt:	180.21	192.46	grams
Wt. of mold:	63.76	63.76	grams
Wet Wt. of sample:	116.45	128.70	grams
Dry Wt. of sample:	110.94	110.94	grams
Height of sample:	0.7650	0.7651	inches
Diameter of sample:	2.5000	2.5000	inches
Area of sample:	4.9088	4.9088	in^2
Volume of sample:	3.7552	3.7557	in^3
Degree of Saturation:	**27.6%**	**88.9%**	
Wet Unit Weight:	118.1	130.5	pcf
Dry Unit Weight:	**112.5**	**112.5**	pcf
Moisture Content:	**5.0%**	**16.0%**	

Percent Swell (%): 0.0 **Restraining Pressure (PSF):** 125

Atterberg Limits	
L.L.	P.L.
N/P	N/P
P.I.	-200%
N/P	19.6
Hand Penetromoter (TSF)	

Testing Condition
Remolded D-698





* Sample does not represent a potential to swell.

Respectfully Submitted,

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Specific Gravity of Soils by Water Pycnometer, ASTM D 854

Project Information

Project: R360-Bvalon LAI Project #: 11-031-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: not given
Job No.: G 3659-11

Sample Information

Boring No: BH-7
Sample No.: Bulk-1 Depth: 25.0 ft Date Sampled: 11/1/2011
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Grayish Light Brown Silty Sand, (SM)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/30/2011

Test Data

Method: B

(Method A) Moisture Content of Material passing No. 4 Sieve

Pan #	24
Tare mass (g):	31.79
Wet mass + Tare (g):	61.63
Dry mass + Tare (g):	61.28
Moister Content:	1.2%

Sample Split over No. 4 sieve

Starting Sample Mass:	375.31	grams
Mass Retianed on No. 4 Sieve:	32.39	grams
Precent Retained on No. 4 Sieve:	8.6%	

Specific Gravity of Material Passing No. 4 Sieve

Air Dry M_S (grams)	Bottle #	T_t (deg. C)	M_P (grams)	V_P (mL)	$\rho_{w,t}$ (g/mL)	Oven Dry M_S (grams)	$M_{pw,t}$ (grams)	$M_{pws,t}$ (grams)	SG_t
75.00	#3	21.97	179.88	499.23	0.9978	75.00	678.0	724.91	2.670

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Laboratory Compaction Characteristics of Soil Using Standard Effort ASTM D 698

Project Information

Project: R360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: Not Given
Job No.: G 3659-11

Sample Information

Boring No: BH-8
Sample No.: Bulk-1 Depth (ft.): 25.0 ft.
Material Origin: New Mexico Date Sampled: 11/1/2011
Sampling Info. provided By: RUL/JF
Material Description: Brown Clayey Sand with gravel, (SC)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/29/2011

Test Data

Maximum Dry Density:	121.6	(lb./ft^3)
Optimum Moisture Content:	10.7	(%)

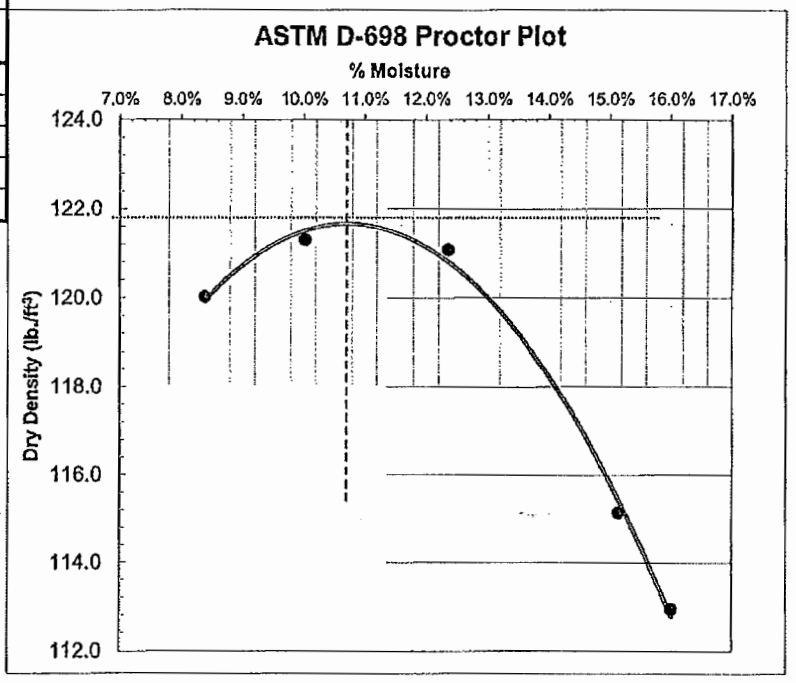
Method
B

Classification
SC

LL	50
PL	24
PI	26

-200 Sieve	21%
+40 Sieve	55%
+4 Sieve	31%

Proctor Data	
% Moisture	Dry Density (lb./ft^3)
8.4%	120.0
10.0%	121.3
12.4%	121.1
15.1%	115.1
16.0%	112.9



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HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test) ASTM D 5084

Project :	R360-Bvalon LAI Project #: 11-0131-01							
Date:	12/15/2011	Panel Number : P-4						
Project No. :	G 3659-11	Permometer Data						
Boring No.:	BH-8	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3	
Sample:	Bulk-1	a_s =	0.767120 cm^2		Pipet Rp	6.7	cm^3	
Depth (ft):	25'	M_1 =	0.030180	C = 0.000431384	Annulus Ra	1.5	cm^3	
Other Location:		M_2 =	1.040953	T = 0.201511953				
Material Description :	Brown Clayey Sand with gravel, (SC)							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			573.21	g	Tare No.:	T-8	Tare No.:	T-2
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	891.60	Wet Wt.+tare	786.90
Wet Wt: of Sample :			573.21	g	Dry Wt.+tare:	792.98	Dry Wt.+tare:	707.70
Diameter :	2.76	In	7.01	cm^2	Tare Wt:	221.88	Tare Wt:	216.90
Length :	2.76	In	7.01	cm	Dry Wt.:	571.1	Dry Wt.:	490.8
Area:	5.99	In^2	38.63	cm^2	Water Wt.:	98.62	Water Wt.:	79.2
Volume :	16.51	In^3	270.59	cm^3	% moist.:	17.3	% moist.:	16.1
Unit Wt.(wet):	132.18	pcf	2.12	g/cm^3				
Unit Wt.(dry):	112.72	pcf	1.81	g/cm^3				

Specific Gravity:	2.67	Max Dry Density(pcf) =	121.6	OMC =	10.7
		% of D-698 max =	92.7	+/- OMC =	6.57
Calculated % saturation:	90.3	Void ratio (e) =	0.48	Porosity (n)=	0.32

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.2 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/5/2011	2100	4.5	2.162485	24.5	0.899	1.06E-07	3.02E-04	
12/5/2011	2280	4.4	2.262485	24.5	0.899	1.04E-07	2.96E-04	
12/5/2011	2460	4.3	2.362485	24.5	0.899	1.03E-07	2.91E-04	
12/5/2011	2640	4.2	2.462485	24.5	0.899	1.01E-07	2.88E-04	

SUMMARY

k_a = 1.04E-07 cm/sec Acceptance criteria = 25 %

	kl		Vm	
k1 =	1.06E-07	cm/sec	2.6	%
k2 =	1.04E-07	cm/sec	0.6	%
k3 =	1.03E-07	cm/sec	1.0	%
k4 =	1.01E-07	cm/sec	2.2	%

$Vm = \frac{|ka - kl|}{ka} \times 100$

Hydraulic conductivity	k =	1.04E-07	cm/sec	2.94E-04	ft/day
Void Ratio	e =	0.48			
Porosity	n =	0.32			
Bulk Density	γ =	2.12	g/cm^3	132.2	pcf
Water Content	W =	0.31	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	1.06E-12	cm^2	(at 20 deg C)	

Liquid Limit	LL	50
Plastic Limit	PL	24
Plasticity Index	**PI**	**26**
- 200 Sieve		20.7 %
+ No 40 Sieve		55.0 %
+ No 4 Sieve		31.0 %

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis ASTM D 6913

Method B

Project Information

Project: R 360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: not given
Job No.: G 3659-11

Sample Information

Boring No: **BH-8**
Sample No.: **Bulk-1** Depth: **25.0** ft Date Sampled: 11/1/2011
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Brown Clayey Sand with gravel, (SC)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/29/2011

Test Data

Sieve Number	Sieve Size (mm)	Accumulated Mass Retained (grams)	Sample Retained (%)	Sample Finer (%)
3"	75	0.00	0.0	100
1-1/2"	37.5	0.00	0.0	100
3/4"	19	0.00	0.0	100
1/2"	12.50	13.90	3.0	97.0
3/8"	9.50	55.76	12.0	88.0
No. 4	4.75	134.34	29.0	71.0
No. 10	2.00	199.75	43.1	56.9
No. 40	0.425	265.01	57.1	42.9
No. 60	0.250	321.13	69.2	30.8
No. 100	0.150	361.61	78.0	22.0
No. 140	0.106	378.53	81.6	18.4
No. 200	0.075	388.63	83.8	16.2

Sample Properties

L.L.	P.L.	P.I.
50	24	26

D 10 (mm)=	N/A
D 15 (mm)=	N/A
D 30 (mm)=	0.2389
D 50 (mm)=	0.9316
D 60 (mm)=	2.4131
D 85 (mm)=	6.895
Cu =	N/A
Cc =	N/A
Shape of Particles:	Angular
Hardness of Particles:	Hard

Sample Washed over No. 200 Sieve
Starting Dry Weight: 463.88 grams

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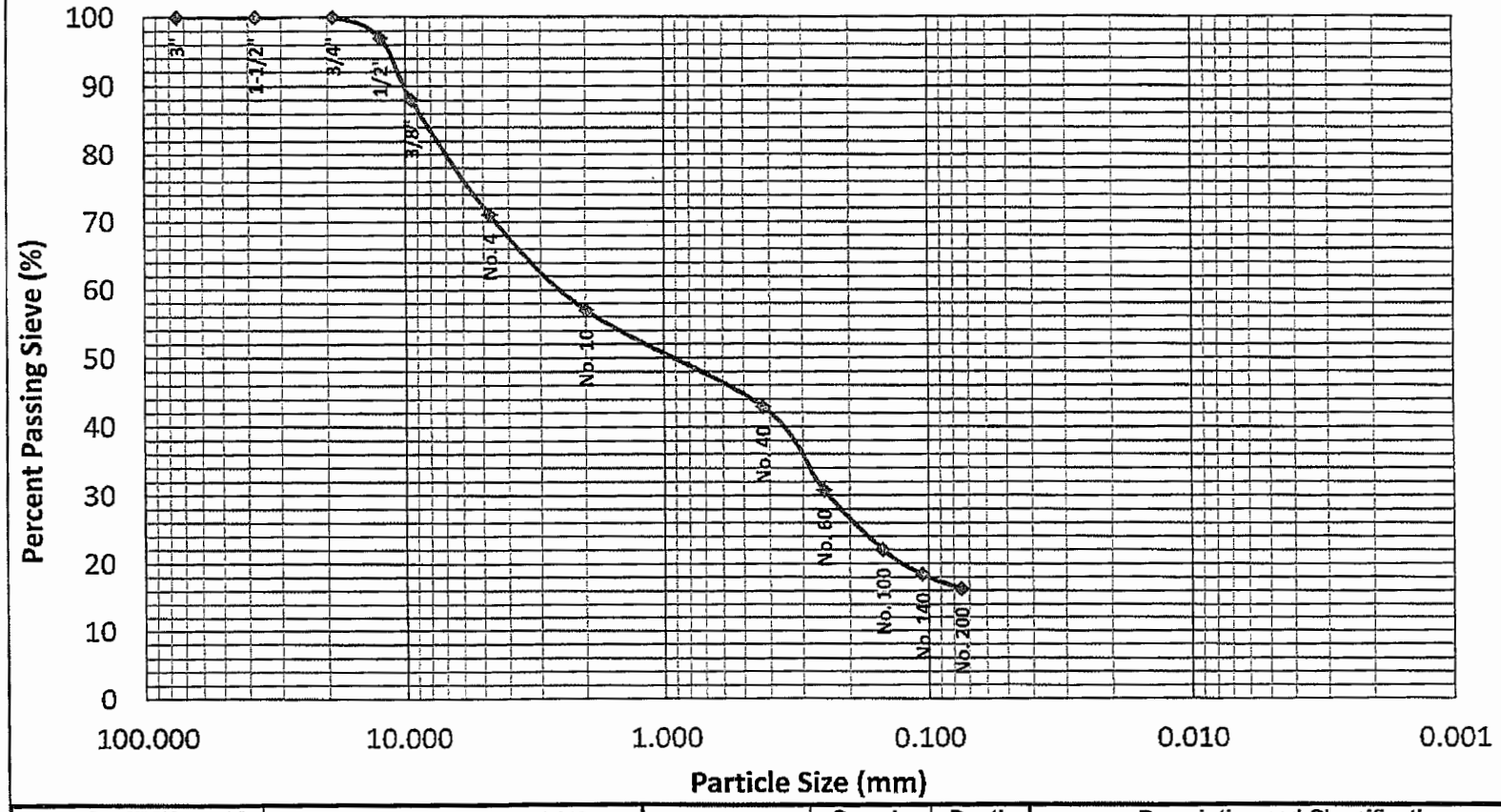
Particle Size Distribution Curve ASTM D 6913



Sieve No.	Dia. (mm)	% Finer
3"	75.000	100
1-1/2"	37.500	100
3/4"	19.000	100
1/2"	12.500	97.0
3/8"	9.500	88.0
No. 4	4.750	71.0
No. 10	2.000	56.9
No. 40	0.425	42.9
No. 60	0.250	30.8
No. 100	0.150	22.0
No. 140	0.106	18.4
No. 200	0.075	16.2

Sample Properties	
Shape of Particles	
Angular	
Hardness of Particles	
Hard	
L.L.	50
P.L.	24
P.I.	26
D_{85}	6.895
D_{60}	2.4131
D_{50}	0.9316
D_{30}	0.2389
D_{15}	N/A
D_{10}	N/A
C_u	N/A
C_c	N/A

PROJECT NAME:	R 360-Bvalon LAI Project #: 11-0131-01	Boring No.	Sample No.	Depth (ft)	Description and Classification	Technician
Client:	Larson & Associates, Inc.				Brown Clayey Sand with gravel, (SC)	Owen Sanderson
ETTL Inc. Job #	G 3659-11	BH-8	Bulk-1	25.0		Date: 11/29/11

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 4546 One-Dimensional Swell or Settlement of Cohesive Soils, Method A/B

Project Information

Project: R360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr: Larson & Associates, Inc.
Contractor: Not Given
Job No: G 3659-11

Sample Information

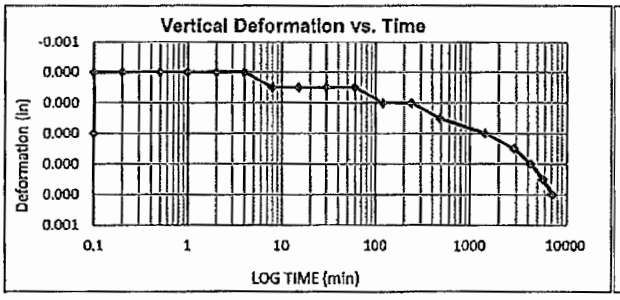
Boring No: BH-8 Date Sampled: 11/1/2011
Sample No: Bulk-1 Depth: 25 ft
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Brown Clayey Sand with gravel, (SC)
Sampled By: RUL/JF
Preparation Technician: Chris Wall Start Date: 12/14/2011
Technician: Chris Wall Finished Date: 12/19/2011

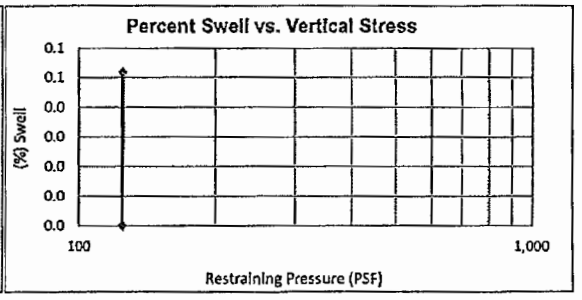
Test Data

	Initial Sample Data	Final Sample Data	
Wt. of mold + Wet Wt:	157.02	176.85	grams
Wt. of mold:	66.17	66.17	grams
Wet Wt. of sample:	90.85	110.68	grams
Dry Wt. of sample:	86.95	86.95	grams
Height of sample:	0.7720	0.7724	inches
Diameter of sample:	2.5000	2.5000	inches
Area of sample:	4.9088	4.9088	in^2
Volume of sample:	3.7896	3.7915	in^3
Degree of Saturation:	**13.2%**	**80.3%**	
Wet Unit Weight:	91.3	111.2	pcf
Dry Unit Weight:	**87.4**	**87.4**	pcf
Moisture Content:	**4.5%**	**27.3%**	
Percent Swell (%):	**0.1**	**Restraining Pressure (PSF):**	**125**

Atterberg Limits	
L.L.	P.L.
50	24
P.I.	-200%
26	20.7
Hand Penetromoter (TSF)	

Testing Condition
Remolded D-698





* Sample does not represent a potential to swell.

Respectfully Submitted,

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Specific Gravity of Soils by Water Pycnometer, ASTM D 854

Project Information

Project: R360-Bvalon LAI Project #: 11-031-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: not given
Job No.: G 3659-11

Sample Information

Boring No: BH-8
Sample No.: Bulk-1 Depth: 25.0 ft Date Sampled: 11/1/2011
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Brown Clayey Sand with gravel, (SC)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/30/2011

Test Data

Method: B

(Method A) Moisture Content of Material passing No. 4 Sieve

Pan #	101
Tare mass (g):	30.21
Wet mass + Tare (g):	55.98
Dry mass + Tare (g):	55.54
Moister Content:	1.7%

Sample Split over No. 4 sieve

Starting Sample Mass:	463.88	grams
Mass Retianed on No. 4 Sieve:	134.34	grams
Precent Retained on No. 4 Sieve:	29.0%	

Specific Gravity of Material Passing No. 4 Sieve

Air Dry M_S (grams)	Bottle #	T_t (deg. C)	M_P (grams)	V_P (mL)	$\rho_{w,t}$ (g/mL)	Oven Dry M_S (grams)	$M_{pw,t}$ (grams)	$M_{pws,t}$ (grams)	SG_t
50.00	#5	21.44	182.16	499.14	0.9979	50.00	680.3	711.49	2.665

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Laboratory Compaction Characteristics of Soil Using Standard Effort ASTM D 698

Project Information

Project: R360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: Not Given
Job No.: G 3659-11

Sample Information

Boring No: BH-8
Sample No.: Bulk-2 Depth (ft.): 50.0 ft.
Material Origin: New Mexico Date Sampled: 11/1/2011
Sampling Info. provided By: RUL/JF
Material Description: Light Brown Lean Clay with sand, (CL)
Sampled By: RUL/JF
Technician: Todd Sliger Test Date: 12/17/2011

Test Data

Maximum Dry Density:	103.4	(lb./ft³)
Optimum Moisture Content:	20.8	(%)

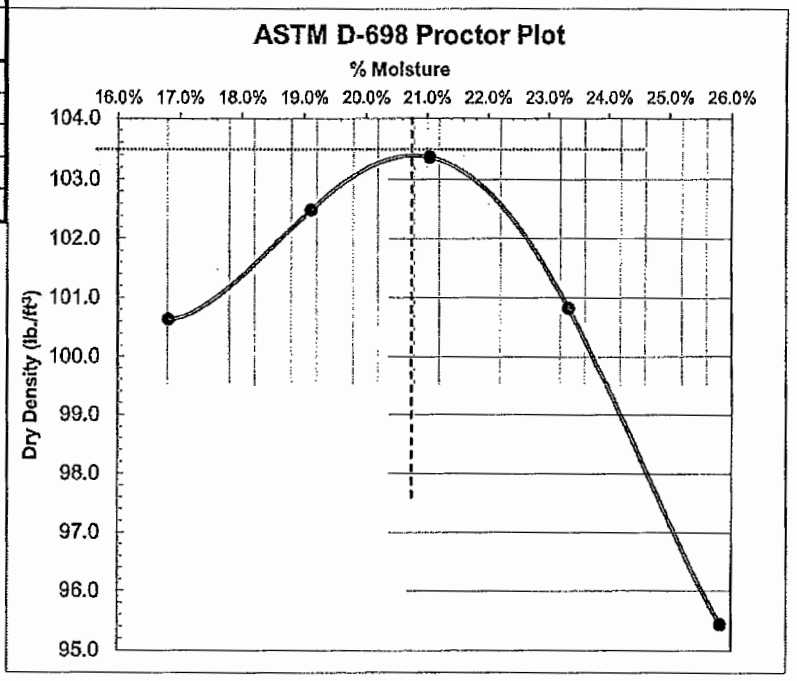
Method
A

Classification
SC

LL	43
PL	19
PI	24

-200 Sieve	71%
+40 Sieve	2%
+4 Sieve	0%

Proctor Data	
% Moisture	Dry Density (lb./ft³)
25.8%	95.4
16.8%	100.6
19.1%	102.5
21.0%	103.4
23.3%	100.8



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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test) ASTM D 5084

Project :	R360-Bvalon LAI Project #: 11-0131-01							
Date:	12/15/2011	Panel Number : P-4						
Project No. :	G 3659-11	Permometer Data						
Boring No.:	BH-8	a_p =	0.031416 cm^2		Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3
Sample:	Bulk-2	a_a =	0.767120 cm^2			Pipet Rp	6.7	cm^3
Depth (ft):	50'	M_1 =	0.030180	C =	0.000431384	Annulus Ra	1.5	cm^3
Other Location:		M_2 =	1.040953	T =	0.201511953			
Material Description :	Light Brown Lean Clay with sand, (CL)							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			542.86	g	Tare No.:	T-16	Tare No.:	T-18
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	593.33	Wet Wt.+tare	692.14
Wet Wt of Sample :			542.86	g	Dry Wt.+tare:	505.23	Dry Wt.+tare:	587.22
Diameter :	2.81	in	7.12	cm^2	Tare Wt:	151.95	Tare Wt:	146.69
Length :	2.81	in	7.12	cm	Dry Wt.:	353.28	Dry Wt.:	440.53
Area:	6.18	in^2	39.87	cm^2	Water Wt.:	88.1	Water Wt.:	104.92
Volume :	17.33	in^3	284.05	cm^3	% moist.:	24.9	% moist.:	23.8
Unit Wt.(wet):	119.26	pcf	1.91	g/cm^3				
Unit Wt.(dry):	95.45	pcf	1.53	g/cm^3				

Specific Gravity: 2.62 Max Dry Density(pcf) = 103.4 OMC = 20.8

% of max = 92.3 +/- OMC = 4.14

Calculated % saturation: 87.6 Void ratio (e) = 0.71 Porosity (n)= 0.42

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.1 cm Hydraulic Gradient = 9.04

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft/day)	Reset = *
12/19/2011	1080	5.7	0.960792	25	0.889	7.67E-08	2.18E-04	
12/19/2011	1380	5.6	1.060792	25	0.889	6.71E-08	1.90E-04	
12/19/2011	1740	5.5	1.160792	25	0.889	5.90E-08	1.67E-04	
12/19/2011	2160	5.4	1.260792	25	0.889	5.23E-08	1.48E-04	

SUMMARY

ka =	6.38E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	7.67E-08	cm/sec	20.3	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	6.71E-08	cm/sec	5.2	%	
k3 =	5.90E-08	cm/sec	7.5	%	
k4 =	5.23E-08	cm/sec	18.0	%	

Hydraulic conductivity	k =	6.38E-08	cm/sec	1.81E-04	ft/day
Void Ratio	e =	0.71			
Porosity	n =	0.42			
Bulk Density	γ =	1.91	g/cm^3	119.3	pcf
Water Content	W =	0.38	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	6.53E-13	cm^2	(at 20 deg C)	

Liquid Limit LL	43	
Plastic Limit PL	19	
Plasticity Index PI	24	
- 200 Sieve	71.2	%
+ No 40 Sieve	1.7	%
+ No 4 Sieve	0.0	%

Respectfully Submitted,

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ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis ASTM D 6913

Method B

Project Information

Project: R 360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: not given
Job No.: G 3659-11

Sample Information

Boring No: **BH-8**
Sample No.: **Bulk-2** Depth: **50.0** ft Date Sampled: 11/1/2011
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Light Brown Lean Clay with sand, (CL)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/29/2011

Test Data

Sieve Number	Sieve Size (mm)	Accumulated Mass Retained (grams)	Sample Retained (%)	Sample Finer (%)
3"	75	0.00	0.0	100
1-1/2"	37.5	0.00	0.0	100
3/4"	19	0.00	0.0	100
1/2"	12.50	0.00	0.0	100
3/8"	9.50	2.33	0.9	99.1
No. 4	4.75	3.47	1.3	98.7
No. 10	2.00	4.64	1.8	98.2
No. 40	0.425	7.04	2.7	97.3
No. 60	0.250	13.08	5.0	95.0
No. 100	0.150	28.56	11.0	89.0
No. 140	0.106	52.91	20.4	79.6
No. 200	0.075	77.6	30.0	70.0

Sample Properties		
L.L.	P.L.	P.I.
43	19	24

D 10 (mm)=	N/A
D 15 (mm)=	N/A
D 30 (mm)=	N/A
D 50 (mm)=	N/A
D 60 (mm)=	N/A
D 85 (mm)=	0.1295
Cu =	N/A
Cc =	N/A
Shape of Particles:	Angular
Hardness of Particles:	Hard

Sample Washed over No. 200 Sieve
Starting Dry Weight: 259.09 grams

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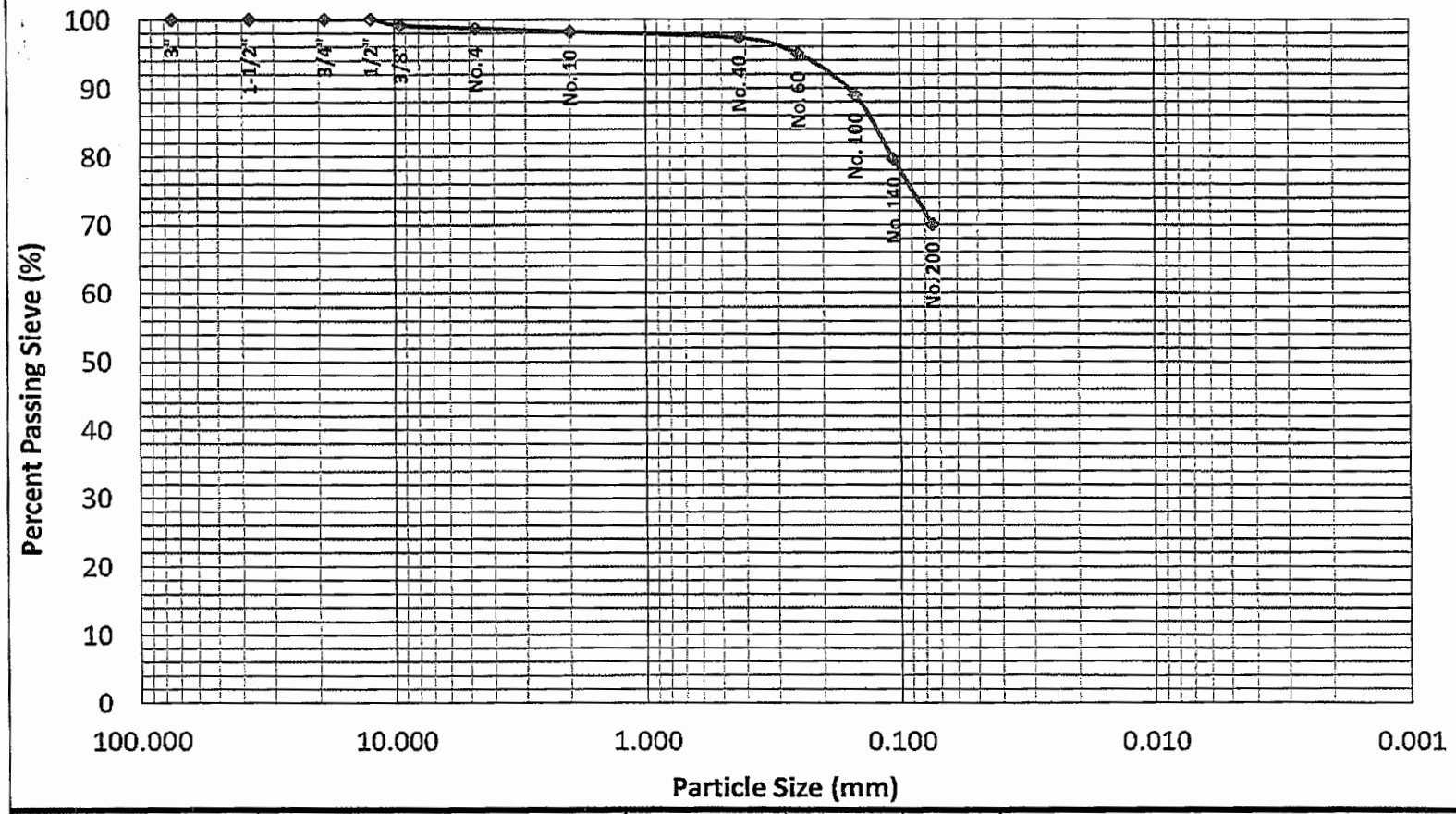
Particle Size Distribution Curve ASTM D 6913



Sieve No.	Dia. (mm)	% Finer
3"	75.000	100
1-1/2"	37.500	100
3/4"	19.000	100
1/2"	12.500	100
3/8"	9.500	99.1
No. 4	4.750	98.7
No. 10	2.000	98.2
No. 40	0.425	97.3
No. 60	0.250	95.0
No. 100	0.150	89.0
No. 140	0.106	79.6
No. 200	0.075	70.0

Sample Properties	
Shape of Particles	
Angular	
Hardness of Particles	
Hard	
L.L.	43
P.L.	19
P.I.	24
D_{85}	0.130
D_{60}	N/A
D_{50}	N/A
D_{30}	N/A
D_{15}	N/A
D_{10}	N/A
C_u	N/A
C_c	N/A

PROJECT NAME:	R 360-Bvalon LAI Project #: 11-0131-01	Boring No.	Sample No.	Depth (ft)	Description and Classification	Technician
Client:	Larson & Associates, Inc.				Light Brown Lean Clay with sand, (CL)	Owen Sanderson
ETTL Inc. Job #	G 3659-11	BH-8	Bulk-2	50.0		Date: 11/29/11

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 4546 One-Dimensional Swell or Settlement of Cohesive Soils, Method A/B

Project Information

Project: R360-Bvalon LAI Project #: 11-0131-01
Client/Arch./Engr: Larson & Associates, Inc.
Contractor: Not Given
Job No: G 3659-11

Sample Information

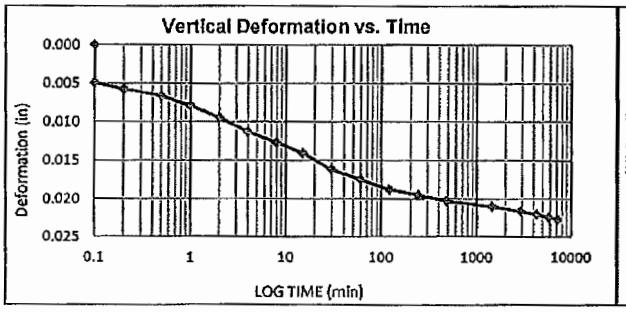
Boring No: BH-8 Date Sampled: 11/1/2011
Sample No: Bulk-2 Depth: 50 ft
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Light Brown Lean Clay with sand, (CL)
Sampled By: RUL/JF
Preparation Technician: Chris Wall Start Date: 12/14/2011
Technician: Chris Wall Finished Date: 12/19/2011

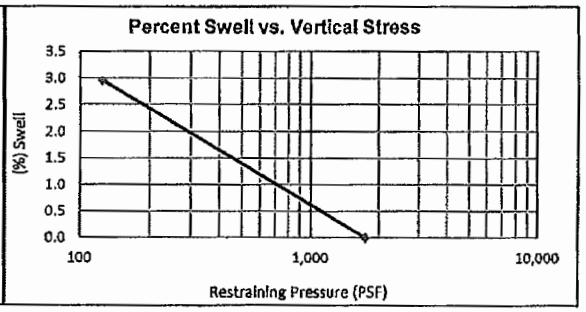
Test Data

	Initial Sample Data	Final Sample Data	
Wt. of mold + Wet Wt:	180.81	192.52	grams
Wt. of mold:	66.06	66.06	grams
Wet Wt. of sample:	114.75	126.46	grams
Dry Wt. of sample:	101.48	101.48	grams
Height of sample:	0.7690	0.7917	inches
Diameter of sample:	2.5000	2.5000	inches
Area of sample:	4.9088	4.9088	in^2
Volume of sample:	3.7748	3.8863	in^3
Degree of Saturation:	**55.7%**	**97.4%**	
Wet Unit Weight:	115.8	124.0	pcf
Dry Unit Weight:	**102.4**	**99.5**	pcf
Moisture Content:	**13.1%**	**24.6%**	
Percent Swell (%):	**3.0**	**Restraining Pressure (PSF):**	**1,750**

Atterberg Limits	
L.L.	P.L.
433	19
P.I.	-200%
24	71.2
Hand Penetromoter (TSF)	

Testing Condition
Remolded D-698





* Sample represent a potential to swell.

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Specific Gravity of Soils by Water Pycnometer, ASTM D 854

Project Information

Project: R360-Bvalon LAI Project #: 11-031-01
Client/Arch./Engr.: Larson & Associates, Inc.
Contractor: not given
Job No.: G 3659-11

Sample Information

Boring No: BH-8
Sample No.: Bulk-2 Depth: 50.0 ft Date Sampled: 11/1/2011
Material Origin: New Mexico
Sampling Info. provided By: RUL/JF
Material Description: Light Brown Lean Clay with sand, (CL)
Sampled By: RUL/JF
Technician: Owen Sanderson Test Date: 11/30/2011

Test Data

Method: B

(Method A) Moisture Content of Material passing No. 4 Sieve

Pan #	112
Tare mass (g):	30.17
Wet mass + Tare (g):	55.25
Dry mass + Tare (g):	54.77
Moister Content:	2.0%

Sample Split over No. 4 sieve

Starting Sample Mass:	259.09	grams
Mass Retianed on No. 4 Sieve:	3.47	grams
Precent Retained on No. 4 Sieve:	1.3%	

Specific Gravity of Material Passing No. 4 Sieve

Air Dry M_S (grams)	Bottle #	T_t (deg. C)	M_P (grams)	V_P (mL)	$\rho_{w,t}$ (g/mL)	Oven Dry M_S (grams)	$M_{pw,t}$ (grams)	$M_{pws,t}$ (grams)	SG_t
90.00	11	21.74	187.46	499.33	0.9978	90.00	685.7	741.30	2.616

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Liquid Limit, Plastic Limit, and Plasticity Index of Soils ASTM D 4318
Method B (One Point Liquid Limit)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Enineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: Caliche Sample
Sample No.: _____ Depth: Unknown ft Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Grayish White Silty Sand with gravel, (SM)
Sampled By: Client
Technician: Tommy Burns Test Date: 3/15/2013

Test Data

Liquid Limit

Can No.	25	26
Wet weight + Tare (g)	31.12	31.73
Dry Weight + Tare (g)	27.75	28.35
Tare Weight (g)	15.17	15.26
Dry Weight of Sample (g)	12.58	13.09
Weight of Water (g)	3.37	3.38
Blow Count:	20	20
Water %	26.8	25.8
Liquid Limit (LL)	26.1	25.1

Plastic Limit

Can No.	27	28
Wet weight + Tare (g)	24.92	25.69
Dry Weight + Tare (g)	22.07	23.64
Tare Weight (g)	10.94	15.46
Dry Weight of Sample (g)	11.13	8.18
Weight of Water (g)	2.85	2.05
Water % = PL	25.6	25.1

Average Liquid Limit (LL)	**26**
Average Plastic Limit (PL)	**25**
Plasticity Index (PI)	**1**

Respectfully submitted

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Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis ASTM D 6913

Method B

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: **Caliche Sample**
Sample No.: _____ Depth: **unknown** ft Date Sampled: unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Grayish White Silty Sand with gravel, (SM)
Sampled By: Client
Technician: Tyler Sutherland Test Date: 3/18/2013

Test Data

Sieve Number	Sieve Size (mm)	Accumulated Mass Retained (grams)	Sample Retained (%)	Sample Finer (%)
3"	75	0.00	0.0	100
1-1/2"	37.5	235.9	3.9	96.1
3/4"	19	1083.8	17.8	82.2
1/2"	12.50	1625.0	26.7	73.3
3/8"	9.50	1985.0	32.6	67.4
No. 4	4.75	2779.1	45.6	54.4
No. 10	2.00	3309.1	54.4	45.6
No. 40	0.425	3657.0	60.1	39.9
No. 60	0.250	4235.1	69.6	30.4
No. 100	0.150	4879.2	80.1	19.9
No. 140	0.106	5066.4	83.2	16.8
No. 200	0.075	5190.2	85.2	14.8

Sample Properties		
L.L.	P.L.	P.I.
26	25	1

D 10 (mm)=	N/A
D 15 (mm)=	0.0782
D 30 (mm)=	0.2447
D 50 (mm)=	3.082
D 60 (mm)=	5.839
D 85 (mm)=	21.78
Cu =	N/A
Cc =	N/A
Shape of Particles:	Angular
Hardness of Particles:	Hard

Sample Washed over No. 200 Sieve
Starting Dry Weight: 6,088.40 grams

Respectfully Submitted

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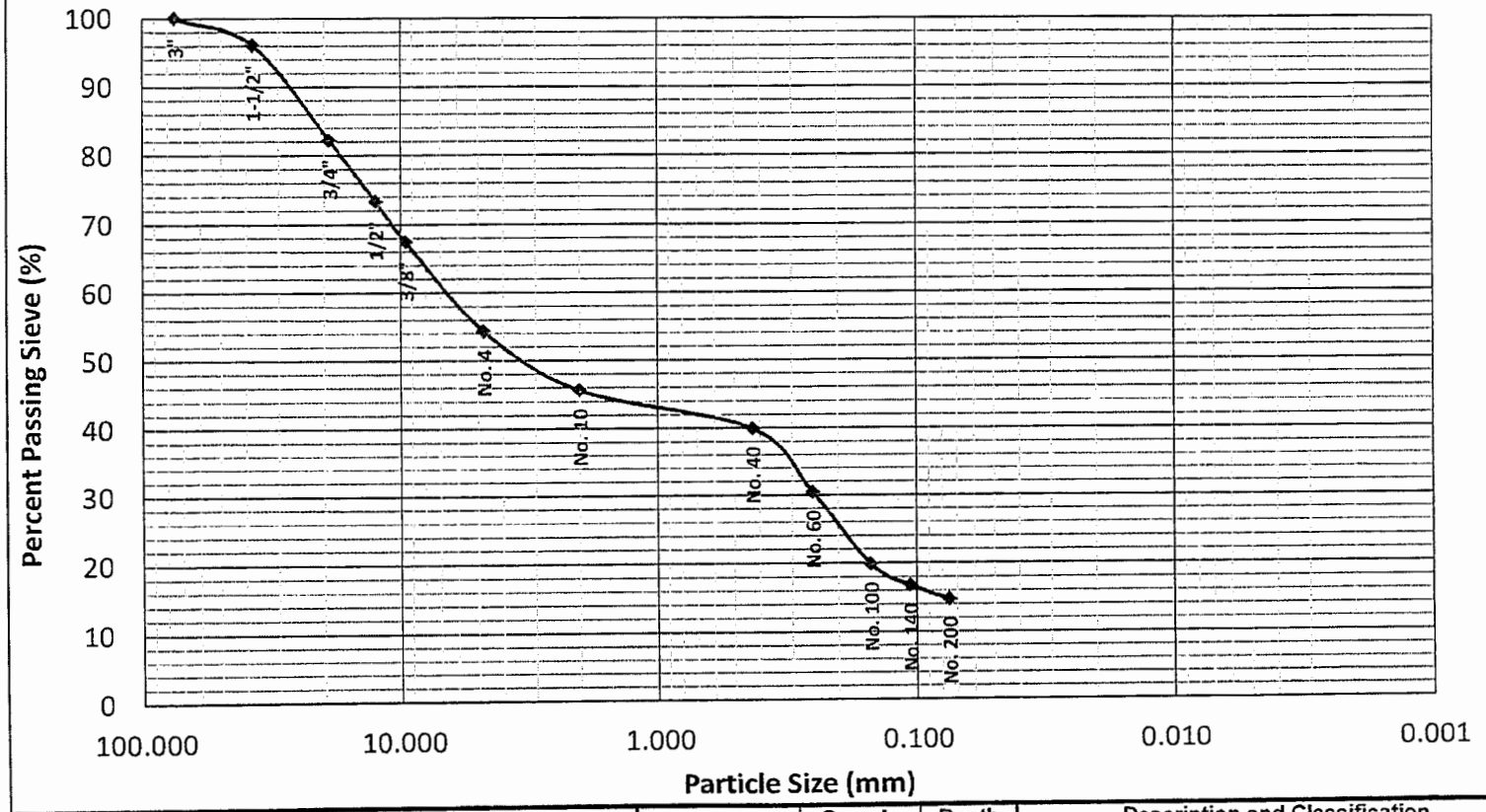
Particle Size Distribution Curve ASTM D 6913



Sieve No.	Dia. (mm)	% Finer
3"	75.000	100
1-1/2"	37.500	96.1
3/4"	19.000	82.2
1/2"	12.500	73.3
3/8"	9.500	67.4
No. 4	4.750	54.4
No. 10	2.000	45.6
No. 40	0.425	39.9
No. 60	0.250	30.4
No. 100	0.150	19.9
No. 140	0.106	16.8
No. 200	0.075	14.8

Sample Properties	
Shape of Particles	
Angular	
Hardness of Particles	
Hard	
L.L.	26
P.L.	25
P.I.	1
D_{85}	21.78
D_{60}	5.839
D_{50}	3.082
D_{30}	0.2447
D_{15}	0.0782
D_{10}	N/A
C_u	N/A
C_c	N/A

PROJECT NAME:	R360 Permian Basin, LLC - Avalon	Boring No.	Sample No.	Depth (ft)	Description and Classification	Technician
Client:	Nai Smith Engineers, Inc.				Grayish White Silty Sand with gravel, (SM)	Tyler Sutherland
ETTL Inc. Job #	G 3927-13	Caliche Sample		unknown		Date: 03/18/13

ETTL Engineers & Consultants Inc.

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Bulk Density / Unit Weight, ASTM D 2937 (modified lab method)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: Caliche Sample
Sample No.: _____ Depth: Unknown ft
Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Grayish White Poorly Graded Silty Sand with gravel, (SM)
Sampled By: Client
Technician: Owen Sanderson
Test Date: 3/14/2012
Remarks: *Remolded to Minimum Index Dnesity, ASTM D 4254*
at As Is Moisture Content, reference attached report page
Material larger than the No. 4 sieve omitted from sample

Test Data

	Diameter (in)	Height (in)	Minimum of 3 Readings
Diameter (top)	2.868	5.966	Height 1
Diameter (Middle)	2.868	5.966	Height 2
Diameter (bottom)	2.868	5.966	Height 3

Ave. Diameter (in)	Ave. Height (in)	Area (in^2)	Volume (in^3)	Wet Wt. (g)	Dry Wt. (g)	Bulk Density Wet Unit Weight (lbf/ft^3)	Dry Unit Weight (lbf/ft^3)
2.868	5.966	6.458	38.53	812.9	762.3	80.4	75.4

Ave. Diameter (mm)	Ave. Height (mm)	Area (mm^2)	Volume (L)	Wet Wt. (Kg)	Dry Wt. (Kg)	Bulk Density Wet Unit Weight (kN/m^3)	Dry Unit Weight (kN/m^3)
72.83	151.54	4166	0.6314	0.8129	0.7623	12.63	11.84

Phase Volumes:

Solids (V_s)	17.59	in^3	Specific Gravity	2.650	Estimated
Voids (V_v)	20.93	in^3	e - Void Ratio	1.190	
Water (V_w)	3.091	in^3	η - Porosity	54.3%	

Tare #	T-1
Tare Wt (g)	217.16
Wet Wt.(g)	292.1
Dry Wt (g)	287.44
ASTM D 2166, Moisture Content	6.63%
Degree of Saturation	14.8%

Respectfully submitted

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Bulk Density / Unit Weight, ASTM D 2937 (modified lab method)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: Caliche Sample
Sample No.: _____ Depth: Unknown ft
Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Grayish White Poorly Graded Silty Sand with gravel, (SM)
Sampled By: Client
Technician: Owen Sanderson
Test Date: 3/14/2012
Remarks: *Remolded to Maximum Index Dnesity, ASTM D 4253*
at As Is Moisture Content, reference attached report page
Material larger than the No. 4 sieve omitted from sample

Test Data

	Diameter (in)	Height (in)	Minimum of 3 Readings
Diameter (top)	2.868	4.953	Height 1
Diameter (Middle)	2.868	4.953	Height 2
Diameter (bottom)	2.868	4.953	Height 3

Ave. Diameter (in)	Ave. Height (in)	Area (in^2)	Volume (in^3)	Wet Wt. (g)	Dry Wt. (g)	Bulk Density Wet Unit Weight (lbf/ft^3)	Dry Unit Weight (lbf/ft^3)
2.868	4.953	6.458	31.99	812.9	762.3	**96.8**	90.8

Ave. Diameter (mm)	Ave. Height (mm)	Area (mm^2)	Volume (L)	Wet Wt. (Kg)	Dry Wt. (Kg)	Bulk Density Wet Unit Weight (kN/m^3)	Dry Unit Weight (kN/m^3)
72.83	125.81	4166	0.5242	0.8129	0.7623	15.21	14.26

Phase Volumes:

Solids (V_s)	17.59	in^3	Specific Gravity	2.650	Estimated	Tare #	T-1
Voids (V_v)	14.39	in^3	e - Void Ratio	0.818		Tare Wt (g)	217.16
Water (V_w)	3.091	in^3	η - Porosity	45.0%		Wet Wt.(g)	292.1
						Dry Wt (g)	287.44
						ASTM D 2166, Moisture Content	6.63%
						Degree of Saturation	21.5%

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test) ASTM D 5084

Project : R360 Permian Basin, LLC- Avalon
Test Date: 3/18/2013 Panel Number : P-4
ETTL Job No.: G 3927-13

Boring No.:		a_p = 0.0314	cm^2	Set Mercury to Pipet Rp at beginning	Permometer Data Equilibrium	1.7	cm^3
Sample No:	Caliche Sample	a_a = 0.7671	cm^2		Pipet Rp	6.7	cm^3
Depth (ft):	unknown	M_1 = 0.0302		C = 0.00043	Annulus Ra	1.5	cm^3
Other Location:	Eddy County, NM	M_2 = 1.0410		T = 0.20151			

Material Description : Grayish White Silty Sand with gravel, (SM)

SAMPLE DATA

					Moisture Content Before Test		After Test	
Wet Wt: of Sample :			571.10	g	Tare No.:	T-19	Tare No.:	T-19
Diameter :	2.87	in	7.28	cm^2	Wet Wt.+tare:	757.32	Wet Wt.+tare	845.11
Length :	3.28	in	8.32	cm	Dry Wt.+tare:	699.05	Dry Wt.+tare:	699.05
Area:	6.46	in^2	41.66	cm^2	Tare Wt:	186.22	Tare Wt:	186.22
Volume :	21.16	in^3	346.82	cm^3	Dry Wt.:	512.83	Dry Wt.:	512.83
Unit Wt.(wet):	102.8	pcf	1.65	g/cm^3	Water Wt.:	58.27	Water Wt.:	146.06
Unit Wt.(dry):	92.3	pcf	1.48	g/cm^3	% moist.:	11.4	% moist.:	28.5

Assumed Specific Gravity: 2.65
Measured B-value: 99.0%
Void ratio (e) = 0.793
Porosity (n)= 0.442

Notes: Sample remolded to its Maximum Index density, ASTM D 4253, with an additional 4.8% water added.

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 2.5 cm Hydraulic Gradient = 3.75

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/18/2013	2	2.5	1.577857	25	0.889	2.73E-04	7.73E-01	
3/18/2013	2	2.25	1.827857	25	0.889	2.60E-04	7.36E-01	
3/18/2013	4	2	2.077857	25	0.889	2.26E-04	6.40E-01	
3/18/2013	6	1.9	2.177857	25	0.889	1.92E-04	5.43E-01	

SUMMARY

k_a = 2.37E-04 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	2.73E-04 cm/sec	14.9	%	$Vm = \frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	2.60E-04 cm/sec	9.3	%	
k3 =	2.26E-04 cm/sec	4.9	%	
k4 =	1.92E-04 cm/sec	19.3	%	

Hydraulic conductivity	k =	2.37E-04	cm/sec	6.73E-01	ft/day
Void Ratio	e =	0.793			
Porosity	n =	0.442			
Bulk Density	γ =	1.65	g/cm^3	102.8	pcf
Water Content	W =	0.168	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	2.43E-09	cm^2	(at 20 deg C)	

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Liquid Limit, Plastic Limit, and Plasticity Index of Soils ASTM D 4318

Method B (One Point Liquid Limit)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Enineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: Gravel Sample
Sample No.: _____ Depth: Unknown ft Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Grayish White Poorly Grade Sand with silty and gravel, (SP-SM)
Sampled By: Client
Technician: Tommy Burns Test Date: 3/15/2013

Test Data

Liquid Limit		
Can No.	33	34
Wet weight + Tare (g)	43.91	39.04
Dry Weight + Tare (g)	38.80	34.83
Tare Weight (g)	15.47	15.58
Dry Weight of Sample (g)	23.33	19.25
Weight of Water (g)	5.11	4.21
Blow Count:	21	22
Water %	21.9	21.9
Liquid Limit (LL)	21.4	21.5

Plastic Limit		
Can No.	35	36
Wet weight + Tare (g)	33.23	32.76
Dry Weight + Tare (g)	30.21	29.91
Tare Weight (g)	15.09	15.44
Dry Weight of Sample (g)	15.12	14.47
Weight of Water (g)	3.02	2.85
Water % = PL	20.0	19.7

Average Liquid Limit (LL)	**22**
Average Plastic Limit (PL)	**20**
Plasticity Index (PI)	**2**

Respectfully submitted

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis ASTM D 6913

Method B

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: **Gravel Sample**
Sample No.: _____ Depth: **unknown** ft Date Sampled: unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Grayish White Poorly Graded Sand with silt and gravel, (SP-SM)
Sampled By: Client
Technician: Tyler Sutherland Test Date: 3/18/2013

Test Data

Sieve Number	Sieve Size (mm)	Accumulated Mass Retained (grams)	Sample Retained (%)	Sample Finer (%)
3"	75	0.00	0.0	100
1-1/2"	37.5	612.5	8.4	91.6
3/4"	19	1084.7	14.9	85.1
1/2"	12.50	1568.1	21.5	78.5
3/8"	9.50	2064.1	28.3	71.7
No. 4	4.75	3370.8	46.3	53.7
No. 10	2.00	4383.3	60.1	39.9
No. 40	0.425	5296.2	72.7	27.3
No. 60	0.250	5796.2	79.5	20.5
No. 100	0.150	6035.2	82.8	17.2
No. 140	0.106	6358.2	87.2	12.8
No. 200	0.075	6436.7	88.3	11.7

Sample Properties		
L.L.	P.L.	P.I.
22	20	2

D 10 (mm)=	N/A
D 15 (mm)=	0.1264
D 30 (mm)=	0.5916
D 50 (mm)=	3.762
D 60 (mm)=	5.660
D 85 (mm)=	18.86
Cu =	N/A
Cc =	N/A
Shape of Particles:	Angular
Hardness of Particles:	Hard

Sample Washed over No. 200 Sieve
Starting Dry Weight: 7,287.50 grams

Respectfully Submitted

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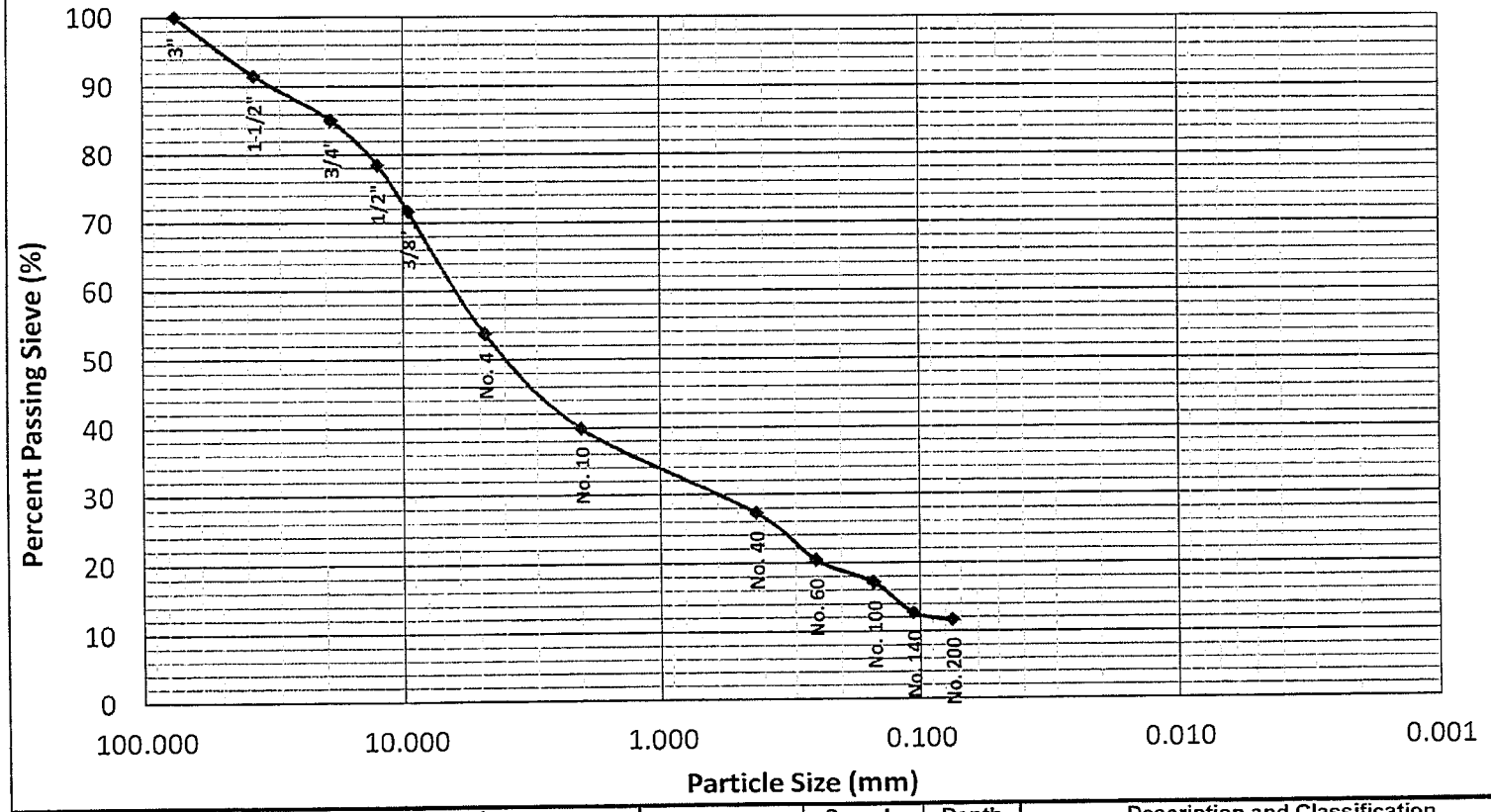
Particle Size Distribution Curve ASTM D 6913



Sieve No.	Dia. (mm)	% Finer
3"	75.000	100
1-1/2"	37.500	91.6
3/4"	19.000	85.1
1/2"	12.500	78.5
3/8"	9.500	71.7
No. 4	4.750	53.7
No. 10	2.000	39.9
No. 40	0.425	27.3
No. 60	0.250	20.5
No. 100	0.150	17.2
No. 140	0.106	12.8
No. 200	0.075	11.7

Sample Properties	
Shape of Particles	
Angular	
Hardness of Particles	
Hard	
L.L.	22
P.L.	20
P.I.	2
D_{85}	18.86
D_{60}	5.660
D_{50}	3.762
D_{30}	0.5916
D_{15}	0.1264
D_{10}	N/A
C_u	N/A
C_c	N/A

		Boring No.	Sample No.	Depth (ft)	Description and Classification	Technician
PROJECT NAME:	R360 Permian Basin, LLC - Avalon					Tyler Sutherland
Client:	Nai Smith Engineers, Inc.				Grayish White Poorly Graded Sand with silt and gravel, (SP-SM)	Date: 03/18/13
ETTL Inc. Job #	G 3927-13	Gravel Sample		unknown		

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Bulk Density / Unit Weight, ASTM D 2937 (modified lab method)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: Gravel Sample
Sample No.: _____ Depth: Unknown ft
Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Grayish White Poorly Graded Sand with silt and gravel, (SP-SM)
Sampled By: Client
Technician: Owen Sanderson
Test Date: 3/14/2012
Remarks: *Remolded to Minimum Index Dnesity, ASTM D 4254*
at As Is Moisture Content, reference attached report page
Material larger than the No. 4 sieve omitted from sample

Test Data

	Diameter (in)	Height (in)	Minimum of 3 Readings
Diameter (top)	2.868	5.966	Height 1
Diameter (Middle)	2.868	5.966	Height 2
Diameter (bottom)	2.868	5.966	Height 3

Ave. Diameter (in)	Ave. Height (in)	Area (in^2)	Volume (in^3)	Wet Wt. (g)	Dry Wt. (g)	Bulk Density Wet Unit Weight (lbf/ft^3)	Dry Unit Weight (lbf/ft^3)
2.868	5.966	6.458	38.53	949.9	926.0	93.9	91.6

Ave. Diameter (mm)	Ave. Height (mm)	Area (mm^2)	Volume (L)	Wet Wt. (Kg)	Dry Wt. (Kg)	Bulk Density Wet Unit Weight (kN/m^3)	Dry Unit Weight (kN/m^3)
72.83	151.54	4166	0.6314	0.9499	0.9260	14.76	14.38

Phase Volumes:

Solids (V_s)	21.37	in^3	Specific Gravity	2.650	Estimated	Tare #	B
Voids (V_v)	17.16	in^3	e - Void Ratio	0.803		Tare Wt (g)	70.05
Water (V_w)	1.462	in^3	η - Porosity	44.5%		Wet Wt.(g)	223.05
						Dry Wt (g)	219.2
						ASTM D 2166, Moisture Content	2.58%
						Degree of Saturation	8.5%

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Bulk Density / Unit Weight, ASTM D 2937 (modified lab method)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: Gravel Sample
Sample No.: _____ Depth: Unknown ft
Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Grayish White Poorly Graded Sand with silt and gravel, (SP-SM)
Sampled By: Client
Technician: Owen Sanderson
Test Date: 3/14/2012
Remarks: *Remolded to Maximum Index Dnesity, ASTM D 4253*
at As Is Moisture Content, reference attached report page
Material larger than the No. 4 sieve omitted from sample

Test Data

	Diameter (in)	Height (in)	Minimum of 3 Readings
Diameter (top)	2.868	4.815	Height 1
Diameter (Middle)	2.868	4.815	Height 2
Diameter (bottom)	2.868	4.815	Height 3

Ave. Diameter (in)	Ave. Height (in)	Area (in^2)	Volume (in^3)	Wet Wt. (g)	Dry Wt. (g)	Bulk Density Wet Unit Weight (lbf/ft^3)	Dry Unit Weight (lbf/ft^3)
2.868	4.815	6.458	31.10	949.9	926.0	116.4	113.4

Ave. Diameter (mm)	Ave. Height (mm)	Area (mm^2)	Volume (L)	Wet Wt. (Kg)	Dry Wt. (Kg)	Bulk Density Wet Unit Weight (kN/m^3)	Dry Unit Weight (kN/m^3)
72.83	122.31	4166	0.5096	0.9499	0.9260	18.28	17.82

Phase Volumes:

Solids (V_s)	21.37	in^3	Specific Gravity	2.650	Estimated	Tare #	B
Voids (V_v)	9.72	in^3	e - Void Ratio	0.455		Tare Wt (g)	70.05
Water (V_w)	1.462	in^3	η - Porosity	31.3%		Wet Wt.(g)	223.05
						Dry Wt (g)	219.2
						ASTM D 2166, Moisture Content	2.58%
						Degree of Saturation	15.0%

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HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test) ASTM D 5084

Project : R360 Permian Basin, LLC- Avalon

Test Date: 3/18/2013 Panel Number : P-4

ETTL Job No.: G 3927-13 Permometer Data

Boring No.:		a_p = 0.0314	cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3
Sample No:	Gravel Sample	a_a = 0.7671	cm^2		Pipet Rp	6.7	cm^3
Depth (ft):	unknown	M_1 = 0.0302		C = 0.00043	Annulus Ra	1.5	cm^3
Other Location:	Eddy County, NM	M_2 = 1.0410		T = 0.20151			

Material Description : Grayish White Poorly Graded Sand with silt and gravel, (SP-SM)

SAMPLE DATA

					Before Test		After Test	
Wet Wt: of Sample :			696.70	g	Tare No.:	T-18	Tare No.:	T-19
Diameter :	2.87	in	7.28	cm^2	Wet Wt.+tare:	843.36	Wet Wt.+tare	909.11
Length :	3.45	in	8.75	cm	Dry Wt.+tare:	792.89	Dry Wt +tare:	792.89
Area:	6.46	in^2	41.66	cm^2	Tare Wt:	146.66	Tare Wt:	146.66
Volume :	22.25	in^3	364.61	cm^3	Dry Wt.:	646.23	Dry Wt.:	646.23
Unit Wt.(wet):	119.2	pcf	1.91	g/cm^3	Water Wt.:	50.47	Water Wt.:	116.22
Unit Wt.(dry):	110.6	pcf	1.77	g/cm^3	% moist.:	7.8	% moist.:	18.0

Assumed Specific Gravity. 2.65
Measured B-value: 99.0%
Void ratio (e) = 0.496
Porosity (n)= 0.332

Notes: Sample remolded to its Maximum Index density, ASTM D 4253, with an additional 5.2% water added.

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 2.5 cm Hydraulic Gradient = 3.56

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/18/2013	2	2.5	1.577857	25	0.889	3.25E-04	9.21E-01	
3/18/2013	2	2.25	1.827857	25	0.889	2.91E-04	8.25E-01	
3/18/2013	4	2	2.077857	25	0.889	2.47E-04	7.00E-01	
3/18/2013	5	1.8	2.277857	25	0.889	2.84E-04	8.04E-01	

SUMMARY

k_a =	2.87E-04	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	3.25E-04	cm/sec	13.4	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	2.91E-04	cm/sec	1.6	%	
k3 =	2.47E-04	cm/sec	13.8	%	
k4 =	2.84E-04	cm/sec	1.1	%	

Hydraulic conductivity	k =	2.87E-04	cm/sec	8.12E-01	ft/day
Void Ratio	e =	0.496			
Porosity	n =	0.332			
Bulk Density	γ =	1.91	g/cm^3	119.2	pcf
Water Content	W =	0.139	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	2.94E-09	cm^2	(at 20 deg C)	

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ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Liquid Limit, Plastic Limit, and Plasticity Index of Soils ASTM D 4318
Method B (One Point Liquid Limit)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Enineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: **Sand Sample**
Sample No.: _____ Depth: **Unknown ft** Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Reddish Brown Silty Sand, (SM)
Sampled By: Client
Technician: Tommy Burns Test Date: 3/15/2013

Test Data

Liquid Limit

Can No.	29	30
Wet weight + Tare (g)	28.83	32.32
Dry Weight + Tare (g)	26.81	29.76
Tare Weight (g)	15.22	15.42
Dry Weight of Sample (g)	11.59	14.34
Weight of Water (g)	2.02	2.56
Blow Count:	20	21
Water %	17.4	17.9
Liquid Limit (LL)	17.0	17.5

Plastic Limit

Can No.	31	32
Wet weight + Tare (g)	32.56	36.7
Dry Weight + Tare (g)	29.6	33.06
Tare Weight (g)	15.23	15.25
Dry Weight of Sample (g)	14.37	17.81
Weight of Water (g)	2.96	3.64
Water % = PL	20.6	20.4

Average Liquid Limit (LL)	**17**
Average Plastic Limit (PL)	**21**
Plasticity Index (PI)	**N/P**

N/P = Non-plastic material

Respectfully submitted

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis ASTM D 6913

Method B

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: **Sand Sample**
Sample No.: _____ Depth: **unknown** ft Date Sampled: unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Reddish Brown Silty Sand, (SM)
Sampled By: Client
Technician: Tyler Sutherland Test Date: 3/18/2013

Test Data

Sieve Number	Sieve Size (mm)	Accumulated Mass Retained (grams)	Sample Retained (%)	Sample Finer (%)
3"	75	0.00	0.0	100
1-1/2"	37.5	0.00	0.0	100
3/4"	19	0.00	0.0	100
1/2"	12.50	0.00	0.0	100
3/8"	9.50	0	0.0	100
No. 4	4.75	0	0.0	100
No. 10	2.00	9.23	3.8	96.2
No. 40	0.425	15.17	6.2	93.8
No. 60	0.250	64.39	26.2	73.8
No. 100	0.150	153.14	62.2	37.8
No. 140	0.106	181.67	73.8	26.2
No. 200	0.075	198.87	80.8	19.2

Sample Properties		
L.L.	P.L.	P.I.
		N/P

D 10 (mm)=	N/A
D 15 (mm)=	N/A
D 30 (mm)=	0.1188
D 50 (mm)=	0.1784
D 60 (mm)=	0.2055
D 85 (mm)=	0.3362
Cu =	N/A
Cc =	N/A
Shape of Particles:	Rounded
Hardness of Particles:	Hard

Sample Washed over No. 200 Sieve
Starting Dry Weight: 246.11 grams

Respectfully Submitted

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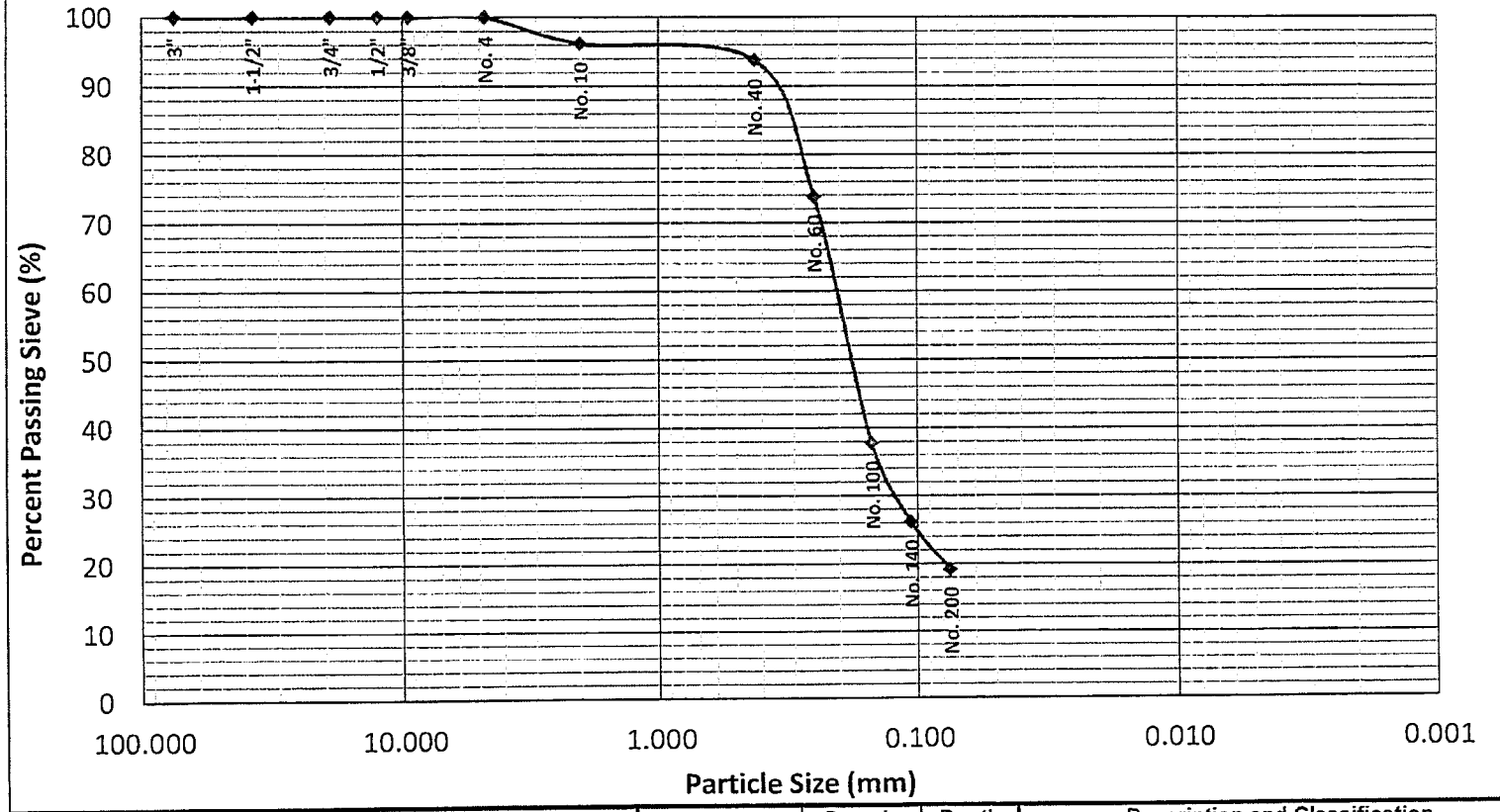
GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle Size Distribution Curve ASTM D 6913



Sieve No.	Dia. (mm)	% Finer
3"	75.000	100
1-1/2"	37.500	100
3/4"	19.000	100
1/2"	12.500	100
3/8"	9.500	100
No. 4	4.750	100
No. 10	2.000	96.2
No. 40	0.425	93.8
No. 60	0.250	73.8
No. 100	0.150	37.8
No. 140	0.106	26.2
No. 200	0.075	19.2

Sample Properties	
Shape of Particles	
Rounded	
Hardness of Particles	
Hard	
L.L.	
P.L.	
P.I.	N/P
D_{85}	0.336
D_{60}	0.2055
D_{50}	0.1784
D_{30}	0.1188
D_{15}	N/A
D_{10}	N/A
C_u	N/A
C_c	N/A

PROJECT NAME:	R360 Permian Basin, LLC - Avalon	Boring No.	Sample No.	Depth (ft)	Description and Classification	Technician
Client:	Nai Smith Engineers, Inc.				Reddish Brown Silty Sand, (SM)	Tyler Sutherland
ETTL Inc. Job #	G 3927-13	Sand Sample		unknown		Date: 03/18/13

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Bulk Density / Unit Weight, ASTM D 2937 (modified lab method)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: Sand Sample
Sample No.: _____ Depth: Unknown ft
Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Reddish Brown Silty Sand, (SM)
Sampled By: Client
Technician: Owen Sanderson
Test Date: 3/14/2012
Remarks: *Remolded to Minimum Index Dnesity, ASTM D 4254*
at As Is Moisture Content, reference attached report page
Material larger than the No. 4 sieve omitted from sample

Test Data

	Diameter (in)	Height (in)	Minimum of 3 Readings
Diameter (top)	2.868	5.966	Height 1
Diameter (Middle)	2.868	5.966	Height 2
Diameter (bottom)	2.868	5.966	Height 3

Ave. Diameter (in)	Ave. Height (in)	Area (in^2)	Volume (in^3)	Wet Wt. (g)	Dry Wt. (g)	Bulk Density Wet Unit Weight (lbf/ft^3)	Dry Unit Weight (lbf/ft^3)
2.868	5.966	6.458	38.53	756.6	732.5	**74.8**	**72.4**

Ave. Diameter (mm)	Ave. Height (mm)	Area (mm^2)	Volume (L)	Wet Wt. (Kg)	Dry Wt. (Kg)	Bulk Density Wet Unit Weight (kN/m^3)	Dry Unit Weight (kN/m^3)
72.83	151.54	4166	0.6314	0.7566	0.7325	11.75	11.38

Phase Volumes:

Solids (V_s)	16.91	in^3	Specific Gravity	2.650	Estimated	Tare #	T-12
Voids (V_v)	21.62	in^3	e - Void Ratio	1.279		Tare Wt (g)	220.07
Water (V_w)	1.470	in^3	η - Porosity	56.1%		Wet Wt.(g)	474.34
						Dry Wt (g)	466.26
						ASTM D 2166, Moisture Content	3.28%
						Degree of Saturation	6.8%

Respectfully submitted

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Bulk Density / Unit Weight, ASTM D 2937 (modified lab method)

Project Information

Project: R360 Permian Basin, LLC - Avalon
Client/Arch./Engr.: Nai Smith Engineers, Inc.
Contractor: Larson & Associates, Inc.
Job No.: G 3927-13

Sample Information

Boring No: Sand Sample
Sample No.: _____ Depth: Unknown ft
Date Sampled: Unknown
Material Origin: Eddy County, New Mexico
Sampling Info. provided By: Client
Material Description: Reddish Brown Silty Sand, (SM)
Sampled By: Client
Technician: Owen Sanderson
Test Date: 3/14/2012
Remarks: *Remolded to Maximum Index Dnesity, ASTM D 4253*
at As Is Moisture Content, reference attached report page
Material larger than the No. 4 sieve omitted from sample

Test Data

	Diameter (in)	Height (in)	Minimum of 3 Readings
Diameter (top)	2.868	4.484	Height 1
Diameter (Middle)	2.868	4.484	Height 2
Diameter (bottom)	2.868	4.484	Height 3

Ave. Diameter (in)	Ave. Height (in)	Area (in^2)	Volume (in^3)	Wet Wt. (g)	Dry Wt. (g)	Bulk Density Wet Unit Weight (lbf/ft^3)	Dry Unit Weight (lbf/ft^3)
2.868	4.484	6.458	28.96	756.6	732.5	99.5	96.4

Ave. Diameter (mm)	Ave. Height (mm)	Area (mm^2)	Volume (L)	Wet Wt. (Kg)	Dry Wt. (Kg)	Bulk Density Wet Unit Weight (kN/m^3)	Dry Unit Weight (kN/m^3)
72.83	113.89	4166	0.4745	0.7566	0.7325	15.64	15.14

Phase Volumes:

Solids (V_s)	16.91	in^3	Specific Gravity	2.650	Estimated	Tare #	T-12
Voids (V_v)	12.05	in^3	e - Void Ratio	0.713		Tare Wt (g)	220.07
Water (V_w)	1.470	in^3	η - Porosity	41.6%		Wet Wt.(g)	474.34
						Dry Wt (g)	466.26
						ASTM D 2166, Moisture Content	3.28%
						Degree of Saturation	12.2%

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test) ASTM D 5084

Project : R360 Permian Basin, LLC- Avalon

Test Date: 3/18/2013 | Panel Number : P-4

ETTL Job No.: G 3927-13 | Permometer Data

Boring No.:		a_p = 0.0314	cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3
Sample No:	Sand Sample	a_a = 0.7671	cm^2		Pipet Rp	6.7	cm^3
Depth (ft):	unknown	M_1 = 0.0302		C = 0.00043	Annulus Ra	1.5	cm^3
Other Location:	Eddy County, NM	M_2 = 1.0410		T = 0.20151			

Material Description : Reddish Brown Silty Sand, (SM)

SAMPLE DATA

					Moisture Content			
					Before Test		After Test	
Wet Wt: of Sample :			563.60	g	Tare No.:	J	Tare No.:	T-17
Diameter :	2.87	in	7.28	cm^2	Wet Wt.+tare:	710.28	Wet Wt.+tare	783.53
Length :	2.99	in	7.60	cm	Dry Wt.+tare:	659.14	Dry Wt.+tare:	659.14
Area:	6.46	in^2	41.66	cm^2	Tare Wt:	146.68	Tare Wt:	146.68
Volume :	19.33	in^3	316.82	cm^3	Dry Wt.:	512.46	Dry Wt.:	512.46
Unit Wt.(wet):	111.0	pcf	1.78	g/cm^{-3}	Water Wt..	51.14	Water Wt.:	124.39
Unit Wt.(dry):	100.9	pcf	1.62	g/cm^{-3}	% moist.:	10.0	% moist.:	24.3

Assumed Specific Gravity: 2.65
Measured B-value: 99.0%
Void ratio (e) = 0.639
Porosity (n)= 0.390

Notes: Sample remolded to its Maximum Index density, ASTM D 4253, with an additional 6.7% water added.

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 2.5 cm Hydraulic Gradient = 4.10

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/18/2013	2	2.5	1.577857	25	0.889	2.12E-04	6.00E-01	
3/18/2013	3	2.25	1.827857	25	0.889	1.90E-04	5.38E-01	
3/18/2013	5	2	2.077857	25	0.889	1.79E-04	5.07E-01	
3/18/2013	8	1.8	2.277857	25	0.889	1.64E-04	4.66E-01	

SUMMARY

	k_a =	1.86E-04	cm/sec	Acceptance criteria =	25 %
	ki			Vm	
k1 =	2.12E-04	cm/sec	13.8	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	1.90E-04	cm/sec	1.9	%	
k3 =	1.79E-04	cm/sec	3.9	%	
k4 =	1.64E-04	cm/sec	11.8	%	

Hydraulic conductivity	k =	**1.86E-04**	cm/sec	**5.28E-01**	ft/day
Void Ratio	e =	**0.64**			
Porosity	n =	**0.390**			
Bulk Density	γ =	**1.779**	g/cm^3	**111.0**	pcf
Water Content	W =	**0.162**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**1.91E-09**	cm^2	(at 20 deg C)	

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APPENDIX D

Water Well Records

STATE OF TEXAS WELL REPORT for Tracking #122867

Owner:	**Zane Kiehne**	Owner Well #:	**No Data**
Address:	**P.O. Box 7 Orla , TX 79770**	Grid #:	**46-03-1**
Well Location:	**17 miles E. of 285 on Hwy 652 TX**	Latitude:	**31° 59' 59" N**
Well County:	**Loving**	Longitude:	**103° 43' 04" W**
Elevation:	**3154 ft.**	GPS Brand Used:	**Garmin**
Type of Work:	**New Well**	Proposed Use:	**Stock**

Drilling Date: Started: **9/14/2007**
Completed: **9/19/2007**

Diameter of Hole: Diameter: **8-3/4 in From Surface To 399 ft**

Drilling Method: **Mud Rotary**

Borehole Completion: Gravel Packed From: **393 ft to 190 ft**
Gravel Pack Size: **3/8 vealmo**

Annular Seal Data: 1st Interval: **From 0 ft to 10 ft with 6 Cement (#sacks and material)**
2nd Interval: **From 170 ft to 190 ft with 8 Hole Plug (#sacks and material)**
3rd Interval: **No Data**
Method Used: **Poured Slurry**
Cemented By: **WTWWS**
Distance to Septic Field or other Concentrated Contamination: **N/A ft**
Distance to Property Line: **N/A ft**
Method of Verification: **N/A**
Approved by Variance: **No Data**

Surface Completion: **Surface Sleeve Installed**

Water Level: Static level: **190 ft. below land surface on 9/20/2007**
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **No Data**

Well Tests: **No Data**

Water Quality: Type of Water: **Fresh**
Depth of Strata: **240-300 / 385-395 ft.**
Chemical Analysis Made: **No**
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **West Texas Water Well Service**
3410 Mankins

	Odessa , TX 79764
Driller License Number:	**4854**
Licensed Well Driller Signature:	**Ronny Keith**
Registered Driller Apprentice Signature:	**Luis Armendariz**
Apprentice Registration Number:	**3030**
Comments:	**No Data**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking **#122867**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft)	To (ft)	Description
0	**5**	**Top Soil**
5	**18**	**White Sandy Caliche**
18	**20**	**Hard White Limestone**
20	**35**	**Brown Sandstone & Sand**
35	**65**	**Loose Brown Sand**
65	**240**	**Red Sand & Shale**
240	**300**	**Loose Red Sand & Water**
300	**385**	**Red Clay**
385	**395**	**Red Sand**
395	**399**	**Red Clay**

CASING, BLANK PIPE & WELL SCREEN DATA

Dia.	New/Used	Type	Setting From/To
5	**New**	**PVC Screen**	**393 - 373 .035**
5	**New**	**PVC Blank**	**373 - 293**
5	**New**	**PVC Screen**	**293 - 233 .035**
5	**New**	**PVC Blank**	**2' AGL - 233**

STATE OF TEXAS WELL REPORT for Tracking #270635

Owner:	CONOCO PHILLIPS	Owner Well #:	JN 2771
Address:	4001 PENBROOK ODESSA , TX 79761	Grid #:	26-59-7
Well Location:	MENTONE , TX 79754	Latitude:	32° 00' 00" N
Well County:	Loving	Longitude:	103° 43' 59" W
Elevation:	No Data	GPS Brand Used:	GARMIN GPS III PLUS
Type of Work:	New Well	Proposed Use:	Rig Supply

Drilling Date: Started: **11/2/2011**
Completed: **11/2/2011**

Diameter of Hole: Diameter: **8.75 in From Surface To 240 ft**

Drilling Method: **Air Rotary**

Borehole Completion: Gravel Packed From: **0 ft to 15 ft**
Gravel Pack Size: **0.02**

Annular Seal Data: 1st Interval: **From 0 ft to 15 ft with 6 BAG CEMENT (#sacks and material)**
2nd Interval: **No Data**
3rd Interval: **No Data**
Method Used: **No Data**
Cemented By: **No Data**
Distance to Septic Field or other Concentrated Contamination: **No Data**
Distance to Property Line: **No Data**
Method of Verification: **No Data**
Approved by Variance: **No Data**

Surface Completion: **Alternative Procedure Used**

Water Level: Static level: **No Data**
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **No Data**

Well Tests: **No Data**

Water Quality: Type of Water: **No Data**
Depth of Strata: **No Data**
Chemical Analysis Made: **No Data**
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **DARRELL CRASS DRILLING**
PO BOX 60031
MIDLAND , TX 79711

Driller License Number:	2752
Licensed Well Driller Signature:	R DARRELL CRASS
Registered Driller Apprentice Signature:	RELLES ALVARADO
Apprentice Registration Number:	57809
Comments:	13 - 18 NOT APPLICABLE

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking #270635) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 - 3 TOP SOIL
3 - 15 CALICHE
15 - 33 SAND
33 - 38 GRAVEL
38 - 50 SANDY CLAY
50 - 60 GRAVEL
60 - 70 SANDY CLAY
70 - 100 SAND
100 - 180 SANDY CLAY
180 - 210 SAND
210 - 230 SANDY CLAY
230 - 240 RED BED

CASING, BLANK PIPE & WELL SCREEN DATA

Dia. New/Used Type Setting From/To
6" NEW PVC PIPE BLANK 0 - 140
6" NEW PVC PIPE SCREEN 140 - 240

STATE OF TEXAS WELL REPORT for Tracking #276294

Owner:	**CONOCO PHILLIPS**	Owner Well #:	**JN 2723**
Address:	**4001 PENBROOK** **ODESSA , TX 79760**	Grid #:	**46-03-1**
Well Location:	**MENTONE , TX 79754**	Latitude:	**31° 59' 56" N**
Well County:	**Loving**	Longitude:	**103° 42' 50" W**
Elevation:	**No Data**	GPS Brand Used:	**GARMIN GPS III PLUS**
Type of Work:	**New Well**	Proposed Use:	**Rig Supply**

Drilling Date: Started: **1/6/2012**
Completed: **1/6/2012**

Diameter of Hole: Diameter: **8.75 in From Surface To 340 ft**

Drilling Method: **Air Rotary**

Borehole Completion: Gravel Packed From: **(No Data) ft to (No Data) ft**
Gravel Pack Size:

Annular Seal Data: 1st Interval: **No Data**
2nd Interval: **No Data**
3rd Interval: **No Data**

Surface Completion: **No Data**

Water Level: Static level: **No Data**
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: The well **was** plugged within 48 hours.
Casing left in well: Cement/Bentonite left in well:
From (ft) To (ft) From (ft) To (ft) Cem/Bent Sacks Used
NO CASING
FILLED HOLE WITH DIRT

Type Of Pump: **No Data**

Well Tests: **No Data**

Water Quality: Type of Water: **No Data**
Depth of Strata: **No Data**
Chemical Analysis Made: **No Data**
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **R DARRELL CRASS**
PO BOX 60031
MIDLAND , TX 79711

Driller License Number: **2752**

Licensed Well Driller Signature:	**R DARRELL CRASS**
Registered Driller Apprentice Signature:	**RON MOTT**
Apprentice Registration Number:	**56409**
Comments:	**9 - 14 NOT APPLICABLE** **16 - 18 NOT APPLICABLE**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking **#276294**) on your written request.

Texas Department of Licensing & Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

DESC. & COLOR OF FORMATION MATERIAL

From (ft) To (ft) Description
0 - 25 CALCHIE
25 - 90 SANDY CLAY
90 - 100 SANDSTONE
100 - 340 CLAY & RED BED

CASING, BLANK PIPE & WELL SCREEN DATA

No Data

APPENDIX E

Analytical Laboratory Report

DHL ANALYTICAL

November 17, 2011

Alexis Johnson
Larson & Associates
507 N. Marienfeld #200
Midland, TX 79701

TEL: (432) 687-0901
FAX: (432) 687-0456

Order No: 1111076

RE:

Dear Alexis Johnson:

DHL Analytical received 1 sample(s) on 11/9/2011 for the analyses presented in the following report.

There were no problems with the analyses and all data met requirements of NELAC except where noted in the Case Narrative. All non-NELAC methods will be identified accordingly in the case narrative and all estimated uncertainties of test results are within method or EPA specifications.

If you have any questions regarding these tests results, please feel free to call. Thank you for using DHL Analytical.

Sincerely,

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-11-7

ACCREDITED IN ACCORDANCE WITH nelac

Table of Contents

CHAIN-OF-CUSTODY

Larson & Associates, Inc.
Environmental Consultants

507 N. Marienfeld, Ste. 200
Midland, TX 79701
432-687-0901

Data Reported to: A. Johnson

DATE: 11-7-11 PAGE 1 OF 1
PO #: _____ LAB WORK ORDER #: 1111076
PROJECT LOCATION OR NAME: _____
LAI PROJECT #: 11-0131-01 COLLECTOR: D. Maloney

TRRP report? ☐ Yes ☐ No

TIME ZONE: Time zone/State: MST/NM

S=SOIL W=WATER A=AIR P=PAINT SL=SLUDGE OT=OTHER

Field Sample I.D.	Lab #	Date	Time	Matrix	# of Containers	PRESERVATION: HCl	HNO_3	H_2SO_4 ☐ NaOH ☐	ICE	UNPRESERVED	ANALYSES: BTEX ☐ MTBE ☐	TRPH 418.1 ☐ TPH 1005 ☐ TPH 1006 ☐	GASOLINE MOD 8015 ☐	DIESEL - MOD 8015 ☐	VOC 8260 ☐	SVOC 8270 ☐	8081 PESTICIDES ☐	8082 PCBS ☐	TCLP - METALS (RCRA) ☐	TCLP - PEST ☐	TOTAL METALS (RCRA) ☐	LEAD - TOTAL ☐	RCI ☐	TDS ☐	pH ☐	EXPLOSIVES ☐	CHLORIDES ☐	Sulfate, Nitrate	FIELD NOTES
Wind Mill	01	11-7-11	1330	W	10	X	X		X		✓									✓				✓	✓				Filtered with 45 per Alexis
																												60
TOTAL																												

RELINQUISHED BY:(Signature) _____ DATE/TIME 11-7-11 0800 RECEIVED BY: (Signature) _____
RELINQUISHED BY:(Signature) _____ DATE/TIME 11/9/11 830 RECEIVED BY: (Signature) _____
RELINQUISHED BY:(Signature) _____ DATE/TIME _____ RECEIVED BY: (Signature) _____

TURN AROUND TIME
NORMAL ☑
1 DAY ☐
2 DAY ☐
OTHER ☐

LABORATORY USE ONLY:
RECEIVING TEMP: 1.1 THERM #: 57
CUSTODY SEALS - ☐ BROKEN ☑ INTACT ☐ NOT USED
☑ CARRIER BILL # _____
☐ HAND DELIVERED

Lone Star Overnight

Airbill No. Z8049199

Lone Star Overnight
800.800.8984
www.lso.com

To: SAMPLE RECEIVING
DHL ANALYTICAL
2300 DOUBLE CREEK DRIVE
ROUND ROCK, TX 78664
(512) 388 - 8222

From: ALEXIS JOHNSON
LARSON AND ASSOCIATES
507 N MARIENFELD
SUITE 200
MIDLAND, TX 79701
(432) 687 - 0901

Service Type: By 10:30am
1D00V

AUS

By 10:30am

QuickCode: DHL
Date Printed: 11/8/2011
Billing Ref 1: 11-0131-01

CUSTODY SEAL
DATE
SIGNATURE

QEC
Quality Environmental Containers
800-255-3950 • 304-255-3900

DHL Analytical

Sample Receipt Checklist

Client Name Larson & Associates | Date Received: 11/9/2011

Work Order Number 1111078 | Received by JB

Checklist completed by: _____ 11/9/11 (Signature / Date) | Reviewed by SS 11-LT-11 (Initials / Date)

Carrier name: LoneStar

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	1.1 °C
Water - VOA vials have zero headspace?	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Adjusted? _____ Checked by _____

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

Page 1 of 1

CLIENT: Larson & Associates
Project:
Lab Order: 1111076

CASE NARRATIVE

Sample was analyzed using the methods outlined in the following references:

Method SW6020 - Metals Analysis
Method SW7470A - Mercury Analysis
Method SW8021B - Volatile Organics by GC Analysis
Method E300 - Anions Analysis
Method M2320 B (18th Edition) - Alkalinity Analysis
Method M2540C (18th Edition) - TDS Analysis

LOG IN

The sample was received and log-in performed on 11/9/11. A total of 1 sample was received. The Time of Collection was Mountain Standard Time. The sample arrived in good condition and was properly packaged. All method blanks, sample duplicates, laboratory spikes, and/or matrix spikes met quality assurance objectives.

DHL Analytical

Date: 11/17/11

CLIENT: Larson & Associates
Project:
Lab Order: 1111076

Work Order Sample Summary

Lab Smp ID	Client Sample ID	Tag Number	Date Collected	Date Recv'd
1111076-01	Windmill		11/07/11 01:30 PM	11/09/11

CLIENT: Larson & Associates
Project:
Lab Order: 1111076

PREP DATES REPORT

Sample ID	Client Sample ID	Collection Date	Matrix	Test Number	Test Name	Prep Date	Batch ID
1111076-01A	Windmill	11/07/11 01:30 PM	Aqueous	SW5030C	Purge and Trap Water GC	11/09/11 04:52 PM	49109
1111076-01B	Windmill	11/07/11 01:30 PM	Aqueous	SW7470A	Mercury Aq Prep, Total	11/09/11 09:07 AM	49092
	Windmill	11/07/11 01:30 PM	Aqueous	SW3005A	Aq Prep Metals: Dissolved	11/11/11 08:53 AM	49140
1111076-01C	Windmill	11/07/11 01:30 PM	Aqueous	E300	Anion Preparation	11/09/11 11:00 AM	49099
	Windmill	11/07/11 01:30 PM	Aqueous	E300	Anion Preparation	11/09/11 11:00 AM	49099
	Windmill	11/07/11 01:30 PM	Aqueous	M2320 B	Alkalinity Preparation	11/09/11 01:00 PM	49100
	Windmill	11/07/11 01:30 PM	Aqueous	M2540C	TDS Preparation	11/11/11 04:20 PM	49153

CLIENT: Larson & Associates
Project:
Lab Order: 1111076

ANALYTICAL DATES REPORT

Sample ID	Client Sample ID	Matrix	Test Number	Test Name	Batch ID	Dilution	Analysis Date	Run ID
1111076-01A	Windmill	Aqueous	SW8021B	Volatile Organics by GC	49109	1	11/09/11 06:39 PM	GC8_111109B
1111076-01B	Windmill	Aqueous	SW6020	Dissolved Metals-ICPMS (0.45µ)	49140	1	11/15/11 06:09 PM	ICP-MS3_111115B
	Windmill	Aqueous	SW7470A	Mercury Filtered (0.45µ)	49092	1	11/10/11 02:11 PM	CETAC_HG_111110B
1111076-01C	Windmill	Aqueous	M2320 B	Alkalinity	49100	1	11/09/11 01:49 PM	TITRATOR_111109B
	Windmill	Aqueous	E300	Anions by IC method - Water	49099	10	11/09/11 11:23 AM	IC_111109A
	Windmill	Aqueous	E300	Anions by IC method - Water	49099	1	11/09/11 11:55 AM	IC_111109A
	Windmill	Aqueous	M2540C	Total Dissolved Solids	49153	1	11/14/11 09:15 AM	WC_111111C

CLIENT: Larson & Associates
Project:
Project No: 11-0131-01
Lab Order: 1111076

Client Sample ID: Windmill
Lab ID: 1111076-01
Collection Date: 11/07/11 01:30 PM
Matrix: Aqueous

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
Volatile Organics by GC		**SW8021B**					**Analyst: DEW**
Benzene	ND	0.000800	0.00200		mg/L	1	11/09/11 06:39 PM
Ethylbenzene	ND	0.00200	0.00600		mg/L	1	11/09/11 06:39 PM
Toluene	ND	0.00200	0.00600		mg/L	1	11/09/11 06:39 PM
Xylenes, Total	ND	0.00300	0.00900		mg/L	1	11/09/11 06:39 PM
Surr: a,a,a-Trifluorotoluene	103	0	87 - 113		%REC	1	11/09/11 06:39 PM
Mercury Filtered (0.45µ)		**SW7470A**					**Analyst: LM**
Mercury	ND	0.0000800	0.000200		mg/L	1	11/10/11 02:11 PM
Dissolved Metals-ICPMS (0.45µ)		**SW6020**					**Analyst: AJR**
Arsenic	ND	0.00200	0.00600		mg/L	1	11/15/11 06:09 PM
Barium	0.178	0.00300	0.0100		mg/L	1	11/15/11 06:09 PM
Cadmium	ND	0.000300	0.00100		mg/L	1	11/15/11 06:09 PM
Chromium	ND	0.00200	0.00600		mg/L	1	11/15/11 06:09 PM
Lead	ND	0.000300	0.00100		mg/L	1	11/15/11 06:09 PM
Selenium	0.00283	0.00200	0.00600		mg/L	1	11/15/11 06:09 PM
Silver	ND	0.00100	0.00200		mg/L	1	11/15/11 06:09 PM
Anions by IC method - Water		**E300**					**Analyst: JBC**
Chloride	35.3	0.300	1.00		mg/L	1	11/09/11 11:55 AM
Nitrate-N	2.71	0.100	0.500		mg/L	1	11/09/11 11:55 AM
Sulfate	190	10.0	30.0		mg/L	10	11/09/11 11:23 AM
Alkalinity		**M2320 B**					**Analyst: JBC**
Alkalinity, Bicarbonate (As CaCO3)	175	10.0	20.0		mg/L	1	11/09/11 01:49 PM
Alkalinity, Carbonate (As CaCO3)	ND	10.0	20.0		mg/L	1	11/09/11 01:49 PM
Alkalinity, Hydroxide (As CaCO3)	ND	10.0	20.0		mg/L	1	11/09/11 01:49 PM
Alkalinity, Total (As CaCO3)	175	10.0	20.0		mg/L	1	11/09/11 01:49 PM
Total Dissolved Solids		**M2540C**					**Analyst: JCG**
Total Dissolved Solids (Residue, Filterable)	589	10.0	10.0		mg/L	1	11/14/11 09:15 AM

Qualifiers:

*	Value exceeds TCLP Maximum Concentration Level	J	Analyte detected between MDL and RL
B	Analyte detected in the associated Method Blank	MDL	Method Detection Limit
C	Sample Result or QC discussed in the Case Narrative	N	Parameter not NELAC certified
DF	Dilution Factor	ND	Not Detected at the Method Detection Limit
E	TPH pattern not Gas or Diesel Range Pattern	RL	Reporting Limit
		S	Spike Recovery outside control limits

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: GC8_111109B

Sample ID:	LCS-49109	Batch ID:	49109		TestNo:		SW8021B		Units:	mg/L
SampType:	LCS	Run ID:	GC8_111109B		Analysis Date:		11/09/11 05:57 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Benzene		0.0507	0.00200	0.0500	0	101	81	125		
Toluene		0.0516	0.00600	0.0500	0	103	84	123		
Ethylbenzene		0.0513	0.00600	0.0500	0	103	83	119		
Xylenes, Total		0.153	0.00900	0.150	0	102	81	117		
Surr: a,a,a-Trifluorotoluene		195		200.0		97.3	87	113		

Sample ID:	MB-49109	Batch ID:	49109		TestNo:		SW8021B		Units:	mg/L
SampType:	MBLK	Run ID:	GC8_111109B		Analysis Date:		11/09/11 06:17 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Benzene		ND	0.00200							
Toluene		ND	0.00600							
Ethylbenzene		ND	0.00600							
Xylenes, Total		ND	0.00900							
Surr: a,a,a-Trifluorotoluene		194		200.0		96.8	87	113		

Sample ID:	1111076-01AMS	Batch ID:	49109		TestNo:		SW8021B		Units:	mg/L
SampType:	MS	Run ID:	GC8_111109B		Analysis Date:		11/09/11 07:00 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Benzene		0.0496	0.00200	0.0500	0	99.3	81	125		
Toluene		0.0500	0.00600	0.0500	0	99.9	84	123		
Ethylbenzene		0.0494	0.00600	0.0500	0	98.7	83	119		
Xylenes, Total		0.148	0.00900	0.150	0	98.4	81	117		
Surr: a,a,a-Trifluorotoluene		193		200.0		96.3	87	113		

Sample ID:	1111076-01AMSD	Batch ID:	49109		TestNo:		SW8021B		Units:	mg/L
SampType:	MSD	Run ID:	GC8_111109B		Analysis Date:		11/09/11 07:21 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Benzene		0.0527	0.00200	0.0500	0	105	81	125	5.94	20
Toluene		0.0529	0.00600	0.0500	0	106	84	123	5.73	20
Ethylbenzene		0.0505	0.00600	0.0500	0	101	83	119	2.30	20
Xylenes, Total		0.150	0.00900	0.150	0	100	81	117	1.62	20
Surr: a,a,a-Trifluorotoluene		203		200.0		102	87	113	0	0

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: GC8_111109B

Sample ID:	ICV-111109	Batch ID:	R57766		TestNo:		SW8021B		Units:		mg/L
SampType:	ICV	Run ID:	GC8_111109B		Analysis Date:		11/09/11 05:36 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Benzene		0.0929	0.00200	0.100	0	92.9	80	120			
Toluene		0.0931	0.00600	0.100	0	93.1	80	120			
Ethylbenzene		0.0943	0.00600	0.100	0	94.3	80	120			
Xylenes, Total		0.283	0.00900	0.300	0	94.2	80	120			
Surr: a,a,a-Trifluorotoluene		194		200.0		97.1	87	113			

Sample ID:	CCV1-111109	Batch ID:	R57766		TestNo:		SW8021B		Units:		mg/L
SampType:	CCV	Run ID:	GC8_111109B		Analysis Date:		11/09/11 07:42 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Benzene		0.0542	0.00200	0.0500	0	108	80	120			
Toluene		0.0540	0.00600	0.0500	0	108	80	120			
Ethylbenzene		0.0520	0.00600	0.0500	0	104	80	120			
Xylenes, Total		0.155	0.00900	0.150	0	104	80	120			
Surr: a,a,a-Trifluorotoluene		207		200.0		104	87	113			

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: CETAC_HG_111110B

Sample ID:	MB-49092	Batch ID:	49092		TestNo:		SW7470A		Units:		mg/L
SampType:	MBLK	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 01:36 PM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		ND	0.000200								
Sample ID:	LCS-49092	Batch ID:	49092		TestNo:		SW7470A		Units:		mg/L
SampType:	LCS	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 01:42 PM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0.00195	0.000200	0.00200	0	97.5	85	115			
Sample ID:	LCSD-49092	Batch ID:	49092		TestNo:		SW7470A		Units:		mg/L
SampType:	LCSD	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 01:44 PM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0.00198	0.000200	0.00200	0	99.0	85	115	1.53	15	
Sample ID:	1111038-01A SD	Batch ID:	49092		TestNo:		SW7470A		Units:		mg/L
SampType:	SD	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 01:52 PM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0	0.0100	0	0				0	10	
Sample ID:	1111038-01A PDS	Batch ID:	49092		TestNo:		SW7470A		Units:		mg/L
SampType:	PDS	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 01:54 PM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0.0215	0.00200	0.0250	0	86.0	85	115			
Sample ID:	1111038-01A MS	Batch ID:	49092		TestNo:		SW7470A		Units:		mg/L
SampType:	MS	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 02:01 PM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0.0186	0.00200	0.0200	0	93.0	80	120			
Sample ID:	1111038-01A MSD	Batch ID:	49092		TestNo:		SW7470A		Units:		mg/L
SampType:	MSD	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 02:03 PM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0.0194	0.00200	0.0200	0	97.0	80	120	4.21	15	

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: CETAC_HG_111110B

Sample ID:	ICV-111110	Batch ID:	R57788		TestNo:		SW7470A		Units:		mg/L
SampType:	ICV	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 01:32 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0.00385	0.000200	0.00400	0	96.2	90	110			
Sample ID:	CCV1-111110	Batch ID:	R57788		TestNo:		SW7470A		Units:		mg/L
SampType:	CCV	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 01:57 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0.00194	0.000200	0.00200	0	97.0	90	110			
Sample ID:	CCV2-111110	Batch ID:	R57788		TestNo:		SW7470A		Units:		mg/L
SampType:	CCV	Run ID:	CETAC_HG_111110B		Analysis Date:		11/10/11 02:21 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Mercury		0.00194	0.000200	0.00200	0	97.0	90	110			

Qualifiers:

B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
DF	Dilution Factor	RL	Reporting Limit
J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
MDL	Method Detection Limit	J	Analyte detected between SDL and RL
ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS3_111115B

Sample ID:	MB-49140	Batch ID:	49140		TestNo:		SW6020		Units:		mg/L
SampType:	MBLK	Run ID:	ICP-MS3_111115B		Analysis Date:		11/15/11 05:36 PM		Prep Date:		11/11/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic		ND	0.00600								
Barium		ND	0.0100								
Cadmium		ND	0.00100								
Chromium		ND	0.00600								
Lead		ND	0.00100								
Selenium		ND	0.00600								
Silver		ND	0.00200								

Sample ID:	LCS-49140	Batch ID:	49140		TestNo:		SW6020		Units:		mg/L
SampType:	LCS	Run ID:	ICP-MS3_111115B		Analysis Date:		11/15/11 05:41 PM		Prep Date:		11/11/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic		0.202	0.00600	0.200	0	101	80	120			
Barium		0.195	0.0100	0.200	0	97.6	80	120			
Cadmium		0.196	0.00100	0.200	0	98.2	80	120			
Chromium		0.198	0.00600	0.200	0	99.0	80	120			
Lead		0.193	0.00100	0.200	0	96.6	80	120			
Selenium		0.194	0.00600	0.200	0	96.8	80	120			
Silver		0.198	0.00200	0.200	0	98.8	80	120			

Sample ID:	LCSD-49140	Batch ID:	49140		TestNo:		SW6020		Units:		mg/L
SampType:	LCSD	Run ID:	ICP-MS3_111115B		Analysis Date:		11/15/11 05:47 PM		Prep Date:		11/11/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic		0.199	0.00600	0.200	0	99.4	80	120	1.70	15	
Barium		0.195	0.0100	0.200	0	97.6	80	120	0.102	15	
Cadmium		0.197	0.00100	0.200	0	98.6	80	120	0.407	15	
Chromium		0.192	0.00600	0.200	0	96.1	80	120	2.97	15	
Lead		0.194	0.00100	0.200	0	97.0	80	120	0.413	15	
Selenium		0.190	0.00600	0.200	0	94.9	80	120	2.03	15	
Silver		0.197	0.00200	0.200	0	98.6	80	120	0.152	15	

Sample ID:	1111086-06A SD	Batch ID:	49140		TestNo:		SW6020		Units:		mg/L
SampType:	SD	Run ID:	ICP-MS3_111115B		Analysis Date:		11/15/11 06:04 PM		Prep Date:		11/11/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic		0	0.0300	0	0				0	10	
Barium		0.0486	0.0500	0	0.0483				0.557	10	
Cadmium		0	0.00500	0	0.000485				0	10	
Chromium		0	0.0300	0	0				0	10	
Lead		0	0.00500	0	0				0	10	
Selenium		0	0.0300	0	0				0	10	
Silver		0	0.0100	0	0				0	10	

Sample ID:	1111086-06A PDS	Batch ID:	49140		TestNo:		SW6020		Units:		mg/L
SampType:	PDS	Run ID:	ICP-MS3_111115B		Analysis Date:		11/15/11 06:49 PM		Prep Date:		11/11/11

Qualifiers:

B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
DF	Dilution Factor	RL	Reporting Limit
J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
MDL	Method Detection Limit	J	Analyte detected between SDL and RL
ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS3_111115B

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic	0.227	0.00600	0.200	0	113	75	125			
Barium	0.242	0.0100	0.200	0.0483	97.0	75	125			
Cadmium	0.195	0.00100	0.200	0.00048	597.2	75	125			
Chromium	0.179	0.00600	0.200	0	89.4	75	125			
Lead	0.191	0.00100	0.200	0	95.4	75	125			
Selenium	0.205	0.00600	0.200	0	103	75	125			
Silver	0.194	0.00200	0.200	0	97.0	75	125			

Sample ID:	1111086-06A MS	Batch ID:	49140	TestNo:	SW6020	Units:	mg/L
SampType:	MS	Run ID:	ICP-MS3_111115B	Analysis Date:	11/15/11 06:54 PM	Prep Date:	11/11/11

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic	0.226	0.00600	0.200	0	113	80	120			
Barium	0.247	0.0100	0.200	0.0483	99.3	80	120			
Cadmium	0.198	0.00100	0.200	0.00048	599.0	80	120			
Chromium	0.179	0.00600	0.200	0	89.6	80	120			
Lead	0.193	0.00100	0.200	0	96.4	80	120			
Selenium	0.208	0.00600	0.200	0	104	80	120			
Silver	0.191	0.00200	0.200	0	95.3	80	120			

Sample ID:	1111086-06A MSD	Batch ID:	49140	TestNo:	SW6020	Units:	mg/L
SampType:	MSD	Run ID:	ICP-MS3_111115B	Analysis Date:	11/15/11 07:00 PM	Prep Date:	11/11/11

Analyte	Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic	0.230	0.00600	0.200	0	115	80	120	1.45	15	
Barium	0.243	0.0100	0.200	0.0483	97.4	80	120	1.51	15	
Cadmium	0.197	0.00100	0.200	0.00048	598.3	80	120	0.708	15	
Chromium	0.180	0.00600	0.200	0	90.2	80	120	0.723	15	
Lead	0.195	0.00100	0.200	0	97.5	80	120	1.13	15	
Selenium	0.209	0.00600	0.200	0	104	80	120	0.528	15	
Silver	0.188	0.00200	0.200	0	94.1	80	120	1.27	15	

Qualifiers:

B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
DF	Dilution Factor	RL	Reporting Limit
J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
MDL	Method Detection Limit	J	Analyte detected between SDL and RL
ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: ICP-MS3_111115B

Sample ID:	ICV1-111115	Batch ID:	R57853		TestNo:		SW6020		Units:		mg/L
SampType:	ICV	Run ID:	ICP-MS3_111115B		Analysis Date:		11/15/11 01:09 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic		0.0962	0.00600	0.100	0	96.2	90	110			
Barium		0.0960	0.0100	0.100	0	96.0	90	110			
Cadmium		0.0974	0.00100	0.100	0	97.4	90	110			
Chromium		0.100	0.00600	0.100	0	100	90	110			
Lead		0.0960	0.00100	0.100	0	96.0	90	110			
Selenium		0.0976	0.00600	0.100	0	97.6	90	110			
Silver		0.104	0.00200	0.100	0	104	90	110			

Sample ID:	CCV2-111115	Batch ID:	R57853		TestNo:		SW6020		Units:		mg/L
SampType:	CCV	Run ID:	ICP-MS3_111115B		Analysis Date:		11/15/11 04:48 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic		0.205	0.00600	0.200	0	103	90	110			
Barium		0.196	0.0100	0.200	0	98.2	90	110			
Cadmium		0.200	0.00100	0.200	0	100	90	110			
Chromium		0.192	0.00600	0.200	0	96.1	90	110			
Lead		0.193	0.00100	0.200	0	96.6	90	110			
Selenium		0.199	0.00600	0.200	0	99.7	90	110			
Silver		0.201	0.00200	0.200	0	101	90	110			

Sample ID:	CCV3-111115	Batch ID:	R57853		TestNo:		SW6020		Units:		mg/L
SampType:	CCV	Run ID:	ICP-MS3_111115B		Analysis Date:		11/15/11 07:17 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Arsenic		0.210	0.00600	0.200	0	105	90	110			
Barium		0.189	0.0100	0.200	0	94.6	90	110			
Cadmium		0.192	0.00100	0.200	0	96.2	90	110			
Chromium		0.194	0.00600	0.200	0	96.8	90	110			
Lead		0.186	0.00100	0.200	0	93.0	90	110			
Selenium		0.195	0.00600	0.200	0	97.6	90	110			
Silver		0.195	0.00200	0.200	0	97.4	90	110			

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: IC_111109A

Sample ID:	LCS-49099	Batch ID:	49099		TestNo:		E300		Units:		mg/L
SampType:	LCS	Run ID:	IC_111109A		Analysis Date:		11/09/11 09:25 AM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Chloride		10.2	1.00	10.00	0	102	90	110			
Nitrate-N		5.25	0.500	5.000	0	105	90	110			
Sulfate		30.8	3.00	30.00	0	103	90	110			

Sample ID:	LCSD-49099	Batch ID:	49099		TestNo:		E300		Units:		mg/L
SampType:	LCSD	Run ID:	IC_111109A		Analysis Date:		11/09/11 09:37 AM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Chloride		10.2	1.00	10.00	0	102	90	110	0.124	20	
Nitrate-N		5.27	0.500	5.000	0	105	90	110	0.309	20	
Sulfate		30.8	3.00	30.00	0	103	90	110	0.026	20	

Sample ID:	MB-49099	Batch ID:	49099		TestNo:		E300		Units:		mg/L
SampType:	MBLK	Run ID:	IC_111109A		Analysis Date:		11/09/11 09:49 AM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Chloride		ND	1.00								
Nitrate-N		ND	0.500								
Sulfate		ND	3.00								

Sample ID:	1111073-01D MS	Batch ID:	49099		TestNo:		E300		Units:		mg/L
SampType:	MS	Run ID:	IC_111109A		Analysis Date:		11/09/11 10:25 AM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Nitrate-N		5.46	0.500	5.000	0.4300	101	90	110			
Sulfate		59.2	3.00	30.00	28.11	104	90	110			

Sample ID:	1111073-01D MSD	Batch ID:	49099		TestNo:		E300		Units:		mg/L
SampType:	MSD	Run ID:	IC_111109A		Analysis Date:		11/09/11 10:37 AM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Nitrate-N		5.47	0.500	5.000	0.4300	101	90	110	0.055	20	
Sulfate		58.8	3.00	30.00	28.11	102	90	110	0.755	20	

Sample ID:	1111073-01D MS	Batch ID:	49099		TestNo:		E300		Units:		mg/L
SampType:	MS	Run ID:	IC_111109A		Analysis Date:		11/09/11 11:00 AM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Chloride		176	10.0	100.0	78.67	97.4	90	110			

Sample ID:	1111073-01D MSD	Batch ID:	49099		TestNo:		E300		Units:		mg/L
SampType:	MSD	Run ID:	IC_111109A		Analysis Date:		11/09/11 11:12 AM		Prep Date:		11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Chloride		176	10.0	100.0	78.67	97.4	90	110	0.000	20	

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: IC_111109A

Sample ID:	ICV-111109	Batch ID:	R57758		TestNo:		E300		Units:		mg/L
SampType:	ICV	Run ID:	IC_111109A		Analysis Date:		11/09/11 09:08 AM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Chloride		25.9	1.00	25.00	0	104	90	110			
Nitrate-N		13.4	0.500	12.50	0	107	90	110			
Sulfate		79.3	3.00	75.00	0	106	90	110			

Sample ID:	CCV1-111109	Batch ID:	R57758		TestNo:		E300		Units:		mg/L
SampType:	CCV	Run ID:	IC_111109A		Analysis Date:		11/09/11 11:43 AM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Chloride		10.2	1.00	10.00	0	102	90	110			
Nitrate-N		5.28	0.500	5.000	0	106	90	110			
Sulfate		31.2	3.00	30.00	0	104	90	110			

Sample ID:	CCV2-111109	Batch ID:	R57758		TestNo:		E300		Units:		mg/L
SampType:	CCV	Run ID:	IC_111109A		Analysis Date:		11/09/11 12:06 PM		Prep Date:		
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Chloride		10.2	1.00	10.00	0	102	90	110			
Nitrate-N		5.24	0.500	5.000	0	105	90	110			

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: TITRATOR_111109B

Sample ID:	LCS-49100	Batch ID:	49100		TestNo:		M2320 B		Units:	mg/L
SampType:	LCS	Run ID:	TITRATOR_111109B		Analysis Date:		11/09/11 01:36 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Alkalinity, Total (As CaCO3)		50.8	20.0	50.00	0	102	74	129		

Sample ID:	MB-49100	Batch ID:	49100		TestNo:		M2320 B		Units:	mg/L
SampType:	MBLK	Run ID:	TITRATOR_111109B		Analysis Date:		11/09/11 01:38 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Alkalinity, Bicarbonate (As CaCO3)		ND	20.0							
Alkalinity, Carbonate (As CaCO3)		ND	20.0							
Alkalinity, Hydroxide (As CaCO3)		ND	20.0							
Alkalinity, Total (As CaCO3)		ND	20.0							

Sample ID:	1111073-01D DUP	Batch ID:	49100		TestNo:		M2320 B		Units:	mg/L
SampType:	DUP	Run ID:	TITRATOR_111109B		Analysis Date:		11/09/11 01:45 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Alkalinity, Bicarbonate (As CaCO3)		94.9	20.0	0	95.40				0.525	20
Alkalinity, Carbonate (As CaCO3)		0	20.0	0	0				0	20
Alkalinity, Hydroxide (As CaCO3)		0	20.0	0	0				0	20
Alkalinity, Total (As CaCO3)		94.9	20.0	0	95.40				0.525	20

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: TITRATOR_111109B

Sample ID:	ICV-111109	Batch ID:	R57760		TestNo:		M2320 B		Units:	mg/L
SampType:	ICV	Run ID:	TITRATOR_111109B		Analysis Date:		11/09/11 01:32 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Alkalinity, Bicarbonate (As CaCO3)		6.08	20.0	0						
Alkalinity, Carbonate (As CaCO3)		93.8	20.0	0						
Alkalinity, Hydroxide (As CaCO3)		0	20.0	0						
Alkalinity, Total (As CaCO3)		99.8	20.0	100.0	0	99.8	98	102		

Sample ID:	CCV-111109	Batch ID:	R57760		TestNo:		M2320 B		Units:	mg/L
SampType:	CCV	Run ID:	TITRATOR_111109B		Analysis Date:		11/09/11 01:54 PM		Prep Date:	11/09/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit Qual
Alkalinity, Bicarbonate (As CaCO3)		9.28	20.0	0						
Alkalinity, Carbonate (As CaCO3)		90.7	20.0	0						
Alkalinity, Hydroxide (As CaCO3)		0	20.0	0						
Alkalinity, Total (As CaCO3)		100	20.0	100.0	0	100	90	110		

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

CLIENT: Larson & Associates
Work Order: 1111076
Project:

ANALYTICAL QC SUMMARY REPORT

RunID: WC_111111C

Sample ID:	LCS-49153	Batch ID:	49153		TestNo:		M2540C		Units:		mg/L
SampType:	LCS	Run ID:	WC_111111C		Analysis Date:		11/14/11 09:15 AM		Prep Date:		11/11/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Total Dissolved Solids (Residue, Fi		826	10.0	745.6	0	111	90	113			

Sample ID:	MB-49153	Batch ID:	49153		TestNo:		M2540C		Units:		mg/L
SampType:	MBLK	Run ID:	WC_111111C		Analysis Date:		11/14/11 09:15 AM		Prep Date:		11/11/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Total Dissolved Solids (Residue, Fi		ND	10.0								

Sample ID:	1111088-01EDUP	Batch ID:	49153		TestNo:		M2540C		Units:		mg/L
SampType:	DUP	Run ID:	WC_111111C		Analysis Date:		11/14/11 09:15 AM		Prep Date:		11/11/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Total Dissolved Solids (Residue, Fi		376	10.0	0	375.0				0.266	5	

Sample ID:	1111093-01CDUP	Batch ID:	49153		TestNo:		M2540C		Units:		mg/L
SampType:	DUP	Run ID:	WC_111111C		Analysis Date:		11/14/11 09:15 AM		Prep Date:		11/11/11
Analyte		Result	RL	SPK value	Ref Val	%REC	LowLimit	HighLimit	%RPD	RPD Limit	Qual
Total Dissolved Solids (Residue, Fi		742	10.0	0	755.0				1.74	5	

Qualifiers:				
	B	Analyte detected in the associated Method Blank	R	RPD outside accepted control limits
	DF	Dilution Factor	RL	Reporting Limit
	J	Analyte detected between MDL and RL	S	Spike Recovery outside control limits
	MDL	Method Detection Limit	J	Analyte detected between SDL and RL
	ND	Not Detected at the Method Detection Limit	N	Parameter not NELAC certified

APPENDIX F

Boring Logs

(SB-1 through SB-4 and SB-13)

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
		Latitude : N 32° 00' 21.68" Longitude: W 103° 44' 16.9" Elevation : 3124.00'				Soil Boring - No Well Completed
	0					
	1.0	Silt: Strong Brown (7.5YR 5/6) very fine grained quartz sand, loose, dry	ML			
		Caliche: Pinkish White (7.5YR 8/2) sandy, very fine grained quartz sand, loose to indurated, soft to moderately hard, dry	Caliche			
	5					
	7.0	Gravel: Gray to Reddish Gray (5YR 5/1 to 5/2) quartz pebbles and cobbles , round, 30mm to 60mm, poorly sorted, dry, conglomerate between 10' and 15', poorly to moderatly cemented to loose below 15', dry moist at 36', dry after 48hrs	GW			
	10					
	15					
	15.5					
	20					
	25					
	30					
	35	Moist at 36', no groundwater after 48hrs				
	36.0	Sand: Pink (7.5YR 7/4) very fine grained quartz sand, poorly sorted, round, dry, very friable	SP			
	40	Sandy Gravel: Dull Yellow Orange to Light Yellow Orange (10YR 6/3 to 8/3) unconsolidated, dry	GW			
	45	Sand: Dull Yellow Orange (10YR 7/3) unconsolidated gravel in matrix, poorly sorted	SP			
	50					
	55	Sand: Dull Yellow Orange (10YR 7/3) very fine grained quartz sand, unconsolidated gravel in matrix, poorly sorted, moist	SP			
	60	Sand: Light Yellow Orange (10YR 8/3) very fine grained quartz sand, unconsolidated, lightly compacted, moist	SW			
	65	Sand: Yellow Orange to Orange (10YR 8/3 to 7.5YR 7/6)				

Legend

- Water Table (Time of Boring)

NR - Lost Core - No Return

Date Drilled - 02/26/2013
Drilling Method - Hollow Stem Auger
Drilled By - Precision Sampling Inc
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	70	Sand: Dull Yellow Orange (10YR 7/4) very fine grained quartz sand, unconsolidated, dry	SW			Soil Boring - No Well Completed
	75					
	80	Clayey Sand: Dull Yellow Orange (10YR 7/4) very fine grained quartz sand, moderately compacted, dry	SM			
	85					
	90					
	95	Dull Yellow Orange to Bright Yellow Brown (10YR 7/4 to 2.5YR 7/6) very fine grained quartz sand, unconsolidated, dry				
	100	Sand: Dull Yellow Orange (10YR 7/4) very fine grained quartz sand, unconsolidated, gravel in matrix, dry	SP			
	105	Sand: Orange (7.5YR 6/6) very fine grained quartz sand, unconsolidated to moderately compacted, interbedded with sandy clay, dry	SW			
	110	Clayey Sand: Dull Yellow Orange (10YR 7/4) very fine grained quartz sand, unconsolidated, interbedded with sandy clay, moist	SW			
	112	Sandy Clay: Dull Orange (7.5YR 6/4) moist	CL			
	115	Clayey Sand: Dull Yellow Orange (10YR 7/3) very fine grained quartz sand, unconsolidated to moderately compacted, dry	SM			
	120	Sand: Dull Yellow Orange (10YR 7/3) very fine grained quartz sand, unconsolidated, dry	SW			
	125					
	130	Clayey Sand: Dull Orange (7.5YR 7/4) very fine grained quartz sand, moderately compacted, dry	SM			
	135	Sand: Dull Yellow Orange (10YR 7/3) very fine grained quartz sand, unconsolidated, moist	SW			

Legend

- Water Table (Time of Boring)

NR - Lost Core - No Return

Date Drilled - 02/26/2013
Drilling Method - Hollow Stem Auger
Drilled By - Precision Sampling Inc
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	140	Sand: Dull Yellow Orange (10YR 7/3) very fine grained quartz sand, unconsolidated, moist	SW			Soil Boring - No Well Completed
	145	Sandy Clay: Dull Yellow Orange (10YR 7/3) dry	CL			
	147	Clayey Sand: Light Yellow Orange (10YR 8/3) very fine grained quartz sand, moderately well compacted, dry	SM			
	148		CH			
	150	Clay: Dull Brown (7.5YR 5/4) moist				
	152	Clayey Sand: Light Yellow Orange (10YR 8/3) very fine grained quartz sand, moderately well compacted, dry	SM			
	153		CL			
	154		CH			
	155	Sandy Clay: Light Yellow Orange (10YR 8/3) moist	SW			
		Clay: Dull Brown (7.5YR 5/4) moist				
	160	Sand: Light Brown (7.5YR 5/4) very fine grained quartz sand, poorly sorted, indurated, dry, loose and unconsolidated, lost core from 155' to 175', collected bag sample				
	165					
	170					
	175	Total Depth: 175' BGS Groundwater Not Observed				
	180					
	185					
	190					
	195					
	200					
	205					

Legend

- Water Table (Time of Boring)

NR - Lost Core - No Return

Date Drilled - 02/26/2013
Drilling Method - Hollow Stem Auger
Drilled By - Precision Sampling Inc
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
		Latitude : N 32° 00' 01.05" Longitude: W 103° 43' 51.64" Elevation : 3108.00'				Soil Boring - No Well Completed
	0					
	1.0	Silt: Strong Brown (7.5YR 5/6) very fine grained quartz sand, loose, dry	ML			
		Caliche: Pinkish White (7.5YR 8/2) sandy, very fine grained quartz sand, soft to indurated, dry, very hard from 10' to 12', indurated, dry	Caliche			
	5					
	10					
	15					
	15.5	Gravel: Gray to Grayish Red (5YR 5/1 to 5/2) quartz pebbles and cobbles from 3mm to 60mm with matrix of coarse to very fine grained quartz sand, dry, interbedded with caliche, dry at 20'	GW			
	20					
	21.5	Sand: Reddish Yellow (7.5YR 7/6) very fine grained quartz sand, poorly sorted, round, structurless friable, dry, intrebbed with silty clay, Red (2.5YR 4/6) dry, sand below 45', friable, very fine grained quartz sand, poorly sorted round, dry	SW			
	25					
	30					
	35					
	37.0					
	40					
	45					
	50					
	55					
	60					
	65					

Legend

- Water Table (Time of Boring)

NR - Lost Core - No Return

Date Drilled - 02/18/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	70					Soil Boring - No Well Completed
	75					
	80	Sand: Reddish Yellow (7.5YR 7/6) very fine grained quartz sand, poorly sorted, round, dry, friable to moderately cemented	SW			
	85					
	90					
	95					
	96.0	Sandy Clay: Reddish Brown (5YR 5/4) very fine grained quartz sand, dry after 12 hours	CL			
	100	Sand: Pink to Reddish Yellow (5YR 7/4 to 7/6) very fine grained quartz sand, poorly sorted, poorly cemented, dry, Reddish Yellow to Strong Brown (7.5 YR 5/8 to 6/8) stain below 105', intermittent dry, interbedded with thin units of sandy clay, dry	SW			
	105					
	110					
	115					
	120					
	125	Sandy Clay: Dull Orange (7.5YR 7/4) moist	CL			
	130					
	135					
	137.0	Clay: Brown (10YR 4/4) moist	CH			

Legend

- Water Table (Time of Boring)

NR - Lost Core - No Return

Date Drilled - 02/18/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	140					Soil Boring - No Well Completed
	141.0	Clay: Brown (10YR 4/4) moist	CH			
	145					
	150					
	155					
	156.0	Sandy Clay: Bright Brown (7.5YR 5/6) interbedded with moderately well cemented sandstone, moist	CL			
	157.0		SW			
	158.0		CL			
	160	Sand: Orange (7.5YR 6/6) very fine grained quartz, unconsolidated slightly compacted, moist				
	161.0		GW			
	164.0	Sandy Clay: Bright Brown (7.5YR 5/6) interbedded with moderately well cemented sandstone, moist				
	165	Gravelly Sand: Light Yellow Orange (10YR 8/3) unconsolidated, dry Total Depth: 165' BGS Groundwater Not Observed				
	170					
	175					
	180					
	185					
	190					
	195					
	200					
	205					

Legend

- Water Table (Time of Boring)

NR - Lost Core - No Return

Date Drilled - 02/18/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
		Latitude : N 32° 00' 10.94" Longitude: W 103° 43' 50.65" Elevation : 3148.22'				Soil Boring - No Well Completed
	0					
	1.0	Silt: Brown (7.5YR 4/4) very fine grained quartz sand, loose, dry	ML			
		Caliche: Pinkish White to Pink (5YR 8/2 to 7/2) sandy, very fine grained quartz sand, weakly to moderately cemented, dry	Caliche			
	5					
	10					
	12.0	Sandy Gravel: Pinkish White to Light Gray (5YR 8/2 to 7/1) very fine to coarse grained quartz sand, pebbles and cobbles to 60mm round, conglomerate near upper contact with caliche, poorly cemented below 20', dry	GW			
	15					
	20					
	25	Sandy Gravel: Reddish Brown to Yellowish Red (5YR 5/4 to 5/6) below 25'	GW			
	30	Sand: Pink to Reddish Yellow (7.5YR 7/4 to 6/6) very fine grained quartz sand, poorly sorted, round, weakly cemented, dry, interbedded with thin clay, hard, Reddish Brown (2.5YR 4/4) dry, massive	SW			
	35					
	40	Sand: Pink to Reddish Yellow (7.5YR 7/4) very fine grained quartz sand, poorly sorted, round, weakly cemented, interbedded with thin clay beds, Reddish Brown (2.5YR 4/4) dry	SW			
	45					
	50					
	55					
	60					
	65	Sandy Clay: Light Reddish Brown to Reddish Yellow (7.5YR 7/4) very fine grained quartz sand, thin bedded to blocky, dry	CL			

Legend

- Water Table (Time of Boring)

Date Drilled - 03/02/2013
Drilling Method - Hollow Stem Auger
Drilled By - Presicion Sampling Inc
Hole Diameter - 7.5" - 4"
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	70					Soil Boring - No Well Completed
	72.0	Sand: Pink (7.5YR 7/4) very fine grained quartz sand, poorly sorted, round, weakly cemented, thin bedded	SW			
	75					
	80					
	85	interbedded with sandy clay from 85' to 87'				
	90					
	95					
	100	min gravel from 100' to 110'				
	105					
	110	interbedded with sandy clay from 110' to 115'				
	115					
	116.0	Sandy Clay: Light Reddish Brown (5YR 6/4) very fine grained quartz sand, massive, blocky, dry	CL			
	120					
	125	Thin bedded to massive below 125'				
	130					
	135					

Legend

- Water Table (Time of Boring)

Date Drilled - 03/02/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5" - 4"
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	140					Soil Boring - No Well Completed
	145	Sand: Pink (7.5YR 7/4) very fine grained quartz sand, poorly sorted, weakly cemented, round, dry	SW			
	150					
	155					
	160					
	165					
	170					
	175					
	180	Total Depth : 180' BGS Groundwater Not Observed				
	185					
	190					
	195					
	200					
	205					

Legend

- Water Table (Time of Boring)

Date Drilled - 03/02/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5"
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
		Latitude : N 32° 00' 00.98" Longitude: W 103° 43' 31.78" Elevation : 3134.68'				Soil Boring - No Well Completed
	0					
	1.0	Silt: Brown (7.5YR 4/4) very fine grained quartz sand, loose, dry	ML			
		Caliche: Pinkish White to Pinkish Gray (5YR 8/2 to 7/2) sandy, very fine grained quartz sand, weakly and moderately hard, dry	Caliche			
	5					
	6.0	Light Reddish Brown to Reddish Brown (5YR 6/3 to 5/3) very hard and indurated				
	10					
	15					
	15.5	Gravel: Reddish Brown to Gray (5YR 5/4 to 6/1) very fine to coarse grain quartz sand, pebbles / cobbles to 50mm, round, conglomerate, moderately well to very well cemented, hard, dry, poorly cemented below 20'	GW			
	20					
	25					
	27.0	Sand: Light Reddish Brown (5YR 6/4) very fine grained quartz sand, poorly sortedk weakly cemented, dry	SW			
	30					
	35					
	36.0	Gravel: Reddish Brown to Gray (5YR 5/4 to 6/1) quartz pebbles and cobbles, round, dry	GW SW			
		Sand: Light Reddish Brown (5YR 6/4) very fine grained quartz sand, poorly sorted, loose, dry, minon clay, loose, dry				
	40					
	45					
	50					
	55	Reddish Yellow (7.5YR 6/6) thin bedded sandstone, weakly cemented, dry				
	60					
	63.0	Sandy Clay: Reddish Brown to Yellowish Red (5YR 5/4 to 5/6) very fine grained quartz sand, fracture at contact, magenese oxide stain, moist at 63' (shut down), dry, no water on 2/28/13 at 08:45	CL			
	65		SW			

Legend

- Water Table (Time of Boring)

NR - Lost Core - No Return

Date Drilled - 02/27/2013
Drilling Method - Hollow Stem Auger
Drilled By - Presicion Sampling Inc
Hole Diameter - 7.5"
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	70	Sand: Light Reddish Brown (5YR 6/4) very fine grained quartz sand, poorly sorted, round, thin bedded to no structure, dry, weakly cemented, minor thin clay beds	SW			Soil Boring - No Well Completed
	75					
	80	Sandy Clay: Reddish Brown (2.5YR 4/4) massive, blocky, dry, interbedded with sand, Pinkish Gray to Reddish Yellow (7.5YR 7/1 to 6/6) very fine grained quartz sand, thin beds	CL			
	85					
	90					
	95					
	100	Sand: Reddish Yellow to Reddish Brown (7.5YR 6/6 to 5YR 6/4) very fine grained quartz sand, poorly sorted, round, weak to no cementation, dry, minor beds of sandy clay, dry	SW			
	105					
	110					
	115					
	120					
	125					
	130					
	135					
		Sandy Clay: Reddish Brown (2.5YR 4/4) massive, blocky, dry	CL			

Legend

- Water Table (Time of Boring)

Date Drilled - 02/27/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	140		CL			Soil Boring - No Well Completed
	145	Interbedded with Reddish Brown (2.5YR 4/4) clayey sand,dry, from 143' to 145'				
	150					
	155					
	160					
	165					
	170					
	175	Total Depth : 175' BGS Groundwater Not Observed				
	180					
	185					
	190					
	195					
	200					
	205					

Legend

- - - - - - Water Table (Time of Boring)

Date Drilled - 02/27/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5"
Logged By - M. Larson
Checked By - M. Larson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
		Latitude : N 32° 00' 10.94" Longitude: W 103° 43' 50.65" Elevation : 3120.28'				Soil Boring - No Well Completed
	0					
	1.0	Silt: Brown (7.5YR 5/6) very fine grained quartz sand, loose, dry	ML			
		Caliche: Pink (7.5YR 8/2) sandy, very fine grained quartz sand, soft, dry	Caliche			
	5					
	10					
	13.0					
	15					
	16.0	Gravel: Gray to Reddish Gray (5YR 5/1 to 5/2) quartz pebbles on cobbles, round, poorly sorted, pebbles to 30mm, dry, moist at 30', *(stopped for 12 hours)*	GW			
	20					
	25					
	27.0					
	30					
	31.0	Sand: Pink (7.5YR 7/4) very fine grained quartz sand, poorly sorted, dry	SP			
	35					
	37.0	Sand: Dull Yellow Orange (10YR 7/4) very fine grained quartz sand, poorly sorted, dry, gravel in matrix, unconsoilidated	SP			
	40					
	42.0					
	45					
	47.0					
	50					
	52.0					
	55					
	57.0	Dull Yellow Orange (10YR 7/4) very fine grained quartz sand, poorly sorted, dry, gravel in matrix, Interbedded with sandy clay				
	60		CL			
	61.0	Sandy Clay: Orange (7.5YR 6/6) moist	SW			
	63.0	Sand: Dull Yellow Orange (10YR 7/4) very fine grained quartz sand, poorly sorted, dry, gravel in matrix, Interbedded with sandy clay				
	65		CL			
	66.0					
	67.0	Sandy Clay: Orange (7.5YR 6/6) moist				

Legend

- - - - - Water Table (Time of Boring)

NR - Lost Core - No Return

Date Drilled - 02/19/2013 - 02/20/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

Well Completion Record

Geolog. Unit	Depth (Feet)	Lithologic Description	Unified Soil Classification	Graphic Log	PID Reading	Well Completion Detail
	70		SM			Soil Boring - No Well Completed
	71.0	Clayey Sand: Yellow Orange (10YR 7/8) very fine grained quartz sand, unconsolidated, dry	SW			
	72.0					
	73.0					
	75	Sand: Dull Yellow Orange (10YR 7/3) very fine grained quartz sand, unconsolidated, dry				
		Total Depth : 75' BGS				
	80					
	85					
	90					
	95					
	100					
	105					
	110					
	115					
	120					
	125					
	130					
	135					

Legend

- Water Table (Time of Boring)

Date Drilled - 02/19/2013 - 02/20/2013
Drilling Method - HSA
Drilled By - PSI
Hole Diameter - 7.5"
Logged By - M. Larson / J. Fergerson
Checked By - M. Larson / J. Fergerson

R360 Environmental Solutions
Avalon Facility
Eddy County, New Mexico
N 32° 00' 10.59"
W 103° 43' 45.86"

Larson & Associates, Inc.
Environmental Consultants

ATTACHMENT 23

Proposed Changes

(Not Applicable To This Facility – Not An Existing Facility)

ATTACHMENT 24

Additional Information

(AS Requested by NMOCD)

APPLICATION FOR SURFACE WASTE

MAMAGEMENT FACILITY

R360 PERMIAN BASIN, LLC

AVALON, EDDY COUNTY, NEW MEXICO

Submitted To The
New Mexico Energy, Minerals and
Natural Resources Department
Oil Conservation Division

April 19, 2013

Prepared By

NaismithEngineering,Inc
ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING

NEI PROJECT NO. 8935