NM1-62

Permit Application

Volume 2
Part 3 of 3

APPLICATION FOR PERMIT
SUNDANCE WEST

VOLUME II: FACILITY MANAGEMENT PLANS
SECTION 7: LINER CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

ATTACHMENT II.7.A

LINER QUALITY CONTROL PROJECT SPECIFICATIONS

Liner Quality Control Project Specifications
Sundance West

1. Project Data

Site Name: _____ Date Prepared _____

Project/Cell: _____

Project Number _____ Project Start Date _____

Project Size _____ Acres or ft^2

Location _____

_____

Client Contact: _____

Phone: _____

Site Phone: _____

		Initials
I Project Manager	_____	_____
CQA Officer	_____	_____
CQA Technicians	_____	_____
	_____	_____
	_____	_____

Project Documentation Available

CQA Plan _____ Construction Drawings _____ Health and Safety Plan _____

Other: _____

Comments: _____

_____

_____

2. Subgrade/Soil Liner

2.1 Grade Control (Survey)

Area: _____ Acres or ft^2

Performed By: _____ Date Performed: _____

Tolerance (vert) _____ feet or inches As-Built Drawing(s) Available? Y or N

_____

Thickness _____ feet or inches **NMED Standard = 1 per acre**

2.2 Compaction

		Sample ID	Maximum Density	Optimum Moisture
Reference Proctor(s)	_____ lb/ft^3	_____		
Standard (ASTM D698)	_____ lb/ft^3	_____		
Modified (ASTM D1557)	_____ lb/ft^3	_____		

Specifications

Density _____ % of Optimum Moisture _____ lb/ft^3

_____ lb/ft^3

Number of Lifts: _____ Lift Thickness (inches):

Loose: _____ Compacted: _____

Field Test Frequency: _____ per: acre/lift yd^3 other units: _____

Compaction Test Method: Nuclear Density Meter or Other: _____

Total Number of Density Tests Required _____ **NMED Standard = 4/acre/lift**

Field Permeability Tests required? Y or N Perm Test Method _____

2.3 Soil Classification Standards

Acceptable USCS: (circle or box)

GW	SW	ML	MH
GP	SP	CL	CH
GM	SM	OL	OH
GC	SC		

Subgrade/Liner Material Testing:

in situ _____ borrow source: _____

Testing Frequency		Quality Requirements	
Project	NMED	Project	NMED

Grain Size:

#200 Sieve _____ (percent passing)

C_u (D_{60}/D_{10}) _____

Other _____

Atterberg Limits: P.I.

Liquid Limit _____

Plastic Limit _____

Other _____

Laboratory Permeability: _____

2.4 Surface Preparation Y or N

_____ smooth surface

_____ remove angular material

_____ remove organic material

_____ remove rocks greater than _____ inches

3.0 Geosynthetics **Conformance Tests**

3.1 GCL

Area: _____ Acres or ft^2

Specifications:

collected by _____
performed by _____
frequency _____
total number _____

3.2 FML

Specifications: _____ 60 mil
_____ other

collected by _____
performed by _____
frequency _____
total number _____

HDPE Smooth Area: _____ Acres or ft^2

HDPE Textured Area: _____ Acres or ft^2

Other _____ Area: _____ Acres or ft^2

3.3 Geotextile (not including leachate system)

Specifications: oz
Woven or Nonwoven

Area: _____ Acres or ft^2

collected by _____
performed by _____
frequency _____
total number _____

3.4 Geonet

Area: _____ Acres or ft^2

Specifications: _____ thickness

collected by _____
performed by _____
frequency _____
total number _____

with Geotextile:
upper _____ lower _____

4.0 Leachate Collection System **Conformance Tests**

4.1 Piping

Collection System Specifications: _____
Linear Quantity Material _____
Diameter _____
_____

Risers Specifications: _____
Linear Quantity Material _____
Diameter _____

4.2 Aggregate collected by _____
Specifications: performed by _____
greater than frequency _____
smaller than total number _____

4.3 Geotextile

Specifications: oz collected by _____
Woven or Nonwoven performed by _____
frequency _____
Area: _____ Acres or ft^2 total number _____

4.4 Sump

Design volume _____ yd^3 or gallons
Double Lined? Y or N
Area of double liner _____ ft^2

5.0 Protective Soil Layer **Conformance Tests**

Area: _____ Acres or ft^2 performed by _____
frequency _____
Thickness (inches): _____ total number _____

Volume _____ yd^3

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ATTACHMENT II.7.B

APPROVAL/AUTHORIZATION TO PROCEED FORM

APPROVAL/AUTHORIZATION TO PROCEED FORM

THE FOLLOWING LINER SYSTEM SURFACE IS DEEMED ACCEPTABLE ON A VISUAL INSPECTION BY LINER CONTRACT REPRESENTATIVE:

PROJECT: _____

LAYER:
1. SUBGRADE _____
2. GEOSYNTHETIC CLAY LINER (GCL) _____
3. HDPE GEOMEMBRANE (FML) _____
4. GEONET _____

LOCATION: _____ TO _____

_____ TO _____

REMARKS: _____

_____

_____

_____

_____

_____

THE ABOVE NOTED LAYER IS NOW ACCEPTABLE FOR COVERING BY THE NEXT LAYER.

AUTHORIZATION BY:

LINER CONTRACTOR REPRESENTATIVE

_____ _____
SIGNATURE DATE

_____
PRINT NAME

SUBMITTED TO:

CQA REPRESENTATIVE

_____ _____
SIGNATURE DATE

_____
PRINT NAME

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ATTACHMENT II.7.C

DAILY SUMMARY REPORT

DAILY SUMMARY REPORT

Project:		**Project No.:**	
Owner:		**Date:**	
Project Location:		**Report No.:**	
Weather:	A.M: ˚F,		
	P.M.: ˚F,		

Contractor(s)

Summary of Daily Construction Progress and Inspections:

Summary of Problems and Resolutions:

Equipment:

Summary of Meeting Held and Attendees:

Site CQA Technician	GEI CQA Officer
_____	_____
Signture	Signture
_____	_____
Print Name	Print Name

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ATTACHMENT II.7.D

FIELD COMPACTION TESTING FORM

FIELD COMPACTION TESTING FORM

PROJECT INFORMATION	
PROJECT NAME:	PROJECT NO.:
OWNER:	DATE:
PROJECT LOCATION:	PAGE NO.:
TESTING INSTRUMENT	TECHNICIAN:
REFERENCE STANDARD PROCTOR (RSP):	REFERENCE MOISTURE (%):

TEST NUMBER	DRY DENSITY (PCF)	% RSP	% MOISTURE

TEST NUMBER	DRY DENSITY (PCF)	% RSP	% MOISTURE

REVIEWED BY: ______________________ **DATE:** ______________________

GORDON ENVIRONMENTAL, INC.

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ATTACHMENT II.7.E

GCL INVENTORY CONTROL LOG

GCL INVENTORY CONTROL LOG

PROJECT NAME: _____ **PROJECT NUMBER:** _____
OWNER: _____ **CONTRACTOR:** _____
PROJECT LOCATION _____ **SHEET NUMBER:** _____

MATERIAL TYPE: _____ **DATE OF INVENTORY:** _____
MATERIAL IDENTIFICATION: _____ **INVENTORY MONITOR:** _____
MATERIAL MANUFACTURER: _____ **UNLOADING METHOD:** _____

	ROLL NUMBER	BATCH OR LOT NO.	MATERIAL DIMENSIONS			MANUF. QC CERT. (Y/N)	CONFORMANCE SAMPLE (Y/N)	REMARKS
			LENGTH (FT)	WIDTH (FT)	AREA (FT^2)			
1								
2								
3								
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REVIEWED BY: _____ **DATE:** _____

GORDON ENVIRONMENTAL, INC.

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ATTACHMENT II.7.F

FML INVENTORY CONTROL LOG

FML INVENTORY CONTROL LOG

PROJECT NAME: _____ **PROJECT NUMBER:** _____
OWNER: _____ **CONTRACTOR:** _____
PROJECT LOCATION _____ **SHEET NUMBER:** _____

MATERIAL TYPE: _____ **DATE OF INVENTORY:** _____
MATERIAL IDENTIFICATION: _____ **INVENTORY MONITOR:** _____
MATERIAL MANUFACTURER: _____ **UNLOADING METHOD:** _____

	ROLL NUMBER	BATCH OR LOT NO.	MATERIAL DIMENSIONS			MANUF. QC CERT. (Y/N)	CONFORMANCE SAMPLE (Y/N)	REMARKS
			LENGTH (FT)	WIDTH (FT)	THICKNESS OR WEIGHT			
1								
2								
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REVIEWED BY: _____ **DATE:** _____

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ATTACHMENT II.7.G

GEONET INVENTORY CONTROL LOG

GEONET INVENTORY CONTROL LOG

PROJECT NAME: _____ **PROJECT NUMBER:** _____
OWNER: _____ **CONTRACTOR:** _____
PROJECT LOCATION _____ **SHEET NUMBER:** _____

MATERIAL TYPE: _____ **DATE OF INVENTORY:** _____
MATERIAL IDENTIFICATION: _____ **INVENTORY MONITOR:** _____
MATERIAL MANUFACTURER: _____ **UNLOADING METHOD:** _____

	ROLL NUMBER	BATCH OR LOT NO.	MATERIAL DIMENSIONS			MANUF. QC CERT. (Y/N)	CONFORMANCE SAMPLE (Y/N)	REMARKS
			LENGTH (FT)	WIDTH (FT)	THICKNESS OR WEIGHT			
1								
2								
3								
4								
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REVIEWED BY: _____ **DATE:** _____

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ATTACHMENT II.7.H

GEOTEXTILE INVENTORY CONTROL LOG

GEOTEXTILE INVENTORY CONTROL LOG

PROJECT NAME: _____ **PROJECT NUMBER:** _____
OWNER: _____ **CONTRACTOR:** _____
PROJECT LOCATION _____ **SHEET NUMBER:** _____

MATERIAL TYPE: _____ **DATE OF INVENTORY:** _____
MATERIAL IDENTIFICATION: _____ **INVENTORY MONITOR:** _____
MATERIAL MANUFACTURER: _____ **UNLOADING METHOD:** _____

	ROLL NUMBER	BATCH OR LOT NO.	MATERIAL DIMENSIONS			MANUF. QC CERT. (Y/N)	CONFORMANCE SAMPLE (Y/N)	REMARKS
			LENGTH (FT)	WIDTH (FT)	THICKNESS OR WEIGHT			
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2								
3								
4								
5								
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REVIEWED BY: _____ **DATE:** _____

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ATTACHMENT II.7.I

LEACHATE COLLECTION AND EXTRACTION PIPE INVENTORY CONTROL LOG

LEACHATE COLLECTION AND EXTRACTION PIPE INVENTORY CONTROL LOG

PROJECT NAME: _____ **PROJECT NUMBER:** _____
OWNER: _____ **CONTRACTOR:** _____
PROJECT LOCATION: _____ **SHEET NUMBER:** _____

MATERIAL TYPE: _____ **DATE OF INVENTORY:** _____
MATERIAL IDENTIFICATION: _____ **INVENTORY MONITOR:** _____
MATERIAL MANUFACTURER: _____ **UNLOADING METHOD:** _____

	TYPE	QUANTITY	MATERIAL DIMENSIONS			MANUF. QC CERT. (Y/N)	TOTAL LENGTH (FT)	DATE INVENTORIED
			LENGTH (FT)	DIA. (IN)	PIPE SDR			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
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REVIEWED BY: _____ **DATE:** _____

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ATTACHMENT II.7.J

GCL DEPLOYMENT LOG

GCL DEPLOYMENT LOG

PROJECT NAME: ____________________ **PROJECT NUMBER:** ____________
OWNER: ____________________ **CONTRACTOR:** ____________
PROJECT LOCATION: ____________________ **SHEET NUMBER:** ____________

PANEL NUMBER	ROLL NUMBER	APPROXIMATE LENGTH (FT)	APPROXIMATE WIDTH (FT)	APPROXIMATE AREA (FT^2)	DATE INSTALLED
			TOTAL LINER PLACED (FT^2):		

REVIEWED BY: ____________________ **DATE:** ____________

GORDON ENVIRONMENTAL, INC.

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SECTION 7: LINER CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

ATTACHMENT II.7.K

FML DEPLOYMENT LOG

FML DEPLOYMENT LOG

PROJECT NAME: ______________________ **PROJECT NUMBER:** __________
OWNER: ______________________ **CONTRACTOR:** __________
PROJECT LOCATION: ______________________ **SHEET NUMBER:** __________

PANEL NUMBER	ROLL NUMBER	APPROXIMATE LENGTH (FT)	APPROXIMATE WIDTH (FT)	APPROXIMATE AREA (FT^2)	DATE INSTALLED
TOTAL LINER PLACED (FT^2):					

REVIEWED BY: __________ **DATE:** __________

GORDON ENVIRONMENTAL, INC.

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VOLUME II: FACILITY MANAGEMENT PLANS
SECTION 7: LINER CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

ATTACHMENT II.7.L

FML TRIAL SEAMING TEST LOG

FML TRIAL SEAMING TEST LOG

PROJECT INFORMATION		PROJECT SPECIFICATIONS					
PROJECT NAME:	PROJECT NUMBER:	FUSION	TEXTURED:	PEEL	98 lbs/in	SHEAR	121 lbs/in
OWNER:	CONTRACTOR:		SMOOTH:	PEEL	98 lbs/in	SHEAR	121 lbs/in
PROJECT LOCATION:	SHEET NUMBER:	EXTRUSION	TEXTURED:	PEEL	78 lbs/in	SHEAR	121 lbs/in
			SMOOTH:	PEEL	78 lbs/in	SHEAR	121 lbs/in

DATE	TIME	QC INITIALS	WELDER'S INITIALS	MACHINE NUMBER	WEDGE WELDS		EXTRUSION WELDS		PULL	FIELD TEST RESULTS				
					Temperature	Speed	Barrel Temp	Pre-Heat Temp		Test #1	Test #2	Test #3	Test #4	Test #5
									P					
									P					
									S					
									P					
									P					
									S					
									P					
									P					
									S					
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APPLICATION FOR PERMIT
SUNDANCE WEST

VOLUME II: FACILITY MANAGEMENT PLANS
SECTION 7: LINER CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

ATTACHMENT II.7.M

FML SEAMING LOG

FML SEAMING LOG

PROJECT NAME: _____ **PROJECT NUMBER:** _____
OWNER: _____ **CONTRACTOR:** _____
PROJECT LOCATION: _____ **SHEET NUMBER:** _____

	DATE	PANEL #/PANEL #	APPROX. LENGTH WELDED	START TIME	SEAMER INITIALS	MACHINE #	TEMP SETTING	SPEED SETTING	DESTRUCTIVE TEST	MONITORED BY
1										
2										
3										
4										
5										
6										
7										
8										
9										
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ATTACHMENT II.7.N

FML SEAM PRESSURE TEST LOG

FML SEAM PRESSURE TEST LOG

PROJECT INFORMATION			PROJECT SPECIFICATIONS
PROJECT NAME:	PROJECT NUMBER:		MIN START PSI:
OWNER:	CONTRACTOR:		TEST DURATION:
PROJECT LOCATION	SHEET NUMBER:		MAX PSI DROP:

	DATE	PANEL #/PANEL #	TESTER	TIME		PRESSURE		MONITORED BY	PASS/FAIL
				START	FINISH	INITIAL	FINAL		
1									
2									
3									
4									
5									
6									
7									
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ATTACHMENT II.7.O

FML DESTRUCTIVE FIELD TEST RECORD

FML DESTRUCTIVE FIELD TEST RECORD

PROJECT INFORMATION	
PROJECT NAME:	PROJECT NUMBER:
OWNER:	CONTRACTOR:
PROJECT LOCATION:	SHEET NUMBER:

PROJECT SPECIFICATIONS					
FUSION	TEXTURED:	PEEL	98 lbs/in	SHEAR	121 lbs/in
	SMOOTH:	PEEL	98 lbs/in	SHEAR	121 lbs/in
EXTRUSION	TEXTURED:	PEEL	78 lbs/in	SHEAR	121 lbs/in
	SMOOTH:	PEEL	78 lbs/in	SHEAR	121 lbs/in

DATE	DT #	QC INITIALS	WELDER'S INITIALS	MACHINE NUMBER	WEDGE WELDS		EXTRUSION		PULL	FIELD TEST RESULTS					COMMENTS
					Temperature	Speed	Barrel Temp	Pre-Heat Temp		Test #1	Test #2	Test #3	Test #4	Test #5	
									P						
									P						
									S						
									P						
									P						
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REVIEWED BY: ______________________ **DATE:** ________________

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ATTACHMENT II.7.P

FML SEAM VACUUM TEST/REPAIR LOG

FML SEAM VACUUM TEST/REPAIR LOG

PROJECT NAME: _____ **PROJECT NUMBER:** _____
OWNER: _____ **CONTRACTOR:** _____
PROJECT LOCATION: _____ **SHEET NUMBER:** _____

	REPAIR DATE	PANEL	TYPE OF REPAIR	REPAIR TECH	NUMBER OF LEAKS	TESTING TECH ID	DATE ACCEPTED	COMMENTS
1								
2								
3								
4								
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7								
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REVIEWED BY: _____ **DATE:** _____

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SECTION 7: LINER CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

ATTACHMENT II.7.Q

GEONET DEPLOYMENT LOG

GEONET DEPLOYMENT LOG

PROJECT NAME: ______________________ **PROJECT NUMBER:** ______________
OWNER: ______________________ **CONTRACTOR:** ______________
PROJECT LOCATION: ______________________ **SHEET NUMBER:** ______________

PANEL NUMBER	ROLL NUMBER	APPROXIMATE LENGTH (FT)	APPROXIMATE WIDTH (FT)	APPROXIMATE AREA (FT^2)	DATE INSTALLED
			TOTAL LINER PLACED (FT^2):		

REVIEWED BY: ______________________ **DATE:** ______________

GORDON ENVIRONMENTAL, INC.

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ATTACHMENT II.7.R

GEOTEXTILE DEPLOYMENT LOG

GEOTEXTILE DEPLOYMENT LOG

PROJECT NAME: ____________________ **PROJECT NUMBER:** ____________
OWNER: ____________________ **CONTRACTOR:** ____________
PROJECT LOCATION: ____________________ **SHEET NUMBER:** ____________

PANEL NUMBER	ROLL NUMBER	APPROXIMATE LENGTH (FT)	APPROXIMATE WIDTH (FT)	APPROXIMATE AREA (FT^2)	DATE INSTALLED
TOTAL LINER PLACED (FT^2):					

REVIEWED BY: ____________________ **DATE:** ____________

GORDON ENVIRONMENTAL, INC.

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SECTION 8: VADOSE ZONE MONITORING PLAN

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SUNDANCE WEST

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SECTION 8: VADOSE ZONE MONITORING PLAN

1.0 INTRODUCTION

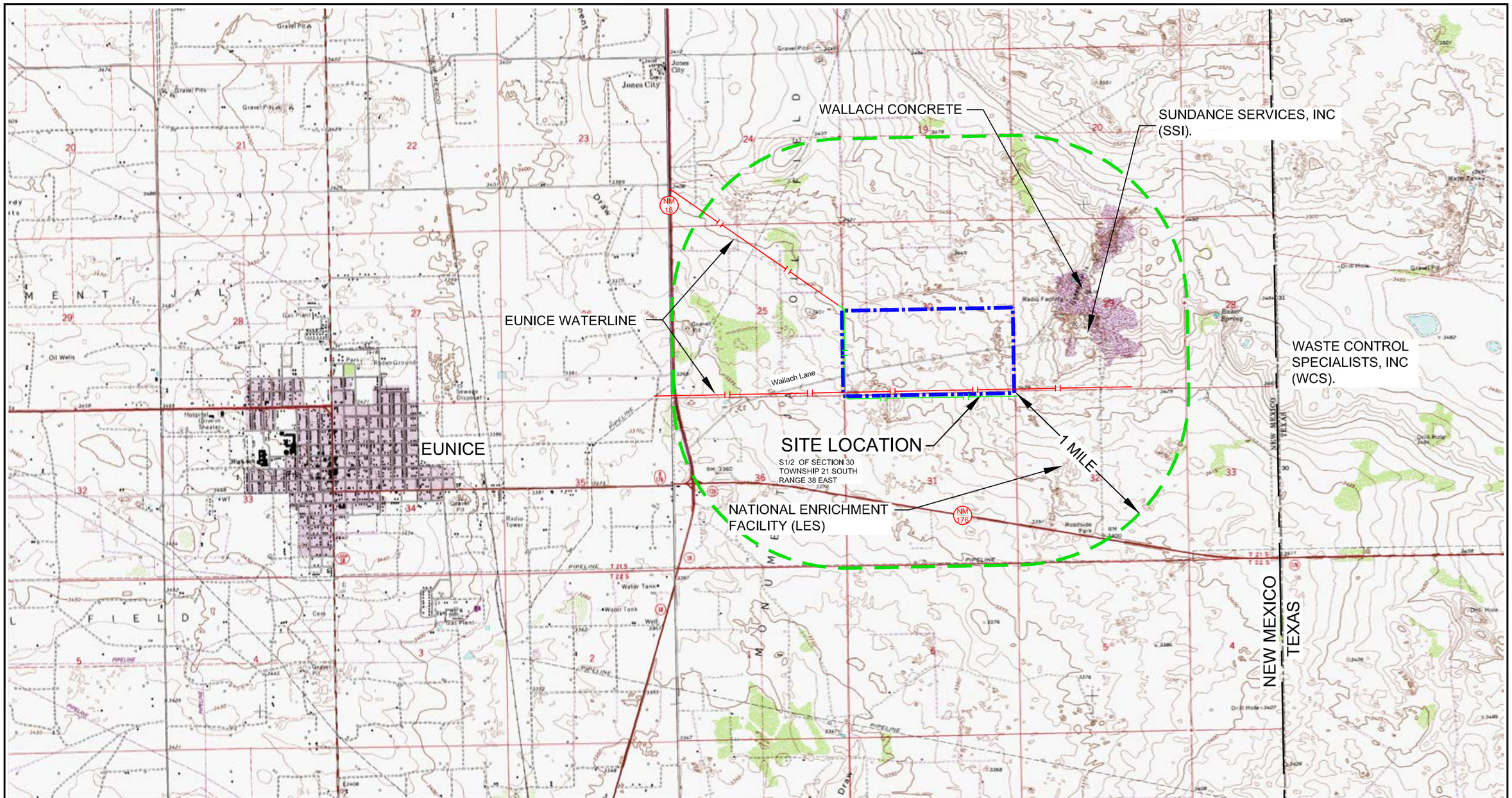
Sundance West is a proposed Surface Waste Management Facility for oil field waste processing and disposal services. The proposed Facility is subject to regulation under the New Mexico Oil and Gas Rules, specifically 19.15.36 NMAC, administered by the Oil Conservation Division (OCD). The Facility is designed in compliance with 19.15.36 NMAC, and will be constructed and operated in compliance with a Surface Waste Management Facility Permit issued by the OCD. The Facility is owned by, and will be constructed and operated by, Sundance West, Inc.

1.1 Purpose

The purpose of this Vadose Zone Monitoring Plan (the Plan) is to provide plans for the monitoring, recordkeeping, and reporting procedures for the site's vadose zone monitoring system. The Plan, as presented herein, is based on the Hydrogeological Report findings presented in **Volume IV, Section 2**. The Plan identifies the locations of up to ten vadose zone monitoring points that are positioned appropriately to provide for early detection of potential fluid releases at the site; and provides additional guidance for monitoring point installation.

1.2 Site Location

The Sundance West site is located approximately 3 miles east of Eunice, 18 miles south of Hobbs, and approximately 1.5 miles west of the Texas/New Mexico state line in unincorporated Lea County, New Mexico (NM). The Sundance West site is comprised of a 320-acre ± tract of land located in the South ½ of Section 30, Township 21 South, Range 38 East, Lea County, NM. Site access will be provided via NM 18 and Wallach Lane. A Site Location Map is provided as **Figure II.8.1**.



Based on Eunice NE, TX.- NM (1969) Photorevised (1979);
Eunice, NM (1969) Photorevised (1978);
Quadrangles, USGS 7.5' SERIES (1:24,000 Scale)

NOTE:

NO STREAMS, SPRINGS OR WATER COURSES WITHIN 1/2 MILE OF SITE

NORTH

0 1500' 3000'

SITE LOCATION MAP

SUNDANCE WEST
SURFACE WASTE MANAGEMENT FACILITY
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 07/22/2016	CAD: DWG NAME.dwg	PROJECT #: 530.06.01
DRAWN BY: DMI	REVIEWED BY: CWF	FIGURE II.8.1
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\530.06.01\REVISED FIGURES(RAI 1)\SITE LOC REVISED 11 x17.dwg
Date/Time:Aug. 11, 2016-08:27:40 ; LAYOUT: B (LS)

1.3 Facility Description

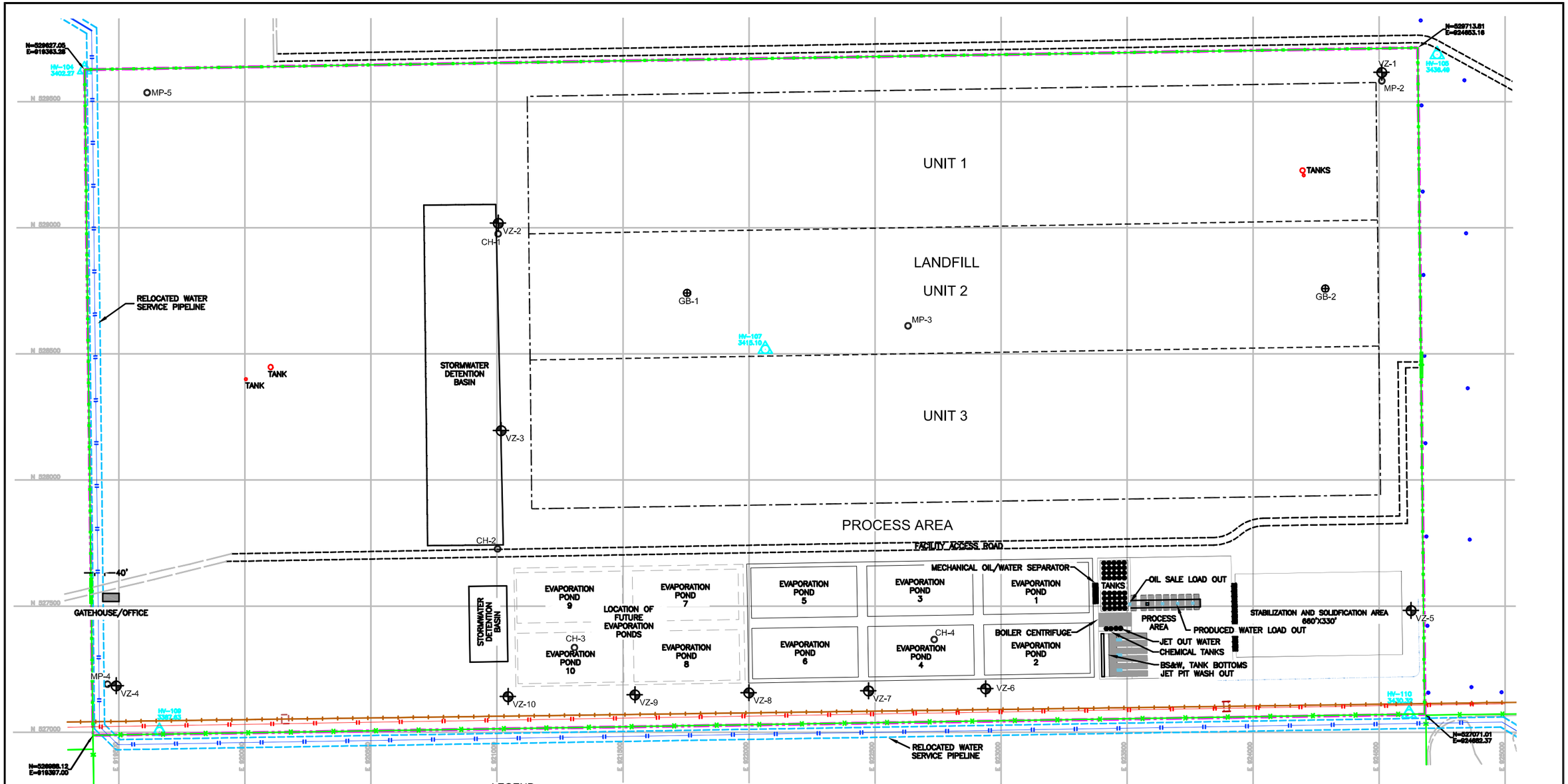
The Sundance West Facility is a proposed new commercial Surface Waste Management Facility that will include two main components; an oil field waste Processing Area (80 acres ±), and an oil field waste Landfill (180 acres ±). Oil field wastes are anticipated to be delivered to the Sundance West Facility from oil and gas exploration and production operations in southeastern NM and west Texas. The Site Plan provided as **Figure I.8.2** identifies the locations of the Processing Area and Landfill facilities, which are further detailed on the **Permit Plans** (**Volume III.1**). The proposed facilities will be developed in phases; which are described in the Operations, Inspection, and Maintenance Plan (**Volume II.1**).

2.0 VADOSE ZONE MONITORING NETWORK

The proposed vadose zone monitoring system for the Facility is designed to provide for earliest possible detection of potential fluid releases from the Landfill. The hydrogeologic setting described in **Volume IV, Section 2** provides the detailed basis for establishing the vadose zone monitoring network for the site. In summary, the vadose zone monitoring wells (VZs) will be positioned such that downgradient wells are located downslope on the mapped upper redbed surface (i.e., Chinle) to the southwest of the Facility, and upgradient wells will be placed upslope on the redbed surface near the northeast corner and along the east boundary of the Facility (**Figure II.8.2**). The redbed structure map provided as **Figure II.8.3** presents a detailed depiction of the terrain on the redbed surface at the Facility; as well as a high confidence level that the proposed downgradient VZs are positioned directly downslope from the proposed waste disposal area in the zone most appropriate for detection of a potential release.

2.1 Monitoring Well Locations

Figure II.8.4 depicts the location of the proposed vadose zone monitoring network designed specifically to address both the known slope of the redbed surface, and the locations of the planned leachate collection sumps for the Landfill. The leachate collection sumps represent the most downgradient termini of the leachate collection system; are the deepest penetrations of the surface deposits; and are vertically most proximate to the redbed surface (i.e., 30 – 45 ft). In addition, the individual disposal cell sumps are the Landfill locations with the greatest potential for leachate head development due to their downgradient positions. In the Process Area, the Evaporation Ponds represent the location with the greatest potential for head development.



NOTE

AERIAL SURVEY BY THOMAS R. MANN & ASSOCIATES AERIAL MAPPING SERVICES, 5115 COPPER NE, ALBUQUERQUE, NM 87108
DATE OF PHOTOGRAPHY: 10-01-08

LEGEND

- FACILITY BOUNDARY
- LIMIT OF WASTE BOUNDARY
- UNIT BOUNDARY
- FENCE (EXISTING)
- PROPOSED 4-STRAND BARBED WIRE FENCING
- NEW UNPAVED ROAD
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- RAILROAD TRACK
- RELOCATED WATER SERVICE PIPELINE
- EXISTING EUNICE WATERLINE
- PIPELINE EASEMENT
- LOCKING GATE
- GB-1 GEOTECHNICAL BOREHOLE
- MP-2 SOIL BORING
- CH-3 COREHOLE BORING
- VZ-1 VADOSE ZONE MONITORING WELL
- POWER POLE
- STORAGE TANK
- EXISTING BOX CULVERT
- HV-109 3387.63 SURVEY CONTROL POINT
- N 527500 / E 922000 SITE GRID

NORTH

0 200' 400'

SITE PLAN

SUNDANCE WEST
SURFACE WASTE MANAGEMENT FACILITY
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 07/18/2016	CAD: SITE DEV.dwg	PROJECT #: 530.06.01
DRAWN BY: DMI	REVIEWED BY: DRT	FIGURE II.8.2
APPROVED BY: IKG	gei@gordonenvironmental.com	

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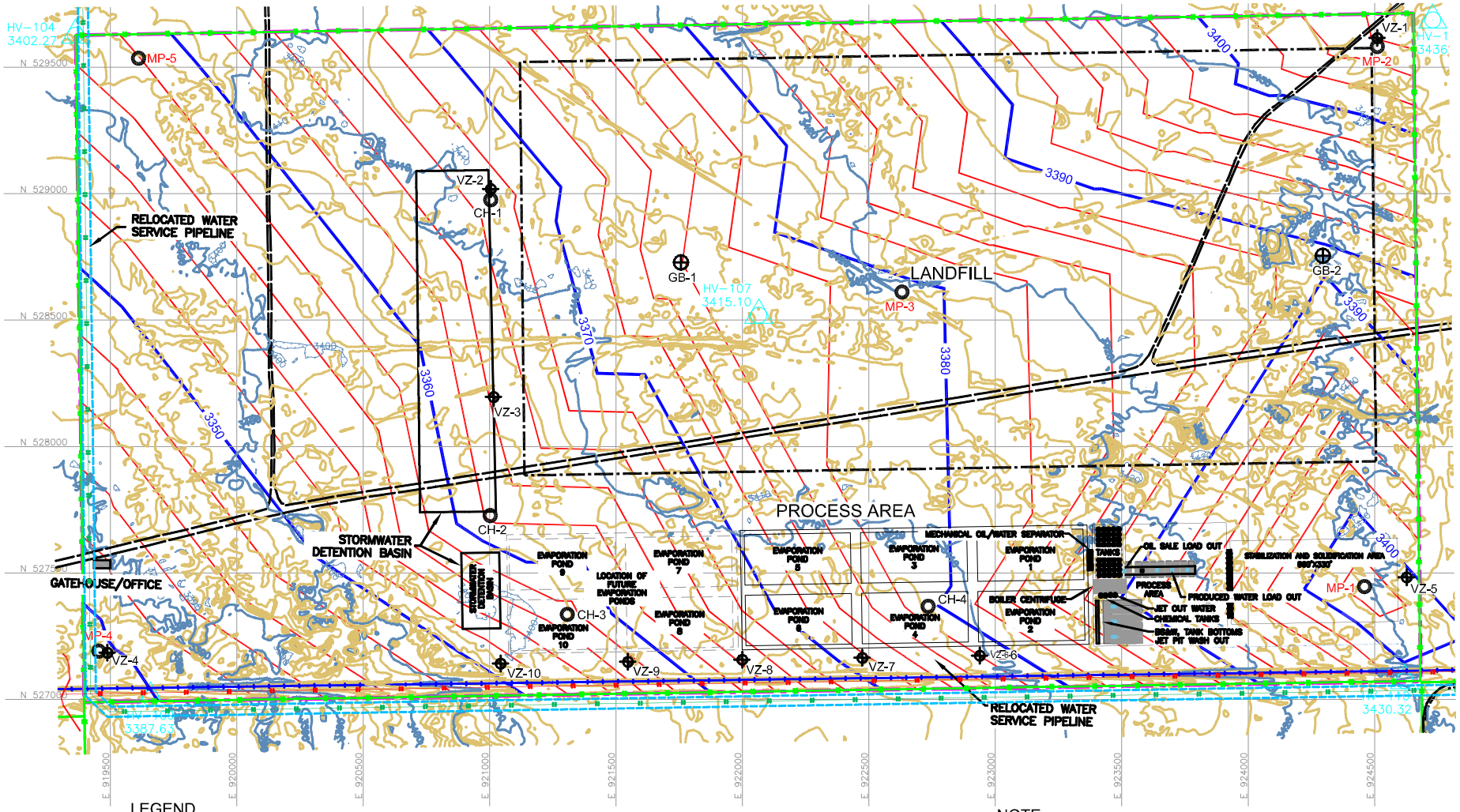
Date/Time:Jul, 19, 2016-05:13:48



LEGEND

- FACILITY BOUNDARY
- LIMIT OF WASTE
- 3390 — 10' CONTOUR
- 2' CONTOUR
- 3350 — TOP OF CHINLE REDBEDS 10' CONTOUR
- TOP OF CHINLE REDBEDS 2' CONTOUR
- FENCE
- UNPAVED ROAD
- PAVED ROAD
- RAILROAD TRACK
- RELOCATED WATER SERVICE PIPELINE
- EXISTING EUNICE WATERLINE
- PIPELINE EASEMENT
- VZ-1 — VADOSE ZONE MONITORING WELL LOCATION
- GB-1 — GEOTECHNICAL BOREHOLE LOCATION (PLUGGED)
- CH-1 — COREHOLE LOCATION (PLUGGED)
- MP-1 — BOREHOLE LOCATION (PLUGGED)
- HV-109 3387.63 — SURVEY CONTROL POINT
- N 527500 / E 922000 — SITE GRID

NORTH

0' 300' 600'

NOTE

AERIAL SURVEY BY THOMAS R. MANN & ASSOCIATES AERIAL MAPPING SERVICES, 5115 COPPER NE, ALBUQUERQUE, NM 87108
DATE OF PHOTOGRAPHY: 10-01-08

TOP OF CHINLE REDBED CONTOURS

SUNDANCE WEST
SURFACE WASTE MANAGEMENT FACILITY
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 07/18/2016	CAD:REDBED CONTOURS.dwg	PROJECT #: 530.06.01
DRAWN BY: DMI	REVIEWED BY: CWF	FIGURE II.8.3
APPROVED BY: IKG	gei@gordonenvironmental.com	

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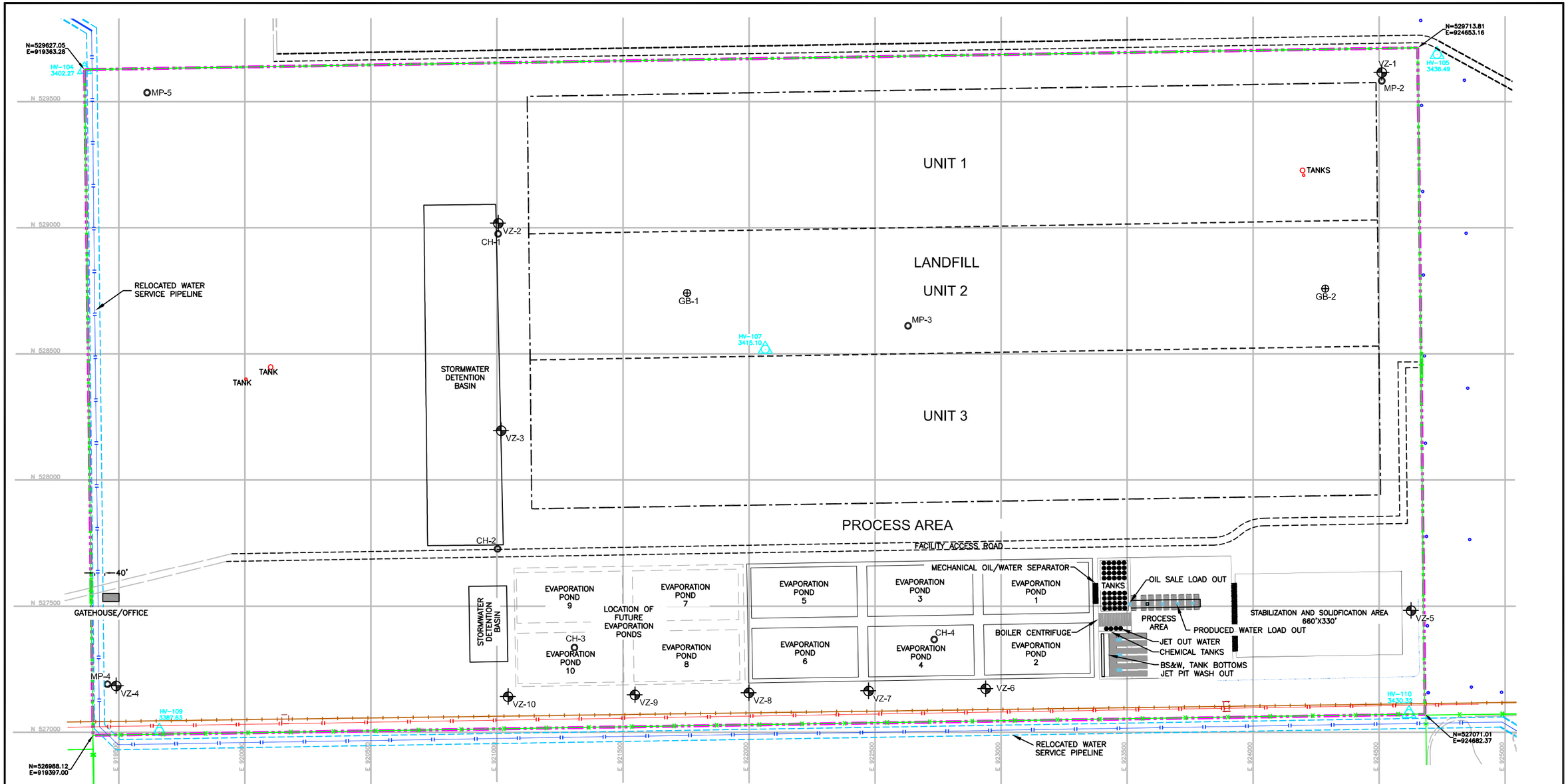

NOTE

AERIAL SURVEY BY THOMAS R. MANN & ASSOCIATES AERIAL MAPPING SERVICES, 5115 COPPER NE, ALBUQUERQUE, NM 87108
DATE OF PHOTOGRAPHY: 10-01-08

LEGEND

- FACILITY BOUNDARY
- LIMIT OF WASTE BOUNDARY
- UNIT BOUNDARY
- FENCE (EXISTING)
- PROPOSED 4-STRAND BARBED WIRE FENCING
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- EXISTING BOX CULVERT
- HV-109 3387.63 SURVEY CONTROL POINT
- N 527500 / E 922000 SITE GRID

NORTH

0 200' 400'

VADOSE ZONE MONITORING NETWORK

SUNDANCE WEST
SURFACE WASTE MANAGEMENT FACILITY
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 07/18/2016	CAD: VADOSE MONITORING.dwg	PROJECT #: 530.06.01
DRAWN BY: DMI	REVIEWED BY: DRT	FIGURE II.8.4
APPROVED BY: IKG	gel@gordonenvironmental.com	

The monitoring network strategy consists of the following elements, which are designed to correlate with the Landfill site development sequence shown in **Figure II.8.4**:

1. Following permitting, and prior to Facility development, wells VZ-1, VZ-2, and VZ-3 will be installed to evaluate ambient conditions; and will be constructed in accordance with the specifications in accordance with the OCD standards listed in Section 2.2. Well VZ-1 (formerly MP-2P) will serve as the upgradient monitoring point for the operations. Wells VZ-2 and VZ-3 will be positioned as "sentinel" downgradient wells for Landfill Units 1-3, and are specifically located adjacent to Sumps 1 and 3 based on the logic discussed above.
2. Downgradient well VZ-4 (Formerly MP-4P) is situated downgradient of the entire operation in order to evaluate both pre-construction and post-construction conditions. Well VZ-5 will be installed prior to the development of the Evaporation Ponds, and will serve as the general upgradient monitoring point for the Processing Area. Well VZ-6 is the downgradient sentinel well for the initial evaporation ponds, and will be installed prior to the development of Ponds 1-4.
3. Shown on **Figure II.8.4** are four additional downgradient monitoring points (i.e., wells VZ-7 through VZ-10) that may be added incrementally dependent upon monitoring results from the primary network (i.e., wells VZ-1 through VZ-6). These future wells will be installed to the same specifications prescribed in Section 2.2; and the well locations may be adjusted in consultation with OCD.

2.2 Well Drilling and Completion

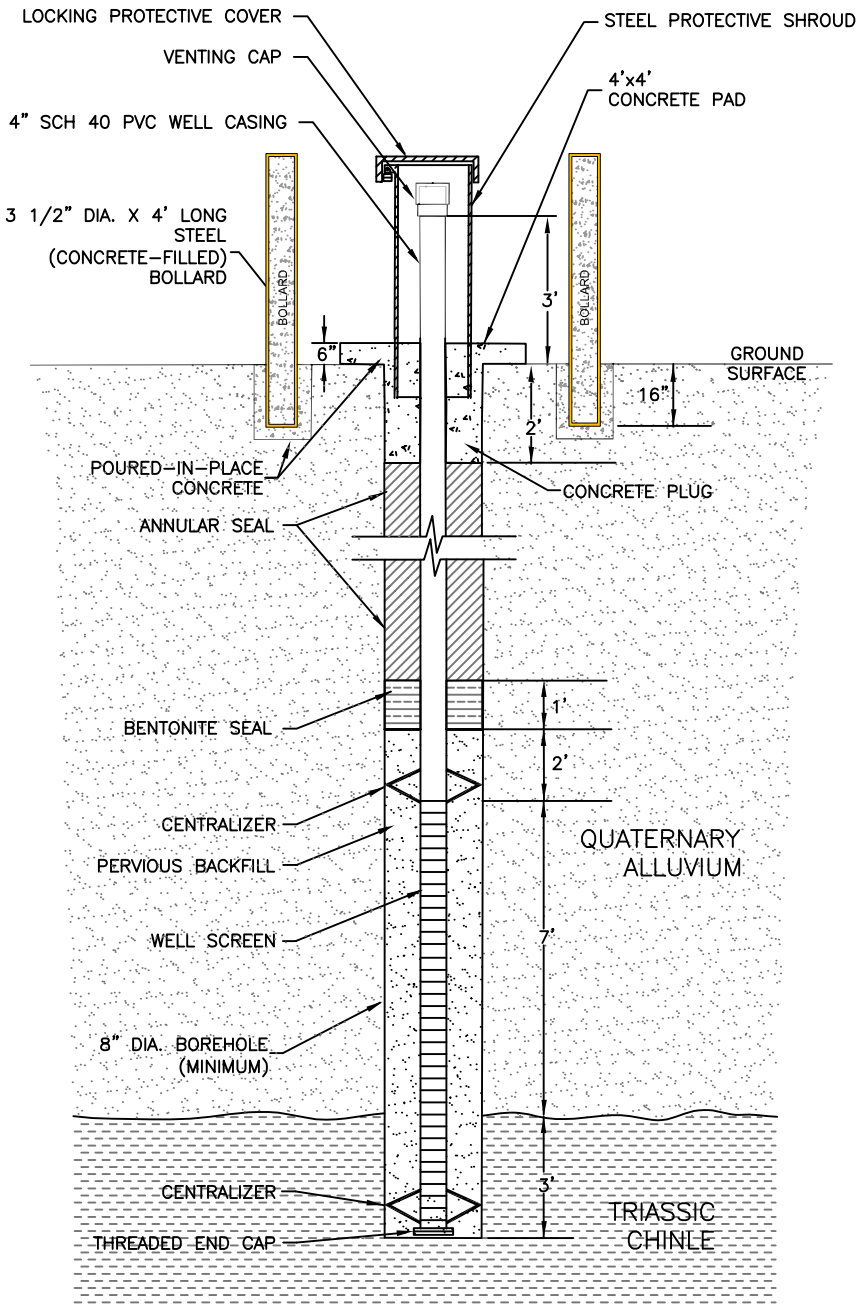
Prior to installation of the additional vadose zone monitoring wells, drilling permits will be obtained from the New Mexico Office of the State Engineer (NMOSE). The vadose zone monitoring wells will be installed using hollow-stem auger drilling methods; and no fluids will be introduced into the borings during drilling. Undisturbed, depth-referenced samples of penetrated sediments will be collected on at least 5-ft intervals using split-spoon sampling equipment. Drive blow counts will be logged during each sampling interval to allow precise determination of the upper redbed surface in each boring; which has typically been well-defined during other subsurface investigations. A qualified hydrogeologist will be present on-site during drilling activities; and will prepare detailed descriptions of the lithology, texture, sorting, rounding, color, and degree of lithification and moisture content of each sample and stratigraphic unit that is penetrated.

Although split-spoon sampling offers ample opportunity to identify saturated sediments with a high degree of confidence, each boring will be further evaluated for the presence of free water. Upon reaching total depth, the drilling rig will be placed on standby for a minimum of two hours, during which time the inside of the augers will be sounded to check for the potential for accumulating fluid.

The vadose zone monitoring wells will be constructed in accordance with the specifications set forth in **Table II.8.1**, and the well detail sheet provided as **Figure II.8.5**:

TABLE II.8.1
Vadose Zone Monitoring Well Installation Specifications
Sundance West, Inc.

- The well borehole will be drilled a minimum of 4 inches (in) larger than the casing diameter to allow for the emplacement of the well casing and annular space materials.
- Each boring will be advanced approximately 3 ft into the indurated Triassic redbed.
- Care will be taken not to introduce contamination to the well, i.e., all tools will be decontaminated prior to drilling the borehole.
- Each well will be constructed with 2-in inside diameter (ID) Schedule 40 (SCH 40) polyvinylchloride (PVC) flush-joint casing equipped with a threaded end cap.
- The well casing will extend from the bottom of the borehole to at least 3 ft above ground surface.
- The well casing will be constructed with a 10-ft length of 0.010-in slotted well screen. The well screen will be positioned with the lowermost portion extending approximately 3 ft below the detected upper redbed surface and the upper portion extending approximately 7 ft into the overlying alluvium. Casing centralizers will be placed at the top and bottom of the screened interval as shown on **Figure II.8.5**.
- The remaining well casing will be constructed with solid 2-in ID SCH 40 PVC flush-joint casing equipped with a venting cap.
- The annular space from the bottom of the borehole to 2 ft above the top of the well screen will be packed with 10-20 grade silica sand.
- A minimum of 1 ft of the annular space above the upper surface of the silica sand will be sealed with hydrated granular bentonite or bentonite chips.
- The annular space above the bentonite seal to 3 ft below ground surface will be sealed with bentonite-cement grout (minimum 2% - 5% bentonite).
- The upper 3 ft of the annular space will be filled with concrete to anchor a steel protective shroud.
- The steel protective shroud shall be minimum 6-inch ID, and will be equipped with a 2-piece cast locking protective cover. The locking protective cover shall be positioned a minimum of 6 in from the top of the PVC well casing to allow for easy access for removal of the PVC vent cap.
- A 4-ft x 4-ft x 6-in-thick concrete pad will be poured around the steel protective shroud. The pad will be radially sloped away from the well to promote stormwater drainage away from the well; and will be protected on each corner by a steel, concrete-filled bollard.
- The top of PVC casing, top of steel shroud, and top of concrete pad of the new monitoring well will be surveyed, referenced to a standard horizontal grid and elevations relative to the site control; and will be subsequently mapped by a licensed surveyor. The location of the well will be determined to within one-tenth of a foot, and the height above sea level at the top of the casing will be determined to within one-hundredth of a foot.
- Well completion data; NMOSE drilling permits and well records; and survey location information will be submitted to OCD in a “Well Completion Report”.



TYPICAL VADOSE ZONE MONITORING WELL

NOT TO SCALE

LEGEND

CASING: 4" DIA. SCH 40 PVC

SCREEN: 4" DIA. 0.010" MACHINE SLOT SCH 40 PVC

PERVIOUS BACKFILL: 10-20 COLORADO® SILICA SAND OR EQUIVALENT

ANNULAR SEAL: NEAT CEMENT WITH 2% TO 5% BENTONITE

NOTE:

SPECIFIC VERTICAL DIMENSIONS FOR EACH NEW WELL WILL BE INCLUDED IN OSE AND OCD SUBMITTALS.

VADOSE ZONE MONITORING WELL CONSTRUCTION DETAIL

SUNDANCE WEST
SURFACE WASTE MANAGEMENT FACILITY
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 07/11/2016	CAD: VADOSE MW .dwg	PROJECT #: 530.06.01
DRAWN BY: DMI	REVIEWED BY: CWF	FIGURE II.8.5
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\530.06.01\REVISED FIGURES(RAI 1)\VADOSE MW.dwg
Date/Time:Jul. 19, 2016-07:32:31

3.0 VADOSE ZONE MONITORING PROGRAM

Evidence of fluids in the VZs should not necessarily be attributed to construction or operation of the Landfill; and the fluid's origin must be interpreted correctly. For example, reconfiguration of Facility stormwater controls may alter surface water recharge to the subsurface, and it is possible that some liquids may accumulate in a monitoring well from condensation within the well casing. The following sections describe the planned monitoring protocol for the Facility vadose zone monitoring network.

3.1 Monitoring Schedule

The proposed vadose zone monitoring program will initially include inspection of each well for the presence of fluid in advance of the applicable disposal area construction. After the initial inspection, each VZ will be monitored for the presence of free liquids on a monthly basis for a period of 12 months. If the monthly monitoring results continually indicate the absence of fluid, the subject wells will be transitioned to less frequent monitoring. The continued lack of fluids in the VZs may be the subject of future specific approvals by OCD for a reduced monitoring, or decommissioning.

3.2 Monitoring Assessment

Monitoring for the presence of liquid will be performed by lowering a calibrated electronic tape (i.e., water level indicator) that emits an audible signal when a water surface is penetrated. Total well depth measurements will also be recorded with the same electronic tape. **Attachment II.8.B** to this Plan is a typical field information form that may be used for routine vadose zone monitoring purposes.

If the water level indicator shows that free liquids are present in the well casing, an attempt will be made to evacuate the liquid to investigate its origin by lowering a 1-in PVC or Teflon bailer to remove the liquid from the well for sampling/testing purposes. If a liquid sample cannot be retrieved, then the quantity of liquid in the well will be considered *de minimus*; and likely the result of condensation. The same procedures will be used to check for liquid and evacuate (as necessary or if possible) for each subsequent monitoring event.

If a sufficient quantity of liquid is available to allow sample collection, the liquid will be field-screened for specific conductance (SC), pH, and temperature (i.e., field parameters). In addition, initial sampling will include independent qualified commercial laboratory analysis for the parameters identified in **Table II.8.2**. The initial field and laboratory data will be evaluated to determine if the water encountered is the result of surface water infiltration; or potential impacts from the Landfill.

If the initial analyses indicate that no impact from the Landfill is evident, then routine monitoring of field parameters will continue on a frequency approved by OCD, as applicable for wells with a measureable water column. If subsequent monitoring indicates elevated measurements of the field parameters relative to the initial measurements (i.e., greater than 5 times background values), additional samples will be collected for laboratory analyses, and the data will be evaluated in accordance with the following Section to determine if a release from the Landfill is possible.

3.3 Monitoring Data Evaluation

If the field parameter measurements indicate that a well shows evidence of non-natural constituents, OCD will be notified within 48 hours and verification re-sampling (VRS) for the parameters listed in **Table II.8.2** will be conducted within 2-weeks. If the VRS analytical results indicate that a potential Landfill release may have occurred, within 90 days of the finding, fluid samples from each active Landfill sump will collected and analyzed for the parameters listed in **Table II.8.2** for comparative evaluation with the VRS results. This data evaluation process is fundamental in determining if the potential source of an identified change is from the monitored Facility, an alternative on-site or off-site source, natural variability, an error in the sampling and analysis process, etc. The Facility will work with OCD to develop an appropriate scope of work for assessing water quality changes.

If the comparative evaluation indicates that the well may contain non-naturally occurring fluids, the Facility will submit an Action Plan to OCD within 30-days of the finding detailing the course of action to investigate further the potential release; and/or complete any mitigation measures as appropriate. If the comparative evaluation results indicate that no impacts have occurred, the monitoring data will be maintained as part of the Facility Operating Record, and submitted with annual vadose zone monitoring data for the Facility.

TABLE II.8.2
Vadose Zone Monitoring Parameters
Sundance West, Inc.

Field Parameters

- Specific Conductance
- pH
- Total Well Depth
- Temperature
- Depth to Water

Major Cations

- Calcium
- Magnesium
- Sodium
- Iron
- Potassium

Major Anions

- Fluoride
- Nitrate as N
- Sulfate
- Chloride
- Phosphorous

RCRA Metals

- Arsenic
- Barium
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Silver

Organic Compounds

- Benzene
- Toluene
- Ethylbenzene
- Xylenes

Additional Parameters

- Total Dissolved Solids (TDS)
- Total Petroleum Hydrocarbons (TPH)

Concurrent with each vadose zone monitoring event, methane monitoring will be performed in each active well using an electronic, intrinsically safe portable gas analyzer, or equivalent instrument. Methane concentrations will be expressed either as percent by volume in air or as a percent of the lower explosive limit (LEL) for methane; and will be recorded on the form provided as **Attachment II.8.B**. In the event that methane concentrations exceed regulatory limits, the Facility will work with OCD to devise an appropriate scope of work for assessing the methane monitoring results.

APPLICATION FOR PERMIT
DNCS ENVIRONMENTAL SOLUTIONS

VOLUME II: FACILITY MANAGEMENT PLANS
SECTION 8: VADOSE ZONE MONITORING PLAN

ATTACHMENT II.8.A

VADOSE ZONE MONITORING FORM

(TYPICAL)

ATTACHMENT II.8.A

Vadose Zone Monitoring Form (Typical)

Sundance West

Monitoring Personnel _____ _____

Weather Information

Date and Amount of Last Precipitation: _____

Temp: _____ °F

Wind Speed: _____ mph

Wind Direction: _____

Barometric Pressure: _____ inches mercury (Hg)

Weather Conditions: _____

Equipment Information

Monitoring Equipment Used: _____ **Monitoring Equipment Used:** _____

Date and Time Last Calibrated: _____ **Date and Time Last Calibrated:** _____

Well I.D.	Monitoring Date (dd/mm/yy)	Total Well Depth (fbtoc)	Depth to Water (fbtoc)	Field Parameter Measurement				Water Volume Removed (gallons)	Sample Collected?		Observations (e.g., color, odor, clarity, etc.)
				Temperature (^{o}C)	pH (standard units)	Specific Conductance (mS/cm)	Methane (%) or (% LEL)		Y	N	
VM-1											
VM-2											
VM-3											
VM-4											
VM-5											
VM-6											
VM-7											
VM-8											
VM-9											
VM-10											

Notes:

- *fmsl: feet above mean sea level*
- *fbtoc: feet below top of PVC casing*

APPLICATION FOR PERMIT
SUNDANCE WEST

VOLUME II: LANDFILL MANAGEMENT PLANS
SECTION 9: LEACHATE MANAGEMENT PLAN

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ATTACHMENTS

APPLICATION FOR PERMIT
SUNDANCE WEST

VOLUME II: LANDFILL MANAGEMENT PLANS
SECTION 9: LEACHATE MANAGEMENT PLAN

1.0 INTRODUCTION

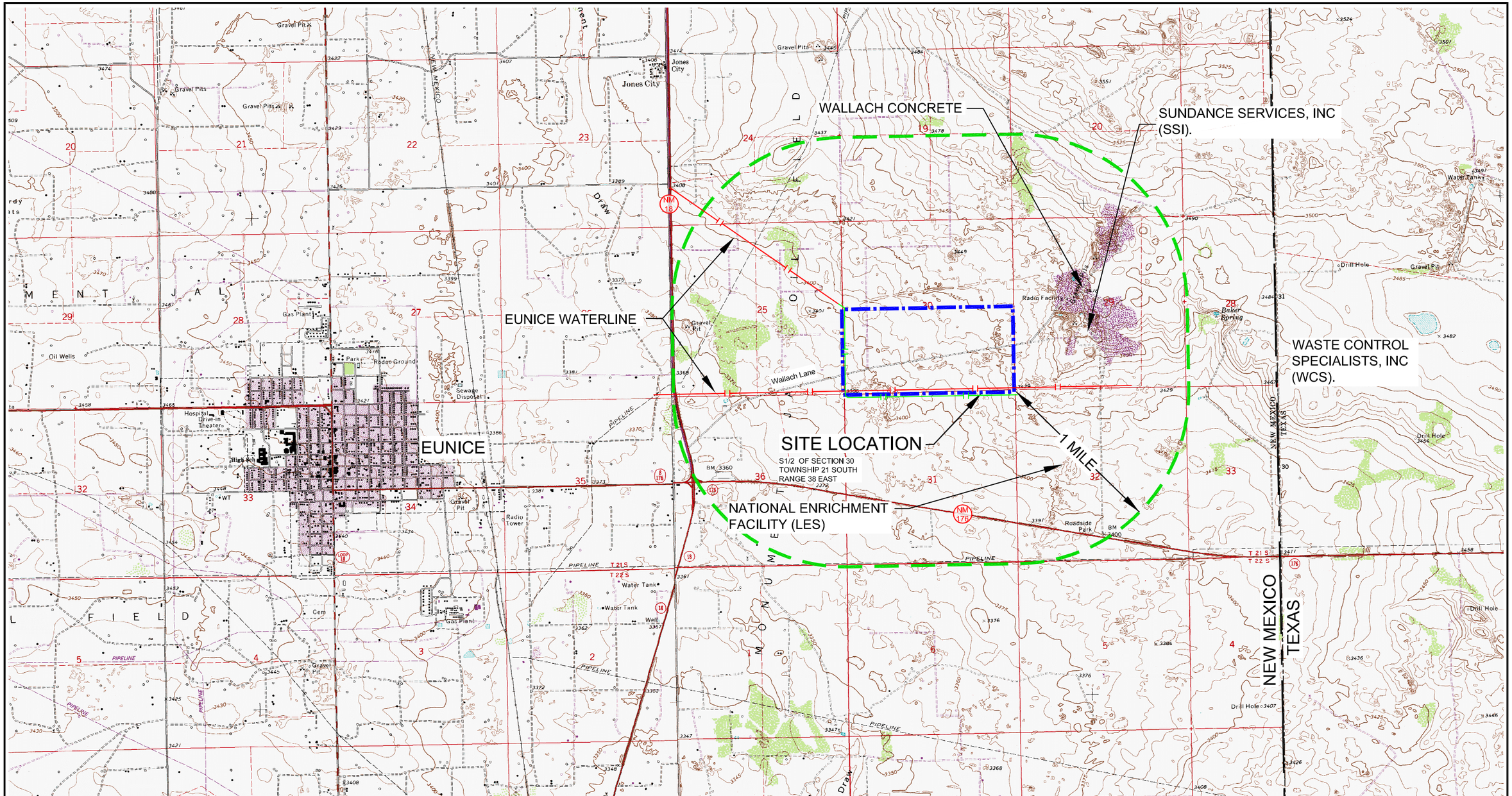
Sundance West is a proposed new commercial Surface Waste Management Facility for oil field waste processing and disposal services. The proposed Sundance West Facility is subject to regulation under the New Mexico Oil and Gas Rules, specifically 19.15.36 NMAC, administered by the Oil Conservation Division (OCD). The Facility is designed in compliance with 19.15.36 NMAC, and will be constructed and operated in compliance with a Surface Waste Management Facility Permit issued by the OCD. The Facility is owned by, and will be constructed and operated by, Sundance West, Inc.

1.1 Site Location

The Sundance West site is located approximately 3 miles east of Eunice, 18 miles south of Hobbs, and approximately 1.5 miles west of the Texas/New Mexico state line in unincorporated Lea County, New Mexico (NM). The Sundance West site is comprised of a 320-acre ± tract of land located in the South ½ of Section 30, Township 21 South, Range 38 East, Lea County, NM. Site access will be provided via NM 18 and Wallach Lane. A Site Location Map is provided as **Figure II.9.1**.

1.2 Description

The Sundance West Facility is a proposed new commercial Surface Waste Management Facility that will include two main component;, a liquid oil field waste Processing Area (80 acres ±), and an oil field waste Landfill (180 acres ±). Oil field wastes are anticipated to be delivered to the Sundance West Facility from oil and gas exploration and production operations in southeastern NM and west Texas. The **Permit Plans** (**Volume III.1**) identifies the locations of the Processing Area and Landfill facilities.



Based on Eunice NE, TX.- NM (1969) Photorevised (1979);
Eunice, NM (1969) Photorevised (1978);
Quadrangles, USGS 7.5' SERIES (1:24,000 Scale)

NOTE:

NO STREAMS, SPRINGS OR WATER COURSES WITHIN 1/2 MILE OF SITE

SITE LOCATION MAP

SUNDANCE WEST
SURFACE WASTE MANAGEMENT FACILITY
LEA COUNTY, NEW MEXICO

Gordon Environmental, Inc.
Consulting Engineers
213 S. Camino del Pueblo
Bernalillo, New Mexico, USA
Phone: 505-867-6990
Fax: 505-867-6991

DATE: 07/22/2016	CAD: DWG NAME.dwg	PROJECT #: 530.06.01
DRAWN BY: DMI	REVIEWED BY: CWF	FIGURE II.9.1
APPROVED BY: IKG	gei@gordonenvironmental.com	

Drawing:P:\acad 2003\530.06.01\REVISED FIGURES(RAI 1)\SITE LOC REVISED 11 x17.dwg
Date/Time:Aug. 09, 2016-12:18:11 ; LAYOUT: B (LS)

1.3 Purpose

A leachate management plan must be developed per 19.15.36.8.C.(12) NMAC that describes the anticipated amount and quality of fluids collected, along with the proposed management, storage and disposal technologies. This Leachate Management Plan (the Plan) details the procedures that will be used to manage contact waters generated at the Sundance West Facility Landfill during the permit period and following closure. This Plan has been developed to address the design and performance requirements of 19.15.36.14 NMAC, and addresses the following items:

1. Projected amounts and rates of leachate generation
2. Expected duration of leachate generation
3. Leachate disposal options
4. Proposed treatment and disposal methods

2.0 LEACHATE COLLECTION SYSTEM

The leachate collection system designed for the Sundance West Landfill meets or exceeds the minimum design and performance standards specified in 19.15.36.14 NMAC, specifically:

1. The minimum design slope on the landfill liner is 2.8%; and the minimum slope on the leachate piping system is 2.0%.
2. The leachate piping system will consist of perforated and solid pipe with a minimum diameter of 6 inches.
3. The leachate drainage layer is enhanced with a 200-mil GEONET with a design hydraulic conductivity of 10 cm/sec.
4. Standard dimension ration (SDR) 11 high density polyethylene (HDPE) piping is demonstrated to meet the site-specific performance standards.
5. The protective soil layer (minimum 24 inches of pervious soil) with $k=1x10^{-5}$ cm/sec will provide both protection for the liner and leachate flow to the piping and extraction system.
6. There is a geonet leak detection layer and secondary 60 mil HDPE below the primary liner and leak collections system.

Each new cell will be outfitted with perforated leachate collection piping that is enveloped in aggregate and geotextile to promote flow while minimizing the intrusion of fines. The cell floor and liner system will be sloped at 45º to each pipe, and leachate will flow through the GEONET and protective soil layer (PSL).

Permanent leachate sumps are designed for each cell at the Sundance West Landfill. Temporary sumps and cleanout risers may also be installed as filling progresses in each cell. Therefore, each cell is designed with its own collection piping. Two solid pipe risers will provide access to each permanent leachate sump at the toe of the slope:

- The leachate extraction riser will be used to measure leachate levels in the leachate sump, and to provide access for a submersible pump to remove accumulated fluids.
- A cleanout riser is connected with a pipe elbow to the collection pipe to facilitate cleaning or flushing if necessary.

Compliance with the design standards of 19.15.36.14 NMAC is demonstrated in the **Permit Plans** (**Volume III.1**). The performance standards specified in the same subsections are addressed as follows:

1. The Liner Construction Quality Assurance (CQA) Plan (**Volume II.7**) specifies the materials and installation techniques which will be used for construction of the leachate collection system and protective soil layer.
2. The performance of the design and the specified materials are documented to meet OCD requirements in the following Landfill Engineering Calculations:
    - Pipe Loading Calculations (**Volume III.5**)
    - Geosynthetic Applications and Compatibility Documentation (**Volume III.6**)
    - Settlement Calculations (**Volume III.8**)

3.0 LEACHATE GENERATION

Leachate in the permanent extraction risers will be measured monthly and after significant rainfall events. The storage capacity in each sump is approximately 1,500 gallons. The maximum head accumulation on the liner is not to exceed 12 inches per 19.15.36.14.F NMAC. Fluid levels on the cell floor will be maintained below the regulatory threshold through regular pumping as recorded and reported to OCD. Sundance West will maintain a record of actual leachate generation and management volumes, using a form similar to the one provided as **Attachment II.9.A** to track the amount of leachate removed from the sumps throughout a given year at the Facility.

Leachate production is projected to approach zero because of the solid nature of the waste and the paint filter restriction. Therefore, leachate generation is attributable solely to precipitation; and particularly fluids from precipitation in the very early stages of cell development.

The leachate generation rate decreases to nearly zero following the placement of the first lift of waste on the liner. This has been calculated in the HELP Model (**Volume III.4**) and confirmed through experience at other facilities. As demonstrated in the HELP Model, the field capacity of the waste and the local evaporation rate far exceed the volume of rainfall experienced at the site, and therefore liquids do not typically reach the leachate collection system. As discussed in detail in the Operations, Inspection, and Management Plan (**Volume II.1**), routine site operation procedures will dictate that a loose lift of waste (approximately 5 feet thick) be placed over the entire floor of a newly constructed cell as soon as practical. This process will protect the liner and leachate collection system; and reduce the generation of contact water, which is stormwater collected within the cell footprint. During the post-closure care period, the site will have been capped and vegetated (**Permit Plans**); and leachate production is modeled to decline to near zero.

4.0 LEACHATE MONITORING

Routine monitoring of leachate levels and extraction of leachate from the sumps will ensure that the fluid accumulation on the liner will not exceed the regulatory 12-inch threshold (measured from the liner at the top of edge of the sump). Procedures to ensure leachate does not accumulate on the liner will include the following:

- The level of the leachate in the sumps will be monitored at least monthly, and leachate will typically be extracted on a minimum quarterly basis; or as needed to maintain <12 inches of head on the liner.
- The leachate will be extracted from the sumps with portable submersible pumps, vacuum trucks, or other suitable devices.
- In the future, the leachate sumps may be equipped with remote level sensors and/or dedicated submersible pumps, if routine leachate removal is required.

The Leachate Monitoring Form provided as **Attachment II.9.A** is a template for monitoring levels and extraction data, as well as the disposal technique used.

5.0 LEACHATE DISPOSAL

Sundance West is requesting approval to recirculate leachate over lined areas of the landfill during the active life of the Sundance West Facility. The following procedures will be adhered to when performing recirculation of leachate at Sundance West:

- On an as-needed basis (initially anticipated to be quarterly), leachate will be pumped from the sump(s) with a portable or permanent submersible pump or vacuum to a tank truck, equipped with appropriate fluid transfer hoses, and will be transported to the active cell. Prior to applying daily cover to the cell, the leachate will be sprayed onto the exposed waste. Cover will be placed after the recirculation activities are complete.
- For the most effective recirculation, and to avoid short-circuiting, the leachate will be applied only in areas where the cell surface is at least 10 feet above the liner system. In addition, the leachate will be applied on cells upgradient in the collection system whenever possible. No leachate recirculation will be conducted within 50 feet of the solid waste boundary.
- Monitoring and recirculation activities will be documented on the Leachate Monitoring Form (**Attachment II.9.A**). The information will be maintained in the Facility Operating Record.

Leachate recirculation will be accomplished via similar collection, transport, and application methods in future cells. Alternatively, leachate may be applied directly to waste deposits in lined cells with pumps and hoses attached directly to the collection system. Sundance West is seeking OCD's approval of additional leachate management alternatives that include, but are not limited to:

- disposal onsite through the Produced Water processing/evaporation process
- use of dilute leachate for dust control over lined cells
- disposal offsite at an OCD-approved facility

Disposal of leachate onsite through the Produced Water evaporation process will be accomplished by pumping leachate directly from the sump with a submersible pump or extraction hose to a tanker truck, equipped with appropriate fluid transfer hoses. The leachate will be transferred to the Produced Water Load-Out Station and unloaded into the Produced Water Tanks for processing with the routine waste stream.

The use of dilute leachate for dust control over lined cells will be accomplished as follows:

- Leachate will be diluted with collected stormwater to minimize the potential for odors.
- The leachate application method will consist of spraying the dilute leachate with the site's water wagon, or similar type vehicle.
- The application of leachate will be conducted only over lined cell areas or future areas to be lined and yet to be excavated.
- Leachate will be sprayed evenly and thinly over lined cell areas to provide for effective dust control and evaporation, and to minimize the potential of recirculation through the waste.
- To enhance safety, leachate will be sprayed only when personnel are not near the spray surface. In addition, leachate will not be sprayed on windy days.
- If there are any issues regarding the potential composition of the leachate (for example, leachate being generated by some means other than heavy rainfall on a new cell), leachate may be analyzed prior to beneficial use in consultation with OCD.

Disposal of leachate offsite at a POTW or OCD-permitted liquids processing facility following closure may be conducted by pumping leachate directly from the sump with a submersible pump or extraction hose to a tanker truck, equipped with appropriate fluid transfer hoses. If the leachate is required to be sampled and analyzed by the disposal facility, the parameters to be analyzed will be determined in consultation with the POTW. Prior to transport, leachate samples will be collected and analyzed to demonstrate compliance with the disposal facility's leachate acceptance criteria for analytical parameters and concentrations. Prior to disposal, the Leachate Management Plan may be updated with OCD approval to reflect the analytical parameters and concentrations, as well as transport methods specified by the selected disposal facility. The updated Plan will be submitted to OCD for approval as an administrative change to the existing Plan prior to implementation of disposal activities. The analytical test results for leachate disposal at the off-site Facility will be maintained in the Facility Operating Record.

Following closure, the most effective treatment and disposal technology for leachate (if produced) will be determined and implemented with the approval of OCD. This disposal technology may include hauling off-site for treatment at an OCD-approved Facility. Leachate monitoring during post-closure will be conducted at least semi-annually. Leachate management information will continue to be documented and maintained in the Facility Operating Record.

6.0 LEAK DETECTION MONITORING

Routine inspection of the leak detection system and sump in each of the Landfill cells and evaporation ponds will be conducted on at least a monthly basis; and documented on the Leachate Monitoring Form (**Attachment II.9.A**), or the Pond Integrity/Leak Detection Inspection Form (**Attachment II.9.B**). At a minimum, the following items will be documented:

- Inspection date, time, and conditions
- Inspector identification
- Depth of liquids in sump
- Sump and piping condition and status
- Volume collected

Prior to placing a newly constructed landfill cell or evaporation pond (or an evaporation pond that has undergone repair or cleaning) into service, liquids will be removed from above the primary liner and from the leak detection system. Once in service, it is anticipated liquid may be present at all times due to condensation and nominal leakage through the primary liner. The sumps are 2 feet deep and have a capacity of approximately 1,500 gallons (gal) using a porosity of 0.40 for the granular material.

Attachment II.9.C is a summary table from an authoritative publication on potential geomembrane liner leakage for 40 mil HDPE lined ponds. As shown on the table, the combined projected permeation/pinhole leakage rate ranges from 9.5 to 138 gal/acre/day. Using a very conservative value of 75 gal/acre/day for the combined leakage/permeation rate (**Attachment II.9.C**), this provides 16 days of storage at a depth of 2 ft in the sump. The rate of 75 gal/acre/day is considered very conservative as it is based on 40 mil HDPE (vs. the actual 60 mil); a fluid depth of 10 ft; and a high number of large pin-holes. Considering that the Landfill leachate collection system is designed to maintain less than 1 ft of liquid on the liner this is and extremely conservative analysis for the Landfill.

The liquid levels in the leak detection sumps will be monitored at least monthly and immediately after the cells or ponds are put into service, and documented. In the event and excessive liquid level [i.e., > corrective action level (ACL)] is observed in a leak detection

system, OCD will be notified within 24 hours. If this liquid level is observed in a Landfill cell the Facility will initiate corrective action which may include but is not limited to:

- Additional sump liquid level monitoring and pumping frequencies
- Liquids analytical testing and submittal of results to OCD
- Enhanced vadose zone monitoring (if applicable)

If this liquid level is observed in an evaporation pond, the affected pond area will be drained. Prior to placing the pond back into service, the Facility will initiate corrective action which may include but is not limited to:

- Actions undertaken to locate source of leakage
- Repair procedures
- Additional sump liquid level monitoring and pumping frequencies
- Liquids testing and submittal of results to OCD
- Groundwater monitoring (if required)

Any liquids recovered from the Leak Detection Sump will be disposed of in the same manner as leachate generated from the landfill cells.

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ATTACHMENT II.9.A

LEACHATE MONITORING FORM (TYPICAL)

ATTACHMENT II.9.A
Leachate Monitoring Form (Typical)
Sundance West

Leachate Level Data				Pumping Data			Notes
Date	Sump I.D.	Time	Monitored By	Date	Company	Volume Pumped (gal)	

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ATTACHMENT II.9.B

POND INTEGRITY/LEAK DETECTION INSPECTION FORM (TYPICAL)

ATTACHMENT II.9.B
Pond Integrity/Leak Detection Inspection Form (Typical)
Sundance West

Date: _____ **Inspector(s):** _____

Time: _____ _____

_____

Weather:

Temperature _____ deg. F Precipitation (last 24 hours) _____ inches

Skies _____

Wind Speed _____ mph

Wind Direction _____ *(direction blowing from)*

NOTES:
"X" indicates that a Deficiency has been noted. "P" indicates that a Photograph has been taken. "S" indicates that a Sample has been collected. Complete descriptions of Deficiencies, Photographs, and Samples are provided on attached pages. Items are referenced by Location.

Pond Condition

Location	Item			
	Erosion	Vegetation Established	Vectors	Sample

Leak Detection System

Riser #	Deficiency	
	Depth of H_2O	Structural Defect

NOTES: _____

_____

_____

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ATTACHMENT II.9.C

POTENTIAL GEOMEMBRANE LINER LEAKAGE

Attachment II.9.C
Potential Geomembrane Liner Leakage
Sundance West

Title: Leakage Through Liners Constructed with Geomembranes - Part 1. Geomembrane Liners

Written by: J.P. Giroud and R. Bonaparte
Published in: Geotextiles and Geomembranes **Volume:** 8 **Issue:** 2 **Pages:** 27 to 67
Phone: +31 20-485-3757 ~ **Web Site:** http://www.elsevier.com

How impermeable are 'impermeable liners'? All liners leak, including geomembranes, but how much? What are the mechanisms of leakage through liners constructed with geomembranes? To answer these questions, a detailed review of leakage mechanisms, published and unpublished data, and analytical studies has been carried out with the goal of providing practical design recommendations. In particular, it appears that a composite liner (i.e. geomembrane on low-permeability soil) is more effective in reducing the rate of leakage through the liner than either a geomembrane alone or a soil liner (low-permeability soil layer) alone. However, the paper shows that the effectiveness of composite liners depends on the quality of the contact between the geomembrane and the underlying low-permeability soil layer.

Table 1
Calculated Leakage Rates Due to Pinholes and Holes in a Geomembrane

	Water depth on top of the geomembrane, h_w					
	Defect Diameter	0.003 m (0.01 ft)	0.03 m (0.1 ft)	0.3 m (1 ft)	3 m (10 ft)	30 m (100 ft)
Pinholes	0.1 mm (0.004 in)	0.006 (0.0015)	0.06 (0.015)	0.6 (0.15)	6 (1.5)	60 (15)
	0.3 mm (0.012 in)	0.5 (0.1)	5 (1)	50 (13)	500 (130)	5000 (1 300)
Holes [a]	2 mm (0.08 in)	40 (10)	130 (30)	400 (100)	1300 (300)	4000 (1 000)
	11.3 mm (0.445 in)	1 300 (300)	4 000 (1 000)	13 000 (3 000)	40 000 (10 000)	130 000 (30 000)
	Values of leakage rate in liters/day (gallons/day)					

Table 2
Calculated Unitized Leakage Rates Due to Permeation of Water Through an HDPE Geomembrane

	Water depth on top of the geomembrane, h_w					
	0 m (0 ft)	*0.003 m (0.01 ft)*	*0.03 m (0.1 ft)*	*0.3 m (1 ft)*	*3 m (10 ft)*	*>10 m (>30 ft)*
Coefficient of migration, m_g(m^2/s)	0	$9x10^{-20}$	$9x10^{-18}$	$9x10^{-16}$	$9x10^{-14}$	$3x10^{-13}$
Unitized leakage rate, q_q	0	$9x10^{-17}$	$9x10^{-15}$	$9x10^{-13}$	$9x10^{-11}$	$3x10^{-10}$
(m/s)	0	$8x10^{-5}$	0.008	0.8	80	260
(lphd)	0	$8x10^{-6}$	0.0008	0.08	8	28
(gpad)						

Notes: These values of utilized leakage rates were calculated using eqn (5) and assuming a geomembrane thickness of 1 mm (40 mils). The coefficients of migration used to calculate the unitized leakage rates in this table were obtained from eqns (19) and (20), with $C_1 = 1x10^{-22}$ m^4 $kg^{-2}s^3$, $n = 2$, and $m_{gmax} = 3x10^{-13}$ m^2/s.

The water depths used here correspond to the typical values defined in Section1.3.6. (To use eqn (19), it is necessary to know the pressure difference, Δp. According to eqn (1), water depths, h_w, are approximately equal to hydraulic head differences, Δh, which are related by eqn (12) to pressure differences, Δp.)

- data used in calculations