Remediation and Reclamation Summary Report

Chalupa #4 SWD – North Remediation Area
1RP-4633
Lea County, NM

Prepared for:

FOUNDATION ENERGY MANAGEMENT

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Table of Contents

1. Introduction

Tasman Geosciences, Inc., (Tasman), on behalf of Foundation Energy Management (FEM) has prepared this Remediation and Reclamation Summary Report for Chalupa #4 Saltwater Disposal facility (Site) with associated RP case number 1RP-4633. This report details remediation and reclamation activities that were performed at the Site to address chloride impacted soil resulting from a produced water surface release that was discovered on March 2, 2017. In accordance with the *Soil Remediation Work Plan for Chalupa #4 SWD Release Site* (Remediation Work Plan) which was approved by the New Mexico Oil Conservation Division (NMOCD) on June 6, 2018, Site assessment, remediation, and reclamation activities within the root zone were conducted within a downgradient area adjacent to the Site referred to as the Northern Release Area (NRA).

2. Site Location and Background

The Site is located in Lea County, NM in the west half of the southwest quarter of Section 13, Township 14 South, Range 33 East and the approximate coordinates are 33.103422, -103.576112 (Figure 1). The Site is located approximately 0.3 miles south of State Highway 108 (Anderson Road) in a rural area on New Mexico State Trust Lands administered by the New Mexico State Land Office (NMSLO) and leased to Norman and Elwanda Hahn Ranches, LTD for agriculture use. The nearest town of Lovington, NM is located approximately 16 miles southeast of the Site.

On March 2, 2017 FEM discovered a release of produced water at the Site from a leak that developed in the pipeline connecting FEM's tank battery to the Chalupa #4 injection well. The release occurred in the NRA as displayed on Figure 2, which is approximately 600-feet south of the tank battery location. Approximately 25 bbls of saltwater were released to the ground surface and approximately 15 bbls were recovered. on March 6, 2017, FEM submitted a Release Notification Corrective Action Form C-141 to the NMOCD for the release and the NMOCD established a maximum permissible chloride level in soil of 600 milligrams per kilogram (mg/kg). On behalf of FEM, Enviro Clean Cardinal, LLC (ECC) performed initial Site investigation activities which included a walkover survey using an EM-38 electrical conductivity (EC) meter and soil boring activities to delineate the horizontal and vertical extents of chloride impacts. As presented in the *Release Characterization Report* that was submitted to the NMOCD on February 16, 2018, the lateral extents of chloride impacts in the NRA covered approximately 1.76 acres and a depth of 9 to 14 feet below ground surface (bgs).

Subsequent to the initial response and investigation activities described above, FEM retained Tasman to conduct additional Site assessment, investigation, remediation, and reclamation activities at the Site within the root zone of the NRA between the surface and four (4) feet bgs as described in the Remediation Work Plan which was approved by the NMOCD on June 6, 2018 and by the NMSLO on June 8, 2018.

3.0 Additional Site Assessment Activities

In accordance with Section 3.0 of the Remediation Work Plan, additional Site assessment activities described in the following sub-Sections were performed to assist with defining Site conditions.

3.1 Background Soil Sampling

As described in Section 3.1 of the Remediation Work Plan, background soil sampling for analysis of cation exchange capacity (CEC), sodium absorption ratio (SAR), mechanical grain size distribution, soil classification, and 12 essential plant nutrients was proposed to be conducted to help determine the nutrients that would be required to facilitate vegetation re-growth at the Site. However, due to the alternative remediation approach that was ultimately chosen for the Site, as discussed in Section 4.0 below, background soil sampling for soil nutrient information was not required. As described in Section 4.0, clean organic topsoil typically used in the area for excavation backfilling and vegetation re-growth was utilized.

3.2 Playa Investigation

During the initial assessment and investigation, a potential playa was identified within the NRA at the location illustrated on Figure 2. Tasman performed a playa survey based on the New Mexico Rapid Assessment Method – Playa Wetlands Worksheet (Playa Worksheet) which involved Level 1 GIS database assessments and Level 2 field inspections.

Between January 25 and 30, 2019, the Level 1 and 2 playa investigation activities were performed in accordance with State regulations. Based on the data collected, Tasman determined that the suspected area within the NRA is a registered playa. The Playa Worksheet and supporting documentation including aerial figures illustrating the playa location and photographs of the Site, the playa, and associated stressors is included in this report as Appendix A. As described in further detail below, the preferred remediation alternative presented in the Remediation Work Plan was transitioned to dig and haul methods due to soil lithology. Therefore, the playa did not affect the outcome of the remediation methods and clean sand and organic topsoil was used to backfill the excavation area.

3.3. Additional Soil Sampling Investigation

To address NMOCD comments provided via e-mail on March 15, 2018, additional investigation activities including a test pit (HA-9) was advanced to five (5) feet bgs using a backhoe at the location illustrated on Figure 2 outside of the play to delineate chloride impacts south of soil boring HA-1. During test pit advancement, the soil lithology was observed as loam and broken caliche from the surface to 1-foot bgs, a hard layer of caliche rock from 1 to 2.5 feet bgs, and a firm layer of silty sand with inclusions of less dense caliche from 2.5 feet bgs to 5 feet bgs. Soil samples were collected at 1-foot intervals from the test pit and submitted to Cardinal Laboratories in Hobbs, NM for laboratory analysis of Chloride using National Environmental Methods Index (NEMI) Standard Method (SM) 4500-Cl B. The laboratory analytical results for chloride from test pit HA-9 ranged from 80.0 mg/kg at one (1) and three (3) feet bgs to 368 mg/kg at

two (2) feet bgs, which are below the State standard of 600 mg/kg. The soil sample analytical results are summarized on Table 1 and the laboratory analytical report is included in Appendix B.

4. Remediation and Reclamation Activities

On May 8, 2019, chloride impacted soil excavation activities were initiated within the NRA between the surface and approximately 4 feet bgs. However, during initial excavation activities, a very hard caliche layer was encountered within the in the first 18 inches of soil. Subsequent to further excavation and subsurface investigation, due to the volume and consistency of the caliche material, it was determined that the native material was not conducive to the preferred remedial alternative presented in the Remediation Work Plan which included on-Site treatment through excavation, impermeable liner installation, backfilling, and soil washing. Concerns that the liner and soil washing system would be severely damaged during backfilling and compaction of the native caliche material rendered the soil washing remediation approach infeasible. Therefore, soil remediation activities were transitioned to traditional dig and haul methods for subsequent disposal of the top 4 feet of impacted material and subsequent impermeable liner installation and backfilling using clean fill material that would not puncture the liner.

Between May 8 and 19, 2019, approximately 9,013 cubic yards (yd^3) of chloride impacted soil was transported under waste manifest procedures to an approved off-Site disposal facility (Gandy Marley Inc.) located near Caprock, NM. On May 22, 2019, prior to backfilling activities, a 20-millimeter thick linear low-density polyethylene (LLDPE) sealed liner manufactured by Raven Industries, Inc. was installed at the base of the excavation area. On May 23, 2019, approximately 7,538 yd^3 of clean sand was used to backfill the bottom of the excavation up to 18 inches bgs and approximately 2,897 yd^3 of a clean organic topsoil was backfilled and compacted within the disturbed area to match the previous grade.

On June 6, 2019, the NMSLO approved an amended seed mixture to be used at the Site and on September 11, 2019, prior to heavy precipitation events that were forecasted for the area, re-seeding activities were performed at the Site using a tractor with a drop seed tiller. During a Site visit on October 8, 2019 to observe vegetation re-growth at the Site, Tasman personnel observed sprouted seedlings throughout the disturbed area indicating that the re-seeding effort has successfully propagated vegetation at the Site. Photos of the observed seedlings are provided in Appendix C.

5. Conclusions and Recommendations

Based on the remediation and reclamation activities described herein, chloride impacts to soil within the root bearing zone between the surface and 4 feet bgs have been remediated. Additionally, based on the October 8, 2019 Site visit, vegetation propagation appears to have been successful through the excavation area. Periodic Site monitoring will be performed during the growing season of 2020 to ensure vegetation re-growth is successful.

Tables

TABLE 1
Foundation Energy
Chalupa #4 SWD
TEST HOLE SOIL SAMPLE ANALYTICAL RESULTS SUMMARY TABLE

Sample ID	Date Sampled	Depth (feet bgs)	Chloride (mg/kg)
HA-09-01	1/30/2019	1	80
HA-09-02	1/30/2019	2	368
HA-09-03	1/30/2019	3	80
HA-09-04	1/30/2019	4	176
HA-09-05	1/30/2019	5	96
NMOCD Action Levels - Soil (mg/kg) [1]			**600**

Notes:

1). Standards for Soil are taken from NMOCD Guidelines for Remediation of Leaks, Spills and Releases, 1993, total ranking >19
Bold indicates concentration exceeds NMOCD Action Levels.
mg/kg= Milligrams per kilogram.
bgs - Below ground surface.

Figures

0 750 1,500 Feet

Figure 1

Site Location Map
Chalupa #4 SWD Well Site
S13 T14S R33E
Lea County, New Mexico

TASMAN GEOSCIENCES

Drawn By: DBA
Date: 5/8/2018

DATE: May 2018 DESIGNED BY: M. Lindstrom DRAWN BY: D. Arnold	TASMAN GEOSCIENCES **Tasman Geosciences, Inc.** **6899 Pecos Street - Unit C** **Denver, CO 80221**	**Foundation Energy Management, LLC** **Chalupa #4 SWD Well Site** Section 13, Township 14 South, Range 33 East Lea County, New Mexico	Northern Release Area Soil Remediation Layout Map	Figure 2

Appendix A

Appendix A

New Mexico Rapid Assessment Method

Playa Wetlands

Field Guide Worksheet Packet

(Version 1.2)

This packet of worksheets is provided for conducting the New Mexico Rapid Assessment Method (NMRAM) for Playa Wetlands. The worksheets are used in conjunction with the Field Guide for evaluation of five Level 1 GIS mapping metrics (Absolute Playa Size, Surrounding Land Use, Playa Configuration, Playa Hydroperiod Reduction and Playa Watershed Connectivity), five Level 2 field-based metrics (Exotic Annual Plant Abundance, Wetland Species Index, Vertical Habitat Disruption, Soil Condition Index and Water Source Augmentation) and evaluation of stressors using Stressor Checklists. The worksheets are designed for either paper use or digital application using an active fillable PDF available from the New Mexico Environment Department Surface Water Quality Bureau (https://www.env.nm.gov/surface-water-quality/). The PDF version computes some of the metric scores and auto-fills the SA Rank Summary Worksheet and headers. If the field team members use paper versions in the field, they can fill in a PDF later to compute the scores and make reports. Regardless, all raw data must be collected first.

NMRAM Playa Wetlands Version 1.2

SA Cover Worksheet			
SA Code	Partial PW	☐ Project	Chalupa #4 SWD
SA Name	PW		
AU Code	AU Name		
SA General Location and Boundary (Rationale, comments)			
Driving Directions and Required Site Permissions. From the intersection of NM-457 N and CR 108 (Anderson Rd.), go EAST on CR-108 (Anderson Rd.) 2.25 miles. Turn RIGHT (SOUTH) on lease road and travel 0.27 miles. Keep LEFT (SOUTHEAST) at Y in road and travel 0.35 miles. Turn RIGHT (WEST) on dirt road and travel 0.17 miles. Access Open.			
Ownership	State Land Office (SLO)	Data Sharing Restrictions	Not Restricted

Surveyor Role	Surveyor Name	Initials	Playa Hydrology	
Size & Landscape	Devin Arnold	DA	Water Present?	No
Biotic	Brett Dennis	BD	Last Known Inundation	Unknown
Abiotic	Nick Kopiasz	NK	Water Source	
Stressors	Nick Kopiasz	NK		

Northing	Easting	Zone	Datum	Latitude	Longitude
3663689	632924	13S	WGS84	33.103736	-103.575459
Survey Date	01/25/2019	**Start Time**	9:00 AM	**End Time**	4:00 PM

SA Description

NMRAM Playa Wetlands Version 1.2

SA Landscape Context (summarize the wetland and surrounding landscape; include condition and impacts)

Playa is dry, local ranch hand stated the last time the playa was filled with water was in 2017. Playa has a gentle slope towards the west of the CBF/SA and and a steeper slope towards the east of the CBF/SA. Saltwater disposal (SWD) line released saltwater starting west of the playa and saltwater flowed towards the east into the playa.

SA Biotic Condition (vegetation patterns, composition and structure, exotics and invasives, disturbance evidence, fire and herbivory)

Areas of dead vegetation from SWD line rupture in the west towards the playa to the east. West side of playa has areas of dead vegetation from saltwater infiltration.

SA Abiotic Condition (hydrological alterations, sediment inputs, water sources, modifications to playa shape, soil features, soil disturbance, pits and fill, other SA impacts)

Natural water runoff in the north-northwest of the playa has been altered due to containment berms for SWD tank batteries and trenching from buried pipelines. Stream-like erosion occurred in the west of the playa in the natural landscape due to the saltwater line rupture.

Assessment Summary (Overall site condition summary and comments after the field data is collected.)

Approximately 10% of the playa had been affected from the saltwater infiltration from the west. Multiple lease roads and containment berms have affected the natural runoff of surface waters into the playa. The playa is also in a semi-arid region with low rain-fall accumulations. Cattle roam freely in this area as well and graze off the playa grasses.

Provisional Field Score	Rank	Surveyor(s)	Final Score	Rank	Initials NK, DA	DateJan 31, 2019

SA CODE:

Date : 2019-01-25

SA Name :

Surveyor Initials : DA, BD, NK, NK

Choose one of the ratings below.	
◉	**All metrics measured**
○	Level 1 metrics only for currently inundated playa
○	Playa completely filled with sediment and no longer exists. **SA Wetland Rank =D**
○	Playa permanently filled with water from artificial sources. **SA Wetland Rank=D**

Does the SA include the whole PW?	
○	The SA includes the entire PW
◉	The SA is partial but represents the entire PW
○	The SA is partial and represents a portion of the PW

NMRAM - SA Rank Summary Worksheet: Playa 1.2

Metric Description	Rating	Weight	Final Score
Size		Σ	2
S1. Absolute Playa Size	2	1	2
Landscape Context		Σ	3.5
L4. Surrounding Land Use	4	0.5	2
L5. Playa Configuration	3	0.5	1.5
Biotic		Σ	2.2
B6. Exotic Annual Plant Abundance	4	0.4	1.6
B7. Wetland Species Index	1	0.4	0.4
B9. Vertical Habitat Disruption	1	0.2	0.2
Abiotic		Σ	2.8
A7. Playa Hydroperiod Reduction	4	0.3	1.2
A8. Soil Condition Index	2	0.3	0.6
A9. Water Source Augmentation	3	0.2	0.6
A10. Playa Watershed Connectivity	2	0.2	0.4

SA Condition Scoring Summary

Major Attribute	Score	Weight	Weighted Score
Size	2	0.1	0.2
Landscape Context	3.5	0.25	0.875
Biotic	2.2	0.3	0.66
Abiotic	2.8	0.35	0.98
SA WETLAND CONDITION SCORE Σ			2.715
SA WETLAND RANK =			B

Level One SA Condition Scoring Summary

Metric	Score
S1. Absolute Playa Size	
L4. Surrounding Land Use	
L5. Playa Configuration	
A7. Playa Hydroperiod Reduction	
A10. Playa Watershed Connectivity	
LEVEL ONE SA WETLAND CONDITION SCORE (Average)	
LEVEL ONE SA WETLAND RANK =	

SA Ratings

Rank	Score	Description
A	≥3.25 - 4.0	Excellent Condition
B	≥2.5 - <3.25	Good Condition
C	≥1.75 - <2.5	Fair Condition
D	1.0 - <1.75	Poor Condition

Stressor Summary	Land Use Zone			Playa Wetland		
	Minor	Moderate	Intense	Minor	Moderate	Intense
Total # Stressors	15	1	0	7	4	0

SA CODE:

Date : 2019-01-25

SA Name :

Surveyor Initials : DA

Size

S1. Absolute Playa Size

Worksheet 1. Playa Area The area of the absolute playa size includes the annulus and basin floor. Estimate the absolute playa size using aerial photography or other wetland maps whose rules include the annulus and basin floor. Field check absolute playa size for any significant deviations or misinterpretations. Enter absolute playa size on worksheet 1 and Table S1 and enter rating on SA Rank Summary Worksheet.

Hectares	Acres
3.39936	8.40000148

Table S1. Ratings for Absolute Playa Size

Score	Size	Description
○ 4	≥ 8 ha (≥ 20 acres)	Very large playa compared to other examples of the same type and potentially capable of supporting a wealth of biodiversity in a functional sustaining ecosystem.
○ 3	≥4 - <8 ha (≥5 - <20 acres)	Large playa compared to other examples of the same type.
◉ 2	≥1 - <4 ha (≥2.5 - <5 acres)	Medium size playa compared to other examples of the same type.
○ 1	<1 ha (<2.5 acres)	Small playa unlikely to sustain full biodiversity and highly susceptible to impacts.

Landscape Context

L4. Surrounding Land Use

Worksheet 2. Land Use Index (LUI). Enter the percent of the Land Use Zone (LUZ) area occupied by a given land use element. Note that for playas less than 8 ha (20 acres), use 500 meter LUZ area. For playas greater than or equal to 8ha, use 1000 meter LUZ area. Calculate LUI Score by element as the product of the element impact coefficient times the percent area occupied by the element. Sum the weighted scores to create the final LUI scores. (total area occupied must equal 100%.) Rate using Table L4 and enter the rating in the SA Rank Summary Worksheet.

Land Use Element	Coef	% LUZ	LUI Score
Urban/suburban development, permanent structures (houses, barns, commerical buildings) paved and unpaved parking lots	0	0	0
City parks, sports fields and courses, commercial landscapes maintained	0.2	0	0
orchards, tree plantations, windbreaks	0.2	0	0
Paved road (highway or residential), graded gravel or dirt road	0	0.3	0
Two-track dirt road, livestock trails, hiking trails	0.6	0.87	0.522
Gas pump, drill pad, pipeline (above or below ground), storage tanks	0	0.88	0
Wind Turbines	0.4	0	0
Powerline without road	0.8	0	0
Center pivot agricultural field, irrigated row crop, plowed fields, orchards or tree plantations	0.2	0	0
Stock tanks, ditch, dirt or rock mounds, berms, bare dirt	0.4	0	0
Trash piles, dumps or old vehicles	0.1	0	0
Dairy, feedlot, paddocks	0	0	0
Pasture, vegetated fallow or old field, CRP Fields	0.6	0	0
Contour rangeland erosion control features	0.5	0	0
Mature restoration areas returned to natural conditions (native vegetation, no contouring)	0.8	0	0
Open rangeland - natural land, area managed for natural vegetation	1	97.95	97.95
LUI Score Sum		100	98.472

Table L4. Ratings for Surrounding Land Use Based on the LUI Scores

Rating	LUI Score
◉ 4	≥95 - 100
○ 3	≥80 - <95
○ 2	≥40 - <80
○ 1	<40

Calculate L4 Rating

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : DA

L5. Playa Configuration

Worksheet 3. Playa Configuration. Check features that impinge on the natural shape and boundary configuration and the interior of the playa. Provide visual estimate of percent playa area occupied by each disturbance feature type that causes departure from natural shape of playa including features within the playa . Mark whether the disturbance feature is GIS-based only, field based, or GIS-based and verified in the field. Provide date of imagery. Rate using Table L5 and enter rating in L5 box on the SA Rank Summary Worksheet.

Imagery Date 1/19/2018

Disturbance Features	% of SA	Source	
		GIS	Field
Excavation (pits, ditches, trenches, earthen tanks along perimeter of playa only)	0	☒	V
Fill (Berms, rubble, trash piles, fill materials)	0	☒	V
Unpaved roads and trails	0	☒	V
Paved Roads, parking lots	0	☒	V
Dairy/feedlot paddock	0	☒	V
Oil/gas/windmill platforms and lines	0.2	☒	V
Alluvial fans	0	☒	U
Erosion gullies	0	☒	V
Buildings	0	☒	V
Agricultural field leveling, center-pivot fields, row crops	0	☒	V
Disking, grading, plowing	0	☒	V
Mining/gravel excavation	0	☒	V
Recontouring for stormwater catchment	0	☒	V
Concrete culverts	0	☒	V
Buried sewer/utility lines, pipelines, storage tanks	9	☒	V
Other Dead vegetation/erosion due to ruptured saltwater disposal line	9.68	☒	V

Table L5. Rating for Playa Configuration

Rating		Description
○ 4	<5%	Playa configuration intact; little or no disruption due to anthropogenic disturbance, PW generally round, elliptical or teardrop shaped with no obvious reduction from historic size.
◉ 3	≥5% - <10%	Some limited disturbance to the playa configuration; disturbance features generally small and low impact. No berms or elevated constructed features on the interior of the PW. PW mostly round, elliptical or teardrop shaped with some alteration of the natural border and minimal reduction from historic size.
○ 2	≥10% - <25%	Clear evidence of disturbance to playa configuration: disturbance features have moderate impact.May have small berms or few elevated constructed features on the interior of the PW. PW deviating from round, elliptical or teardrop shape on at least one side with obvious alteration of the natural border and noticeable reduction from historic size.
○ 1	≥25%	Playa configuration highly disrupted with many or large disturbance features having a high impact. Berms or elevated constructed features on the interior of the PW are large or numerous. PW no longer round, elliptical or teardrop shaped with an obvious irregular border on many sides and a noticeable reduction from historic size. A road through the interior of a PW rates an automatic 1.

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : DA

Photo Point Log for Playa and Watershed Photographs (Taken along Playa Wetland Boundary at each cardinal direction point)							
Cardinal Direction	**Easting**	**Northing**	**Latitude**	**Longitude**	**Playa**	**Watershed**	**Comments**
N	633031	3663845	33.10519	-103.57429	X		Coordinates corrected from photos to represent general area photographs were taken.
E	633096	3663757	33.104326	-103.57360	X		Coordinates corrected from photos to represent general area photographs were taken.
S	633015	3663660	33.103456	-103.57448	X		Coordinates corrected from photos to represent general area photographs were taken.
W	632946	3663757	33.104347	-103.57521	X		Coordinates corrected from photos to represent general area photographs were taken.

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : BD

Biotic

Worksheet 4. Species composition by polygon for Exotic Annual Plant Abundance and Wetland Species Index metrics. Record Polygon location as "CBF" for Current Basin Floor or "Other" for other surrounding polygons in the SA. Record % of SA as the percentage of the SA occupied by the map polygon; the sum of all polygons must equal 100%. Record % woody cover and each herbaceous species cover as actual percent (e.g., 8% as 8). "D" refers to duration recorded as either "A" for annual or biennial, "P" for perennial or "U" for Unknown. "W" refers to the binary Wetland Code in Table 2 in the Field Guide, and is recorded as either "w" for wetland or "x" for non-wetland or unknown. "O" refers to Origin and is recorded as "N" for native species, "E" for exotic or introduced species, and "U" for unknown species or unknown origin.

Polygon	Playa Location	% of SA	% Woody Cover	Species1	% Cover	D	W	O	Species2	% Cover	D	W	O	Species 3	% Cover	D	W	O	Species 4	% Cover	D	W	O	Species 5	% Cover	D	W	O	Species 6	% Cover	D	W	O
1	CBF	81	0	BODA2	80	P	x	N	PAOB	15	P	x	N	GUSA2	5	P	x	N															
2	Other	19	0	BODA2	90	P	x	N	BOGR2	10	P	x	N																				
3																																	
4																																	
5																																	
6																																	
7																																	
8																																	
9																																	
10																																	
11																																	
12																																	

Comments (other species of note; status, environmental conditions; voucher specimens collected for unknowns.)
Vegetation was dormant since assessment occurred in the winter months.

Calculate

SA CODE:

Date : 2019-01-25

SA Name :

Surveyor Initials : BD

B6. Exotic Annual Plant Abundance

	Worksheet 5. Annual Exotic Plant Abundance and Wetland Species Index Scoring								
			Annual Exotic Plant Abundance				Wetland Species Index		
Polygon Location	Polygon Number	% of SA	Exotic Annual Cover	Total Herbaceous Cover	Relative Exotic Annual Cover	**Weighted Relative Exotic Annual Cover**	Total Wetland Cover	Relative Wetland Cover	**Weighted Relative Wetland Cover**
Current Basin Floor Polygons	1	81	0	100	0	0	0	0	0
								Σ Weighted Relative Wetland Cover	0
All Other Polygons in SA	2	19	0	100	0	0			
						∑ Weighted Relative Exotic Annual Cover	0		

Table B6. Ratings for Exotic Annual Plant Abundance

Rating	Weighted Relative Annual Cover	Description
(●) 4	0%	**Excellent Condition.** Exotic annual species are not present or very scarce in the SA and not significant components of any vegetation polygon to make the list of six species.
( ) 3	≤5%	**Good Condition.** Exotic annual species are present in the SA but have low abundance and only make the list of six species at low cover in few or smaller vegetation polygons.
( ) 2	>5 - ≤30%	**Fair Condition.** Exotic annual species are common in the SA, included on the list of six species in many vegetation polygons, or present in high cover in one or two smaller vegetation polygons.
( ) 1	>30%	**Poor Condition.** Exotic annual species abundant and present throughout the SA, and/or the dominant species in many vegetation polygons.

Table B7. Ratings for Wetland Species Index

Rating	Weighted Relative Wetland Cover	Description
( ) 4	>50%	Excellent wetland status. Facultative wetland and/or obligate wetland species are dominant and abundant in most patches within the current basin floor.
( ) 3	>25 - ≤50%	Good wetland status. Wetland and non-wetland species mixed across the current basin floor, either co-dominants or alternating dominance and abundance among vegetation patches.
( ) 2	>5 - ≤25%	Fair wetland status. Non-wetland species are dominant and abundant but some wetland species are represented in the top 6 dominants for some patches on the current basin floor.
(●) 1	≤5%	Poor Wetland Status. Wetland species are poorly represented in, or absent from the top 6 dominants for most patches, or are completely absent from the current basin floor.

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : BD

B9. Vertical Habitat Disruption

Worksheet 6. Vertical Habitat Disruption. Check vertical structure features that occur within the SA or 100 m (328ft) of the SA Boundary (buffer) . Provide number of features by type. Mark whether the disturbance feature is GIS-based only, field-based, or GIS-based and verified in the field. Provide date of imagery. Rate using Table B9 and enter rating in B9 box on the SA Rank Summary Worksheet.

Imagery Date1/19/2018

Vertical Structure	Number of Features		Source	
Feature	SA	100m	GIS	Field
Buildings, towers and utility lines	0	1	☐	V
Power lines/Wind turbines	0	0	☐	V
Small windmills, road signs, billboards	0	0	☐	V
Oil or gas derrick	0	0	☐	V
Single tree	0	0	☐	V
Grove of trees or tall shrubs (estimate # of individuals)	0	0	☐	V
Scattered trees and tall shrubs (estimate # of individuals)	0	0	☐	V
Tall fence (> 2m)	0	0	☐	V
Other SWD Battery	0	4	☐	V

Table B9. Ratings for Vertical Habitat Disruption

Rating	Description
○ 4	No vertical structures or tall woody vegetation within the SA and 100 m
○ 3	No vertical structures or tall woody vegetation within the SA, and only 1 structure or a small grove of trees (<4 trees) within the 100 m
○ 2	No vertical structures or tall woody vegetation within the SA, and 2-4 vertical structures or larger grove of trees (4-10 trees) within the 100 m
◉ 1	Vertical structures or trees are within the SA; and/or more than 4 vertical structures, many scattered trees or shrubs, or large grove of trees (>10 trees) within the 100 m, power lines or wind turbines in the SA or within 100 m ranks D.

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : NK

Abiotic

A7. Playa Hydroperiod Reduction

Worksheet 7. Playa Hydroperiod Reduction. Enter pit area as percentage of the CBF and the average depth of the pit. Using Table A7a find the rating for Playa Hydroperiod Reduction using the Pit% of CBF and average pit depth. If average pit depth is unknown, use 0.5-2m depth. Enter the rating on Table A7b and in the SA Rank Summary Worksheet.

Pit % of CBF	Pit avg. depth (m)
0	0

Table A7a. Playa Hydroperiod Reduction rating calculation

	Average pit depth		
Pit % of CBF	<.5m	.5 - 2m	>2m
<1%	4	4	3
≥1 - <5%	4	3	2
≥5 - <10%	3	2	1
≥10%	2	1	1

Table A7b. Ratings for Playa Hydroperiod Reduction

Rating	Description
(●) 4	Little or no playa wetland hydroperiod reduction by excavations that drain waters into a pit or trench.
( ) 3	Some playa wetland hydroperiod reduction by excavations that drain waters into a pit or trench.
( ) 2	Moderate playa wetland hydroperiod reduction by excavations that drain waters into a pit or trench.
( ) 1	Excessive hydroperiod reduction by excavations that drain waters into a pit or trench.

A8. Playa Soil Condition Index

Worksheet 8. Soil Condition Index. Number each core location along the transect on the Abiotic Map. On Worksheet 8, select the core location (East/Center/West) and fill in GPS coordinates. Characterize soil layers to a depth of 50 cm (20 in) for each core, photograph and record photo # of the soil core. For clay pan layers, record an estimate of % percent sediment intrusion and indicate clay pan in the comments box. Using the uppermost layer for each soil core, assign a Soil Color Type as A or B from the soil value and chroma according to Table A8a and enter in the Soil Color Type box for the core. Using the Soil Color Type identified from Table A8a, select the soil condition raw score based on the depth to the clay pan measured from the surface and enter in the Core Raw Score box for the core. If > 30% sediment intrusion was recorded for the clay pan layer, then reduce the Core Raw Score by 0.5 and fill in the Modified Score box for the core. Average the three core scores and enter into the Average SA score box. Rate the Soil Condition Index using the Average SA Score on Table A8c and enter rating on SA Rank Summary Worksheet.

Core # 1 | West | Easting 632953 | Northing 3663756 | Photo # 9

Layer	Depth (cm)	Hue	Value	/	Chroma	Texture	% Sediment	Comments	Soil Color Type:
1	10	5 YR	3	/	2	Sandy Clay L			A
2	20	5 YR	3	/	2	Sandy Clay L			Core Raw Score:
3	30	10 YR	4	/	2	Clay Loam			1.5
4	40	10 YR	4	/	2	Silty Clay Lo			Modified Score:
5	5	10 YR	2	/	2	Clay	10	Clay Pan	

Core # 2 | Center | Easting 633026 | Northing 3663756 | Photo # 10

Layer	Depth (cm)	Hue	Value	/	Chroma	Texture	% Sediment	Comments	Soil Color Type:
1	10	5 YR	3	/	2	Sandy Clay L			A
2	20	10 YR	4	/	2	Clay Loam			Core Raw Score:
3	30	10 YR	2	/	2	Clay	5	Clay Pan	1.5
				/					Modified Score:
				/					

Core # 3 | East | Easting 633085 | Northing 3663756 | Photo # 11

Layer	Depth (cm)	Hue	Value	/	Chroma	Texture	% Sediment	Comments	Soil Color Type:
1	6	5 YR	2	/	2	Clay Loam			A
2	12	5 YR	2	/	2	Clay	5	Clay Pan	Core Raw Score:
3	18	10 YR	2	/	2	Clay	0	Clay Pan	2.5
				/					Modified Score:
				/					

Notes for Soil Cores:

Clay Pan is deeper below ground surface (bgs) in the west compared to the east. A hand auger was used.

Table A8a. Soil Color Type assignment based on soil chroma and value

	Value	2	2.5	3	4	5-8
Chroma	1	A	A	A	A	B
	2	A	A	A	B	B
	3-8	B	B	B	B	B

Table A8b. Playa soil condition raw scores based on depth to clay pan measured from the surface and soil color type from Table A8a.

Non-Clay depth from the surface (cm)	Soil Color Type A Dark Soils Raw Scores	Soil Color Type B Light Soils Raw Scores
0-<2	4	3.5
≥2-<5	3.5	3
≥5-<10	3	2.5
≥10-<15	2.5	2
≥15-<20	2	1.5
≥20	1.5	1

Average SA Score: 1.83333

Table A8c. Rating for Soil Condition Index

Rating	Description
○ 4	SA Soil Condition Score ≥3.5 - 4
○ 3	SA Soil Condition Score ≥2.5 - <3.5
◉ 2	SA Soil Condition Score ≥1.5 - <2.5
○ 1	SA Soil Condition Score <1.5

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : NK

A9. Water Source Augmentation

Worksheet 9. Water Source Augmentation. Check water sources that increase inflows from artificial sources. Include features that occur within the LUZ. Mark whether the disturbance feature is GIS-based only, field-based, or GIS-based and verified in the field. Provide date of imagery. Rate using Table A9 and enter rating on the SA Rank Summary Worksheet.

Imagery Date 1/19/2018

		Source	
	Water Source	GIS	Field
☒	Artificial inlets such as channels, ditches, gullies	☐	V
☒	Pumps, hoses	☐	V
☒	Roads, trails that concentrate and channel water into the playa	☐	V
☐	Irrigated agriculture runoff	☐	
☐	Stormwater discharges or other effluent input, culverts, pipes	☐	
☐	Dairy/ feedlot discharges	☐	
☐	Discharges from impervious surfaces adjacent to the playa	☐	
☐	Other	☐	

Table A9. Ratings for Water Source Augmentation

Rating	Description
○ 4	No artificial water sources to the PW from the surrounding LUZ.
◉ 3	Evidence of occasional or small amounts of additional inflow to PW from anthropogenic sources; e.g., minimal adjacent impervious surfaces, road runoff from minimal drainage area.
○ 2	Evidence that PW receives appreciable inflow from anthropogenic sources; e.g., storm drains or local point source discharges; Roads, trails, or erosional gullies divert and concentrate runoff; impervious surfaces and/or irrigated agriculture contribute appreciable runoff into PW.
○ 1	Site is commonly inundated most or all of the time from artificial water sources; e.g., supplemental pumping; storm drains that drain extensive impervious surfaces; or industrial pipe discharges.

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : NK

A10. Playa Watershed Connectivity

Worksheet 10. Playa Watershed Connectivity. Check watershed features that decrease inflows to PW. Include features that occur within the LUZ (500 m for playas < 8ha, 1000 meters for playas ≥ 8ha) . Mark whether the disturbance feature is GIS-based only, field based, or GIS-based and verified in the field. Provide date of imagery. Rate using Table A10 and enter rating on the SA Rank Summary Worksheet.

Imagery Date 1/19/2018

	Feature	Source	
		GIS	Field
☐	Contour rangeland erosion control features that prevent runoff to the playa	☐	
☒	Roads, trails that interrupt, change direction and/or hold back sheet flow into the playa	☐	V
☐	Earthen or stock tanks, ponds that capture surface flows upslope of the playa	☐	
☐	Active pumping of water out of the playa to the surrounding landscape	☐	
☐	Furrows and dryland agriculture that intercepts runoff to the playa	☐	
☒	Ditches, dams, berms that capture natural flows and convey flow away from the playa	☐	V
☐	Other	☐	

Table A10. Ratings for Playa Watershed Connectivity

Rating	Description
○ 4	No landscape alterations that restrict or prevent natural flows into the playa from the surrounding watershed; no pumping from the playa.(0%)
○ 3	Evidence of minor restrictions of inflow to SA from surrounding watershed; e.g., agricultural restrictions or road diversions from a small portion of the watershed. (>0 - <10% of runoff affected)
◉ 2	Evidence of appreciable restrictions of natural runoff into the playa; e.g., contour terracing or berms surrounding a large portion of the playa; pumps or direct withdrawals of water from the playa; multiple earthen tanks along natural draws. (≥10 - <40% of runoff affected)
○ 1	Playa is commonly dry most or all of the time from extensive land alterations in the watershed that restrict natural surface flow; e.g., contour terracing surrounding most of the playa; active pumping; multiple features that convey most of the natural surface flow away from the playa. (≥40 - 100% of runoff affected)

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : NK

Stressors

Worksheet 11. Stressor Checklists. For each checklist below, during the field reconnaissance check each stressor whether it is absent, occupies less than 10%, 10-50%, or more than 50% of the LUZ or PW. Note that for playas less than 8 ha (20 acres), use 500 m LUZ. For playas greater than or equal to 8ha, use 1000 m LUZ. Naturally occurring disturbances (e.g. lunettes, low intensity wildlife trails) are not included on these checklists. Fill in any comments in box after Worksheet 11d.

Worksheet 11a. Land Use.

Land Use	Land Use Zone				Playa Wetland			
	Absent	Minor <10%	Moderate 10-50%	Intense >50%	Absent	Minor <10%	Moderate 10-50%	Intense >50%
Residential development	☒	☐	☐	☐	☒	☐	☐	☐
Industrial/commercial development	☒	☐	☐	☐	☒	☐	☐	☐
Military training/air traffic use	☐	☐	☐	☐	☐	☐	☐	☐
Transportation corridor	☐	☒	☐	☐	☒	☐	☐	☐
Sports fields and urban parklands (golf courses, soccer fields, etc.)	☒	☐	☐	☐	☒	☐	☐	☐
Intensive row-crop agriculture	☒	☐	☐	☐	☒	☐	☐	☐
Orchards/Nurseries	☒	☐	☐	☐	☒	☐	☐	☐
Dryland farming	☒	☐	☐	☐	☒	☐	☐	☐
High intensity commercial livestock (dairy,feedlots, etc.).	☒	☐	☐	☐	☒	☐	☐	☐
Moderate enclosed livestock areas, horse paddocks.	☒	☐	☐	☐	☒	☐	☐	☐
Ranching - low intensity (livestock rangeland)	☐	☒	☐	☐	☐	☒	☐	☐
Passive recreation (bird-watching, hiking, etc.)	☒	☐	☐	☐	☒	☐	☐	☐
Active recreation (off-road vehicles, mountain biking, hunting, fishing, recreational camping)	☒	☐	☐	☐	☒	☐	☐	☐
Physical resource extraction, mining, quarrying (rock, sediment)	☒	☐	☐	☐	☒	☐	☐	☐
Biological resource extraction (aquaculture, commercial fisheries, horticultural and medical plant collecting)	☒	☐	☐	☐	☒	☐	☐	☐
Trash Dump / Land Fill	☒	☐	☐	☐	☒	☐	☐	☐
Stormwater management/detention land modifications	☒	☐	☐	☐	☒	☐	☐	☐
Wind turbine, power lines	☒	☐	☐	☐	☒	☐	☐	☐
Oil/gas pads, pumps, pipelines, holding tanks	☐	☒	☐	☐	☐	☒	☐	☐
Other	☐	☒	☐	☐	☐	☒	☐	☐

SA CODE :

Date : 2019-01-25

SA Name :

Surveyor Initials : NK

Worksheet 11b. Vegetation (Biotic).								
Vegetation	Land Use Zone				Playa Wetland			
	Absent	Minor <10%	Moderate 10-50%	Intense >50%	Absent	Minor <10%	Moderate 10-50%	Intense >50%
Mowing	☒	☐	☐	☐	☒	☐	☐	☐
Grazing, excessive herbivory	☐	☐	☒	☐	☐	☐	☒	☐
Excessive human visitation -trampling	☐	☒	☐	☐	☒	☐	☐	☐
Predation and habitat destruction by non-native vertebrates, including feral introduced naturalized species (domestic livestock, exotic game animals, and pet predators)	☒	☐	☐	☐	☒	☐	☐	☐
Tree/Sapling or shrub encroachment	☒	☐	☐	☐	☒	☐	☐	☐
Treatment of non-native and nuisance plant species	☒	☐	☐	☐	☒	☐	☐	☐
Pesticide application or vector control	☒	☐	☐	☐	☒	☐	☐	☐
Biological resource extraction or stocking (various)	☐	☒	☐	☐	☐	☒	☐	☐
Introduction of exotic grasses	☒	☐	☐	☐	☒	☐	☐	☐
Agricultural crops	☒	☐	☐	☐	☒	☐	☐	☐
Other	☒	☐	☐	☐	☒	☐	☐	☐

Worksheet 11c. Hydrologic Modifications.								
Hydrologic Modifications	Land Use Zone				Playa Wetland			
	Absent	Minor <10%	Moderate 10-50%	Intense >50%	Absent	Minor <10%	Moderate 10-50%	Intense >50%
Point source discharges, other non-storm water discharge	☐	☒	☐	☐	☐	☐	☒	☐
Non-point source discharges (road and urban runoff, farm drainage)	☐	☒	☐	☐	☒	☐	☐	☐
Flow diversions or unnatural inflows (restrictions and augmentations)	☐	☒	☐	☐	☐	☐	☒	☐
Culverts	☐	☒	☐	☐	☒	☐	☐	☐
Excavated inlet/channel/outlet	☒	☐	☐	☐	☒	☐	☐	☐
Groundwater extraction	☐	☒	☐	☐	☒	☐	☐	☐
Earthen tanks	☒	☐	☐	☐	☒	☐	☐	☐
Center-pivot irrigation	☒	☐	☐	☐	☒	☐	☐	☐
Other	☒	☐	☐	☐	☒	☐	☐	☐

SA CODE:

Date : 2019-01-25

SA Name :

Surveyor Initials : NK

Worksheet 11d. Physical Structure.

Physical Structure (Soil/Substrate)	Land Use Zone				Playa Wetland			
	Absent	Minor <10%	Moderate 10-50%	Intense >50%	Absent	Minor <10%	Moderate 10-50%	Intense >50%
Filling or dumping of sediment or soils (N/A for restoration areas)	☒	☐	☐	☐	☒	☐	☐	☐
Grading/Compaction (N/A for restoration areas)	☐	☒	☐	☐	☒	☐	☐	☐
Plowing/Disking (N/A for restoration areas)	☒	☐	☐	☐	☒	☐	☐	☐
Resource extraction (sediment, gravel, oil and/or gas)	☐	☒	☐	☐	☒	☐	☐	☐
Vegetation management as negative impact (terracing, root plowing, pitting, drilling seed, or other practices that disturb soil surface)	☒	☐	☐	☐	☒	☐	☐	☐
Disruption of leaf litter/humus, or peat/organic layer, or biological soil crust	☐	☒	☐	☐	☐	☒	☐	☐
Excessive sediment or organic debris (e.g. excessive erosion, gullying, slope failure)	☒	☐	☐	☐	☐	☒	☐	☐
Pesticides or trace organics impaired (point source or non-point source pollution)	☒	☐	☐	☐	☒	☐	☐	☐
Trash or refuse	☒	☐	☐	☐	☒	☐	☐	☐
Disruption of clay pan	☒	☐	☐	☐	☐	☒	☐	☐
Oil/gas field dumping, bring dumping, pipeline releases	☐	☒	☐	☐	☐	☐	☒	☐
Potash mining residue, by-products	☒	☐	☐	☐	☒	☐	☐	☐
Other	☒	☐	☐	☐	☒	☐	☐	☐

Stressor Comments

Saltwater disposal (SWD) Tank batteries and SWD pipelines surround the playa from the northwest and around to the south. Cattle roam freely in this area and frequently graze in the playa.

Worksheet 11e. Stressor Summary.

Stressor Summary	Land Use Zone			Playa Wetland		
	Minor	Moderate	Intense	Minor	Moderate	Intense
Total # Land Use Stressors	4	0	0	3	0	0
Total # Vegetation (Biotic) Stressors	2	1	0	1	1	0
Total # Hydrologic Modification Stressors	5	0	0	0	2	0
Total # Physical Structure Stressors	4	0	0	3	1	0
Total # Stressors	15	1	0	7	4	0

calculate stressors

Version Date: 04/05/2018

Beware this will clear all the data you just entered. Reset Form

Schema: Playa 1.2

SA CODE:

Date : 2019-01-25

SA Name :

Surveyor Initials : DA, BD, NK, NK

Photo Point Log. AZM = azimuth compass direction of photo; GPS UTM northing and eating location.

Photo PT File	AZM	Northing	Easting	Latitude	Longitude	Description	Initial
#1	360	3663838	633027	33.10506	-103.57433	Northern playa boundary upslope	NK
#2	180	3663852	633031	33.10519	-103.57429	Northern playa boundary downslope	NK
#3	90	3663756	633080	33.10432	-103.57378	Eastern playa boundary upslope	NK
#4	270	3663755	633137	33.1043	-103.57317	Eastern playa boundary downslope	NK
#5	180	3663754	633174	33.10429	-103.57277	Southern playa boundary upslope	NK
#6	360	3663644	633015	33.10332	-103.57449	Southern playa boundary downslope	NK
#7	270	3663757	632963	33.10434	-103.57503	Western playa boundary upslope	NK
#8	90	3663761	632924	33.10438	-103.57545	Western playa boundary downslope	NK
#9	N/A	3663756	632953	33.104326	-103.575144	PS-1: Playa soil core #1 West	NK
#10	N/A	3663756	633026	33.104323	-103.574352	PS-2: Playa soil core #1 Center	NK
#11	N/A	3663756	633085	33.104317	-103.573721	PS-3: Playa soil core #1 East	NK
#12	180	3663753	633084	33.10429	-103.57373	Stressors: Undocumented pipeline through	NK
#13	225	3663631	632873	33.10322	-103.57601	Stressors: Grazing cattle nearby playa	NK
#14	360	3663703	632976	33.10385	-103.5749	Stressors: Cattle hoof prints and dung in pl a	NK
#15	45	3663631	632856	33.10322	-103.57619	Stressors: SWD pipeline release into playa	NK
#16	225	3663880	633050	33.10544	-103.57408	Stressors: Above-ground SWD poly pipelin e	NK
#17	270	3663880	633050	33.10544	-103.57408	Stressors: SWD tank battery and containme	NK

772625.341891

776930.888834

767805.697073

765652.923600

Anderson Rd

Anderson

Legend

- Buried Pipeline Utilites (Alignments sourced from multiple sets of aerial images)
- Oil & Gas Facility
- Area of Dead Vegetation (Collected via Trimble GPS)
- Land Use Zone (LUZ) Boundary
- Roads within Land Use Zone (LUZ) (Alignments sourced from multiple sets of aerial images)
- Current Playa Basin Floor (CBF) (Collected via Trimble GPS)
- Extent of Playa Wetland (PW) & Sampling Area (SA) (Collected via Trimble GPS)

N

0 250 500 Feet

Document Path: Z:\General\GIS\MXDs\Foundation\Chalupa SWD\Chalupa - Playa Assessment - Landscape Map.mxd

DATE: January 2018 DESIGNED BY: M. Lindstrom DRAWN BY: D. Arnold	TASMAN GEOSCIENCES **Tasman Geosciences, Inc.** **6899 Pecos Street - Unit C** **Denver, CO 80221**	**New Mexico Rapid Assessment Method** **Playa Asessment** Section 13, Township 14 South, Range 33 East Lea County, New Mexico	Landscape Map	Figure 1

Document Path: Z:\General\GIS\MXDs\Foundation\Chalupa SWD\Chalupa - Playa Assessment - Playa Wetland Post-Inspection.mxd

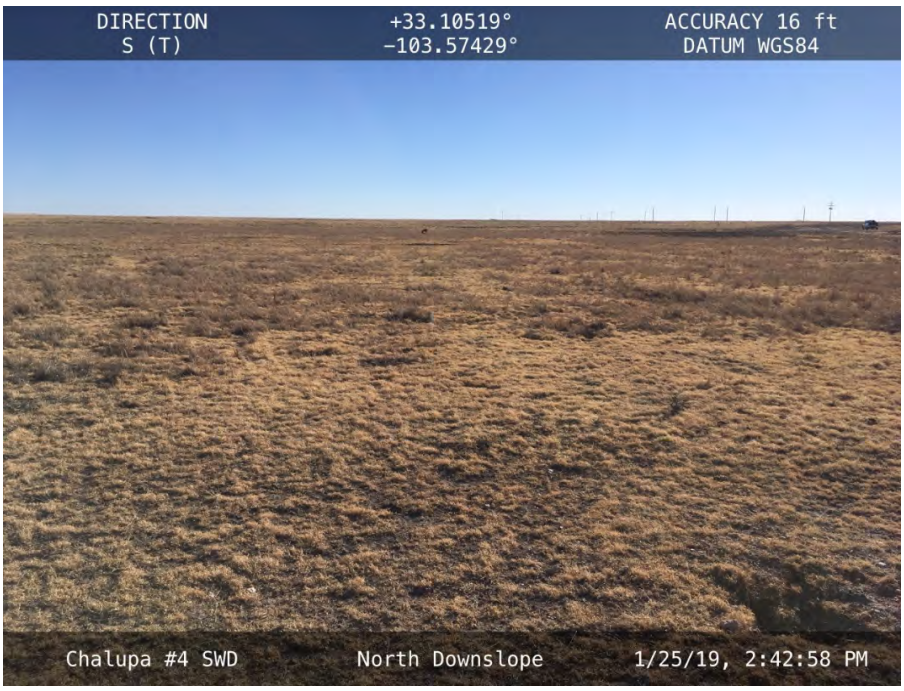
DATE: January 2018 DESIGNED BY: M. Lindstrom DRAWN BY: D. Arnold	TASMAN GEOSCIENCES **Tasman Geosciences, Inc.** **6899 Pecos Street - Unit C** **Denver, CO 80221**	**New Mexico Rapid Assessment Method** **Playa Asessment** Section 13, Township 14 South, Range 33 East Lea County, New Mexico	Sampling Area (SA) Biotic Map	Figure 2

Document Path: Z:\General\GIS\MXDs\Foundation\Chalupa SWD\Chalupa - Playa Assessment - Playa Wetland Post-Inspection-Abiotic.mxd

DATE: January 2018 DESIGNED BY: M. Lindstrom DRAWN BY: D. Arnold	TASMAN GEOSCIENCES **Tasman Geosciences, Inc.** **6899 Pecos Street - Unit C** **Denver, CO 80221**	**New Mexico Rapid Assessment Method** **Playa Asessment** Section 13, Township 14 South, Range 33 East Lea County, New Mexico	Sampling Area (SA) Abiotic Map	Figure 3

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log

#1



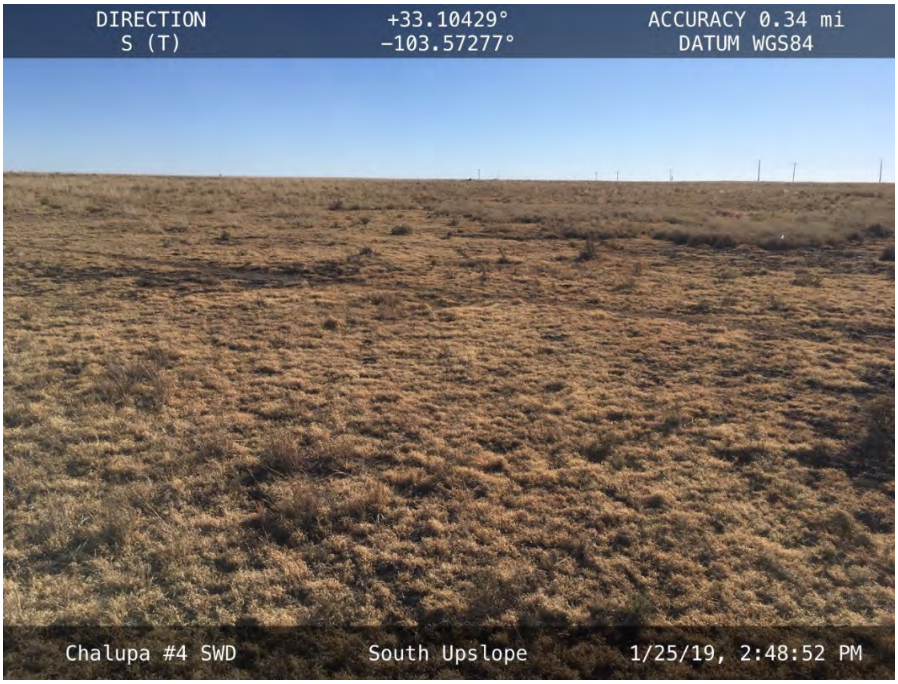
#2

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log

#3

#4

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log



#5

#6

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log

#7

#8

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log

#9

#10

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log

#11

#12. Stressors: Undocumented pipeline through playa.

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log

#13. Stressors: Grazing cattle nearby playa.

#14. Stressors: Cattle hoof prints and dung in playa.

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log

#15. Stressors: SWD pipeline release into playa.

#16. Stressors: Aboveground SWD poly pipeline surrounding playa.

Foundation Energy Management
Chalupa #4 SWD Playa Investigation
Photo Point Log

#17. Stressors: SWD Tank battery and containment berm upslope relative to playa.

Appendix B

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

January 31, 2019

KYLE NORMAN

TASMAN GEOSCIENCES

6899 PECOS ST. UNIT C

DENVER, CO 80221

RE: CHALUPA #4 SWD

Enclosed are the results of analyses for samples received by the laboratory on 01/30/19 16:55.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-18-11. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

TASMAN GEOSCIENCES
KYLE NORMAN
6899 PECOS ST. UNIT C
DENVER CO, 80221
Fax To:

Received:	01/30/2019	Sampling Date:	01/30/2019
Reported:	01/31/2019	Sampling Type:	Soil
Project Name:	CHALUPA #4 SWD	Sampling Condition:	** (See Notes)
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	LEA COUNTY		

Sample ID: HA-9-01 (H900347-01)

Chloride, SM4500Cl-B **mg/kg** **Analyzed By: AC**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**80.0**	16.0	01/31/2019	ND	416	104	400	0.00	

Sample ID: HA-9-02 (H900347-02)

Chloride, SM4500Cl-B **mg/kg** **Analyzed By: AC**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**368**	16.0	01/31/2019	ND	416	104	400	0.00	

Sample ID: HA-9-03 (H900347-03)

Chloride, SM4500Cl-B **mg/kg** **Analyzed By: AC**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**80.0**	16.0	01/31/2019	ND	416	104	400	0.00	

Sample ID: HA-9-04 (H900347-04)

Chloride, SM4500Cl-B **mg/kg** **Analyzed By: AC**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**176**	16.0	01/31/2019	ND	416	104	400	0.00	

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

TASMAN GEOSCIENCES
KYLE NORMAN
6899 PECOS ST. UNIT C
DENVER CO, 80221
Fax To:

Received:	01/30/2019	Sampling Date:	01/30/2019
Reported:	01/31/2019	Sampling Type:	Soil
Project Name:	CHALUPA #4 SWD	Sampling Condition:	** (See Notes)
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	LEA COUNTY		

Sample ID: HA-9-05 (H900347-05)

Chloride, SM4500Cl-B **mg/kg** **Analyzed By: AC**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**96.0**	16.0	01/31/2019	ND	416	104	400	0.00	

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

RUSH!!

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

CARDINAL LABORATORIES
101 East Marland, Hobbs, NM 88240 2111 Beechwood, Abilene, TX 79603
(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325)673-7020

Company Name: Foundation Energy Managment	**BILL TO**
Project Manager: Mike Lindstrom	**P.O. #:**
Address: 1801 Broadway Suite 1500	**Company:** Tasman
City: Denver **State:** CO **Zip:** 80202	**Attn:** Kyle Norman
Phone #: **Fax #:**	**Address:** 6899 Pecos St.
Project #: **Project Owner:**	**City:** Denver
Project Name: Chalupa #4 SWD	**State:** CO **Zip:** 80221
Project Location: Lea County, NM	**Phone #:** 303-487-1228
Sampler Name: N. Kopiasz	**Fax #:**

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	Chlorides	TPH 8015 M EXT	BTEX	Texas TPH	Complete Cations/Anions	TDS	Total RCRA 8 Metals					
H900347																									
1	HA-9-01	G	1			✓					✓		1/30/19	1410	✓										
2	HA-9-02	↓	1			✓					↓		↓	1430	✓										
3	HA-9-03		1			✓								1440	✓										
4	HA-9-04	↓	1			✓					↓		↓	1445	✓										
5	HA-9-05	G	1			✓					✓		1/30/19	1455	✓										

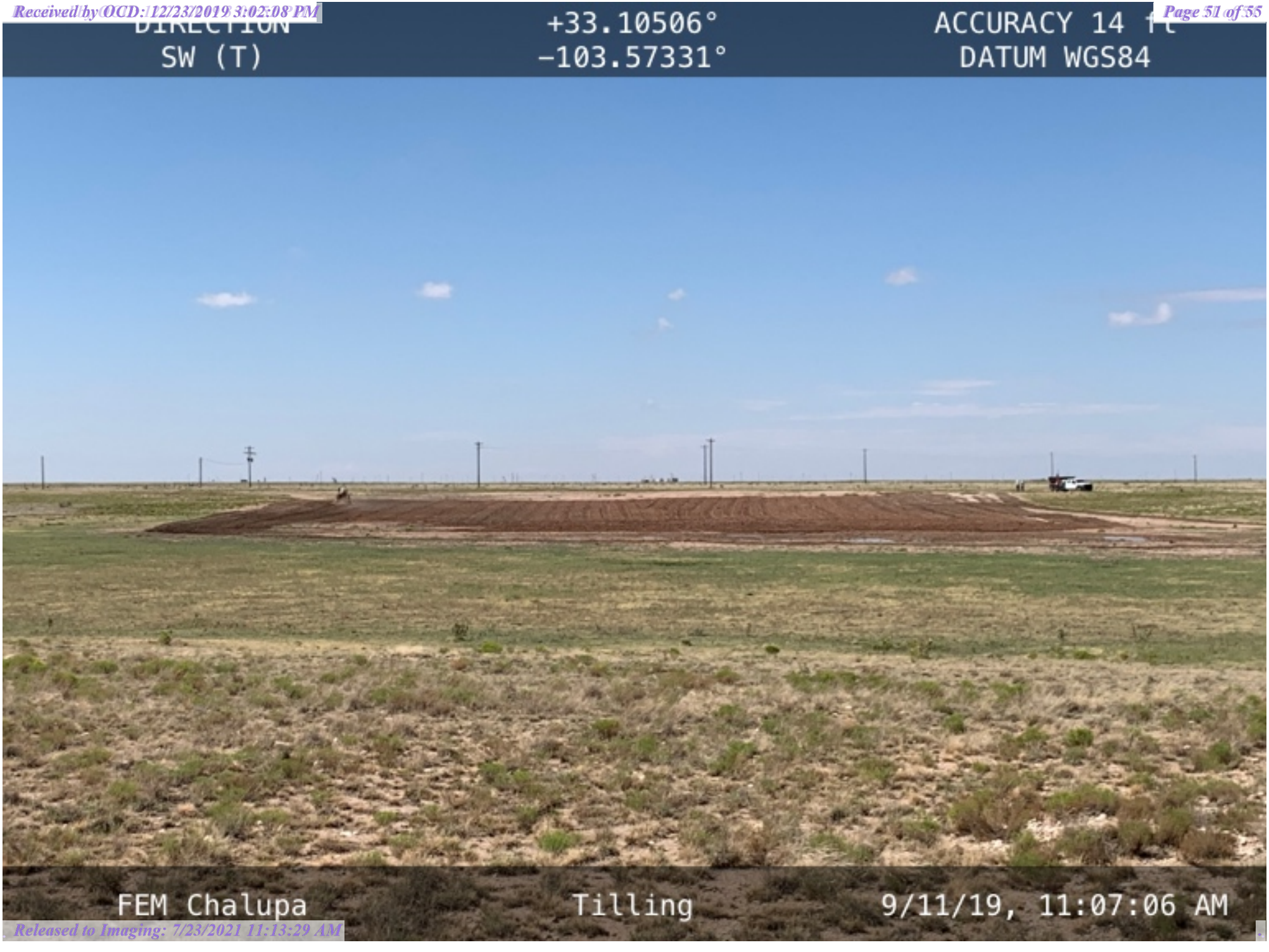
Relinquished By:	**Date:** 1/30/19 **Time:** 1655	**Received By:** Jodi Henson	Phone Result: ☐ Yes ☑ No Add'l Phone #:
Relinquished By:	**Date:** **Time:**	**Received By:**	Fax Result: ☐ Yes ☑ No Add'l Fax #:
Delivered By: (Circle One) Sampler - UPS - Bus - Other: 9.1°C / #97	**Sample Condition** Cool: ☐ Yes ☑ No Intact: ☑ Yes ☐ No	**CHECKED BY: (Initials)**	**REMARKS:** email results:bhumphrey@tasman-geo.com knorman@tasman-geo.com mlindstrom@tasman-geo.com nKopiasz@tasman-geo.com RUSH!!

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

Appendix C


DIRECTION
W (T)
+33.10374°
−103.57633°
ACCURACY 19 ft
DATUM WGS84
FEM Chalupa
Tilling
9/11/19, 10:48:05 AM


DIRECTION
NW (T)
+33.10374°
−103.57633°
ACCURACY 19 ft
DATUM WGS84
FEM Chalupa
Tilling
9/11/19, 10:48:08 AM


DIRECTION
SW (T)
+33.10506°
-103.57331°
ACCURACY 14 ft
DATUM WGS84
FEM Chalupa
Tilling
9/11/19, 11:07:06 AM


DIRECTION
NE (T)
+33.10370°
-103.57572°
ACCURACY 18 ft
DATUM WGS84
FEM Chalupa
Northern Area
10/8/19, 2:56:50 PM


DIRECTION
E (T)
+33.10414°
-103.57562°
ACCURACY 20 ft
DATUM WGS84
FEM Chalupa
Northern Area
10/8/19, 2:57:59 PM


DIRECTION
S (T)
+33.09838°
-103.57519°
ACCURACY 15 ft
DATUM WGS84
FEM Chalupa
Seedlings
10/8/19, 2:51:37 PM

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 3071

CONDITIONS

Operator: FOUNDATION ENERGY MANAGEMENT, LLC 5057 KELLER SPRINGS RD ADDISON, TX 75001	OGRID: 370740
	Action Number: 3071
	Action Type: [C-141] Release Corrective Action (C-141)

CONDITIONS

Created By	Condition	Condition Date
bbillings	Summary Report accepted but this is not a CLOSURE. Not asked for in report and no C-141 present.	7/23/2021