



March 20, 2018

Mr. Mike Bratcher  
Environmental Specialist  
New Mexico Oil Conservation District  
District 2 – Artesia  
811 S. First St  
Artesia, NM 88210

**RE: 2RP-4543 - Submittal of Proposed WorkPlan for Soil Delineation at the Cotton Draw Unit 294H, T-24-S, R-31-E, Eddy County, New Mexico**

Dear Mr. Bratcher,

TETRA Technologies Inc. (TETRA), a contractor to Devon Energy Production Co, LP (6137) (Devon) wishes to submit this Proposed Delineation Workplan (Workplan) to the New Mexico Oil Conservation Division (NMOCD) to address the release at the Cotton Draw Unit 294 H site on December 21, 2017. The purpose of this Workplan is to describe proposed methodologies and activities to carry out the delineation to assess the horizontal and vertical extent of impact to soils at the release site. The legal description of the Release Site is Unit Letter "N", Section 36, Township 24 South, Range 31 East, in Eddy County, New Mexico. The site location is shown in Figure 1.

### **Background**

On December 21, 2017 at 11:30 PM MST, TETRA, under contract to Devon was involved in completion operations at Cotton Draw Unit 294H. While water was being transferred to the location a bolt on the 12" hose connection failed, which allowed the end to separate from the hose. A faulty gasket was identified as contributing to the incident. The pumping operations were immediately shut down and the hose and gasket were repaired. A vacuum truck was dispatched to recover any available fluids. Approximately 209 bbls of treated produced water was released and approximately 50 bbls of treated produced water was recovered by the vacuum truck. The source of the released water was the Trionyx Pond. The location of the release area is shown in Figure 2.

### **Soil Investigation**

A sample of the treated produced water was taken from the Trionyx pond to determine the quality of the water released and to also ascertain what impacts may have occurred as a result of the release. The analytical results are provided in Table 1 below. Analytical reports from Cardinal Laboratories are attached to this Workplan.

All results in mg/L	250 BBL COTTON DRAW WATER PIT
Benzene	0.813
Toluene	0.569
Ethylbenzene	0.031
Total xylenes	0.154
Total BTEX	1.57
Chloride	150000
GRO C6-C10	2.27
DRO > C10-C28	<1.00
EXT DRO > C28-C36	<1.00

Table 1 – Analytical results from Trionyx pond.

As shown in Table 1, the levels found clearly show benzene, toluene, ethylbenzene and xylenes (BTEX) levels and total petroleum hydrocarbons (TPH) (GRO+DRO+MRO C6 thru C36) to be very low. TETRA would expect low TPH levels since the produced water had been treated prior to its use by TETRA. BTEX and TPH levels found are expected to have little or no impact to soils.

The results were also compared to the most restrictive NMOCD Site Classification criteria remediation levels, 10 mg/kg for benzene, 50 mg/kg for BTEX and 100 mg/kg for TPH. Results clearly indicate delineation of BTEX and TPH are not needed and therefore are not part of this delineation Workplan.

Chloride levels were found to be elevated and are part of this proposed delineation Workplan. Chloride remediation levels for the release site were determined to be 600 mg/kg, per discussions with NMOCD. This Workplan will focus on the delineation of chlorides and the horizontal and vertical impact to soils.

TETRA is currently screening contractors to perform the work required in this Workplan. TETRA proposes to delineate the release using either soil borings (with a hollow stem auger) or investigation trenches (using a backhoe). The method will be determined upon selection of a remediation contractor. Samples will be collected at the surface and at 1 to 2 foot intervals below ground surface (bgs) to assess the vertical extent of chloride impact. To assess the horizontal extent soil samples will be collected at sample points adjacent to the release point and at approximately twenty (20) foot intervals downgradient from the release point. Samples will be collected and field screened for chloride to assess the horizontal and vertical extent of impact to soils. Sampling will continue until chloride field screening indicate chloride concentrations do not exceed the recommended NMOCD regulatory guidelines of 600 mg/kg. Confirmation samples will be taken at the extent of the delineation to confirm field sampling results. Confirmation samples will be analyzed for chloride by EPA Method 300.0.

One (1) background soil sample will be collected from a non-impacted area approximately fifty (50) feet southwest of the release area.

## Reporting

Upon receipt of the analytical results, a soil investigation report will be prepared by the TETRA contractor and submitted to the NMOCD for review and approval. If it is determined by NMOCD that remediation is required a Workplan for the remediation will be prepared and submitted to NMOCD for approval.

Should you have any questions or comments, please do not hesitate to contact me at 281-364-5116.

Sincerely,

A handwritten signature in black ink, appearing to read "Cliff Kirchof", written over a horizontal line.

Clifford Kirchof  
Environmental/Chemical  
Regulatory Compliance Manager

cc. Mike Shoemaker, Devon  
Adam Calvin, TETRA  
Delfino Escalante III. TETRA

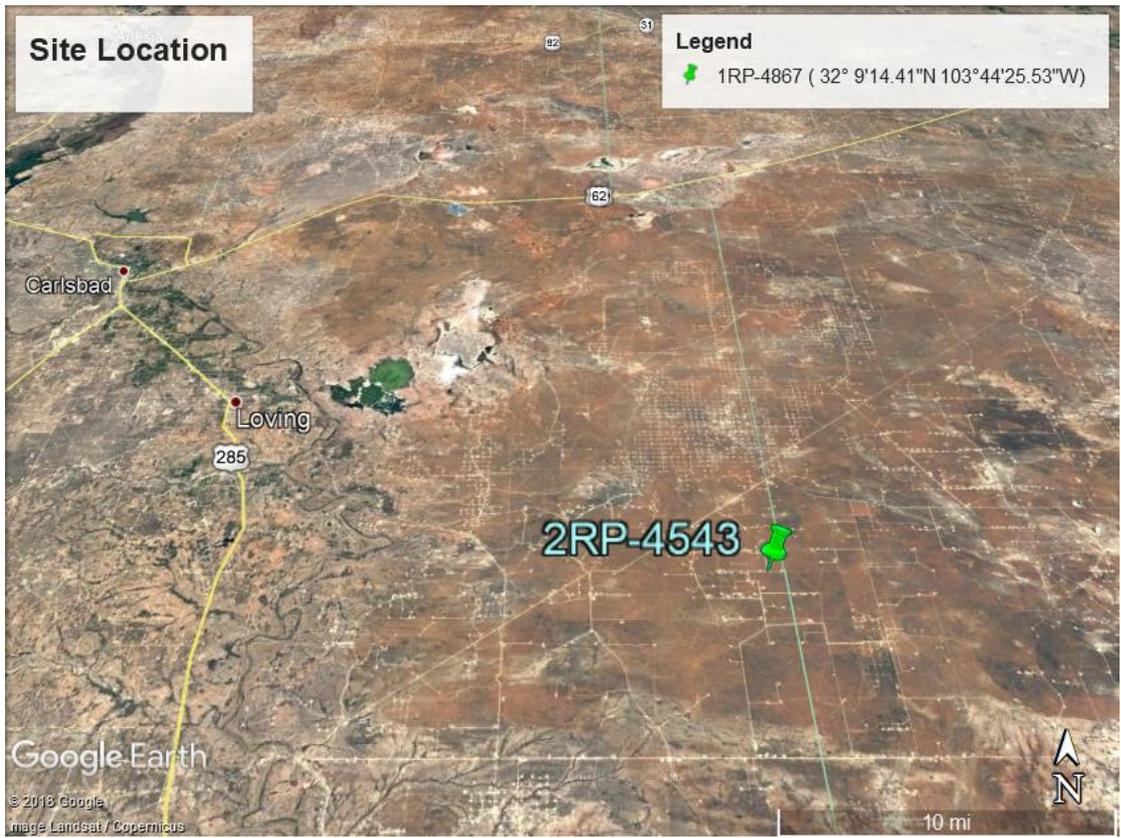


Figure 1: – Site location with Lat/Long coordinates.



Figure 2: Area of Release at Cotton Draw Unit 294 – 209 bbls with 50 bbls recovered.

February 13, 2018

ANDREW ROMO

TETRA TECHNOLOGIES

1114 S FM 1788

MIDLAND, TX 79765

RE: COTTON DRAW WATER PIT

Enclosed are the results of analyses for samples received by the laboratory on 02/12/18 11:30.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-17-10. 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](http://www.tceq.texas.gov/field/qa/lab_accred_certif.html).

Cardinal Laboratories is accredited 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,



Mike Snyder For Celey D. Keene

Lab Director/Quality Manager

**Analytical Results For:**

 TETRA TECHNOLOGIES  
 ANDREW ROMO  
 1114 S FM 1788  
 MIDLAND TX, 79765  
 Fax To:

Received:	02/12/2018	Sampling Date:	02/12/2018
Reported:	02/13/2018	Sampling Type:	Wastewater
Project Name:	COTTON DRAW WATER PIT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	LOVINGTON, NM		

**Sample ID: 250 BBL COTTON DRAW WATER PIT (H800433-01)**

BTEX 8021B		mg/L		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>Benzene*</b>	<b>0.813</b>	0.020	02/12/2018	ND	0.020	99.2	0.0200	0.733	
<b>Toluene*</b>	<b>0.569</b>	0.020	02/12/2018	ND	0.020	97.9	0.0200	1.35	
<b>Ethylbenzene*</b>	<b>0.031</b>	0.020	02/12/2018	ND	0.020	97.5	0.0200	2.48	
<b>Total Xylenes*</b>	<b>0.154</b>	0.060	02/12/2018	ND	0.061	102	0.0600	1.74	
<b>Total BTEX</b>	<b>1.57</b>	0.120	02/12/2018	ND					

*Surrogate: 4-Bromofluorobenzene (PID) 101 % 81.3-128*

Chloride, SM4500Cl-B		mg/L		Analyzed By: AC					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>Chloride*</b>	<b>150000</b>	4.00	02/12/2018	ND	104	104	100	3.92	

TDS 160.1		mg/L		Analyzed By: AC					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>TDS*</b>	<b>220000</b>	5.00	02/13/2018	ND	209	98.1	213	2.38	

TPH 8015M		mg/L		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>GRO C6-C10*</b>	<b>2.27</b>	1.00	02/12/2018	ND	37.4	74.8	50.0	0.837	
DRO >C10-C28*	<1.00	1.00	02/12/2018	ND	48.5	96.9	50.0	2.18	
EXT DRO >C28-C36	<1.00	1.00	02/12/2018	ND					

*Surrogate: 1-Chlorooctane 70.5 % 37.1-138*
*Surrogate: 1-Chlorooctadecane 90.7 % 44.6-151*

Cardinal Laboratories

\*=Accredited Analyte

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Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

**Analytical Results For:**

 TETRA TECHNOLOGIES  
 ANDREW ROMO  
 1114 S FM 1788  
 MIDLAND TX, 79765  
 Fax To:

Received:	02/12/2018	Sampling Date:	02/12/2018
Reported:	02/13/2018	Sampling Type:	Wastewater
Project Name:	COTTON DRAW WATER PIT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	LOVINGTON, NM		

**Sample ID: 90 BBL COTTON DRAW WATER PIT (H800433-02)**

BTEX 8021B		mg/L		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>Benzene*</b>	<b>0.823</b>	0.020	02/12/2018	ND	0.020	99.2	0.0200	0.733	
<b>Toluene*</b>	<b>0.583</b>	0.020	02/12/2018	ND	0.020	97.9	0.0200	1.35	
<b>Ethylbenzene*</b>	<b>0.033</b>	0.020	02/12/2018	ND	0.020	97.5	0.0200	2.48	
<b>Total Xylenes*</b>	<b>0.162</b>	0.060	02/12/2018	ND	0.061	102	0.0600	1.74	
<b>Total BTEX</b>	<b>1.60</b>	0.120	02/12/2018	ND					

Surrogate: 4-Bromofluorobenzene (PID) 103 % 81.3-128

Chloride, SM4500Cl-B		mg/L		Analyzed By: AC					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>Chloride*</b>	<b>146000</b>	4.00	02/12/2018	ND	104	104	100	3.92	

TDS 160.1		mg/L		Analyzed By: AC					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>TDS*</b>	<b>213000</b>	5.00	02/13/2018	ND	209	98.1	213	2.38	

TPH 8015M		mg/L		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>GRO C6-C10*</b>	<b>2.65</b>	1.00	02/12/2018	ND	37.4	74.8	50.0	0.837	
DRO >C10-C28*	<1.00	1.00	02/12/2018	ND	48.5	96.9	50.0	2.18	
EXT DRO >C28-C36	<1.00	1.00	02/12/2018	ND					

Surrogate: 1-Chlorooctane 75.0 % 37.1-138

Surrogate: 1-Chlorooctadecane 78.7 % 44.6-151

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\*=Accredited Analyte

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Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

**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

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\*=Accredited Analyte

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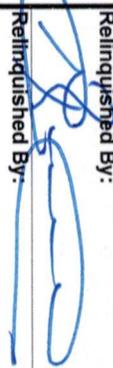


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Mike Snyder For Celey D. Keene, Lab Director/Quality Manager

101 East Marland, Hobbs, NM 88240  
 (575) 393-2326 FAX (575) 393-2476

**CHAIN-OF-CUSTODY AND ANALYSIS REQUEST**

Company Name: <b>Tetra Technology</b> Project Manager: <b>Andrew Romero</b> Address: City: State: Zip: Phone #: Fax #: Project #: Project Owner: Project Name: <b>Cotton Dross Water P.t</b> Project Location: <b>Livingston NM</b> Sampler Name: <b>Andrew Romo</b>		<b>BILL TO</b> P.O. #: Company: Attn: Address: City: State: Zip: Phone #: Fax #:	
Lab I.D. <b>H800433</b> Sample I.D.		(G)RAB OR (C)OMP. # CONTAINERS MATRIX GROUNDWATER WASTEWATER SOIL OIL SLUDGE OTHER: ACID/BASE: ICE / COOL OTHER:	
FOR LAB USE ONLY DATE TIME 2/12/18 10:30 2/12/18 10:30		ANALYSIS REQUEST TPH 8015 BTEX Cl TDS	
Relinquished By:  Date: <b>2/12/18</b> Time: <b>11:30</b>		Received By: <b>Adri Mendez</b> Date: <b>2/12/18</b> Time:	
Delivered By: (Circle One) <b>UPS</b> Sampler - UPS - Bus - Other: <b>1.10c / 1.35c</b>		Sample Condition Cool Intact <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	
CHECKED BY:  (Initials)		REMARKS: <b>romod@tetratec.com</b> <b>RUSH!!</b>	

\* Cardinal cannot accept verbal changes. Please fax written changes to (575) 393-2326