

1R - 427-236

WORKPLANS

Date:

7-12-10



Infrastructure, buildings, environment, communications

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Ed Hansen
New Mexico Oil Conservation Division
1220 So. Saint Francis Drive
Santa Fe, New Mexico 87505

Certified Mail Receipt No. 7002 2410 0001 5813 3760

Subject:
Corrective Action Plan
Eunice Monument Eumont (EME) Junction H-20 (1R427-236)
T20S, R37E, Section 20, Unit H, Monument, Lea County, New Mexico

Date:
July 12, 2010

Mr. Hansen,

Contact:
Sharon Hall

RICE Operating Company (ROC) has retained ARCADIS U.S., Inc. (ARCADIS) to address potential environmental concerns at the above-referenced site. ROC is the service provider (agent) for the Eunice Monument Eumont (EME) SWD System and has no ownership of any portion of the pipeline, well, or facility. The System is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis. Environmental projects of this magnitude require System Parties AFE approval and work begins as funds are received.

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On behalf of ROC, ARCADIS respectfully submits this Corrective Action Plan (CAP) for the above-referenced site.

SITE HISTORY AND BACKGROUND

The site is located south of the town of Monument, New Mexico. Elevated chlorides in this area have been reported since as early as 1952 (Ground-Water Report 6, Geology and Ground-Water conditions in Southern Lea County, Alexander Nicholson, Jr. and Alfred Clebsch, Jr.). The depth to groundwater at this site is approximately 24 feet below ground surface.

The junction box was eliminated and the site by-passed with a poly line. Initial delineation began on March 1, 2002 and was completed on March 7, 2002. A backhoe was used to collect soil samples to a depth of 15 feet below ground surface (bgs) at the removed junction box location. Additional samples were collected at a depth of 11 feet bgs from excavations 10 feet south, east and west and 15 and 20 feet north of the junction box location. Soil samples were analyzed in the field for

Part of a bigger picture

chlorides using field-adapted Method 9253 and screened in the field using a photoionization detector (PID).

A backhoe was used to excavate soils around the former junction box creating an excavation measuring 30 feet by 20 feet by 11 feet deep. A four wall composite sample was collected at a depth of 10 feet bgs from each of the four walls and five-point composite sample was collected from the bottom at 11 feet bgs of the excavation and submitted to Environmental Lab of Texas for benzene, toluene, ethylbenzene and xylenes (BTEX), gasoline range organics (GRO), diesel range organics (DRO) and chloride analysis. BTEX, GRO and DRO were not detected in the samples. Chlorides were detected in both the samples submitted to the lab and the samples analyzed in the field at concentrations less than 250 milligrams per kilogram (mg/kg).

Field chloride analysis was performed on samples excavated from the former junction box location and the delineation excavations north, south east and west of the former junction box location. Elevated chlorides were detected in samples collected from the former junction box location. Chlorides were detected at a concentration of 700 mg/kg in the delineation excavation 15 feet north of the former junction box locations. Chloride concentrations in excess of 250 mg/kg were not detected in any of the other horizontal delineation samples. Based on the results of the soil sampling analytical results, elevated chloride concentrations are present at the subject site.

A one-foot thick compacted clay barrier was installed to inhibit downward chloride migration. Blended soils were used to backfill the excavation to ground surface and to contour the surrounding area.

A sample of the blended backfill material was analyzed in the field for chlorides. The remediated (blended) composite sample concentration was 250 mg/kg.

ROC disclosed potential groundwater impact at the site to NMOCD via e-mail on April 15, 2002. A disclosure report was submitted to NMOCD with all of the ROC 2002 Junction Box Reports in March 2003 per the ROC Junction Box Upgrade Work plan. The source of this potential impact is historical and has been removed.

On behalf of ROC, ARCADIS submitted an Investigation Characterization Plan (ICP) to NMOCD on October 9, 2009. The proposed ICP was approved by NMOCD on October 15, 2009.

INVESTIGATION AND CHARACTERIZATION PLAN RESULTS

Two soil borings (SB 1 and SB 2) were drilled at the site on November 3rd, 2009. The soil borings were drilled to a depth of 21 and 20 feet below ground surface (bgs), respectively. Soil samples were collected every three feet and analyzed in the field for chlorides using field-adapted Method 4500-Cl-B and screened in the field using a PID. Two samples from each boring were submitted to Cardinal laboratories and analyzed for chlorides, gasoline range organics (GRO) and diesel range organics (DRO). The sample collected from SB 2 at a depth of 20 feet bgs was also analyzed for benzene, toluene, ethylbenzene and xylenes. Soil boring logs are attached and include the field and laboratory analytical results,

Laboratory and field analysis confirm that elevated chloride concentrations are present in soils at the site. Based on the results of the ICP investigation and excavation and sampling results submitted in the Disclosure Report the estimated area of chloride impacted soil is 30 feet by 20 feet.

Based on the fact that elevated chloride concentrations in groundwater have been reported to occur in the area since the early 1950s we propose a chloride mass removal plan.

CHLORIDE MASS ESTIMATION AND REMOVAL

Our chloride mass estimation and plan for removal of that chloride mass follows:

Estimate of chloride mass in vadose zone

Calculations used to estimate the chloride mass in the vadose zone that may have resulted from the former junction box are detailed in the attached table. The size of the impacted area is conservatively assumed based on chloride concentrations in soil samples collected from the junction box excavation. This total area is then multiplied by the thickness of the affected area (24 feet). The average chloride increase (388 ppm) is calculated by subtracting the background chloride concentration (250 mg/kg) from the average chloride concentrations in the soil borings (638 mg/kg). The weight of the affected soils is calculated by multiplying the total affected soil volume (14,400 cubic feet) by unsaturated zone mass density (45.4 kg per cubic feet). This weight of the affected soils (653,760 kg) multiplied by the average chloride concentration (388 ppm) results in mass of contributed residual soil chloride of 253.66 kilograms.

Estimate of Chloride Mass

Parameter	Value	Description of equations used
Impact Area	600 ft ²	Physical measurement of excavation
Vadose zone thickness	24 ft	Estimate Soil Borings (SB-1 and SB-2)
Volume of impacted vadose zone	14,400 ft ³	Impact Area x Vadose Zone Thickness
Mass of impacted vadose zone	653,760 kg	Volume of Impacted Vadose Zone x Mass Density (1 ft ³ of soil weighs ~45.4 kg)
Chloride concentration added to soil from former junction box	388 ppm	Difference between average chloride concentration in two soil borings (638 mg/kg) and background concentration (250 mg/kg)
Total Chloride Mass	253.66 kg	Multiplication of two parameters above

Estimate of chloride mass in groundwater

Based on a review of several sites with a considerably larger area of chloride impacted soil, the potential increase in chloride concentrations in groundwater is conservatively estimated to be 500 milligrams per liter (mg/L). This conservatively estimated increase in the concentration of chlorides is multiplied by the total saturated pore space volume resulting in the estimated chloride mass as shown in the following table:

Estimate of Chloride Mass

Parameter	Value	Description of equations used
Impact Area	600 ft ²	Physical measurement of excavation
Longitudinal Dispersivity	10	Professional estimate for factoring the plume length
Aquifer Thickness	15 ft	Based on regional groundwater data*
Porosity	25%	Professional estimate of pore volume
Volume of impacted groundwater below former junction boxes	22,500 ft ³	Multiplication of parameters listed above
Volume of impacted groundwater below former junction boxes	637,129 L	Unit conversion of above value to liters
Averaged increase in on-site chloride concentrations	500 mg/L	Conservative estimate of potential chloride increase based on a comparison to other sites
Total Chloride Mass	318.56 kg	Multiplication of two parameters above

* Ground-Water Report 6; Geology and Ground-Water Conditions in Southern Lea County, New Mexico; Nicholson and Clebsch

Estimate of Groundwater Recovery System Removal

Adding together the chloride mass calculated in the vadose zone and the chloride mass calculated in the groundwater results in a total chloride mass of 572.22 kg. The groundwater recovery system located at EME Jct. A-20, extracting water with chloride concentration of 3,450 mg/L, could extract about 0.5485 kg per barrel, assuming an average pumping rate of 0.5 gallons per minute (gpm) can be achieved. At that rate, it would take approximately 61 days and the equivalent of 1,043 barrels to remove 572.22 kg of chloride mass.

The design and specifications of the groundwater recovery system include a recovery well submersible pump capable of discharging at a minimum of 0.5 gpm. Water from the recovery well will be utilized in pipeline and well maintenance operations. Total volume and chloride content of the recovery well will be measured and recorded on a log.

ROC is the service provider (agent) for the EME Salt Water Disposal (SWD) System and has no ownership of any portion of pipeline, well or facility. The EME SWD System is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis.

Thank you for your consideration concerning this proposed treatment of groundwater at this site. If you have any questions, do not hesitate to contact me.

Very truly yours,

ARCADIS U.S, Inc.



Sharon E. Hall
Associate Vice President

Copies:
Hack Conder- Rice Operating Company

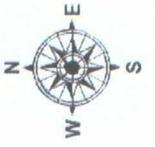
Attachments:
Site Location, Soil Boring Locations, Soil Boring Logs



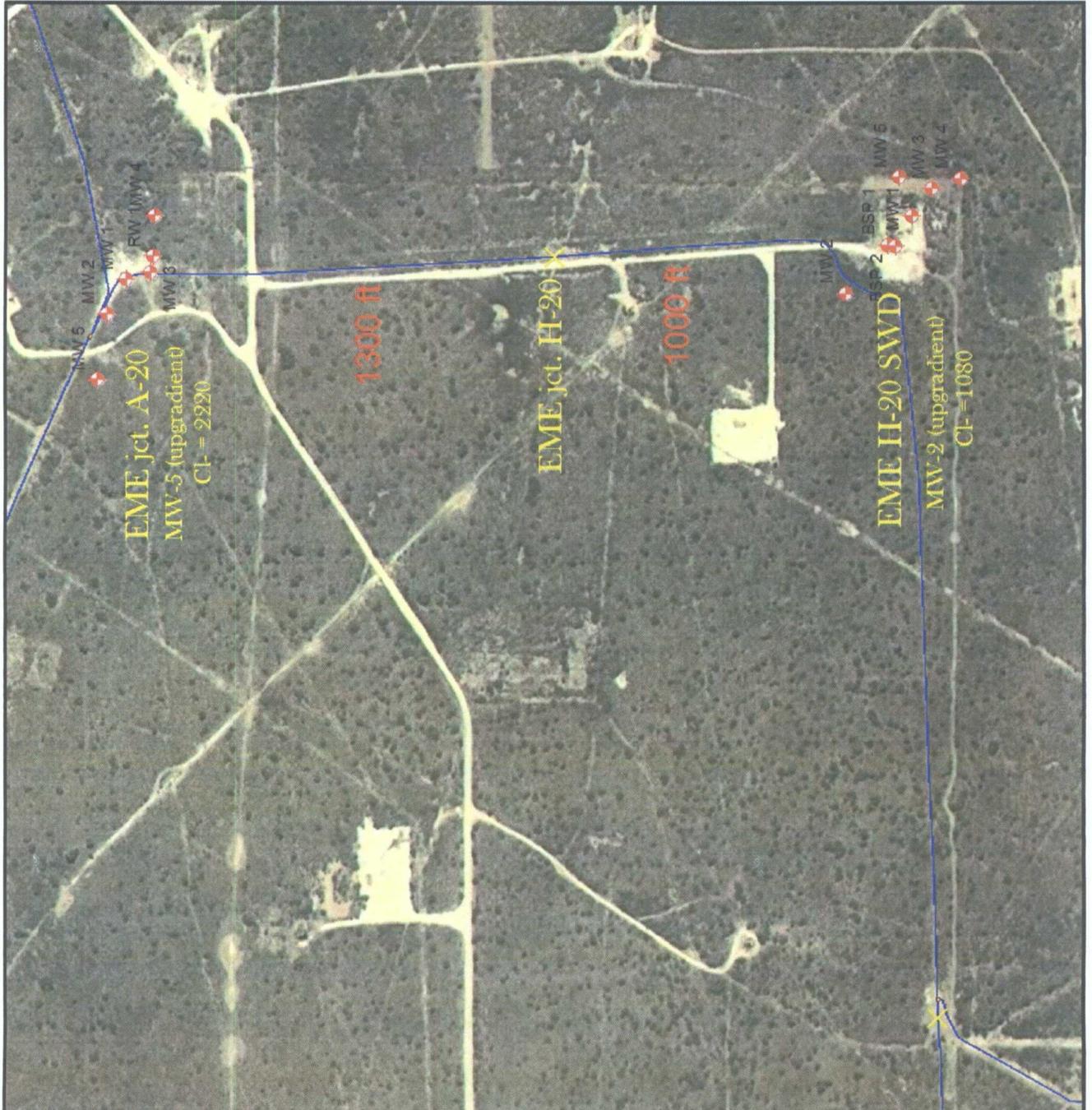
122 W. Taylor
Hobbs, NM 88240
Phone (575) 393-9174
Fax (575) 397-1471

EME jct. H-20

Legals: UL/H sec. 20 T20S R37E
NMOCD Case #: 1R427-236



Drawing date: 6-10-2010
Drafted by: Lara Weinheimer



Soil Bore Locations



122 W. Taylor
Hobbs, NM 88240
Phone (575) 393-9174
Fax (575) 397-1471

EME jct. H-20

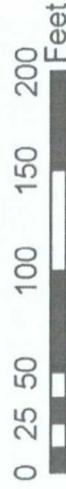
Legals: UL/H sec. 20 T20S R37E
NMOCD Case #: 1R 427-236
Consultant: Arcadis

- Former junction box
- ⊙ Soil bores

EME ACTIVE LINES

STATUS

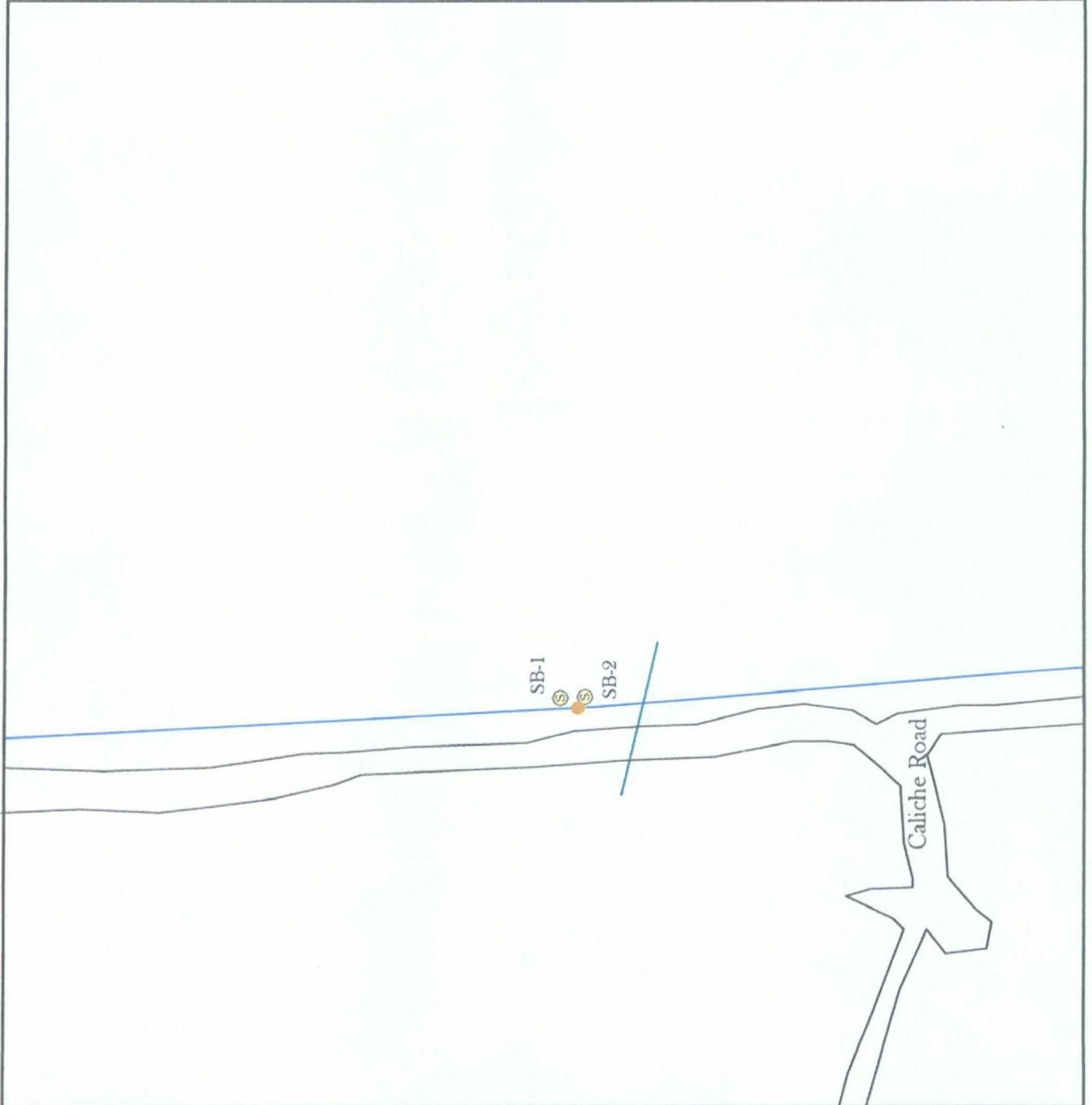
- ROC ACTIVE LINE
- CUSTOMER LINE
- EME NON-ROC PIPELINES



Drawing date: 10-18-09
Revision date:
Drafted by: Lara Weinheimer



Figure 1



Logger: Ralph Lang
Driller: Harrison & Cooper, Inc. Drilling
Consultant: Arcadis
Drilling Method: Air rotary
Start Date: 11/3/2009
End Date: 11/3/2009



Project Name: EME jct. H-20
Well ID: SB #1
Location: UL/H sec. 20 T20S R37E
Lat: N32°33'43.438"
Long: W103°15'56.754"
County: Lea
State: NM

Comments: All samples from cuttings
 Located 15' N of former junction box site.
 Drafted by: Lara Weinheimer
 TD = 21 ft GW = 24 ft

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				0 - 3 ft		
				SANDSTONE		
3	266		1.1	7 YR 6/6, yellowish red, med. grained, subangular, well sorted, poorly cemented		
6	225		1.7			
9	247		2.2	3 - 21 ft		
				MEDIUM GRAINED SAND		
				7.5 YR 8/4 pink, well rounded, well sorted, loose		
12	320		2			
15	477		0.9			
18	986	Cl- 576	0.9			} bentonite seal
		GRO <10				
		DRO <10				
21	360	Cl- 256	1.6			
		GRO <10				
		DRO <10				

Logger:	Ralph Lang
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Arcadis
Drilling Method:	Air rotary
Start Date:	11/3/2009
End Date:	11/3/2009



Comments: All samples from cuttings
 Located 5' E of former junction box site.
 Drafted by: Lara Weinheimer
 TD = 21 ft GW = 24 ft

Project Name: EME jct. H-20 **Well ID:** SB #2
Location: UL/H sec. 20 T20S R37E
Lat: N32°33'43.288" **County:** Lea
Long: W103°15'56.746" **State:** NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				0 - 3 ft SANDSTONE		 bentonite seal
3	216		1.8	7 YR 6/6, yellowish red, med. grained, subangular, well sorted, poorly cemented		
6	242		0.9			
9	213		1	3 - 21 ft MEDIUM GRAINED SAND		
				7.5 YR 8/4 pink, well rounded, well sorted, loose		
12	205		1.2			
15	491		2.5			
18	2318	Cl- 4000	7.4			
		GRO <10				
		DRO 13.2				
20	2362	Cl- 1200	124			
	B <0.05 T <0.05	GRO <10				
	E <0.05 x <0.30	DRO <10				

Hansen, Edward J., EMNRD

From: Hall, Sharon [Sharon.Hall@arcadis-us.com]
Sent: Tuesday, July 27, 2010 7:56 AM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; Katie Jones
Subject: ROC EME Jct. H-20 CAP addendum (1R427-236)

Mr. Hansen,
Mr. Hansen,

The following is an addendum to the EME Jct. H-20 (1R427-236) Corrective Action Plan (CAP) submitted to the NMOCD on July 12, 2010.

*The following paragraph and table should replace the paragraph and table on page 4, under the section **Estimate of chloride mass in groundwater:***

Based on laboratory analysis of chloride concentrations in soil samples collected from the vadose zone, the potential increase in chloride concentrations in groundwater is conservatively estimated to be **728** milligrams per liter (mg/L). This conservatively estimated increase in the concentration of chlorides is multiplied by the total saturated pore space volume resulting in the estimated chloride mass as shown in the following table:

Estimate of Chloride Mass

Parameter	Value	Description of equations used
Impact Area	600 ft ²	Physical measurement of excavation
Longitudinal Dispersivity	10	Professional estimate for factoring the plume length
Aquifer Thickness	15 ft	Based on regional groundwater data*
Porosity	25%	Professional estimate of pore volume
Volume of impacted groundwater below former junction boxes	22,500 ft ³	Multiplication of parameters listed above
Volume of impacted groundwater below former junction boxes	637,129 L	Unit conversion of above value to liters
Averaged increase in on-site chloride concentrations	728 mg/L	Average chloride concentration in the saturated zone
Total Chloride Mass	463.82 kg	Multiplication of two parameters above

* Ground-Water Report 6; Geology and Ground-Water Conditions in Southern Lea County, New Mexico; Nicholson and Clebsch

*The following paragraph should replace the paragraph on page 5, under the section **Estimate of Groundwater Recovery System Removal:***

Adding together the chloride mass calculated in the vadose zone (253.66 kg) and the chloride mass calculated in the groundwater (463.82 kg) results in a total chloride mass of **717.48 kg**.

The groundwater recovery system located at EME Jct. A-20, extracting water with chloride concentration of 3,450 mg/L, could extract about 0.5485 kg per barrel, assuming an average pumping rate of 0.5 gallons per minute (gpm) can be achieved. At that rate, it would take approximately **76 days** and approximately **1,308 barrels** to remove **717.48 kg** of chloride mass.

Sharon Hall | Associate Vice President | Sharon.Hall@arcadis-us.com

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