

FREMONT ENVIRONMENTAL INC.

September 15, 2014

Mr. Phil Wright
Homestead Oil Inc.
16880 Wild Plum Circle
Morrison, CO 80465

Subject: **Proposed Remediation Report**
 Stephens #1
 API # 05-123-11552
 SENW Sec 15, T4N, R66W
 Weld County, Colorado
 Fremont Project No. C014-027
 Facility #243760, Remediation # 8307, Spill #2148350

Dear Mr. Wright:

Enclosed please find a copy of the above referenced Proposed Remediation Report for the Stephens #1 site in Weld County, Colorado. The enclosed report describes the proposed air sparge/soil vapor extraction remediation system for this site.

Please contact me at (303) 956-8714 if you require any additional information.

Fremont appreciates the opportunity to provide this service.

Sincerely,
FREMONT ENVIRONMENTAL INC.



Paul V. Henahan, P.E.
Senior Consultant

Enclosure

PROPOSED REMEDIATION REPORT
HOMESTEAD OIL INC.
STEPHENS #1 WATER VAULT RELEASE
WELD COUNTY, COLORADO
FREMONT PROJECT NO. C014-027
FACILITY #243760, REMEDIATION #8307, SPILL #2148350

Prepared by:

Fremont Environmental Inc.
12061 Pennsylvania Street, Suite A-105
Thornton, CO 80241
(303) 956-8714

September 15, 2014

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 BACKGROUND INFORMATION	1
2.1 Site Location	1
2.2 Site History	1
3.0 PROPOSED REMEDIATION APPROACH	3
4.0 REMARKS.....	4

Tables

Table 1: Summary of Ground Water Chemistry and Elevation Data

Figures

Figure 1: Site Location Map
Figure 2: Site Map
Figure 3: Inferred Ground Water Contour Map
Figure 4: Ground Water Chemistry Map
Figure 5: Proposed Remediation Layout

PROPOSED REMEDIATION REPORT
HOMESTEAD OIL INC.
STEPHENS #1 WATER VAULT RELEASE
WELD COUNTY, COLORADO
FREMONT PROJECT NO. C014-027
FACILITY #243760

1.0 INTRODUCTION

The purpose of this document is to present a proposed air sparging/soil vapor extraction (AS/SVE) remediation system for Homestead Oil Inc.'s (Homestead's) Stephens #1 site in Weld County, Colorado. Impacted soil and ground water were identified at this location due to a release from the produced water vault as the well and facility were being plugged and abandoned. Eight monitoring wells were installed at this site on August 20, 2014 to delineate the magnitude and extent of subsurface impacts. Based on the site characteristics, an AS/SVE system has been determined to be the most cost effective and technically feasible remediation option for this site.

2.0 BACKGROUND INFORMATION

2.1 Site Location

The Stephens #1 site is located approximately 1.5 miles north of Gilcrest, Colorado in Weld County as shown on Figure 1. The site is located in a rural and agricultural area 0.5 miles southeast of the intersection of County Road 31 and County Road 46. The location is further described as the SE $\frac{1}{4}$ of the NW $\frac{1}{4}$ of Section 15, Township 4N, Range 66W.

2.2 Site History

The site consists of the former water vault and aboveground storage tank (AST) for the Stephens #1 natural gas well. The well was drilled in 1984 to a depth of 7,850 feet. Soil impacts were recently identified during the plugging and abandoning of this well and

ancillary equipment. Those observations initiated the site investigation at this location to determine the extent of subsurface impacts.

An excavation to remediate the source impacts was undertaken on May 5, 2014 by Fremont Environmental Inc. (Fremont). Approximately 120 cubic yards of impacted soil were excavated and removed from the storage tank and water vault area. One ground water sample was collected from the excavation and analyzed for petroleum constituents. The laboratory analysis of the water sample indicated that the ground water exhibited a dissolved petroleum concentration of benzene of 4,112 ug/L which is greater than the Colorado Oil and Gas Conservation Commission's (COGCC's) Table 910-1 limit of 5 ug/L. As a result, a site investigation to determine the extent of ground water impacts was required.

A site investigation was conducted at the site on August 20, 2014. Eight soil borings were advanced utilizing a Geoprobe rig. The locations of these monitoring wells are illustrated on the attached figures. Generally, the subsurface consists of sand with some silty sand to a depth of approximately 36 feet.

Water table contours inferred from the August 2014 data are illustrated on Figure 3. Based on these data, ground water is inferred to flow to the northeast. Ground water is present across the site at a depth of approximately 18 feet.

Ground water samples were collected from the eight monitoring wells on August 20, 2014. The ground water samples from MW-1, MW-3 and MW-5 had benzene concentrations of 2,616, 8.1, and 1,755 ug/L, respectively, which are above the COGCC Table 910-1 limit of 5 ug/L for benzene. The ground water chemistry of the other

monitoring wells were below their respective COGCC Table 910-1 values. The ground water chemistry is shown on Figure 4 and summarized in Table 1.

3.0 PROPOSED REMEDIATION APPROACH

Based on the site specific characteristics, which include reasonable soil permeability and the presence of a relatively volatile and biodegradable contaminant, an air sparging and soil vapor extraction (AS/SVE) remediation system was selected as being the most cost effective and technically feasible approach for this location.

As shown on the Proposed Remediation Layout (Figure 5), nine AS wells and four SVE will be installed in the area of soil and ground water impacts. Based on experience with similar soil conditions, Fremont has estimated a radius of influence (ROI) of 15 feet for the AS wells and 30 feet for the SVE wells. The ROI for each well is shown on Figure 5 and provides adequate remedial coverage of the entire impacted area.

Each AS and SVE well will be individually piped to a remediation system enclosure to be positioned on the south side of the location and closest to the available electrical power further south. The AS piping will consist of 1-inch diameter HDPE pipe and the SVE piping will be 2-inch diameter PVC pipe. Care will be taken to ensure that the center pivot irrigation system will pass overhead of the remediation building.

The AS system consists of a Rietschle DTA-80 compressor with a 7.5 HP motor. The SVE system consists of a Rietschle SAP-300 blower with a 4.8 KW motor. These two units are housed within the remediation building.

A request for new service has been submitted to Xcel Energy for this site. Xcel has indicated that the wait time for new service is approximately 12 to 16 weeks. In the interim, Fremont will install the AS and SVE wells and remediation building at the site in anticipation of installing power to the site in approximately December 2014.

In the past, similarly impacted sites have been remediated in six to twelve months. Fremont anticipates a cleanup to the COGCC Table 910-1 levels in approximately a similar duration.

4.0 REMARKS

The discussion and conclusions contained in this report represent our professional opinions. These opinions are based on currently available information and are arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

This report was prepared by **FREMONT ENVIRONMENTAL INC.**



Paul V. Henehan, P.E.

Senior Consultant

9/15/14
Date _____

TABLE

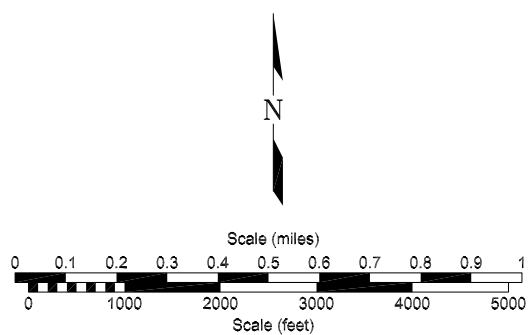
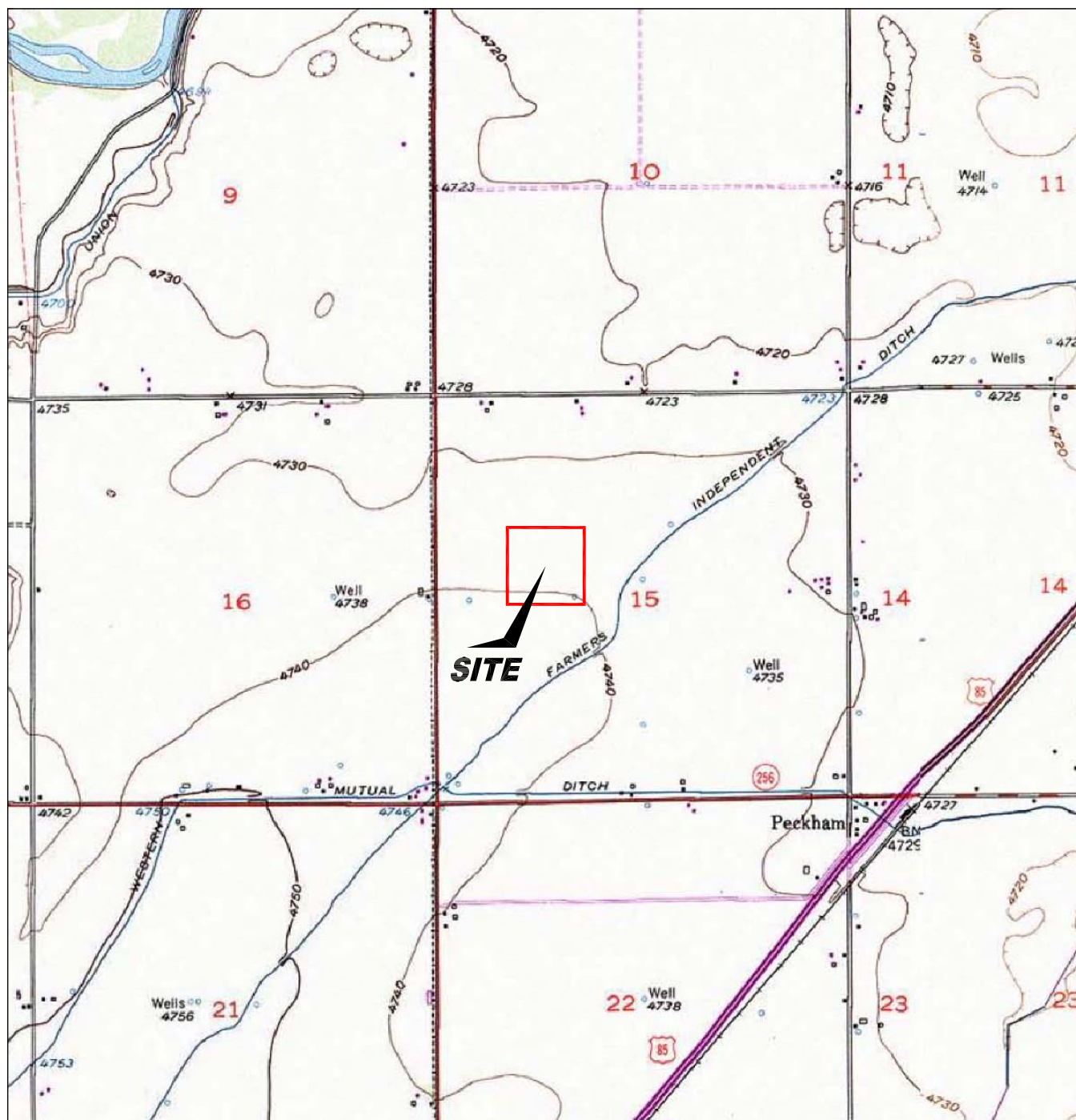
TABLE 1
SUMMARY OF GROUND WATER ELEVATION DATA AND CHEMISTRY DATA
HOMESTEAD OIL INC.
STEPHENS #1, WELD COUNTY, COLORADO
FREMONT PROJECT NO. C014-027

SAMPLE LOCATION	DATE	BENZENE (µg/L)	TOLUENE (µg/L)	ETHYL BENZENE (µg/L)	TOTAL XYLENES (µg/L)	TOC ELEVATION (feet)	DEPTH TO GROUND WATER (ft)	GROUND WATER ELEVATION (ft)	FREE PRODUCT THICKNESS (ft)
MW-1	08/20/14	2616	3751	4182	96434	99.22	17.94	81.28	NP
MW-2	08/20/14	<1.0	<1.0	<1.0	<1.0	99.43	18.11	81.32	NP
MW-3	08/20/14	8.1	<1.0	<1.0	<1.0	99.81	18.39	81.42	NP
MW-4	08/20/14	<1.0	<1.0	<1.0	<1.0	99.89	18.63	81.26	NP
MW-5	08/20/14	1755	3134	454	10854	99.68	18.55	81.13	NP
MW-6	08/20/14	<1.0	<1.0	<1.0	<1.0	99.51	18.3	81.21	NP
MW-7	08/20/14	<1.0	<1.0	<1.0	<1.0	100.00	19.00	81.00	NP
MW-8	08/20/14	<1.0	<1.0	<1.0	<1.0	99.29	18.33	80.96	NP
Table 910-1 Limits		5	560	700	1,400				

Bold face values exceed the COGCC limits

NP - No Free Product

FIGURES



USGS 7.5 MINUTE SERIES (TOPOGRAPHIC)

Figure 1
SITE LOCATION MAP

Homestead Oil - Stephens 1
SW NW Section 15, T4N, R66W
Weld County, Colorado

Project No. C014-027	Prepared by	Drawn by JMA
Date 8/22/14	Reviewed by	Filename 14027T





LEGEND

	MONITORING WELL
	CONTAINMENT
	FORMER FACILITY
	PIPELINE
	WATER LINE (buried)

Figure 2
SITE MAP

Homestead Oil - Stephens 1
SW NW Section 15, T4N, R66W
Weld County, Colorado

Project No.
C014-027

Prepared by

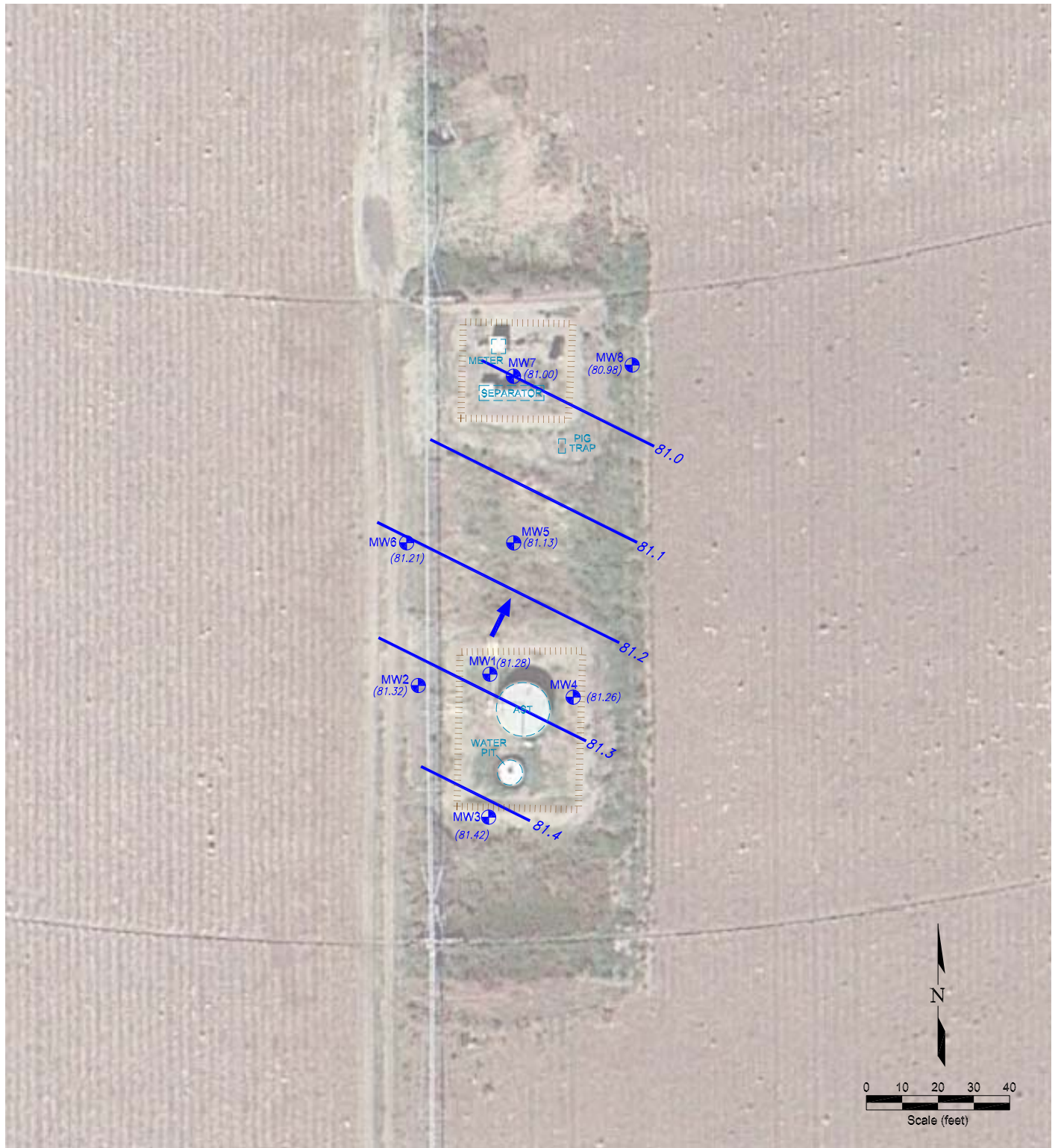
Drawn by
JMA

Date
9/12/14

Reviewed by

Filename
14027Q





LEGEND





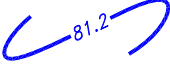

-  MONITORING WELL
-  CONTAINMENT
-  FORMER FACILITY
-  GROUND WATER ELEVATION (ft above arbitrary datum)
-  WATER TABLE CONTOUR
-  GROUND WATER FLOW DIRECTION

Figure 3
INFERRED GROUNDWATER CONTOUR
AUGUST 20, 2014

Homestead Oil - Stephens 1
 SW NW Section 15, T4N, R66W
 Weld County, Colorado

Project No.
C014-027

Prepared by

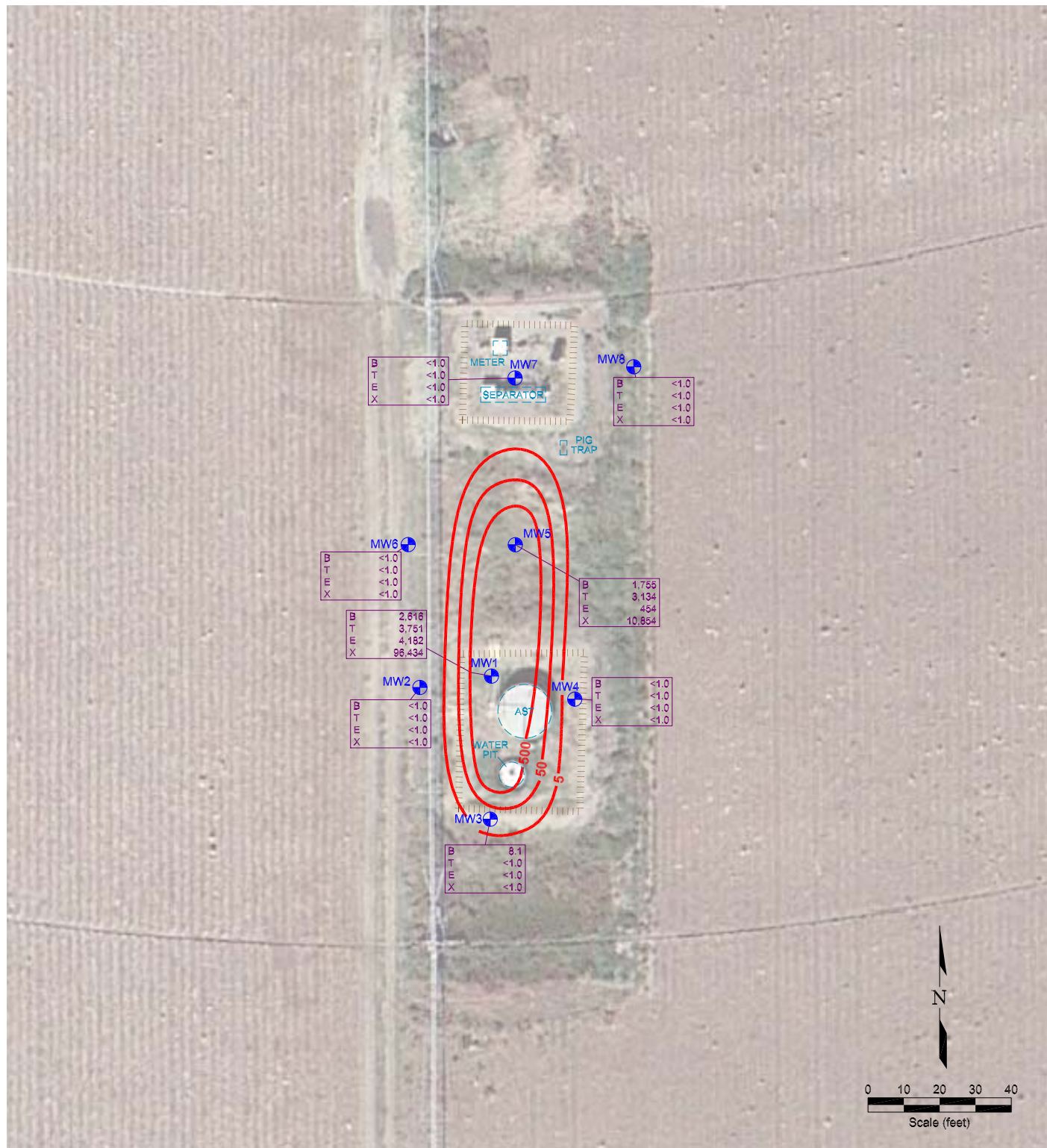
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JMA

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9/12/14

Reviewed by

Filename
14027Q





LEGEND



MONITORING WELL
CONTAINMENT
FORMER FACILITY

B	<1.0
T	<1.0
E	<1.0
X	<1.0

BENZENE (ug/L)
TOLUENE (ug/L)
ETHYLBENZENE (ug/L)
TOTAL XYLENES (ug/L)



BENZENE ISOCONCENTRATION (ug/L)
Dashed where inferred

Figure 4
GROUND WATER CHEMISTRY MAP
AUGUST 20, 2014

Homestead Oil - Stephens 1
SW NW Section 15, T4N, R66W
Weld County, Colorado

Project No.
C014-027

Prepared by

Drawn by

JMA

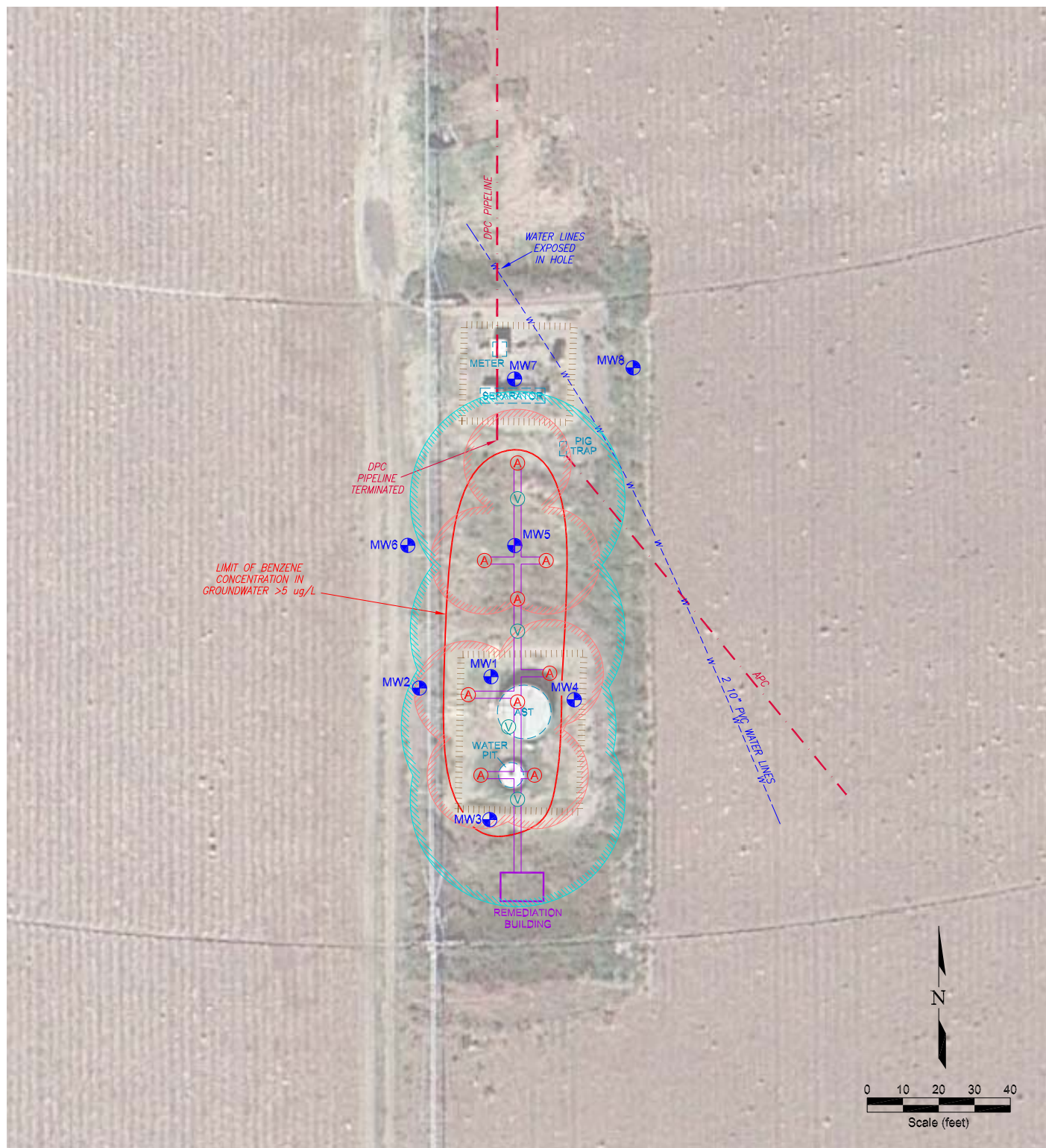
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9/12/14

Reviewed by

Filename

14027Q





LEGEND

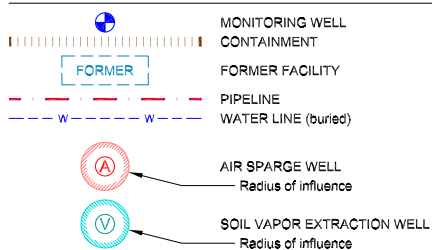


Figure 5
AS/SVE REMEDIATION SYSTEM LAYOUT

Homestead Oil - Stephens 1
SW NW Section 15, T4N, R66W
Weld County, Colorado

Project No.
C014-027

Prepared by

Drawn by
JMA

Date
9/12/14

Reviewed by

Filename
14027Q

