February 14, 2017

Keith Piontek, P.E.
TRC Companies, Inc.
415 South 15th Street, Suite 105
St. Louis, Missouri 63103

RE Diamond Animal Health Groundwater Modeling Summary
2538 SE 43rd Street
Des Moines, Iowa
Apex Project # 400895-001

Dear Mr. Piontek:

Apex Companies, LLC (Apex) was retained by TRC Companies, Inc. (TRC) to perform Tier II modeling of impacted groundwater encountered during a Limited Phase II Environmental Site Assessment completed on the Diamond Animal Health facility located at 2538 SE 43rd Street in Des Moines, Iowa by Allender Butzke Engineers, Inc (ABE). Apex, at the request of TRC, completed Tier II Groundwater Modeling to illustrate Benzene (**Figure 1A**), Toluene (**Figure 1B**), Ethylbenzene (**Figure 1C**), and total Xylenes (**Figure 1D**) plumes as they are compared to the Levee Area Groundwater Remediation Goals (LGRG) developed for the Magellan Midstream Partners, L.P. Des Moines Terminal remediation project. The Tier II modeling program and procedures used to develop these Figures are the same as was utilized by Apex for Semi-Annual Reporting during the two-year post-remediation monitoring program of the Des Moines Terminal Southern Area(the April 2009 through March 2011 period referenced in the Iowa Department of Natural Resources (IDNR) "no further action" letter dated August 22, 2011). .

Plume Summary

Each contamination plume map was created using the IDNR Tier II software Version 3.0. The Tier II model generates an iso-concentration contour of the LGRG based on the spatial distribution of the available data points. The ABE-provided groundwater data was utilized for plume contour generation. In addition to the ABE data, 2011 groundwater data from MW-29 and MW-30 was also used for plume definition. The MW-29 and MW-30 groundwater data from the March 22, 2011 sampling event was the last available data set from the two-year post-remediation monitoring program. The MW-29 and MW-30 concentrations were used to support projection of plume boundaries to the east, as did ABE location TB-1, TN-2, and TB-5 to the west. A summary of groundwater data utilized to generate the plume contours is included in the table below:

	Boring Location	Sample ID	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylene (mg/L)
Diamond 2016 Phase II Data	TB-1	DAH-1W	0.008	<0.005	0.368	0.036
	TB-2	DAH-2W	0.025	<0.005	0.0198	<.01
	TB-3	DAH-3W	2.05	0.394	8.47	13.8
	TB-4	DAH-4W	0.295	0.103	3.35	0.738
	TB-5	DAH-5W	0.0128	<0.005	0.511	0.427
Magellan 2011 Monitoring Data	MW-30		1.14	0.144	1.27	1.78
	MW-29		0.00507	0.0351	0.0832	0.125
IDNR-Approved LGRG			**3.88**	**1.9**	**1.3**	**1.65**

Figure 1A Benzene: The ABE Limited Phase II data indicated the highest Benzene concentration (2,050 ppb) was recorded at TB-3. The LGRG for Benzene is 3,880 ppb; therefore, the Tier II modeling software did not generate a plume boundary.

Figure 1B Toluene: The ABE Limited Phase II data indicated the highest Toluene concentration (394 ppb) was recorded at TB-3. The LGRG for Toluene is 1,900 ppb; therefore, the Tier II modeling software did not generate a plume boundary.

Ethylbenzene: The ABE Limited Phase II data indicated the highest Ethylbenzene concentration (8,470 ppb) was recorded at TB-3. The LGRG for Ethylbenzene is 1,300 ppb; therefore, the Tier II modeling software generated a plume boundary. For the purpose of plume definition, March 2011 groundwater data from MW-29 and MW-30 was utilized. With this data set, the Tier II model shows the plume is primarily confined to the Diamond Animal Health facility property.

Total Xylenes: The ABE Limited Phase II data indicated the highest total Xylenes concentration (13,800 ppb) was recorded at TB-3. The LGRG for total Xylenes is 1,650 ppb; therefore, the Tier II modeling software generated a plume boundary. For the purpose of plume definition, March 2011 groundwater data from MW-29 and MW-30 was utilized. With this data set, the Tier II model shows the plume is primarily confined to the Diamond Animal Health facility property.

Groundwater Flow

To further support assessment of the ABE data and the Tier II model results, Apex assessed groundwater elevation data from the Des Moines Terminal Southern Area two-year post-remediation monitoring program for insights into groundwater flow direction and gradient. . Groundwater elevations from monitoring wells MW-29, MW-30, MW-32, MW-04A, and MW-5 from the September 21, 2009, March 15, 2010, September 15, 2010, and March 21, 2010 sampling events were utilized to determine groundwater head gradient and flow direction. Groundwater flow direction maps for each sampling event is included as **Appendix A,** and key parameters are summarized below

Date	Groundwater Flow Direction (degrees east of north)	Head Gradient (ft/ft)
9/21/2009	137°	0.00288
3/15/2010	45°	0.00809
9/15/2010	85°	0.00496
3/21/2011	89°	0.00247
Average	89°	0.00460

Note: The 2009 sampling event identified low groundwater elevations, indicative of drought conditions. The March 2010 sampling event identified elevated groundwater levels, indicative of flooding conditions.

The available data indicates a net groundwater flow direction to east (away from the Des Moines River) with an average gradient of 0.0046 ft/ft. This provides further support of the Tier II model results, which show the extent of LGRG exceedance will not reach the Des Moines River, located to the west and south of the area of interest.

If you need additional information regarding this summary, please contact Dave Hruby at (515) 727-8025.

Sincerely,
Apex Companies, LLC



Dave Hruby
Senior Project Manager

Attachments:
Figure 1A: Benzene Groundwater Contamination Plume Map
Figure 1B: Toluene Groundwater Contamination Plume Map
Figure 1C: Ethylbenzene Groundwater Contamination Plume Map
Figure 1D: Total Xylenes Groundwater Contamination Plume Map
Appendix A: Groundwater Flow Direction Maps



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DRAWN BY	EM
DATE	1/20/2017
SCALE	AS SHOWN
CAD NO.	400895
PRJ NO.	400895

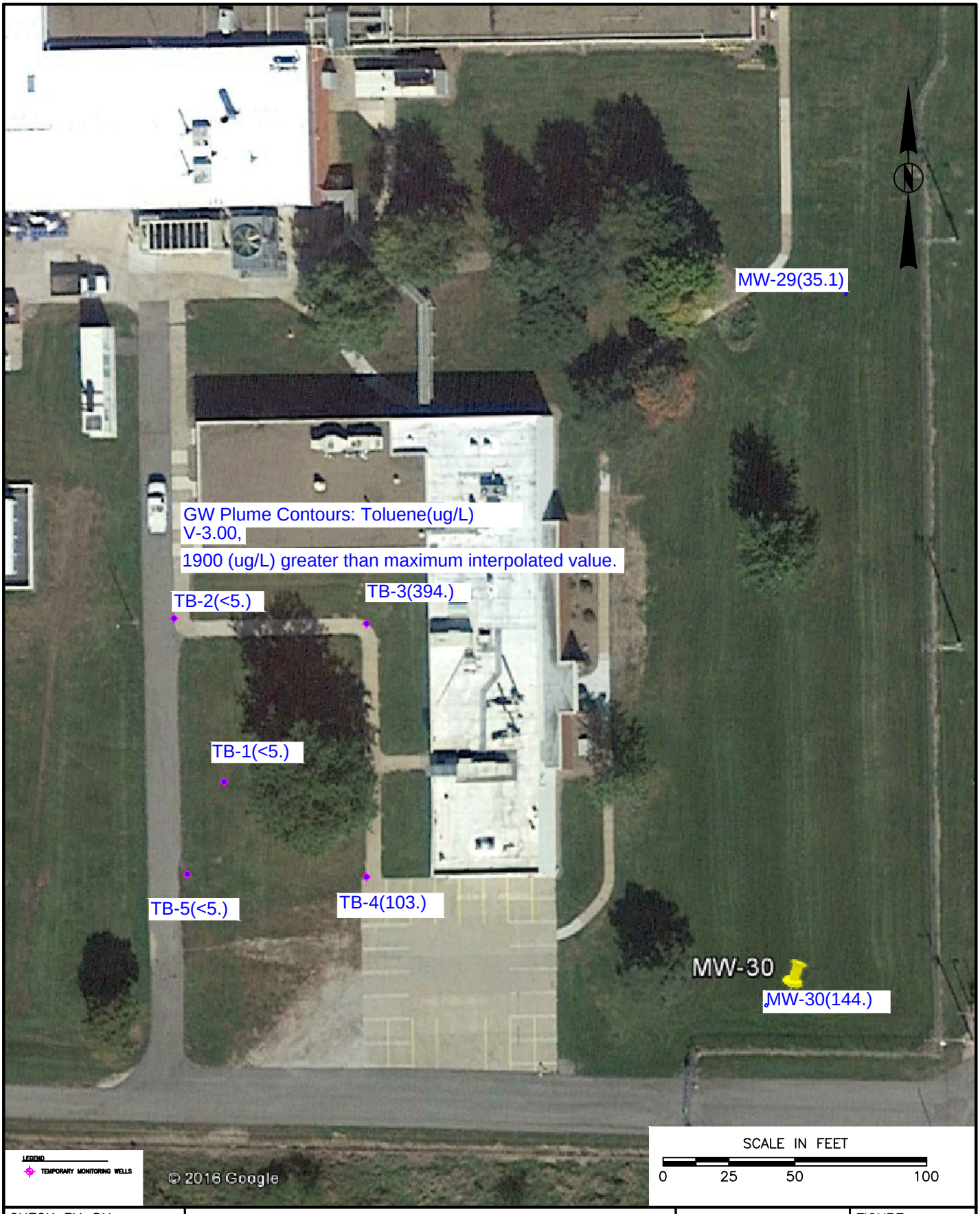
GROUNDWATER CONTAMINATION PLUME MAP
BENZENE

SOUTHERN REMEDIATION AREA
2503 SE 43RD STREET
PLEASANT HILL, IOWA

APEX

FIGURE

1 A



CHECK BY	DH
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DATE	1/20/2017
SCALE	AS SHOWN
CAD NO.	400895
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GROUNDWATER CONTAMINATION PLUME MAP
TOLUENE

SOUTHERN REMEDIATION AREA
2503 SE 43RD STREET
PLEASANT HILL, IOWA

APEX

FIGURE
1 B



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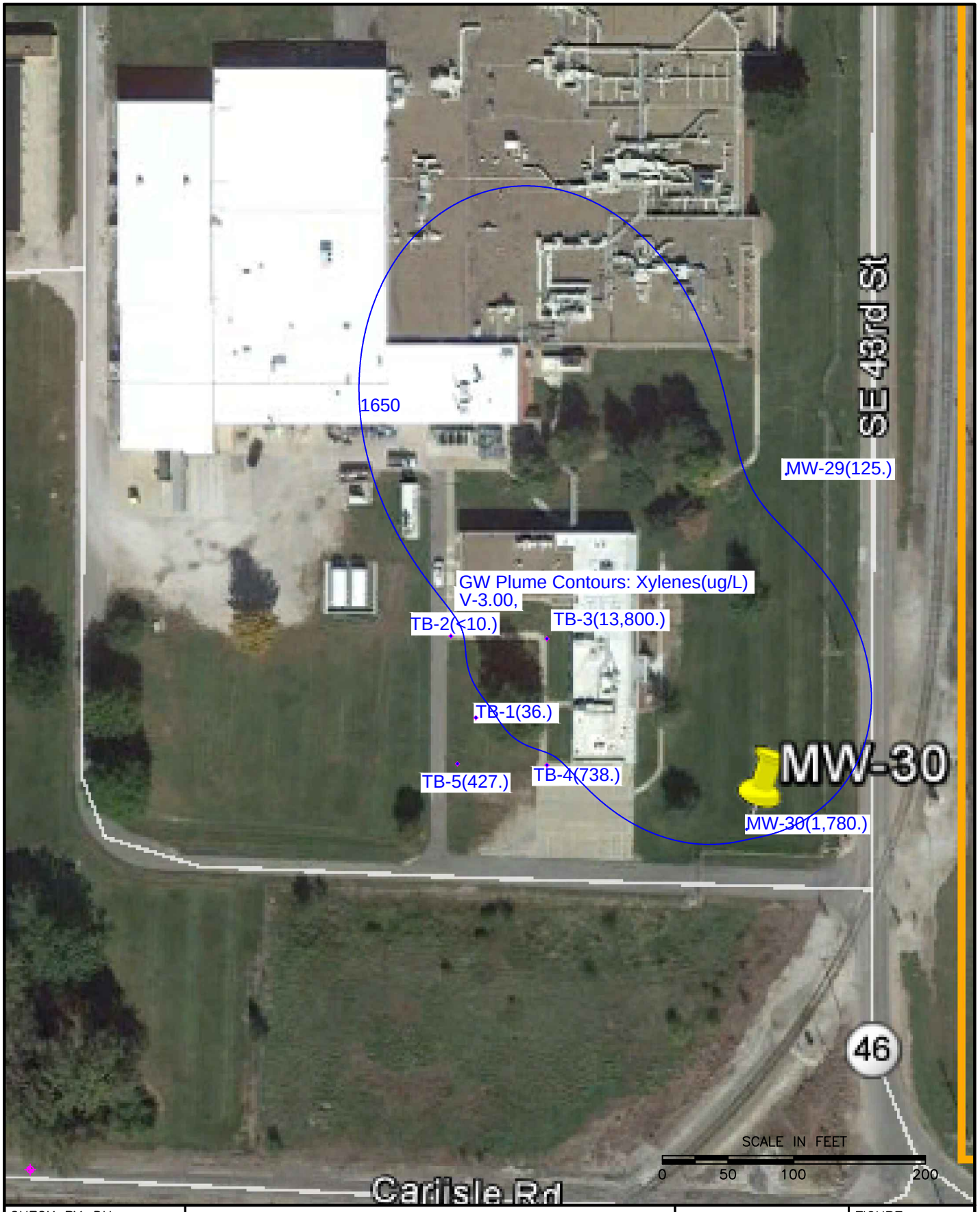
GROUNDWATER CONTAMINATION PLUME MAP
ETHYLBENZENE

SOUTHERN REMEDIATION AREA
2503 SE 43RD STREET
PLEASANT HILL, IOWA

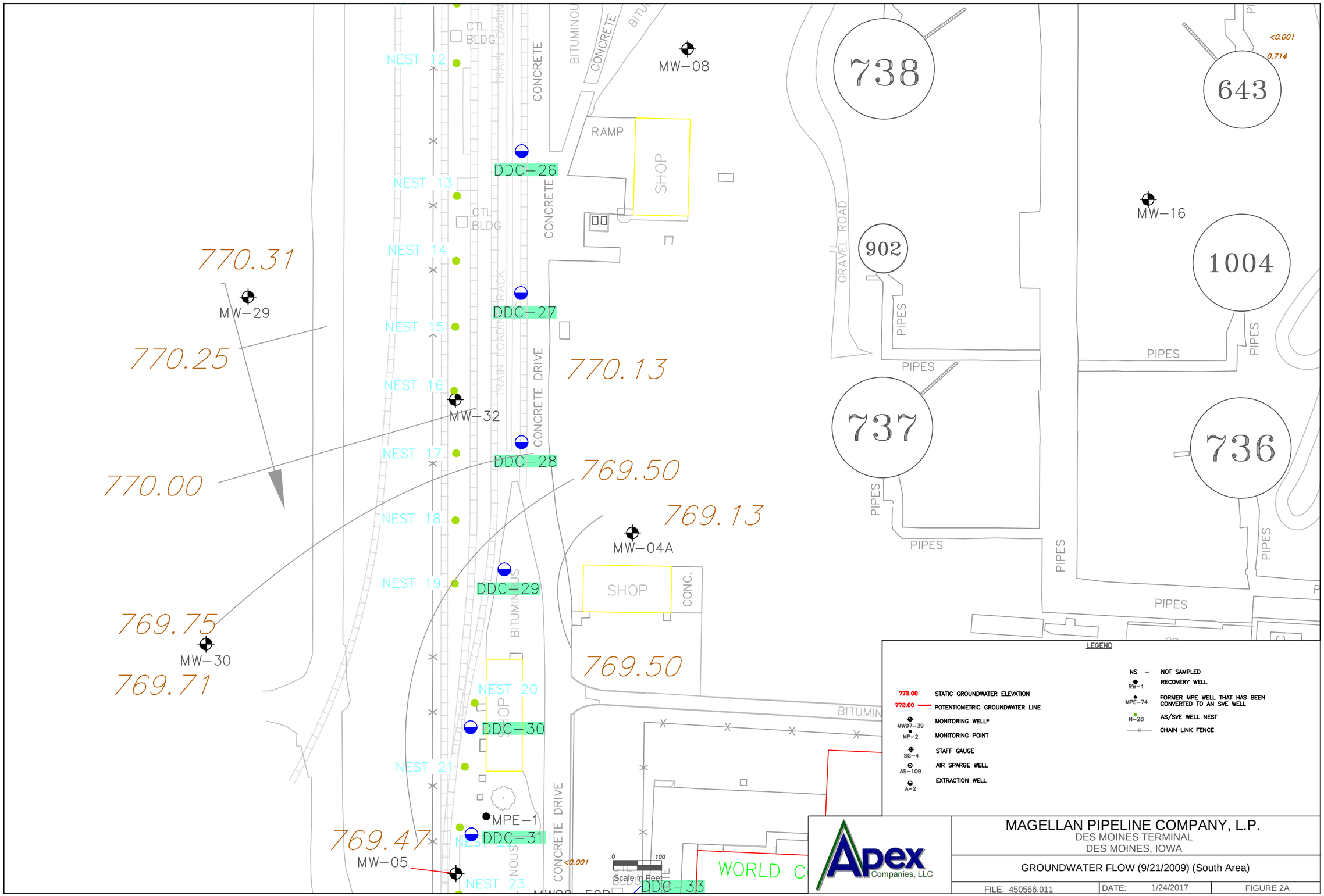
APEX

FIGURE

1C



CHECK BY DH	GROUNDWATER CONTAMINATION PLUME MAP XYLENES		FIGURE
DRAWN BY EM			
DATE 1/20/2017			1 D
SCALE AS SHOWN	SOUTHERN REMEDIATION AREA 2503 SE 43RD STREET PLEASANT HILL, IOWA		
CAD NO. 400895			
PRJ NO. 400895			



LEGEND

772.00	STATIC GROUNDWATER ELEVATION
772.00	POTENTIOMETRIC GROUNDWATER LINE
MW97-39 / MP-2	MONITORING WELL* / MONITORING POINT
SG-4	STAFF GAUGE
AS-109	AIR SPARGE WELL
A-2	EXTRACTION WELL
NS –	NOT SAMPLED
RW-1	RECOVERY WELL
MPE-74	FORMER MPE WELL THAT HAS BEEN CONVERTED TO AN SVE WELL
N-28	AS/SVE WELL NEST
	CHAIN LINK FENCE

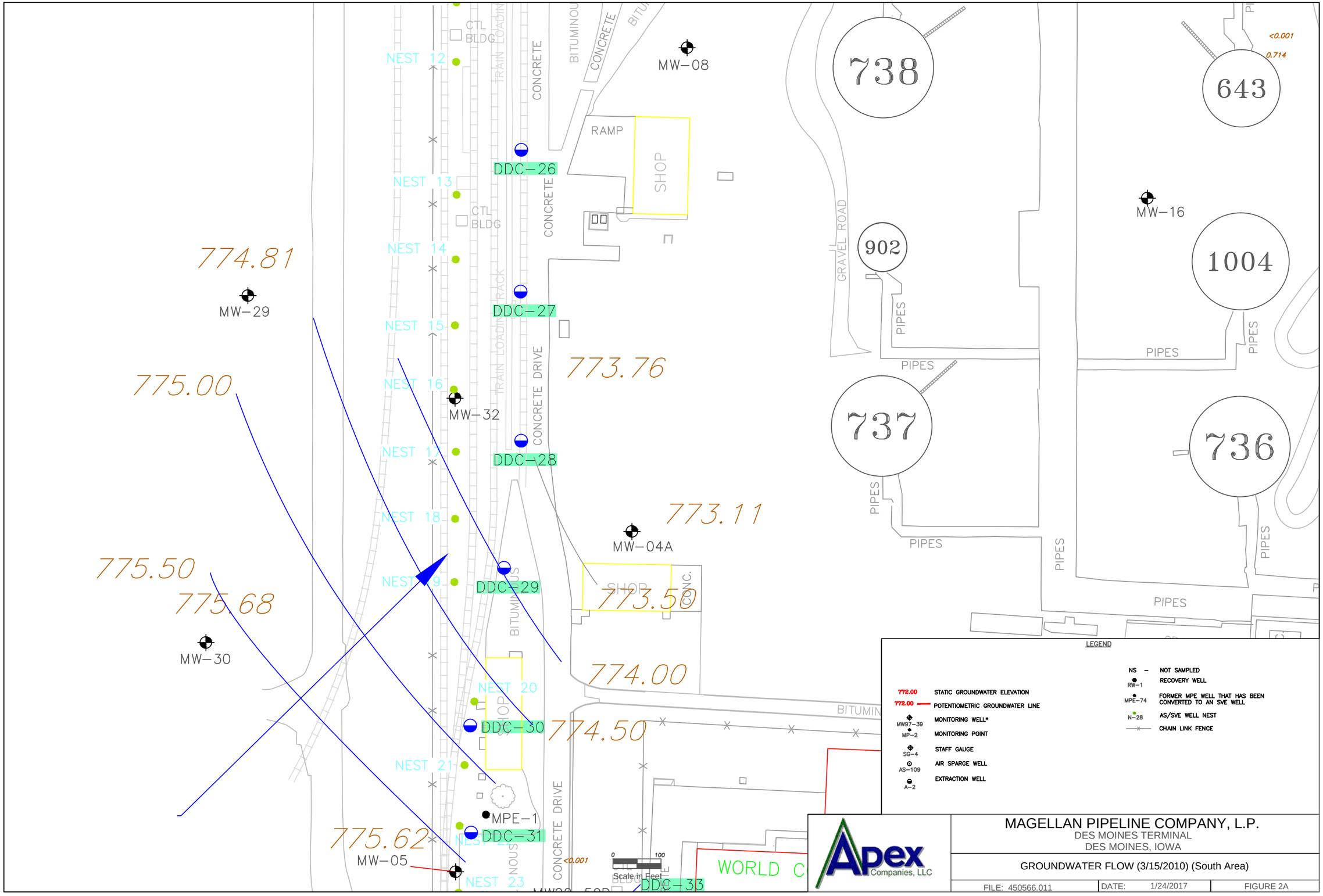
Apex Companies, LLC

MAGELLAN PIPELINE COMPANY, L.P.

DES MOINES TERMINAL
DES MOINES, IOWA

GROUNDWATER FLOW (9/21/2009) (South Area)

FILE: 450566.011 | DATE: 1/24/2017 | FIGURE 2A



LEGEND

772.00	STATIC GROUNDWATER ELEVATION
772.00	POTENTIOMETRIC GROUNDWATER LINE
MW97-39	MONITORING WELL*
MP-2	MONITORING POINT
SG-4	STAFF GAUGE
AS-109	AIR SPARGE WELL
A-2	EXTRACTION WELL
NS –	NOT SAMPLED
RW-1	RECOVERY WELL
MPE-74	FORMER MPE WELL THAT HAS BEEN CONVERTED TO AN SVE WELL
N-28	AS/SVE WELL NEST
	CHAIN LINK FENCE

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DES MOINES TERMINAL
DES MOINES, IOWA

GROUNDWATER FLOW (3/15/2010) (South Area)

FILE: 450566.011 | DATE: 1/24/2017 | FIGURE 2A

774.10

MW–29

774.57

MW–30

773.60

MW–05

774.04

773.12

MW–04A

MW–08

MW–16

MW–32

MPE–1

NEST 12

NEST 13

NEST 14

NEST 15

NEST 16

NEST 17

NEST 18

NEST 19

NEST 20

NEST 21

NEST 23

DDC–26

DDC–27

DDC–28

DDC–29

DDC–30

DDC–31

DDC–33

CTL BLDG

CTL BLDG

TRAIN LOADING RACK

CONCRETE

BITUMINOUS

CONCRETE

RAMP

SHOP

CONCRETE

SHOP

CONC.

BITUMINOUS

CONCRETE DRIVE

CONCRETE DRIVE

738

643

902

1004

737

736

GRAVEL ROAD

PIPES

PIPES

PIPES

PIPES

PIPES

PIPES

PIPES

PIPES

<0.001

0.714

0.129

<0.001

0 100

Scale in Feet

WORLD C

LEGEND

772.00 STATIC GROUNDWATER ELEVATION

772.00 POTENTIOMETRIC GROUNDWATER LINE

MW97–39 MONITORING WELL*

MP–2 MONITORING POINT

SG–4 STAFF GAUGE

AS–109 AIR SPARGE WELL

A–2 EXTRACTION WELL

NS – NOT SAMPLED

RW–1 RECOVERY WELL

MPE–74 FORMER MPE WELL THAT HAS BEEN CONVERTED TO AN SVE WELL

N–28 AS/SVE WELL NEST

CHAIN LINK FENCE

Apex Companies, LLC

MAGELLAN PIPELINE COMPANY, L.P.

DES MOINES TERMINAL

DES MOINES, IOWA

GROUNDWATER FLOW (9/24/2010) (South Area)

FILE: 450566.011 | DATE: 9-2010 | FIGURE 4

772.07
MW–29
772.00
MW–30
771.81
MW–32
771.95
772.75
MW–04A
771.07
772.25
MW–05
771.77
MW–08
772.50
MW–16
772.14
NEST 12
NEST 13
NEST 14
NEST 15
NEST 16
NEST 17
NEST 18
NEST 19
NEST 20
NEST 21
NEST 23
DDC–26
DDC–27
DDC–28
DDC–29
DDC–30
DDC–31
DDC–33
MPE–1
CTL BLDG
CTL BLDG
TRAIN LOADING RACK
CONCRETE
BITUMINOUS
CONCRETE
RAMP
SHOP
CONCRETE
GRAVEL ROAD
CONCRETE DRIVE
BITUMINOUS
SHOP
CONC.
738
902
737
643
1004
736
<0.001
0.714
PIPES
PIPES
PIPES
PIPES
PIPES
PIPES
PIPES
PIPES
<0.001
0 100
Scale in Feet
WORLD C

LEGEND

772.00	STATIC GROUNDWATER ELEVATION
772.00	POTENTIOMETRIC GROUNDWATER LINE
MW97–39	MONITORING WELL*
MP–2	MONITORING POINT
SG–4	STAFF GAUGE
AS–109	AIR SPARGE WELL
A–2	EXTRACTION WELL
NS –	NOT SAMPLED
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N–28	AS/SVE WELL NEST
	CHAIN LINK FENCE

Apex Companies, LLC

MAGELLAN PIPELINE COMPANY, L.P.
DES MOINES TERMINAL
DES MOINES, IOWA

GROUNDWATER FLOW (3/21/2011) (South Area)

FILE: 450566.011 | DATE: 1/24/2017 | FIGURE 2A