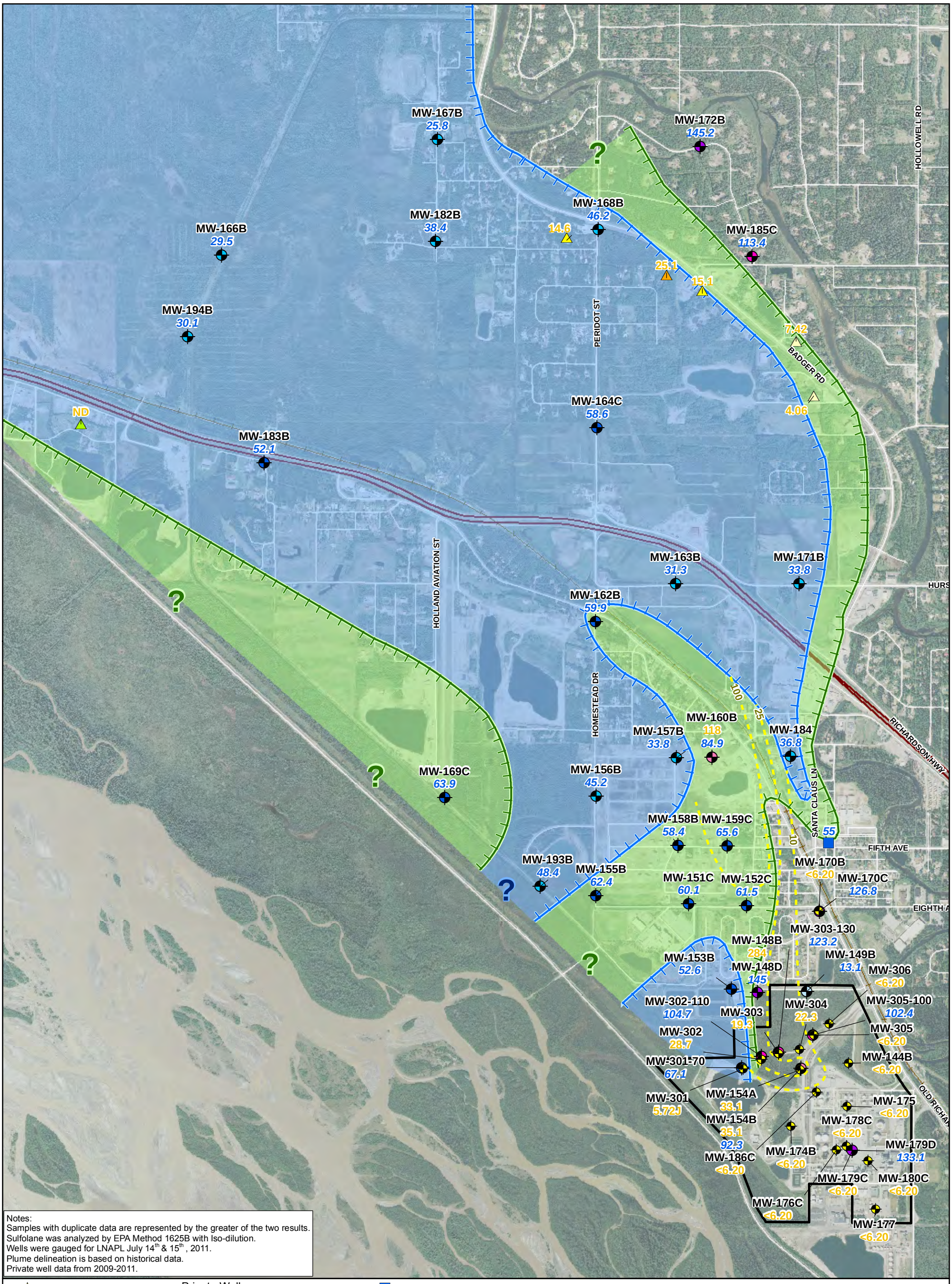


Notes:
Samples with duplicate data are represented by the greater of the two results.
Sulfolane was analyzed by EPA Method 1625B with Iso-dilution.
Wells were gauged for LNAPL July 14th & 15th , 2011.
Plume delineation is based on historical data.
Private well data from 2009-2011.

Monitoring Well

Depth to Permafrost
- 0 - 24.9
- 25 - 49.9
- 50 - 74.9
- 75 - 99.9
- 100 - 124.9
- 125 - 149.9

FHRA Property Boundary

Private Wells
- Not Detected
- 3.2 µg/L - 10 µg/L (J-flagged)
- 10 µg/L - 25 µg/L
- 25 µg/L - 100 µg/L
- Greater than 100 µg/L

Aquifer Frozen at 55' Below the Water Table

Aquifer Frozen at 90' Below the Water Table

City Well

Approximate Sulfolane Isopleth in µg/L

118 Sulfolane Concentration (µg/L)

13.1 Depth to Permafrost (feet BWT)

N

0 750 1,500 3,000

Feet

Figure 111
SULFOLANE CONCENTRATIONS
IN GROUNDWATER
55-90' BELOW THE WATER TABLE
FROM PRIVATE WELLS
North Pole Refinery
Flint Hills Resources Alaska, LLC

MW-167B
25.8

MW-172B
<6.46
145.2

HOLLOWELL RD

MW-168B
46.2

14.4

MW-182B
38.4

MW-166B
29.5

17

ND

MW-185C
113.4

MW-194B
30.1

PERIDOT ST

21.1

19.3

BADGER RD

19.9

MW-164C
58.6

MW-183B
52.1

97.9

HOLLAND AVIATION ST

MW-163B
31.3

MW-171B
33.8

HURST RD

MW-162B
59.9

HOMESTEAD DR

MW-157B
33.8

MW-184
36.8

RICHARDSON HWY

MW-160B
84.9

MW-156B
45.2

MW-169C
63.9

SANTA CLAUS LN

55

MW-158B
58.4

MW-159C
65.6

FIFTH AVE

MW-193B
48.4

MW-155B
62.4

MW-151C
60.1

MW-152C
61.5

MW-170C
<6.20
126.8

EIGHTH AVE E

MW-148D
<6.20
145

MW-149B
13.1

MW-153B
52.6

MW-305-100
102.4

MW-303-130
123.2

MW-306
<6.20

MW-302-110
104.7

MW-305
4.45J

MW-173B
<6.20

MW-301-70
67.1

OLD RICHARDSON HWY

MW-186C
<6.20

MW-302
<6.20

MW-304
<6.20

MW-154B
92.3

MW-186D
NS

MW-179D
NS
133.1

Notes:
Samples with duplicate data are represented by the greater of the two results.
Sulfolane was analyzed by EPA Method 1625B with Iso-dilution.
Wells were gauged for LNAPL July 14th & 15th, 2011.
Plume delineation is based on historical data.
Private well data from 2009-2011.

Monitoring Well

Depth To Permafrost

- 0 - 24.9 Ft
- 25 - 49.9 Ft
- 50 - 74.9 Ft
- 75 - 99.9 Ft
- 100 - 124.9 Ft
- 125 - 150 Ft

FHRA Property Boundary

Private Wells

- Not Detected
- 3.2 µg/L - 10 µg/L (J-flagged)
- 10 µg/L - 25 µg/L
- 25 µg/L - 100 µg/L
- Greater than 100 µg/L

Aquifer Frozen at 55' Below the Water Table

Aquifer Frozen at 90' Below the Water Table

City Well

118 Sulfolane Concentration (µg/L)

13.1 Depth to Permafrost (feet BWT)

0 750 1,500 3,000

Feet

Figure 112
SULFOLANE CONCENTRATIONS
IN GROUNDWATER
90-160' BELOW THE WATER TABLE
FROM PRIVATE WELLS
North Pole Refinery
Flint Hills Resources Alaska, LLC

Private Wells

- Not Detected
- 3.2 µg/L - 10 µg/L (J-flagged)
- 10 µg/L - 25 µg/L
- 25 µg/L - 100 µg/L
- Greater than 100 µg/L
- <10.3 Sulfolane Concentration (µg/L)

FHRA Property Boundary

0 1,000 2,000 4,000

Feet

Private well data from 2009-2011.

Figure 113
SULFOLANE CONCENTRATIONS
IN GROUNDWATER
>160' BELOW THE WATER TABLE
FROM PRIVATE WELLS
North Pole Refinery
Flint Hills Resources Alaska, LLC

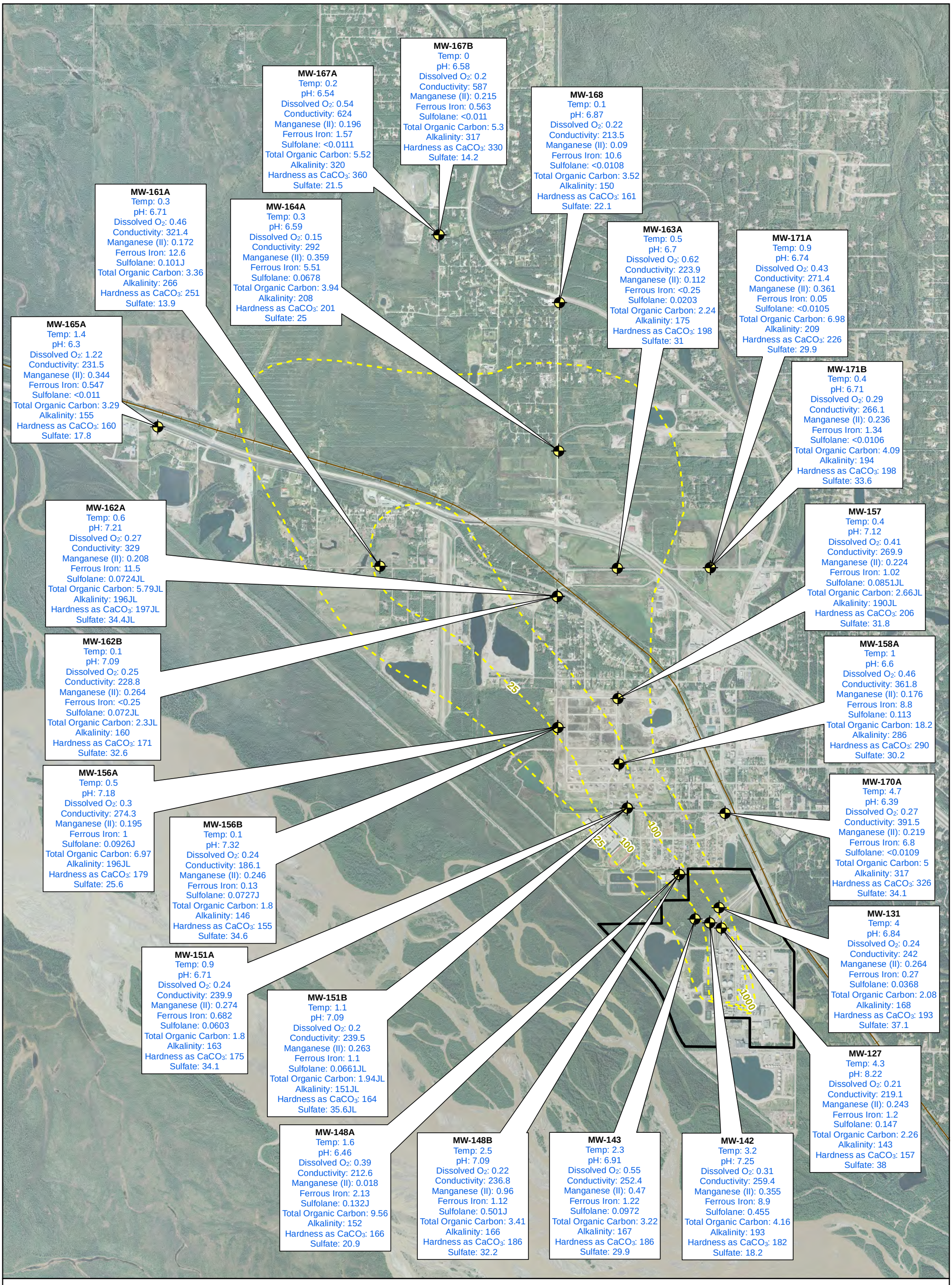


Figure 114
MONITORED NATURAL ATTENUATION PARAMETERS
FIRST QUARTER 2011
North Pole Refinery
Flint Hills Resources Alaska, LLC

Monitoring Well

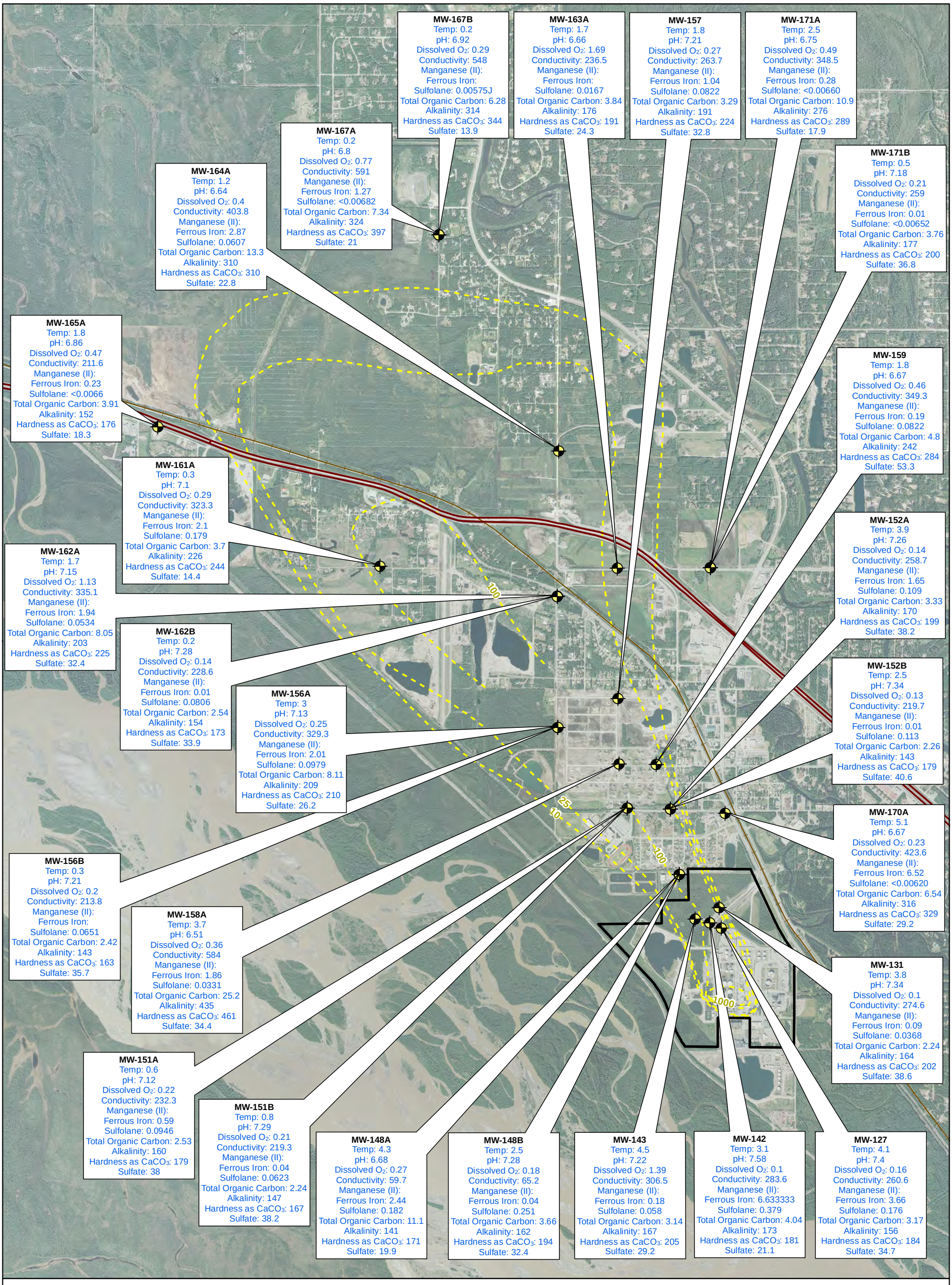
Sulfolane Isopleth in µg/L
(Dashed where approximate)

FHRA Property Boundary

0 1,000 2,000 4,000

Feet

Figure 115
MONITORED NATURAL ATTENUATION PARAMETERS
SECOND QUARTER 2011
North Pole Refinery
Flint Hills Resources Alaska, LLC



Monitoring Well

Sulfolane Isopleth in µg/L
(Dashed where approximate)

FHRA Property Boundary

N

0 1,000 2,000 4,000

Feet

Figure 116
MONITORED NATURAL ATTENUATION PARAMETERS
THIRD QUARTER 2011
North Pole Refinery
Flint Hills Resources Alaska, LLC

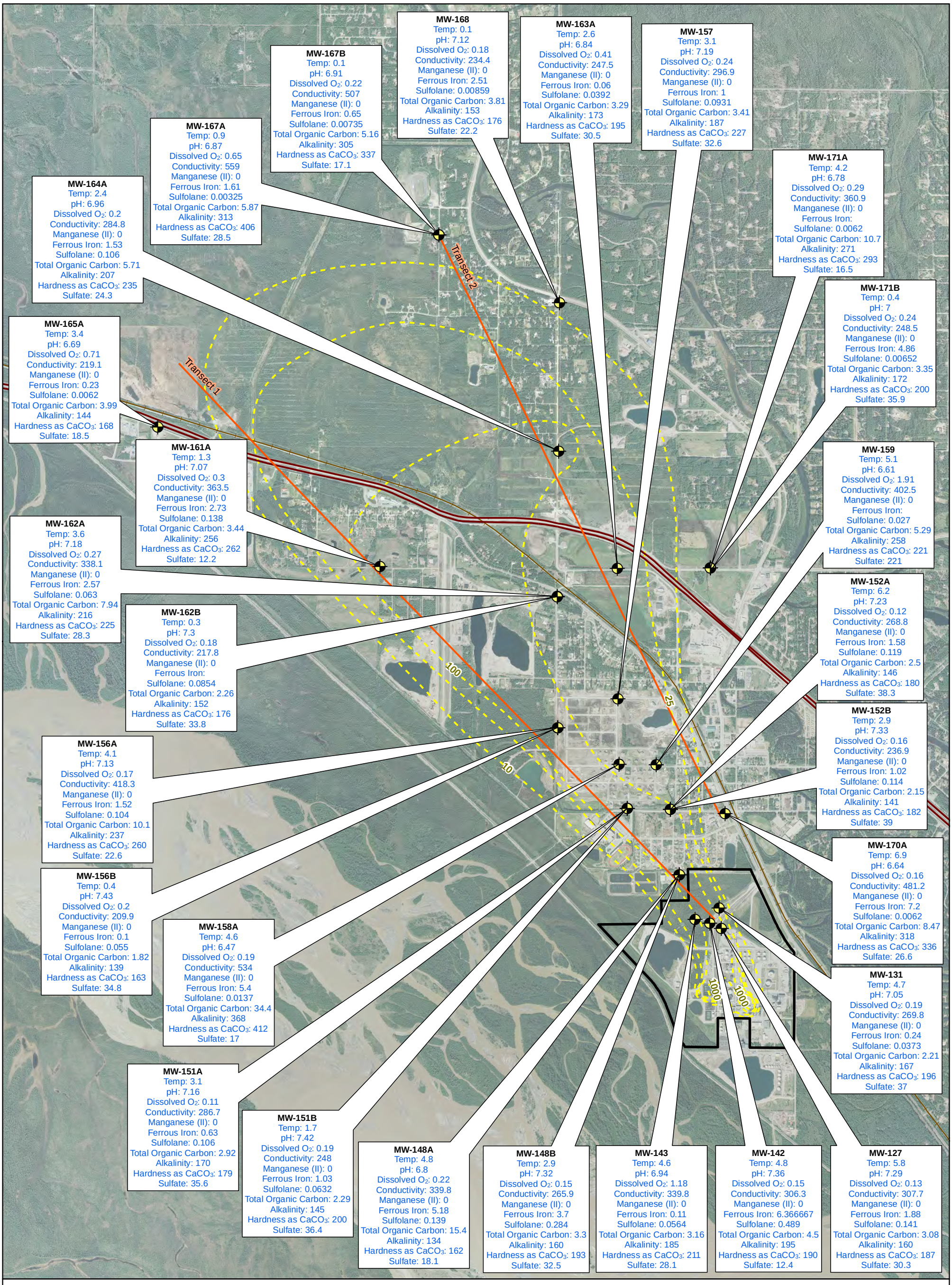


Figure 117
MONITORED NATURAL ATTENUATION PARAMETERS
FOURTH QUARTER 2011
North Pole Refinery
Flint Hills Resources Alaska, LLC

Figure 118
Principal Component Plot - Transect 1
North Pole Refinery
Flint Hills Resources Alaska, LLC

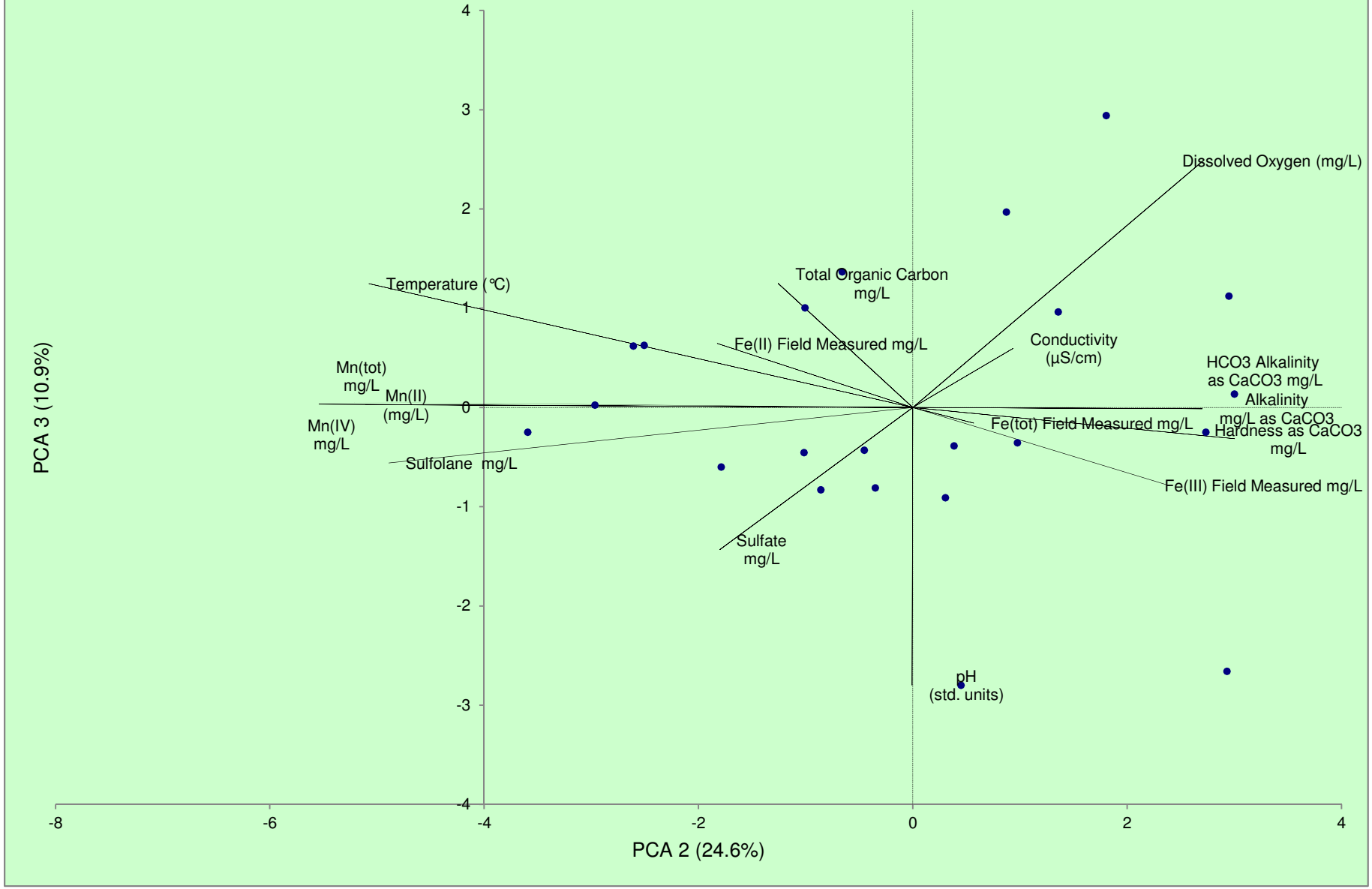


Figure 119
Principal Component Plot - Transect 2
North Pole Refinery
Flint Hills Resources Alaska, LLC

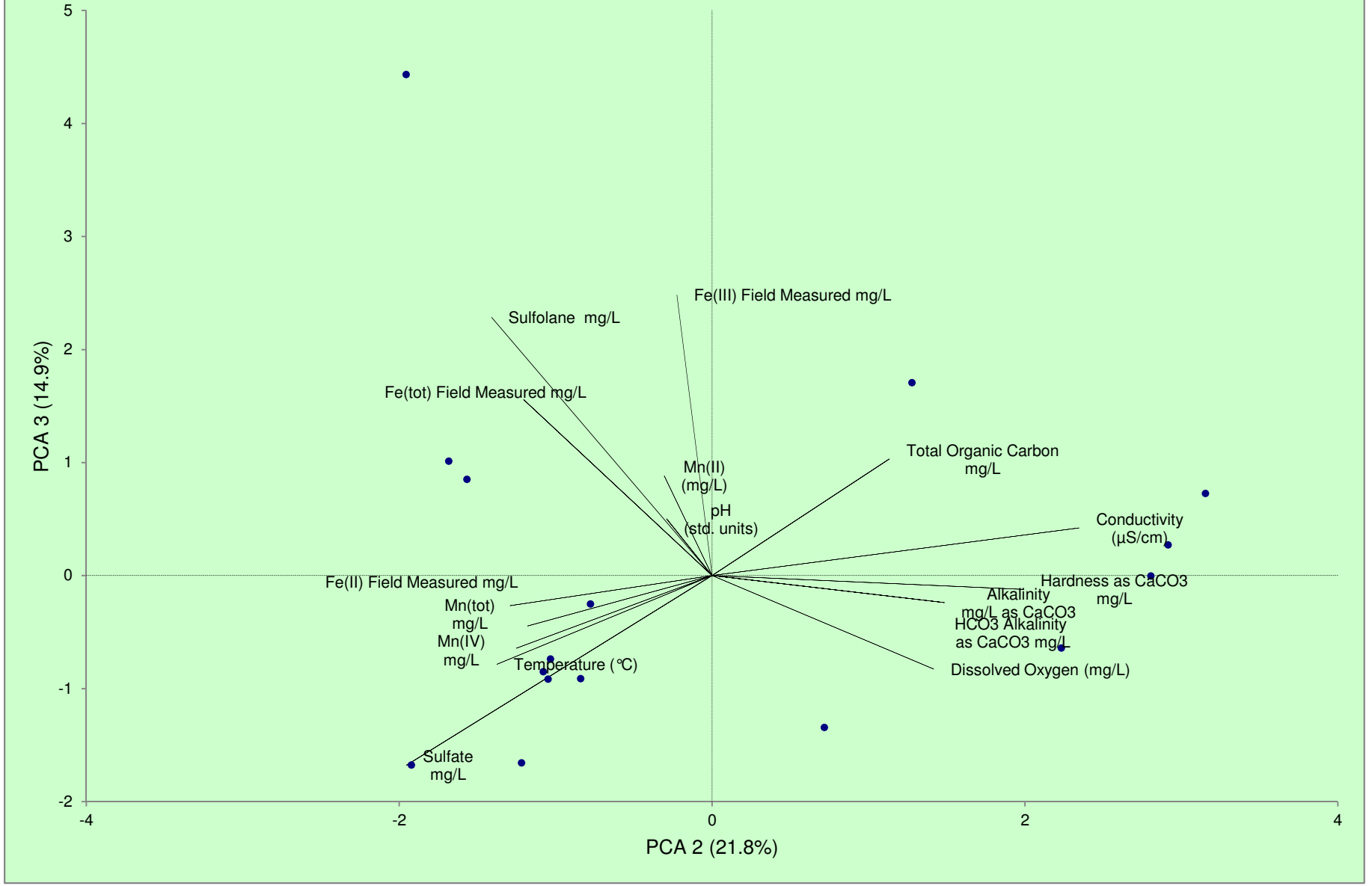


Figure 120
Discriminant Analysis Plot
MNA Parametersand Mann Kendall Trends
North Pole Refinery
Flint Hills Resources Alaska, LLC

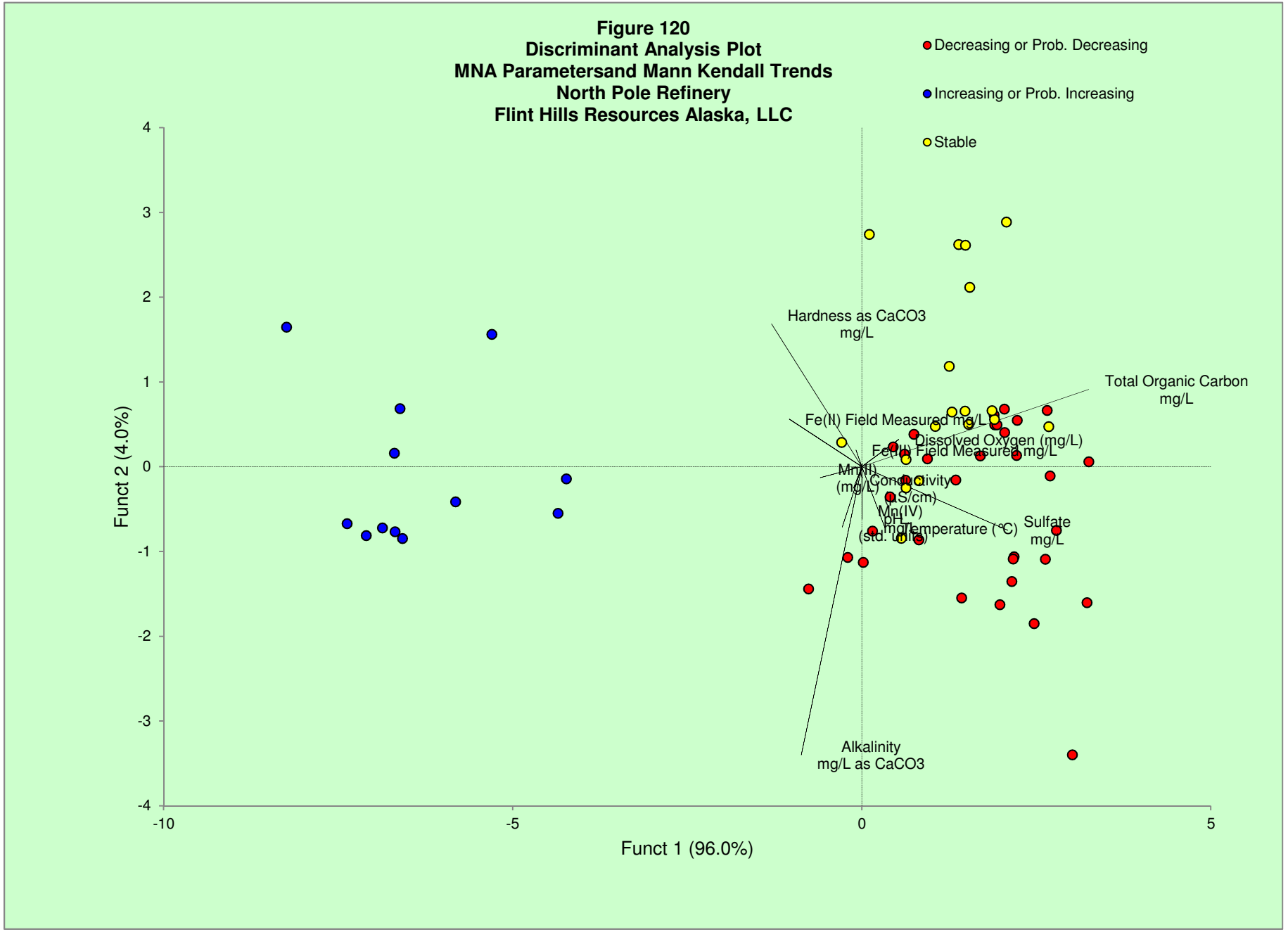


Figure 121
TOTAL PLFA BIOMASS IN WELL MW-130
North Pole Refinery
Flint Hills Resources Alaska, LLC

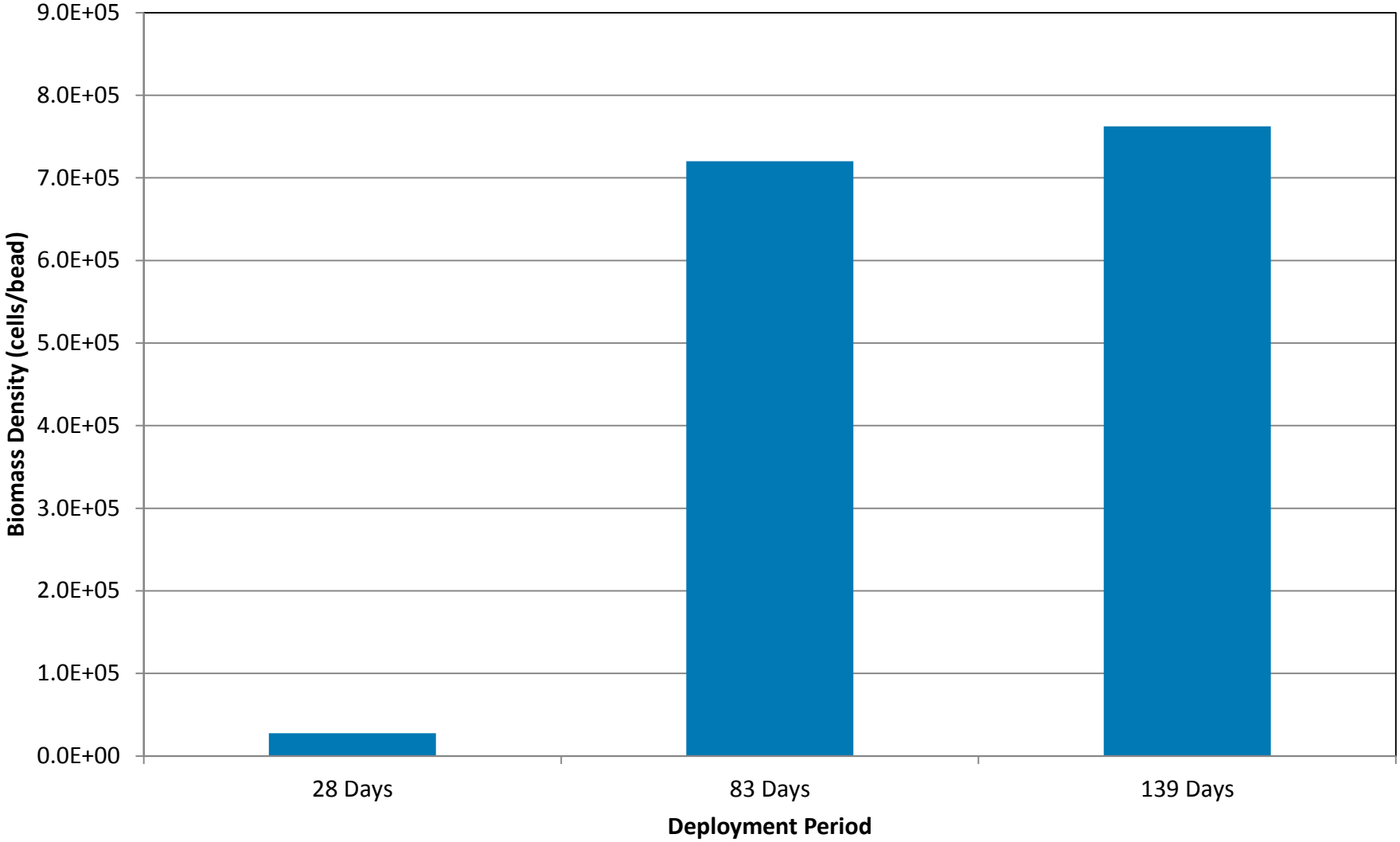


Figure 122
COMMUNITY COMPOSITION IN WELL MW-130
North Pole Refinery
Flint Hills Resources Alaska, LLC

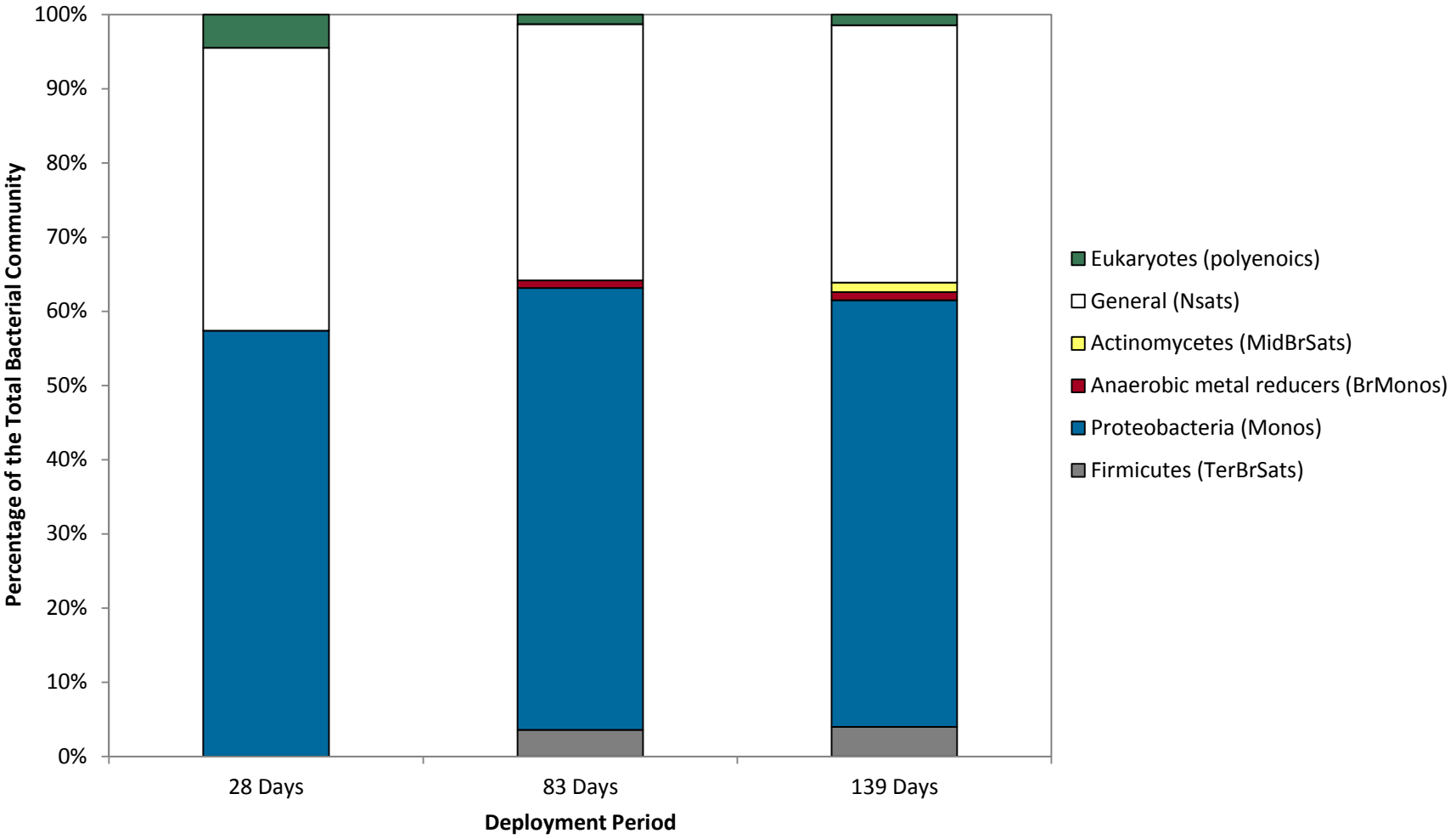


Figure 123
PHYLOGENETIC GROUP DENSITIES IN WELL MW-130
North Pole Refinery
Flint Hills Resources Alaska, LLC

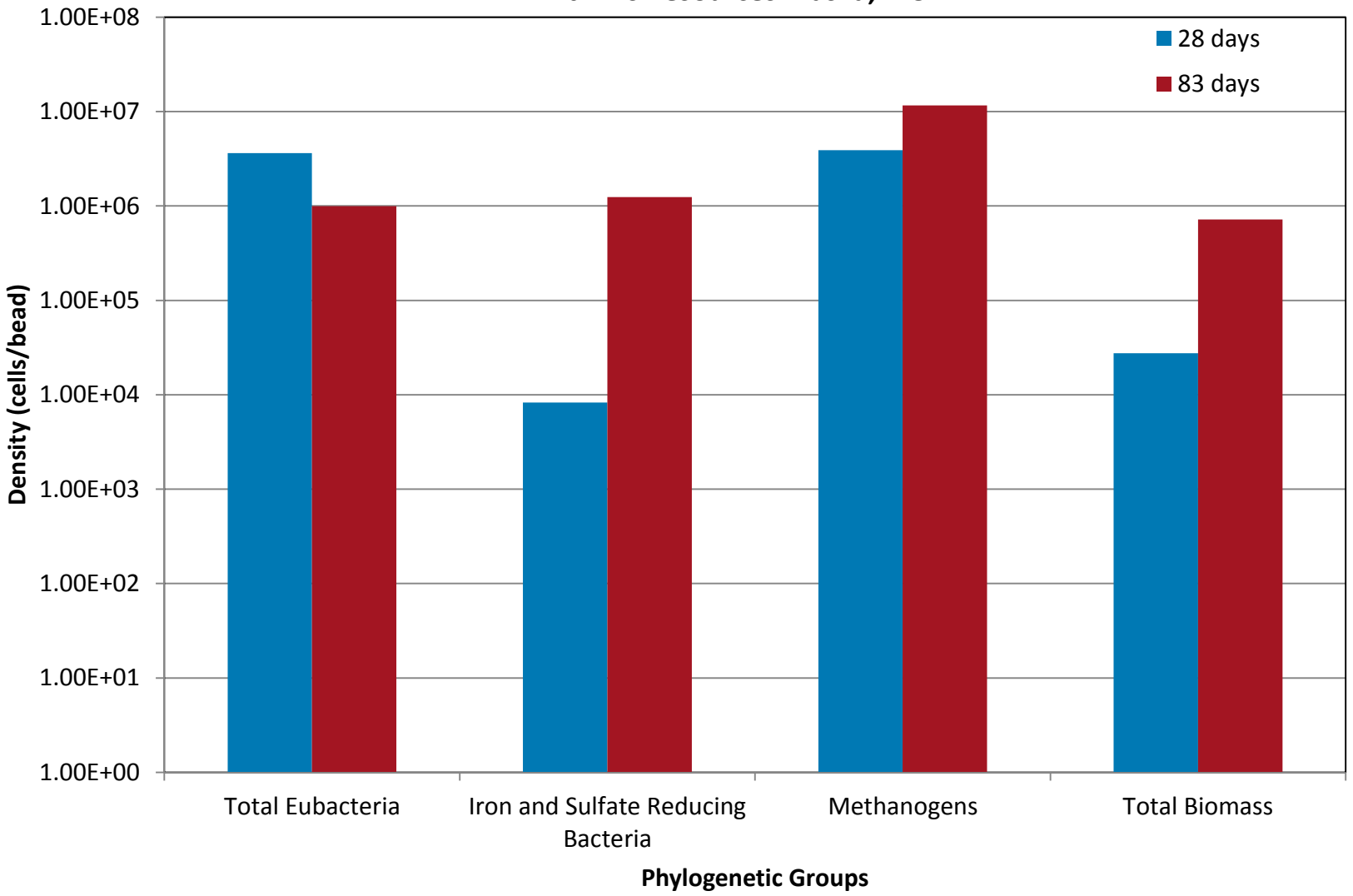
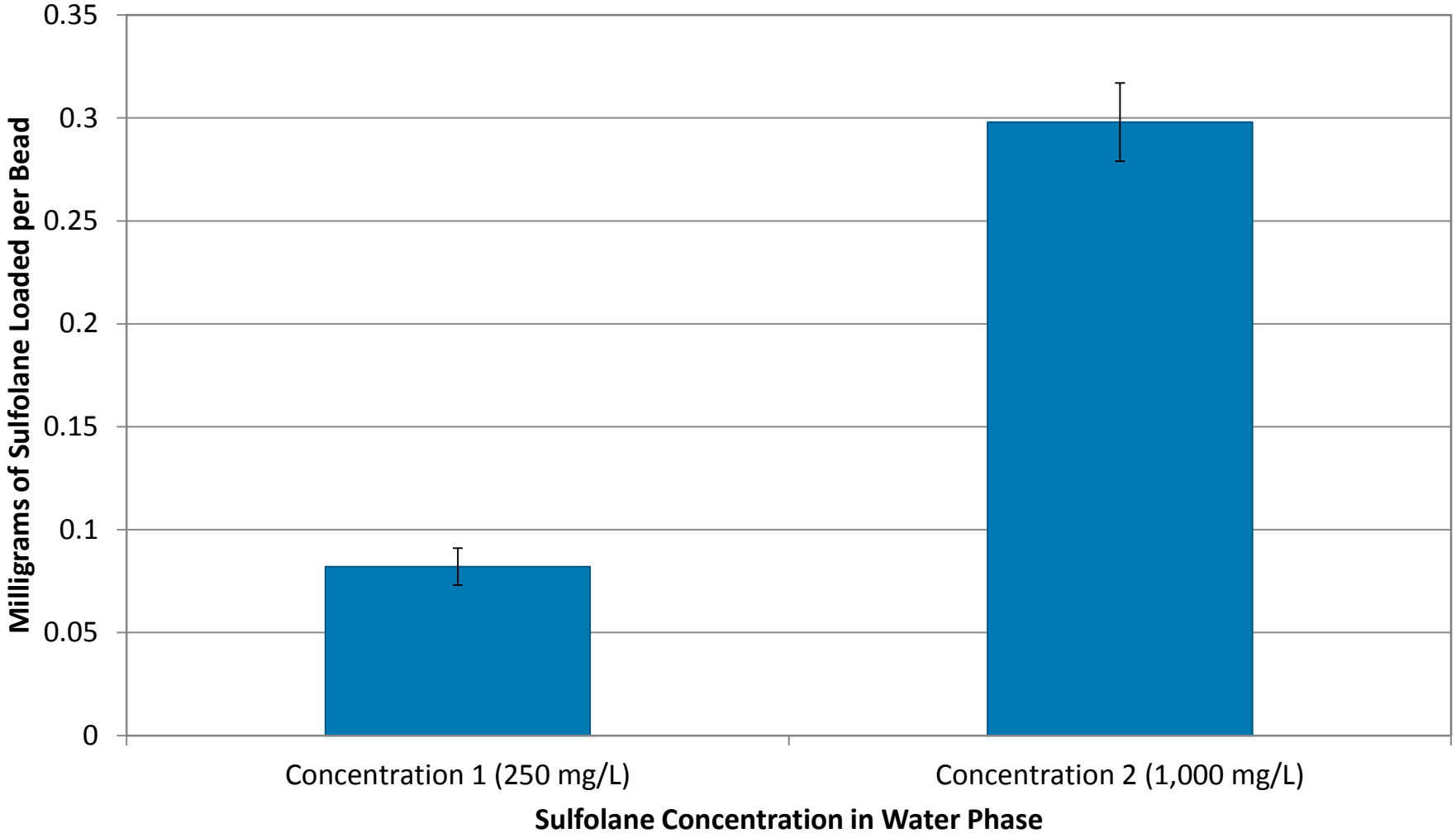


Figure 124
LOADING RATE OF SULFOLANE ONTO BIO-SEP BEADS
North Pole Refinery
Flint Hills Resources Alaska, LLC



mg/L = milligrams per liter

Figure 125
COMPARISON OF SULFOLANE EXTRACTION TECHNIQUE FOR BIO-SEP BEADS
North Pole Refinery
Flint Hills Resources Alaska, LLC

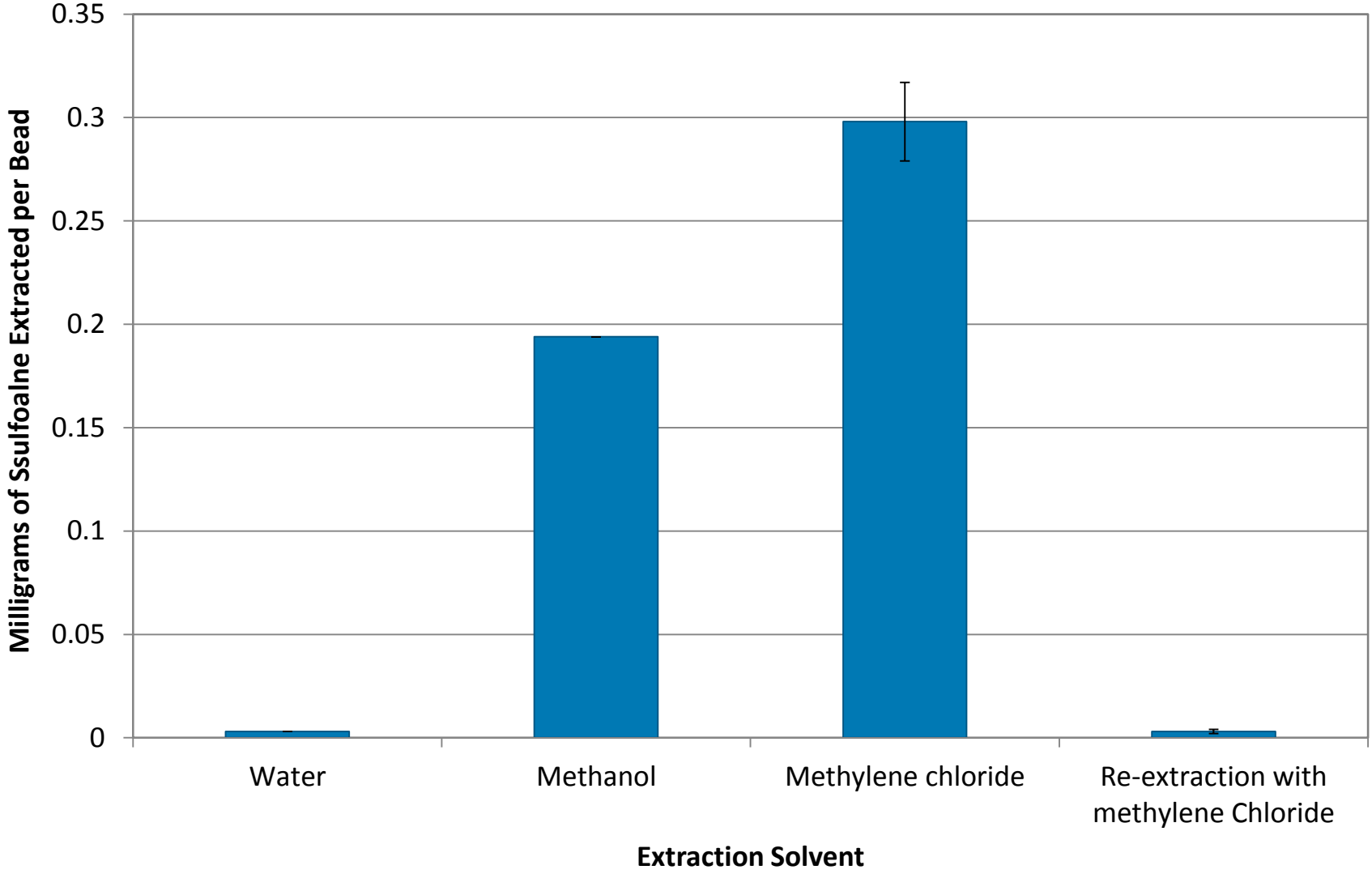


Figure 126
Sulfolane Leaching Study Results
North Pole Refinery
Flint Hills Resources Alaska, LLC

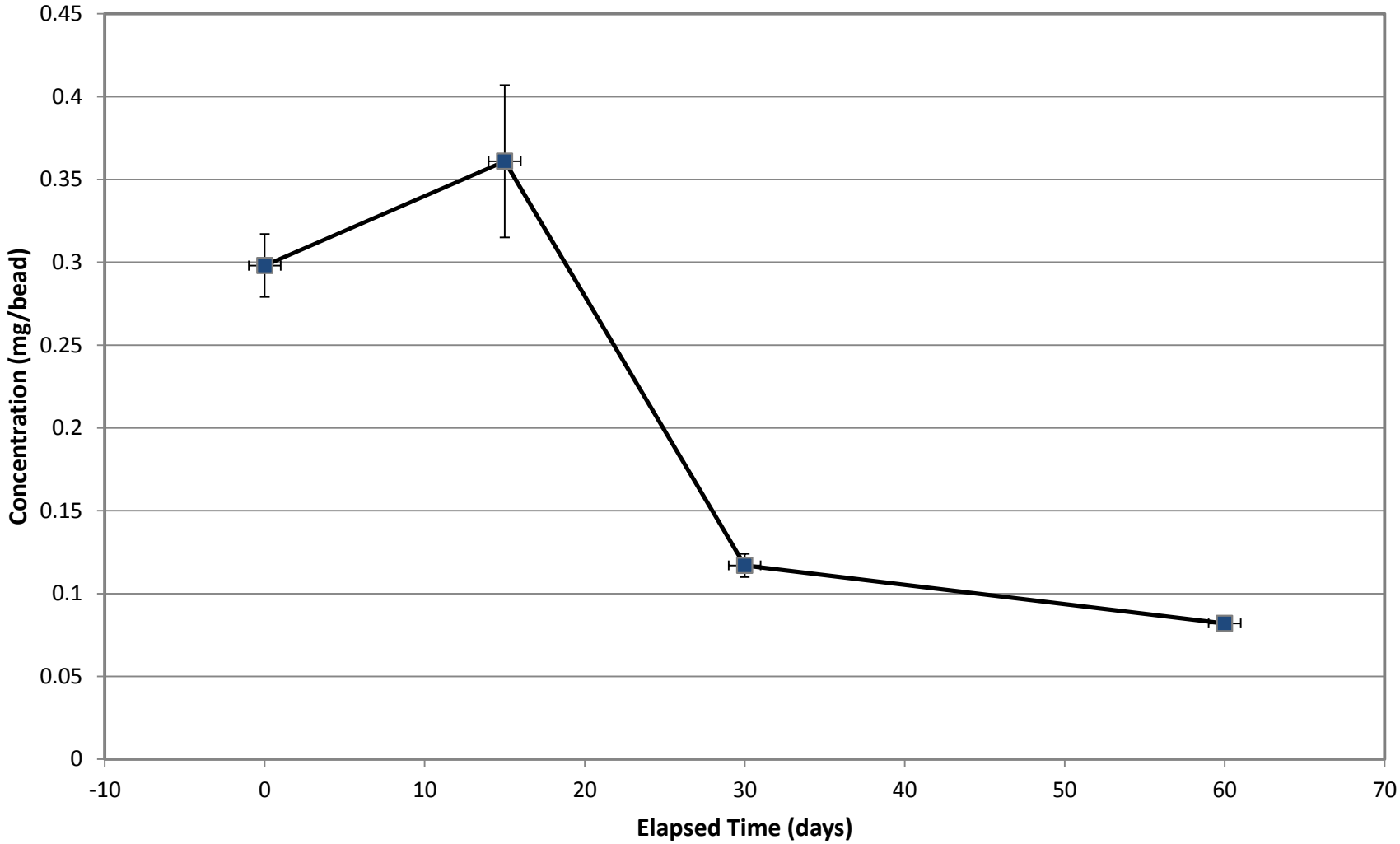


Figure 127
Isotopic Composition (δ^{13}Carbon) of Sulfolane vs. Distance Downgradient
North Pole Refinery
Flint Hills Resources Alaska, LLC

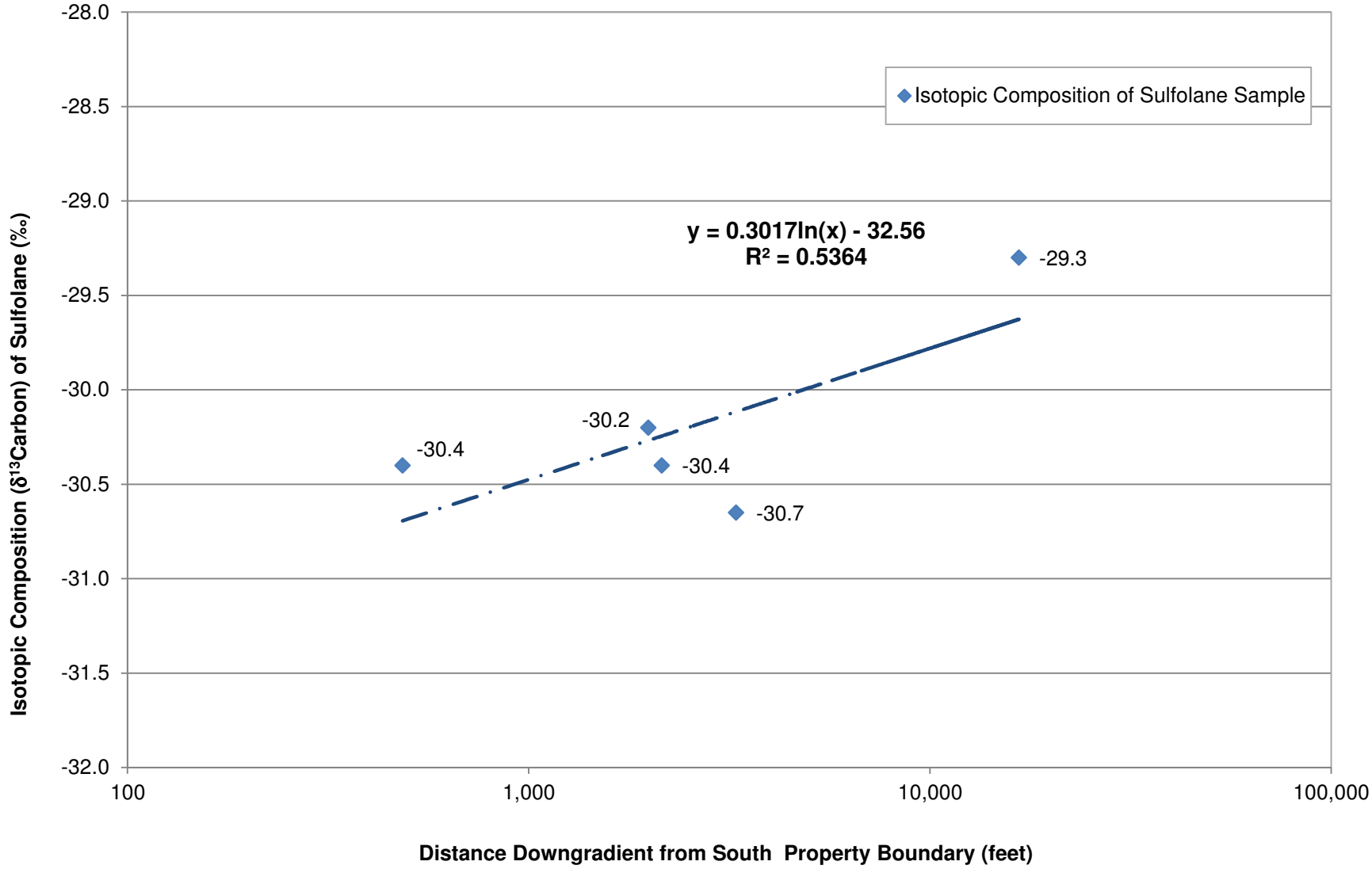
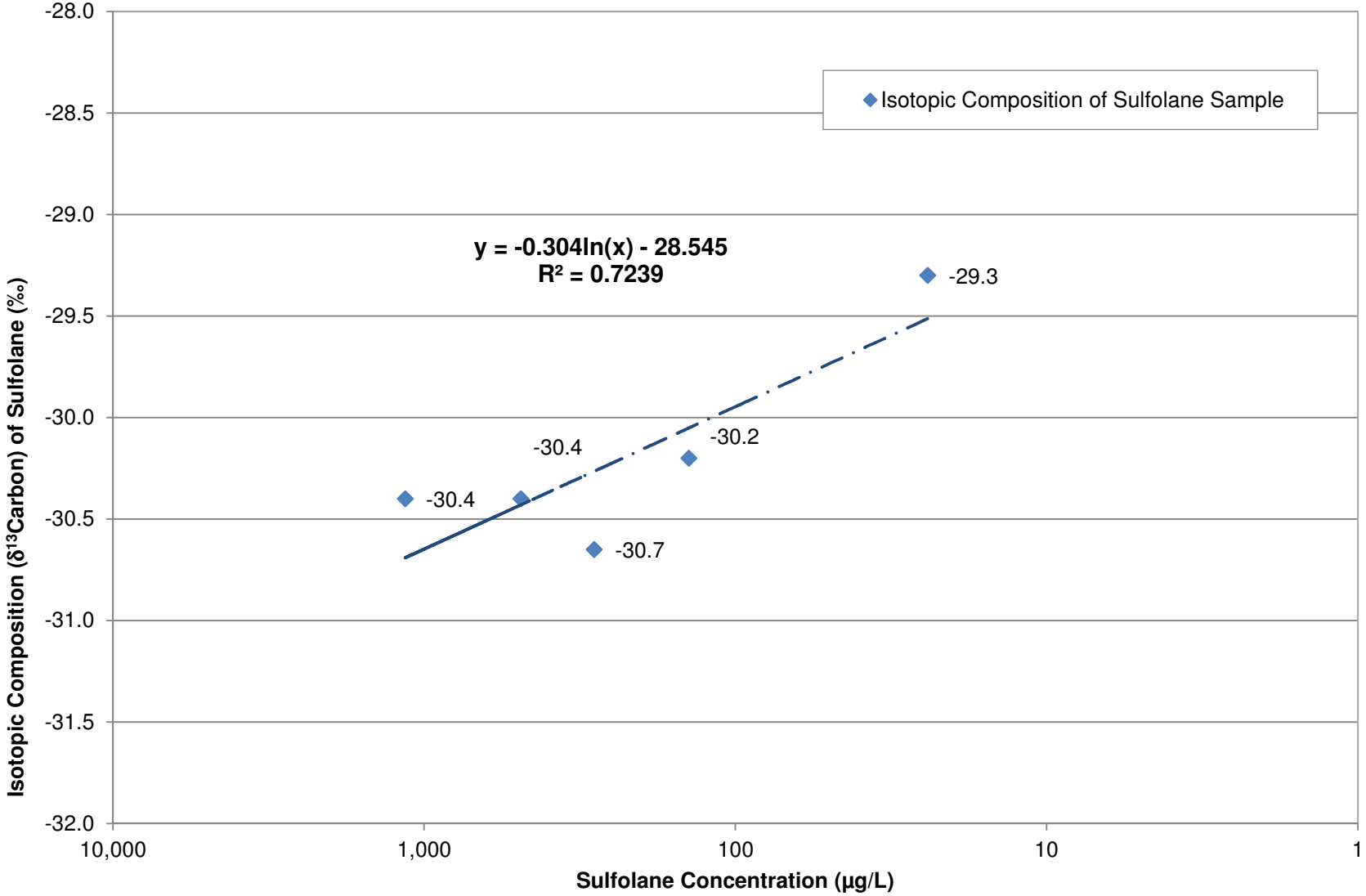


Figure 128
Isotopic Composition (δ^{13}Carbon) of Sulfolane vs. Sulfolane Concentration
North Pole Refinery
Flint Hills Resources Alaska, LLC



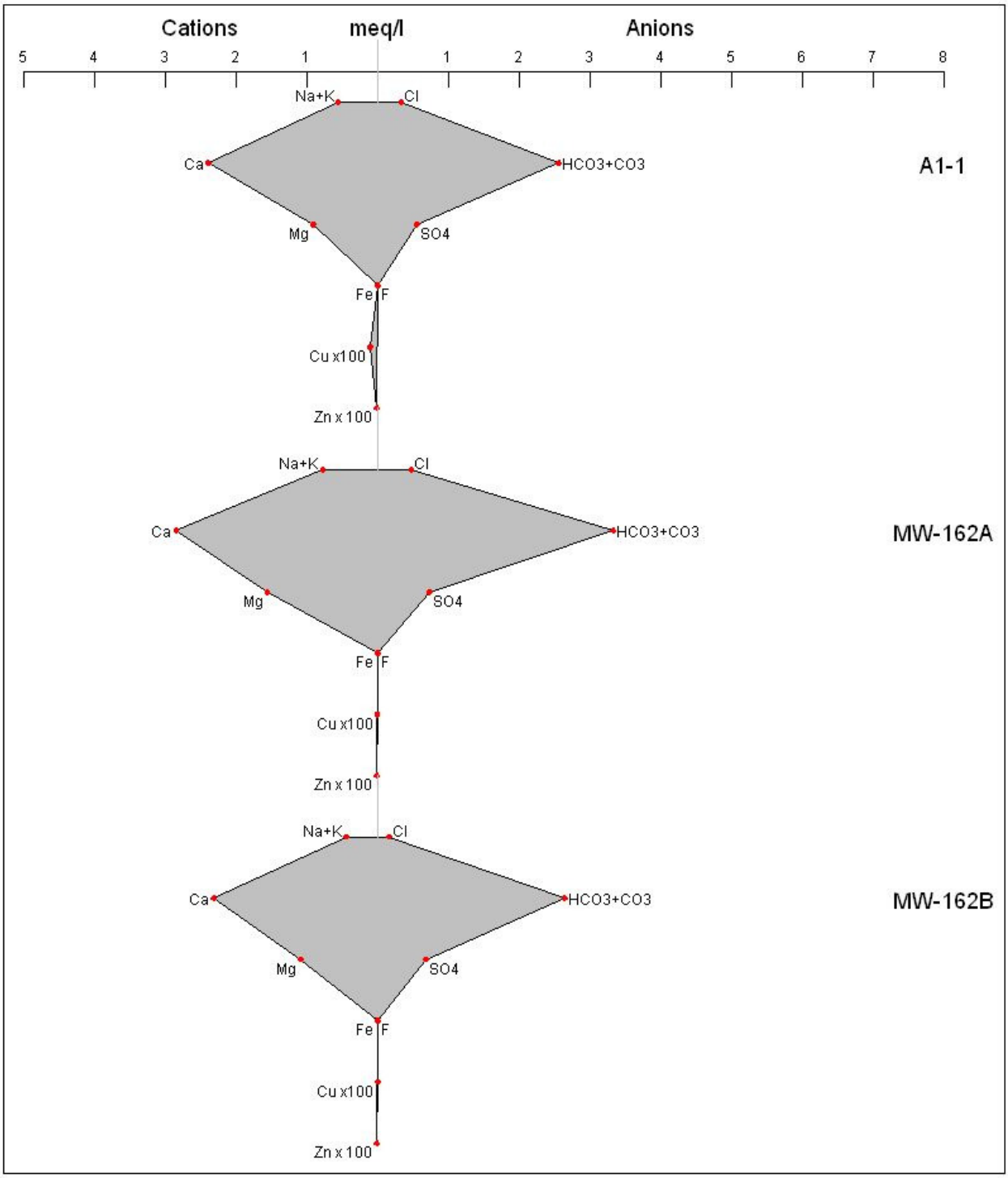


Figure 129
SUPRA- AND SUBPERMAFROST GEOCHEMISTRY COMPARISON – AREA 1
North Pole Refinery
Flint Hills Resources Alaska, LLC

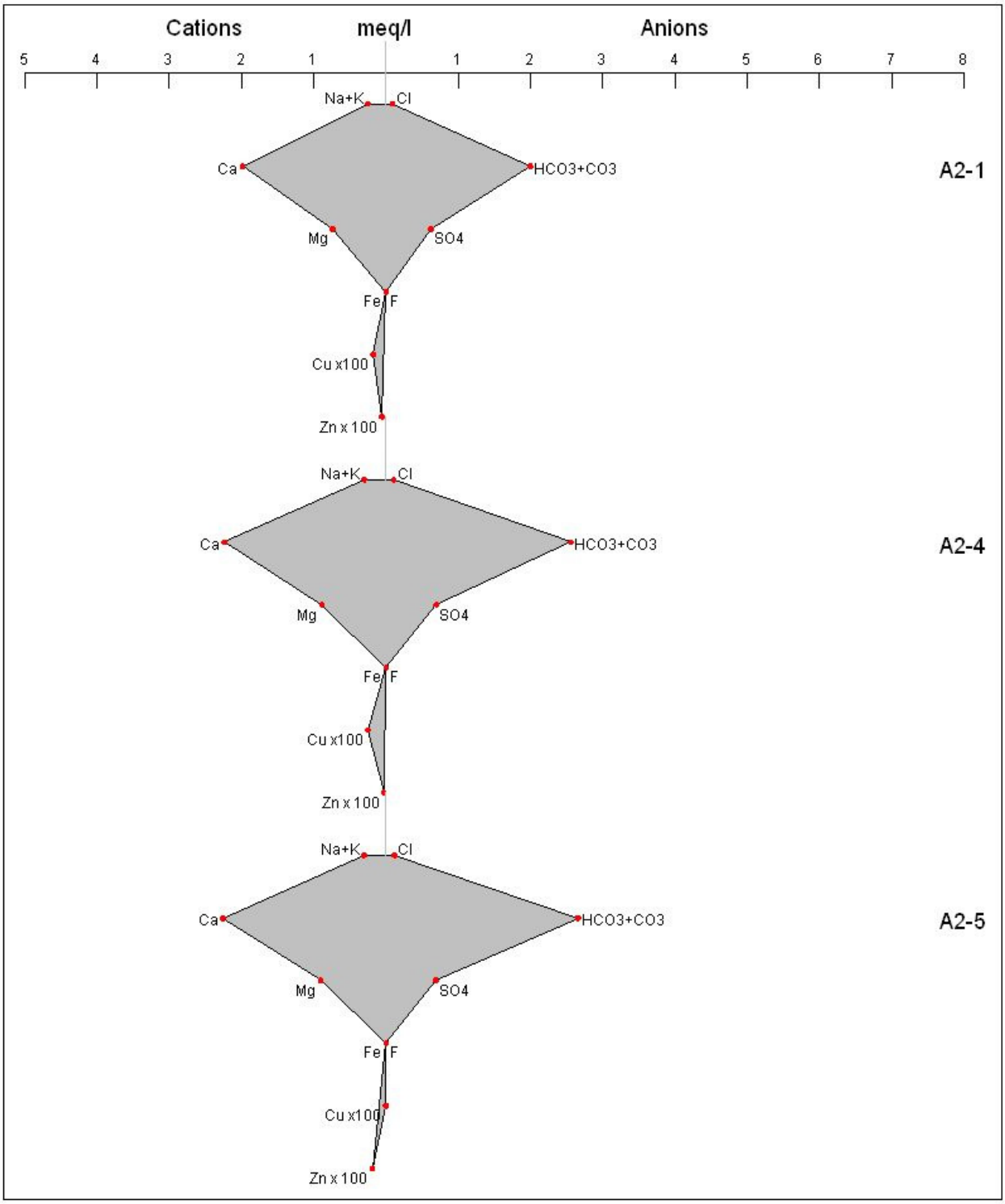


Figure 130A
SUPRA- AND SUBPERMAFROST GEOCHEMISTRY COMPARISON – AREA 2
North Pole Refinery
Flint Hills Resources Alaska, LLC

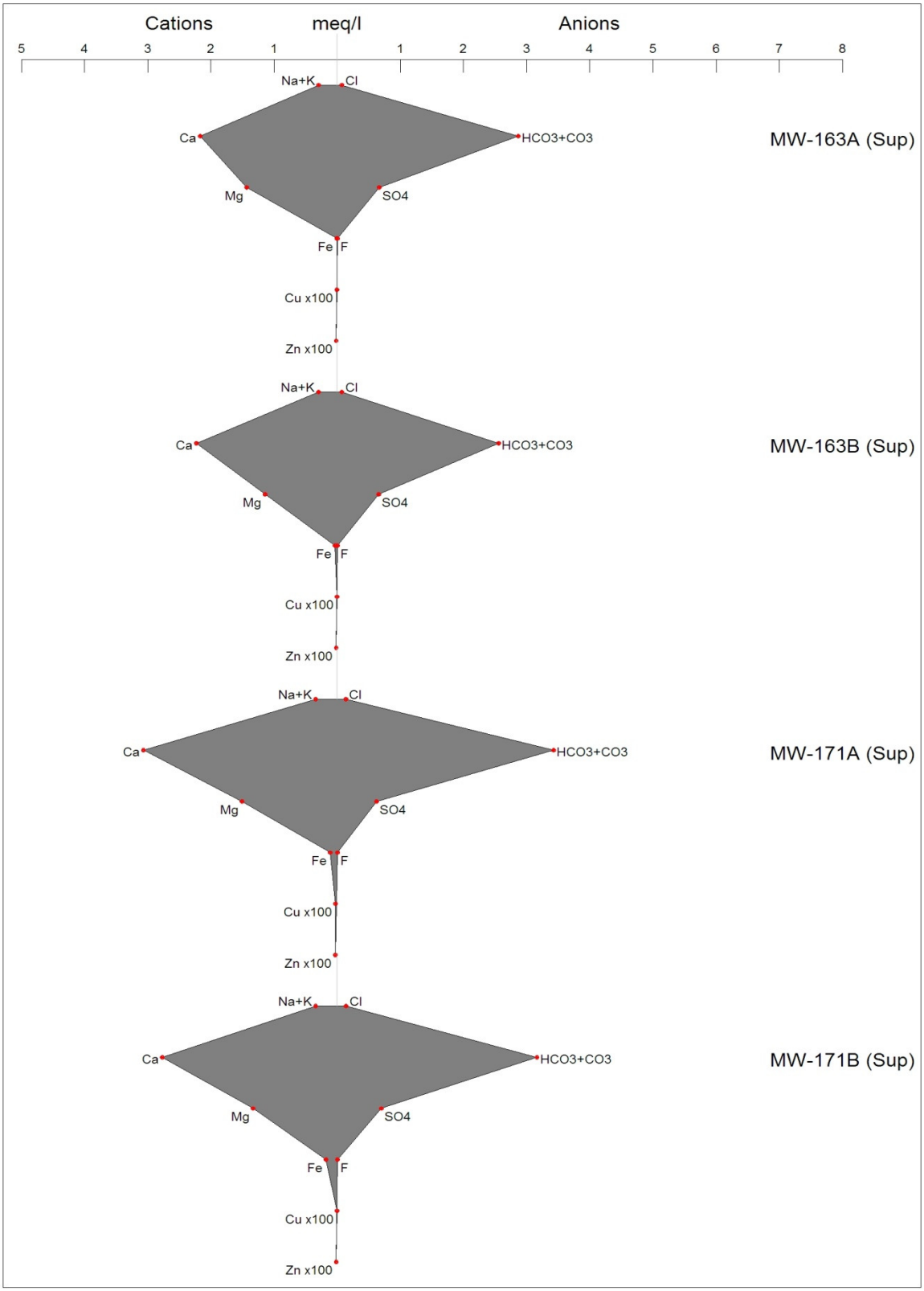


Figure 130B
SUPRA- AND SUBPERMAFROST GEOCHEMISTRY COMPARISON – AREA 2
North Pole Refinery
Flint Hills Resources Alaska, LLC

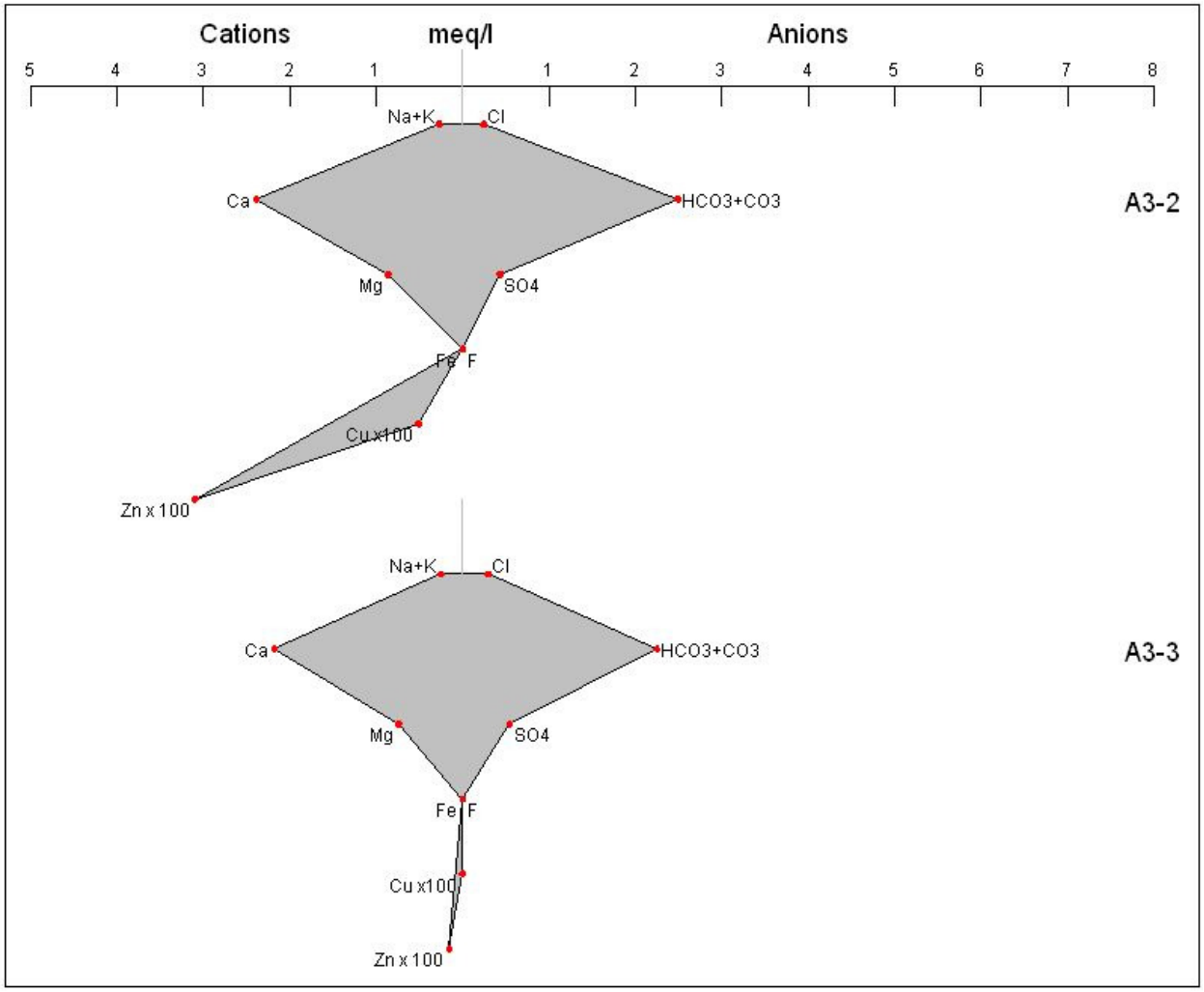


Figure 131A
SUPRA- AND SUBPERMAFROST GEOCHEMISTRY COMPARISON – AREA 3
North Pole Refinery
Flint Hills Resources Alaska, LLC

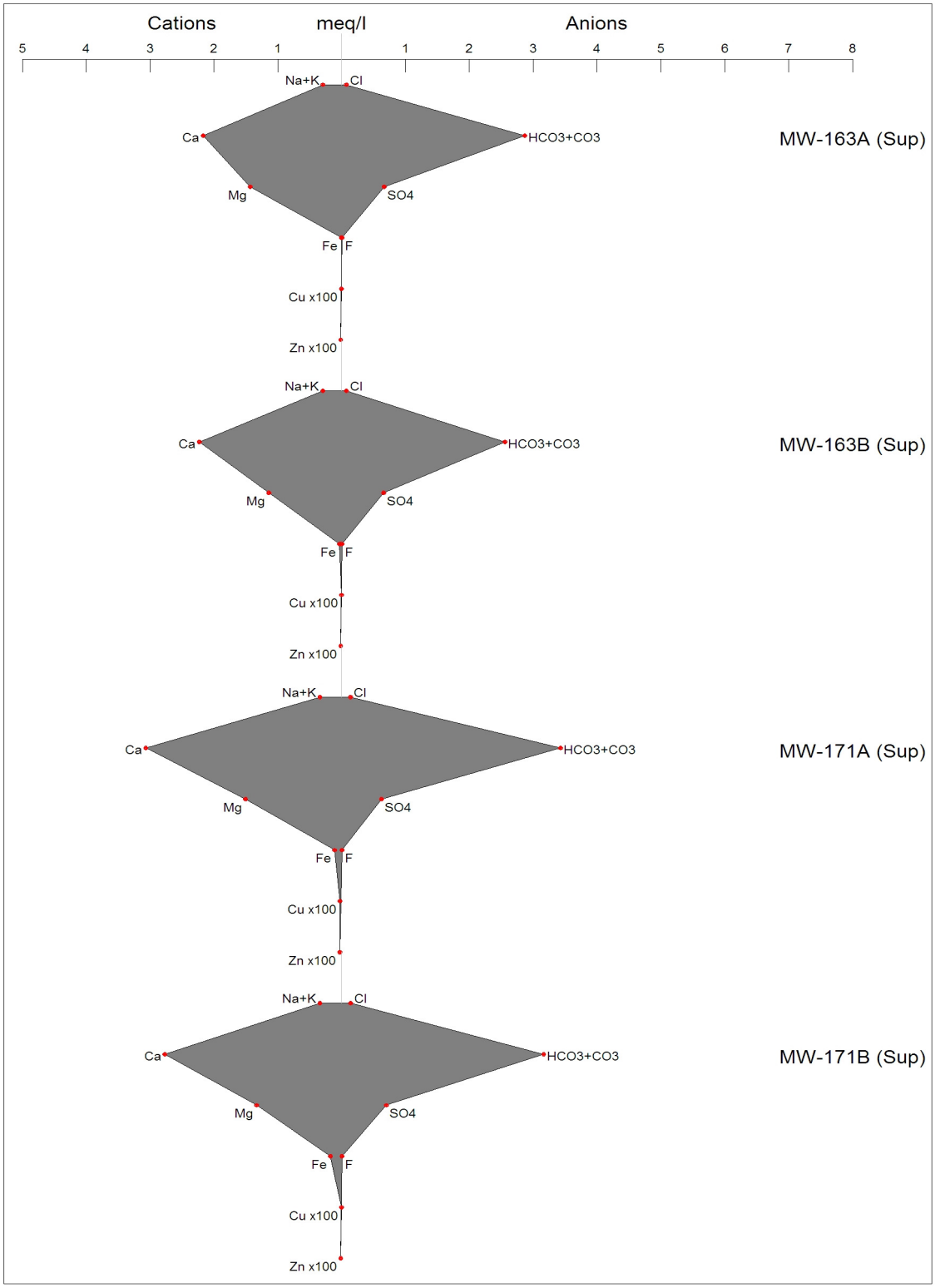


Figure 131B
SUPRA- AND SUBPERMAFROST GEOCHEMISTRY COMPARISON – AREA 3
North Pole Refinery
Flint Hills Resources Alaska, LLC

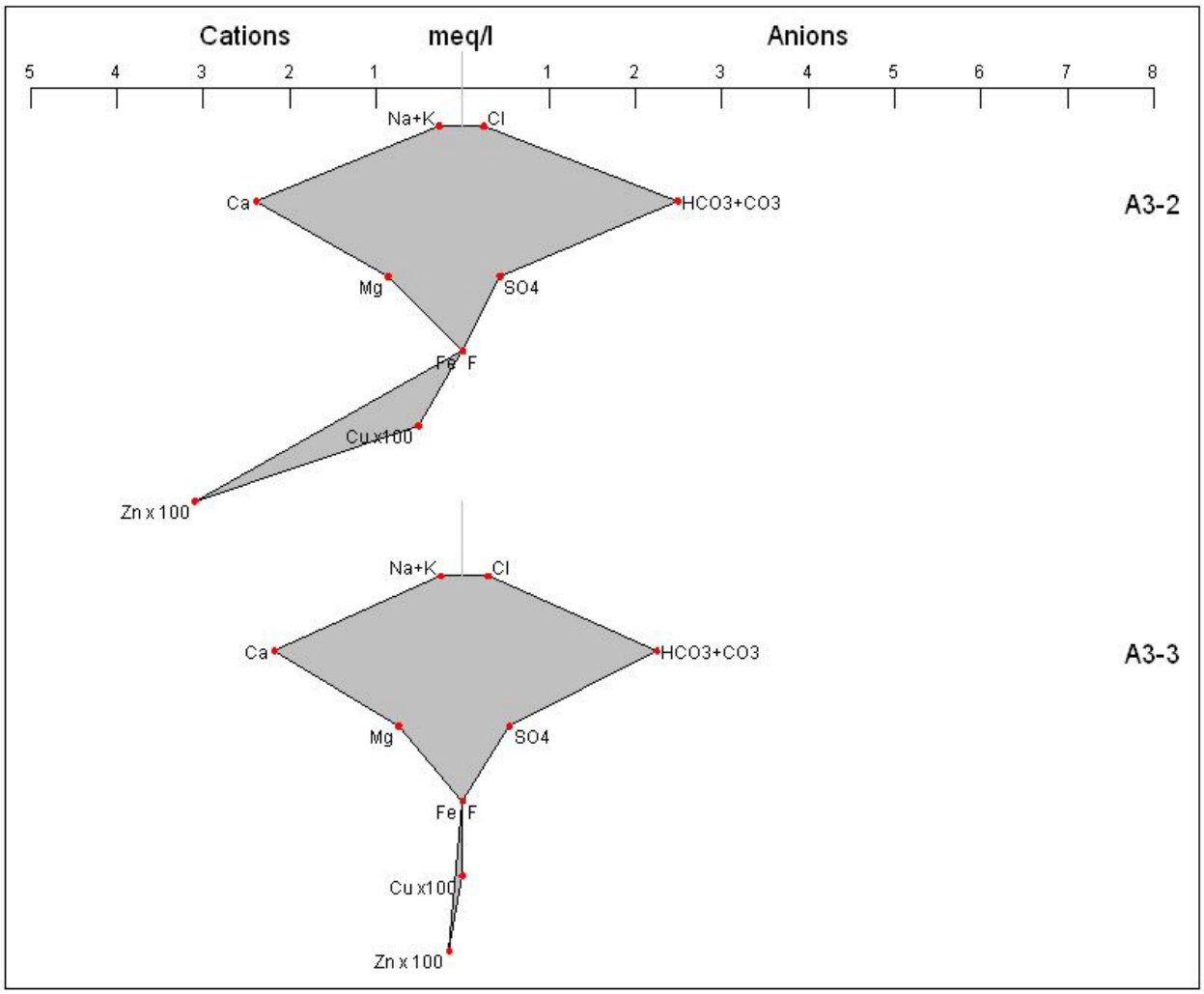


Figure 132A
SUPRA- AND SUBPERMAFROST GEOCHEMISTRY COMPARISON – AREA 4
North Pole Refinery
Flint Hills Resources Alaska, LLC

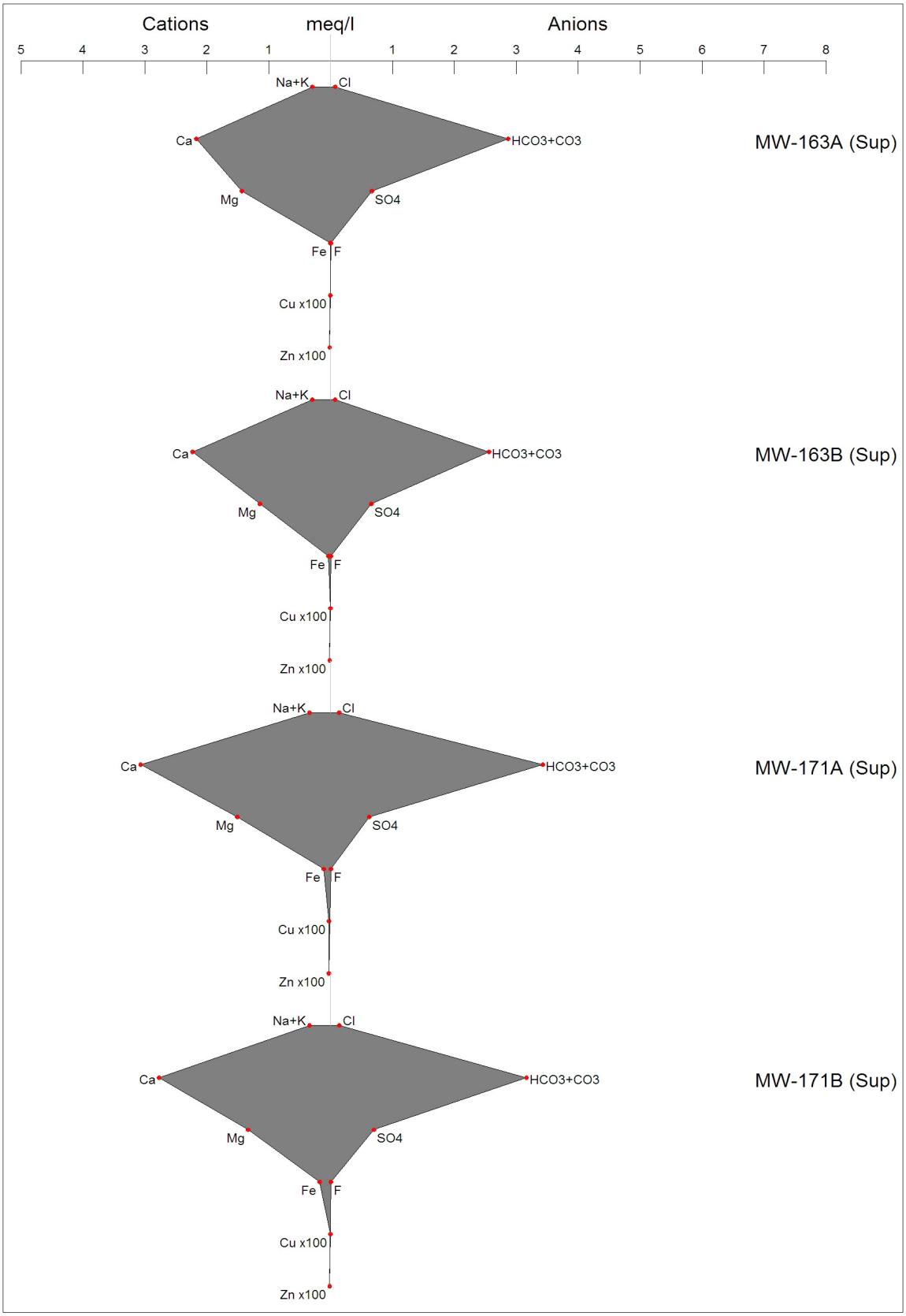


Figure 132B
SUPRA- AND SUBPERMAFROST GEOCHEMISTRY COMPARISON – AREA 4
North Pole Refinery
Flint Hills Resources Alaska, LLC

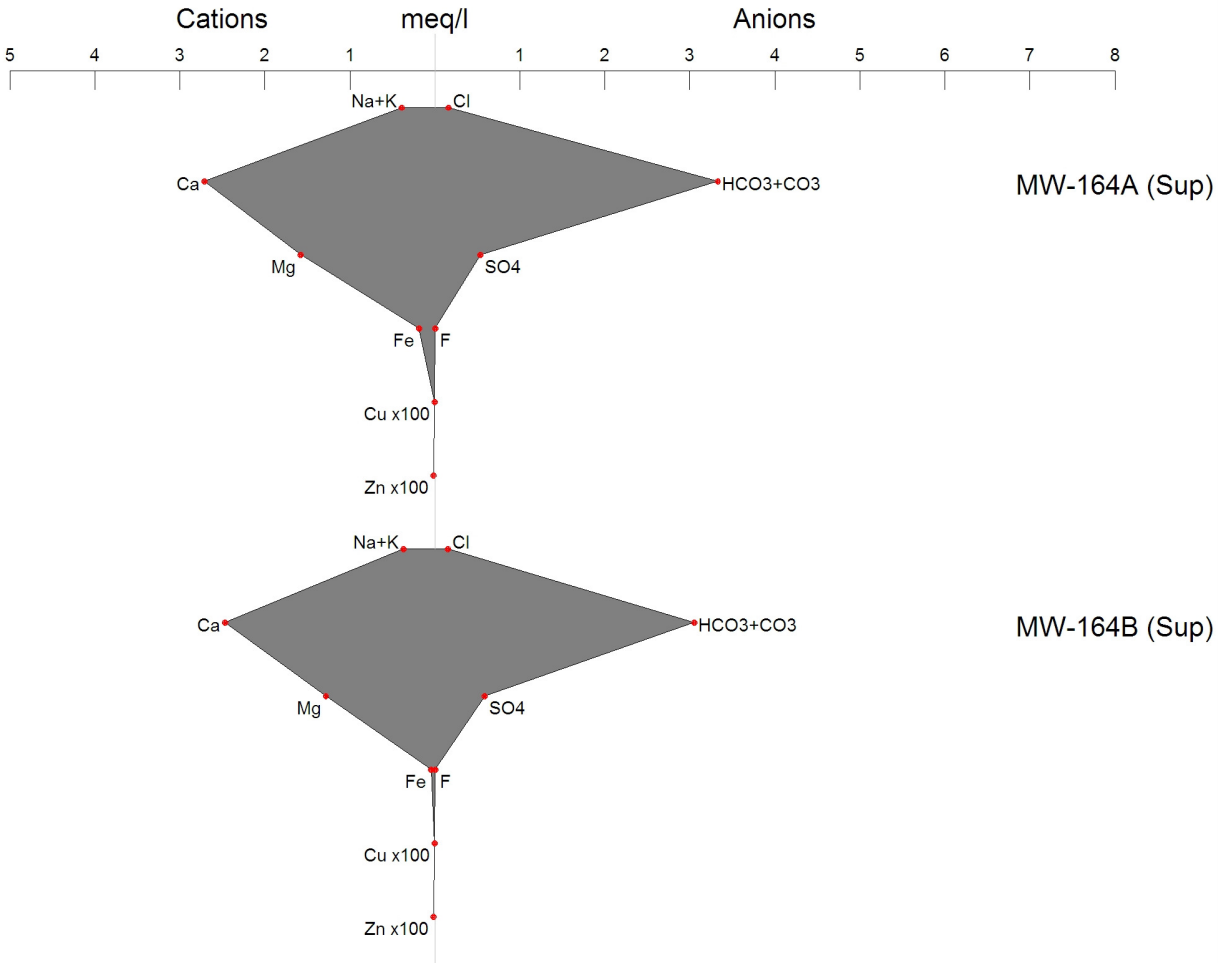
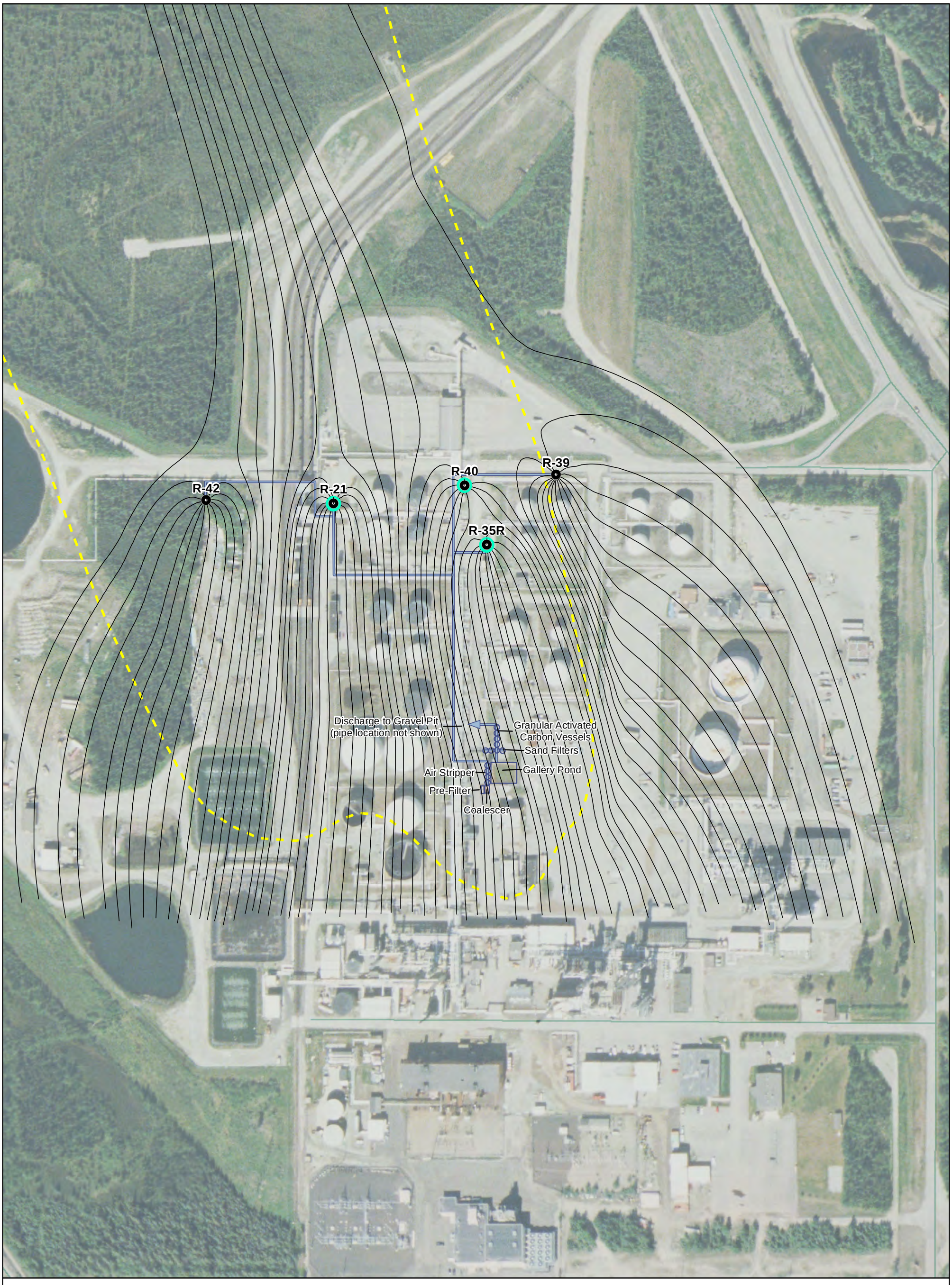


Figure 133
SUPRA- AND SUBPERMAFROST GEOCHEMISTRY COMPARISON – AREA 5
North Pole Refinery
Flint Hills Resources Alaska, LLC



Recovery Well

Installed Product Recovery System

High-stage Capture Lines based on simulation, not measured data

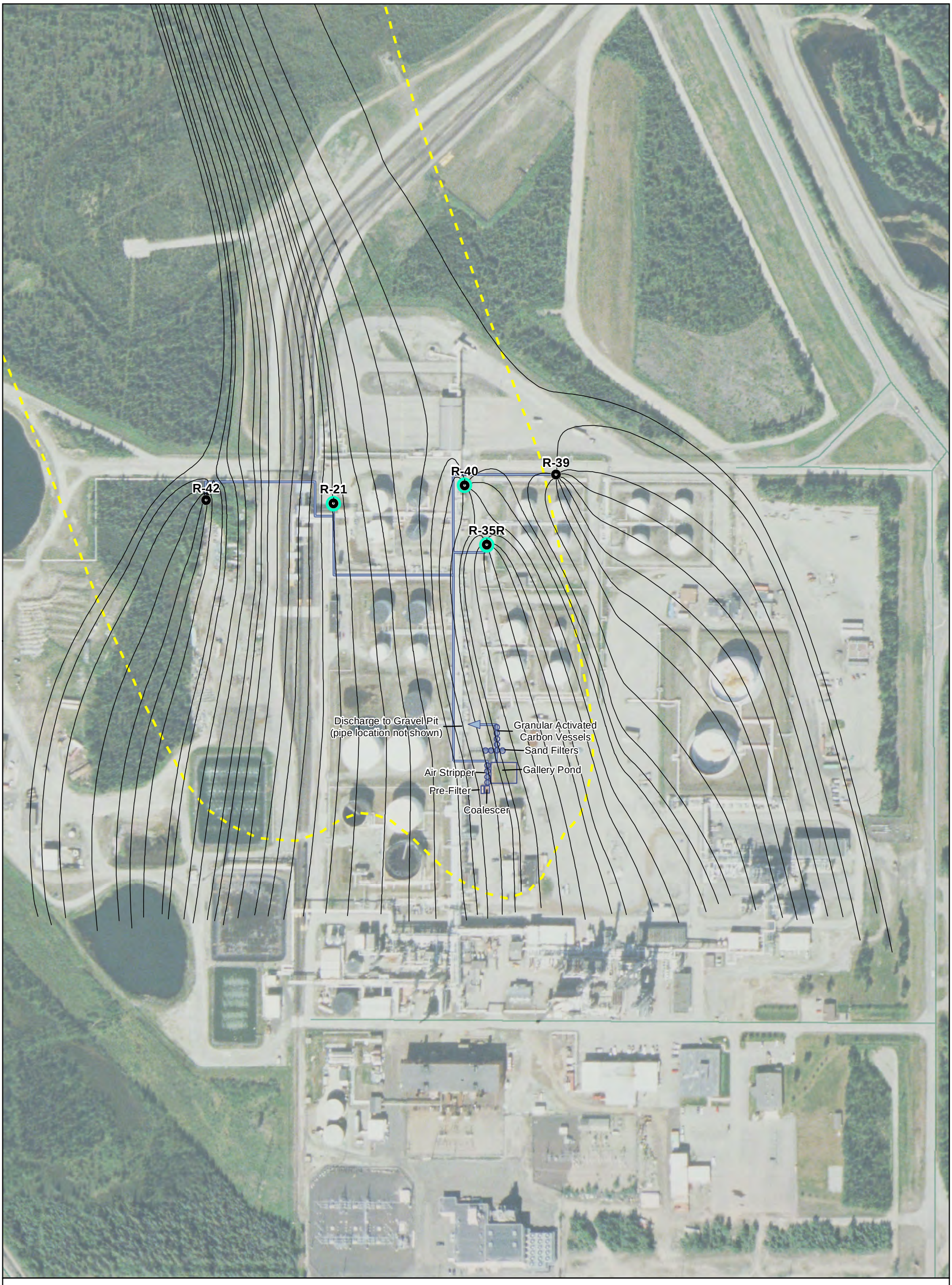
Approximate Sulfolane Plume (10 µg/L Isopleth)

Remediation System Piping

0 125 250 500

Feet

Figure 140
HIGH-STAGE CAPTURE EVALUATION
40 FEET BGS (30-35 FEET BWT)
North Pole Refinery
Flint Hills Resources Alaska, LLC



Recovery Well

Installed Product Recovery System

High-stage Capture Lines based on simulation, not measured data

Approximate Sulfolane Plume (10 µg/L Isopleth)

Remediation System Piping

0 125 250 500

Feet

Figure 141
HIGH-STAGE CAPTURE EVALUATION
60 FEET BGS (50-55 FEET BWT)
North Pole Refinery
Flint Hills Resources Alaska, LLC

Figure 142
MONITORING WELL ANALYTICAL DATA-MW-127
North Pole Refinery
Flint Hills Resources Alaska, LLC

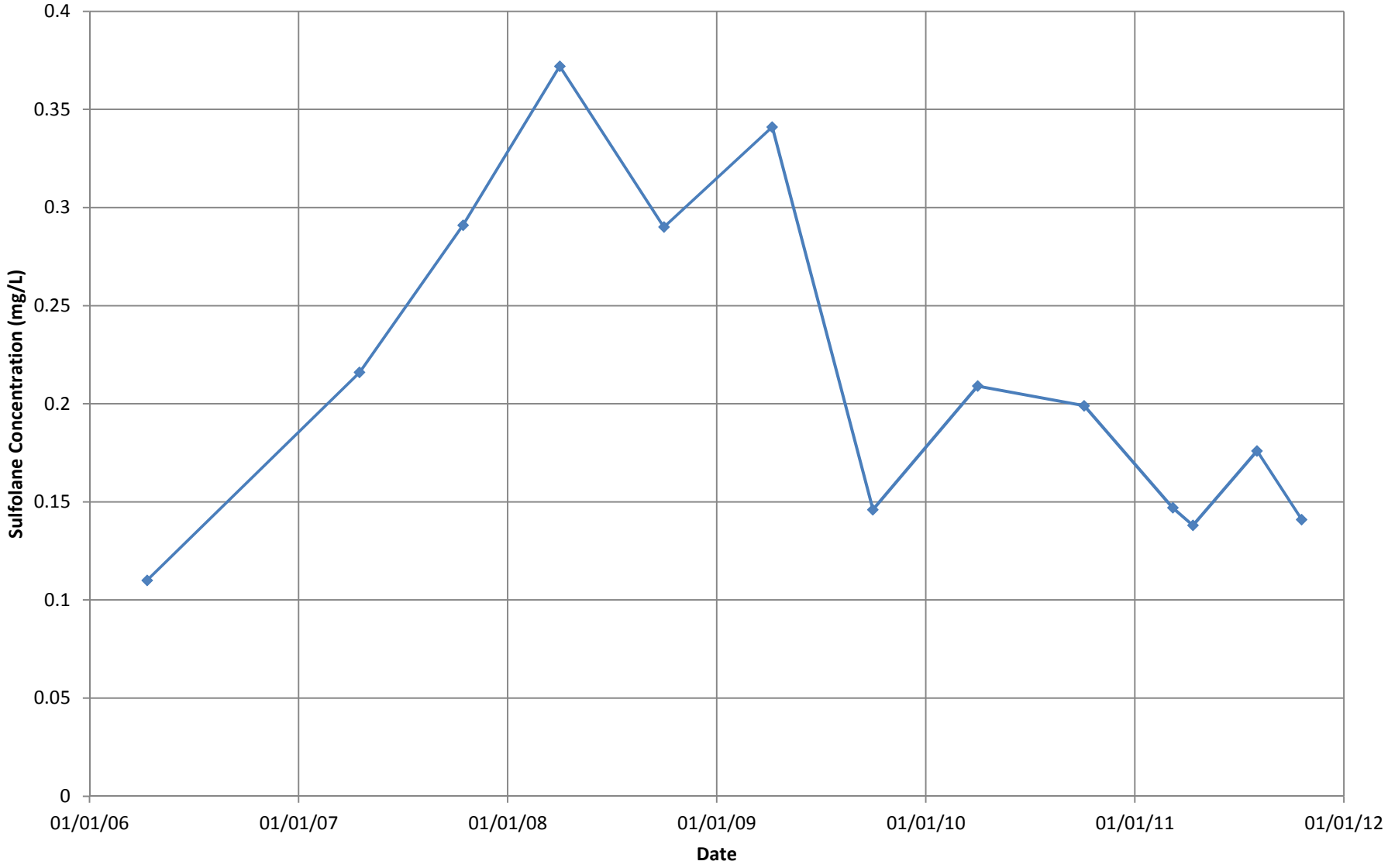


Figure 143
MONITORING WELL ANALYTICAL DATA-MW-131
North Pole Refinery
Flint Hills Resources Alaska, LLC

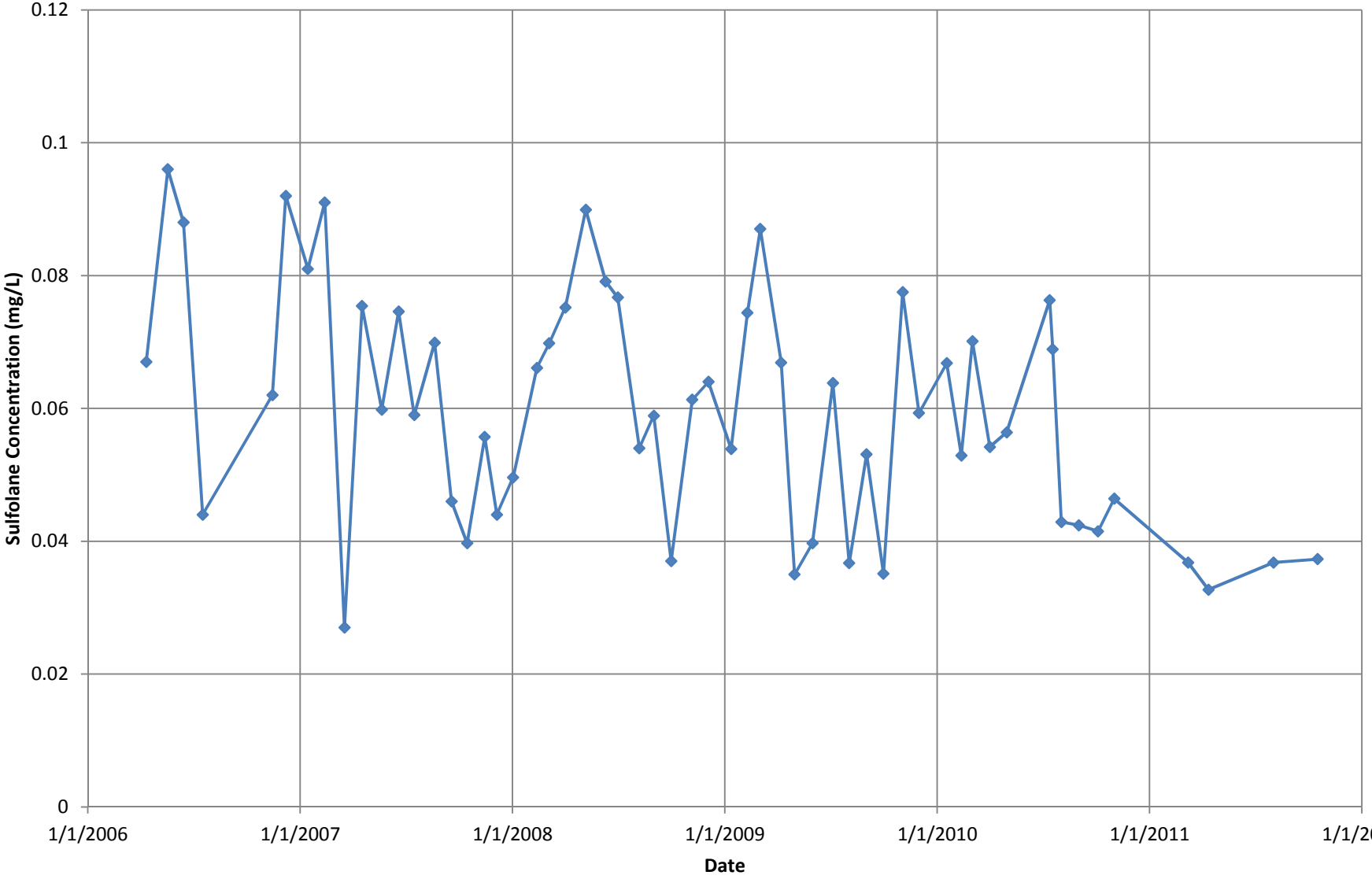


Figure 144
MONITORING WELL ANALYTICAL DATA-MW-139
North Pole Refinery
Flint Hills Resources Alaska, LLC

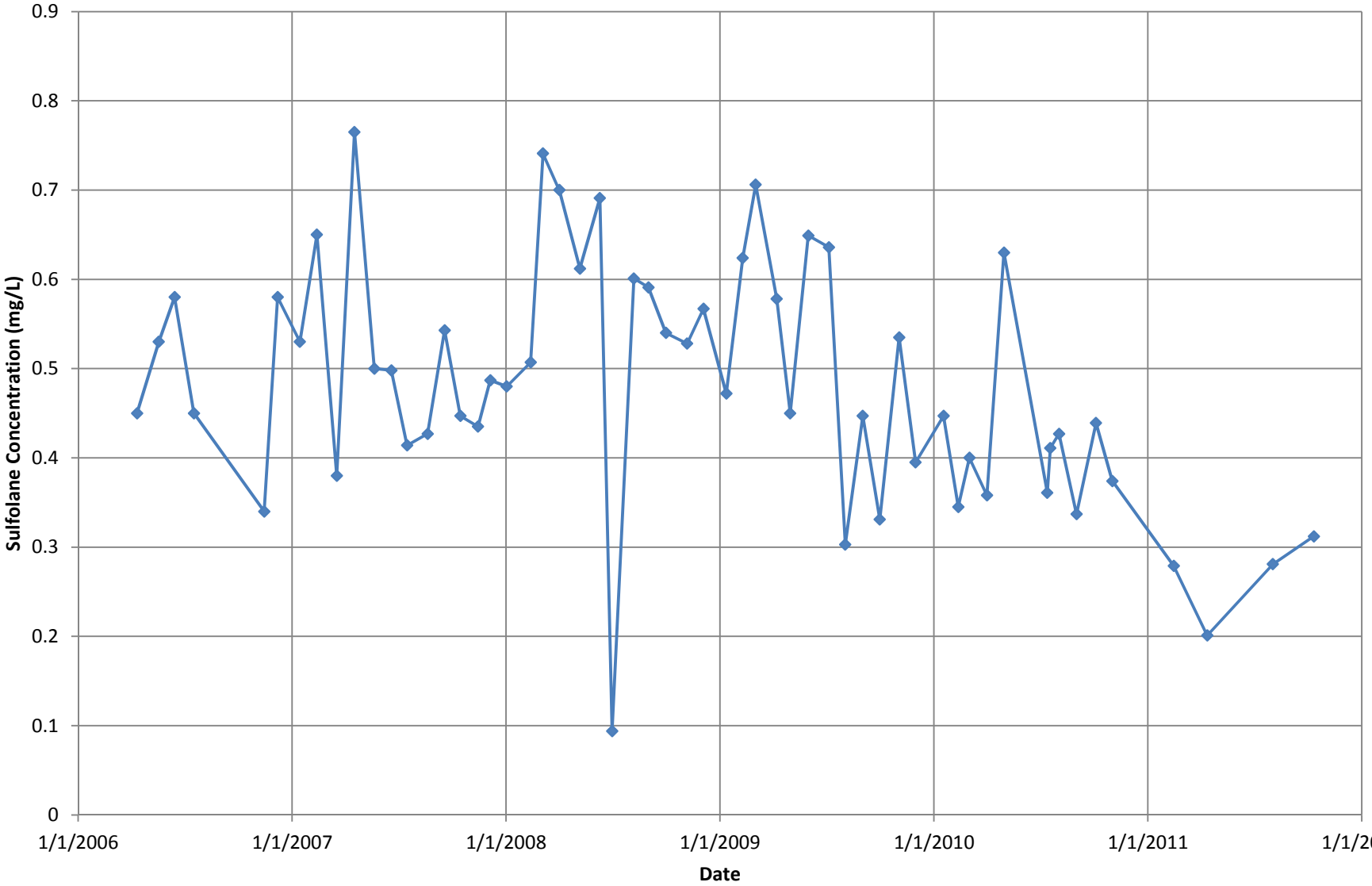


Figure 145
MONITORING WELL ANALYTICAL DATA-MW-142
North Pole Refinery
Flint Hills Resources Alaska, LLC

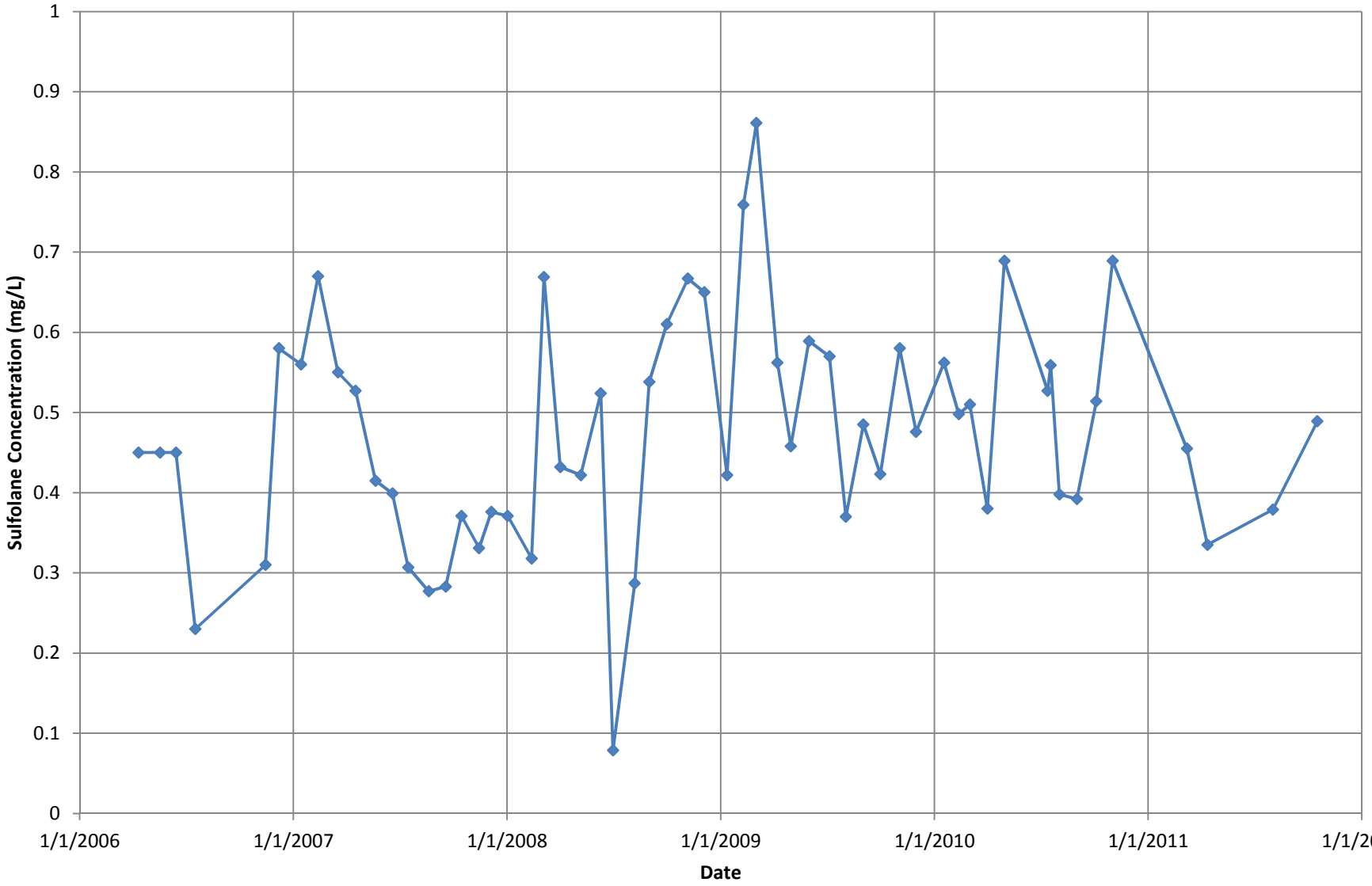
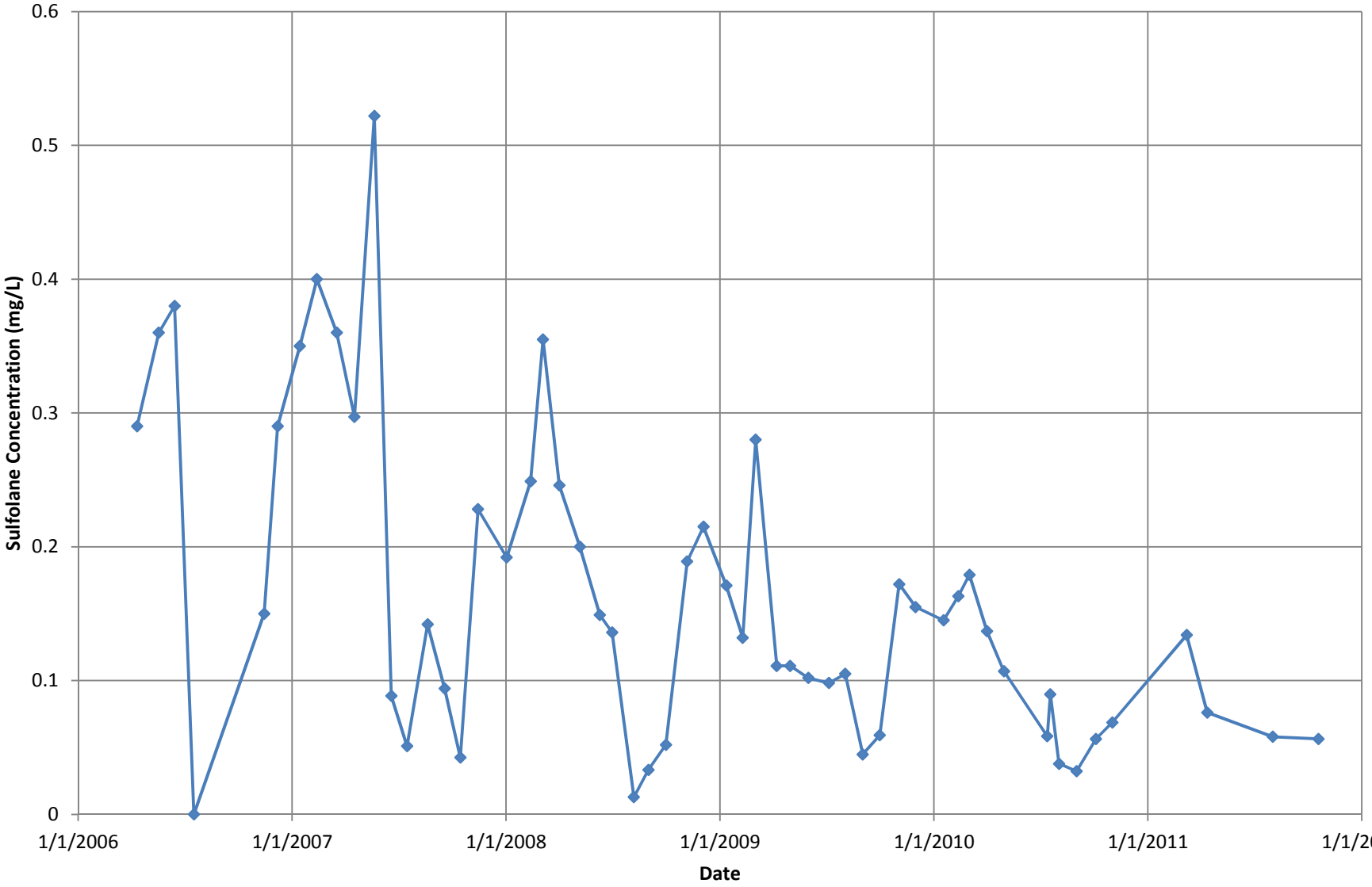


Figure 146
MONITORING WELL ANALYTICAL DATA-MW-143
North Pole Refinery
Flint Hills Resources Alaska, LLC



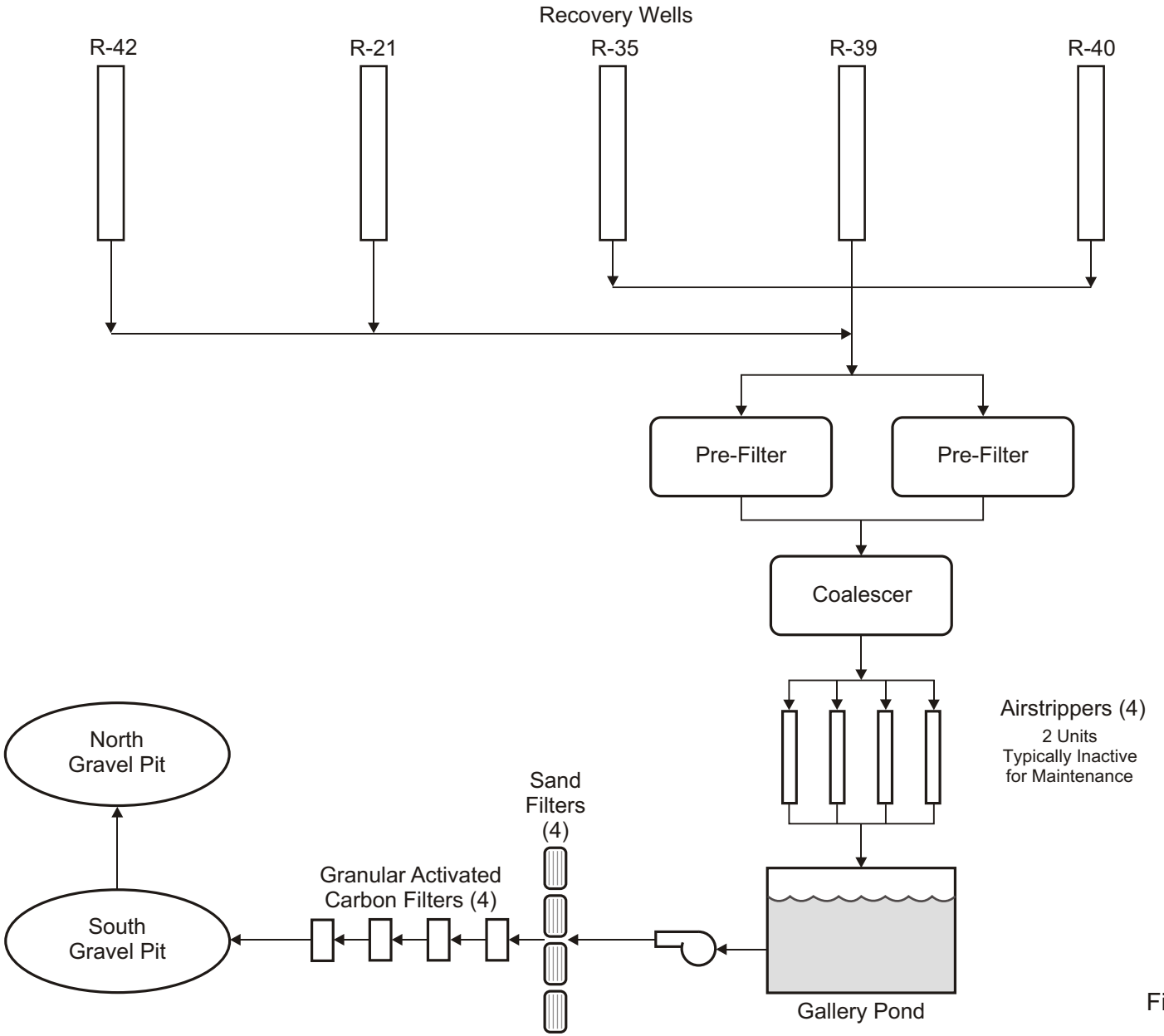


Figure 147

PROCESS FLOW DIAGRAM
GROUNDWATER CAPTURE
AND TREATMENT SYSTEM
North Pole Refinery
Flint Hills Resources Alaska, LLC

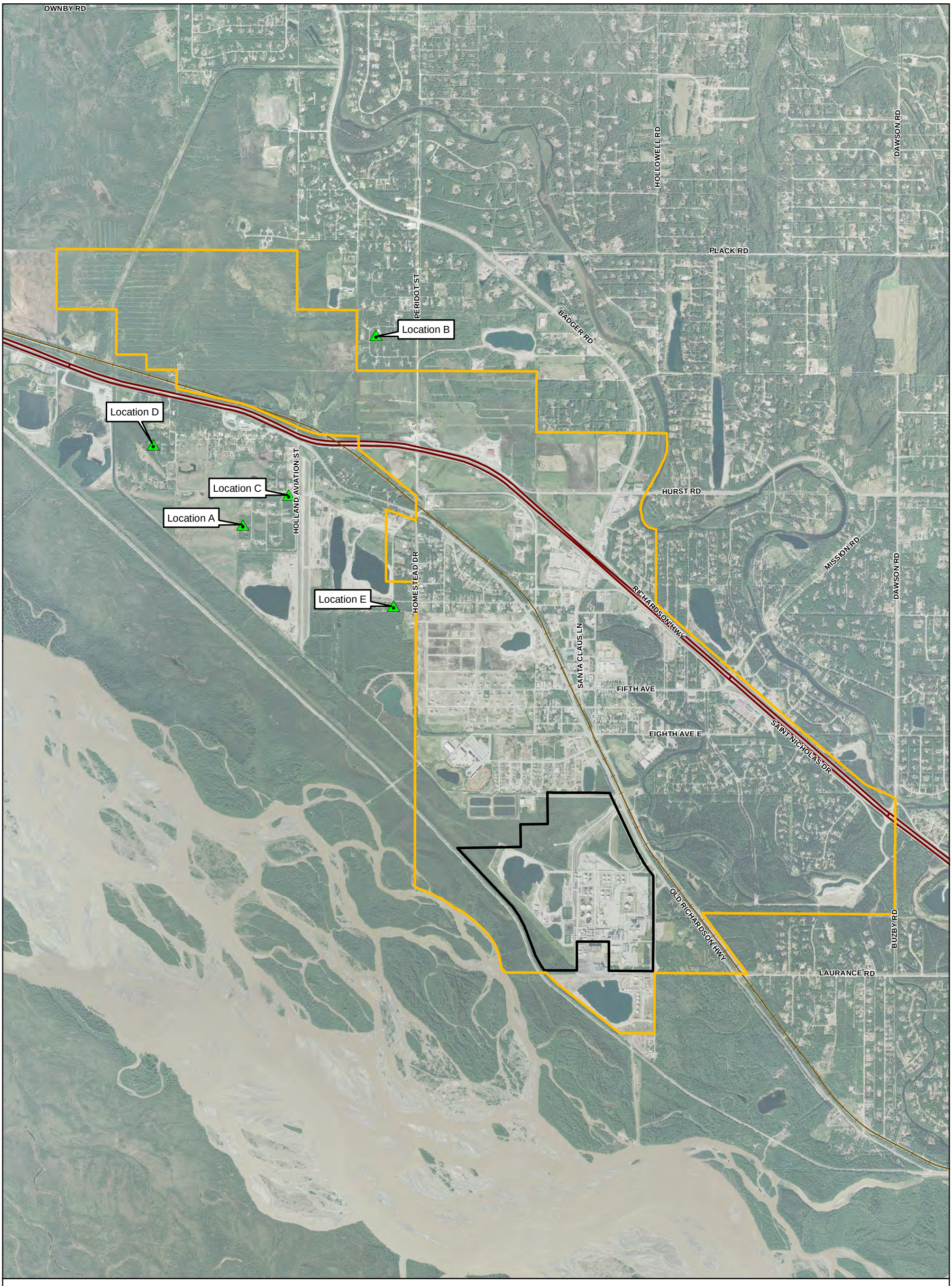
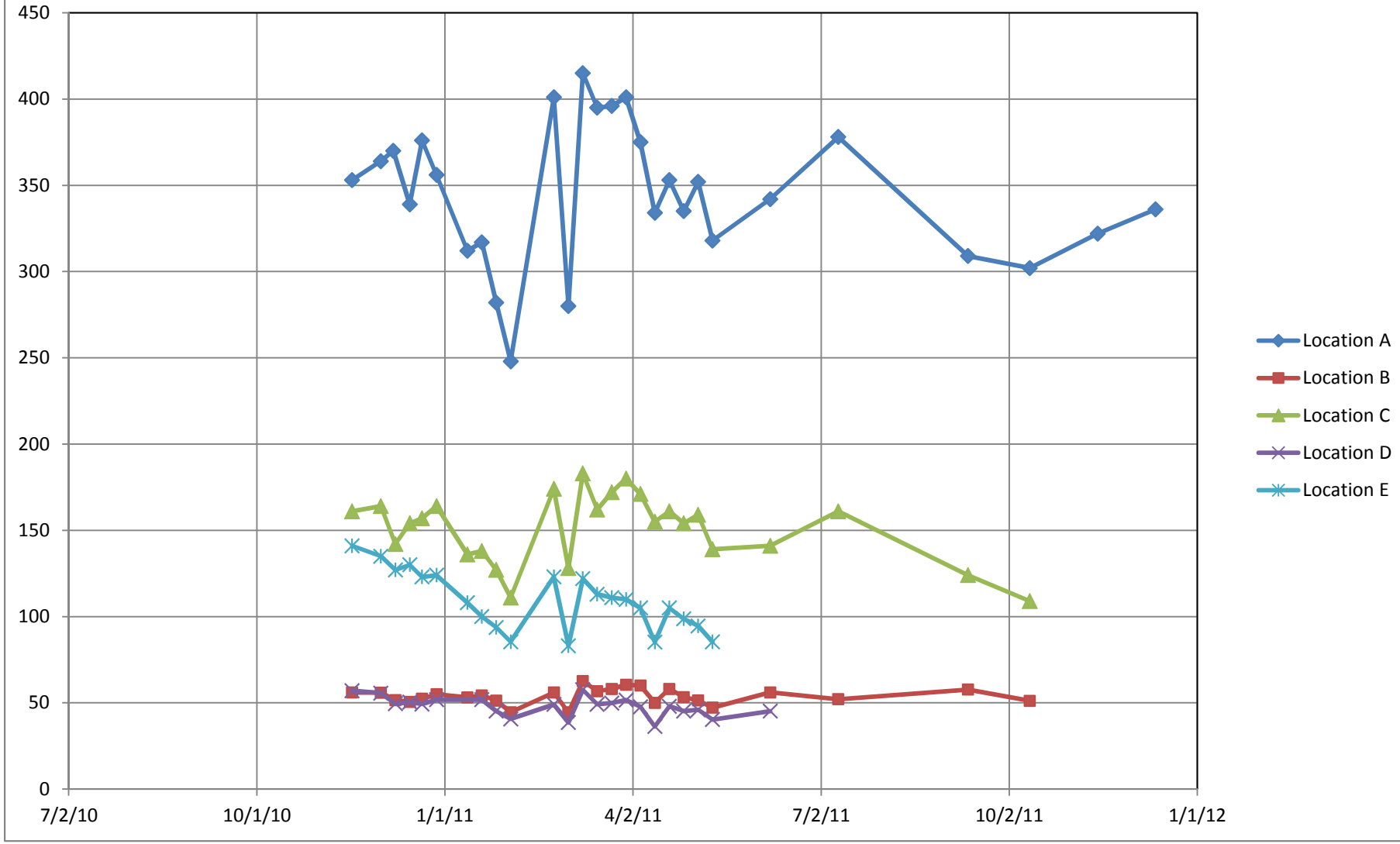
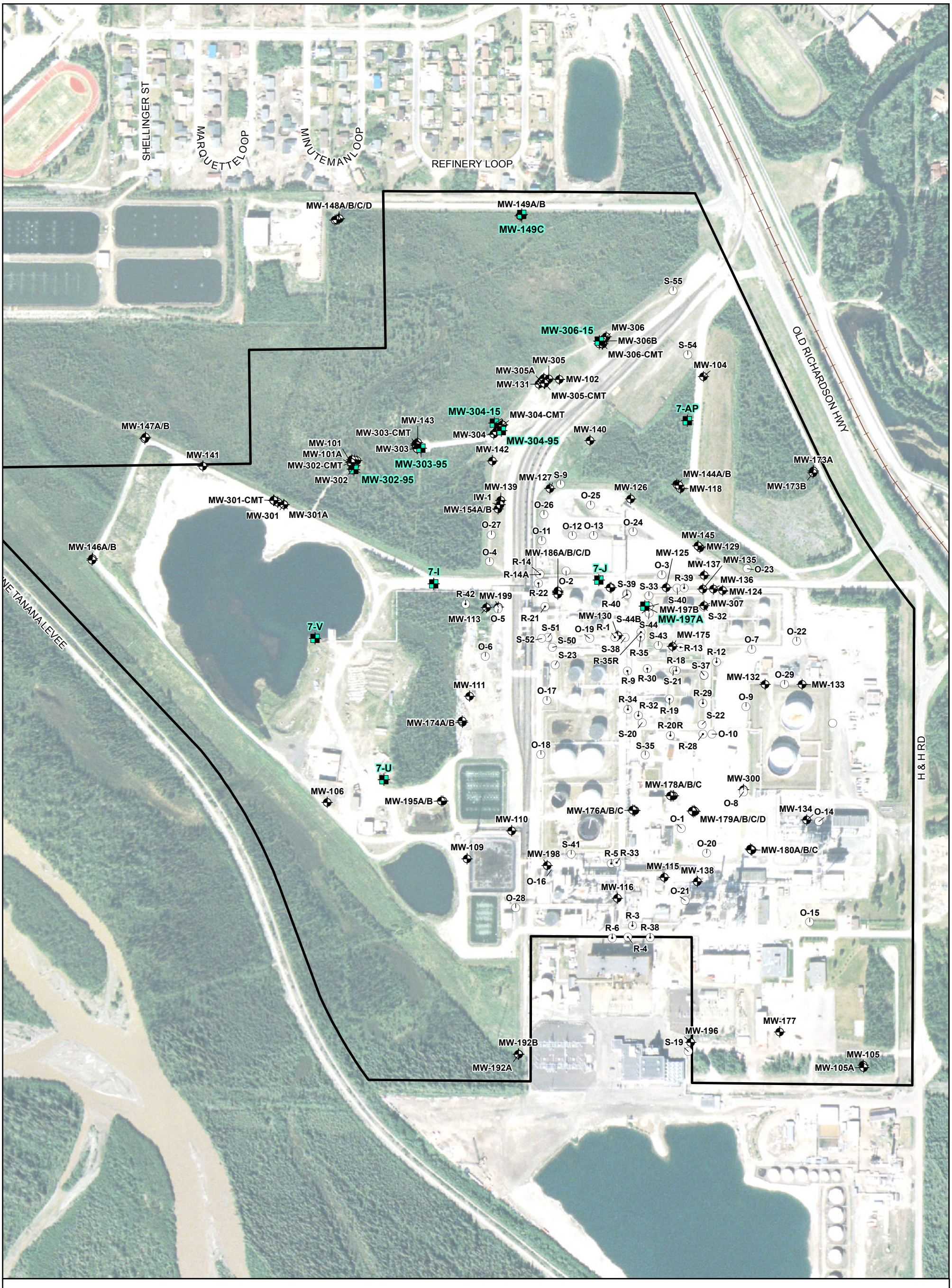


Figure 148
POINT-OF-ENTRY TREATMENT SYSTEM
IN-HOME TESTING LOCATIONS
North Pole Refinery
Flint Hills Resources Alaska, LLC

Figure 149
POINT-OF-ENTRY TREATMENT SYSTEM
IN-HOME TESTING RAW WATER
North Pole Refinery
Flint Hills Resources Alaska, LLC





Proposed Phase 7 Well

Monitoring Well

Observation Well

Recovery Well

FHRA Property Boundary

0 200 400 800

Feet

Figure 150
PROPOSED PHASE 7 WELLS, ONSITE
North Pole Refinery
Flint Hills Resources Alaska, LLC

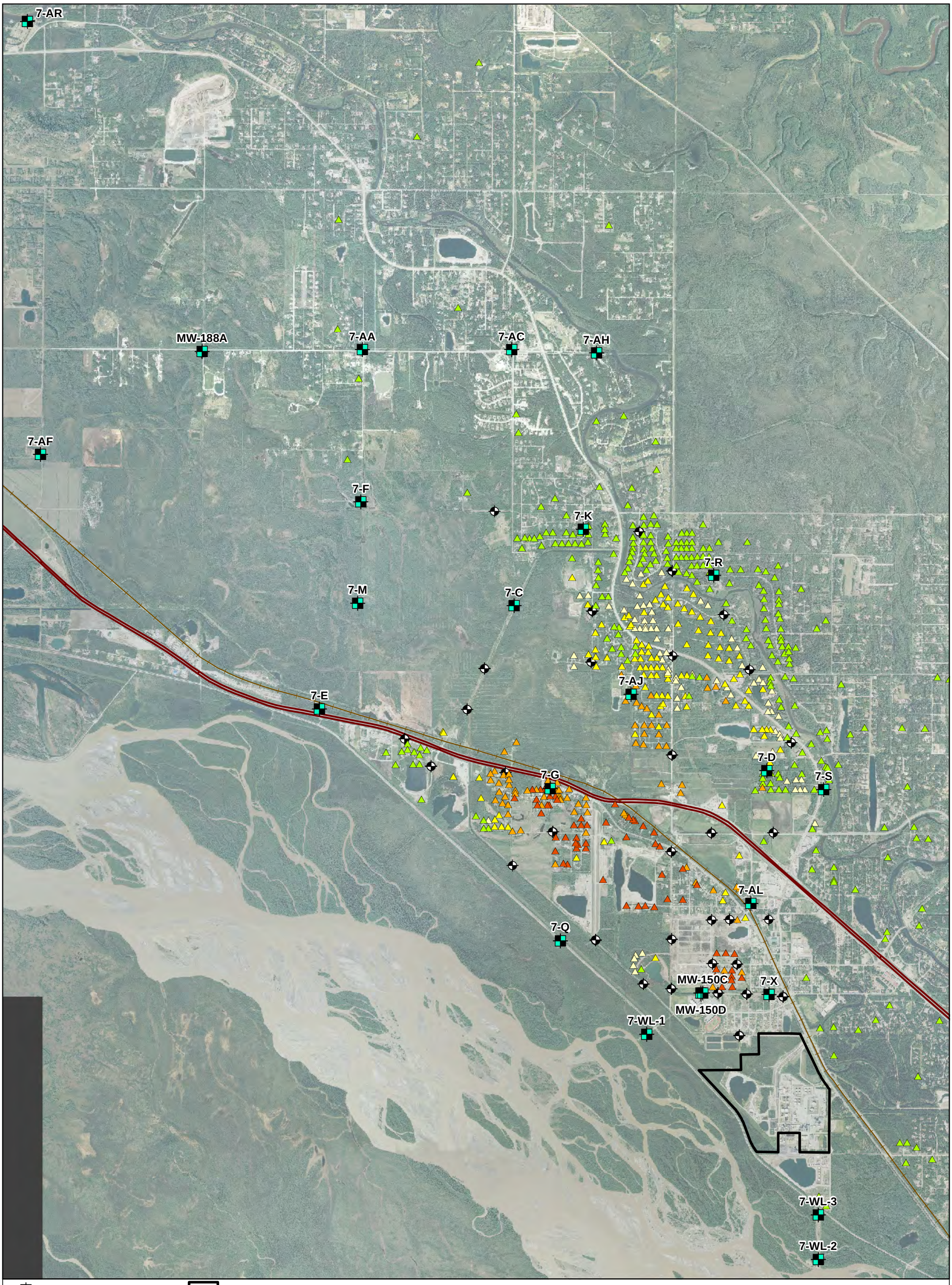


Figure 151
PROPOSED PHASE 7 WELLS, OFFSITE
North Pole Refinery
Flint Hills Resources Alaska, LLC

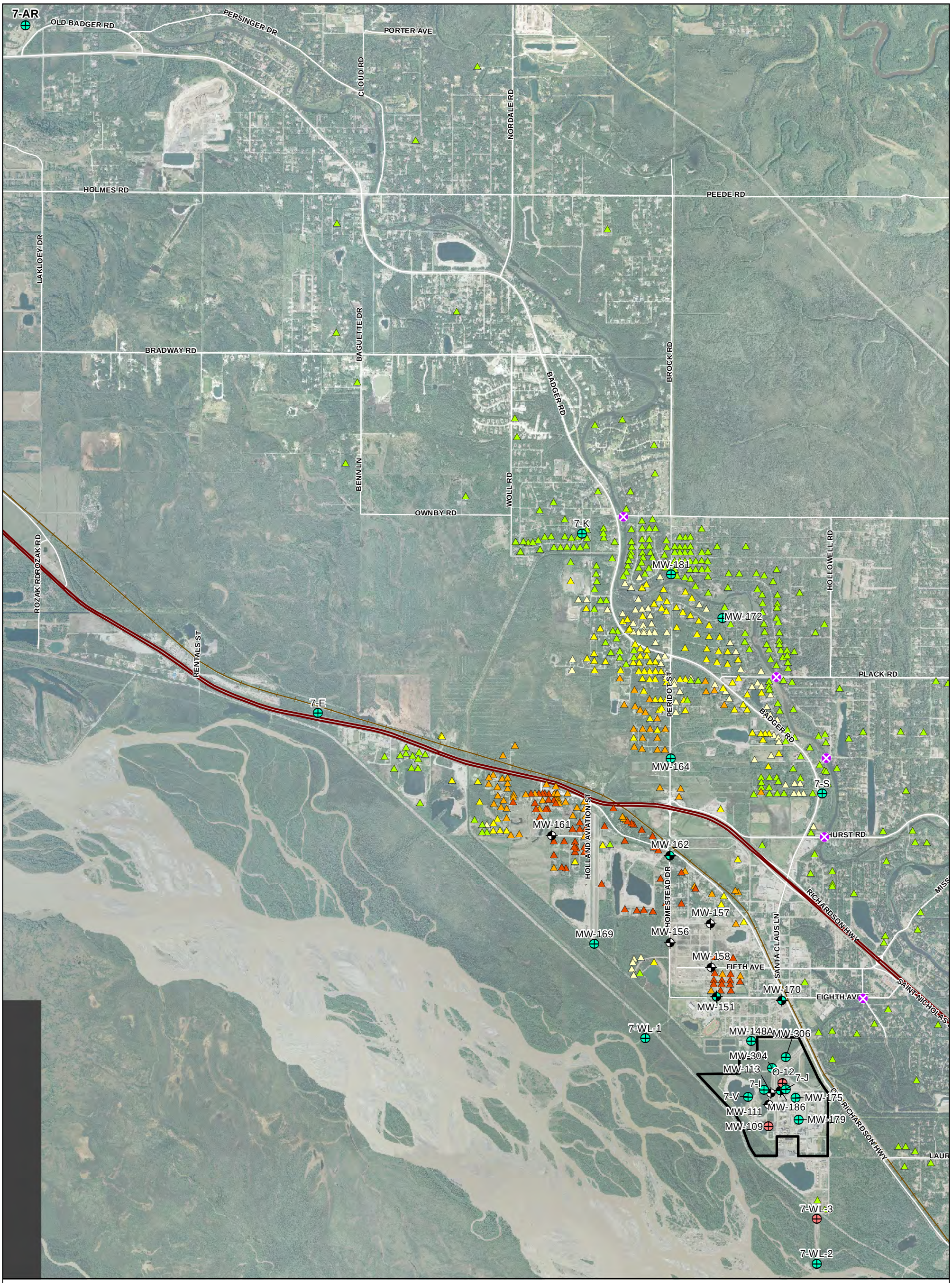
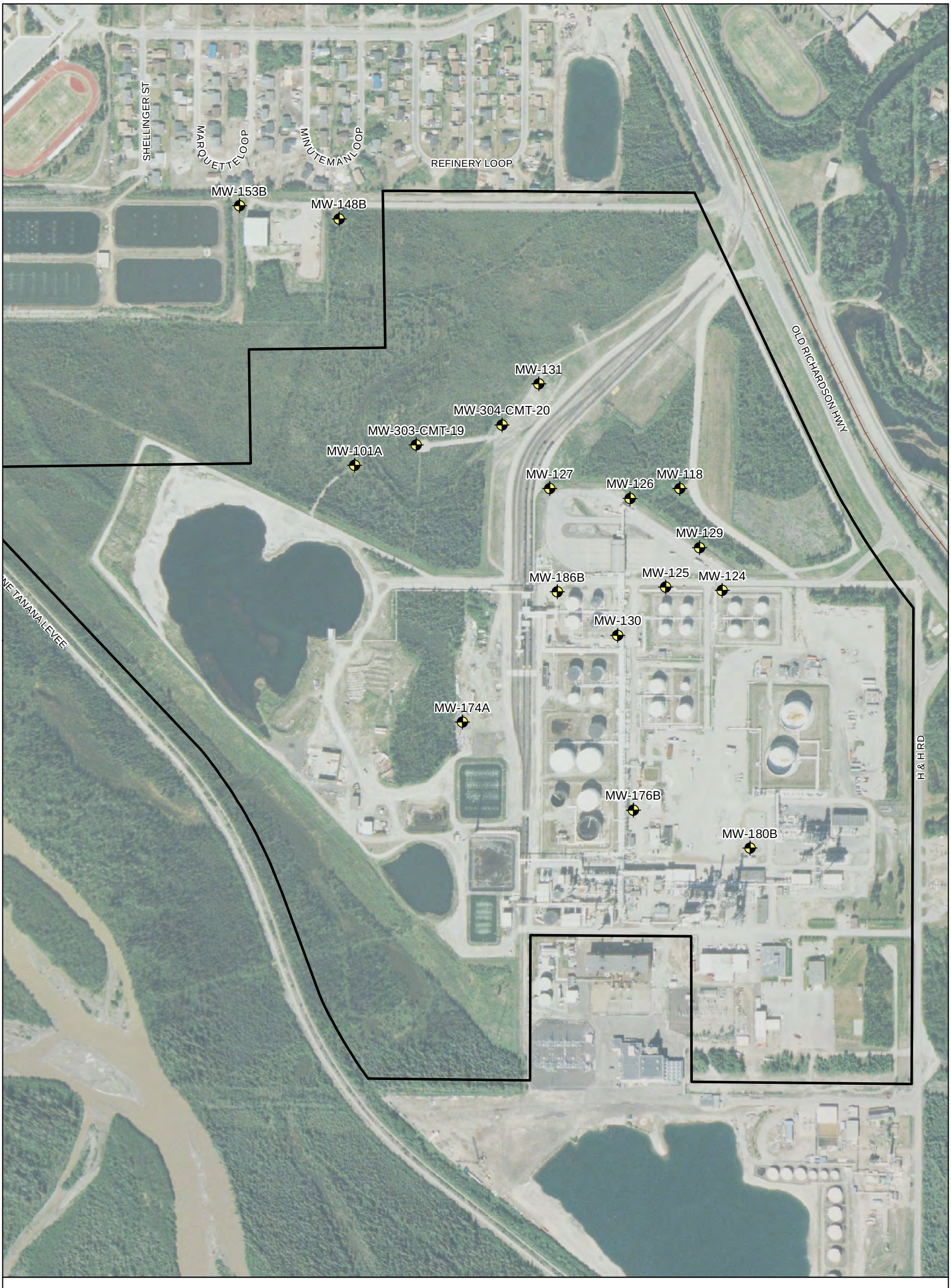


Figure 152
PROPOSED PRESSURE TRANSDUCER NETWORK AND CULVERTS GAUGING LOCATIONS
North Pole Refinery
Flint Hills Resources Alaska, LLC



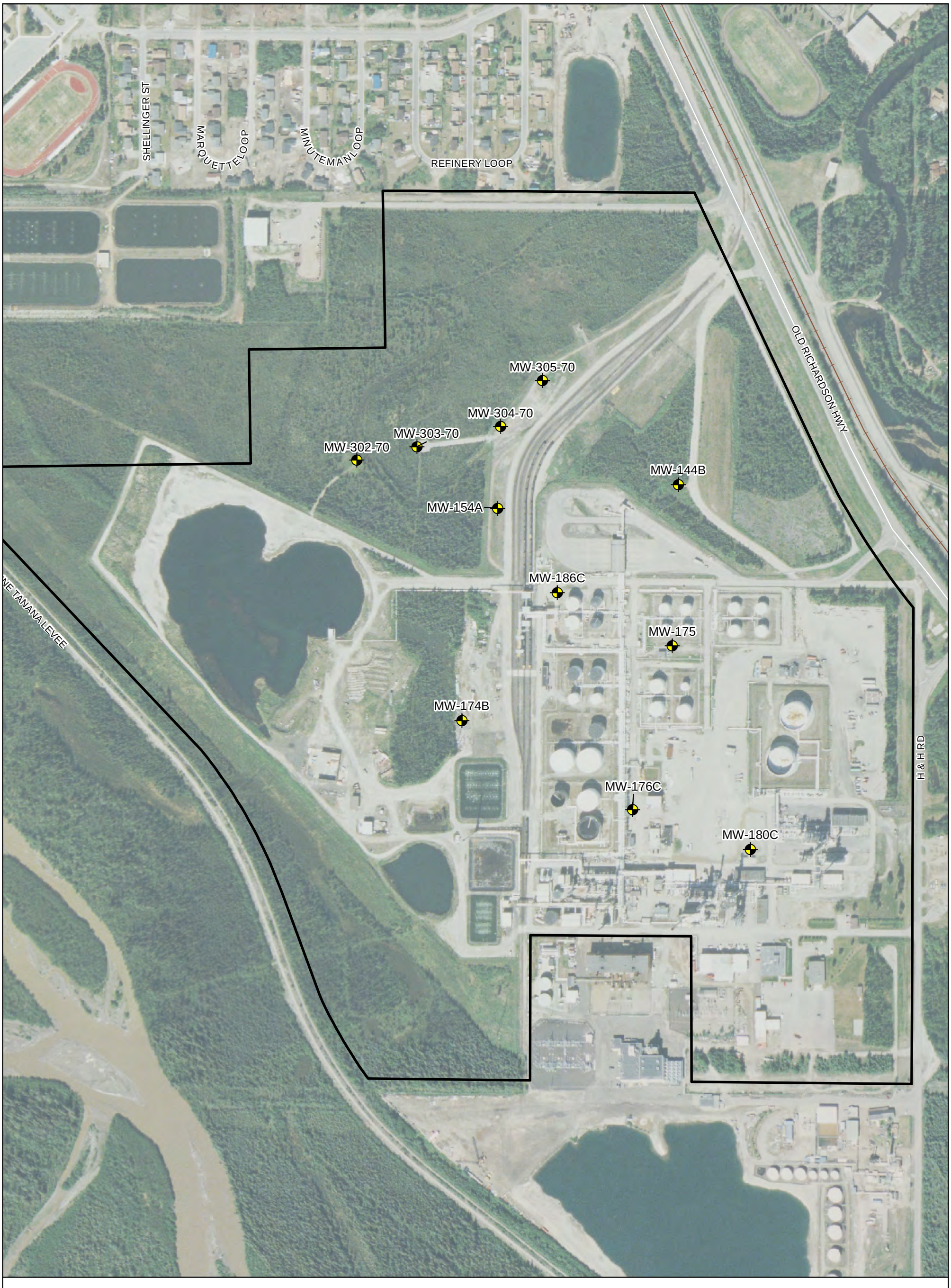
Well Locations

FHRA Property Boundary

0 200 400 800

Feet

Figure 153
PROPOSED BTEX
MONITORING LOCATIONS
10 to 55' BELOW THE WATER TABLE
North Pole Refinery
Flint Hills Resources Alaska, LLC



Monitoring Well

FHRA Property Boundary

0 200 400 800

Feet

Figure 154
PROPOSED BTEX
MONITORING LOCATIONS
55 to 90' BELOW THE WATER TABLE
North Pole Refinery
Flint Hills Resources Alaska, LLC

MW-182
24.1

MW-164A
106

MW-183A
87.1

MW-161A
151

MW-156A
106

MW-152A
119

MW-148A
139

MW-304-CMT-20
262

SEE INSET

HOLLOWELL RD
PERIDOT ST
BADGER RD
HOLLAND AVIATION ST
HOMESTEAD DR
SANTA CLAUS LN
FIFTH AVE
EIGHTH AV
RICHARDSON HWY
OLD RICHARDS

MW-142
489

MW-127
142

MW-130
1130

MW-110
1150

O-1
10400

MW-138
NS

0 275 550 Feet

Monitoring Well
Vertical Profile Transect Well
Observation Well
Sulfolane Isopleth in µg/L from 4th Quarter 2011
FHRA Property Boundary

118 Sulfolane Concentration (µg/L)
J Estimated value
NS Not Sampled
JH Estimated results biased high due to sulfolane-d8 surrogate failure

0 750 1,500 3,000 Feet

Notes:
Samples with duplicate data are represented by the greater of the two results.
Sulfolane was analyzed by EPA Method 1625B with Iso-dilution.
Wells were gauged for LNAPL July 14th & 15th, 2011.
Plume delineation is based on historical data.

Figure 155
PROPOSED STABLE ISOTOPE INVESTIGATION MONITORING WELL NETWORK - NEAR WATER TABLE
North Pole Refinery
Flint Hills Resources Alaska, LLC

Monitoring Well

Approximate Sulfolane Isopleth in µg/L

FHRA Property Boundary

118 Sulfolane Concentration (µg/L)

J Estimated value

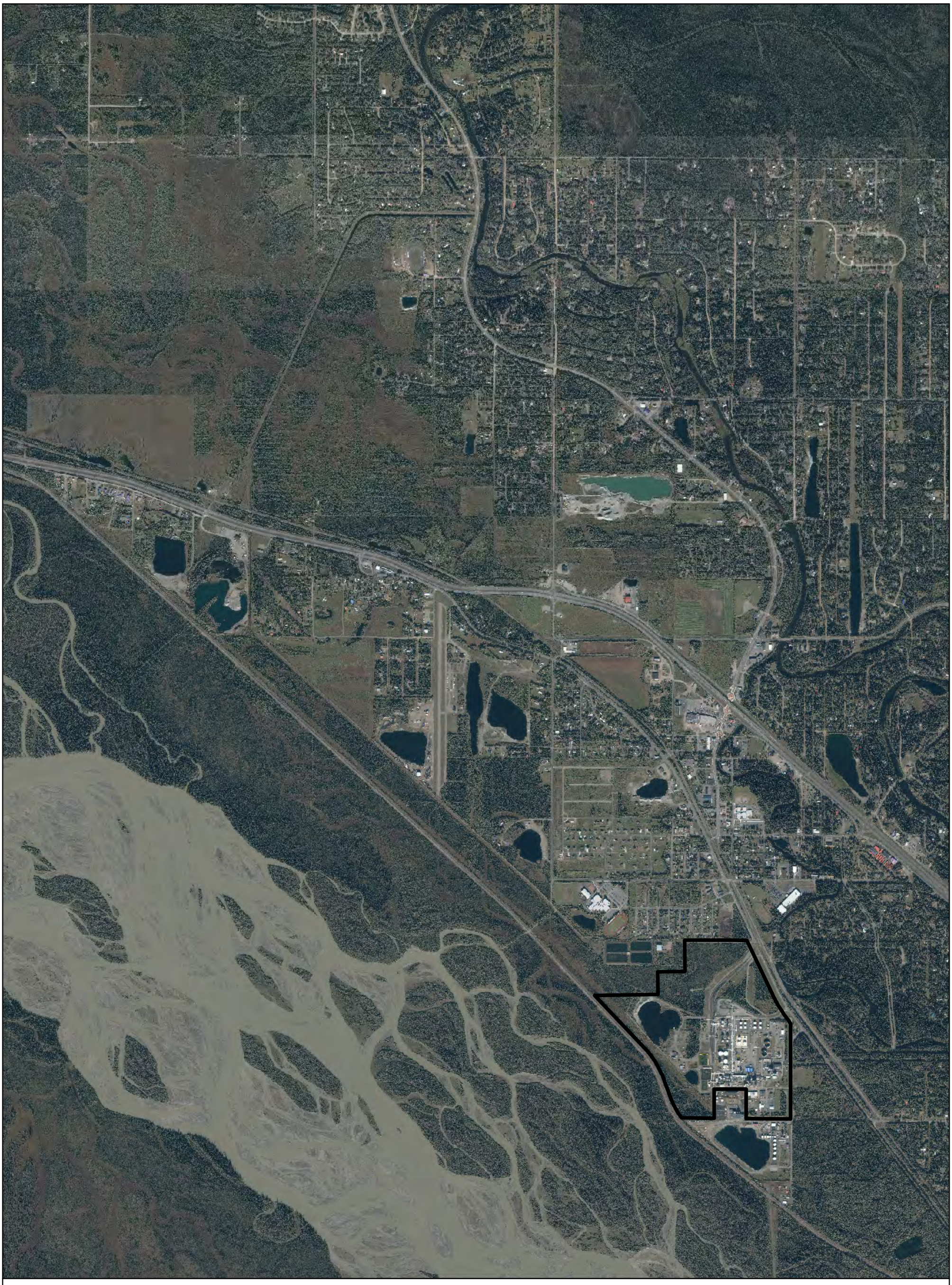
NS Not Sampled

0 750 1,500 3,000

Feet

Notes:
Samples with duplicate data are represented by the greater of the two results.
Sulfolane was analyzed by EPA Method 1625B with Iso-dilution.
Wells were gauged for LNAPL July 14th & 15th, 2011.
Plume delineation is based on historical data.

Figure 156
PROPOSED STABLE ISOTOPE INVESTIGATION MONITORING WELL NETWORK - ZONE B
North Pole Refinery
Flint Hills Resources Alaska, LLC



FHRA Property Boundary

0 1,000 2,000 4,000

Feet

Figure 157
AIR PHOTO
North Pole Refinery
Flint Hills Resources Alaska, LLC