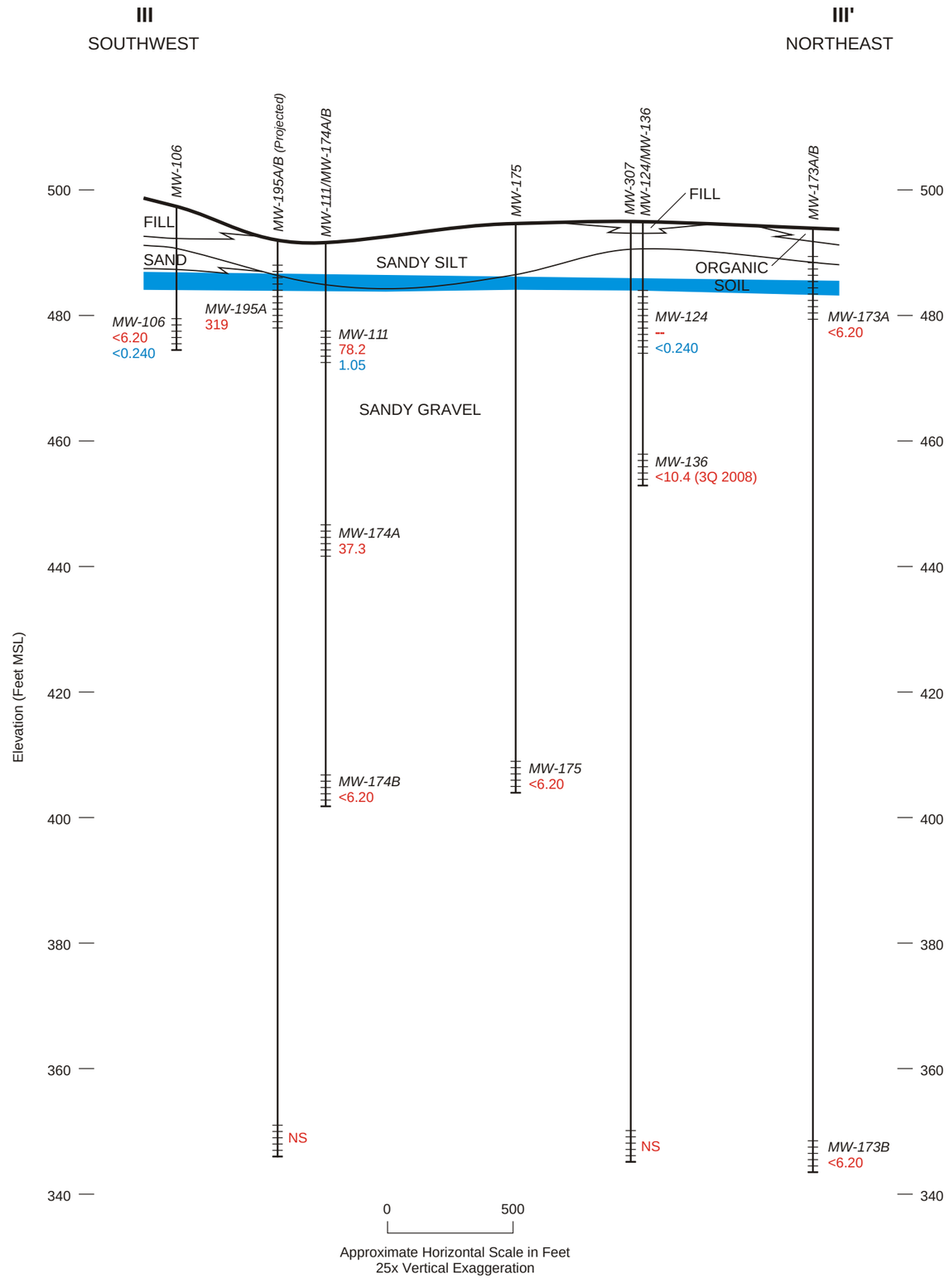
I
NORTHWEST
I'
SOUTHEAST
Elevation (Feet MSL)
500
480
460
440
420
400
380
360
GRAVEL FILL
SILTY SAND
SILT
SAND
SAND AND GRAVEL
SILTY SAND
SANDY SILT
FROZEN SANDY GRAVEL
FROZEN SANDY SILT
FROZEN SAND AND GRAVEL
FROZEN SAND
MW-165A/B
MW-191A/B
MW-183A/B
34 (1979)
12 (1972)
MW-161A/B
61 (1980)
MW-156A/B
MW-158A/B
71 (2006)
52 (2006)
95 (2005)
74 (2005)
MW-151A/B/C
MW-153A/B
MW-302-CMT
MW-302-70/80/110
7-I (Proposed)
MW-111
MW-174A/B
MW-195A/B
MW-198
MW-192A/B
<6.20
87.1
145
43.7 (1Q 2010)
11.4 (3Q 2011)
151
316
156 (4Q 2009)
106
55.0
13.7
132
128 (4Q 2009)
129 (4Q 2009)
112 (4Q 2009)
96.5 (4Q 2009)
109
63.2
39.6
66.2
33.3
55.5
76.2
35.6
63.0
33.2
33.1
28.7
3.39J
78.2
37.3
319
NS
0
500
Approximate Horizontal Scale in Feet
25x Vertical Exaggeration
LEGEND
Monitoring Well Screen (Nested wells shown on same riser for clarity)
Approximate Zone of Water Table Fluctuation
Approximate Top of Permafrost
106 Sulfolane Concentration (ug/L) 4Q 2011 (Unless otherwise noted)
NS Not Sampled
J Estimated Concentration

Figure 33

CROSS SECTION I-I'
North Pole Refinery
Flint Hills Resources Alaska, LLC

Figure 34

CROSS SECTION II-II'
North Pole Refinery
Flint Hills Resources Alaska, LLC



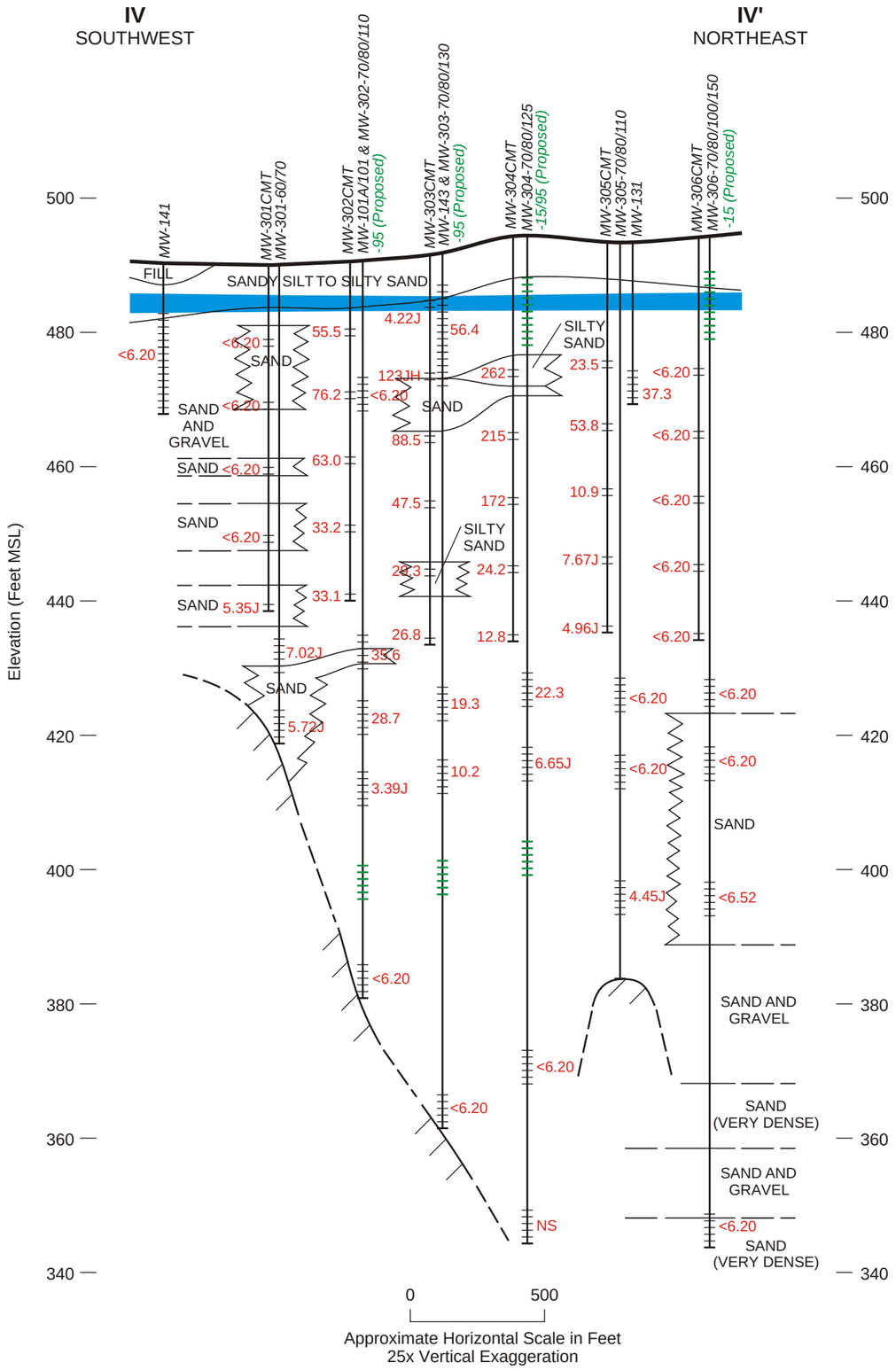
LEGEND

- Monitoring Well Screen (Nested wells shown on same riser for clarity)
- Approximate Zone of Water Table Fluctuations
- Approximate Top of Permafrost
- MW-139 — Well Name
- 312 — Fourth Quarter 2011 Sulfolane Concentration (ug/L)
- 46.8 — Fourth Quarter Benzene Concentration (ug/L)
- NS — Not Sampled

Figure 35

CROSS SECTION III-III'
North Pole Refinery
Flint Hills Resources Alaska, LLC

P:\Mpls\02 AK\01\02011001\WorkFiles\Workfiles\Graphics\Site Cross Section III-III'.CDR RLG 11-12-12



LEGEND

- Monitoring Well Screen (Nested wells shown on same riser for clarity)
- Approximate Zone of Water Table Fluctuation
- Approximate Top of Permafrost
- 262 — Sulfolane Concentration (ug/L) 4Q 2011
- J — Estimated Concentration
- JH — Estimated Results Biased High
- NS — Not Sampled

Figure 36

CROSS SECTION IV-IV'
North Pole Refinery
Flint Hills Resources Alaska, LLC

P:\Mpls\02 AK\01\02011001\WorkFiles\Graphics\2012 Cross Sections\Cross Section IV-IV'.CDR RLG 11-14-12

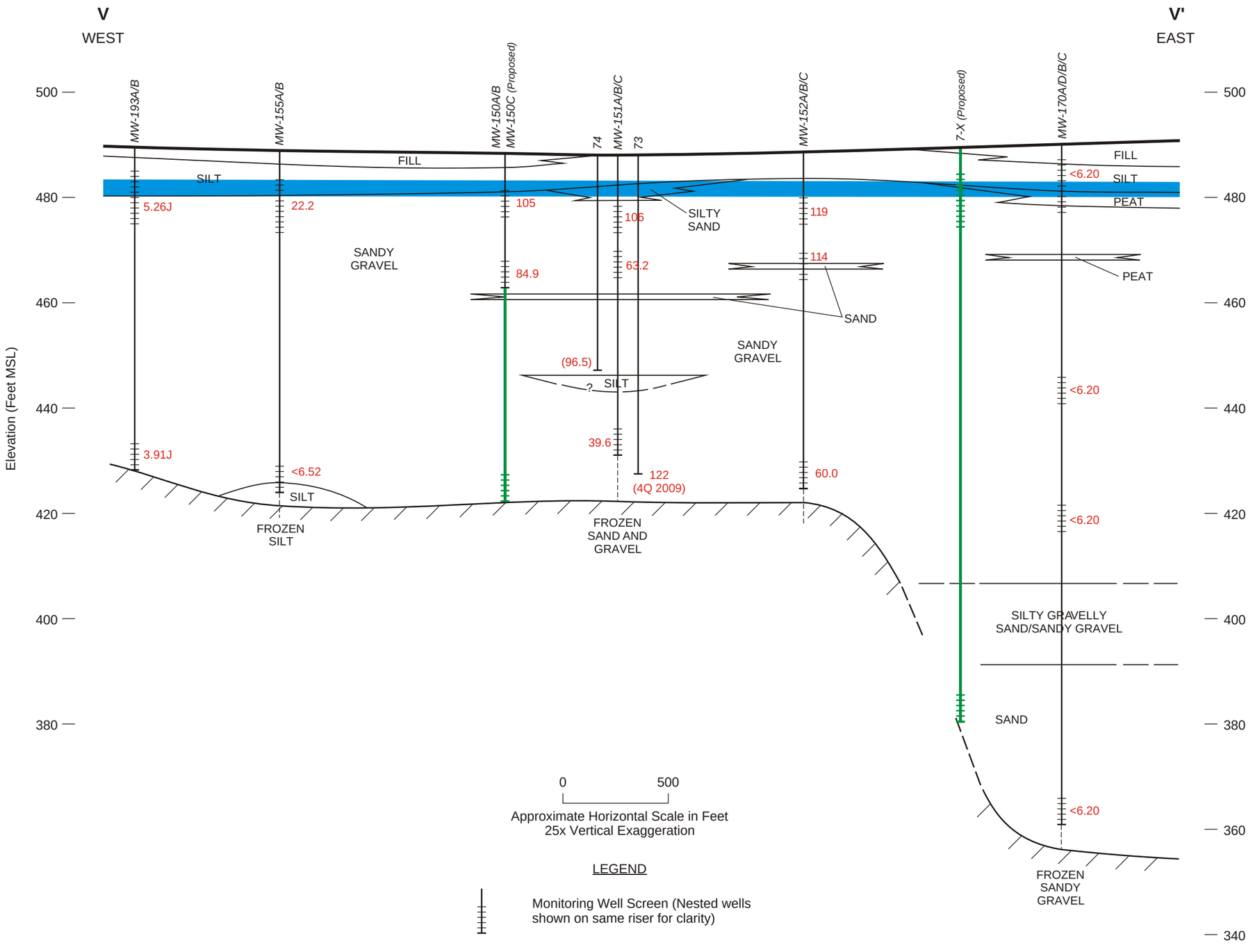
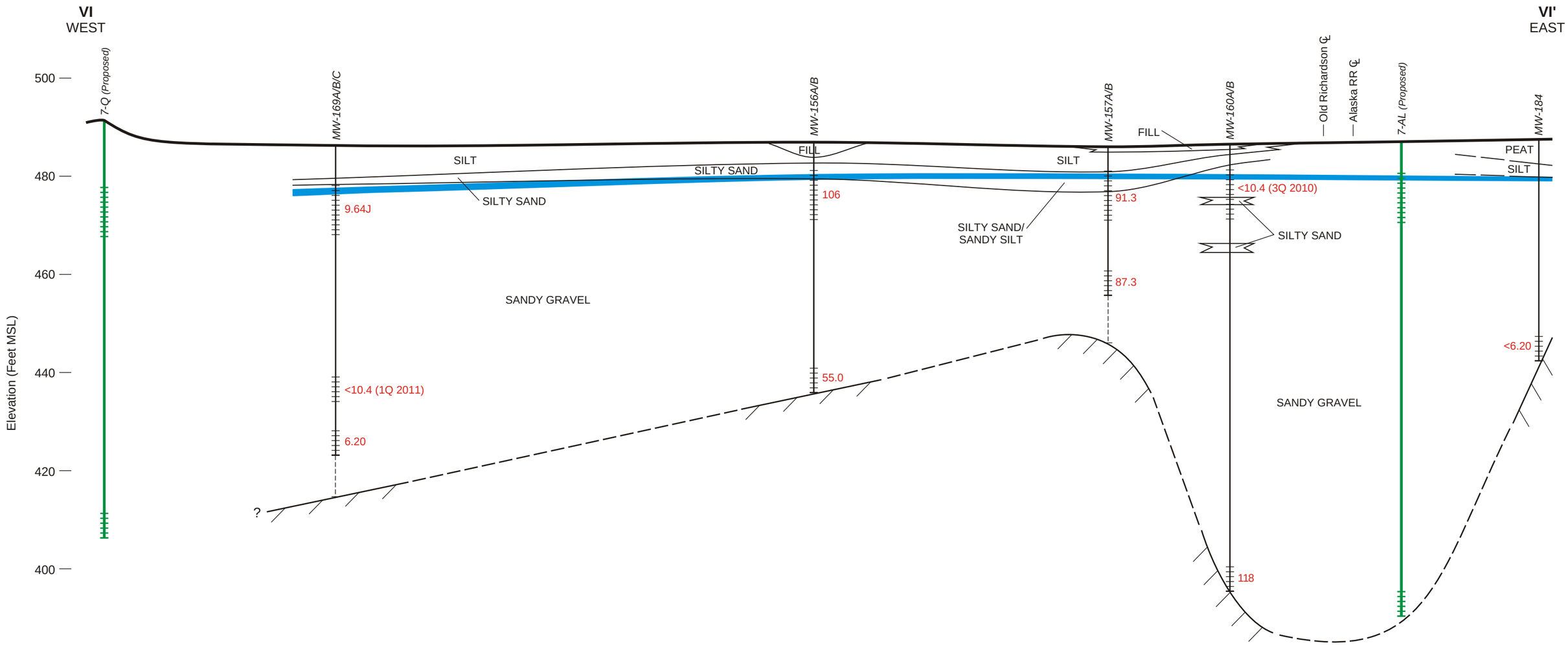


Figure 37

CROSS SECTION V-V'
North Pole Refinery
Flint Hills Resources Alaska, LLC

P:\Mpls\02 AK\01\02\11001\WorkFiles\Graphics\2012 Cross Sections\Area Cross Section V-V'.CDR RLG 11-12-12



0 500

Approximate Horizontal Scale in Feet
25x Vertical Exaggeration

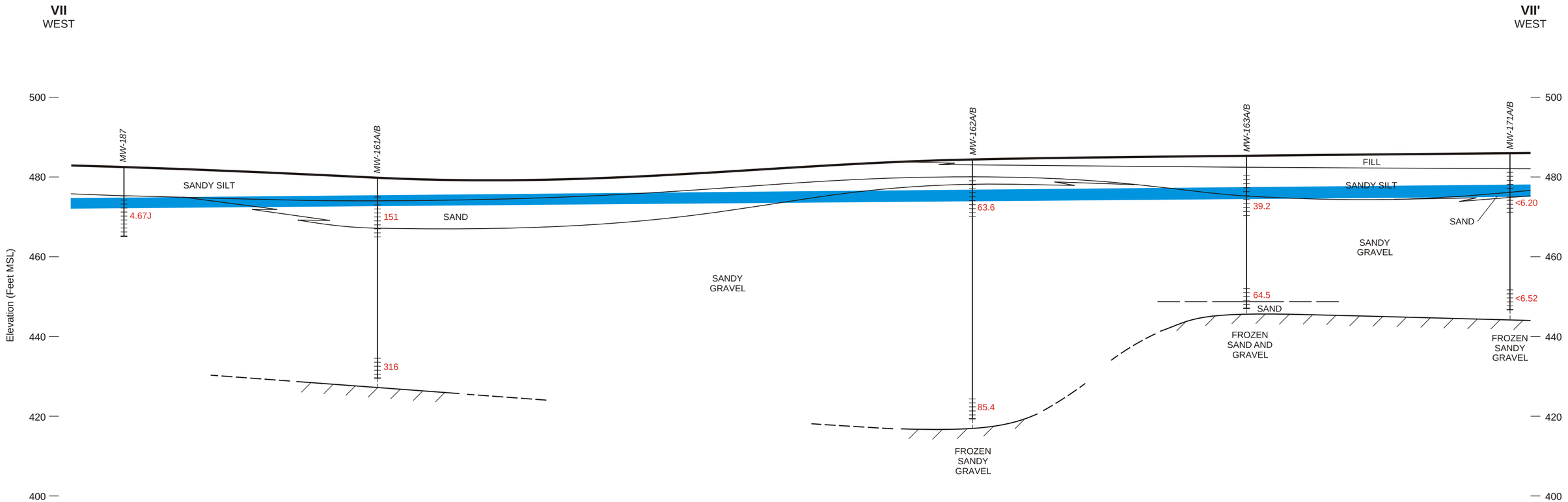
LEGEND

- Monitoring Well Screen (Nested wells shown on same riser for clarity)
- Approximate Zone of Water Table Fluctuation
- Approximate Top of Permafrost
- 106 — Sulfolane Concentration (ug/L) 4Q 2011 (Unless otherwise noted)
- J — Estimated Concentration

Figure 38

CROSS SECTION VI-VI'
North Pole Refinery
Flint Hills Resources Alaska, LLC

P:\Mpls\02 AK\01\02011001\WorkFiles\Graphics\Cross Section Rossens.CDR RLG 11-12-12



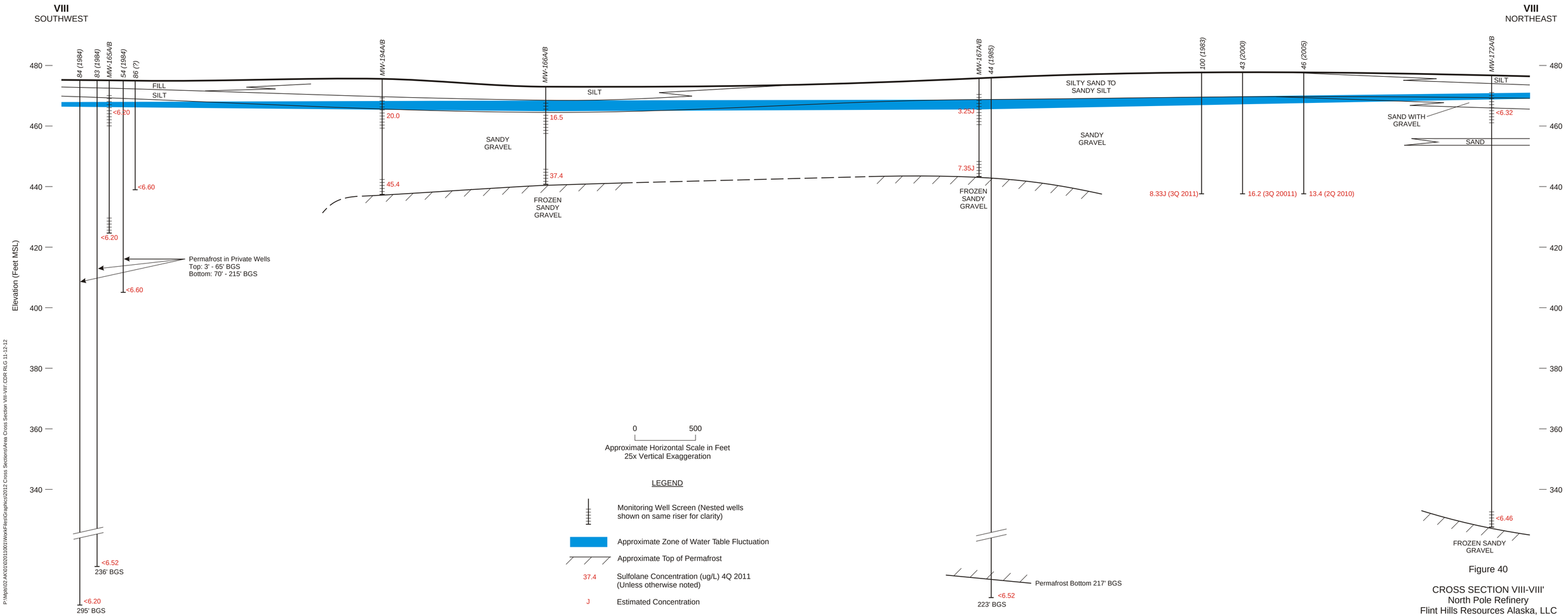
LEGEND

- Monitoring Well Screen (Nested wells shown on same riser for clarity)
- Approximate Zone of Water Table Fluctuation
- Approximate Top of Permafrost
- 316 — Sulfolane Concentration (ug/L) 4Q 2011 (Unless otherwise noted)
- J — Estimated Concentration

Figure 39

CROSS SECTION VII-VII'
North Pole Refinery
Flint Hills Resources Alaska, LLC

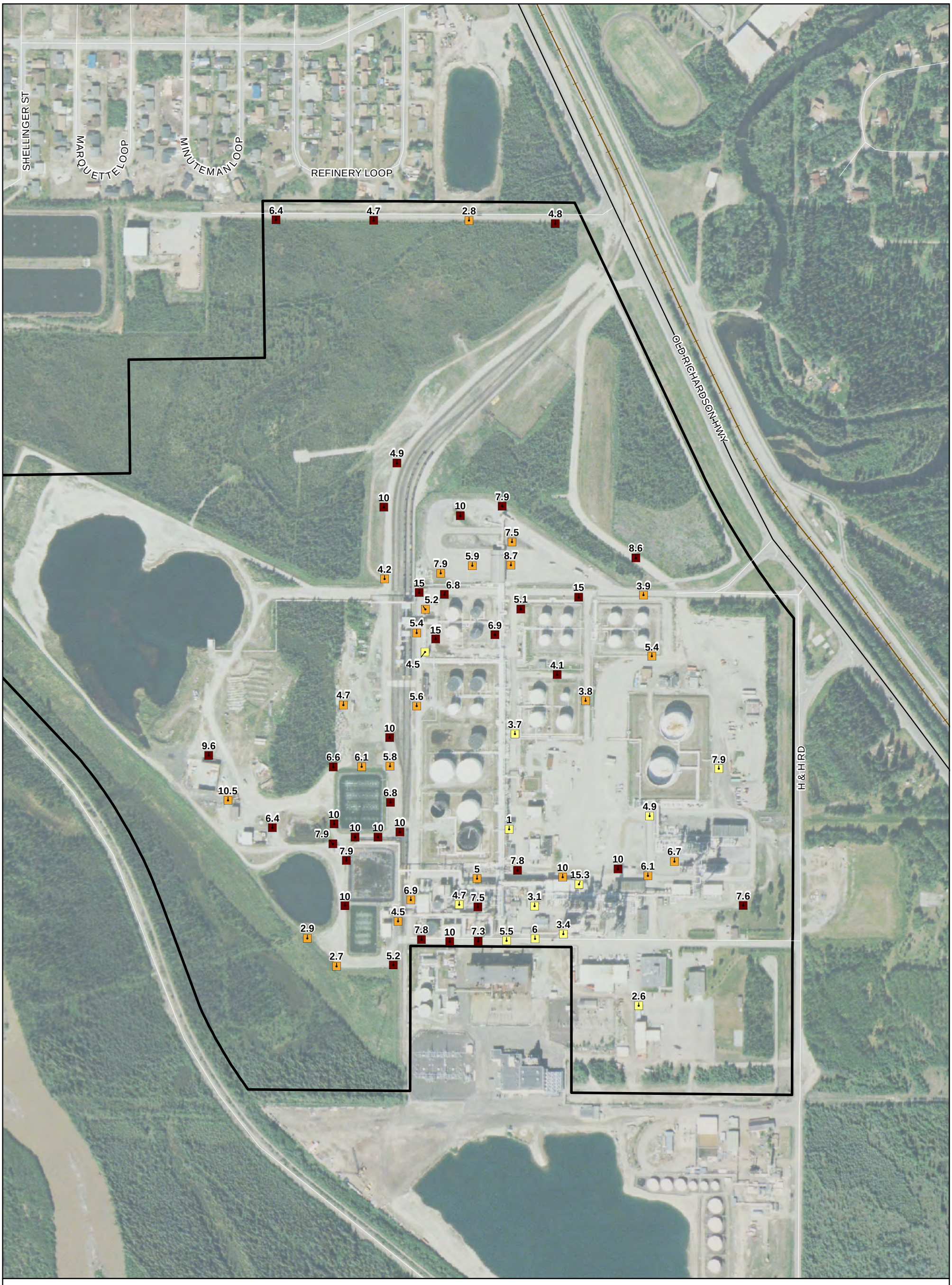
P:\Mpls\02 AK\01\2011001\WorkFiles\Graphics\2012 Cross Sections\Area Cross Section VII-VII'.CDR RLG-11-12-12



P:\Mpls\02.AK\01\020111001\Work Files\Graphics\2012 Cross Sections\Area Cross Section VIII-VIII' CDR RLG 11-12-12

Figure 40

CROSS SECTION VIII-VIII'
North Pole Refinery
Flint Hills Resources Alaska, LLC



Silt Thickness at Soil Borings

- 0 - 2 feet
- 2 - 4 feet
- Greater than 4 feet
- FHRA Property Boundary

Number in boring location marker is depth (ft) to contact between fine-grained soil and gravel.

0 200 400 800

Feet

Figure 41
SILT THICKNESS
North Pole Refinery
Flint Hills Resources Alaska, LLC

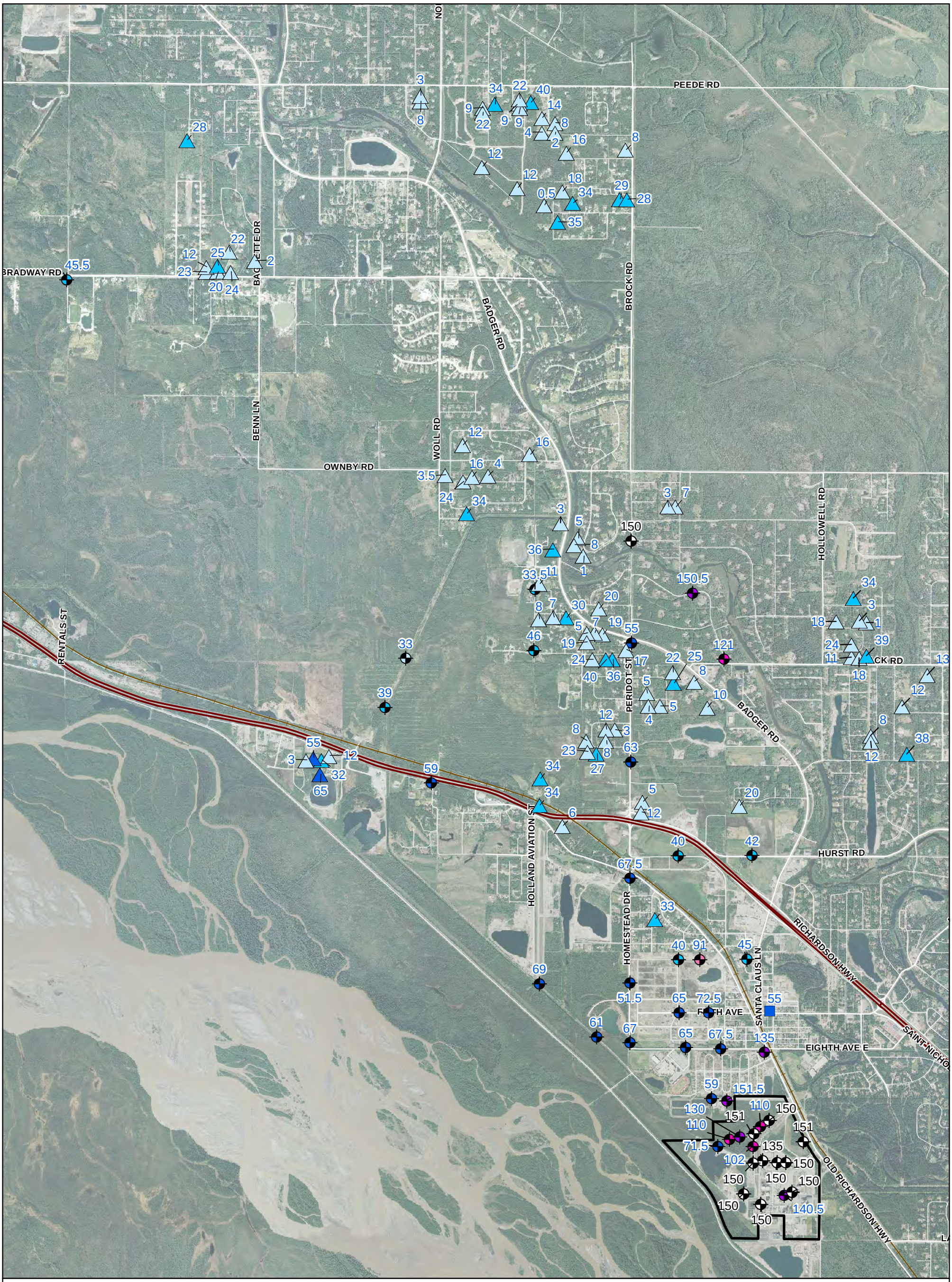
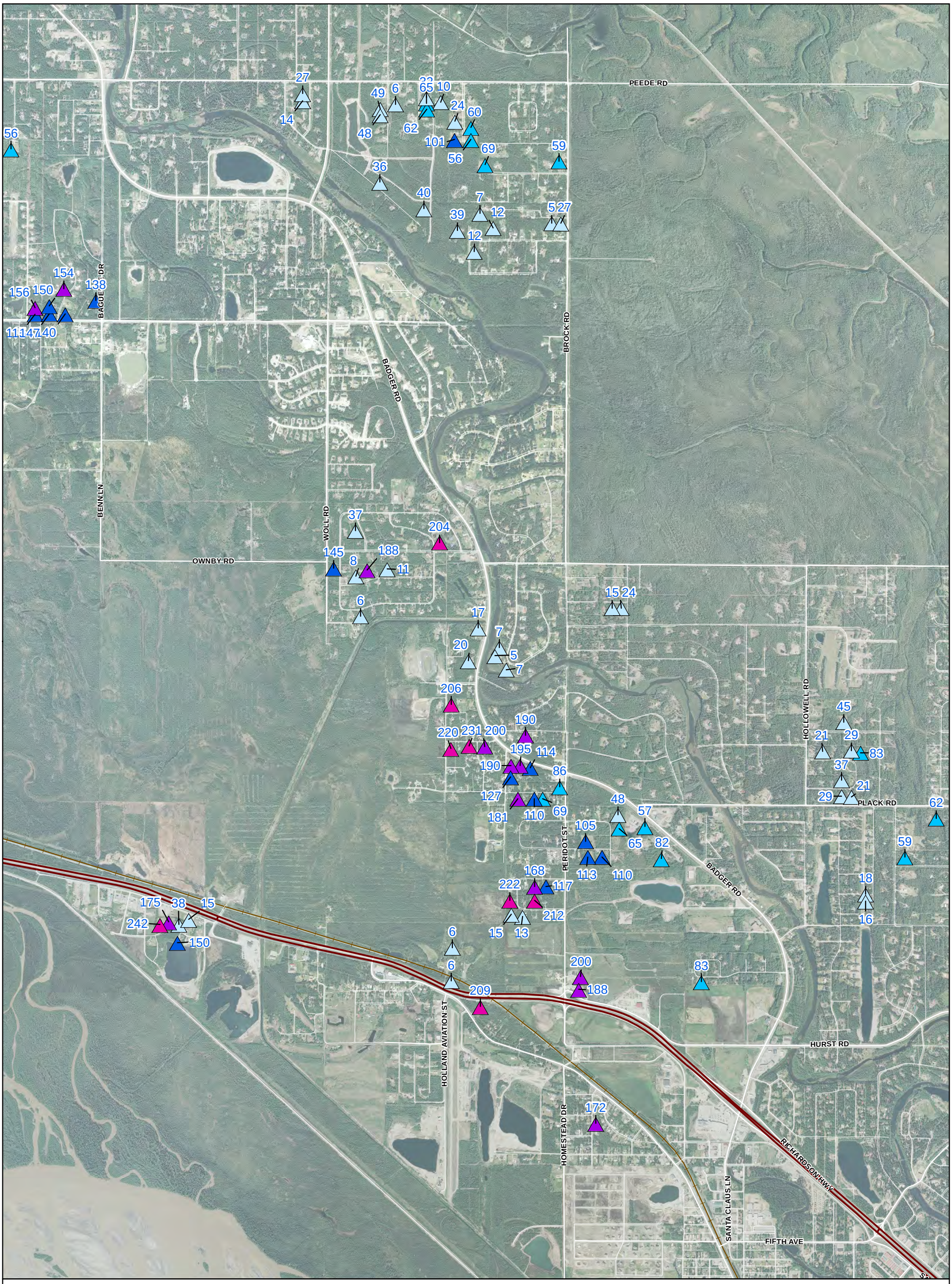


Figure 42
DEPTH TO TOP OF PERMAFROST
North Pole Refinery
Flint Hills Resources Alaska, LLC



Permafrost Thickness

- 0 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- 200 - 250

0 1,000 2,000 4,000

Feet

Figure 43
PERMAFROST THICKNESS
North Pole Refinery
Flint Hills Resources Alaska, LLC

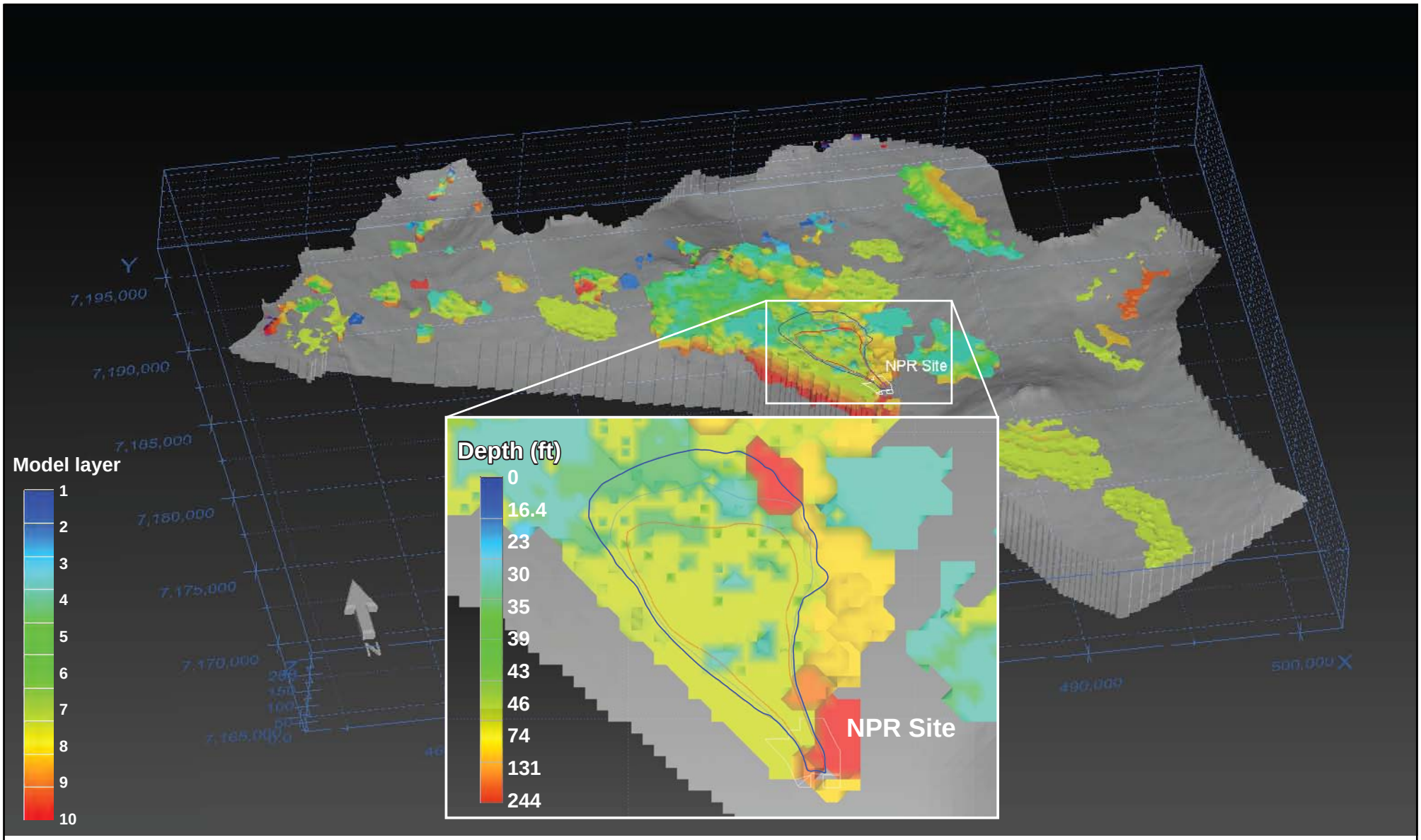


Figure 44
THREE-DIMENSIONAL PERMAFROST IMAGE SHOWING DETAIL IN THE PLUME AREA (INSET)
North Pole Refinery
Flint Hills Resources Alaska LLC

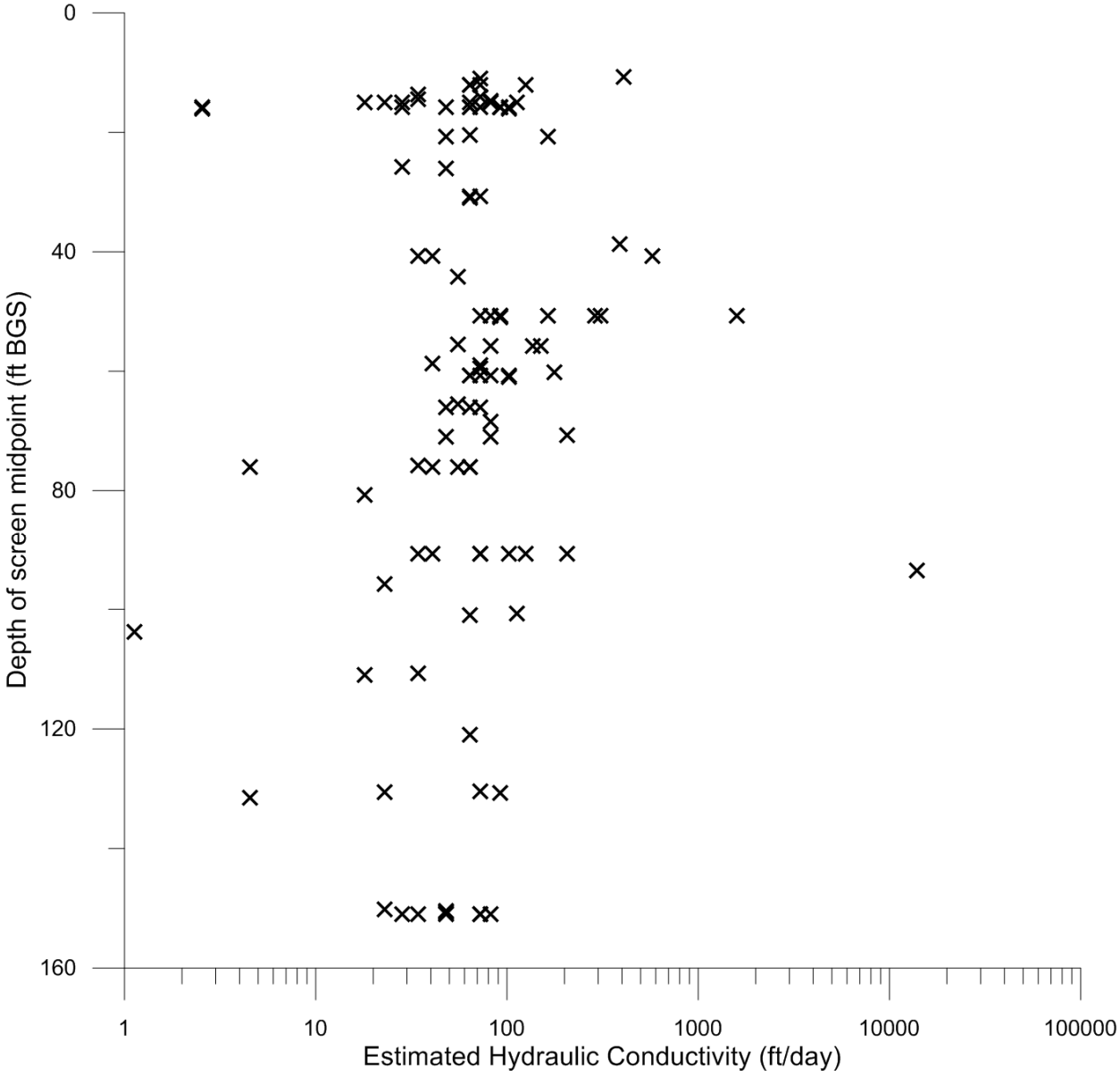
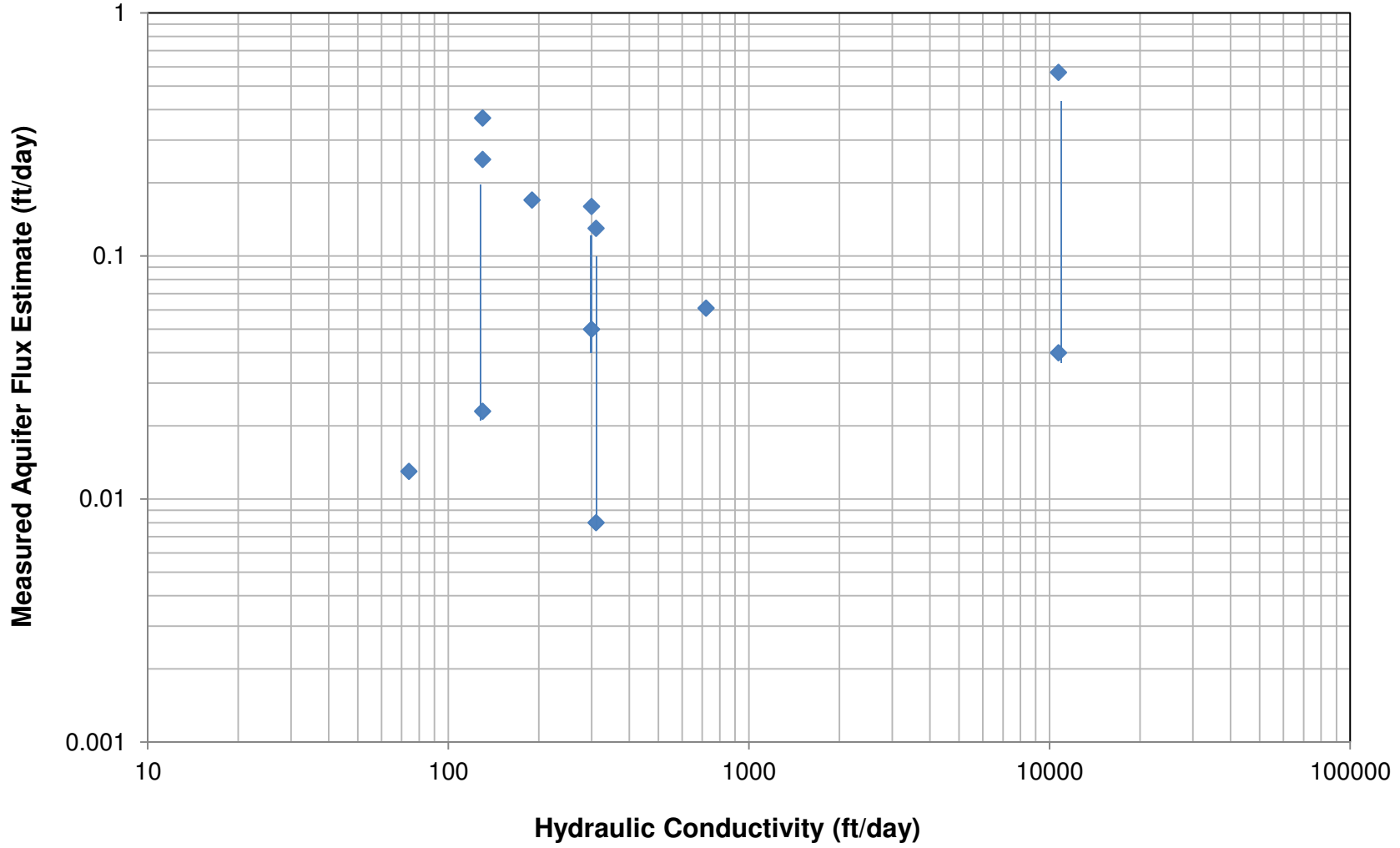
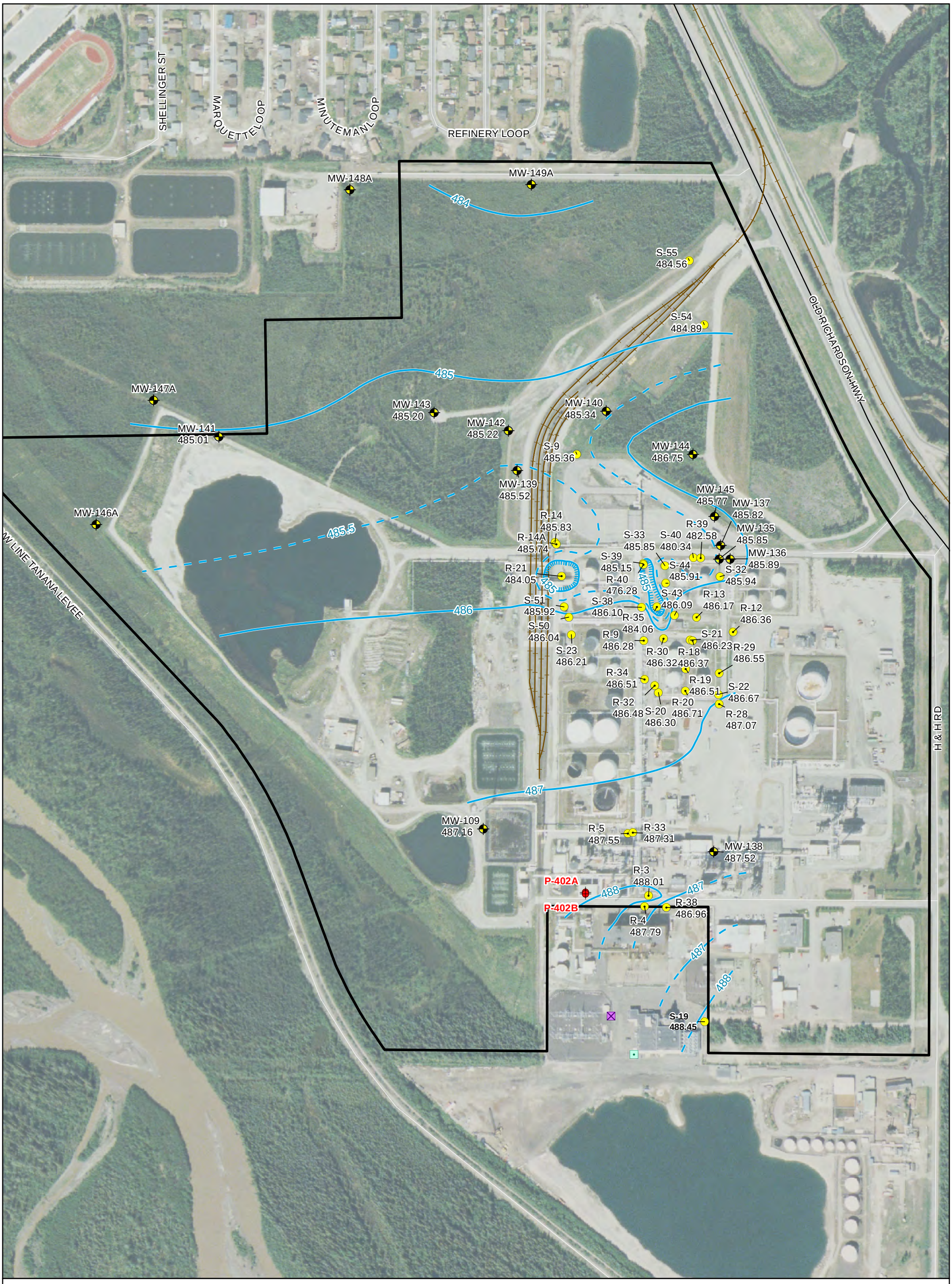


Figure 45
SCATTER PLOT OF ESTIMATED HYDRAULIC CONDUCTIVITY BASED ON GRAIN SIZE DISTRIBUTIONS
North Pole Refinery
Flint Hills Resources Alaska, LLC

Figure 46
Groundwater Flux vs. Single Well Pump Testing Hydraulic Conductivity Estimates
North Pole Refinery
Flint Hills Resources Alaska, LLC





Monitoring Well

Observation Well

Recovery Well

Production Wells

GVEA Injection Well (Approximate)

GVEA Production Well (Approximate)

FHRA Property Boundary

486.55 Groundwater Elevation (feet MSL)

Groundwater Elevation Contours

0 200 400 800

Feet

Figure 47
GROUNDWATER ELEVATIONS
AUGUST 17-21, 2009
North Pole Refinery
Flint Hills Resources Alaska, LLC

Figure 48
GROUNDWATER ELEVATION AND LNAPL THICKNESS AT MW-138
North Pole Refinery
Flint Hills Resources Alaska, LLC

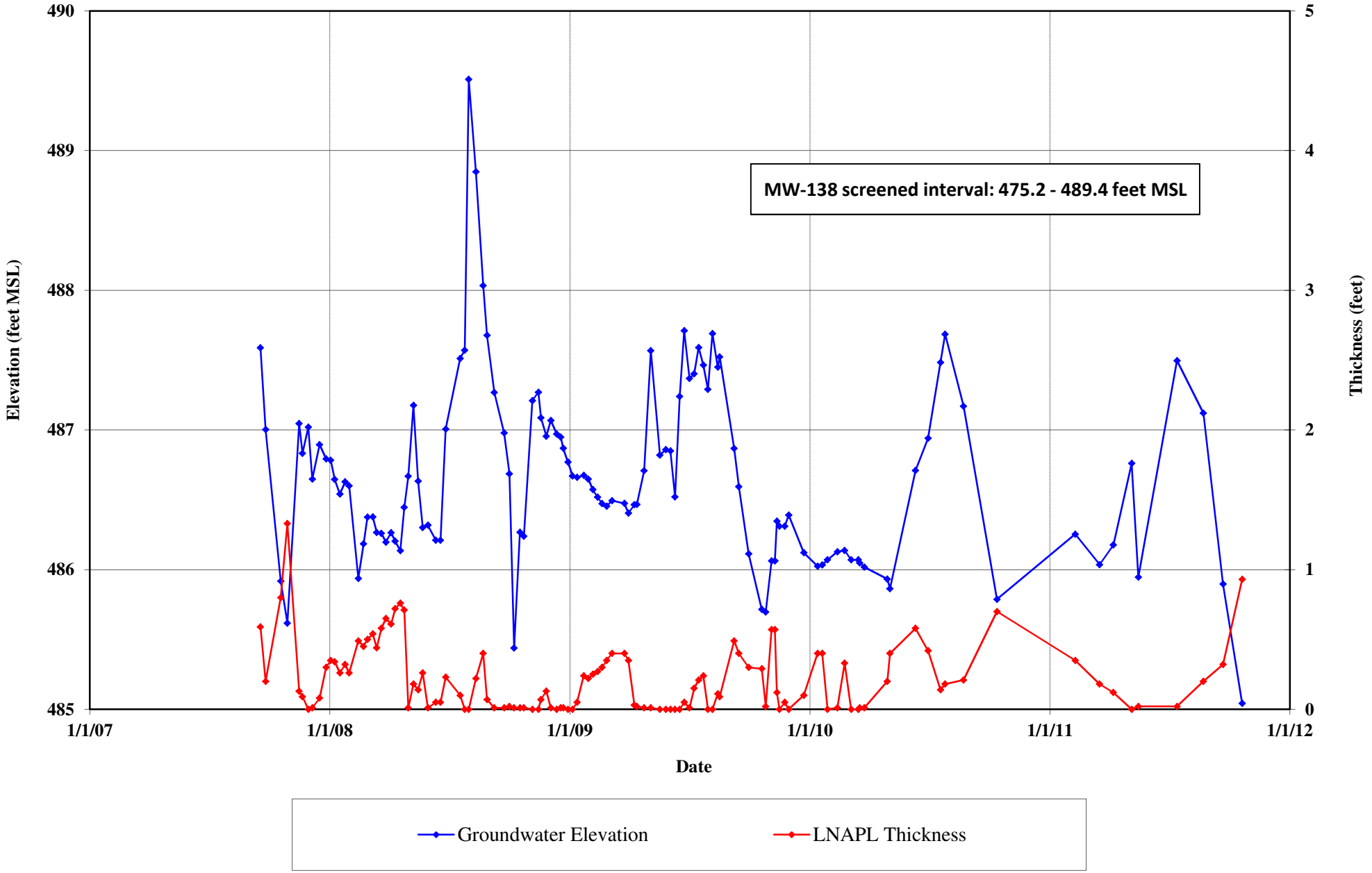


Figure 49
GROUNDWATER ELEVATION AND LNAPL THICKNESS AT R-20 AND R-20R
North Pole Refinery
Flint Hills Resources Alaska, LLC