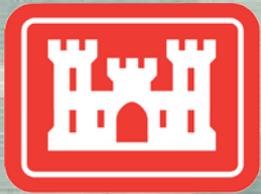


Shallow Land Disposal Area (SLDA)

Parks Township, PA

Groundwater Monitoring Review and 2013 Sampling Results

Pittsburgh and Buffalo
Districts



Building Strong



Aerial Photo Courtesy of BWXT

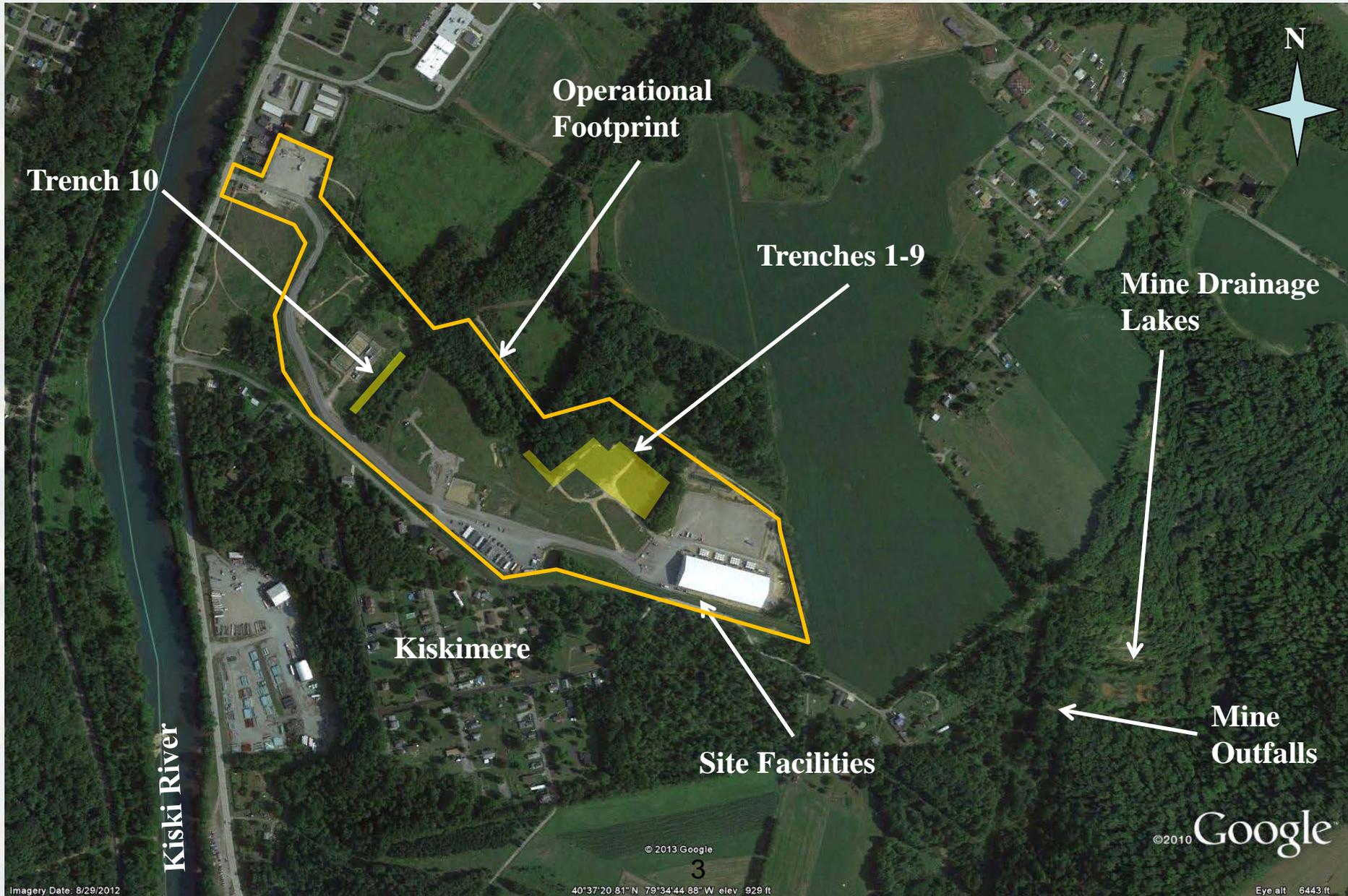
SLDA Groundwater Sampling Review

Tonight's Agenda

1. Groundwater Hydrology Review
2. Results of Previous Sampling Efforts
3. Annual Groundwater Monitoring Program
4. Future Groundwater Monitoring



SLDA Site Layout



SLDA Groundwater – Key Findings

- No evidence of off-site migration of radionuclides
- Groundwater results from 2013 are consistent with previous sampling results (2003-2004, 2011)
- Groundwater contains naturally occurring radioactive materials normally found in rock and soil
- The radionuclides detected in groundwater are less than USEPA, PADEP, or NRC drinking-water standards
- No change in the presence of industrial chemicals near upper trenches
- Groundwater sampling will continue during the Corps' presence



SLDA Groundwater Hydrology

- Five water-bearing zones underlie the upper trench area:
 1. Overburden Soil Layer
 2. First Shallow Bedrock Zone
 3. Second Shallow Bedrock Zone
 4. Upper Freeport Coal (mined under site and by Trench 10)
 5. Deep Bedrock Zone

- 114 monitoring wells cover all five zones

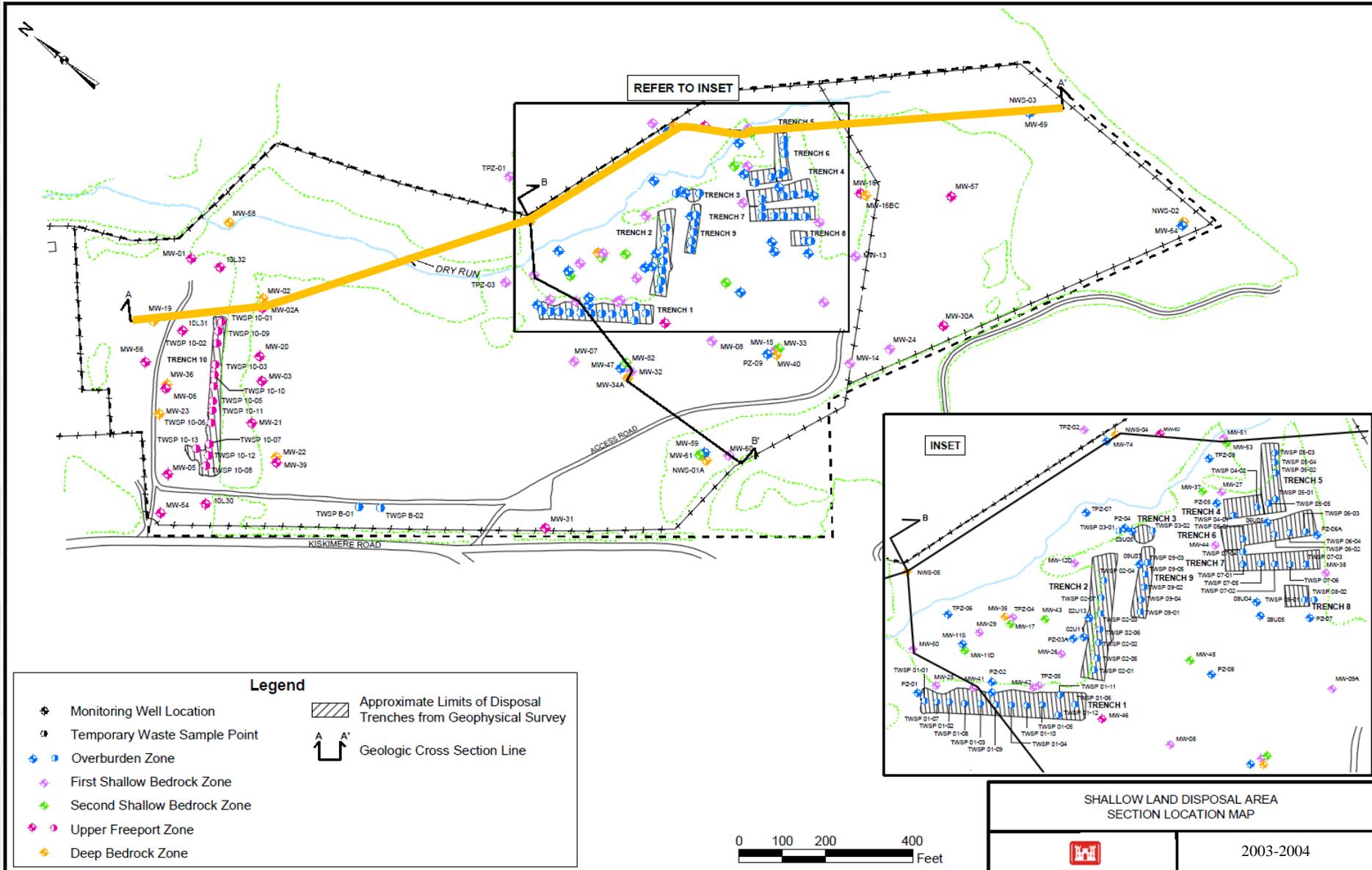
- 58 trench-water sampling points throughout the 10 trenches

- Groundwater flows differently in each zone

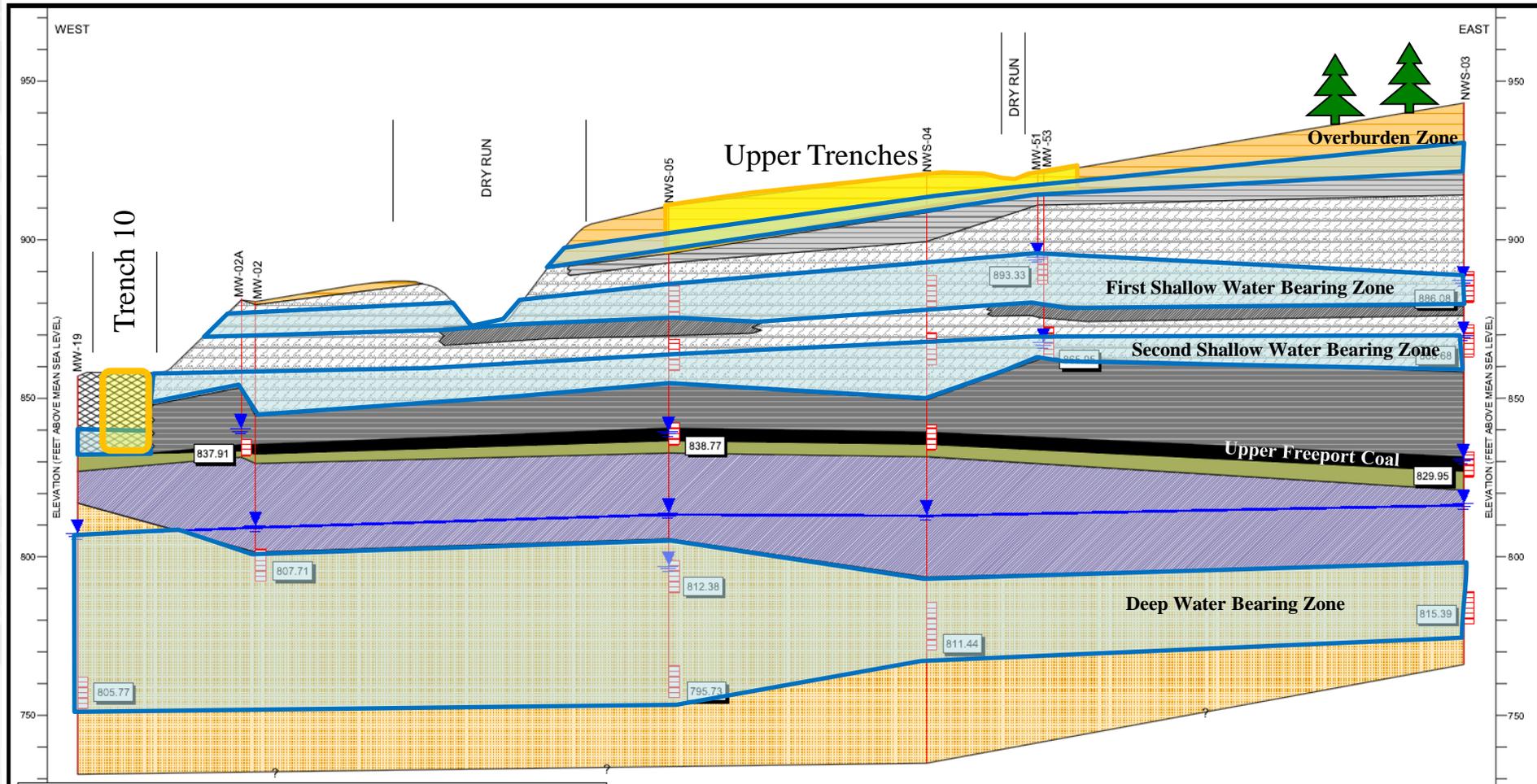
- Groundwater flow directions have not changed



SLDA Groundwater and Trench Monitoring Wells



SLDA Geologic Cross Section and Water Bearing Zones



Legend

Overburden	Black Shale
Weathered Shale	Upper Freeport
Upper Bedrock	Underclay
Mine Fill	Lower Tight Zone
Tight Zone	Siltstone with Sandstone Beds

Location ID MW-19

Monitoring Well (Red vertical line with screen symbol)

Water Level In Well (Blue horizontal line with arrowhead)

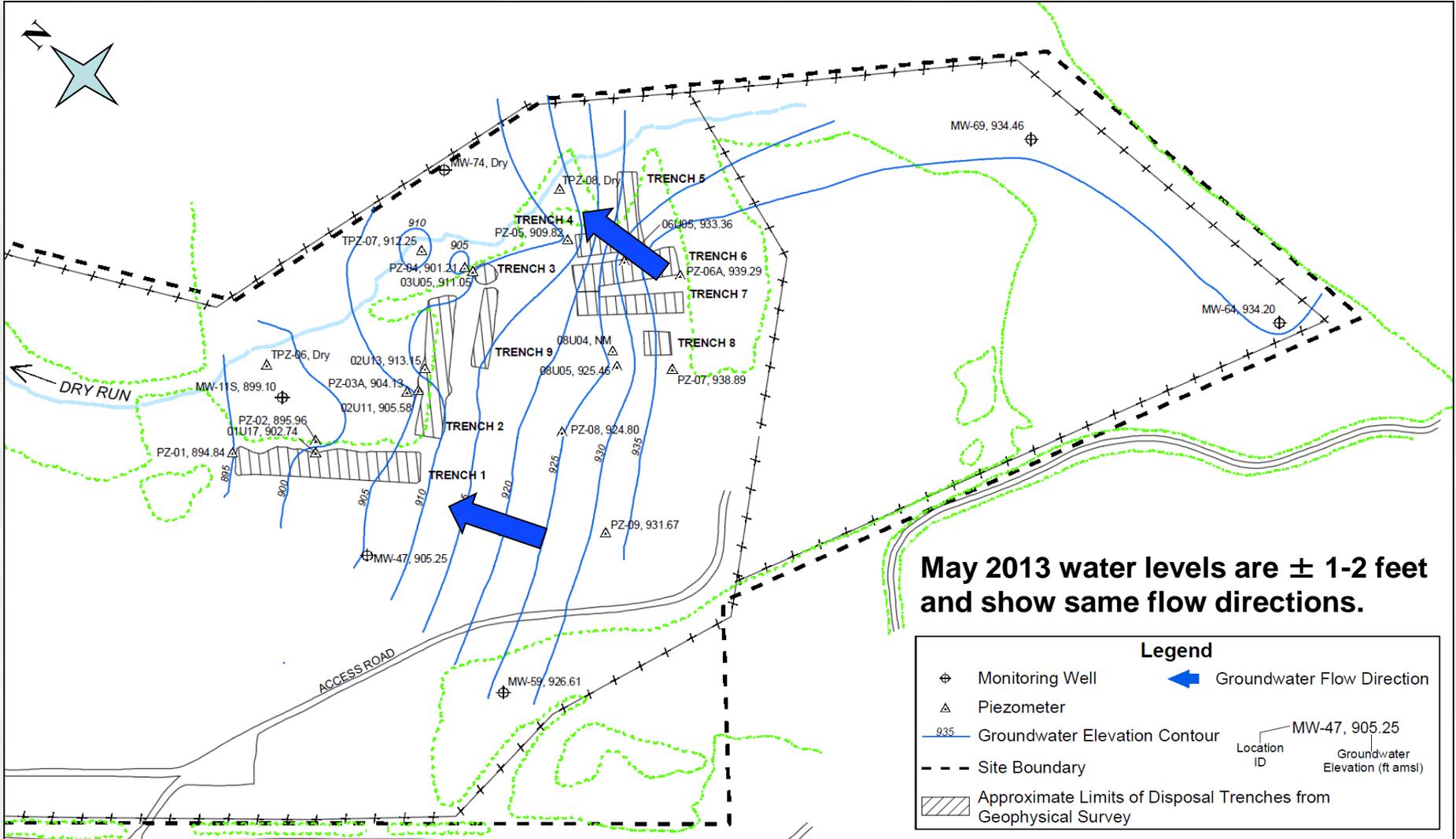
Interpolated Potentiometric Surface (Blue line with arrowheads)

Groundwater Elevation (ft amsl) 805.77

SHALLOW LAND DISPOSAL AREA
STRATIGRAPHIC CROSS SECTION A-A'

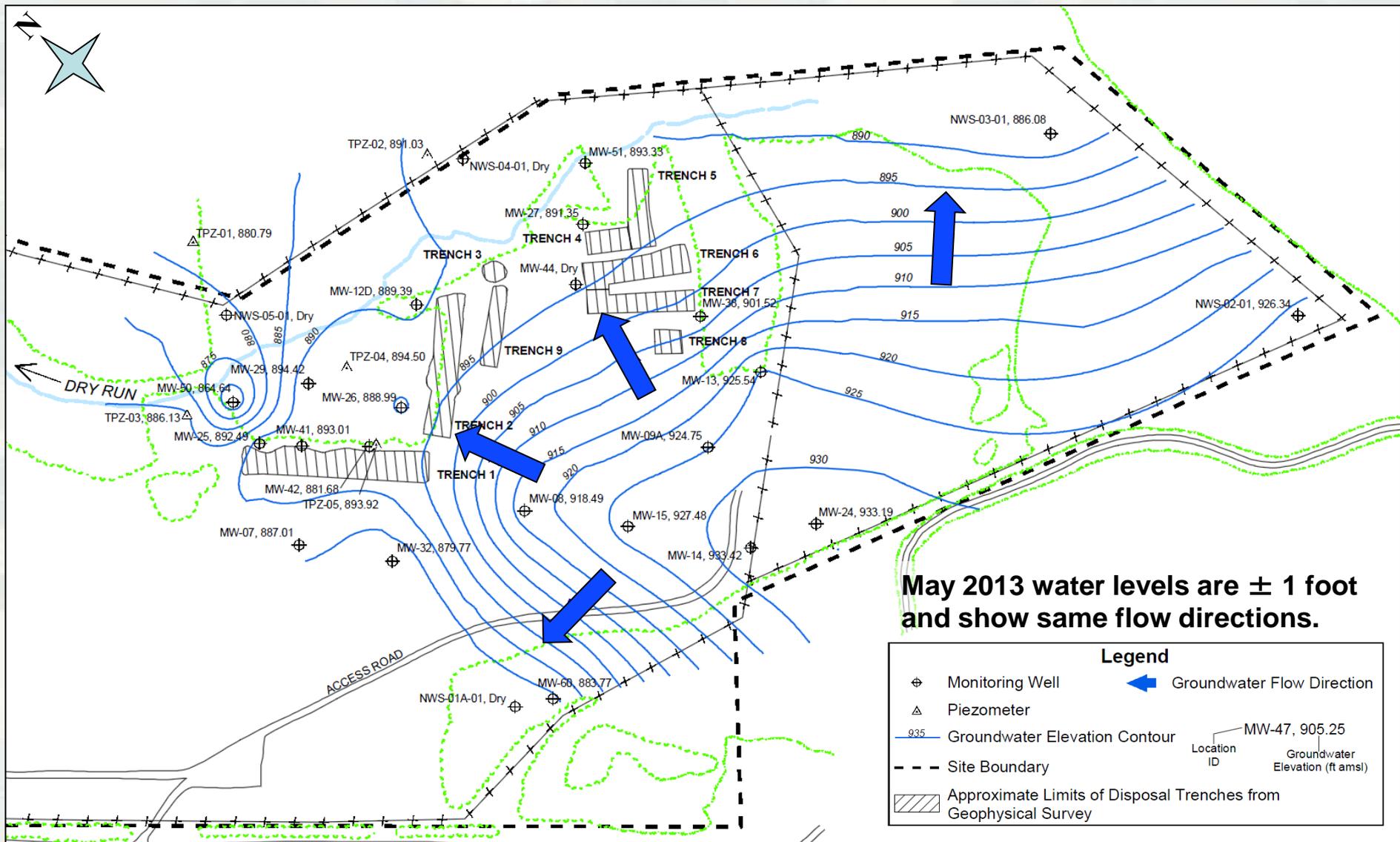
Groundwater Flow – Soil Zone

December 2003



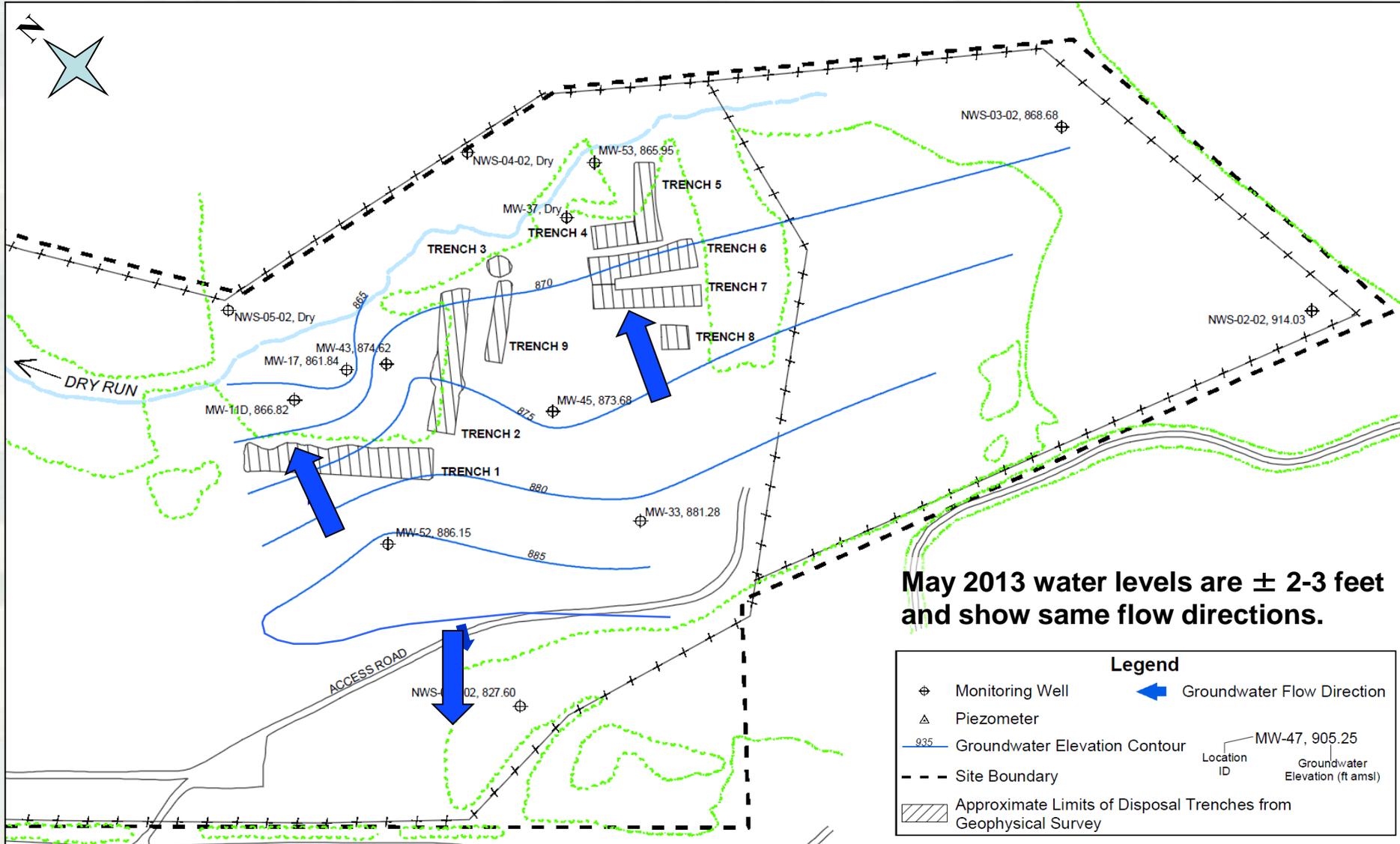
Groundwater Flow – First Bedrock Zone

December 2003



Groundwater Flow – Second Bedrock Zone

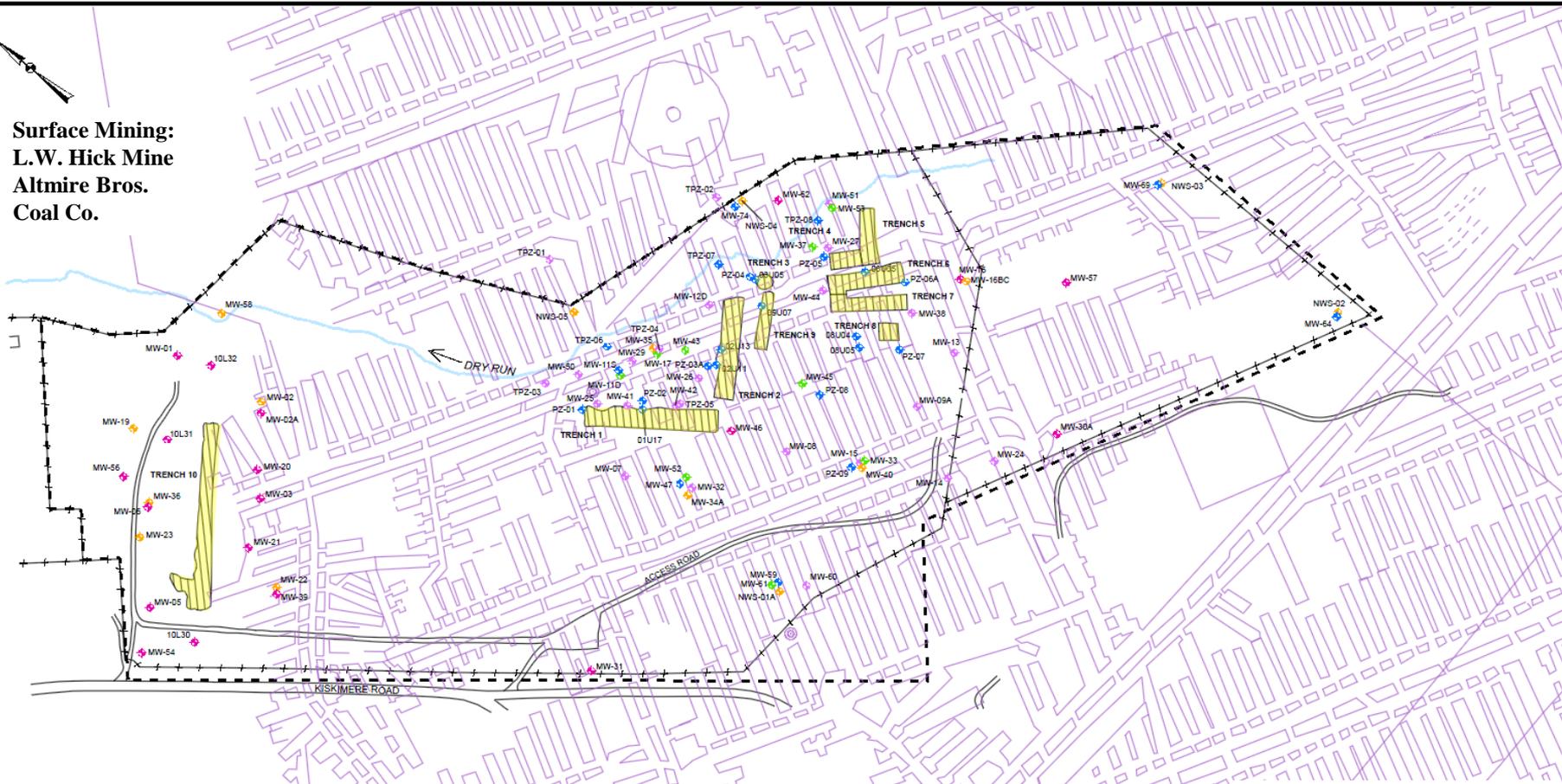
December 2003



May 2013 water levels are ± 2-3 feet and show same flow directions.

Upper Freeport Coal Mine

**Surface Mining:
L.W. Hick Mine
Altmire Bros.
Coal Co.**



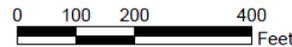
Legend

- ◆ Monitoring Well Location
- ◆ Overburden Zone
- ◆ First Shallow Bedrock Zone
- ◆ Second Shallow Bedrock Zone
- ◆ Upper Freeport Zone
- ◆ Deep Bedrock Zone
- ◆ Flute Multiport Sampling System (1SB, 2SB, UF, and DB Zones)
- ×-×-× Chain Link Fence
- - - Site Boundary
- ▨ Approximate Limits of Disposal Trenches from Geophysical Survey
- Mine Workings

NOTE: Mine workings were reproduced from electronic files provided by ARCO.

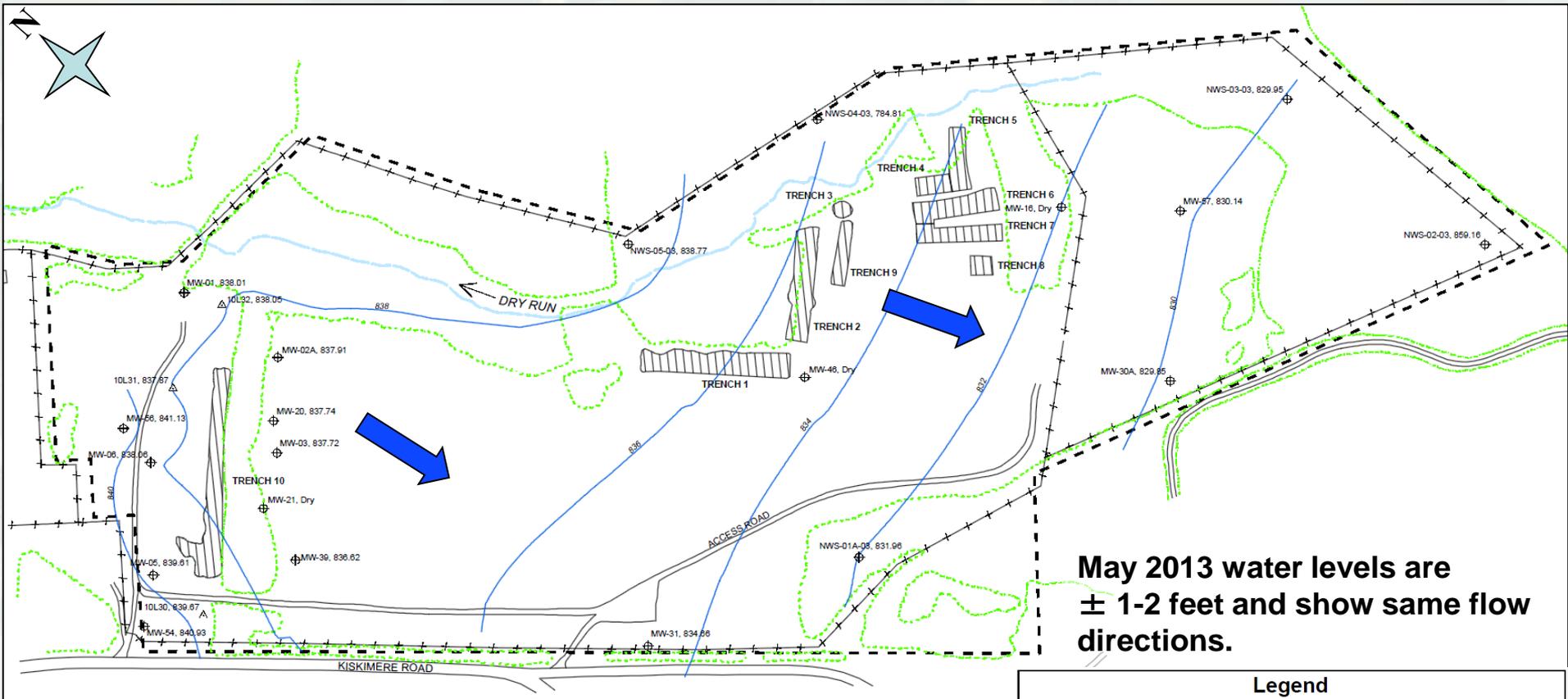
**Deep Mining by
Leechburg Mining Company**

SHALLOW LAND DISPOSAL AREA
MINE WORKINGS



Groundwater Flow – Upper Freeport Coal

December 2003



May 2013 water levels are \pm 1-2 feet and show same flow directions.

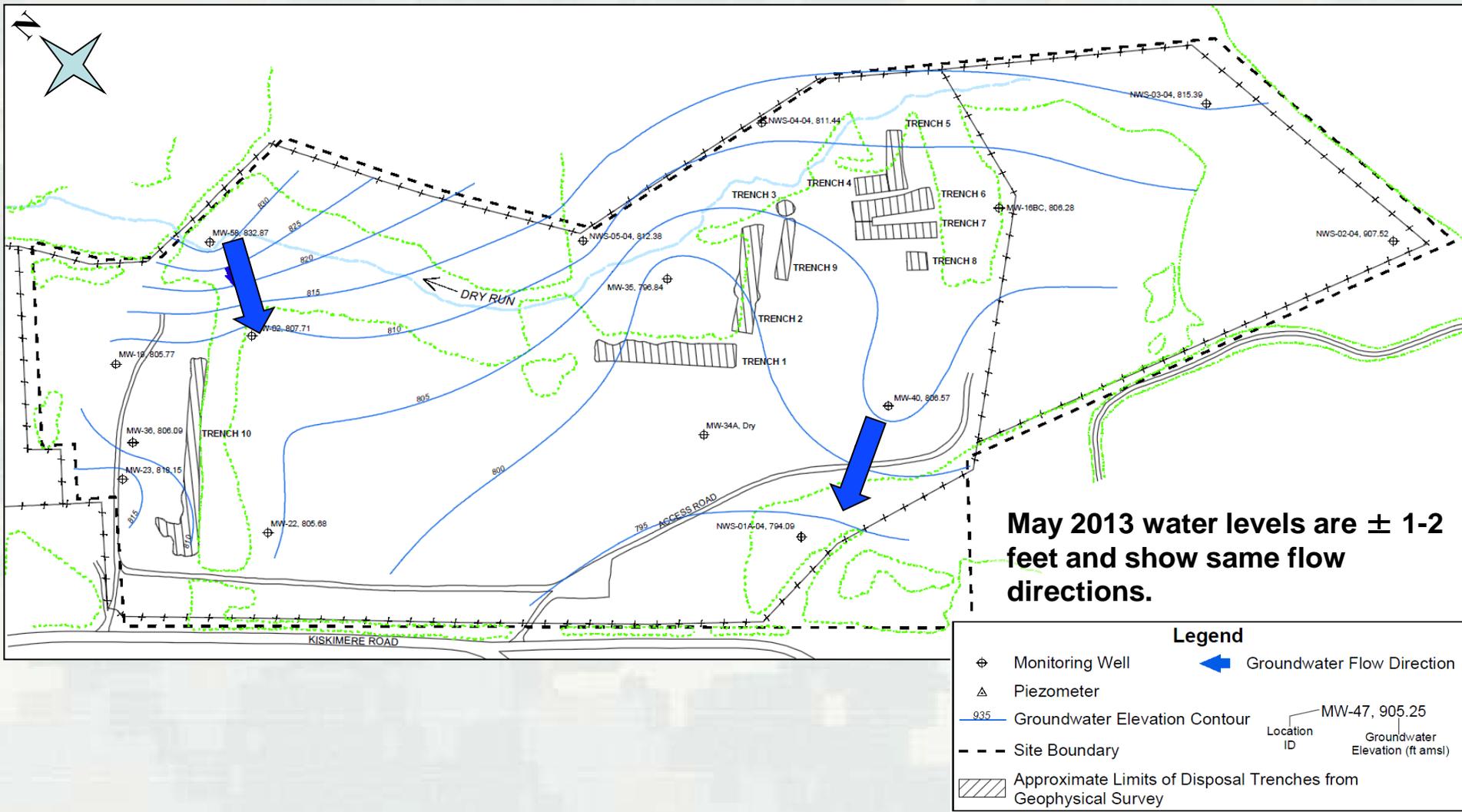
Legend

- \oplus Monitoring Well
- \triangle Piezometer
- Groundwater Elevation Contour
- Site Boundary
- Approximate Limits of Disposal Trenches from Geophysical Survey
- Groundwater Flow Direction

Location ID: MW-47, 905.25
 Groundwater Elevation (ft amsl)

Groundwater Flow – Deep Bedrock Zone

December 2003



SLDA Groundwater Sampling Events

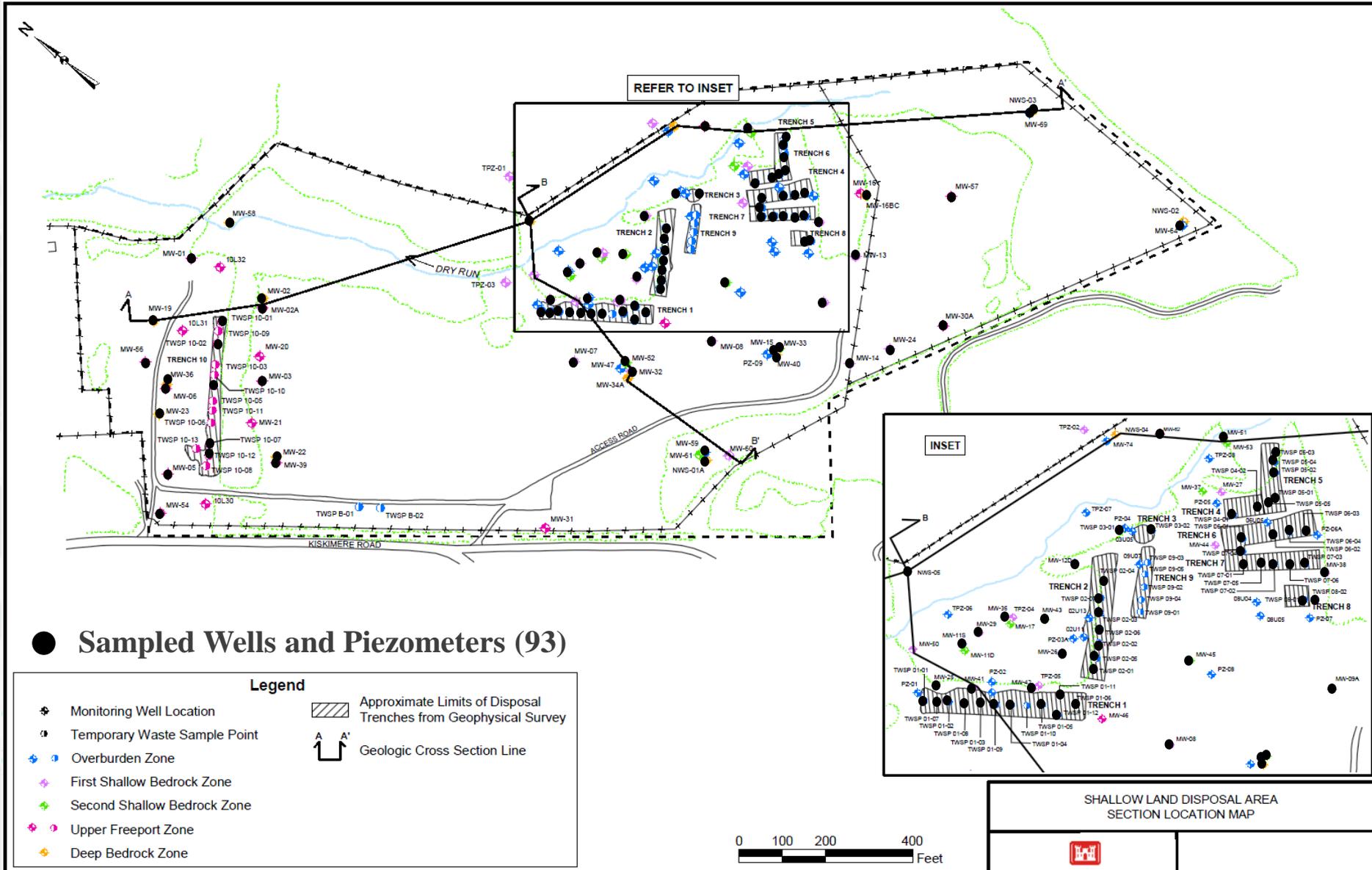
- **Remedial Investigation:**
 - December 2003 and June 2004
 - 108 water levels obtained throughout five zones
 - 93 monitoring wells and trench piezometers sampled

- **Remedial Action (during excavation period):**
 - 14 wells in three upper zones down-gradient of Trenches 1-9
 - Monthly sampling from April 2011 to December 2011

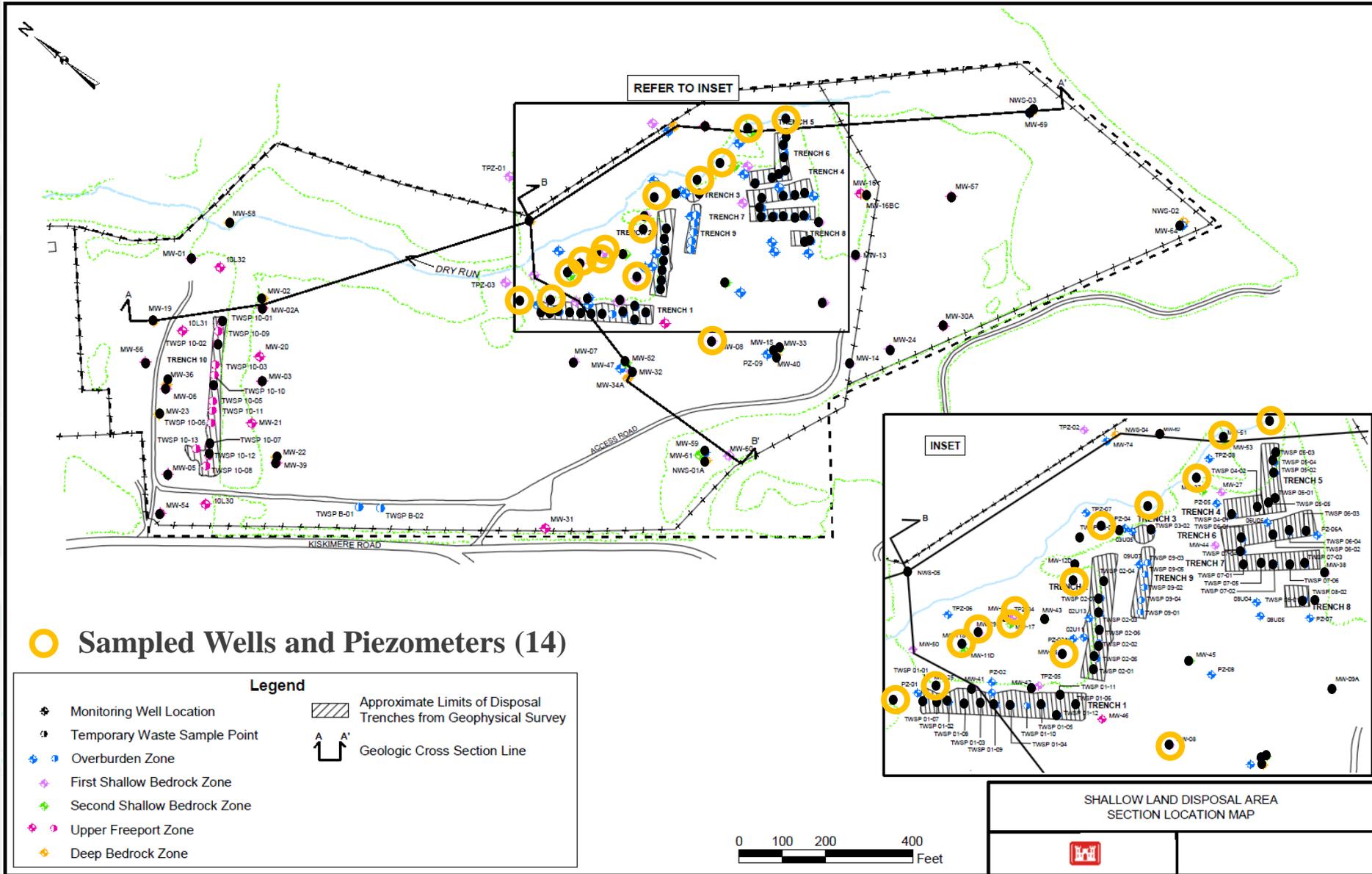
- **Annual Groundwater Sampling (new in 2013):**
 - Spring sampling (May 2013 completed)
 - 24 wells spanning five water-bearing zones between Trenches and Kiskimere



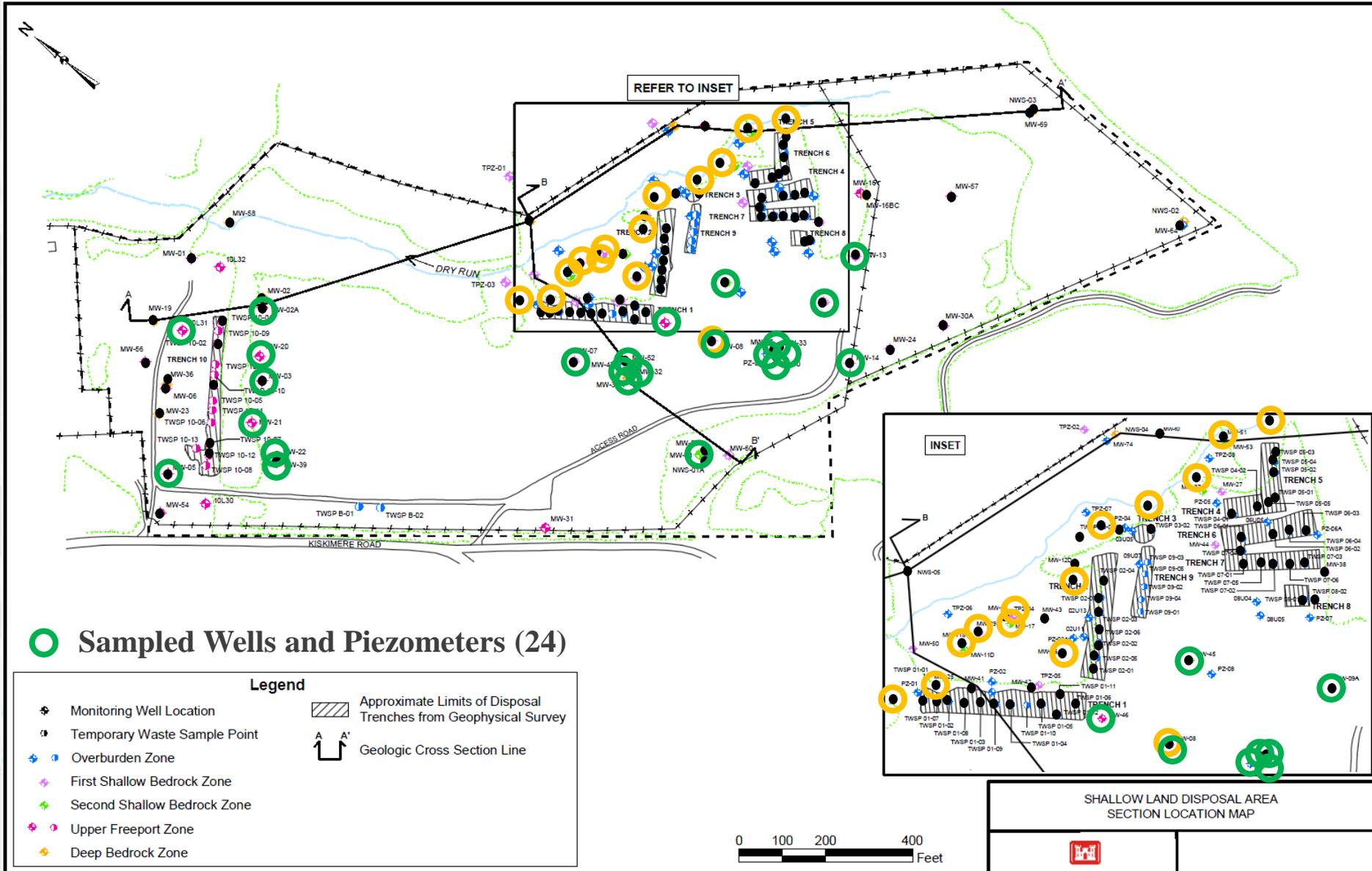
2003-2004 Groundwater Sampling Locations



2011 Groundwater Sampling Locations



Annual Groundwater Sampling Plan



What We Looked For In Groundwater

FUSRAP Related Radionuclides (radioactive metal isotopes):

- Uranium: U-234, U-235, U-238
- Thorium: Th-232
- Plutonium: Pu-239/240, Pu-241
- Americium: Am-241
- Radium: Ra-228
- 15 other radionuclides to ensure site profile is understood

Groundwater Geochemistry Suite:

- 24 Metals (such as Arsenic, Calcium, Iron, Magnesium)
- Common Anions (sulfate, chloride, fluoride, carbonate)
- Industrial Chemicals:
 - Volatile Organic Compounds (VOCs)
 - Semi-volatile Organic Compounds (SVOCs)



SLDA Groundwater Summary

- No evidence of off-site migration of radionuclides
 - Confirmed by USEPA sampling
- Groundwater results from 2013 are consistent with previous sampling results (2003-2004, 2011)
- The radionuclides detected in groundwater are less than USEPA, PADEP, or NRC drinking-water standards
- No change in the presence of industrial chemicals near upper trenches
- Annual groundwater sampling will continue during the Corps' presence



Future Groundwater Activities

- USACE released data report in December 2013
 - Includes 2011 sampling information
- USACE will continue to collaborate with the USEPA and annually sample wells
- Monthly sampling to restart once remedial action begins
- Monthly and annual groundwater sampling programs will occur throughout the USACE remedial action
- Annual groundwater monitoring reports will be generated



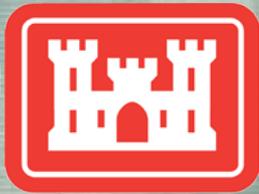
Contact Us

US Army Corps of Engineers
Pittsburgh and Buffalo District
SLDA FUSRAP Team

<http://www.lrp.usace.army.mil>

daniel.w.jones@usace.army.mil

1-412-395-7502



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- Welcome and Introductions
- Where we are in the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Process
- Overview of accomplishments and Remedial Investigation Report (RIIR) conclusions
- Follow up on public comments received since the RIIR Public Information Session #1
- Future Actions - RIIR Addendum/F Feasibility Study
- Question and information session

Back-up Slides for Q&A



SLDA Groundwater Sampling Specifics

- 99 of 114 wells have been sampled on site for up to 22 radionuclides (2003-2013)

- 2003-2004 and 2013 efforts:
 - 1,486 groundwater sampling results
 - 83% of results showed no detectable radionuclides
 - Natural radioactive elements were seen in 200 results

- Less than 5% of detections are not naturally occurring radionuclides – all below drinking water standards

- 2011 sampling produced similar results (mainly naturally occurring isotopes)



SLDA Groundwater Sampling Summary

Average Total Radionuclides (2003-2004, 2013)

ANALYTE	UNITS	SLDA Groundwater Zone				
		Overburden Soil	First Shallow Bedrock	Second Shallow Bedrock	Upper Freeport Coal	Deep Zone
AMERICIUM-241	PCI/L	--	0.12 (3/38)	--	0.11 (1/28)	0.11 (1/24)
BERYLLIUM-7	PCI/L	--	--	--	--	--
BISMUTH-212	PCI/L	--	--	--	--	--
CESIUM-137	PCI/L	--	--	--	--	--
COBALT-60	PCI/L	--	--	--	--	--
GROSS ALPHA	PCI/L	2.73 (1/5)	128.0 (1/5)	--	--	--
GROSS BETA	PCI/L	--	88.04 (2/5)	4.50 (1/1)	3.54 (2/2)	--
LEAD-212	PCI/L	--	--	--	--	--
LEAD-214	PCI/L	--	--	--	--	--
PLUTONIUM-238	PCI/L	0.26 (1/5)	0.13 (3/12)	0.16 (1/3)	0.18 (5/9)	0.15 (1/5)
PLUTONIUM-239/240	PCI/L	0.09 (2/9)	0.04 (1/38)	--	0.09 (1/28)	0.10 (2/24)
PLUTONIUM-241	PCI/L	--	5.00 (2/38)	--	--	--
PLUTONIUM-242	PCI/L	--	--	--	--	--
POTASSIUM-40	PCI/L	47.90 (1/1)	87.40 (1/5)	--	--	--
RADIUM-226	PCI/L	1.29 (1/1)	2.90 (3/5)	--	0.69 (1/2)	1.09 (1/2)
RADIUM-228	PCI/L	2.38 (3/7)	3.65 (13/31)	1.44 (2/9)	1.79 (4/22)	2.73 (8/21)
THORIUM-228	PCI/L	0.63 (2/2)	0.75 (2/7)	0.82 (1/2)	1.80 (3/6)	0.64 (2/2)
THORIUM-230	PCI/L	--	0.48 (2/12)	--	0.47 (2/8)	1.05 (1/4)
THORIUM-232	PCI/L	10.70 (1/9)	0.80 (2/38)	--	2.78 (5/28)	0.04 (1/24)
THORIUM-234	PCI/L	--	--	--	--	--
URANIUM-234	PCI/L	3.90 (2/9)	1.30 (7/38)	1.36 (6/11)	2.19 (7/28)	0.59 (9/24)
URANIUM-235	PCI/L	0.06 (1/9)	0.57 (2/38)	--	0.09 (1/28)	--
URANIUM-238	PCI/L	7.55 (1/9)	0.42 (5/38)	0.73 (4/11)	1.66 (5/28)	0.52 (1/24)
TOTAL URANIUM	UG/L	0.16 (2/2)	0.23 (7/7)	0.34 (2/2)	1.23 (6/6)	0.20 (2/2)

NOTE: Values represent: average of samples (detections / total samples)
 -- Indicates constituent was not detected in water samples

SLDA Groundwater Sampling Summary

Average Dissolved Radionuclides (2013)

ANALYTE	UNITS	SLDA Groundwater Zone				
		Overburden Soil	First Shallow Bedrock	Second Shallow Bedrock	Upper Freport Coal	Deep Zone
AMERICIUM-241	PCI/L	--	0.11 (4/7)	0.09 (1/2)	0.10 (1/4)	--
PLUTONIUM-238	PCI/L	0.17 (1/2)	0.17 (3/7)	0.14 (1/2)	0.19 (3/4)	--
PLUTONIUM-239/240	PCI/L	0.07 (2/2)	0.08 (2/7)	0.08 (1/2)	0.04 (1/4)	--
PLUTONIUM-241	PCI/L	--	--	--	8.18 (1/4)	4.84 (1/2)
THORIUM-228	PCI/L	--	0.70 (4/7)	--	--	0.64 (1/2)
THORIUM-230	PCI/L	--	0.06 (1/7)	0.03 (1/2)	--	--
THORIUM-232	PCI/L	--	--	--	--	--
URANIUM-234	PCI/L	--	0.63 (5/7)	0.20 (2/2)	0.70 (2/4)	0.11 (1/2)
URANIUM-235	PCI/L	--	0.20 (1/7)	--	0.13 (2/4)	0.08 (1/2)
URANIUM-238	PCI/L	--	0.13 (5/7)	0.05 (2/2)	0.10 (1/4)	--
TOTAL URANIUM	UG/L	0.16 (2/2)	0.24 (6/7)	0.28 (2/2)	0.28 (4/4)	0.13 (2/2)

- Radionuclides do not exceed EPA, PADEP, NRC drinking water standards
- Most results are non-detect or reflect up-gradient ranges



NOTE: Values represent: average of detected analyte (detections / total samples)
 -- Indicates constituent was not detected in samples

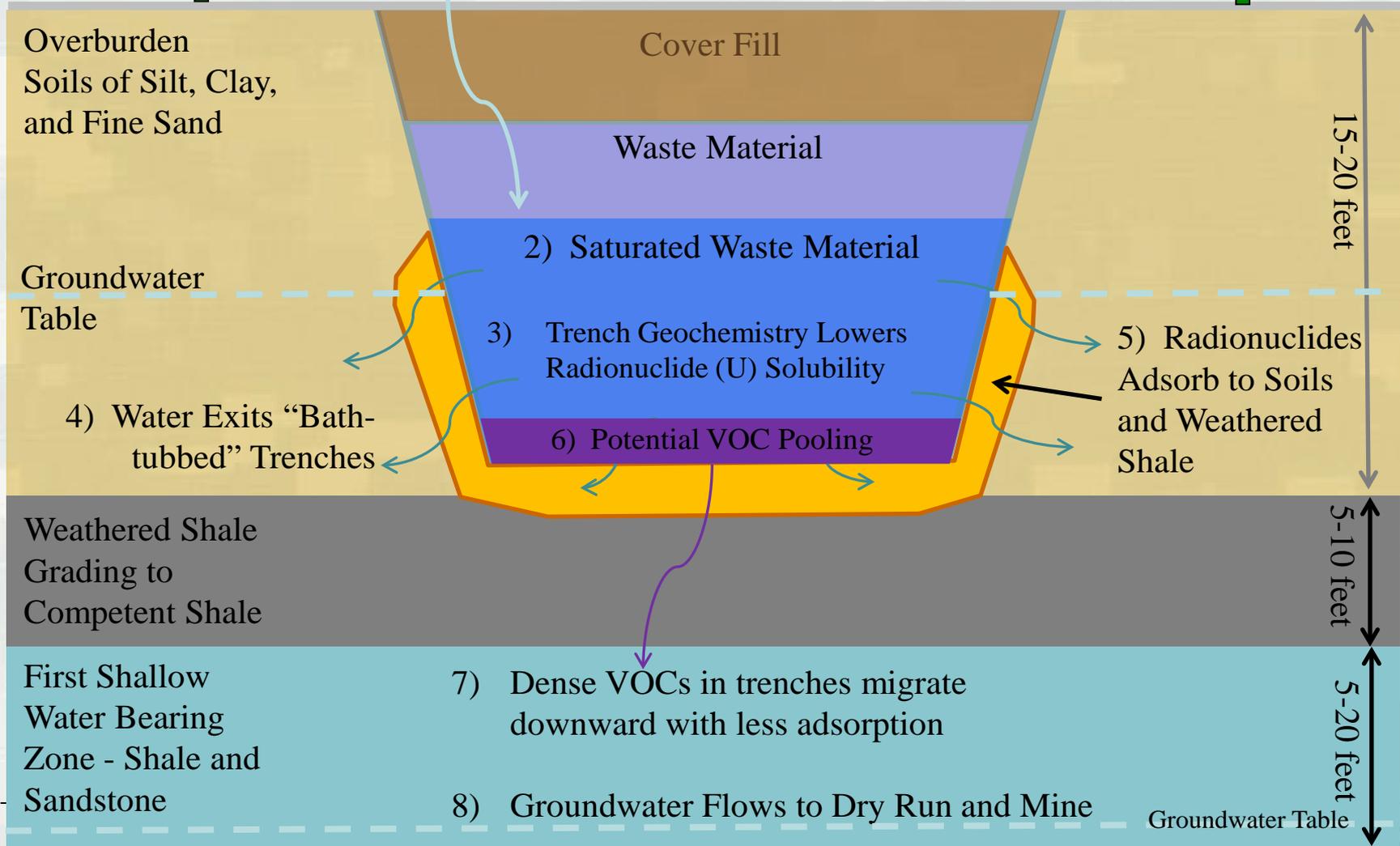
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SLDA Trench Transport Conceptual Model



Upper Trenches

1) Rain Infiltration



Overburden
Soils of Silt, Clay,
and Fine Sand

Cover Fill

Waste Material

Groundwater
Table

2) Saturated Waste Material

3) Trench Geochemistry Lowers
Radionuclide (U) Solubility

5) Radionuclides
Adsorb to Soils
and Weathered
Shale

4) Water Exits "Bath-
tubbed" Trenches

6) Potential VOC Pooling

Weathered Shale
Grading to
Competent Shale

First Shallow
Water Bearing
Zone - Shale and
Sandstone

7) Dense VOCs in trenches migrate
downward with less adsorption

8) Groundwater Flows to Dry Run and Mine

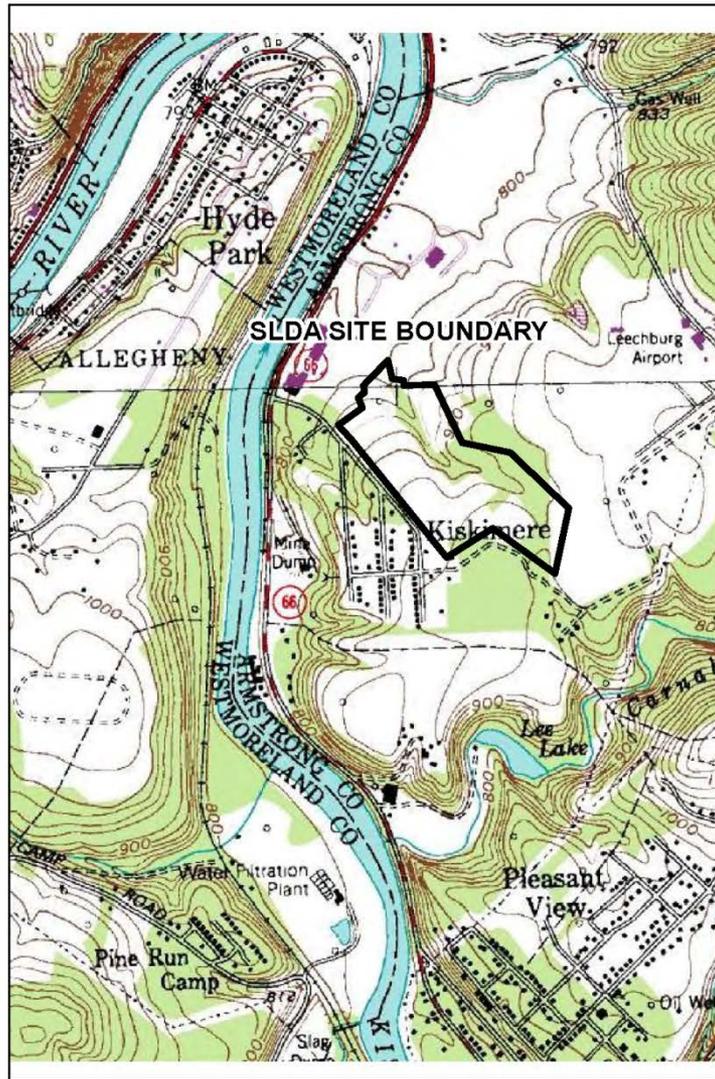
Groundwater Table

15-20 feet

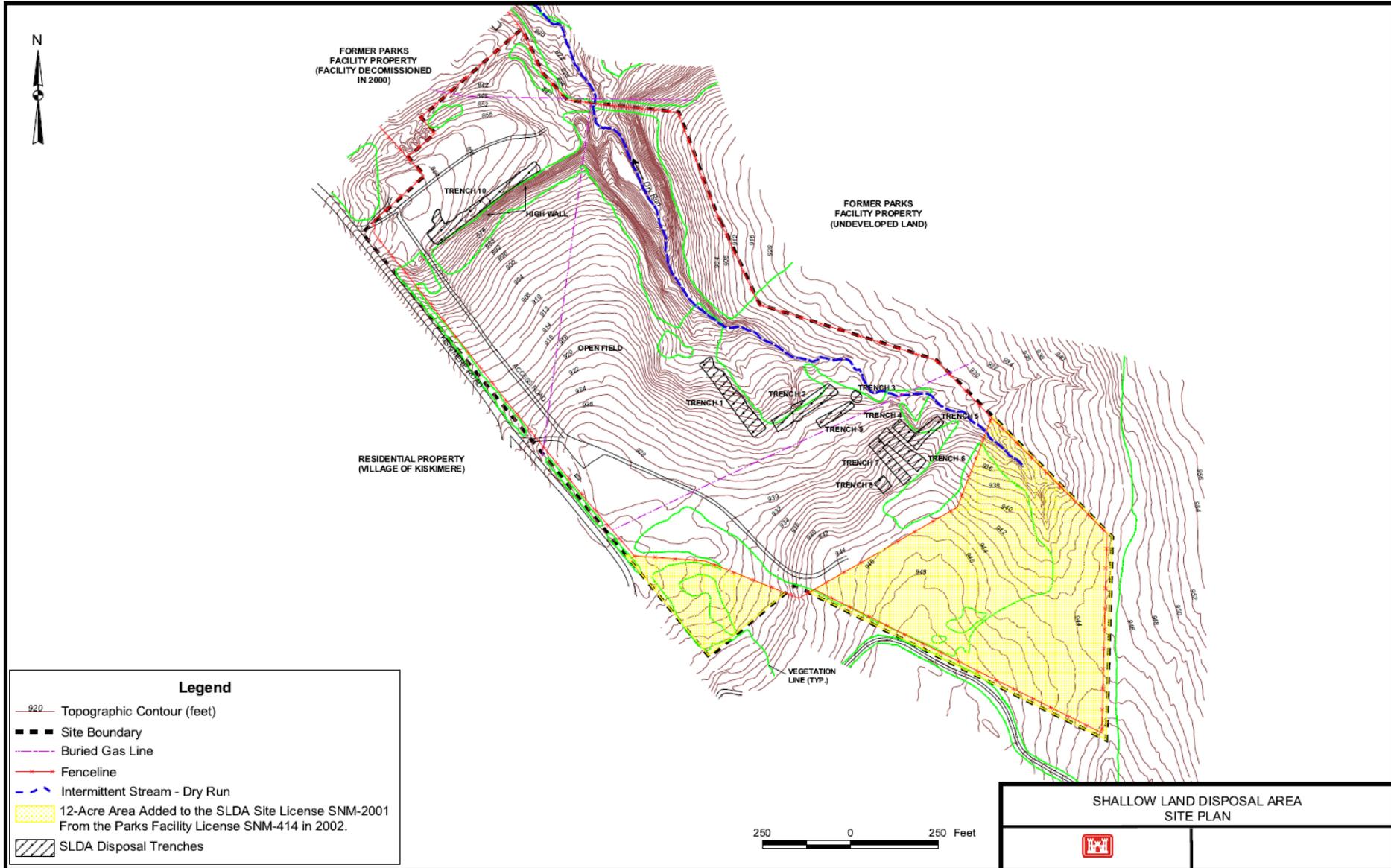
5-10 feet

5-20 feet

SLDA Site Location



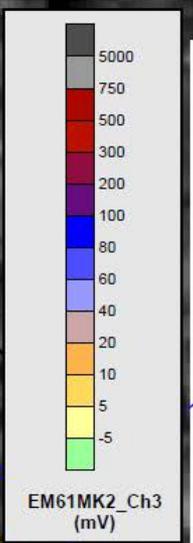
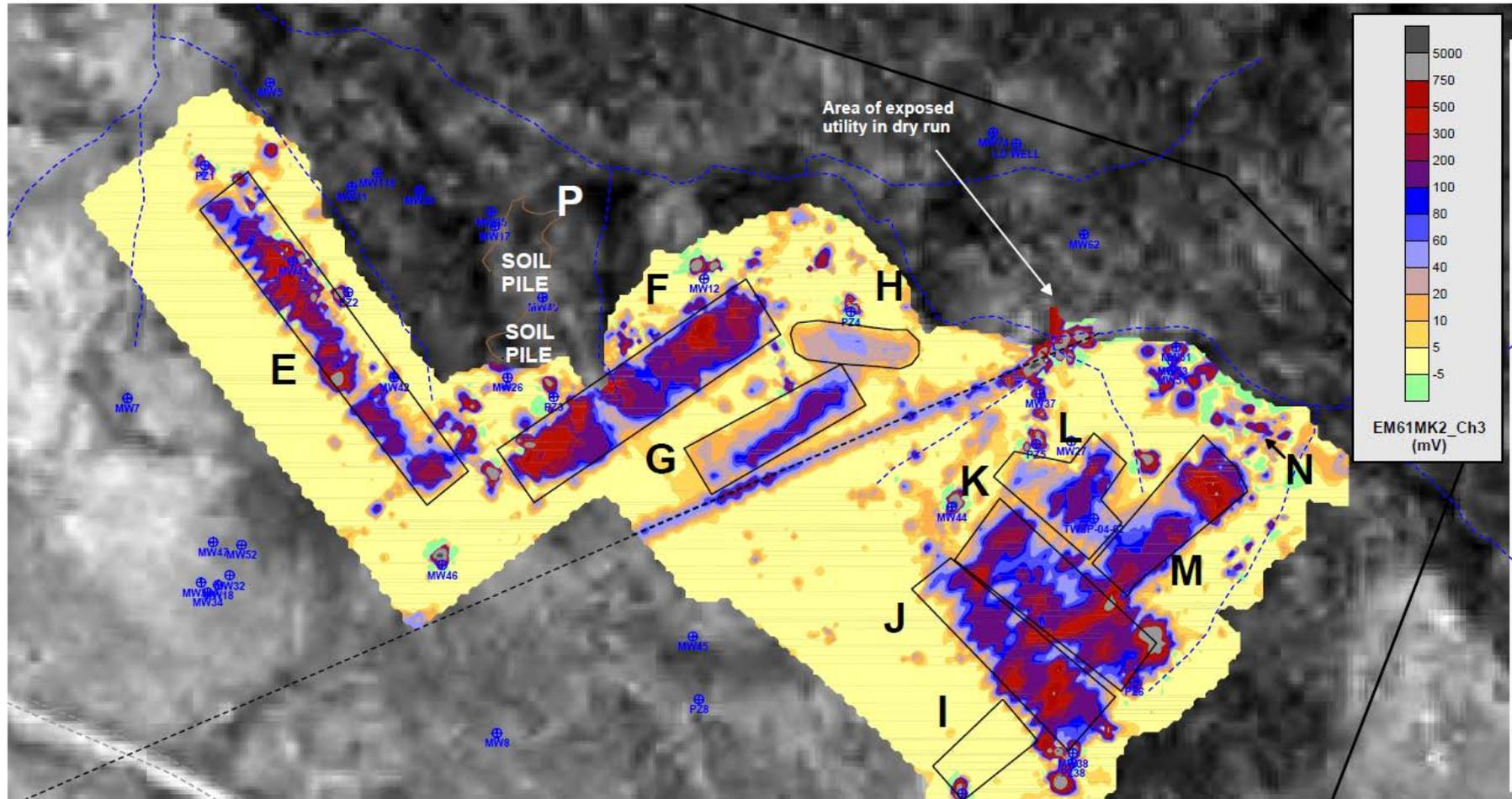
SLDA Site Physiography



SHALLOW LAND DISPOSAL AREA
SITE PLAN

SLDA Geophysical Survey – EM-61

Upper Trench Area



LEGEND

- North Arrow
- Monitoring Well Location and Identifier
- Road
- Fence Line
- Drainage Pattern
- Interpreted Underground Utility
- Anomaly Location and Identifier



Coordinates in US State Plane 1983,
PA South 3702, U.S. Feet

USACE - Pittsburgh District
SLDA - Parks Township, Pennsylvania

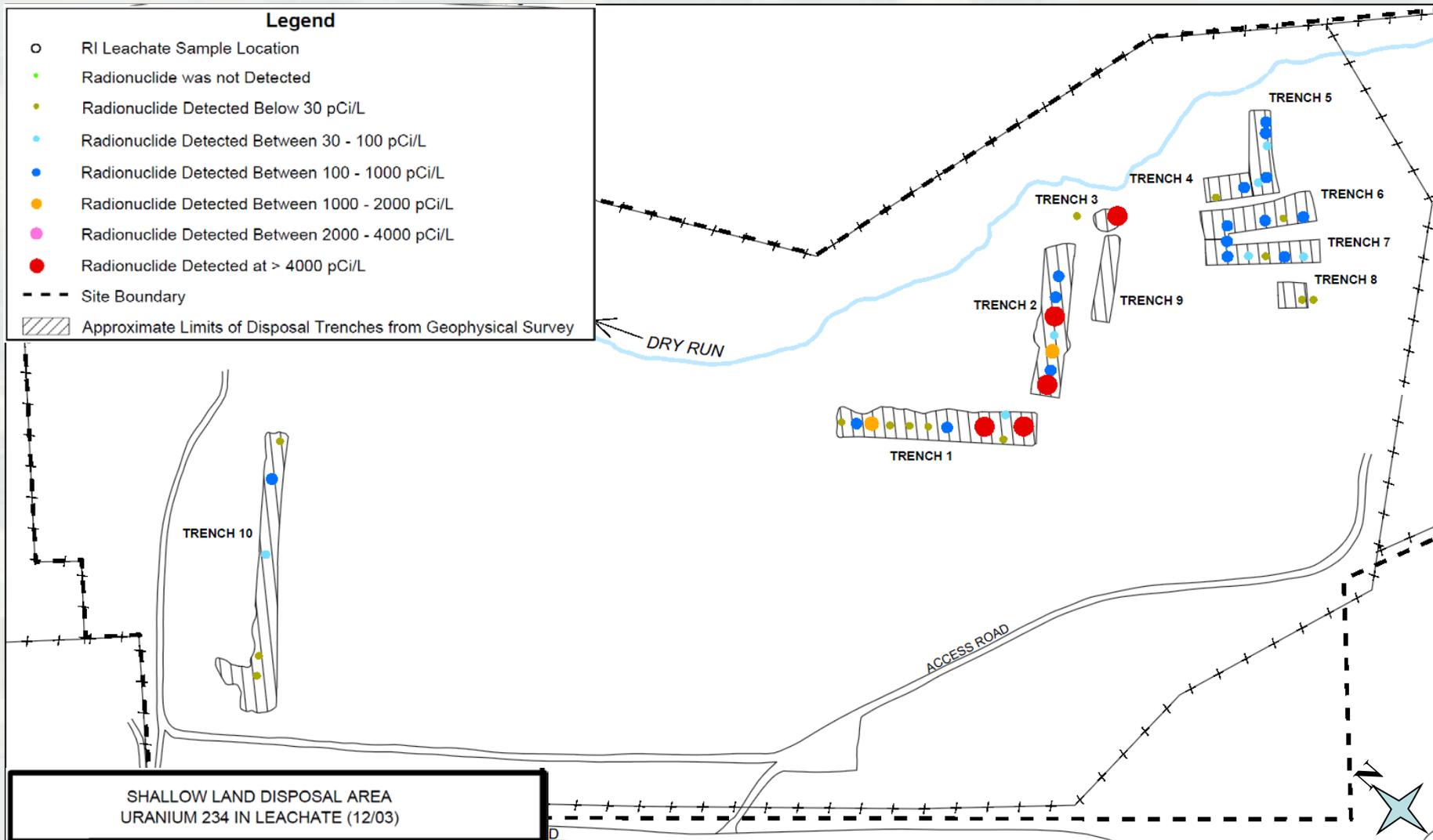
Geophysical Survey Results
EM61-MK2 Channel 3 Response Map -
Upper Trench Area

Drawn by: J. Warren	Checked by: T. Reeves	Reviewed by: J. Larrick	Figure no.:
Date: 10/20/06	Date: 10/17/06	Date: 10/24/06	Figure 17
Job no.: 01J-533-04-26 (A-10)	Scale:	Scale:	

SAIC Science Applications International Corporation
An Employee-Owned Company

SLDA Trench Water Sampling (12/2003)

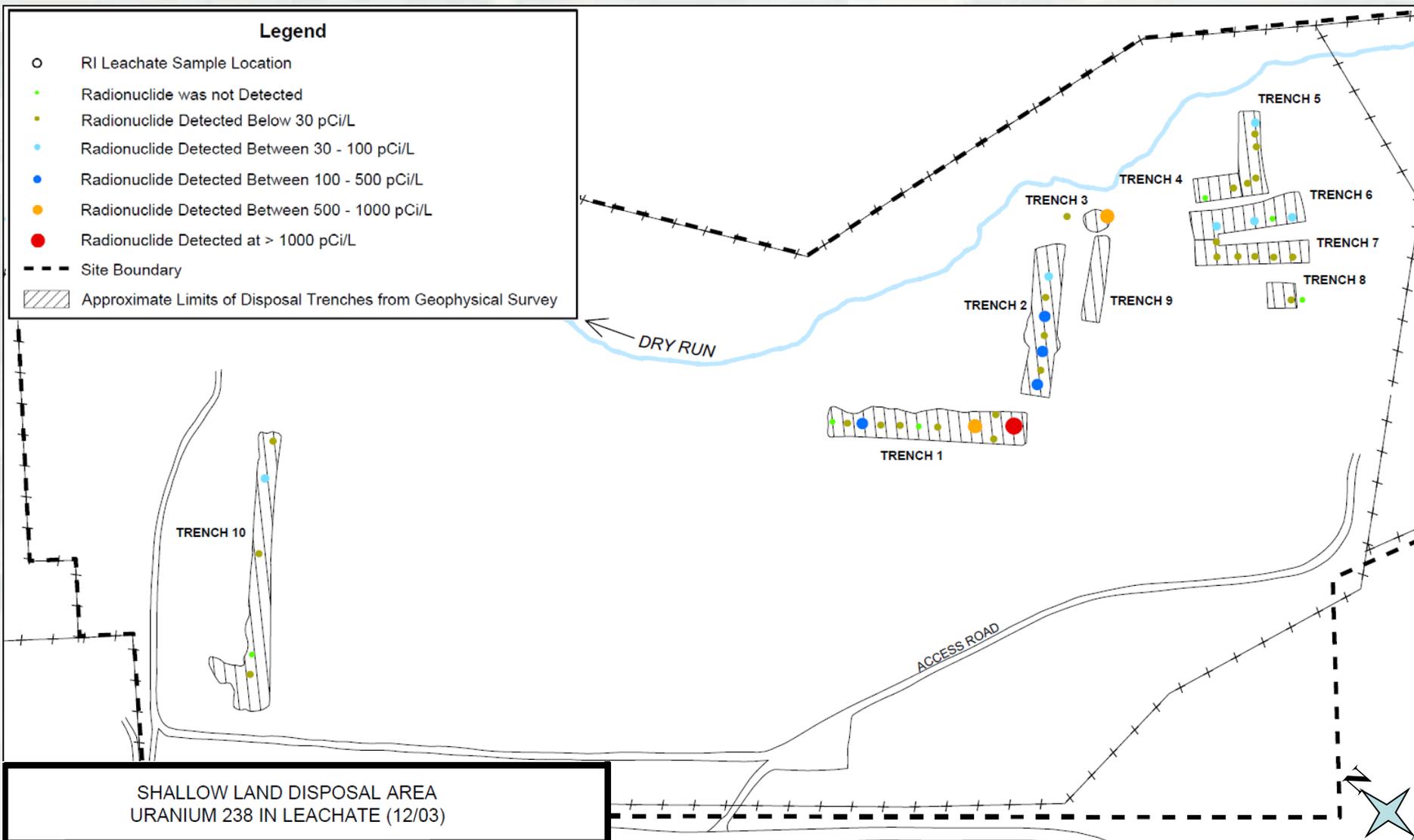
Uranium-234



SHALLOW LAND DISPOSAL AREA
URANIUM 234 IN LEACHATE (12/03)

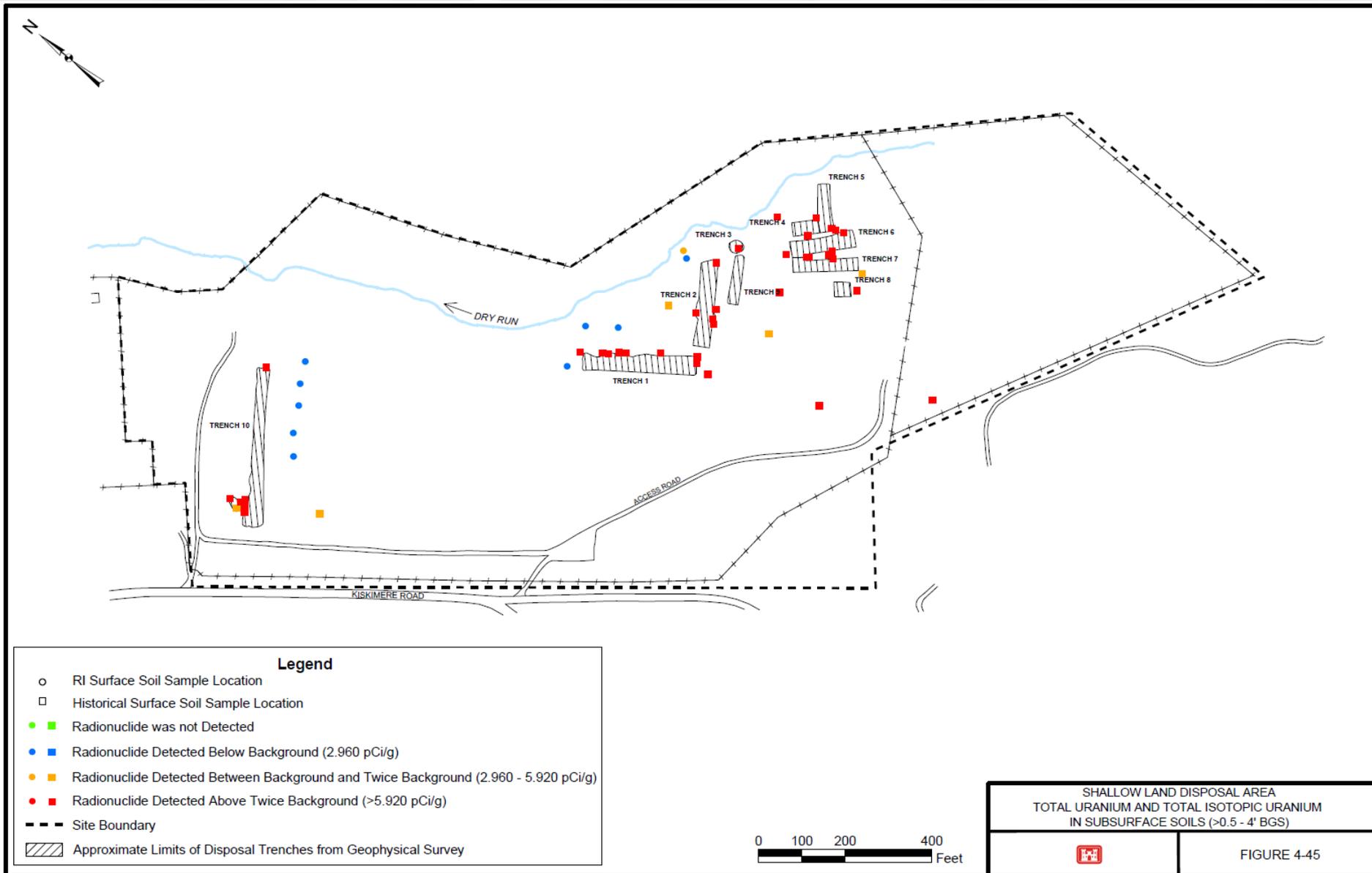
SLDA Trench Water Sampling (12/2003)

Uranium-238



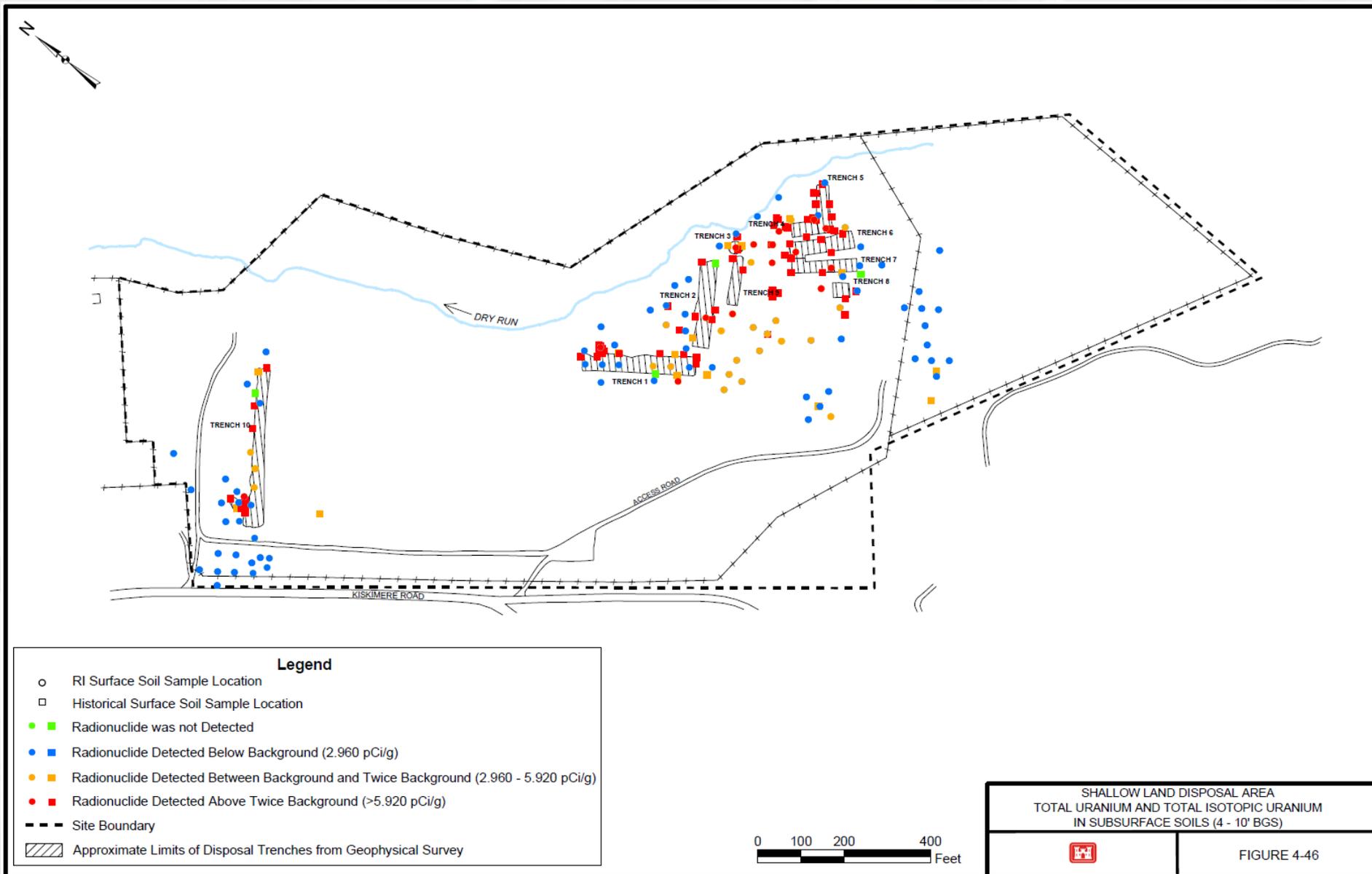
SLDA Soil Sampling

Total U and Total Isotopic U, 0.5 – 4 feet deep



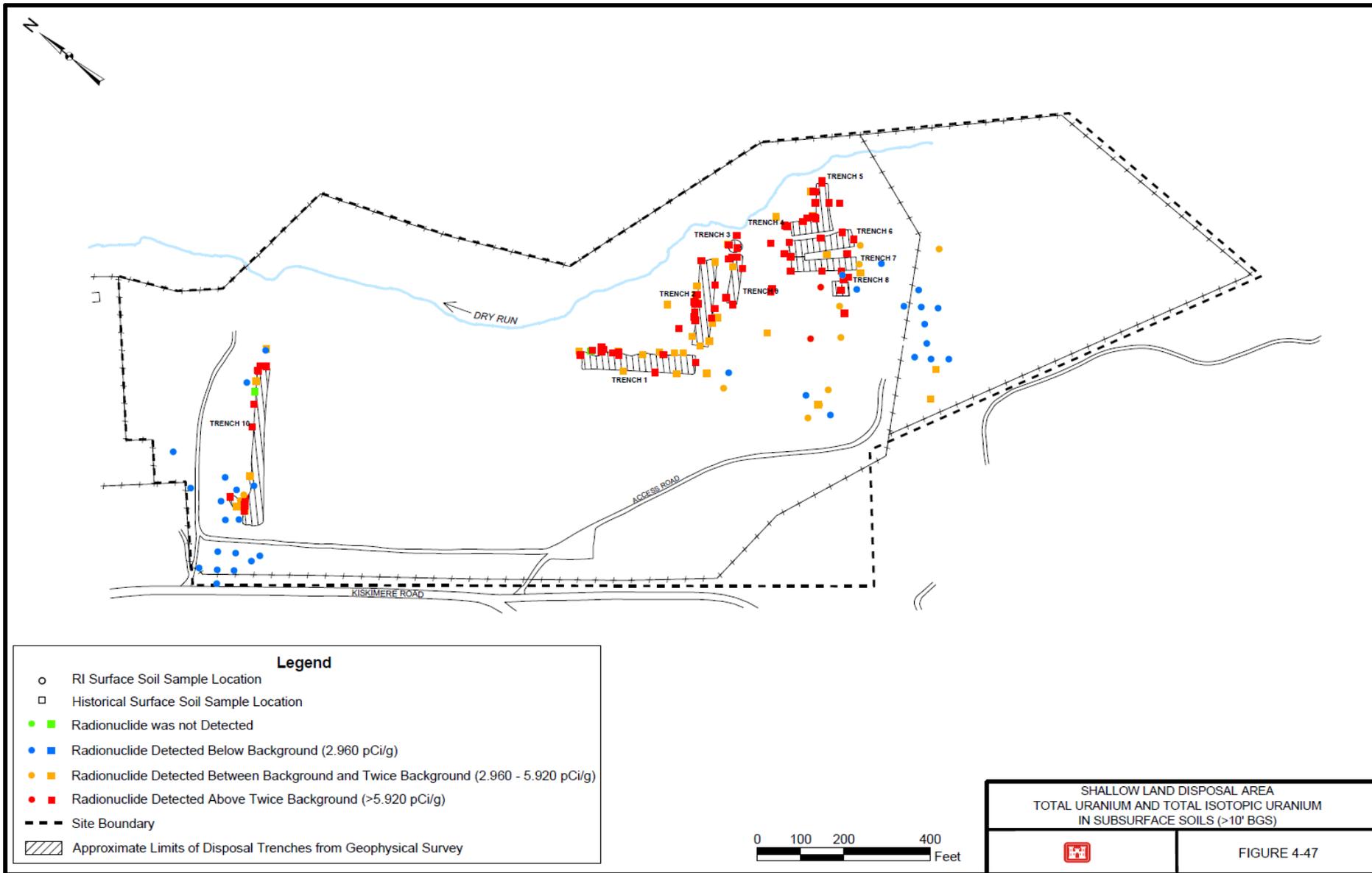
SLDA Soil Sampling

Total U and Total Isotopic U, 4-10 feet deep

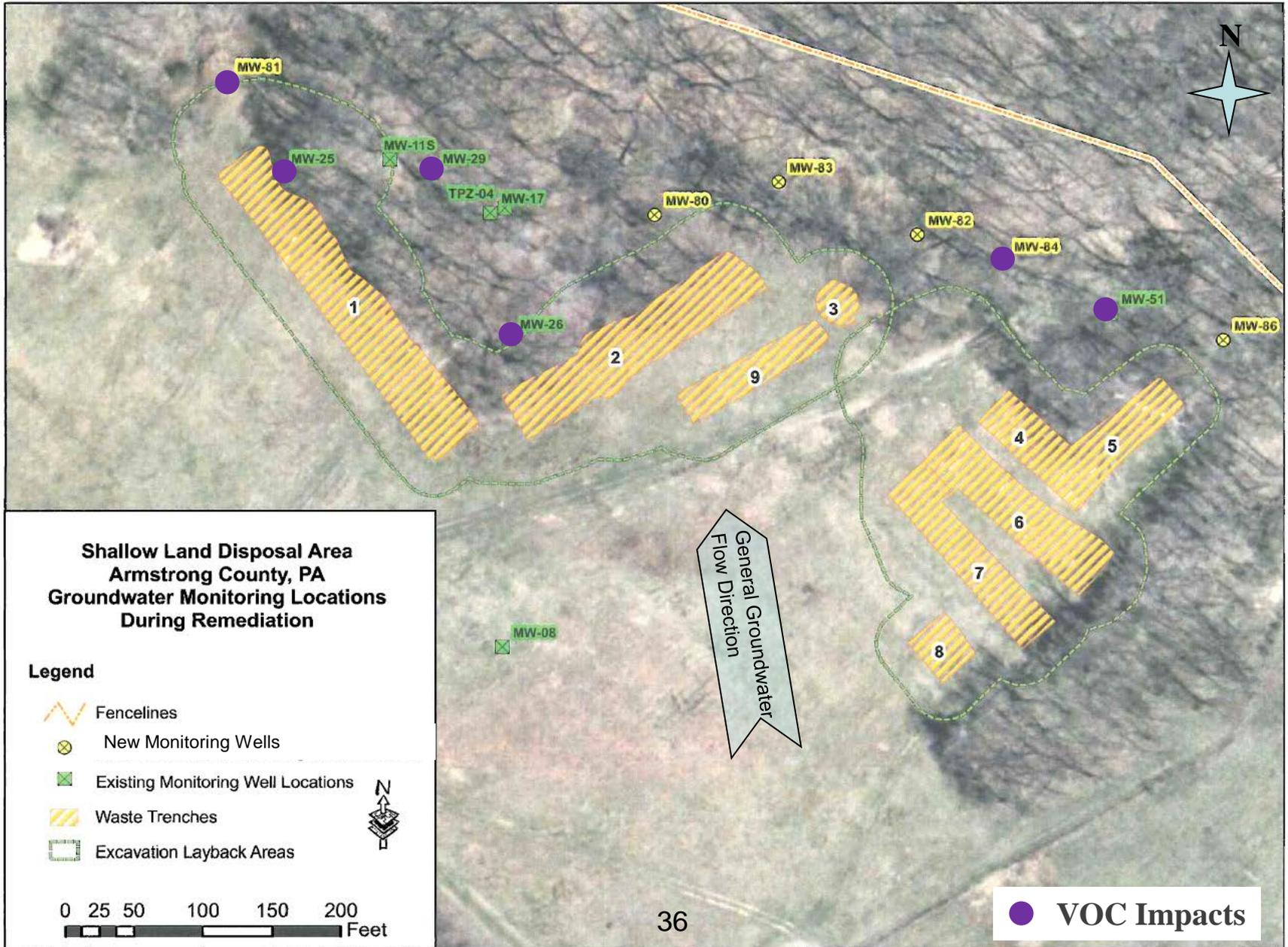


SLDA Soil Sampling

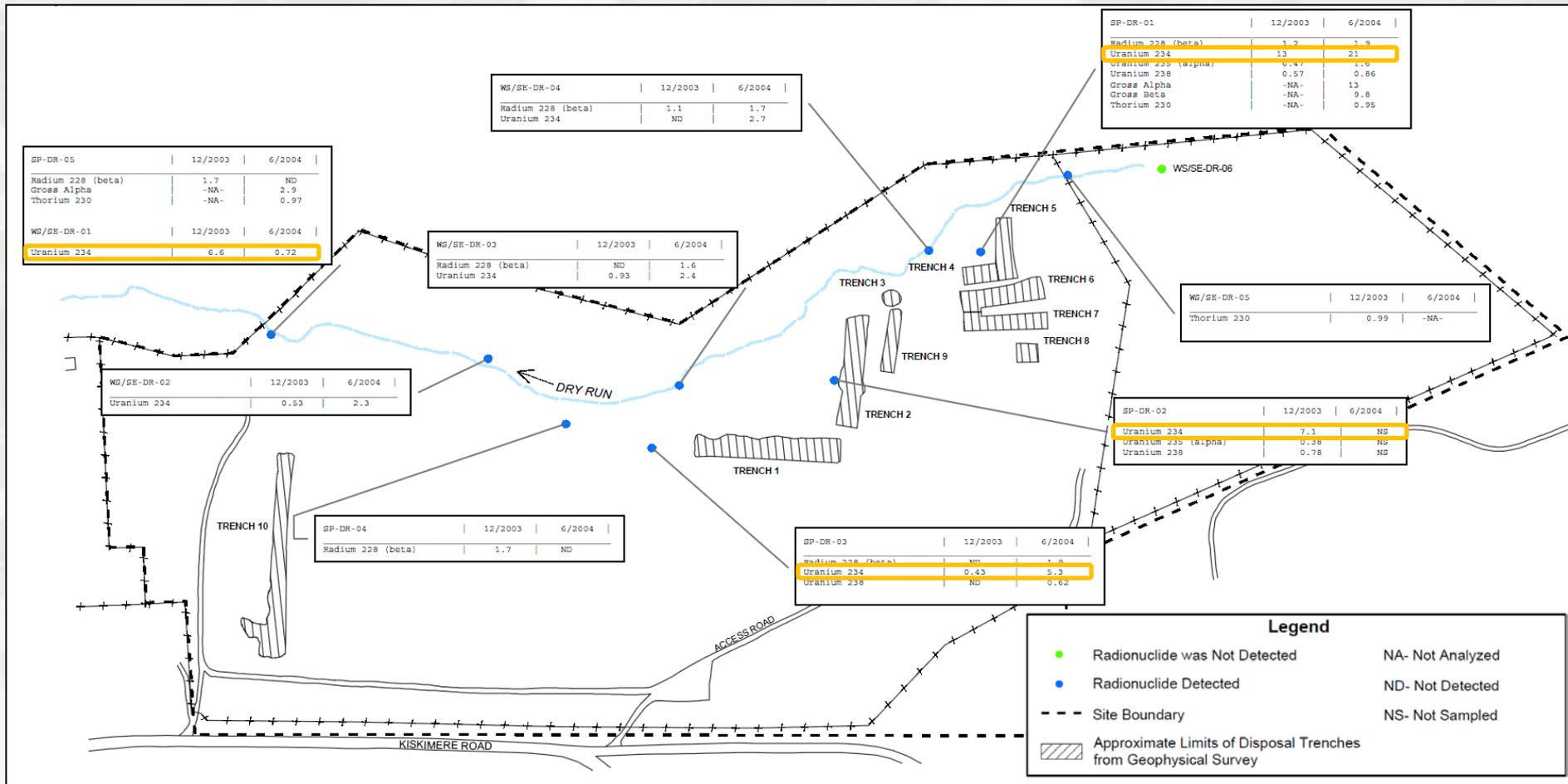
Total U and Total Isotopic U, >10 feet deep



2011 Remedial Action Sampling Locations



SLDA On-site Seep Sampling (2003)



Surface seep and Dry Run sampling indicates a 2x to 20x dilution along Dry Run



SLDA Off-site Surface-water Samples (2003)

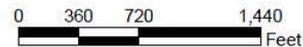


Legend

- Radionuclide was Not Detected
- Radionuclide Detected
- Site Boundary
- NA- Not Analyzed
- ND- Not Detected

Notes:

1. Only detected radionuclides are shown. Gamma spectroscopy data are not shown for AM-241, U-235, Ra-228, and Ra-226 since isotope specific analyses were completed.
2. All results reported in pCi/L.



SHALLOW LAND DISPOSAL AREA
SUMMARY OF DETECTIONS IN SURFACE WATER AND
MINE OUTFALL (CARNAHAN RUN RI SAMPLING)



FIGURE 4-86

SLDA Groundwater Sampling Results

2003-2013

- Radionuclides detected in groundwater:
 - U-234, U-235, U-238, Total U, Ra-228, Ra-226, Th-228, Th-230, Th-232, Pu-238, Pu-239, Pu-241, Am-241, K-40, gross alpha/beta
 - Radionuclides do not exceed EPA, PADEP, NRC drinking water standards
 - Most results reflect up-gradient ranges

- Radionuclides detected in trench water:
 - U-234, U-235, U-238, Ra-228, Ra-226, Th-230, Th-232, Pu-239, K-40, gross alpha/beta
 - Several radionuclides significantly exceed drinking water standards

