



US Army Corps
of Engineers
Buffalo District

Formerly Utilized Sites Remedial Action Program

PUBLIC MEETING

LINDE GROUNDWATER

PROPOSED PLAN

LTC. Timothy B. Touchette
Buffalo District Commander



US Army Corps
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Buffalo District

LINDE FUSRAP SITE, TONAWANDA, NY





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MEETING PURPOSE

- Describe the Proposed Plan for the Linde Groundwater Operable Unit
- Seek public input by June 30th for consideration in the Decision-Making Process



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AGENDA

- Introduction and Ground Rules
- Proposed Plan Presentation
- Seek formal comments in writing
- Accept Statements and Comments
- Q & A's



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GROUND RULES

- Individuals who wish to speak should indicate that on the sign-in card
- One person speaks at a time
- Speakers limited to five minutes to allow everyone an opportunity to speak
- Please use microphone when speaking



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Linde Groundwater

Project Presentation Linde Groundwater Proposed Plan

Raymond L. Pilon
Project Manager



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Former Linde Site Currently PRAXAIR Technology Center





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OUTLINE OF PRESENTATION

- Explain the study process
- Discuss History
- Explain our groundwater investigations
- Present the Preferred Alternative
- Accept Statements and Comments
- Q & A's



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WHAT IS FUSRAP

Formerly Utilized Sites Remedial Action Program (FUSRAP)

- Established in 1974
- Purpose is to investigate and, if necessary clean up residual contamination from our Nation's early atomic energy programs



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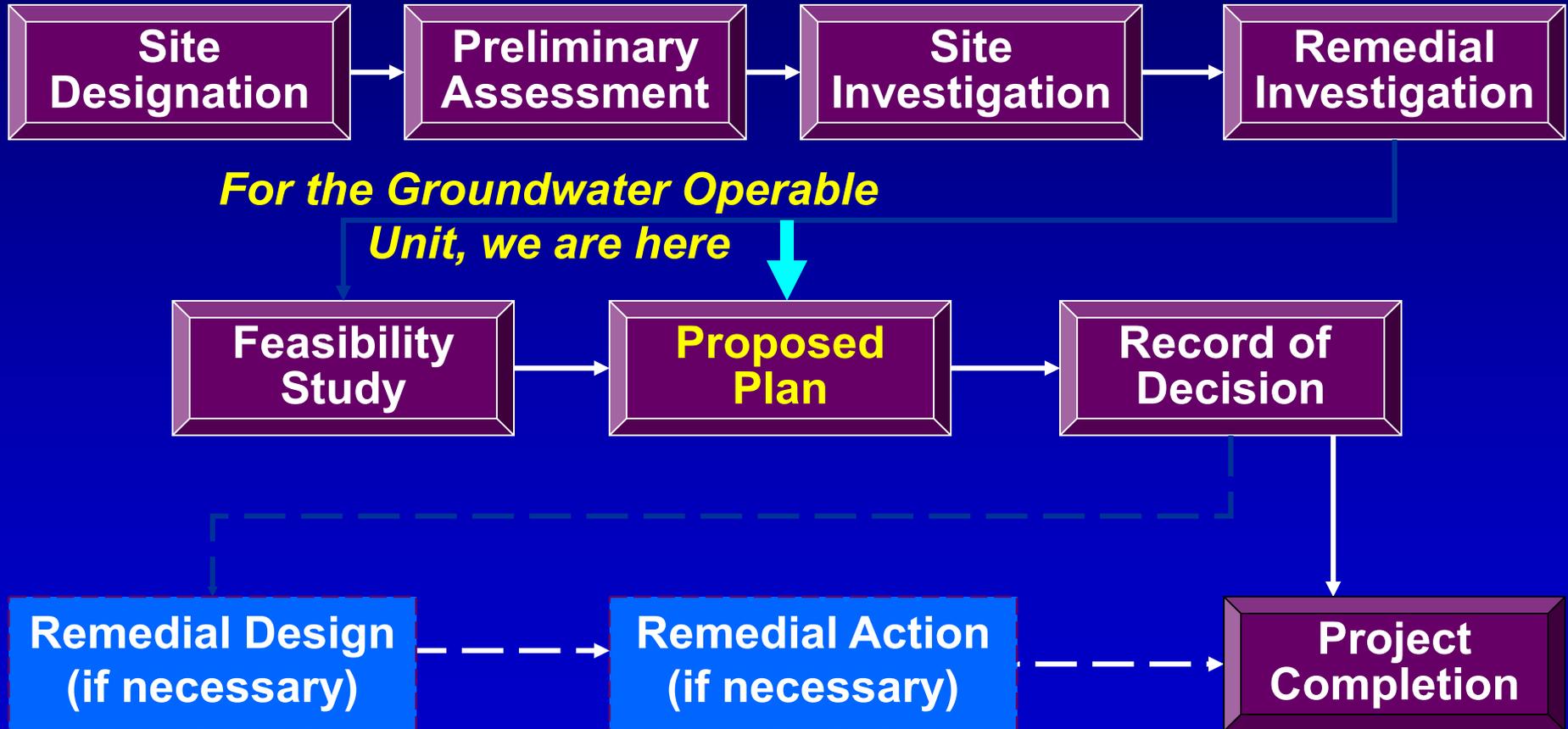
FUSRAP MISSION STATEMENT

- Protect human health and the environment
- Execute the program in the most safe, effective, and efficient manner
- Follow CERCLA process
 - CERCLA - Comprehensive Environmental Response, Compensation and Liability Act



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Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Process





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MAIN POINTS

- U.S. Army Corps of Engineers continues to remediate soil and building contamination at the Linde Site
- Groundwater Investigations are complete
 - GW is the last Operable Unit being addressed
- GW Proposed Plan presentation
- Written comments required by June 30, 2006



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The Former Linde Site

LOCALITY MAP

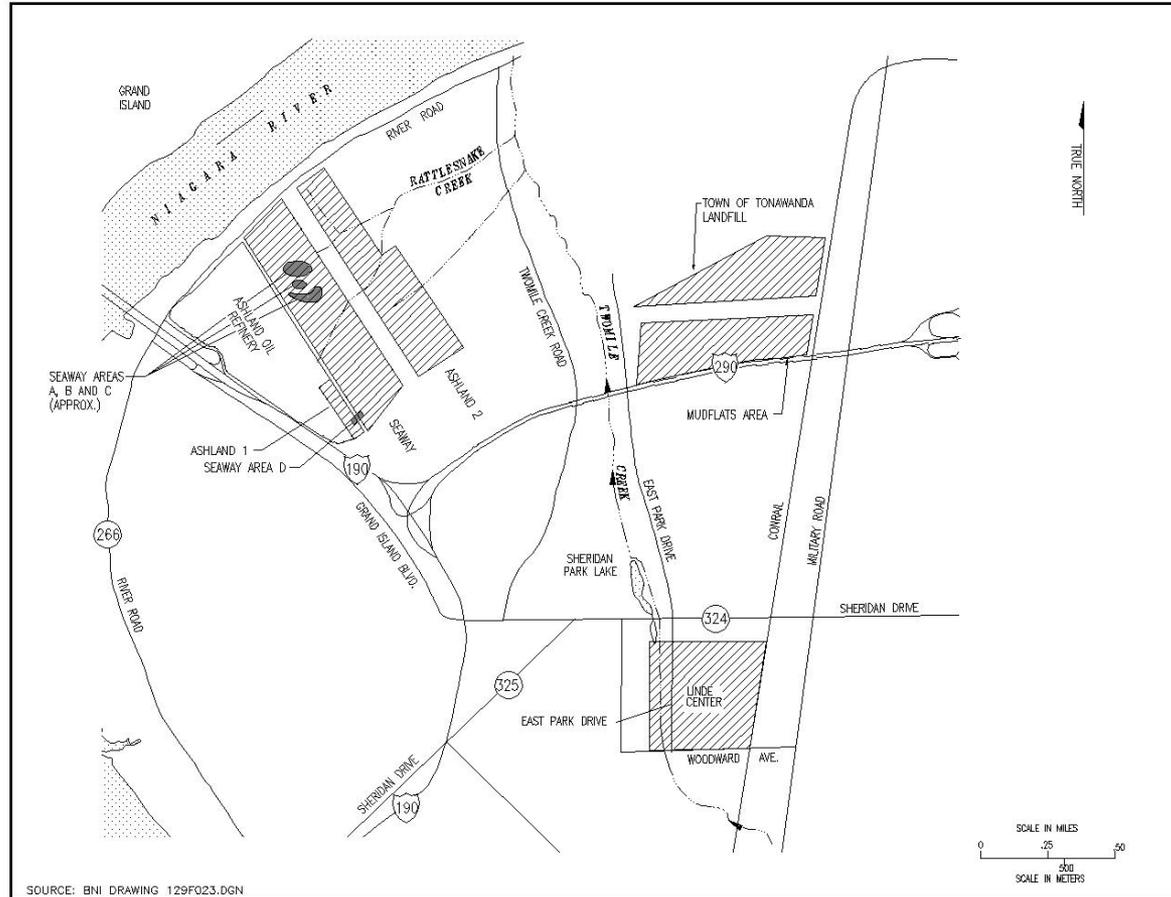
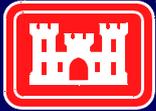
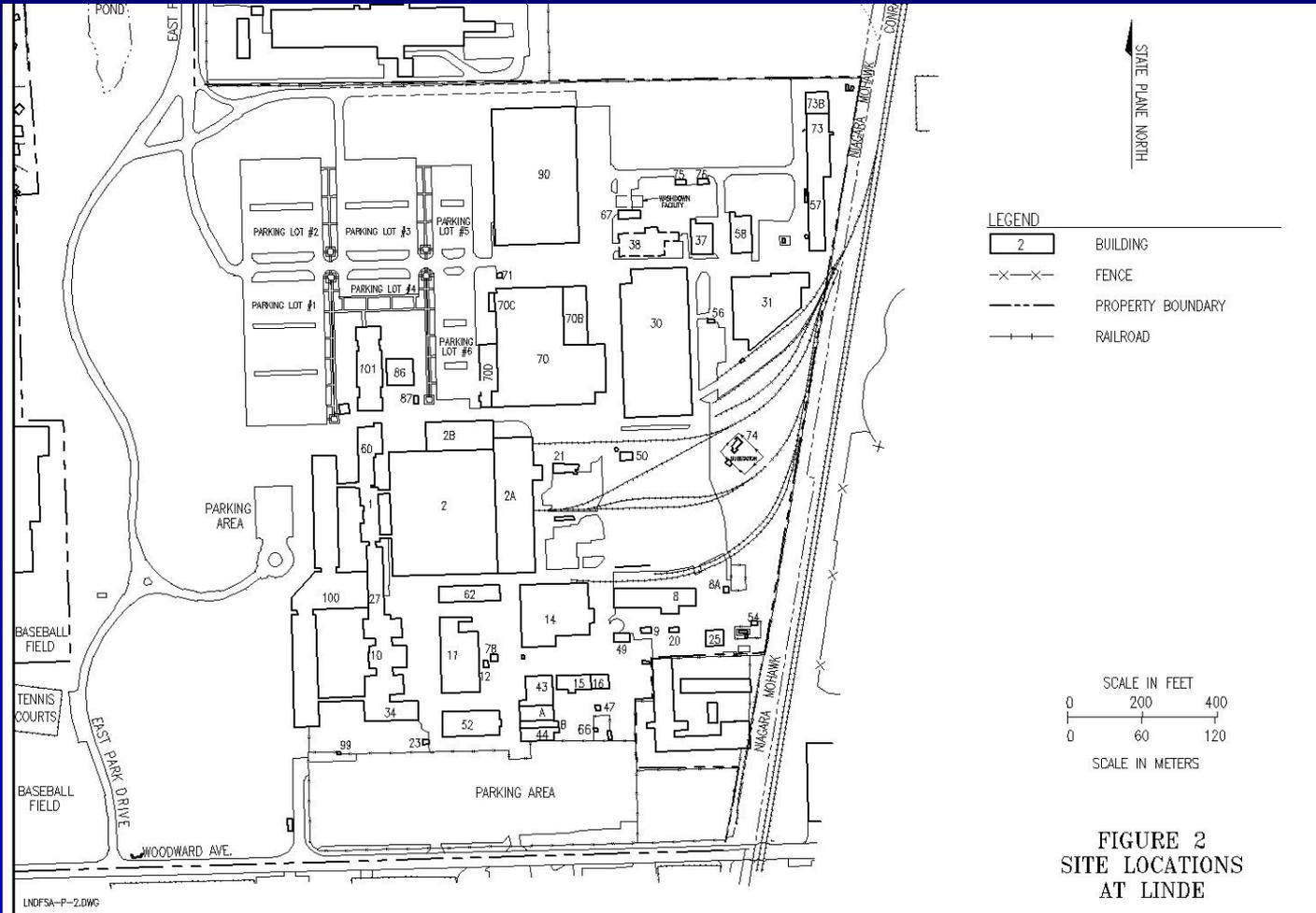


FIGURE 1
LOCATIONS OF ASHLAND 1, ASHLAND 2,
SEAWAY, LINDE AND THE TONAWANDA LANDFILL SITES



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The Former Linde Site





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The Former Linde Site

Background

- The former Linde site is 105 acres in size
- Site was used by the Government in the 1940s to process uranium ores for the Manhattan Engineering District
- Legacy results are residual low levels of radiological contamination at various locations
- Linde Site designated into FUSRAP in 1980



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The Former Linde Site

Background

In 1993, the Department of Energy (DOE) issued a:

- Remedial Investigation / Feasibility Study *
- Proposed Plan for the Tonawanda Sites

** Concluded natural high levels of total dissolved solids, and salinity precluded use of groundwater for drinking purposes without extensive costly treatment, and that a completed exposure pathway does not exist because groundwater is not potable*



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The Former Linde Site

Background

- In 1994, decision-making for the Tonawanda Sites was suspended based on community concerns related to the Proposed Plan
- The DOE began to re-evaluate remedial alternatives



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The Former Linde Site

Background

In 1997, responsibility for FUSRAP changed from the DOE to the U.S. Army Corps of Engineers (USACE)



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The Former Linde Site

USACE ACTIVITIES

1998

- Building 30 Removal Action initiated

1999

- Building 30 debris removal completed



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The Former Linde Site

USACE ACTIVITIES

Building 30 Removal Action



*Removed 4,200 tons of
contaminated material out of
New York State to permitted
/licensed facilities*

*Safely worked over
25,000 man hours*





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The Former Linde Site

USACE ACTIVITIES

1999

- Linde Site Feasibility Study Addendum
- Linde Site Proposed Plan

2000

- Record of Decision (for soils)
 - *excluded Building 14 and Groundwater Operable Units*
- Soils remediation initiated



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USACE ACTIVITIES

Soil Remediation



Removed over 250,000 tons of contaminated material out of New York State to permitted / licensed facilities to date

Safely worked over 750,000 man hours to date





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USACE ACTIVITIES

2000

- Groundwater Operable Unit re-evaluation
- Building 14 Operable Unit re-evaluation

2001 - Building 14 Feasibility Study

2002 - Building 14 Proposed Plan

2003 - Building 14 Record of Decision

2004 - Building 14 Dismantling completed



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USACE ACTIVITIES

Building 14 Removal Action



Removed over 14,000 tons of contaminated material out of New York State to permitted / licensed facilities

Safely worked over 73,000 man hours





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USACE ACTIVITIES

2001 - 2002 Groundwater Investigations



*Roto-sonic Drilling
Equipment*



Well Installation Activities



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USACE ACTIVITIES

2004 - Groundwater Feasibility Study (FS)

2005 - Groundwater FS Addendum

- *assessment of potential exposure pathways to address comments on original FS*

2006

Groundwater Proposed Plan issued



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MED ACTIVITIES

1940's

Ore Processing Activities



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Linde Site Groundwater Ore Processing Activities

During the 1940's Uranium ore processing generated two types of wastes

- Liquid Wastes
- Solid (sludge-like) material

Process wastes contained Radium-226, Thorium-230, and total Uranium



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Linde Site Groundwater Ore Processing Activities

During the 1940's, approximately 130 million gallons of liquid process wastes were generated. The liquid wastes:

- Were high temperature and had a high pH
- Contained radium, uranium oxide, sodium sulfate, sodium carbonate, sodium hydroxide and elements such as vanadium, nickel and cobalt



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Linde Site Groundwater Liquid Waste Discharges

- During the 1940's, initial discharges were made to sanitary sewers
- Process changes in 1944 increased pH levels
- Increased pH levels no longer allowed discharges to the sanitary sewers



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Linde Site Groundwater Liquid Waste Discharges

In 1944 through 1946, the Government disposed of the liquid waste by discharging it into seven on-site wells that ranged in depths of 90 to 150 feet deep

Approximately 55 million gallons were discharged in this manner



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Linde Site Groundwater Liquid Waste Discharges

Liquid wastes were injected:

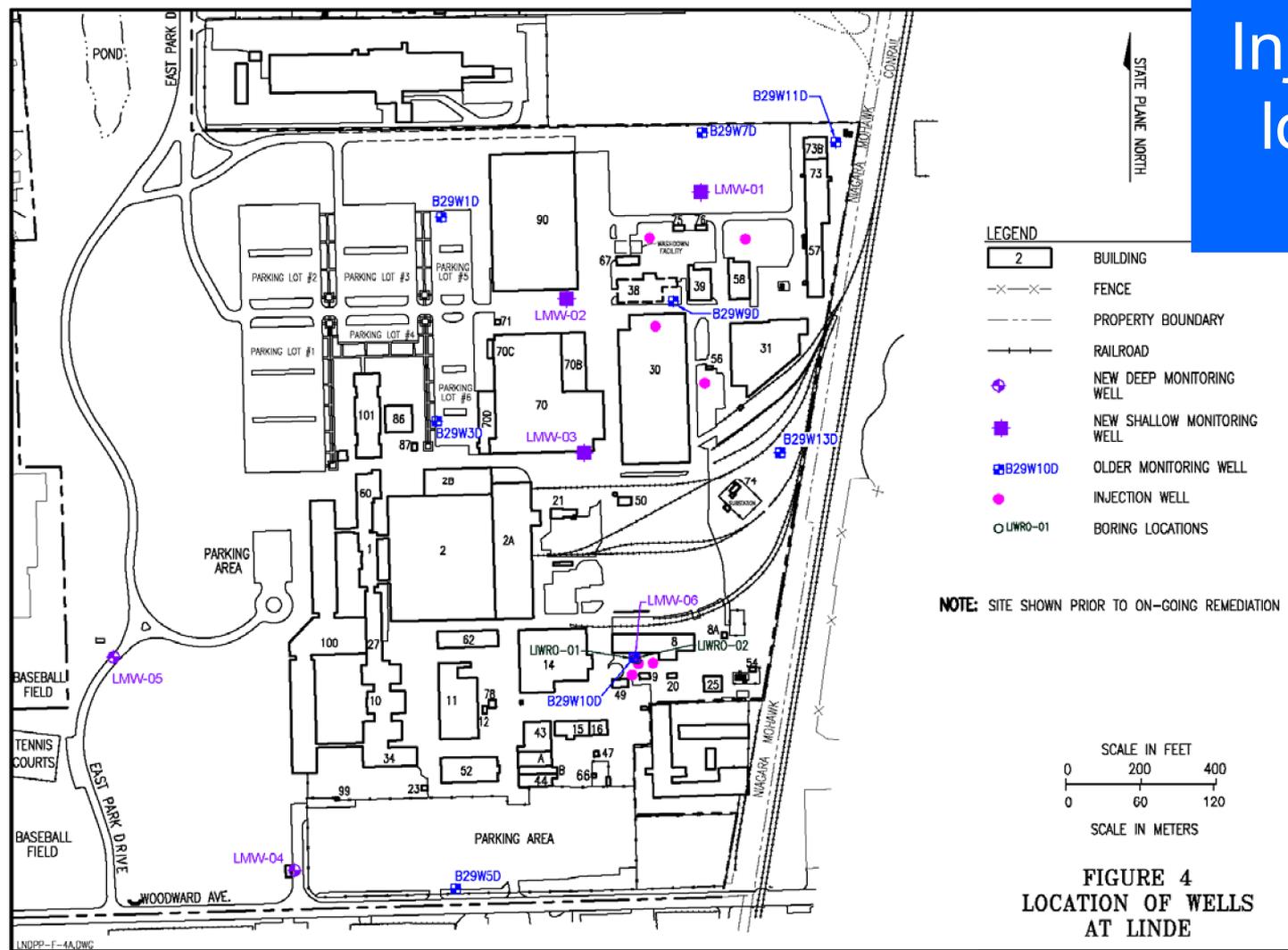
- Below the thick clay layer that underlies the site
- Into the strata referred to as the contact zone aquifer
 - consists of sand and gravel overlying fractured weathered bedrock



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Linde Site Groundwater Well Locations

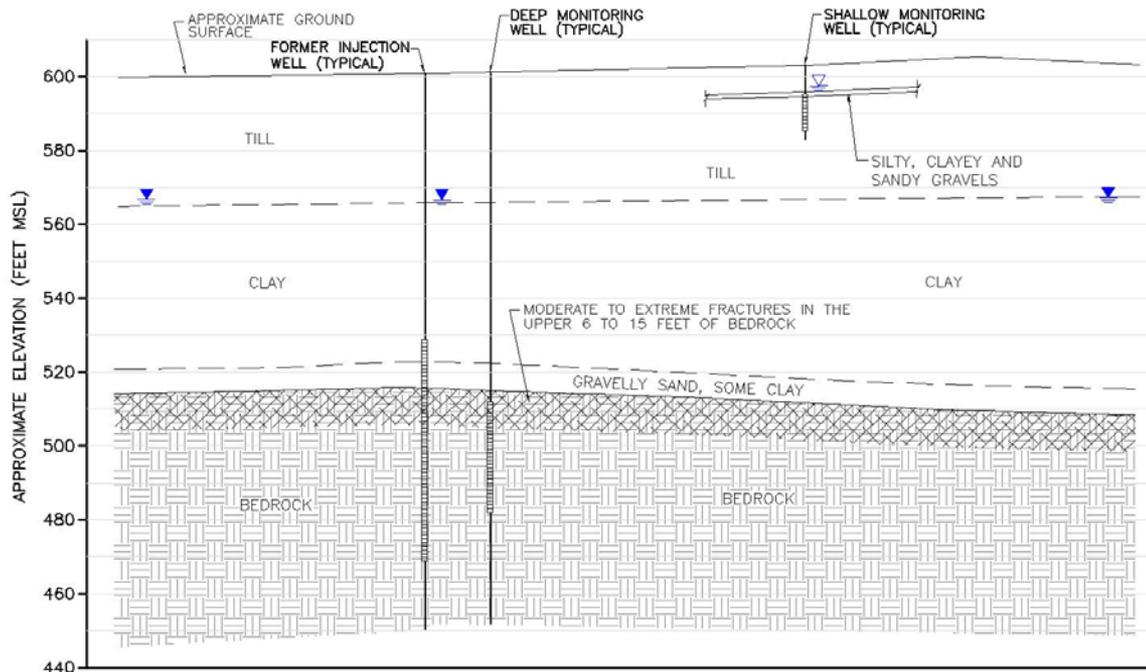
Injection Well
locations in
pink





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Linde Site Groundwater Liquid Waste Discharges



NOTE:

ADAPTED FROM USACE FEASIBILITY STUDY
FIGURE 6. DETAILS NOT SHOWN.

FIGURE 4
FORMER INJECTION
WELLS AND CURRENT
MONITORING WELLS AT
LINDE - SCHEMATIC

Typical profile of
Injection Wells
used in 1940's

and
USACE
Monitoring wells



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USACE ACTIONS

GROUNDWATER ASSESSMENT

- Agency coordination with USEPA and NYS
- Agreements reached on:
 - Characterization of Geology at Site
 - The need for additional information on groundwater quality
 - Sampling and analysis plan



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USACE ACTIONS

GROUNDWATER ASSESSMENT

2001

- Six new monitoring wells installed and eight existing monitoring wells verified
- Sampling & Analysis conducted*

2002

- Sampling & analysis conducted*

* *analyzed for radiological constituents, metals and general chemistry*



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USACE ACTIONS

GROUNDWATER ASSESSMENT

Analysis found concentrations of naturally occurring constituents consistent with USGS groundwater quality data in area

- High concentrations of Sulfates, Chlorides and Total Dissolved Solids



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USACE ACTIONS

GROUNDWATER ASSESSMENT

Results support previous findings:

- Deep groundwater is NOT usable without costly treatment due to natural sulfates, chlorides, and solids.
- Treatment would be required to use groundwater for drinking, irrigation, etc.



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USACE ACTIONS

GROUNDWATER ASSESSMENT

Geochemical computer modeling and analysis of uranium in deep groundwater

- *Results indicate the uranium that was soluble in the injected waste dropped out of solution when encountering natural conditions in deep groundwater*
- *Analysis confirms transport of material off site is unlikely*



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USACE ACTIONS

GROUNDWATER ASSESSMENT

- Performed aggressive leaching tests to determine potential for soils to leach uranium
- Shallow groundwater sampling results obtained before remediation of the soils do not show elevated uranium concentrations.
- Radiologically contaminated soils are being removed from site, thus reducing any leaching potential.



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USACE ACTIONS

GROUNDWATER ASSESSMENT

A complete exposure pathway requires 4 elements

- 1) a source and mechanism of contaminant release
- 2) an environmental transport medium
- 3) a point of contact, i.e., a receptor
- 4) a route of exposure, i.e., ingestion



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USACE CONCLUSIONS

There is no complete exposure pathway:

- 1) Uranium has precipitated out of solution and is in the solid phase within the aquifer (minimal release mechanism)
- 2) Groundwater moves extremely slow and the uranium migration is even slower because it will form solid minerals (minimal transport)



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USACE CONCLUSIONS

There is no complete exposure pathway:

- 3) There is no current or anticipated future use of groundwater (no receptors)
- 4) There is no direct exposure to deep groundwater (no drinking, breathing, or skin contact)



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USACE CONCLUSIONS

- No evidence that any contamination has moved off site
- Analysis confirms transport of material off site unlikely
- Groundwater quality from natural conditions precludes any reasonable, foreseeable use, without costly treatment



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USACE CONCLUSIONS

- The area is served with municipal water supply
- Municipal water supply is located near the Great Lakes which is the world's largest source of fresh water
- There is no reasonable, foreseeable future use of the groundwater



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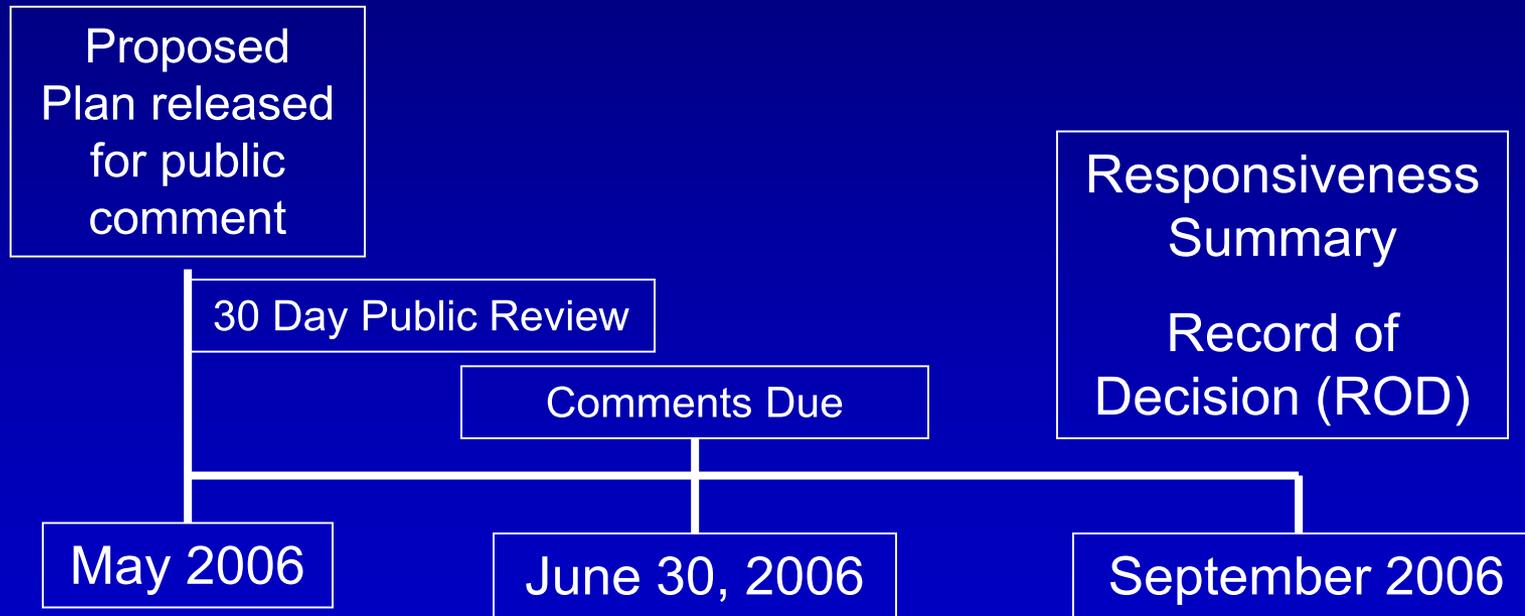
USACE CONCLUSIONS

- There is no point of contact and no route of exposure to the GW contaminants of concern
- The Linde GW OU poses no current or future threat to human health or the environment
- No CERCLA action is warranted



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Decision-Making Schedule





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Administrative Record

Administrative Record Files are located at:

Tonawanda Public Library
333 Main Street
Tonawanda, New York 14150

US Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207



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Written Comments

Written public comments are welcome

Comments must be postmarked by June 30,
2006 and mailed to:

U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207



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Q & A's

Thank you for your participation