# Case Study: Successful Remediation of Operating Service Station and Third-Party Properties at a National Park Townsite

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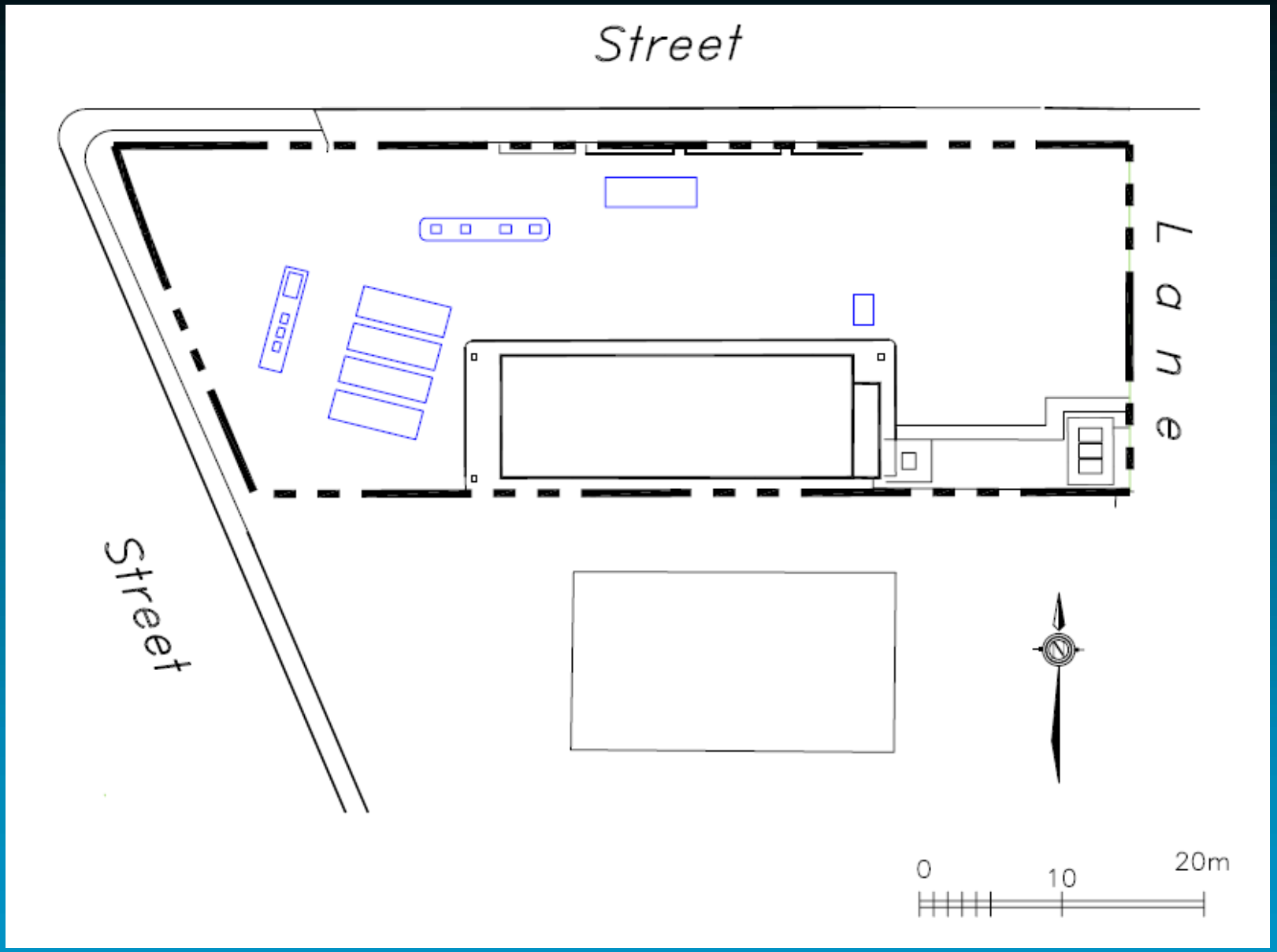
# Key Points for Success

- Importance of Communication with ALL Stakeholders
- Understanding Stakeholder's Needs for their Decision-making
- Flexible Remediation Strategy

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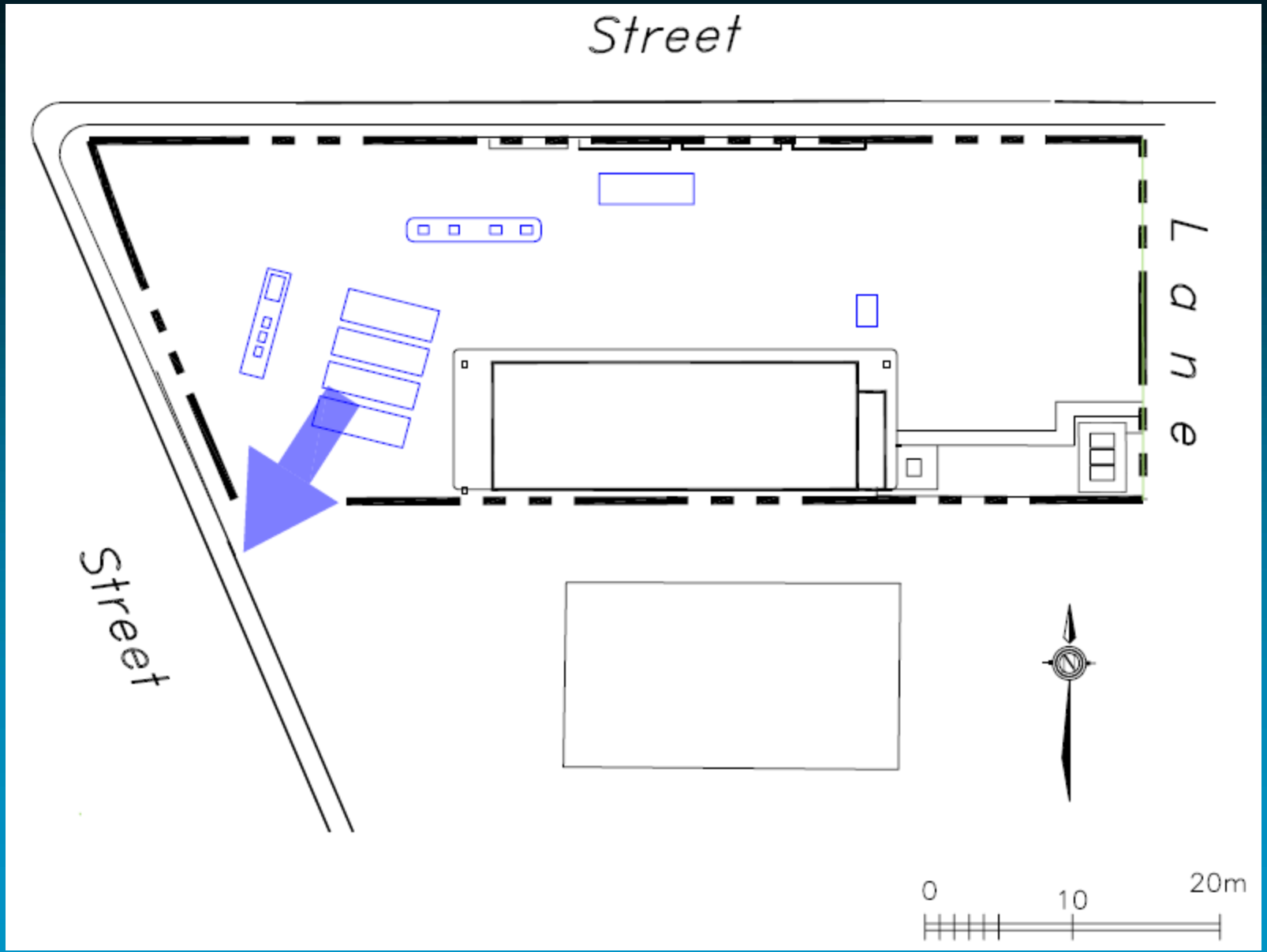
Looking east from near the west property line

- **Parks Canada directive in 1998 to have the tank/fuel systems upgraded to meet Federal Regulations**
- **Client was looking to remove service bays from the building and replace with a convenience store**
- **Town was looking for the site redevelopment to meet their architectural controls, to change the adjacent intersection layout and locations of some of their utilities**

- Lithology is alluvial sand and gravel with interbedded silt units
- Depth to groundwater at ~3 m bgs

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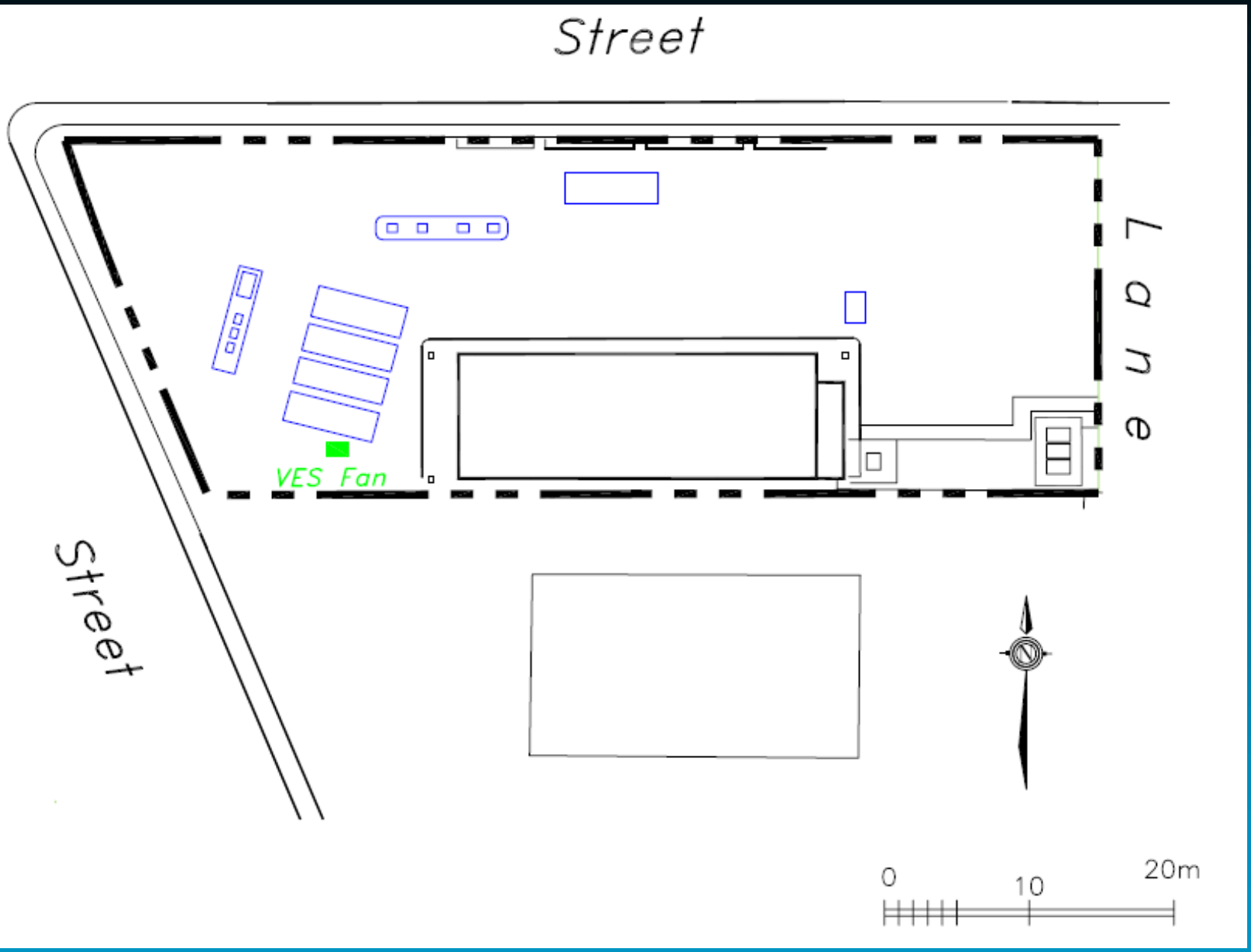


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- **Start with a Conceptual Model**
  - Quantitatively describe contaminant sources and migration mechanisms related to exposure pathways and receptors
- **Develop risk management criteria**

- **Typically the industry practice for upgrading service stations is to clean up the site only as necessary to complete the upgrade**
- **Full remediation completed at site closure**

- Parks Canada was under pressure to uphold National Parks as pristine environments (even townsites)
- Park is UNESCO World Heritage site
- Risk management was <u>not acceptable</u>
- Site needed to be “clean”

- **Parks Canada required stringent CCME criteria to be met**
  - **residential / parkland criteria for soil**
  - **freshwater aquatic life criteria for groundwater**

- **Required Extensive Suite of Chemical Analyses: VOCs (BTEX), PAHs, phenolic compounds, lead, petroleum hydrocarbon fractions**
- **Contaminants of Concern:**
  - **Soil: BTEX, PHC F1 – F4, PAHs (naphthalene and pyrene)**
  - **GW: BTEX, PHC F1, F2, lead?, PAHs?**

- Capital Projects (Facility Upgrades) versus Environmental Projects (Site Closure)
- Early and frequent discussions with All Stakeholders about the project objectives
- Discussion with Parks Canada of applicability for very stringent remediation criteria and how this related to risk

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# Remediating Federal Contaminated Sites

- Fully delineate
- Develop a full remediation strategy
- Receive approval before implementation

# For this site.....

- Offsite delineation drilling had started but not completed
- Comprehensive remedial action plan was not possible

- Agreement amongst Stakeholders that onsite remediation could be separated from the offsite remediation
- The Client put up a (nominal) security bond for offsite remediation to satisfy concerns from Parks Canada

# Excavation wasn't going to be easy!

- Sandy soils in the saturated zone
- High hydraulic conductivity – pumping rate of 1600 L/min to reduce water table to the required depth of the new tank nest at 4.6 m bgs
- Limited disposal options for water – sanitary sewer: restriction of 600 L/min
- Groundwater Modelling predicted that shoring would be successful for tank installation

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- Identified to Stakeholders that it wasn't logistically possible to shore the complete site – only the new tank nest
- Required by Parks Canada to establish a "clean" tank nest base before new tanks could be installed

- How deep does the contamination go?
- How deep should the shoring go?
- How much flexibility can we build into the design if we have to go beyond 4.6 m bgs?

# Sheet Piling

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Dewatering of the tank nest

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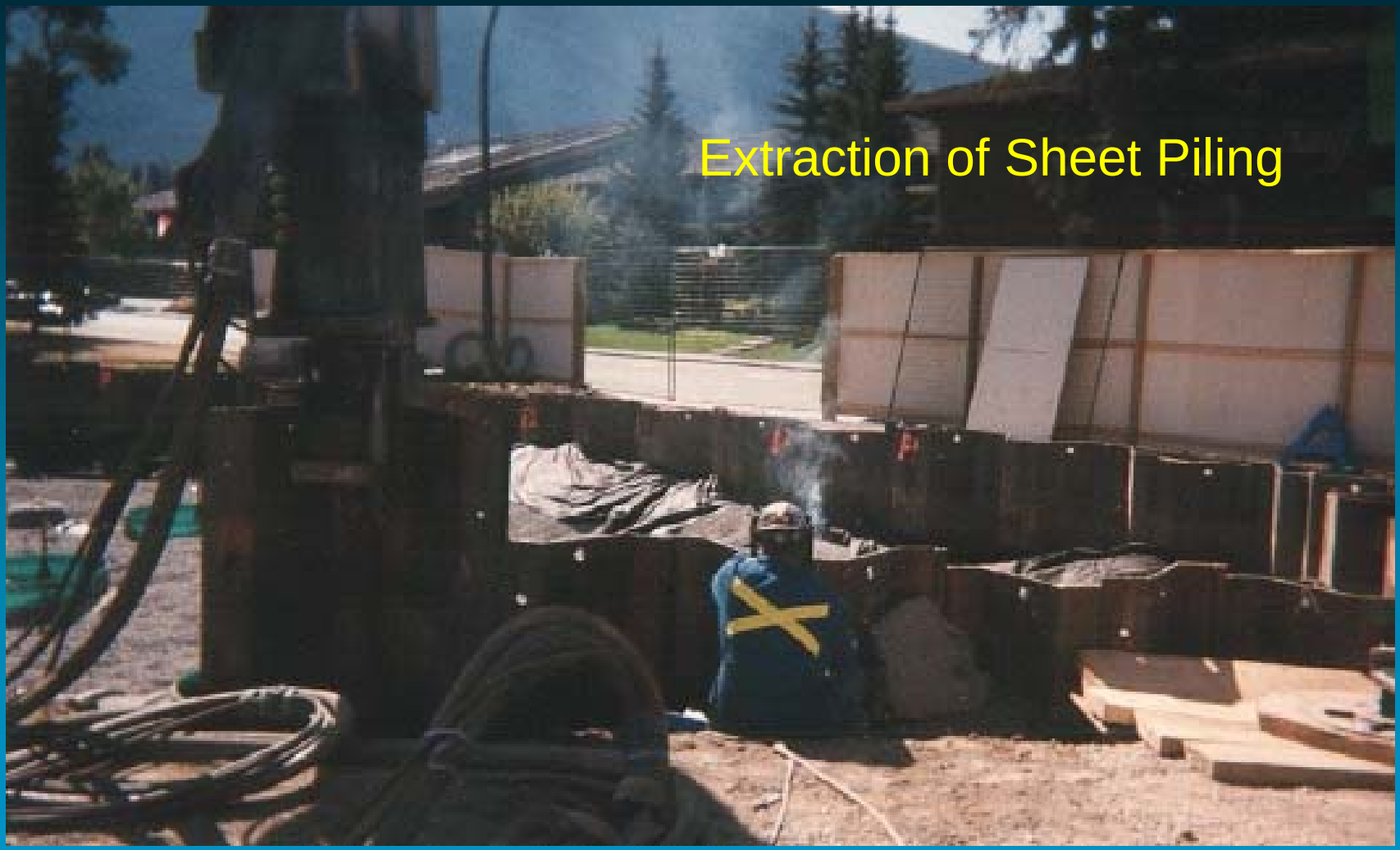
- used a mobile laboratory to establish “clean” base so Parks Canada could approve installation of new tanks
- deepest point of excavation was 4.8 m bgs, consistent with expectations
- 1600 $m^3$ of petroleum hydrocarbon impacted soil removed outside the park boundary

- **1700 $m^3$ of groundwater was treated using GAC and discharged to sanitary sewer**
- **Maximum flow rate of 180 L/min and average of 74 L/min (<<600 L/min), consistent with Groundwater Modelling predictions**


New tanks in the ground!


Extraction of Sheet Piling

Excavation beneath building

Vapour Management System

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1 of 2 abandoned tanks found near pump island

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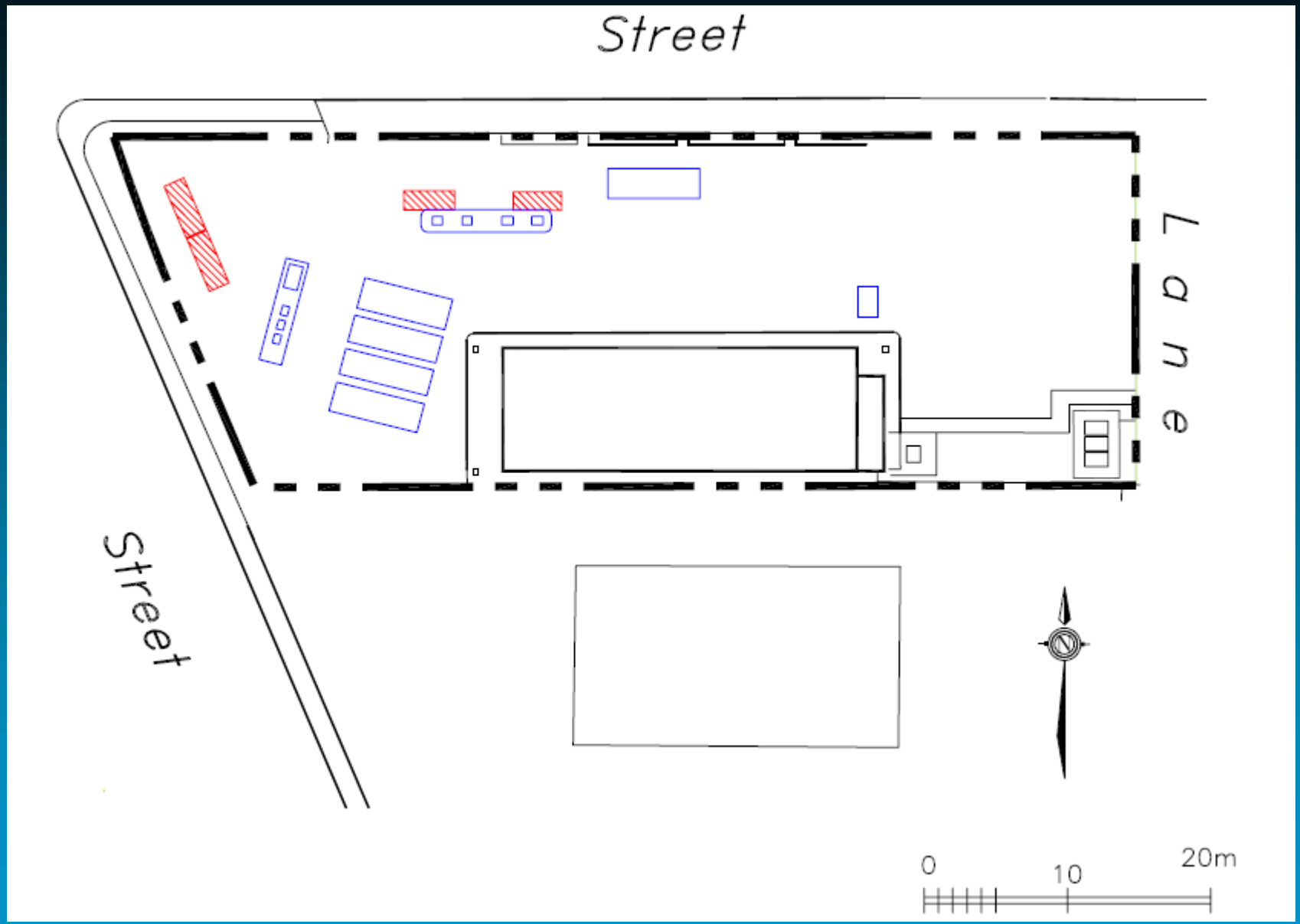
2 abandoned tanks near west property line

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Pump Island excavation

- outside the shoring, confirmed excavation below the water table for soil remediation not possible

- backfilling required filter cloth followed by wash rock and pitrun gravel

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# Soil Vapour Extraction/Groundwater Aeration

Piping north of new pump islands

Piping near south property line and west of building

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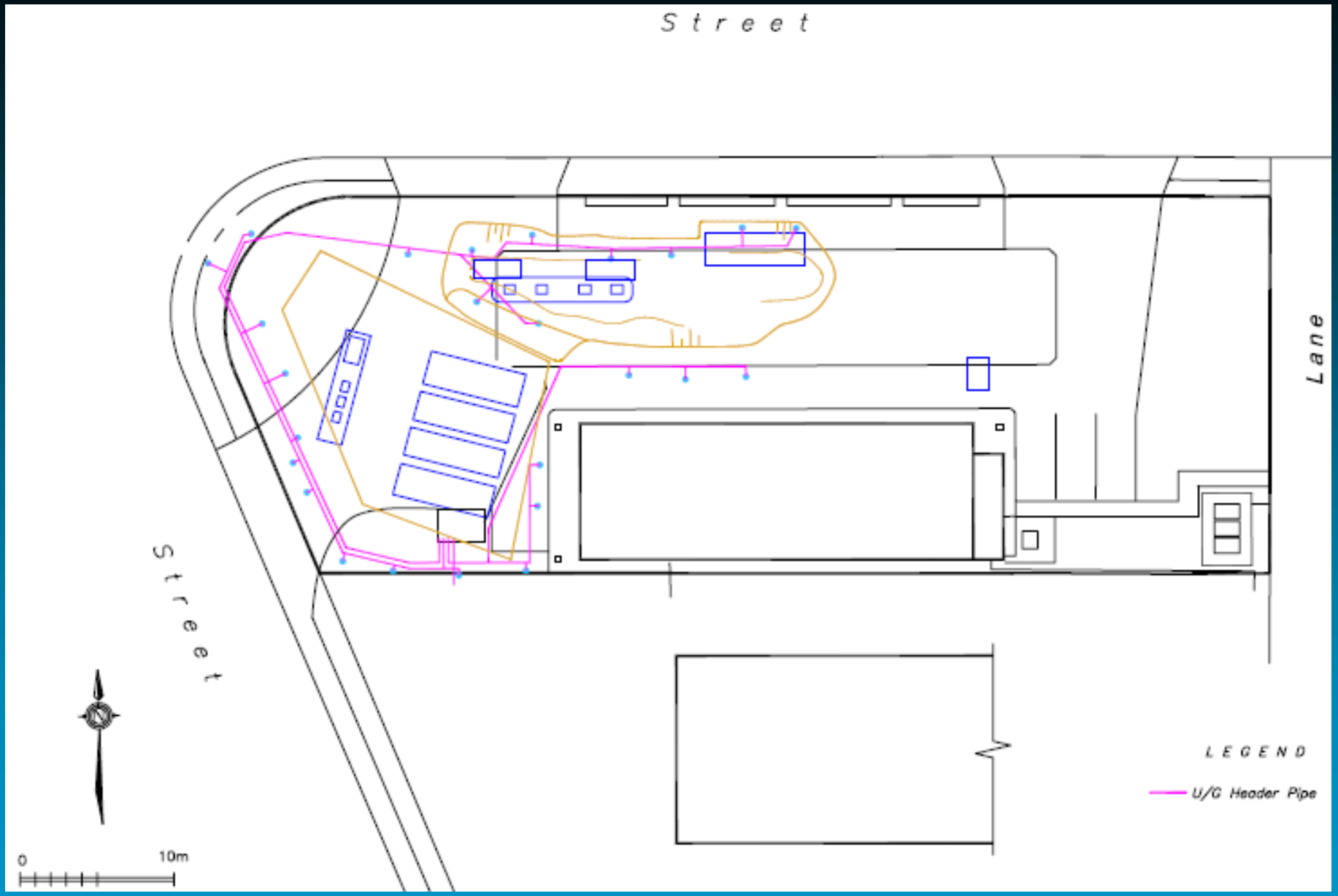


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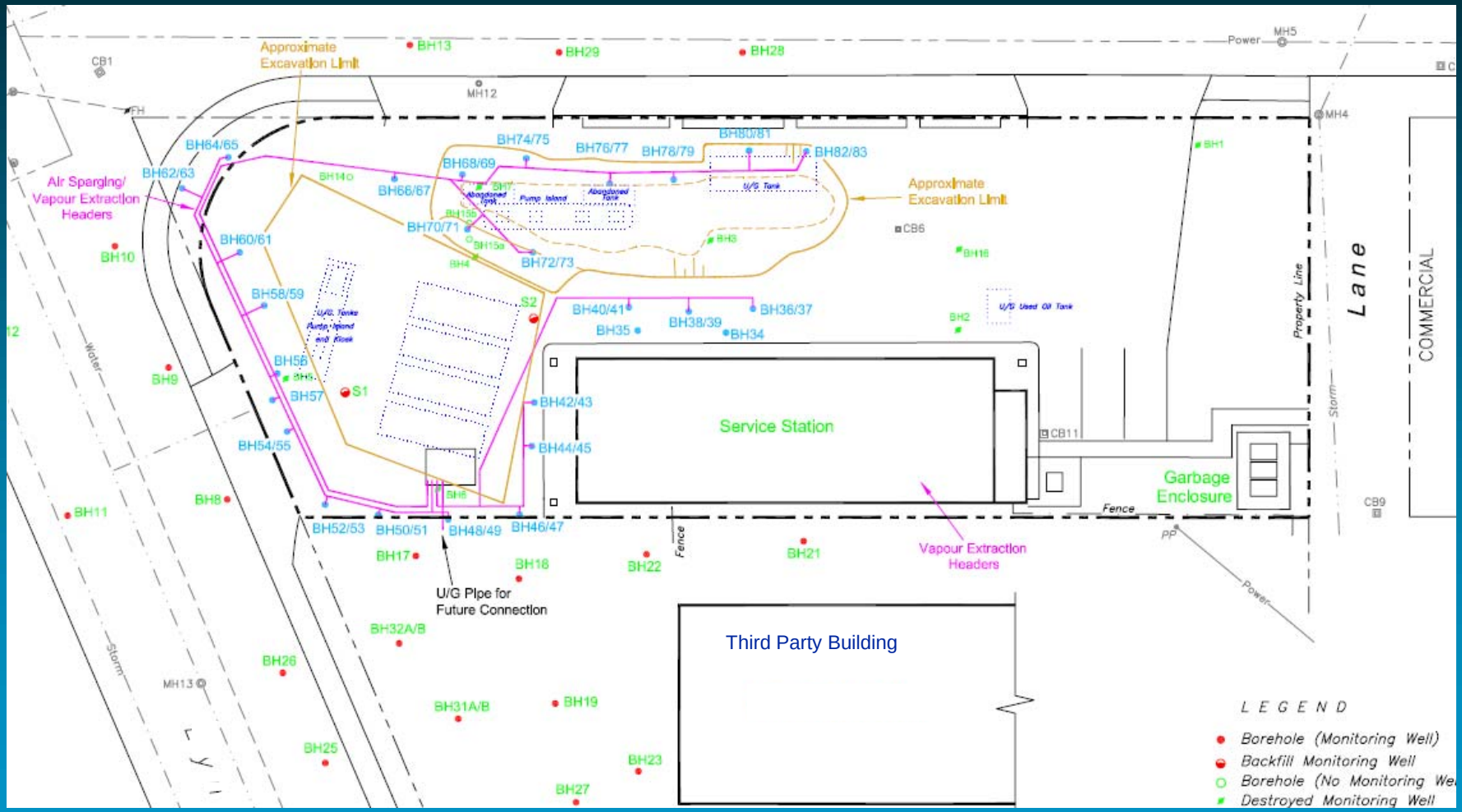
- **Piping installed but system not to be operational until approved**
- **Updated the 1999 Environmental Screening Report / Remedial Action Plan in 2002 with insitu remediation options for outside of the tank nest**
  - **Soil Vapour Extraction/Groundwater Aeration**
  - **Enhanced Bioremediation using Oxygen Releasing Compounds**

- **Soil Vapour Extraction (with Groundwater Aeration) – effective in the first year then extraction rate was very low**
- **Groundwater Aeration – effective in the second and third year to enhance bioremediation**
- **SVE/GA successfully remediated the onsite contaminated soils and groundwater to meet the CCME criteria**

# Offsite Assessment

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- SVE/GA designed for piping to be installed on third-party property
- SVE/GA: insitu bioremediation contribution was going to be more effective than the aeration and vapour extraction contribution
- Enhanced Bioremediation using Oxygen Releasing Compounds
  - Pilot Study on third-party property before extending onto roadway

# Enhanced Bioremediation

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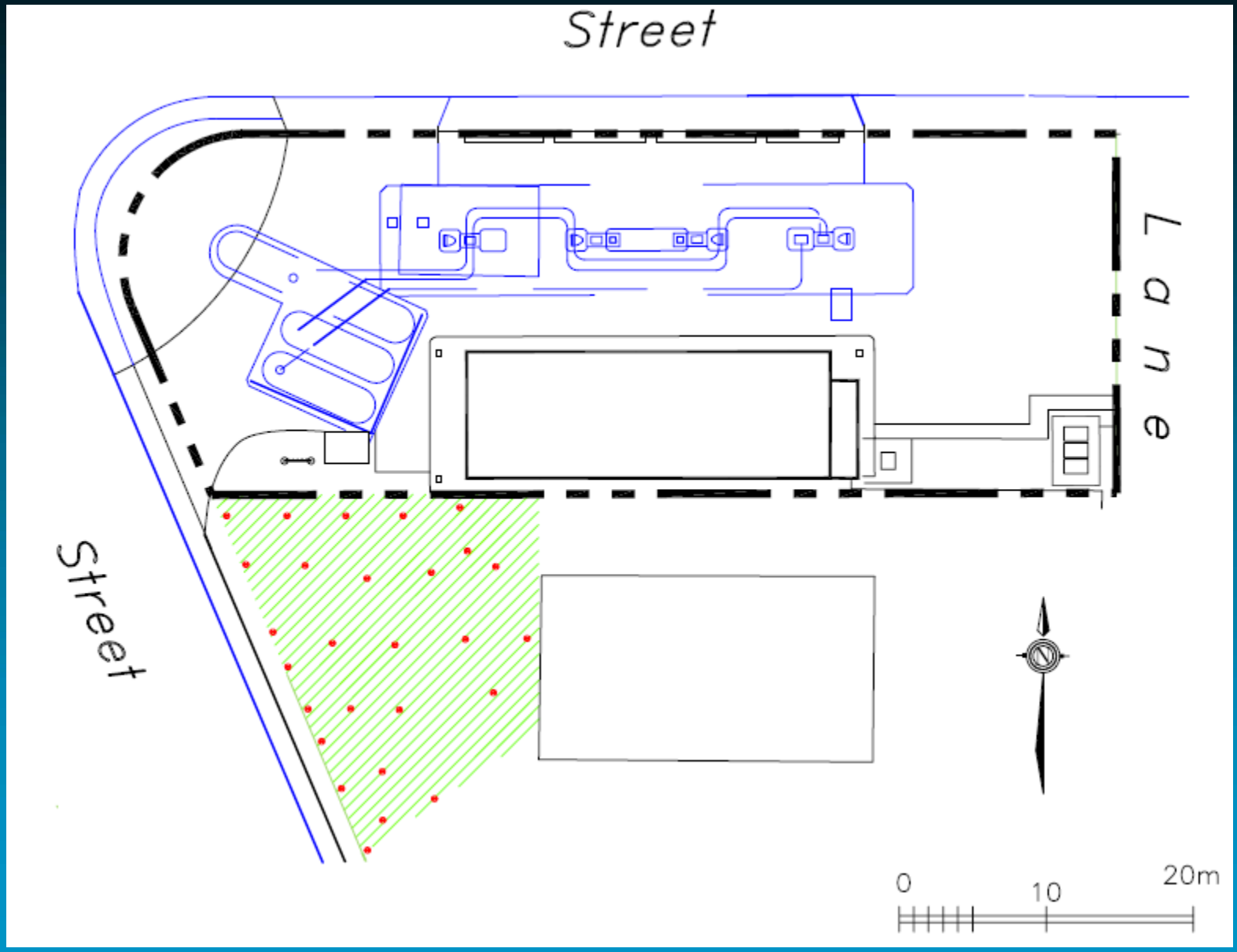


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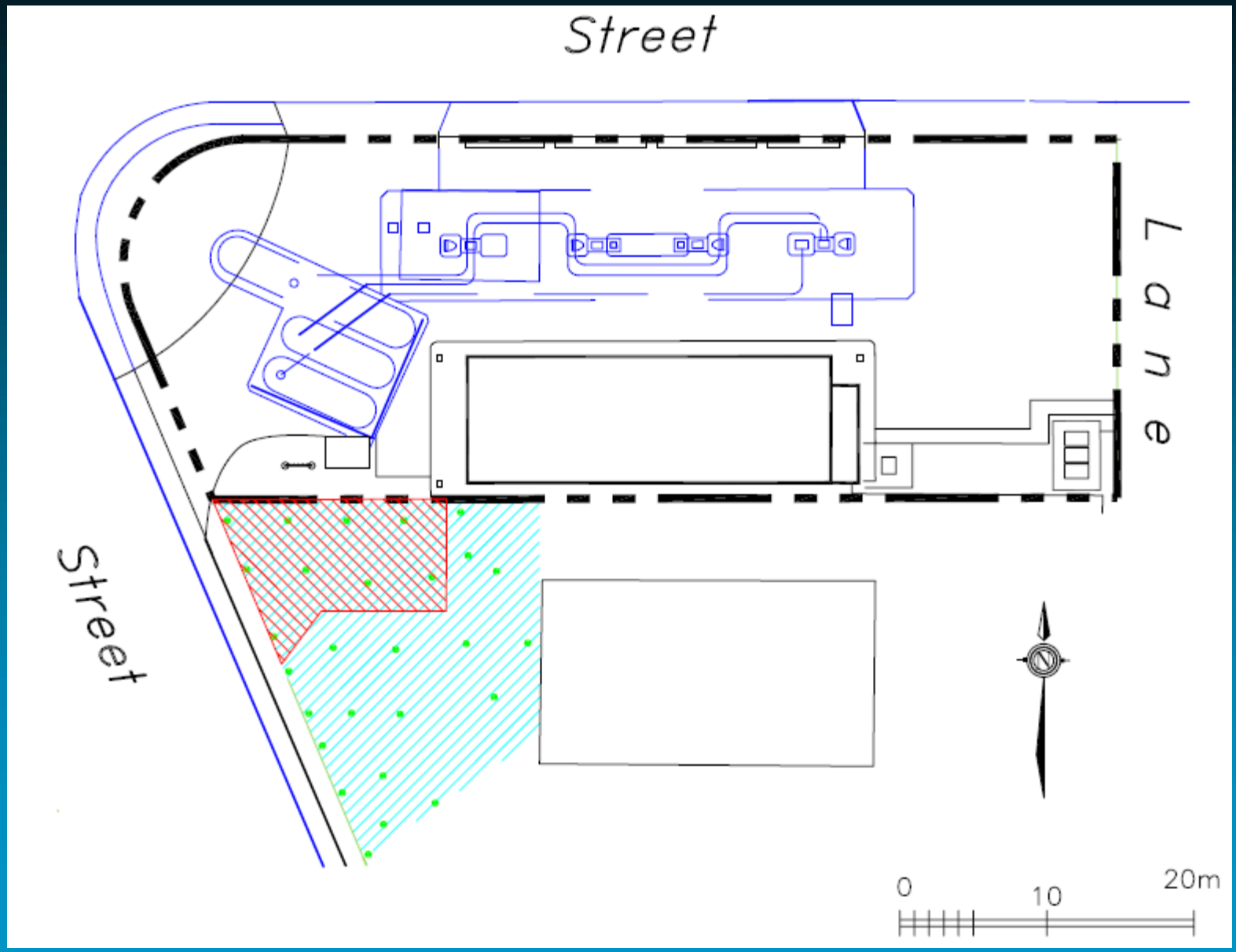


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# Learnings

- Remediation – Technical Challenges
- Importance of communication with All Stakeholders about Project Objectives and Uncertainties
- Understanding the needs of the Stakeholders for their decision making

# Learnings / Take Aways

- **Make it easier to get Buy-In from Regulatory Agency**
  - **compile chemical data into easy-to-read format that relates contamination to site features**

# Learnings / Take Aways

- **Discuss the Conceptual Model with Client and Regulatory Agency - Know your Endpoints!**
  - **Understanding the CCME criteria and the significance of changing criteria (e.g. less stringent 2004 benzene criterion in soil adopted)**
  - **Reduced suite of chemical analyses**
  - **Reduced frequency of monitoring and sampling programs**
  - **Allowances for increased timeframes for remediation**

# Learnings / Take Aways

- Continuous communication with ALL Stakeholders
- Historical Review may not be complete even with best efforts during the Phase 1 Investigation
- Use low-flow groundwater sampling to meet stringent CCME criteria
- Consider a security bond?.....to allow flexibility with remediation program; assurance that work will continue
- Best to have a Remediation Strategy that is not focussed on one option but can respond to changes in conditions or the lifecycle of the property

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# Thank You