Ausenco

Barriers to Redeveloping a Contaminated Site with an Active Service Station across the Street – A Case Study in Navigating Challenging Technical Issues and Finding Unique Solutions

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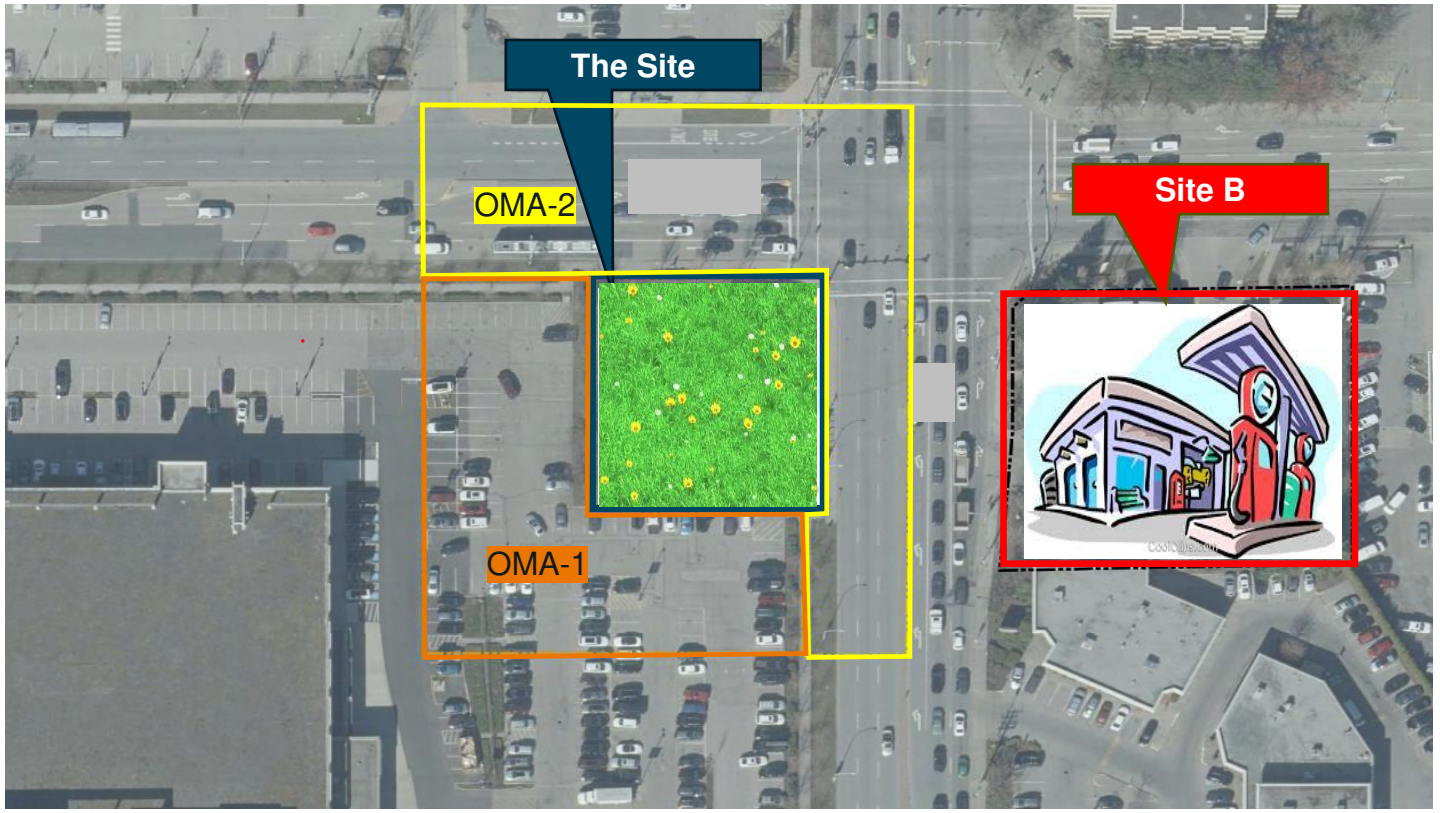
October 13, 2023
Banff, Alberta

Agenda

1. Site Location and History
2. Contamination and remediation summary
3. Regulatory considerations – Client wants to develop the site
4. Challenges
5. Solutions
6. Result

Site Location and History



N

Decommissioned – 2006

Sold to Client

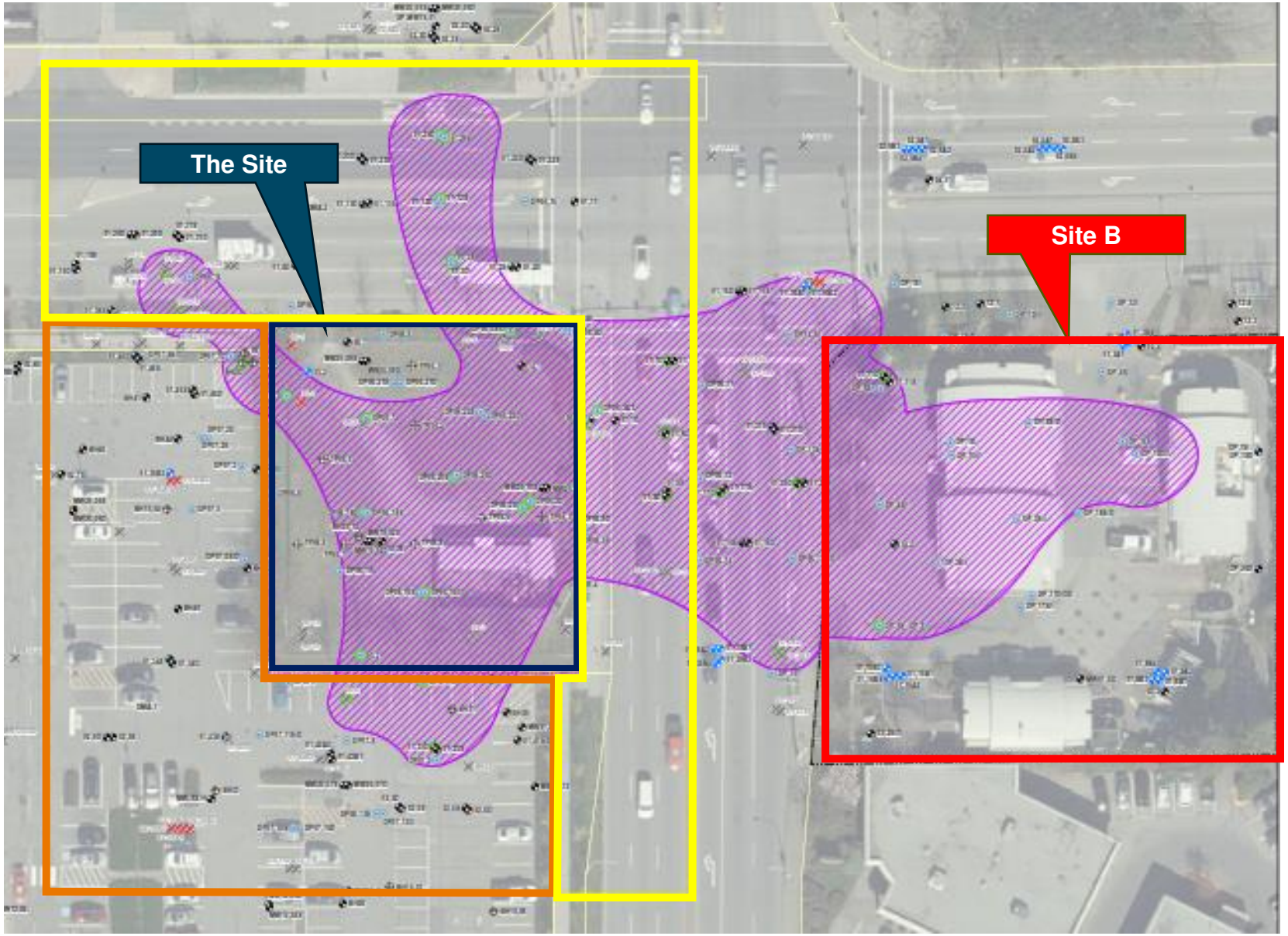
The Site — **In Operation: late 1960s - 2006**

Remediation System: 2007 - 2017

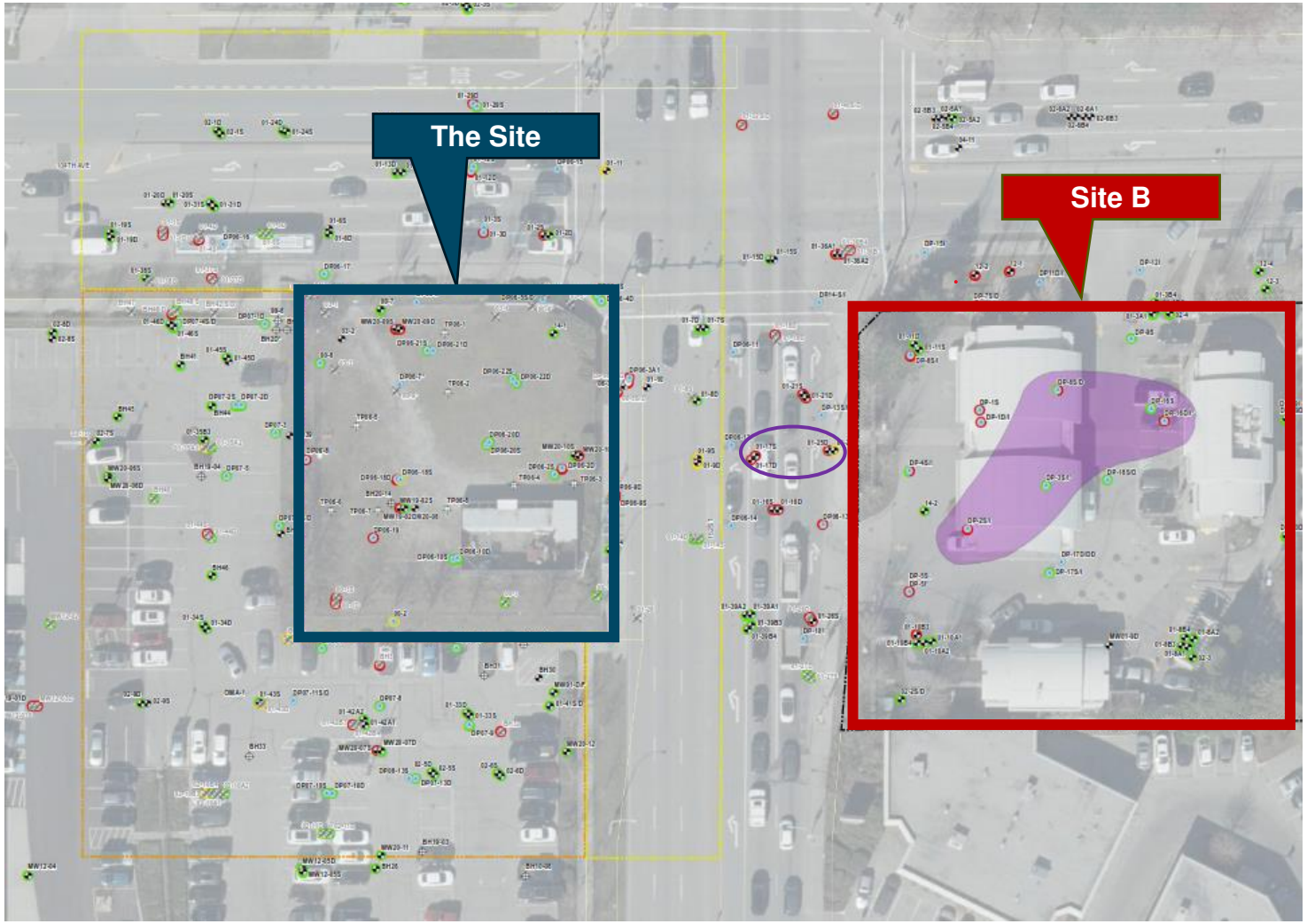
OMA-1 AiP 2010

Site B — **In operation: 1970s - present**

Historical LNAPL extent



Current Groundwater Contamination



- LNAPL has been remediated at The Site (no NAPL on-site or in OMAs)
- Groundwater quality has significantly improved
- Some LNAPL / issues remain at Site B

Regulatory Considerations – Types of "Instruments"

1. Determination

- Confirmation that a site is clean

2. Approval in Principle (AiP)

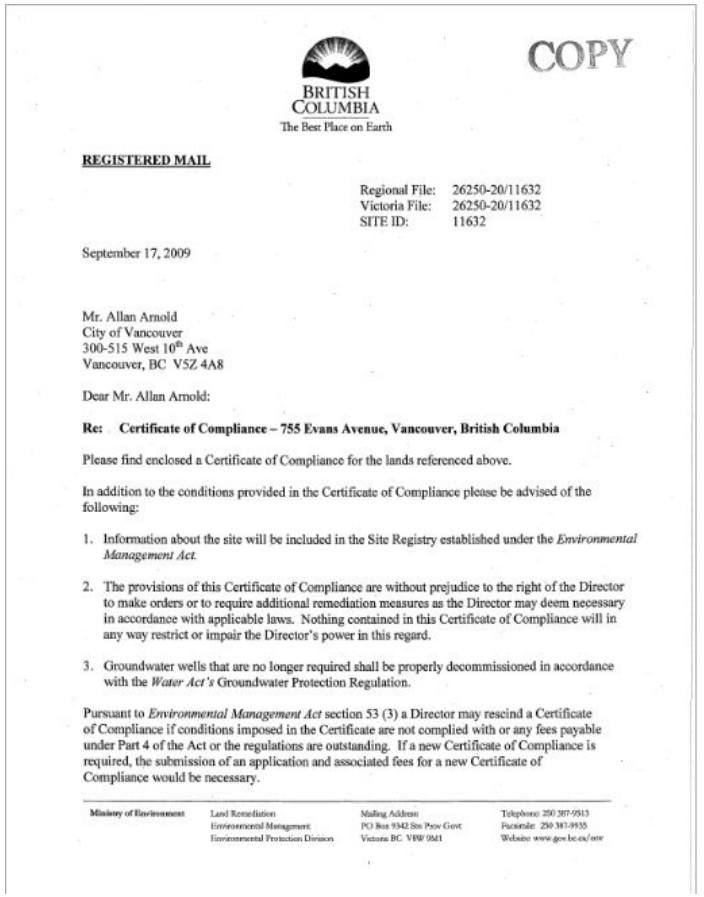
- An Approval based on a RAP
- A Commitment
- End goal: obtain a Certificate of Compliance

3. Certificate of Compliance

- Confirmation that a site is clean

Requirements for a Certificate of Compliance

1. Characterize
2. Delineate
3. Remediate
4. Prove plume stability
5. Address all contamination



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REGISTERED MAIL

Regional File: 26250-20/11632
Victoria File: 26250-20/11632
SITE ID: 11632

September 17, 2009

Mr. Allan Arnold
City of Vancouver
300-515 West 10th Ave
Vancouver, BC V5Z 4A8

Dear Mr. Allan Arnold:

Re: Certificate of Compliance – 755 Evans Avenue, Vancouver, British Columbia

Please find enclosed a Certificate of Compliance for the lands referenced above.

In addition to the conditions provided in the Certificate of Compliance please be advised of the following:

1. Information about the site will be included in the Site Registry established under the *Environmental Management Act.*
2. The provisions of this Certificate of Compliance are without prejudice to the right of the Director to make orders or to require additional remediation measures as the Director may deem necessary in accordance with applicable laws. Nothing contained in this Certificate of Compliance will in any way restrict or impair the Director's power in this regard.
3. Groundwater wells that are no longer required shall be properly decommissioned in accordance with the *Water Act's* Groundwater Protection Regulation.

Pursuant to *Environmental Management Act* section 53 (3) a Director may rescind a Certificate of Compliance if conditions imposed in the Certificate are not complied with or any fees payable under Part 4 of the Act or the regulations are outstanding. If a new Certificate of Compliance is required, the submission of an application and associated fees for a new Certificate of Compliance would be necessary.

Ministry of Environment | Land Remediation, Environmental Management, Environmental Protection Division | Mailing Address: PO Box 9342 Stn Prov Govt, Victoria BC V8W 9M1 | Telephone: 250 387-9513, Facsimile: 250 387-9935, Website: www.gov.bc.ca/env

The Challenge:

- *To develop The Site, we need a CofC.*
- *To get a CofC, we need to address all five requirements.*
- *Three of five are extremely difficult or impossible in this scenario.*

The Solutions:

Requirement	Challenge	Solution
Characterize	✓	n/a
Delineate	Co-mingled off-site plume from Site B	Protocol 6 Preapproval
Remediate	✓	MPE System and Risk Assessment
Prove Plume Stability	Up-gradient plume from on-going operations at Site B contributing to plume in street	Innovative Plume Stability assessment (The Site and Site B)
Address All Contamination	Co-mingled off-site plume from Site B	Protocol 6 Preapproval

Protocol 6 Preapprovals

"In circumstances where difficulties exist in meeting requirements at a site, a responsible person October need to request and obtain ministry pre-approval under Protocol 6."

Examples:

1. Where contamination will not be delineated and/or remediated as per the requirements…..and the entire extent of contamination will not be included in one or more applications for an Approval in Principle of a remediation plan or certification, including parts of contaminated sites.
   a) Denial of access
   b) No technically feasible or safe method
   c) Merging contaminant plumes or co-mingled contamination from different source parcels where neighbouring source parcel owners will not cooperate in investigating and remediating the contaminated sites.
   d) Flow-through contaminated site
   e) Beneficial use
   f) Area-wide contamination
   g) Remediation is occurring in stages
2. A risk assessment would be used that includes derivation or use of a site-specific risk-based concentration
3. High-risk site
4. AiP valid for longer than 5 years.

This allowed us to address **Challenge 2: Delineation** *and* **Challenge 5: Address All Contamination**

Our Protocol 6 Preapproval

The rationale for plume separation was based on the following sequential lines of evidence:

1: Service station at Site B is an on-going contaminant source

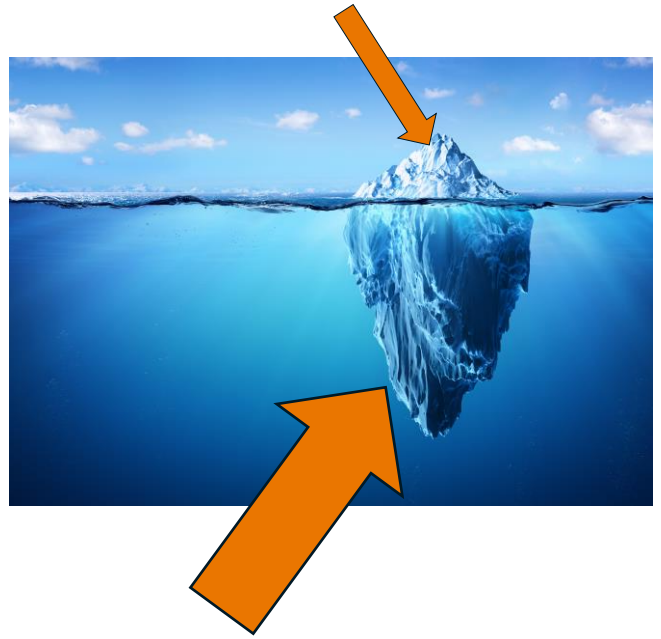
2: LNAPL was historically detected on The Site, Site B, the adjacent mall, and the surrounding streets

3: Overall groundwater flow direction is to the west

4: MPE system operated on The Site for 10 years and removed LNAPL from The Site and surrounding mall/streets

5: MPE system also significantly reduced the dissolved-phase groundwater contamination on The Site and surrounding mall/streets

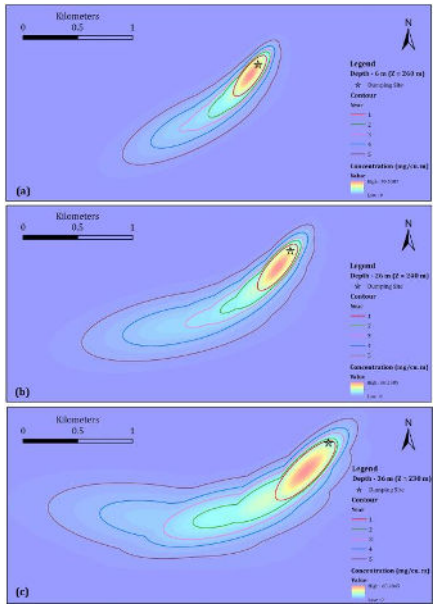
6: LNAPL returned to two wells on the east side of the street, indicating there is an on-going source at the operating service station/Site B



Proving Plume Stability

We used multiple lines of evidence to support plume stability:

1. Standard statistical evaluation - Mann-Kendall trend analysis
2. Seasonal fluctuations in groundwater concentrations
3. Evaluation of geochemical indicator parameters
4. Spatiotemporal plume analysis – GWSDAT

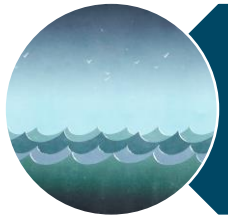


This allowed us to address **Challenge 4: Plume Stability**

Plume Stability Results

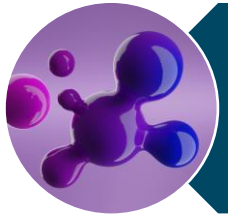
Mann-Kendall trend analysis

- Plume A, on the Site, stable and/or decreasing on-site and in both OMAs, with one on-site well increasing
- Plume B, east side of street and Site B, both decreasing and increasing trends



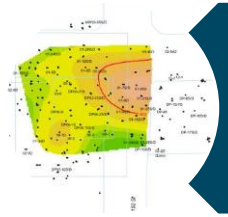
Seasonal fluctuations in groundwater concentrations

- Delineation was achieved during worst-case scenario conditions



Geochemical indicator parameters

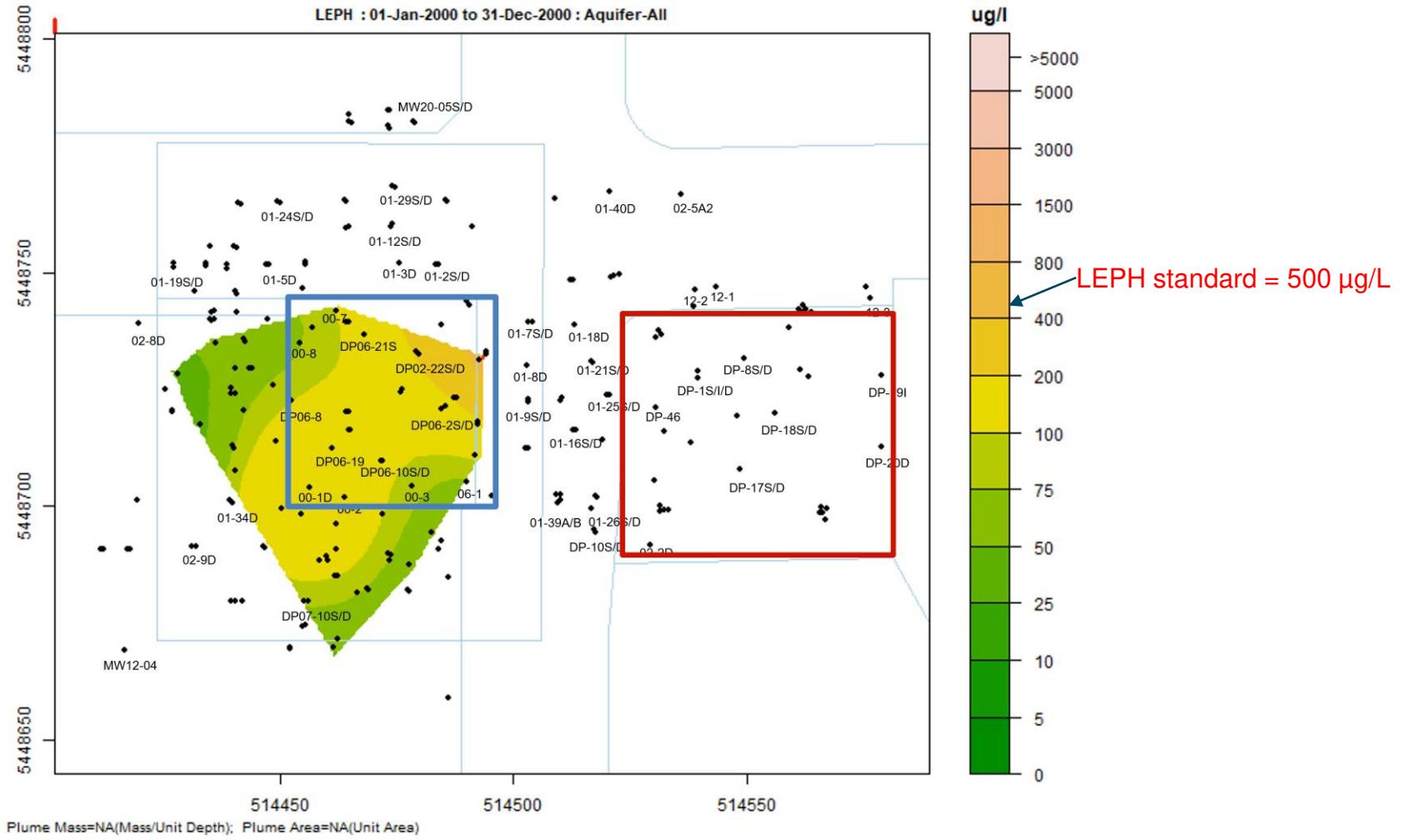
- Hydrocarbons are largely degraded
- Oxidizing conditions re-established in aquifer system



GWSDAT

- Plume A concentration and spatial extent has decreased

Plume Stability - GWSDAT Time-Lines of Plume Extents (LEPH)



The Result:

Protocol 6 Preapproval issued by Ministry of Environment in June 2023!

Next Steps:

Risk Assessment currently being completed

Detailed Site Investigation report completed and CSAP review underway

Submit for CofC in December 2023.

Thank you

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