Hydrocarbon Impacts and Remedial Action at an Active Service Station

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Fairmont Banff Springs Hotel

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WHAT WE LEARNED

- Value in Early Communication with Stakeholder Groups
- Spend Time to Choose the Right Team
- Do Not Hesitate to Innovate

BACKGROUND

- Retail Location Since 1920's
- Chevron Retail Outlet Since 1950's
  - Currently Four 46,000L Fiberglass USTs
- Maintenance Upgrade Work in the 1990's
- Early Investigation Work in Late 1990's
- On Site Source Removal in Late 1990's

PROJECT GOALS

- Ensure Safety of All Receptors
- Manage Contamination Issue and Liabilities
- Obtain CoC for Off-Site Stakeholders

How to Obtain These Goals:

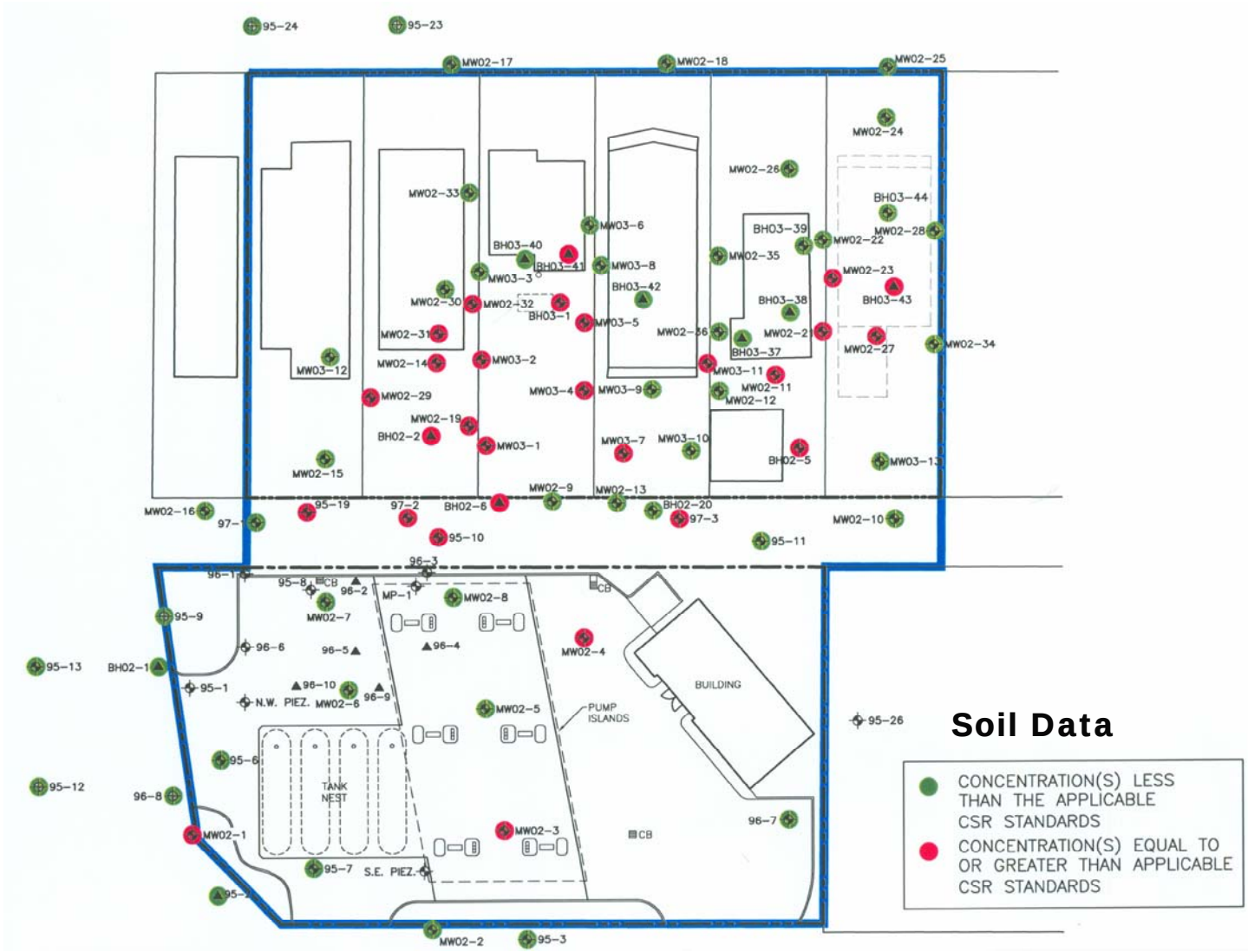
- Define and Delineate Hydrocarbon Plume
- Abate Further Migration
- Remove Existing Contamination
- Retain Future Lingering Contamination to Site
- Execute Monitoring Strategy

SITE CHARACTERIZATION

- Keystone Environmental Conducts Detailed Site Investigation
  - 62 Boreholes Advanced On and Off-Site
  - Analyzed > 400 Soil samples for Hydrocarbon Indicators
  - Analyzed > 500 Ground Water Samples for Hydrocarbon Indicators
  - Developed Detailed Conceptual Site Model
- Conducted Indoor Air Quality Monitoring
- Regular Liaison with Stakeholders (i.e. Residents, Local and Provincial Governments)

SITE LAYOUT

INVESTIGATED AREAS



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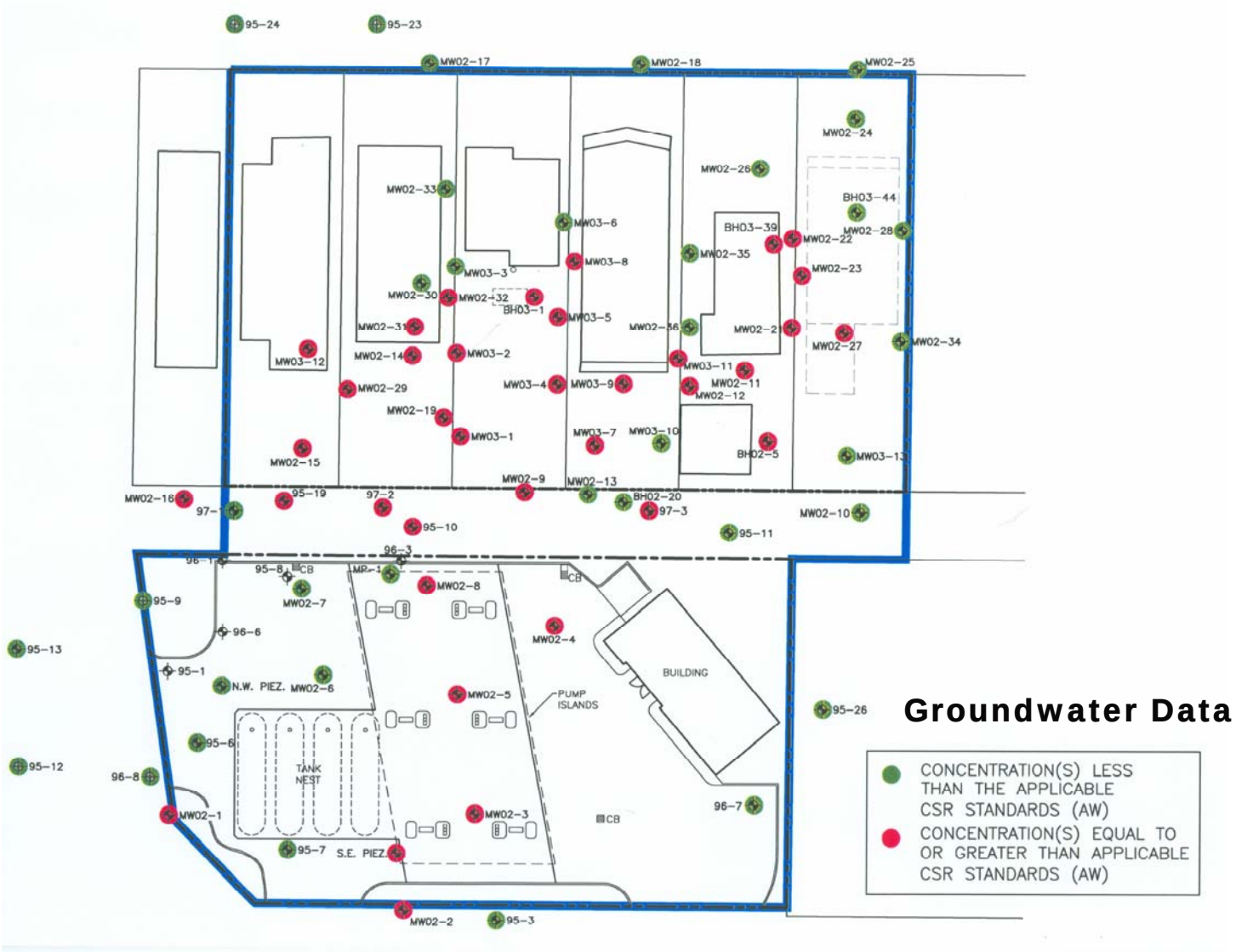
INVESTIGATED AREAS



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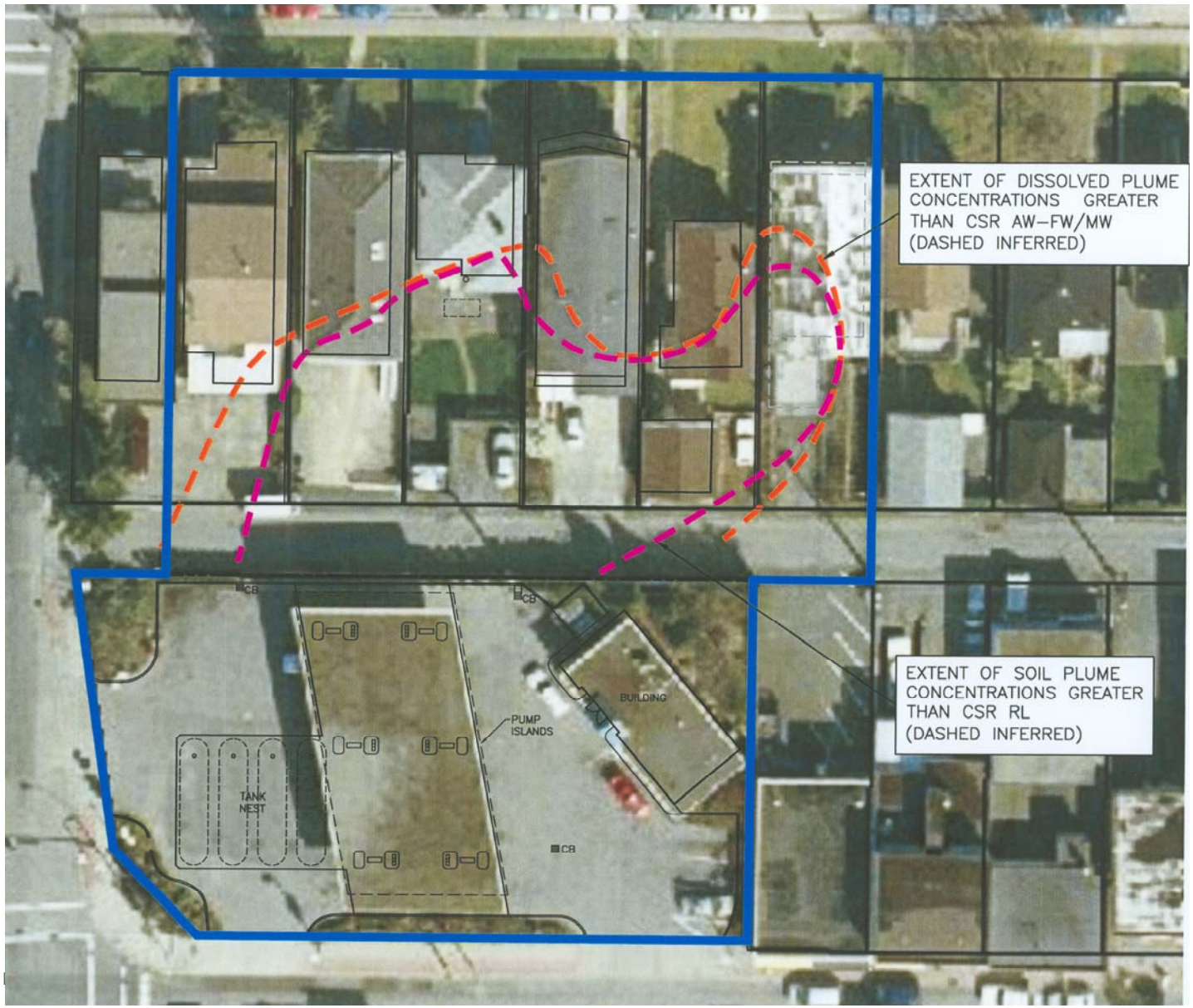
SOIL AND GROUNDWATER PLUME



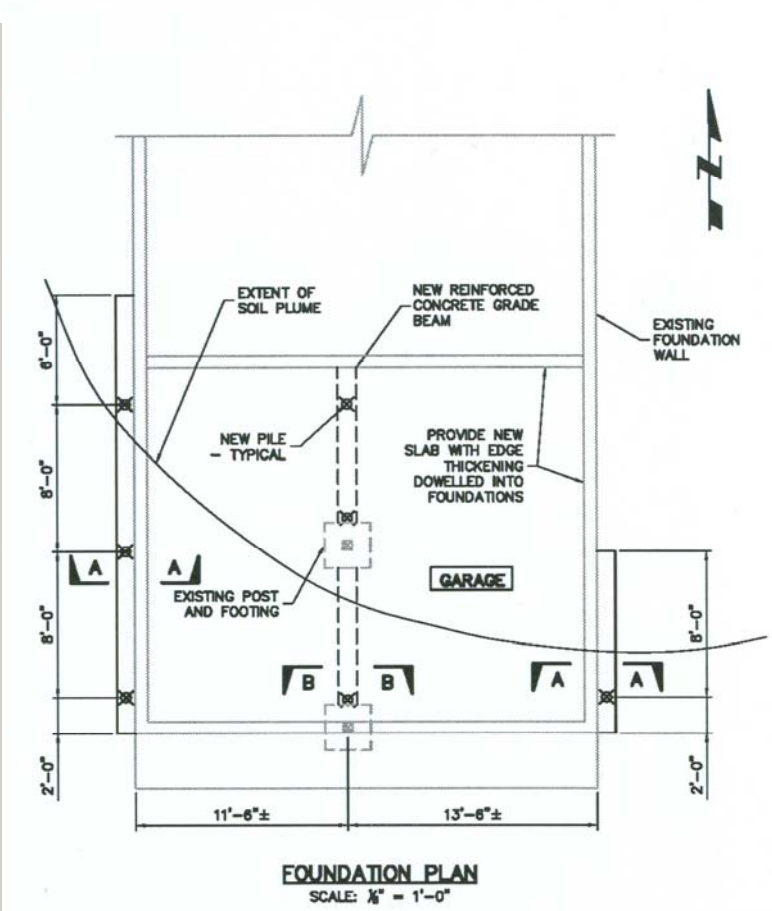
PROJECT PLANNING

- Evaluate Remedial Options
  - Series of Options Developed
  - Economic Evaluation of Options
- Select Remedial Option
- Agreement with Stakeholders, Internal and External
- Assemble Project Team
- Coordinate with Municipality, Utilities, Residents and Neighbours

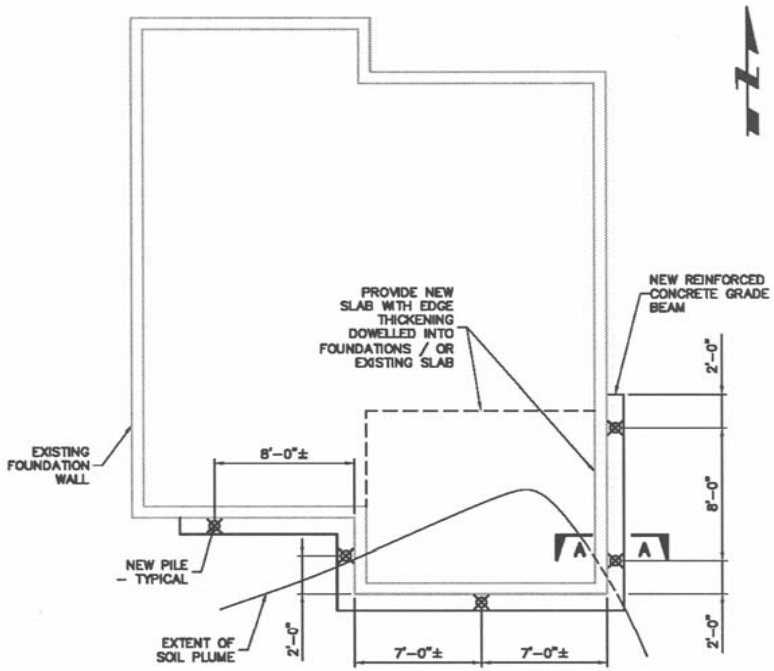
REMEDIATION

- Underpinning and Shoring
  - Piles and grade beams installed on 4 homes
  - One home demolished
- Excavation
  - Removed all backyard improvements
  - Removed soil from backyards and under homes
- Barrier Wall Installation
  - 45m by 5.5m organic reactive barrier wall installed on retail station property line

UNDERPINNING AND SHORING



FOUNDATION PLAN
SCALE: ⅛" = 1'–0"



FOUNDATION PLAN
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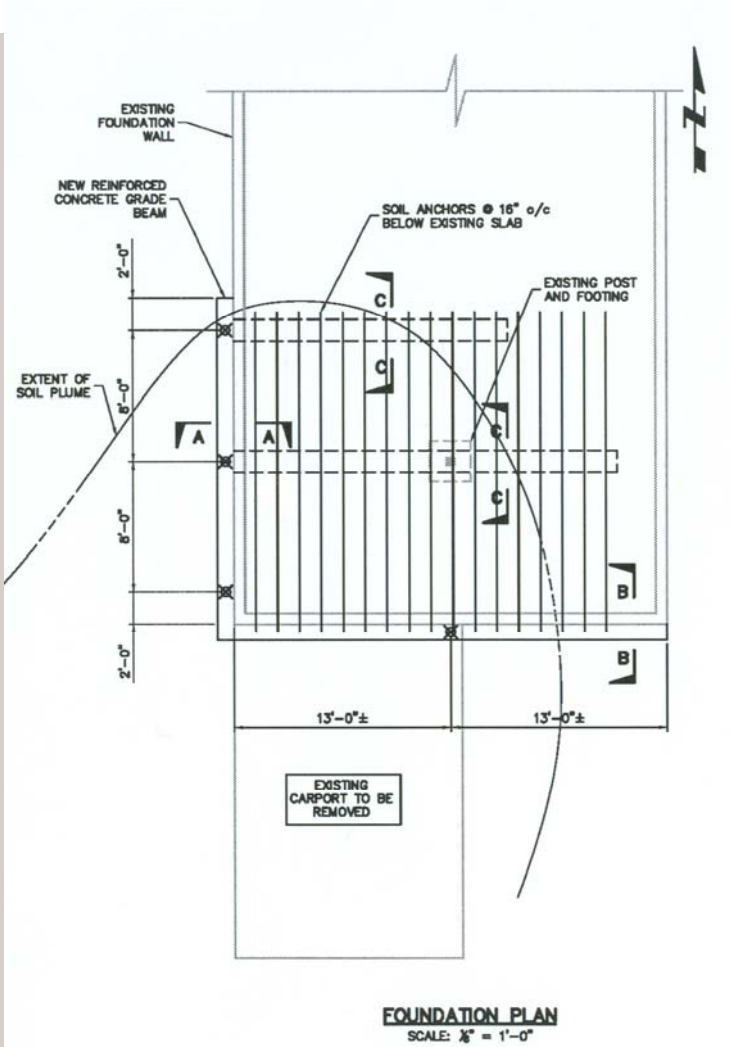
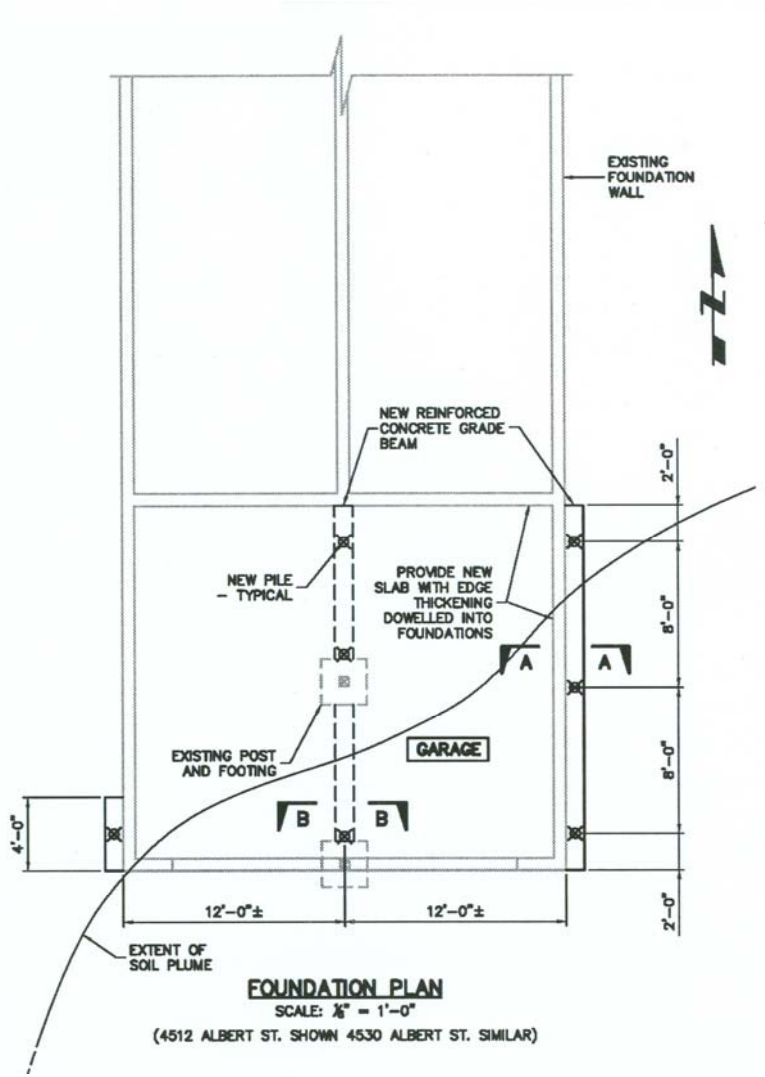
UNDERPINNING AND SHORING



FOUNDATION PLAN
SCALE: ⅛" = 1'-0"



FOUNDATION PLAN
SCALE: ⅛" = 1'-0"
(4512 ALBERT ST. SHOWN 4530 ALBERT ST. SIMILAR)

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UNDERPINNING AND SHORING

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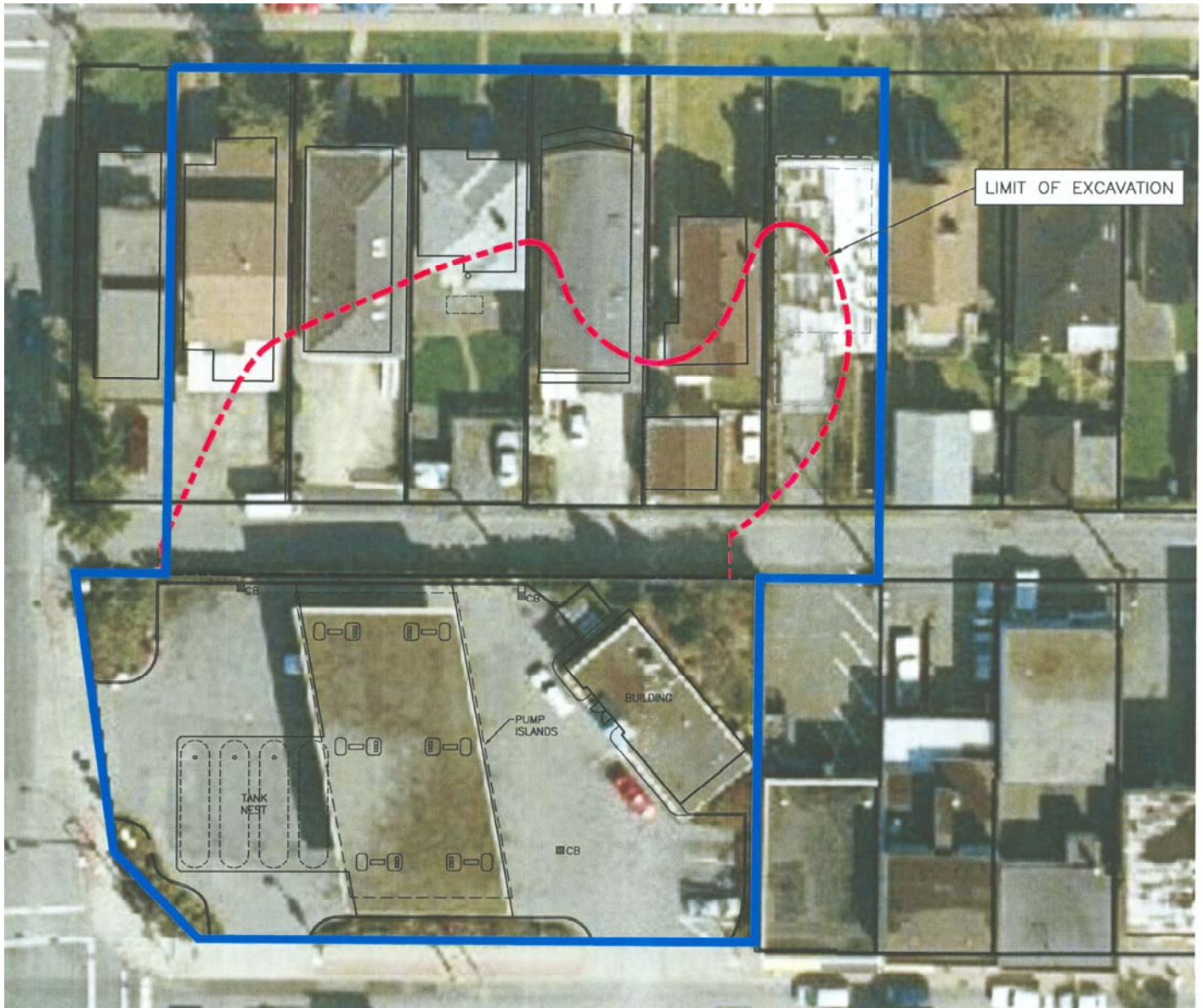
EXCAVATION LIMITS



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EXCAVATION

EXCAVATION

KEYSTONE ENVIRONMENTAL

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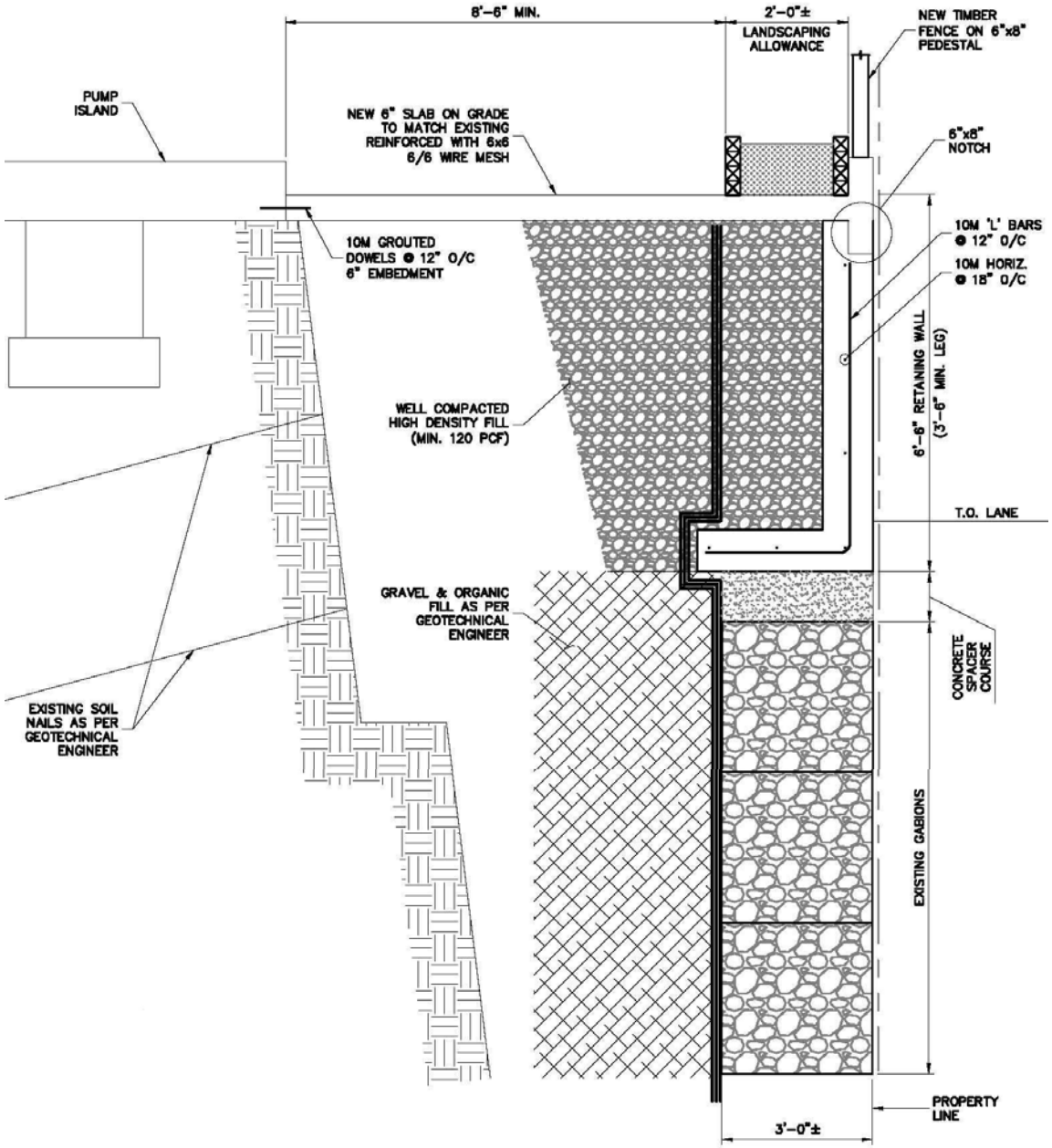
EXCAVATION

BARRIER WALL DESIGN



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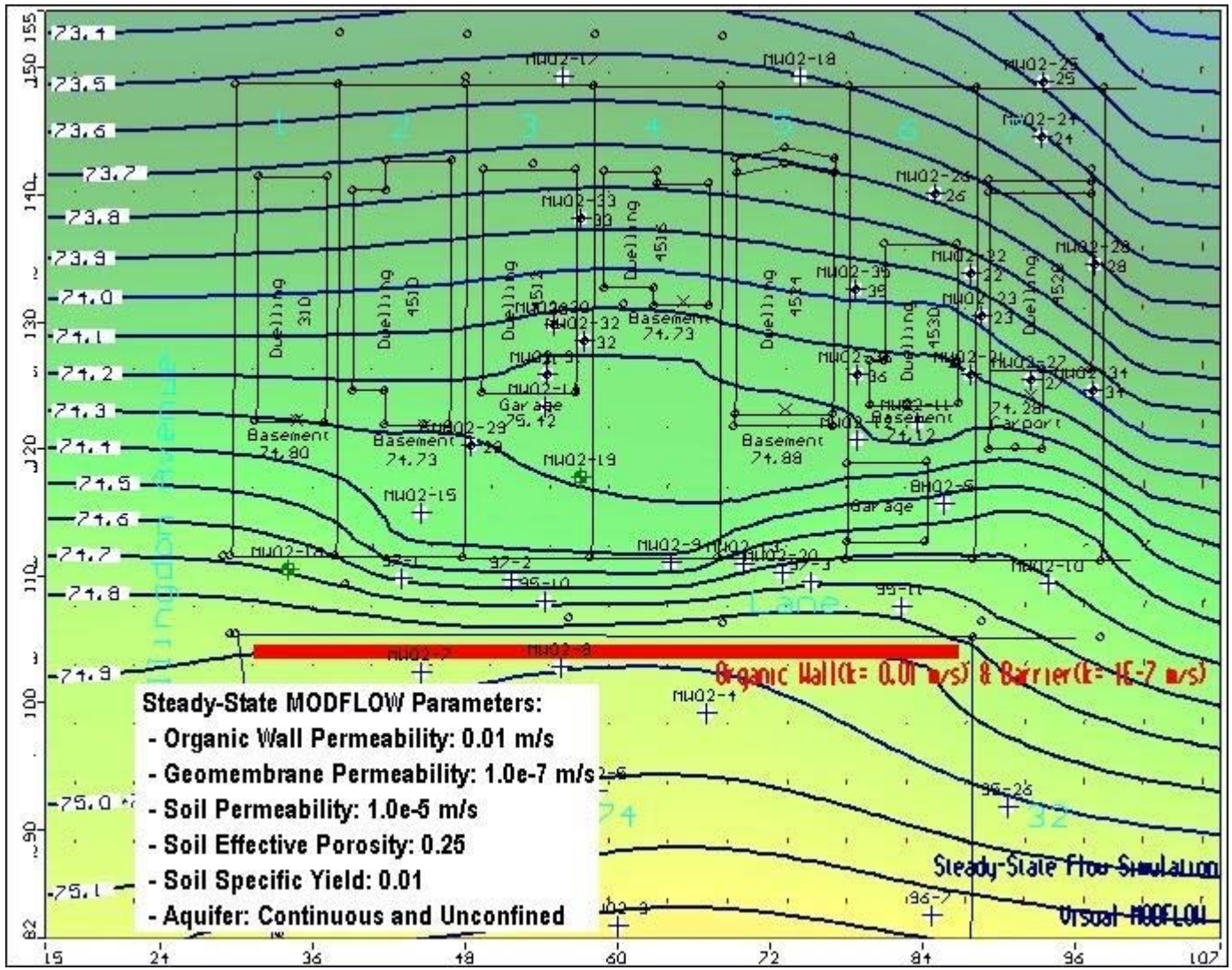
BARRIER WALL MODEL



BARRIER WALL INSTALLATION

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POST REMEDIATION ACTIVITIES

- Install Post Remediation Confirmatory Wells
- Reinstate Structures (eg. floor slabs)
- Reinstate Rear Yards, Fences, Garages
- Reconnect Utilities
- Performance Monitoring of Barrier Wall
- Preparing Closure Reports for Certificates of Compliance on Off-Site Properties

PROJECT PARTICIPANTS

- Chevron Canada Limited (Environment, Public and Government Affairs, Legal, and Engineering)
- Keystone Environmental Ltd. (Environmental and Contract Administrator)
- Hazco Environmental Services Ltd. (Remediation Contractor)
- City of Burnaby (Engineering, Planning, Traffic)
- GeoPacific Consultant Ltd. (Geotechnical)
- Sommerset Engineering Group (Structural)
  - PLUS several other sub-contractors

CONCLUDING REMARK

Treat project as an investment, not an expense

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THANK YOU