LNAPL STATUS

RACER Malleable Iron Industrial Land

Review with MDEQ
November 7, 2014

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OUTLINE

1. Malleable Iron Industrial Land (Site)
   - A. Background
   - B. Adjacent Land Uses
   - C. Site Geology
   - D. Site Hydrogeology
   - E. Remedial History
2. Southwest Plant LNAPL Area
   - A. Background
   - B. Previous Characterization
   - C. Previous Remedial Activities
   - D. LNAPL Conceptual Site Model
   - E. LNAPL Remedial Decision Tree
   - F. Conclusions/Recommendations

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OUTLINE

3. Quench Pit LNAPL Area
   - A. Background
   - B. Previous Characterization
   - C. Previous Remedial Activities
   - D. LNAPL Conceptual Site Model
   - E. LNAPL Remedial Decision Tree
   - F. Conclusions/Recommendations
4. Summary of Review
5. Discussion

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1. MALLEABLE IRON INDUSTRIAL LAND (SITE)

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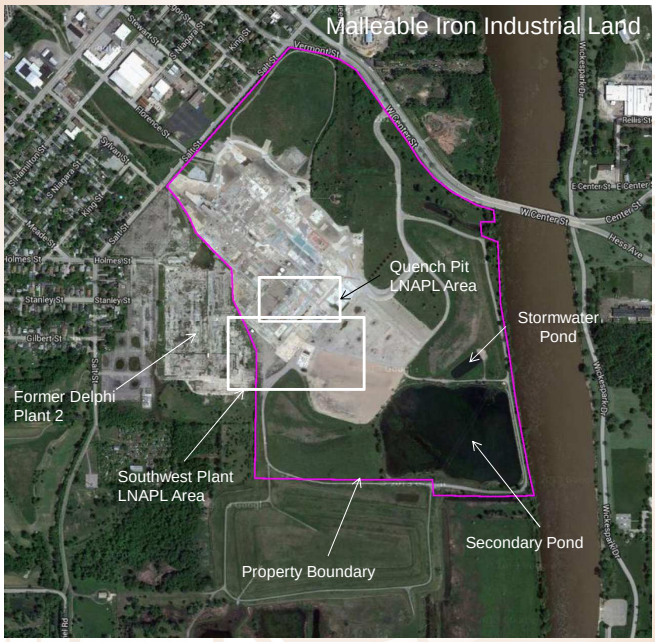

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1. Malleable Iron Industrial Land

A. Background

- Approximate size of Site: 150 acres
- Approximate size of former Saginaw Malleable Iron (SMI) Plant : 1 million square feet
- Approximate slab elevation: 593.5 feet AMSL
- Historical manufacturing operations involved casting and heat treating of iron
- Historically, used large volumes of quench and hydraulic oil
- Operated from 1907 to 2007
- Demolition was initiated in 2009 and was completed in December 2010

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1. Malleable Iron Industrial Land

B. Adjacent land uses

- To the north is a residential area
- To the south is the Greenpoint landfill (RACER property)
- To the west is the former Delphi Plant 2 which historically cut and ground parts. Delphi Plant 2 was closed in 2001
- To the east is the Saginaw River

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1. Malleable Iron Industrial Land

C. Site Geology

- Overburden at the Site is approximately 86 feet thick and is comprised generally of (in descending order): fill materials, glaciolacustrine silts and clays, a sand unit which becomes coarser with depth, glaciolacustrine silty clay, and glacial till
- The Site lies over bedrock units in the central part of the Michigan basin, the shallowest of which consists of Pennsylvanian age bedrock of the Grand River and Saginaw Formations

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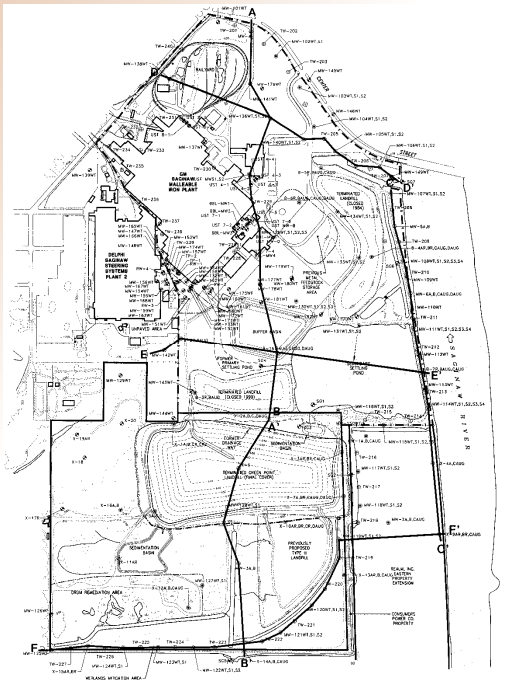

LEGEND

- GM SAGINAW MALLEABLE IRON PLANT PROPERTY LINE (APPROX.)
- REALM, INC. PROPERTY LINE (APPROX.)
- UNPAVED ROAD
- GROUND SURFACE ELEVATION CONTOUR (10 FT INTERVAL)
- FENCE LINE
- SWAMPY AREA
- MW-4 MONITORING WELL
- MW-102WT,S1 MONITORING WELL CLUSTER
- TW-203 TEMPORARY MONITORING WELL
- SGS STAFF GAUGE
- TP-2 PIEZOMETER
- RW-4 RECOVERY WELL
- X-11AR ABANDONED MONITORING WELL
- A—A' CROSS SECTION LOCATION

NOTES:

1. THIS PHOTOGRAMMETRIC BASE MAP FOR THE GM SAGINAW MALLEABLE IRON PLANT AND DELPHI SAGINAW STEERING SYSTEMS PLANT 2 PROPERTIES WAS PREPARED BY LOCKWOOD MAPPING, INC. OF ROCHESTER, NEW YORK. AERIAL PHOTOGRAPHY WAS CONDUCTED ON 11/11/94. ORIGINAL LOCKWOOD MAP WAS AT A SCALE OF 1"=100' AND WAS INTERPRETED FOR TWO-FOOT CONTOURS.
2. SAMPLING LOCATIONS SURVEYED BY ATWELL-HICKS, INC. UTICA, MICHIGAN, FILE NO. M1014SU2, FILE DATE 3/22/96, REVISED 8/8/96, OR SPICER GROUP.
3. VERTICAL DATUM REFERENCED TO NGVD OF 1929, HORIZONTAL DATUM REFERENCED TO MICHIGAN SPC-NAD 1983.
4. BASE MAP HAS BEEN MODIFIED TO INCORPORATE BUFFER BASIN, SEDIMENTATION BASINS, WETLANDS MITIGATION AREA, AND GREEN POINT LANDFILL (GPL) FINAL COVER FROM THE FINAL ENGINEERING DESIGN REPORT PREPARED BY BBL FOR THE GPL, DATED JANUARY 1998.
5. PROPERTY BOUNDARY FOR REALM, INC. DIGITIZED FROM SPICER GROUP DRAWING NO. A-21854-1, DATED 3/27/98.

Cross Section Locations

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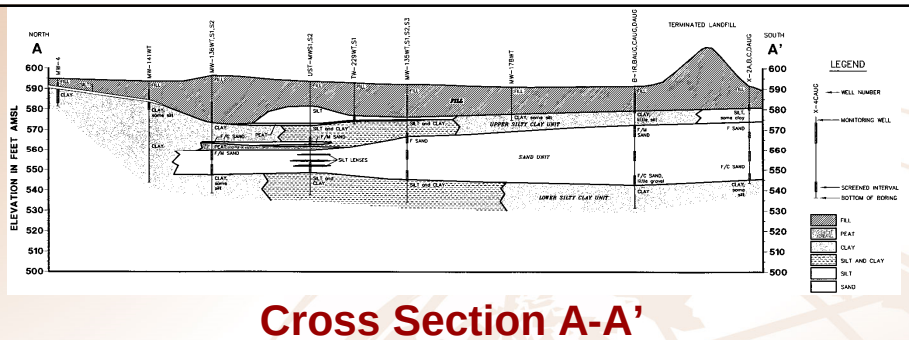
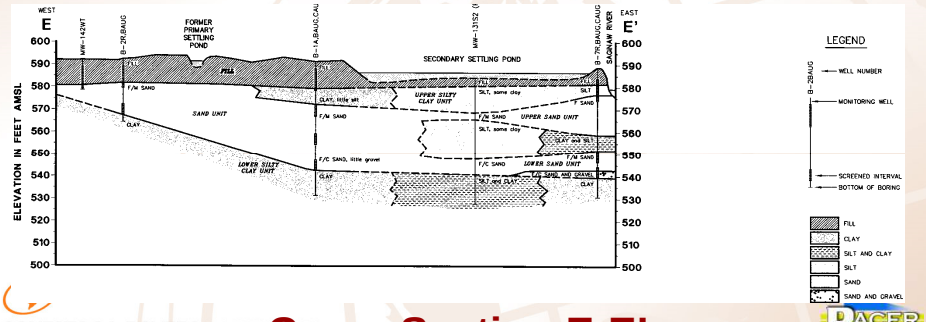


Cross Section A-A'



Cross Section E-E'

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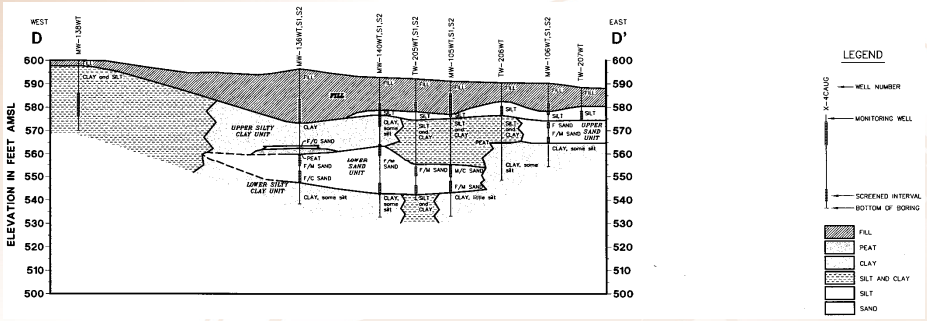

Cross Section D-D'

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1. Malleable Iron Industrial Land

D. Site Hydrogeology

- Shallow groundwater exists in an unconfined condition in the fill or silty clay units and the depth to groundwater varies from 2 to 10 feet bgs
- The fill/sand units, which pinch out toward the west, act as primary pathways for groundwater flow
- The underlying silty clay unit acts as a local flow boundary or lower confining unit
- The bedrock aquifer is confined by the continuous lower silty clay
- Groundwater flow is controlled on a regional scale by the Saginaw River, which acts as a discharge point for overburden groundwater

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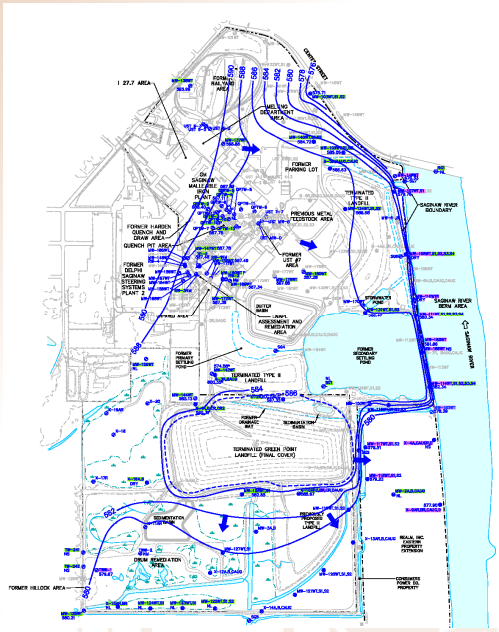

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5. BASE MAP INFORMATION SOUTH OF MAIN REALM, INC. PROPERTY LINE FROM AIR-LAND SURVEYS, INC. PHOTO DATE 11/93, MAPPING DATE 10/01.
6. CONTOURS HAVE BEEN INFERRED IN THE AREA OF THE LANDFILL BASED ON HISTORICAL DATA.

* ELEVATIONS AT MW-142WT AND B-3R WERE NOT USED FOR CONTOURING.
* MONITORING WELLS RW-1, RW-2 AND RW-3 NOT MEASURED BECAUSE THE VAULTS WERE FLOODED.

LEGEND:

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- STAFF GAUGE
- PIEZOMETER
- RECOVERY WELL
- ABANDONED MONITORING WELL
- ABANDONED MONITORING WELL CLUSTER
- RIVER GAUGE
- WELL NOT FOUND
- 580.33 GROUNDWATER ELEVATION (FEET AMSL)
- NS NOT SURVEYED
- NL NOT LOCATED
- NM NOT MEASURED
- P PRODUCT MEASURED IN WELL
- DRY MONITORING WELL DRY AT TIME OF GAUGING
- 582 GROUNDWATER ELEVATION CONTOUR LINE (FEET AMSL), DASHED WHERE INFERRED
- GROUNDWATER FLOW DIRECTION

RAP (7/31/08) MONITORING PROGRAM; REVISED 12/08

- SAMPLING AND GROUNDWATER ELEVATION MEASUREMENT LOCATION
- LNAPL AND/OR GROUNDWATER ELEVATION MEASUREMENT LOCATION

Water Elevation Contour Map Sept. 23, 2013

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1. Malleable Iron Industrial Land

E. Remedial History

- The Remedial Investigation (RI) was completed between December 1994 and August 2000 in accordance with the MDEQ approved Work Plan and the additional phases of RI activities
- The RI report was submitted to the MDEQ on November 27, 2000 and approved on July 5, 2001

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1. Malleable Iron Industrial Land

E. Remedial History cont'd

- A Feasibility Study, including Human Health Evaluation Report (HHE) and Ecological Risk Assessment (ERA) Report, was completed and submitted in July of 2003 and approved by the MDEQ in a letter dated November 18, 2003
  - The HHE evaluated groundwater contact, industrial groundwater volatilization to indoor air inhalation, flammability and explosivity screening, water solubility screening, soil direct contact, and industrial drinking water protection exposure pathways in the Southwest Plant LNAPL and Quench Pit areas
  - LNAPL was being addressed through on-going LNAPL removal and monitoring, evaluation of remedial alternatives, other than deed restrictions, were not required at that time

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1. Malleable Iron Industrial Land

E. Remedial History cont'd

- Environmental Indicator (EI) CA 750 – Migration of contaminated groundwater under control was approved by US EPA on September 15, 2006
  - The EI CA 750 identified that monitoring should continue in the areas with LNAPL. At the time the document was prepared LNAPL was being recovered
- EI CA 725 – Current Human Exposures Under Control was approved by US EPA on September 27, 2007

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1. Malleable Iron Industrial Land

E. Remedial History cont'd

- A Remedial Action Plan (RAP) was initially submitted on July 30, 2008, was modified on December 31, 2008, and approved with conditions on February 27, 2009. A revised RAP was submitted on May 29, 2009
  - The approved RAP included the following specific activities associated with the Southwest Plant and Quench Pit LNAPL areas:
    - Continued operation and maintenance of LNAPL recovery systems
    - Areas subject to restrictive covenant that limits property to non residential, prohibits the installation of potable water supply wells, and places restrictions on intrusive activities. Worker duration restrictions also apply
    - Monitoring of LNAPL thickness and groundwater level elevations on an annual basis

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2. SOUTHWEST PLANT LNAPL AREA

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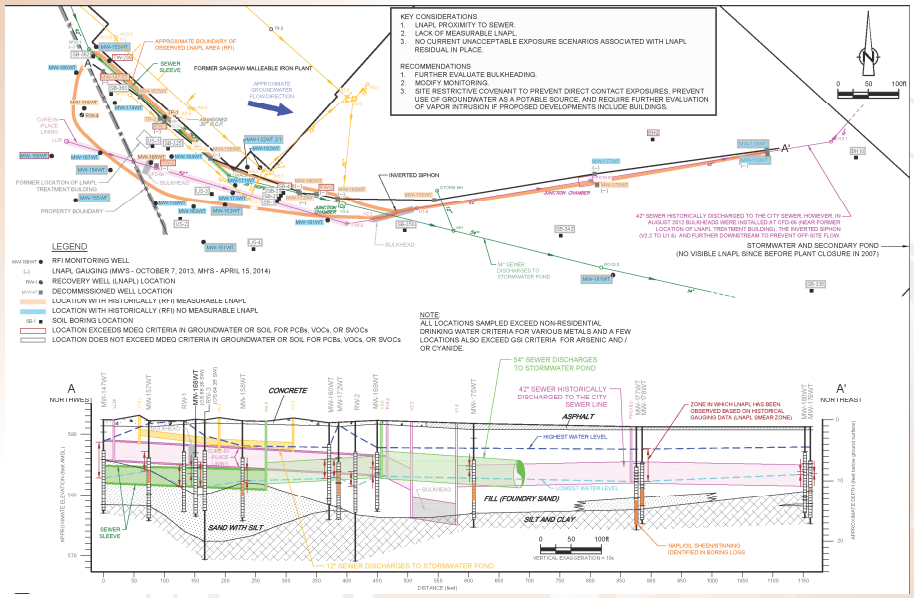

Southwest Plant LNAPL Area Plan and Profile

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2. Southwest Plant LNAPL Area

A. Background

- LNAPL was first observed in monitoring wells in the southwest corner of the Plant during the RI in March 1995
- Subsequent investigations were completed between June 1995 and August 1996 to determine the extent of LNAPL impacts and to provide additional data for design of a LNAPL and groundwater recovery and treatment system (completed in September 1997)
- An LNAPL fingerprint analyses was completed (January 2005)

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2. Southwest Plant LNAPL Area

A. Background, cont'd

- The storm sewer system intersects groundwater table
  - Since demolition, the groundwater surface has risen (rebounded) in the area of the former Plant
- Two large storm sewers pass through the LNAPL area. The bedding for the two sewers were investigated for potential preferential pathways
- The magenta colored sewer on the plan and profile figure historically discharged to the City sewer system further downstream at Outfall CFD-02 (several bulkheads have been installed)
- The green colored sewer on the plan and profile figure discharges to the stormwater pond which discharges into the secondary pond. The secondary pond has no outlet.

2. Southwest Plant LNAPL Area

A. Background, cont'd

- A letter to cease automated recovery of LNAPL in the Southwest Plant LNAPL area was submitted in August 2010
- MDEQ agreed passive recovery was appropriate in October 2010
- In November 2013, a draft memorandum was submitted to the MDEQ for review, summarizing the LNAPL evaluation activities completed in the Southwest Plant LNAPL Area and proposed activities moving forward
- As a follow-up a presentation was given on May 5, 2014

2. Southwest Plant LNAPL Area

A. Background, cont'd

- As a follow-up to the May 5, 2014 meeting, a Proposed Monitoring Plan was submitted to the MDEQ on May 27, 2014
- Comments on the Proposed Monitoring Plan were received on August 21, 2014.
- A redline of the plan was submitted to the MDEQ on September 8, 2014 (response pending)

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2. Southwest Plant LNAPL Area

B. Previous Characterization

- Investigation included:
  - 33 monitoring wells (including wells in sewer bedding)
  - 12 soil borings
  - 4 recovery wells
  - LNAPL, soil, and groundwater sampling
- Concentrations of PCBs detected during the RI were:
  - Non-detect to 9,600 ppm in LNAPL
  - Non-detect to 41 ppm in soil
  - No PCBs were reported in filtered groundwater samples
- LNAPL was characterized as an amber colored, light, viscous, multi-component mixture of petroleum based oils, containing PCBs

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2. Southwest Plant LNAPL Area

B. Previous Characterization, cont'd

- The sewers at the Site have been investigated extensively since 1996:
  - 326 manhole surveys were completed at the former SMI Plant and 84 were completed at Delphi Plant 2 (prior to Delphi separation from GM)
  - More than 3,000 ft of sewers at the Former SMI Plant were evaluated using a combination of video inspections, visual observations, and dye testing
  - This resulted in a comprehensive sewer map that was developed for the Site including the Southwest Plant LNAPL Area
- Potential on-site sources of LNAPL are the historical operations of the former SMI Plant

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2. Southwest Plant LNAPL Area

C. Previous Remedial Activities

- September 1995: Manual LNAPL recovery initiated from wells (bailing)
- April 1996: Repair of sewer that discharge to the stormwater pond
  - Various sections of the sewer (42" Ø concrete) that discharges to the stormwater pond, upstream of manhole W13.1 to manhole W6.8, were replaced to prevent LNAPL from entering the sewer
  - The two ends of a truncated 30" Ø sewer line which was previously abandoned was also located while completing the 42" Ø sewer repair
  - Approximately 4,300 gallons of LNAPL was removed from the 30" Ø abandoned sewer line and an additional 700 gallons of LNAPL was removed from the excavation
  - A recovery well (RW-1) was installed in the backfill of the 30" Ø abandoned sewer excavation to allow for ongoing LNAPL recovery

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2. Southwest Plant LNAPL Area

C. Previous Remedial Activities, cont'd

- June 1996: Additional sewer repairs
  - Approximately 600 ft of cure-in-place lining was installed in the 42" Ø sewer line that formerly discharged to the City between the former Plant 2 diversion chamber and the inverted siphon (manhole V2.2 and manhole U1.6)
  - Three additional recovery wells (RW-2, RW-3, and RW-4) were installed
- September 1997: Initiated operation of LNAPL and Groundwater Recovery and Treatment System:
  - Four recovery wells
  - An oil/water separator
  - A hydrogen peroxide system to control iron bacteria
  - Bag filters
  - GAC treatment

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2. Southwest Plant LNAPL Area

C. Previous Remedial Activities, cont'd

- July 1998: PCB impacted soil excavation
  - PCB impacted soil (up to 41 ppm) was excavated from a 40'x10' area to a depth of 1 ft, south of the Southwest Plant LNAPL Area
  - Confirmation samples confirmed that soils containing PCBs above industrial direct contact values were removed
- August 1998: Sewer Sleeve installation
  - Approximately 300 ft of 36" Ø HDPE pipe was installed between manhole W13.1 and W6.8 within the 42" Ø sewer line that discharges to the stormwater pond which discharges to the secondary pond
- Mid 1990's to 2000: More than 2,500 ft of sewers at the Site were cleaned by jetting and bucketing

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2. Southwest Plant LNAPL Area

C. Previous Remedial Activities, cont'd

- August 2000: Stormwater Pond Improvements
  - Oily material identified in the stormwater pond in 1998
  - PCBs were detected in the oily material and from sediment samples located adjacent to the active storm sewer discharge line that goes through the LNAPL impacted area, however Industrial Direct Contact values for soil were not exceeded
  - No PCBs were detected in surface water
  - As a result of the supplemental investigation sediments were stabilized using lime and fly ash and the Stormwater Pond was lined in August 2000

2. Southwest Plant LNAPL Area

C. Previous Remedial Activities, cont'd

- October 1998 to 2007: Stormwater Pond Inspections/Maintenance
  - Inspections of the stormwater pond were conducted weekly for the presence of LNAPL
  - Oil absorbent booms and containment booms were replaced, as necessary
  - LNAPL was occasionally skimmed off the stormwater pond
  - Weekly inspections and maintenance of the stormwater pond ceased in 2007 when the plant was closed. Periodic inspections of the stormwater pond have been conducted since the plant closed
  - LNAPL has not been observed in the stormwater pond since before 2007

2. Southwest Plant LNAPL Area

C. Previous Remedial Activities, cont'd

- 1997 to 2007: O&M of LNAPL and Groundwater Recovery and Treatment System
  - May 2001: the scavenger pump in RW-1 was switched to a skimmer pump, and RW-2, RW-3, and RW-4 continued to operate with scavenger pumps
  - October 2001: RW-4 was disconnected from the system and wells located on the Delphi Plant 2 property were excluded from gauging
  - 3,700 gallons of LNAPL recovered
  - December 2007: Operation of the system ceased when power was turned off, as a result of SMI closure
  - Periodic monitoring of LNAPL thicknesses and manual LNAPL removal (bailing) in area wells was completed during the operation of the system

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2. Southwest Plant LNAPL Area

C. Previous Remedial Activities, cont'd

- 2007 to Present: Post-LNAPL and Groundwater Recovery System Operation
  - 2007 to October 2013: Passive and/or manual recovery and monitoring has occurred periodically
  - July to August 2010: conducted a study to determine the effectiveness of passive recovery utilizing absorbent socks.
  - MDEQ approved use of passive recovery using absorbent socks instead of re-starting the system in October 2010
  - Measurable LNAPL (generally less than 0.1 ft present at four wells)
  - Late 2010: the water table rose above the top of a number of monitoring well screens due to groundwater rebound after plant demolition
  - April 2012: last measurable LNAPL reading

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2. Southwest Plant LNAPL Area

C. Previous Remedial Activities, cont'd

- 2007 to Present: Post-LNAPL and Groundwater Recovery System Operation, cont'd
  - October 2013: last LNAPL readings taken (no measureable LNAPL) prior to abandonment of the majority of monitoring wells in the area
  - 2007 to present: no LNAPL observed in the stormwater pond
- August 2011: Bulkheads installed in sewer that discharge to City
  - Flow directed to the City sewer from the 42" Ø sewer was bulkheaded at the inverted siphon (manhole V2.2 to manhole U1.6, at CFD-06, and further downstream where the 42" Ø sewer connects to the City 60" Ø sewer

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2. Southwest Plant LNAPL Area

C. Previous Remedial Activities, cont'd

- 2014: Quarterly Manhole inspections initiated in June
  - Nine manholes are inspected quarterly for the presence of LNAPL
  - During the first quarterly inspection in June, LNAPL was observed in three manholes (one on 30" abandoned sewer, X8.2, and W6.8). Absorbent booms were installed in each of the manholes.
  - Booms were removed in the second quarterly event in October with a saturation level of approximately 25% (< 2 gallons per boom). During the second quarterly event, there was no measurable product in the manholes inspected
- To date no LNAPL has been observed at the ground surface

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2. Southwest Plant LNAPL Area

D.1 LCSM - Release History

- Potential sources of LNAPL are the historical operational activities at the Former SMI Plant and adjacent property
  - Former SMI Plant closed in 2007
  - Former Delphi Plant 2 was closed in 2001

D.2 LCSM - Remedial History

- Recovery of LNAPL has been performed by various methods since 1995
  - Automated recovery system efficiency decreased significantly prior to water table submerging screens post-demolition (ratio of LNAPL recovered/water recovered decreased from high of 0.01 in 2000 to 0.0004 in 2006 and 2007)

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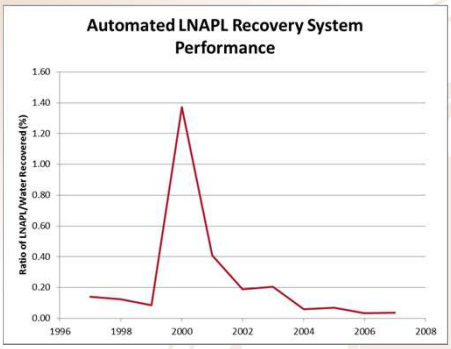
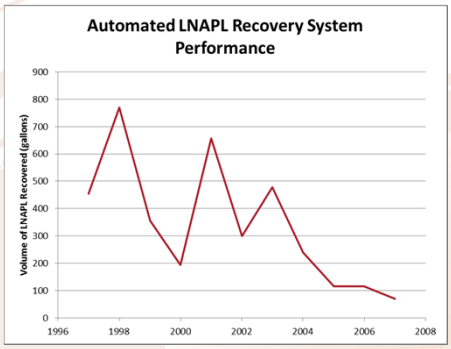
Annual LNAPL Recovery Performance





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2. Southwest Plant LNAPL Area

D.3 LCSM - Land Use

- Residual LNAPL within the confines of former heavy industrial site with future land use restricted to non-residential

D.4 LCSM - LNAPL Properties

- Amber colored, light, viscous, multi-component mixture of primarily petroleum based oils resembling motor oils
- LNAPL results from a waste characterization sample collected in June 2010 indicated the presence of PCBs at 17 ppm

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2. Southwest Plant LNAPL Area

D.5 LCSM - LNAPL Spatial Distribution

- Vertical impacts 4-14 ft bgs
- Extent of potentially mobile/recoverable LNAPL historically delineated by MWs
  - Limited measurable LNAPL detected mid-2010
  - Trace LNAPL thicknesses or no LNAPL detected prior to post-demo water table rise (submerging screens)
  - No measurable LNAPL in monitoring wells since April 2012 (including wells where screens are not submerged currently)
- Residual LNAPL impacts may extend from up-gradient property (from historical sources)

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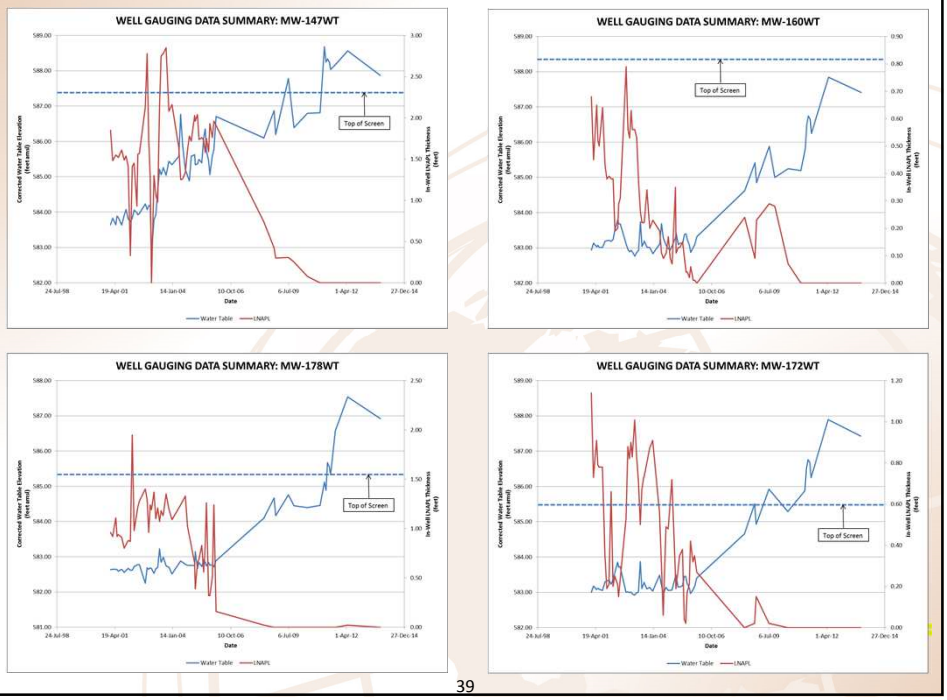

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2. Southwest Plant LNAPL Area

D.6 LCSM - LNAPL Mobility and Recoverability

- Only trace amounts of LNAPL observed recently and prior to water table submerging screens
  - de minimis mobility/recoverability condition
  - Post-demolition water table rise would have significantly smeared and further immobilized/submerged the limited mobile LNAPL observed prior
- Active recovery completed until 2007 when the SMI Plant was shut down
  - Recovery efficiency diminished prior to shut down and post-demolition water table rise
- MDEQ agreed passive recovery was appropriate in October 2010

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2. Southwest Plant LNAPL Area

D.7 LSCM - LNAPL Stability

- LNAPL stable based on:
  1. Time since possible release
  2. Historical LNAPL recovery performance
  3. Diminishing mobility/recoverability trend before post-demolition water table rise
  4. Significant post-demolition water table rise (further immobilization)
  5. De minimis mobility/recoverability of potential source zone(s)

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2. Southwest Plant LNAPL Area

D.8 LSCM - Potential Exposures

- The results for groundwater samples collected during the RI from the Southwest Plant LNAPL Area exceed current generic State of Michigan criteria for various metals, PCBs, SVOCs, and VOCs for GSI, Non-Residential Drinking Water, and Vapor Intrusion
- Groundwater and soil data from the RI was also evaluated in the HHE and concluded that there are no completed unacceptable exposure pathways following implementation of restrictive covenant

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2. Southwest Plant LNAPL Area

D.8 LCSM - Potential Exposures cont'd

- Exposures that exceed current State of Michigan Criteria will be addressed as identified below:
  - Drinking Water Pathway
    - This pathway is incomplete since the Site is serviced by municipal water supply
    - Use of groundwater as a potable source will be prohibited by Restrictive Covenant
  - Vapor Intrusion Pathway
    - This pathway is not currently complete as there are no buildings
    - Will include RRD template language for VI restriction for possible future redevelopment in Restrictive Covenant

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2. Southwest Plant LNAPL Area

D.8 LCSM - Potential Exposures cont'd

- GSI Pathway
  - Any remaining LNAPL is stable and is a significant distance from the Saginaw River (~1,000 ft)
  - Sewers routed through the LNAPL area discharge to the stormwater pond which empties into the Secondary Pond, however, no LNAPL has been observed in the stormwater pond since before 2007
  - Ongoing quarterly monitoring of nine manholes in the Southwest Plant LNAPL area including the three manholes with observed LNAPL. Including inspections of the stormwater pond and the Secondary Pond for the presence/absence of LNAPL. LNAPL, if present, will be recovered. Once there are four consecutive rounds of no measurable LNAPL at a given location, monitoring of that location will cease

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2. Southwest Plant LNAPL Area

D.8 LCSM - Potential Exposures cont'd

- Direct Contact
  - Not currently a relevant pathway as NAPL is located at least 4 ft bgs, however, there is a potential pathway in the future should the area be excavated for redevelopment or other purposes
  - A restrictive covenant will be placed on the Southwest Plant LNAPL Area that identifies that caution is required and proper precautions should be in place while excavating or conducting other work in the area, and that requires maintaining 2 ft of cover over the area following any work and to properly manage any impacted material encountered while performing the work

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2. Southwest Plant LNAPL Area

E. LNAPL Remedial Decision Tree

- Risk-based LNAPL management decision-making process developed in conjunction with MDEQ
  - Implemented at RACER sites across Michigan
  - Strategies based on realistic assessment of risk and potential benefit of engineered remedies
  - The process can be implemented at any point in the life of a project to determine an appropriate risk-based LNAPL management strategy (e.g., determine whether to start, stop or continue LNAPL recovery if already implemented)
- Consistent with MDEQ Petroleum NAPL Policy

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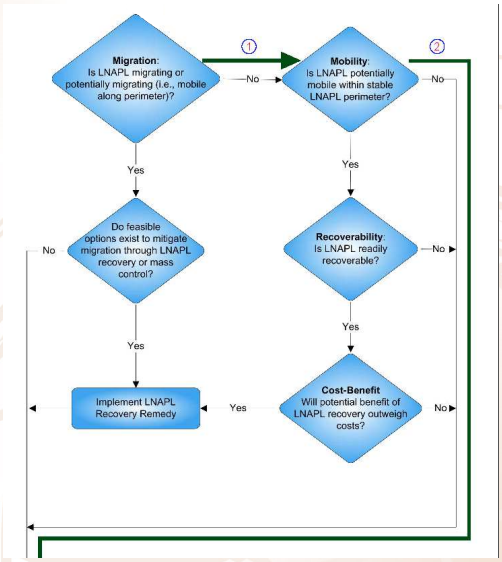
LNAPL Saturation Concerns (mobility and migration issues)
- Potential for LNAPL to spread and create new or increased risk (migration toward surface water, property boundary, underground utilities)
- Aesthetic/Nuisance issues



1. AGE, LNAPL WELL OBSERVATIONS SINCE 2000 INDICATE LNAPL IS STABLE.
2. NO MEASURABLE LNAPL IN WELLS, SHEEN OBSERVED (DE MINIMIS MOBILITY CONDITION, INSUFFICIENT LNAPL PRESENT TO EVALUATE TRANSMISSIVITY)

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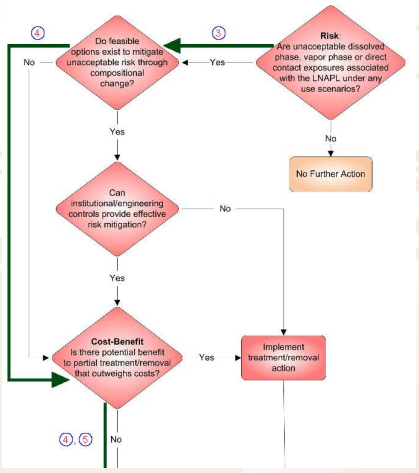
LNAPL Compositional Concerns (potential exposure/risk issues):
- Explosive hazards (vapor accumulation in confined spaces/ utilities, open excavations)
- Dissolved-phase concentrations (migration toward surface water bodies or groundwater supply wells)
- Vapor-phase concentrations (vapor intrusion/Long-term exposure risk)
- Direct contact or ingestion



3. NO CURRENT RISK DUE TO LNAPL PRESENCE DIRECT CONTACT REMAINS A POTENTIAL FUTURE CONCERN IN THE EVENT OF SUBSURFACE EXCAVATION.
4. COMPOSITIONAL CHANGE WILL NOT MITIGATE POTENTIAL EXPOSURE TO LNAPL IN THE EVENT OF EXCAVATION.
5. RESTRICTIVE COVENANT WILL PROVIDE EFFECTIVE MITIGATION AND WILL BE THE MOST SUSTAINABLE APPROACH.

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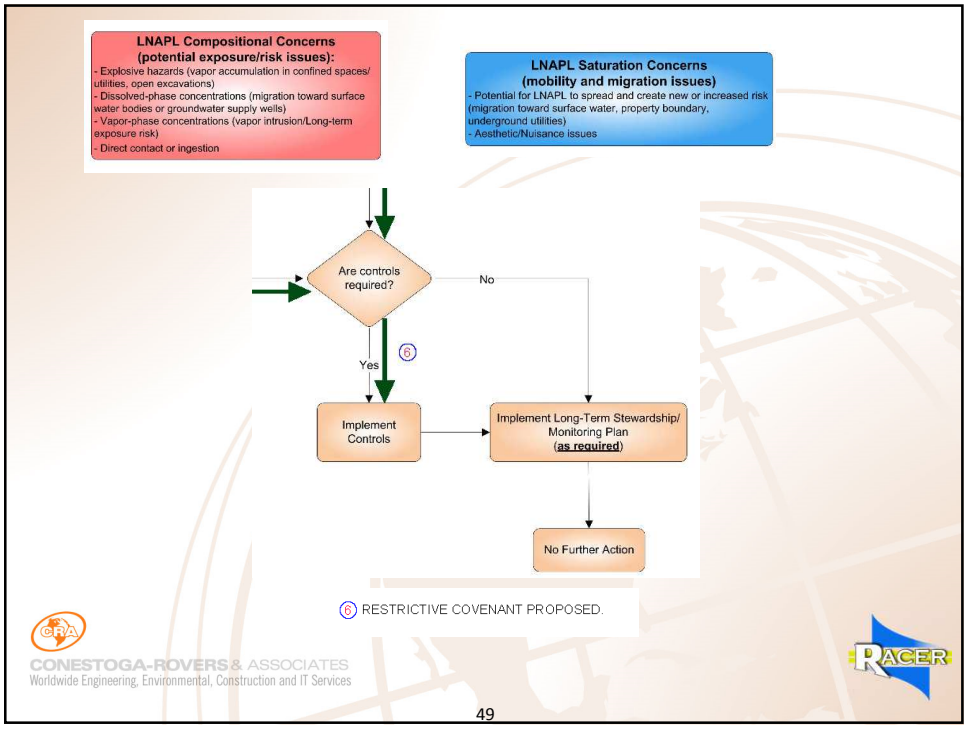
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- Vapor-phase concentrations (vapor intrusion/Long-term exposure risk)
- Direct contact or ingestion
LNAPL Saturation Concerns
(mobility and migration issues)
- Potential for LNAPL to spread and create new or increased risk (migration toward surface water, property boundary, underground utilities)
- Aesthetic/Nuisance issues
Are controls required?
No
Yes
6
Implement Controls
Implement Long-Term Stewardship/ Monitoring Plan
(as required)
No Further Action
6 RESTRICTIVE COVENANT PROPOSED.
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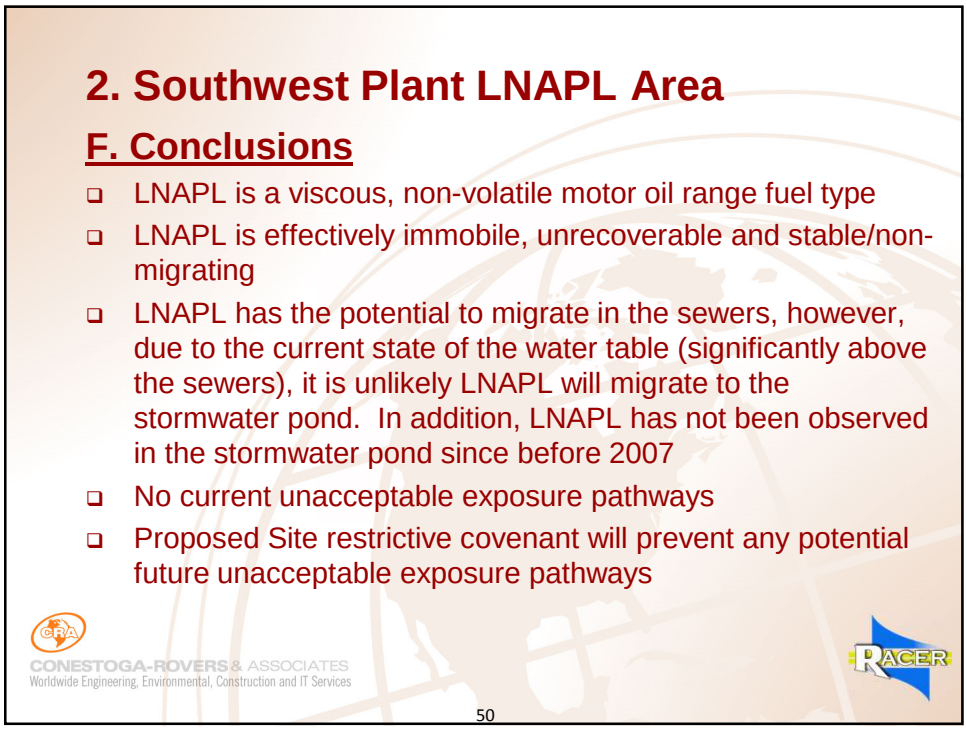
2. Southwest Plant LNAPL Area
F. Conclusions
LNAPL is a viscous, non-volatile motor oil range fuel type
LNAPL is effectively immobile, unrecoverable and stable/non-migrating
LNAPL has the potential to migrate in the sewers, however, due to the current state of the water table (significantly above the sewers), it is unlikely LNAPL will migrate to the stormwater pond. In addition, LNAPL has not been observed in the stormwater pond since before 2007
No current unacceptable exposure pathways
Proposed Site restrictive covenant will prevent any potential future unacceptable exposure pathways
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2. Southwest Plant LNAPL Area

G. Recommendations

- Proposed Monitoring
  - Discontinue monitoring of remaining wells for LNAPL with water levels above the screen and abandon
  - Collect quarterly depth to LNAPL/water in nine manholes in the Southwest Plant LNAPL area (including the three manholes with LNAPL observed in June 2014)
  - Inspect the stormwater pond and the Secondary Pond for the presence/absence of LNAPL. LNAPL, if present, will be recovered.
  - **Endpoint:** Once there are four consecutive rounds of no measurable LNAPL at a given location, monitoring of that location will cease.
  - **Reporting:** Annual data summary reports

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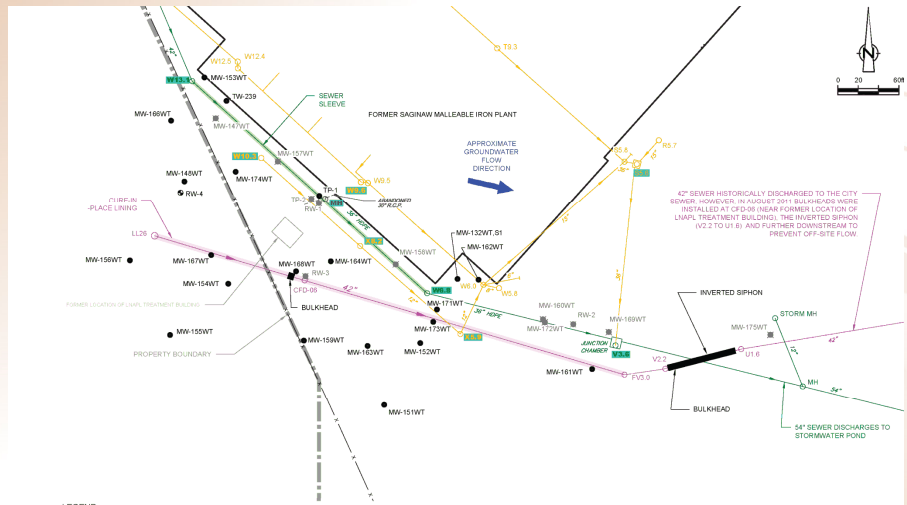

figure 2
PROPOSED MONITORING PLAN
SOUTHWEST PLANT LNAPL AREA
MALLEABLE IRON INDUSTRIAL LAND
Saginaw, Michigan

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2. Southwest Plant LNAPL Area

G. Recommendations cont'd

- Implement restrictive covenant
  - Prevent direct contact exposures
  - Prevent use of groundwater as a potable source
  - Require further evaluation of vapor intrusion pathway should future development include buildings in vicinity
- **Contingency:** In the event measurable LNAPL continues to be observed in the manholes a proposed investigation will be submitted to MDEQ within sixty days of the annual report

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3. QUENCH PIT AREA

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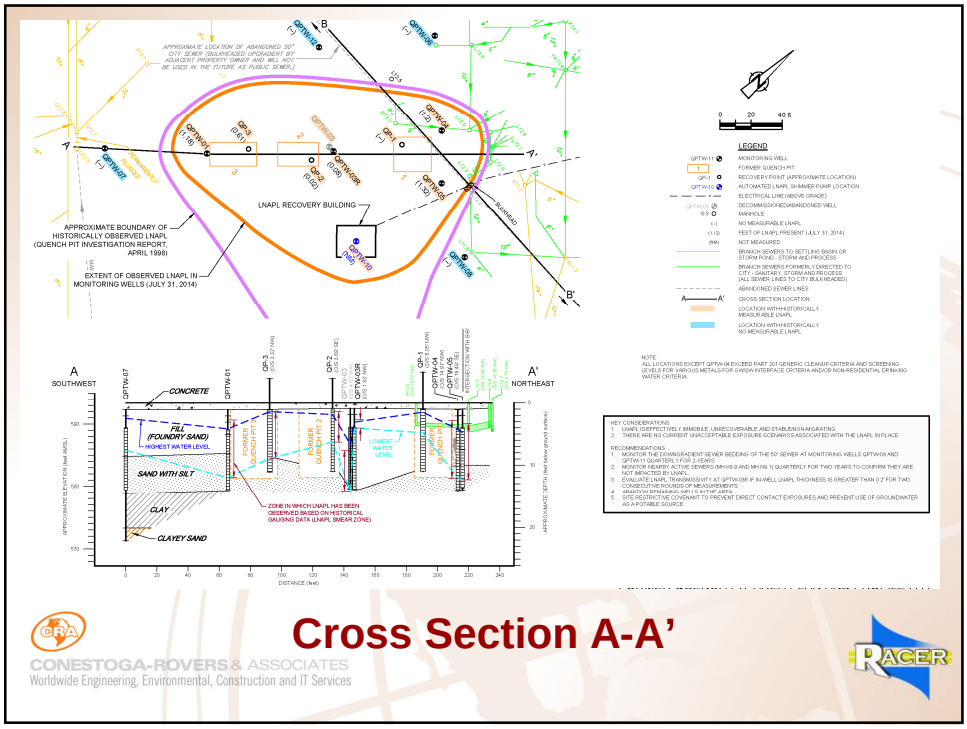

Cross Section A-A'

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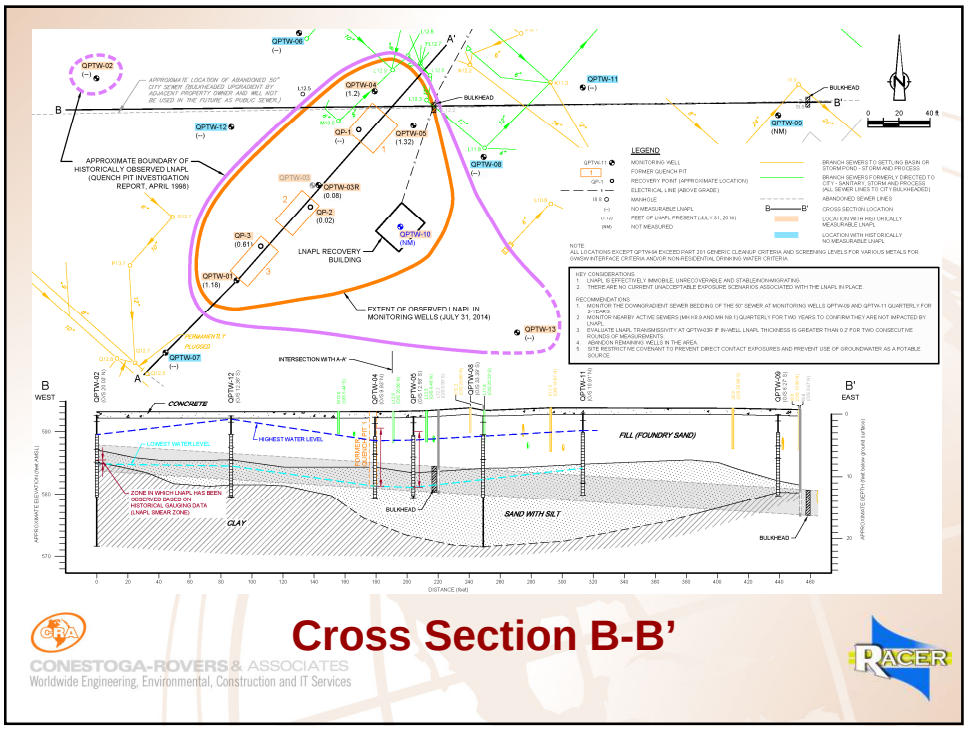

Cross Section B-B'

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3. Quench Pit Area

A. Background

- The Quench Pit Area is located in the former Annealing Department (heat treatment) in the south-central portion of the former SMI Plant
- The area contained three quench pits, installed in the late 1960's which each held 25,000 gallons of quench oils used in the heat treatment process
- In 1997, the quench pits were emptied, cleaned and leaks repaired.
- In January 1998 smaller stainless steel shells were built inside the quench pits to act as primary containment while the original stainless steel structures acted as secondary containment

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3. Quench Pit Area

B. Previous Characterization

- The Plant periodically analyzed the quench oils for PCBs and detections were noted in 1977 and 1979. Since 1979, PCBs were not detected in the quench oils used at the Plant
- Quench Pit Investigation (March 1997) included:
  - 13 monitoring wells (including wells in sewer bedding)
  - groundwater and LNAPL sampling
- Concentrations of PCBs detected in the Quench Pit Area during the Investigation were:
  - Non-detect to 19 ppm in LNAPL
  - No PCBs were reported in groundwater samples

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3. Quench Pit Area

B. Previous Characterization, cont'd

- Samples of LNAPL were collected from the Quench Pit monitoring wells in March 2007
- Concentrations of PCBs detected in the samples ranged from 2.7ppm to 6.0 ppm
- During demolition, a composite LNAPL sample was collected from Quench Pit #2 and #3 in June 2010 for waste characterization and reported PCBs as non-detect
- LNAPL was characterized as being non-volatile and viscous, having similar properties to hydraulic oil

3. Quench Pit Area

C. Previous Remedial Activities

- 1997: During a Site-wide sewer investigation LNAPL was identified in a 50-inch abandoned sewer line immediately adjacent to former Quench Pit #1
  - 4,000 gallons of LNAPL were removed
  - Two bulkheads were installed on the 50-inch abandoned sewer downgradient of the quench pits
  - A third bulkhead was previously installed upgradient from the Quench Pit Area by the adjacent facility
- 1997 to 2002: approximately 6,500 gallons of LNAPL was manually recovered (bailed)

3. Quench Pit Area

C. Previous Remedial Activities, cont'd

- February 2002: automated LNAPL recovery system (skimmer pump) was installed in QPTW-03
- 2002 to 2007: O&M of LNAPL recovery system
  - ~2,400 gallons of LNAPL recovered from QPTW-03
  - Periodic monitoring of LNAPL thicknesses and manual LNAPL removal (bailing) in area wells was completed during the operation of the system
- December 2007: Operation of the LNAPL recovery system ceased as a result of closure activities
- December 2007 to present: Ongoing periodic monitoring and manual recovery of LNAPL from wells
- June 2010: QPTW-03 was decommissioned due to damages sustained during plant demolition

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3. Quench Pit Area

C. Previous Remedial Activities, cont'd

- 2007 to 2010: Demolition of the SMI Plant
  - Quench pits were emptied of product when the plant was shut down in 2007
  - Bulkheads were installed (green) to eliminate all discharges from the Site to the City (pink)
  - Summer 2010: Demolition of quench pits
    - Stainless steel shells were removed and the remaining concrete structure sidewalls and floors were punched through to ensure the pits do not act as a "bathtub"
    - 55,000 gallons of LNAPL were removed from the quench pit excavations and disposed of in accordance with applicable laws
    - Three LNAPL recovery wells were installed, one in each quench pit excavation and were added to the monitoring program

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3. Quench Pit Area

C. Previous Remedial Activities, cont'd

- October 2011: LNAPL building from the Southwest Plant LNAPL Area was moved to the former Quench Pit Area and the LNAPL skimmer pump was installed in QPTW-10 (well reporting the greatest thickness of LNAPL)
- January 2012: Skimmer pump in QPTW-10 was commissioned
  - To date 60 gallons of LNAPL has been recovered
- October 2013: replacement well was installed within 3-feet of the abandoned QPTW-03, to confirm presence/absence of LNAPL

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3. Quench Pit Area

C. Previous Remedial Activities, cont'd

- QPTW-03R was added to the monitoring program. The most recent reading (October 2014) reported no measurable LNAPL. Since the installation of QPTW-03R, the greatest thickness of LNAPL measured was 0.37 feet in April 2014
- To date no LNAPL has been observed at the ground surface

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3. Quench Pit Area

D.1 LCSM - Release History

- Source of LNAPL is the three former quench pits
  - Former SMI Plant closed in 2007 and significant LNAPL (55,000 gallons) removed during the summer of 2010

D.2 LCSM - Remedial History

- Recovery of LNAPL has been performed by various methods since 1997
  - 55,000 gallons of oil were removed from the quench pit excavations during their decommissioning
  - Various efforts involving manual bailing and skimming pumps have recovered an additional 60 gallons (since 2012)

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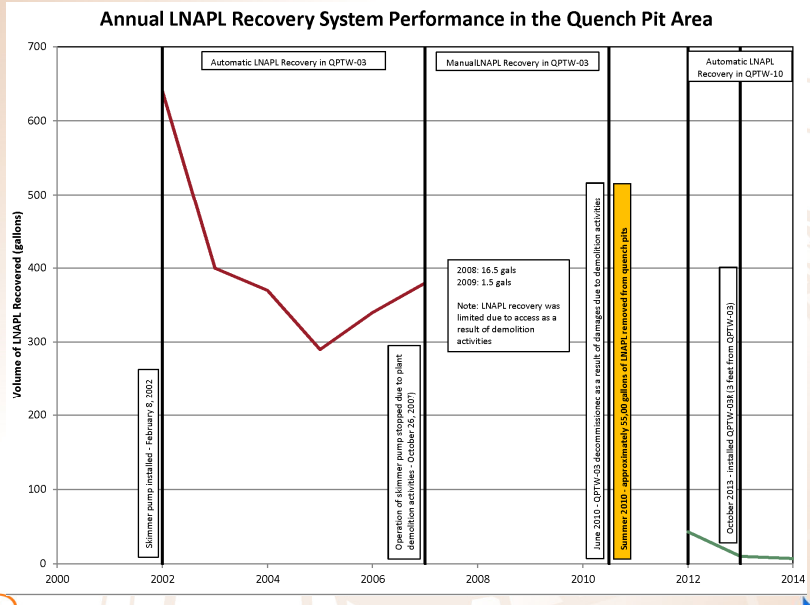

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3. Quench Pit Area

D.3 LCSM - Land Use

- Residual LNAPL within the confines of former heavy industrial site with future land use restricted to non-residential

D.4 LCSM - LNAPL Properties

- Viscous, non-volatile hydraulic oil range fuel type
- LNAPL results have indicated the presence of PCBs, however, most recent sampling in 2010 reported ND

D.5 LCSM - LNAPL Spatial Distribution

- Vertical impacts 1.5-13.5 ft bgs
- Extent of potentially mobile/recoverable LNAPL delineated by MWs (approximately 200 ft by 200 ft in size)

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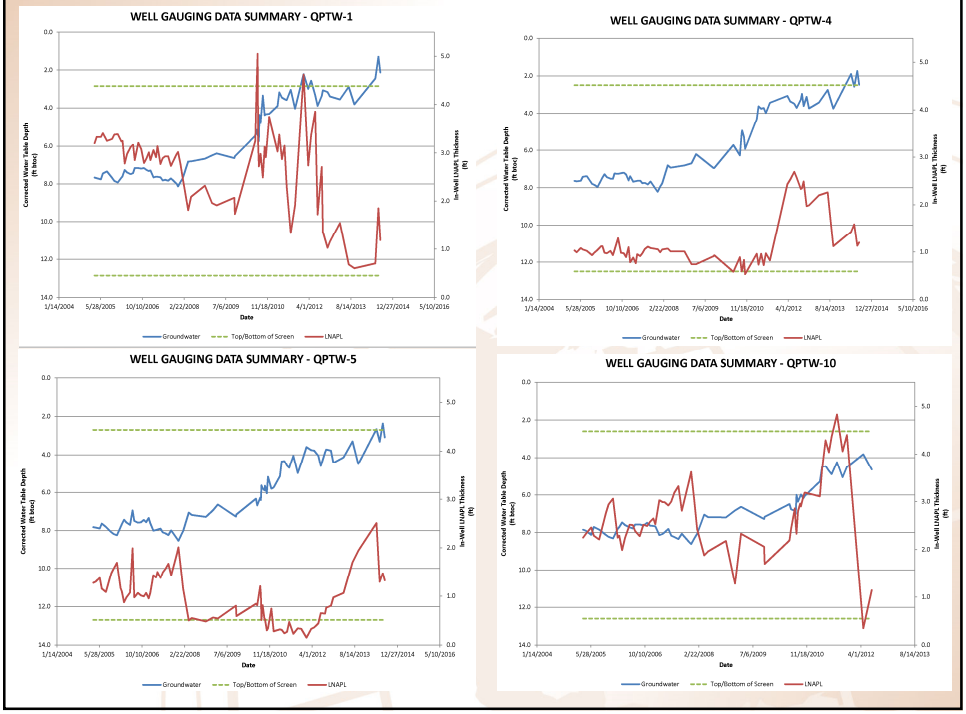

3. Quench Pit Area

D.6 LCSM - LNAPL Mobility and Recoverability

- Fraction of LNAPL that remains potentially mobile is likely negligible given:
  - The age of the LNAPL (>4 years since source of LNAPL removed – demolition of quench pits)
  - Historical recovery efforts that were continued until performance was observed to diminish to very low levels
  - Post-demolition water table rise would have significantly smeared and further immobilized/submerged the limited mobile LNAPL observed prior
- LNAPL transmissivity results are all within MDEQ de minimis range, with the possible exception of QPTW-10
- Therefore, LNAPL is predominantly present at residual saturation (i.e., effectively immobile, unrecoverable)

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3. Quench Pit Area

D.7 LSCM - LNAPL Stability

- LNAPL stable based on:
  1. The footprint of where LNAPL is observed in wells has decreased over time
  2. Time since possible release
  3. Well gauging, remedial history, and LNAPL transmissivity estimates confirm that the potential mobility of the LNAPL is very low
  4. Diminishing mobility/recoverability following demolition of quench pits
  5. Post-demolition water table rise (further immobilization)

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3. Quench Pit Area

D.8 LSCM - Potential Exposures

- The results of available groundwater samples collected in the Quench Pit Area exceed current generic State of Michigan criteria for various metals for GSI and Non-Residential Drinking Water
- Groundwater and soil data from the RI was also evaluated in the HHE and concluded that there are no completed unacceptable exposure pathways following implementation of restrictive covenant

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3. Quench Pit Area

D.8 LCSM - Potential Exposures cont'd

- Exposures that exceed current State of Michigan Criteria will be addressed as identified below:
  - Drinking Water Pathway
    - This pathway is incomplete since the Site is serviced by municipal water supply
    - Use of groundwater as a potable source will be prohibited by the Restrictive Covenant

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3. Quench Pit Area

D.8 LCSM - Potential Exposures cont'd

- GSI Pathway
  - Any remaining LNAPL is stable and is a significant distance from the Saginaw River (~1,500 ft)
  - Some sewers in the vicinity of the LNAPL area discharge to the former stormwater pond which empties into the Secondary Pond, however, no LNAPL has been observed in the stormwater pond since before 2007

PJ15

  - Quarterly monitoring of select manholes is recommended to confirm presence/absence of LNAPL. LNAPL, if present, will be recovered. Once there are four consecutive rounds of no measurable LNAPL at a given location, monitoring at that location will cease

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3. Quench Pit Area

D.8 LCSM - Potential Exposures cont'd

- Direct Contact
  - Not currently a relevant pathway as NAPL is located below a concrete slab, however, there is a potential pathway in the future should the area be excavated for redevelopment or other purposes
  - A restrictive covenant will be placed on the Quench Area that identifies that caution is required and proper precautions should be in place while excavating or conducting other work in the area, and that requires maintaining a minimum 6" concrete cover over the area following any work and to properly manage any impacted material encountered while performing the work

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Slide 73

PJ15 DF Does Pond Actually discharge to the river?

JEP Not directly, only passively through the banks of the secondary pond
Pardys, John-Eric, 11/4/2014

3. Quench Pit Area

E. LNAPL Remedial Decision Tree

- Risk-based LNAPL management decision-making process developed in conjunction with MDEQ
  - Implemented at RACER sites across Michigan
  - Strategies based on realistic assessment of risk and potential benefit of engineered remedies
  - The process can be implemented at any point in the life of a project to determine an appropriate risk-based LNAPL management strategy (e.g., determine whether to start, stop or continue LNAPL recovery if already implemented)
- Consistent with MDEQ Petroleum NAPL Policy

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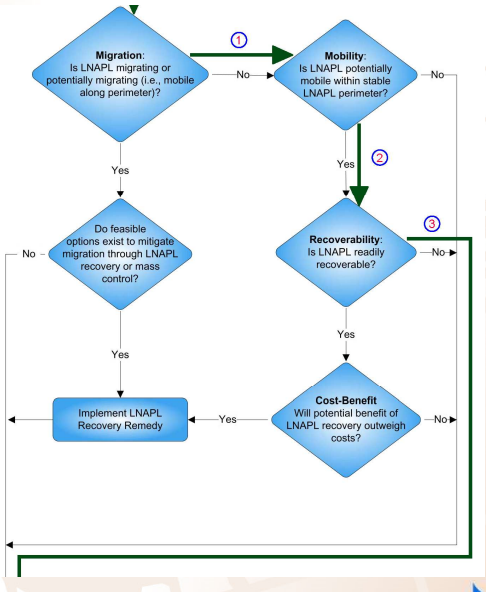
LNAPL Saturation Concerns (mobility and migration issues)
- Potential for LNAPL to spread and create new or increased risk (migration toward surface water, property boundary, underground utilities)
- Aesthetic/Nuisance issues



1. AGE, LNAPL WELL OBSERVATIONS INDICATE LNAPL IS STABLE.
2. LNAPL IN WELLS INDICATES POTENTIALLY MOBILE LNAPL WITHIN STABLE PERIMETER.
3. LNAPL TRANSMISSIVITY IN THE DE MINIMIS RANGE.

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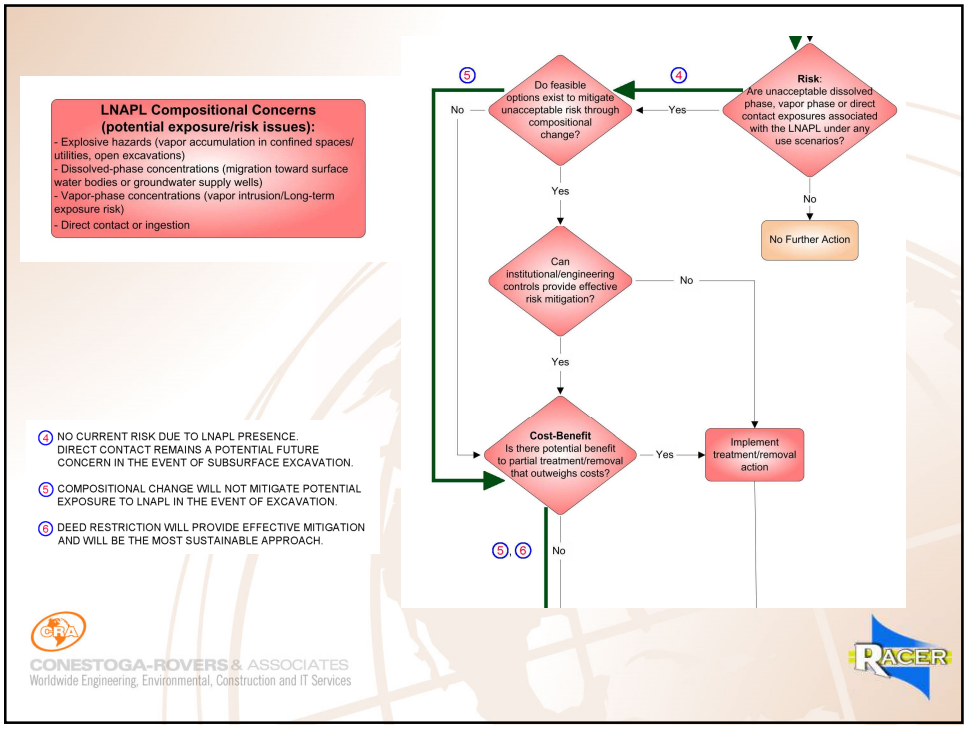
LNAPL Compositional Concerns
(potential exposure/risk issues):
- Explosive hazards (vapor accumulation in confined spaces/ utilities, open excavations)
- Dissolved-phase concentrations (migration toward surface water bodies or groundwater supply wells)
- Vapor-phase concentrations (vapor intrusion/Long-term exposure risk)
- Direct contact or ingestion
Risk:
Are unacceptable dissolved phase, vapor phase or direct contact exposures associated with the LNAPL under any use scenarios?
4
Yes
No
No Further Action
Do feasible options exist to mitigate unacceptable risk through compositional change?
5
No
Yes
Can institutional/engineering controls provide effective risk mitigation?
No
Yes
Cost-Benefit
Is there potential benefit to partial treatment/removal that outweighs costs?
Yes
Implement treatment/removal action
5, 6
No
4 NO CURRENT RISK DUE TO LNAPL PRESENCE. DIRECT CONTACT REMAINS A POTENTIAL FUTURE CONCERN IN THE EVENT OF SUBSURFACE EXCAVATION.
5 COMPOSITIONAL CHANGE WILL NOT MITIGATE POTENTIAL EXPOSURE TO LNAPL IN THE EVENT OF EXCAVATION.
6 DEED RESTRICTION WILL PROVIDE EFFECTIVE MITIGATION AND WILL BE THE MOST SUSTAINABLE APPROACH.
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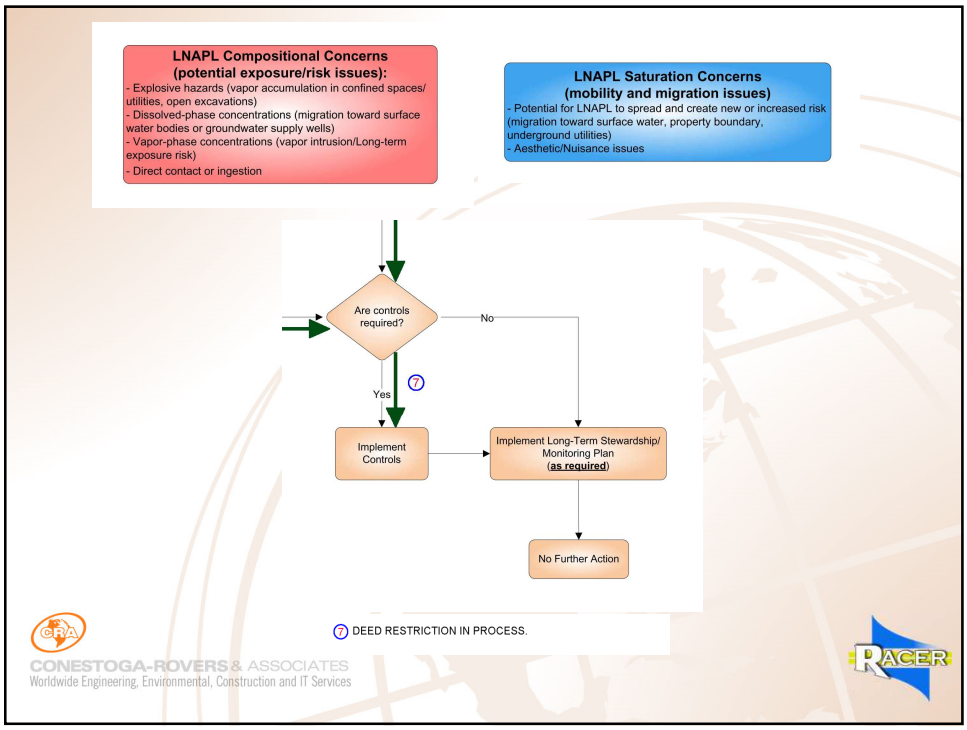
RACER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LNAPL Saturation Concerns
(mobility and migration issues)
- Potential for LNAPL to spread and create new or increased risk (migration toward surface water, property boundary, underground utilities)
- Aesthetic/Nuisance issues
Are controls required?
No
Yes
7
Implement Controls
Implement Long-Term Stewardship/ Monitoring Plan (as required)
No Further Action
7 DEED RESTRICTION IN PROCESS.
CONESTOGA-ROVERS & ASSOCIATES
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RACER

3. Quench Pit Area

F. Conclusions

- LNAPL is a viscous, non-volatile hydraulic oil range fuel type
- LNAPL is effectively immobile, unrecoverable and stable/non-migrating overall in the bulk of the soil matrix
  - LNAPL transmissivity estimates are predominantly within MDEQ de minimis range
- LNAPL has the potential to migrate in the sewers, however, due to the current state of the water table (above the sewers), it is unlikely LNAPL will migrate to the stormwater pond. In addition, LNAPL has not been observed in the stormwater pond since before 2007
- No current unacceptable completed exposure pathways associated with the LNAPL
- Proposed Site restrictive covenant will prevent any potential future unacceptable completed exposure pathways

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3. Quench Pit Area

G. Recommendations

- Proposed Monitoring
  - Monitor downgradient sewer bedding monitoring wells (QPTW-09 and QPTW-11) quarterly to confirm LNAPL is not migrating along sewer bedding
  - Monitor all other Quench Pit monitoring wells (QPTW-01 to QPTW-13 and QP-1, QP-2, and QP-3) quarterly
  - Monitor nearby active sewers at MH K8.9 that ultimately discharge to the storm sewer then to the stormwater pond quarterly to confirm they are not impacted by LNAPL
  - Monitor nearby sewers that historically discharged to the City at MH 11.8, MH 13.0, MH L12.8, and MH L12.3 but have since been bulkheaded, quarterly to confirm they are not impacted by LNAPL
  - **Endpoint:** Monitoring at a given location will cease after 4 consecutive rounds of no measurable LNAPL or when all Quench Pit monitoring wells show transmissivity levels less than 0.5 ft^2/day
  - **Reporting:** Annual data summary reports

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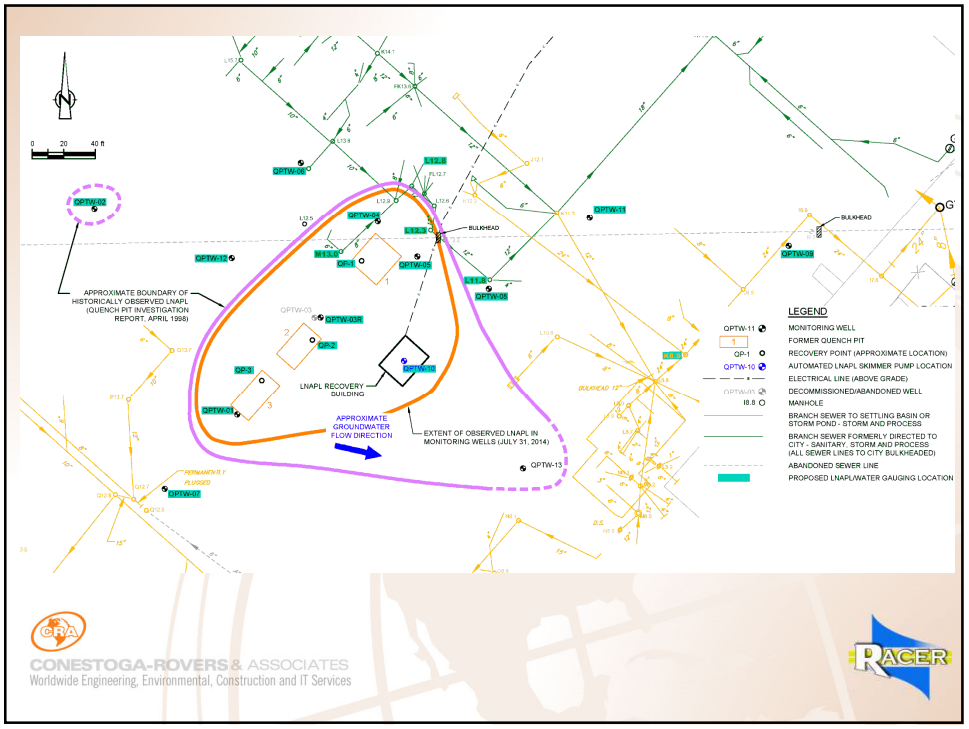

3. Quench Pit Area

G. Recommendations cont'd

- Implement restrictive covenant
  - Prevent direct contact exposures
  - Prevent use of Site groundwater as a potable source
  - Future land use restricted to non-residential
- Continue operation of skimmer pump in QPTW-10 until transmissivity levels are less than 0.5 ft^2/day
- Abandon monitoring wells following 4 consecutive rounds of no measurable LNAPL or when all Quench Pit monitoring wells show transmissivity levels less than 0.5 ft^2/day, with MDEQ concurrence
- **Contingency:** In the event measurable LNAPL is observed in the manholes or monitoring wells a proposed investigation will be submitted to MDEQ within sixty days of the annual report

4. Summary of Review

Southwest Plant LNAPL Area

- Conclusions
  - LNAPL is effectively immobile, unrecoverable and stable/non-migrating overall in the bulk of the soil matrix
  - LNAPL has the potential to migrate in the sewers, however, LNAPL has not been observed in the stormwater pond since before 2007
  - No current unacceptable exposure pathways associated with the LNAPL
  - Proposed Site restrictive covenant will prevent any potential future unacceptable exposures
- Recommendations
  - Implement restrictive covenant
  - Monitor LNAPL levels in nearby manholes, stormwater pond, and secondary pond to confirm LNAPL is not migrating

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4. Summary of Review

Quench Pit Area

- Conclusions
  - LNAPL is effectively immobile, unrecoverable and stable/non-migrating overall in the bulk of the soil matrix
  - LNAPL has the potential to migrate in the sewers, however, LNAPL has not been observed in the stormwater pond since before 2007
  - No current unacceptable exposure pathways associated with the LNAPL in place
  - Proposed Site restrictive covenant will prevent any potential future unacceptable exposures
- Recommendations
  - Implement restrictive covenant
  - Monitor LNAPL levels in nearby manholes and in Quench Pit monitoring wells to confirm LNAPL is not migrating or accumulating
  - Continue operating skimmer pump in QPTW-10 until transmissivity levels are less than 0.5 ft^2/day

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5. Discussion

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