CORRECTIVE ACTION
ADAPTIVE MANAGEMENT
& LEAN PROCESS

DAN DAILEY, Environmental Engineer,
Michigan Department of Environmental Quality
Overview

• The People
• The Process
• The Science
• Lessons Learned
• Application
The People

• Local Government: The City of Midland

• The Company: Dow Chemical

• Property Owners: City of Midland, non-residential owners, residential owners.

• State of Michigan: DEQ, DOT
The Process: Adaptive Management

• Controlling Regulation
  – Part 111 Operating License reissued 2015
  – Contains Corrective Action provisions of Rule 629
  – Part 201 Site-Specific Screening Values for Dioxins/Furans

• Dow Interim Response Action Plan Designed to meet Criteria
  – Approved by DEQ in 2012
  – Contains Adaptive Management Scope

• Regulations and Agreements only Change with Written Agreement
The Process: Adaptive Management

What could change?

– How data was gathered. The methods, the analysis.
– Once a presumptive remedy was discerned, work could be directed to serve the remedy.
– The iterative review process. The parties met frequently and communicated informally, whether orally or in writing.
– Communications to facilitate an approvable final report that serves as a basis for further actions and determinations.
Project Meta Data

- 1,700 acre study area within the City of Midland (Midland Resolution Area)
- ~425 acres of Residential or Residential-like land use
- ~1,275 acres of industrial/commercial land use
- Dow collected/analyzed over 1,633 samples from 2012 to Report submittal in 2016.
- Contaminants of Concern: dioxins and furans from historical, legacy air deposition, and arsenic. Dioxins and Furans were the driver for presumptive remedy.
Goals

• Protection of Human Health and the Environment
  – Ensure that the interim response action will meet requirements of the operating license corrective action provisions.
  – Support a quick and efficient remedy with the least amount of disruption to property owners.
  – Facilitate Dow’s efforts with Property owners and the City of Midland for institutional control of property use.
  – Get financial assurance in place for long-term monitoring and maintenance,
  – include notification programs for subsequent property transactions.
The Science: Sample Methodology

Credit to:
Art Ostaszewski
Senior Environmental Quality Analyst
Hazardous Waste Section, DEQ
Background

- **City of Midland Soils:** Soil contamination located north and east of Dow Plant site
- **Primary contaminants:** Dioxins and furans
- **Sources of released materials:** Particulates from historic burning and incineration; vehicle track out from plant; dust blow off from Dow Plant
- **Target populations:** People living and/or working in the City of Midland
Midland Presumptive Approach

- Soil contamination located primarily north and east of Dow Plant site
- Dioxins and furans as typically less than 1000 ppt TEQ but greater than 200 ppt over large residential areas.
- Very limited soil data.
- Alternative approach is a “site specific” soil criteria with independent peer review.
Midland Area
Soils
Dioxins/Furans
Cleanup
Midland Area
Soils
Dioxins/Furans
Cleanup
Phase 1 - Establishing variability associated with field and laboratory methods:

- Establish appropriate practices for field collection, homogenization and handling in the field;
- Establish appropriate practices for sample handling and extraction in the laboratory;
- Analyze the contribution of field and laboratory methods to the overall data variability; and
- Comparability between MAS Fast Analysis and 1613b.
Phase 2 - Understanding of site-specific variability in the environment:

• Establish an appropriate number of increments for composite sampling over the scale of interest; and

• Conduct a preliminary evaluation of representativeness and reliability of larger scale composite area for decision-making.
Midland Area
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Midland Area Soils Dioxins/Furans Cleanup

This ended up being 30 increments rather than 9.
Midland Area
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- Tested a “riffle splitter”
- Results are pending
Midland Area Soils Dioxins/Furans Cleanup
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Midland Area Soils Dioxins/Furans Cleanup
### Midland Area Soils Dioxins/Furans Cleanup

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>Site A</th>
<th>Site B</th>
<th>Site C</th>
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<tbody>
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<td>B1-E1-C1-V1</td>
<td>457</td>
<td>297</td>
<td>504</td>
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<tr>
<td>B1-E1-C1-V2</td>
<td>443</td>
<td>287</td>
<td>613</td>
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<tr>
<td>B1-E1-C1-V3</td>
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<td>613</td>
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<tr>
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<td>434</td>
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<tr>
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<td>482</td>
<td>217</td>
<td>639</td>
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</tbody>
</table>
### Midland Area Soils Dioxins/Furans Cleanup

#### Table 2. Summary of Random Variability of Field/Laboratory Procedures

<table>
<thead>
<tr>
<th>Source #</th>
<th>Source of Variability</th>
<th>Site A2</th>
<th>Site 1</th>
<th>Site O</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laboratory analysis of liquid sample extract</td>
<td>1.3%</td>
<td>1.6%</td>
<td>1.2%</td>
</tr>
<tr>
<td>2</td>
<td>Laboratory sample cleanup of liquid extract sample</td>
<td>1.1%</td>
<td>2.2%</td>
<td>2.0%</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory soil sub-sampling and extraction of liquid sample</td>
<td>7.8%</td>
<td>3.9%</td>
<td>4.2%</td>
</tr>
<tr>
<td>4</td>
<td>Field sample composited from individual increment samples (Method 1)</td>
<td>7.7%</td>
<td>11.7%</td>
<td>12.3%</td>
</tr>
<tr>
<td>5</td>
<td>Field collection of a single sample directly from increment locations (Method 2)</td>
<td>10.7%</td>
<td>2.6%</td>
<td>16.7%</td>
</tr>
<tr>
<td>6</td>
<td>Field sampling method (Method 1 or 2)</td>
<td>8.3%</td>
<td>11.2%</td>
<td>10.4%</td>
</tr>
</tbody>
</table>
Midland Area Soils Dioxins/Furans Cleanup
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Figure 6. Proposed Pilot Study Area – Sampling Nomenclature

Parcel PA1 = 1/4 acre
Subplot PA = PA1 + PA2 + PA3 + PA4 = 1 acre
8A = PA + PB + PC + PD = 4 acres
Midland Area Soils Dioxins/Furans Cleanup

10 increments from 4 of the ¼ acre parcels will also be individually analyzed and compared to the ICS sample(s).
Midland Area Soils Dioxins/Furans Cleanup

Figure 8. Effect of Number of Increments on Data Variability
Institutional Controls

Credit to Al Taylor, Manager, Hazardous Waste Section, DEQ
Presumptive Remedy

• Based on a City of Midland dioxin/furan site-specific action level of 250-ppt TEQ threshold triggering a presumptive response at residential properties.

• Most dioxin/furan contamination requiring action in soils was located within the top 12” of soils.
Presumptive Remedy

• Where sample results showed a need for remedy, the top 12” of soils were removed and disposed of in a landfill or reused on the Dow Plant site (non-residential direct contact criteria is 990 ppt TEQ).

• Property was restored to grade and previous landscaping, or better

• Presumptive remedy relies on Institutional Controls for maintaining current property uses.
Midland Area Soils Dioxins/Furans Cleanup
Institutional Controls

- Maintain existing uses for non-residential properties
- Provide site development standards for certain types of residential-like uses to ensure protection of human health
- Identify and manage properties that are eligible for remedial action but have not yet participated
Institutional Controls

• Regulate the movement and disposal of soil from MRA properties that have not been sampled or remediated

• Maintain the current restriction on raising poultry and other farm animals that could ingest impacted soil from within the City and make it reliable for continuing exposure control
Institutional Controls
Mechanisms - Ordinances

MRA Overlay District

• Only applies if you have not been sampled
• Does not apply if you have received remedy
• Prohibit certain variances
Institutional Controls
Mechanisms - Ordinances

MRA Overlay District

- Residential-like uses would require special “environmentally protective” site development standards
- Public website and registry of eligible properties
- Prohibit movement of surface soil unless it is to the City of Midland Landfill
Institutional Controls
Mechanisms – Ordinances

• Maintain prohibition of farm animals within city limits (except for outlying areas zoned agricultural)
• This is a larger area than the MRA
• Requires notice to DEQ if ordinance is changed or challenged
Institutional Controls Mechanisms
Environmental License Agreements

- MDOT has Right of Way on M-20 and easements
- Environmental License Agreement between Dow and MDOT to notify Dow prior to maintenance or construction
- Dow will arrange sampling and/or proper disposal of soils
Institutional Controls Mechanisms

“Miss Dig”

• Necessary because of multiple utility easements on multiple properties

• Provides real time notification of requirements

• In addition to restrictions required by MRA Overlay District

• Process similar to what is in place on Tittabawassee River Floodplain
Institutional Controls Mechanisms
Restrictive Covenants

• Property owned by Dow or the City of Midland
• Recorded with Midland County
• Restrictive Covenant:
  – Prohibits land uses inconsistent with the generic non-residential land use exposure assumptions
  – Remains in effect until remedy or determination that it not longer presents an unacceptable risk
  – Legal description of properties
  – Approval and consent of non-Dow property owners prior to recording
Institutional Controls Mechanisms
Restrictive Covenants
Institutional Controls Mechanisms

Contingency Plan

• Necessary in case the MRA Overlay District is not adopted by Midland or is changed or rescinded

• If MRA Overlay District is not adopted by Midland Dow will submit a monitoring plan will be proposed to annually assess residential/residential-like uses in offices, industrial, commercially zoned areas

• Address subject properties via sampling and/or remediation and/or individual restrictive covenants
Purpose: Define long-term monitoring methods to:

- Obtain access to properties yet to granted access
- Implement a MISS DIG notification system
- Verify undeveloped woodlands remain non-residential use
- Describe contingent monitoring
- Report results and apply adaptive management
Monitoring, Operations, and Maintenance Plan

Applicable Within the MRA Boundary Area at:

- Properties where access was not granted (requires Property Monitoring Program)
- Undeveloped Woodlands
- Non-Residential Property in MRA residential areas Paved or covered
- Easements – MISS DIG
- Non-Residential Properties in the MRA
Monitoring, Operations, and Maintenance Plan

Property Monitoring Program for Actions Within the MRA Boundary Area:

- Notification to DEQ of changes
- Letter upon any “clearing” activities
- Soil Movement Advisory: MISS DIG
- Maintain existing zoning
- Regulate movement and disposal of soil
Lessons Learned

• Setting a framework of adaptive management, ordered towards relationships, substantially improved remediation times

• Decision units help streamline sampling

• Number of Incremental samples per property standardized

• Presumptive remedies, based on agreements with property owners, were facilitated quickly and efficiently

• Some did not want sampling – Respect for their choice.

• Dow monitor property transactions to contact new owners, in communication with DEQ
Application

• Decision Unit and Incremental sampling approach is adaptable to other cleanup sites.

• Making sure to set goals and get agreements for the common good of the parties makes the process smoother and more efficient, and later understanding and agreements easier.

• Resolving issues in face-to-face and informal written communications helps avoid misunderstandings and helps develop an administrative record to support the final decision without undue delays to cleanup implementation.
Resources

DEQ Dioxins/ Furans Website

- Go to www.Michigan.gov/ deqdioxin

- Contains links to Dow Chemical Hazardous Waste Facility Operating License (see Amendment 7), and Midland Area Soils Corrective Action web pages.
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Questions?