

Executive Summary

ARCADIS was retained by Ford Motor Company to conduct additional soil investigation and risk assessment services regarding potential environmental impacts in the baseball field area (Feature 139) of the Twin Cities Assembly Plant (TCAP) property located in St. Paul, Minnesota. These services were conducted to supplement the environmental investigations for Feature 139 described in the following ARCADIS reports: *Phase I Environmental Site Assessment (June 29, 2007)*, *Initial Phase II – Exterior Investigation Report (October 29, 2007)*, and *Soil Investigation Report – Baseball Fields – Feature 139 (September 7, 2007)*.

The findings from these previous investigations indicated that (1) historical battery disposal activities could potentially have taken place in the area of Feature 139 and (2) arsenic, copper, and iron were detected in certain surface and subsurface soil samples at concentrations above applicable Minnesota Pollution Control Agency (MPCA) soil screening levels (Tier 2 Soil Reference Values [SRV] for recreational land use). Based on these previous findings, ARCADIS prepared a *Soil Investigation and Risk Assessment Work Plan – Baseball Fields – Feature 139* report, which was approved by the MPCA on September 11, 2007. The additional soil investigation and risk assessment activities defined in the approved Work Plan were conducted in accordance with the MPCA Voluntary Investigation and Cleanup (VIC) Program to achieve the following objectives:

- Characterization of surface soils to facilitate further evaluation of arsenic, copper, iron (constituents of potential concern [COPCs]), and lead that may be present in the surface soils in the Feature 139 area. Although lead was not detected above the Tier 2 SRV during the initial investigation, it was included for analysis because it is a common component of batteries. For this study, surface soils are defined as soils encountered from 0 to 0.5 feet below ground surface (bgs).
- Completion of a surface soil risk assessment to evaluate risks and hazards, if any, associated with continued recreational use of the baseball fields by the general public. Based on the current recreational land use, this risk assessment focused on potential human exposure to surface soils.
- Characterization of subsurface soils and perched groundwater to facilitate further evaluation of COPCs and to evaluate potential battery disposal activities. Worker exposure to subsurface soils during potential future excavation activities (e.g., construction, landscaping, or grading activities) was evaluated by comparison to

Tier 2 Short-Term Worker SRVs. For this study, subsurface soils are defined as soils encountered within the depth interval of 0.5 foot to 12 feet bgs.

Field Investigation Activities

In September 2007, ARCADIS collected and analyzed 36 surface soil samples and 57 subsurface soil samples and installed and sampled two temporary groundwater monitoring wells. Nine surface soil samples were collected from each of the three baseball fields in the Feature 139 area. The locations of surface soil samples were biased toward base running areas, warning tracks, and other areas with exposed soil to aid in determining the concentrations of constituents in non-vegetated areas (i.e., sample locations were chosen to represent anticipated worst-case exposure conditions based on the current recreational land use). In addition, nine surface soil samples were collected from locations outside the baseball fields and were biased toward areas of high use and where soil was exposed (i.e., in front of the concession stand, the batting cages, the sand box, and the gravel parking area). All of the surface soil samples were analyzed for arsenic, copper, iron, and lead.

The subsurface soil samples were collected from soil borings in September 2007 and were completed in a grid pattern (100 feet by 100 feet), and one soil boring was completed within each of the 29 grid locations. In total, 57 subsurface samples from multiple depths within the soil borings were analyzed for arsenic, copper, iron, and lead. Two temporary wells were installed and sampled along the eastern side of the investigated area in perched groundwater, which was encountered at depths of approximately 8 to 12 feet bgs. Both perched groundwater samples were analyzed for arsenic, copper, iron, and lead, and one of the samples was also analyzed for volatile organic compounds (VOCs).

Field Investigation Results

Arsenic was detected above the MPCA Tier 2 Recreational SRV in five of the 39 surface soil samples collected during both investigations, with the highest concentration reported as 16.4 milligrams per kilograms (mg/kg); copper was detected above the Tier 2 Recreational SRV in 13 of the 39 surface soil samples, with the highest concentration reported as 19.4 mg/kg; and iron was detected above the Tier 2 Recreational SRV in 14 of the 39 surface soil samples, with the highest concentration reported as 18,100 mg/kg. Lead was not detected at concentrations exceeding the Tier 1 Residential or Tier 2 Recreational SRVs.

The results from the subsurface soil samples collected during both investigations indicate that arsenic was detected above the Tier 2 Recreational SRV at 17 of the 30 subsurface boring locations, with the highest concentration reported as 18.9 mg/kg; copper was detected above the Tier 2 Recreational SRV at 17 of the 30 subsurface boring locations, with the highest concentration reported as 79.6 mg/kg; and iron was detected above the Tier 2 Recreational SRV at 28 of the 30 subsurface boring locations, with the highest concentration reported as 28,000 mg/kg. Lead was not detected at concentrations exceeding the Tier 1 Residential or Tier 2 Recreational SRVs.

Results from the two perched groundwater samples indicate that arsenic, copper, and lead were detected above the Minnesota Department of Health (MDH) Health Risk Limits (HRLs). Iron was also detected in both samples; however, there is no established HRL for iron. One perched groundwater sample was also analyzed for VOCs, and no VOCs were detected above the HRLs.

Risk Assessment

Potential risks and hazards associated with COPCs in surface soil were evaluated based on surface soil data collected in the Feature 139 area. The property is currently used for recreational purposes. MPCA SRVs protective of a recreational land-use and protective of short-term worker exposure were deemed appropriate to evaluate the site. Arsenic, copper, and iron were identified as COPCs based on a comparison to the MPCA's generic Tier 2 Recreational SRVs.

A statistical analysis was completed to characterize the data sets for surface soil samples and to provide a basis for comparing to applicable statewide background data that were provided by the MPCA. Surface soil sample results for arsenic, copper, and iron, which are all naturally occurring elements, were shown to be consistent with statewide background data for these constituents. However, one sample result for arsenic (16.4 mg/kg) appeared to be an outlier and was slightly higher than the maximum arsenic background concentration (15 mg/kg).

A risk assessment was conducted consistent with applicable MPCA guidance (MPCA's *Draft Guidelines, Risk-Based Guidance for the Soil – Human Health Pathway, Volume 2. Technical Support Document*, dated January 1999 (Guidance Document) and the latest Tier 2 excel spreadsheets, dated May 2007, associated with the Guidance Document) for COPCs using surface soil sample results collected during both investigations. The surface soil data were initially evaluated against background

data as described above and then by comparison to MPCA Tier 2 SRVs based on both acute and chronic exposure conditions. Arsenic and copper exceeded generic Acute Child Tier 2 SRVs and were further evaluated through a Short-Term Hazard Assessment based on MPCA guidance. Based on the results of the Short-Term Hazard Assessment and the comparisons to the Tier 2 Recreational SRVs, concentrations of constituents detected in surface soils were consistent with background conditions and do not present a concern (unacceptable risk or hazard) to users of the baseball fields.

Because the current recreational land use does not create any exposure to the subsurface soils, a detailed risk assessment was not conducted for the subsurface soils. However, the subsurface data were evaluated relative to the Tier 2 Short-Term Worker SRVs to determine if there would be any unacceptable human health risks during any future construction or grading work that may be conducted at this site in the future. The subsurface soil evaluation demonstrated that the Tier 2 Short-Term Worker SRVs were not exceeded in any of the subsurface soil samples.

Perched groundwater data were not evaluated at this time. The perched groundwater samples were collected from the temporary groundwater wells with limited development and the perched groundwater samples were not filtered, which could potentially result in elevated metal concentrations because of the presence of sediments. More representative data will be collected from a permanent perched groundwater monitoring well installed in the area at a future date and the data will then be evaluated.

Conclusions/Recommendations

Conclusions and recommendations reached from the additional soil investigation and surface soil risk assessment study are provided below.

Surface Soil

- The analytical results indicate there were no lead exceedances above the Tier 1 Residential or Tier 2 Recreational SRVs in surface soils at Feature 139. Levels of lead detected in the soil are acceptable for the current use of the property. There was no evidence within the surface soils of alleged battery disposal activities.
- Based on the data collected and the results of the risk assessment, concentrations of arsenic, copper, and iron detected in surface soils do not present a concern

(unacceptable risk or hazard) to users of the baseball fields. Levels detected in surface soil samples are consistent with, and generally lower than, naturally occurring background concentrations in Minnesota. Although the site data appear to be consistent with applicable background data, one surface soil sample result for arsenic (16.4 mg/kg) appears to be a statistical outlier and was slightly higher than the background screening level (15 mg/kg), which is also equivalent to the maximum arsenic concentration in the background data set.

- While the surface soil evaluation indicates that risks and hazards are acceptable for the current land use, Ford is electing to implement precautionary measures for the surface soils proximal to the one surface soil sample where arsenic was detected at a level slightly above the range of background concentrations. The proposed mitigation measures will involve removal of the surface soils in this one defined area. A work plan will be developed and submitted to the MPCA prior to removal activities. Following completion of the removal activities, the area will be backfilled with clean soil and restored to its previous condition. It is recommended that the baseball fields be reopened following completion of the removal activities.

Subsurface Soil

- The analytical results indicate there were no lead exceedances above the Tier 1 Residential or Tier 2 Recreational SRVs. Levels of lead detected in the soil are acceptable for the current use of the property. The visual observations, combined with the laboratory results for lead, indicate that there is no evidence of the alleged battery disposal activities in the baseball field area.
- Based on current recreational land use, the only potentially complete exposure pathways to subsurface soils are associated with subsurface activities such as construction or grading work in this area (e.g., below-grade utility installation, planting). To evaluate this potential worker exposure, the subsurface data were compared against the Tier 2 Short-Term Worker SRVs. No constituent concentrations in the subsurface soils samples exceeded the Tier 2 Short-Term Worker SRV. As a result, no further action or investigation of the subsurface soils is recommended at this time. If subsurface soils are excavated or brought to the surface at some point in the future, the work will be conducted in accordance with applicable rules and regulations.

Perched Groundwater

- Perched groundwater samples were collected from the temporary groundwater wells with limited development. In addition, the perched groundwater samples were not filtered, which could potentially result in elevated metal concentrations because of the presence of sediments. Therefore to facilitate further evaluation of perched groundwater conditions, the installation of one perched groundwater monitoring well is recommended near the eastern edge of the area followed by two additional groundwater sampling events. Samples will be analyzed for both dissolved and total arsenic, copper, iron, and lead for the first sampling event and dissolved arsenic, copper, iron, and lead thereafter.