Phase II Subsurface Investigation

USX Property
Mountain Iron, Minnesota

Wenck File #0754-05

Prepared for:

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1.0 Introduction

This document presents the results and evaluation of a Phase II Investigation, conducted on behalf of the City of Mountain Iron (City), of a property owned by United States Steel Corporation adjacent to the City. The Site is approximately 133 acres. Portions of the Site were previously used for open dumps and iron mining tailings disposal.

The Site location is depicted in Figure 1. A Plat Map is provided in Figure 2. Two former dump sites are located on the Site. For reference, these dump sites are referred to as Open Dump 1 (the western dump) and Open Dump 2 (the eastern dump).

1.1 SCOPE OF WORK

The scope of work was presented in the "Phase II Investigation Work Plan, USX property, Mt. Iron, Minnesota," February 2003, prepared by Wenck Associates (Work Plan). The Work Plan called for investigation of both Open Dump 1 and Open Dump 2. Subsequently, United States Steel Corporation declined access to the City for the Open Dump 2 portion of the Investigation.

The scope of work consisted of completing soil borings, test trenches and monitoring wells for the characterization of the nature and extent of fill material and potential contamination from the former dump. The Work Plan was approved by the MPCA with comments in an e-mail dated April 3, 2003, and the responses to the comments in an e-mail dates April 21, 2003.

1.2 PURPOSE OF INVESTIGATION

The City is considering re-use options that include using the Site for an industrial park. It is possible that future development of the Site, by the City, could involve excavation and removal of material at the Site. Therefore, the purpose of this investigation was first, to identify the nature, extent and magnitude of fill material and past soil and groundwater impacts. And second, to complete a Tier II risk evaluation to determine if Site conditions present an unacceptable level of human health or environmental risk for the potential commercial use of the Site. The risk assessment will allow the City to determine a Site re-use strategy that will be consistent with applicable regulations.

2.0 Site Background

2.1 SITE DESCRIPTION

2.1.1 Site Location and Description

The Site does not have a postal address. It is described as N ½ of the SW ¼ and the SW ¼ of the SW ¼ (east of railroad) and the SE ¼ of the SW ¼ (west of County Road) of Section 10, and NE ½ of SE ¼ (east of railroad) of Section 9, Township 58 North, Range 18 West (the Site). The entire Site is approximately 133 acres.

2.1.2 Site History

Based on information presented in the Phase I Environmental Site Assessment (Wenck 2001), the Site was the location of an open solid waste dump (Open Dump 1). Open Dump 1 was located on the western portion of the Site, for an undocumented period of time (existing prior to 1940 and ceasing in the early to mid-1940s). The western portion of the Site was also used by United States Steel Corporation as taconite tailings disposal ponds from the mid 1940s to the mid-1960s. The development of the tailings pond effectively isolated Open Dump 1 from additional filling activities after the early 1940s. Based on the topographic footprint of Open Dump 1, there is an estimated 45,000 cubic yards of material located at the site.

A second open dump (Open Dump 2), which is located on the eastern portion of the Site, was operated by the City from 1959 to 1981. Approximately 27,000 cubic yards of material are located in Open Dump 2. Since closure of Open Dump 2, the City's Public Works Department has used the area for outside storage of public works equipment and supplies. As discussed above, United States Steel Corporation declined access to the City for investigating Open Dump 2.

2.2 GEOLOGIC AND HYDROGEOLOGIC SETTING

The Site is generally a flat lying area approximately 20 feet above the original flat low lying topography and is approximately 1,500 feet above sea level. The area of Open Dumps 1 and 2 are approximately 2.0 and 2.5 acres, respectively.

Published references describe the geology at the Site as consisting of surficial deposits of the Aurora till plain of the St. Louis sublobe of the Des Moines lobe of the Wisconsinian glaciation. The till is of low permeability and composed mainly of clay. Argillite and greywacke bedrock underlies the glacial materials at a depth of approximately 100 feet.

Groundwater flow in the unconfined water table system (where present) is anticipated to be southerly. Depth to groundwater is estimated to be approximately 10 feet below ground surface. Locally, topographical or man-made features likely influence flow direction and discharge points.

2.3 PREVIOUS INVESTIGATIONS

In November 2000, STS Consultants, Ltd. completed "Phase I Environmental Site Assessment – Mountain Iron Dump in Mountain Iron, St. Louis County, Minnesota" for the Minnesota Pollution Control Agency. STS Consultants concluded that the dumpsite (Open Dump 2) had the potential to contaminate soil and or groundwater at the Site. An investigation to determine if this dumpsite has caused soil or groundwater contamination was recommended.

In June 2001, Wenck Associates completed the "Phase I Environmental Site Assessment, USX Property, Mt. Iron, Minnesota". The Phase I identified the former disposal areas, the mine tailings disposal, and an unidentified vertical PVC pipe in Open Dump 1 as recognized environmental conditions. Subsequently, Wenck Associates completed the "Phase II Subsurface Investigation Workplan, USX Property, Mt. Iron, Minnesota."

3.0 Overview of Phase II Investigation

3.1 SCOPE AND RATIONALE

The investigation was conducted to determine the nature, extent and quantity of the fill material, to develop a waste profile for potential disposal options, and for completing a risk evaluation. After the investigation of Open Dump 2 was deleted from the scope of work, the investigative effort for Dump 1 was refocused. The final scope of work consisted of:

- Eleven test trenches
- Twelve soil borings
- Four monitoring wells

Figure 3 presents the locations of the trenches, borings and monitoring wells.

The risk evaluation was conducted according to the MPCA Risk Based Site Evaluation Manual (RBSE). The objective of the risk evaluation was to determine if hazardous substances, pollutants or contaminants are present at the Site at levels in excess of acceptable levels of risk (i.e., 1×10^{-5} excess cancer for carcinogenic compounds, a hazard quotient of no greater than 0.2 for an individual contaminant, or a cumulative hazard quotient of no greater than 1.0) for commercial or industrial re-use of the Site. A list of potential contaminants of concern (COCs), based on Site history includes:

- Total Resource Conservation and Recovery Act (RCRA) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver)
- Polychlorinated biphenyls (PCBs)
- Semi-volatiles organic compounds (SVOCs)
- Volatile organic compounds (VOCs)

- Pesticides
- Diesel range organics (DRO)
- Oil and grease

Groundwater monitoring wells were installed to evaluate the localized groundwater flow direction and groundwater quality. Proposed well locations were selected on the anticipated local groundwater flow directions at the dumpsites.

3.2 FIELD INVESTIGATION METHODS

3.2.1 Soil Trenches

Eleven soil trenches (labeled T1-T11) were completed during this phase of investigation, at locations shown in Figure 4. Trench logs are included in Appendix A. The trenches were dug with a backhoe, and were advanced to depths of between 6 and 13 feet below grade. At each trench native soil was encountered.

Procedures for trenching and soil sampling activities are outlined in detail in the Field Sampling Plan (FSP) included as Appendix A in the Work Plan. The FSP should be consulted for specific information regarding equipment, methods, materials, and procedures used for this field investigation.

Trenching allowed for the observation, on a macro scale, of the types of the waste materials, the consistency of the soil cover, and evidence of soil/waste layering. Trenches T1, T4, T5, T9 and T11 were placed to encounter significant waste thickness and to collect representative waste samples. The remaining six test pits were placed to help define the limits of waste fill material and did not encounter any fill material.

The trenches were logged by a Wenck field geologist. Soil classification was performed in the field in accordance with ASTM Method D2488, Standard Practice for Description and Identification of Soils. A trench log was created for each soil trench showing the stratigraphic sequence and associated field screening notes and observations. Field screening was conducted as samples were collected using a photoionization detector (PID) with a source lamp of 11.7 eV. The PID readings are included on the trench logs. There were no significant PID readings from any of the samples. Upon completion of each trench, the trench was backfilled with the excavated material. No obviously hazardous materials were observed within the trench spoils.

3.2.2 Soil Borings

Twelve soil borings were completed using hollow stem auger drilling techniques to define the limits of waste material. 1.5-foot split spoon samples were collected at three-foot intervals and logged by the on-site field geologist. The soil boring logs are presented in Appendix A. PID readings were taken on each sample as it was collected. The PID readings are shown on the boring logs. There were no significant PID readings. Since trenching provided the opportunity to collect analytical samples of the fill material, the boring were not used for analytical sampling.

3.2.3 Monitoring Well Installations

Four monitoring wells were installed along the eastern portion of former Open Dump 1. Figure 3 presents the well locations. Monitoring well drilling logs are included in Appendix A.

Construction of monitoring wells was performed according to the Minnesota Department of Health Well Code using hollow stem auger drilling techniques. Wells are 2-inch diameter with schedule 40 PVC casing and ten foot long, 0.010-inch, continuous slot PVC screens with the exception of MW-3B, which has a five-foot long screen. Red flint sand was used as the screen filter packs and the sand was extended to two feet above the screen. A two-foot bentonite seal was installed in the annular space above the filter pack and cement/bentonite grout was installed in the annular space above the bentonite seal to surface. The casing will extend approximately

three feet above ground surface. Six-inch steel surface casings were installed as protective casings. The wells were developed by bailing and pumping with a submersible pump to remove fines from the formation near the well screen.

At monitoring well location MW-3 a nested pair of wells (MW-3A and MW-3B) was installed. The decision to install a nest was made in the field based on the observation of waste fill located below the mine tailings. This Well MW-3A was initially set to monitor the water table, consistent with the other monitoring well depths. MW-3B was placed to collect a groundwater sample from the deeper waste materials as a "worst case" sample at that location.

3.2.4 Site Specific Sampling and Chemical Analytical Methodologies

Table 3.1 presents a summary of the depth, location and requested analyses of the soil and groundwater and samples collected. Table 3.2 presents the analytical methods.

The trench samples were analyzed in the field for metals by XRF and one sample was selected for laboratory confirmation. Samples were only collected from the trenches that encountered significant waste fill above the water table.

3.2.4.1 Groundwater Sampling Method

The monitoring wells were sampled using a peristaltic pump. New dedicated polyethylene tubing was used at each well. The tubing inlet was placed approximately 2 feet below the top of the water column. The well was purged until a minimum of three casing volumes was removed. The tubing inlet level was adjusted as purging proceeded. Field water quality parameters were measured for stabilization after each water-column volume was purged. The stabilization criteria were:

1. Ph +/- 0.1

2. temp +/- 0.1 deg C
3. spec. cond. +/- 5%

Groundwater samples were collected from the pump outlet immediately after purging was completed. Metals samples were filtered in the field with an in-line 0.45 micron filter. New filters were used at each location.

A Field duplicate sample was collected at MW-3A and a field blank was collected by drawing distilled water through sampling tubing and pump at MW-3B prior to purging the well.

4.0 Phase II Investigation Results

4.1 RESULTS OF GEOLOGIC AND HYDROGEOLOGIC SITE INVESTIGATION

Three major geologic materials were encountered in the test pits and borings. These are waste fill materials (ash and cinders), mine tailings, and native clay. Lesser amounts of sand, silt, and topsoil were also encountered.

Figure 5 presents the location of the waste fill material on the ground surface. Figure 6 presents a series of five cross sections selected to illustrate the relationship of the waste fill to the mine tailings and the underlying native clays. Figures 7 through 10 present the cross sections.

Based on the cross sections, the fill material appears to have been placed adjacent to a topographic high. The maximum fill thickness of 10 to 11 feet was encountered in trenches T5 and T11. The stratigraphy indicates that a significant amount of the eastern area of fill was later covered with mine tailings (e.g. Cross section B-B').

Groundwater was encountered only on the eastern portion of the Site, within the waste and mine tailings. The water table is shown on the cross sections. The low permeability clays in the western portion of the Site did not yield water.

Table 4.1 presents groundwater elevations measured on May 29 and June 2, 2003. Figure 11 presents a contour map of the water table elevations for the May 29 round. The groundwater flow direction is to the southeast. It appears that localized water table is the result of water infiltrating the higher permeability mine tailings and to some extent the waste fill. The likely discharge areas are the wetland to the south and east of the Site. The underlying native clay material limits the potential for downward migration of groundwater.

4.2 RESULTS OF SOIL QUALITY INVESTIGATION

The analytical reports are presented Appendix B. The data are summarized in the following Tables:

- Table 4.2 SVOCs in Soil and BaP equivalent analysis
- Table 4.3 RCRA Metals in Soil
- Table 4.4 DRO in Soil
- Table 4.5 Metals in Soil by XRF

PCBs, pesticides, and VOCs were not detected in any of the soil samples, and therefore the results are not tabulated.

4.3 RESULTS OF GROUNDWATER QUALITY INVESTIGATION

Table 4.6 presents the groundwater analytical results for DRO. DRO was detected three of the samples. Metals, VOCS, PCBs and pesticides were not detected in the groundwater samples.

5.0 Risk Evaluation

5.1 CURRENT AND PROPOSED PROPERTY USE

The property is currently vacant. The City is considering developing portions of the Site for an Industrial Park.

5.2 ADJACENT PROPERTY USE

The surrounding area consists of wetlands and former mine dumps. The Site is bounded by railroad tracks to the southwest and southeast and by mine dumps to the north (see Figure 1). Northeast of the Site, across Highway 102 are mine dumps and a railroad switching area. Immediately north of the Site are the City drinking water plant, the municipal public works tool shed, and an abandoned blasting company storage facility. To the south is a General Electric electric motor repair facility. The nearest residential areas to former Open Dump 1 are approximately ¼ mile to the north and ¼ mile to the southeast

5.3 POTENTIAL EXPOSURE PATHWAYS OF CONCERN

The exposure pathways of concern to the City are direct exposure to soil or groundwater during potential construction activity and by potential future Site tenants. The area has municipal water and the shallow aquifer is not a viable potable source.

5.4 HUMAN HEALTH SOIL EXPOSURE PATHWAY EVALUATION

Table 4.2 presents the SVOC analytical results and the benzo(a)pyrene (BaP) equivalent analysis utilizing the MPCA provided spreadsheet for Tier II risk evaluations. (http://www.pca.state.mn.us/cleanup/riskbasedoc.html). The three samples from test trench T1 and the samples from test trenches T9 and T10 exceeded the industrial BaP equivalent Soil Reference Values (SVR) of 4 mg/Kg.

Tables 4.3 and 4.4 include the industrial SVRs for metals. Iron was detected above the SRV in test trenches T4, T5 and T9. This is as expected due to the mine tailings disposal and high background iron in the Site area.

Lead was detected above the SRV in samples from test trenches T5 and T11, and nickel was detected in the sample from T5, based on the XRF data. The laboratory data for the test trench T5 sample was also above the SRV for lead.

5.5 GROUNDWATER EXPOSURE PATHWAY EVALUATION

There were no detections of VOCs, SVOCs, pesticides, PCBs or RCRA metals in groundwater.

The only detections in groundwater were DRO at between 170 mg/L and 280 mg/L. There are no specific criteria for DRO at a non-under ground storage tank site. The DRO detections are not a health concern from the standpoint of industrial development of the Site.

6.0 Conclusions and Recommendations

Based on the results of the Phase II investigation the following conclusions are made:

1. The extent of the waste fill in former Open Dump 1 has been delineated. Waste extends north, south, and east from its surface expression and is covered by mine tailings in some areas.

2. Groundwater had no detections of contaminants other than DRO.

3. The waste material samples exceeded industrial SRVs for SVOCs, at three test pits, based on the BaP equivalent analysis.

4. The waste materials samples exceeded the Industrial SRVs for lead in two test pits and for nickel in one test pit.

5. Future industrial development of the waste disposal area will need to address the presence of materials exceeding the industrial standards for direct contact. Development of the former Open Dump 1 area will require the preparation of a Remedial Action Plan (RAP) under the Minnesota Voluntary Investigation Cleanup program.

7.0 References

STS Consultants, Ltd., *Phase I Environmental Site Assessment – Mountain Iron Dump in Mountain Iron, St. Louis County, Minnesota,* November 2000.

Wenck Associates, Inc., *Phase I Environmental Site Assessment, USX Property Mt. Iron, Minnesota,* June 2001.

Wenck Associates, Inc., *Phase II Subsurface Investigation Work Plan, USX Property Mt. Iron, Minnesota,* February 2003.