Waste Deposition Area, National Zinc Site
Cherryvale, Kansas

Design Basis Report

Revision 2
November 28, 2018
Waste Deposition Area, National Zinc Site
Cherryvale, Kansas

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Executive Summary

CH2M HILL Engineers, Inc. (CH2M), a subsidiary of Jacobs Engineering Group Inc., (Jacobs) has been contracted to provide engineering services for the expansion and capping design of a Waste Deposition Area (WDA) at the National Zinc Site in Cherryvale, Kansas.

This Design Basis Report (DBR) presents the engineering design criteria, approaches, and assumptions for the conceptual design of the proposed WDA expansion and capping.

This DBR includes the following Drawings:
- Drawing G-1 – Title, Vicinity Map, Index to Drawings, & Location Map
- Drawing G-2 – General Notes, Legend, & Abbreviations
- Drawing G-3 – Existing Site Conditions
- Drawing C-1 – Proposed Site Plan and Sedimentation and Erosion Control Plan
- Drawing C-2 – Finished Grading Plan
- Drawing C-3 – Site Cross-Sections
- Drawing C-4 – Site Cross-Sections
- Drawing C-5 – Details
- Drawing C-6 – Details

This DBR includes the following Technical Specifications:
- 01 57 13 – Temporary Erosion and Sediment Control
- 02 61 00 – Removal and Disposal of Contaminated Soil
- 31 10 00 – Site Clearing
- 31 23 23 – Fill and Backfill
- 31 32 00 – Soil Stabilization

Report Organization

The contents of this report are organized as follows:
- Section 1 – Background
- Section 2 – Design Basis
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## Acronyms and Abbreviations

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1. Background

The Site is the former National Zinc facility in Cherryvale, Kansas, see Design Drawing Sheet G-1 for vicinity and location maps. The former smelter property is approximately 360 acres in size and is located in a mixed residential and light industrial area located along US Highway 169 at the northwestern edge of Cherryvale, Montgomery County, Kansas. The Site currently has an EPA constructed Waste Deposition Area (WDA) that has a clay cover placed over the waste materials. Several seeps have been noted at the western edge of the WDA.

The WDA has been designated by Kansas Department of Health and Environment (KDHE) for investigation concerning possibly eliminating the seepage area. Additionally, potentially responsible parties have had discussions with KDHE on possibly adding an estimated 50,000 cubic yards and, on a contingent basis, up to 120,000 cubic yards of waste to the WDA to support remedial activities within the City of Cherryvale. The planning and completion of the remedial activities associated with this additional waste disposal is not addressed in this Design Basis Report (DBR).

The history and details of the smelter facility are documented in various Site reports which are on file at KDHE. In general, the timeline is as follows:

- 1898 – Operations begin under the Edgar Zinc Company
- 1976 – Facility permanently ceases operations
- 1978 – Remedial action for treatment and discharge of water initiated
- 1979 – Temporary permit to discharge treated water to Drum Creek
- 1983 – KDHE acknowledges completion of remedial activities (water treatment and discharge)
- 2001 to 2002 – Removal activities under the EPA Region 7 Emergency Response and Removal Services (ERRS) contract where soil was removed from the yards of Cherryvale residences and the Rodeo Grounds and transported to the southeast portion of the Site where it was consolidated into a repository and capped with clean soil (the WDA) (Tetra Tech, 2002)
- 2007 – Removal of soils from areas containing contaminants of concern in concentrations above the KDHE non-residential risk-based limits to a consolidated area on the former lagoon area on the west side of the Site (Entact, 2010)
- 2010 – Seeps noted at the boundary between the remediated area and the EPA repository
- 2011 – Soil Management Plan developed for the East Portion of the National Zinc Smelter Site (KDHE, 2011)
- 2012 – Removal action from 8 residential properties located south of the former smelter facility, but within the National Zinc Company facility property, that were impacted from smelter operations (Project Navigator, Ltd., 2013), with the excavated materials placed on the WDA
- 2015 – Removal action from 7 residences and 1 park within the City of Cherryvale, called “early action” properties, with the excavated materials placed on the WDA
- 2017 – City of Cherryvale relocated materials from the City Interim Storage Facility to the WDA

1.1 EPA Repository

1.1.1 Existing Cover Materials

The EPA repository cover area boundary defined by EPA is approximately 12 acres. The reported thickness of the cover material ranges between 8 and 12 inches. The cover material source area was identified as being from the distal end of Unnamed Creek near its confluence with Drum Creek. No testing or specifications for the cover material were identified and the geotechnical characteristics of the soil were not investigated by EPA or its contractors. Clay layers below the current cover and waste soil suggest
previous capping was performed prior to placement of waste soil by EPA in 2001 and 2002 as reflected in borehole logs prepared by Project Navigator, Ltd. (PNL) in September 2010.

1.1.2 Seeps Observed

At the time of the remediation in 2007, water seepage was observed at the base of the cut face, which is close to the historical groundwater level. No conditions were observed at the time that could reasonably foreshadow the current seepage conditions.

1.1.3 Site Investigations

To better understand subsurface conditions, a series of boreholes, wells (TMW-2 through TMW-7), and soil samples were evaluated on and within the EPA repository by PNL in 2011. The Design Drawings show the locations of these wells. The exact nature of the seeps could not be determined at the time. PNL has continued to monitor the water levels within the wells to better understand the source of the seeps. PNL has indicated that over time, they have observed the seeps to be less evident and smaller in size.

In the spring of 2018, 8 boreholes and 7 peizometers (LFI-1 through LFI-7D) were installed at the Site by PNL. The Design Drawings show the locations of these wells. Boring logs can be found in Appendix C. The new wells were surveyed, gauged, and subsurface water elevations calculated. This resulted in a total network of 14 piezometers at the Site. TMW-7 has been damaged with the last data collected from this well on July 16, 2018. This network of wells has been gauged nine times between March and August 2018. Subsurface water depths were taken from the top of well casing. The depth was then subtracted from the elevation of the top of casing to compute the subsurface water elevations. The results of these gauging events are shown in Tables 1-1 and 1-2 and visually on Sheet C-3, Site Cross-Sections, of the Design Drawings.

Table 1-1. Depth to Groundwater from Top of Well Casing

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#### 1.1.4 Remedial Activities Post EPA Capping

In the time since the initial removal activities in 2001 and 2002 by the EPA, waste soils have been identified and removed from various locations within the City of Cherryvale and deposited on the existing WDA cap. These have been deposited in the form of stockpiles covered with plastic sheeting to contain soils until a permanent location is selected and the soils are permanently capped as shown on Sheet G-3, Existing Site Conditions, of the Design Drawings.
2. Design Basis

2.1 Vertical Hydraulic Gradients

The vertical hydraulic gradients were assessed at two well pairs. One well pair consisted of an original well (TMW-6) and a new well (LFI-2) where the original shallow well screen is in the fill and the deep new well screen is straddling the fill/native interface. The second pair consisted of two of the new wells (LFI-7S and LFI-7D) where the shallow well screen is completely within the waste fill and the deep well screen is completely and only within the native. Using the static groundwater levels obtained from PNL for March, April, May, and June 2018, both well pairs indicate a hydraulic gradient from the fill downward into the native soil for all four months. The new well pair gives a stronger downward gradient than the pair with the original well. Vertical hydraulic gradient calculations can be found in Appendix D.

The gradients assessed indicate that at the location of the well pairs, the subsurface water should flow from the fill down into the native soil. This does not explain directly where the water in the fill comes from, either from seepage across the entire cap or in certain spots but does indicate there is some seepage in the existing cap section.

2.2 Waste Materials

Since the removal action completed in May and June of 2012, KDHE has been working with potentially responsible parties to address a more widespread area of waste soil. These areas include property located within the corporate limits of the City of Cherryvale, excluding all operating and abandoned railroad rights of way. A phased Site investigation was conducted to identify areas in need of waste removal action. On the basis of the Site investigation and available historical documents, a final remedy for the Site was recommended and approved by KDHE in November 2016 (KDHE, 2016). The recommended removal action includes waste material from the following locations:

- Residential yards
- Drip lines
- Driveways
- City ditches
- City walkways

The waste material generated from the removal action will be placed within the proposed WDA and graded as shown on the Drawings in Appendix A.

2.3 Waste Deposition Area Geometry

2.3.1 Limits of waste

The WDA will encompass not only the current EPA repository limits but be expanded in a northerly direction to accommodate an estimated 50,000 cubic yards and, on a contingent basis, up to an estimated 120,000 cubic yards of waste material between the final grade and the existing ground within the proposed footprint. The fill plan will include clearing and stripping of the topsoil and organic material within the waste footprint and either disposed of or stockpiled for reuse as final cap material. Only materials that meet the specifications for the cap materials will be allowed to be stockpiled for reuse. Design Drawing C-2, Finished Grading Plan, shows the proposed limits of the WDA.

Historical documents and previous Site investigations indicate that waste materials appear to be directly adjacent to the existing wall at the railroad right of way. To a reasonable depth, waste between the wall and the WDA will need to be pulled back from the wall and placed within the proposed limits. Excavation
limits will be filled with general fill material, graded, then compacted. Topsoil will be placed on the fill material and vegetated to match the surrounding areas.

2.3.2 Grading Plan

After stripping, the existing ground will be compacted to achieve a smooth and unyielding surface. Grading of the waste will be achieved in maximum 12-inch-thick lifts. The first lift will be constructed over the entire footprint and advanced vertically, while maintaining appropriate slopes with each vertical lift. The Design Drawings detail the proposed limits and slopes for the completed WDA. Depending on the exact volume of waste generated from the removal activities, the 5 percent top deck of the WDA can be adjusted up or down vertically while maintaining the geometry and slopes of the side slopes and top deck. This makes the proposed design adjustable to actual conditions during the construction period.

To assist with long term care consisting of mowing and maintenance of cover vegetation, the side slopes have been limited to a slope of 10 percent with a top deck slope of 5 percent. Once the waste deposition is complete, the final cover system will be installed.

2.4 Proposed Final Cover System

The final cover system will consist of the following (from bottom up):

- Compacted subgrade – the waste body will be compacted to create a smooth and unyielding surface by utilizing a minimum 12-inch thick layer of select waste material as discussed in the technical specifications.
- 12-inch cover soil layer – Cover soil will be placed over the waste body as a protective cover. This material will consist of a low permeability soil to reduce stormwater migration through the overlying topsoil and into the waste body.
- 12-inch vegetated topsoil layer – A topsoil layer will be placed over the cover soil and vegetated.

The effectiveness of the final cover system is highly dependent on having a well-graded final surface without penetrations that could possibly allow infiltration through the final cover system and into the waste body. To that end, all monitoring wells within the limits of the final cover system will be abandoned in accordance with KDHE regulation K.A.R. 28-30-7. No penetrations will be allowed through the final cover system.

2.5 Stormwater Management

The Site is bounded by drainageways to the south and north. Both drainageways travel in an east to west direction. All stormwater that falls on the cap section will be routed away from the waste body and into existing drainageways. Stormwater run-off from the easterly side of the proposed cap will sheet flow from the 5 percent top deck to the 10 percent sideslopes to a permanent run-off control ditch that discharges into existing drainageways. The westerly side will continue to sheet flow once leaving the 10 percent side slopes until it reaches existing drainageways.

2.6 Recommendations

The proposed WDA project minimizes seepage into the waste body from stormwater contacting the cap of the WDA by installing a cap constructed of low permeability material while also using appropriate grades and stormwater controls. The project also consolidates future removal actions with the existing EPA repository to create the proposed WDA. This project is limited to this consolidation and capping. If installed to parameters outlined in this DBR, the Design Drawings, and the Technical Specifications, the new cap will contain the waste beneath the cap and minimize any stormwater infiltration from contacting the waste body. This project does not prevent the waste body from coming in any contact with subsurface stormwater migration from offsite. If the proposed cap does not alleviate the seeps, further evaluation of offsite subsurface stormwater migration will be required.
3. References


