

Work-in-Progress

Excavation Plan for Phase B Soil Remediation of RZ-E Addendum to the Removal Action Work Plan Tronox LLC Henderson, Nevada

July 13, 2010

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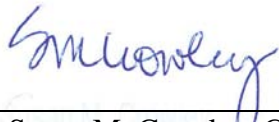
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Excavation Plan
For Phase B Soil Remediation of Remediation Zone RZ-E
Addendum to the Removal Action Work Plan
Tronox LLC
Henderson, Nevada

Responsible Certified Environmental Manager (CEM) for this project

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state and local statutes, regulations and ordinances.



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1.0 INTRODUCTION

Northgate Environmental Management, Inc. (Northgate) has prepared this Excavation Plan (EP) for Remediation Zone E (RZ-E) at the Tronox LLC (Tronox) facility located in Henderson, Nevada (the Site). This EP is an addendum to the *Removal Action Work Plan for Phase B Soil Remediation of Remediation Zones RZ-B through RZ-E* (RAW) issued May 4, 2010 and approved by the Nevada Division of Environmental Protection (NDEP) on May 12, 2010. This EP presents the methods and procedures to be used to implement the remedial alternative approved by NDEP for RZ-E to address contaminated soil within 10 feet below ground surface (bgs) at the Site. The scope of work presented in this EP is based on the NDEP-approved scope of work contained in the RAW and discussions with NDEP, and incorporates the results of a pre-confirmation sampling program (described in Section 1.2) performed to identify the limits of the cleanup actions. Soil remediation work will be performed in accordance with this EP, including the Standard Operating Procedures (SOPs) established by Basic Remediation Company (BRC, 2009a-j) for the Black Mountain Industrial (BMI) complex and the *Quality Assurance Project Plan* (QAPP; AECOM and Northgate, 2009). A human health risk assessment will be conducted for RZ-E in accordance with the *Health Risk Assessment Work Plan* (HRA WP; Northgate, 2010a).

The objective of this EP is to present a cleanup strategy that complies with the NDEP Order issued to Tronox on December 14, 2009 to remove impacted soil from RZ-E by the end of 2010. The remediation limits presented in this excavation plan have been developed based on human health criteria including commercial worker and construction worker BCLs, modified risk based goals for dioxins/furans and background concentrations for metals in soil. This EP does not consider the soil-to-groundwater leaching pathway. Tronox previously submitted a Leaching Memorandum, dated June 11, 2010 which was received by NDEP on June 12, 2010 for consideration by NDEP. NDEP has provided comments on the memo and Tronox is currently considering a program to incorporate the soil to groundwater leaching pathway. Tronox will be requesting a meeting with NDEP to present the program.

For purposes of the EP and delineation of RZ-E excavation area boundaries, “contaminated soil” is generally defined as soil containing chemicals of potential concern at concentrations exceeding NDEP worker Basic Comparison Levels (BCLs), or modified risk-based goals for dioxins/furans agreed upon by NDEP. For metals with background concentrations exceeding BCLs (e.g., arsenic), “contaminated soil” is defined as concentrations that exceed the background for the RZs as a whole. There are no NDEP BCLs for asbestos; therefore, “asbestos-related contaminated soil” is defined as amphibole (one or more long fibers) and/or chrysotile (five or more long fibers). The final soil cleanup goals will achieve a cumulative theoretical upper-bound



incremental carcinogen risk level point of departure of 1×10^{-6} and a target organ specific non-cancer hazard index of 1 for each decision unit at the Site. If needed, NDEP may re-evaluate these goals in accordance with United States Environmental Protection Agency (USEPA) guidance.

1.1 Site Description

The Tronox Site is a portion of a larger historic complex that was first developed by the U.S. government in 1942 as a magnesium plant for World War II operations. The Tronox LLC active facility currently produces electrolytic manganese dioxide, used in the manufacturing of alkaline batteries; elemental boron, a component of automotive airbag igniters; and boron trichloride, used in the pharmaceutical and semiconductor industries and in the manufacturing of high-strength boron fibers for products including sporting equipment and aircraft parts.

RZ-E consists of an unlined historic conveyance ditch referred to as the Beta Ditch. The ditch extends roughly east-west across the entire Site, as shown on Figure 1. The Beta Ditch no longer serves as a conveyance ditch and is currently blocked by an earthen dam near the eastern end and at the Tronox/Timet property boundary by gravel filled bags that were installed as part of the Stormwater Pollution Prevention Plan for the removal of the manganese tailings pile. Complete descriptions of the Site, history of its use, and historical environmental investigations are presented in the RAW.

1.2 Background

The Beta Ditch was constructed at the same time as the magnesium plant (1941/1942). The original Beta Ditch terminated on the west end near the current Tronox AP Maintenance Shop (see Figure 1) and received various liquid and slurry wastes from historic property operations that flowed to the pond areas to the east of the Tronox property. In 1970, the ditch was extended westward to allow wastes from facilities to the west to be transmitted through the ditch.

Subsequent to 1976, effluent to the Beta Ditch was limited to stormwater runoff and non-contact cooling water. The Beta Ditch continued to carry stormwater until it was completely blocked in early 2010.

At the completion of the Phase A and B Investigations and the Area I and II supplemental soil sampling, a pre-confirmation sampling program was developed in concert with NDEP to refine remediation planning and establish the vertical and horizontal extent (cutlines) of the proposed excavations in shallow soils (0 to 10 feet bgs).



Remediation of RZ-E differs from other RZs in that the almost all of RZ-E will be excavated from 0-10 ft bgs. This is based on the conceptual site model (CSM) which indicates that, with the exception of one of the eastern ditch extensions, the entire unlined ditch is likely to be impacted. The eastern-most ditch extension does not appear to be associated with historical facility operations nor is there any physical ditch present in the area. In addition, the sampling performed indicates this ditch extension does not have exceedances of BCLs or other chemical criteria (see Figure 1).

Soil will be excavated 25 feet laterally as measured from the top of slope from the sides of the ditch except at the ends of the ditch. The cutline identification also provided an opportunity for the final risk assessment calculations to be prepared in parallel with the excavation of contaminated soils, further facilitating completion of remedial excavation by the end of 2010, as required by the NDEP Order dated December 14, 2009 (NDEP, 2009).

Chemical analyses of soil samples collected in RZ-E during the Phase A and B Investigations showed that there are locations within the upper 10 feet of soil where dioxins/furans, semi-volatile organic compounds (SVOCs; hexachlorobenzene [HCB] and benzo[a]pyrene), asbestos, metals (arsenic, lead, magnesium, and manganese), pesticides (4,4-DDE, 4,4,-DDT, dieldrin, and alpha-BHC), perchlorate, and polychlorinated biphenyls (PCBs – Aroclor 1260), exceed the various BCL criteria. These are the constituents driving the excavation. Remedial excavation of RZ-E has been developed using the data generated from Phase A and B soil investigations, the Area I and II supplemental soil sampling, and the pre-confirmation sampling (herein referred to as Soil Investigation Programs). Chemical data, BCL exceedances, or other criteria, are shown on Figure 1 of this EP.

The analytical data for the samples collected from the Soil Investigation Programs are included in the Appendix A Table. The Table is a set of summary tables of the above-described information organized by sample number and constituent. The analytical data for the samples collected during the Soil Investigation Programs are included in the Table. The Appendix data highlighted in orange indicate soil concentrations for one or more of the highlighted constituents are above defined comparison criteria (see Target Remediation Concentrations table, Figure 1) and soil will be excavated. These data will not be retained in the post-remediation HRA. Data highlighted in green indicate soil concentrations not exceeding above-defined comparison criteria; however, there are some exceptions for arsenic and manganese based on CSM considerations. Data highlighted in purple indicate soil concentrations above-defined comparison criteria; however, soil will not be excavated because soil is located at depth below 10 feet bgs and area will be backfilled to original grade. As part of the RZ-E risk assessment, a complete



evaluation of validated data for chemicals will be conducted to document soil concentrations removed from further evaluation due to soil removal activities.

1.3 RZ-E Site Conditions

The shape of RZ-E is defined by the historical path of the Beta Ditch, including ditch tributaries. The main part of RZ-E runs across the entire Site between the eastern and western property lines (Figure 1). The southern boundary of RZ-E is the northern boundary of RZ-C, while the northern boundary of RZ-E is the southern boundary of RZ-D, as shown on Figure 1. In general, the land surface in RZ-E slopes east-northeast at a gradient of approximately 0.005 feet per foot.

There are seven road crossings of the Beta Ditch and one railroad crossing (not currently in use). The road crossings are earthen embankments underlain by metal culvert pipes.

Some underground and above-ground utilities cross RZ-E. Figure 2 presents the approximate locations and types of utilities that are present in RZ-E, as well as the summation of the information provided on known utility lines. The locations of the lines have been field-checked by Northgate where surface expressions of the utilities are present. It is likely that unknown utilities, both active and inactive, also exist in RZ-E and may be encountered during remediation. Field procedures to address the possibility of encountering unknown utilities will be included in the contractor plans and specifications. It is Tronox's intent that the contractor be responsible for locating, avoiding, and protecting underground and above-ground utilities during remediation.



2.0 SCOPE OF WORK

The remediation program at RZ-E will consist of soil excavation and off-Site disposal. The proposed excavation area (RZ-E-01) was generated using information gathered during the Soil Investigation Programs, a CSM review, and a field check of the existing Site conditions.

Based on NDEP guidance and the results of the Soil Investigation Programs, Tronox will excavate contaminated soil to the excavation boundaries shown on Figure 1 and to a vertical extent of 10 feet bgs. Currently the proposed excavation area includes the Beta Ditch and 25 feet laterally from the top-of-slope on each side of the Beta Ditch. Because of the limited data defining the lateral extent of the contaminated soil associated with the Beta Ditch, Tronox proposes to perform four soil boring transects perpendicular to the Beta Ditch in strategic locations. Soil borings will be drilled at lateral distances of 10, 15, and 20 feet from the top of the Beta Ditch slope on either side of the ditch. Soil samples will be collected at 2 vertical foot intervals to an elevation at least as deep as 10 feet below the bottom of the ditch. Soil samples will be analyzed for those chemicals driving remediation in the Beta Ditch. Based on this additional investigative program, Tronox may propose to reduce the lateral extent of the excavation beyond the top-of-slope.

Tronox proposes to drill four additional confirmation borings in the main eastern ditch extension as shown on Figure 1. These confirmation locations will allow Tronox to further assess the extent of contamination and potentially reduce the volume of soil proposed for remediation within the main eastern ditch extension.

As noted above, the proposed excavation depth for RZ-E-01 is 10 feet below existing grades. However, there may be areas around some utilities where changes in depths may be proposed to NDEP (as described in Section 3.2), to be handled on a case-by-case basis.

Excavated soil will be transported for permanent off-Site disposal at the Republic Landfill in Apex, Nevada or other approved landfills in accordance with sampling results and landfill acceptance criteria.

All work conducted as part of this EP will be performed in accordance with the following plans:

- Dust Mitigation Plan and Clark County Dust Permit (to be submitted by the Remediation Contractor);
- Perimeter Air Monitoring Plan (PAMP; Approved by NDEP on May 12, 2010);
- Stormwater Pollution Prevention Plan (SWPPP; Approved by NDEP on May 12, 2010);



- Contractor's Site Specific Health and Safety Plan (HSP; to be submitted by the Remediation Contractor); and
- Transportation Plan (TP; Approved by NDEP on May 12, 2010).

These plans are part of the RAW (Northgate, 2010), with the exception of the contractor's Dust Mitigation Plan and Clark County Dust Permit, and Site Specific Health and Safety Plan.



3.0 EXCAVATION BOUNDARY CONSTRAINTS

The RZ-E footprint is defined by the top-of-slope of the banks of the former ditch and ditch tributaries, with an additional 25 feet on either side of the top-of-slope as shown on Figure 1. This section describes in detail the constraints for the proposed excavation of RZ-E.

3.1 Property Lines

At the eastern end, the excavation of RZ-E is constrained by the Tronox Site property line. On the west end, the proposed end of the remediation will be the headwall associated with the existing 4th Street where the culvert ends and the Beta Ditch begins. This location is near the property line. One confirmation sample will be collected at each of the limits of RZ-E at the eastern and western boundaries. Samples will be collected near the proposed excavation sidewall at a height coinciding with the maximum concentration in the nearest sample. Samples will be analyzed for the chemical(s) driving the excavation as described herein.

3.2 Utility Lines and Roads

Currently, no excavation boundary modifications are proposed for existing utilities or roads; however, as shown on Figure 2, a number of overhead and buried utilities are present in proposed excavation area. It is Tronox's intent to excavate to the entire RZ-E-01 to a depth of 10 feet bgs (see Figure 1). Existing utilities will be supported as necessary during excavation and until clean backfill is in place.

3.3 Equalization (BT) Tanks

Four tanks exist in the central portion of RZ-E adjacent to the southern boundary of RZ-E, as shown on Figure 1. Two of these tanks are currently in use by Veolia for their water treatment operations. These tanks are expected to continue to be in use for the foreseeable future. Special care will be used when excavating near these tanks so as not to cause damage to the concrete foundations that support the tanks. The engineering approach that may be needed to protect the tanks will be determined as construction activities proceed. Tronox proposes to drill one confirmation sampling location adjacent to the equalization tanks and collect soil samples for analysis. If impacted soil is required to remain in place as part of any engineering design to maintain support the tanks, Northgate will immediately notify NDEP.



4.0 REMEDIATION

4.1 Work Area Preparation

This section describes the preparation activities that will be performed prior to excavating and transporting soil from the RZ excavation areas. As described in the RAW, the following remediation support features will be established and/or constructed prior to performing soil excavation activities in RZ-E, as delineated in Figure 5 of the RAW:

- Access routes for authorized visitor and contractor Site ingress and egress;
- Haul roads to the public access roads;
- Clearing and disposal of vegetation in excavation areas, and access and haul roads;
- Dust-control water source(s);
- Visitor area;
- Management/engineering trailers;
- Parking areas for workers, vehicles, and heavy equipment;
- Debris storage area; and
- Vehicular and personnel decontamination areas.

Portions of RZ-E may contain debris. Prior to beginning soil excavation in the excavation areas, any debris will be moved from the work area and disposed or stockpiled in non-working areas.

4.2 Well Abandonment

Two active wells (M-89 and M-34) are located within RZ-E, as shown approximately on Figure 3. Tronox will discuss with NDEP the need to maintain these wells. If NDEP considers that the well coverage is sufficient without one or more of these wells, the well(s) will be properly abandoned. If in NDEP's opinion the wells are required to remain in service, these wells may be protected during excavation and backfilling by marking and placing barricades and caution tape, then carefully excavating around them, or they could be properly abandoned prior to excavation and similar wells will be installed after remediation work is complete in order to continue groundwater characterization and remediation activities. Well abandonment and installation procedures would be performed in accordance with Nevada Division of Water Resources (NDWR) requirements.



4.3 Excavation

This section describes the excavation of contaminated soil from RZ-E. In general, the cutlines represent the lateral limit of the bottom of the excavation area. The excavations will generally be sloped or benched outward and upward from the cutline at a slope of 1:1 slope (horizontal to vertical). In cases where the excavation abuts a structure, feature that cannot be removed, or a property line, the cutline represents the top-of-slope. Temporary fencing will be placed along the perimeter of excavated areas until clean compacted backfill is placed. During construction, portions of the excavation sidewalls may also be flattened or the excavation partially backfilled to facilitate vehicle traffic or soil handling activities.

The target excavation depth is 10 feet and the lateral limits are based on the 25-foot setback from the top-of-slope. The lateral extent may be increased based on visual staining, odor monitoring instrumentation readings, or other indications. Depths may be modified in the field if utilities and other buried structures are encountered. Northgate will obtain NDEP approval of any changes to the excavation depth of 10 feet as field work progresses and if special cases are encountered.

The volume of excavation is estimated at 103,000 cubic yards. This is an approximate estimate due to the uneven nature of the surface of the Beta Ditch and the variable width of the ditch.

RZ-E excavation will be accomplished using heavy earth-moving excavators and possibly scrapers. Equipment selection will be made by the contractor. The contractor may elect to stockpile soil in the excavation area or may load the soil directly into trucks for off-Site disposal.

4.4 Post-Excavation Backfilling

Tronox proposes to backfill the excavated RZ-E with clean material to provide a minimum 10-foot thickness of clean soil from the bottom of the excavation to the ground surface and to restore vehicle and utility access across the Beta Ditch where it currently exists. When the backfilling is complete, the shape of the Beta Ditch is expected to be similar to the existing conditions. Backfilling will be performed by the contractor in accordance with the remediation plans and specifications. Backfill materials will be tested by Northgate for geotechnical engineering and environmental compliance requirements. The test results will be provided to NDEP before the material is accepted by Tronox for use in backfilling. It is anticipated that some or all of the soil backfill borrow sources will be from clean areas on the project Site. "Clean areas" are defined as areas with soil concentrations meeting the NDEP worker BCLs, background for arsenic, and modified risk based cleanup goals. If insufficient borrow is available from the Tronox site, imported borrow sources will be considered. Sufficient chemical data will be collected in the proposed borrow materials to perform a human health risk assessment.



4.5 Air Monitoring

Air monitoring will be performed for fugitive dust emissions, chemicals of concern, and volatile chemical emissions in accordance with the *Perimeter Air Monitoring Plan* (PAMP; Appendix B of the RAW) and the Contractor's HSP. A list of specific constituents that will be monitored are presented in Table 1 of the PAMP. Because of the relatively small size of the excavation area in comparison to the overall Site, it is Tronox's opinion that perimeter monitoring at the edges of the excavation areas is not necessary to demonstrate that the dust control measures are adequate. Tronox proposes to perform the perimeter air monitoring at the Site perimeter as described in the PAMP. In addition, PM10 real-time monitoring will be performed on selected workers in the work area. Perimeter and worker air monitoring will be used to evaluate the effectiveness of dust control measures in mitigating emissions. If emissions exceed the action levels outlined in the PAMP, actions will be taken in accordance with the PAMP to bring the emissions into conformance with the plan. Mitigation actions include additional soil wetting, covering exposed soil stockpiles, use of dust palliatives, ceasing operations if the wind velocity exceeds the value set in the PAMP, and ceasing operations until effective measures are implemented.



5.0 INSTITUTIONAL AND ENGINEERING CONTROLS

Currently, there are no locations where institutional or engineering controls are proposed within RZ-E. If a situation arises where engineering or institutional controls become necessary, NDEP will be contacted and a decision will be in concert with NDEP. If a decision is made to institute institutional or engineering controls, the procedures will be in accordance with the *Revised Environmental Covenants, Institutional and Engineering Control Plan* submitted by Tronox on June 9, 2010 and delivered on June 10, 2010 for NDEP review and comment.



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TABLE



FIGURES



APPENDIX A
RZ-E ANALYTICAL DATA

