Revised Interim
Remedial Action Plan

Umicore USA Inc. - Maxton Facility (LMAC Area)
17180 Airport Road
Maxton, Scotland County, North Carolina
NONCD0002833

Prepared For:

Umicore USA Inc.
Raleigh, North Carolina

Submitted To:

North Carolina Department of Environment and Natural Resources
Division of Waste Management - Superfund Section
Inactive Hazardous Sites Branch
217 West Jones Street
Raleigh, North Carolina

Prepared By:

Duncklee & Dunham, P.C.
Cary, North Carolina

March 19, 2013

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March 19, 2013

Ms. Janet K. Macdonald, P.G.
North Carolina Department of Environment and Natural Resources
Division of Waste Management - Superfund Section
Inactive Hazardous Sites Branch – REC Program
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Reference: **Revised Interim Remedial Action Plan**
Umicore USA Inc. - Maxton Facility (LMAC Area)
17180 Airport Road
Maxton, Scotland County
NONCD0002833

Dear Ms. Macdonald:

On behalf of Umicore USA Inc. (Umicore**),** Duncklee & Dunham, P.C. (Duncklee & Dunham) has prepared this Revised Interim Remedial Action Plan for the above-referenced site. This document presents to the North Carolina Department of Environment and Natural Resources (DENR), Division of Waste Management, Superfund Section, Inactive Hazardous Sites Branch (IHSB) the scope of work for interim remedy remediation activities per the rules and guidelines associated with the Registered Environmental Consultant (REC) program. Duncklee & Dunham has completed both a Remedial Investigation Report (RIR) and a Request for Concurrence of Containment Remedy to the IHSB**.**

The previously submitted February 12, 2013, Remedial Action Plan is revised by this submittal and converted to an interim remedy as discussed with the agency by telephone on March 15, 2013. This interim remedy is part of a larger remedy at the facility. Therefore, no Draft Notice of Inactive Hazardous Substance or Waste Disposal Site (Notice) or Declaration of Perpetual Land Use Restrictions (DPLUR) is required for this interim action. These items have been removed from the earlier submittal. Following completion of the RAP for the On-Site area of the Umicore facility, a draft Notice and DPLUR will be submitted to the IHSB for the entire LMAC and on-site areas.

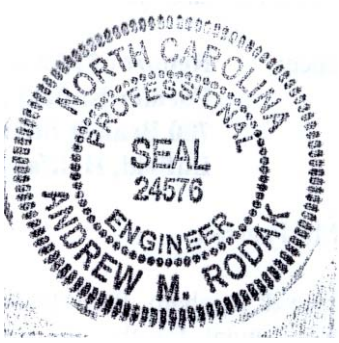
As required by the REC program, this document includes the executed signatures that signify report approval by Umicore as the Responsible Party (RP), Duncklee and Dunham, P.C. as the Registered Environmental Consultant, and the Registered Site Manager, David L. Duncklee, P.G., R.S.M.

The preferred remedy for the area of concern is excavation of soil impacted with cobalt above 150 mg/kg. Excavation of the contaminated soil meets all the criteria for selection as a remedy and is protective of underlying groundwater. This remedy will allow future land usage in accordance with deed restrictions.

If there are any questions or you require any additional information, please do not hesitate to contact Mr. David L. Duncklee, PG, RSM at dave@dunckleedunham.com or (919) 858-9898, or Mr. Theron Grim at theron.grim@am.umicore.com or at (919) 874-7138.

Sincerely,

Duncklee & Dunham, P.C.



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1.0 Introduction

1.1 AOC Description and RI Results [.0306 (l)(1)]

The area of concern (AOC) addressed in the September 6, 2011, *Remedial Investigation Report* (RIR 2011) and the September 12, 2012, *Remedial Investigation Report Addendum* (RIRA 2012) is a portion of the approximately 22-acre (Figure 1) property formerly owned by the Laurinburg Maxton Airport Commission (LMAC). Former Umicore USA Inc. (Umicore) manufacturing operations and stormwater runoff from the adjacent parcel to the east (the On-Site Area) impacted shallow soils on approximately 5-acres of the LMAC Area.

The following RI results were observed for the LMAC Area:

- Cobalt was identified as the primary concern. The source of the LMAC Area cobalt was contaminated sediment transported by surface water runoff from the on-site area.
- Soil sampling undertaken to delineate the cobalt impacted soil at six-inch, 18-inch, 36-inch, and six-foot intervals (see Figures 10, 11, 12, and 13, respectively in the RIR 2011) indicated the volume of contaminated soil equal to or greater than the site specific soil cleanup criteria of 150 mg/kg is approximately 1,100 cubic yards (about 1,630 tons).
- A discontinuous perched groundwater zone in the upper 10 feet of soil was identified and assessed by eight monitoring wells. When wells in this unit contained water sufficient for sampling, cobalt was detected in six of them ranging from 47 µg/L to 4,600 µg/L (Figure 14 and 15 in RIR 2011). However, most of the groundwater monitoring events of these wells produced data sets with too many dry wells to allow the generation of representative potentiometric surface maps.
- The first consistent water bearing hydrogeologic unit is a water table aquifer assessed by four 30-foot wells (Figures 3, 4, and 5 in RIR 2011). The shallow aquifer flow direction is from the LMAC Airport to the northwest, across the LMAC Area, with a hydraulic gradient of about 0.004 ft/ft (Figures 8 and 9 in RIR 2011). Each of these wells has been sampled between eleven and fifteen times (Table 12 in the RIRA 2012) with cobalt detected intermittently. Cobalt has been detected above the 2L groundwater standard in DMW-2 three times from 5.5 J to 11 µg/L; and in DMW-4 four times between 1 and 13 µg/L.
- Soil attenuation testing evaluated the soils' ability to retard cobalt migration through the matrix by measuring the K_d. The K_d values for shallow LMAC Area soil, and deeper uncontaminated CL/SW zone soil, indicate the matrix will attenuate cobalt at a level of 300 mg/kg (ppm).

- The treatability testing of four reagents found the use of Enviro-Mag® at a two percent dry weight dose was optimum for limiting the leaching of cobalt to groundwater if the cobalt contaminated soil remains in place. The one percent dose did not result in low, stable cobalt results for the LMAC Area soil. The two percent dose for the LMAC Area soil controlled the leachable cobalt concentrations to near or below the 0.0010 mg/L reporting limit. The two percent dosage was capable of maintaining this low level through 10 sequential extractions with simulated acidic rainwater for an estimated leaching period of about 800 years.

The conclusions drawn from the results:

- The cobalt contamination is in surficial soils.
- The volume of contaminated soil equal to or greater than the site specific soil cleanup criteria of 150 mg/kg is approximately 1,100 cubic yards.
- The K_d values for the LMAC Area SW zone soil and the uncontaminated and underlying CL and SW soil zone will attenuate cobalt at a level of 300 mg/kg as it migrates vertically. Levels of cobalt in soil following excavation to a level of 150 mg/kg (the site specific soil cleanup level selected by Umicore) should not leach to groundwater.
- The preponderance of data indicates cobalt has not impacted the shallow water table aquifer below the contaminated soil. Sporadic low levels of cobalt are present in two wells in the shallow groundwater.
- Based on the treatability tests, the use of a two percent dose of Enviro-Mag® can fixate cobalt and further reduce leaching vertically.

1.2 Remedial Action Plan Objectives [.0306 (l)(2)]

The primary objective of this Revised Interim Remedial Action Plan (RAP) is to excavate cobalt contaminated soil equal to or greater than the site specific remedial goal of 150 mg/kg. The use of Enviro-Mag® as a fixation product is not expected to be necessary because all areas of impacted soil are believed to be accessible by excavation. The proposed remedial measures evaluated in this Revised RAP are given in Section 2.

The Inactive Hazardous Sites Branch (IHSB) Registered Environmental Consultant (REC) industrial preliminary health based soil remediation goal (IPSRG) is 60 mg/kg for cobalt based on the U. S. Environmental Protection Agency (EPA) industrial screening level. For sites with less than five non-carcinogens, the final remediation goal can be adjusted per IHSB guidelines using the IHSB hazard quotient (HQ) of 0.2. Because no other critical group carcinogens were identified by the RI, a factor of 5 can be used, which results in a cobalt cleanup goal of 300 mg/kg. Per Umicore's request, a 0.5 safety factor was used to establish the proposed cleanup level of 150 mg/kg for cobalt in soil.

Soil with cobalt above the unrestricted use level of 4.6 mg/kg from the migration of cobalt contaminated surface water and sediment was detected southwest of the site (Figure 2). A dozer or pan will be used to pull the contaminated soil back onto the LMAC site for management. The Revised RAP includes engineering measures to control stormwater runoff during the site remediation activities and afterwards.

1.3 Miscellaneous REC Report Requirements

Duncklee & Dunham is listed with DENR as an REC firm. All reports, notes, laboratory data referenced herein are kept on file, electronically at the office located at 511 Keisler Drive, Suite 102, Cary, North Carolina, 27518. Copies of documents, both paper and electronic may be obtained, by making a request in writing to Duncklee & Dunham. Copying and shipment fees associated with documents obtained from Duncklee & Dunham will be borne by the requestor.

1.3.1 Submission of Revised RAP [.0302(l)(1-5)]

A public copy of this document has been submitted to the DENR within 30 days of its completion and may be obtained from the DENR office located at the following address:

North Carolina Department of Environment and Natural Resources
Division of Waste Management
Superfund Section, Inactive Hazardous Sites Branch
217 West Jones Street
Raleigh North Carolina 27603

1.3.2 Imminent Hazard Requirements [.0305(b)(2)]

See Section 1.3.2 - *Imminent Hazard Requirements [.0305(b)(2)]* in the RIR, June 2011.

1.3.3 Off-site Migration, Sensitive Environments, Mixed Wastes [.0305(b)(3)]

During the investigations reported in the RIR 2011 and the RIRA 2012, no sensitive environments were discovered, and there were no mixed chemical and radioactive waste discovered that required 24 hour reporting to the DENR. Migration of cobalt above the unrestricted use level of 4.6 mg/kg was detected southwest of the site (Figures 10 and 11 in the RIRA 2012) and has been reported to the Laurinburg Maxton Airport Commission.

1.3.4 Revised RAP Certification [.0306(b)(4)]

The Proposed Remedial Action Plan Completion Certification and RP and RSM certifications for this Revised RAP are included in Appendix A.

1.3.5 Remedy Requiring Branch Approval [.0306(i)]

The remedy outlined in this Revised RAP requires IHSB prior concurrence since the contaminated soil is not fully removed or treated to residential standards. A February 29, 2012, *Request for Concurrence of Containment Remedy LMAC Area* (Concurrence Proposal 2012) was submitted to the IHSB for concurrence. A September 27, 2012, email was received from IHSB concurring with the proposed remedy (Appendix B).

The containment remedy requires a Draft Notice of Inactive Hazardous Substance or Waste Disposal Site (Notice) and a Declaration of Perpetual Land Use Restrictions (DPLUR) be prepared and included in a RAP for agency review and approval. By phone call on March 15, 2013, the agency requested that no DPLUR be included since this is an interim remedy. Following completion of the on-site RAP , a draft

Notice and DPLUR will be submitted to the IHSB in the on-site RAP for both the LMAC and on-site areas. Following completion of the LMAC and on-site remedial activities, the documents will be returned to the RSM for recordation at the Register of Deeds and a copy of the signed and recorded DPLUR and Notice will be returned to the IHSB.

1.3.6 Public Notice of RAP [.0306(j)]

The REC will provide public notice for the RAP upon receipt of an IHSB drafted public notice and mailing list of interested parties. The REC will add to the mailing list any additional parties who have expressed an interest in the site and then send public notice (see Appendix D) by certified mail and will indicate on the notification the deadline for comment submittal (35 days after mailing date). The REC will provide proof of mailing (certified mail receipts) and any comments to the public notice to the IHSB located in Appendix C. Comments received by the IHSB and REC will be addressed by the REC prior to approving the RAP.

1.3.7 Hazardous Waste Removal from Site [.0305(b)(10),.0306(q)]

There will be no hazardous waste removal from the site under the Revised RAP. The removal of remedial action derived wastes from the site is discussed in detail in several sections of this Revised RAP. In general, cobalt impacted soil above remedial goal levels will be disposed of in a licensed, DENR approved, Subtitle D- lined landfill. A construction stormwater permit has been obtained from DENR for the removal action. Trucks will be cleaned before leaving the site. All remedial action derived wastes will be handled and disposed of in compliance with applicable rules, regulations, and guidelines.

2.0 Feasibility Study [.0306(l)(3)]

2.1 Preliminary Selection of Remedial Options

2.1.1 Selection Process

The objectives of the feasibility study (FS) are to evaluate the potential remedial measures, technologies and process options, for cobalt contaminated soil to be protective of the groundwater and allow the selection of one or more remedial measures. The selection criteria used are listed below:

- Overall protectiveness of human health and the environment,
- Compliance with remediation goals (RGs),
- Long-term effectiveness and permanence,
- Reduction of toxicity, mobility, or volume through treatment,
- Short-term effectiveness,
- Implementability, and
- Cost

The community acceptance criteria are presented in section 2.9 below. A list of common treatment technologies used for cleanup of soil was evaluated for use at the site. These treatment technologies are summarized in Table 1. After incorporating site and impacted soil conditions with the screening

criteria outline above, some of the treatment technologies were eliminated and the following remedial options (see Table 2) were kept for additional evaluation:

- Natural attenuation of the cobalt to the surficial soil following excavation of cobalt contaminated soil containing greater than 300 mg/kg cobalt to meet IHSB health-based remedial goals along with land use restriction and groundwater monitoring;
- Cobalt fixation by blending two percent Enviro-Mag® into the soil; with land use restriction and groundwater monitoring. The soil blending would mix the soil to where the average cobalt level would be less than 300 mg/kg and thereby meet IHSB health-based remedial goals.
- Excavate cobalt contaminated soil equal to or greater than 150 mg/kg with land use restriction and groundwater monitoring.

2.1.2 Descriptions of Preliminary Remedial Options

Three preliminary remedial options are presented below.

2.1.2.1 Cobalt Attenuation

Soil attenuation testing performed during the RI shows cobalt levels at or below 300 mg/kg will attenuate in unsaturated zone soils before reaching the water table depth. Furthermore, the K_d results for the LMAC Area soil and the lack of confirmed cobalt contamination in the shallow groundwater (shallow aquifer wells DMW-1 through DMW-4) indicate the soil has also attenuated cobalt levels greater than 300 mg/kg.

As part of the RI, soil attenuation testing was conducted to evaluate the ability of the soil to retard the migration of cobalt through the matrix. Three soil layers were evaluated: 1) shallow unconfined sand unit, 2) the underlying silty clay semi-confining unit, and 3) the intermediate depth sand beneath the silty clay. The attenuation values for cobalt calculated for each soil layer included the distribution coefficient (K_d) and retardation factor (R_f). Soil samples with a cobalt target range of 30 to 150 mg/kg were selected from these areas. Soil containing cobalt above 150 mg/kg was omitted from this evaluation because these soils were proposed to be excavated and disposed of off-site as a remedy.

ReSolution Partners, LLC (ReSolution) of Madison, Wisconsin was contracted to perform the attenuation studies for the LMAC Area and Umicore on-site area soil. Copies of ReSolution's reports are in Appendix H of the RIR 2011. The results of the attenuation study are presented below.

Study Area	Soil Description	K_d, in mL/g	Initial pH	Final pH
LMAC Area	Shallow SM-SW	-0.3 to 10	4.2	5.84 to 5.93
	CL Zone	10 to >630	6.3	4.9 to 5.0
	SW Zone	10 to 170	6.3	6.3 to 6.5

SM-SW = Silty sands, sand-silt mixtures to well graded sands
SW = Well graded sands, little or no fines
CL = Inorganic clays of low to medium plasticity, sandy clays, silty clays

In general, the following trends were noted for cation adsorption:

- increasing pH will result in greater adsorption
- increasing ionic strength will result in lower adsorption

In summary, the K_d in acidic shallow LMAC Area soil is in the order of 0 to 10 mL/g. The K_d values of uncontaminated CL and SW zone soil for the LMAC Area ranged from 10 to 550 mL/g. The attenuation study found pH strongly controlled the partitioning of cobalt to soil. Partitioning increased with increasing pH.

2.1.2.2 Cobalt Fixation

As part of the RI, treatability testing was conducted to evaluate the effectiveness of products that can be used to fixate or immobilize cobalt and other inorganics, including:

- The evaluation of additives to soil to fixate cobalt and inorganic COCs,
- The determination of physical-chemical properties of each potential chemical additive, and
- The development of an estimated dosage rate for each of the tested chemicals.

ReSolution investigated four reagents for treating cobalt contaminated soil. Based on the test results, Enviro-Mag® was found to be the most cost effective product. Enviro-Mag® is a chemical grade magnesium oxide powder (CAS Number 1309-48-4) used for heavy metal stabilization. The ingredients are 99 to 100 percent magnesium oxide and 0 to 1 percent quartz (CAS Number 14808-60-7).

Enviro-Mag® was evaluated at a one percent and two percent dry weight dose. The product was tested under the Multiple Extraction Procedure (MEP) and leached ten times using the Synthetic Precipitation Leaching Procedure (SPLP) fluid to simulate rainwater. The results are summarized in Table 7 of the ReSolution November 2010 report entitled *Treatability Study Results in Support of the Maxton Facility Supplemental Remedial Investigation Plan* (Appendix H in RIR 2011). The ten cycles of the MEP was equivalent to approximately 800 years of leaching.

At a two percent dose, the LMAC Area leachable cobalt concentrations were near or below the 0.0010 mg/L reporting limit for the laboratory analyses, indicating that the reagent at two percent was effective. The Enviro-Mag® can be distributed in surficial and near-surficial soil by manual spreaders and tilling machinery. For a full application in the area of concern, subsurface distribution and mixing would be performed using injection techniques, or more likely, soil blending equipment.

2.1.2.3 Excavate Cobalt Impacted Soil

The excavation of cobalt impacted soil remedy is a combination of:

- Excavate soil containing cobalt equal to or greater than 150 mg/kg (Figure 2). Based on the RI results, the volume of contaminated soil equal to or greater than 150 mg/kg is approximately 1,100 cubic yards (about 1,630 tons);

- Fixation of soils using two percent Enviro-Mag® of areas with elevated cobalt levels that cannot be excavated, due to underground utilities for example. However, soil excavation is the preferred method; and
- Natural attenuation of cobalt impacted soil containing less than 150 mg/kg of cobalt

The excavation of the impacted soil with cobalt levels equal to or greater than 150 mg/kg is a permanent solution, with the removal of impacted soil from the site eliminating the need for future treatment of the soil in the excavation area. The soil left behind will contain cobalt above the preliminary residential health based soil remediation goal (RPSRG) of 4.6 mg/kg, but below the site specific industrial land use soil remediation goal of 300 mg/kg (individual level of 60 mg/kg preliminary health based soil remedial goal (IPSRG) multiplied by the hazard quotient 5).

2.1.3 Detailed Evaluation of Preliminary Remedies

These three preliminary remedies are evaluated below in Sections 2.2 through 2.9 in more detail to select a final remedy for the site.

2.2 Protection of Human Health and Environment [.0306(l)(3)(A)]

2.2.1 Cobalt Attenuation

Natural attenuation of cobalt at levels up to 300 mg/kg can effectively bind the compound to subsurface soil and prevent migration to groundwater. Soil contaminated with cobalt greater than 300 mg/kg will be excavated to meet the IHSB industrial health-based remedial goal. The land use restriction will prevent disturbance to the soil and potential exposure to the general public and site workers. The lack of shallow groundwater contamination is evidence that attenuation of cobalt to the subsurface soil is occurring.

2.2.2 Cobalt Fixation

The treatability study (Appendix H of RIR 2011) determined that a two percent by dry weight Enviro-Mag® application would fixate cobalt to the soil, preventing leaching of the cobalt to the groundwater. The blending process would incorporate cobalt contaminated soil greater than 300 mg/kg and less than 150 mg/kg, resulting in a blended soil less than 300 mg/kg meeting the IHSB industrial health-based remedial goal. The land use restriction will prevent disturbance to the soil and potential exposure to the general public and site workers.

2.2.3 Excavate Cobalt Impacted Soil

The excavation of cobalt impacted soil equal to or greater than 150 mg/kg will provide a safety factor compared to a cleanup goal of 300 mg/kg. Contaminant mass in the LMAC Area will be reduced to where attenuation processes will retard impact to groundwater, and IHSB industrial health-based remedial goals will be met or exceeded. If an area cannot be excavated, which is not anticipated but could be encountered due to underground utilities, for example, soil fixation methods can be used. The land use restriction will prevent disturbance to the soil and potential exposure to the general public, site workers, and the environment, and meet the REC requirement .0306(i)(2).

2.3 Compliance with Regulations [.0306(l)(3)(B)]

2.3.1 Cobalt Attenuation

The laboratory attenuation bench test results and the lack of cobalt contaminated groundwater indicate cobalt attenuation is capable of preventing impact to groundwater and meeting the 2L Standard (15A NCAC 2L.0202 Groundwater Quality Standards). Since the soil will not be remediated to residential SRGs, a land use restriction would be used to prevent disturbance to the soil and potential exposure to the general public and site workers, and meet REC requirement .0306(i)(2). However, this option does not remove or remediate soil impacted with cobalt above the industrial health-based soil remediation goal (SRG). To meet the industrial health-based SRG, soil containing cobalt greater than 300 mg/kg will be excavated and disposed off-site. Groundwater monitoring would be conducted to confirm compliance to 2L Standards.

2.3.2 Cobalt Fixation

The laboratory treatability bench test indicates cobalt fixation with Enviro-Mag® is capable of binding cobalt to the soil and preventing impact to the groundwater and meeting the 2L Standard. Since the soil will not be remediated to residential SRGs, the land use restriction could be used to prevent disturbance to the soil and potential exposure to the general public and site workers, and meet REC requirement .0306(i)(2). The blending process will incorporate cobalt contaminated soil greater than 300 mg/kg and less than 150 mg/kg resulting in a blended soil less than 300 mg/kg meeting the IHSB industrial health-based SRG. Groundwater monitoring would be conducted to confirm compliance to 2L Standards.

2.3.3 Excavate Cobalt Impacted Soil

The excavation of the cobalt impacted soil equal to or greater than 150 mg/kg will reduce contaminant mass to where cobalt attenuation has been demonstrated to prevent impact to the groundwater, and will meet soil industrial health-based SRG and groundwater 2L Standards. The soil fixation product could be used in areas where soils cannot be excavated, but this is neither anticipated nor desired. The land use restriction will prevent disturbance to the soil and potential exposure to the general public and the environment and meet the REC requirement .0306(i)(2). Groundwater monitoring would be conducted to confirm compliance to 2L Standards.

2.4 Long Term Effectiveness [.0306(l)(3)(C)]

2.4.1 Cobalt Attenuation

With Umicore managing cobalt levels in stormwater runoff (the source of cobalt) through better housekeeping, the cessation of the cobalt generating manufacturing process on the adjoining On-Site Area, and the attenuation capacity of the matrix, long-term migration of cobalt through LMAC Area soil should be controlled. The laboratory attenuation bench testing, the lack of cobalt in soil samples collected vertically in the matrix, and the lack of cobalt contaminated groundwater indicate that cobalt attenuation is capable of preventing impacts to the groundwater. Groundwater monitoring will be conducted to confirm compliance to 2L Standards.

2.4.2 Cobalt Fixation

With Umicore managing cobalt levels in stormwater runoff (source of cobalt) through better housekeeping, the cessation of the cobalt generating manufacturing process on the adjoining On-Site Area, and soil fixation with Enviro-Mag®, long-term migration of cobalt through the soil would be controlled. In the treatability test, the samples were leached ten times using SPLP fluid to simulate rainwater equivalent to approximately 800 years of leaching. Groundwater monitoring will be conducted to confirm compliance to 2L Standards.

2.4.3 Excavate Cobalt Impacted Soil

With Umicore managing cobalt levels in stormwater runoff (the source of cobalt) through better housekeeping, the cessation of the cobalt generating manufacturing process on the adjoining On-Site Area, the construction of a sediment trap after the excavation of soil containing greater than 150 mg/kg of cobalt, and the attenuation capacity of the matrix, the long-term migration of cobalt through the LMAC Area soil should be controlled. Groundwater monitoring will be conducted to confirm compliance to 2L Standards.

2.5 Contaminant Reduction Potential [.0306(l)(3)(D)]

2.5.1 Cobalt Attenuation

The laboratory attenuation bench test showed site soil is capable of binding cobalt, reducing the mobility. However, the cobalt attenuation remedy alone is not capable of reducing the overall volume or toxicity of cobalt in soil.

2.5.2 Cobalt Fixation

The laboratory treatability testing showed Enviro-Mag® is capable of binding levels of approximately 300 mg/kg or lower cobalt to soil reducing the mobility and preventing impact to groundwater for period of approximately 800 years of leaching (Appendix H in RIR 2011). However, cobalt fixation alone is not capable of reducing the overall volume or toxicity of cobalt in soil.

2.5.3 Excavate Cobalt Impacted Soil

The excavation of cobalt impacted soil equal to or greater than 150 mg/kg will remove more contaminant volume from the site than the other options. The volume will be physically removed to another location. Cobalt attenuation to soils will reduce mobility. The excavation process does not chemically or biologically breakdown the cobalt into non-hazardous substances; therefore, there is no reduction in cobalt toxicity.

2.6 Short Term Effectiveness [.0306 (l)(3)(E)]

2.6.1 Cobalt Attenuation

The laboratory attenuation bench test data, the lack of cobalt migration evident from the soil assessment data, and the lack of cobalt contaminated groundwater indicate that cobalt attenuation is capable of meeting short-term effectiveness goals for soil. The process is ongoing with cobalt migrating through the shallow soils to deeper zones as the attenuation capacity is consumed until the source of mobile cobalt is exhausted.

2.6.2 Cobalt Fixation

The laboratory treatability bench testing data showed cobalt fixation is capable of meeting short-term effectiveness goals for soil with cobalt at 300 mg/kg or less. The binding process is physical-chemical and not biological and occurs upon contact with the contaminated soil.

2.6.3 Excavate Cobalt Impacted Soil

The excavation of cobalt contaminated soil from 150 mg/kg or greater is capable of meeting short-term effectiveness goals.

2.7 Remedy Implementability [.0306 (l)(3)(F)]

2.7.1 Cobalt Attenuation

The cobalt attenuation process is naturally occurring and is based on the ability of the soil to bind up cobalt. The lack of cobalt in the soil column vertically and no confirmed groundwater impacts indicate that cobalt attenuation is ongoing. The cobalt attenuation remedy assumes the soil has more cobalt attenuation capacity than there is cobalt mass in the source area. There is no process to implement other than surface water control (see discussion in Section 2.7.3), land use restrictions and groundwater monitoring to evaluate remedy effectiveness. This process will require long-term groundwater monitoring, estimated to be 30-years for cost comparison purposes.

2.7.2 Cobalt Fixation

Implementation of the optional cobalt fixation process involves contacting the contaminated soil with two percent dry weight Enviro-Mag®. The Enviro-Mag® can be distributed in shallow soils using manual spreaders and tilling machinery. Subsurface application can be performed using injection methods or soil blending machinery. The in-situ blending technology provides a more cost effective means to continuously contact the soil with Enviro-Mag® than injection.

For subsurface soil blending/mixing, the blending is done by a 28-inch diameter mixing tiller rotating at speeds up to 100 rpm by a hydraulic motor. The tiller is mounted on the end of a track hoe arm. The track hoe provides the movement of the equipment horizontally and vertically. A separate 400-hp motor and hydraulic pump generates hydraulic pressure up to 5,000 psi to rotate the tiller. The hydraulic driven tiller produces torque of 20,300 foot pounds. The in situ blender, designed and manufactured by Lang Tool Company, Beaverton Michigan, is capable of mixing dry soil as well as sludge material to depths of 20 to 22 feet bgs.

The Enviro-Mag® is added to cells within the area to be remediated along with water. The blender mixes the soil, Enviro-Mag®, and water under aqueous conditions. Once one cell is blended, a second cell is blended and so forth until the entire area is mixed with Enviro-Mag® and water. Temporary water lines would be extended into the LMAC Area for this approach. Soil in the remediated area becomes saturated during the blending process and loses the ability to support vehicle traffic. The run-off from the Umicore facility will have to be routed around the mixed area rather than across the area.

The cobalt fixation process assumes the fixation/attenuation capacity of the Enviro-Mag® is greater than the source contaminant mass. Surface water controls (see discussion in Section 2.7.3) and land use restrictions will need to be implemented. Groundwater monitoring would be necessary, for an estimated period of 10 years for cost-comparison purposes, to evaluate remedy effectiveness.

2.7.3 Excavate Cobalt Impacted Soil

Implementation of the excavation remedy involves the sequence of events outlined below:

1. Grub large vegetation and store in a designated area. Material would be ground and scattered over the site as mulch after it has been graded and vegetated.
2. Grade the surrounding soils to minimize surface water run on to the excavated area. Two temporary earthen berms and diversion swales would be constructed to direct surface water flow around the soil remediation area to the existing drainage channel downstream of the area (Figures 3 and 4).
3. Storm water from the Umicore facility (On-Site Area) discharge would be routed or pumped from the existing concrete channel into one of the temporary diversion channels (Figures 3 and 4) and accumulated rainfall in the excavation would be pumped from the excavation into one of the diversion channels.
4. Excavation and disposal of the cobalt impacted soil in the LMAC Area to a properly licensed facility. Previously, soil has been disposed of at the Sampson County Disposal facility in Roseboro, North Carolina. During the excavation, monitoring wells DMW-1, DMW-3, and DMW-4 must be protected from damage. Monitoring well DMW-2 will have to be removed because of its location within the new basin.
5. Optional - Spread Enviro-Mag® at two or more locations in the excavation to a thickness of 1/2-inch prior to backfilling the excavation. Samples would be collected from potential application areas and tested to determine if any area needs the Enviro-Mag® treatment. A dry granular fertilizer spreader can be used along with mechanical tilling machinery. Two areas that may require fixation are in the vicinity of monitoring wells DMW-2 and DMW-4. A coverage area of approximately 10-foot radius could be placed around each well.
6. Following excavation and any fixation activities construction of a sediment basin (Figures 3 and 5) within a portion of the excavation area and backfilling the remaining excavation with clean fill and compact. Fill material will consist of chemically clean material from on-site clean excavated borrow materials. On-site clean fill material is being used to lower cost of this task. Backfill material will consist of silty sands to sandy silts. No cobbles, rocks, or stones greater than 2 inches in maximum dimension would be allowed. All fill material will be free of organic material, sod, peat, or perishable or other deleterious materials. The Environmental Contractor must supply analytical results for samples collected from the proposed off-site borrow material within one month of the project start. The analytical test should include Inactive Hazardous Sites Branch hazardous substance list metals plus cobalt, 8260 volatile organic compounds and 8270 semi-volatile organic compounds.

   Uncompacted fill material will be placed in layers not to exceed 12 inches during construction of the sediment basin bank walls. Compaction will consist of two passes of a vibratory drum roller or rubber tired roller in areas not associated with the sediment basin. The backfill soil would be tested by Modified Proctor (ASTM D 1557) to develop the type of compaction equipment and number of passes to achieve 95% modified Proctor.

The sediment basin will have a volume of 0.58 acre-ft at normal depth, and a volume of 1.07 acre-ft at flood pool depth. The sediment basin will have a normal pool depth of 2 feet and a flood pool depth of 3 feet, with 6:1side slopes. The bottom of the sediment basin will be lined with a 6-inch thick reinforced concrete pad, and the side slopes will be lined with a geotextile liner to allow for heavy equipment travel into and out of the basin during basin dredging operations.

7. Grading the surrounding soils to minimize surface water run on to the excavated area and grading the backfilled area to promote drainage of the surface water to the new sediment basin or to the grass-lined drainage channel installed downstream of the remediation area. The seeded fill within the remediation area will be sloped such that rainfall drains toward the sediment basin.

8. Inflow into the basin will be through a 24-inch diameter reinforced concrete pipe (RCP) that transfers water from the collection area at the downstream end of the concrete channel on the adjoining Umicore facility. Outflow from the basin will be controlled by a 3-foot by 3-foot corrugated metal circular barrel flashboard weir structure installed at the downstream end of the basin. The riser will be equipped with a rectangular weir to maintain normal pool level at a 2-foot depth, control peak flow from a 10-year storm event to match the peak flow during existing site conditions, and allow flow from a 100-year storm event to pass through the basin.

   Discharge from the basin will be through a 12-inch diameter RCP and energy dissipation device. The device will be an apron 10 feet in length and minimum eight inches deep, lined with a geotextile filter fabric or 6-inch of gravel fill, and then filled with rip rap consisting of stone (four to eight inch diameters) having a unit weight of 165 or greater pounds per cubic foot. The apron will be constructed on flat (0%) grade, be level or slightly depressed in the middle, and aligned with the basin outlet pipe and receiving channel. A level spreader (Figure 4) may be placed at the discharge of the energy dissipation device as needed to prevent downstream scour. A 50-foot vegetated channel would be constructed downstream of the rip-rap structure in the location of the former ditch area. The channel will be 4 foot wide in the bottom and have one vertical to four horizontal side slopes as noted on Figure 2. The depth of the channel shall be 0.5 foot, and the bottom slope shall be maintained at 1% (see Figure 3). The discharge end of the channel would be graded to blend into the existing surface grade to promote flow through the channel.

9. Soil southwest of the site with cobalt above the unrestricted use level of 4.6 mg/kg from the migration of cobalt contaminated surface water and sediment will be pulled back onto the LMAC site for management with the other cobalt contaminated soil.

10. All disturbed areas will be stabilized with a permanent site-specific vegetation mixture cover within 15 days of the final grading (see Figure 5 Seeding Schedule).

2.8 Remedy Cost Evaluation [.0306 (l)(3)(G)]

EPA guidance suggests that the cost estimates be accurate from minus 30 percent to plus 50 percent. Using a 7 percent discount factor, cost estimates have been prepared for three potential remedial options. State and community acceptance is speculative for the purpose of the RAP; additional comments on remedial alternatives will be included in any addendums to this RAP based on any public participation received.

All three remedies will require post-remediation construction of a sediment basin for capture and containment of soil and sediment particles transported in the stormwater runoff from on-site and a discharge ditch from the basin to mitigate erosion from the basin overflow (Figures 3 through 5). The capture of stormwater runoff by the basin and discharge channel will eliminate ponding and minimize leaching cobalt from the soil. All three remedies will require pulling the soil southwest of the site with levels of cobalt above 4.6 mg/kg (the residential PSRG) back onto the LMAC site for management with the other cobalt contaminated soil. All three remedies require land use restriction and groundwater monitoring.

2.8.1 Cobalt Attenuation

The main capital items are soil excavation to 300 mg/kg, deed restriction, sediment basin, and surface water drainage (Table 3). The primary operations and maintenance (O & M) costs are groundwater sampling, sediment removal from the sediment basin, and maintenance of the drainage ditch (Table 3). The cost for implementing Cobalt Attenuation is approximately $456,000.

2.8.2 Cobalt Fixation

The main capital items are soil blending of contaminated soils, deed restriction, sediment basin, and surface water drain from Umicore property (Table 4). The main O & M costs are groundwater sampling, sediment removal from the sediment basin, and maintenance of the drainage ditch (Table 4). The cost for implementing Cobalt Fixation is approximately $407,000.

2.8.3 Excavate Cobalt Impacted Soil

The main capital items are soil excavation, deed restriction, surface water run-on control, sediment basin, and surface water drain (Table 5). The main O & M costs are groundwater sampling, removal of sediment from the sediment basin, and maintenance of the drainage ditch (Table 5). The cost for implementing excavation of cobalt impacted soil is approximately $504,420.

2.9 Community Acceptance [.0306 (l)(3)(H)]

2.9.1 Cobalt Attenuation

There should be no social stigma (“not in my backyard”) associated with the cobalt attenuation remedy that would cause the community to want to prevent its use. The area is adjacent to the Maxton-Laurinburg Airport without any residential areas. The activities involve constructing surface water diversion swales and ditches to route runoff from the Umicore facility around the cobalt impacted area. The diversion and drainage ditch construction would be done on-site during the day without disturbing traffic flow patterns, creating excessive noise or odors. Good housekeeping of equipment, supplies, and trash should minimize any visual issues with the community. Equipment leaving the site will be cleaned within the remediation zone to prevent leaving a trail of mud on Airport Road. The long-term activities would involve groundwater sampling, along with sediment basin and surface water diversion ditch O & M.

2.9.2 Cobalt Fixation

There should be no social stigma associated with cobalt fixation that would cause the community to want to prevent its use. The area is adjacent to the Maxton-Laurinburg Airport without any residential areas. The activities would include the construction of a drainage ditch around the soil blending area to prevent stormwater intrusion. The blending operations using heavy equipment take two to three weeks to complete. The drainage ditch and soil blending processes would be done during the day without disturbing traffic flow patterns, creating excessive noise or odors. Good housekeeping of equipment, supplies, and trash should minimize any visual issues with the community. Equipment leaving the site will be cleaned to prevent leaving a trail of mud on Airport Road. The on-site activities after the soil blending only involve groundwater sampling, sediment basin, and surface water drainage ditch O & M.

2.9.3 Excavate Cobalt Impacted Soil

There should be no social stigma associated with excavation of cobalt impacted soil that would cause the community to want to prevent its use. The area is adjacent to the Maxton-Laurinburg Airport without any residential areas. The on-site activity will involve soil excavation, backfilling, and compaction with heavy equipment and should last three to four weeks. The excavation process would be done during the day on-site without disturbing traffic flow patterns, creating excessive noise or odors. Good housekeeping of equipment, supplies, and trash should minimize any visual issues with the community. Equipment leaving the site will be cleaned to prevent leaving a trail of mud on Airport Road. The on-site activities after the soil excavation only involve groundwater sampling, sediment basin, and surface water diversion ditch and drainage ditch O & M.

3.0 Proposed Remedy

The excavation of cobalt impacted soil is preferred for the site soil because of its higher degree of overall effectiveness, resulting in minimizing potential risk, and its projected cost essentially equivalent to the other remedies. While the short-term tasks are not the least expensive of the three, the long-term O & M costs are projected to be less than the other options.

Remedy Selection Criteria	***Cobalt Attenuation***	***Cobalt Fixation***	***Excavate Cobalt Impacted Soil***
Protection of Human Health and the Environment	Yes	Yes	Yes
Compliance with Regulations	Yes	Yes	Yes
Long Term Effectiveness	Yes	Yes	Yes
Contaminant Reduction Potential	Yes	Yes	Yes
Short Term Effectiveness	Yes	Yes	Yes
Remedy Implementability	Yes	Yes	Yes
Community Acceptance	Yes	Yes	Yes
Capital Costs, Permitting	$278,000	$252,000	$375,330
Present Worth O & M Costs	$178,300	$155,200	$129,090
Total Costs for Remediation Period	***$456,300***	***$407,200***	***$504,420***

See Tables 3, 4, and 5 for the details of the remedy costs developed during the feasibility study

3.1 Conceptual Design Description of Proposed Remedy [0306(l)(4)]

See sections 2.1.2.3 for the conceptual design and section 2.7.3 for a more detailed description.

3.2 Justification of Selected Interim Remedy [.0306(l)(5)]

The primary reasons for selection of the Excavate Cobalt Impacted Soil interim remedy are:

- The excavation and removal of cobalt contaminated soil equal to or greater than 150 mg/kg will remove from the site approximately 1,100 cubic yards (about 1,630 tons) of soil reducing the volume of cobalt at the site and removing soil with levels above the industrial PRG. Cobalt attenuation to the underlying soils will reduce mobility. The excavation process does not chemically or biologically breakdown the cobalt into non-hazardous substances; therefore, there is no reduction in cobalt toxicity.
- The cobalt impacted soil left behind (with cobalt levels between the residential and industrial PRG) can be controlled by Cobalt Attenuation and Cobalt Fixation process.
- The risk to future cobalt impact to the groundwater is minimal.
- The use of land use restriction will prevent unauthorized disturbance of the cobalt contaminated soil left behind and will prevent use of the groundwater beneath the site.
- The costs are comparable to other alternatives.

3.3 Revised RAP Activities [.0306(l)(6)]

3.3.1 Excavate Cobalt Impacted Soil

Excavating cobalt impacted soil equal to or greater than 150 mg/kg will remove approximately 1,100 cubic yards (about 1,630 tons). The soil left behind can be controlled by attenuation and fixation processes. There is no additional assessment required prior to implementing the RAP. Upon starting the soil excavation process, soil samples will be collected to confirm if the soil with cobalt concentrations equal to or greater than 150 mg/kg has been excavated. Samples will be collected and submitted to a North Carolina certified laboratory. The samples will be analyzed for cobalt according to EPA Method 6020. Upon confirmation levels less than 150 mg/kg have been reached, the area will be backfilled with clean soil or incorporated into the sediment basin.

An Erosion and Sedimentation Control Plan has been submitted to and approved by the DENR Fayetteville Regional Office through the issuance of a stormwater construction permit. Any remedial action derived wastes will be properly handled and disposed of in accordance with applicable rules, regulations, and guidelines.

3.3.2 Groundwater Monitoring

The four monitoring wells in the shallow groundwater will be protected during the remediation process. If during soil excavation or construction a monitoring well is damaged or destroyed, it will be abandoned and replaced with a new well in the same vicinity. Monitoring well DMW-2 will be removed due to its location within one of the basin walls.

Long term groundwater monitoring will be performed for the following analytical parameters:

- Cobalt according to EPA Method 6020
- Field parameters pH, conductivity, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity.

Monitoring will be performed on a quarterly basis for one year after soil excavation is completed. If no groundwater is impacted by cobalt during this time, monitoring will be discontinued.

4.0 Remedy Implementation

4.1 Treatability Study and Additional Site Assessment [.0306(l)(7)]

There is no need for additional work in the form of assessment or treatability to support the proposed excavation remedy. Treatability testing has been previously performed to support final design.

4.2 Revised RAP Procedures and Schedule [.0306(l)(8)]

The tentative schedule is shown below predicated on a start date that has not been established by Umicore.

RAP Timeline & Tasks	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Complete/Submit RAP									
Public Notice for RAP									
Finalize RAP									
Implement RAP									
Bid Specification/Contractor Mobilize									
Excavation or Fixation									
Confirmation Sampling and Analysis									
Sedimentation Basin									
Land Use Restriction									
Construction Completion Report									
Groundwater Monitoring									
(Continue quarterly monitoring one year									
past final soil excavation or fixation.)									
Completion Report									
Quarterly Progress Reports									
Legend									
Work in Progress									
Task Completed									
Scheduling Contractors/Suppliers									

4.2.1 Additional Assessment Methods

There are no additional assessment methods required.

4.2.2 Treatability Study Procedures

There is no need for new treatability studies for the proposed remedy. Treatability studies were conducted during the RI and reported in the RIR 2011.

4.2.3 Final Design

Based on the RIR and the feasibility evaluation, the proposed design in this RAP is the final design for the LMAC site area.

4.2.4 Construction

There is construction of the temporary storm water run-off diversions, sedimentation basin, and storm water collection channel from the Umicore facility. After construction activities are complete, a Construction Completion Report will be prepared and combined with the first quarterly Progress Report.

4.2.5 Operation and Maintenance

There is no active remediation system to require operation and maintenance. The monitoring wells will be inspected during each sampling event for any necessary repairs to the well head, protective casing, and surface pad. The storm water run-off diversions and storm water ditch from the Umicore facility will be inspected for damage annually and will be mowed as necessary. The sediment basin will have accumulated sediment removed as needed.

4.2.6 System Monitoring and Performance Evaluation

System monitoring will be through the evaluation of the monitoring well results to maintain 2L groundwater standards quarterly for the first year. All the monitoring wells will be measured for depth of groundwater and a flow map prepared to track groundwater movement direction and gradient. Results from each well proposed for sampling during the time period will be plotted on a plume map for that event. Historical tables of results for each well will be maintained.

4.2.7 Progress Reports

Progress reports each quarter for the first year will be provided within 30 days of receiving the analytical results from the sampling event. The progress report will provide a brief summary of the field work, groundwater measurements and sampling and any observations for needed well maintenance or repair; a groundwater flow map and plume map for the event, the updated historical results table, and a brief discussion of conclusions and recommendations. The progress reports will contain the required remediating party and RSM certifications.

4.3 Revised RAP Completion Criteria [.0306(l)(9)]

The proposed excavation remedy will begin with confirmation sampling and analysis during the excavation. Upon finishing the excavation, backfilling and storm water diversion channel installation, groundwater monitoring will begin and continue until four consecutive sampling events meet 2L standards. After four consecutive sampling events meet 2L standards, the monitoring wells will be abandoned according to Aquifer Protection Section standards. If 2L standards are met for the four quarterly consecutive sampling events, the site will be determined to have reached IHSB remediation goals. Progress reports as described in Section 4.2.7 will be prepared for each event and a final Remedial Action Completion Report will then be prepared.

4.4 Community Health and Safety Plan [.0306(l)(10)]

The hazardous substance site health and safety plan (HASP) prepared for the RIP will be modified to include the soil excavation and storm water diversion ditch construction activities. Furthermore, measures will be used to monitor site workers for cobalt dust and airborne particulates during the remedial activities. This data will be compared to health-based regulatory levels to ensure nearby residences and businesses will not be adversely affected by the remedial action activities. However, there are no other businesses or residences in close proximity to the remediation area. The HASP has been updated with historical data summarizing the soil and groundwater results of the RI and RI Addendum.

4.5 Decontamination Procedures [.0306(l)(11)]

Decontamination procedures required for the soil excavation remedy are the responsibility of the environmental remediation contractor. The construction contractor will be responsible for construction of a construction entrance at a designated location(s) of ingress and egress to and from the excavation area. The contractor will be required to decontaminate any equipment used to excavate or move the cobalt impacted soil. Trucks leaving the site will be required to have wheels cleaned of site soil to prevent carry-out to the public roadway. Decontamination procedures for groundwater sampling and site O & M are present in the site Health & Safety Plan.

5.0 Revised RAP Certification and Completion Statements

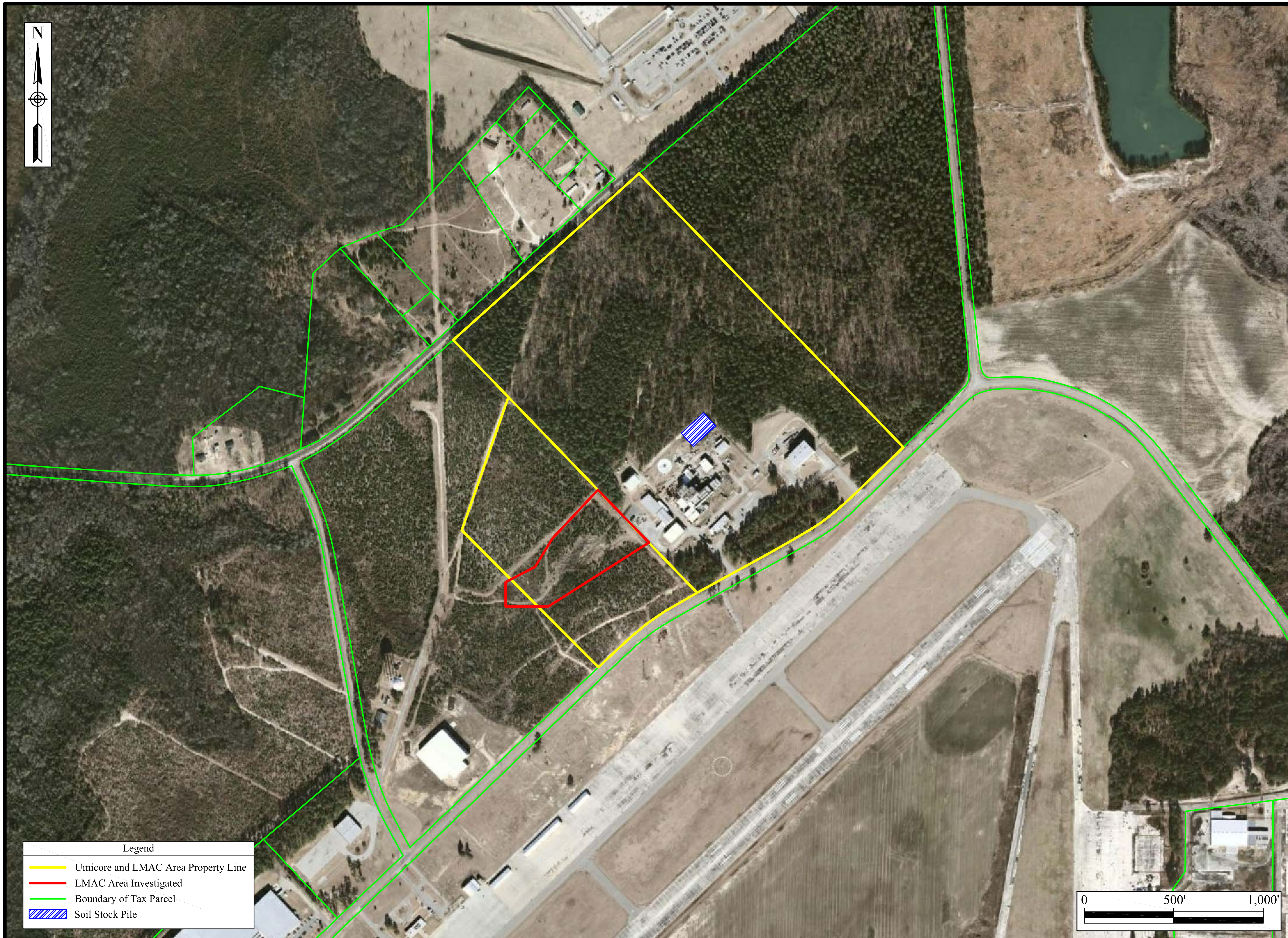
5.1 RP and RSM Certification of RAP [.0306(b) (1-2)]

The RAP has been certified by the remediating party first and the RSM second that the Revised RAP complies with the REC rules and the IHSB Act.

5.2 Revised RAP Completion Statement [.0306(b)(5)]

Upon completion of the public notice period and all comments have been received and addressed in the Revised RAP; the final Revised RAP will be certified by the remediating party first and the RSM second.

Figures



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Soil Stock Pile and On-Site and Off-Site Investigation Areas

Umicore Facility Investigation Areas
Maxton, North Carolina

Drawn By: wmf	Checked By: [illegible]	Project Number: 200917	Date: April 2012
Scale: 1" = 500'	Size: 11" x 17"	Layers: 0,1,2,3	Filename: P:\Umicore\Maxton - 200917\8 Field and Technical \8.8 CAD and GIS Maps\LMAC\LMAC CAD\Onsite and Offsite Investigation Areas

References: Scotland County GIS, Field Notes

Figure

1

Cobalt Isoconcentration in Soil at Six Inches for LMAC Area

Unicore Facility Investigation Areas

Maxton, North Carolina

Drawn By:	Checked By:	Project Number:	Date:	References:	Scale:	Size:	Layers:
wmf/baj		200917	9-2012	Base Map provided by Unicore, Google Satellite Imagery	1" = 50'	22" x 34"	0,1,43,44,45

P:\Unicore\Unicore - 200917\8.8 CAD and GIS Maps\LMAC\LMAC CAD\Master LMAC Area Site Map Cobalt Isocons @ 6 inches

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Figure

2

Legend

g4 ●	S&ME Soil Sample Location
D7A ●	D&D Soil Sample Location
(1.0)	Cobalt Concentration (mg/kg)
●	Deep Soil Boring
NS	Not Sampled
DMW - 4	Monitoring Well Location

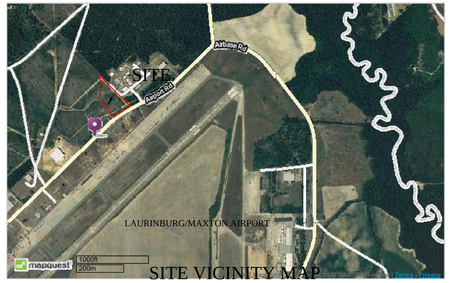
Cobalt Contours (mg/kg)

2.0 = Background Level
4.6 = Residential PSRG (IHSB) Feb. 2011
100 = 1/3 Industrial PSRG (IHSB) July 2012
150 = 1/2 Industrial PSRG (IHSB) July 2012
300 = Industrial PSRG (IHSB) July 2012

Note: Industrial PSRG for Single Compound, PSRG = Preliminary Health Based Soil Remediation Goal, IHSB = Inactive Hazardous Sites Branch.

0 50 100

Graphic Scale: 1" = 50'



SITE VICINITY MAP

SITE STATISTICS

Total Acreage: 22 acres

Total Area of Disturbance: 5.0 acres:
- Access: Road Construction: 0.20 acres
- Soil Excavation (on-site:) 3.4 acres
- Soil Excavation (off-site:) 1.4 acres

River Basin: Lumber

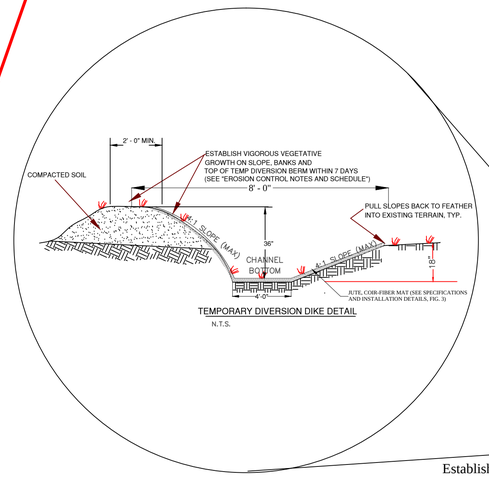
Site Soils: Eustis-Wagram-Kenansville sands

CONSTRUCTION SEQUENCE:

1. CONTRACTOR TO NOTIFY N.C. DIVISION OF ENERGY, MINING, AND LAND RESOURCES, REGIONAL OFFICE IN FAYETTEVILLE, (910) 433-3300, PRIOR TO BEGINNING CONSTRUCTION.
2. CONSTRUCT TEMPORARY CONSTRUCTION ENTRANCE.
3. INSTALL ANY EROSION CONTROL MEASURES INCLUDING AT STAGING AREA(S).
4. INSTALL SEDIMENT AND EROSION/TUBIDITY MEASURES AS SHOWN, PRIOR TO CONSTRUCTION ACTIVITIES. AT THE END OF EACH DAY, EROSION CONTROL DEVICES MUST BE IN PLACE, AS DEPICTED ON THE PLANS, UP TO THE CURRENT END OF DISTURBED AREA.
5. CLEAR SITE, BEGIN GRADING AND EXCAVATION
6. IMMEDIATELY FOLLOWING EXCAVATION, ALL DISTURBED AREAS ARE TO BE LEVELED OUT, SEEDED, AND MULCHED AS OUTLINED ON FIGURE 3. DISTURBED AREAS ARE NOT TO LAY EXPOSED LONGER THAN 14 DAYS.
7. MAINTAIN ALL TEMPORARY MEASURES UNTIL PERMANENT AND UNIFORM VEGETATION IS ESTABLISHED.
8. CONTRACTOR SHALL CLEAN AND RESTORE TO PRE-DISTURBANCE CONDITIONS ANY AREAS OUTSIDE THE PROJECT LIMITS THAT MAY INADVERTENTLY BE DAMAGED DUE TO THE FAILURE OF THE EROSION MEASURES.
9. REMOVE THE REMAINING TEMPORARY EROSION CONTROL MEASURES UPON APPROVAL BY THE N.C. LAND QUALITY.

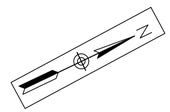
EROSION CONTROL NOTES:

1. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN COMPLIANCE WITH THE SEDIMENTATION POLLUTION CONTROL ACT OF 1973.
2. ALL LAND DISTRIBUTING ACTIVITIES ARE TO BE PLANNED AND CONDUCTED SO AS TO LIMIT EXPOSURE OF BARE EARTH, PER THE REQUIREMENTS OF NCDWQ CONSTRUCTION GENERAL PERMIT NCG01 AS FOLLOWS:
   A. ALL PERIMETER DIVERSION DITCHES, STORMWATER CONVEYANCE SWALES AND DITCHES, AS WELL AS SLOPES STEEPER THAN 3:1 AND LONGER THAN 10' SHALL BE STABILIZED WITHIN SEVEN (7) DAYS FOLLOWING CONSTRUCTION (14 DAYS IF SHORTER THAN 10' AND FLATTER THAN 2:1).
   B. SLOPES 3:1 OR FLATTER SHALL BE STABILIZED WITHIN 14 DAYS FOLLOWING CONSTRUCTION (7 DAYS FOR SLOPES GREATER THAN 50-FT IN LENGTH)
3. ALL DISTURBED AREAS SHALL BE STABILIZED BY THE PLANTING AND ESTABLISHMENT OF PERMANENT AND UNIFORM GROUND COVER AS SPECIFIED.
4. TEMPORARY MATERIAL STAGING AREAS SHALL HAVE ADEQUATE SEDIMENT AND EROSION CONTROL MEASURES INSTALLED TO PREVENT OFF SITE SEDIMENTATION, AND SHALL BE SEEDED AS NECESSARY TO BRING THE SITE BACK TO ITS NATURAL STATE UPON COMPLETION OF THE THE PROJECT.
5. SEDIMENT AND EROSION/TURBIDITY CONTROL MEASURES SHALL BE INSPECTED WEEKLY AND AFTER A STORM EVENT OF AT LEAST 0.5" TO INSURE THEY ARE FUNCTIONAL AND IN GOOD WORKING CONDITION. SEDIMENT DEPOSITION ACCUMULATION TO BE PERIODICALLY REMOVED TO MAINTAIN UNIT EFFECTIVENESS.
6. INSPECTIONS SHALL BE PERFORMED DURING NORMAL BUSINESS HOURS.
7. INSPECTION RECORDS MUST BE MAINTAINED ON-SITE AND MADE AVAILABLE TO NC DENR PERSONNEL UPON REQUEST.
8. RECORDS MUST BE MAINTAINED FOR TEH ENTIRE DURATION OF THE PROJECT OR THREE (3) YEARS, WHICHEVER IS SHORTER.
9. CONTRACTOR SHALL CONTACT DESIGN ENGINEER (ANDREW RODAK) AT 919-858-9898 FOR ISSUES RELATED TO MAINTENANCE OF ESC MEASURES
10. OVER THE DURATION OF THE PROJECT, THE OWNER'S REPRESENTATIVE SHALL MAKE PERIODIC AND UNSCHEDULED INSPECTIONS TO EVALUATE THE EFFECTIVENESS OF ALL EROSION CONTROL MEASURES. IF EROSION OCCURS, THE OWNER SHALL NOTIFY THE CONTRACTOR TO TAKE ADEQUATE STEPS TO REMEDY THE SITUATION.
11. CULVERTS, DITCH-LINES, OR RIP-RAP DISTURBED BY THIS CONSTRUCTION WILL BE REPLACED OR REPAIRED BY THE CONTRACTOR TO AN EQUAL OR BETTER CONDITION TO THAT PRIOR TO THE DISTURBANCE.



TEMPORARY DIVERSION DIKE DETAIL

N.T.S.



Site Plan

LMAC Area Soil Remediation
Maxton, North Carolina

Layers:	
Size:	22" x 34"
Scale:	1" = 60'
References:	Base Map provided by Wampler Survey
Date:	Dec 2012/Jan 2013
Project Number:	200917
Checked By:	
Drawn By:	amr
P:\Umicore\8 Field and Technical\8.8 CAD & GIS\LMAC\LMAC CAD\ESC Plan Site	

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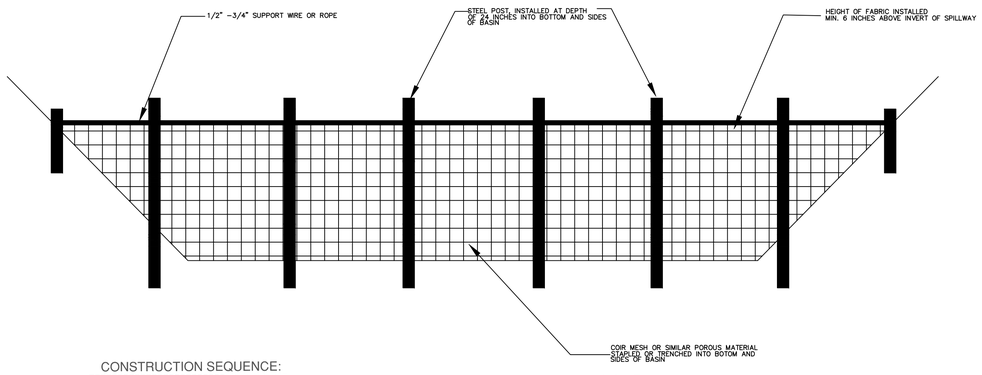
Figure

3



CONSTRUCTION SEQUENCE:

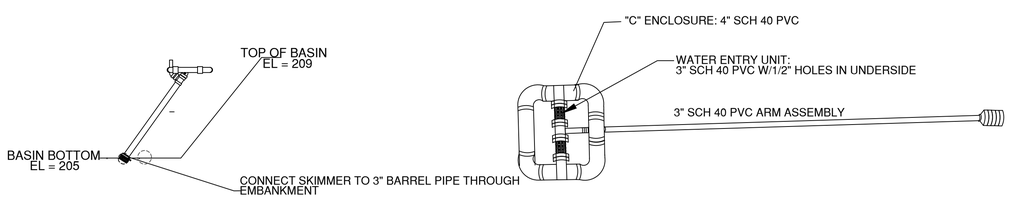
1) GRADE BASIN SO THAT BOTTOM IS LEVEL FROM FRONT TO BACK AND SIDE TO SIDE.
2) INSTALL POSTS OR SAW HORSES ACROSS WIDTH OF BASIN (SEE INSTALLATION DETAILS FOR SILT FENCE)
3) INSTALL POSTS TO A DEPTH OF 24 INCHES, PLACE AT MAXIMUM 4 FT ON CENTER, AND INSTALLED INTO SIDES OF BASIN AS WELL.
4) INSTALL POSTS SUCH THAT TOP OF BAFFLE FABRIC IS 6 INCHES HIGHER THAN INVERT OF THE OUTLET STRUCTURE AND TWO INCHES LOWER THAN THE TOP OF THE BERMS.
5) INSTALL AT LEAST THREE ROWS OF BAFFLES BETWEEN THE INLET AND OUTLET LOCATIONS. SPACE BASED ON LAYOUT SHOWN IN SITE PLAN. PLACE FILL IN 6"-8" CONTINUOUS LIFTS OVER LENGTH OF FILL AREA AND COMPACT USING CONSTRUCTION HAULING EQUIPMENT. CONSTRUCT EMBANKMENT AT AN ELEVATION 10% HIGHER THAN DESIGN FOR SETTLEMENT.
6) INSTALL SUPPORT WIRE OR ROPE ACROSS THE TOP OF THE POSTS TO PRVENT SAGGING IN THE BAFFLES.
7) WRAP COIR MESH BACKED BY JUTE MESH OR LIKE POROUS MATERIAL OVER THE TOP WIRE. FABRIC SHALL HAVE 5-10% OPENINGS IN WEAVE.
8) ATTACH FABRIC TO TOP WIRE AND POSTS WITH ZIP TIES, WIRES, OR STAPLES.
9) ANCHOR BOTTOM AND SIDES OF FABRIC IN A TRENCH ADVANCED ALONG THE BOTTOM AND SIDES OF THE BASIN, OR PINNED INTO THE GROUND WITH 8-INCH EROSION CONTROL MATTING STAPLES.
10) USE ONE CONTINUOUS PIECE OF FABRIC FOR EACH BAFFLE; DO NOT SPLICE.

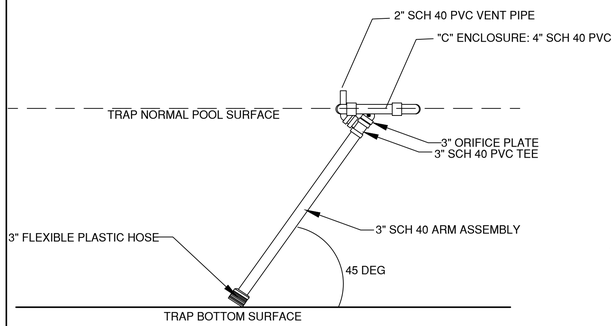
MAINTENANCE:

1. INSPECT BAFFLES WEEKLY AND AFTER EACH SIGNIFICANT (≥ 0.5 IN.) RAINFALL EVENT AND REPAIR AS NEEDED.
2. MAINTAIN ACCESS AT ALL TIMES TO BAFFLES. IF THE FABRIC COLLAPSES, TEARS, DECOMPOSES, OR BECOMES INEFFECTIVE, REPLACE IMMEDIATLEY. STABILIZE EXCAVATED MATERIAL APPROPRIATELY.
3. REMOVE SEDIMENT DEPOSITS FROM THE UPSTREAM SIDE OF EACH BAFFLE WHEN SEDIMENT HEIGHT REACHES 50% OF THE BAFFLE HEIGHT.

POROUS BAFFLE DETAIL

N.T.S.





DESIGN NOTES:

1. SKIMMER ORIFICE SHALL BE DESIGNED TO DEWATER THE TRAP IN 2-5 DAYS.
2. SKIMMER SHALL BE ATTACHED TO A SCHEDULE 40 PVC BARREL PIPE OF THE SAME DIAMETER AS THE SKIMMER ARM.

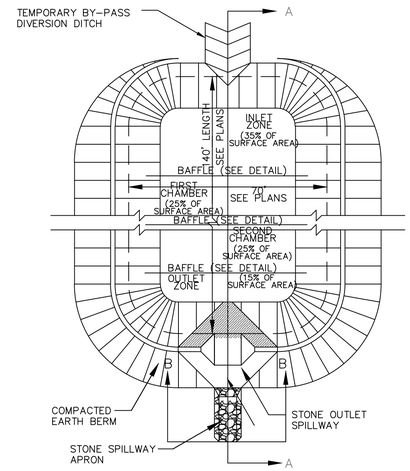
CONSTRUCTION NOTES:

1. ASSEMBLE SKIMMER FOLLOWING MANUFACTURER'S INSTRUCTIONS.
2. LAY THE ASSEMBLED SKIMMER ON THE BOTTOM OF THE TRAP WITH THE FLEXIBLE JOINT AT THE INLET OF THE BARREL PIPE.
3. ATTACH THE FLEXIBLE JOINT TO THE BARREL PIPE AND POSITION THE SKIMMER OVER THE EXCAVATED PIT.
4. ATTACH A ROPE TO THE SKIMMER AND ANCHOR TO THE SIDE OF THE TRAP FOR MAINTENANCE ACCESS.

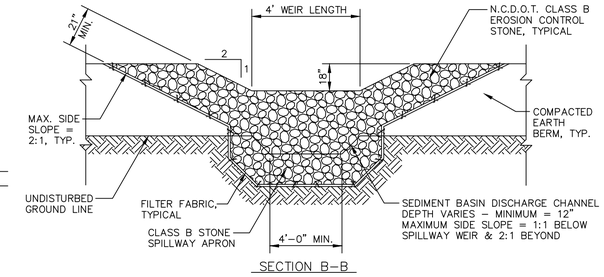
MAINTENANCE NOTES:

1. INSPECT THE SKIMMER WEEKLY AND AFTER EVERY RAIN EVENT 0.5" OR MORE
2. PULL THE SKIMMER TO THE SIDE OF THE TRAP WHEN REMOVING SEDIMENT FROM THE TRAP. REMOVE TRASH AND DEBRIS FROM THE SKIMMER ORIFICE.
3. IF THE SKIMMER IS CLOGGED WITH TRASH AND THEIR IS WATER IN THE TRAP, PULL ON THE ROPE TO MAKE THE SKIMMER BOB UP AND DOWN AND DISLODGE THE TRASH
4. USE A PLUMBER SNAKE OR WATER PRESSURE TO UNCLOG THE SKIMMER ARM OR BARREL PIPE
5. REPLACE THE ORIFICE BEFORE RE-POSITIONING THE SKIMMER IN THE TRAP.

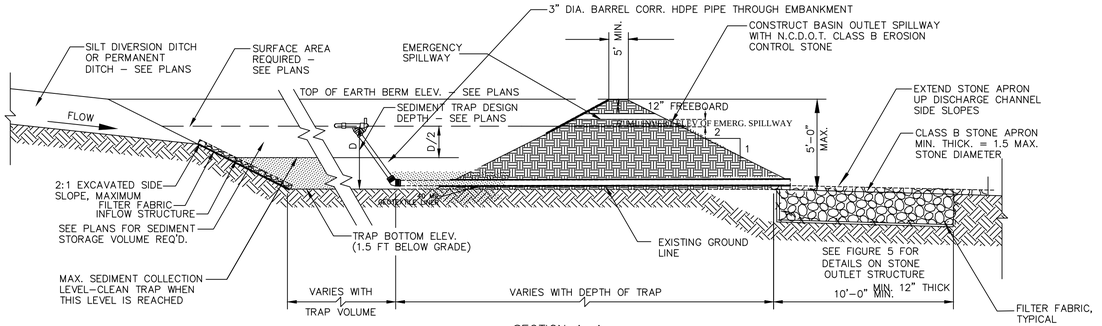
FAIRBANKS SKIMMER DEWATERING DEVICE DETAIL



PLAN VIEW



SECTION B–B



SECTION A–A

DESIGN NOTES:

1. THIS SEDIMENT BASIN IS TO BE USED WITH DRAINAGE AREAS NOT EXCEEDING 5 ACRES.
2. REQUIRED SEDIMENT BASIN VOLUME = 1800 CUBIC FEET PER DISTURBED ACRE.
3. MINIMUM SEDIMENT BASIN LENGTH (FT.) = 2 x BASIN WIDTH. BASIN LENGTH & WIDTH MEASURED AT CREST OF SPILLWAY.

MAINTENANCE NOTES

1. INSPECT BASIN AT LEAST WEEKLY AND AFTER EVERY 0.5" OR GREATER RAIN EVENT. REPAIR DAMAGE TO BASIN IMMEDIATELY
2. REMOVE SEDIMENT FROM BASIN AND RESTORE CAPACITY TO ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO 1/2 DESIGN DEPTH.
3. INSPECT EMBANKMENT FOR DAMAGE DUE TO EROSION.
4. PERIODICALLY INSPECT THE EMERGENCY SPILLWAY FOR SIGNS OF EROSION OR SETTLEMENT DAMAGE MAKE ALL NECESSARY REPAIRS IMMEDIATELY.
5. IMMEDIATELY FILL IN ANY EMBANKMENT SETTLED AREAS TO SLIGHTLY ABOVE DESIGN GRADE.
6. REPAIR BAFFLES IF THEY ARE DAMAGED. RE–ANCHOR IF WATER IS FLOWING BENEATH THEM.
7. FOLLOWING COMPLETION OF EXCAVATION ACTIVITIES AND CONSTRUCTION OF PERMANENT BASIN, REMOVE THE STRUCTURE AND ACCUMULATED SEDIMENT, AND GRADE INTO BASIN OUTLET CHANNEL.

CONSTRUCTION NOTES:

1. CLEAR, GRUB AND STRIP THE AREA UNDER THE EMBANKMENT. REMOVE ALL ROOT MAT AND ORGANIC MATTER, DISPOSE OF APPROPRIATELY.
2. PLACE FILL MATERIAL (FREE OF ROOTS/ORGANIC MATTER) IN MAX. 9" LIFTS. OVERFILL EMBANKMENT 6 INCHES TO ALLOW FOR SETTLEMENT
3. SHAPE BASIN TO SPECIFIED DIMENSIONS. PREVENT SKIMMING DEVICE FROM SETTLING INTO MUD BY EXCAVATING A SHALLOW PIT UNDER THE SKIMMER OR ELEVATING THE SKIMMER WITH STONE OR TIMBER.
4. PLACE SKIMMER BARRREL OUTLET SECTION ON A FIRM, SMOOTH FOUNDATION OF IMPERVIOUS SOIL. PROTECT THE CONNECTION BETWEEN THE PIPE AND SOIL WITH FILTER FABRIC, A GEOTEXTILE LINER OR A CUTOFF TRENCH PLACE FILL MATERIAL AROUND PIPE SPILLWAY IN 4" LAYERS AND COMPACT AROUND PIPE TO DENSITY OF EMBANKMENT.
5. PLACE A MINIMUM DEPTH OF TWO FT. OF COMPACTED BACKFILL OVER THE PIPE SPILLWAY FOR HEAVY EQUIPMENT CROSS–OVER.
6. ASSEMBLE SKIMMER PER MANUFACTURER'S INSTRUCTIONS.
7. LAY ASSEMBLED SKIMMER ON THE BOTTOM OF THE BASIN WITH THE FLEXIBLE JOINT AT THE INLET OF THE BARREL PIPE. ATTACH THE FLEXIBLE JOINT TO THE BARREL PIPE AND POSITION THE SKIMMER OVER THE EXCAVATED PIPE. ATTACH A ROPE TO THE SKIMMER AND ANCHOR IT TO THE SIDE OF THE BASIN FOR MAINTENANCE.
8. INSTALL TEH EMERGENCY SPILLWAY IN UNDISTURBED SOIL. LINE TEH SPILLWAY WITH LAMINATED PLASTIC OR IMPERMEABLE GEOTEXTILE LINER. THE LINER MUST BE WIDE AND LONG ENOUGH TO COVER THE BOTTOM AND SIDES AND EXTEND TO THE TOP OF THE EMBANKMENT FOR ANCHORING IN A TRENCH. WIDTH OF THE LINER MUST BE IN ONE PIECE, NOT JOINED OR SPLICED. MULTIPLE SECTIONS MAY BE USED, WITH OVERLAP OF UPPER SECTION OVER LOWER SECTION, TO MEET LENGTH REQUIREMENT. SECURE THE UPPER EDGE AND SIDES OF THE LINER WITH STAPLES OR PINS.
9. DIRECT WATER INTO THE UPPER ENDS OF THE BASIN FROM THE TEMPORARY DIVERSION DITCHES THROUGH RIP RAP INLET STRUCTURES.
10. STABILIZE EMBANKMENT AND ALL DISTURBED AREAS ABOVE CREST OF PRINCIPAL SPILLWAY AND DOWNSTREAM OF BASIN IMMEDIATELY AFTER CONSTRUCTION.
11. INSTALL POROUS BAFFLES AS SPECIFIED.
12. FOLLOWING COMPLETION OF EXCAVATION AND STORMWATER BASIN CONSTRUCTION ACTIVITIES, AND WHEN ALL SEDIMENT–PRODUCING AREAS HAVE BEEN STABILIZED, REMOVE THE STRUCTURE AND ACCUMULATED SEDIMENT AND GRADE INTO THE OUTLET CHANNEL FROM THE STORMWATER BASIN.

SKIMMER SEDIMENT BASIN

NOT TO SCALE

Stormwater Conveyance Measures Details

Umicore LMAC Soil Remediation
Maxton, North Carolina

Drawn By:	Checked By:	Date:	Project Number:	References:	Scale:	Size:	Layers:
amr		Dec 2012/Jan 2013	200917	ESC Manual	NTS	22" x 34"	

P:\Umicore\8 Field and Technical\8.8 CAD & GIS\LMAC\LMAC CAD\SW and ESC Details

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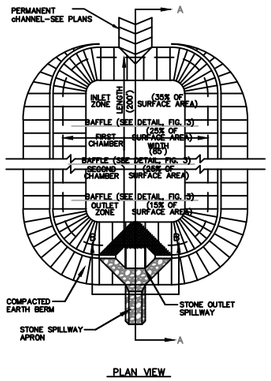
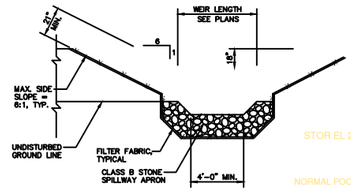
Figure

4



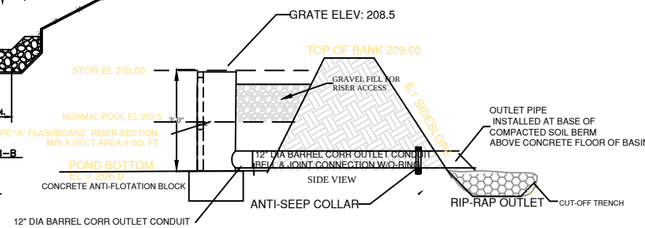
PLAN VIEW

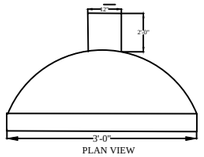
WEIR DIMENSION SCHEDULE	
MINIMUM WEIR LENGTH (FT.)	DRAINAGE AREA (ACRES)
4.0	5
6.0	10
8.0	15
10.0	20

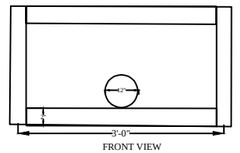


SECTION B-B

NOTES:

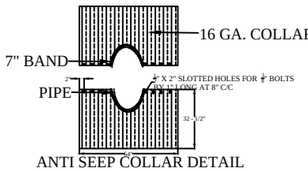






OUTLET DEVICE DETAIL

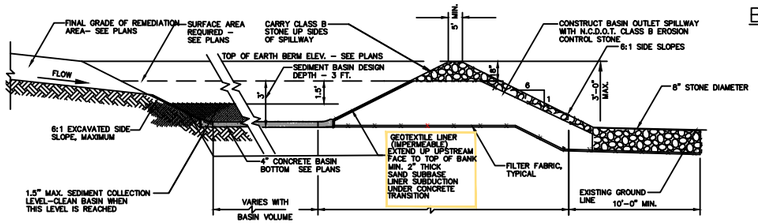
NTS



ANTI SEEP COLLAR DETAIL

NTS

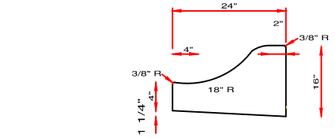
NOTES:
1. COLLAR SIZE BASED ON PLACEMENT AT PIPE JOINTS (20' C/C)
2. BAND IS CORRUGATED TO MATCH RE-ROLLED END OF PIPE BEING JOINED.
3. EACH DIAPHRAGM IS CONNECTED WITH (4) 1/2" X 6" BOLTS AND 98) 3/8" X 1" BOLTS



SECTION A-A

DETENTION BASIN

NOT TO SCALE



BASIN FLOOR TO SIDE SLOPE TRANSITION

SCALE: 1:2

GRATE DETAIL

DESIGN NOTES:

1. THIS BASIN IS TO BE USED WITH DRAINAGE AREAS GREATER THAN 5 ACRES.
2. REQUIRED BASIN VOLUME = 1,800 CUBIC FEET PER DISTURBED ACRE.
3. MINIMUM BASIN LENGTH (FT.) = 2 x WIDTH. BASIN LENGTH & WIDTH MEASURED AT CREST OF SPILLWAY.

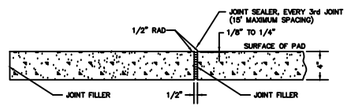
MAINTENANCE NOTES

1. INSPECT BASIN AT LEAST WEEKLY AND AFTER EVERY 0.5" OR GREATER RAIN EVENT. REPAIR DAMAGE TO BASIN PROMPTLY
2. REMOVE SEDIMENT FROM BASIN PERIODICALLY AND RESTORE CAPACITY TO ORIGINAL BASIN DIMENSIONS, AT LEAST WHEN SEDIMENT HAS ACCUMULATED TO 1/2 DESIGN DEPTH.
3. INSPECT OUTLET STRUCTURE FOR DAMAGE DUE TO EROSION.
4. PERIODICALLY INSPECT THE DEPTH OF THE SPILLWAY TO ENSURE A MINIMUM DEPTH OF 1.5 FT BELOW THE LOW POINT OF THE EMBANKMENT.
5. IMMEDIATELY FILL IN ANY EMBANKMENT SETTLED AREAS TO SLIGHTLY ABOVE DESIGN GRADE.
6. REPLACE IMMEDIATELY ANY RIPRAP DISPLACED FROM THE SPILLWAY.

CONSTRUCTION NOTES:

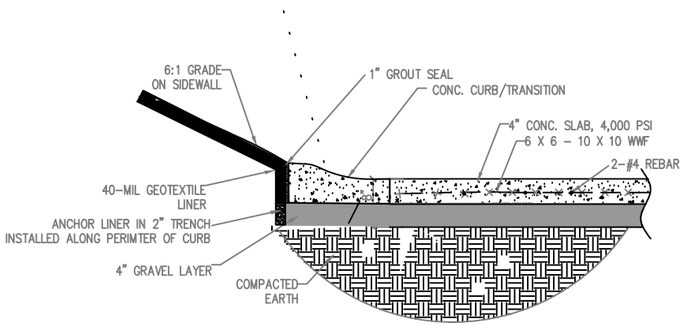
1. CLEAR, GRUB AND STRIP THE AREA UNDER THE EMBANKMENT AND WITHIN THE POOL AREA. REMOVE ALL ROOT MAT AND ORGANIC MATTER, DISPOSE OF APPROPRIATELY.
2. EXCAVATE CUT-OFF TRENCHES ALONG THE CENTER LINE OF THE EMBANKMENT ON THE UPSTREAM AND DOWNSTREAM ENDS OF THE BASIN. CUT THE TRENCHES INTO STABLE SOIL, NOT LESS THAN 2 FT. IN DEPTH. CUT-OFF TRENCHES SHALL EXTEND INTO BOTH ABUTMENTS TO THE ELEVATION OF BASIN FLOOR AND THE RISER CREST. MINIMUM BOTTOM ELEVATION SHALL PERMIT OPERATION OF EXCAVATION EQUIPMENT; NOT LESS THAN 2 FT. 1:1 SIDE SLOPES. COMPACT IN A MANNER SIMILAR TO THE EMBANKMENT. KEEP TRENCH DRY DURING BACKFILLING AND COMPACTION.
3. PLACE 24" RCP (INLET PIPING) AND 12" RCP (OUTLET PIPING) IN CUT-OFF TRENCHES.
4. PLACE EMBANKMENT FILL MATERIAL (FREE OF ROOTS/ORGANIC MATTER) FROM APPROVED AREAS IN 6-8" LIFTS. FILL MATERIAL MUST HAVE SUFFICIENT MOISTURE FOR COMPACTION. OVERFILL EMBANKMENT 10% HIGHER THAN DESIGN HEIGHT TO ALLOW FOR SETTLEMENT
5. CONSTRUCT BASIN CONCRETE LINER AS SPECIFIED.
6. SECURE FLASHBOARD RISER STRUCTURE TO BARREL OR BARREL STUB TO MAKE A WATERTIGHT CONNECTION. SECURE ALL CONNECTIONS BETWEEN BARREL CONNECTIONS WITH APPROVED WATERTIGHT ASSEMBLIES.
7. PLACE BARREL AND RISER ON CONCRETE FLOOR OF BASIN. PLACE FILL AROUND PIPE SPILLWAY IN 4" LIFTS AND COMPACT UNDER AND AROUND PIPE TO DENSITY SIMILAR TO EMBANKMENT. DO NOT RAISE PIPE FROM CONTACT WITH LINER WHEN COMPACTING UNDER PIPE HAUNCHES.
8. PLACE A MINIMUM DEPTH OF 2 FT. OF COMPACTED BACKFILL OVER THE PIPE SPILLWAY FOR EQUIPMENT CROSSING. ANCHOR RISER IN PLACE WITH CONCRETE OR OTHER MEANS TO PREVENT FLOATATION. DO NOT CUT TRENCH THROUGH EMBANKMENT AFTER IT HAS BEEN CONSTRUCTED.
9. INSTALL THE EMERGENCY SPILLWAY IN UNDISTURBED SOIL.
10. DIRECT WATER INTO THE UPPER END OF THE BASIN THROUGH INLET PIPE FROM THE TEMPORARY DIVERSION DITCHES.
11. STABILIZE EMBANKMENT AND ALL DISTURBED AREAS ABOVE CREST OF EMERGENCY SPILLWAY AND DOWNSTREAM OF BASIN IMMEDIATELY AFTER CONSTRUCTION.
12. INSTALL POROUS BAFFLES AS SPECIFIED.
13. PLACE 40-MIL, GEOTEXTILE LINER ON ALL EMBANKMENT SLOPES.

GRASS-LINED CHANNEL-VEGETATED FILTER CROSS-SECTION



TRANSVERSE EXPANSION JOINT IN CONCRETE PAD

NOT TO SCALE



BASIN CONCRETE FLOOR PAD DETAIL

SCALE: NTS

RIP RAP APRON AND LEVEL SPREADER OUTLET STRUCTURE

CONSTRUCTION SPECIFICATIONS, RIP RAP APRON (SKIMMER BASIN AND SW BASIN)

1. EXCAVATE SUBGRADE BELOW EXT ELEVATION TO A DEPTH OF TWO FT. ALLOW FOR THICKNESS OF FILTER FABRIC AND RIPRAP
2. INSTALL RIPRAP TO MINIMUM THICKNESS OF 22 INCHES
3. CONSTRUCT APRON ON ZERO GRADE. CROSS SECTION OF APRON TO BE LEVEL OR SLIGHTLY DEPRESSED IN THE MIDDLE. BLEND RIPRAP SMOOTHLY TO THE SURROUNDING GRADE
4. APRON SHALL BE STRAIGHT AND PROPERLY ALIGNED WITH RECEIVING CHANNEL
5. COMPACT FILL USED IN SUBGRADE TO THE DENSITY OF THE SURROUNDING UNDISTURBED MATERIAL. SUBGRADE SHALL BE SMOOTH ENOUGH AND FREE OF MATERIALS TO PROTECT FABRIC FROM TEARING
6. INSTALL A CONTINUOUS SECTION OF EXTRA STRENGTH, 2-IN THICK FILTER FABRIC ON SMOOTH, COMPACTED FOUNDATION.
7. PLACE RIPRAP STONE IIN APRON TRENCH WITH A D50 OF 9.6" AND A DMAX OF 14.4". STONE SHALL BE FIELD OR QUARRY STONE, HARD, ANGULAR, AND HIGHLY WEATHER-RESISTANT. SPECIFIC GRAVITY OF THE STONE SHALL BE A MINIMUM OF 2.5
8. PROTECT FILTER FABIC FROM TEARING WHILE PLACING RIPRAP WITH MACHINERY. REPAIR ANY DAMAGE IMMEDIATELY BY REMOVING RIPRAP AND INSTALLING ANOTHER SECTION OF FABRIC.
9. UPSTREAM SECTION OF FABRIC SHALL OVERLAP DOWNSTREAM SECTION A MINIMUM OF 1 FT.
10. TOP OF RIPRAP APRON SHALL BE LEVEL WITH RECEIVING CHANNEL
11. RIPRAP SHALL NOT RESTRICT THE CHANNEL OR PRODUCE AN OVERFALL.
12. AFTER INSTALLATION, STABILIZE DISTURBED AREAS WITH TEMPORARY COVERS AND INSTALL PERMANENT MEASURES AS DESCRIBED IN PLAN.

CONSTRUCTION SPECIFICATIONS, LEVEL SPREADER (SW BASIN)

1. EXCAVATE A VERTICAL TRENCH ON THE LOWER EDGE OF THE DISSIPATION DEVICE FOR LEVEL SPREADER INSTALLATION.
2. INSTALL MATTING FOR LEVEL SPREADER AT A MINIMUM WIDTH OF 4 FT EXTENDING SIX INCHES OVER THE LIP AT A MINIMUM DEPTH OF 6 INCHES WITHIN THE TRENCH.
3. THE UPPER EDGE OF THE LEVEL SPREADER SHALL BUTT UP AGAINST A STRIP OF SMOOTH CUT SOD, AND BE ANCHORED IN PLACE WITH CLOSELY SPACED HEAVY DUTY WIRE STAPLES A MINIMUM OF 12 INCHES IN LENGTH
4. ENSURE THAT THE LEVEL SPREADER IS LEVEL FOR UNIFORM DISTRIBUTION OF RUNOFF.
5. CONSTRUCT THE 6" CONCRETE LEVEL SPREADER WITHIN 6" OF UNDISTURBED SOIL (NOT WITHIN FILL)
6. CONSTRUCT A 20-FT TRANSITION SECTION FROM THE RIP-RAP DISSIPATOR TO BLEND SMOOTHLY TO THE WIDTH AND DEPTH OF SPREADER.
7. DISPERSE RUNOFF FROM THE SPREADER ACROSS A PROPERLY STABILIZED SLOPE WITH A MAXIMUM SLOPE OF 10%.
8. SEED AND MULCH DISTURBED AREAS AROUND THE SPREADER IMMEDIATLEY AFTER CONSTRUCTION.

Stormwater Management Details

LMAC Remediation Area
Maxton, North Carolina

Layers:

Size: 22" x 34"

Scale: NTS

References: NC DLR ESC Design Manual

Date: February 2012

Project Number: 200917

Checked By: bdt

Drawn By: amr

P:\Umicore\Maxton - 200917\8 Field and Technical\8.8 CAD and GIS Maps\LMAC\LMAC CAD\UMICORE TOPO SURVEY 12-19-11

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Figure

5

Tables

Table 1 Preliminary Screening of Treatment Technologies for Cobalt Contaminated Soil Remediation, Umicore USA, Inc., LMAC Area, Maxton, North Carolina

General Response	Remediation Technology	Process Option	Description	Screening Comments
NO ACTION	No Action	Not Applicable	No action with periodic monitoring	Not really applicable since groundwater has potential to be impacted if no action is implemented
INSTITUTIONAL CONTROLS	Access Restrictions	Deed restrictions or recordations	Restriction to limit the future exposure to the soil and the use of groundwater, if cobalt appears. Deed records the impacted areas. Would require off-site owners' cooperation.	Potentially applicable, since most off-site owners are on municipal water. Southern States wants no IC.
	Monitoring	Monitoring	Periodic testing of groundwater	Potentially applicable. Southern States wants no IC.
CONTAINMENT ACTIONS	Vertical Barriers	Slurry wall, grout curtain, or sheet piling	A barrier is formed with bentonite slurry or grout trench, or steel sheets to restrict the horizontal migration of water into the impacted soil. Usually combined with a cap.	NA - High cost to prevent water migration into soil. No treatment of cobalt contaminated soil. Would not stop the water in storage from migrating to groundwater.
	Capping	Clay and synthetic membrane for cap	Ground surface over impacted areas of aquifer are capped to reduce infiltration of water	NA due to use of site and high cost of cap.
COLLECTION ACTIONS	Extraction Wells	Extraction wells possibly used in conjunction with reinjection	A system of extraction wells collect impacted ground water. Injection wells can reintroduce uncontaminated fluids to increase flow to extraction wells.	NA – No groundwater contaminated that requires extraction and treatment.
	Subsurface Drains	Interceptor trenches	Drain pipe in shallow trenches backfilled with porous media to collect perched groundwater	NA High cost; nowhere to transfer contaminated water w/out pumping to treatment system prior to surface water discharge
EX SITU TREATMENT ACTIONS	Physical/Chemical Treatment	Air Stripping	Large volumes of air or steam to transfer VOCs to air phase and discharge to atmosphere	NA- COC's are not volatile
		Reverse Osmosis	Water forced through membrane to remove COCs	NA - COC levels too low, very low extraction rate; not cost effective
		Carbon adsorption	Activated carbon used to adsorb VOCs	NA- COC's are not volatile; metals overload carbon
		Precipitation	Added chemicals reduce solubility of metals. Typically used as a pretreatment step	NA - inorganic levels not high enough to warrant treatment
		Ion Exchange	Resin bed is used to exchange ions with water	NA – high cost to extract contaminated water from soil
		Chemical Fixation	Chemical reagents used to change valence bind cobalt to soil particle	NA due to the high cost to excavate, treat, and return to excavation compared to in-situ treatment.
		Chemical Reduction	Reducers such as sulfur dioxide or ferrous iron used to decrease oxidation states	NA to the contaminants at the site
		Chemical Oxidation	The use of oxidizers such as ozone or hydrogen peroxide to increase oxidation states.	NA – oxidation of contaminants not desirable
	Biological Treatment	Aerobic Treatment	Aerobic microorganisms used to degrade organics. Nutrients and oxygen may be added	NA- cobalt is not degradable with aerobic microbes
		Anaerobic Treatment	Use of anaerobic microorganisms	NA - contaminants not degradable with anaerobic microbes
	Thermal Treatment	Incineration or pyrolysis	Use of high temperatures and oxygen to combust contaminants	NA for COCs in soil
	Off-Site Treatment	POTW	No contaminated groundwater to add to on- site waste water stream for pretreatment and discharge to LMAC waste water treatment plant	NA – Volume and characteristics of ground water not wanted by Town
		RCRA Facility	Off-site transport, treatment and disposal	NA high cost to remove hazardous substance to hazardous waste TSD
IN SITU TREATMENT	Natural Attenuation	Natural Attenuation	Subsurface processes that naturally occur such as volatilization, dilution, biodegradation, adsorption, and ion exchange may reduce levels of COCs to acceptable levels.	Potentially applicable
	Chemical Fixation	Blend or inject chemical to bind cobalt to soil particles	Chemical reagents used to change valence state to bind cobalt to soil particle	Applicable to the contaminants at the site. Reasonable cost to work soil in-situ..
	Phytoremediation	Passive treatment through cobalt uptake in roots of selected plantings	Selected plants species are introduced to the area of contamination to remove cobalt from soil.	NA due to high maintenance, need for drought resistant plants with deep root system, and plant disposal
DISCHARGE ACTIONS	Excavation and Off-site Disposal	Excavate cobalt contaminated soil	Excavate cobalt contaminated soil with levels greater than 150 mg/kg and remove off-site for disposal	Applicable. Reasonable cost, permanently removes some cobalt from the site. Low risk that groundwater will be contaminated from remaining cobalt.

NA = Not applicable

Table 2 Final Screening of Treatment Technologies for Cobalt Contaminated Soil Remediation, Umicore USA, Inc., LMAC Area, Maxton, North Carolina

General Response	Remediation Technology	Process Option	Description	Screening Comments
IN SITU TREATMENT	Natural Attenuation	Attenuation property of soil is allowed to bind cobalt and prevent vertical migration.	Subsurface processes that naturally occur such as dilution, adsorption, and ion exchange that may reduce levels of COCs to acceptable levels.	Applicable. Soil has been determined to have attenuation properties that should prevent migration of cobalt to groundwater. There is a risk that soil with cobalt contamination >300 mg/kg could leach and eventually the precipitation recharge to the soil could flush some cobalt into the groundwater. Leaving any soil > 300 mg/kg does not meet compliance with the regulations for an industrial use site with cobalt contamination; therefore, soil contaminated at levels > 300 mg/kg will need to be excavated and disposed off-site.
	Chemical Fixation	Blend or inject chemical to bind cobalt to soil particles	Chemical reagents used to change valence state to bind cobalt to soil particle	Applicable to the contaminants at the site. Lab test of Enviro-Mag showed that a 2% by weight addition to the soil would bind 300 mg/kg or less concentrations of cobalt to the soil. Reasonable cost to work soil in-situ. Some risk that the precipitation recharge to the soil with cobalt contamination >300 mg/kg could leach and flush some cobalt into the groundwater in the future.
DISCHARGE ACTIONS	Excavation and Off-site Disposal	Excavate cobalt contaminated soil	Excavate cobalt contaminated soil with levels greater than 150 mg/kg and remove off-site for disposal	Applicable. Reasonable cost, permanently removes some cobalt from the site. Low risk that groundwater will be contaminated from remaining cobalt contaminated soil < 150 mg/kg..

Table 3 **Natural Attenuation of Cobalt Costs, Umicore USA, Inc., LMAC Area, Maxton, North Carolina**

Cost Item		Estimated Costs
Capital Expenditures		
LUR/Deed Restriction	***Subtotal***	***$ 21,324.00***
Surface Water Control from Umicore	***Subtotal***	***$ 38,611.00***
Excavate and Backfill	***Subtotal***	***$ 126,500.00***
Sediment Basin	***Subtotal***	***$ 55,250.00***
	Total	**$ 241,685.00**
Administrative, Engineering,	Permits-15% of Total	$ 36,252.75
CAPITAL EXPENDITURES	**TOTAL**	**$ 277,937.75**
Present Worth O&M Cost		
Deed Restriction Certification	***Subtotal***	***$ 40,949.84***
Quarterly Groundwater Monitoring (First Year)	***Subtotal***	***$ 14,983.18***
Annual Plume Monitoring (Years 2 through 30)	***Subtotal***	***$ 49,208.92***
Drainage Diversion Ditch Maitenance	***Subtotal***	***11.111.54***
Sediment Basin Maintenance	***Subtotal***	***$ 62,045.21***
PRESENT WORTH O&M	**COSTS TOTAL**	**$ 178,298.67**
	TOTAL COST	**$ 456,236.43**
30 Year Remediating Period		

Table 4 Fixation of Cobalt Costs, Umicore USA, Inc., LMAC Area, Maxton, North Carolina

Cost Item		Estimated Costs
Capital Expenditures		
LUR/Deed Restriction	***Subtotal***	***$ 21,324.00***
Soil Blending	***Subtotal***	***$ 104,000.00***
Surface Water Control from Umicore	***Subtotal***	***$ 38,611.00***
Sediment Basin	***Subtotal***	***$ 55,250.00***
	Total	**$ 219,185.00**
Administrative, Engineering,	Permits-15% of Total	$ 32,877.75
CAPITAL EXPENDITURES	**TOTAL**	**$ 252,062.75**
Present Worth O&M Cost		
Deed Restriction Certification	***Subtotal***	***$ 40,949.84***
Quarterly Groundwater Monitoring (First Year)	***Subtotal***	***$ 14,983.18***
Annual Plume Monitoring (Years 2 through 9)	***Subtotal***	***$ 26,113.03***
Sediment Basin Maintenance	***Subtotal***	***$ 11,111.54***
Diversion Ditch Maintenance	***Subtotal***	***$ 62,045.21***
PRESENT WORTH O&M	**COSTS TOTAL**	**$ 155,202.81**
	TOTAL COST	**$ 407,265.56**
10 Year Remediating Period		

Table 5 **Excavate Cobalt Contaminated Soil Costs, Umicore USA, Inc., LMAC Area, Maxton, North Carolina**

Cost Item		Estimated Costs
Capital Expenditures		
LUR/Deed Restriction	***Subtotal***	***$ 21,324.00***
Excavate Soil/Backfill	***Subtotal***	***$ 200,150.00***
Surface Water Control from Umicore	***Subtotal***	***$ 38,611.00***
Temporary Surface Water Controls	***Subtotal***	***$ 11,040.00***
Sediment Basin	***Subtotal***	***$ 55,250.00***
	Total	**$ 326,375.00**
Administrative, Engineering,	Permits-15% of Total	$ 48,956.25
CAPITAL EXPENDITURES	**TOTAL**	**$ 375,331.25**
Present Worth O&M Cost		
Deed Restriction Certification	***Subtotal***	***$ 40,949.84***
Quarterly Groundwater Monitoring (One Year)	***Subtotal***	***$ 14,983.18***
Sediment Basin Maintenance	***Subtotal***	***11,111.54***
Diversion Fence Maintenance	***Subtotal***	***$ 62,045.21***
PRESENT WORTH O&M	**COSTS TOTAL**	**$ 129,089.75**
	TOTAL COST	**$ 504,421.00**
1 Year Remediating Period		

Appendix A

REC PROGRAM DOCUMENT CERTIFICATION FORM - PAGE 1 OF 2
IHSB SITE NAME Umicore USA Inc. Maxton Facility (LMAC Area) - NONCD0002833
DATE & NAME OF DOCUMENT Revised Interim Remedial Action Plan 3/19/13
TYPE OF SUBMITTAL (circle all that apply): Report, (Work plan,) Work Phase Comp. Statement, Schedule Change

REMEDIATING PARTY DOCUMENT CERTIFICATION STATEMENT (.0306(B)(2))

"I certify under penalty of law that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certification, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information."

Ravila Gupta, Umicore USA Inc.
Name of Remediating Party

RPGupl
Signature of Remediating Party

3/21/13
Date

NOTARIZATION

North Carolina (Enter State)

Wake **COUNTY**

I, Cynthia F. Dietrich, a Notary Public of ~~said~~ Granville County and State, do hereby certify that Ravila Gupta did personally appear and sign before me this day, produced proper identification in the form of driver license, was duly sworn or affirmed, and declared that, to the best of his or her knowledge and belief, after thorough investigation, the information contained in the above certification is true and accurate, and he or she then signed this Certification in my presence.

WITNESS my hand and official seal this 21st day of March, 2013.

Cynthia F. Dietrich
Notary Public (signature)

(OFFICIAL SEAL)

My commission expires: 7/23/2015

CYNTHIA F. DIETRICH
NOTARY PUBLIC
GRANVILLE COUNTY
STATE OF NORTH CAROLINA
MY COMMISSION EXPIRES 7-23-2015

REC PROGRAM DOCUMENT CERTIFICATION FORM - PAGE 2 OF 2
IHSB SITE NAME Umicore USA Inc Maxton Facility (LMAC Area) - NONCD0002833
DATE & NAME OF DOCUMENT Revised Interim RAP 3/19/13
TYPE OF SUBMITTAL (circle all that apply): Report, Work plan, Work Phase Comp. Statement, Schedule Change

REGISTERED SITE MANAGER CERTIFICATION OF SIGNATURES

As the Registered Environmental Consultant for the Site for which this filing is made, I certify that the signatures included herewith are genuine and authentic original handwritten signatures and/or true, accurate, and complete copies of the genuine and authentic original handwritten signatures of the persons who purport to sign for this filing. I further certify that I have collected through reliable means the originals and/or copies of said signatures from the persons authorized to sign for this filing who, in fact, signed the originals thereof. Those persons and I understand and agree that any copies of signatures have the same legally binding effect as original handwritten signatures, and I certify that any person for whom I am submitting a copy of their signature has provided me with their express consent to submit said copy. Additionally, I certify that I am authorized to attest to the genuineness and authenticity of the signatures, both originals and any copies, being submitted herewith and that by signing below, I do in fact attest to the genuineness and authenticity of all the signatures, both originals and copies, being submitted for this filing.

David L. Duncklee
Name of Registered Site Manager

David L. Duncklee
Signature of Registered Site Manager

3/26/13
Date

REGISTERED SITE MANAGER DOCUMENT CERTIFICATION STATEMENT (.0306(b)(1))

"I certify under penalty of law that I am personally familiar with the information contained in this submittal, including any and all supporting documents accompanying this certification, and that the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete and complies with the Inactive Hazardous Sites Response Act N.C.G.S. 130A-310, et seq, and the remedial action program Rules 15A NCAC 13C .0300. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information."

David L. Duncklee
Name of Registered Site Manager

David L. Duncklee
Signature of Registered Site Manager

3/26/13
Date

NOTARIZATION

NC (Enter State)

Wake **COUNTY**

I, Beth A. Janes, a Notary Public of said County and State, do hereby certify that David Duncklee did personally appear and sign before me this day, produced proper identification in the form of ncdl, was duly sworn or affirmed, and declared that, he or she is the duly authorized environmental consultant of the remediating party of the property referenced above and that, to the best of his or her knowledge and belief, after thorough investigation, the information contained in the above certifications is true and accurate, and he or she then signed these Certifications in my presence.

WITNESS my hand and official seal this 26 day of March

Beth A. Janes
Notary Public (signature)

(OFFICIAL SEAL)

BETH A. JANES NOTARY PUBLIC WAKE COUNTY, NC Comm. Exp. 4-11-2015.

My commission expires: 4-11-2015.

Document Certification Form No. DC - II
(Revised 8/11)

Appendix B

Bryson Trexler

From: Macdonald, Janet K <jkmacdonald@ncdenr.gov>
Sent: Friday, October 19, 2012 9:58 AM
To: dave@dunckleedunham.com
Cc: 'Grim, Theron'; 'Gupta, Ravila'; 'Bryson Trexler'
Subject: RE: Umicore LMAC Site - Response to Containment Remedy Proposal
Attachments: DPLUR Template.doc

Here's the DPLUR template. Have a great weekend!

Janet

Janet Macdonald
Phone: (919) 707-8349

From: David L. Duncklee [mailto:dave@dunckleedunham.com]
Sent: Friday, October 19, 2012 9:57 AM
To: Macdonald, Janet K
Cc: 'Grim, Theron'; 'Gupta, Ravila'; 'Bryson Trexler'
Subject: RE: Umicore LMAC Site - Response to Containment Remedy Proposal

Janet:
Thank you for the response and the agency's concurrence. We will proceed as indicated below with the LURs and RAP process. Have a good weekend.
Regards,
Dave

David L. Duncklee, PG, RSM
Senior Hydrogeologist
Mobile: 919-417-9923
Office: 919-858-9898 x201
www.dunckleedunham.com

DUNCKLEE & DUNHAM
ENVIRONMENTAL CONSULTING & ENGINEERING
A Professional Geologic and Engineering Corporation

From: Macdonald, Janet K [mailto:jkmacdonald@ncdenr.gov]
Sent: Friday, October 19, 2012 9:51 AM
To: dave@dunckleedunham.com
Cc: 'Grim, Theron'; 'Gupta, Ravila'
Subject: RE: Umicore LMAC Site - Response to Containment Remedy Proposal

Dear Mr. Duncklee,

A Containment Remedy with Land Use Restrictions (LURs) Proposal for the above-referenced site, dated February 29, 2012, was received by the Inactive Hazardous Sites Branch (Branch) via e-mail on April 25, 2012. Supplemental information was also provided by you in an e-mail dated May 22, 2012. I provided comments on the LUR proposal in a letter sent via e-mail dated June 15, 2012. Based on your response to our comments in the form of a Remedial Investigation Addendum Report, dated September 20, 2012, we concur with your proposed containment remedy. Be aware that, when the Branch provides concurrence as required by 15A NCAC 13C .0306(i)(3) for an on-site containment remedy that is part of the site's Remedial Action Plan (RAP), the Branch does not review and approve the entire RAP and all data associated with a Site. Compliance with the REC Rules, including completion of all portions of the RAP, and all other applicable laws from other agencies is the responsibility of the RSM.

For a proposed containment remedy, two documents will ultimately be recorded at the Register of Deeds: a Draft Notice of Inactive Hazardous Substance or Waste Disposal Site (Notice) and a Declaration of Perpetual Land Use Restrictions (DPLUR) document. Instructions for the Notice can be found under 'Guidance' on the IHS website (http://portal.ncdenr.org/web/wm/sf/ihs/ihsguide). A blank DPLUR document is attached to this e-mail and must be completed for the site. We will keep the original version, but please provide the information highlighted in yellow and review the required and optional elements with the Remediating Party and discuss the restrictions planned for this site. You may e-mail me your mocked up version. After we have agreed upon the restrictions for the DPLUR document and the draft Notice is complete, draft versions of each document will need to be included as an appendix of the proposed Remedial Action Plan (RAP) for public notice. These two documents can then be finalized while the proposed RAP is undergoing public notice.

Following completion of the site remedial activities and receipt of the signed and notarized Notice and DPLUR, the Branch will execute the DPLUR and Notice and return them to you for recordation at the Register of Deeds. Within 15 working days, a copy of the signed and recorded DPLUR and Notice must be returned to the Branch along with the relative grantor/grantee index pages showing all documents are appropriately referenced.

If you have any questions, please feel free to contact me at (919) 707-8349.

Sincerely,

Janet

Janet Macdonald
Phone: (919) 707-8349

From: David L. Duncklee [mailto:dave@dunckleedunham.com]
Sent: Thursday, September 27, 2012 8:10 AM
To: Macdonald, Janet K
Cc: 'Grim, Theron'; 'Gupta, Ravila'
Subject: Umicore LMAC Site - RI Addendum Report

Janet:
Attached is the RI Addendum Report to finalize the RI activities on this portion of the Umicore facility. With IHSB acceptance of this report, we will proceed with the preparation of the RAP and specifications for contractors to bid on the soil removal and new basin construction. Please let me know if you have any questions or comments.
Regards,
Dave

David L. Duncklee, PG, RSM
Senior Hydrogeologist
Mobile: 919-417-9923
Office: 919-858-9898 x201
www.dunckleedunham.com

Divider
Page

Proposal for Concurrence of Containment Remedy
LMAC Area

Umicore USA, Inc.
17180 Airport Road
Maxton, Scotland County, North Carolina

Prepared for

Umicore USA, Inc.
Raleigh, North Carolina

Prepared by

Duncklee & Dunham, P.C.
Cary, North Carolina

February 29, 2012

DUNCKLEE
& DUNHAM

ENVIRONMENTAL CONSULTING & ENGINEERING
511 KEISLER DRIVE – SUITE 102
CARY, NORTH CAROLINA 27518
OFFICE: (919) 858–9898
WWW.DUNCKLEEDUNHAM.COM

February 29, 2012

Ms. Janet K. Macdonald, P.G.
North Carolina Department of Environment and Natural Resources
Division of Waste Management - Superfund Section
Inactive Hazardous Sites Branch – REC Program
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Reference: **Request for Concurrence of Containment Remedy**
LMAC Area - Umicore USA Inc. - NONCD0002833
Maxton, Scotland County

Dear Ms. Macdonald:

As required by Section .0306(i)(2) of the Inactive Hazardous Sites Branch (IHSB), Registered Environmental Consultants Program rules, Umicore USA Inc. (Umicore) and Duncklee & Dunham, P.C. (Duncklee & Dunham) have prepared this request for concurrence of a containment remedy. This remedy will be proposed in a forthcoming Remedial Action Plan (RAP) for cobalt impacted soil on the LMAC Area adjacent to the Umicore plant facility (Figure 1).

Remedial Investigation Findings

As presented in the Remedial Investigation Report (*Remedial Investigation Report, Umicore USA Inc. - Maxton Facility, 17180 Airport Road (LMAC Area) Maxton, Scotland County, North Carolina, NONCD0002833, September 6, 2011*, RIR 2011), the LMAC Area has been assessed for possible contaminants, the extent of impacts, saturated and unsaturated zone stratigraphy, soil attenuation capabilities, and the efficacy of treatability products to fix cobalt to the soil. The following results were determined:

- The Umicore facility began production of cobalt powders and cobalt containing chemical products in 1980 and continued the process until 2009. Intermttently, during 29 years, surface water runoff from the facility carried cobalt contaminated water and sediment onto the LMAC Area.
- Soil sampling undertaken to delineate the cobalt impacted soil at six-inch, 18-inch, 36-inch, and six-foot intervals (Figures 10, 11, 12, and 13, respectively in the RIR 2011) indicate the volume

of contaminated soil equal to or greater than 150 mg/kg is approximately 1,100 cubic yards (about 1,630 tons).

- A discontinuous perched groundwater zone was identified and assessed by eight monitoring wells. When wells in this unit contained water sufficient for sampling, cobalt was detected ranging from 47 µg/L to 4,600 µg/L (Figure 14 and 15 in RIR 2011). On most occasions, these very shallow wells have been dry. A groundwater potentiometric map generated from one data set when enough wells did contain water showed this feature to be a perched zone in the study area (Figure 7 in RIR 2011).
- The first uniform and consistent water bearing hydrogeologic unit is a water table aquifer that was assessed by four 30-foot wells (Figures 3, 4, and 5 in RIR 2011). Each of these wells has been sampled ten times (Table 1). Cobalt has been detected in DMW-2 at 11 µg/L and DMW-4 at 13 µg/L in July 2009 immediately following well construction and is suspected to have been carried down by drilling through the contaminated perch zone. Neither DMW-1 nor DMW-3 has shown cobalt above 2L in ten sampling events. DMW-2 has only detected cobalt three times in ten sampling events and DMW-4 has detected cobalt four times in ten sampling events (at levels of only 1.1 to 1.6 µg/L). No pattern has been seen indicating contaminated groundwater after 29 years of the overlying soil receiving cobalt-contaminated runoff from the facility.
- The constituent of concern is cobalt in soil.
- The K_d values exhibited in the unsaturated zone soil will attenuate cobalt vertically. Levels of cobalt under a level of 300 mg/kg should not leach to groundwater.

  Three soil layers were found and evaluated in the attenuation study: 1) a shallow unconfined sand unit, 2) an underlying silty clay semi-confining unit, and 3) an intermediate depth sand beneath the silty clay.

  Soil samples with a cobalt target range of 30 to 300 mg/kg were selected for K_d testing. The K_d values found in the surficial sandy unit ranged from 0 to 10 mL/g. The K_d values of the uncontaminated and underlying clay and sand units ranged from 10 to 550 mL/g.

  The data shows cobalt levels at or below the industrial level of 300 mg/kg will attenuate in unsaturated zone soils before reaching the water table depth of 16 to 18 feet below grade. Furthermore, the K_d results for the LMAC Area soil and the lack of cobalt contamination in the shallow groundwater (shallow aquifer wells DMW-1 through DMW-4) indicate the soil can attenuate cobalt levels greater than 300 mg/kg.
- Based on the treatability tests on shallow soil and the proposed excavation and removal of cobalt contaminated soil greater than 150 mg/kg, a 2% dose of Enviro-Mag® can fixate cobalt in the soil and prevent leaching to shallow groundwater. The 2% dose controlled the leachable cobalt concentrations to below the 0.0010 mg/L reporting limit through 10 sequential extractions with simulated acidic rainwater for an estimated leaching period of about 800 years (Appendix H of RIR 2011).

Proposed Remedy

The remedial goal selected is designed to meet the industrial preliminary health based soil remediation goal (IPSRG) of 60 mg/kg for cobalt based on the U. S. Environmental Protection Agency (EPA) industrial screening level and adjusted using a hazard quotient (HQ) of 0.2 versus EPA's HQ of 1 to account for the lack of other non-carcinogens per critical group. The calculated IPSRG therefore

becomes 300 mg/kg. Per Umicore's request, a safety factor has been incorporated to halve this level for a proposed cleanup level of 150 mg/kg.

After incorporating site and impacted soil conditions with the screening criteria, the excavation of cobalt impacted soil remedial option was selected. This option consist of excavating cobalt impacted soil equal to or greater than 150 mg/kg and remediate deeper cobalt contaminated areas with two percent Enviro-Mag®. This remedy will protect groundwater from cobalt leaching from the contaminated soil with land use restriction and groundwater monitoring. Figures 9 through 15 show the analytical results in cross-section. The proposed areas for excavation of 150 mg/kg and greater cobalt contaminated soil are shown on the cross-sections.

This remedy includes post-remediation construction of a sediment basin for trapping soil and sediment particles transported in the runoff from on-site and a discharge ditch from the basin to mitigate erosion from the basin overflow (Figures 7 and 8). As needed, the sediment will be removed from the basin and disposed in a properly permitted landfill.

The excavation of the cobalt impacted soil equal to or greater than 150 mg/kg will bring the contaminant level down to where the cobalt attenuation process has been demonstrated to prevent impact to the groundwater and meet 2L Standards. The associated cobalt fixation process can stabilize highly contaminated areas and prevent impact to the groundwater for 800 years of leaching as shown by bench-scale testing. There is minimal risk that a future breakthrough of the cobalt could reach the shallow groundwater and prevent the long-term effectiveness of excavation of cobalt-impacted soil.

The excavation of cobalt impacted soil is preferred by Umicore for the site soil because the minimal risk of future impact of the groundwater. The remedy is not the least expensive of the options evaluated up front, but the long-term operations and maintenance costs are lower and the safety factor is important for Umicore.

Land Use Restriction

Umicore proposes a remedy utilizing land use restrictions on the LMAC Area. The assessed area is the outlined area pointing southwest and the Umicore LMAC property is the large area extending northwest to southeast.

The LMAC Area and LMAC property is underdeveloped woodland. The property is surrounded by the Umicore facility to the north and east, undeveloped woodland to the west owned by the Laurinburg Maxton Airport Commission (LMAC), and the Laurinburg-Maxton airport to the south (Figure 2 and Table 2 of the Remedial Investigation Plan 2010).

Umicore plans to restrict use of the LMAC Area to industrial use and will restrict:

- Excavating soil to depths of six feet without evaluating environmental compliance and worker safety and Umicore's authorization,
- Planting or removal of vegetation including edible plants,
- Recreational use in the form of hunting or off-road motorized vehicles,
- Installation of water supply wells,

- Construction of buildings or other man-made structures without evaluating environmental compliance and worker safety and Umicore's authorization.

Umicore will meet the 2L groundwater standards through the proposed remedy and will monitor as specified in the RAP to demonstrate that the remedy is protecting the groundwater.

In summary, Duncklee & Dunham believes that the excavation of cobalt contaminated soil at and above 150 mg/kg with spot application of cobalt fixing chemical in areas that cannot be excavated will provide protection of the groundwater from leaching. The K_d results for the soil and the lack of cobalt contamination in the shallow groundwater after 29 years of contaminated facility surface water ponding in the LMAC Area indicate the soil can attenuate cobalt levels greater than 300 mg/kg and prevent a cobalt contaminated aquifer from developing. The lower concentration of cobalt contaminated soil left behind and the control of additional sediment and surface water away from the area also minimizes future impact.

This document includes the executed signatures that signify concurrence proposal of contaminant remedy approval by Umicore as the Remediating Party, Duncklee & Dunham, P.C. as the Registered Environmental Consultant, and David L. Duncklee as the Registered Site Manager (Appendix A). If you have any questions, please do not hesitate to contact Dave Duncklee at dave@dunckleedunham.com or (919) 858-9898.

Sincerely,

Duncklee & Dunham, P.C.

David L. Duncklee, P.G., R.S.M.
Senior Project Manager

ec: Mr. Dick Laird – Umicore
Ms. Ravila Gupta – Umicore

P:\Umicore\Maxton - 200917\10.0 RAP\LMAC\10.1 Process and Final Plan\10.1.1 Remedy Concurrence\Request-12069.docx

Figures

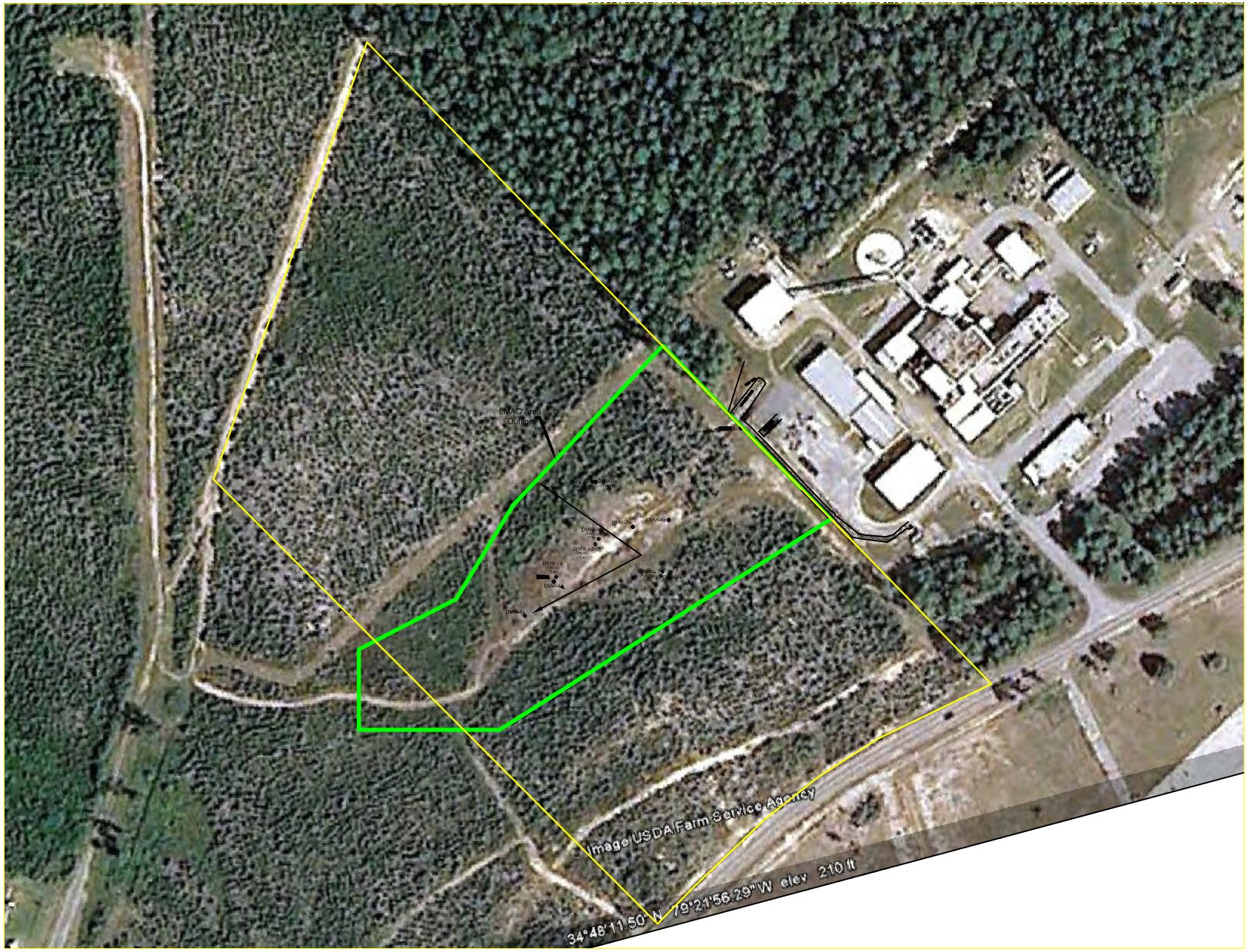
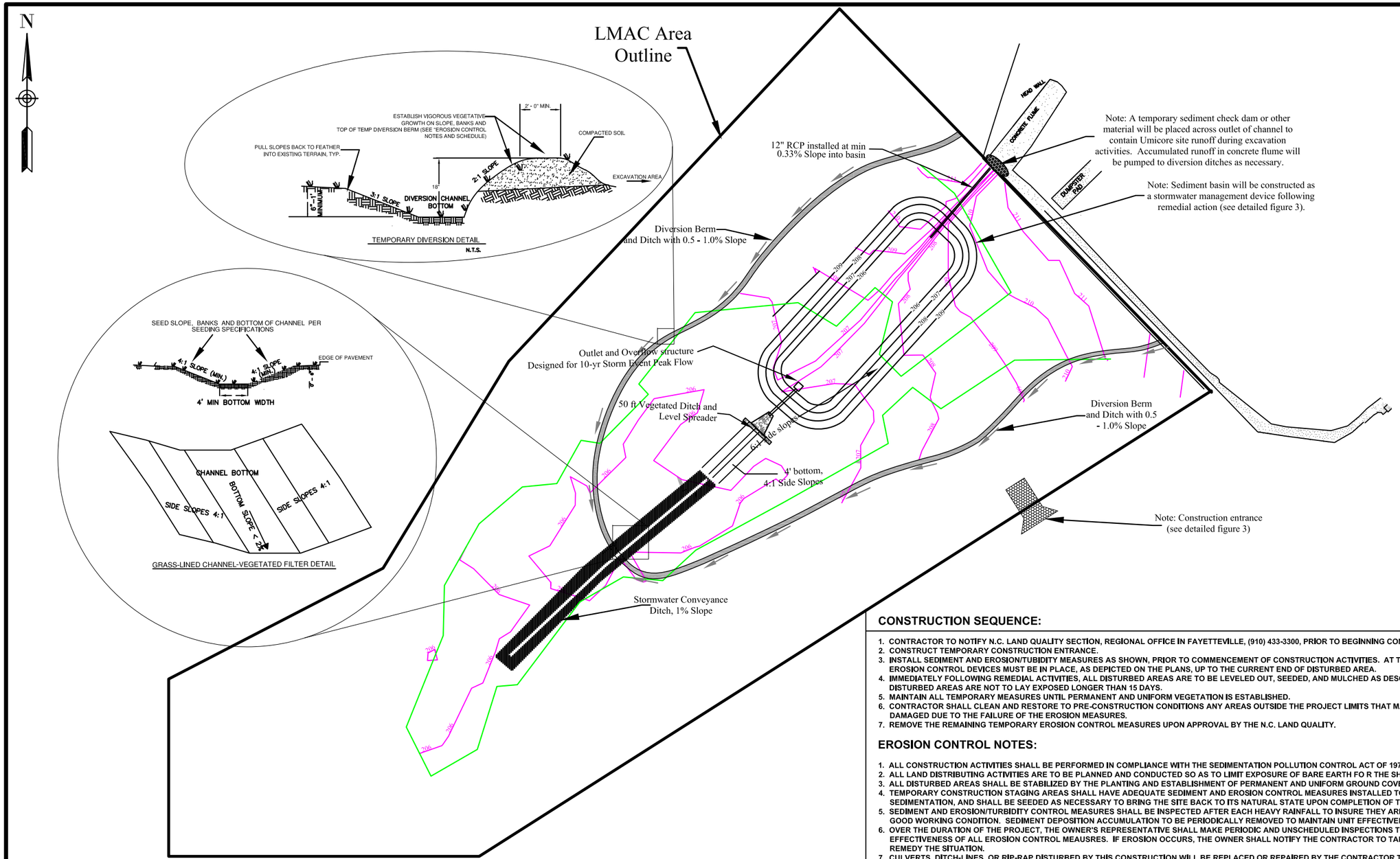

EMAC Area
Outline
Image USDA Farm Service Agency
34°48'11.50" N 79°21'56.29" W elev 210 ft

Figure 1

There is no Figure 2 through Figure 6.



CONSTRUCTION SEQUENCE:

1. CONTRACTOR TO NOTIFY N.C. LAND QUALITY SECTION, REGIONAL OFFICE IN FAYETTEVILLE, (910) 433-3300, PRIOR TO BEGINNING CONSTRUCTION.
2. CONSTRUCT TEMPORARY CONSTRUCTION ENTRANCE.
3. INSTALL SEDIMENT AND EROSION/TUBIDITY MEASURES AS SHOWN, PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES. AT THE END OF EACH DAY, EROSION CONTROL DEVICES MUST BE IN PLACE, AS DEPICTED ON THE PLANS, UP TO THE CURRENT END OF DISTURBED AREA.
4. IMMEDIATELY FOLLOWING REMEDIAL ACTIVITIES, ALL DISTURBED AREAS ARE TO BE LEVELED OUT, SEEDED, AND MULCHED AS DESCRIBED IN THE ESC PLAN. DISTURBED AREAS ARE NOT TO LAY EXPOSED LONGER THAN 15 DAYS.
5. MAINTAIN ALL TEMPORARY MEASURES UNTIL PERMANENT AND UNIFORM VEGETATION IS ESTABLISHED.
6. CONTRACTOR SHALL CLEAN AND RESTORE TO PRE-CONSTRUCTION CONDITIONS ANY AREAS OUTSIDE THE PROJECT LIMITS THAT MAY INADVERTANTLY BE DAMAGED DUE TO THE FAILURE OF THE EROSION MEASURES.
7. REMOVE THE REMAINING TEMPORARY EROSION CONTROL MEASURES UPON APPROVAL BY THE N.C. LAND QUALITY.

EROSION CONTROL NOTES:

1. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN COMPLIANCE WITH THE SEDIMENTATION POLLUTION CONTROL ACT OF 1973.
2. ALL LAND DISTRIBUTING ACTIVITIES ARE TO BE PLANNED AND CONDUCTED SO AS TO LIMIT EXPOSURE OF BARE EARTH FO R THE SHORTEST POSSIBLE TIME.
3. ALL DISTURBED AREAS SHALL BE STABILIZED BY THE PLANTING AND ESTABLISHMENT OF PERMANENT AND UNIFORM GROUND COVER.
4. TEMPORARY CONSTRUCTION STAGING AREAS SHALL HAVE ADEQUATE SEDIMENT AND EROSION CONTROL MEASURES INSTALLED TO PREVENT OFF SITE SEDIMENTATION, AND SHALL BE SEEDED AS NECESSARY TO BRING THE SITE BACK TO ITS NATURAL STATE UPON COMPLETION OF THE THE PROJECT.
5. SEDIMENT AND EROSION/TURBIDITY CONTROL MEASURES SHALL BE INSPECTED AFTER EACH HEAVY RAINFALL TO INSURE THEY ARE FUNCTIONAL AND IN GOOD WORKING CONDITION. SEDIMENT DEPOSITION ACCUMULATION TO BE PERIODICALLY REMOVED TO MAINTAIN UNIT EFFECTIVENESS.
6. OVER THE DURATION OF THE PROJECT, THE OWNER'S REPRESENTATIVE SHALL MAKE PERIODIC AND UNSCHEDULED INSPECTIONS TO EVALUATE THE EFFECTIVENESS OF ALL EROSION CONTROL MEASURES. IF EROSION OCCURS, THE OWNER SHALL NOTIFY THE CONTRACTOR TO TAKE ADEQUATE STEPS TO REMEDY THE SITUATION.
7. CULVERTS, DITCH-LINES, OR RIP-RAP DISTURBED BY THIS CONSTRUCTION WILL BE REPLACED OR REPAIRED BY THE CONTRACTOR TO AN EQUAL OR BETTER CONDITION TO THAT PRIOR TO THE DISTURBANCE.

Legend

- Contour for Sediment Basin
- Topography Contour Line
- Tree Line

0 80 160

Graphic Scale: 1" = 80'

DUNCKLEE & DUNHAM
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www.dunckleedunham.com
NC Geo. License No. C-261

Stormwater Conveyance Measure Following Soil Remediation

Umicore Facility Investigation Areas
Maxton, North Carolina

References:
Base Map Provided by Unicore, Whompler Survey Data

Date: February 2012

Filename:
P:\Umicore\Maxton - 2009\7\8 Field and Technical\8.8 CAD and GIS Maps\LMAC\LMAC CAD\Ditch Construction Cross Sections

Project Number: 200917

Layers: 0,1,58,85,86

Checked By:

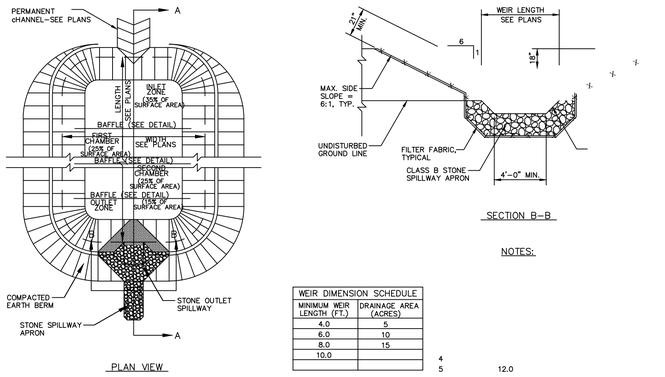
Size: 11" x 17"

Drawn By: amr/wmf

Scale: 1" = 80'

Figure

7

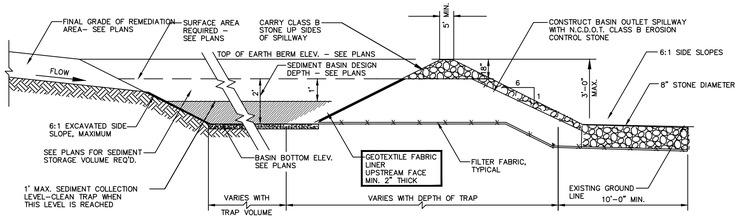


PLAN VIEW

SECTION B–B

NOTES:

WEIR DIMENSION SCHEDULE	
MINIMUM WEIR LENGTH (FT.)	DRAINAGE AREA (ACRES)
4.0	5
6.0	10
8.0	15
10.0	
	4
	5
	12.0

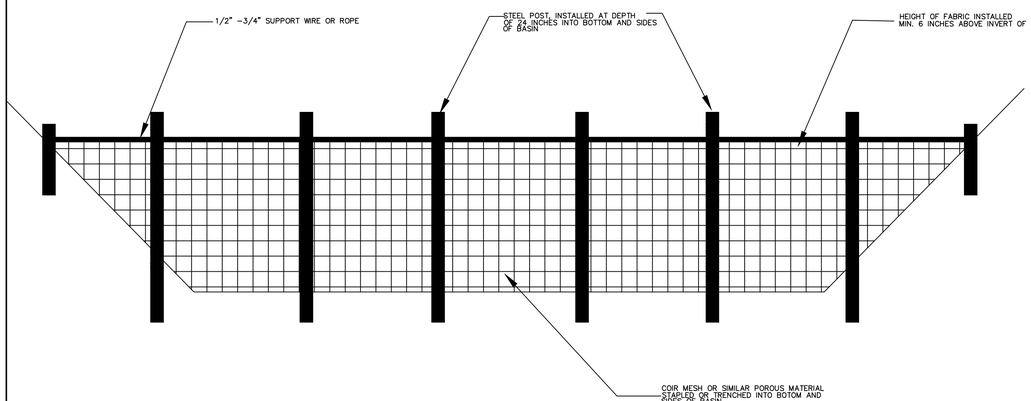


SECTION A–A

SEDIMENT BASIN

NOT TO SCALE

D2003A



CONSTRUCTION SEQUENCE:

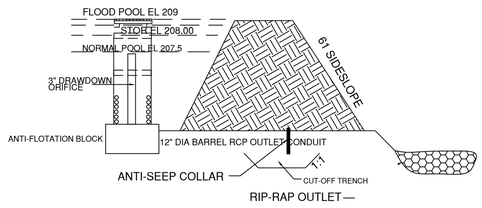
1) GRADE BASIN SO THAT BOTTOM IS LEVEL FROM FRONT TO BACK AND SIDE TO SIDE.
2) INSTALL POSTS OR SAW HORSES ACROSS WIDTH OF BASIN (SEE INSTALLATION DETAILS FOR SILT FENCE)
3) INSTALL POSTS TO A DEPTH OF 24 INCHES, PLACE AT MAXIMUM 4 FT ON CENTER, AND INSTALLED INTO SIDES OF BASIN AS WELL.
4) INSTALL POSTS SUCH THAT TOP OF BAFFLE FABRIC IS 6 INCHES HIGHER THAN INVERT OF THE OUTLET STRUCTURE AND TWO INCHES LOWER THAN THE TOP OF THE BERMS.
5) INSTALL AT LEAST THREE ROWS OF BAFFLES BETWEEN THE INLET AND OUTLET LOCATIONS. SPACE BASED ON LAYOUT SHOWN IN SITE PLAN. PLACE FILL IN 6"-8" CONTINUOUS LIFTS OVER LENGTH OF FILL AREA AND COMPACT USING CONSTRUCTION HAULING EQUIPMENT. CONSTRUCT EMBANKMENT AT AN ELEVATION 10% HIGHER THAN DESIGN FOR SETTLEMENT.
6) INSTALL SUPPORT WIRE OR ROPE ACROSS THE TOP OF THE POSTS TO PRVENT SAGGING IN THE BAFFLES.
7) WRAP COIR MESH BACKED BY JUTE MESH OR LIKE POROUS MATERIAL OVER THE TOP WIRE. FABRIC SHALL HAVE 5-10% OPENINGS IN WEAVE.
8) ATTACH FABRIC TO TOP WIRE AND POSTS WITH ZIP TIES, WIRES, OR STAPLES.
9) ANCHOR BOTTOM AND SIDES OF FABRIC IN A TRENCH ADVANCED ALONG THE BOTTOM AND SIDES OF THE BASIN, OR PINNED INTO THE GROUND WITH 8-INCH EROSION CONTROL MATTING STAPLES.
10) USE ONE CONTINUOUS PIECE OF FABRIC FOR EACH BAFFLE; DO NOT SPLICE.

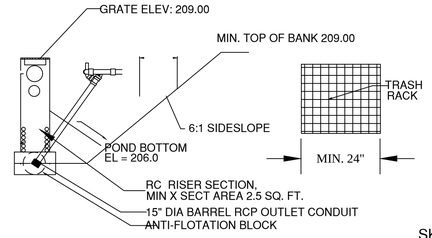
MAINTENANCE:

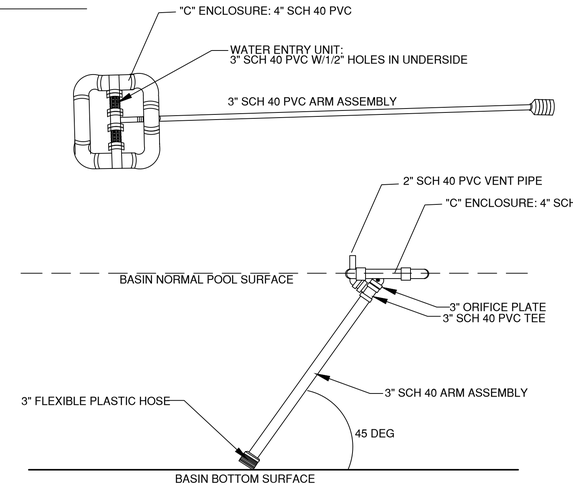
1. INSPECT BAFFLES WEEKLY AND AFTER EACH SIGNIFICANT (> 0.5 IN.) RAINFALL EVENT AND REPAIR AS NEEDED.
2. MAINTAIN ACCESS AT ALL TIMES TO BAFFLES. IF THE FABRIC COLLAPSES, TEARS, DECOMPOSES, OR BECOMES INEFFECTIVE, REPLACE IMMEDIATLEY. STABILIZE EXCAVATED MATERIAL APPROPRIATELY.
3. REMOVE SEDIMENT DEPOSITS FROM THE UPSTREAM SIDE OF EACH BAFFLE WHEN SEDIMENT HEIGHT REACHES 50% OF THE BAFFLE HEIGHT.
4. WHEN CONTRIBUTING DRAINAGE AREA HAS BEEN ADEQUATELY STABILIZED, REMOVE ALL BAFFLE MATERIALS AND DISPOSE OF SEDIMENT APPROPRIATELY. BRING DISTURBED AREA TO FINAL GRADE.

POUROUS BAFFLE DETAIL

OUTLET DEVICE DETAIL



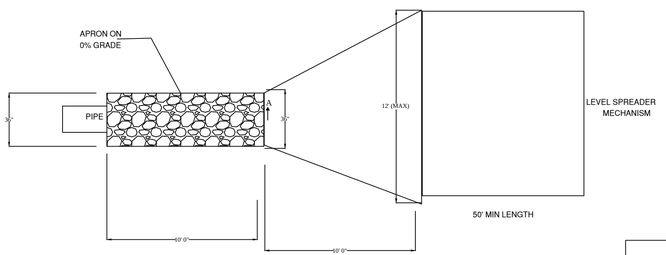




SKIMMER DEWATERING DEVICE DETAIL (OPTIONAL)

EROSION CONTROL MAINTENANCE REQUIREMENTS:

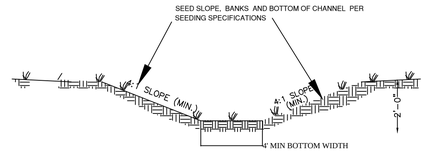
1. CONSTRUCTION ENTRANCE MUST BE MAINTAINED TO PREVENT MUD OR SEDIMENT FROM LEAVING SITE. PERIODIC TOP DRESSING WITH TWO INCH STONE MAY BE REQUIRED.
2. ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CHECKED FOR STABILITY AND OPERATION FOLLOWING EVERY RUNOFF PRODUCING RAINFALL, BUT IN NO CASE LESS THAN ONCE EVERY WEEK. ANY NEEDED REPAIRS WILL BE MADE IMMEDIATELY TO MAINTAIN ALL PRACTICES AS DESIGNED.
3. SEDIMENT WILL BE REMOVED FROM WITHIN DIVERSION CHANNEL WHEN IT BECOMES ABOUT 0.5 FEET DEEP
4. ALL SEEDED AREAS WILL BE FERTILIZED, RESEEDED AS NECESSARY, AND MULCHED ACCORDING TO SPECIFICATIONS IN THE SEEDING SCHEDULE TO MAINTAIN A VIGOROUS, DENSE VEGETATIVE COVER.
5. SEDIMENT WILL BE REMOVED FROM THE SEDIMENT BASIN INLET WHEN STORAGE CAPACITY HAS BEEN APPROXIMATELY 50% FILLED. GRAVEL WILL BE CLEANED OR REPLACED WHEN THE SEDIMENT POOL NO LONGER DRAINS PROPERLY.
6. THE SEDIMENT BASIN WILL BE CLEANED OUT WHEN THE LEVEL OF SEDIMENT REACHES 2.0 FEET BELOW THE TOP OF THE RISER. GRAVEL WILL BE CLEANED OR REPLACED WHEN THE SEDIMENT POOL NO LONGER DRAINS PROPERLY.



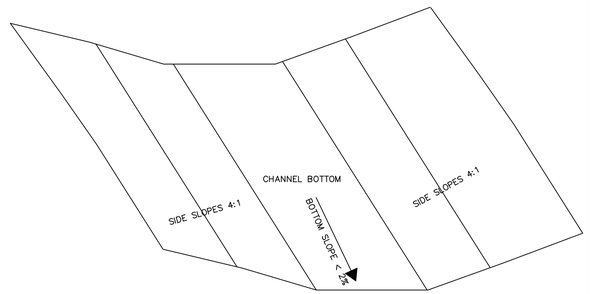
PLAN VIEW

CONSTRUCTION SPECIFICATIONS

1. EXCAVATE SUBGRADE BELOW EXIT ELEVATION TO ALLOW FOR THICKNESS OF FILTER FABRIC AND RIPRAP
2. INSTALL RIPRAP TO MINIMUM THICKNESS OF 18 INCHES
3. CONSTRUCT APRON ON ZERO GRADE. CROSS SECTION OF APRON TO BE LEVEL OR SLIGHTLY DEPRESSED IN THE MIDDLE. BLEND RIPRAP SMOOTHLY TO THE SURROUNDING GRADE
4. APRON SHALL BE STRAIGHT AND PROPERLY ALIGNED WITH RECEIVING CHANNEL
5. COMPACT FILL USED IN SUBGRADE TO THE DENSITY OF THE SURROUNDING UNDISTURBED MATERIAL. SUBGRADE SHALL BE SMOOTH ENOUGH AND FREE OF MATERIALS TO PROTECT FABRIC FROM TEARING
6. INSTALL A CONTINUOUS SECTION OF EXTRA STRENGTH, 6-IN THICK FILTER FABRIC ON SMOOTH, COMPACTED FOUNDATION.
7. PROTECT FILTER FABIC FROM TEARING WHILE PLACING RIPRAP WITH MACHINERY. REPAIR ANY DAMAGE IMMEDIATELY BY REMOVING RIPRAP AND INSTALLING ANOTHER SECTION OF FABRIC.
8. UPSTREAM SECTION OF FABRIC SHALL OVERLAP DOWNSTREAM SECTION A MINIMUM OF 1 FT.
9. TOP OF RIPRAP APRON SHALL BE LEVEL WITH RECEIVING CHANNEL
10. RIPRAP SHALL NOT RESTRICT THE CHANNEL OR PRODUCE AN OVERFALL.
11. AFTER INSTALLATION, STABILIZE DISTURBED AREAS WITH TEMPORARY COVERS AND INSTALL PERMANENT MEASURES AS DESCRIBED IN PLAN.
12. EXCAVATE A VERTICAL TRENCH ON THE LOWER EDGE OF TEH DISSIPATION DEVICE FOR LEVEL SPREADER INSTALLATION.
13. INSTALL MATTING FOR LEVEL SPREADER AT A MINIMUM WIDTH OF 4 FT EXTENDING SIX INCHES OVER THE LIP AT A MINIMUM DEPTH OF 6 INCHES WITHIN THE TRENCH.
14. THE UPPER EDGE OF THE LEVEL SPREADER SHALL BUTT UP AGAINST A STRIP OF SMOOTH CUT SOD, AND BE ANCHORED IN PLACE WITH CLOSELY SPACED HEAVY DUTY WIRE STAPLES A MINIMUM OF 12 INCHES IN LENGTH
15. ENSURE THAT THE LEVEL SPREADER IS LEVEL FOR UNIFORM DISTRIBUTION OF RUNOFF.
16. CONSTRUCT THE LEVEL SPREADER WITHIN UNDISTURBED SOIL (NOT WITHIN FILL).
17. CONSTRUCT A 20-FT TRANSITION SECTION FROM THE RIP-RAP DISSIPATOR TO BLEND SMOOTHLY TO THE WIDTH AND DEPTH OF SPREADER.
18. DISPERSE RUNOFF FROM THE SPREADER ACROSS A PROPERLY STABILIZED SLOPE WITH A MAXIMUM SLOPE OF 10%.
19. SEED AND MULCH DISTURBED AREAS AROUND THE SPREADER IMMEDIATELY AFTER CONSTRUCTION.



GRASS-LINED CHANNEL-VEGETATED FILTER CROSS-SECTION



SEEDING SCHEDULE

ALL DISTURBED AREAS SHALL BE STABILIZED WITH A PERMANENT VEGETATIVE COVER. THE CONTRACTOR MAY USE METHODS AND SCHEDULES SHOWN BELOW; HOWEVER, IT IS RECOMMENDED THAT A SPECIALIST BE CONSULTED WITH ATTENTION GIVEN TO SITE SPECIFIC CONDITIONS.

A. CULTIVATE AREA TO A DEPTH OF 5".
B. APPLY AGRICULTURAL LIME AT THE RATE OF 4000 LBS. PER ACRE.
C. APPLY 10-20-20 COMMERCIAL FERTILIZER AT THE RATE OF 500 LBS PER ACRE.
D. SOW GRASS SEEDS AT THE FOLLOWING RATES:

KIND	RATE PER ACRE
COMMON BERMUDA GRASS (UNHULLED)	20 LBS.
COMMON BERMUDA GRASS (HULLED)	12 LBS.
PENSACOLA BAHIGRASS	50 LBS.
KOREAN LESPEDEZA	25 LBS
TALL FASCUE	30 LBS.

E. MULCH WITH STRAW AT THE RATE OF 3250 TO 4350 LBS PER ACRE.
F. ANCHOR STRAW WITH ASPHALT EMULSION TACK COAT APPLIED AT THE RATE OF 300 GALLONS PER ACRE IN LOCATIONS AS AUTHORIZED BY THE ENGINEER.

Stormwater Management Details

LMAC Remediation Area
Maxton, North Carolina

Drawn By: amr	Checked By: bdt	Date: February 2012	References: NC DLR ESC Design Manual
Project Number: 200917		Scale: NTS	Size: 22" x 34"
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Figure

8

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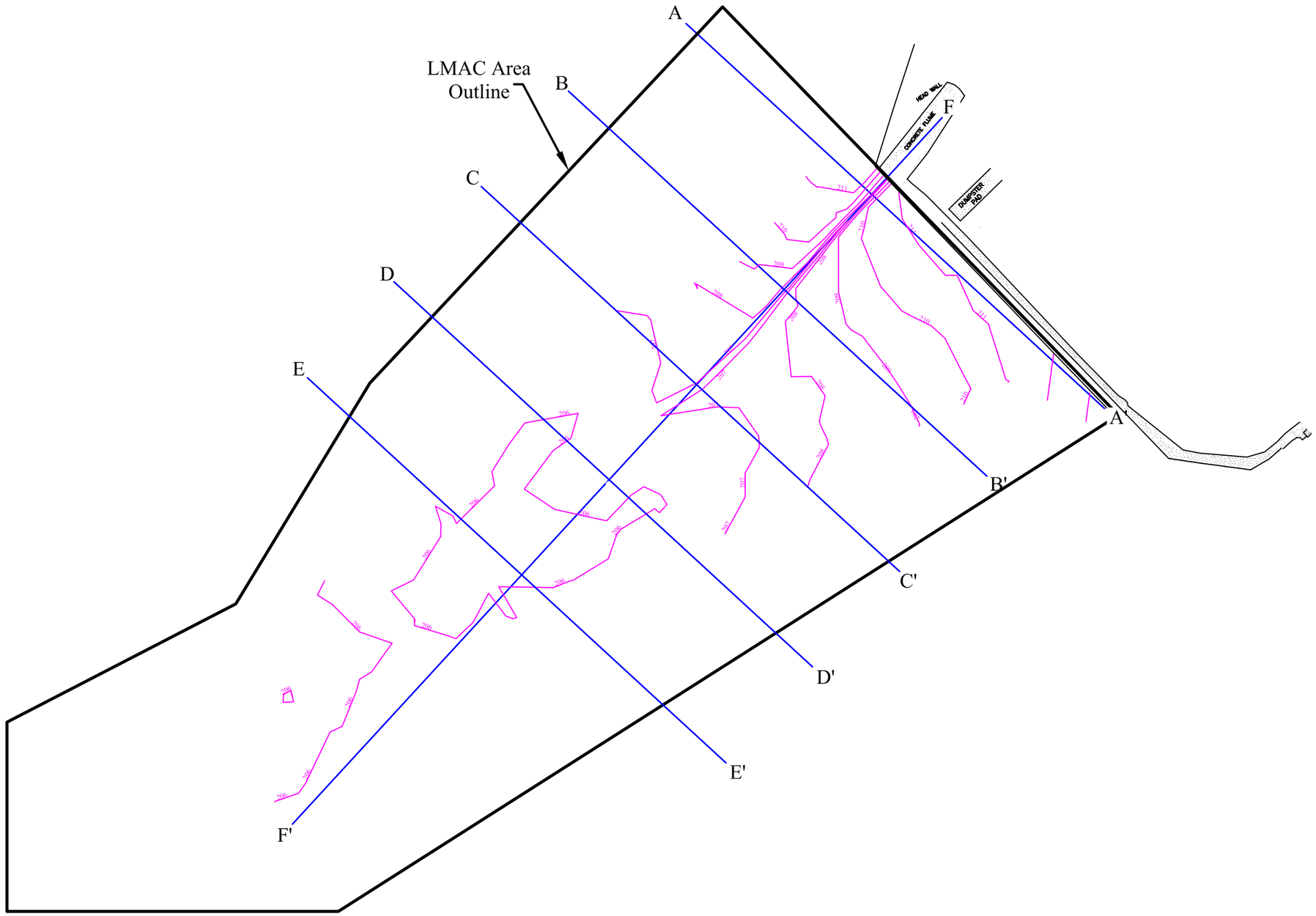

0 80 160

Graphic Scale: 1" = 80'

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Cross Section Trace Lines

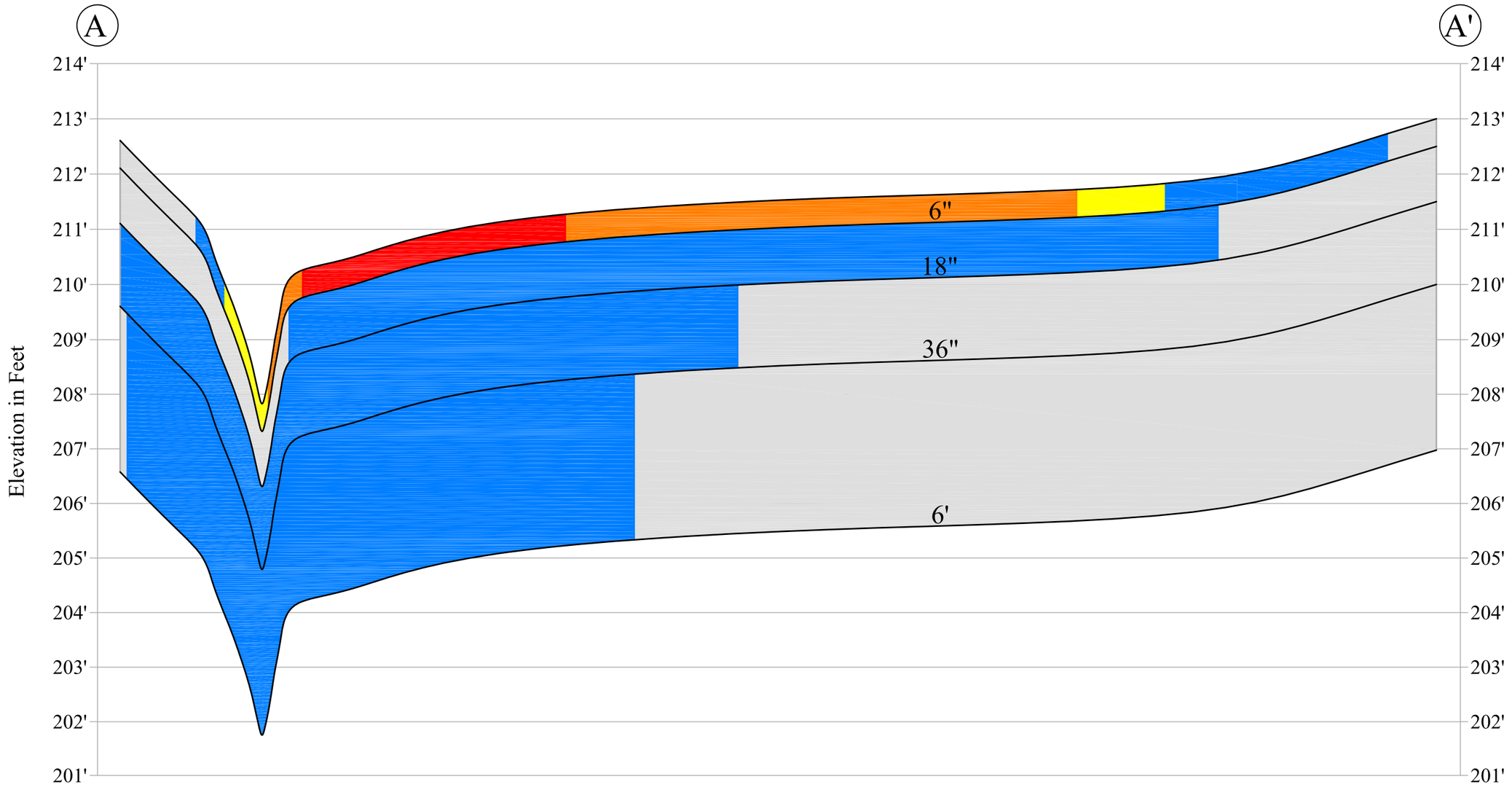
Umicore Facility Investigation Areas
Maxton, North Carolina

Drawn By: ccw/wmf	Checked By: bdt	Project Number: 200917	Date: 10-8-2010
Scale: 1" = 80'	Size: 11" x 17"	Layers: 0,60	Filename: P:\Umicore\Umicore - 200917\8 Field and Technical Documentation\8.8 CAD and GIS Maps\LMAC\LMAC CAD\Mast LMAC Area Site Map

References:
Base Map Provided by Umicore, Field Notes

Figure

9



Legend

- 4.6 = Residential PSRG (IHSB) Feb. 2011
- 100 = 1/3 Site Specific Industrial PSRG Aug. 2011
- 150 = 1/2 Site Specific Industrial PSRG Aug. 2011
- 300 = Site Specific Industrial PSRG Aug. 2011
- No Detections

Note: IHSB = Inactive Hazardous Sites Branch. PSRG = IHSB Preliminary Health Based Soil Remediation Goal. The IHSB Industrial PSRG is 60 mg/kg (HQ=0.2) assuming the presence of five non-carcinogens; PSRG is based on EPA's Industrial Screening Level of 300 mg/kg (HQ=1.0). A Site-Specific Industrial RG for cobalt is 300 mg/kg since cobalt is the only non-carcinogen. A safety factor of two was used for a more conservative cleanup level of 150 mg/kg.

Horizontal Scale: 1" = 40'
Vertical Scale: As Shown

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Topographic Cross Section of LMAC Area A - A'

Umicore Facility Investigation Areas
Maxton, North Carolina

References: Whompler Survey Data, D&D Analytical Data

Drawn By: wmf
Checked By:
Date: 1-19-2012
Project Number: 200917
Scale: As Shown
Size: 11" x 17"
Layers: 0,1,60
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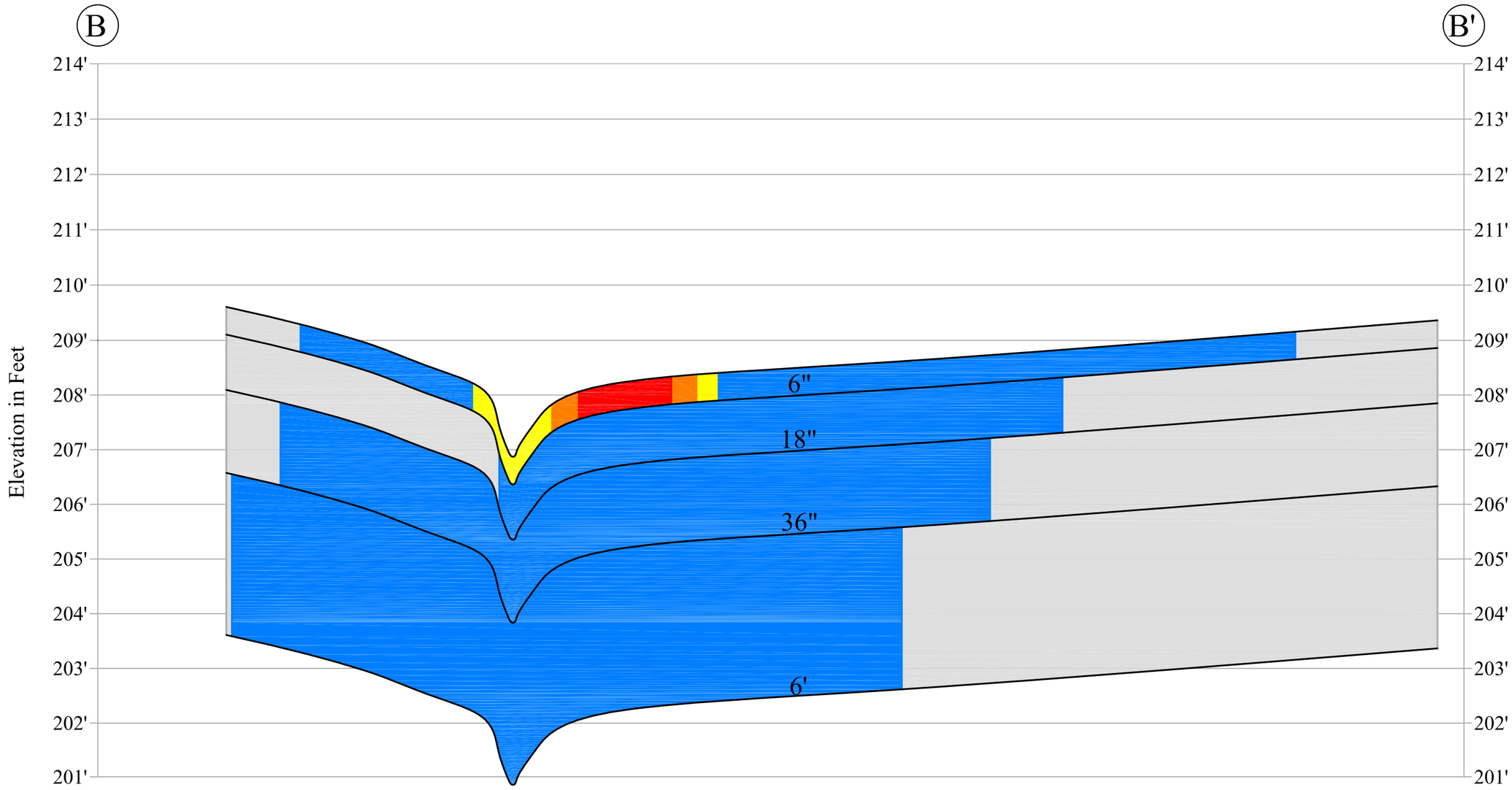
Figure

10



Legend

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- 150 = 1/2 Site Specific Industrial PSRG Aug. 2011
- 300 = Site Specific Industrial PSRG Aug. 2011
- No Detections

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Horizontal Scale: 1" = 40'
Vertical Scale: As Shown

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Topographic Cross Section of LMAC Area B - B'

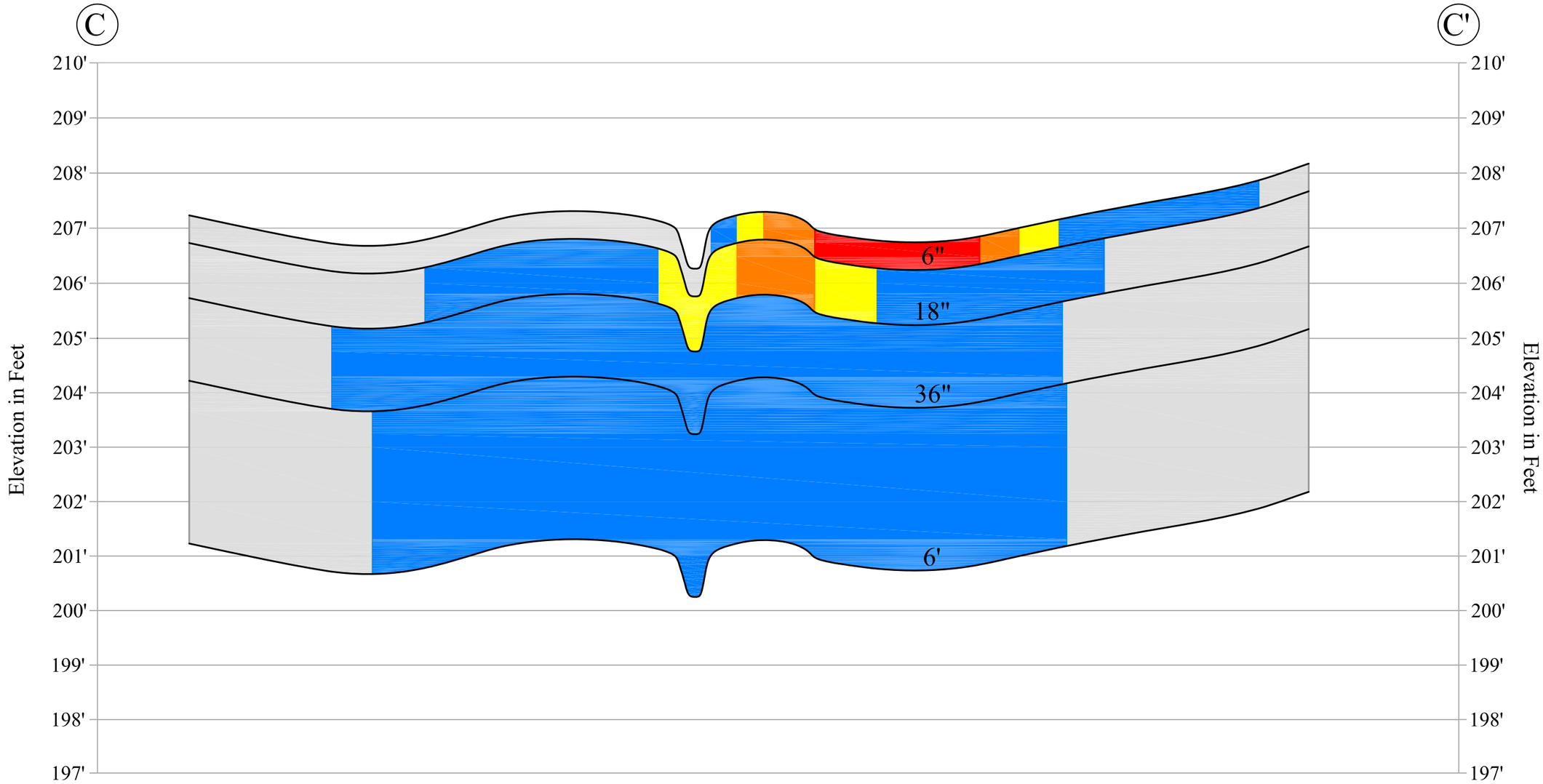
Umicore Facility Investigation Areas
Maxton, North Carolina

References: Whompler Survey Data, D&D Analytical Data

Drawn By: wmf
Checked By:
Date: 1-19-2012
Project Number: 200917
Size: 11" x 17"
Layers: 0,1,62
Scale: As Shown
Filename: P:\Umicore\Maxton - 200917\8 Field and Technical\8.8 CAD and GIS Maps\LMAC\LMAC CAD\Cross Section with concentrations

Figure

11



Legend

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- 100 = 1/3 Site Specific Industrial PSRG Aug. 2011
- 150 = 1/2 Site Specific Industrial PSRG Aug. 2011
- 300 = Site Specific Industrial PSRG Aug. 2011
- No Detections

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Horizontal Scale: 1" = 40'
Vertical Scale: As Shown

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Topographic Cross Section of LMAC Area C - C'

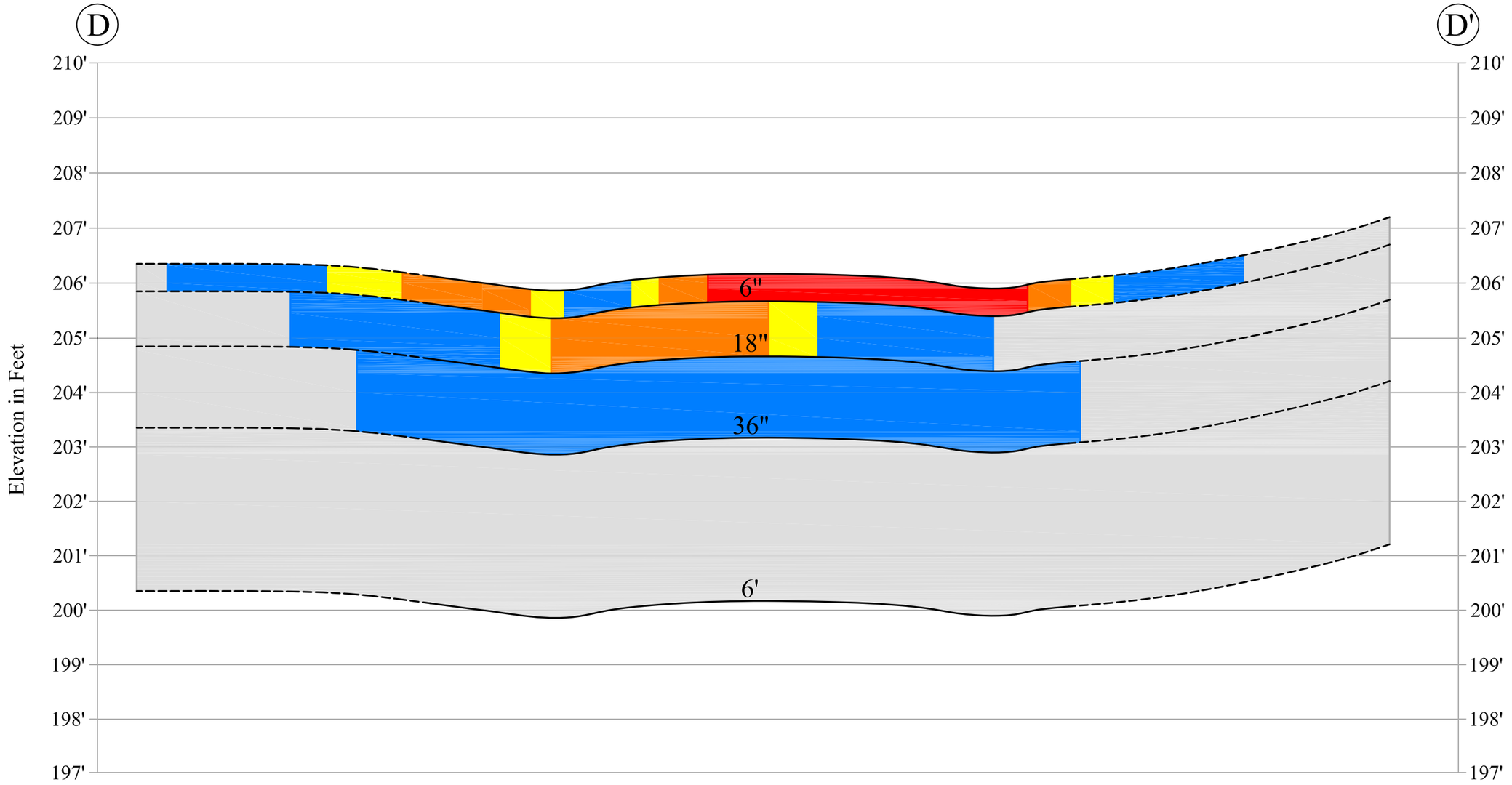
Umicore Facility Investigation Areas
Maxton, North Carolina

References: Whompler Survey Data, D&D Analytical Data

Drawn By: wmf
Checked By:
Date: 1-19-2012
Project Number: 200917
Scale: As Shown
Size: 11" x 17"
Layers: 0,1,63
Filename: P:\Umicore\Maxton - 200917\8 Field and Technical\8.8 CAD and GIS Maps\LMAC\LMAC CAD\Cross Section with concentrations

Figure

12



Legend

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- 300 = Site Specific Industrial PSRG Aug. 2011
- No Detections

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Horizontal Scale: 1" = 40'
Vertical Scale: As Shown

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Topographic Cross Section of LMAC Area D - D'

Umicore Facility Investigation
Maxton, North Carolina

Drawn By: wmf	Checked By:
Scale: As Shown	Size: 11" x 17"
Project Number: 200917	Layers: 0,1,64
Date: 1-19-2012	References: Whompler Survey Data, D&D Analytical Data
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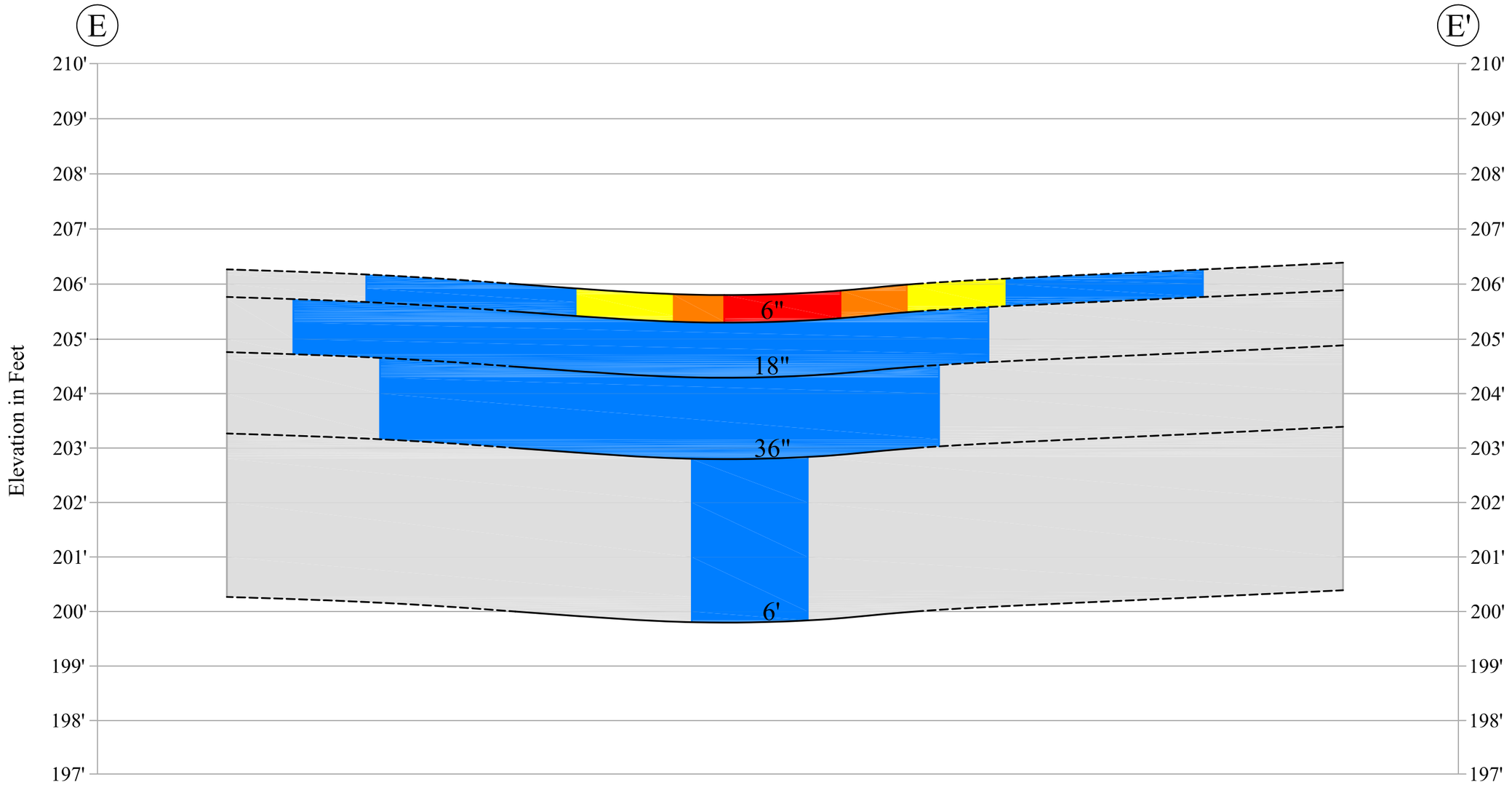
Figure

13



Legend

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- 150 = 1/2 Site Specific Industrial PSRG Aug. 2011
- 300 = Site Specific Industrial PSRG Aug. 2011
- No Detections

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Horizontal Scale: 1" = 40'
Vertical Scale: As Shown

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Topographic Cross Section of LMAC Area E - E'

Umicore Facility Investigation Areas
Maxton, North Carolina

References: Whompler Survey Data, D&D Analytical Data
Date: 1-19-2012
Filename: P:\Umicore\Maxton - 2009\738 Field and Technical\8.8 CAD and GIS Maps\LMAC\LMAC CAD\Cross Section with concentrations
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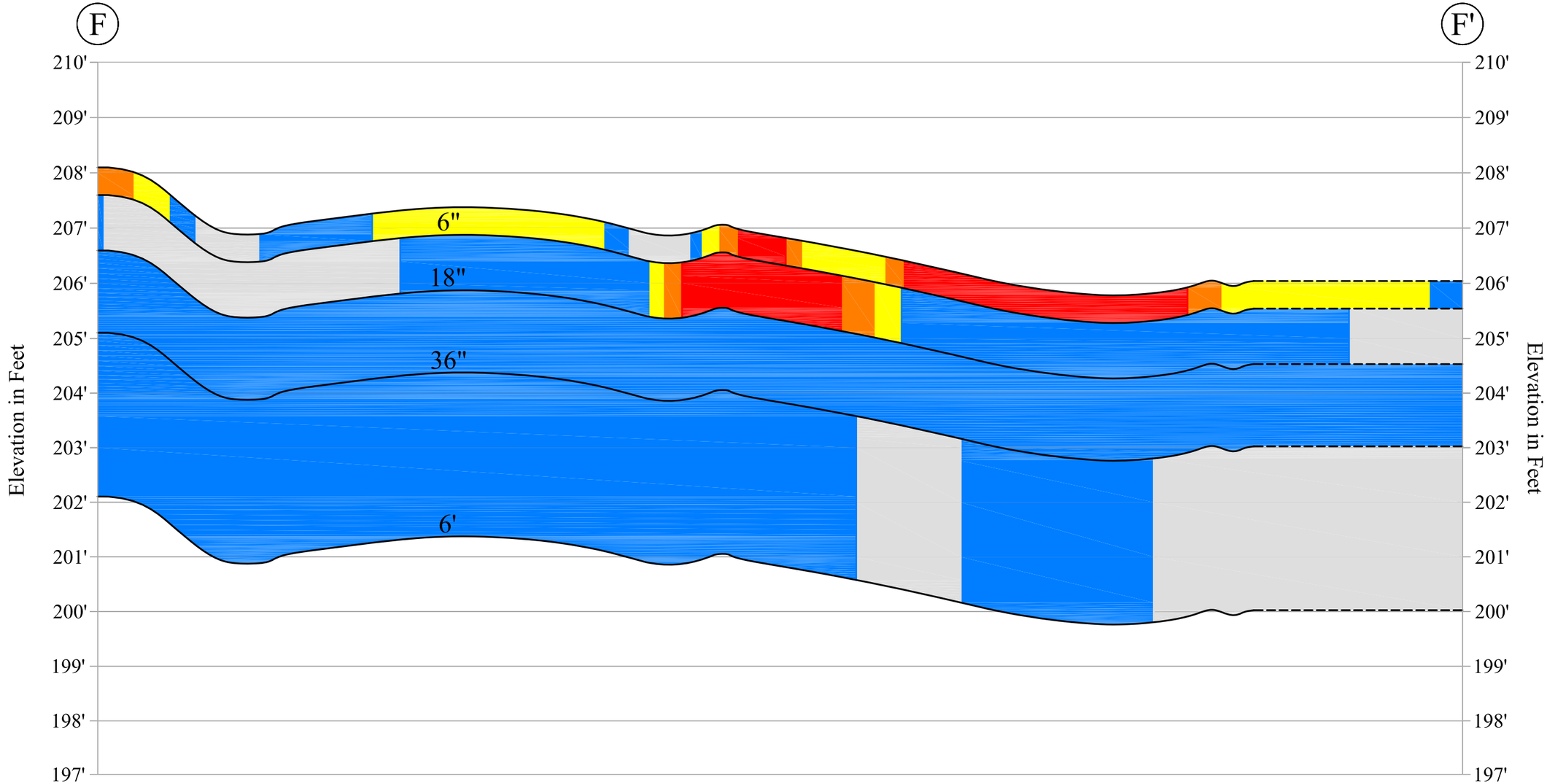
Checked By:
Size: 11" x 17"
Drawn By: wmf
Scale: As Shown

Figure

14



Legend

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- 300 = Site Specific Industrial PSRG Aug. 2011
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Horizontal Scale: 1" = 80'
Vertical Scale: As Shown

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Topographic Cross Section of LMAC Area F - F'

Umicore Facility Investigation Areas
Maxton, North Carolina

References: Whompler Survey Data, D&D Analytical Data

Drawn By: wmf
Checked By:
Scale: As Shown
Project Number: 200917
Date: 1-19-2012
Size: 11" x 17"
Layers: 0,1,66
Filename: P:\Umicore\Maxton - 20091738 Field and Technical\8.8 CAD and GIS Maps\LMAC\LMAC CAD\Cross Section with concentrations

Figure

15

Tables

Table 1: Historical Summary of Metals and Other Inorganics in Ground Water, LMAC Area, Umicore, Maxton, North Carolina

Sample Location	Aquifer Type	Method	9056	9056	6010B/6020	6010B	6010B	6010B	6010B	6010B/ 6020
		Parameter	Chloride	Sulfate	Cobalt	Iron	Manganese	Potassium	Sodium	Thallium
		Date/2L Standard	250	250	0.001 a	0.3	0.05	NS	NS	0.0002a
DMW-1	Shallow	7/30/2009	NT	NT	<0.010	**0.11**	<0.010	<0.50	**11**	NT
		9/2/2009	**4.0**	**11**	<0.010	**2.2**	<0.010	<0.50	**13**	NT
		1/7/2010	**3.7**	**12**	<0.010	<0.10	<0.010	<0.50	**16**	NT
		4/13/2010	**5.0**	**18**	<0.010	**1.2**	<0.010	<0.50	**11**	NT
		7/1/2010	**4.2**	**9.2**	<0.010	**0.56**	<0.010	<0.50	**11**	NT
		2/3/2011	**4.4**	**6.2**	<0.0010	**<0.10**	<0.010	<0.50	**7.2**	NT
		2/3/2011 Dup	**4.5**	**6.4**	<0.0010	<0.10	<0.010	<0.50	**7.5**	NT
		4/7/2011	**4.1**	**5.4**	<0.0010	<0.10	<0.020	<0.50	**6.9**	NT
		4-7-11 Dup	**4.1**	**5.5**	<0.0010	<0.10	<0.020	<0.50	**7.0**	NT
		7/27/2011	**5.0**	**7.6**	0.00036 J	0.5 P1	**0.0013 J**	<0.14	**8.5**	NT
		10/13/2011	**4.5**	**4.9**	<0.00026	**0.030 J**	**0.0017 J**	**0.150 J**	**7.6**	<0.00019
		10/13/2011 Dup	**4.5**	**5.4**	<0.00026	**0.027 J**	<0.010	**0.130 J**	**6.2**	<0.00019
		2/9/2012	**5.0**	**5.3**	<0.00026	**0.026 J**	<0.0015	**0.270 J**	**7.9**	<0.00019
		2/9/2012 Dup	**5.0**	**5.4**	<0.00026	**0.028 J**	**0.002 J**	<0.120	**7.8**	<0.00019
DMW-1s	Perched	4/4/2010	**2.7**	**16**	<0.010	NT	NT	0.71	**14**	NT
		4/4/2010 Dup	**4.1**	**12**	<0.010	NT	NT	0.67	**14**	NT
		7/1/2010	**3.0**	**15**	<0.010	<0.1	0.034	<0.5	**15**	NT
		2/3/2011	**2.6**	**18**	<0.0010	**0.69**	<0.010	<0.5	**15**	NT
DMW-2	Shallow	7/30/2009	NT	NT	**0.011**	**0.63**	<0.010	NT	**6.1**	NT
		9/2/2009	**8.3**	<5.0	<0.010	<0.10	<0.010	<0.50	**5.6**	NT
		1/7/2010	**6.7**	<5.0	<0.010	<0.10	<0.010	<0.50	**4.7**	NT
		4/13/2010	**7.7**	<5.0	<0.010	<0.10	<0.010	<0.50	**5.0**	NT
		7/1/2010	**7.0**	<5.0	<0.010	<0.1	<0.010	<0.50	**4.9**	NT
		2/3/2011	**5.7**	<5.0	<0.0010	<0.1	<0.010	<0.50	**4.1**	NT
		4/7/2011	**6.3**	**4.2**	<0.0010	<0.1	<0.020	<0.50	**5.4**	NT
		7/27/2011	**5.9**	**1.3**	**0.0055 J**	**0.021 J**	**0.0013 J**	<0.14	**3.9**	<0.00019
		10/13/2011	**4.7**	**0.740 J**	**0.0074**	**0.059 J**	**0.0025 J**	**0.290 J**	**3.0**	<0.00019
		2/9/2012	**5.1**	**3.4**	<0.00026	**0.041 J**	<0.0015	**0.350 J**	**3.4**	<0.00019
DMW-2s	Perched	4/7/2010	**25.0**	**5.8**	**0.76**	NT	**0.11**	1.7	**9.9**	NT
		7/1/2010	**10.0**	<5.0	**0.32**	0.14	0.025	1.4	**8.4**	NT
		2/3/2011	**3.9**	**5.8**	**0.17**	**4.3**	0.045	1.1	**6.7**	NT
DMW-3	Shallow	7/30/2009	NT	NT	<0.010	NT	NT	NT	NT	NT
		7/30/2009 DUP	NT	NT	<0.010	NT	NT	NT	NT	NT
		9/2/2009	**5.8**	<5.0	<0.010	<0.10	<0.010	<0.50	**3.8**	NT
		1/7/2010	**6.5**	<5.0	<0.010	<0.10	<0.010	<0.50	**5.4**	NT
		4/13/2010	**7.2**	<5.0	<0.010	**0.41**	0.01	<0.50	**4.1**	NT
		7/1/2010	**6.7**	<5.0	<0.010	**0.39**	<0.010	<0.50	**4.8**	NT
		2/3/2011	**7.3**	<5.0	<0.0010	<0.10	<0.010	<0.50	**4.6**	NT
		4/7/2011	**8.0**	<5.0	<0.0010	<0.1	<0.020	<0.50	**5.4**	NT
		7/27/2011	**7.6**	1.1 J	0.00044 J	<0.019	<0.0011	**0.14**	**5.1**	NT
		7/27/11 EB	<1.5	<0.46	<0.00019	<0.019	<0.0011	<0.14	<0.12	<0.00019
		10/13/2011	**6.4**	**0.470 J**	<0.00026	<0.026	**0.0015 J**	**0.130 J**	**4.2**	<0.00019
		10/13/2011 EB	<0.150	<0.460	<0.00026	<0.026	<0.0015	<0.120	**0.320 J**	<0.00019
		2/9/2012	**7.6**	**0.530 J**	<0.00026	<0.026	**0.002 J**	**0.320 J**	**5.2**	<0.00019
		2/9/2012 EB	<0.053	<0.400	<0.00026	<0.026	<0.0015	<0.120	<0.120	<0.00019
DMW-3s	Perched	4/7/2010	**4.2**	**15.0**	<0.010	NT	NT	<0.50	**13**	NT
		7/1/2010	**6.3**	**14.0**	<0.010	**4.4**	**0.030**	<0.50	**14**	NT
		2/3/2011	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NT

Notes:

All values expressed in milligrams per liter (mg/L)

2L Standard = North Carolina groundwater standards as promulgated by 15A North Carolina Administrative Code, Subchapter 2L.

NS- No Standard NT - Not Tested EB- Equipment Blank

"a" - indicates this value is currently a Interim Maximum Allowable Concentration (IMAC) and is enforceable under 15A NCAC 2L Standards.

Bold values indicate result is above Laboratory Reporting Limits

Bold and shaded only values indicate result is above the 2L standard.

Aquifer Type - Refers to either the perched aquifer or the shallow aquifer.

Table 1: Historical Summary of Metals and Other Inorganics in Ground Water, LMAC Area, Umicore, Maxton, North Carolina

Sample Location	Aquifer Type	Method	9056	9056	6010B/6020	6010B	6010B	6010B	6010B	6010B/ 6020
		Parameter	Chloride	Sulfate	Cobalt	Iron	Manganese	Potassium	Sodium	Thallium
		Date/2L Standard	250	250	0.001 a	0.3	0.05	NS	NS	0.0002a
DMW-4	Shallow	7/30/2009	NT	NT	**0.013**	NT	NT	NT	NT	NT
		9/2/2009	**6.1**	<5.0	<0.010	**0.67**	**0.018**	<0.50	**5.4**	NT
		1/7/2010	**5.4**	<5.0	<0.010	**0.12**	<0.010	**0.83**	**7.5**	NT
		4/13/2010	**5.5**	<5.0	<0.010	**0.13**	<0.010	**1.0**	**6.1**	NT
		7/1/2010	**5.1**	<5.0	<0.010	<0.10	<0.010	**1.8**	**5.7**	NT
		2/3/2011	**5.4**	<5.0	**0.0014**	**0.33**	<0.010	**1.2**	**4.8**	NT
		4/7/2011	**5.3**	<5.0	<0.0010	<0.10	<0.020	**1.7**	**5.5**	NT
		7/27/2011	**5.6**	**2.4**	**0.0016**	**0.024 J**	**0.0025 J**	**1.3**	**6.5**	<0.00019
		10/13/2011	**6.2**	**1.6**	<0.00026	<0.026	**0.0032 J**	**3.3**	**7.7**	<0.00019
		2/9/2012	**5.9**	**1.4**	**0.0011**	<0.026	**0.003 J**	**0.6**	**6.8**	<0.00019
DMW-4s	Perched	4/7/2010	NT	NT	**0.530**	NT	NT	**0.80**	**7.9**	NT
		7/1/2010	**5.4**	<5.0	**0.30**	**1.0**	**0.099**	**0.55**	**6.6**	NT
		2/3/2011	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NT
DMW-5s	Perched	4/7/2010	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NT
		7/1/2010	**7.5**	<5.0	**2.9**	**2.4**	**0.14**	**3.5**	**19**	NT
		2/3/2011	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NT
DMW-6s	Perched	4/7/2010	Dry	Dry	Dry	Dry	DRY	DRY	DRY	NT
		7/1/2010	**6.8**	**9.4**	**0.047**	**0.75**	**0.069**	**0.71**	**8.7**	NT
		2/3/2011	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NT
DMW-7s	Perched	4/7/2010	**16**	**7.0**	**4.6**	NT	NT	**27**	**20**	NT
		7/1/2010	**10**	**7.7**	**0.33**	**0.33**	**0.038**	**1.5**	**15**	NT
		2/3/2011	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NT
DMW-8s	Perched	2/3/2011	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NT
P-1	Perched	3/3/2009	**6.0**	**15.0**	**0.02**	**3.4**	**0.064**	NT	**28.0**	NT
		6/18/2009**	**5.4**	**7.7**	**0.026**	**2.9**	**0.085**	NT	**15.0**	NT
P-2	Perched	3/3/2009	**13.0**	**16.0**	**1.6**	**14.0**	**0.38**	NT	**51.0**	NT
		6/18/2009**	**5.0**	**8.5**	**0.9**	**0.34**	**0.048**	NT	**6.3**	NT
P-3	Perched	3/3/2009	<1.0	**5.5**	**0.014**	**0.7**	**0.075**	NT	**2.4**	NT
		6/18/2009**	**3.0**	<5	<0.010	<0.10	<0.010	NT	**13.0**	NT
P-4	Perched	3/3/2009**	**1.5**	**7.3**	**0.049**	**0.85**	**0.11**	NT	**7.7**	NT
P-7	Perched	6/18/2009**	**10.0**	**14.0**	<0.010	**10.0**	**0.18**	NT	**10.0**	NT

Notes:

All values expressed in milligrams per liter (mg/L)

2L Standard = North Carolina groundwater standards as promulgated by 15A North Carolina Administrative Code, Subchapter 2L.

NS- No Standard NT - Not Tested

"a" - indicates this value is currently a Interim Maximum Allowable Concentration (IMAC) and is enforceable under 15A NCAC 2L Standards.

Shaded values indicate result is above Laboratory Reporting Limits

Bold and shaded only values indicate result is above the 2Lstandard.

Aquifer Type - Refers to either the shallow unconfined (i.e., perched water table zone), intermediate, or deep aquifer zones that have been identified thus far.

** - Indicates well was abandoned following sampling on the date shown. P-1, P-2, P-3, P-4 and P-7 were abandoned by S&ME.

Appendix A

REC PROGRAM DOCUMENT CERTIFICATION FORM - PAGE 1 OF 2
IHSB SITE NAME Umicore Maxton
DATE & NAME OF DOCUMENT 2/29/12 Proposal for Concurrence of Contaminant Remedy LMAC Area
TYPE OF SUBMITTAL (circle all that apply): (Report) Work plan, Work Phase Comp. Statement, Schedule Change

REMEDIATING PARTY DOCUMENT CERTIFICATION STATEMENT (.0306(B)(2))

"I certify under penalty of law that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certification, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information."

Umicore USA Inc
Name of Remediating Party

R C
Signature of Remediating Party

3-14-12
Date

NOTARIZATION

North Carolina (Enter State)

Wake **COUNTY**

I, Cynthia F. Dietrich, a Notary Public of ~~said~~ Granville County and State, do hereby certify that Richard Laird did personally appear and sign before me this day, produced proper identification in the form of NC driver license, was duly sworn or affirmed, and declared that, to the best of his or her knowledge and belief, after thorough investigation, the information contained in the above certification is true and accurate, and he or she then signed this Certification in my presence.

WITNESS my hand and official seal this 14th day of March, 2012.

Cynthia F. Dietrich
Notary Public (signature)

(OFFICIAL SEAL)

My commission expires: 7/23/2015

CYNTHIA F. DIETRICH
NOTARY PUBLIC
GRANVILLE COUNTY
STATE OF NORTH CAROLINA
MY COMMISSION EXPIRES 7-23-2015

REC PROGRAM DOCUMENT CERTIFICATION FORM - PAGE 2 OF 2
IHSB SITE NAME Umicore Maxton
DATE & NAME OF DOCUMENT 2/29/12 Proposal for Concurrence of Contaminant Remedy LMAC Area
TYPE OF SUBMITTAL (circle all that apply): (Report,) Work plan, Work Phase Comp. Statement, Schedule Change

REGISTERED SITE MANAGER CERTIFICATION OF SIGNATURES

As the Registered Environmental Consultant for the Site for which this filing is made, I certify that the signatures included herewith are genuine and authentic original handwritten signatures and/or true, accurate, and complete copies of the genuine and authentic original handwritten signatures of the persons who purport to sign for this filing. I further certify that I have collected through reliable means the originals and/or copies of said signatures from the persons authorized to sign for this filing who, in fact, signed the originals thereof. Those persons and I understand and agree that any copies of signatures have the same legally binding effect as original handwritten signatures, and I certify that any person for whom I am submitting a copy of their signature has provided me with their express consent to submit said copy. Additionally, I certify that I am authorized to attest to the genuineness and authenticity of the signatures, both originals and any copies, being submitted herewith and that by signing below, I do in fact attest to the genuineness and authenticity of all the signatures, both originals and copies, being submitted for this filing.

David L. Duncklee
Name of Registered Site Manager

Signature of Registered Site Manager

3/15/12
Date

REGISTERED SITE MANAGER DOCUMENT CERTIFICATION STATEMENT (.0306(b)(1))

"I certify under penalty of law that I am personally familiar with the information contained in this submittal, including any and all supporting documents accompanying this certification, and that the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete and complies with the Inactive Hazardous Sites Response Act G.S. 130A-310, et seq, and the remedial action program Rules 15A NCAC 13C .0300. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information."

David L. Duncklee
Name of Registered Site Manager

Signature of Registered Site Manager

3/15/12
Date

NOTARIZATION

NC (Enter State)

Wake **COUNTY**

I, Nina K Jarrad, a Notary Public of said County and State, do hereby certify that David Duncklee did personally appear and sign before me this day, produced proper identification in the form of NCDL, was duly sworn or affirmed, and declared that, he or she is the duly authorized environmental consultant of the remediating party of the property referenced above and that, to the best of his or her knowledge and belief, after thorough investigation, the information contained in the above certifications is true and accurate, and he or she then signed these Certifications in my presence.

WITNESS my hand and official seal this 15th day of March, 2012

Notary Public (signature)

(OFFICIAL SEAL)

NINA K JARRAD NOTARY PUBLIC WAKE COUNTY, NC

My commission expires: June 15th 2013

Document Certification Form No. DC - II
(Revised 8/11)

Appendix C