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SITE-WIDE
EXPLANATION OF SIGNIFICANT DIFFERENCES

**MODIFYING THE DECISIONS FOR THE SEDIMENT, FLOODPLAIN / WETLAND
AND SOURCE CONTROL OPERABLE UNITS**

FIELDS BROOK SUPERFUND SITE - ASHTABULA, OHIO

I. INTRODUCTION

The Fields Brook Site (Site) is located in northeast Ohio, in Ashtabula County, approximately 55 miles east of Cleveland, Ohio. The U.S. Environmental Protection Agency (U.S. EPA) is the lead agency for conducting the remedial action at the Site under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. Section 9601, *et seq.* This "site-wide" Explanation of Significant Differences (ESD) modifies the cleanup decisions made in the three Records of Decisions (RODs) previously issued for the Site to address the contamination in Fields Brook sediment, floodplain/wetland soils, and contaminated areas within the watershed that have the potential to recontaminate Fields Brook.

The U.S. EPA issued a Record of Decision (ROD) on September 30, 1986, which outlined the remedy selection process and the selected clean-up action for the Sediment Operable Unit (SOU) of the Site. Since that time, additional investigation was performed at the Site to identify the sources of contamination and determine to what extent the contamination in the brook sediment has moved into the floodplain/wetland soils adjacent to Fields Brook. In 1997, the U.S. EPA signed RODs for the Source Control Operable Unit and the Floodplain/Wetland Operable Unit and modified the requirements of the Sediment Operable Unit with an Explanation of Significant Differences (ESD).

After issuance of the two 1997 RODs (for the Source Control Operable Unit and the Floodplain/Wetland Operable Unit) and the ESD for the Sediment Operable Unit, progress on the Fields Brook project continued as the project moved into the Remedial Design phase. When the Remedial Design for the cleanup of the Fields Brook sediment and the Floodplain/Wetland soils was at the 90% complete stage, the U.S. EPA received information regarding radionuclide data. In January 1998, Dr. Michael Ketterer, then a researcher with John Carroll University, submitted a grant proposal requesting funds from the Great Lakes National Program Office (GLNPO) to continue his study of radionuclide contamination in Ashtabula River. As the grant proposal was being reviewed by GLNPO, a copy of the data was provided to the U.S. EPA Region 5 Superfund Division for review. After a review of Dr. Ketterer's radionuclide sampling data, the U.S. Superfund staff decided to re-review the historical radionuclide data for Fields Brook. Based on that review of historical radionuclide data from the Fields Brook Site, the U.S. EPA determined that there was a likely source of additional radioactivity, the Millennium TiCl₄ facility. The Millennium TiCl₄ facility is not subject to regulation, in terms of radionuclides, but

utilizes ores that inherently have elevated levels of radionuclides. During the processing of these ores, radionuclide levels can be concentrated in the waste materials. During the Remedial Investigation, concerns about radiation had always centered on RMI Extrusion, where a cleanup is underway in conjunction with the U.S. Department of Energy and the Nuclear Regulatory Commission (NRC). Millennium was not considered as a possible source of radionuclides to the brook, and the U.S. EPA did not conduct or require site-wide analyses for radium because radium was not a radionuclide that would have been present at levels of any significance at the RMI Extrusion facility.

Although the Millennium facility had already been slated for cleanup under the Source Control Operable Unit ROD due to PCB contamination, U.S. EPA was concerned about the possible presence of radionuclides at the Millennium facility and in Fields Brook. Superfund staff researched the status of NORM wastes in Ohio and identified preliminary Applicable or Relevant and Appropriate Requirements (ARARs) that would guide any action at the Millennium facility and in Fields Brook. See Appendix A for a table summarizing ARARs associated with radionuclides that have been identified for the Fields Brook site. From July 27 to July 29, 1998, the U.S. EPA and the Fields Brook PRPs conducted a joint sampling effort to determine the levels of radionuclides in the Millennium $TiCl_4$ mining residual pile and in the soils and sediment along Fields Brook. The sampling was conducted to identify areas with elevated levels of radionuclide contamination and thus led to results that were biased high. U.S. EPA's samples were sent to the U.S. EPA National Air and Radiation Environmental Laboratory (NAREL) lab in Montgomery, Alabama.

The results of the sampling (see Appendix B for figures and summary tables) identified unacceptable levels of radionuclides from the uranium and thorium chains (specifically radium-226, radium-228, and thorium-228) at the Millennium facility and in Floodplain/Wetland soils near the Millennium facility. Levels of radium and thorium in Fields Brook sediment appeared relatively low, but were above what would be expected for background. U.S. EPA has determined that radionuclides should be added as contaminants of concern for the cleanup of the Millennium facility and for the Fields Brook sediment and the Floodplain/Wetland soils. In addition, because of the presence of radionuclides, specific components of the remedial action should be modified for soils and sediment that contain radium:

- ▶ Commercial thermal treatment (incineration) is not appropriate for sediment that contains levels of radionuclides above background. For sediment with background levels of radionuclides, off-site thermal treatment will proceed as previously planned. For sediment with levels of radionuclides above background, the sediment will be solidified to minimize the mobility of contaminants (i.e. hexachlorobenzene) prior to disposal in the on-site landfill. The design of the stabilization mixture will also consider possible additives to chemically stabilize contaminants during the solidification process. Containment is an appropriate mechanism to address radionuclide-contaminated soil and sediment.

- ▶ The design of the on-site landfill that will be built to contain site soils and sediment from the SOU, the Floodplain/Wetlands Area (FWA) and some source-control areas will be upgraded with the addition of clay to both the landfill base and cover. Monitoring wells around the landfill will be routinely sampled, and the samples will be analyzed for radionuclides. Air monitoring will be performed at the landfill to ensure that levels of radon gas emanating from the landfill do not present any risk to human health.
- ▶ Although the Ashtabula River Partnership has not yet resolved all of the disposal issues related to the dredged sediments from the Ashtabula River, it is likely that the proposed disposal location for river sediments regulated by the Toxic Substances Control Act (TSCA) would be the Fields Brook on-site landfill. If this approach is pursued, the size of the on-site landfill would be increased to provide sufficient capacity for the acceptance of some or all of this material.
- ▶ For residential areas of Fields Brook, additional soil and sediment will be excavated from the site to meet the residential/recreational radium cleanup level of 5 picocuries per gram (pCi/g) above background, for combined levels of radium-226 and radium-228. In residential areas of Fields Brook, possible exposure to brook soils and sediment is primarily recreational and the 5 pCi/g above background cleanup level would result in residual exposures within U.S. EPA's acceptable risk range. This residential cleanup level satisfies the requirements of 40 CFR Part 192. By addressing the radium-226 and radium-228 contamination, the cleanup will also address the low-level thorium contamination which is present in areas of radium contamination. In addition, while the 5 pCi/g above background radium cleanup level was developed to ensure that the cleanup in residential areas of Fields Brook will be protective of human health, the remedial action will aim to reach levels as low as reasonably achievable (ALARA) during field excavation activities.
- ▶ For industrial areas of Fields Brook and the Millennium TiCl_4 facility, additional soil and sediment will be excavated from the site to meet the industrial radium cleanup level of 10 pCi/g above background, for combined levels of radium-226 and radium-228. In industrial areas of Fields Brook and especially in the FWA, exposure to soils and sediment is currently very limited and, in the future, any exposure would likely be occupational. The radium cleanup level of 10 pCi/g above background would result in possible future exposures within U.S. EPA's acceptable risk range. This risk-based cleanup level is considered a "supplemental standard" and satisfies the requirements of 40 CFR Part 192. By addressing the radium-226 and radium-228 contamination, the cleanup will also address the low-level thorium contamination which is present in areas of radium contamination. In addition, while the 10 pCi/g above background radium cleanup level was developed to ensure that the cleanup in industrial areas of Fields Brook will be protective of human health, the remedial action will aim to reach levels as low as reasonably achievable (ALARA) during field excavation activities.

- ▶ U.S. EPA has reevaluated the uranium cleanup levels previously selected for the site and has determined that the previous uranium cleanup levels are not sufficiently protective.

U.S. EPA is now setting the uranium cleanup level as 30 pCi/g for total uranium (U-234, U-235, U-238), consistent with the cleanup level established by the Nuclear Regulatory Commission (NRC) for the RMI Extrusion facility adjacent to Fields Brook. This modification is not anticipated to result in a significant increase in the volume of material to be remediated.

As none of these significant differences are considered to be fundamental changes to the RODs, U.S. EPA has determined that no public comment period is required. However, U.S. EPA issued a Fact Sheet and held an informational meeting on November 19, 1998, to discuss the changes noted herein.

This document shall become part of the Administrative Record file, which is available for viewing at the Ashtabula County District Library, 335 West 44th Street, Ashtabula, Ohio, and at U.S. EPA's Records Center, 77 West Jackson Blvd., Chicago, Illinois, during normal business hours.

II. SITE HISTORY

A. General

Fields Brook drains a six square mile watershed including an industrial area where manufacturing activities ranging from metal fabrication to chemical production have occurred over the past 50 years (see Figure 1). Sediments of the brook are contaminated with polychlorinated biphenyls (PCBs), chlorinated benzene compounds, chlorinated solvents, hexachlorobutadiene, polyaromatic hydrocarbons (PAHs), arsenic, chlorinated ethenes (solvents), chromium, arsenic, other organic and inorganic hazardous substances, and uranium and thorium-related radionuclides.

The industrial zone of Ashtabula is concentrated around Fields Brook and is comprised of several chemical industries and waste disposal sites. Manufacturing has occurred since the early 1940's in this area. Activities including metal fabrication, production of complex chemical products, and ore processing occurred on approximately 18 separate industrial properties, and the decades of industrial activity along Fields Brook and its tributaries resulted in the release of chemical contamination to the Fields Brook watershed.

The Site was placed on the National Priorities List (NPL) for hazardous waste sites on September 8, 1983. The site consists of Fields Brook, its tributaries, and any surrounding areas which contribute, potentially may contribute, or have contributed to the contamination of the brook and its tributaries. The Site is a multi-source site and involves multiple media, including soil, sediment, groundwater and surface water.

For purposes of site investigation, the U.S. EPA divided the Site into three "operable units." The Sediment Operable Unit (SOU) involves the cleanup of contaminated sediment in Fields Brook and its tributaries. The Floodplain/Wetland Area (FWA) Operable Unit involves the cleanup of contaminated soils and sediments in the floodplain which are located within the 100-year floodplain area surrounding Fields Brook and outside of the channel and sideslope areas of Fields Brook. The Source Control Operable Unit (SCOU) involves the location and cleanup of sources of contamination to Fields Brook to prevent recontamination of Fields Brook and the Floodplains/Wetland Area. Since the commencement of Remedial Design activities at the SCOU areas of contamination, the SCOU has been further broken down into facility-specific operable units in order to better track project milestones and billing costs.

B. Sediment Operable Unit

Between April 1983 and July 1986, the U.S. EPA performed a Remedial Investigation/Feasibility Study (RI/FS) for the Sediment Operable Unit. U.S. EPA completed the RI Report in March 1985 and the FS report in July 1986. The RI included a baseline human health risk assessment which demonstrated human health risks for the Brook sediment. The FS Report described several alternatives for remedial action of the SOU. The U.S. EPA issued a ROD for the SOU in September 1986 detailing a cleanup remedy that U.S. EPA determined to be necessary for the Fields Brook sediments. Based on predesign work conducted by the PRPs (with oversight by U.S. EPA and the U.S. Army Corps of Engineers), the U.S. EPA issued an Explanation of Significant Differences in August 1997 to refine the work to be performed as part of the Fields Brook sediment cleanup.

C. Floodplain/Wetland Operable Unit

The 1985 Remedial Investigation of the SOU included a baseline human health risk assessment which demonstrated human health risks not only for exposure to the brook sediment, but also exposure to soils in the floodplain area adjacent to Fields Brook. In 1993, the PRPs initiated a voluntary assessment of the nature and extent of contamination in the Floodplain/Wetland Area of the Fields Brook riparian corridor. The PRPs conducted three rounds of FWA soil sampling, additional flora and biota sampling and field investigations, and a wetland survey which identified the size and location of wetlands that could be affected by the Fields Brook cleanup. The PRPs investigation of the FWA was conducted under the oversight of U.S. EPA and the U.S. Army Corps of Engineers and was completed by the spring of 1995. After completion of the site investigation, the PRPs prepared a Feasibility Study to evaluate cleanup alternatives. The Feasibility Study report was finalized in October 1996. In July 1997, U.S. EPA issued the ROD for the FWA Operable Unit.

D. Source Control Operable Unit

Because it was recognized that the cleanup of the Fields Brook sediment should not be performed unless the source(s) of contamination are addressed prior to the cleanup, the U.S. EPA required

the PRPs to investigate the industrial area of Ashtabula. From 1992 to 1995, the PRPs evaluated 94 properties in the Fields Brook watershed to determine whether the properties could cause future recontamination once the Brook cleanup is underway. Contamination could be caused by discharges from pipes, the movement of contaminated soil or sediment during rainstorms, and subsurface releases to the brook from flowing groundwater. As a result of the source control evaluation, the U.S. EPA identified five industrial properties as possible sources of recontamination to Fields Brook. The industrial properties include Detrex Corporation, Millennium Plant II TiCl₄ (formerly SCM), Acme Scrap Iron and Metal, RMI Metals, and Conrail. In addition, several sewer systems located to the north and south of Fields Brook were also found to be potential sources of contamination. Detailed information about the types and extent of contamination at the source areas can be found in the Source Control Remedial Investigation Report, which was approved by U.S. EPA in May of 1997.

In conjunction with the preparation of the Source Control Remedial Investigation report, the PRPs prepared a Source Control Feasibility Study to identify and evaluate cleanup alternatives. The Source Control Feasibility Study was finalized in June, 1997. The report describes the initial screening of alternatives, the identification of a range of remedial alternatives, and the detailed analysis of the assembled alternatives for each of the five properties and the sewer systems. Because this ESD deals with a modification of only one of the six source control areas, further discussion of the Source Control Operable Unit will be limited to the Millennium Inorganic Chemicals TiCl₄ facility.

E. Enforcement

After the 1997 issuance of the two RODs (for floodplain/wetlands and source control) and the ESD for the Sediment Operable Unit, progress on the Fields Brook project continued. In December of 1997, the U.S. EPA issued 7 Unilateral Administrative Orders (UAO). One UAO was to the broad group of PRPs responsible for the Sediment and Floodplain/Wetland contamination. This UAO required the PRPs to prepare the design for the cleanup and conduct the cleanup consistent with the SOU ROD, the SOU ESD and the FWA ROD. The SOU and FWA designs were combined for practical reasons, because it makes sense to remove the contaminated soils next to the brook at the same time that the brook sediment is excavated. The other six UAOs were sent to PRPs responsible for the individual source control properties, including Millennium.

III. Description of RODs to be Modified By This ESD

A. General

The discovery of unacceptable levels of radionuclides at the Millennium Inorganic Chemical Company TiCl₄ facility requires the modification of the facility's cleanup plan. Since some of the radionuclide contamination has eroded into Floodplain/Wetland soils adjacent to the brook and, to some extent, into the brook itself, the Sediment and Floodplain/Wetland RODs also must

be modified. Although the previous section (Section II) of this ESD discusses the Operable Units in an order that is most appropriate for a historical summary of activities at the site, the discussion of Operable Units will now be ordered in such a way that the discussion logically tracks the movement of the radionuclide contamination from the Millennium $TiCl_4$ facility and identifies the changes required to modify the current cleanup plans.

B. Source Control Operable Unit - Millennium Inorganic Chemicals

The Source Control ROD for Millennium requires the excavation of soils with 50 ppm or greater total PCBs. The excavated soils are to be disposed in either an on-site TSCA-equivalent landfill or sent off-site to a TSCA-approved disposal facility. The landfill that is to be constructed by the PRPs at the property now known as RMI Sodium will meet the requirements of TSCA. See Figure 2 for the location of the landfill that will be built to accommodate excavated material from the Fields Brook cleanup. For the remaining soils at the Millennium facility (with PCB levels less than 50 ppm), the ROD requires Millennium to cover and contain the soils in order to prevent the erosion of the material into Fields Brook. Regular inspection of the cover would be required to ensure that the contaminated soil is sufficiently contained and is not eroding off-site.

After issuance of a Unilateral Order to Millennium that required the preparation of the Remedial Design and the performance of the Remedial Action (cleanup), the company informed the U.S. EPA that it wanted to exceed the requirements of the ROD and remove virtually all of the PCB-contaminated soil from the property. This offer to perform the additional excavation was contingent upon U.S. EPA's acceptance of Millennium's process waste landfill (see Figure 3) as a disposal site for Millennium's PCB-contaminated soil. The U.S. EPA Region 5 TSCA office conducted the requested review and determined that the design is acceptable for the disposal of PCB-contaminated soils from the Millennium property. This approval of Millennium's process waste landfill is contingent upon Millennium committing to some additional administrative and monitoring requirements and the addition of a 30-mil flexible membrane liner (FML) over the area which will contain TSCA-regulated material. Thus, the cleanup of the Millennium facility has been greatly simplified to one of excavation of contaminated soil, with disposal in Millennium's own process waste landfill.

C. Floodplain/Wetland Operable Unit

For industrial areas of Fields Brook, the Floodplain/Wetland ROD requires the excavation of all soil in industrial areas with 50 ppm or greater total PCBs and/or over 200 ppm hexachlorobenzene (HCB). For residential areas of Fields Brook, the ROD requires the excavation and disposal of all soil with total PCB contamination above 30 ppm and HCB contamination above 80 ppm. For soil in residential areas of Fields Brook with between 6 and 30 ppm total PCBs, the ROD requires a 6-inch hydric-compatible soil cover to reduce the erosion of the material into Fields Brook.

In addition to outlining the required cleanup of contaminated Floodplain/Wetland soils, the

Floodplain/Wetland ROD identifies the requirements of the on-site landfill to be built at the property now known as RMI Sodium to accommodate excavated sediment and soil from the Fields Brook Site.

D. Sediment Operable Unit

The Sediment Operable Unit ROD, as modified by the 1997 ESD, requires the excavation of sediment that exceeds "confidence removal goals" for PCBs, HCB and other contaminants found at unacceptable levels in the brook. The cleanup will include off-site thermal treatment (incineration) of sediment that contains greater than 50 ppm total PCBs and the thermal treatment of sediments with high potential for contaminant mobility (with a soil/water partition coefficient (koc) of below 2400). Excavated sediment not requiring thermal treatment will be placed in an on-site TSCA-equivalent landfill that is to be built at the property now known as RMI Sodium.

IV. Modifications Required By This ESD

A. General Discussion of Radionuclide Cleanup Levels

The additional cleanup of radionuclides required under this ESD is based on an evaluation of site risks based on occupational exposures to site soils and sediment in the industrial areas of Fields Brook and recreational exposure to site soils and sediment in the residential areas of Fields Brook. 40 CFR Part 192 ("Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings") is relevant and appropriate for the cleanup at the Fields Brook Superfund Site and requires a radium cleanup level for combined radium-226 and radium-228 concentrations of 5 pCi/g above background for surface soils in occupied areas, or the calculation of supplemental risk-based standards. 40 CFR Part 192 allows the use of a 15 pCi/g standard for subsurface soils; however, U.S. EPA has made the determination that the 15 pCi/g standard is not health-based and instead recommends the use of the 5 pCi/g standard for all soils in occupied areas, regardless of depth.

The 5 pCi/g above background standard being set by this ESD for soils and sediment in residential areas of Fields Brook is based on an assessment of site risks, and is consistent with the 5 pCi/g above background standard established as the default radium cleanup value. Furthermore, by addressing the radium-226 and radium-228 contamination, the cleanup will also address the low-level thorium contamination which is present in areas of radium contamination. While the 5 pCi/g above background radium cleanup level was developed to ensure that the cleanup in residential areas of Fields Brook will be protective of human health, the remedial action will aim to reach levels as low as reasonably achievable (ALARA) during field excavation activities.

The cleanup level for industrial areas of Fields Brook is set at 10 pCi/g above background for combined concentrations of radium-226 and radium-228. The 10 pCi/g above background industrial cleanup level established for radium at the Fields Brook site is greater than the default

5 pCi/g above background standard in 40 CFR Part 192, but satisfies U.S. EPA's risk requirements (and the supplemental risk-based requirements of 40 CFR Part 192) under a realistic evaluation of future land use and human exposure. An evaluation of possible future risk based on industrial exposure assumptions estimated that the risk of long-term exposure to soils and sediments with residual radium levels of 10 pCi/g above background was between 1.8×10^{-4} and 2.4×10^{-4} . This risk is at the upper bound of U.S. EPA's acceptable risk range but is consistent with levels generally considered protective in other governmental actions, particularly regulations and guidance developed by U.S. EPA in other radiation control programs. In addition, the upper boundary of U.S. EPA's acceptable risk range is not a discrete line at 1×10^{-4} . A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions. U.S. EPA believes that after the completion of the remedial action at Fields Brook, the actual residual level of radium contamination will average below 10 pCi/g above background because excavation will also have been performed to address non-radionuclide chemical contamination (such as PCBs) in areas where radium contamination levels are elevated but below the cleanup level. In addition, while the 10 pCi/g above background radium cleanup level was developed to ensure that the cleanup will be protective of human health, the remedial action will aim to reach levels as low as reasonably achievable (ALARA) during field excavation activities. Therefore, after cleanup, the resulting level of residual contamination will correspond to possible long-term risk levels within U.S. EPA's acceptable risk range. Furthermore, by addressing the radium-226 and radium-228 contamination, the cleanup will also address low-level thorium contamination which is present in areas of radium contamination.

Another important issue to note in the development of radium cleanup levels is U.S. EPA's decision to consider soils and sediment as generally equivalent for the calculation of radionuclide cleanup levels. This decision was based on characteristics specific to the Fields Brook site. In many locations and during much of the year, the depth of Fields Brook is very shallow. Although some commenters may argue that the presence of the water, though limited, could provide a deterrence to enter the brook and come into contact with brook sediment, U.S. EPA believes that area's physical characteristics make the brook more attractive to children and young adults. Furthermore, there is dense vegetation in the floodplain areas along-side the brook. Because of this vegetation, the easiest way to walk through in a large portion of the Fields Brook watershed is to enter the brook and walk in the sediments. For these reasons, sediment and soil cleanup levels are considered equal from a risk management perspective.

The Ohio Department of Health Bureau of Radiation Protection is the designated radiation control agency for the State of Ohio (Ohio Revised Code §3748.02). Development of the residential and industrial radium cleanup levels was coordinated with the Ohio Department of Health Bureau of Radiation Protection.

B. Source Control ROD - Millennium Inorganic Chemicals

In order to address the presence of radionuclides in site soils at the Millennium facility (especially in the Mining Residual Pile), this ESD establishes a cleanup level for radium in

industrial areas of Fields Brook. For the Millennium facility, which is in an industrial area, the cleanup level is set at 10 pCi/g above background for combined radium-226 and radium-228. Soils (including mining residual) exceeding the radium cleanup level shall be excavated and properly managed for disposal. Excavation of all soil exceeding the cleanup level is required, regardless of the depth of contamination. Excavated soil shall be placed in either the on-site landfill (to be constructed at what is now RMI Sodium) or in Millennium's existing process waste landfill. The Millennium process waste landfill has received preliminary approval from U.S. EPA for the on-site disposal of TSCA-regulated soil. U.S. EPA has also reviewed the Millennium landfill design and has determined that the landfill is acceptable for the disposal of the Millennium soil containing radionuclides. Groundwater at the selected landfill shall be routinely monitored for radionuclides. Groundwater contaminant concentrations at the points of compliance shall not exceed Maximum Contaminant Levels (MCLs). Leachate from the landfill shall be collected and monitored to evaluate the extent of contaminant leaching from the excavated material contained within the landfill. Air quality and radon gas emanation rates at the landfill shall be regularly monitored over the surface of the landfill and at the perimeter of the property to identify any possible exceedances of air quality due to radon gas emissions. Maintenance of the landfill and performance of air, leachate and groundwater monitoring will extend for a minimum of 30 years, and will continue beyond 30 years as necessary to ensure that the landfill is securely containing wastes and that there are no unacceptable releases to the environment.

Should the landfill selected for disposal not sufficiently contain the chemical and radionuclide contamination or unacceptable levels are found to be leaching to groundwater, U.S. EPA may require follow-up actions which could include (but are not limited to) one or more of the following:

- ▶ construction of a slurry wall around the landfill to restrict the flow of groundwater;
- ▶ extraction, treatment and disposal of contaminated groundwater;
- ▶ modification of the landfill cover; and/or
- ▶ increased frequency of monitoring.

In addition to requiring the excavation and disposal of contaminated soil from the Millennium TiCl_4 facility, U.S. EPA will evaluate the hydraulic conductivity of Millennium soils and the partitioning characteristics of radium and determine whether groundwater at the Millennium TiCl_4 facility should be sampled to determine if the Mining Residual Pile has resulted in radionuclide groundwater contamination in the vicinity of the Millennium facility. If radium contamination is found in the groundwater at levels requiring action, U.S. EPA will require that additional work be performed to address any threat to human health and the environment.

C. Floodplain/Wetland ROD

Radium contamination from the Millennium TiCl_4 facility has eroded into Floodplain/ Wetland soils and Fields Brook sediment. High water events have extended the radionuclide contamination into downgradient Floodplain/Wetland Areas of the site. This ESD establishes

both residential and industrial cleanup levels for radium. The cleanup level is to be applied to the combined level of radium-226 and radium-228. For residential portions of the Floodplain/Wetland Area, the cleanup level is 5 pCi/g above background. For industrial areas of the Floodplain/Wetland Area, the radium cleanup level is set at 10 pCi/g above background. The design for the cleanup of Fields Brook shall be modified to require excavation of soils with radionuclide contamination in excess of the cleanup level. Excavation is required for all FWA soils exceeding the radium cleanup level, regardless of the depth of contamination.

This ESD also adds additional requirements for the landfill to be constructed to contain site sediment and soils. An additional 3 feet of compacted clay (with a permeability of less than 1×10^{-7} cm/sec) is required for the base of the landfill. An additional 2 feet of clay (of equivalent permeability) is required for the landfill cover. This additional clay is required due to the addition of radionuclide-contaminated material, the addition of sediments that would otherwise have been incinerated due to their organic content (see Section IV D below), and the results of the Consolidation/Landfill Area Siting Report prepared by the PRPs. Groundwater around the landfill shall be routinely monitored for radionuclides (in addition to the monitoring required for chemical contamination). Groundwater contaminant concentrations at the points of compliance shall not exceed Maximum Contaminant Levels (MCLs). Leachate from the landfill will be collected and analyzed to determine to what extent contamination is leaching from the soil and sediment contained within the landfill. Air quality and radon emanation rates over the landfill and at the perimeter of the landfill property shall be monitored for the presence of radon gas. Maintenance of the landfill and performance of air, leachate and groundwater monitoring will extend for a minimum of 30 years, and will continue beyond 30 years as necessary to ensure that the landfill is securely containing wastes and that there are no unacceptable releases to the environment.

Although the Ashtabula River Partnership has not yet resolved all of the disposal issues related to the sediments to be dredged from the Ashtabula River, it is likely that the proposed disposal location for TSCA-regulated river sediments will be the Fields Brook on-site landfill. If this approach is pursued, the size of the on-site landfill would be increased to provide sufficient capacity for the acceptance of some or all of this material.

Should the landfill not sufficiently contain the chemical and radionuclide contamination and unacceptable levels are found to be leaching to groundwater, U.S. EPA may require follow-up action(s) which could include (but is not limited to) one or more of the following:

- ▶ construction of a slurry wall around the landfill to restrict the flow of groundwater;
- ▶ extraction, treatment and disposal of contaminated groundwater;
- ▶ modification of the landfill cover; and/or
- ▶ increased frequency of monitoring;

As part of the overall evaluation of radionuclide contamination within the Fields Brook watershed, the U.S. EPA has reevaluated the radionuclide levels previously selected for the site and has determined that the previous uranium cleanup levels are not sufficiently protective. This

ESD sets the uranium cleanup level for soils as 30 pCi/g for total uranium (U-234, U-235, U-238), consistent with the cleanup level established by the Nuclear Regulatory Commission (NRC) for the RMI Extrusion facility adjacent to Fields Brook. This modification is not anticipated to result in a significant increase in the volume of material to be remediated.

D. Sediment Record of Decision

This ESD establishes radionuclides as contaminants of concern for Fields Brook sediment. For residential areas of Fields Brook, the cleanup level in sediment shall be 5 pCi/g above background for combined radium-226 and radium-228, consistent with the requirements of 40 CFR 192. For industrial areas of Fields Brook, U.S. EPA has developed a risk-based supplemental standard to 40 CFR Part 192, and has established the cleanup level for sediment in industrial areas of Fields Brook at 10 pCi/g above background for combined radium-226 and radium-228. The design for the cleanup of Fields Brook shall be modified to require excavation of sediments with radionuclide contamination in excess of the cleanup level.

The sediment (SOU) ROD (as modified by the 1997 ESD) requires the incineration of sediment with greater than 50 ppm total PCBs and/or the presence of highly mobile organic contaminants. Because of the presence of radium and low-levels of other radionuclides in the Fields Brook sediment, U.S. EPA has determined that it is inappropriate to incinerate this material in a commercial thermal treatment facility. Sediment that cannot be incinerated because radionuclide levels are above background shall instead be solidified to minimize the mobility of contaminants (such as hexachlorobenzene and hexachlorobutadiene) and placed in the on-site landfill. The design of the solidification mixture shall also consider possible additives that could further reduce mobility by chemically stabilizing organic contaminants.

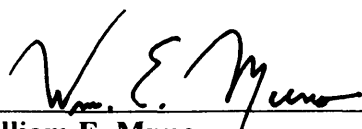
Levels of PCBs in the sediment are consistent with levels of PCBs in soils already planned for disposal from the Millennium $TiCl_4$ facility. Thus, conceptually, this modification does not place in a landfill higher levels of PCB contamination than are allowed by existing Agency cleanups planned for the site. Levels of other types of organic contamination in the landfill will be at higher levels than originally planned. The presence of the additional organic contamination is addressed by the stabilization of the most contaminated sediment prior to landfilling and the addition of 3 feet of clay in the base and 2 feet of clay in the cap of the landfill. The stabilization will reduce the leachability of contaminants. This clay in the cap will reduce infiltration into the soil and sediment contained within the landfill. The additional clay in the base of the landfill will provide a barrier to the movement of contamination. Leachate from the landfill will be extracted and monitored to determine if contamination is leaching from the soils and sediments contained within the landfill. Extracted leachate will be sampled and treated and/or disposed consistent with ARARs. Routine monitoring of the groundwater will be performed to ensure that the landfill design and leachate removal is containing the organic, inorganic and radionuclide contamination. Air monitoring will be performed to ensure that there are no unacceptable releases to the atmosphere.

Although it is possible that some of the sediment that will be placed in the landfill will be characteristically hazardous due to leaching of organic contamination, land disposal restrictions (LDRs) do not apply to this action. This ESD modifies a ROD dated September 30, 1986, prior to the first statutory deadline for solvent wastes established pursuant to 40 CFR 268.40-43. U.S. EPA has evaluated whether it is appropriate to apply LDRs to the site at this time and has determined that, because the sediment remedy (as modified by this ESD) is protective, it is not necessary to apply ARARs enacted after issuance of the Record of Decision. The sediment remedy includes containment of waste in a double-lined landfill that includes a leachate detection and a leachate collection system. The landfill will be constructed on-site, meets the technical requirements of a RCRA facility and is similar to a Corrective Action Management Unit (CAMU). Groundwater monitoring will be conducted to verify that the landfill is successfully containing the waste.

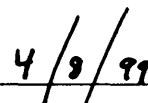
As part of the overall evaluation of radionuclide contamination within the Fields Brook watershed, the U.S. EPA has reevaluated the radionuclide levels previously selected for the site and has determined that the previous uranium cleanup levels are not sufficiently protective. This ESD sets the uranium cleanup level for sediments as 30 pCi/g for total uranium (U-234, U-235, U-238), consistent with the cleanup level established by the Nuclear Regulatory Commission (NRC) for the RMI Extrusion facility adjacent to Fields Brook. This modification is not anticipated to result in a significant increase in the volume of material to be remediated.

V. Conclusion

U.S. EPA has reviewed the new information that has been developed and has considered the changes that have been made to the selected remedies. Based upon this review, U.S. EPA has determined that the selected remedies, with the changes described above, will remain protective of human health and the environment, will comply with federal and State requirements that are applicable or relevant and appropriate to this remedial action, and will be cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site. Upon review of the suggested changes and the information submitted to support such changes, U.S. EPA, therefore, has changed the remedy set out in the Fields Brook RODs in the manner described above.



William E. Muno
Director, Superfund Division



Date

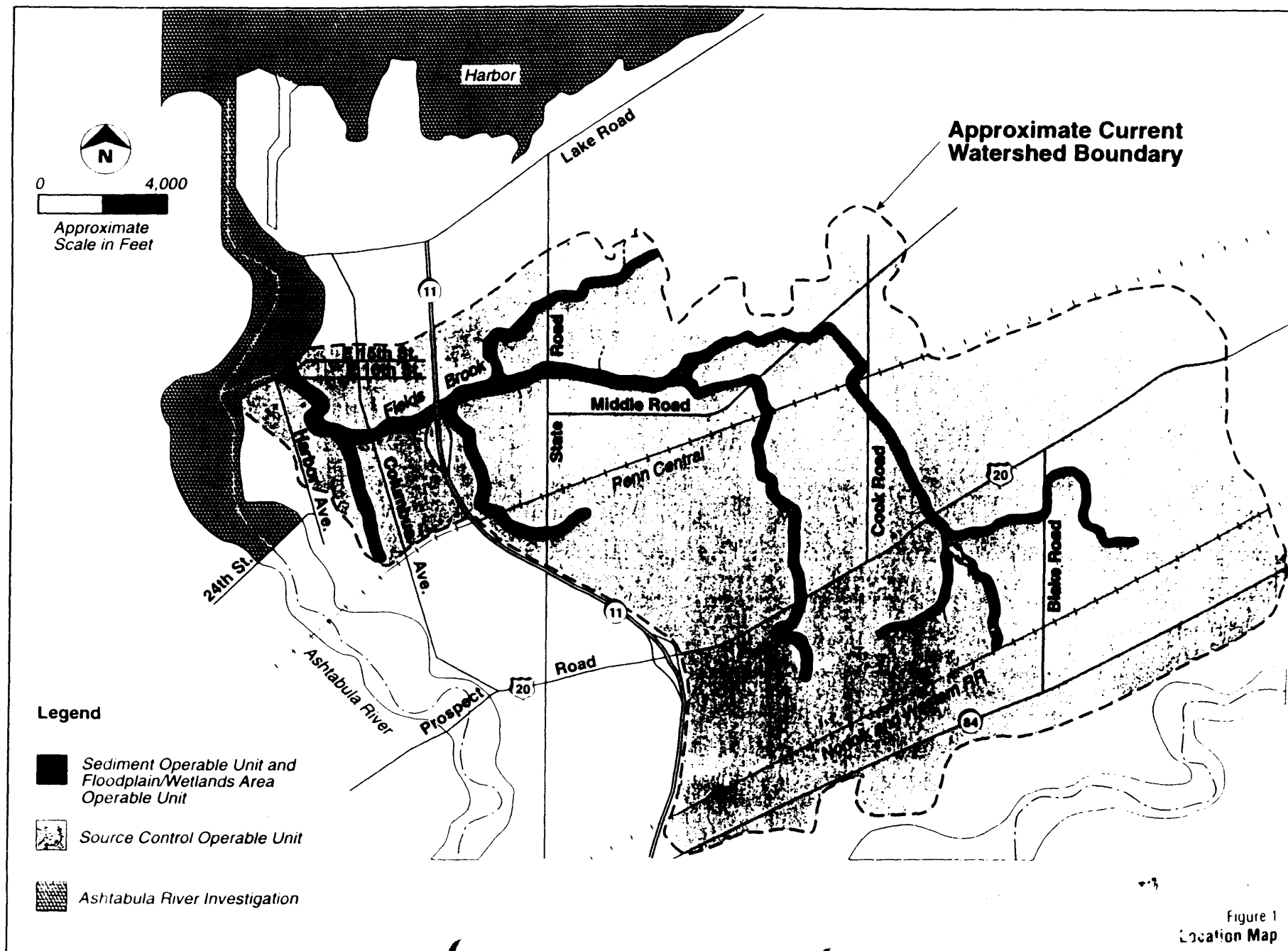
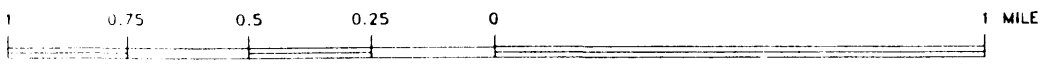
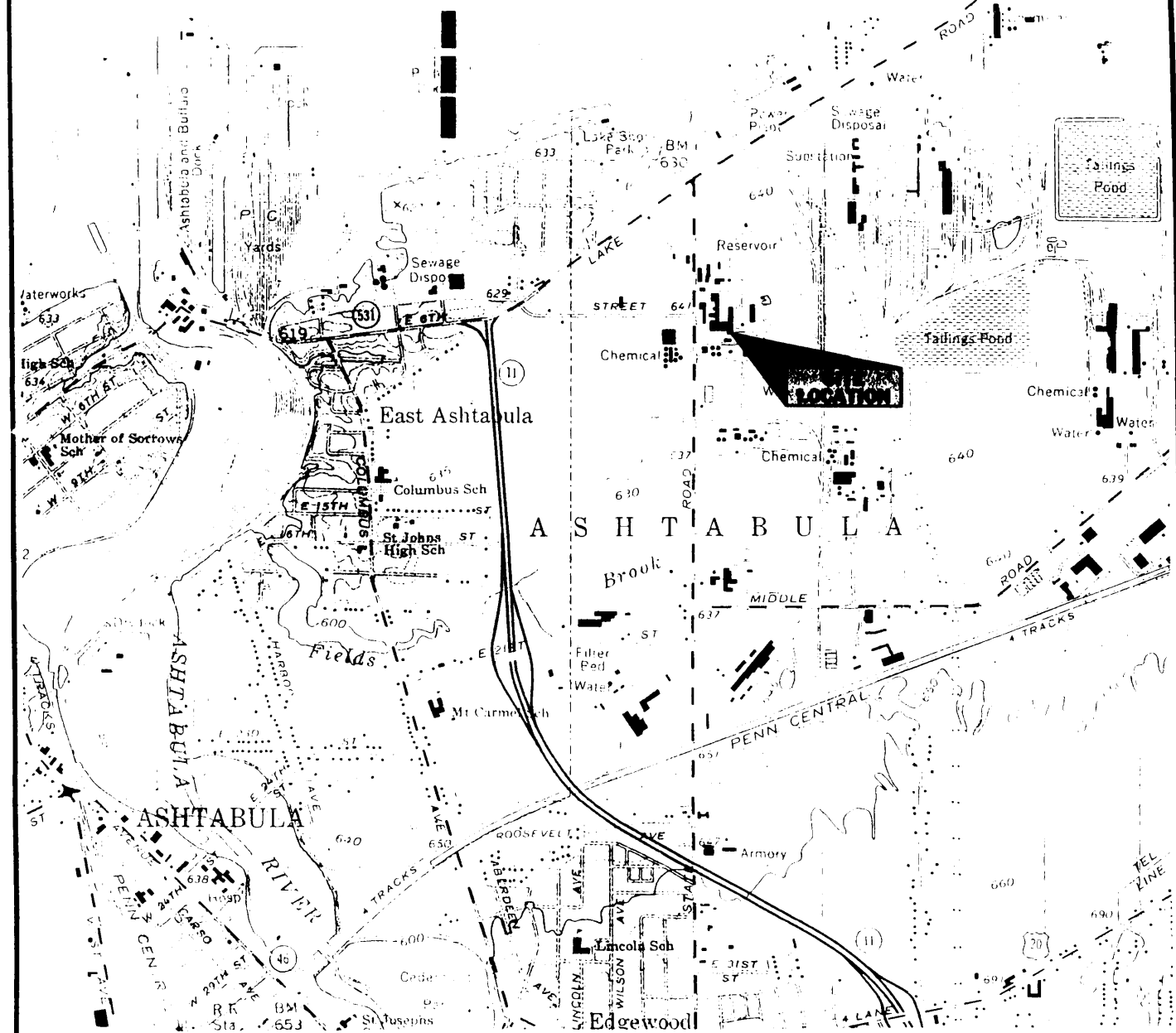


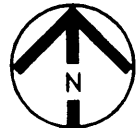
Figure 1: Fields Brook Superfund site

Figure 1
Location Map

UNITED STATES
 DEPARTMENT OF THE INTERIOR
 GEOLOGICAL SURVEY
 ASHTABULA NORTH, OHIO
 196C PHOTOREVISED 1970

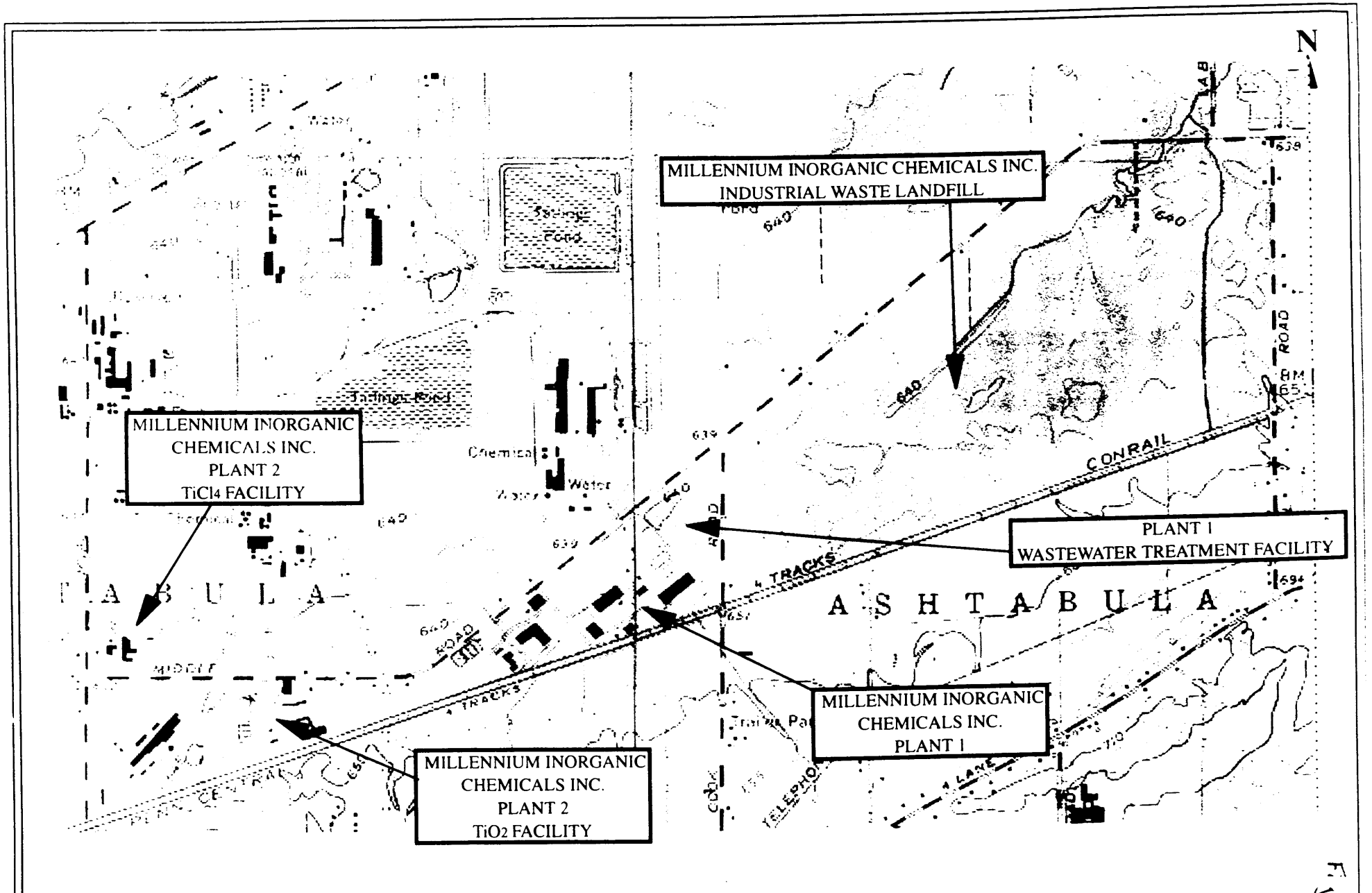


CONTOUR INTERVAL 10 FEET



GENERAL LOCATION MAP
RMI TITANIUM SODIUM FACILITY - ASHTABULA, OHIO

DRAWN BY: MMS	CHECKED BY: WEC	PROJECT NUMBER: 86C3609S	DATE: 01-28-98	FIGURE NO: 2
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SOURCE: USGS 7.5 min TOPOGRAPHIC MAP, QUADRANGLES ASHTABULA NORTH, 011, 1970; NORTH GAGEVILLE, OH, 1979.

FIGURE 3
AREA MAP

Figure 3

APPENDIX A
FEDERAL RADIATION ARARs

APPENDIX A: RADIATION ARARs FOR THE FIELDS BROOK SITE

Standard	Citation	ARAR Evaluation
<p>Maximum contaminant levels (MCLs). Drinking water regulations designed to protect human health from the potential adverse effects of drinking water contaminants.</p>	<p>40 CFR 141</p>	<p>Standard is relevant and appropriate where ground or surface water is considered a potential or current source of drinking water.</p>
<p>Concentration limits for liquid effluents from facilities that extract and process uranium, radium, and vanadium ores.</p>	<p>40 CFR 440 Subpart C</p>	<p>Standard is relevant and appropriate for discharges to surface waters of some kinds of radioactive waste.</p>
<p>Federal Water Quality criteria (FWQC) and State Water Quality Standards (WQS). Criteria/standards for protection of aquatic life and/or human health depending upon the designated water use.</p>	<p>Water Quality Criteria; Report of the National Technical Advisory committee to the Secretary of the Interior; April 1, 1968.</p>	<p>Standards are applicable for any discharge from a CERCLA site to surface water. Standards are relevant and appropriate if the action involves the restoration of contaminated surface water.</p>
<p>Concentration limits for cleanup of radium-226, radium-228, and thorium in soil at inactive uranium processing sites designated for remedial action.</p>	<p>40 CFR 191.12(a), 192.32(b)(2), and 192.41</p>	<p>Standards are relevant and appropriate for sites with soil contaminated with radium-226, radium-228 and/or thorium.</p>

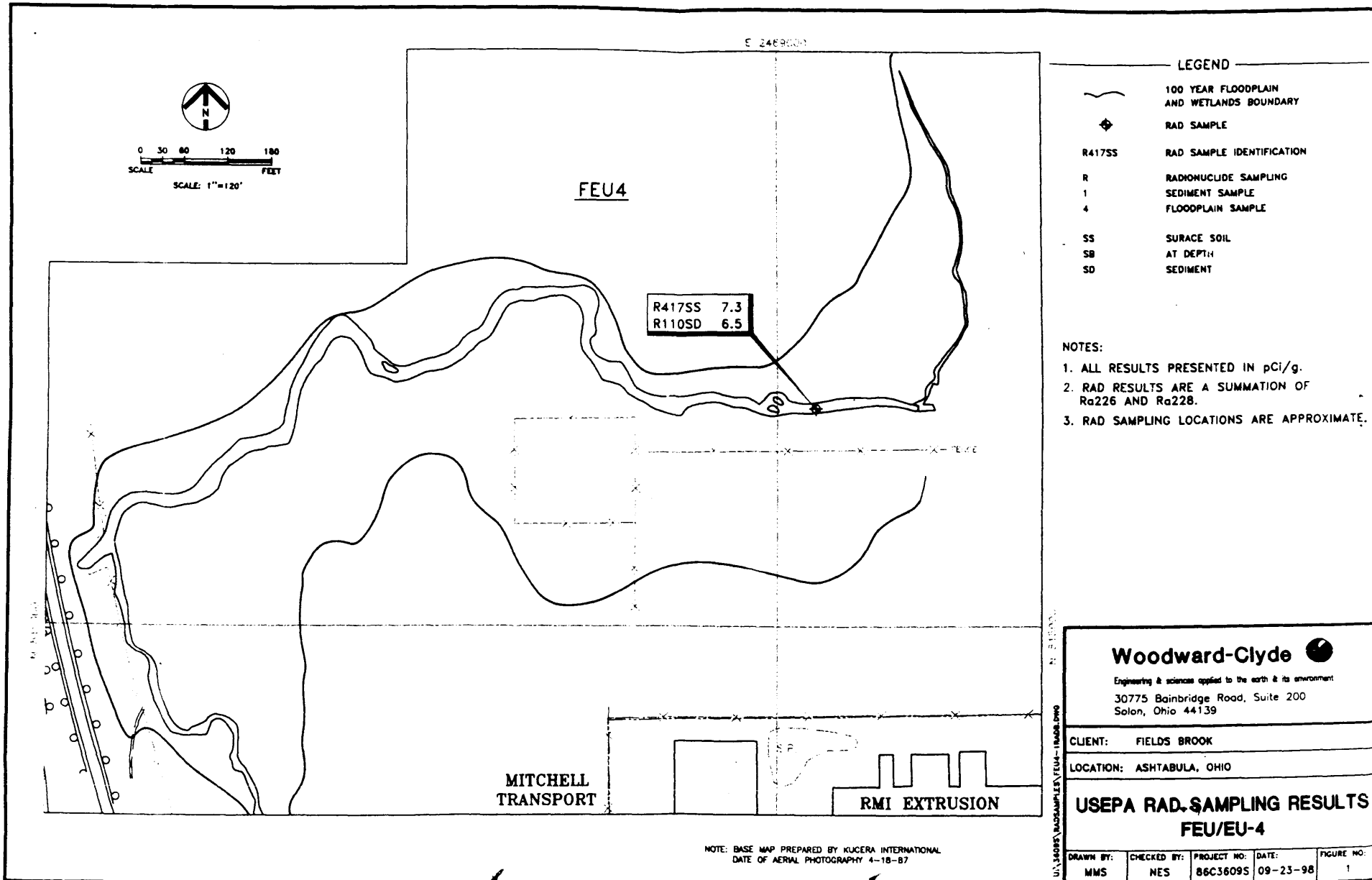
<p>Combined exposure limits for cleanup of radon decay products in buildings at inactive uranium processing sites designated for remedial action.</p>	<p>40 CFR 192.12(b)(1) and 192.41(b)</p>	<p>Standards are relevant and appropriate for sites with radioactive contamination that is currently, or may potentially result in radon that is caused by site related contamination migrating from the soil into buildings.</p>
<p>Concentration limits for cleanup of gamma radiation in buildings at inactive uranium processing sites designated for remedial action.</p>	<p>40 CFR 192.12(b)(2)</p>	<p>Standards are relevant and appropriate for sites with radioactive contamination that is currently, or may potentially, emit gamma radiation.</p>
<p>Design requirements for remedial actions that involve disposal for controlling combined releases of radon-220 and radon-222 to the atmosphere at inactive uranium processing sites designated for remedial action</p>	<p>40 CFR 192.02</p>	<p>Standards are relevant and appropriate for sites with radon-220 or radon-222 as contaminants which will be disposed of on-site.</p>
<p>National Emission Standards for Hazardous Air Pollutants (NESHAPs) under the Clean Air Act, that apply to radionuclides.</p>	<p>40 CFR 61 Subparts H and I</p>	<p>Standards are applicable for airborne emissions during the cleanup of Federal Facilities and licensed NRC facilities. Standards are relevant and appropriate for the cleanup of other sites with radioactive contamination.</p>

APPENDIX B
RADIUM RESULTS FROM 1998 RADIONUCLIDE SAMPLING

Sample ID	Description	Location	Sample Depths (ft)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Ra-226 + Ra-228 (pCi/g)
R101SDB	Background Brook Sediment	South of Rt. 20 across from Molta's Body & Frame Shop	0.0 - 0.5'	1	0.369	1.4
R102SDBD	Background Brook Sediment Duplicate		0.0 - 0.5'	0.96	0.353	1.3
R103SDB	Background Brook Sediment	North of Route 20	0.0 - 0.5'	1.26	0.697	2.0
R401SSB	Background Floodplain Surface Soil	Adjacent to R103SDB	0.0 - 0.5'	1.76	0.836	2.6
R104SDB	Background Brook Sediment	North of Route 20	0.0 - 0.5'	0.934	0.388	1.3
R104SDBD	Background Brook Sediment Duplicate		0.0 - 0.5'	0.966	0.358	1.3
R402SSB	Background Floodplain Surface Soil	Adjacent to R104SD	0.0 - 0.5'	1.68	0.757	2.44
R601SS	Waste Pile	Millennium	0.0 - 0.5'	23.2	45.4	68.6
R602SSD	Waste Pile Duplicate		0.0 - 0.5'	22.4	31.7	54.1
R603SB	Waste Pile Boring		3.8 - 4.3'	36.9	16.8	53.7
R604SS	Waste Pile	Millennium	0.0 - 0.5'	21.7	49.0	70.7
R605SB	Waste Pile Boring		3.9 - 4.5'	25.1	15.4	40.5
R606SS	Waste Pile	Millennium	0.0 - 0.5'	23.7	48.8	72.5
R607SB	Waste Pile Boring		4.2 - 4.7'	17.3	19.4	36.7
R403SS	Floodplain Surface Soil	EU8 - Adjacent to Millennium	0.0 - 0.5'	18.3	25.2	43.5
R404SS	Floodplain Surface Soil	EU8 - Adjacent to Millennium	0.0 - 0.5'	19.4	26.4	45.8
R405SS	Floodplain Surface Soil	EU8 - Adjacent to Millennium	0.0 - 0.5'	13.7	13.7	27.4
R405SSD	Floodplain Surface Soil Duplicate	EU8 - Adjacent to Millennium	0.0 - 0.5'	13.9	13.8	27.7
R406SS	Floodplain Surface Soil	EU8 - Adjacent to Millennium	0.0 - 0.5'	3.61	2.18	5.8

R105SD	Brook Sediment	EU8 - Adjacent to Millennium	0.0 - 0.5'	2.15	1.66	3.8
R407SS	Floodplain Surface Soil	EU8 - Adjacent to Millennium	0.0 - 0.5'	14.6	14.5	29.1
R408SS	Floodplain Surface Soil	EU8 - Adjacent to Millennium	0.0 - 0.5'	6.81	3.75	10.6
R409SB	Floodplain Soil Boring		0.5 - 1.0'	12.3	4.04	16.3
R410SB	Floodplain Soil Boring		1.0 - 1.5'	25.9	1.73	27.6
R106SD	Brook Sediment	EU6 - West of State Road	0.0 - 0.5'	4.68	2.75	7.4
R411SS	Floodplain Surface Soil		0.0 - 0.5'	3.26	2.01	5.3
R107SD	Brook Sediment	EU6 - Adjacent to RMI Outfall	0.0 - 0.5'	4.47	2.59	7.1
R412SS	Floodplain Surface Soil		0.0 - 0.5'	5.64	1.95	7.6
R413SB	Floodplain Soil Boring		0.5 - 1.0'	3.04	2.61	5.7
R414SB	Floodplain Soil Boring		1.0 - 1.5'	2.1	0.899	3.0
R108SD	Brook Sediment	EU6 - Just upstream of RMI Extrusion	0.0 - 0.5'	3.61	2.89	6.5
R415SS	Floodplain Surface Soil		0.0 - 0.5'	3.36	2.43	5.8
R415SSD	Floodplain Surface Soil Duplicate		0.0 - 0.5'	3.41	2.45	5.9
R109SD	Brook Sediment	EU6 - Adjacent to RMI	0.0 - 0.5'	2.22	1.7	3.9
R416SS	Floodplain Surface Soil		0.0 - 0.5'	3.43	2.59	6.0
R110SD	Brook Sediment	UE4 - Adjacent to RMI	0.0 - 0.5'	3.23	3.22	6.5
R417SS	Floodplain Surface Soil		0.0 - 0.5'	5.14	2.16	7.3
R111SD	Brook Sediment	DS Tributary - EU5 a	0.0 - 0.5'	1.63	0.708	2.3
R418SS	Floodplain Surface Soil		0.0 - 0.5'	1.95	1	3.0

R112SD	Brook Sediment	DS Tributary - EU5 b	0.0 - 0.5'	1.22	0.611	1.8
R419SS	Floodplain Surface Soil		0.0 - 0.5'	1.64	0.638	2.3



E 2469000

E 2470000

FEU 6



R415SS 5.8
R108SD 6.5

R411SS 5.3
R106SD 7.4

R416SS 6.0
R109SD 3.9

R412SS 7.6
R413SB 5.7
R414SB 3.0
R107SD 7.1

LEGEND

-  100 YEAR FLOODPLAIN AND WETLANDS BOUNDARY
-  RAD SAMPLE
- R417SS RAD SAMPLE IDENTIFICATION
- R RADIONUCLIDE SAMPLING
- 1 SEDIMENT SAMPLE
- 4 FLOODPLAIN SAMPLE
- SS SURFACE SOIL
- SB AT DEPTH
- SD SEDIMENT

NOTES:

1. ALL RESULTS PRESENTED IN pCi/g.
2. RAD RESULTS ARE A SUMMATION OF Ra226 AND Ra228.
3. RAD SAMPLING LOCATIONS ARE APPROXIMATE.



0 30 60 120 180
SCALE FEET

SCALE: 1"=120'

Woodward-Clyde

Engineering & sciences applied to the earth & its environment
30775 Bainbridge Road, Suite 200
Solon, Ohio 44139

CLIENT: FIELDS BROOK

LOCATION: ASHTABULA, OHIO

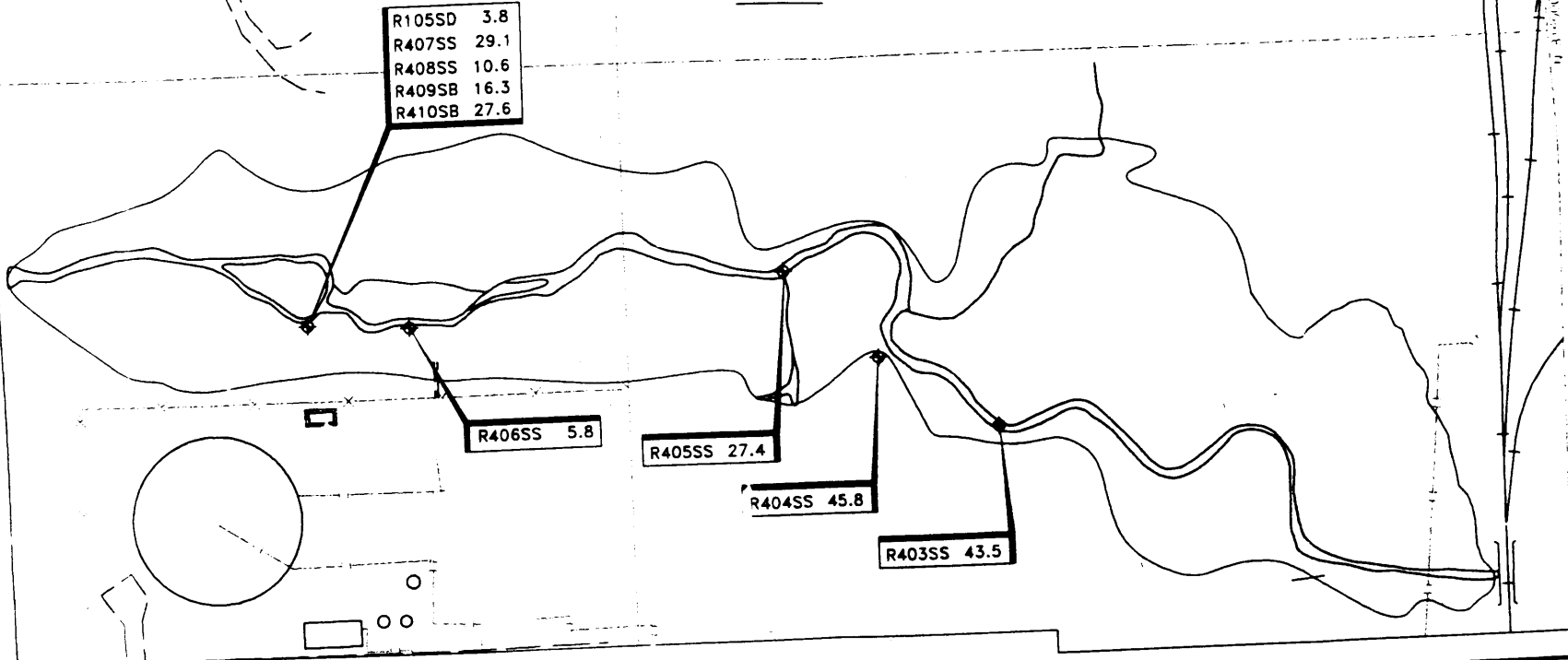
USEPA RAD₁ SAMPLING RESULTS
FEU/EU-6

DRAWN BY: WMS	CHECKED BY: MLS	PROJECT NO: 86C3609S	DATE: 09-23-98	FIGURE NO: 2
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NOTE: BASE MAP PREPARED BY KUCERA INTERNATIONAL
DATE OF AERIAL PHOTOGRAPHY 4-18-87

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FEU 8

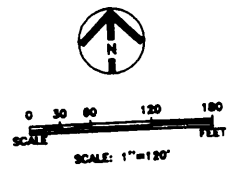


LEGEND

- 100 YEAR FLOODPLAIN AND WETLANDS BOUNDARY
- RAD SAMPLE
- R417SS RAD SAMPLE IDENTIFICATION
- R RADIONUCLIDE SAMPLING
- 1 SEDIMENT SAMPLE
- 4 FLOODPLAIN SAMPLE
- SS SURFACE SOIL
- SB AT DEPTH
- SD SEDIMENT

- NOTES:
1. ALL RESULTS PRESENTED IN pCi/g.
 2. RAD RESULTS ARE A SUMMATION OF Ra226 AND Ra228.
 3. RAD SAMPLING LOCATIONS ARE APPROXIMATE.

NOTE: BASE MAP PREPARED BY KUCERA INTERNATIONAL
DATE OF AERIAL PHOTOGRAPHY 4-18-87



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Engineering & sciences applied to the earth & its environment.
30775 Bainbridge Road, Suite 200
Solon, Ohio 44139

CLIENT:	FIELDS BROOK			
LOCATION:	ASHTABULA, OHIO			
USEPA RAD SAMPLING RESULT				
FEU/EU-8				
DRAWN BY:	CHECKED BY:	PROJECT NO:	DATE:	FIGURE
MMS	MLS	86C36095	09-23-98	3

U:\SOPR\RAD\SAMPLES\FEU8-RAD.DWG

APPENDIX C
CONCURRENCE LETTERS

OHIO DEPARTMENT OF HEALTH

246 N. HIGH STREET
Post Office box 118
Columbus, Ohio 43266-0118
Telephone (614) 466-3543



BOB TAFT
Governor

March 9, 1999

Terese Van Donsel
Project Manager
Waste Management Division
USEPA Region 5
77 W. Jackson Blvd. HSRW-6J
Chicago, Illinois 60604

Dear Terese:

The Ohio Department of Health / Bureau of Radiation Protection (ODH/BRP) concurs with the Site-Wide explanation of Significant Differences for the Fields Brook Superfund Site in Ashtabula, Ohio with the following exception. ODH/BRP withholds concurrence with Section IV(B), Source Control ROD - Millenium Inorganic Chemicals due to ongoing efforts in determining the licensability of the Millenium on-site landfill.

If you have any questions concerning this letter, please feel free to contact us at 614-644-2727.

Sincerely,

A handwritten signature in cursive script that reads "Ruth H. Vandegrift".

Ruth Vandegrift, Supervisor
Decommissioning
Bureau of Radiation Protection

cc: Regan S. Williams, Environmental Scientist, OEPA - N.E. District Office
Kurt Princic, Environmental Supervisor, OEPA - N.E. District Office
file

U.S. EPA has been informed that the Ohio Environmental Protection Agency will concur on the ESD and is awaiting the signed concurrence letter. Upon receipt of the letter, it will be placed in the administrative record for the Fields Brook site.

APPENDIX D
INDEX FROM ADMINISTRATIVE RECORD UPDATE

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
FIELDS BROOK SITE
(SITE-WIDE)
ASHTABULA, OHIO

ORIGINAL
APRIL 5, 1999

<u>NO.</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
1	00/00/00	Bennett, D.	Public	Newspaper Article: <i>EPA Says River Cleanup Delayed</i>	2
2	00/00/00	U.S. EPA	File	Tables: Soil and Sediment Sampling Data for the Fields Brook Site	4
3	00/00/00	U.S. EPA	File	Graphs: Fields Brook Site Gamma Count Rate	7
4	00/00/00	Gradient Corporation	U.S. EPA	Tables: Background Levels of Radium at the Fields Brook Site	4
5	08/00/81	Conference of Radiation Control Program Directors, Inc., et al.	U.S. EPA	Report: <i>Natural Radio- activity Contamination Problems</i> (Norm Report No. 2)	10
6	1994-1996	U.S. EPA	File	Various Sampling Pro- cedures for Specific Testing Analyses and to Detect Levels of Thorium and Uranium (DRAFT)	59
7	01/16/98	Ketterer, M., John Carroll University	Farber, N., Ohio EPA	Letter Forwarding Attached Preproposal: <i>An Assessment of Uranium in Ashtabula AOC Sediments w/ Sampling Data Figures and Narrative Summary</i>	15
8	02/12/98	Luftig, S., U.S. EPA/ OERR	Addressees	Memorandum re: Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites (Directive No. 9200.4-25) w/Attach- ments	32

<u>NO.</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
9	02/27/98	Ohio EPA	VanDonsel, T., U.S. EPA	Fax Transmission Forwarding Excerpts from Ohio Revised Code re: Low-Level Radioactive Waste and Treatment, Recycling, Storing or Disposal of Waste	3
10	04/08/98	Muno, W., U.S. EPA	Breslow, S., Millenium Inorganic Chemicals	Letter re: U.S. EPA Conditions for Use of the Millenium Industrial Waste Landfill for Disposal of PCB-Contaminated Soils from the Millenium Source Control Area	4
11	04/22/98	Mason, R., RMI Titanium Company	VanDonsel, T., U.S. EPA	Letter re: Information Concerning the September 30, 1996 Characterization Report for the Uranium in Fields Brook Flood Plain and the July 1994 Report: Summary of Uranium Levels, Fields Brook Sediments and Floodplain Soils, 1985-1993	4
12	04/22/98	Mason, R., RMI Titanium Company	Vandegrift, R., Ohio Department of Health	Letter Forwarding (1) General Description of the Material Processed at RMI Titanium Extrusion Plant and (2) Thorium Levels Sampling Data	27
13	04/29/98	Mason, R., RMI Titanium Company	VanDonsel, T., U.S. EPA	Letter Transmitting Attached Radionuclide Data for Fields Brook Sediments	38
14	08/31/98	Hudson, T., U.S. EPA/ NAREL	VanDonsel, T., U.S. EPA	FAX Transmission Forwarding Attached Fields Brook Sampling Results	53
15	04/30/98	Muno, W., U.S. EPA	Ullrich, D., U.S. EPA	Memorandum re: Administrative Order Compliance Status and Closure	21
16	07/01/98	Code of Federal Regulations		Health and Enviromental Protection Standards For Uranium and Thorium Mill Tailings (CFR Title 40, Part 192)	16
17	10/09/98	Griggs, J., U.S. EPA/ ORIA/NAREL	Jensen, L., U.S. EPA/ Region 5	Memorandum re: Radiochemical Results for Fields Brook Samples	230

<u>NO.</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
18	11/00/98	U.S. EPA	Public	Fact Sheet: Project Update for the Fields Brook Superfund Site	6
19	12/14/98	Jensen, L., U.S. EPA	VanDonsel, T., U.S. EPA	Memorandum re: Cleanup Criteria for the Fields Brook Site	6
20	12/23/98	Jensen, L., U.S. EPA	VanDonsel, T., U.S. EPA	Memorandum re: Detailed Memo on Risk Assessment Calculations for the Fields Brook Site	12
21	12/29/98	Bowers, T., Gradient Corporation	VanDonsel, T., U.S. EPA	Memorandum re: Radio-nuclide Risks	9
22	12/30/98	Jensen, L., U.S. EPA	VanDonsel, T., U.S. EPA	Memorandum re: Comments on the December 29, 1998 Gradient Memorandum Concerning Radionuclide Risks along the Fields Brook Site	3
23	12/30/98	Griggs, J., U.S. EPA/ ORIA/NAREL	Jensen, L., U.S. EPA	Memorandum re: Radio-chemical Results for the Fields Brook and Sanyo(IN) Samples	50
24	01/07/99	Griggs, J., U.S. EPA/ ORIA/NAREL	Jensen, L., U.S. EPA	Memorandum re: Radio-chemical Results for the Fields Brook Samples	78
25	01/08/99	VanDonsel, T., U.S. EPA	Heimbuch, J., DeMaximus, Inc.	Fax Transmission Forwarding U.S. EPA Memorandum re: Cleanup Criteria for the Fields Brook Site	5
26	02/09/99	VanDonsel, T., U.S. EPA	Beaumier, R., Ohio EPA	Letter re: Request for OEPA Review of the Site-Wide <i>Explanation of Significant Differences (ESD)</i> for the Fields Brook Site	1
27	03/09/99	Vandegrift, R., Ohio Department of Health/ Bureau of Radiation Protection	VanDonsel, T., U.S. EPA	Letter re: ODH/BRP's Concurrence with the <i>ESD</i> for the Fields Brook Site	1