Progress and Future Plans for Mercury Remediation at the Y-12 National Security Complex, Oak Ridge, Tennessee – 13059

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ABSTRACT

The U.S. Department of Energy (DOE), along with the Tennessee Department of Environment and Conservation (TDEC) and the U.S. Environmental Protection Agency (EPA), has identified mercury contamination at the Y-12 National Security Complex (Y-12) as the highest priority cleanup risk on the Oak Ridge Reservation (ORR). The historic loss of mercury to the environment dwarfs any other contaminant release on the ORR. Efforts over the last 20 years to reduce mercury levels leaving the site in the surface waters of Upper East Fork Poplar Creek (UEFPC) have not resulted in a corresponding decrease in mercury concentrations in fish. Further reductions in mercury surface water concentrations are needed. Recent stimulus funding through the American Recovery and Reinvestment Act of 2009 (ARRA) has supported several major efforts involving mercury cleanup at Y-12. Near-term implementation activities are being pursued with remaining funds and include design of a centrally located mercury treatment facility for waterborne mercury, treatability studies on mercury-contaminated soils, and free mercury removal from storm drains. Out-year source removal will entail demolition/disposal of several massive uranium processing facilities along with removal and disposal of underlying contaminated soil. As a National Priorities List (NPL) site, cleanup is implemented under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and directed by the Federal Facility Agreement (FFA) between DOE, EPA, and TDEC. The CERCLA process is followed to plan, reach approval, implement, and monitor the cleanup.

INTRODUCTION

Y-12 is one of four production facilities in the National Nuclear Security Administration's Nuclear Security Enterprise with a unique emphasis in the processing and storage of uranium, and development of technologies associated with those activities. Decades of precision machining experience and earlier isotope enrichment activities make Y-12 a production facility with capabilities unequaled nationwide, yet have left the site with a legacy of contaminated facilities requiring replacement and/or demolition, and soils and ground/surface water in need of urgent remediation, mainly due to the presence of mercury. Releases of mercury during operations at Y-12 in the 1950s and early 1960s resulted in contamination of environmental media and facilities within the complex including East Fork Poplar Creek (EFPC). Remediation efforts began in the 1980s and have reduced waterborne mercury concentrations within the EFPC ecosystem and removed some mercury contamination from buildings, but elevated levels of mercury remain in the soil, sediment, water, and biota as well as in the building structures and equipment where the operations took place. Industrial development and separation processes using mercury were conducted in Buildings 9201-2 (Alpha-2), 9204-4 (Beta-4), 9201-4 (Alpha-4), and 9201-5 (Alpha-5) beginning in the 1950s and were discontinued in 1963. Building 81-10 in the southern portion of Y-12 housed equipment (roaster and condenser) to recover mercury; all that remains is the building slab. These facilities are shown in Figure 1, along with other major mercury-associated features of the site. The estimated total release of mercury to air, surface water, and soil at Y-12 is provided in Table I.

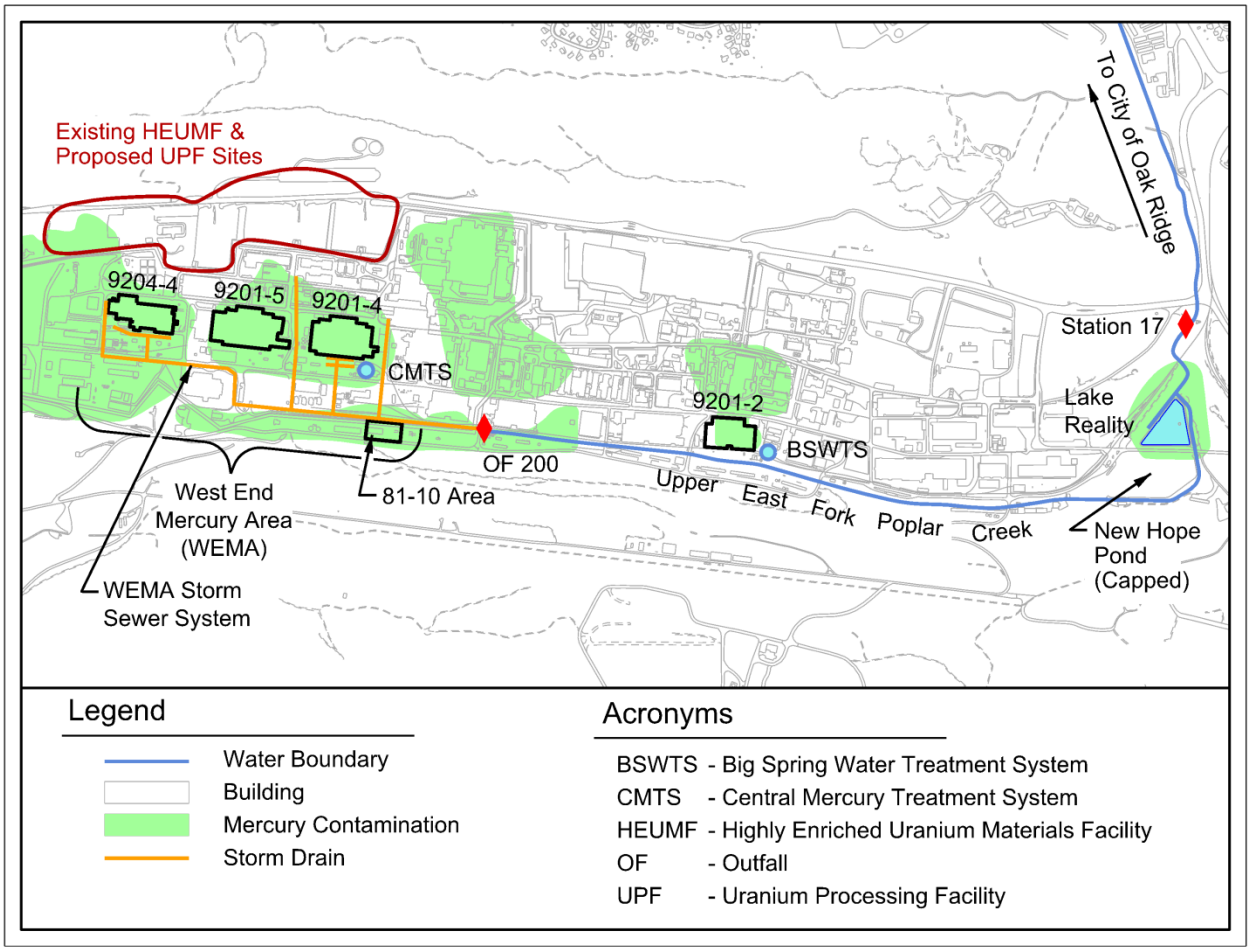

Figure 1. Y-12 Site Layout Showing Major Features in UEFPC Watershed

Table I. Historical Losses of Mercury at Y-12.[1]

Mercury Losses	Major Pathway	Mercury	
		(pounds)	(kilograms)
Lost to air (1950 – 1963)	Ventilation systems	~51,000	23,000
Lost to East Fork Poplar Creek (1950 – 1982)	Process waste stream	~239,000	109,000
Lost to ground of Y-12 Complex	Accidents/spills	~428,000	195,000
Lost to sediment in New Hope Pond	Building drains	~15,000	7,000
Not Accounted for [2]	Not received; buildings; other	~1,292,000	587,000
Total		**~2,025,000**	**921,000**

[1] *Mercury at the Y-12 Plant, a Summary of the 1983 UCC-ND Task Force Study*, Y/EX-23, November 1983 [1].

[2] This mass of unaccounted for mercury has been estimated at closer to 650,000 lbs, when historical knowledge regarding shortage of receipts, losses to building structures, and other specific losses are taken into account [1].

The EFPC passes through the city of Oak Ridge, and is divided into several discrete sections. The portion that occurs within the Y-12 Plant is referred to as the Upper EFPC (UEFPC). UEFPC leaves the ORR, entering public property at Station 17. Outfall 200, just east of the major processing facilities, is the

confluence of a complex underground storm water system draining the West End Mercury Area (WEMA) into the headwaters of UEFPC as shown in Figure 1.

Although the release of high concentrations of mercury from the plant stopped in 1963, mercury continues to be released into EFPC from various point and nonpoint sources of contamination. These sources include infiltration of contaminated shallow groundwater into the storm water drain network, dissolution of mercury from the contaminated pipes, advection of contaminated sediment into the surface flow, and emergence of contaminated groundwater from the karst system in springs and seeps [2]. Further information on historical releases and sources is available in *Conceptual Model of Primary Mercury Sources, Transport, Pathways, and Flux at the Y-12 Complex and Upper East Fork Poplar Creek, Oak Ridge, Tennessee* [3].

REGULATORY FRAMEWORK

The ORR was placed on the NPL in 1989, subjecting it to CERCLA. The FFA, which coordinates corrective actions under Resource Conservation and Recovery Act of 1976 (RCRA) permits with CERCLA response actions, became effective on January 1, 1992. Parties of the FFA agreed that implementation of CERCLA actions would be in compliance with any RCRA applicable and relevant or appropriate requirements (ARARs) specified in the CERCLA decision documents, including requirements for waste characterization, treatment to meet Land Disposal Restrictions (LDRs), and waste handling, storage, and disposal. Remediation of the ORR was divided by watersheds; Y-12 remediation falls under two watersheds, Bear Creek and UEFPC. UEFPC watershed encompasses the main plant area, and the contaminants of concern are chiefly mercury and uranium.

Comprehensive Environmental Response, Compensation, and Liability Act

Per CERCLA, a Remedial Investigation of UEFPC was completed in 1998, which identified and defined areas of mercury contamination (as well as all other contamination, mainly uranium) and established risks associated with that contamination [4]. Alternatives for remediation were evaluated and screened in a Feasibility Study and Addendum, and Focused Feasibility Study, where the contamination area was broken into 14 exposure units (EUs) [5, 6, 7]. Proposed plans were issued, which documented the selected cleanup alternative chosen from the several alternatives presented in the feasibility studies [8, 9]. Interim decisions for media (soil, sediments, and subsurface structures) remediation were then documented in the Phase I and Phase II Records of Decision (RODs) [10, 11]. Building demolition decisions were subsequently addressed in an Engineering Evaluation/Cost Analysis and Action Memorandum [12, 13].

With the decision documents in hand, the remainder of the CERCLA process is addressed within individual projects. These projects include development of project-specific regulatory documents, DOE-required documents, execution of the remediation and/or demolition actions, and project closeout.

Resource Conservation and Recovery Act

RCRA governs operations at facilities that generate, treat, store, dispose, or transport materials that meet the RCRA regulatory definition of a hazardous waste. In terms of the mercury cleanup at Y-12, the most significant RCRA regulations are the LDRs given under 40 Code of Federal Regulations (CFR) Part 268 (40 CFR § 268).

Clean Water Act

Discharges to UEFPC are subject to the Clean Water Act of 1972 (CWA) through National Pollutant Discharge Elimination System (NPDES) permits; the NPDES permit at Y-12 was recently renewed in

2011, and places considerable emphasis on reducing mercury flux in UEFPC to 2.42 grams per day or less. Remediation projects dealing with legacy mercury contamination are being completed under CERCLA, and as such permits are not required to be obtained for on-site actions. All CERCLA actions comply with substantive requirements – ARARs – identified in CERCLA decision documents.

Pursuant to Section 303(d) of the CWA, TDEC has informed DOE that a Total Maximum Daily Load (TMDL) for mercury in EFPC will be established based on the fish tissue standard of 0.3 mg/kg, and will require approval by EPA. It is yet unclear how the TMDL will be determined from the fish tissue standard.

THE MERCURY PROBLEM

As noted, approximately 900,000 kg (2 million pounds) of mercury have been lost to the surrounding Y-12 environment and/or are unaccounted for. Some of that contamination is contained in the soils surrounding and under the process buildings. A site conceptual model that identifies the major mercury sources, transport pathways, and flux based on the most recent data and knowledgeable scientific interpretation has been developed [3]. Major mercury sources delineated in the model include soils, creek sediments, buildings, and subsurface structures (storm drains, piping, sumps, and tanks). Mercury leaves the Y-12 site primarily through UEFPC. Transport pathways are very complex as is the mercury chemistry and behavior in the environment, and the amount of mercury leaving the site per a given time period (or flux) is quite variable. One of the least understood issues centers around the production and uptake of methylmercury. Methylmercury plays a significant role in the mercury concentrations measured in fish.

Considerable progress has been made in reducing the amount of mercury leaving the site through UEFPC (see Figure 2) since the 1980s. However, EPA evaluates mercury levels in fish as an indication of the "health" of the water body, and these levels have not seen a corresponding decrease within UEFPC (see figure). Additionally, the last several years (since 2008) have seen an increase in mercury flux, partially explained in terms of increased rainfall. Mercury flux correlates with rainfall due to the increase in flow and turbidity and because mercury preferentially resides with the suspended solids. A significant increase of flux in 2011 is attributed to the WEMA storm system cleanout, which resulted in disturbances of storm drain and creek sediments, both primary mercury sources. In fact, the most recent measurements of mercury flux have decreased back to pre-WEMA cleanup levels. This phenomenon, increasing mercury concentrations and flux within UEFPC during remediation activities, is likely to be an issue during future process facility demolitions and follow-on remediation of WEMA soils. Mercury flux continues to be a significant issue and reduction of mercury leaving the site has been identified as a high priority requiring immediate action.

COMPLETED WORK

Considerable work has been completed in pursuit of cleaning mercury from the environment and buildings at Y-12. Table II summarizes some of the more significant activities. Most recently, funding from ARRA enabled the completion of several activities as noted briefly in the table, and presented in more detail in the text below. New, interim mercury-related activities are being completed with remaining ARRA funding and are discussed later in the document.

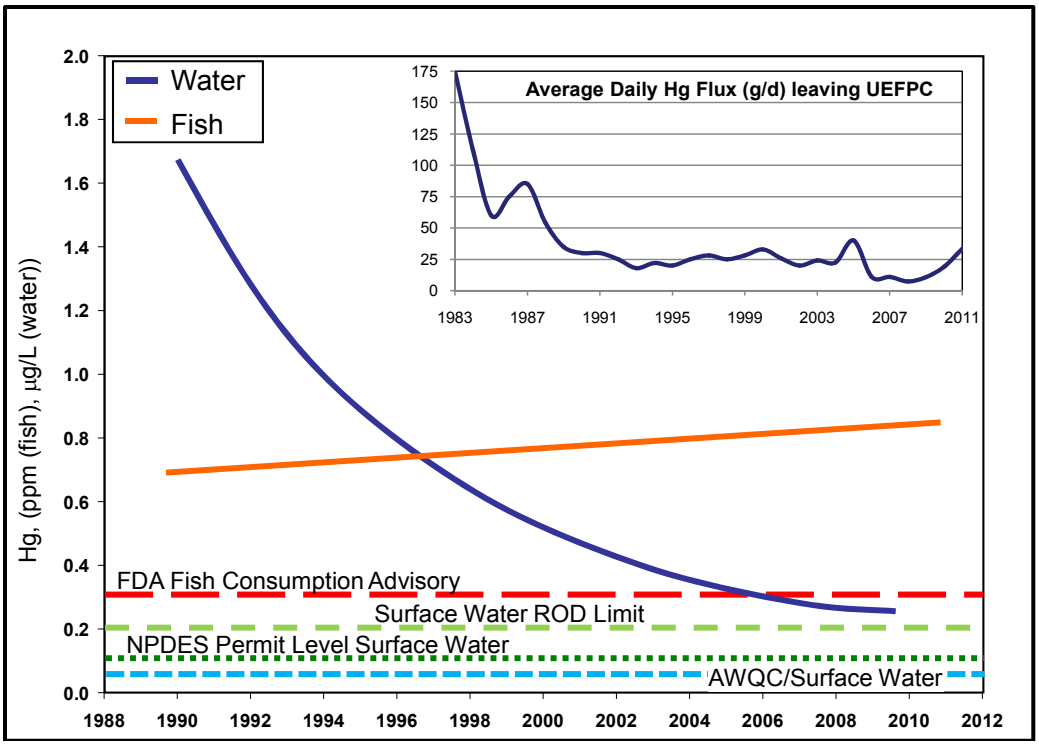

Figure 2. Historic Mercury Loading to UEFPC (Water and Fish) and Current Standards

Table II. Chronology of Significant Mercury Cleanup Activities at Y-12

Year(s)	Project	Summary of Significant Actions	
1985 – 1995	Building remediation activities	• Elimination of mercury (Hg) sources & rerouting of process pipe in Bldgs. 9201-2, 9201-4, 9201-5 & 9204-4; decon of facilities/equipment; equipment removal	
1986 – 1987	Storm drain cleaning/ lining; removal of Hg-contaminated sediment	• 1,707meters (m) [5,600 feet (ft)] of storm sewers cleaned • 2,560m (8,400 ft) of storm sewers relined • 226,800 kg (500,000 lbs) of sediment removed	
1988 – 1989	New Hope Pond closure (replaced by Lake Reality)	• Unlined settling basin to remove suspended sediments from UEFPC prior to discharge from Y-12 Plant	• Constructed in 1962 • Dredged in 1973 • Closed and capped in 1989
1988 – 1995	North/South (N/S) pipe replaced in 1988	• 610m (2,000 ft) of Hg-contaminated N/S Pipe replaced • N/S Pipe conveys UEFPC in western area of complex	
1992	Tank remediation	• 3 concrete settling tanks contributed to Hg releases in UEFPC • ~ 13,610 kg (30,000 lbs) of Hg-contaminated sediment were removed	
1994	Plant effluent Hg reduction	• Storm sewer cleaning/relining • >90 % Hg reductions achieved	• Rerouting process water & UEFPC • Water treatment at Outfall 51
1996 – pres.	Flow augmentation	• To protect stream water quality per 1995 NPDES permit • Adds ~17,030,000 L/d (4.5 million gal/d) from Clinch River at Outfall (OF) 200	
1996 – pres.	Central Mercury Treatment System	• New Hg treatment system uses granular activated carbon (GAC) • Treats contaminated sump water from Bldgs. 9201-4 and 9201-5	
1996 – 1997	EFPC floodplain soil removal	• 1995 Record of Decision • Public input raised cleanup level based on Hg-form (sulfide)	• Excavation of ~26,760 m^3 (35,000 yd^3) of Hg-contaminated soil • Surface water decision deferred
1997	Basin 9822 Remediation	• Hg/PCB source basin adjacent to 81-10 area Roaster, demolished and filled	• Water/sediment removed/treated • 81-10 sump cleanout/closure included
2001	Bank stabilization	• CERCLA Treatability Study • Stabilized stream bank	• Reduced storm-driven Hg releases
2005 – pres.	Big Spring Water Trmt Sys	• Hg treatment system at OF 51/Alpha-2, uses GAC; treats ~1136 Lpm (300 gpm)	
2009 – pres.	Multiple Projects	• Multiple projects under ARRA-funding - WEMA storm sewer cleanout; legacy material removal from Alpha-5/Beta-4; Alpha-5 building characterization; etc.	

WEMA Storm Sewer Remediation

The WEMA storm sewer system consists of approximately 6,700 meters (22,000 ft) of storm sewer piping and is known to be a significant conveyance of mercury to UEFPC.

Previous actions to mitigate mercury migration from the WEMA have included plugging building floor drains; cleaning sediment and sludge from sumps, manholes, drain lines, and storm sewers; lining or relining portions of the storm sewer system; replacement of the storm sewer trunk line; rerouting or removal of process piping; and installation of the Central Mercury Treatment System to capture and treat sump water at Alpha-4 and Alpha-5. However, an unknown amount of mercury remains trapped in soils adjacent to mercury-use buildings, process pipelines, and storm sewers. Despite the previous mitigation actions, mercury continues to leach from theses sources into the storm sewer system, discharging to the UEFPC.

The objective of the WEMA Storm Sewer Remediation project was to remove mercury-contaminated sediments from the main lines of the storm sewers located in the WEMA, reline or replace storm sewers, and replace catch basins as needed. A total of 2,468 m (8,096 ft) of WEMA sewers were cleaned and 365 m (1,196 ft) were lined by the project. A total of 481 m^3 (16,980 ft^3) of solid waste were disposed at the Nevada National Security Site, and 24 kg (54 lbs) of elemental mercury were treated and disposed at the Energy Solutions facility in Clive, Utah. Wastewater was treated and discharged through the Y-12 West End Treatment Facility.

Pre-mobilization activities commenced in December 2010. Field work occurred from February 2011 until September 2011, with wastewater treatment continuing into January 2012. Demobilization was completed in May 2012.

Old Salvage Yard Scrap Removal

The Old Salvage Yard (OSY) is located at the west end of the industrialized area of Y-12 in two EUs, EU11 to the east and EU13 to the west. The OSY was used as an area for the accumulation, sorting, processing, and storage of scrap metal and equipment from Y-12 operations from 1968 until 1999. Northern sections of the OSY were used for the storage of used oils and the accumulation, recycling, or de-heading and crushing of 55-gallon metal drums. When the OSY was in operation, both radioactively contaminated (principally uranium) and non-radioactively contaminated scrap metals were handled there. The open-air storage of scrap metal was routine until 1995, when procedures were changed to place scrap metal received at the OSY into B-24 containers and B-25 boxes. The Phase II ROD presents the selected interim remedial action for contaminated areas within the industrialized part of Y-12 to address contaminated soil, scrap, buried waste, and subsurface structures. The decision establishes remediation levels to protect future users of the site (i.e., industrial workers) and to protect groundwater and surface water from soil contamination. Remediation (excavation) of soils in the Scrap Yard was determined to be required to protect groundwater.

Completion of the OSY soils remediation under ARRA resulted in much lower than anticipated volumes of soil requiring removal, and mercury was not found to be a contaminant of concern. The excavated soil met the waste acceptance criteria for disposal at the on-site CERCLA disposal facility, the Environmental Management Waste Management Facility.

Alpha-4 and Alpha-5 Legacy Material Removal

In preparation for future building demolition, legacy material and equipment were removed/disposed from the two largest mercury-use facilities: Alpha-5 (Building 9201-5) and Beta-4 (Building 9204-4)

during fiscal year (FY) 2010 and FY 2011. All legacy material was removed and dispositioned from Alpha-5, and legacy material was removed and dispositioned from the second floor and second floor mezzanine of Beta-4. A total of 3,610 m^3 (4,721 yd^3) was removed from Beta-4, while the total removed from Alpha-5 was approximately 23,500 m^3 (30,700 yd^3). Activities to complete the removal and disposition included characterization, prerequisite shipping activities, and the final loading, shipping, and disposition of the waste. Some materials were placed in storage for reuse. The majority of the waste (73%) was disposed at Nevada National Security Site. Approximately 12% was disposed of at the on-site Environmental Waste Management Facility, 10% was disposed of at on-site sanitary landfills, and the remainder was disposed of at various commercial facilities or recycled.

Alpha-5 Characterization

Characterization of the Alpha-5 facility structure was completed in anticipation of building demolition. The characterization was completed on over 1097 different sampling points and included floor, concrete, structural steel, and wall media sampling. Mobile and traditional cold vapor laboratory extraction methods were employed to identify and delineate areas that exceed RCRA Toxicity Characteristic Leachate Procedure (TCLP) levels for mercury. Of 259 samples analyzed for mercury, 32 or 12.4% failed the mercury RCRA TCLP threshold of 0.2 milligrams per liter (mg/L), with the highest measured at 12.9 mg/L. Other identified contaminants of concern include thorium, uranium, asbestos, and beryllium.

NEAR-TERM INITIATIVES

Several projects are being accomplished with remaining ARRA funds, and are underway to help control mercury releases off-site either directly or indirectly. These projects are:

- **Outfall 200 Water Treatment System –** The conceptual design for a water treatment system to reduce mercury concentrations in UEFPC is being developed using ARRA funds. Outfall 200 combines many surface water and groundwater sources with an average base flow of approximately 5,500 Lpm (1,500 gpm) that can vary substantially based on weather conditions. The conceptual design includes an alternatives analysis to explore various treatment options (e.g., using granular activated carbon adsorption or alternatively, chemical reduction of dissolved ionic mercury to elemental mercury with air stripping for removal). These and other options are being examined and compared based on criteria (such as complexity, secondary waste generation, technology readiness level, reliability, and cost). DOE-required documentation is being developed to support the capital project to construct and startup the facility. Pre-design studies are being performed to (1) investigate ways to reduce the base flow requiring treatment, (2) assess the need and extent of treatment for storm flow, and (3) optimize the selected design. Significant features of the conceptual design include the ability to add unit operations as needed (modular construction) and also allow for scale-up/down as necessary. A remedial design work plan will be submitted to regulators in the latter half of FY 2013.
- **Free Mercury Recovery –** This project removes free mercury from accessible areas of major storm drains at the site by installing mercury traps upstream from outfalls to UEFPC. These mercury traps, installed in manholes throughout the WEMA area, remove mercury through settling and separating the mercury, which deposits in the traps as water flows through the sewer system. A total of almost 12 kg (26 lbs) of elemental mercury has been recovered through this effort to date. Work continues on installation of these traps and elemental mercury will continue to be collected and removed.
- **Secondary Pathways –** The purpose of the Secondary Pathways project is to identify and correct potential water infiltration and mercury migration points at the three large mercury-contaminated process buildings (Alpha-4, Alpha-5, and Beta-4). Secondary water infiltration around the Alpha-5 and Beta-4 facilities will be mitigated by modifying drains, drainage systems, and installing

graded surfaces to ensure surface water runoff is appropriately routed to storm drains, thereby reducing water percolation through mercury-contaminated soil. Investigations of potential mercury source points within the facilities will be made, along with collection and disposal of any free mercury encountered. Similar activities performed at Alpha-4 will be verified.

- **Tanks Disposal –** This recently completed project has disposed of five excess tanks located at the Y-12 site. Three of the tanks contained over 3,700 kg (1,700 lbs) of mercury-contaminated material that has been recovered and will be treated and disposed off-site.
- **Mercury Soils Treatability Study –** This subproject evaluates technologies and capabilities to stabilize mercury-contaminated soil to meet LDRs. Three vendors received excavated mercury-contaminated soils from Y-12 and successfully completed demonstrations for treating the materials. All three treatability studies were successful in meeting the 40 CFR, Part 268.49 "Alternative Treatment Standard for Contaminated Soils" by achieving the required TCLP concentration of <0.2 mg/L.

In addition to the ARRA-funded projects above, several tech development studies are ongoing or planned, including a field study to examine the extent of mercury contamination in soils in WEMA using real-time, vapor-phase measurements. The technique involves driving a pushprobe into the ground and measuring elemental vapor mercury concentrations.

OUT-YEAR SCOPE

Figure 3 is a brief recap of the CERCLA process presented earlier in this document, and shows the organization of projects that have been planned to accomplish the source removal – building demolition and soil, sediment, slabs, and substructure remediation – in UEFPC. As seen in the figure, several actions have been completed, but the large building demolitions and remediation of large areas of soil and sediment remain to be performed in the years ahead.

Building Deactivation/Demolition

Demolition of the mercury-use buildings at Y-12 will be an enormous effort. Four facility complexes will be demolished and include the major process buildings (Alpha-2, Alpha-4, Alpha-5, and Beta-4) as well as numerous small associated buildings and structures. Table III demonstrates the scope of the demolition that will take place; each complex given in the table represents a multi-million dollar demolition project.

Table III. Mercury-use Facilities to be Demolished

Complex	Number of facilities	Total Area	
		(m^2)	(ft^2)
Alpha-2	4	30,899	332,595
Alpha-4	4	47,694	513,374
Alpha-5	15	61,091	657,575
Beta-4	10	32,250	347,132

The resulting debris from demolition will be segregated, and a portion will very likely require treatment to meet regulatory limits for landfill disposal. Removal of the buildings will provide access to the subsurface structures and soils beneath the buildings.

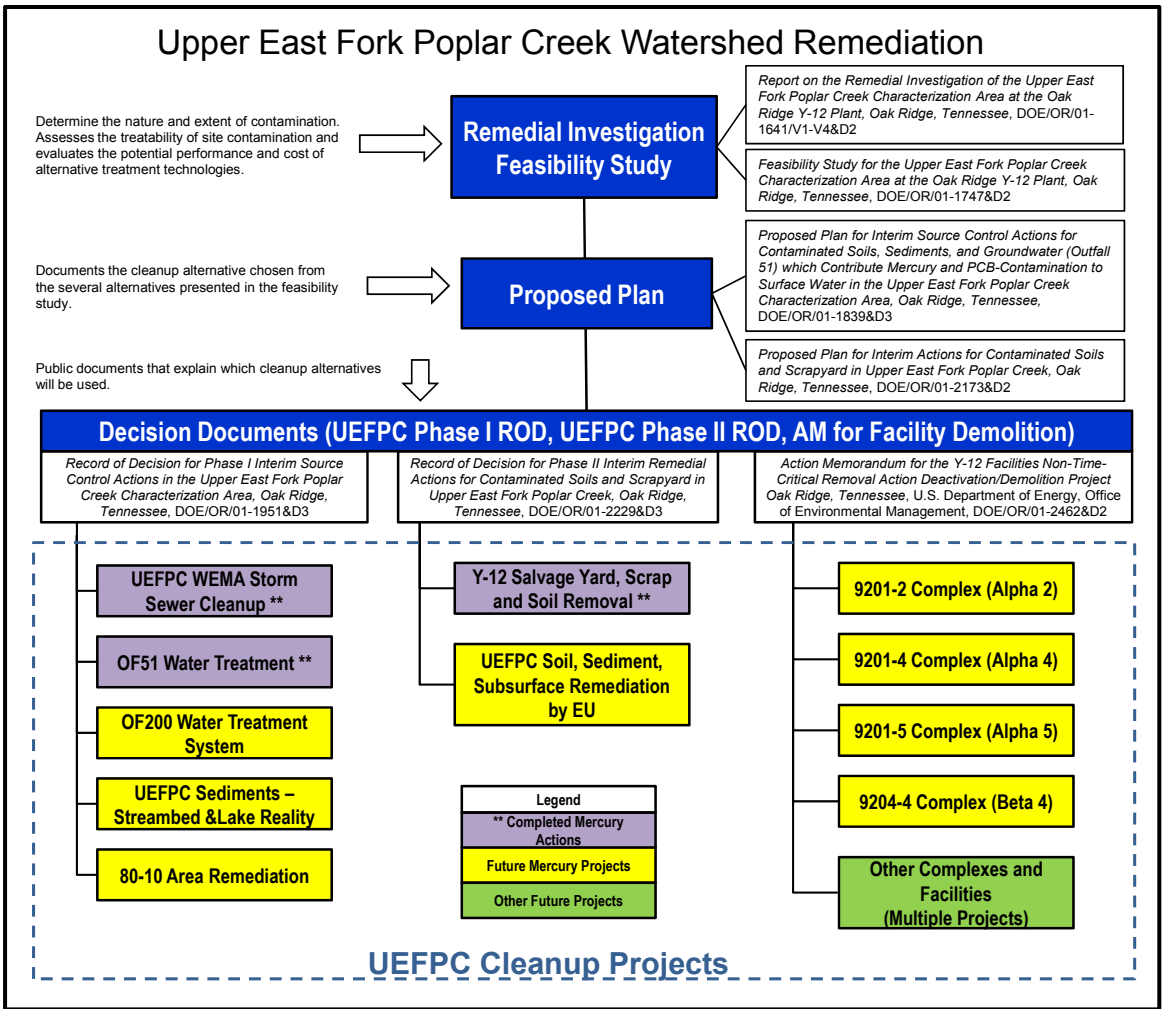

Figure 3. UEFPC Remediation Diagram, Showing Mercury Remediation Projects

Soil, Sediment, Subsurface Structures Remediation

The Phase I ROD addresses remediation of mercury-contaminated soil, sediment, and groundwater discharges that contribute contamination to surface water. The Phase I ROD Remedial Action Objective is to achieve a concentration of 200 parts per trillion (ppt) mercury in surface waters of UEFPC at Station 17. Several actions have been completed under this ROD (UEFPC WEMA storm sewer cleanup and Outfall 51 Treatment). Actions yet to be completed under this ROD include:

- Outfall 200 Water Treatment System
- Area 81-10 Remediation
- UEFPC Sediments (Streambed and Lake Reality) Remediation

The focus of the Phase II ROD is remediation of the balance of contaminated soil, scrap, subsurface structures (including slabs and currently inaccessible soils under buildings), and buried materials within the Y-12 Complex [11]. The Remedial Action Objective of the Phase II ROD is to protect industrial workers from exposure to hazardous substances and protect surface water and groundwater by reducing existing contamination of the solid matrix of the site (i.e., soil, sediment, buried waste, and subsurface structures). Soil remediation levels and calculation methods are established in the ROD. One action has been completed thus far under the Phase II ROD, *Y-12 Salvage Yard Scrap and Soil Removal*. The

balance of scope to be completed under the Phase II ROD will entail excavation and remediation of UEFPC soil and subsurface structures associated with the process buildings.

Soils under buildings are presently not well characterized. Some data exist; however, depth and areal extent of mercury contamination under and around buildings (basements) remains largely unknown [14]. Conjecture based on masses of mercury lost to the environment, and specifically to the ground, lead to the belief that contaminated soil volumes may be excessive. Several EU areas contain mercury-contaminated soil and sediments. In Figure 3, *UEFPC Soil, Sediment, and Subsurface Remediation by EU* will remediate the soils in and around the buildings and *UEFPC Sediments – Streambed and Lake Reality* will remediate UEFPC sediments and the associated retention area.

CONCLUSIONS

Mercury-related cleanup at the Y-12 site involves many challenges, the most significant being (1) the potential size/volume of the cleanup (water, soil, and debris), (2) the treatment and disposition of solids, and (3) the treatment of contaminated water. These challenges must be solved in the next several years in order to address the immediate issue of mercury flux leaving the site in surface water and to prepare for the imminent large-scale demolition projects and soil/sediment remediation of WEMA and the UEFPC itself.

A challenge to reduce the flux of mercury leaving the Y-12 site has been issued through the most recent Y-12 NPDES Permit. Additionally, TDEC has informed DOE that a new TMDL for mercury in EFPC will be set based on the fish tissue standard of 0.3 mg/kg, and will require EPA approval. Recent remediation activities resulted in temporary increases of mercury flux entering offsite waters. Large-scale demolition and extensive remediation planned in the future is likely to result in the same observation of mercury flux increases. The proposed Outfall 200 Water Treatment System is expected to progressively address these challenges through a scalable, modular design resulting in the removal of mercury from a significant fraction of the WEMA storm sewer system and UEFPC flows.

The on-going and future mercury remediation at Y-12 is an extremely large and complex problem from all perspectives: chemical, geological, ecological, physical, regulatory, and monetary. Efforts are being made daily by multiple contractors, regulators, and DOE officials to define, develop, and implement solutions to the issues. A mercury remediation strategy plan is being developed to organize and focus efforts to define the work, and to ultimately lead to successful completion of cleaning up mercury from the Y-12 site.

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