Proposed Plan for Outfall 200 (OF200) Mercury Treatment Facility (MTF)

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Background – Mercury at Y-12

Large quantities of mercury were used at the Y-12 National Security Complex (Y-12) during the Cold War era for nuclear weapons research and development from 1950 to 1963.

- 24 million pounds was brought to Y-12 (General Services Administration estimate).
- Over 2 million pounds was spilled, lost, or unaccounted for.
- Approximately 700,000 pounds was lost to the environment.
  - Contamination in process buildings and soils – 428,000 pounds
  - Releases to Upper East Fork Poplar Creek (UEFPC) – 239,000 pounds
  - Contamination in New Hope Pond sediment – 15,000 pounds
  - Airborne releases – 51,000 pounds
- Approximately 1.3 million pounds is unaccounted for.
Y-12 Process Buildings and Mercury Use Areas

Mercury flasks arriving at Y-12 (1955)

Emptying Hg flasks at the dumping shed (1955)

Mercury flasks arriving at Y-12 (1955)
Mercury contamination originates in the West End Mercury Area (WEMA), flows through storm drains, and enters Upper East Fork Poplar Creek (UEFPC) at Outfall 200.
Chronology of Key Mercury Remediation Actions at Y-12

1980's-1990's – National Pollutant Discharge Elimination System Permit Actions
   – Identification and reduction of point source discharges, process pipe rerouting, water treatment, storm sewer inspection & cleaning

1995-2000 – Lower East Fork Poplar Creek Floodplain Soil Removal

2002 – Upper East Fork Poplar Creek (UEFPC) Phase I Record of Decision (ROD)
   – Big Spring Water Treatment System, BSWTS (2005)
   – WEMA Storm Sewer Cleanout/Relining (2009-2011)
   – Sediment removal from UEFPC & Lake Reality (Future implementation)

2006 – UEFPC Phase II ROD
   – Remediation of onsite soils and scrapyards (ongoing)
   – Old Scrapyward Cleanup (2009-2012)

2010-2013 – Mercury Reduction Project
   – Actions under the American Recovery and Reinvestment Act of 2009 (ARRA), including mercury tank removal, MTF conceptual design.

2013 – Strategic Plan for Mercury Remediation at Y-12

2015 – Proposed Outfall 200 Mercury Treatment Facility (MTF) (Amendment to UEFPC Phase I ROD)

Future – Process Building Demolition & Soil Remediation
UEFPC Phase I ROD

• Record of Decision for Phase I Source Control Actions issued 2002.
  – Selected Remedy focused on a series of source control actions designed to reduce release of mercury to UEFPC.
  – Selected Remedy has been modified by Non-Significant Change Notices in 2006 & 2014, and Explanation of Significant Differences (ESD) in 2012.

• What New Information Has Led to the Proposed ROD Amendment?
  – Treatability study and conceptual design study for Outfall 200 MTF have been completed in support of the Phase I ROD requirement to study the viability of large-scale treatment of mercury-contaminated surface water.
  – Revised site conceptual model now indicates greater contribution from the WEMA storm sewer system at Outfall 200 than previously thought.
  – Operating experience of Big Spring Water Treatment System to treat discharge from Outfall 51 & Building 9201-2 sumps has been very successful.
UEFPC – Basis for Proposed Action

- While actions completed to date under the UEFPC Phase I ROD and other Y-12 remediation programs have achieved significant reductions in mercury releases from Y-12, levels of mercury in UEFPC surface water and fish tissue continue to exceed target levels.
- The West End Mercury Area storm sewer system, which discharges at Outfall 200, is estimated to be the most important current source of mercury release to UEFPC (~70%).
- Future demolition of former mercury-use buildings and remediation of underlying soils could lead to increased mercury releases to UEFPC.
Alternatives Evaluated

Comparing the Proposed Plan alternatives

- **Alternative 1: No Further Action**
  - Cost: None
  - Outfall 200 mercury flux reduction: None

- **Alternative 2: New Water Treatment System at Outfall 200**
  - **Alternative 2a:**
    - Influent treatment capacity of 1,500 gallons per minute & no stormwater storage capacity.
    - Outfall 200 mercury flux reduction: 52%
    - Construction cost: $115 million
  
  - **Alternative 2b:**
    - Influent treatment capacity of 3,000 gallons per minute & no stormwater storage capacity.
    - Outfall 200 mercury flux reduction: 68%
    - Construction cost: $125 million

  - **Alternative 2c: (DOE’s preferred alternative)**
    - Influent treatment capacity of 3,000 gallons per minute & 2 million gallon stormwater storage.
    - Outfall 200 mercury flux reduction: 84%
    - Construction cost: $146 million

  - **Alternative 2d:**
    - Influent treatment capacity of 3,000 gallons per minute & 10 million gallon stormwater storage.
    - Outfall 200 mercury flux reduction: 91%
    - Construction cost: $179 million

All Alternative 2 options assume modular construction design to facilitate future modifications as needed.

All Alternative 2 options assume same set of unit operations and only differ in treatment capacity and stormwater storage capacity.
UEFPC Preferred Alternative

- Alternative 2c:
  - Two-stage headworks designed to manage flows up to 40,000 gpm.
  - Treatment capacity for 3000 gpm of influent flow (~95th percentile UEFPC flow at Outfall 200) plus 1000 gpm of recycle flow.
  - Storage for 2 million gallons of stormwater above treatment capacity. Stormwater storage would be optimized to capture “first flush” runoff.
  - Physical/chemical treatment operations designed to reduce mercury concentrations in system effluent to a goal of 51 ppt.
  - Estimated to achieve 84% reduction in mercury flux at Outfall 200.
  - Modular design would facilitate any future modifications if needed.
  - Capital cost estimated at $146 million; Operations & Maintenance (O&M) cost estimated at $3.1 million/year.
  - Meets CERCLA threshold criteria (protectiveness & ARARs) and provides best mix of tradeoffs among CERCLA balancing criteria.
Preferred Alternative – MTF Proposed Location
Preferred Alternative – MTF Process Flow Diagram
Outfall 200 MTF Would Provide Multiple Benefits

• The proposed MTF would achieve immediate reductions in mercury releases from the WEMA storm sewer system to UEFPC surface water and make progress toward achieving compliance with regulatory criteria.

• The proposed MTF would provide a mechanism to control potential increases in mercury releases to UEFPC that might result from future demolition of the WEMA mercury-use buildings.

• The proposed MTF would supplement other response actions already underway or planned for future implementation under the Phase I ROD, as well as other actions under the Strategic Plan for Mercury Remediation, to achieve the ultimate goal of eliminating current fish advisories and use restrictions.