KAPL Report

IMPROVEMENTS TO SEDIMENT REMEDIATION AND ZEBRA MUSSEL REMOVAL TECHNOLOGY RESULTS FROM A CONFINED SPACE AT KNOLLS ATOMIC POWER LABORATORY RIVER ROAD SCHENECTADY, NY 12301

2009, 2011, 2013 and 2015

AIR & EARTH LLC

341 SETTLES HILL ROAD

ALTAMONT, NY 12009

518-428-3332

INTRODUCTION

This report details Improvements ENVIRONMENTAL LUNCH BOX TECHNOLOGY LLC (ELBT) experienced using its new patented technology for sediment and zebra mussel removal projects in a confined space at KNOLLS ATOMIC POWER LABORATORY (KAPL) completed in December, 2009 and in October 2011.

The technical specifications called for ELBT to submit procedures for removing sediment and zebra mussels from the inlet channel which travels from the Mohawk River to KAPL's pump house galley and required approval from the Department Of Energy, US Navy and Bechtel Representatives.

The submitted procedures were designed to comply with the NY State DEC permit and employ ELBT's most recent patented dredging and invasive species eradication technology.

BACKGROUND

ENVIRONMENTAL LUNCH BOX TECHNOLOGY (ELBT) is a subsidiary of AIR & EARTH LLC (A&E), a research and development firm which provides new Patented Technology for use in the environmental and energy sectors. ELBT provides a system and method for SEDIMENT MANAGEMENT in the areas of sampling, in-place treatment, removing, relocating, filtering, capping, invasive species eradication, habitat restoration and artifact recovery in both fresh and salt water environments.

KNOLLS ATOMIC POWER LABORATORY (KAPL) "based in upstate New York's Capital Region, is a world-class research and development facility dedicated to support of the United States NAVAL NUCLEAR PROPULSION PROGRAM. KAPL is operated for the DEPARTMENT OF ENERGY by BECHTEL MARINE PROPULSION CORPORATION (BMPC)." 1 "Bechtel is one of the world's premier engineering, construction, and project management companies. Since its founding in 1898, Bechtel has worked on more than 22,000 projects in 140 countries.

Knolls Atomic Power Laboratory Web Site

Today, Bechtel's 42,500 employees are teamed with customers, partners and suppliers on hundreds of projects in nearly 50 countries. At the KAPL Site employees develop advanced nuclear propulsion technology, provide technical support for the safe and reliable operation of existing naval reactors and provide training to naval personnel who operate them."2

The Knolls Atomic Power Laboratory Site (KAPL) is located on the Mohawk River in Schenectady New York adjacent to the General Electric Research and Development Site. The Mohawk River flows over 500 miles with its extensive canal system and waterways servicing the agricultural, industrial and manufacturing sectors. It flows largely west to east till it joins the Hudson River north of Albany NY. It flows through low lying lands that contribute to its high sediment load. In 2007 the river experienced a 100 year flood event that left a major impact on the amount of sediment loading to the river. It has a system of canals with origins from the Erie Canal and a vast lock system creating a man made sediment trap that impedes the natural flow and speed of the river. The Mohawk River provides over 63% of the sediment loading to the Hudson River on its way south to New York City.

The KAPL site relies on water drawn from the Mohawk River for their Laboratory cooling system and requires high rates of delivery. The high levels of suspended sediment and Zebra Mussels in the river poses a concern for the steady delivery of water through the inlet channel leading to KAPL's pump house due to the ongoing sediment buildup. A second area of concern is when the river locks are raised prior to the winter season allowing the summer high water level to drop to its natural lower flow level. This reduces the volume of water readily available for uptake to the cooling system as the water has to flow up and over the growing mound of sediment in the inlet channel. In the past winter seasons as the river froze the ice thickness extended downward approaching the inlet channel sediment mound. This situation lead to the water flow being squeezed for available space between the ice and the sediment mound. This situation endangered the available water supply necessary to operate the onsite cooling system.

The DEPARTMENT OF ENERGY engineering staff prepared the technical specifications for a sediment removal project for the Mohawk River inlet channel leading to the pump house galley with the following criteria;

Bechtel Marine Propulsion Corporation Web Site

UNDER SCOPE OF WORK PROVIDE;

Provide all materials, services, labor, tools, and equipment necessary to remove all sediment, silt, leaves, twigs, zebra mussel shells from the L4 Pump House Concrete Inlet Channel leading to the Mohawk River.

UNDER SUBMITTALS PROVIDE;
Inlet channel sediment removal procedure
Diving procedure
De-watering procedure
Written elevated work procedure
Confined space entry procedure
Respirator procedure
Written hazard analysis plan
Written safety program including on-site safety representative Diver certification (NAUI or PADI) training
Diver's air cylinder certificate

SITE SPECIFIC CONDITIONS;
Comply with the NY STATE DEC permit
Complete as a land based project
Provide diver's in the water start dates
VACUUM vs PUMP sediments 55 feet VERTICALLY above the water line Crane operator "WORKING BLIND" and BEHIND the pump house Provide a 30 ton crane to reach OVER the pump house roof and down into the inlet channel
Operate a 210 foot VACUUM PIPELINE distance for sediment recovery Contend with inlet channel overhead structural impediments
Contend with trash rack impediments
Entry to inlet channel by ladder only
Diver Vision assistance required

PROJECT EXECUTION

1. Used ELBT designed sediment removal procedures with a new AIR ASSIST LIFT SYSTEM that standard dredging practices do not have. Encountered hard bottoms (cement lined inlet channel), zebra mussels, sediment re-suspension and residual regulations, large debris issues (wood/ rocks), confined space issues, narrow and limited access and equipment constraints.

2. The patented ENVIRONMENTAL LUNCH BOX (ELB), nicknamed the TOXIVORE, was used for this site specific application. Sediment/mussels within the ELB confines were suspended using a water/air nozzle agitating system. The confined suspended sediment was removed under a vacuum using an air assist lift system flowing to sealed decanting dumpsters.

3. The ELB process was designed for a removal rate up to 700CF/M (5,250 gal/min) and equipped with a 6-inch diameter uptake pipeline.

4. Work was performed from shore, sediment/mussels traveled a vertical distance 55 feet above the inlet channel and 50 feet over the pump house. A 210-foot pipeline was established running from the submerged ELB, up the river bank to the sealed decanting dumpsters alternating between them for ongoing decanting.

5. All principle members of the project were linked thru radio communication with the project site commander for safety and operational controls.

6. Entry into the inlet channel was by ladder access only.

7. The ELB was crane lifted into the inlet channel, submerged and guided throughout the project by a dive team member equipped with a live cable feed to a laptop viewed by the dive coordinator.

8. The ELB system proceeded to remove the sediment and zebra mussels within the inlet channel overcoming the 55-foot elevation while still using a vacuum recovery system.

9. Completion of the project was diver and video verified.

IMPROVEMENTS

1. ELB units controlled by both above water level operators/computers and/ or by divers below the water level.

2. ELB units adjusted for agitator heights, velocities and directions.

3. ELB units equipped with assorted agitator devices such as multi-directional rotating jets, whips, chains, cutters, augers, choppers, blades, drills, etc. used independently and/or together.

4. ELB units adjusted for the elevation of the internal uptake line and filter.

5. ELB units adjusted for the air/water lift assist system.

6. ELB units use multi-length ends with flexible seals, plain ends or sled ends.

7. ELB units operate with an underwater buoy support and propulsion system.

PROJECT RESULTS

1. The ELB removed more sediment than the 4-foot depth forecasted in the project scope while ultimately removing increasing sediment levels of 7 feet at the river's edge.

2. All non-sediment (wood and rocks larger than 6 inches in diameter) was segregated from entering the ELB's vacuum pipeline for sediment recovery.

3. Using the ELB achieved a cost savings by;

   3.1. Reducing the 4-day work schedule to less than 1 day.

   3.2. Reducing the non-sediment volume, handling and disposal costs.

   3.3. Employing alternating sealed sediment dumpsters with built-in decanting features.

4. No turbidity plumes, re-suspension or sediment releases to the water column were observed or recorded.

SUMMARY

1. The project results demonstrated that the designed sediment removal procedures engineered by ELBT employed the newest and best dredging technology, controls and management practices.

2. Efforts were made in the design by ELBT to incorporate remedial alternatives directed to CERCLA Sect.121(d),42 U.S.C. Sect 9621(b)(1), which mandates that remedial actions must be protective of human health and the environment, cost effective and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity or mobility of the hazardous substances, pollutants and contaminants at a site.

3. ELBT complied with the NY State DEC permit requirements and the Department of Energy project specifications with the ELBT's patented sediment removal procedures having recorded no re-suspension, releases or turbidity plumes thru out the project while meeting the scope of work "to remove all sediment, silt, leaves, twigs and zebra mussel shells."

CLOSING SECTION

New technologies developed by ELBT aids projects that require Sediment and Invasive Species removals. One area of mounting concern is for industries that use water from our rivers, lakes, dams and waterways as a source for power generation and manufacturing processes. The Power Generation Industry is now a matter of Homeland Security and poses new security risks in

addition to the current Environmental Risks we are facing today. Many processes use over 100,000 gallons a day and draw water at high flow rates compounding the accumulation of Sediments and Invasive

Species in their uptake lines, supply channels and debris screens. There are processes still that require drawing additional primary source water to be added to their discharge water, so as not to create issues of Thermal Pollution or Species Kill Zones when this process water is returned to the supply waterways. This secondary water supply injection also adds to the increasing accumulation rates of Sediments and Invasive Species that we are experiencing today. As we begin to deal with the effects that Climate Change has on our environment we can only expect to see an increase of sedimentation and Invasive Species issues for power generation firms, industries and commerce sectors, manufacturing, shipping, ports and harbors as well as issues concerning clean water and water scarcity now being seen across all continents.