

## Case Studies: Discovering Mercury During Renovations

or  
How a Simple Project gets Complicated

### Case Studies

- Physics – Simple mercury clean-up
- South- Wastewater Pipe Replacement Project

### Physics 0040 and 0042

- In July 2002, EP receives call from FMD -Is safe to move equipment from room before they renovate it?
- While surveying the room, mercury is discovered on the shelf and floor.
- Spill team begins cleanup. Work stopped when meter pegs over 0.9 ppm.

### Physics 0040 and 0042

- In August 2002, EP contracted Clym Environmental Services (Clym) to remediate the room.
- In order to remediate 0042, the excess equipment stored in the room had to be removed.
- Room 0036 was lined with plastic and the equipment was moved.....

*I was in Iowa while they did this!*



### Physics 0040 and 0042

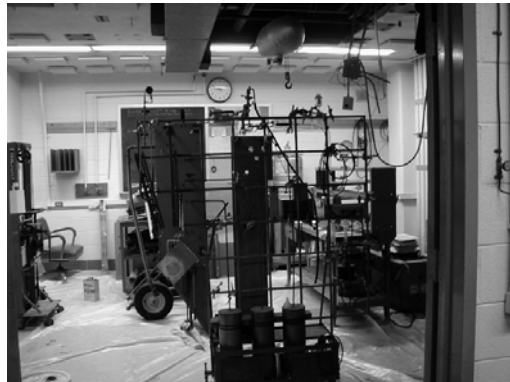
- Clym removed all floor tile and remediated the bare floor using Mercon-X.
- A survey indicated mercury present in the floor drain. Floor drain and the soil beneath were removed.
- Mercury vapors were also detected in Room 0040 during this project.

### Physics 0040 and 0042

- While remediating 0042, we checked room 0036 and determined that the mercury levels were rising in the room.

### Physics 0040 and 0042

- In September, Clym returned to remediate Room 0040.
- Added bonus – Asbestos Floor Tiles!
- Clym attempted to determine what pieces of equipment were contaminated in rooms 0036 and 0040. Results were inconclusive.
- EP collected swipe samples from the equipment for laboratory analysis.



### Physics 0040 and 0042

- Clym and EP determined that the equipment in 0036 and 0040 was contaminated with mercury dust. Highest reading 1000 ug/swipe.
- So now what?????
- After talks with the Physics Department, plan is to decontaminate the equipment in room 0040 and dispose of the equipment in room 0036.





## Physics 0040 and 0042

### *Remedial Costs*

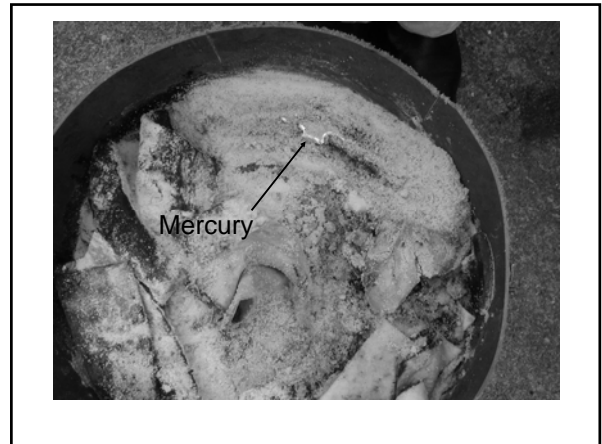
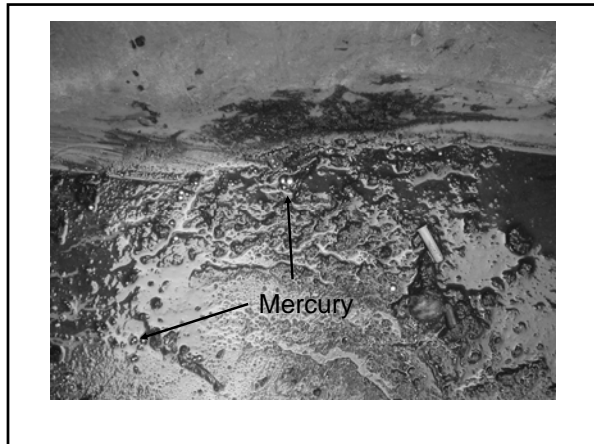
- Clym - \$5,450
- Laboratory - \$315.00
- CleanHarbors/Heritage - **\$20,358.16**

## Duke South

- Late Spring 2005
  - Engineering & Operations (E&O) began acid line replacement project (~300ft) in the basement of the Green Zone.
  - Project work was conducted solely on weekends over the period of a month
  - Hallways and floor were lined with plastic to prevent damage
  - Work space above the ceiling was very tight so piping was removed in small sections

- E&O personnel noticed "silver stuff" on the plastic lining after removing a section of pipe.
- E&O Plumbing Shop Supervisor called Afterhours Spill Responder for help.
- While waiting for the Afterhours Responder, E&O personnel checked the piping and discovered the extent of the problem.
- Afterhours Responder, and other OESO personnel (Karen picked a good weekend to go to DC) evaluated the site.
- They:
  - decided to encase all piping in plastic for future (Monday) packing for disposal
  - decided to provide drums to E&O prior to additional work for onsite (real time) packaging for disposal





- The next two weekends, E&O removed the piping and placed them into drums for disposal.
- OESO personnel were onsite to monitor the Hg vapors during removal.
  - High levels (>0.025) were not recorded during the piping removal.

- Inspection of work tools during wrap up identified a number of contaminated items.
  - Ladders, gloves, extension cords, hammers, etc.
  - Workers who had already received a crash course in mercury were shocked by the "spread" of contamination.

- Over the course of the project, plumbers had been using a shop vac to clean up excess water onto of the plastic lining. Said plumbers then emptied the shop vac into the storm sewer. Problem????
  - Upon inspection of the suspect drain, OESO personnel found a large amount of mercury in and around the catch basin.
  - Contracted Clym Environmental, Inc. to decontaminate and clean the basin, any impacted downstream piping and basins, & the area surrounding the basin.
- TOTAL PROJECT COST - \$194,000**

## The adventure continues...

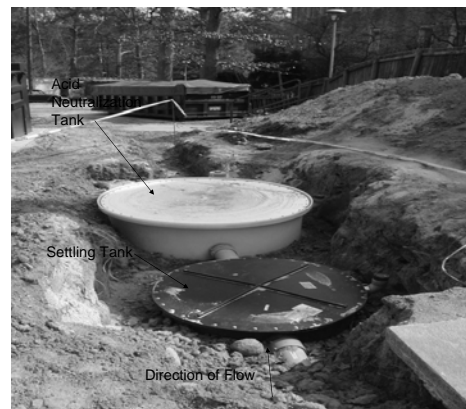


- The E&O Plumbing Shop Supervisor located the acid neutralization tank that would have been impacted by the previous project.
- Tank is believed to have been installed during original construction of Duke South (approx. 75 years old).
- When tank was opened, we discovered that the tank was full of sludge.
- E&O and OESO EP prepared a proposal to replace the old tank and remove the sludge.

- Project was approved in August 2005.
- Sludge was sampled to determine levels of possible contaminants and, if contaminated, disposal options.

CONTAMINANT	SLUDGE (SL-1)	WASTEWATER (WW-1)
<b>Metals</b>		
Mercury	90,000 mg/kg	4.45 mg/L
Arsenic	22 mg/kg	0.015 mg/L
Barium	1,020 mg/kg	0.926 mg/L
Cadmium	51.1 mg/kg	0.02 mg/L
Chromium	2,320 mg/kg	- mg/L
Lead	2,750 mg/kg	0.058 mg/L
Selenium	5 mg/kg	- mg/L
Silver	7,330 mg/kg	- mg/L
<b>Volatile Organics</b>		
Acetone	- ug/kg	100 ug/L
Methylene Chloride	- ug/kg	10 ug/L
1,1,2,2-Tetrachloroethane	69,000 ug/kg	370 ug/L
Chloroform	- ug/kg	16 ug/L
Benzene	3,700 ug/kg	15 ug/L
Bromodichloroethane	- ug/kg	5 ug/L
Toluene	17,000 ug/kg	46 ug/L
Ethylbenzene	15,000 ug/kg	35 ug/L
m-Xylene & p-Xylene	84,000 ug/kg	180 ug/L
o-Xylene	18,000 ug/kg	49 ug/L
Isopropylbenzene	1,100 ug/kg	- ug/L
n-Propylbenzene	760 ug/kg	- ug/L
Naphthalene	760 ug/kg	- ug/L
<b>Hazardous Waste Characteristics</b>		
Ignitability (D001)	No	Yes
Corrosivity (D002)	No	No
Reactivity (D003)	Yes	Yes
<b>Other</b>		
TCM	42 mg/kg	0.62 mg/L

- New acid neutralization tank was reengineered based on the lab results.
- A small settling tank was added to the plan to “settle” the Hg out of the water before the AN tank.



- On April 27, Clym Environmental arrived onsite to remove the contaminated sludge from the tank.
- Of course, we picked the first day in months that it decided to rain...all day long!



Sludge removed from tank.



Disposable sludge removal buckets

Decon of Tank (removal of mud from shoes)





- Total of 13 drums (715 gallons) of sludge were removed from the tank.
- Laboratory analysis of the concrete indicate tank is non-hazardous.
- Tank was filled with sand and closed in place.
- Still to do – Sample the effluent of the new tank system to determine effectiveness.

- Waste was shipped via Heritage Environmental, Inc. for disposal.
    - Total # of drums – 23 (13 sludge drums)
- Total Project Cost – \$60,497.08**  
*(does not include OESO time)*

- ### The Project Continues....
- Samples of the wastewater effluent have been collected over a 6 month period.
  - Results indicate the presence of mercury and zinc above the discharge standards.
  - Next step – apply for discharge permit

## Results of Both Projects

- Both maintenance departments developed Mercury SOPs.
- Environmental concerns now part of preplanning for every remodel/renovation.
- All piping in Duke South flagged as being possibly mercury contaminated.