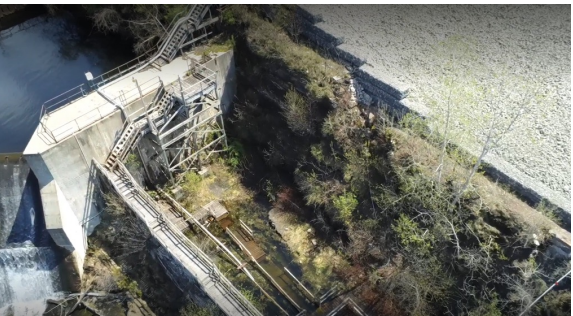
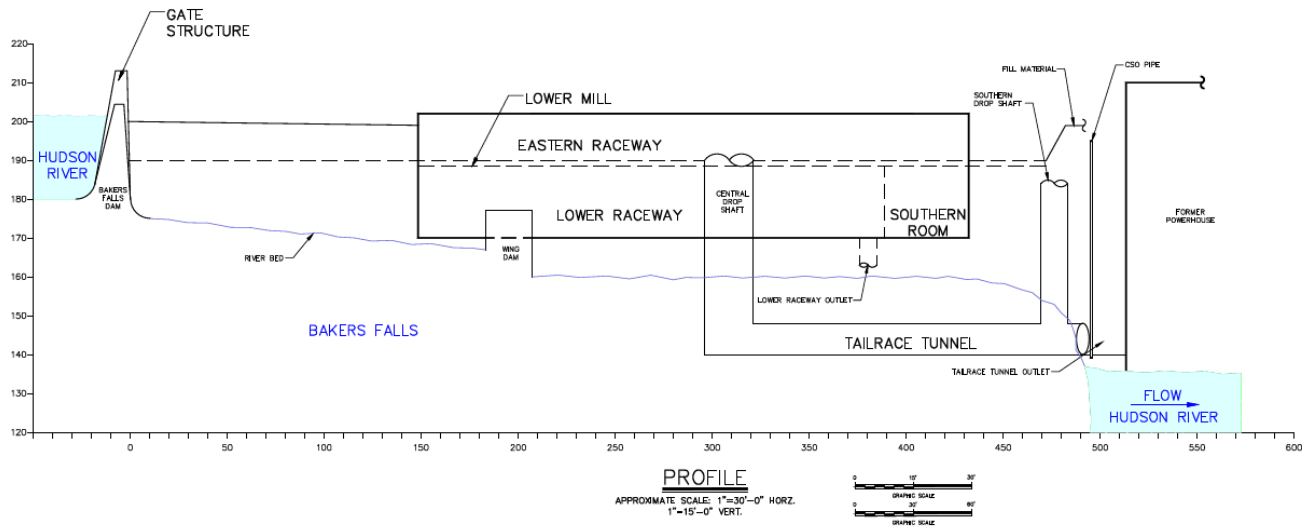
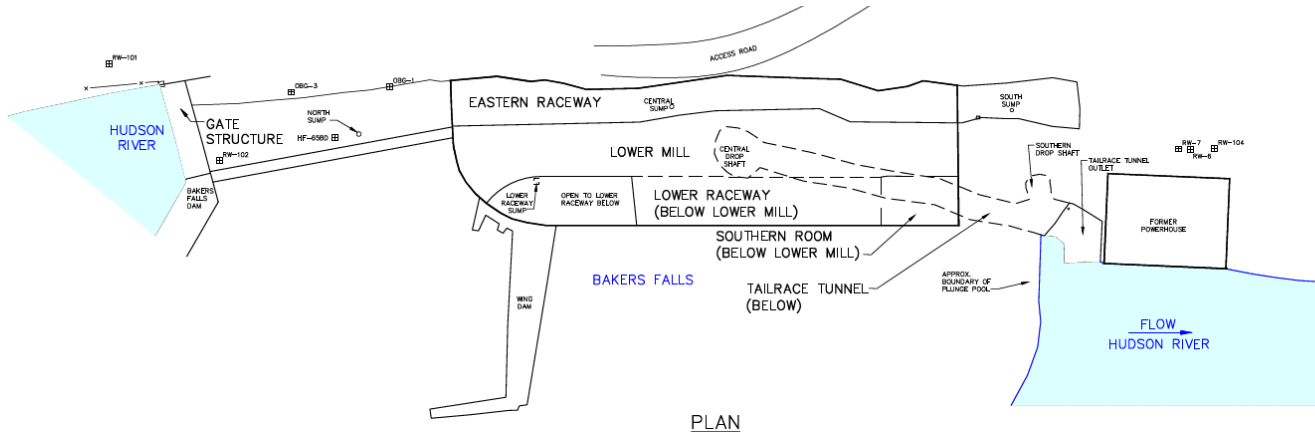


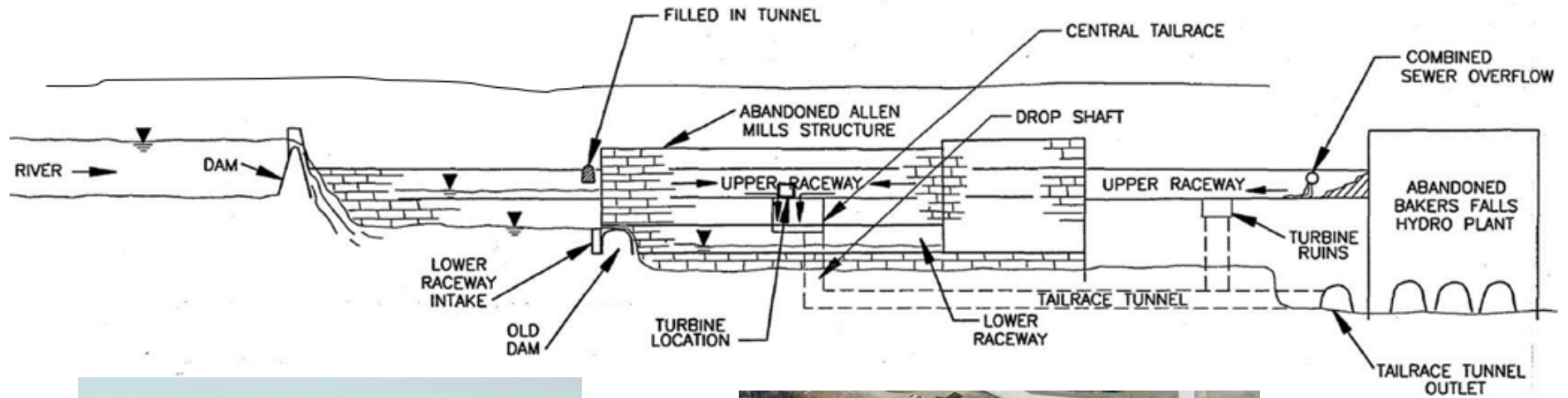
Environmental Summary

Allen Mill

Allen Mill Structure

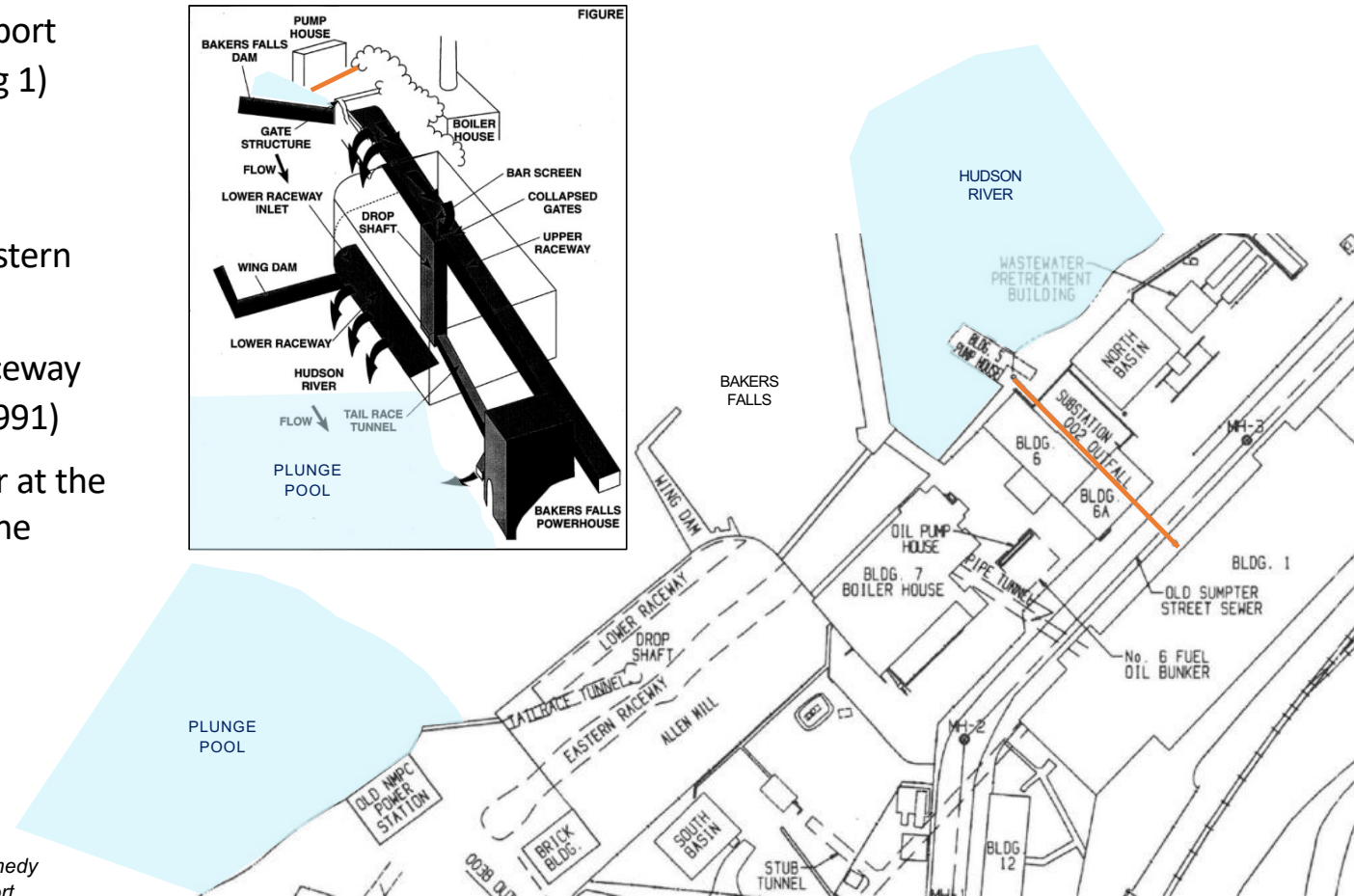


Allen Mill Structure



Conceptual Model for Allen Mill NAPL

- Primary source of NAPL transport was Outfall 002 (from Building 1)
 - NAPL transport through fractured bedrock
- NAPL collected behind the Eastern Raceway gate structure
- NAPL entered the Eastern Raceway when structure failed (circa 1991)
- Discharge to the Hudson River at the base of Bakers Falls through the Tailrace Tunnel



References:

1996 OU3 IRMs Report
 1997 Bedrock RI Report OUs 2C & 2D
 2001 Recommendation for a Comprehensive Site-Wide Remedy
 and FS for Bedrock Groundwater (OU-2C and OU-2D) Report

IRMs and Other Remedial Activities

- **Early 1993:** Retrieved 7 capacitors and components from an additional unit from the Hudson River bottom
Ref: 1996 OU3 IRMs Report
- **1993:** Constructed a water pretreatment system for seepage and surface water runoff collected from the Eastern Raceway; effluent trucked to Fort Edward water treatment plant (WTP) *Ref: 1997 Bedrock RI Report OUs 2C & 2D*
- **1993:** Initiated bedrock water seepage collection from Eastern Raceway *Ref: 1996 OU3 IRMs Report*
- **1994:** DNAPL and bedrock water seepage collection in Tailrace Tunnel *Ref: 1997 Bedrock RI Report OUs 2C & 2D*
- **1993-1995:** Collected and treated ~19.5 million gallons of seepage/surface runoff from Eastern Raceway
Ref: 1996 OU3 IRMs Report
- **1993-1995:** Removed >45 tons of PCBs from Allen Mill Eastern Raceway, Lower Raceway, Tailrace Tunnel

Allen Mill IRM <i>Ref: 1997 Bedrock RI Report OUs 2C & 2D</i>	Removal Quantity (Tons)	
	Sediment	PCBs
Eastern Raceway	1,832	7.5
Lower Raceway	768	0.7
Tailrace Tunnel	830	37.5
Totals	3,430	45.7

- **1994-1995:** Following sediment removal, installed bedrock sumps for long-term seepage collection in Eastern Raceway, Tailrace Tunnel, and Lower Raceway and started DNAPL removal *Ref: 1996 OU3 IRMs Report*

IRMs and Other Remedial Activities

- **1994:** Temporarily dewatered Bakers Falls Wing Dam pool; collected and removed DNAPL and PCB-impacted water from exposed seeps *Ref: 1996 OU3 IRMs Report*
- **1994:** Installed grout curtain (300 cubic feet of grout) and upgradient groundwater relief well system in Eastern Raceway prior to re-introduction of flow to dewatered portion of Bakers Falls *Ref: 1996 OU3 IRMs Report*
- **1994:** Walled off the Tailrace Tunnel to reduce potential discharges of water *Ref: 1997 Bedrock RI Report OUs 2C & 2D*
- **1995:** Initiated Site-wide DNAPL recovery program *Ref: 1997 Bedrock RI Report OUs 2C & 2D*
 - Monitor and remove DNAPL from Site wells and sumps in Eastern Raceway, Tailrace Tunnel, and Lower Raceway
- **1995:** Initiated operation of the Site WTP *Ref: 1997 Bedrock RI Report OUs 2C & 2D*
- **1996:** Initiated Site-wide groundwater recovery programs in overburden and bedrock, including RW-104 *Ref: 1996 Overburden RI Report OUs 2A & 2B*
- **1996:** Discovered and installed containment system for underwater Seep-13; operated through early 1997 and recovered 4.4 gallons of DNAPL *Ref: 1997 Bedrock RI Report OUs 2C & 2D*

IRMs and Other Remedial Activities

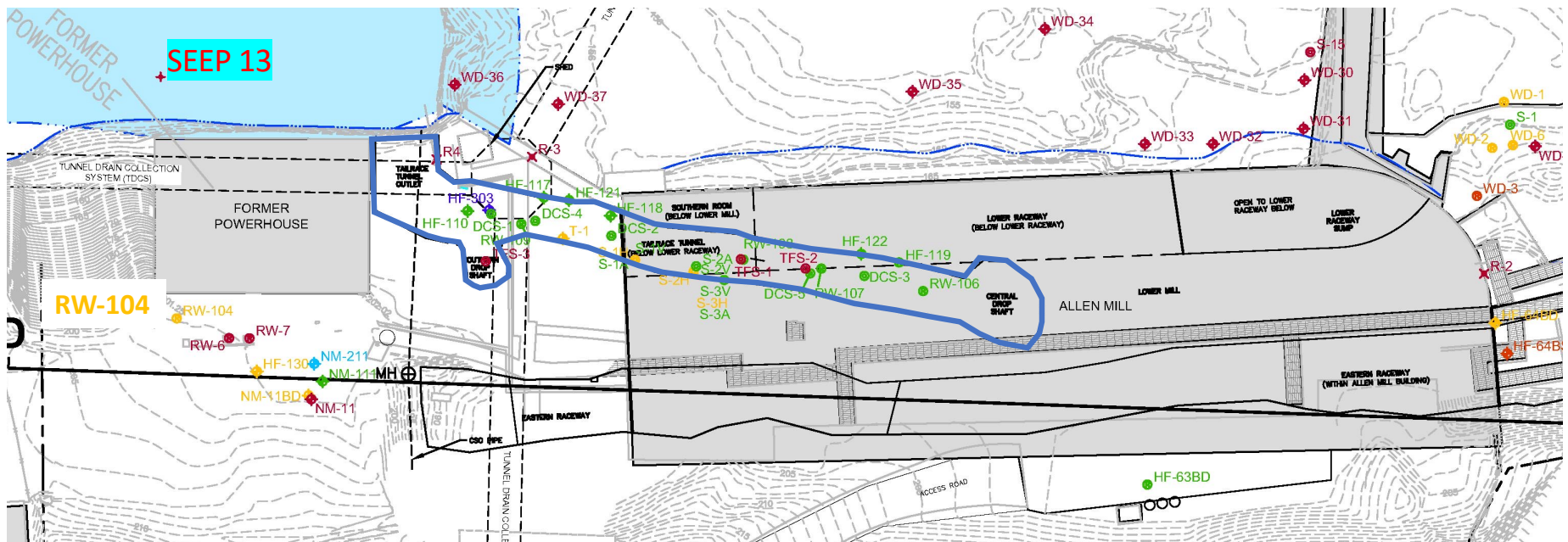
- **1995-1997:** *Ref: 1997 Hydraulic Containment Status Report*

- Ongoing monitoring of DNAPL seeps along River
- Ongoing DNAPL recovery from ~ 90 Site locations: **2,134 gallons from recovery start (1995/1996) through March 1997**

Recovery System	Volume	Percentage of Total
Bedrock recovery wells	1,573 gallons	74%
Overburden/upper Snake Hill Shale recovery wells	377 gallons	18%
Monitoring wells	117 gallons	6%
Tailrace tunnel borings and wells	61 gallons	3%
River seeps	4.8 gallons	0.2%

- Ongoing groundwater recovery from 6 overburden RWs, 5 bedrock RWs, Tailrace Tunnel, and HF-63BD and HF-65BD: **5.9 million gallons removed from recovery start (1995/1996) through March 1997**
- **1997 –1998:** Performed Powerhouse pad IRM and diver-assisted NAPL recovery
- **1998:** Constructed Wing Dam containment/collection system and installed shallow Wing Dam wells WD-1 - WD-39
Ref: 1998 Hydrogeologic Summary Report and 1999 Work Plan
- **1998:** Relocated 3,500 tons of rock and removed 120 tons of rock/debris from Wing Dam pool; pressure washed surface of upper fault plane and surveyed Wing Dam pool *Ref: 1998 Hydrogeologic Summary Report and 1999 Work Plan*

➤ 59 gallons DNAPL and 552,000 gallons groundwater recovered January – September 1997 *Ref: 1997 Bedrock RI Report OUs 2C & 2D*



IRMs and Other Remedial Activities

- **1999-2000:** *2001 Bedrock Investigation Report Addendum II*
 - Performed water and polymer floods at Wing Dam wells WD-2 through WD-6 (recovered ~12 grams of PCBs)
 - Installed numerous FLUTe™ multi-level monitoring systems
 - Installed and sampled Bakers Falls bedrock wells BF-1BD through BF-4BD
 - Inspected Wing Dam wells WD-1 through WD-39; no DNAPL observed
 - Inspected Wing Dam containment and collection system; recovered 0.1 gallons of DNAPL from sump near Seep-5
 - Removed 120 pounds of rock and debris at from Wing Dam area near Seep 14 in upper fault plane; pressure washed area and installed four new collection sumps
 - Confirmed integrity of Seep-13 collection system
 - Performed pumping tests at well BF-2BD and numerous recovery wells

DNAPL Characterization / Removal Actions (Pre-TDCS)

- **2001:**

- Ongoing recovery at 35 groundwater extraction systems and 19 NAPL extraction systems
- >5,100 gallons of DNAPL recovered since 1995
- Completed bedrock RI
- Submitted recommendation for comprehensive site-wide remedy for bedrock groundwater: proposed TDCS

- **2003: PRAP**

- **2004: ROD**

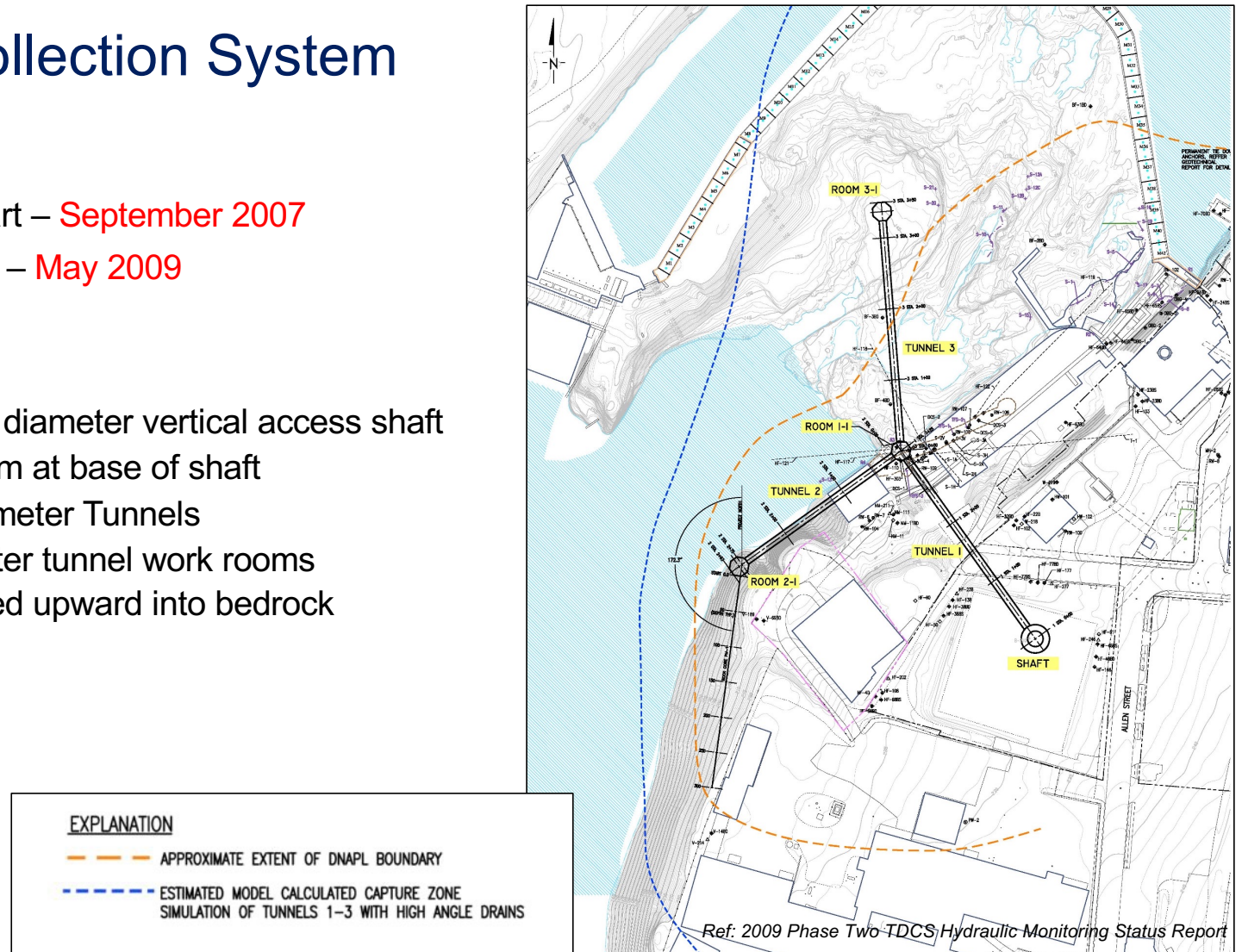
- **2005 – 2006:
TDCS Pre-Design**



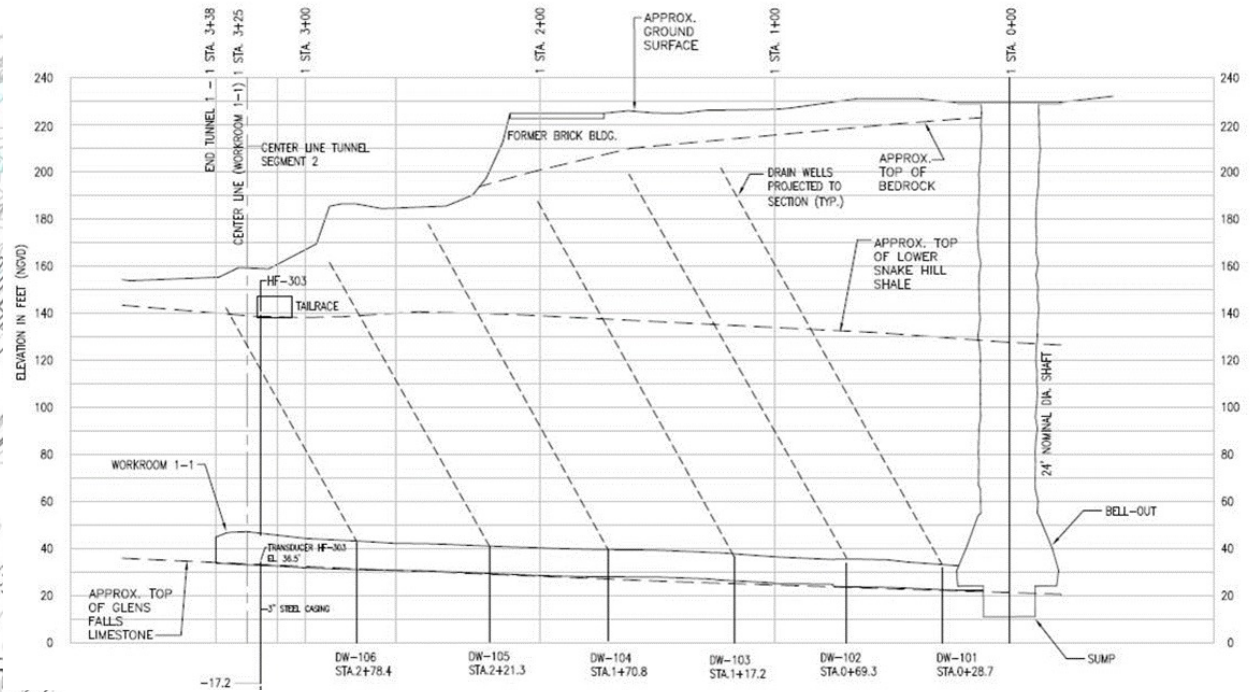
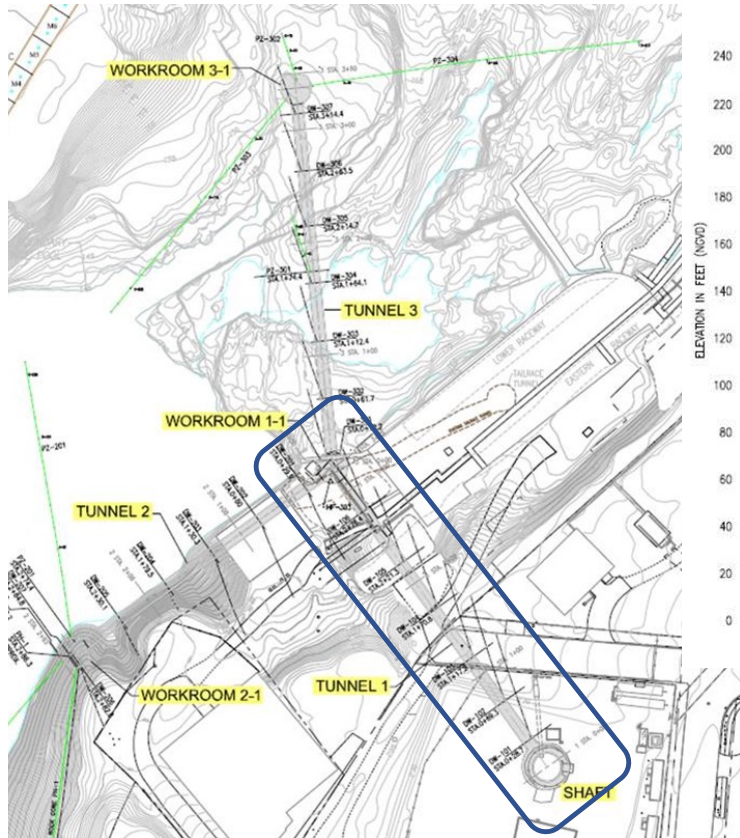
Ref: 2001 Recommendation for a Comprehensive Site-Wide Remedy and FS for Bedrock Groundwater (OU-2C and OU-2D) Report

Tunnel Drain Collection System

- TDCS Construction Start – **September 2007**
- TDCS Operations Start – **May 2009**
- TDCS Components
 - ✓ 200-ft. deep, 24-ft. diameter vertical access shaft
 - ✓ 44-ft dia. Work room at base of shaft
 - ✓ 971 ft. of 10 ft. diameter Tunnels
 - ✓ Three 26-ft. diameter tunnel work rooms
 - ✓ 20 drain wells drilled upward into bedrock

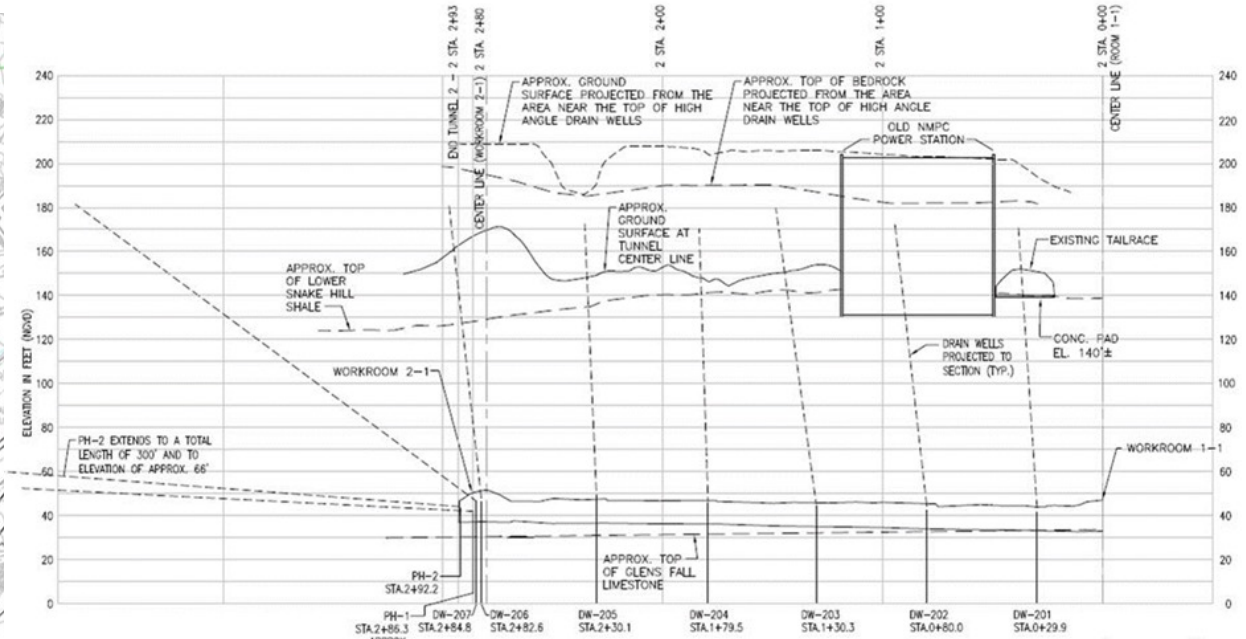
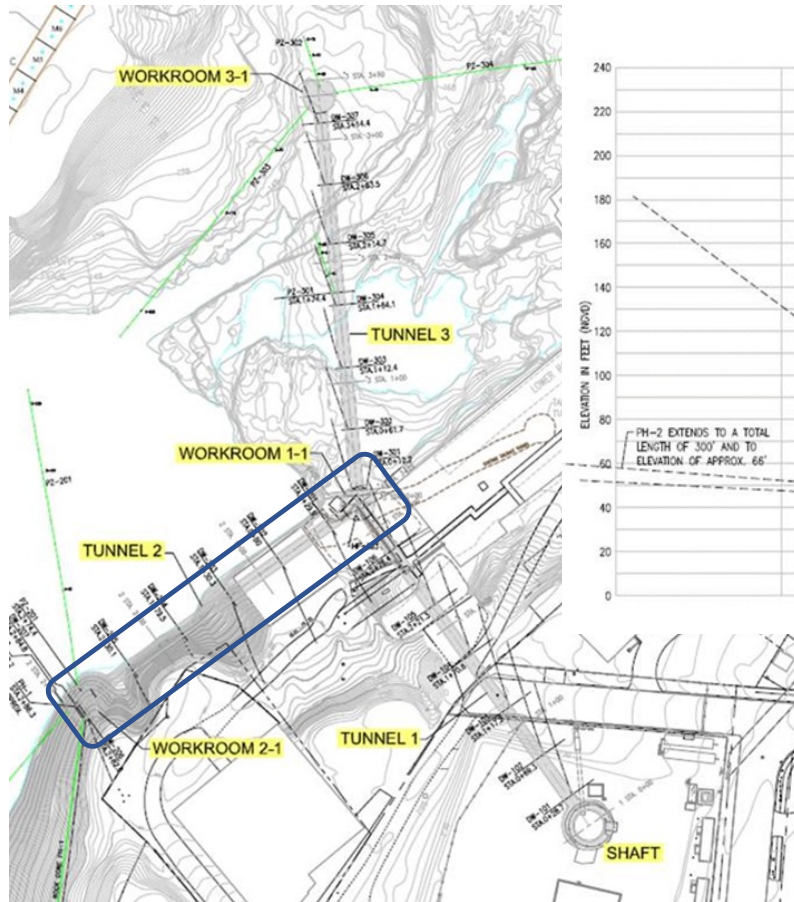


TDCS and Bedrock Profile – Tunnel 1



Closest drain well within ~10 feet of ground surface

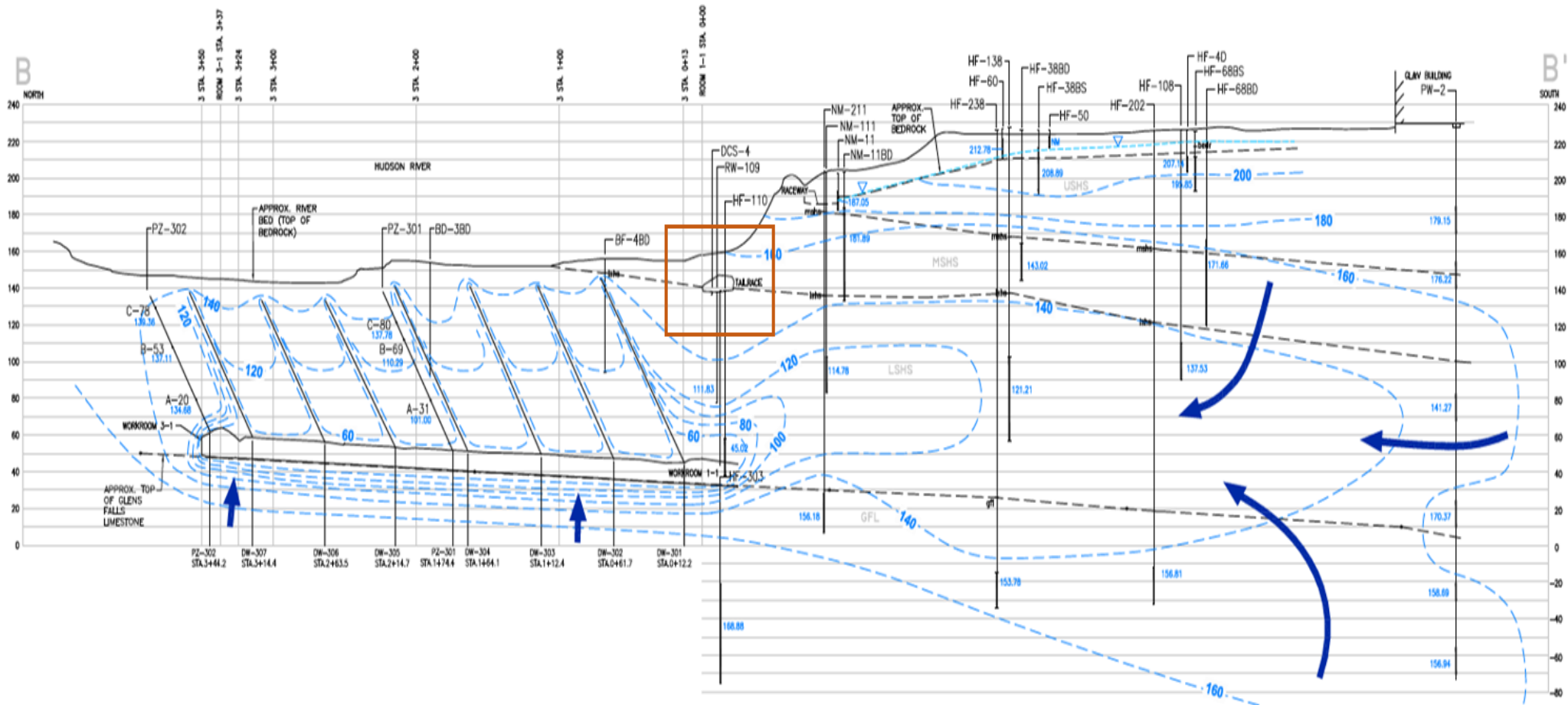
TDCS and Bedrock Profile – Tunnel 2



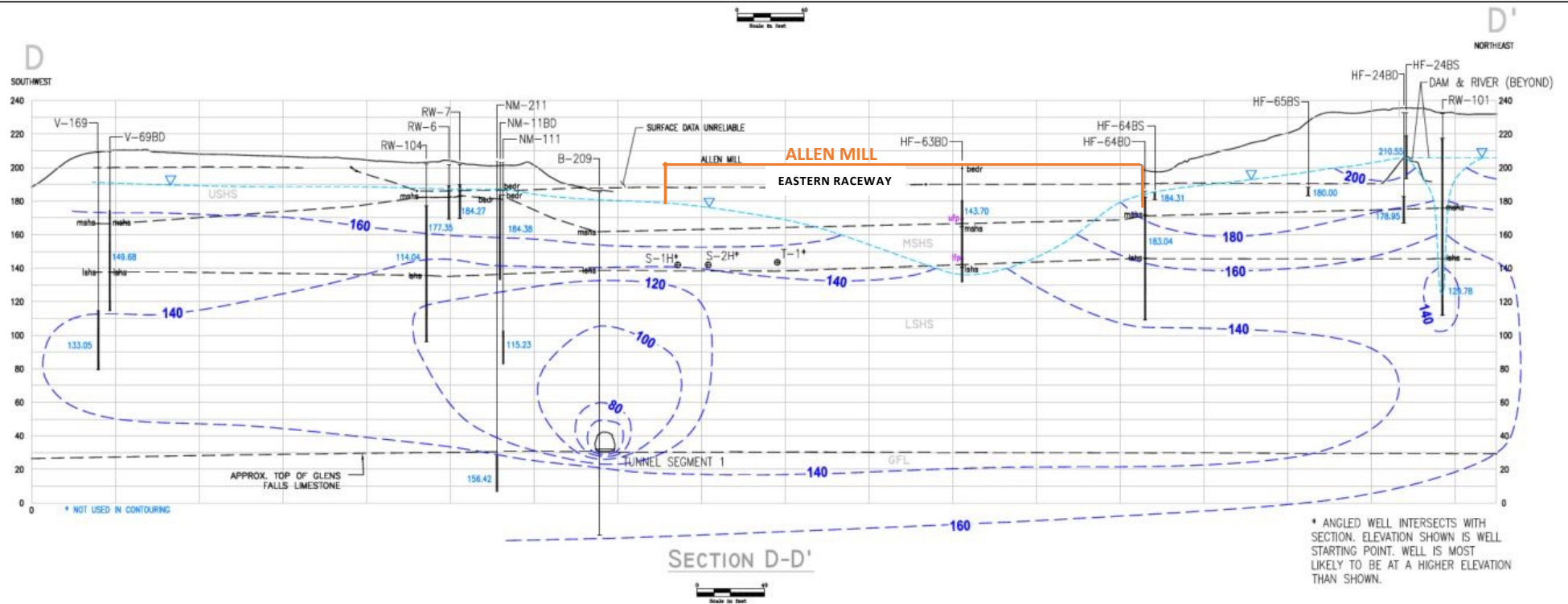
Closest drain well within ~16 feet of ground surface

Ref: 2010 Phase Three TDCS Hydraulic Status Monitoring Report

TDCS Hydraulic Capture (~2010)



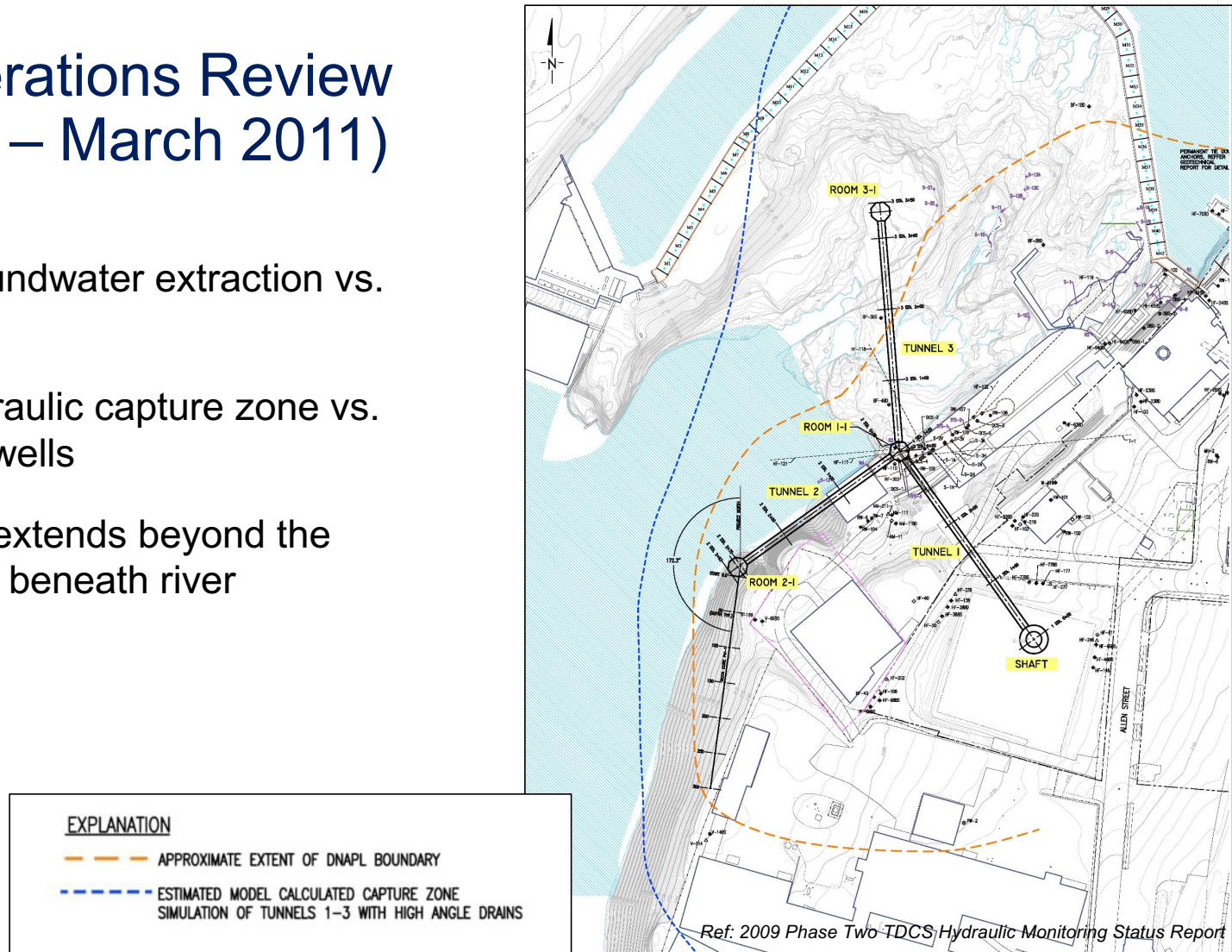
Potentiometric Section through Allen Mill Area



Ref: 2010 Phase Three TDCS Hydraulic Monitoring Status Report

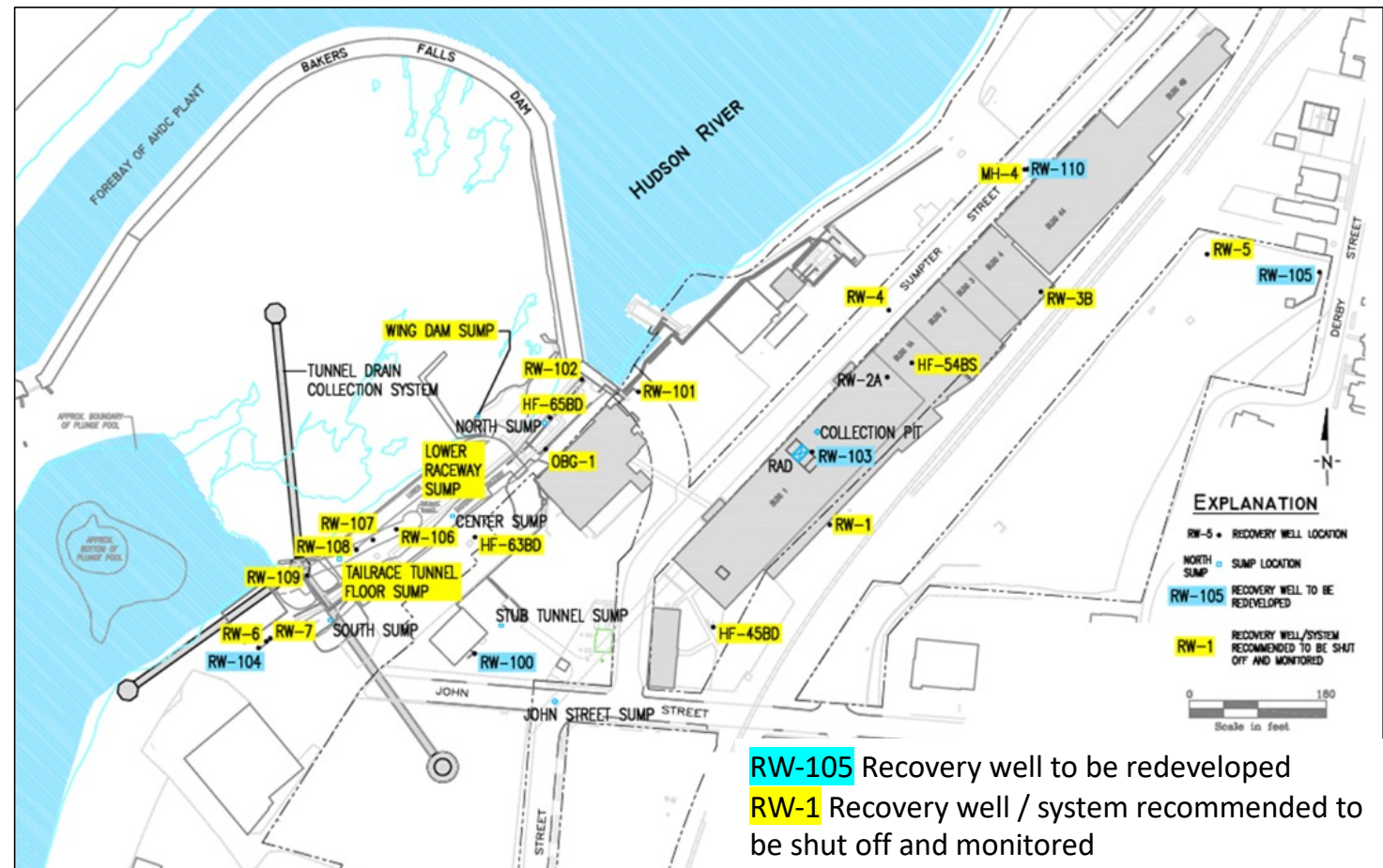
TDCS Operations Review (May 2009 – March 2011)

- Increased groundwater extraction vs. previous IRMs
- Increased hydraulic capture zone vs. IRM recovery wells
- Capture zone extends beyond the known DNAPL beneath river



Recovery System Optimization Plan - 2011

- Ongoing O&M of TDCS, drain, and recovery systems
- Shut down recovery wells / systems within the TDCS capture zone
- Redevelop groundwater / DNAPL recovery wells
- Ongoing long-term monitoring



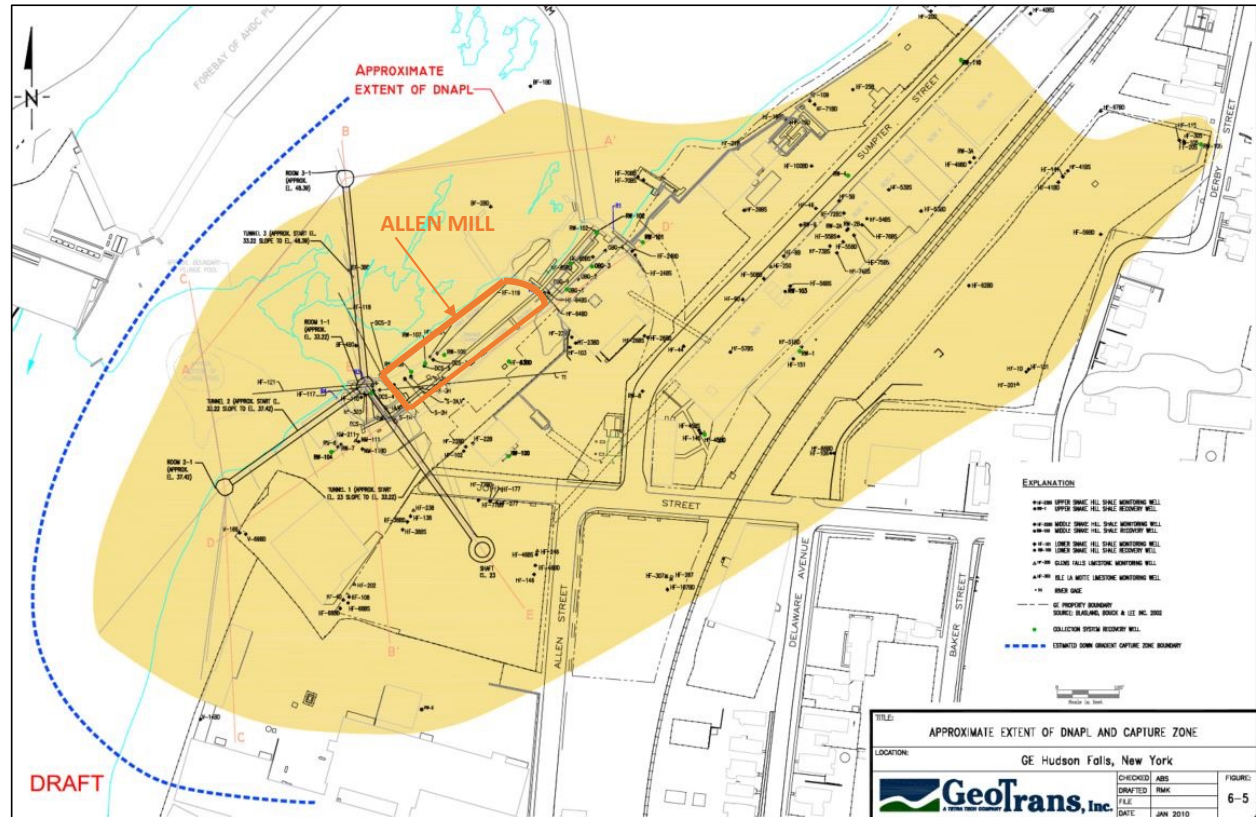
Ref: 2011 TDCS Performance Evaluation and Phase Three Completion Report

2009-2023

- 14 years of TDCS operation has maintained capture
- Periodic DNAPL monitoring at 111 locations
- Ongoing DNAPL recovery
 - >8,500 gallons since 1995
- Annual TDCS entry and drain well redevelopment
- Recovery well RW-104 rehabilitation

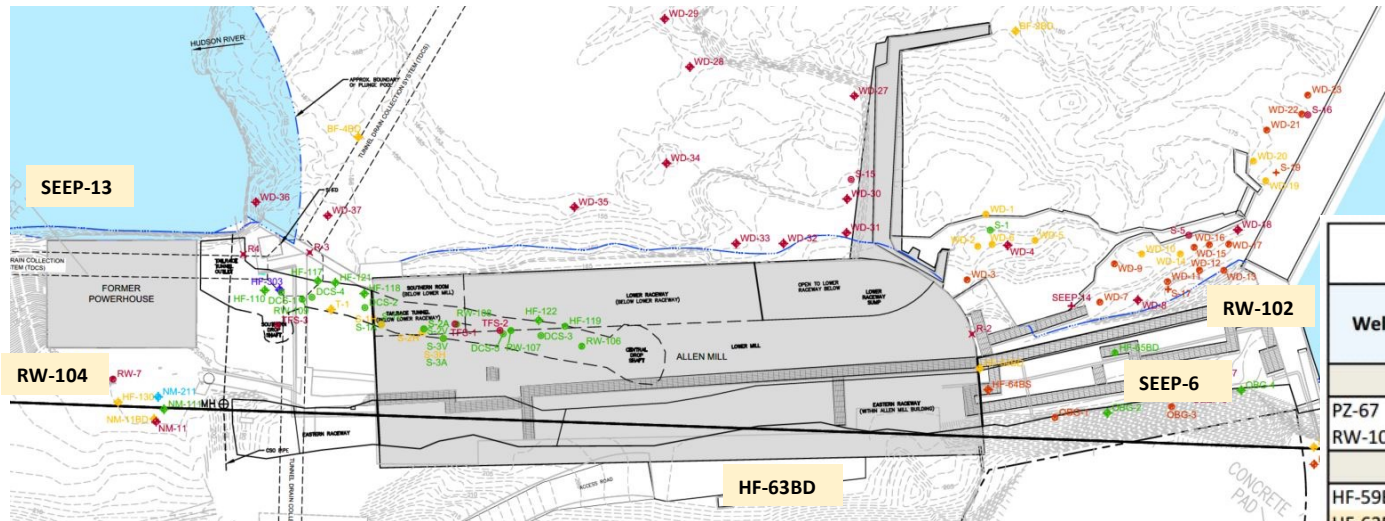
Most Recently

- Regained access to north end Eastern Raceway
- Reestablishing access to Tailrace Tunnel, Allen Mill, and Bakers Falls



Ref: 2010 Phase Three TDCS Hydraulic Monitoring Status Report

Ongoing Sitewide DNAPL Recovery



Continued decrease in average annual DNAPL recovery

Annual DNAPL Recovery Sitewide Totals (Gallons)	
2016	50.46
2017	40.68
2018	44.97
2019	25.88
2020	23.97
2021	16.08
2022	15.45

Observation Frequency and DNAPL Recovered (Gallons)		
Well Identification	2022 Observation Frequency	2022 Total DNAPL Recovered
Overburden/Upper Snake Hill Shale		
PZ-67	Quarterly	0.00
RW-10	Quarterly	0.00
Middle/Lower Snake Hill Shale		
HF-59BD	Monthly	0.24
HF-63BD	Weekly	0.00
HF-108	Quarterly	0.14
RW-102	Annually	NC
RW-103	Weekly	0.76
RW-104	Weekly	0.04
RW-105	Weekly	4.94
RW-110	Weekly	3.32
Tunnel Drain Collection System		
PH-1	Annually	0.25
Eastern Raceway Seeps		
Seep-6	Monthly	NC
Glens Falls/Isle la Motte Limestone Monitoring Wells		
HF-201	Quarterly	5.76

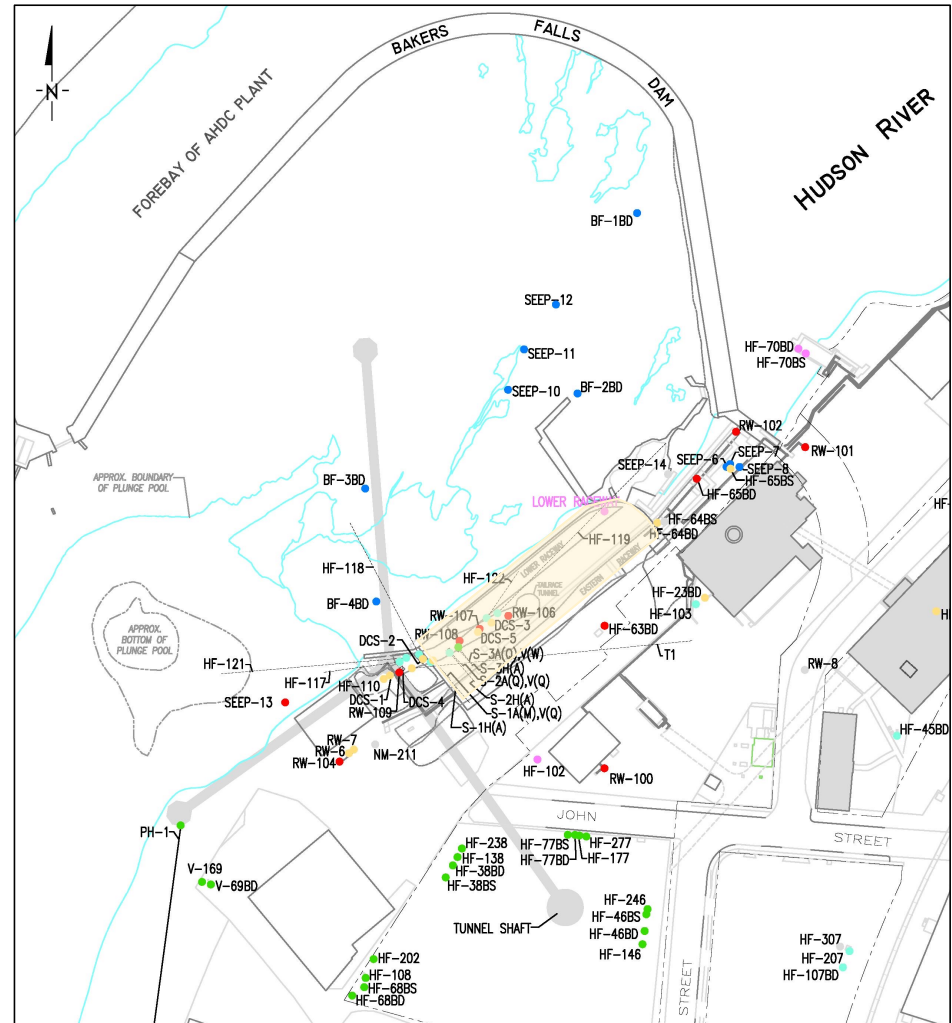
NC = Not Checked

Ref: Draft 2022 Hudson Falls PRR

Allen Mill Area DNAPL Monitoring / Recovery

Area	Last Measurement Date	DNAPL Recovery (Gallons)
Tailrace Tunnel (25 locations)		378
RW-106 through RW-109	2013	210
Other Wells and Sumps	2013	168
Eastern Raceway		110
Seep-6, RW-102, and other Wells	2018	214
Eastern Raceway HF-63BD	2022	53
Lower Raceway Sump	2012	1
Wing Dam	1999	0.03
River Seep-10 through Seep-14	2012	5
South of Powerhouse		128
RW-104	2022	128
RW-6	2022	0.1
RW-7	2022	0.1
TOTAL THROUGH 2022		621

Ref: TBL_NAPL.xlsx provided 1/10/2023



Questions / Discussion