Narragansett Bay Commission's (NBC) Asset Management Program Presents

"Planning for Change"

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The Narragansett Bay Commission

What is the NBC?

- Rhode Island sewerage agency serving 10 communities; 360,000 people and 160 significant industrial users
- Approximately 250 NBC employees responsible for the operation and maintenance of two treatment plants, interceptors, pump stations and CSO tunnel system treating an average of 65 MGD discharging into Narragansett Bay
- Float our own bonds for projects
- One of the few (if only) publically regulated wastewater agencies (rates controlled by PUC)
- Over 20 consecutive years of operating surpluses

NBC Infrastructure

- 110+ miles of interceptors (combined sewers system). Large diameter, many > 100 yrs.
- 65 OFs, more than 200 regulators, catch basins, connector pipes and tidegates
- Six pump stations and approximately 75 flow meter stations
- Two WWTFs (24 MGD & 65 MGD)
- One main campus with lab, COB and IM hqtrs.

Why did the NBC undertake Asset Management and plan for change so early?

- Municipal infrastructure (especially water and sewer) was reaching the end of its useful life
- Several very large construction projects with lots of new equipment coming down the road
- Widespread political pressure against rate/tax increases
- Financial bodies beginning to ask if we were contemplating AM
- One very expensive, unexpected equipment failure forced us to re-think maintenance strategy vs. replacement

A $614,000 Lesson learned

$136,000 in bypass pumping costs incurred by NBC

$478,000 for contractor to replace two damaged screws

Field's Point Influent Pump Station Screw Failure

- Screw pumps had been in continual use for twenty years
- BNR design called for their replacement for 5/1/2014 compliance date
- We thought our preventive maintenance was working well and we had time
- Two 37.5 MGD screw pumps "unraveled" within two months
- Well into the FY with no operating funds to cover costs
- Had to take inefficient route of emergency replacement – no time to study alternatives

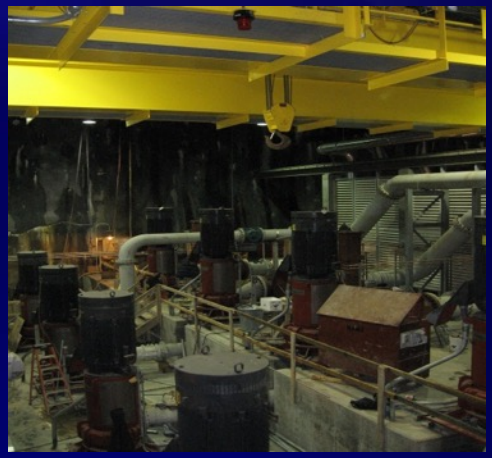
BUT WE DID IT !!

Screw Lift Pumps were replaced and other equipment was repaired and upgraded.

AND NOW WE HAD TO GET READY FOR THE CHANGES THAT WERE BEING PLANNED !

New Projects that were coming down the road

FP BNR Project 1,751 pieces of equipment



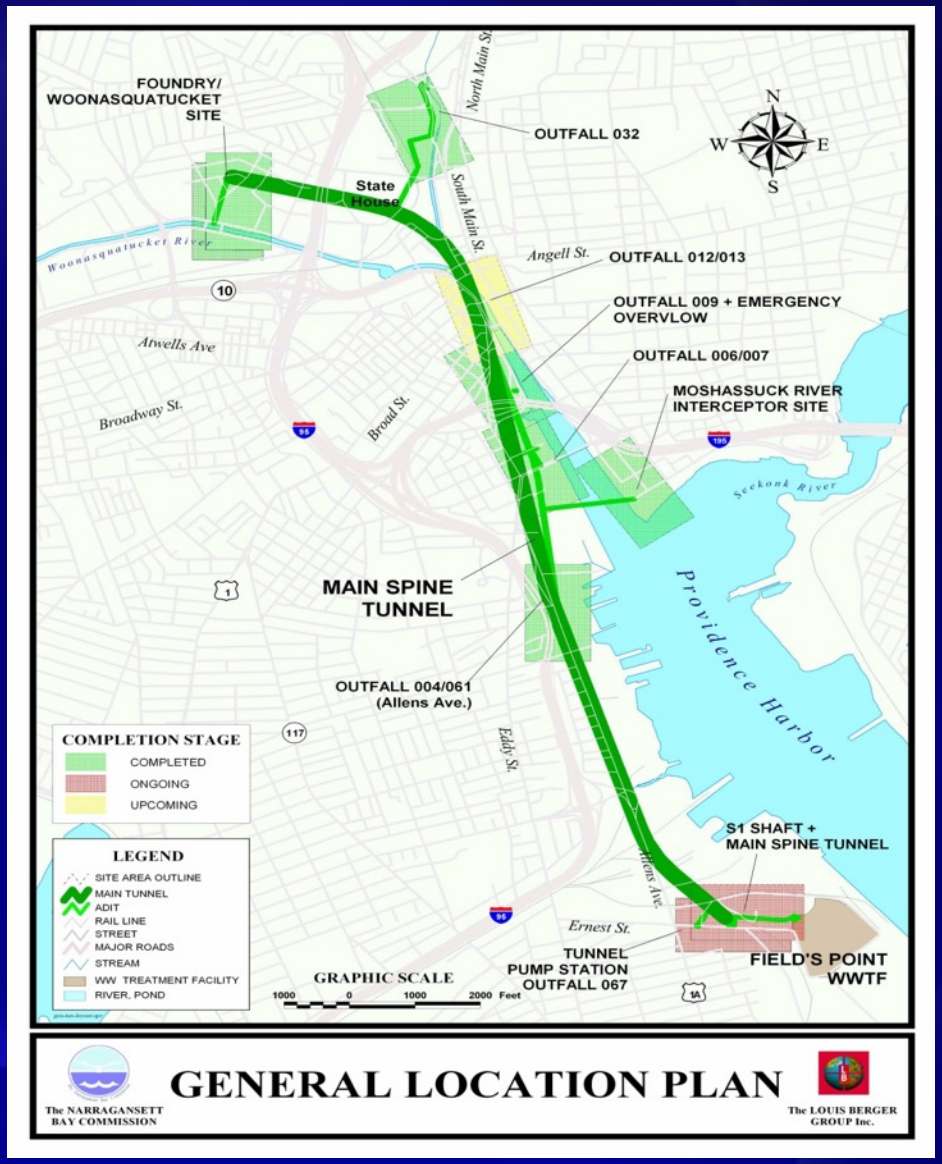
Tunnel Pump Station 2,500 pieces of equipment

BP BNR Project 1,546 pieces of equipment

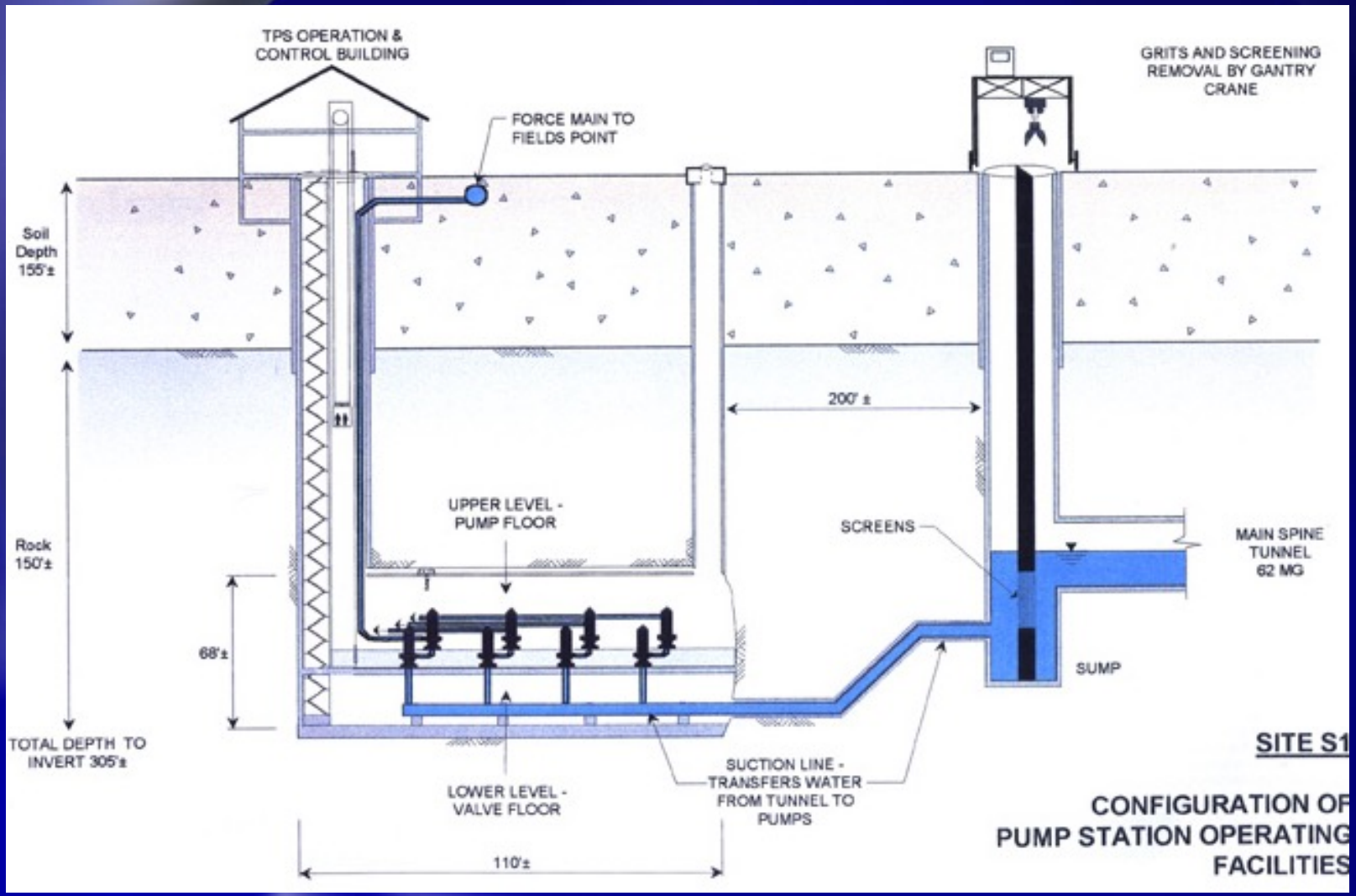
For this conference, let's focus on the CSO and Tunnel Project.

Phase I Facilities….

- CSO Diversion and Collection
- CSO Storage - Main Spine Tunnel
- Tunnel Capacity:
- 61.8 MG Design
- 66.5 MG Actual
- Tunnel Pump Station



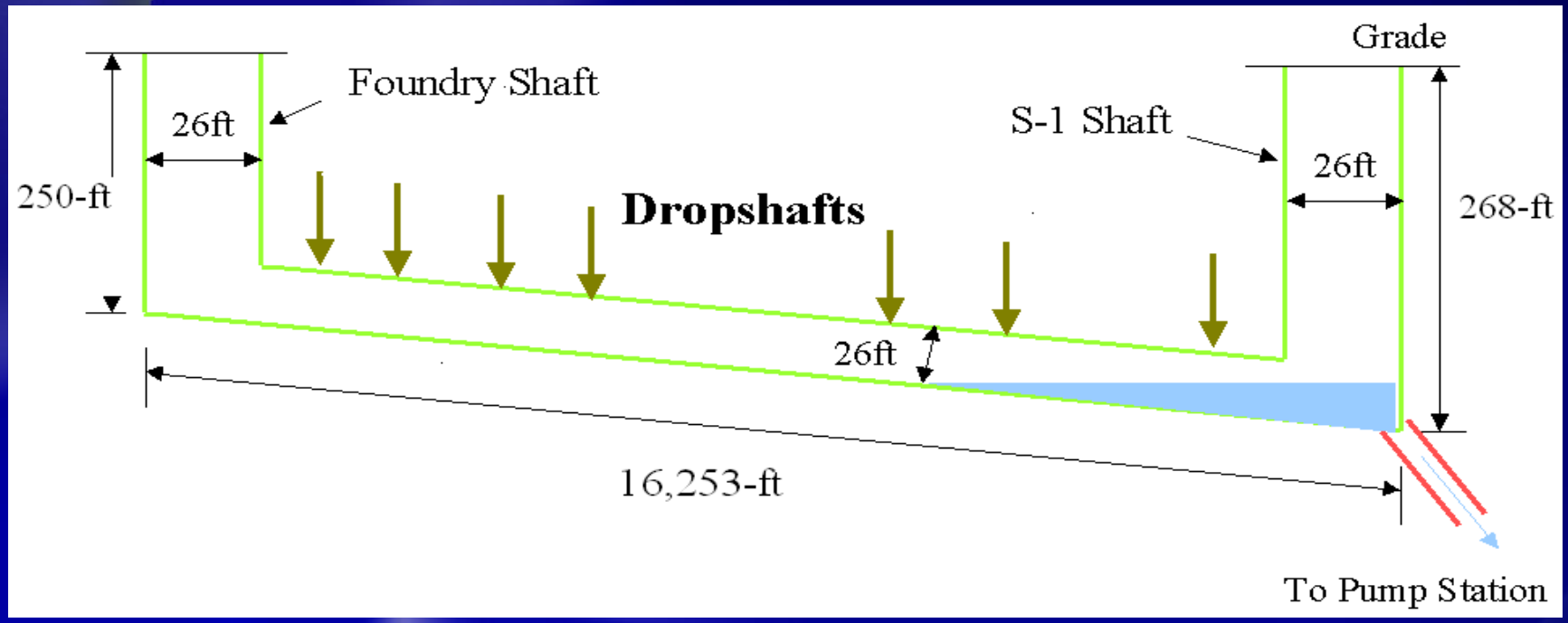
Tunnel Pump Station and Screenings Facility



CSO Storage
Main Spine Tunnel

- Tunnel capacity:
- 61.88 MG (Design)
- 66.5 MG (Actual)

- Seven dropshafts divert flow to the tunnel



Tunnel Operational Startup

- Start-up Date November 1, 2008
- Phased Start-up Approach
- 30%, 60%, 80% & 100% Witnessed Fill Events
- 27 Significant Rainfall Events thru May 2009
- 656 MG of CSO/Interceptor Flow Stored
- Wet Weather Treatment limited to 142 MG

Planning for the new Tunnel Facilities

1. Naming of the new Tunnel Facilities.
    a. If GIS system and a computerized maintenance system is being used, the naming of the facilities should match to avoid confusion.

2. How will the new Tunnel Facilities affect your existing facility areas? Does criticality of area change?
    a. The NBC has a Wet Weather Pump Station that was used during rain events. The Tunnel changed the criticality of that area.

3. Original planning for the CSO Sites might have to be changed because of the working history.

a. The NBC's Tunnel Ventilation Facility has two blower motors that had an original life expectancy of 20 years. The two blower motors and variable frequency drives had to be replaced after 10 years. This caused the NBC to update the life expectancy to 10 years.

b. Actuators in the CSO Gate & Screening Structures had to be replaced after 5 years. The original life expectancy was 10 years.

4. The addition of the Tunnel Facilities showed an increase in work orders and this proved to provide adequate documentation to add more staff.

The next page shows the preventive and corrective maintenance costs since the inception of the Tunnel and Tunnel Facilities.

TUNNEL FACILITY	YEAR ENDING 12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	AS OF 9/17/2018	Total Cost
CSO Gate & Screening Structures 1-8											
Preventive Maintenance	$91,993	$18,609	$20,028	$16,924	$16,635	$14,529	$17,751	$20,244	$17,908	$13,387	$248,008
Corrective Maintenance	$10,208	$19,743	$15,300	$11,498	$9,628	$20,285	$12,848	$3,057	$15,581	$5,003	$123,151
TOTAL COST	$102,201	$38,352	$35,328	$28,422	$26,263	$34,814	$30,599	$23,301	$33,489	$18,390	$371,159
Tunnel Odor Control/ Ventilation											
Preventive Maintenance	-	-	$1,700	$93	$530	$2,394	$2,435	$3,106	$2,034	$2,660	$14,952
Corrective Maintenance	-	-	$641	$1,469	$3,517	$1,984	$899	$638	$665	$343	$10,156
TOTAL COST	$0	$0	$2,341	$1,562	$4,047	$4,378	$3,334	$3,744	$2,699	$3,003	$25,108
Tunnel S1 Shaft Screening Facility											
Preventive Maintenance	$367	$712	$459	$1,462	$1,430	$675	$4,409	$1,245	$7,122	$201	$18,082
Corrective Maintenance	$2,418	$5,168	$2,804	$2,368	$328	$1,434	$3,261	$3,047	$453	$825	$22,106
TOTAL COST	$2,785	$5,880	$3,263	$3,830	$1,758	$2,109	$7,670	$4,292	$7,575	$1,026	$40,188
Tunnel Screening Facility Building											
Preventive Maintenance	$319	$1,062	$1,300	$858	$240	$2,136	$2,534	$1,763	$934	$4,257	$15,403
Corrective Maintenance	$3,145	$2,216	$1,229	$2,023	$2,860	$1,421	$3,276	$4,119	$8,083	$1,381	$29,753
TOTAL COST	$3,464	$3,278	$2,529	$2,881	$3,100	$3,557	$5,810	$5,882	$9,017	$5,638	$45,156
Tunnel Pump Station											
Preventive Maintenance	$3,719	$18,720	$13,636	$5,578	$2,429	$7,768	$13,293	$17,734	$10,656	$6,317	$99,850
Corrective Maintenance	$7,678	$35,157	$12,312	$8,693	$4,760	$7,649	$18,784	$11,685	$39,620	$5,321	$151,659
TOTAL COST	$11,397	$53,877	$25,948	$14,271	$7,189	$15,417	$32,077	$29,419	$50,276	$11,638	$251,509
TOTAL TUNNEL COST AS OF 9/17/2018	$119,847	$101,387	$69,409	$50,966	$42,357	$60,275	$79,490	$66,638	$103,056	$39,695	$733,120

9.56262 BILLION OF GALLONS COLLECTED AS OF MIDNIGHT, SEPTEMBER 17, 2018.

MAINTENANCE COST PER GALLON: $.000077

Rhode Island Sea Grant

Narragansett Bay is Cleaner Than it's Been in 150 years

Tunnel Inspection

February 26, 2014

Foundry Shaft

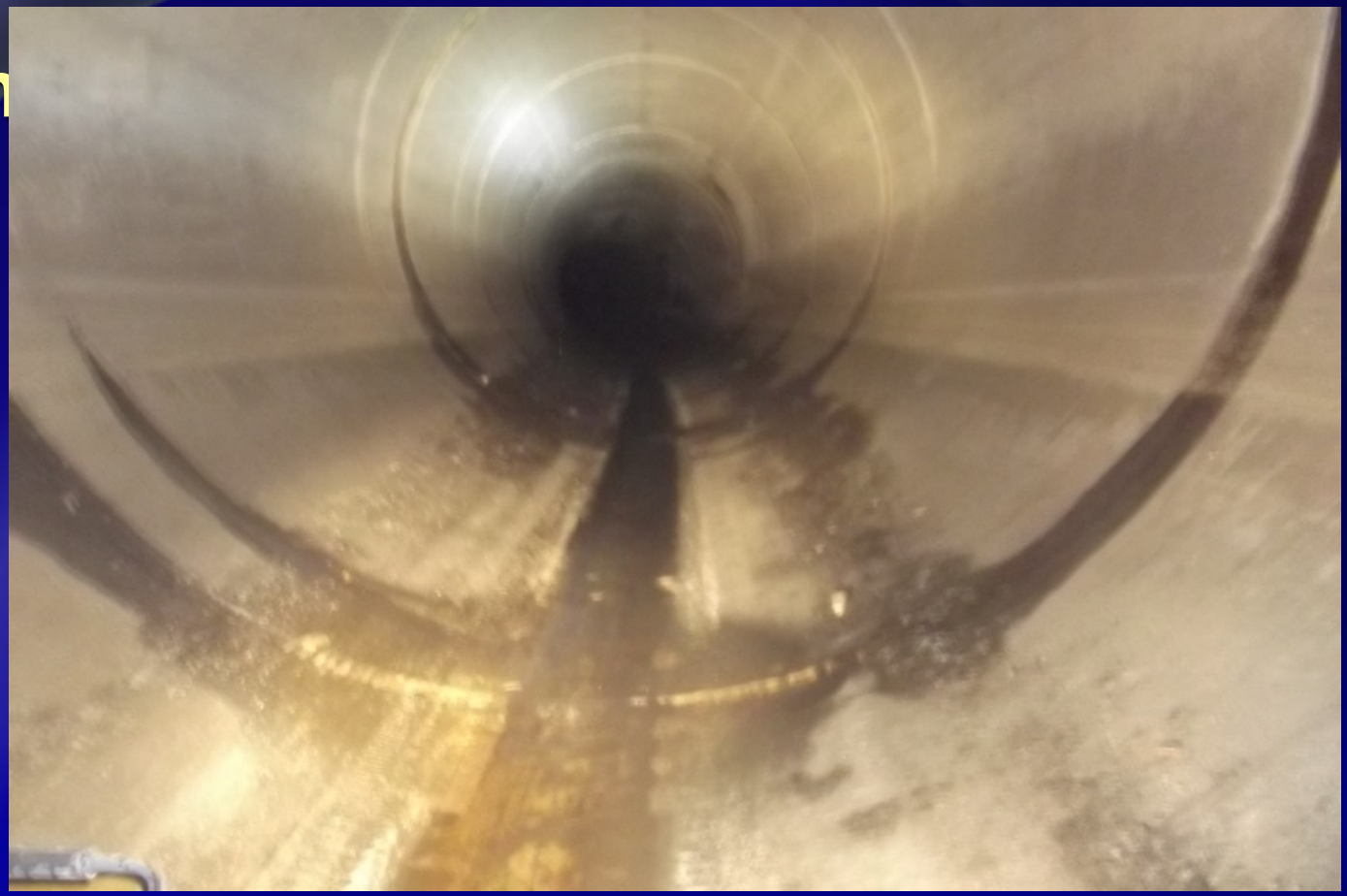
Personnel Cage w/Bubbler Tube Level Sensor

Base of Foundry Shaft

G&SS # 7

Tunnel – Looking Towards FP

Minor Infiltration



Debris on Sides of Tunnel

More Scum Adhered Debris

Infiltration

Bottles

As Far as We Could Go