

working for clean rivers



Outfall 33 Rehabilitation

Urgent Sewer Repair using Pilot Tube Construction Method

Ruben Gonzalez, M.Sc., P.E.
Bureau of Environmental Services
City of Portland, OR

January 12th, 2017



ENVIRONMENTAL SERVICES
CITY OF PORTLAND

NICK FISH, COMMISSIONER
MICHAEL JORDAN, DIRECTOR

Agenda

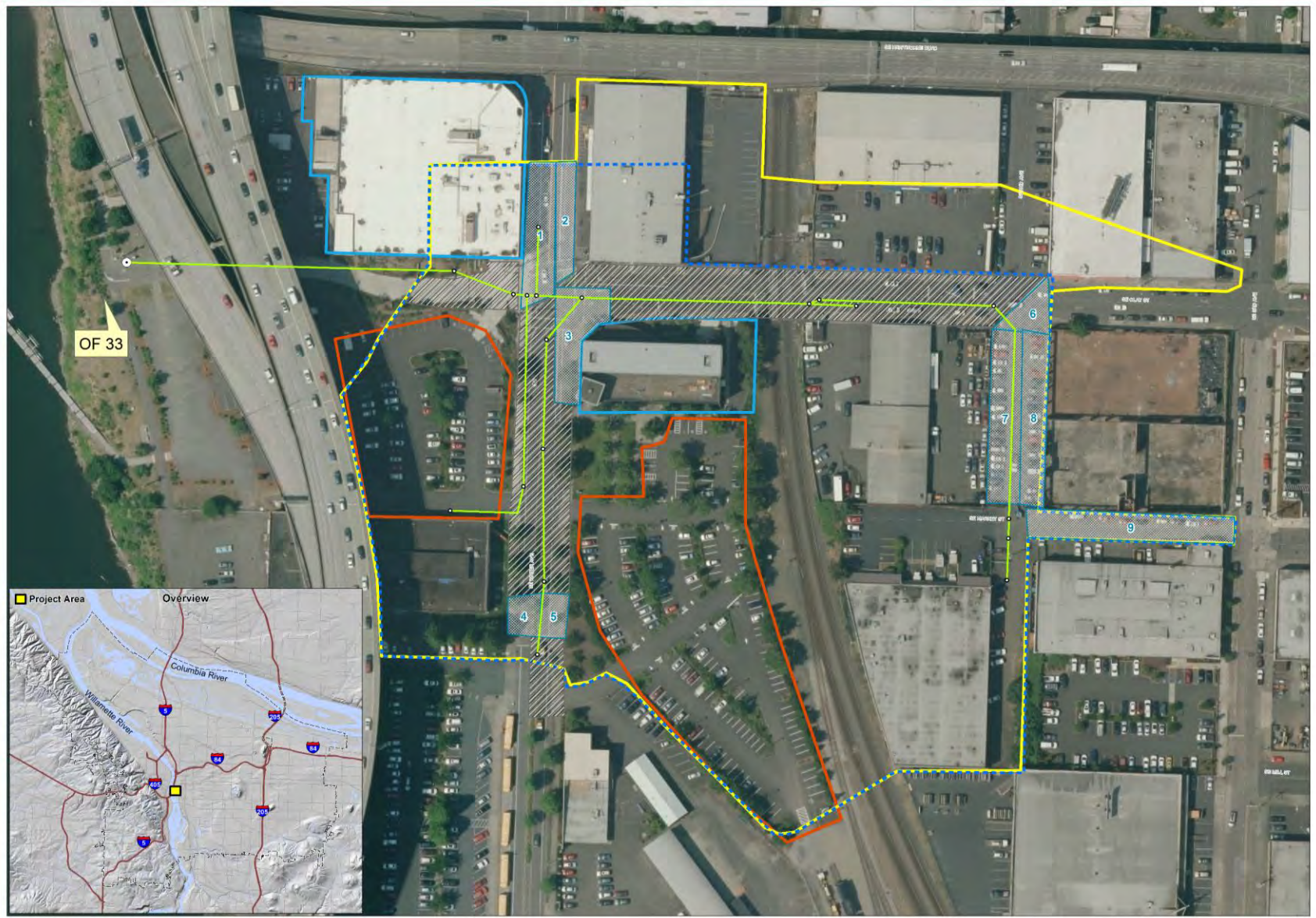
- **Project area background & overview**
 - Outfall basin & pipe condition
 - Utility conflicts
 - PGE/DEQ site cleanup
 - Proposed Eastbank beach/habitat
- **Alternatives analysis**
 - Repair/replace in existing alignment
 - Re-alignment/phased approach
 - Basin transfer to OF34 system
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- **Design**
 - PAURSS
 - Project team
 - Field Investigations
- **Construction**
- **Conclusion/discussion**



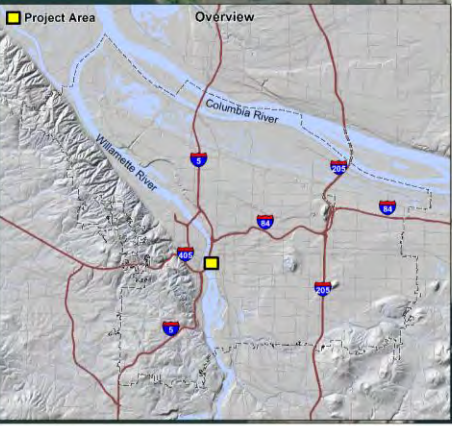
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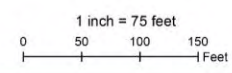



OF 33



Legend

- Roof areas currently draining to WQ Facility
- Parking areas currently draining to WQ Facility
- Proposed Revision to OF33 MS4 Boundary
- OF33 MS4 Boundary
- Modeled storm pipe
- Modeled manholes



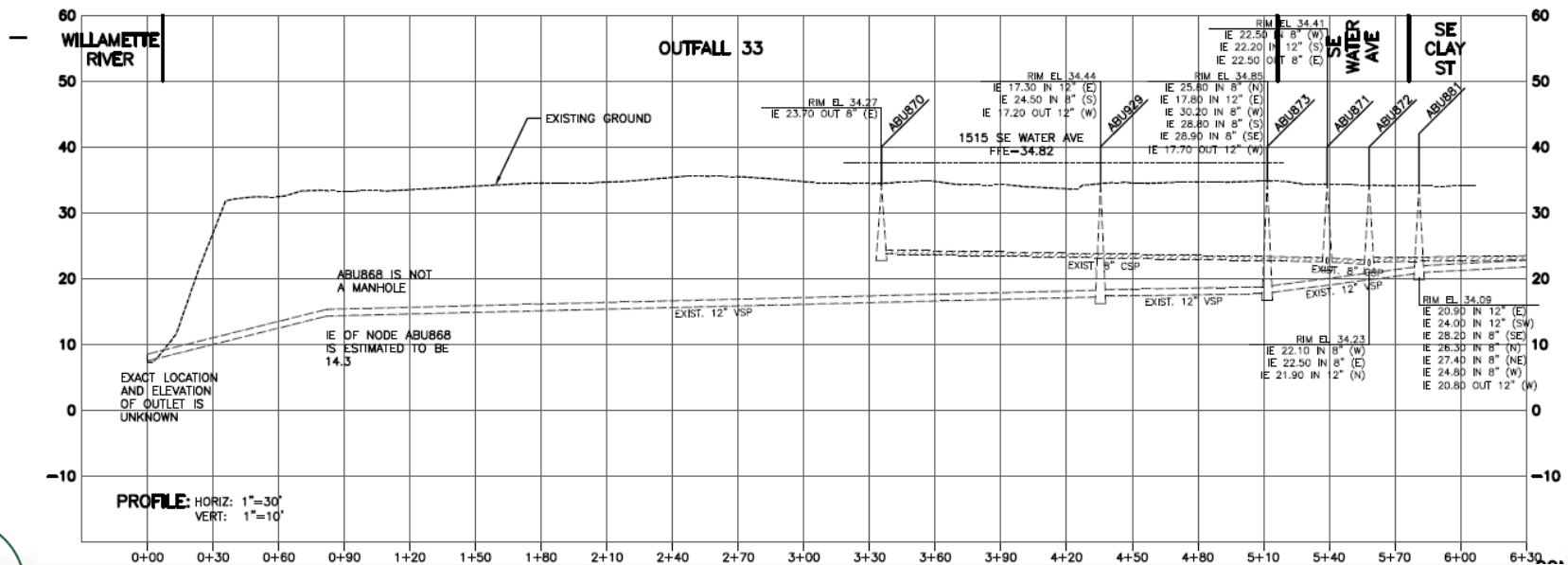
 ENVIRONMENTAL SERVICES CITY OF PORTLAND <i>working for clean rivers</i>	
Title OF 33 Rehabilitation	
Project No. E10731	
Sheet No. 1 OF 1	Date Printed 1/9/2017

Pipe/Outfall Condition

- Existing pipe

Install Date	Size	Material	Length
1895	12"	VSP, CSP, CMP	360-ft to ABU868 (orig. outfall point); 80-ft to discharge in bank

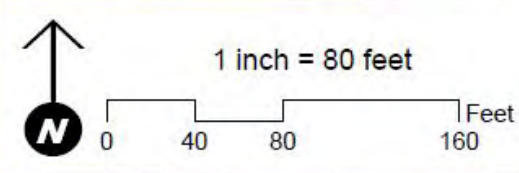
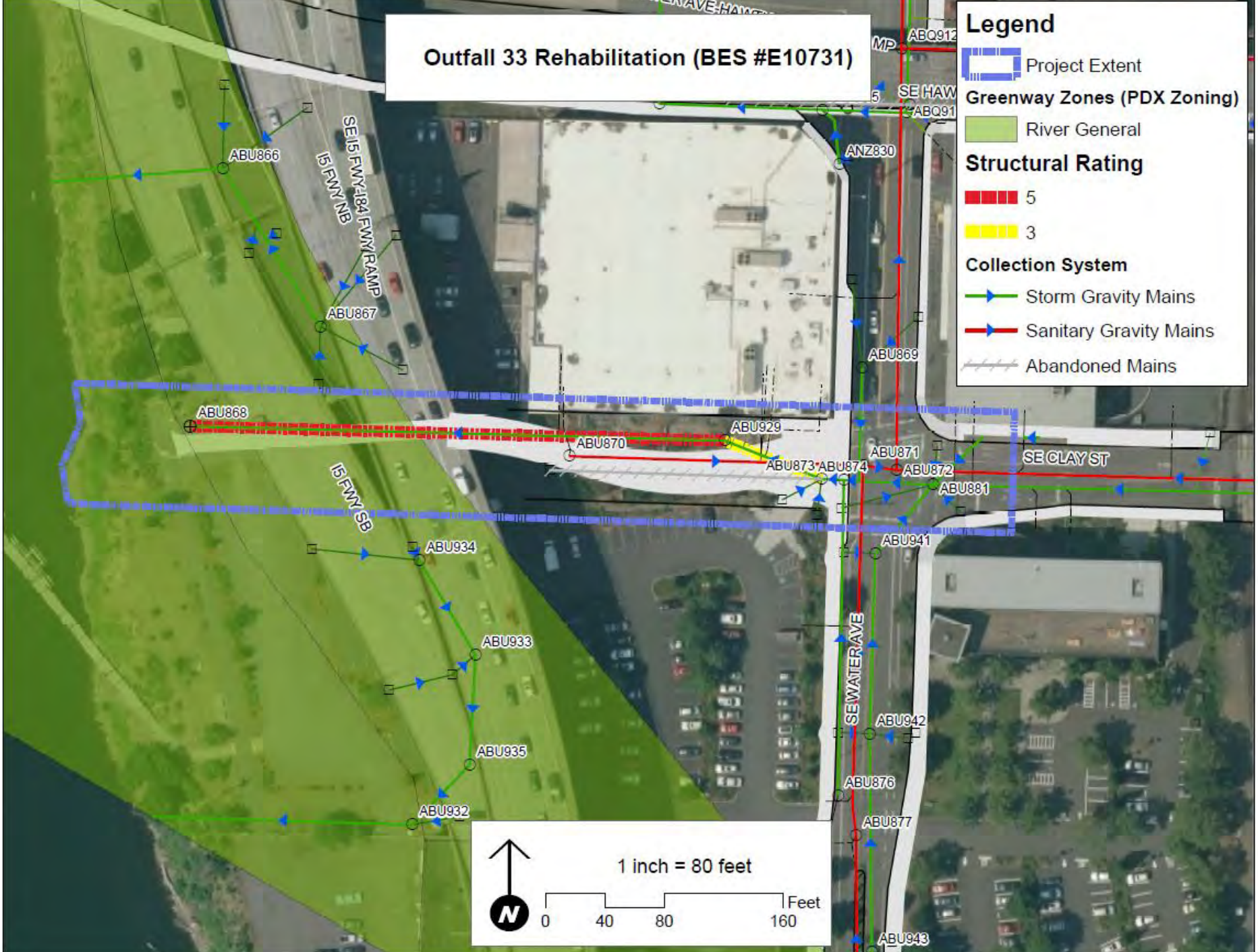
- Recent inspection dates: August, 2015; April, 2014.
 - Pipe segment ABU929-ABU868 has a grade 5 structural score.
 - Pipe segment ABU873-ABU929 has is a grade 3.
- OF33 is buried by undocumented fill.



Outfall 33 Rehabilitation (BES #E10731)

Legend

- Project Extent
- Greenway Zones (PDX Zoning)**
 - River General
- Structural Rating**
 - 5
 - 3
- Collection System**
 - Storm Gravity Mains
 - Sanitary Gravity Mains
 - Abandoned Mains



14.6 FT.

UP-ABU929
DN-ABU868

347.0 FT.

UP-ABU929
DN-ABU868

46.9 FT.

UP-ABU929
DN-ABU868

350.1 FT.

UP-ABU929
DN-ABU868



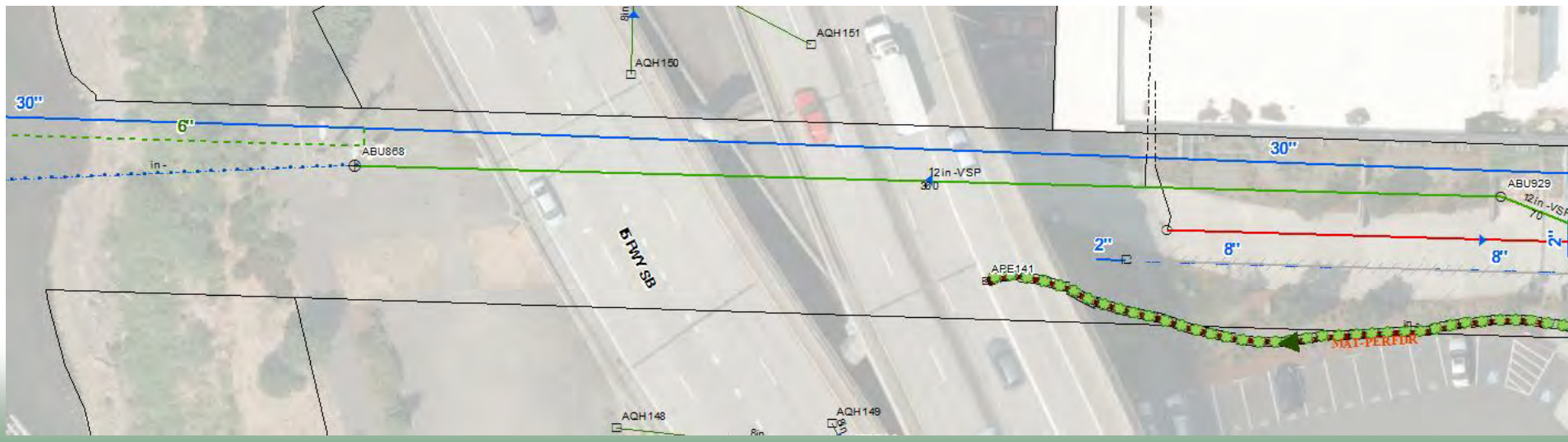
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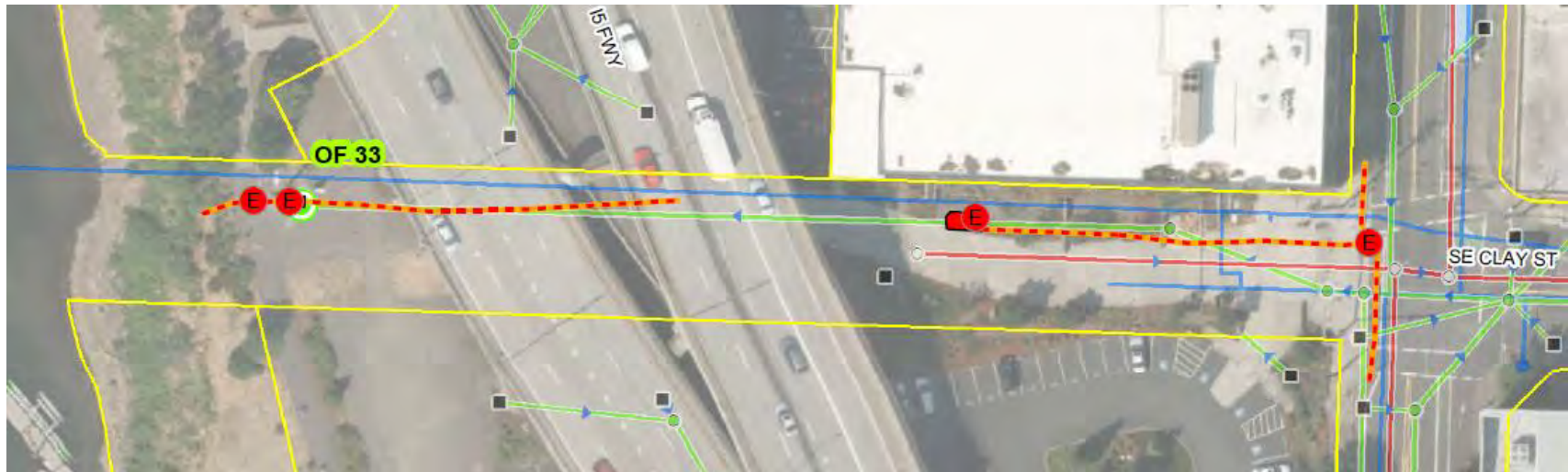
Utility Conflicts

- **30" water transmission line**
 - Installed 1910.
 - Major transmission conduit serving Downtown PDX.
 - Recent repair conducted beneath Willamette River (2015).
 - Based on recent survey, approximate horizontal separation varies from approximately 5-12' center-to-center (3.25-10.25' skin-to-skin).
 - Approx. IE = 11.25' (approx. IE of existing storm main @ ABU868 = 14.3').
 - 6" blow-off line runs approx. 6' south of transmission conduit.



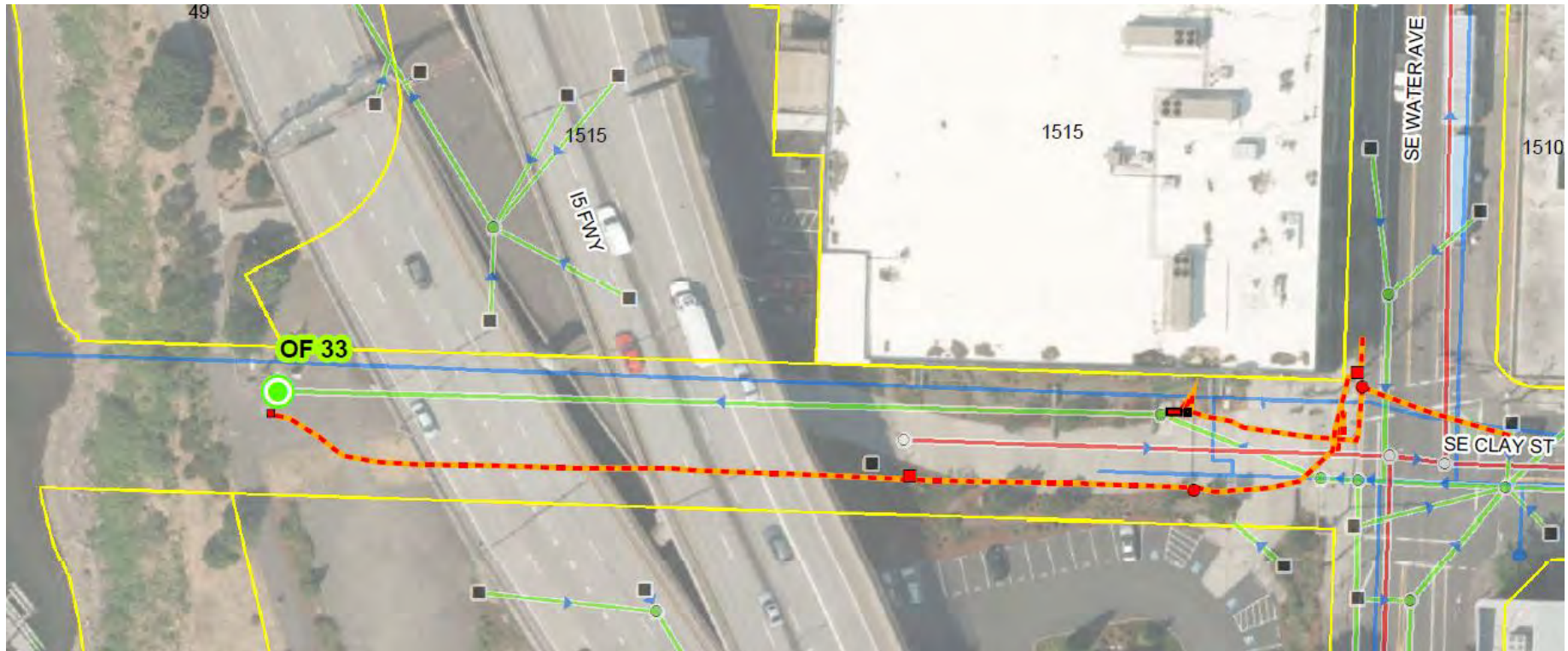
Utility Conflicts

- **PGE Vaults & Conduit**
 - Two major vaults along existing storm main alignment
 - High voltage conduit is above significant portions of storm main
 - Possible PGE abandonment - ~2yrs



Utility Conflicts

- CenturyLink / Time Warner
 - Vault & telecom conduit above storm main and near ABU929



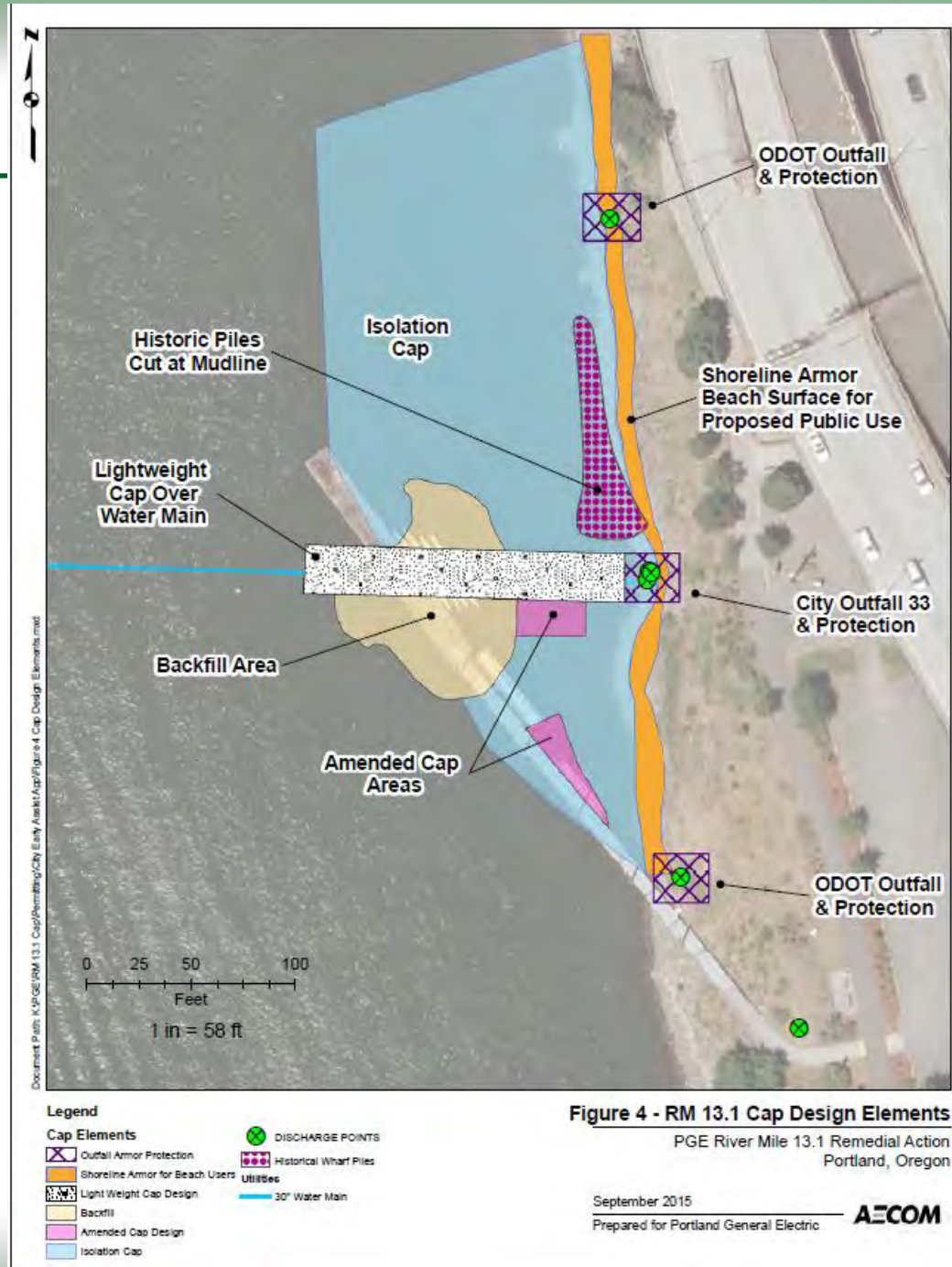
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PGE/DEQ Site Remediation

- PCB contamination (OF33 pathway) – PGE facility connection to storm system.
- Originally scheduled for Summer 2016. Now 2017
- Remedial activities in immediate vicinity of OF33 and proposed Eastbank beach and habitat restoration project.



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Eastbank Beach/Habitat

- Bureau of Planning & Sustainability, BES, Mayor, etc.
- \$300K in FY16 budget.
- Preferred Alternative selected engineering Aug., 2016.
- Beach restoration and access project also in FY16 budget.
- Politically driven -> up in the air.
- Presented several interface challenges with OF33



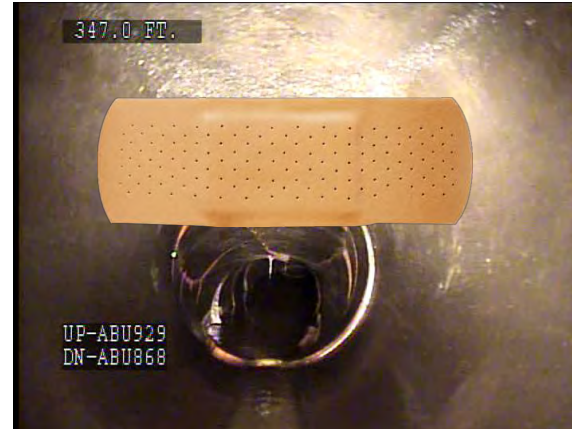
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Alternatives: Repair/Replace Existing

- **Potential design approaches:**
 - Spot repair
 - Spot repair & CIPP lining
 - Pipe bursting
- **Phased approach required**
- **Contamination**
- **Utilities**
- **Cost/risk**
 - Cost is lower in theory
 - Risk is higher due to above items



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Alternatives: Re-alignment / Phased

- Jack & bore + open cut
- Phased approach
- Very expensive (~\$1600/ft for J&B)
- Cost = approx. 3 X budgeted \$



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Alternatives: Basin Transfer to OF34

- Intercept flow @ SE Clay & Water
- Route into OF34 system @ Hawthorne (OF34 has capacity)
- Initial cost estimate = can be done within budget +/- 10%
- Long-term solution (OF33 could be abandoned)



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Alternatives Comparison

Alternative	Details	Project Cost (-)	Long-Term Risk(s) (-)	Long-Term Benefit(s) (+)	Short-Term Risk(s) (-)	Short-Term Benefit(s) (+)	Traffic Impacts (-)	Score
Do Nothing	Run to failure	Low (-1)	High	Low (+1)	Moderate	Low	None	$-1-3+1-2+1-0 = -4$
Spot repair	Replace segment(s) in very poor condition	Low* (-1)	High	Low (+1)	High	Moderate	Moderate	$-1-3+1-3+2-2 = -6$
Pipe burst	Pipe burst from ABU929-ABU868; existing OF replaced in Phase 2 project	Moderate* (-2)	High	Moderate (+2)	High	Moderate	Moderate	$-2-3+2-3+2-2 = -6$
CIPP Lining	Line from ABU929-ABU868; existing OF replaced in Phase 2 project	Low* (-1)	High	Moderate (+2)	Moderate	Moderate	Moderate	$-1-3+2-2+2-2 = -4$
Re-alignment (trenchless)	Jack & Bore; existing OF replaced in Phase 2 project	High (-3)	Moderate	Moderate (+2)	Moderate	Moderate	Moderate	$-3-2+2-2+2-2 = -5$
Basin transfer to OF34	Intercept stormwater in SE Water and route to OF34 system	Moderate (-2)	Low	High (+3)	Low	High	High	$-2-1+3-1+3-3 = +1$

*Project cost expected to fluctuate depending on contingency cost due to project risks associated with alternative design approach

Alternative Selection

- **Basin Transfer to OF34**
 - Fits in budget (+/-) (at the time...)
 - Better suited to design & constructability
 - Long-term solution
 - Doesn't require multiple phases
 - OF33 can be abandoned -> consolidated with OF34
 - Lowers long-term maintenance & reliability burden
 - Lower risk
 - Fewer conflicts with existing utilities
 - Contamination
 - Challenges (known knowns and known unknowns)
 - Storm connections W of ABU929
 - Work in SE Water
 - Traffic control
 - Possible geotechnical issues



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Design - PAURSS

- **Price Agreement for Urgent Repair of Sanitary Sewers**
- Project re-prioritized due to PGE / DEQ site remediation
- Project given “Urgent” status (but we called it an emergency)
- J.W. Fowler Co. awarded “on-call” construction contract
 - Based on pre-approved bid items & unit prices (NOTE: pilot tube was not one of these ☹)



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Design – Project Team

- **HDR: Design Consultant**

- Geotechnical sub-Consultant: RhinoOne



- Environmental sub-Consultant: Northwest Geotech, Inc.



- Trenchless sub-Consultant: Staheli Trenchless Consultant



- **JWF: Construction Contractor**

- Also provided Design phase services!



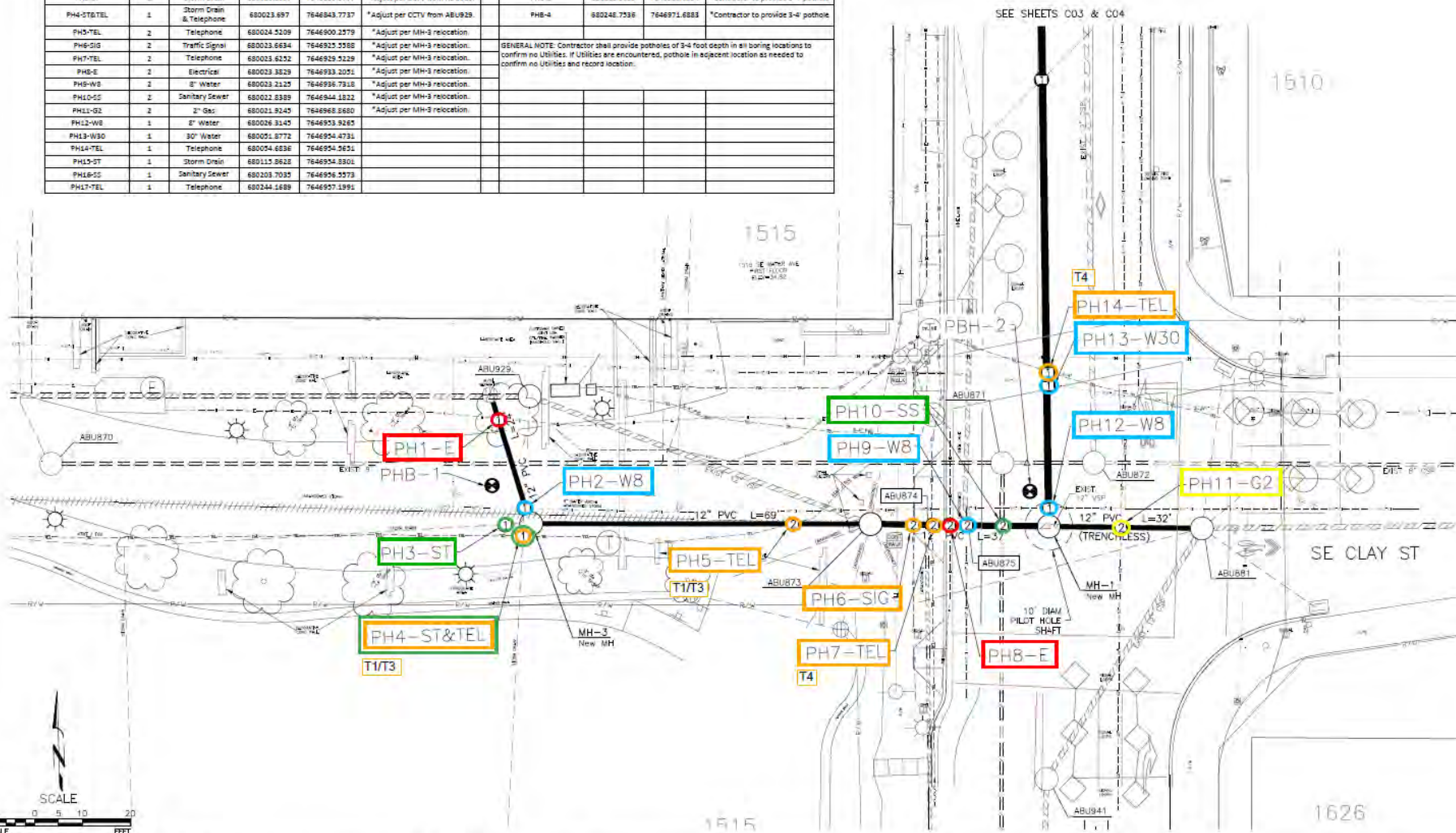
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Field Investigations - Utilities

Pothole/Boring ID	Phase	Utility Conflict	Northing	Easting	Notes	Pothole/Boring ID	Northing	Easting	Notes
PH1-E	1	Electrical	680048.3811	7646939.3090		PHB-1	680034.4681	7646937.3613	*Contractor to provide 3'-4" pothole
PH2-W8	1	8" Water	680029.3179	7646944.6822		PHB-2	680029.9511	7646950.0539	*Contractor to provide 3'-4" pothole
PH3-ST	1	Storm Drain	680026.2637	7646939.9777	*Adjust per CCTV from ABU929.	PHB-3	680123.0853	7646950.0504	*Contractor to provide 3'-4" pothole
PH4-ST&TEL	1	Storm Drain & Telephone	680023.697	7646943.7737	*Adjust per CCTV from ABU929.	PHB-4	680248.7536	7646971.6883	*Contractor to provide 3'-4" pothole
PH5-TEL	2	Telephone	680024.5209	7646900.2579	*Adjust per MH-3 relocation.	GENERAL NOTE: Contractor shall provide potholes of 3-4 foot depth in all boring locations to confirm no Utilities. If Utilities are encountered, pothole in adjacent location as needed to confirm no Utilities and record location.			
PH6-SIG	2	Traffic Signal	680023.6634	7646925.2588	*Adjust per MH-3 relocation.				
PH7-TEL	2	Telephone	680023.6252	7646929.5229	*Adjust per MH-3 relocation.				
PH8-E	2	Electrical	680023.3829	7646933.2051	*Adjust per MH-3 relocation.				
PH9-W8	2	8" Water	680023.2125	7646936.7318	*Adjust per MH-3 relocation.				
PH10-SS	2	Sanitary Sewer	680022.8389	7646944.1822	*Adjust per MH-3 relocation.				
PH11-G2	2	2" Gas	680021.9245	7646968.2680	*Adjust per MH-3 relocation.				
PH12-W8	1	8" Water	680026.3145	7646953.9265					
PH13-W30	1	30" Water	680051.8772	7646954.4731					
PH14-TEL	1	Telephone	680054.6836	7646954.5651					
PH15-ST	1	Storm Drain	680115.8628	7646954.8301					
PH16-SS	1	Sanitary Sewer	680203.7035	7646956.5573					
PH17-TEL	1	Telephone	680244.1689	7646957.1991					



CITY OF PORTLAND
ENVIRONMENTAL SERVICES



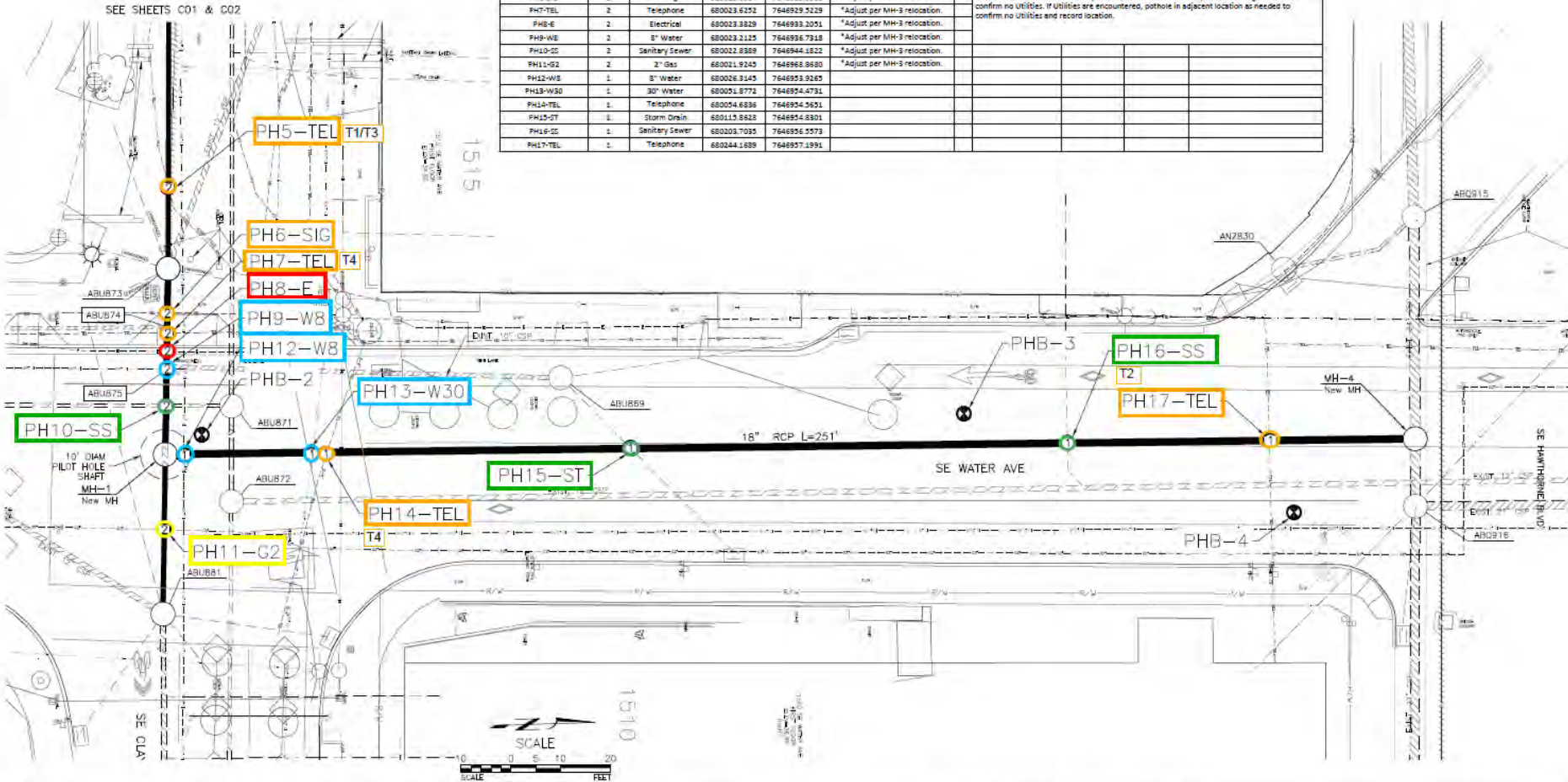
PRELIMINARY

OUTFALL 33
REHABILITATION
SE CLAY ST
POTHOLE AND BORING PLAN

DATE: 10/20/10
SCALE: AS SHOWN
DRAWING NAME: E:\07310101-004.dwg

Field Investigations - Utilities

Pothole/Boring ID	Phase	Utility Conflict	Northing	Easting	Notes	Pothole/Boring ID	Northing	Easting	Notes
PH1-E	1	Electrical	680046.3511	7646839.3090		PHB-1	680034.4661	7646837.5613	*Contractor to provide 3'-4" potmole
PH2-W6	1	8" Water	680029.2179	7646844.6622		PHB-2	680029.9511	7646850.0598	*Contractor to provide 3'-4" potmole
PH3-ST	1	Storm Drain	680026.2897	7646839.9777	*Adjust per CCTV from ABU929	PHB-3	680183.0653	7646850.0284	*Contractor to provide 3'-4" potmole
PH4-ST&TEL	1	Storm Drain & Telephone	680023.697	7646843.7737	*Adjust per CCTV from ABU929	PHB-4	680248.7536	7646871.8883	*Contractor to provide 3'-4" potmole
PH5-TEL	2	Telephone	680024.5209	7646800.1579	*Adjust per MH-3 relocation.	GENERAL NOTE: Contractor shall provide potholes of 3-4 foot depth in all boring locations to confirm no utilities. If utilities are encountered, potholes in adjacent location as needed to confirm no utilities and record location.			
PH6-SIG	2	Traffic Signal	680023.6634	7646823.5558	*Adjust per MH-3 relocation.				
PH7-TEL	2	Telephone	680023.6252	7646829.5229	*Adjust per MH-3 relocation.				
PH8-E	2	Electrical	680023.3829	7646893.3051	*Adjust per MH-3 relocation.				
PH9-W6	2	8" Water	680023.2125	7646896.7818	*Adjust per MH-3 relocation.				
PH10-SS	2	Sanitary Sewer	680022.8369	7646844.1822	*Adjust per MH-3 relocation.				
PH11-G2	2	2" Gas	680021.9245	7646866.8680	*Adjust per MH-3 relocation.				
PH12-W6	1	8" Water	680026.3145	7646853.9260					
PH13-W30	1	30" Water	680051.8772	7646854.4731					
PH14-TEL	1	Telephone	680054.6836	7646854.5651					
PH15-ST	1	Storm Drain	680115.8623	7646854.8301					
PH16-SS	1	Sanitary Sewer	680203.7035	7646856.5573					
PH17-TEL	1	Telephone	680244.1689	7646857.1991					



DATE	DESCRIPTION	BY	CHECKED
10/17/2018	REVISED	MEYER	

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

PRELIMINARY

OUTFALL 33
 REHABILITATION
 SE WATER AVE
 POT HOLE AND BORING PLAN

323
 E107
 PH0
 2 of

Field Investigations - Utilities



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Field Investigations – Inspections

May 26, 2016

CCTV - Outfall 33

- CCTV Needed - Fowler
- CCTV Complete - Fowler

5/26/16:
Connections to storm main, Roof drain confirmed abandoned. Dye testing resulted in drainage from side of building.

5/19/16:
Only incoming flow is from the N and NE inlets.

5/25/16:
Connection to sanitary line. Dye test to confirm if pipe flows into ABU871 (flowing water in pipe; push cam not extended past turn; direction not known; assumed sanitary connection).

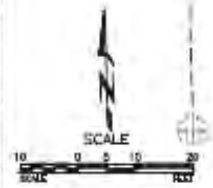
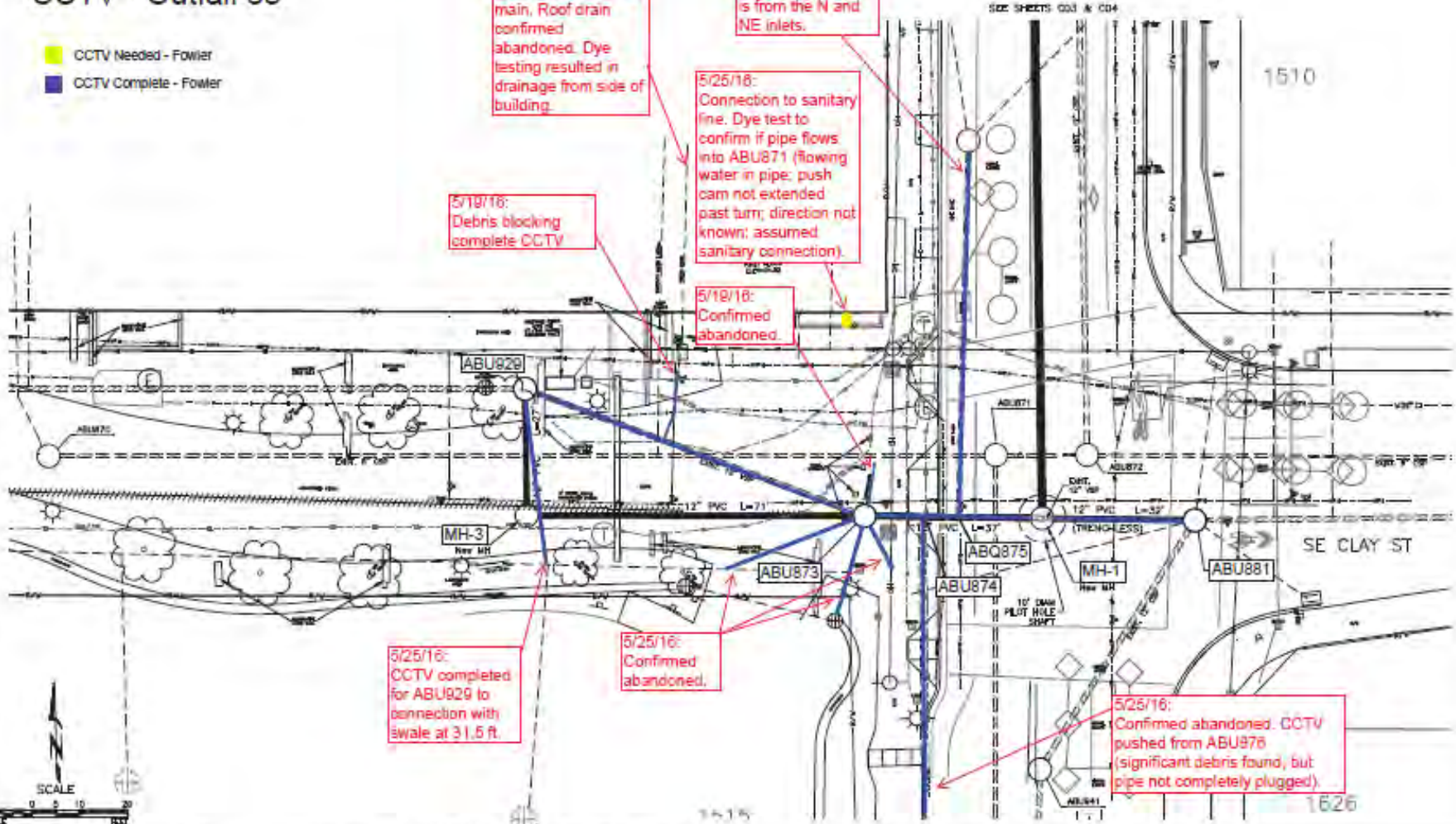
5/19/16:
Debris blocking complete CCTV

5/19/16:
Confirmed abandoned.

5/25/16:
CCTV completed for ABU929 to connection with swale at 31.5 ft.

5/25/16:
Confirmed abandoned.

5/25/16:
Confirmed abandoned. CCTV pushed from ABU976 (significant debris found, but pipe not completely plugged).



NO.	DATE	DESCRIPTION	BY

CITY OF PORTLAND
ENVIRONMENTAL SERVICES

PRELIMINARY

**OUTFALL 33
REHABILITATION**
SE CLAY ST
PLAN

01 REVISION	52.50
DATE	E107.11
NO.	002
OF	5 OF 5

Field Investigations – Inspections




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Field Investigations - Geotechnical



Legend:
 Boring Location and Number
 B-1

Prepared for:
 HDR Engineering, Inc.
 1001 SW 5th Avenue, Suite 1800
 Portland, OR 97204



Project Number
 HDR-2016-004
 Date
 June 27, 2016

Site Exploration Plan
 Outfall 33 Rehabilitation
 (BES E10731)
 Portland, Oregon

Figure
 2

RhinoOne GEOTECHNICAL		Outfall 33 Rehabilitation SE Water Avenue Portland, Oregon		Boring Number: E10731 B-1	
Project: Outfall 33 Rehabilitation		Driller: Western States Soil Conservation, Inc.			
File No.: HDR-2016-004		Date: 07/2016			
Logging Method: Modified Stem Log		Elevation: 49 ft 14 in CGP Datum			
Diameter: 7.75 inch O.D.		Wave Table: 17.7 in		Logged by: Christina H	
DEPTH (ft)	DEPTH (m)	Soil Color	Moisture (%)	Material Description	Remarks
0	0	10YR 5/6	21.4	Portland Cement Concrete	
1	0.3	10YR 5/6	21.4	Loose, soft brown, sandy GRAVEL, with coarse and fine clay in matrix, subrounded to angular	
2	0.6	10YR 5/6	11		
3	0.9	10YR 5/6	11		
4	1.2	10YR 5/6	11		
5	1.5	10YR 5/6	11		
6	1.8	10YR 5/6	11		
7	2.1	10YR 5/6	9	Very loose, black to brown, silty fine to coarse grained SANDS, moist, fine plastic	12 = NA 13 = NA 14 = NA 15 = NP Flow = 28.0%
8	2.4	10YR 5/6	9	Remains wet	
9	2.7	10YR 5/6	9		Boring terminated at 25.9 (see BCS) headwall with horizontal drive and capped with CastPact Asphalt Cement Concrete

RhinoOne GEOTECHNICAL		Outfall 33 Rehabilitation SE Water Avenue Portland, Oregon		Boring Number: E10731 B-2	
Project: Outfall 33 Rehabilitation		Driller: Western States Soil Conservation, Inc.			
File No.: HDR-2016-004		Date: 07/2016			
Logging Method: Modified Stem Log		Elevation: 49 ft 14 in CGP Datum			
Diameter: 7.75 inch O.D.		Wave Table: 17.7 in		Logged by: Christina H	
DEPTH (ft)	DEPTH (m)	Soil Color	Moisture (%)	Material Description	Remarks
0	0	10YR 5/6	21.4	Asphalt Cement Concrete	
1	0.3	10YR 5/6	14.5	Very loose, dark brown, sandy GRAVEL, with subfine and silt; deep to moist, subrounded to angular	
2	0.6	10YR 5/6	14.5	Medium to fine brown, sandy CLAY, moist, low to medium plasticity, with rounded siltstone up to 2.5 mm	
3	0.9	10YR 5/6	14.5	Loose, brown to black, silty-grained coarse grained SANDS, deep to moist, moderate	
4	1.2	10YR 5/6	23.1	S&W Brown to black, sandy SILT with some fine grained, deep, low plasticity	12 = 39% 13 = 22% 14 = 8% Flow = 56.1%
5	1.5	10YR 5/6	29.6	Remains wet	
6	1.8	10YR 5/6	30.2	Remains medium stiff	
7	2.1	10YR 5/6	30.2		
8	2.4	10YR 5/6	34.0	Very loose, dark brown, silty fine to coarse grained SANDS, wet, low plasticity	Flow = 46.2%
9	2.7	10YR 5/6	37.2		
10	3.0	10YR 5/6	42.7	Soft, bluish-grey with orange mottling, sandy SILT with some fine sand, moist to wet, low to medium plasticity	Flow = 71.2%
11	3.3	10YR 5/6	46.4	Soft, bluish-grey, CLAY with some fine sand, moist, medium plasticity	
12	3.6	10YR 5/6	46.4	Boring terminated at 31.7 (see BCS) headwall with horizontal drive and capped with CastPact Asphalt Cement Concrete	

RhinoOne GEOTECHNICAL		Outfall 33 Rehabilitation SE Water Avenue Portland, Oregon		Boring Number: E10731 B-3	
Project: Outfall 33 Rehabilitation		Driller: Western States Soil Conservation, Inc.			
File No.: HDR-2016-004		Date: 07/2016			
Logging Method: Modified Stem Log		Elevation: 49 ft 14 in CGP Datum			
Diameter: 7.75 inch O.D.		Wave Table: 18.2 in		Logged by: Christina H	
DEPTH (ft)	DEPTH (m)	Soil Color	Moisture (%)	Material Description	Remarks
0	0	10YR 5/6	21.4	Asphalt Cement Concrete	
1	0.3	10YR 5/6	21.4	Loose, soft brown, sandy GRAVEL, with subfine and silt; deep to moist, subrounded to angular	
2	0.6	10YR 5/6	27.0	Medium to fine brown to bluish-grey, sandy CLAY, deep, low plasticity	
3	0.9	10YR 5/6	23.6	Loose, soft brown, sandy GRAVEL, deep to moist, subrounded to angular	
4	1.2	10YR 5/6	26.4	Remains very loose	
5	1.5	10YR 5/6	22.4	Remains loose	
6	1.8	10YR 5/6	22.4	Remains very loose	
7	2.1	10YR 5/6	27.0		Flow = 43.4%
8	2.4	10YR 5/6	38.9		12 = NA 13 = NA 14 = NP
9	2.7	10YR 5/6	38.9	Loose, brown, fine to coarse grained SANDS, wet	
10	3.0	10YR 5/6	42.0	Very stiff to stiff, grey with orange mottling, sandy SILT, moist to wet, low to medium plasticity	
11	3.3	10YR 5/6	44.9	Soft, bluish-grey, SILT with some fine sand, moist, medium plasticity	
12	3.6	10YR 5/6	44.9	Boring terminated at 31.7 (see BCS) headwall with horizontal drive and capped with CastPact Asphalt Cement Concrete	

RhinoOne GEOTECHNICAL		Outfall 33 Rehabilitation SE Water Avenue Portland, Oregon		Boring Number: E10731 B-4	
Project: Outfall 33 Rehabilitation		Driller: Western States Soil Conservation, Inc.			
File No.: HDR-2016-004		Date: 07/2016			
Logging Method: Modified Stem Log		Elevation: 49 ft 14 in CGP Datum			
Diameter: 7.75 inch O.D.		Wave Table: 17.6 in		Logged by: Christina H	
DEPTH (ft)	DEPTH (m)	Soil Color	Moisture (%)	Material Description	Remarks
0	0	10YR 5/6	21.4	Asphalt Cement Concrete	
1	0.3	10YR 5/6	14.5	Very loose, dark brown, sandy GRAVEL, with subfine and silt; deep to moist, subrounded to angular	
2	0.6	10YR 5/6	24.9	Remains loose	
3	0.9	10YR 5/6	24.9	Loose, black to brown, fine to medium grained SANDS with fine sand and silt; deep to moist, (organic at 4 ft)	
4	1.2	10YR 5/6	24.9	Very loose, black to brown, fine to coarse grained SANDS, moist	
5	1.5	10YR 5/6	33.1	Very stiff to stiff, black to dark brown, sandy SILT, moist, low plasticity	
6	1.8	10YR 5/6	33.1	Remains medium stiff	
7	2.1	10YR 5/6	36.0	Remains soft wet	
8	2.4	10YR 5/6	38.8	Very loose, brown, fine to coarse grained SANDS with some silt, wet, low plasticity	
9	2.7	10YR 5/6	46.1	Soft, grey with orange mottling, sandy SILT, moist to wet, low plasticity	
10	3.0	10YR 5/6	46.1	Boring terminated at 31.7 (see BCS) headwall with horizontal drive and capped with CastPact Asphalt Cement Concrete	
11	3.3	10YR 5/6	47.9	Soft, bluish-grey, SILT with some fine sand, moist, medium plasticity	
12	3.6	10YR 5/6	47.9	Boring terminated at 31.7 (see BCS) headwall with horizontal drive and capped with CastPact Asphalt Cement Concrete	Flow = 66.9%

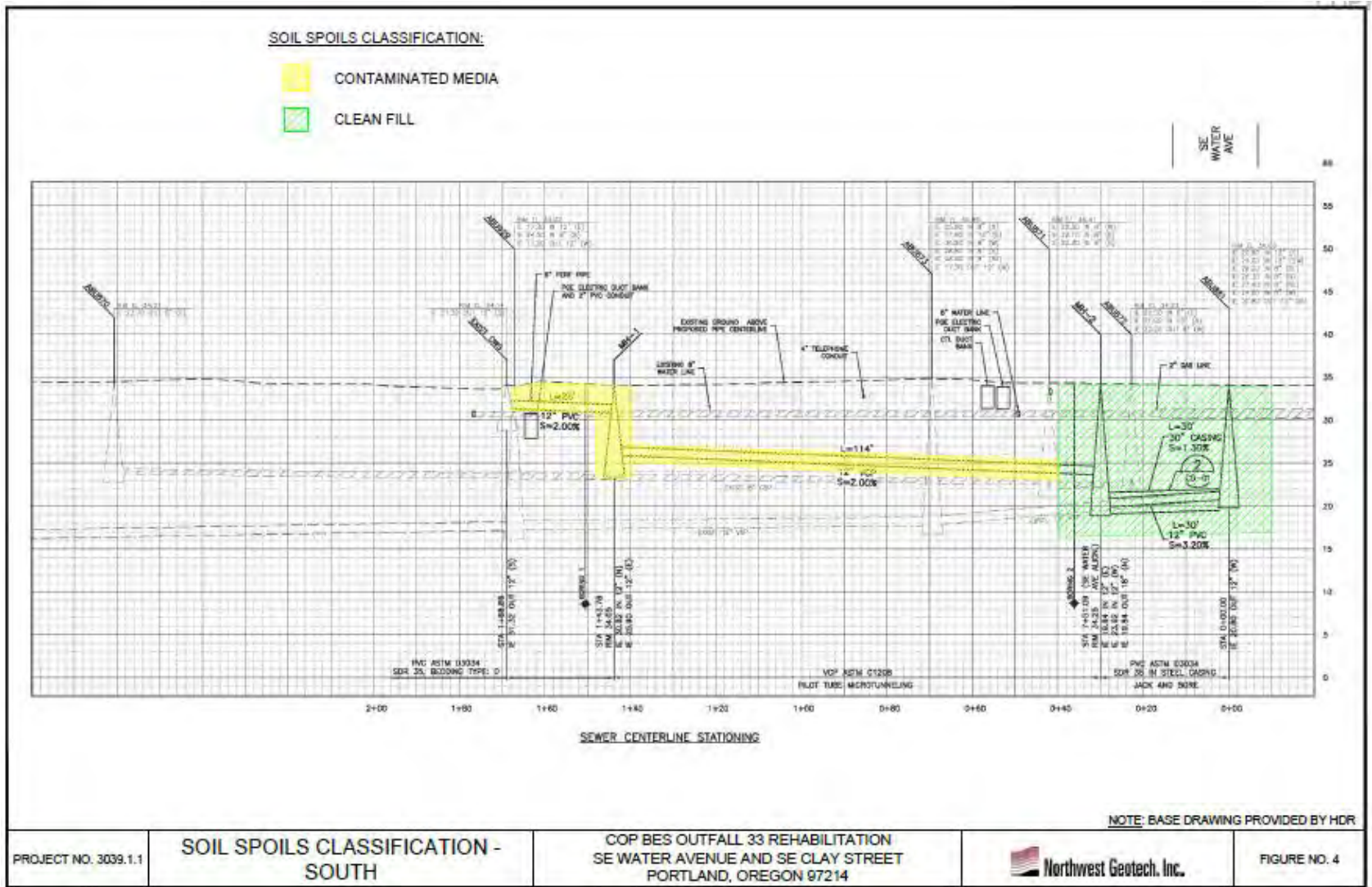


Agenda

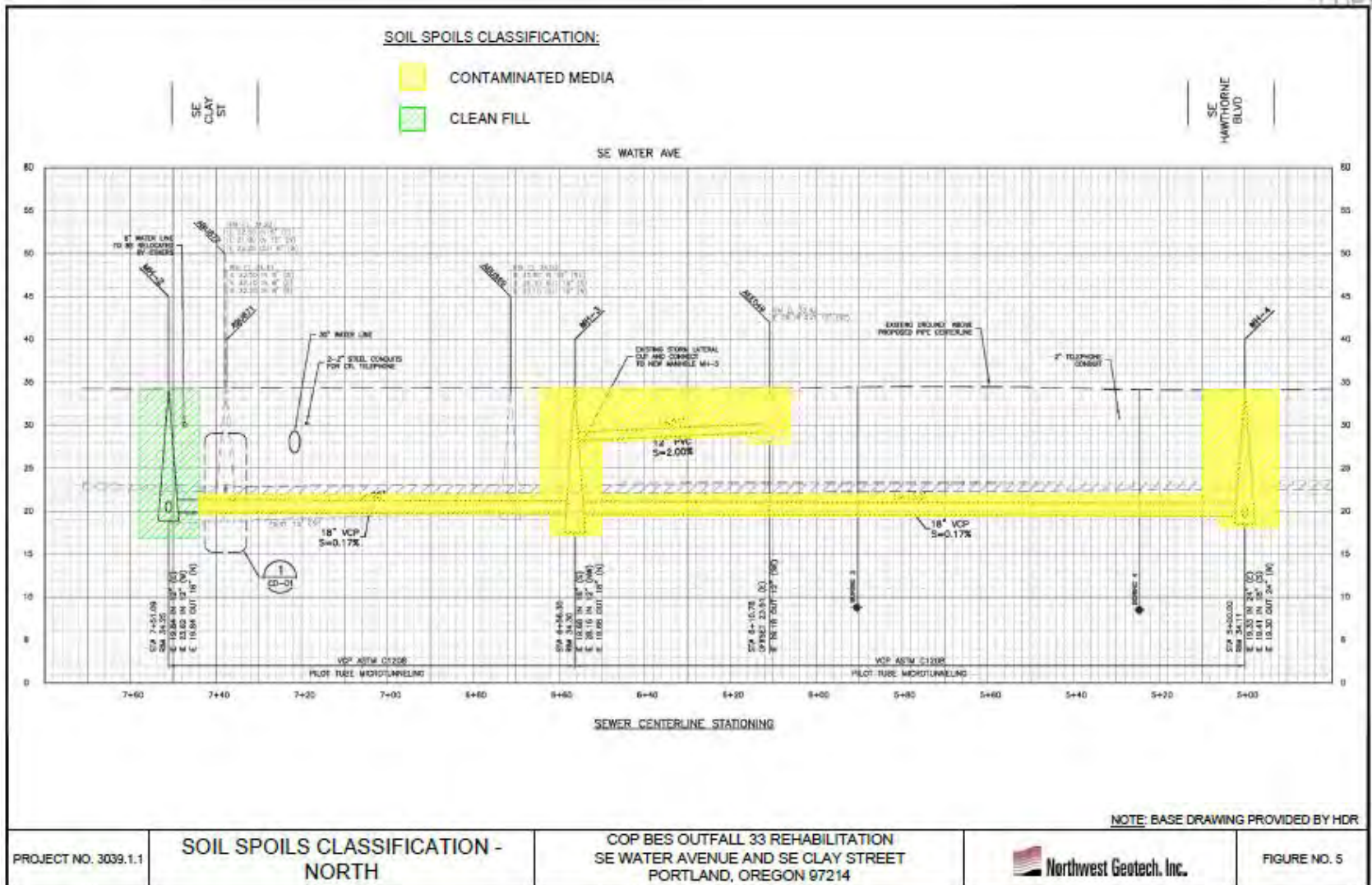
- Project area background & overview
- Alternatives analysis
- **Design**
 - PAURSS
 - Project Team
 - **Field investigations**
 - Utilities
 - Inspections
 - Geotechnical
 - **Environmental**
- Construction
- Conclusion/discussion

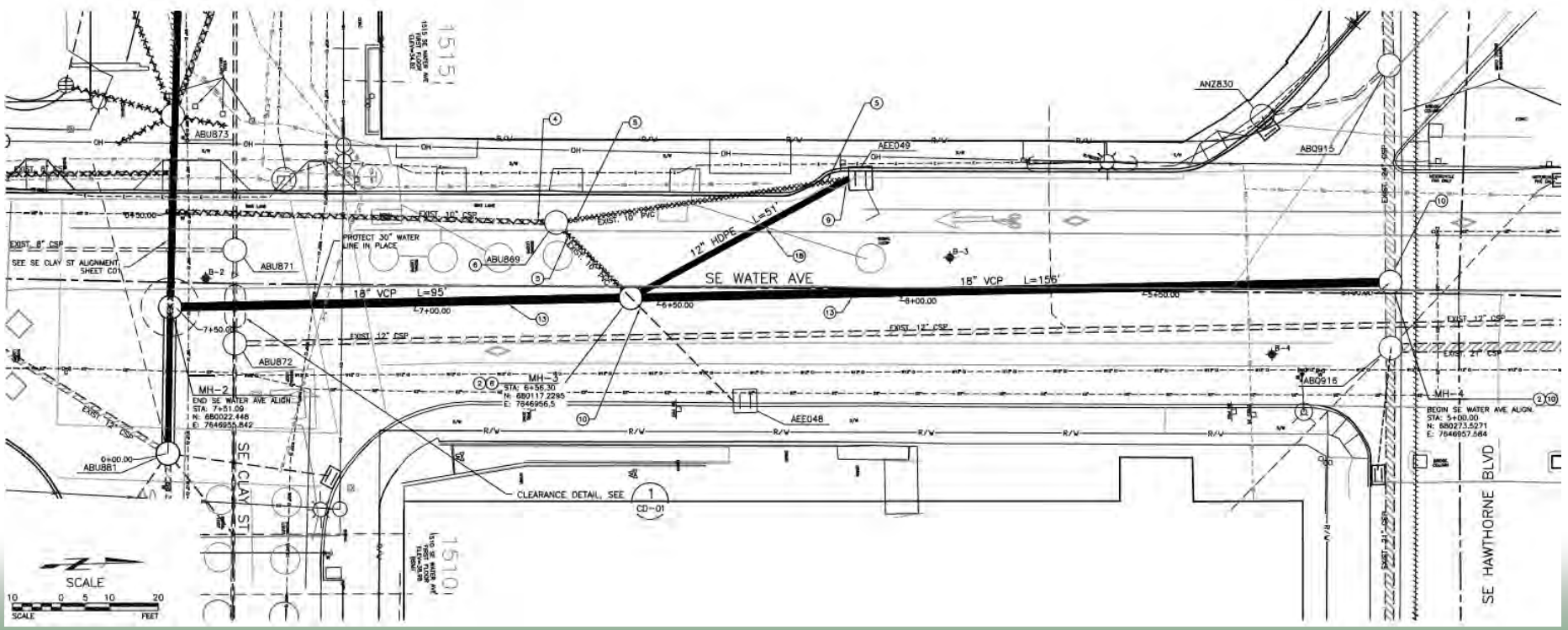
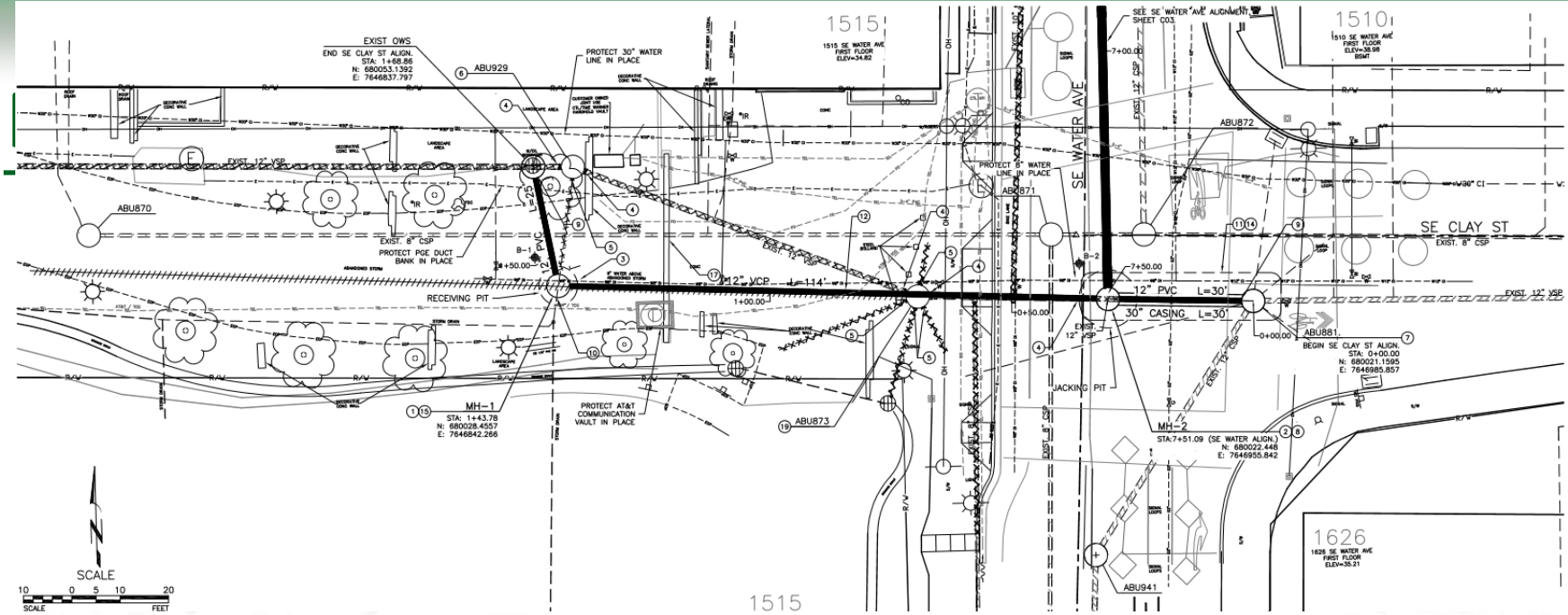


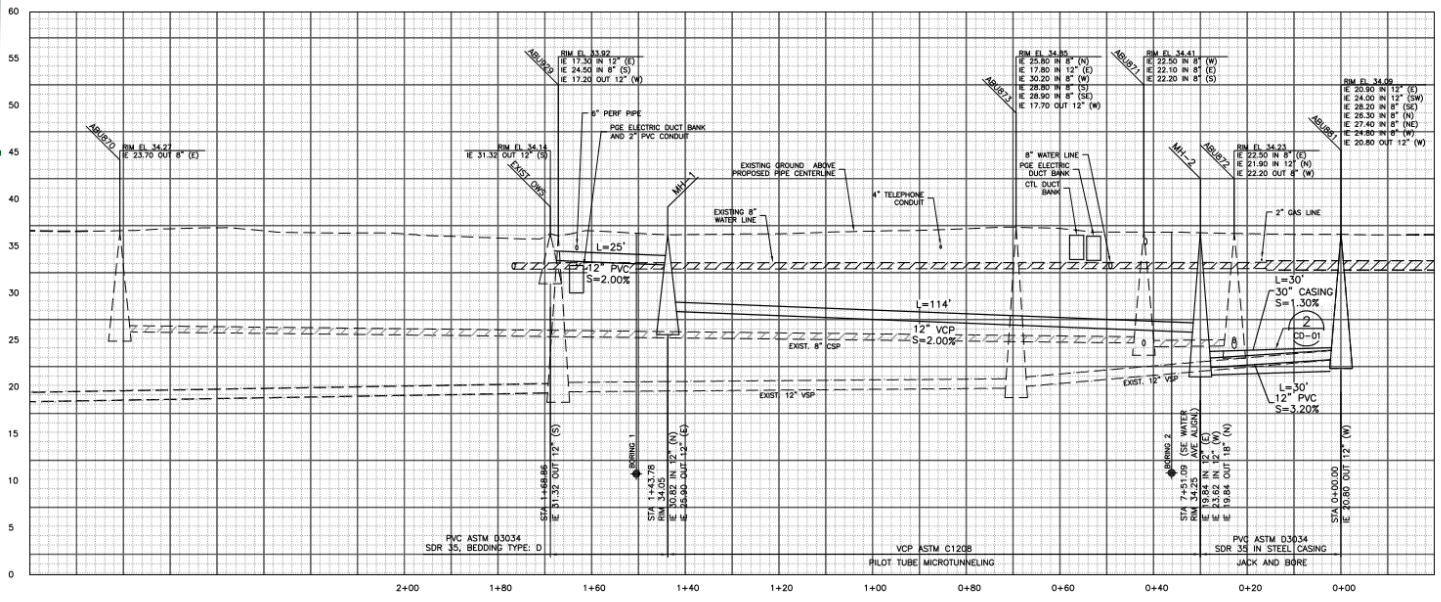
Field Investigations - Environmental



Field Investigations - Environmental







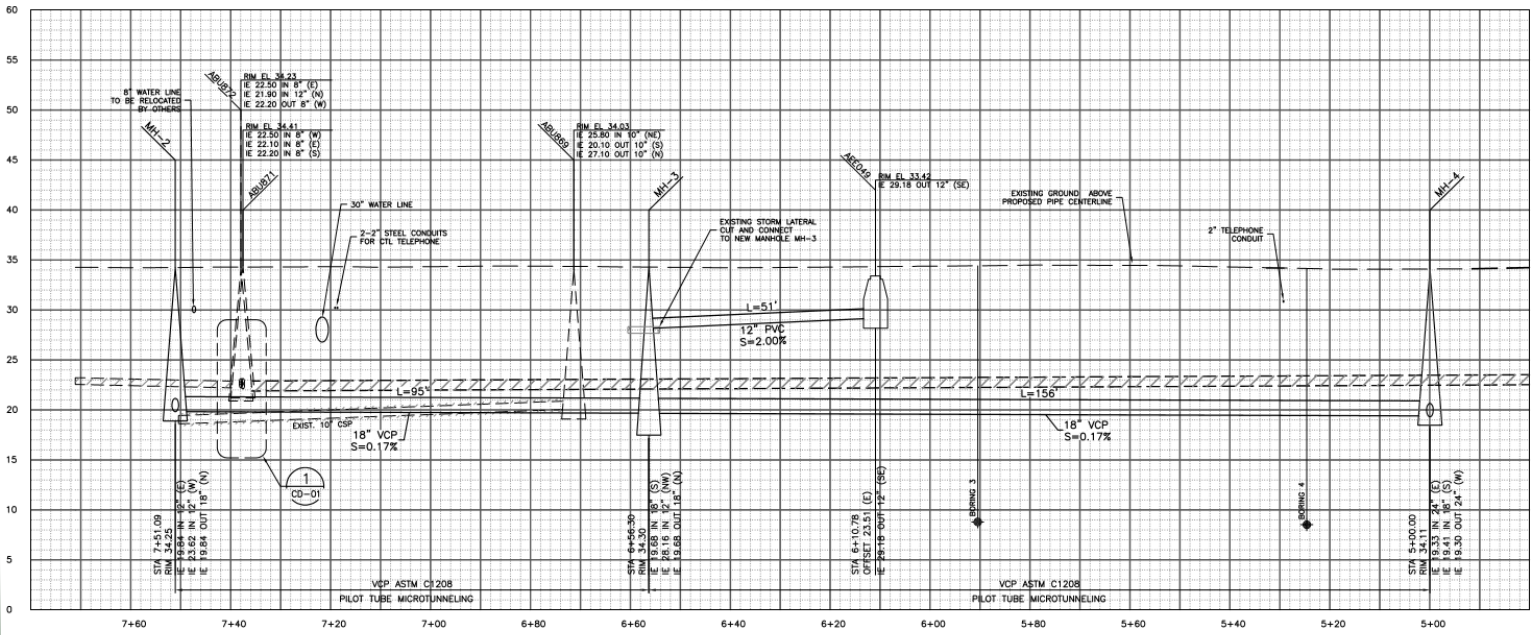
PROFILE: HORIZ: 1"=10'
VERT: 1"=4'

SEWER CENTERLINE STATIONING

SE
CLAY
ST

SE
HAWTHORNE
BLVD

SE WATER AVE



PROFILE: HORIZ: 1"=10'
VERT: 1"=5'

SEWER CENTERLINE STATIONING



Agenda

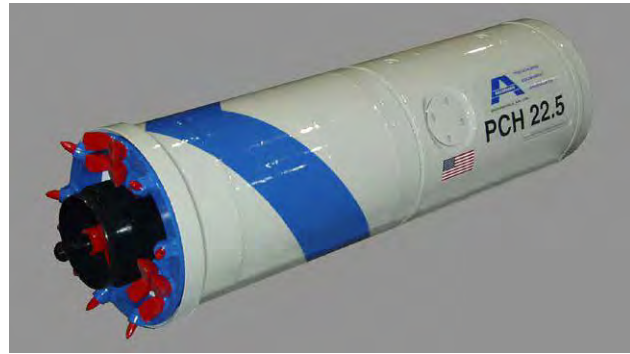
- Project area background & overview
- Alternatives analysis
- Proposed design scope
- Design
- **Construction**
- Conclusion/discussion



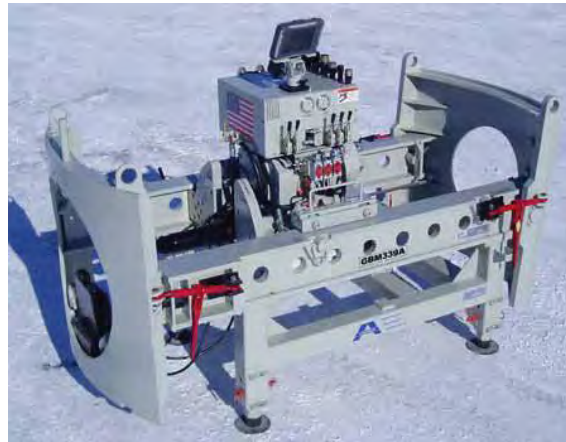
Construction - Setup



Construction - Equipment



22.5" Powered Cutter Head



339A Latching Frame
(jacking force: 100 ton)



16" Powered Reaming Head



12" & 18" (I.D.) Logan NO-DIG VCP



Construction – Clay to Hawthorne



Construction – OF 34 Basin Transfer Tie-in



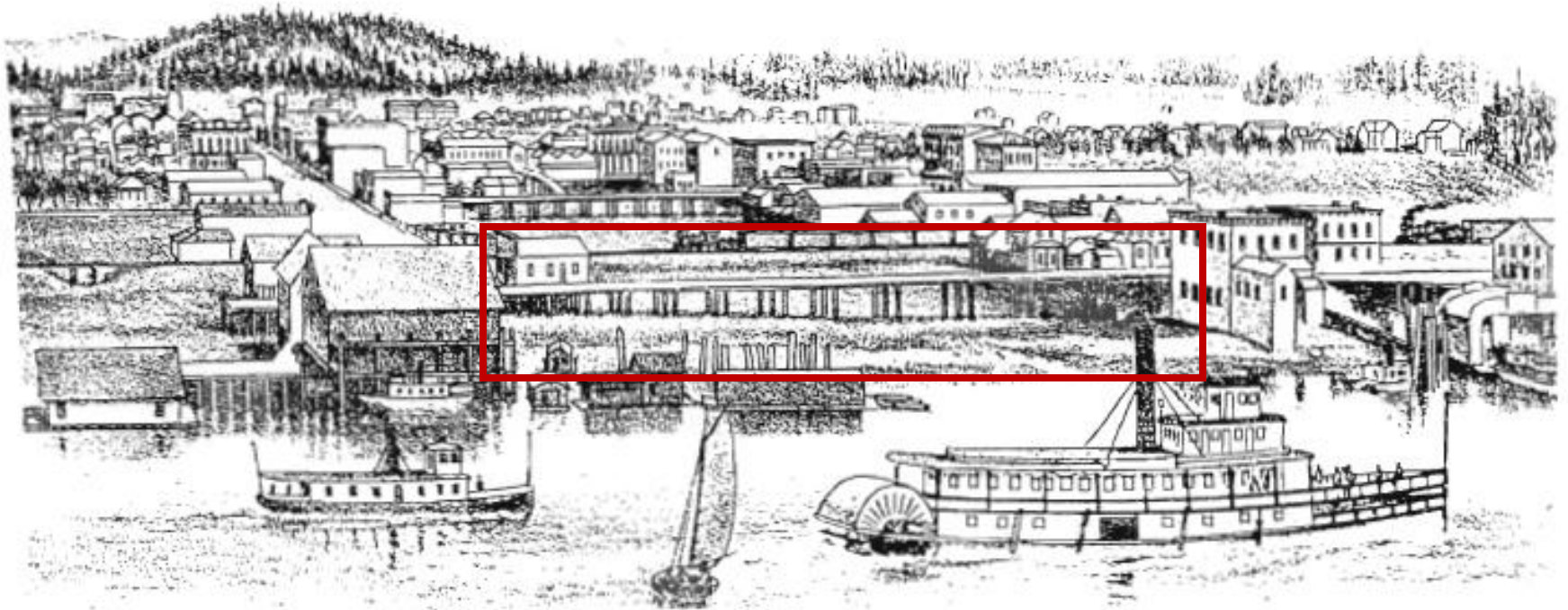


Figure 11. Wharfs, warehouses on piling, and elevated plank streets reaching from Water to Fourth Street, East Portland, 1870s (*West Shore Magazine*, 1886) (OHS Neg. 733).



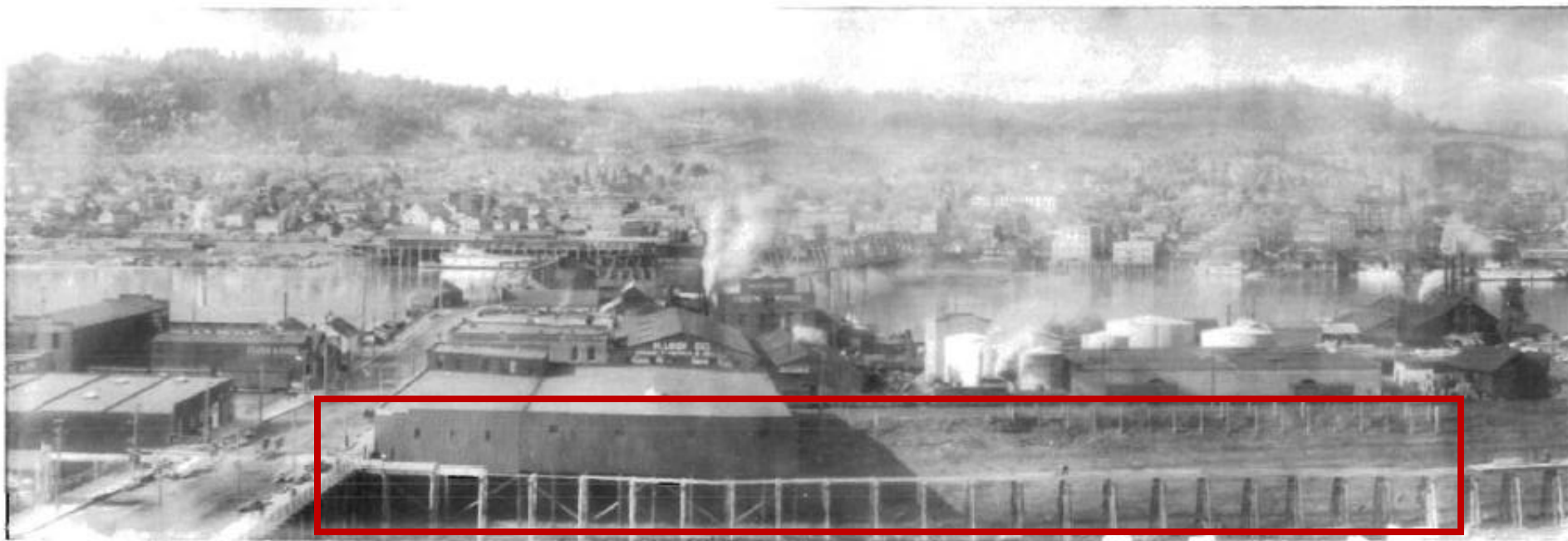
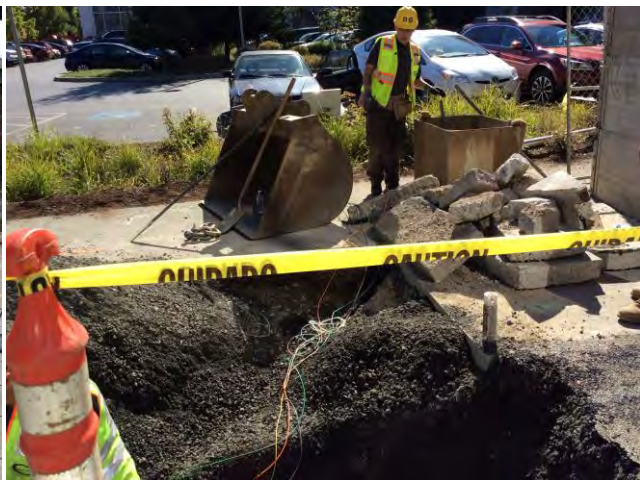


Figure 21. View west toward Willamette River, 1890s, Hawthorne Street on left and a succession of elevated plank roads extending north prior to filling of Hawthorne Slough (OHS 5523). Note: horizontal photograph cut and entered in two parts.

Construction – OF33 Basin Tie-in



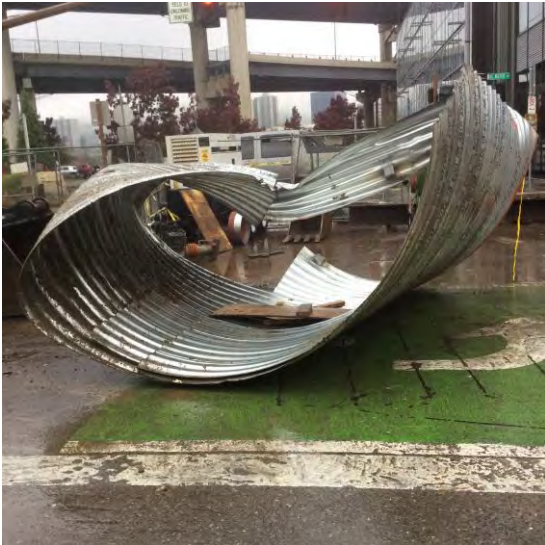
Construction – Flow Reverse Run



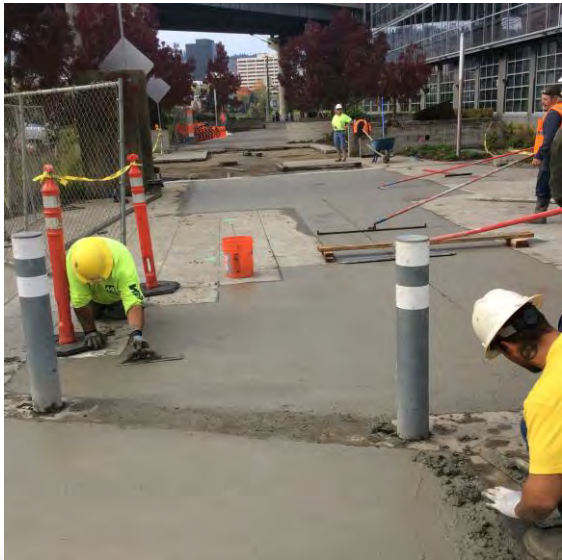
Construction – Upstream Storm



Construction – Wrap-up/Restoration



Construction - Restoration



Agenda

- Project area background & overview
- Alternatives analysis
- Design
- Construction
- **Conclusion/discussion**



Conclusion

- **Urgent repair triggered by structural condition.**
- **Many alternatives evaluated -> 'Basin Transfer' selected.**
- **Difficult project site led us to Pilot Tube as construction method.**
- **Coordination with local/State stakeholders accelerated project schedule -> PAURSS.**
- **Partnering with Consultants/Contractor proved to be good decision.**



Discussion

