

# **WSSC IMPROVES RELIABILITY WITH CFRP**

# **WSSC AMELIORE LA FIABILITE AVEC CFRP**

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21 November 2012



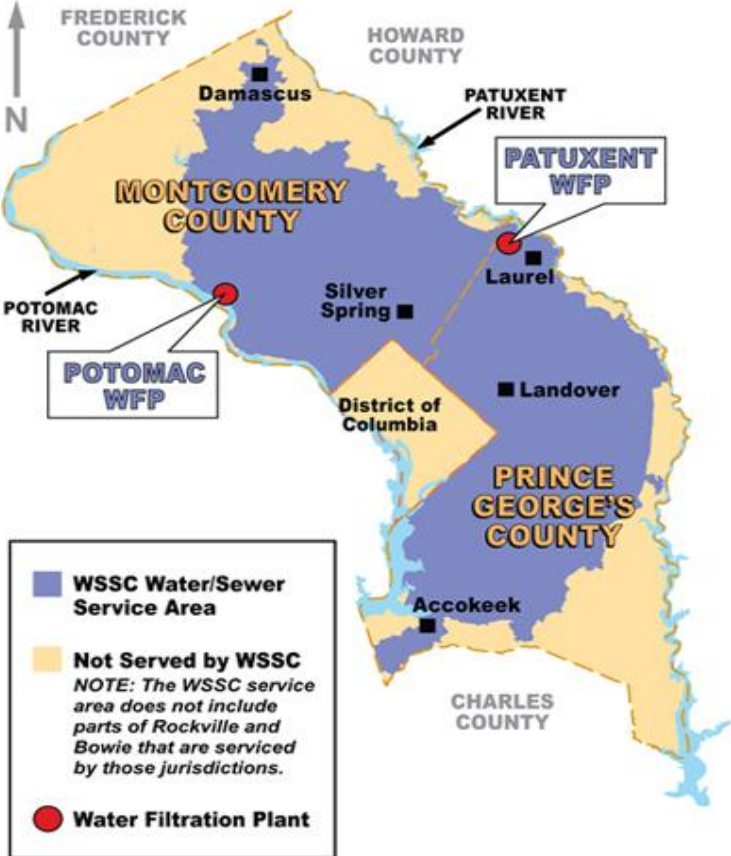
# Washington Suburban Sanitary Commission Overview

- 1,800,000 retail customers
- 5,500 miles (8,050 km) of water mains, sizes 2 to 120in (5 cm to 300cm)
- Many of pipelines located underneath or directly adjacent to major roadways
- Inventory: Approx. 150 miles (240 km) of prestressed concrete cylinder pipe



# Washington Suburban Sanitary Commission Overview

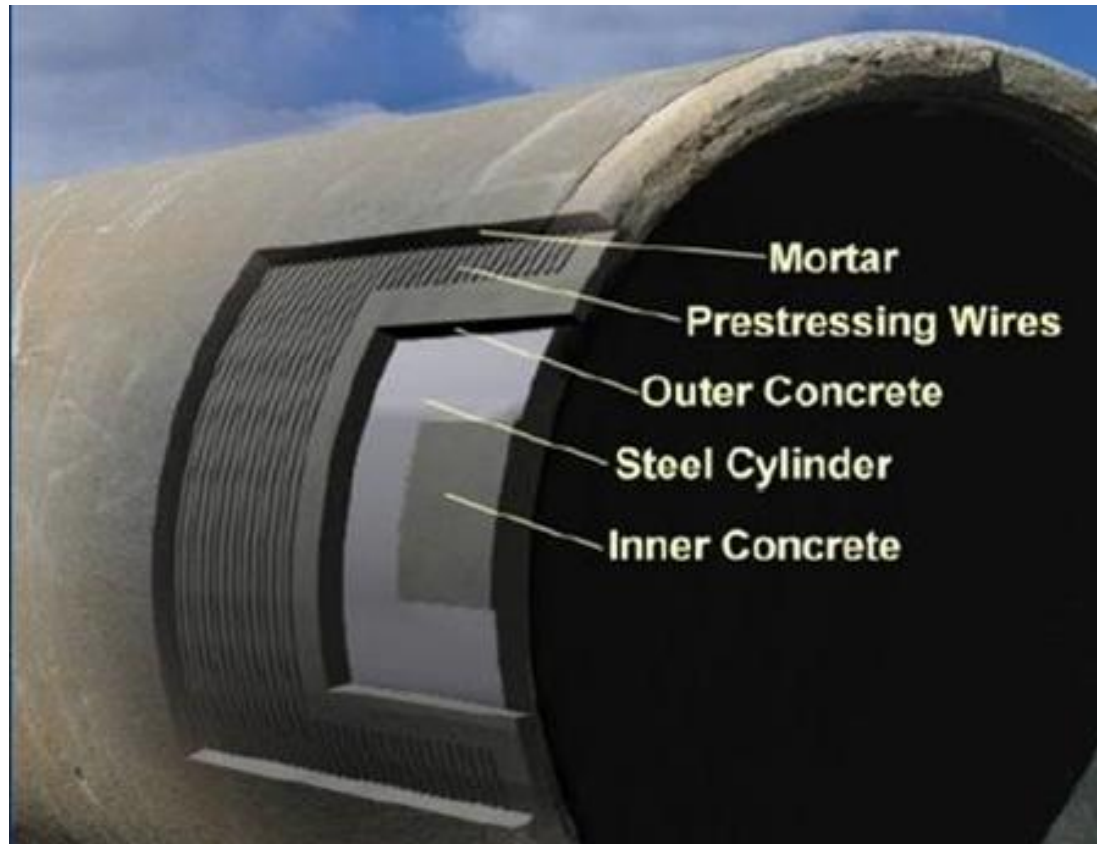
## WSSC Water/Sewer Service Area



- WSSC Water/Sewer Service Area**
- Not Served by WSSC**  
*NOTE: The WSSC service area does not include parts of Rockville and Bowie that are serviced by those jurisdictions.*
- Water Filtration Plant**



# Typical Construction of a Prestressed Concrete Cylinder Pipe (PCCP)



# WSSC: Renewed Focus on Pipeline Management

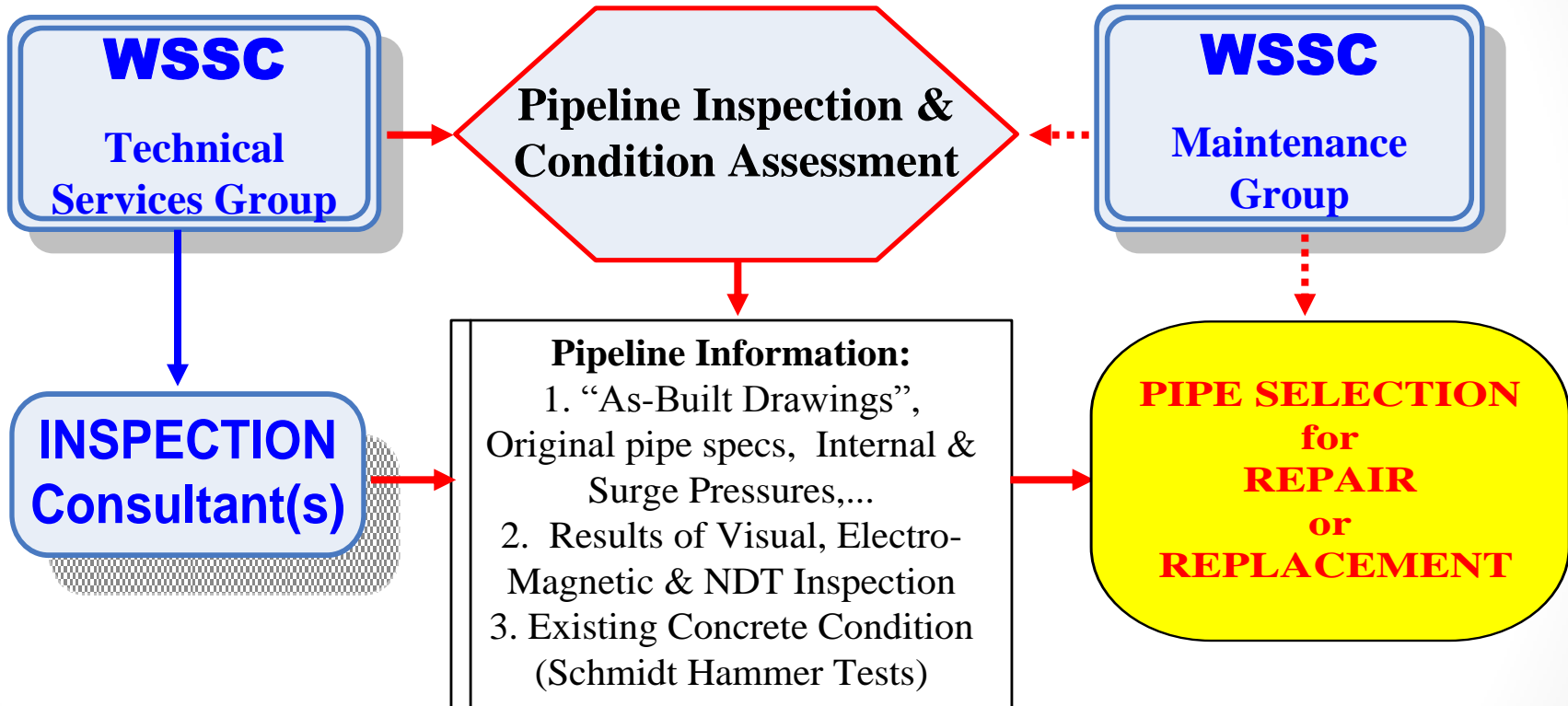
- PCCP Asset Management Program created by WSSC.
- Purpose of program: proactive approach to managing large diameter pipeline system to minimize disruptions to residents as well as associated financial and political costs.
- Precision inspection, minimally disruptive, targeted rehabilitation of distressed pipes.



# WSSC's Program Minimizes Impact on Traffic through use of Trenchless Technologies



# WSSC's Condition Assessment and Pipe Selection Process



# Precision Inspection of PCCP



Photo Courtesy of Pure Technologies

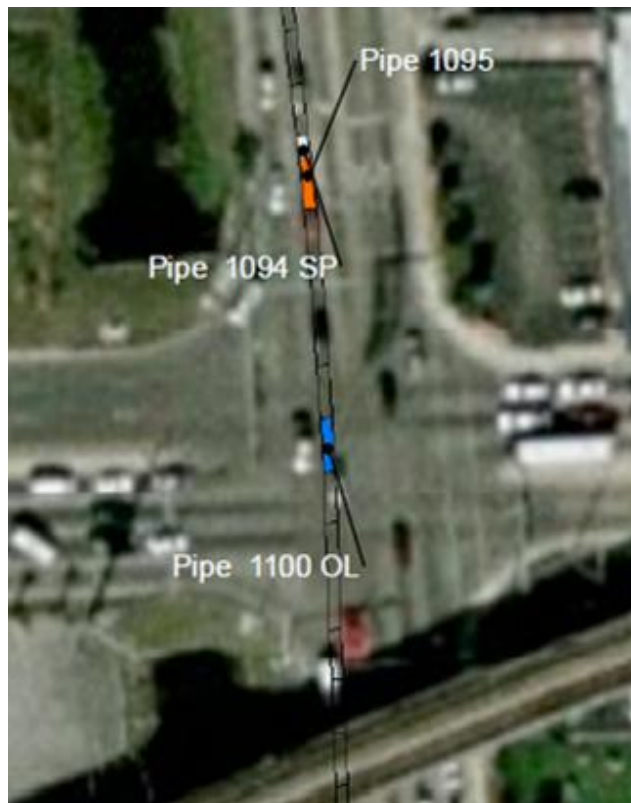


- Electromagnetic Inspection
- Avoids pipeline outage
- Determines number and location of wire breaks
- Determines non-distressed pipes
- Allows WSSC to prioritize rehabilitations





# Results of Precision Inspection of PCCP: Exact Locations of Distressed Segments of Pipe



# Use of CFRP Rehabilitation Option: Minimizing Pipeline Outages

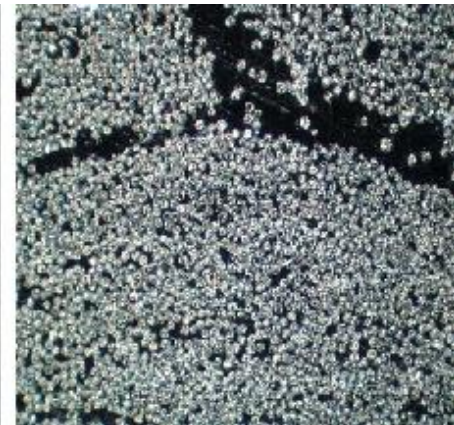
- No digging required
- Targeted rehabilitation
- Stand-alone design
- 50-year design life
- NSF-61 Certified
- Accelerated construction
- Requires experienced technicians



# Background of CFRP Strengthening

## Saturation of Fibers with Resin

### Close-up of fibers



**CFRP: Carbon Fiber Reinforced Polymer**

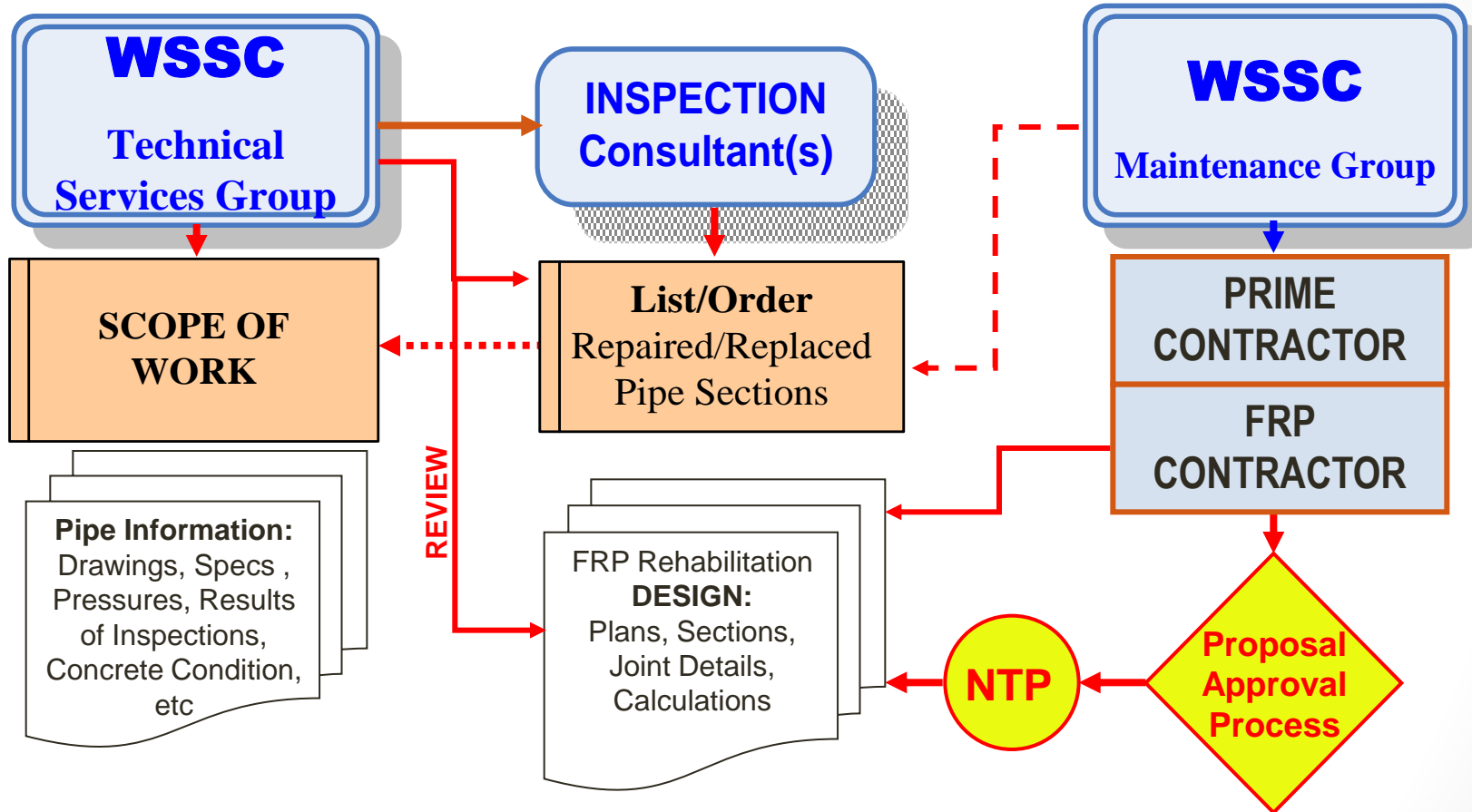


# WSSC Process for CFRP Rehab

- Pipes with distress in need of rehabilitation selected based on inspection results.
- WSSC issues request with design and construction requirements to prequalified specialty carbon fiber lining contractors.
- Technical submittal by specialty contractor reviewed by WSSC prior to construction commencement.



# WSSC's CFRP Design Review Process




# Purpose of QA/QC Program for CFRP Lining

## Verification and Confirmation

- Specifications
- Design criteria
- Manufacturer Requirements



CFRP Liner Construction QC Records (FRP) - 1			
Project:	FY'12 PCCP Rehabilitation, 96" Potomac Main Zone Emergency		
Process Document:	FRP - 1	Overall Due Date:	
Current Workflow Step:	Finish	Step Due Date:	
Subject:	96" Potomac Main Zone - Pipe B-294		
Status:	Approved		
<b>Pipe Details</b>			
Contract:	66-BL2621-B	Date:	01.25.2012
Installer/Contractor:	Fibrwrap Construction	General Contractor:	Orbit
Station From:	115+34	Station To:	115+50
Longitudinal Layer:	SEH 51A	Pipe:	B-294
Joint Detail #1:	Recessed	Joint Detail #2:	Recessed
Hoop Layers:	SCH 41-2x	# Layers:	8
<b>Step 1 - Surface &amp; Joint Preparation</b>			
Surface & Joint Preparation - Notes (Contractor):	surface and joints prepared, cleaned, and dried	Surface & Joint Preparation - Notes (Inspector):	Joints cut approximately 6" from adjacent pipe, cleaned. Latent surface material removed with hydro blaster to "CSP 8. Surface was clean and dry per spec.
Surface & Joint Preparation - Name (Contractor):	Please select contractor/installer name from the drop down list. Clark, Gordon	Surface & Joint Preparation - Name (Inspector):	Please select inspector name from the drop down list. McNealy, Ashan
Surface & Joint Preparation - Date (Contractor):	02.03.2012	Surface & Joint Preparation - Date (Inspector):	02.04.2012
<b>Step 2 - Surface Clean &amp; Dry</b>			
Surface Clean & Dry		Surface Clean & Dry	



# Surface Preparation Performed on the Concrete Substrate

- Hydroblaster with greater than 30,000psi water pressure utilized
- Laitance removed
- Minimum CSP3 profile
- Aggregate exposed



# Verification of Adhesion to Concrete



- ASTM D4541 Adhesion Test utilized
- Minimum of 200psi bond strength





# WSSC Process for CFRP Rehab



# Application of Primer and Thickened Resin



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# Use of Mechanical Saturator



# Confirmation of Material Properties Witness Panels for ASTM D3039 Testing



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# Installation of CFRP Reinforcement



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# End Termination of the CFRP Lining





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Sanitary Commission**



**Questions?**



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