

Northeast WTP Repurposing - Updated Life Cycle Cost Evaluation

GLWA Water Engineering



Background

- GLWA currently operates 5 water treatment plants with total rated treatment capacity of 1,720 MGD (individual capacities noted in parenthesis):
 - Water Works Park (240 MGD)
 - Southwest (240 MGD)
 - Northeast (300 MGD)
 - Lake Huron (400 MGD)
 - Springwells (540 MGD)
- For average day demand conditions, the five WTPs operate between 23% - 35% of rated treatment capacity.
- For max day demand conditions, the five WTPs operate between 38% - 67% of rated treatment capacity.

Background

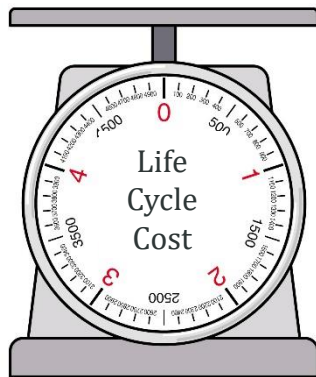
- 2015 Water Master Plan Update evaluated alternatives to right-size treatment capacity within the system to include:
 1. Reducing treatment capacity at all WTPs
 2. Repurpose Northeast and reduce treatment capacity at other WTPs
 3. Repurpose Northeast & Southwest and reduce treatment capacity at other WTPs
 4. Repurpose Springwells and reduce treatment capacity at other WTPs
- Repurpose Northeast and reduce treatment capacity at other WTPs was selected alternative to right-size treatment capacity.

Key Alternatives

- Comparison of two basic alternatives (groups of projects).
- Both alternatives provide 200 MGD of finished water supply from the Northeast site.

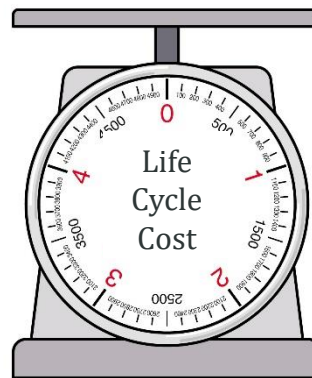
Rehabilitate Northeast WTP to 200 MGD

CIP #####	CIP 116002
Northeast WTP Rehab	Raw Water Tunnel Rehab



Repurpose Northeast WTP (WWP to NE transmission)

CIP 115003
WWP to NE Transmission Main



These three projects are pipeline rehab projects that would have to be completed even if GLWA rehabilitated Northeast. Considered common to both alternatives.



CIP 122003 (Phase 1)	CIP 122017	CIP 122018
Northeast Flow Control Facility	7 Mile/Nevada Transmission	Garland/Bewick/Hurbut Rehab

Key Alternatives – Northeast WTP Rehab Option Scope

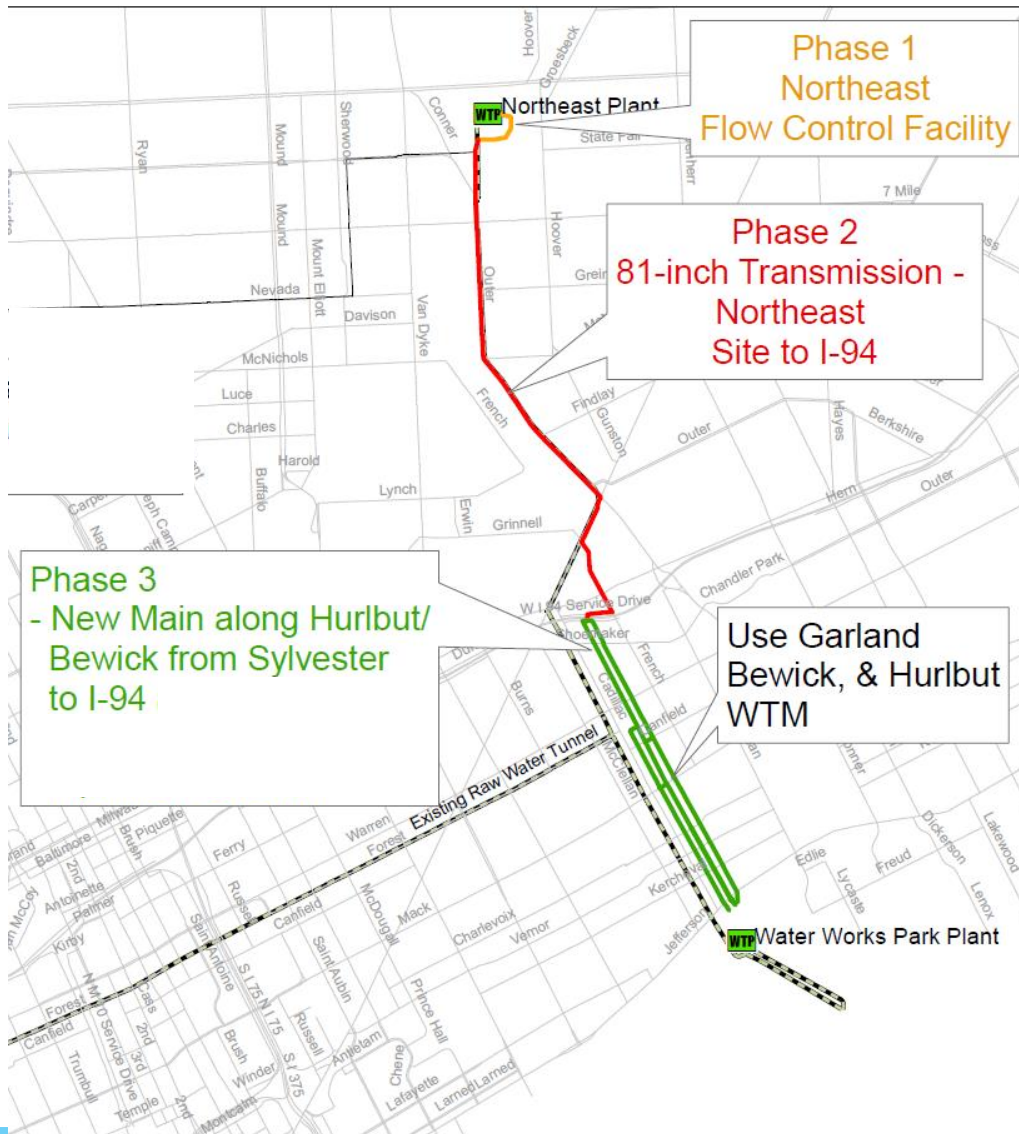
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Needs assessment identified critical projects:

- Solids Handling Facility/Sludge Collector System
- Filter Building Rehab
- Low Lift Pump Station Rehab
- Raw Water Tunnel Rehab
- Building Mechanical Upgrades (HVAC, water service, natural gas, compressed air)
- Building Architectural Upgrades (grating, windows, handrail, doors, hatches)
- Roof Replacement
- Rapid Mix/Flocculation Rehab

Key Alternatives – WTP Repurposing Option (new transmission) Scope

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- Northeast Flow Control Facility (Phase 1) - Common to both alternatives. Not factored into cost analysis.
- New 81-inch water transmission main from Northeast to I-94 (Phase 2)
- New 66-inch water transmission main from I-94 to Sylvester (Phase 3)
- Use existing water transmission mains in Garland, Hurlbut, and Bewick to transmit flows from Water Works Park to Northeast

NE Rehab Option Capital Cost

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Project	Capital Cost
Chain and Flight Sludge Removal System and Solids Handling Facility	\$ 65,500,000
Filter Building Rehab	\$ 52,530,000
Low Lift Pump/Valve Replacement	\$ 34,890,000
Raw Water Tunnel Rehab	\$ 27,000,000
Steam and Condensate System Replacement	\$ 26,550,000
Rapid Mix/Floculation Rehab	\$ 8,170,000
Plant-wide Electrical Upgrades	\$ 10,770,000
Architectural Upgrades to All Buildings	\$ 9,560,000
Chem Feed Systems Replacement	\$ 11,060,000
Roof Replacement	\$ 6,140,000
Plant-wide Mechanical Upgrades (compressed air, water service, natural gas, drain line, elevators)	\$ 11,970,000
Ventilation/Air Conditioning System and Ducting Replacement	\$ 7,160,000
Plant-wide Structural Repairs (sed basin, chem bldg, ped. Tunnel, low lift structure, switchhouse roof, filtered water chamber)	\$ 5,580,000
Replace all Access Roads	\$ 3,570,000
Washwater Building Rehab	\$ 1,950,000
Raw Water Conduit/Venturi Meter Rehab	\$ 3,790,000
Inspect/Replace 12-inch Service Water Main	\$ 5,400,000
Sed Basin Valve and Gate Replacement	\$ 1,090,000
Replace Belt Drains/Underdrain Systems	\$ 3,290,000
Backflow Preventers	\$ 460,000
Total Capital Costs	\$ 296,500,000

Northeast Repurposing Option (new transmission) Capital Costs

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Project	Capital Cost
81-inch water transmission main from Northeast to I-94 (CIP 122003 Phase 2)	\$98,400,000
66-inch water transmission main from I-94 to Sylvester (CIP 122003 Phase 3)	\$33,800,000
<u>Total Capital Cost</u>	\$133,300,000

Life Cycle Cost Evaluation

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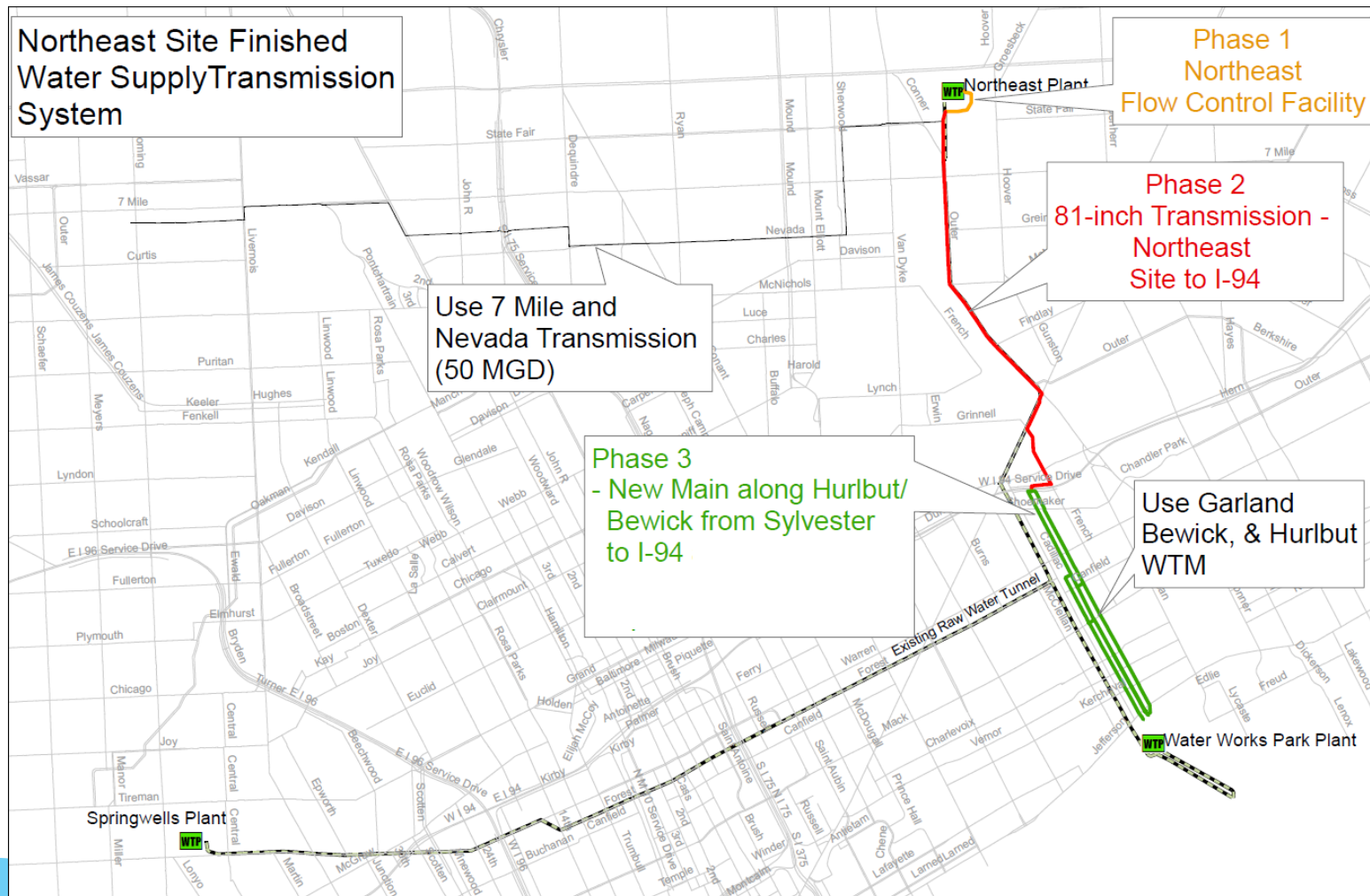
Alternative	Capital Cost	Incremental Annual O&M Cost	Salvage Value (P/F, 4%, 20yrs.)	Present Worth of Annual O&M Cost (P/A, 4%, 20yrs)	<u>Equivalent Uniform Annual Cost (EUAC)</u>	<u>Net Present Worth</u>
Northeast Rehabilitation	\$296,470,000	\$8,800,000	\$70,100,000.00	\$119,600,000	<u>\$19,400,000</u>	<u>\$346,000,000</u>
Northeast Repurposing	\$133,300,000	\$3,150,608	\$48,700,000.00	\$42,800,000	<u>\$8,600,000</u>	<u>\$127,400,000</u>

Northeast Repurposing Pipeline Advantage?	Non-Cost Factor	Northeast Plant Rehabilitation Advantage?	Alternatives Analysis – Non-Cost Factors
✓	Reliability		While NE Operations have been consistent over the recent past, the reliability provided by Garland/7 Mile mains narrows the margins
=	Constructability	=	Northeast Repurposing pipeline construction has potential for more environmental, property acquisition, geotechnical, and utility conflict issues, but maintenance of service, multi-disciplinary nature of plant work for Northeast Rehabilitation is equally challenging.
✓	Maintainability		Maintaining transmission system is less complex than maintaining mechanical systems at a rehabilitated water treatment plant. Transmission System easier to maintain then raw water tunnel
=	Operability	=	Northeast WTP can be taken out of service by treatment train but this issue is mitigated in large part by use of Garland/7 Mile Mains in future. Furthermore, longer service life for pipeline alternative means less frequent disruptions to service for future capital upgrades.
	Accessibility	✓	WTP equipment is visible in terms of condition/performance, however, GLWA would design new pipeline for ready access for in-site inspection.
✓	Work Environment		Close proximity to high-voltage electricity, chemical storage, and heavy mechanical equipment at WTP requires more safety training and is slightly more adverse as working in pipeline repair/construction environment with associated trench/confined space issues. Moreover, even with Northeast Rehabilitation expenditures, you still have 1958 plant infrastructure and technology
	Community Impacts	✓	Less work in public right-of-way means less community impacts. Impacts of pipeline construction have been minimized. Community risks reduced due to elimination of chemical treatment requirements at the Northeast site.
✓	Scheduling and Permitting		More work required with Northeast Rehabilitation coupled with more staging requirements for WTP work means extended schedule for Northeast Rehabilitation.
✓	Water Quality		Enhanced ozone treatment provided with finished water treatment from Water Works Park
✓	Future Regulatory Requirements		With only 4 WTPs in operation, future regulatory requirements would be more costs effective to implement

Recommended Alternative

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- GLWA recommendation is to implement NE Repurposing Alternative that includes construction of the new transmission system from WWP to NE. This alternative optimizes capital investment in existing and proposed transmission systems.





GLWA

Great Lakes Water Authority

