



North Jersey District Water Supply Commission (NJDWSC)
Upgrades Two of Their Clarification Basins

A Little Background on NJDWSC

- ▶ The North Jersey District Water Supply Commission was established in 1916 pursuant to N.J.S.A. 58:5-1 et seq. for the "purpose of developing municipal water supplies" in the Counties of Sussex, Warren, Hunterdon, Passaic, Morris, Monmouth, Somerset, Bergen, Hudson, Essex, Union and Middlesex. As its first order of business, the Commission began reviewing preliminary surveys made by Newark engineers in the late 1890's. The Commission quickly succeeded in developing a regional consensus among municipalities and a massive 29.6 billion gallon reservoir project was launched in 1920 with construction of a dam across the Wanaque River in upper Passaic County. The cities and towns that decided to join the Commission in building water supply projects also would be responsible for paying 100 percent of the costs. The mandate of voters had become law: No state funds would be used to build and operate the new water supplies so urgently needed by New Jersey's expanding population and industrial growth.
- ▶ Success was celebrated on March 20, 1930 when officials from throughout New Jersey gathered to dedicate the new Wanaque Reservoir and its 21 mile aqueduct. The project was New Jersey's first large-scale regional water supply system but wouldn't be the last. Over the years, the Commission continued to bring together groups of municipalities to develop, expand and upgrade drinking water resources in New Jersey.
- ▶ Today, the NJDWSC oversees the operation of the largest regional water supply in the State of New Jersey, including more than 95-square-miles of watershed area, two major reservoirs, two river-diversion pumping stations, and a 210-million gallon / day (MGD) water filtration plant. At peak capacity, the NJDWSC's facilities can serve the water needs of more than three million people in Northern New Jersey

The Reservoir

- ▶ Wanaque Reservoir has a capacity of about 30 BG of water and Monksville Dam has a capacity of about 7 BG of water.
- ▶ The Reservoirs are fed from:
 - ▶ The Wanaque River
 - ▶ The Ramapo River
 - ▶ Wanaque South/Two Bridges Pump Station which pumps river water from the Pompton River, upstream of the confluence of the Pompton and Passaic Rivers

Treatment Plant

- Treatment Plant has a 210 MGD capacity
- Water is pumped from the Reservoir to the Treatment Plant
- The Treatment Facility utilizes chemical addition along with Flocculation, clarification and then mixed media filters to process the water



Clarifier System Rehabilitation in Basins 5 & 6

- Dewater and Clean Existing Flocculation Basins and Settling Basins in train 5 & 6
- Concrete Crack and Spall Repair
- Study and upgrade Hydraulics to better facilitate settling
- Replace Old Flocculators with New Flocculators
- Replace existing FRP Tube Settlers with New Stainless Steel Plate Settlers Including weirs and baffles
- Replace existing sludge collectors with new collectors
- Upgrades to controls
- Replacement of existing dehumidification system with new system

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Overview of Presentation:

- ▶ Working with the process equipment vendors to reach a mutually acceptable outcome for all stakeholders
- ▶ The hydraulic challenges and how they were overcome
- ▶ How to overcome a survey datum problem mid project
- ▶ Why it was a benefit to construct this project as a Design Build Project

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Process Vendors

- ▶ Design Build Team (SHC & HDR) working closely with Owner (NJDWSC) identified early on, potential vendors for key process equipment packages:
 - Flocculation Equipment (Evoqua (Existing), MRI, Jim Myers)
 - Plate Settlers (MRI, Roberts, Jim Myers)
 - Sludge Collectors (MRI, Roberts, Jim Myers)
 - Baffle Walls (MRI, Jim Myers)

Clarifier System Rehabilitation in Basins 5 & 6



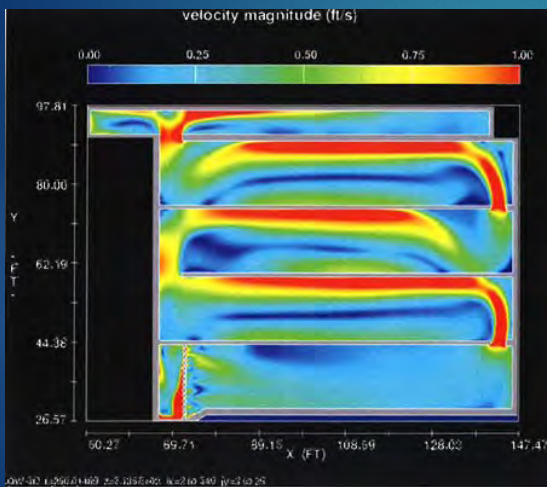
Process Vendors



- ▶ By checking references and getting costing information early on, the following were selected early and used throughout the design process to minimize problems down the road.
 - Flocculation Equipment (Jim Myers)
 - Plate Settlers (MRI)
 - Sludge Collectors (MRI)
 - Baffle Walls (Jim Myers)



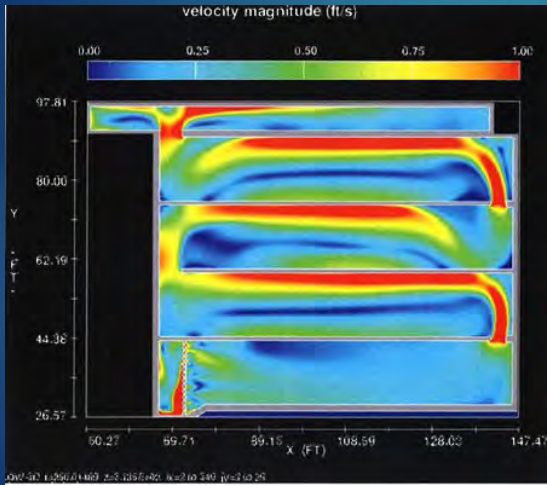
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Flocculation Basin
35 MGD Flow Rate/Basin

Basin #5 (Basin #6 Similar)

Clarifier System Rehabilitation in Basins 5 & 6



Settling Basin
35 MGD Flow Rate/Basin

Basin #5 (Basin #6 Similar)

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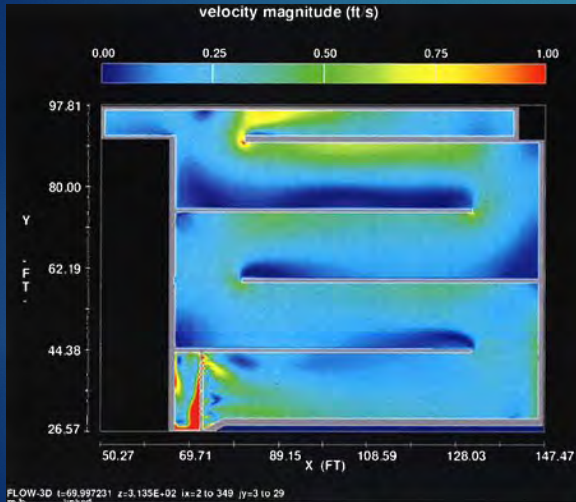
Clarifier System Rehabilitation in Basins 5 & 6



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Basin #5 (Basin #6 Similar)

Clarifier System Rehabilitation in Basins 5 & 6

Survey Discrepancy



Clarifier System Rehabilitation in Basins 5 & 6

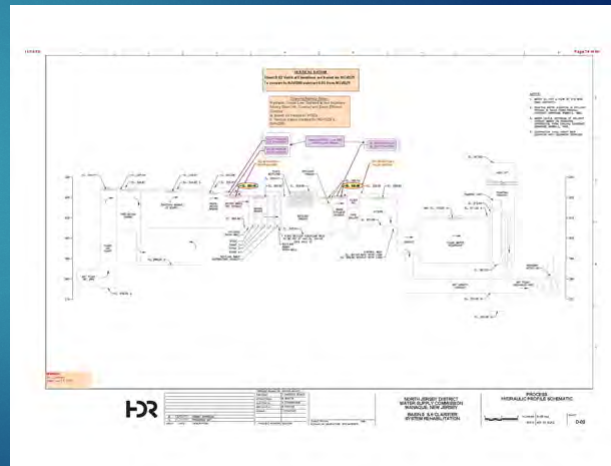
Survey Discrepancy

- ▶ Design drawings for settling tanks 5 & 6 and mixing basins 5 & 6 at the Wanaque Water Treatment Plant (Dec, 2017) were based on record drawings from Clinton Bogert Associates (CBA) dated March 1989. No reference to datum used, however Working assumption is that the vertical datum used was NGVD29 as that was the datum in common usage at that time.
- ▶ An "as-built" survey of settling tanks 5 & 6 and mixing basins 5 & 8 was conducted by MASER (October, 2017). The stated vertical datum for this survey is NAVD88.
- ▶ A difference of 1.08 ft. was observed between the Surveyed elevation and record drawings.
- ▶ Correct conversion for NGVD29 to NAVD88 at Wanaque is:
Elevation_NAVD88 = Elevation_NGVD29 - 0.81

Clarifier System Rehabilitation in Basins 5 & 6

Survey Discrepancy

- ▶ Hydraulics through basins 5&6 are tight as previously mentioned, so this would be a major problem
- ▶ A hydraulics test was performed to determine what flows were going through basins 1-4 (since 5 & 6 were out of service).
- ▶ Combining the efforts of NJDWSC Staff, HDR and Stone Hill working closely together to install temporary devices to get a better idea of flow conditions.



Clarifier System Rehabilitation in Basins 5 & 6

Survey Discrepancy

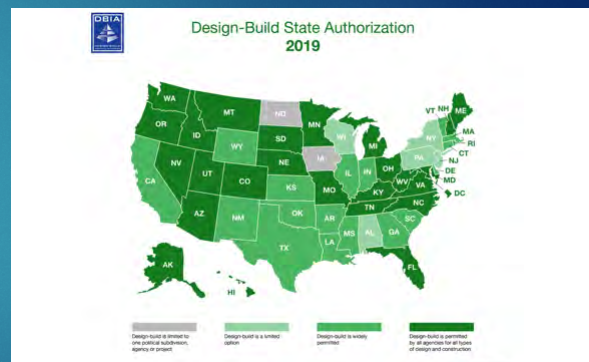
- ▶ Based on our analysis and review of existing record drawings it is suspected that the 1976 drawings and WM88-2 drawings on which HDR's drawings were based are in the NGVD29 datum.
- ▶ Elevation differences between the Contract WM88-2 drawings (NGVD29 ft.) assumed and the current survey (NAVD88 ft.) appear to be consistent and range from 0.98 ft. to 1.35 ft. (20 points total) and average 1.08 ft.
- ▶ Correct conversion for NGVD29 to NAVD88 at Wanaque is: $\text{Elevation_NAVD88} = \text{Elevation_NGVD29} - 0.81$
- ▶ Based on Maser's survey of local benchmark LY0458, a correction of +0.10 ft. must be ADDED to all NJDWSC CLARIFIER GPS observations to match the local benchmark LY0458.
- ▶ Based on an independent check on the Maser survey, the Maser survey is within a reasonable expectation of accuracy
- ▶ Assuming the record drawings are NVGD29, the observed difference of 1.08 ft. between the record drawings and the 2018 survey (NAVD88) is probably made up of three components:
 1. +0.81 ft. = NAVD88 ft. to NVGD29 ft.
 2. +0.10 ft. = GPS correction as per Maser
 3. +0.17 ft. = unexplained difference
- ▶ The reason for the +0.17 ft. (2.04 inches) unexplained difference remains unknown.



Clarifier System Rehabilitation in Basins 5 & 6

Benefits of Design Build Use

- ▶ Design Build is growing throughout the country and is now available to use in some form in all but two states (North Dakota and Iowa).
- ▶ Municipal Authority projects in New Jersey are not currently using Design Build
- ▶ NJDWSC, being a "Commission" is permitted to utilize Design Build on a case by basis with certain approvals
- ▶ Advantages to Design Build are usually schedule related
- ▶ Schedule drives cost, so typically there are also some savings



Clarifier System Rehabilitation in Basins 5 & 6

Benefits of Design Build Use

- ▶ Permitting was expediting to allow construction to move more quickly
- ▶ NJDEP allowed Sludge Removal and Demolition operations to commence prior to permit approval
- ▶ Replacing lights was the only portion permitted through DCA, that was broken out until DCA approval was received
- ▶ Once NJDEP permitting was achieved full "construction operations" commenced
- ▶ Having the ability to work together as a cohesive Team of Owner, Designer Contractor and Owner's Representative, decisions to benefit all stakeholders were easy to attain.

Clarifier System Rehabilitation in Basins 5 & 6

In Conclusion

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In Conclusion

► Thanks to all stakeholders who helped to make this project a success:

- North Jersey District Water Supply Commission (NJDWSC) – (Owner)
- HDR Engineering (Engineering Partner)
- Stone Hill Contracting Co., Inc. (Design Builder)
- ARCADIS (Owner's Rep)
- Jack Pears & Associates
- R. Spark Electric
- Hays Sheet Metal
- Cooper Plumbing and Mechanical
- Trijay Systems
- Meurer Research (MRI)
- Raritan Group
- Harrington Plastics
- Jim Myers & Sons
- Quality Controls, Inc.
- Zack Painting

Clarifier System Rehabilitation in Basins 5 & 6

In Conclusion

► And Special thanks to the following for all their assistance and cooperation to help meet deadlines:

- NJDEP
- The New Jersey Water Bank - NJWB (formerly New Jersey Environmental Infrastructure Financing Program - NJEIFP)

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