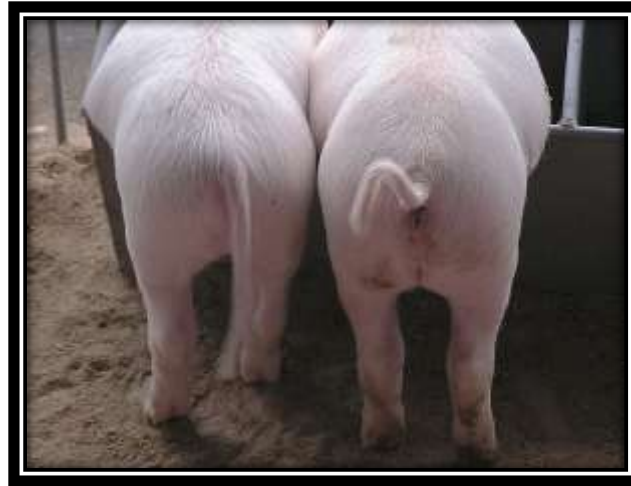




“A Pig’s Tale”



Interplant Force Main Cleaning Project



Presentation Overview

- Who is NEW Water?
- Project Background
- Discovery of the problem - Slime
- Poly Pigging Project
 - ✓ Identification of risks
 - ✓ Mitigation of risks
- Project Conclusion
- Video
- Questions



NEW Water Service Area Overview

- Green Bay Metropolitan Sewerage District (GBMSD) formed in 1931
- Rebranded to NEW Water in 2013, legal name is still Green Bay Metropolitan Sewerage District
- De Pere Facility (DPF) – 8.5 MGD & Green Bay Facility (GBF) 27.0 MGD
- Service area population of 225,000, 285 square miles served, 57 Significant Industrial Users, 78 miles of gravity interceptors, 25 miles of force mains, 13 lift stations and 18 customers
- In 2008, facility planning and construction for an interplant force main link from the DPF to the GBF
- Conveyance from DPF to GBF began the summer of 2010
- System composition: 7.1 miles, 18 air release structures, two dedicated 10 inch and one 20 inch force main



Fiber Mill Line

- Fiber mill wastewater characteristics: high temp (105 degrees), very high BOD (3,000 mg/L), low TSS, low TP and low TKN
- Flow volume is approximately 1.0 mgd
- Fiber mill has a dedicated 12 inch force main to the DPF
- Force main is approximately 3.6 miles long with eight air release structures
- Fiber mill wastewater is received and split at the DPF: 15 to 85 ratio
- Desired at the GBF...Why?
 1. Reduces ferric chloride need
 2. High BOD waste was extremely beneficial for operations and Bio P
 3. Help meeting permit limits
 4. Saves operating cost



**NEW Water/GBMSD
Green Bay WWTF**

**Interimate Chemical
Feed Building**

**NEW Water/GBMSD
DePere WWTF**

Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013



The Investigation

- Conveyance of fiber mill wastewater to the DPF began Jan 18, 2010
- Interplant FM (DPF to GBF) was performance tested in April 2010: 75 psi and 850 gpm
- Fiber mill wastewater conveyance to GBF began June 2010
- Increased discharge pump pressure & declining pumping rates: 90 psi and <600 gpm
- Field Services collected force main system discharge pressures at each air release structure
 - ✓ results were plotted and reviewed
 - ✓ problem was consistent throughout the length...not one area
- Contracted with CCTV firm to video various force main segments
- Video work....slime existed throughout!!



So we had a problem...a slimy one!!
How do we clean the slime?

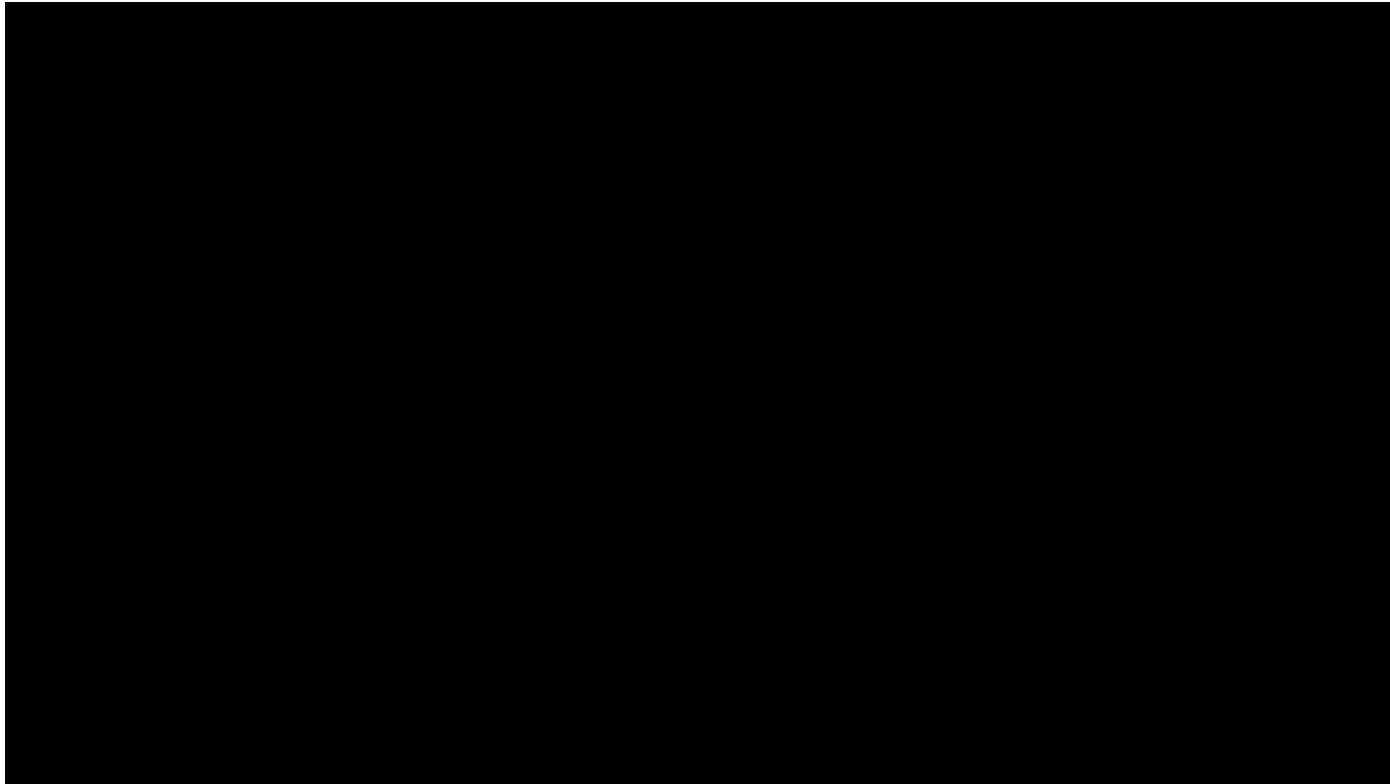


2011/01/11





Before and After Chemical Cleaning





Mitigation Methods

NEW Water Staff met to discuss FM restoration options and associated risks:

1. Poly pig technology
 - Dezurik values, square vs full port opening
 - Design engineer expressed concern
2. Conventional pipe jetting
3. Chemical treatment (ferric chloride, Bioxide, caustic & hydrogen peroxide)
4. Ozone technology

Decided to pursue hydrogen peroxide chemical and experiment with ozone/oxygen generator technology mitigation



Ozone/Oxygen Mitigation

- Rented a trailer mounted ozone/oxygen generator unit
- Injected at DPF for about a two-month period
- Some mitigation achieved, slightly lower pressures and 100 gpm increase
- Unit did not achieve desired results
- Large capital investment



Chemical Mitigation

- Contracted - turn key assistance, setup, product, equipment and operation
- Peroxide was feed from DPF and Intermediate Chemical Feed Building
- Different dosing rates
- Different mixtures: mill waste, mill waste with service water and only service water with elevated pH
- Best results achieved: service water, elevated pH and a high feed rate 250 gpd
- Could never add enough peroxide to clean the entire length, demand from slime
- Conclusion
 - ✓ effective in small segments
 - ✓ concerns with handling another chemical
 - ✓ concluded to be too costly and too laborous



Pigging Technology – Revisited

- Discussed again with design engineer
- Recommended switching out plug valves to full port
- Required at 18 large monolithic structures
- Removal of flat top covers to switch valves
- Center median of four lane high traffic
- Engineering estimate was approximately \$350,000



Pigging Technology – Revisited

- Met and consulted with the poly pig contractor
- Drove the route
- Provided force main system information
 - ✓ overall length
 - ✓ distance between air release structures
 - ✓ pumping pressures
 - ✓ velocities
 - ✓ system profiles
- Contractor encouraged staff that cleaning with pigging technology is very doable
 - ✓ Required the right type of poly pig
 - ✓ A risk management plan



Pigging Technology - Poly Pigs

- Many poly pig supplies
- Shapes and sizes
- Different densities
- Abrasive cutting edges
- Important to select the correct pig for the cleaning application
- Most importantly, contract assistance with an experienced contractor





Pigging Technology - Poly Pigs





Project Risk Components

A project risk has three components:

1. Risk Event – A discrete occurrence that may affect the project for better or worse.
2. Probability – The likelihood that an uncertain event will occur.
3. Impact – The measure of the event's negative or positive outcome if it occurs.



Risk Identification

- Cross functional staff members met to and conducted a brainstorming session.
- Discussed the probability of an risk event happening, its impact and corrective actions.
 - ✓ Launching and catching a pig
 - ✓ Dewatering the FM
 - ✓ Pig getting stuck
 - ✓ How much slime existed...GBF upset
 - ✓ Release to the environment
 - ✓ Crossing the Fox River
 - ✓ Knowledge of pigging technology



Risk Mitigation Plan

Highest risks of concern:

- Volume of slime - fear of slug loading the treatment facility
- Existing square port plug valves – fear of pig becoming stuck
- Release to the environment
- Crossing the Fox River – fear of excessive slime, low velocities and becoming stuck under the river



Risk Mitigation Plan

Developed a three-phased risk management project approach (mitigate acceptable risks)

1. Phase I – GBF Tunnels
2. Phase II – Air Relief Vault (ARV)-016 (Prairie and Broadway) to poly pig catcher at the GBF
3. Phase III – DPF to GBF

Each phase addresses an acceptable project risk concern and through exhibited performance eliminates that concern.



Risk Mitigation - Phase I

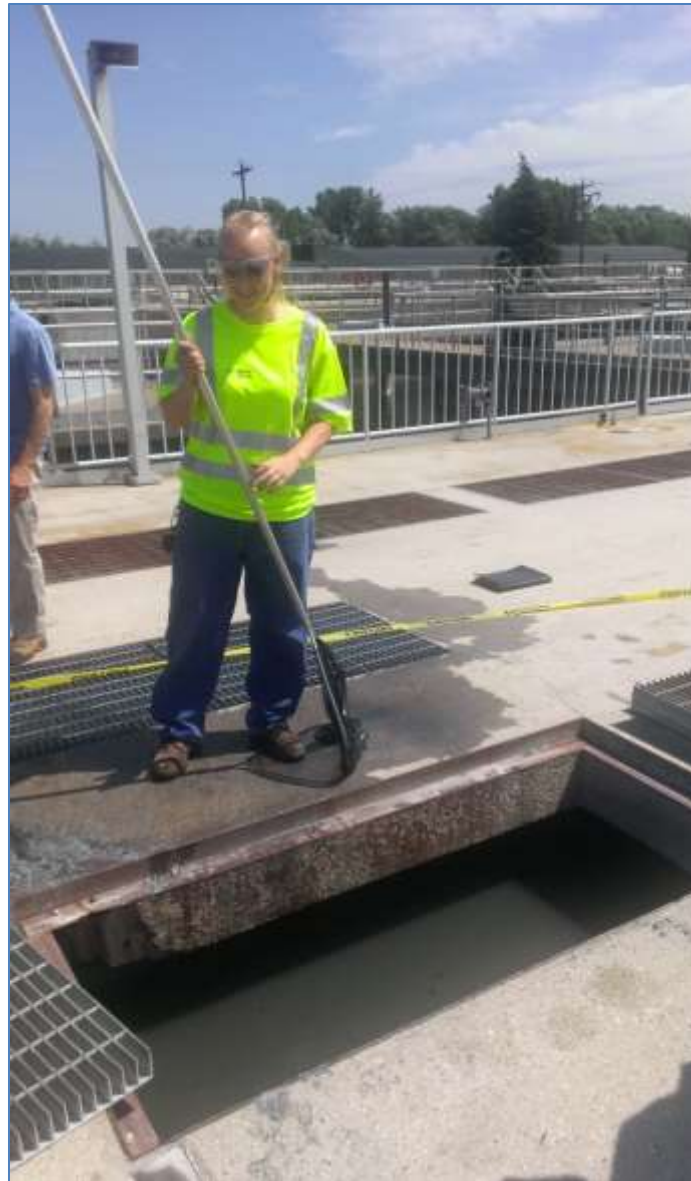
- Contractor assistance - conducted in July 2013
- Project phase limits, Green Bay tunnels
- Approximately 1,100 feet or 3% of the FM system length
- Walked route to ensure obstructions were removed, injection quills check valve flapper
- Design and installation of pig launcher
- First version of a poly pig catching device
- Eliminated one project risk – passage of poly pig through four existing square port valves
- Lessons learned from Phase I



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2013/09/24





NEW Water
The brand of the Green Bay
Metropolitan Sewerage District



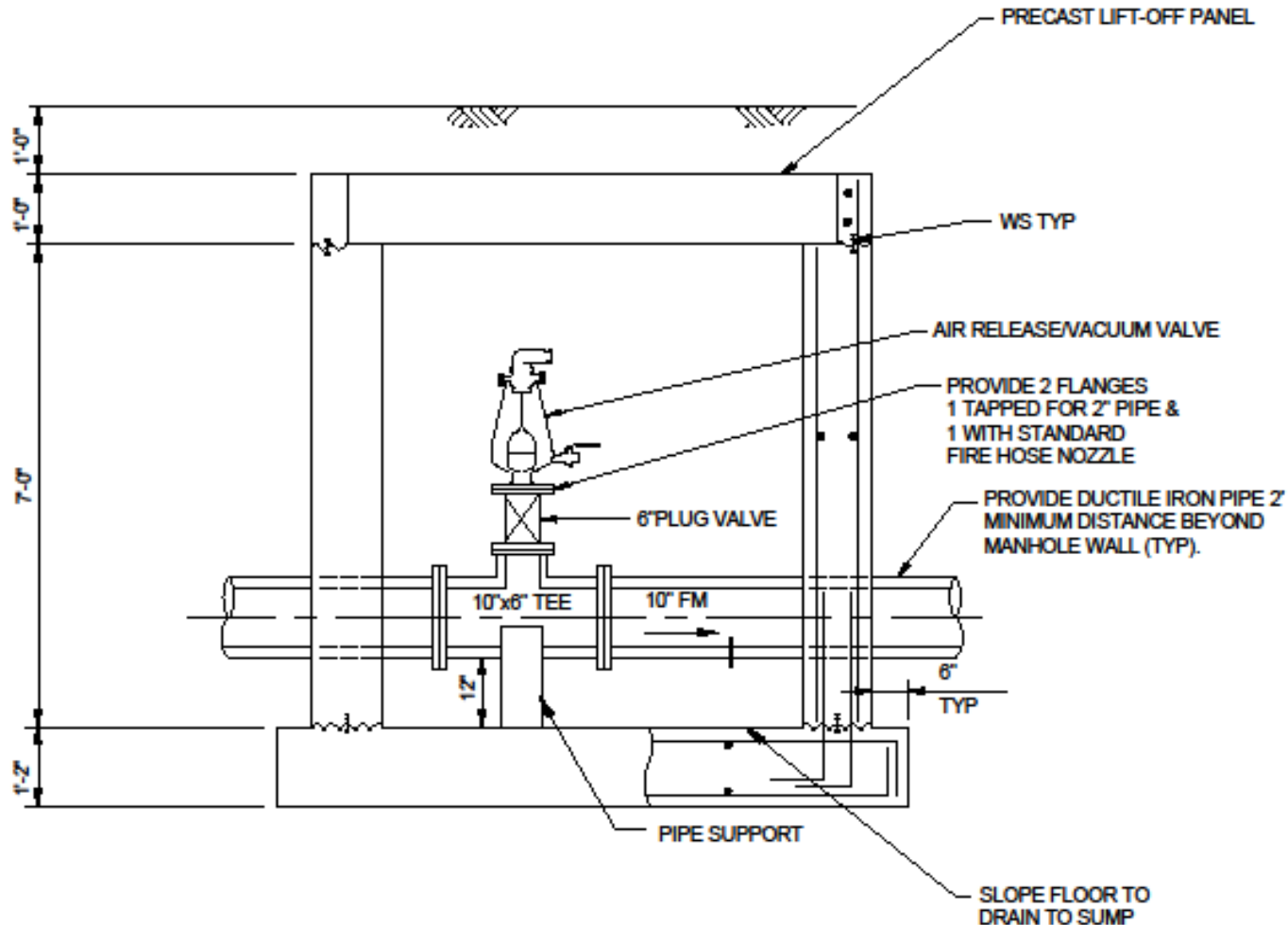


Risk Mitigation - Phase II

(September 2013)

- Project phase limits, ARV-016 to Poly pig catcher
- Approximately 5,100 feet or 13.6% of system length
- Launch poly pig from ARV structures (six inch valve)
- Locate, design, and installed the second version of poly pig catcher
- Phase II success eliminated the following project risks:
 1. Ability to safely dewater the FM
 2. Ability to pass a poly pig under the Fox River
 3. Ability to launch a poly pig from an ARV and pass through additional valves
 4. Removed slime at WWTF had no adverse effect





AIR RELEASE / VACUUM VALVE MANHOLE - TYPE A



2013/09/24



Risk Mitigation - Phase II

(Sept. & Oct. 2013)

- Project phase limits, DPF to GBF
- Approximately 7.1 miles
- Relocate poly pig launcher at DPF
- Relocated check valve
- Three sub-phases:
 1. IP-ARV-010, 38.6% of system length
 2. IP-ARV-003, 78.6% of system length
 3. Blower Bldg #2 (DPF) to GBF, 100% of system length
- System improvements: GPM and PSI
- Mitigated slug load of slime at WWTF



10.08.2013



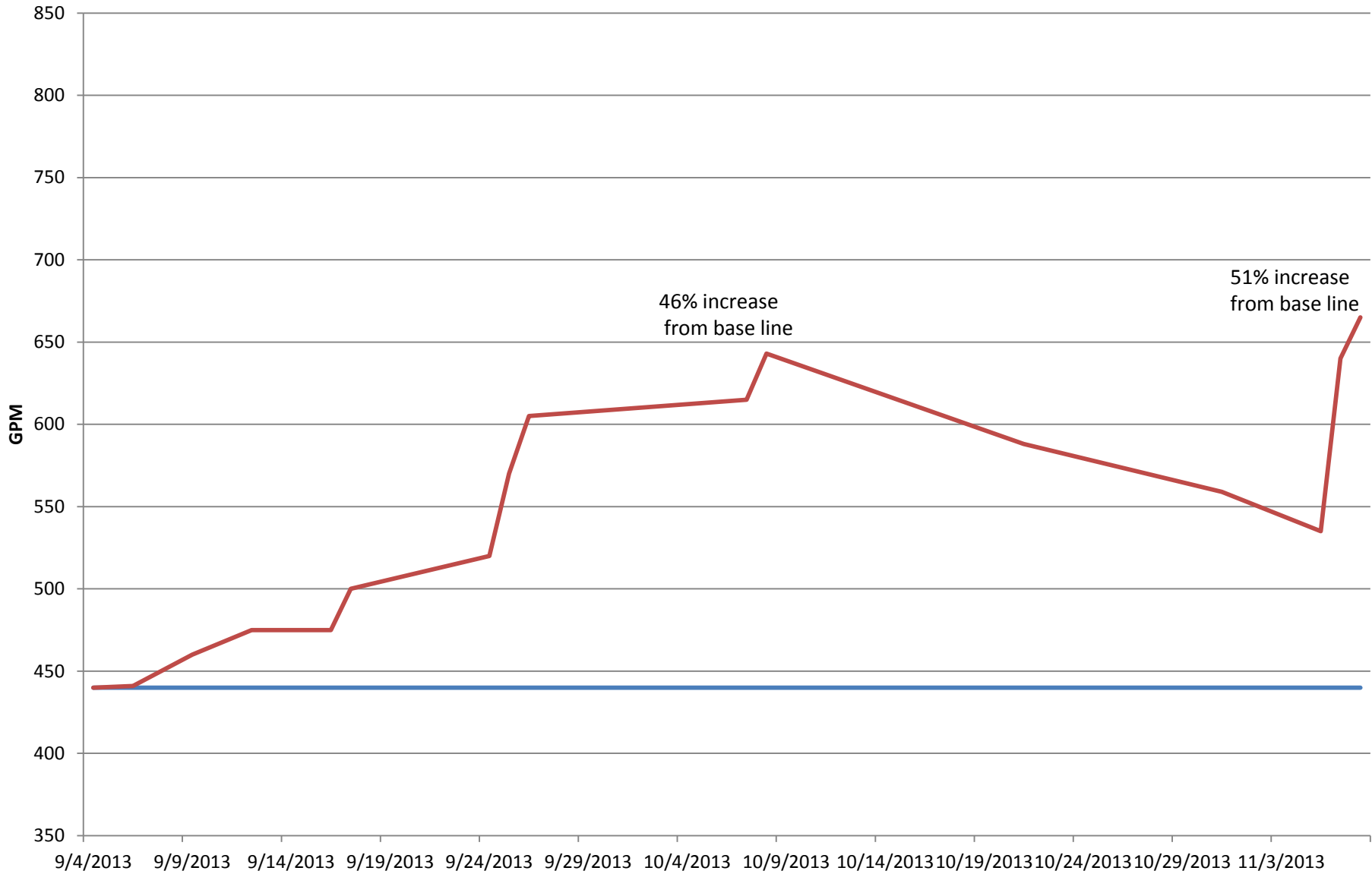
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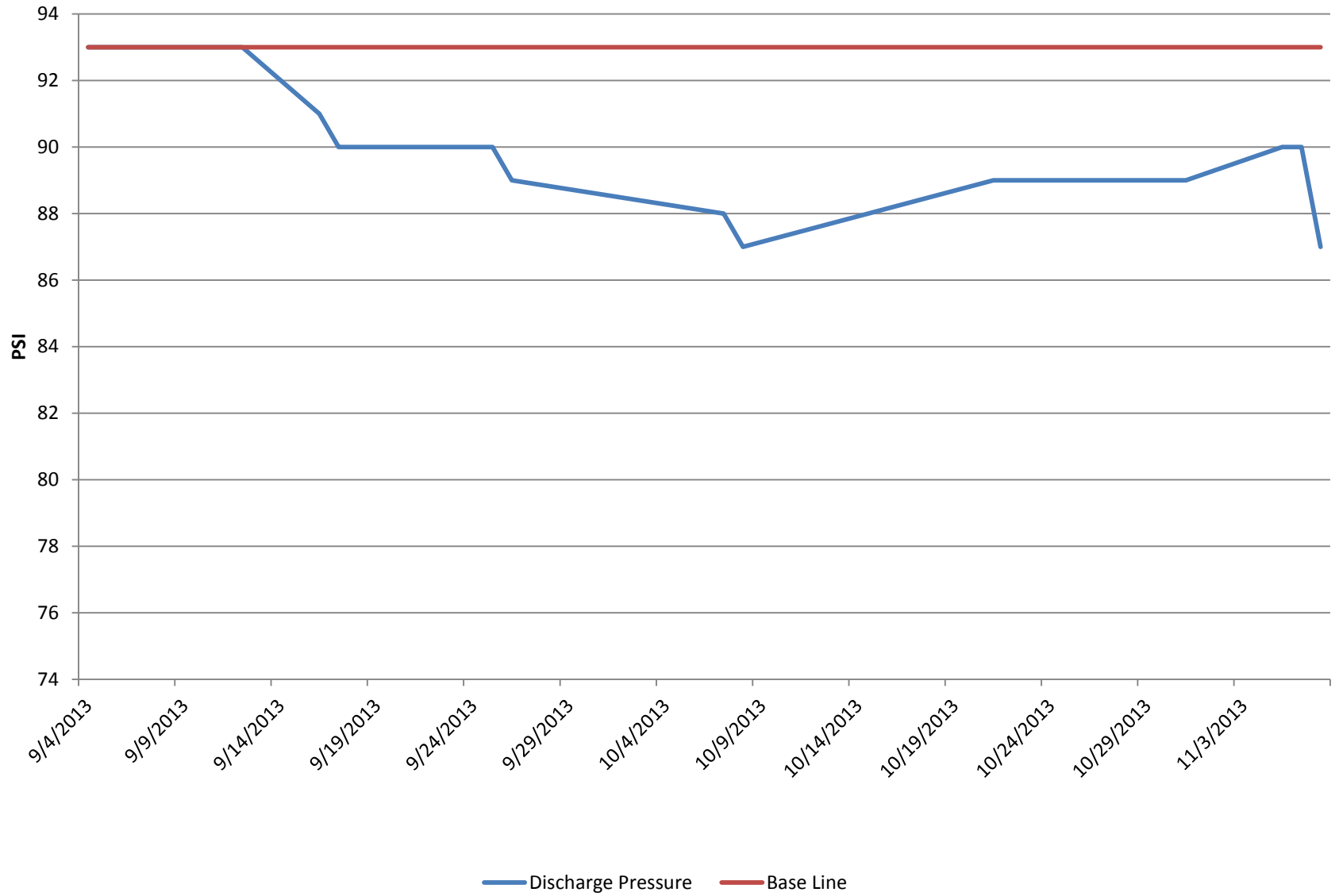
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Poly Pig Results - Flow Rate



— Base Line — Mill Flow Rate

Poly Pig Results - Discharge Pump Pressure





Project Summary

- Project concerns were successfully eliminated with each project phase
- Collaborative effort that engaged several departments
- Staff comfort with interceptor force main cleaning process
- Poly pig equaled and/or exceeded results achieved through chemical addition
- The need to store and handle another hazardous chemical was eliminated
- Treatment efficiency/process stability:
 - ✓ DPF does not need any mill flow to operate
 - ✓ Reduces the potential need for ferric polishing of effluent at GBF
 - ✓ Happier bugs during low flow periods – weekends and holidays
 - ✓ Electrical savings – operating range of pumps: 80% vs 100%



Project Summary - Continued

- Poly pig cost vs. chemical addition cost = large annual \$\$ savings
- Large capital expenditure avoided
- Most importantly, the poly pig saves NEW Water rate payers money!



“Pig on”

The Little Pig that Could: *Saving NEW Water \$378,000*

NEW Water Productions
November 2013



A Pig's Tale



Questions



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