



IMPROVING THE EFFICIENCY OF AN EXISTING GROUNDWATER REMEDIATION SYSTEM

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CORPORATE SUSTAINABILITY CREATES VALUE

- Enhances Corporate performance
- Improve the efficiency, cost-effectiveness and sustainability of environmental remedies



SITE BACKGROUND

- The Shoreham Facility
- 230 acres
- Northeast Minneapolis, Minnesota
- Railroad operations by CP and its predecessors from the late 1880s.



CORRECTIVE ACTIONS: SOIL

- 1926-1972-Wood treating lessee
- Pentachlorophenol (PCP) release
- Soil Corrective actions included:
 - Excavation
 - On-site soil treatment



CORRECTIVE ACTIONS: GROUNDWATER

- The selected groundwater remedy included 2 groundwater recovery wells

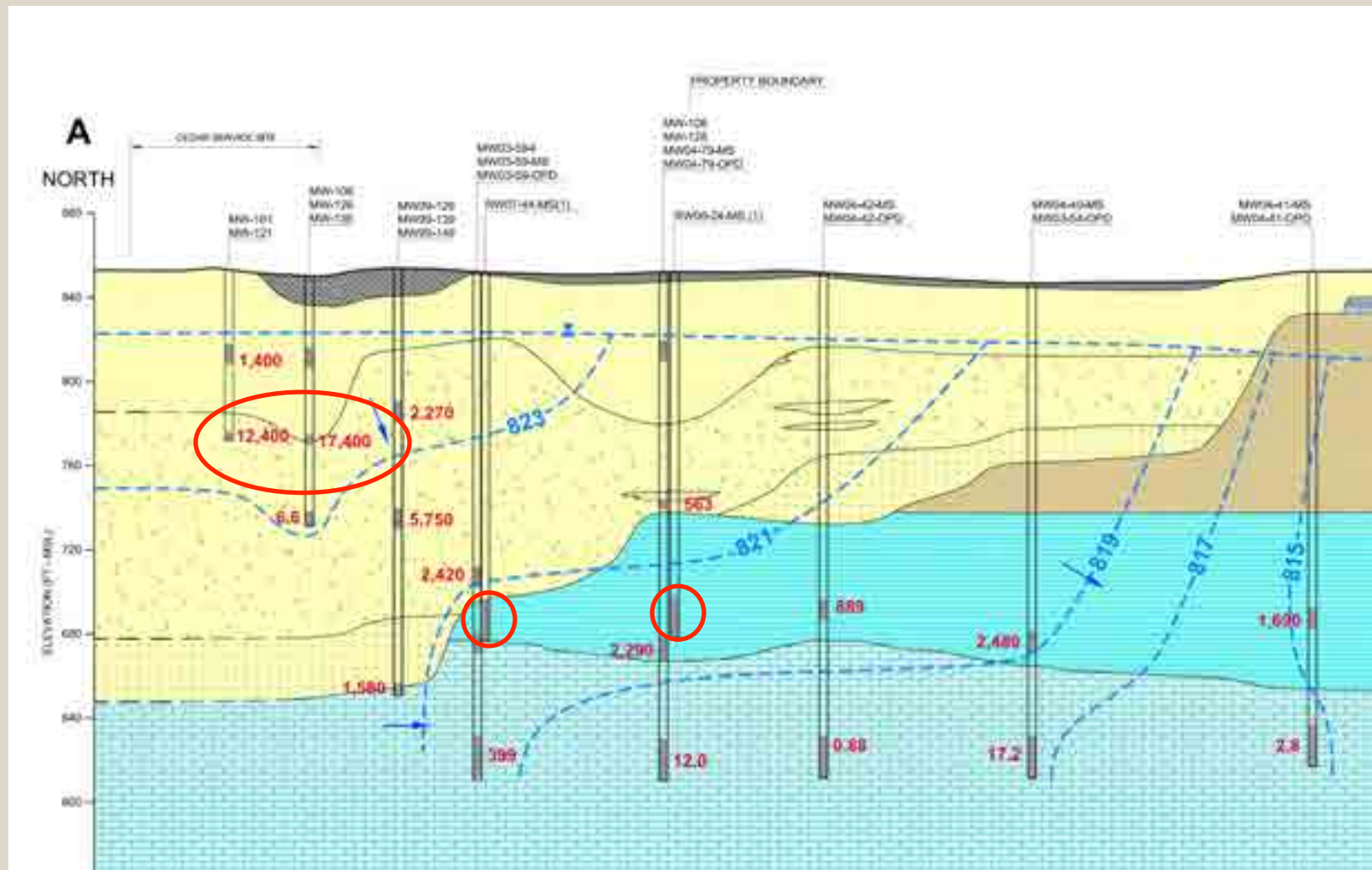


CORRECTIVE ACTIONS: GROUNDWATER

- Groundwater is treated with Granular Activated Carbon (GAC) to adsorb PCP.
- Treated water was discharged under permit to the municipal sewage treatment plant.



CORRECTIVE ACTIONS: GROUNDWATER



GROUNDWATER REMEDY: ASSESS AREAS FOR IMPROVEMENT

- Monitoring demonstrated that the treatment system is effective
- Consumes aquifer groundwater for treatment and discharge to sanitary sewer system at ~34 gpm
- Incurred unnecessary cost
- Long term use of energy resources



REMEDY ENHANCEMENT OBJECTIVES

- **Reduce**
 - The impact on the groundwater resource => 0
 - The drain on non-renewable energy resources
 - The load on the municipal infrastructure
 - The cost of the system's operations and maintenance

- Maintain the same remedial effectiveness



GROUNDWATER SYSTEM IMPROVEMENTS

- Objectives achieved
- Constructed an infiltration basin:
 - Regulatory agency support
 - Provided recharge
 - Reduced the load on municipal infrastructure
 - O&M costs significantly reduced



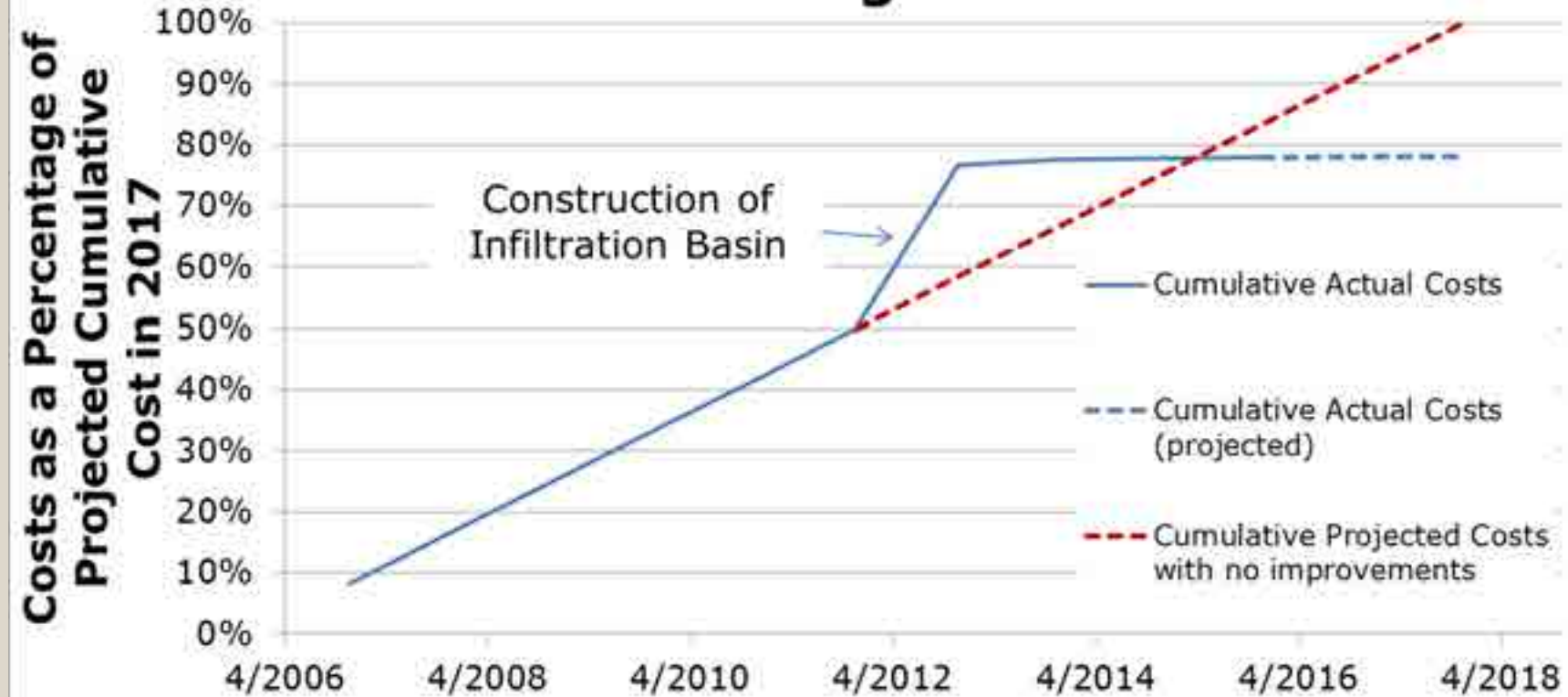
GROUNDWATER SYSTEM IMPROVEMENTS

- Treated water discharged under NPDES permit
- Advantages
 - Space available on property
 - Lithology allows for easy infiltration
- Challenges
 - Directional drilling
 - Procedural changes to maintain water flow in pipes
 - Establish vegetation in sideslopes



RETURN ON INVESTMENT: INFILTRATION BASIN

Discharge Costs



GROUNDWATER SYSTEM: REDUCE DRAIN ON ENERGY RESOURCES

- Installed solar panels to source more of the required energy from renewable sources and reduce impact on non-renewable energy sources
 - Southern Solar Array: 60 panel system (11.7 kilowatt total)

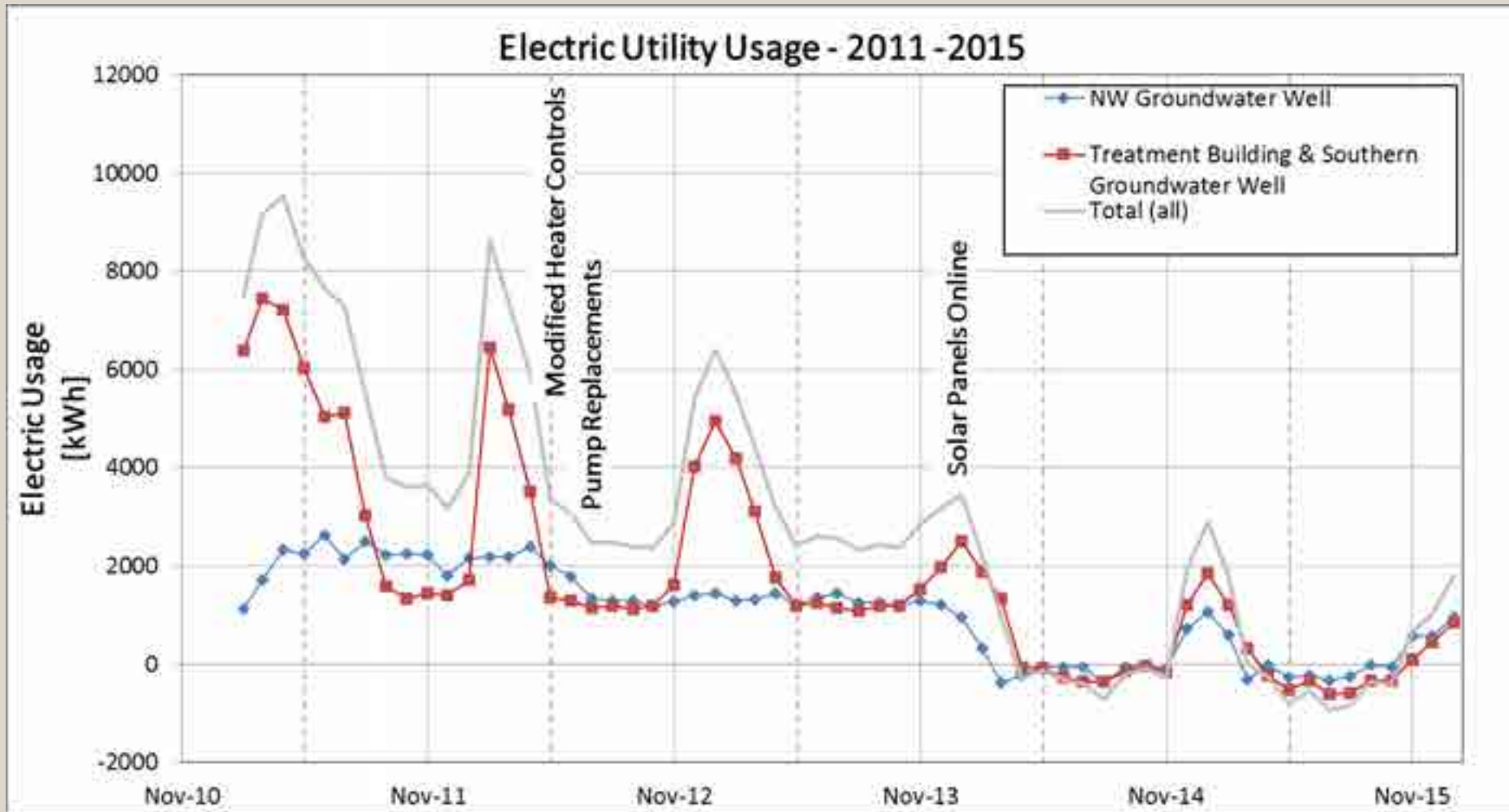


GROUNDWATER SYSTEM ENERGY IMPROVEMENTS

- Northern Solar Array: 56 panel system (10.9 kilowatt total)



REDUCING DEMAND ON ENERGY RESOURCES



CONCLUSION

- Infiltration basin created a sustainable groundwater remediation system
- No net drain on groundwater resources
- Reduced consumption of non-renewable energy with solar panel arrays
- Long-term operations and maintenance costs were significantly reduced



THANK YOU!

Questions?

