



Cost Savings Opportunities for CCR Pond Closure Projects

Ground/Water Treatment & Technology, LLC

A Total Water Management Solutions Company

Cost and Schedule Correlation: Site Work, Dewatering, and Treatment

It is well understood that upstream site activities are highly dependent on the efficiencies of downstream site activities. Take, for example, the dependency of a site civil contractor on the dewatering system performance in order to achieve their productivity objectives (the removal of millions of tons of coal ash). Similarly, the dewatering contractor depends on water treatment system performance in order to achieve dewatering productivity objectives (keeping the ash dry during excavation). A bottleneck in either of the downstream site activities will impact not only the cost of that activity, but also negatively affect cost and schedule of each upstream activity.

To illustrate this further, consider the following scenario: A water treatment system designed to operate at 1,500 GPM realizing only a fraction of its discharge capacity. The cost of labor per discharged gallon will increase significantly in inverse correlation to flow rate, as illustrated in **Figure 1**. The cost impact to the dewatering contractor and site civil contractor are orders of magnitude greater and, while it is impossible to calculate the overall project schedule impact, it is material.

Figure 1: Treatment Labor Cost Multiplier (Per Gallon) as a Function of Treatment System Flow Rate

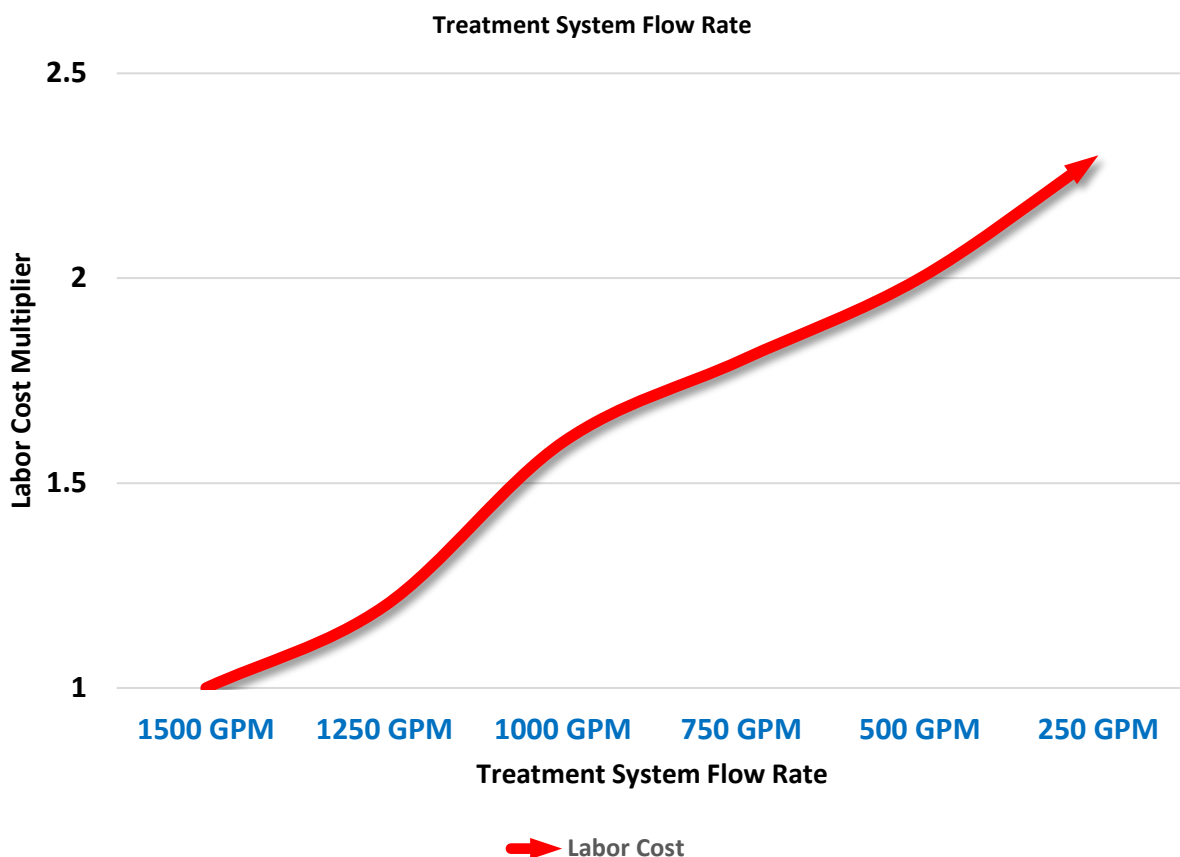
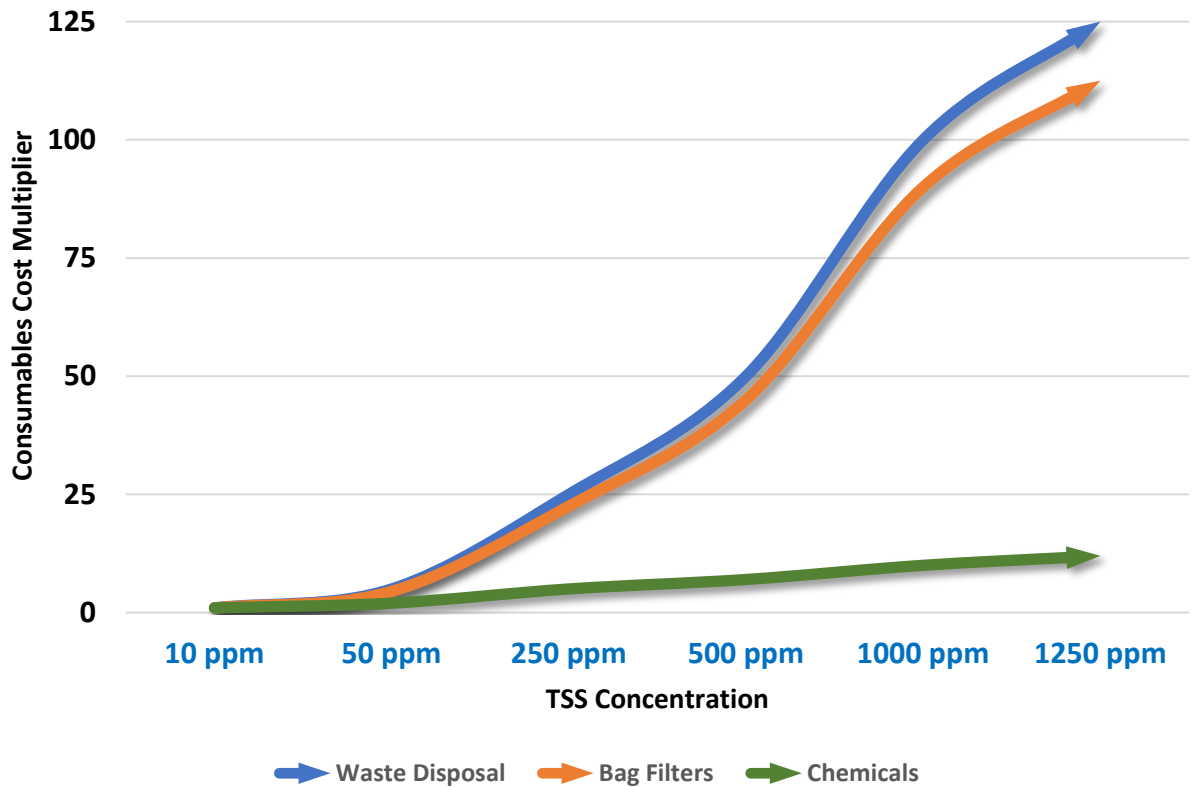


Figure 2 illustrates relative monthly cost for consumables (coagulant, flocculant, bag and cartridge filters, and sludge disposal) as a function of the TSS concentration. It is estimated that from the baseline cost, the chemicals and disposal cost can increase by three times if the TSS increases to approximately

1000mg/L. The main driver of this estimate is the coagulant cost. The water treatment company would need more coagulant in order to neutralize all the surface charges of all the particles in the wastewater. This estimate also does not take into consideration all the incremental labor costs that the extra solids will require for maintenance and operations (filter changes, probe cleaning, pump cleaning, filter press operation, etc.).

Figure 2: Consumables Cost Multiplier as a Function of TSS Concentration



The correlation to water quality, project cost, and schedule, is not a linear correlation. As water quality changes, different chemicals or unit operations may be needed to adjust the treatment to remove contaminants. This can increase or decrease costs, as well as speed up or slow down the project schedule. For example, if certain contaminants are no longer present in the water, then flow rate might be able to be increased, chemical usage decreased, etc. The reverse case is also possible. Competing constituents in the waste stream that may not have a regulatory limit might inhibit treatment or cause increased maintenance and may have to be removed from the waste stream in order to maximize treatment plant efficiency in both flow rate and water quality produced. This additional treatment may cause an increase in treatment plant costs even though permitted parameters may decrease in the influent of the treatment system.

Case Study

A utility client awarded three separate contracts for their CCR pond closure project: 1) a site civil contractor, 2) a dewatering contractor, and 3) a water treatment system contractor (GWTT). Because each contractor was responsible for their own scope of work and operated independently, each focused on their specific requirements and milestones.

Over the course of this multi-year, multi-billion-gallon project, the dewatering contractor, under the direction of the site civil contractor, would send water to the treatment system with total suspended solids concentrations in excess of the influent specifications. During high-TSS periods, it was not uncommon for the 1,500 GPM treatment system to be reduced to flows between 600 to 800 GPM and even shut down for increased maintenance (sludge removal / management). The non-conforming influent increased cost and discharge compliance risk. Chemical usage and labor cost per discharged gallon increased significantly, as did the quantity of bag and cartridge filters consumed. Waste disposal costs also increased.

The result was that the all parties (client, civil contractor, dewatering contractor, and water treatment contractor) realized a material increase in cost due to project delays and productivity decline, ultimately extending project completion.

Solution: A Vertically Integrated Approach

By bundling dewatering and treatment site activities under one contractor, the owner and/or site civil contractor will realize materially significant cost and schedule reductions. Soft-cost savings will also be significant.

Benefits to the site civil contractor (ash excavation and disposal) include:

- Unified dewatering and treatment responsibility eliminates bottlenecks and the associated negative impacts on the site civil contractor's ash removal productivity;
- Equipment costs are optimized, as all site equipment is engaged continuously;
- Budgeted labor cost is maintained;
- Project schedule is maintained.

The combined service includes the removal of the surface contact water, the installation of well points, and the treatment of the contact surface and pore water.

Additional benefits of a single-source provider include:

- Monitor and control the treatment system influent water quality in a way that allows the CCR wastewater treatment system to perform at its optimal level;
- Anticipate variations in water quality throughout the process flow and build in the necessary controls to manage changes in water chemistry;
- Maintain control of CCR wastewater treatment system costs:
 - chemicals
 - filters

- sludge
- waste disposal
- O&M labor;
- Optimize the schedule to meet owner-critical project / regulatory dates;
- Engineer the treatment system to include additional capacity in both flow and treatment parameters, based on intimate knowledge of the dewatering system operations characteristics.

Conclusion

All CCR pond closure project activities are interrelated and interdependent. Combining dewatering and water treatment responsibilities under a single contractor ensures the reduction of project cost, mitigation of risk, and optimization of project schedules.

About GWTT

GWTT is a leading dewatering and treatment solutions provider with more than a dozen successfully completed CCR projects and over **2 BILLION** gallons of CCR water compliantly discharged. GWTT's turnkey capabilities include: influent analysis, pilot studies, system design, integration, installation, and operations and maintenance services. Our ability to customize dewatering and water treatment systems that meet the most demanding requirements is unique in the industry.

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