

**Addendum to Conceptual Design of a Combined
Sediment (Retention) Basin/Constructed Wetland System
March 20, 2000**

This document highlights the key assumptions for the Conceptual Design of a Combined Sediment (Retention) Basin/Constructed Wetland System. Also presented is an analysis of the sensitivity of the influent total phosphorus concentration and the associated annualized cost.

At the request of Mr. Robbin Finch, Brown and Caldwell has refined the total phosphorus removed (pounds) using an influent concentration of 0.366 mg/L. The initial conceptual design used a concentration of 0.322 mg/L, which was based on USGS 1994 – 1998 annual average data. The refined conceptual design is based on the use of the irrigation season only and reflects the median concentration as collected by Boise City at the Mason Creek confluence from 1994 – 1998. Note that these numbers are for a *conceptual design only* many factors were assumed (e.g., removal efficiency, actual performance) and can change depending on the actual design.

Original Conceptual Design

Detail regarding the Original Conceptual Design assumptions was presented in the November 16, 1999 Brown and Caldwell Technical Memorandum, “Wastewater Treatment and Water Quality Planning, Conceptual Design of a Combined Sediment (Retention) Basin/Wetland System”. The Original Conceptual Design conclusions are briefly described below.

- TP, as bound with TSS, removed by the sedimentation basins = 1,040 pounds/season (assuming that for every ton of sediment removed, one pound of TP was removed)
- TP removed by the wetlands = 860 pounds/season
- Total TP removed = 1,900 pounds/season
- Total cost of wetland construction (Table 1, Technical Memo) = \$3,004,000 (includes \$600,000 for 60-acre land acquisition)
- O&M costs = \$326,000
- Annualized O&M cost (reflected as cost per pound of phosphorus removed) ranged from \$125/pound to \$172/pound (based on interest rates of 3% and 7%, respectively)

Revised Conceptual Design

All of the assumptions for the Original Conceptual Design remain the same for the Revised Conceptual Design, with the exception of the refined influent phosphorus concentration of 0.366 mg/L.

Summary of TP Removal

An additional 120 pounds of TP was removed by the Revised Conceptual Design (0.366 mg/L). This reflects an overall greater removal of TP due to the higher influent concentration or volume of TP (Figure 2a). However, the efficiency of the system remains about the same (Figure 1a). Figure 2a shows the amount of TP removed (pounds) as a function of flow rate. As the flow rate through the wetlands increases, the amount of TP removed increases, but at a small increment.

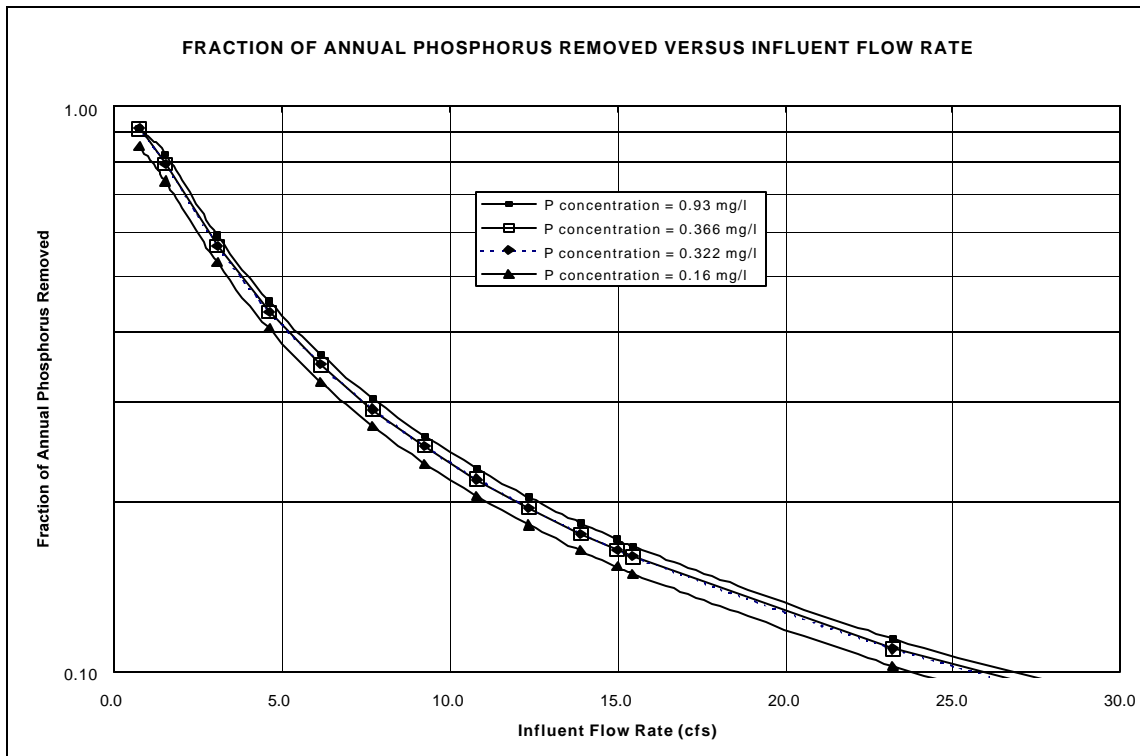


Figure 1a. Fraction of Total Phosphorus removed as a function of influent flow rate.

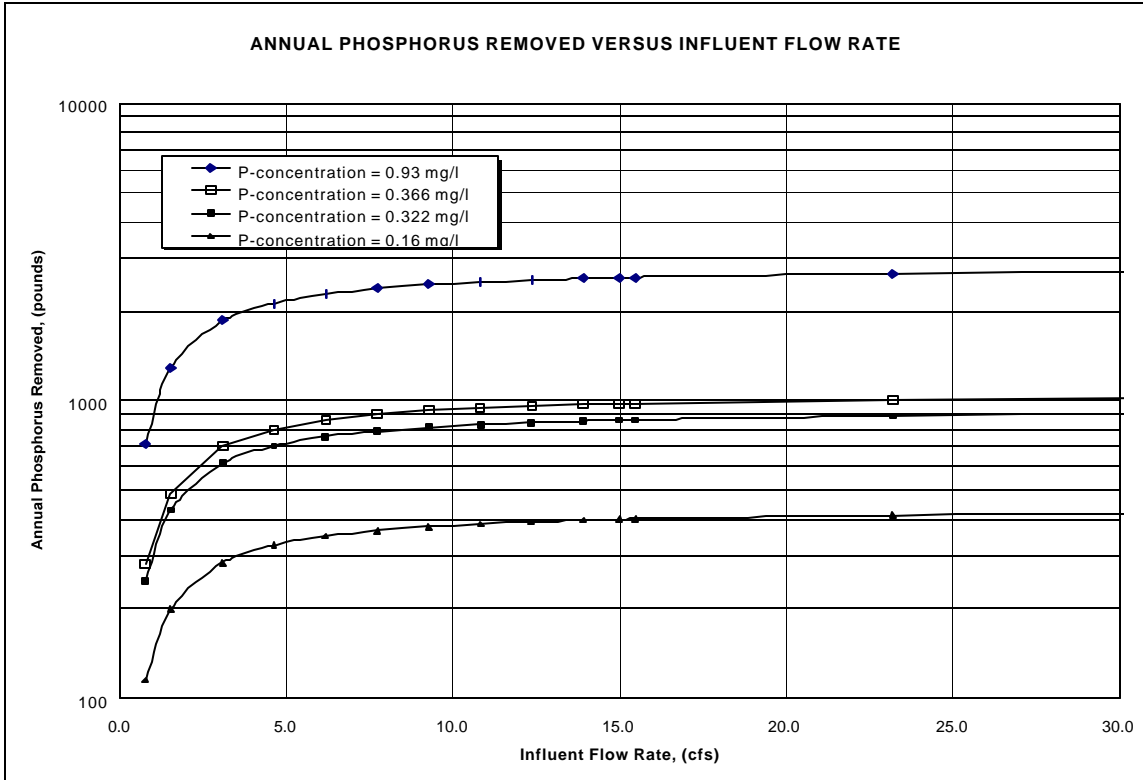


Figure 2a. Total Phosphorus removed as a function of influent flow rate.

Cost Benefit/Sensitivity Analysis

A cost benefit/sensitivity analysis was performed to assess the effect of influent TP concentration in the wetland system on the annual O&M costs. Figure 3a shows the annualized O&M costs as a function of influent concentration for two different interest rates (3% and 7%). The general trend observed for both interest rates is that for lower influent concentrations there is a greater the cost for removal of TP (per pound). For an influent concentration of 0.366 mg/L, the annualized O&M costs range from \$118/pound to \$161/pound (of TP removed) at interest rates of 3% and 7%, respectively. For an influent concentration of 0.322 mg/L these cost were slightly higher, ranging from \$126/pound to \$172/pound.

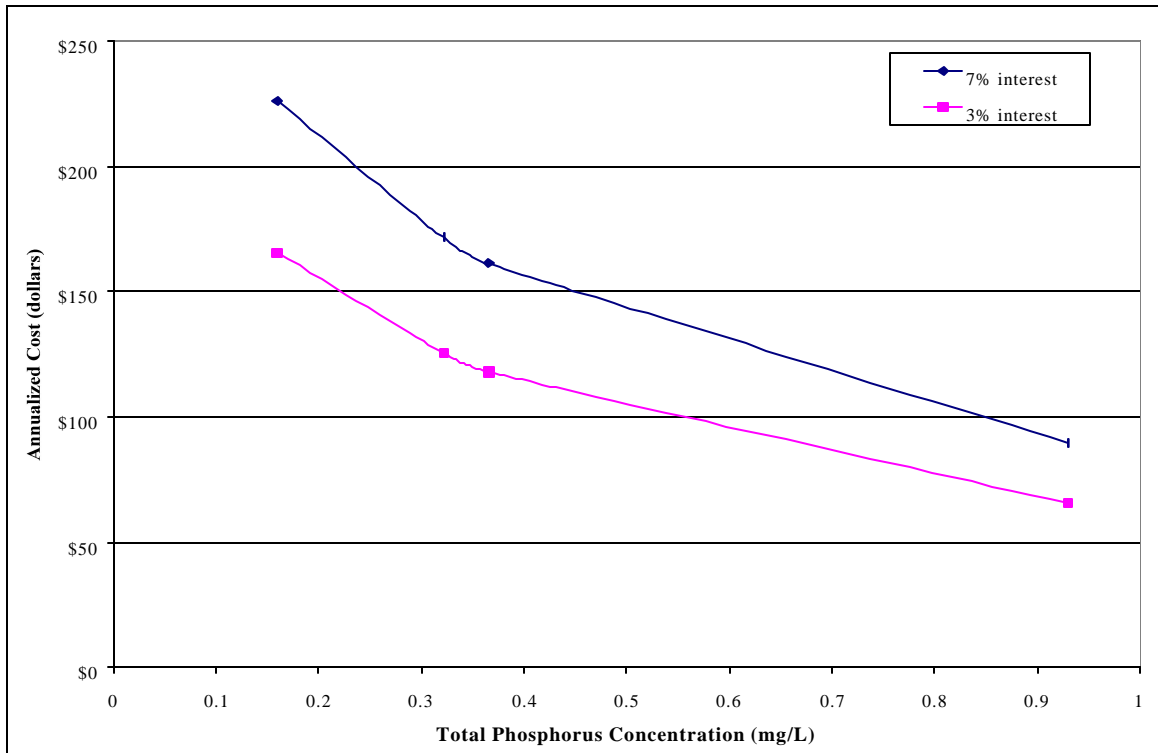


Figure 3a. Annualized Costs as a function of influent TP concentration for interest rates of 3% and 7%.

Conclusions

Overall, the efficiency of the conceptual wetland system does not measurably change at a flow rate of 15 cfs. The amount of TP removed increases slightly as a function of a greater influent concentration. The Refined Conceptual Design conclusions are described below.

- ❑ TP removed by the wetlands = 980 pounds/season
- ❑ Total TP removed = 2,020 pounds/season
- ❑ Annualized O&M cost (reflected as cost per pound of phosphorus removed) ranged from \$118/pound to \$161/pound (based on interest rates of 3% and 7%, respectively)