

EXHIBIT K

CDM

Memorandum

From: A. C. Firmin
Date: 7 December 2005
Subject: Costs for 0.2 mg/l P at Northbridge

SUMMARY

Estimated costs for achieving 0.2 mg/l effluent P at Northbridge

Capital Costs	
Effluent Filters (cloth disk)	\$2,800,000
Chemical Storage and Feed	<u>130,000</u>
Total	\$2,930,000
Annual chemical costs	\$64,000 per year
Chemical Sludge	640 dry lbs per day
Same concentration as the waste activated from the SBR	

BACKUP

Basis of estimate

1. Costs were prepared based on recent CDM construction costs and appropriate escalations (time and size). The capital costs were not developed through the CDM cost estimating group and are to be considered very preliminary and are order of magnitude for "owner positioning" with regard to proposed NPDES permit.
2. Costs were based on following design year flows and loads
 - a. Average flow 2.0 mgd
 - b. Max day flow 6.0 mgd
3. Filters were based on Aqua cloth disks sized at 6 gpm/sf under max day flows. It was assumed that post-SBR equalization would limit flows to the filters to max day rates. Filter costs were based on complete filter packages in steel tanks, two tanks, 8 disk filters per tank. Concrete tanks could be substituted if future cost estimates indicate a cost preference for such. Costs of the two steel tank filters is \$520,000. Building and site work costs were based on Marion MA construction costs. The 1280 sf building in Marion house 2 tanks with space for 4 disks each. Provision of 8 disk tanks would require another 160 sf. Building space for

Northbridge was estimated at $1280 + 160 = 1340$ sf. The cost of the Marion filter project, less the cost for actual filter equipment was, was \$740/sf of building based on an August 2000 bid. The August 2000 bid value was adjusted to present day costs using a 1.23 factor from the ENR cost index and then adjusted an additional two years to an assumed midpoint of construction using 5% inflation per year. Total adjustment was 1.36. Estimated cost of the filter building is $1340 \times 740 \times 1.36 = \1.35 million. Cost of the building plus filter equipment is \$1.87 million. With 50% contingency the estimated cost is \$2.8 million.

4. Chemical addition was based on alum, an influent P of 4 mg/l and an effluent P of 0.2 mg/l. Alum requirements include any chemicals that are currently being added for P removal. Requirements to get to 0.2 mg/l were based on Brockton design feed rates of 25 lbs of alum per lb of P removed. Removal requirements are $(4-0.2) \times 2 \times 8.34 = 63$ lbs/day. Alum requirements are $63 \times 25 = 1600$ lbs/day (294 gal/day). Estimated alum cost is \$ 64,000 per year.
5. Chemical sludge production was based on Brockton design value of 0.40 dry lbs of chemical sludge per lb of alum added. Estimated chemical sludge, including current production, is 640 dry lbs per day. Alum would be added to the SBRs and the solids concentration of the chemical sludge should be identical to the current waste activated sludge concentration.