

APPENDIX G

UNIT PRICING AND CORRECTION FACTORS USED FOR PLANNING LEVEL COST ESTIMATES

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The following unit prices and correction factors have been used for the development of planning level cost estimates for the New Hampshire Seacoast Region Wastewater Management Study Alternatives Analysis.

The planning level cost estimates are intended to be comparative costs. The purpose of preparing costs for these alternatives is only to compare the relative costs among the four (4) alternatives. These costs have been based on engineering judgment and experience with other projects. If any of these alternatives are carried forward then more detailed evaluations of costs would be performed as the concepts and potentially designs became more refined.

These planning level costs are estimates of the project costs which includes design and construction engineering, construction, and contingency. These estimates do not include estimates for some unknown factors including pricing for additional studies, permitting, and legal issues required for implementation.

WWTF Treatment Upgrades

All WWTF treatment upgrades are based on the year 2025 maximum month flow.

- Carbon Removal Upgrades – \$7.50/gallon of wastewater.
- Filtration Upgrades for Carbon Removal - \$2.00/gallon (based on cloth/disc filters)
- Total Nitrogen Removal Upgrades – \$40.00/lb/day of TN removed (assumes influent TN concentration of 20 mg/l and the use of a Modified Ludzack-Ettinger (MLE) Process).
- Total Phosphorus Removal Upgrades – \$3.00/gallon (based on cloth/disc filtration and chemical addition (alum)).
- Other Unit Process and Equipment Upgrades:
 - Influent Pumping - \$2.50/gallon.
 - Preliminary Treatment (screenings or grit removal) - \$2.50/gallon.
 - Disinfection - \$1.00/gallon.
 - Membranes - \$3.00/gallon.
 - Metals Removal Evaluations – Assumes \$100,000 study to be performed.
 - Aeration Capacity - \$1.00/gallon.
 - Solids Handling Capacity - \$5.00/gallon.
 - SBR Mods (Pease WWTF) – Assumes \$50,000 (in TN upgrades in lieu of an MLE process)
 - Rochester Secondary Clarifier – Assumes \$1.5 M for new clarifier.

Treatment upgrade planning level cost estimates included an economy of scale factor. For upgrades a sliding scale was used to account for the larger upgrades having a larger economy of scale than the smaller upgrades. The economy of scale factors were applied to the treatment upgrade planning level costs as follow:

Plant Flow, 2025 Maximum Month , MGD	Economy of Scale Factor
0.1 – 0.49	1.0
0.5 – 0.99	0.9
1.0 – 1.99	0.8
2.0 – 4.99	0.7
5.0 or larger	0.6

Conveyance

- Conveyance Pipelines. Pipeline planning level cost estimates were based on a unit price per liner foot of pipe basis for various pipe diameters. The following table summarizes the unit pricing for pipelines used based on pipe diameter:

Conveyance Pipe Diameter, in.	Installed Pipeline Cost, \$/linear foot
less than 12"	\$ 250
12" – 21"	\$ 300
24" – 30"	\$ 350
36" – 48"	\$ 400
greater than 48"	\$ 500

- Pump Stations. Pump station planning level costs estimates were based on a unit price basis for pump stations with various capacities. The following table summarizes the unit pricing for pump stations based on pump station capacity:

Pump Station Capacity, MGD	Pump Station Cost, \$/Pump Station
0 – 0.99	\$ 750,000
1.00 – 4.99	\$ 2,000,000
5.00 – 9.99	\$ 5,000,000
10.00 – 24.99	\$ 12,500,000
25.00 – 49.00	\$ 22,500,000
50.00 – 74.00	\$ 35,000,000
75.00 or larger	\$ 50,000,000

Disposal

The planning level disposal costs estimates of the four (4) alternatives were developed based on the following assumptions:

- Regional Post Treatment Facility (unit cost including land) - \$10,000,000.
- Effluent Pump Station. - Depending on the outfall location as well as the location and elevation of the Regional Post Treatment Facility there is the potential that a pump station may be required at the Regional Post Treatment Facility to push the effluent through the Gulf of Maine outfall (especially under peak flow conditions). In general the further the outfall is away from the Regional Post Treatment Facility the greater the chance that a pump station will be required. For the purposes of this Feasibility Study it is assumed

that this effluent pump station would be required. See the conveyance table above for the unit pricing for pump stations based on pump capacity.

- **Outfall and Diffuser Section.** The planning level cost estimate for the outfall pipe and outfall diffuser section were based on a unit price per linear foot of outfall pipe or diffusers section. The following table summarizes the unit pricing for the outfall components:

Outfall Component	Cost, \$/linear foot
72 " Outfall Pipe	\$ 2,000
Diffuser Section and Diffusers	\$ 3,000

- **Decentralized Systems.** A planning level cost of \$600,000 was assumed for each standardized 10,000 gallon per day community on-lot system.
- **Land Application Costs.** The planning level cost estimates for the disposal portion of the land application alternative have been estimated based on information in the US EPA Wastewater Technology Fact Sheet - *Rapid Infiltration Land Treatment*. Based on this document the following assumptions apply for the land application estimated construction costs
 - The equation is based on a May 2001 ENR index of 6318. The calculated cost has been escalated to an ENR index of 8040 (October 2007).
 - Basin construction costs include field preparation, no seasonal storage, assumed hydraulic loading of 60 meters/yr, gravel service roads and stocka fence around the site perimeter.
 - Equations are valid up to flows of 3785 cubic meters per pay (10 MGD) wastewater flow and using the following notation:

- § C= cost in millions of dollars
- § Q = Wastewater flow in MGD

The construction cost estimate is as follows:

$$C=0.58(Q)^{(0.888)}$$

- **Land Acquisition Costs.** For the alternatives where land acquisition is accounted for a planning level cost estimate of \$15,000 /acre was used.