

TABLE 5-1

SUMMARY OF ADVANCED / SECONDARY TREATMENT TECHNOLOGIES

ALTERNATIVE	REGULATORY REQUIREMENTS	EFFLUENT QUALITY	MAINTENANCE REQUIREMENTS AND COMPLEXITY OF OPERATION	FLEXIBILITY	ENERGY USE	LAND REQUIREMENTS	POTENTIAL FOR AIR EMISSIONS	PUBLIC ACCEPTANCE	EASE OF IMPLEMENTATION	RELATIVE CAPITAL COSTS	RELATIVE O&M COSTS	SELECTED FOR FURTHER EVALUATION
Activated Sludge MLE Process	All these processes need MassDEP approval and require an effluent discharge permit.	Effluent N, 3 to 10 mg/L. BNR/ENR	Moderately complex. High reliability and proven performance. Good process control allows adjustable performance	High flexibility with good process control.	High energy use for aeration.	Relatively small building and equipment footprint required.	Not a significant source of odors.	High. Would require modification of existing tanks.	Requires modification of existing facilities.	Moderate, compared to other facilities.	Moderate, compared to other facilities.	No, reuse of existing facilities with modifications would not provide sufficient capacity. New larger facilities would be required.
Rotating Biological Contactor (RBC)		Effluent N, 6 to 10 mg/L. BNR	Relatively easy operations.	Moderate, with minimal process control.	Low energy use for aeration.	High for large covered process.	Not a source of problems in existing installations.	Moderate. Would require construction of new tanks at high cost.	Requires construction of new facilities.	High capital costs.	Low compared to other facilities.	No, primary treatment required. High capital costs.
Sequencing Batch Reactor (SBR) following denite filter		Can meet 3 to 10 mg/L total nitrogen. BNR/ENR	High reliability and proven performance at limited number of facilities. Good process control allows adjustable performance.	Unique operator control of process cycles accommodates variable influent flows and loadings.	Aeration and effluent pumping equipment requirements.	Relatively small.	Not a source of problems in existing installations.	Moderate. Reliable technology with proven performance.	Requires construction of new facilities.	Moderate capital costs.	Moderate, compared to other facilities.	Yes, due to proven reliability and performance and moderate capital costs.
Membrane Bioreactors (MBR)		Effluent N, 3 to 6 mg/L. BNR/ENR	Need to clean membrane filters. More complex operations.	High flexibility with good process control.	Aeration and pumping requirements.	Relatively small.	Not a significant source of odors.	Moderate.	Requires modification of existing facilities.	Moderate capital costs. No large installations exist.	Moderate. Automated processes reduce costs; maintenance of mechanical equipment increases costs.	Not at this time, due to complexity, and O&M requirements. May be considered with other technologies.
Activated Sludge/Extended Air in new tankage (Carrousel®, Orbal®)		Can meet 3 on average total nitrogen. BNR/ENR	High reliability and proven performance. Good process control allows adjustable performance	Somewhat less flexible than other technologies.	Lower aeration requirements than for MLE processes.	Higher due to size and number of tanks required.	Not a source of problems in existing installations.	Moderate. Many successful installations, but requires new large tanks.	Requires construction of new facilities.	High capital costs compared to other facilities.	Moderate compared to other facilities.	Yes, due to proven reliability and performance and low O&M costs.
Aerated Biological Filter (Biofor, Biostyr)	All these processes need MassDEP approval and require an effluent discharge permit.	Typically provides nitrification but not denitrification.	Relatively simple filter operations and maintenance.	Less flexibility and process control.	Aeration and pumping requirements.	Relatively small.	Not a significant source of odors.	Moderate. Requires new facilities.	Requires construction of new facilities.	Moderate capital costs.	Moderate.	No. It is best to obtain combined nitrification and denitrification.
Denite Filter		Process can meet 3 to 5 mg/L total nitrogen (and reduce BOD and TSS) with methanol feed and upstream nitrification.	High reliability and proven performance. Relatively simple operations.	Control of methanol feed allows good treatment of variable nitrate loadings. Filtration enhances process flexibility.	Filter backwash and possible effluent pumping.	Relatively small.	Minimal potential.	Moderate. Requires new facilities.	Can be added to end of various treatment trains easily.	Moderate capital costs when used in conjunction with other nitrogen removal processes.	Moderate for methanol feed.	Yes. Denitrifying filters can reliably produce an effluent of 3 to 5 mg/L total nitrogen and should be considered for effluent polishing.
Solar Aquatics	All these processes need MassDEP approval and require an effluent discharge permit. They may also need pilot testing.	Not expected to reliably produce a high quality effluent year-round.	High operations and maintenance requirements.	Minimal process control.	Minimal.	High compared to other centralized alternatives.	Odors are possible, although treatment is spread over a large area.	Moderate; systems are typically popular because they use natural processes, but have high capital costs and use large land areas.	Extensive site work required to accommodate all the area needed for wetland construction. Piloting may be needed.	High costs for site work and facility construction.	Moderate due to energy use and high maintenance requirements.	No, due to high land requirements, siting issues, and the inability of process to provide consistent quality effluent year-round.
Constructed Wetlands		Not expected to reliably produce a high quality effluent year-round.	Simple system with minimal process control. Likely to have lower quality effluent in winter.	Moderate; can be expanded for additional flows.	Minimal.	Very high compared to other centralized alternatives.	Odors are possible if flooding occurs.	Moderate; systems are typically popular because they use natural processes, but have high capital costs.	Extensive site work required to accommodate all the area needed for wetland construction. Piloting may be needed.	High costs for site work and facility construction.	Low due to low energy requirements and vegetation harvesting.	No, due to high land requirements, siting issues, and the inability of process to provide consistent quality effluent year round.