TABLE 7-1

SUMMARY OF TREATED WATER RECHARGE TECHNOLOGIES

ALTERNATIVE	REGULATORY REQUIREMENTS	EFFLUENT QUALITY	MAINTENANCE REQUIREMENTS AND COMPLEXITY OF OPERATION	FLEXIBILITY	ENERGY USE	LAND REQUIREMENTS	POTENTIAL FOR AIR EMISSIONS	PUBLIC ACCEPTANCE	RELATIVE CAPITAL COSTS	RELATIVE O&M COSTS	SELECTED FOR DETAILED EVALUATION
Sand infiltration beds	Permitting and monitoring of treated water recharges and design requirements. Disinfection may be required by MassDEP.	Effluent is already treated and sand beds provide some additional treatment.	Treated water recharge is reliable throughout the year and easy to maintain.	Flexibility is possible with multiple beds.	Lowest energy requirements due to no need to repump the treated water at the sand beds.	Moderate at large wastewater flows when compared to subsurface leaching.	Effluent is treated to a high level and odors would be minimal.	Potential for low acceptance from residents who are impacted by bed siting and construction.	Relatively low due low land area and easier construction.	Low due to low energy requirements and minimal maintenance.	Yes; the technology is simple and reliable. O&M requirements are minimal.
Subsurface infiltration	Disinfection is not required prior to recharge, unless required to meet the Interim Guidelines for Reclaimed Water Use.	Effluent is already treated and infiltration facilities provide additional treatment. Effluent should be filtered before recharge.	Repair of the beds would be difficult because they are subsurface.	Moderate depending on construction of dosing equipment and distribution piping.	Moderate due to effluent dosing pumps.	Relatively high. Land surface above the infiltration system can be used for other purposes	Minimal	Acceptance should be high due to minimal visual impacts and potential reuse of land area.	Relatively high due to highest land area and extensive piping.	High due to pumping requirements and potential high repair/cleaning costs.	Yes; technology is reliable and provides secondary use of recharge area.
Spray irrigation	Permitting and monitoring of treated water recharges and design requirements. Disinfection may be required by MassDEP.	Spray irrigation provides further uptake of nitrogen in the effluent.	Moderate maintenance to maintain piping. Spray irrigation cannot be used in freezing weather.	Must have redundant back-up facilities for winter recharge.	Moderate due to repumping requirements.	Relatively high. Land above system can be can be used for other purposes when spray irrigation is turned off.	Minimal	The public will want to see recycling of the treated water though they may be concerned about possible health threats.	Site work is relatively low due to minimal excavation, and minimal need to reshape the land. Additional treatment and transmission costs are very high.	High due to treatment maintenance and pumping requirements.	Yes; it provides additional nitrogen uptake and reuse of the effluent.
Ocean Outfall	The Massachusetts Ocean Sanctuaries Act prohibits recharge of municipal wastewater into an ocean sanctuary. Special legislation and NPDES permit required.	Disinfection may be required for the outfall.	Maintenance similar to a large force main.	Minimal, unless land disposal remains for some backup recharge.	Moderate due to pumping requirements.	Minimal	Minimal	Low. Based on the opposition to the Deer Island outfall and the Ocean Sanctuaries Act.	Relatively high due to land area, extensive permitting pumping requirements.	Moderate due to pumping requirements.	No. This is not allowed by State Law without a variance.
Wick Wells	Permitting and monitoring of treated water recharges and design requirements. MassDEP may require a second technology for redundancy.	Disinfection and filtration may be required. No credit for any additional treatment received.	Uncertain reliability due to few operating installations and increased maintenance due to the potential of plugging of injection point with solids.	Installation of multiple wells would allow individual wells to rest or be repaired.	Moderate due to pumping requirements.	Relatively low compared to sand infiltration beds and subsurface leaching.	Minimal.	Land area requirements and visual impacts are minimal.	Relatively low due to minimal excavation, and minimal need to reshape the land.	Moderate due to pumping requirements.	No, because of the possible requirement for a second technology for redundancy.

TABLE 7-1 (continued)

SUMMARY OF TREATED WATER RECHARGE TECHNOLOGIES

ALTERNATIVE	REGULATORY REQUIREMENTS	EFFLUENT QUALITY	MAINTENANCE REQUIREMENTS AND COMPLEXITY OF OPERATION	FLEXIBILITY	ENERGY USE	LAND REQUIREMENTS	POTENTIAL FOR AIR EMISSIONS	PUBLIC ACCEPTANCE	RELATIVE CAPITAL COSTS	RELATIVE O&M COSTS	SELECTED FOR DETAILED EVALUATION
Drip Irrigation	Permitting and monitoring of treated water recharges and design requirements.	Disinfection and filtration may be required. No credit for any additional treatment received.	Uncertain reliability due to few operating installations and increased maintenance due to the potential of plugging of system.	Moderate depending on construction of dosing equipment and distribution piping.	Moderate due to pumping requirements.	High, due to the low discharge rates.	Minimal	The public will want to see recycling of the treated water though they may be concerned about possible health threats as this application would most likely be in a park or playing field.	High because of the large land areas and the site restoration required for parks and athletic fields.	High, annual maintenance of system, drainage and flushing and pumping requirements.	Possible as alternative to traditional subsurface leaching. However limited long term data available on technology in N.E. for large facilities
Wetland Restoration	May require extensive permitting as a wetland in addition to the normal requirements of monitoring and design.	Additional nitrogen removal credits potentially could be negotiated with MassDEP.	Uncertain reliability due to few operating installations and increased maintenance may be required to deal with excessive vegetative growth.	Highly dependant on the wetland system.	Low, can be gravity fed.	High	Low to moderate, highly dependant on the wetland system.	Acceptance should be high due to minimal visual impacts and potential restoration of the wetland system and additional nitrogen removal possible.	Relatively high due to permitting and design considerations, construction costs (if restoring an existing wetland) should be low.	Low, if pumping is not required.	Yes, for its potential nitrogen uptake.
Deep well injection	Permitting and monitoring of treated water recharges and design requirements. MassDEP has been less supportive of this technology.	Effluent must be well treated (filtered and chlorinated) before recharge.	Uncertain reliability due to few operating installations and increased maintenance due to the potential of plugging of injection point with solids.	Installation of multiple wells would allow individual wells to rest or be repaired.	Moderate due to repumping requirements.	Relatively low compared to sand infiltration beds and subsurface leaching.	Minimal	Land area requirements and visual impacts are minimal.	Relatively low due to minimal excavation, and minimal need to reshape the land.	Moderate due to pumping requirements. And maintenance needs.	No; MassDEP is resistant to support the technology due to the need to chlorinate the effluent.