SECTION 10
POTENTIAL FOR WATER REUSE

10.1 INTRODUCTION

Any wastewater treatment facility built in Orleans would provide a high level of wastewater treatment, removing most contaminants to very low levels and providing thorough disinfection. Such high levels of treatment are required under the DEP Groundwater Discharge Permit program and are necessary to accomplish the goals of this project. By providing an even higher level of treatment, the Town could also produce an effluent suitable for reuse in a number of settings. Reusing highly treated water would lessen the demand on the public water system, since potable water is now used for irrigation and other functions. Reuse also allows the controlled recycling of the nutrients remaining after treatment.

This section of the report identifies options for reuse, discusses the level of treatment needed, presents costs for selected reuse opportunities, and discusses regulatory and other non-cost factors.

10.2 REUSE OPTIONS

The options that are available are dictated by the DEP's Reclaimed Water Guidelines, which currently allow four types of reuse:

- Spray irrigation of golf courses,
- Reuse at landscape nurseries,
- Artificial aquifer recharge, and
- Toilet flushing

DEP's guidelines are undergoing revision, and more uses may be allowed under the new guidelines, perhaps including private lawn irrigation.

Section 5 of this report, which describes the identification and screening of alternatives, concluded that the following reuse options have the most promise:

- Toilet flushing at public buildings,
- Lawn irrigation at public sites,

- Irrigation of ballfields,
- Irrigation of golf courses, and
- Use of reclaimed water in concrete production.

Reuse options are considered to be viable as supplements to Plans 1 and 2, and reuse in the form of golf course irrigation is an important aspect of Plan 3. To form a uniform basis of comparison, a goal has been established to reuse a total of 10 to 15 million gallons of water each month over the period of June 15 to September 15. If that goal can be reached, then the effluent disposal facilities in each plan would see sharply reduced summer peak flows, and a month-to-month variation in effluent volume more typical of a largely year-round community.

The reuse facilities that would be feasible parts of the three plans are described below, starting with Plan 3.

Plan 3

This wastewater management plan was formulated in part around the concept of irrigation golf courses in Brewster and Harwich that are close to the southern border of Orleans. Plan 3 would include a year-round subsurface disposal system, either at the treatment plant site or under the parking lots at one or both golf courses. This system is needed to allow effluent disposal during cold weather, and as a back-up system to the irrigation that would occur in summer months. The treatment plant would have the facilities to produce an effluent that meets the Reclaimed Water Guidelines and those facilities would be operated during the irrigation season. The cost estimates presented in Section 7 of this report include all of these facilities.

The irrigation needs of the golf courses would be discussed with course managers to see how much reused water they could accommodate. Initial calculations indicate that the 54 holes that comprise the Captains and Cape Cod National courses could use all of the 10 to 15 million gallon reuse goal discussed above. Therefore, it has been assumed that any "supplemental" reuse facilities would not be needed in this plan to reach that goal. Should discussions with course managers result in lower irrigation needs, then this plan could be supplemented with effluent

pipelines and irrigation facilities to serve a local tree farm and landscaping operations, and (if allowed under the new Reclaimed Water Guidelines) irrigation of private lawns.

Plan 2

Plan 2 includes a year-round rapid infiltration system at the site of the Tri-Town Septage Treatment Facility, which would provide both the primary means of disposal and the standby system for any summer reuse. One of the advantages of Plan 2 is the location of the treatment facility with respect to potential reuse sites. For the purposes of this evaluation, it has been assumed that the Town would build a reclaimed water pipeline from the Tri-Town site to serve a number of reuse customers in the most developed part of Orleans. As shown in Figure 10-1, that pipeline would run from Site 241 along Old Colony Road to Main Street, down Main Street to Route 28, south along Route 28 to Eldredge Parkway, along Eldredge Parkway to Route 6A and then back to the Tri-Town site. Reclaimed water would be provided to the following uses:

- Toilet flushing in public buildings to include the Highway Garage, the Snow Library, the police and fire stations, and the public toilets on Main Street and at Eldredge Field;
- Lawn irrigation at those same public facilities, as well as at town parks; and
- Irrigation of the ballfields at the Elementary and Middle Schools.

These uses could consume the full 10- to 15-million-gallon-per-month reuse goal. One additional outlet could be toilet flushing at downtown restaurants, if allowed under the new Reclaimed Water Guidelines.

The wastewater treatment facility at the Tri-Town site would be equipped with additional facilities needed to achieve the higher effluent quality, which would be sized for the goal of up to 15 million gallons per month.

Plan 1

In this decentralized plan, any of the four wastewater treatment facilities could produce the higher-quality water needed for reuse. The facility at the Tri-Town site would be the favored location, given its location near potential reuse customers. The reuse opportunities near the other

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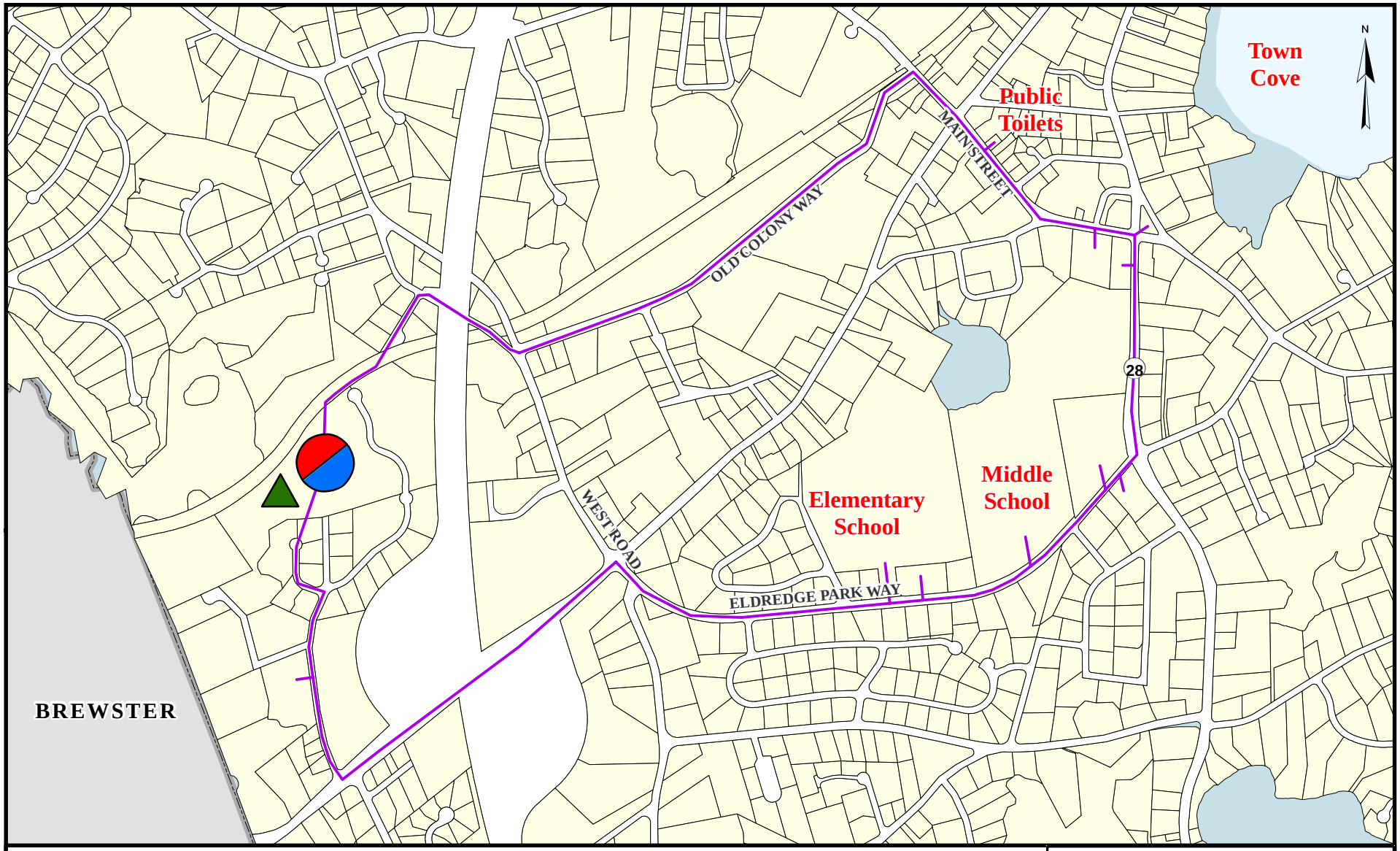

Septage Treatment Facility

Effluent Disposal Stie

Wastewater Treatment Site

Proposed Routing of Reclaimed Water Pipeline

Source: GIS data obtained from the Town of Orleans and MassGIS.

0 450 900 1,350 1,800 Feet

Orleans CWMP

Possible Reclaimed Water Pipeline

PROJ NO: 10645D | DATE: Oct. 2008 | FIGURE: 10-1

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three facility sites are limited primarily to private lawn watering, which would require more cost to serve than the reuse pipeline described for Plan 2. Therefore, the reuse program for Plan 1 would be the same as for Plan 2.

10.3 LEVEL OF TREATMENT

The treatment standards for reclaimed water are similar to those for the standard groundwater discharge permit in some ways, and more stringent in others. With respect to BOD and nitrogen removal, the effluent limits would be the same. To enable reuse, a higher degree of suspended solids removal is required, along with a higher level of disinfection.

There are two approaches to producing reuse-quality effluent. In the first case, the treatment facility would include additional facilities for suspended solids removal following the SBR system, the biological aerated filter or the oxidation ditch needed to meet the basic requirements for a groundwater discharge permit (see Appendix B for description of these technologies). Those add-on systems would include a membrane system for high level solids removal, and enhancements to the disinfection system. In the second case, the Town could build a membrane bioreactor (MBR) to meet the basic requirements, which would not require all of the add-on systems for reuse. In the first case, the add-on equipment could be installed any time in the future that the Town chooses to proceed with a reuse program. In the second case, the Town would install the MBR as part of the initial construction, and be faced with only minor upgrading to allow reuse. If reuse is to be part of the adopted plan, it would be wise to install the MBR initially. If reuse is to be implemented later, or may not be implemented at all, it would be prudent to pursue the first option. For cost estimating purposes, it has been assumed that the add-on approach is used.

In addition to effluent quality requirements for reclaimed water, the treatment facilities would be designed for a higher level of reliability and more frequent effluent monitoring would be required.

10.4 COST ESTIMATES

Estimates of capital costs were prepared for reuse facilities, using the same basis as the cost estimates reported in Section 7.6. The reuse program that is assumed for Plans 1 and 2 would add approximately $7 million to the capital costs for those plans. That represents about 5% of the costs for Plan 2 and 4% of the costs for Plan 1. Operation and maintenance costs would increase with a reuse program, primarily for energy, monitoring and administrative expenses. That increase is projected to be about $120,000 per year, which represents about 8 to 9% of the O&M costs for the basic options. On a present worth basis, the reuse program would add about $9 million to Plans 1 and 2, an increase of 4 to 5%.

Section 7 shows how the project costs are the least for Plan 2 and the most for Plan 1. To some extent, the comparison of Plan 3 with the other plans, as previously reported, does not account for the added benefits of reuse that are implicit in that plan. This analysis of the costs to add a reuse program to Plans 1 and 2 indicates that Plan 2 would still be the least expensive, once the reuse costs are included. The capital cost of Plan 2 would be $18 million less than Plan 3 (instead of the reported $25 million with a Plan 2 reuse program).

These capital cost estimates assume that a reuse program would be implemented after initial development of the overall project. Should reuse be included from the beginning, its cost would be 10 to 20% less. The savings include the ability to install the reclaimed water line at the same time as the sewer system is built.

10.5 REGULATORY ISSUES

A formal municipal reuse program, serving multiple private customers, is a rarity in Massachusetts. Therefore, the Town should recognize that such a program would require time and effort in coordination with DEP to address all of the relatively new aspects of reuse. The revised regulations for reclaimed water should be in force by the end of 2008, and changes from the current programs may affect the description and costs presented here.

To be effective, a reuse program must include contracts between the water supplier (the Town) and the customers. In the options described above, the customers include the Town itself, the

school district, golf course owners, and (perhaps) downtown restaurant owners. These customers are listed in the approximate order to complexity with respect to legal and administrative matters.

10.6 OTHER NON-COST FACTORS

Water reuse entails costs that would only partially be offset by any revenues from the possible sale of water. If water reuse is to be implemented, it would be on the strength of non-cost factors.

Some of the advantages of a reuse program include:

- Reduced demand on the municipal water supply system;
- Reduced reliance on commercial fertilizers to the extent that nitrogen and phosphorus in the reclaimed water can offset current uses on irrigated surfaces;
- For irrigation, a higher quality recharge to the groundwater (in terms of both nutrients and a wide range of other contaminants that would be present in low concentrations); compared with other effluent disposal options.
- Reduced use of the year-round effluent disposal systems, extending their useful life; and
- Elimination of existing private irrigation wells and pumping systems whose maintenance and replacement can be costly.

Among the disadvantages of a reuse program are:

- A higher level of oversight needed to ensure that reclaimed water is not used for inappropriate purposes;
- The legal and administrative aspects related to customer agreements and liability control; and
- Possible reduced revenue for the municipal water system.

There are two subjective advantages of a reuse program that warrant discussion, related to TMDL compliance and effluent disposal capacity.

Irrigation of vegetated surfaces is a key part of the reuse programs evaluated here. That contact between high quality effluent and growing vegetation will remove nitrogen and phosphorus and

will provide better protection of ponds and coastal waters than either a subsurface leaching system or a rapid infiltration system. It is possible that DEP might allow some credit toward compliance with the nitrogen-based TMDLs if a successful reuse program is implemented. The Town should not presume that it can reduce its expenditures for nitrogen control as a direct result, but a well-documented program might allow cost savings in the future.

DEP requires a traditional effluent disposal system as a back-up to any reuse program to address the possibility that irrigation is not possible during some unusually wet year, or that effluent quality is not achieved for a protracted period. That requirement is a prudent one. However, a successful reuse program, that is demonstrated to be effective over a range of weather conditions and over a number of years of operation of the required treatment technology, should allow DEP to reduce its 100% standby requirement to some smaller percentage of capacity. If the Town were required to provide only two-thirds back-up, for example, then costs would be reduced for later phases of construction of the traditional effluent disposal systems.

Plan 2 is based on the premise that follow-up soils explorations at the Tri-Town site will confirm early projections of that site's effluent disposal capacity. On one hand, those future explorations might show that more capacity exists than has been estimated, and there would be room at that site for other municipal uses, such as a public works facility. On the other hand, less favorable results would require the Town to seek a nearby supplemental site, particularly if regionalization options are implemented or full town sewering is needed or desired. If the reclaimed water pipeline were added to Plan 2, it would be a relatively easy matter to also construct a subsurface leaching system below the ballfields at the elementary and middle schools. In that scenario, the transport facilities would already exist (to convey reclaimed water to the schools for irrigation). Thus the reuse option establishes a system that could facilitate a future supplemental effluent disposal system, should it be needed.