

ES EXECUTIVE SUMMARY

The City of Newberg's Water Treatment Plant (WTP) has successfully met the City's drinking water needs for over 50 years. The groundwater supply has concentrations of dissolved iron and manganese, well in excess of the recommended levels for drinking water (0.3 mg/L and 0.05 mg/L, respectively). In fact, the iron concentrations in some of the wells are higher than almost any groundwater supply in the Pacific Northwest. The WTP's main purpose is to remove iron and manganese to provide an aesthetically acceptable water supply which meets all current and future drinking water regulations.

The plant's peak summer production has reached its rated capacity of 5.6 mgd during two of the past three years. Even though summertime production was relatively low during 2001 due to extraordinary conservation efforts by consumers, the WTP had extreme difficulty producing acceptable quality and quantity due to abnormally high iron concentrations in the groundwater. The drought during late 2000 and early 2001 created very low groundwater levels and forced the use of high-iron wells, especially the new Well 7. The City received numerous complaints due to "dirty water", presumably created by elevated concentrations of iron (and possibly manganese) in the finished water. The plant's filters became clogged very quickly and had to be backwashed frequently, thereby overtaxing the plant's washwater, solids handling and backwashing systems.

The fact that the plant is basically "at capacity" and encountered treatment difficulties last summer led the City to commission a Facilities Planning effort to determine current and future water treatment requirements. Recently, the City has implemented other water system improvements including:

- New groundwater well
- New distribution system storage and transmission pipeline
- Evaluation of Springs supplies

The Water Treatment Facilities Plan (WTFP) provides guidance for improving this major element of the City's water system and recommends a capital improvement program (CIP) that should meet the City's water treatment needs for the next 20 to 25 years.

Initial efforts for the WTFP included the following elements that represent a "situation audit" according to planning guidelines for water treatment plants:

- Review of current and future water demands
- Review of historical water quality and WTP performance
- Review of current and future drinking water regulations and compliance
- Review of hydraulic and process capacity
- Detailed investigation of the filter media, and preliminary chemical dosing schemes
- Review of plant facilities and systems, for performance and code compliance

Based on these efforts, the following major findings were reported:

- The WTP is currently at capacity. Maximum day system demands are projected to be 6.6 mgd in 2005, 7.7 mgd in 2010, and 10.2 mgd in 2020.
- The plant and groundwater supply have historically met all primary and secondary drinking water standards and regulations with the exception of finished water iron.
- Treated water iron concentrations have historically been acceptable, but were relatively high last summer due to treatment difficulties.
- The plant's existing filter media is in very poor condition and significant media has been lost. This was a primary cause of high iron concentrations and very high backwash water usage last summer. The media and filters require immediate upgrading to ensure acceptable performance.
- Although the manganese concentrations in the groundwater appear to be high, no raw or treated water sampling for manganese has been performed.
- The groundwater supply is classified by the Oregon Health Division as "not under the influence of surface water" and therefore, surface water treatment rules and regulations do not apply.
- The City has violated its NPDES permit for discharge of lagoon overflow to the Willamette River on a few occasions, mostly in conjunction with excessive filter backwashing due to treatment difficulties.
- The solids produced at the plant and collected in the backwash lagoon are removed manually and disposed of at the City's wastewater treatment plant (WWTP). This is a labor-intensive process which also increases the likelihood of NPDES permit violations, especially during the summer, when sludge production is highest.
- The plant has the ability to be expanded up to about 9.5 mgd with the addition of two new filters, additional high service pumps and finished water pipeline improvements.
- Space at the existing plant site is limited and is not adequate to consider a multitude of improvement options.
- The plant site experienced a significant landslide during the floods of 1995/1996 and improvements have been made to protect against further damage.
- The plant structures have a remaining useful life of approximately 15 to 20 years based upon the age of oldest structures--the contact basins and the older portions of the administration/chemical building.
- The older plant structures are vulnerable to damage during a severe seismic event.
- Various plant support systems should be upgraded to meet current codes and industry standards if plant is to remain in service.

The existing WTP needs to remain in service for at least 3 to 4 years as it would take this long to design, permit and construct a new plant if desired by the City. The plant requires immediate improvements to maintain its capacity, ensure good performance and optimize operating costs. Recommended improvements to be completed by June 2003, at a total estimated project cost of \$1,000,000, include:

- Re-build existing 4 filters with new gravel-less underdrains and deeper dual media
- Pilot plant study to verify media selection and demonstrate treatment performance

- New surface wash system for each filter, plus main supply system
- Backwash flow control
- Permanent sodium hydroxide storage and feed system to enhance performance, provide safer conditions, and to significantly reduce chemical costs
- Instrumentation and control improvements to integrate the new systems
- Seismic/site stability evaluation
- Hydraulic study of contact basins during high flow period

Other improvements should be made at the existing WTP if it is to remain in service for longer than 3 to 4 years including:

- Replace existing filter valves and install new electric valve actuators
- Replace existing filter and backwash flowmeters and instrumentation
- Upsize filter-to-waste piping and valves
- New finished water flowmeter and vault
- Repair cracks in contact basins
- New raw water pH meter/control system and new sample pump
- Piping and valves to drain contact basins to lagoon
- New liquid sodium hypochlorite storage and feed system to replace existing chlorine gas system
- Safety and access improvements
- Instrumentation and control improvements to integrate new systems

These improvements would be implemented after the high-priority improvements are made. The estimated total project cost for these other plant improvements is \$865,000.

The City attempted to install new anthracite filter media on top of the existing media as a "stopgap" measure to improve treatment performance during summer 2002, prior to completion of the filter upgrades. However, the supplier was unable to meet the required timeline for delivery of filter media.

Various scenarios for integrating the use of the existing plant with construction of a new plant were developed and evaluated including:

1. Abandon existing WTP and build new 9 mgd WTP immediately to come on-line in 2005/2006; expand new WTP to 12 mgd by 2015 and 15 mgd by 2027
2. Expand/upgrade existing WTP to 7.5 mgd and abandon in 2010; build new 12 mgd WTP to come on-line in 2010; expand new WTP to 15 mgd by 2027
3. Expand/upgrade existing WTP to 9.5 mgd and abandon in 2017; build new 12 mgd WTP to come on-line in 2017; expand new WTP to 15 mgd by 2027
4. Build new 5 mgd WTP to come on-line in 2005/2006; use existing WTP for summer peaking until 2017 and then abandon; expand new WTP to 12 mgd by 2017 and 15 mgd by 2027

Scenarios 1 and 4 may have slightly lower present worth costs compared to Scenarios 2 and 3. Scenarios 2 and 3 have the lowest initial costs. Due to City budget constraints with other significant water system improvements also required, Scenario 3 is the optimal treatment scenario. Continued use of the existing plant, with upgrades and expansion, will defer the construction of a new WTP for at least 10 years depending on actual water demands experienced by the City.

Recommended capital improvements to be completed at the existing plant for Scenario 3, in addition to the improvements listed above, include:

- Two new filters
- Contact basin improvements (launders, baffles)
- Sludge removal equipment in contact basins
- Pump station and pipeline to deliver solids/liquids to WWTP
- Up to 250,000 gallons of additional clearwell volume
- Two new 350 Hp high service pumps with VFDs
- Finished water pipeline and surge control improvements
- Increase site electrical service to 1,000 kVA
- Site electrical improvements to support upgrades
- Instrumentation and control improvements to support upgrades
- Seismic and structural upgrades, if identified in evaluation

The estimated total project cost for these improvements is \$2,900,000 in 2002 dollars.

The City is planning to build a new WTP in the future, and this is an appropriate time to decide when and where the new facility will be built. The WTFP also developed preliminary criteria, size and costs for the new WTP with an ultimate capacity of 23 mgd, which represents "build out" conditions for at least year 2050 demands. Various treatment options for a new WTP were evaluated and a conventional filtration plant with dissolved air flotation (DAF) clarification was recommended for siting and costs. The DAF plant was used to determine space requirements and cost estimates.

The City identified five potential sites for a new WTP and developed a short list of three sites relatively close to the existing WTP. Based on the suggested size and layout of a new plant, it is recommended that the City purchase Site A as soon as possible to ensure its availability when the new plant is to be constructed. Further evaluation of certain potential issues with Site A are required before purchase.

Figure ES.1 presents a site plan of proposed plant improvements and upgrades to allow it to continue serving the City's water treatment needs for approximately the next 15 years.

Table ES.1 presents a schedule and costs for implementing the recommended plant improvements.

Figure ES.2 presents the range of water system demand projections as well as the proposed schedule for WTP improvements.

**Table ES.1
Implementation Plan for Plant Improvements**

| Fiscal Year | Improvements | Estimated Project Costs¹ |
|--------------------|-------------------------------------|--------------------------------------------|
| 2002/2003 | Tier-One Improvements | \$1,000,000 |
| 2003/2004 | None | None |
| 2004/2005 | Tier-Two Improvements | \$900,000 |
| | Design and Bidding for Expansion | \$312,000 |
| | Initial Expansion Construction | \$208,000 |
| | Purchase Land for New WTP | \$337,000 |
| 2005/2006 | Complete Expansion Construction | \$2,550,000 |

¹ Costs estimated were escalated by 2 percent per year to determine cost for the year that the improvement is recommended for implementation.

**Figure ES.2
City of Newberg
Demand Projections and WTP Improvement Schedule**

