PACE Water System Presentation and Update
August 21, 2007

An overview of the system: What has been accomplished and where PACE sees it going.
Brian Lee handed out copies of the 1995 Master Plan, and its 2003 update, as well as copies of the slide presentation.

Brian Lee expressed appreciation for the fifteen plus years relationship with CWD and offered his hopes for continue good relations.

History

In the early 90s Duane Lee and Jim Smith started working with the CWD treatment plant project, they did the District's water rights and perfection, then they completed the master plans. In a review of old documents, it was found that Jim Smith, ex-owner of Lee Engineering and subcontractor to Compass Engineering at the time, worked on the design of the building portion of the water treatment plant.

The 1995 Master Plan, because of the size of the District, was mandated by state law and required to cover certain elements in the code: population forecasting, water use forecasting, water rights issues, and discussion about water treatment, storage requirements and distribution system. Following the Master Plan, the district undertook several key projects, and therefore, the update was done to take out those elements that had been done and established the priority list for the work that has been done up through 2006: the million gallon reservoir, treatment plant update, and several water line improvements.

CIP Plan 2006

Sets the tone for what's upcoming, the board set some priorities
Took in 600000 in reimbursement monies and set up a priority list earmark

Approved and signed
Done as a commitment to customers of the District

System

Brian Lee provided a brief overview of the intake system: The North Fork of Gordon Creek is an old structure that has a dam across the creek, a little pond on the side that is fully encased in concrete on bottom, it has screens off to the side that allows water to flow into a little vault, and then into a pipe that goes to the treatment plant. It suffers high maintenance in the fall, with leaves and sediments slowing down the flow. Russell Lawrence is currently working with PACE Engineering and the District Manager to design a new screen that will reduce the maintenance. It is a two-step project, with a short-term fix and a more long-term solution being considered.

The South Fork of the Gordon Creek has a newer structure, which consists of a dam that goes completely across the creek and an intake box in the center of the creek at an angle. Bank erosion and undermining of the structure, caused by several recent winter events, has been a problem. To eliminate the erosion problem, Russ Lawrence, working with the District, designed a stone vain to be placed in front of the dam that would direct the flow away from the bank and center the flow through a channel created by the dam. Fabric was placed underneath to trap sediment and small diameter rock to backfill the area that was undermined.

Water Rights

It was explained that the District is permitted to take 2 cfs or 900 gallons at each intake, but also that they are linked such that the combined take can not exceed 2 cfs. It was explained that this is in acknowledgement that at times one intake may be nonfunctional, either from low flow at the S. Fork or high flow and debris plugging at the N. Fork.

Discussion followed regarding the possibility of increasing the District's water rights or whether wells might be a possible solution. It was suggested that, due to the District's need to sandbag the North Fork to get water out of it and the lack of water at the South Fork, application for additional water might not be readily approved. Though the drilling of wells could supplement the system, there are additional rules that must be considered; among them whether treatment would be required and if so, the costs associated with the location of the well and treatment of its water.

Brian Lee advised that the original Master Plan, Section 4.3, included a water supply study, but it is dated. Besides Gordon Creek, the study considered the development of deep wells (risky and expensive) and connection to Troutdale (considerable cost). He suggested, that in light of new technologies, there might be value in an update to this study.

It was noted that ensuring an adequate water supply to meet current, as well as growing need was of such importance further discussion was required. In the interim, the following actions were suggested:

- Calls should be made to Water Resources to determine if they would consider increasing the District's water rights to a maximum of 2.5 cfs, or removing the restrictive clause to increase the water rights to 2 cfs per intake.
- Compile information on an existing well near Corbett School: water samples to be tested for composition, depth of the water, and the address and well number to be used to obtain information from public records.

Water Treatment Plant

Water flows from stream intakes through the treatment plant and out to the distribution system is all by gravity alone. Water from the two intakes flows towards a combined pipe, prior to which there are two flow meters. The pipeline has leaks and has been a constant maintenance issue due to damage from log truck traffic over the lines, slides, and other natural disasters in the area. As repairs are needed, PVC pipeline should be replaced with ductile iron pipe. Once past the flow meters, the pipelines combine into a

ten-inch ductile iron pipeline to the treatment plant. It then goes through the three sand filter basins (Brian referenced materials on the filter system handed out by Phil at a previous meeting).

The one million gallon steel reservoir allows the contact chamber to run at a steady state, with a more constant flow over the weirs, delivering water to the system with a more consistent chlorine contact time. Two tracer studies were conducted, one of the contact chamber and the other of the reservoir; the latter demonstrated the reservoir's ability to serve for additional contact time. The crew now has two formulas to use to record contact time, one each for the contact chamber and the reservoir. In the bottom of the reservoir is a header pipe designed with flapper valves that acts as a mixer ensuring that there are no stagnant areas of chlorine residual or temperature stratification.

There are two elements of chlorine usage in the system – disinfection and corrosion control. By law, chlorine contact time and residual levels in the distribution system must be sufficient to provide for disinfection of pathogens to the farthest reaches of the system. Residual levels must be sufficient for effective disinfection and corrosion control, but not so high as to risk the production of tri-halo-methane, a known carcinogen. Just enough chlorine is used to meet the required contact time, and additional chlorine can be added post-reservoir if needed for the distribution system.

<u>Filter Pond 2 – Highlights of Phil's Report</u>

- During construction, it was necessary for the contractors to fix joint leaks. It also took a great deal of time to get it rinsed down till it was making good water.
- An additional problem arose at the flow split box where raw water comes in and splits between the 3 filters. The flow entering Filter Pond 2 was free falling, hitting the bottom, and causing entrained air to rise up in the filter and produce a boiling effect that created a divot around the influent. It was determined that the free fall effect was the cause and a simple throttling back of a valve resolved the problem.
- The slow sand filter is biological and if water is not kept at a high enough rate, the organisms will die off and pass through the filter and make the turbidity worse than that coming in. There were a couple incidents where flow was so low that water had to go through other the two filters.
- Zackary Bertz caught a beaver in the influent pipe, resulting in contamination concerns and the need to shut off the flow for a couple days till the problem was resolved.
- Phil advised that Filter Ponds 1 & 2 are about to overflow and will need to be skimmed; Jim advised Filter Pond 2 was skimmed today.
- Filter Pond 2 has as much capacity as the other 2 put together, and as a result needs more water to keep it going.
- The divot near the influent of Filter Pond 2 needs to be skimmed; Jim Jans advised it will need to be done using the little gater and by hand.
- Phil reported noticing an interesting pattern of growth in the filters: when the water is cold in the winter, a green plant grows on the sand; that dies off when the water warms up and a heavy green algae is then found growing in the filter; in spring, pollen and blossoms get into to the filter pond turning everything yellow for about two

weeks, then goes away. There has been no apparent impact on the water quality. The biggest problem could arise from the algae since it is sticky and could be the biggest contributor to filters plugging up.

Computer Controls – Brian Lee

In addition to Filter Pond 2, they completed controls replacement that provides continuous computer monitoring of the raw water and filter water sides of the treatment process; and continuous monitoring and alarm for high/low levels. There were some compatibility issues with PC Dialogic Board used for the alarm signaling and remote control software - all issues were resolved by removing the board, rebuilding the computer, and redoing the way they do alarm backup. In order to ensure critical data is recorded if the computer system fails, the chart board was rewired to the system – it will provide a historical hard copy log of the three main elements (flow, temperature and guage). Wireless access points were added to the computer system so the laptop provided during upgrade could be used to control the plant. Yard piping improvements provides the ability to detect high levels of turbidity and to shut itself down, to auto switch from flow to filter, to flow to bypass, all by computer.

There is capacity in the future to upgrade for fully automatic mode where the plant can be run by remote controls with little onsite control beyond replacement of chemicals; in order to make this happen a few more automatic valves and monitoring equipment will need to be added; primarily to the effluent side of the system.

In response to several questions regarding the computer controls, the answers are summarized below:

- The computer system running the system is XP Pro.
- Alen Bradley 500 is the serial interface.
- Software is the Alen Bradely RS package.
- There is a complete set of analog inputs and digital inputs monitoring the flow rates.
- Lateral Logic Diagram is used to run the core plant operations.
- If the computer fails, for whatever reason, it can run in a lights out mode.
- PLC is enough to run the system at a basic level.

Reservoirs

Larch Mountain: Concrete with hopper bottom and steel roof; oldest in system (built in the 1930s). It was refurbished when Reservoir 4 was built (1970s), and, Per Victor Schmidt, it was relined with a stucco/concrete material because there was a leakage problem. There have been several discussions regarding its decommissioning. Piping is a problem and it may be necessary to cut them off and install new valves in order to shut it off. Victor Schmidt asked if there were any problems with it as far as meeting federal standards; in other words are there any major driving reason to pull it off line. Brian Lee advised that he didn't believe so, but he has not done a physical examination of the interior.

Reservoir Number 2 (Mershon Road): Same configuration as Larch Mountain – concrete with hopper bottom and steel roof. Had a nasty joint compound put in it; upon research they found it to be a know carcinogen. It was carefully removed and then a

seal was placed over it (same type on seal that was used on filter 2 but only 24 inches wide over the joints). In addition, the piping was fixed and pressure sustaining and pressure rducing valves were installed to help reduce the water hammering.

Reservoir Number 3 – Brian Lee advised that this reservoir has not had any repairs or retrofit probably that he knows of. It should probably be the next on the priority list in terms of steel reservoirs. He would like to have any information on what it looks like on the inside. Suggested the possibly to recoat and retrofit like the Reservoir 5.

Reservoir Number 4 – Was just recoated.

Reservoir Number 5 (Louden) – Jim Jans reported that it will be online this week.

Reservoir Number 6 (million gallon) – Brand new.

The system now has a total capacity of 1.85 million gallons of storage. There are several recommendations in the Master Plan for improving – the million gallon reservoir was highest on the priority list. Other recommendations included 300-500,000 gallon reservoirs, one at Resv. No. 4 site or over by Louden site; both depend upon storage needs and growth of District.

Distribution System

The system is a mixture of materials, but primarily PVC and ductile iron pipe (DIP). In the Master Plan, problems identified with PVC pipes included its reaction to high pressure where it was not properly embedded. The District made the conscious decision to switch to DIP for main line work.

PRV stations that reduce pressure to acceptable levels in the distribution system Frank did good job to identify each PRV station, repair it, install or improve vaults that were safer and more convenient to maintain. A project was started, but not finished, that was to identified set pressure zones where redesigned PRV vaults would be installed and maintained by the District. Frank had frequent contact with Tom Hacktel and Brian Lee during that time and GC System (representatives for Clay Valve of Oregon) was his design team.

The leak problems have steadily improved. Leak rate has not seen estimated for 2007; 2006 saw a significant reduction.

A hydraulic model was developed as part of the Master Plan Update, and now have the capability to develop computer models of the system. Can be used for such problems as the PRV project or for analyzing the impact of improvements such as additional water storage reservoirs on the overall distribution system.

Asset Management List – This small project, working with aerial photography and system maps from other work and putting them together, developed an assest management software program. It was not implemented due to lack of staff – there should be a disk somewhere in the District office. It can be used to map whole entire system, keep track of where all services are such as fire hydrants and valves, can

create custom tables for each entity, track preventative maintenance, when valves need to be looked at, when PRVs need to be flushed, etc. It is an add in to GIS system.

Questions

Reservoir 5 – update requested on the paint on the outside – it is not only discolored; not allowed to dry thoroughly so it is easily flaked off with a fingernail. Jim Jans took pictures and sent to Brian Lee. Brian advised he will look into it; suggested it could be caused by two things: the fiberglass ladder had to be installed after tank painted, so when installed they had to patch; also Brian found a few areas a bit shy of required thickness and so needed to be touched up by hand brushed to make sure they were over the required thickness.