TO: Douglas J. Schmitz, City Manager
FROM: Joel Komarek, City Engineer
SUBJECT: Oswego Lake Interceptor Sewer Replacement Project – Presentation of Staff Recommended Replacement Alternative
DATE: June 7, 2007

Action

Staff will present to the City Council its recommendation for a preferred Oswego Lake Interceptor Sewer replacement alternative.

Background

Beginning sometime in the late 1950’s, the then City Council and community embarked on a planning, engineering and financing effort of significant proportion to construct what is today our Oswego Lake Interceptor Sewer (OLIS) system. Comprised of tens of thousands of feet of pipe ranging in size from 12-inches to 36-inches, this system was constructed in the early 1960’s within the canals, bays and main lake. Early record drawings tell a story of how the system was constructed and it is clear the challenges and impacts to the community were significant. Rock excavation in the canals was completed by blasting and many thousands of feet of the main lake system is supported on piles driven to great depths. It has been reported by long time residents that the lake was drawn down over 24-feet to facilitate pile driving operations on the main lake and that these operations continued day in and day out and in some cases long after the sun set on Oswego Lake. Geographically speaking, it made perfect sense to place this public work, so critical to public health and our quality of life, in the lake and canals as any other alternative would require multiple pumping facilities and force mains through private property and public streets.
It’s not unreasonable to surmise that concern for the long term O&M of pumped systems and associated risks of mechanical/electrical breakdown likely factored highly in the decision to choose a gravity system in the Lake over a pumped system. The system we have today is over 45 years old, and is known to be deficient in both wet weather capacity and structural integrity. As such, the current system is vulnerable and must be replaced.

Beginning in 2000, the City initiated what would become more than a decade long process to replace the ailing OLIS system. Much engineering research and analysis has been undertaken to evaluate a multitude of replacement alternatives. Interim options to defer ultimate replacement have been identified and vetted technically, financially and politically, and have been found infeasible as well as a universe of options, both gravity and pumped. Over the last five years, engineering focus has been on replacing the OLIS system with either an in-lake system or an around the lake system. Today staff is prepared to make a recommendation regarding a preferred replacement alternative. From staff’s point of view, arriving at this point has been challenging, exciting and has involved many hours of technical analysis, problem solving, creative thinking and open communication with the public.

What is clear today is that the City must go forward with the replacement of this aging pipeline system. All of the options for that replacement are expensive and they all involve substantial inconvenience for a large number of the residents and businesses of Lake Oswego. Given the public expense and inconvenience that will result, the staff and consultants have worked diligently over the last few years to study the alternatives and determine whether there are any fatal flaws in our reasoning. Frankly, we are confident that we could proceed to construct and operate any of the alternative designs. We are also confident that the recommended alternative is the best choice for the immediate and long-term interests of the community.

**Discussion**

From the onset of this predesign effort, City staff, with support and advice from the consulting engineering firm of Brown and Caldwell, developed performance objectives that any replacement alternative should be expected to achieve. These objectives and their related criteria and evaluation metrics have guided the technical engineering and analytical efforts expended in identifying and vetting replacement alternatives. Since delivery of the final Phase 1 Predesign Report in February 2007, additional analyses and research have been conducted regarding the in-lake buoyant alternative as well as the around-the-lake alternative. On May 30th and 31st, a series of technical workshops were conducted with City staff. The workshop on May 30th benefited from the participation of several City Council members. The information imparted at these workshops was the focus of staff’s presentation to the City Council at a study session conducted June 4th, 2007. At that meeting, staff presented an evaluation matrix to Council members. The process of completing this matrix has enabled identification of staff’s preferred replacement alternative.

As you review the matrix and the evaluation metrics therein, you will note that an evaluation criterion related to the primary objective “Feasibility” is public acceptance. Comprising the
criterion are four evaluation metrics, two of which are key differentiators and two of which are secondary. In order to gauge public acceptance of these particular metrics as they relate to each alternative, it was paramount to involve the public in a conversation on the technical aspects of an alternative and the relative strengths and weaknesses each alternative exhibited with respect to any particular metric. To effect that conversation significant effort was expended by staff and the consulting team. Since December 2006 the team estimates that approximately 300 people have been involved in a variety of presentations, public open houses, council meetings and workshops. In addition to these direct contacts, a substantial amount of written and graphic information have been made available to the community through such information sources as the Hello LO, Lake Oswego Review (over 20 articles), the Oregonian, LO Down Weekly news, City website and mailings. Opportunities to receive public input are ongoing through such means as an on-line survey (26 responses received thus far), tonight’s public meeting and future public meetings including a special session of the Council scheduled for August 7, 2007.

**Staff Analysis of Replacement Alternatives**

As noted earlier, staff developed the evaluation matrix with support and advice from the consultant team. Staff believes the evaluation metrics are comprehensive and reflect the technical, political and financial risks associated with a project of this magnitude. As staff completed an initial assessment of the alternatives using the matrix, a clear ranking or weighting of metrics appeared appropriate. In other words, in the process of rating each alternative against a particular metric, clear differences between alternatives could be discerned within particular metrics. Thus it seemed appropriate to rank the evaluation metrics according to their ability to expose key differences among alternatives. Metrics ranking highest in their ability to expose key differences between alternatives are:

- ✓ Cost: Capital, O&M and future replacement costs
- ✓ Financial Risk
- ✓ Siting and easement acquisition risk
- ✓ Impacts of construction on the public
- ✓ Risk of failure
- ✓ Consequence of failure
- ✓ Emergency response as it relates to risk of failure

*Evaluation Metric: Cost*

Exclusive of O&M and future replacements, the around-the-lake (ATL) option is more economical to build relative to the in-lake buoyant (ILB) and in-lake pile (ILP) supported options. However, when one considers the ATL and ILP options in the context of the Financial Risk metric, the slight capital cost advantage enjoyed by the ATL relative to the ILB quickly dissipates. Looking beyond the initial capital cost advantage of the ATL option, O&M costs and future replacement costs for the ATL and ILP options relative to the ILB option, differentiates these options as the most expensive and most at risk to metric #4: Financial Risk. **Staff has identified the ILB option as preferable for this evaluation metric.**
**Evaluation Metric: Financial Risk**

This metric weighs the risk of cost increases for any alternative as a function of construction risk in the near term and inflation risk in the long term. Evaluation of the alternatives relative to this metric exposes a clear preference for the ILB option as it has no future replacement costs upon which inflation risk can act. In terms of near-term construction risk, by virtue of the substantial additional length of overland piping needing to be constructed in the ATL option, (+28,000 feet) differing subsurface conditions correlate directly to added construction risk. Relative to the ILB option, the ILP option has a higher degree of risk of construction cost increases due to the critical importance of lake bed sediment engineering properties to the development of pile capacity, which dictates pile length and the potential need to anchor to bedrock should lake bed sediments prove unsuitable for developing sufficient pile capacity. In addition, the greater future replacement cost for the ILP option relative to the ILB option, renders it more prone to risk of cost increases due to increases in future inflation rates. **Therefore, staff has identified the ILB option as being preferable for this evaluation metric.**

**Evaluation Metric: Siting and Easement Acquisition**

Simply put, the need to secure an additional four points of access and easements sufficient to site and stage construction for six new pump stations relative to the need to secure access for two access points for the in-lake options clearly define the in-lake options as preferable to the ATL option for this evaluation metric. **Therefore, staff has identified the in-lake options as being preferable for this evaluation metric.**

**Evaluation Metric: Construction Impacts to Public**

All alternatives will present varying levels of impact to various segments of the community. All alternatives will require a drawdown. The ILP option will require a deeper drawdown than either the ILB or ATL options and will generate noise from pile driving operations, thus this option achieves a lower rating relative to the ILB option. With its requirement for multiple construction sites on private property and significant additional piping on public and private property, disruption to normal traffic operations on major and minor arterials, the ATL option achieves the lowest rating on this metric. **Staff has identified the ILB option as being preferable for this evaluation metric.**

**Evaluation Metric: Risk of Failure**

All options can be designed to withstand the design earthquake event. All options can be designed to withstand the negative effects of corrosion. Relative to the ILB option however, achieving this level of performance in the ILP and ATL options requires additional protective systems, greater factors of safety in design and a higher level of vigilance regarding on-going maintenance to reduce risk of failure. By virtue of its simple design and use of robust materials, the individual elements comprising the ILB system are inherently better able to withstand seismic
events and the effects of corrosion without the addition of special design features or systems. Use of standardized QA/QC (quality assurance/quality control) procedures during manufacture and assembly of the various components and systems for the ILB option are believed to reduce the risk of failure well below levels of concern. By contrast, the many mechanical and electrical parts and systems associated with the ATL option are guaranteed to fail at some time in their service life despite use of best design and construction practices. **For these reasons, staff has identified the in-lake options as being most preferable for this metric.**

**Evaluation Metric: Consequence of Failure**

Despite its higher risk of failure within its design life, and absent an event which completely disables an entire pump station or significant length of force main, the consequences of the failure for the ATL option are less relative to the in-lake options. Failure of any significant portion of the ATL option would result in overflows to receiving bodies of water, pollution of private property and related disruption. Failure of any significant portion of the in-lake options could result in greater volumes of untreated waste water discharged to public waters and the potential for disrupting operations at the Tryon Creek Wastewater Treatment Plant. **For these reasons, staff has identified the around-the-lake option as being preferable for this metric.**

**Evaluation Metric: Emergency Response**

This metric measures the ability to quickly mount an effective response and repair effort to any element of any alternative that fails unexpectedly. Relative to the ILB option, it is believed failure of any portion of the ILP system would require a significantly different approach to repair. Standby pile supports to speed replacement would not be feasible as it would not be known what pile length would be needed. A barge mounted pile driver would need to be mobilized to the site. Once pile repair were affected, new pile caps and pipe cradles would need to be formed and concrete placed to complete the repair. In contrast, assuming a section of the ILB pipe failed, it is not unreasonable to presume prefabricated lengths of pipe in each pipe size could be sunk in the lake for later mobilization to the site of the repair. **For these reasons, the ILB option rates higher than the ILP option. However, as compared to the ATL option, the in-lake options are presumed to present more challenges for repair e.g., requiring specialized equipment and contractors and lake access all of which may result in less timely repair. For these reasons, staff has identified the around-the-lake option as being preferable for this metric.**

**Conclusion**

A summary of the above findings favor the in-lake options over the around-the-lake options in a 5 to 2 ratio. Of the metrics which favor the in-lake options, the in-lake buoyant option is favored in three of the five metrics: Cost, Financial Risk and Construction Impacts. The ILB option has an equivalent ranking relative to the ILP option in terms of Siting and Easement Acquisition and Risk of Failure. For the metrics Consequence of Failure and Emergency Response, the ATL option ranks higher than the ILB option.
It is staff’s opinion that the lower rating of the ILB option relative to the ATL option for Consequence of Failure and Emergency Response can be mitigated through use of prefabricated and locally stored system elements (i.e., pipe, anchors, tethers and brackets) and establishing emergency response protocols and training, which would be tested periodically in the field during hypothetical response exercises. Staff also believes that by requiring stringent QA/QC procedures for materials procurement, fabrication, installation and project documentation, the risk of failure can be further reduced so as to render less meaningful the lower ranking of this alternative as measured by the Consequence of Failure and Emergency Response metrics.

Expanding the evaluation beyond the key differentiators to include those of medium importance, the ILB option ranks better than or equal to the ATL option in all but the sediment testing metric. This is attributed to the slightly larger volume of in-water excavation required at the east end of the lake for the ILB option relative to the in-water excavation required at the mouth of Springbrook Creek in the ATL option. Expanding the evaluation even further to include the low importance differentiators, the ILB option again ranks equal to or better than the ATL option in all but the underwater excavation metric and again this is due to the relative differences in excavation volumes between the ILB and ATL options.

**Recommendation**

For the above reasons, staff concludes the in-lake buoyant option best meets the project objectives and therefore confidently makes its recommendation that this alternative be selected by the City Council as the preferred method for replacing the Oswego Lake Interceptor Sewer.

**Next Steps**

With this report staff has presented its recommended interceptor sewer replacement alternative. Based upon discussions with the Council at their June 4th study session staff understands the Council may wish to conduct additional public outreach regarding project financing and drawdown needs but that the Council is ready to receive staffs recommendation for a replacement alternative without the need for further deliberation or public input. Therefore, staff seeks the Council’s endorsement of the recommended replacement alternative in order to document the decision in the Phase 2 report due July 16th and proceed with the following critical tasks:

- Development of the design phase scope of services upon which project fees can be developed.
- Development and initiation of the qualifications based procurement process for the Construction Manager/General Contractor who will become a key member of the design development team.
- Coordination with the Finance Department regarding revenue bond requirements to fund the design phase work including contractor procurement.
- Initiation and completion of formal negotiations with all necessary parties from which easements, property or rights of access will be negotiated. As access to the lake is so
critical to the final design development and contractor input, timely completion of
ease ment negotiations are key to the efficient prosecution of early design phase activities.
✓ Completion of the next quarterly progress report to ODEQ as required by the MAO.
✓ Identification of early equipment procurement needs.

Staff stands ready to assist the Council in matters of drawdown, easement acquisition and project
financing as your needs dictate.

Attachment: Oswego Lake Interceptor Sewer Alternatives Evaluation Matrix (Final).
### Feasibility - Can We Build It?

<table>
<thead>
<tr>
<th>GENERAL CATEGORY</th>
<th>Cost - Can we pay for it?</th>
<th>Technical - Can it be done?</th>
<th>Public Acceptance - Preference of stakeholders and public?</th>
<th>Permits - Can we get agencies’ OK?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRITERIA</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Alternative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-Lake Buoyant</td>
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<td>$69M</td>
<td>✓</td>
<td>$4M</td>
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<tr>
<td>In-Lake Piles</td>
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<td>$78M</td>
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<td>$4M</td>
</tr>
<tr>
<td>Around-Lake Pumping</td>
<td>✓</td>
<td>$65M</td>
<td>-</td>
<td>$8M</td>
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</table>

### Reliability - Will It Work?

<table>
<thead>
<tr>
<th>GENERAL CATEGORY</th>
<th>Dependability - Can we count on it?</th>
<th>Ease of O&amp;M - Can we take care of it?</th>
<th>Longevity - Will it last?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRITERIA</td>
<td>15</td>
<td>16</td>
<td>17</td>
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<td>-</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Legend**

- **Legend**: Ratings are based on criteria color:
  - **High importance differentiator**: +
  - **Medium importance differentiator**: ✓
  - **Low importance differentiator**: -

**Criteria No.**  Criteria Description

1. Capital cost in 2006 dollars, includes 30% contingency and 25% for engineering, construction management, easements, and admin. Does NOT include escalation.
2. 75-year present worth of ongoing routine O&M including labor, materials, and energy costs.
3. 75-year present worth for future replacement cost of components that don’t last 75 years.
4. Risk of cost increases for items such as construction claims for differing site conditions or variable discount rate for future O&M and replacement.
5. Availability of required methods and materials to construct each alternative to established tolerances.
6. Adequacy of construction access points to work site(s) and staging areas for contractor to stockpile materials and store equipment.
7. Necessity for using highly qualified contractor and subcontractors; interest level of likely contenders
8. Ability to site facilities and obtain easements from multiple parties.
9. Impacts to traffic, business, local access, and other disruption including noise and dust from construction activities.
10. Impacts, primarily noise and odor, from ongoing operation and maintenance activities.
11. Drawdown depth and duration to construct work at west end of lake.
12. Quantity of underwater excavation required to construct work at east end of lake or Springbrook Creek may impact permit schedule.
13. Likelihood of sediment testing requirement by regulators.
15. Risk of catastrophic failure of some critical component of system. Examples: for around-lake, break in a force main or a mechanical/electrical pumping system malfunction; for in-lake, break in pipeline or support and grade loss in dam failure scenario.
16. Consequence of a system failure. Examples: for around-lake, overflows to lake or private property until crew responds and completes repairs; for in-lake, more difficult repairs = longer overflow to lake and lake partially drains to WWTP; ongoing cleaning of buoyant system if dam fails.
17. Accessibility of system components for routine maintenance to detect and prevent impending problems; also, accessibility for major replacements and emergency maintenance activities.
18. Requirement to use outside contractor for maintenance activities.
19. Ability to quickly implement emergency responses measures to address a system failure and minimize consequences. Designing system with replaceable components and extras on-hand is recommended.
20. Long-term corrosion resistance of system.
21. Ability of overall system to survive design-level seismic forces.
22. Potential for system components to wear out or become obsolete (e.g., spare parts not available).