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Dual System Evaluation for New Developments

City of Sparks, Nevada, US

POTABLE AND EFFLUENT REUSE SYSTEMS

optimization to meet drinking water and irrigation demands of new developments, enabled cost comparison of single and dual piping systems in the Truckee Meadows Community.

KEY POINTS

- Comparison of costs of potable vs dual supply systems
- Optimization facilitates evaluation of alternative design criteria

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"The optimization study has provided defensible comparative solutions for the piping system under investigation. The results of this study will provide benefit to the entire Truckee Meadows Community by allowing the multiple governing agencies to make informed decisions regarding future expansion of our effluent reuse system."

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System description

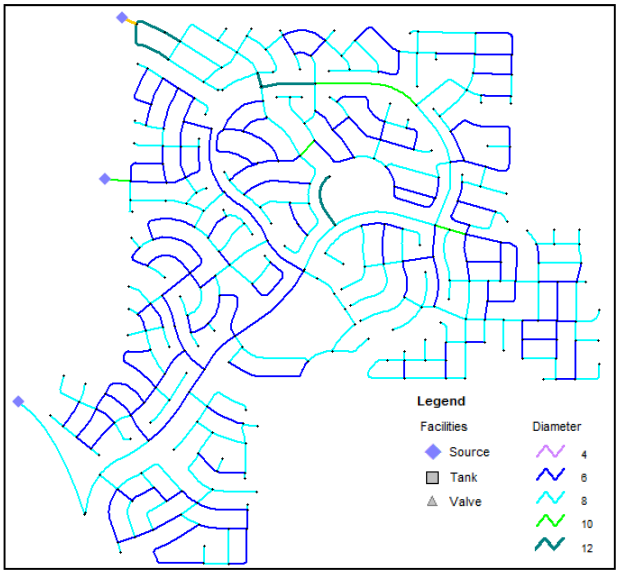
This study was commissioned by the City of Sparks as part of a wider study for the Truckee Meadows Community. The Community encompasses the City of Reno, City of Sparks and Washoe County.

A proposed subdivision in the Lemmon Valley area was used as a case study to determine the relative costs of installing a standard potable water system compared with a dual potable and effluent reuse system. The layout of the subdivision is shown in the figure below.

The potable system has three supply connection points along the western side of the system (representing connections to a transmission main), while the effluent reuse supply source is located at the southwest corner of the system.

A storage tank was included in the effluent reuse system to minimize peak flows. It was assumed that storage for the potable system would be part of the transmission system.

Downtown Reno as seen from Sparks.



Optimized solution – Combined potable and irrigation system

The system was sized to meet maximum day demands and fire flow at every node. It was assumed that fire flow would always be provided from the potable system. A school located centrally in the network has a higher fire flow requirement (2,500 gpm) than other sites within the area (1,500 gpm).

Project scope

The aim of the optimization analysis was to aid in the design of least-cost, hydraulically feasible designs for subdivisions, as well as to assess the feasibility of including effluent reuse in new development areas.

The optimization determined the best combination of pipe sizes for the subdivision, based on the different demand cases, design criteria, allowable pipe sizes and unit costs.

Using optimization, the City was confident that the solutions met the required design constraints at least cost, ensuring a fair comparison of the alternatives.

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Sensitivity analyses provided the City with a range of pipe network solutions and costs to include in an evaluation of alternative supply options within the community.

Sensitivity Analysis

The major finding from the initial results was that a dual pipe system would cost almost twice as much as a single potable system. Some of the reasons for this are:

- The cost of small diameter mains (4-inch to 8-inch) was very similar, as the cost of installation was the major factor. As a result, removing the irrigation demand from the potable system did not significantly reduce the cost.
- Because the irrigation system had a single supply point a large diameter trunk main was necessary, increasing the cost of this system.

After review of initial solutions the City requested that alternative design criteria be considered in the final set of analyses. Specifically the optimization was modified to consider an increased maximum allowable velocity and reduced peak demand in the irrigation system.

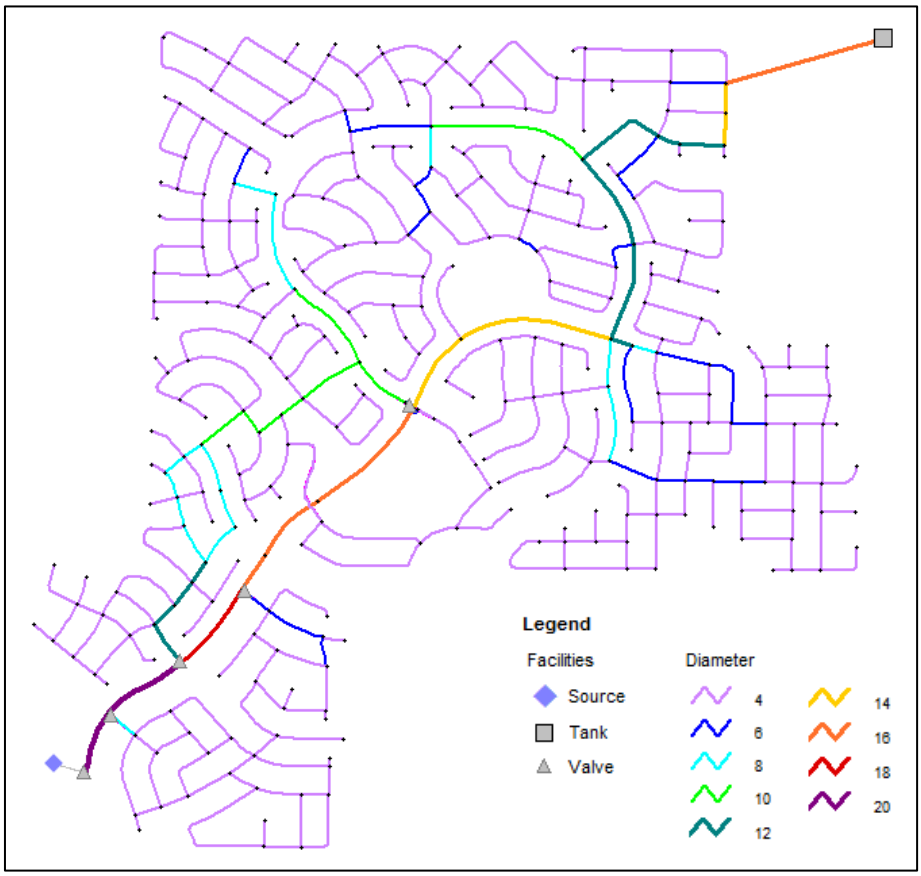
Conclusions

The revised criteria for the irrigation system did result in a lower cost solution, however there was still a significant difference in the cost of the dual versus combined pipe networks.

The cost per dwelling unit was calculated to allow the City to extend the results to other developments. It should be noted that a number of specific factors influenced the results of this particular study. These include:

- The option of providing fire flow from the effluent reuse system was not allowed.
- The location of the supply points for each system had an impact on the feasible pipe sizes and hence cost.
- The option of installing the dual system pipes in a single trench was not allowed, so there was no economy to be gained in the installation of a dual system.

The City of Sparks is now using the results of this optimization study, together with an assessment of additional costs associated with production and delivery of different quality water supplies, to help evaluate different supply options within their community.



Optimized solution – Effluent reuse system

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