Pressurized Irrigation System Capacity Assessment

August 14, 2014
Background

- City is approximately 90 percent built-out
- During 2013 P.I. water use was very high with the system operating at or above design capacity much of the summer
- City is concerned that long-term operation at 2013 levels will cause premature failure of key system components and unreliable system performance
- Future growth will make this situation worse
Scope of Study

- Evaluate the capacity and performance of P.I. System
- Develop a computer model of P.I. System
- Evaluate P.I. System under 2013 water demand conditions
- Evaluate P.I. System with reduced water demands
  - Current level of development
  - Build-out conditions
- Evaluate system operation with failure of key components
2013 Water Usage vs. Recommended

* Based on 55 percent overall efficiency. Effective precipitation not included. May values are for May 15-31.
http://digitalcommons.usu.edu/extension_histall/181
Daily Demand Distribution
Pressure Fluctuation Comparison
Timpanogos Cove

With Conservation

2013 Demands
Pressure Fluctuation Comparison
Wedgewood Drive

With Conservation

2013 Demands
Pressure Fluctuation Comparison
Dorchester Drive

With Conservation
2013 Demands
Analysis Results

• Scenario 1
  – Very high water demand of 5.9 million gallons per day.
  – Inadequate pressures exist on Timpanogos Cove.
  – Marginal pressures occur near the top of the middle and lower zones.
  – Very high velocities in excess of 7 feet per second occur in several pipes
  – High pressure fluctuations occur in several areas, particularly in the lower zone
  – System pressures limit the available flow from the CUP South turnout.
Analysis Results (continued)

• Scenario 2
  – With conservation goals achieved demand would be reduced to 3.5 million gallons per day
  – System pressures significantly improved
  – Pipe velocities are improved – still a few trouble spots
  – Pressures are much more stable
  – A properly located booster pump is needed for CUP South turnout
• Scenario 3
  – At build-out, with conservation goals achieved demand would be 3.8 million gallons per day
  – System behaves similar to scenario 2 with only minor differences in pressures and velocities
  – System appears to have adequate capacity for build-out if water conservation measures are implemented
Analysis Results (continued)

- Scenario 4 – Well Failure (Cottonwood or Harvey)
  - Increase deliveries from CUP North Turnout, deliver water to lower zone from Pond 12
  - Short-term solution only – quantity of CUP water is limited
  - Demand would need to be curtailed significantly due to high velocities in booster pump discharge pipe
• Scenarios 5 & 6 – Booster Pump Failures at Ponds 10 & 12
  – Water could still be delivered, but water conservation would be critically important
  – Other pumps remaining in operation would need to operate for longer periods of time
  – Increased probability of additional pump failures due to extended operation
  – Curtailment of demand would help relieve stress on remaining pumping facilities until failed booster pump is back on line