Small, Old & Six Feet Underground
The Tale of a Small Water System with Shallow Wells

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Agenda

- Background
- Water supply & treatment
- Water storage
- Communication
- Surprises along the way
- What’s new?
- Lessons learned
• 12km NE of Lillooet
• Main Community
  • 14 homes
  • ADD 0.3 L/s
  • MDD 1.0 L/s
• Orchard Springs
  • 48 homes
  • ADD 1.0 L/s
  • MDD 3.0 L/s
• Two kms apart.
Water Supply

• Main Community
  • Underground river
  • Upper & lower infiltration gallery
  • 200mm diameter PVC pipe
  • 1.5-2.0m deep
  • Yield of 1-3 L/s each

• Orchard Springs
  • Bedrock springs
  • Wet well
  • Yield of 1.0-1.5 L/s each

• Climate change sensitivity
Water Supply
Microbiological

• Surface water - protozoa, bacteria & viruses
• “Classic” groundwater – bacteria & viruses
• GUDI – Groundwater Under Direct Influence of surface water
• GARP – Groundwater at Risk of containing Pathogens
• Same risk as surface water
• Main Community & Orchard Springs supplies = GUDI/GARP
Water Supply Microbiological

- Why does this matter?
- All are health risks, but different treatment.
- Viruses and bacteria – chlorination very effective.
- Cryptosporidium and Giardia – chlorination not effective.
- Both communities chlorinated, but more was needed.
Water Supply
Other Water Quality

• Physical / Chemical Properties
  • Main Community: meets BC drinking water standards
  • Orchard Springs: high TDS, high hardness
  • Prefer Main Village water over Orchard Springs

• Opportunity to supply both from Main Village
Domestic Water System Schematic Plan

Main Community Wells → Main Community WTP → Main Community Reservoir → Main Village Distribution System → PRV1 PRV2 PRV3 → Orchard Springs Distribution System
Water Treatment

- GARP Well
  - Treat like surface water.
  - Giardia, Cryptosporidium & Viruses.
  - Filtration & disinfection.

- Filtration Avoidance
  - Two forms of treatment that achieve same removal/inactivation.
  - High quality of raw water.
  - Source water/wellhead protection plan.
**Water Treatment**

- Treatment is chlorination & UV.
- Water quality monitoring - 12 months of regular sampling for Turbidity & *E. coli*.
- Source Water Protection Plan
- Success!
Water Storage Reservoirs

• Minimum Required Fire Flow is 500 m$^3$
  • Main Village Reservoir $= 198$ m$^3$
  • Orchard Springs Reservoir $= 201$ m$^3$

• Selected option:
  • Increase storage at Main Village.
  • Orchard Springs Reservoir disconnected from water distribution system.
Surprises Along the Way!!!

• Not all as-builts are created equally.
• A Tale of Two Pipes.
• Where are the air valves?
• Where are the service lines?

Make a record.
Any sketch is better than nothing at all!
Surprises Along the Way!!!

• Wanted to isolate Orchard Springs Reservoir for new system tie-in.
• Line would never drain.
• Traced the line and found a break...
• Bypass in operation for years!

Make a change?
Mark it up!
Surprises Along the Way!!!

• Seized valves because they had not been exercised.
• More capacity, but reservoir levels kept dropping.
• Summer demands or leaks?
• Flow meters help!

Loops that include O&M Staff & data collection is for a reason.
Surprises Along the Way!!!

• Brown outs & “Dirty power”.
• False alarms.
• Loss of setpoints because of power outages.

Critical alarms vs Warnings?
What are default settings?
Surprises Along the Way!!!

• Dial-out alarms only. Great if:
  • Few false alarms.
  • Enough operators ready to respond.
  • Troubleshooting is not a problem.

• Remote access & data archiving.

• SCADA System
  • Save a trip;
  • Bring in the cavalry; and
  • Historical data to see the story.

Remote access & data archives. WORTH THE INVESTMENT!
What’s New

• Tough first summer:
  • Water demands and leaks;
  • UV alarms; and
  • Remote access.

• Improve supply reliability.
• Groundwater exploration.
Tips & Lesson Learned

• Combined systems:
  • Take the best of each; and
  • Less infrastructure – less to operate & maintain.
  • Groundwater not always simple to treat.

• Filtration exclusion takes planning:
  • Do you have the data to prove it is “clean”?
  • How can you get the data?
  • Can you protect the source?
Tips & Lesson Learned

• Record drawings:
  • Document what you know.
  • Made a change? Document it!
• Exercise your valves.
• Pumping straight to reservoir makes life easier.
• Measure flow & watch reservoir levels.
• Night flow analysis.
• Build data history & remotely monitor if you can.
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Questions?

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