





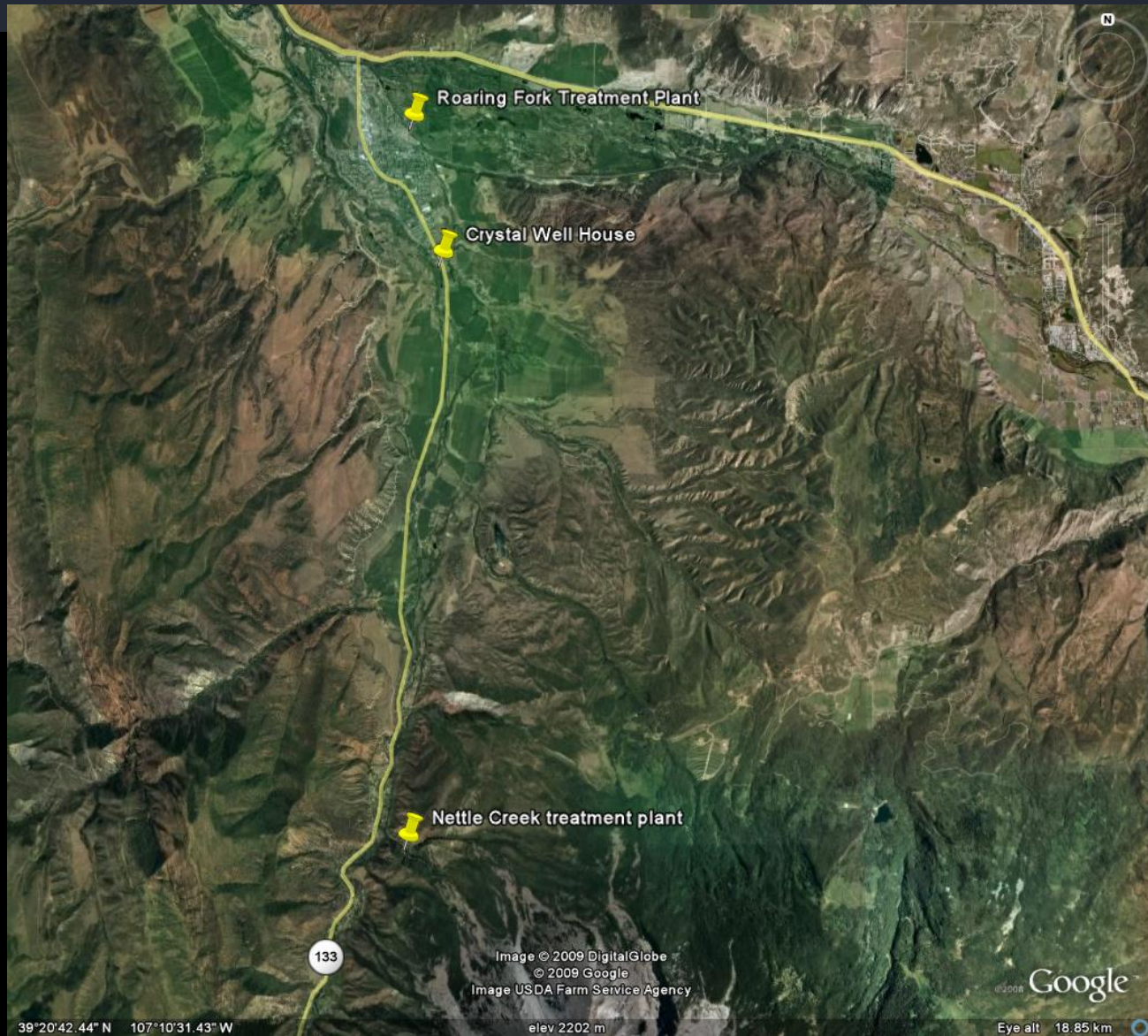
TOWN OF CARBONDALE MEMBRANE EXPERIENCE



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Overview of System

Three Facilities Three Technologies



Nettle Creek Treatment Plant

Primary water supply

2.0 MGD Microfloc Trident system manufactured by US Filter, surface water source, coagulant and chlorine disinfection

Advantages:

- Low cost of production from facility
- Gravity flow delivery from source to customer
- Less demand for technological expertise from operators
- Effective in cold water
- Life expectancy of media

Disadvantages:

- Higher O&M costs due to staffing the plant to operate
- Lower Crypto and Giardia removal rates
- Requires chemical pretreatment and process addition
- Lower water quality in regard to microscopic removal
- Lower WQ reliability , susceptible to micro burst precipitation events and run off with turbidity flashing on water source
- Higher backwash volumes



Crystal Well House

Secondary water supply for make up water

1.0 MGD alluvial ground water supply not under the influence of surface water, chlorine disinfection

Advantages:

- Simplicity in operation compared to other plants
- Water quality is relatively uniform through out the year
- Low O&M cost to operate

Disadvantages:

- Possible WQ issues primarily during run off
- Future needs may not be met with limitations of aquifer



Roaring Fork Treatment Plant

Secondary water supply for make up water

1.0 MGD alluvial ground water supply under the influence of surface water, chlorine disinfection

Advantages:

- O&M costs lower than conventional due to automation in the facility to operate
- No chemical pretreatment required
- Effective in cold water
- Can handle high turbidities, regardless of seasonal fluctuations
- Low operational labor demand
- Fully automated filter and backwash processes, plants can be set up for a high level of water quality protection as well as equipment fault protection
- Very high removal rates of "screening" algae, Giardia, Cryptosporidium, Coliform bacteria and many viruses, as well as significantly reducing turbidity
- Lower backwash volumes
- Easily expandable
- Smaller footprint than conventional plants



Roaring Fork Treatment Plant

Disadvantages:

- Operator familiarity as a filtration system
- Automation requires skills in technology which operators can be unfamiliar with
- Life of the membranes compared to conventional media filters
- O&M of equipment can be trouble some due to technology and familiarity
- Sonic testing resulting in pinning of membranes require units to be disassembled
- Higher number of valves and actuators to operate the system



Cost Comparison Between Facilities For Equivalent Production Over One Month

	Power cost	Usage		
Nettle Creek				
▪ 19.9 MG	\$1151	13715 KW	\$58/MG	689 kW/MG
Crystal Well				
▪ 19.6 MG	\$1323	12678 KW	\$68 /MG	646 kW/MG
Roaring Fork				
▪ 19.9 MG (*157 CU FT gas)	\$ 1317*	9380 KW	\$69/MG	471 kW/MG



Questions?

