

LONG VALLEY HYDROLOGIC ADVISORY COMMITTEE

DRAFT MEETING NOTES

February 1, 2017

PUBLIC MEETING ATTENDEES

Ormat: Janice Lopeman, Steve Henricksen, Mark Hanneman, Cheryl Eanes & Edward Pozek.

USGS: Jim Howle, Bill Evans & Deborah Bergfeld.

BLM: Steve Nelson, Mike Lystad, Dan Munger, Mark Spendel & Dale Johnson.

Lahontan Regional Water Board: Jeff Fitzsimmons & Tom Browne.

CA DOGGR: Jack Truschel & Chris Costa.

USFS: Margie DeRose

MCWD: Pat Hayes, Eric Kaufman, John Pedersen, Irene Yamashita.

Great Basin Unified Air Pollution Control District: Grace Holder, Jan Sudomier

Mono County: Nick Criss & CD Ritter

Other: Mike Bodine, *The Sheet*; Dave Harvey, Southern Mono Historical Society; Malcolm Clark, Sierra Club; Sandra Moberly, Town of Mammoth Lakes

1. **Call to order & introductions:** Nick Criss called the meeting to order at 10:01 a.m. in Town/County Conference Room at Minaret Village Mall, Mammoth Lakes. Attendees introduced themselves and their agencies.
2. **Public comment:** None
3. **Meeting notes:** Approve meeting notes of Aug.10, 2016, as amended: 1) . (*Criss/Hayes. Ayes: All.*)
4. **Subcommittee status reports:** Nick Criss summarized reports: Ormat will continue flow tests into spring when snow melts; USGS noted obstruction in well 14A-25; and Ormat corrected well numbering systems.
Howle speculated that rock flour from drilling remained. Put hoses down well, air compressor to blow water out, made well flood. Tube decoupled, stuck about 125' in shallow piezometer. Cannot collect water chemistry. Maybe use Ormat rig to remedy. Or, USGS could get it out when drilling another well next summer.
Wells till when? February 2016.
5. **USGS Basalt Canyon temperature logs:** Howle presented PowerPoint. Lowest monitoring point, saw reversal. If climate-induced signal, would see upward trend increase. East of airport on groundwater divide between Convict Creek/Mammoth Creek. Normally declines till April, but with wet fall and early winter, seeing upward trend already. Sherwin Creek campground: SC-1, SC-2. 8' water level rise from October in SC-1. Vandalism at site SC-2, equipment ripped out. 14A-25... Similar rate of steady decline in wells, flatline piezo surface in that area.
6. **Thermal infrared flight:** Deb Bergfeld presented results from 2016 aerial survey. Quantum Spatial (QS) flew in 2014, got usable data, but had problems with imagery resolution. QS did high-resolution GPS, flew early morning for highest contrast. Resolution = 1-meter pixels across entire area. Some fumaroles have calmed down, but long-known features like Casa Hill were located. Shady Rest box: Pixel temps. Teapot thermal area: Sample gas from time to time. Summary: Excellent imagery, single pixel resolution for entire area = 1 m x 1 m. Some trees hold onto heat, radiant temp. Water gives exact temperatures, but all else changes from substance to substance. Cost to fly = \$40,000. No attempt to correlate dead or dying trees.
Evans cited drought conditions in 2014, recovery in 2016. No big changes from drought to normal year.
How does aerial compare to on-ground surveys? Bergfeld indicated learning about some as worked, happy to see what expected to see. Large, exportable file.
7. **Water chemistry of MCWD & Basalt Canyon monitoring wells:** Bill Evans cited isotopic data from

groundwater data. Oxygen shift happens at high temps, underground. MCWD wells fall into Sherwin Creek groundwater and MMSA. Isotopes follow known paths of groundwater flow. Add in 14A-25, deep water oxygen shift away, halfway to geothermal line. Used mud pits for drilling. Both levels are strange. Mixing trend noted in true reservoir fluid and isotopically cool groundwater.

Hayes noted wells about same elevation. Evans thought maybe old water heated hotter earlier. Still dealing with well that needs to be produced more before interpreting chemistry.

If unconstrained by finance? Evans thought to remove as much water as possible; if it refills with same water, retire again. Ran Boron isotopes on water, couldn't get any set of findings that gave consistent picture.

Evans noted storm tracks define ocean water as zero. As move inland, heavier isotopes fall out first. Isotopes are good tool for Long Valley.

Evans noted 28A-25 has few percent of boron, chloride, bromide. Surface waters on mountain near source. Hayes thought it was limited to MCWD's area. Need elevations of outlying areas to make comparison. Evans indicated boron vs. chloride graph contains a few more data points. Most MCWD wells plot near origin. MMSA puts halide on slopes. No evidence of ski salt in any waters. P17: Gradual increase in chloride and sulfate over time, bit of jump in recent sampling, maybe related to drought. No correlation between snow water at Mammoth Pass and chloride in P17.

Production numbers for Basalt Canyon? Evans cited gradual process, can't quantify at this time. Pedersen offered to send data.

Pump more during drought? Hayes noted 2013 entire supply groundwater, pumped a lot. Pedersen stated P17 pumped more consistently than others. Recycled water for golf course. Did not pump P17 that much this past year.

8. RV Park monitoring well: Dale Johnson cited special use permit to install monitoring well on USFS land near RV park. Processed NEPA. Proposed set of wells like 28-25 site, so potential for dual- depth wells, deep well. Effort by MCWD and Ormat in last couple weeks to apply for grant for deep monitoring well.

DeRose looked at potential locations, wanted to consider impact on RV operations.

Late summer drilling? Johnson cited NEPA requirement for after Sept. 15 on earlier wells.

Dual monitoring wells? Johnson noted 24-hr drilling operations.

Hayes stated MCWD has lead on grant application Jan. 20, 80% grant / 20% MCWD. \$1,050,000. Report out in March. Asking \$800,000 in spread, grant pool has competing applications.

If no grant, still drill well? Hayes indicating no funding plan right now

9. CD-IV: Dale Johnson stated BLM worked closely for three years with Ormat/MCWD/USGS/others. Sent letter to Ormat Jan. 13, copied to others, 30-page monitoring plan approved by BLM. Quarterly meeting for implementation today. Adaptable plan, not set in stone. Extensive monitoring network, geochemical constituents to be sampled, flow/stress test protocols, data sharing components. Plan available. BLM-1 or RV park dual piezometer in place before minimum baseline monitoring can start. If deep well BLM-2 is in, add that.

Chloride increase in content at 14A-25 indicate mixing of geothermal fluids in aquifer?

Evans indicated it's hard to understand what's going on at 14A-25. Use as many tools as possible to fingerprint additional component. Some chemical species not work, but isotopes of conservative boron, bromide, chloride, lithium, rubidium. Spell out process desired, but chemistry of 14A-25 is strange. P17 has increased in all geothermal components monitored, unknown reason. Look at time graphs. Quarterly monitoring plan might help track changes.

Munger noted purpose of baseline monitoring is to see what's changing.

Evans stated CD-IV hasn't begun yet. It's not a textbook process people would like. Happening 1.5 years at currently existing wells, ready to expand to new wells.

Pedersen stated MCWD contracted for baseline monitoring at its own expense. BLM conditions in permit will identify who pays costs.

Hayes cited well 17 as one of best production wells. MCWD is concerned about expansion of geothermal production. Since 2005-06, chloride has gone up considerably. At its own expense, MCWD put in well 26. Things already happening, yet when is something done about it other than explain away data? BLM plan has no trigger points, so would have same discussion next 30 years. Significant vs not significant argument.

Evans noted other data streams like water level in flow tests. Many extremes of data would have to be brought to bear. Flow lines not fully explained yet. When see changes, focus on what happened to water levels, temperatures, who pumped what, what happened to surrounding wells. Still argument, but lots to argue about.

Troubling to spend \$50,000 rate payer funds to correct baseline. Build upon bedrock, but no trigger points beyond.

Evans stated participants must argue it out to reach satisfactory trigger points.

Johnson noted there is nothing to go back to with monitoring plan. Includes historical data records. Involves all parties providing input, looking at data.

Steve Nelson was confident as decision maker that framework provides what's needed for BLM to make hard decision.

MCWD rep opined we live in world of trigger points. For chloride 250mg/liter. Share sensitivity MCWD has. Delivering water to customers is heavily scrutinized. Any pollution damages reputation for decades.

Yamashita noted EIR/EIS is supposed to look at potential impacts to MCWD. Now questions arise that should have been examined prior to document approval. Is 18-mo baseline adequate?

Go to map first, let arguments fall out from there. Anybody considered shutting off wells for a while?

Lopeman indicated Ormat did that, monitored pressure, saw no response. Long weekend outage scheduled. When snow melts will continue to monitor responses in Ormat and MCWD wells. Doing all to get data that's calibrated, actually true. Hayes thought weekend shutdown probably was not significant enough.

Spendel mentioned wells six months, data collected/analyzed before 18-mo baseline starts.

Johnson noted 18-mo baseline set, comfortable with hydrologic cycle. Ormat has to do steps before CD-IV.

Nelson suggested bigger data set.

MCWD rep indicated CD-IV is on line, but MCWD thinks causing harm to aquifers is not delineated. General lack of confidence in protecting water supply.

Lopeman noted BLM stated it will establish boundaries once competent data are collected. When divergence from expected trend occurs, require additional sampling, pressure transducer installation. Make sure it actually happened, why, what to do about it.

10. **Adjourn** at 11:38 a.m. to Aug. 2, 2017, 10 a.m.