SOUTHWEST JORDAN VALLEY GROUND WATER CLEANUP PROJECT
STATE OF UTAH NATURAL RESOURCE DAMAGE TRUSTEE

COMMENT RESPONSE SUMMARY
AUGUST 31, 2004

Response to Common Comment No. 6 – Zone B and Shallow Aquifer (Lost Use) Groundwater Cleanup

Several comments raise questions about the Zone B remediation effects and impacts to water quality and quantity, including the amount of reduction of sulfate contamination and the drawdown in the aquifer. Additional comments pertain to effects in the shallow aquifer from pumping, including drawdown of groundwater levels, extraction volumes, and potential impacts on the Sharon Steel Tailings site. Other comments and questions address issues of reverse osmosis (RO) concentrate discharge to the Jordan River.

Principal Aquifer Remediation and Water Levels

In the Joint Proposal, the eastern area of sulfate contamination in the deep, principal aquifer is termed the Zone B plume. The Zone B aquifer cleanup will be substantially accomplished within the 40-year life of the Joint Proposal project. Groundwater flow and transport modeling performed by Kennecott shows that 80% - 90% of sulfate will be removed from the Zone B area by the end of 40 years. Joint Proposal, Appendix D. Jordan Valley Water Conservancy District (JVWCD) anticipates the continued need for demineralization treatment in Zone B after 40 years. This is because the background TDS concentrations will still be too high for municipal and industrial supply.

A regional groundwater drawdown model prediction is shown in the Joint Proposal, Appendix D. At the end of 40 years, regional water levels in the Zone B principal aquifer will have generally decline by 10 – 20 feet. Declines in the Riverton City well field are generally in the range of 10 – 15 feet. These declines are less than or comparable to those that have been experienced in the southeastern Salt Lake Valley, prior to initiation of the Zone B plume cleanup, as well development has approached the natural recharge amount.

Shallow Aquifer Extractions and Water Levels

The shallow aquifer extraction volume will depend on which treatment option is chosen by JVWCD. Descriptions of the alternatives are included in Section 1.2 of the Joint Proposal. The shallow aquifer extraction volumes are shown in Table 5.2B of the Joint Proposal.

To consider drawdown effects in the shallow aquifer, JVWCD commissioned a groundwater modeling study. JVWCD retained Bowen Collins and Associates to perform groundwater modeling of the shallow aquifer. The JVWCD shallow aquifer model was prepared as a further refinement to two previous regional models prepared for Salt Lake Valley. The first was the calibrated US Geological Survey (USGS) Salt Lake Valley Regional Model (Lambert, technical publication No. 110 B. Utah Department of Natural Resources, 1995). The 1995 USGS was further refined and updated in 1996 by CH2M Hill, as commissioned by JVWCD, Midvale City, Murray City, Salt Lake City, South Salt Lake City, Sandy City, White City Water Improvement District, and Holladay Water Company. The 1996 refined Salt Lake Valley model provided further calibration based upon data from over a hundred municipal wells located throughout Salt Lake Valley.

Both models represent the aquifer system using seven layers. The uppermost (1st) layer simulates the shallow aquifer system, and the 2nd layer simulates the confining unit. The underlying layers (layers 3 through 7) simulate the principal aquifer system with its multiple layers. Bowen Collins then provided further refinements to the 1995 and 1996 models in 2000 to focus on the shallow aquifer. The shallow groundwater flow model incorporated the following modifications to the USGS Salt Lake Valley regional model:

- A refined grid size of 250-foot squares throughout the principal study area.
- Increase permeability in the shallow aquifer within the Jordan River floodplain to match pump test results from the JVWCD shallow test well at 8300 South 1000 West and information from the Sharon Steel Remedial Investigation (RI).
- Thickening of the shallow aquifer by 60 feet to match the hydrogeologic characterization results at the JVWCD headquarters, the Sharon Steel Superfund site, and the Southwest Groundwater Treatment Project.
- The addition of canals, which did not exist in the previous regional model. Also, canal seepage was modified to occur only during April to September to more accurately simulate existing conditions (versus year round seepage in the USGS regional model). Canal refinements did not include adding the North Jordan Canal, which is a small canal close to the Jordan River.
- Adjustments to the Jordan River stage elevations to match data from gauging stations.

The creation of the JVWCD shallow groundwater model uses the best available modeling techniques and information for Salt Lake Valley. The models have benefited from the regional calibration and water budgets prepared by the USGS.

The groundwater model simulations show maximum shallow aquifer drawdown levels as a result of the treatment option known as the “Separate Design”. With these maximum extractions, aquifer water levels are drawn down generally three feet near 1300 West, and along 8600 South. Drawdown impacts west and south of these areas are substantially less.

Concerns were expressed regarding effects of shallow aquifer withdrawals to the groundwater plume beneath the Sharon Steel site. A review of these issues did not result in any concern of adverse impact to the Sharon Steel site. The remedial work at the Sharon Steel site, which capped the tailings from precipitation recharge, constitutes only a very minor portion of the recharge to the shallow aquifer underlying the Sharon Steel tailings. The great majority of the recharge occurs throughout the Salt Lake Valley up gradient from the tailings.

To address the unlikely concerns regarding the potential for metals migration from beneath the Sharon Steel tailings site to the project shallow wells, JVWCD has committed to institute a dissolve metals monitoring program in the extracted water from its shallow aquifer wells. Section 5.2 of the Joint Proposal describes this monitoring program. This monitoring will be done on a quarterly basis for five years, and on a yearly basis thereafter. The results will be reported to DEQ on an annual basis, to assist in demonstrating trends, using all previous data collected. This data will enable the tracking of the potential metals migration into JVWCD’s shallow wells, if it were to occur.

The following canal systems are simulated in the JVWCD shallow groundwater model:

- Provo Reservoir Canal

- Utah Lake Distributing Canal
- Utah & Salt Lake Canal
- South Jordan Canal
- Jordan and Salt Lake Canal
- East Jordan Canal
- Draper Canal

A seepage study was conducted by the USGS during 1982 and 1983 on each of these canals, except for the South Jordan canal (Herbert et al, 1985). Canal flow measurements were conducted for three to five different time periods along each canal, and gains and losses were calculated from the differences in flow and from measured diversions. The gains and losses measured by the USGS were converted into the Groundwater Vistas program (in which the JVWCD Shallow Groundwater Model is constructed). The data includes identification of reaches where the seepage is directly into the principal aquifer (Layer 3), due to the absence of the shallow aquifer along certain canal reaches.

The South Jordan Canal, which was not studied by the USGS, was assigned a seepage rate to groundwater of 7 cubic feet per second (cfs) along its full reach. This rate was conservatively estimated at slightly less than half of the total rate of 15.5 cfs measured along a similar parallel reach (between stations USL7 and USL23) in the Utah & Salt Lake Canal, which lies to the immediate west of the South Jordan Canal. The South Jordan Canal was included in the model because geologic cross sections and canal elevation data indicate that the canal is above the water table and therefore is a likely source of water to the shallow aquifer system.

Treatment Options

JVWCD has proposed three treatment options, Minimum Integrated Design, Integrated Design, and Separate Design, which were described in Section 5.4 of the revised (June 11, 2004) Joint Proposal. In the Integrated and Minimum Integrated Design options, RO concentrates from the Zone B treatment plant are discharged to Kennecott's tailing impoundment utilizing a pipeline constructed from the Zone B. treatment plant to the tailings impoundment. Under these options, the Shallow Aquifer is not treated through the RO plant, so there are no RO concentrates for disposal. Under the Separate option, both the Zone B plume and the Shallow Aquifer are treated through the RO, and the combined concentrates are proposed to be discharges to the Great Salt Lake, in accordance with the terms of the Joint Proposal and if a UPDES discharge permit is approved. Any treatment of shallow groundwater by RO will produce a shallow aquifer concentrate that could only feasibly be discharged to the south arm of Great Salt Lake. Shallow aquifer concentrate cannot be discharge to KUCC's Tailings Impoundment (see Response to Common Comment No. 7). JVWCD desires to construct a single pipeline for concentrate discharge, due to the length and cost of two pipelines. Therefore, the options provide for concentrates to be disposed at either the tailings impoundment or the Great Salt Lake, but not both.

The outcome of the DEQ Division of Water Quality's program for Great Salt Lake selenium studies and a numeric selenium standard (see Response to Common Comment No. 9), together with consultations with DEQ and EPA, will help guide JVWCD's decision on which treatment and concentrate disposal option to select. JVWCD will make a decision on which treatment option to pursue by the summer of 2007. A decision to proceed with the Separate Design option and implement a discharge of RO concentrate to Great Salt Lake is dependant on the selenium studies concluding that this option will not cause environmental degradation to Great Salt Lake and its surrounding environment. While completing these studies over the next two years, JVWCD will simultaneously complete other activities related to the project, such as preliminary engineering, engineering designs, construction and testing of Zone B and shallow wells, and construction of collection pipelines.