PUBLIC PARTICIPATION SUMMARY

Proposed Ground Water Discharge Permit Modifications

Bingham Canyon Mine and Water Collection System (UGW350010)

North Concentrator (UGW350015)

Kennecott Utah Copper, LLC
Salt Lake County, Utah

Introduction

The purpose of this document is to summarize public comments received by the Utah Division of Water Quality regarding proposed modifications to Kennecott Utah Copper Ground Water Discharge Permit UGW350010 for the Bingham Canyon Mine and Water Collection System, and Kennecott Utah Copper Ground Water Discharge Permit UGW350015 for the North Concentrator. In accordance with UAC R317-6-6.5 of the Administrative Rules for Ground Water Quality Protection, the Executive Secretary published a public notice on May 26, 2011 in the Salt Lake Tribune, a newspaper in the affected area, and allowed 30 days for interested persons to comment. Based on a request from three parties, a second public notice was published in the Salt Lake Tribune on July 4, 2011, which extended the 30-day public comment period to July 11, 2011.

Written Public Comments

Written comments were received from the following four parties during the public comment period.

1) Friends of Great Salt Lake
2) Ivan Weber, Principal/Owner, Weber Sustainability Consulting
3) Terry Marasco, Natural Resources Project Management
4) Bonnie Gestring, Earthworks

Below is a summary of the comments received, which are indicated by italics, followed by a DWQ response.

FRIENDS of GREAT SALT LAKE

Comments were received via email at 5:13 PM on June 27, 2011 from Joro Walker and Rob Dubuc of Western Resource Advocates on behalf of Friends of Great Salt Lake.

Introductory Comments: *Thank you for the opportunity to provide comments on the draft Ground Water Discharge Permits for Kennecott Utah Copper (Kennecott) relating to the Kennecott Bingham Canyon Mine and water collection system (UGW350010) and the Kennecott Power Plant and Historic North Concentrator (UGW350015). I submit*

these comments on behalf of FRIENDS of Great Salt Lake. As you know, FRIENDS is particularly interested in these permits because its members extensively use and enjoy Great Salt Lake, and especially Gilbert Bay, for purposes that include wildlife viewing, boating, hunting, photography, scientific study and solitude. FRIENDS is deeply concerned about cumulative adverse impacts from pollutants discharged directly into Great Salt Lake from Kennecott's tailings reservoir as well as via a hydrological connection between groundwater and the Lake. Moreover, FRIENDS is particularly troubled by the proposed groundwater permits because it appears that much of the contaminated water collected by the procedures and processes described in these permits is ultimately pumped into Kennecott's tailings pond and discharged without treatment to Great Salt Lake.

As an initial matter, we request a meeting with the Division of Water Quality (DWQ) to discuss several issues involving the Bingham Mine and North Concentrator groundwater permits and Kennecott's operations, including: 1) the status of DWQ's analysis and permitting of Kennecott's expansion proposal (Cornerstone Project); 2) the relationship between the proposed groundwater permits at issue here and the Cornerstone Project; and 3) the cumulative analysis and impact of Kennecott current and planned operations on ground and surface water. We also seek to understand the present permits more fully, as we find the information DWQ has disseminated to be insufficient to provide the public with the data it needs to comment in a meaningful fashion on the relevant permitting actions. We have always found meetings with DWQ to be extremely helpful and look forward to another equally fruitful opportunity to discuss Kennecott operations in the context of surface and groundwater permitting.

Before we turn to additional comments on the proposed permits, we underscore one of the most worrisome aspects of the actions contemplated by your agency – that DWQ appears to be extending these permits for five years, in spite of the fact that they appear to examine only limited issues such as the pilot test heap leach pad and the replacement Magna Process Water Reservoir water handling facility. If DWQ proposes to reissue these permits, Kennecott must submit and DWQ must analyze ***complete*** *permit applications covering all relevant activities including, inter alia, demonstrations that the applicable TDS limits, groundwater quality standards protection levels, and permit terms and conditions will be met. Given that Kennecott activities appear to be currently contaminating groundwater, and appear to be violating groundwater quality standards this demonstration is of key importance.*

DWQ Response

The Division of Water Quality (DWQ) published two separate public notices to solicit comments on specific modifications to the following two existing ground water discharge permits: 1) the Kennecott Utah Copper (KUC) Bingham Canyon Mine and Water Collection System best available technology (BAT) upgrade to a double synthetic liner system with leak detection for the chalcopyrite heap leach pilot project (UGW350010), and 2) the Magna Reservoir replacement project and BAT retrofit for the existing Magna Reservoir under the KUC North Concentrator permit (UGW350015). In addition, permit

UGW350015 was reopened to add boron ground water protection levels based on data from the accelerated monitoring program.

Under the heading "Further Information" of the Public Notice, it states: "Additional information may be obtained upon request by calling Dan Hall [for permit UGW350010] at (801) 536-4356 or Ed Hickey [for permit UGW350015] at (801) 536-4357 or by writing the aforementioned address". Public documents pertaining to KUC's permits are available to any person or group who requests them under the Government Records Access and Management Act (GRAMA). Several requests for specific documents were received during the comment period and the requested documents were provided within 24 hours of the request, or sooner. Based on these requests and your comments, DWQ will assess what additional supporting documents can be made readily available on the public notice website the next time a public comment period is opened for a ground water discharge permit.

Neither one of these two permits is currently up for the standard 5-year term renewal.

In addition, neither one of these two permit modifications is related to KUC's Cornerstone project. To date, DWQ has not received any formal plans or specifications relating to Cornerstone, and no permit modifications or alterations related to Cornerstone have been requested by KUC. The two subject permit modifications (UGW350010 and UGW350015) are not related, and it was purely coincidental that the public notices were published at the same time.

We respectfully disagree with your statement "that much of the contaminated water collected by the procedures and processes described in these permits is ultimately pumped into KUC's tailings pond and discharged without treatment to Great Salt Lake". Under Utah Pollutant Discharge Elimination System (UPDES) Permit UT0000051, no water is discharged to the Great Salt Lake unless it meets permit discharge limits. Moreover, KUC utilizes an acidic water treatment system, which relies on operating KUC milling facilities, including: a) the tailings pipeline, which serves as a 17-mile plugtype treatment reactor; b) the Copperton Concentrator lime plant, which has the ability to add hydrated lime directly to the tailings line as needed; and c) the North Tailings Impoundment, which provides a repository for nonhazardous solid treatment residuals within a much larger mass of tailings. While not necessarily apparent or conventional, the addition of the collected or pumped water to the tailings line and transportation along the 17-mile pipeline does impart treatment to the waters. Excess calcium carbonate reacts with the low pH waters and chemical reactions and changes do occur. Additional information on water treatment is available at the following URL: http://www.kennecott.com/library/media/Final%20SE%20GW%202010%20Annual%20Report%20Final.pdf

Other permits address the quality of the water as it reaches the north end tailings (Ground Water Discharge Permit UGW350011), and potential surface discharges to the Great Salt Lake are regulated under UPDES Permit UT0000051.

General Comments: *The following comments apply to both the proposed Bingham Mine and North Concentrator groundwater permits:*

General Comment 1*: As a general matter, neither permit either explains nor analyzes the cumulative impact of Kennecott's operations on groundwater and surface water. Such an approach is plainly necessary to protect water quality and to meet applicable standards and beneficial uses.*

DWQ Response

We have considered the impacts to ground water from these projects and are confident that these permits will protect the resource. In fact, both permit modifications will result in a greater level of ground water quality protection. These ground water discharge permits are facility- and site-specific state permits that are issued to minimize the effects of potential ground water discharges on the quality and beneficial uses of ground water. Surface water discharges are regulated by the EPA-delegated National Pollutant Discharge Elimination System under UAC R317-8.

Ground water discharge permits are individual permits that are issued under the Administrative Rules for Ground Water Quality Protection (UAC R317-6) to minimize the effects of potential ground water discharges on the quality and beneficial uses of ground water. The two primary components of a ground water discharge permit are containment technology and ground water monitoring. Best available technology is used for new facilities, and discharge minimization technology is used for existing facilities to minimize the discharge of contaminants from the waste source by applying control and containment technologies such as liners, leak detection systems, leak collection systems, and pump-back systems. Ground water quality monitoring in compliance wells is used to measure the actual affect of the facility operations on ground water quality. The distance to the compliance monitoring wells must be as close as practicable to the point of discharge (R317-6-6.9A). In addition, ground water discharge permits contain compliance evaluation procedures that require an accelerated monitoring frequency to quarterly or monthly (R317-6-6.16 and R317-6-6.17). These compliance evaluation procedures are designed to verify that the contamination is real, determine the source by implementing a contamination assessment plan, and if necessary, implement a corrective action plan. Furthermore, R317-6 utilizes federal drinking water maximum contaminant levels as ground water quality standards (R317-6-2, Table 1), and ground water protection levels (R317-6-4), which are percentages of the standards based on the site- or well-specific Ground Water Class (i.e., the better the ground water quality, the more stringent the protection level). Thus, compliance monitoring wells will provide an early warning of contamination, which allows ample time to assess the source, and if necessary implement corrective actions well before beneficial uses are adversely affected.

General Comment 2*: It appears that permit conditions are based on background concentrations of groundwater. This approach seems insufficiently protective of this crucial natural resource given that Kennecott's past activities have contaminated groundwater.*

DWQ Response

"Background Concentration" is defined as the concentration of a pollutant in ground water upgradient or lateral hydraulically equivalent point from a facility, practice or activity which has not been affected by that facility, practice or activity (R317-6-1.2). A number of facilities were in operation when the Ground Water Quality Protection Rules were enacted in 1990, which prevents pre-operational background concentrations from being determined. Permits are issued for existing facilities when: 1) the applicant demonstrates that the applicable class TDS limits, ground water quality standards and protection levels will be met; 2) the monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements; 3) the applicant utilizes treatment and discharge minimization technology commensurate with plant process design capability and similar or equivalent to that utilized by facilities that produce similar products or services with similar production process technology; and, 4) there is no current or anticipated impairment of present and future beneficial uses of the ground water (R317-6-6.4C).

General Comment 3: *It appears that the classification of groundwater is based on current or recent quality, rather than pre-contamination quality of that water. This approach seems insufficiently protective of this crucial natural resource given that Kennecott's past activities have contaminated groundwater.*

DWQ Response

Please refer to DWQ Response to Comment 2 above.

General Comment 4: *The permits fail to require sufficiently frequent well monitoring. This is particularly problematic given that certain actions are triggered by consecutive permit violations. As a result, Kennecott could be in violation of its groundwater permit for a year or more before any corrective action is taken.*

DWQ Response

We respectfully disagree with your comment. Even the most mobile contaminants (non-reactive, low sorption potential, low molecular weight, high solubility) will travel as solutes through porous media at a velocity equal to or slightly less than the velocity of the ground water by advection. However, most contaminants travel at a fraction of the ground water velocity due to retardation from adsorption, which is the partitioning of the contaminant between the liquid and solid phases. Depending on site-specific hydrogeology, ground water velocities typically range from a few feet to tens of feet per year, and as required by R317-6-6.9A, the distance to the compliance monitoring wells must be as close as practicable to the point of discharge. Therefore, ground water contaminant transport will be slow enough to allow detection at the compliance monitoring wells using a quarterly or semi-annual sampling frequency. In addition, ground water discharge permits have compliance evaluation procedures that require accelerated monitoring frequency to quarterly or monthly (R317-6-6.16 and 17). These compliance evaluation procedures are designed to verify that the contamination is real, determine the source by implementing a contamination assessment plan, and if necessary,

implement a corrective action plan. Furthermore, the Utah antidegradation policy utilizes federal drinking water maximum contaminant levels as ground water quality standards (R317-6-2, Table 1), and ground water protection levels (R317-6-4), which are a fraction of the standards based on the site- or well-specific Ground Water Class (i.e., the better the ground water quality, the more stringent the protection level). Thus, compliance monitoring wells will provide an early warning of contamination, which allows ample time to assess the source, and if necessary implement corrective actions well before beneficial uses are adversely affected.

General Comment 5: *Relevant analyses identify past and apparently ongoing violations of the groundwater permits, but fail to respond in any apparent way to those violations.*

DWQ Response

Without specific examples, we cannot address this comment. However, ground water discharge permits contain compliance evaluation procedures that require an accelerated monitoring frequency to quarterly or monthly (R317-6-6.16 and R317-6-6.17). These compliance evaluation procedures are designed to verify that the contamination is real, determine the source by implementing a contamination assessment plan, and if necessary, implement a corrective action plan.

General Comment 6: *The relevant analyses, which were undertaken at some point in the past – perhaps 2009 – promise certain actions, studies and plans. Yet, the permits fail to report on completion, progress or results of these activities. Such information is critical to the public's ability to participate in the present permitting processes.*

DWQ Response

Without specific examples, we cannot address this comment. However, as indicated above in DWQ response to General Comment 5, ground water discharge permits contain compliance evaluation procedures that require an accelerated monitoring frequency to quarterly or monthly (R317-6-6.16 and R317-6-6.17). These compliance evaluation procedures are designed to verify that the contamination is real, determine the source by implementing a contamination assessment plan, and if necessary, implement a corrective action plan.

General Comment 7: *The permits contain insufficient analysis. As you are well aware, Kennecott is one of the largest mines in the world. At the same time, it is indisputable that the company's activities have severely contaminated and continue to contaminate Salt Lake Valley groundwater. Yet, DWQ's analysis of the company's groundwater permits – at least that released to the public for the purposes of the present action – is very limited. Moreover, with regard to the particular actions at issue here, the examination is extremely cursory. Particularly lacking are: 1) the results of well monitoring and/or some indication of whether the company is complying with its permits; 2) a map or maps; 3) an understanding of whether groundwater impacts surface water and if so, the results of surface water monitoring data; and, 4) actual numbers quantifying groundwater quality. The truncated treatment in the permit documents does not seem appropriate*

given the value of affected resource, historical and ongoing contamination, and the degree of public interest in Kennecott's operations.

DWQ Response

Both Public Notices were for specific modifications that represent additional monitoring or operational improvements to two existing individual permits (UGW350010 and UGW350015), which are not related. Although the public comment periods were the same for both permit modifications, this was purely coincidental. Neither of these two permits is currently up for renewal. The public notices were published to solicit comments related to the specific modifications for each of these permits. Additional information and documents pertaining to these permits are available to any person or group who requests them as required by the Government Records Access and Management Act (GRAMA). Several requests for specific documents were received during the comment period and the requested documents were provided within 24 hours of the request or sooner. Based on these requests and your comments, DWQ will assess what additional supporting documents can be made readily available on the public notice website the next time a public comment period is opened for a ground water discharge permit.

Ground water discharge permits are individual permits that are issued under the Administrative Rules for Ground Water Quality Protection (UAC R317-6) to minimize the effects of potential ground water discharges on the quality and beneficial uses of ground water. The two primary components of a ground water discharge permit are containment technology and ground water monitoring. Best available technology is used for new facilities, and discharge minimization technology is used for existing facilities to minimize the discharge of contaminants from the waste source by applying control and containment technologies such as liners, leak detection systems, leak collection systems, and pump-back systems. Ground water quality monitoring in compliance wells is used to measure the actual affect of the facility operations on ground water quality. The distance to the compliance monitoring wells must be as close as practicable to the point of discharge (R317-6-6.9A). In addition, ground water discharge permits contain compliance evaluation procedures that require an accelerated monitoring frequency to quarterly or monthly (R317-6-6.16 and R317-6-6.17). These compliance evaluation procedures are designed to verify that the contamination is real, determine the source by implementing a contamination assessment plan, and if necessary, implement a corrective action plan. Furthermore, R317-6 utilizes federal drinking water maximum contaminant levels as ground water quality standards (R317-6-2, Table 1), and ground water protection levels (R317-6-4), which are percentages of the standards based on the site- or well-specific Ground Water Class (i.e., the better the ground water quality, the more stringent the protection level). Thus, compliance monitoring wells will provide an early warning of contamination, which allows ample time to assess the source, and if necessary implement corrective actions well before beneficial uses are adversely affected.

Surface water quality is regulated by the EPA-delegated National Pollutant Discharge Elimination System under UAC R317-8.

General Comment 8: *The permits fail to focus on selenium contamination. This toxic water pollutant has been identified as a threat to Great Salt Lake waterbirds. The permit analyses also indicate that Kennecott operations are the cause of elevated levels of selenium in groundwater. Therefore, the permits must examine and regulate this toxin.*

DWQ Response

The compliance monitoring parameters in the permit (pH, total dissolved solids, cadmium, copper, and zinc) were chosen because they are key indicators of acid-mine impacts. Although selenium has been detected in South End wells, the concentrations are below Utah ground water quality standards. Generally, selenium is a byproduct of the refining and smelting processes, which do not occur on the South End.

The Statement of Basis for permit UGW350015 states that "higher TDS values correlate with proximity to the Great Salt Lake. Metals values for arsenic, selenium, and cadmium in excess of state ground water quality standards have been observed in the Principal Aquifer." This is a descriptive reference to the Principal Aquifer as a whole on the north end, not specifically under the North Concentrator facilities. There are some isolated areas in the smelter wetlands and refinery area of Operable Unit 23 of the Natural Resources Damage Claim with elevated arsenic, cadmium, and selenium concentrations. However, since 1991, ground water monitoring data from the North Concentrator permit monitoring wells, which are located downgradient of the power plant and Magna Reservoir, have not detected arsenic, selenium, and cadmium at concentrations above the Utah ground water quality standards. Therefore, the permit monitoring wells are compliant.

Comments Specific to Permit No. UGW350010: Kennecott Bingham Canyon Mine and Water Collection System

Specific Comment 1: *Although it distinguishes between the East Side and West Side waste rock dumps, the permit analysis fails to address the West Side dumps in any detail.*

DWQ Response

There is no distinction between east and west side dumps because both are located upgradient and west of the Bingham Canyon Mine Water Collection system and monitoring well network.

Specific Comment 2: *The permit continues the disturbing trend of indicating that water of poor quality will be collected and transferred eventually to Kennecott's tailings pond for discharge, untreated, into Great Salt Lake. This indicates the need to examine the entirety of Kennecott's operations in the context of water quality protection and suggests that Great Salt Lake should not be a dumping ground for contaminated water collected from other areas affected by Kennecott's operations.*

DWQ Response

We respectfully disagree with your assertion that "water of poor quality will be collected and transferred to Kennecott's tailings pond for discharge, untreated, into Great Salt

Lake". Under Utah Pollutant Discharge Elimination System (UPDES) Permit UT0000051, no water is discharged to the Great Salt Lake unless it meets permit discharge limits. Moreover, KUC utilizes an acidic water treatment system, which relies on operating KUC milling facilities, including: a) the tailings pipeline, which serves as a 17-mile plugtype treatment reactor; b) the Copperton Concentrator lime plant, which has the ability to add hydrated lime directly to the tailings line as needed; and c) the North Tailings Impoundment, which provides a repository for nonhazardous solid treatment residuals within a much larger mass of tailings. While not necessarily apparent or conventional, the addition of the collected or pumped water to the tailings line and transportation along the 17-mile pipeline does impart treatment to the waters. Excess calcium carbonate reacts with the low pH waters and chemical reactions and changes do occur. Additional information on water treatment is available at the following URL: http://www.kennecott.com/library/media/Final%20SE%20GW%202010%20Annual%20Report%20Final.pdf. While not necessarily apparent or conventional, the addition of the collected or pumped water to the tailings line and transportation along the 17-mile pipeline does impart treatment to the waters. Excess calcium carbonate reacts with the low pH waters and chemical reactions and changes do occur. Other permits address the quality of the water as it reaches the north end tailings (Ground Water Discharge Permit UGW350011 for the tailings impoundment), and potential surface discharge to the Great Salt Lake under UPDES Permit UT0000051.

Specific Comment 3: *The permit analysis fails to explain why permit limits have not yet been established for the Dry Fork compliance wells. Plainly, some monitoring must be in place to protect groundwater in this area. Moreover, DWQ relies on the existence of monitoring wells in the Dry Fork area to defend its permitting decision.*

DWQ Response

Tables 1 and 2 for permit UGW350010 summarize the compliance monitoring wells, parameters, and compliance limits. Note # 11 of Table 2, Bingham Canyon Mine Dry Fork Compliance Wells, states "Permit limits have not been assigned for the three Dry Fork wells (ECG2789A&B and K93). Permit limits for these wells will be based upon 12 quarterly samples collected after the wells have been re-established. The existing wells in these locations will be sampled semi-annually until they are abandoned." At the end of the accelerated monitoring period, permit limits will be set in accordance with UAC R317-6-4.

Specific Comment 4: *The permit fails to include limits on selenium.*

DWQ Response

The compliance monitoring parameters in the permit (pH, total dissolved solids, cadmium, copper, and zinc) were chosen because they are key indicators of acid-mine impacts. Although selenium has been detected in South End wells, the concentrations are below Utah ground water quality standards. Generally, selenium is a byproduct of the refining and smelting processes, which do not occur on the South End.

Specific Comment 5: *The permit analysis does not provide an update to Kennecott's efforts to date and does not identify the source of groundwater to establish whether wells*

are showing historic or recent contamination. Plainly, such analysis is of critical importance to protecting groundwater from recent and current activities. Moreover, any studies must be completed as soon as possible so that any necessary corrective measures can be implemented quickly.

DWQ Response

Ground Water Discharge Permit UGW350010 was issued to KUC on May 1, 1999 and renewed on March 15, 2005, and again on March 15, 2010. As required by the permit, KUC submits quarterly compliance monitoring reports for the Bingham Canyon Mine and Water Collection System monitoring. These reports are available in accordance with GRAMA. Forty-five (45) compliance wells are monitored and thirty six (36) of these wells are located along the Eastside Collection System, while nine (9) wells are located in the Bingham Canyon/Dry Fork area. The quarterly compliance monitoring reports discuss in great detail any trends associated with ground water monitoring wells that are in probable out-of-compliance or out-of-compliance status with respect to compliance limits established for the permit. In addition, KUC submits an annual operational report as required by the permit, which provides the results of operational monitoring and analyzes the trends in these data. These reports are also available in accordance with GRAMA. The annual report focuses on the operational monitoring sites including sumps, seeps, tunnels, and collected flows reporting to the cutoff walls within the water collection system. Compliance sites have been closely monitored and evaluated for over ten years and compliance limits have been established for all compliance wells, except in the case of Dry Fork, where an accelerated monitoring program has recently been completed to establish compliance limits.

In 1999, KUC began to reduce the amount of leach water being applied to the east and west side waste rock dumps, and all leach water application was terminated in 2000. Prior to this time, approximately 28,000 gallons per minute (gpm) of active leach water was being applied to the waste rock dumps. As expected, water flows at downgradient collection sites decreased dramatically after leaching operations were terminated in 2000. Meteoric precipitation, spring run-off resulting from snow melt, and residual drain down are the major contributions to flow as measured at the cut-off walls. In 2010, the mean flow from the entire Eastside Collection System including the Bingham Canyon cut-off wall was 1,060 gpm. The Bingham Canyon cut-off wall contributes about 40% of the total flow collected along the east side collection system, which is about 400 gpm. Additional studies have been completed to address the question of historic versus ongoing contamination. Specifically, “Evaluation of Geochemical and Isotopic Techniques for Assessing the Performance of the Eastside Collection System” (May 2001), and “Contaminant Transport and Distribution in the Vicinity of the Eastside Waste Rock Dumps and the Eastside Collection System, Bingham Canyon Mine” (February 2002) address this issue among others. The first report shows that contamination east of the upgraded collection and cutoff walls is from KUC, as one would expect. It does not clearly show when or how the contamination arrived east of the fairly new and upgraded collection system. The second report provides a much more convincing explanation and description. In particular, the report notes that generally, contamination east of the collection system and cutoff walls decreases with depth. This is the complete opposite of

what one would expect for contamination originating from an ongoing bedrock source, which is the only other likely source. Also, the reports note and describe operations prior to the installation of the upgraded collection system and cutoff walls. The general practice at the time was to contain collected leach water in unlined ponds in several of the drainages south of Bingham Canyon. In essence these unlined ponds acted as "mini" Bingham Canyon reservoirs and reasonably demonstrated that the existing contamination was from past practices and that generally, contamination east of the collection system would stabilize and decrease with time.

Specific Comment 6: *Although it references annual groundwater reports, DWQ fails to make these readily available to the public. Without this information, the public is not in a position to comment on the proposed actions in a meaningful and well informed manner.*

DWQ Response

Under the heading "Further Information" of the Public Notice, it states: "Additional information may be obtained upon request by calling Dan Hall at (801) 536-4356 or by writing the aforementioned address." Public documents pertaining to Kennecott's permits are available to any person or group who requests them under the Government Records Access and Management Act (GRAMA). No requests for these documents were received. However, based on your comments, DWQ will assess what additional supporting documents can be made readily available on the public notice website the next time a public comment period is opened for a ground water discharge permit.

Specific Comment 7: *The permit analysis discussion of the SXEW Plan is extremely limited and fails to inform the public of the potential impacts of the project on ground and surface water. As this is a new process, all care must be taken to ensure that water quality is protected. Indeed, the analysis fails to discuss the ultimate fate of any waste water which may result from the proposed process. Again, we are deeply concerned that this water may be destined for Great Salt Lake.*

DWQ Response

The solvent extraction electro-winning (SXEW) process is not new. The permit has allowed for this type of operation since its inception. The modification is for a pilot test to determine certain operating parameters of the process. KUC requested a permit modification to construct an entirely new double synthetic liner system with leak detection, which meets best available technology standards. This liner system with leak detection will be constructed on top of the currently approved and lined facility. The location of this facility is well up-gradient of the currently existing leach collection system and monitoring well network. As proposed, engineered and when properly constructed under DWQ construction permitting authority, the facility is not anticipated to have any adverse impacts on ground water.

Comments Specific to Permit No. UGW350015: Kennecott Power Plant and Historic North Concentrator

Specific Comment 8: *The permit analysis admits that Kennecott operations, including its coal ash storage, are contaminating groundwater. Yet, the permit and its attendant Statement of Basis fail to explain what steps are being taken to address this problem. Indeed, there is no information or explanation that ties the proposed replacement of the water reservoir to impacts on groundwater. The reader is left puzzled about the purpose of the project.*

DWQ Response

There is no indication from compliance monitoring wells that the North Concentrator facilities are contaminating ground water. In addition, there is no coal ash storage on the ground. Furthermore, there are no known impacts to groundwater from the old Magna Reservoir. In fact, the Magna reservoir replacement and upgrade projects will result in an improvement in best available technology, which will be more protective of the quality and beneficial uses of ground water. The Statement of Basis states the following regarding the purpose of the project: "Kennecott has replaced the Magna Process Water Reservoir, an integral component of the water circuit that recycles water from the Tailings Impoundment to the Copperton Concentrator."

Specific Comment 9: *The permit analysis fails to provide the ultimate fate of the water collectedly* [sic] *in the Magna Reservoir. We are particularly concerned that that water may ultimately be discharged into Great Salt Lake via Kennecott's tailings discharge. Plainly, DWQ must examine and explain to the public whether Kennecott's proposal will further impact surface water and, if so, how water quality standards and beneficial uses will be maintained.*

DWQ Response

Water is pumped from the Tailings Impoundment to the Magna Reservoir for storage, then to Copperton for recycling. There is no discharge to the Great Salt Lake from any facility in the North Concentrator permit. KUC's permitted discharge points to the Great Salt Lake are regulated under UPDES Permit UT0000051.

KUC is replacing the Magna Reservoir with a new reservoir constructed with best available technology, which includes a double synthetic liner system with leak detection. In addition, the existing reservoir is being retrofitted with the same best available technology using a double synthetic liner system with leak detection. Therefore, the Magna reservoir replacement and upgrade projects will result in an improvement in best available technology, which will be more protective of the quality and beneficial uses of ground water.

Specific Comment 10: *The permit analysis admits impacts from Kennecott's operation to surface water via groundwater. However, DWQ does not review these impacts or explain how water quality standards and beneficial uses will be maintained.*

DWQ Response
The Statement of Basis does not state that surface water is affected by impacts from ground water. It does state that there are springs sourced by the bedrock and principal aquifer, and that UPDES permit UT0000051 exists for discharge to the Utah-Salt Lake Canal.

Specific Comment 11: *The permit analysis concedes that water quality in the Principal [sic] Aquifer exceed standards. Yet, DWQ does not require any actions to address this significant issue and does not explain how these exceedances may impact surface water.*

DWQ Response
The Statement of Basis for Permit UGW350015 states that "higher TDS values correlate with proximity to the Great Salt Lake. Metals values for arsenic, selenium, and cadmium in excess of state Ground Water Quality Standards have been observed in the Principal Aquifer." This is a descriptive reference to the Principal Aquifer as a whole on the north end, not specifically under the North Concentrator facilities. There are some isolated areas in the smelter wetlands and refinery area of Operable Unit 23 of the Natural Resources Damage Claim with elevated arsenic, cadmium, and selenium concentrations. However, since 1991, ground water monitoring data from the North Concentrator permit monitoring wells, which are located downgradient of the power plant and Magna Reservoir, have not detected arsenic, selenium, and cadmium at concentrations above the Utah Ground Water Quality Standards. Therefore, the permit monitoring wells are compliant.

Specific Comment 12: *The permit analysis failed to indicate how the limits on boron will protect groundwater quality.*

DWQ Response
Boron is a potential contaminant of coal combustion waste that may impact ground water quality. As with any other compliance monitoring parameter, boron ground water quality data will be used as an indicator of potential impacts to ground water from process water management.

IVAN WEBER
Initial comments were received via email at 9:40 AM on June 28, 2011.

Initial Comments: *No one will object to lining the Magna Reservoir; what would be great would be to show it on a map (Magna Reservoir), together with the major pipelines connecting to it. It's one thing to call it a systems "hub," but that's a bit meaningless if we aren't allowed a view of how it functions in the interchange of contamination loads from South to North zones, leading to some rate of discharge to the GSL. The only information I was able to find online was in the North and South RODs of 2001-02, preceding the Joint Settlement Agreement. In interests of forthrightness, a flow diagram, showing management variations as KUC encounters high-water conditions like the present, as well as low-water episodes, would make it so very much more clear.*

DWQ Response
Under the heading "Further Information" of the Public Notice, it states: "Additional information may be obtained upon request by calling Ed Hickey at (801) 536-4357 or by writing the aforementioned address". Public documents pertaining to Kennecott's permits are available to any person or group who requests them under the Government Records Access and Management Act (GRAMA). Several requests for specific documents were received during the comment period and the requested documents were provided within 24 of the request or sooner. Based on these requests and your comments, DWQ will assess what additional supporting documents can be made readily available on the public notice website the next time a public comment period is opened for a ground water discharge permit.

Below are additional comments received via email at 11:29 AM on July 11, 2011.

Introductory Comments: *Please consider the following comments on the two Kennecott Utah Copper ("Kennecott") ground water discharge permits currently subject to public comment, and please also consider the portion of these comments directed at the regulatory connections of the two 'zones,' which we contend should be recognized as integral parts of a single industrial facility.*
We wish to urge careful consideration, also, of the comments submitted by Friends of Great Salt Lake, and by Earthworks.
In the narrow sense, both permits appear to be responsibly considered in many respects, representing significant improvements in some system elements over the last 10-15 years. Many measures instituted in the Bingham Creek and Dry Fork areas are particularly gratifying for their probable assurance of ground water protection. We are grateful that closure planning is being imposed on the South Zone permitting process, and we hope that the plan will be rigorously developed, executed and enforced, with appropriate financial assurance mechanisms to back it up (i.e., bonds).

DWQ Response
DWQ has carefully considered all of the comments received during the 30-day public comment period, and has granted a two-week extension as requested. We appreciate the time and effort it takes to prepare and submit comments and agree with you statement that "both permits appear to be responsibly considered in many respects, representing significant improvements in some system elements over the last 10-15 years".

With respect to closure planning, the Administrative Rules for Ground Water Quality Protection (UAC R317-6) do not include provisions or requirements for financial assurance (i.e., bonding) for ground water discharge permits or closure plans. In the particular case of KUC, DWQ is relying upon other agencies and their authority for cleanup and bonding. In particular, the Utah Department of Natural Resources (DNR) Division of Oil, Gas and Mining (DOGM) has statutory authority for mine reclamation and financial assurance. In addition, both the North and South End of KUC have ongoing corrective actions for historic mining contamination under the Utah Division of Environmental Response and Remediation (DERR) and their Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) branch, and a Utah Natural Resource Damage Claim (NRDC), which has financial assurance

mechanisms for long term operation and maintenance of ground water remediation systems and contaminant source control structures. Also, in accordance with R317-6-6.3(S), KUC has a closure and post closure management plan demonstrating measures to prevent ground water contamination during the closure and post closure phases of operation. This plan is contained in Appendix D of permit UGW350010 titled Water Management and Reclamation Plan, and is a joint closure plan with DOGM.

General Comment 1: *The 'Cornerstone' mine expansion, and the capacity of the water management system to contain , monitor and correct for long-term escalation of acid mine drainage products, particularly selenium travelling* [sic] *through the leach water, tailings and process system, ultimately destined for the Great Salt Lake. Does the system offer capacity to handle worst-case scenarios of water management, such as in the Dry Fork area, in the tailings Return Canal, and in selenium management in event that Lake ecosystem monitoring reveals that wildlife damage is occurring?*

DWQ Response

Neither of the subject permit modifications in the public notices for permit UGW350010 and UGW350015 is related to the KUC Cornerstone expansion project. To date, DWQ has not received any formal submittals, engineering plans or specifications, or permit modification requests relating to the Cornerstone project. The two subject permit modifications are not related and the fact that the public notices were published at the same time was purely coincidental.

General Comment 2: *Seismic stability of most elements of the system, including waste rock dumps relative to leach water interception cutoff walls and leach water conveyance pipelines , reservoirs at both South (especially Large Bingham Reservoir and Magna Process Water Reservoir), Tailings Pipeline, and the Magna Tailings Impoundment (all phases). What assurances exist that seismic activity on the Oquirrhs Fault and/or the Wasatch Fault will not cause waste rock dumps, reservoirs, tailings line, and the tailings impoundments, themselves, to fail?*

DWQ Response

Under UAC R317-6-6.2A.20, pipelines, such as the tailings pipeline, are permitted by rule. Seismic concerns for the waste rock dumps, reservoirs, and tailings impoundment are regulated by other agencies. In regard to the mine waste dumps, DOGM rules require that mine dumps be maintained in a "safe and stable" manner. The tailings impoundment and reservoirs are regulated by Dam Safety in the Utah DNR Division of Water Rights. The state engineer has the authority to regulate dams for the purpose of protecting public safety and dams are classified according to hazard, size, and use. The dam inventory gives the identification, location, construction parameters, and the operation and maintenance history of the dams in Utah. Specific dam safety information for these facilities is available at http://www.waterrights.utah.gov/daminfo/default.asp.

General Comment 3: *Wildlife endangerment throughout the system, primarily through exposure of migratory waterfowl to contaminated water in reservoirs and ponds, counterpoised to the almost complete lack of availability of fresh water for the entire*

extent of the Oquirrh Mountains east flank. How are birds and other wildlife being protected from contaminated water exposures? We offer the observation that they are not. This is not only ethically reprehensible, but flatly illegal. 'Takings' should be rigorously monitored, and an accounting charged to Kennecott for wildlife deaths caused by poisoned water, and lack of fresh water caused by mining activities.

DWQ Response

The purpose of the Ground Water Discharge Permit is to protect ground water quality and beneficial uses by applying best available technology (BAT) for new facilities and discharge minimization technology (DMT) for existing facilities to minimize discharge of pollutants and to verify the effectiveness of the BAT and DMT by ground water quality compliance monitoring. DOGM and its sister agency, the Division of Wildlife Resources, have the regulatory authority to protect wildlife. Please contact Paul Baker, Minerals Program Manager in DOGM at (801) 538-5261 for more information.

General Comment 4: *As a subset of wildlife concerns, the exchange of selenium between South and North has engineered into a single, intricate and almost inscrutable system, obfuscating selenium releases through multiple outfalls. We request an accounting of selenium releases through mass balance analysis, integrating all sources, and revealing the full extent of past, deliberately engineered evacuation of the North selenium plume below the Refinery, in addition to releases known or suspected through the Tailings Impoundments.*

DWQ Response

The compliance monitoring parameters in the permit (pH, total dissolved solids, cadmium, copper, and zinc) were chosen because they are key indicators of acid-mine impacts. Although selenium has been detected in South End wells, the concentrations are below Utah ground water quality standards. Generally, selenium is a byproduct of the refining and smelting processes, which do not occur on the South End.

The Statement of Basis for permit UGW350015 states that "higher TDS values correlate with proximity to the Great Salt Lake. Metals values for arsenic, selenium, and cadmium in excess of state ground water quality standards have been observed in the Principal Aquifer." This is a descriptive reference to the Principal Aquifer as a whole on the north end, not specifically under the North Concentrator facilities. There are some isolated areas in the smelter wetlands and refinery area of Operable Unit 23 of the Natural Resources Damage Claim with elevated arsenic, cadmium, and selenium concentrations. However, since 1991, ground water monitoring data from the North Concentrator permit monitoring wells, which are located downgradient of the power plant and Magna Reservoir, have not detected arsenic, selenium, and cadmium at concentrations above the Utah ground water quality standards. Therefore, the permit monitoring wells are compliant.

General Comment 5: *RO treatment concentrates are still directed through the tailings pipeline to the tailings impoundments, to the likely detriment of the Great Salt Lake, the ultimate receiving body. In effect, this action relocates the worst mining-contaminated*

ground water known directly into the tailings impoundment, from which some of the most ecologically dangerous constituents make their way to the Great Salt Lake. This remains the most objectionable consequence of the 2004 Joint Settlement Agreement of the Kennecott Ground Water 'Southwest Jordan Valley Project' Natural Resource Damage Claim. It is the most direct result of the regulatory lack of regard for the Great Salt Lake's ecological integrity.

DWQ Response

Under Utah Pollutant Discharge Elimination System (UPDES) Permit UT0000051, no water is discharged to the Great Salt Lake unless it meets permit discharge limits.

General Comment 6: *Long-term, post-mining ramifications and impacts must be thought through, and effective countermeasures and 'institutional controls' implemented, guarding against the consequences of major, likely forces of system degradation. In addition to seismic forces, climate change must be considered. The 2003 'Preparing for a Changing Climate: Rocky Mountain/Great Basin Region' report, issued by Utah State University as one of national coverage analyses by the Climate Assessment teams around the country (available on request from our files, if you can't locate it), indicates that increased precipitation is likely, with general loss of snowpack in the high country due to dramatically rising winter temperatures. Given that the Oquirrhs are not a drinking water source, directly, this may be beneficial to Kennecott water management except during severe precipitation events. The amplitude of change from wet periods to drought is projected to be greater than the range of historical variability, with possibilities ranging from much higher Lake levels than observed in the period of historic human occupation, to prolonged episodes of severe drought and Lake level decline. The implications of each extreme must be considered in the water management future of Kennecott's closure --- even possible combinations of effects, such as a seismic event during exteme* [sic] *high Lake levels. We see no sign that DWQ and Kennecott have given this set of possibilities, now appearing increasingly probable, any thought whatsoever.*

DWQ Response

In accordance with R317-6-6.3(S), KUC has a closure and post closure management plan demonstrating measures to prevent ground water contamination during the closure and post closure phases of operation. This plan is contained in Appendix D of permit UGW350010 titled Water Management and Reclamation Plan and is a joint closure plan with DOGM. Although the Administrative Rules for Ground Water Quality Protection (UAC R317-6) do not include provisions or requirements for financial assurance (i.e., bonding) for ground water discharge permits or closure plans, DWQ is relying upon other agencies and their authority for reclamation bonding and cleanup. In particular, Utah DOGM has statutory authority for mine reclamation and financial assurance. In addition, both the North and South End of KUC have ongoing corrective actions for historic mining contamination under the Utah Division of Environmental Response and Remediation (DERR) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and a Utah Natural Resource Damage Claim (NRDC), which has financial assurance mechanisms for long term operation and maintenance of ground

water remediation systems and contaminant source control structures. If this year is any guide for heavy precipitation events, the containment structures should have no problem. Despite a heavy snowpack and the three wettest months on record KUC did not report any problems with the eastside collection system.

General Comment 7: *Above all, we contend that the two permits are inseparable, due to the strategic mixing of contaminants of concern (CoCs) from both South and North in the unified Kennecott water management and discharge system. We will further contend that Kennecott, subject to erroneous past regulatory consent of Utah Division of Water Quality (DWQ) and EPA Region 8, conducts water system management in such a manner inevitably to damage and degrade the Great Salt Lake's globally significant ecosystem.*

DWQ Response

DWQ acts within its statutory authority and associated rules to protect waters of the state by issuing surface and ground water discharge permits. Ground water discharge permits are individual permits that are issued under the Administrative Rules for Ground Water Quality Protection (UAC R317-6) to minimize the effects of potential ground water discharges on the quality and beneficial uses of ground water. The two primary components of a ground water discharge permit are containment technology and ground water monitoring. Best available technology is used for new facilities, and discharge minimization technology is used for existing facilities to minimize the discharge of contaminants from the waste source by applying control and containment technologies such as liners, leak detection systems, leak collection systems, and pump-back systems. Ground water quality monitoring in compliance wells is used to measure the actual affect of the facility operations on ground water quality. The distance to the compliance monitoring wells must be as close as practicable to the point of discharge (R317-6-6.9A). In addition, ground water discharge permits contain compliance evaluation procedures that require an accelerated monitoring frequency to quarterly or monthly (R317-6-6.16 and R317-6-6.17). These compliance evaluation procedures are designed to verify that the contamination is real, determine the source by implementing a contamination assessment plan, and if necessary, implement a corrective action plan. Furthermore, R317-6 utilizes federal drinking water maximum contaminant levels as ground water quality standards (R317-6-2, Table 1), and ground water protection levels (R317-6-4), which are percentages of the standards based on the site- or well-specific Ground Water Class (i.e., the better the ground water quality, the more stringent the protection level). Thus, compliance monitoring wells will provide an early warning of contamination, which allows ample time to assess the source, and if necessary implement corrective actions well before beneficial uses are adversely affected.

Under Utah Pollutant Discharge Elimination System (UPDES) Permit UT0000051, no water is discharged to the Great Salt Lake unless it meets permit discharge limits. DWQ is confident that the ground water and surface water discharge permits protect waters of the state.

Background Overview:

Because the Great Salt Lake ecosystem, rather than human health exposures, constitutes the primary set of environmental concerns for the Kennecott water 'system,' and because both Kennecott and DWQ assume the environment to be a static constant, this intricate system of water management is not truly complete. It has come into existence as a series of relatively minor (though hardly inexpensive, in some parts) adjustments and improvements of pre-existing system elements. Throughout, the highest objective appears to have been minimizing liability for the company, as opposed to acting for the environmental welfare of surrounding communities, including ecosystem communities and wildlife.

Contaminants we see to be of greatest concern, therefore, are those known to threaten wildlife directly and indirectly, and through cumulative effects.

Among CoCs found in Kennecott's effluent waters, those most hazardous to wildlife are elements and compounds that damage food chain and reproduction, or that cause mortality. Nearly the entire catalog of toxic metals present in Kennecott's acid mine drainage, acid/metals ground water contamination, and effluents from smelting and refining must be considered on this extensive list, arguably one of the world's most severe and extensive known to environmental science and industrial practice: Aluminum, Arsenic, Cadmium, Cobalt, Chromium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, Tellurium, Uranium, Vanadium, Zinc. Others, including magnesium, potassium, sodium and their salts, characteristic of Great Salt Lake native chemistry, are present in significant quantities, but are of less or no concern because of their resemblance to Lake water constituents.

Selenium rises to the top of this list of CoCs, due to its widely recognized causing of 'teratogenic effects' (embryo deformation) and reproductive failures of various sorts, as well as for its tendency to remain soluble and mobile through a wide pH range. This is not to diminish the negative impacts of arsenic and other toxics that may share this mobility, but rather, to recognize the fact that Kennecott's selenium emanates from multiple segments of the mining process, is of high oxidation state, and consequently is not readily reduced, precipitated, adsorbed or likely to be biogeochemically immobilized. Selenium as selenate (Se+4 oxidation state) is 'indifferent' to pH changes, once brought into existence. Selenate is a Kennecott signature contaminant, occurring in the following segments of the mining process:

- *Leach water from waste rock breakdown by iron oxidizing bacteria, and likely in acidified zones of the Magna Tailings Impoundment where older tailings contained higher quantities of pyrite minerals than later, more thoroughly processed materials;*
- *Acid/metals-rich ground water in the South Zone, down-gradient of the Mine's vigorous leach water areas, and possibly in acid-forming zones of the tailings impoundment;*
- *Reverse osmosis (RO) concentrates discharges, first from the Bingham Creek Water Treatment RO Plant near Copperton, the result of separating 'source water' for human use from contaminants in the Zone A acid/metals laded ground water contamination plume; and second, from the Jordan Valley Water Conservancy District's RO plant, which will commence treatment of Kennecott's*

Zone B sulfate plume in South Jordan, roughly under the Daybreak development. This latter source seems s about to commence discharges through the new 21-mile pipeline built from the RO plant directly to the Great Salt Lake. Each is a huge source of selenium, though possibly of different selenium species (selenite, in the case of the JVWCD plant's concentrates).

- *Acidic/electrolytic slimes from Refinery copper purification at the North, where a portion of selenium is captured for commercial markets, and the huge selenium-specific ground water plume in the Garfield area apparently caused by negligent past contaminated waters management ('dumping') at the Refinery.*

Selenate is one of the most mobile constituents of mining-contaminated water, defying removal except by bacterially mediated reduction, or a combination of biological reduction with filtration or other inorganic reduction. This bacterial reduction completes the circle begun with bacterial oxidation. Even the much-vaunted 'tailings line treatment' process proposed in the mid-1990s by Shepherd Miller, does not constitute 'treatment' by the measure of selenate, since it offers little reduction of selenium content to a removable form. The Shepherd-Miller report, itself, acknowledges that neither selenium nor arsenic are significantly removed by mixing with tailings. Manganese may also be expected to pass through substantially. To be sure, acidity may be decreased by 'tailings treatment,' and most other metals compounds may be adsorbed or precipitated , regardless whether the mixing of RCRA toxics into Bevill-exempt wastes (tailings) is legal or not. For selenium, specifically, passing through the tailings pipeline and impoundment <u>does not constitute treatment</u>. Selenium is the contaminant of greatest concern for the Great Salt Lake. Kennecott has created a complex system of sources, which are institutionalized in the water management system that is the subject of these two permits, assuring ongoing, and apparently permanent, selenium mass release into the Great Salt Lake.

Kennecott and DWQ could instead have proceeded from realization of the Great Salt Lake's vulnerability and sensitivity to selenium pollution, devising a water management system that removes selenium from the contaminated water stream. This has been demonstrated to be technologically feasible by a number of variations on biological reduction, followed by one or another form of filtration. Selective removal of selenium is only one of several possible 'materials recovery' strategies that can provide economic returns to defray costs of treatment. It must be clearly understood that the benefit is both ecological and regulatory; evaluation of treatment options must integrate all these benefits, and weigh them against the value of risks, including that to the Great Salt Lake.

The fact also remains that metals retained in tailings have been relocated from leach water and ground water into the tailings impoundments, proximate to the Great Salt Lake and, therefore, ecologically in harm's way. If old tailings, containing sufficient pyrite to become acidic do, in fact, acidify, then 'treatment' can be reversed, and tailings pore water can re-dissolve the full catalog of metals. This fact is reprehensible, and should be subject to deeper scrutiny before it is continued. Instead of a potential Superfund ground water contamination occurrence at South and North, we may now face a single Superfund-scale contamination accumulation in the tailings impoundments.

To recapitulate for emphasis, selenium originates from the Kennecott mining-beneficiation process at the following stages, from leach water at surface, from ground water consequences of 'fugitive' leach water, and from post-refining processing of electrolytic 'slimes' produced from copper purification:

- *Waste rock, rich in iron pyrite variants and an exhaustive catalog of sulfide minerals, is attacked by iron-oxidizing bacteria (Thiobacillus ferrooxidans and other related species) in the presence of oxygen and moisture, to form 'acid mine drainage' ('acid rock drainage' among the sensitive) in Kennecott's leach water, which is intensely loaded in Kennecott's leach waters with sulfate and highly oxidized selenium, as selenate. It is hardly surprising that Kennecott's world's largest copper mine would also create a proportionally immense selenium and acid mine drainage source. Ground water contamination was loaded with acidic/metals concentrated leach water from the beginnings of waste rock accumulation and consequent acid mine drainage, infiltrating alluvial soils. Multiple sources of acid mine drainage contributed to ground water contamination plumes:*
    - *Large Bingham Reservoir, which was 'improved' in 1964-65 by construction of a dam, but without any liner in the large (estimated 1500 to 2000 acre-feet) basin. This basin is generally acknowledged to have leaked between one million gallons and seven million gallons per day for more than 27 years, from 1964 through 1991, a period useful to view as about 10,000 days. This intensely contaminated water, therefore, penetrated into the aquifer, contributing between 10 billion gallons and 70 billion gallons of unprecedented mining water contamination --- from the Large Bingham Reservoir, alone.*
    - *Midas Creek area, both from the enormous East Rail Dumps and from faults in the relatively primitive leach water conveyance system that existed prior to cutoff wall and pipeline modernization of the 1990s. In other words, for the 70 years or so between the discovery of deliberate waste rock leaching and copper recovery enhanced by massive sulfuric acid dumping on the East Side waste rock dumps (see reference, Brierley article from Scientific American, 'Microbiological Leaching'), the entire east-side dumps system made up partly by design one of the world's largest sources of mine leach water and acid/metals ground water contamination, focused predominantly through the Large Bingham Reservoir, Bingham Creek and Midas drainages.*
    - *Keystone and the Lark area, in the skarn geological contact zone between the porphyry (volcanic/igneous) ore body and the limestone host rock to the south, included the Bingham Tunnel, Mascotte Tunnel and other underground mining operations of the decades preceding their supersession by the open pit mining operation. Although most of the mines that preceded Kennecott's Bingham Pit were pursuing silver, lead and zinc, the primary minerals were sulfides. These sulfides were susceptible to acid forming iron-oxidizing bacteria, just as were the chalcopyrite family typical of the porphyry targeted in the open pit.*

Overburden and tailings from these earlier mines, particularly around Lark, contributed significantly to the acid/metals plumes on Bingham's east flank.

- *Leach water collection from the south area waste rock dump drainages northward. This collection system was impressively replaced in the early 1990s, by installing substantial concrete 'cutoff walls' with HDPE pipelines dedicated to separated leach water and storm water conveyance flows. The previous clay- and concrete-lined canal system was perforated with joints and flaws, built in an age that was not equipped to make these materials serve the purpose of true, responsible containment. They leaked like sieves throughout their extent. Given the extreme toxic metals and sulfate load in waters carried in these canals, and given their pervasive flaws, it is not surprising that their contamination contribution to ground water is notable, showing up in the mapping of subsurface water contamination.*
- *Canals and conveyance elements in and around Bingham Creek, below the Large Bingham Reservoir. None of the canals was "lined" to standards that would be recognized today as 'best available technology.' They leaked freely, many of them depositing tailings, precipitates and evaporates copiously. Although solids were cleaned up very thoroughly during the Bingham Creek cleanup projects of the early 1990s, these solids contributed to ground water contamination for decades (at least 1934 into the late 1980s, and more chaotically prior to the 1930s commissioning of the South Jordan Evaporation Ponds).*
- *South Jordan Evaporation Ponds, a complex of 33 ponds covering more than two square miles in what is now South Jordan City's municipal area, where the Daybreak development is taking shape. Although the water 'evaporated' and infiltrated during the evaporation ponds term of operation was episodically lime-neutralized to varying degrees, selenium travelled freely through this system, 'indifferent' to pH modification. It is important to realize that inorganic pH modification has little effect on selenate; only biological reduction, through sulfate-reducing bacterial mediation can change selenate to selenite (Se+2) or 'ground state' elemental selenium, which may be precipitated or adsorbed.*
- *North Zone selenium, down gradient from the Refinery area, has a very large selenium ground water contamination plume, which fed springs in the Garfield area with high selenium water. It is understood that this water has been pumped directly to the Great Salt Lake for many years through an unpermitted, dedicated pipeline extending out into the Lake approximately one mile, discharging water mixed for dilution purposes with other selenium-containing water from Tooele County. The Garfield Wetlands plume may be one of the largest selenium contamination occurrences known anywhere, with concentrations several orders of magnitude higher than permissible, and additional orders of magnitude higher than would be ecologically tolerable. Whether the plume is being reduced by pumping into the Great Salt Lake or into the tailings system, as*

may be the case with selenium byproduct water from the Refinery, ultimately it is likely to pass into the Great Salt Lake. This constitutes an enormous concern for the Lake ecosystem, particularly for the fate of migratory bird populations --- many of them threatened, and dozens of them on the list of those species protected by the Migratory Bird Treaty Act of 1918.

Permit Geography: *By segmenting permits, rendering the Kennecott water system discontinuous, it is therefore made not subject to adequate monitoring or any other kind of environmental, regulatory accountability. "South" and "North" are artificial constructs, obfuscating the tracking of water contaminants, or even through the suspect mechanism of State environmental discharge permits. The process water management system is a single system, with the Magna Process Water Reservoir as its operational 'hub.' The permit should be revised to reflect this reality, to establish protection of the Great Salt Lake as its highest priority, and to enforce the mechanisms and best practices to assure protection of the Lake from selenium, arsenic and other CoCs. Sampling and monitoring in the Lake, according to forensic geography found to be necessary for this adjusted set of environmental objectives, must be instituted to assure that CoC mass transport to the Lake is not happening, and will never occur from Kennecott's operations --- never.*

Leach water will form forever, wherever pyrite minerals are exposed to degradation by air, water and iron-oxidizing bacteria can reach them. We appreciate the post-closure plan emphasized in the South Zone permit, but will anticipate expansion of its effectiveness by stimulating Kennecott to account for long-term changes described herein, and which may arise as the years pass (e.g., wildfire prevalence in climate change scenarios may denude hillsides, making them vulnerable to flashflood, mudslides and massive silt transport and erosion). The very long term leaching of sulfide waste rock and tailings must be conceptualized as possibly lasting for millennia, certainly for centuries, constituting a barrier to constructive reuse of affected Oquirrh Mountains areas that may otherwise be attractive for recreational, open space, wildlife habitat, and even urban development uses. Creation of clean water resources in these mountains can restore ecological processes, especially habitat values for diverse wildlife, and add value not only to the mountains, but also to adjacent communities such as those on the West Side, if not to the entire region. Like air quality impacts of the Mine, Power Plant and Smelter, leach water is a palpable constraint to sustainable growth on the Wasatch Front --- another cancer on the healthfulness of our region. Restraining acid formation, and ultimately suppressing it entirely, should be a top priority of Kennecott and DWQ.

South Zone – Specific Comment 1: *The present South Zone permit, UGW350010, is ostensibly only for the purpose of evaluating the 'pilot heap leach pad' for SX/EW (solvent extraction/electro-wining, the technological successor to the cementation process employed for many decades at Kennecott. Cementation has been replaced more or less universally throughout the copper mining industry with SX/EW. Kennecott is one of the curious holdouts to use the earlier, more primitive cementation technology in its Copperton 'precipitation plant' for many decades. There are likely to be few objections to a responsibly lined leach pad for SX/EW, compared to the irresponsibly reckless prior*

approaches to copper recovery from acid/metals laden leach waters. The integrity of this 'liner,' however, is subject to question, requiring strict construction standards and monitoring. The monitoring wells described in the permit appear formidable, but there's not a good replacement for a competent liner system underlying the SX/EW pad.

DWQ Response

KUC requested a permit modification to construct an entirely new double synthetic liner system with leak detection on top of the currently approved and lined chalcopyrite heap leach pilot test facility. KUC has stated that the purpose of the chalcopyrite heap leach pilot is for determination of relevant controlling chemical parameters to maximize copper extraction. They have also stated that they chose this site because it has containment structures (cutoff walls, monitoring wells and a currently lined and permitted facility) to which they offered the additional containment of a new double lined system with leak detection. At no time has KUC indicated that they intend to use this process at Bingham Canyon Mine to replace the previous leaching process. DWQ considers the cessation of active leaching at the Bingham Canyon Mine to be a major and irreversible source control feature of the Bingham Canyon Mine and Water Collection System permit (UGW350010). Prior to the cessation of active leaching KUC was regularly circulating 25,000 to 30,000 gpm of very high TDS, low pH water. Currently KUC is collecting approximately 500 to 800 gpm of low quality water, which is much better quality compared to when active leaching was occurring, and several hundred gallons of the total are from capture of subsurface water at the Bingham Creek cutoff wall. The amount of captures varies due to seasonality.

DWQ agrees that monitoring wells are not a good replacement for a competent liner system underlying the SX/EW pad. A DWQ Professional Engineer reviewed the engineering plans and construction specifications for this permit modification request and determined that they comply with the Utah Water Quality Rules (R317). As required by the Construction Permit, the facility cannot be placed into service until DWQ has conducted a final inspection and reviewed and approved the As-Built Construction Certification Report for this facility. The Construction Certification Report must include test results of construction quality assurance and quality control elements, which include flexible membrane liner panel placement logs, trial seam test logs, seaming records, seam test records, repair logs, manufacturer certification including quality assurance and quality control testing of the rolls, and professional engineer certification.

South Zone – Specific Comment 2: *The 'Cornerstone' mine expansion, despite complete omission from these two permits, is inseparable from the present permit application. During the term of authority of these permits, many changes will be made to mine operations --- as they are already occurring, judging by rapid changes of waste rock dumping patterns viewed from air and satellite. The advent of SX/EW leach water processing is a minor aspect of Kennecott's mining rate expansion --- one of many throughout the escalating industrial experience of Kennecott Utah Copper and predecessor organizations.*

DWQ Response
Neither of the subject permit modifications in the public notices for permit UGW350010 and UGW350015 is related to the KUC Cornerstone expansion project. To date, DWQ has not received any formal submittals, engineering plans or specifications, or permit modification requests relating to the Cornerstone project. DWQ does not have authority over dumping of waste rock. This falls under the authority of the Division of Oil, Gas and Mining. KUC has not indicated any plans to use the SX/EW process at the Bingham Canyon Mine.

South Zone – Specific Comment 3: *Each episode in the Kennecott 'story' carries with it a ratio of contamination release to the environment, on the one hand, to the total quantity of acid mine drainage or leach water produced by the Mine, on the other. This ratio has surely varied; it has surely been improved, most notably as a result of the extensive 'modernization' in leach water interception, conveyance, containment and circulation into 'process' circuits, and especially the cessation of active leaching in 2000. The mass relocation of the last century's ground water contamination into the tailings, process water circuit, and ultimately to the Great Salt Lake, however, does nothing to instill confidence in Kennecott's, DWQ's and EPA's engineering planning, management and corrective action practices. The wrong set of questions was asked, and so the wrong set of answers has been made the basis of all permits and regulatory expectations.*

DWQ Response
In August 1989, the Bureau of Water Pollution Control, which later became DWQ, enacted the Ground Water Quality Protection Rules, which formed the building block for a formal program to protect present and probable future beneficial uses of ground water. The three main regulatory concepts of the rules are to: 1) prohibit the degradation of ground water quality, 2) prevent ground water degradation rather than clean up after the fact, and 3) provide protection based on the different existing classes of ground water quality, which means that correspondingly higher quality ground water will receive more stringent protection. The five significant administrative components of the rules are: 1) ground water quality standards, 2) ground water classification, 3) ground water protection levels, 4) aquifer classification procedures, and 5) ground water discharge permit system.

DWQ currently administers nine permits for KUC facilities and operations including seven Ground Water Quality Discharge permits, one Utah Pollutant Discharge Elimination permit, and one Domestic Wastewater Disposal System Operating Permit. These permits are listed below:

- Ground Water Discharge Permit UGW350001 (Barney's Canyon)
- Ground Water Discharge Permit UGW350006 (Large and Small Reservoirs)
- Ground Water Discharge Permit UGW350008 (Smelter)
- Ground Water Discharge Permit UGW350010 (Leach Collection System)
- Ground Water Discharge Permit UGW350011 (Tailings Impoundment)
- Ground Water Discharge Permit UGW350015 (North Concentrator)
- Ground Water Discharge Permit UGW350017 (Copperton Concentrator)
- UPDES Permit UT0000051 (Surface Water and Storm Water discharges)
- Operating Permit 2010-05-06 (Domestic Wastewater Disposal System)

DWQ has carefully evaluated the activities and operations in these permits for compliance with the R317 rules to minimize potential impacts and be protective of waters of the state. In addition, both the North and South End of KUC have ongoing corrective actions for historic mining contamination under the Utah Division of Environmental Response and Remediation (DERR) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and a Utah Natural Resource Damage Claim (NRDC), which has financial assurance mechanisms for long term operation and maintenance of ground water remediation systems and contaminant source control structures.

South Zone – Specific Comment 4: *Profound events occurred in the late 1990s and early years of the 21st Century, deeply affecting the disposition of South Zone leach water and acid/metals ground water. Most of these events, including the conceptualization and institution of RO water treatment as the technology of choice at both Kennecott (Zone A acid/metals plume treatment) and the Jordan Valley Water Conservancy District (Zone B sulfate plume treatment) were created strictly for company and human benefit. The Great Salt Lake and all its cornucopia of wildlife will suffer for all time, as contaminants are officially allowed to be jettisoned into the Lake.*

DWQ Response

The Southwest Jordan Valley Ground Water Project is designed to clean up ground water contaminated from historic mining activities in the Oquirrh mountains in southwest Salt Lake County. Over the next 40 years, extraction and treatment of ground water from the contaminated zones will remove contaminants and provide municipal-quality drinking water to the public in the Affected Area. By removing contaminated water from the underlying aquifer, the project will also improve ground water quality and prevent further migration of the contamination in the valley. Under UPDES Permit UT0000051, no water is discharged to the Great Salt Lake unless it meets permit discharge limits.

North Zone – Specific Comment 1: *The North Zone permit is difficult for citizens to assess, given the geographic complexity of this array of industrial facilities (not that the South is simple, by any means, but it is more straightforward, and better represented in maps and satellite imagery). To the point, the map provided by DWQ fails clearly to communicate key facility locations, especially the Magna Process Water Reservoir, much less a schematic of flows through the facility. If there is any single criticism that must be mentioned, it is the lack of an overall --- North and South as an integrated facility --- schematic to represent flows and their magnitudes or ranges, particularly for selenium and other CoCs that may threaten the integrity of Great Salt Lake ecosystems and wildlife. An overview, also, of the Oquirrhs as a whole, noting where contaminated water is accessible to birds and wildlife, would also be an important step, including both South and North.*

DWQ Response

Under the heading "Further Information" of the Public Notice, it states: "Additional information may be obtained upon request by calling Ed Hickey at (801) 536-4357 or by

writing the aforementioned address". Public documents pertaining to Kennecott's permits are available to any person or group who requests them under the Government Records Access and Management Act (GRAMA). Several requests for specific documents, including yours, were received during the comment period and the requested documents were promptly provided. Based on these requests and your comments, DWQ will assess what additional supporting documents can be made readily available on the public notice website the next time a public comment period is opened for a ground water discharge permit.

These ground water discharge permits are facility- and site-specific state permits that are issued to minimize the effects of potential ground water discharges on the quality and beneficial uses of ground water. Surface water discharges are regulated by the EPA-delegated National Pollutant Discharge Elimination System under UAC R317-8.

Water is pumped from the Tailings Impoundment to the Magna Reservoir for storage, then to Copperton for recycling. There is no discharge to the Great Salt Lake from any facility in the North Concentrator permit. KUC's permitted discharge points to the Great Salt Lake are regulated under UPDES Permit UT0000051.

DOGM and its sister agency, the Division of Wildlife Resources, have the regulatory authority to protect wildlife. Please contact Paul Baker, Minerals Program Manager in DOGM at (801) 538-5261 for more information.

Concluding Comments: *Comprehensive long-term planning is as important as it has ever been in the past for Kennecott properties and surrounding lands and waters. 'Cornerstone' may spell the beginning of the end of mining here, making this long-term planning even more important, however, especially as it manifests itself in tailings expansion, waste rock dumps reclamation for closure, and the devising of more or less perpetual institutional controls. Kennecott has not done any of this well, nor have DEQ or EPA pressed them to do it. In this sense, Superfund listing would have been very desirable, particularly assuring that more forensic science would have been done. It is not helpful when we find it necessary to go to EPA documents, such as the 2002 North Zone and South Zone Record of Decision for comprehensive background history and geography. Yet, that is the case for much of this process. As the public insists on greater involvement in Kennecott's last years, more forthright disclosure will go a long way toward public acceptance of proposed measures that are parts of the whole mining wind-down and closure effort. If Kennecott is ever to earn any measure of the 'sustainable mining' their actions seem to indicate is valuable to them (e.g., metals for London Olympic medals), then it follows that a very different approach from that exercised in the 'Cornerstone full-court press' will be necessary. The rectification of deficiencies in these water discharge permits would be a great place to start.*

DWQ Response

The Utah Division of Water Quality, the Utah Division of Environmental Response and Remediation, and the Environmental Protection Agency have pressed KUC on these issues, even if not to the satisfaction of everyone. Both of these permits have been

renewed in accordance with UAC R317-6 and were public noticed as required. In addition, permit UGW350010 for the Bingham Canyon Mine and Water Collection System, and permit UGW350006 for the Bingham Canyon Reservoirs, were both renewed approximately one year ago and no public comments were received during the required 30-day public comment period.

TERRY MARASCO, Natural Resources Project Management

Comment 1 received via email at 3:50 PM on June 29, 2011.
Comment 2 received via email at 5:54 PM on June 30, 2011.

Comment 1: *What would be most usefull* [sic] *is* [:]
1. an inventory of pollutants being discharged currently by KUC operations
2. an estimate of all future pollutants discharged by KUC per each permit
First of all is any of this available at the DEQ site?
Otherwise we do not have a picture of the entire discharge with the expansion.

DWQ Response

Ground water discharge permits are issued to minimize the effects of potential ground water discharges on the quality and beneficial uses of ground water. The two primary components of a ground water discharge permit are containment technology and ground water monitoring. Best available technology is used for new facilities, and discharge minimization technology is used for existing facilities to minimize the discharge of contaminants from the waste source by applying control and containment technologies such as liners, leak detection systems, leak collection systems, and pump-back systems. Ground water quality monitoring in compliance wells is used to measure the actual affect of the facility operations on ground water quality.

The information you are requesting may be available on the Toxic Release Inventory web page of the CERCLA branch of the Utah Division of Environmental Response and Remediation may have some of this information at:
http://www.superfund.utah.gov/trihome.htm

Ground Water Discharge Permit UGW350010 for the Bingham Canyon Mine and Water Collection System requires an annual report, which provides the results of operational monitoring and analyzes the trends in these data. The annual report focuses on the permit's operational monitoring sites including sumps, seeps, tunnels, and collected flows reporting to the cutoff walls within the water collection system. Compliance sites have been closely monitored and evaluated for over ten years and compliance limits have been established for all compliance wells, except in the case of Dry Fork, where an accelerated monitoring program has recently been completed to establish compliance limits for these new wells.

In 1999, KUC began to reduce the amount of leach water being applied to the east and west side waste rock dumps, and all leach water application was terminated in 2000. Prior to this time, approximately 28,000 gallons per minute (gpm) of active leach water

was being applied to the waste rock dumps. As expected, water flows at downgradient collection sites decreased dramatically after leaching operations were terminated in 2000. Meteoric precipitation, spring run-off resulting from snow melt, and residual drain down are the major contributions to flow as measured at the cut-off walls. In 2010, the mean flow from the entire Eastside Collection System including the Bingham Canyon cut-off wall was 1,060 gpm. The Bingham Canyon cut-off wall contributes about 40% of the total flow collected along the east side collection system, which is about 400 gpm. Additional studies have been completed to address the question of historic versus ongoing contamination. Specifically, "Evaluation of Geochemical and Isotopic Techniques for Assessing the Performance of the Eastside Collection System" (May 2001), and "Contaminant Transport and Distribution in the Vicinity of the Eastside Waste Rock Dumps and the Eastside Collection System, Bingham Canyon Mine" (February 2002) address this issue among others. The first report shows that contamination east of the upgraded collection and cutoff walls is from KUC, as one would expect. It does not clearly show when or how the contamination arrived east of the fairly new and upgraded collection system. The second report provides a much more convincing explanation and description. In particular, the report notes that generally, contamination east of the collection system and cutoff walls decreases with depth. This is the complete opposite of what one would expect for contamination originating from an ongoing bedrock source, which is the only other likely source. Also, the reports note and describe operations prior to the installation of the upgraded collection system and cutoff walls. The general practice at the time was to contain collected leach water in unlined ponds in several of the drainages south of Bingham Canyon. In essence these unlined ponds acted as "mini" Bingham Canyon reservoirs and reasonably demonstrated that the existing contamination was from past practices and that generally, contamination east of the collection system would stabilize and decrease with time.

Neither of the subject permit modifications in the public notices is related to the KUC Cornerstone expansion project. To date DWQ has not received any formal submittals, engineering plans or specifications, or permit modification requests relating to the Cornerstone project.

Comment 2: *also Walt can this be done:*
1. 'mass transport' of contamination be estimated including non-Kennecott mines, smelters and refineries in the watershed[.]
A century of mining ground water contamination is being separated via RO and sent, indirectly or directly, to the Great Salt Lake, to be added to the burden created by the non-Kennecott mines, smelters and refineries in the watershed[.]

DWQ Response
Please refer to DWQ response to Comment 1 above.

BONNIE GESTRING, Earthworks
Comment 1 received via email at 12:31 PM on June 27, 2011.
Comment 2 received via email at 09:51 AM on June 29, 2011.

Comment 1: *We also request an extension on the public comment period for these two permits, given the unavailability of various documents and final drafts of documents. We would ask the agency to extend the public comment date to give the public adequate time to respond in a meaningful manner. [Bonnie Gestring was a co-signatory for the comments of Ivan Weber.]*

DRC Response: The comment period was extended until July 11, 2011. [DWQ asked Ms. Gestring which documents and final drafts of documents were unavailable to her.]

Comment 2: *I was referring to the appendix B, for which a final draft was not available until part-way through the comment period. We certainly appreciate that the lining will be an improvement over the existing conditions, but there are other components of the permit that we wanted to submit comments on. It's particularly challenging for NGOs and members of the public to participate in the public process when there are so many permits being issued at the same time, and so little information available with each one (i.e., maps, statements of basis, etc...). Once again, I ask that the department extend the comment period.*

DRC Response: The requested information was provided by DWQ.