STATE OF NEW MEXICO
BEFORE THE WATER QUALITY CONTROL COMMISSION

In the Matter of:	)	
PROPOSED AMENDMENT TO 20.6.2 NMAC (Copper Rule)	)	**No. WQCC 12-001(R)**

WRITTEN REBUTTAL TESTIMONY OF T. NEIL BLANDFORD

In the following sections I provide rebuttal testimony to selected portions of testimony of other witnesses involved in this WQCC Copper Rule hearing based on review of their direct testimony and exhibits, as well as other sources of information where noted.

I. REBUTTAL TO THE DEPARTMENT'S AMENDED PETITION FILED FEBRUARY 18, 2013

I have the following comments and testimony on two proposed changes to the Proposed Rule. The first is the change to the language of Subsection H of Section 20.6.7.28. The rule language presented with the October 30, 2012 Petition allows for reduction in sampling frequency for an analyte if it is not detected for eight consecutive quarters. This period is consistent with the current abatement rules, Section 20.6.2.4103.D NMAC (providing that abatement may be deemed complete if applicable standards are met for eight consecutive quarters). The rule language presented with the Amended Petition would require a demonstration that the contaminant is not present and cannot be generated from solutions or mined materials. This demonstration would be very difficult, if not impossible, to meet. In my opinion, the Commission should adopt the language for this subsection as contained in the October 30, 2012 Petition and should not accept the changes proposed with the Amended Petition.

I also recommend against the Commission's adoption of the changes to Subsection D of Section 20.6.7.33.D as shown in the attachments to the Amended Petition, and recommend that the Commission adopt the language for this subsection as shown in the October 30, 2012 Petition. The modified language submitted with the Amended Petition would require pumping to maintain hydrologic containment as the only method allowed to maintain compliance with ground water quality standards at the monitoring wells. The language presented with the October 30, 2012 Petition would allow other mitigation measures. Other mitigation measures might include in-situ treatment of water in the open pit or a demonstration of natural attention, in which case pumping the water may not be necessary.

II. REBUTTAL TESTIMONY IN RESPONSE TO THE WRITTEN DIRECT TESTIMONY OF CONNIE TRAVERS

Ms. Travers states that the Proposed Rule allows mining companies to degrade ground water quality in excess of standards beneath and downgradient of mine facilities (including their interceptor system) to a point or points of compliance regardless of the potential for this ground water to be withdrawn and used now or in the future (p. 3). I do not agree. First, the Proposed Rule requirements for monitoring are no different than existing permit requirements and historical Department practice, which requires monitor wells as close as practical to the edges (or toes) of a given mine facility, such as a leach stockpile, waste rock stockpile, or tailing impoundment. Where interceptor systems are utilized, such as at a tailing impoundment, the interceptor systems are implemented very close to the facility, so the "downgradient' portion of ground water referred to by Travers is minimal; the same is true for leach collection systems, which are implemented at the toe of leach stockpiles. The proposed rule is more stringent than current practice because 1) formal monitor well location proposals must be submitted to, and

approved by, the Department, and 2) the proposed rule formalizes the monitor well location requirements in Section 20.6.7.28.B(2) as follows:

> Each monitoring well shall be installed as close as practicable to the proposed leach stockpile, waste rock stockpile or tailings impoundment, including its leachate and solution capture and containment systems, that is to be monitored considering the slope of the land surface, hydrogeological conditions, geologic controls, infrastructure, engineering design plans, depth to ground water, working distance and safety.

Moreover, the proposed rule adds specific requirements, such as liners for leach stockpiles and process water and impacted stormwater impoundments, and detailed requirements for waste rock stockpiles that go beyond existing requirements to prevent ground water pollution beneath and downgradient of these facilities, regardless of monitoring well locations. The combination of specifying measures to prevent water pollution and where monitoring wells will be located does not reduce protection of water compared to existing permit conditions, but adds reasonable certainty to the existing rule requirements and will help to help encourage investment in New Mexico. Finally, these requirements in the Proposed Rule are not made "regardless of the potential for this ground water to be withdrawn and used now or in the future" as claimed by Travers. Since applicable standards must be met at monitor wells which are immediately adjacent to mine facilities, the claim by Travers that ground water that may be used in the future is not considered in the Proposed Rule presumes that ground water users <u>other than the mine</u> have a need and must obtain ground water from below, or immediately adjacent to (*i.e.* closer than a monitor well), a mine facility such as a tailing impoundment or waste rock stockpile. Such a contention makes no sense and is not reasonably defensible. Even Mr. Marshall of the Department, when questioned about places of potential withdraw of water for domestic or agricultural water supply wells at the Tyrone Mine during the 2009

Commission Hearing, did not identify any locations immediately beneath tailing impoundments or stockpiles. *See* pages 31 and 32 of the WQCC 2009 decision and Order on Remand (NMAG Direct Exhibit 1). In reality, to the extent there are other ground water users in close proximity to such facilities outside the required monitoring locations, the water is protected by rule and would continue to be protected by the Proposed Rule in essentially the same manner.

Ms. Travers also criticizes the Proposed Rule, asserting that it does not provide sufficient requirements for establishing locations for points of compliance where ground water quality standards must be met (p. 3). I do not agree. The Proposed Rule is consistent with or more stringent than guidance provided for other states and, importantly, is consistent with existing Department practice, which generally requires that monitor wells be placed as close to a given facility as practicable. These issues are discussed in detail below in response to specific opinions of Ms. Travers.

Ms. Travers states that the Proposed Rule relies on interceptor systems capturing ground water that has been degraded by seepage from waste rock stockpiles and tailing impoundments, rather than preventing ground water degradation in the first place (p. 3). I do not agree. The Proposed Rule requires numerous measures other than liners to avoid or minimize impacts to ground water outside the open pit surface drainage area. *See* Sections 20.6.7.21.A and B(1). Interceptor wells or other measures (including liners) may be utilized if necessary as specified in subparagraphs c and d of Section 20.6.7.21.B(1) as follows:

> (c) Interceptor wells or other measures to reduce, attenuate or contain the discharge of leachate that may cause ground water to exceed applicable standards shall be installed and operated where applicable.

> (d) If the permittee or the department determines that, with the measures described in Paragraphs (a) through (c) of this Subsection, discharges of leachate from a stockpile located outside of the open pit surface drainage area would cause ground water to exceed applicable standards at a monitoring well located pursuant to 20.6.7.28 NMAC, the permittee may propose, or the department may require as an additional condition in accordance with Subsection I of 20.6.7.10 NMAC, additional controls, including but not limited to, a liner system.

Inside the open pit surface drainage area, any ground water potentially impacted by seepage from waste rock stockpiles will be collected and managed at the open pit, and is therefore contained.

Ms. Travers opines that in the fractured rock systems that are typically present at mine sites, contaminated ground water can easily escape detection and capture (p. 3). I do not agree. Fractured rock aquifers may or may not be more complex than other types of aquifers. Regardless, effective ground water monitoring and capture (if required) rely on adequate site characterization, which is necessary under the existing rules as well as the proposed rule. Multiple sections of the proposed rule require hydrogeologic analysis that effects the proposed locations of monitor wells and the design and operation of capture systems.

Furthermore, mining is fundamentally different than other kinds of activities that may lead to ground water contamination in fractured rock because 1) large portions of the rock mass are removed as part of the mining process, 2) detailed geologic characterization is conducted at mine sites before mining occurs through exploration drilling and other means; and 3) mining often involves the extraction of ground water in order for the mining process to occur, which leads to a zone of ground water containment (called the area of hydrologic containment in the proposed Rule) that the rule utilizes in a reasonable manner. At a mature mine site, the area of hydrologic containment often encompasses large volumes of the fractured rock aquifers adjacent to the open pit(s), and provides certainty regarding the fate of the impacted ground water if it occurs.

Ms. Travers opines that remediation and/or hydraulic control of ground water contaminated by mining is expensive and remediation and control systems must be managed for generations, "essentially in perpetuity". Therefore, preventing ground water from becoming contaminated is more efficient than ground water remediation (p. 3). I do not agree. Ms. Travers' statement is not supported by facts or analysis and is not true as general statement. If taken at face value, one would have to believe that the construction and operation any ground water remediation system at any copper mine site is more expensive than any measure that would be required (such as a liner) to prevent ground water contamination in the first place. This is not the case for many reasons, but one is that Travers' claim that all ground water remediation systems must be operated "essentially in perpetuity" is incorrect. For example, ground water within the Mangas Valley at the Tyrone Mine generally meets Section 3103 ground water standards, and the one interceptor system at the toe of storm water collection ponds adjacent to the No. 1X tailing impoundment will likely meet standards based on current trends.

In addition, the Proposed Rule requires covers to minimize infiltration into mine facilities at closure outside the open pit surface drainage area and does not rely on ground water remediation systems for closure. Inside the open pit surface drainage area, where the top surfaces of facilities will be covered, there is no technology available to prevent ground water from being impacted beneath and adjacent to the open pit. The impacted water in this area is contained by effective hydraulic control, and any long-term pumping or water treatment requirements are assured through financial assurance.

Ms. Travers testifies that ground water contamination from copper mines in New Mexico is at high contaminant concentrations, is extensive and widespread at the mine sites, and has

migrated off and away from the sites (p. 8). I do not agree. The vast majority of historical and current ground water contamination at mine sites in New Mexico occurred and has remained within the primary mining areas in the vicinity of the open pits and immediately adjacent stockpiles. The migration of contaminants "off and away from the sites" was due primarily to historical, uncontrolled sources of ground water contamination that has been contained and partially remediated through operational discharge permit conditions, and more importantly would be prevented from occurring in the future by the Proposed Rule requirements. For example, at the Tyrone Mine the two regions of significant ground water contamination that extend outside of mine/stockpile area are at the No. 3 leach stockpile north of the Main Pit and in the perched ground water system of Oak Grove Wash and Brick Kiln Gulch. Sources of ground water contamination for both of these areas were unlined leach stockpiles outside the area of hydrologic containment associated with the Tyrone open pits. Under the rule, such leach stockpiles would have been lined and the associated ground water contamination would have been prevented. Inside the area of hydrologic containment, impacted ground water occurs below leach and waste rock stockpiles and below open pits above the water table, but flows to and will ultimately be extracted at one of several open pits that intersect the water table, and is therefore contained.

Ms. Travers' testimony discusses ground water degradation under and adjacent to Tyrone and Chino open pit mines by in-pit leaching operations and movement of precipitation; and plumes of contaminated ground water that emanate from the waste rock and open pit areas at the Cobre Mine (p. 8). I do not agree. I am not aware of any evidence of contaminated ground

water emanation from the open pit at Cobre due to containment by the hydrologic sink created by the open pit.

Ms. Travers states that the proposed rule does not distinguish between existing and new open pits; and because of the statement that ground water standards do not apply within the area of hydrologic containment, water quality standards can be exceeded in an area overlying or adjacent to open pits (p. 8). **S**ince there is no technology to prevent any impacts to ground water from the open pit mining process, other than containment through creation of hydraulic controls, including the pit sink, the implication of this testimony would be that the Commission should prohibit open pit mining.

Ms. Travers states that the Proposed Rule establishes a point of compliance regulatory system because ground water quality standards must be met at designated monitoring wells (p. 11). In my opinion, the Proposed Rule does not establish some type of fundamentally new point of compliance system. Under the current rules, compliance with applicable standards is measured at monitoring wells, the locations of which are approved by the Department and formally specified through discharge permit conditions. The proposed rule merely adds specificity for copper mines regarding the placement of monitor wells, which for the most part is very similar to how the Department has functionally been making such decisions for many years.

Ms. Travers makes numerous claims regarding a supposed lack of specificity and uncertainty in the rule regarding monitor well placement. For example, Travers states that

> "The proposed rule contains uncertainty about how and where to establish compliance." (p. 11)

> "The Proposed Rule's requirements for monitoring well locations - that monitoring wells be located "as close as practical" "around and downgradient of the perimeter" of the monitored mine facilities , which includes their respective "leachate and solution capture and containment systems" - potentially allows an extensive and undefined area under which groundwater standards may be exceeded." (p. 12)
>
> "... no guidance is included regarding how wells should be located" (p. 12)
>
> "No maximum distance from mine facilities is identified in the Proposed Rule." (p. 12)
>
> "The proposed rule allows for ground water beneath leach piles, waste rock piles and tailings impoundments, and up to an undefined distance downgradient of facilities and there capture systems but upgradient of a monitoring well, to be contaminated above ground water standards." (p.15)

I do not agree with these statements. In my opinion, the proposed rule is very clear where monitoring wells must be established, considering site-specific conditions, and is much more specific than the existing rules. The phrase "as close as practical" is well-understood by the Department staff and the regulated community. The rules add additional detail and specific requirements to an existing monitor well design and siting process that is already in place through Department practice for existing discharge permits.

Rebuttal Exhibits Blandford-1 through Blandford-3 are provided to illustrate current monitor well locations at existing mines in order to illustrate the Department current and past practice regarding monitor well locations, and what is meant by the rule language that monitor

wells are to be placed "as close as practical" to a facility. Rebuttal Exhibit Blandford-1 is map of monitor well locations in the vicinity of the No. 1 series tailing impoundments at the Tyrone Mine. The No. 1X capture system wells and associated monitor wells are evident at the northern edge of the reclaimed facility, which includes former storm-water collection ponds at the north end of the No. 1X tailing impoundment. Rebuttal Exhibit Blandford-2 illustrates regional aquifer monitor wells at the toe of the No. 3A leach stockpile at Tyrone. Rebuttal Exhibit Blandford -3 illustrates the existing interceptor and monitor wells at the Chino Mine tailing Pond 7. As clearly indicated by the examples provided, "as close as practical" pretty much means the toe of a facility or immediately dowgradient of seepage collections, to the extent that other factors identified in the rule (i.e. slope of the land surface, infrastructure, working distance and safety, etc.) do not preclude reasonable and safe well construction methods and activities.

Ms. Travers states that there is no provision that requires consideration of the potential to adversely affect ground water users such as future drinking water sources, wellhead protection areas or where groundwater discharges to surface water (p. 12). I do not agree. For new copper mines, the Proposed Rule contains setback provisions are required by Section 20.6.7.19 as follows:

> **20.6.7.19 SETBACK REQUIREMENTS FOR A COPPER MINE FACILITY APPLYING FOR A DISCHARGE PERMIT:**
>
> **A.** The setback requirements of this Section apply to a new copper mine facility for which an application for a discharge permit is received by the department after the effective date of the copper mine rule.
>
> **B.** The setback requirements shall be measured as horizontal map distances.
>
> **C.** The required setback distances shall be met as certified by the applicant as of the receipt date of the application.
>
> **D.** If the setback requirements apply to a copper mine facility, an applicant or permittee shall not propose or construct a leach stockpile, waste rock stockpile, tailing impoundment, or process water and impacted stormwater impoundment that does not meet the setback as determined as of the receipt date of the application for a new discharge permit by the department.
>
> **E. Leach stockpile, waste rock stockpile, tailing impoundment, process water impoundment or impacted stormwater impoundment setback requirements.**
>
> (1) Leach stockpiles, waste rock stockpiles, tailing impoundments, process water impoundments or impacted stormwater impoundments shall be located:

(a) greater than 500 feet from a private domestic water well or spring that supplies water for human consumption; and

(b) greater than 1000 feet from any water well or spring that supplies water for a public water system as defined by 20.7.10 NMAC, unless a wellhead protection program established by the public water system requires a greater distance.

(2) The requirements of Subparagraph (a) of Paragraph (1) of this Subsection shall not apply to wells or springs that supply water to the copper mine facility for human consumption and are located within the property boundary of the copper mine facility.

(3) The requirements of Paragraph (1) of this Subsection shall not apply to wells that are constructed after a copper mine facility received a discharge permit for a leach stockpile, waste rock stockpile, tailing impoundment, process water impoundment or impacted stormwater impoundment.

(4) Setback distances shall be measured from the toe of the outer edge of a leach stockpile, waste rock stockpile, tailing impoundment, process water impoundment or impacted stormwater impoundment at its final design build out.

At both new and existing mine sites, these types of issues would be considered in the monitor well location proposals required under Section 20.6.7.28.A. The monitoring well location proposal must consider ground water flow direction, which is the primary issue of concern in regard to adjacent users.

Ms. Travers criticizes the Proposed Rule, claiming there is no guidance on the depth of well placement or how wells should be located in the case of multiple aquifers or hydrogeologic units (p. 12). I do not agree. Guidance on the depth of well placement is provided in Section 20.6.7.28.D(7) - Well Screen. This section provides requirements for the depth of well screen, which is equivalent to the "depth of well placement" language by Travers. Requirements are listed for water table monitoring wells (shallowest water) and deep or confined aquifer monitoring wells. Regarding well placement in the case of multiple aquifers or hydrogeologic units, this issue is addressed in the rule through Section 20.6.7.28.A, which requires monitoring well location proposals. It is neither necessary or desirable that the rule attempt to define detailed monitor well placement requirements for every conceivable hydrogeologic scenario or aquifer configuration that may exist at a mine site; details of this type are best left to the proposals by experts retained by permit applicants and the judgment of the Department technical

staff based on site-specific information provided by the permittee and their professional knowledge and experience.

Ms. Travers states that some states have more protective criteria than those of the proposed rules and similar to those required by New Mexico's Water Quality Act. Montana has non-degradation requirements for high quality ground water, but allows site-specific mixing zones where water quality standards can be exceeded (p. 12). I do not agree that Ms. Travers' statement is supported, either by comparison with existing practice in New Mexico or by review of the Montana requirements. First, Travers implies through reference to the Water Quality Act that the Proposed Rule would be less protective than the current rules. This is not the case, as noted at numerous places in my testimony; in many ways the Proposed Rule simply codifies current and past Department practices and ensures that these practices are integrated into facility and design up front.

Second, since the above opinion is provided by Travers in response to a question regarding well location criteria in the proposed rule and how they compare to those of other states, Travers appears to imply that Montana's well location criteria are more protective than those in the Proposed Rule. A review of the relevant Administrative Rules of Montana, ARM Title 17, Chapter 30, subchapter 5 (Mixing Zones in Surface and Ground Water) and subchapter 7 (Nondegradation of Water Quality) was conducted by DBS&A staff and the Montana Department of Environmental Quality (DEQ) Hard Rock Mining Program hydrologist, Mr. Wayne Jepson (406- 444-0529), was contacted to determine Montana requirements for monitor well siting.

The Montana nondegradation rule [Section 17.30.706, (7) (k)] only requires that an application to degrade state waters include "a proposed monitoring and reporting plan that will determine the actual water quality changes." There is no specific language regarding particular requirements for well siting, and it is the responsibility of the DEQ to either approve a proposed monitoring plan or require modifications. A primary requirement in the Montana rule (Section 17.30.706, (9) (a)) is that the DEQ shall require "a showing that the change will not result in violations of Montana water quality standards outside of a mixing zone."

Section 17.30.5 of the Montana rules provides the definition of mixing zones as buffer areas downgradient of a discharge within which water quality exceedances are allowed. The applicant for a mixing zone must demonstrate with well-defined mixing calculations that water quality standards are met at the boundary of the mixing zone. Within a lengthy list of information required of the applicant regarding mixing zones, the only item pertaining to monitor wells is a requirement for information addressing "compliance monitoring" [Section 17.30.518, (5)(j)]. Thus, the Montana rules have no specific language regarding particular requirements for well siting.

When asked what the Montana DEQ requirements are for metal mine sites, Mr. Jensen responded that, (1) monitor wells are required, (2) they must be downgradient, and (3) they have to be on the mine property. There are no specific distance requirements. The primary regulatory requirement is that the water quality must meet water quality standards at the mixing zone boundary. For mine sites, Mr. Jensen stated that this is generally established at the property boundary.

In summary, in my opinion, the monitor well location criteria required in the Proposed Rule are more specific and protective of ground water than those of Montana. The Proposed Rule does not allow for a mixing zone or monitor wells placed at the mine property boundary, but rather requires ground water monitoring "as close as practical" to potential sources of impacts to ground water.

Ms. Travers states that, in comparison with other states with point of compliance systems, the Proposed Rule does not provide adequate guidance for locating ground water monitoring wells to be used to determine compliance with water quality standards (p. 13). I do not agree. The Montana requirements are discussed in detail above. A similar review of the environmental regulations and monitor well location criteria to that conducted for Montana was also completed for Arizona, Colorado and Idaho. The results of these reviews are briefly summarized below.

Arizona regulations set a point of compliance at the limit of the pollutant management area, which is the "area on which pollutants are or will be placed." This is equivalent to the boundary of a mine facility, such as the toe of a waste rock pile. Arizona also allows for an alternative point of compliance under certain conditions, but the alternative point of compliance cannot be further downgradient than the property boundary, any point of an existing or reasonably foreseeable future drinking water, or 750 feet from a facility boundary. In essence, the Arizona rules are essentially the same as the Proposed Rule in that they stipulate that monitoring occur immediately downgradient of a facility, and some allowances for monitoring farther away are provided if certain conditions are met.

Ms. Jennifer Widloski (602-771-2256), a hydrologist with the Arizona Department of Environmental Quality (ADEQ) was contacted and questioned regarding ADEQ's procedures

for establishing monitor well locations at mine sites. Ms. Widloski stated that there is no more detailed guidance beyond that laid out in the Arizona statutes for monitor well siting. Basically, the applicant proposes monitoring well locations and the ADEQ staff verify that the proposed well locations meet the statute requirements. The wells must be on the downgradient edge of the pollutant management area (the facility boundary), or on the mine property as close as possible to the pollutant management area boundary, but not more distant than 750 feet.

Colorado rules are similar to Arizona rules in that the point of compliance is generally established at the downgradient boundary of the footprint of the area on which the pollutants are placed (*i.e.* the mine facility boundary). However, substantial leeway is granted to the regulators to modify point of compliance locations on a case-by-case basis. Beyond these general point of compliance specifications, there is no additional specific guidance for monitor well siting.

The Idaho Administrative code is highly general in nature and is written such that the Idaho Department of Environmental Quality (DEQ) has ample discretion to consider a wide variety of "relevant factors" in monitor well placement. The only firm requirement is that the points of compliance (monitor wells) must be located as close as possible to the mine area boundary, but not inside the boundary, taking into consideration relevant factors that presumably dictate that they be located on the downgradient side of the mine and elsewhere as determined by the Idaho DEQ based on their evaluation of the application. Beyond that, there is not specific guidance for monitor well siting.

In summary, taken as a whole the regulatory framework for other states quoted by Travers are not more stringent, and in some cases are less stringent, than those currently

followed by the Department as a matter of practice and those that would be required under the Proposed Rule.

Ms. Travers claims on page 13 of her testimony that "Even if [ground water] standards are exceeded at and *downgradient of* the point of compliance, the proposed Rule does not require abatement of the contamination to water quality standards" and Travers also claims in the same paragraph that this is a fundamental change from current regulatory requirements under the Abatement Regulations. In the following paragraph on page 13 of her Testimony Travers claims that existing leach facilities may continue to operate as previously permitted, and the corrective action requirements do not require cleanup (p. 13). I do not agree. In my opinion, Ms. Travers fundamentally misinterprets the proposed rule and the existing abatement regulations with regard to these issues. The proposed rule does not change abatement requirements or the existing abatement process, and therefore there is no fundamental change from current regulatory requirements as claimed by Travers. Section 20.6.7.30 NMAC provides

> **20.6.7.30 CONTINGENCY REQUIREMENTS FOR COPPER MINE FACILITIES:**
>
> **A. Exceedance of ground water standards - all monitoring wells except impoundment monitoring wells.** If monitoring of a water contaminant source other than an impoundment indicates that applicable standards are exceeded, or the extent or magnitude of existing ground water contamination is significantly increasing, the permittee shall collect a confirmatory sample from the monitoring location(s) within 15 days to confirm the initial sampling results, unless the permittee elects to accept the initial sampling results as an accurate measurement of water quality. Within 30 days of the confirmation of the exceedance of applicable standards or significant increases in existing contamination, the permittee shall take the following actions. The department may approve a longer time period not to exceed 90 days for good cause shown.
>
> (1) A corrective action plan shall be submitted to the department for approval. The corrective action plan shall describe any repairs made or proposed to address the cause of the exceedance or increase and shall propose source control measures and a schedule for implementation. The department shall approve or disapprove the corrective action plan within 60 days of receipt. Following the department's approval of the corrective action plan, the permittee shall initiate implementation of the plan according to the approved schedule. If the department does not approve the corrective action plan, the department shall notify the permittee of the

> deficiencies by certified mail. The permittee shall submit a revised corrective action plan to the department within 60 days of the date of postal notice of the notice of deficiency. The department shall approve or disapprove the revised corrective action plan within 60 days of receipt.
>
> (2) The permittee may be required to submit to the department for approval an abatement plan, which includes a site investigation to define the source, nature and extent of contamination; a proposed abatement option, and a schedule for its implementation. The site investigation and abatement option shall be consistent with the requirements and provisions of Sections 20.6.2.4101, 20.6.2.4103, 20.6.2.4106, 20.6.2.4107, 20.6.2.4108 and 20.6.2.4112 NMAC.
>
> (3) A corrective action plan or abatement plan approved or submitted prior to the date of the copper mine rule that shall satisfy the requirements of this Subsection provided that any substantial change in monitoring results after the effective date of the copper mine rule may require additional corrective action under this Subsection or modification of a previously approved or submitted corrective action plan or abatement plan.

Note that the listed provisions from Section 20.6.2 NMAC under Section 20.6.7.30.A(2) are the abatement regulations that Travers claims are no longer applicable. Similar requirements are listed in the rule for impoundment monitoring wells under Section 20.6.7.30.B.

What Ms. Travers apparently does not realize is that, under the existing rules the ground water abatement process is not triggered by the exceedance of applicable standards, but rather is triggered by "written notice from the secretary that an abatement plan is required" as provided in Section 20.6.2.4106 NMAC or through a notice requiring a discharge plan amendment under 20.6.2.3109.E NMAC. However, the secretary is <u>not required</u> to notify a facility owner/operator that an abatement plan is required simply because ground water standards are exceeded. Under 20.6.2.1203 NMAC, for example, notification of discharge is made including the details of such discharge and actions taken to mitigate immediate damage from the discharge (*see* Section 20.6.2.1203.A(1)(g) NMAC). The same section of the regulations discusses how "the owner/operator of the facility shall take such corrective actions as are necessary or appropriate to contain and remove or mitigate the damage caused by the discharge." (*see* Section 20.6.2.1203.A(5) NMAC). A corrective action report is provided to the Bureau Chief for evaluation, and finally under Section 20.6.2.1203.A(9) NMAC "..the secretary **may** [emphasis

added] notify the facility owner/operator that he is a responsible person and that an abatement plan **may** [emphasis added] be required ...". The discretion provided to the secretary in these and other portions of the regulations is an appropriate and reasonable approach, and is the basis for submission of a corrective plan in the proposed rule under Sections 20.6.7.30.A(1) and 20.6.7.30.B(1), rather than a blanket requirement (apparently favored by Travers) that an abatement plan process be initiated immediately for all cases where ground water standards are exceeded. If an abatement plan process were triggered every time a ground water quality standard were exceed at a monitoring well in New Mexico, the regulatory process would be untenable.

Ms. Travers also claims on page 13 of her testimony that existing leach facilities may continue to operate as previously permitted, and the corrective action requirements do not require cleanup. I do not agree. Section 20.6.7.20.B(2) of the rule states the following:

> (2) **Existing leach stockpiles.** A leach stockpile system, including its associated solution collection or containment system, at a copper mine facility in existence on the effective date of the copper mine rule is not required to meet the design and construction requirements of Subsection A of 20.6.7.20 NMAC and may continue to operate as previously permitted under a discharge permit subject to compliance with the contingency requirements of 20.6.30 NMAC. A permit issued for such an existing leach stockpile system after the effective date of the copper mine rule may include the conditions of the existing discharge permit, which shall not be considered to be additional conditions.

Therefore, the contingency and corrective action requirements of the proposed rule continue to apply, as do existing permit conditions. As explained above, if the contingency requirements for the exceedance of ground water standards are triggered (Section 20.6.7.30.A), then impacts to ground water must be abated, either through a corrective action plan or through a formal abatement plan process that may be required at the discretion of the secretary.

Furthermore, all existing leach stockpiles are already regulated under existing discharge permits, all of which include contingency plans and, if necessary, required abatement actions. For example, Discharge Permit 286 at the Tyrone Mine for the No. 3 Leach Stockpile, provided as Exhibit Blandford-10 as part of my direct testimony, includes ground water abatement and contingency measures. In fact, as part of this and other discharge permit conditions at Tyrone for other facilities, an amended abatement plan is required to address "any exceedances of ground water and surface water standards not currently addressed in the site-wide abatement plan." A site-wide abatement plan addressing all mine facilities and exceedances of ground water standards was required for the Tyrone Mine under Discharge Permit 1341.

Ms. Travers is apparently unaware of the discharge permit conditions at existing mine facilities, and her testimony does not indicate that she reviewed those permit conditions. Consequently, Ms. Travers assertion that abatement of existing ground water contamination at existing leach stock piles (or other facilities for that matter) is not required by the rule is incorrect.

Ms. Travers asserts that, for flow-through pits, standards would not need to be met up to the point of compliance for the pit, and outside the point of compliance, water quality would only need to be managed to mitigate exceedances, but not to meet standards (page 15). I do not agree. As I interpret the language of the October 30 version of the Proposed Rule, on which Ms. Travers' testimony is based, I interpret that the rule language requires mitigation measures inside the open pit, such as pumping, to prevent exceedances beyond monitoring locations. As addressed elsewhere, the Department's Amended Petition modified this language.

Ms. Travers opines that allowing ground water to become degraded beneath and downgradient of facilities without consideration of site-specific factors that may make it difficult to intercept and detect contamination migrating off site is not best practice, and allowing widespread contamination is not best practice (p. 15). A related opinion by Travers on page 16 is that the proposed rule does not require that site-specific conditions be considered as would be required in determination of a variance under the existing rules, and site-specific review would provide for additional ground water protections. In my opinion, the Proposed Rule requires consideration of site-specific conditions by an engineer designing the facility, in the determination of appropriate monitoring well locations, and in the design of seepage collection and interceptor well systems. For example, Section 20.6.7.22.A(4) of the rule requires:

> (4) **New tailings impoundments.** Tailings impoundments shall be designed according to the following requirements.
>
> (a) The applicant shall submit design plans signed and sealed by a licensed New Mexico professional engineer along with a design report that describes how the following features were considered in developing the design plans:
>
> (i) the annual volumes and daily maximum design rates of tailings and effluent to be deposited in the impoundment;
>
> (ii) the topography of the site where the impoundment will be located;
>
> (iii) hydrologic characteristics of the site, including depth to and quality of ground water;
>
> (iv) the geology of the site;
>
> (v) the design of drainage collection systems, to be proposed based on consideration of site-specific conditions and if drainage will be collected or will report at or above the ground surface;
>
> (vi) the design of seepage collection systems, to be proposed based upon consideration of site-specific conditions where substantial seepage may report to ground water, including a design report that includes an aquifer evaluation to demonstrate that interceptor wells will be able to efficiently capture seepage such that applicable standards will not be exceeded at monitor well locations specified by 20.6.7.28 NMAC. The aquifer evaluation shall include a description of aquifer characteristics, hydrogeologic controls for seepage containment and capture, and an analysis of well spacing and capture rates. The interceptor well system shall be designed to maximize seepage capture and efficiency: and
>
> (vii) a hydrologic analysis of drainage and seepage from the tailings impoundment based on the proposed design.
>
> (b) If the permittee or the department determines that the proposed tailings impoundment, when operated in accordance with the design plan specified in Subparagraph (a) of this Paragraph, would result in discharges of seepage or leachate that would cause ground water to exceed applicable standards at a monitoring well located pursuant to 20.6.7.28 NMAC, the permittee may propose,

> or the department may require as an additional condition in accordance with Subsection I of 20.6.7.10 NMAC, additional controls, including but not limited to, a liner system.

Clearly the rule requires a detailed analysis of site-specific factors, which the Department must review and approve. The Department can require additional analysis if warranted, and if the permitte or the Department determines that discharges from a facility "would cause ground water to exceed applicable standards at a monitoring well located pursuant to 20.6.7.28 NMAC" then the Department may require "additional controls, including but not limited to, a liner system."

Ms. Travers (p. 15) states that "... not requiring cleanup to standards is not best practice" and "lack of stringent clean-up requirements results in less incentive to safeguard ground water quality in the first place." As explained in detail above, the rule does not change the ground water abatement requirements and, as a practical matter, does not change anything with respect to existing practice under the existing rules with respect to required ground water abatement. There is abundant incentive for the regulated industry to do a good job of design and operation of copper mine facilities to manage impacts to ground water and to minimize long-term costs.

Ms. Travers (p. 15) states that new waste rock facilities and tailings impoundments are not required to have liners or other mitigation measures, and capturing contaminated groundwater can be difficult and uncertain, especially in fractured rock environments, so there is a significant risk that contaminated ground water will migrate beyond the interceptor systems. Travers adds to this opinion on p. 17 with the claim that "Ground water capture by interceptor wells is imperfect, particularly in the fractured rock environments present at most mine sites." Travers also states on page 16 that the proposed rule increases the risk of ground water degradation because ground water monitoring is imperfect due to preferential flow paths and

gradients that cannot be completely characterized in complex hydrogeological systems (citing an EPA report provided as NMAG Exhibit 18). I do not believe that Ms. Travers takes into account all of the requirements in the Proposed Rule. In my opinion, the collection of proper site-specific hydrogeologic information will minimize this risk. Ms. Travers (p. 16) quotes from the EPA report as follows: "Relative to most unconsolidated deposits, characterization of contaminant migration in fractured rock usually requires more information to provide a similar level of understanding," This is a general statement made in an introductory paragraph, and does not imply that appropriate monitoring or interceptor system operation is impossible or unachievable in fractured rock settings. Under the rule, site-specific technical analysis, subject to Department review and approval, will be conducted to determine the appropriate placement of monitor wells and the appropriate design and operation of interceptor systems in fractured rock as required. In addition, Travers implication that most facilities at mine sites occur in fractured rock is not accurate. For example, existing tailing impoundments at Tyrone (now reclaimed) and Chino (operational) are constructed on unconsolidated or semi-consolidated deposits, not fractured rock.

Ms. Travers states on p. 17 that **"**Ground water capture systems have failed at the Chino and Tyrone Mines.", and she notes that pregnant leach solution (PLS) has impacted Oak Grove Wash and upper Mangas Wash. The capture system "failures" that Travers refers to were not ground water capture systems, but were process solution (PLS) capture systems and to refer to them as failures is questionable. Impacts to ground water that occurred due to the PLS collection system seepage would be substantially reduced under the proposed rule, because the leach stockpiles that impacted ground water in the upper Mangas Wash and Oak Grove Wash would

be synthetically lined if they were constructed after adoption of the Proposed Rule requirements. Ground water capture systems implemented to address the impacted ground water have been effective and are abating ground water impacts at this site.

Ms. Travers mentions the Buckhorn Mountain Mine in Washington state in support of her statement on page 17 that "Even at relatively new mines, hydrogeological characterization techniques for designing ground water capture zones are not failsafe." The Buckhorn Mine is an underground gold mining operation situated on 46 acres in a mountainous region of Washington State, in a climatic setting very different from that of New Mexico. Environmental problems at this site appear to be related, at least in large part, to the inability of a water treatment system (sized for a peak flow of 110 gpm) to accommodate high spring runoff volumes. Operational issues at this mine appear to be related to insufficient planning and design on behalf of the operator relative to peak flows that have occurred. Regardless, the observation that water handling capacity problems have occurred at a small underground gold mine in Washington State is hardly justification that the Proposed Rule for copper mines in New Mexico is inadequate, and I believe that the Proposed Rule, if adopted by the Commission, would minimize the likelihood of a similar situation occurring in New Mexico.

Ms. Travers states that contaminated groundwater is expensive to control and clean up, and in many cases it may be technically infeasible to restore the ground water to pre-release conditions (p. 17). The proposed rule is intended to prevent or minimize ground water contamination outside the open-pit surface drainage area. Inside the open-pit surface drainage area, ground water (impacted or not) will flow to an open pit where it will be contained either by

pumping and/or evaporation. If water is extracted from the pit to be discharged (*e.g.* at closure), it must be treated to meet applicable standards prior to discharge.

With regard to tailings, which would typically be located well outside the open-pit surface drainage area, as a general matter it is technically feasible to restore impacted ground water to meet applicable standards. Such is the case, for example, at Tyrone where the vast majority of ground water adjacent to the reclaimed tailing impoundments meet Section 3103 standards, and for the limited areas that do not meet standards restoration to standards is foreseeable.

Ms. Travers opines that the Chino, Tyrone and Cobre mines were not permitted to degrade ground water quality and yet contamination has occurred, and permitting contamination of ground water beneath and downgradient of mine facilities increases the likelihood of additional and long-term ground water degradation (pp. 17-18). Ms. Travers may be unaware of the history of discharge permitting at these sites and the implementation of the Water Quality Act in New Mexico. For example, some ground water contamination at the Chino, Tyrone and Cobre Mines pre-existed the discharge permit program (authorized by the Water Quality Act), and therefore could not have been prevented by it. In addition, the Department permitted a number of mine facilities where there was clear evidence provided in the permit application that ground water quality beneath the facility would be impacted, based upon specific calculations of seepage rates through unlined or partially lined facilities. Nevertheless, the Department issued discharge permits based on those applications.

As explained in my direct testimony, ground water within the area of hydrologic containment, whether impacted or not, will not migrate downgradient of mine facilities but will

be contained at one or more open pits where it can be collected and treated if necessary. Impacted ground water within the area of hydrologic containment at the Chino, Tyrone and Cobre Mines has not contributed to the contamination of ground water downgradient of mine facilities referred to by Travers. The proposed rule requirements, including the engineered design and monitoring requirements, are designed to address the risk of long-term ground water degradation.

Ms. Travers (p. 20) recommends an alternative approach to (1) determine based on site specific conditions and the seven criteria identified by the Commission whether part or all of a mine site is a place of withdrawal for present or reasonably forseeable future use of ground water; (2) require compliance with standards within the places of withdrawals, allowing for variances in certain circumstances; (3) require abatement of ground water exceeding water quality standards at places of withdrawal; (4) allow mining companies to request alternative abatement standards upon closure if standards cannot be met due to demonstrated technical infeasibility. For the reasons stated above, and in Freeport's other testimony, I do not agree with that approach.

As explained in prior rebuttal testimony and as illustrated in Rebuttal Exhibits Blandford -1 through Blandford-3, the intent of monitoring as clearly outlined in the proposed rule is to meet applicable standards at or immediately adjacent ("as close as practical") to the boundary of mine facilities. Where interceptor systems are utilized, such system would still be implemented near the toe of a given facility, and ground water monitoring for compliance purposes would be conducted immediately downgradient of the system. *See* Rebuttal Exhibit Blandford-3. Ground water capture and remediation systems at existing mines, such as Tyrone, that operate at greater

distances from mine facility boundaries do so in order to conduct ground water abatement of past impacts; these types of systems are not the "leachate and solution capture and containment systems" referred to in Section 20.6.7.28.B referred to in the rule.

Therefore, as noted previously, the discussion and claims that mining operations have a negative effect on the availability of groundwater supply in New Mexico presumes that ground water users other than the mine have a need and must obtain ground water from below, or immediately adjacent to (*i.e.* closer than a monitor well), a mine facility such as a tailing impoundment or waste rock stockpile. As noted previously, Mr. Marshall of the Department, when questioned about places of potential withdraw of water for domestic or agricultural water supply wells at the Tyrone Mine during the 2009 Commission Hearing, did not identify any locations immediately beneath tailing impoundments or stockpiles. *See* pages 31 and 32 of the WQCC 2009 decision and Order on Remand (NMAG Direct Exhibit 1).

In addition, such arguments ignore the fact that ground water extracted from interceptor systems is used in mine operations, and therefore serves to directly offset the utilization of water from other non-impacted sources. For example, at Tyrone water from interceptor and remediation systems is supplied directly to the mine operational fluid circuit, the majority of which consists of leach solution (raffinate) and pregnant leach solution. Fluid in this operational circuit exceeds numerous water quality standards. Utilizing water from interceptor systems, therefore, to supply the operational circuit allows a corresponding reduction in pumping from Tyrone's Mimbres Basin well field or from Bill Evans Lake on the Gila River. Tyrone has the water rights to conduct these activities, and pumping at interceptor systems other points of diversion is accounted for by the State Engineer.

The Attorney General proposes to not include the "area of hydrologic containment," found in the Department's proposed rule because the proposed amendments would require that ground water standards apply at all locations at a mine site, unless a variance is approved by the Commission on a case-by-case basis (pp. 22-23). In my opinion, the area of hydrologic containment approach should be retained. The area of hydrologic containment approach is based on sound science and is a reasonable and appropriate alternative to a cumbersome, expensive and time-consuming case-by-case variance approach which has no certainly of outcome for mining companies. The area of hydrologic containment concept has already been incorporated into existing discharge permits, such as Discharge Permit 166 at Tyrone which requires that the Main Pit be pumped down to contain impacted ground water.

III. REBUTTAL TESTIMONY IN RESPONSE TO THE WRITTEN DIRECT TESTIMONY OF DR. BRUCE THOMSON

Dr. Thomson testifies that the Balleau (2009) groundwater report (which he refers to as Romero and Cook [2009]) agreed with the earlier State Engineer modeling report by Johnson, *et al* 2002) that unless an additional source of supply is identified, severe water shortages will be expected in the next few decades, and drawdown from Silver City wells extends to within a few miles of the Tyrone Mine, though the model cannot be used to determine if contamination from the mine might reach the well fields (p. 6). For completeness, I note that the Balleau (2009) report is a draft report, and the final version of the report is provided as Rebuttal Exhibit Blandford-4. I have recently addressed these issues on behalf of Tyrone directly with the Silver City administration. Attached as Rebuttal Exhibit Blandford-5 is a copy of a presentation I prepared and gave on this topic. The key points are that discharges from the Tyrone Mine could not affect Silver City's well fields due to existing geologic and hydrologic conditions. This conclusion would be true even in the absence of the measures required in Tyrone's discharge permits and without implementation of Tyrone's proposed Stage 2 Abatement Plan, which is

addressing existing contamination. I also understand that Silver City does not plan on and does not need to consider the area of Tyrone Mine for any future water supply, as confirmed by Silver City utility staff and groundwater consultant at our meeting. Importantly, the reports cited by Dr. Thomson do not conclude that the ground water supply is physically limited, but that expected drawdown at existing well field locations may be limiting. I discuss this point in further detail below.

Dr. Thomson states that ground water is virtually the only source for municipal and domestic supply in Grant County and current pumping exceeds recharge. He also states that a Gila River supply is speculative, but the Tyrone Mine is a potential source of supply, demonstrating that there may be a significant amount of ground water for future use at the Tyrone Mine. Dr. Thomson says that this underscores the importance of protecting the quality of this water for future use. (pp. 8-9). In my opinion, the Proposed Rule satisfies the need to protect ground water supplies by establishing clear and transparent requirements for prevention of water pollution from existing and future copper mines, consistent with the measures that the Department has required under the existing rules. Moreover, in my opinion, the main Tyrone Mine area would not be a target for a future groundwater supply, regardless of the mines presence, as there are better well field locations closer to areas of present and future demand. Moreover, as discussed above, the primary limiting factor in Grant County is the location of existing well fields and the fact that the same relatively local regions of the aquifer have been pumped for extended periods of time, not the physical supply of ground water in general.

Dr. Thomson further opines that Balleau (2009) ground water model generally agrees with the Johnson et al. (2002) model that unless an additional source of supply is identified

severe water shortages will be expected in the next few decades (p. 6). In my opinion, this statement mischaracterizes the results of the ground water modeling presented in Romero and Cook (2009). Severe water shortages are nowhere referenced in the report. A 2006 report by Balleau (Rebuttal Exhibit Blandford-6) addresses the availability of water for the Town of Silver City under the existing well configurations. The Balleau (2006) report states that without he changes to the current well field configurations, sufficient water supply is available for 30 and 40 years under high and medium growth scenarios, respectively. In addition, the report concludes that the certain infrastructure improvement (*e.g.* deepening of existing wells), ground water supply at the existing well fields will last even longer.

Dr. Thomson further states that drawdown from Silver City wells extends to within a few miles of the radius of influence of the Tyrone Mine according to the Romero and Cook (2009) ground water model, and although the model cannot be used to determine if contaminated ground water from Tyrone might reach the Silver City well fields, such a possibility is a concern that should be considered (p. 6). However, the observation that simulated drawdown from Silver City wells extends to within a few miles of Tyrone has no bearing on the potential for water quality impacts. The direction of ground water flow is determined by the hydraulic head values and the hydraulic gradient, not drawdown. The maps of hydraulic gradient in the Romero and Cook (2009) report and the final version of that report (Balleau 2010) clearly indicate that ground water does not flow from the Tyrone Mine toward the Silver City wells, and will not in the future. This result is not surprising and is consistent with the geology and hydrogeology of the region. The Silver City wells are east of Tyrone in a structural portion of the Mangas Trench that is separated from the Tyrone Mine by the uplifted, low permeability rocks that form the

Little Burro Mountains. The nature of the intervening rocks, as well as the topographic high zone that they form, leads to effective hydraulic separation of the basins between the Tyrone Mine and the Silver City wells. The results of the natural configuration of the geology is that in the vicinity of Tyrone, ground water does not flow to the east from the Tyrone Mine toward the Silver City wells, but flows to the southeast, as indicated by the simulated water level contours of the Romero and Cook (2009) model for both historical and future conditions. This fact is underscored by results presented in Romero and Cook (2009), and Balleau (2010), where they present calculations of the contributing areas of the Silver City wells, for the period 1946 to 2008 and 1946 through 2048. The figure (Figure 10 provided near the end of Rebuttal Exhibit Blandford-5) shows that over the 102 year simulation time span (40 of which are predictive), the source of water to the Silver City wells is from the north and east, and the source of water is not, nor will it be in the future, from the Tyrone area.

As discussed above, this issue was the topic of a meeting held with the mayor and other representatives of Silver City on October 30, 2012. In addition to Silver City representatives, representatives of GRIP, Mr. Dave Romero (co-author of the Romero and Cook [2009] report and other Balleau ground water reports), myself and other Freeport representatives were present. Based on the information presented in a PowerPoint presentation (Rebuttal Exhibit Blandford-6) and related discussion held during the meeting, and based on prior discussions and information sharing conducted between myself and Mr. Romero, Silver City has not expressed a concern that its wells will be impacted by Tyrone. Also confirmed at the meeting was the fact that Silver City has no current plans to pursue water resources in the Tyrone Mine area, a strategy which is consistent with the results of the Cook and Romero (2009) and the Johnson (2002) modeling

studies. Physical availability is not a limitation on ground water supply in the Silver City area based on current and projected demands. Limitations, to the extent they exist, are a function of well field location, well construction and age, and available water rights.

For example, the U.S. Bureau of Reclamation (BOR) as well as other entities such as the Interstate Stream Commission (ISC) have been conducting various demand and supply studies in the Silver City/Grant County area as part of the Arizona Water Settlement Act (AWSA). These studies confirm the view provided above that there are local constraints on water supply in the Silver City area, based on local drawdown at long-time well field locations, but there is an ample supply of ground water in portions of the aquifer outside the main area of influence of the well fields. For example, the BOR (2010) Supply and Demand Correlation Report (Rebuttal Exhibit Blandford-7), based on review of the Balleau reports, the Regional Water Plan, and numerous other reports, concludes (p. 22) that as previous studies have concluded, there are specific areas within the Southwest New Mexico Region that are experiencing groundwater declines of more than 2 feet/year. Wells in the Deming area show a decrease in water levels of about 0.6 feet/year since the 1950's. Water levels in Silver City's municipal wells have dropped as much as 150 feet since the 1950's. Groundwater pumping for the Tyrone Mine has resulted in 200-foot water level declines in wells. <u>These localized declines have little impact on regional basin aquifers which appear to contain an ample supply of water for the next 100 years [emphasis added]</u>, provided water quality is acceptable.

This conclusion, as well the conclusions regarding Silver City water supply provided in the previous responses to Thomson's opinions, is supported by official commentary from Silver City representatives. Peter Russell from the Town of Silver City Community Development

Department commented (in part) on the draft version of the BOR study (BOR, 2010, p. A-9)as follows "In summary, the draft correlation report, and the other reports that it assessed, show there is adequate groundwater and a local source of water rights to address the long-term needs of Silver City and its neighboring communities. A local development and delivery system here is an essential component of a reasonable strategy for meeting these needs. While AWSA water may be available to supplement or replenish the local groundwater sources, and would be used if available, that water is not essential [emphasis added]".

In summary, regarding future water supplies for Silver City and other municipalities, solutions are being identified, investigated and pursued, as municipalities and water providers typically do. None of the proposed solutions make mention of the Tyrone Mine area as a targeted source of future supply, which makes sense for numerous reasons, one of which is that the aquifer beneath the Tyrone Mine area is not suitable for required municipal water supply production rates. (*i.e.* the Tyrone Mine is not located in a very productive aquifer as erroneously claimed by Thomson on p. 11 of his testimony). The productivity of the aquifer is limited, and although capable of supplying small uses, such as that required by a domestic well, is not capable of supporting high yield wells as would be required by a municipality. There are saturated Gila Conglomerate sediments adjacent to the granitic rocks that host the ore body, but their thicknesses are limited (compared to other areas) adjacent to the mine and increase with distance from the mine; this is one reason that Tyrone's main well field is located several miles to the southeast of the mine down Oak Grove Wash, rather than closer to the mine. Finally, the purpose of the Proposed Rule is to protect ground water for future use in a reasonable and balanced manner, and in my opinion it will do that.

IV. REBUTTAL TESTIMONY IN RESPONSE TO THE WRITTEN DIRECT TESTIMONY OF JIM KUIPERS

Mr. Kuipers states that the area of hydrologic containment for open pits is a highly temporal and transient physical ground water feature that is affected by factors such as pit filling, which can take hundreds of years, and pumping withdrawal rates both within the pit and also in surrounding aquifers." (page 3, ¶ 7). In my opinion, the area of hydrologic containment for open pits is not a highly temporal and transient feature as Mr. Kuipers claims. Rather the area of hydrologic containment is a predictable, measureable, and manageable feature that exists at any mine site where groundwater has been extracted for significant periods of time in order to dewater open pits that are deep enough to reach the water table. Areas of hydrologic containment have existed and been identified and mapped at the Tyrone and Chino Mines for decades. In addition, the area of hydrologic containment will tend to grow through time as pumping from open pits continues and the extent of the open pit increases in size.

Mr. Kuipers opines that pollution of groundwater above standards at some sites may be unavoidable, but the decision to do it and conditions necessary to limit and control it should be made on a site-specific basis and not by rule (page 3, ¶ 7). As discussed above in my testimony, while the Proposed Rule has very specific requirements, largely based on a 30+ year history of regulating copper mines under discharge permits, it also requires that site-specific information be made available and allows for some site-specific adjustments to facility design. This includes the opportunity for the Department to propose additional conditions, such as liners for facilities not required to be lined under the standard requirements, based on site-specific conditions. Moreover, Mr. Kuipers seems to be favoring the variance approach advocated by his client, yet the variance approach is based on a subjective standard of "unreasonable burden," not

necessarily any detailed site-specific evaluation. From the standpoint as a technical professional involved in mine permitting, it is much more preferable to have a specific set of requirements for permitting, and I believe that the approach in the Proposed Rule will result improved technical evaluations and permit applications that will significantly improve pollution prevention at future copper mines.

Mr. Kuipers opines that sources of pollution at copper mines sites are essentially permanent in duration, and even though groundwater pollution may theoretically be contained through continuous pumping, it is doubtful that pumping can be maintained as long as the sources of pollution will exist. (page 6, ¶15). I believe that the Proposed Rule takes into account the nature of potential water quality impacts from copper mines over the long term, based on the best current science and regulatory requirements developed through years of experience to address closure and post-closure management of copper mines. For example, covers required for acid-generating stockpiles and for tailing impoundments at closure will greatly reduce acid-generation and eliminate (or at a minimum greatly reduce) the need for long-term pumping. Inside the open pit surface drainage area, covers are required for top surfaces of stockpiles and infiltration rates (and therefore ground water inflow to the pit) will be significantly reduced. In addition, long-term pumping may not be required if an open pit is a hydrologic evaporative sink. If the pit may become a flow-through pit, there may be no other options, because the presence of the open pit itself can lead to ground water impacts and there is no feasible closure alternative.

Mr. Kuipers states that determination of the extent of hydrologic containment and of the pollution itself is subject to error and misjudgment, systems breakdown and poor location of monitoring, so regulations should be designed to prevent pollution in the first place. (page 6,

¶15). I disagree. The determination of the extent of hydrologic containment can be done using well-understood practices and measurements, as is determining the extent of pollution. The extent of hydrologic containment has already been implemented as a permit condition for many years in some operational DPs (e.g. DP-166 at Tyrone). The proposed rules are designed to prevent pollution to the extent practicable by specifying the required measures.

Mr. Kuipers states that new tailings impoundments or waste rock stockpiles should be designed to prevent intentional discharges to ground water (apparently objecting to references to interceptor well systems and to lack of cover requirements inside the open pit surface drainage area) (pages 9-10, ¶26 and 27). Mr. Kuipers appears to be focusing on the lack of liner system requirements for these facilities under the Proposed Rule. This point is addressed in detail in Freeport's other testimony, which explains how other pollution prevention measures, including measures previously accepted by the Department in existing discharge permits, will be effective to prevent pollution, and why liner systems are often not feasible or more protective of the environmental in many instances.

V. REBUTTAL TESTIMONY IN RESPONSE TO THE WRITTEN DIRECT TESTIMONY OF WILLIAM OLSON

Mr. Olson states that groundwater moves and contamination spreads and a future production well drilled in a clean part of the aquifer outside the POC could draw contamination from some distance away (page 22). In my opinion, the Proposed Rule thoroughly addresses any concern that ground water impacts from a copper mine could adversely affect production wells drilled for other water supplies. First, the Proposed Rule requires that monitoring wells must be placed as close as practicable to source, consistent with current Department practice. Monitoring ground water is well understood, and the Proposed Rule requires specific and detailed best

practices. It is highly unlikely that new pumping would be a surprise, since New Mexico water rights regulations require ample notice, and any effects of any new pumping would be detected by changes in water level data. If ground water standards are exceeded at monitoring well locations, the contingency requirements are triggered, requiring action to address the exceedance. The setback provisions in the Proposed Rule also restrict establishing new mining facilities close to production wells. In my opinion, this approach is protective of other water supplies, as it is unlikely that production wells will be placed close enough to a mine facility that they would be adversely affected. For these reasons, I believe that the concerns raised by Mr. Olson are thoroughly addressed under the Proposed Rule and in combination with other New Mexico laws.

VI. CONCLUSION

For the reasons expressed above, I urge the Commission to adopt the Proposed Rule as proposed in the Department's Amended Petition, subject to the suggested changes identified in Freeport's other testimony. This concludes my written rebuttal testimony.

T. Neil Blandford