APPENDIX D

RESULTS OF MONITORING WELL INSTALLATION

TASK 2.4 OF AQUIFER CHARACTERIZATION PLAN

REVISION 1

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TASK 2.4 OF AQUIFER CHARACTERIZATION PLAN MITIGATION ORDER ON CONSENT DOCKET NO. P-50-06

Prepared for:

PHELPS DODGE SIERRITA, INC.
6200 West Duval Mine Road
Green Valley, Arizona

Prepared by:

HYDRO GEO CHEM, INC.
51 West Wetmore Road
Tucson, Arizona 85705
(520) 293-1500

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Prepared for:

PHELPS DODGE SIERRITA, INC.
6200 West Duval Mine Road
Green Valley, Arizona

Approved by:

Rick K. Zimmerman
Arizona Registered Geologist No. 24064

Prepared by:

Kim S. Wilson
Geologist

January 26, 2009

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLES

FIGURES

APPENDICES

LIST OF ACRONYMS

ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
bls	below land surface
ft	feet
GEFCO	George E. Failing Company
HGC	Hydro Geo Chem, Inc.
PDSI	Phelps Dodge Sierrita, Inc.
PDSTI	Phelps Dodge Sierrita Tailing Impoundment
PVC	poly vinyl chloride
MO	Mitigation Order
mg/L	milligrams per liter
WDC	WDC Exploration and Wells, Inc.

1. INTRODUCTION

In June 2006, Arizona Department of Environmental Quality (ADEQ) and Phelps Dodge Sierrita Inc. (PDSI) entered into a Mitigation Order on Consent (Docket P-50-06) (MO) requiring PDSI to characterize the extent of sulfate in groundwater and to develop a Mitigation Plan for any impacted drinking water supplies attributable to the Phelps Dodge Sierrita Tailing Impoundment (PDSTI). Section III.A of the MO required a work plan designed to characterize the vertical and horizontal extent of the sulfate plume downgradient of the PDSTI. Hydro Geo Chem, Inc. (HGC) prepared the Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Phelps Dodge Sierrita Tailing Impoundment, Pima County, Arizona (Work Plan) on behalf of PDSI (HGC, 2006).

Pursuant to Task 2.4 of the Work Plan, HGC has conducted drilling, construction and testing of thirteen water quality monitoring wells in areas east and northeast of the PDSTI in and near the community of Green Valley, Arizona. Drilling, sampling, well construction, well development, and pump testing were conducted in accordance with the drilling specifications prepared for the project. Results of these activities are presented in this report.

The MO-2007 series of monitor wells were installed for the following purposes:

- Define the lateral extent of the sulfate plume.
- Define the vertical zoning of sulfate.
- Provide installations for long term monitoring of water levels and water quality.
- Characterize the aquifer materials and hydraulic properties in the basin fill aquifer.
- Determine depth to bedrock and thickness of the basin fill at each location.

Monitoring wells were installed at six locations (sites), MO-2007-1 through MO-2007-6, located east and northeast of the PDSTI (Figure D.1). The location of the sulfate plume as defined by the 250 milligrams per liter (mg/L) concentration contour is also shown on Figure D.1. The sites were selected to provide additional definition of the plume limits at their respective locations.

Monitor well installation was focused at the northern and eastern portions of the plume because groundwater flow downgradient from the PDSTI is to the east and then north, and because these areas have the greatest uncertainty regarding the distribution of sulfate and are of concern with respect to future plume migration. Some of the well sites were selected so that the monitoring wells will serve as sentinel wells for water supply wells near the current plume margin.

Nests of two to three wells were installed at all sites with the exception of MO-2007-2 to assess vertical differences in hydraulic properties and sulfate distribution in the basin fill aquifer. Only one well with one screened interval was installed at MO-2007-2 because the saturated thickness of the basin fill is insufficient to warrant multiple wells or multiple well screens. The well nests allow sampling and hydrologic testing of specific vertical intervals within the basin fill. Selection of screened intervals for the monitor well nests was based on two primary criteria. First, the screened intervals were positioned to monitor the top, middle, and bottom of the basin fill with the shallow ("A" well), middle ("B" well), and deep ("C" well), respectively, to follow the pattern that had been established for some of the MH-series wells. Second, the lithological

and water quality information provided by the pilot borehole were used to select specific hydrostratigraphic units to include or avoid in the screened intervals in a particular well.

2. DRILLING, CONSTRUCTION, AND WELL DEVELOPMENT

Drilling, construction and development of thirteen monitor wells were conducted during the period March 14, 2007 through October 13, 2007. A total of 12,663 feet (ft) was drilled for the offsite well installation and testing program. Table D.1 lists the monitor well name, Arizona Department of Water Resources (ADWR) registration number, location, completion date, ground surface elevation, drilled depth, casing depth and diameter, depths to top and bottom of the screens, screened length(s), and water level for each well. The monitoring wells were drilled, installed, and developed by WDC Exploration and Wells, Inc. (WDC), with onsite oversight monitoring, documentation, and logging of lithologic materials by HGC personnel.

2.1 Drilling Methods

Monitoring wells were drilled with George E. Failing Company (GEFCO) Speedstar 50K-CH rotary drill rigs. An initial 18-inch borehole was drilled to a depth of 20 ft and 10-inch conductor casing installed. The annulus between the borehole wall and conductor casing was cemented to provide a surface seal. At some locations a bucket auger rig was used to drill and set the surface casing prior to the arrival of the drill rig. Drilling activities for each well including drilling progress, changes in drilling conditions, setbacks, and milestones were recorded in a notebook by HGC personnel.

The first boring drilled at each site was a pilot borehole drilled for the purpose of determining basin fill material and thickness, bedrock lithology, and reconnaissance water

sampling during drilling. The pilot borehole was drilled as deeply as possible by reverse-circulation air with a down-hole hammer, followed by reverse-circulation air-rotary when feasible. Reverse-circulation air methods were utilized to provide high-quality lithologic samples and to allow reconnaissance groundwater sampling during drilling. Procedures and results of water sampling during drilling are discussed in Section 4. When penetration by reverse-circulation air was no longer possible due to excessive groundwater inflow or borehole stability problems, the rig was converted to mud-rotary and water sampling was discontinued. The pilot borehole was then reamed and advanced to bedrock by conventional mud-rotary methods.

During drilling of the pilot boreholes, drill cuttings were sampled at 10-foot intervals and placed in labeled zip-seal plastic bags. Representative splits from each sample were placed in chip trays for reference purposes. HGC personnel prepared lithologic logs that include a description of each sample. Basin fill material was logged according to the specifications of American Society of Testing of Materials D2488-00. Lithologic logs of the pilot boreholes are provided in Appendix D.1.

Drilling penetration rates were monitored and recorded in a field notebook by HGC personnel during drilling of the pilot boreholes. Graphs depicting the drilling rates for the pilot boreholes are included as Appendix D.2. During drilling, cuttings and excess drilling fluids were collected in a hopper and then placed in roll-off bins and allowed to dry, and transported to a local landfill.

After pilot borehole drilling and construction of the deep monitoring well were completed on each site, intermediate- and shallow-depth wells were drilled as needed using conventional mud-rotary methods. No water samples were collected nor cuttings logged from the intermediate or shallow-depth wells. No downhole geophysical surveys of the wells were conducted.

2.2 Well Construction

The approach to monitor well installation and construction was based on aquifer thickness, aquifer material characteristics, and results of water quality sampling. At sites where three wells were installed, the deep monitor well at each site was constructed in the reamed pilot borehole drilled to bedrock and designated as the "C" well. One or two additional wells were installed subsequently to monitor the middle and upper portions of the aquifer as needed. Wells monitoring the middle of the aquifer are designated as "B" wells, and wells monitoring the upper portion of the aquifer are designated "A" wells. At site MO-2007-6, where two wells were installed, the deeper well is designated the "B" well and the shallower the "A" well. At site MO-2007-2, where only one well was installed, no letter designation is used.

Installation of a shallow monitoring well was contingent on the proximity and availability of pre-existing wells suitable for monitoring of the upper portion of the aquifer at or near the site. For example, at sites MO-2007-3 and MO-2007-5, access was obtained to pre-existing shallow wells NP-2 and CW-3, respectively, which are sufficiently close to the sites that it was not necessary to drill an additional shallow well.

Wells were constructed in accordance with the general well construction guidelines described in the Work Plan, with the exception that in order to minimize potential incursion of No. 60 sand into the gravel pack, an intermediate layer of at least 5 ft of No. 8-12 choke sand was placed on top of the gravel filter pack rather than 10 ft of No. 60 sand directly on top of the gravel pack as originally planned.

The length of screened interval(s) for each well was chosen based on aquifer thickness, lithologic characteristics of the aquifer material, and at site MO-2007-1 on water quality sampling results. Details of water quality sampling and results are included in Section 4. Casing and screen are welded 5-inch diameter, Schedule 40 mild steel in the deep and middle aquifer monitoring wells, and 5-inch diameter, Schedule 80 flush-threaded poly vinyl chloride (PVC) in the shallow monitoring wells. Factory cut slots are 0.05-inch wide in the steel screens and 0.04-inch wide in the PVC screens. A sump of 5-10 ft of blank casing with a bottom cap extends below the screen (or the bottommost screen in well MO-20070-6A) in all wells. In pilot boreholes penetrating more than 20 ft of bedrock (e.g., MO-2007-2 and MO-2007-6B), which penetrated 53 and 100 ft of bedrock, respectively), bentonite pellets were used to seal the uncased bottom of the borehole to prevent groundwater penetration of the bedrock from the basin fill aquifer.

Following casing installation, No. 8 Tacna gravel filter pack was installed from the bottom of the well (or from the top of the bentonite pellet seal in MO-2007-2 and MO-2007-6B) to at least 10 ft above the well screen using a tremie pipe. Surging was conducted inside the well screen to agitate the annular materials and promote settling of the filter pack. The top of the

filter pack was measured periodically to confirm the height of filter pack in the annulus and check for bridging of filter packing materials. Approximately 5 ft of No. 8-12 sand was placed on top of the gravel pack, followed by 5 ft of No. 60 silica sand. At least 10 ft of time-release bentonite pellets were placed on top of the No. 60 sand. The remainder of the annular space between the boring and casing was filled with high solids bentonite slurry.

At each well site, HGC personnel recorded well construction progress in a field notebook and on a well construction summary form, and created a diagram of the construction as the well was built. Copies of well construction summary forms, which include construction times, materials, quantities, installed, and development procedures for each well are presented in Appendix D.3. Construction diagrams for individual wells with static water levels as well as water quality and stratigraphy for the pilot borehole wells are presented in Appendix D.4. Composite diagrams showing data from all wells comprising the well nest at each site are presented in Figures D.2 through D.6.

2.3 Well Development

Well development activities including bailing, swabbing, airlifting, and pumping were conducted by WDC with oversight by HGC personnel. Airlifting and swabbing were performed either by the drilling rig following well construction or by a WDC development rig. Airlifting or pumping typically continued until the discharge water was clear and free of sediment. Details of development activities for each well are included in the well construction summaries in

Appendix D.3. Field parameters including pH, electric conductivity, and temperature were recorded in a field notebook during development operations, but are not included in this report.

De Minimus General Permits were obtained for the release of development water into nearby washes for each site with the exception of MO-2007-4C, where water was stored in a 20,000-gallon tank and later hauled away for disposal. Development water from MO-2007-4C was hauled away because there was no nearby wash to which water could be discharged. At sites with discharge permits, the first 4,000 gallons of development water was trucked to the mine site to prevent drilling mud from being discharged into local washes.

Pursuant to the Work Plan, aquifer testing and collection of an initial water sample were conducted at each site following well development. Aquifer testing typically consisted of step tests at 1/3 and 2/3 of the pump capacity for one hour each followed by a constant rate test at full capacity for approximately 8 hours. Details of the pumping tests and initial water sampling are presented in separate reports.

After well development, testing, and sampling, surface completions of the monitoring wells were built. Each surface completion includes the installation of a temporary compression well plug in preparation for installation of a dedicated pump and sanitary well seal. The north side of the sounding tube installed with the pump and well seal is marked and establishes a permanent measurement datum for water levels. An Arizona Registered Land Surveyor contracted by PDSI surveyed this measuring point elevation to +/-0.01 ft. A painted steel box was installed around the well casing on a concrete pad to protect the wellhead. The ADWR well

registry number was stamped into the top of the well casing and the well name written on the concrete pad and well cover lid. After well completion, the depth-to-water was measured and recorded.

2.4 Geologic Summary

Pilot boreholes drilled at the MO-2007 sites intercepted Quaternary- to Tertiary-aged basin fill deposits overlying Cretaceous clastic sedimentary and volcanic bedrock. The basin fill is composed of unconsolidated to moderately consolidated gravel, sand, silt, and clay. Basin fill thicknesses encountered in the pilot boreholes drilled to bedrock ranged from a minimum of 687 ft in MO-2007-2 to a maximum of 1,442 ft in MO-2007-3C.

The gravel fraction of the basin fill ranges from fine- to coarse-grained, but actual sizing of the gravels is obscured by the grinding action of the drill bit. Most gravel clasts are subangular to subrounded. In places, the presence of cobbles was inferred based on drill rig performance in conjunction with the presence of angular fragments which were interpreted to represent larger gravel or cobbles reduced in size by the drilling process. Clast composition of the gravel clasts in the basin fill sequence is polymictic, including varying ratios of igneous and sedimentary clasts, and rarely metamorphic rocks. Igneous clasts observed include various granitoids, felsic porphyries, and aphanitic to porphyritic volcanics. Sedimentary clasts observed include quartzose sandstone, arkose, siltstone, and rarely limestone. Varying clast lithologies and their ratios to one another define compositional horizons within the basin fill. Pre-erosional hydrothermal alteration was observed commonly in both igneous and sedimentary clasts,

represented by (in the order of abundance) epidote as feldspar replacements, veinlets, and as matrix or groundmass material; oxidized sulfides, occurring as limonite and hematite; chlorite, as groundmass material and replacing biotite; vein quartz; sericite; calcite veinlets; and silicification.

The sand fraction of the basin fill encountered in the MO-2007 monitoring wells is coarse- to fine-grained, and typically well-graded, commonly all the way to silt. The sand is composed primarily of quartz, with lesser feldspar and epidote grains; igneous and clastic sedimentary lithic grains (generally as part of the coarser fraction of the sand); and up to one percent fine-grained, crystalline magnetite.

The fine fraction (silt and clay) of the basin fill was visually estimated during logging of the drill cuttings. No geotechnical testing of the material was conducted. Silt and clay occur primarily intermixed with variable amounts of sand and occasionally gravel, as clay and/or silt with sand, sandy clay, or sandy silt. Occasionally the presence of silt and clay interbedded with coarser material was inferred based upon intermittent discharge of clay and silt balls from the drill cyclone in conjunction with corresponding changes in drill penetration rates.

Depth to bedrock and bedrock lithology encountered in the pilot boreholes are summarized in Table D.2. Bedrock units encountered in the pilot boreholes at sites MO-2007-1, MO-2007-2, MO-2007-3, MO-2007-4, and MO-2007-5 are quartzose sandstone and arkose, interpreted to be units of the lower Cretaceous Angelica Arkose. Bedrock material intercepted at

site MO-2007-6 is felsic volcanics, interpreted to be part of the lower rhyolite tuff member of the upper Cretaceous Demetrie Volcanics.

3. DRILLING AND CONSTRUCTION OF INDIVIDUAL WELLS

This section depicts the geology at each site and summarizes the drilling and construction of wells. A generalized stratigraphy for each site is presented based on interpretation of the geologic logs.

3.1 Monitoring Well Site MO-2007-1

Monitor well site MO-2007-1 is located at the Green Valley American Legion Hall on West Duval Mine Road, Green Valley, Arizona (Figure D.1). Three wells, MO-2007-1C, MO-2007-1B, and MO-2007-1A were installed at the site to monitor the lower, middle and upper portions of the aquifer, respectively. Figure D.2 depicts well constructions of the three wells, stratigraphy, depth to water, and water quality parameters from formation water samples collected during drilling at the site. Drilling and well construction dates of the wells are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-1C	May 24 through June 13, 2007	June 14 through 17, 2007
MO-2007-1B	June 20 through 26, 2007	June 26 through 28, 2007
MO-2007-1A	June 28 through July 2, 2007	July 2 through 3, 2007

3.1.1 Pilot Borehole MO-2007-1C

MO-2007-1C was drilled to total depth of 1,260 ft bls using a reverse-circulation down-hole air hammer to 820 ft below land surface (bls), followed by reaming and advancement

into bedrock by conventional mud-rotary methods with a tricone bit. Bedrock was intercepted at 1,243 ft bls. Ground water was first noted during drilling at 460 ft bls, and reconnaissance water samples were collected at 20-ft intervals from 460 to 820 ft bls.

3.1.1.1 Geologic Summary of MO-2007-1C

The geologic log for MO-2007-1C is in Appendix D.1. Basin fill at MO-2007-1 can be summarized as follows:

- 0-50 ft: Well-graded sand with silt
- 50-70 ft: Sand with gravel
- 70-150 ft: Silty to clayey sand
- 150-180 ft: Silt and clay with sand
- 180-380 ft: Silty to clayey sand with trace gravel; sandy clay at 320-340 ft
- 380-420 ft: Well-graded sand with silt, clay, and gravel
- 420-510 ft: Well-graded sand with gravel, local silt beds
- 510-600 ft: Well-graded sand with trace to 20 percent gravel
- 600-660 ft: Well-graded sand with 15-35 percent gravel
- 660-750 ft: Well-graded sand, locally with gravel
- 750-810 ft: Well-graded sand with 20-25 percent gravel
- 810-920 ft: Well-graded sand with local gravels at 830 and 900 ft
- 920-1,010 ft: Well-graded sand with silt
- 1,010-1,210 ft: Silty sand with local clayey fines
- 1,210-1,243 ft: Silty sand with few gravels

The gravel fraction of the basin fill material at site MO-2007-1 is polymictic, composed of variable ratios of granite and related intrusives, porphyries, gray aphanitic volcanics, arkose, quartzose sandstone, siltstone and occasional limestone clasts. The gravel fraction is primarily granitic and volcanic with few clasts of sedimentary rock in the upper portion of the basin fill from the surface to 480 ft bls; polymictic (granitic, volcanic, arkose, and quartzose sandstone) from 480-1,130 ft bls; and dominantly clastic sedimentary (arkose, quartzose sandstone, and

siltstone in approximately equal proportions) from 1,130 ft bls to bedrock. Bedrock in MO-2007-1C is fine-grained arkosic sandstone and siltstone and is interpreted to be part of the lower Cretaceous Angelica Arkose.

3.1.2 Screened Intervals, Site MO-2007-1

Screened intervals for the MO-2007-1 wells were selected to evaluate multiple depth intervals in three stratigraphic horizons the basin fill aquifer. Approximately 820 ft of saturated thickness of basin fill encountered in the pilot hole extends from the water table to bedrock (Figure D.2). Deep well MO-2007-1C installed in the pilot borehole is screened from 1,020 to 1,180 ft bls to sample a silty sand layer present from 1,010 to 1,210 ft bls. The upper 500 ft of the basin fill aquifer consists of sands and gravels with minor silty interbeds. This zone is sampled in the upper portion by MO-2007-1A from 460 to 600 ft bls. The lower portion of this zone has less silt and more gravel and is sampled by MO-2007-1B, which is screened from 740 to 900 ft bls (Figure D.2).

In selecting the screened intervals for wells MO-2007-1A and MO-2007-1B, the results of water quality sampling during drilling were also taken into consideration. Within the upper and intermediate portions of the aquifer where water quality samples were collected, lower concentrations of sulfate were encountered below 620 ft bls than above 620 ft bls (Figure D.2). MO-2007-1B is designed to sample the higher sulfate zone separately from the lower sulfate zone sampled by MO-2007-1B.

3.2 Monitoring Well Site MO-2007-2

Site MO-2007-2 is located on West Duval Mine Road near its intersection with View Point Road (Figure D.1). Initially two nested monitoring wells were proposed for the MO 2007-2 site. Because the saturated thickness of the basin fill was found to be only 112 ft at the MO-2007-2 site, only a single monitoring well was installed. Well construction, depth to water, and stratigraphy of MO-2007-2 are shown in Figure D.3. Well drilling and construction dates are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-2	March 14 through April 11, 2007	April 13 through 15, 2007

3.2.1 Pilot Borehole MO-2007-2

Two attempts were made to drill to bedrock at the MO-2007-2 site. The first attempt used reverse-circulation air-rotary with a tricone bit to a depth of 590 ft bls. The first boring was abandoned when lost tools could not be recovered from the hole, preventing further penetration. The second attempt was drilled to 590 ft bls using reverse-circulation air-rotary followed by reaming and mud-rotary to a total depth of 740 ft bls.

3.2.1.1 Geologic Summary of MO-2007-2

The geologic log for MO-2007-2 is included in Appendix D.1. Basin fill at MO-2007-2 can be summarized as follows:

- 0-30 ft: Silty sand and sandy silt with gravel
- 30-324 ft: Well-graded sand with gravel and locally silt; clay layers at 112 and 208 ft
- 324-410 ft: Sand with up to 10 percent gravel
- 410-460 ft: Well-graded sand with silt and silty sand
- 460-540 ft: Well-graded sand with gravel
- 540-690 ft: Well-graded sand with silt and gravel interbedded with gravels

From the surface to 540 ft bls, the gravel fraction is composed primarily of granitic, porphyritic, and aphanitic volcanic clasts with lesser arkose and quartzose sandstone clasts. From 540 to 610 ft bls, the gravel fraction is dominantly arkose and quartzose sandstone, with lesser amounts of igneous clasts. From 610 through 640 ft bls, the gravel fraction contains abundant soft gray rhyolite fragments, which may represent a volcanic interbed within the early basin fill sequence at this location. Granite and arkose clasts are the primary components of the gravel fraction from 660 ft bls to bedrock at 687 ft bls.

Bedrock in MO-2007-2 is fine-grained arkosic sandstone and siltstone with weak hydrothermal alteration represented by fine disseminated and fracture controlled oxidized pyrite, chloritic laminae, sericite, and epidote replacing feldspars and some of the groundmass in sandy layers. The bedrock is interpreted to be part of the lower Cretaceous Angelica Arkose.

3.2.2 Screened Interval, MO-2007-2

The small saturated thickness of only 112 ft encountered by MO-2007-2 made it impractical to install more than one well, as originally planned. Bedrock was encountered at approximately 693 ft bls and the static water level is 574.82 ft bls, recorded on August 9, 2007.

MO-2007-2 is screened from 520 to 680 ft bls to include the entire saturated thickness with a 10-ft sump of blank casing from 680 to 690 ft bls (Figure D.3).

3.3 Monitoring Well Site MO-2007-3

Site MO-2007-3 is located on the northeast corner of the intersection of La Canada Drive and West San Ignacio (Figure D.1). Two wells, MO-2007-3C and MO-2007-3B, were installed at the site to monitor the lower and middle portions of the aquifer, respectively. NP-2, a pre-existing well located approximately 200 ft east-northeast of the MO-2007-3 site, has been converted to a monitoring well and serves as the shallow well monitoring the upper portion of the aquifer at this location. Figure D.4 shows the construction of NP-2, MO-2007-3B, and MO-2007-3C, static water levels, and the stratigraphy and water quality encountered in MO-2007-3C. Drilling and well construction dates of MO-2007-3C and MO-2007-3B are summarized below:

Well	Drilling Dates	Construction Dates
MO-2007-3C	April 25 through May 13, 2007	May 14 through 23, 2007
MO-2007-3B	August 11 through 25, 2007	August 28 through 30, 2007

NP-2 was drilled and constructed to a total depth of 515 ft bls in 1974. A video survey and test pumping of NP-2 were conducted prior to initial sampling of the well. A summary of the video findings and data pertaining to the construction of NP-2 available from the ADWR well registry (ADWR, 2007a) are presented in Appendix D.5.

3.3.1 Pilot Borehole MO-2007-3C

MO-2007-3C was drilled to a total depth of 1,430 ft bls using reverse-circulation air with a downhole hammer to 870 ft, followed by reaming and advancement by reverse-circulation air-rotary from 870 to 980 ft, and finally advanced into bedrock by conventional mud-rotary methods. Bedrock was intercepted at 1,422 ft bls. Formation water was reconnaissance sampled from 470 to 980 ft bls at 20-foot intervals. The presence of flowing sand from 1,010 to 1,030 ft bls was reported by the driller.

3.3.1.1 Geologic Summary of MO-2007-3C

The geologic log for MO-2007-3C is included in Appendix D.1. The basin fill can be summarized as follows:

- 0-40 ft: Well-graded sand with gravel
- 40-80 ft: Silty sand
- 80-120 ft: Silt
- 120-200 ft: Silt with sand and sandy silt
- 200-280 ft: Clay and silt with sand
- 280-480 ft: Clay and silt with sand interbedded with silty sand
- 480-540 ft: Well-graded sand with silt and silty sand, locally with gravel
- 540-600 ft: Well-graded sand, locally with gravel
- 600-680 ft: Well-graded sand with gravel
- 680-810 ft: Well-graded sand, locally with gravel
- 810-880 ft: Well-graded sand with gravel
- 880-990 ft: Well-graded sand, locally with gravel
- 990-1,422 ft: Well-graded sand, few silty fines

The gravel fraction of the basin fill sequence is polymictic, composed varying ratios of granitic, volcanic, quartzose sandstone, arkose, and rare limestone clasts. No vertical compositional zoning based on gravel clast lithology was seen in MO-2007-3C.

Bedrock in MO-2007-3C is fine-grained arkosic sandstone composed mostly of fine quartz sand with few feldspar grains in a calcareous matrix, with up to 1 percent disseminated and fracture-controlled oxidized pyrite and other non-magnetic, fine-grained gray metallics. The bedrock is interpreted to be part of the Angelica Arkose.

3.3.2 Screened Intervals, Site MO-2007-3

Groundwater is encountered at about 350 ft bls in existing well NP-2, resulting in over 1,000 ft of saturated thickness in the basin fill at site MO-2007-3. Based on the video log of the well, NP-2 has open screen from 331 to 486 ft bls, and is used to monitor the upper aquifer zone of sandy silt and silty sand. Gravelly sands that predominate from 530 to 990 ft bls are monitored by MO-2007-3B, which is screened from 740 to 940 ft bls. The lower zone in the aquifer that consists of a fairly uniform sand with 5 percent silt from 990 to 1,422 ft bls is monitored by MO-2007-3C, screened from 1,160 to 1,320 ft bls (Figure D.4).

3.4 Monitoring Well Site MO-2007-4

Site MO-2007-4 is located in the median of La Canada Drive approximately 100 ft south of West Camino Penasco (Figure D.1). Three wells, MO-2007-4C, MO-2007-4B, and MO-2007-4A were installed to monitor the lower, middle, and upper portions of the basin fill aquifer, respectively. Well construction diagrams and static water levels of the three wells and water quality parameters of samples collected during drilling and the stratigraphy encountered in

MO-2007-4C are presented in Figure D.5. Well drilling and construction dates of the three wells are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-4C	June 19 through July 11, 2007	July 13 through 15, 2007
MO-2007-4B	September 4 through 11, 2007	September 12 through 18, 2007
MO-2007-4A	September 19 through 23, 2007	September 24 through 26, 2007

3.4.1 Pilot Borehole MO-2007-4C

MO-2007-4C was drilled to a total depth of 1,153 ft bls and is the deepest of three wells installed at site MO-2007-4. MO-2007-4C was drilled using a reverse-circulation downhole air hammer to 560 ft bls, followed by reaming and advancement to total depth by conventional mud-rotary methods with a tricone bit. MO-2007-4C intercepted bedrock at 1,140 ft bls. Formation water was sampled at 40-foot intervals from 380 to 540 ft bls. Flowing sand at 560 ft bls was reported by the driller.

3.4.1.1 Geologic Summary of MO-2007-4C

The geologic log of MO-2007-4C is included in Appendix D.1. The basin fill can be summarized as follows:

- 0-40 ft: Well-graded sand with silt, locally with gravel
- 40-90 ft: Sandy silt to silty sand, locally with gravel
- 90-120 ft: Well-graded gravel with sand; locally little silt
- 120-150 ft: Well-graded sand with gravel, grading to silty sand
- 150-240 ft: Sandy silt with interbeds of silty sand
- 240-330 ft: Clayey silt, few fine-grained sands
- 330-400 ft: Silt with sand, trace to 10 percent gravel
- 400-420 ft: Well-graded gravel with silt and sand

- 420-460 ft: Silt with sand, some clay, trace gravel
- 460-510 ft: Well-graded gravel with silt and sand
- 510-560 ft: Silty sand, with gravel from 530-560 ft
- 560-600 ft: Silty sand and well-graded sand with silt
- 600-690 ft: Well-graded sand and sand with silt, trace gravel locally
- 690-1,050 ft: Well-graded sand, trace silt and gravel locally, silty from 860-910 and 960-980 ft
- 1,050-1,140 ft: Well-graded sand, trace silt

The gravel fraction of the basin fill sequence is polymictic, composed of granitic, porphyritic to aphanitic volcanic, arkose, quartzose sandstone, and rare limestone clasts. Epidote was commonly noted in addition to occasional oxidized sulfides and quartz veinlets. Three gravel compositional horizons defined by the relative abundance of various clast lithologies were observed in the basin fill: from the surface to 70 ft bls gravel clasts were primarily granitic, porphyritic, and volcanic; from 70 to 730 ft bls clasts were granitic, porphyritic, and volcanic with lesser amounts of arkose and quartzose sandstone; and from 730 to 1,140 ft bls clasts were dominantly arkose and quartzose sandstone with lesser amounts of igneous clasts.

Bedrock in MO-2007-4C was intercepted at 1,140 ft bls and is fine-grained arkosic sandstone composed mostly of fine quartz sand with few feldspar grains in a calcareous, or locally epidote, matrix, with up to 1 percent disseminated limonite and fine-grained magnetite. The bedrock is interpreted to be part of the Angelica Arkose.

3.4.2 Screened Intervals, Site MO-2007-4

Approximately 790 ft of saturated alluvial aquifer is present at the location of MO-2007-4C. The bottom portion of the basin fill aquifer from 1,050 to 1,140 ft bls is

characterized by medium- to fine-grained sand with 5 percent silt and may be partially indurated, as indicated by its resistance to drill penetration. Well MO-2007-4C is screened from 1,090 to 1,130 ft bls to sample this horizon (Figure D.5). Above this horizon, the basin fill is dominated by sand with some silty interbeds and variable gravel content. The upper portion of this zone is monitored by MO-2007-4A, screened from 360 to 560 ft bls, and is characterized by a mixture of interbedded sand, silt, and gravel layers. The lower portion is predominantly sand and sand with silt, locally with gravel, and is monitored by MO-2007-4B, screened from 700 to 940 ft bls (Figure D.5).

3.5 Monitoring Well Site MO-2007-5

Site MO-2007-5 is located in the median of La Canada Drive approximately 400 ft south of West Paseo del Canto (Figure D.1). Two wells, MO-2007-5C and MO-2007-5B, were installed at the site for the purpose of monitoring the lower and middle portions of the aquifer, respectively. A pre-existing well, CW-3, located approximately 250 ft north-northeast of the site is used to monitor the upper portion of the aquifer. Figure D.6 shows the well constructions of CW-3, MO-2007-5B, and MO-2007-5C, static water levels, and the stratigraphy and water quality parameters of samples collected during drilling of MO-2007-5C. Well drilling and construction dates for MO-2007-5C and MO-2007-5B are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-5C	July 16, through August 1, 2007	August 8 through 11, 2007
MO-2007-5B	September 21 through 27, 2007	October 3 through 5, 2007

CW-3 was drilled and constructed in 1964 with a total depth of 501.5 ft bls. A down-hole video survey and test pumping of CW-3 were conducted prior to initial sampling of CW-3. The survey showed that CW-3 is screened from 178 to at least 462 ft bls and filled with sediment to 462 ft bls. A summary of the video findings and the ADWR well registry data regarding construction of CW-3 (ADWR, 2007b) are included in Appendix D.5.

3.5.1 Pilot Borehole MO-2007-5C

MO-2007-5C was drilled to a total depth of 1,370 ft bls using reverse-circulation air with a downhole hammer to 440 ft bls, followed by reaming and advancement into bedrock by conventional mud-rotary methods with a tricone bit. Bedrock was intercepted at 1,363 ft bls. Formation water was reconnaissance sampled from 320 to 440 ft bls. Flowing sand was encountered at 450 ft bls.

3.5.1.1 Geologic Summary of MO-2007-5C

The geologic log of MO-2007-5C is included in Appendix D.1. The basin fill can be summarized as follows:

- 0-30 ft: Silty sand with gravel
- 30-60 ft: Well-graded sand with trace silt grading to sand with silt and gravel
- 60-100 ft: Gravel with sand
- 100-200 ft: Silty gravel with sand grading to silty sand with gravel
- 200-250 ft: Silty clay and clayey sand
- 250-300 ft: Sand with silt and gravel, grading to silty sand
- 300-440 ft: Well-graded sand with silt and gravel, with silty sand above basal gravel unit
- 440-850 ft: Well-graded sand, trace silt, locally trace gravel

- 850-1,070 ft: Sand with silt, with silty sand from 990-1,040 ft
- 1,070-1,170 ft: Silty, clayey sand, (10-30 percent fines)
- 1,170-1,230 ft: Sandy silt and clay grading to silty clayey sand (40 percent) fines
- 1,230-1,363 ft: Silty sand (20-40 percent fines from 1,230-1,290 ft; 10-20 percent fines from 1,290-1,363 ft)

The gravel fraction of the basin fill sequence is polymictic, composed primarily of granitic, various volcanic, quartzose sandstone, siltstone, arkose and rare limestone clasts. Three horizons characterized by different ratios of clast lithologies were recognized in the basin fill penetrated by MO-2007-5C: from the surface to 400 ft bls volcanics are dominant with lesser granitic clasts; from 400 to 1,000 ft bls volcanics are dominant with lesser quartzose sandstone and arkose and few granitic clasts; and from 1,000 to 1,363 ft bls, volcanic and arkosic to quartzose sandstone clasts are present in varying ratios.

Bedrock in MO-2007-5C was intercepted at 1,363 ft bls and is composed of fine-grained gray, white, tan, and maroon quartzose sandstone, arkosic sandstone, and siltstone. The bedrock is interpreted to be part of the Angelica Arkose.

3.5.2 Screened Intervals, Site MO-2007-5

Groundwater is encountered at approximately 265 ft bls in CW-3 with bedrock at 1,363 ft bls, indicating approximately 1,100 ft of thickness in the basin fill aquifer. Pre-existing well CW-3 has open screen from 178 to 462 ft bls, based on the video log of the well, and is used to monitor the upper basin fill zone consisting of silty sand and sand with variable amounts of silt and gravel. The bottom portion of the basin fill consists of silty to clayey sand with no gravel from approximately 1,060 ft bls to bedrock at 1,363 ft bls and is monitored by MO-2007-5C,

screened from 1,150 to 1,350 ft bls (Figure D.6). The middle zone of the aquifer is comprised of well-graded sand with 5 percent silt and trace gravel from 440 to 850 ft bls increasing to 10 percent silt from 850 to 990 ft bls. The middle zone is monitored by MO-2007-5B, which is screened from 660 to 960 ft bls (Figure D.6).

3.6 Monitoring Well Site MO-2007-6

Site MO-2007-6 is located on the west side of Camino del Sol approximately 300 ft south of Placita Beldad Road. Two wells were installed at the MO-2007-6 site, MO-2007-6B and MO-2007-6A. MO-2007-6B was drilled to bedrock and is the deeper of the two wells, monitoring the lower portion of the basin fill aquifer. MO-2007-6A has two screened intervals in a single well, to monitor two zones in the upper portion of the basin fill aquifer. Well construction diagrams of MO-2007-6A and MO-2007-6B, static water levels, and the stratigraphy and water quality parameters of samples collected during drilling of MO-2007-6B are presented in Figure D.7. Well drilling and construction dates are presented below:

Well	Drilling Dates	Construction Dates
MO-2007-6B	August 14 through 28, 2007	September 6 through 10, 2007
MO-2007-6A	September 10 through 18, 2007	September 19 through 21, 2007

3.6.1 Pilot Borehole MO-2007-6B

MO-2007-6B was drilled using reverse-circulation air with a down-hole hammer to a depth of 370 ft bls, followed by reaming and advancement by conventional mud-rotary methods with a tricone bit to a total depth of 1,060 ft bls. Borehole stability problems during drilling due

to caving in an unconsolidated gravel bed intercepted from 310 to 400 ft bls prevented advancement by reverse-circulation air hammer drilling beyond 370 ft bls. Bedrock in MO-2007-6B was intercepted at 960 ft bls (Figure D.7). Formation water was reconnaissance sampled at 20-foot intervals from 320 to 360 ft bls.

3.6.1.1 Geologic Summary of MO-2007-6B

The geologic log of MO-2007-6B is in Appendix D.1. The basin fill at MO-2007-6 can be summarized as follows:

- 0-30 ft: Clayey sand, 10 percent gravel
- 30-60 ft: Gravel with variable sand and clay
- 60-90 ft: Clay and silt
- 90-250 ft: Silt and clay with sand to clayey sand, locally with gravel; clay from 140-170 ft and 230-250 ft
- 250-260 ft: Gravel
- 260-310 ft: Clay with sand
- 310-400 ft: Clayey gravels and gravel with clay and sand
- 400-570 ft: Silty sand with gravel (10-30 percent) grading to sand with silt and gravel
- 570-630 ft: Silty and clayey sands
- 630-710 ft: Clay with 10-25 percent sand
- 710-770 ft: Sandy silt and clay (40 percent sand)
- 770-870 ft: Silty sand, variable clay
- 870-960 ft: Sandy clay to silty, clayey sand

The gravel fraction of the basin fill sequence is polymictic, composed primarily of various volcanic, porphyritic, and granitic clasts with lesser amounts of sedimentary clasts of fine-grained quartzose sandstone, siltstone, and arkose. The gravel fraction encountered in MO-2007-6B has a larger percentage of volcanic clasts relative to other clast types compared to the basin fill gravels intercepted at other MO-2007 well sites. Varying ratios of igneous and

sedimentary clasts defined five compositional horizons encountered in MO-2007-6C: from the surface to 130 ft bls, primarily volcanic clasts; from 130 to 630 ft bls, volcanic with lesser sandstone and granitic clasts; from 630 to 770 ft bls volcanic, quartzose sandstone and arkose in varying ratios; from 770 to 900 ft bls, dominantly volcanic clasts; and from 900 to 960 ft bls, volcanic approximately equal to quartzose sandstone and arkose clasts.

The sand fraction of the basin fill is comprised of mixed quartz, quartz-biotite, and feldspar grains; volcanic, granitic and fine-grained quartzose sandstone, arkose and siltstone lithic grains; few epidote grains, and small amounts of very fine-grained magnetite. The majority of coarse-grained sand-sized particles in MO-2007-6B are lithic grains.

Bedrock in MO-2007-6B is represented by variable felsic volcanics, including gray to brown aphanite, reddish rhyolite, fine-grained biotite-feldspar aphanitic-porphyry, fine volcanic breccia, and rhyolitic volcaniclastic material. Based on drilling penetration rates, the volcanic units are moderately soft from 960 to 1,050 ft bls and become hard below 1,050 ft bls. The volcanic bedrock in MO-2007-6B is interpreted to be part of the lower rhyolite tuff member of the upper Cretaceous Demetrie Volcanics.

3.6.2 Screened Intervals, Site MO-2007-6

The basin fill aquifer thins in the vicinity of the MO-2007-6, extending from 300 ft bls to bedrock at approximately 960 ft bls. The lower zone of basin fill from 720 to 960 ft bls consists of sandy clay and silty, clayey sand and is separated from the upper portion by a clay layer with

10 to 25 percent sand from 630 to 710 ft bls. The lower zone is monitored by MO-2007-6B, which is screened from 780 to 940 ft bls (Figure D.7). The upper zone of the basin fill aquifer consists of an upper unit of gravel with variable sand and clayey fines from 310 to 400 ft bls and a lower unit consisting of sand with silt and gravel from 430 to 570 ft bls and silty, clayey sand from 570 to 630 ft bls. The units are separated by silty sand with gravel from 400 to 430 ft bls. Two screened intervals monitor the upper zone of the aquifer in MO-2007-6A, one from 310 to 390 ft bls to monitor the upper unit and another from 430 to 630 ft bls to monitor the lower unit (Figure D.7). The screens are separated by 40 ft of blank casing with a 20-ft annular seal of hydrated bentonite pellets. This configuration enables the two screens to be sampled separately with the use of packers should the need arise in the future.

4. WATER QUALITY

Reconnaissance grab samples of groundwater were collected from the reverse-circulation air hammer and air-rotary return for estimation of sulfate concentration with depth. Sampling using decontaminated containers commenced when the pilot borehole encountered groundwater and continued at 20- to 40-foot intervals as long as it was possible to proceed with reverse-circulation air drilling. Field parameters of pH and electrical conductivity were taken on the samples as soon as possible after sample collection occurred. The field parameters were recorded in a notebook along with the name of the boring, depth of drilling at the time of sample collection, and the date and time of the measurements.

Collected water samples were passed through a 0.45 micron filter and delivered under chain-of-custody to Turner Laboratories, Inc. in Tucson, Arizona, for sulfate analyses by ion chromatography. All samples were labeled with the project number, borehole name, and sample depth. The custody of the samples was documented using chain-of-custody forms from the time of sample collection to completion of analyses. When water was excessively turbid, solids were allowed to settle prior to filtration. Results of the analyses for sulfate are presented in Tables D.3 through D.7. Copies of laboratory reports and chain-of-custody documentation are included in Appendix D.6.

The results of reconnaissance water samples are plotted on Figures D.2, D.4, D.5, D.6, and D.7. Sulfate concentrations in reconnaissance water samples were well below the standard of 250 mg/L established in the MO, ranging from 6.6 to 99 mg/L, with the exception of samples

from MO-2007-4C, which yielded concentrations ranging from 39 to 670 mg/L (Tables D.3 through D.7). No usable reconnaissance water samples were collected from MO-2007-2.

5. REFERENCES

Arizona Department of Water Resources (ADWR), 2007a. Imaged Records 55 Database, well number 55-605898 (NP-2), downloaded May 13, 2007.

ADWR, 2007b. Imaged Records 55 Database, well number 55-627483 (CW-3), downloaded May 13, 2007.

Errol L. Montgomery and Associates, 2006. Results of Drilling, Construction, and Testing of Groundwater Monitoring Well Suites MH-25, MH-26, and MH-13, Phelps Dodge Sierrita, Inc., Pima County, Arizona.

Hydro Geo Chem, Inc. (HGC), 2006. Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Phelps Dodge Sierrita Tailing Impoundment, Pima County, Arizona. August 11, 2006, revised October 31, 2006.

TABLES

TABLE D.1
Well Construction Details

WELL NAME	ADWR WELL REGISTRY NUMBER	UTM NORTHING (NAD 83, meters)	UTM EASTING (NAD 83, meters)	DRILLED DEPTH (ft bls)	CASING DEPTH (feet)	CASING DIAMETER (inch)	DEPTH TO TOP OF SCREEN (ft bls)	DEPTH TO BOTTOM OF SCREEN (ft bls)	SCREEN LENGTH (feet)	MEASURING POINT ELEVATION (NAVD 88, ft amsl)	DATE MEASURED	DEPTH TO WATER BELOW MEASURING POINT (feet)	STATIC WATER LEVEL ELEVATION (ft amsl)
MO-2007-1A	907342	3529331.380	500016.947	620	610	5	460	600	140	2967.15	07/30/07	425.87	2541.28
MO-2007-1B	907210	3529325.119	500021.574	920	910	5	740	900	160	2966.35	07/30/07	425.67	2540.68
MO-2007-1C	907209	3529328.959	500013.405	1260	1190	5	1020	1180	160	2964.34	07/30/07	423.87	2540.47
MO-2007-2	906765	3527621.102	497912.410	740	685	5	520	680	160	3153.61	08/09/07	575.30	2578.31
MO-2007-3B	906816	3528508.801	500522.491	960	950	5	740	940	200	2910.75	09/10/07	359.38	2551.37
MO-2007-3C	906817	3528508.743	500529.713	1430	1330	5	1160	1320	160	2910.09	07/05/07	356.30	2553.79
MO-2007-4A	907213	3525634.956	500383.682	580	570	5	360	560	200	2923.47	10/09/07	307.67	2615.80
MO-2007-4B	907212	3525613.952	500380.947	960	950	5	700	940	240	2923.22	10/11/07	308.72	2614.50
MO-2007-4C	907211	3525624.484	500382.217	1153	1140	5	1090	1130	40	2923.49	08/12/07	307.13	2616.36
MO-2007-5B	907456	3523743.376	500013.850	980	970	5	660	960	300	2943.42	10/12/07	268.27	2675.15
MO-2007-5C	907457	3523736.459	500014.152	1370	1360	5	1150	1350	200	2944.33	08/23/07	294.04	2650.29
MO-2007-6A	907607	3521842.050	498367.161	630	620	5	310	390	80	3042.49	10/02/07	303.60	2738.89
							430	610	180				
MO-2007-6B	907606	3521849.495	498367.887	1060	950	5	780	940	160	3041.95	10/04/07	319.17	2722.78
Existing Wells at MO-2007 Sites													
CW-3	627483	3523809.985	500047.663	501	500	16	182	500	318	2941.44	06/06/07	265.35	2676.09
NP-2	605898	3528517.116	500582.904	515	515	12	331	515 [1]	184[1]	2907.05	06/04/07	351.50	2555.55

Notes:

ADWR = Arizona Department of Water Resources
UTM = Universal Transverse Mercator (Zone 12)
NAD 83, meters = North American Datum of 1983
NAVD 88 = North American Vertical Datum of 1988
ft amsl = feet above mean sea level
ft bls = feet below land surface

[1] *depth to bottom of screen and screen length are not provided in the ADWR well registry and therefore estimated*

TABLE D.2
Bedrock Data from MO-2007 Pilot Boreholes

WELL	ADWR 55 WELL REGISTRY NUMBER	GROUND SURFACE ELEVATION	DRILLED DEPTH	DEPTH TO BEDROCK	BEDROCK LITHOLOGY
		(ft amsl)	(ft bls)	(ft bls)	
MO-2007-1C	907209	2964.34	1260	1243	Arkosic Sandstone
MO-2007-2	906765	3153.12	740	687	Arkosic Sandstone
MO-2007-3C	906817	2910.09	1430	1422	Arkosic Sandstone
MO-2007-4C	907211	2923.49	1153	1140	Arkosic Sandstone
MO-2007-5C	907457	2941.34	1370	1363	Arkosic Sandstone
MO-2007-6B	907606	3041.93	1060	960	Felsic Volcanics

Notes:

ft amsl = feet above mean sea level

ft bls = feet below land surface

TABLE D.3
Results of Reconnaissance Water Sampling
MO-2007-1C

Depth (ft bls)	EC (µS)	pH	Sulfate (mg/L)
460	332	7.37	72
480	498	7.45	
500	387	7.64	90
520	550	7.68	
540	385	7.30	73
560	415	7.78	
580			52
600	373	8.01	
620	381	7.91	17
640	368	7.85	
660	347	7.63	8.3
680	325	7.84	
700	327	7.92	6.6
720	330	8.02	
740	354	7.75	14
760	342	8.12	14
780	330	7.40	15
800	305	7.58	16
820	319	7.49	14

Notes:
ft bls = feet below land surface
EC = electrical conductivity
mg/L = milligrams per liter
µS = microsiemens

TABLE D.4
Results of Reconnaissance Water Sampling
MO-2007-3C

Depth (ft bls)	EC (µS)	pH	Sulfate (mg/L)
470	428	7.72	52
480			
490	370	7.93	42
500	417	7.94	43
510			
520	437	7.90	41
530			
540	433	7.77	44
550			
560	438	7.71	41
570			
580	427	7.93	39
600	448	7.84	
620	439	7.92	38
640	438	7.71	
660	416	7.64	14
680	425	7.91	
700	415	7.89	41
720	410	7.95	
740	370	7.44	43
760	350	7.62	
780	347	8.00	41
800	363	7.89	
820	335	8.06	34
840	324	7.69	
860	324	8.07	31
880	399	7.50	
900	413	7.60	38
920	381	7.73	
940	381	7.73	41
960	413	7.83	
980	357	7.57	39, 40 (duplicate)

Notes:
ft bls = feet below land surface
EC = electrical conductivity
µS = microsiemens
mg/L = milligrams per liter

TABLE D.5
Results of Reconnaissance Water Sampling
MO-2007-4C

Depth (ft bls)	EC (µS)	pH	Sulfate (mg/L)
380	480	7.50	110
400	1174	7.38	
420	1243	7.24	670
440	722	7.43	
460	1243	7.12	240
480	518	7.83	
500	722	7.68	39
520	544	7.73	
540	525	7.60	100

Notes:

ft bls = feet below land surface
EC = electrical conductivity
mg/L = milligrams per liter
µS = microsiemens

TABLE D.6
Results of Reconnaissance Water Sampling
MO-2007-5C

Depth (ft bls)	pH	Sulfate (mg/L)
320	7.71	98
340	7.77	80
360	7.74	86
380	7.82	82
400	7.81	68
420	7.77	58
440	7.88	99

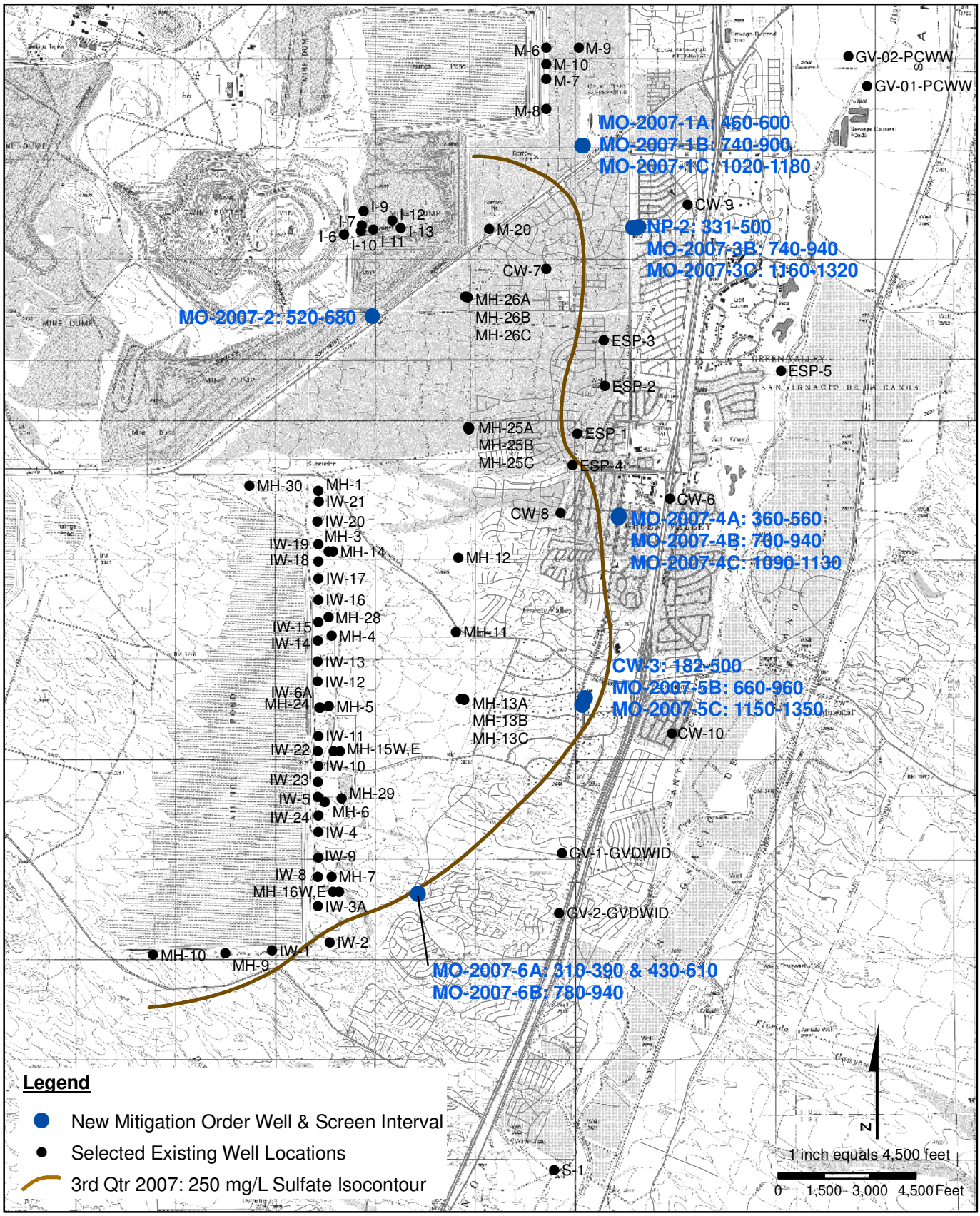
Notes:
ft bls = feet below land surface
mg/L = milligrams per liter

TABLE D.7
Results of Reconnaissance Water Sampling
MO-2007-6B

Depth (ft bls)	EC (µS)	pH	Sulfate (mg/L)
320	439	7.72	69
340	316	7.85	49
360	302	7.84	36

Notes:
ft bls = feet below land surface
EC = electrical conductivity
mg/L = milligrams per liter
µS = microsiemens

FIGURES



HYDRO GEO CHEM, INC.

NEW MITIGATION ORDER MONITORING WELL LOCATIONS

Approved	Date	Author	Date	File Name	Figure
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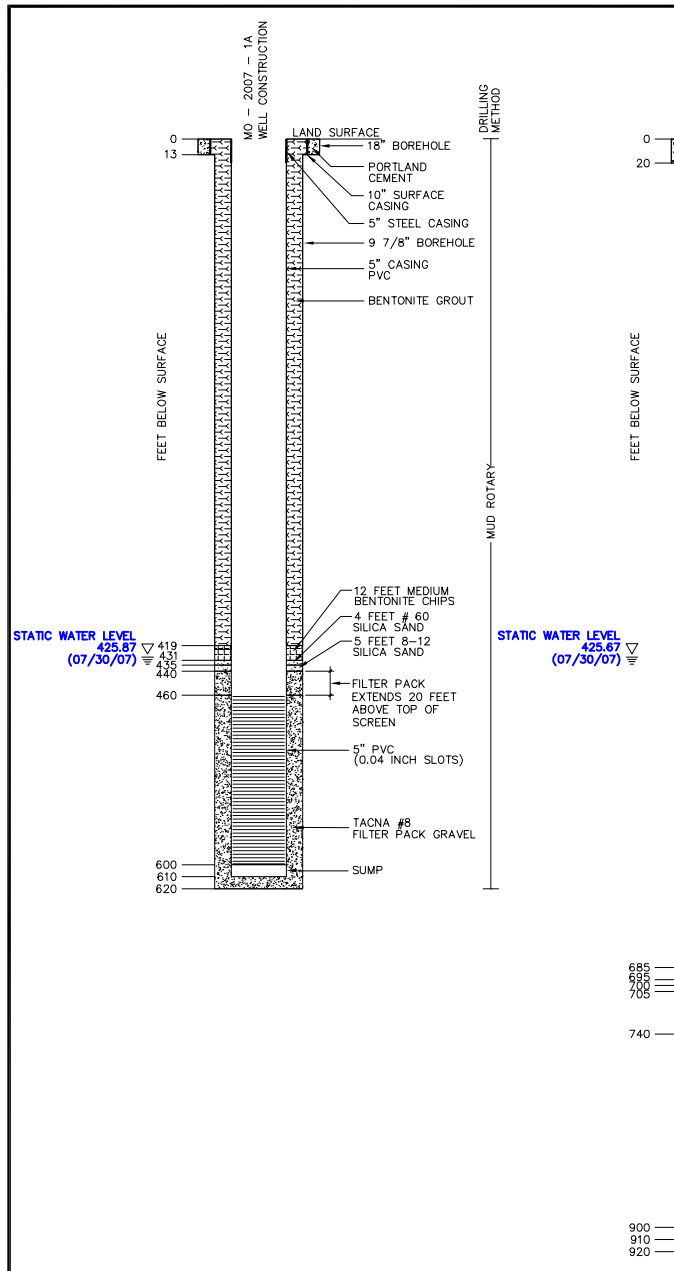
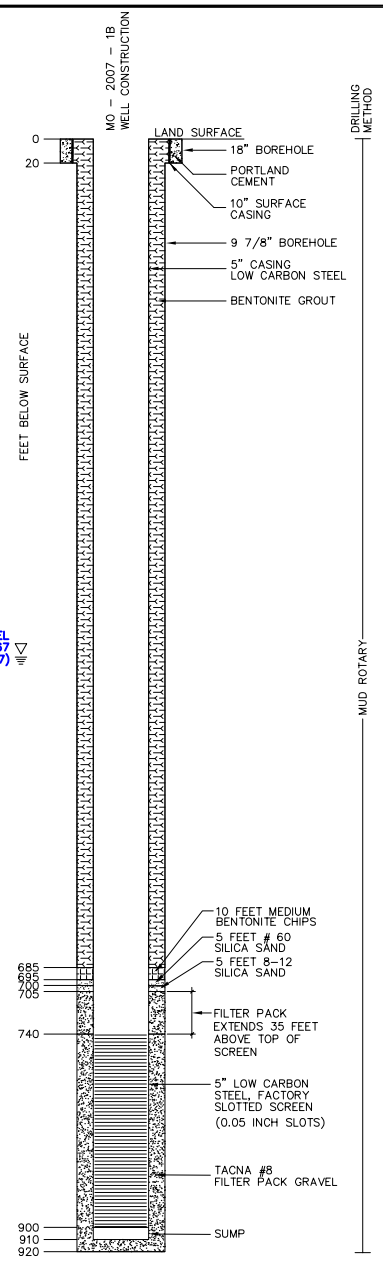
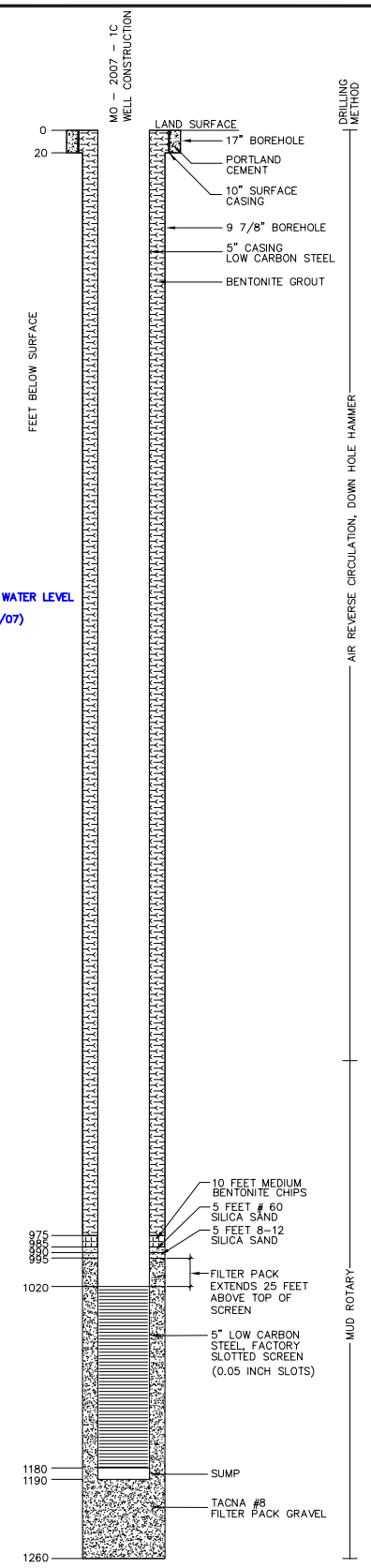
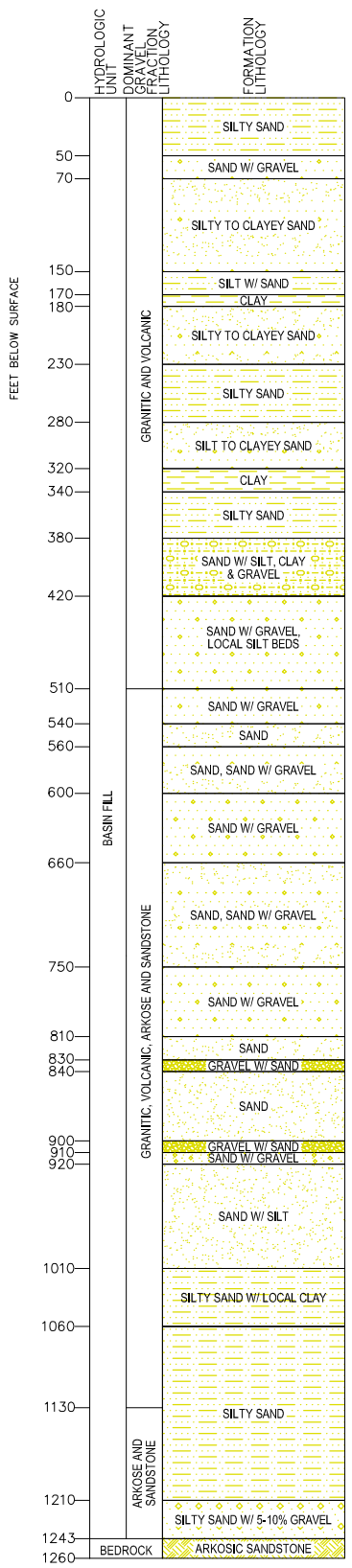






WATER SAMPLES

DEPTH	EC (µs/cm)	pH	SULFATE, mg/L
460	332	7.37	72
480	498	7.45	
500	385	7.30	90
520	550	7.68	
540	385	7.30	73
560	415	7.78	
580			
600	373	8.01	
620	381	7.91	17
640	368	7.85	
660	347	7.63	8.3
680	325	7.84	
700	327	7.92	6.6
720	330	8.02	
740	354	7.75	14
760	342	8.12	14
780	330	7.40	15
800	305	7.58	16
820	319	7.49	14



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAMS AND STRATIGRAPHY FOR WELLS MO-2007-1A, MO-2007-1B, AND MO-2007-1C

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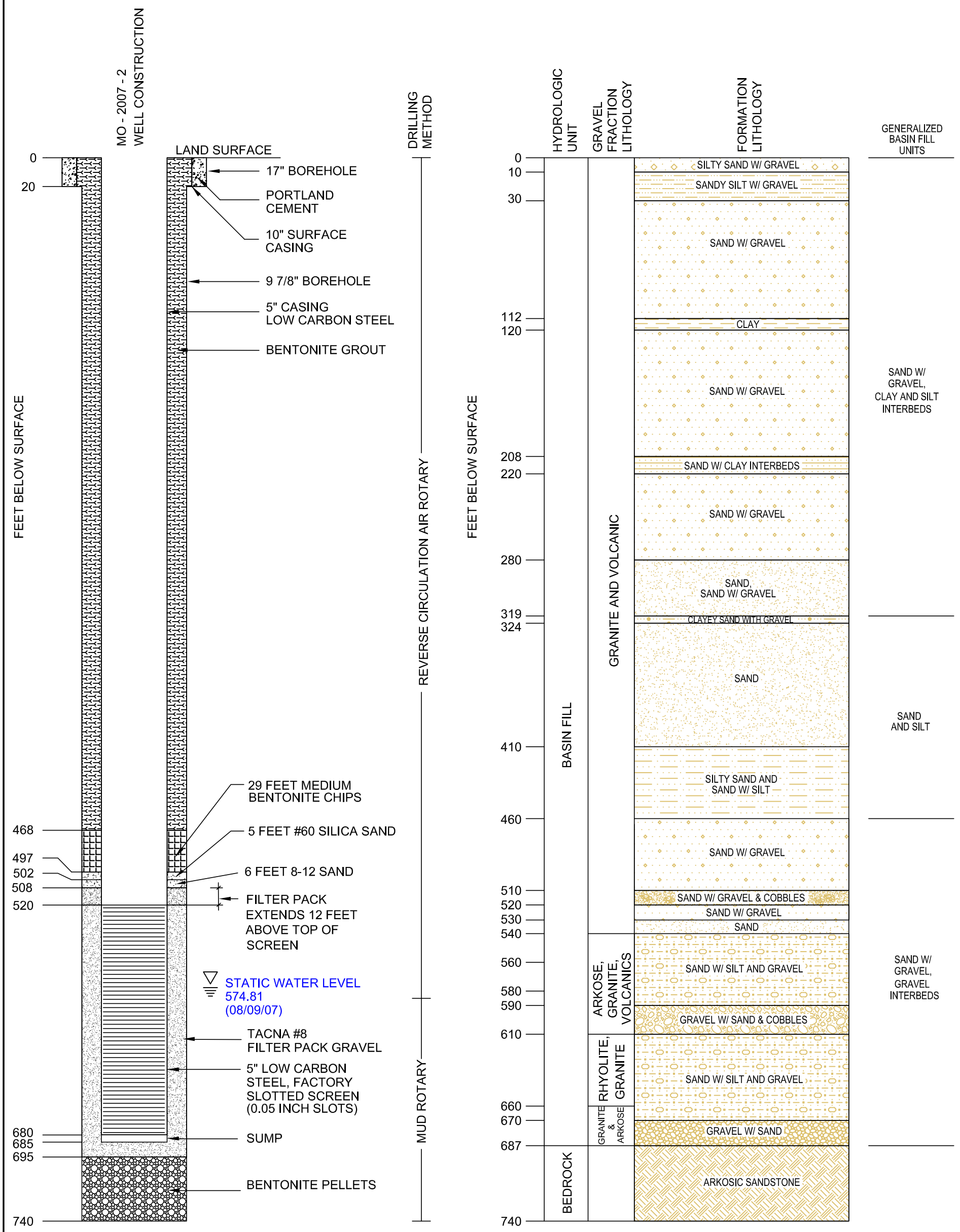

HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-2 (55-906765)

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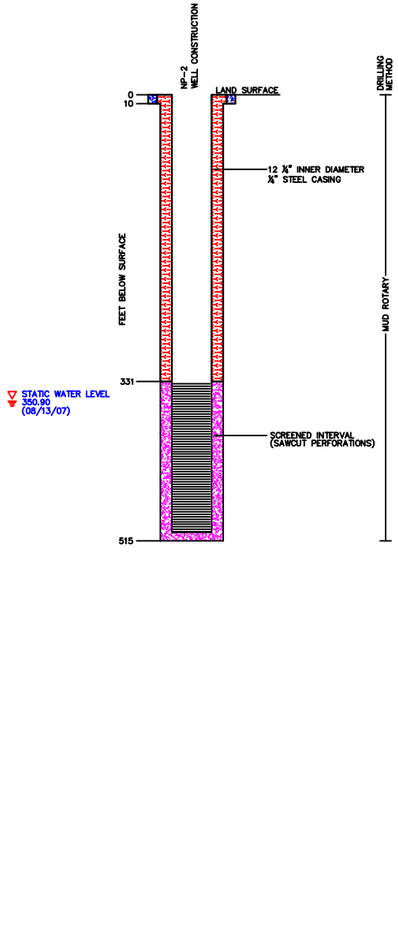
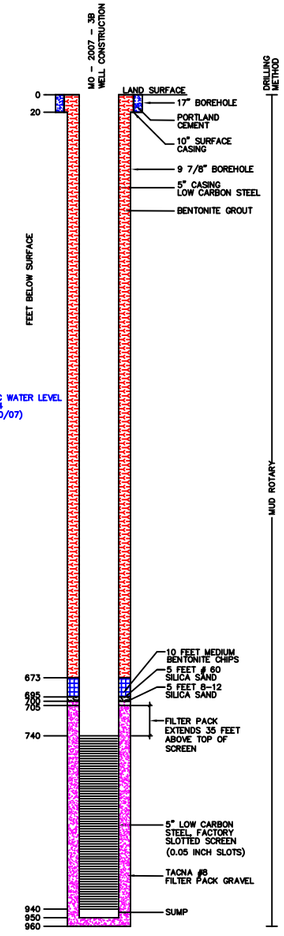
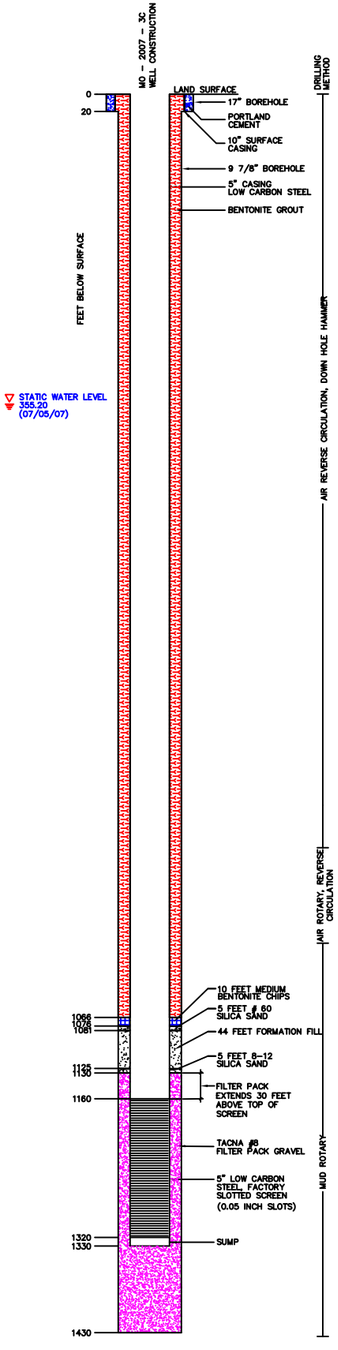
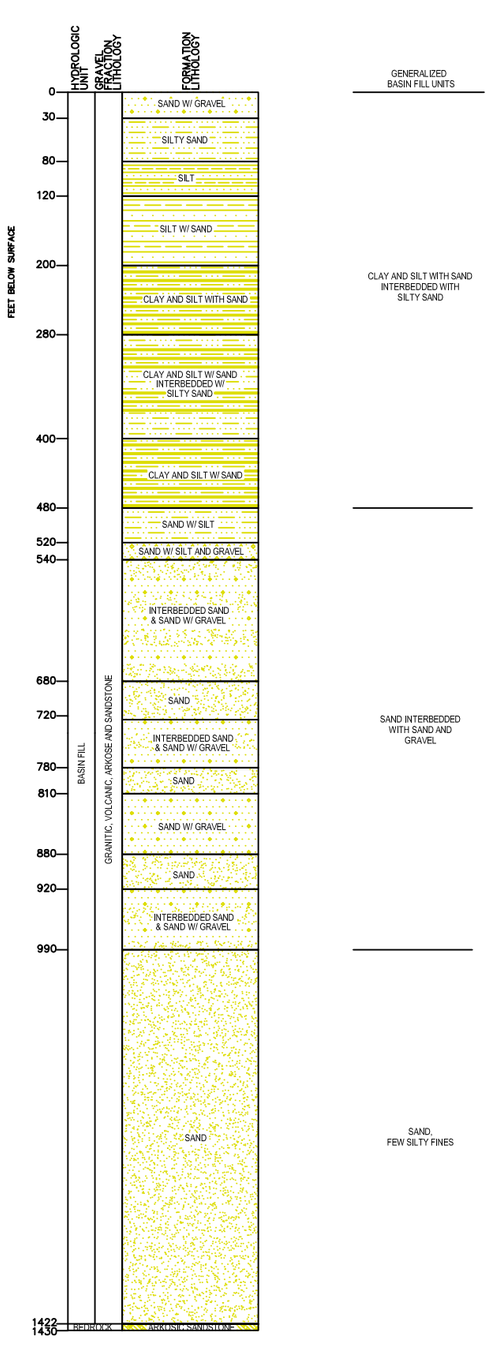






WATER SAMPLES

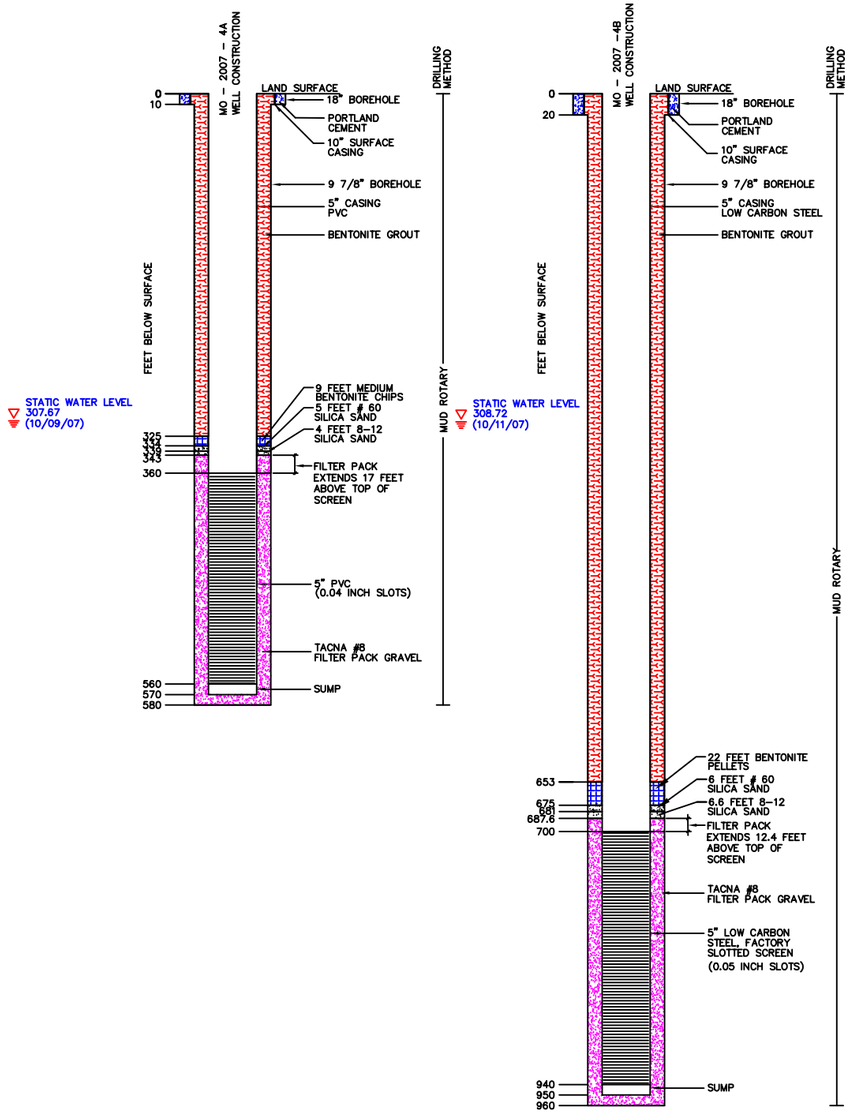
DEPTH	EC (µs/cm)	pH	SULFATE, mg/L
470	428	7.72	52
490	370	7.93	42
500	417	7.94	43
520	437	7.90	41
540	433	7.77	44
560	438	7.71	41
580	427	7.93	39
600	448	7.84	
620	439	7.92	38
640	438	7.71	
660	416	7.64	14
680	425	7.91	
700	415	7.89	41
720	410	7.95	
740	370	7.44	43
760	350	7.62	
780	347	8.00	41
800	363	7.89	
820	335	8.06	34
840	324	7.69	
860	324	8.07	31
880	399	7.50	
900	413	7.60	38
920	381	7.73	
940	381	7.73	41
960	413	7.83	
980	357	7.57	39

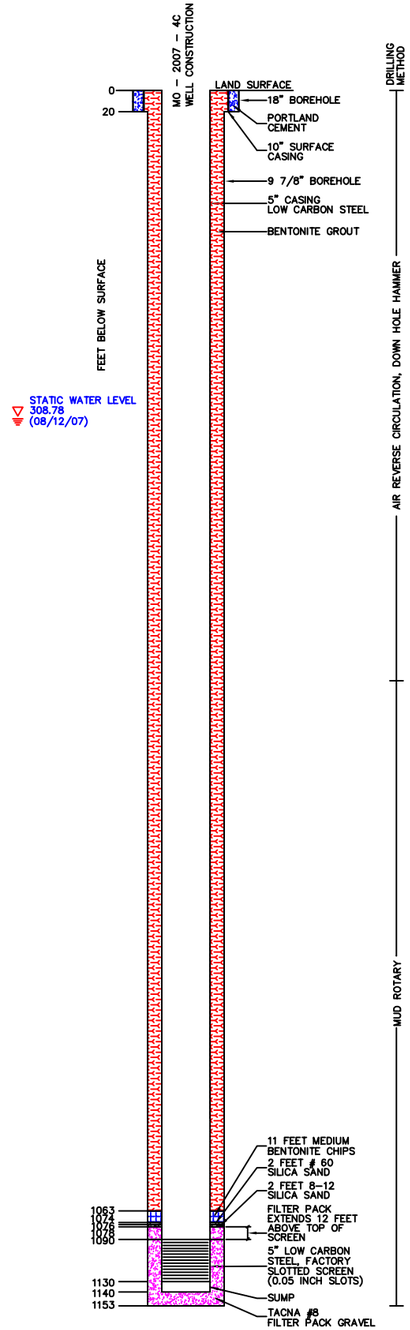


HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAMS AND STRATIGRAPHY FOR WELLS NP-2, MO-2007-3B, AND MO-2007-3C

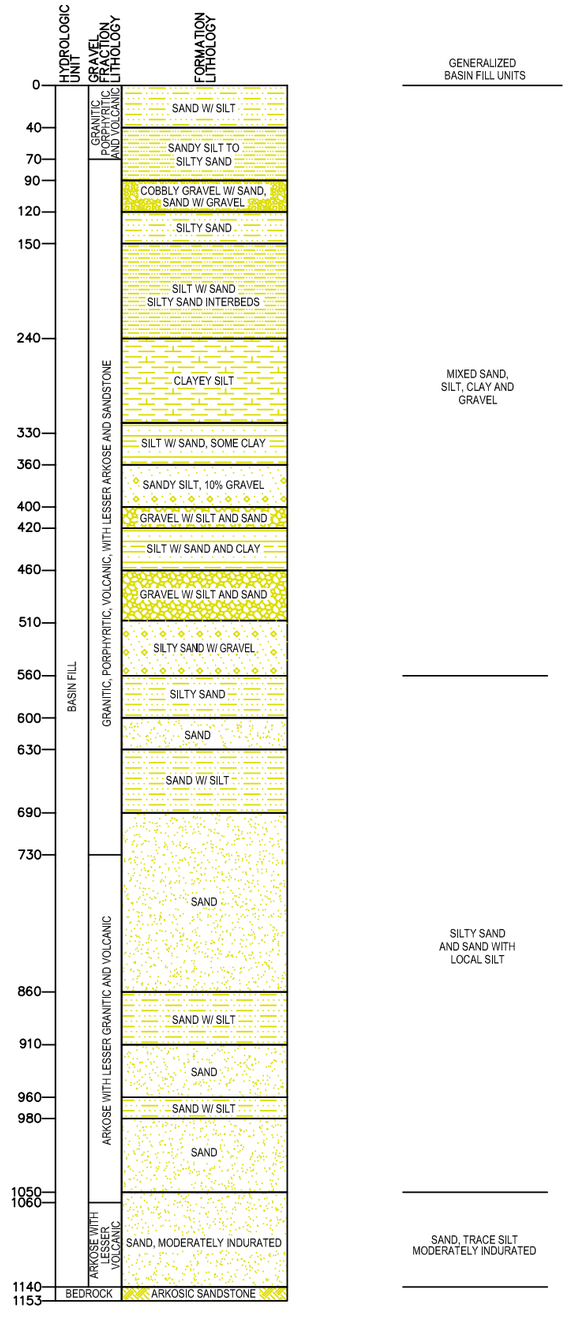
Approved	Date	Author	Date	File Name	Figure
KSW	09/10/07	DKW	09/10/07	7830150A	D.4





WATER SAMPLES

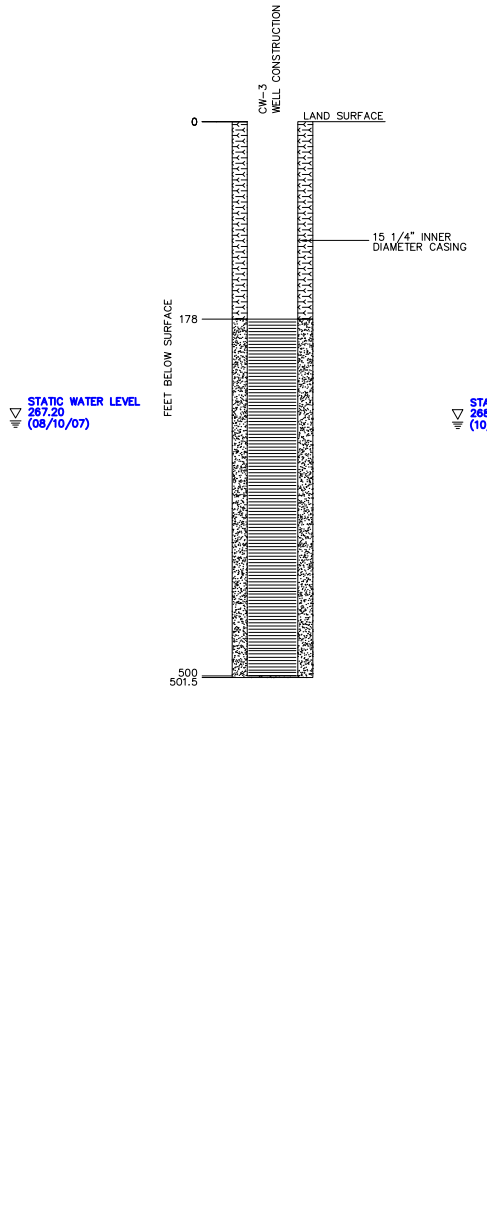
DEPTH	SULFATE, mg/L
380	110
420	670
460	240
500	39
540	100

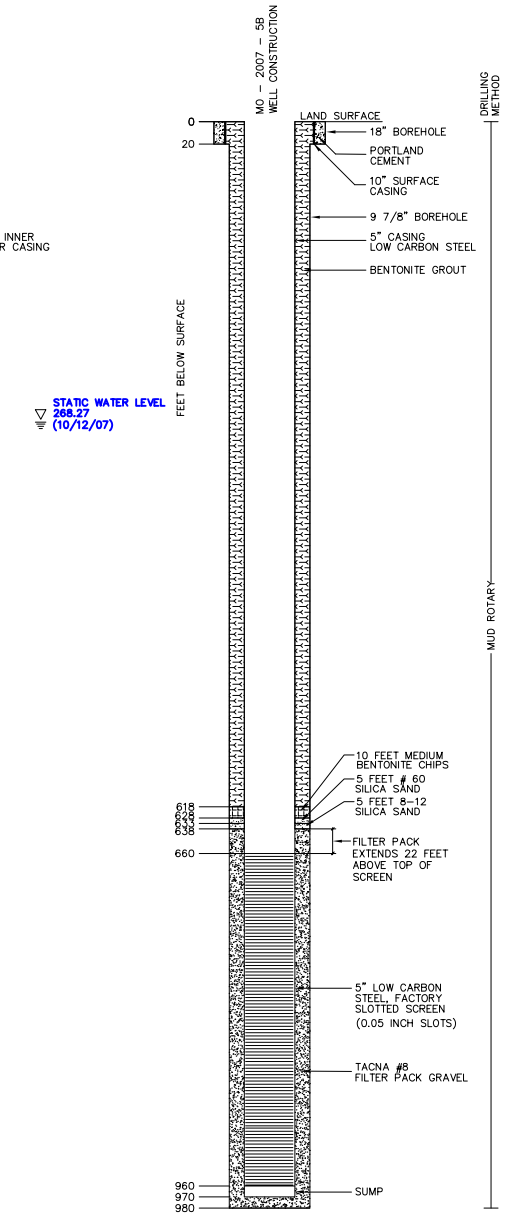


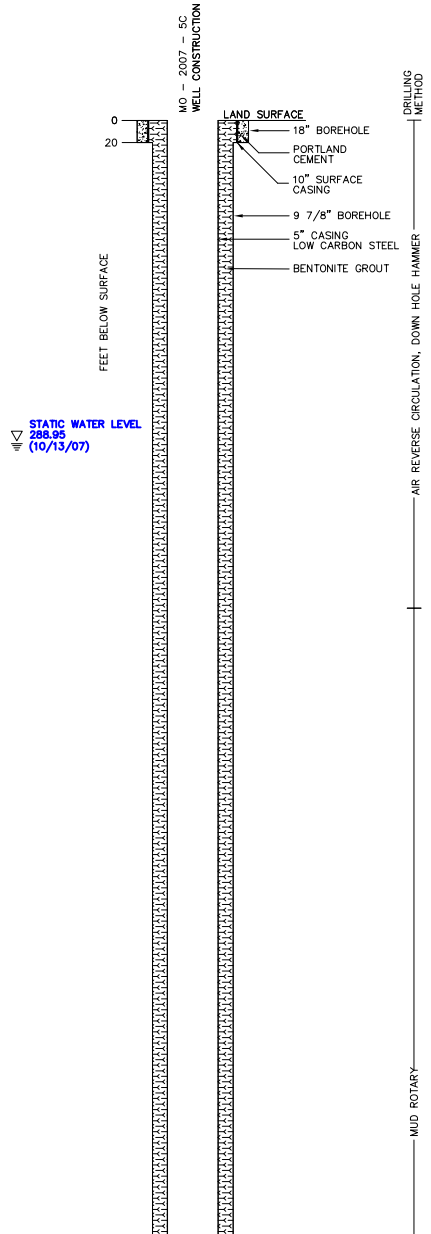
HYDRO GEO CHEM, INC.

WELL CONSTUCTION DIAGRAMS AND STRATIGRAPHY FOR WELLS MO-2007-4A, MO-2007-4B, AND MO-2007-3C

Approved	Date	Author	Date	File Name	Figure
KSW	10/10/07	RAM	10/10/07	7830155A	D.5

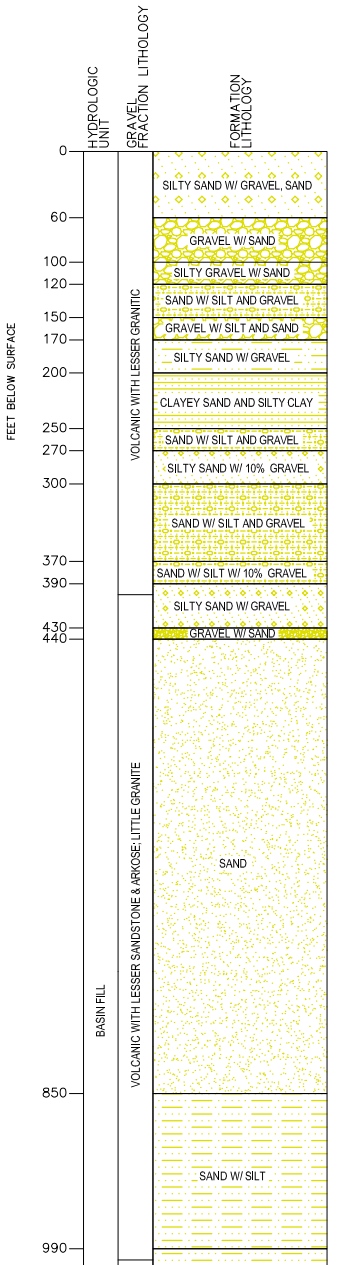


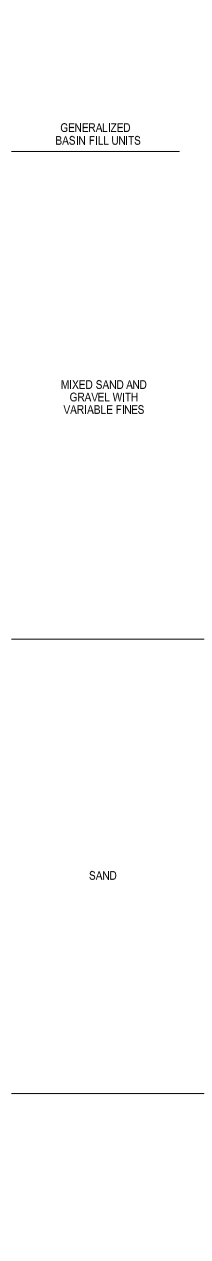




WATER SAMPLES

DEPTH	pH	SULFATE, mg/L
320	7.71	96
340	7.77	80
360	7.74	86
380	7.82	82
400	7.81	68
420	7.77	58
440	7.88	99

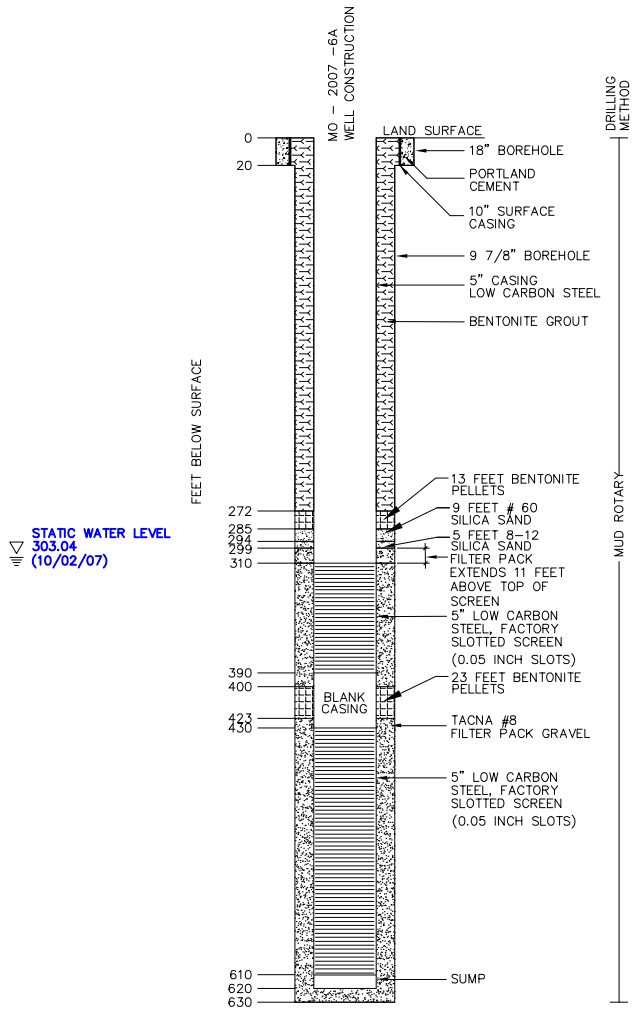


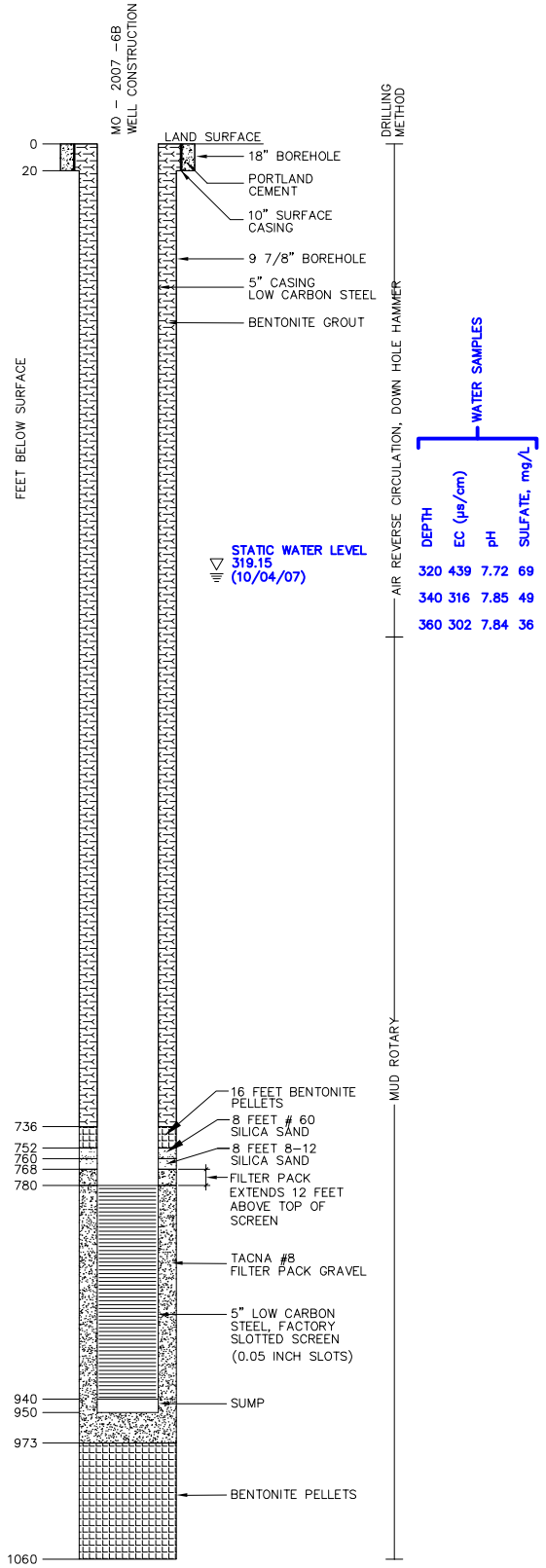


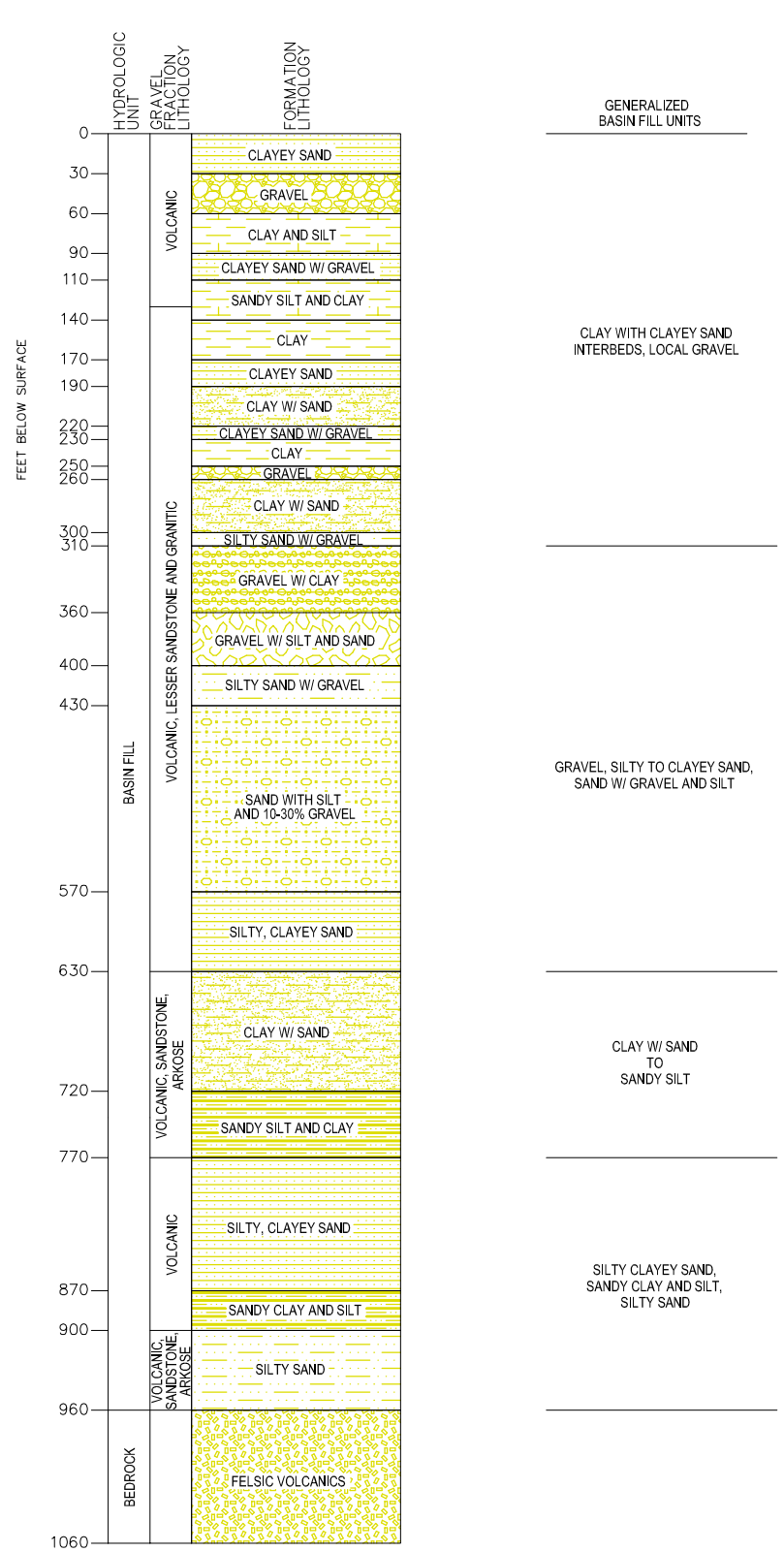
HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAMS AND STRATIGRAPHY FOR WELLS CW-3, MO-2007-5B, AND MO-2007-5C

Approved	Date	Drawn By	Date	File Name	Figure
KSW	10/10/07	RAM	10/10/07	7830156A	D.6







HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAMS AND STRATIGRAPHY FOR WELLS MO-2007-6A AND MO-2007-6B

Approved	Date	Drawn By	Date	File Name	Figure
KSW	09/28/07	DKW	09/28/07	7830154A	D.7

APPENDIX D.1

LITHOLOGIC LOGS OF PILOT BOREHOLES MO-2007-1C, MO-2007-2, MO-2007-3C, MO-2007-4C, MO-2007-5C, AND MO-2007-6B

HYDRO GEO CHEM, INC.

Geologic Boring Log

	Boring No.: **MO-2007-1C**
Project Name: **Phelps Dodge Sierrita Mitigation Order**	Project No.: 78300
Drilling Company: WDC Exploration and Wells	Driller: Arnold Lamon
Site Plan at Boring Location:	ADWR Registration No.: **55-907209**
	Drilling Equipment: GEFCO Speedstar 50K
	Drilling Method: RC Air and Mud Rotary
	Bit Type/Size: Tricone, 9 7/8 inch
	Total Borehole Depth: 1260 feet
	Casing Depth: 1190 feet
	Screened Interval: 1020-1180 feet
	Depth to Water/Date: 423.87 feet 7/30/07
	Screen slot size: 0.05 inches
	Filter pack type: No. 8 Tacna Gravel
	Top of Casing Elevation:
	Ground surface Elevation: 2964.34 feet amsl
	Date/Time Started: 5/24/07 8:30
	Date/Time Completed: 6/13/07 11:32
Township, Range, Section: T17S, R13E, 34dcd	Logged by: K.Wilson/ W.Thompson
Lattitude: 31 53 59.27 Longitude: 110 59 59.49	Checked by: Kim Wilson

Depth (Ft)	Graphic Log	Estimated % GR	SA	Fl	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
0		5	85	10	SW-SM	10YR6/2	S	Alluvium, light brownish gray sand with silt.
30		5	85	10	SW-SM	10YR6/2	S	Light brownish gray sand with silt. Gravel fraction is polymictic, composed of granitoids with epidote and limonite, sandstone and arkose with disseminated oxidized pyrite, and dark gray aphanitic volcanics. Sand fraction is mostly quartz with lesser feldspar, few volcanic grains, and < 1% fine grained magnetite.
40		5	65	30	SM	10YR6/3	W	Pale brown silty sand. Gravel fraction is granite and diorite with oxidized sulfides and disseminated epidote.; clasts are subrounded to angular, up to 2 cm diameter. Sand fraction is moderately well graded, fine to coarse grained, but mostly fine of medium grained; mostly quartz with lesser feldspar, < 1% fine magnetite, trace epidote and mica flakes.
50		15	83	2	SW	7.5YR6/3	M	Light brown well graded sand with gravel. Gravel fraction is primarily granitoids (Ruby Star granodiorite and Pre-cambrian granite), with lesser arkose and schist; some clasts show epidote and limonite alteration; clasts sub-angular. Sand is subangular to subrounded, fine to coarse grained, mostly fine to medium grained, moderately well graded; mostly quartz with lesser feldspar, epidote, magnetite, and hematite.
60		25	75	trace	SW	7.5YR6/3	M	Light brown sand with gravel. Gravel is fine, subangular granite and felsic porphyries with rare arkose. Sand fraction is mostly coarse grained comprised of quartz, quartz-feldspar, trace epidote, few dark gray volcanics, and fine grained magnetite.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-1C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
70			70	30	SM	7.5YR6/3	S	Light brown silty sand. Sand is mostly fine to very fine
								grained, primarily quartz with little feldspar, </=1% gray
								metallics including some magn 55-907209
80			85	15	SM	7.5YR6/3	S	Light brown silty sand, as above. Sand is mostly fine to
								very fine grained, primarily quartz with little feldspar, up to
								1% fine grained crystalline magnetite.
90			65	35	SC	7.5YR6/3	S	Light brown clayey sand. Composition as above, with clay.
100		5	75	20	T17S, R13	7.5YR6/3	S	Light brown clayey sand. Sand is very fine through medium
								but mostly fine grained; primarily quartz with little feldspar
								and </= 1%very fine grained magnetite. Gravel is angular
								to subangular, up to 2 cm clasts of granite, diorite, and
								rhyolite containing variable amounts of epidote and
								oxidized sulfides.
110		trace	70	30	SM	7.5YR6/3	S	Light brown silty sand. Sand is fine to coarse grained,
								mostly fine through medium grained, subrounded; primarily
								quartz, quartz-feldspar lithic grains, with lesser feldspar
								grains, </=1% magnetite. Some limonite stain on sand
								grains. Small gravel fraction is granite with oxidized pyrite
								and silicified arkose.
120			65	35	SC	7.5YR6/3	S	Light brown clayey sand; with some silt. Sand is mostly
								subrounded quartz with little feldspar and trace very fine
								grained magnetite.
130			60	40	SC	7.5YR6/3	S	As above.
140			60	40	SC	7.5YR6/3	S	As above.
150			20	80	ML	7.5YR6/3	S	Silt with sand; with some clay also present. Sand fraction
								is subangular to subrounded, primarily quartz with little
								feldspar and trace magnetite.
160			40	60	ML	7.5YR6/3	S	As above. Sand fraction is fine to medium grained, quartz
								with trace feldspar and fine magnetite, sun angular to
								subrounded, moderately well graded.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-1C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
170			45	55	CL	7.5YR6/3	S	Light brown sandy lean clay. Sand is subangular, fine to
								coarse but mostly fine to medium grained, primarily quartz
								with little feldspar, fine grained magnetite and trace
								epidote.
180			65	35	SC	7.5YR6/3	S	Light brown clayey sand. Sand composition as above,
								subrounded, fine to coarse grained, well graded.
190			70	30	SM	7.5YR6/3	S	Light brown silty sand. Sand fraction as above.
200			65	35	SC	7.5YR6/3	S	Light brown clayey sand. Sand fraction composition as
								as above, mostly fine to medium with some coarse grained.
210		trace	70	30	SM	7.5YR6/3	S	Light brown silty sand; some clay. Sand is coarse to fine
								grained, well graded through silt; primarily quartz grains
								with quartz-feldspar, quartz-biotite, and quartz-epidote
								grains, very fine grained magnetite grains. Trace granitic
								gravel clasts.
220			70	30	SM	7.5YR6/3	S	As above.
230			75	25	SM	7.5YR6/3	S	As above, with increased sand fraction.
240			80	20	SM	7.5YR6/3	S	Light brown silty sand. Sand is subangular to
								subrounded, fine to medium grained, well graded, mostly
								quartz with little feldspar, trace magnetite, and gray
								volcanic grains.
250		trace	60	40	SM	7.5YR6/3	S	Light brown silty sand; some clay. Small gravel fraction
								is granitic; sand is granitoid-derived. Sand grains are
								subangular to subrounded, coarse through fine but mostly
								medium through fine grained, quartz, quartz-feldspar, quartz-
								biotite, trace epidote and magnetite grains.
260			70	30	SM	7.5YR6/3	S	As above.
270		trace	70	30	SM	7.5YR6/3	S	Light brown silty sand; some clay. Sand is coarse through
								fine, mostly medium to fine grained, composed of small
								granitoid grains, quartz, feldspar and very fine grained
								magnetite.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-1C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
280			70	30	SC	7.5YR6/3	S	Light brown clayey sand; some silt. As above with a bit
								more clay. Sand fraction as above.
290			65	35	SC	7.5YR6/3	S	Light brown clayey sand; some silt. Sand is fine to medium
								well graded thru silt. Rare coarse grains are granitic lithic
								fragments. Sand is mostly subrounded.
300		trace	85	15	SM	7.5YR6/3	S	Light brown silty sand. <5% gravel is granitoids. Sand is
								fine to coarse grained, subangular to subrounded, mostly
								quartz, with quartz-biotite, quartz feldspar, trace epidote
								and very fine magnetite grains.
310		5	80	15	SM	7.5YR6/3	S	Light brown silty sand. Gravel fraction is granitoids and
								andesite with epidote alteration. Sand composition is as
								above, fine to coarse grained, well graded.
320			35	65	CL	7.5YR6/3	S	Light brown sandy clay; some silt also present. Sand
								fraction is as above.
330			35	65	CL	7.5YR6/3	S	Light brown sandy clay as above. Sand is mostly fine to
								medium grained quartz with little feldspar and trace very
								fine grained magnetite.
340			70	30	SM	7.5YR6/3	S	Light brown silty sand. Sand is fine to coarse grained,
								subangular to subrounded, well graded, composed of quartz
								and quartz-feldspar grains with lesser feldspar and trace
								amounts of epidote and magnetite.
350		5	80	15	SM	7.5YR6/3	S	Light brown silty sand. Small gravel fraction is composed
								of granitoids and gray volcanics. Sand fraction is mostly
								quartz with lesser feldspar, often fine biotite specks and/or
								iron oxides intergrown with quartz grains; sand is fine to
								coarse grained, subangular to subrounded.
360		trace	85	15	SM	7.5YR6/3	S	Light brown silty sand, with 5% clay. Sand is subrounded,
								fine to medium grained, mostly fine grained; primarily
								quartz with little feldspar and trace magnetite. Gravel is
								angular to subangular granitic clasts.
370		trace	75	25	SC	7.5YR7/3	W	Light pinkish brown clayey sand. Sand is subrounded, fine
								to coarse grained, mostly quartz with lesser feldspar and
								trace epidote and fine grained magnetite. Weak limonite
								surface stain on grains. Trace fine gravel is granitic.
380		trace	90	10	SW-SM	10YR7/2	S	Very pale brown sand with silt. Gravel is granite with
								epidote and oxidized pyrite. Sand fraction is subrounded,
								fine to coarse, but mostly fine to medium grained;
								composition as above.
390		5	85	10	SW-SC	10YR7/3	M	Very pale brown sand with clay. Gravel fraction is granitic
								with epidote and iron oxides and quartz fragments; clasts
								are angular to subangular. Sand is angular to subangular,
								coarse through fine grained, composition as above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-1C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
400		15	80	5	SW	10YR7/3	S	Very pale brown sand with gravel. Gravel fraction is composed
								of limonitic granitoids and gray aphanitic porphyry with fine
								feldspar. Sand is subrounded, fine to coarse grained, but
								mostly medium to coarse.
410		15	75	10	SW-SC	10YR7/3	M	Very pale brown sand with clay and gravel. Gravel fraction
								is comprised of granitoids with limonite and epidote and
								lesser gray aphanitic volcanics. Sand fraction is sub-
								rounded, fine to coarse grained, mostly medium to coarse
								grained.
420		5	85	10	SW-SM	10YR7/2	S	Light gray sand with silt. Gravel clasts are granitoids and
								feldspar porphyry. Sand fraction is primarily quartz with
								fine grained granitoid grains, feldspar with oxidized pyrite.
								Sand sized grains are angular to subrounded, fine through
								coarse grained.
430		10	75	15	SM	10YR7/2	S	Light gray silty sand. Granite fraction is angular to
								subangular silicified volcanics and granitoids. Sand
								fraction is subangular to subrounded, fine to coarse
								grained, well graded through to silt; composition as above.
440		15	80	5	SW	10YR7/2	S	Light gray sand with gravel. Gravel fraction is subangular
								granitoids with epidote and oxidized pyrite and angular
								silicified volcanics. Sand is subrounded with some
								subangular grains, fine to coarse grained, mostly medium
								grained, composed mostly of quartz and granitic grains,
								with few feldspars, trace epidote and magnetite.
450		30	60	10	SW-SM	10YR7/2	S	Light gray well graded sand with silt and gravel. Gravel is
								angular to subangular granitoids with lesser volcanics.
								Sand fraction is subangular, fine to coarse grained,
								composition as above with a few dark gray volcanic grains.
460		5	90	5	SW	10YR7/2	S	Light gray sand with composition and texture as above.
								First water.
470		25	70	5	SW	10YR7/3	S	Very pale brown sand with gravel. Gravel fraction is mostly
								granitic with few volcanic clasts. Sand is fine to coarse,
								mostly coarse grained, with texture and composition as
								above.
480		10	80	10	SW-SM	10YR7/3	M	Pale brown sand with silt, with about 5% clay. Gravel
								fraction is composed of granitoids with epidote, sandstone,
								arkose, and rare volcanics. Sand is subrounded with some
								subangular grains; well-graded coarse grained through to
								to silt. Sand grains are mostly quartz and other granitic
								minerals with a few lithic grains of grey aphanitic volcanics
								and fine grained sandstone.
490		20	75	5	SW	10YR7/2	M	Light gray sand with gravel. Gravel is angular to sub-
								angular granitoids with lesser fine grained sandstone and
								volcanics. Sand fraction composition and texture as above,
								with abundant coarse grains.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-1C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
500		15	80	5	SW	10YR7/3	S	Very pale brown sand with gravel. Gravel fraction is
								angular to subangular granite with epidote and fine grained
								sandstone. Sand fraction is subrounded, fine to coarse
								grained, mostly medium grained, composed of quartz with
								lesser feldspar, fine magnetite, trace epidote.
510		15	80	5	SW	10YR7/3	S	Very pale brown sand with gravel. Sand fraction as above.
								Gravel is fine except for a few 1-2 cm clasts, comprised of
								granite, arkose and volcanics. Well is making a lot of water,
								making estimation of % fines difficult from here on in.
520		20	75	5	SW	10YR7/3	S	Very pale brown sand with gravel. Sand fraction as above.
								Gravel fraction is angular to subangular volcanics,
								granitoids with epidote, and few sandstone clasts.
530		15	80	5	SW	10YR7/3	M	Very pale brown sand with gravel. Sand fraction as above.
								Gravel as above, up to 1 cm volcanics, granitoids, and
								arkose.
540		trace	95	5	SW	10YR7/3	M	Very pale brown well graded sand. Sand is subangular to
								subrounded, fine to coarse grained, mostly quartz with
								lesser feldspar, <1% very fine grained magnetite, trace
								epidote, with few grains of gray volcanics, granitoids,
								and sandstone. Trace gravel is siltstone with limonitic
								fracture filling.
550		5	90	5	SW	10YR7/3	M	Very pale brown well graded sand. Fine to coarse grained
								with abundant medium sized grains. Composition and
								grain shape as above. Gravel fraction is granitoids and
								volcanics.
560		20	80		SW	10YR7/3	M	Very pale brown sand with gravel. Gravel fraction is
								mostly subangular to subrounded granitoids with few
								volcanics, and arkose with epidote. Sand fraction is as
								above.
570		10	90		SW	10YR7/3	M	Very pale brown sand. As above, with smaller gravel
								fraction.
580		15	85		SW	10YR7/3	M	Very pale brown sand with gravel. Sand fraction as above.
								Sand fraction is as above. Gravel fraction is granitoids,
								volcanics and little arkose.
590		5	95		SW	10YR7/3	M	Very pale brown sand. Sand is fine to coarse, mostly
								medium to coarse grained, subangular to subrounded;
								composed of primarily quartz with lesser quartz-feldspar,
								quartz-biotite, and feldspar grains, trace epidote and very
								fine grained magnetite. Gravel fraction is granite, schist,
								and few volcanics.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-1C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
600		15	85		SW	10YR7/2	M	Very pale brown sand with gravel. Sand fraction as above.
								Gravel fraction is subangular granitoids, volcanics and
								metasediments.
610		25	70	5	SW	10YR7/1	M	Light gray sand with gravel. Gravel fraction is subangular
								up to 2 cm clasts of granitoids, volcanics, trace arkose.
								Sand fraction is subangular to subrounded, fine to coarse
								grained quartz, feldspar, granitic grains, trace epidote and
								fine magnetite.
620		30	70		SW	10YR7/1	M	Light gray sand with gravel. Sand fraction as above.
								Gravel is subangular granitoids, angular silicic volcanics
								and fine grained sandstone with oxidized fine grained
								pyrite.
630		15	85		SW	10YR7/3	M	Very pale brown sand with gravel. Gravel fraction as above.
								Sand fraction is subrounded, fine to coarse grained with
								abundant medium sized grains; composition as above with
								a few dark gray volcanic lithic grains.
640		25	75		SW	10YR7/3	M	As above, with larger gravel fraction.
650		35	60	5	SW	10YR7/2	M	Very pale brown sand with gravel. Gravel fraction is
								composed of granitoids, volcanics, fine grained sandstone,
								Sand fraction is fine to coarse, mostly medium to coarse
								grained, subangular to subrounded, composed of lithic
								fragments, quartz, quart-feldspar, and feldspar grains and
								trace fine grained magnetite.
660		10	85	5	SW	10YR7/2	M	Very pale brown well graded sand. Composition and
								textures as above, with smaller gravel fraction.
670		15	80	5	SW	10YR7/2	M	Very pale brown sand with gravel. Sand fraction is well
								graded, coarse through fine grained, as above. Gravel is
								angular to subangular dark gray volcanics, gray feldspar
								porphyry and granitoids.
680		5	90	5	SW	10YR6/2	M	Light brownish gray sand. Composition and textures as
								above,with smaller gravel fraction. Gravel is fine grained with
								occasional 2 cm clasts, angular to subangular, comprised
								of dark gray aphanitic volcanics, crystal rich porphyry,
								chert and granitoids.
690		25	70	5	SW	10YR6/2	M	Very pale brown sand with gravel. Sand is fine to coarse
								grained, mostly medium to coarse grained, subangular to
								subrounded, primarily quartz and quartz with fine biotite,
								with lesser feldspar, trace epidote and fine magnetite.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-1C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
700		trace	95	5	SW	10YR7/2	S	Very pale brown sand. Sand is fine to coarse grained,
								mostly medium through coarse grained, subangular,
								composed of quartz, quartz-feldspar, quartz-biotite and
								lithic grains. Gravel fraction is polymictic comprised of
								granitoid, volcanic, and fine grained limonite-epidote
								altered fine grained sandstone clasts up to 1 cm.
710		10	88	2	SW	10YR6/2	M-S	Light brownish gray sand. Sand fraction is fine to coarse,
								mostly medium through coarse grained, subangular
								quartz, quartz-feldspar, quartz-biotite, feldspar and lithic
								grains. Gravel fraction is polymictic comprised of volcanic,
								grantoid, and fine grained limonitic sandstone clasts up to
								1 cm diameter.
720		15	85		SW	10YR6/3	M	Pale brown sand with gravel. As above, with a larger gravel
								fraction.
730		10	85	5	SW	10YR6/2	M	Light brownish gray sand. Gravel and sand fractions as
								above.
740		5	95	trace	SW	10YR6/2	M	Light brownish gray sand. Gravel fraction as above. Sand
								as above, but mostly fine to medium grain. 5% dark gray
								sand-size angular volcanic fragments, probably ground up
								gravel fraction during drilling.
750		20	70	10	SW	10YR7/1	W	Light gray sand with gravel. Gravel fraction angular to
								subrounded arkose, granitoids and volcanics. Sand is well
								graded, coarse grained through silt; angular to subrounded,
								and composed of quartz and lithic grains.
760		35	50	15	SW	10YR7/1	W	Light gray sand with gravel. Composition as above, with
								larger gravel fraction and more fines. Small amounts of
								epidote and fine grained oxidized pyrite are present in a few
								arkose and grainitc clasts. HCl reaction restricted to fines.
770		25	70	5	SW	10YR7/2	M	Very pale brown sand with gravel. Gravel fraction is angular
								to subrounded, dark to light gray aphanitic volcanics,
								granitoids, and a few fine grain sandstone clasts. Sand fraction
								is coarse through fine grained, well graded, primarily quartz
								and some feldspar, rust colored iron oxide stain, fairly
								clean.
780		10	80	10	SW-SM	10YR6/3	M	Pale brown well-graded sand with silt. Gravel fraction is
								angular to subrounded, dark through light gray aphanitic
								volcanics, few granitoids, few light pink quartz clasts.
								Sand fraction is coarse through fine grained, fairly well-
								graded through to silt.
790		20	75	5	SW	10YR6/3	M	Pale brown sand with gravel. Gravel fraction as above.
								Sand fraction is coarse through fine, but has larger
								amount of coarse grained material compared to above,
								fairly well-graded, clean.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-1C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
800		20	75	5	SW	10YR6/3	M	As above, except sand fraction slightly finer grained
								overall.
810		10	85	5	SW	10YR6/3	M	Pale brown well-graded sand. Gravel fraction is angular to
								subrounded, dark through light gray aphanites with few
								granitoids. Sand fraction is coarse through fine grained,
								primarily quartz, few feldspars, fairly well graded, clean,
								saturated.
820		10	85	5	SW	10YR6/3	M	As above.
830		70	25	5	GW	10YR6/3	M	Pale brown and mottled gravel with sand. Gravel fraction
								broken up due to drilling, composed of angular to subrounded
								dark gray volcanics, granitoids, arkose, and white translucent
								limestone, and numerous quartz clasts. Sand fraction is coarse
								through fine grained, fairly clean, saturated.
838		10	85	5	SW	10YR6/3	M	Pale brown sand. Coarse through very fine grained, fairly
								well graded, primarily quartz with some dark gray aphanitic
								lithic grains, white limestone; rust colored iron oxide stain
								on some grains; clean. Gravel is polymictic, composition as
								above.
850		10	85	5	SW	10YR6/3	M	As above.
860		15	80	5	SW	10YR6/3	M	Pale brown sand with gravel. As above, with more coarse
								grained sand and a slightly larger gravel fraction.
870			95	5	SW	10YR6/3	M	Pale brown well-graded sand, coarse through fine grained,
								well-graded through to minor silt fraction; primarily quartz,
								dark gray volcanics, some epidote, and numerous grains of
								white translucent limestone; clean.
880			95	5	SW	10YR6/3	M	As above.
890			95	5	SW	10YR6/3	M	As above.
900		70	25	5	GW	10YR6/3	M	Pale brown gravel with sand. Gravel fraction is angular
								due to breakage during drilling. Primarily quartz, dark gray
								aphanitic volcanics, and granitoids with few limestone
								clasts. Sand fraction is coarse through fine grained quartz,
								quartz-biotite, quartz-feldspar grains; clean.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-1C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
910		20	75	5	SW	10YR6/3	M	Pale brown sand with gravel. Gravel fraction angular to
								subrounded, composition as above. Sand fraction is coarse
								though fine grained, fairly well graded, clean, saturated.
920		10	85	5	SW	10YR6/3	S	Pale brown sand. Gravel fraction as above. Sand fraction
								is coarse through very fine grained, primarily quartz, with
								dark gray aphanitic volcanic lithic grains. Fairly well-
								graded, clean.
930			90	10	SW-SM	10YR6/3	S	Pale brown well graded sand, coarse through fine grained,
								composed primarily of quartz with lesser dark gray volcanic
								and limestone lithic grains, few feldspar and green epidote
								grains; well-graded through to silt fraction.
940		5	85	10	SW-SM	10YR6/3	S	As above.
950		5	85	10	SW-SM	10YR6/3	S	As above.
960			90	10	SW-SM	10YR6/3	S	Pale brown well-graded sand, coarse through fine grained,
								primarily quartz with lesser dark gray volcanics, and few
								arkose, granitoid, limestone, epidote and feldspar grains;
								fairly clean.
970			90	10	SW-SM	10YR6/3	S	As above.
980			90	10	SW-SM	10YR6/3	S	As above.
1000		10	80	10	SW-SM	10YR6/3	S	Pale brown well-graded sand with silt. Gravel fraction broken by
								drilling, angular to subrounded, primarily quartz with dark
								gray aphanitic volcanics, few granitoid and arkose clasts.
								Sand is coarse through fine grained, primarily quartz with
								lesser limestone and dark volcanic lithic grains, and few
								feldspar grains. About 50% of clasts are granitoid derived,
								10% volcanic, and 40% arkose, sandstone, and siltstone.
1010			75	20	SM	10YR6/3	S	Pale brown clayey, silty sand. Sand fraction is medium to
								very fine grained, primarily quartz with dark colored
								volcanics, few feldspar, epidote and calcite grains; rust
								colored iron oxide stain on surface of some grains. Clay
								fraction sticky, cohesive, possibly occurring as thin
								interbeds.
1020			85	15	SM	10YR6/3	S	Pale brown silty sand. As above without clay; sand is
								more coarse grained, ranging form very coarse to fine
								grained; fairly well-graded.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-1C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
1030			85	15	SM	10YR6/3	S	As above, with several clay balls.
1040			85	15	SM	10YR6/3	S	As above. Sand is about 30% arkose, sandstone, and sea green siltstone particles as coarse angular fragments, 25% angular fine to coarse volcanic grains, and 50% subangular to subrounded quartz, quartz-biotite, and quartz-feldspar grains.
1050			85	15	SM	10YR6/3	S	Pale brown silty sand. Sand fraction is coarse through fine grained, primarily quartz with dark colored aphanitic volcanic lithic grains, white translucent calcite, few grains of arkose, epidote, and brick red colored aphanite. Several small balls of soft plastic clay. Fairly well graded through to silt.
1060			85	15	SM	10YR6/3	S	As above, with no clay.
1070			85	15	SM	10YR6/3	S	As above.
1080			85	15	SM	10YR6/3	S	As above. About 50% of the sand is quartz and granitic-derived grains, 40% arkose, sandstone and siltstone, and 15% gray volcanic grains.
1090			80	20	SM	10YR6/3	S	As above.
1100			80	20	SM	10YR6/3	S	As above.
1110			80	20	SM	10YR6/3	S	As above.
1120			80	20	SM	10YR6/3	S	As above.
1130			80	20	SM	10YR6/3	S	As above. Material is very consistent. Sand particles are 80% arkose, sandstone and few sea green siltstone lithic grains; 15% quartz and quartz-biotite grains; and 5% volcanic grains. Coarsest grains are angular sandstone, siltstone, with trace amounts of fine oxidized pyrite.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-1C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
1140			80	20	SM	10YR6/3	S	As above.
1150			80	20	SM	10YR6/3	S	As above.
1160			80	20	SM	10YR6/3	S	As above. Sand is 10% quartz and quartz-biotite, 10% gray volcanic grains, 80% sedimentary particles including arkose, sandstone with oxidized pyrite, greenish siltstone, and limestone.
1170			75	25	SM	10YR6/3	S	Pale brown silty sand. Sand fraction is medium to very fine grained with abundant quartz grains, lesser calcite, and dark colored volcanic lithic grains; fairly well-graded through to silt fraction.
1180			75	25	SM	10YR6/3	S	As above. About 5% granitic and free quartz grains, 15% gray volcanics, 80% arkose and related sediment grains, and trace chert.
1190			75	25	SM	10YR6/3	S	As above.
1200			75	25	SM	10YR6/3	S	As above. Coarse and some medium sand size particles are angular to subangular, 85% arkose, siltstone and sandstone, 10% dark gray aphanite, and 5% quartz with very fine biotite.
1210		10	65	25	SM	10YR6/3	S	Pale brown silty sand with 10% gravel. Gravel fraction is angular to subrounded, broken up in the process of drilling. Mostly fine quartz sandstone, arkose, sea green siltstone, with lesser aphanitic gray volcanic, and granitoids. Sand fraction is comprised of about 5% quartz grains, many with intergrown biotite specks, 15% dark gray aphanitic volcanics, and 80% sedimentary lithic grains including arkose and siltstone with rare epidote and fine oxidized pyrite, and clean fine grained sandstone. Quartz +/- biotite grains are generally finer and sub-rounded compared to the coarser angular to subangular lithic particles. Few thin calcite veinlet chips.
1215		10	65	25	SM	10YR6/3	S	As above, but with a higher percentage (15%) of quartz and quartz-biotite grains.
1220		10	65	25	SM	10YR6/3	S	As above. Sample is dominantly sedimentary lithic particles with rare feldspar porphyry and granite in the gravel fraction. Sand fraction is about 75% arkose, siltstone and fine sandstone, 10% quartz and quartz-biotite fine biotite grains, 10% dark gray aphanitic volcanic grains. Sand grains are angular to subrounded. Angular grains are mostly sedimentary and volcanic lithic fragments and the quartz +/- biotite subangular to subrounded. Drilling has slowed to about one foot per hour.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-1C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
1230		5	75	20	SM	10YR6/3	S	Pale brown silty sand. Sand fraction is coarse throught fine
								grained, well graded, primarily quartz lith some calcite,
								dark gray volcanics, light green fine grained arkose, few
								granitoids.
1240		5	75	20	SM	10YR6/3	S	As above.
1243								Bedrock. Fine grained arkose, interpreted to be part of the
								Angelica Arkose.
1250						10YR5/4	S	Bedrock. Sample is largely chips of gray fine grained
								arkose.
1260						10YR5/4	S	As above. TD = 1260' bls.

HYDRO GEO CHEM, INC.

Geologic Boring Log

	Boring No.: **MO-2007-2**
Project Name: **Phelps Dodge Sierrita Mitigation Order**	Project No.: 78300
Drilling Company: WDC Exploration and Wells	Driller: Jeff Burris
Site Plan at Boring Location:	ADWR Registration No.: **55-906765**
	Drilling Equipment: GEFCO Speedstar 50K
	Drilling Method: RC Air and Mud Rotary
	Bit Type/Size: Tricone, 9-7/8 inch
	Total Borehole Depth: 740 feet
	Casing Depth: 685 feet
	Screened Interval: 520-680 feet
	Screen slot size: 0.050 inch
	Filter pack type: Tacna No. 8
	Top of Casing Elevation:
	Land surface Elevation:
	Date/Time Started: 3/14/07 8:30
	Date/Time Completed: 3/29/07 11:32
Township, Range, Section: T18S, R13E, 9baa	Logged by: Warren Thompson
Lattitude: 31 53 03.79 Longitude: 111 01 19.47	Checked by: Kim Wilson

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
0		20	50	30	SM	7.5YR5/4	M	Brown silty sand with gravel, few cobbles up to 6" in
								diameter. Gravel fraction is subangular to rounded. Sand
								fraction is coarse to very fine grained, well graded through
								to silt fraction. Alluvial mix, dry. Moderate reaction to HCL.
5		20	30	50	SM	7.5YR5/4	M	As above, with greater clay content. Sample exhibits
								slight plasticity when wet; cohesive when dry. Gravel
								fraction composed of granitic fragments, quartz, trace
								volcanics. Sand fraction is mostly quartz with some
								feldspar, quartz-biotite, trace epidote, and up to 0.5%
								fine to extremely fine grained magnetite crystals.
								Moderate reaction to HCL.
10		20	30	50	ML	7.5YR5/3	S	Brown sandy silt with gravel and clay. Sample material
								very ground up; gravel fraction partially inferred based
								on drill performance. Gravel fraction granitic. Sand
								fraction is coarse to very fine grained, mostly quartz
								with lesser feldspar, fine to extremely fine magnetite
								crystals, trace epidote. Slight to moderate plasticity
								when wet; cohesive when dry.
								Strong reaction to HCL.
20		20	30	50	ML	7.5YR6/4	S	As above. Gravel fraction ground up due to drilling.
								Sample is a slurry due to much water injected down
								hole. Sand fraction is very coarse to very fine, fairly
								well graded through to silt fraction.

Project Name: **Phelps Dodge Sierrita Mitigation Order** Boring No.: **MO-2007-2**

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
30		45	45	10	SW-SM	7.5YR6/3	M	Light brown sand with silt and gravel. Gravel fraction is angular to subrounded, ground up in drilling process, few cobbles present in formation, composed of granitoids, abundant sandstone and arkosic sandstone with little epidote and common oxidized disseminated pyrite. Sand fraction is coarse to fine grained, well graded through to silt fraction, mostly quartz and quartz-feldspar grains, with magnetite. Caliche coatings, moderate reaction to HCL.
40		45	50	5	SW	7.5YR6/3	W	Light brown gravelly sand with gravel, very little silt. Gravel fraction includes feldspar porphyry with silicified groundmass and oxidized disseminated pyrite, sericitized granite, granite with chlorite, epidote, oxidized pyrite. Sand is quartz, quartz -feldspar, quartz-magnetite, and fine magnetite. Weak reaction to HCL.
50		30	50	20	SM	7.5YR6/3	S	Light brown silty sand with gravel, as above, with greater silt content. Gravel fraction ground up due to drilling, mixed granitoids with hydrothermal alteration, sandstone, chert, and limestones. Sand fraction is very coarse through fine grained, well graded through to silt. Very strong reaction to HCL
60		30	65	5	SW	7.5YR7/2	W	Pinkish-gray sand with gravel. Gravel fraction ground up, comprised of volcanics, granite, rare arkose. Sand fraction is mostly quartz with lesser pink and white feldspars, and small amounts of magnetite; coarse through very fine grained, well graded. Very weak reaction to HCL.
70		30	65	5	SW	7.5YR7/2	W	As above; gravel fraction includes medium to dark gray aphanitic volcanic, small fragments of dark limestone, light colored sandstone, quartz, chert, and granitoids. Weak reaction to HCL.
80		30	60	10	SW-SM	7.5YR7/2	S	Sand with silt and gravel. As above, but with higher silt content and greater reactivity to HCL. Strong reaction to HCL.
90		30	55	10	SW-SM	7.5YR6/4	S	Light brown sand with silt and gravel. Gravel fraction has abundant light colored granite with very fine grained biotite, and granite with chlorite and disseminated fine pyrite. Some limonite staining on surface of sand grains. Strong reaction to HCL.
100		5	90	5	SW	7.5YR6/4	M	Light brown sand, coarse to very fine grained, well graded, with moderately strong limonite stain, little silt. Moderate reaction to HCL.
110						no sample		Driller reports intercepting clay layer; but difficult to distinguish from drilling mud.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-2**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
120		25	65	10	SW-SM	7.5YR6/3	N	Light brown gravelly sand with silt. Gravel fraction
								broken up from drilling action; angular to subrounded,
								mix of granitic clasts with silica-epidote-pyrite alteration
								and medium to dark gray aphanites. Sand fraction is
								coarse to fine grained, well graded, with moderately strong
								limonite stain on grain surfaces. No reaction to HCL.
130		15	85	5	SW	7.5YR6/2	M	Pinkish gray sand with gravel. Less gravel and silt than
								previous interval. Gravel includes granitic clasts with
								sericite alteration and oxidized pyrite, and dark gray
								limestones. Moderate reaction to HCL.
140		15	75	10	SW-SM	7.5YR6/3	M	Sand with silt and gravel.
								Light brown sand with minor gravel and silt, as above
								with slightly higher silt fraction. Moderate reaction with
								HCL.
150		30	65	5	SW	7.5YR6/4	N	Light brown sand with gravel. Gravel fraction broken by
								drilling, primarily light colored granite and sandstone, with
								some light to dark gray aphanitic clasts. Silica-epidote-
								chlorite-oxidized pyrite alteration in granite fragments; fine
								oxidized pyrite in light colored sandstone/bleached arkose
								clasts. No reaction to HCL.
160		25	65	10	SW-SM	7.5YR6/4	W	Light brown sand with silt and gravel. As above, with a
								slight increase in silt content and very weak reaction to
								HCL.
170		20	75	5	SW	7.5YR6/4	N	Light brown sand with gravel. Gravel fraction broken due
								to drilling, composed of granite containing fresh
								disseminated pyrite. Sand fraction consists of
								light colored silicate grains, granitic fragments, dark
								aphanites; is coarse to fine grained, well graded, clean.
								No reaction to HCL.
180		20	75	5	SW	7.5YR6/4	N	Same as above. No reaction to HCL.
190		20	75	5	SW	7.5YR6/4	N	As above. Consistent smooth drilling indicates
								homogeneous formation. Granite with silica-pyrite-
								sericite-chlorite alteration in gravel fraction. No reaction
								to HCL.
200		20	75	5	SW	7.5YR6/4	N	As above. Gravel fraction includes granite with pervasive
								silicification and dark gray aphanitic volcanic clasts.
								No reaction to HCL.
208		10	70	20	SM	7.5YR6/4		Silty sand, with clay intebeds from 208-212, and
								small amount of gravel., as indicated by drill performance.
								Sand is similar to above consisting of well-graded fine to
								coarse grained light colored silicates. Gravel fraction
								granitic. Clay fraction reacts strongly with HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order** Boring No.: **MO-2007-2**

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
220		20	75	5	SW	7.5YR5/3	M	Brown sand with gravel. Gravel fraction broken up due to drilling; primarily comprised of light colored granitic material with silica-biotite-oxidized pyrite alteration and dark gray limestones. Sand fraction is coarse through fine grained, mostly white to translucent silicates with limonite surface stain. Fairly clean, moderate reaction to HCL.
230		20	75	5	SW	7.5YR5/3	M	As above. Consistent drilling suggests homogenous lithology. Gravel fraction consists of granitic clasts with locally strong silicification and weak oxidized pyrite. Moderate reaction to HCL.
240		20	75	5	SW	7.5YR6/3	M	As above, slight color change to light brown. Gravel fraction is hydrothermally altered granite clasts showing silicification, secondary biotite, and epidote after feldspar.
250		20	75	5	SW	7.5YR6/3	N	Light brown sand with gravel. Gravel fraction is dominantly granitic with fine biotite, chlorite, epidote alteration with rare andesite, arkose and limestone. Sand fraction is well graded, coarse to fine grained, primarily quartz and feldspar with minor limonite stain, and rare dark gray aphanite. No reaction to HCL.
260		20	75	5	SW	7.5YR6/3	W	As above, except for very weak reaction to HCL.
270		20	75	5	SW	7.5YR6/3	W	As above, epidote, fine grained oxidized pyrite in granitic clasts.
280		10	85	5	SW	7.5YR6/3	W	Sand. As above, with decreased gravel fraction
290		10	85	5	SW	7.5YR6/3	W	As above, except sand fraction is coarse through medium grained with very little fine grained material.
300								As above.
310		15	80	5	SW	7.5YR6/3	M	Light brown sand with gravel. Slightly greater gravel fraction, comprised largely of granite and porphyritic volcanics, both with silicification. Moderate reaction to HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order** Boring No.: **MO-2007-2**

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
319		20	60	20	SC	7.5YR5/3	M	Brown clayey sand with gravel. Gravel fraction broken up due to drilling. Gravel fraction is primarily light colored andesite and arkose, with lesser dark colored limestones, granite, quartz and feldspar with weak to moderate limonite stain. Sand fraction is mostly quartz and feldspar, coarse through medium grained with little fines. Clay fraction is as interbedded material in layers up to 6 " thick based on drill rig response. Moderate reaction to HCL.
324		10	85	5	SW	7.5YR5/3	M	Brown sand. Sand with little gravel and very little fines. fairly clean; composition as above. Moderate reaction to HCL.
330		10	85	5	SW	7.5YR5/3	M	As above.
340		10	85	5	SW	7.5YR5/3	M	As above; gravel fraction is largely granitic with lesser gray quartz and arkose.
350		10	85	5	SW		M	As above; dominantly granitic clasts with variable epidote and weak potassium feldspar alteration; with lesser volcanic and rare arkose clasts. Sand fraction is quartz and feldspar, with small amounts of mafic grains.
360		10	85	5	SW	7.5YR5/3	W-M	Dark brown sand. Sand fraction primarily light colored silicates including translucent and opaque quartz often with fine biotite intergrowths, feldspar, and little epidote; medium to coarse grained, moderately well graded. Gravel is primarily granitic with rare chert and metasediments. Weak to moderate reaction to HCL.
370		10	85	5	SW	7.5YR5/3	W-M	As above.
380		10	85	5	SW	7.5YR5/3	W-M	As above.
390		10	85	5	SW	7.5YR5/3	W-M	As above; gravel fraction is granitic with lesser silicified volcanic clasts. Weak to moderate reaction to HCL.
400		10	85	5	SW	7.5YR6/3	W	Light brown sand. Gravel fraction small, broken up in drilling, consists of variably hydrothermally altered granitic, volcanic and metasedimentary material. Sand fraction is well graded, coarse to medium grained, mostly quartz, quartz-feldspar intergrowths with little fine grained magnetite. Weak reaction to HCL.
410		10	65	25	SM	10YR6/2	S	Light brownish gray silty sand. Gravel and sand fraction compositions as above. Silt fraction reacts strongly to HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order** Boring No.: **MO-2007-2**

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
420		20	65	15	SM	10YR6/2	S	Light brownish gray gravelly silty sand. As above but with larger gravel fraction and less silt.
430		10	80	10	SW	7.5YR6/3	W	Light brown sand. Minor amount of gravel and silt. Sand fraction is fine to coarse grained, well graded, composed of abundant quartz, small granite fragments, and few dark gray aphanitic grains. Gravel fraction is silicified granitoids.
440		10	80	10	SW	7.5YR5/3	S	Brown sand. Minor gravel and silt. Gravel fraction is andesite, arkose, and coarse feldspar. Sand fraction is quartz and feldspar, with little dark aphanitic material, well graded, very fine to coarse grained with moderate limonite stain. Strong reaction to HCL
450		15	75	10	SW-SM	10YR7/2	S	Light gray sand with gravel. Little silt. Gravel fraction comprised of hydrothermally altered granite, volcanics and arkose. Sand is quartz and feldspar with few dark aphanitic grains, coarse to very fine grained, well graded. Strong reaction to HCL
460		30	65	5	SW	10YR7/2	M	Light gray sand with gravel. Little silt. As above with increase in gravel fraction. Moderate reaction to HCL.
470		30	65	5	SW	10YR7/2	M	As above. Little return from cyclone discharge.
480		30	65	5	SW	10YR7/2	M	Light gray sand with gravel. Gravel fraction is granitoids, quartz, feldspar and few dark gray limestone clasts. Sand fraction is coarse to fine grained but primarily medium through fine grained; moderately well graded throughout size range. Moderate reaction to HCL.
490		30	65	5	SW	7.5YR6/3	W	As above, except sand is mostly coarse through medium grained. Sand is primarily quartz. Weak reaction to HCL.
500		30	65	5	SW	7.5YR6/3	W	As above, with an increase in the amount of black volcanic material. Sand is quartz, quartz-feldspar, quartz-epidote, and small arkose particles, trace magnetite. Weak reaction to HCL.
510		40	55	5	SP	10YR6/3	W	Pale brown sand with gravel, with boulders and cobbles. Sand is primarily coarse grained, angular to rounded, comprised primarily of quartz and granitoids with some epidote and black aphanite. Very weak reaction to HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-2**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
520		20	70	5	SW	10YR6/3	W	Sand with gravel, as above. Sand is medium to fine
								grained, moderately well graded. Weak reaction to HCL
530		10	85	5	SW	10YR6/3	S	Pale brown sand. Sand fraction is medium
								through fine grained, angular to well-rounded, moderately
								well graded; comprised primarily of quartz, some
								granitoids and dark aphanites. Moderate limonite stain.
								Strong reaction to HCL.
								First water at 535'.
540		30	60	10	SW-SM	10YR6/5	S	Pale brown sand with silt and gravel.
								Gravel fraction very broken up due to drilling;
								angular to subrounded granitoids, quartz, arkose,
								dark to medium gray volcanic clasts. Moderate limonite
								stain. Oxidized pyrite and epidote in arkose clasts.
								Sand fraction is very coarse through fine grained, fairly
								well graded, angular to subrounded. Silt fraction reacts
								strongly to HCL. Saturated.
550		30	60	10	SW-SM	10YR6/3	S	As above. Gravel fraction composed of mostly arkose
								with lesser amount of granitoids; arkose contains oxidized
								oxidized pyrite and epidote.
								Strong reaction to HCL.
560		30	60	10	SW-SM	10YR6/3	M	Pale brown sand with silt and gravel. Little silt, as above.
								Moderate reaction to HCL.
570		20	70	10	SW-SM	10YR6/2	M	Light brownish gray sand with silt and gravel. Gravel
								fraction broken up in drilling, angular to subrounded.
								Sand fraction is coarse through fine grained, moderately
								well graded, primarily quartz with medium to dark gray
								aphanitic volcanics, few granitoids, moderate iron oxide
								stain, saturated. Silt fraction reacts moderately with HCL.
								Gravel is arkose and granitoids with epidote and limonite
								alteration.
580		20	70	10	SW-SM	10YR6/2	M	As above.
590		60	30	10	GM	mottled	W	Gravel with silt and sand.
								Sandy, cobbly gravel with 10% silt and clay. Mottled
								coloration. Cobbles are inferred by drill response. Cobble
								and gravel fraction is angular to subrounded, primarily
								arkose, granitoids and volcanics, with chlorite, epidote,
								alteration and limonite stain. Sand fraction is subangular
								to rounded, primarily quartz, little feldspar and epidote,
								some iron oxide staining, clean. Few small interbeds of
								soft sticky silt and clay. Weak reaction to HCL. Saturated.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-2**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
600		60	30	10	GM	mottled	W	As above.
610		40	50	10	SW-SM	mottled	W	Sand with silt and gravel, mottled coloration. Gravel has abundant arkose clasts and light gray soft rhyolite fragments (quartz phenocrysts in aphanitic groundmass) which might reflect presence of volcanic tuff layer within the basin fill sequence.
620		30	60	10	SW-SM	10YR6/3	W	Light yellowish brown sand with silt and gravel. Gravel fraction broken up in drilling, primarily arkose, granitoids dark gray volcanics and medium gray soft rhyolite. Sand fraction is mostly quartz, with few dark gray aphanitic volcanics, epidote, scarce dark gray limestone grains, angular to subrounded, limonite stained, fairly well graded from very coarse through medium grained, saturated. Weak reaction to HCL.
630		20	70	10	SW-SM	mottled	W	As above, without rhyolite component and less iron oxide stain.
640		30	60	10	SW-SM	10YR6/3	W	Pale brown sand with silt and gravel. Gravel fraction is soft gray rhyolite with lesser arkose and granite clasts. Sand fraction is primarily quartz with some dark volcanic and few dark gray limestone grains, coarse through fine grained, fairly well graded, saturated. Very weak reaction to HCL.
650		20	70	10	SW-SM	mottled	W	As above.
660		20	70	10	SW-SM	10YR6/3	M	As above except for absence of gray rhyolite in gravel fraction. Moderately strong limonite stain, saturated. Moderate reaction to HCL. Granitic content greater than arkose in gravel fraction.
670		70	25	5	GW	mottled	M	Dark to light gray mottled gravel with sand. Gravel clasts angular to subrounded, abundant arkose fragments showing silicification, epidote, chlorite, and oxidized pyrite alteration; dark gray volcanic and few limestone clasts also present in gravel fraction. Sand fraction is mostly coarse grained. Saturated. Moderate reaction to HCL
680		60	30	10	GW-GM	mottled	W	Gravel with clay and sand. Gravel angular to subangular, gray aphanites, quartz, and abundant flat angular arkose chips with epidote and oxidized pyrite. Arkose bedrock estimated at 687' based on drilling characteristics. Sand fraction is very coarse through fine grained fairly well graded. Saturated. Weak reaction to HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-2**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
690	bedrock					mottled	W	Angular arkose chips, grayish brown, greenish brown.
								Clay fraction moderately plastic, sticky, cohesive.
								Weak reaction to HCL overall; clay moderately reactive.
								Angelica Arkose bedrock.
700						2.5Y5/2	W	Grayish brown arkose, fine-grained sandstone, greenish
								gray siltstone weakly metamorphosed. Disseminated fine-
								grained oxidized pyrite, occasional chloritic laminae,
								epidote matrix in some sandy layers.
								Very weak reaction to HCL.
710						2.5Y5/2	W	As above.
720						2.5Y5/2	W	As above, fine sandstone, arkose, siltstone chips.
								Small amount of black aphanitic material.
730						2.5Y5/2	W	As above, with more fine grained arkosic sandstone and
								fewer siltstone chip. Oxidized fine grain disseminated
								pyrite, epidote, little sericite alteration.
740						2.5Y5/2	W	As above, grayish brown angular chips of arkose.
								Few dark gray volcanic and granite fragments with
								epidote-sericite alteration, probably representing a pebbly
								layer in the arkose as observed in surface outcrops of the
								formation.

HYDRO GEO CHEM, INC.

Geologic Boring Log

Boring No.:	**MO-2007-3C**
Project Name: **Phelps Dodge Sierrita Mitigation Order**	Project No.: 78300
Drilling Company: WDC Exploration and Wells	Driller: Arnold Lamon
Site Plan at Boring Location:	ADWR Registration No.: **55-906817**
	Drilling Equipment: GEFCO Speedstar 50K
	Drilling Method: RC Air and Mud Rotary
	Bit Type/Size: Tricone, 9-7/8 in.
	Total Borehole Depth: 1430 feet
	Casing Depth: 1130 feet
	Screened Interval: 1160 - 1320 feet
	Depth to Water/Date: 355.20 feet 7/5/07
	Screen slot size: 0.05 inches
	Filter pack type: No. 8 Tacna
	Top of Casing Elevation:
	Ground surface Elevation: 2910.09 feet amsl
	Date/Time Started: 4/25/07 10:52
	Date/Time Completed: 5/13/07 15:36
Township, Range, Section: T18S, R13E, 2bcc	Logged by: Warren Thompson
Lattitude: 31 53 32.63 Longitude: 110 59 39.83	Checked by: Kim Wilson

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
1		30	70	0	SW	2.5YR4/3	W	Reddish brown, sand with gravel. Gravel is fine, sub-
								rounded to subangular, composed of chloritic diorite,
								and arkose and granite with variable silicification,
								epidote and chlorite alteration. Sand fraction is primarily
								with lesser feldspar and minor chlorite, well-graded.
								Weak reaction to HCL. (0'-870' drilled with 6"button bit)
5		30	70	0	SW	7.5YR5/4	W	Brown well-graded sand with gravel. Gravel fraction is
								subrounded to subangular, comprised if arkose and
								granite. Sand fraction is mostly quartz with lesser
								feldspar and various mica flakes. Fine biotite commonly
								attached to quartz grains.
10		30	70	0	SW	7.5YR5/4	W	Brown subrounded well-graded sand with gravel.
								Gravel fraction is limonite stained granite and arkose.
								Sand fraction as above.
								Weak reaction to HCL.
15		20	90	0	SW	7.5YR5/4	W	Brown subrounded to subangular well-graded sand with
								gravel. Gravel is limonitic granite. Sand is quartz, feldspar,
								small granitic particles, fine magnetite. Strong limonite
								stain. Weak reaction to HCL.
20		50	50	0	GW	10YR6/4	W	Light yellowish brown subrounded to subangular
								well-graded sand with gravel. Gravel fraction comprised of
								limonitic granite and arkose with weak epidote-silica alter-
								ation. Sand fraction is primarily quartz with lesser feldspar
								and very fine biotite and chlorite grains.
30		5	90	5	SW	7.5YR5/4	M	Brown sand. Gravel fraction is
								minor, clasts to 1/2" maximum diameter, angular to
								subrounded. Sand fraction is coarse through medium
								grained with 5% fines; composed primarily of quartz with
								moderate limonite stain with few dark colored mafic
								volcanic grains. Loose, dry. Slight to moderate reaction
								with HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
40			10	90	ML	10YR6/2	W	Light brownish gray silt. Sand fraction is very
								fine grained, loose, powdery, dry. Sand is composed of
								quartz, little feldspar, and traces of biotite.
								Weak reaction to HCL.
50			85	15	SM	10YR5/2	M	Grayish brown silty sand. Sand fraction is coarse through
								fine grained, moderately well-graded, primarily quartz with
								few pink granite fragments, arkose and fine grained
								volcanic aphanites, traces of epidote, oxidized pyrite and
								chlorite. Moderately strong iron oxide stain on quartz
								grains. Dry. Moderate reaction with HCL.
60		trace	60	40	SM	10YR6/4	S	Light yellowish brown silty sand. Sand fraction is fine to
								very fine grained, powdery, dry; composed primarily of
								quartz with traces of specular hematite and octahedral
								magnetite. Gravel fraction is granite with epidote, chlorite
								and iron oxides. Strong reaction to HCL.
70		trace	75	20	SM	10YR6/4	S	Light yellowish brown silty sand. Sand fraction is coarse
								through fine grained, moderately well-graded, primarily
								quartz and quartz-fine chlorite, with lesser feldspar, little
								little epidote and magnetite. Strong reaction to HCL.
80		trace	30	70	ML	10YR6/3	S	Pale brown sandy silt. Sand fraction is coarse through
								very fine grained. <5% gravel clasts, composed of granite
								and arkose. Sand is quartz with lesser feldspar, trace
								epidote and iron oxide grains.
								Strong reaction to HCL.
90		trace	10	90	ML	10YR6/3	S	Pale brown clayey silt with sand. Sand fraction is very
								grained, powdery. Sand is primarily quartz and grains of
								decomposed granite, feldspar and trace magnetite.
								Strong reaction to HCL.
100			10	90	ML	10YR6/3	S	As above.
110			10	90	ML	10YR6/3	S	As above. Drillers are injecting a considerable amount of
								water to lift material from hole.
120			15	85	ML	10YR6/3	S	Pale brown clayey silt with sand. Sand fraction is coarse
								through fine grained but is primarily coarse through
								medium grained, composed mostly of quartz with small
								amounts of gray aphanitic material. Fine fraction contains
								a few clumps of very soft clay. Drillers injecting a lot of
								water to keep hole clear. Strong reaction to HCL.
130			15	85	ML	10YR6/3	S	As above, except that the sand fraction is finer grained,
								ranging from medium to very fine grained.
140			15	85	ML	10YR6/3	S	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
150			20	80	ML	10YR6/3	S	As above, slightly higher sand content.
160			20	80	ML	10YR6/3	S	As above.
170			20	80	ML	10YR63	S	As above.
180			30	70	ML	10YR6/3	S	Pale brown sandy clayey silt, as above with increased sand content, sand is coarse to very fine grained. Small lumps of very soft plastic clay. Cuttings in a slurry due to injection of water while drilling. Sand is mostly quartz with minor feldspar, trace epidote and and magnetite. Strong reaction to HCL.
190			30	70	ML	10YR6/3		As above.
200			25	75	ML-CL	10YR6/3	S	Pale brown clay and silt with sand. Sand fraction is medium through very fine grained. Clay fraction is as very soft small balls. Sand is quartz, quartz-biotite, quartz-chlorite, lithic arkose grains, mica flakes, trace epidote and magnetite grains. Strong reaction to HCL.
210			25	75	ML-CL	10YR6/3	S	As above, except that sand fraction is slightly less and fine grained.
220			20	80	ML-CL	10YR6/3	S	Pale brown clay and silt with sand. Sand fraction is coarse through fine grained. Fines are a mix of clays and silt, primarily very soft, plastic, sticky clay. Strong reaction to HCL.
230			25	75	CL	10YR6/3	S	As above.
240		trace	25	75	CL-ML	10YR6/3	S	As above. Rare small gravel fragments are arkose and granitic fragments with fine epidote and oxidized pyrite.
250			25	75	CL-ML	10YR6/3	S	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
260			15	85	CL-ML	10YR6/3	S	Pale brown silty clay with sand. Sand fraction is fine
								grained. Clay is soft, plastic, sticky. Strong reaction to
								HCL.
270			10	90	CL-ML	10YR6/3	S	As above, except for slightly less sand.
280		5	75	20	SM	10YR6/3	S	Pale brown silty sand; little gravel. Sand and gravel
								fractions are mostly quartz with lesser arkose and dark
								gray limestone. Sand fraction is coarse through fine
								grained, moderately well graded through to silty fraction.
								Strong reaction to HCL.
290			20	80	CL-ML	10YR6/3	S	Pale brown clay and silt mix with sand. Sand fraction is
								coarse through fine grained. Strong reaction to HCL.
300			20	80	CL-ML	10YR6/3	S	Pale brown sandy clay and silt. Sand fraction is fine to
								very fine grained. Material is as a slurry due to injection
								of water down hole. Strong reaction to HCL.
310			20	80	CL-ML	10YR6/3	S	As above.
320		5	75	20	SM	10YR6/3	S	Pale brown silty sand; trace gravel. Gravel fraction is
								angular to subrounded arkose, black aphanitic volcanics,
								and pieces of limestone. Sand fraction contains abundant
								quartz with some iron oxide stain on grains, coarse to fine
								grained, moderately well graded. Strong reaction to HCL.
330		10	70	20	SM	10YR6/3	S	As above, slight increase in gravel fraction.
340			20	80	CL-ML	10YR6/3	S	Pale brown silt and clay mix with sand. Sand fraction is
								medium to very fine grained. Clay-silt fraction is plastic,
								sticky and soft. Strong reaction to HCL.
350			20	80	CL-ML	10YR6/3	S	As above.
360			40	60	CL-ML	10YR6/3	S	As above, except for increase in sand fraction. Sand is
								primarily quartz with lesser amounts of feldspar and little
								epidote, magnetite and chlorite grains. Strong reaction to
								HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
370		10	80	10	SW-SM	10YR6/3	S	Pale brown sand with silt. Gravel fraction is
								angular to subrounded clasts of diorite and granite with
								silicification and oxidized pyrite. Sand fraction is very
								coarse through fine grained, composed of primarily quartz
								with arkose and lesser gray volcanic and fine grained
								limestone clasts. Strong reaction to HCL
380		trace	70	30	SM	10YR6/3	S	Pale brown clayey silty sand. Sand fraction is coarse
								through fine grained, moderately well graded; few (<5%)
								gravel clasts; cohesive, sticky. Strong reaction to HCL.
390		10	75	15	SM	10YR6/3	S	Pale brown clayey silty sand. Sand fraction is coarse
								through fine grained, moderately well graded through to
								silt. Gravel fraction is angular to subrounded, composed
								of arkose with epidote and granite with chlorite and iron
								oxides. Sand fraction is quartz and feldspar.
								Strong reaction to HCL.
400		trace	30	70	CL-ML	10YR6/3	S	Pale brown sandy silt and clay mix. Sand fraction is fine
								grained. Sample is a slurry due to water injection down
								hole. Gravel is epidotized granite. Sand is largely quartz
								with few epidote, hematite and magnetite grains.
								Strong reaction to HCL.
410			30	70	CL-ML	10YR6/3	S	As above.
420			30	70	CL-ML	10YR6/3	S	As Above.
430		trace	50	50	SM/CL	10YR6/3	S	Pale brown sand, silt and clay mix with few gravel clasts.
								Sand fraction is coarse through fine grained. Cohesive,
								sticky. Strong reaction to HCL.
440			30	70	CL-ML	10YR6/3	S	Pale brown sandy silt and clay mix. Sand fraction is fine
								grained.
								Strong reaction to HCL.
450			30	70	CL-ML	10YR6/3	S	As above, except the sand fraction is coarse through fine
								grained Strong reaction to HCL.
								First water @ 450'
460			40	60	CL-ML	10YR6/3	S	Pale brown sandy clay and silt. Sand fraction is coarse
								through fine grained. Strong reaction to HCL.
470			40	60	CL-ML	10YR6/3	S	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
480		5	85	10	SW-SM	10YR6/3	M	Pale brown sand with silt. Sand fraction is very coarse
								through fine grained, moderately well graded. Gravel
								fraction is angular to subrounded.
								Moderate reaction to HCL.
490		trace	80	20	SM	10YR6/3	M-S	Pale brown silty sand. Sand fraction is coarse to fine
								grained, moderately well graded to silt fraction. Primarily
								quartz with few gray aphanites and limestone grains.
								Rare gravel clasts are altered granite with a little arkose.
								Moderate to strong reaction to HCL.
500			90	10	SM-SW	10YR6/3	M	Sand with silt. As above, except for decrease in silt content.
510			90	10	SM-SW	10YR6/3	M	As above.
520		15	75	10	SW-SM	10YR6/3	W	Pale brown sand with silt and gravel. Gravel fraction is
								angular to subrounded, primarily a mix of quartz, dark to
								light gray aphanitic volcanics, few granitoids, arkose,
								and small amount of limestone. Sand fraction is coarse
								through fine grained, moderately well graded, fairly clean.
								Weak reaction to HCL.
530		15	75	10	SW-SM	10YR6/3	W	As above.
540		10	85	5	SW	7.5YR5/3	M	Mottled brown, gray and white sand; minor gravel.
								Sand fraction is primarily coarse grained but ranges from
								very coarse through fine grained, mainly quartz with some
								gray aphanitic volcanics, and a few limestone grains.
								Moderate reaction to HCL.
550		10	85	5	SW	7.5YR5/3	M	As above, but sand much better graded from coarse to
								fine grained.
								Moderate reaction to HCL.
560		20	75	5	SW	mottled	M	Mottled white to black sand with gravel. Gravel fraction is
								angular to subrounded granite and dark aphanitic volcanics.
								Sand fraction is coarse through fine grained, fairly well
								graded, primarily quartz with some fine grained dark gray
								volcanics. Moderate reaction to HCL.
570		20	75	5	SW	mottled	M	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
580		10	85	5	SW	10YR5/3	M	As above, except for decrease in gravel fraction.
590		10	85	5	SW	10YR5/3	M	Brown sand. Gravel fraction clasts are up to 2 inches diameter dark gray aphanitic volcanics and light colored granitoids. Sand fraction is primarily quartz and gray aphanitic grains; moderately strong limonite stain on quartz grains. Fairly well graded from very coarse to fine grained; clean. Moderate reaction to HCL.
600		25	70	5	SW-SM	10YR5/3	M	Brown sand with gravel. Gravel fraction clasts are a mix of angular to subrounded quartz, granitoids, volcanic aphanites, epidote. Sand is fairly well graded, very coarse through fine grained. Moderate to strong reaction to HCL.
610		25	70	5	SW-SM	10YR5/3	M	As above.
620		25	70	5	SW-SM	10YR5/3	M	As above. Sand fraction is almost entirely quartz with few light through dark gray aphanites.
630		10	85	5	SW	10YR5/3	M	Sand. As above, except for decrease in gravel fraction.
640		20	75	5	SW	10YR5/3	M	Brown sand with gravel. Gravel fraction is angular to sub-rounded dark gray aphanitic volcanics, some granitoids and arkose with a small amount of epidote. Sand fraction is coarse through fine grained, fairly well graded, primarily quartz with moderately strong limonitic stain. Moderate reaction to HCL.
650		20	75	5	SW	10YR5/3	M	As above.
660		10	85	5	SW	10YR5/3	M	As above except for a decrease in gravel fraction; material is finer grained overall.
670		20	75	5	SW	7.5YR5/2	W	Mottled brown sand with gravel. Gravel fraction is angular to subrounded, abundant dark gray to black aphanitic volcanics, biotite speckled granitoids, arkose and quartz. Sand fraction is coarse through fine grained, moderately well graded, primarily quartz with some epidote, moderate to strong limonitic stain, fairly clean. Weak reaction to HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
680		10	85	5	SW	7.5YR5/2	W/M	Sand. As above, except that gravel fraction has decreased and
								reaction to HCL has increased.
690		10	85	5	SW	7.5YR5/2	W/M	As above.
700			95	5	SW	10YR6/4	W	Light yellowish brown sand. Primarily quartz with few
								gray volcanic aphanites; coarse through fine grained,
								well graded, clean.
								Weak reaction to HCL.
710		10	85	5	SW	10YR6/4	W	Sand. As above, but with minor gravel fraction which is
								comprised of angular to subrounded dark through
								medium gray volcanics and light granitoids.
720		15	80	5	SW	10YR6/4	W	Light yellowish brown sand with gravel. As above, with
								slight increase in gravel fraction.
730		15	80	5	SW	10YR6/4	W	As above.
740			95	5	SW	10YR6/4	W	Light yellowish brown sand, coarse through fine grained,
								moderately well graded, primarily quartz with some iron
								oxide stain, clean.
								Weak reaction to HCL.
750		10	90		SW	Mottled	W	Sand, mottled whites, grays, blacks with a few rust
								colored clasts. Gravel fraction is angular to sub-rounded
								granitoids, dark through medium gray volcanic aphanites.
								Sand fraction is coarse through fine grained, well graded,
								abundant quartz.
								Weak reaction to HCL.
760			100		SW	10YR6/3	W	Pale brown sand, medium to fine grained, primarily quartz.
								Some limonitic stain, well graded.
								Very weak reaction to HCL.
770		15	85		SW	Mottled	W	Sand with gravel, mottled coloration of whites, browns and
								grays. Gravel fraction is angular to subrounded
								of granitoids and dark through medium gray volcanics.
								Sand fraction is coarse through fine grained, fairly well
								graded, clean, saturated. Weak reaction to HCL.
780		5	95		SW	10YR6/3	W	Pale brown sand, with very little gravel. Gravel is primarily
								dark gray to black volcanics. Sand fraction is coarse
								through fine grained, well graded, primarily quartz, clean,
								Weak reaction to HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
790		10	90		SW	10YR6/2	W	As above except gravel fraction has increased and
								includes light colored granitoids.
								Weak reaction to HCL.
800		5	95		SW	10YR6/3	W	Sand as above, with decrease in gravel fraction
								Weak reaction to HCL.
810		25	75		SW	Mottled	W	Sand with gravel, mottled coloration with whites, grays and
								browns. Gravel fraction is angular to subrounded
								granitoids, quartz and volcanics. Sand fraction is coarse
								through fine grained, moderately well graded, clean,
								saturated. Very weak reaction to HCL.
820		15	85		SW	Mottled	W	As above, decrease in gravel fraction.
830		15	85		SW	Mottled	W	As above.
840		15	85		SW	Mottled	W	As above, consistent composition and texture.
850		60	40		GM	Mottled	N	Gravel with sand, mottled coloration with whites, grays,
								browns. Gravel fraction up to 1" diameter, angular to sub-
								rounded, primarily light colored granotoids, dark through
								medium gray fine grained and aphanitic volcanics, and
								abundant quartz. Sand fraction is coarse through fine
								grained, moderately well graded, clean. No
								reaction to HCL.
860		15	85		SW	10YR6/3	W	Pale brown sand with gravel. Gravel as described above.
								sand fraction is coarse through fine grained, but primarily
								coarse through medium grained; mostly quartz with some
								limonite stain on grain surfaces; moderately well graded,
								clean. Very weak reaction to HCL.
870		25	75		SW	Mottled	W	Sand with gravel, mottled coloration including whites, grays,
								black with little gold reddish brown and green. Appears
								same as 810' sample. Gravel fraction includes granitoids,
								volcanics and arkose. Sand is primarily quartz with lesser
								feldspar, trace epidote and magnetite.
880			95	5	SW	10YR6/3	W	Pale brown sand, medium to fine grained well graded,
								primarily quartz, fairly clean. Very weak reaction to HCL.
890		5	90	5	SW	10YR6/3	W	Pale brown sand; very little gravel. Sand fraction is
								coarse through fine grained, well graded, fairly clean,
								Very weak reaction to HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
900		5	90	5	SW	10YR6/3	W	As above.
910		10	90		SW	10YR6/3	W	Pale brown sand. Gravel fraction is primarily fine grained volcanics, limonitic arkose, and quartz. Sand fraction is very coarse through fine grained, moderately graded, clean. Very weak reaction to HCL.
920		25	75		SW	Mottled	W	Sand with gravel, mottled coloration, whites, grays, and browns. Gravel fraction is dark through medium gray aphanitic volcanics with few granitoids. Sand fraction is primarily very coarse through medium grained, moderately well graded, clean. Very weak reaction to HCL.
930		10	90		SW	10YR6/3	W	Pale brown sand; as above, with smaller gravel fraction.
940		15	85		SP	10RY6/3	W	Pale brown poorly graded sand with gravel. As above, but coarser grained overall. Gravel fraction contains a few clasts of brick red fine grained sandstone as well as granitic clasts.
950		10	90		SW	10YR6/3	W	Pale brown sand. Gravel is arkose and granite. Sand fraction is coarse through fine grained, primarily quartz with limonite stain, moderately well graded, clean. Weak reaction to HCL.
960		10	90		SW	10YR6/3	W	As above.
970		5	95		SW	10YR6/3	W	Pale brown sand, coarse through fine grained, well graded, clean. Very weak reaction to HCL.
980		25	75		SW	Mottled	W	Sand with gravel, mottled whites, medium to dark grays, browns. Gravel fraction is angular to subrounded, granite, medium through dark gray aphanitic volcanics and little arkose, abundant quartz and little epidote. Sand fraction coarse through fine grained, but primarily coarse grained, primarily quartz with minor feldspar and trace epidote and magnetite; clean. Very weak reaction to HCL.
990			95	5	SW	10YR6/3	M	Pale brown sand, medium to very fine grained, well graded, mostly quartz, little feldspar, with small arkose and few volcanic grains, calcite flakes, very fine magnetite grains. Loose, clean. Moderate reaction to HCL.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
1000			95	5	SW	10YR6/3	M	As above, slightly finer grained.
1010			95	5	SW	10YR6/3	M	As above. Driller reports flowing sand.
1020			90	10	SW	10YR6/3	M	Pale brown sand, medium to very fine grained, small amount of silt, flowing. Moderate reaction to HCl.
1030			95	5	SW	10YR6/3	M	As above. Very consistent.
1040			95	5	SW	10YR6/3	M	As above.
1050			95	5	SW	10YR6/3	M	Pale brown sand, coarse through fine grained, primarily quartz with numerous dark gray aphanitic volcanics, few granitoids, some limonitic staining on grain surfaces. Well graded, fairly clean, loose. Moderate reaction to HCL.
1060			90	10	SW	10YR6/3	M	Pale brown sand as above, coarse through very fine grained, primarily medium through very fine grained, loose, clean. Weak to moderate reaction to HCL.
1070			95	5	SW	10YR6/3	M	Pale brown sand, coarse through fine grained, primarily quartz, some dark magnetite-bearing grains, and aphanitic volcanics. Well graded, loose. Moderate reaction to HCL.
1080			95	5	SW	10YR6/3	M	Pale brown sand as above, with less coarse grained material.
1090			95	5	SW	10YR6/3	M	Sand as above.
1100			95	5	SW	10YR6/3	M	Sand as above.
1110			95	5	SW	10YR6/3	M	Sand as above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
1120			95	5	SW	10YR6/3	M	Sand as above.
1130			95	5	SW	10YR6/3	M	Sand as above.
1140			95	5	SW	10YR6/3	M	Sand as above, continuing pale brown, coarse through fine grained, primarily quartz with lesser dark through light gray aphanitic volcanics, few light green epidote and brick red grains, some surficial limonite stain, well graded, clean. Weak to moderate reaction to HCL.
1150			95	5	SW	10YR6/3	M	Sand as above.
1160			95	5	SW	10YR6/3	M	Sand as above.
1170			95	5	SW	10YR6/3	M	Sand as above.
1180			95	5	SW	10YR6/3	M	Sand as above.
1190			95	5	SW	10YR6/3	M	Sand as above.
1200			95	5	SW	10YR6/3	M	Sand as above.
1210			95	5	SW	10YR6/3	M	Sand as above, very consistent.
1220			95	5	SW	10YR6/3	M	Sand as above.
1230			95	5	SW	10YR6/3	M	Sand as above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
1240			95	5	SW	10YR6/3	M	Sand as above.
1250			95	5	SW	10YR6/3	M	Sand as above.
1260			95	5	SW	10YR6/3	M	Sand as above.
1270			95	5	SW	10YR6/3	M	Sand as above.
1280			95	5	SW	10YR6/3	M	Sand as above.
1290			95	5	SW	10YR6/3	M	Sand as above.
1300			95	5	SW	10YR6/3	M	Sand as above. Continuing polymictic sand with primarily quartz grains, with feldspar, quartz-biotite, magnetite, trace epidote; sand sized particles of fine grained sandstone, dark gray volcanic with epidote-replaced feldspar phenocrysts. Occasional caliche cement.
1310			95	5	SW	10YR6/3	M	Sand as above.
1320			95	5	SW	10YR6/3	M	Sand as above.
1330			95	5	SW	10YR6/3	M	Sand as above.
1340			95	5	SW	10YR6/3	M	Sand as above.
1350			95	5	SW	10YR6/3	M	Sand as above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-3C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
1360			95	5	SW	10YR6/3	M	Sand as above.
1370			95	5	SW	10YR6/3	M	Sand as above.
1380			95	5	SW	10YR6/3	M	Sand as above.
1390			95	5	SW	10YR6/3	M	Sand as above.
1400			95	5	SW	10YR6/3	M	Sand as above.
1410			95	5	SW	10YR6/3	M	Sand as above.
1420			95	5	SW	10YR6/3	M	Sand as above.
1422	bedrock					10YR6/3	S	Bedrock; Pale brown fine grained calcite-cemented arkosic sandstone, composed of fine grained quartz with little feldspar, oxidized and trace fresh fine grained disseminated pyrite, non-magnetic gray metallic, limonitic microfractures, traces of epidote.
1430								As above.

HYDRO GEO CHEM, INC.

Geologic Boring Log

Boring No.:	**MO-2007-4C**
Project Name: **Phelps Dodge Sierrita Mitigation Order**	Project No.: 78300
Drilling Company: WDC Exploration and Wells	Driller: Jeff Burris
Site Plan at Boring Location:	ADWR Registration No.: **55-906765**
	Drilling Equipment: GEFCO Speedstar 50K
	Drilling Method: RC Air and Mud Rotary
	Bit Type/Size: Tricone, 9-7/8 in.
	Total Borehole Depth: 1153 feet
	Casing Depth: 1140 feet
	Screened Interval: 1190-1130 feet
	Depth to Water/Date: 308.78 feet 8/12/07
	Screen slot size: 0.05 inches
	Filter pack type: No. 8 Tacna Gravel
	Top of Casing Elevation:
	Ground surface Elevation: 2923.49 feet amsl
	Date/Time Started: 6/19/07 11:43
	Date/Time Completed: 7/11/07 11:17
Township, Range, Section: T18S, R13E, 15aad	Logged by/Date: Warren Thompson
Lattitude: 31 51 58.95 Longitude: 110 59 45.45	Checked by/Date: Kim Wilson

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
0		20	70	10	SW-SM	2.5YR5/4	S	Brown well-graded sand with silt and gravel.
20								As above.
30		trace	90	10	SW-SM	7.5YR5/4	S	Brown well-graded sand with silt. Sand is medium through very fine grained, well-graded through to silt fraction, loose, dry. Gravel clasts are subrounded gray fine-grained volcanics.
40			30	70	ML	7.5YR5/4	M	Brown sandy silt. Sand fraction is very fine grained. Material is loose, dry. Drillers began water injection to stabilize hole at 40'.
50		trace	40	60	ML	7.5YR3/6	M	Brown sandy silt. As above, with slightly higher sand fraction and sand is coarser grained. Gravel clasts are subangular sericite-altered granitics and gray feldspar porphyry.
60		trace	60	40	SM	10YR6/4	M	Light brown silty sand, medium through very fine grained, moderately well-graded through to silt fraction; loose. Gravel clasts are gray feldspar porphyry.
70			30	70	ML	7.5YR6/4	M	Light brown sandy silt. Sand is very fine grained, loose.

Project Name:		**Phelps Dodge Sierrita Mitigation Order**						Boring No.: **MO-2007-4C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
80		25	50	25	SM	10YR6/4	M	Light brown silty sand with gravel. Gravel fraction is mixed,
								angular to subrounded, composed of quartz, granitoids,
								reddish brown to dark gray feldspar porphyry volcanics, and
								fine grained arkosic sandstone with epidote alteration.
								Sand fraction is coarse through fine grained, fairly well-
								graded through to silt fraction.
90		70	20	10	GW-GM	mottled	M	Gravel with silt and sand; cobbly. Mottled coloration, clasts
								are feldspar porphyry volcanics, fine grained dark and light
								gray and green epidotized arkose, Loose. Sand fraction is
								as above. Moderate reaction to HCL is confined to sand and
								silt fraction.
100		70	25	5	GW	mottled	S	Gravel with sand, mottled reds, grays, and whites; mix of angular
								to rounded clasts of quartz, abundant feldspar porphyry,
								granitoids, volcanics, fine grained sandstone, limestone;
								epidote in some clasts. Sand fraction is very coarse to fine
								grained, well-graded.
110		70	25	5	SW	mottled	S	As above.
120		35	60	5	GW	7.5YR5/4	M	Brown sand with gravel. Gravel as above, sand fraction
								is coarse through very fine grained, moderately well graded,
								loose.
130		10	80	10	SW-SM	7.5YR5/4	W	Brown sand with silt. As above, with less gravel and
								increased sand and silt fractions.
140		trace	80	20	SM	7.5YR5/4	W	Brown silty sand. Sand fraction is medium through very
								fine grained, fairly well-graded through to silt fraction.
								Gravel is red-brown feldspar porphyry and fine grained
								arkosic sandstone.
150			20	80	ML	7.5YR5/4	W	Brown silt with sand, very soft. Sand fraction is fine
								grained.
160			20	80	ML	7.5YR5/4	W	As above.
170			20	80	ML	7.5YR5/4	W	As above,
180			20	80	ML	7.5YR5/4	W	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-4C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
190			20	80	ML	7.5YR5/4	W	As above.
200		trace	30	70	ML	7.5YR5/4	S	Brown sandy silt. Sand fraction is coarse to very fine grained. Gravel fraction is angular to subrounded granitic clasts with limonite and little epidote, and fine grained quartz sandstone.
210			70	30	SM	7.5YR5/4	S	Brown silty sand. Gravel fraction and coarse sand is angular to subrounded, mostly granitic with lesser fine grained sandstone and reddish volcanic with feldspar phenocrysts. Sand is quartz, granitic grains, and very fine grained magnetite.
220			50	50	SM/ML	7.5YR5/4	M/S	Brown sandy silt. Mixed sand and silt, sand fraction is medium to very fine grained but primarily fine to very fine grained; soft.
230			30	70	ML	7.5YR5/4	M	Brown sandy silt, with small amount of clay. As above, with clay and less sand.
240			10	90	ML	7.5YR5/4	M	Brown silt with clay. Sand is fine to very fine grained. Samples are sticky, cohesive, very soft. Driller is adding a lot of water to keep the hole open.
250			10	90	ML-CL	7.5YR5/4	M	As above, with slightly more clay.
260			10	90	ML-CL	7.5YR5/4	M	As above.
270			10	90	ML-CL	7.5YR5/4	M	As above.
280			10	90	ML-CL	7.5YR5/4	M	As above.
290			10	90	ML-CL	7.5YR5/4	M	As above.
300			10	90	ML-CL	7.5YR5/4	M	As above.

Project Name:		**Phelps Dodge Sierrita Mitigation Order**						Boring No.: **MO-2007-4C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
310		trace	10	90	ML-CL	7.5YR5/4	M	As above. Trace gravel fraction is granitic.
320			10	90	ML-CL	7.5YR5/4	M	As above.
330		trace	15	85	ML	7.5YR5/4	M/S	Brown silt with sand and clay. Sand fraction is minor, coarse through very fine grained. Sticky, cohesive. Trace gravel fraction is granitic.
340			15	85	ML	7.5YR5/4	M/S	As above.
350								missed sample
360		10	30	60	ML	7.5YR5/4	M/S	Sandy silt. Gravel fraction is fine, up to 1/2" diameter clasts, comprised of gray feldspar porphyry, epidote-altered granitoid, and fine grained arkosic sandstone with quartz veinlet.
370		10	30	60	ML	7.5YR5/4	M/S	Brown sandy silt, as above. Gravel is medium grained granitic intrusive and arkose. One gravel size chunk of caliche-cemented sand.
380	first water	10	25	65	ML	7.5YR5/4	M/S	Brown sandy silt. As above, slight decrease in sand fraction. Gravel clasts are epidote-hematite altered porphyry. First water at 380' below surface.
390		10	30	60	ML	7.5YR5/4	W	Brown sandy silt. Some clay, sticky, cohesive, very soft. Gravel is granitic with epidote replacing feldspar; trace caliche-cemented sand. Sand is mostly quartz with lesser felspar and little fine grained magnetite.
400		70	20	10	GW-GM	7.5YR5/4	M	Gravel with silt and sand, brown. Gravel fraction is angular to subrounded, primarily light colored granitic clasts with some sandstone, arkose, and limestone clasts. Sand fraction is coarse through fine grained, loose.
410		70	20	10	GW-GM	7.5YR5/4	M	As above.
420		20	40	40	SM	7.5YR5/4	M	Brown silty sand with gravel; some clay. Gravel fraction is angular to subrounded, primarily granitic with some fine grained arkosic sandstone with epidote, and volcanics. Sand fraction is coarse through fine grained, quartz and granitic-derived grains, trace very fine grained magnetite.

Project Name:		**Phelps Dodge Sierrita Mitigation Order**						Boring No.: **MO-2007-4C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
430		5	25	70	ML	7.5YR5/4	M	Brown sandy silt and clay. As above, except only trace
								gravel. Sticky, cohesive; sand fraction is medium through
								fine grained.
440		5	25	70	ML	7.5YR5/4	M	As above.
450		5	25	70	ML	7.5YR5/4	M	As above.
460		40	30	30	GM	7.5YR5/4	M	Brown silty gravel with sand. Gravel fraction is fine grained,
								angular to subrounded, primarily granitic and fine grained
								volcanics, limonite stain on some surfaces. Sand fraction
								is coarse through fine grained, but primarily coarse grained.
470		50	40	10	GW-GM	7.5YR5/4	M	Brown gravel with silt and sand. As above, but with
								increased sand and gravel relative to fines.
480		50	40	10	GW-GM	7.5YR5/4	M	As above.
490		30	60	10	SM	7.5YR5/4	M	Brown sand with silt and gravel. Gravel fraction as above;
								sand fraction is coarse through fine grained, primarily
								coarse grained.
500		50	40	10	GM	10YR6/4	M	Light yellowish brown gravel with silt and sand. Gravel
								fraction is angular to subrounded, granitic, dark gray fine
								grained limestone, volcanics, and arkose. Sand fraction is
								coarse through fine grained, primarily coarse grained.
510		10	50	40	SM	10YR6/4	W	Light yellowish brown silty sand, with 10% gravel. Gravel
								is primarily angular to subrounded volcanic clasts; sand
								fraction is coarse through fine grained.
520		10	70	20	SM	10YR6/3	W	Pale brown silty sand. Small gravel fraction as above; sand
								fraction is coarse through very fine grained, fairly well-
								graded through to silt fraction.
530		20	60	20	SM	10YR6/3	W	Pale brown silty sand with gravel, as above.

Project Name:		**Phelps Dodge Sierrita Mitigation Order**						Boring No.: **MO-2007-4C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
540		20	60	20	SM	10YR6/3	W	As above.
550		20	60	20	SM	10YR6/3	M	Pale brown silty sand with gravel. Gravel fraction is fine, angular to rounded, primarily granitic and volcanic, with some fine grained limestone. Sand fraction is coarse through fine grained.
560			85	15	SM	10YR6/3	M	Pale brown silty sand. Sand is coarse through fine grained, well-graded through to silt fraction; primarily quartz with some dark through light gray volcanic grains; loose. Driller reports flowing sand rapidly coming into the borehole.
570			85	15	SM	10YR6/3	M	As above.
580			90	10	SW-SM	10YR6/3	M	Sand with silt, as above with slightly less silt.
590			90	10	SW-SM	10YR6/3	W	As above.
600		trace	95	5	SW	10YR6/3	W	Pale brown sand. Trace gravel, 1/2" maximum diameter, angular to subrounded, aphanitic volcanics. Sand fraction is coarse through fine grained, primarily quartz with some granitic lithic grains, some limonites surface stain, well-graded, fairly clean.
610		trace	95	5	SW	10YR6/1	W	As above.
620		trace	95	5	SW	10YR6/3	W	As above.
630			90	10	SW-SM	10YR6/3	W	Pale brown sand with silt. Sand fraction is coarse through fine grained, well-graded, primarily quartz with some volcanic lithic grains.
640			90	10	SW-SM	10YR6/3	W	As above.
650			90	10	SW-SM	10YR6/3	W	As above.

Project Name:	**Phelps Dodge Sierrita Mitigation Order**						Boring No.: **MO-2007-4C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
660		5	85	10	SW-SM	10YR6/3	W	Pale brown sand with silt. Trace gravel fraction is angular
								to subrounded, dark to medium gray aphanitic volcanics.
								Sand is coarse through fine grained, moderately well-graded
								through to silt fraction; composed primarily of quartz and
								volcanic grains with few granitic and epidote grains.
670		5	85	10	SW-SM	10YR6/3	W	As above. Sand is mostly quartz with some lithic granitic grains,
								trace volcanic and arkose grains.
680		5	85	10	SW-SM	10YR6/3	W	As above.
690		trace	95	5	SW	10YR6/3	W	Pale brown sand. Trace gravel as above. Sand fraction is
								coarse through fine grained, primarily quartz with aphanitic
								volcanic and few epidote grains, well-graded, fairly
								clean.
700		5	90	5	SW	10YR6/3	W	As above, with slightly increased gravel fraction. Granitic lithic
								grains more common than volcanic plus arkose grains.
710			95	5	SW	10YR6/3	W	As above, except for absence of gravel fraction. Granitic and
								arkose lithic grains present in equal proportions.
720		5	90	5	SW	10YR6/3	W	Pale brown sand; traces of gravel and silt. Gravel fraction is
								angular to subrounded, granitic and volcanic clasts. Sand
								fraction is coarse through very fine grained, well-graded
								through to silt fraction, primarily quartz with dark to light
								gray aphanitic volcanic lithic grains, fairly clean.
730		5	90	5	SW	10YR6/3	W	As above, slightly less gravel fraction. Gravel and coarser lithic
								sand size particles are granitic and arkose.
740		5	90	5	SW	10YR6/3	W	As above. Sand is quartz rich with few quartz-feldspar grains,
								few arkose-sandstone lithic grains. Coarsest grains are angular
								to subangular arkose fragments.
750		5	90	5	SW	10YR6/3	W	As above. Coarsest sand-size paraticles are flat, angular arkose
								fragments. Very fine grain free magnetite grains.
760		5	90	5	SW	10YR6/3	W	As above.

Project Name:		**Phelps Dodge Sierrita Mitigation Order**						Boring No.: **MO-2007-4C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
770		5	90	5	SW	10YR6/3	W	As above. Increased arkose chips; arkose lithic grains more
								abundant that volcanic and granitic lithic grains.
780		5	90	5	SW	10YR6/3	W	As above.
790		5	90	5	SW	10YR6/3	W	As above.
800		trace	95	5	SW	10YR6/3	W	Pale brown sand, as above, with only a trace of gravel. Sand
								fraction is coarse through very fine grained, well-graded
								through to silt fraction, mostly quartz with some epidote
								and aphanitic volcanic lithic grains, fairly clean.
810		trace	95	5	SW	10YR6/3	W	As above. Arkose lithic grains a bit more common than granitic,
								trace volcanic grains in coarse sand fraction; about 1% fine
								magnetite in the fine grain sand portion of the sample.
820		trace	95	5	SW	10YR6/3	W	As above.
830		5	90	5	SW	10YR6/3	W	As above, with a slight increase in gravel fraction. Gravel
								is angular to subrounded, dark through medium gray fine
								grained volcanics, arkose, few granitic and quartz clasts. Arkose
								lithis grains more abundant than granitic. Hematite, limonite,
								epidote, magnetite in groundmass of arkose grains.
840		5	90	5	SW	10YR6/3	W	Pale brown sand, Traces of silt and gravel. Gravel fraction
								is angular to subrounded, primarily dark to medium gray
								volcanics and arkose. Sand fraction is coarse through fine
								grained, well-graded, primarily quartz with gray volcanic lithic and
								few epidote grains, fairly clean.
850		5	90	5	SW	10YR6/3	W	As above, coarsest material is angular arkose fragments.
860		5	85	10	SW-SM	10YR6/3	W	Pale brown sand with silt. As above with slightly greater
								gravel and silt fractions.
870		3	87	10	SW-SM	10YR6/3	W	As above, with scarce gravel and larger amount of fine
								grained sand. Sand is primarily quartz with little epidote and
								magnetite. Coaser sand grains are sandstone and arkose lithic
								grains.
880		3	87	10	SW-SM	10YR6/3	W	As above.

Project Name:	**Phelps Dodge Sierrita Mitigation Order**						Boring No.: **MO-2007-4C**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
890		3	87	10	SW-SM	10YR6/3	W	As above.
900		3	87	10	SW-SM	10YR6/3	W	As above.
910		3	92	5	SW	10YR6/3	W	Pale brown sand; trace fine angular to subrounded gravel.
								Sand fraction is coarse through very fine grained, fairly
								well-graded, primarily quartz with lesser dark gray aphanitic
								lithic grains, fine sandstone grains, some epidote grains.
								Moderate limonite stain on grain surfaces.
920		3	92	5	SW	10YR6/3	W	As above.
930			95	5	SW	10YR6/3	W	Pale brown sand, coarse through very fine grained, well-
								graded, mixed quartz and dark to light gray aphanitic
								volcanic lithic grains, sandstone lithic grains, and few epidote
								and limonite grains; fairly clean.
940			95	5	SW	10YR6/3	W	As above.
950			95	5	SW	10YR6/3	W	As above, except sand is finer grained overall.
960			90	10	SW-SM	10YR6/3	W	Pale brown sand with silt. As above, with slightly greater
								silt fraction.
970			90	10	SW-SM	10YR6/3	W	Pale brown sand, coarse through very fine grained, well-
								graded, mostly quartz with lesser dark to light gray volcanic
								and multi-colored arkose and sandstone lithic grains, some
								epidote, feldspar, and limonite grains.
980			95	5	SW	10YR6/3	W	As above, consistent composition and texture. Coarser sand
								sized partcles are mostly sandstone and arkose lithic grains.
990			95	5	SW	10RY6/3	W	As above. Coarser sand size particles are sandstone, arkose,
								and gray volcanic lithic grains.

Project Name:	**Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-4C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
1000			95	5	SW	10RY6/3	W	As above.
1010			95	5	SW	10RY6/3	W	As above.
1020			95	5	SW	10RY6/3	W	As above.
1030			95	5	SW	10RY6/3	W	As above.
1040			95	5	SW	10RY6/3	W	As above.
1050			95	5	SW	10RY6/3	W	As above. Drilling penetration rate slowed.
1060			95	5	SW	10RY6/3	W	As above, but finer grained overall. Sand is comprised of primarily quartz with lesser feldspar, epidote, fine sandstone and arkose lithic grains, and very fine grained magnetite. Oxidized pyrite and epidote in matrix of arkose.
1070			95	5	SW	10YR6/3	M/S	Pale brown sand; medium to very fine grained, a mix of primarily quartz with lesser arkose and volcanic lithic grains, few epidote and limonite grains.
1080			95	5	SW	10YR6/3	M	Pale brown sand. Sand fraction is medium through very fine grained, but primarily fine grained; mostly quartz with little aphanitic volcanics and arkose lithic grains. Drilling has slowed to 5 feet per hour; formation may be cemented.
1090			95	5	SW	10YR6/3	M	As above, coarser sand sized grains are arkose and sandstone lithic grains.
1100			95	5	SW	10YR6/3	M	As above, except the sand fraction is coarse through very fine grained; well-graded.

Project Name:	**Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-4C**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
1110			95	5	SW	10YR6/3	M	Pale brown silty sand. Sand fraction is primarily fine to very fine
								grained, with approximately 20% coarse through medium
								grained material; composed primarily of quartz, with lesser lithic
								grains including abundant arkose, lesser volcanic and few
								granitic grains.
1120			95	5	SW	10YR6/3	M	As above, coarser sand grains are primarily arkose.
1130			95	5	SW	10YR6/3	M	As above.
1140	bedrock					10YR6/3	M	Arkose bedrock. Drilling has slowed to 3 feet/hour. Sample
								consists of ground up arkose. Coarser material angular arkose
								chips; finer portion free quartz sand grains. Arkose is white
								tan, reddish, greenish to gray, fine grained quartz in calcareous
								with local epidote matrix, with up to 1% disseminated limonite
								and fine grained magnetite.
1150	bedrock					10YR6/3	M	Arkose bedrock, as above.
1153	bedrock					10YR6/3	M	Arkose bedrock, as above.
	TD							

HYDRO GEO CHEM, INC.

Geologic Boring Log

	Boring No.: **MO-2007-5C**
Project Name: **Phelps Dodge Sierrita Mitigation Order**	Project No.: 78300
Drilling Company: WDC Exploration and Wells	Driller: Arnold Lamon
Site Plan at Boring Location:	ADWR Registration No.: **55-907457**
	Drilling Equipment: GEFCO Speedstar 50K
	Drilling Method: RC Air and Mud Rotary
	Bit Type/Size: Tricone, 9-7/8 inch
	Total Borehole Depth: 1370 feet
	Casing Depth: 1360 feet
	Screened Interval: 1150-1350 feet
	Depth to Water/Date: 288.95 feet 8/23/07
	Screen slot size: 0.05 inches
	Filter pack type: No. 8 Tacna
	Top of Casing Elevation:
	Ground surface Elevation: 2945.08 feet amsl
	Date/Time Started: 7/16/07 16:21
	Date/Time Completed: 8/1/07 15:05
Township, Range, Section: T13S, R13E, 22acd	Logged by/Date: Warren Thompson
Lattitude: 31 50 57.63 Longitude: 110 59 59.46	Checked by/Date: Kim Wilson

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
0		20	60	20	SM	10YR6/4	S	Light yellowish brown silty sand with gravel. Gravel fraction is subangular to well-rounded, light colored granitics, light to dark gray volcanics and some sandstone. Sand fraction is coarse through very fine grained, well-graded through to silt fraction, loose, dry.
10		20	60	20	SM	10YR6/4	S	As above.
20		20	60	20	SM	10YR6/4	M	As above, less reactive to HCl.
30			95	5	SW	7.5YR5/4	W	Brown well-graded sand; coarse through very fine grained sand to minor silt fraction; loose, dry. Sand is mostly quartz and quartz-feldspar, with lesser feldspar grains, granitic and rhyolite lithic grains, trace fine crystalline magnetite grains.
40			95	5	SW	7.5YR5/4	W	As above. Driller began injecting water. Gravel is andesite with epidote alteration, rhyolite, quartz-feldspar porphyry and granite.
50		15	75	10	SW-SM	7.5YR5/4	S	Brown sand with silt and gravel. Gravel is up to one inch diameter, subangular to subrounded quartz, granitics, and volcanics including gray aphanitic, gray feldspar. porphyry and trace rhyolite. Sand fraction is very coarse through fine grained, loose.
60		70	20	10	GW-GM	7.5YR5/4	S	Brown gravel with silt and sand. Gravel fraction is angular to subrounded, ground up chips due to drilling, mix of reddish, white, and gray igneous rocks including epidote altered quartz-feldspar porphyry, aphanitic, and granitic clasts. Sand is coarse through fine grained, loose. Strong reaction to HCl is confined to the silt fraction.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-5C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
70		75	20	10	GW	mottled	N	Gravel with sand, mottled coloration with light to dark grays, whites, reds. Gravel is angular to rounded volcanics, mostly andesite porphyry with some rhyolite, with lesser quartz and granitic clasts; clean, loose.
80		85	15		GW	mottled	N	As above, with less sand and no silt. Sand is very coarse to coarse grained. Gravel is rhyolite and andesite clasts.
90		70	25	5	GW	7.5YR5/4	N	Brown gravel with sand. Gravel as above; sand fraction is coarse through fine grained, loose.
100		40	40	20	GM/SM	7.5YR5/4	N	Brown silty gravel and sand. Gravel fraction is angular to rounded, various colors including pink, red, purple, white and grays; mostly andesite, some rhyolite porphyry, and lesser amounts of granitic and arkose clasts. Sand is coarse through fine grained, loose, many lithic grains.
110		40	40	20	GM/SM	7.5YR5/4	N	As above. Gravel is mostly andesite and rhyolite porphyry.
120		40	50	10	SW-SM	7.5YR5/4	N	Brown sand with silt and gravel. Gravel fraction as above but with more dark gray aphanitic volcanic rock. Sand fraction is coarse through fine grained, well graded, loose, contains abundant andesite and rhyolite lithic grains.
130		40	50	10	SW-SM	7.5YR5/4	N	As above.
140		40	50	10	SW-SM	7.5YR5/4	N	As above, abundant andesite clasts.
150		50	40	10	GW-GM	7.5YR5/4	N	Brown gravel with silt and sand. As above, except with increased gravel fraction.
160		50	40	10	GW-GM	7.5YR5/4	N	As above. Dominantly andesite clasts with little granitic and trace sandstone.
170		30	50	20	SM	7.5YR5/4	N	Brown silty sand with gravel. Gravel clasts are mostly angular to rounded andesite and rhyolite. Sand fraction is coarse through fine grained, mostly quartz and granitic grains, some arkose, sandstone and few gray volcanic lithic grains.
180		30	50	20	SM	7.5YR5/4	N	As above, except that the coarse sand material is more granitic with abundant quartz and quartz-feldspar grains and fewer volcanic lithic grains.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-5C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
190		10	70	20	SM	7.5YR5/4	M	Brown silty sand. Gravel fraction is granitic
								with gray volcanics. Sand is coarse through fine grained,
								moderately well-graded, loose, primarily quartz and quartz-
								feldspar grains.
200			10	90	CL/ML	10YR6/3	W/M	Pale brown silty clay with 10% sand. Very soft, sticky,
								cohesive. Sand is mostly fine grained.
210		10	65	25	SM/SC	7.5YR6/4	M	Light brown silty clayey sand. Minor gravel fraction is
								angular to rounded granitics and volcanics. Sand is
								coarse through fine grained, mostly quartz with some
								fine grained sandstone lithic grains. Clay is as clay balls,
								soft plastic, cohesive.
220		5	25	70	CL	7.5YR6/4	M	Light brown sandy clay with silt. Clay is very soft,
								plastic, and cohesive. Sand and gravel as above.
230		10	65	25	SC	7.5YR6/4	M	Light brown clayey sand. Small gravel fraction is primarily
								dark gray volcanics with light colored granitics. Sand
								fraction is coarse through fine grained. Clay is cohesive
								and soft, occurring as clay balls.
240		10	75	15	SC	7.5YR6/4	M	Light brown clayey sand. As above, with less clay and
								silt. Gravel is rhyolite; sand is quartz and volcanic lithic
								grains. Clay is as few clay balls.
250		15	75	10	SW-SM	7.5YR6/4	M	Light brown sand with silt and gravel. Gravel is angular
								to rounded, abundant light colored granitics, with lesser
								dark to light gray volcanics. Sand fraction is coarse to
								fine but primarily coarse grained quartz, quartz-feldspar,
								feldspar, and granitic grains. Silt fraction reacts with HCl.
260		15	75	10	SW-SM	7.5YR6/4		As above; gravel fraction contains abundant andesite
								porphyry, little rhyolite, trace arkose. Sand is quartz, plus
								granitic and andesite porphyry lithic grains.
								First water at 265'.
270		10	70	20	SM	7.5YR6/4	M	Light brown silty sand. 10% gravel fraction is angular to
								subrounded dark gray volcanics, granitics, and quartz.
								Sand fraction is coarse through fine grained, mostly coarse
								through medium grained, composed of abundant quartz
								with lesser volcanic and some epidote grains; fairly well-
								graded.
280		10	70	20	SM	7.5YR6/4	M	As above. Gravel is rhyolite with quartz and epidote
								micro-veinlets.
290		10	65	25	SM	7.5YR6/4	M	Light brown clayey silty sand. Gravel and sand fractions
								as above. Clay fraction is soft, cohesive, plastic.
300		10	80	10	SW-SM	7.5YR6/4	M	Light brown sand with silt. Gravel fraction as above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-5C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
								Sand fraction is coarse through fine grained, but primarily
								coarse grained. Abundant quartz, granitic and arkose
								lithic grains, some epidote. Trace calcite cement.
310		15	75	10	SW-SM	7.5YR6/4	M	Light brown sand with silt and gravel. As above, with a
								larger gravel fraction.
320		15	75	10	SW-SM	7.5YR6/4	M	As above.
330		15	75	10	SW-SM	7.5YR6/4	M	As above. Little return from the cyclone.
340		10	75	15	SM	7.5YR6/4	M	As above, with increase in silt fraction. Rhyolite gravel
								clasts have epidote-replaced feldspar. Sand is mostly
								quartz, quartz-biotite, and quartz-feldspar.
350		15	75	10	SW-SM	7.5YR6/4	M	Light brown sand with silt and gravel. Little return from
								the cyclone. Abundant rounded sand sized lithic grains
								of andesite, rhyolite, and granite.
360		20	70	10	SW-SM	10YR6/4	M	Light brown sand with silt and gravel. Gravel fraction is
								angular to subrounded, primarily light to dark gray
								rhyolite and aphanitic volcanics, granite, and quartz.
370		10	80	10	SW-SM	10YR6/4	M	Light brown sand with silt. Gravel fraction as above.
								Sand fraction is coarse through fine grained, moderately
								well-graded, primarily quartz. Trace calcite cement.
380		10	80	10	SW-SM	10YR6/4	M	As above. Gravel fraction is granitic, rhyolite, and
								arkose with an epidote groundmass.
390		25	55	20	SM	10YR6/4	M/S	Light brown silty sand with gravel. As above but with
								increased amounts of gravel and silt.
400		25	55	20	SM	10YR6/4	M/S	As above. Gravel is feldspar porphyry and light to dark
								gray aphanitic volcanics, granitic and arkose with
								epidote alteration; coarser sand grains are lithics of same
								composition. Calcite cement coatings on few clasts.
410		25	55	20	SM	10YR6/4	M	As above.
420		25	55	20	SM	10YR6/4	M	As above.
430		80	15	5	GW	mottled	M	Gravel with sand, mottled coloration. Gravel clasts include

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-5C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**Fl**				
								gray fine grained volcanics, silicified feldspar porphyry,
								volcaniclastic, granitic porphyry, and minor arkose.
440			95	5	SW	10YR6/4	W	Light yellowish brown sand. Primarily quartz, fine grained,
								well-graded through to silt fraction. Coarser sand grains
								are gray volcanics, porphyritic granite, silicified arkose,
								and sericitized pink feldspar porphyry.
450			95	5	SW	10YR6/4	W	As above, flowing. Fine grained, well sorted, poorly
								graded. Clogged down hole hammer; very difficult to pull
								out of hole. Flowing sand.
460		5	90	5	SW	10YR6/4	W/M	Light yellowish brown sand. Sand fraction is primarily
								quartz with some dark gray volcanic and few arkose lithic
								grains, few epidote grains. Moderately well graded, clean.
470		5	90	5	SW	10YR6/4	M	As above. Coarse sand sized particles are angular to
								subrounded arkose, volcanic and granitic lithic grains;
								trace fine grained crystalline magnetite grains.
480			95	5	SW	10YR6/4	N	Light yellowish brown sand. Sand is coarse through fine
								grained, but primarily coarse through medium grained.
								Composed mostly of quartz with lesser dark to light gray
								volcanic lithic grains, few arkose, epidote and fine grains.
								magnetite grains. Well graded, clean.
490			95	5	SW	10YR6/4	N	As above.
500		trace	95	5	SW	10YR6/3	N	Pale brown sand. Trace broken up gravel is primarily
								angular to subrounded gray aphanitic volcanics with few
								granitics. Coarse to medium grained sand fraction
								contains abundant arkose, sandstone and few volcanic
								lithic grains
510		trace	95	5	SW	10YR6/3	W	As above, sand fraction also contains few lithic grains of
								limestone.
520		5	95	5	SW	10YR6/3	W	As above, with slight increase in gravel fraction and fewer
								fines; material coarser grained overall.
530			100	trace	SW	10YR6/3	W	Pale brown sand. Coarse through fine grained, primarily
								coarse through medium grained. Mostly quartz with some
								volcanic grains, few arkose, epidote, feldspar and
								limestone grains; moderately well-graded.
540		5	90	5	SW	10YR6/3	W	Pale brown sand, as above. Gravel and coarse sand
								fraction is arkose, aphanitic gray volcanic, and
								granitic porphyry.
550		5	90	5	SW	10YR6/3	W	Pale brown sand, as above. Gravel and coarse sand
								fraction is dominantly arkose and fine grained sandstone

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-5C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**Fl**				
								with epidote-limonite alteration.
560		5	90	5	SW	10YR6/3	W	Pale brown sand. Trace gravel, broken up during drilling
								is angular to subrounded fine grained volcanics. Sand
								fraction is coarse through fine grained, but primarily coarse
								grained; abundant quartz and dark to light gray fine
								grained to aphanitic volcanics, few epidote and arkose
								grains.
570			95	5	SW	10YR6/3	W	As above, with no gravel.
580			95	5	SW	10YR6/3	W	As above. Coarse sand fraction composed of arkose with
								lesser volcanic angular to subangular lithic grains.
590			95	5	SW	10YR6/3	W	As above, very consistent texture and composition.
600		5	90	5	SW	10YR6/3	W	As above, with a small amount of broken gravel, primarily
								volcanics with lesser granitics and arkose.
610		trace	95	5	SW	10YR6/3	W	As above, few gravel clasts.
620		trace	95	5	SW	10YR6/3	W	As above.
630			95	5	SW	10YR6/3	W	Pale brown sand. Coarse through fine grained, primarily
								quartz with light to dark gray grains of fine grained
								volcanic, few epidote, arkose and limestone grains;
								moderately well-graded.
640			95	5	SW	10YR6/3	W	As above.
650			95	5	SW	10YR6/3	W	As above.
660			95	5	SW	10YR6/3	W	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-5C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**Fl**				
670			95	5	SW	10YR6/3	W	As above, very consistent texture and composition.
680		5	95	5	SW	10YR6/3	W	Pale brown sand with trace gravel. Gravel broken up from drilling, angular to subrounded quartz, fine grained volcanics, arkose and granitics. Sand fraction is coarse through fine grained, but primarily coarse through medium grained; mostly quartz with fine grained and aphanitic volcanics, few granitic, epidote, feldspar and limestone grains, moderately well-graded, fairly clean.
690		5	95	5	SW	10YR6/3	W	As above.
700		5	95	5	SW	10YR6/3	W	As above,
710		5	95	5	SW	10YR6/3	W	As above
720		5	95	5	SW	10YR6/3	W	Sand with trace gravel. Gray volcanic lithic grains have increased, comprising about 50% of the sand. Material appears to be cemented based on drilling; bit is chattering and binding. May be a cobbly or bouldery zone.
730		5	95	5	SW	10YR6/3	W/M	As above. Gravel is mostly dark gray volcanics, some with silica- and carbonate-filled microfractures. Sand is coarse through fine grained, mostly quartz and dark gray fine grained volcanic lithic grains; fairly well-graded.
740		5	95	5	SW	10YR6/3	W/M	As above.
750		5	95	5	SW	10YR6/3	W	As above.
760		5	95	5	SW	10YR6/3	W/M	As above.
770			95	5	SW	10YR6/3	W	Pale brown sand. Sand is medium through fine grained, mostly quartz with lesser dark gray fine grained volcanic grains; fairly well-graded and clean. Appear to be out of the volcanic-rich cobbly material.
780			95	5	SW	10YR6/3	W	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-5C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**Fl**				
790			95	5	SW	10YR6/3	W	As above, except sand is coarse through fine grained.
800			95	5	SW	10YR6/3	W	As above. Driller said based on drilling characteristics there have been several one-foot thick clay interbeds between 770-800', but no evidence seen in the cuttings.
810			95	5	SW	10YR6/3	W	Pale brown sand. Coarse through fine grained, primarily quartz with lesser dark gray volcanics, few epidote and and feldspar grains; moderately well graded, fairly clean.
820			95	5	SW	10YR6/3	W	As above.
830			95	5	SW	10YR6/3	W	As above.
840			95	5	SW	10YR6/3	W	As above.
850			90	10	SW-SM	10YR6/2	W	Light brownish gray sand with silt. Sand is medium to fine grained, primarily quartz and dark gray volcanic grains with few epidote, feldspar and arkose grains; moderately well-graded.
860			90	10	SW-SM	10YR6/2	W	As above.
870			90	10	SW-SM	10YR6/2	W	As above, but slightly finer grained overall.
880			90	10	SW-SM	10YR6/2	W	As above.
890			90	10	SW-SM	10YR6/2	W	As above.
900			90	10	SW-SM	10YR6/2	W	As above.
910			90	10	SW-SM	10YR6/2	W	As above, continuing light brownish gray sand with silt. Sand fraction is coarse through fine grained, primarily

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-5C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
								quartz and aphanitic gray volcanics, few epidote and
								granitic grains; moderately well-graded. Silt fraction reacts
								weakly with HCl.
920			90	10	SW-SM	10YR6/2	W	As above.
930			90	10	SW-SM	10YR6/2	W	As above.
940			90	10	SW-SM	10YR6/2	W	As above.
950			90	10	SW-SM	10YR6/2	W	As above.
960			90	10	SW-SM	10YR6/2	W	As above.
970			90	10	SW-SM	10YR6/2	W	As above.
980			90	10	SW-SM	10YR6/2	W	As above.
990			85	15	SM	10YR6/2	W	Light brownish gray silty sand. Sand fraction is coarse
								through fine grained, primarily quartz and gray volcanics,
								few granitic and epidote grains; moderately well-graded
								through to silt fraction. Silt fraction reacts weakly to HCl.
1000			85	15	SM	10YR6/2	W	As above.
1010			80	20	SM	10YR6/2	M	Light brownish grayish brown silty sand. Silt fraction
								more reactive to HCl than above. Some clay, possibly
								occurring as thin interbeds. Coarse sand size particles are
								angular to subangular, abundant volcanic with lesser
								arkose and sandstone lithic grains
1020			80	20	SM	10YR6/2	M	As above.
1030			80	20	SM	10YR6/2	M	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-5C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
1040			90	10	SW-SM	10YR6/2	M	Light brownish gray sand with silt. Sand is coarse-
								through fine-grained, moderately well-graded through to
								silt; primarily quartz, dark gray volcanics, arkose with
								variable epidote, specularite, magnetite; yellowish to white
								sandstone, and granitic grains. Coarse to medium sand
								sized particles are mostly lithic fragments.
1050			90	10	SW-SM	10YR6/2	M	As above. Clastic>volcanic>granitic grains among coarse
								to medium sized grains.
1060			90	10	SW-SM	10YR6/2	M	As above, very consistent material. Abundant tan to
								white arkose and sandstone, lesser gray volcanic and red
								porphyry and well as quartz sand-sized particles.
1070			80	20	SM/SC	10YR6/2	M	Light yellowish brown silty clayey sand. Sand fraction as
								described above. Sticky clay in cuttings may indicate
								presence of thin clay interbeds.
1080			80	20	SM/SC	10YR6/2	M	As above.
1090			90	10	SW-SM	10YR6/2	M	Light grayish brown sand with silt. Sand is medium to
								fine grained, primarily quartz and gray aphanitic volcanics,
								with lesser white opaque limestone, reddish aphanites,
								few epidote and granitic grains; moderately well-graded.
1100			80	20	SM/SC	10YR6/2	M	Light grayish brown silty clayey sand. Sand as described
								above. Small clay fraction probably as thin interbeds,
								very soft, plastic, sticky.
1110			75	25	SM/SC	10YR6/2	M	As above, with increase in fine fraction. Lithic sand grains
								include reddish feldspar porphyry, andesite with chlorite
								and epidote, sandstone with epidote matrix, and few
								quartz-biotite grains.
1120			70	30	SM/SC	10YR6/2	M	As above, with increase in fine fraction. Coarsest sand-
								sized particles are angular volcanic and arkose/sandstone
								chips.
1130			70	30	SM/SC	10YR6/3	M	As above.
1140			70	30	SM/SC	10YR6/3	M	As above, but sand fraction has increased lithic grains of
								reddish brown volcanic grains, abundant gray volcanic
								grains, variably-colored fine sandstone, quartz, and few
								epidote grains. Clay probably is as thin interbeds
1150			90	10	SW-SM	10YR6/3	M	Light grayish brown sand with silt. Sand fraction as

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-5C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
								described above, medium to very fine grained, moderately
								well-graded through to silt fraction; no clay.
1160			85	15	SM	10YR6/2	M	Light brownish gray silty clayey sand. Sand fraction as
								is quartz, quartz-biotite, arkose, red porphyritic and gray
								aphanitic volcanic grains. Coarser sand size particles are
								about 40% fine sandstone and arkose, 30% subrounded
								quartz and few quartz-biotite grains, and 30% volcanic
								grains. Clay is present as small soft, cohesive, sticky
								balls.
1170			40	60	CL/ML	10YR6/2	M	Light grayish brown sandy clay and silt. Sand fraction is
								medium to very fine grained, but mostly fine to very fine
								grained. Clay fraction is very soft, plastic and sticky.
1180			60	40	SM/SC	10YR6/2	M	Light grayish brown silty clayey sand. Sand fraction is
								medium to very fine grained, but primarily fine to very fine
								grained; sticky, cohesive.
1190			60	40	SM/SC	10YR6/2	M	As above, with weaker reaction to HCl. More than 50%
								of coarse sand-sized particles are lithic grains, dominantly
								green, white and yellow sandstone and arkose with lesser
								porphyritic volcanics.
1200			60	40	SM/SC	10YR6/2	W	As above.
1210			60	40	SM/SC	10YR6/2	W	As above.
1220			50	50	SM/ML	10YR6/2	W	Light grayish brown sandy silt. Sand is primarily fine to
								very fine grained, mostly quartz and volcanics with some
								epidote, granitic and limestone/calcite grains. Sticky,
								cohesive
1230			70	30	SM	10YR6/2	W	Light grayish brown silty sand with trace clay. Sand
								fraction is coarse through very fine grained, primarily
								quartz and gray to reddish volcanics, few epidote, granitic,
								arkose and limestone grains; moderately well-graded
								through to silt fraction; sticky.
1240			60	40	SM	10YR6/2	W	As above, with increased silt. Drilling speed has
								increased; soft zone is present 1240-1280'.
1250			60	40	SM	10YR6/2	W	As above, but sand is primarily fine grained with about
								10-15% medium sized grains. Abundant multi-colored
								coarse sand size particles of sandstone and arkose.
1260			60	40	SM	10YR6/2	W	As above. Very weak reaction to HCl.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-5C**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
1270			60	40	SM	10YR6/2	W	As above.
1280			70	30	SM	10YR6/2	W	As above, with less silt and medium sized sand fraction is about 25%.
1290			85	15	SM	10YR6/2	W	Light grayish brown silty sand. Sand fraction is coarse through fine grained, well-graded, composed of quartz, fine grained sandstone, arkose, quartz, quartz-biotite, quartz-feldspar, gray to reddish volcanic and trace chert limestone and magnetite grains. Coarse to medium sized grains are mostly angular to subangular lithic particles.
1300			90	10	SW-SM	10YR5/2	W	Grayish brown sand with silt. Sand is coarse through fine grained, primarily dark gray with some reddish volcanics, some fine grained sandstone, arkose, and quartz grains. Coarse to medium sized grains are primarily angular to subangular lithic grains.
1310			85	15	SM	10YR5/2	W	Grayish brown silty sand. As above with slightly higher silt content and sand is finer grained overall.
1315								Very hard drilling beginning at 1315'.
1320			90	10	SW-SM	10YR5/4	W	Grayish brown sand with silt. Sand is coarse through fine grained, mostly medium through fine grained, well-graded; primarily light to dark gray aphanitic and red to brown fine grained aphanitic-porphyritic volcanics with lesser arkose, sandstone, free quartz, and few epidote grains.
1330			85	15	SM	10YR5/4	W	Silty sand. As above, slight increase in silt fraction. Most medium to coarse sand-sized particles are lithic grains of gray chlorite-epidote altered fine grained volcanic, reddish fine grained sandstone, magnetite-quartz-sericite grains, and arkose, with lesser free clear quartz.
1340			80	20	SM	10YR5/4	W	As above. Most coarse sand sized grains appear to be altered arkose and sandstone with chlorite, magnetite, epidote and sericite.
1350			80	20	SM	10YR5/4	W	As above.
1360			80	20	SM	10YR5/4	W	As above. Abundant multi-colored arkosic and sandstone sand-sized particles, some with epidote-chlorite-magnetite alteration, gray aphanitic volcanic grains, quartz, quartz-feldspar grains.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-5C**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**Fl**				
1363	BEDROCK				SW-SM	10YR5/4	W	Very hard drilling. Sample is mixed gray volcanic grains
								and clastic (arkose and sandstone) grains in about equal
								proportions, with some free quartz grains. Coarse to
								medium sized particles are angular to subangular.
1370	TD=1370'					10YR5/4	W	Sample is mostly clastic material including fine quartz
								sand, fine grained gray, tan white, and maroon sandstone
								and siltstone chips; with some gray aphanitic volcanic
								grains. Few chips are limonite stained and/or have traces
								of oxidized pyrite.

HYDRO GEO CHEM, INC.

Geologic Boring Log

		Boring No.:	**MO-2007-6B**
Project Name:	**Phelps Dodge Sierrita Mitigation Order**		Project No.: 78300
Drilling Company:	WDC Exploration and Wells	Driller:	Arnold Lamon
Site Plan at Boring Location:		ADWR Registration No.:	**55-907606**
		Drilling Equipment:	GEFCO Speedstar 50K
		Drilling Method:	RC Air and Mud Rotary
		Bit Type/Size:	Tricone, 9 7/8 inch
		Total Borehole Depth:	1060 feet
		Casing Depth:	950 feet
		Screened Interval:	780-940 feet
		Depth to Water/Date:	319.15 feet 10/04/07
		Screen slot size:	0.05 inches
		Filter pack type:	No. 8 Tacna
		Top of Casing Elevation:	
		Ground surface Elevation:	3041.93 feet amsl
		Date/Time Started:	8/14/07 12:45
		Date/Time Completed:	8/29/07 15:36
Township, Range, Section:	T18S, R13E, 28dbd	Logged by:	K.Wilson/W.Thompson
Lattitude:	31 49 56.34 Longitude: 111 01 02.10	Checked by:	Kim Wilson

Depth (Ft)	Graphic Log	Estimated % GR	SA	FI	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
10		10	70	20	SC	7.5YR4/4	S	Brown clayey, silty sand. Mix of loose sand and silty
								to+J87 sandy clay balls. Gravel is angular to subrounded,
								comprised of gray feldspar-rich porphyry with some
								epidote replacement of feldspars, gray volcanic with few
								feldspar phenocrysts with variable epidote alteration,
								biotite schist, quartzite, rhyolite, and vein quartz. Sand
								fraction is coarse to fine grained, moderately well-graded,
								coarse to medium grains are about 50% quartz, 50% lithic
								grains; fine fraction is mostly quartz with trace fine
								crystalline magnetite.
20		10	70	15	SC	7.5YR4/4	S	As above, with fewer clay balls. Gravel is primarily
								volcanic porphyry and phenocryst-rich porphyry with
								lesser metamorphic and sedimentary clastic clasts.
30		80	5	15	GC	7.5YR4/4	M	Brown clayey gravel. Gravel is angular to subrounded
								gray feldspar porphyry, brownish gray volcanic with few
								feldspars, and soft gray ashy aphanitic volcanic clasts.
40		75	20	5	GW	7.5YR4/4	W	Brown gravel with sand. Gravel is angular to subrounded,
								abundant gray aphanitic to feldspar porphyritic volcanics,
								with few arkose clasts. Sand fraction is mostly coarse
								grained, angular to subrounded quartz and lithic grains.
50		85	10	5	GW	10YR5/4	M	Yellowish brown gravel. Few small clay balls and clay
								coatings on gravel clasts. Clasts are up to 3 cm diameter,
								angular to subrounded, light gray ashy tuff, medium to
								dark gray aphanitic to feldspar porphyritic volcanics
								(possibly andesite from Demetrie Volcanics), feldspar
								porphyry, with little rhyolite and gray quartz vein material.
60		10	10	80	CL	10YR5/4	M	Yellowish brown clay. Little silt, sand and gravel. Gravel
								clasts are gray feldspar porphyry with or without epidote,
								and quartz-feldspar porphyry with quartz-hematite veining.
								Sand is coarse to fine grained; mostly quartz, but coarse
								grained sand is 50% quartz/50% lithic grains.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-6B**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
70		10	25	65	ML/CL	10YR5/4	S	Yellowish brown sandy silt and clay. Some sufficiently
								indurated to survive drilling, showing finely banded silt
								and clay with matrix supported angular to subrounded
								fine to medium quartz sand grains. Sand throughout entire
								sample is fine to coarse grained. Gravel and coarse sand
								fraction is gray andesitic volcanics, feldspar porphyry,
								and quartz vein material.
80		10	25	65	ML/CL	10YR5/4	S	As above.
90		30	40	30	SC	10YR4/4	M	Dark yellowish brown clayey sand with gravel. Gravel is
								angular to subrounded clasts of gray aphanitic to porphy-
								ritic volcanics with epidote-altered feldspar, epidotized
								granitic, crystal-rich quartz-feldspar porphyry in reddish
								groundmass, and fine grained sandstone. Sand is fine
								through coarse grained, quartz and lithic grains. Clay dries
								whitish and crusty.
100		25	35	40	SC	10YR5/4	S	As above. Gravel fraction is multi-colored due to varying
								red and tan iron oxide stain, some bleaching, and green
								epidote alteration.
110		5	40	55	ML/CL	10YR5/4	M	Dark yellowish brown sandy clay and silt. Rare gravel is
								fine grained dark gray volcanic (andesite) with epidote
								alteration and quartz-Kfeldspar vein material.
120		15	20	65	ML/CL	7.5YR5/4	S	Brown sandy silt and clay with gravel. Gravel is angular
								to subangular gray volcanics and feldspar porphyry with
								epidote alteration.
130		10	50	40	SM-SC	7.5YR4/3	M	Brown silty and clayey sand. Gravel fraction and coarse
								sand grains are angular to subrounded gray fine grained
								volcanics and feldspar porphyry, crystal-rich quartz-
								feldspar porphyry, rhyolite, fine grained sandstone, and
								chert. Sand is poorly graded, fine to coarse grained. Fine
								grained sand is quartz with little magnetite; medium to
								coarse sand is lithic grains with abundant sandstone and
								arkose particles.
140		5	5	90	CL	7.5YR5/3	M	Brown clay. Very little sand and gravel. Gravel is fine
								grained gray andesitic volcanic with epidote alteration
								and quartz- feldspar rich porphyry clasts.
150		trace	5	95	CL	7.5YR4/3	M	Brown clay. Rare gravel clasts are gray andesitic volcanic
								porphyry with epidote and fine grained sandstone. Clay
								is very sticky, plastic and cohesive

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-6B**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
160			5	95	CL	7.5YR4/3	S	Brown clay. Sticky, cohesive, plastic; little sand.
170		20	50	30	SC	7.5YR5/3	M	Brown clayey sand with gravel. Gravel is angular to
								rounded clasts of gray andesitic volcanic with epidote,
								fine grained brecciated gray volcanic (probably eroded
								Demetrie Volcanics), brownish gray aphanitic volcanic,
								red rhyolite porphyry, arkose, and reddish siltstone. Sand
								fraction is quartz, volcanic lithic grains, and few sandstone
								with epidote grains, little magnetite.
180		10	50	35	SC	7.5YR5/4	W	Brown clayey sand. As above with greater clay content
								and less gravel. Gravel clasts are primarily assorted
								volcanics as described above with lesser amount of
								sandstone. Clay fraction is sticky, cohesive and plastic.
190		trace	20	80	CL	7.5YR6/3	S	Brown clay with sand. Small gravel fraction is aphanitic to
								fine grained porphyritic andesite with epidote alteration
								(probably Demetrie Volcanics) and quartz sandstone.
								Sand is very fine to coarse grained, well-graded, mostly
								quartz, some lithic grains, and little magnetite. Clay is
								sticky, cohesive, plastic.
200		trace	15	85	CL	7.5YR6/4	S	Brown clay with sand, as above. Gravel and coarse sand
								are primarily assorted volcanics with lesser arkose.
210		5	20	75	CL	7.5YR6/4	M	Light brown clay with sand. Gravel is mostly epidotized
								andesite with lesser aphanitic brownish gray volcanic and
								quartzite clasts. Sand is mostly fine grained but ranges
								from fine to coarse grained, poorly graded; fine grained
								sand is mostly quartz with <1% fine crystalline magnetite;
								coarse sand size particles are mostly lithic grains. Clay
								is sticky, cohesive.
220		15	65	20	SC	7.5YR6/3	M	Light brown clayey sand with gravel. Gravel is angular to
								subrounded clasts of brownish gray aphanitic volcanics,
								gray fine grained volcanics, arkose with epidote and
								limonite, chert, and siltstone. Sand is white, gray, red, tan
								and green quartz and lithic grains.
230		5	15	80	CL	7.5YR6/3	S	Light brown clay with sand. Very sticky, cohesive, plastic.
								Gravel fraction as above.
240			5	95	CL	7.5YR6/4	M	Light brown clay; sticky, cohesive, plastic. Some silt and
								and fine-grained sand.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-6B**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
250		80	10	10	GW-GC	7.5YR 5/3	S	Brown gravel with clay. Gravel is angular to subrounded
								clasts of limonitic crystal rich quartz-feldspar porphyry,
								andesitic volcanics, red to pale gray rhyolite, and very fine
								grained white siliceous rock. Few clay balls. HCl reaction
								is in clay fraction.
260		trace	15	85	CL	7.5YR5/4	S	Brown clay with sand; some silt. Very sticky, plastic,
								cohesive. Rare gravel is andesitic volcanic. Sand is
								mostly fine grained quartz, with 1-2% very fine grained
								magnetite.
270		20	15	65	CL	7.5YR5/4	M	Brown gravelly clay with sand. Poorly sorted.
								Gravel is mostly andesitic with epidote alteration
								with lesser brownish gray aphanitic volcanic, quartz
								sandstone, and quartz-feldspar intrusive clasts. Clay is
								sticky plastic and cohesive.
280		5	15	80	CL	7.5YR6/4	M	Brown clay with sand. Gravel as above.
290		trace	25	75	ML/CL	7.5YR6/3	S	Brown clay and silt with sand. Rare gravel, as above.
								One 3 cm diameter gravel clast; others = 1 cm diameter.
300		15	55	30	SM	7.5YR6/3	W	Brown silty sand with gravel. Gravel is angular to sub-
								rounded clasts of andesitic volcanics, brown aphanitic
								volcanic with few quartz and feldspar phenocrysts, and
								quartz sandstone. Sand is coarse through fine grained;
								abundant volcanic lithic grains and few epidotized sand-
								stone lithic grains in coarse sand fraction.
310		80	10	10	GP-GC	7.5YR 5/2	M	Brown gravel with clay. Gravel is angular to subangular
								clasts up to 2.5 cm diameter. Clasts are primarily andesitic
								with some epidote alteration of feldspar; volcanic breccia
								textures visible in few clasts; lesser amounts of rhyolite,
								brown aphanitic volcanic, gray feldspar porphyry, crystal
								rich quartz-feldspar intrusive, and trace sandstone with
								epidote matrix. HCl reaction is in fine fraction.
320		75	10	15	GC	7.5YR5/2	M	Brown clayey gravel. As above, with a slightly greater
								fine fraction. Color of washed gravel is more gray at
								10YR5/2. HCl reaction restricted to fine fraction. First
								water. Water sample.
330		80	10	10	GP-GC	7.5YR5/2	S	Brown gravel with clay. As above with a little less fines.
								Majority of gravel clasts are volcanics, with andesitic most
								abundant, probably derived from Demetrie Volcanics.
340		80	10	10	GP-GC	7.5YR5/2	M	As above. Water sample.

Project Name: **Phelps Dodge Sierrita Mitigation Order**								Boring No.: **MO-2007-6B**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
350		80	10	10	GP-GC	7.5YR5/2	M	As above. Clast size up to 2.5 cm, dominantly andesite.
360		60	20	20	GM	7.5YR5/2	S	Brown silty gravel with sand. Increased sand, silt, and
								clay content. Gravel is finer than above 50 feet. Volcanic
								clasts continue to be predominate, but sandstone, arkose,
								and crystal rich quartz-feldspar intrusive clasts have
								increased. Sand is fine to coarse grained, mix of quartz,
								volcanic and sandstone lithic grains, few feldspars and 1%
								very fine magnetite.
370		75	15	10	GP-GM	7.5YR5/2	M	Brown gravel with silt and sand. Gravel is angular to sub-
								rounded clasts up to 4 cm on long axis. Clasts dominantly
								andesitic with epidote alteration, with sandstone clasts
								increased to about 10% and crystal rich intrusive to about
								15%. Sand is fine to coarse grained, composed of quartz,
								lithic grains, and little magnetite. Gravel is loose and
								caving. Rig got stuck one hour and has not been able to
								get past 370' depth without gravel caving behind the bit.
380		70	20	10	GW-GM	10YR5/3	W	Brown gravel with silt and sand. Gravel is angular to
								subrounded dark gray volcanics (some chloritic alteration),
								granitic, and gray sandstone clasts with few feldspar and
								epidote fragments. Sand fraction is coarse through fine
								grained, but primarily coarse grained, fairly clean.
390		85	10	5	GW	10YR5/3	W	Brown gravel. Gravel clasts are angular to rounded,
								primarily dark gray fine grained volcanic, granitic, and
								sandstone clasts, with some chlorite and epidote alteration.
								Sand fraction is coarse through medium grained, clean.
400		40	50	10	SW-SM	10YR5/3	W	Brown sand with silt and gravel. Gravel fraction as above
								but finer grained overall; sand fraction is coarse through
								fine grained, well-graded through to silt fraction.
410		15	65	20	SM	10YR5/3	M	Brown silty sand with gravel. Gravel fraction as above.
								Sand fraction is primarily quartz and dark to light gray
								volcanic and sandstone lithic grains; fairly well-graded.
420		20	65	15	SM	10YR5/3	M	As above, slightly more gravel.
430		25	65	10	SW-SM	10YR5/3	M	Brown sand with silt and gravel. Gravel fraction is fine
								grained, angular to subrounded fine grained volcanic and
								granitic with some feldspar and epidote clasts. Sand
								fraction is coarse through fine grained, but primarily
								coarse grained; fairly clean.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-6B**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
440		10	80	10	SW-SM	10YR5/3	W	Brown sand with silt. Gravel fraction is fine grained with
								maximum clast diameter of 1/4 inch, angular to subrounded
								dark to light gray fine grained and aphanitic volcanics.
								Sand is coarse through fine grained volcanic, quartz, few
								epidote and limestone grains; some iron oxide staining,
								fairly well-graded.
450		10	80	10	SW-SM	10YR5/3	W	As above.
460		10	80	10	SW-SM	10YR5/3	W	As above, except sand fraction is coarser, primarily coarse
								through medium grained.
470		25	65	10	SW-SM	10YR5/3	W	Brown sand with silt and gravel. As above, with greater
								gravel fraction.
480		25	65	10	SW-SM	10YR5/3	W	As above.
490		30	60	10	SW-SM	10YR5/3	M	Brown sand with silt and gravel. Gravel is fine grained up
								to 1/2 inch maximum diameter, angular to subrounded;
								angular clasts may represent larger clasts crushed during
								drilling. Clasts are primarily fine grained and aphanitic
								volcanics, with few granitic and quartz clasts. Chlorite
								and epidote alteration and limonite surface stain present
								on some clasts.
500		25	65	10	SW-SM	10YR5/3	M	As above.
510		25	65	10	SW-SM	10YR6/2	W	Light grayish brown sand with silt and gravel. Gravel
								fraction is fine grained chips up to 3/8 inch diameter,
								angular to subrounded, mostly dark to light gray volcanics
								with little quartz and granitic clasts. Sand fraction is coarse
								through medium grained, fairly well-graded.
520		25	65	10	SW-SM	10YR6/3	W	As above.
530		25	65	10	SW-SM	10YR6/3	W	As above.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-6B**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
540		25	65	10	SW-SM	10YR6/3	W	As above, with small amount of friable sandstone.
550		25	65	10	SW-SM	10YR6/3	W	As above.
560		10	85	10	SW-SM	10YR6/3	W	Light grayish brown sand with silt. Gravel as above. Sand is coarse through fine grained, but primarily coarse through medium grained quartz, volcanic, some epidote, and small amount of sandstone lithic grains.
570		5	70	25	SM/SC	10YR5/3	W	Brown clayey, silty sand. Gravel as above. Sand fraction is coarse through very fine grained quartz and volcanic lithic grains. Clay fraction is as small balls of soft moderately plastic material.
580		5	70	25	SM/SC	10YR5/3	W	As above. Sandstone gravel fragments are carbonate cemented, reacting strongly to HCl; overall cuttings react weakly to HCl.
590		5	80	15	SM	10YR5/3	W	Brown silty clayey sand. As above with decreased clay and silt fraction.
600			55	45	SM/SC	10YR5/3	W	Brown clayey silty sand. Sand primarily medium through very fine grained with some coarse grains; material is sticky and cohesive.
610			55	45	SM/SC	10YR5/3	W	As above.
620			55	45	SM/SC	10YR5/3	W	As above, except that the sand fraction is well-graded from very coarse through very fine grained, with more coarse grained material than above.
630			10	90	CL	7.5YR6/3	N	Light brown clay, 10% sand. Sand fraction is medium to fine grained. Clay is very soft, plastic and sticky. No reaction to HCl.
640			25	75	CL	7.5YR6/3	N	Light brown clay with sand. Sand fraction is coarse through fine grained, primarily quartz and dark gray volcanic and small amount of reddish sandstone lithic grains; some iron oxide stain on grain surfaces; very soft, sticky, cohesive.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-6B**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
650			10	90	CL	7.5YR6/3	N	Brown clay. As above with less sand.
660			20	80	CL	7.5YR6/3	N	Brown clay with sand. As above, with increased sand.
670			20	80	CL	7.5YR6/3	N	As above.
680			20	80	CL	7.5YR6/3	N	As above.
690			20	80	CL	7.5YR6/3	N	As above.
700			25	75	CL	7.5YR6/3	N	As above, with slightly increased sand fraction. Very soft, drilling rate has increased between 690' and 700'.
710			25	75	CL	7.5YR6/3	N	As above.
720			40	60	ML/CL	10YR6/2	W	Light brownish gray sandy silt and clay. Sand fraction is coarse through fine grained, primarily quartz and aphanitic volcanic lithic grains. Very soft material.
730			40	60	ML/CL	10YR6/2	W	As above.
740			40	60	ML/CL	10YR6/2	W	As above.
750			40	60	ML/CL	10YR6/2	W	As above.
760			40	60	ML/CL	10YR6/2	W	As above.

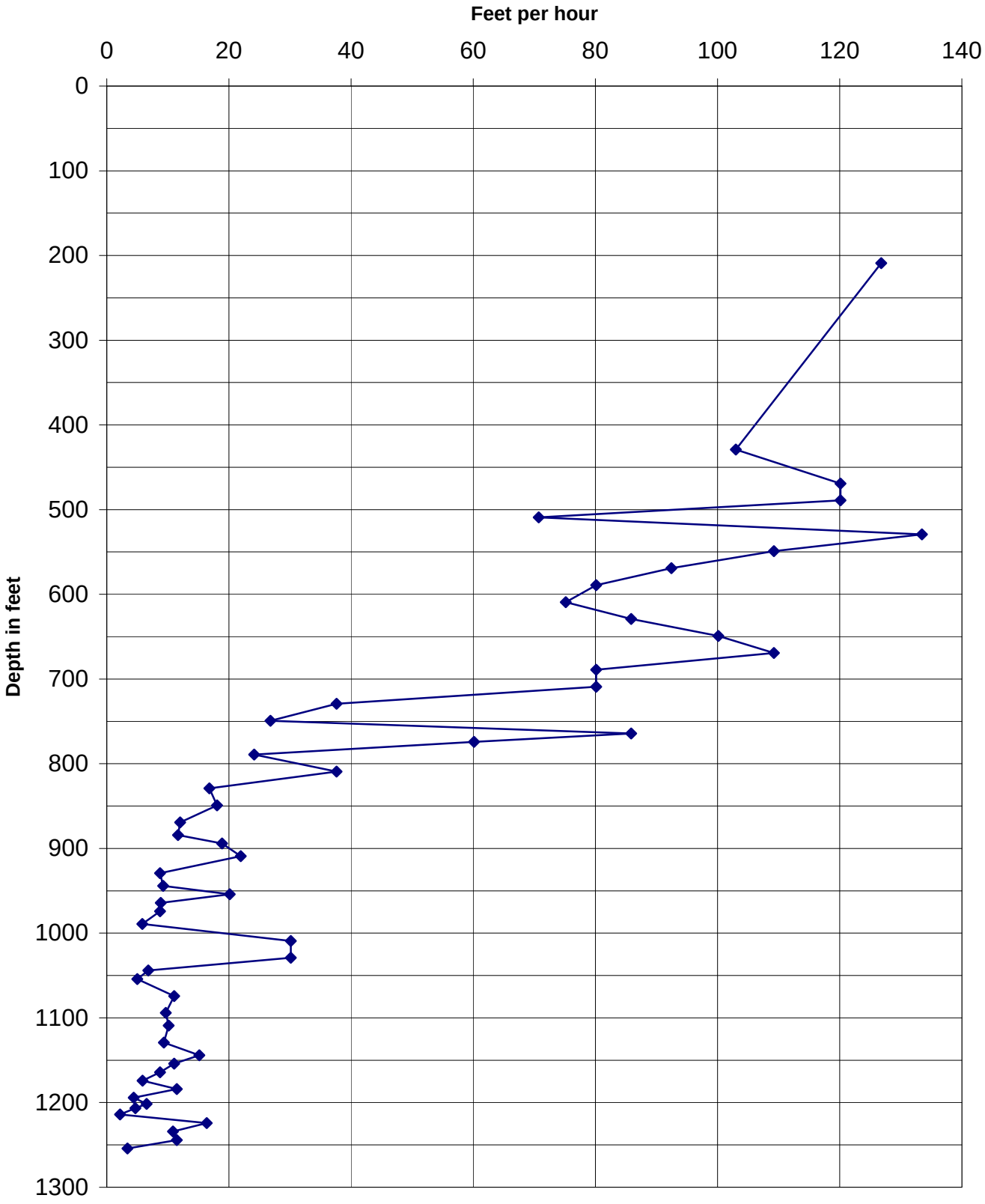
Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-6B**	
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
770			70	30	SM/SC	10YR6/2	W	Light brownish gray silty, clayey sand. Sand is coarse
								through fine grained, primarily composed of dark to light
								gray aphanitic volcanic and quartz grains, with small
								amounts of granitic and sandstone lithic grains; well-
								graded through to silt. Washed sample is very dark gray
								due to high percentage of volcanic grains.
780			70	30	SM/SC	10YR6/2	W	As above.
790			70	30	SM/SC	10YR6/2	W	As above.
800			80	20	SM	10YR6/2	N	Light brownish gray silty sand. Sand fraction is coarse
								to fine grained, well -graded through to silt. Sand is
								primarily volcanic grains with abundant quartz, some
								granitic, feldspar, and epidote grains.
810			55	45	SM/SC	10YR6/2	N	Light brownish gray silty, clayey sand. Sand as above,
								very soft, sticky, cohesive material.
820			55	45	SM/SC	10YR6/2	N	As above.
830			75	25	SM	10YR6/2	N	Light brownish gray silty sand. Sand fraction is coarse to
								very fine grained, well-graded through to silt fraction;
								primarily dark to light gray and reddish brown volcanic
								grains with abundant quartz and few feldspar grains.
840			70	30	SM/SC	10YR6/2	N	As above except for small amounts of clay as small soft,
								plastic, cohesive balls.
850			70	30	SM/SC	10YR6/2	W	As above, except weakly reactive to HCl.
860			70	30	SM/SC	10YR6/2	W	As above.
870			40	60	CL/ML	10YR6/3	W	Pale brown sandy clay and silt. Sand fraction is coarse
								to fine grained, primarily dark gray volcanic and quartz
								grains with some reddish brown aphanitic volcanic grains.
								Soft, sticky.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-6B**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
880			40	60	CL/ML	10YR6/3	W	As above.
890			40	60	CL/ML	10YR6/3	W	As above, except that sand is finer, ranging from medium to very fine grained.
900		5	75	20	SM	10YR6/3	W	Pale brown silty sand. Gravel is up to 1/2 " diameter. Sand is coarse through fine grained, well-graded to silt. Sand grains are primarily fine grained to aphanitic dark volcanics and quartz, with some sandstone grains.
910		5	75	20	SM	10YR6/2	W	As above.
920		5	80	15	SM	10YR6/3	W	Pale brown silty sand; trace gravel. As above, except with less silt and the sand and gravel fraction contain numerous lithic grains and clasts of reddish sandstone.
930			70	30	SM	10YR6/3	W	Pale brown silty, clayey sand. Sand fraction is coarse through fine grained, but mostly fine grained quartz, aphanitic volcanic and reddish sandstone grains.
940			70	30	SM	10YR6/3	W	As above.
950		10	70	20	SM	10YR6/2	W	Light brownish gray silty sand. Gravel fraction is fine grained to 1/2 inch maximum diameter, angular to sub-rounded, primarily dark colored volcanic, granitic, quartz, sandstone and trace shaley clasts. Volcanic clasts include gray andesite with epidote-replaced feldspars, gray aphanitic siliceous chips with few diffuse feldspars, brown rhyolite, reddish brown aphanitic with feldspar and biotite phenocrysts, gray tuff, and small amount of finely brecciated volcanic with silica matrix. Some sandstone grains have pre-erosional epidote, sericite, oxidized pyrite alteration.
960	bedrock		70	30	SM	10YR6/2	N	Light brownish gray silty sand. Sand is coarse through fine grained, fairly well-graded, mostly dark gray volcanic and quartz grains. Sample lacks variety of lithologies described above, consisting of only the biotite-feldspar, diffuse feldspar, brownish gray aphanitic volcanics and few silica-breccia volcanics. Interpreted to be top of volcanic bedrock.

Project Name: **Phelps Dodge Sierrita Mitigation Order**							Boring No.: **MO-2007-6B**	
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
970			80	20	SM	10YR6/2	N	Light brownish gray silty sand. Grains are very angular,
								primarily dark to light gray and reddish brown volcanics
								with biotite and feldspar phenocrysts, and few fine
								volcanic breccia chips.
980			70	30	SM	10YR6/2	N	Light brownish gray clayey, silty sand. As above, with
								clay. Clay is soft, cohesive, sticky. Sand sized particles
								are about 90% brown volcanic with feldspar, biotite and
								rare quartz phenocrysts, 5% free quartz, and 5% fine
								volcanic breccia.
990			40	60	CL/ML	10YR6/2	N	Light brownish gray sandy clay and silt. Sand as above;
								clay is very soft, sticky, cohesive.
1000			40	60	CL/ML	10YR6/2	W	As above.
								Drilling has slowed down to 10 feet per hour.
								From 950 to present depth, seem to be passing through
								interbeds of volcanics and clay-silt. Volcanic layers slow
								drilling penetration rate; clayey layers drill more quickly.
1010			60	40	SM	10YR6/2	W	Light brownish gray clayey, silty sand. Sand fraction is
								primarily medium to fine grained, fairly well-graded
								through to silt fraction.
1020			60	40	SM	10YR6/2	W	As above, except that sand fraction is coarse through
								fine grained.
1030			20	80	CL	10YR5/2	W	Grayish brown clay with sand. Sand fraction is coarse
								through fine grained volcanic, quartz and feldspar grains.
								Clay is cohesive, sticky, very soft.
1040			85	15	SM	10YR6/2	N	Light brownish gray silty sand, ground up volcanics. Mix
								of gray to brown aphanitic and fine fragmental textured
								volcanics.
1050			85	15	SM	10YR5/2	W	Grayish brown silty sand, interpreted as ground up
								volcanic bedrock. Drilling very slow. Sand sized particles
								mostly angular with little subrounded material. Sample is
								about 50% gray to brown aphanitic volcanic with feldspar
								and few biotite phenocrysts and 50% small angular
								volcanic fragments and individual biotite, feldspar and
								grains, densely packed, and cemented with light pinkish
								tan siliceous material. Some epidote replacement of
								feldspars in both the volcanic porphyritic and fragmental
								material.
1060			95	5	SW	10YR5/2	N	As above, 75% fine fragmental volcaniclastic textures.

APPENDIX D.2

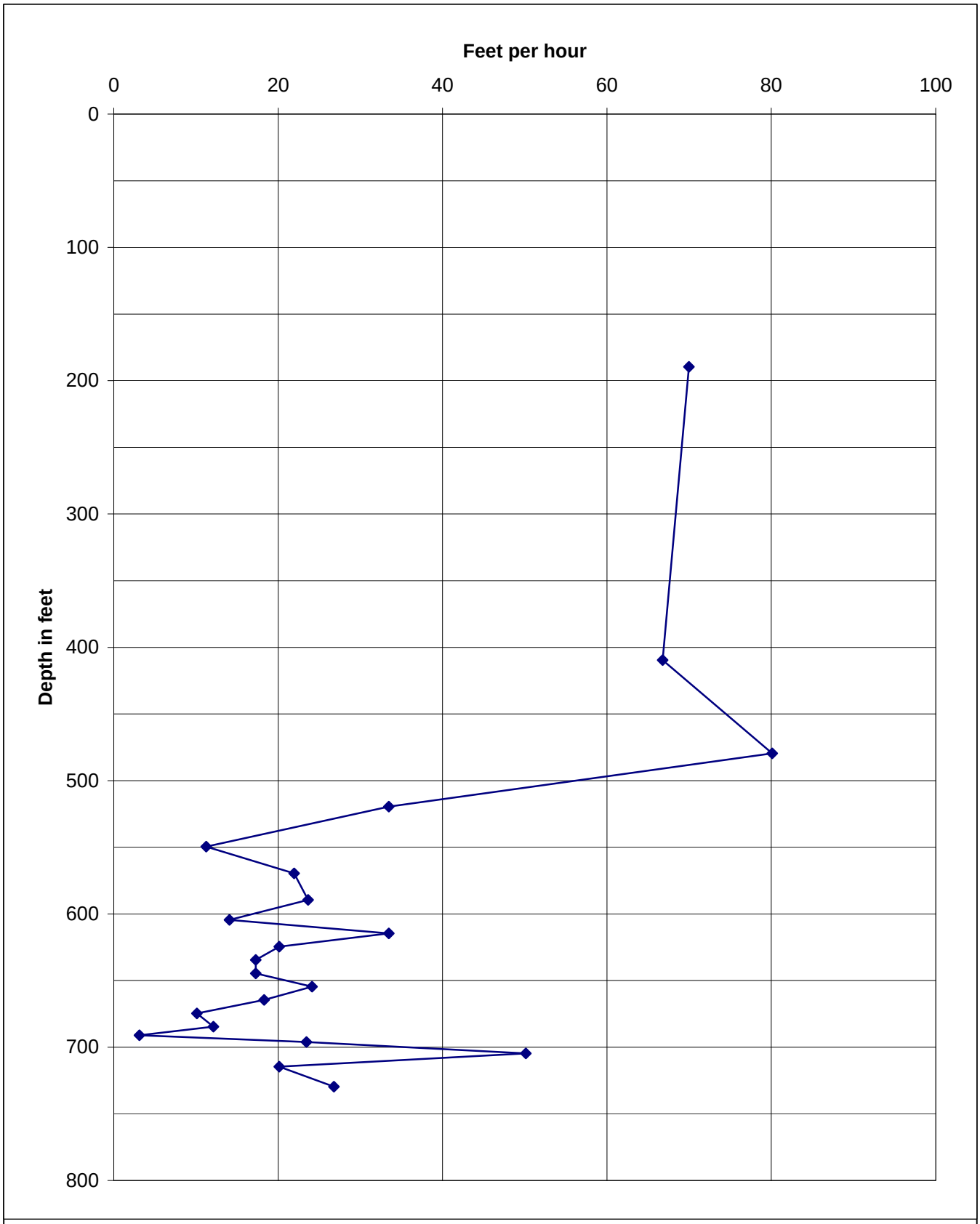
DRILLING PENETRATION RATES



HYDRO GEO CHEM, INC.

DRILLING PENETRATION RATE
MO-2007-1C

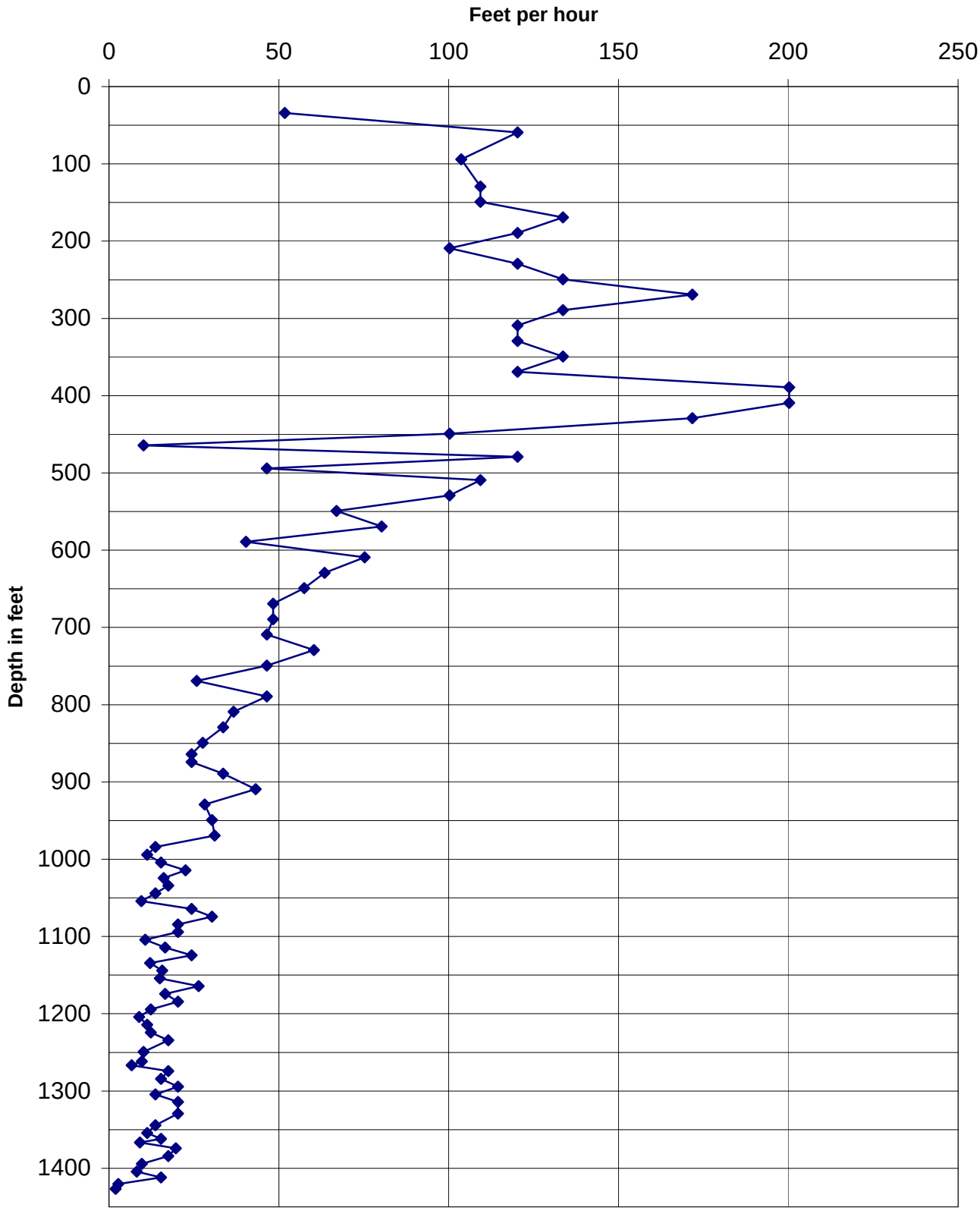
APPROVED	DATE	FIGURE
RKZ	10/30/07	**D.2.1**



HYDRO GEO CHEM, INC.

DRILLING PENETRATION RATE
MO-2007-2

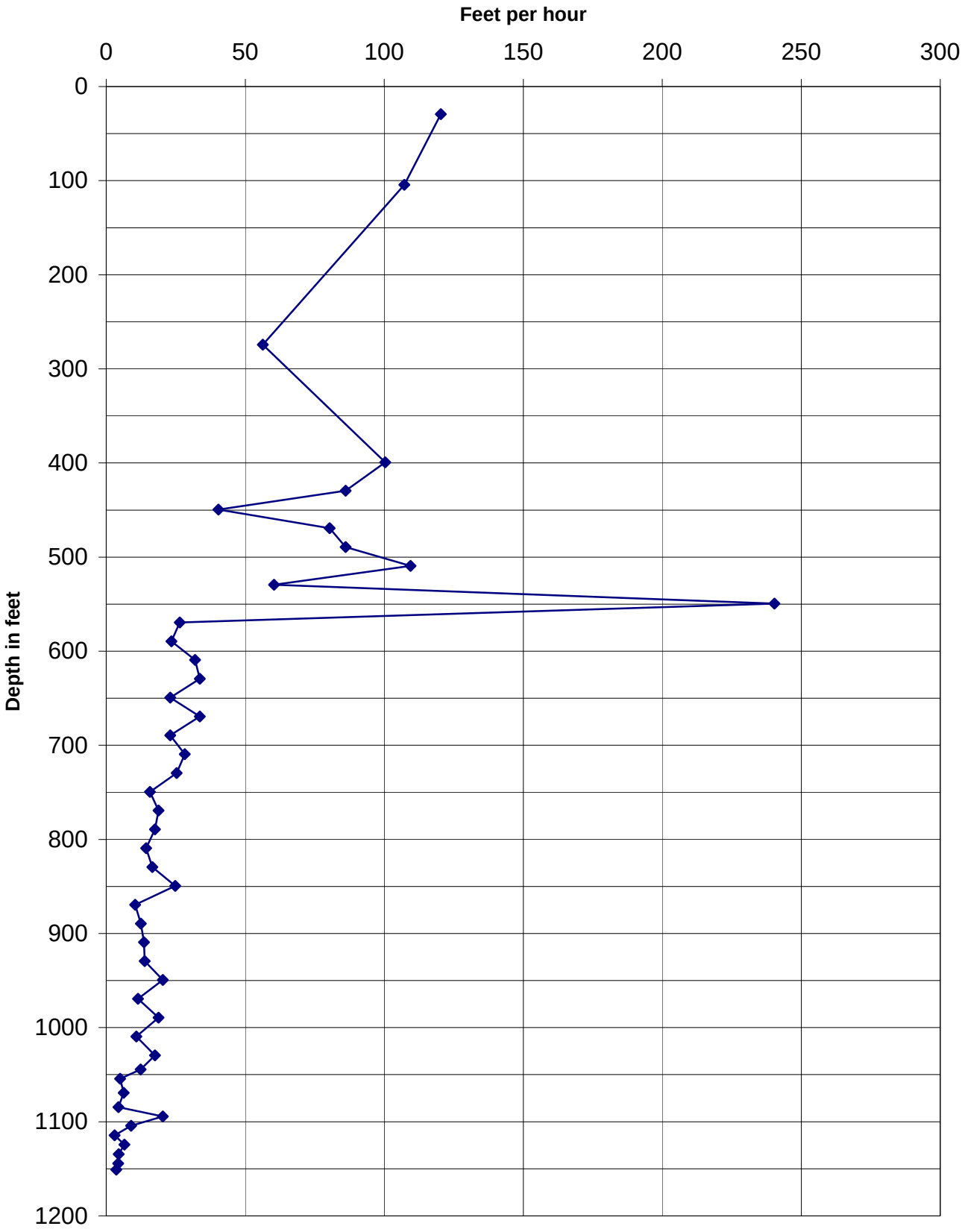
APPROVED	RKZ	DATE	10/30/07	FIGURE	**D.2.2**



HYDRO GEO CHEM, INC.

DRILLING PENETRATION RATE
MO-2007-3C

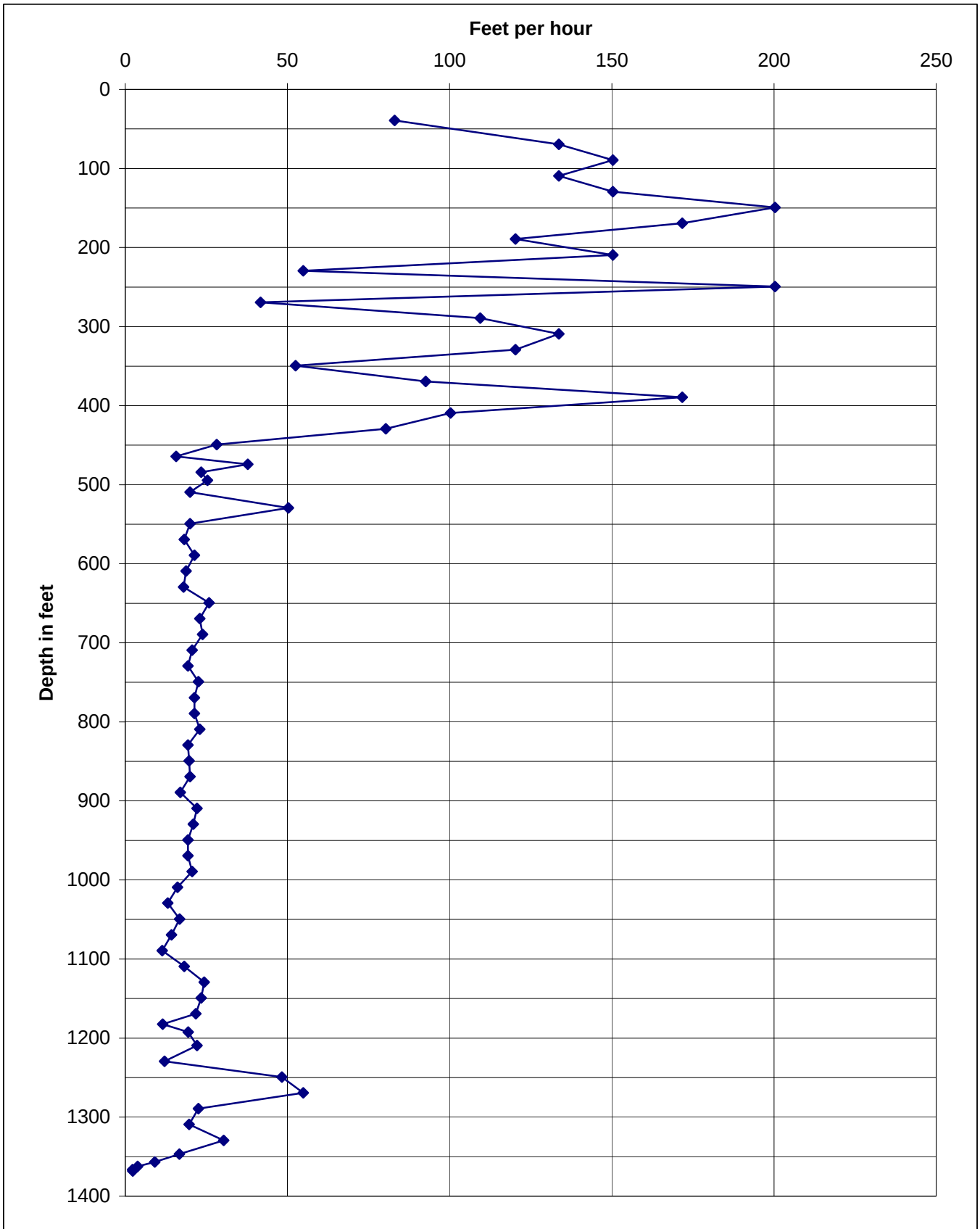
APPROVED	RKZ	DATE	10/30/07	FIGURE	**D.2.3**



HYDRO GEO CHEM, INC.

DRILLING PENETRATION RATE
MO-2007-4C

APPROVED	RKZ	DATE	10/30/07	FIGURE	D.2.4

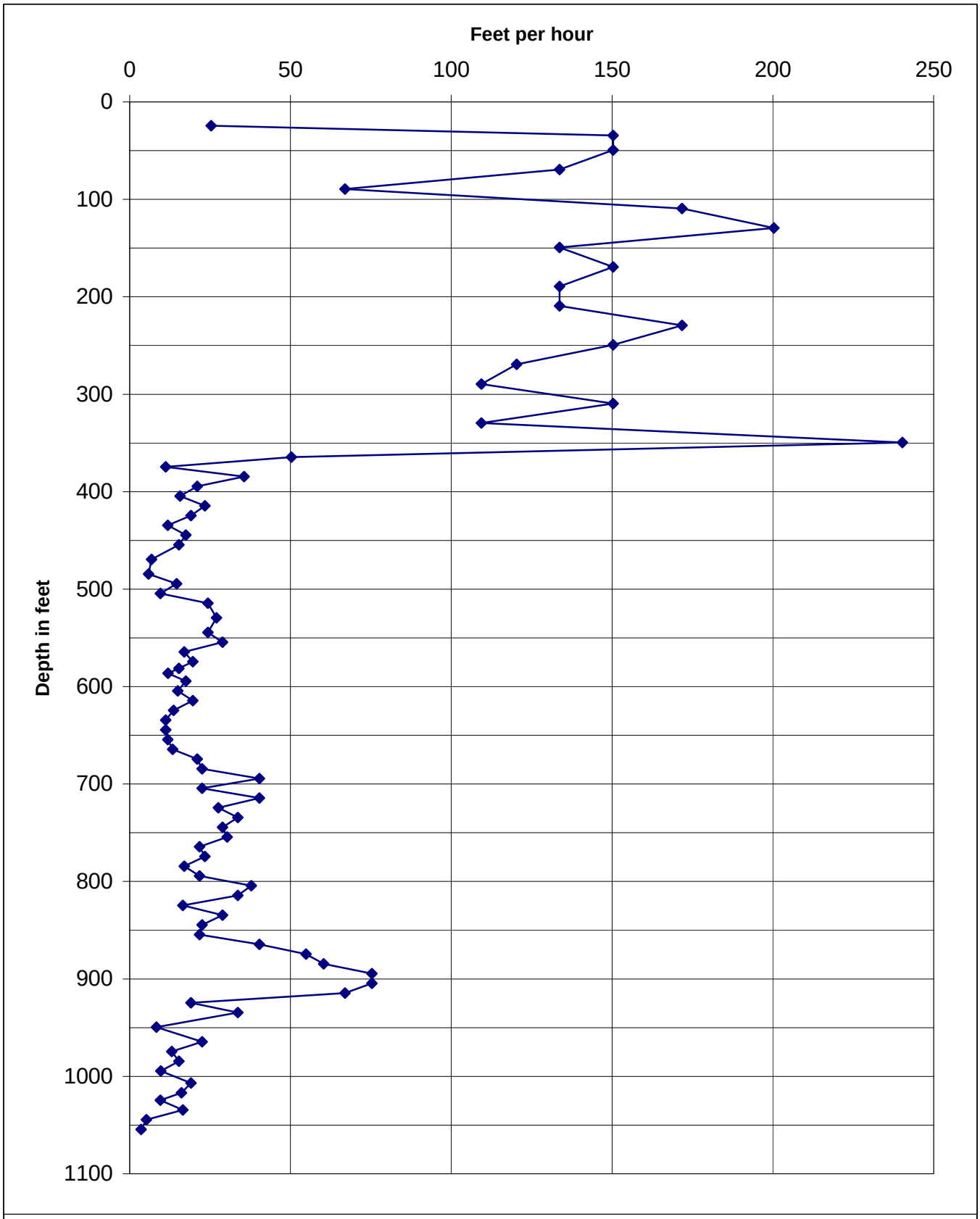


HYDRO GEO CHEM, INC.

DRILLING PENETRATION RATE
MO-2007-5C

APPROVED	DATE	FIGURE
RKZ	10/30/07	**D.2.5**

H:\78300\78306.4\Drilling Results\Drilling Report\Appendix D.2\Figures D.2.1 to D.2.6.xls: MO-5C FD.2.5



HYDRO GEO CHEM, INC.

DRILLING PENETRATION RATE
MO-2007-6B

APPROVED	RKZ	DATE	10/30/07	FIGURE	D.2.6

APPENDIX D.3

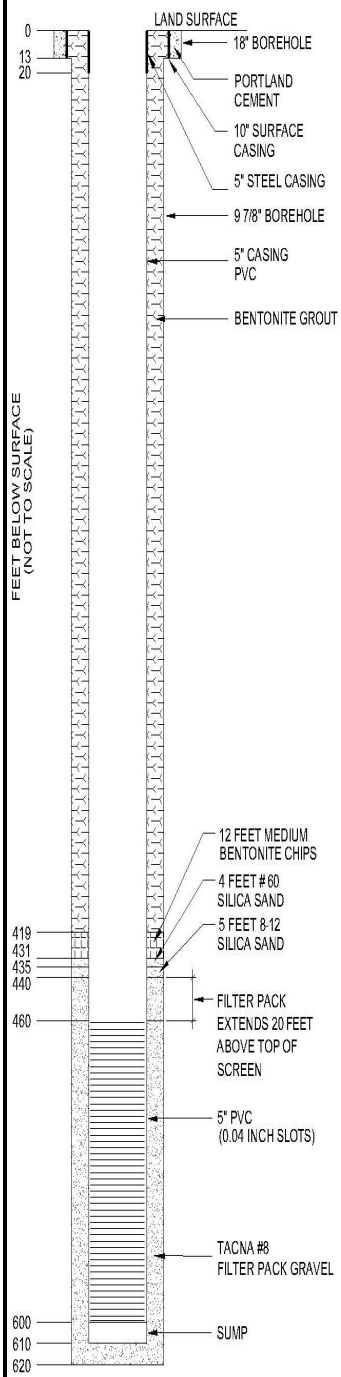
WELL CONSTRUCTION SUMMARY FORMS

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-1A
Drilling Company: WDC	Driller: Steve Huston	Project No.: 78300
ADWR Well Registration No.: 55-907342		Geologist: M. Arneson
Location: American Legion Hall		
Township, Range, Section: 17S 13E 34dcd		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 620 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 13'		10" steel
0-20'		5" steel, sch 40
+1-20'		5" sch 80 PVC
	460'-600'	5" sch 80 PVC 0.04" Slots
600-610'		5" sch 80 PVC w/ bottom cap

Filter Pack Material: #8 Tacna gravel	Interval: 440' - 620'
Filter Pack Material: #8-12 sand	Interval: 435' - 440'
Filter Pack Material: #60 sand	Interval: 431' - 435'
Bentonite chips: time release pellets	Interval: 419' - 431'
Grout: bentonite grout slurry	Interval: 10' - 419'
Cement:	Interval: 0' - 10'
Surface Completion: above-ground steel box	
Measuring Point: to be established	
Centralizer Locations: every 50 ft along screened interval	

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	6/28/07 13:00	7/2/07 10:30
Casing	7/2/07 14:30	7/2/07 16:46
Filter Pack	7/2/07 16:46	7/2/07 19:30
Bentonite Chips	7/2/07 19:40	7/2/07 19:59
Bentonite Grout	7/2/07 20:15	7/2/07 22:00
Bentonite Grout	7/3/07 12:00	7/3/07 15:00
Cement	8/21/07	8/21/07
Surface Completion	8/21/07	8/21/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing	3.5	240	07/14/07 8:15	07/14/07 11:45
Airlifting				
Swabbing				
Development				
Pumping	13.25		07/18/07 11:18	07/19/07 16:30
Pump Testing	10.75		08/08/07 8:40	08/08/07 19:27
Total	**27.5**			

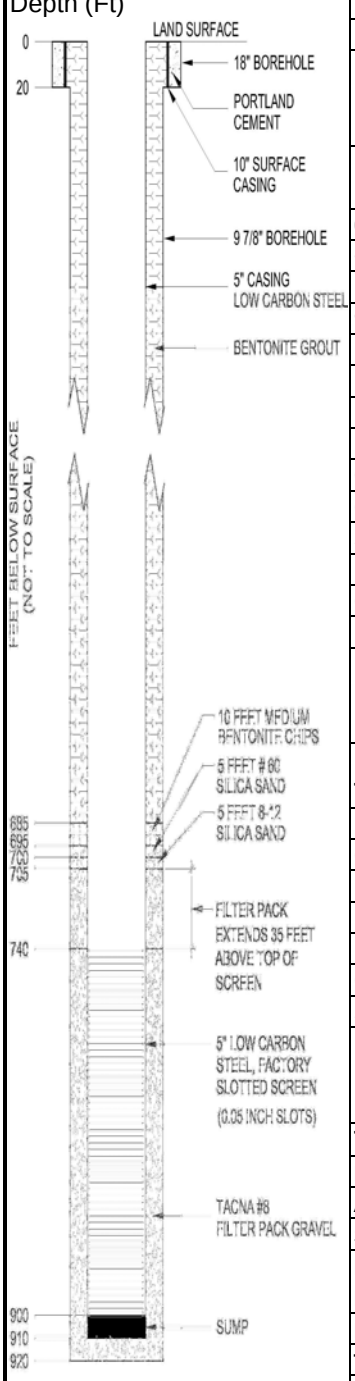
Remarks:

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-1B
Drilling Company: WDC	Driller: Ryan Reynolds	Project No.: 78300
ADWR Well Registration No.: 55-907210		Geologist: M. Arneson
Location: American Legion Hall		
Township, Range, Section: 17S 13E 34dcd		

AS-BUILT DIAGRAM



Remarks:

DRILLING SUMMARY

Total Depth: 920 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1-740'		5" steel, sch 40
	740' - 900'	5" steel, .05" vertical slot
900' - 910' (sump)		5" steel w/bottom cap
Filter Pack Material: #8 Tacna gravel		Interval: 705' - 920'
Filter Pack Material: #8-12 sand		Interval: 700' - 705'
Filter Pack Material: #60 sand		Interval: 695' - 700'
Bentonite chips: time release pellets		Interval: 685' - 695'
Grout: bentonite grout slurry		Interval: 20' - 685'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: every 50' along screened interval		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	6/20/07 8:30	6/26/07 9:30
Casing	6/26/07 15:00	6/27/07 10:30
Filter Pack	6/27/07 14:15	6/27/07 15:25
Bentonite Chips	6/27/07 15:30	6/27/07 15:35
Bentonite Grout	6/27/07 16:00	6/28/07 9:15
Cement	6/28/07 9:30	6/28/07 10:30
Surface Completion	8/21/07	8/21/07

WELL DEVELOPMENT

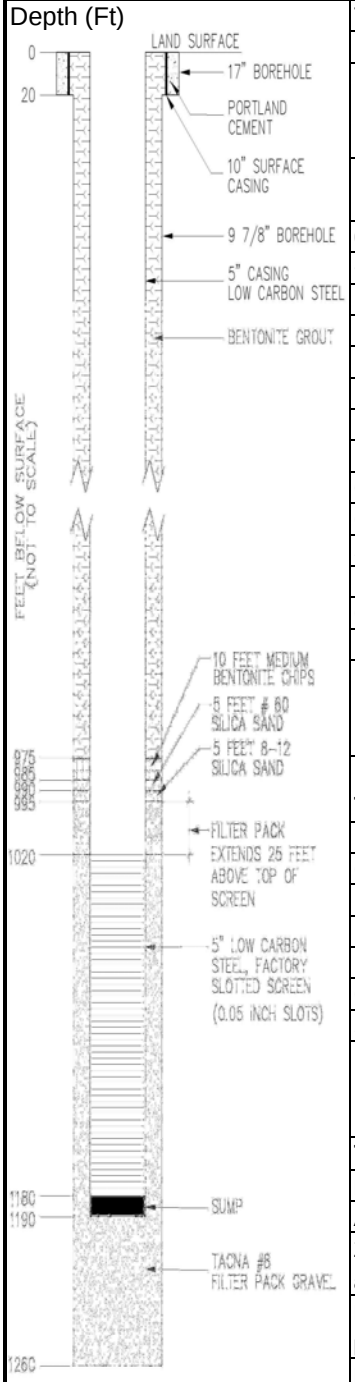
Task	Time (hrs)	Gallons	Start	End
Bailing	9.2	240	7/27/07 9:20	7/28/07 14:15
Airlifting	3.0		7/30/07 9:55	7/30/07 15:50
Swabbing	1.5		7/28/07 10:30	7/28/07 12:00
Development Pumping				
Pump Testing	5.9		8/2/07 8:03	8/2/07 15:55
Total	**19.6**			

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-1C
Drilling Company: WDC	Driller: Arnold Lamon	Project No.: 78300
ADWR Well Registration No.: 55-907209		Geologist: W. Thompson
Location: American Legion Hall		
Township, Range, Section: D-17-13-34dcd		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 1260 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 -1020'		5" steel, sch 40
	1020' - 1180'	5" steel, .05" vertical slot
1180' - 1190' (sump)		5" steel w/bottom cap
Filter Pack Material: #8 Tacna gravel		Interval: 995' -1260'
Filter Pack Material: #8-12 sand		Interval: 990' - 995'
Filter Pack Material: #60 sand		Interval: 985' - 990'
Bentonite chips: time release pellets		Interval: 975' - 985'
Grout: bentonite grout slurry		Interval: 20' - 975'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: every 50' along screened interval		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	5/24/07 8:30	6/13/07 11:32
Casing	6/15/07 9:05	6/15/07 17:36
Filter Pack	6/16/07 7:30	6/16/07 13:30
Bentonite Chips	6/16/07 14:00	6/16/07 14:25
Bentonite Grout	6/16/07 15:20	6/17/07 9:20
Cement	6/17/07 11:30	6/17/07 12:30
Surface Completion	9/11/07	9/11/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing	6.67	450	7/11/07 14:00	7/12/07 15:26
Airlift pumping	6.83	2643	7/13/07 13:45	7/14/07 11:45
Zonal airlifting and swabbing	9.08	4598	7/15/07 11:10	7/16/07 15:20
Development pumping	18.13		7/26/07 9:07	7/27/07 17:05
Pump testing	11.7		7/31/07 8:20	7/31/07 20:02
Total	**52.41**			

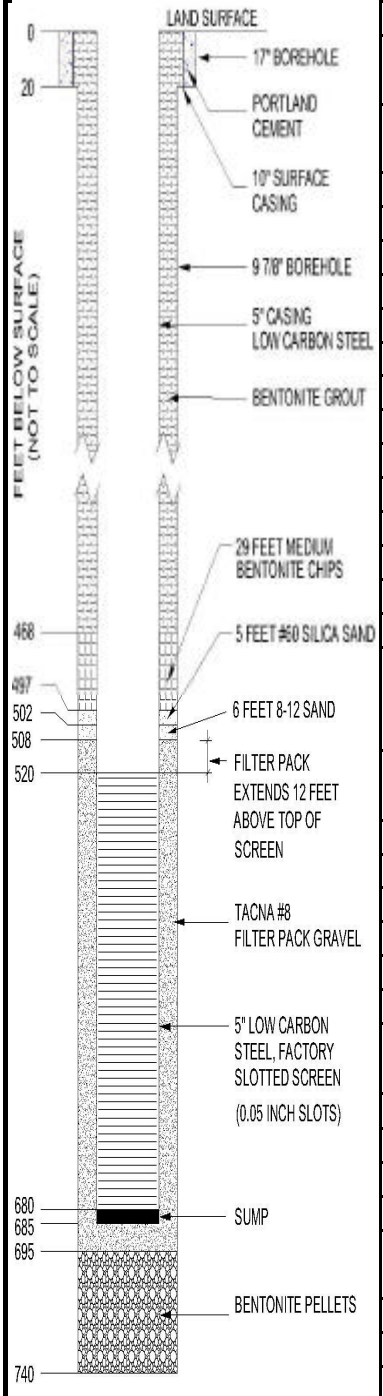
Remarks:

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-2
Drilling Company: WDC	Driller: Jeff Burris	Project No.: 78300
ADWR Well Registration No.: 55-906765		Geologist: W. Thompson
Location: Duval Mine Road (north side) and View Point Road (east side)		
Township, Range, Section: D-18-13-9baa		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 740 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0-10'		10" steel
1'-520'		5" steel, sch 40
	520' to 680'	5" steel, .05" vertical slot
680' - 685' (sump)		5" steel w/ bottom cap
Filter Pack Material: #8 Tacna gravel		Interval: 695' - 508'
Filter Pack Material: #3 sand		Interval: 508' - 502'
Filter Pack Material: #60 choke sand		Interval: 502' - 497'
Grout: time release bentonite		Interval: 740' - 695'
Bentonite chips: medium		Interval: 497 - 468'
Grout: bentonite grout/slurry		Interval: 468' - 20'
Cement:		Interval: 20 - 0'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: every 50' along screened interval		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	3/14/07 8:40	4/11/07 12:00
Casing	4/13/07 9:06	4/13/07 16:00
Filter Pack	4/13/07 17:30	4/13/07 19:30
Bentonite Slurry	4/13/07 17:30	4/13/07 20:00
Cement	4/15/07 11:00	4/15/07 12:00
Surface Completion	4/19/07	4/19/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing			06/02/07 10:30	06/04/07 17:00
Airlifting				
Swabbing				
Development				
Pumping			06/05/07 8:20	06/06/07
Pump Testing			06/14/07 7:30	06/14/2007
Total				

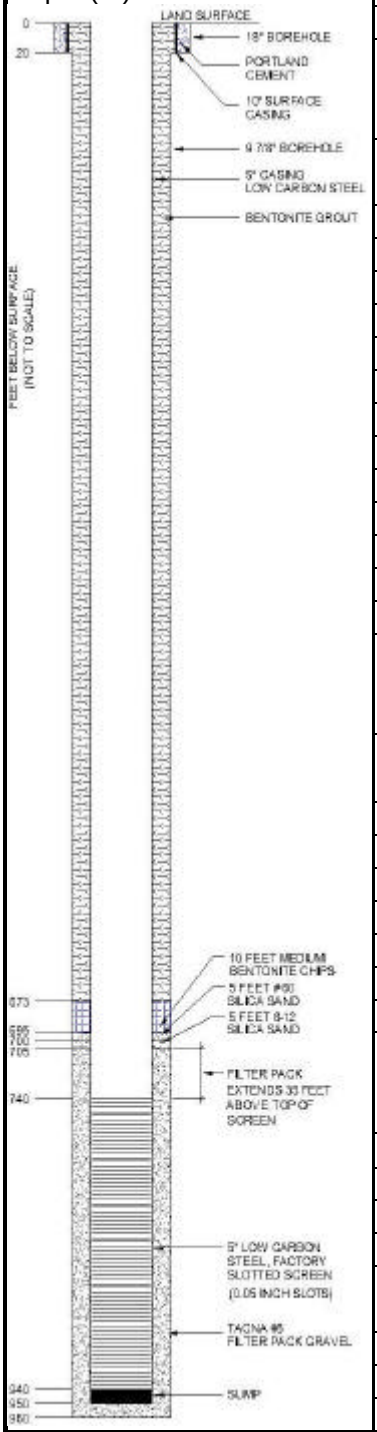
Remarks:

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-3B
Drilling Company: WDC	Driller: Art Cortez	Project No.: 78300
ADWR Well Registration No.: 55-906816		Geologist: W. Thompson
Location: NE corner of La Canada and San Ignacio on north side of wash		
Township, Range, Section: D-18-13-2bcc		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 960 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 -740'		5" steel, sch 40
	740' - 940'	5" steel, .05" slot, sch 40
940' - 950' (sump)		5" steel, sch 40 w/bottom cap
Filter Pack Material: #8 Tacna gravel		Interval: 705' -960'
Filter Pack Material: #8-12 choke sand		Interval: 700' - 705'
Filter Pack Material: #60 choke sand		Interval: 695' - 700'
Bentonite chips: time release pellets		Interval: 673' - 695'
Grout: bentonite grout/slurry		Interval: 20' - 673'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: 940', 890', 840', 790', 740'		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	8/11/07 10:30	8/25/07 16:30
Casing	8/28/07 11:00	8/28/07 17:39
Filter Pack	8/29/07 9:50	8/29/07 15:40
Bentonite Chips	8/29/07 15:50	8/29/07 16:07
Bentonite Grout	8/30/07 8:13	8/30/07 14:25
Cement	9/18/07	9/18/07
Surface Completion	9/18/07	9/18/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing	3.5	500	8/12/07 7:45	8/12/07 17:00
Airlifting	2.45		9/6/07 12:35	9/6/07 15:10
Swabbing				
Development Pumping				
Pump Testing	9.0		9/10/07 8:00	9/10/07 17:00
Total	**14.95**			

Remarks:

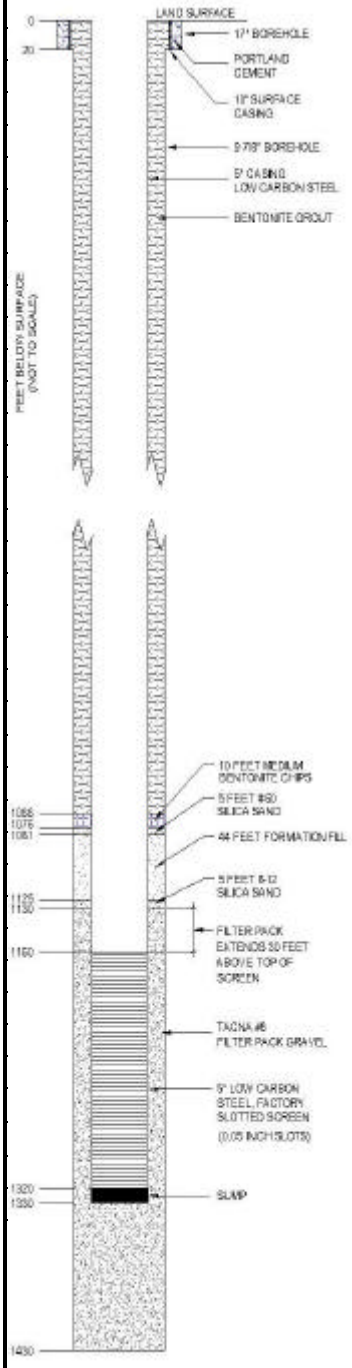
HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-3C
Drilling Company: WDC	Driller: Arnold Lamon	Project No.: 78300
ADWR Well Registration No.: 55-906817		Geologist: W. Thompson
Location: NE corner of La Canada and San Ignacio on north side of wash		
Township, Range, Section: D-18-13-2bcc		

AS-BUILT DIAGRAM

Depth (Ft)



DRILLING SUMMARY

Total Depth: 1430 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 -1160'		5"mild steel, sch 40
	1160' - 1320'	5" mild steel, .05" slot, sch 40
1320' - 1330'		5" mild steel, sch 40
Filter Pack Material: #8 Tacna gravel		Interval: 1130' -1430'
Filter Pack Material: # 8-12 choke sand		Interval: 1125' - 1130'
Filter Pack Material:		formation fill 1081' - 1125'
Filter Pack Material: #60 sand		Interval: 1076' - 1081'
Bentonite chips: time release pellets		Interval: 1066' - 1076'
Grout: bentonite grout/slurry		Interval: 20' - 1066'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: every 50' along screened interval		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	4/25/07 10:52	5/13/07 15:36
Casing	5/15/07 8:30	5/16/07 12:00
Filter Pack	5/17/07 7:40	5/17/07 17:16
Bentonite Chips	5/22/07 9:55	4/13/07 20:00
Bentonite Grout	5/22/07 10:45	5/22/07 15:20
Cement	5/23/07 7:00	5/23/07 9:45
Surface Completion	9/18/07	9/18/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing	5.0		6/4/07 12:30	6/6/2007 13:00
Airlift Pumping	10.0		6/14/07 10:00	6/15/2007 13:30
Zonal airlifting and swabbing	10.25		6/16/07 15:45	6/17/2007 18:30
Development Pumping	11.0		6/21/07 8:00	6/27/2007 17:30
Pump Testing	10.5		6/28/07 7:00	6/28/2007 17:30
Total	**46.75**		**24**	**24 days**

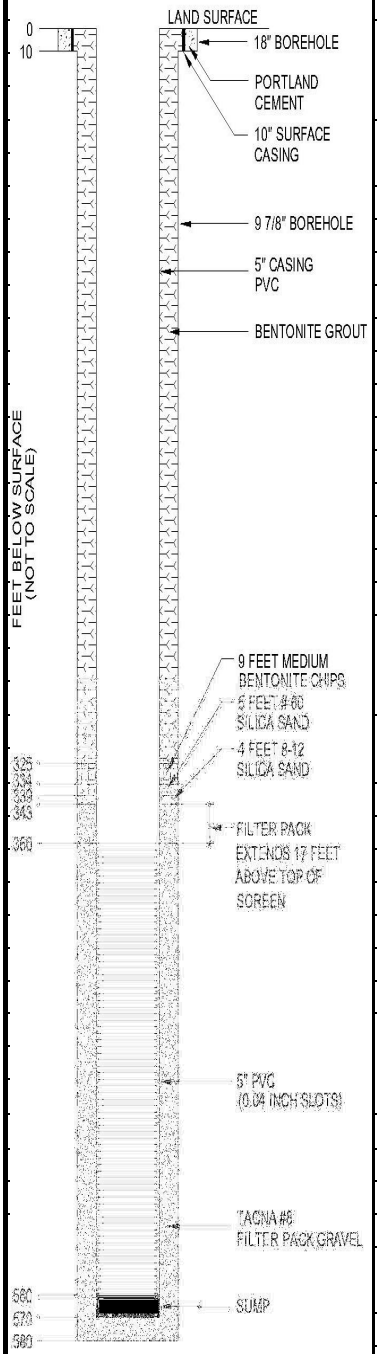
Remarks:

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-4A
Drilling Company: WDC	Driller: Art Cortez	Project No.: 78300
ADWR Well Registration No.: 55-907213		Geologist: W. Thompson
Location: La Canada median approximately 100' south of Penasco, Green Valley, Arizona		
Township, Range, Section: D-18-13-15aad		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 580 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 - 360'		5" sch 80 PVC
	360' - 560'	5" sch 80 PVC, .04" slot
560' - 570'		5" sch 80 PVC
Filter Pack Material: #8 Tacna gravel		Interval: 343' - 580'
Filter Pack Material: #8-12 choke sand		Interval: 339' - 343'
Filter Pack Material: #60 choke sand		Interval: 334' - 339'
Bentonite chips: time release pellets		Interval: 325' - 334'
Grout: bentonite grout/slurry		Interval: 20' - 325'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: 560', 510', 460', 410', 360'		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Start Time
Drilling	9/19/07 14:05	9/23/07 12:25
Casing	9/24/07 10:30	9/24/07 13:03
Filter Pack	9/24/07 14:00	9/25/07 8:40
Bentonite Chips	9/25/07 8:50	9/25/07 9:00
Bentonite Grout	9/25/07 9:25	9/25/07 11:36
Cement	9/26/07 10:00	9/26/07 10:30
Surface Completion	10/24/07	10/24/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing				
Airlifting				
Swabbing				
Development				
Pumping	11.75		10/05/07 15:00	10/06/07 17:45
Pump Testing	9.0		10/08/07 10:00	10/08/07 19:00
Total	**20.75**			

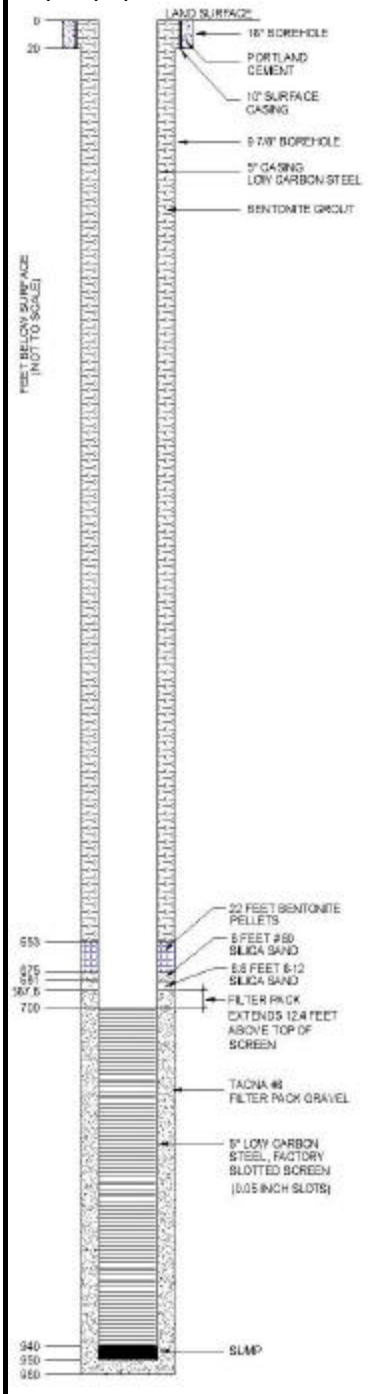
Remarks:

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-4B
Drilling Company: WDC	Driller: Art Cortez	Project No.: 78300
ADWR Well Registration No.: 55-907212		Geologist: W. Thompson
Location: La Canada median approximately 100' south of Penasco, Green Valley, Arizona		
Township, Range, Section: D-18-13-15aad		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 960 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 to 20'		10" steel
+1' - 700'		5" steel
	700' to 940'	5"steel, .05" slot
940' to 950'		5" steel with bottom cap
Filter Pack Material: #8 Tacna gravel		Interval: 687.6' - 960'
Filter Pack Material: #8-12 choke sand		Interval: 681' - 687.6'
Filter Pack Material: #60 choke sand		Interval: 675' - 681'
Bentonite chips: time release pellets		Interval: 653' - 675'
Grout: bentonite grout/slurry		Interval: 20' - 653'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: 940', 890', 840', 790', 740'		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	9/4/07 8:00	9/11/07 10:25
Casing	9/12/07 7:30	9/12/07 13:45
Filter Pack	9/13/07 7:30	9/13/07 14:00
Bentonite Chips	9/13/07 14:15	9/13/07 14:30
Bentonite Grout	9/18/07 11:30	9/18/07 13:20
Cement	9/26/07 10:30	9/26/07 11:00
Surface Completion	10/24/2007	10/24/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing				
Airlifting	5.0		09/25/07 10:00	09/25/07 14:30
Swabbing				
Development Pumping				
Pump Testing	9.75		10/10/07 8:00	10/10/07 17:45
Total	**14.75**			

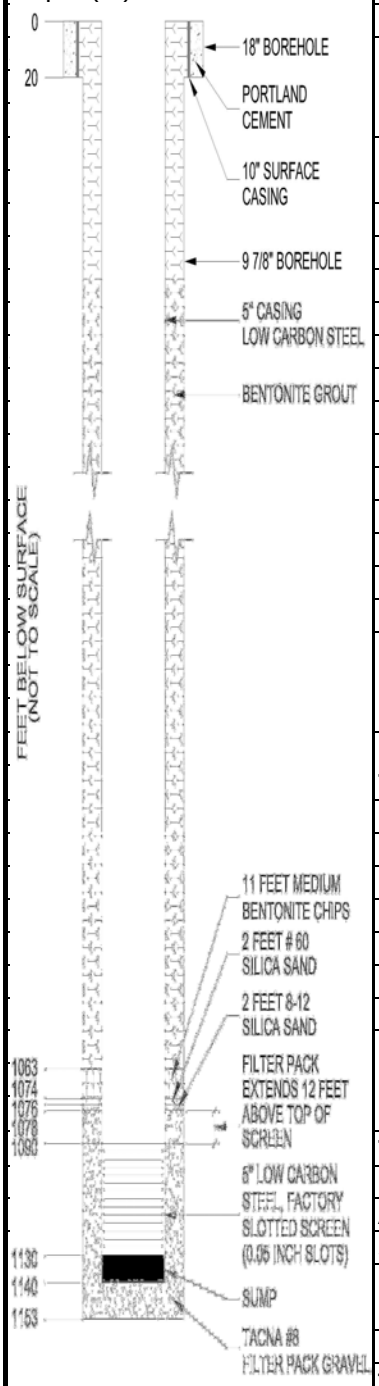
Remarks:

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-4C
Drilling Company: WDC	Driller: Arnold Lamon	Project No.: 78300
ADWR Well Registration No.: 55-907211		Geologist: W. Thompson
Location: La Canada median approximately 100' south of West Camino de Penasco, Green Valley, Arizona		
Township, Range, Section: D-18-13-15aad		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 1153 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 -1090'		5" steel
	1090' - 1130'	5" steel, .05" slot
1130' - 1140'		5" mild steel
Filter Pack Material: #8 Tacna gravel		Interval: 1078' -1152'
Filter Pack Material: #8-12 choke sand		Interval: 1076' - 1078'
Filter Pack Material: #60 choke sand		Interval: 1074' - 1076'
Bentonite chips: time release pellets		Interval: 1063' - 1074'
Grout: bentonite grout/slurry		Interval: 20' - 1063'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: 1090', 1120', 1135'		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Start Time
Drilling	6/19/07 11:48	7/11/07 11:17
Casing	7/13/07 9:07	7/13/07 16:11
Filter Pack	7/14/07 10:45	7/14/07 11:55
Bentonite Chips	7/14/07 13:11	7/14/07 13:38
Bentonite Grout	7/14/07 13:45	7/14/07 16:46
Cement	7/15/07 16:30	7/15/07 17:05
Surface Completion	10/24/2007	10/24/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing	3.5	500	8/12/07 7:45	8/12/07 17:00
Airlifting	4.67		8/14/07 9:45	8/14/07 14:25
Swabbing	2.5		8/12/07 13:00	8/12/07 15:30
Development Pumping	5.08		8/15//07 9:45	8/15/07 14:50
Pump Testing	11.28		8/16/07 7:48	8/16/07 19:05
Total	**27.03**			

Remarks:

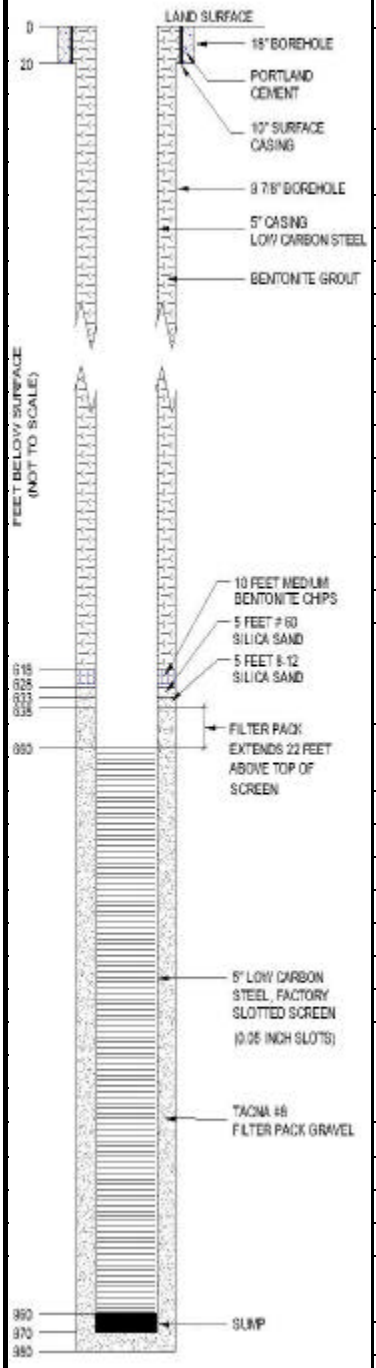
HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-5B
Drilling Company: WDC	Driller: Arnold Lamon	Project No.: 78300
ADWR Well Registration No.: 55-907456		Geologist: W.Thompson
Location: LaCanada Drive median strip, approximately 400' south of West Paseo de Canto		
Township, Range, Section: 18S -13E - 22acd		

AS-BUILT DIAGRAM

Depth (Ft)



DRILLING SUMMARY

Total Depth: 980'	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 - 660'		5" steel
	660' - 960'	5" steel, .05" slot
960' - 970' (sump)		5" steel, with bottom cap
Filter Pack Material: #8 Tacna gravel		Interval: 638' -980'
Filter Pack Material: #8-12 choke sand		Interval: 633' - 638'
Filter Pack Material: #60 choke sand		Interval: 628' - 633'
Bentonite chips: time release pellets		Interval: 618' - 628'
Grout: bentonite grout/slurry		Interval: 20' - 618'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: 660', 710', 760', 810', 860', 910', 960'		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	9/21/07 10:54	9/27/07 17:35
Casing	10/3/0711:05	10/3/07 16:38
Filter Pack	10/4/07 7:30	10/4/07 10:06
Bentonite Chips	10/4/07 10:55	10/4/07 11:15
Bentonite Grout	10/4/07 13:40	10/4/07 15:15
Cement	10/5/07 15:50	10/5/07 16:22
Surface Completion	10/23/07	10/23/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing	2 *	55	10/10/07 15:30*	10/10/07 17:30
Airlifting	1.9		10/5/07 12:04	10/05/07 13:58
Swabbing				
Development				
Pumping	1.5		10/11/07 15:00	10/11/07 16:30
Pump Testing	9.0		10/11/07 16:40	10/12/07 15:15
Total	**14.4**			

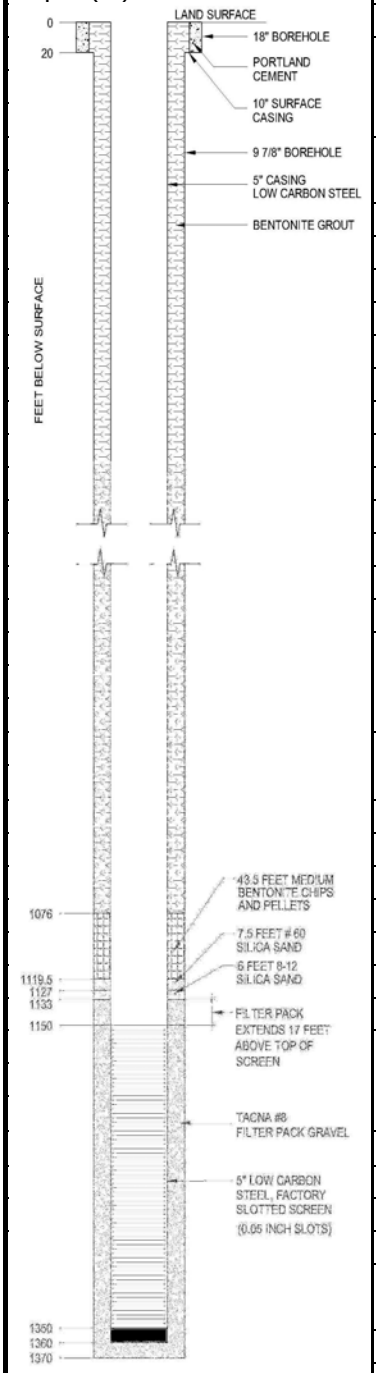
Remarks: * estimated

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-5C
Drilling Company: WDC	Driller: Arnold Lamon	Project No.: 78300
ADWR Well Registration No.: 55-907457		Geologist: Wilson/Thompson
Location: La Canada Drive median strip, approximately 400' south of West Paseo de Canto		
Township, Range, Section: D-18-13-22acd, San Ignacio de La Canoa Land Grant		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 1370 feet	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 -1150'		5" steel, sch 40
	1150' - 1350'	5" steel, .05" slot, sch 40
1350' - 1360'		5" steel, sch 40
Filter Pack Material: #8 Tacna gravel		Interval: 1133' -1370'
Filter Pack Material: #8-12 choke sand		Interval: 1127' - 1133'
#60 choke sand		Interval: 1119.5' - 1127'
Bentonite chips: time release pellets and chips		Interval: 1076' - 1119.5'
Grout: bentonite grout/slurry		Interval: 20' - 1076'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: 1150', 1200', 1250', 1300', 1350'		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	7/16/07 16:21	8/1/07 15:17
Casing	8/8/07 9:45	8/8/07 18:45
Filter Pack	8/9/07 10:08	8/10/07 12:30
Bentonite Chips	8/10/07 12:32	8/10/07/ 13:35
Bentonite Grout	8/11/07 9:15	8/11/07 12:45
Cement		
Surface Completion	10/23/07	10/23/07

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing	0.5	55	8/22/07 11:15	8/22/07 11:42
Airlifting	7.82		8/12/07 9:13	8/12/07 17:02
Swabbing				
Development Pumping				
Pump Testing	5.0		8/23/07 13:00	8/23/07 18:00
Total	**13.32**			

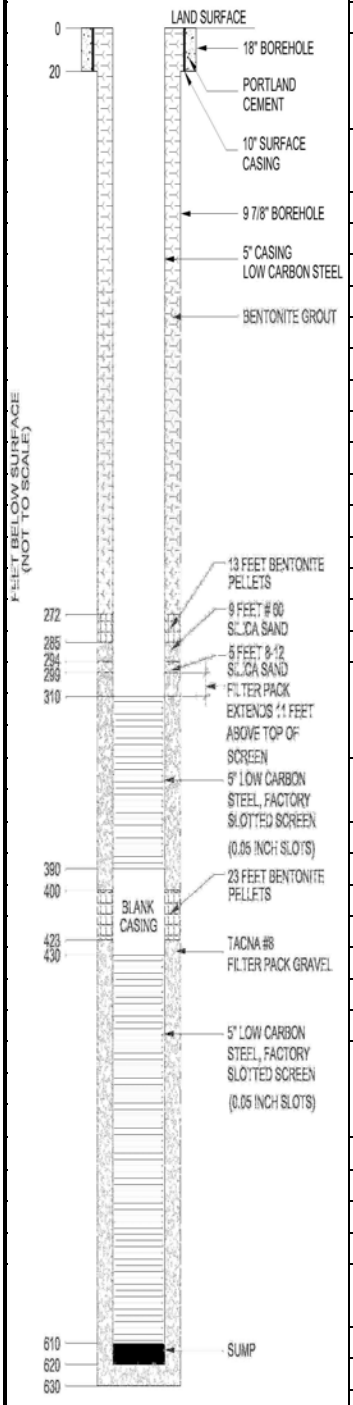
Remarks:

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-6A
Drilling Company: WDC	Driller: Arnold Lamon	Project No.: 78300
ADWR Well Registration No.: 55-907607		Geologist: W. Thompson
Location: Camino del Sol, west side, approximately 300' south of Placita Beldad Road, Green Valley, Arizona		
Township, Range, Section: 18S - 13E 28dbd		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 630'	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 - 310'		5" steel
	310' - 390'	5" steel, .05" slot
390 - 430		5" steel
	430' - 610'	5" steel, .05" slot
610' - 620' (sump)		5" steel, bottom cap
Filter Pack Material: #8 Tacna gravel		Intervals: 299' - 400', 423' - 630'
Filter Pack Material: #8-12 choke sand		Interval: 294' - 299'
Filter Pack Material: #60 choke sand		Interval: 285' - 294'
Bentonite chips: time release pellets		Intervals: 272' - 285', 400' - 423'
Grout: bentonite grout/slurry		Interval: 20' - 272'
Cement:		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: 610', 560', 510', 460', 360'		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Finish Time
Drilling	9/10/07 9:10	9/18/07 13:10
Casing	9/19/07 11:55	9/19/07 15:58
Filter Pack	9/20/07 9:58	9/20/07 15:58
Bentonite Chips	9/20/07 16:15	9/20/07 16:53
Bentonite Grout	9/21/07 7:00	9/21/07 8:25
Cement		
Surface Completion	10/24/07	10/24/07 0:00

WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing	5.0		9/26/07 11:15	9/26/07 16:15
Airlifting				
Swabbing				
Development Pumping	3.8	18,562	9/28/07 12:32	9/27/07 17:00
Pump Testing	9.92		10/02/07 9:00	10/02/07 19:55
Total	**18.72**			

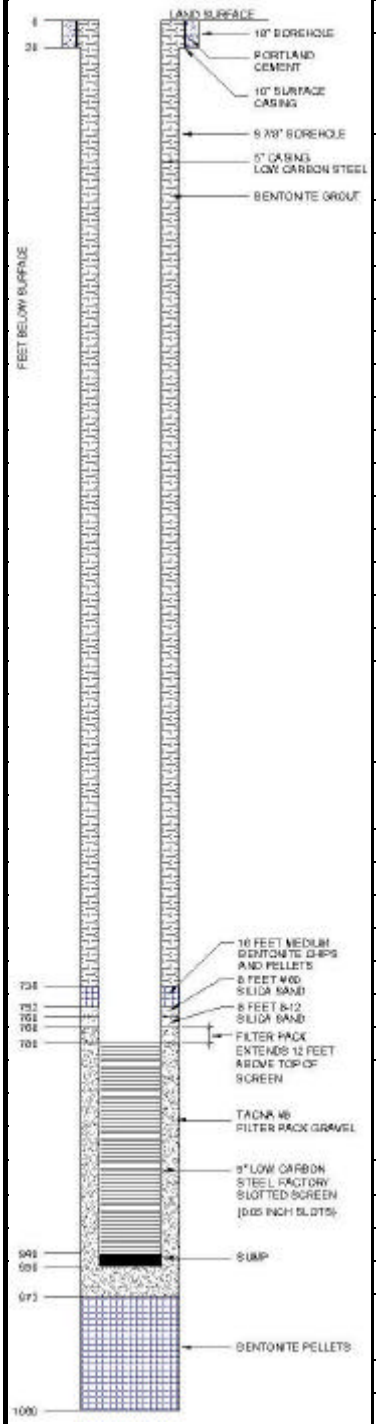
Remarks:

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name: Phelps Dodge Sierrita Inc. Sulfate Investigation		Boring No.: MO-2007-6B
Drilling Company: WDC	Driller: Arnold Lamon	Project No.: 78300
ADWR Well Registration No.: 55-907606		Geologist: W.Thompson
Location: Camino del Sol, west side, approximately 300' south of Placita Beldad Road, Green Valley, Arizona		
Township, Range Section: 18S - 13E - 28dbd		

AS-BUILT DIAGRAM



DRILLING SUMMARY

Total Depth: 1060'	Hole Diameter: 9 7/8"	Method: mud rotary
Drill Rig: Gefco Speedstar 50K		Bit Type: tricone

WELL DATA

Depth Interval (Ft) Casing	Screen	Diameter, Material, Slot Size
0 - 20'		10" steel
+1 -780'		5" steel
	780' - 940'	5" steel, .05"slot
940' - 950' (sump)		5" steel, with bottom cap
Grout: bentonite chips (bottom seal)		Interval: 973' - 1060'
Filter Pack Material: #8 Tacna gravel		Interval: 768' -973'
Filter Pack Material: #8-12 choke sand		Interval: 760' - 768'
Filter Pack Material: #60 choke sand		Interval: 752' - 760'
Bentonite chips: time release pellets		Interval: 736' - 752'
Grout: bentonite grout/slurry		Interval: 20' - 736'
Cement: Portland		Interval: 0' - 20'
Surface Completion: above-ground steel box		
Measuring Point: to be established		
Centralizer Locations: 780', 830', 880', 930'		

CONSTRUCTION TIME LOG

Task	Date and Start Time	Date and Start Time
Drilling	8/15/07 10:55	8/29/07 15:36
Casing	9/6/07 14:26	9/7/07 15:09
Filter Pack	9/8/07 9:56	9/8/07 16:10
Bentonite Chips	9/8/07 16:25	9/8/07 17:05
Bentonite Grout	9/9/07 9:00	9/9/0711:29
Cement	9/10/07 12:30	9/10/07 13:00
Surface Completion	10/24/07	10/24/07 0:00

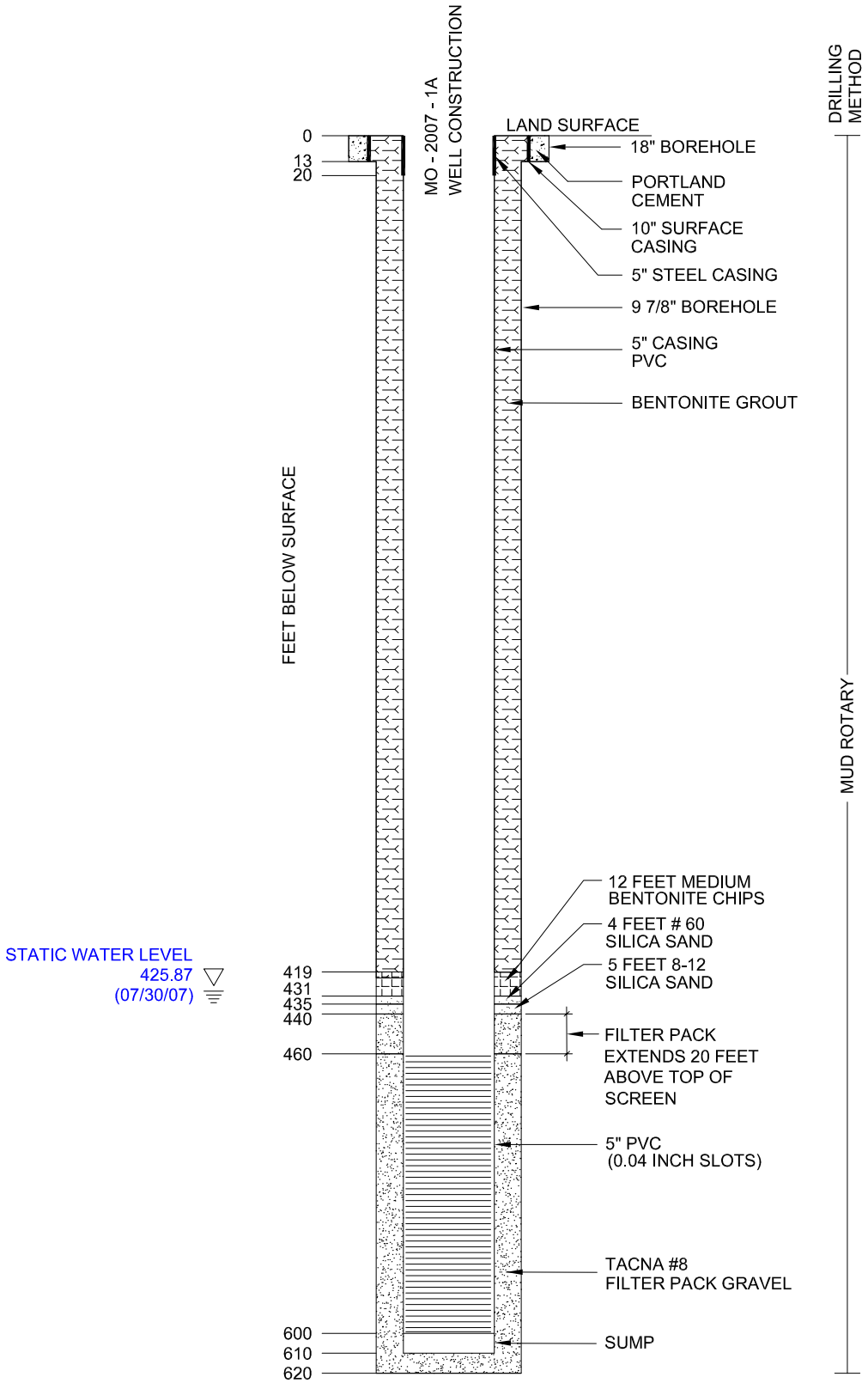
WELL DEVELOPMENT

Task	Time (hrs)	Gallons	Start	End
Bailing				
Airlifting	5.5	4000	10/01/07 10:30	10/01/07 16:00
Swabbing				
Development Pumping				
Pump Testing	4.0		10/03/07 16:15	10/03/07 20:15
Total	**9.5**			

Remarks:

APPENDIX D.4

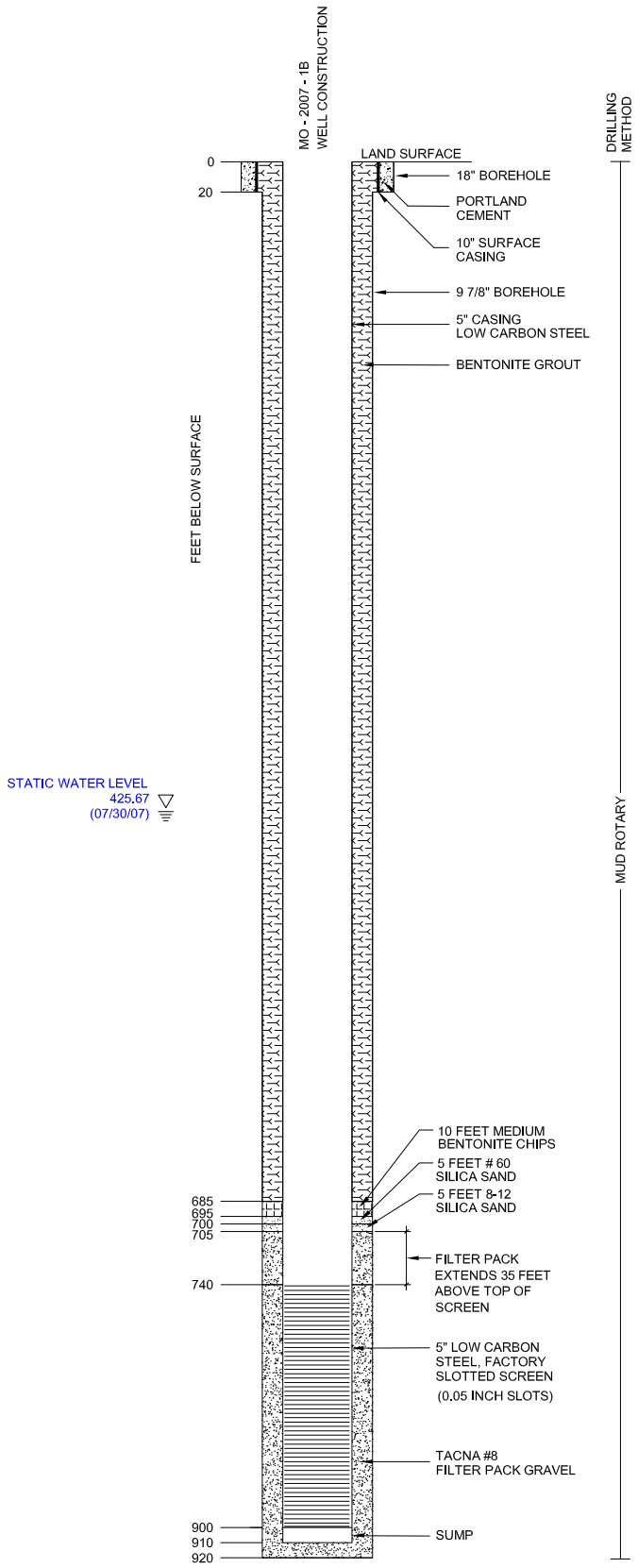
WELL CONSTRUCTION DIAGRAMS OF INDIVIDUAL MITIGATION ORDER WELLS



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-1A (55-907342)

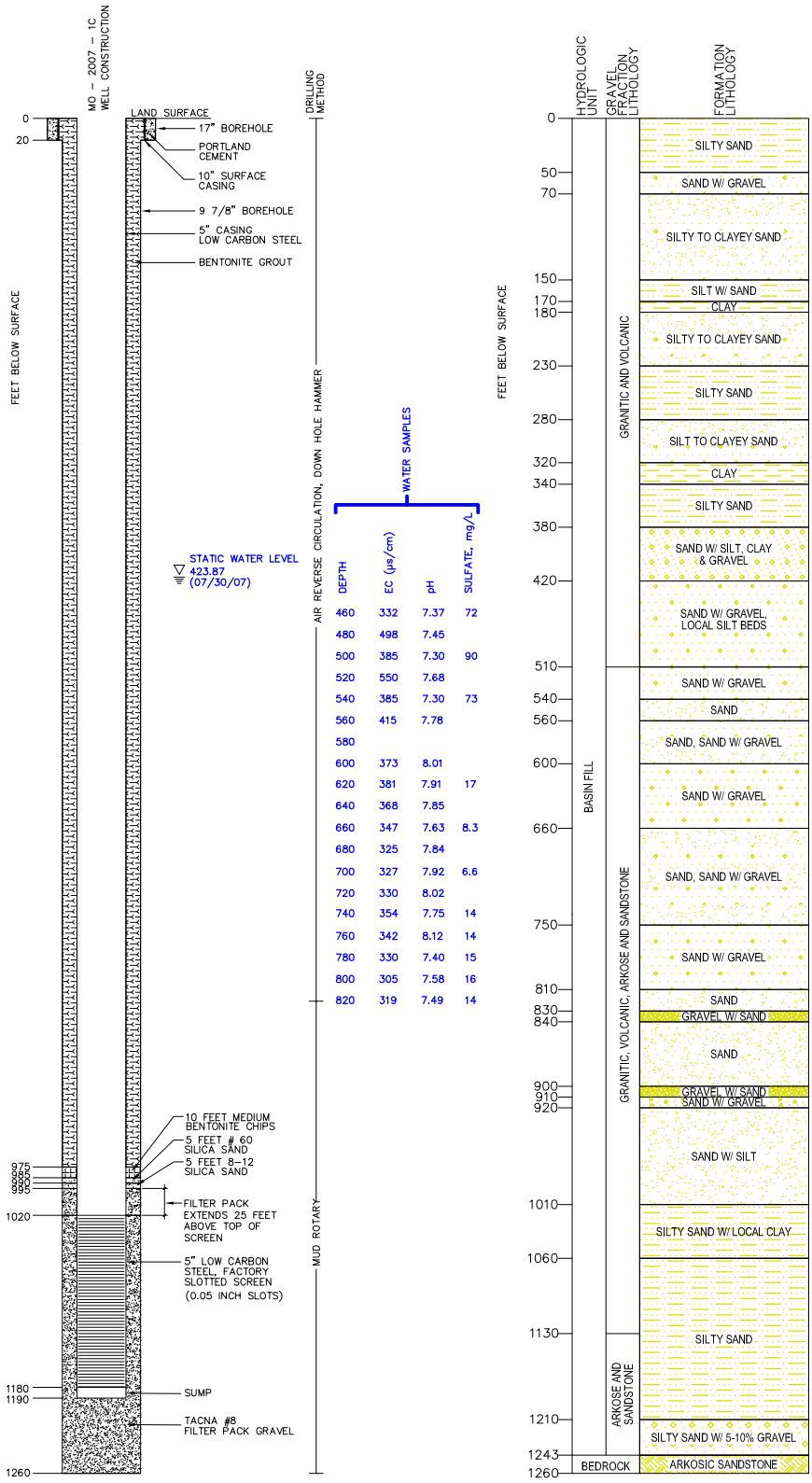
Approved	Date	Drawn By	Date	File Name	Figure
KSW	07/05/07	DKW	07/05/07	7830138A	D.4.1



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-1B (55-907210)

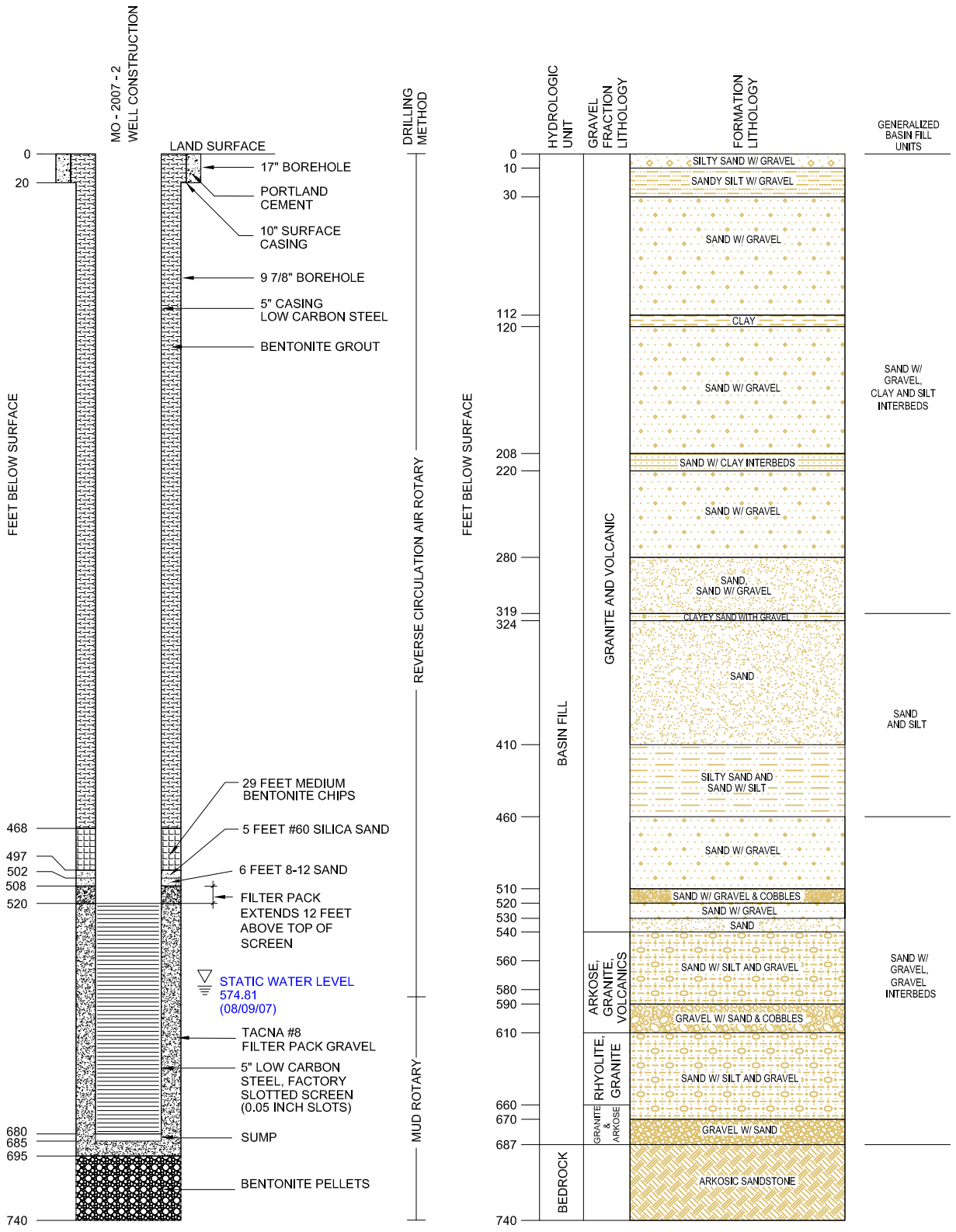
Approved	Date	Drawn By	Date	File Name	Figure
KSW	07/03/07	DKW	07/03/07	7830137A	D.4.2



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-1C (55-907209)

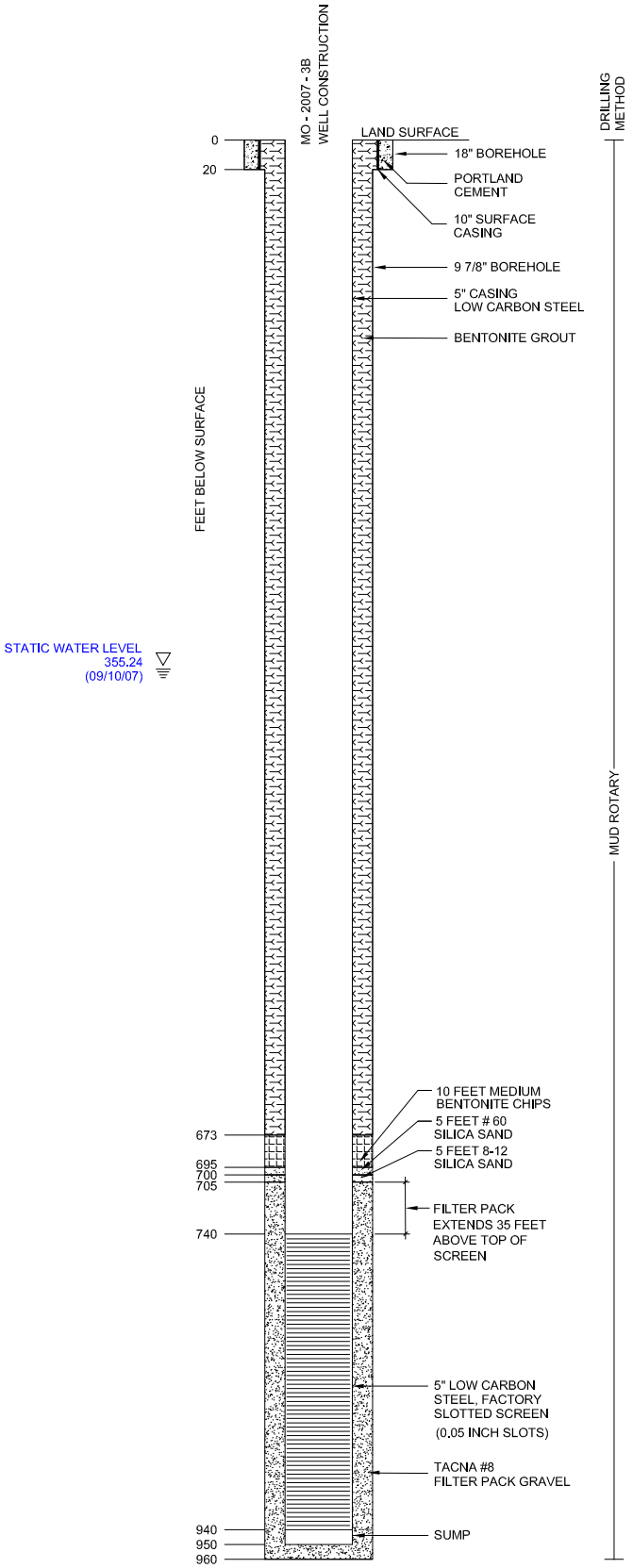
Approved	Date		Date	File Name	Figure
KSW	06/19/07	DKW	06/19/07	7830134A	D.4.3



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-2 (55-906765)

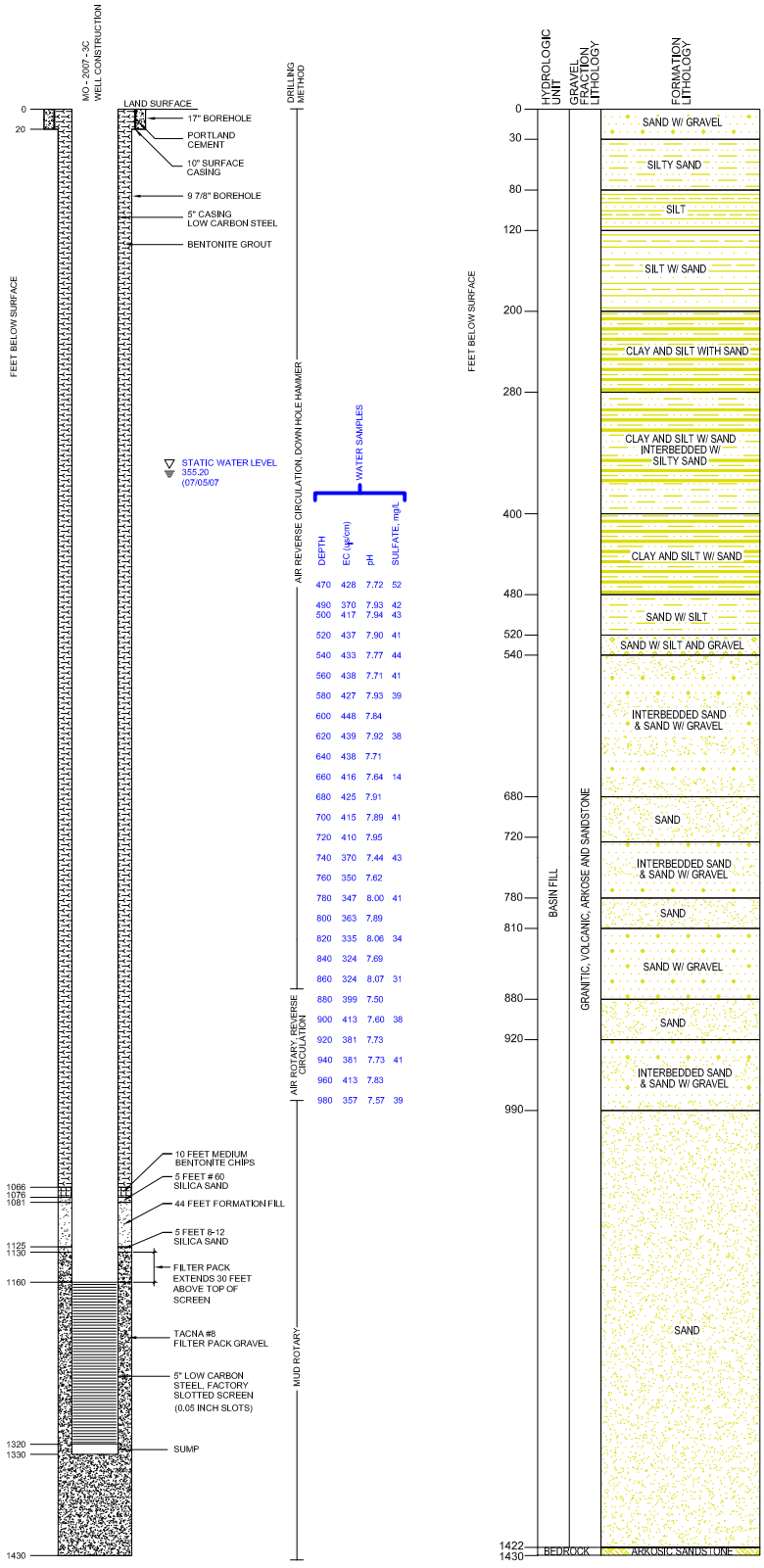
Approved	Date	Drawn By	Date	File Name	Figure
KSW	05/29/07	JEK	05/07/07	7830131A	D.4.4



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-3B (55-906816)

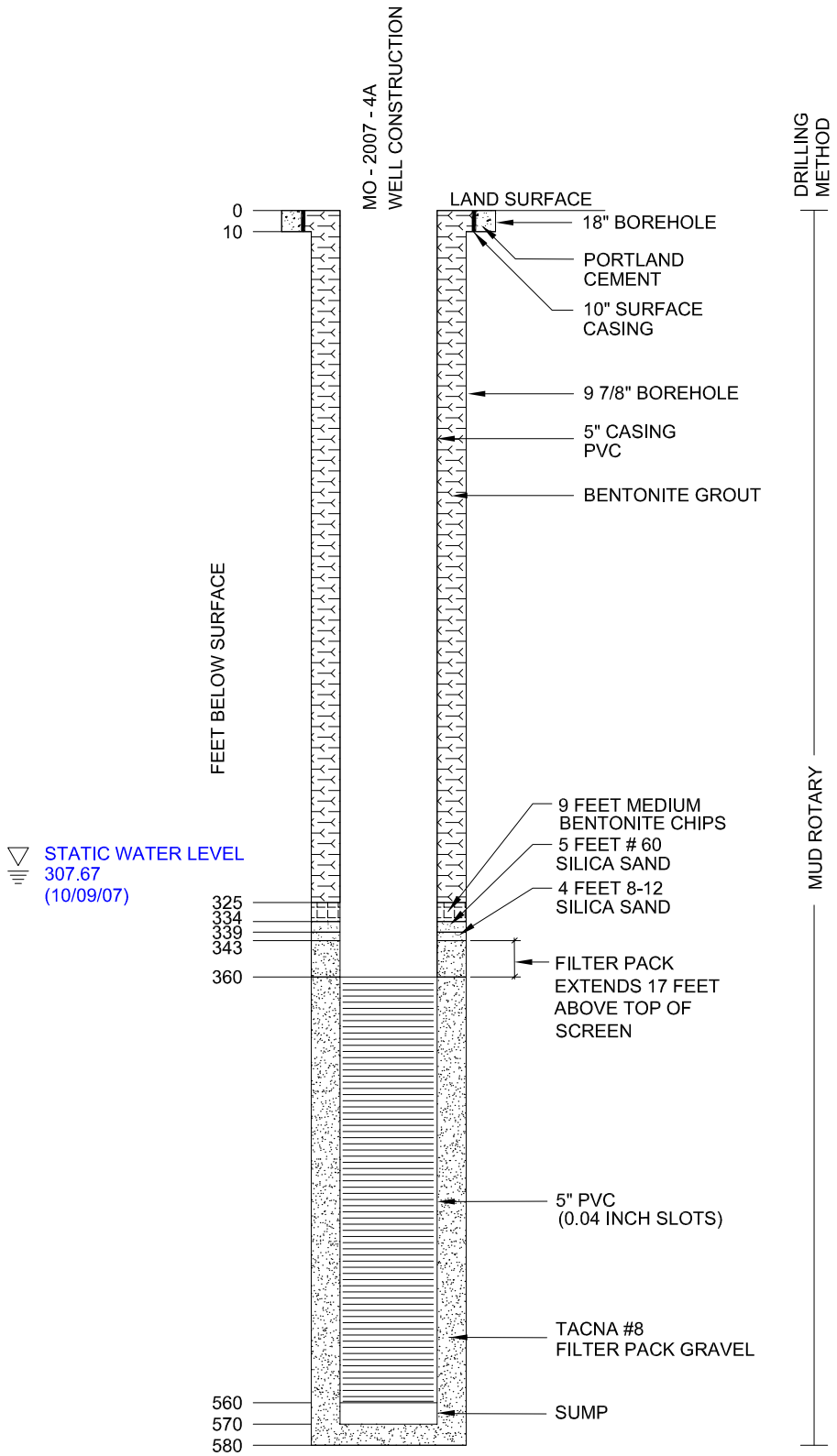
Approved	Date	Drawn By	Date	File Name	Figure
KSW	9/6/07	DKW	9/6/07	7830149A	D.4.5



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-3C (55-906817)

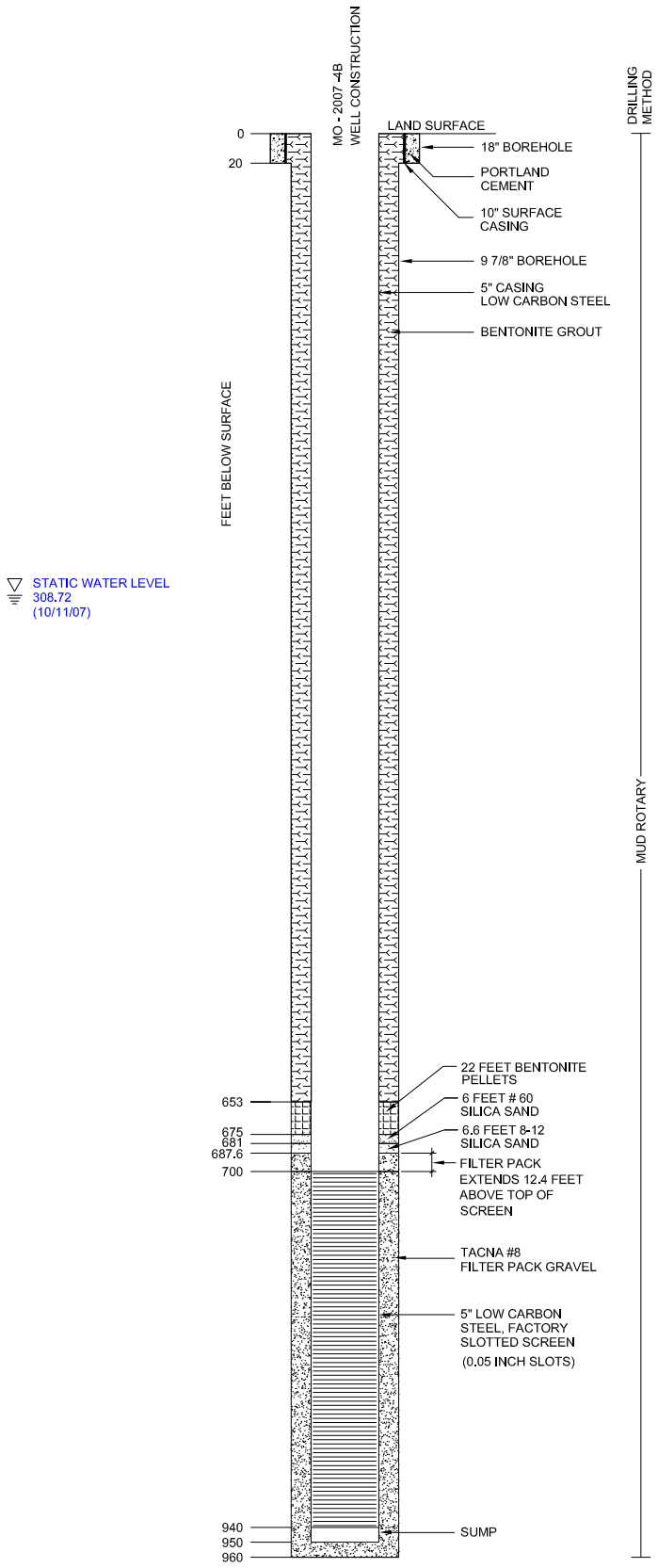
Approved	Date	Drawn By	Date	File Name	Figure
KSW	06/18/07	DKW	06/18/07	7830133A	D.4.6



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-4A (55-907213)

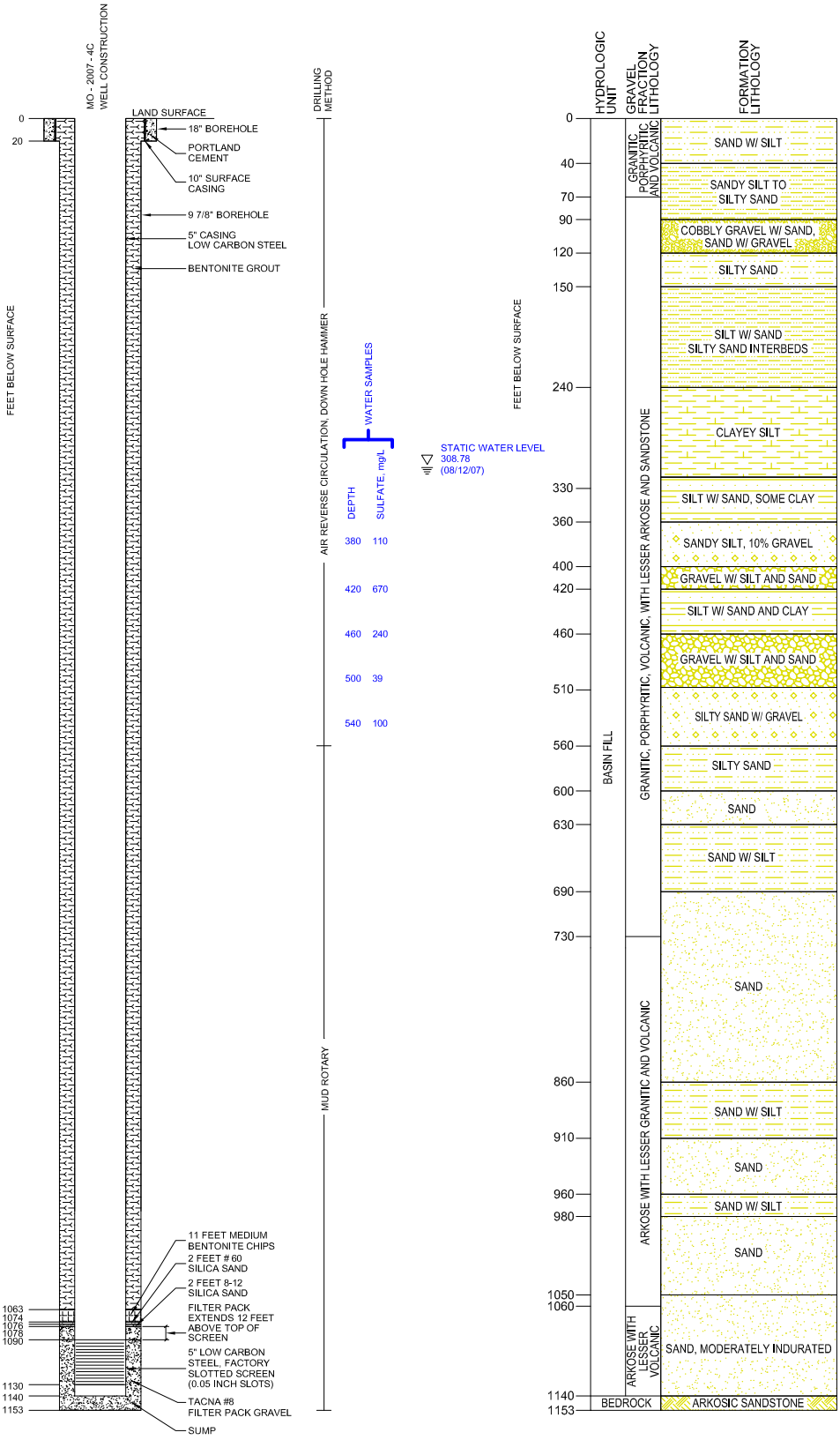
Approved	Date	Drawn By	Date	File Name	Figure
KSW	10/11/07	RAM	10/11/07	7830158A	D.4.7



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-4B (55-907212)

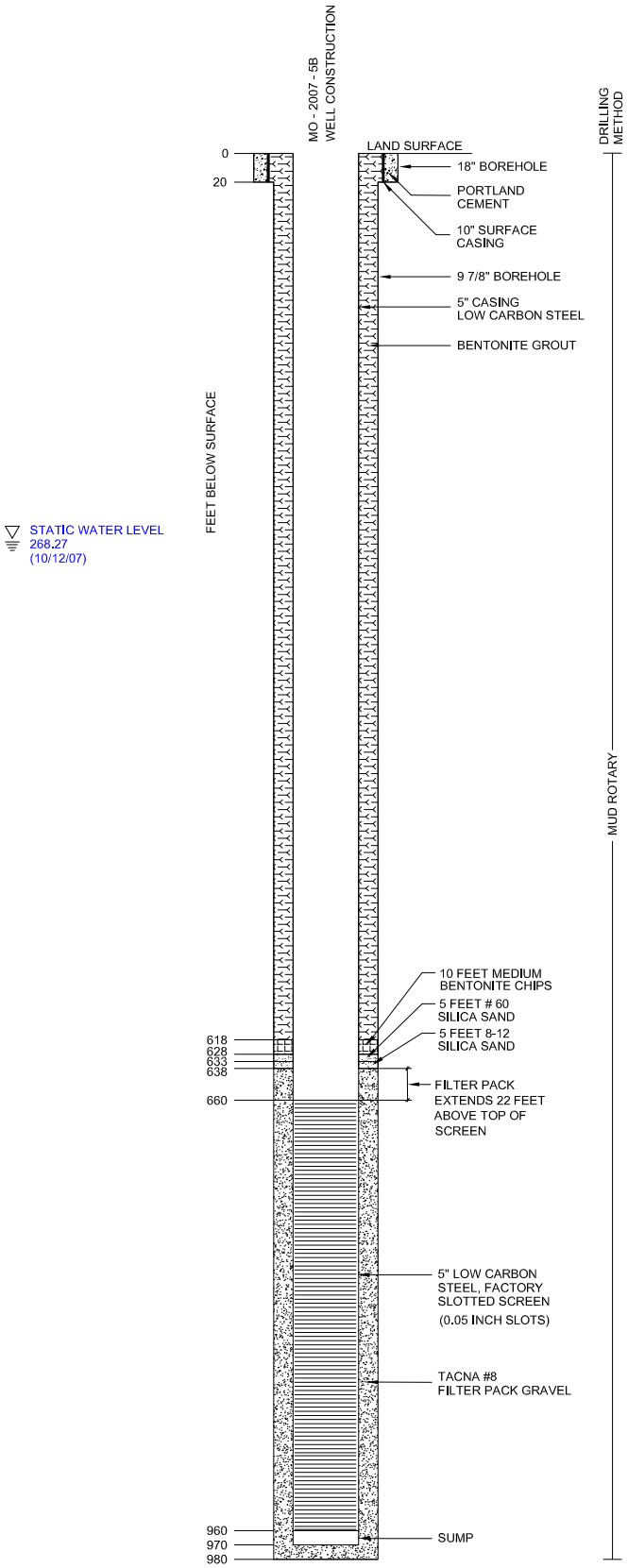
Approved	Date	Drawn By	Date	File Name	Figure
KSW	9/24/07	DKW	9/24/07	7830152A	D.4.8



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-4C (55-907211)

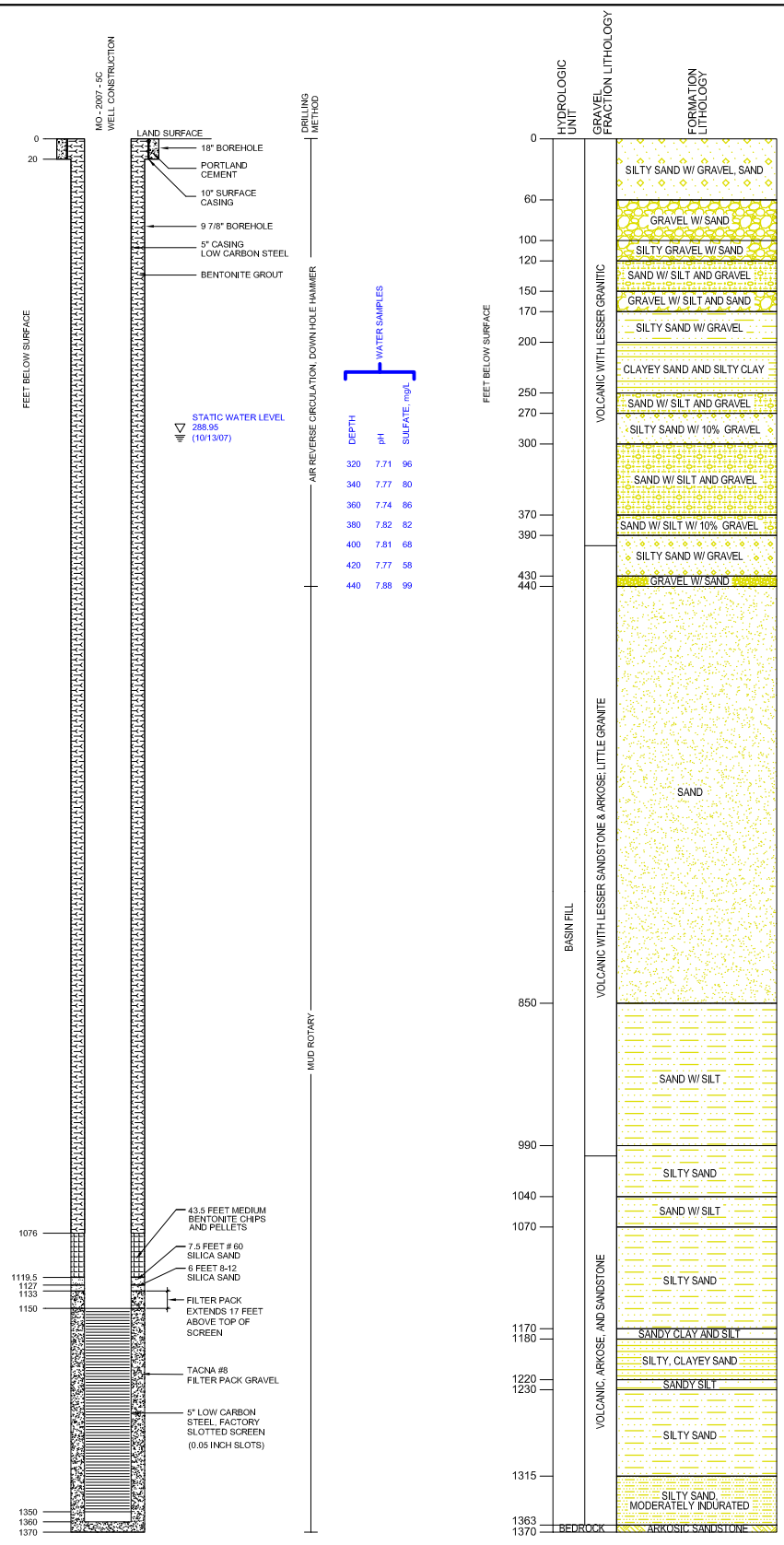
Approved	Date	Drawn By	Date	File Name	Figure
KSW	07/26/07	RAM	07/26/07	7830140A	D.4.9



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-5B (55-907456)

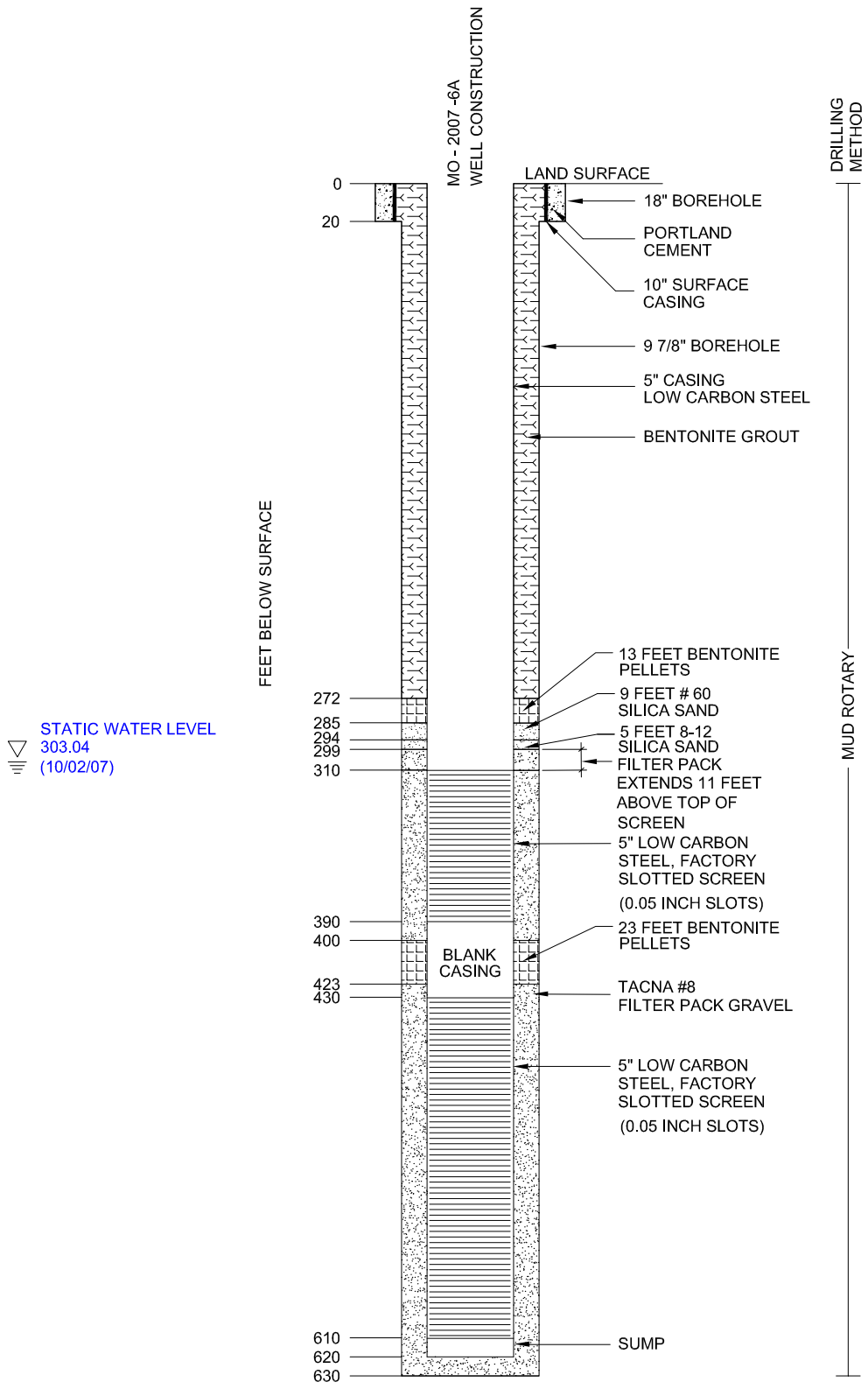
Approved	Date	Drawn By	Date	File Name	Figure
KSW	10/11/07	RAM	10/11/07	7830157A	D.4.10



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-5C (55-907457)

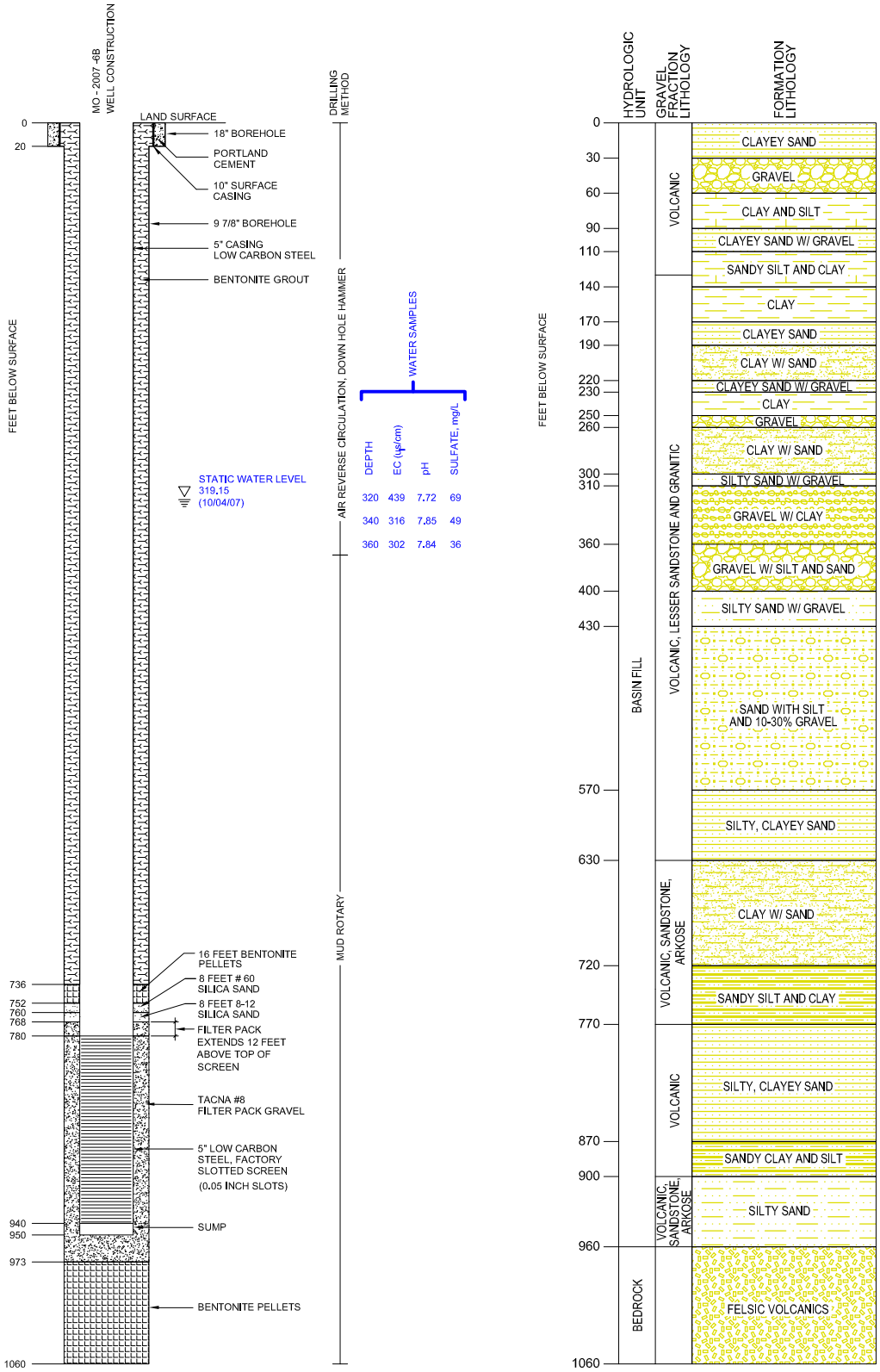
Approved	Date	Drawn By	Date	File Name	Figure
KSW	09/06/07	DKW	09/06/07	7830148A	D.4.11



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM FOR WELL MO-2007-6A (55-907607)

Approved	Date	Drawn By	Date	File Name	Figure
KSW	9/25/07	DKW	9/25/07	7830153A	D.4.12



HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2007-6B (55-907606)

Approved	Date	Drawn By	Date	File Name	Figure
KSW	9/11/07	DKW	9/11/07	7830151A	D.4.13

APPENDIX D.5

WELL CONSTRUCTION DATA FOR NP-2 AND CW-3

NP-2

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

APR 1982 DEPARTMENT OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE — FILE IN DUPLICATE

09

REGISTRATION FEE (CHECK ONE)	
EXEMPT WELL (NO CHARGE)	☐
NON-EXEMPT WELL — $10.00	☒

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 605898
FILE NO. D(18-13)2 bcc
FILED 4/15/82 (DATE) AT 2 (TIME)
INA —
AMA Tucson

1. Name of Registrant:
New Pueblo Constructors, Inc.
P.O. Box 27566 (Address) Tucson (City) AZ (State) 85726 (Zip)

2. File and/or Control Number under previous groundwater law:
D(18-13)2 bcc (File Number) 35- (Control Number)

3. a. The well is located within the SW ¼ SW ¼ NW ¼, Section 2, of Township 18 N/S, Range 13 E/W, G & SRB & M, in the County of Pima.

b. If in a subdivision: Name of subdivision Green Valley Pueblo Estates, Lot No. _____, Address 341 West Rosa Drive, Green Valley, AZ.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial)
Franchised water system serving domestic customers and some commercial customers.

5. If for irrigation use, number of acres irrigated from well _____.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
_____ (Address) _____ (City) _____ (State) _____ (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well 515 feet
b. Diameter of casing 12 inches
c. Depth of casing 515 feet
d. Type of casing ¼" steel.
e. Maximum pump capacity 189 gallons per minute.
f. Depth to water 314.4 feet below land surface.
g. Date well completed November (Month) 12 (Day) 1974 (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☒.
_____¼ _____¼ _____¼, Section _____ Township _____ Range _____
_____¼ _____¼ _____¼, Section _____ Township _____ Range _____
Green Valley Pueblo Estates Subdivision
Attach additional sheet if necessary.

9. DATE 4/13/82 SIGNATURE OF REGISTRANT Karl D Lindall

Layne
12030 E. Riggs Road
Chandler, AZ 85249
Telephone: 480/895-9404

T.V. CAMERA SURVEY

Date 5-31-2007

Customer Hydro Geo Chem

Job Number 81-9725 Well Number #NP-2 S.W.L. 351'

LOCATION: County _____ City Green Valley State Arizona

Sec _____ Twp _____ Rge _____

Tape Made: Yes ☑ No ☐ Tape File Number _____

Brief Well Description 12¼" ID casing

	DEPTH		DESCRIPTION
	~~0~~		AT Top of Casing 12" casing
		18'	Rust Buildup on Casing
		330'	Buildup on Casing
		331'	Perforations (saw cut)
		351'	Static Water level (dowly)
		362'	Piece of Plastic
		375'	Heavy Buildup on Casing
		410'	Second Piece of Plastic
		450'	Heavy Buildup on Casing & Perforations
		486'	Tg of Fill

Technician _____

CW-3

acres ±1

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

IMPORTANT

PLEASE COMPLETE AND RETURN

This report should be prepared by the driller in all detail and filed with the State Land Commissioner following completion of the well.

1. OWNER TUCSON GREEN VALLEY
Name
c/o A. A. McDaniel Well & Machine Co., 2838 Ruthrauff Rd., Tucson, Arizona
Address

2. Lessee or Operator
Name
Address

3. DRILLER A.A. McDANIEL WELL & MACHINE CO.
Name
Tucson, Arizona
Address

4. Location of well: Twp. 18S Rge. 13E Section 22 NE ¼ SW ¼ NE ¼
10-acre subdivision

5. Intention to Drill File No. D(18-13)22 aca Permit No.

DESCRIPTION OF WELL

6. Total depth of hole 501' 5" ft.

7. Type of casing Linepipe

8. Diameter and length of casing 16 in. from 0 to 500 in. from to , in. from to

9. Method of sealing at reduction points

10. Perforated from 182 to 500, from to , from to , from to

11. Size of cuts 3/8" X1½" Number of cuts per foot 8

12. If screen was installed: Length ft. Diam. in. Type

13. Method of construction Drilled cable tools
drilled, dug, driven, bored, jetted, etc.

14. Date started
Month Day Year

15. Date completed March 16, 1964
Month Day Year

16. Depth of water 193 ft.
If flowing well, so state.

17. Describe point from which depth measurements were made, and give sea-level elevation if available

18. If flowing well, state method of flow regulation

19. REMARKS:

DO NOT WRITE IN THIS SPACE
OFFICE RECORD

Received 3-29-65 by R

Filed 3-22-65 by K

File No. D(18-13)22 aca

(Well Log to Appear on Reverse Side)

WD FORM G-301
REV. 4-27-53

Layne
12030 E. Riggs Road
Chandler, AZ 85249
Telephone: 480/895-9404

T.V. CAMERA SURVEY

Date 5-31-2007

Customer Hydro Geo Chem

Job Number 81-4725 Well Number #CW-3 S.W.L. 265'

LOCATION: County _____ City Green Valley State Arizona

Sec _____ Twp _____ Rge _____

Tape Made: Yes ☑ No ☐ Tape File Number _____

Brief Well Description 15 ¼" ID casing

DEPTH		DESCRIPTION
0		AT Tg of Casing
	178'	Perforations (Mills Knife) 182-500'
	265'	Static Water level 260 (1964)
	270'	Buildup on Casing
	300'	Heavy Buildup
398' to	399'	Split in Casing
	419'	Heavy Buildup on Casing
	462'	Tg of Soft Fill TD 501.5 1964

ADWR

Technician _____

CW-3

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

#3

RECEIVED
NOV 15 1982
DEPT. OF
WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE — FILE IN DUPLICATE

16 09

REGISTRATION FEE (CHECK ONE)	
EXEMPT WELL (NO CHARGE)	☐
NON-EXEMPT WELL — $10.00	☒

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 627483
FILE NO. D(18-13) 22 ddd A
FILED 3-23-82 (DATE) AT 9:00 AM (TIME)
INA
AMA Tucson

1. Name of Registrant:
COMMUNITY WATER COMPANY OF GREEN VALLEY
P.O. Box 1078, Green Valley, Arizona 85614
(Address) (City) (State) (Zip)

2. File and/or Control Number under previous groundwater law:
(D-18-13) - 22-1 (File Number)
35- SW (Control Number)

3. a. The well is located within the SE D ¼ SW B ¼ NE A-3 ¼, Section 22,
of Township ~~16~~ 18 N/S, Range 13 E/W, G & SRB & M, in the
County of Pima.

b. If in a subdivision: Name of subdivision Green Valley Acres,
Lot No. 23 Blk. 1 Address 1501 S. LA Canada, Green Valley, AZ 85614.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial)
Domestic.

5. If for irrigation use, number of acres irrigated from well ---.

6. Owner of land on which well is located. If same as Item 1, check this box ☒

(Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well 501.5 feet
b. Diameter of casing 16- 250 inches
c. Depth of casing 501.5 feet
d. Type of casing domestic steel line pipe.
e. Maximum pump capacity 500 gallons per minute.
f. Depth to water 260 feet below land surface.
g. Date well completed March 16, 1964 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☒. See attached CC & N Map.
____¼ ____¼ ____¼, Section ____ Township ____ Range ____
____¼ ____¼ ____¼, Section ____ Township ____ Range ____
Attach additional sheet if necessary.

MICROFILMED

9. DATE 3-22-82 SIGNATURE OF REGISTRANT [signature]

CW-3

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	24	Sandy topsoil and boulders
24	61	Soft conglomerate
61	105	Dry sand and gravel
105	116	Dry sand and boulders
116	180	Dry sand and gravel
180	181	Gravel and wate r
181	203	Sandy clay with streaks of gravel and water
203	299	Congomerate, possible water
299	331	Sticky brown clay
331	372	Hard conglomerate & clay streaks
372	378	Sand , gravel & water
378	390	Sticky brown clay
390	411	Hard conglomerate
411	429	Sandy clay
429	445	Cemented sand
445	450	Sandy clay
450	456	Clean gravel & water
456	474	Hard conglomerate
474	479	Soft conglomerate
479	500	Hard conglomerate

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller A. A. McDaniel Well & Machine Co.
Name

2838 Ruthrauff Rd. Tucson, Arizona
Address

Date March 16, 1964

RECEIVED MAR 19 1964 STATE LAND DEPT.

C1 x 01

APPENDIX D.6

WATER QUALITY ANALYSES

78306.4 MO-2007-1C

JUN 14 2007

TURNER
LABORATORIES INC.

June 12, 2007

Rick Zimmerman
Hydro Geo Chem, Inc.
51 W. Wetmore Rd.
Suite 101
Tucson, AZ 857051678
TEL: (520) 293-1500
FAX (520) 293-1550

RE: PDSI 78306.4 Order No.: 0705848

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 3 samples on 5/31/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Shari Bauman

Shari Bauman
Laboratory Director

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-780
Lab Order:	0705848	**Collection Date:**	5/29/2007 12:45:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705848-01A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	15	5.0		mg/L	1	5/31/2007 4:34:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-800
Lab Order:	0705848	**Collection Date:**	5/29/2007 1:35:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705848-02A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	16	5.0		mg/L	1	5/31/2007 4:52:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-820
Lab Order:	0705848	**Collection Date:**	5/29/2007 2:07:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705848-03A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	14	5.0		mg/L	1	5/31/2007 5:11:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

TURNER LABORATORIES INC.

Turner Laboratories W.O. #: 0705848

Received By: RD

Received Date/Time: 5/31/07 15:00

Delivered by: Client

1.	Shipping container/cooler in good condition?	☑ Yes	☐ No	☐ Not Present	
2.	Custody seals intact on sample bottles?	☐ Yes	☐ No	☑ Not Present	
3.	Chain of custody present?	☑ Yes	☐ No		
4.	COC signed when relinquished and received?	☑ Yes	☐ No		
5.	COC agrees with sample labels?	☑ Yes	☐ No		
6.	Samples in proper container/bottle?	☑ Yes	☐ No		
7.	Sample container intact?	☑ Yes	☐ No		
8.	Sufficient sample volume for requested tests?	☑ Yes	☐ No		
9.	Samples received within holding times?	☑ Yes	☐ No		
10.	VOA vials received with no headspace?	☐ Yes	☐ No	☑ No Vials	
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml	
		☑ Not Applicable		☐ Below 100ml	

12. Temperature upon receipt? -3°C

13. Number of sample containers received? 3

Additional Comments:

2445 NORTH COYOTE DRIVE ▪ SUITE #104 ▪ TUCSON, ARIZONA 85745 ▪ 520 882-5880 ▪ FAX # 520 882-9788

TURNER LABORATORIES INC
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 0705848 DATE _____ PAGE _____ OF _____

PROJECT NAME PDSI # 78306.4
CONTACT NAME Rick Zimmerman
COMPANY NAME HGC Inc.
ADDRESS 51 W. Wetmore Rd Tucson AZ
293-1500 PHONE _____ FAX _____
SAMPLER'S SIGNATURE

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	Base Neutrals ☐ Acids ☐ 625/8270	Volatile Organics 624/524.2/8260	TTHMS ☐ HAA5 ☐	Pesticides ☐ PCB's ☐ 8081 8082	Total Petroleum Hydrocarbons IR(8015A) ☐ 1664A ☐	Oil and Grease Grav. 1664A ☐	TCLP Analysis VOA ☐ Semi-VOA ☐ Pest./Herb. ☐	Metals TCLP ☐ Total ☐ Dissolved ☐ Priority Pollutants ☐	Cyanide Total ☐ Amen. ☐ WAD ☐	SDWA-INORGANICS PRIMARY ☐ SECONDARY ☐	Coliform MPN ☐ Colilert ☐	pH ☐ Cl2 ☐	COD ☐ TSS ☐ BOD ☐	Sulfate
MO-2007-1B-780	5/29/07	1245		GW	1														X
MO-2007-1B-800	5/29/07	1335		GW	1														X
MO-2007-1B-820	5/29/07	1407		GW	1														X

1. RELINQUISHED BY:
Signature
Mark Arneson
Printed Name
HGC Inc.
Firm
5/29/07 1735
Date/Time

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
_____ Standard (approx. 10 days)*
_____ Next Day _____ 2 Day _____ 5 Day*
_____ Fax Preliminary Results
Requested Report Date _____
* Working Days

REPORT REQUIREMENTS:
_____ I. Routine Report
_____ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
_____ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account _____ Y _____ N
P.O. # _____
Bill to: _____

SAMPLE RECEIPT:
Total Containers 3
Temperature -3°C
☐ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature
Mark Arneson
Printed Name
HGC Inc.
Firm
5/31/07 1503
Date/Time

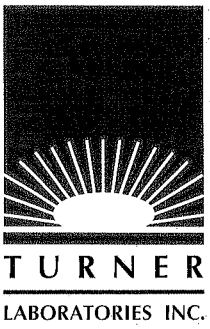
4. RECEIVED BY:
Signature
R. Daly
Printed Name
TURNER LABORATORIES, INC.
Firm
5/31/07 15:00
Date/Time

* LEGEND
ST = STORMWATER
SL = SOIL
SD = SOLID
SG = SLUDGE
WW = WASTEWATER
GW = GROUNDWATER
DW = DRINKING WATER

SPECIAL INSTRUCTIONS/COMMENTS:
Compliance Analysis: ☐ Yes ☐ No
ADEQ Forms: ☐ Yes ☐ No
Mail ADEQ Forms: ☐ Yes ☐ No

DISTRIBUTION: WHITE - return to originator PINK - retained by originator See back of pink copy for general terms and conditions/limits of liability.

78306.4 MO-2007-1C



JUN 14 2007

June 12, 2007

Rick Zimmerman
Hydro Geo Chem, Inc.
51 W. Wetmore Rd.
Suite 101
Tucson, AZ 857051678
TEL: (520) 293-1500
FAX (520) 293-1550

RE: PDSI 78306.4 Order No.: 0705728

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 10 samples on 5/25/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Shari Bauman

Shari Bauman
Laboratory Director

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-700
Lab Order:	0705728	**Collection Date:**	5/24/2007 3:18:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705728-01A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	6.6	5.0		mg/L	1	5/30/2007 2:14:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-500
Lab Order:	0705728	**Collection Date:**	5/24/2007 12:25:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705728-02A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	90	50		mg/L	10	5/29/2007

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-580
Lab Order:	0705728	**Collection Date:**	5/24/2007 1:58:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705728-03A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	52	50		mg/L	10	5/29/2007

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-620
Lab Order:	0705728	**Collection Date:**	5/24/2007 2:26:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705728-04A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	17	5.0		mg/L	1	5/30/2007 3:09:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-660
Lab Order:	0705728	**Collection Date:**	5/24/2007 2:52:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705728-05A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	8.3	5.0		mg/L	1	5/30/2007 3:27:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-460
Lab Order:	0705728	**Collection Date:**	5/24/2007 12:05:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705728-06A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	72	50		mg/L	10	5/29/2007

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-760
Lab Order:	0705728	**Collection Date:**	5/25/2007 11:15:00 AM
Project:	PDSI 78306.4		
Lab ID:	0705728-07A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	14	5.0		mg/L	1	5/30/2007 3:45:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-740
Lab Order:	0705728	**Collection Date:**	5/25/2007 4:40:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705728-08A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	14	5.0		mg/L	1	5/30/2007 4:04:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-540
Lab Order:	0705728	**Collection Date:**	5/24/2007 1:31:00 PM
Project:	PDSI 78306.4		
Lab ID:	0705728-09A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	73	25		mg/L	5	5/30/2007 4:22:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *12-Jun-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-1B-760-OG
Lab Order:	0705728	**Collection Date:**	5/25/2007 11:15:00 AM
Project:	PDSI 78306.4		
Lab ID:	0705728-10A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA 1664A-OIL & GREASE		**E1664A**				Analyst: **PSL**
Oil & Grease	ND	5.0		mg/L	1	6/4/2007 5:35:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

TURNER LABORATORIES INC.

Turner Laboratories W.O. #: 0705728

Received By: RD

Received Date/Time: 5/25/07

Delivered by: Client

1.	Shipping container/cooler in good condition?	☑ Yes	☐ No	☐ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	☐ No	☑ Not Present
3.	Chain of custody present?	☑ Yes	☐ No	
4.	COC signed when relinquished and received?	☑ Yes	☐ No	
5.	COC agrees with sample labels?	☑ Yes	☐ No	
6.	Samples in proper container/bottle?	☑ Yes	☐ No	
7.	Sample container intact?	☑ Yes	☐ No	
8.	Sufficient sample volume for requested tests?	☑ Yes	☐ No	
9.	Samples received within holding times?	☑ Yes	☐ No	
10.	VOA vials received with no headspace?	☐ Yes	☐ No	☑ No Vials
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml
		☑ Not Applicable		☐ Below 100ml
12.	Temperature upon receipt? -3°C			
13.	Number of sample containers received? 10			

Additional Comments:

2445 NORTH COYOTE DRIVE ▪ SUITE #104 ▪ TUCSON, ARIZONA 85745 ▪ 520 882-5880 ▪ FAX # 520 882-9788

TURNER LABORATORIES INC
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 0705728 DATE _____ PAGE _____ OF _____

PROJECT NAME PDSI # 78306.4
CONTACT NAME Rick Zimmerman
COMPANY NAME HydroGeoChem Inc.
ADDRESS 51 W. Wetmore Rd
293-1500 x131 PHONE _____ FAX _____
SAMPLER'S SIGNATURE [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	Sulfate
MO-2007-1B-700	5/24/07	1518		GW	1	X
MO-2007-1B-500	5/24/07	1220		GW	1	X
MO-2007-1B-580	5/24/07	1358		GW	1	X
MO-2007-1B-620	5/24/07	1426		GW	1	X
MO-2007-1B-660	5/24/07	1452		GW	1	X
MO-2007-1B-460	5/24/07	1705		GW	1	X
MO-2007-1B-760	5/25/07	1115		GW	1	X
MO-2007-1B-740	5/25/07	1640		GW	1	X
MO-2007-1B-540	5/24/07	1331		GW	1	X
MO-2007-1B-760-DUP	5/25/07	1115		GW	1	

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

- Base Neutrals ☐ Acids ☐ 625/8270
- Volatile Organics 624/524.2/8260 ☐ TTHMs ☐
- HAA5 ☐
- Pesticides ☐ PCB's ☐ 8081 8082
- Total Petroleum Hydrocarbons IR(801.5AZ) ☐ 1664A ☐
- Oil and Grease Grav. 1664A ~~X~~
- TCLP Analysis: VOA ☐ Semi-VOA ☐ Pest./Herb. ☐
- Metals: TCLP ☐ Dissolved ☐ Total ☐ Priority Pollutants ☐
- Cyanide: Total ☐ Amen. ☐ WAD ☐
- SDWA-INORGANICS PRIMARY ☐ SECONDARY ☐
- Coliform: MPN ☐ Colilert ☐
- pH ☐
- Cl_2 ☐
- COD ☐ TSS ☐ BOD ☐

1. RELINQUISHED BY:
Signature [signature]
Printed Name Mark Arneson
Firm HGC Inc.
Date/Time 5/25/07 13:49

2. RECEIVED BY:
Signature _____
Printed Name _____
Firm _____
Date/Time _____

TURNAROUND REQUIREMENTS:
X Standard (approx. 10 days)*
___ Next Day ___ 2 Day ___ 5 Day*
___ Fax Preliminary Results
Requested Report Date _____
* Working Days

REPORT REQUIREMENTS:
X I. Routine Report
___ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
___ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account ___ Y ___ N
P.O. # _____
Bill to: _____

SAMPLE RECEIPT:
Total Containers 10
Temperature -3°C
☐ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature _____
Printed Name _____
Firm _____
Date/Time _____

4. RECEIVED BY:
Signature [signature]
Printed Name R. Daly
Firm TURNER LABORATORIES, INC.
Date/Time 5/25/07 13:48

* LEGEND
ST = STORMWATER
SL = SOIL
SD = SOLID
SG = SLUDGE
WW = WASTEWATER
GW = GROUNDWATER
DW = DRINKING WATER

SPECIAL INSTRUCTIONS/COMMENTS:
Compliance Analysis: ☐ Yes ☐ No
ADEQ Forms: ☐ Yes ☐ No
Mail ADEQ Forms: ☐ Yes ☐ No

DISTRIBUTION: WHITE - return to originator PINK - retained by originator See back of pink copy for general terms and conditions/limits of liability.

7830644 MW-3C

TURNER
LABORATORIES INC.

May 10, 2007

Rick Zimmerman
Hydro Geo Chem, Inc.
51 W. Wetmore Rd.
Suite 101
Tucson, AZ 857051678
TEL: (520) 293-1500
FAX (520) 293-1550

RE: Groundwater PDSI 78300 Order No.: 0704810

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 9 samples on 4/30/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Shari Bauman

Shari Bauman
Laboratory Director

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-940
Lab Order:	0704810	**Collection Date:**	4/28/2007 2:21:00 PM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-01A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	41	10		mg/L	2	4/30/2007 5:32:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	170	20		mg/L	1	5/2/2007 3:00:00 PM

Qualifiers:

ND - Not Detected at or above the PQL

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

PQL - Practical Quantitation Limit

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-980
Lab Order:	0704810	**Collection Date:**	4/28/2007 5:29:00 PM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-02A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	39	10		mg/L	2	4/30/2007 5:50:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	200	20		mg/L	1	5/4/2007 10:45:00 AM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-DUP-1
Lab Order:	0704810	**Collection Date:**	4/28/2007 12:01:00 PM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-03A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	40	10		mg/L	2	4/30/2007 6:08:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	210	20		mg/L	1	5/3/2007 2:20:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-900
Lab Order:	0704810	**Collection Date:**	4/28/2007 11:16:00 AM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-04A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	38	10		mg/L	2	4/30/2007 6:26:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	200	20		mg/L	1	5/4/2007 10:45:00 AM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-740
Lab Order:	0704810	**Collection Date:**	4/26/2007 4:36:00 PM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-05A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	43	10		mg/L	2	4/30/2007 6:45:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	210	20		mg/L	1	5/2/2007 3:00:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-820
Lab Order:	0704810	**Collection Date:**	4/27/2007 2:55:00 PM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-06A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	34	10		mg/L	2	4/30/2007 7:03:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	190	20		mg/L	1	5/2/2007 3:00:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-780
Lab Order:	0704810	**Collection Date:**	4/27/2007 1:56:00 PM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-07A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	41	10		mg/L	2	4/30/2007 7:21:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	210	20		mg/L	1	5/3/2007 2:20:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-540
Lab Order:	0704810	**Collection Date:**	4/26/2007 9:25:00 AM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-08A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	44	10		mg/L	2	4/30/2007 7:39:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	200	20		mg/L	1	5/3/2007 10:40:00 AM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-860
Lab Order:	0704810	**Collection Date:**	4/27/2007 4:15:00 PM
Project:	Groundwater PDSI 78300		
Lab ID:	0704810-09A	**Matrix:**	DRINKING WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	31	25		mg/L	5	4/30/2007 7:58:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				Analyst: **PSL**
Total Dissolved Solids (Residue, Filterable)	170	20		mg/L	1	5/2/2007 3:00:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

TURNER LABORATORIES INC.

Turner Laboratories W.O. #: 0704910

Received By: TH

Received Date/Time: 4/30/07 11:00A

Delivered by: Mail

1.	Shipping container/cooler in good condition?	☒ Yes	☐ No	☐ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	☐ No	☒ Not Present
3.	Chain of custody present?	☒ Yes	☐ No	
4.	COC signed when relinquished and received?	☒ Yes	☐ No	
5.	COC agrees with sample labels?	☒ Yes	☐ No	
6.	Samples in proper container/bottle?	☒ Yes	☐ No	
7.	Sample container intact?	☒ Yes	☐ No	
8.	Sufficient sample volume for requested tests?	☒ Yes	☐ No	
9.	Samples received within holding times?	☒ Yes	☐ No	
10.	VOA vials received with no headspace?	☐ Yes	☐ No	☒ No Vials
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml
		☒ Not Applicable		☐ Below 100ml

12. Temperature upon receipt? -1

13. Number of sample containers received? 9

Additional Comments:

2445 NORTH COYOTE DRIVE ▪ SUITE #104 ▪ TUCSON, ARIZONA 85745 ▪ 520 882-5880 ▪ FAX # 520 882-9788

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 0704810 DATE 4/30/07 PAGE _____ OF _____

PROJECT NAME PDSI # 783000
CONTACT NAME Rick Zimmerman
COMPANY NAME Hydro Geo Chem Inc.
ADDRESS 51 W. Wetmore Rd.
Tucson, AZ PHONE 293-1500 FAX 293-1550
SAMPLER'S SIGNATURE

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	SO4	TDS
MO-2007-SC-3C-940	4/26/07	1421		GW	1	X	
MO-2007-SC-3C-940	4/24/07	1729		GW	1	X	
MO-2007-SC-3C-DUP-1	4/24/07	1201		GW	1	X	
MO-2007-SC-3C-900	4/26/07	1116		GW	1	X	
MO-2007-SC-3C-740	4/26/07	1636		GW	1	X	
MO-2007-SC-3C-820	4/27/07	1455		GW	1	X	
MO-2007-SC-3C-780	4/27/07	1356		GW	1	X	
MO-2007-SC-3C-540	4/26/07	0925		GW	1	X	
MO-2007-SC-3C-860	4/27/07	1615		GW	1	X	

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

Base Neutrals ☐ 625/8270 · Acids ☐ · Volatile Organics 624/524.2/8260 ☐ · TTHMS ☐ · HAA5 ☐ · Pesticides ☐ 8081 · PCB's ☐ 8082 · Total Petroleum Hydrocarbons IR(8015AZ) ☐ · Oil and Grease Grav. 1664A ☐ · 1664A ☐ · TCLP Analysis VOA ☐ · Semi-VOA ☐ · Pest/Herb. ☐ · Metals TCLP ☐ · Dissolved ☐ · Total ☐ · Priority Pollutants ☐ · Cyanide Total ☐ · Amen ☐ · WAD ☐ · SDWA/INORGANICS PRIMARY ☐ · SECONDARY ☐ · Coliform MPN ☐ · Colilert ☐ · pH ☐ · Cl ☐ · COD ☐ · TSS ☐ · BOD ☐

1. RELINQUISHED BY:
Signature
Mark Arneson
Printed Name
HydroGeoChem
Firm
4/30/07 1101
Date/Time

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
____ Standard (approx. 10 days)*
____ Next Day ____ 2 Day ____ 5 Day*
____ Fax Preliminary Results
Requested Report Date _____
* Working Days

REPORT REQUIREMENTS:
____ I. Routine Report
____ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
____ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account ____ Y ____ N
P.O. # _____
Bill to: _____

SAMPLE RECEIPT:
Total Containers 7
Temperature -1
☐ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

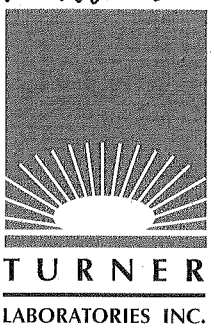
4. RECEIVED BY:
Signature
Printed Name
TURNER LABORATORIES, INC.
Firm
4/30/07 1106
Date/Time

* LEGEND
ST = STORMWATER
SL = SOIL
SD = SOLID
SG = SLUDGE
WW = WASTEWATER
GW = GROUNDWATER
DW = DRINKING WATER

SPECIAL INSTRUCTIONS/COMMENTS:
Compliance Analysis: ☐ Yes ☐ No
ADEQ Forms: ☐ Yes ☐ No
Mail ADEQ Forms: ☐ Yes ☐ No

DISTRIBUTION: WHITE - return to originator PINK - retained by originator See back of pink copy for general terms and conditions/limits of liability.

783064 MD-3C



May 10, 2007

Rick Zimmerman
Hydro Geo Chem, Inc.
51 W. Wetmore Rd.
Suite 101
Tucson, AZ 857051678
TEL: (520) 293-1500
FAX (520) 293-1550

RE: PDSI-MO # 783000 Order No.: 0704800

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 9 samples on 4/27/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Shari Bauman

Shari Bauman
Laboratory Director

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT: Hydro Geo Chem, Inc.
Project: PDSI-MO # 783000
Lab Order: 0704800
Date Received: 4/27/2007

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date
0704800-01A	MO-2007-SC-3C-700		4/26/2007 3:50:00 PM
0704800-02A	MO-2007-SC-3C-520		4/25/2007 5:13:00 PM
0704800-03A	MO-2007-SC-3C-560		4/26/2007 9:43:00 AM
0704800-04A	MO-2007-SC-3C-490		4/25/2007 4:46:00 PM
0704800-05A	MO-2007-SC-3C-500		4/25/2007 4:59:00 PM
0704800-06A	MO-2007-SC-3C-470		4/25/2007 4:36:00 PM
0704800-07A	MO-2007-SC-3C-580		4/26/2007 10:00:00 AM
0704800-08A	MO-2007-SC-3C-620		4/26/2007 1:34:00 PM
0704800-09A	MO-2007-SC-3C-660		4/26/2007 2:12:00 PM

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-700
Lab Order:	0704800	**Collection Date:**	4/26/2007 3:50:00 PM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-01A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	41	10		mg/L	2	4/30/2007 1:34:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-520
Lab Order:	0704800	**Collection Date:**	4/25/2007 5:13:00 PM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-02A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	41	10		mg/L	2	4/30/2007 1:53:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-560
Lab Order:	0704800	**Collection Date:**	4/26/2007 9:43:00 AM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-03A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	41	10		mg/L	2	4/30/2007 2:11:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-490
Lab Order:	0704800	**Collection Date:**	4/25/2007 4:46:00 PM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-04A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	42	10		mg/L	2	4/30/2007 2:29:00 PM

Qualifiers:

ND - Not Detected at or above the PQL
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
PQL - Practical Quantitation Limit
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-500
Lab Order:	0704800	**Collection Date:**	4/25/2007 4:59:00 PM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-05A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	43	10		mg/L	2	4/30/2007 2:47:00 PM

Qualifiers:

ND - Not Detected at or above the PQL

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

PQL - Practical Quantitation Limit

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-470
Lab Order:	0704800	**Collection Date:**	4/25/2007 4:36:00 PM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-06A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	52	25		mg/L	5	5/1/2007 11:12:00 AM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-580
Lab Order:	0704800	**Collection Date:**	4/26/2007 10:00:00 AM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-07A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	39	10		mg/L	2	4/30/2007 3:24:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-620
Lab Order:	0704800	**Collection Date:**	4/26/2007 1:34:00 PM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-08A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	38	10		mg/L	2	4/30/2007 3:42:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *10-May-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-SC-3C-660
Lab Order:	0704800	**Collection Date:**	4/26/2007 2:12:00 PM
Project:	PDSI-MO # 783000		
Lab ID:	0704800-09A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY	**E300**					Analyst: **JM**
Sulfate	14	10		mg/L	2	4/30/2007 4:00:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

TURNER LABORATORIES INC.

Turner Laboratories W.O. #: 0704800

Received By: RD

Received Date/Time: 4/27/07 11:44

Delivered by: Client

1.	Shipping container/cooler in good condition?	☑ Yes	☐ No	☐ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	☐ No	☑ Not Present
3.	Chain of custody present?	☑ Yes	☐ No	
4.	COC signed when relinquished and received?	☑ Yes	☐ No	
5.	COC agrees with sample labels?	☑ Yes	☐ No	
6.	Samples in proper container/bottle?	☑ Yes	☐ No	
7.	Sample container intact?	☑ Yes	☐ No	
8.	Sufficient sample volume for requested tests?	☑ Yes	☐ No	
9.	Samples received within holding times?	☑ Yes	☐ No	
10.	VOA vials received with no headspace?	☐ Yes	☐ No	☑ No Vials
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml
		☑ Not Applicable		☐ Below 100ml

12. Temperature upon receipt? -3°C

13. Number of sample containers received? 9

Additional Comments:

2445 NORTH COYOTE DRIVE ▪ SUITE #104 ▪ TUCSON, ARIZONA 85745 ▪ 520 882-5880 ▪ FAX # 520 882-9788

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 0704800 DATE 4/26/07 PAGE 1 OF 1

PROJECT NAME PDSI-MO # 783000
CONTACT NAME Rick Zimmerman
COMPANY NAME Hydro Geo Chem Inc.
ADDRESS 51 W. Wetmore Tucson AZ 85705 PHONE 293-1500 FAX 293-1550
SAMPLER'S SIGNATURE

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	Sulfide Only
MO-2007-SC-3C-700	4/26/07	1550		GW	1	X
MO-2007-SC-3C-520	4/25/07	1713		GW	1	X
MO-2007-SC-3C-560	4/26/07	0943		GW	1	X
MO-2007-SC-3C-490	4/25/07	1646		GW	1	X
MO-2007-SC-3C-500	4/25/07	1659		GW	1	X
MO-2007-SC-3C-470	4/25/07	1636		GW	1	X
MO-2007-SC-3C-580	4/26/07	1000		GW	1	X
MO-2007-SC-3C-620	4/26/07	1334		GW	1	X
MO-2007-SC-3C-660	4/26/07	1412		GW	1	X

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

Base Neutrals ☐ 625/8270 · Acids ☐ · Volatile Organics 624/524.2/8260 ☐ · TTHMS ☐ · HAA5 ☐ · Pesticides ☐ 8081 · PCB's ☐ 8082 · Total Petroleum Hydrocarbons IR(8015AZ) ☐ · Oil and Grease Grav. 1664A ☐ · 1664A ☐ · TCLP Analysis VOA ☐ · Semi-VOA ☐ · Pest/Herb. ☐ · Metals TCLP ☐ · Dissolved ☐ · Total ☐ · Priority Pollutants ☐ · Cyanide Total ☐ · Amen. ☐ · WAD ☐ · SDWA-INORGANICS PRIMARY ☐ · SECONDARY ☐ · Coliform MPN ☐ · Colilert ☐ · pH ☐ · Cl2 ☐ · COD ☐ · TSS ☐ · BOD ☐

1. RELINQUISHED BY:
Signature
Mark Arneson
Printed Name
HGC Inc.
Firm
4/26/07
Date/Time

2. RECEIVED BY:
Signature
MARK O'BOYLE
Printed Name
Hydro Geo Chem Inc
Firm
4/27/07 11:42
Date/Time

TURNAROUND REQUIREMENTS:
____ Standard (approx. 10 days)*
____ Next Day X 3 Day ____ 5 Day*
____ Fax Preliminary Results
Requested Report Date ____
* Working Days

REPORT REQUIREMENTS:
____ I. Routine Report
____ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
____ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account ____ Y ____ N
P.O. # 78306.4
Bill to: ____

SAMPLE RECEIPT:
Total Containers 9
Temperature -3°C
☐ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature
MARK O'BOYLE
Printed Name
Hydro Geo Chem Inc
Firm
4/27/07 11:43
Date/Time

4. RECEIVED BY:
Signature
R. Daly
Printed Name
TURNER LABORATORIES, INC.
Firm
4/27/07 11:44
Date/Time

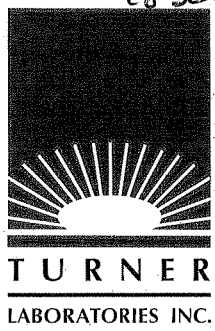
* LEGEND
ST = STORMWATER
SL = SOIL
SD = SOLID
SG = SLUDGE
WW = WASTEWATER
GW = GROUNDWATER
DW = DRINKING WATER

SPECIAL INSTRUCTIONS/COMMENTS:
Compliance Analysis: ☐ Yes ☐ No
ADEQ Forms: ☐ Yes ☐ No
Mail ADEQ Forms: ☐ Yes ☐ No

Quote 579

DISTRIBUTION: WHITE - return to originator PINK - retained by originator See back of pink copy for general terms and conditions/limits of liability.

MW-2007-4R 783064



July 11, 2007

Rick Zimmerman
Hydro Geo Chem, Inc.
51 W. Wetmore Rd.
Suite 101
Tucson, AZ 857051678
TEL: (520) 293-1500
FAX (520) 293-1550

RE: PDSI 78306.4 Order No.: 0706671

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 5 samples on 6/22/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Shari Bauman

Shari Bauman
Laboratory Director

CC:

Turner Laboratories, Inc.

Date: *11-Jul-07*

CLIENT: Hydro Geo Chem, Inc.
Project: PDSI 78306.4
Lab Order: 0706671
Date Received: 6/22/2007

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date
0706671-01A	MO-2007-4C-380		6/19/2007 4:56:00 PM
0706671-02A	MO-2007-4C-420		6/20/2007 8:55:00 AM
0706671-03A	MO-2007-4C-460		6/19/2007 10:00:00 AM
0706671-04A	MO-2007-4C-500		6/20/2007 10:29:00 AM
0706671-05A	MO-2007-46-540		6/20/2007 11:00:00 AM

Turner Laboratories, Inc.

Date: *11-Jul-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-4C-380
Lab Order:	0706671	**Collection Date:**	6/19/2007 4:56:00 PM
Project:	PDSI 78306.4		
Lab ID:	0706671-01A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	110	50		mg/L	10	6/25/2007 3:16:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quanititation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *11-Jul-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-4C-420
Lab Order:	0706671	**Collection Date:**	6/20/2007 8:55:00 AM
Project:	PDSI 78306.4		
Lab ID:	0706671-02A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	670	250		mg/L	50	6/25/2007 3:34:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quanititation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *11-Jul-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-4C-460
Lab Order:	0706671	**Collection Date:**	6/19/2007 10:00:00 AM
Project:	PDSI 78306.4		
Lab ID:	0706671-03A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	240	100		mg/L	20	6/25/2007 3:53:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quanititation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *11-Jul-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-4C-500
Lab Order:	0706671	**Collection Date:**	6/20/2007 10:29:00 AM
Project:	PDSI 78306.4		
Lab ID:	0706671-04A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **PSL**
Sulfate	39	10		mg/L	2	6/23/2007 6:43:00 AM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quanititation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *11-Jul-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-46-540
Lab Order:	0706671	**Collection Date:**	6/20/2007 11:00:00 AM
Project:	PDSI 78306.4		
Lab ID:	0706671-05A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	100	50		mg/L	10	6/25/2007 4:11:00 PM

Qualifiers:

ND - Not Detected at or above the PQL
J - Analyte detected below quanititation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
PQL - Practical Quantitation Limit
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

TURNER LABORATORIES INC.

Turner Laboratories W.O. #: 0706671

Received By: NH

Received Date/Time: 6/22/07 12:11

Delivered by: Client

1.	Shipping container/cooler in good condition?	☑ Yes	☐ No	☐ Not Present	
2.	Custody seals intact on sample bottles?	☐ Yes	☐ No	☑ Not Present	
3.	Chain of custody present?	☑ Yes	☐ No		
4.	COC signed when relinquished and received?	☑ Yes	☐ No		
5.	COC agrees with sample labels?	☑ Yes	☐ No		
6.	Samples in proper container/bottle?	☑ Yes	☐ No		
7.	Sample container intact?	☑ Yes	☐ No		
8.	Sufficient sample volume for requested tests?	☑ Yes	☐ No		
9.	Samples received within holding times?	☑ Yes	☐ No		
10.	VOA vials received with no headspace?	☐ Yes	☐ No	☑ No Vials	
11.	Bacti bottles received with appropriate headspace?	☐ Yes		☐ Above 100ml	
		☑ Not Applicable		☐ Below 100ml	

12. Temperature upon receipt? 0°C

13. Number of sample containers received? 5

Additional Comments:

2445 NORTH COYOTE DRIVE ▪ SUITE #104 ▪ TUCSON, ARIZONA 85745 ▪ 520 882-5880 ▪ FAX # 520 882-9788

TURNER LABORATORIES INC
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
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CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 0706671 DATE _____ PAGE _____ OF _____

PROJECT NAME PDSI # 78306.4
CONTACT NAME Rick Zimmerman
COMPANY NAME Hydro Geo Chem Inc.
ADDRESS 51 W. Wetmore Rd Tucson AZ 85705 PHONE 293-1500 FAX 293-1550
SAMPLER'S SIGNATURE _____

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	Sulfate
MO-2007-4C-380	6/19/07	1656		GW	1	X
MO-2007-4C-420	6/20/07	0855		GW	1	X
MO-2007-4C-460	6/19/07	1000		GW	1	X
MO-2007-4C-500	6/20/07	1029		GW	1	X
MO-2007-4C-540	6/20/07	1100		GW	1	X

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

Base Neutrals ☐ 625/8270 · Acids ☐ · Volatile Organics ☐ 624/524.2/8260 · TTHMS ☐ · HAA5 ☐ · Pesticides ☐ 8081 · PCB's ☐ 8082 · Total Petroleum Hydrocarbons IR(8015AZ) ☐ · Oil and Grease ☐ Grav. 1664A · 1664A ☐ · TCLP Analysis VOA ☐ · Semi-VOA ☐ · Pest./Herb. ☐ · Metals TCLP ☐ · Total ☐ · Dissolved ☐ · Priority Pollutants ☐ · Cyanide Total ☐ · Amen. ☐ · WAD ☐ · SDWA-INORGANICS PRIMARY ☐ · SECONDARY ☐ · Coliform MPN ☐ · Colilert ☐ · pH ☐ · Cl2 ☐ · COD ☐ · TSS ☐ · BOD ☐

1. RELINQUISHED BY:
Signature
Mark Arneson
Printed Name
HGC Inc. C
Firm
6/22/07 1211
Date/Time

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
_____ Standard (approx. 10 days)*
_____ Next Day X 2 Day _____ 5 Day*
_____ Fax Preliminary Results
Requested Report Date _____
* Working Days

REPORT REQUIREMENTS:
_____ I. Routine Report
_____ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
_____ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account _____ Y _____ N
P.O. # _____
Bill to: _____

SAMPLE RECEIPT:
Total Containers 5
Temperature 0°C
☒ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

4. RECEIVED BY:
Signature
Don Hurst
Printed Name
TURNER LABORATORIES, INC.
Firm
6/22/07 12:11
Date/Time

* LEGEND
ST = STORMWATER
SL = SOIL
SD = SOLID
SG = SLUDGE
WW = WASTEWATER
GW = GROUNDWATER
DW = DRINKING WATER

SPECIAL INSTRUCTIONS/COMMENTS:
Compliance Analysis: ☐ Yes ☐ No
ADEQ Forms: ☐ Yes ☐ No
Mail ADEQ Forms: ☐ Yes ☐ No

Rush Results

DISTRIBUTION: WHITE - return to originator PINK - retained by originator See back of pink copy for general terms and conditions/limits of liability.

78306.4 MO-2007-SC

TURNER
LABORATORIES INC.

August 01, 2007

Rick Zimmerman
Hydro Geo Chem, Inc.
51 W. Wetmore Rd.
Suite 101
Tucson, AZ 857051678
TEL: (520) 293-1500
FAX (520) 293-1550

RE: PDSI 783000 Order No.: 0707652

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 7 samples on 7/20/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Maryne Turner for Shari Bauman

Shari Bauman
Laboratory Director

CC:

Turner Laboratories, Inc.

Date: *01-Aug-07*

CLIENT: Hydro Geo Chem, Inc.
Project: PDSI 783000
Lab Order: 0707652
Date Received: 7/20/2007

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date
0707652-01A	MO-2007 5C-320		7/17/2007 11:00:00 AM
0707652-02A	MO-2007 5C-340		7/17/2007 11:15:00 AM
0707652-03A	MO-2007 5C-360		7/17/2007 1:04:00 PM
0707652-04A	MO-2007 5C-380		7/17/2007 1:19:00 PM
0707652-05A	MO-2007 5C-400		7/17/2007 1:26:00 PM
0707652-06A	MO-2007 5C-420		7/17/2007 3:28:00 PM
0707652-07A	MO-2007 5C-440		7/17/2007 3:58:00 PM

Turner Laboratories, Inc.

Date: *01-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007 5C-320
Lab Order:	0707652	**Collection Date:**	7/17/2007 11:00:00 AM
Project:	PDSI 783000		
Lab ID:	0707652-01A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	98	25		mg/L	5	7/20/2007 5:37:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quanititation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *01-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007 5C-340
Lab Order:	0707652	**Collection Date:**	7/17/2007 11:15:00 AM
Project:	PDSI 783000		
Lab ID:	0707652-02A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	80	25		mg/L	5	7/20/2007 8:22:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quanititation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *01-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007 5C-360
Lab Order:	0707652	**Collection Date:**	7/17/2007 1:04:00 PM
Project:	PDSI 783000		
Lab ID:	0707652-03A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	86	25		mg/L	5	7/20/2007 8:40:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quanititation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *01-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007 5C-380
Lab Order:	0707652	**Collection Date:**	7/17/2007 1:19:00 PM
Project:	PDSI 783000		
Lab ID:	0707652-04A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	82	25		mg/L	5	7/20/2007 8:58:00 PM

Qualifiers:

- ND - Not Detected at or above the PQL
- J - Analyte detected below quanititation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- PQL - Practical Quantitation Limit
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

Turner Laboratories, Inc.

Date: *01-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007 5C-400
Lab Order:	0707652	**Collection Date:**	7/17/2007 1:26:00 PM
Project:	PDSI 783000		
Lab ID:	0707652-05A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	68	25		mg/L	5	7/20/2007 9:16:00 PM

Qualifiers:

ND - Not Detected at or above the PQL
J - Analyte detected below quanititation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
PQL - Practical Quantitation Limit
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

Turner Laboratories, Inc.

Date: *01-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007 5C-420
Lab Order:	0707652	**Collection Date:**	7/17/2007 3:28:00 PM
Project:	PDSI 783000		
Lab ID:	0707652-06A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	58	25		mg/L	5	7/20/2007 9:35:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quanititation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *01-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007 5C-440
Lab Order:	0707652	**Collection Date:**	7/17/2007 3:58:00 PM
Project:	PDSI 783000		
Lab ID:	0707652-07A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	99	25		mg/L	5	7/20/2007 9:53:00 PM

Qualifiers:

ND - Not Detected at or above the PQL

J - Analyte detected below quanititation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

PQL - Practical Quantitation Limit

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

TURNER LABORATORIES, INC.

SAMPLE CONTROL RECEIPT CHECKLIST

TURNER LABORATORIES INC.

Turner Laboratories W.O. #: 0707652

Received By: RD

Received Date/Time: 7/20/07 14:45

Delivered by: Client

1.	Shipping container/cooler in good condition?	☑ Yes	☐ No	☐ Not Present
2.	Custody seals intact on sample bottles?	☐ Yes	☐ No	☑ Not Present
3.	Chain of custody present?	☑ Yes	☐ No	
4.	COC signed when relinquished and received?	☑ Yes	☐ No	
5.	COC agrees with sample labels?	☑ Yes	☐ No	
6.	Samples in proper container/bottle?	☑ Yes	☐ No	
7.	Sample container intact?	☑ Yes	☐ No	
8.	Sufficient sample volume for requested tests?	☑ Yes	☐ No	
9.	Samples received within holding times?	☑ Yes	☐ No	
10.	VOA vials received with no headspace?	☐ Yes	☐ No	☑ No Vials
11.	Bacti bottles received with appropriate headspace?	☐ Yes	☐ Above 100ml	
		☑ Not Applicable	☐ Below 100ml	

12. Temperature upon receipt? -3°C

13. Number of sample containers received? 7

Additional Comments:

45 NORTH COYOTE DRIVE ▪ SUITE #104 ▪ TUCSON, ARIZONA 85745 ▪ 520 882-5880 ▪ FAX # 520 882-9788

TURNER LABORATORIES INC
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 0707652 DATE 7/18/07 PAGE 1 OF 1

PROJECT NAME PDSI # 783000
CONTACT NAME Rick Zimmerman
COMPANY NAME Hydro Geo Chem Inc
ADDRESS 51 W. Wetmore Rd
Tucson AZ 85705 PHONE 293 1500 FAX 293 1550
SAMPLER'S SIGNATURE

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	SO4
MO-2007-SC-330	7/12/07	1100		GW	1	X
MO-2007-SC-340	7/12/07	1115		GW	1	X
MO-2007-SC-360	7/12/07	1304		GW	1	X
MO-2007-SC-390	7/12/07	1319		GW	1	X
MO-2007-SC-400	7/12/07	1326		GW	1	X
MO-2007-SC-420	7/12/07	1528		GW	1	X
MO-2007-SC-440	7/12/07	1558		GW	1	X

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

Base Neutrals ☐ Acids ☐ 625/8270
Volatile Organics 624/524.2/8260
TTHMS ☐ HAA5 ☐
Pesticides ☐ PCB's ☐ 8081 8082
Total Petroleum Hydrocarbons IR(8015AZ) ☐ 1664A ☐
Oil and Grease Grav. 1664A ☐
TCLP Analysis VOA ☐ Semi-VOA ☐ Pest./Herb. ☐
Metals TCLP ☐ Total ☐ Dissolved ☐ Priority Pollutants ☐
Cyanide Total ☐ Amen. ☐ WAD ☐
SDWA-INORGANICS PRIMARY ☐ SECONDARY ☐
Coliform MPN ☐ Colilert ☐
pH ☐ Cl ☐ COD ☐ TSS ☐ BOD ☐

1. RELINQUISHED BY:
Signature
Warren Thompson
Printed Name
HGC
Firm
7/18/07 14:30
Date/Time

2. RECEIVED BY:
Signature
Mark Arneson
Printed Name
HGC
Firm
7/18/07
Date/Time

TURNAROUND REQUIREMENTS:
X RD Standard (approx. 10 days)*
X Next Day ____ 2 Day ____ 5 Day*
____ Fax Preliminary Results
Requested Report Date ____
* Working Days

REPORT REQUIREMENTS:
X I. Routine Report
____ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
____ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account ____ Y ____ N
P.O. #
Bill to:

SAMPLE RECEIPT:
Total Containers 7
Temperature -3°C
☐ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

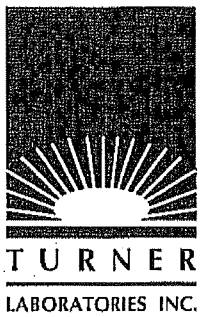
4. RECEIVED BY:
R. Daly
Signature
R. Daly
Printed Name
TURNER LABORATORIES, INC.
Firm
7/20/07 14:45
Date/Time

* LEGEND
ST = STORMWATER
SL = SOIL
SD = SOLID
SG = SLUDGE
WW = WASTEWATER
GW = GROUNDWATER
DW = DRINKING WATER

SPECIAL INSTRUCTIONS/COMMENTS:
Compliance Analysis: ☐ Yes ☐ No
ADEQ Forms: ☐ Yes ☐ No
Mail ADEQ Forms: ☐ Yes ☐ No
Rush Results

DISTRIBUTION: WHITE - return to originator PINK - retained by originator See back of pink copy for general terms and conditions/limits of liability.

MO-2007-6 B



August 28, 2007

Rick Zimmerman
Hydro Geo Chem, Inc.
51 W. Wetmore Rd.
Suite 101
Tucson, AZ 857051678
TEL: (520) 293-1500
FAX (520) 293-1550

RE: PDSI #78306.4 Order No.: 0708746

Dear Rick Zimmerman,

Turner Laboratories, Inc. received 3 samples on 8/17/2007 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Shari Bauman

Shari Bauman
Laboratory Director

CC:

Turner Laboratories, Inc.

Date: *28-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-6B-320
Lab Order:	0708746	**Collection Date:**	8/15/2007 2:57:00 PM
Project:	PDSI #78306.4		
Lab ID:	0708746-01A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		E300				Analyst: **JM**
Sulfate	69	25		mg/L	5	8/20/2007 5:43:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *28-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-6B-340
Lab Order:	0708746	**Collection Date:**	8/15/2007 3:08:00 PM
Project:	PDSI #78306.4		
Lab ID:	0708746-02A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		E300				Analyst: JM
Sulfate	49	10		mg/L	2	8/20/2007 1:28:00 PM

Qualifiers:	ND - Not Detected at or above the PQL	PQL - Practical Quantitation Limit
	J - Analyte detected below quantitation limits	S - Spike Recovery outside accepted recovery limits
	B - Analyte detected in the associated Method Blank	R - RPD outside accepted recovery limits
	* - Value exceeds Maximum Contaminant Level	E - Value above quantitation range

Turner Laboratories, Inc.

Date: *28-Aug-07*

CLIENT:	Hydro Geo Chem, Inc.	**Client Sample ID:**	MO-2007-6B-360
Lab Order:	0708746	**Collection Date:**	8/15/2007 3:13:00 PM
Project:	PDSI #78306.4		
Lab ID:	0708746-03A	**Matrix:**	GROUNDWATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **JM**
Sulfate	36	10		mg/L	2	8/20/2007 1:46:00 PM

Qualifiers:

ND - Not Detected at or above the PQL
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
PQL - Practical Quantitation Limit
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
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www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 07087460 DATE _____ PAGE _____ OF _____

PROJECT NAME PDSI # 783064
CONTACT NAME Rick Zimmerman
COMPANY NAME Hydro GeoChem Inc.
ADDRESS 51 W. Wetmore Rd
Tucson AZ 85705 PHONE 293-1500 FAX 293-1550
SAMPLER'S SIGNATURE _____

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	Base Neutrals ☐ 625/8270	Acids ☐	Volatile Organics 624/524.2/8260	TTHMS ☐	HAA5 ☐	Pesticides ☐ 8081	PCB's ☐ 8082	Total Petroleum Hydrocarbons IR(8015A2) ☐	Oil and Grease Grav. 1664A ☐	1664A ☐	VOA ☐	TCLP Analysis SemiVOA ☐	Pest./Herb. ☐	TCLP ☐	Metals Total ☐	Dissolved ☐	Priority Pollutants ☐	Total ☐	Cyanide Amen. ☐	WAD ☐	SDWA/INORGANICS PRIMARY ☐	SECONDARY ☐	MPN ☐	Coliform	pH ☐	Collion ☐	Cl, ☐	COD ☐	TSS ☐	BOD ☐	Sulfate
MO-2007-GB-320	8/15/07	1457																															X	
MO-2007-GB-340	8/15/07	1508																															X	
MO-2007-GB-360	8/15/07	1513																															X	
~~MO-2007-3~~	~~8/16/07~~	1430												X																				

1. RELINQUISHED BY:
Signature
Mark Atkinson
Printed Name
HGC Inc.
Firm
8/17/07 1542
Date/Time

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
____ Standard (approx. 10 days)*
____ Next Day ____ 2 Day ____ 5 Day*
____ Fax Preliminary Results
Requested Report Date _____
* Working Days

REPORT REQUIREMENTS:
____ I. Routine Report
____ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
____ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account ____ Y ____ N
P.O. # _____
Bill to: _____

SAMPLE RECEIPT:
Total Containers 3
Temperature 12°C
☐ Wet Ice ☐ Blue Ice

3. RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

4. RECEIVED BY:
Signature
Brian Bauman
Printed Name
TURNER LABORATORIES, INC.
Firm
8/17/07 1542
Date/Time

* LEGEND
ST = STORMWATER
SL = SOIL
SD = SOLID
SG = SLUDGE
WW = WASTEWATER
GW = GROUNDWATER
DW = DRINKING WATER

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Mail ADEQ Forms: ☐ Yes ☐ No

Rush Results

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