FREEPORT-McMoRan COPPER & GOLD

Sierrita Operations
Environment, Land & Water Department
6200 West Duval Mine Road
PO Box 527
Green Valley, Arizona 85622-0527

September 3, 2009

Via Certified Mail # 7008 2810 0000 0983 3443
Return Receipt Requested

Ms. Cynthia S. Campbell
Arizona Department of Environmental Quality
Water Quality Compliance Section
1100 West Washington Street
Phoenix, Arizona 85007-2935

Re: Monitor Well MO-2009-1 Installation Report

Dear Ms. Campbell:

Attached please find three (3) hard copies and one (1) disc of the *Monitor Well MO-2009-1 Installation Report* prepared by Hydro Geo Chem for Freeport-McMoRan Sierrita Inc (Sierrita). This monitor well was installed by Sierrita in response to Arizona Department of Environmental Quality letter dated April 24, 2008. The purpose of this well is to evaluate the eastern extent of the sulfate plume in the vicinity of well MO-2007-5B and to serve as a sentinel well for water supply wells in this area.

Please do not hesitate to contact Mr. Ned Hall at (520) 229-6470 or myself at (520) 393-4435

Sincerely,

Martha G. Mottley
Chief Environmental Engineer
Freeport-McMoRan Sierrita Inc.

MGM:ms
Attachment
20090903_001

xc: Henry Darwin, Arizona Department of Environmental Quality
John Broderick, Sierrita
Chad Fretz, Sierrita
Ned Hall, Freeport-McMoRan Copper & Gold Inc.
Stuart Brown, Bridgewater Group, Inc.
Jim Norris, Hydro Geo Chem, Inc.

MONITOR WELL INSTALLATION REPORT
MO-2009-1

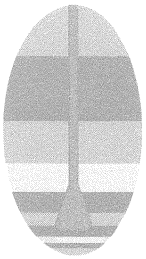
Prepared for:

FREEPORT-MCMORAN SIERRITA INC.
6200 West Duval Mine Road
Green Valley, Arizona 85614

Prepared by:

HYDRO GEO CHEM, INC.
51 West Wetmore Road, Suite 101
Tucson, Arizona 85705-1678
(520) 293-1500

August 28, 2009



HYDRO GEO CHEM, INC.

Environmental Science & Technology

MONITOR WELL INSTALLATION REPORT
MO-2009-1

Prepared for:

FREEPORT-MCMORAN SIERRITA INC.
6200 West Duval Mine Road
Green Valley, Arizona 85614

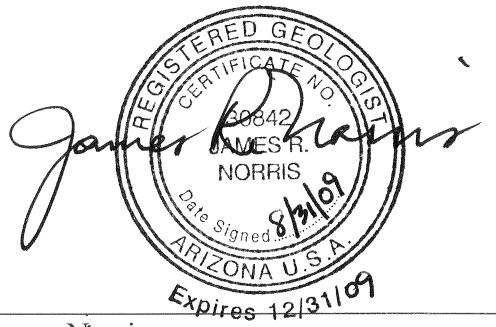
Prepared by:

HYDRO GEO CHEM, INC.
51 West Wetmore Road, Suite 101
Tucson, Arizona 85705-1678
(520) 293-1500

Prepared by:

Warren Thompson
Project Geologist

Reviewed and Approved by:



James Norris
Arizona Registered Geologist No. 30842

August 28, 2009

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FIGURES

APPENDICES

1. INTRODUCTION

Monitoring well MO-2009-1 was installed to monitor a plume of sulfate-bearing groundwater detected down gradient of the Freeport-McMoran Sierrita Inc. (Sierrita) Tailing Impoundment (STI) south of Tucson, Arizona. A regional site location map is provided in Figure 1. The well was installed in accordance with the requirements of Mitigation Order on Consent Docket No. P-50-06 between the Arizona Department of Environmental Quality (ADEQ) and Sierrita. All work involved with the construction, development, and completion of monitoring well MO-2009-1 was done is accordance with the field work plan (FWP): Technical Specifications for Drilling, Construction and Development of Monitoring Well MO-2009-1 for Mitigation Order on Consent Docket Number P-50-06 (Hydro Geo Chem Inc. [HGC], 2009a). Drilling, well construction, well development, and pump installation were performed by Yellow Jacket Drilling Services LLC (YJD) under contract with Sierrita.

1.1 Objectives

In 2007, HGC supervised the construction of 13 monitoring wells to estimate the lateral extent of a sulfate plume in the aquifer as stipulated in the Mitigation Order (HGC, 2009b). Well installation and subsequent water sampling revealed that the sulfate concentration in samples from monitor well MO-2007-5B exceeded 250 milligrams per liter (mg/L). ADEQ requested that MO-2009-1 be installed to evaluate the eastern extent of the plume in the vicinity of MO-2007-5B. Monitor well MO-2009-1 was installed between MO-2007-5B and a public

drinking water supply well CWC-10 to determine the extent of the plume and to act as a sentinel well for CW-10. Well locations are shown on Figures 1 and 2.

Well CW-10 is screened from 500 to 1,110 feet below ground surface. The top and bottom of the CW-10 well screen are at approximately 2,368 feet above mean sea level (ft amsl) and 1,758 ft amsl, respectively. Well MO-2009-1 was designed with a screened interval between 1,880 ft amsl and 2,240 ft amsl so that it would monitor a similar depth range as CW-10. The MO-2009-1 screened interval also spans the approximate depth range of the sulfate plume at MO-2007-5B to the northwest (Figure 2).

2. MONITOR WELL INSTALLATION

Monitor well MO-2009-1 was installed in accordance with the FWP (HGC, 2009a). Preparation for well installation included obtaining a Right-of-Way permit from Pima County to drill in the public right-of-way, a De Minimus General Permit from the ADEQ to allow for well development water to be discharged into a natural wash adjacent to the drill site, a Blue Stake survey to check for utility conflicts at the drilling location, and filing a Notice of Intent to Drill, Deepen, or Modify a Monitor Well form with the Arizona Department of Water Resources (ADWR) prior to installation of the well (Appendix A). A well location map is presented in Figure 2. Table 1 is a well construction summary with construction details and work dates.

2.1 Well Drilling

Monitor well MO-2009-1 was drilled to a total depth of 1,057 feet below land surface (ft bls) and completed as a monitor well by YJD from March 9 to 31, 2009. The borehole was drilled with a nominal 10-inch diameter tricone bit using a mud circulation rotary drilling system. A certified mud engineer from Baroid Products Inc. was on site periodically to test the quality of the drilling mud and make corrections to the drilling fluid composition as needed. This was done to maximize downhole drilling progression rates by maintaining a mud consistency that was effective in removing drill cuttings from the boring, sealing off the formation to minimize mud circulation, loss, and stabilizing the boring wall. When the mud fell outside of its specifications due to the build up of formational silts and clays during drilling it was pumped into a 1,500 gallon mobile tank and transported to Sierrita for disposal and a new

batch was prepared. To insure that the boring was progressing down hole in a vertically plumb fashion, a Sure Shot® drift analyzer was used at 100-foot intervals to measure any variance out of plumb. Results from the drift analyzer showed that the borehole stayed within 3 degrees of plumb.

2.2 Lithologic Logging

Cuttings samples were collected at 10-foot intervals to characterize the grain size, texture and lithology of the subsurface material encountered in the borehole. A portion of each sample was placed in a re-sealable plastic bag and labeled as to depth and collection date for archival purposes. HGC classified the samples using American Society of Testing and Materials (ASTM) D-2488 in accordance with the FWP. The boring log for MO-2009-1 is presented in Appendix B. Figure 3 shows the generalized stratigraphy for MO-2009-1.

2.3 Well Completion

Well construction took place from April 7 to 14, 2009. The well was completed as a monitor well with 5-inch diameter, ASTM A53-B steel casing to a depth of 1,015 ft bls (Figure 3). The bottom 5 feet of the well was equipped with a sump to collect particulate matter drawn into the well during pumping. Factory slotted, low carbon steel well screen with 0.125-inch vertical openings was installed from 650 to 1,010 ft bls. The screened interval was constructed of 20-foot lengths of flush threaded screen. The blank casing was constructed of 20-foot lengths of butt welded casing. Centralizers were installed along the entire length of well casing on

40-foot centers. A filter pack of No. 8 Tacna gravel was emplaced in the annular space from the bottom of the hole to 10 feet above the top of the screen, followed by fine transition sand, and hydrated bentonite pellets. The remaining annular space was filled with a high solids-bentonite grout to within 20 feet of the land surface followed by Portland cement to ground surface. The wellhead was completed above land surface and protected with a 36-inch-long by 24-inch-wide by 20-inch-high, lockable steel vault (Tucson Box) mounted on a 60-inch by 36-inch concrete slab 6-inches thick (Figure 4).

3. WELL SURVEY

Sierrita retained AMEC Infrastructure, Inc., an Arizona-registered land surveyor, to provide elevations and horizontal coordinates. The survey was conducted in May 2009. The coordinates of MO-2009-1 are 3523369.438 meters north and 500534.089 meters east in the Universal Transverse Mercator, Zone 12 North, North American Datum (1983) system. The top of casing measuring point elevation is 2,890.78 feet above mean sea level.

4. WELL DEVELOPMENT

Well development was conducted to remove drilling mud, fine-grained sediment, and loose hole cake from the well and gravel pack to maximize well efficiency. The monitor well was developed by YJD. Preliminary development was done on April 13, 2009 by airlifting the well using a 350 pound per square, 900 standard cubic feet per minute air compressor connected to a 2 inch airline installed downhole to within 5 feet from the bottom of the well. Airlifting was used to remove the heavy drilling mud and sands from the well bore. Following airlifting, development was continued on April 16 and 17, 2009 by bailing, surging, and pumping. Water samples were collected during development and analyzed on site for: pH, electrical-conductivity, temperature, and turbidity. Results are shown on Table 2. Well development continued until the development water was clear and water quality parameters measured had stabilized. All highly turbid development water was placed in a 1,500 gallon portable water tank and hauled to Sierrita for disposal. Clean development water was discharged into the wash adjacent to the well site in accordance with a De Minimus discharge permit.

5. PUMP INSTALLATION AND WATER QUALTIY SAMPLING

On April 21, 2009, following well development, monitor well MO-2009-1 was equipped with a dedicated Grundfos®, Model 40S50-15 submersible pump powered by a 5 horsepower, single phase, 240 volt, alternating current motor capable of a pumping rate of 30 gallons per minute (gpm). The inlet to the pump was set at 320 ft bls. The groundwater discharge line connected to the pump is constructed from 1.25-inch diameter galvanized steel pipe. The top of the discharge line is equipped with a 1.25-inch galvanized Tee. Installed on one leg of the Tee is a 1.25-inch brass ball valve. The other leg of the Tee is equipped with a 0.75-inch hose bib. The pump motor is connected to a Grundfos® motor controller and overload relay panel enclosed in a National Electrical Manufacturers Association 3R rated electrical enclosure using 6 gauge, 3 wire submersible pump cable. Power is supplied to the pump through a 250 volt, 50 ampere, 3-wire, 2-pole plug. A 10 kilowatt (minimum) generator is required to operate the pump.

A 1-inch diameter, flush threaded, Schedule 40, PVC, sounding tube was installed to 290 ft bls. The bottom 30 feet of the tube is constructed of 0.02-inch slot screen equipped with a stainless steel bottom cap. The pump water discharge line, electrical line, and sounding tube all pass though a sanitary seal installed on top of the well. Surface completion details are provided in Figure 5.

A water quality sample was collected from MO-2009-1 after purging the well at 30 gpm for three hours (Table 2). No drawdown measurements were collected during purging.

6. INVESTIGATION-DERIVED WASTE DISPOSAL

Drill cuttings from the borehole were contained in a roll-off bin spotted near the drill site. The soil cuttings were removed from the site and transported to Sierrita for disposal. Spent drilling mud removed from the well during drilling and well development water were contained in a portable tank and disposed of on Sierrita property. Clean development water was discharged into the wash adjacent to the drill site as allowed under the De Minimus Permit.

7. CONCLUSIONS

Monitor well MO-2009-1 was successfully installed according to the Technical Specifications for Drilling, Construction, and Development of Monitoring Well MO-2009-1 for Mitigation Order on Consent Docket Number P-50-06 (HGC, 2009a).

MO-2009-1 was installed as a groundwater monitoring well near the southern end of the sulfate plume. On April 16, 2009 groundwater was measured at 214.30 feet below top of casing corresponding to an elevation of 2,676.48 ft amsl. Groundwater grab samples collected at the end of well purging on April 22, 2009 and analyzed in the field indicate that the water has the following approximate characteristics: pH of 7.3, electrical conductivity of 401 microsiemens, total dissolved solid of 199 parts per million, and a temperature of 31.5 degrees Celsius (Table 2). The groundwater sample collected by Sierrita on April 22, 2009 had a sulfate concentration of 62.1 milligrams per liter indicating that MO-2009-1 is not within the sulfate plume.

8. REFERENCES

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. Revised October 31, 2006.

HGC. 2009a. Technical Specifications for Drilling, Construction and Development of Monitoring Well MO-2009-1 for Mitigation Order on Consent Docket Number P-50-06. January 6, 2009.

HGC. 2009b. Revision 1, Aquifer Characterization Report, Task 5 of Aquifer Characterization Plan, Mitigation Order on Consent Docket Number P-50-06. January 30, 2009.

9. LIMITATIONS

This Well Installation Report was prepared by HGC. The opinions and recommendations presented in this report are based upon the scope of services and information obtained through the performance of the services, as agreed upon by HGC and the party for whom this report was originally prepared. Results of any investigations, tests, or findings presented in this report apply solely to conditions existing at the time HGC's investigative work was performed and are inherently based on and limited to the available data and the extent of the investigation activities. No representation, warranty, or guarantee, express or implied, is intended or given. HGC makes no representation as to the accuracy or completeness of any information provided by other parties not under contract to HGC to the extent that HGC relied upon that information. This report is expressly for the sole and exclusive use of the party for whom this report was originally prepared and for the particular purpose that it was intended. Reuse of this report, or any portion thereof, for other than its intended purpose, or if modified, or if used by third parties, shall be at the sole risk of the user.

TABLES

TABLE 1

HYDRO GEO CHEM, INC.

Well Construction Summary

Project Name	Freeport McMoRan, Sierrita	Boring No.	**MO-2009-1**
Drilling Company	Yellow Jacket Drilling Services LLC	Project No.	783000.16
ADWR Well No.	55-910458 Driller Jacob Lagana	Geologist	W. Thompson
Location	3523369.438 meters north and 500534.089 meters east in the Universal Transverse Mercator, Zone 12 North, North American Datum System (1983)		

DRILLING SUMMARY

Boring Depth	1057 ft. below land surface	Hole Diameter	Nominal 10 inch
Drill Rig	Versa-drill 2000	Bit Type	9 7/8 inch tricone

WELL CONSTRUCTION DATA

Type of Material	Depth Interval (Ft below land surface) From	To	Description
Casing	1' als	650'	5"diam. ASTM: A53-B Steel
Screen	650'	1010'	5"diam., 0.125 Slot, A53-B Steel
Sump	1010'	1015'	5"diam. ASTM: A53-B Steel
Filter Pack	639'	1057'	#8 Tacna Gravel
Transition Sand	635'	639'	#3 Feldspathic Silica Sand
Transition Sand	628'	635'	#60 Silica Sand
Coated Bentonite Pellets	614'	628'	Time Released
Bentonite Grout	20'	614'	20% Solids Bentonite Grout
Cement Grout	0'	20'	Portland Cement
Centralizer Locations	40'	1015'	40' Centers Along Entire Casing
Surface Completion	5' x 3' x 6" Cement Slab Equipped with Locking Steel Tucson Box		
Measuring Point	Land Surface		

CONSTRUCTION TIME LOG

	Start		Finish	
	Date	**Time**	**Date**	**Time**
Drilling	9-Mar-09	13:40	31-Mar-09	10:33
Casing	7-Apr-09	10:20	7-Mar-09	18:18
Filter Pack	8-Apr-09	8:00	8-Apr-09	16:34
Bentonite Pellets (coated)	8-Apr-09	17:00	8-Apr-09	17:35
Bentonite Grout, 20% Solids	9-Apr-09	7:40	9-Apr-09	11:44
Surface Completion	14-Apr-09	8:00	14-Apr-09	10:15

WELL DEVELOPMENT

Date & Time Started	4/16/2009 8:10	Date & Time Completed	4/17/2009 15:05
a = Cased Depth (ft)	1015	d = Casing Diameter (in.)	5
b = Water Depth (ft)	214.3	Date & Time Measured	4/16/2009 7:38
Well Volume(ft^3) = (a - b) * d^2 * 0.0408 =	816.7		
Method of Development	Airlift, Swab, Bail, and Pump (pre-installation of dedicated pump)		
Swabbed and Bailed for	180 minutes		
Pumped at 62 gpm for 680 minutes and 30 gpm for 209 minutes			
Gallons Purged	48430		

Remarks: Well Screen is Flush Threaded and Blank Casing is Butt Welded 20 ft Lengths.
Water Sample was Collected by Aaron Hilshorst of Sierrita on 4/22/09 for Sulfate Analysis.

TABLE 2
MO-2009-01 Water Quality Parameters
Measured During Well Development

Date	Time	pH	EC (µs)	TDS (ppm)	Temperature (°C)	Comments
4/16/2009	7:48					Water Level = 214.3' btoc
4/16/2009	8:10					Pump On, Flow Rate = 60 gpm
4/16/2009	8:12	8.16	1240	614	25.3	Very Turbid
4/16/2009	8:15					Water Level = 230' btoc
4/16/2009	8:20	8.01	707	353	29.6	
4/16/2009	8:21					Pump Down due to Blown Fuse
4/16/2009	8:55					Pump On, Fuse Replaced
4/16/2009	9:00	7.67	571	281	31.3	Very Turbid but Clearing
4/16/2009	9:10	7.57				
4/16/2009	9:18					Flow Rate = 65 gpm, Water Level = 231.5' btoc
4/16/2009	9:20	7.7	479	242	31.5	Turbid but Clearing Nicely
4/16/2009	9:37	7.53	442	225	31.7	
4/16/2009	9:57	7.53	438	224	31.6	
4/16/2009	10:00					Flow Rate = 62 gpm
4/16/2009	10:26	7.33	441	225	31.5	Water Level = 232.6' btoc
4/16/2009	11:05	7.33	440	220	31.5	NTU = 100 (estimated)
4/16/2009	11:10					Flow Rate = 62 gpm, Water Level = 233.3' btoc
4/16/2009	11:30	7.32	441	223	31.5	NTU = 60 (estimated)
4/16/2009	12:00	7.31	420	205	31.5	
4/16/2009	12:05					Water Level = 233.3' btoc
4/16/2009	12:30	7.32	420	204	31.5	Water Level = 233.4' btoc
4/16/2009	13:00	7.28	421	205	31.4	Water Level = 233.6' btoc
4/16/2009	13:30					Flow Rate = 62 gpm, Water Level = 233.7' btoc
4/16/2009	13:36	7.27	415	203	31.3	NTU = 50 (estimated)
4/16/2009	14:05	7.27	395	196	31.2	
4/16/2009	14:40	7.27	395	197	31.2	NTU = 30 (estimated)
4/16/2009	15:10	7.25	413	202	31.9	
4/16/2009	15:15					Flow Rate = 62 gpm, Water Level = 232.5' btoc
4/16/2009	15:43	7.25	398	199	31.7	NTU = 25 (estimated)
4/16/2009	16:15	7.25	401	202	31.7	
4/16/2009	16:47	7.25	399	199	31.7	Water Level = 229.5' btoc
4/16/2009	16:55					Flow Rate = 62 gpm
4/16/2009	17:00					Pump Off for PM
4/17/2009	6:45					Water Level = 215.5' btoc (pre start up)
4/17/2009	7:00					Pump On
4/17/2009	7:10	7.18	410	200	18.3	Water is Slightly Hazy, NTU = 20 (estimated)
4/17/2009	7:40	7.29	432	218	25.4	Flow Rate = 61 gpm, Water Level = 226.3' btoc
4/17/2009	8:10	7.31	416	210	30.5	
4/17/2009	8:15					Flow Rate = 62 gpm, Water Level = 228.4' btoc
4/17/2009	8:30	7.31	407	199	31.2	
4/17/2009	8:43	7.3	401	201	31.4	Water is Slightly Hazy, NTU = 20 (estimated)
4/17/2009	8:45					Flow Rate = 61 gpm, Water Level = 229.6' btoc
4/17/2009	9:25	7.29	400	199	31.5	Water Level = 230.1' btoc
4/17/2009	9:30					Pump Off
4/22/2009	11:00					Newly Installed Dedicated Pump On, Q = 30 gpm
4/22/2009	14:10	7.38	401	199	31.5	Sample collected by Aaron Hilshorst of Sierrita for Sulfate analysis.
4/22/2009	15:05					Water is Clear, Pump Off, Development is Complete

Notes:

EC = electrical conductivity

µ s = micro siemens

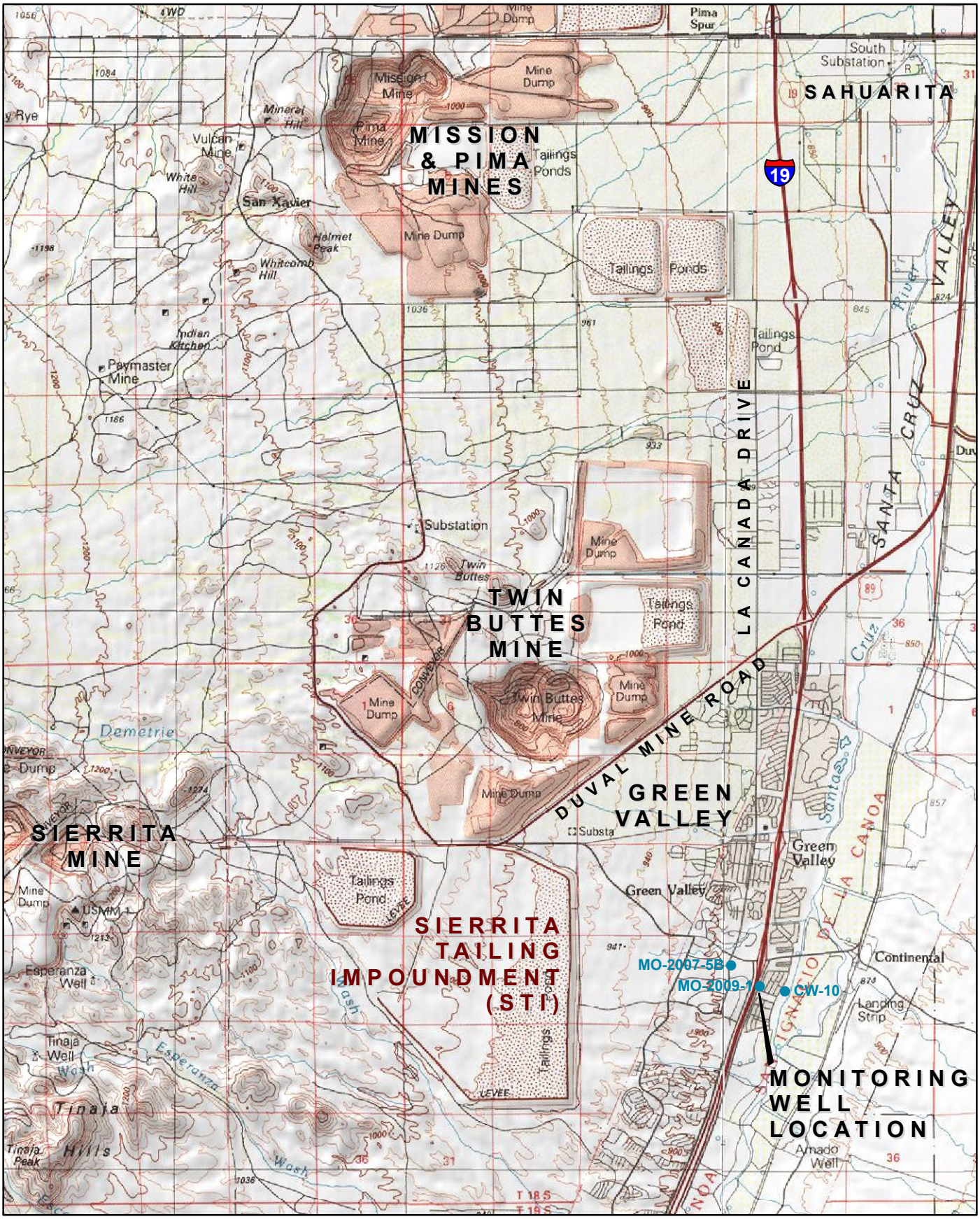
ppm = parts per million

^{o} C = degrees Celsius

NTU = nephelometric turbidity unit

btoc = below top of casing

FIGURES



0 4,000 8,000 Feet

PROJECTION:
UTM Zone 12N NAD83

N

HYDRO GEO CHEM, INC.

REGIONAL SITE LOCATION MAP

Approved	Date	Author	Date	File Name	Figure
WAT	08/25/09	AMC	08/25/09	783016006G	1

Legend

- Well Location and ID

0 250 500 Feet

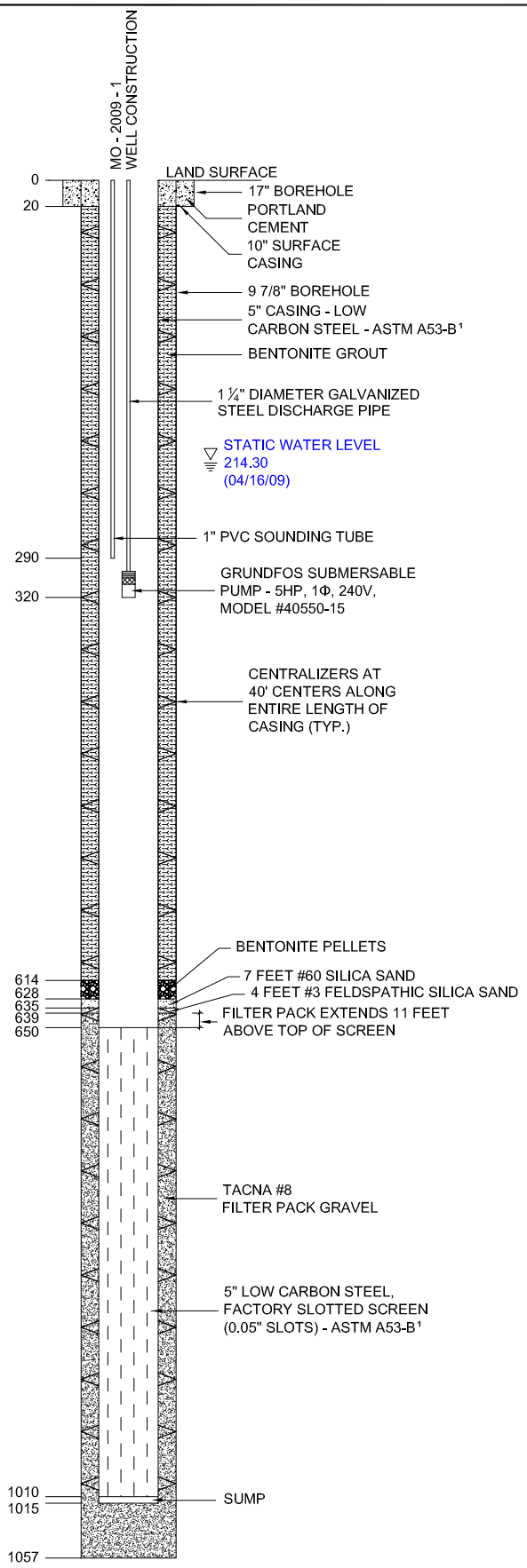
PROJECTION:
UTM Zone 12N NAD83

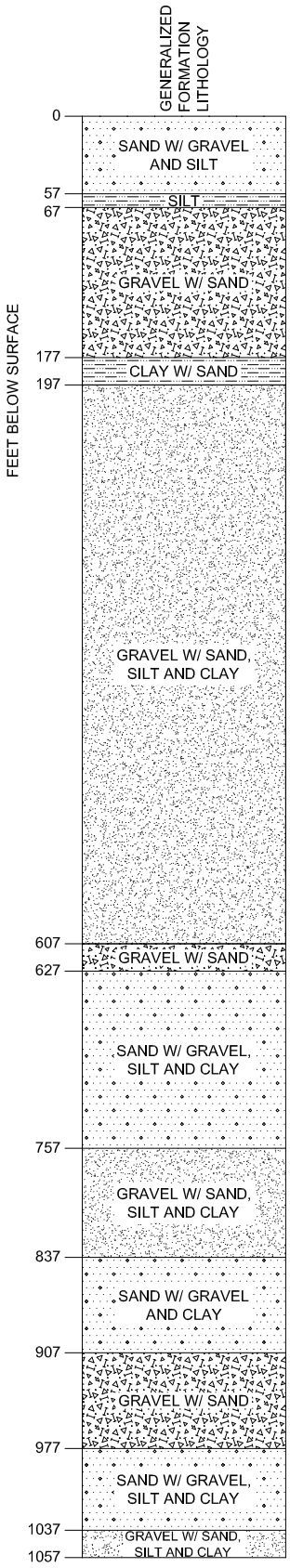
N

HYDRO GEO CHEM, INC.

MO-2009-1 LOCATION MAP

Approved	Date	Author	Date	File Name	Figure
JRN	08/25/09	AMC	08/25/09	783016007G	2



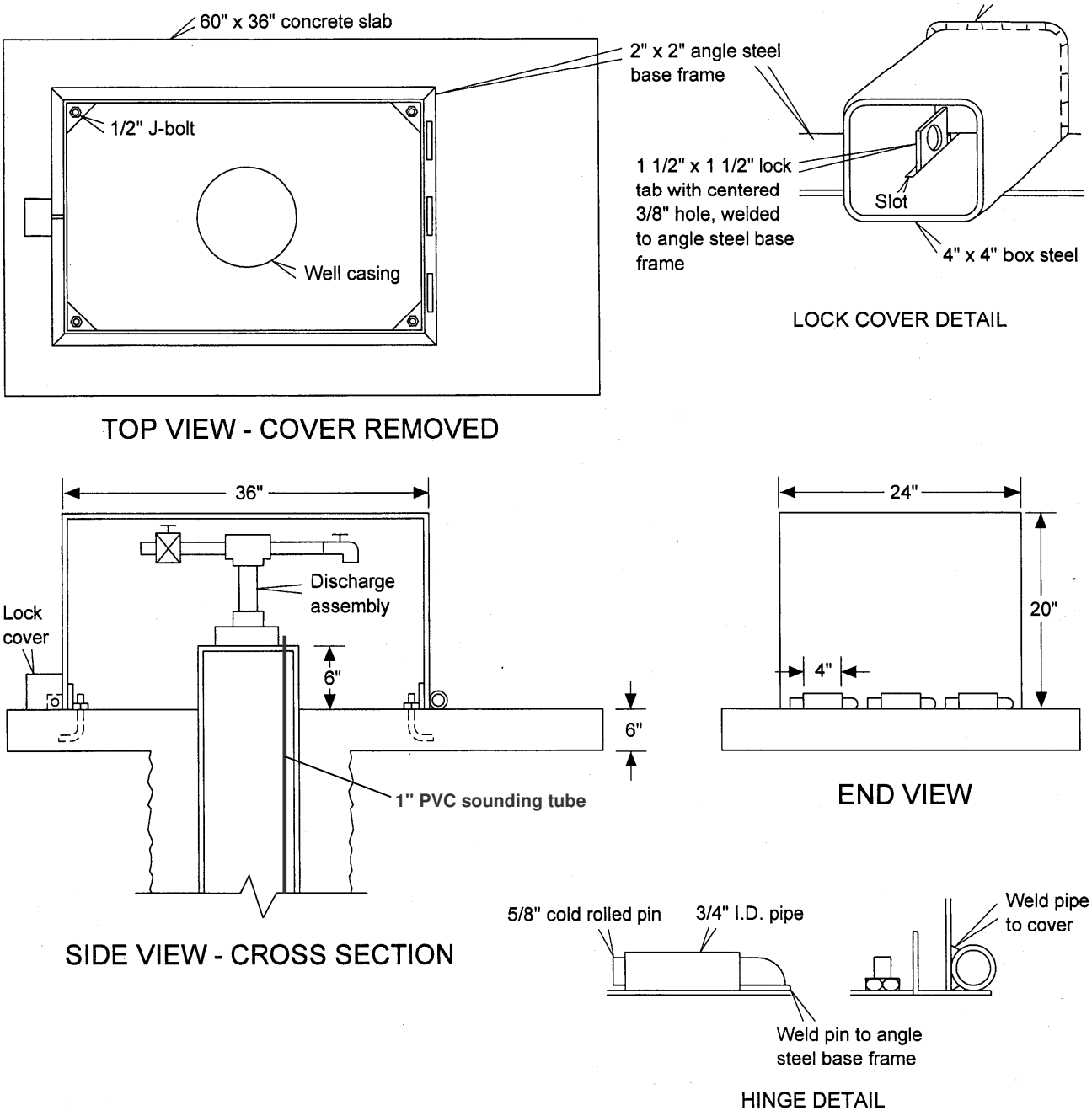


[1] - ASTM A53-B HAS A WALL THICKNESS OF 0.258" ±1%

HYDRO GEO CHEM, INC.

WELL CONSTRUCTION DIAGRAM AND STRATIGRAPHY FOR WELL MO-2009-1 (55-910458)

Approved	Date	Author	Date	File Name	Figure
WAT	08/28/09	AMC	08/28/09	78316003A	3



NOTES:

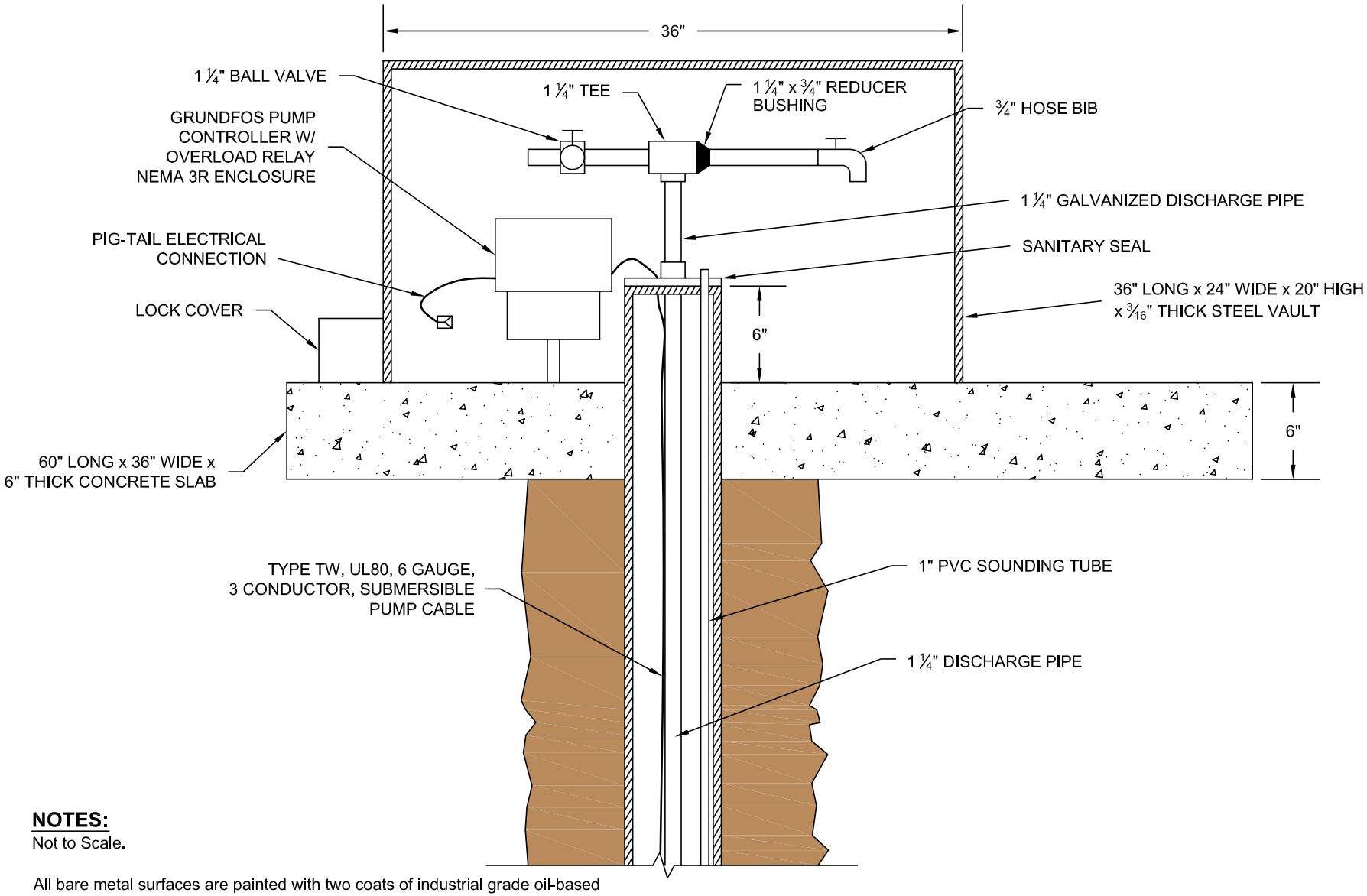
Not to scale.

All steel is at least 3/16" thick, unless otherwise specified.
All bare metal surfaces are painted with two coats of industrial grade oil base primer.

HYDRO GEO CHEM, INC.

MO-2009-1
WELLHEAD SURFACE COMPLETION SCHEMATIC

Approved	Date	Author	Date	File Name	Figure
MWK	6/16/09	WAT	6/16/09	Fig 4	4



NOTES:

Not to Scale.

All bare metal surfaces are painted with two coats of industrial grade oil-based primer, and finished with oil-based Desert Tan color.

Well is equipped with a 5HP, Single Phase, 240 Volt Grundfos Pump, Model #40550-15.

Power is supplied to the pump through a 250 Volt, 50 Amp, 3 Wire, 2 Pole Plug.

A 10KW (min.) Generator is required to operate pump.

HYDRO GEO CHEM, INC.

WELLHEAD SURFACE COMPLETION DETAILS

Approved	Date	Author	Date	File Name	Figure
WAT	08/25/09	AMC	08/25/09	78316004A	5

APPENDIX A

PIMA COUNTY RIGHT-OF-WAY PERMIT, ADEQ DE MINIMUS PERMIT, NOTICE OF INTENT TO DRILL FORM, AND ADWR ISSUED DRILLING CARD

PIMA COUNTY DEPARTMENT OF TRANSPORTATION
1313 S MISSION ROAD TUCSON, AZ 85713
201 N. STONE AVENUE, 4TH FLOOR TUCSON, AZ 85701

RENEWAL
PERMIT TO USE COUNTY RIGHT-OF-WAY
PERMIT NO. P08RW02315

NO PAVEMENT CUTS ON NEW PAVEMENT (SEE CONDITION#6)

THE UNDERSIGNED MAKES APPLICATION FOR A PERMIT TO ENTER UPON A PORTION OF THE PUBLIC HIGHWAY, STREET, ALLEY OR DRAINAGEWAY FOR CONSTRUCTION IMPROVEMENT PURPOSES.

TAX CODE:

LOCATION: S I19 NB FRONTAGE RD, S/O CONTINENTAL

INSPECTION DISTRICT:_____

NEAREST CROSS STREET (S): ABREGO DR

TOWNSHIP-RANGE-SECTION: 18S- 13E - 23

TYPE OF WORK: MISC: OTHER (SEE DESCRIP
DESCRIPTION OF PROPOSED WORK: ROW:/SIERRITA GROUNDWATER MONITORING WELL/ DRILING & INSTALLATION OF SIERRITA MONITOR WELL, COMPLETED WITH ABOVE GROUND VAULT

FOR AND IN CONSIDERATON OF THE GRANTING OF THE PERMIT, THE APPLICANT AGREES TO COMPLY WITH ALL CONDITIONS AS SPECIFIED ON THE BACK OF THIS PERMIT AND ANY AND ALL SPECIAL CONDITIONS THAT THE COUNTY ENGINEER MAY REQUIRE.

THE WORK SHALL BE COMPLETED WITHIN FORTY-FIVE (45) DAYS FOR UTILITY AND MISCELLANEOUS WORK AND ONE HUNDRED EIGHTY (180) DAYS FOR SUBDIVISION WORK, FROM THE DATE OF THIS PERMIT. PERMIT RENEWALS ARE TO BE OBTAINED AT THE PIMA COUNTY DEPARTMENT OF TRANSPORTATION PRIOR TO EXPIRATION DATE. AN ADDITIONAL PERMIT FEE WILL BE CHARGED. PIMA COUNTY ACCEPTS NO RESPONSIBILITY FOR THE ENGINEERING DESIGN FOR WORK COVERED BY THIS PERMIT. THE APPLICANT ACCEPTS ALL FINANCIAL AND/OR LEGAL LIABILITIES OR OBLIGATIONS WHICH MY RESULT FROM WORK PERFORMED UNDER THIS PERMIT.

THE CONTRACTOR, PERSON OR FIRM DOING THE WORK MUST CALL PIMA COUNTY INSPECTION AT 740-2650 AT LEAST FORTY-EIGHT (48) HOURS PRIOR TO STARTING WORK.

License Agreement with Pima County? {R_LICA_Y/N}

APPLICANT: NED HALL
HYDRO GEO CHEM
6200 W DUVAL MINE RD
GREEN VALLEY AZ
85622
520-648-8857

CONTRACTOR:

520-293-1500

APPLICANT'S SIGNATURE: _____ DATE: 12/19/2008
ZIMMERMAN RICK

SPECIAL CONDITIONS

1: CONTACT INSPECTOR AT 740-2650 PRIOR TO STARTING WORK.
2: WORK ON APPROVED TRAFFIC CONTROL PLANS ONLY.
3: COMPACTION TESTS MAY BE REQUIRED - CONTACT INSPECTOR AT 740-2650 FOR FURTHER INSTRUCTIONS.
4: COPY OF DENSITY TESTS TO BE MAILED TO PERMIT INSPECTOR.
5: ALL WORK WITHIN COUNTY RIGHT-OF-WAY SHALL CONFORM TO COUNTY/ CITY STANDARDS - 2003 EDITION.
6: ANY CULTURE, VEGETATION, MAILBOXES, DRIVES, PAVEMENT OR OTHER EXISTING IMPROVEMENTS WITHIN COUNTY RIGHT-OF-WAY THAT ARE DISTURBED DURING INSTALLATION OF THESE UTILITIES SHALL BE RESTORED.
7: SAMPLING STATION SHALL BE PLACED WELL AWAY FROM VEHICLE PATHS AND AS CLOSE TO FENCELINE OR EXISTING WATER FACILITIES AS POSSIBLE.

PIMA COUNTY ENGINEER

SEE CONDITION #13
PERMIT RENEWED: 01/27/2009
PERMIT EXPIRATION: 03/20/2009

BY: _____
MELISSA MARKS
PIMA COUNTY DEPARTMENT OF TRANSPORTATION

DEVELOPMENT SERVICES DEPARTMENT

201 N. STONE AVENUE, 1ST FLOOR TUCSON, AZ 85701
PHONE: 740-6508 FAX: 740-6862

RECEIPT

PIMA COUNTY, ARIZONA

****

ACTIVITY P08RW02315 **FEES RECEIPT# 09R00155**

SITE ADDRESS: S I19 NB FRONTAGE RD, S/O CONTINENTAL

DATE: 01/27/2009 **TIME: 03:02 PM**
COMP TYPE: ROW **TYPE:**
RMOT

DESCRIPTION OF WORK: ROW:/SIERRITA GROUNDWATER MONITORING WELL/ DRILING & INSTALLATION OF SIERRITA MONITOR WELL, COMPLETED WITH ABOVE GROUND VAULT

APPLICANT: NED HALL
Receipt By: MM

****

NOTATION:

PAID BY:

Type	Method	Description	Amount
Payment	Credit C	VCREDI XXXX-XXXX-XXXX-5438	25.00

TOTAL: 25.00

FEES PAID:

DESCRIPTION	CURRENT PMTS
RIGHT OF WAY RENEWAL	25.00

TOTAL: 25.00

ACCOUNT#:
TYPE OF ACCOUNT:
ENDING BALANCE: $ **Reference # (if applicable): 078352**

Legend

Proposed Well Location

0 75 150 Feet

PROJECTION:
UTM Zone 12 NAD83

N

HYDRO GEO CHEM, INC.

PROPOSED MO-2009-1 MONITOR WELL LOCATION

Approved	Date	Author	Date	File Name	Figure
MWK	12/11/08	RAM	12/11/08	7830301G	3

PRIVILEGED AND CONFIDENTIAL
Prepared at the Direction of Legal Counsel

NOTICE OF INTENT (NOI)
for De Minimus Discharges to Waters of the United States
Under AZPDES Permit No. AZG2004-001

• *SINGLE-SOURCE DISCHARGE* •

FOR COVERAGE, A COMPLETE AND ACCURATE NOI MUST BE FAXED TO (602) 771-4674 OR SUBMITTED TO:

Arizona Department of Environmental Quality
Surface Water Section / Permits Unit / De Minimus
1110 W. Washington, 5415A-1, Phoenix, AZ 85007

A. GENERAL INFORMATION

Is the facility located on/or will discharge to Indian Country Lands?
____ Yes ✔ No

I. APPLICANT (must be same as signer, page 3)

Name: John Broderick Phone: (520) 648-8500

Business/Agency: Freeport-McMoRan Sierrita Inc.

Mailing Address: Post Office Box 527

City: Green Valley State: | AZ | Zip Code: 85622-0527

The Applicant is the: ____ Owner ✔ Operator ____ Owner/Operator

II. CONTACT INFORMATION

Name of Contact Person: Ned Hall Phone: (520) 648-8857

Contact Person's Position/Title: Chief Environmental Engineer

Contact Person's Address (if different than above): _____

City: _____ State: |_____| Zip Code: _____

Fax (optional): (520) 648-8608 e-mail (optional) _____

III. FACILITY/DISCHARGE LOCATION (address if applicable, or driving directions from nearest municipality):

Approximately 0.4 mile south of the intersection of Continental Road and Interstate 19 northbound frontage road, Green Valley, Arizona.

IV. OTHER ENVIRONMENTAL PERMITS HELD OR APPLIED FOR BY THE APPLICANT (related to the discharge) (Reference Permit Numbers & Type: UST, RCRA, APP, etc.)

_____ _____

_____ _____

_____ _____

V. BEST MANAGEMENT PRACTICES PLAN (BMP). Check one of the following statements, if true. Permit authorization cannot occur until a BMP Plan has been developed according to the terms of the De Minimus General Permit, AZG2004-001.

✔ For discharges to ephemeral, canals without DWS, or effluent dependent waters, I have prepared and will implement prior to discharge, a BMP Plan in compliance with the terms of this General Permit. The BMP will address the pollutants identified in this NOI and will control erosion.

Printed Name of Contact for BMP plan: Ned Hall Phone: (520) 648-8857

____ For discharges to canals with DWS, perennial, intermittent, unique or impaired waters, a copy of the BMP prepared for the discharge(s) is attached.

B. DISCHARGE INFORMATION **Applicant Name: John Broderick**

Average Daily Flow Volume (GPD):
28,800

____ measured ✔ estimated

Flow Rate (GPM):
Average Flow Rate: 15
Maximum Flow Rate: 20

____ measured ✔ estimated

Estimated total volume of discharge (in gallons):
115,000

Frequency & Duration of Discharge (in days):
Semiannual; one day each

Estimated Date(s) of Discharge:
January 20, 2009
June 23, 2009
January 18, 2010
June 21, 2010

Source of Discharge (check one):

✔ Well installation, development, test pumping & purging.
____ Water supply system flushings, pressure releases, and overflows.
____ Maintenance of water supply wells, pipelines, tanks, etc.
____ Subterranean Dewatering.
____ Hydrostatic testing of new pipes, tanks, or vessels.
____ Hydrostatic testing of pipes, tanks, or vessels previously used to transport oil or gas. [Must include ADEQ approval under A.A.C. R18-9-301(C)(3) and analytical data with NOI.]
____ Hydrostatic testing of potable water system, reclaimed water transport systems, or sewer collection system components.
____ Disinfection of water supply pipelines, tanks, etc.
____ Other (describe) _____

If the discharge is from a well give the DWR well registration number:
Proposed Monitor Well MO-2009-1

Does the discharge contain reclaimed wastewater?
____ Yes ✔ No If yes, what class? _____

Location of Discharge:

Latitude: | 31 |° | 50 |' | 40 |" . | 85 | (Degrees, minutes, seconds)
Longitude: | 110 |° | 59 |' | 21 |" . | 95 | (Degrees, minutes, seconds)
County Pima Township 18S Range 13E Section 23

Description of discharge:* Include purpose of discharge, any treatment processes, any added chemicals, and describe the presence and concentration of constituents of concern (known or suspected) in discharge. Also describe any vessels or piping associated with discharge and distance from receiving water.

See Attached Sheet

RECEIVING WATER:

Discharge is to: ____ EFFLUENT DEPENDENT WATERS ✔ EPHEMERAL or CANALS without DWS WATERS

____ PERENNIAL, INTERMITTENT, or CANALS with DWS WATERS ____ UNIQUE or IMPAIRED WATERS

Name of receiving stream or waterbody: Unnamed ephemeral drainage to ephemeral Santa Cruz River

If ephemeral, the name of the closest perennial/intermittent waterbody: Santa Cruz at Roger Road WWTP

If ephemeral, distance to the closest perennial/intermittent waterbody: 30 miles

Is there potential for the discharge to enter a municipal storm sewer system (MS4), canal, or privately owned conveyance?

____ Yes ✔ No If yes, enter name of the MS4 or conveyance owner: _____

If yes, has a copy of the NOI been sent to the owner/operator of the conveyance? ____ Yes ____ No

MAP:

☛ Attach a topographic map detailing the path from the point of release to the point of discharge(s) to a water of the U.S. If the discharge is conveyed to the water of the U.S. through an MS4, canal, or other stormwater conveyance, the location of the entry to conveyance is to be shown.

CERTIFICATION (PER PART V.K.1 OF THE PERMIT):

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, I believe the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition I certify that the operator will comply with all terms and conditions stipulated in General Permit No. AZG2004-001 issued by the Director."

Printed Name of Applicant John Broderick Date: 2-2-09

Signature of Applicant ** _____ Title: VICE PRESIDENT/ General Manager

Business Name Freeport-McMoRan Sierrita Inc.

Business Address 6200 West Duval Mine Road, Green Valley, Arizona 85622-0527

rev. 12/19/05

* **You may attach additional text if desired to convey additional information/explanation relative to the discharge or this NOI.**

** **Please see signatory requirements, De Minimus General Permit (AZG2004-001), Part V.K.1.**

Additional Information
Notice of Intent for De Minimus Discharges to Waters of the United States
Freeport-McMoRan Sierrita Inc.
P.O. Box 527
Green Valley, AZ 85622-0527

Attn: Ned Hall (520) 648-8857

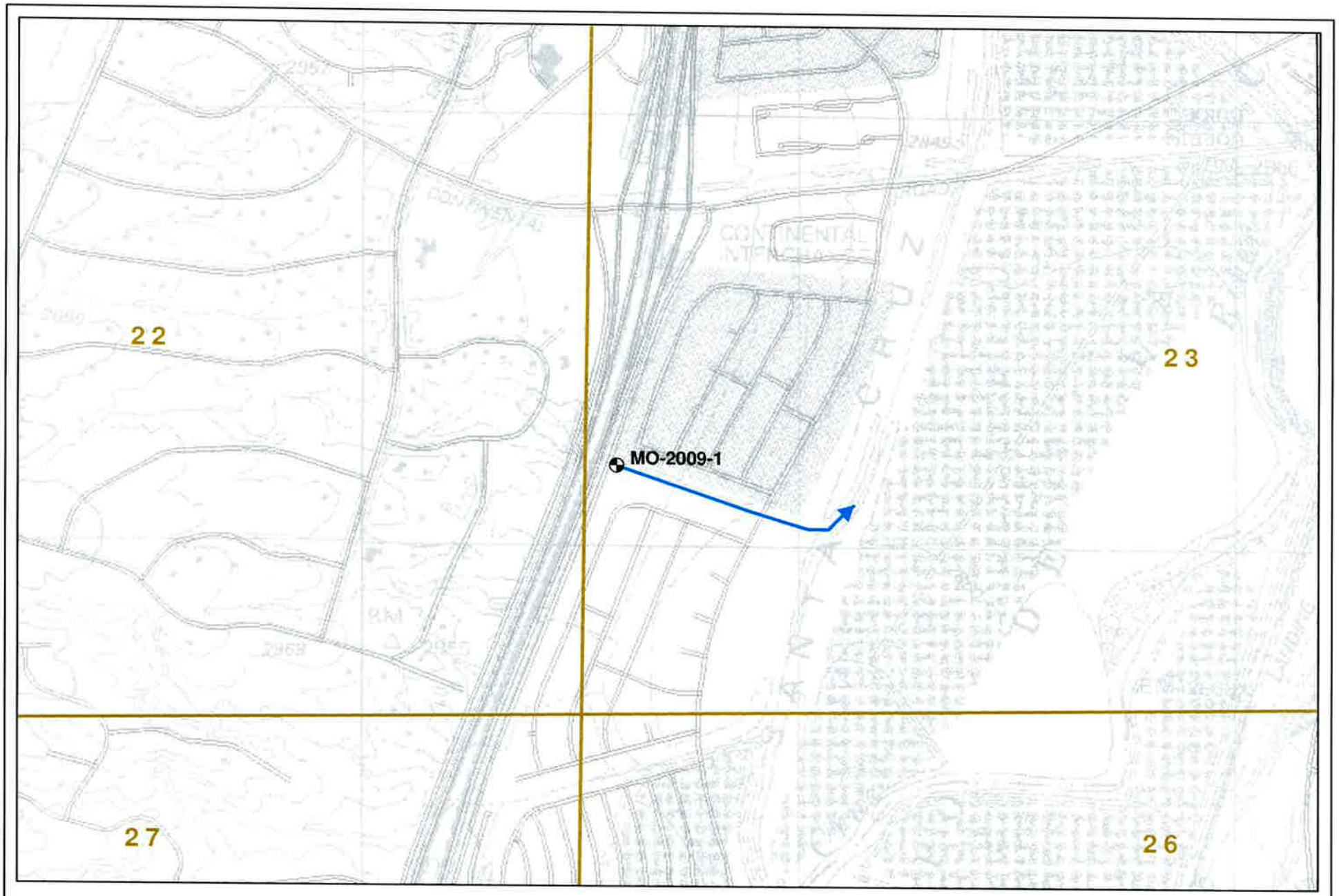
B. DESCRIPTION OF DISCHARGE

The purpose of the discharge activity is to install, develop and conduct hydraulic tests on a newly installed well and obtain semiannual groundwater samples. All activities are being conducted for investigation of sulfate in groundwater pursuant to Mitigation Order on Consent Docket No. P-50-06 between Arizona Department of Environmental Quality and Freeport-McMoRan Sierrita Inc. Discharge rates are not expected to exceed 20 gallons per minute and the longest expected discharge duration is 12 hours.

Discharged water will be discharged to an ephemeral tributary of the ephemeral Santa Cruz River. Erosion will be controlled by routing the discharge via a pipe to the bottom of an established drainage channel. The well discharge rate will be monitored throughout testing.

Proposed monitor well MO-2009-1 will be completed in a regional groundwater aquifer used for municipal drinking water supply. The discharge is not expected to contain constituents in amounts in excess of the Arizona Surface Water Quality Standards in Arizona Administrative Code Title 18, Chapter 11, Article 1.

Pursuant to Table A for discharges to ephemeral receiving waters (Appendix A of the De Minimus Permit), the flow rate and duration of each discharge event will be measured and a sample of the discharge for each event will be collected and submitted for laboratory analyses for sulfate. Turbidity will also be measured onsite on a daily basis.



PROJECTION:
UTM Zone 12N NAD83

0 500 1,000 Feet

N

HYDRO GEO CHEM, INC.

DISCHARGE WATER FLOW DIRECTION
MO-2009-1

Approved	Date	Author	Date	File Name	Figure
DRS	12/17/08	RAM	12/17/08	7830302G	1

PRIVILEGED AND CONFIDENTIAL
Prepared at the Direction of Legal Counsel

Best Management Practices Plan
Groundwater Discharges at Well MO-2009-1
Freeport-McMoRan Sierrita Inc.

Purpose: This Best Management Practices (BMP) Plan complies with the requirement of the De Minimus Discharges to Waters of the United States under Arizona Pollutant Discharge Elimination System (AZPDES). Discharges are anticipated from the referenced well for purging, sampling, and hydrologic testing purposes. The BMP plan will be retained on-site at the Freeport-McMoRan Sierrita Inc. environmental department offices. A copy of the BMP plan, and a copy of the De Minimus General AZPDES Permit, will be available at the discharge location during discharging events for use by all operators.

Setting of Discharge: The discharge will take place in Green Valley, Arizona which has a desert climate. Adjacent land uses include a roadway and residential property. Downstream, the flow pathway passes next to residential property. The area around the discharge drains easterly toward the Santa Cruz River. Discharge from the well will be conveyed via hoses or piping to the discharge location into an established drainage way into an ephemeral wash that is tributary to the ephemeral Santa Cruz River. Figure 1 shows the flow path for the discharge

Potential Pollutant Sources: The well will be completed in the regional groundwater aquifer that is used for municipal drinking water supply. Discharge from this well is not expected to contain constituents in excess of Arizona Surface Water Standards in Arizona Administrative Code Title 18, Chapter 11, Article 1. Pursuant to Table A for discharges to ephemeral receiving waters (Appendix A of the De Minimus Permit), the flow rate and duration will be measured and a sample of the discharge will be collected and submitted for laboratory analyses for sulfate. Turbidity will also be measured on a daily basis.

Containment/Reduction Measures: No containment/reduction measures are considered necessary for discharges from this well.

Erosion prevention: Discharge will be to an established watercourse. Appropriate measures will be taken to dissipate the energy of discharge water to prevent surface erosion. These measures may include directing discharge water to cemented channel slopes, large cobbles, bales of hay, or other energy dissipation structures. Discharge shall be monitored and shall be stopped if it appears that the discharge is causing erosion. Photographs of the wash and discharge area will be taken before and after the discharge event to document the site condition and any erosion resulting from the discharge.

Temporary Containment: Discharges involving well development will be contained in tanks and allowed to settle prior to discharge.

Possible Chemical Spills: No chemical spills are anticipated with respect to these discharges. Any chemical spills will be cleaned up, removed from the site, and disposed of in accordance with federal, state, and local regulations.

Responsible Personnel: The Field Supervisor for Hydro Geo Chem, Inc., contractor to Sierrita will be responsible for monitoring compliance with the provisions of the discharge permit. The Field Supervisor will:

- Inspect the conveyance system prior to beginning discharges from the well.
- Take photographs of the discharge area and wash downstream of the discharge area to document initial site conditions.
- Oversee the discharges to ensure that flows are metered, samples are collected at the prescribed intervals, and that erosion from the discharges is kept to a minimum.
- Take measures necessary to dissipate the energy of the discharges if flows result in unacceptable erosion.
- Document any chemical spills that take place during the discharge.
- Take photographs of the discharge area and wash downstream of the discharge area after the discharges are complete to document final site conditions.
- Prepare Notice of Termination and include De Minimus Discharge Monitoring Report (DDMR) forms, if any, once the permitted discharging activity ceases.

Documentation: The Field Supervisor will document field activities in a bound field log book and field data sheets prepared for velocity testing and groundwater sampling. All entries will be legible, in ink, dated, signed, and contain accurate information. The logbook, data sheets, and BMP plan will be onsite at all times during sampling operations. Field records will include:

- Date and time of testing.
- Name of person(s) conducting the test.
- Flow rate and duration.
- Visual observations.
- Sampling equipment or field screening techniques used.
- Name, model, range, and accuracy of equipment used.
- Sampling results.
- BMPs or treatment technologies used.
- Pre- and post-discharge photographs for discharges exceeding four days in duration or 0.25 million gallons in one day.

All field documentation, monitoring information, and laboratory analytical results will be maintained for at least three years from the expiration date of the permit or the filing date of the NOT, whichever is earlier.

Training: Site personnel will be briefed by the Field Supervisor on site prior to the inception of discharges covered under the permit. Training will include aspects of this BMP including: metering and recording of flows, sampling of the discharge, spill prevention and clean-up, and erosion control methods and monitoring.

Revision: This BMP plan will be revised if (1) there is a change in design, operation, maintenance, procedures, or other conditions that may cause a significant effect on the discharge pollutants to surface waters; (2) inspections indicate the BMP plan is ineffective in eliminating or significantly reducing pollutants in the discharges; or (3) there is a new operator who will implement any portion of the overall plan.

Signature:

I certify under penalty of law, that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition, I certify that the operator will comply with all terms and conditions stipulated in General Permit No. AZ2004-001 issued by the Director.

John Broderick
VICE PRESIDENT/General Manager
Freeport-McMoRan Sierrita Inc.

Hall, E. L. (Ned)

From: ENV_Scanner@fmi.com
Sent: Monday, February 02, 2009 4:39 PM
To: Hall, E. L. (Ned)
Subject: Job Done Notice(Send)

```
                  ****************************
                  *** Job Done Notice(Send) ***
                  ****************************

JOB NO.           2144
ST. TIME          02/02 18:35
PGS.              8
SEND DOCUMENT NAME

TX IMCOMPLETE     -----
TRANSACTION OK    916027714674
ERROR             -----
```

Arizona Department of Water Resources
Water Management Support Section
P.O. Box 458 • Phoenix, Arizona 85001-0458
(602) 771-8500 • (800) 352-8488
www.azwater.gov

Notice of Intent to Drill, Deepen, or Modify a *Monitor / Piezometer / Environmental* Well

FEE

- ❖ Review instructions prior to completing form in black or blue ink.
- ❖ You must include with your Notice:
- \$150 check or money order for the filing fee.
- Well construction diagram, labeling all specifications listed in Section 6.
- ❖ Authority for fee: A.R.S. § 45-596.

AMA / INA	B SB
RECEIVED DATE	WS
ISSUED DATE	WQAR CERCLA

FILE NUMBER

WELL REGISTRATION NUMBER
55 -

** PLEASE PRINT CLEARLY **

SECTION 1. REGISTRY INFORMATION

Well Type
CHECK ONE
- ☑ Monitor
- ☐ Piezometer
- ☐ Vadose Zone
- ☐ Air Sparging
- ☐ Soil Vapor Extraction
- ☐ Other (*please specify*):

Proposed Action
CHECK ONE
- ☑ Drill New Well
- ☐ Deepen
- ☐ Modify

If Deepening or Modifying:
WELL REGISTRATION NUMBER
55 -

Location of Well
WELL LOCATION ADDRESS (IF ANY)

TOWNSHIP (N/S)	RANGE (E/W)	SECTION	160 ACRE	40 ACRE	10 ACRE
18S	13E	23	SW ¼	NW ¼	SW ¼

COUNTY ASSESSOR'S PARCEL ID NUMBER
BOOK 304 MAP 24 PARCEL 7000

COUNTY WHERE WELL IS LOCATED
PIMA

SECTION 2. OWNER INFORMATION

Well Owner
FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL
Freeport-McMoRan Sierrita Inc.

MAILING ADDRESS
6200 West Duval Mine Road

CITY / STATE / ZIP CODE
Green Valley, Arizona 85614

CONTACT PERSON NAME AND TITLE
Ned Hall, Chief Environmental Engineer

TELEPHONE NUMBER: 520-648-8857
FAX: 520-648-8608

Landowner (if different from Well Owner)
FULL NAME OF COMPANY, GOVERNMENT AGENCY, OR INDIVIDUAL
Pima County

MAILING ADDRESS
1313 South Mission Road

CITY / STATE / ZIP CODE
Tucson, Arizona 85713

CONTACT PERSON NAME AND TITLE
Melissa Marks, Pima County Engineer

TELEPHONE NUMBER: 520-740-6508
FAX: 520-740-6862

SECTION 3. DRILLING AUTHORIZATION

Drilling Firm
NAME
Yellow jacket Drilling Services, LLC

DWR LICENSE NUMBER: 78
ROC LICENSE CATEGORY: A-04

TELEPHONE NUMBER: 602-453-3252
FAX: 602-453-3258

E-MAIL ADDRESS
paul@yjdrilling.com

Consultant (if applicable)
CONSULTING FIRM
Hydro Geo Chem, Inc.

CONTACT PERSON NAME
Mark Kuhn

TELEPHONE NUMBER: 520-293-1500 x141
FAX: 520-293-1550

E-MAIL ADDRESS
markk@hgcinc.com

SECTION 4.

Questions	Yes	No	Explanation:
1. Are all annular spaces between the casing(s) and the borehole for the placement of grout at least 2 inches?	✔		2-inch annular spaces are special standards required for wells located in and near groundwater contamination sites (such as CERCLA, WQARF, DOD, LUST).
2. Is the screened or perforated interval of casing greater than 100 feet in length?	✔		100-foot maximum screen intervals are a special standard for wells located in and near groundwater contamination sites (such as CERCLA, WQARF, DOD, LUST).
3. Are you requesting a variance to use thermoplastic casing in lieu of steel casing in the surface seal?		✔	The wells must be constructed in a vault as defined in A.A.C. R12-15-801(27).
4. Is there another well name or identification number associated with this well? (e.g., MW-1, PZ2, 06-04, etc.)	✔		IF YES, PLEASE STATE MO-2009-1
5. Have construction plans been coordinated with the Arizona Department of Environmental Quality?	✔		IF YES, PLEASE STATE AGENCY CONTACT & PHONE NUMBER Cynthia Campbell, 602-771-2209
6. For monitor wells, is dedicated pump equipment to be installed?	✔		IF YES, PLEASE STATE DESIGN PUMP CAPACITY 20 Gallons per Minute
7. Is this well a new well located in an Active Management Area **AND** intended to pump water for the purpose of remediating groundwater?		✔	IF YES, UNLESS THE WELL IS A REPLACEMENT WELL AND THE TOTAL NUMBER OF OPERABLE WELLS ON THE SITE IS NOT INCREASING, YOU MUST ALSO FILE A SUPPLEMENTAL FORM A.R.S. § 45-454(C) & (F). *(See instructions)*
8. Will the well registration number be stamped on the vault cover or on the upper part of the casing?	✔		IF NO, WHERE WILL THE REGISTRATION NUMBER BE PLACED?

Notice of Intent to Drill, Deepen, or Modify a *Monitor* / *Piezometer* / *Environmental* Well

WELL REGISTRATION NUMBER
55 -

SECTION 5. WELL CONSTRUCTION DETAILS

Drill Method

CHECK ONE

- ☐ Air Rotary
- ☐ Bored or Augered
- ☐ Cable Tool
- ☐ Dual Rotary
- ☑ Mud Rotary
- ☐ Reverse Circulation
- ☐ Driven
- ☐ Jetted
- ☐ Air Percussion / Odex Tubing
- ☐ Other (*please specify*):

DATE CONSTRUCTION TO BEGIN
March 2, 2009

Method of Well Development

CHECK ONE

- ☐ Airlift
- ☐ Bail
- ☑ Surge Block
- ☐ Surge Pump
- ☐ Other (*please specify*):

Method of Sealing at Reduction Points

CHECK ONE

- ☑ None
- ☐ Welded
- ☐ Swedged
- ☐ Packed
- ☐ Other (*please specify*):

Grout Emplacement Method

CHECK ONE

- ☐ Gravity
- ☐ Pressure Grout
- ☑ Tremie
- ☐ Other (*please specify*):

Surface or Conductor Casing

CHECK ONE

- ☐ Flush Mount in a vault
- ☑ Extend 1' above grade

SECTION 6. PROPOSED WELL CONSTRUCTION PLAN (attach additional page if needed)

Attach a well construction diagram labeling all specifications below.

Borehole

DEPTH FROM SURFACE FROM (feet)	DEPTH FROM SURFACE TO (feet)	BOREHOLE DIAMETER (inches)
0	1015	9.875

Casing

DEPTH FROM SURFACE FROM (feet)	DEPTH FROM SURFACE TO (feet)	OUTER DIAMETER (inches)	MATERIAL TYPE (T) STEEL	PVC	ABS	IF OTHER TYPE, DESCRIBE	PERFORATION TYPE (T) BLANK OR NONE	WIRE WRAP	SHUTTER SCREEN	MILLS KNIFE	SLOTTED	IF OTHER TYPE, DESCRIBE	SLOT SIZE IF ANY (inches)
+1	650	5.563	☑	☐	☐		☑	☐	☐	☐	☐		
650	1010	5.563	☑	☐	☐		☐	☐	☐	☐	☑		0.125
1010	1015	5.563	☑	☐	☐		☑	☐	☐	☐	☐		

Annular Material

DEPTH FROM SURFACE FROM (feet)	DEPTH FROM SURFACE TO (feet)	ANNULAR MATERIAL TYPE (T) NONE	CONCRETE	NEAT CEMENT OR CEMENT GROUT	CEMENT-BENTONITE GROUT	BENTONITE GROUT	BENTONITE CHIPS	BENTONITE PELLETS	IF OTHER TYPE OF ANNULAR MATERIAL, DESCRIBE	FILTER PACK SAND	FILTER PACK GRAVEL	FILTER PACK SIZE
0	20	☐	☐	☑	☐	☐	☐	☐		☐	☐	
20	640	☐	☐	☐	☑	☐	☐	☐		☐	☐	
640	1015	☐	☐	☐	☐	☐	☐	☐		☐	☑	Tacna No. 8

IF THIS WELL HAS NESTED CASINGS, SPECIFY NUMBER OF CASING STRINGS

EXPECTED DEPTH TO WATER
212 Feet Below Ground Surface

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

TYPE OR PRINT NAME AND TITLE	SIGNATURE OF WELL OWNER	DATE
Ned Hall, Chief Environmental Engineer		
TYPE OR PRINT NAME AND TITLE	SIGNATURE OF LANDOWNER, IF APPLICABLE (SEE INSTRUCTIONS)	DATE
Melissa Marks, Pima County Engineer		

ARIZONA DEPARTMENT OF WATER RESOURCES
3550 N. Central Avenue Suite 200
Phoenix, Arizona 85012

DRILLING CARD

THIS AUTHORIZATION SHALL BE IN POSSESSION OF THE DRILLER DURING ALL DRILLING OPERATIONS

WELL REGISTRATION NO: **55-910458**

AUTHORIZED DRILLER: **YELLOW JACKET DRILLING SERVICES L L C** LICENSE NO: **78**

NOTICE OF INTENT TO **DRILL A MONITOR WELL** HAS BEEN FILED WITH THE DEPARTMENT BY:

WELL OWNER: **Freeport-McMoran Sierrita Inc.**

ADDRESS: **6200 West Duval Mine Road, Green Valley, AZ, 85614**

THE WELL(S) IS/ARE TO BE LOCATED IN THE:

SW 1/4 of the **NW** 1/4 of the **SW** 1/4 Section **23** Township **18 S** Range **13 E**

NO. OF WELLS IN THIS PROJECT: **1** ASSESSOR'S PARCEL NO: **304-24-7000**

THIS AUTHORIZATION EXPIRES AT MIDNIGHT ON THE DAY OF **2/19/2010**

THE DRILLER MUST FILE A WELL DRILLER REPORT AND WELL LOG WITHIN 30 DAYS OF COMPLETION OF DRILLING

This drilling or abandonment authority was granted based upon the certifications made by the above-named Driller in the notice of intent to drill or abandon. Those certifications, along with any variances granted, are listed below. By drilling or abandoning the well pursuant to this authorization, the above-named driller acknowledges the accuracy of the driller certifications. If the certifications are in error, this authorization is invalid and driller must contact the Department of Water Resource's NOI Section in writing at the address above to correct.

Variance(s) Granted To Driller: **None**

Certification(s) Made By Driller:

- þ By checking this box, I certify that I have all necessary Registrar of Contractor (ROC) licenses in all necessary license categories for this drilling or abandonment project and that those licenses are current.
- þ If the landowner and the well owner are not the same, by checking this box, I certify that I have obtained written approval from the landowner in order to conduct this drilling or abandonment project. A copy of the written approval shall be submitted to ADWR with the Well Driller Report and Well Log or Well Abandonment Completion Report within 30 days of completion of drilling or abandonment.
- þ By checking this box, I certify that this NOI application is not an application to replace, deepen, or modify an existing well.
- þ By checking this box, I certify that I have been authorized by the above-named well owner to submit this Notice of Intent on the well owner's behalf.
- þ By checking this box, I certify that the information above is complete and correct, and that the well shall be drilled or abandoned in compliance with all pertinent statutes and rules, including any special standards that may be required to protect the aquifer or other water sources.

ARIZONA DEPARTMENT OF WATER RESOURCES

Electronic Filing - NOI Report

3550 N. Central Avenue Suite 200
Phoenix, Arizona 85012

NOI Type: Notice of Intent to Drill, Deepen, Modify a Monitor/Piezometer/Environmental Well
Well Type: MONITOR
Date Received at ADWR Website: 2/20/2009 10:00:14 AM

Fee Paid: $150.00 Order Number: VQCE3BECE218

Well Registration Number: 55 - 910458
Number of Wells/Holes: 1 Drilling Authority Expires On: 2/19/2010

Driller's ADWR License Number: 78

Authorized Driller: YELLOW JACKET DRILLING SERVICES L L C
ROC License Number Entered By Driller: 218848
Qualifying Party License Categories: A-4

Well Owner Name: Freeport-McMoran Sierrita Inc.
Well Owner Address: 6200 West Duval Mine Road
Well Owner City, State - Zip: Green Valley, AZ - 85614
Well Owner Phone: 520 648-8857

Book: 304 Map: 24 Parcel: 7000

Is the Land Owner the same as the Well Owner?: No

Land Owner Name: Pima County
Land Owner Address: 1313 South Mission Road
Land Owner City, State - Zip: Tucson, AZ - 85713
Land Owner Phone: 520 740-6508

Well Location: **SW** 1/4 of the **NW** 1/4 of the **SW** 1/4 Section **23** Township **18 S** Range **13 E**

AMA: TUCSON AMA
County: PIMA
Contamination Site: NOT IN ANY WQARF SITE

Primary Water Use: MONITORING
Secondary Water Use(s): N/A

Is any portion of the land, on which the well is to be located, within 100 feet of a designated municipal provider's operating water distribution system as shown on the municipal provider's most recent digitized service area map filed by the municipal provider with the director of ADWR. N/A

Proximity to a designated municipal provider's operating water distribution system exemption type:
N/A

Will you be installing a dedicated pump ?: No

Will the installed pump have a pumping capacity of greater than 35 GPM, or will the well will be used to withdraw greater than 10 Acre Feet per year?: N/A

Is this NOI an application to replace, deepen, or modify an existing well? No

Variance(s) Granted To Driller: **None**

Certification(s) Made By Driller:

- þ By checking this box, I certify that I have all necessary Registrar of Contractor (ROC) licenses in all necessary license categories for this drilling or abandonment project and that those licenses are current.
- þ If the landowner and the well owner are not the same, by checking this box, I certify that I have obtained written approval from the landowner in order to conduct this drilling or abandonment project. A copy of the written approval shall be submitted to ADWR with the Well Driller Report and Well Log or Well Abandonment Completion Report within 30 days of completion of drilling or abandonment.
- þ By checking this box, I certify that this NOI application is not an application to replace, deepen, or modify an existing well.
- þ By checking this box, I certify that I have been authorized by the above-named well owner to submit this Notice of Intent on the well owner's behalf.
- þ By checking this box, I certify that the information above is complete and correct, and that the well shall be drilled or abandoned in compliance with all pertinent statutes and rules, including any special standards that may be required to protect the aquifer or other water sources.

Arizona Department of Water Resources
Information Management Unit
P.O. Box 33589 ' Phoenix, Arizona 85067-3589
(602) 771-8627 ' (800) 352-8488
www.water.az.gov

Well Driller Report and Well Log

THIS REPORT MUST BE FILED WITHIN **30 DAYS** OF COMPLETING THE WELL.

PLEASE PRINT CLEARLY USING BLACK OR BLUE INK

FILE NUMBER
D(18-13)23 CBC

WELL REGISTRATION NUMBER
55 - 910458

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:

NAME	DWR LICENSE NUMBER
YELLOW JACKET DRILLING SERVICES L L C	78
ADDRESS	**TELEPHONE NUMBER**
P.O. BOX 801	602-453-3252
CITY / STATE / ZIP	**FAX**
GILBERT, AZ, 85299-0801	

SECTION 1. REGISTRY INFORMATION

Well Owner

FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL
Freeport-McMoran Sierrita Inc.

MAILING ADDRESS
6200 West Duval Mine Road

CITY / STATE / ZIP
Green Valley, AZ, 85614

CONTACT PERSON NAME AND TITLE

TELEPHONE NUMBER
520 648-8857

FAX

WELL NAME (e.g., MW-1, PZ-3, lot 25 Well, Smith Well, etc.)

Location of Well

WELL LOCATION ADDRESS (IF ANY)

TOWNSHIP (N/S)	RANGE (E/W)	SECTION	160 ACRE 1/4	40 ACRE 1/4	10 ACRE 1/4

LATITUDE			LONGITUDE		
°	'	"N	°	'	"W

METHOD OF LATITUDE/LONGITUDE (CHECK ONE)
☐ USGS Quad Map ☐ Conventional Survey ☐ *GPS: Hand-Held ☐ *GPS: Survey-Grade

LAND SURFACE ELEVATION AT WELL
Feet Above Sea Level

METHOD OF ELEVATION (CHECK ONE)
☐ USGS Quad Map ☐ Conventional Survey ☐ *GPS: Hand-Held ☐ *GPS: Survey-Grade

*IF GPS WAS USED, GEOGRAPHIC COORDINATE DATUM (CHECK ONE)
☐ NAD-83 ☐ Other (please specify)

COUNTY

ASSESSOR'S PARCEL ID NUMBER (MOST RECENT)

BOOK	MAP	PARCEL
304	24	7000

SECTION 3. WELL CONSTRUCTION DETAILS

Drilling Method

CHECK ONE
☐ Air Rotary
☐ Bored or Augered
☐ Cable Tool
☐ Dual Rotary
☐ Mud Rotary
☐ Reverse Circulation
☐ Driven
☐ Jetted
☐ Air Percussion / Odex Tubing
☐ Other (please specify)

Method of Well Development

CHECK ONE
☐ Airlift
☐ Bail
☐ Surge Block
☐ Surge Pump
☐ Other (please specify)

Condition of Well

CHECK ONE
☐ Capped
☐ Pump Installed

Method of Sealing at Reduction Points

CHECK ONE
☐ None
☐ Packed
☐ Swedged
☐ Welded
☐ Other (please specify)

Construction Dates

DATE WELL CONSTRUCTION STARTED

DATE WELL CONSTRUCTION COMPLETED

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

Well Driller Report and Well Log

WELL REGISTRATION NUMBER
55 - 910458

SECTION 4. WELL CONSTRUCTION DESIGN (AS BUILD) (attach additional page if needed)

Depth

DEPTH OF BORING	DEPTH OF COMPLETED WELL
Feet Below Land Surface	Feet Below Land Surface

Water Level Information

STATIC WATER LEVEL	DATE MEASURED	TIME MEASURED	IF FLOWING WELL, METHOD OF FLOW REGULATION
Feet Below Land Surface			☐ Valve ☐ Other:

Borehole / Installed Casing

Borehole			Installed Casing			MATERIAL TYPE (T)				PERFORATION TYPE (T)						
DEPTH FROM SURFACE			DEPTH FROM SURFACE													
FROM (feet)	TO (feet)	BOREHOLE DIAMETER (inches)	FROM (feet)	TO (feet)	OUTER (inches)	STEEL	PVC	ABS	IF OTHER TYPE, DESCRIBE	BLANK OR NONE	WIRE WRAP	SHUTTER SCREEN	MILLS KNIFE	SLOTTED	IF OTHER TYPE, DESCRIBE	SLOT SIZE (inches)

Installed Annular Material

DEPTH FROM SURFACE		ANNULAR MATERIAL TYPE (T)								FILTER PACK		
						BENTONITE						
FROM (feet)	TO (feet)	NONE	CONCRETE	NEAT CEMENT OR CEMENT GROUT	CEMENT-BENTONITE GROUT	GROUT	CHIPS	PELLETS	IF OTHER TYPE OF ANNULAR MATERIAL, DESCRIBE	SAND	GRAVEL	SIZE

Well Driller Report and Well Log

WELL REGISTRATION NUMBER
55 - 910458

SECTION 5. GEOLOGIC LOG OF WELL

DEPTH FROM SURFACE		**Description**	Check (T) every interval where water was encountered (if known)
FROM (feet)	TO (feet)	Describe material, grain size, color, etc.	

Well Driller Report and Well Log

WELL REGISTRATION NUMBER
55 - 910458

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER	COUNTY ASSESSOR'S PARCEL ID NUMBER (MOST RECENT)		
	BOOK	MAP	PARCEL
Freeport-McMoran Sierrita Inc.	304	24	7000

v Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.

v Please indicate the distance between the well location and any septic tank system or sewer system.

						
						1" = _____ ft

OWNER ADRESS LABEL PAGE

Freeport-McMoran Sierrita Inc.
6200 West Duval Mine Road
Green Valley, AZ 85614

ARIZONA DEPARTMENT OF WATER RESOURCES
3550 N. Central Avenue Suite 200, Phoenix, Arizona 85012
Telephone (602) 771-8500
Fax (602) 771-8691

Friday, February 20, 2009

Janice K. Brewer
Governor

Herbert R. Guenther
Director

Freeport-McMoran Sierrita Inc.
6200 West Duval Mine Road
Green Valley, AZ 85614

Registration No. 55- 910458
File No. D(18-13)23 CBC

Dear Applicant:

Enclosed is a copy of the Notice of Intent to Drill a Monitor/Piezometer/Environmental Well ("NOI") which you recently filed with this Department pursuant to A.R.S. § 45-596. This is to inform you that the Department has approved the NOI and has mailed (or otherwise provided) a drilling card authorizing the drilling of the well to the well driller identified in the NOI. The driller may not begin drilling until he has received the drilling card which he must keep in his posssession at the well site during drilling. Well drilling activities must be completed within one year after the date the NOI was filed with the Department. If drilling is not completed within one year, you must file a new NOI before proceeding with further drilling.

If it is necessary to change the location of the proposed well, you may not proceed with drilling until you file a new NOI with the Department and the Department issues an amended drilling card to the driller. If you change drillers, you must notify the Department of the new driller's identity. A new driller may not begin drilling until he receives a new drilling card from the Department. If in the course of drilling the well, it is determined that the well cannot be successfully completed as initially intended (dry hole, cave in, lost tools, etc.), the well must be properly abandoned and a Well Abandonment Completion Report filed as required by A.A.C. R12-15-816(F).

A.R.S. § 45-600 requires the driller to file a complete and accurate Well Drillers Report and Well Log (DWR Form 55-55) with the Department within 30 days after completion of drilling. That form was mailed to your driller with the drilling card.

Please be advised that A.R.S. § 45-593(C) requires the person to whom a well is registered to notify the Department of a change in ownership of the well and/or information pertaining to the physical characteristics of the well in order to keep this well registration file current and accurate. Any change in well information or a request to change well driller must be filed on a Request to Change Well Information form (DWR form 55-71A) that may be downloaded from the ADWR Internet website at
http://www.azwater.gov/dwr/Content/Find_by_Category/Permits_Forms_Applications/default.htm.

APPENDIX B

GEOLOGIC BORING LOG

HYDRO GEO CHEM, INC.

Geologic Boring Log

Boring No.: **MO-2009-01**

Project Name: **Freeport McMoRan, Sierrita**

Drilling Company: Yellow Jacket Drilling Services, LLC — Driller: Jake Lagana

Site Plan at Boring Location:

ADWR Registration No.: **55-910458**

Drilling Equipment: Versa Drill 20000

Drilling Method: Mud Rotary

Bit Type/Size: Tricone / 9 7/8"

Total Borehole Depth (Ft.): 1057

Casing Depth (Ft.): 1015

Screened Interval (Ft.): 650 - 1010

Screen slot size: 0.125"

Filter pack type: #8 Tacna Gravel

Top of Casing Elevation:

Land surface Elevation (Ft. amsl): Approx. 2890

Date/Time Started: 3/9/2009 13:40

Date/Time Completed: 3/31/2009 10:33

SW 1/4 of the NW 1/4 of the SW 1/4: T18S, R13E, Sec. 23

Logged by: W. Thompson, K. Wilson

Latitude: N31° 50' 45" Longitude: W110° 59' 39"

Checked by:

Depth (Ft)	Graphic Log	Estimated % GR	SA	Fl	USCS Symbol	Munsell Color	HCl Rxn	Sample Description
0	Basin Fill	15	55	30	SM	7.5YR5/4	M	Silty sand with gravel- Brown, gravel to 2" diameter, subrounded to well rounded, mostly volcanics. Sand fraction is coarse through very fine grained, primarily quartz with some dark colored mafics, fairly well graded through to silt fraction. Silt fraction reacts moderately with HCL
10		15	55	30	SM	7.5YR5/4	M	As above.
20		15	55	30	SM	7.5YR5/4	M	As above.
25		10	90		SW	7.5YR5/4	W	Sand with trace gravel- Brown, gravel to 1/2" maximum diameter, subangular to well rounded, primarily quartz with some dark colored aphanitic volcanics. Sand fraction is coarse though fine grained, fairly well graded, primarily quartz with some dark colored mafic grains. Weak reaction to HCL.
30		10	90		SW	7.5YR5/4	W	As described above except that numerous quartz grains are stained with rust colored oxides. A small amount of greenish colored chloritic grains are also present.

Project Name: **Freeport McMoRan, Sierrita**							Boring No.: **MO-2009-01**	
Depth (Ft)	**Graphic Log**	**Estimated % GR**	**SA**	**FI**	**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
40		10	90		SW	7.5YR5/4	W	Sand with trace gravel- Brown, similar to above with numerous quartz grains exhibiting a considerable amount of surficial rust colored staining; many dark through light gray, reddish brown, and greenish aphanitic mafic grains are also present. Sand fraction is primarily coarse through medium grained, subangular to well rounded, fairly well graded.
								Drillers have lost circulation at 42 ft due to a gravelly zone and have mixed a shredded drilling paper product to the circulation fluid to seal off the formation.
47		90	10		GP	Mottled	N	Gravel with sand- Mottled coloration is a mix of grays, reddish browns, whites and greens. Gravel clasts are angular to subrounded, fairly well sorted at about 1/2" diameter; primarily quartz, granitoids, dark through light gray volcanics, some chlorite and feldspathic clasts. Sand fraction is coarse through very coarse grained. No reaction to HCL.
49		90	5	5	GP	Mottled	N	Gravel with trace of sand and clay- Mottled coloration, similar to above except that gravel clasts are larger to 1" in diameter, subangular to subrounded, small amount of a conglomeritic silicious mudstone. Trace amount of silty clay, slightly plastic, very soft, cohesive.
57		25	15	60	ML	7.5YR5/4	N	Gravelly silt with sand- Brown, gravel and sand fractions are as described above. Fines are a mix of silt and clay, very soft, sticky, cohesive, and slightly plastic.
67		10	65	25	SM	7.5YR5/4	N	Silty clayey sand with trace gravel- Brown, gravel fraction is fine grained to 1/2" maximum diameter, angular to subrounded. Sand fraction is very coarse through fine grained, subangular to well rounded, primarily quartz with dark through light gray volcanics; fairly well graded through to silt fraction. Silt and clay fractions are very soft, sticky, cohesive and slightly plastic.
77	**Basin Fill**	30	60	10	SP-SM	7.5YR5/4	N	Sand with silt and gravel- Brown, gravel fraction is fine grained to 1/2" maximum diameter, angular to subrounded. Sand fraction is very coarse through fine grained but is primarily coarse grained, mostly quartz and dark through light gray volcanics, poorly graded.
87		80	20		GP	Mottled	N	Sandy gravel- Mottled color, gravel fraction is fine grained to 1/2" maximum diameter, subangular to subrounded, primarily dark through light gray volcanic silicates, few poorly graded silica cemented sandstone and cherty clasts. Sand fraction is primarily coarse grained, poorly graded overall.
97			100		SW	7.5YR5/4	N	Sand- Brown, primarily quartz, coarse through fine grained but mostly coarse through medium grained, fairly well graded, loose.
107		10	90		SW	7.5YR5/4	N	Sand with trace gravel- Brown, as described above except for a small amount of fine grained gravel to 1/2" maximum diameter, subangular to rounded, primarily dark through light gray volcanics.
117		10	90		SW	7.5YR5/4	N	As above.
127		10	90		SW	7.5YR5/4	N	As above.
130		10	80	10	SW-SM	7.5YR5/3	N	Sand with clay and trace gravel- brown, as above except for inclusion of a small amount of clay, most probably as thin interbeds. Clay is very soft, moderately plastic, sticky, and cohesive.

Project Name: **Freeport McMoRan, Sierrita**							Boring No.:	**MO-2009-01**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
137		10	80	10	SW-SM	7.5YR5/3	N	As above.
147		10	90		SW	7.5YR5/4	N	Sand with trace gravel- Brown, gravel to 1/2" maximum diameter, primarily quartz, volcanics, few reddish granitoids. Sand fraction is coarse through medium grained but primarily coarse grained, composed of mostly quartz and volcanics.
157		10	90		SW	7.5YR5/4	N	As above except for the inclusion of a small amount of a reddish brown medium grained sandstone.
167		10	90		SW	7.5YR5/4	N	As above.
177			20	80	CL	5YR5/4	N	Clay with sand- Reddish brown, clay is sticky, cohesive, plastic. Sand is coarse through fine grained, well graded through to silt fraction, composed of quartz and lithic grains, angular to subrounded.
187		5	40	55	CL	5YR5/4	N	Sandy clay- Reddish brown, as above with 5% gravel.
197	**Basin Fill**	5	80	15	SC	7.5YR5/3	N	Clayey sand- Brown, sand is angular to subrounded, fine to coarse grained but mostly coarse grained, primarily quartz, volcanics and fine grained sandstones.
207		5	90	5	SP	7.5YR5/3	N	Sand- Brown, sand is mostly coarse grained, angular to subrounded, composed of quartz and lithic sandstone and volcanic grains.
217		20	80		SP	5YR5/3	N	Sand with gravel- Reddish brown, sand is as described above with increased gravel. Gravel and lithic sand grains are primarily volcanics with some granitic porphyry and little fine grained quartzite.
227		20	75	5	SP	7.5YR5/3	N	Sand with Gravel- Brown, sand as above: gravel and lithic sand grains are primarily multi-colored volcanics. 5% clay.
237		10	65	25	SC	7.5YR5/4	N	Clayey sand- Brown, sand is fine to coarse grained, angular to subrounded, composed of quartz and lithic grains. Gravel and lithic grains are mostly volcanic and crystal rich granitic porphyry, clay and silt occur with sand in balls.
247		5	75	20	SC	7.5YR5/4	N	Clayey sand- Brown, as above with less clay and gravel.

Project Name: **Freeport McMoRan, Sierrita**							Boring No.:	**MO-2009-01**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
257		10	60	30	SC	7.5YR5/3	N	Clayey sand- Brown, As above. Driller reports penetration rate has slowed due to clay content of formation using the button bit that has performed well in in gravelly material.
267		5	65	30	SC	2.5YR5/4	N	Clayey sand- Brown, as above. Gravel and lithic sand grains are primarily volcanics with little granitic and fine grained sandstone.
277		5	65	30	SC	2.5YR5/4	N	As above.
287		5	65	30	SC	2.5YR5/4	N	As above.
297		10	85	5	SW	7.5YR5/3	N	Sand with trace gravel and clay- Brown, gravel fraction to 1/2"maximum diameter, angular to sub rounded, primarily quartz, volcanics, and fine grained sandstone clasts. Sand is mostly quartz and dark through light gray volcanics, coarse through medium grained, fairly well graded.
307	**Basin Fill**	10	85	5	SW	7.5YR5/3	N	As above.
317		10	85	5	SW	7.5YR5/3	N	As above.
327		10	75	15	SC	7.5YR5/3	N	Clayey sand with trace gravel- Brown, gravel and sand fractions are as described above. Clay is very soft, cohesive, and moderately plastic.
337		10	75	15	SC	7.5YR5/3	N	As above.
347		10	85	5	SW	7.5YR5/3	N	As above except that clay fraction is only trace.
357		10	85	5	SW	7.5YR5/3	N	As above.

Project Name: **Freeport McMoRan, Sierrita**							Boring No.:	**MO-2009-01**
Depth (Ft)	**Graphic Log**	**Estimated %**			**USCS Symbol**	**Munsell Color**	**HCl Rxn**	**Sample Description**
		GR	**SA**	**FI**				
367		10	60	30	SM	7.5YR5/3	N	Clayey sand with trace gravel- Brown, gravel fraction to 1/2" maximum diameter, angular to sub rounded, primarily aphanitic volcanics, small amount of reddish brown fine grained sandstone. Sand is coarse through fine grained, fairly well graded. Clay is very soft, sticky, cohesive, and moderately plastic.
377		10	70	20	SM	7.5YR5/3	N	As above except that clay fraction has decreased.
387		20	65	15	SC	7.5YR5/3	N	Clayey sand with gravel- Brown, gravel to 1/2" maximum diameter, angular to subrounded, mostly aphanitic volcanics, few granitoids, and fine grained sandstone clasts. Sand fraction is coarse through medium grained, fairly well graded. Clay is very soft, sticky, cohesive, and moderately plastic.
397		20	65	15	SC	7.5YR5/3	N	As above
407		5	90	5	SW	7.5YR5/4	N	Sand with trace gravel and clay- Brown, sand is coarse through fine grained but primarily coarse through medium grained, mostly quartz and aphanitic volcanics, fairly well graded.
417		5	90	5	SW	7.5YR5/4	N	As above
427	**Basin Fill**	20	50	30	SC	7.5YR5/4	W	Clayey sand with silt and gravel- Brown, gravel to 1/2" maximum diameter, angular to subrounded, primarily quartz, volcanics, with small amount of fine grained sandstone. Sand is coarse through fine grained, mostly quartz with dark through light gray volcanics, fairly well graded through to silt fraction. Clay is soft, cohesive, sticky, and moderately plastic. Very weak reaction with HCL.
437		10	60	30	SC	7.5YR5/4	W	As above except that gravel fraction is trace only.
447		10	60	30	SC	7.5YR5/4	W	As above.
457		10	60	30	SC	7.5YR5/4	W	As above.
467		5	85	10	SW-SM	7.5YR5/4	N	Sand with trace gravel silt and sand- brown, gravel as described above. Sand fraction is coarse through fine grained, primarily quartz with dark through light gray volcanics, fairly well graded through to silt fraction.
477		5	85	10	SW-SM	7.5YR5/4	N	As above.

Project Name: **Freeport McMoRan, Sierrita**							Boring No.:	**MO-2009-01**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
487		20	60	20	SC	7.5YR5/4	N	Gravelly sand with clay- Brown, gravel to 1/2" maximum diameter, angular to subrounded, mostly aphanitic volcanics with few granitoids and fine grained sandstone clasts. Sand fraction is coarse through fine grained, fairly well graded. Fines are as a silty clay, soft, sticky, cohesive, and moderately plastic.
497		20	50	30	SC	7.5YR5/4	N	As above except for an increase in the clay fraction.
507		20	60	20	SC	7.5YR5/4	N	As above except for a decrease in the clay fraction.
517		20	60	20	SC	7.5YR5/4	N	As above.
527		30	50	20	SM	7.5YR5/4	N	Gravelly sand with clay and silt- Brown, gravel to 1/2" maximum diameter, angular to subrounded, primarily volcanics and quartz, few granitoids, and fine grained sandstone clasts. Sand fraction is coarse through fine grained but mostly coarse through medium grained. Fine fraction is a silty clay, very soft, sticky, cohesive, and moderately plastic.
537		40	50	10	SM	7.5YR5/4	N	As above except for an increase in the gravel fraction and a decrease in the clay - silt fractions.
547	**Basin Fill**	40	50	10	SM	7.5YR5/4	N	As above.
557		20	70	10	SW-SM	7.5YR5/4	N	Sand with gravel trace silt and clay- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, mostly volcanics, granitic clasts with small amount of a reddish fine grained sandstone. Sand fraction is coarse through fine grained but is primarily coarse through medium grained, fairly well graded.
567		20	65	15	SM	7.5YR5/4	N	As above except for a slight increase in the clay and silt fractions.
577		20	65	15	SM	7.5YR5/4	N	As above.
587		20	65	15	SM	7.5YR5/4	N	As above.
597		35	55	10	SM	7.5YR5/4	N	As above except for an increase in the gravel fraction.

Project Name: **Freeport McMoRan, Sierrita**							Boring No.:	**MO-2009-01**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
607		40	30	30	GC	7.5YR5/4	N	Clayey gravel with sand- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, primarily a medium gray, aphanitic, volcanic, few granitic clasts. Sand fraction is coarse through fine grained, fairly well graded. Clay is very soft, sticky, and moderately plastic.
617		80	20		GW	Mottled	N	Gravel with Sand- Mottled coloration, gravel is fine grained to 1/2" maximum diameter, angular to subrounded, mostly aphanitic volcanics, quartz and a small amount of fine grained sandstone clasts. Sand fraction is coarse through medium grained, fines are absent.
627		20	65	15	SM	7.5YR5/4	N	Clayey silty sand with gravel- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, primarily volcanics, granitoids, with a small amount of reddish fine grained sandstone clasts. Sand fraction is coarse through fine grained, primarily quartz and volcanics, fairly well graded through to silt fraction. Clay is very soft, sticky, cohesive and moderately plastic.
637		20	65	15	SM	7.5YR5/4	N	As above.
647		30	55	15	SM	7.5YR5/4	N	As above except for an increase in the gravel fraction.
657		25	65	10	SM	7.5YR5/4	N	As above except for slight decrease in the clay fraction.
667	**Basin Fill**	30	60	10	SM	7.5YR5/4	N	As above except for a slight increase in the gravel fraction.
677		25	65	10	SM	7.5YR5/4	N	As above except for slight decrease in the gravel fraction.
687		25	60	15	SM	7.5YR5/4	N	As above except for a slight increase in the clay and silt fractions.
697		60	20	20	GM	7.5YR5/4	N	Clayey silty gravel with sand- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, primarily volcanics, quartz, with a few granitoids, and reddish brown sandstone clasts. Sand fraction is coarse through fine grained, mostly quartz and dark through light gray volcanics. Clay fraction is very soft, sticky, cohesive and moderately plastic.
707		25	65	10	SW-SC	7.5YR5/4	N	Sand with clay and gravel- Brown, all fractions are as described above; only the proportions have changed.
717		25	65	10	SW-SC	7.5YR5/4	N	As above.

Project Name: **Freeport McMoRan, Sierrita**							Boring No.:	**MO-2009-01**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**Fl**	**Symbol**	**Color**	**Rxn**	
727		25	65	10	SW-SC	7.5YR5/4	N	As above.
737		35	55	10	SW-SC	7.5YR5/4	N	Sand with clay silt and gravel- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, primarily quartz and aphanitic volcanics, few granitic clasts. Sand fraction is coarse through fine grained but primarily coarse through medium grained, fairly well graded. Fines are as mixes of clay and silt, very soft, cohesive, sticky, and moderately plastic.
747		35	55	10	SW-SC	7.5YR5/4	N	As above.
757		60	35	5	GW	7.5YR5/4	N	Gravel with sand- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, mostly dark through light gray volcanics, few granitoid and dark red, fine grained, sandstone clasts. Sand fraction is coarse through medium grained, fairly well graded. Clay fraction is trace, very soft, cohesive, moderately plastic.
760		40	35	25	GM	7.5YR5/4	N	Gravel with sand and clay- Brown, as described above except that clay fraction has increased considerably.
767		40	35	25	GM	7.5YR5/4	N	As above.
777	**Basin Fill**	30	45	25	GM	7.5YR5/4	N	Gravel with sand and clay- Brown, as described above except that sand fraction has increased.
787		60	30	10	GW-GC	Mottled	N	Gravel with sand and clay- Mottled color, gravel fraction to 1/2" maximum diameter, angular to subrounded, primarily aphanitic volcanics, granitoids, with a small amount of a reddish brown, fine grained sandstone. Sand fraction is coarse through medium grained, fairly well graded. Fines are a silty clay, very soft, sticky, cohesive, and slightly plastic.
797		55	30	15	GW-GC	Mottled	N	As above except that clay fraction has increased slightly.
809		50	30	20	GW-GC	Mottled	N	As above except that clay fraction has increased.
817		50	40	10	GW-GC	Mottled	N	Gravel with sand and clay- Mottled color, gravel fraction to 1/2" maximum diameter, angular to subrounded, numerous dark gray volcanic aphanites, quartz with a few granitic clasts. Sand fraction is coarse through fine grained but is primarily coarse grained. Trace amount of a silty clay, very soft, sticky, cohesive, and slightly plastic.
827		45	40	15	GC	7.5YR5/4	N	Clayey gravel with sand- Brown, as above except for an increase in the clay fraction.

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Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**FI**	**Symbol**	**Color**	**Rxn**	
837		35	45	20	SC	7.5YR5/4	N	Clayey sand with gravel- Brown, as above except for an increase in the clay fraction.
847		20	70	10	SW-SC	7.5YR5/4	N	Sand with gravel silt and clay- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, mostly dark through light gray volcanics, quartz, with a few granitic clasts. Sand fraction is coarse through fine grained, fairly well graded to silt fraction.
857		20	70	10	SW-SC	7.5YR5/4	N	As above.
867		30	60	10	SW-SC	7.5YR5/4	N	As above except for an increase in the gravel fraction.
877		30	60	10	SW-SC	7.5YR5/4	N	As above.
887		25	55	20	SC	7.5YR5/4	N	Clayey silty sand with gravel- Brown, as above except for an increase in the silt and clay fractions.
897	**Basin Fill**	25	55	20	SC	7.5YR5/4	N	As above.
907		60	40		GW	7.5YR5/2	N	Gravel with sand- Brown, gravel to 1/2" maximum diameter, angular to sub rounded, primarily dark gray volcanics, quartz, few granitic clasts. Sand fraction is very coarse through medium grained, fairly well grade; clean with very few fines.
917		50	40	10	GW-GC	7.5YR5/2	N	Gravel with sand silt and clay- Brown, as described above except for the inclusion of a very soft, sticky, cohesive, slightly plastic, silty clay.
927		50	40	10	GW-GC	7.5YR5/2	N	As above.
937		50	45	5	GW	7.5YR5/2	N	As above except that the clay and silt fractions are only trace.
947		50	45	5	GW	7.5YR5/2	N	As above.

Project Name: **Freeport McMoRan, Sierrita**							Boring No.:	**MO-2009-01**
Depth	**Graphic**	**Estimated %**			**USCS**	**Munsell**	**HCl**	**Sample Description**
(Ft)	**Log**	**GR**	**SA**	**Fl**	**Symbol**	**Color**	**Rxn**	
957		30	60	10	SW-SC	7.5YR5/4	N	Sand with gravel and clay- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, mostly volcanics and quartz, few granitic clasts
967		60	35	5	GW	Mottled	N	Gravel with sand- Mottled color, gravel to 1/2" maximum diameter, angular to subrounded, primarily dark gray volcanics, quartz with few granitoids. Sand fraction is coarse through fine grained but mostly coarse through medium grained, fairly well graded. Trace of silt.
977		20	65	15	SC	7.5YR5/4	N	Clayey sand with gravel- brown, gravel to 1/2" maximum diameter, angular to subrounded, mostly dark through light gray volcanics, and quartz, few clasts of a poorly graded, medium grained, reddish brown sandstone. Sand fraction is coarse through fine grained, fairly well graded to silt fraction. Fines are a mix of clay and silt, very soft, sticky, cohesive, and slightly plastic.
987		20	65	15	SC	7.5YR5/4	N	As above.
997		30	60	10	SW-SC	7.5YR5/4	N	Sand with gravel silt and clay- Brown, as above except that the gravel fraction has increased.
1007	**Basin Fill**	60	30	10	GW-GC	7.5YR5/4	N	Gravel with sand silt and clay- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, mostly very dark gray to black aphanitic volcanics, and quartz with a few granitoids and medium grained, reddish brown, sandstone clasts. Sand fraction is coarse through fine grained, fairly well graded. fines are a mix of silt and clay, very soft, sticky, cohesive, and slightly plastic.
1017		40	50	10	SW-SC	7.5YR5/4	N	Sand with gravel silt and clay- As described above except that gravel fraction has decreased.
1027		20	65	15	SC	7.5YR5/4	N	Clayey silty sand with gravel- Brown, as above except for an increase in silt and clay fractions.
1037		60	25	15	GC	7.5YR5/4	N	Clayey silty gravel with sand- Brown, gravel fraction to 1/2" maximum diameter, angular to subrounded, mostly dark gray volcanics and quartz with few granitic and reddish brown, fine grained, sandstone clasts. Sand is coarse though fine grained but primarily coarse through medium grained. Fines are a silt clay mix, very soft, sticky, cohesive, and slightly
1047		60	25	15	GC	7.5YR5/4	N	As above.
1057		50	35	15	GC	7.5YR5/4	N	As above except for an increase in the sand fraction.