FREEPORT-McMoRan
COPPER & GOLD

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

June 30, 2011

Via Certified Mail # 7008 2810 0000 0983 7212
Return Receipt Requested

Ms. Mindy Cross
Arizona Department of Environmental Quality
Water Quality Compliance Section
1110 West Washington Street
Phoenix, Arizona 85007-2935

Re: Mitigation Order on Consent Docket No. P-50-06
April 1st through June 30, 2011 Status Report

Dear Ms. Colquitt:

In accordance with Section V.A. of the Mitigation Order on Consent Docket No. P-50-06, Freeport-McMoRan Sierrita Inc. (Sierrita) submits the Status Report covering the period from April 1st through June 30, 2011.

Since the last Status Report was submitted, the following measures have been taken under Section III of the Mitigation Order:

- Submitted the Semiannual Groundwater Monitoring Report for Samples Collected during the Fourth Quarter 2010 and First Quarter 2011.
- Completed the 2nd quarter 2011 groundwater monitoring activities.
- Held the second CAG meeting of the year on June 21st.
- Continued work towards acquisition of State Trust land.
- Continued work on obtaining the easements and/or rights-of-way on public or private land where new wells and associated infrastructure will be placed.
- Worked with developer to secure access via easement and/or purchase of land for MC-2 and MC-3 wells locations.
- Prepared the Operations & Maintenance Manual for the new I-wells and the existing interceptor wellfield, which is included with this report.
- Continued work on the feasibility study for the new tailings impoundment.

During the next quarter, the following activities will be conducted:

- Begin construction of new I-wells conveyance system and associated infrastructure
- Award contract and commence drilling of PS wells and possibly MC-2 and MC-4 wells.
- Continue work to obtain the easements and/or right-of-ways on public or private lands where new wells that are not dependant on the purchase of State Land will be placed.
- Continue work towards acquiring State Trust land.
- Continue working on the feasibility study for the new tailings impoundment.
- Conduct quarterly groundwater monitoring according to the revised groundwater monitoring schedule.

Please do not hesitate to contact Mr. Stuart Brown at (602) 448-0972 or myself at (520) 393-2696 if you have any question regarding this submittal.

Sincerely,

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

MGM:ms
Attachment
20110630_001

xc: Henry Darwin, Arizona Department of Environmental Quality
Marcia Colquitt, Arizona Department of Environmental Quality
John Broderick, Sierrita
Lana Fretz, Sierrita
Ned Hall, Freeport-McMoRan Copper & Gold
Stuart Brown, Freeport-McMoRan Copper & Gold
Jim Norris, Clear Creek Associates

FREEPORT--MCMORAN SIERRITA INC.
OPERATION AND MAINTENANCE MANUAL FOR THE INTERCEPTOR WELL FIELD

June 30, 2011

FREEPORT--MCMORAN SIERRITA INC.

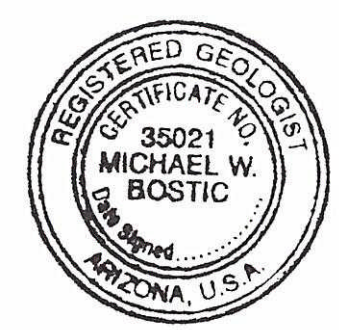
OPERATION AND MAINTENANCE MANUAL FOR THE INTERCEPTOR WELL FIELD

Prepared for

Freeport--McMoRan Sierrita, Arizona

June 30, 2011

BASINWELLS ASSOCIATES PLLC PROJECT NO. 11-003



Michael W. Bostic, R.G

Kara Festa, P,E,

IN ASSOCIATION WITH

WestLand Resources, Inc.
Engineering and Environmental Consultants

BasinWells
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ADWR	Arizona Department of Water Resources
BasinWells	BasinWells Associates, PLLC
bls	below land surface
gpm	gallons per minute
IW	Interceptor Well
O&M Manual	Interceptor Well Field Operation and Maintenance
Sierrita	Freeport -McMoRan Sierrita Inc.

SIERRITA INTERCEPTOR WELL FIELD OPERATION AND MAINTENANCE MANUAL

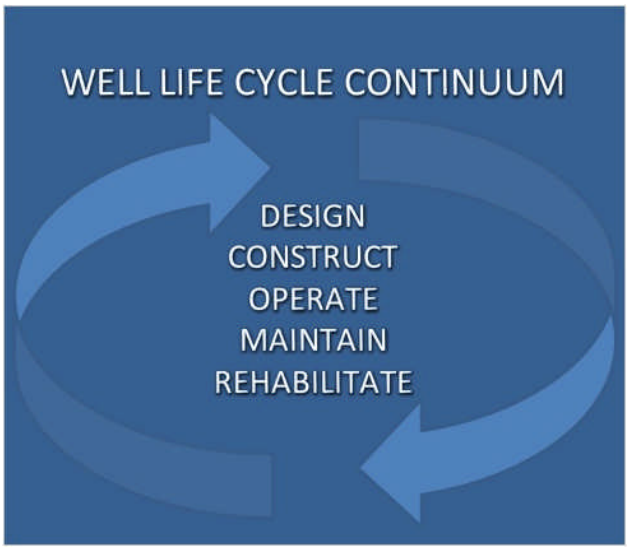
1. INTRODUCTION

This Interceptor Well Field Operation and Maintenance Manual (O&M Manual) developed for Freeport--McMoRan Sierrita Inc. (Sierrita) by BasinWells Associates, PLLC, in association with Westland Resources, Inc., presents recommended O&M activities to optimize well field performance. The principal goal of operation of the Interceptor Well Field is to effectively contain and capture seepage from the Sierrita Tailings Impoundment within the local groundwater aquifer (Figure 1.)

Well field performance goals established by Sierrita to meet the goal of operation include:

- Operate all interceptor wells on a continual duty cycle, as close to 100 percent as practical.
- Operate each interceptor well at or above target yield rates developed for each well.

This O&M Manual was developed within the framework of the Well Lifecycle Continuum as presented by Smith and Comeskey in *Sustainable Wells, Maintenance, Problem Prevention and Rehabilitation* (2010).



1.1 LOCATION

As of the date of this O&M Manual, the Interceptor Well Field is comprised of 20 active interceptor wells, with four new interceptor wells installed in late 2010 with plans for activation in late 2011. Groundwater from the interceptor wells is collected through a transmission pipeline running along the east and south flank of the tailings impoundment. Groundwater is conveyed through this transmission pipeline to the 50,000 gallon Sierrita Interceptor Tank, and then boosted to the 85,000 gallon Reclaim

Tank. At the Reclaim Tank, the groundwater developed by the Interceptor Well Field is combined with the Reclaim water from the tailings dewatering and Duval Channel, for pumping to the mill site. The Reclaim water system provides a portion of the process water supply for mine operations.

The locations of the interceptor wells are shown on Figure 1. Table 1 tabulates well information including cadastral legal locations, target yield rates, well construction details, drill date and well age. Additional Groundwater Mitigation wells are planned in the near future for an area to the east of the existing Interceptor wells, and will be included in future updates to this O&M Manual.

1.2 PURPOSE

This O&M Manual was developed to assist Sierrita to optimize well field performance. Effective containment and capture of seepage from the Sierrita Tailings Impoundment requires consistent and diligent O&M activities at each interceptor well. The O&M Manual will present the set of operational parameters that require routine monitoring, and analysis to aid in the identification and scheduling of required pump equipment maintenance, well cleaning and redevelopment, and well rehabilitation activities to optimize well field performance. Criteria for well replacement is also presented.

This manual should also serve as the basis of training of new operators and provide continuity during changes in assigned personnel. The principal goals of this O&M manual are to provide:

- Guidance for operation of the well field in a manner that optimizes pumping of groundwater to meet target yield rates;
- Instructions for monitoring of well field operational parameters, and criteria for planning maintenance reviews for specific wells; and
- Basis for long-term budgetary planning for well field operation, maintenance, and monitoring activities.

The O&M Manual should be reviewed at least annually and updated periodically as new information about the interceptor wells is acquired. In addition, as future changes or additions to the interceptor wellfield occur, additional O&M issues not covered in the manual may become apparent, and additional revisions to the manual may be needed.

1.3 ORGANIZATION OF SIERRITA WITH RESPECT TO INTERCEPTOR WELL FIELD OPERATION

The current organizational structure of Sierrita divides the responsibilities and labor for maintenance and operations of the Interceptor Well Field into two major groups: the Environment, Land and Water Department (ELW) and Sierrita Water Company. ELW tasks center around the regular data acquisition, monitoring of trends and notification regarding identified issues, with a focus on yield goals for the system and individual wells. Sierrita Water Company tasks are mainly concerned with the maintenance and operation of the well field. Their main goal is to ensure that the system is running smoothly and efficiently, and to remedy any equipment malfunctions or failures, and to respond to trends and

identified issues with the required troubleshooting and repair or rehabilitation of the wells. The Sierrita Water Company is tasked with keeping the well pumps operating at the maximum possible availability.

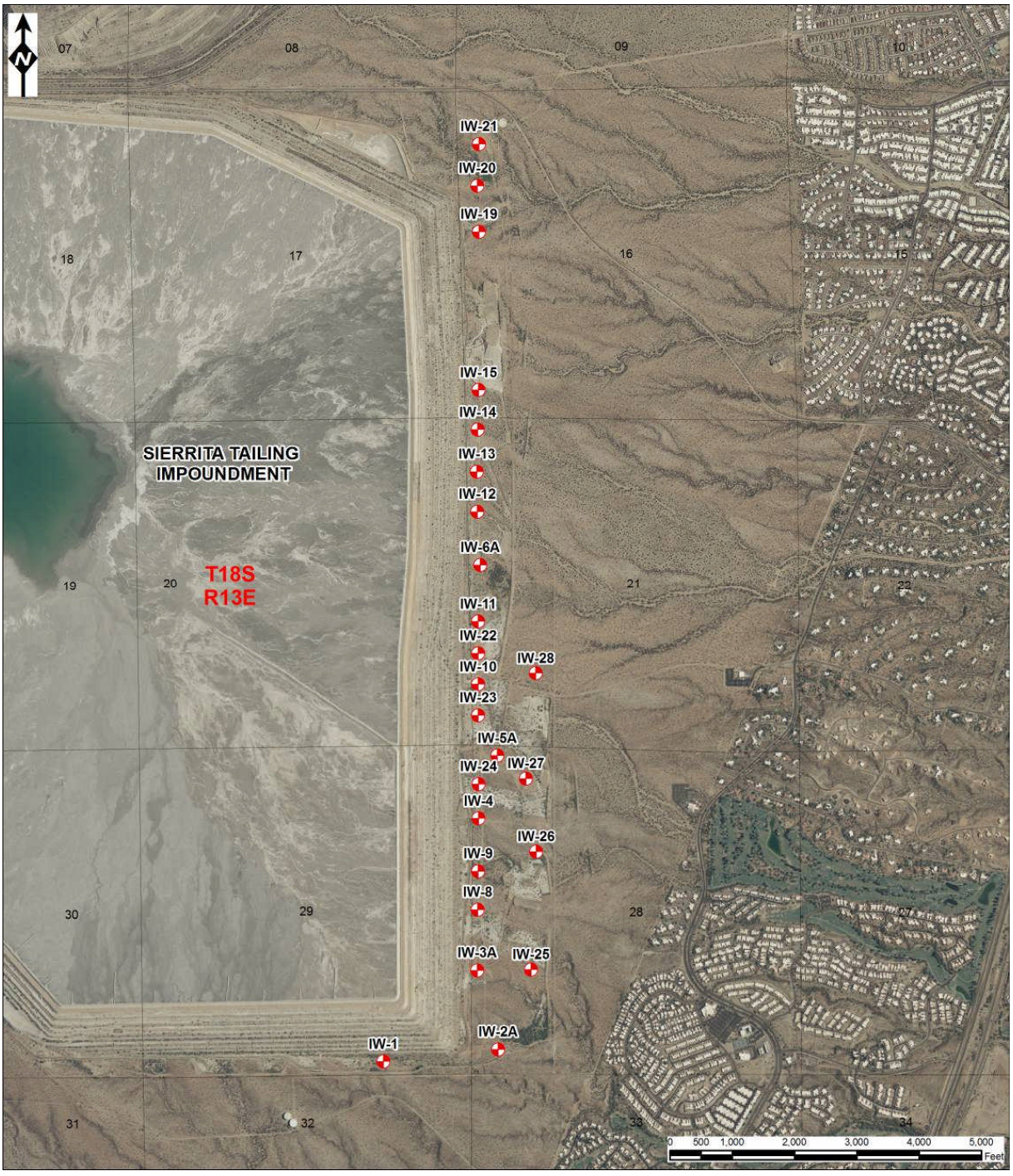


Figure 1. 2011 Sierrita Interceptor Wells Field

TABLE 1. 2011 SIERRITA INTERCEPTOR WELL FIELD INFORMATION

Well	Cadastral Location	ADWR Reg. No.	Target Yield Rate (gpm)	Well Depth (ft)	Well Dia. (in.)	Borehole Diameter (in.)	Casing Material	Upper Screen Depth (ft bls)	Lower Screen Depth (ft bls)	Pump Gallery?/Interval (ft bls)	Current Pump Setting (ft bls)	Filter Pack Material	Basinfill Alluvium Base Depth (ft bls)	Drill Date	Well Age
IW-1	D-18-13 29DCD	55-623129	250	855	14		STEEL	234	843	No	480	GRAVEL	760	7/31/1978	32.9
IW-2A	D-18-13 28CCC	55-216464	425	1051	14	20	STEEL	350	1031	600-640	620	GRAVEL	1020	3/11/2008	3.2
IW-3A	D-18-13 28CBC	55-201732	500	1052	14	20	STEEL	400	1030	No	540	GRAVEL	820	1/1/2004	7.4
IW-8	D-18-13 28BCC	55-508236	425	783	14	20	STEEL	382	783	No	540	GRAVEL	759	7/26/1984	26.9
IW-9	D-18-13 28BCC	55-508238	250	853	14	20	STEEL	412	853	No	605	GRAVEL	740	8/6/1984	26.9
IW-4	D-18-13 28BCB	55-623132	80	946	14		STEEL	312	946	No	600	GRAVEL	490	7/23/1978	32.9
IW-24	D-18-13 28BBB	55-200556	100	884	14	20	STEEL	348	860	No	602	GRAVEL	410	1/1/2004	7.4
IW-5A	D-18-13 28BBB	55-219131	100	900	14	20	STAINLESS	382	890	620-640	630	TACNA	436	5/1/2010	1.1
IW-23	D-18-13 21CCB	55-200555	150	964	14	20	STEEL	375	935	No	550	TACNA	420	1/1/2004	7.4
IW-10	D-18-13 21CBC	55-508237	325	831	14	20	STEEL	420	831	No	600	GRAVEL	730	8/15/1984	26.8
IW-22	D-18-13 21CBC	55-200554	325	590	14	20	STEEL	359	560	No	550	GRAVEL	550	1/1/2004	7.4
IW-11	D-18-13 21CBC	55-508235	325	605	14	20	STEEL	371	605	No	500	GRAVEL	563	8/24/1984	26.8
IW-6A	D-18-13 21BCC	55-545565	90	497	12	20	STEEL	356	456	No	460	GRAVEL	456	11/29/1994	16.5
IW-12	D-18-13 21BCB	55-545555	150	600	12	20	STEEL	358	560	No	560	GRAVEL	498	12/6/1994	16.5
IW-13	D-18-13 21BBC	55-545556	0	497	12	20	STEEL	355	456	No	460	GRAVEL	452	12/1/1994	16.5
IW-14	D-18-13 21BBB	55-545557	75	549	12	20	STEEL	357	508	No	520	GRAVEL	509	12/20/1994	16.5
IW-15	D-18-13 16CCC	55-545558	50	547	12	20	STEEL	357	506	No	505	GRAVEL	507	1/8/1995	16.4
IW-19	D-18-13 16BCC	55-545562	200	540	12	20	STEEL	379	499	No	522	GRAVEL	498	1/30/1995	16.4
IW-20	D-18-13 16BCB	55-545563	0	502	12	20	STEEL	380	460	No	460	GRAVEL	470	2/6/1995	16.3
IW-21	D-18-13 16BBC	55-545564	150	601	12	20	STEEL	400	560	No	520	GRAVEL	520	2/1/1995	16.4
IW-25	D-18-13 28CBD	55-219596	YTBD	782	16	24	STAINLESS	359	720	No		SILICA SAND	475	11/1/2010	0.6
IW-26	D-18-13 28BCD	55-219143	YTBD	780	16	24	STAINLESS	340	720	No		SILICA SAND	475	11/1/2010	0.6
IW-27	D-18-13 28BBD	55-219136	YTBD	720	14	22	STAINLESS	380	660	No		SILICA SAND	465	11/1/2010	0.6
IW-28	D-18-13 21CCA	55-219137	YTBD	760	16	24	STAINLESS	380	700	No		SILICA SAND	680	11/1/2010	0.6

SIERRITA INTERCEPTOR WELL FIELD OPERATION AND MAINTENANCE MANUAL

2.0 DESCRIPTION

2.1 INTERCEPTOR WELL INSTALLATION AND CONSTRUCTION

Interceptor wells were installed from 1978 to 2010, resulting in current well ages from 0.5 to 33 years as of the date of this O&M Manual. The installation dates of the interceptor wells are provided in Table 1. A number of wells have been replaced since installation including IW-2, IW-3, IW-5, and IW-6 (Replacement well names are designated with an "A" suffix on Table 1.) As referenced in Table 1, four additional wells, IW-25, IW-26, IW-27 and IW-28, were installed in late 2010 and, as of the date of this O&M Manual, are in the process of being equipped with pumping equipment.

Based on available information, the majority of the wells were drilled by the reverse-circulation rotary method, but historic information suggests early wells may have been drilled by the cable-tool method. All wells installed prior to 2010 utilized low-carbon steel casing. Stainless steel casing was utilized for wells installed in 2010 (IW-5A, IW-25, IW-26, IW-27 and IW-28) with the goal of extending well life, because the corrosive nature of local groundwater is suspected to have attributed to past well failures. IW-2, IW-3, IW-5 and IW-6 were replaced due to well integrity issues occurring within 25 to 30 years of their installation.

Well depths range from 497 to 1,052 feet. Well diameters range from 12 to 16 inches. Screen intervals are comprised of Mill slots for early wells, and louvered openings for recent wells. All wells are gravel packed with standard industrial graded gravel, Tacna gravel or silica sand.

General well construction diagrams of all active interceptor wells with general stratigraphic sequence penetrated by wells are illustrated on Interceptor Well Field Data Plots included in Appendix A and discussed in Section 4.5.

2.2 WELL YIELD AND GENERAL HYDROGEOLOGY

Current well yields are generally consistent with current target rates as shown on Table 1. Well yields as of late May 2011, ranged from 25 to 577 gallons per minute (gpm) as illustrated on Interceptor Well Field Data Plots included in Appendix A.

All active interceptor wells penetrate saturated portions of basinfill alluvium and bedrock in varying proportions. Basinfill alluvium in the area consists of unconsolidated to moderately consolidated sand, gravel, silt and clay. Bedrock in the area consists of fractured igneous and sedimentary rocks as illustrated on Interceptor Well Field Data Plots included in Appendix A. Well yields are generally greater where saturated thickness of basinfill alluvium is greater.

Similarly, well yields have declined significantly in strong correlation to declining groundwater levels reducing saturated thickness of basinfill alluvium. Based on this hydraulic response, it strongly suggests that permeability characterisicstics of basinfill alluvium is significantly greater than fractured bedrock in the area.

IW-16, IW-17 and IW-18 were deactivated in early 2011 due to the progressive reduction of yield to less than 25 gpm as a result of dewatering of large portions of basinfill alluvium. These wells are consequently not included on Figure 1 and Table 1.

2.3 EXISTING PUMP EQUIPMENT

In general, the following equipment is installed at each interceptor well:

- Vertical solid shaft motor and line-shaft turbine pump, or submersible well pump and motor;
- Steel conduit (3/4-inch or ½-inch diameter) installed in the well for obtaining manual groundwater level measurements with a water level sounder;
- Oil reservoir (drum) and feed tube for lubrication of line-shaft;
- Air release assembly and in-line check valve assembly in discharge pipe.

2.4 EXISTING WELLHEAD INSTRUMENTATION AND MONITORING EQUIPMENT

In general, the following equipment is installed at each wellhead:

- Sampling port at the wellhead to obtain groundwater samples;
- Flow rate transmitters and digital display for continuous flow-rate monitoring;
- Pressure gauge for determining the wellhead pressure and reviewing discharge piping system conditions.

The following monitoring and operational capabilities exist for each well:

- Interceptor well operation is supervised at central control at the mine site. Data is monitored in real-time and also archived for historical recordkeeping and trending. The automation and information interface allows Sierrita Water Company personnel to review the current and historical operation of each well.
- Telemetry and automation functions currently include remote on/off control and flow data recording and archiving.
- Low pumping rate protection of the pump and motor occurs via a low flow trigger in the telemetry system. Low flow generally triggers motor shut-down at measured pumping rates of 50 gpm or less for a period of 5 minutes.

SIERRITA INTERCEPTOR WELL FIELD OPERATION AND MAINTENANCE MANUAL

3.0 OPERATIONAL REQUIREMENTS

3.1 TARGET YIELD RATES

Target yield rates for each interceptor well are presented on Table 1. These rates were established by numerical groundwater flow modeling to determine the pumping rate required to effectively contain and capture seepage from the Sierrita Tailings Impoundment by creating a hydraulic "sink" within the groundwater aquifer. However, numerical groundwater flow modeling is only as accurate as the accuracy of input parameters. Optimum target yield rates should be recalculated by recalibration of the model as new data describing changing groundwater conditions are collected and analyzed.

3.2 PUMPING PRIORITY

As previously stated, one of the principle well performance goals is to operate all interceptor wells at a continual duty cycle, as close as practical to 100 percent duty cycle operation to maintain the hydraulic "sink" in the groundwater aquifer. In practical terms, 100 percent duty cycle cannot be achieved due to required well monitoring, maintenance or rehabilitation activities. All maintenance activities resulting in a deactivation of interceptor wells for a period of time should be performed, whenever possible, such that neighboring wells remain active.

In the event of equipment malfunction or well failure, appropriate corrective actions should be taken immediately to bring the well back into operation as quickly as possible. Corrective actions should include troubleshooting and identifying the cause(s) of malfunction or failure, followed by appropriate pump maintenance, well repair, well rehabilitation, etc. to remedy the cause of malfunction or failure. The goal of this O&M Manual is to assist Sierrita personnel in maximizing the operation of the Interceptor Well Field.

3.2.1 NEW WELLS IW-25 THROUGH IW-28

As the date of this O&M Manual, IW-25, IW-26, IW-27, and IW-28 had not yet been brought online. When these wells are first brought into production, more frequent monitoring will be required of these wells and other wells in the vicinity, as the operation of the existing wells is expected to be impacted by the additional pumping. The most likely impact scenario will be a change to the pumping water level of existing wells, that will result in a change in the yield for the existing well pumps. The yields of existing wells and the new interceptor wells need to be analyzed and well equipment modified in order to maintain sustainable target yield rates. This process may be iterative, as several adjustments may be required until all the wells in the area reach a new equilibrium with respect to the head, flow conditions, installed pumping equipment and required target yield rate.

SIERRITA INTERCEPTOR WELL FIELD OPERATION AND MAINTENANCE MANUAL

4.0 MAINTENANCE MONITORING

4.1 MONITORING REQUIREMENTS

Optimizing well field performance requires routine monitoring of a set of relevant parameters that describe the following on a well-by-well basis:

- Groundwater Conditions
- Well Hydraulics
- Pumping Equipment Efficiency

4.1.1 GROUNDWATER CONDITIONS AND WELL HYDRAULICS

Parameters that describe groundwater conditions include the following:

- Static water level
- Sulfate Concentrations

Parameters that describe well hydraulics include the following:

- Yield
- Static water level
- Pumping water level

Measurements of yield, and static and pumping water levels allow for the evaluation of the following derivative parameters:

- Specific capacity
- Saturated thickness of basin fill alluvium under non-pumping conditions.
- Saturated thickness of basin fill alluvium under pumping conditions.

Monitoring and evaluating groundwater parameters (static water levels and saturated thickness of basin fill alluvium under non-pumping conditions) over time on a well-by-well basis provides important insight on potential maximum yield (and rate of capture of elevated sulfate) of a particular interceptor well given the existing groundwater conditions.

Specific capacity, instantaneous yield divided by stabilized water-level drawdown, is considered one of the most important derivative well hydraulic parameters. Specific capacity is calculated by the following relationship.

$$SC = \text{Well Yield}/(PWL-SWL)$$

where SC = Specific Capacity (gpm/ft)

PWL = pumping water level (ft)

SWL = static water level (ft)

Monitoring and evaluating changes in specific capacity over time and saturated thickness of basin fill alluvium under pumping conditions on a well-by-well basis provides important insight on changing well hydraulics resulting from progressive well plugging or thinning of basin fill alluvium. Well plugging is caused by a buildup of inorganic encrustations (mineral salts) or bio-fouling byproducts on slots of perforated well casings causing significant increases in well losses. Specific capacity can also be influenced by changing groundwater conditions, so the evaluation of potential well plugging must also consider parameters that describe thinning of basin fill alluvium.

Evaluations of saturated thickness of basin fill alluvium under non-pumping and pumping conditions is performed by subtracting static and pumping water levels from the base depth of basin fill alluvium, respectively. Estimation of base depth of basin fill alluvium at each interceptor well is shown on Table 1.

4.1.2 PUMPING EQUIPMENT EFFICIENCY

Parameters that describe pump equipment efficiency include the following:

- Yield
- Pumping water level
- Head pressure
- Motor amps
- Sand production

Measurements of yield, pumping water level (lift requirement), head pressure and motor amps allow for the evaluation of pump efficiency, considering pump setting and specifications (pump curves) of pump and motor equipment installed in a particular interceptor well. Pressure at the wellhead can also be used as an indicator to review performance of the transmission piping system. Performance pumping evaluations should be conducted before and after maintenance operations, and on an annual basis to document well and pump performance and assist in decision making for pump replacement or well remedial work.

Sand production can result in excessive wear on pumping equipment (impellers, bearings, etc) resulting in progressive loss in pump equipment efficiency and eventual failure. To date, sand production had only been monitored sporadically on a qualitative basis. In the future, more quantitative measurements may be recommended utilizing a portable Rossum sand indicator installed, as required, at discharge piping.

4.2 MONITORING RESPONSIBILITIES

Regular inspection and precise record keeping is vital to proper well operation and maintenance. Therefore, varying levels of site and equipment inspections and data logging should occur on a daily, monthly, and annual basis. Operators should provide documentation showing variations of pump and well performance. This information should be used to chart changes in groundwater conditions with influence on well performance (e.g. decreases or increases in basin fill thickness due to changes in regional water levels). A complete set of records should include a detailed log of well components to facilitate ordering of parts for pump repairs as well as identification of existing parts that may be wearing faster than normal.

Example formats for field data collection and wellhead status, and example spreadsheets showing compiled data are provide in Appendix B. Forms for well pump performance are provide in Appendix C.

4.2.1 ENVIRONMENT, LAND, AND WATER DEPARTMENT RESPONSIBILITIES

Environment, Land, and Water Department (ELW) responsibilities center around the regular data acquisition, monitoring of trends and notification regarding identified issues, with a focus on yield goals for the system and individual wells. The frequency of the tasks designed for this purpose is as follows;

4.2.1.1 Weekly

- Record yield rate and totalized volume for the previous period for each well.
- Record total hours of operation (run-hours) of each well
- Collect amperage readings at each well site.
- Collect pressure readings at each well site.
- Compare collected yield rate data to target yield rate at each well.
    - Flag those values that are 10% less than target rate to monitor further.
    - Flag those values that are 20% less than target rate for immediate action.
- Provide list of flagged well sites to Sierrita Water Company for corrective action.

4.2.1.2 Monthly:

- Graph average production yield rates and volumes for wells, for comparison with previous months.

- Review run-hour data and analyze to determine which pumps (if any) are running significantly more or less often than the other pumps.
- Measure and record pumping water levels of each well. Measurement protocol is that pumping water level be measured after well is pumping for at least 3 hours.
- Measure and record static pumping levels for certain set of nearby wells in the well field, alternating and staggering which wells are taken briefly out of operation for this purpose. Strategic planning needs to be provided for task, to ensure that disruption to the system is minimized by proper choice of concurrent well shutoffs. This task should be timed as much as possible to coincide with well outages conducted for maintenance purposes. Measurement protocol is that static water level be measured after well is shut down for at least 3 hours.

4.2.1.3 Quarterly:

- Evaluate performance of each pump, using procedures provided in Appendix C.
- Sample and collect groundwater sample from each well for analysis of sulfate. Deliver water sample to laboratory according to Sierrita sampling protocols.

4.2.1.4 Yearly:

- Aggregate all data collected throughout the year for analysis and reporting, including well and pump operation information from Sierrita Water Company.
- Compile a yearly summary of well and pump operation, well field pumping volume, aquifer status, and water quality results. A copy of the report should be kept in the ELW and Sierrita Water Company offices for long-term analysis of well field and aquifer status.
- Work with outside groundwater hydrologist to adjust target yield rates of all interceptor wells in well field to provide effective and efficient capture of elevated sulfate.
- Evaluate pumping performance to assist in decision-making for pump replacement or well remedial work. More information on this decision making process is provided in Section 4.4. This evaluation may not be necessary for any wells that have been rehabilitated or repaired within the last 12 months.

4.2.2 SIERRITA WATER COMPANY RESPONSIBILITIES

Sierrita Water Company responsibilities center around the O&M activities of the well field and piping systems. **It is imperative that the Interceptor Well Maintenance Record is kept current with all information from the wells as maintenance activities are performed**. The frequency for tasks assigned to Sierrita Water Company is as follows;

4.2.2.1 Weekly:

- Observe mechanical parameters (pressure gauge) reading for wellheads and pressure gauges in the transmission piping system.
- Inspect transmission piping system for leaks or other malfunctions.

4.2.2.2 Bi-Weekly:

- Inspect well discharge and transmission pipelines for:
    - Proper operation of valves and ancillary piping (hose bib operation for water quality sampling, gate valves, check valve, vacuum release, etc.)
    - Leaks at valves.
    - Proper operation of pressure gauges
    - Proper operation of discharge manifolds.
    - Proper operation of magnetic flow meter. Service and maintain according to manufacturer's recommendations.
- Replenish oil reservoir and verify oiler rate is correct. Repair oiler or oiler piping if necessary.
- Motor Maintenance
    - Service and maintain according to manufacturer's recommendations.
    - Check and record incoming voltages and check for voltage and current imbalances. If an unbalanced condition exists that cannot be corrected by adjustments to the plant equipment, then the power supplier needs to be contacted.
    - Inspect for leaking oil, unusually high surface temperature, unusual noise or smells, or excessive vibration. Pull and replace improperly functioning motors as needed with electrical assistance of rotation check and rewiring.
- Pump Maintenance
    - Service and maintain according to manufacturer's recommendations
    - Review data received from ELW to coordinate timelines for temporary removal of wells from active service to perform maintenance or rehabilitation.
    - Examine data received from ELW to assess possible problems with well functionality
    - Schedule repairs and well downtime.
- Well Casing Vent Maintenance
    - Check for proper operation
    - Check screen for integrity
    - Ensure that all fittings are tight and sealed
- Pump Pedestal
    - Check for developing cracks and repair/seal as necessary

- Air Release/ Vacuum Breaker Assembly
  - Check for proper orientation
  - Check screen integrity
  - Service per the manufacturer's recommendations

4.2.2.3 Monthly:

- Provide a detailed log of changes to the pumping equipment to ELW.

4.2.2.4 Yearly:

- Provide a yearly summary of well and pump operations.

4.2.2.5 General Responsibilities – As Needed:

- Replace any leaking or malfunctioning parts or piping.
- Troubleshoot any red flagged wells received from ELW.
- Work with pump distributor and/or manufacturer to assess all items and materials used in well, both above and below ground for possible upgrades to extend the life of pumps and to rehabilitate wells.
- Fabricate and replace improperly functioning discharge line manifolds

4.2.3 WELL FIELD DATA MANAGEMENT

Well field data management includes input of all monitoring parameters into dedicated spreadsheets or dedicated relational database for data storage, manipulation and analysis. Industry standard quality assurance/quality control (QA/QC) procedures must be performed prior to input into the dedicated database. Well field data management activities should be conducted by a professional groundwater hydrologist with significant experience with groundwater production wells. BasinWells is contracted to Sierrita to perform these professional services for the 2011 calendar year.

4.3 WELL PERFORMANCE EVALUATIONS

Effective evaluations of well performance on a well-by-well basis require simultaneous, multi-parameter, time-series analyses of groundwater conditions, well hydraulic and pumping equipment parameters. Troubleshooting of suspected deterioration conditions can then be performed to identify effective remedial actions.

To effectively perform simultaneous multi-parameter analyses to evaluate well performance over time, well specific data plots were developed by BasinWells in early 2011. Copies of all data plots dated June 7, 2011 are included in Appendix A.

The plots include the following:

- Interceptor well location map with cadastral location, Arizona Department of Water Resources registration number, and year of construction.
- General well construction diagram with current pump setting, and earliest and latest measured static water level data from 2003 to 2011.
- General stratigraphic sequence with saturated thickness of basinfill alluvium under static conditions based on most current static water level depth.
- Time series plot of available static and pumping water level data from 2003 to 2011 with base depth of basinfill alluvium.
- Time series plot of available yield and evaluated specific capacity data from 2003 to 2011 with target yield rate. [Specific capacity values were only calculated where yield and pumping water levels were measured on the same day and static water level measured within a time frame of +/- 30 days. Future plots will include specific capacity values calculated from pumping and static water levels within a time frame of +/- 30 days of the yield measurement.]
- Time series plot of available sulfate concentrations and saturated thickness of basinfill alluvium under pumping conditions based on most current pumping water level depth.
- Annotated information of past well failures, reconstructive maintenance, well rehabilitation and cleaning activities with dates.

A full set of data plots for all active interceptor wells will be updated and copies submitted to ELW Department and Sierrita Water Company staff on a quarterly basis. Additional parameters (i.e. head pressure) may be added to the plots in the future.

In 2011, IW-25, IW-26, IW-27, and IW-28 will be equipped and activated. Well interference effects potentially may negatively affect yield rates of neighboring wells by altering local groundwater conditions. These effects must be evaluated once these wells are activated. Revisions to target yield rates may be required if well interference affects are determined to be significant.

SIERRITA INTERCEPTOR WELL FIELD OPERATION AND MAINTENANCE MANUAL

5.0 MAINTENANCE REQUIREMENTS

5.1 PUMP EQUIPMENT MAINTENANCE

Pump equipment maintenance activities may include the following and will be performed on an as-needed basis:

- Replacement of deteriorated or failed pump or motor equipment.
- Replacement of deteriorated and leaking column pipe.
- Replacement of inoperable flow meters and well head pressure gages.

Sizing of replacement pump equipment should be performed under the review of an engineer or other professional familiar with well pump sizing criteria. When wells are taken out of operation for pump replacement, step-rate pump testing is recommended to acquire current hydraulic data to form the basis of pump and motor replacement.

When a pump equipment part is determined to be in need of replacement or rehabilitation, the Sierrita Water Company or Contractor should record the following information in the Interceptor Well Maintenance Record using the Well Rehabilitation Report form provided for record-keeping during pumping equipment replacement or maintenance. Sample report provided in Appendix D:

- Location of maintenance event
- Date of maintenance event
- Part replaced or rehabilitated and reason for its replacement or rehabilitation
- New tare distance of sounding tube in relation to survey control point for the well, if applicable.

A well outage to allow for repairs and/or rehabilitation provides a convenient opportunity to perform tasks that may only be performed on a non-operating well. Sierrita Water Company should perform the following tasks whenever repairs or rehabilitation require that a well be shut down:

- Notify ELW of shutdown and startup of well.
- Measure and record static water level measurement on well. Measurement protocol is that static water level be measured after well is shut down for at least 3 hours.
- If well pump equipment has been removed, perform well review and rehabilitation in accordance with Section 5, documenting all activities.

- Mark tare distance and date in prominent place on sounding tube in permanent marker.

Historically, deteriorated and leaking column pipe has been realized in the Interceptor wells at a frequency of 3 to 4 years. Column pipe historically used consist of low-carbon steel. The new Interceptor wells, IW-25, IW-26, IW-27 and IW-28, will be installed with stainless steel column piping. It is recommended that the performance of the column pipe be monitored and a cost/benefit evaluation be performed to evaluate the efficacy of utilizing column pipe manufactured with more corrosive-resistant steel or epoxy coated low-carbon steel.

5.2 WELL CLEANING AND REDEVELOPMENT

Well cleaning and redevelopment activities may include the following and it is recommended that these be performed on a scheduled basis at a frequency of 3 to 4 years at each well or at every occurrence when pumping equipment is removed.

- Brush and bail cleaning
- Dry ice treatment
- Over pumping redevelopment with a test pump
- Acid treatment
- Bio-fouling treatment with biocides or oxidizing compounds.
- Performing pre and post cleaning well video surveys is recommended to visually inspect well conditions before and after treatment.

In the past, brush and bail cleaning and dry ice treatments have been applied to select number of interceptor wells. Well performance improvements resulting from these cleaning and redevelopment activities is unclear due to the paucity of specific capacity values before and after treatment. It is recommended that specific capacity values be obtained before and after all future well cleaning and redevelopment activities are performed to provide a metric of the efficacy of these methods in improving well performance.

In the future, other well cleaning and redevelopment methods of over-pumping redevelopment, and acid and bio-fouling treatments will be evaluated to improve well performance.

5.3 WELL REHABILITATION

Well rehabilitation activities may include the following, which will be performed on an as-needed basis:

- Swedge patching (regain well integrity, control sanding)
- Liner installation (regain well integrity, causes decreased diameter)

In some cases where well integrity has been compromised, swedge patching or liner installation may be prudent to extend well life and reduce costs. Sand development may also be controlled if the location of sand invasion can be identified. Liner installation with new casing will invariably reduce well diameter, limiting the size of pumping equipment that can be installed. However, since many of interceptor wells have experienced significant declines in yield as a result of dewatering of portions of basinfill alluvium, installation of appropriately down-sized pump equipment may not be prohibitive.

5.4 WELL REPLACEMENT

Well replacements will be necessary when the life cycle of a particular interceptor well is exceeded. As stated in Section 2.1, all interceptor wells installed prior 2010 were constructed with low-carbon steel casings. Based on life cycles of interceptor wells that have been replaced due to well integrity issues, [IW-2, IW-3, IW-5 and IW-6] typical life cycle of interceptor wells constructed with low-carbon steel casing is about 25 to 30 years.

Priority of replacement should consider review of previously performed or new well video surveys to evaluate current well integrity. Priority of replacement should also consider potential effects on yield of replacement wells from activation of IW-25, IW-26, IW-27, and IW-28. Potential yields of replacement wells for IW-4, IW-8, IW-9, IW-10 may be negatively effected (See Section 4.3) and magnitude of these effects should be evaluated prior to replacing these wells.

To extend well life, all future wells should be constructed with stainless steel casings. Life cycle of wells constructed with stainless steel casings can approach 60 years under normal operating conditions, greatly extending the current well life cycle of interceptor wells at about 25 to 30 years. Well designs should be based on local hydrogeologic conditions.

SIERRITA INTERCEPTOR WELL FIELD OPERATION AND MAINTENANCE MANUAL

6.0 TROUBLESHOOTING GUIDE

6.1 DECLINING WELL PERFORMANCE

Declining well performance may be the result of the following or combination of the following:

- Dewatering of basin fill alluvium.
- Well plugging from a buildup of inorganic encrustations (mineral salts) or bio-fouling byproducts on slots of perforated well casings.
- Pump equipment deterioration or failure (i.e. pump impeller wear , column pipe leaks etc.)
- Increase in wellhead pressure.

As stated in Section 4.1.1, specific capacity is considered one of the most important, derivative well hydraulic parameters in evaluating causes for declining well performance. Specific capacity, along with trends in static water levels, can provide important insight of changing groundwater conditions, alterations of well hydraulics from well plugging, and eminent pump equipment failure. Possible causes of identified trends in specific capacity are listed below:

- Declining trends in specific capacity can be attributed to either aquifer dewatering or well plugging.
- Declining trends in specific capacity with little to no change in static water levels suggests well plugging.
- No change or increase in specific capacity and minimal or no change in static water level, but a decline in instantaneous yield suggests progressive or eminent pump equipment failure. Pumping levels would be expected to rise in this case.

Specific capacity will necessarily decline when instantaneous yield is increased which increases well losses and should be considered in any evaluations.

These corollaries along with parallel evaluations of other parameters can provide the required information to properly identify the cause(s) of declining well performance and allow for effective remedial actions to be developed and applied prior to an unexpected well outage occurs.

6.2 PUMPING EQUIPMENT AND TRANSMISSION PIPELINE DETERIORATION OR FAILURE

If it has been determined that an identified well performance issue is caused by the failing pumping equipment, the following are a list of common causes:

- Improper shaft lubrication causing premature wear of bearings and loss of horsepower. Check oil reservoir drip for proper function.
- Improper pump installation methods may cause leakage at column pipe collars from improper tightening or loss in horsepower due to crooked shafts.
- Poor pump selection for the current operating condition: With proper flow and pressure readings, the operating point of a pump on its pump curve can be determined. A pump in an inefficient range on the pump curve will exhibit poor performance, and shortened operating life. If this is the case, a more suitable pump should be selected and installed. A copy of the pump curve should be provided in the Interceptor Well Maintenance Record, and the operating point of the pump on its curve should be evaluated periodically.
- Poor motor performance: If a pump is in the correct range on a pump curve, the amperages may be checked to ensure that sufficient power is being provided by the motor. Poor performance here may require replacement or rehabilitation of the motor.
- High pressure measurements in the discharge piping or the transmission pipeline may be due to improper functioning of an air release valve. If gradually increasing pressures are recognized, all air release valves along discharge pipeline should be checked to confirm proper functioning. Sudden increases in pressure are likely related to valve closures in the system, and shut-off valves should be checked for position.

APPENDIX A

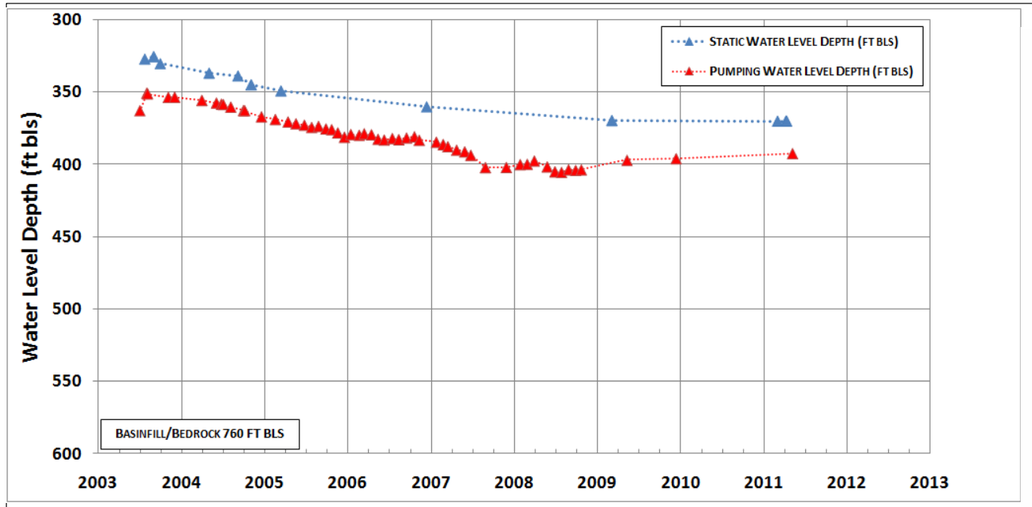
Sierrita Interceptor Well Field Plots (Version Date: June 7, 2011)

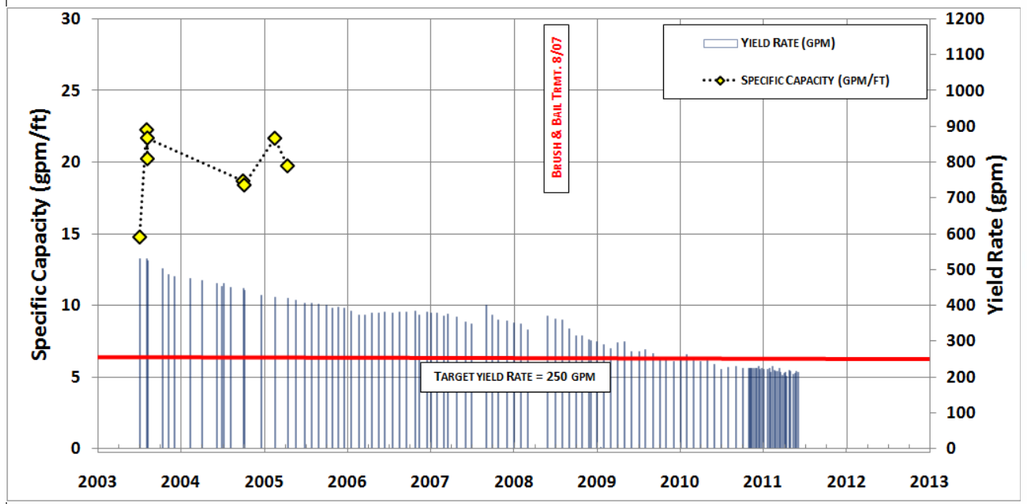
TABLE 1. FREEPORT MCMORAN COPPER & GOLD - SIERRITA OPERATIONS - ACTIVE INTERCEPTOR WELL FIELD SUMMARY INFORMATION - 06/07/2011														
Well	Cadastral Location	ADWR Reg. No.	Well Depth (ft)	Well Dia. (in.)	Borehole Diameter (in.)	Casing Material	Upper Screen Depth (ft bls)	Lower Screen Depth (ft bls)	Pump Gallery?/Interval (ft bls)	Current Pump Setting (ft bls)	Filter Pack Material	Basinfill Alluvium Base Depth (ft bls)	Drill Date	Well Age
IW-1	D-18-13 29DCD	55-623129	855	14		STEEL	234	843	No	480	GRAVEL	760	7/31/1978	32.9
IW-2A	D-18-13 28CCC	55-216464	1051	14	20	STEEL	350	1031	600-640	620	GRAVEL	1020	3/11/2008	3.2
IW-3A	D-18-13 28CBC	55-201732	1052	14	20	STEEL	400	1030	No	540	GRAVEL	820	1/1/2004	7.4
IW-8	D-18-13 28BCC	55-508236	783	14	20	STEEL	382	783	No	540	GRAVEL	759	7/26/1984	26.9
IW-9	D-18-13 28BCC	55-508238	853	14	20	STEEL	412	853	No	605	GRAVEL	740	8/6/1984	26.9
IW-4	D-18-13 28BCB	55-623132	946	14		STEEL	312	946	No	600	GRAVEL	490	7/23/1978	32.9
IW-24	D-18-13 28BBB	55-200556	884	14	20	STEEL	348	860	No	602	GRAVEL	410	1/1/2004	7.4
IW-5A	D-18-13 28BBB	55-219131	900	14	20	STAINLESS STEEL	382	890	620-640	630	TACNA GRAVEL	436	5/1/2010	1.1
IW-23	D-18-13 21CCB	55-200555	964	14	20	STEEL	375	935	No	550	TACNA GRAVEL	420	1/1/2004	7.4
IW-10	D-18-13 21CBC	55-508237	831	14	20	STEEL	420	831	No	600	GRAVEL	730	8/15/1984	26.8
IW-22	D-18-13 21CBC	55-200554	590	14	20	STEEL	359	560	No	550	GRAVEL	550	1/1/2004	7.4
IW-11	D-18-13 21CBC	55-508235	605	14	20	STEEL	371	605	No	500	GRAVEL	563	8/24/1984	26.8
IW-6A	D-18-13 21BCC	55-545565	497	12	20	STEEL	356	456	No	460	GRAVEL	456	11/29/1994	16.5
IW-12	D-18-13 21BCB	55-545555	600	12	20	STEEL	358	560	No	560	GRAVEL	498	12/6/1994	16.5
IW-13	D-18-13 21BBC	55-545556	497	12	20	STEEL	355	456	No	460	GRAVEL	452	12/1/1994	16.5
IW-14	D-18-13 21BBB	55-545557	549	12	20	STEEL	357	508	No	520	GRAVEL	509	12/20/1994	16.5
IW-15	D-18-13 16CCC	55-545558	547	12	20	STEEL	357	506	No	505	GRAVEL	507	1/8/1995	16.4
IW-19	D-18-13 16BCC	55-545562	540	12	20	STEEL	379	499	No	522	GRAVEL	498	1/30/1995	16.4
IW-20	D-18-13 16BCB	55-545563	502	12	20	STEEL	380	460	No	460	GRAVEL	470	2/6/1995	16.3
IW-21	D-18-13 16BBC	55-545564	601	12	20	STEEL	400	560	No	520	GRAVEL	520	2/1/1995	16.4
IW-25	D-18-13 28CBD	55-219596	782	16	24	STAINLESS STEEL	359	720	No		SILICA SAND	475	11/1/2010	0.6
IW-26	D-18-13 28BCD	55-219143	780	16	24	STAINLESS STEEL	340	720	No		SILICA SAND	475	11/1/2010	0.6
IW-27	D-18-13 28BBD	55-219136	720	14	22	STAINLESS STEEL	380	660	No		SILICA SAND	465	11/1/2010	0.6
IW-28	D-18-13 21CCA	55-219137	760	16	24	STAINLESS STEEL	380	700	No		SILICA SAND	680	11/1/2010	0.6

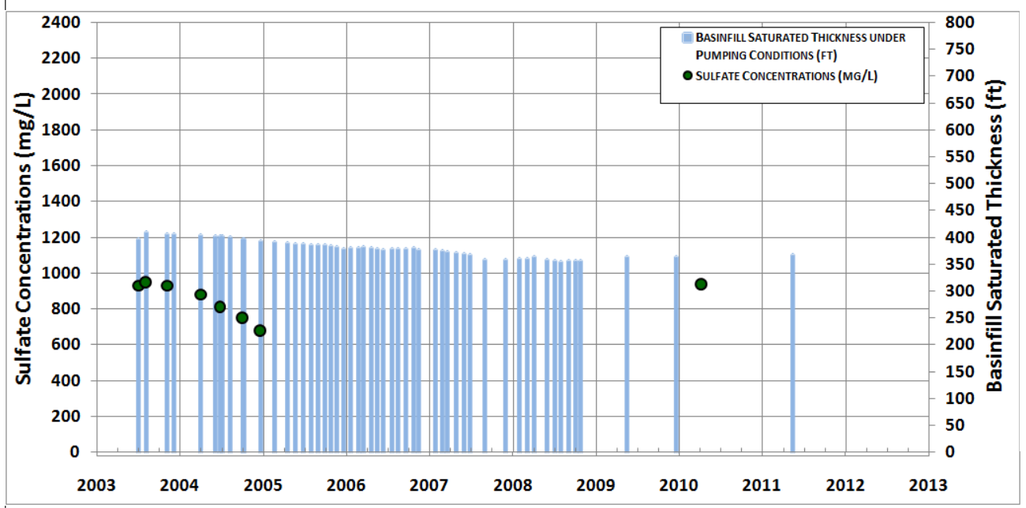
Notes:

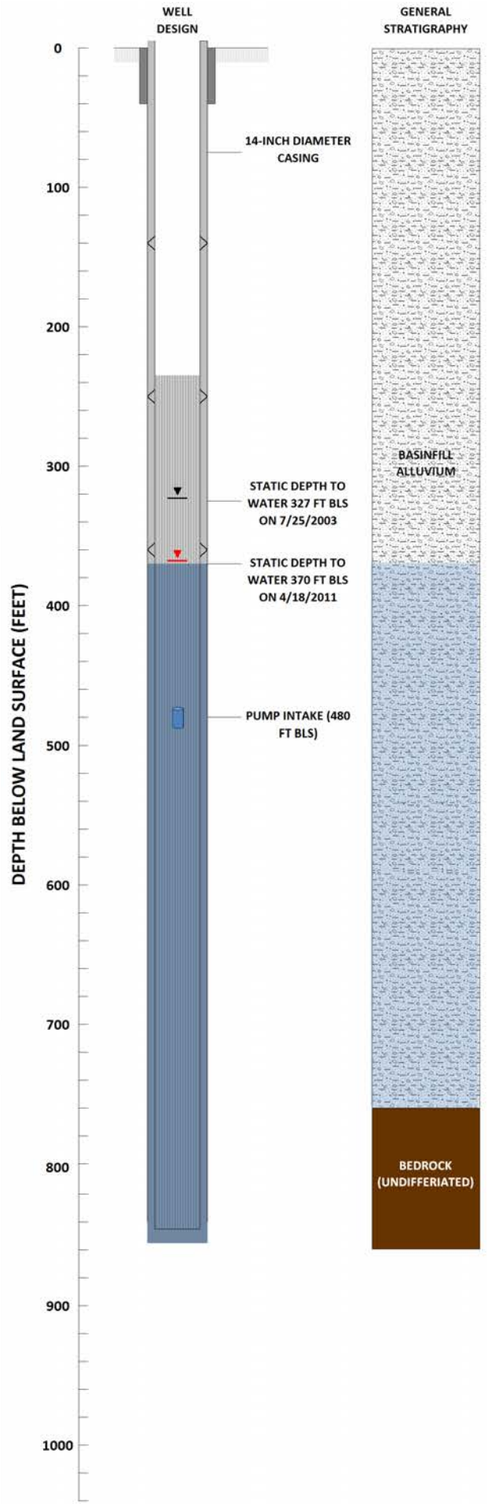
ft bls = feet below land surface

in. = inches









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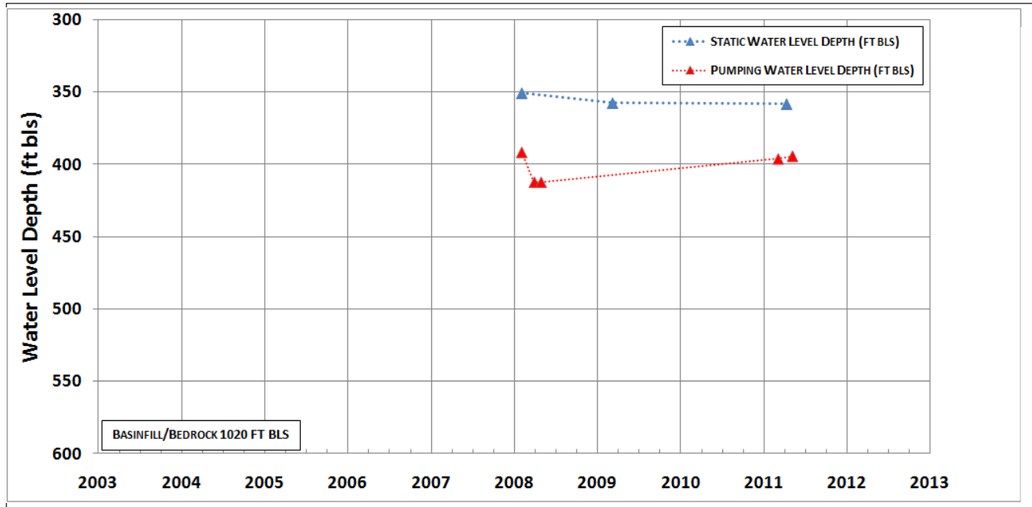
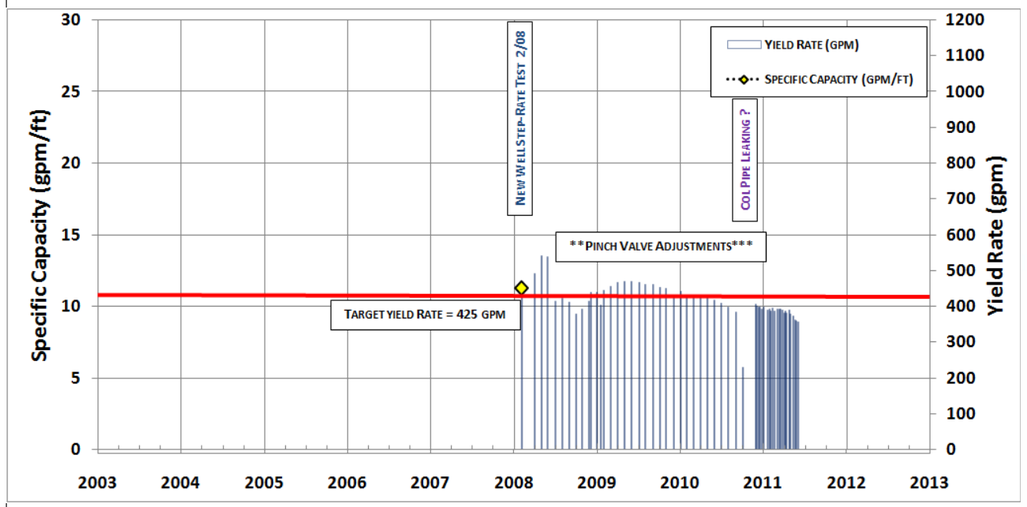
FREEPORT-McMoRan COPPER & GOLD

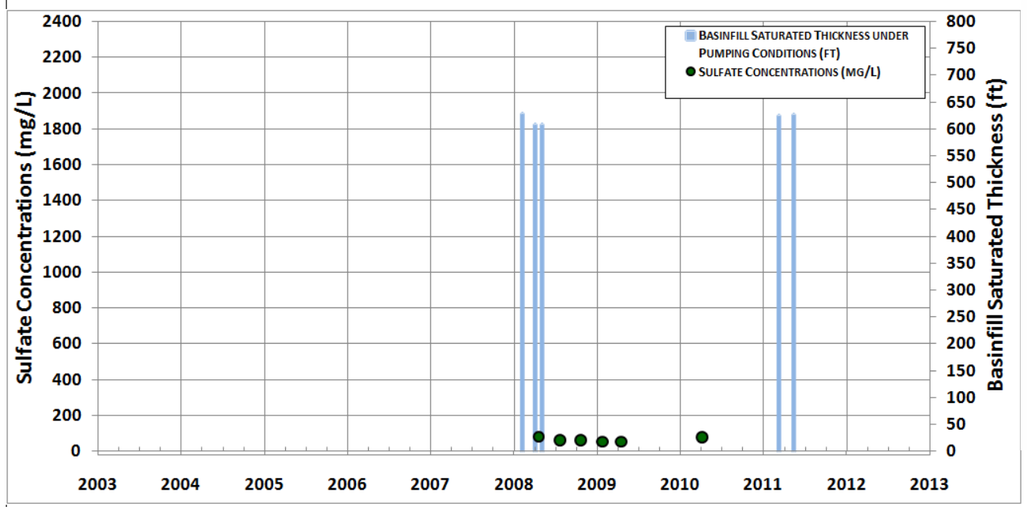
IW-1: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

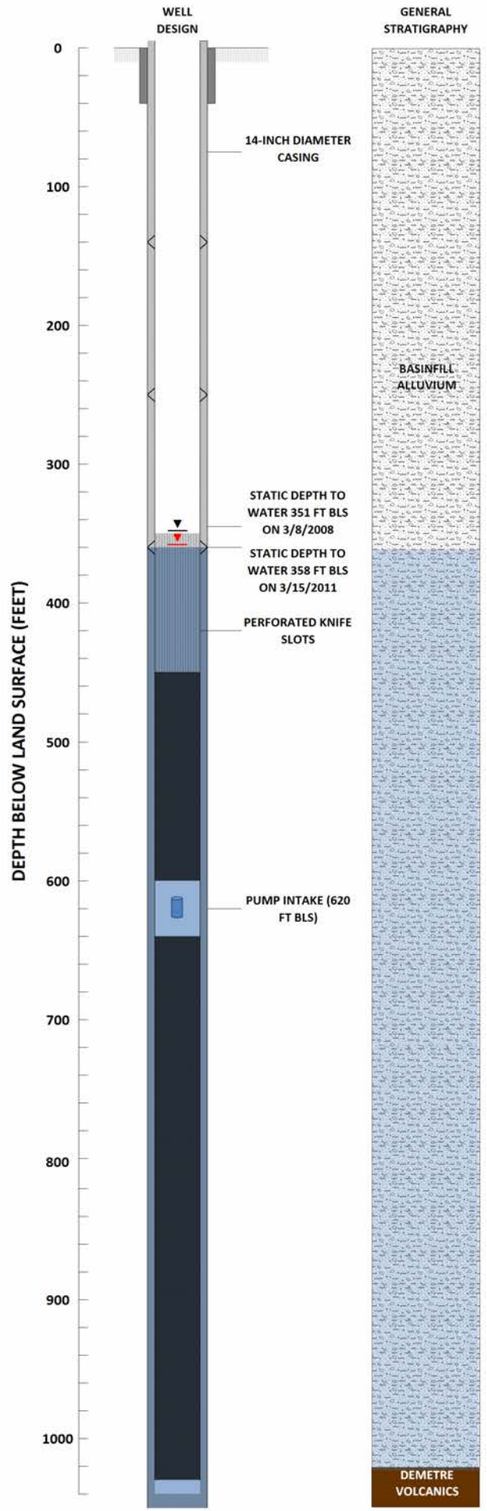
VERSION DATE: JUNE 7, 2011

CADASTRAL: D-18-13 29DCD
ADWR REG. NO.: 55-623129
DRILL YEAR: 1978









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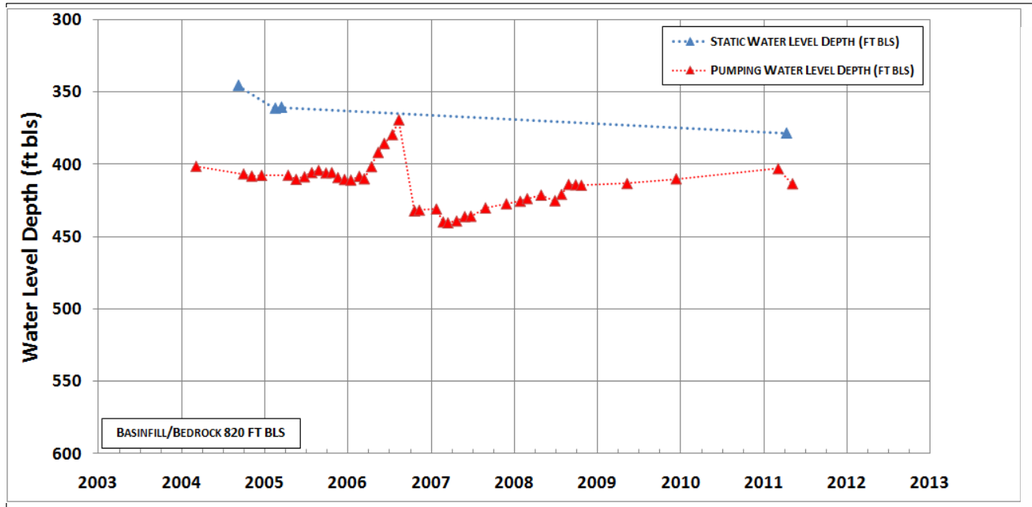
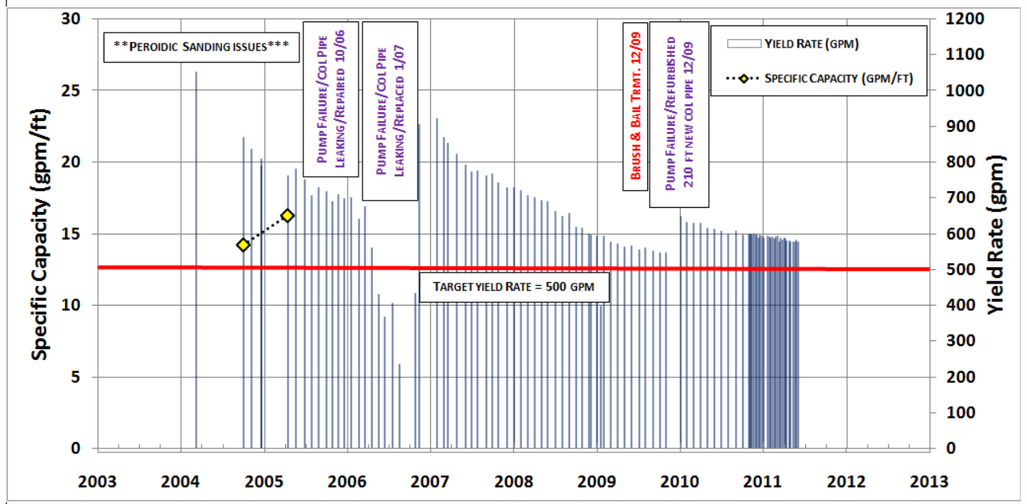
FREEPORT-MCMORAN COPPER & GOLD

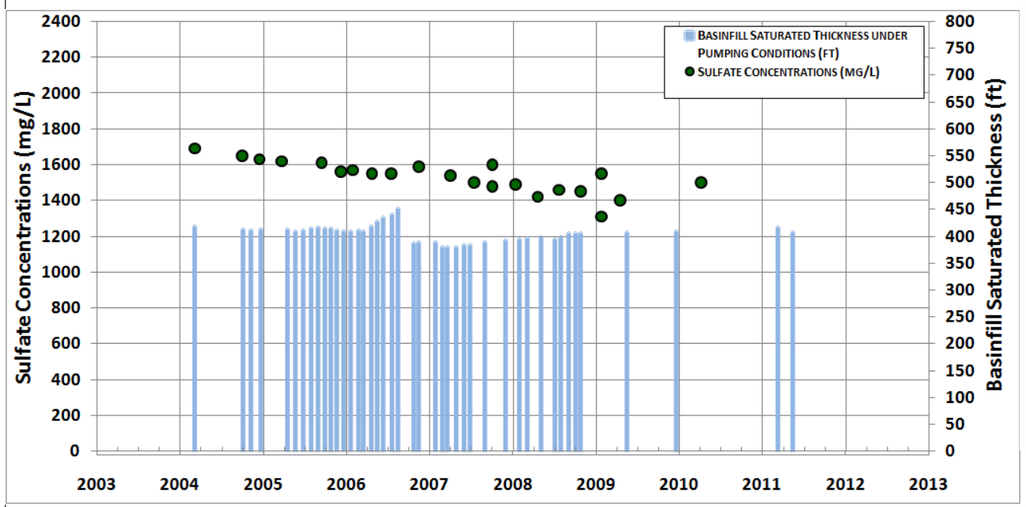
IW-2A: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

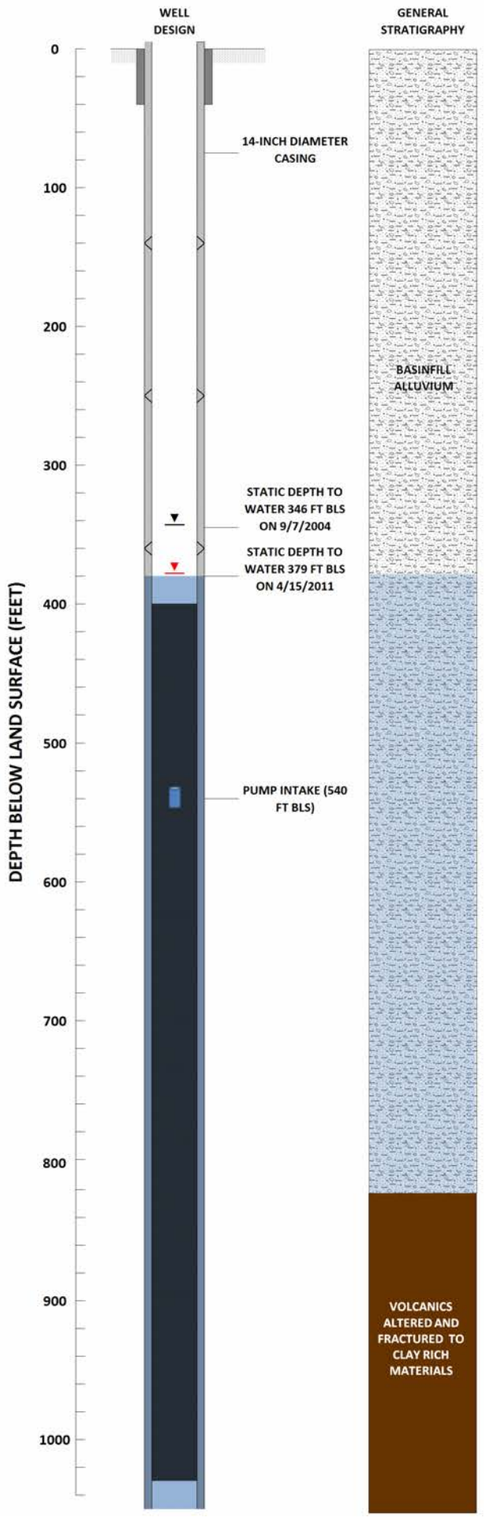
VERSION DATE: JUNE 7, 2011

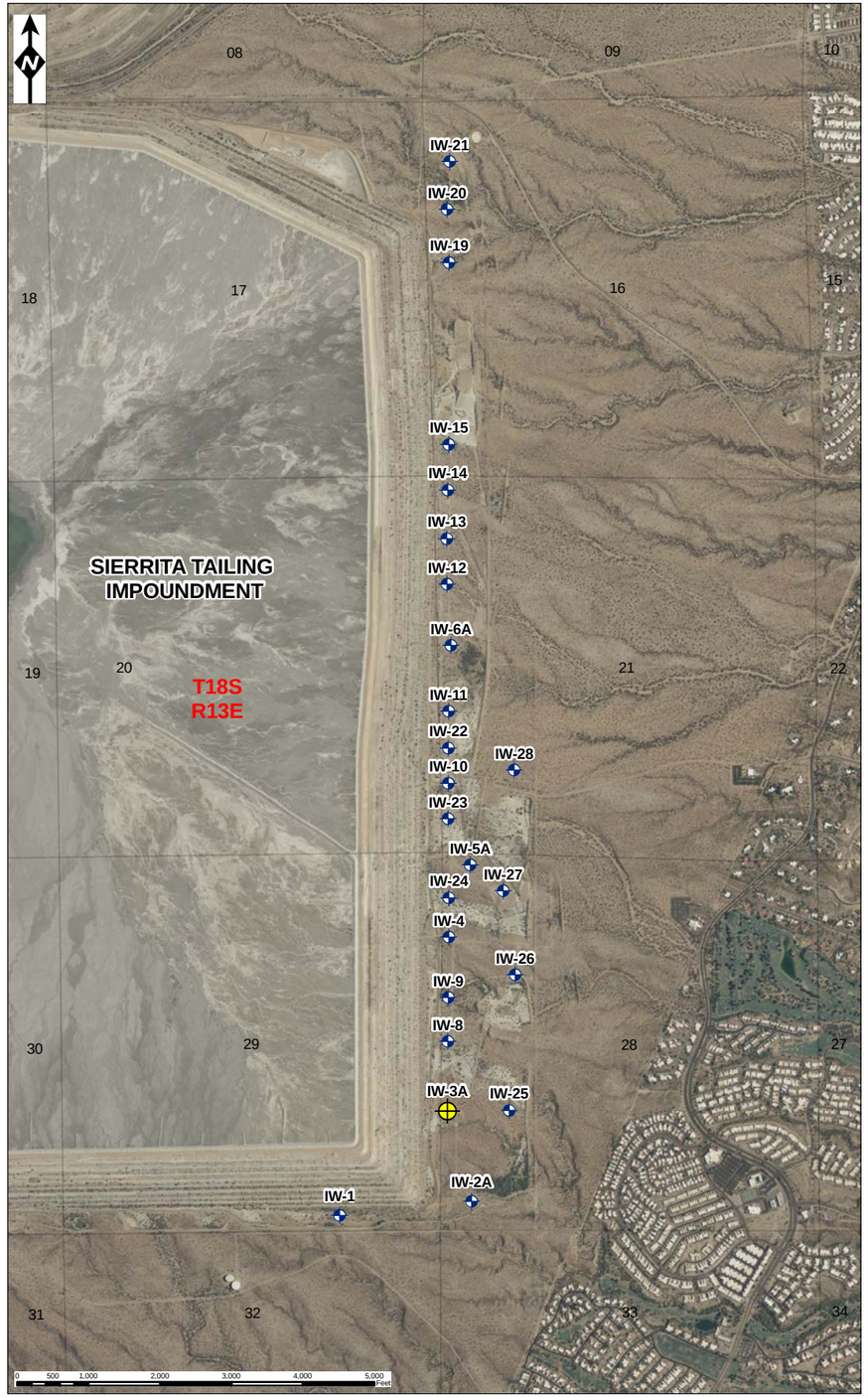
CADASTRAL: D-18-13 28CCC
ADWR REG. NO.: 55-216464
DRILL YEAR: 2008











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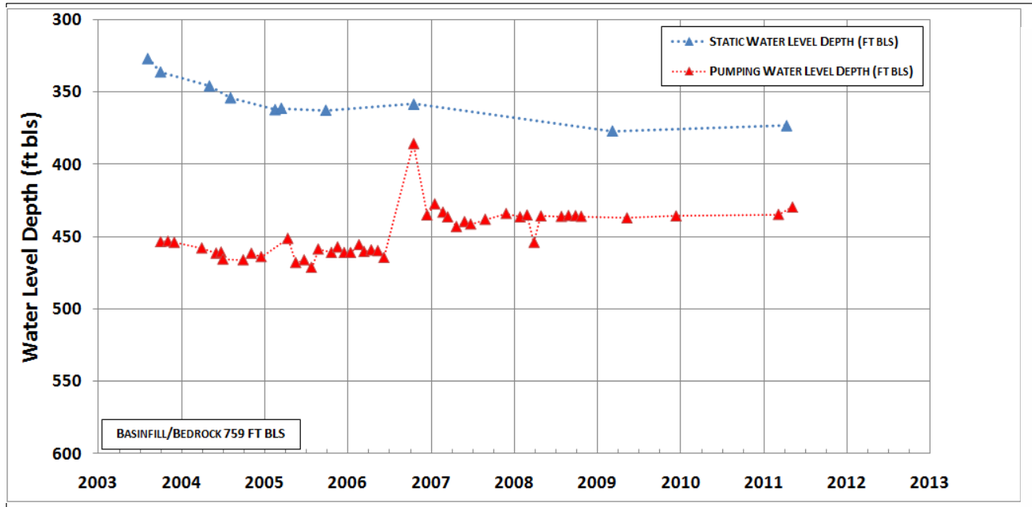
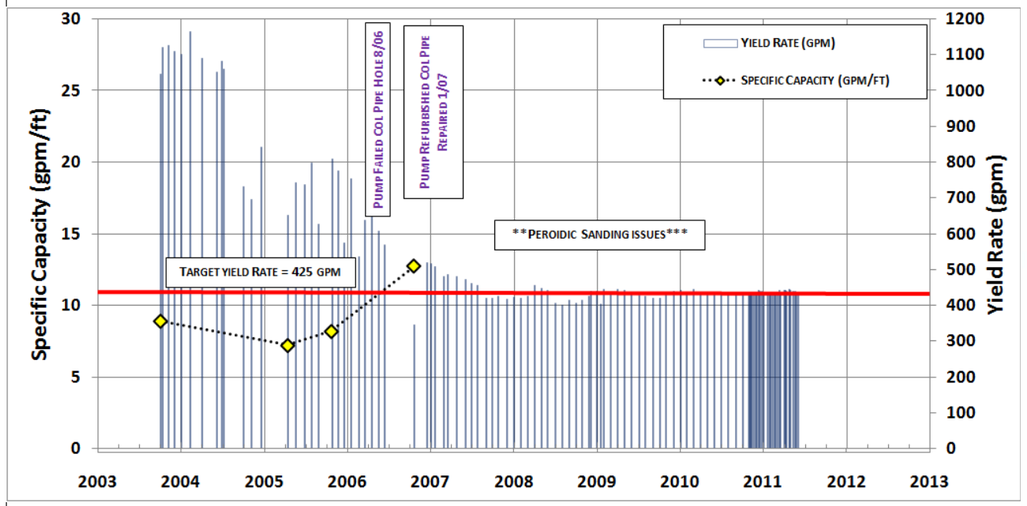
FREEPORT-MCMORAN COPPER & GOLD

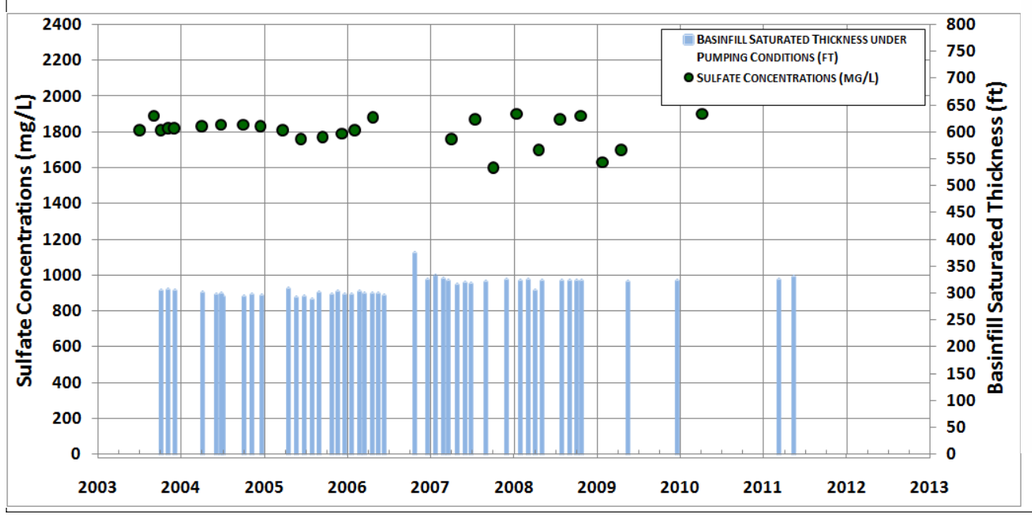
IW-3A: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

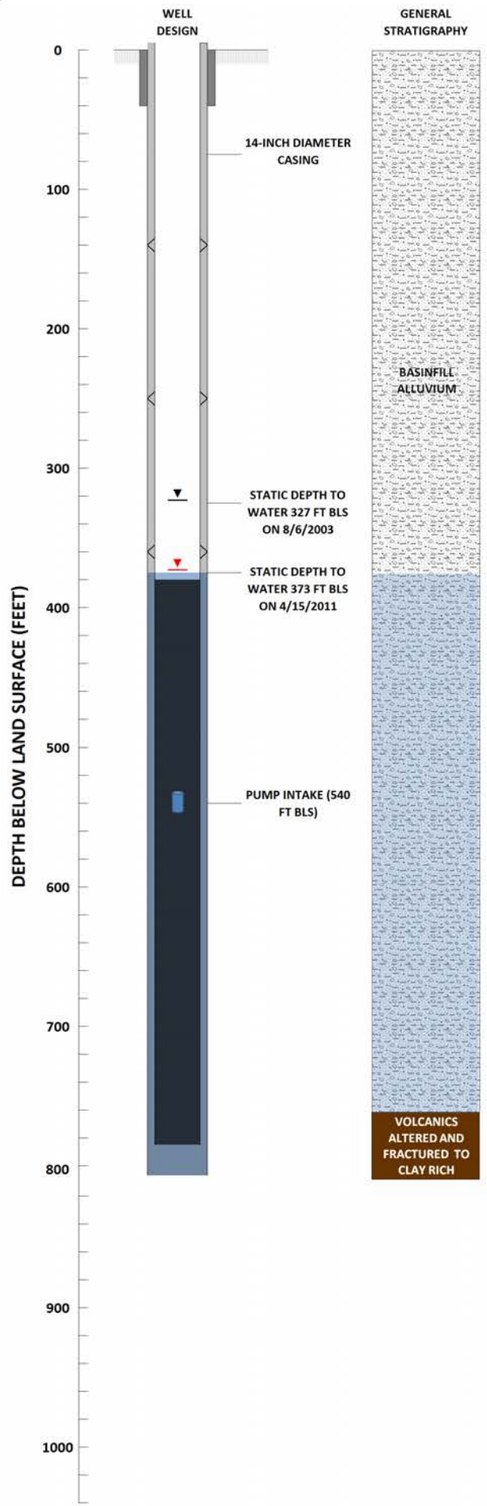
VERSION DATE: JUNE 7, 2011

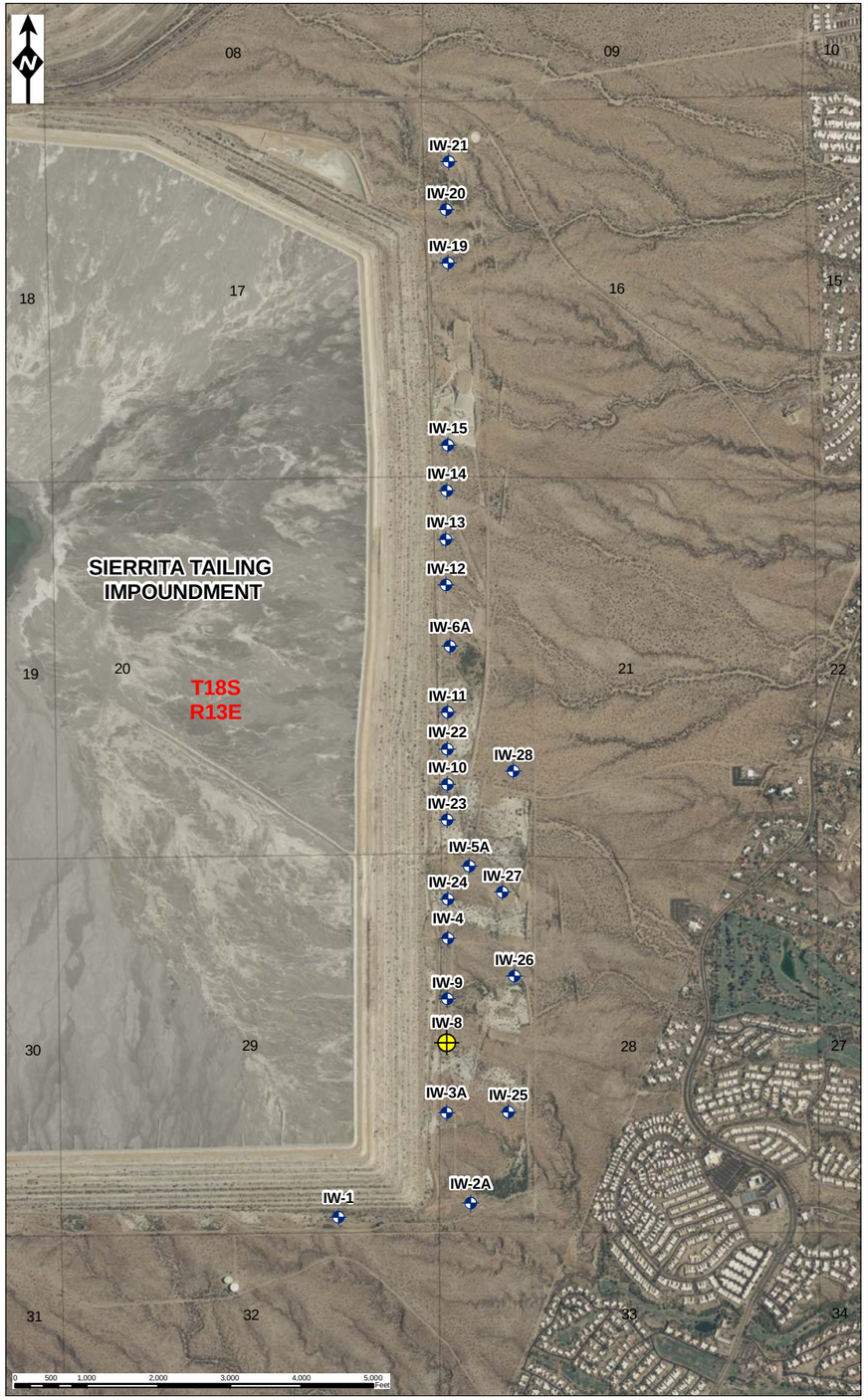
CADASTRAL: D-18-13 28CBC
ADWR REG. NO.: 55-201732
DRILL YEAR: 2004











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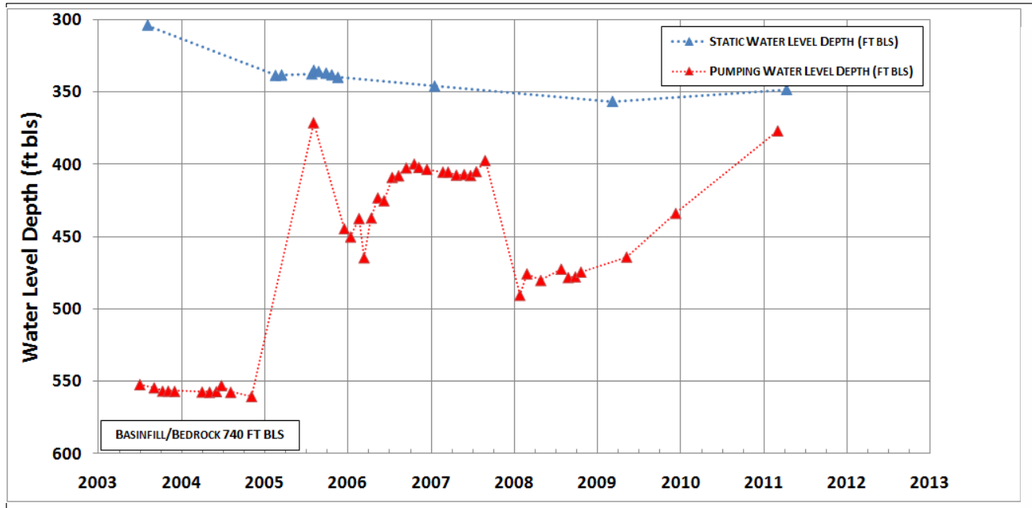
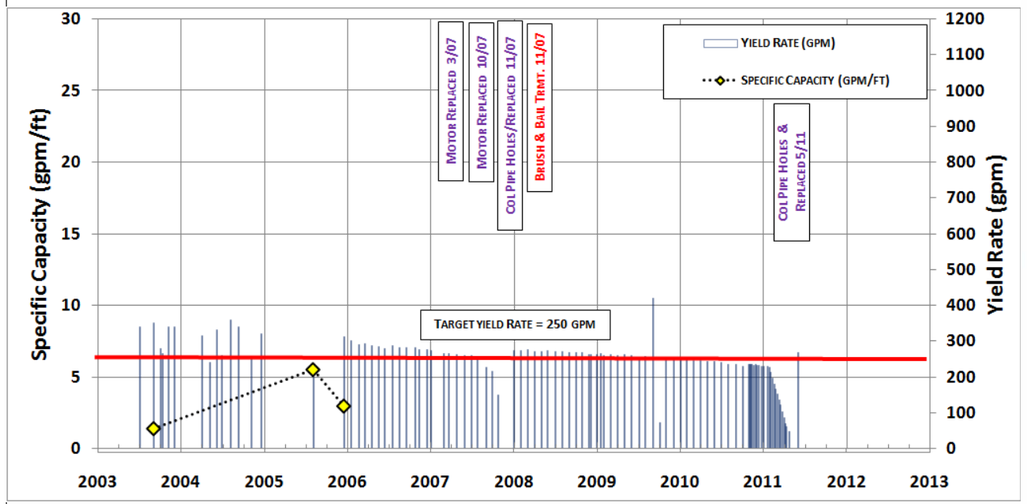
FREEPORT-MCMORAN COPPER & GOLD

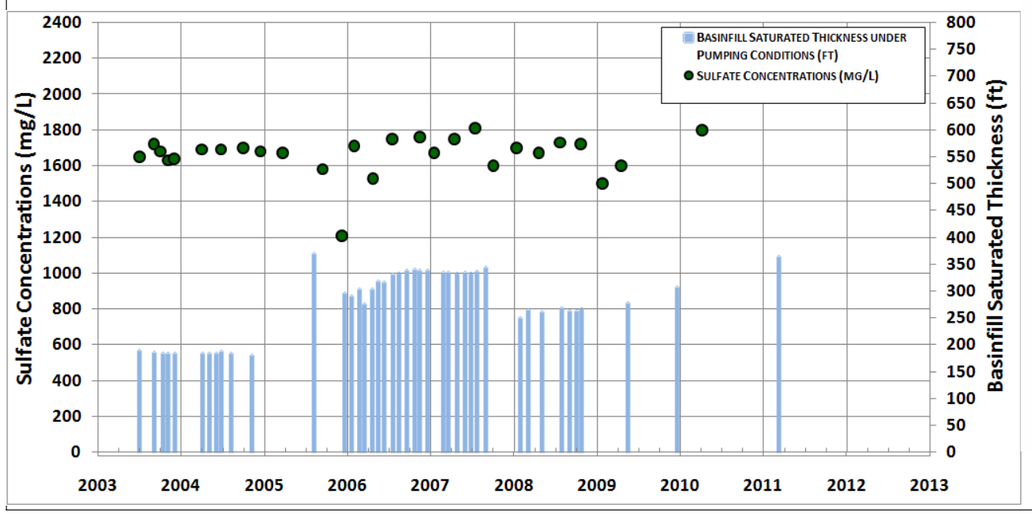
VERSION DATE: JUNE 7, 2011

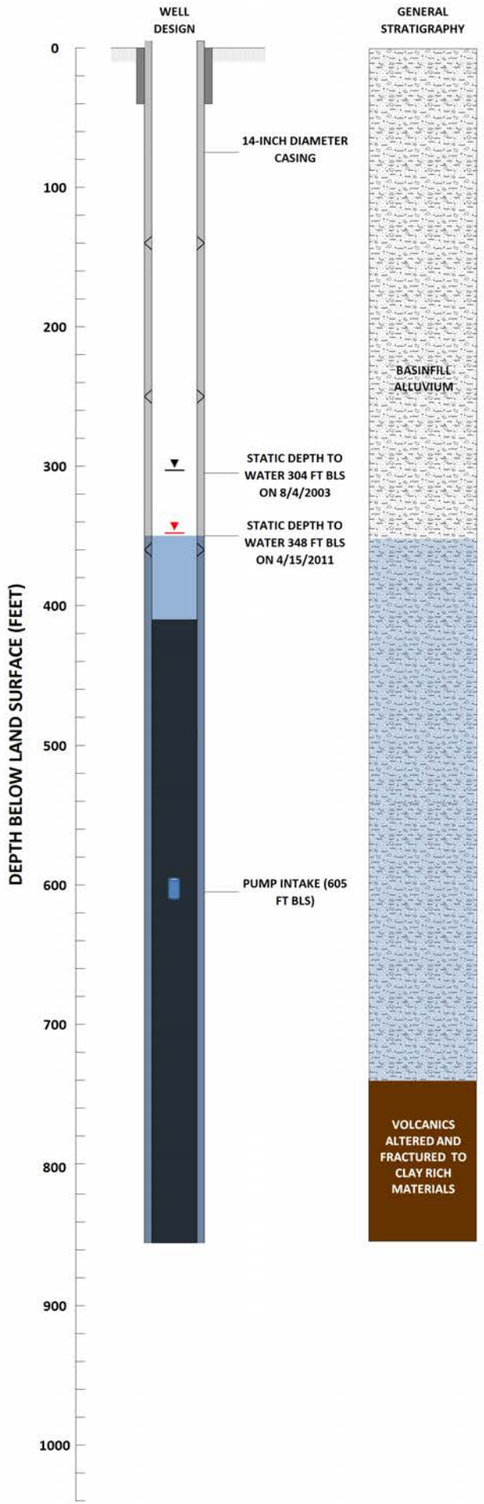
IW-8: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

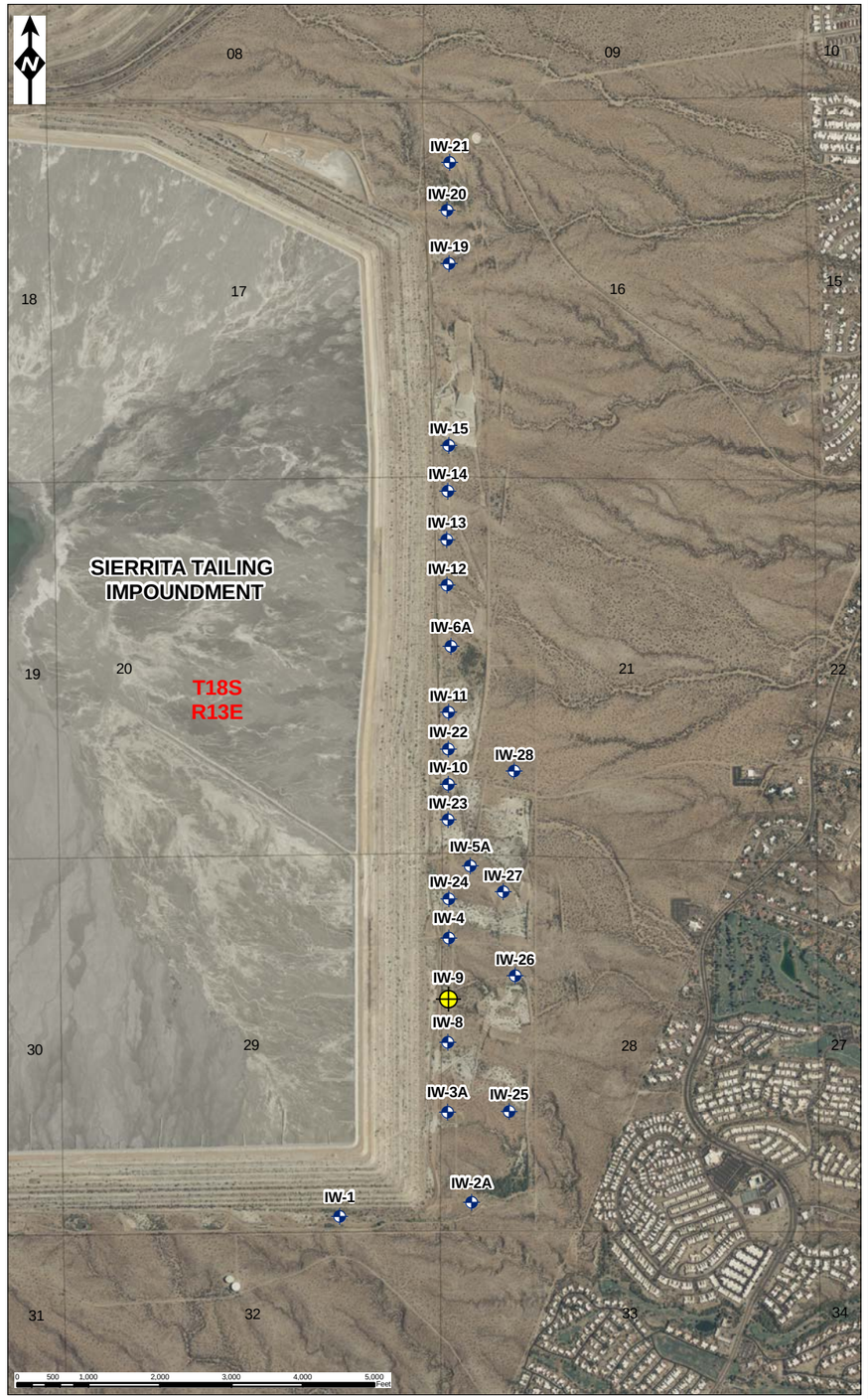
CADASTRAL: D-18-13 28BCC
ADWR REG. NO.: 55-508236
DRILL YEAR: 1984











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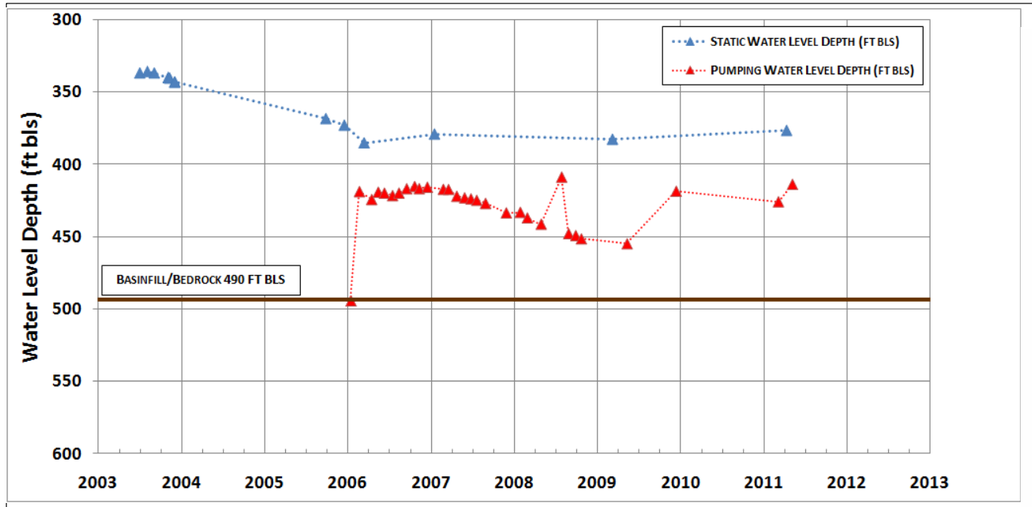
SPECIALISTS IN GROUNDWATER DEVELOPMENT

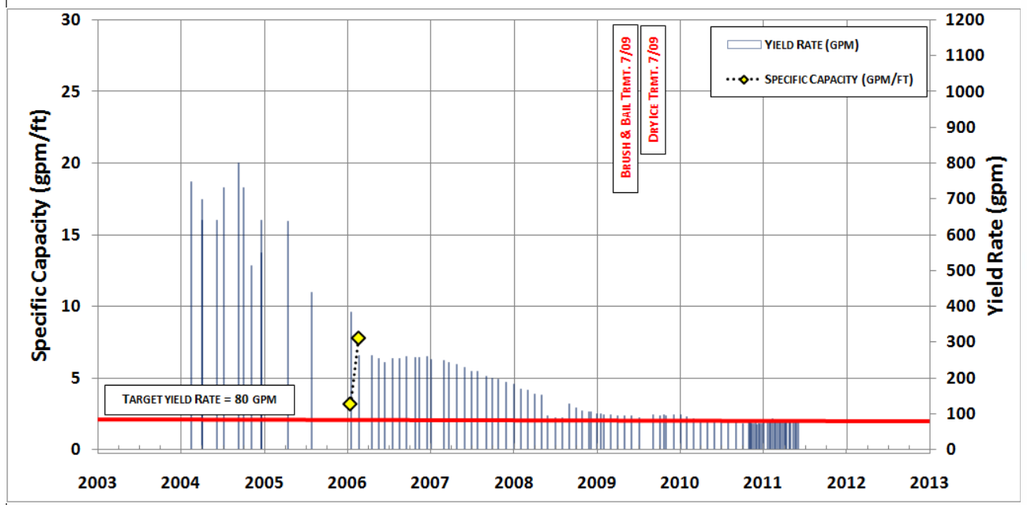
FREEPORT-MCMORAN COPPER & GOLD

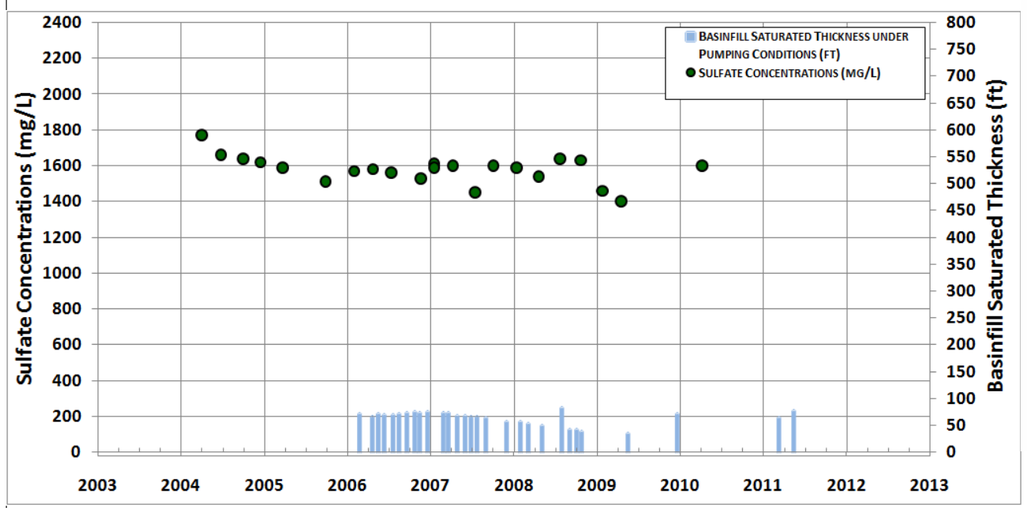
IW-9: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

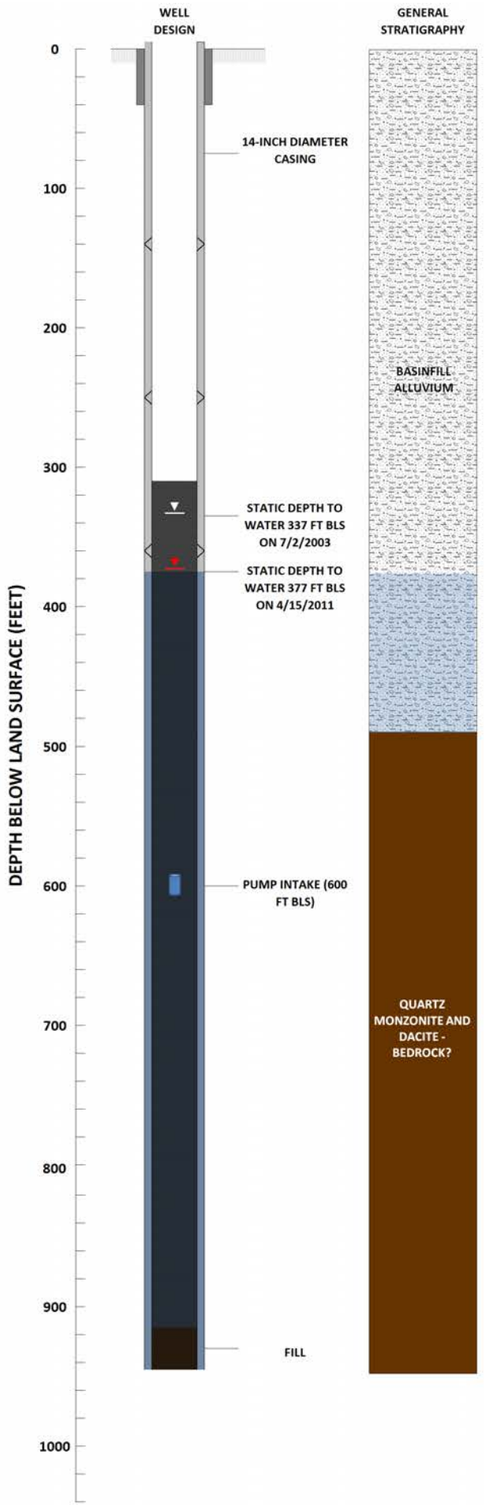
VERSION DATE: JUNE 7, 2011

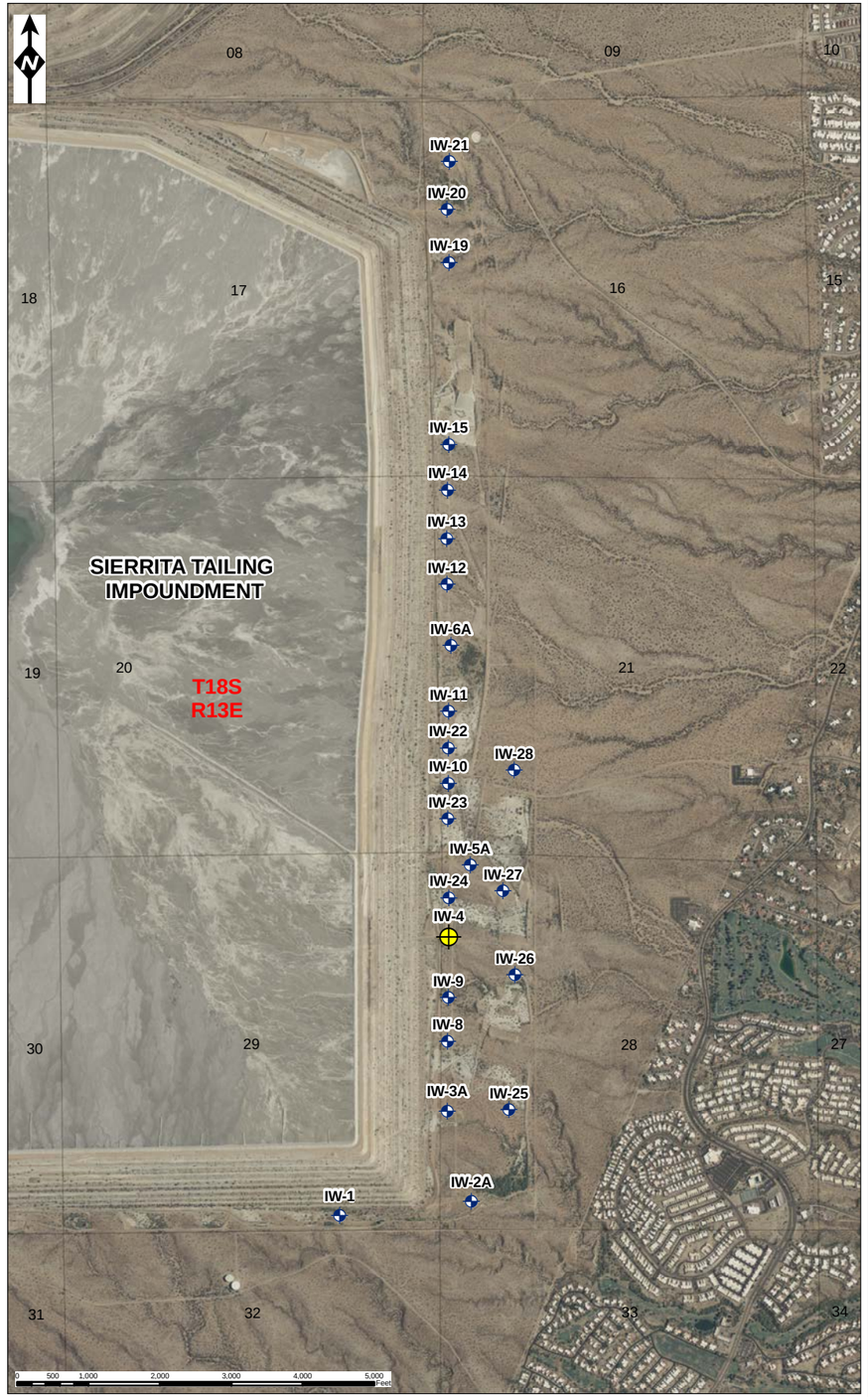
CADASTRAL:D-18-13 28BCC
ADWR REG. NO.: 55-508238
DRILL YEAR: 1984











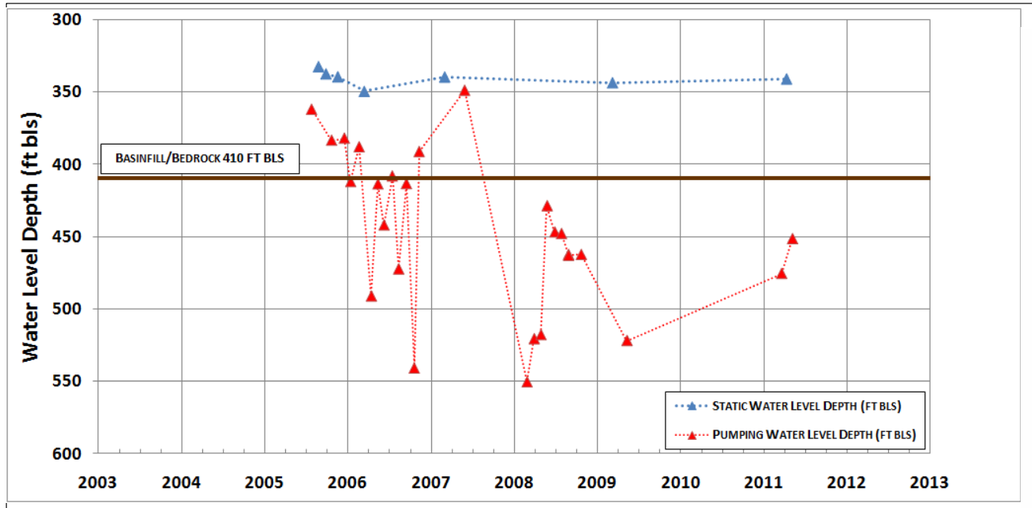
BasinWells ASSOCIATES PLLC
SPECIALISTS IN GROUNDWATER DEVELOPMENT

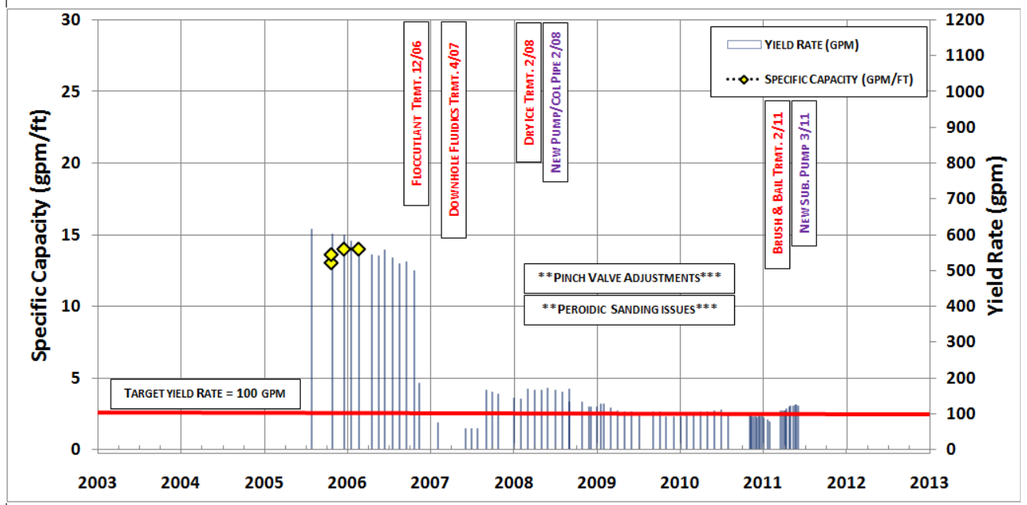
FREEPORT-MCMORAN COPPER & GOLD

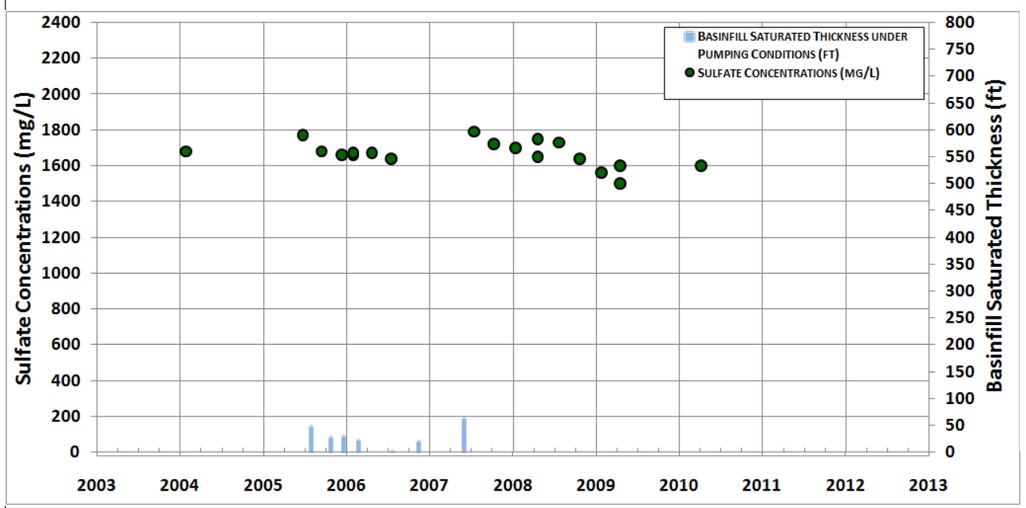
IW-4: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

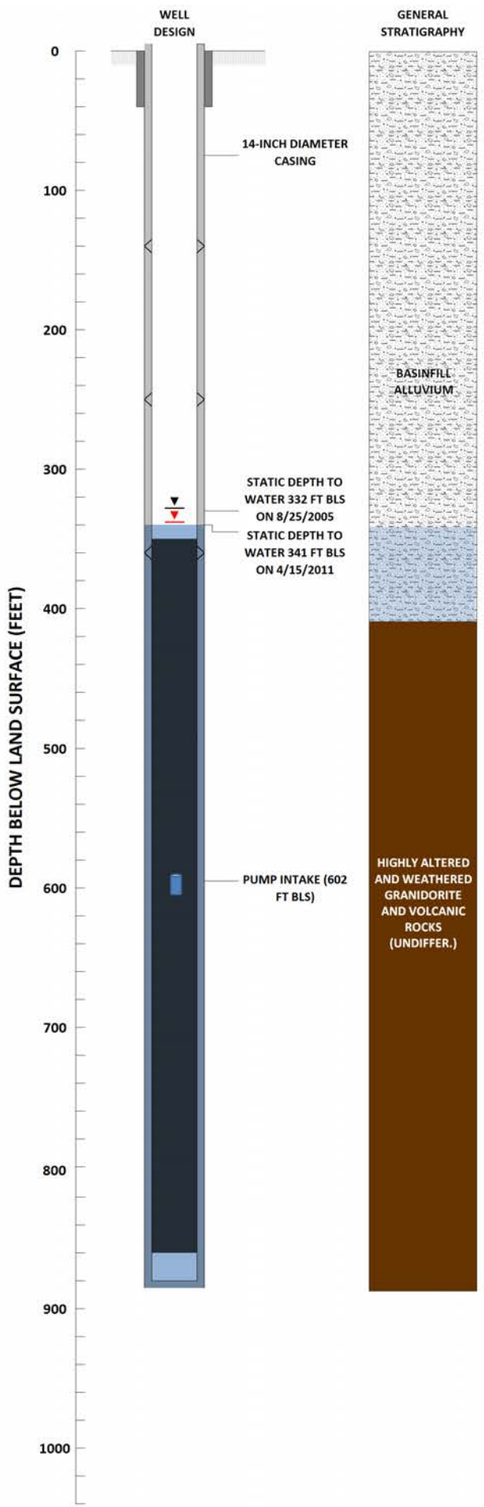
VERSION DATE: JUNE 7, 2011

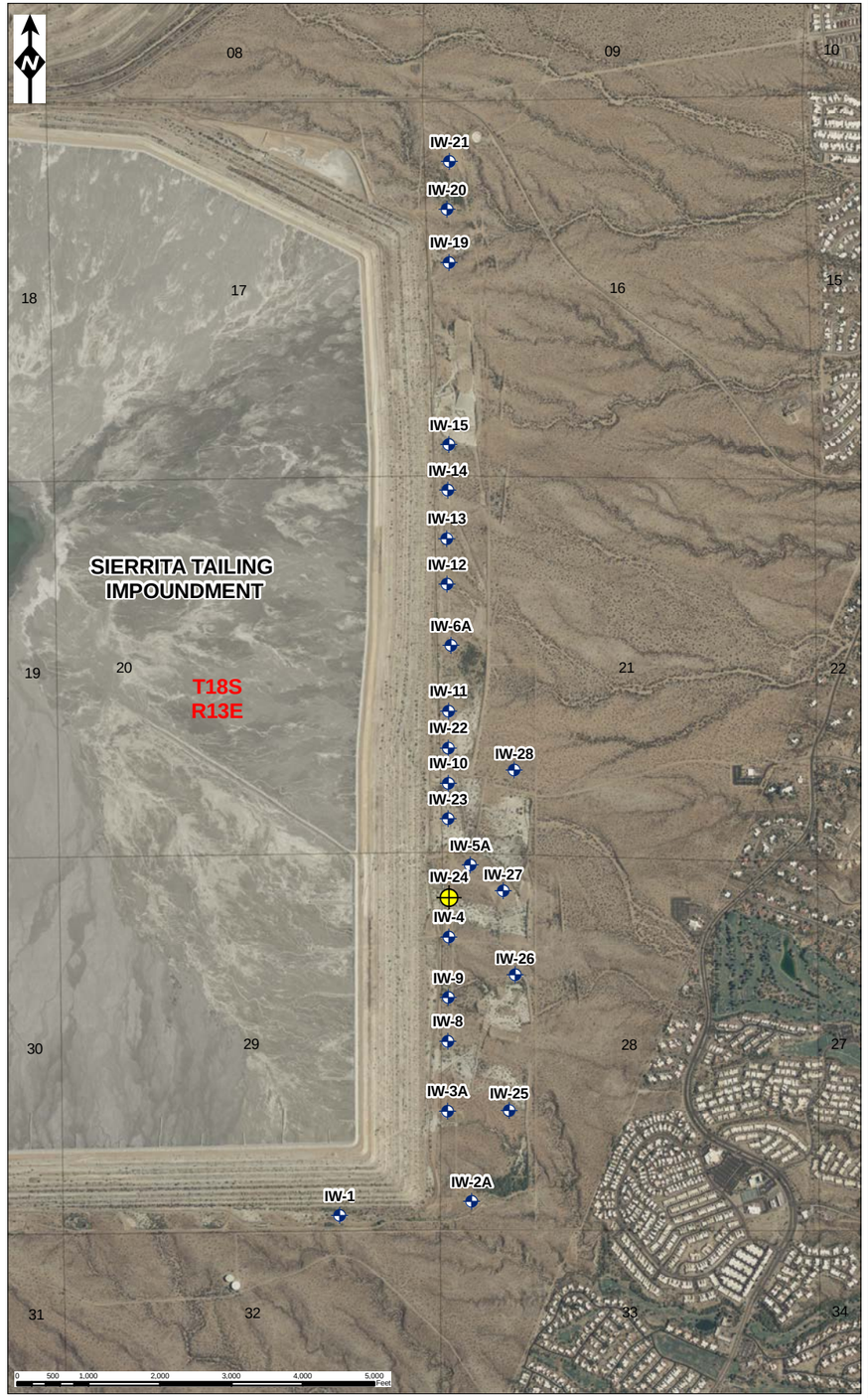
CADASTRAL:D-18-13 28BCB
ADWR REG. NO.: 55-623132
DRILL YEAR: 1978











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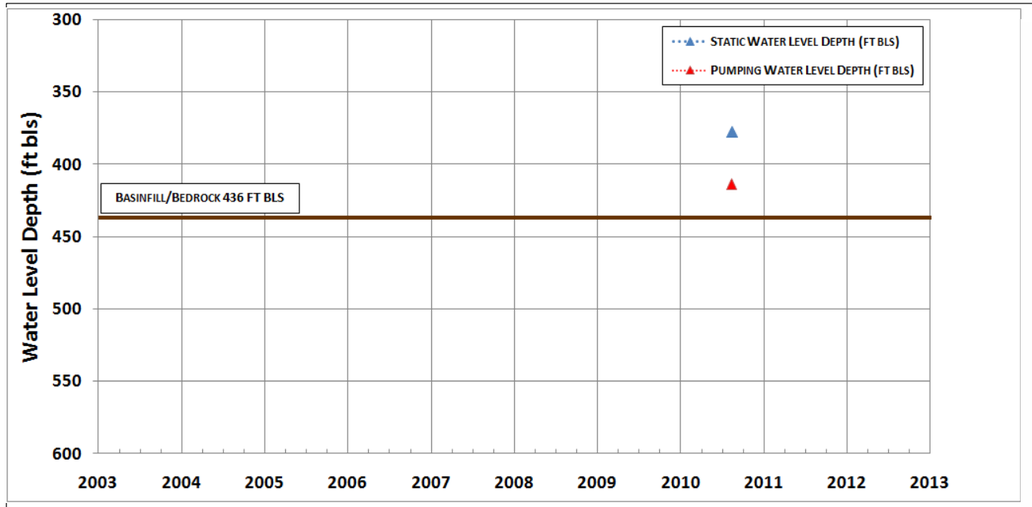
SPECIALISTS IN GROUNDWATER DEVELOPMENT

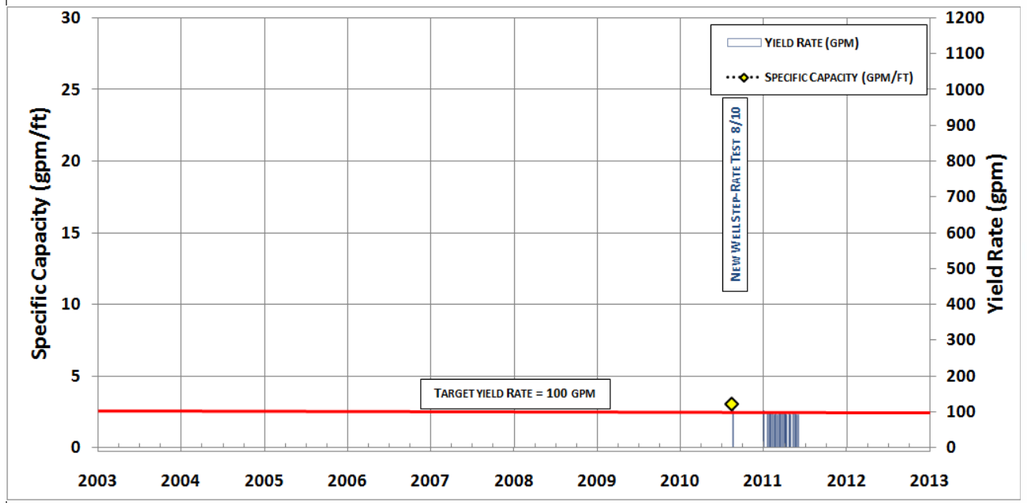
FREEPORT-MCMORAN COPPER & GOLD

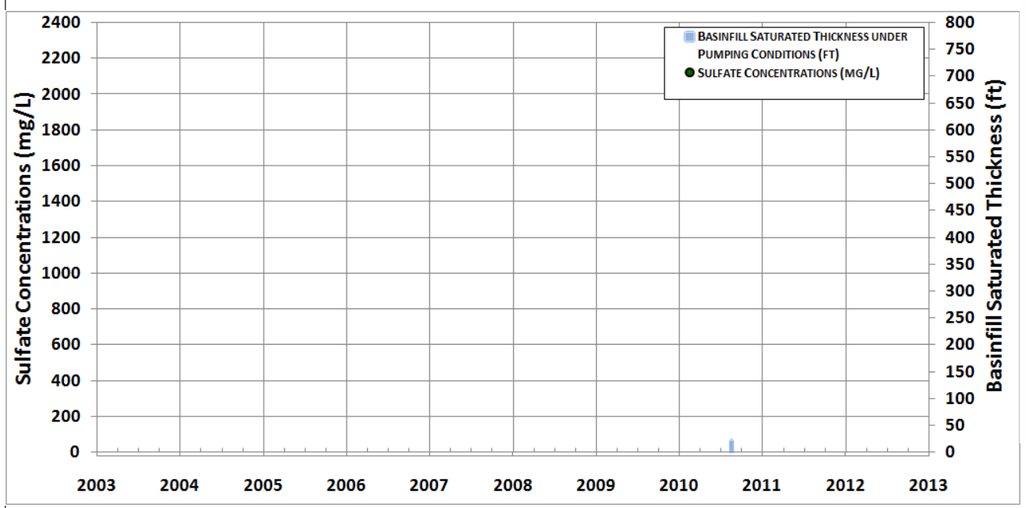
IW-24: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

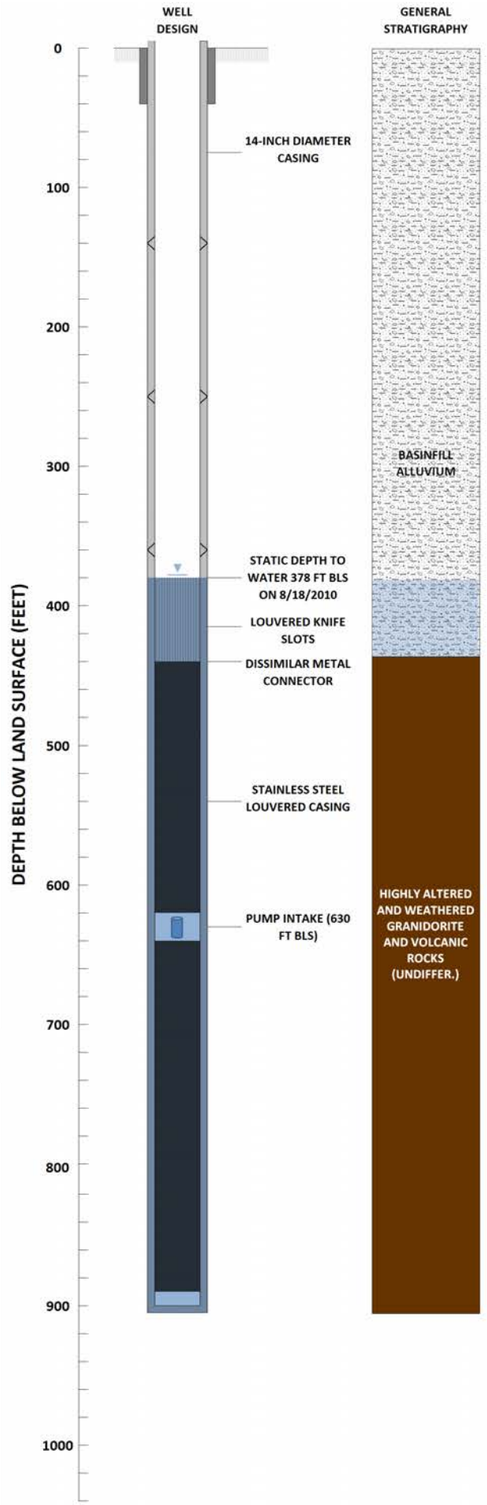
VERSION DATE:
JUNE 7, 2011

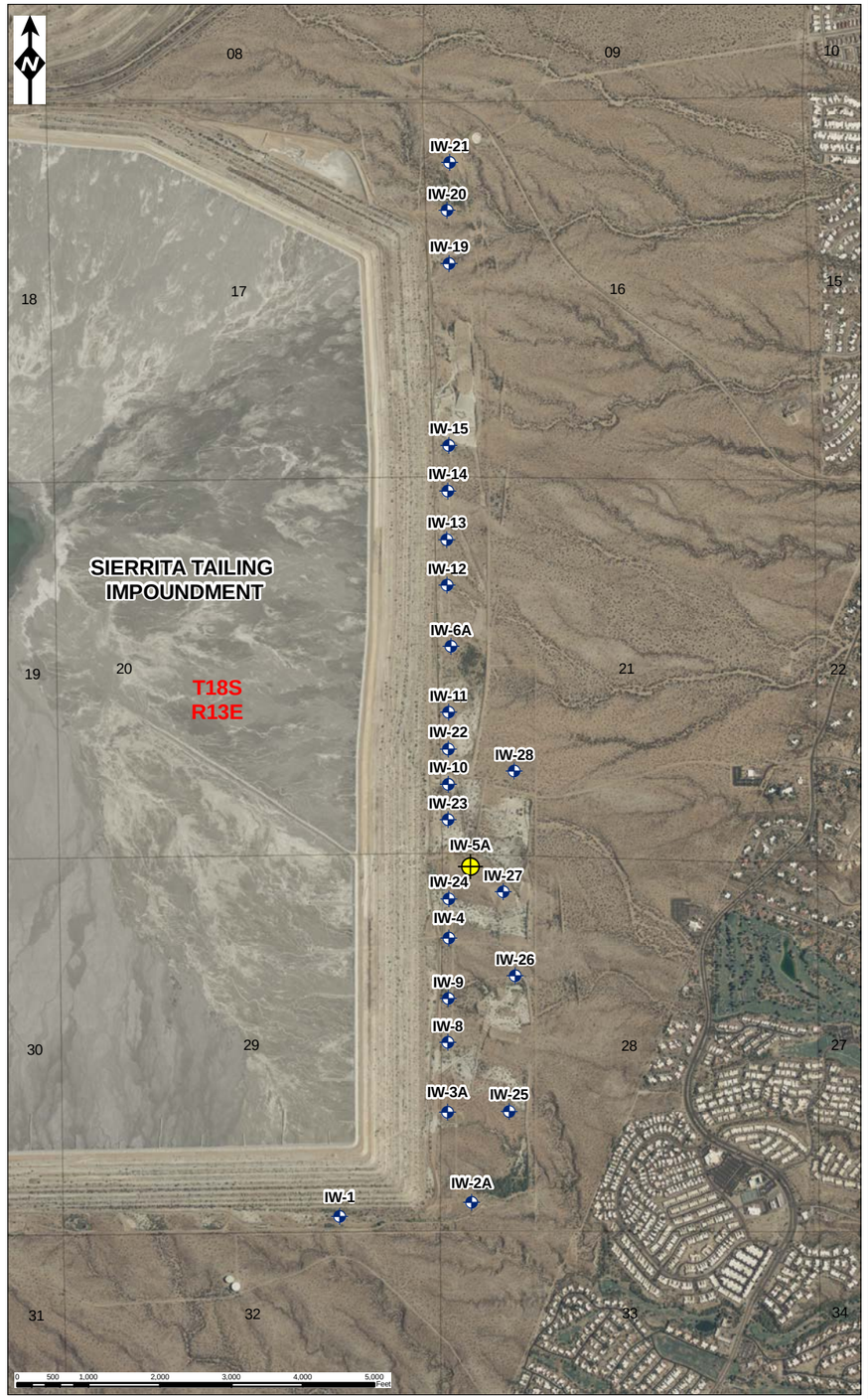
CADASTRAL:D-18-13 28BBB
ADWR REG. NO.: 55-200556
DRILL YEAR: 2004











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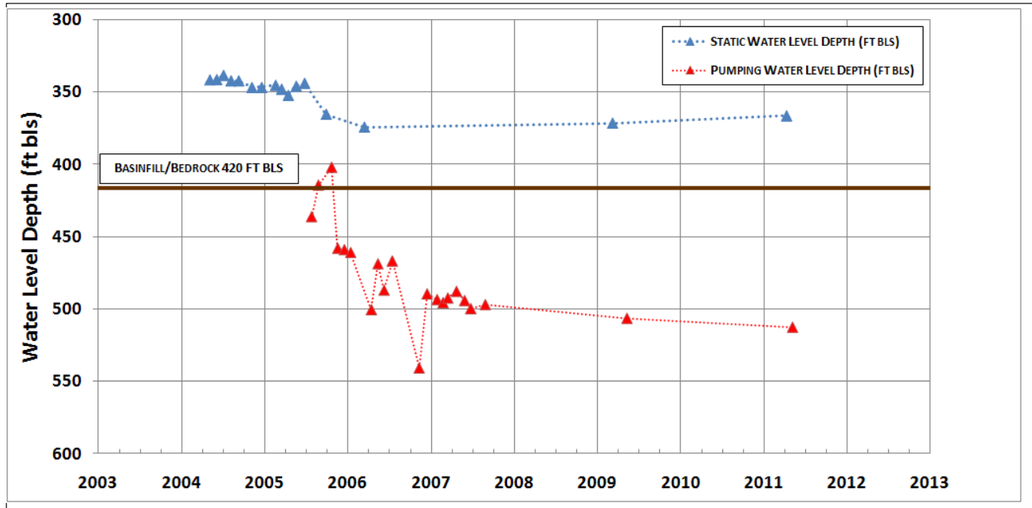
SPECIALISTS IN GROUNDWATER DEVELOPMENT

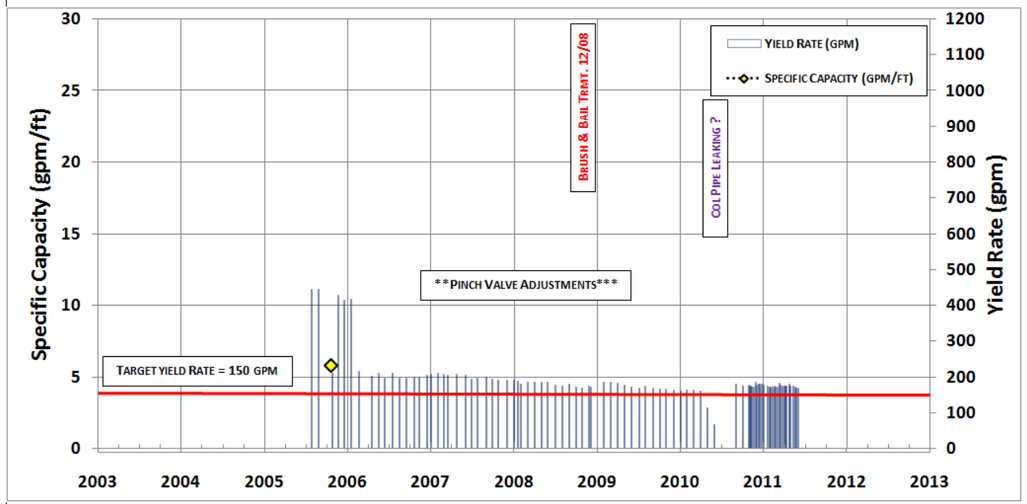
FREEPORT-MCMORAN COPPER & GOLD

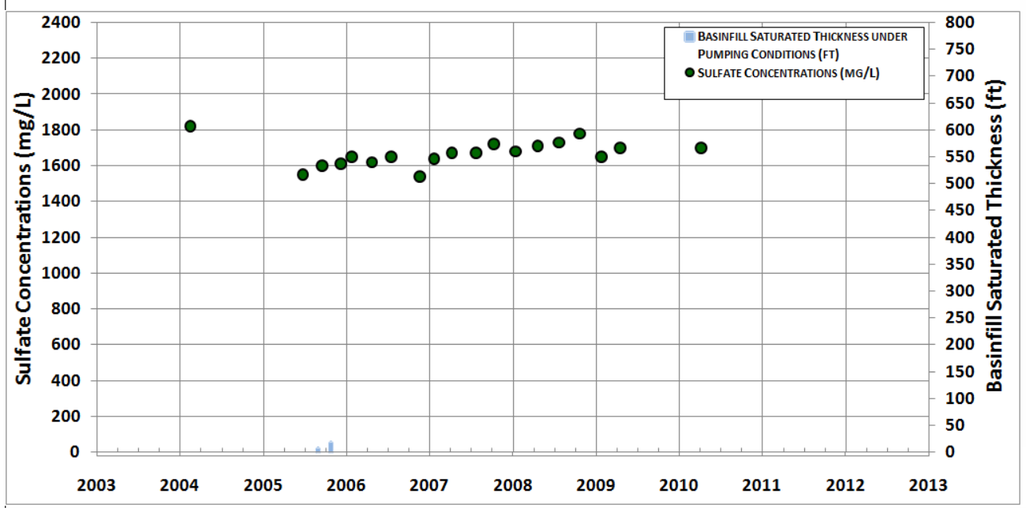
IW-5A: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

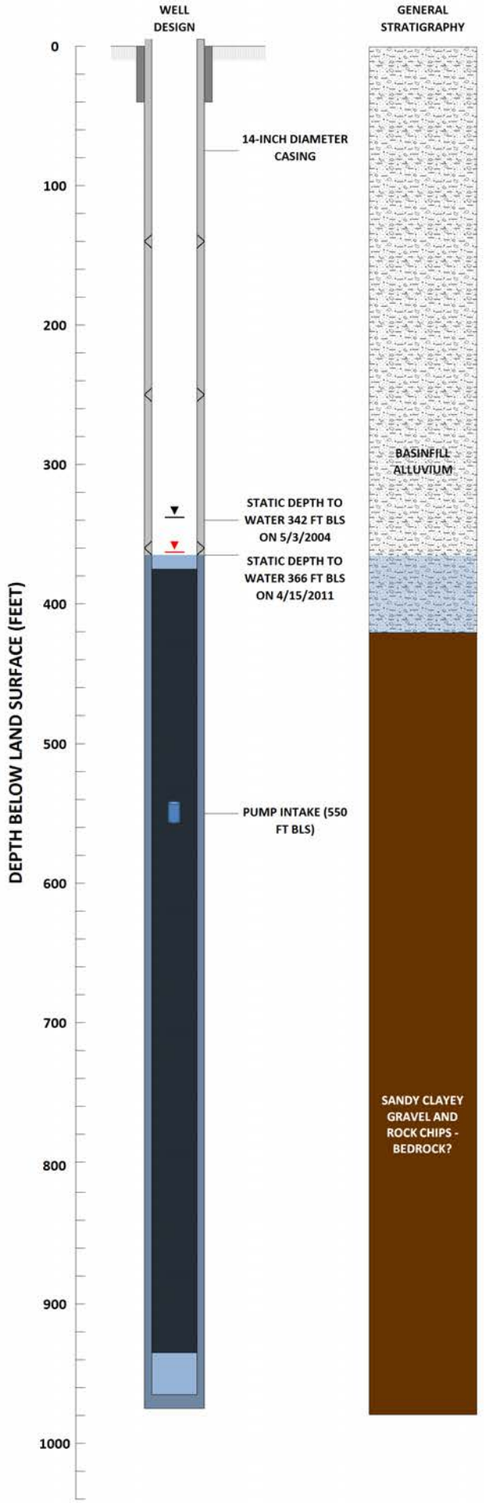
VERSION DATE: JUNE 7, 2011

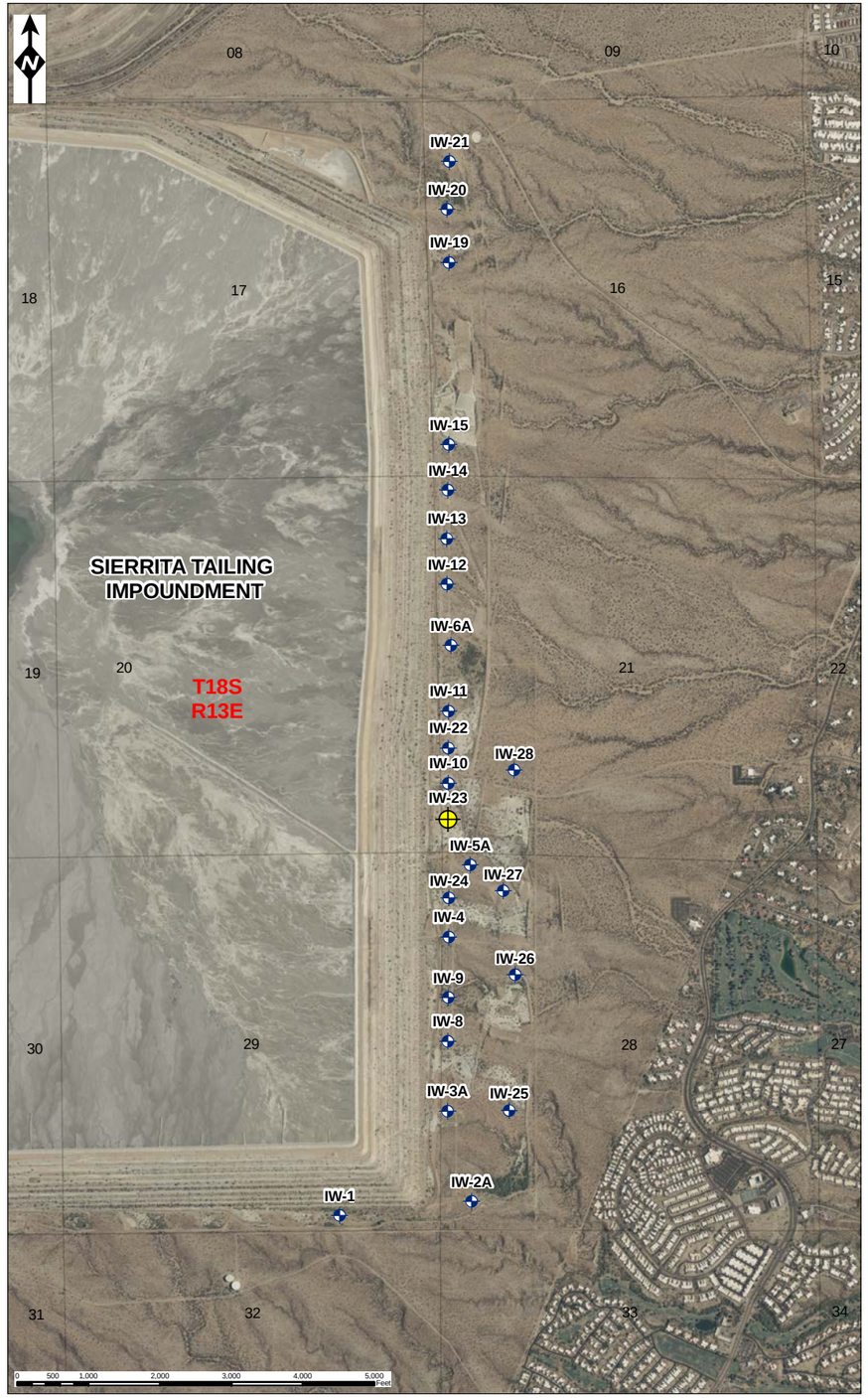
CADASTRAL:D-18-13 28BBB
ADWR REG. NO.: 55-219131
DRILL YEAR: 2010











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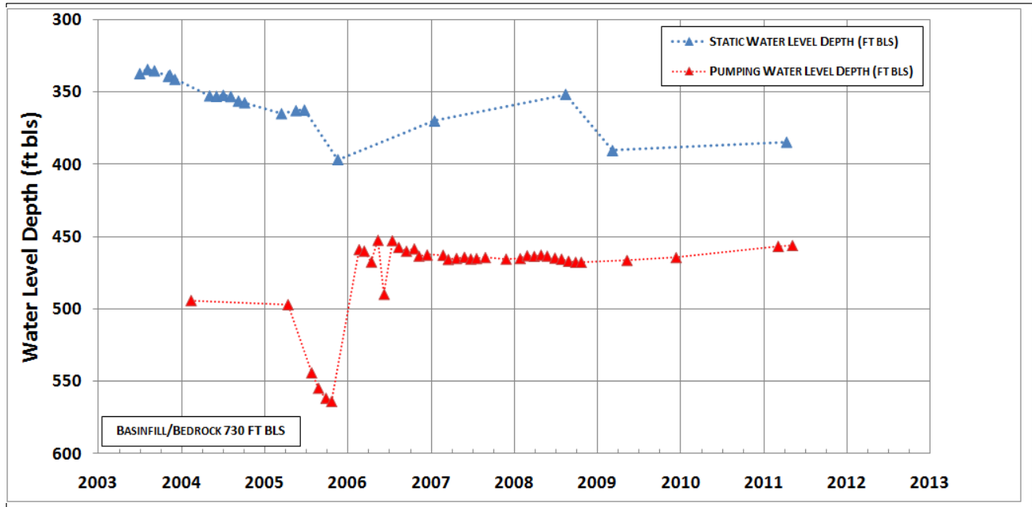
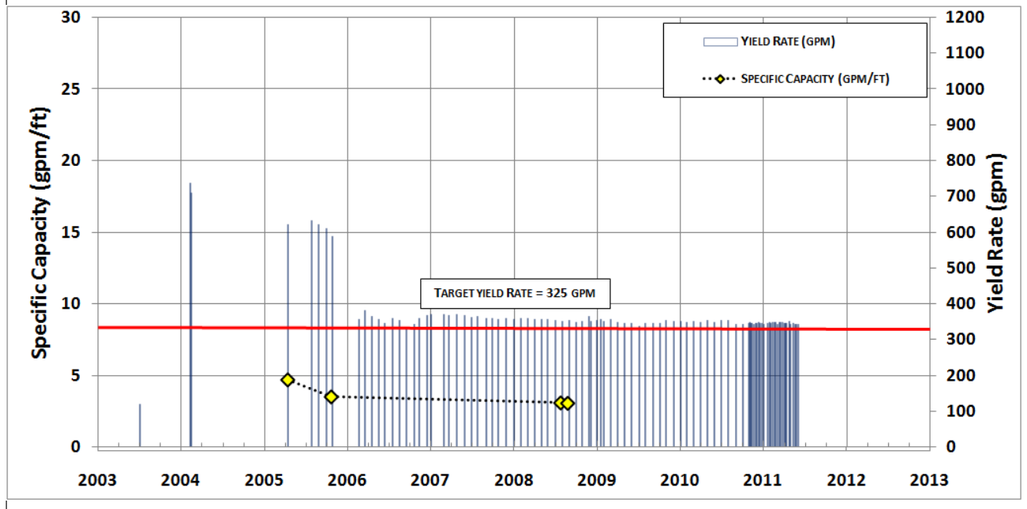
FREEPORT-MCMORAN COPPER & GOLD

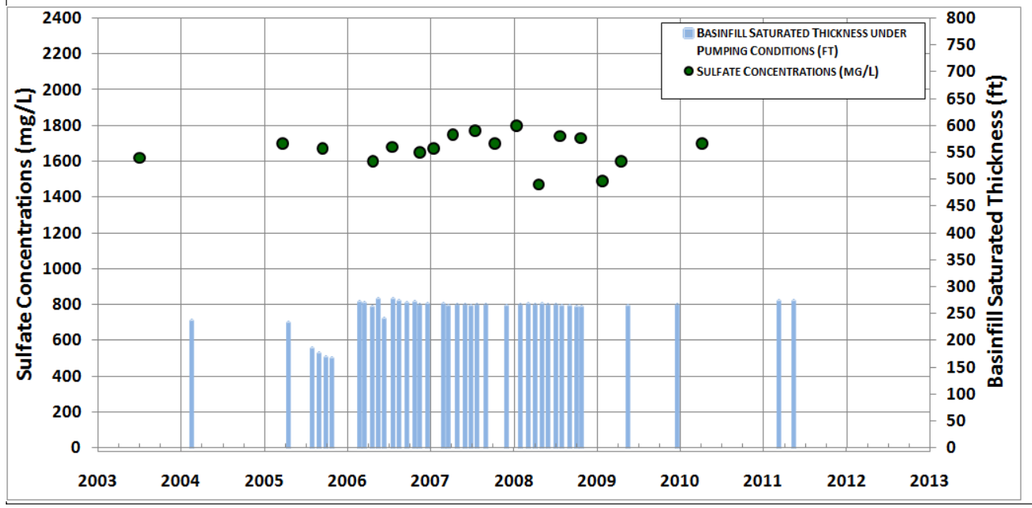
IW-23: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

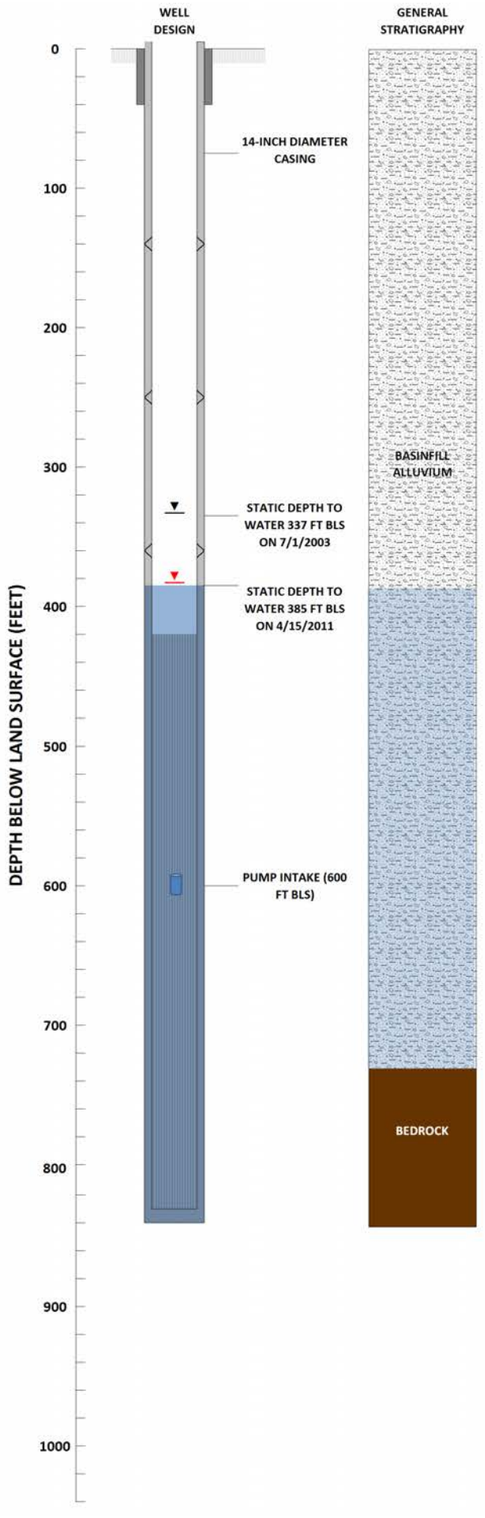
VERSION DATE: JUNE 7, 2011

CADASTRAL:D-18-13 21CCB
ADWR REG. NO.: 55-200555
DRILL YEAR: 2004









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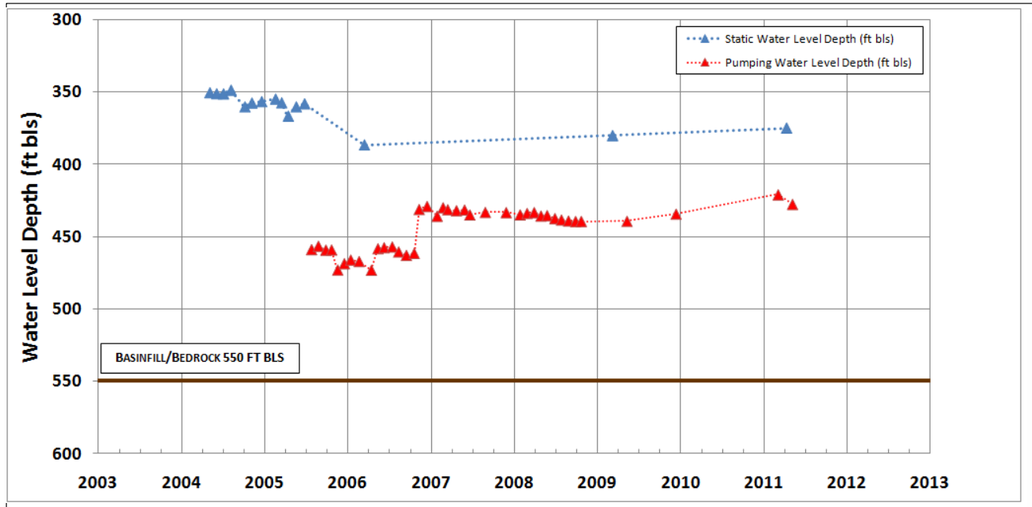
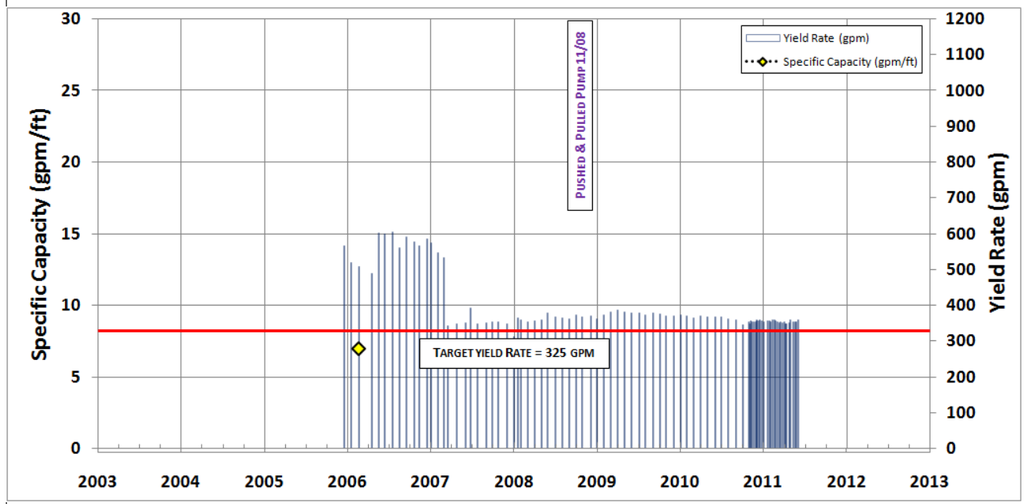
FREEPORT-MCMORAN COPPER & GOLD

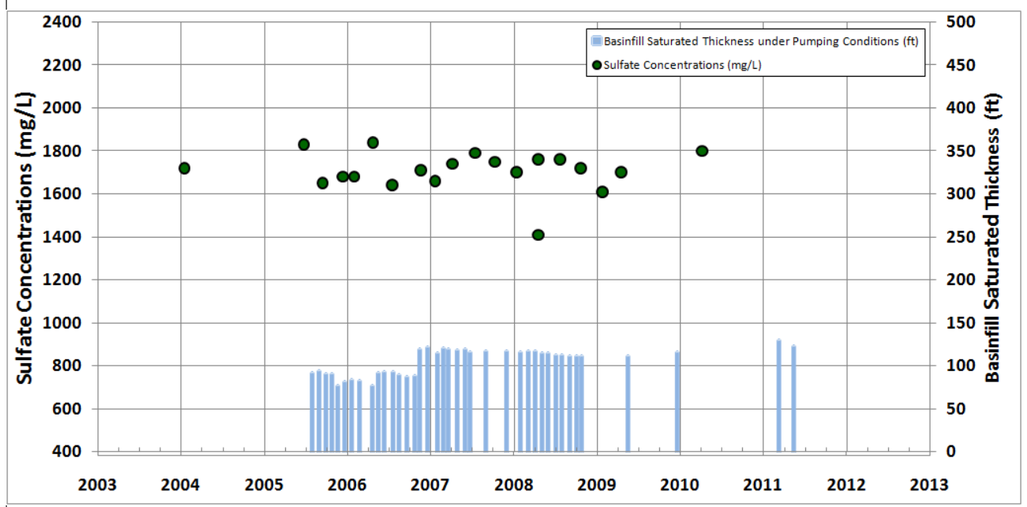
VERSION DATE:
JUNE 7, 2011

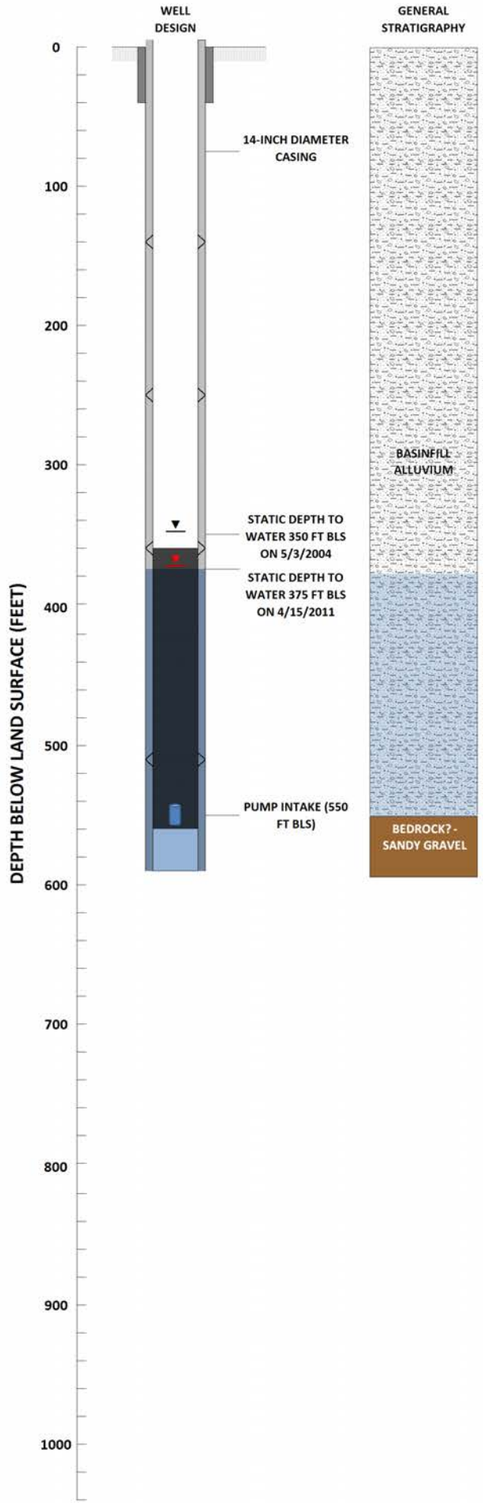
IW-10: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

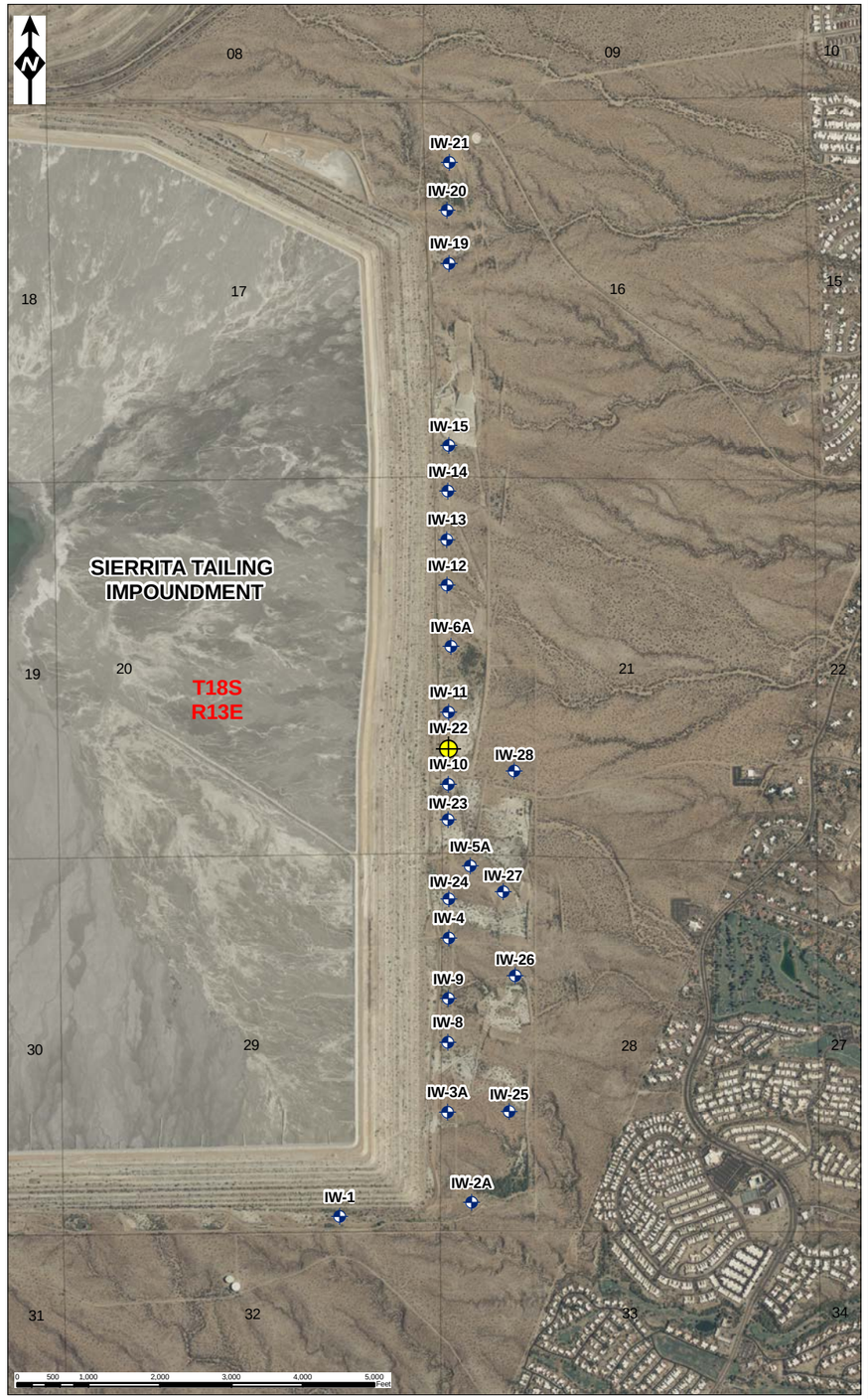
CADASTRAL: D-18-13 21CBC
ADWR REG. NO.: 55-508237
DRILL YEAR: 1984











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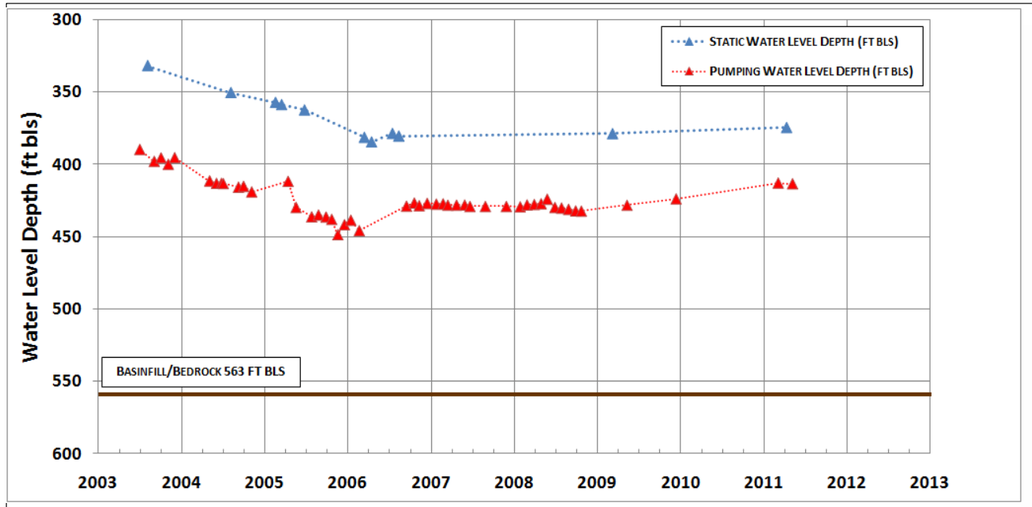
SPECIALISTS IN GROUNDWATER DEVELOPMENT

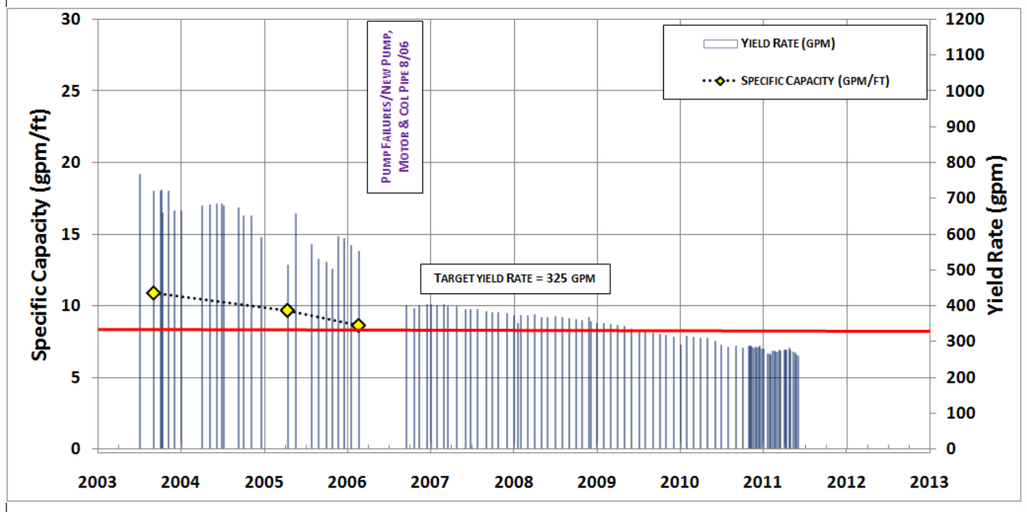
FREEPORT-MCMORAN COPPER & GOLD

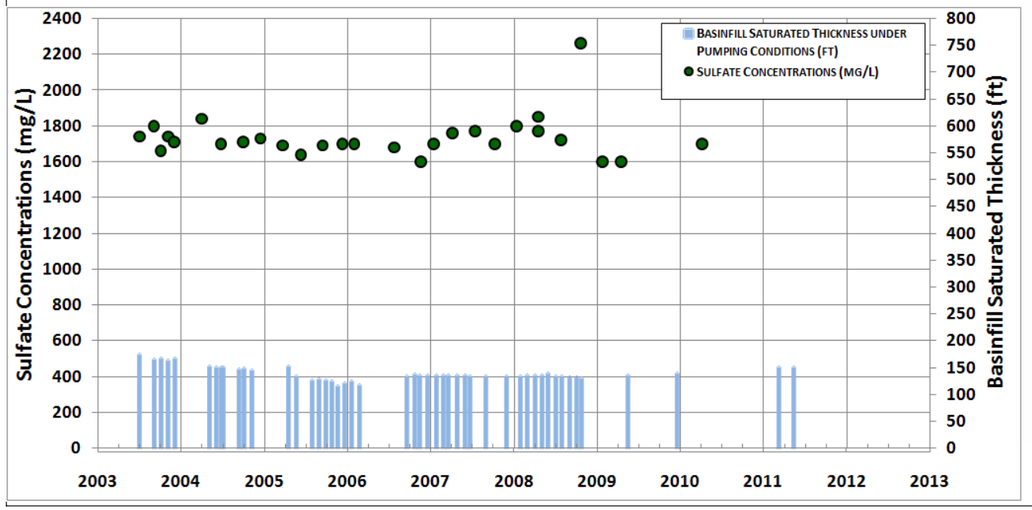
IW-22: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

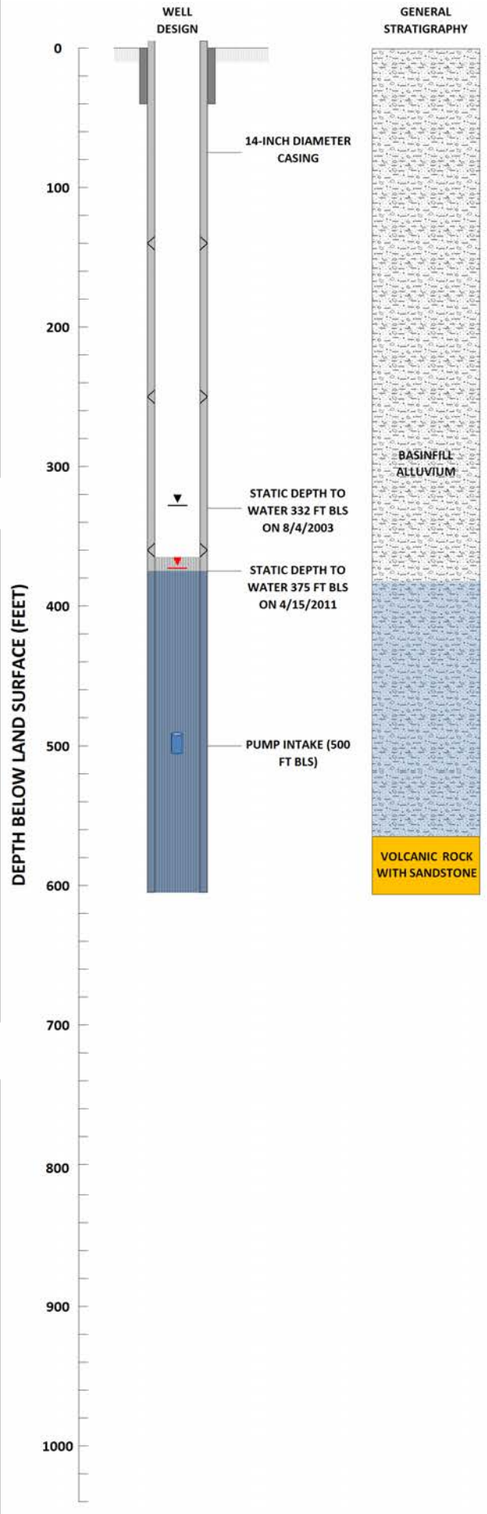
VERSION DATE: JUNE 7, 2011

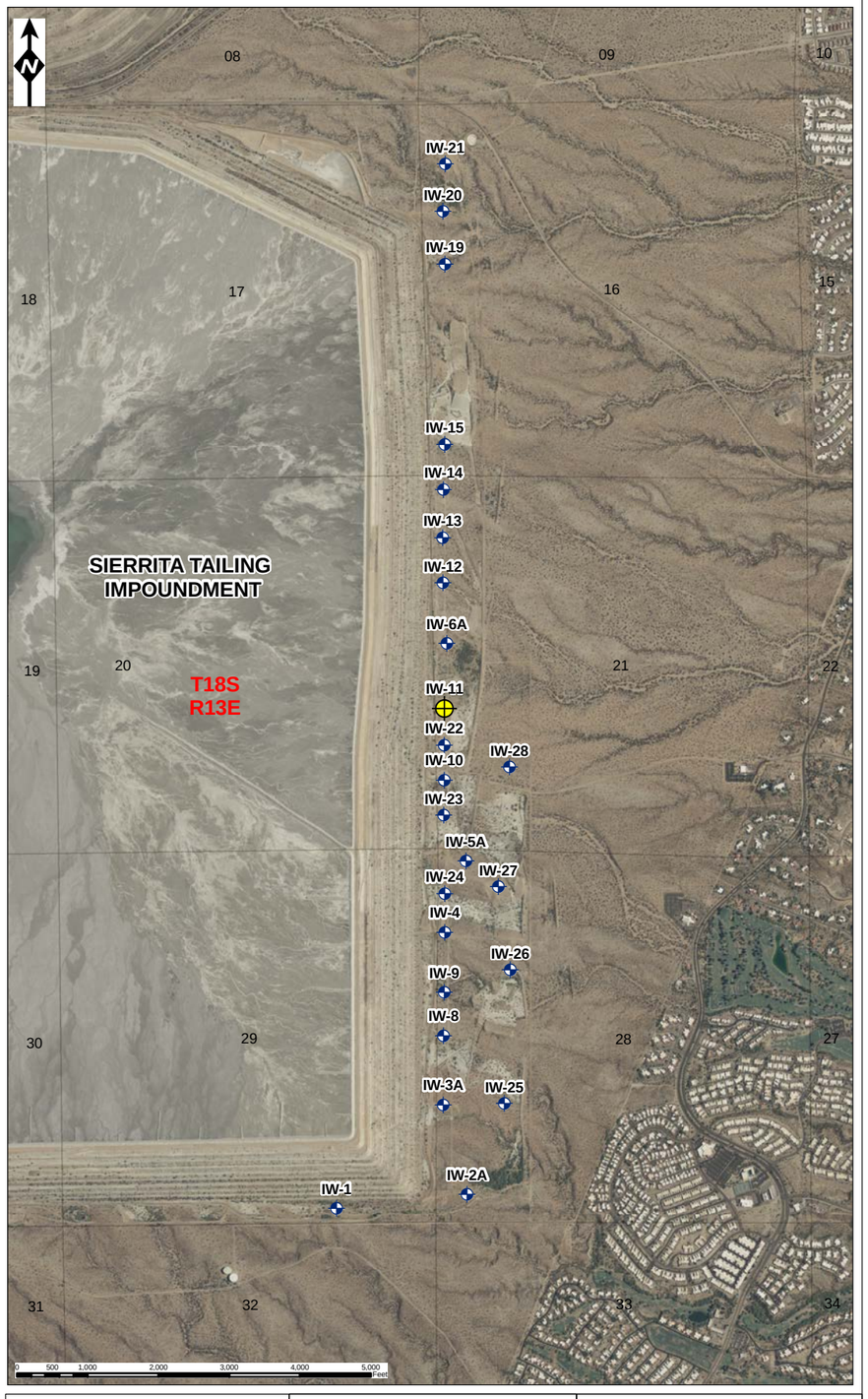
CADASTRAL: D-18-13 21CBC
ADWR REG. NO.: 55-200554
DRILL YEAR: 2004











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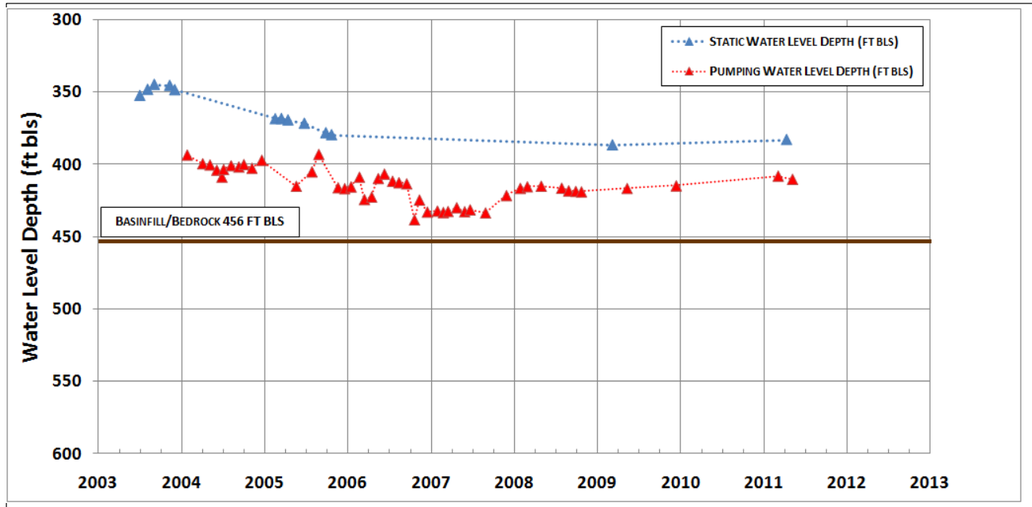
SPECIALISTS IN GROUNDWATER DEVELOPMENT

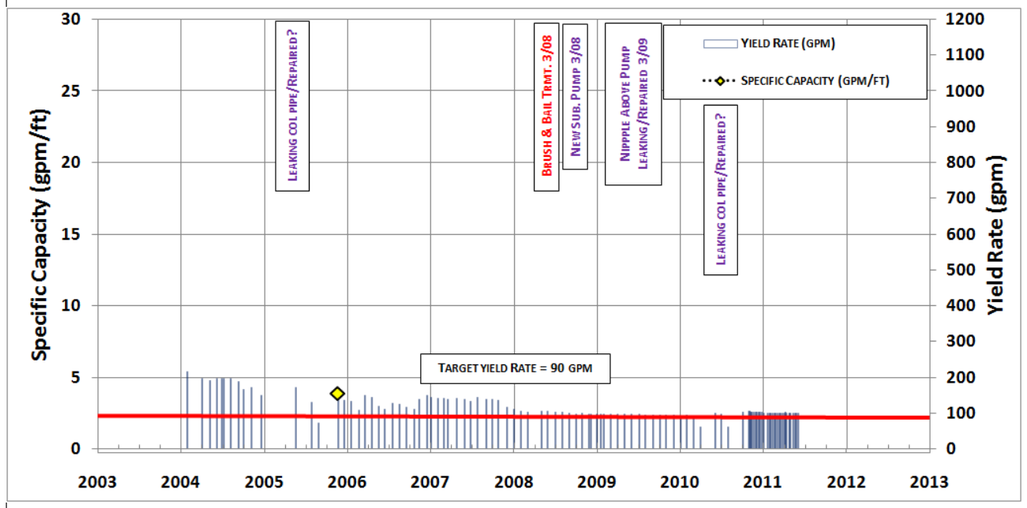
FREEPORT-McMoRan COPPER & GOLD

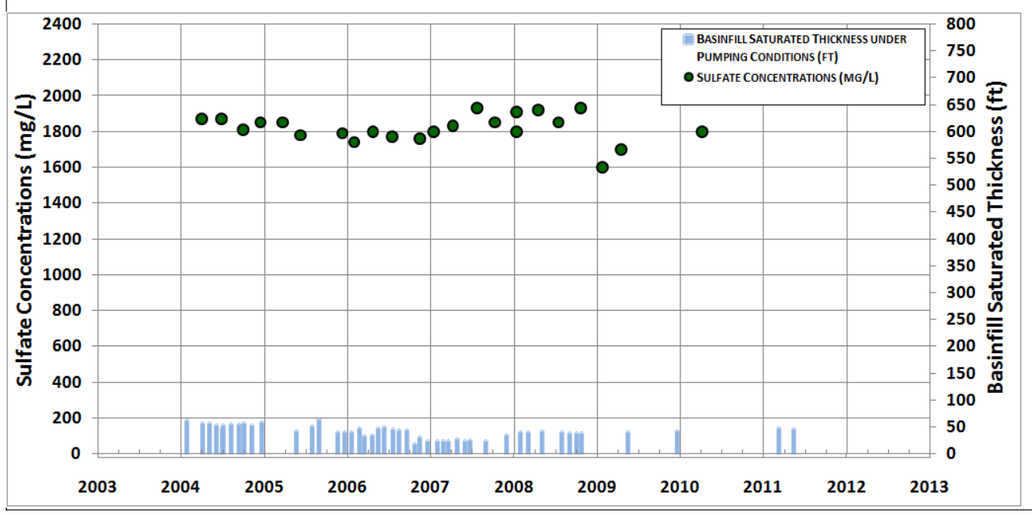
IW-11: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

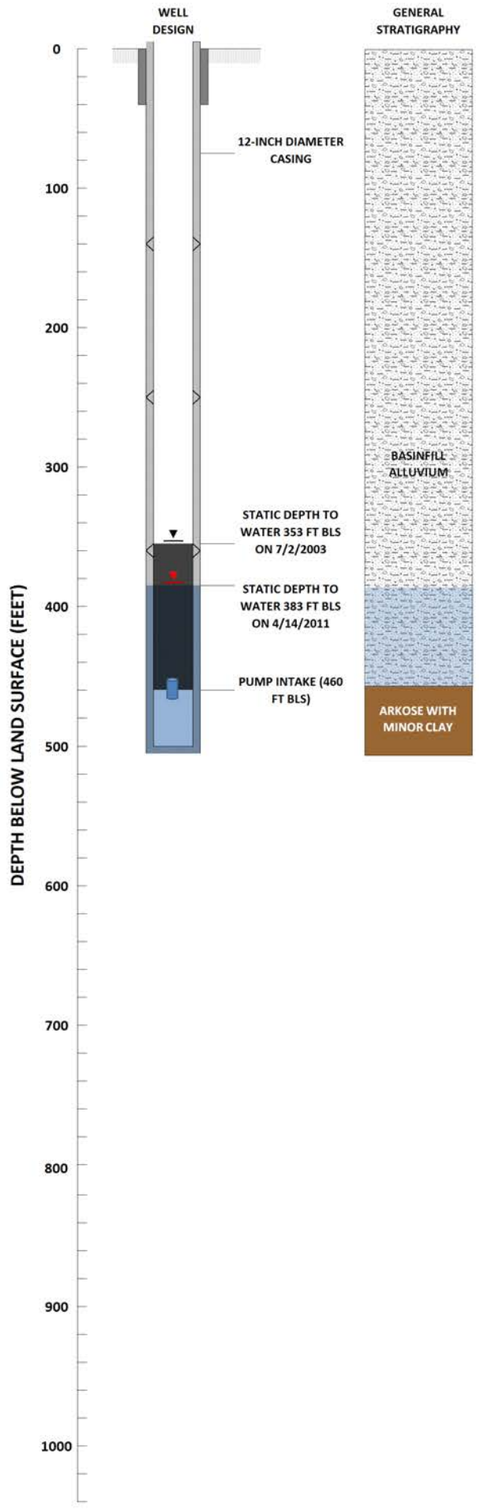
VERSION DATE: JUNE 7, 2011

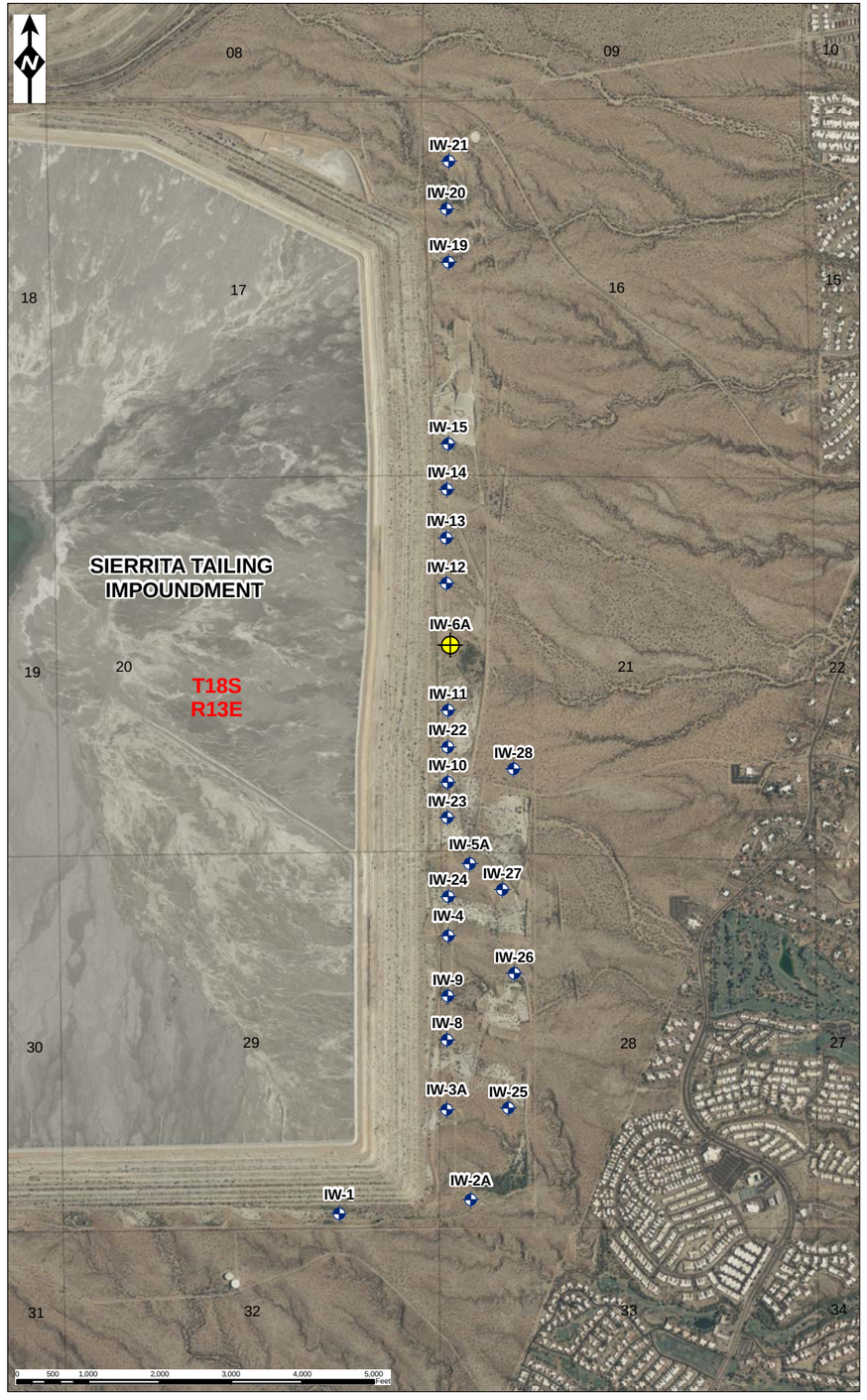
CADASTRAL: D-18-13 21CBC
ADWR REG. NO.: 55-508235
DRILL YEAR: 1984











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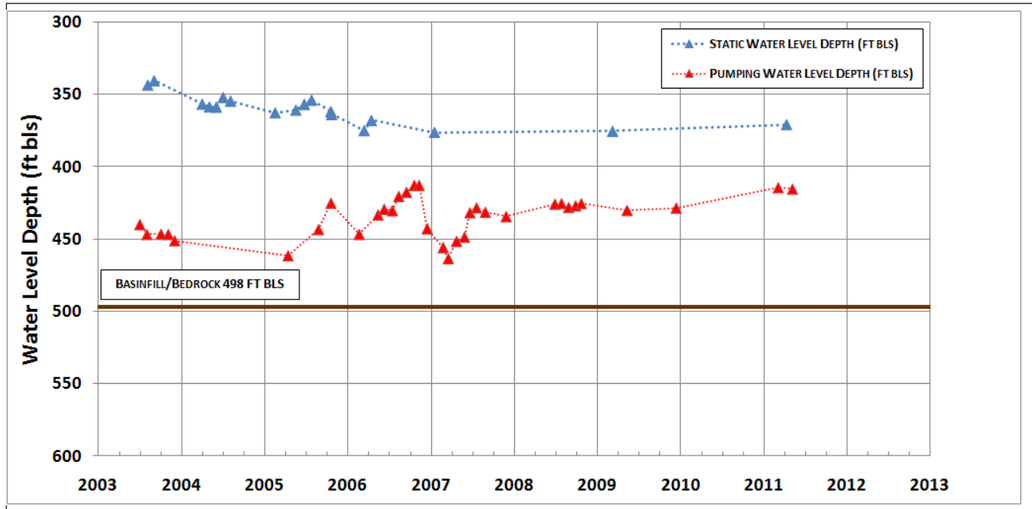
SPECIALISTS IN GROUNDWATER DEVELOPMENT

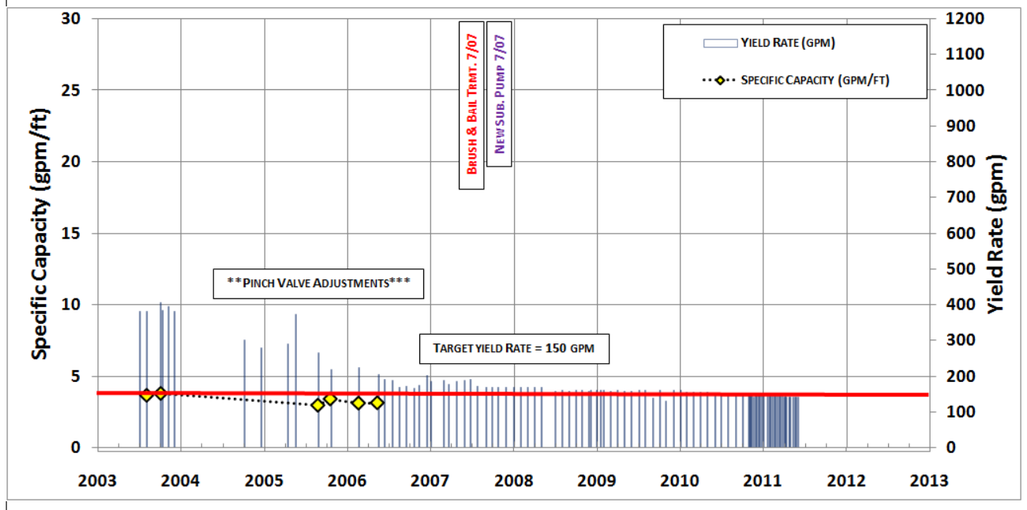
FREEPORT-MCMORAN COPPER & GOLD

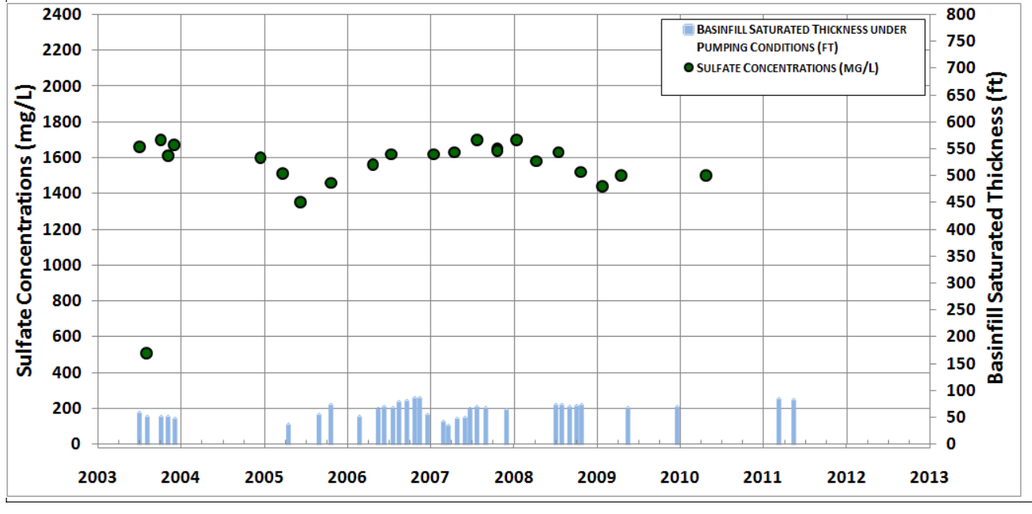
IW-6A: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

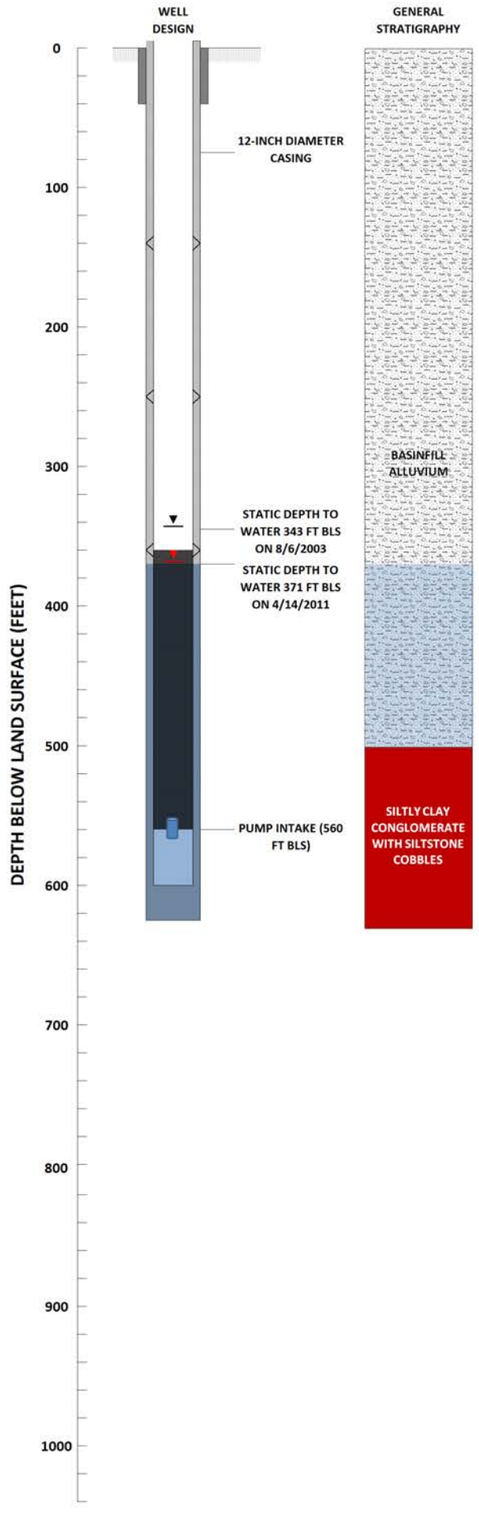
VERSION DATE: JUNE 7, 2011

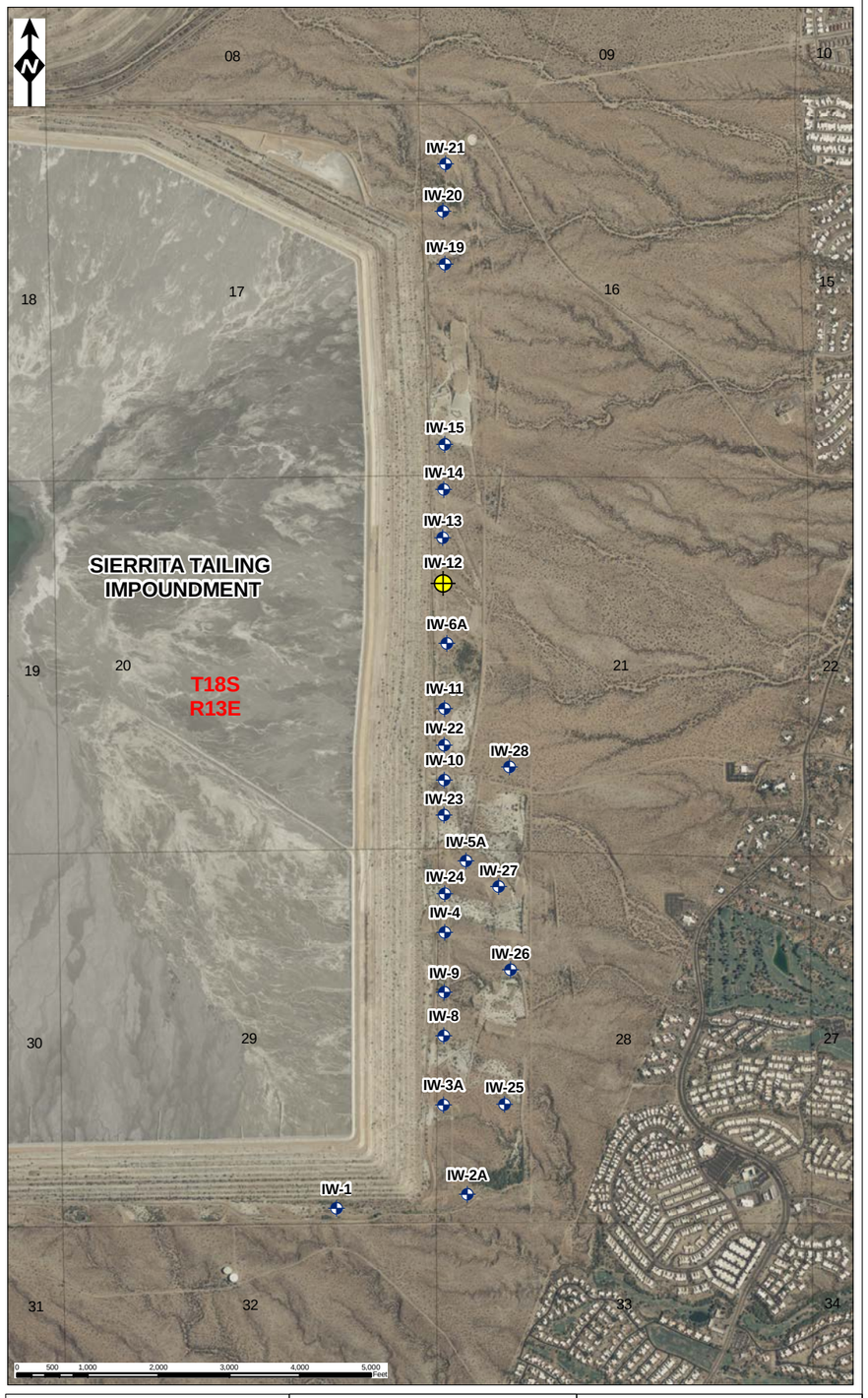
CADASTRAL: D-18-13 21BCC
ADWR REG. NO.: 55-545565
DRILL YEAR: 1994











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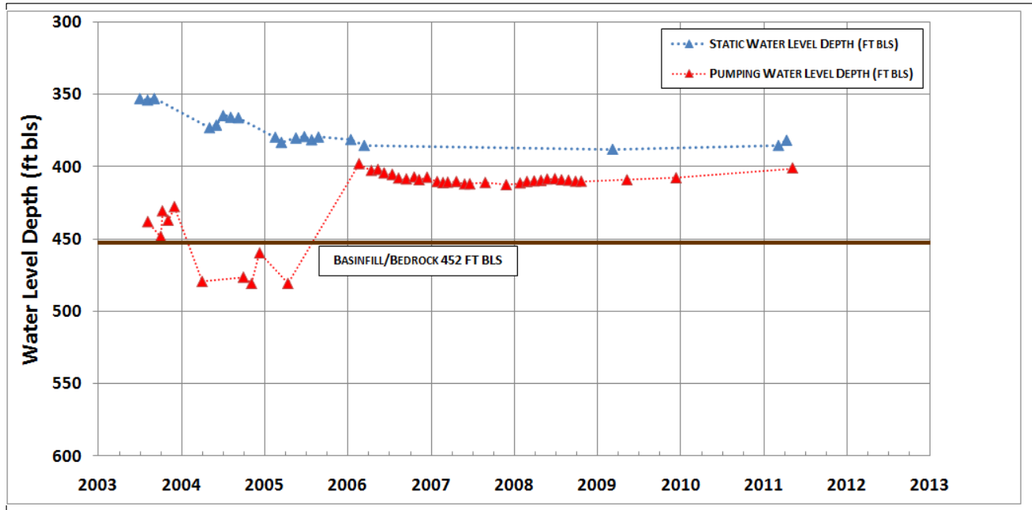
SPECIALISTS IN GROUNDWATER DEVELOPMENT

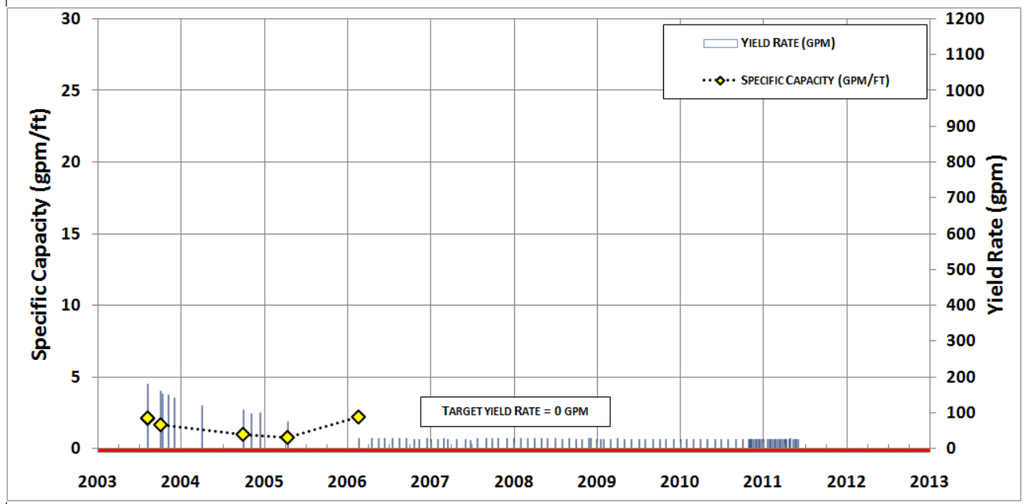
FREEPORT-MCMORAN COPPER & GOLD

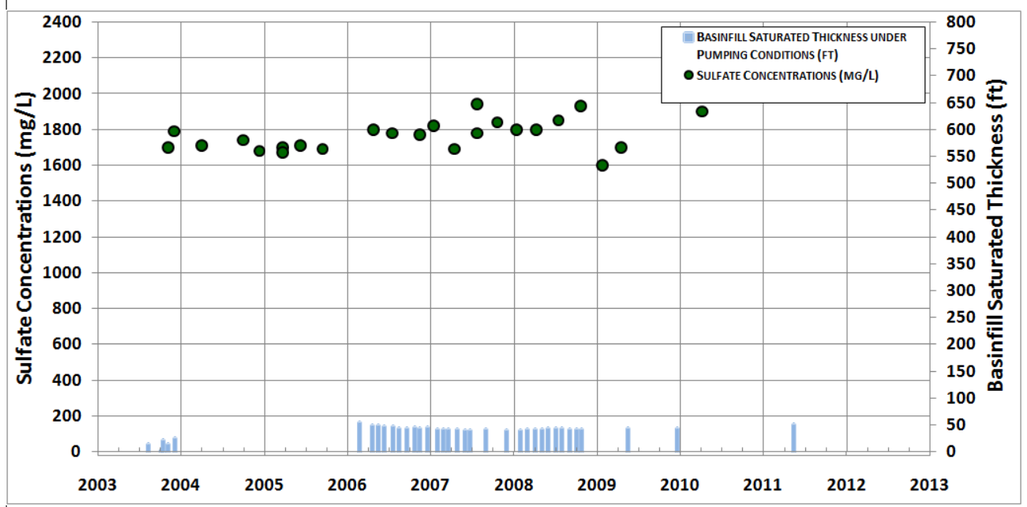
IW-12: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

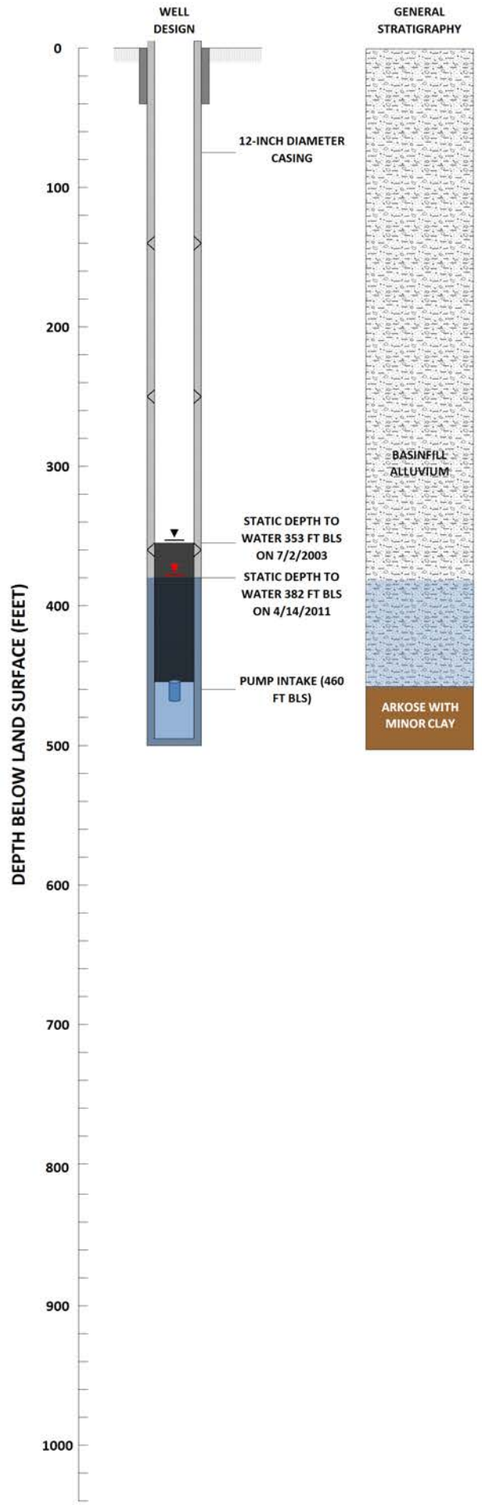
VERSION DATE: JUNE 7, 2011

CADASTRAL: D-18-13 21BCB
ADWR REG. NO.: 55-545555
DRILL YEAR: 1994









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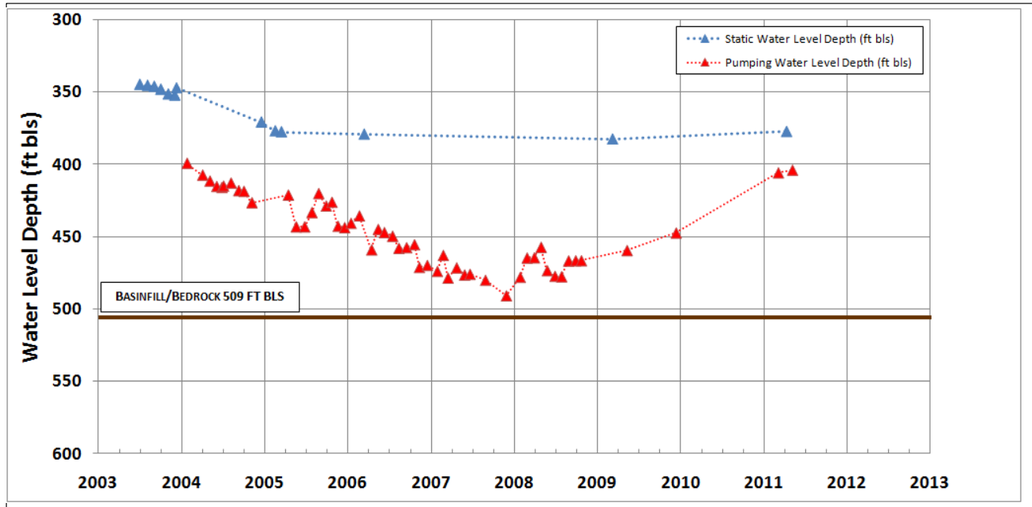
SPECIALISTS IN GROUNDWATER DEVELOPMENT

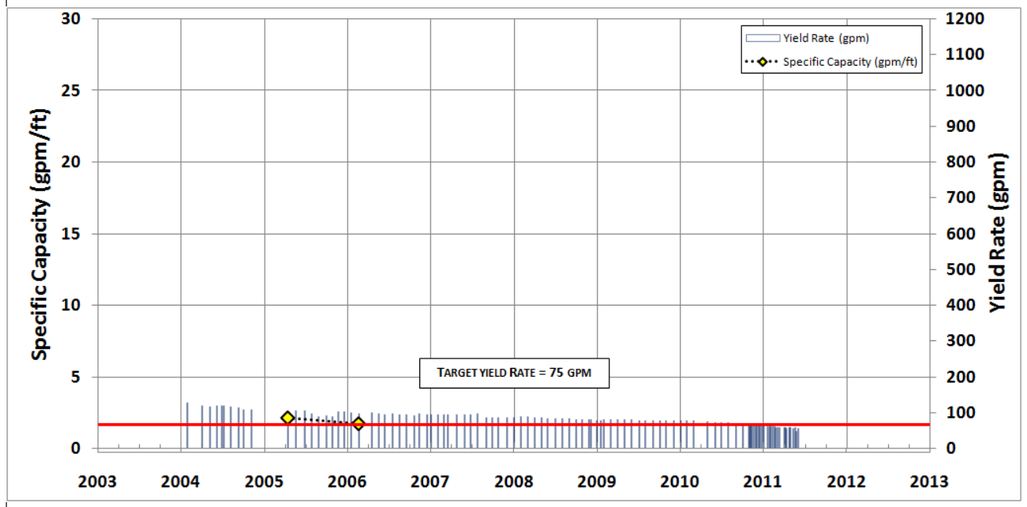
FREEPORT-MCMORAN COPPER & GOLD

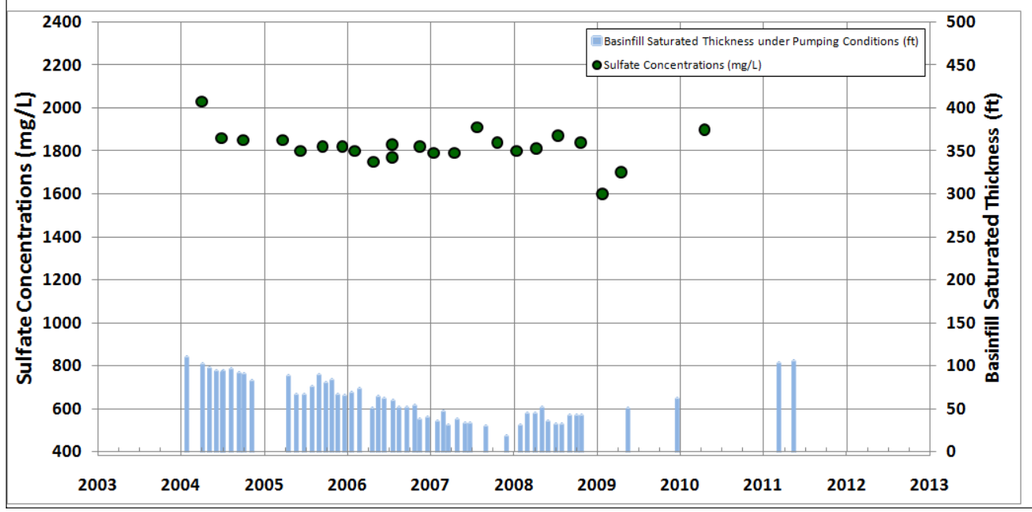
IW-13: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

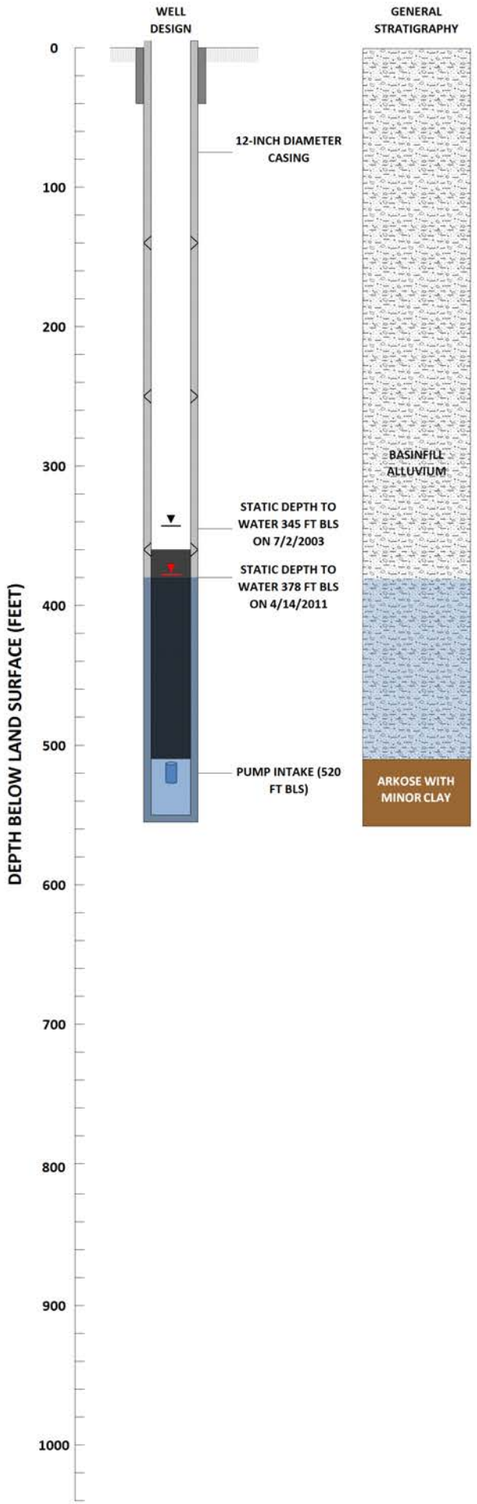
VERSION DATE: JUNE 7, 2011

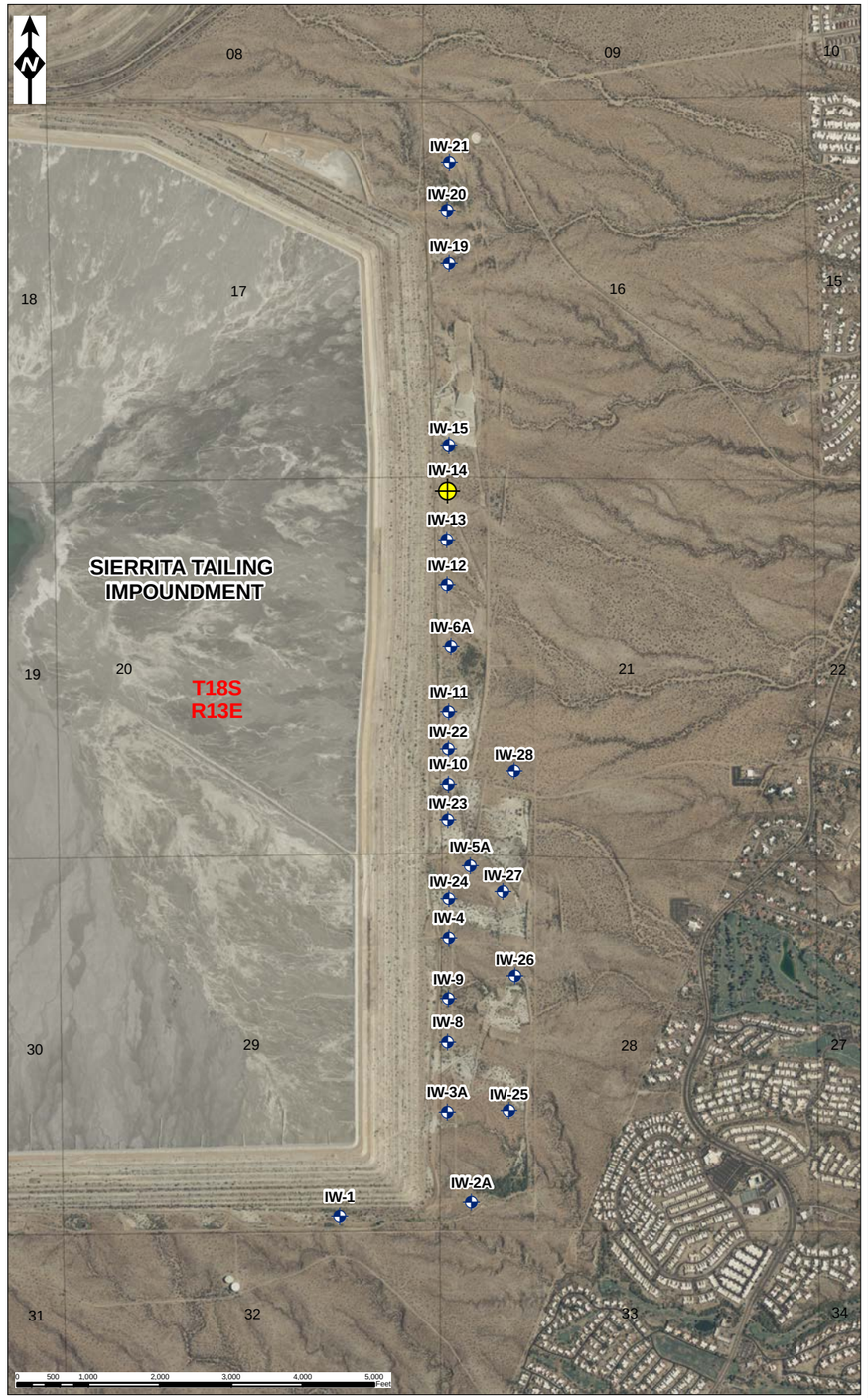
CADASTRAL: D-18-13 21BBC
ADWR REG. NO.: 55-545556
DRILL YEAR: 1994











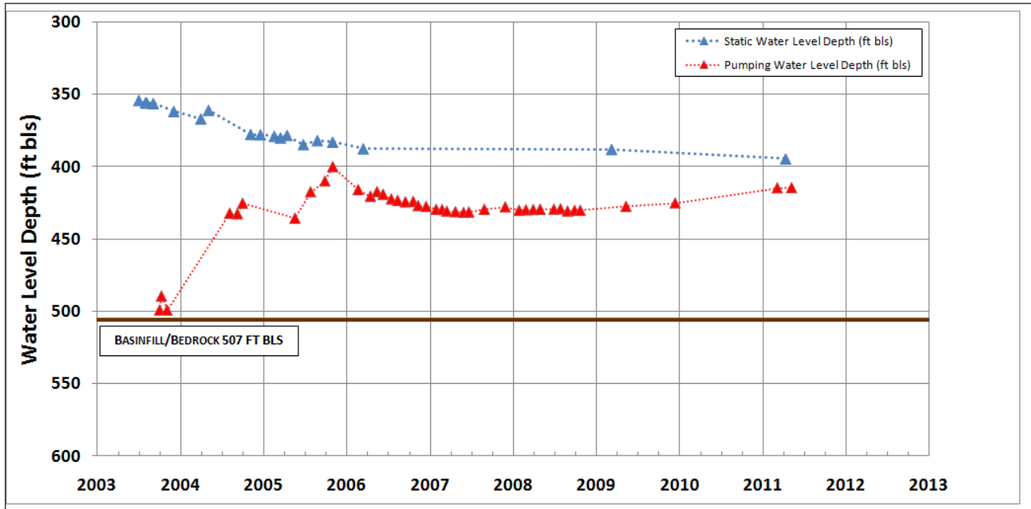
BasinWells ASSOCIATES PLLC
SPECIALISTS IN GROUNDWATER DEVELOPMENT

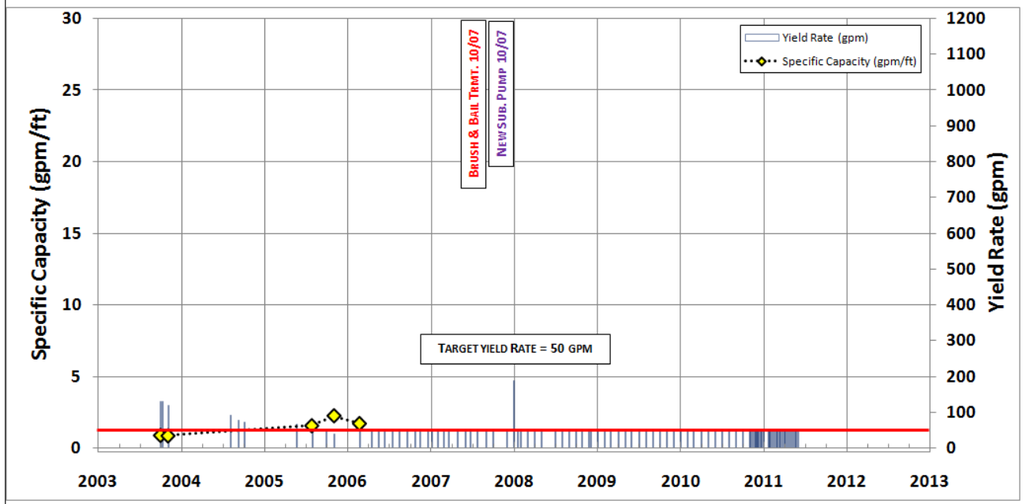
FREEPORT-MCMORAN COPPER & GOLD

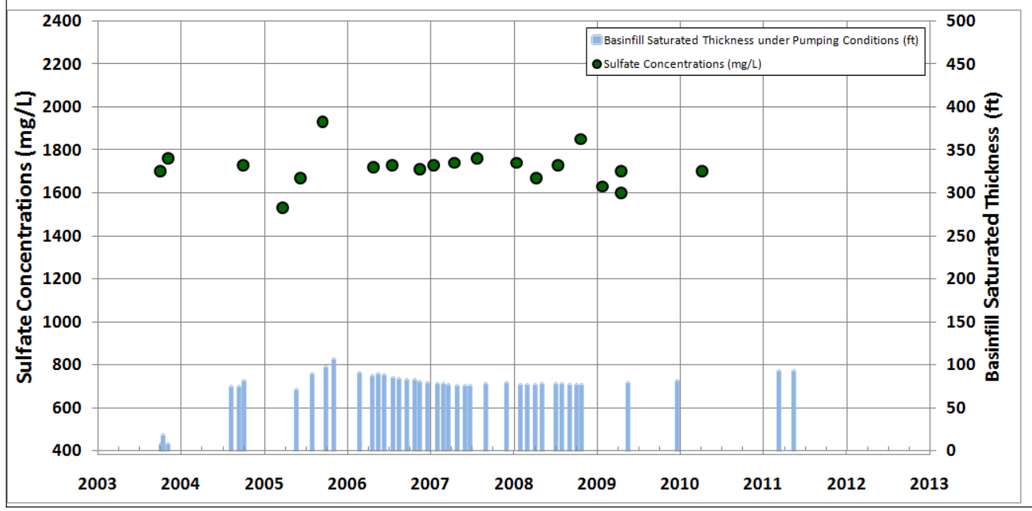
IW-14: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

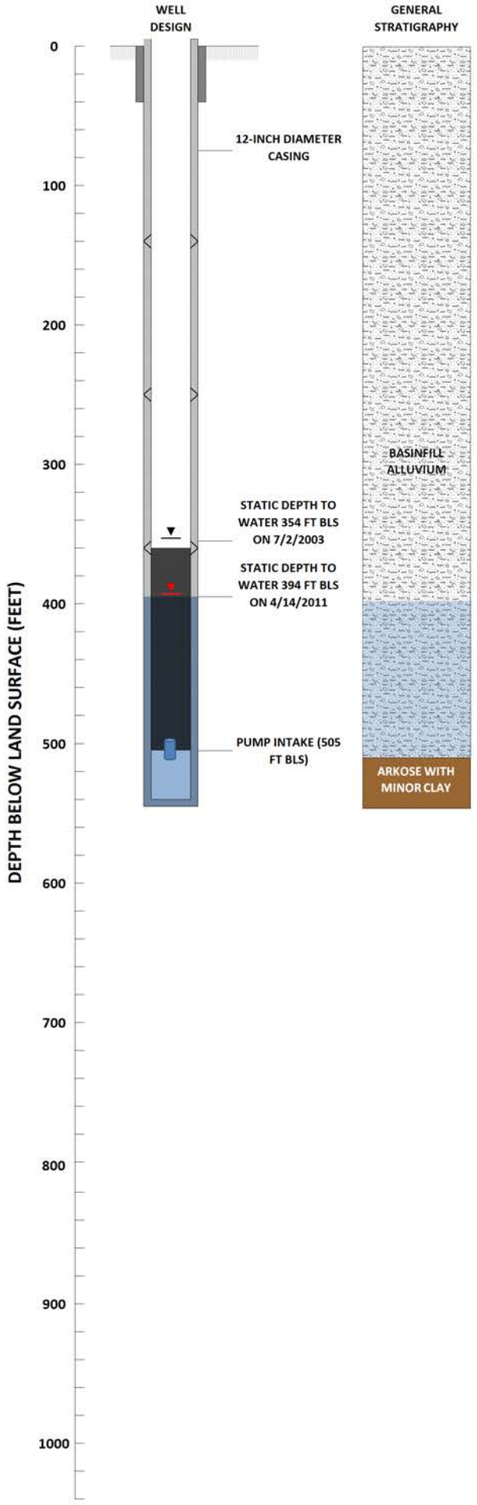
VERSION DATE: JUNE 7, 2011

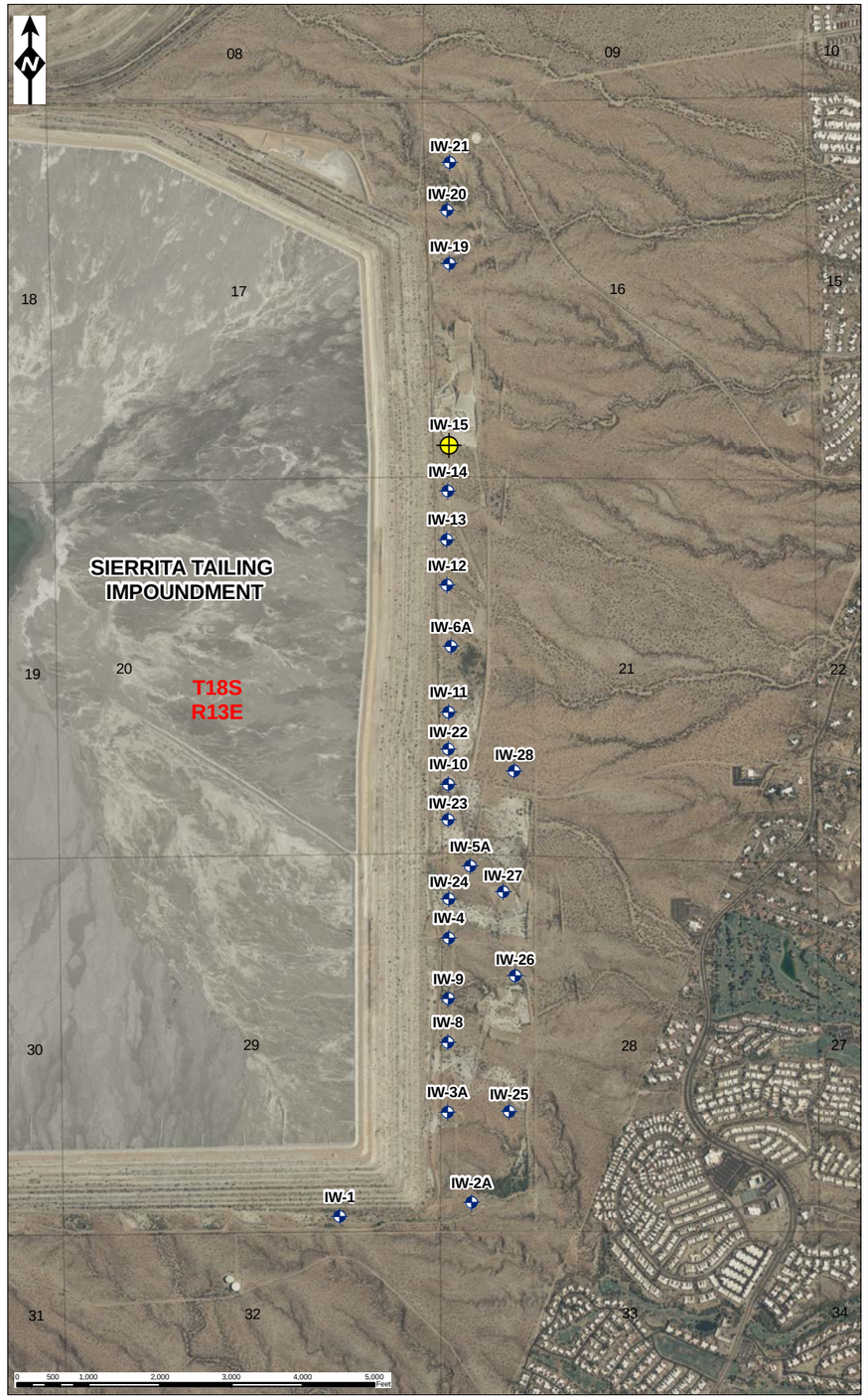
CADASTRAL: D-18-13 21BBB
ADWR REG. NO.: 55-545557
DRILL YEAR: 1994











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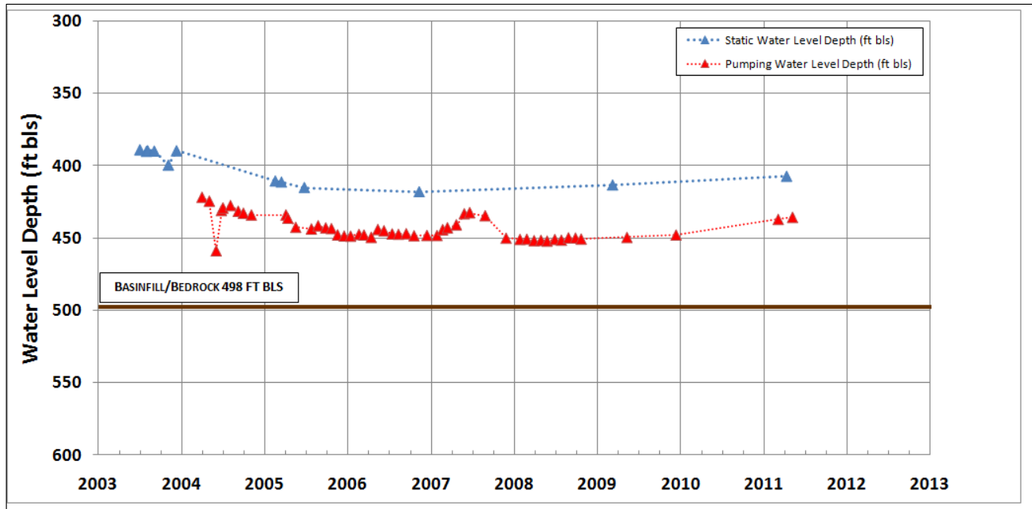
SPECIALISTS IN GROUNDWATER DEVELOPMENT

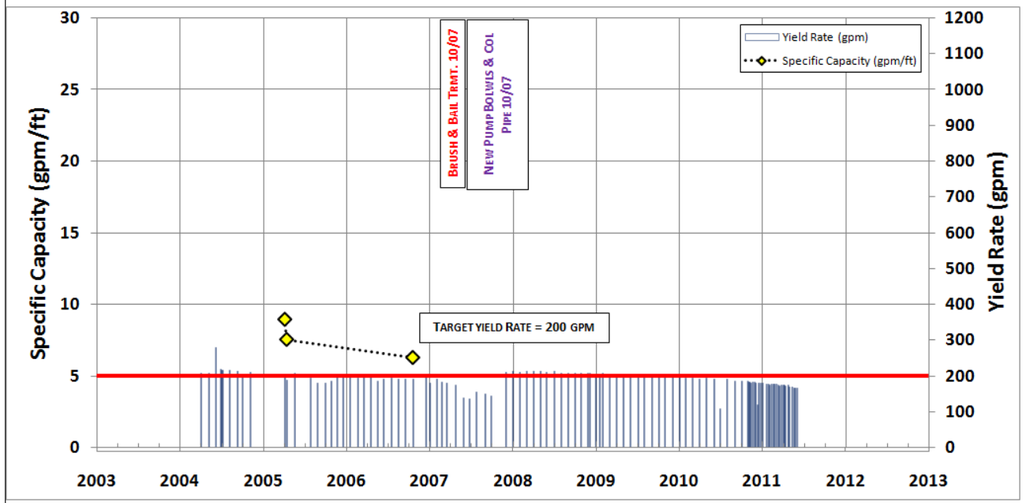
FREEPORT-MCMORAN COPPER & GOLD

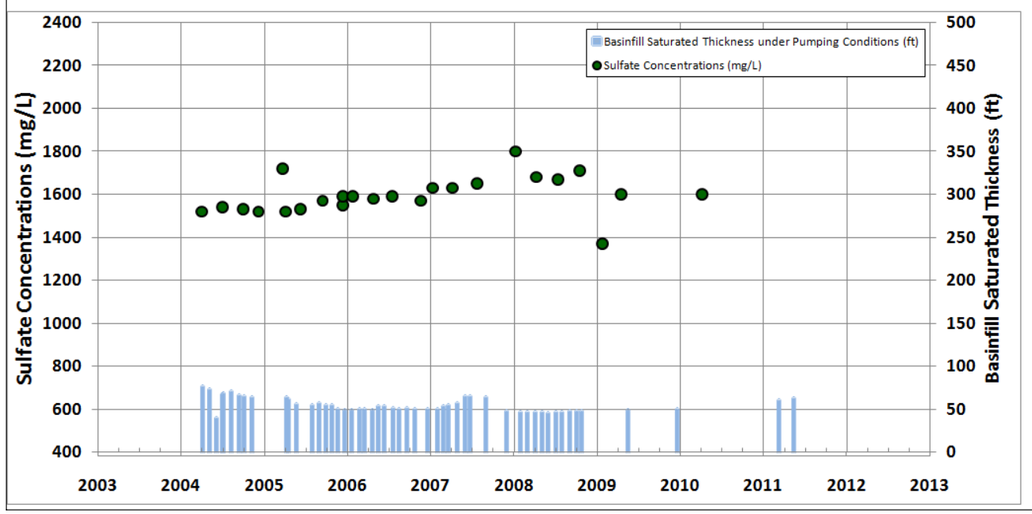
IW-15: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

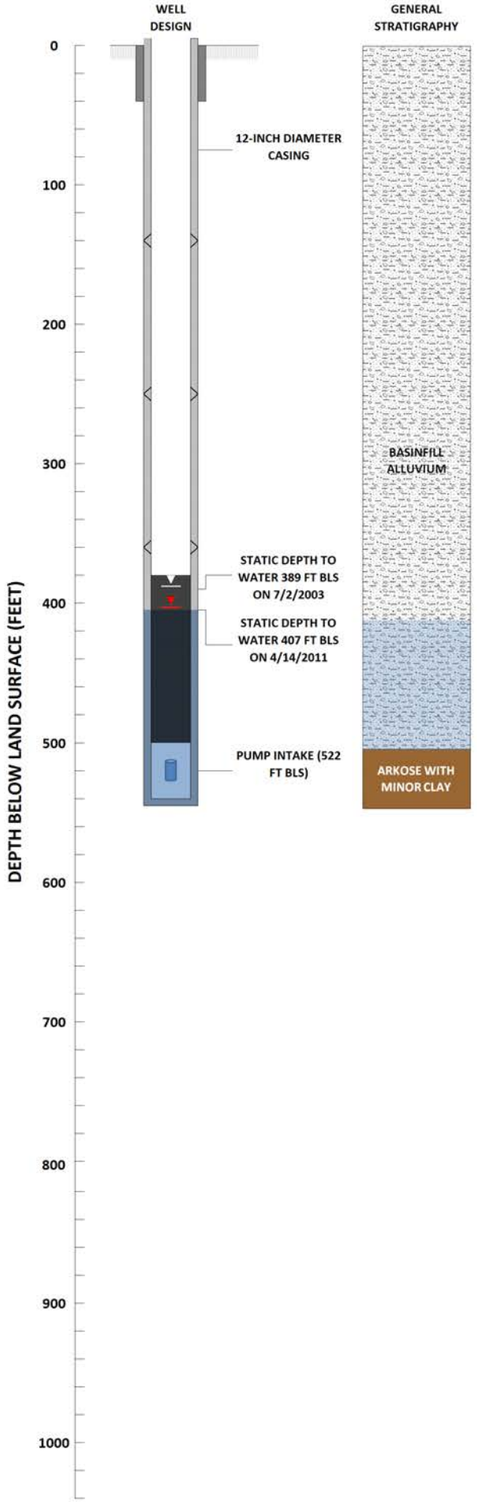
VERSION DATE: JUNE 7, 2011

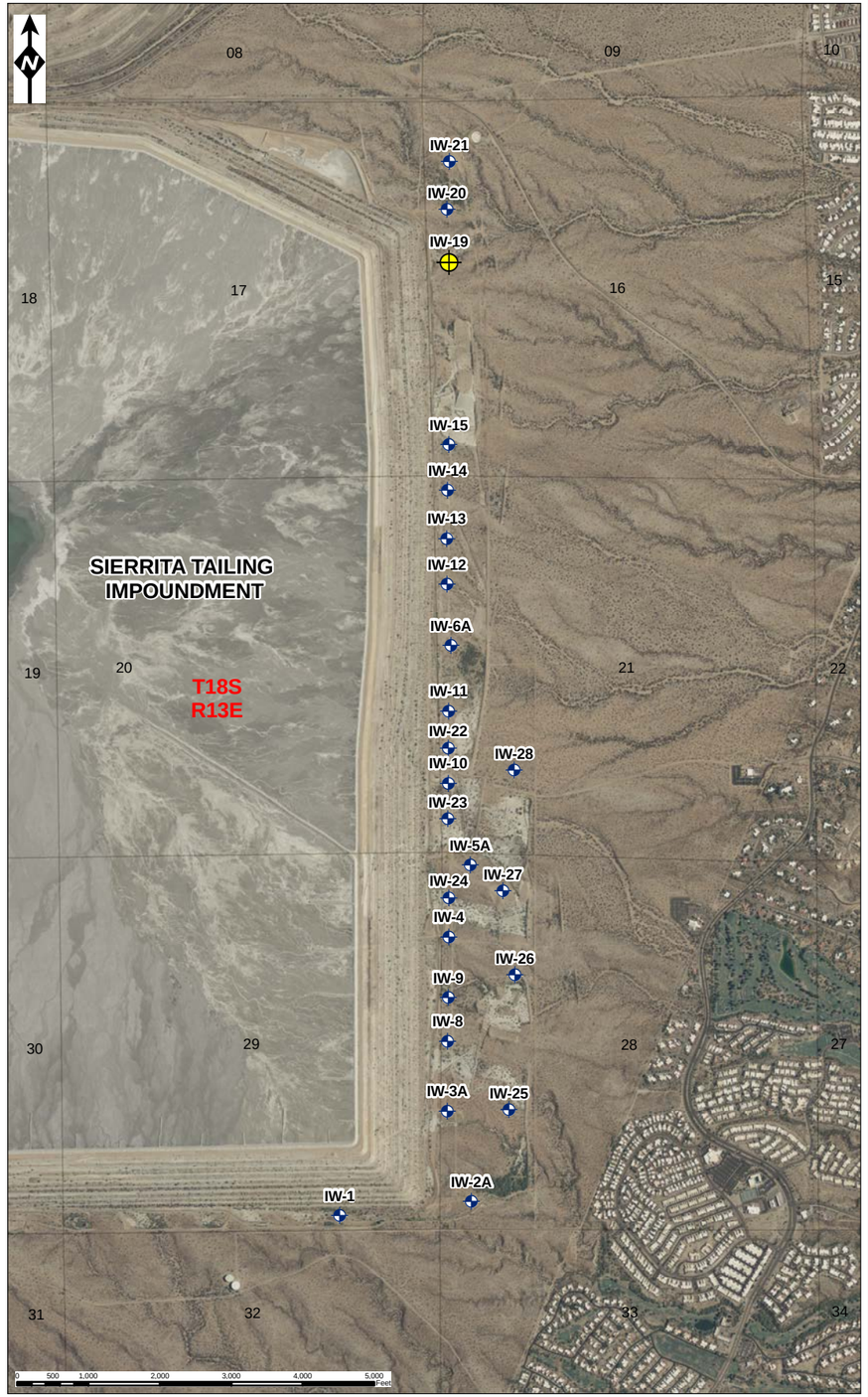
CADASTRAL: D-18-13 16CCC
ADWR REG. NO.: 55-545558
DRILL YEAR: 1995











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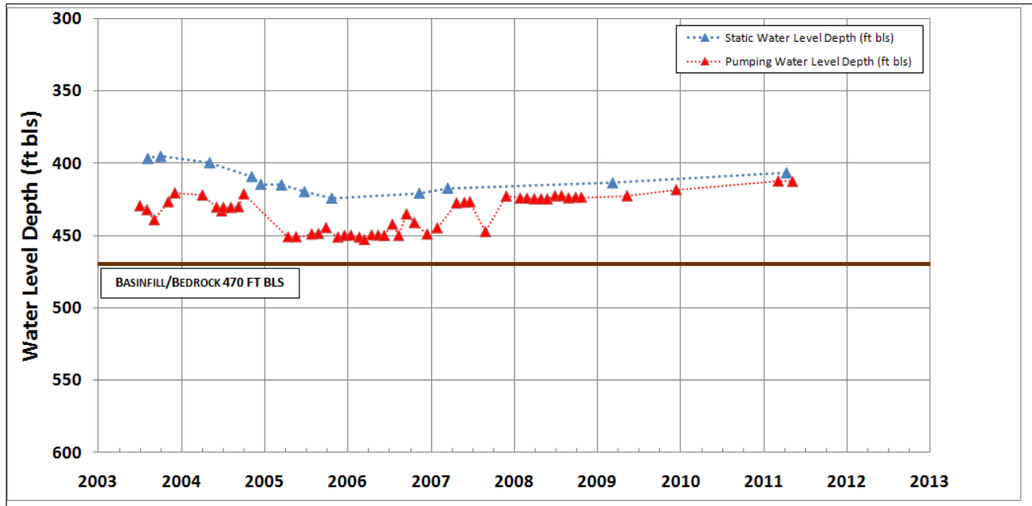
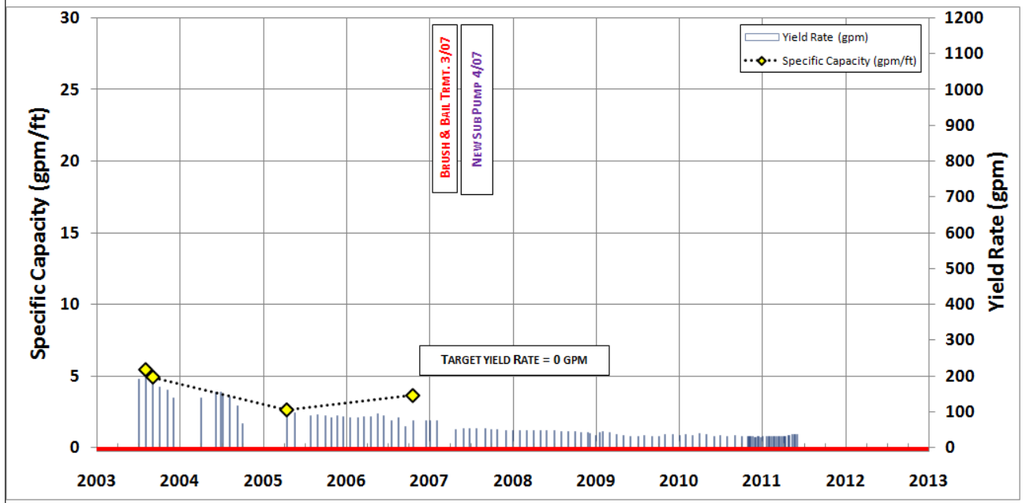
FREEPORT-MCMORAN COPPER & GOLD

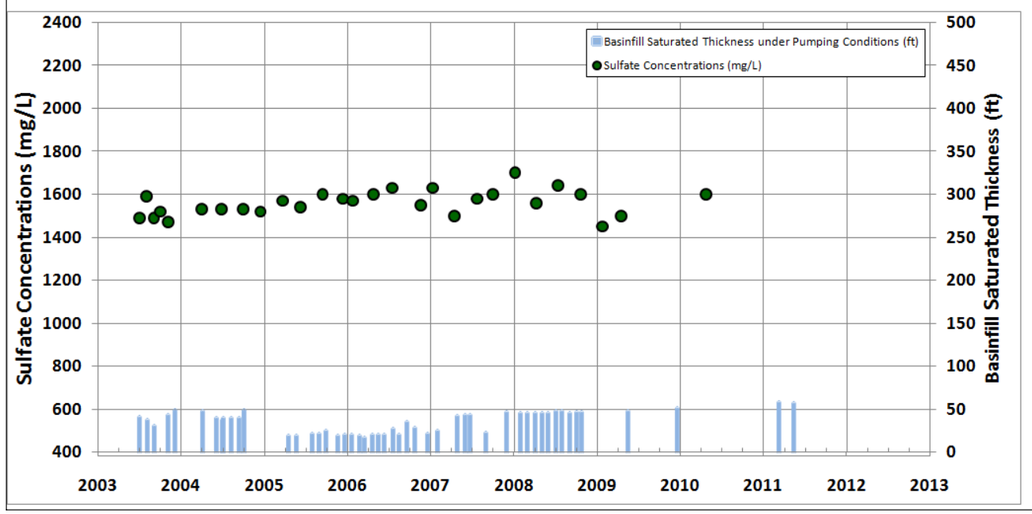
IW-19: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

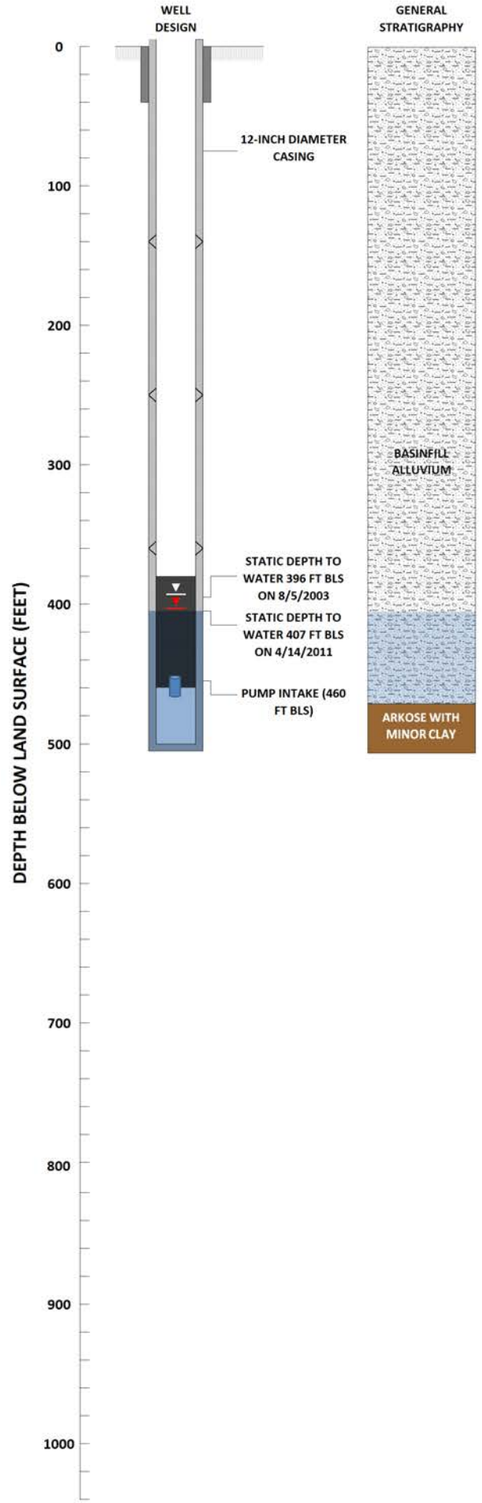
VERSION DATE: JUNE 7, 2011

CADASTRAL: D-18-13 16BCC
ADWR REG. NO.: 55-545562
DRILL YEAR: 1995









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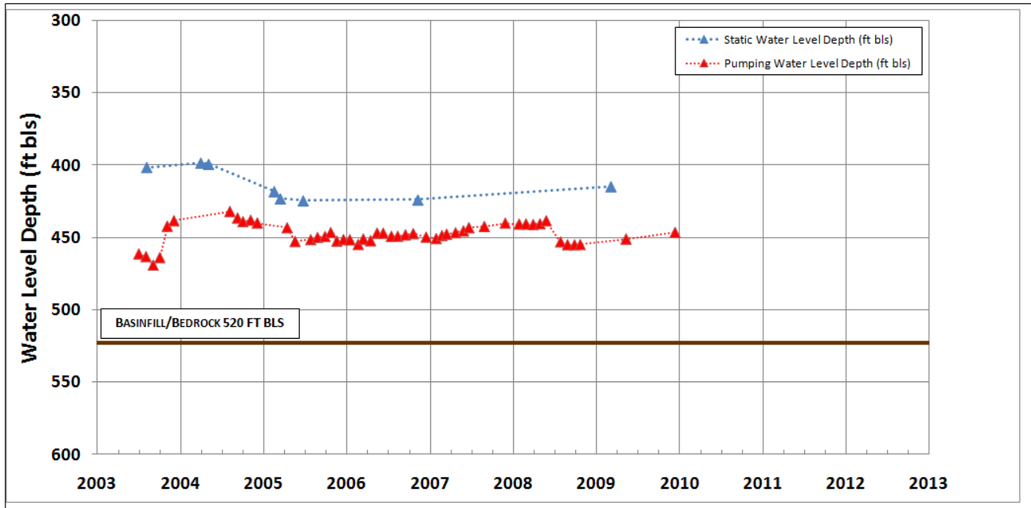
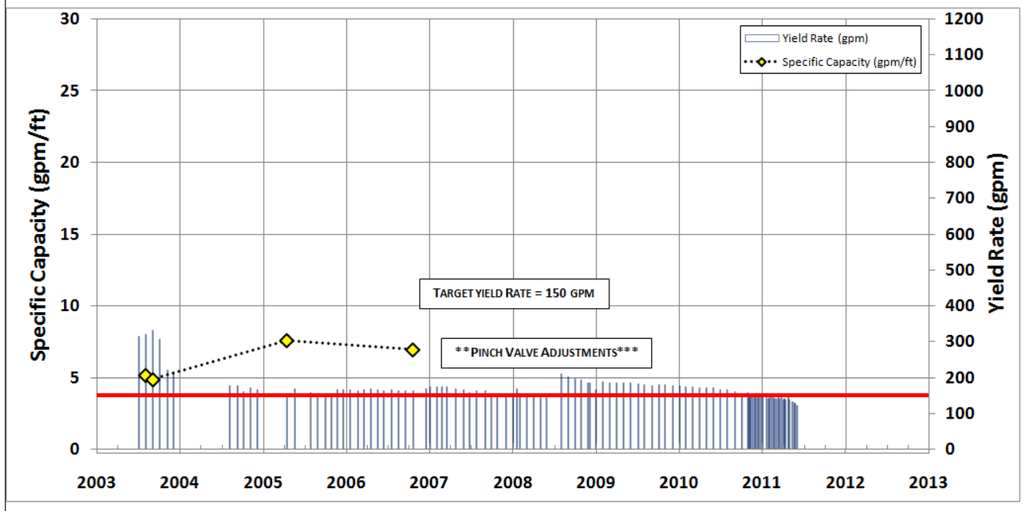
FREEPORT-MCMORAN COPPER & GOLD

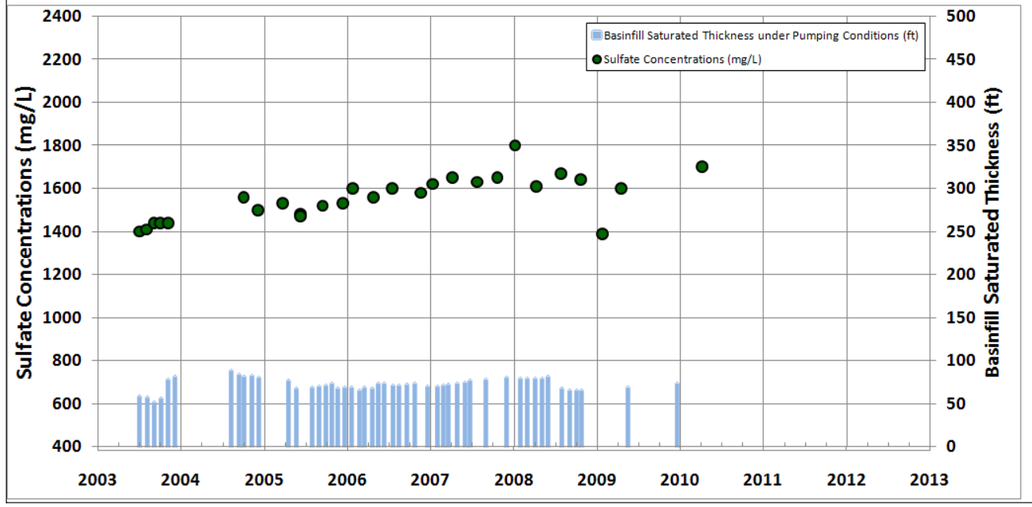
IW-20: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

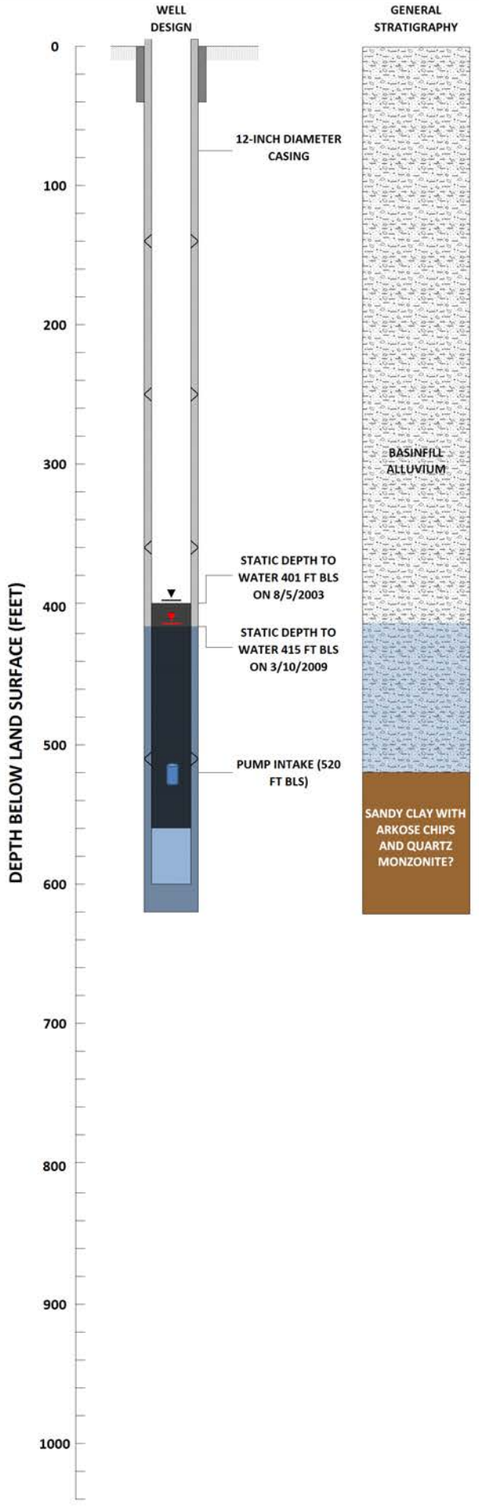
VERSION DATE: JUNE 7, 2011

CADASTRAL: D-18-13 16BCB
ADWR REG. NO.: 55-545563
DRILL YEAR: 1995









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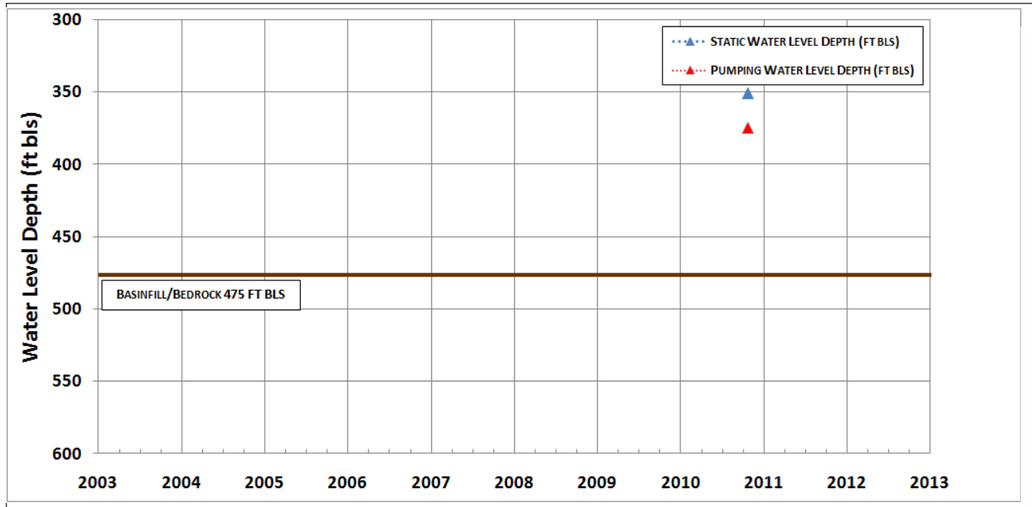
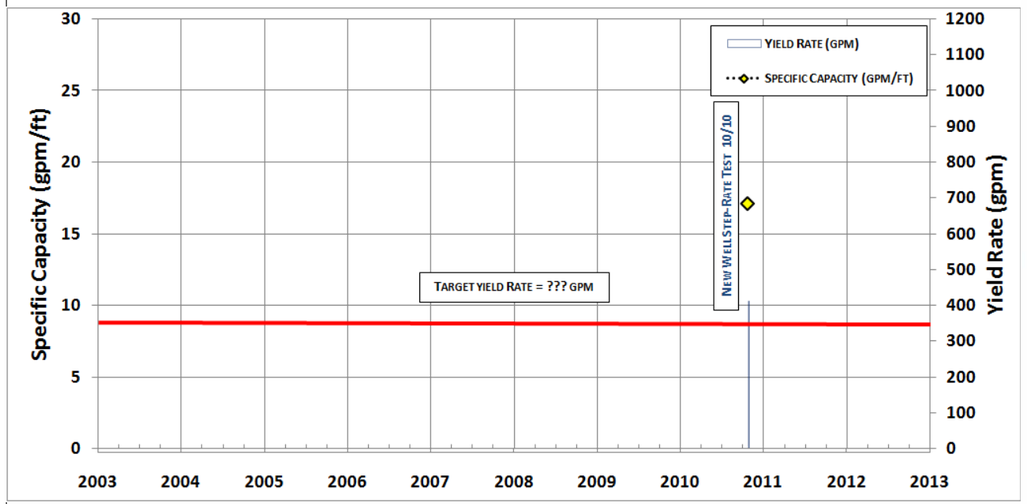
FREEPORT-MCMORAN COPPER & GOLD

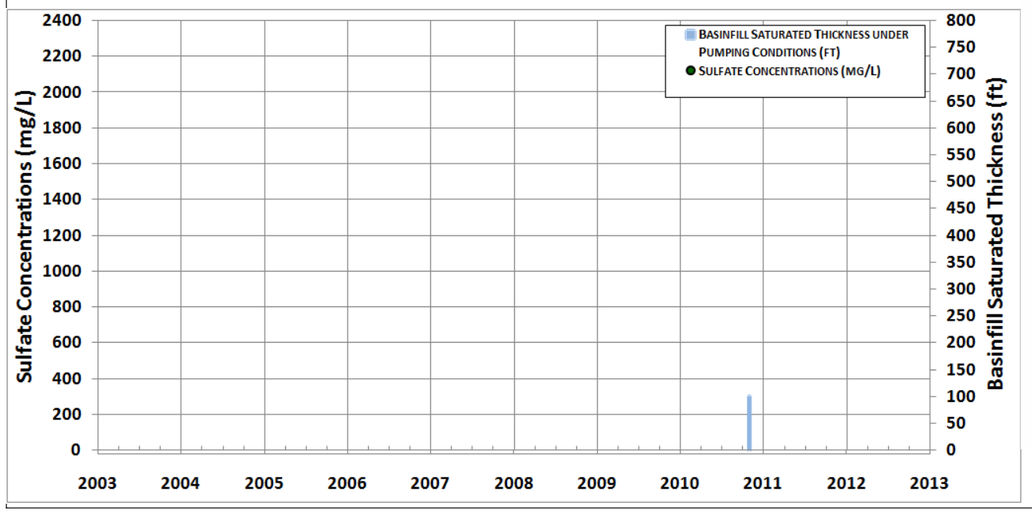
IW-21: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

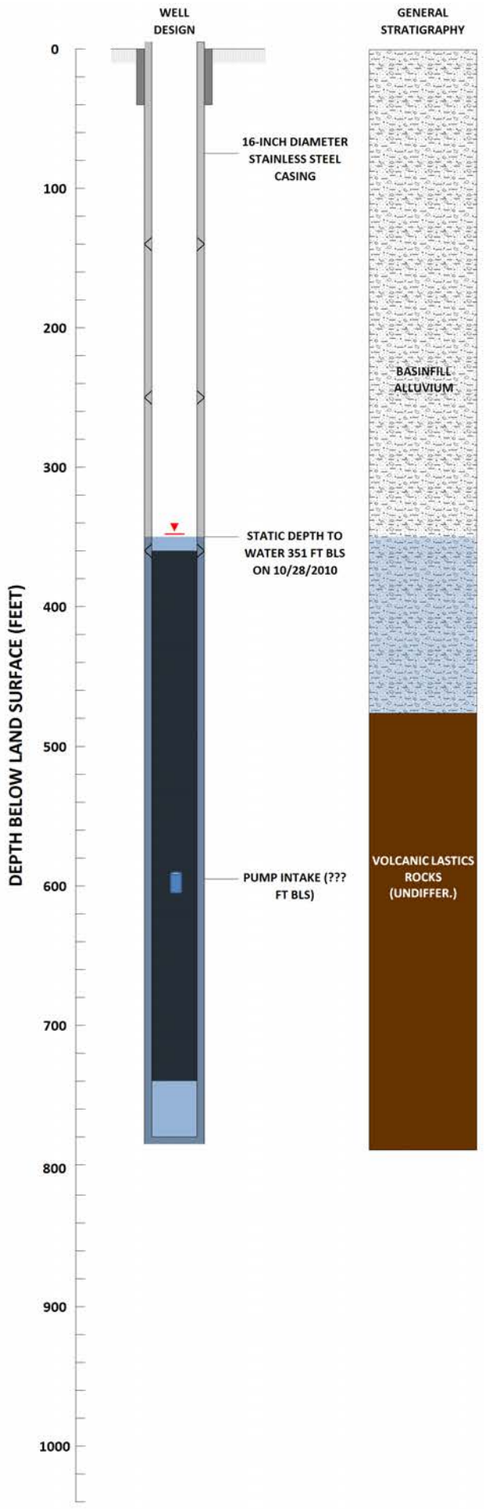
VERSION DATE: JUNE 7, 2011

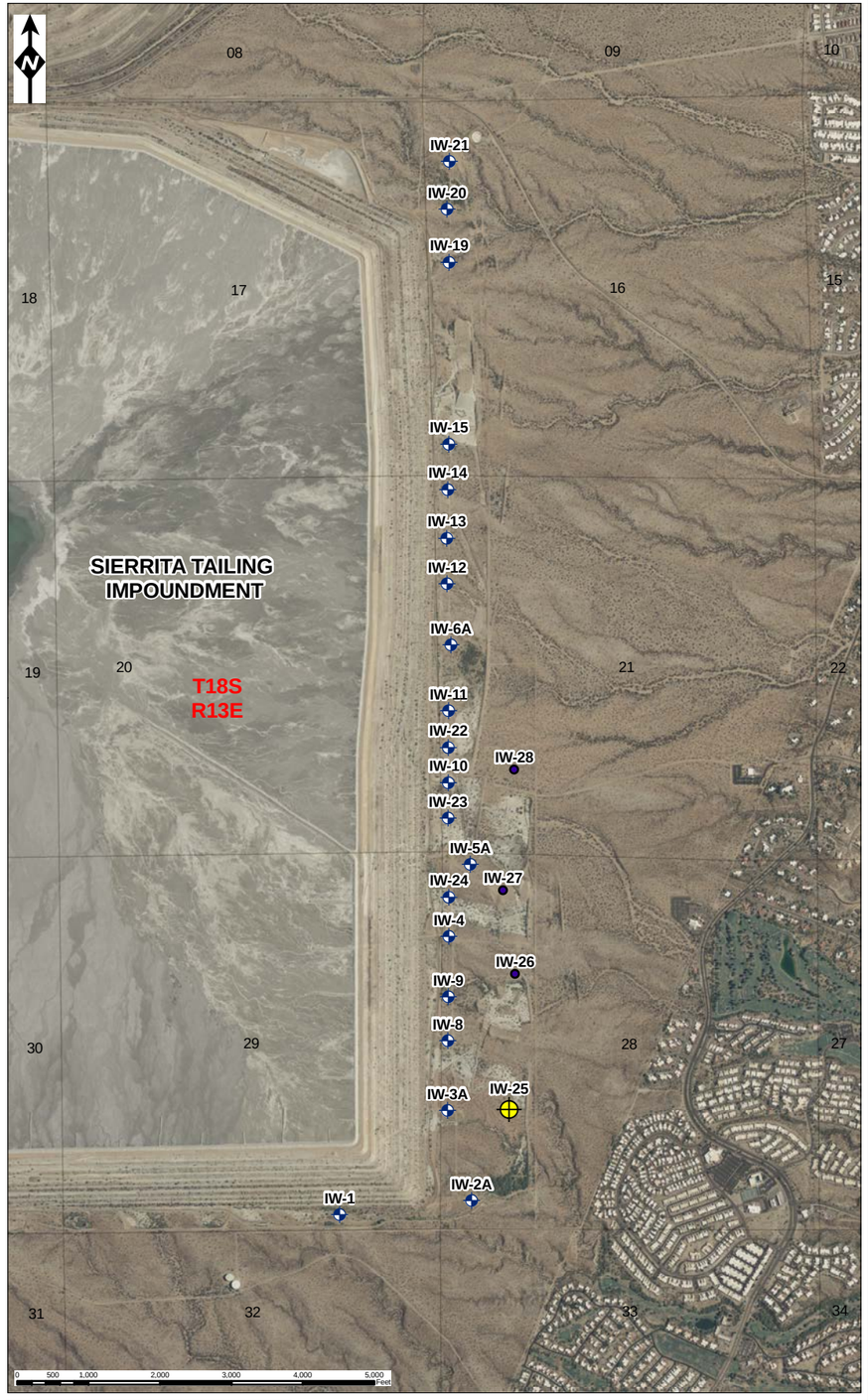
CADASTRAL: D-18-13 16BBC
ADWR REG. NO.: 55-545564
DRILL YEAR: 1995











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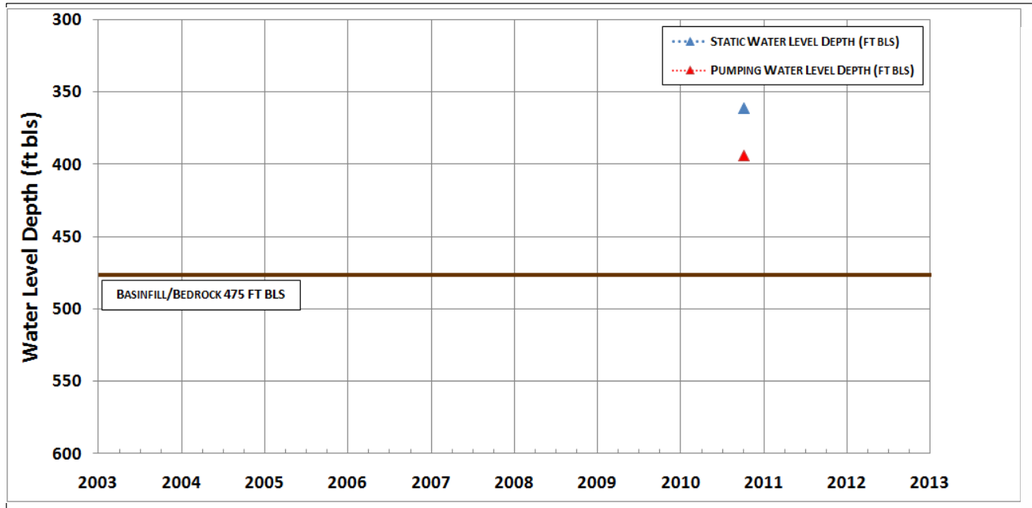
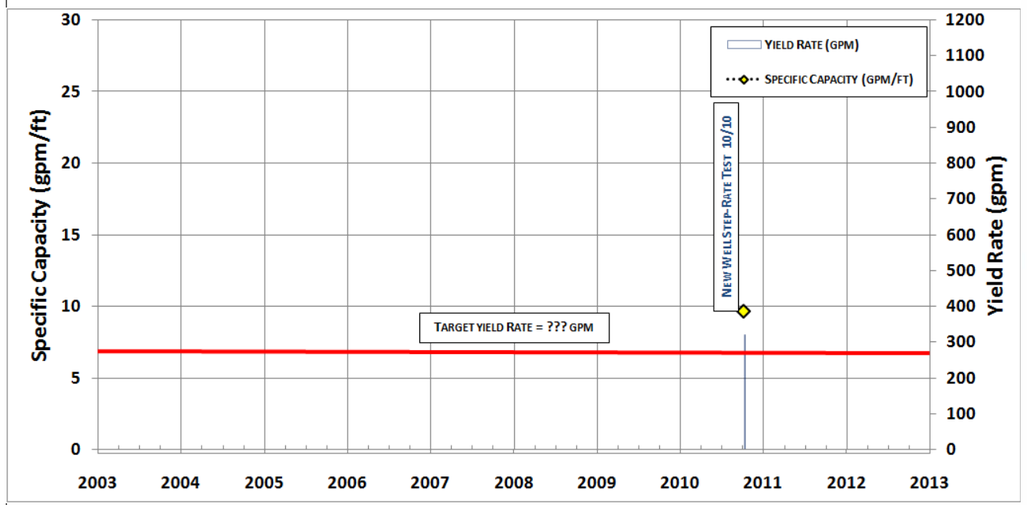
FREEPORT-MCMORAN COPPER & GOLD

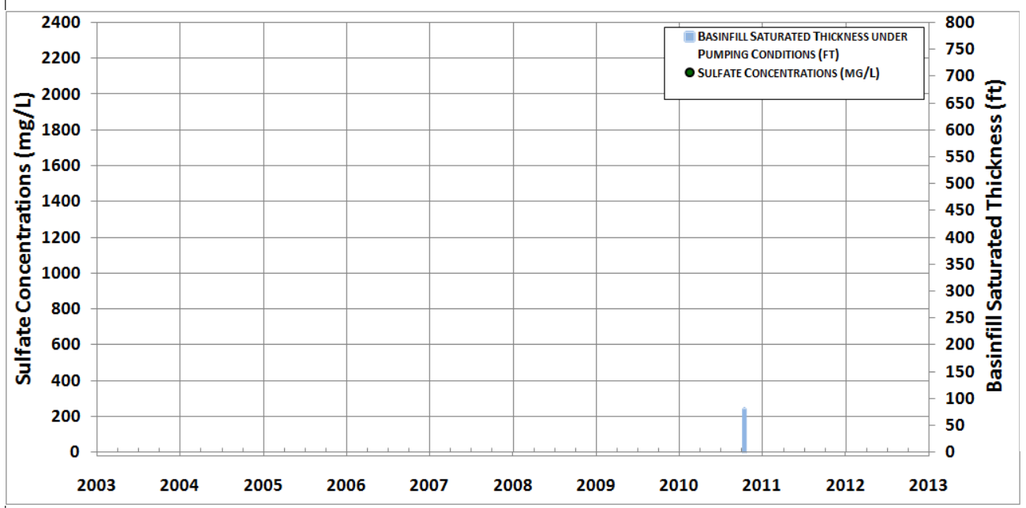
IW-25: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

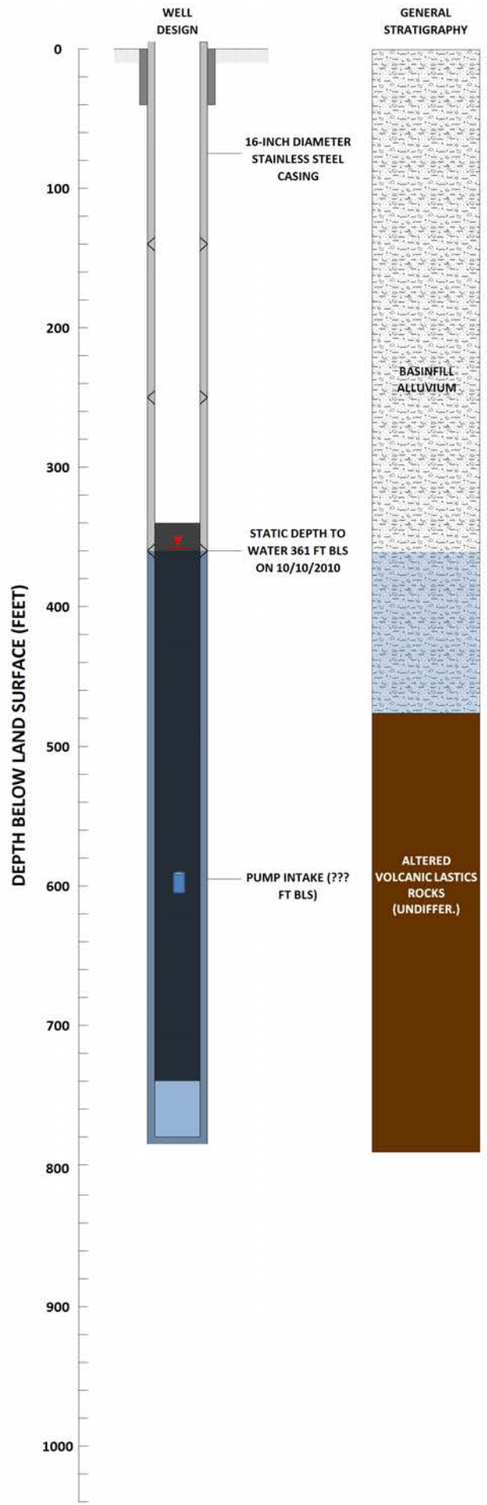
VERSION DATE: JUNE 7, 2011

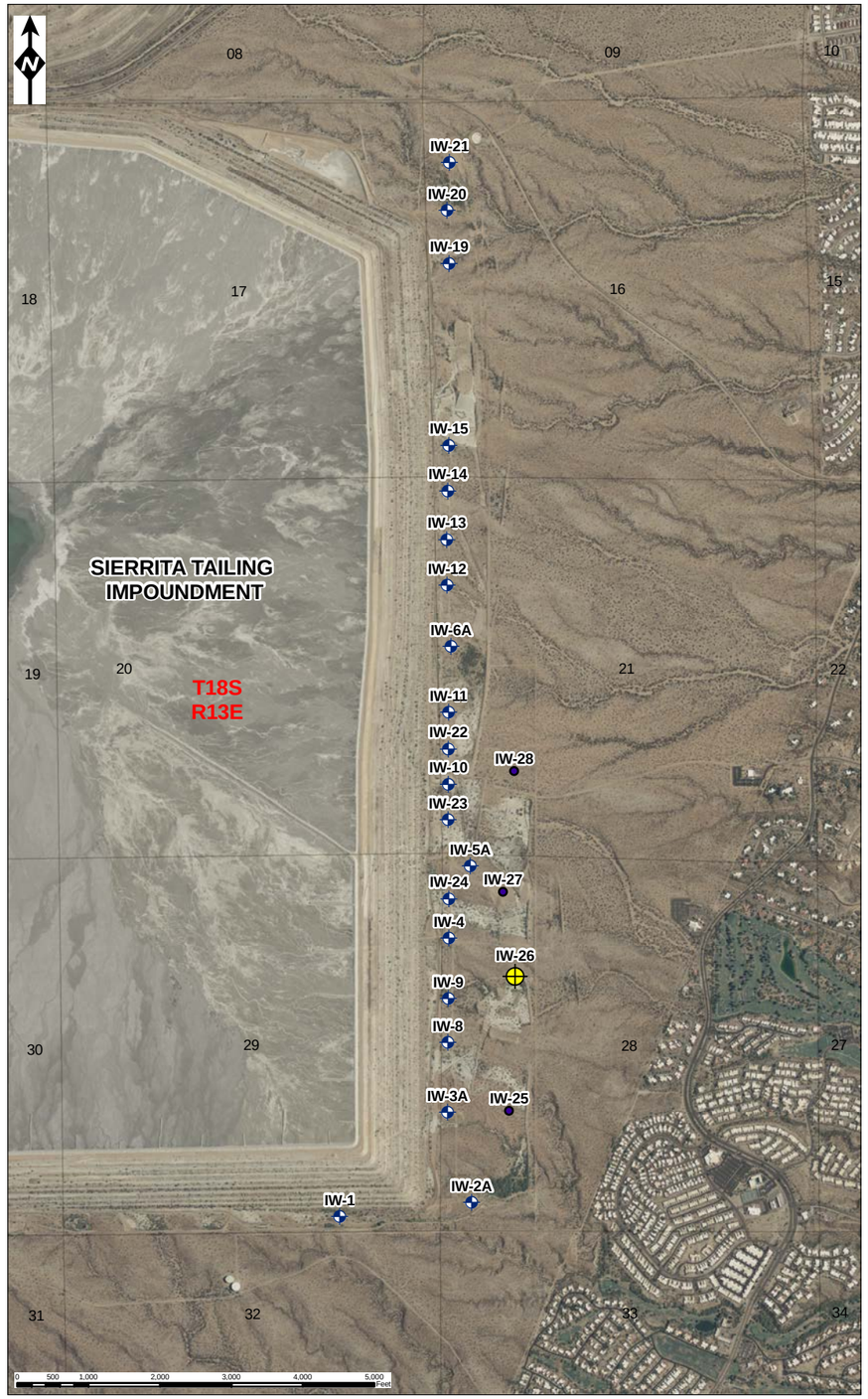
CADASTRAL: D-18-13 28CBD
ADWR REG. NO.: 55-219596
DRILL YEAR: 2010











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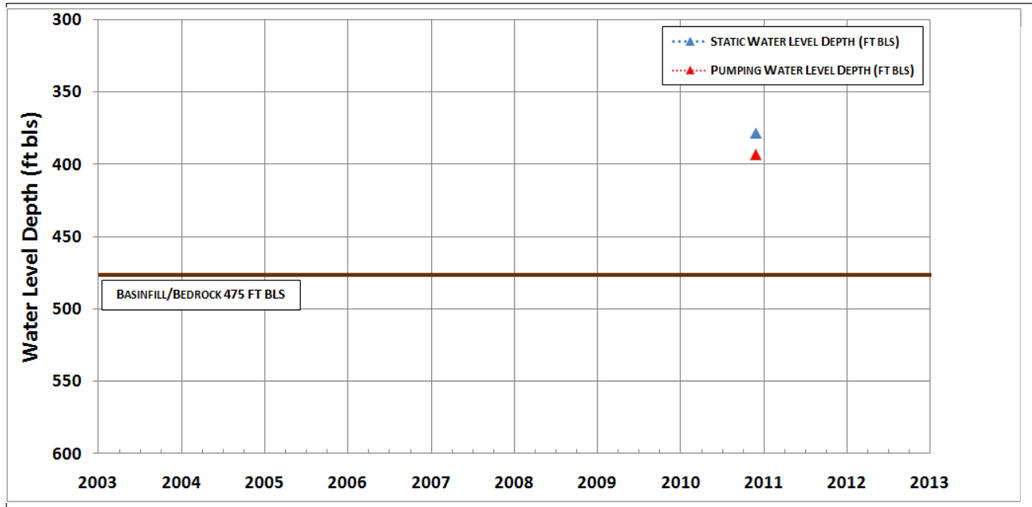
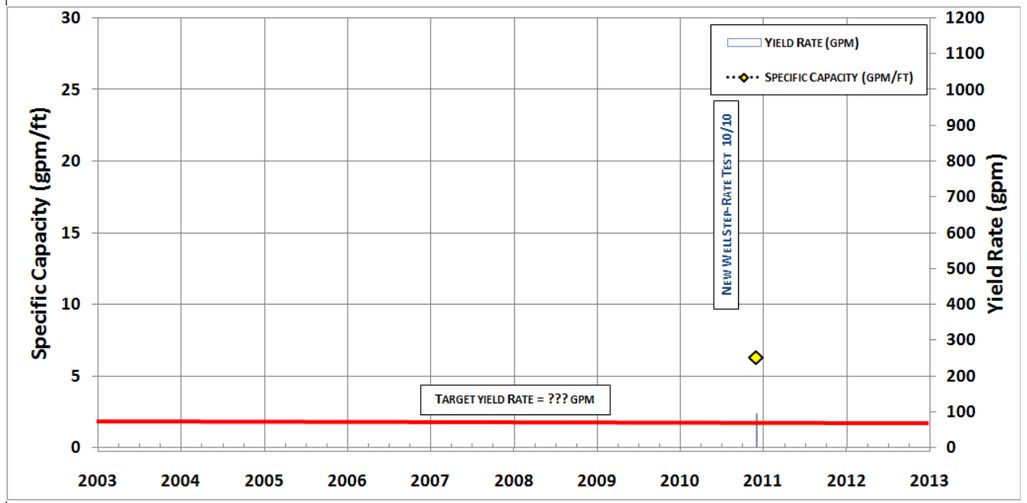
FREEPORT-MCMORAN COPPER & GOLD

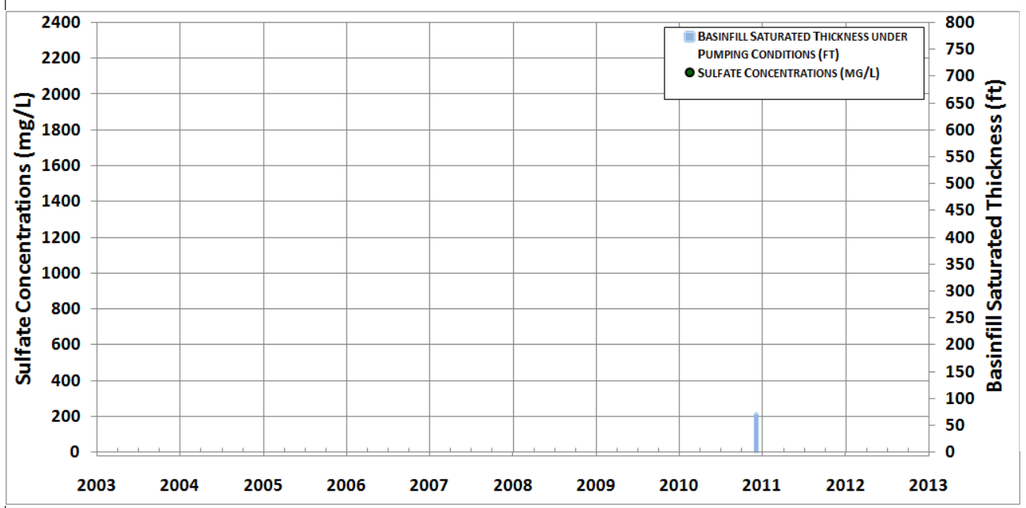
IW-26: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

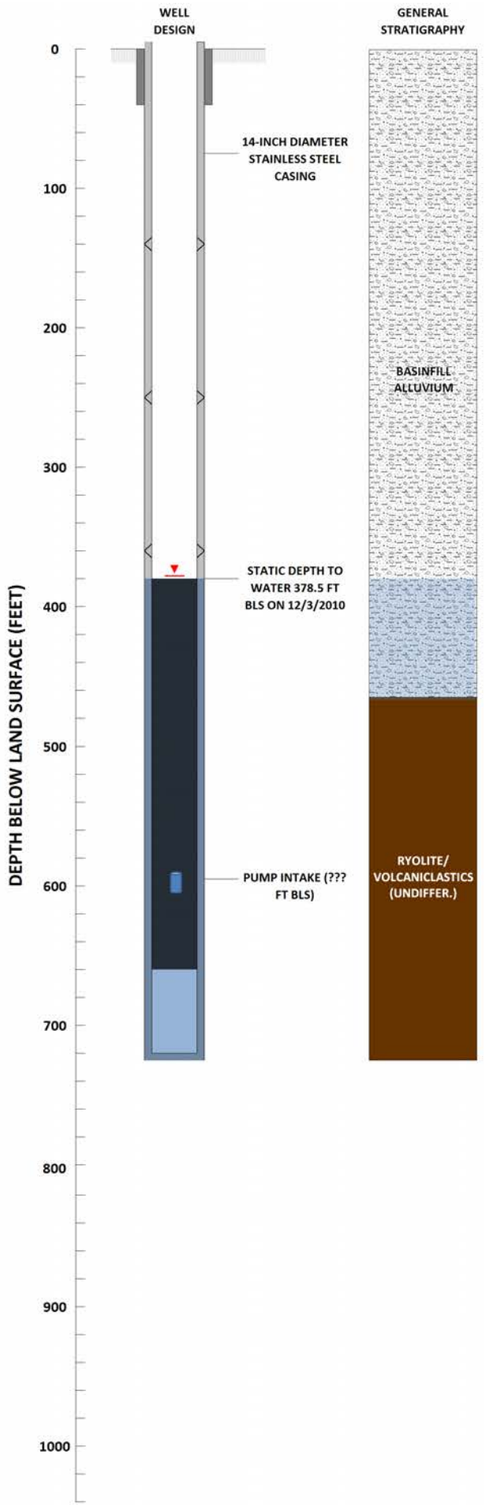
VERSION DATE: JUNE 7, 2011

CADASTRAL: D-18-13 28BCD
ADWR REG. NO.: 55-219143
DRILL YEAR: 2010









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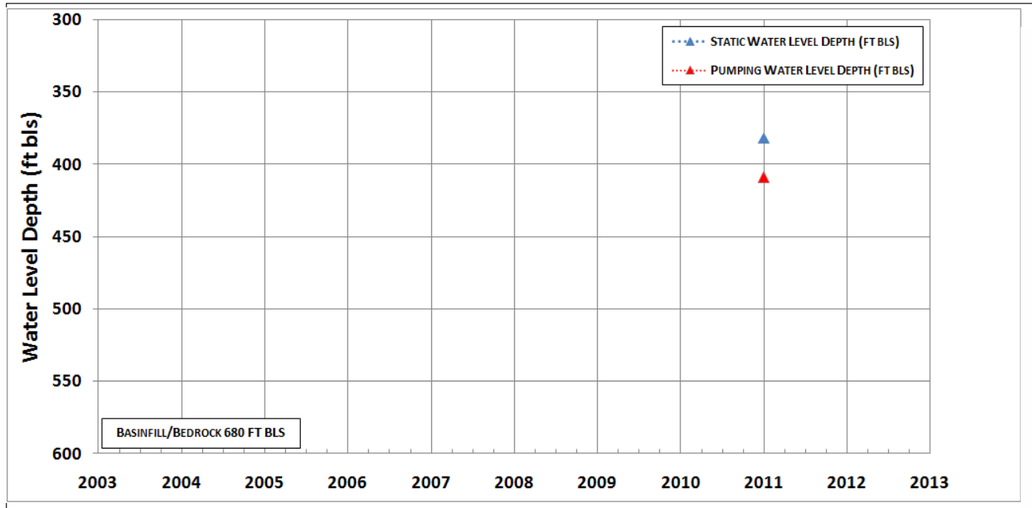
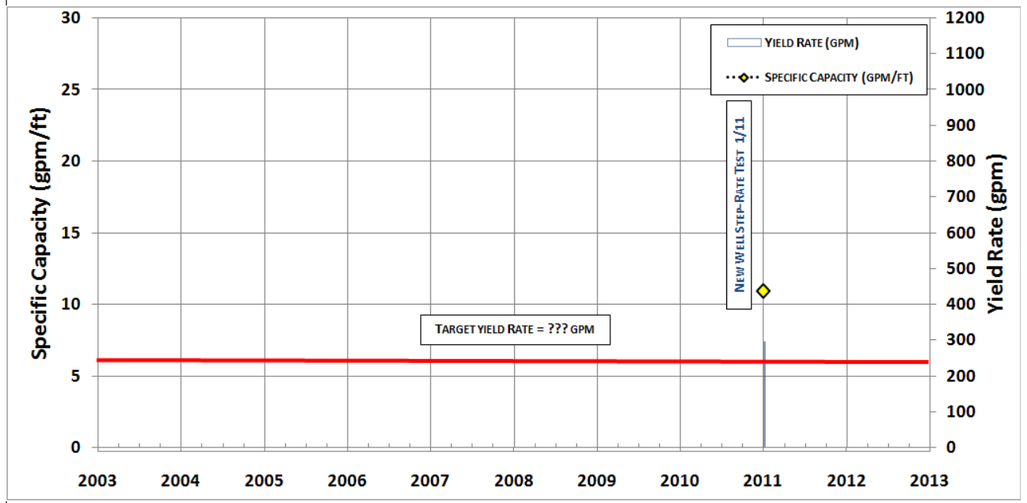
FREEPORT-MCMORAN COPPER & GOLD

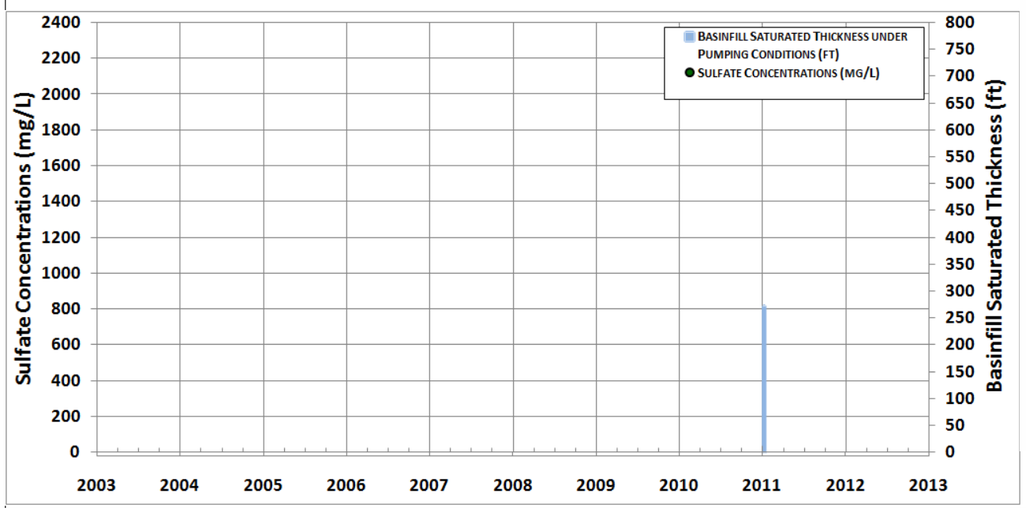
IW-27: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

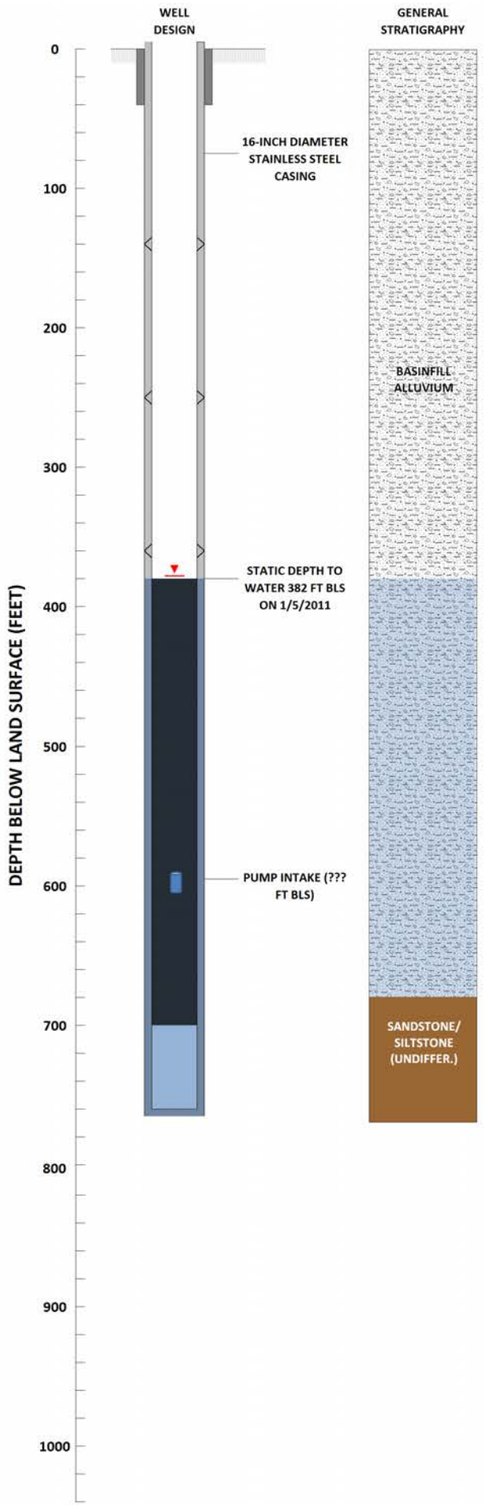
VERSION DATE: JUNE 7, 2011

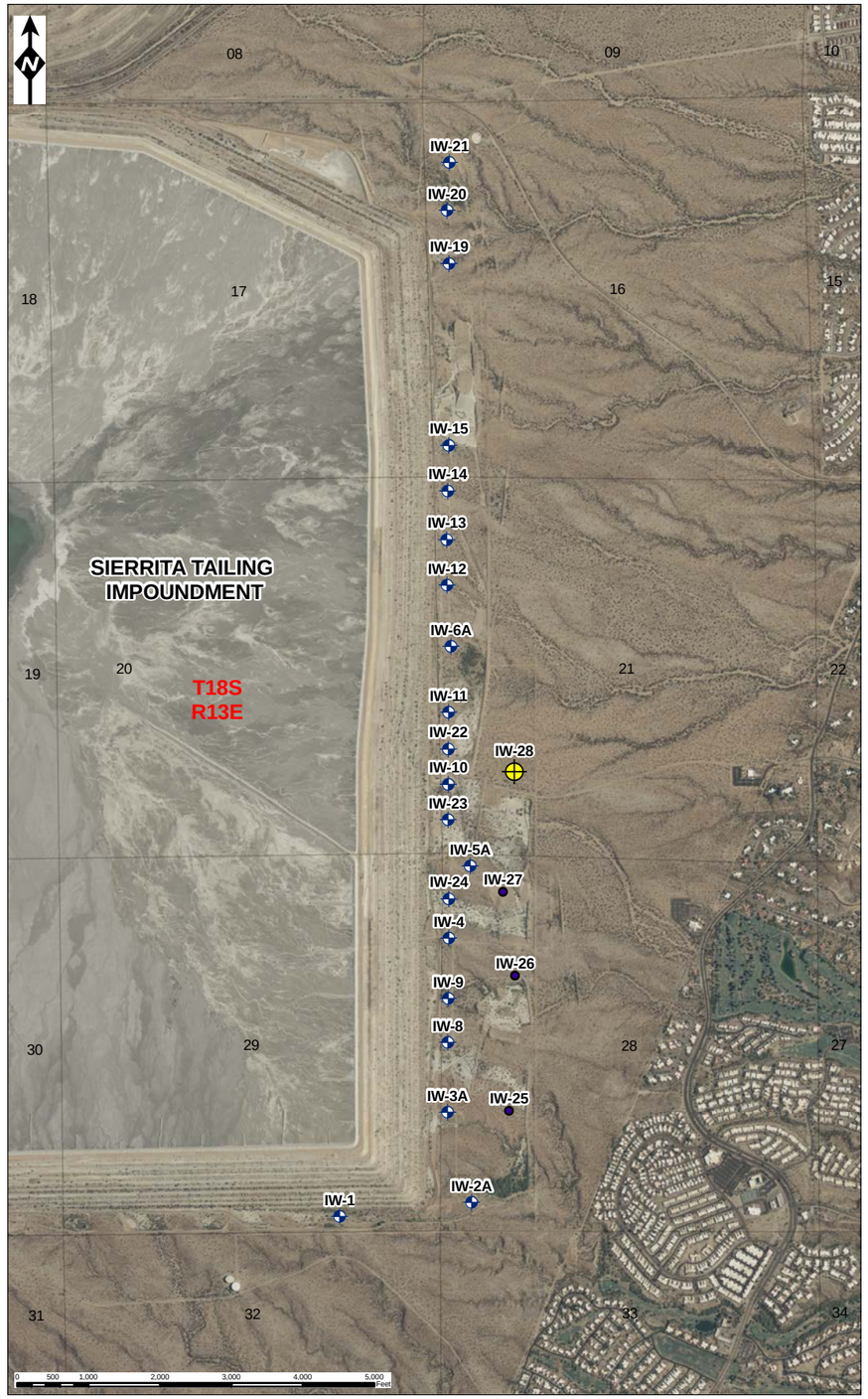
CADASTRAL: D-18-13 28BBD
ADWR REG. NO.: 55-219136
DRILL YEAR: 2010











BasinWells ASSOCIATES PLLC
SPECIALISTS IN GROUNDWATER DEVELOPMENT

FREEPORT-MCMORAN COPPER & GOLD

IW-28: WATER LEVELS, YIELD, SPECIFIC CAPACITY, BASINFILL SAT. THK. AND SULFATE

VERSION DATE: JUNE 7, 2011

CADASTRAL: D-18-13 21CCA
ADWR REG. NO.: 55-219137
DRILL YEAR: 2010

APPENDIX B

Sample Field Forms

WEEKLY FORM NOTES

Week of: _____

	Time	Run Status	Totalizer	Flow	Hours	AMPs	Pressure
IW-1							
IW-2A							
IW-3A							
IW-4							
IW-5A							
IW-6A							
IW-8							
IW-9							
IW-10							
IW-11							
IW-12							
IW-13							
IW-14							
IW-15							
IW-16							
IW-17							
IW-18							
IW-19							
IW-20							
IW-21							
IW-22							
IW-23							
IW-24							

Notes:

Revision date:xx/xx/xx

MONTHLY FIELD FORM

Month: _____

	Time	Run Status	Totalizer	Flow	Hours	AMPs	Pressure
IW-1							
IW-2A							
IW-3A							
IW-4							
IW-5A							
IW-6A							
IW-8							
IW-9							
IW-10							
IW-11							
IW-12							
IW-13							
IW-14							
IW-15							
IW-16							
IW-17							
IW-18							
IW-19							
IW-20							
IW-21							
IW-22							
IW-23							
IW-24							

Notes:

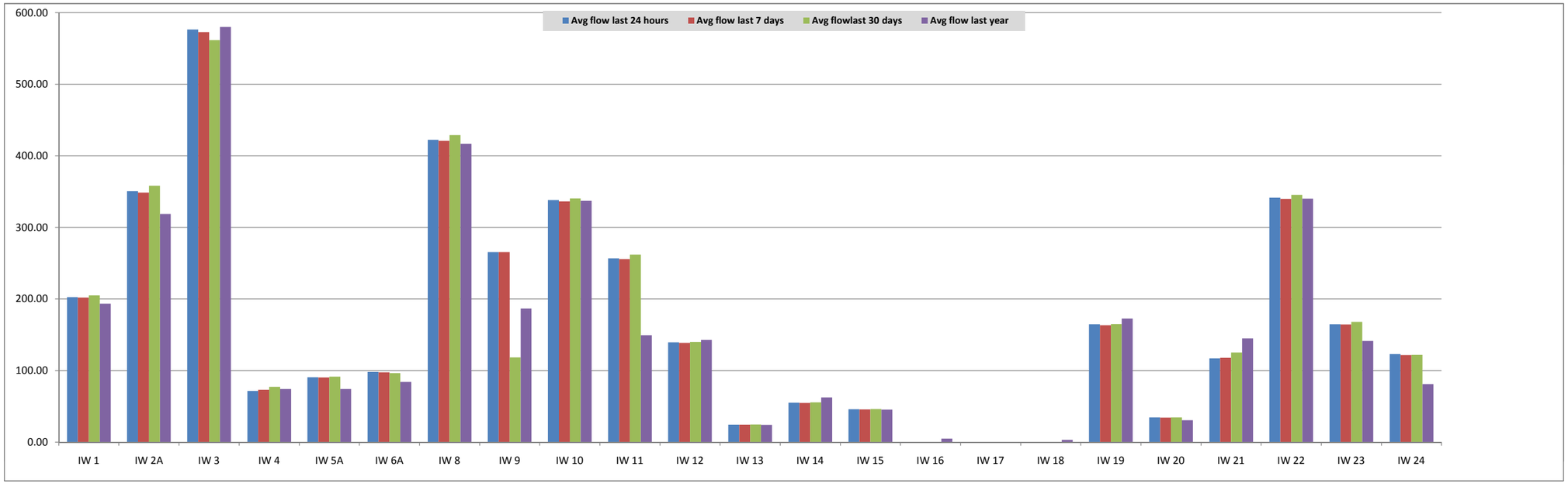
Revision date:xx/xx/xx

APPENDIX C

Pump Performance Evaluation Review Forms

Well Status Report: 04/05/11										
Well	Available		Run Status	Pumping Water Depth	Totalizer	Hours	Amps	Comments	Pumping Rate	Target Pumping Rate
	Yes	No								
Interceptor Well #1										250
Interceptor Well #2A										425
Interceptor Well #3A										500
Interceptor Well #8										425
Interceptor Well #9										250
Interceptor Well #4										80
Interceptor Well #24										100
Interceptor Well #5A										100
Interceptor Well #23										150
Interceptor Well #10										325
Interceptor Well #22										325
Interceptor Well #11										325
Interceptor Well #6A										90
Interceptor Well #12										150
Interceptor Well #13										0
Interceptor Well #14										75
Interceptor Well #15										50
Interceptor Well #16										0
Interceptor Well #17										0
Interceptor Well #18										0
Interceptor Well #19										200
Interceptor Well #20										0
Interceptor Well #21										150
										3960
Canoa Deep Well #1										N/A
Canoa Deep Well #2										N/A
Canoa Deep Well #3										N/A
Canoa Deep Well #4										N/A
Canoa Deep Well #5										N/A
Canoa Deep Well #6										N/A
										10990
Esperanza Deep Well #1										N/A
Esperanza Deep Well #2										N/A
Esperanza Deep Well #3										N/A
Esperanza Deep Well #4										N/A
RT-1										N/A

	6/6/11 10:02 AM	IW 1	IW 2A	IW 3	IW 4	IW 5A	IW 6A	IW 8	IW 9	IW 10	IW 11	IW 12	IW 13	IW 14	IW 15	IW 16	IW 17	IW 18	IW 19	IW 20	IW 21	IW 22	IW 23	IW 24	Total Flow
Avg flow last 24 hours	6/5/11 10:02 AM	202.61	350.55	576.53	71.51	90.58	98.11	422.44	265.62	338.17	256.72	139.46	24.29	55.11	45.87	0.00	0.00	0.00	164.56	34.43	117.01	341.58	164.76	122.90	3,882.81
Avg flow last 7 days	5/30/11 10:02 AM	201.91	348.61	572.78	73.02	90.33	97.42	420.89	265.54	336.34	255.63	138.62	24.20	54.73	45.58	0.00	0.00	0.00	163.37	34.27	117.76	339.89	164.28	121.74	3,866.91
Avg flowlast 30 days	5/7/11 10:02 AM	205.10	358.30	561.60	77.13	91.49	96.28	429.00	118.34	340.40	261.98	140.04	24.57	55.44	46.11	0.00	0.00	0.00	164.96	34.54	125.11	345.35	167.89	121.90	3,765.54
Avg flow last year	6/6/10 10:02 AM	193.37	318.84	580.01	74.10	74.25	83.95	417.00	186.53	337.13	149.25	142.76	24.08	62.34	45.26	4.84	0.00	3.30	172.62	30.46	144.94	340.09	141.36	80.90	3,607.40
																Shutdown and locked out of service Jan. 20, 2011									



APPENDIX D

Procedures for Evaluation of Well Pump Performance

PROCEDURE FOR EVALUATION OF WELL PUMP PERFORMANCE

1. Obtain copy of pump performance curve from Interceptor Well Maintenance Record.
2. Determine column pipe diameter
3. Determine pump bowl setting from Interceptor Well Maintenance Record.
4. Input the following data into IW-Well Total Dynamic Head versus Flow spreadsheet provided to ELW (see example next page)
    a. Recorded Pressure Reading at discharge head of well
    b. Recorded flow in gpm from flowmeter at well
    c. Recorded pumping water level via sounding tube measurement.
5. Plot the given TDH versus the measured flow rate on pump performance curve.
6. Determine if the point is located in a satisfactory location for that pump curve.
7. If the point is not acceptable, flag the well for review of pumping equipment..

Example IW-Well Total Dynamic Head versus Flow

HAZEN-WILLIAMS WORKSHEET

Head Loss Parameters			Source
Column Pipe Diameter	6	in	Interceptor Well Maintenance Record
Pump Bowl Setting	730	ft	
Hazen Williams Coefficient	130		Estimated
**Pumping Water Level	480	ft below surface	Field Measurements
Pressure Reading at Discharge	75	psi	
Flow (gpm)	400	gpm	

Velocity	Column Pipe Head Loss*	**TDH**	**Flow (Q)**
fps	ft	ft	gpm
4.5	10	**663**	**400**

Assumptions:

* Column Pipe Head loss is estimated based on full-diameter flow through the column pipe. For more accurate column pipe headloss, please refer to the Column Friction Loss Table on following page.

** Pumping Water Level determined by sounding Tube Measurement

SIMFLO PUMPS

COLUMN FRICTION LOSS
OPEN AND CLOSED LINESHAFT
4" TO 12" COLUMN

SECTION	502
PAGE	1
DATE	12/1/97
SUPERCEDES	All Previous

COL. SIZE	4"		5"			6"				8"			
TUBE SIZE	1 1/2	2	1 1/2	2	2 1/12	1 1/2	2	2 1/2	3	1 1/2	2	2 1/2	3
SHAFT SIZE	1	1 1/4	1	1 1/4	1 1/2 1 11/16	1	1 1/4	1 1/2 1 11/16	1 15/16	1	1 1/4	1 1/2 1 11/16	1 15/16 2 3/16
GPM	COLUMN FRICTION LOSS (IN FEET) PER 100 FEET OF COLUMN												
100	2.90	5.30		.90	1.20								
200	9.50	17.00	2.20	3.10	4.00	.73	.95	1.40	2.20				
300	19.00		4.50	6.40	8.30	1.60	2.00	2.90	4.50				
400			7.50	10.50		2.70	3.40	4.70	7.60		.61	.74	1.05
500			11.20			3.80	4.90	6.90	11.80		.91	1.10	1.55
600						5.20	7.00	9.50	17.10		1.30	1.55	2.20
700						7.00	9.00	12.50		.98	1.80	2.10	2.90
800						8.90	12.00	16.20		1.30	2.20	2.70	3.70
900						11.50	14.50			1.60	2.80	3.20	4.70
1000										1.90	3.30	3.90	5.40
1200										2.60	4.50	5.50	7.50
1400										3.50	5.95	7.20	9.98
1600										4.50	7.55	9.20	13.00
1800										5.50	9.40	14.00	16.40
2000										6.70	12.50		
2200										7.90	15.10		
2400										9.40			
2600										11.00			
2800										12.80			
3000										14.70			
3200										16.70			

COL.SIZE	10"				12"			
TUBE SIZE	1 1/2	2	2 1/2	3	2	2 1/2	3	3 1/2
SHAFT SIZE	1	1 1/4	1 1/2 1 11/16	1 15/16 2 3/16	1 1/4	1 1/2 1 11/16	1 15/16 2 3/16	2 7/16
GPM	COLUMN FRICTION LOSS (IN FEET) PER 100 FEET OF COLUMN							
700			.50	.62				
800		.58	.67	.80				
900		.72	.83	1.00				
1000		.89	1.00	1.17				
1200	1.08	1.20	1.38	1.65				
1400	1.40	1.59	1.81	2.18		.90		1.02
1600	1.79	2.20	2.30	2.78		1.11	1.04	1.30
1800	2.20	2.50	2.88	3.50	.99	1.36	1.29	1.65
2000	2.69	3.02	3.50	4.25	1.20	1.60	1.57	1.95
2200	3.20	3.60	4.10	5.05	1.42	1.89	1.85	2.35
2400	3.75	4.20	4.80	5.95	1.68	2.18	2.18	2.76
2600	4.33	4.90	5.60	6.90	1.92	2.50	2.50	3.23
2800	5.00	5.60	6.40	7.90	2.20	2.87	2.90	3.69
3000	5.65	6.40	7.25	8.95	2.50	3.20	3.30	4.20
3200	6.35	7.15	8.20	9.99	2.80	3.60	3.72	4.73
3400	7.05	8.00	9.10	12.00	3.15	4.00	4.15	5.28
3600	7.85	8.90	10.50	13.50	3.50	4.40	4.60	5.90
3800	8.70	9.80	12.50	14.50	3.85	4.80	5.15	5.55
4000	9.60	12.00	13.50		4.20	5.25	5.65	7.25
4200	10.60	14.50	14.90		4.60	5.80	6.15	7.85
4400	11.60				5.10	6.30	6.70	8.60
4600	12.70	14.40			5.50	6.80	7.25	9.30
4800	13.80	15.60			5.90	7.30	7.90	10.10
5000	15.00				6.40	8.70	8.55	11.10
5500					7.60	10.40	10.30	13.30
6000					9.00	12.20	12.30	15.80
6500					10.60	14.10	14.40	
7000					12.30	16.20	16.80	
7500					14.10			
8000					16.00			

NOTE: For product lube use shaft size, for oil lube use tube size.