

Underground Injection Control Program

AREA PERMIT

**Class III In-Situ Production of Copper
Permit No. R9UIC-AZ3-FY11-1**

**Florence Copper Project
1575 West Hunt Highway
Florence, Arizona 85132**

Issued to:

Florence Copper, Inc.

**1575 West Hunt Highway
Florence, Arizona 85132**

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- *Exhibit K-2, Operations Plan, including Table 3.1 in Appendix A in Attachment K*

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- *Exhibit P-1, Alert Levels, in Attachment P*
- *Tables P-3 and P-4 in Attachment P, compliance monitoring tables*

PART I. AUTHORIZATION TO CONSTRUCT AND INJECT

Pursuant to the Underground Injection Control regulations of the U.S. Environmental Protection Agency (EPA) codified at Title 40 of the Code of Federal Regulations, Parts 124, 144, 146, 147, and 148,

Florence Copper, Inc.
1575 W. Hunt Highway
Florence, Arizona 85132

is hereby authorized, contingent upon Permit conditions, to construct and operate a Class III injection well Production Test Facility (PTF) and engage in in-situ copper recovery (ISCR) operations at the Florence Copper Project (FCP). The PTF site is located in Township 4 South, Range 9 East, Section 28 in Pinal County, Arizona, approximately two miles northwest of the business district of Florence, Arizona, as depicted in Figure A-9 in Appendix A. The PTF will consist of four (4) injection, nine (9) recovery, seven (7) observation and four (4) multi-level sampling wells situated in an area approximately 300 by 300 feet and two acres in size.

The permit authorizes injection of an acidic solution into the Oxide Bedrock Zone at depths greater than 40 feet below the top of the Oxide Bedrock Zone for the purpose of copper recovery and production testing. The Oxide Bedrock Zone is located approximately 475 to 1,200 feet below ground level at the PTF site and is situated within the EPA-approved aquifer exemption area. The PTF well field will be surrounded by eight (8) monitoring wells located within the 500-foot radius circular Area of Review (AOR) that circumscribes the well field.

For the permitted wells within the AOR, EPA will issue authorization to drill and construct only after requirements of Financial Responsibility in Part II, Section L of this permit have been met. EPA will grant authorization to inject only after the requirements of Part II, Sections C, D and E-2 of this permit have been met. Operation of each injection well will be limited to maximum volume and pressure as stated in this permit.

All conditions set forth herein refer to Title 40 Parts 124, 144, 146, 147 and 148 of the Code of Federal Regulations (CFR), which are regulations in effect on the date that this permit is effective.

This permit consists of forty-six (46) pages plus appendices, and includes all items listed in the Table of Contents. Further, it is based upon representations made by Florence Copper, Inc. (the Permittee) and on other information contained in the administrative record. It is the responsibility of the Permittee to read, understand, and comply with all terms and conditions of this permit.

This permit and the authorization to construct, test, and inject are issued for a period to include the approximate two (2)-year PTF operational life and five (5)-year post-closure monitoring period, unless terminated under the conditions set forth in Part III, Section B.1 of this permit. This permit and authorization to inject shall also include any additional post-closure monitoring beyond five (5) years, if deemed necessary by EPA.

This permit is issued on 20th December 2016 and becomes effective on 30th January 2017.

/Original signed by Alexis Strauss/

Alexis Strauss
Acting Regional Administrator
EPA Region IX

PART II. SPECIFIC PERMIT CONDITIONS

A. REQUIREMENTS PRIOR TO DRILLING, TESTING, CONSTRUCTING, OR OPERATING

1. Financial Assurance

The Permittee shall supply evidence of financial assurance prior to commencing any well drilling and construction, in accordance with Section L of this part.

2. Field Demonstration Submittal, Notification, and Reporting

- a. Prior to each demonstration required in the following sections B through D, the Permittee shall submit plans and specifications for procedures to the EPA Region 9, Drinking Water Protection Section for approval. The submittal address is provided in Section G, paragraph 5. No demonstration in these sections may proceed without prior written approval from EPA.
- b. The Permittee must notify EPA at least thirty (30) days prior to performing any required field demonstrations, after EPA approves the plans/procedures for testing, in order to allow EPA to arrange to witness if so elected.
- c. The Permittee shall submit results of each demonstration required in this Part to EPA within thirty (30) days of completion, unless otherwise noted.

B. AQUIFER EXEMPTION

1. Exempted Zone

EPA approved an Aquifer Exemption at the FCP site on May 1, 1997. Pursuant to 40 CFR §§144.7 and 146.4, the exempted portion of the aquifer at the FCP site is defined by the following lateral and vertical boundaries:

a. Lateral Aquifer Exemption Boundary

The lateral aquifer exemption boundary is located 500 feet beyond the outline of the orebody referred to as the in-situ copper recovery (ISCR) area delineated in Figure S-1 and in the existing Aquifer Exemption in Exhibit S-1 in Appendix A.

b. Vertical Aquifer Exemption Boundaries

The upper and lower boundary of the exempted aquifer are described in the existing Aquifer Exemption in Exhibit S-1 in Appendix A, as the following:

The upper aquifer exemption boundary is defined as 200 feet above the oxide zone, or the base of the Middle Fine-Grained Unit (MFGU), whichever is further below ground surface. The lower aquifer exemption boundary is defined by the base of the reactive interval amenable to copper leach solutions. The lower boundary encompasses the Oxide Bedrock Zone, which contains an economical amount of copper, and copper in the Sulfide Bedrock Zone that is leachable.

The vertical aquifer exemption boundaries are depicted in Figure S-2.

2. No Migration into or between Underground Sources of Drinking Water (USDWs).

Pursuant to 40 CFR Parts 144 and 146 and the conditions established herein, during well construction and testing and the approximate two (2)-year life of the PTF operation and five (5)-year post-closure monitoring period, the Permittee shall ensure that there is no migration of injection fluids, process by-products, or formation fluids beyond the exempted zone described at Part II, Section B.1 and delineated in the existing Aquifer Exemption in Appendix A of this permit.

3. Adequate Protection of USDWs.

Pursuant to §§144.12 and 146.10(a)(4), the Permittee shall adequately protect USDWs by commencing, within sixty (60) days after completing copper recovery operations in the PTF, restoration of groundwater in the injection and recovery zone of the PTF to primary maximum contaminant levels (MCLs) under 40 CFR Part 141, or to pre-operational concentrations if those concentrations exceed MCLs, and by subsequently plugging and abandoning the wells in the PTF in accordance with Part II.I.1, Restoration and Plugging & Abandonment Plan, and Appendix F, Closure and Post-Closure Plan, of this permit.

C. WELL CONSTRUCTION

1. Location of PTF Wells

- a. The PTF's four (4) injection, nine (9) recovery, seven (7) observation, and four (4) multi-level sampling wells shall be constructed within the designated area delineated in Figure A-9 in Appendix A and located in Township 4 South, Range 9 East, Section 28 in Pinal County, Arizona (at coordinates latitude 33 degrees, 3 minutes, 1.39 seconds North and 111 degrees, 26 minutes, 4.69 seconds West). The PTF site will be

approximately 300 feet in diameter and octagonal in shape, as depicted in Figure A-9 in Appendix A. The PTF site is located approximately two miles northwest of the business district of Florence, Arizona.

- b. After drilling is completed, the Permittee must submit final well location coordinates, distances in feet from the closest section lines in Section 28 and latitude/longitude coordinates of the wells constructed under this permit, including all monitoring wells and point of compliance (POC) wells. The distances and direction of each monitoring and POC well from the PTF well field shall also be provided in the Final Well Construction Report required under paragraph 9(a) of this section. If final well field coordinates differ significantly from the proposed coordinates described in paragraph (a) above, justification and documentation of any communication with and approval by EPA shall be included.

2. Logging and Testing during Drilling and Construction

Open-hole geophysical logs shall be run in each well boring for the purpose of formation evaluation, depth control, and detection of borehole anomalies. Geophysical tools will include caliper, gamma-ray, temperature, directional survey, and electrical logs. In addition, compensated neutron-density logs will be run in selected borings, including the four injection well borings within the PTF. Porosity values determined from the neutron-density logs shall be compared to porosities applied to the groundwater flow model in the PTF project area, and the porosity values in the model shall be revised accordingly if significant differences are found in the comparison with log porosities.

Cased-hole geophysical logs, including gamma ray, temperature, and cement bond logs (CBLs), shall be run in all injection, recovery, and steel-cased monitoring wells over the entire length of each well after the outer steel casing has been installed and cemented to surface. Gamma ray and temperature logs are required in fiberglass reinforced plastic (FRP)-cased observation and multi-level sampling wells. CBLs are also required in these wells if they produce useful information about the cement bond to the FRP casing and borehole wall. Additional geophysical surveys may be conducted as required by EPA. The CBL evaluation will enable the analysis of bond between cement and casing, as well as between casing and formation, and shall allow detection and assessment of any micro-annulus between the casing and cement as well as any cement channeling in the borehole annulus. Refer to Appendix D for information on EPA Region 9 temperature logging guidelines and requirements.

3. Drilling, Work-over, and Plugging Procedures

Drilling, work-over, and plugging procedures must comply with applicable portions of the Arizona Oil and Gas Conservation Commission's requirements in the Arizona Administrative Code, found at Title 12, Natural Resources, Chapter 7, Article I, R12-7-108 to R12-7-127. Drilling, work-over, and plugging procedures shall be submitted to EPA for approval. Once approved, a thirty (30)-day advance notice shall be submitted to EPA for witnessing purposes. Procedures shall include the following:

- a. Details for cementing casing strings;
- b. Records of daily Drilling Reports (electronic and hard copies);
- c. Blowout Preventer (BOP) System testing on recorder charts including complete explanatory notes during the test(s), if applicable;
- d. Casing and other tubular and accessory measurement tallies.

Information to be provided for reporting forms such as EPA Form 7520-9, Completion of Construction Report, EPA Form 7520-12, Well Rework Record, or EPA Form 7520-14, Plugging and Abandonment Plan (refer to list in Appendix I) is also acceptable to include in the procedures. The Permittee must also comply with the requirements of the Arizona Department of Water Resources minimum construction standards in the Arizona Administrative Code found at Title 12, Chapter 15, Article 8, Well Construction and Licensing of Drillers.

4. Well Casing and Drilling

The well construction procedures described in Attachment L of the permit application and schematic details submitted in Attachment M of the application are hereby incorporated into this permit as Appendix B, and shall be binding on the Permittee. Where any conflict or inconsistency exists between Appendix B and the permit conditions, the permit condition shall supersede the procedure or detail in Appendix B. All new PTF and monitoring wells shall be cased and cemented to prevent the migration of fluids into or between USDWs. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well and shall be maintained until the well is plugged and abandoned.

EPA may require minor alterations to the construction requirements based upon information obtained during well drilling and related operations. Final casing setting depths will be determined by the field conditions, well logs, and other input from the Permittee and EPA staff. EPA approval must be obtained for any revisions prior to installation, and these will be documented in the Final Well Construction Report (See paragraph 9(a) below).

5. Cementing

PTF injection and recovery wells will be drilled, and casing will be installed in two stages. The steel casing will be installed and cemented from land surface to a point at least 40 feet below the top of bedrock (defined as the bedrock exclusion zone) by the plug displacement method. The lower section of each injection and recovery well will be drilled from the bottom of the cemented steel casing to the design depth.

In the second stage for the injection and recovery wells, after the FRP casing and PVC well screen have been installed and annular materials have been emplaced in the lower section of the boring by tremie, cementing of the upper section of the inner FRP casing will be accomplished by pumping a cement slurry down a tremie pipe to fill the annular space between the inner FRP casing and outer steel casing from the bottom of the bedrock exclusion zone to ground surface.

The observation and multi-level sampling wells will be drilled in a single stage at a constant diameter to the design depth. After the FRP casing, PVC screen, and filter pack have been installed, cementing of the upper portion of the casing will be accomplished by pumping a cement slurry down a tremie pipe to fill the annular space between the borehole and casing from the bottom of the bedrock exclusion zone to ground surface.

In wells where a tremie pipe is used for cement placement, the discharge end of the tremie pipe will be continuously submerged in the cement until the zone to be filled is completely filled. An acid-resistant, sulfate-resistant, Portland Type V cement or an EPA-approved substitute shall be placed in the well annuli of all wells from the bottom of the casing to land surface. The well casing will be hung in tension until the cement has cured. The well casing will be filled with a fluid of sufficient density to maintain pressure equalization with the cement slurry in the annulus to prevent collapse of the well casing during the cementing operation.

Water and/or appropriate mud-breaker chemicals will be circulated through the casing or tremie pipe prior to cement placement to reduce mud viscosity and assist in removal of mud from the borehole/casing annulus. An excess quantity of cement will be pumped into the annular space in order to verify "clean" slurry returns from the well prior to terminating the cementing operation. Following placement of the cement slurry, the cement will be allowed to cure for a minimum of 24 hours before performing additional operations on the well.

- a. The cement shall be Type V unless the Permittee submits the following information to the Director regarding a Type V substitute:

- i. The results of an immersion test for resistance to pregnant leach solution of equivalent mass samples of Type V cement and any proposed substitute cement,
- ii. A comparison of the percentage weight change between samples,
- iii. A demonstration that the substitute experiences little visual change, a weight increase or decrease within 5 % to 8 % and no significant change in compressive strength.

Upon completion of this demonstration, and subject to EPA approval, a substitute cement that meets these criteria may be substituted for Type V cement for well construction.

6. Monitoring Devices

The Permittee shall install and maintain in good operating condition:

- a. A tap on the discharge line between the injection pump and the wellhead for the purpose of obtaining representative samples of injection fluids; and
- b. Devices to continuously measure and record injection pressure, flow rates, injection and production volumes, subject to the following:
 - i. Pressure gauges shall be of a design to provide:
 - (A. A full pressure range of at least fifty (50) percent greater than the anticipated operating pressure; and
 - (B. A certified deviation accuracy of five (5) percent or less throughout the operating pressure range.
 - ii. Flow meters shall measure cumulative volumes and be certified for a deviation accuracy of five (5) percent or less throughout the range of rates allowed by the permit.
- c. Annular Conductivity Devices

The Permittee shall rely on a monitoring program to demonstrate mechanical integrity in observation and multi-level sampling wells, under 40 CFR §146.8(a)(2) and condition Part II.E.3.a.ii.A of this permit. Each well shall be equipped with an annular conductivity device (ACD) to detect vertical channels adjacent to the well bore. The ACD will be installed on the FRP well casing and shall be placed as close to the MFGU as possible and shall never be more than 10 feet

above the MFGU or more than 10 feet above the exempted zone in the Lower Basin Fill Unit (LBFU) if the MFGU base is more than 200 feet above the LBFU (vertical limit of the exempted zone). The ACD will consist of a pair of metal bands spaced approximately three (3) feet apart and connected to electrical wires that extend to the surface. The ACD shall be constructed of materials suitable for contact with the annular seal materials and the process related solutions. Details of the ACDs are presented in Drawings M-6 and M-7 in Appendix B.

d. Conductivity Sensors:

A conductivity sensor (CS) shall be strapped to the well screens of recovery, observation, and multi-level sampling wells at regular intervals to facilitate electrical resistivity profiling of the formation during injection and recovery operations as depicted in Drawings M-8 and M-9 in Appendix B. Conductivity sensors shall be installed with a spacing of 20 feet between sensors through the LBFU/Oxide interface in the annulus of observation wells.

7. Injection Interval

The Permittee shall only inject fluids at depths greater than forty (40) feet below the top of the Oxide Bedrock Zone unless the Permittee has received written approval from the Director to expand the injection interval. To ensure that the injection interval is at least forty (40) feet below the top of the Oxide Bedrock Zone, the Permittee shall case and cement all injection wells in a manner described at Part II.C.4 and C.5 of this permit from ground surface to at least forty (40) feet below the top of the Oxide Bedrock Zone. The Permittee will develop the injection interval for each well by drilling into the Oxide Bedrock Zone, beyond the bottom of the steel casing and cemented interval. Well screen and short blank PVC casing sections will be installed through the oxide interval below the bedrock exclusion zone.

8. Injection Formation Testing

The Permittee shall perform aquifer pump and tracer tests prior to injection in order to evaluate subsurface characteristics of the Oxide Bedrock Zone, overlying basin fill units, and the confining MFGU within the PTF AOR. Proposed formation testing procedures must be submitted to EPA for review and approval in accordance with Part II.A.2. Test results will be reported to EPA in accordance with Part II.G of this permit. Results of the aquifer tests will be compared to parameters used in the groundwater flow model, and the model parameters will be revised accordingly if the resulting test parameters are significantly different from those used in the model.

9. Final Well Construction Report and Completion of Construction Notice

- a. The Permittee must submit a final well construction report, including logging and other results, with a schematic diagram and detailed description of construction, including driller's log, materials used (e.g., tubing tally, cement, and other volumes), to EPA within sixty (60) days after completion of all PTF and monitoring wells. Construction details, downhole equipment, depths to key formation tops and the USDW base, and screened interval depths will be in the Well Construction Report and schematics of all PTF and monitoring wells.
- b. The Permittee must also submit a notice of completion of construction to EPA (refer to EPA Form 7520-9 listed in Appendix I). Injection operations may not commence until all well and formation testing is complete, necessary reports are submitted, and EPA has inspected or otherwise reviewed and approved the construction and other details for the permitted wells and notified the Permittee of EPA's approval.

10. Proposed Changes and Work-overs

A well work-over is any physical alteration or addition to an existing well that results in a change in the composition, diameter, perforations, screen depths, tubing, or depth of the well casing or a change in the cement in the outer annulus.

- a. The Permittee shall give advance notice to EPA, as soon as possible, of any planned physical alterations or additions to the permitted PTF and monitoring wells. Any changes in well construction require prior approval by EPA and may require a permit modification under the requirements of 40 CFR §§144.39 and 144.41.
- b. In addition, the Permittee shall provide all records of well work-overs, logging, or other subsequent test data, including required mechanical integrity testing, to EPA within thirty (30) days of completion of the activity.
- c. Appendix I contains a list of the appropriate EPA reporting forms for well changes or work-overs.
- d. Demonstration of mechanical integrity shall be performed within thirty (30) days of completion of workovers or alterations and prior to resuming PTF injection and recovery activities, in accordance with Section E.3 of this part.

D. CORRECTIVE ACTION (PLUGGING AND ABANDONMENT PLAN)

Before injection and recovery wells are placed in service:

1. All existing non-Class III wells and coreholes within the 500-foot PTF Project AOR shall be abandoned according to the Plugging and Abandonment Plan (Appendix C) and the following conditions in D.2 and 3. The identification, location, and construction details of the wells and coreholes to be plugged and abandoned are listed in Table C-1 and the Plugging and Abandonment Plans (EPA Form 7520-14) for each well and corehole within the AOR are included in Appendix C. EPA shall be notified, and final plugging and abandonment (P&A) plans and procedures shall be submitted to EPA for approval at least 30 days in advance of plugging operations.
2. As the cementing and abandonment records for the DM-B well are not available, DM-B well shall be re-entered, and the Permittee shall demonstrate subject to EPA's approval that cement is placed at the base of the USDW in the casing/wellbore annulus and to the surface within the casing. If this cannot be demonstrated to EPA's satisfaction, the Permittee shall re-plug the well to ensure cement is placed at the base of the USDW in the casing/wellbore annulus and to the surface within the casing. EPA shall be notified and final P&A plans and procedures shall be submitted to EPA for approval at least 30 days in advance of such plugging operations for the DM-B well.
3. The OB3-1, OB4-1, PW3-1, and PW4-1 wells in Table C-1 list bentonite grout seal in the casing annulus. The Permittee shall demonstrate, subject to EPA's approval, that this is Portland cement (with bentonite as an additive) or other acceptable material placed at the base of the USDW in the casing/wellbore annulus and to the surface within the casing prior to plugging operations. If this cannot be demonstrated to EPA's satisfaction, the Permittee shall perforate the casing and place Portland Type V or equivalent cement at the base of the USDW in the casing/wellbore annulus and to the surface within the casing. EPA shall be notified and final P&A plans and procedures shall be submitted to EPA for approval at least 30 days in advance of such plugging operations for these wells.

E. WELL OPERATION

1. Operations Plan

The revised Operations Plan submitted with the permit application for the PTF is incorporated into this permit as Appendix E, and shall be binding on the Permittee with the following conditions. Where any conflict or inconsistency exists between the Operations Plan and the permit conditions, the permit condition shall supersede the language in the Plan.

- a. Planned PTF injection and recovery rates will be approximately 240 and 300 gallons per minute (gpm), respectively. During PTF operations, the injection rate shall not exceed 240 gpm, and the extraction rate shall not fall below 110 percent of the injection rate on a

daily average basis without prior written approval of a lower percentage from EPA.

- b. An inward gradient of at least one foot between observation and recovery wells must be established prior to injection of sulfuric acid solution and maintained for demonstrating hydraulic control, unless adjusted by EPA as specified in Part II.H.1.b.
- c. Bulk electrical conductivity measurements in the observation wells are required to confirm hydraulic control. Bulk conductivity readings in the observation wells shall not significantly exceed baseline conductivity and statistical noise levels, as determined by EPA approved procedures, to confirm hydraulic control.
- d. Actions shall be taken to restore hydraulic control within 24 hours if the extraction to injection ratio falls below 110 percent, the inward gradient at any well pair is less than one foot, or the electrical conductivity data indicate a possible loss of hydraulic control.

2. Demonstrations Required Prior to Injection

For the PTF wells, injection operations may not commence until construction is complete, and the Permittee has complied with following mechanical integrity requirements.

The Permittee shall demonstrate that the PTF wells have and maintain mechanical integrity consistent with 40 CFR §146.8 and with paragraph 3 of this section. The Permittee shall demonstrate that there are not significant leaks in the casing and tubing, and that there is not significant fluid movement through the casing/wellbore annulus or vertical channels adjacent to the injection wellbore. The Permittee may not commence initial injection into the wells, nor recommence injection after a work-over which has corrected any loss of well integrity, until the Permittee has received written notice from EPA that the demonstration provided is satisfactory and that injection is authorized.

3. Mechanical Integrity

Pursuant to 40 CFR §144.51(q), all PTF wells, monitoring wells, and the existing BHP test wells shall maintain mechanical integrity at all times. Pursuant to 40 CFR §146.8, all PTF wells, monitoring wells, and BHP test wells shall demonstrate mechanical integrity, Parts I and II, by the following methods and schedule:

- a. Methods for Demonstrating Mechanical Integrity

- i. Part I: Mechanical Integrity Pursuant to 40 CFR §146.8(a)(1), the Permittee shall demonstrate Part I of the mechanical integrity requirement by the following methods:
 - (A. A packer will be installed immediately above the proposed injection interval, the wellbore will be completely filled with water, and a hydraulic pressure equal to or above the maximum allowable wellhead injection pressure and not less than 100 pounds per square inch (psi) will be applied. This test shall be for a minimum of thirty (30) minutes. A well passes the mechanical integrity test (MIT) if there is less than a five (5) percent decrease/increase in pressure over the thirty (30) minute period. A well shall not be operated at injection pressures greater than the maximum allowable injection pressure determined as set forth in Part II.E.4 below; and,
 - (B. Continuous pressure monitoring
The tubing/casing annulus and injection pressure in active injection wells shall be monitored and recorded continuously by a digital instrument with a resolution of one tenth (0.1) psi. The average, maximum, and minimum monthly results shall be included in the quarterly report to EPA per Section G, paragraph 2.k of this part unless more detailed records are requested by EPA.

- ii. Part II: Mechanical Integrity Pursuant to 40 CFR §146.8(a)(2), the Permittee shall demonstrate Part II of the mechanical integrity requirement by the following methods:
 - (A. A monitoring program, as defined at Part II.F.6 of this permit, designed to verify the absence of fluid movement through vertical channels adjacent to the well bore in observation and multi-level sampling wells.
 - (B. A demonstration that the injectate is confined to the proper zone shall be conducted and presented by the Permittee and subject to approval by EPA. A temperature log and radioactive tracer survey shall be run in all PTF wells. Temperature logs and radioactive tracer surveys shall be run in accordance with EPA Region 9 guidance (Temperature log guidance in Appendix D). Proposed MIT procedures must be submitted to EPA for review and approval. Once approved, the Permittee may schedule the external MIT, providing EPA at least thirty (30) days notice before the external MIT is conducted. The

demonstration shall be scheduled to occur approximately sixty (60) days after commencement of injection; and,

- (C. After installing and cementing casing, conducting a cement squeeze operation, or any well cement repair, the Permittee shall provide cementing records and cement evaluation logs that demonstrate isolation of the injection interval and other formations from the USDWs. Cementing records and logs shall demonstrate complete filling of the annulus between the borehole wall and well casing with cement.

Cement evaluation must assess the following four objectives:

- 1) Bond between casing and cement;
- 2) Bond between cement and formation;
- 3) Detection and assessment of any micro-annulus (small gaps between casing and cement); and
- 4) Identification of any absence of cement and cement channeling in the borehole annulus.

The Permittee may not commence or recommence injection until the Permittee has received written notice from EPA that the cement evaluation/demonstration is satisfactory.

b. Schedule for Demonstrations of Mechanical Integrity

EPA may require that an MIT be conducted at any time during the permitted life of any well authorized by this permit. The Permittee shall also arrange and conduct MITs according to the following requirements:

- i. A demonstration of mechanical integrity shall be made within thirty (30) days subsequent to the installation of a new PTF or monitoring well. Injection wells will be pressure tested for mechanical integrity in accordance with paragraph 3.a.i.A of this section no less frequently than once every twelve (12) months while active and every two (2) years while inactive unless abandonment or closure occurs prior to that time. Internal mechanical integrity of PTF wells shall also be demonstrated within thirty (30) days after a work-over is conducted, the construction of the well is modified, a conversion of a well to injection or recovery service occurs, or when loss of mechanical integrity becomes evident during operation.

- ii. A demonstration of mechanical integrity using a monitoring program shall be made in accordance with the schedule in Part II.F.6.
 - iii. Results of the MITs shall be submitted to the Director in the quarterly reports.
- c. Loss of Mechanical Integrity

The Permittee shall notify EPA, in accordance with Part II, Section G, Paragraph 2(g) of this permit, under any of the following circumstances:

- i. a well fails to demonstrate mechanical integrity during a test, or
- ii. a loss of mechanical integrity becomes evident during operation, or
- iii. a significant change in the injection pressure and/or rate occurs during normal operating conditions.

Furthermore, for new injection wells, injection shall not commence, and for operating wells, injection shall be terminated and may not resume, until the Permittee has taken necessary actions to restore integrity to the well and has demonstrated that the well has integrity as defined at Part II.E.2(a), above.

- d. Prohibition without Demonstration

After the permit effective date, injection into the well may commence only if:

- i. The well has passed an internal pressure MIT in accordance with paragraph 3.a.i.A of this section; and
- ii. The Permittee has received written notice from EPA that the internal pressure MIT demonstration is satisfactory.

4. Injection Pressure Limitation

- a. Injection wells shall be operated at pressures less than the fracturing pressure of the Oxide Bedrock Zone. Based on field test data at the PTF site, a fracture gradient of 0.65 psi/foot (ft) of depth, measured from ground surface to the top of the injection interval, will be used to establish maximum hydraulic pressure that may be exerted on the injection zone. The maximum wellhead pressure will vary accordingly, dependent on the depth of the interval receiving the injection fluid, but in no event shall it exceed the calculated pressure that can be safely

applied to well equipment. In no case shall pressure in the injection zone during injection initiate new fractures or propagate existing fractures in the injection zone or the confining zone. In no case shall injection cause the movement of injectate or formation fluids into a USDW. Injection pressures shall be monitored continuously and recorded on a daily basis. Automatic alarms and shut-in equipment shall be installed and triggered if injection pressures exceed the maximum allowable pressures.

- b. The injection pressure limitations in paragraph (a) may be increased by the Director based on the results of a valid step-rate injection test in the respective proposed injection zone(s). The Director will determine any allowable increase based upon the step-rate test results and other parameters reflecting actual injection operations. Step-rate testing shall be performed in accordance with the EPA Region 9 Step-Rate Test Policy, which is included in Appendix J of this permit.
- c. Should the Director approve an increase in injection pressure limitations per paragraph (b), the increase shall be made part of this permit by minor modification procedures (40 CFR §144.41).

5. Injection Volume (Rate) Limitation

- a. The planned PTF injection and recovery rates are approximately 240 and 300 gpm, respectively. During PTF operations, the injection rate will not be allowed to exceed 240 gpm, and extraction will not be allowed to fall below 110 percent of the injection rate on a daily average basis without prior written approval from EPA.
- b. The Permittee may request an increase in the maximum injection rate or a decrease in the minimum ratio of extraction to injection rate allowed in paragraph (a) above. Any such request shall be made in writing and appropriately justified to EPA.
- c. Any request for an increase in injection rate or decrease in the minimum ratio of extraction to injection rate shall demonstrate to the satisfaction of EPA that the increase in volume or reduction in the minimum percent extraction to injection rate will not interfere with the operation of the facility or its ability to meet conditions described in this permit, change its well classification, or cause migration of fluids into USDWs or beyond the PTF well field AOR.
- d. The injection rate shall not cause an exceedance of the injection pressure limitation established under item 4(a) of this section.

6. Injectate Fluid Limitations

- a. The Permittee shall not inject any solid wastes as defined by 40 CFR Part 261.
- b. Injection fluids shall be limited to only fluids authorized by this permit and generated by the PTF operation. No fluids shall be accepted from other sources for injection into the permitted wells.
- c. Fresh water may be injected to assess the hydraulics of the injection and recovery patterns in the PTF and to assess the performance of related surface facilities.
- d. During PTF operations, the injectate solution (lixiviant) shall consist of a dilute sulfuric acid solution that includes inorganic and organic constituents as defined below. The lixiviant shall have a pH of approximately 2 and not less than 1. Organic compounds in the lixiviant shall be limited to those listed in Part II.F.7.(a) of this permit. The average total concentration of all organics in the lixiviant listed in Part II.F.7(a) for each quarter of monthly sampling shall not exceed 10 milligrams per liter (mg/L). The estimated composition of the injectate is provided in Table 3.1 in Appendix E. Inorganic constituents in the lixiviant shall be limited to constituents in the sulfuric acid, in calcium carbonate, or other neutralizing agents used for the purposes described in Section (e) below, and to constituents resulting from the interaction of lixiviant with groundwater and minerals in the oxide zone. Concentrations of inorganic constituents in the lixiviant shall be subject to the requirements of Section (f) below.
- e. During closure, fresh groundwater may be injected to restore the zone to federal drinking water standards or pre-operational background concentrations. The Permittee may also adjust the pH with sodium bicarbonate or other neutralizing agents to aid in the precipitation of soluble metals.
- f. At least 30 days prior to commencement of the PTF operations, the permittee shall submit a report for the Director's approval that includes the name and grade of each process chemical that is proposed to be used at the PTF and that fits in one of the three following categories: (1) organic compounds to be used in the SX/EW process; (2) sulfuric acid to be used in the SX/EW process or to prepare solutions for injection; or (3) sodium carbonate or other chemicals to be injected, or to be used in ISCR solutions. The report shall include the name and grade of each reported chemical, and a Material Safety Data Sheet (MSDS) for each. The report shall also include recommendations, with justifications, as to which constituents of the reported chemicals should

or should not be included in the Level 1 or Level 2 groundwater monitoring program defined at Part II.F.2 and the injectate monitoring program defined at Part II.F.7 of this permit.

- g. The permittee may use a process chemical not included in the reports submitted pursuant to Section (f) above provided the permittee submits a report for the Director's approval at least 30 days prior to the date of the proposed use of the chemical and receives written approval by the Director. Reports submitted pursuant to this section during PTF operations must include information required by Section (f) above.
- h. The permittee shall expand the groundwater monitoring program defined at Part II.F.2 and the injectate monitoring program defined at Part II.F.7 as necessary to conform to the Director's conditions of approval of reports submitted pursuant to Sections (f) and (g) above.
- i. The monitoring and advance notification requirements of Part II.E.6 and Part II.F.7 apply only to injectate solution (lixiviant) prior to injection and to constituents of process chemicals that may become part of the lixiviant. The requirements do not apply to pregnant leach solution (PLS) that is being re-injected to increase the concentration of copper in the PLS before it is delivered to the SX/EW plant for processing.

F. MONITORING PROGRAM

1. Water Quality Monitoring Wells.

The seven (7) additional monitoring wells required by EPA, and the MW-01 operational monitoring well shall serve as water quality monitoring wells for the federal UIC permit established herein. The proposed POC and water quality monitoring well locations are depicted in Figures P-1 and 11-1 and are described in Tables P-1 and P-2 in Appendix A. In addition, any POC wells established by ADEQ for the PTF well field, pursuant to a final Aquifer Protection Permit, will also serve as water quality monitoring wells for the federal UIC permit. The water quality monitoring well designs are shown in Figures 11-2, 12-1 through 12-4, 18-2, 18-3, and M1-1 in Appendix B.

2. Level 1 and Level 2 Parameters, Alert Levels, and Aquifer Quality Limits

- a. **Level 1 Parameters:** Level 1 analytes include constituents of ISCR solutions that are most likely to provide an early indication of groundwater impacts associated with the operation of the solvent extraction/electrowinning (SX/EW) plant and PTF. Level 1 analytes shown in Table 1 below, shall be sampled at least quarterly from each POC and monitoring well in accordance with the schedule described in

Part II.F.4 of this permit. Refer to Table P-3 in Appendix K for complete details.

- b. Level 2 Parameters: Level 2 analytes include probable constituents of the ISCR solutions for which primary MCLs have been established pursuant to 40 CFR Part 141 and other relatively probable constituents which are likely to appear in greater concentrations in groundwater impacted by ISCR solutions than in non-impacted groundwater. Level 2 analytes shown in Table 2, below, shall be sampled at least once every six months from each POC and monitoring well in accordance with the schedule described in Part II.F.4 of this permit. Refer to Table P-4 in Appendix K for complete details.
- c. Alert Levels (ALs): With the exception of the field parameters which will not be assigned ALs (except for pH), the Permittee shall establish ALs for Level 1 and Level 2 analytes subject to review and approval by EPA, as described in Exhibit P-1: Alert Levels in Appendix K of this permit. Where any conflict or inconsistency exists between Exhibit P-1 and the permit conditions, the permit condition shall supersede the language in the Exhibit.
- d. Aquifer Quality Limits (AQLs): The Permittee shall establish AQLs for parameters with primary MCLs pursuant to 40 CFR Part 141, as follows:
 - i. If the calculated AL is less than the MCL, then the AQL shall be set equal to the MCL.
 - ii. If the calculated AL is greater than the MCL, then the AQL shall be set equal to the AL.

Table 1: Water Quality Parameters - Level 1

Parameter (mg/L unless noted)	AQL	AL
Fluoride	TBD	TBD
Magnesium	NA	TBD
Sulfate	NA	TBD
Total Dissolved Solids	NA	TBD
pH, units (field)	NA	TBD
Specific Conductance, micromhos/cm (field)	NA	NA
Temperature, deg F or deg C	NA	NA

Note: The Permittee shall utilize the applicable analytical methods described in Table I of 40 CFR §136.3, or in Appendix III of 40 CFR Part 261, or in certain circumstances, other methods that have been approved by the EPA Administrator.

AQL - Aquifer Quality Limit (as defined at Part II.F.2.d)

AL - Alert Level

TBD - To be determined and approved by the Director for all POC wells, the seven monitoring wells required by EPA, and the MW-01 operational monitoring well prior to the commencement of injection.

NA - Not applicable: Shall be measured and reported but no contingency level shall be established.

Table 2: Water Quality Parameters - Level 2

Parameter	AQL	AL
Common Ions (mg/L unless noted)		
pH (field), units	NA	NA
Specific conductance (field), micromhos/cm	NA	NA
Temperature (field), deg F or deg C	NA	NA
pH (lab)	NA	NA
Bicarbonate	NA	NA
Calcium	NA	NA
Carbonate	NA	NA
Chloride	NA	NA
Fluoride	TBD	TBD
Magnesium	NA	TBD
Nitrate-N ¹	TBD	TBD
Nitrite-N	TBD	TBD
Potassium	NA	NA
Sodium	NA	NA
Sulfate	NA	TBD
Total dissolved solids	NA	TBD
Cation/Anion balance	NA	NA
Formation-Related Metals (mg/L)		
Aluminum	NA	TBD
Antimony	TBD	TBD
Arsenic	TBD	TBD
Barium	TBD	TBD
Beryllium	TBD	TBD
Cadmium	TBD	TBD
Chromium (Total)	TBD	TBD
Cobalt	NA	TBD
Copper	TBD	TBD
Iron	NA	TBD
Lead	TBD	TBD

Parameter	AQL	AL
Manganese	NA	TBD
Mercury (inorganic)	TBD	TBD
Nickel	NA	TBD
Selenium	TBD	TBD
Thallium	TBD	TBD
Zinc	NA	TBD
Formation-Related Radioactive Chemicals		
(pCi/L)		
Gross Alpha	TBD	TBD
Adjusted Alpha ^{2,3}	TBD	TBD
Gross Beta	TBD	TBD
Radium 226 and Radium 228 (combined) ²	TBD	TBD
Radon	NA	TBD
Uranium isotopes ²	NA	NA
Uranium (Total), micrograms/L	NA	TBD
Process-Related Organics⁴		
(mg/L)		
Total petroleum hydrocarbons-diesel	NA	TBD
Benzene	TBD	TBD
Ethyl benzene	TBD	TBD
Toluene	TBD	TBD
Total Xylene	TBD	TBD
Napthalene	TBD	TBD
Octane	TBD	TBD

Note: The Permittee shall utilize the applicable analytical methods described in Table I of 40 CFR §136.3, or in Appendix III of 40 CFR Part 261, or in certain circumstances, other methods that have been approved by the EPA Administrator.

AQL - Aquifer Quality Limit (as defined at Part II.F.2.d)

AL - Alert Level

TBD -To be determined and approved by the Director for all POC wells, the seven monitoring wells required by EPA and the MW-01 operational monitoring well prior to the commencement of injection.

NA -Not applicable: Shall be measured and reported but no contingency level shall be established.

¹ Nitrate will be used only for calculation of cation/anion balance because of regional nitrate pollution and no nitrate used in processes.

² These parameters are to be analyzed only if the concentration of Gross Alpha Particle Activity exceeds the parameter's AL or AQL.

³ Adjusted gross alpha includes radium-226 but excludes radon-222 and total uranium.

⁴ Any organic compound not listed above shall be so listed if an MCL has been established for that organic compound and if the organic compound is detected in the injectate.

3. Baseline Data and Statistical Methods

Prior to the commencement of injection, the Permittee shall:

- a. Collect baseline water quality samples for all Level 1 and Level 2 parameters such that accepted statistical methods can be applied to assign ALs and AQLs at all POC and monitoring wells. For Process-Related Organics (Level 2), two (2) months of data collection with nondetectable organic levels will be sufficient for background characterization.
- b. Submit to the Director mean baseline concentrations, standard deviations, ALs, federal AQLs, based on statistical methods used to establish ALs and AQLs, as described in Exhibit P-1 in Appendix K of this permit, or based on other methods approved by the Director, which:
 - i. establishes a means of verifying whether or not USDWs are endangered during PTF recovery operations, closure, and post-closure, and
 - ii. establishes specific points at which contingency plans are activated.
- c. Receive written approval from the Director for the baseline data, action levels, and statistical approach defined at (b), above.

4. Water Quality Monitoring Schedule

All POC wells and all monitoring wells shall comply with the following monitoring schedule for the approximate two (2) year PTF operation and restoration life and the five (5)-year post-closure period:

Table 3. Monitoring Schedule for the POC and Monitoring Wells during PTF Life and Post-Closure Period

Time Period	Water Quality Parameters	Sampling Frequency
PTF Life	Level 1	At least once per quarter
	Level 2	At least once every six months
Post-Closure	Level 1	At least once per quarter for the first two years after closure
	Level 2	At least once every six months
Note: Level 1 and Level 2 Water Quality Parameters are defined at Part II, Section F.2 in Table 1 and Table 2, respectively.		

Note: The Quarterly Compliance Monitoring Tables (Level 1 parameters) for each POC and monitoring well are presented in Table P-3 and the Semiannual and Contingency Monitoring Tables (Level 2 parameters) for each POC and monitoring well are presented in Table P-4 in Appendix K of this permit. Refer to Tables P-3 and P-4 for water quality monitoring well schedules.

5. Hydraulic Control Monitoring Wells

External monitoring of the ISCR process around the perimeter of the PTF well field shall be conducted to verify hydraulic control. This monitoring of the oxide zone shall be performed using seven observation wells at the perimeter of the PTF well field and nine recovery wells. PTF hydraulic monitoring will entail using the nearest two recovery wells to each perimeter observation well for head comparison and for verifying that the head gradient is inward, that is, from the observation well towards the PTF well field. Head monitoring will be accomplished using pressure transducers placed in both the observation wells and recovery wells from which average daily head measurements will be recorded. In addition, the Permittee shall monitor bulk electrical conductivity in the observation wells to verify that hydraulic control is maintained and to detect any excursion in accordance with the approved procedures defined in 6.b, below.

6. Conductivity Monitoring

- a. If the Permittee relies on a monitoring program to demonstrate mechanical integrity under 40 CFR §146.8(a)(2) and Part II.E.3.a.ii., the Permittee shall measure annular conductivity at the following frequency:
 - i. Prior to injection and recovery to obtain baseline data, and
 - ii. At least once per quarter during the life of the well.

- b. Prior to commencement of injection, the Permittee shall comply with the following conductivity sensor monitoring requirements:
 - i. The Permittee shall collect baseline conductivity measurements in observation wells to establish the range of background bulk electrical conductivity levels.
 - ii. For the purpose of detecting any loss of hydraulic control or any excursion of injection or ISCR fluids at the perimeter of the well field, the Permittee shall submit to the Director a report describing the results of baseline measurements and proposed procedures for identifying a statistically significant increase above statistical noise levels in bulk conductivity values at the observation wells confirming a loss of hydraulic control and a possible excursion requiring contingency actions.
 - iii. Receive written approval from the Director for the baseline data, proposed action levels, and proposed procedures.
- c. During PTF operations, the Permittee shall measure bulk electrical conductivity in the observation wells at the screens on a daily basis and at the exclusion zone through the LBFU/Oxide interface on a weekly basis.

7. Injectate Solution (Lixiviant) Monitoring

The Permittee shall comply with the following injectate solution monitoring requirements:

- a. At least once per month, the Permittee shall measure the pH and the total concentration of total petroleum hydrocarbons (TPH)-diesel, benzene, toluene, ethylbenzene, xylenes (total), naphthalene, and octane in the injectate solution using applicable analytical methods described in Table I of 40 CFR §136.3, in USEPA SW-846, Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, unless other methods have been approved by EPA.
- b. The Permittee shall modify the list of organic constituents required under the injectate solution monitoring program defined at (a), above, if the Permittee has received written approval from the Director for a change in the injectate solution, as detailed at Part II.E.6. of this permit, and the list described at (a), above, does not include all organic constituents which are present or could be present in the raffinate pond.
- c. The Permittee shall measure inorganic constituents in the pregnant leach solution (PLS) and lixiviant at least once per month using

applicable analytical methods described in Table I of 40 CFR §136.3, in USEPA SW-846 unless other methods have been approved by EPA. The inorganic analytes to be measured shall include all constituents listed in Table 3.1, Appendix E of this permit plus molybdenum, strontium, and thorium.

- d. The Permittee shall modify the list of inorganic constituents described in (c) above in accordance with the requirements of Part II.E.6.

8. Groundwater Elevation Monitoring.

Groundwater depths and elevations, measured in feet relative to mean sea level, in the POC and other monitoring wells shall be measured on a quarterly basis and reported in accordance with Part.II.G.2.d.

9. Monitoring Information

Records of monitoring activity required under this permit shall include:

- a. Date, exact location, and time of sampling or field measurements;
- b. Name(s) of individual(s) who performed sampling or measurement;
- c. Exact sampling method(s) used;
- d. Date(s) laboratory analyses were performed;
- e. Name(s) of individual(s) who performed laboratory analyses;
- f. Types of analyses; and
- g. Results of analyses.

10. Monitoring Devices

- a. Continuous monitoring devices

Temperature and injection pressure shall be measured at the wellhead using equipment of sufficient precision and accuracy, as described below. All measurements must be recorded at minimum to a resolution of one tenth of the unit of measure, except temperature (e.g., injection and production rates and volumes must be recorded to a resolution of a tenth of a gallon; pressure must be recorded to a resolution of a tenth of a psi gauge (psig); injection fluid temperature must be recorded to a resolution of one degree Fahrenheit). Exact dates and times of measurements, when taken, must be recorded and submitted. Injection

and production rates shall be measured at or near the wellhead. The Permittee shall continuously monitor and shall record the following parameters at the prescribed frequency:

Parameters	Frequency	Instrument
Injection rate (gpm)	continuous	digital recorder
Daily injection volume (gallons)	daily	digital totalizer
Total cumulative injection volume (gallons)	continuous	digital totalizer
Injection pressure (psig)	daily	digital recorder
Injection fluid temperature (degrees Fahrenheit)	daily	digital recorder
Production rate (gpm)	continuous	digital recorder
Daily produced fluid volume (gallons)	daily	digital totalizer
Total cumulative produced fluid volume (gallons)	continuous	digital totalizer
Produced fluid temperature (degrees Fahrenheit)	daily	digital recorder

The Permittee must adhere to the required format below for reporting injection rate, and well head injection pressure. An identical format is required for reporting production rates but omitting the injection pressure column. An example of the required electronic data format is provided below:

<u>DATE</u>	<u>TIME</u>	<u>INJ. PRESS (psig)</u>	<u>INJ. RATE (gpm)</u>
06/27/10	16:33:16	1025.6	5.8
06/27/10	17:33:16	2075.4	10.3

Each data line shall include four (4) values separated by a consistent combination of spaces or tabs. The first value contains the date measurement in the format of mm/dd/yy or mm/dd/yyyy, where mm the number of the month, dd is the number of the day, and yy or yyyy is the number of the year. The second value is the time measurement, in the format of hh:mm:ss, where hh is the hour, mm are the minutes and ss are the seconds. Hours should be calculated on a twenty-four (24)-hour basis (e.g., 6 PM is entered as 18:00:00). Seconds are optional. The third value is the well head injection pressure in psig. The fourth column is injection rate in gpm.

b. Calibration and Maintenance of Equipment

All monitoring and recording equipment shall be calibrated and maintained on a regular basis to ensure proper working order.

G. RECORDKEEPING AND REPORTING

1. Recordkeeping

The Permittee shall retain the following records and shall have them available at all times for examination by an EPA inspector:

- a. All monitoring information, including required observations, calibration and maintenance records, recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the permit application;
- b. Information on the physical nature and chemical composition of all injected fluids;
- c. Records and results of MITs, any other tests required by EPA, and any well workovers completed.
- d. The Permittee shall maintain copies (or originals) of all records described in paragraphs (a) through (c) above during the operating life of the well and shall make such records available at all times for inspection at the facility.
- e. The Permittee shall only discard the records described in paragraphs (a) through (c) if:
 - i. The records are either delivered to the EPA Region 9 Drinking Water Protection Section, or
 - ii. Written approval from the Regional Administrator to discard the records is obtained.

2. Reporting of Results

The Permittee shall submit, in accordance with the required schedule, accurate reports to EPA containing, at minimum, the following information:

- a. A map showing the current PTF operational status and groundwater elevation contours based on the current quarterly monitoring data.
- b. A table and graph showing daily cumulative injection volumes and recovery volumes and the daily percent recovery to injection volume in the PTF over the reporting period. The record shall identify any 24 hour periods that the volume recovered is less than the minimum percent of

volume injected and any contingency actions taken during the reporting period.

- c. A table and graphs comparing daily average head measurements in the seven (7) observation wells surrounding the PTF well field with the same measurements in the nine (9) recovery wells.
- d. A table and graph showing results of the electrical conductivity measurements in the observation, recovery, and multi-level sampling wells profiling electrical resistivity of the formation during injection and recovery operations.
- e. A table and graph showing results of the bulk electrical conductivity measurements and depth in the observation wells compared to the established background and action levels identifying any statistically significant increase above statistical noise levels in conductivity values. The record shall also include a discussion of any increase that occurred, an evaluation of whether an excursion has occurred, and mitigating actions taken during the reporting period.
- f. A table showing POC and monitoring well groundwater depths and elevations, analytical results, AQLs, and ALs along with a summary narrative, plus a graphical presentation of those results since inception of monitoring for the current reporting quarter. The records should also include a discussion of any exceedances that occurred and mitigating actions taken during the reporting period.
- g. Results of monthly analyses of organics in the lixiviant.
- h. Results of monitoring required at Part II.F.7 (pursuant to 40 CFR §146.33(b)(1)) whenever the injection fluid is modified to the extent that previously reported analyses are incorrect or incomplete.
- i. Results of mechanical integrity tests conducted during the reporting period.
- j. Results of ACD monitoring in the observation and multi-level sampling wells to demonstrate mechanical integrity for the current quarter.
- k. A summary of the any plugging and abandonment activity conducted during the reporting period.
- l. A summary of closure operations conducted during the reporting period.

- m. A table showing the average, maximum, and minimum monthly tubing/casing annulus and injection pressures.
3. Quarterly reports shall be submitted by the dates listed below:

Reporting Period	Report Due
Jan, Feb, Mar	Apr 28
Apr, May, June	Jul 28
July, Aug, Sept	Oct 28
Oct, Nov, Dec	Jan 28

4. Copies of all reports of PTF formation testing and geophysical well logging conducted prior to beginning PTF operations shall be submitted to EPA and reviewed and approved by EPA before commencement of PTF operations is authorized.
5. Copies of the monitoring results and all other reports required by this permit shall be submitted to the following address:

U.S. Environmental Protection Agency, Region 9
 Drinking Water Protection Section (WTR-3-2)
 75 Hawthorne St.
 San Francisco, CA 94105-3901

H. CONTINGENCY PLANS

1. Loss of Hydraulic Control
- a. The Permittee shall initiate the following actions within 24 hours of becoming aware that the volume of fluids recovered from the injection and recovery zone of the PTF during a 24-hour period is less than 110 percent of the amount of fluid injected during the same 24-hour period:
 - i. adjust the flow rate for the recovery and/or injection wells to restore the percent of recovered fluid volume to at least 110 percent of the injected volume,
 - ii. inspect the injection and recovery lines, pumps, flow meters, totalizers, pressure gages, pressure transducers and other associated instruments and facilities,
 - iii. initiate pressure testing of wells if the loss of fluids cannot be determined to be caused by a surface facility failure, and
 - iv. repair system as necessary to restore the percent of recovered fluid volume to at least 110 percent of the injected volume.

- b. A loss of hydraulic control is deemed to occur when the amount of fluid recovered during a 48-hour period is less than 110 percent of the amount of fluid injected during the same 48-hour period. Loss of hydraulic control is also defined by an inward gradient (in head differential) of less than one (1) foot or an outward gradient observed in any pair of observation/recovery wells over a 48-hour period or by an action level in bulk conductivity values above statistical noise levels in observation wells over a 48-hour period. An inward gradient of less than (1) foot (ie, loss of hydraulic control) shall require action to restore the inward gradient to at least one (1) foot in the subsequent 24-hour period.

The minimum inward flow ratio and head differentials may be adjusted during the course of the PTF operation if warranted by electrical conductivity data from observation wells or head data from observation/recovery well-pairs and from POC and monitoring wells, subject to EPA approval.

The Permittee shall initiate the following actions within 24 hours of becoming aware of the loss of hydraulic control within the PTF for more than 48 consecutive hours, as defined above. The Permittee shall:

- i. cease injection in one or more wells as necessary to restore hydraulic control,
 - ii. operate recovery wells until the amount recovered equals an amount sufficient to restore the ratio of fluid recovered to injected during the prior 72-hour period to a minimum of 110 percent and restore all observation and recovery well pair head differentials to at least one (1) foot to verify an inward flow gradient,
 - iii. verify proper operation of all facilities within the PTF, and
 - iv. perform any necessary repairs.
- c. If action is taken under either a) or b) above, in the next quarterly report, the Permittee shall describe the causes and impacts of the loss of hydraulic control or the variance from the required recovery to injection ratio and the actions that were taken to correct the event.

2. Water Quality Exceedances at POC and other Monitoring Wells

The following describes contingency plans to be followed after the verification of a federal AL or AQL exceedance in a POC or other monitoring well during the

approximate two (2)-year PTF life and during the five (5)-year Post-Closure period:

- a. AL exceedance during operational PTF Life
 - i. The Permittee shall collect a verification sample within fourteen (14) days after becoming aware of an exceedance of a federal AL listed in Table 1 or Table 2 of Part II.F.2.
 - ii. Within five (5) days after receiving the results of verification sampling from the laboratory, the Permittee shall notify the director if the results indicate an exceedance.
 - iii. If the results of verification sampling indicate that an AL has not been exceeded, the Permittee shall notify EPA of the results and assume that no exceedance has occurred. No further action is required until the next scheduled monitoring round.
 - iv. Within thirty (30) days of receiving the laboratory results verifying that an AL has been exceeded, the Permittee shall do the following:
 - (A. Submit a written report to EPA providing an evaluation of the cause, impacts, or mitigation of the discharge responsible for the AL exceedance, or
 - (B. Submit a written report to EPA which definitively demonstrates that the AL exceedance resulted from an error(s) in sampling, analysis, or statistical evaluation.
 - v. Upon review of the report documenting the AL exceedance, the Director may require additional monitoring and/or action beyond those specified in this permit.
- b. AQL Exceedance during operational PTF Life, Closure, and Post-Closure period.
 - i. The Permittee shall collect a verification sample within fourteen (14) days of becoming aware of an exceedance of a federal AQL listed in Table 1 or Table 2 of Part II.F.2.
 - ii. Within five (5) days of receiving the results of verification sampling from the laboratory, the Permittee shall notify the Director of the results, regardless of whether the results are positive or negative.

- iii. If the results of verification sampling indicate that an AQL has not been exceeded, the Permittee shall assume that no exceedance has occurred and no further action is required until the next scheduled monitoring round.
 - iv. Within thirty (30) days of receiving the laboratory results verifying that an AQL has been exceeded, the Permittee shall do the following:
 - (A. Submit a written report to EPA providing an evaluation of the cause, impacts, or mitigation of the discharge responsible for the AQL exceedance, or
 - (B. Submit a written report to EPA which definitively demonstrates that the AQL exceedance resulted from an error(s) in sampling, analysis, or statistical evaluation.
 - v. Upon review of the report documenting the AQL exceedance, the Director may require additional monitoring and/or action beyond those specified in this permit.
- c. Verification Sample Requirements

The verification sample shall be collected only from the well in which an exceedance was detected and shall be analyzed for the constituents of Table 1 of Part II.F.2. If the constituent that exceeded an AL or AQL is one that is listed in Table 2 of Part II.F.2 but not in Table 1, the verification sample shall be analyzed for all constituents listed in Table 1 and only for constituent(s) from Table 2 that exceed the AL or AQL

I. RESTORATION and PLUGGING & ABANDONMENT

Pursuant to 40 CFR Parts 146.10 and 144.12, the Permittee shall comply with the Closure and Post-Closure Plan in Appendix F and the Plugging and Abandonment Plan in Appendix C in accordance with the schedule for aquifer restoration, ground water monitoring, and plugging and abandonment activities to ensure adequate protection of USDWs. The Permittee shall also comply with the conditions at I.1 and I.2 below. Where any conflict or inconsistency exists between the Plans and permit conditions, the permit condition shall supersede the language in the Plan.

- 1. Closure
 - a. Constituents with primary MCLs: Within 60 days after completing copper recovery operations in the injection and recovery zone, the Permittee shall commence restoration activities for the zone. The groundwater in the injection and recovery zone shall be restored to

concentrations which are less than or equal to primary MCLs defined at 40 CFR Part 141, or to pre-operational background concentrations if the pre-operational background concentrations exceed MCLs. The Permittee shall follow the procedure detailed at (c), below.

- b. Constituents without primary MCLs: In addition to constituents with primary MCLs, the Permittee shall ensure that constituents which do not have primary MCLs do not impact USDWs in a way that could adversely affect the health of persons.
- c. Closure and Plugging & Abandonment Procedure: The Permittee will commence closure operations in the injection and recovery zone after copper recovery operations have been completed. During closure operations, the Permittee will cease injection of lixiviant and initiate rinsing of the injection and recovery zone by injection/recovery or recovery operations. At all times during injection and recovery zone rinsing, the Permittee shall maintain inward hydraulic gradients (ie, maintaining hydraulic control) of the injection and recovery zone. The Permittee will monitor the rinsing progress by analyzing water recovered from well-field manifolds for sulfate concentration. When levels of sulfate in the manifolds have declined below 750 (mg/L) , the Permittee will sample manifold discharges for all Level 2 constituents defined at Part II.F of this permit. If results of the Level 2 sampling show that one or more compounds are above primary MCLs and the pre-operational background concentrations, rinsing operations will continue until all compounds are below primary MCLs or the pre-operational background concentrations if pre-operational background concentrations exceed MCLs. The sulfate concentration at which all primary MCLs or pre-operational background concentrations are met will serve as an indication for acceptable closure for the PTF, subject to the following well sampling protocol.

The Permittee will sample all wells in the PTF undergoing closure to determine if the sulfate concentrations are less than or greater than the PTF's indicator sulfate concentration. If the sulfate concentration in a well is below the indicator sulfate concentration, the Permittee may discontinue rinsing that well until the end of the thirty (30)-day period described below. If the sulfate concentration in a well exceeds the indicator sulfate concentration, the Permittee shall continue rinsing operations until such time that the sulfate concentration in the well is less than the indicator concentration for the PTF.

When all individual well concentrations within the injection and recovery zone are below the PTF indicator sulfate concentration, hydraulic control for all wells within the injection and recovery zone will be discontinued for thirty (30) days. At the end of the thirty (30)-

day period, the wells will be re-sampled and if sulfate concentrations remain below the PTF indicator sulfate concentration in all wells, the Permittee may cease all rinsing and monitoring activities for the wells in the injection and recovery zone. The Permittee shall document the results of the closure operation in the subsequent quarterly monitoring report and notify EPA of the schedule for plugging and abandonment operations at least thirty (30) days in advance of commencing plugging and abandonment operations. The Permittee shall submit with the notification the closure report and an updated Plugging and Abandonment Plan and schedule for EPA approval. The wells shall be abandoned in accordance with the Plugging and Abandonment Plan (Appendix C) and the Closure and Post-Closure Plan in Appendix F unless modified for individual well conditions.

2. Post-Closure:

Monitoring at POC and other monitoring wells: To ensure that the restoration required at (1), above, accomplished the objective of returning the injection and recovery zone to primary MCLs (or pre-operational background concentrations) and thereby providing adequate protection to surrounding USDWs, the Permittee shall comply with the Post-Closure Monitoring Program at Part II.F.4 and the AQL exceedance contingency plan established in Part II.H.2.b of this permit. The post-closure monitoring at Part II.F.4 may be extended beyond five years if EPA deems it necessary to ensure adequate protection of USDWs. The Permittee shall submit a post-closure notification and report, with documentation, to EPA within 30 days following completion of the post-closure plan.

J. POST-CLOSURE AUDITS

The Permittee shall verify that the pollutant fate and transport are behaving as predicted. During the third (3), fifth (5), and seventh (7) years after the commencement of PTF operations, the Permittee shall conduct a post-closure audit of the computer modeling which predicted the fate and transport of pollutants discharged by the Florence Copper PTF operations. For each audit, the Permittee shall submit a report to EPA describing the post-closure audit as well as any changes in the conceptual model, any model redesign, and any changes in predicted post-closure conditions.

K. DURATION OF PERMIT

The duration of this Class III permit shall include well construction, corrective actions, and demonstrations required prior to injection under permit conditions in Part II, Sections C, D and E.2. After injection is authorized, the duration of this Class III permit shall include the approximate two (2)-year PTF operational and closure period and five (5) year post-closure monitoring period unless terminated under the conditions set forth in Part III, Section B.1 of this permit. The duration of this Class III permit shall include any post-closure monitoring required beyond five (5) years.

L. FINANCIAL RESPONSIBILITY

1. Demonstration of Financial Responsibility

The Permittee is required to demonstrate and maintain financial responsibility and resources sufficient to meet the restoration and plugging and abandonment requirements established at Part II, Section I of this permit and described in the Plugging and Abandonment Plan (Appendix C) and the Closure and Post Closure Plan (Appendix F) and consistent with 40 CFR §144.52(a)(7) and Subpart F, which the Director has chosen to apply.

- a. The Permittee shall post an approved financial instrument such as a surety bond or other financial assurance in the amount of \$4,457,000 to guarantee aquifer restoration, ground water monitoring, and plugging and abandonment activities for closure and post-closure. Authority to construct, inject and operate the wells under the authority of this permit will be granted only after the financial instrument has been posted and approved by EPA.
- b. The level and mechanism of financial responsibility shall be reviewed and updated periodically, upon request of EPA. The Permittee may be required to change to an alternate method of demonstrating financial responsibility. Any such change must be approved in writing by EPA prior to the change.
- c. EPA may require the Permittee to estimate and to update the estimated restoration, plugging, and/or post-closure activity costs periodically. Such estimates shall be based upon costs that a third party would incur to carry out the required restoration activities, properly plug and abandon the wells, and post-closure monitoring activities, including materials, equipment, mud and disposal costs, and labor with appropriate contingencies.

2. Insolvency of Financial Institution

The Permittee must submit an alternate instrument of financial responsibility acceptable to EPA within sixty (60) days after either of the following events occurs:

- a. The institution issuing any bond or other financial instrument that is secured to demonstrate financial responsibility in accordance with section II.L.1. of this permit files for bankruptcy; or
- b. The authority of the trustee institution to act as trustee, or the authority of the institution issuing the financial instrument, is suspended or revoked.

Failure to submit an acceptable financial demonstration may result in the termination of this permit pursuant to 40 CFR §144.40(a) (1).

3. Insolvency of Owner or Operator

An owner or operator must notify EPA by certified mail of the commencement of voluntary or involuntary proceedings under U.S. Code Title 11 (Bankruptcy), naming the owner or operator as debtor, within ten (10) business days. A guarantor of a corporate guarantee must make such a notification if he/she is named as debtor, as required under the terms of the guarantee.

M. NATIONAL HISTORIC PRESERVATION ACT

EPA considered the potential effects of this permit on historic properties eligible for inclusion in the National Register of Historic Places in compliance with the Section 106 process of the National Historic Preservation Act (NHPA) and its implementing regulations, 36 CFR Part 800. EPA determined that the undertaking had the potential to cause adverse effects on historic properties, subject to the criteria in 36 CFR §800.5(a). The permittee shall carry out stipulations as agreed to in the attached Memorandum of Agreement (MOA) in Appendix G in order to resolve the adverse effects on historic properties from the FCP.

PART III. GENERAL PERMIT CONDITIONS.

A. EFFECT OF PERMIT

The Permittee is allowed to engage in underground injection well construction and operation in accordance with the conditions of this permit. The Permittee shall not construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant (as defined by 40 CFR §144.3 and 146.3) into USDWs (as defined 40 CFR §§144.3 and 146.3).

Any underground injection activity not specifically authorized in this permit is prohibited. The Permittee must comply with all applicable provisions of the Safe Drinking Water Act (SDWA) and 40 CFR Parts 124, 144, 145, and 146. Such compliance does not constitute a defense to any action brought under Section 1431 of the SDWA, 42 U.S.C. §300(i), or any other common law, statute, or regulation other than Part C of the SDWA. Issuance of this permit does not convey property rights of any sort or any exclusive privilege, nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations. Nothing in this permit shall be construed to relieve the Permittee of any duties under all applicable laws and regulations.

B. PERMIT ACTIONS

1. Modification, Revocation and Reissuance, or Termination

EPA may, for cause or upon request from the Permittee, modify, revoke and reissue, or terminate this permit in accordance with 40 CFR §§124.5, 144.12, 144.39, and 144.40. The permit is also subject to minor modifications for causes as specified in 40 CFR §144.41. The filing of a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance by the Permittee, does not stay the applicability or enforceability of any permit condition. EPA may also modify, revoke and reissue, or terminate this permit in accordance with any amendments to the SDWA if the amendments have applicability to this permit.

2. Transfers

This permit is not transferable to any person unless notice is first provided to EPA and the Permittee complies with requirements of 40 CFR §144.38. EPA may require modification or revocation and reissuance of the permit to change the name of the Permittee and incorporate such other requirements as may be necessary under the SDWA.

C. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

D. CONFIDENTIALITY

In accordance with 40 CFR §§2 and 144.5, any information submitted to EPA pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the validity of the claim will be assessed in accordance with the procedures contained in 40 CFR §2 (Public Information). Claims of confidentiality for the following information will be denied:

1. Name and address of the Permittee, or
2. Information dealing with the existence, absence, or level of contaminants in drinking water.

E. GENERAL DUTIES AND REQUIREMENTS

1. Duty to Comply

The Permittee shall comply with all applicable UIC Program regulations and conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit issued in accordance with 40 CFR §144.34. Any permit noncompliance constitutes a violation of the SDWA and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application. Such noncompliance may also be grounds for enforcement action under the Resource Conservation and Recovery Act (RCRA).

2. Penalties for Violations of Permit Conditions

Any person who violates a permit requirement is subject to civil penalties, fines, and other enforcement action under the SDWA and may also be subject to enforcement actions pursuant to RCRA. Any person who willfully violates permit conditions may be subject to criminal prosecution.

3. Need to Halt or Reduce Activity not a Defense

It shall not be a defense, for the Permittee in an enforcement action, that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4. Duty to Mitigate

The Permittee shall take all reasonable steps to minimize and correct any adverse impact on the environment resulting from noncompliance with this permit.

5. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit.

6. Property Rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

7. Duty to Provide Information

The Permittee shall furnish to EPA, within a time specified, any information which EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to EPA, upon request, copies of records required to be kept by this permit.

8. Inspection and Entry

The Permittee shall allow EPA, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

- a. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;

- b. Have access to and copy, at reasonable times, any records that are kept under the conditions of this permit;
- c. Inspect and photograph at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the SDWA, any substances or parameters at any location.

9. Signatory Requirements

All applications, reports, or other information submitted to EPA shall be signed and certified by a responsible corporate officer or duly authorized representative according to 40 CFR §144.32.

10. Additional Reporting Requirements

- a. **Planned Changes** - The Permittee shall give notice to EPA as soon as possible of any planned physical alterations or additions to the permitted facility affecting any of the terms and conditions of the permit.
- b. **Anticipated Noncompliance**-The Permittee shall give advance notice to EPA of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- c. **Compliance Schedules** - Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted to EPA no later than thirty (30) days following each schedule date.
- d. **Twenty-four Hour Reporting.**
 - i. The Permittee shall report to EPA any noncompliance which may endanger health or the environment. The following Information shall be provided orally within 24 hours from the time the Permittee becomes aware of the circumstances.
 - (A. Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; and

- (B. Any noncompliance with a permit condition, malfunction of the injection system, or loss of mechanical integrity, which may cause fluid migration into or between USDWs.
- ii. A written submission of all noncompliance as described in paragraph (i) shall also be provided to EPA within five (5) days of the time the Permittee becomes aware of the circumstances. The written submission shall contain: a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
- e. Other Noncompliance - At the time monitoring reports are submitted, the Permittee shall report in writing all other instances of noncompliance not otherwise reported. The Permittee shall submit the information listed in Part III, Section E.10.d of this permit.
- f. Other Information - If the Permittee becomes aware that it failed to submit all relevant facts in the permit application, or submitted incorrect information in the permit application or in any report to EPA, the Permittee shall submit such facts or information within two (2) weeks of the time such facts or information becomes known.

11. Continuation of Expiring Permit

- a. Duty to Reapply - If EPA requires the permittee to continue an activity regulated by this permit past the expiration date of this permit, the Permittee must submit a complete application for a new permit at least one hundred and eighty (180) days before this permit expires.
- b. Permit Extensions - The conditions and requirements of an expired permit continue in force and effect in accordance with 5 U.S.C. §558(c) until the effective date of a new permit, if:
 - i. The Permittee has submitted a timely and complete application for a new permit; and
 - ii. EPA, through no fault of the Permittee, does not issue a new permit with an effective date on or before the expiration date of the previous permit.