



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
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UNDERGROUND INJECTION CONTROL
DRAFT CLASS I AREA MAJOR MODIFICATION

Area Permit No. CO12163-00000

Class I Non-hazardous Injection Well Area Permit
Sterling Deep Disposal Well Project
Logan County, CO

Issued To

City of Sterling, CO
421 N 4th St, PO Box 4000
Sterling, CO 80751-0400

Part I. AUTHORIZATION TO CONSTRUCT AND OPERATE

Under the authority of the Safe Drinking Water Act and Underground Injection Control (UIC) Program regulations of the U. S. Environmental Protection Agency (EPA) codified at Title 40 of the Code of Federal Regulations (40 CFR) Parts 2, 124, 144, 146, and 147, and according to the terms of this Area Permit,

**City of Sterling, CO
421 N 4th St, PO Box 4000
Sterling, CO 80751-0400**

is authorized to construct and to operate the following Class I Non-hazardous injection well project:

Sterling Deep Disposal Well Project Logan County, Colorado

Area Permit Boundary

The area permit is described by the boundary enclosing the entirety of Sections 22, 23, 27, and the north ½ of Section 34, in Township 8 North, Range 52 West, Logan County, Colorado.

Well Locations

This area permit authorizes the construction and operation of two disposal wells within the project described above. These wells are located as follows:

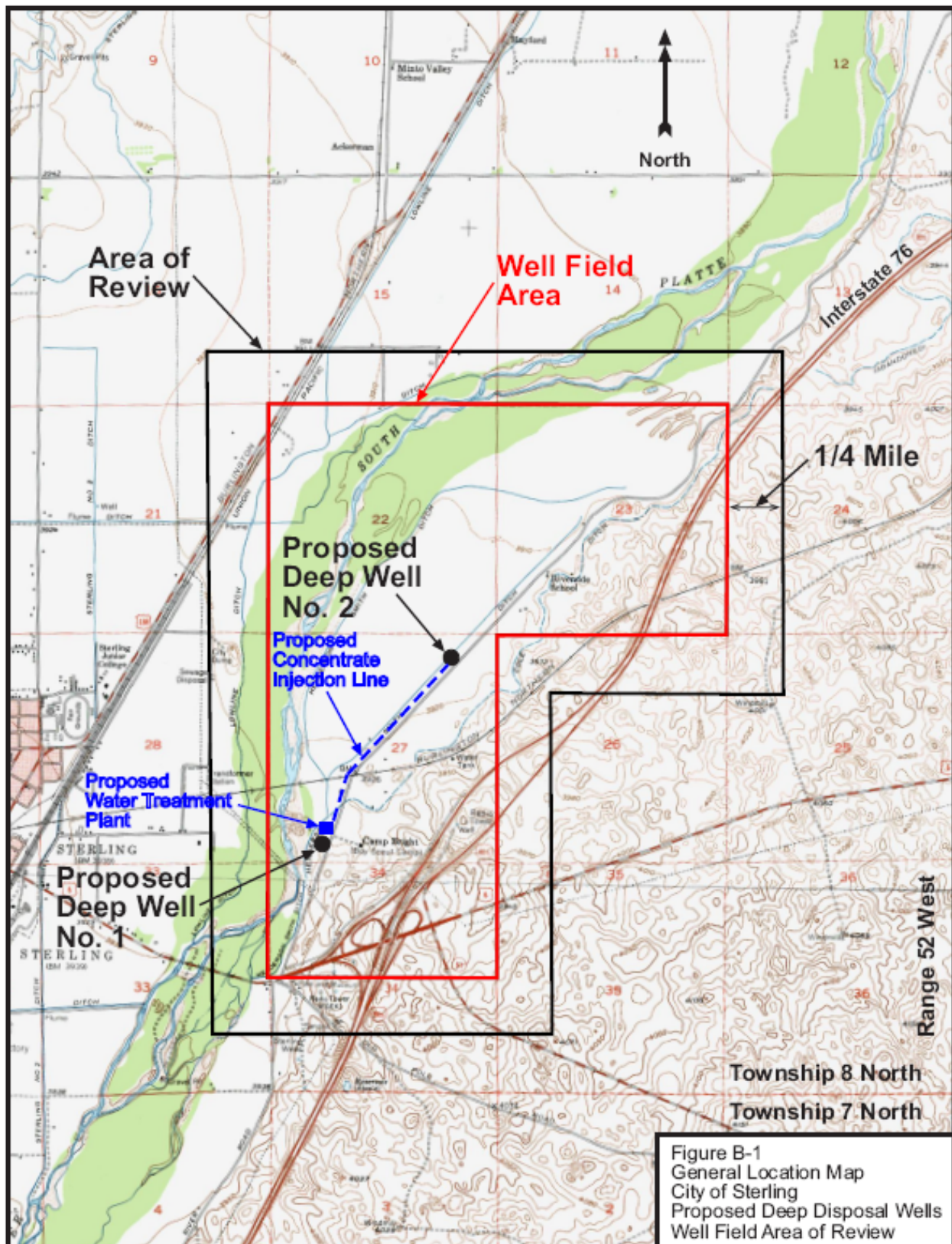
Well Name	UIC Well ID	Proposed Location
Sterling Deep Disposal Well No. 1	CO12163-08741	390 FSL, 1020 FWL, S27, T8N, R52W, Logan County, CO
Sterling Deep Disposal Well No. 2	CO12163-08742	1200 FNL, 1380 FEL, S27, T8N, R52W, Logan County, CO

The map on the following page illustrates the boundary of the area permit boundary (shown in red as “Well Field Area”), the area of review (shown in black as “Area of Review”), the location of the proposed water treatment plant, and the location of the two injection wells.

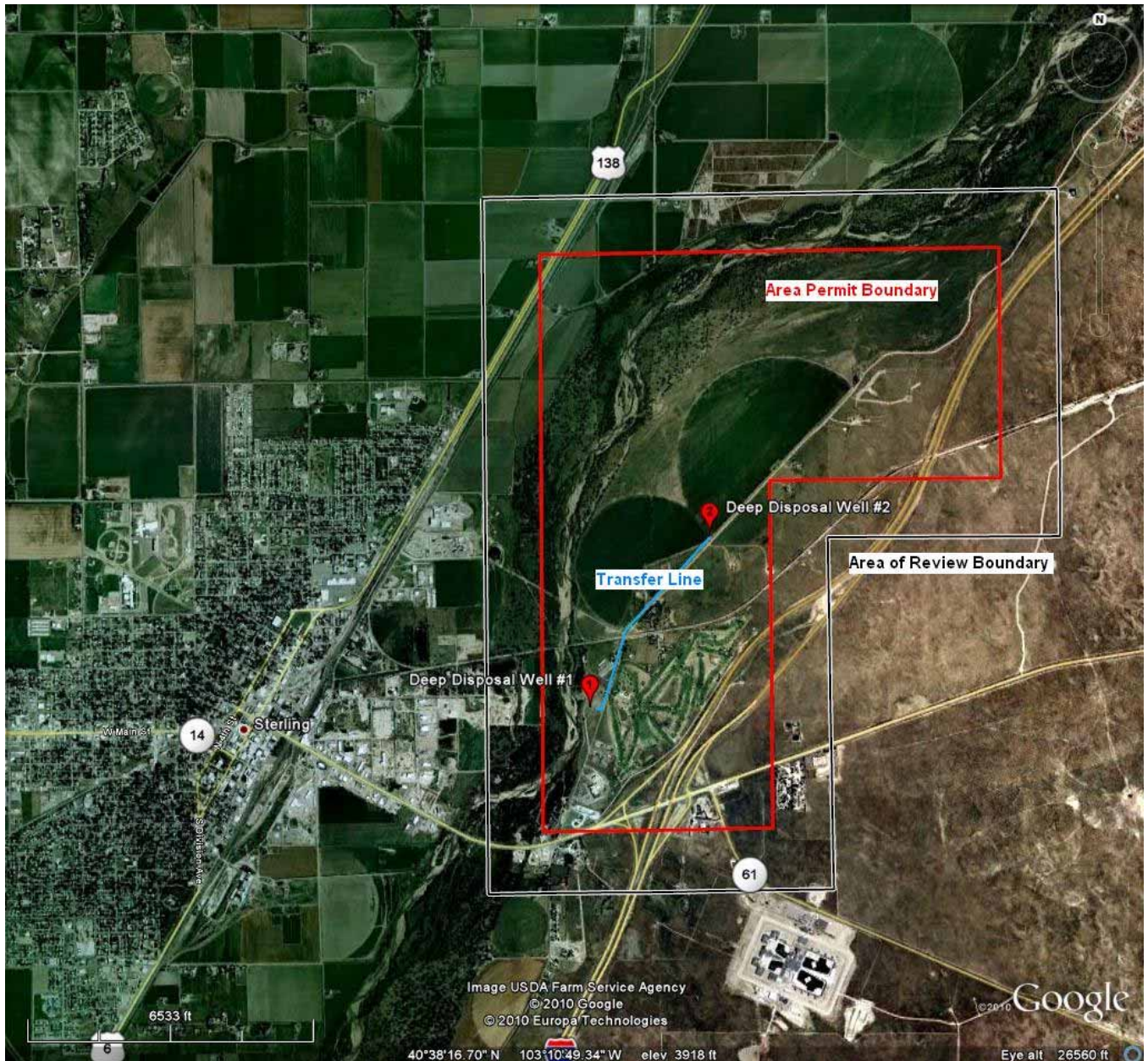
Permit requirements herein are based on regulations found in 40 CFR Parts 124, 144, 146, and 147, which are in effect on the Effective Date of this Permit.

This Permit is based on representations made by the applicant and on other information contained in the Administrative Record. Misrepresentation of information or failure to fully disclose all relevant information may be cause for termination, revocation and reissuance, or modification of this Permit and/or formal enforcement action. This Permit will be reviewed periodically to determine whether action under 40 CFR 144.36(a) is required.

Sterling Deep Disposal Well Area Permit



Sterling Deep Disposal Well Area Permit



This Permit is issued for a period of ten (10) years unless modified, revoked and reissued, or terminated under 40 CFR 144.39 or 144.40. This Permit may be adopted, modified, revoked and reissued, or terminated if primary enforcement authority for this program is delegated to an Indian Tribe or a State. Upon the effective date of

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Sterling Deep Disposal Well Project

delegation, all reports, notifications, questions and other compliance actions shall be directed to the Indian tribe or State Program Director or designee.

Issue Date: _____

Effective Date: _____

Expiration Date: _____

Derrith R. Watchman-Moore
Assistant Regional Administrator*
Office of Partnerships and Regulatory

*NOTE: The person holding this title is referred to as the "Director" throughout this Permit.

PART II. SPECIFIC PERMIT CONDITIONS

Section A. WELL CONSTRUCTION REQUIREMENTS

These requirements represent the approved minimum construction standards for well casing and cement, injection tubing, and packer.

Details of the approved well construction plan are incorporated into this Permit as APPENDIX A. Changes to the approved plan that may occur during construction must be approved by the Director prior to being physically incorporated.

1. Casing and Cement.

The well or wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The well casing and cement shall be designed for the life expectancy of the well and of the grade and size described in APPENDIX A. Remedial cementing may be required if shown to be inadequate by cement bond log or other attempted demonstration of Part II (External) mechanical integrity.

2. Injection Tubing and Packer.

Injection tubing is required, and shall be run and set with a packer at or below the depth described in APPENDIX A. The packer setting depth may be changed provided it remains below the depth described in APPENDIX A and the Permittee provides notice and obtains the Director's approval for the change.

3. Sampling and Monitoring Devices.

The Permittee shall install and maintain in good operating condition:

- (a) Sampling taps conveniently located and isolated by shut-off valves, to enable collection of representative samples of the fluid in the injection tubing and in the tubing-casing annulus (annulus); and
- (b) One-half (1/2) inch female iron pipe fitting, isolated by shut-off valves and located at the wellhead at a conveniently accessible location, for the attachment of a pressure gauge capable of monitoring pressures ranging from normal operating pressures up to the Maximum Allowable Injection Pressure specified in APPENDIX C:
 - (i) on the injection tubing; and
 - (ii) on the annulus; and
- (c) Continuous recording devices located to monitor and record injection pressure, annulus pressure, flow rate, and volume
- (d) An automated shut-off device set to shut-off the injection pump when or before the Maximum Allowable Injection Pressure specified in APPENDIX C is reached at the wellhead; and

Additional monitoring and sampling devices may be described in APPENDIX A.

4. Well Logging and Testing

Well logging and testing requirements are found in APPENDIX B. The Permittee shall ensure the log and test requirements are performed within the time frames specified in APPENDIX B. Well logs and tests shall be performed according to current EPA-approved procedures. Well log and test results shall be submitted to the Director within sixty (60) days of completion of the logging or testing activity, and shall include a report describing the methods used during logging or testing and an interpretation of the test or log results.

5. Postponement of Construction or Conversion

The Permittee shall construct and complete at least one of the two originally permitted wells within one year of the Effective Date of the Permit, or in the case of an additional well added to this Area Permit, within one year of authorization of the additional well.

Authorization to construct and operate shall expire if at least one of the two originally permitted wells has not been constructed and completed within one year of the Effective Date of the Permit or authorization and the Permit may be terminated under 40 CFR 144.40, unless the Permittee has notified the Director and requested an extension prior to expiration. Notification shall be in writing, and shall state the reasons for the delay and provide an estimated completion date. Once Authorization has expired under this part, the complete permit process including opportunity for public comment may be required before Authorization to construct and operate can be reissued.

6. *Workovers and Alterations*

Workovers and alterations shall meet all conditions of the Permit. Prior to beginning any addition or physical alteration to an injection well that may significantly affect the tubing, packer or casing, the Permittee shall give advance notice to the Director and obtain the Director's approval. The Permittee shall record all changes to well construction on a Well Rework Record (EPA Form 7520-12), and shall provide this and any other record of well workover, logging, or test data to EPA within sixty (60) days of completion of the activity.

A successful demonstration of Internal Mechanical Integrity (Part I MI) is required following the completion of any well workover or alteration which affects the casing, tubing, or packer. Injection operations shall not be resumed until the well has successfully demonstrated mechanical integrity and the Director has provided written approval to resume injection.

7. *Annual Pressure Falloff Test*

The Permittee must perform pressure falloff testing for each permitted injection well prior to beginning injection and at least once every twelve months after injection begins. The pressure falloff test is required for Class I operations [40CFR 146.13(d)(1)] to monitor pressure buildup in the injection zone, to monitor reservoir parameters, to identify any fracturing, and to identify any boundaries within the injection formations.

The Permittee is required to prepare a plan for running the yearly falloff test. EPA Region 6 has developed a set of guidelines that should be used by the Permittee when developing a site specific plan. Region 6 "UIC Pressure Falloff Testing Guideline" is available from EPA and will be provided upon request. The final test plan shall be submitted to Region 8 for review at least 30 days prior to conducting the annual pressure falloff test.

It is important that the initial and subsequent tests follow the same test procedure, so that valid comparisons of reservoir pressure, permeability, and porosity can be made. The Permittee shall analyze test results and provide a report with an appropriate narrative interpretation of the test results, including an estimate of reservoir parameters, information of any reservoir boundaries, and estimate of the well skin effect and reservoir flow conditions. The report shall also compare the test results with previous years test data, unless it is the first test performed at that well, and shall be prepared by a knowledgeable analyst.

Section B. MECHANICAL INTEGRITY

The Permittee is required to ensure each injection well maintains mechanical integrity at all times. The Director, by written notice, may require the Permittee to comply with a schedule describing when mechanical integrity demonstrations shall be made.

An injection well has mechanical integrity if:

- (a) There is no significant leak in the casing, tubing, or packer (Part I MI); and
- (b) There is no significant fluid movement into an underground source of drinking water through

vertical channels adjacent to the injection well bore (Part II MI).

1. Demonstration of Mechanical Integrity (MI).

The Permittee shall demonstrate MI prior to commencing injection and periodically thereafter. Well-specific conditions dictate the methods and the frequency for demonstrating MI and are discussed in the Statement of Basis. The logs and tests are designed to demonstrate both Internal Mechanical Integrity (Part I MI) and External Mechanical Integrity (Part II MI) as described above. The conditions present at this well site warrant the methods and frequency required in Appendix B of this Permit.

In addition to these regularly scheduled demonstrations of Mechanical Integrity, the Permittee shall demonstrate Internal Mechanical Integrity (Part I MI) following any workover which affects the tubing, packer or casing.

The Director may require additional or alternative tests if the results presented by the Permittee are not satisfactory to the Director to demonstrate there is no movement of fluid into or between USDWs resulting from injection activity. Results of MI tests shall be submitted to the Director as soon as possible but no later than sixty (60) days after the test is complete.

2. Mechanical Integrity Test Methods and Criteria

EPA-approved methods shall be used to demonstrate mechanical integrity. Current copies of Ground Water Section Guidance No. 34 - "Cement Bond Logging Techniques and Interpretation," Ground Water Section Guidance No. 35 - "Procedures to follow when excessive annular pressure is observed on a well," Ground Water Section Guidance No. 37 - "Demonstrating Part II (External) Mechanical Integrity," Ground Water Section Guidance No. 39 - "Pressure Testing Injection Wells for Part I (Internal) Mechanical Integrity," and "Radioactive Tracer Surveys for Evaluating Fluid Channeling Behind Casing near Injection Perforations " are provided at issuance of this Permit.

The Director may stipulate specific test methods and criteria best suited for a specific well construction and injection operations.

3. Notification Prior to Testing.

The Permittee shall notify the Director at least seven calendar days prior to any regularly scheduled mechanical integrity test. When the mechanical integrity test is conducted after a well construction, well conversion, or a well rework, any prior notice is sufficient. The Director may allow a shorter notification period if it would be sufficient to enable EPA to witness the mechanical integrity test. Notification may be in the form of a yearly or quarterly schedule of planned mechanical integrity tests, or it may be on an individual basis.

4. Loss of Mechanical Integrity.

If the well fails to demonstrate mechanical integrity during a test, or a loss of mechanical integrity becomes evident during operation (such as presence of pressure in the annulus, water flowing at the surface, etc.), the Permittee shall notify the Director within 24 hours (see Part III Section E Paragraph 11(e) of this Permit), and the well shall be shut-in within 48 hours unless the Director requires immediate shut-in.

Within five days, the Permittee shall submit a follow-up written report that documents test results, repairs undertaken or a proposed remedial action plan.

Injection operations shall not be resumed until after the well has successfully been repaired and demonstrated mechanical integrity, and the Director has provided approval to resume injection.

The annulus valve shall remain closed during normal operating conditions and the annulus pressure shall be maintained at zero (0) psi.

If the annulus pressure cannot be maintained at zero (0) psi, the Permittee shall follow the procedures in Ground Water Section Guidance No. 35 "Procedures to follow when excessive annular pressure is observed on a well."

Section C. WELL OPERATION

INJECTION BETWEEN THE OUTERMOST CASING PROTECTING UNDERGROUND SOURCES OF DRINKING WATER AND THE WELL BORE IS PROHIBITED.

Injection is approved under the following conditions:

1. Requirements Prior to Commencing Injection.

Injection operation may commence only after all construction and pre-injection requirements herein have been met and approved. The Permittee may not commence injection until:

- (a) construction is complete, and
- (b) The Permittee has submitted to the Director a notice of completion of construction and a completed EPA Form 7520-12; all applicable logging and testing requirements of this Permit (see APPENDIX B) have been fulfilled and the records submitted to the Director; mechanical integrity (pursuant to 40 CFR 146.8 and Part II, Section B of this Permit) has been demonstrated; and all corrective action requirements (APPENDIX F) have been fulfilled; and
 - (i) The Director has inspected or otherwise reviewed the new injection well and finds it is in compliance with the conditions of the Permit; or
 - (ii) The Permittee has not received notice from the Director of his or her intent to inspect or otherwise review the new injection well within 13 days of the date of the completion of the above items, in which case prior inspection or review is waived and the Permittee may commence injection.

2. Injection Interval.

Injection is permitted only within the approved injection interval, listed in APPENDIX C. Additional injection perforations may be added, provided that they remain within the approved injection interval and the Permittee provides notice to the Director in accordance with Part II, Section A, Paragraph 6 of this Permit. In no case shall the operation of the injection well cause the movement of injected or formation fluids outside of the permitted injection interval listed in APPENDIX C.

3. Injection Pressure Limitation

Injection pressure shall not exceed the amount the Director determines is appropriate to ensure that injection does not initiate new fractures or propagate existing fractures in the injection zone. In no case shall the operation of the injection well cause the movement of injected or formation fluids outside of the permitted injection interval listed in APPENDIX C.

- (a) The permitted Maximum Allowable Injection Pressure (MAIP), measured at the wellhead, is found in APPENDIX C.
- (b) The Permittee may request a change of the MAIP, or the MAIP may be increased or decreased by the Director in order to ensure that the requirements in Paragraph (a) above are fulfilled. The Permittee may be required to conduct a step rate injection test or other suitable test to provide information for determining the fracture pressure of the injection zone. Change of the permitted MAIP by the Director shall be made by modification of this Permit and APPENDIX C.

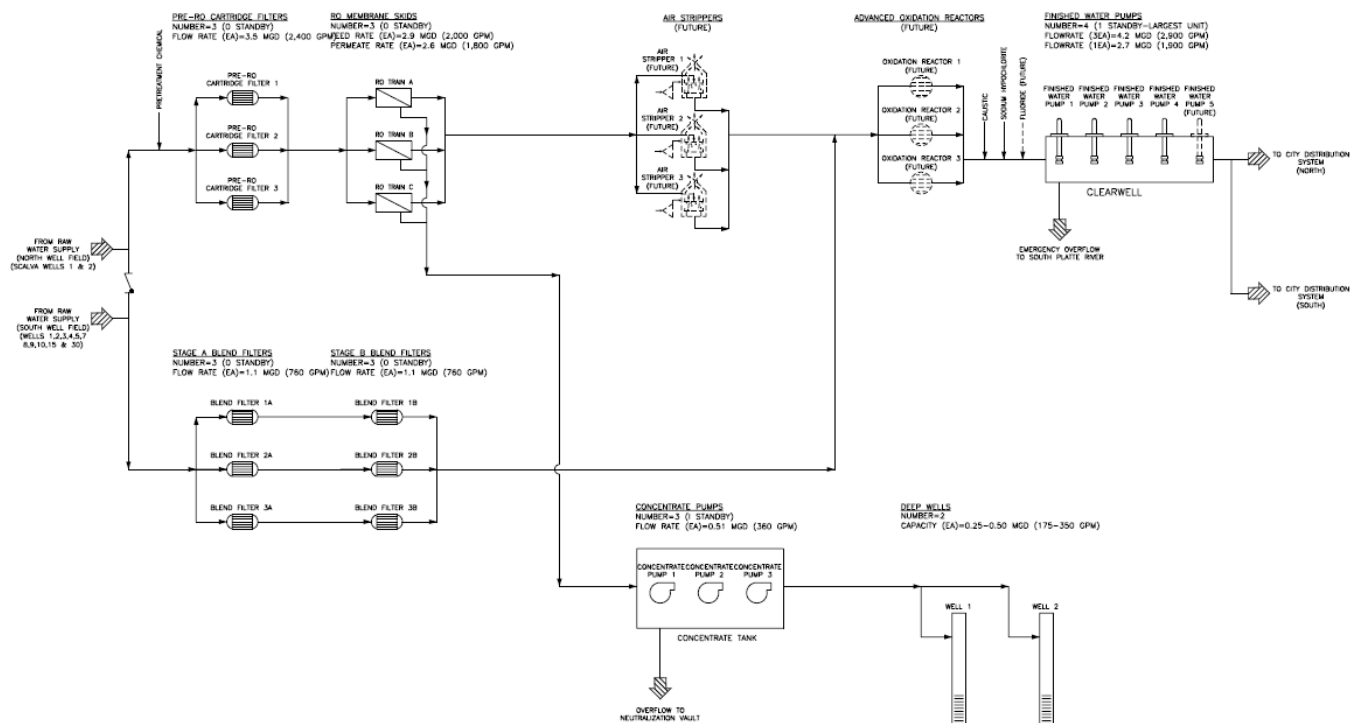
4. Injection Volume Limitation.

Injection volume is limited to the total volume specified in APPENDIX C.

5. Injection Fluid Limitation.

Injection fluid is limited to the concentrated brine generated from the reverse osmosis treatment of raw well water from the city's water treatment plant near the site of the Sterling Deep Injection Well #1. This fluid may be injected into the deep disposal wells only after sample analysis proves that it meets EPA standards for non-hazardous municipal disposal fluids (see APPENDIX D).

This treatment plant receives raw water from the City's water production wells and removes contaminants through a reverse osmosis (RO) process. Approximately 80-90% of the raw water emerges from the RO units as product water for distribution to city residents. The remaining 10-20% of the water from the RO units emerges as concentrated brine that will be disposed deep underground via Sterling's Deep Disposal Wells No. 1 and No. 2. This waste water is required to meet EPA standards for non-hazardous municipal fluids prior to disposal. See the water treatment process, below:



In addition to the concentrated brines from the RO units, additional waste fluids may be generated as a result of periodic cleaning of the RO units. As salts concentrate on the high pressure side of the membrane, the very small pores of the membrane may become plugged. Organic compounds can also plug the pores. As a result of this plugging, the flow decreases and the membrane must be cleaned. To maintain efficiency of the RO units, a volume of water is circulated on the high pressure side of the system with a cleaning agent (for hardness or organic plugging) until the membrane is flushed clean.

Prior to introducing this flush fluid to the RO units, it is expected to fall within a pH range of 2.5 to 12. After it is removed from the RO units, this flush fluid will be neutralized prior to disposal. This fluid may be injected into the deep disposal wells only after sample analysis proves that it meets EPA standards for non-hazardous municipal disposal fluids (see the permit, APPENDIX D).

6. Tubing-Casing Annulus (annulus)

The annulus shall be filled with water treated with a corrosion inhibitor, or other fluid approved by the Director. The annulus valve shall remain closed during normal operating conditions and the annulus pressure shall be

maintained at zero (0) psi.

If the annulus pressure cannot be maintained at zero (0) psi, the Permittee shall follow the procedures in Ground Water Section Guidance No. 35 “Procedures to follow when excessive annular pressure is observed on a well.”

1. Seismicity

The U.S. Geological Survey (USGS) Earthquake Hazards Program operates an email notification service which reports real-time earthquake events for any area specified by the user. The permittee is required to subscribe to this service, known as the Earthquake Notification Service (ENS). Details for the ENS can be found at:

<https://sslearnquake.usgs.gov/ens/>

and a subscription can be initiated at:

<https://sslearnquake.usgs.gov/ens/register>

For any seismic event reported within two miles of the permit boundary, the permittee shall immediately cease injection and report to EPA within twenty-four (24) hours according to Part III, Section E.11. of this permit. Injection shall not resume until the Permittee has obtained approval to recommence injection from EPA.

For any seismic event occurring between two and fifty miles of the permit boundary, that event will be recorded and reported to EPA on a quarterly basis.

Section D. MONITORING, RECORDKEEPING, AND REPORTING OF RESULTS

1. Monitoring Parameters, Frequency, Records and Reports.

Monitoring parameters are specified in APPENDIX D. Pressure monitoring recordings shall be taken at the wellhead. The listed parameters are to be monitored, recorded and reported at the frequency indicated in APPENDIX D even during periods when the well is not operating.

Monitoring records must include:

- (a) the date, time, exact place and the results of the observation, sampling, measurement, or analysis, and;
- (b) the name of the individual(s) who performed the observation, sampling, measurement, or analysis, and;
- (c) the analytical techniques or methods used for analysis.

2. Monitoring Methods.

- (a) Monitoring observations, measurements, samples, etc. taken for the purpose of complying with these requirements shall be representative of the activity or condition being monitored.

Methods used to monitor the nature of the injected fluids must comply with analytical methods cited and described in Table 1 of 40 CFR 136.3 or Appendix III of 40 CFR 261, or by other methods that have been approved in writing by the Director.

- (b) Injection pressure, annulus pressure, injection rate, and cumulative injected volumes shall be observed and recorded at the wellhead under normal operating conditions, and all parameters shall be observed simultaneously to provide a clear depiction of well operation.
- (c) Pressures are to be measured in pounds per square inch (psi).

- (d) Fluid volumes are to be measured in standard oilfield barrels (bbl).
- (e) Fluid rates are to be measured in barrels per day (bbl/day).

3. Records Retention.

- (a) Records of calibration and maintenance, and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit shall be retained for a period of AT LEAST THREE (3) YEARS from the date of the sample, measurement, report, or application. This period may be extended anytime prior to its expiration by request of the Director.
- (b) Records of the nature and composition of all injected fluids must be retained until three (3) years after the completion of any plugging and abandonment (P&A) procedures specified under 40 CFR 144.52(a)(6) or under Part 146 Subpart G, as appropriate. The Director may require the Permittee to deliver the records to the Director at the conclusion of the retention period. The Permittee shall continue to retain the records after the three (3) year retention period unless the Permittee delivers the records to the Director or obtains written approval from the Director to discard the records.
- (c) The Permittee shall retain records at the location designated in APPENDIX D.

4. Quarterly Reports.

Following authorization to begin injection, the Permittee shall submit Quarterly Reports to the Director summarizing the results of the monitoring required by Part II Section D and APPENDIX D (whether the well is operating or not). Reporting periods and due dates for Quarterly Reports are shown in APPENDIX D. EPA Form 7520-11 may be copied and shall be used to submit the Quarterly Reports, however, the monitoring requirements specified in this Permit are mandatory even if EPA Form 7520-11 indicates otherwise.

Section E. PLUGGING AND ABANDONMENT

1. Notification of Well Abandonment, Conversion or Closure.

The Permittee shall notify the Director in writing at least forty-five (45) days prior to: 1) plugging and abandoning an injection well, 2) converting to a non-injection well, and 3) in the case of an Area Permit, before closure of the project.

2. Well Plugging Requirements

Prior to abandonment, the injection well shall be plugged with cement in a manner which prevents the movement of fluids into or between underground sources of drinking water. Prior to placement of the cement plug(s) the well shall be in a state of static equilibrium with the mud weight equalized top to bottom, either by circulating the mud in the well at least once or by a comparable method prescribed by the Director. The well shall be plugged in accordance with the approved plugging and abandonment plan and with 40 CFR 146.10.

3. Approved Plugging and Abandonment Plan.

The approved plugging and abandonment plan is incorporated into this Permit as APPENDIX E. Changes to the approved plugging and abandonment plan must be approved by the Director prior to beginning plugging operations. The Director also may require revision of the approved plugging and abandonment plan at any time prior to plugging the well.

4. Forty Five (45) Day Notice of Plugging and Abandonment.

The Permittee shall notify the Director at least forty-five (45) days prior to plugging and abandoning a well and provide notice of any anticipated change to the approved plugging and abandonment plan.

5. *Plugging and Abandonment Report.*

Within sixty (60) days after plugging a well, the Permittee shall submit a report (EPA Form 7520-13) to the Director. The plugging report shall be certified as accurate by the person who performed the plugging operation. Such report shall consist of either:

- (a) A statement that the well was plugged in accordance with the approved plugging and abandonment plan; or
- (b) Where actual plugging differed from the approved plugging and abandonment plan, an updated version of the plan, on the form supplied by the Director, specifying the differences.

6. *Inactive Wells.*

After any period of two years during which there is no injection the Permittee shall plug and abandon the well in accordance with Part II Section E Paragraph 2 of this Permit unless the Permittee:

- (a) Provides written notice to the Director;
- (b) Describes the actions or procedures the Permittee will take to ensure that the well will not endanger USDWs during the period of inactivity. These actions and procedures shall include compliance with mechanical integrity demonstration, Financial Responsibility and all other permit requirements designed to protect USDWs; and
- (c) Receives written notice by the Director temporarily waiving plugging and abandonment requirements.

PART III. CONDITIONS APPLICABLE TO ALL PERMITS

Section A. EFFECT OF PERMIT

The Permittee is allowed to engage in underground injection in accordance with the conditions of this Permit. The Permittee shall not construct, operate, maintain, convert, plug, abandon, or conduct any other activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR 142 or may otherwise adversely affect the health of persons. Any underground injection activity not authorized by this Permit or by rule is prohibited. 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. Compliance with the terms of this Permit does not constitute a defense to any enforcement action brought under the provisions of Section 1431 of the Safe Drinking Water Act (SDWA) or any other law governing protection of public health or the environment, for any imminent and substantial endangerment to human health or the environment, nor does it serve as a shield to the Permittee's independent obligation to comply with all UIC regulations. Nothing in this Permit relieves the Permittee of any duties under applicable regulations.

Section B. CHANGES TO PERMIT CONDITIONS

1. Modification, Reissuance, or Termination.

The Director may, for cause or upon a 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. Also, this Permit is subject to minor modification for causes as specified in 40 CFR 144.41. The filing of a request for modification, revocation and reissuance, termination, or the notification of planned changes or anticipated noncompliance on the part of the Permittee does not stay the applicability or enforceability of any condition of this Permit.

2. Conversions.

The Director may, for cause or upon a written request from the Permittee, allow conversion of the well from a Class I injection well to a non-Class I well. Conversion may not proceed until the Permittee receives written approval from the Director. Conditions of such conversion may include but are not limited to, approval of the proposed well rework, follow up demonstration of mechanical integrity, well-specific monitoring and reporting following the conversion, and demonstration of practical use of the converted configuration.

3. Transfer of Permit.

Under 40 CFR 144.38, this Permit is transferable provided the current Permittee notifies the Director at least thirty (30) days in advance of the proposed transfer date (EPA Form 7520-7) and provides a written agreement between the existing and new Permittees containing a specific date for transfer of Permit responsibility, coverage and liability between them. The notice shall adequately demonstrate that the financial responsibility requirements of 40 CFR 144.52(a)(7) will be met by the new Permittee. The Director 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 Safe Drinking Water Act; in some cases, modification or revocation and reissuance is mandatory.

4. Permittee Change of Address.

Upon the Permittee's change of address, or whenever the Permittee changes the address where monitoring records are kept, the Permittee must provide written notice to the Director within 30 days.

5. Construction Changes, Workovers, Logging and Testing Data

The Permittee shall give advance notice to the Director, and shall obtain the Director's written approval prior to any physical alterations or additions to the permitted facility. Alterations or workovers shall meet all conditions as set forth in this permit. The Permittee shall record any changes to the well construction on a Well Rework Record (EPA Form 7520-12), and shall provide this and any other record of well workovers, logging, or test data

to EPA within sixty (60) days of completion of the activity.

Following the completion of any well workovers or alterations which affect the casing, tubing, or packer, a successful demonstration of mechanical integrity (Part II, Section B of this permit) shall be made, and written authorization from the Director received, prior to resuming injection activities.

Section 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.

Section D. CONFIDENTIALITY

In accordance with 40 CFR Part 2 and 40 CFR 144.5, 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 in 40 CFR Part 2 (Public Information).

Claims of confidentiality for the following information will be denied:

- The name and address of the Permittee, and
- information which deals with the existence, absence or level of contaminants in drinking water.

Section E. GENERAL PERMIT REQUIREMENTS

1. Duty to Comply.

The Permittee must comply with all conditions of this Permit. Any noncompliance constitutes a violation of the Safe Drinking Water Act (SDWA) and is grounds for enforcement action; for Permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application; except that the Permittee need not comply with the provisions of this Permit to the extent and for the duration such noncompliance is authorized in an emergency permit under 40 CFR 144.34. All violations of the SDWA may subject the Permittee to penalties and/or criminal prosecution as specified in Section 1423 of the SDWA.

2. Continuation of Expiring Permits.

- (a) Duty to Reapply. If the Permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the Permittee must submit a complete application for a new permit at least 180 days before this permit expires.
- (b) Permit Extensions. The conditions of an expired permit may continue in force 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 application which is a complete application for a new permit; and
 - (ii) The Director, 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.
- (c) Enforcement. When the Permittee is not in compliance with the conditions of the expiring or expired permit the Director may choose to do any or all of the following:
 - (i) Initiate enforcement action based upon the permit which has been continued;

- (ii) Issue a notice of intent to deny the new permit. If the permit is denied, the owner or Permittee would then be required to cease the activities authorized by the continued permit or be subject to enforcement action for operating without a permit;
 - (iii) Issue a new permit under part 124 with appropriate conditions; or
 - (iv) Take other actions authorized by these regulations.
- (d) State Continuation. An EPA issued permit does not continue in force beyond its expiration date under Federal law if at that time a State has primary enforcement authority. A State authorized to administer the UIC program may continue either EPA or State-issued permits until the effective date of the new permits, if State law allows. Otherwise, the facility or activity is operating without a permit from the time of expiration of the old permit to the effective date of the State-issued new permit.

3. Need to Halt or Reduce Activity Not a Defense.

It shall not be a defense for a 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 or 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 Permittee 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. Permit Actions.

This Permit may be modified, revoked and reissued or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

7. Property Rights.

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

8. Duty to Provide Information.

The Permittee shall furnish to the Director, within a time specified, any information which the Director 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 the Director, upon request, copies of records required to be kept by this Permit. The Permittee is required to submit any information required by this Permit or by the Director to the mailing address designated in writing by the Director.

9. Inspection and Entry.

The Permittee shall allow the Director, 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 must be kept under the conditions of this Permit;
- (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;

- (c) Inspect 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 purpose of assuring permit compliance or as otherwise authorized by the SDWA, any substances or parameters at any location.

10. Signatory Requirements.

All applications, reports or other information submitted to the Director shall be signed and certified according to 40 CFR 144.32. This section explains the requirements for persons duly authorized to sign documents, and provides wording for required certification.

11. Reporting Requirements.

- (a) Planned changes. The Permittee shall give notice to the Director as soon as possible of any planned changes, physical alterations or additions to the permitted facility, and prior to commencing such changes.
- (b) Anticipated noncompliance. The Permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- (c) Monitoring Reports. Monitoring results shall be reported at the intervals specified in this Permit.
- (d) 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 no later than 30 days following each schedule date.
- (e) Twenty-four hour reporting. The Permittee shall report to the Director any noncompliance which may endanger human health or the environment, including:
 - (i) Any monitoring or other information which indicates that any contaminant may cause endangerment to a USDW; or
 - (ii) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between USDWs.

Information shall be provided, either directly or by leaving a message, within twenty-four (24) hours from the time the Permittee becomes aware of the circumstances by telephoning (800) 227-8917 and requesting EPA Region VIII UIC Program Compliance and Technical Enforcement Director, or by contacting the EPA Region VIII Emergency Operations Center at (303) 293-1788.

In addition, a follow up written report shall be provided to the Director 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, and if the noncompliance has not been corrected the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

- (f) Oil Spill and Chemical Release Reporting: The Permittee shall comply with all reporting requirements related to the occurrence of oil spills and chemical releases by contacting the National Response Center (NRC) at (800) 424-8802, (202) 267-2675, or through the NRC website <http://www.nrc.uscg.mil/index.htm>.

- (g) Other Noncompliance. The Permittee shall report all instances of noncompliance not reported under paragraphs Part III, Section E Paragraph 11(b) or Section E, Paragraph 11(e) at the time the monitoring reports are submitted. The reports shall contain the information listed in Paragraph 11(e) of this Section.
- (h) Other information. Where the Permittee becomes aware that it failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Director, the Permittee shall promptly submit such facts or information to the Director.

Section F. FINANCIAL RESPONSIBILITY

1. Method of Providing Financial Responsibility.

The Permittee shall maintain continuous compliance with the requirement to maintain financial responsibility and resources to close, plug, and abandon the underground injection well(s). No substitution of a demonstration of financial responsibility shall become effective until the Permittee receives written notification from the Director that the alternative demonstration of financial responsibility is acceptable. The Director may, on a periodic basis, require the holder of a permit to revise the estimate of the resources needed to plug and abandon the well to reflect changes in such costs and may require the Permittee to provide a revised demonstration of financial responsibility.

2. Insolvency.

In the event of:

- (a) the bankruptcy of the trustee or issuing institution of the financial mechanism; or
- (b) suspension or revocation of the authority of the trustee institution to act as trustee; or
- (c) the institution issuing the financial mechanism losing its authority to issue such an instrument,

the Permittee must notify the Director in writing, within ten (10) business days, and the Permittee must establish other financial assurance or liability coverage acceptable to the Director within sixty (60) days after any event specified in (a), (b), or (c) above.

The Permittee must also notify the Director by certified mail of the commencement of voluntary or involuntary proceedings under Title 11 (Bankruptcy), U.S. Code naming the owner or Permittee as debtor, within ten (10) business days after the commencement of the proceeding. A guarantor, if named as debtor of a corporate guarantee, must make such a notification as required under the terms of the guarantee.

APPENDIX A WELL CONSTRUCTION DETAILS

Sterling Deep Disposal Wells No. 1 and No. 2 (depths approximate):

Hole, Casing, and Cement:

- 12-1/4" hole drilled to 1000 ft.
- 9-5/8" Surface Casing set to a depth of 1000 ft., cemented to surface
- 8-3/4" hole drilled to Precambrian (approx 6989 ft.).
- 7" Longstring Casing set to total depth (approx 6989 ft.), cemented to surface

Perforations:

- The proposed injection zones exist in the Lower Mesozoic and Paleozoic interval below the Skull Creek Shale.
- Injection zones and perforated intervals will only be permitted for a formation:
 - 1) existing below all known USDWs; and,
 - 2) separated from USDWs by a competent confining interval; and,
 - 3) isolated from USDWs by adequate casing and cement.
- Suitability for perforated injection intervals will be determined based on results of formation water sample analysis, well logging and testing results, and the adequacy of casing and cementing to prevent USDW contamination.

Tubing and Packer:

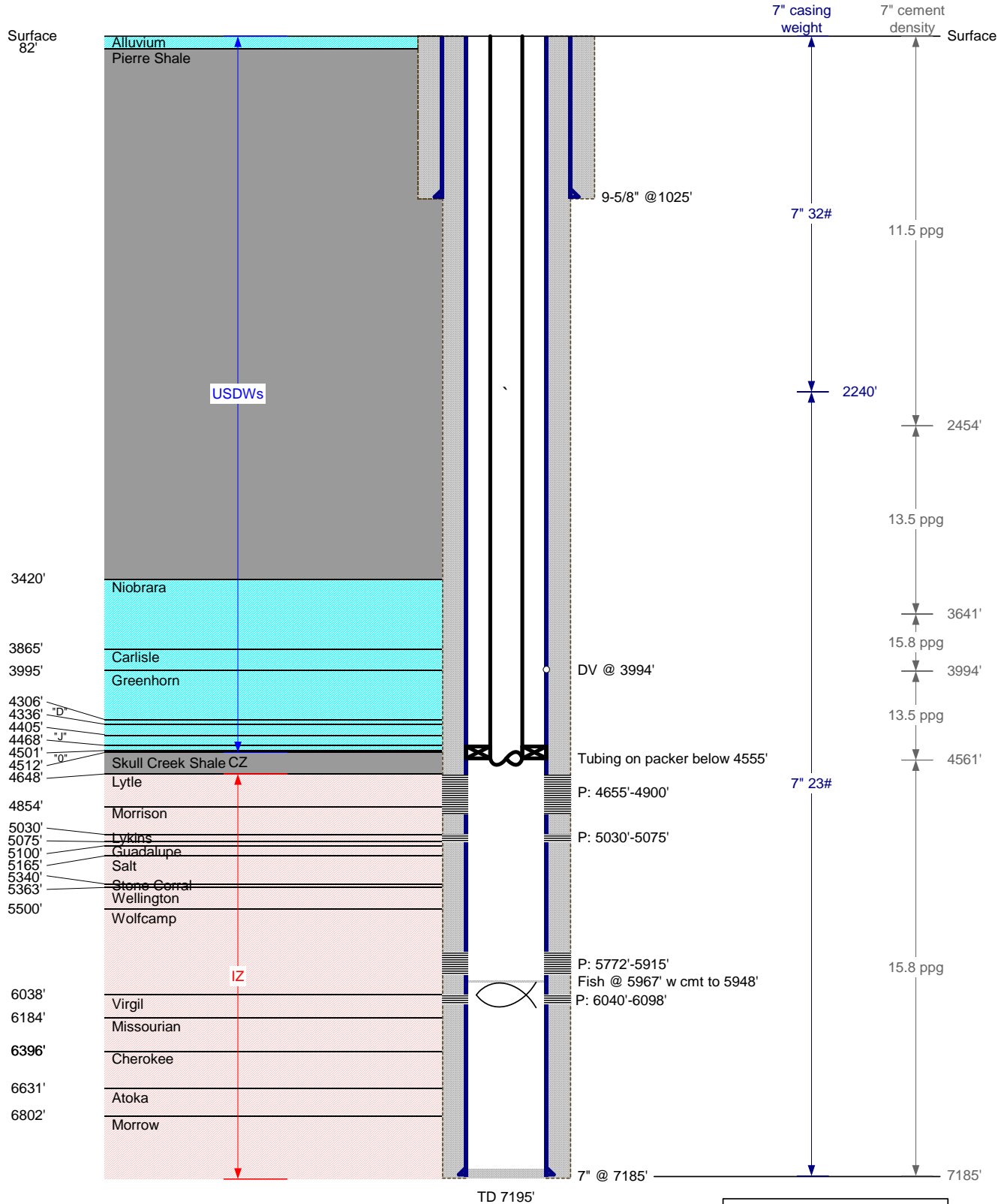
- Injection will take place through a tubing string set on packer which is set no more than 100 ft. above the top perforation.

Wellhead and Surface Equipment:

- Sampling taps located to enable sampling the fluid in the injection tubing and in the annulus
- Pressure gauges isolated by 1/2" FIP shut-off valve or quick-connect located to enable reading pressure on the injection tubing and on the annulus
- Continuous recording devices located to monitor and record injection pressure, annulus pressure, flow rate, and injected fluid volume.
- A crown valve on the wellhead that will allow a lubricator and well logging equipment to be rigged up and run into the well while the well remains on injection.
- An automatic shut-in device designed and set to shut in injection operations before operating pressures exceed the Maximum Allowable Operating Pressure (MAIP).

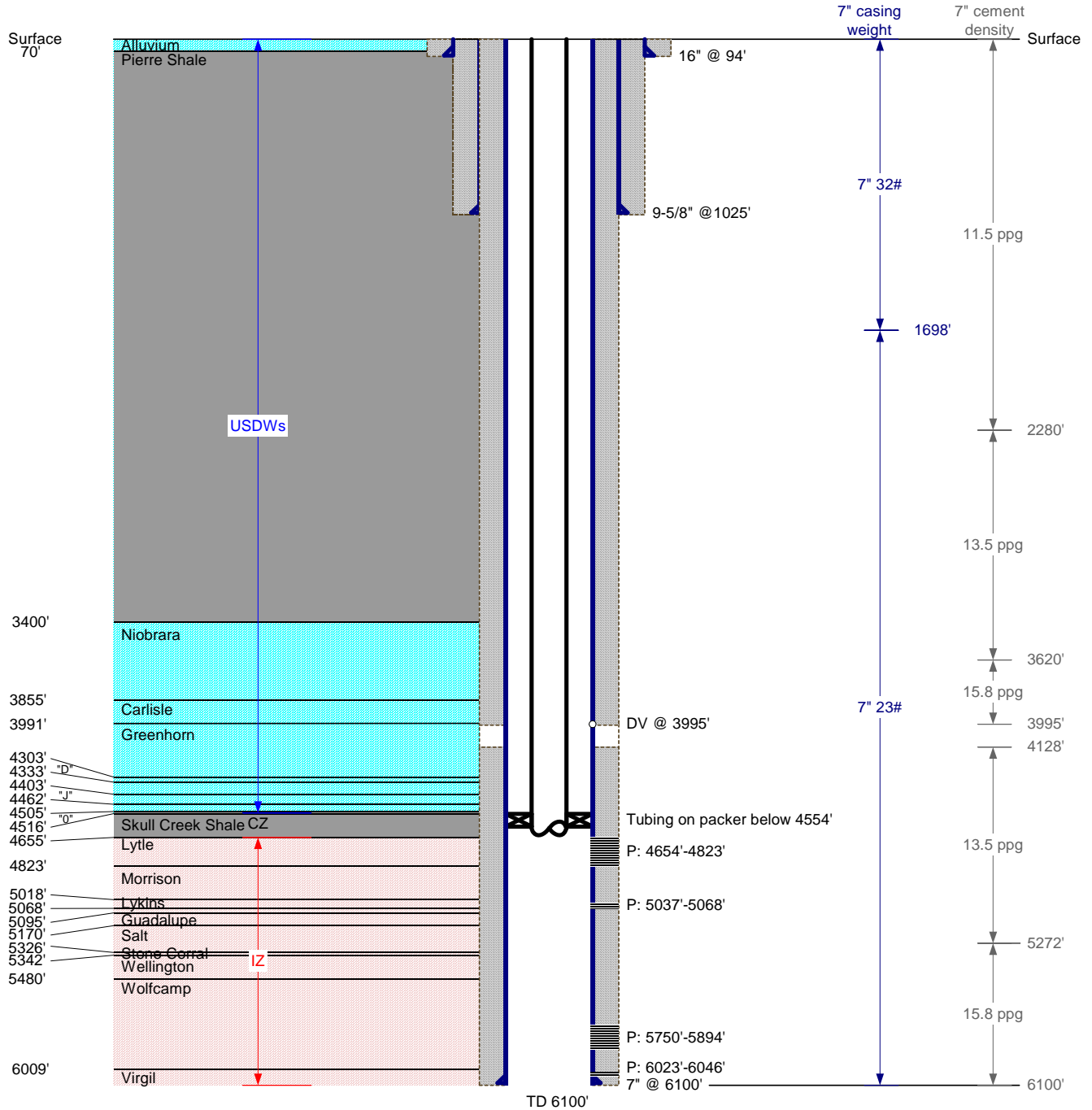
(see schematics on the following pages)

APPENDIX A WELL CONSTRUCTION DETAILS



Sterling Deep Disposal No. 1
CO12163-08742
As-Built

APPENDIX A WELL CONSTRUCTION DETAILS



Sterling Deep Disposal No. 2
CO12163-08743
As-Built

APPENDIX B LOGGING AND TESTING REQUIREMENTS

Logs and Tests

Logging operations will be conducted according to current UIC guidance. It is the responsibility of the Permittee to obtain and use guidance prior to conducting any well logging required as a condition of this permit.

Sterling Deep Disposal Wells No.1 and No.2:

Surface Casing Logging Program

TYPE OF LOG	PURPOSE	DUE DATE
Dual Induction	12-1/4" open-hole formation evaluation	Prior to setting 9-5/8" casing
Formation Density	12-1/4" open-hole formation evaluation	Prior to setting 9-5/8" casing
Compensated Neutron	12-1/4" open-hole formation evaluation	Prior to setting 9-5/8" casing
Microlog	12-1/4" open-hole formation evaluation	Prior to setting 9-5/8" casing
Spontaneous Potential	12-1/4" open-hole formation evaluation	Prior to setting 9-5/8" casing
Gamma Ray	12-1/4" open-hole formation evaluation	Prior to setting 9-5/8" casing
Caliper	12-1/4" open-hole cement estimate	Prior to setting 9-5/8" casing
CBL or CET	Cement quality behind the 9-5/8" casing	Prior to setting 7" casing

Longstring Casing Logging Program:

TYPE OF LOG	PURPOSE	DUE DATE
Dual Induction	8-3/4" open-hole formation evaluation	Prior to setting 7" casing
Formation Density	8-3/4" open-hole formation evaluation	Prior to setting 7" casing
Compensated Neutron	8-3/4" open-hole formation evaluation	Prior to setting 7" casing
Microlog	8-3/4" open-hole formation evaluation	Prior to setting 7" casing
Spontaneous Potential	8-3/4" open-hole formation evaluation	Prior to setting 7" casing
Gamma Ray	8-3/4" open-hole formation evaluation	Prior to setting 7" casing
Fracture Finder Log	8-3/4" open-hole formation evaluation	Prior to setting 7" casing
Caliper	8-3/4" open-hole cement estimate	Prior to setting 7" casing
CBL or CET	Cement quality behind the 7" casing	Prior to receiving authorization to inject
Temperature Survey	Baseline formation temperature	Prior to receiving authorization to inject
Temperature Survey	To assess Part II Mechanical Integrity.	Within 6-12 months after beginning injection operations, and at least once every five (5) years after the last successful demonstration of Part II MI
Radioactive Tracer Survey	To assess the ability of the cement to prevent movement of injected fluids out of the approved injection formations.	(only if the CBL or CET fails to show >80% bonding through confining zones) Prior to receiving authorization to inject, and at least once every five (5) years concurrent with the Temperature log as required above.

APPENDIX B LOGGING AND TESTING REQUIREMENTS

Well and Fluid Testing Program:

TYPE OF TEST	PURPOSE	DUE DATE
Injection Formation Pressure	To determine the fluid pressure within each injection formation	Prior to receiving authorization to inject
Injection Formation Water Sample Analysis	To determine TDS content, pH, Specific Gravity, and Specific Conductivity for water within each injection formation	Prior to receiving authorization to inject; performed according to the procedures listed below.*
Injected Fluid Water Sample Analysis	To determine the nature and specific gravity of the injected fluid.	Monthly, until consecutive analyses show that analytes have stabilized, quarterly, after that point, and whenever changes to the treatment system alter the waste stream.
Standard Annulus Pressure Test	To assess Part I Mechanical Integrity	Prior to receiving authorization to inject, following any workover which affects the tubing, packer or casing, and at least once every five (5) years after the last successful demonstration of Part I MI
Pressure Fall-off Test	To determine the pressure buildup in the injection formation	Within the first 6-12 months of operation, and at least once every year after injection operations begin.
Step Rate Injectivity Test	To determine the fracture pressure for each injection formation and to set MAIP.	Prior to receiving authorization to inject

* **INJECTION ZONE WATER SAMPLING PROCEDURE**

The goal of this procedure is to obtain an uncontaminated representative sample of the naturally occurring formation water within each proposed injection zone in order to determine it's status as a USDW.

Well Preparation and Sampling Procedure

1. The well should be perforated slightly underbalanced in order to prevent wellbore fluids from entering the formation and contaminating the naturally occurring formation water.
2. Sampling should take place prior to any formation stimulation or any other procedure where fluids may enter the formation and contaminate the naturally occurring formation water.
3. Intervals within the same geologic formation may be perforated and sampled together, as long as there is a reasonable expectation that water from those intervals is similar.
4. The sampling procedure should follow immediately after perforating an interval in order to prevent wellbore fluids from contaminating the naturally occurring injection formation water.
5. Sample and analyze the well completion fluid for reference purposes.
6. Swab or foam the well to get a representative fluid sample from the proposed injection interval.
7. Take fluid samples following each tubing volume recovered, measuring the time, volume of fluid recovered, pH, and conductivity.
8. When the pH and conductivity have stabilized during three successive tubing volumes, collect one representative sample for complete water analysis, measuring for TDS, pH, SG, and conductivity.

APPENDIX C OPERATING REQUIREMENTS

MAXIMUM ALLOWABLE INJECTION PRESSURE:

Except during stimulation, injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the injection zone. In no case shall injection pressure initiate fractures in the confining zone or cause the movement of injection or formation fluids into an underground source of drinking water.

Maximum Allowed Injection Pressure (MAIP) for both wells is initially set at 2,200 psi and is based on the results of step rate tests which were conducted on each well following completion.

INJECTION INTERVAL(S):

The proposed injection zones are the Lytle, Morrison, Lykins, Guadalupe, Salt, Stone Corral, Wellington, Wolfcamp, Virgil, Missourian, Cherokee, Atoka, and Morrow formations occurring beneath the Skull Creek Shale in the intervals below 4,648 ft. (approx.) below ground level. Specific injection zones were identified and approved only after the well was drilled and logged, after formation fluids were sampled and analyzed, and after rock characteristics were determined.

Injection zones and perforated intervals were authorized for formations:

- 1) existing below all known USDWs; and,
- 2) separated from USDWs by a competent confining interval; and,
- 3) isolated from USDWs by adequate casing and cement.

The approved perforated injection intervals are shown for each well in APPENDIX A. Suitability for the specific perforated injection intervals were determined based on results of formation water sample analysis, well logging and testing results, and the adequacy of casing and cementing to prevent USDW contamination.

Injection between the outermost casing protecting underground sources of drinking water and the wellbore is prohibited.

ANNULUS PRESSURE:

The annulus pressure shall be maintained at zero (0) psi as measured at the wellhead. If this pressure cannot be maintained, the Permittee shall follow the procedures listed under Part II, Section C.2 of this permit.

MAXIMUM INJECTION VOLUME:

There is no limitation on the number of barrels of fluid that shall be injected into this well, provided further that in no case shall injection pressure exceed that limit shown above.

APPENDIX D MONITORING AND REPORTING REQUIREMENTS

CONTINUOUSLY	
MONITOR, OBSERVE AND RECORD	Injection Pressure (psig)
	Annulus Pressure (psig)
	Injection Rate (bbl/day)
	Cumulative Injected Volume (bbl/day)
REPORT	Any seismic events within a 2 mile radius of the area permit boundary, gathered from USGS Earthquake Hazard Program website or through personal communication.

WEEKLY	
ANALYZE	Injection fluid Specific Gravity to maintain below 1.04

MONTHLY	
ANALYZE	Until results stabilize, injectate, according to the methods described in Table 1 of 40 CFR 136.3, Appendix II of 40 CFR 261, or those methods listed on the following page*
REPORT	Until results stabilize, results of injectate analysis.

QUARTERLY	
ANALYZE	Injection fluid total dissolved solids content (mg/l)
	Injection fluid Specific Conductivity
	Injection fluid pH
	Injectate, according to the methods described in Table 1 of 40 CFR 136.3, Appendix II of 40 CFR 261, or those methods listed on the following page*
REPORT	Monthly Average, Maximum, and Minimum values for Injection Pressure (psig)
	Monthly Average, Maximum, and Minimum values for Annulus Pressure (psig)
	Monthly Average, Maximum, and Minimum values for Daily Injection Rate (bbl/day)
	Monthly Average, Maximum, and Minimum values for Injected Fluid Specific Gravity
	Cumulative Volume Injected since the well began injection operations (bbls)
	Results of injectate fluid analysis.
	Summary of monthly reviews of seismic events within a fifty (50) mile radius of the area permit boundary.

	REPORTING PERIOD	REPORT DUE TO EPA
1 st Quarter	January 1 – March 31	May 15
2 nd Quarter	April 1 – June 30	August 15
3 rd Quarter	July 1 – September 30	November 15
4 th Quarter	October 1- December 31	February 15

Records of all monitoring activities must be retained and made available for inspection at the following location:

City of Sterling, CO
205 North Riverview Road
Sterling, CO 80751

APPENDIX D
MONITORING AND REPORTING REQUIREMENTS

INJECTATE ANALYSIS

Parameter Analyzed	EPA Analytical Method
Total Dissolved Solids (mg/l)	
Total Suspended Solids (mg/l)	
Specific Conductivity (umhos/cm)	
pH	
Specific Gravity	
Corrosivity Index (Langelier Saturation Index)	
Nitrate-Nitrite (both as N) mg/l	
Sulfate (mg/l)	
Chloride (mg/l)	
Magnesium (mg/l)	
Sodium (mg/l)	
Calcium (mg/l)	
Iron (mg/l)	
Gross Alpha (pCi/l)	E900.0
Gross Beta (pCi/l)	E900.0
Strontium (mg/l)	272.1, 272.2, 200.7
Uranium-234 (pCi/l)	E907.0
Uranium-238 (pCi/l)	E907.0
Thorium-230 (pCi/l)	E907.0
Radium-226 (pCi/l)	E903.0
Radium-228 (pCi/l)	E904.0
Potassium-40 (pCi/l)	E901.1
Lead-210 (pCi/l)	E905.0 Mod.

APPENDIX E
PLUGGING AND ABANDONMENT REQUIREMENTS

Sterling Deep Disposal Well No.1:

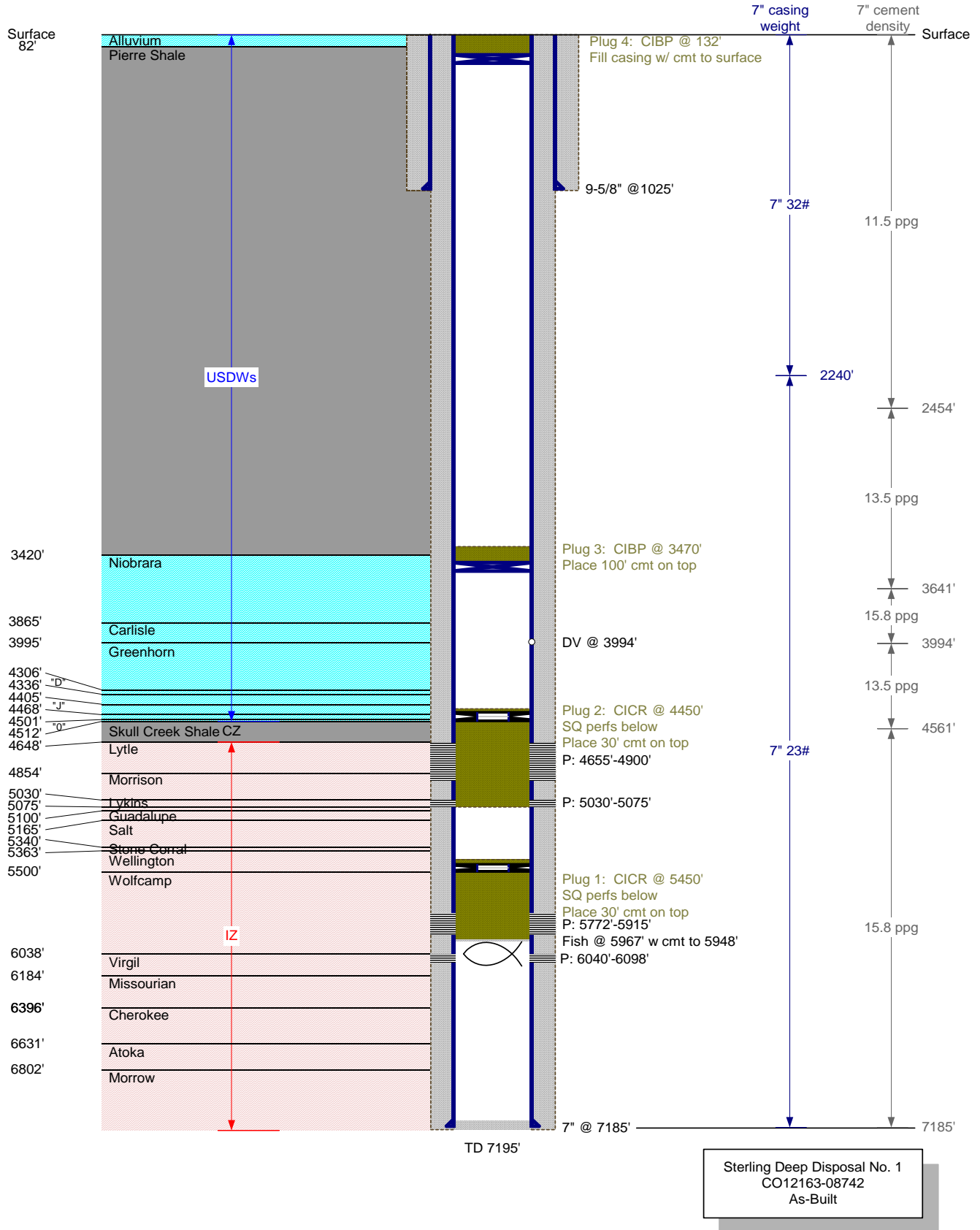
- Perform Internal Mechanical Integrity Test (Part I)
- Repair any Casing Leaks
- Circulate well with 9.6 ppg drilling mud or plugging gel
- Set CICR at 5450ft and squeeze perforations 5772 – 5915 ft leaving 30 ft of cement on top of the CICR.
- Set CICR at 4450 ft and squeeze perforations 5030 – 5075 ft and 4655 – 4900 ft leaving 30 ft of cement on top of the CICR.
- Set CIBP at 3470 ft and place 100 ft of cement on top of the CIBP.
- Set CIBP at 132 ft and fill the 7” casing with cement from the CIBP to surface.
- Cut and mark wellhead, and reclaim surface location as required by Colorado Oil and Gas Association rules.

Sterling Deep Disposal Well No. 2:

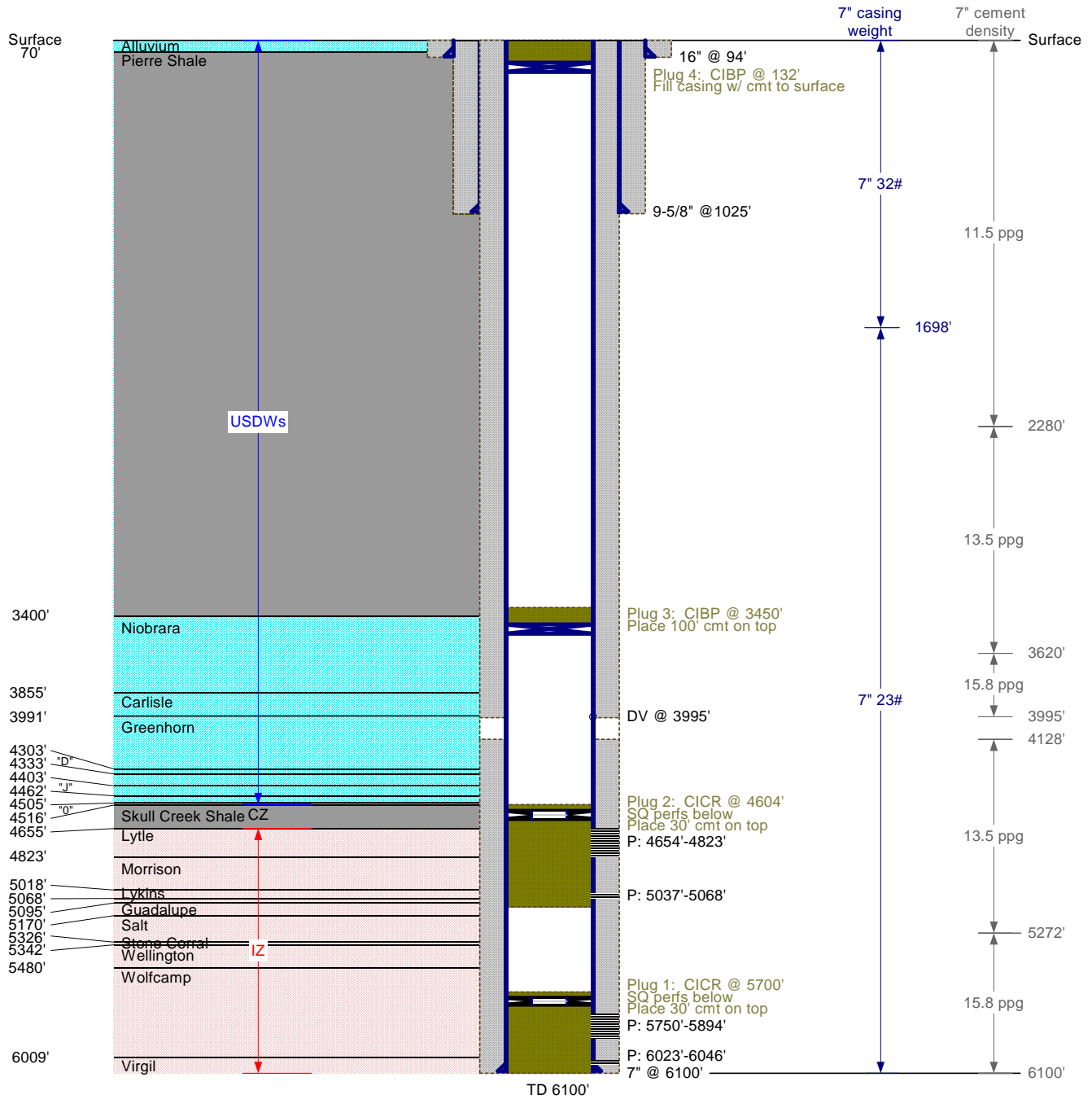
- Perform Internal Mechanical Integrity Test (Part I)
- Repair any Casing Leaks
- Circulate well with 9.6 ppg drilling mud or plugging gel
- Set CICR at 5700 ft and squeeze perforations 6023-6046 ft and 5750–5894 ft leaving 30 ft of cement on top of the CICR.
- Set CICR at 4604 ft and squeeze perforations 5037 – 5068 ft and 4654 – 4868 ft leaving 30 ft of cement on top of the CICR.
- Set CIBP at 3450 ft and place 100 ft of cement on top of the CIBP.
- Set CIBP at 132 ft and fill the 7” casing with cement from the CIBP to surface.
- Cut and mark wellhead, and reclaim surface location as required by Colorado Oil and Gas Association rules.

(see schematics on the following pages)

APPENDIX E PLUGGING AND ABANDONMENT REQUIREMENTS



APPENDIX E PLUGGING AND ABANDONMENT REQUIREMENTS



Sterling Deep Disposal No. 2
CO12163-08743
As-Built

APPENDIX F
CORRECTIVE ACTION REQUIREMENTS

CORRECTIVE ACTION:

There are no wells within the area of review which penetrate the confining zone. No corrective action requirements are needed for this permit.