



ISSUANCE DATE AND SIGNATURE PAGE

U.S. ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT: CLASS I
Permit Number AK-1I007-B

In compliance with provisions of the Safe Drinking Water Act (SDWA), as amended, (42 U.S.C. 300f-300j-9), and attendant regulations incorporated by the U.S. Environmental Protection Agency (EPA) under Title 40 of the Code of Federal Regulations, Cook Inlet Energy, LLC (CIE, permittee) is authorized to inject non-hazardous industrial waste utilizing up to two (2) Class I injection wells at the Redoubt Unit (RU) and West McArthur River Unit (WMRU) in Cook Inlet, Alaska. Injection shall not commence until the operator has received written authorization from the EPA Director, Region 10 Office of Compliance and Enforcement, to inject. Authorized injection must remain in accordance with Title 40 CFR § 144.33 and the conditions set forth herein. Injection of hazardous wastes as defined under the Resource Conservation and Recovery Act (RCRA), as amended, (42 USC 6901) or radioactive wastes are not authorized under this permit.

The submitted application requests authorization for two (2) wells Class I non-hazardous injection wells. Permit AK1I007-A, which expires on October 11, 2016, previously authorized the use of two wells drilled at this location for the use of Class I injection. One well is located on the offshore Osprey platform in the Redoubt unit (RU D1), and the second well is located onshore, six miles west, in the West McArthur River Unit (WMRU 4D). The top hole location of RU D1 is located at the latitude and longitude measurements of [60.695556, -151.670833]. The top hole location of WMRU 4D well is located at the latitude and longitude measurements [60.7853936, -151.7515525]. Both of these wells inject into intervals of the Upper Tyonek Formation at over 5,000 feet (') measured depth (MD) below ground surface. The precise geographical locations of these wells are subject to substitution, change and/or correction when more accurate values becomes available.

EPA granted a *No USDW* ruling on July 24, 2006 for the areas within ½ mile radius of the wells RU DI and WMRU 4D across the following correlative internals: For RU D1, an upper confining zone is comprised of interbedded siltstone, shales, and coal from 5,650' to 5,780' MD. The a volume made by a ½ mile radius following the wellbore at this location from depths of 5,650' MD to 8,047' MD was granted a *No USDW* determination by EPA. The bottom confining zone at RU D1 is made of tight shales and coal stringers from depths of 7,920' to 8,035' MD. For WMRU 4D, an upper confining zone is comprised of tight sandstone, shale and coals from 4,855' MD to 5,040' MD. The volume made by a ½ mile radius following the wellbore at this location from depths of 4,855' MD to 6,344' MD was granted a *No USDW* determination by EPA. The bottom confining zone at WMRU 4D is made of tight shales and coals from depths of 6,258' to 6,344' MD. EPA has determined that these portions of aquifers within the Upper Tyonek Formation contain total dissolved solids (TDS) in values greater than 10,000 milligrams per liter (mg/L). The proposed injection intervals for these two wells therefore do not qualify as underground sources of drinking water pursuant to 40 C.F.R. § 144.3.

The permit limits injection to those naturally saline intervals of the Upper Tyonek Formation across the West McArthur River Unit and Redoubt Unit. Injection of hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA), as amended, (42 USC 6901) or radioactive wastes (excluding naturally occurring radioactive material from pipe scale and radioactive tracer beads) are not authorized under this permit. All references to Title 40 of the Code of Federal Regulations are shall be effected to the date that this permit was issued. Figures and appendices are referenced to the permit

application for the West McArthur River Unit and Redoubt Unit application for UIC Permit AK-11007-B submitted by CIE in 2016. This permit shall become effective at midnight on October 11, 2016, at shall expire at midnight on October 11, 2026 in accordance with 40 C.F.R. § 124.15 unless terminated on a date prior.

Signed this _____ day of _____, 2016.

Edward J. Kowalski, Director
Office of Compliance and Enforcement
U.S. Environmental Protection Agency
Region 10 (OCE-101)
1200 Sixth Avenue Suite 900
Seattle, WA 98101

TABLE OF CONTENTS

ISSUANCE DATE AND SIGNATURE PAGE	1
PART I GENERAL PERMIT CONDITIONS	4
<u>EFFECT OF PERMIT</u>	4
<u>PERMIT ACTIONS</u>	4
<u>Modification, Reissuance, or Termination</u>	4
<u>Transfer of Permits</u>	4
<u>SEVERABILITY</u>	5
<u>CONFIDENTIALITY</u>	5
<u>GENERAL DUTIES AND REQUIREMENTS</u>	5
<u>Duty to Comply</u>	5
<u>Penalties for Violations of Permit Conditions</u>	5
<u>Duty to Reapply</u>	5
<u>Need to Halt or Reduce Activity Not a Defense</u>	6
<u>Duty to Mitigate</u>	6
<u>Proper Operation and Maintenance</u>	6
<u>Duty to Provide Information</u>	6
<u>Inspection and Entry</u>	6
<u>Records</u>	7
<u>Reporting Requirements</u>	8
<u>Anticipated Noncompliance</u>	8
<u>Twenty-Four Hour Reporting</u>	9
<u>Other Noncompliance</u>	9
<u>Reporting Corrections</u>	9
<u>Signatory Requirements</u>	9
<u>PLUGGING AND ABANDONMENT</u>	10
<u>Notice of Plugging and Abandonment</u>	10
<u>Plugging and Abandonment Report</u>	10
<u>Cessation Limitation</u>	10
<u>Cost Estimate for Plugging and Abandonment</u>	11
<u>FINANCIAL RESPONSIBILITY</u>	11
PART II WELL SPECIFIC CONDITIONS	12
<u>CONSTRUCTION</u>	12
<u>Casing and Cementing</u>	12
<u>Tubing and Packer Specifications</u>	13
<u>New Wells in the Area of Review</u>	13
<u>CORRECTIVE ACTION</u>	13
<u>WELL OPERATION</u>	14
<u>During Injection</u>	14
Mechanical Integrity	15
Injection Zone	17
<u>Waivers to UIC Program Requirements</u>	17
Annulus Pressure	18
Injection Fluid Limitation	19
<u>MONITORING</u>	19
Monitoring Requirements	19
Continuous Monitoring Devices	19
Monitoring Direct Waste Injection	19
Alarms and Operational Modifications	20
<u>REPORTING REQUIREMENTS</u>	20
Quarterly Reports	20
Report Certification	21

PART I

GENERAL PERMIT CONDITIONS

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 any contaminant into USDWs, except as authorized by 40 C.F.R. Part 146. The underground injection activity authorized by this permit shall not allow 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 C.F.R. Part 141, or may otherwise adversely affect the health of persons or the environment. Compliance with this permit during its term constitutes compliance for purposes of enforcement with Part C of the Safe Drinking Water Act (SDWA). Such compliance does not constitute a defense to any action brought under Section 1431 of the SDWA, or any other law governing protection of public health or the environment from imminent and substantial endangerment to human health or the environment.

This permit may be modified, revoked and reissued, or terminated during its term for cause. Issuance of this permit does not convey property rights or mineral 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. This permit does not authorize any above ground generating, handling, storage, or treatment facilities.

This permit is based on a permit application submitted by Cook Inlet Energy in 2016, as well as supplemental material related to a No Underground Sources of Drinking Water (*No USDW*) determination by EPA for Forest Oil Corporation¹ dated July 24, 2006.

B. PERMIT ACTIONS1. Modification, Reissuance, or Termination

This permit may be modified, revoked and reissued, or terminated for cause as specified in 40 C.F.R. §§ 144.39 and 144.40. In addition, the permit can undergo minor modifications for cause as specified in 40 C.F.R. § 144.41. The filing of a request for a permit modification, revocation and reissuance, or 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 permit condition.

2. Transfer of Permits

This permit is not transferable to any person except after notice to the Director on APPLICATION TO TRANSFER PERMIT (EPA Form 7520-7) and in accordance with 40 C.F.R. § 144.38. The Director may require modification or revocation and reissuance of the

¹ Permit AK-1I007A was transferred from Forest Oil Corporation to Pacific Energy Resources to correspond to a change in ownership and operator of these facilities on November 26, 2007. In February, 2010, EPA approved a request for permit transfer of AK1I007-A from Pacific Energy Resources to Cook Inlet Energy.

permit to change the name of the permittee and incorporate such other requirements as may be necessary under the SDWA. Upon request, electronic submittal may be approved by an EPA authorized representative.

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 C.F.R. Part 2, 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 in the manner prescribed in 40 C.F.R. § 2.203 and on the application form or instructions, or, in the case of other submissions, by stamping the words "confidential" or "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 information will be treated in accordance with the procedures in 40 C.F.R. Part 2 (Public Information).

Claims of confidentiality for the following information will be denied:

1. The name and address of the permittee.
2. Information that deals 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 conditions of this permit. 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; 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 C.F.R. § 144.34.

2. Penalties for Violations of Permit Conditions

Any person who violates a permit condition is subject to a civil penalty value calculated on a per day basis of such violation. Any person who willfully or negligently violates permit conditions is subject to a fine of not more than \$37,500 per day of violation and/or being imprisoned for not more than (3) years.

3. 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 apply for and obtain a new permit. To be timely, a complete application for a new permit must be received at least 180 days before this permit expires.

4. 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.

5. 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.

6. 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. De-characterized waste may be appropriately disposed in a Class I non-hazardous well [refer to 40 C.F.R. § 148.1 (d)].

7. Duty to Provide Information

The permittee shall provide to the Director, within a reasonable time, any information, including logging data that the Director may request to determine whether cause exists for modifying, revoking and reissuing, terminating this permit, or to determine compliance with this permit. The permittee shall also provide to the Director, upon request, copies of records, including logging data, required to be kept by this permit.

8. Inspection and Entry

The permittee shall allow the Director, or an authorized EPA 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 (including logging data) that are 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 purposes of assuring permit compliance or as otherwise authorized by SDWA, any contaminants or parameters at any location.

9. Records

- a. The permittee shall retain records and all monitoring information, including all calibration and maintenance records 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 this permit application for a period of at least three years from the date of the sample, measurement, report or application. These periods may be extended by request of the Director at any time. This permit does not require retention of hard copies or original records for the record keeping requirements of the permit are met by retaining the records in electronic or original hard copy format. The original records are not required to be retained when electronic versions are retained.
- b. The permittee shall retain records concerning the nature and composition of all injected fluids until three years after the completion of plugging and abandonment. At the conclusion of the retention period, if the Director so requests, the permittee shall deliver the records to the Director. The permittee shall continue to retain the records after the three-year retention period unless he delivers the records to the Director or obtains written approval from the Director to discard the records. This permit does not require retention of hard copies or original records for the record keeping requirements of the permit are met by retaining the records in electronic or original hard copy format. The original records are not required to be retained when electronic versions are retained.
- c. Records of monitoring information shall include:
 - (1) The date, exact place, and time of sampling or measurements;
 - (2) The name(s) of the individual(s) who performed the sampling or measurements;
 - (3) The date(s) analyses were performed;
 - (4) The name(s) of the individual(s) who performed the analyses;
 - (5) The analytical techniques or methods used; and
 - (6) The results of such analyses.
- d. Monitoring of the nature of injected fluids shall comply with applicable analytical methods cited and described in Table I of 40 C.F.R. § 136.3, in appendix III of 40 C.F.R. Part 261, or in certain circumstances by other methods that have been approved by the Administrator.
- e. All environmental measurements required by the permit, including, but not limited to measurements of pressure, temperature, mechanical integrity, and chemical analyses shall be done in accordance with EPA's Quality Assurance Program Plan.

f. As part of the COMPLETION REPORT, the permittee must submit a PLAN that describes the procedures to be carried out to obtain detailed chemical and physical analysis of representative samples of the waste including the quality assurance procedures used including the following:

- (1) The parameters for which the waste will be analyzed and the rationale for the selection of these parameters;
- (2) The test methods that will be used to test for these parameters; and
- (3) The sampling method that will be used to obtain a representative sample of the waste to be analyzed.

This permit covers two (2) proposed wells, including Class I well RU D1 and Class I well WMRU 4D. Substitute wells warrant review prior to approval for substitution. The waste analysis plan (WAP) from the permit application may be incorporated by reference to satisfy the WAP plan submittal requirements. An updated WAP may be incorporated by reference to replace the WAP from the permit application. Upon request of the EPA authorized representative, field copies of logging data shall be provided within 24 hours of the logging event. As part of the completion report, two copies of the final logging data shall be provided with the completion report.

g. The permittee shall require a written manifest for each batch load of waste received for waste streams that are not hard piped and continuous. The manifest shall contain a description of the nature and composition of all injected fluids, date of receipt, source of material received for disposal, name and address of the waste generator, a description of the monitoring performed and the results, a statement stating if the waste is exempt from regulation as hazardous waste as defined by 40 C.F.R. § 261.4, and any information on extraordinary occurrences.

For waste streams that are hard-piped continuously from the source to the wellhead, the permittee shall also provide for continuous, recorded measurement of the discharge rate and shall provide such sampling and testing as may be necessary to provide a description of the nature and composition of all injected fluids, and to support any statements that the waste is exempt from regulation as hazardous waste as defined by 40 C.F.R. § 261.4.

h. Dates of most recent calibration or maintenance of gauges and meters used for monitoring required by this permit shall be noted on the gauge or meter. Earlier records shall be available through a computerized maintenance history database.

10. Reporting Requirements

The permittee shall give notice to the Director, as soon as possible, of any planned physical alterations or additions to the permitted facility or changes in type of injected waste.

11. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any significant planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

12. Twenty-Four Hour Reporting

- a. The permittee shall report to the Director or an authorized EPA representative any noncompliance that may endanger human health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. If EPA or the permittee discovers that fluids have moved above the upper confining zone along a wellbore within the area of review (AOR), then injection shall cease until the fluid movement problem can be diagnosed and corrected. The following shall be included as information that must be reported orally within 24 hours:
 - (1) Any monitoring or other information that indicates that any contaminant may cause an endangerment to an underground source of drinking water.
 - (2) Any noncompliance with a permit condition or malfunction of the injection system.
- b. A written submission shall also be provided (in electronic format for release to the public and, upon request by an EPA authorized representative, directly to Tribal Government(s)) 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 date and times, and, 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.

13. Other Noncompliance

The permittee shall report all other instances of noncompliance not otherwise reported at the time monitoring reports are submitted. The reports shall contain the information listed in Permit Condition Part I E.12.b.

14. Reporting Corrections

When the permittee becomes aware that he/she 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.

15. Signatory Requirements

- a. All permit applications, reports required by this permit and other information requested by the Director shall be signed by a principal executive officer of at least the level of vice-president, or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - (1) The authorization is made in writing by a principal executive of at least the level of vice-president.
 - (2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility. A duly authorized representative may thus be either a named individual or any individual occupying a named position.

- (3) The written authorization record is retained on site, an electronic scan copy is submitted to the Director and upon request the original is submitted to the Director or an EPA authorized representative.
- b. If an authorization under paragraph 15.a. of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph 15.a. of this section must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an EPA authorized representative.
- c. Any person signing a document under paragraph 15.a. of this section shall make the following certification:

"I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

F. PLUGGING AND ABANDONMENT

1. Notice of Plugging and Abandonment

The permittee shall notify the Director no later than 45 days before conversion or abandonment of the well.

2. Plugging and Abandonment Report

The permittee shall plug and abandon the well as provided in the Plugging and Abandonment Plan (7520-6 Attachment Q) of UIC Class I Permit Application submitted by the permittee, which is hereby incorporated as a part of this permit. Within 60 days after plugging any well the permittee shall submit a report to the Director in accordance with 40 C.F.R. § 144.51(p). EPA reserves the right to change the manner in which the well will be plugged if the well is not proven to be consistent with EPA requirements for construction and mechanical integrity. The Director may ask the permittee to update the estimated plugging cost periodically.

3. Cessation Limitation

After a cessation of operations of two years, the permittee shall plug and abandon the well in accordance with the plan unless he/she:

- a. Provides notice to the Director; and
- b. Demonstrates that the well will be used in the future; or
- c. Describes actions or procedures, satisfactory to the Director that the permittee will take to ensure that the well will not endanger underground sources of drinking water during the period of temporary abandonment. These actions and procedures shall include compliance

with the technical requirements applicable to active injection wells unless waived by the Director.

4. Cost Estimate for Plugging and Abandonment

- a. The permittee is required in the permit application (see 7520-6 attachment R) to estimate the cost of plugging and abandonment of the permitted Class I UIC well(s) per well. Please refer to the permit application (7520-6 attachment R) for the plugging and abandonment cost estimates(s) per well for the year the application is submitted.
- b. The permittee must submit financial assurance and a revised estimate prior to April 30 of each year. The estimate shall be made in accord with 40 C.F.R. § 144.62. The Director or an EPA authorized representative may approve electronic submittal of this requirement provided the permittee retains the original and submits the original upon request.
- c. The permittee must keep at the facility or at the permittee central files in Alaska during the operating life of the facility the latest plugging and abandonment cost estimate.
- d. When the cost estimate changes, the documentation submitted under 40 C.F.R. § 144.63(f) shall be amended as well to ensure that appropriate financial assurance for plugging and abandonment is maintained continuously.
- e. The permittee must notify the Director by registered mail of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the owner or operator as debtor, within ten (10) business days after the commencement of the proceeding.

G. 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. If the financial test and corporate guarantee provided under 40 C.F.R. § 144.63(f) should change, the permittee shall immediately notify the Director. The permittee shall not substitute an alternative demonstration of financial responsibility for that which the Director has approved, unless it has previously submitted evidence of that alternative demonstration to the Director and the Director notifies him or her that the alternative demonstration of financial responsibility is acceptable.

Consistent with 40 C.F.R. §144.63 and regarding incapacity of owners or operators, guarantors, or financial institutions, the permittee must notify the Director by registered mail of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the owner or operator as debtor, within ten (10) business days after the commencement of the proceeding. Furthermore, an owner or operator must notify the Regional Administrator by certified mail of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the owner or operator as debtor, within ten (10) business days after the commencement of the proceeding. A guarantor of a corporate guarantee as specified in §144.63(f) must make such a notification if he is named as debtor, as required under the terms of the guarantee (§144.70(f)).

PART II

WELL SPECIFIC CONDITIONS

A. CONSTRUCTION1. Casing and Cementing

The permittee shall case and cement the well(s) to prevent the movement of fluids into or between underground sources of drinking water other than the authorized injection interval (see II.C.4, below). Casing and cement shall be installed in accordance with a casing and cement program approved by the Director and in accordance with EPA Class I well construction practices (40 C.F.R. § 146.12) and the State of Alaska/AOGCC Regulations (20 AAC § 25.412 and 20 AAC § 25.252). For any Class I wells to be drilled at this location (including replacement/sidetracks), in addition to the above requirements, the permittee shall provide not less than 30 days advance notice to the Director or EPA authorized representative to witness all cementing operations. The 30 days advance notice requirement to witness cementing operations may be revised (either increased or decreased in duration) by the Director or EPA authorized representative.) If primary cement returns to surface are not observed for the (20 inch or other) surface casing cementing procedure, the Director or EPA authorized representative is to be notified as to the nature of the augmented testing proposed to ensure the integrity of the cement bond and adequacy of any Top Job procedure. The Cement Bond/Ultrasonic Imaging (USIT or other) logs and pressure tests (leak off test and/or formation integrity test) will be run for both the (20 inch or other) surface and (9 5/8 inch or other) injection casings to confirm zonal isolation and verify casing integrity. Upon request of the Director or EPA authorized representative, the permittee shall provide all data requested, including but not limited to two (2) field copies of all logging data at the time (within 24 hours) of the well logging activities and two (2) final log copies with the final completion report.

Should a change(s) be required to the design casing and cementing program (due to unanticipated conditions), the Director or EPA authorized representative shall be notified as to the nature of the change(s), so that approval is obtained from the Director or EPA authorized representative enabling the well to be drilled and completed in a safe and successful manner.

The casing, cementing and well construction data will be in compliance with the procedures outlined in construction procedures and construction details (including but not limited to well schematics, 7520-6 Attachments L and M) of the permit application.

Two (2) proposed candidate Class I wells in the Redoubt and West McArthur River Units have previously been drilled. In 1998 (well WMRU 4D) and 2001 (well RU D1) these candidate wells were drilled, cased, cemented, and completed according to the State of Alaska regulations Title 20, AAC 25.412 and AAC 25.030 in effect at the time. EPA has reviewed the construction details and well history of each of the candidate wells and approved their use as Class I disposal wells.

2. Tubing, Packer and Completion Details of Existing Sidetrack and/or Replacement Wells

The well shall inject fluids through tubing with a packer. Tubing and packer shall be installed in accordance with the procedures in the permit application. In the event that a packer needs to be set or re-set at a revised depth at a later date, the permittee will perform a mechanical integrity test prior to resuming injection, submit the necessary data, and obtain authorization from EPA prior to resuming injection. The packer will be set no more than 100 feet measured Depth, MD) from the top of the injection zone unless a greater spacing from the packer to the top of the injection zone is specified and authorized by the Director or EPA authorized representative. Well WMRU 4D has the packer set at 5,587 feet MD which is 121 feet above the top of the perforated interval at 5,708 feet MD and approximately 400 feet MD below the upper confining zone. The well RU D1 packer is set at 7,320 feet MD which is 1,620 feet below the upper confining zone at 5,700 feet MD, but is 330 feet above the top of the lowest depth perforated interval at 7,650 feet MD. Setting the packer at this depth provides the opportunity to perforate an additional disposal interval from 7,350-7,600 feet MD at a future date. EPA authorizes the current packer setting depth at these wells because of the injection depth and standoff between the upper confining zone and the injection zone and approves the packer setting depths as they now exist. At the discretion of the Director, test procedures and subsequent frequency of tests may be revised.

3. New Wells in the Area of Review

EPA has set a quarter mile radius as the Area of Review (AOR) for this Class I UIC permit application. New Class I permitted UIC wells shall be installed in accordance with a casing and cement program approved by the Director and in accordance with EPA Class I well construction practices (40 C.F.R. § 146.12) and will also follow the State of Alaska/AOGCC Regulations (20 AAC 25.412 and 20 AAC 25.252). New wells within the AOR shall be constructed in accordance with the Alaska Oil and Gas Conservation Commission Regulations Title 20 Chapter 25. If any development or service wells are drilled in the future that penetrate the injection intervals within the area of review, these wells shall have casing cemented to the formation throughout the entire section from 200' TVD below to 200' TVD above the (proposed, revised or updated) injection zone as identified in the permit application.

B. CORRECTIVE ACTION

One previously drilled well resides within the area of review surrounding well WMRU 4D. The Pan American WF Unit #2 is located approximately 1600 feet north of this well. Pan American WF #2 was properly drilled, cemented, and then abandoned as documented in 7520-6 Attachment (B) of the permit application. Therefore no corrective actions are required on offset wells within the 1/4 mile area of review to prevent fluids from moving above the confining zone.

If the applicant later discovers that a well or wells within the AOR require(s) corrective action to prevent fluid movement, then the applicant shall inform the EPA upon such discovery and provide a corrective action plan for EPA review and approval. If the EPA or the permittee discovers that fluids have moved above the confining zone along a wellbore within the AOR, then injection shall cease until the fluid movement problem can be diagnosed and corrected.

C. WELL OPERATION

1. Prior to Commencing Injection

Unless the well has previously fulfilled requirements of Part II C.1., prior to commencing injection of new, existing sidetrack, and/or replacement wells, injection operations pursuant to this permit may not commence until the requirements found in Part II C.1.(a), (b), and (c) are satisfied.

Wells WMRU 4D and RU D1 have fulfilled the requirements of Part II C.1.

- a. Construction is complete and the permittee has submitted two copies of COMPLETION FORM (with logging data) FOR INJECTION WELLS (EPA Form 7520-9, see Attachments to be submitted with the completion report); and
 - (1) The Director or EPA authorized representative has inspected or otherwise reviewed the new, existing, sidetrack or replacement injection well(s) and finds it is in compliance with the conditions of the permit; or
 - (2) The permittee has not received notice from the Director or EPA authorized representative of intent to inspect or otherwise review the new, sidetrack or replacement injection well(s) within thirteen (13) days of EPA receiving the COMPLETION REPORT (with logging data) in which case prior inspection or review is waived and the permittee may commence injection.
- b. The permittee demonstrates that the well has mechanical integrity as described in Part II.C.3. Mechanical Integrity below, and the permittee has received notice from the Director or EPA authorized representative that such a demonstration is satisfactory. The permittee shall notify EPA at least two (2) weeks prior to conducting this initial test so that an EPA authorized representative may be present.
- c. The permittee has conducted a step-rate injection test (SRT) and submitted a preliminary report to EPA that summarizes the results. However, upon approval of the Director or EPA authorized representative, if an SRT was conducted on the subject well and the results were submitted to the EPA, then the permittee is not required to conduct another SRT prior to resumption of Class I injection activities or prior to permit renewal.

2. During Injection

The RU and WMRU Class I facilities shall be manned 24 hours per day by trained and qualified operators while injection is occurring. During injection, the well injection pressure, tubing-casing (inner) annulus pressure, injection rate, will be monitored on a continuous basis. Out-of-limit alarms and shut-off systems will be installed and the injection facility plant shall be monitored by trained and qualified operators during injection. Visual and automatic monitoring of the tubing-casing (inner annulus) and tubing pressures will occur routinely with pre-set, out-of-limit alarms to inform supervisory personnel.

The wellhead, controls, and monitoring instrumentation will be enclosed in an insulated structure.

3. Mechanical Integrity

a. Standards

The injection well(s) must have and maintain mechanical integrity pursuant to 40 C.F.R. § 146.8.

b. Prohibition without Demonstration of Mechanical Integrity

Injection operations are prohibited after the effective date of this permit unless the permittee has conducted the following tests and submitted the results to the Director:

- (1) In order to demonstrate there is no significant leak in the casing, tubing or packer, the tubing/casing annulus must be pressure tested, in conformation with State of Alaska regulation 200 AAC 25.412 which requires the casing to be tested to 0.25 psi/ft multiplied times the vertical depth of the packer, but not to exceed 70% of the minimum yield strength of the casing. Pressure tests shall show a stabilizing tendency. That is, the pressure may not decline more than 10 percent during the 30-minute test period and shall experience less than one-third of its total loss in the second (last) half of the 30-minute test period. If the total loss exceeds 10 percent or if the loss during the second 15 minute period is equal to or greater than one-half the loss during the first 15 minutes, the permittee may extend the test period for an additional 30 minutes to demonstrate stabilization. However, the MIT meets criteria at the completion of the first 30 minute test if the total pressure loss in the 30 minute period is 2% or less and the pressure loss in the first 15 minutes (first time period) is more than the pressure loss in the second 15 minutes (second time period). After the effective start date of this permit, this internal mechanical integrity test (standard annulus pressure test; SAPT) will be required annually if the well is active and once every two (2) years if the well is inactive. If approved by the Director or EPA authorized representative, the internal mechanical integrity test due dates may be extended up to three (3) months to accommodate constraints resulting from drilling, operational or other logistics related to operating in the remote environment. At the discretion of the Director, and depending on the results of the internal annulus mechanical integrity test data, the frequency for demonstrating internal mechanical integrity (no leaks in the tubing-casing annulus or in the tubing-packer assembly) may be revised (either increase or decrease in frequency) as specified and approved by the Director or EPA authorized representative. If a well has been on injection and has successfully demonstrated its mechanical integrity (both internal and external) on an annual basis (with the tests being witnessed by an EPA authorized representative), the well is approved to continue injection upon approval of a permit renewal.
- (2) To detect movement of fluids in vertical channels adjacent to the well bore and to determine that the confining zone is not fractured, an approved fluid movement test shall be conducted at an injection pressure at least equal to the average continuous injection pressure observed in the previous six months. Approved fluid movement tests include, but are not limited to tracer surveys, temperature survey logs (conducted after a 12 hour shut-in/ or at the discretion of the EPA authorized

representative), noise logs, oxygen activation/water flow logs (WFL), borax pulse neutron logs (PNL), or other equivalent logs. Fluid movement test procedures must be submitted 30 days in advance and are subject to prior approval by the Director or an EPA authorized representative. Upon request, two field copies shall be provided to the EPA authorized representative immediately upon completion of the logging activities, and final copies of all logs shall be submitted to EPA accompanied by a descriptive and interpretive report. Fluid movement/confinement logs will be run initially upon completion of a new, existing sidetrack and/or replacement well and prior to initiation of injection at start-up. After acquiring this baseline data, the fluid movement/confinement logs will be required every two years while the well is active until expiration of the ten (10) year permit period. If approved by the Director or EPA authorized representative, the external mechanical integrity test due dates may be extended up to three (3) months to accommodate constraints related to operating in the remote environment. At the discretion of the Director or an EPA authorized representative, and depending on the results of the baseline data, the frequency for demonstrating external mechanical integrity (no flow behind pipe and isolation above injection interval) and utilizing alternative diagnostic techniques, may be revised (either increase or decrease in frequency) as specified and approved by the Director or an EPA authorized representative.

- (3) Internal tubing inspection logs (pipe analysis logs, caliper logs, or other equivalent logs) shall be run once every two (2) years while the well is active and may be revised (either increase or decrease in frequency) at the Director or EPA authorized representative's discretion, to monitor well condition, thickness and integrity of the downhole tubing. Inspection log test procedures must be submitted 30 days in advance and are subject to prior approval by the Director or an EPA authorized representative. If approved by the Director or EPA authorized representative, the test due dates may be extended up to three (3) months to accommodate constraints related to operating in the remote environment. Unless waived by the EPA authorized representative, any exposed section of the injection casing will have to be logged during any scheduled workover for tubing change-out, etc. Copies of the logs shall be accompanied by a descriptive and interpretive report.

c. Terms and Reporting

- (1) Two (2) copies of the log(s) and two (2) copies of a descriptive and interpretive report of the mechanical integrity tests identified in 3.b (2) and 3.b (3) shall be submitted within 45 days of completion in electronic copy, unless waived by an EPA representative. Two (2) field copies of log(s) shall be submitted (upon request by an EPA authorized representative to the representative) immediately upon completion of the field logging event.
- (2) Mechanical integrity shall also be demonstrated by the pressure test in 3.b. (1) any time the tubing is removed from the well or if a loss of mechanical integrity becomes evident during operation. The permittee shall report the results of such tests within 45 days of completion of the tests.

- (3) After the initial mechanical integrity demonstration, the permittee shall notify the Director of intent to demonstrate mechanical integrity at least 30 days prior to subsequent demonstrations.
- (4) The Director will notify the permittee of the acceptability of the mechanical integrity demonstration within 13 days of receipt of the results of the mechanical integrity tests. Injection operations may continue during this 13-day review period. If the Director does not respond within 13 days, injection may continue.
- (5) In the event that the well fails to demonstrate mechanical integrity during a test or a loss of mechanical integrity occurs during operation, the permittee shall halt operation immediately and shall not resume operation until the Director or an EPA authorized representative gives approval to resume injection.
- (6) The Director may, by written notice, require the permittee to demonstrate mechanical integrity at any time.

4. Injection Zone

Injection shall be limited to the injection zone (IZ) intervals in the Upper Tyonek Formation, a zone consisting of non-marine clean sands grading to shaly sands and interspersed siltstones, shales, and coals. The injection zone for well WMRU 4D includes the current perforations set from 5,708' to 6,130' feet as shown on the well WMRU No. 4 (original borehole) log. This approved injection interval is bound above by an upper confining zone (UCZ), and below by a lower confining zone (LCZ). Both zones are considered impervious due to their composition made of shale and coals. The UCZ, preventing upward fluid movement, occurs from 4,855' to 4,935' MD and is approximately 80' in thickness. The upper confining zone is buffered by an arresting zone from 4,935' MD to 5,040' MD. The lower confining zone (LCZ) beneath the injection interval sits at a depth of 6,258' MD and continues to a measure depth of 6,344' MD. The stratigraphic character of these UCZ and LCZ correlate with other offset wells in the surrounding area, including the Pan Am West Foreland Unit No. 2 well. The RU unit well is authorized to inject into the interval between 5,780' and the LCZ. The UCZ is made of shales and coals between 5,650' MD and 5,780' MD. This interval contains interbedded tight sand, siltstone, shales, and coal stringers. The LCZ, situated approximately 250' below the bottom set or perforations (current sets of perforations from 7,650' MD to 8,450' MD), is formed by an approximately 42' thick section of tight shale as well as two coal stringers with an estimated thickness of 24'.

5. Waivers to UIC Program Requirements

As a result of the subsurface aquifer conditions (greater than 10,000 mg/L total dissolved solids) surrounding wells RU D1 and WMRU 4D wells, EPA determined that for portions of aquifers from 5,650' to 8,047' MD (RU D1) and from 4,855' to 6,344' MD (WMRU 4D) and within ¼ mile of the boreholes do not qualify as underground sources of drinking water (*No USDW*). EPA is granting the following waivers of UIC regulatory program requirements as listed below:

- i. Compatibility of Formation and Injectate [40 C.F.R. §§ 146.12 (e) (4), (5) and 146.14 (a) (8)]: Based upon the applicability of past injection studies, including a water compatibility study, plus successful injection practices into formations in the geographic

area vicinity, EPA is waiving the above two requirements for any additional sampling and characterization of formation fluids and injection rock matrix in order to determine whether or not they are compatible with the proposed injectate.

- ii. Injection Zone Fracturing, Ambient Monitoring and Pressure Buildup [40 C.F.R. § 146.13 (a)(1), (b)(1), (b)(4), and (d)]: Based on log surveillance results into formations in the Cook Inlet vicinity that consistently verify no significant upward movement of injected fluids, continuity of geologic formations and that transmission through faulting is not likely to transmit fluid above the confining zone, and there are no improperly sealed, completed, or abandoned wellbores in the area of review, EPA is waiving the above three requirements of an ambient monitoring of saline aquifers above the confining zone, monitoring the strata overlying the confining zone for fluid movement and a monitoring program including a pressure buildup of the injection zone annually. Also, based on the above, EPA is waiving the prohibition against fracturing the injection interval, so long as new fractures are not initiated nor existing ones propagated within the upper or lower confining zones. In no case shall injection pressure initiate fractures in the confining intervals described in Part II. C. 4. of this permit and described in attachment F of the permit application. Additionally, external mechanical integrity demonstrations are required to verify that all injected fluids are exiting in the approved injection interval and that there is no flow behind pipe due to channeling, etc. [See Part II C.3.b.(2)]

6. Injection Rate and Pressure

Injection pressures shall not initiate new fractures or propagate existing fractures in the upper confining zone as that stratigraphic interval is described in 7520-6 Attachment F in the permit application. Injection pressures will average between 2500-4000 psi. Never shall the maximum injection pressure, measured at the wellhead, exceed 4500 pounds per square inch (psig), except as follows.

In the event of a plant shut-down or outage, there may be instances where injection pressures exceed 4500 psi (unrelated to fluid injection activities). In any instance of an exceedance of the pressure limitation, the permittee shall notify the Director or an EPA authorized representative by telephone or electronic mail within twenty four (24) hours of the initial exceedance and shall submit a written incident report not later than ten (10) days thereafter. Upon request, electronic mail submittal of the incident report may be approved by an EPA authorized representative.

It should be noted that the wellhead working pressure limit of 5000 psig should not be exceeded at any time. Besides alarms and automatic shutdown controls, the wellhead assembly will include a surface safety valve to provide additional security.

7. Annulus Pressure

The annulus between the tubing and the long string casing shall be filled with a corrosion inhibited non-freezing solution. To accommodate swings in wellbore temperatures and tubing thermal expansion, a positive surface pressure up to 1500 psig is authorized for the inner annulus (tubing x long string injection casing).

Since the tubing-casing annulus pressure will vary due to temperature changes, the high-low annulus pressure limits can be adjusted if necessary and upon approval by the Director or an

EPA authorized representative (to include both the summer and winter ambient temperature variations).

Note: The authorization of up to 1500 psi on the inner annulus is to enable shut-down and alarm systems to be set at appropriate pressure limits, so as not to shut-down the facility from unintended causes not related to direct injection activities, and is not intended to allow the permittee to continue to maintain the well on injection, in the event of a loss of mechanical integrity or when there is pressure build-up either in the tubing by inner annulus or between the injection casing and surface casing (between the inner annulus by outer annulus), resulting in a potential sustained casing pressure scenario. In the event of a loss of mechanical integrity, then the permittee has to meet the requirements as outlined in Part II.C.3.c.5 of this permit.

8. Injection Fluid Limitation

This permit only authorizes the injection of those fluids identified in the permit documentation. De-characterized waste may be appropriately disposed in a Class I non-hazardous well (refer to 40 C.F.R. § 148.1(d)). Fluids generated from Class I injection well construction and well workover, and fluids generated from the operation and maintenance of Class I injection wells and associated injection well piping, may be disposed in a Class I non-hazardous injection well. No radioactive wastes other than naturally occurring radioactive material (NORM) from pipe scale and/or radioactive tracer beads shall be injected for disposal. In the event that third party wastes are accepted, the third party must certify the fluids are eligible for injection.

NOTE: Neither hazardous waste as defined in 40 CFR 261 nor radioactive wastes other than naturally occurring radioactive material (NORM) from pipe scale shall be injected for disposal.

D. MONITORING

1. Monitoring Requirements

Samples and measurements collected for the purpose of monitoring shall be representative of the monitored activity.

2. Continuous Monitoring Devices

Continuous monitoring devices shall be installed, maintained, and used to monitor injection pressure and rate, and annulus pressure between the tubing and the long string casing for hard piped waste disposal. Calculated flow rates are not acceptable except as a back-up system if the primary continuous injection rate device malfunctions. All new wells to be drilled and constructed will need to have continuous monitoring devices installed for monitoring the injection and annulus pressures. Visual and automatic monitoring of the tubing-casing (inner annulus) and tubing pressures will occur routinely with pre-set, out-of-limit alarms to inform supervisory personnel.

3. Monitoring Direct Waste Injection

In the event of a direct waste injection (not hard-piped), pumping operations at the well site shall be continuously manned and visually monitored. During these pumping operations, a chronological record of the time of day, a description of the waste pumped, injection rate and pressure, and well annulus pressure observations shall be maintained. The person in charge of the pumping operations must be identified on the pumping record. The waste disposed of in this manner should correspond to the active waste analysis plan on record.

4. Alarms and Operational Modifications

- a. The permittee shall install, continuously operate, and maintain alarms to detect excess injection pressures and significant changes in annular fluid pressure. These alarms must be of sufficient placement and urgency to alert operators in all operating spaces including but not limited to the control room. The permittee shall install and maintain an emergency shutdown system to respond to losses of internal mechanical integrity as evidenced by deviations in the annular fluid pressures.
- b. Plans and specifications for the alarms shall be submitted to the Director or EPA authorized representative prior to the initiation of injection.

E. REPORTING REQUIREMENTS

Permittee hereby consents to EPA posting reports, plans, and information related to this permit on an EPA website should EPA choose to do so (Confidential Business Information withholding).

1. Quarterly Reports

The permittee shall submit quarterly reports to the Director containing the following information:

- a. Monthly average, maximum, and minimum values for injection pressure, rate, and volume shall be reported on INJECTION WELL MONITORING REPORT (EPA Form 7520-8). Upon request of an EPA authorized representative, an electronic submittal is required.
- b. Graphical plots of continuous injection pressure and rate monitoring.
- c. Daily monitoring data in an electronic format.
- d. Physical, chemical, and other relevant characteristics of the injected fluid.
- e. Any well workover or other significant maintenance of downhole or injection-related surface components.
- f. Results of all mechanical integrity tests performed since the previous report including any maintenance-related tests and any trial tests.
- g. Any other tests required by the Director.

2. Report Certification

All reporting and notification required by this permit shall be signed and certified in accordance with Part I.E.15. This documentation shall be electronically stored and maintained at the permittee's facility, or company headquarters and submitted to an electronic (email) address provided by the Director or an EPA authorized representative. Upon request by the Director or an EPA authorized representative, submitted as a hard copy to the following address:

UIC Manager, Ground Water Unit (OCE-101)
U.S. Environmental Protection Agency Region 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101

APPENDIX A
REPORTING FORMS

Enclosed are EPA Forms:

7520-7	APPLICATION TO TRANSFER PERMIT
7520-8	INJECTION WELL MONITORING REPORT
7520-9	COMPLETION FORM FOR INJECTION WELLS