

FACT SHEET

Proposed Issuance of Underground Injection Control (UIC) Area Permit AK-11001-A
for the Construction and Operation of Class I Non-Hazardous Industrial Waste Injection Wells
at the Badami Oil and Gas Unit on the North Slope of Alaska

U.S. Environmental Protection Agency, Region 10
Ground Water Protection Unit, OW-137
1200 Sixth Avenue
Seattle, Washington 98101

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Introduction

BP Exploration (Alaska), Inc., known as BPX, submitted an Underground Injection Control (UIC) permit application for the construction and operation of one or two Class I non-hazardous industrial waste injection wells at the Badami Unit, on April 10, 1996. Additional information was submitted to EPA on June 10, 1996; November 21, 1996; December 3, 1996; February 5, 1997; May 12, 1997; and May 29, 1997. Also, BPX presented information to representatives from EPA Headquarters and Regions 3,4,5,6,8,9, and 10 at an all-day technical meeting held in Seattle on February 5, 1997.

EPA is now seeking comment on a draft Class I non-hazardous waste industrial injection well area permit for the disposal of waste fluids at the Badami Unit, which is located about 27 miles northeast of Prudhoe Bay on the North Slope of Alaska. The 10-year term permit would allow BPX, to inject non-hazardous waste fluids such as seawater, produced brine, domestic waste water, workover fluids, water-based drilling muds and drill cuttings through either one or two injection wells.

The proposed permit would allow BPX to inject all of the non-hazardous waste fluids generated at Badami. This plan to blend and inject all non-hazardous waste fluids is favored by EPA since it will allow zero discharge to the land surface and surface water bodies, and will reduce the need to transport waste from this isolated unit to off-site treatment or disposal.

Some solid waste materials (such as frac sand and drill cuttings) will be pulverized onsite and mixed with wastewater to be injected as a thin slurry. This will require injection pressures great enough to fracture the receiving formation. In order to minimize the vertical extent of fractures, EPA has developed permit conditions which limit both the daily, monthly and instantaneous injection rate. Further, the proposed EPA permit restricts injection to the deepest stratigraphic interval of the requested injection zone.

The proposed permit limits injection to the naturally saline Ugnu Formation at a depth of about 7000 feet below the land surface. EPA has determined that this interval and all of the other aquifers beneath the permafrost (which extends to about 2000 feet below the surface at Badami) are too naturally saline to be considered potential sources of drinking water.

Public Comment

Persons wishing to comment on the proposed permit may do so in writing by August 20, 1997. All comments should include the name, address, and telephone number of the person making commenting, a concise statement of the exact basis of any comment, and the relevant facts upon which it is based. All written comments and requests should be submitted to EPA at the above address to the attention of the Manager, Ground Water Protection Unit. After August 20, 1997, EPA may finalize the permit as drafted if no substantive comments are received during the public notice period.

Regulatory Framework

The Underground Injection Control (UIC) program is authorized by Part C of the Safe Drinking Water Act for the principal purpose of protecting Underground Sources of Drinking Water (USDWs) from contamination by injection through wells. The UIC regulations (see 40 CFR 144.3) broadly define USDWs as any aquifer capable of supplying a public water system with water of less than 10,000 milligrams per liter (mg/L) total dissolved solids (TDS).

Primary responsibility for regulation of injection wells through the UIC program is split in Alaska between EPA and the Alaska Oil and Gas Conservation Commission (AOGCC). The AOGCC regulates Class II injection wells, which are defined as those wells used to dispose of waste fluids brought to the surface from oil and gas production operations (see 40 CFR 144.6). EPA directly regulates the other four classes of injection wells. BPX estimates that 76 percent of the waste stream at Badami will be eligible for injection into a Class II disposal well, and the remainder will be domestic wastewater or other fluids eligible for disposal into a Class I non-hazardous industrial waste injection well. Therefore, by obtaining a Class I non-hazardous waste injection well permit from EPA, BPX can dispose of the entire non-hazardous waste stream at Badami into the same one or two disposal wells.

Generally speaking, underground injection requires the protection of USDWs within the geologic column. However, there are no USDWs to be found within the entire stratigraphic section on the portion of the North Slope of Alaska where Badami is located. Under these circumstances, the Director may authorize injection with less stringent requirements than would otherwise be required (see 40 CFR 144.16). EPA intends to grant several waivers requested by BPX which are described under the Geologic Setting and Injection Issues portion of this Fact Sheet.

General Project Overview

The Badami Unit is located about 27 miles northeast of the main infrastructure at Prudhoe Bay, and the isolated oil development will not be served by an all-weather road. BPX has requested the option to drill two Class I non-hazardous industrial waste injection wells from the main facilities pad. The permit application notes that although a second well will probably not be needed, the option will provide operational flexibility and redundancy in the event of a mechanical failure.

Based upon past experience on the North Slope, BPX estimates that the typical injection stream at Badami will consist of the following:

	<u>Approximate Percentage</u>
• Seawater, produced brine, fresh water gel	49%
• Camp sewage and other domestic wastewater:	23
• Workover fluids, crude oil, spent acid, vessel sludge/sand methanol, frac sand, cement, snow melt, and misc.	15
• Water-based drilling mud:	11
• Water-based drill cuttings:	2

Most of the waste stream will already be in liquid form. That portion of the anticipated waste stream which is solid will be pulverized in an onsite ball mill and mixed with liquid waste to form a thin slurry. In order to prevent formation plugging, injection pressures will need to be high enough to propagate fractures within the injection zone. The amount of slurried material needing to be injected is expected to decline over time because drill cuttings, drilling mud, and frac sand are mostly generated during the early drilling and completion phase of production.

Average monthly injection is expected to be about 32,000 Barrels (1,344,000 gallons) when the drilling rigs are operating, and about 18,000 Barrels (756,000 gallons) after the drilling rigs have shut down. A maximum monthly volume of 65,000 Barrels (2,730,000 gallons) has been requested by BPX in order to allow for disposing of backlogs which might develop because of plant upsets, scheduled yearly shutdowns, well treatments, workovers, etc. The injection well(s) is expected to dispose of 4,300,000 Barrels (180,600,000 gallons) of fluid waste over the anticipated 20-year life of the project.

BPX has not applied for a hazardous waste injection well permit. Therefore, any listed hazardous wastes will need to be collected, stored, and transported to RCRA-approved hazardous waste treatment or disposal facility. Those wastes which are hazardous only because of a characteristic (such as ignitability, corrosivity, toxicity, etc.) may be treated to remove that characteristic and

then injected as a Class I non-hazardous waste fluid. The only radioactive substance which may be injected under the proposed permit is naturally occurring radioactive material (NORM) from sludge or pipe scale (a mineral precipitate formed during production), which can be injected into either Class II or Class I non-hazardous waste injection wells.

Geologic Setting and Injection Issues

The geologic setting at the Badami Unit is very favorable for waste disposal via injection wells. The stratigraphic sequence and lithology are highly correlative with the formations found at Prudhoe Bay, where hundreds of Class II injection wells have operated successfully for almost two decades. These formations dip to the northeast at 1 to 2 degrees, and there are no faults within the injection, arresting, or confining zones.

EPA has determined that all of the aquifers beneath the permafrost at Badami are too naturally saline to qualify as USDWs. Even the least saline aquifers are conservatively estimated to have TDS concentrations over 15,000 mg/L. Since the proposed well(s) will not inject below a USDW, EPA may allow less stringent requirements for area of review, construction, mechanical integrity, operation, monitoring, and reporting than would otherwise be required by the UIC regulations (see 40 CFR 144.16). At Badami, EPA intends to only relax some of the operating and monitoring requirements, as described below.

Compatibility of Formation and Injectant: Based upon the applicability of past injectability studies and injection practices at Prudhoe Bay, EPA intends to waive the requirements of 40 CFR 146.12(e) and 146.14(a) which require sampling and characterization of formation fluids and matrix in order to determine whether or not they are compatible with the proposed injectant.

Injection Zone Fracturing: Class I injection wells are prohibited from injecting at pressures which would initiate new fractures or propagate existing fractures within the injection zone. The draft permit instead allows hydraulic fracturing within the injection zone so long as new fractures are not initiated nor existing ones propagated within the upper confining zone. The draft permit contains several provisions in an effort to assure that this permit condition will be met. The instantaneous injection rate is limited to 5 barrels (210 gallons) per minute. Daily volume is limited to 3000 barrels (12,600 gallons), and monthly volume to 65,000 barrels (2,730,000 gallons). Injection will be limited to the Ugnu Formation at about 7000 feet in depth. The Ugnu Formation is overlain by an almost 2000 foot thick impermeable interval composed mostly of shale and siltstone that is itself about 1000 feet beneath the upper confining zone. The top of the upper confining zone (which is an approximately 500 foot thick impermeable shale sequence) is about 4000 feet below the land surface.

Ambient Monitoring Above the Confining Zone: EPA intends to waive the requirement to monitor the strata overlying the confining zone for fluid movement (see 40 CFR 146.134). The principal purpose of this requirement is to protect overlying USDWs. However, these are not present at Badami.

Summary of Proposed Action and Permit Conditions

EPA has primary enforcement authority in Alaska for the Class I portion of the UIC program (authorized by Part C of the Safe Drinking Water Act). Class I wells are used to inject waste fluids for safe disposal beneath any existing USDWs. EPA proposes to grant a permit to BPX for up to two Class I non-hazardous waste injection wells at the Badami Unit, located about 27 miles northeast of Prudhoe Bay, on the North Slope of Alaska. EPA considered all of the available disposal options, and concludes the underground injection is the most appropriate disposal method for the non-hazardous liquid and solid wastes to be generated at the Badami Unit during its anticipated 20-year lifetime.

EPA has determined that there are no USDWs beneath or within 2.5 miles of the Badami site. Considering the absence of USDWs, EPA proposes to grant BPX a waiver of the UIC program regulation which prohibits hydraulic fracturing of the injection zone during operation (40 CFR 146.13). This waiver is necessary to enable the injection of a slurry composed of non-hazardous waste liquid and pulverized non-hazardous solid wastes (drill cuttings, frac sand, etc.) characteristic of oil drilling and production operations, and is authorized by the UIC program regulations under 40 CFR 144.16a. EPA's primary permit consideration is to ensure that the injected wastes remain safely isolated beneath an impermeable shale sequence called the upper confining zone, which is located about 4000 feet below the land surface.

The draft permit contains general legal provisions common to EPA permits, specific technical requirements which apply to all Class I injection wells, and particular technical requirements for the proposed injection operations at Badami. The project specific permit conditions include limitations on injection rate, pressure, and volume, and restrictions on the vertical extent of the injection zone.

EPA contacts for further information are Jonathan Williams at (206) 553-1369 or Grover Partee at (206) 553-6697.