Underground Injection Control-Revisions of Underground Injection Control Requirements for Class I Municipal Wells in Florida; Notice of Availability

EPA 816-Z-03-001

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 146

[FRL–7488–8]

Underground Injection Control Program—Relative Risk Assessment of Management Options for Treated Wastewater in South Florida; Notice of Availability

AGENCY: Environmental Protection Agency.

ACTION: Notice of availability.

SUMMARY: On July 7, 2000, the Environmental Protection Agency (EPA)

proposed revisions to the Underground Injection Control (UIC) regulations that would allow for continued wastewater injection by existing Class I municipal wells that have caused or may cause the movement of fluid into or between underground sources of drinking water (USDWs) in specific areas of South Florida. These revisions would provide owners and operators of such wells with an alternative for compliance with the existing UIC regulations, which prohibit such fluid movement, by allowing them to continue using their wells provided the injection does not endanger USDWs. Also in 2000, in a separate but related initiative, Congress directed EPA to conduct a relative risk assessment of four management options for treated municipal wastewater in South Florida: deep (Class I municipal) well injection, ocean disposal, surface discharge, and aquifer recharge. This document announces the availability of the relative risk assessment report required by Congress. EPA will consider the information collected on deep (Class I municipal) well injection contained in this relative risk assessment in making a final determination on the July 7, 2000, proposed rule. In a separate document in today's **Federal Register**, EPA is soliciting public comment on how this information in the relative risk assessment should inform the final rule on deep municipal wastewater injection in South Florida.

DATES: Comments on this notice of the data availability must be in writing and either postmarked or received by the docket by July 7, 2003.

ADDRESSES: Send written comments to: Nancy H. Marsh, U.S. Environmental Protection Agency, Region 4, 61 Forsyth Street, SW., Atlanta, GA 30303–8960. Comments must be submitted electronically to *marsh.nancy@epa.gov.* For additional information see Additional Docket Information in the **SUPPLEMENTARY INFORMATION** section of this **Federal Register** document.

FOR FURTHER INFORMATION CONTACT: For inquiries, and/or to access the risk assessment report, contact Nancy H. Marsh, Ground Water & UIC Section, EPA Region 4, 61 Forsyth Street, SW, Atlanta, GA 30303 (phone: 404–562–9450; E-mail: *marsh.nancy@epa.gov)* or Howard Beard, Office of Ground Water and Drinking Water, U.S. Environmental Protection Agency, EPA East, 1200 Pennsylvania Ave., NW., Mail Code 4606M, Washington, DC 20460 (phone: 202–564–3874; E-mail: *beard.howard@epa.gov*) or contact the Safe Drinking Water Hotline, phone 800–426–4791. The Safe Drinking Water Hotline is open Monday through Friday, excluding Federal holidays, from 9 a.m. to 5:30 p.m. Eastern daylight-saving time.

SUPPLEMENTARY INFORMATION:

Table of Contents

I. General Information

Who Are Regulated/Affected Entities?

This notice is limited in application to the owners and/or operators of existing deep (Class I) underground injection wells that inject domestic wastewater effluent in specific counties in Florida. The counties are: Brevard, Broward, Charlotte, Collier, Dade, Flagler, Glades, Hendry, Highlands, Hillsborough, Indian River, Lee, Manatee, Martin, Monroe, Okeechobee, Orange, Osceola, Palm Beach, Pinellas, St. Johns, St. Lucie, Sarasota, and Volusia. Regulated categories and entities include:

Category	Examples of entities
Municipalities and Local Government	Class I municipal injection wells disposing of domestic wastewater effluent in certain parts of Florida.
Private	Class I municipal injection wells disposing of domestic wastewater effluent in certain parts of Florida.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be interested in this notice. This table lists the types of entities that EPA is now aware of that could potentially be affected by decisions related to this notice. Other types of entities could potentially be affected by such decisions. To determine whether your injection well might be affected, you should carefully examine the applicability criteria in 40 CFR 146.15 of the July 7, 2000, proposed revisions to the Class I UIC regulations (65 FR 42234). If you have questions regarding the applicability of this action to a particular entity, consult one of the persons listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

II. Background

A. Definition of Class I Municipal Wells

Class I injection wells are wells that inject fluids beneath the lowermost formation containing, within one-quarter mile of a well bore, a USDW (40 CFR 144.6(a)). Class I wells can be used to inject hazardous, industrial, or municipal wastes. Class I municipal wells inject treated wastewater from publicly or privately owned and operated facilities that treat domestic wastewater, which is principally derived from dwellings, business buildings, and institutions. Domestic wastewater is commonly referred to as sanitary wastewater or sewage. Treated wastewater from industrial facilities, often controlled through pretreatment standards, may also be found in this wastewater. Currently, Class I municipal wells are located only in the State of Florida.

B. Proposed Rule for Class I Municipal Wells in Florida

EPA has established minimum requirements for Class I municipal wells and other underground injection activities through a series of UIC regulations at 40 CFR parts 144 through 147, developed under the authority of the Safe Drinking Water Act. These regulations ensure that Class I municipal wells will not endanger USDWs by prohibiting the movement of any contaminant into USDWs.

On July 7, 2000, EPA proposed revisions to the UIC regulations that would allow continued wastewater injection by existing Class I municipal

wells that have caused or may cause movement of contaminants into USDWs in specific areas of Florida (65 FR 42234). Continued injection would be allowed only if owners or operators meet certain requirements that provide adequate protection for USDWs. In the alternative, if new requirements are not promulgated, owners and/or operators of wells targeted by the proposal would be required to close their wells and adopt different wastewater disposal practices, which could consist of surface water disposal, ocean outfall, and/or reuse. Use of these alternative disposal practices would likely require the construction of systems for advanced wastewater treatment, nutrient removal, and high-level disinfection.

The preamble to the proposed rule describes in detail the history of domestic wastewater injection in Florida, the features of Florida geology that have allowed some of that injected wastewater to enter USDWs, and the two major (as well as subsidiary) regulatory options EPA proposed to address this issue in a manner that would permit continued injection that would not endanger USDWs. EPA received approximately 1,200 comments on the proposal (the comment period closed on October 22, 2000). The Agency will address these comments, along with comments received in response to the related notice published separately in today's **Federal Register**, as part of the final determination on this rulemaking.

C. Relative Risk Assessment of Management Options for Treated Municipal Wastewater in South Florida

As part of EPA's Fiscal Year 2000 Appropriations bill, Congress included the following provision: "Within available funds, the conferees direct EPA to conduct a relative risk assessment of deep well injection, ocean disposal, surface discharge, and aquifer recharge of treated effluent in South Florida, in close cooperation with the Florida Department of Environmental Protection [DEP] and South Florida municipal water utilities." Because this directive came at a time when EPA's work on the July 7, 2000, proposal was substantially complete, the Agency decided to proceed with the proposal and the relative risk assessment along separate but converging paths. First, EPA published and sought comment on the proposal based on information available at that time. Second, EPA initiated and conducted the relative risk assessment with the intent of using relevant findings to inform the final rulemaking.

EPA started the relative risk assessment by working with stakeholders to develop an appropriate methodology. The Agency first outlined a proposed methodology following standard risk assessment principles and guidance, such as the "Guide for Developing Conceptual Models for Ecological Risk Assessments."[1] EPA then held a stakeholders meeting on March 20, 2001, in Tallahassee, Florida to discuss the proposed methodology. The meeting was attended by 17 stakeholders representing municipal water utilities, regulators, and community and environmental groups. Participants offered comments on the proposed methodology, which EPA revised accordingly.

The methodology involved a process for investigating the four very different wastewater disposal options: deep well injection, aquifer recharge, discharge to ocean outfalls, and discharge to other (non-ocean) surface water bodies. Each option has its own specific stressors (hazards), exposure pathways, receptors, and effects. Parameters that are relevant to one particular disposal option are not necessarily relevant to the remaining three. Therefore, a strictly quantitative comparison between the four options was not possible.

Instead, EPA conducted what is termed a relative risk assessment to assess the risks and allow comparisons. Individual risk assessments were completed for each wastewater disposal option and the risks associated with each were characterized. The risks and risk factors identified for each wastewater management option were then evaluated and described. The overall comparisons and conclusions were then presented as relative risk assessment matrices.

The steps involved in the relative risk assessment included developing a Generic Risk Analysis Framework followed by conducting analyses of option-specific conceptual models. Data from many sources were used to support the analyses. These sources include the Florida Department of Environmental Protection, utilities (and the South Florida Water Environment Utility Council), and municipalities in South Florida. EPA also worked with a panel of experts both inside and outside of EPA and representing a variety of fields to review and incorporate data and information acquired through comprehensive searches of the relevant scientific research literature. Risk characterization for each option included identifying and describing the associated risks, their potential magnitude, and the potential effects on human and ecological health. The relative risk assessment then described and compared risks for all four wastewater management options. Finally, the relative risk assessment was peer reviewed in accordance with the Agency's Peer Review Handbook.

Section III summarizes the major findings of the relative risk assessment, which has been finalized. In a separate notice of data availability published elsewhere in today's **Federal Register**, EPA requests comment on how the relative risk assessment should inform the final rulemaking on deep municipal injection wells in Florida.

III. Findings of the Relative Risk Assessment

The relative risk assessment offers comparisons of deep well injection, ocean disposal, surface discharge, and aquifer recharge of treated municipal wastewater in South Florida by considering several factors important for determining risk. This section highlights how the report addresses the following questions: (A) What level of treatment and disinfection is provided? (B) What stressors remain (after treatment) that may be a concern? (C) What exposure pathways are (or may be) of significance? (D) What is the overall estimate of risk? (E) What are the important data or knowledge gaps? The purpose of this summary, the publication of the report, and this notice of availability is to discharge fully EPA's responsibility to complete the relative risk assessment mandated by Congress.

A. What Level of Treatment and Disinfection Is Provided?

Municipal wastewater managed by any of the four options studied in South Florida receives secondary treatment, at a minimum. Secondary treatment comprises biological removal of dissolved organic and inorganic matter, commonly through such methods as activated sludge and trickling filter processes. By itself, secondary treatment does not provide disinfection, *i.e.*, removal of microorganisms.

1. Deep Well Injection

All facilities that manage municipal wastewater by deep well injection in Florida are required by Florida law to provide at least secondary treatment of the wastewater prior to injection. In addition, utilities that employ deep well injection must maintain disinfection capability, but many do not disinfect treated effluent prior to injection. For

[1] Prepared by G.W. Suter II of Oak Ridge National Laboratory for the U.S. Department of Energy. Report No. ES/ER/TM–186 issued in May 1996. Available at *http://www.esd.ornl.gov/programs/ecorisk/tm186.pdf.*

example, treatment of wastewater that is injected by Class I municipal wells in Dade and Brevard Counties consists of secondary treatment with no disinfection, although backup disinfection capability is required. In contrast, in Pinellas County, wastewater is treated to more stringent reclaimed water standards before being discharged into Class I municipal wells, because the Class I wells are used to dispose of reclaimed water during periods of wet weather. Reclaimed water standards, as specified by the State of Florida, include secondary treatment plus a variety of techniques to remove microorganisms, including basic disinfection, filtration, and high-level disinfection.

2. Ocean Disposal

Utilities in South Florida that employ ocean disposal provide basic disinfection in addition to secondary treatment prior to discharge. Basic disinfection removes fecal coliform bacteria by treating the wastewater with chlorine. However, wastewater that is discharged into the ocean does not undergo filtration. This means that pathogenic protozoans, such as *Cryptosporidium*, *Giardia*, and other chlorine-resistant microorganisms, may remain in the treated wastewater.

3. Aquifer Recharge

Utilities that employ aquifer recharge (which includes but is not limited to replenishment of surficial aquifers through irrigation, wetlands discharge, or discharge to percolation ponds) treat to reclaimed water standards prior to discharge. Small amounts of nitrogen and phosphorus and trace amounts of other inorganic and organic constituents remain. However, viruses and bacteria are inactivated and *Cryptosporidium* and *Giardia* are largely removed through filtration.

4. Surface Discharge

Utilities in South Florida that employ surface water discharges provide advanced treatment as required to meet State water quality-based effluent limits. Advanced wastewater treatment includes secondary treatment, basic disinfection, filtration, high-level disinfection, removal of chlorine following disinfection (*i.e.*, dechlorination), and further removal of nitrogen and phosphorus. It represents the highest level of treatment conducted in South Florida.

B. What Stressors Remain (After Treatment) That May Be a Concern?

"Stressors" include chemical or biological agents that may cause adverse effects if exposure levels are high enough. The relative risk assessment report describes the human health and ecological health stressors that may be found in wastewater effluent after it has been treated and that may pose a risk.

C. What Exposure Pathways Are (or May Be) of Significance?

An "exposure pathway" is the course a stressor takes from a source of release to an exposed organism. It is defined by the different environmental media through which a stressor migrates (*e.g.*, air, surface water, ground water) as well as the mechanism by which an organism is actually exposed (*e.g.*, inhalation, drinking, topical contact). The relative risk assessment report discusses a variety of exposure pathways by which humans, plants, and animals may be exposed to municipal wastewater contaminants under each of the management options.

D. What Is the Overall Estimate of Risk?

Although the report does not quantify risks, it offers conclusions about the relative risks of the four wastewater management options and about the various factors that influence risks to human and ecological health.

1. Human Health

The human health risks associated with all four management options in South Florida are generally low. While it is difficult to compare the overall risks of the options directly, a relative comparison can be made on the basis of certain factors that tend to increase or decrease the risks of one or more options relative to the others. In particular, as discussed in turn in the following paragraphs, relative human health risks are higher when: (1) An option provides less wastewater treatment; (2) is more likely to contaminate current or potential drinking supplies; and (3) is more likely to result in people being exposed to discharged contaminants in other ways besides drinking.

The degree of wastewater treatment, and in particular the level of disinfection and filtration of pathogenic microorganisms (*Cryptosporidium*, *Giardia*), is a major risk driver. Clearly, there is greater potential risks associated with wastewater that is not treated to remove microorganisms. This would suggest higher relative risks for the deep well injection and ocean disposal options, which generally do not filter wastewater to remove *Cryptosporidium* and *Giardia* prior to disposal. Looking just at deep well injection, the risk would be highest in situations where the injectate migrates through fractures, faults, and solution cavities. The risk associated with *Cryptosporidium* and *Giardia* being released by deep well injection would be mitigated somewhat in situations where the injection is dominated by porous media flow, characterized by long travel times to current or potential drinking water sources and fine pore spaces capable of retaining microorganisms.

Once *Cryptosporidium*, *Giardia*, and other stressors are released to the environment, the level of risk they pose to human health depends largely on how likely they are to enter drinking water supplies. The relative risk assessment again suggests that deep well injection has a higher risk than the other options based on this factor. Movement of contamination into USDWs has been confirmed or is suspected at 9 of the 45 municipal facilities that utilize Class I deep injection in South Florida, as evidenced by levels of nitrates and ammonia, as well as significant changes in dissolved solids concentrations. The other option with a relatively high risk of contaminating drinking water supplies is aquifer recharge. Ocean outfalls and surface water discharges pose a lower risk of contaminating drinking water supplies, for reasons given previously.

Relative to the other options, however, ocean outfalls and surface water discharges pose a higher risk of people coming into direct contact with the released contaminants in other ways, such as by eating contaminated fish, by swimming in contaminated waters, and by participating in other recreational activities. These same two options also pose a risk of stimulating algal blooms that could be harmful, although this risk associated with surface water discharges is mitigated substantially by the removal of wastewater nutrients prior to release to surface waters in South Florida.

2. Ecological Health

Overall, the risk to surface water ecosystems is low when treated wastewater is managed by deep well injection and aquifer recharge in South Florida. The risk to surface water ecosystems is also generally low when treated wastewater is discharged directly to surface waters. For all three of these management options, however, the potential for damage may be higher where treated wastewater is released in proximity to surface water that already has impaired water quality, which is the case for many surface water bodies in South Florida. In these cases, the nutrients that might enter impaired waters could exacerbate existing water quality and ecological problems.

The risk to marine ecosystems is obviously greatest for the ocean disposal option. Ocean outfall monitoring data from available studies indicate that, for the most part, water quality standards are met by most constituents at the edge of the permitted mixing zone (approximated by a circle with a 400-meter radius), with the occasional exception of nitrogen and some metals. It is recognized, however, that effluent plumes may well extend outside the 400-meter radius and that marine organisms exposed in and around such plumes can likewise travel farther distances. Pathogenic microorganisms in particular pose some concern, because effluent discharged to the ocean is not filtered and there is some evidence to suggest that aquatic organisms suffer from high concentrations of such microorganisms. The effects of pathogenic microorganisms on aquatic animals need to be better documented, as does their concentration in ocean discharges and resulting plumes.

Deep well injection could also pose a risk to marine ecology if contaminants can readily migrate and discharge to offshore waters. However, the extent to which this actually happens in South Florida and poses a real threat in the ocean is uncertain.

Two potential ecological effects of particular concern, should surface or ocean waters be sufficiently contaminated, include harmful algal blooms and bioconcentration of toxic contaminants in the food web. Algal blooms can cause a variety of toxic symptoms in aquatic organisms (including death) as well as nontoxic adverse effects such as clogging of gills and smothering of coral reefs and seagrass beds. Food web bioconcentration of metals and other contaminants can also cause of variety of toxic effects.

Finally, the ocean discharge option introduces the potential for the physical destruction of coral reefs traversed by discharge pipelines. The existing ocean outfalls in South Florida range from 0.9 to 3.6 miles offshore. Any widening or extension of existing pipelines leading to these outfalls could impair or destroy any nearby coral reefs. The same would be true if new outfalls and pipelines are constructed through coral reefs in the future to accommodate increased disposal needs.

E. What Are the Important Data or Knowledge Gaps?

For all four wastewater management options, the relative risk assessment found that there is a lack of definitive studies in South Florida that use a physical or chemical tracer or indicator to identify the source and transport pathways of stressors detected in the environment. Ocean discharge is the only disposal option for which there is a known tracer study proving the source of stressors. In this study, a stable isotope tracer indicated that nitrogen was not being taken up in any significant amount by phytoplankton in the vicinity of the South Florida ocean outfalls. However, without more definitive tracer studies for each wastewater management option, it is difficult to assess the potential effects of local conditions on the fate and transport of treated wastewater after being released into the environment.

While results from ground water monitoring around some Class I municipal wells in South Florida confirm that fluids have migrated out of the permitted injection zone, the full areal extent of USDW impact is not known. This is not only because available monitoring data are limited, but also because the location and connectivity of natural conduits for fluid flow (fractures and solution cavities in the underground formation) are difficult to predict.

Specifically for the deep well injection and aquifer recharge options, the fate and transport of pathogens in South Florida's aquifers are not completely understood. For example, the rates of microbial survival, inactivation, and transport are difficult to predict. Also uncertain are the rates of microbial straining or filtration by geological materials under different fluid flow scenarios, including porous media and conduit flow. The fate and transport of pathogens is especially difficult to verify for deep well injection, even with the most sophisticated modeling or with expensive monitoring, since the receiving formations are thousands of feet underground.

Of particular relevance for the ocean disposal option, there is a lack of understanding regarding down-current impacts, risks to marine organisms passing through the mixing zone, and the potential for food web bioconcentration. Potential long-term ecological risks may exist inside and outside the mixing zone, but due to a lack of ongoing ecological monitoring studies around any of the existing ocean outfalls in South Florida, there is no information on actual biological receptors or exposure pathways that undoubtedly exist at the outfall sites. The lack of such long-term monitoring information makes it impossible to confirm that there are no long-term or cumulative ecological or biological effects of discharged effluent.

With respect to surface discharges, there is significant uncertainty regarding the potential for food web bioconcentration and the severity of cumulative impacts caused by other sources of the same chemical and microbiological stressors contained in treated municipal wastewater.

These other sources of contamination include onsite sewage disposal systems, non-point source runoff from agricultural or urban areas, atmospheric deposition, or other point sources. The risks posed by surface water discharge need to be put into overall context of the cumulative risks posed by all sources of stressors in order to gain a sense of their relative importance.

Dated: April 17, 2003.

G. Tracy Mehan III,

Assistant Administrator for Water.

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