

TY Farm Interim Surface Barrier Demonstration Project

Responsiveness Summary



DEPARTMENT OF
ECOLOGY
State of Washington

**Department of Ecology
Nuclear Waste Program
3100 Port of Benton Blvd.
Richland, WA 99354**

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Responsiveness Summary

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Introduction

In 2006, the United States Department of Energy (USDOE), in response to recommendations by an Expert Panel, proposed applying interim surface barriers at the Hanford Site in south-central Washington. The purpose of the barriers is to prevent infiltration of water that would spread contamination below underground storage tanks. In 2009, USDOE requested approval from the Department of Ecology (Ecology) to install a demonstration barrier over the 241-TY Single Shell Tank Farm or “TY Tank Farm.”

Ecology held a public comment period on the request from December 21, 2009, to January 22, 2010. We received comments from the Oregon Office of Energy (ODOE). ODOE’s comments and Ecology’s responses follow.

Responsiveness Summary

Comment 1:

“We have concerns both with the timing of this proposed action and the extent of performance evaluation proposed for the new barrier.”

Ecology’s Response:

USDOE proposed applying Interim Surface Barriers in 2006. Interim surface barrier placement was included in the Proposed Consent Decree and Tri-Party Agreement Modification for Hanford Tank Waste Treatment, which completed public review on December 11, 2009. Proposed Milestone M-045-92 requires the installation of the TY barrier by September 30, 2010. USDOE agreed to install this interim surface barrier prior to signing the Proposed Consent Decree and Tri-Party Agreement Modification so they could use American Recovery and Reinvestment Act funding for construction.

Ecology agrees that monitoring for a few years does not answer the bigger issue of long-term effectiveness of an interim surface barrier. However, this is an interim action barrier. Its purpose is to limit infiltration of contaminants toward groundwater. The principal influence of such a short-term barrier will be in the shallow vadose zone directly beneath the barrier. Delaying the arrival of contaminants to groundwater is a good idea.

Comment 2:

“...report for the past full year operation of the T-farm barrier has been collected and analyzed and the report on the barriers performance is nearly complete and expected to be issued in the next several weeks. Ecology should wait to review that report prior to issuing comments or approval on the proposed TY Farm barrier.”

Ecology's Response:

Ecology received monitoring results of the T Farm interim barrier as part of our review of the TY Barrier design package. The T Farm interim barrier has been monitored for one year (PNNL-19123). The barrier appears to be functioning as planned, but the limited monitoring data is insufficient to determine the effectiveness of an interim surface barrier. Changes in moisture content are slight and are barely detectable. Continued monitoring will provide more information about the effectiveness of interim surface barriers.

Comment 3:

“Questions about T-farm barrier have not yet been fully answered. The instrumentation nests were damaged or failed to perform as expected under the T-farm barrier, limiting the amount of data available in the first year of data collection. “...data collected do provide hints about questions we raised, but do not fully resolve the questions or issues”.

Ecology's Response:

The drain gauges did not function as anticipated, but no damage to the gauges occurred (see PNNL-17306, Section 3.5). The other instruments functioned and continue to function as expected. Probes will gather data to interpret the moisture flux, changes in soil moisture content, and pressure head beneath the interim surface barrier.

While moisture flux is important, it is hard to measure in this arid environment. Detecting changes in the moisture content of such dry soil is a challenge to the equipment now available. However, significant pressure head changes have been detected in the soil beneath the barrier since its completion.

Comment 4:

“From the as yet unpublished data on the past full year of operation, several conclusions seem apparent; ...”

Ecology's Response:

It is unclear what unpublished data this comment refers to. Data for the 2009 reporting period were presented at the American Geophysical Union conference in December 2009 (*Monitoring the Vadose Zone Moisture Regime Below a Surface Barrier*, PNNL-SA -69915) and released in a Pacific Northwest National Laboratory report (PNNL-19123). The data for Fiscal Year 2009 are consistent with data from Fiscal Year 2008, which shows drying beneath the barrier.

Comment 4a:

Soil outside the barrier does dewater after rain events, but with no significant impact on soil moisture content with depth.

Ecology's Response:

This observation is expected and is consistent with normal net infiltration behavior. There is a significant signature of incident infiltration outside the barrier, but little change noted at depth. This is an expected outcome under a draining environment. As the source of water is eliminated, soil moisture level will decrease slowly and steadily as the draining water is not replaced. Fine-grained segments of the vadose zone will retain more water than coarse-grained segments. Since evaporation begins from the ground surface to depth, drying also begins at the ground surface.

Most of the accumulated moisture from winter precipitation rises through capillary action and is lost during the summer dry season. The water that remains drains toward groundwater as recharge, but this is generally a very small percentage of the total precipitation. Monitoring data show progressive, but very little, draining beneath the interim barrier.

Comment 4b:

There is no significant drying effect under the barrier, nor do we expect one.

Ecology's Response:

The soil beneath the barrier is draining. The soil moisture change is minor, but it is decreasing. This decrease is confirmed by soil water tension. Consistent with earlier monitoring reports, the Fiscal Year 2009 monitoring trending and a recently released monitoring report show decreasing soil water content and pressure head changes. This reflects a continuing decline in both soil moisture and soil water flux.

Comment 4c:

Based on the seasonally unchanging moisture levels in the soil, there does not appear to be a major rain-hat effect (condensation cycling of water vapor condensing on the underside of the barrier becoming a driving force for waste movement).

Ecology's Response:

This phenomenon may be taking place, but it would be local and would not increase the overall water content beneath the barrier. To date, no effect of this phenomenon has been detected at the first instrument depth at 1 foot. However, the current monitoring data are at the limit of what levels of moisture are detectable.

Comment 4d:

Lacking water flux meters and relying on moisture measurements makes this a very tentative conclusion. A balanced flux of up-flowing soil vapor condensing on the barrier and raining through the soil would likely look nearly the same as conditions w/o condensation. Flux monitoring is needed to detect this.

Ecology's Response:

Water flux monitoring cannot detect these small changes in moisture flow within the Tank Farm backfill materials (PNNL-17306, Section 3.5). Operational meters would provide no additional value for measuring this presumed phenomenon. Flux meters were installed at the T Farm Barrier as a potential opportunity to explore fluxes beyond those expected. Since the meters did not perform, the TY monitoring design did not use them. We will investigate other flux meters to see if they perform better and would welcome other suggestions.

Comment 5:

“The limited data we have seen does not allay our concerns about the dominant flow mechanisms in the subsurface (e.g. lateral flow on subsurface fines layers) which may serve to introduce water laterally into the tank farm excavation, and which most probably do negate any significant effect by the barrier on movement of wastes through the soils beneath the excavation.”

Ecology's Response:

The barrier is not designed to address lateral flow specifically. However, the tank farm excavation backfill consists of poorly sorted and compacted sands and gravels. Sands and gravels are features that can control moisture movement at low water contents. Rapidly changing vertical and lateral strata (layers of different types of soils), result in the natural heterogeneity in native soils. This heterogeneity of the soils at the Hanford Site causes anisotropic flow of infiltration. So, lateral flow is not expected to be a dominant mechanism in the tank farm backfill.

There may be some lateral flow due to the lateral capillary gradient. But it is not known how large a factor this would be in the backfill material. Currently, no study of this phenomenon is planned as part of monitoring the TY Barrier. Lateral flow beneath the backfill might occur with this or any barrier that might be constructed as part of closure activities. Since closure decisions have not yet been made, the need for a barrier can only be assumed.

Comment 6:

“Monitoring approach for TY is less than for T-farm. Since DOE proposes to place barriers over additional tank farms, we believe monitoring should be expanded and extended deeper and run longer than 2 years.”

Ecology's Response:

The differences between the monitoring designs of the TY and T barriers are discussed in detail in RPP-PLAN-36705. Because the two tank farms are so close together, there was no need to duplicate the monitoring ongoing at T Farm.

Monitoring will be conducted for a minimum of two years, but may go on longer. The T Farm interim barrier will be monitored for at least five years. We will evaluate the monitoring plan for

the TY Barrier at the annual Tri-Party Agreement Milestone M-045-56 meetings. The evaluation will consider whether the monitoring system is adequate or needs to be modified.

Comment 7:

“Barrier itself should be monitored closely for long-term performance.”

Ecology’s Response:

The TY Barrier Monitoring Plan includes quarterly inspection of the TY Barrier surface to ensure its integrity. The barrier material was chosen because it is quick and easy to repair.

Comment 8:

“TY Farm barrier improves on T-Farm by directing runoff to vegetated surface impoundment for evaporation. However impoundment is only designed for a 25 year storm event and is undersized. Doe has said they plan to take actions to pump out impoundment in the event of runoff greater than 25 year storms, which is impractical and untimely. Design for 100 year event.”

Ecology’s Response:

This is an interim surface barrier and not a final cap. Therefore, a 25-year storm event is appropriate for this design. To be conservative in the calculation of a 25-year storm event, a more conservative method than called for in the Benton County Hydrology Manual and Drainage Design Review Procedure (1979) was used. The calculation is in Appendix A of RPP-CALC-41539.

Ecology has not approved a final barrier is part of the tank farm closure actions. If a barrier is chosen for final closure, its design would likely be different than this interim surface barrier.

Comment 9:

“Project needs some method to monitor the contamination below the tanks and TY Farm, including amount and source of waste infiltrating this plume. Absent this information how will it be possible to determine effectiveness of this surface barrier?”

Ecology’s Response:

As stated in RPP-PLAN-36705, Section 1.3, “...the primary objective for monitoring an interim barrier at TY is to verify the integrity of the barrier, and provide assurance that the barrier is functioning as designed to prevent water from migrating into the soil beneath the barrier footprint [emphasis added].”

The barrier is designed to reduce infiltration by capturing and redirecting precipitation, and that is being monitored. The monitoring described in the comment is beyond the scope of monitoring required to determine if the barrier is functioning as designed.

Current technology limits what, if any, monitoring can be done directly beneath the tanks in TY or other tank farms. The changes in moisture content are too subtle to measure by methods that address the entire volume of the subsurface.

Comment 10:

“We recommend there be extensive monitoring under, proximal and lateral to the barrier to obtain 3-D information about barriers affects on moisture, humidity, water fluxes and contaminant movement beneath the barrier. Monitoring should include examination of how the changes to subsurface conditions affect external corrosion of the tanks, piping, etc. Monitoring should also assess the potential redistribution of contamination under the barrier driven by the condensation processes occurring.”

Ecology’s Response:

The recommended studies are beyond the scope of the TY interim surface barrier project. Some of the studies might better be considered as part of a Corrective Measures Study that evaluates potential closure options.

Monitoring will continue for both T and TY barriers, as agreed through the annual Tri-Party Agreement Milestone M-045-56 meetings, for moisture content and soil moisture tension. The expert Single Shell Tank (SST) Integrity Panel will have this information as they formulate their recommendations for continued safe storage in SSTs.

Summary of Public Involvement Actions

Hanford Info Listserv announcement on December 10, 2009 - screen shot below.

The screenshot shows an email client window titled "LISTSERV 15.0 - HANFORD-INFO Archives". The interface includes navigation links for "View" (Next Message, Previous Message, Next in Topic, Previous in Topic, Next by Same Author, Previous by Same Author, Chronologically, Most Recent First, Proportional Font, Monospaced Font) and "Options" (Join or Leave HANFORD-INFO, Reply, Post New Message, Search Archives). The email header shows the subject as "Message from the Dept. of Ecology - Advance Notice of Public Comment Period", from "Wireman, Ginger (ECY)", and dated "Thu, 10 Dec 2009 15:32:39 -0800". The content type is "multipart/alternative" with parts for "text/plain" and "text/html".

Content-Type: text/html
Advance Notice of TY-Farm Interim Surface Barrier Demonstration Project

The Washington State Department of Ecology invites you to comment on the U. S. Department of Energy's (USDOE) plans to place a temporary barrier (similar to commercial asphalt) over the TY Tank Farm. "Farm" is the term used for groups of underground waste storage tanks on Hanford's central plateau.

The proposed project will demonstrate the ability of an interim surface barrier to inhibit or limit the infiltration of rain and melting snow into the soil. This will significantly reduce the downward migration of contamination below the TY Tank Farm.

The public may comment on the proposal from December 21, 2009 to January 22, 2010.

For more information please contact Joe Caggiano at the Washington State Department of Ecology's Nuclear Waste Program, (509) 372-7915 or [\[log in to unmask\]](#)">
[\[log in to unmask\]](#).

Documents will be available for viewing online at www.ecy.wa.gov/programs/nwp and all Hanford Public Information Repositories by the start of the comment period.

Ginger Wireman
Community Outreach and Environmental Education
Ecology, Nuclear Waste Program
3100 Port of Benton Bl.
Richland, WA 99354
509-372-7935

Learn more about Hanford Cleanup!
Call to schedule a speaker for your class, club, or group.

Notice on Ecology and United States Department of Energy Websites.

Attachments

Copy of notice sent via postal mail.

Public Comment Period



Nuclear Waste Program

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TY-Farm Interim Surface Barrier Demonstration Project

The Washington State Department of Ecology invites you to comment on the U. S. Department of Energy's (USDOE) plans to place a temporary barrier (similar to commercial asphalt) over the TY Tank Farm. "Farm" is the term used for groups of underground waste storage tanks on Hanford's central plateau.

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Background

Hanford has enormous amounts of radioactive waste left over from making plutonium for the nation's defense. Much of the high-level waste went into underground storage tanks. The first 149 tanks built had single steel liners and reinforced concrete shells. Sixty-seven of these tanks are known or suspected to have leaked.

Five of the six single-shell tanks in the TY Tank Farm are known or suspected to have leaked. Characterization activities performed in 2008 found high concentrations of contaminants in the soil to the south of the tank farm.

Most of the leaked contaminants remain in the vadose zone – the area between ground surface and the groundwater. The existing surface of the tank farm is gravel, which water can easily penetrate. Rain and snow melt push contaminants down toward the water table. Once contaminants reach the groundwater they can move to the Columbia River. That is why it is important to keep rain and snow from driving the contaminant plume deeper.

Regulatory Framework

Cleanup of the Hanford Site is well underway. The Hanford Federal Facility Agreement and Consent Order, or Tri-Party Agreement (TPA), guides the cleanup. The commitment for cleanup of contaminated soil around the tanks is designated in TPA Milestone M-45, Complete Closure of all Single-Shell Tank Farms.

COMMENT PERIOD OPEN

December 21, to
January 22, 2010

CONTACT INFORMATION

**For more information,
or if you would like to
comment, please write
or email:**

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The single-shell tank farm closure process has several parts. The main parts are to:

- Retrieve the waste from inside each tank.
- Remediate contamination in the sand and gravel around the tanks and related equipment.
- Investigate the contaminated soil in the tank farm, down to the groundwater.

Cleanup of groundwater in the 200 West Area has started and will continue after cleanup and closure of all contaminant sources.

The TPA addresses the legal deadline for final cleanup and closure of the single-shell tank farms. An amendment to the TPA has been proposed in the Settlement Agreement announced on August 11, 2009.

Our focus is to prevent the spread of the contamination below the tanks. We must keep contaminants from reaching the groundwater.

The Plan

In 2006, USDOE proposed installing interim barriers over some contaminated soil in the tank farms. The installation of other interim measures is referenced in the TPA. Milestones for additional barriers are proposed in the Settlement Agreement.

The first interim barrier demonstration is underway at the T Tank Farm.

The second interim barrier planned will cover the TY Tank Farm and a region to the south of the tank farm. This barrier is intended to keep water from penetrating the soil by redirecting the water away from the contaminated area in the tank farm.

The TY Farm was selected as a location for an interim surface barrier because:

TY Farm ranked in the top five for placement of a barrier due to the presence of mobile contaminants based on USDOE's comparison study RPP-ENV-41309.

Recent characterization data shows additional concentrations of Technetium-99 and nitrate at the south end of the TY Farm.

Construction would be easier and more cost effective, since TY Farm does not have above-ground equipment and obstructions.

The modified asphalt product proposed for the TY Tank Farm interim barrier would be constructed similar to an asphalt road or parking lot. The modified asphalt would be at least four inches thick and would contain a binder to make the material water-resistant. The barrier will be sloped to drain rain and snow melt to an area west of the tank farm where it will be discharged to a vegetated evaporation basin.

The proposed barrier is a test. It is an interim measure and does not rule out or restrict any final remedy. The demonstration barrier will help USDOE answer a number of questions:

- How well will this technique work?
- Is it practical to install a barrier over a tank farm?
- What do barriers like this really cost?
- How effective will the barrier be?
- What are the long-term costs for operations and maintenance?
- Does the barrier reduce risk to the groundwater in localized areas, and how much?

The plan is to:

- Complete the design in Fall 2009.
- Plan the installation and procure contractors and materials through Spring 2010.
- Construct and install the barrier in 2010.
- Monitor and evaluate soil moisture content under and next to the barrier.
- Monitor and evaluate overall barrier performance.
- Perform regular visual inspections of the barrier.

TY Tank Farm

The TY Farm has six tanks, each with a 758,000-gallon capacity. USDOE believes five tanks have leaked: TY-101, TY-103, TY-104, TY-105, and TY-106. In addition, it is likely that piping to the 242-T Evaporator has also leaked in the area.

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The Plume

How deep is the contamination plume?

Characterization activities performed in the TY farm through 2008 found contamination at elevated concentrations approximately 100 feet below the ground surface. Contamination from the TY Tank Farm has reached groundwater.

How deep is the groundwater under the TY Farm?

The groundwater is approximately 240 feet below ground surface, but the water table is slowly dropping about 1 foot per year.

What direction does the groundwater flow under the TY Farm?

The current direction of groundwater flow beneath the TY Tank Farm is east-northeast. During Hanford operations, it varied from south to northeast. Over time, groundwater should flow eastward, as it did before Hanford operations began. Operation of an expanded pump and treat system for carbon tetrachloride in 200 West Area will likely alter the direction of groundwater flow over the next decade.

The Barrier

How big will the barrier be?

The barrier will be about 80,000 square feet. (For comparison, a football field is 57,600 square feet.) It will cover the TY Tank Farm.

How thick will the barrier be?

The modified asphalt material will be about 4 inches thick after it is compacted. To achieve the desired slope for drainage, up to one foot of engineered fill will be placed before the barrier is installed.

Will the asphalt interim surface barrier crack?

The asphalt compound that will be applied to the TY Farm has an additive intended to minimize cracking. The interim surface barrier will also be inspected and maintained. The barrier technology is flexible and can be expanded, repaired, or removed as needed.

Will the barrier prevent the usual monitoring of the tanks?

No. Tank monitoring equipment will remain accessible. Boreholes surrounding the tanks will remain accessible for geophysical logging activities.

Will the barrier be monitored to check its effectiveness at reducing water penetration?

Yes. Several boreholes will contain instruments to measure moisture content and movement.
Future Plans

When will you know how well the barrier performs?

The demonstration and related monitoring will last at least two years.

When will the barrier be removed?

We don't know yet. If the barrier works as planned, we may leave it until final TY-Farm remediation decisions are made.

If this barrier demonstration is successful, will more temporary barriers be constructed?

Yes. New barriers would cover areas of large releases in other tank farms, as proposed in the Settlement Agreement announced on August 11, 2009.

What do you think?

Learn how to submit comments on the first page.





Nuclear Waste Program
3100 Port of Benton Blvd
Richland, WA 99354

Nuclear Waste Program

December 2009

TY-Tank Farm, Proposed Barrier

COMMENT PERIOD OPEN

**December 21 2009, to
January 22, 2010**

See the documents by appointment at Ecology's Nuclear Waste Program office, 3100 Port of Benton Blvd., Richland. Call (509) 372-7920.

View the documents online at ecy.wa.gov/programs/nwp or one of the below Hanford Public Information Repositories

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Consolidated Information Center, Room 101-L
2770 University Dr.
Attn: Janice Parthree 509-372-7443

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