

Environmental Radiation Monitoring and Assessment Program

**Department of Health Oversight
at the 310 Treated Effluent Disposal
Facility (TEDF) 1995 - 2006**

January 2007



Division of Environmental Health

Environmental Radiation Monitoring and Assessment Program

**Department of Health Oversight
at the 310 Treated Effluent Disposal
Facility (TEDF) 1995 - 2006**

January 2007



For more information or
additional copies of this report contact:

Office of Radiation Protection
Environmental Radiation Monitoring and Assessment Section
P.O. Box 47827
Olympia WA 98504-7827

360-236-3251
INTERNET: Debra.McBaugh@doh.wa.gov
FAX: 360-236-2255

Mary Selecky
Secretary of Health

R.A. Danielson
G.R. Priddy

Contents

Executive Summary 1

 Introduction..... 2

 Process Description..... 2

 Department of Health Oversight..... 4

 Conclusion 6

References..... 6

Appendix A

Analytical Results of Samples Taken by the Treated Effluent Disposal Facility (TEDF). 7

Appendix B

Analytical Results of Samples Taken by the Department of Health (DOH) 11

Executive Summary

In 1999 the Department of Health issues a report on the 300 Area TEDF that summarizes oversight activities conducted by the Washington State Department of Health for the 310 Treated Effluent Disposal Facility (TEDF) as acknowledged in the Aquatic Lands Sewer Outfall Lease No. 20-013357. This agreement, between the Washington Department of Natural Resources (DNR) and the U.S. Department of Energy (USDOE), requires the Department of Health (DOH) to ensure that river and effluent concentrations do not exceed applicable standards for radioactivity.

This lease requires:

- The facility operator to conduct monthly radiological analysis of effluent water and transmit results in the form of a report to the Department of Health.
- The facility operator to split effluent samples with DOH biannually.
- Notification of DOH within 24 hours of gamma scan results that exceed WAC 246-221-290 Table II or gross alpha at 15 pCi/l, gross beta at 50 pCi/l and tritium at 20,000 pCi/l.
- Isotopic analysis of all samples meeting or exceeding reporting requirements.
- Annual sampling and analysis by the facility operator of the receiving water (Columbia River) upstream of the outfall and downstream at the edge of the mixing zone for all radionuclides identified in the Drinking Water Standard, WAC 246-290-310 (8). A report shall be sent to DOH identifying radioactivity with respect to this standard.
- The operator to pay for all associated costs of analysis and verification.

The 310 Treated Effluent Disposal Facility (TEDF) was constructed as part of a Tri-Party Agreement Milestone to cease discharges to the 300 Area Process Trenches under the project number L-045H. The facility began operation in December 1994, and effluent sampling has been conducted by the Department of Health and U.S. Department of Energy contractors since that time.

Reported radiological measurements in all effluent samples analyzed by these programs were less than the drinking water standards during this reporting period.

Department of Health Oversight at the 310 Treated Effluent Disposal Facility (TEDF) 1995 - 2006

Introduction

The 310 Treated Effluent Disposal Facility (TEDF) was constructed as part of a Tri-Party Agreement Milestone to cease discharges to the 300 Area Process Trenches. The facility began operation in December 1994, and effluent sampling has been conducted by the Department of Health and U.S. Department of Energy contractors since that time.

Process Description

The 300 Area TEDF, operated by Fluor Hanford Company, is located on the northernmost boundary of the 300 Area, adjacent to the Columbia River. The TEDF collects process waste water which is discharged to the 300 Area Process Sewer from approximately thirty office buildings, research laboratories, and support facilities in the 300 Area. Some waste water of this type is also brought to the TEDF from other areas of the site. The facility removes metals and organic contaminants before the purified water is discharged to the Columbia River. Heavy metals with radioactive isotopes are also removed in the metals removal process. The process waste water stream consists primarily of potable water, equipment cooling water, steam condensate, and laboratory and research waste water. The mean daily flow rate is currently in the range of 35 to 150 gallons per minute, with maximum spikes attaining 600 gallons per minute.

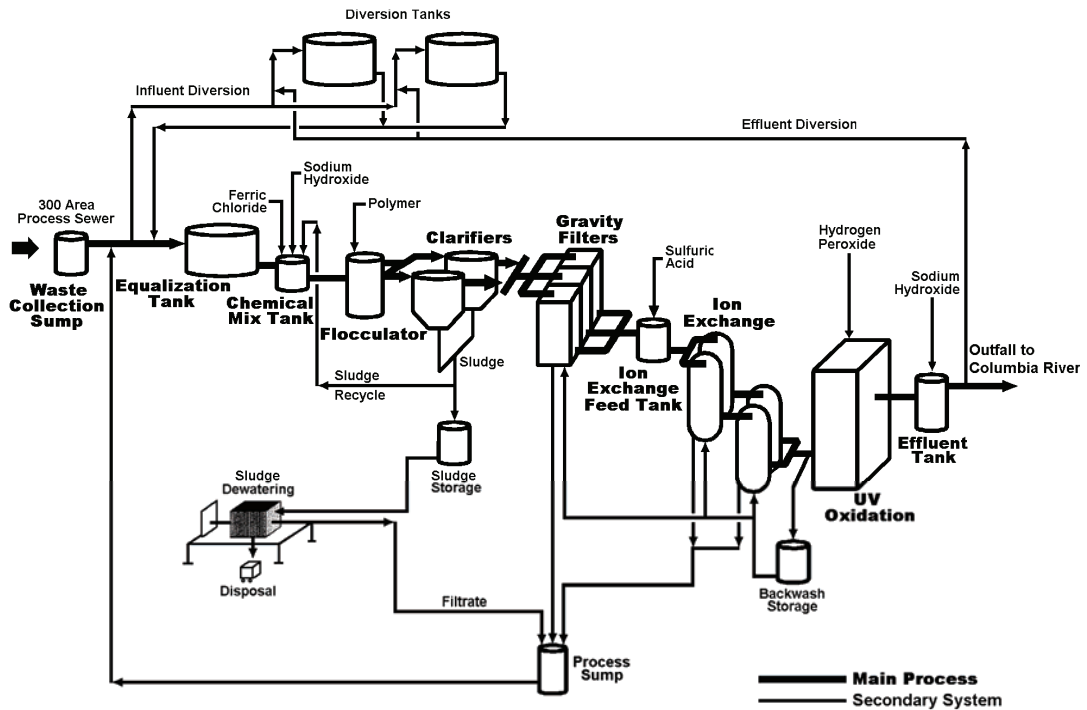


Liquid Treatment Facilities - 300 TEDF

Waste water from buildings connected to the Retention Process Sewer branch of the Process Sewer passes through a beta detector in the building. If radioactivity is detected, water is diverted to the Retention Basins.

The following processes are employed to purify the TEDF feedstream:

- Chemical Precipitation - Heavy metals form nearly insoluble precipitates under slightly alkaline conditions. Ferric Chloride is added as a co-precipitant, and anionic polymer is added as a flocculent (settling) aid.
- Clarification/filtration - Coagulated solids from the precipitation system are settled and filtered to remove suspended solids from the process stream.
- Ion exchange - Mercury that was not removed in the precipitation process is eliminated with the ion exchange columns.
- UV light/hydrogen peroxide destruction of organics - Organic compounds are destroyed with a process that utilizes UV light.



310 Treated Effluent Disposal Facility Process Diagram

300 Area facility effluent enters the main header at the north end of the 300 Area and is discharged into the waste collection sump. In this 80,000-gallon vessel, waste water is monitored for temperature, pH, and conductivity before it is pumped to the 480,000 gallon equalization tank. This tank provides the "feed water" for the TEDF process and is regulated to maintain a steady influent stream for the process. The "feed water" is pumped to the chemical mix tank where ferric chloride is added along with sodium hydroxide to control the pH (9-11) as the first step in the iron co-precipitation process.

Under neutral or high pH conditions, many heavy metals form relatively insoluble precipitates. When iron is added as a co-precipitant, it forms well-settling ferric hydroxide flocs that help settle the other metal precipitates by trapping and adsorbing them on the iron flocs. A flocculent aid polymer is added as the feed water gravity flows from the chemical mix tank to the flocculator tank. The waste stream is gently mixed in the flocculator in order to increase the size and mass of the floc. The flocculated waste water then flows by gravity to the clarifiers where settling takes place. From the clarifiers, it flows through the gravity filters, which use a dual media bed of charcoal and sand to remove suspended solids.

The treated water flows by gravity into the ion exchange tank before being pumped into the ion exchange column system. Sulfuric acid is added in the ion exchange feed tank to lower the pH. The water passes through one of the two parallel trains of two ion exchange columns in series. The ion exchange columns are packed with a resin which has an affinity for mercury and other metals that form insoluble metal sulfides.

The water is then pumped through the UV/peroxide system. This destroys organic compounds, sulfide, nitrite, and cyanide by chemical oxidation. Ultraviolet light catalyzes the chemical oxidation reaction by the combined effect on the organic compounds and reaction with the hydrogen peroxide that is fed upstream of the UV reactor. Organics are converted to carbon dioxide and water.

The treated effluent is discharged into the EF-T-10 effluent tank where sodium hydroxide may be added to comply with regulatory pH requirements. A "composite sample" of treated effluent is collected from the effluent discharge line in 100 ml aliquots before the effluent gravity-flows through the outfall pipeline to the Columbia River. Typically, 10 to 12 liters of sample are collected each month and analyzed.

Department of Health Oversight

The Department of Natural Resources' lease requires the Department of Health to collect split samples of effluent semiannually and review monthly data to identify potential impacts to human health and to assess water and sediment quality. Each effluent sample taken by the lessee (DOE) is analyzed for gross alpha, gross beta, and tritium. In addition, each sample is scanned for gamma emitting radionuclides. DOH is notified by the lessee within 24 hours of gamma scan results that exceed [WAC 246-221-290](#) Table II or gross alpha at 15 pCi/l, gross beta at 50 pCi/l and tritium at 20,000 pCi/l. All samples exceeding the standard require characterization of the alpha or beta constituents.



Composite Sample Apparatus at the 310 TEDF

In 1997 the facility reported two instances where the limits for various isotopes of radium were exceeded.

- September 17, 1997 - The downstream annual receiving water sample taken as part of the Receiving Water Quality monitoring requirements of the DNR lease exceeded the combined Radium 226 and 228 limit of 5 pCi/l. Analysis indicated levels of 8.3 pCi/l for Ra-226 and 5.9 pCi/l for Ra-228.
- November and December 1997 - Effluent samples exceeded the National Pollutant Discharge Elimination System (NPDES) maximum daily limit (MDL) of 0.4 pCi/l for Ra-228. Levels of Ra-228 for these samples were reported as 0.61 and 0.43 pCi/l respectively.

In both instances, the facility was unable to identify through influent sampling a source of radium that would have been introduced into the facility process. The reported non-compliance issues for radium results can be attributed to their laboratory methods for detecting total radium. The facility has requested the laboratory detection limit be lowered to minimize counting error as a contributor to a non-compliant result.

In January 2000 there was one case where the gross alpha result exceeded the 15 pCi/l trigger point, but subsequent alpha isotopic analysis results were below WAC 246-221-290, Table II limits.

There were no other occurrences of exceeding trigger levels. The vast majority of laboratory results for both the sample taken by TEDF staff and DOH are below detection levels. The analytical results of all split samples are attached in Appendix A.

DOH has access to the results of all pertinent internal audits, and periodically audits the facility sampling program and analytical laboratory. The facility was inspected by DOH Environmental Radiation Section staff in May 1998 as part of a USEPA "multi-media inspection." These types of comprehensive inspections are routinely conducted in conjunction with state agencies to examine facilities with a variety of waste streams that have the potential for significant environmental contamination. The 300 Area TEDF was inspected to ensure compliance with a full array of federal and state environmental laws.

Conclusion

Analytical techniques utilized by each program are based on standard methods. Rigorous quality control protocols are employed to ensure that data collected and the resultant conclusions are traceable to the source of the data.

The cooperation between Fluor Hanford Company and DOH environmental monitoring programs enables verification of results as well as characterization and quantification of radioactive contaminants discharged to the Columbia River. Program deficiencies are identified and quickly resolved. It is evident that the current monitoring program continues to be effective for detecting and tracking radioactive pollutants before they become a problem.

References

Washington State Department of Natural Resources (DNR), Aquatic Lands Sewer Outfall Lease No. 20-013357, Olympia, Washington.

U.S. Department of Energy (DOE), *Hanford Site 1998 Environmental Report*, PNNL-12088 UC-602, Pacific Northwest National Laboratory, Richland, Washington, September 1999.

U.S. Department of Energy (DOE), Hanford Home Page, <http://www.hanford.gov>

U.S. Department of Energy (DOE), *Monthly Effluent Radionuclides Monitoring Reports*, 1995-1999.

Waste Management Hanford Company (WMHC), *300 Area Liquid Effluent Facility, 310 Systems Manual*, 700120 Rev 1, Richland, Washington, November 1999.

Appendix A- Analytical Results of Samples Taken by the TEDF

300 Area TEDF DNR Land Lease Property Data

Date	Gross Alpha pCi/l	Gross Beta pCi/l	H-3 pCi/l	Co-60 pCi/l	Ru-106 pCi/l	Cs-134 pCi/l	Cs-137 pCi/l	Zn-65 pCi/l	Sb-125 pCi/l	Ce/Pt-144 pCi/l	Eu-152 pCi/l	Eu-154 pCi/l	Sn-113 pCi/l	Am-241 pCi/l	Pu-238 pCi/l	Pu-239 pCi/l	U-234 pCi/l	U-235 pCi/l	U-238 pCi/l	
1/31/1995	0	7.8	365	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/28/1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/31/1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/30/1995	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/31/1995	0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/30/1995	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/31/1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/23/1995	0.2	0.7	450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/20/1995	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/25/1995	0.6	1.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/29/1995	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/20/1995	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/31/1996	1.3	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/28/1996	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/27/1996	1.7	1	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/1996	1.3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/23/1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/26/1996	1.9	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/24/1996	0	0	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/21/1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/25/1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/23/1996	0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/20/1996	0	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/26/1996	0	0	570	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/30/1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/27/1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/27/1997	0	6.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/29/1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/26/1997	4.9	6.4	180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/31/1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/1997	0	0	190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/25/1997	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/23/1997	0	2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/26/1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/31/1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Oversight At The 310 Treated Effluent Disposal Facility 1995 - 2006

300 Area TEDF DNR Land Lease Property Data

Date	Gross Alpha pCi/l	Gross Beta pCi/l	H-3 pCi/l	Co-60 pCi/l	RU-106 pCi/l	Cs-134 pCi/l	Cs-137 pCi/l	Zn-65 pCi/l	Sb-125 pCi/l	Ce/Pr-144 pCi/l	Eu-152 pCi/l	Eu-154 pCi/l	Sn-113 pCi/l	Am-241 pCi/l	Pu-238 pCi/l	Pu-239 pCi/l	U-234 pCi/l	U-235 pCi/l	U-238 pCi/l	
1/29/1998	0	1.3	340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/22/1998	0	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/30/1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/30/1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/13/1998	0	0	310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/28/1998	0	0	240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/25/1998	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/30/1998	4.3	1.4	360	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/31/1998	0	1.1	430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/28/1998	0	2.7	550	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0
10/29/1998	0	0.7	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/30/1998	0	0	680	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/28/1998	0	2.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/25/1999	4.7	0	350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/25/1999	4.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/29/1999	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/26/1999	3	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/27/1999	0	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/30/1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/28/1999	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/30/1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/22/1999	1.6	0	1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/27/1999	0	5.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/23/1999	5.3	3.3	340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/27/1999	6.3	0	2800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/26/2000	21	3.8	230	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/23/2000	8.1	6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/22/2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/26/2000	4.1	2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/24/2000	1.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/21/2000	4.9	0	340	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/26/2000	2.5	0	310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/23/2000	0	0	260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/27/2000	4.5	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/27/2000	6.6	0	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/27/2000	3.3	2.9	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/27/2000	7.5	2.9	307	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Washington State Environmental Radiation Monitoring and Assessment Program

300 Area TEDF DNR Land Lease Property Data

Date	Gross Alpha pCi/l	Gross Beta pCi/l	H-3 pCi/l	Co-60 pCi/l	Ru-106 pCi/l	Cs-134 pCi/l	Cs-137 pCi/l	Zn-65 pCi/l	Sb-125 pCi/l	Ce/Pr-144 pCi/l	Eu-152 pCi/l	Eu-154 pCi/l	Sn-113 pCi/l	Am-241 pCi/l	Pu-238 pCi/l	Pu-239 pCi/l	U-234 pCi/l	U-235 pCi/l	U-238 pCi/l	
1/24/2001	7.4	0	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/22/2001	6.4	2.3	1800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/28/2001	3.2	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/25/2001	4.6	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/23/2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/27/2001	0	0	0	0	0	0	36.2	0	0	0	0	0	0	0	0	0	0	0	0	0
7/25/2001	0	1.4	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/22/2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/26/2001	0	0	210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/24/2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/26/2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/19/2001	7.4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/23/2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/20/2002	4.7	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/30/2002	5.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2002	3.6	2.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/22/2002	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/19/2002	1.8	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/24/2002	2.9	4.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2002	1.8	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/25/2002	0	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/23/2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/20/2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/18/2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/22/2003	0	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/19/2003	0	0	260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/19/2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/23/2003	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/21/2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/25/2003	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/28/2003	2.4	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/25/2003	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/24/2003	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/22/2003	0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/24/2003	0.3	3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/17/2003	0	3.7	0	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Oversight At The 310 Treated Effluent Disposal Facility 1995 - 2006

300 Area TEDF DNR Land Lease Property Data

Date	Gross Alpha pCi/l	Gross Beta pCi/l	H-3 pCi/l	Co-60 pCi/l	Ru-106 pCi/l	Cs-134 pCi/l	Cs-137 pCi/l	Zn-65 pCi/l	Sb-125 pCi/l	Ce/Pr-144 pCi/l	Eu-152 pCi/l	Eu-154 pCi/l	Sn-113 pCi/l	Am-241 pCi/l	Pu-238 pCi/l	Pu-239 pCi/l	U-234 pCi/l	U-235 pCi/l	U-238 pCi/l	
1/20/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/24/2004	7.4	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/24/2004	4.6	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/21/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/19/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/23/2004	0	2.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/21/2004	1.2	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/25/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/22/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/20/2004	3.4	1.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/17/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/15/2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/19/2005	4	4.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/23/2005	0	3.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/23/2005	4.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/20/2005	2	4.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/25/2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/22/2005	7.7	3.5	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/20/2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/24/2005	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/21/2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/26/2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/22/2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/20/2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/24/2006	0	3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/21/2006	4.2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/21/2006	0	5.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/25/2006	2.3	4.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/23/2006	1.8	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/22/2006	0	8.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/25/2006	1.6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/22/2006	3.9	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/5/2006	1.5	3.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/24/2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/21/2006	0	2.8	96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B - Analytical Results of Samples Taken by DOH

Collect Date	Analyte	Result	Error	LLD	Units
02/23/1995	Gross Alpha	-0.2	2.9	4	pCi/L
02/23/1995	Gross Beta	1.3	0.7	1	pCi/L
02/23/1995	H-3	237	29	50	pCi/L
10/25/1995	Gross Alpha	0.6	3.5	4	pCi/L
10/25/1995	Gross Beta	3	1	1	pCi/L
10/25/1995	Cs-137	1	1	3	pCi/L
10/25/1995	Co-60	0.3	0.8	3	pCi/L
10/25/1995	H-3	89	31	50	pCi/L
02/28/1996	Co-60	0.3	0.8	3	pCi/L
02/28/1996	H-3	119	43	50	pCi/L
02/28/1996	K-40	39	17	40	pCi/L
02/28/1996	Gross Beta	2	1	1	pCi/L
02/28/1996	Gross Alpha	0	3	4	pCi/L
02/28/1996	Cs-137	0	0.8	3	pCi/L
08/28/1996	Co-60	-4.6	2.4	3	pCi/L
08/28/1996	Gross Alpha	1	3	4	pCi/L
08/28/1996	H-3	156	51	50	pCi/L
08/28/1996	K-40	60	100	40	pCi/L
08/28/1996	Cs-137	0	3	3	pCi/L
08/28/1996	Gross Beta	1.5	0.7	1	pCi/L
02/27/1997	Gross Beta	2	4	1	pCi/L
02/27/1997	Cs-137	0.2	0.9	3	pCi/L
02/27/1997	Co-60	0.6	0.9	3	pCi/L
02/27/1997	H-3	-15	62	50	pCi/L
02/27/1997	Gross Alpha	1	3	4	pCi/L
08/28/1997	K-40	38	20	40	pCi/L
08/28/1997	Gross Alpha	0	3	4	pCi/L
08/28/1997	H-3	178	42	50	pCi/L
08/28/1997	Co-60	0.1	0.8	3	pCi/L
08/28/1997	Gross Beta	3	4	1	pCi/L
08/28/1997	Cs-137	0	0.8	3	pCi/L
02/26/1998	Gross Alpha	-1	2	4	pCi/L
02/26/1998	Gross Beta	2	1	1	pCi/L
02/26/1998	Cs-137	2	1	3	pCi/L
02/26/1998	Co-60	-0.3	0.8	3	pCi/L
02/26/1998	H-3	130	40	50	pCi/L
08/31/1998	H-3	300	50	50	pCi/L
08/31/1998	Gross Alpha	0	2	4	pCi/L
08/31/1998	Gross Beta	3	3	1	pCi/L
08/31/1998	Cs-137	0	1	3	pCi/L
08/31/1998	Co-60	0	1	3	pCi/L
05/13/1998	H-3	354	35	50	pCi/L
05/13/1998	Co-60	0	1	3	pCi/L
05/13/1998	K-40	56.3	23.5	40	pCi/L
05/13/1998	Cs-137	-0.3	0.9	3	pCi/L

Oversight At The 310 Treated Effluent Disposal Facility 1995 - 2006

Collect Date	Analyte	Result	Error	LLD	Units
05/13/1998	Gross Alpha	1	3	4	pCi/L
05/13/1998	Gross Beta	1	4	1	pCi/L
09/03/1998	Cs-137	0	0.02	0.04	pCi/g
09/03/1998	K-40	12	1	0.3	pCi/g
09/03/1998	H-3	280	310	500	pCi/L
09/03/1998	Be-7	3.6	1.1	0.09	pCi/g
02/25/1999	Co-60	1	1	3	pCi/L
02/25/1999	H-3	74	47	50	pCi/L
02/25/1999	Gross Alpha	3.8	1.2	4	pCi/L
02/25/1999	Gross Beta	3.7	1	1	pCi/L
02/25/1999	Cs-137	0	1	3	pCi/L
09/22/1999	H-3	1790	95	50	pCi/L
09/22/1999	Gross Alpha	-0.8	0.9	4	pCi/L
09/22/1999	Gross Beta	0.7	1.4	1	pCi/L
09/22/1999	Cs-137	-1	1	3	pCi/L
09/22/1999	Co-60	0	1	3	pCi/L
10/21/1999	H-3	420	470	500	pCi/L
02/23/2000	H-3	110	50	50	pCi/L
02/23/2000	Cs-137	-0.1	0.5	3	pCi/L
02/23/2000	Gross Beta	9.3	2.1	1	pCi/L
02/23/2000	Gross Alpha	3.5	1.4	4	pCi/L
02/23/2000	Co-60	-0.1	0.4	3	pCi/L
02/23/2000	K-40	35	11	40	pCi/L
08/23/2000	K-40	15	10	40	pCi/L
08/23/2000	Co-60	0.4	0.5	3	pCi/L
08/23/2000	Cs-137	-0.3	0.5	3	pCi/L
08/23/2000	Gross Alpha	1.3	0.9	4	pCi/L
08/23/2000	H-3	113	32	50	pCi/L
08/23/2000	Gross Beta	1.7	1.7	1	pCi/L
02/21/2001	K-40	24	9	40	pCi/L
02/21/2001	H-3	108	44	50	pCi/L
02/21/2001	H-3	200	50	50	pCi/L
02/21/2001	Co-60	0.01	0.39	3	pCi/L
02/21/2001	Gross Beta	7	3	1	pCi/L
02/21/2001	Gross Alpha	4.3	1.5	4	pCi/L
02/21/2001	Cs-137	-0.05	0.42	3	pCi/L
08/22/2001	Co-60	0.07	0.86	3	pCi/L
08/22/2001	H-3	73	42	50	pCi/L
08/22/2001	K-40	50	24	40	pCi/L
08/22/2001	Cs-137	-0.1	0.9	3	pCi/L
08/22/2001	Gross Beta	-1	4	1	pCi/L
08/22/2001	Gross Alpha	-1	2	4	pCi/L
02/20/2002	Gross Beta	3	1	1	pCi/L
02/20/2002	Cs-137	0.23	0.49	3	pCi/L
02/20/2002	K-40	17.5	10.6	40	pCi/L
02/20/2002	Co-60	0.25	0.45	3	pCi/L
02/20/2002	H-3	90	40	50	pCi/L

Washington State Environmental Radiation Monitoring and Assessment Program

Collect Date	Analyte	Result	Error	LLD	Units
02/20/2002	Gross Alpha	4	1	4	pCi/L
08/28/2002	Co-60	0.05	0.89	3	pCi/L
08/28/2002	K-40	2	24	40	pCi/L
08/28/2002	H-3	71	46	50	pCi/L
08/28/2002	Gross Beta	2	0.8	1	pCi/L
08/28/2002	Gross Alpha	1	2	4	pCi/L
08/28/2002	Cs-137	1	0.9	3	pCi/L
02/19/2003	Gross Alpha	1.4	2.2	4	pCi/L
02/19/2003	Gross Beta	2	1	1	pCi/L
02/19/2003	Cs-137	-0.3	1	3	pCi/L
02/19/2003	K-40	54	24	40	pCi/L
02/19/2003	Co-60	0.5	1.1	3	pCi/L
02/19/2003	H-3	443	58	50	pCi/L
08/25/2003	Gross Alpha	0	1.5	4	pCi/L
08/25/2003	H-3	30	40	50	pCi/L
08/25/2003	Co-60	-0.2	0.5	3	pCi/L
08/25/2003	K-40	35	12	40	pCi/L
08/25/2003	Gross Beta	1	4	1	pCi/L
08/25/2003	Cs-137	0.1	0.5	3	pCi/L
02/24/2004	Gross Alpha	2	3	4	pCi/L
02/24/2004	Gross Beta	3	1	1	pCi/L
02/24/2004	Cs-137	0.3	1	3	pCi/L
02/24/2004	Co-60	-0.3	1	3	pCi/L
02/24/2004	H-3	70	30	50	pCi/L
08/25/2004	Cs-137	-0.3	1.2	3	pCi/L
08/25/2004	H-3	160	30	50	pCi/L
08/25/2004	K-40	-16	16	40	pCi/L
08/25/2004	Gross Beta	2.1	0.8	1	pCi/L
08/25/2004	Gross Alpha	2	2	4	pCi/L
08/25/2004	Co-60	0.3	1.1	3	pCi/L
02/23/2005	H-3	38	32	50	pCi/L
02/23/2005	Gross Alpha	3	3	4	pCi/L
02/23/2005	Gross Beta	4	1	1	pCi/L
02/23/2005	Cs-137	0	1	3	pCi/L
02/23/2005	Co-60	0	1	3	pCi/L
08/24/2005	Co-60	0.8	1	3	pCi/L
08/24/2005	H-3	80	30	50	pCi/L
08/24/2005	Cs-137	0.6	1.1	3	pCi/L
08/24/2005	Gross Beta	1.6	0.7	1	pCi/L
08/24/2005	Gross Alpha	-0.3	1.4	4	pCi/L
08/24/2005	K-40	4	19	40	pCi/L
02/21/2006	H-3	100	30	50	pCi/L
02/21/2006	Co-60	0	1	3	pCi/L
02/21/2006	Cs-137	0	1	3	pCi/L
02/21/2006	Gross Beta	2.6	0.8	1	pCi/L
02/21/2006	Gross Alpha	0.5	1.8	4	pCi/L