SGW-65049
Revision 1

200 WEST PUMP AND TREAT NEW FEED STREAM EVALUATION: INTEGRATED DISPOSAL FACILITY LEACHATE

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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Terms

IDF	Integrated Disposal Facility
ILAW	immobilized low-activity waste
IX	ion exchange
LLBG	low-level burial grounds
MSU	modular storage unit
OU	operable unit
P&T	pump and treat

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1 Purpose and Introduction

The purpose of this document is to review the ability of the 200 West pump and treat (P&T) to treat water from the Integrated Disposal Facility (IDF) in accordance with the acceptance criteria in SGW-59872, *Feed Stream Acceptance Criteria for 200 W Pump and Treat.* The acceptance criteria have been adjusted for the suspension of biological activity.

SGW-59872 presents the criteria considered for the IDF leachate to be accepted as a new feed stream and outlines the approval process to accept new feed streams at the 200 West P&T. The process includes an evaluation of the new feed stream by 200 West P&T engineering staff. This document addresses the requirement for the 200 West P&T engineering staff to compare the water quality to the acceptance criteria.

The 200 West P&T serves as a central treatment facility for operable units (OUs) located primarily in the 200 Areas of the Hanford Site. The 200 West P&T also receives purgewater from the 100 Area through the modular storage units (MSUs). The 200 West P&T is currently classified as a below hazard class 3, and as new feed streams are considered, the feed streams must be assessed for the ability of the 200 West P&T to provide adequate treatment and for the impact on hazard classification. Hazard classification is documented in a separate document (SGW-40032, *Soil and Groundwater Remediation Project Facility Hazard Categorization)*.

2 Background of the Integrated Disposal Facility and Integrated Disposal Facility Leachate

The IDF is an engineered disposal site located at the center of the Hanford Site. It is designed to receive immobilized low-activity waste (ILAW) from the Waste Treatment and Immobilization Plant and other low-level waste from Hanford Site operations.

Approximately 212 million L (56 million gal) of radioactive and chemical waste are stored in 177 underground tanks at the Hanford Site. By the end of 2023, low-activity waste from the tanks will be transferred directly to the Low-Activity Waste Facility at the Waste Treatment and Immobilization Plant for treatment. Through vitrification, the waste will be blended with glass-forming materials, heated to 1149°C (2100°F), and poured into stainless-steel containers to cool and solidify. In this glass form, the ILAW is stable.

The IDF will provide permanent, environmentally safe disposition for the ILAW containers and mixed low-level waste streams from Hanford Site operations. Similar in design to the Hanford Site's Environmental Restoration Disposal Facility, the IDF is engineered to protect the groundwater.

A permit modification is required from Washington State to allow the IDF to treat, store, and dispose waste. The modification is expected to be issued in the late summer or fall of 2021.

Leachate from precipitation and dust suppression will be monitored, collected, and treated as necessary. The IDF's two disposal cells can be expanded to accommodate additional capacity. Given the seasonal nature of dust suppression and based on operation of similar systems on the Hanford Site, the IDF leachate is assumed to be an intermittent flow. The flow rate used for this evaluation is discussed in Section 4.1.

The IDF leachate has not yet been chemically characterized because the Waste Treatment and Immobilization Plant is not operational and leachate is not yet being generated. Leachate from mixed waste burial Trenches 31 and 34 is used as a surrogate. The mixed waste trenches (Trenches 31 and 34) are part of the Solid Waste Operations Complex, which includes a combination of treatment, storage, and disposal operating unit groups consisting of the Central Waste Complex, Waste Receiving and Processing Facility, T Plant, and Low-Level Burial Grounds (LLBG) Trenches 31 and 34. The LLBG Trenches 31 and 34 and the associated container storage units are located within the 218-W-5 Burial Ground in the 200 West Area. The LLBG are used to treat, store, and dispose radioactive and chemically dangerous waste from Hanford Site activities. The LLBG Trench 31 waste storage pad dangerous waste management unit and LLBG Trench 34 waste storage pad dangerous waste management unit are located adjacent to and positioned on the apron liner of each corresponding landfill. The landfills were constructed with soil and synthetic liners, as well as leachate collection and removal systems, and began receiving waste for disposal on September 15, 1999. The water from LLBG Trenches 31 and 34 is expected to represent a worst case in terms of water quality.

3 Role of the Modular Storage Units in Evaluation

Two options for treatment of IDF leachate at the 200 West P&T were considered: transfer the water directly to the 200 West P&T for treatment, and pump the water to the MSU tanks first, and then transfer the MSU water to the 200 West P&T for treatment.

The advantage of direct transfer is that the leachate will not mix with the MSU water that could potentially add contaminants from other waste streams. The advantage of a transfer to the MSUs first is that there is an existing pipeline to pump the water to the 200 West P&T. In addition, the established approach for the transfer and treatment of MSU water at the 200 West P&T could be used (DOE/RL-2018-70, *Optimization Pilot Test Results of Treating Water from Modular Storage Units at 200 West Pump and Treat Facility*).

4 Initial Evaluation of Leachate

Table 1 provides a comparison of the leachate from Trenches 31 and 34 compared to the acceptance criteria. The leachate largely meets the acceptance criteria, with the following exceptions:

- The arsenic concentration (50 µg/L) exceeds the acceptance criteria (10 µg/L).
- The iron concentration (1,770 µg/L) exceeds the acceptance criteria (150 µg/L).
- Total dissolved solids concentration (2,980,000 µg/L) exceeds the acceptance criteria (500,000 µg/L).
- The gross alpha values exceed the acceptance criteria and are of concern because the source of the alpha radiation is not known. The ability of the 200 West P&T facility to remove the alpha radiation cannot be determined without knowledge of the source.
- The activities of tritium, technetium-99, and cobalt-60 are not known. Technetium-99 and cobalt-60 yield beta radiation as they decay. Gross beta readings were used in lieu of the activity for these specific constituents. Tritium activity measurements are required before full acceptance can be granted.

When the concentration of a proposed feed stream exceeds the acceptance criteria, the next step in the evaluation is to determine the concentration of these contaminants in a blended influent. Section 4.1 defines the flow rates used to calculate blended concentrations.

Table 1. Water Quality in Trench 31 and Trench 34 Compared to Acceptance Criteria

Contaminant	Cleanup Level or Drinking Water Standard (µg/L or pCi/L for Activity)[a]	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[b]	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[c]	Trench 31 95th Percentile Concentration (µg/L or pCi/L for Activity)[d]	Trench 34 95th Percentile Concentration (µg/L or pCi/L for Activity)[d]	Mixed Waste Burial Trenches (µg/L or pCi/L for Activity)[e]
Contaminants of Concern[f]						
Carbon tetrachloride	3.4	2,125	2,125	No data	No data	<1
Trichloroethene	1	8	7	No data	No data	<1
Hexavalent chromium	48	73	48	<9.19[g]	<22.1	No data
Total chromium	100	100	100	9.19	22.1	25.5
Gross alpha - radon (activity)	15	53	53	257	13	710
Vanadium	None[h]	No criteria	No criteria	26.6	32.8	35.5
Technetium-99 (activity)	540[i]	47,203	540	No data	No data	No data
Manganese	50	15	15	16	16	29.9
Arsenic	10	10	10	18.9	18.9	50.4
Iodine-129 (activity)	1	1.1	1	No data	No data	No data
Uranium	30	4,555	30	20	22.3	27.2
Gross alpha - uranium (activity)	15	2,277	15	257	13	710
Strontium-90 (activity)	8	10	8	No data	No data	No data

Table 1. Water Quality in Trench 31 and Trench 34 Compared to Acceptance Criteria

Contaminant	Cleanup Level or Drinking Water Standard (µg/L or pCi/L for Activity)[a]	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[b]	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[c]	Trench 31 95th Percentile Concentration (µg/L or pCi/L for Activity)[d]	Trench 34 95th Percentile Concentration (µg/L or pCi/L for Activity)[d]	Mixed Waste Burial Trenches (µg/L or pCi/L for Activity)[e]
Nitrate (as N)[j]	10,000	44,000	44,000	31,000	14,700	33,000
Ferrocyanide[k]	200	740,741	200	No data	No data	No data
Free cyanide	4.8	4.8	4.8	2	2	No data
Tritium (activity)	20,000	20,000	20,000	No data	No data	No data
Sulfate	250	250	250	38	81	No data
Contaminants of Interest[l]						
1,1,1-trichloroethane	200	459,770	459,770	No data	No data	<1
1,2-dichlorethane	5	11	11	No data	No data	<1
Chloroform	70	3,570	3,570	No data	No data	<1
Dichloroethenes (all)	70	142,850	142,850	No data	No data	No data
Cobalt-60 (activity)	100	269	100	No data	No data	No data

Table 1. Water Quality in Trench 31 and Trench 34 Compared to Acceptance Criteria

Contaminant	Cleanup Level or Drinking Water Standard (µg/L or pCi/L for Activity)[a]	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[b]	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[c]	Trench 31 95th Percentile Concentration (µg/L or pCi/L for Activity)[d]	Trench 34 95th Percentile Concentration (µg/L or pCi/L for Activity)[d]	Mixed Waste Burial Trenches (µg/L or pCi/L for Activity)[e]
***Resource Conservation and Recovery Act of 1976* Metals Not Covered Elsewhere**						
Barium	2,000	2,000	2,000	59.6	56.5	61
Cadmium	5	5	5	0.095	0.0963	<0.3
Lead	15	15	15	0.713	0.5	4.82
Mercury	2	2	2	0.0807	0.0295	0.075
Selenium	50	50	50	3.67	2.1	0.004
Silver	100	100	100	2.34	2.3	0.005
Constituents with Secondary Maximum Contaminant Limit or That Are Well Foulants[m]						
Iron	150[n]	150	150	1601	350	1,770
Total dissolved solids	500,000	500,000	500,000	793,000	1,629,000	2,980,000
pH[o]	6.5 – 9.5[m]	<7.8	>6.0	7.05 – 8.25	7.81 – 8.91	8.0 – 8.9
Aluminum	75[n]	75	75	No data	No data	No data
Phosphate	100[n]	100	100	No data	No data	No data
Chemical oxygen demand	7,000[n]	7,000	7,000	No data	No data	No data

Table 1. Water Quality in Trench 31 and Trench 34 Compared to Acceptance Criteria

Contaminant	Cleanup Level or Drinking Water Standard (µg/L or pCi/L for Activity)[a]	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[b]	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[c]	Trench 31 95th Percentile Concentration (µg/L or pCi/L for Activity)[d]	Trench 34 95th Percentile Concentration (µg/L or pCi/L for Activity)[d]	Mixed Waste Burial Trenches (µg/L or pCi/L for Activity)[e]

Note: The shaded columns highlight the acceptance criteria for full treatment and central treatment facility.

a. The values listed apply to the 200-ZP-1 Operable Unit. The values listed are recommended to be used as limits in the effluent from the 200 West Area. Values shown are based on the regulatory cleanup level unless noted.

b. Maximum level in the blended stream entering the ion exchange system.

c. Maximum level in the blended stream entering the central treatment facility.

d. Data provided by the Waste and Fuels Management Project.

e. Data provided by Washington River Protection Solutions in email correspondence.

f. Contaminants with a cleanup level or drinking water limit identified in Table 4 of SGW-59872, *Feed Stream Acceptance Criteria for 200 W Pump and Treat*.

g. Hexavalent chromium data are not available but hexavalent chromium is believed to be the majority of total chromium present.

h. No specific cleanup level; refer to Table 2 in SGW-59872.

i. The cleanup level for technetium-99 is 900 pCi/L. An activity of 540 pCi/L has been adopted as a treatment goal at the 200 West P&T.

j. Nitrate treatment has been suspended as of October 2019, as described in DOE/RL-2019-38, *200-ZP-1 Operable Unit Optimization Study Plan*.

k. The primary component of total cyanide measured in groundwater treated by the 200 West P&T is ferrocyanide. Ferrocyanide was used to help separate cesium-137 in some of the storage tanks (PNL-7822, *A Summary of Available Information on Ferrocyanide Tank Wastes*).

l. Contaminants that were identified as potential contaminants in the original mass balance for the 200 West P&T.

m. Limit based on primary drinking water limit.

n. Limit recommended to limit the potential for well fouling.

o. pH is not “removed,” per se, but can be adjusted to some extent.

P&T = pump and treat

4.1 Flow Rates

The acceptance criteria apply to the influent sent to the 200 West P&T for the three treatment areas listed in Section 4.2. The influent represents a blend of water from more than 20 wells. When the leachate is added to the existing blend, the concentration of iron and alpha radiation may be reduced to the point of acceptance. The flow rates used to determine the concentration at the influent to the 200 West P&T are as follows:

- **Well flow to central treatment facility = 9,085 L/min (2,400 gal/min):** The flow to the central treatment facility influent tank is typically about 6,435 L/min (1,700 gal/min). In addition, about 3,028 L/min (800 gal/min) is added directly to the air strippers from extraction transfer building #2.
- **Well flows to uranium ion exchange (IX) = 1,324 L/min (350 gal/min):** This water is from the 200-UP-1, 200-BP-5, and 200-DV-1 OUs.
- **Well flows to technetium-99 IX = 2,839 L/min (750 gal/min):** This water is from the uranium IX, as well as the 200-ZP-1 OU.

A recent review of IDF water monthly production rates by Washington River Protection Solutions found that the maximum was caused by rapid snowmelt in February 2017, resulting in a flow rate of 193 L/min (51 gal/min) over the course of 12 days. This value (193 L/min [51 gal/min]) was used to determine the potential worst-case concentrations in the influent to the 200 West P&T. Note that this value is considered a maximum and is not indicative of the typical flow. The average flow from the IDF leachate is expected to be closer to 3.8 million L/yr (1 million gal/yr).

4.2 Contaminant Concentrations in Blended Feed Stream

Table 2 lists the contaminant concentrations used to evaluate the treatability of the IDF leachate. The concentrations of the existing feed streams represent typical concentrations in samples taken in 2019 from the influent tanks to the following three treatment areas:

- Central treatment facility (air stripping)
- Uranium IX
- Technetium-99 IX

The IDF leachate is not yet available for characterization. This feed stream will not be available until the facility is routinely operating. A plan for treatment of this source must be developed before the facility begins operations. To remedy this apparent conflict, water characterization from leachate generated at Trenches 31 and 34 from the mixed waste burial site (described in Chapter 2) was used.

4.3 Flow-Weighted Average Concentrations

The concentration of select contaminants in the blend was calculated from the flow rates (discussed in Section 4.1) and the concentrations listed in Table 2. Table 2 lists the typical concentrations in select feed streams before addition of the IDF leachate. The concentrations shown serve as the basis for calculating the concentration once IDF leachate is added to the blend.

Table 2. Concentrations of Contaminants in the New Feed Stream and Existing Inlet Tanks

Contaminant	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[a]	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[b]	Assumed Leachate Concentration (µg/L or pCi/L for Activity)[c]	Typical Concentration in Water to Central Treatment Facility (µg/L or pCi/L for Activity)	Typical Concentration in Influent Uranium Ion Exchange (µg/L or pCi/L for Activity)	Typical Concentration in Influent to Technetium-99 Ion Exchange (µg/L or pCi/L for Activity)
Assumed Flow Rate→	**N/A[d]**	**N/A**	**18 gal/min**	**2000 gal/min**	**350 gal/min**	**750 gal/min**
Contaminants of Concern[e]						
Carbon tetrachloride	2,125	2,125	<1	350	30	250
Trichloroethene	8	7	<1	3.2	1	2
Hexavalent chromium	73	48	<22.1	26	6	25
Total chromium	100	100	25.5	26	6	22
Gross alpha - radon (activity)	53	53	710	4	No data	No data
Vanadium	No criteria	No criteria	35.5	24	No data	No data
Technetium-99 (activity)[f,g]	47,203	540	25	125	1,650	1,370
Manganese	15	15	29.9	<1	<1	<1
Arsenic	10	10	50.4	1.9	4	4
Iodine-129 (activity)	1.1	1	No data	0.9	1.5	1
Uranium	4,555	30	27.2	1	150	1
Gross alpha - uranium (activity)	2,277	15	710	4	400	No data
Strontium-90 (activity)	10	8	No data	0.2	5	0.9

Table 2. Concentrations of Contaminants in the New Feed Stream and Existing Inlet Tanks

Contaminant	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[a]	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[b]	Assumed Leachate Concentration (µg/L or pCi/L for Activity)[c]	Typical Concentration in Water to Central Treatment Facility (µg/L or pCi/L for Activity)	Typical Concentration in Influent Uranium Ion Exchange (µg/L or pCi/L for Activity)	Typical Concentration in Influent to Technetium-99 Ion Exchange (µg/L or pCi/L for Activity)
Assumed Flow Rate→	**N/A[d]**	**N/A**	**18 gal/min**	**2000 gal/min**	**350 gal/min**	**750 gal/min**
Nitrate (as N)[h]	30,000	30,000	33,000	25,000	49,000	24,000
Ferrocyanide[i]	740,741	200	No data	1.2	68	5
Free cyanide	4.8	4.8	2	<1	2	1
Tritium (activity)	20,000	20,000	No data	2,200	2,600	2,500
Sulfate	250,000	250,000	81,000	56,000	69,000	7,200
Contaminants of Interest[j]						
1,1,1-trichloroethane	459,770	459,770	<1	<0.3	No data	No data
1,2-dichlorethane	11	11	<1	<0.3	No data	No data
Chloroform	3,570	3,570	<1	4	2	3
Dichloroethenes (all)	142,850	142,850	No data	<0.3	<0.3	<0.3
Cobalt-60 (activity)[g]	269	100	25	0	1.8	0.4
***Resource Conservation and Recovery Act of 1976* Metals Not Covered Elsewhere**						
Barium	2,000	2,000	61	60	No data	No data
Cadmium	5	5	0.0963	<1	<0.1	<0.1
Lead	15	15	4.82	<3.3	<0.1	<0.1
Mercury	2	2	0.0807	<0.067	No data	No data

Table 2. Concentrations of Contaminants in the New Feed Stream and Existing Inlet Tanks

Contaminant	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[a]	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[b]	Assumed Leachate Concentration (µg/L or pCi/L for Activity)[c]	Typical Concentration in Water to Central Treatment Facility (µg/L or pCi/L for Activity)	Typical Concentration in Influent Uranium Ion Exchange (µg/L or pCi/L for Activity)	Typical Concentration in Influent to Technetium-99 Ion Exchange (µg/L or pCi/L for Activity)
Assumed Flow Rate→	**N/A[d]**	**N/A**	**18 gal/min**	**2000 gal/min**	**350 gal/min**	**750 gal/min**
Selenium	50	50	3.67	3	4	3
Silver	100	100	2.34	<1	No data	No data
Constituents with Secondary Maximum Contaminant Limit or That Are Well Foulants[k,l]						
Iron	150	150	1,770	<30	<30	<30
Total dissolved solids	500,000	500,000	2,980,000	43,000	760,000	600,000
pH[m,n]	<7.8	>6.0	7.05 - 8.9	7.2	7.2	7.5
Aluminum	75	75	No data	<19.3	<19.3	<19.3
Phosphate	100	100	No data	<200	<205	<205
Chemical oxygen demand	7,000	7,000	No data	<2,400	No data	No data

Note: The shaded columns highlight the acceptance criteria for full treatment and central treatment facility.

a. Maximum level in the blended stream entering the ion-exchange system.

b. Maximum level in the blended stream entering the central treatment facility.

c. Greatest concentration of Trench 31, Trench 34, and combined in Table 1.

d. Not applicable.

e. Contaminants with a cleanup level or drinking water limit identified in Table 4 of SGW-59872, *Feed Stream Acceptance Criteria for 200 W Pump and Treat*.

f. The cleanup level for technetium-99 is 900 pCi/L. An activity of 540 pCi/L has been adopted at the 200 West P&T.

g. Technetium-99 and cobalt-60 data are not available. Gross beta is used as a conservative estimate.

h. Nitrate treatment has been suspended as of October 2019, as described in DOE/RL-2019-38, *200-ZP-1 Operable Unit Optimization Study Plan*.

i. The primary component of total cyanide measured in groundwater treated by the 200 West P&T is ferrocyanide. Ferrocyanide was used to help separate cesium-137 in some of the storage tanks (PNL-7822, *A Summary of Available Information on Ferrocyanide Tank Wastes*).

Table 2. Concentrations of Contaminants in the New Feed Stream and Existing Inlet Tanks

Contaminant	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[a]	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[b]	Assumed Leachate Concentration (µg/L or pCi/L for Activity)[c]	Typical Concentration in Water to Central Treatment Facility (µg/L or pCi/L for Activity)	Typical Concentration in Influent Uranium Ion Exchange (µg/L or pCi/L for Activity)	Typical Concentration in Influent to Technetium-99 Ion Exchange (µg/L or pCi/L for Activity)
Assumed Flow Rate→	**N/A[d]**	**N/A**	**18 gal/min**	**2000 gal/min**	**350 gal/min**	**750 gal/min**

j. No specific cleanup level; refer to Appendix F, Table F in SGW-59872.

k. Contaminants that have secondary drinking water limits that may be present in the water processed at the 200 West P&T.

l. Limit recommended to limit the potential for well fouling.

m. Limit based on primary drinking water limit.

n. pH is not "removed," per se, but can be adjusted to some extent.

N/A = not applicable

P&T = pump and treat

The blended concentration was calculated for each constituent as follows:

$$blended\ concentration\ to\ central\ treatment = \frac{(concentration\ in\ leachate\ x\ leachate\ flow) + (existing\ inlet\ tank\ concentration\ x\ existing\ flow)}{(total\ flow\ including\ leachate)}$$

The arsenic concentration, if the leachate is added to the existing central treatment facility inlet tank (called the equalization tank), is calculated as follows:

$$Blended\ arsenic\ concentration = \frac{\left(50.4\ \frac{\mu g}{L} \times 51 \frac{gal}{min}\right) + \left(1.9 \frac{\mu g}{L} \times 2000 \frac{gal}{min}\right)}{2051 \frac{gal}{min}}$$

$$Blended\ arsenic\ concentration = 3.1\ \frac{\mu g}{L}$$

The calculated blended concentration added to the equalization tank is 3.1 µg/L, which meets the acceptance criteria (10 µg/L).

Table 3 lists the calculated blended concentrations in the inlet tanks that feed the central treatment facility and uranium IX feed streams, as well as the acceptance criteria for these locations. The values shown in Table 3 serve two functions: to compare to acceptance criteria, and to determine whether the IDF leachate should be introduced to the equalization tank or the IX inlet tank. From an operations perspective, it is preferable to add an intermittent flow stream to the equalization tank rather than to the IX inlet tank. The flow to the IX inlet tank is lower, and the IDF leachate takes a larger percentage of the IX treatment capacity and, thus, is more disruptive to routine operation.

Table 3. Feed Stream Concentrations Based on IDF Leachate Mixing with Existing Feed Streams

Contaminant	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[a]	Calculated Concentration in Blend Uranium Ion Exchange (µg/L or pCi/L for Activity)	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[b]	Calculated Concentration in Blend to Central Treatment Facility (µg/L or pCi/L for Activity)
Contaminants of Concern[c]				
Carbon tetrachloride	2,125	26	2,125	340
Trichloroethene	8	1	7	3
Hexavalent chromium	73	8	48	26
Total chromium	100	8	100	26
Gross alpha - radon (activity)	53	No data	53	25
Vanadium	No criteria	No data	No criteria	24
Technetium-99 (activity)[d,e]	47,203	1,443	540	122
Manganese	15	5	15	2

Table 3. Feed Stream Concentrations Based on IDF Leachate Mixing with Existing Feed Streams

Contaminant	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[a]	Calculated Concentration in Blend Uranium Ion Exchange (µg/L or pCi/L for Activity)	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[b]	Calculated Concentration in Blend to Central Treatment Facility (µg/L or pCi/L for Activity)
Arsenic	10	10	10	3
Iodine-129 (activity)	1.1	No data	1	No data
Uranium	4,555	134	30	2
Strontium-90 (activity)	10	No data	8	No data
Nitrate (as N)	44,000	46,965	44,000	25,233
Ferrocyanide	740,741	No data	200	No data
Free cyanide	4.8	2	4.8	1
Tritium (activity)	20,000	No data	20,000	No data
Sulfate	250,000	70,526	250,000	56,728
Contaminants of Interest[f]				
1,1,1-trichloroethane	459,770	No data	459,770	0.3
1,2-dichlorethane	11	No data	11	0.3
Chloroform	3,570	2	3,570	4
Dichloroethenes (all)	142,850	No data	142,850	No data
Cobalt-60 (activity)[e]	269	5	100	1
***Resource Conservation and Recovery Act of 1976* Metals Not Covered Elsewhere**				
Barium	2,000	No data	2,000	60
Cadmium	5	0	5	1
Lead	15	1	15	3
Mercury	2	0.07	2	0.07
Selenium	50	4	50	3
Silver	100	1	100	1
Constituents with Secondary Maximum Contaminant Limit or That Are Well Foulants				
Iron	150	251	150	81
Total dissolved solids	500,000	1,042,344	500,000	128,544
pH	<7.8	7	>6.0	7.2
Aluminum	75	No data	75	No data

Table 3. Feed Stream Concentrations Based on IDF Leachate Mixing with Existing Feed Streams

Contaminant	Acceptance Criteria – Full Treatment (Treatment by Ion Exchange and Air Stripping) (µg/L or pCi/L for Activity)[a]	Calculated Concentration in Blend Uranium Ion Exchange (µg/L or pCi/L for Activity)	Acceptance Criteria Central Treatment Facility (Treatment by Air Stripping) (µg/L or pCi/L for Activity)[b]	Calculated Concentration in Blend to Central Treatment Facility (µg/L or pCi/L for Activity)
Phosphate	100	No data	100	No data
Chemical oxygen demand	7,000	No data	7,000	No data

Note: The shaded columns highlight the acceptance criteria for full treatment and central treatment facility.

a. Maximum level in the blended stream entering the ion-exchange system.

b. Maximum level in the blended stream entering the central treatment facility.

c. Contaminants with a cleanup level or drinking water limit identified in Table 4 of SGW-59872, *Feed Stream Acceptance Criteria for 200 W Pump and Treat*.

d. The cleanup level for technetium-99 is 900 pCi/L. An activity of 540 pCi/L has been adopted at the 200 West P&T.

e. Technetium-99 or cobalt-60 data are not available for IDF leachate. Gross beta (25 pCi/L) is used in lieu of activity for technetium-99 or cobalt-60.

f. No specific cleanup level; refer to Table 2 in SGW-59872.

IDF = Integrated Disposal Facility

P&T = pump and treat

A number of constituents have yet to be evaluated for the IDF leachate feed stream before full acceptance can be determined. However, based on the constituents that are known, the feed stream can be treated at the 200 West P&T. Furthermore, it appears that treatment by the central treatment facility will be sufficient. Treatment through IX is not needed to meet the cleanup levels in the treated effluent while treating IDF leachate. In addition, the high total dissolved solids value in the blend to uranium IX (1,042,344 µg/L) may interfere with the IX process and decrease the resin life.

Regarding whether to transfer the water to the MSUs first or to transfer directly to the 200 West P&T, there is no strong recommendation based on water chemistry. The IDF feed stream can be treated directly or after mixing with MSU water. However, given that neither the water quality nor the flow rate are well defined, it would be best to transfer the water to the MSUs first. The MSUs are approximately 3.8 million L (1 million gal) and would provide a way to buffer changes in water quality and flow rate. In addition, there are documented steps to evaluate the nature of the water in the MSUs prior to transfer. The MSU water approach provides established steps to be taken by engineering and operations should the concentration of any contaminant exceed the acceptance criteria. These steps would be available to accommodate change in the nature of the IDF leachate water. The use of an existing approach avoids the development of a parallel approach that may at times conflict with existing practices.

This feed stream does not contain enough activity to cause an immediate impact on the hazard classification and should not be rejected for this reason.

5 Summary and Conclusions

This evaluation was completed to determine if leachate from the IDF can be treated at the 200 West P&T. The IDF leachate is not yet available for characterization; therefore, for this evaluation, this report used leachate from mixed waste burial Trenches 31 and 34 as a surrogate. A worst-case scenario based on the highest concentration of contaminant and the maximum expected flow was used to evaluate treatability.

This evaluation remains incomplete until the remaining contaminant concentrations are determined. The contaminants that remain undefined include the following:

- Iodine-129
- Strontium-90 (total radiostrontium is used onsite as a surrogate)
- Ferrocyanide
- Tritium
- Total dichlorethenes
- Aluminum
- Phosphate
- Chemical oxygen demand

An evaluation based on the known data indicates that once blended with typical influent water, the resulting influent meets the acceptance criteria documented in SGW-59872.

The IDF leachate can either be blended at the 200 West P&T in the equalization tank or can be transferred to the MSUs first. Transferring the IDF leachate to the MSUs is recommended, wherein the existing equipment and approach to transfer the MSU water to the 200 West P&T can be used.

This document is currently being issued as Revision 1 but remains incomplete until additional water quality date are available. Once the data are available, this document will be revised and reissued as Revision 2.

6 References

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