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Status Update for Implementing Best Available Technology per DOE Order 5400.05

September 2002

Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

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Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho 83415

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ABSTRACT

This report identifies discharges of liquid waste streams that require documentation of the Best Available Technology selection process at Bechtel BWXT Idaho, LLC, operated facilities at the Idaho National Engineering and Environmental Laboratory. The Best Available Technology selection process is conducted according to Department of Energy Order 5400.5, Chapter II (3), “Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns” and Department of Energy guidance. Only those liquid waste streams and facilities requiring the Best Available Technology selection process are evaluated in further detail. In addition, this report will be submitted to the Department of Energy Idaho Operations Office Field Office manager for approval according to DOE Order 5400.5, Chapter II, Section 3.b.(1).

Two facilities (Idaho Nuclear Technology and Engineering Center existing Percolation Ponds and Test Area North/Technical Support Facility Disposal Pond) at the Idaho National Engineering and Environmental Laboratory required documentation of the Best Available Technology selection process (Section 4). These two facilities required documentation of the Best Available Technology selection process because they discharge wastewater that may contain process-derived radionuclides to a soil column even though the average radioactivity levels are typically below drinking water maximum contaminant levels. At the request of the Department of Energy Idaho Operations Office, the 73.5-acre Central Facilities Area Sewage Treatment Plant land application site is included in Section 4 of this report to ensure the requirements of DOE Order 5400.5, Chapter II, Section 3 are met. The Central Facilities Area Sewage Treatment Plant effluent contains process-derived radionuclides from radioactive tracers used in certain analytical procedures. The radioactivity levels of these radionuclides are below maximum contaminant levels.

According to Department of Energy guidance, “If the liquid waste stream is below maximum contaminant levels, then the goals of the Best Available Technology selection process are being met and the liquid waste stream is considered *clean water*. However, it is necessary to document this through the Best Available Technology selection process.” Because liquid waste streams below maximum contaminant levels are already considered “clean water,” additional treatment technologies are considered unnecessary and are not addressed in this report.

CONTENTS

ABSTRACT iii

ACRONYMS vii

1. INTRODUCTION 1

2. OVERVIEW OF THE BEST AVAILABLE TECHNOLOGY SELECTION PROCESS 2

   2.1 Applicability of the Best Available Technology Selection Process 2

   2.2 Liquid Discharges Not Requiring the Best Available Technology Selection Process 3

   2.3 Radiological Evaluations 3

   2.4 Liquid Waste Streams Requiring Documentation of the Best Available Technology Selection Process 4

   2.5 Best Available Technology Selection Process 5

3. LIQUID DISCHARGES REQUIRING FURTHER EVALUATION 6

4. FACILITIES REQUIRING DOCUMENTATION OF THE BEST AVAILABLE TECHNOLOGY SELECTION PROCESS 7

   4.1 Central Facilities Area Facility Requiring Best Available Technology Selection Process 8

      4.1.1 Central Facilities Area Sewage Treatment Plant General Information 9
      4.1.2 Sources and Controls for Radionuclide Contamination 9
      4.1.3 Radiological Sample Results 10
      4.1.4 Conclusion 10

   4.2 Idaho Nuclear Technology and Engineering Center Facilities Requiring Best Available Technology Selection Process 11

      4.2.1 Idaho Nuclear Technology and Engineering Center Service Waste System and Percolation Pond General Information 11
      4.2.2 Interim Control Strategy 13
      4.2.3 Sources and Controls for Radionuclide Contamination 13
      4.2.4 Radiological Sample Results 14
      4.2.5 Conclusion 15

   4.3 Test Area North Facilities Requiring Best Available Technology Selection Process 16

      4.3.1 Test Area North/Technical Support Facility Sewage Treatment Facility Disposal Pond General Information 16
      4.3.2 Interim Control Strategy 16
      4.3.3 Sources and Control for Radionuclide Contamination 18
      4.3.4 Radiological Sample Results 18
      4.3.5 Conclusion 19

5. CONCLUSION 20

6. REFERENCES 21

FIGURES

1. Idaho National Engineering and Environmental Laboratory facilities 7

2. Map of Central Facilities Area 8

3. Map of Idaho Nuclear Technology and Engineering Center 12

4. Map of Test Area North/Technical Support Facility 17

TABLES

1. Liquid waste streams applicable to Best Available Technology selection process 2

2. INEEL facilities requiring documentation of Best Available Technology selection process 4

3. Septic tanks and associated buildings at the Idaho Nuclear Technology and Engineering Center 6

4. Test Area North/Technical Support Facility Sewage Treatment Facility (TAN-655) effluent radiological data for Calendar Year 2001 18

ACRONYMS

BAT	Best Available Technology
BBWI	Bechtel BWXT Idaho, LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
DCG	Derived Concentration Guide
DEQ	Department of Environmental Quality
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
ER	Environmental Restoration
ICARE	Issue Communication and Resolution Environment
ICS	interim control strategy
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LET&D	Liquid Effluent Treatment and Disposal
MCL	maximum contaminant level
NEPA	National Environmental Policy Act
pCi/L	picocuries per liter
PEW	Process Equipment Waste
ROD	Record of Decision
STF	sewage treatment facility
STP	sewage treatment plant
TAN	Test Area North
TSF	Technical Support Facility
WGS	Waste Generator Services
WLAP	Wastewater Land Application Permit

Status Update for Implementing Best Available Technology per DOE Order 5400.5

1. INTRODUCTION

This report identifies the discharges of liquid waste streams that require documentation of the Best Available Technology (BAT) selection process at Bechtel BWXT Idaho, LLC (BBWI)-operated facilities at the Idaho National Engineering and Environmental Laboratory (INEEL). The Best Available Technology selection process is conducted according to Department of Energy (DOE) Order 5400.5, Chapter II (3), "Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns"[1] and DOE guidance. In addition, DOE-Idaho Operations Office (DOE-ID) will submit this report to their field office manager for approval according to DOE Order 5400.5, Chapter II, Section 3.b.(1).

Last year's "Status Update for Implementing Best Available Technology per DOE Order 5400.5"[2] was reviewed. The purpose of the review was to identify those liquid waste streams and/or facilities that require documentation of the BAT selection process or further evaluation. In addition, BBWI-operated facilities were reviewed to determine if any previously unidentified liquid waste streams require the BAT selection process.

It was determined from the review, that only liquid waste streams that will continue to be discharged to soil columns for indefinite periods and that contain process-derived radionuclides require documentation of the BAT selection process. Currently no liquid waste streams containing process-derived radionuclides discharge to surface waters, and no liquid waste streams discharge to a sanitary sewerage at greater than five times derived concentration guide[3] (DCG) values for radionuclides.

For this report, liquid waste (wastewater) from the following INEEL sources were reviewed:

- Sewage treatment plants (STPs)
- Routine operations that produce process wastewater
- Septic tanks
- Nonroutine projects, such as environmental restoration (ER), decontamination and decommissioning, surveillance, and maintenance.

2. OVERVIEW OF THE BEST AVAILABLE TECHNOLOGY SELECTION PROCESS

2.1 Applicability of the Best Available Technology Selection Process

The BAT selection process is applicable to those liquid waste streams identified in Table 1.

Table 1. Liquid waste streams applicable to Best Available Technology selection process.

Liquid Waste Stream	Requirement
Liquid wastes containing radionuclides from DOE activities which are discharged to surface water. The BAT selection process is used if the surface waters otherwise would contain, at the point of discharge and prior to dilution, radioactive material at an annual average concentration greater than the DCG values in liquids given in Chapter III of DOE Order 5400.5. **NOTE:** *For the purposes of BAT and DOE Order 5400.5, "surface water" is defined as naturally occurring waters such as rivers, streams, lakes and springs when flowing in their natural channels.*	DOE Order 5400.5, Chapter II, Section 3.a.
Liquid waste streams that will continue to be discharged to soil columns for indefinite periods and which contain **process-derived** radionuclides.	DOE Order 5400.5, Chapter II, Section 3.b.(1)
Liquid wastes discharged from DOE activities into sanitary sewerage containing radionuclides at concentrations, averaged monthly, that would otherwise be greater than five times the DCG values for liquids at the point of discharge.	DOE Order 5400.5, Chapter II, Section 3.d

In addition, DOE Headquarters has provided the following guidance[a]:

- If a liquid waste stream is below 1 DCG and BAT is being implemented, the discharge is considered to be *clean water* (from a radiological standpoint) and not a discharge to a soil column under DOE Order 5400.5. That is, the soil column is not functioning as a *treatment system* to remove radionuclides.

- If the liquid waste stream meets BAT (determined there is no need for further treatment or process modifications required to reduce radionuclide concentrations) and is below 1 DCG but is above the radiological maximum contaminant levels[4] (MCLs), it is acceptable to discharge *clean water* to the soil.

a. James R. Cooper, DOE-ID, e-mail to Brett R. Bowhan, R. M. Kauffman, etc., "Perc Pond Update," February 5, 2001, 10:38 a.m., CCN 35553.

- If the liquid waste stream is at or below MCLs, this indicates that the goals of the BAT selection process are being met and the liquid waste stream is considered *clean water*. However, it is necessary to document this through the BAT selection process.

2.2 Liquid Discharges Not Requiring the Best Available Technology Selection Process

The following examples of liquid discharges to the soil were determined not to require documentation of the BAT selection process:

- Storm water that may be contaminated as a result of radiological contamination from atmospheric deposition or past operating practices (residual radioactive material). The BAT selection process only applies for process-derived radionuclides at the point of discharge from the conduit to the environment.

- Production water, potable water, firewater, steam condensate, etc., that has not passed through a radiologically contaminated process.

- Street and building wash water. Radiological contamination would be from atmospheric deposition or past operating practices (residual radioactive material) and not considered process derived.

- Liquid discharges to evaporation ponds.

- INEEL well purge water. Radiological contamination would be from atmospheric deposition or past operating practices (residual radioactive material) and not considered process derived. However, as a best management practice in order to minimize impacts to human health and the environment, BBWI applies the radiological MCLs as a screening tool for disposal of purge water.

2.3 Radiological Evaluations

The INEEL has used a number of different references or screening values to evaluate wastewater for its associated risk to human health and the environment. Four of these references are:

- DCGs

- MCLs

- 10 Code of Federal Regulations (CFR) 20 "Standards for Protection Against Radiation"[5]

- Release levels from the draft *INEEL Management Guidance for Disposal of Wastewater*.[6]

The objective of using these references is to meet DOE requirements, protect human health, and minimize potential future environmental characterization and cleanup liability at INEEL wastewater disposal sites.

Currently, for radiological contaminants in wastewater, MCLs are the primary standard used at BBWI-controlled facilities at the INEEL to determine acceptable release levels to a soil column.

2.4 Liquid Waste Streams Requiring Documentation of the Best Available Technology Selection Process

Table 2 shows the three facilities requiring documentation of the BAT selection process, the justification, and applicability. The average radioactivity levels in the effluent discharged to these three facilities are typically below MCLs. As indicated in the guidance in Section 2.1, when the liquid waste stream is at or below MCLs, the goals of the BAT selection process are being met and the waste stream is considered clean water from a radiological standpoint. However, this must be documented through the BAT selection process.

Table 2. INEEL facilities requiring documentation of Best Available Technology selection process.

Facility	Justification for BAT Selection Process	Applicability
Idaho Nuclear Technology and Engineering Center (INTEC) existing Percolation Ponds	Liquid waste streams potentially containing process-derived radionuclides will continue to be discharged to a soil column for an indefinite period.	Low potential for inadvertent releases (for example, equipment failures) of process-derived radionuclides. Facility may be used for disposal of individual waste streams containing process-derived radionuclides.
Test Area North/Technical Support Facility (TAN/TSF) Sewage Treatment Facility (STF) Disposal Pond	Liquid waste streams potentially containing process-derived radionuclides will continue to be discharged to a soil column for an indefinite period.	Low potential for inadvertent releases (for example, equipment failures) of process-derived radionuclides. Facility may be used for disposal of individual waste streams containing process-derived radionuclides.
Central Facilities Area (CFA) Sewage Treatment Plant (STP)	DOE-ID request	Discharge of wastewater containing radioactive tracers used in certain analytical procedures. Facility may be used for disposal of additional waste streams containing process-derived radionuclides. CFA STP wastewater is then discharged to a 73.5-acre land application site.

2.5 Best Available Technology Selection Process

Typically, selection of BAT for a specific application is made from among candidate alternative treatment technologies. Those alternative treatment technologies are identified by an evaluation process according to DOE Order 5400.5, Chapter II, Section 3.a.(1)(a). The evaluation process includes factors related to technology, economics, and public policy considerations.

As discussed in Section 2.1, if the liquid waste stream is at or below MCLs, the goals of the BAT selection process are being met and the liquid waste stream is considered “clean water.” The guidance further states that this must be documented through the BAT selection process. However, because the radioactivity levels in the wastewater discharged from the three facilities identified in Section 2.4 are typically at or below MCLs, alternative treatment technologies were not analyzed.

3. LIQUID DISCHARGES REQUIRING FURTHER EVALUATION

Seven septic tanks (Table 3) at the Idaho Nuclear Technology and Engineering Center (INTEC) were identified in the previous annual report. Preliminary characterization had been performed. However, final characterization of the septic tanks has not been completed.

Presented below is a discussion on the current status of these tanks and the applicability of the BAT selection process. **NOTE:** *The term "characterization" as used in the discussion below, refers to characterizing the waste through process knowledge, analytical data, or a combination of both and is left to the discretion of the responsible manager.*

Water lines to buildings CPP T-1 and T-5 have been secured (shut-off), and waste is no longer discharged to VES-YDB-102. Closure of the two buildings is planned for FY-2002. The contents of VES-YDB-102 shall be characterized prior to disposal and the tank abandoned in accordance with IDAPA 58.01.03 ("Individual and Subsurface Sewage Disposal Rules"[7]) and company procedures. Because there is no longer a discharge to a soil column, the BAT selection process does not apply.

Sanitary waste is still discharged to VES-CFE-6012 and VES-CFE-6013. It is expected that potable water in the buildings that discharge to these tanks will be secured in the fall of 2002. Once the discharge to the tanks has been secured, the BAT selection process no longer applies. However, final closure of the tanks will not occur until the future of the Coal Fired Steam Generation Facility has been determined. Whether the final decision is to utilize or close the facility, the contents of the septic tanks shall be characterized.

Septic tank VES-CW-100 was sampled, and radiological analyses were performed. The validated data have been received. The data will be evaluated to determine the status of the tank contents (above or below MCLs for radionuclides) or whether further characterization is required. Applicability of the BAT selection process can be determined once the final characterization is complete.

Further evaluation of septic tanks VES-MA-107, VES-CA-101, and ST-SFE-102 is under consideration. It will be determined whether additional characterization is required. Once the final characterization for these tanks is complete, applicability of the BAT selection process can be determined.

New information on the characterization efforts will be provided in the 2003 report.

Table 3. Septic tanks and associated buildings at the Idaho Nuclear Technology and Engineering Center.

Tank	Buildings
VES-YDB-102	For CPP-T1 & T5
VES-CFE-6012	For CPP-687
VES-CFE-6013	For CPP-696 and overflow from VES-CFE-6012
VES-CW-100	For CPP-655
VES-MA-107	For CPP-662
VES-CA-101	For CPP-656
ST-SFE-102	New tank for CPP-626

4. FACILITIES REQUIRING DOCUMENTATION OF THE BEST AVAILABLE TECHNOLOGY SELECTION PROCESS

The following sections describe the BBWI-operated facilities (Central Facilities Area [CFA], Idaho Nuclear Technology and Engineering Center [INTEC], Test Area North/Technical Support Facility [TAN/TSF]; see Figure 1) that require the BAT selection process, their respective wastewater disposal sites, and review of the potential to discharge radionuclides.

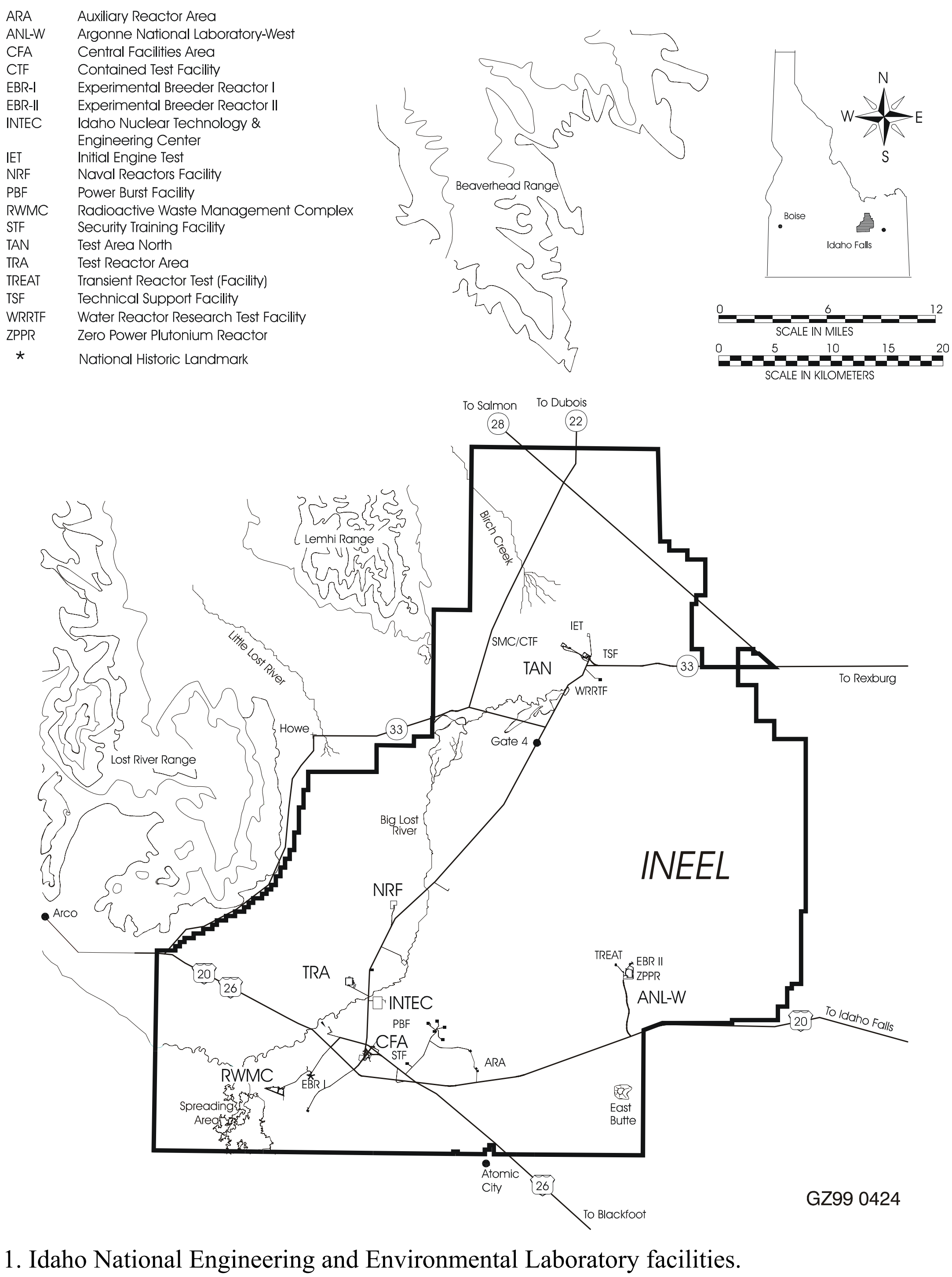

Figure 1. Idaho National Engineering and Environmental Laboratory facilities.

4.1 Central Facilities Area Facility Requiring Best Available Technology Selection Process

The CFA Sewage Treatment Plant (STP) serves all major facilities at CFA (Figure 2). The STP is southeast of the CFA area, approximately 2,200 ft downgradient of the nearest drinking water well . Wastewater from the CFA STP is applied to a maximum of 73.5-acres (maximum of 65-acres when end gun is not in use) by a pivot sprinkler system. The CF-625 laboratory uses radionuclide tracers while performing bioassay analyses. These radionuclides (considered process-derived) are discharged to the CFA STP.

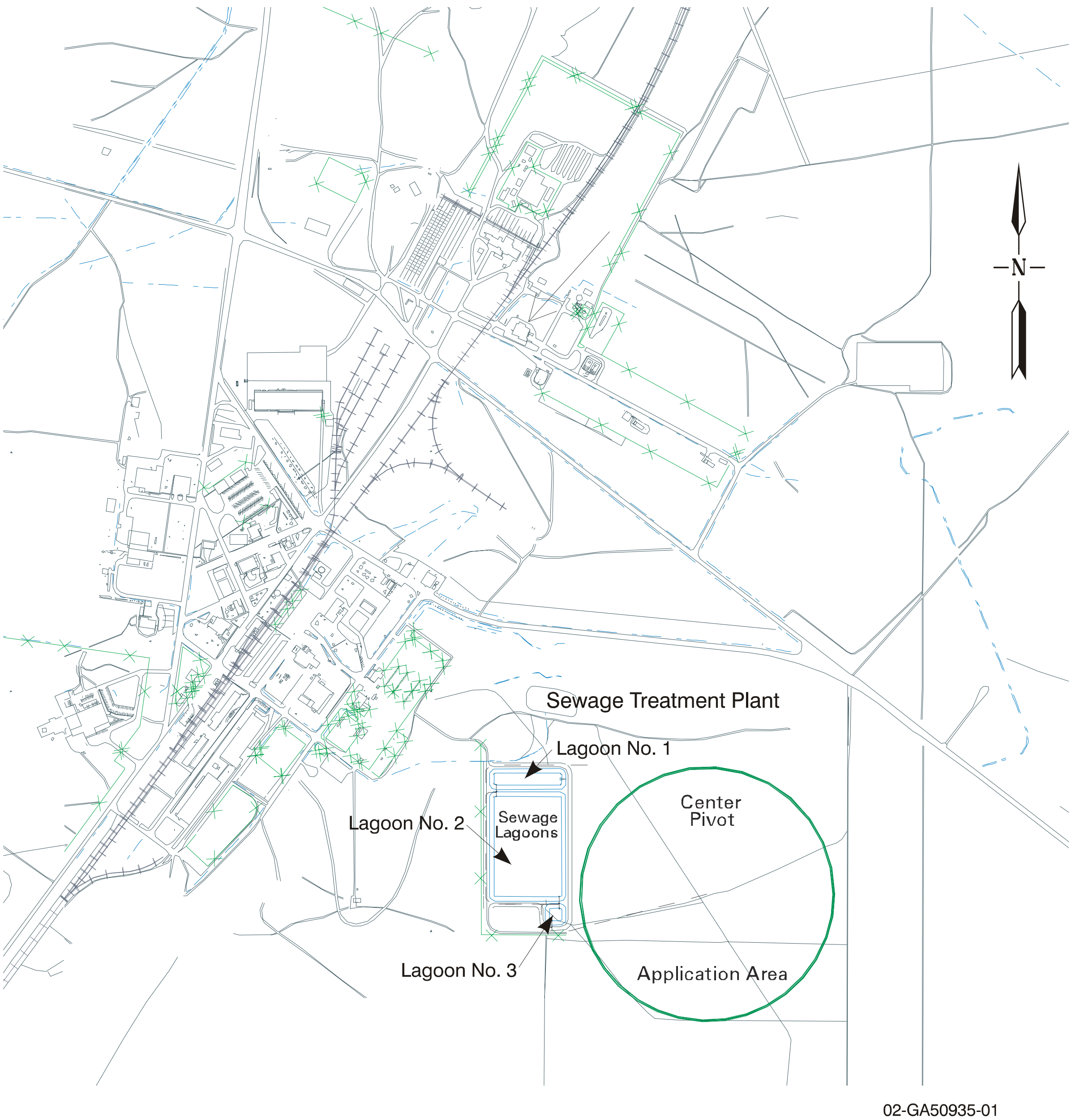

Figure 2. Map of Central Facilities Area.

4.1.1 Central Facilities Area Sewage Treatment Plant General Information

The CFA STP was built in 1994 and put into service on February 6, 1995. It processes approximately 110,000 gallons per day (gpd) of water from sanitary sewage drains throughout the CFA. Wastewater is derived from restrooms, showers, and the cafeteria, a significant portion of which is comprised of noncontact cooling water from air conditioners and heating systems. This large volume of cooling water dilutes and weakens the wastewater effluent. Other contributing discharge sources include those from bus and vehicle maintenance areas, analytical laboratories, and a medical dispensary.

The STP consists of:

- 1.7-acre partial-mix, aerated lagoon (Lagoon No. 1)
- 10.3-acre facultative lagoon (Lagoon No. 2)
- 0.5-acre polishing pond (Lagoon No. 3)
- Sprinkler pivot irrigation system, which applies wastewater on up to 73.5 acres of native desert rangeland.

Wastewater is collected at the lift station and pumped under pressure to Lagoon No. 1. Floating-type aerators mix, aerate, and agitate the wastewater within the cell of the first lagoon. Under normal operation, the wastewater flows by gravity from Lagoon No. 1 to Lagoon No. 2 and into Lagoon No. 3. The wastewater flows through an outlet structure in Lagoon No. 3 and is pumped out to the center pivot irrigation system.

A 400-gallon-per-minute pump applies wastewater from the lagoons to the land through a computerized center pivot system. The center pivot operates at low pressures (30 lbs/in.^{2}) to minimize aerosols and spray drift. The Wastewater Land Application Permit (WLAP) limits wastewater application to 25 acre-in./acre/year from March 15 through November 15 and limits leaching losses to 3 in./year.[8]

On July 25, 1994, the State of Idaho Department of Environmental Quality (DEQ) issued a WLAP for the CFA STP. That WLAP expired on August 7, 1999. However, DEQ issued a letter authorizing the continued operation of the CFA STP under the original WLAP on September 18, 2000.[9] The authorization is effective until DEQ issues a new WLAP.

4.1.2 Sources and Controls for Radionuclide Contamination

Analyses on bioassay samples (urine and fecal matter) are performed at the CF-625 laboratory. Minute quantities of radioactive tracers are added to the samples prior to the analysis. Therefore, the wastewater generated during these analyses, contain both process-derived and naturally occurring radionuclides. Approximately 330 gallons of this wastewater was generated in 2001 and discharged to the CFA STP. It has been determined through analysis and process knowledge that the radioactivity levels in the wastewater are below MCLs prior to discharge into the sewage system.[a]

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a. A. R. Bhatt, INEEL, e-mail to M. G. Lewis, "Radionuclide Discharges to the CFA Sewage Treatment Plant," July 11, 2002, 1:32 p.m., CCN 35554.

4.1.3 Radiological Sample Results

Duplicate samples were collected on June 27, 2001, from the CFA-STF (CFA-STF is the designation for the sampling point located just prior to the wastewater being discharged to the sprinkler pivot) and analyzed for gross alpha, gross beta, and gamma spectroscopy. The results are as follows:

- Gross alpha—All results reported as undetected at 1.2 pCi/L for the sample and 0.7 pCi/L for the duplicate sample. The results were considerably less than the MCL of 15 pCi/L for gross alpha.

- Gross beta—Detected in both the sample and duplicate sample. The sample result was 4.72 pCi/L, and the duplicate sample result was 6.54 pCi/L. Although there is no MCL for gross beta, for comparison, the results were below the conservative gross beta screening level of 15 pCi/L for community water systems utilizing waters contaminated by a nuclear facility (40 CFR 141.26.b(1)(i). It is expected that naturally occurring radionuclides (for example, potassium-40) in sanitary waste are contributing to the gross beta activity.

- Gamma spectroscopy—All results reported as undetected.

4.1.4 Conclusion

The radioactivity levels in the CFA STP effluent show that the wastewater is below MCLs. As discussed in Section 2, wastewater below MCLs indicates that the goals of the BAT selection process are being met and that the wastewater is considered “clean” for radionuclides. However, this must be documented through the BAT selection process.

The radioactivity levels in the wastewater discharged from the CFA STP to the land application area are already below MCLs. After applying the cost consideration component of the BAT selection process, it was apparent that any additional treatment would be unjustifiable and too costly for the minimal benefit.

By procedure, the responsible manager must not generate a liquid waste without a means for disposing of it. The Waste Generator Services (WGS), at the request of the responsible manager or designee, evaluates discharges (other than from new projects) to the CFA STP that may contain process-derived radionuclides. The mission of the WGS is “to provide the INEEL on-site and off-site waste generators with professional waste management services and to disposition legacy and newly generated waste in a safe, compliant, timely, and cost effective manner.” The WGS ensures the liquid waste is disposed of according to federal, state, and local regulations, and DOE orders. For new projects, the generation of liquid waste is evaluated through the National Environmental Policy Act (NEPA)/Environmental Checklist process.

Before discharging any new liquid waste streams containing process-derived radionuclides into the CFA STP, an evaluation is performed. To ensure the effluent discharged from the CFA STP complies with DOE Order 5400.5, newly identified liquid waste streams must be below MCLs prior to discharge into the CFA STP. Completion of the BAT selection process is required if the radioactivity in the wastewater is above MCLs but below 1 DCG. The BAT selection process determines if the wastewater requires additional treatment prior to discharge.

4.2 Idaho Nuclear Technology and Engineering Center Facilities Requiring Best Available Technology Selection Process

At INTEC (see Figure 3), the main wastewater discharges to the environment are the effluent from the sewage treatment plant to the rapid infiltration trenches and effluent from the Service Waste System to the existing Percolation Ponds. Since only sanitary wastewater is discharged to the sewage treatment plant, the BAT selection process does not apply. This section (Section 4.2) of the report addresses the INTEC existing Percolation Ponds through August 25, 2002. However, the information pertaining to the Service Waste System, including radioactivity levels and wastewater characterization activities and requirements, apply to the INTEC new Percolation Ponds. **Note:** *Beginning August 26, 2002, service waste wastewater was routed to the new Percolation Ponds. At the same time, flow to the existing Percolation Ponds was ceased. The existing Percolation Ponds have been taken out of service, and additional use of these ponds for disposal of wastewater is not expected. The new Percolation Ponds will be addressed in detail during the next annual update of this report.*

Documentation of the BAT selection process applies to the INTEC existing Percolation Ponds due to the potential for inadvertent releases (for example, due to equipment failures) of radionuclides to this facility. In addition, the INTEC existing Percolation Ponds may be used for disposal of individual waste streams containing process-derived radionuclides. Only those individual waste streams that have received the appropriate approval may be discharged.

4.2.1 Idaho Nuclear Technology and Engineering Center Service Waste System and Percolation Pond General Information

The Service Waste System collects the process wastewater generated at the INTEC. The wastewater consists primarily of noncontact cooling water, steam condensate, reverse osmosis regenerate, water softener, boiler blowdown wastewater, and other nonhazardous liquids. The Service Waste System monitors the waste streams for radioactivity and transfers the waste to one of two large Percolation Ponds (existing ponds) for surface disposal. The Service Waste System consists of collection headers, pipes, tanks, valves, pumps, monitoring and diversion stations (located in multiple buildings throughout INTEC), and the two existing Percolation Ponds.[10]

Through 1986, service waste was disposed to an injection well. Beginning in 1984, the wastewater was transferred to one of two percolation surface ponds. The injection well was used only sparingly during the three overlapping years (1984–1986), and was in a standby mode until 1989. In 1989, the injection well was closed and capped. On September 20, 1995, the DEQ issued a WLAP for the service waste discharge to the INTEC existing Percolation Ponds. The original WLAP expired on September 17, 2000. However, DEQ granted an extension for continued coverage under the original WLAP on June 5, 2000.[11] The extension authorized operation of the existing Percolation Ponds until December 2003. The WLAP, however does not regulate radionuclides.

Service waste includes only nonhazardous, nonradioactive (less than MCLs or less than 1 DCG with implementation of BAT) waste streams. Approximately 1.5 million gallons of service wastewater is discharged per day to the existing Percolation Ponds. Separate hazardous or radioactive wastewater from processes and laboratories are managed by the Process Equipment Waste (PEW) Evaporator (low-activity streams), the New Waste Calcining Facility–Evaporator Tank System (high-activity streams), the Tank Farm Facility tanks, or packaged and shipped to a treatment, storage, and disposal facility. Sanitary wastes and other related wastes are either discharged to the INTEC STP or directed to on-site septic tank systems.

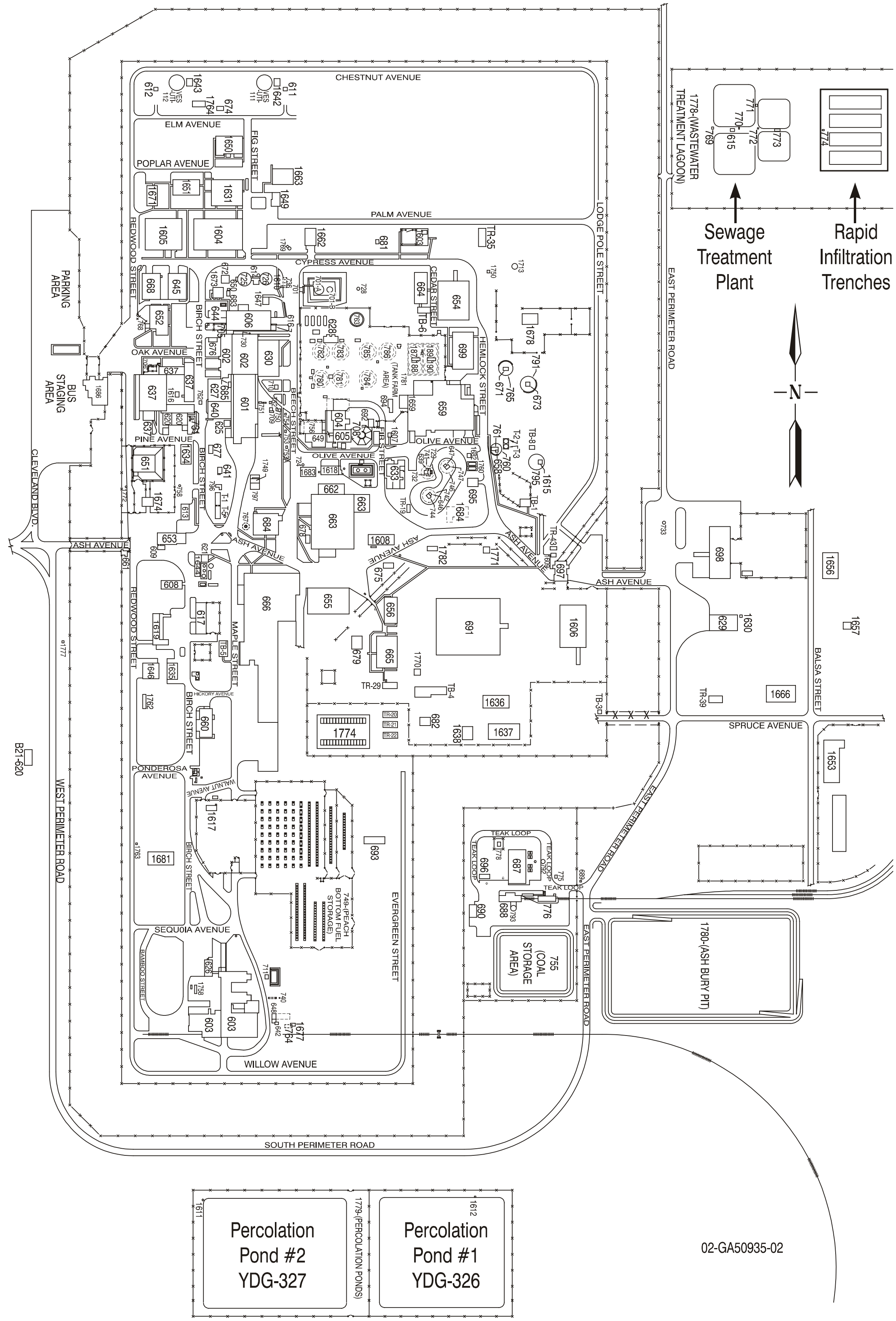

Figure 3. Map of Idaho Nuclear Technology and Engineering Center.

All service waste enters CPP-797, the final sampling and monitoring station, before discharging to the existing Percolation Ponds. In CPP-797, the combined effluent is measured for flow rate and continuously monitored for radioactivity. Samples are also collected monthly for analyses. Wastewater is normally sent to only one of the two existing Percolation Ponds at a time.

If the radioactivity in the service waste at CPP-797 exceeds the set threshold level of the continuous monitor, an alarm sounds, and an operator manually diverts the service waste flow to holding vessel VES-WM-191, usually in less than a minute. VES-WM-191 has a design capacity of approximately 300,000 gallons and would take approximately 2 to 8 hours to fill depending upon the processes in operation. During the diversion, the source of radioactivity would be located and corrected. Radioactively contaminated wastewater would then be sent to the PEW system for disposal.

4.2.2 Interim Control Strategy

In order to support temporary continued discharge of service wastewater to the existing Percolation Ponds and demonstrate compliance for the new ponds, BBWI prepared an interim control strategy[9] (ICS) for the DOE-ID pursuant to DOE Order 5400.5, Chapter II, Section 3.e(1). The ICS is a documented exception to the liquid waste control requirements of the DOE order. The ICS was specifically required for the existing Percolation Ponds under DOE Order 5400.5, Chapter II, Section 3.c(2). This requires that "liquid discharges, even though uncontaminated, are prohibited in inactive release areas to prevent further spread of radionuclides previously deposited."

The bases for the ICS are:

- Existing wastewater discharges do not contain radionuclides above established limits

- The risk of inadvertent discharge of radionuclides above acceptable limits is acceptably low due to implementation of engineered barriers and the operation of a continuous monitoring and diversion system

- Discharges to the existing Percolation Ponds are required to be discontinued before December 2003 per the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD) for Operable Unit 3-13, Waste Area Group 3.[12]

4.2.3 Sources and Controls for Radionuclide Contamination

Through 1988, total radioactivity discharged from the Service Waste System to the existing Percolation Ponds averaged hundreds of curies per year, with tritium being the major contributor. Since 1989 however, total radioactivity averaged less than 1 curie per year. This large reduction is mainly due to two factors: (1) INTEC no longer reprocesses spent nuclear fuel, and (2) the overhead condensates of the process equipment waste (PEW) evaporator are no longer discharged to the service wastewater stream. Since January 1993, the PEW evaporator overhead condensates have been sent to the Liquid Effluent Treatment and Disposal (LET&D) Facility for processing.

In the early 1990s, an effort was made to eliminate all potentially contaminated sources from discharging to the Service Waste System. Floor drains were capped, piping was modified, and other physical barriers were implemented to ensure that no known sources of radionuclide contamination are inadvertently discharged to the service waste stream.

In addition, an engineering evaluation was performed in 2001.[13] The purpose of the evaluation was to determine the risk of inadvertent discharge of radiologically contaminated liquids into the Service Waste System. This evaluation sought to confirm the results of the earlier evaluation (described previously) and identify any deficiencies due to subsequent modifications.

The evaluation identified no discharges of process-derived radionuclide-contaminated solutions. In general, INTEC facilities and processes have implemented sufficient engineered physical barriers to prevent inadvertent discharge of radionuclides to the Service Waste System in the event of an operational upset condition, except for two systems. These two systems are the CPP-666 Sump SU-FT-148 and the CPP-602 LC-Area Sump.

The CPP-666 sump is an open sump located in a radiological buffer area that could receive radiologically contaminated water solutions from a variety of locations throughout the CPP-666 facility. Under normal operation, the sump was monitored continuously and the contents were automatically diverted to a holding tank if radioactivity was detected above 5,000 counts per minute. Currently, the sump is diverted automatically by the computer system to VES-FT-134. In addition, the operators' Daily Orders require the sump discharge to remain diverted to this vessel. Liquid waste from VES-FT-134 discharges into the PEW system and not into the Service Waste System. An Engineering Change Form is in process, and a work request was obtained to complete the permanent piping and/or procedure modifications.[a]

All of the service waste drains in CPP-602 are routed to the CPP-602 LC-Area Sump. The sump area is currently posted as a contamination area. The sump had smearable contamination of 1,000 to 2,000 disintegrations per minute. The source of contamination was unknown, but was believed to be the result of historical, not ongoing, activities.

For the CPP-602 LC-Area sump, controls (administrative and engineering) have been implemented to ensure inputs to the sump are clean from a radiological standpoint. Caps were placed on all laboratory drain standpipes connected to the Service Waste System that are not in use. Only cooling water that has not become radiologically contaminated is discharged into those drain standpipes currently in use. Each drain standpipe was labeled to indicate that the drain was connected to the Service Waste System and radiologically contaminated discharges were not allowed.[b] All floor drains in radiological buffer areas not in use were plugged with either a mechanical drain plug or waterproof tape or both. Similar to the drain standpipes, only uncontaminated cooling water will be allowed to discharge into any floor drains currently in use. In addition, the sump was decontaminated. These corrective actions were completed on September 25, 2001, and documented in the Issue Communication and Resolution Environment (ICARE, #25416).

4.2.4 Radiological Sample Results

The radioactivity levels in the service waste are determined from samples taken at the CPP-797 monitoring station. The samples are monthly flow proportional composites collected according to approved operating procedures. The monthly composite sample is analyzed using a highly sensitive 24-hour scan for gamma-emitting radiation.

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a. E. F. Armstrong, INEEL, e-mail to K. C. Barton, INEEL, "Service Waste Control Barriers for VES-FT-134," July 16, 2002, 10:36 a.m., CCN 35556.

b. K. C. Barton, INEEL, e-mail to M. G. Lewis, INEEL, "Service Waste Control Barriers in the CPP-602 Labs," July 23, 2002, 2:32 p.m., CCN 35555.

The only radionuclide identified as a positive detection in the monthly gamma analyses for 2001 was cobalt-60. Cobalt-60 was detected in the April sample at 1.81 pCi/L. This is well below the MCL of 100 pCi/L for cobalt-60.[14]

4.2.5 Conclusion

The Best Available Technology process was implemented in 1993 with the installation of the LET&D Facility, which was designed to remove the majority of process-derived radionuclides. In addition, the installation of physical barriers in the early 1990s and the engineering evaluation in 2001 were undertaken to eliminate all potentially contaminated sources from inadvertently discharging to the Service Waste System.

Data from the routine monthly samples collected during Calendar Year 2001 continue to show that the service waste effluent is still well below MCLs for radiological parameters. The INTEC High Level Waste Operations continues to routinely monitor for gamma-emitting radionuclides.

Based on current information, a single source of radioactive contamination in the effluent cannot be determined with certainty. However, based on data currently available, the source of radioactive contamination in the Service Waste System may be from the raw water obtained from the production wells (CPP-01 and -02). Another possible, but unlikely, source may be residual contamination from historical discharges of radionuclides that have accumulated in the Service Waste System piping, which continue to leach into the effluent.

The radioactivity levels in the effluent from the INTEC Service Waste System are below MCLs. As discussed in Section 2, this implies that the goals of the BAT selection process are being met and that the wastewater is considered “clean” for radionuclides. However, this must be documented through the BAT selection process.

In addition, if a liquid waste stream is below 1 DCG and BAT is being implemented, the discharge is considered “clean water” and not a discharge to a soil column according to DOE Order 5400.5. That is, the soil column is not needed as a *treatment system* to remove radionuclides. Implementation of BAT for the Service Waste System includes:

- The LET&D Facility
- Engineered barriers to prevent inadvertent discharge
- Operation of a continuous monitoring and diversion system.

The radioactivity levels in the wastewater discharged through the Service Waste System to the existing Percolation Ponds is already below MCLs; therefore, the cost of additional treatment would exceed the benefit and would be unjustifiable.

All new discharges (other than from new projects) to the Service Waste System that may contain process-derived radionuclides are evaluated by WGS. The WGS ensures the liquid waste will be disposed of in accordance with federal, state, and local regulations, and DOE orders. For new projects, the generation of liquid waste is evaluated through the NEPA/Environmental Checklist process.

Before a new liquid waste stream containing process-derived radionuclides is discharged into the Service Waste System, an evaluation is performed. To ensure the effluent discharged to the existing Percolation Ponds complies with DOE Order 5400.5, newly identified liquid waste streams must be below MCLs prior to discharge into the Service Waste System. If the wastewater is above MCLs but below 1 DCG, the BAT selection process must be completed. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge.

4.3 Test Area North Facilities Requiring Best Available Technology Selection Process

Only the TAN/TSF Sewage Treatment Facility (STF) Disposal Pond (Figure 4), located southwest of the TSF, requires a BAT evaluation. Documentation of the BAT selection process applies to the TAN/TSF STF Disposal Pond because radiocuclides may (although unlikely) inadvertently be released (for example, due to equipment failures) to this facility. In addition, individual waste streams containing process-derived radionuclides may be disposed of to this facility. Only those individual waste streams that have received the appropriate approval may be discharged.

4.3.1 Test Area North/Technical Support Facility Sewage Treatment Facility Disposal Pond General Information

The TAN/TSF STF Disposal Pond is located southwest of the TAN/TSF (Figure 4). The TAN/TSF sewage system collects and transports sanitary waste to the STP. Water is treated and discharged to the TAN/TSF STF Disposal Pond. Sewage or sanitary waste consists primarily of spent water containing wastes from rest rooms, sinks, and showers. The process drain system collects wastewater from process drains and building sources originating from various TAN/TSF facilities and transports the wastewater to a sump where it is commingled with treated sanitary water and then discharged to the TAN/TSF STF Disposal Pond. Process water collected from the process drain system is not treated by the sewage system; rather, the process water bypasses the plant and flows directly to the common sump (TAN-655). Wastewater discharged to the process drain includes steam condensate, boiler blow down, water softener regeneration, demineralizer regenerate solution, water tank discharge, cooling water, and pressure relief discharges.

The TAN/TSF STF Disposal Pond was constructed in 1971; before that, treated wastewater was disposed of through an injection well. The Disposal Pond consists of a primary disposal area and an overflow section, both of which are located within an unlined, fenced 35-acre area. The overflow pond is rarely used, and is used only when the water is diverted to it for brief cleanup and maintenance periods. The Disposal Pond and overflow pond areas are approximately 39,000 ft^2 (0.9 acres) and 14,400 ft^2 (0.33 acres), respectively, for a combined area of approximately 53,400 ft^2 (1.23 acres).

The TAN/TSF STF Disposal Pond is a WLAP facility. On May 9, 1996, DEQ issued a WLAP for the TAN/TSF STF. The original WLAP expired on May 8, 2001. However, DEQ issued a letter authorizing the continued operation of the TAN/TSF STF under the original WLAP on July 12, 2001.[15] The authorization is effective until DEQ issues a new WLAP.

The WLAP flow limit to the Disposal Pond is 34 million gallons/year. The average daily flow to the Disposal Pond for Permit Year 2001 (November 2000 through October 2001) was 28,340 gallons/day. The total flow for Permit Year 2001 was 10.34 million gallons, which is under the WLAP flow limit.

4.3.2 Interim Control Strategy

It was verified on May 2, 2001, that an ICS was required for the TAN/TSF Disposal Pond according to DOE Order 5400.5, Chapter II, Section 3.e(1). This requirement was entered into the ICARE tracking system on May 2, 2001. The ICARE system identifies the issue, assigns a responsible manager, and a completion date. The ICS is expected to be issued in November 2002.

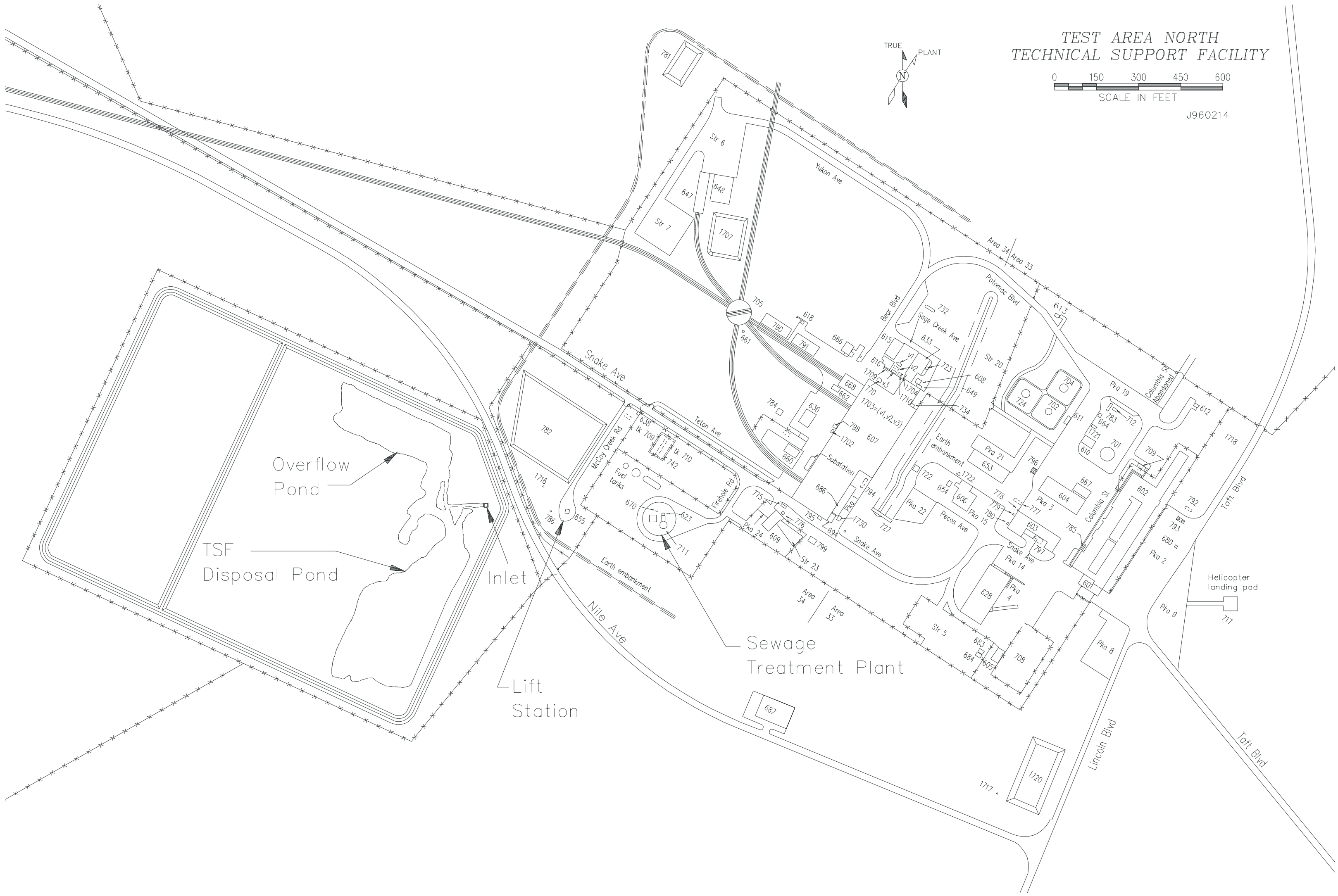

Figure 4. Map of Test Area North/Technical Support Facility.

4.3.3 Sources and Control for Radionuclide Contamination

The TAN-655 lift station was remediated in August–September 1993 as part of a CERCLA interim action.[16] However, some residual radioactive contamination may be in the TAN/TSF process wastewater lines, which could result in some continued radiological contaminant discharges to the sewage treatment plant and Disposal Pond.

Because of past discharges and possible residual contamination in wastewater lines, sludge from the TAN/TSF STP normally has detectable amounts of radioactivity, and will, therefore, continue to be disposed of at the Radioactive Waste Management Complex.

Before any new liquid waste streams containing process-derived radionuclides is discharged into the TAN/TSF STF, an evaluation will be performed. To ensure the effluent discharged to the Disposal Pond complies with DOE Order 5400.5, newly identified liquid waste streams must meet one of the three criteria (DOE Headquarters guidance) in Section 2.1.

4.3.4 Radiological Sample Results

Quarterly, a 24-hour composite sample is collected from the TAN-655 lift station and analyzed for gross alpha, gross beta, and gamma emitters. A duplicate sample was collected during the October 2001 sampling event, resulting in five samples being collected during Calendar Year 2001. Table 4 presents data for radionuclides reported above the minimum detection limits for Calendar Year 2001.

Gross alpha was positively detected in one of the October samples at 2.65 pCi/L (Table 4) but well below the MCL of 15 pCi/L. Gross alpha was not detected in any of the other four samples.

Table 4. Test Area North/Technical Support Facility Sewage Treatment Facility (TAN-655) effluent radiological data for Calendar Year 2001.[a]

Parameter	Sample Date	# Samples/ #Detections	Activity (pCi/L)	MCL[b]
Gross Alpha	10/31/01	5/1	2.65	15
Gross Beta	3/27/01, 4/25/01, 9/27/01,10/31/01	5/5	11.24[c]	15[d]
Cesium-137	10/31/01	5/1	4.77	200[e]
Potassium-40	4/25/01	2/1	48.5	NC[f]

a. Only those parameters that were reported above the laboratory minimum detection limits are listed.

b. Maximum Contaminant Level, 40 CFR 141 unless otherwise specified.

c. Gross beta was positively detected in all five samples. Table shows average activity of all five samples.

d. Screening level of 15 pCi/L gross beta is used for community water systems utilizing waters designated by the State as contaminated by a nuclear facility [40 CFR 141.26.b(1)(i)].

e. Derived 1976 MCLs based on critical organ dose at 4 mrem/yr.[13]

f. NC means not calculated.

Gross beta was positively detected in all five samples collected. The average activity for all five samples was 11.24 pCi/L. The maximum activity for any particular sample was 20.6 pCi/L collected on October 31, 2001, and the minimum activity was 3.9 pCi/L collected on September 27, 2001. For comparison, the average gross beta activity in the TAN-655 effluent was below the Environmental Protection Agency screening level of 15 pCi/L for community water systems utilizing waters designated by the state as contaminated by a nuclear facility. Similar to beta activity in the CFA STP effluent, it is likely that naturally occurring beta emitters in the sanitary waste are contributing to the total gross beta activity in the TAN/TSF STF effluent.

Both cesium-137 and potassium-40 were positively identified during the gamma analysis. Cesium-137 was reported above the detection limit at 4.77 pCi/L in one of the two samples collected on October 31, 2001, and is significantly less than the MCL of 200 pCi/L. In addition, cesium-137 was not detected in the duplicate sample. Potassium-40 was detected at 48.5 pCi/L. The EPA has not calculated an MCL for potassium-40, however. Potassium-40 is also a naturally occurring beta emitter and is a likely contributor to the gross beta activity in the effluent.

4.3.5 Conclusion

Major facility construction/expansion is not planned for the TAN/TSF. Activities will be focused on deactivating facilities and completing environmental restoration activities. Therefore, no increased discharges to the TAN/TSF STF Disposal Pond requiring upgrades are expected.

The radioactivity levels in the effluent from the STF are below MCLs. Although it is unclear, the higher gross beta activity in the wastewater may be the result of naturally occurring radionuclides in the sewage discharged to the STF.

As discussed in Section 2, wastewater below MCLs indicates that the goals of the BAT selection process are being met and that the wastewater is considered “clean” for radionuclides. However, this must be documented through the BAT selection process.

Since the radioactivity levels in the wastewater discharged to the TAN/TSF STF Disposal Pond are below MCLs, the cost for additional treatment outweighs the benefit and would therefore be unjustifiable.

By procedure, the responsible manager must not generate a liquid waste without a means for disposing of it. The WGS, at the request of the responsible manager or designee, evaluates discharges (other than from new projects) to the TAN/TSF Disposal Pond that may contain process-derived radionuclides. The WGS ensures the liquid waste will be disposed of according to federal, state, and local regulations, and DOE orders. For new projects, the generation of liquid waste is evaluated through the NEPA/Environmental Checklist process.

Before any new liquid waste streams containing process-derived radionuclides is discharged into the TAN/TSF STF, an evaluation is performed. To ensure the effluent discharged to the TAN/TSF Disposal Pond complies with DOE Order 5400.5, newly identified liquid waste streams must be below MCLs for radionuclides prior to discharge into the TAN/TSF STF. Completion of the BAT selection process is required if the radioactivity in the wastewater is above MCLs but below 1 DCG. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge.

5. CONCLUSION

Last year's "Status Update for Implementing Best Available Technology per DOE Order 5400.5" was reviewed. The purpose of the review was to determine those previously identified liquid waste streams and/or facilities that would require documentation of the BAT selection process or further evaluation. In addition, BBWI-operated facilities were reviewed to determine if any previously unidentified liquid waste streams require the BAT selection process.

Based on the review, two BBWI facilities, the INTEC existing Percolation Ponds and TAN/TSF STF Disposal Pond were determined to require documentation of the BAT selection process. In addition, DOE-ID requested that the 73.5-acre CFA STP land application site be included in Section 4 ("Facilities Requiring Documentation of the Best Available Technology Selection Process") of this report to ensure requirements of DOE Order 5400.5, Chapter II, Section 3 are met.

The review concluded that these facilities were discharging minimal (typically below drinking water MCLs) levels of radiological contaminants (some of which may be process-derived) to a soil column. Guidance defined in Section 2.1 states, "If the liquid waste stream is below MCLs, this indicates that the goals of the BAT selection process are being met and the liquid waste stream is considered "clean water." However, it is necessary to document this through the BAT selection process." Section 4 of this report is considered documentation of the BAT selection process for the CFA STP, INTEC existing Percolation Ponds, and the TAN/TSF STF Disposal Pond according to this guidance. Because liquid waste streams below MCLs are already considered "clean water," additional treatment technologies were considered unnecessary based on cost.

In addition, newly generated liquid wastes containing process-derived radiological contaminants will be evaluated before discharge. Newly identified liquid waste streams must be below MCLs for radionuclides prior to discharge. For liquid waste streams that are below 1 DCG but above MCLs, the BAT selection process must be completed. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge. This ensures compliance with DOE Order 5400.5 and will also protect human health and the environment.

6. REFERENCES

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14 U.S. EPA, “Radionuclides Notice of Data Availability Technical Support Document,” USEPA Office of Ground Water and Drinking Water in collaboration with USEPA Office of Indoor Air and Radiation and United States Geological Survey, March 2000.

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