CHAPTER 7.0
100-N AREA INTEGRATION PLAN FOR D&D & REMEDIAL ACTION

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7.0 100-N AREA INTEGRATION PLAN FOR D&D & REMEDIAL ACTION

7.1 Introduction

This appendix (hereafter referred to as the Integration Plan) was developed to ensure that decontamination and demolition (D&D) and remediation activities associated with the 100-N Area would be coordinated and conducted in an efficient manner. The intent of the Integration Plan is to minimize the cost and optimize the efficiency of environmental remediation of contaminated waste sites and the removal of the facilities in the 100-N Area. Integration of 100-N Area D&D and remediation activities has been recognized by the U.S. Department of Energy, Richland Operations Office (RL) and the Washington State Department of Ecology (Ecology) as a critical step in ensuring effective and efficient environmental remediation of the 100-N Area.

The plan includes (1) assumptions used to develop the Integration Plan, (2) the criteria used to group waste sites into remedial units (RUs) and to establish remediation priority of the waste site groups, (3) the general work sequence established for the remediation of the 100-N Area, and (4) the proposed integrated schedule of the D&D of the 100-N facilities and the remediation of the RUs.

The prioritization and sequencing of the waste sites within a RU, and the detailed planning and design for the D&D of facilities and remediation activities are considered beyond the scope of this Integration Plan and will be provided in the remedial design report/remedial action work plan document.

7.2 Assumptions

This section identifies the assumptions used to develop the Integration Plan. They are based on direction and scoping assumptions provided by RL and are based on current project planning strategies for the Environmental Restoration Program. These assumptions are:

- A ten-year duration was used for completion of D&D and remediation activities.
- The proposed schedule presented in the Integration Plan is a duration-only schedule (i.e., does not include specific start or end dates) and allows for flexibility for determining the start of the remedial activities.
- The recommended alternatives, as described in Section 6.0 of the Engineering Evaluation/Cost Analysis (EE/CA) will be implemented to address the 100-N Area ancillary facilities.
- For 100-N Area facilities, the D&D cost estimates, schedule and durations, and waste volume estimates were derived from the U.S. Army Corps of Engineers' Micro Computer-Aided Cost Estimating System (MCACES).
- For waste sites, the cost estimates, schedule and duration, and waste volume estimates were taken from the 100-NR-1 and 100-NR-2 Corrective Measures Study (CMS).
- The Integration Plan only addresses the liquid and solid waste disposal sites in the 100-N Area identified for the remedial action and D&D of the 100-N ancillary facilities.
- The 105-N Reactor Facility and the 109-N Heat Exchanger Facility (hereafter referred to as the Reactor Complex) are not addressed in this Integration Plan. These facilities are part of the Interim Safe Storage (ISS) Project and will be addressed with the long-term disposition of the 100-N Reactor.
- Remediation activities of waste sites in the buffer zone (defined as the facilities needed to support the reactor until the ISS program is implemented and all waste sites within 15.25 m [50 ft] of the 105-N and 109-N facilities) will not be conducted until a decision is made on the future disposition of the 100-N Reactor. The remediation activities will be according to the recommended alternative identified in the 100-NR-1 and 100-NR-2 Record of Decision (ROD). The facilities in the buffer zone will be limited to surveillance and maintenance until a decision is made on the future disposition of the 100-N Reactor. Then, the facilities will be removed according to the recommended alternative identified in this document. These facilities and

waste sites are included in the integrated schedule. This will allow early action on these sites and facilities should the opportunity occur but in no case later than the ISS.

- The Hanford Generating Plant Complex is addressed in the Integration Plan.
- Identification of the waste sites in the Integration Plan was based on the most current information available in the Corrective Measures Study for the 100-NR-1 and 100-NR-2 Operable Units, Draft A, DOE/RL-95-111 (DOE-RL 1996) and 100-NR-1 Treatment, Storage, and Disposal (TSD) Units Corrective Measures Study/Closure Plan, Draft A, DOE/RL-96-39 (DOE-RL 1997). The remediation cost estimates, schedule and durations, and waste volumes for the waste sites were also derived from the current information available in these documents.
- After the 100-NR-1 and 100-NR-2 Operable Units ROD is issued, the remedial design/remedial action process will be used to establish the detailed schedule for the integrated activities and the remedial design report/remedial action work plan will document the negotiated schedule dates.

7.3 Remediation Prioritization and Sequencing Criteria

This section provides the criteria used to establish the remediation prioritization for the waste sites and a sequence in which the work activities could be performed without causing interferences between activities.

7.3.1 Remediation Prioritization

The 100-N Area waste sites have been grouped into six RUs, the treatment, storage, and disposal (TSD) unit, and the Columbia River shoreline. Subdividing the 100-N Area waste sites by geographic location and type of contamination was found to be an effective management tool to plan and implement the remediation activities. In other words, when individual waste sites were in close proximity to one another, a common-sense approach was applied in considering their inclusion in a particular grouping. The contaminants of concern at the 100-N Area waste sites include radionuclides, petroleum hydrocarbons, and inorganic chemicals such as acids, nitrate, chromium, and lead. Grouping the waste sites increased flexibility for scheduling, funding, and contracting. The RUs do not have an established boundary, but are defined as:

Table 7.1. Comprehensive List of the Waste Sites Grouped by RUs

RU 1	Radioactive sites located between the 105-N Reactor and the Columbia River.
RU 2	Petroleum and fuel oil spills and leaks in the vicinity of the 184-N Powerhouse, which is directly east of the 105-N Reactor.
RU 3	A mixture of sites, mostly spills and releases of acids and caustics with potential radioactivity, south of the 105-N Reactor and near the water treatment facilities.
RU 4	A mixture of sites, mostly radioactive or diesel, and fuel oil spills and leaks in the vicinity of the 1310-N Chemical Storage Tank and the oil storage tank farm, north of the 105-N Reactor and near the Columbia River.
RU 5	Sites associated with the Hanford Generating Plant.
RU 6	Miscellaneous solid waste sites not included as part of another RU.
TSD Unit	Group of the four sites designated as TSD units under the Resource Conservation and Recovery Act of 1976 (RCRA).
River Shoreline	The river shoreline area adjacent to the N-Springs Area up to approximately the 123 m

	(402 ft) elevation. (The river shoreline is not addressed in the Integration Plan. No schedule has been proposed pending selection of the final groundwater remedial action alternative.)

Table A.1 provides a comprehensive list of the waste sites grouped by RUs, and Figures A.1 to A.6 illustrate the RU groupings. The TSD units are shown in Figure A.7. The remediation prioritization of the six RUs and the TSD unit was based on the following considerations:

- Potential short-term impact to the public and/or the environment
- Inventory of contaminants
- Potential of contaminant migration to the groundwater
- Proximity to the Columbia River
- Input by RL and regulators.

After evaluating the impacts of these factors, it was determined that, in the short term, there are no significant negative impacts to the public or the environment. This is based on the current administrative and institutional controls that are in place for the purpose of protecting the public and environment. Therefore, the first consideration did not weigh heavily in the prioritization process.

The type and quantity of contaminants were considered when prioritizing remedial units. It was determined that, in general, those sites contaminated with high inventories of radionuclides would receive a higher priority than sites that contain other hazardous substances, such as petroleum-product contamination or acids/caustics. However, because these factors are not considered independently of one another, there may be some sites without radioactive contamination that received a higher priority than some sites with radioactive contamination. Because petroleum is immiscible, petroleum contamination was also considered to be an important factor in determining priorities, particularly in terms of impact on groundwater. Another consideration was the recognition that the TSD units and certain ancillary facilities may be considered contributors to the "skyshine" that exists at the 100-N Area. Skyshine is a phenomena created by 100-N Area facilities and waste sites containing significant inventories of gamma emitting radionuclides (primarily cobalt-60). Skyshine is produced by the interaction of gamma rays with the atmosphere and the subsequent downward scatter of the gamma rays. Skyshine results in an increase in the ambient radiation over background conditions in the 100-N Area. The following TSD units and ancillary facilities have been considered contributors:

- 1304-N Emergency Dump Tank
- 1310-N Liquid and Waste Treatment Facility
- 1314-N Liquid Disposal Building
- 107-N Basin Recirculation Cooling Facility
- 105-N Fuel Basin
- 1301-N Liquid Waste Disposal Facility
- 1325-N Liquid Waste Disposal Facility

The recognition that these units and ancillary facilities could potentially contribute to skyshine supports the prioritization/sequencing criteria established in Section A3.0. The 1301-N and 1325-N facilities are within the TSD unit and the remaining facilities except for the 105-N, which is part of the ISS Program are within RU 1 and RU 4. These three units are the highest priority.

In conjunction with other considerations, waste sites in close proximity to the Columbia River were given a relatively higher priority because of the major importance to the community and public concern about this resource. RL and the regulators have confirmed during a planning meeting that these are valid factors for prioritizing remediation of waste sites.

Based on the considerations described above, the following is the priority ranking for the RUs and the TSD unit:

Table 7.2. Priority Ranking for the RUs and the TSD Unit

Priority	Unit	Reason
1	TSD	Largest radionuclide inventory/regulator input
2	RU 1	Radionuclide inventory/proximity to the Columbia River
3	RU 4	Radionuclide and petroleum inventories/proximity to the Columbia River
4	RU 2	Petroleum inventory/proximity to the Columbia River
5*	RUs 3, 6, and 5	Radionuclide and acid/caustic inventory plus solid waste

Note: Based on the applicable considerations, RUs 3, 6, and 5, scheduled in that order, were determined to be the lower priority units. However, the schedule is flexible to allow for reprioritization of these RUs. Remediation work associated with these units will be scheduled in a way that accomplishes efficient funding and contracting over the designated duration of the project.

7.3.2 Sequencing of Work

In establishing the sequence of work to integrate facility D&D and waste site remediation, several factors were considered: (1) proximity of facilities to waste sites, (2) 100-N Area active facilities and infrastructure requirements, and (3) impact of the ISS Program on the 100-N Reactor and the buffer zone.

7.3.2.1 Proximity of Facilities to Waste Sites

Several facilities in the 100-N Area are in close proximity to or will interfere with waste site remediation. If the selected remedy for the 100-NR-1 and 100-NR-2 operable units is the remove and dispose alternative, the facilities that are located adjacent to, or overlap, the waste site excavation footprint would need to be demolished prior to remediation. The facilities requiring D&D before remediation of a waste site (see Table A.2) were determined by assuming that excavation of a waste site would be 4.6 m (15 ft) below surrounding grade and would have a safety zone of approximately 7.6 m (25 ft) around the excavation footprint to provide protection from slope failure.

7.3.2.2 Critical Infrastructure Systems

Several facilities in the 100-N Area will remain active to support 100-Area D&D and remediation activities. These facilities will be operated until it is determined that they are no longer needed, at which time they will be decommissioned and demolished. Contaminated ancillary facilities will be decommissioned and demolished according to the decision documented in the Action Memorandum, a CERCLA decision document; a CERCLA decision document is not required for noncontaminated facilities. The noncontaminated facilities will be decommissioned and demolished under the existing NEPA categorical exclusion for decommissioning of small buildings according to 10 CFR 1021, B1.23. CERCLA applies to management of hazardous substances; therefore, no *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) documentation, such as an EE/CA, is required for addressing facilities that contain only nonhazardous substances.

Critical infrastructure systems (e.g., potable and sanitary water lines, electrical power utilities, and fire suppression pipelines), which must be maintained to protect and service active facilities, are expected to be near or within the excavation footprint of waste sites to be remediated. To avoid possible interferences with the remediation work, wherever possible, these utilities will be isolated, rerouted, and/or partially removed prior to remediation of the waste sites. However, it is recognized that some factors associated with the isolation of the infrastructure systems could potentially impact the waste site remediation sequence. These factors are identified below so the potential impacts to remediation of waste sites may be considered in the remedial design.

Electrical

Removal of electrical systems is typically the last isolation activity performed because power would be needed to support the D&D and remediation activities. However, if the underground conduit poses a threat to workers during excavation to isolate another utility (e.g., raw water), the electrical system would be deactivated first and alternative power supplies (e.g., generators, temporary overhead lines) would be used.

There are two areas of buried conduit banks that could impact the D&D and remediation activities. One area is located between the 1705-N and the 105-NB facilities, north of the 105-N Reactor facility, which feeds the office complex and machine shops in the 1705-N Building. There are no waste sites in the immediate vicinity. However, waste site 100-N-22 is located north of the area and the exact location of the conduit line would need to be determined to ensure that safety would not be jeopardized during excavation of the waste site. The other electrical conduit line begins on the north side of the 183-N, continues around the facility, then branches west toward the clearwell and south to the 1137-N and 163-NA facilities. Waste sites 100-N-27 and UPR-100-N-34 could be impacted by this conduit line.

Fire Protection

Fire protection pipelines, considered the most important underground utility at the site, would be a long-term requirement for the 100-N Area until all the facilities are removed. Once facilities have been decommissioned and demolished to the extent necessary to alleviate the need for fire suppression, the facilities would be isolated/removed from the buried fire line system. Therefore, the only buried fire pipes that could impact remediation are those supporting facilities during S&M. It is expected that D&D and remediation activities will interfere with buried fire lines, during which time acceptable temporary systems may be utilized (e.g., portable wheeled units using dry chemicals or carbon dioxide).

Potable Water and Sanitary Sewer

The 100-N area currently maintains a potable water supply system which serves several facilities. Additionally, several facilities are serviced by sanitary sewer systems. Isolation/removal of these systems would not impact the D&D and remediation activities because temporary sanitary systems (e.g., port-a-systems) would be installed, and bottled drinking water would be supplied.

Railroads

Prior to segregating the rail spur, railroad cars containing the contaminated shipping casks would need to be dispositioned and/or moved out of the area. The rail lines lying on the west side of the 100-N Reactor complex could impact the remediation of waste sites located in RUs 1 and 4. However, at this time there is no justification to keep the rail lines functional, therefore, they would be removed.

Roadways and Paved Areas

It is preferable to use existing paved and gravel roads because construction of new roads would potentially impact cultural and ecological resources. However, if roads interfere with D&D and remediation activities, the roads would be removed. Alternative transportation routes would be selected to minimize impacts to undisturbed areas.

Communications and Alarm Systems

Telephone and Hanford local area network (HLAN) fiber-optics lines are located throughout the 100-N Area and may be rerouted at relatively little expense and with short notice without impact to D&D and remediation activities. The public address system is not considered a critical system since the 105-N Reactor facility is currently being deactivated. An alarm tower on the 184-N facility would remain operable. The alarm system would be relocated prior to D&D of the facility.

7.3.2.3 ISS of the 100-N Reactor and the Buffer Zone

The 105-N Reactor Facility and the 109-N Heat Exchanger Facility are considered part of the ISS Program for the N Reactor. The ISS Program delays remediation of the N Reactor until sometime in the future. Associated with the 105-N and 109-N facilities are three other facilities, the 116-N Air Stack, the 117-N Exhaust Filter House, and the 119-N Stack Air Sampling Monitor Building, which support the ventilation system for the 105-N and 109-N facilities until the ISS Program is implemented. Additionally, 15 contaminated waste sites have been identified as sites that cannot be remediated until the facilities that interfere with these sites have been decommissioned and demolished. This sequence of D&D and remediation will preserve the integrity of the 105-N and 109-N Reactor buildings. Remediation of the 15 waste sites (in the buffer zone) that are identified in the 100-NR-1 and 100-NR-2 ROD will not be conducted until a decision is made on the future disposition of the 100-N Reactor. Additionally, the 116-N, 117-N, and the 119-N facilities (in the buffer zone) will be limited to surveillance and maintenance until a decision is made on the future disposition of the 100-N Reactor. The facilities will then be removed according to the recommended alternative identified in this document. The facilities and waste sites are included in the integrated schedule. This will allow early action on these sites and facilities should the opportunity occur but in no case later than the ISS.

The buffer zone consists of the waste sites identified below within 15.25 m (50 ft) of the 105-N and 109-N Reactor buildings and the following facilities:

Waste Sites		**Facilities**
100-N-29[1]	UPR-100-N-10	116-N Air Stack
100-N-30[1]	UPR-100-N-12	117-N Exhaust Filter House
100-N-31	UPR-100-N-3	119-N Stack Air Sampling Monitor Building
100-N-32	UPR-100-N-35	1300-N Emergency Dump Basin
100-N-38	UPR-100-N-39	1303-N Spacer Silos
116-N-4	UPR-100-N-9	
118-N-1	UPR-N-100-7	
UPR-100-N-14		

7.3.3 General Work Sequence

An evaluation of the sequencing factors (which were identified in Sections 3.2.1 through 3.2.3) indicates that initiation of remediation activities is dependent on the reconfiguration of interfering critical infrastructure systems and the D&D of interfering facilities. In addition, the sequence or timing of remediation of a small number of waste sites will be dictated by future decisions regarding the need for various 100-N active support facilities (e.g., water systems, electrical power) and final disposition of the 100-N Reactor. These considerations result in the following general work sequence applicable to each RU:

1. Reconfiguration of interfering critical infrastructure systems
2. D&D of interfering facilities
3. Remediation of waste sites
4. D&D of active facilities
5. Final remediation of waste sites associated with the active facilities and the 100-N Reactor.

[1] Waste sites 100-N-29 and 100-N-30 are in close proximity to 116-N-4 and may need to be remediated as part of 116-N-4.

7.4 SCHEDULE

Figure A.8 illustrates the integrated schedule for completing the remediation of the TSD unit, the six RUs (which include waste sites and interfering facilities), and D&D of the facilities independent of waste sites. This integrated schedule was developed based on the prioritization and sequencing discussed in Section A3.0 (e.g., remediation of the TSD unit was identified as the highest priority and therefore appears first on the schedule followed by RU 1, then RU 4). The remediation of the TSD units with the remaining RUs and interfering facilities was determined to encompass the first four years, and the independent facilities and underground piping system remediation was scheduled to begin during year four and continue through year ten.

The sequencing of the interfering facilities and waste sites within the RUs was based on the following logical order:

1. Deactivated interfering facilities
2. Associated waste sites
3. Active facilities
4. Associated waste sites
5. Independent facilities and underground piping systems

The primary driver was to develop a schedule with a relatively even distribution of funding requirements across the remaining six years. Generally, this sequence was followed, except when the independent facilities and underground piping systems were scheduled to accomplish the relatively even funding distributions. Work durations and cost for the TSD units and the RU waste sites were taken from the 100-NR-1 and 100-NR-2 CMS and the 100-NR-1 TSD CMS/CP. Work duration and cost for all the facilities were taken from the MCACES data sheets.

Refined scheduling within these subgroups will be accomplished during detailed remedial design and documented in the remedial design report/remedial action work plan. The schedule assumes a critical path sequencing where first, initial infrastructure requirements, (e.g., isolating or rerouting underground utilities) will be completed at the affected waste site(s) followed by D&D of interfering facilities, and finally waste site remediation.

7.5 REFERENCES

10 CFR 1021, *National Environmental Policy Act Implementing Procedures*, Code of Federal Regulations, as amended.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq.

DOE-RL, 1996, *Corrective Measures Study for the 100-NR-1 and 100-NR-2 Operable Units*, DOE/RL-95-111, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

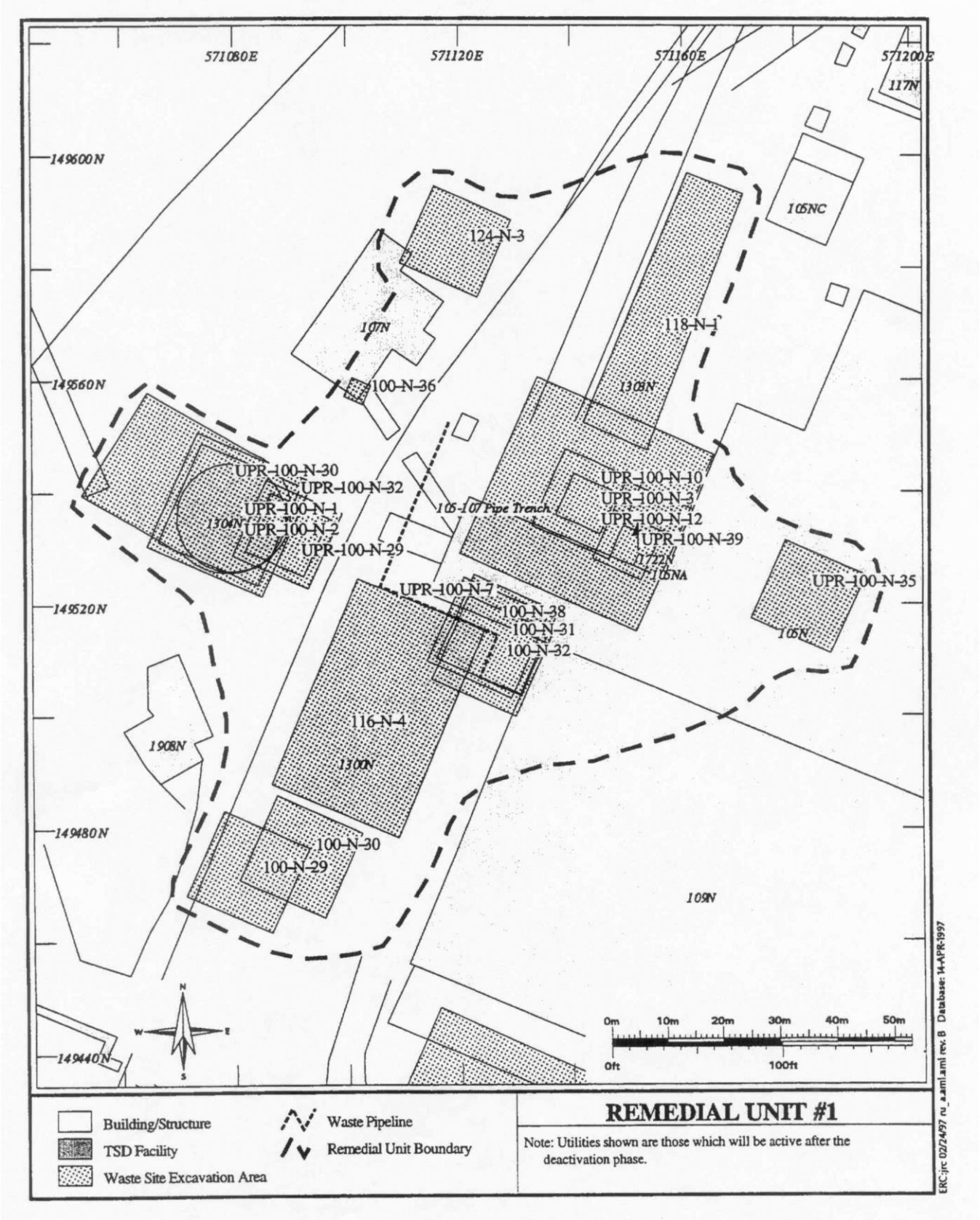
DOE-RL, 1997, *100-NR-1 Treatment, Storage, and Disposal (TSD) Units Corrective Measures Study/Closure Plan*, DOE/RL-96-39, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

Table 7.3. Interfering Facilities by Remedial Unit

Remedial Unit 1
1300-N Emergency Dump Basin
105-N to 107-N Pipe Trench
1304-N Emergency Dump Tank
1722-N Decontamination Hot Shop
107-N Recirculation Cooling Building
1303-N Spacer Silos
Remedial Unit 2
184-N Powerhouse
184-NA Powerhouse Annex
184-NB Air Handlers Main Building
184-NC Sample Shack
Remedial Unit 3
163-N Demineralization Water Treatment Plant
183-N Water Filter/Treatment Plant
Remedial Unit 4
13-N Storage Facilities
1310-N Radioactive Liquid and Waste Treatment Facility
1314-N Liquid Disposal Building
1322-N Waste Treatment Pilot Plant Facility
1322-NA Effluent Water Treatment Pilot Plant Annex
116-N Exhaust Air Stack
119-N Stack Air Sampling and Monitoring
Remedial Unit 5
185-N HGP
1716-NE Maintenance Garage
1908-NE HGP Outfall

Note: Remedial Unit 6 and the TSD sites do not contain facilities that would interfere with waste sites.



1 **Figure 7.1 Remedial Unit Number 1**

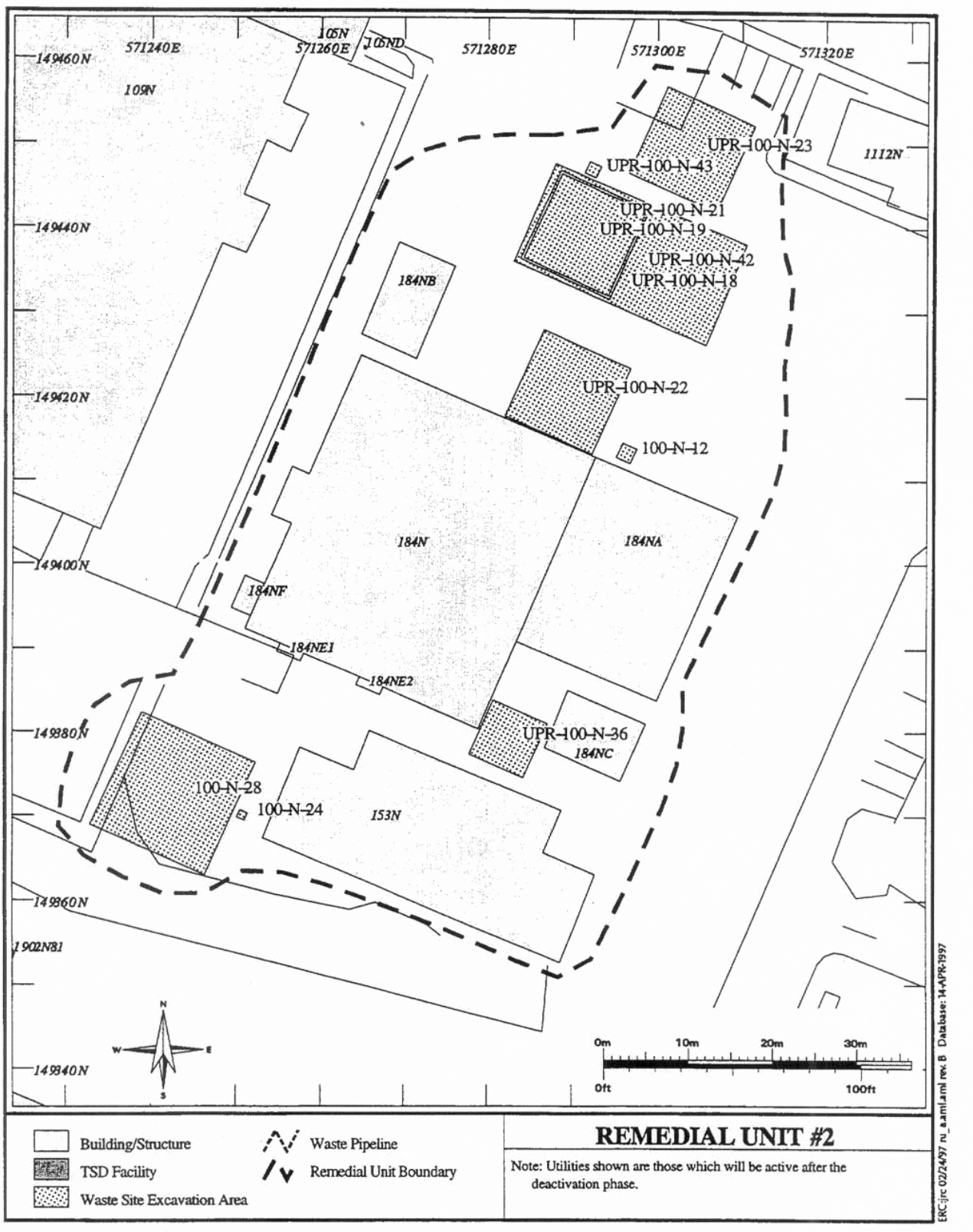


Figure 7.2 Remedial Unit Number 2

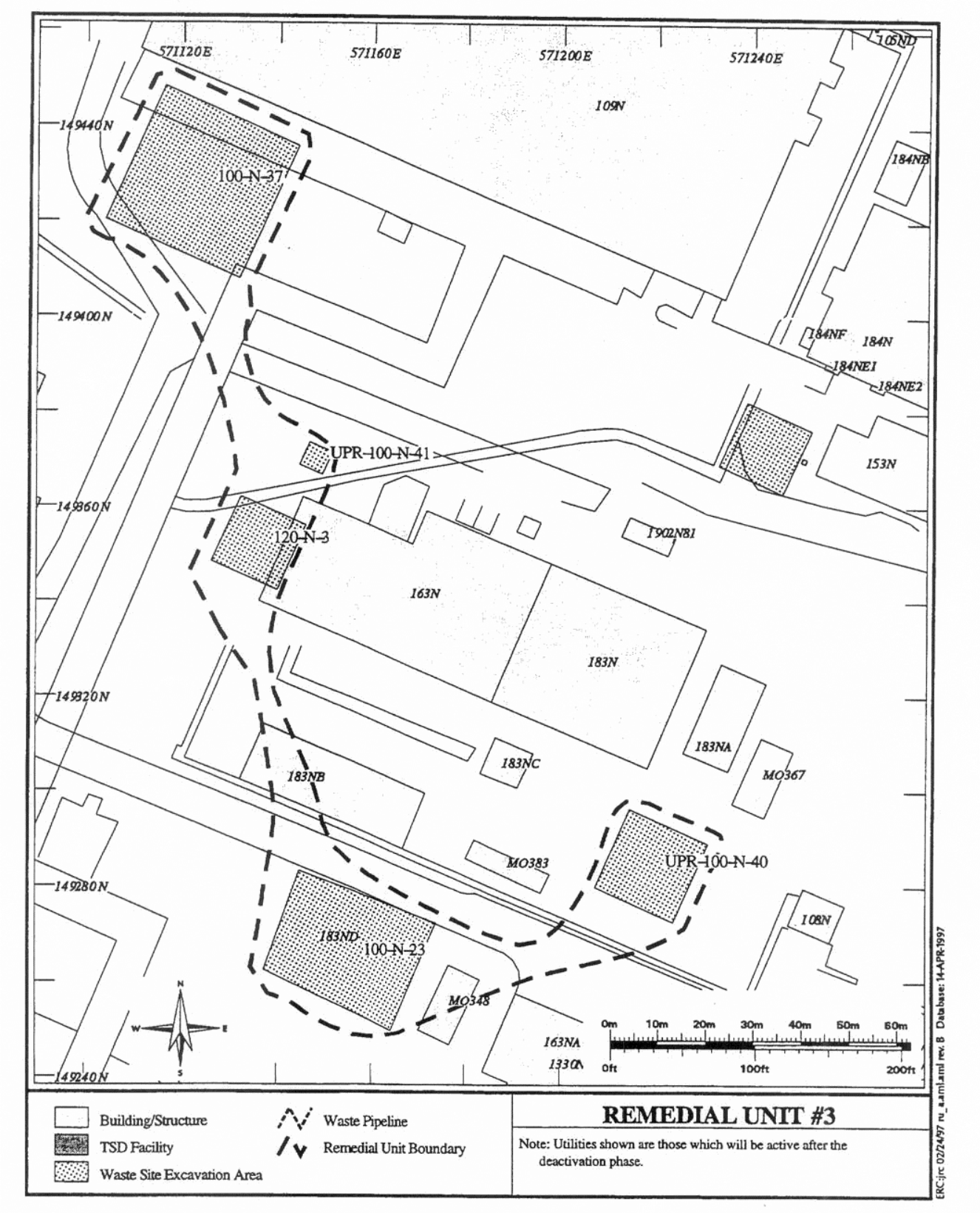


Figure 7.3 Remedial Unit Number 3

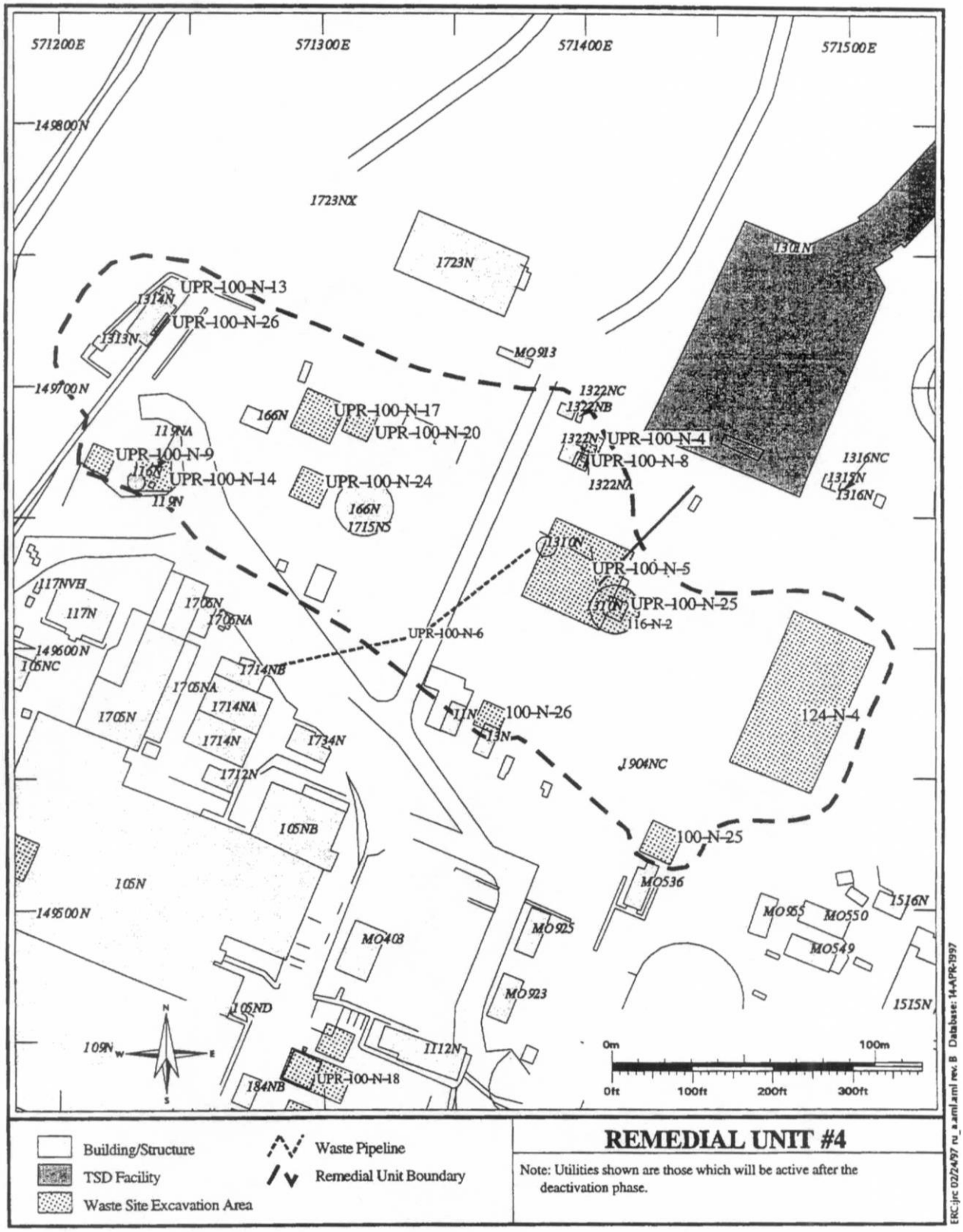


Figure 7.4 Remedial Unit Number 4

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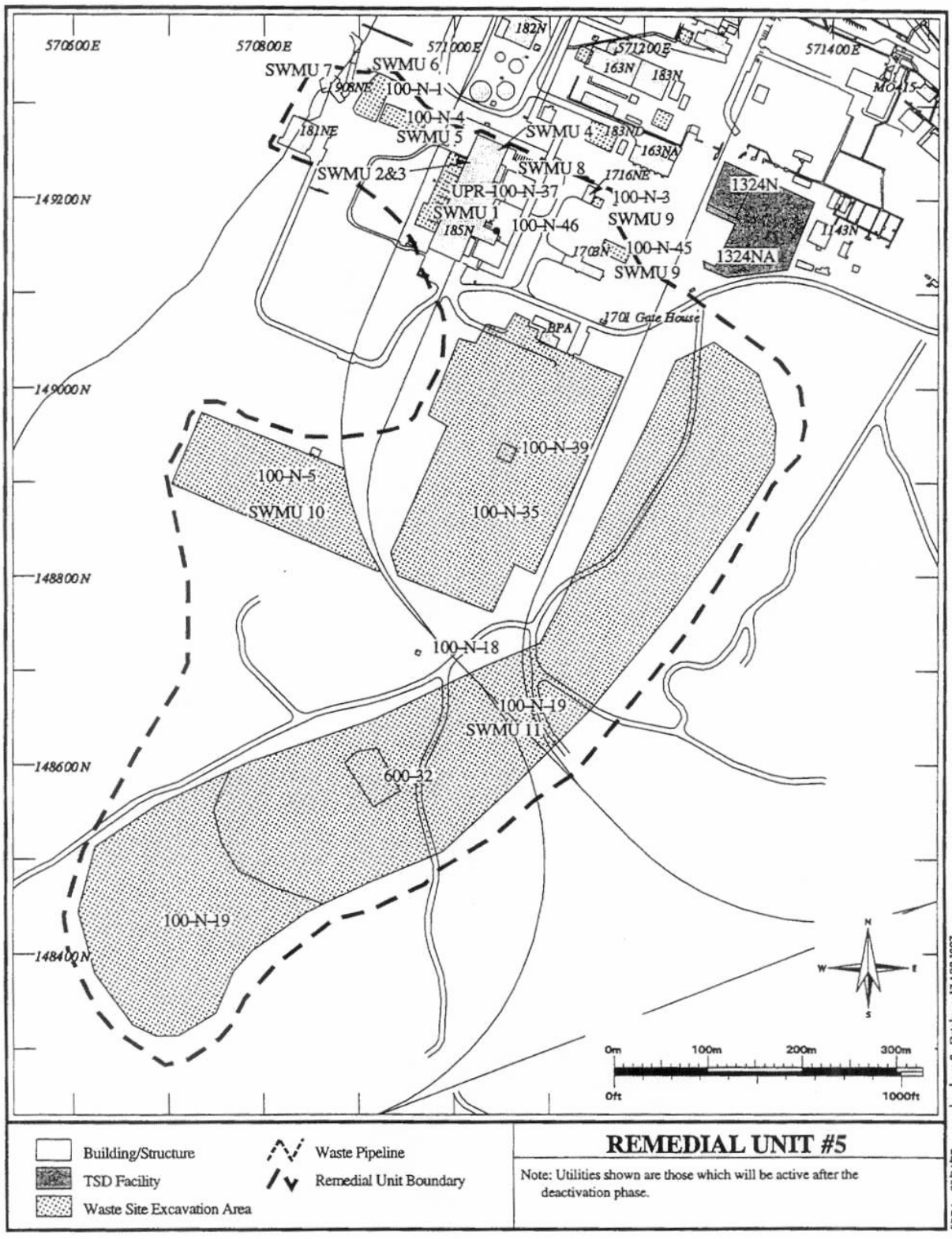


Figure 7.5 Remedial Unit Number 5

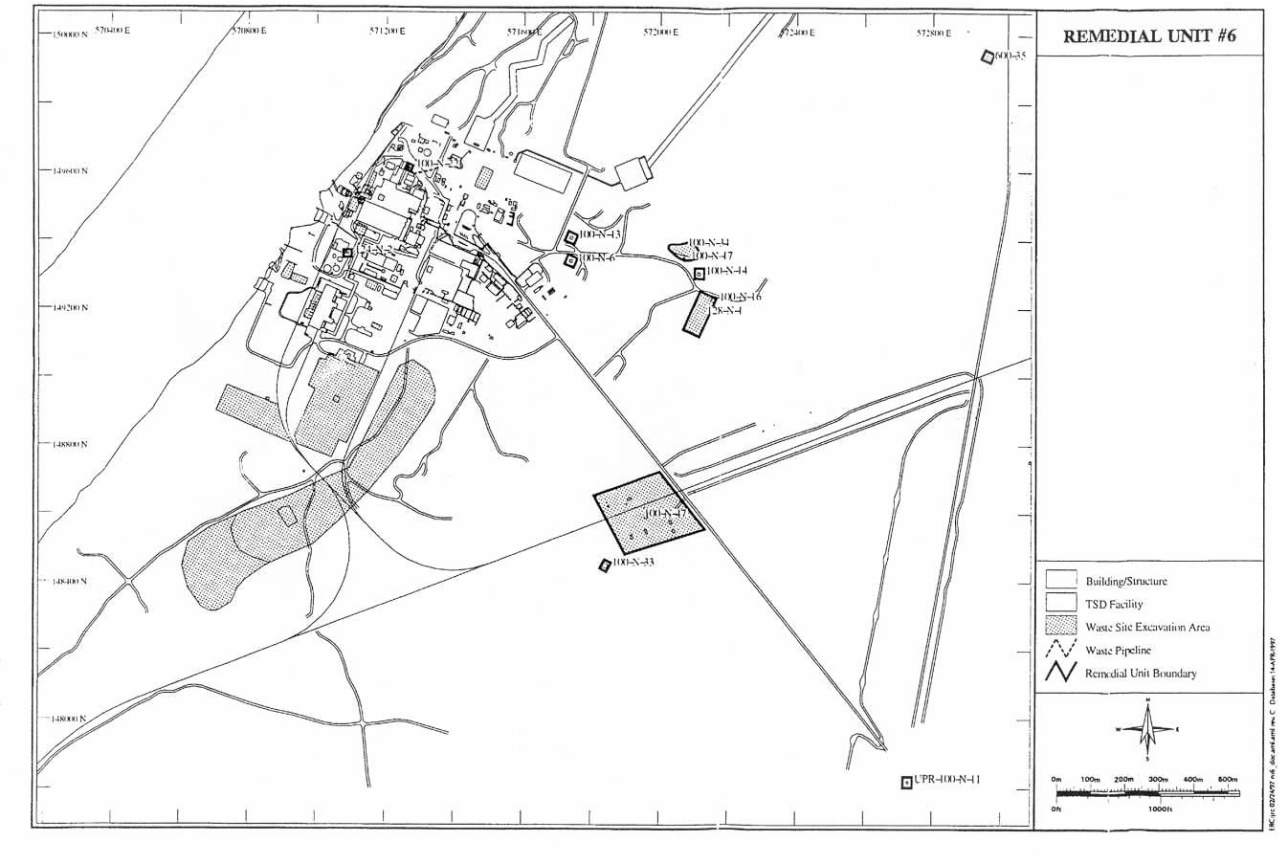


Figure 7.6 Remedial Unit Number 6

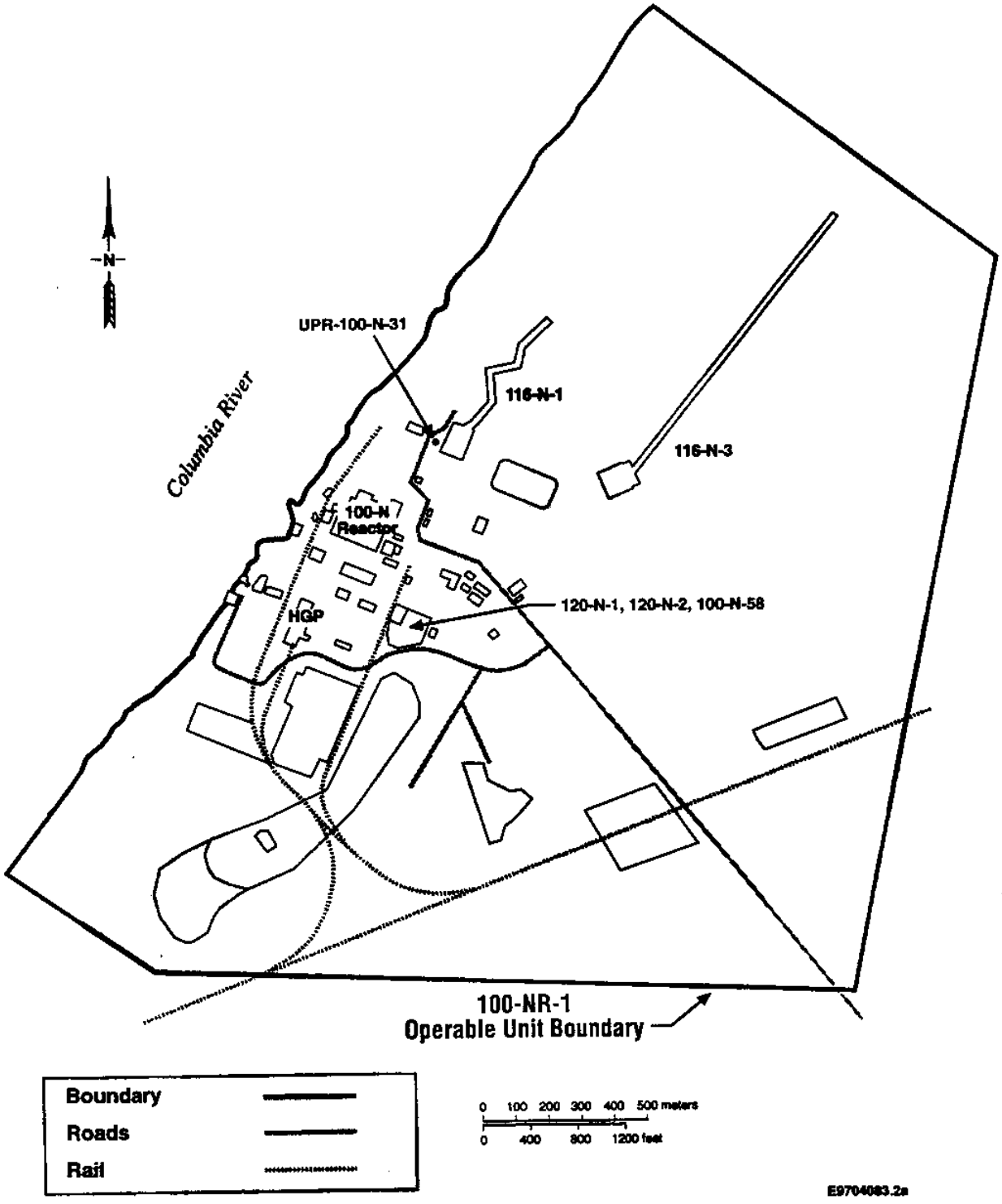


Figure 7.7 TSD Waste Sites at the 100-N Area

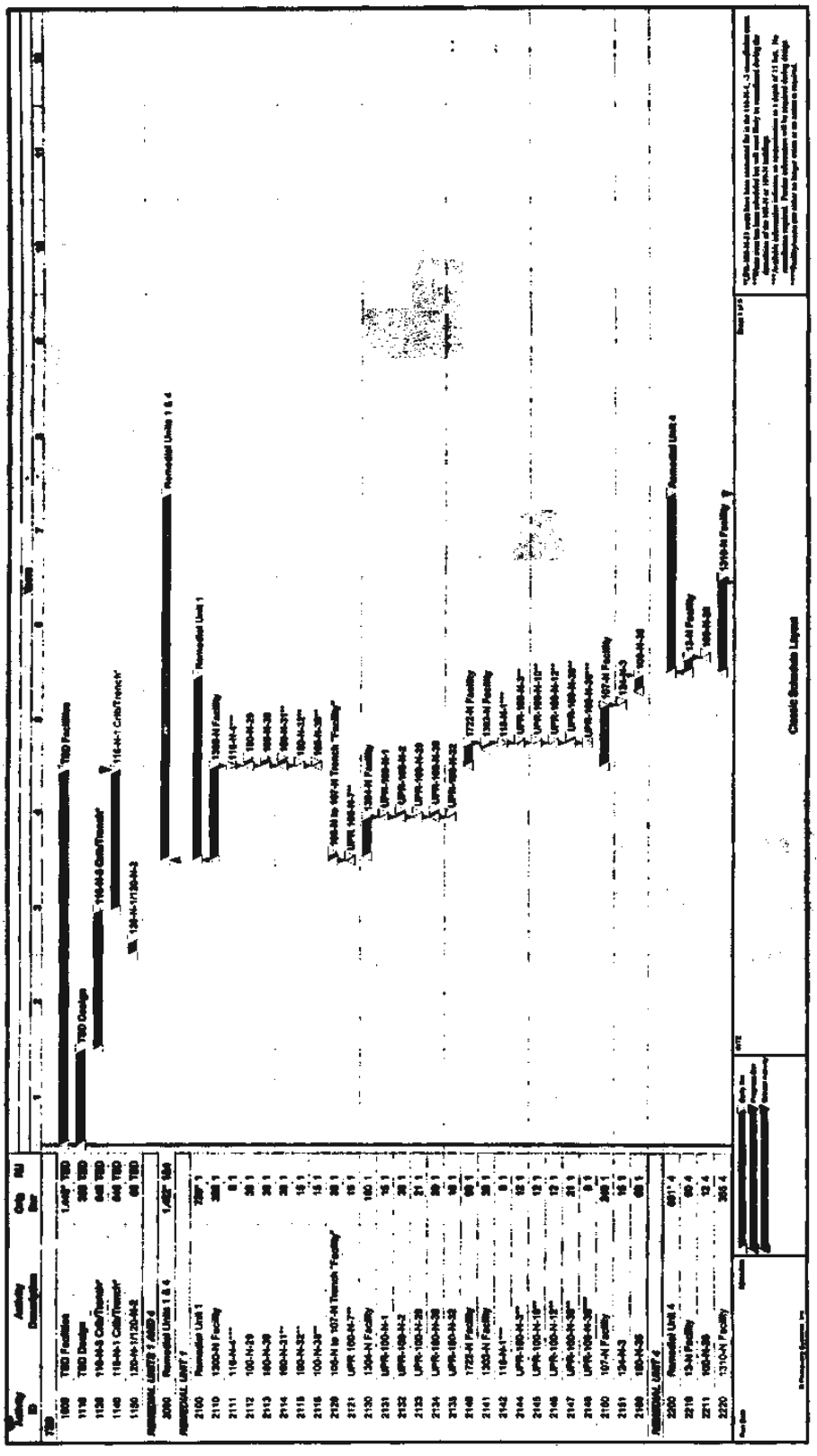
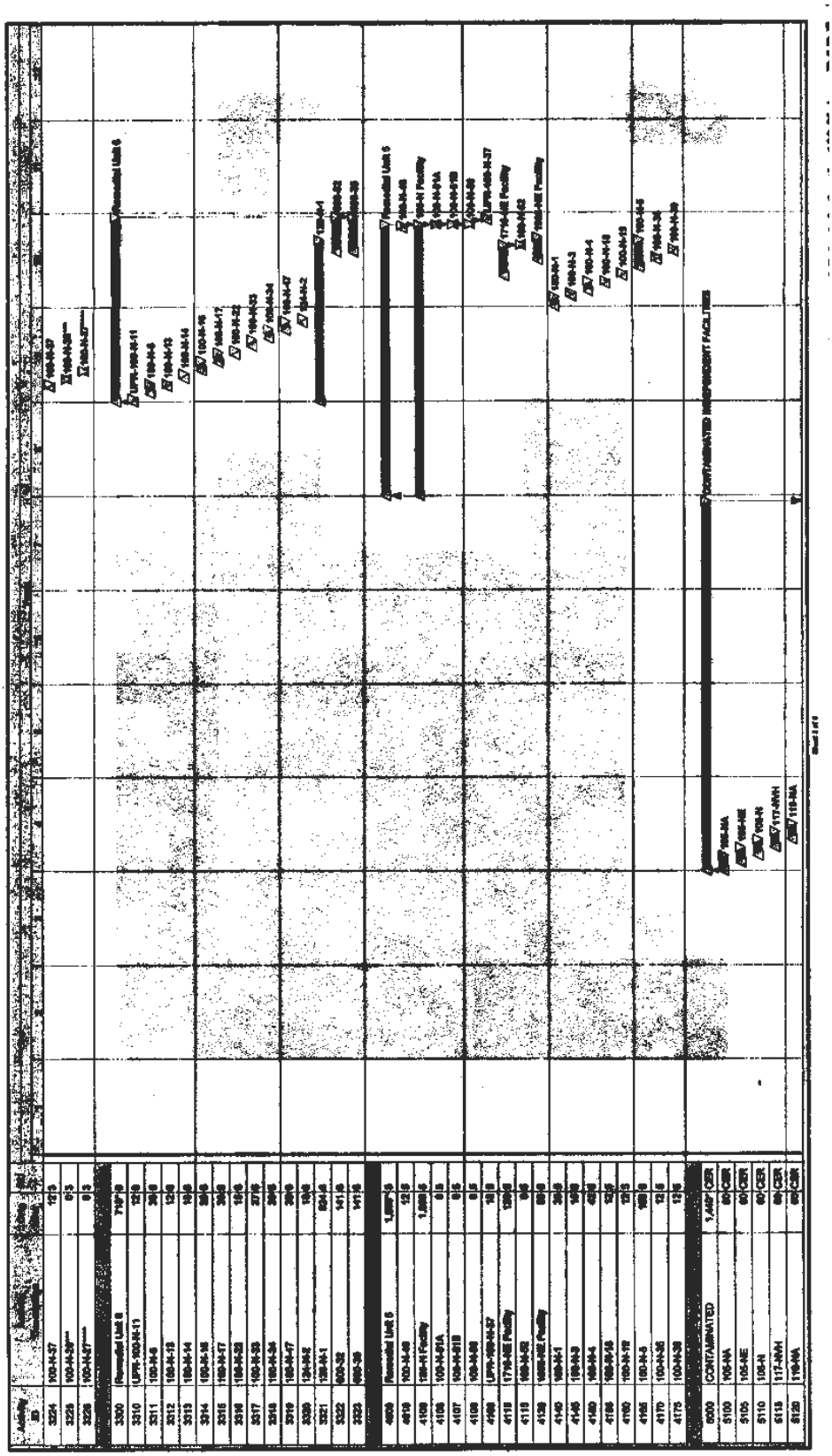
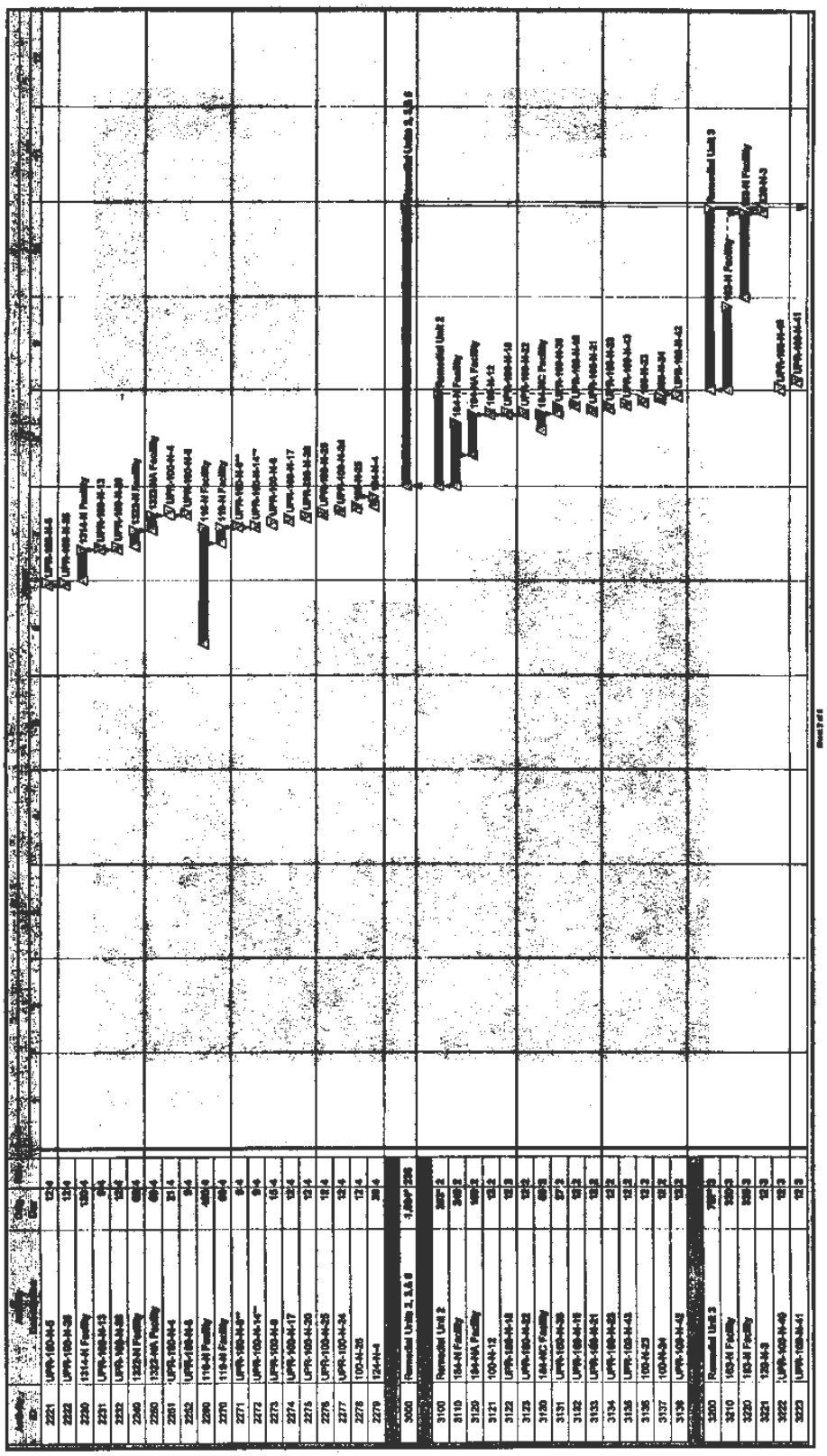
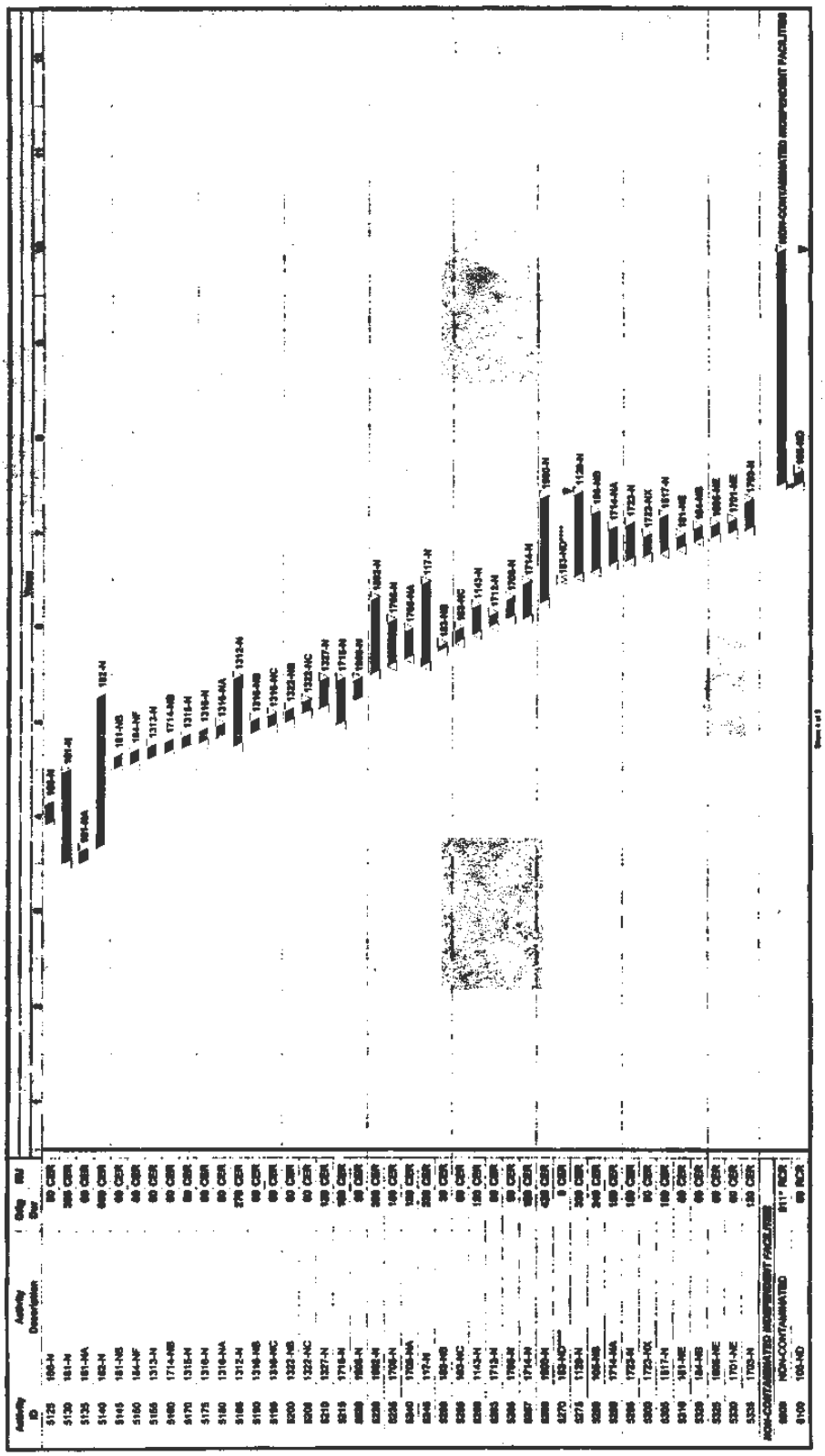


Figure 7.8 Integrated Schedule for the 100-N Area D&D Facilities and Remediation Activities







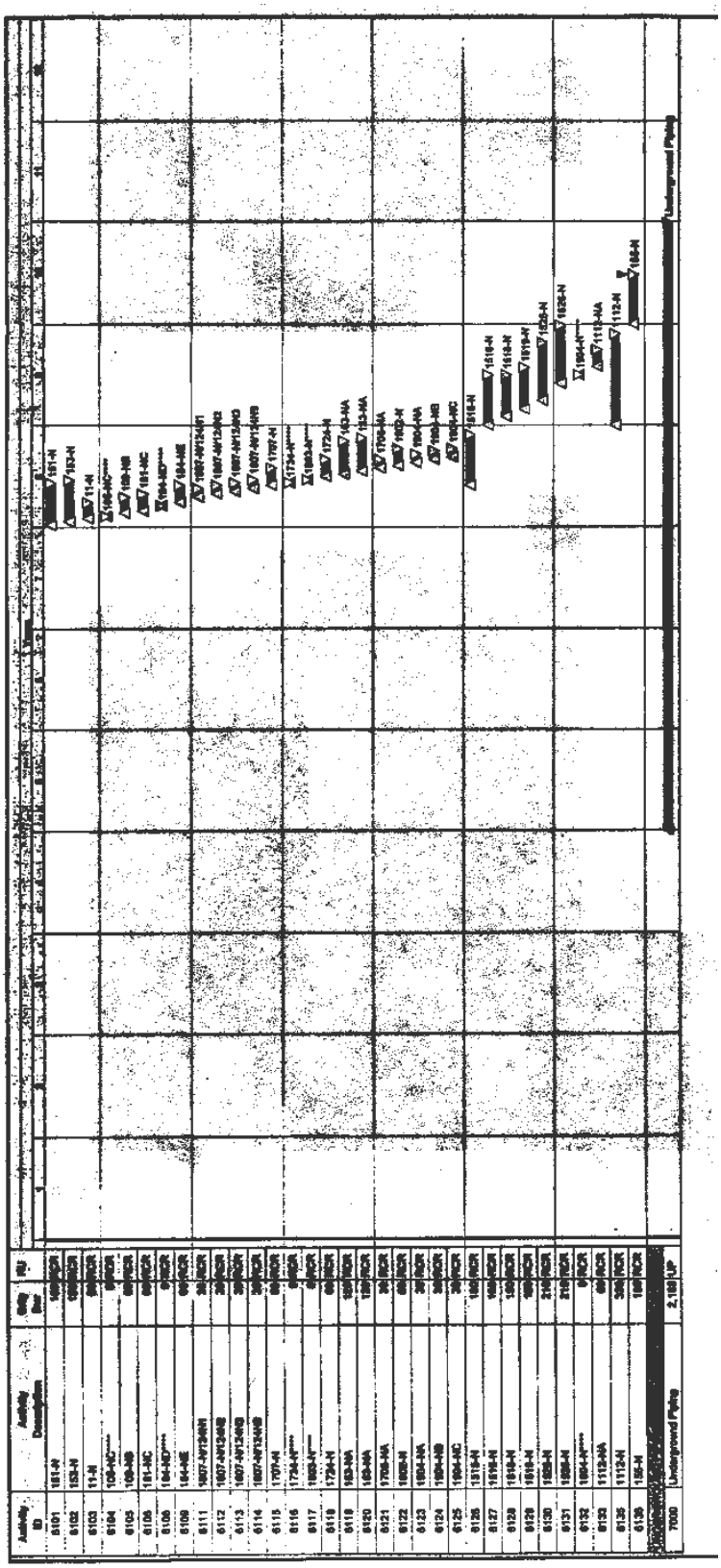


Table 7.4 100-N Area Remedial Action Waste Sites

Remedial Unit No. 1	Remedial Unit No. 2	Remedial Unit No. 3	Remedial Unit No. 4	Remedial Unit No. 5	Remedial Unit No. 6	River Shoreline	TSD Facilities
100-N-29[a] 100-N-30[a] 100-N-31[a] 100-N-32[a] 100-N-36 100-N-38[a] 116-N-4[a] 118-N-1[a] 124-N-3 UPR-100-N-1 UPR-100-N-2 UPR-100-N-3[a] UPR-100-N-7[a] UPR-100-N-10[a] UPR-100-N-12[a] UPR-100-N-29 UPR-100-N-30 UPR-100-N-32 UPR-100-N-35[a] UPR-100-N-39[a]	100-N-12 100-N-28 100-N-24 UPR-100-N-18 UPR-100-N-19 UPR-100-N-21 UPR-100-N-22 UPR-100-N-23 UPR-100-N-36 UPR-100-N-42 UPR-100-N-43	100-N-23 100-N-37 120-N-3 UPR-100-N-40 UPR-100-N-41	100-N-25 100-N-26 124-N-4 UPR-100-N-4 UPR-100-N-5 UPR-100-N-6 UPR-100-N-8 UPR-100-N-9[a] UPR-100-N-13 UPR-100-N-14[a] UPR-100-N-17[b] UPR-100-N-20 UPR-100-N-24 UPR-100-N-25 UPR-100-N-26	100-N-1 (SWMU 6) 100-N-3 (SWMU 9) 100-N-4 (SWMU 5) 100-N-5 (SWMU 10) 100-N-18 100-N-19 (SWMU 11) 100-N-35 100-N-39 100-N-45 (SWMU 9) 100-N-46 UPR-100-N-37 (SWMU 1) 1908-NE (SWMU 7)[c] 100-N-50 (SWMU 4)[c] 100-N-51a (SWMU 2)[c] 100-N-51b (SWMU 3)[c] 100-N-52 (SWMU 8)[c]	100-N-6 100-N-13 100-N-14 100-N-16 100-N-17 100-N-22 100-N-33 100-N-34 100-N-47 124-N-2 128-N-1 600-32 600-35 UPR-100-N-11	100-N-65 Shoreline Site	116-N-1 116-N-3 120-N-1 120-N-2 100-N-58 (South Pond) UPR-100-N-31

[a] Buffer zone sites; 13 buffer zone sites in RU 1 out of 15 total sites and 2 buffer zone sites in RU 4 out of a total of 15 sites.

[b] This site has been subdivided into two sites: UPR 100-N-17 is the leak and 100-N-65 is now the petroleum burn pit. 100-N-17 includes 100-N-65.

[c] Waste site contained within a facility.