FEB 27 2004

DATE

This is to acknowledge the receipt of your letter/application dated 2/17/04, and to inform you that the initial processing, which includes an administrative review, has been performed.

☒ There were no administrative omissions. Your application will be assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card:

The action you requested is normally processed within 90 days.

☐ A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 469933.
When calling to inquire about this action, please refer to this mail control number.
You may call me at 817-860-8103.

Sincerely,

Colleen Burnahan

Licensing Assistant

NRC FORM 532 (RIV)
(9-2003)

Xcel Energy℠

10 CFR 30.36(g)(1)

February 17, 2004

Nuclear Materials Licensing Section
U.S. Nuclear Regulatory Commission, Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011

Pathfinder Generating Plant
Docket No. 030-05004
Byproduct Materials License No. 22-08799-02

Subject: License Amendment Request to Authorize Decommissioning Activities at Pathfinder

Reference: Letter from Charles H. Fuller, Xcel Energy, to U.S. Nuclear Regulatory Commission, February 21, 2003

By the above reference, Xcel Energy notified the staff that it had permanently ceased operating activities at the Pathfinder generating plant. Xcel Energy also informed the staff that it would submit a decommissioning plan for the Pathfinder facility. Accordingly, Xcel Energy is hereby submitting the Pathfinder Decommissioning Plan as an amendment request to the Pathfinder byproduct materials license. Xcel Energy requests NRC approval of this plan to allow for decommissioning activities in accordance with the requirements of 10 CFR 30.36(g)(1).

The Pathfinder Decommissioning Plan is included herewith as an attachment to this letter. The plan was developed using the guidance contained in NUREG-1757, Volume 1, *Consolidated NMSS Decommissioning Guidance, Decommissioning Process for Materials Licensees*, for Class 3 decommissioning groups.

A separate Environmental Information Addendum is also provided as an attachment to aid the staff in its environmental review of the proposed decommissioning activities. The addendum was developed using the guidelines contained in Section 15.7 of the above NUREG and NUREG-1748, *Environmental Review Guidance for Licensing Actions*

Associated with NMSS Programs. Xcel Energy believes that this addendum will support an environmental finding of no significant impact (FONSI).

Please contact Joel Beres, Pathfinder Decommissioning Project Manager, at 612 766 0381 if you have any questions.

Sincerely,

Charles Bomberger
General Manager, Xcel Nuclear Asset Management

Xcel Energy
414 Nicollet Mall
Minneapolis, MN 55401

Attachments:
Pathfinder Decommissioning Plan
Environmental Information Addendum

Cc: Joel Beres
Lloyd Hilgart (w/o attachments)
Tim Brown (w/o attachments)
Pathfinder Decommissioning File

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

(FOR LFMS USE)
INFORMATION FROM LTS

Program Code: 03124
Status Code: 0
Fee Category: 3P
Exp. Date: 20070531
Fee Comments: _____
Decom Fin Assur Reqd: Y

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED
   Applicant/Licensee: NORTHERN STATES POWER CO.
   Received Date: 20040218
   Docket No: 3005004
   Control No.: 469933
   License No.: 22-08799-02
   Action Type: Amendment

2. FEE ATTACHED
   Amount: /
   Check No.: /

3. COMMENTS

Signed Colleen Murnahan
Date 2/27/04

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /__/)

1. Fee Category and Amount: _____

2. Correct Fee Paid. Application may be processed for:
   Amendment _____
   Renewal _____
   License _____

3. OTHER _____

Signed _____
Date _____

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EXECUTIVE SUMMARY

Xcel Energy is providing this decommissioning plan as part of its license amendment request to incorporate decommissioning activities. The present license does not include the necessary provisions to decommission the site. The decommissioning activities, release criteria, and methods to ensure worker protection are detailed herein. Environmental information is provided in a separate addendum submitted with this document. The plan format is in accordance with the guidance for a Group 3 Decommissioning as described in Section 10.2 of NUREG 1757, *Consolidated NMSS Decommissioning Guidance*, Volume 1, Decommissioning Process for Materials Licensees.

The proposed decommissioning activities are relatively simple and pose very low risk to the public and the environment. The largest portion of the radioactive material at the Pathfinder site was removed by previous remediation activities in 1991. Only a very small fraction of the contamination from reactor operations is present at the site, and the radiological history of the site is well documented. Annual surveys have been conducted since 1969, and the site radiological profile was recently updated in detail by a comprehensive characterization survey. This survey demonstrated that the remaining radiation levels at the site are relatively low. The contamination is fixed and primarily localized to surfaces within the basement of one site building. In addition, the site's soil, groundwater, and surface waters are not contaminated and do not require any remediation.

Xcel Energy is proposing to remediate the contaminated areas to permit unrestricted use of the Pathfinder site. The dose assessment method for the Pathfinder site employs the application of screening criteria using predefined models for Derived Concentration Guideline Levels (DCGLs). This method will be used to demonstrate compliance with the radiological release criteria of 10 CFR Part 20, Subpart E. A site-specific dose analysis is not required.

When decommissioning activities are complete, a Final Status Survey will be conducted to demonstrate compliance with dose criteria for unrestricted release. Xcel Energy will then submit a request to terminate the Pathfinder Byproduct Material license in accordance with regulatory requirements.

Pathfinder Decommissioning Plan

February 17, 2004

1. FACILITY OPERATING HISTORY

Licensing History

Northern States Power, now a wholly owned subsidiary of Xcel Energy, obtained an operating license (DPR-11) for the operation of the Pathfinder Atomic Power plant in 1964. Low power testing was conducted under this license from March 1964 to September 1967. Economic and other factors resulted in a decision to shutdown the nuclear plant and place it in SAFSTOR. The nuclear fuel was transferred offsite, the operating license was terminated, and the current byproduct materials license (22-08799-02), which is still in effect, was issued on August 9, 1972 under the provisions of 10 CFR 30. The license was subsequently amended to allow for a decommissioning of the reactor side of the plant and the fuel storage facilities in 1992. The termination of this byproduct materials license is the ultimate goal of the Pathfinder decommissioning effort.

Operational History

The Pathfinder Atomic plant was designed to generate 66 MW of electrical energy. The reactor vessel had a unique design that employed in-core superheaters. Outside of the vessel, the plant configuration was similar to modern day boiling water reactors. Initial criticality was achieved on March 24, 1964. The plant commenced commercial operations on August 1, 1966 and was permanently shutdown soon after on September 16, 1967. Most of the operation during this period involved phased testing, and sustained full power operation at the design power level was never achieved. All radioactive releases during this period were within regulatory limits. There were no indications of fuel failures during plant operation.

The brief operating period introduced a relatively small amount of radioactive contamination into the Balance of Plant systems (BOP) from translocation. The BOP has not been subject to any additional radioactivity from reactor sources since the nuclear plant was permanently shutdown. The residual radioactivity contained within the BOP is a byproduct of materials activated during operation of the Pathfinder nuclear reactor.

Only one significant radiation event occurred during this brief operational period. A condenser tube leak occurred simultaneous with the final shutdown in 1967. This leak resulted in contamination of a portion of the service water system and the cooling tower basin. The affected equipment was decontaminated. The primary radioactivity was from radionuclides with short half lives (Zn-65 and Na-24). A comprehensive examination of the cooling tower concluded that no significant residual radioactivity remained in the cooling tower in 1982. This was later confirmed by an NRC sponsored survey. See Section 3.2 of Ref. 1.

In 1968, the Pathfinder BOP was decontaminated and disconnected from the reactor plant. Phosphoric acid (30%) solution was used to decontaminate the turbine, the condenser, an inlet steam line, and two of the feedwater heaters (Section C.3 of Ref. 1).

This decontamination effort removed 500 mCi from the turbine and condenser (mostly Zn-65), 300 mCi from turbine parts, and 500 mCi from feedwater heaters. A total of 1300 mCi was packaged and shipped offsite. All contaminated material that had been stored in the Turbine Building was removed and stored on the reactor side of the plant or shipped offsite. The nuclear plant and associated systems were isolated from the Turbine Building. Steam, reactor feedwater, and other nuclear process lines were cut and capped. The BOP was then integrated into a fossil-fueled peaking plant. Three new gas/oil package boilers housed in a new Boiler Building supplied steam to the BOP to operate the turbine. Commercial operation of this new power configuration, known as the Pathfinder Peaking Plant, commenced in May 1969 and continued until July 2000.

The nuclear fuel was shipped offsite in 1970 and the plant was placed in SAFSTOR in 1971. In 1991 a decommissioning of the reactor plant and fuel storage facilities was conducted. The details of this decommissioning are presented in Section 2.2.1 herein.

The Pathfinder Peaking Plant continued to operate until July 13, 2000, when the cooling tower collapsed in a storm. Due to economic reasons, the decision was made to cease operations of the peaking plant and commence decommissioning activities. The suspension of activities such as boiler and turbine maintenance will effectively prevent future use of existing peaking plant equipment for electrical generation without major modifications and capital expenditures. By letter dated February 21, 2003, Xcel Energy notified the NRC that power operation at the Pathfinder Peaking Plant had permanently ceased. None of the Pathfinder Peaking Plant power systems such condensate, feed, or steam systems are in current usage. These systems contain most of the fixed contamination at Pathfinder.

The Angus Anson fossil plant, which consists of two simple cycle combustion turbines, was constructed on the eastern end of the Pathfinder site outside of the secured area. The plant commenced commercial operations in September 1994. These two units continue to operate. An additional simple cycle unit is planned for installation in 2005. The Angus Anson plant operates separately from the steam and condensate BOP systems of the Pathfinder Peaking Plant except for an auxiliary services connection to the former Pathfinder cooling water system for fire protection services. The cooling water system line has been cut and capped and isolated from the Pathfinder condenser by a recent modification.

2. FACILITY DESCRIPTION

2.1 Site Location and Description

The Pathfinder Site is owned and operated by Northern States Power Company, a wholly owned subsidiary of Xcel Energy Inc. The Pathfinder site is located at 7100 East Rice Street, Sioux Falls, SD 57110. The Xcel Energy corporate headquarters are located at 414 Nicollet Mall, Minneapolis, MN 55402.

Although Xcel Energy owns additional land that surrounds the Pathfinder

location, the Pathfinder site as referred to herein principally includes the secured area shown in Figures 2-1 and 2-2. The buildings and the areas enclosed within the secured area and the influent and effluent pathways to the Big Sioux River (e.g. settling ponds and diversion ditch) are the subjects of this decommissioning plan. Three of the existing buildings have been previously decommissioned and approved for unrestricted release (Ref. 2). These buildings include: 1) the Reactor Building, which was demolished above grade and backfilled below grade, 2) the Fuel Handling Building including the Fuel Transfer Vault, and 3) the Temporary Loading and Storage Building (both of which are in use today to support Angus Anson operations).

2.2 Radiological Status of the Facility

2.2.1 Previous Radiological Characterizations

Baseline Characterization

In 1980, Battelle's Pacific Northwest Laboratory prepared a radionuclide inventory for Pathfinder for the NRC under an agreement with the US Department of Energy (Ref. 1). This survey was conducted as part of a pilot program to provide the NRC with information on types, quantities, and locations of radionuclides at retired power plants. The study is referenced in several correspondences between the NSP and the NRC and included as Appendix C to this decommissioning plan.

Among other areas, this investigation included soil sampling (Section 3.1), cooling tower sampling (Section 3.2), surveys of auxiliary buildings (Section 3.3), and Turbine Building concrete samples (Section 3.4.2). These sampling efforts are relevant to the proposed decommissioning activities. Section C.3 describes the 1980 radiological status of the Turbine Building, which is the main focus of this decommissioning plan. According to this study, the activity in the Turbine Building was the result of fixed contamination from translocated activated corrosion products in piping and metal surfaces. A decay calculation applied to the estimated inventories of Co-60 and Zn-65 provided in the Battelle study resulted in the byproduct radioactivity amounts in the current license, which is 40 mCi and 1mCi respectively.

Previous Decommissioning of Reactor Plant and Fuel Storage Facilities

In 1991, the reactor plant and fuel storage facilities were decommissioned. This effort removed approximately 562 Ci. The effects of the 1991 decommissioning activities did not result in any adverse effects to the environment or spread of contamination.

The radiological release criteria for the 1991 decommissioning was based on Regulatory Guide 1.96, Termination of Operating Licenses for Nuclear Reactors, June 1974. Table 1 of this guide provides the acceptable surface contaminated levels for unrestricted use.

The guide does not specify a dose equivalent for unrestricted release, and the resultant dose from the 1991 decommissioning was therefore not specifically determined.

The NRC contracted a radiological survey to confirm the results of decommissioning surveys reported by NSP. The survey was performed by the Oak Ridge Institute for Science and Education (ORISE) and completed in November 1992 (Ref. 3). The confirmatory study included soil sampling. All samples were demonstrated to be below the requirements of Regulatory Guide 1.86. By letter dated Nov. 10, 1992 (Ref. 2) the NRC staff authorized unrestricted release of the decommissioned buildings and demolition of the reactor building.

By letter dated February 15, 1993 (Ref. 4), NSP provided the NRC staff with an evaluation of radionuclide release data to the environment in compliance with Condition 14 of the Material License. This evaluation was submitted subsequent to the completion of decommissioning activities. This report showed that no liquid releases occurred. Gaseous releases were filtered, and samples of continuously monitored ventilation exhausts all were well below the allowed limits. Most of the reported Continuous Air Monitor (CAM) activity was attributed to naturally occurring radon daughters.

Historical Environmental Monitoring

After 20 years of comprehensive liquid effluent sampling, environmental monitoring of liquid releases was discontinued due to extremely low levels of radiation. This action was permitted in 1992 by Amendment 11 to the Pathfinder Materials License (Ref. 2 and Ref. 5). A separate and extensive radiological monitoring program was also in effect during the decommissioning activities conducted in 1992. Radiological measurements were taken of samples of ambient air, ground water, surface water, drinking water, bottom river sludge, raw milk, fish, plants, and soil. No detectable radionuclides attributable to licensed activities were found (Ref. 5). Since the liquid sampling program was suspended and the previous decommissioning was completed, there has been no transport of significant amounts of contaminated material to the environment from routine operations and maintenance or from an unplanned event such as a fire or explosion.

Figure 2-1
Pathfinder Site Plan

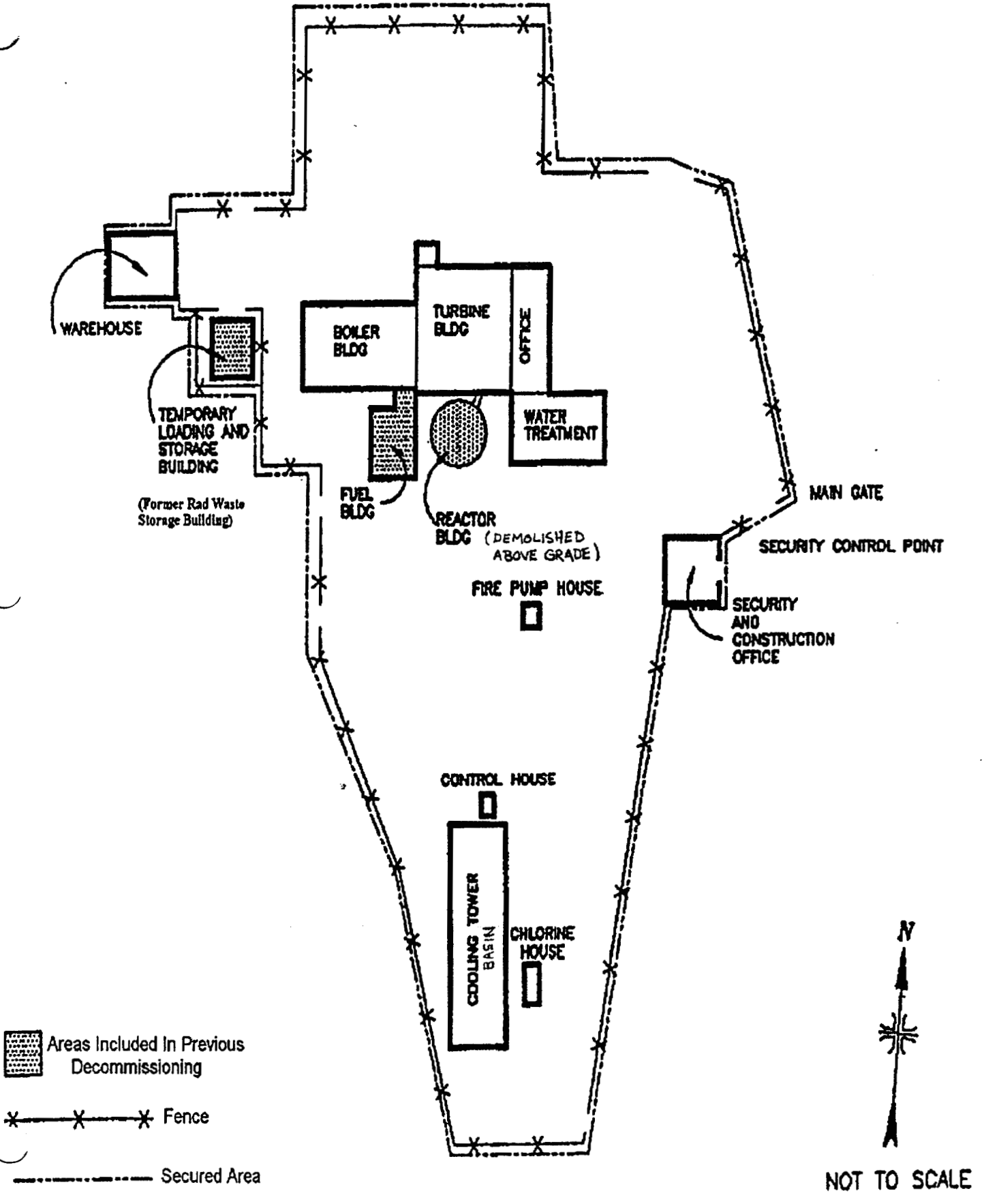


Figure 2-2
Pathfinder Secured Area

2.2.2 Ongoing Radiological Characterizations

Radiological surveys of the Turbine Building and Boiler Building have been performed annually in accordance with license requirements since the BOP was converted into the Pathfinder Peaking Plant in 1968. These surveys will continue to be performed until the byproduct materials license is terminated. The records of these surveys were examined as part of the Historical Site Assessment. The trends and radiation levels from these surveys correspond well with the most recent characterization study conducted in October 2003. See Appendix D. Detailed results of the characterization data are available for inspection.

2.2.3 Present Radiological Status of the Pathfinder Site

This section of the decommissioning plan discusses the present radiological status of the Pathfinder Site. It is based on the results of a comprehensive characterization survey of the site performed by the project consultant, Duratek Inc. in October 2003. The resulting survey report is included as an Appendix D to this decommissioning plan. The detailed survey results are available for inspection.

The characterization survey was performed in accordance with a site-specific plan based in part on information obtained from the Historical Site Assessment. The site assessment identified numerous locations and systems where radioactivity was known to exist, or had the potential to exist. These areas were specifically included in the characterization survey. The characterization survey included the interior portions of the HP turbine, steam piping, feedwater, and condensate piping. Various peaking plant systems were disassembled to facilitate the performance of the characterization survey.

The results of the characterization survey indicate that the amount of residual activity remaining within the Pathfinder Peaking Plant is relatively small and largely confined to several well-defined areas within the plant. The samples collected in the environs surrounding the plant did not identify any radioactivity attributable to licensed activities.

A preliminary DCGL of 5,000 dpm/100 cm^2 was established for building surfaces to facilitate the characterization survey. Table 2-1 below identifies those areas in which fixed activity in excess of the preliminary DCGL was identified.

Table 2-1
Areas With Residual Radioactivity In Excess of the
Preliminary DCGL

Area Surveyed	**Number Of** Measurements	**Mean dpm/ 100 cm^2**	**Maximum dpm/ 100 cm^2**	**Standard Deviation dpm/ 100 cm^2**
Floor Drain Line Upstream Of Condenser	16	1,999	8,143	2,397
Floor Drain Line Downstream Of Condenser	27	10,253	38,714	7,233
Circ Water Piping Near Flange	15	1,292	12,631	3,174
Floor Under Condenser	20	969	8,075	1,731
Condenser Hot Well Bottom	20	1,518	5,849	1,869
Condenser Expansion Joint	30	1,872	12,757	3,662

The information provided in Table 2-1 is further amplified below.

Only the drain lines beneath the condenser could be effectively surveyed due to a blockage. It is possible that additional residual activity is present in the floor drain system beneath the basement floor on the hot side of the Turbine Building. These remaining lines were conservatively assumed to be contaminated for planning purposes.

The activity in the floor drain lines, hotwell, and condenser expansion joint may be higher than reported due to attenuation and self absorption. In addition, any debris remaining in the floor drain system may be contaminated.

Only the floor area beneath the condenser in the basement of the Turbine Building appears to contain fixed contamination. The remaining floor surfaces in the basement of the Turbine Building did not have fixed activity in excess of the preliminary DCGL.

The affected area within the circulating water system piping near the flange appears to be limited to a small area. The affected area is limited to a small portion of the retired intake water pipe inside the Turbine Building. A recently installed blank flange isolates this piping from the cooling tower basin.

Biased samples were collected throughout the plant as part of the characterization survey. Table 2-2 below identifies those areas where residual activity attributable to licensed activities in excess of the Minimum Detectable Activity (MDA) were found.

Table 2-2
Biased Sample Analysis Results in Excess of MDA

Sample Location	Radionuclide	Activity (pCi/g)	MDA (pCi/g)
Condenser Expansion Joint (Turbine Building)	Co-60 Zn-65	2.35 E2 1.31 E0	2.70 E-1 7.62 E-1
Mud Drum (Boiler Building)	Co-60	1.05 E1	8.76 E-2
Condenser Hotwell (Turbine Building)	Co-60	9.09 E0	1.48 E-1
Condensate Pump Sump (Turbine Building)	Ag-108m Co-60 Eu-155	3.18 E3 2.12 E0 4.42 E1	2.09 E0 1.28 E0 2.88 E0
Turbine Building Sump Hot Side (Turbine Building)	Co-60 Cs-137 Eu-152 Eu-155	8.25 E0 8.65 E-1 2.08 E0 1.45 E0	9.34 E-2 8.98 E-2 7.76 E-1 2.27 E-1
		Activity (pCi/l)	**MDA (pCi/l)**
Hydrogen Cooler (Turbine Building)	H-3	1.40 E4	3.58 E-2

As Table 2-2 above shows, the radionuclides of interest for the decommissioning include: H-3, Co-60, Zn-65, Ag-108m, Cs-137, Eu-152, and Eu-155. This list of radionuclides will be reviewed prior to performing a final status survey in order to account for additional radioactive decay, the presence of previously unidentified radionuclides, and the effects of any remediation activities.

Table 2-3 below lists the half lives of the radionuclides identified during the characterization survey.

Table 2-3
Half Lives Of Identified Radionuclides

Radionuclide	Half Life Years
H-3	12.28
Co-60	5.27
Zn-65	0.67
Ag-108m	127
Cs-137	30.17
Eu-152	13.6
Eu-154	8.8

2.3 Contaminated Building Surfaces

There is presently no indication of significant radioactive contamination from reactor-originated sources on the building surfaces or structures at the Pathfinder Site other than certain portions of the Turbine Building and Boiler Building. The surfaces with fixed contamination in the Turbine Building include the following.

- The condenser hotwell and expansion joint
- The condensate pump area sump in the Turbine Building floor
- The turbine room sump (hot side) in the Turbine Building floor
- The Turbine Building floor under the condenser
- The Turbine Building floor drain piping (hot side)

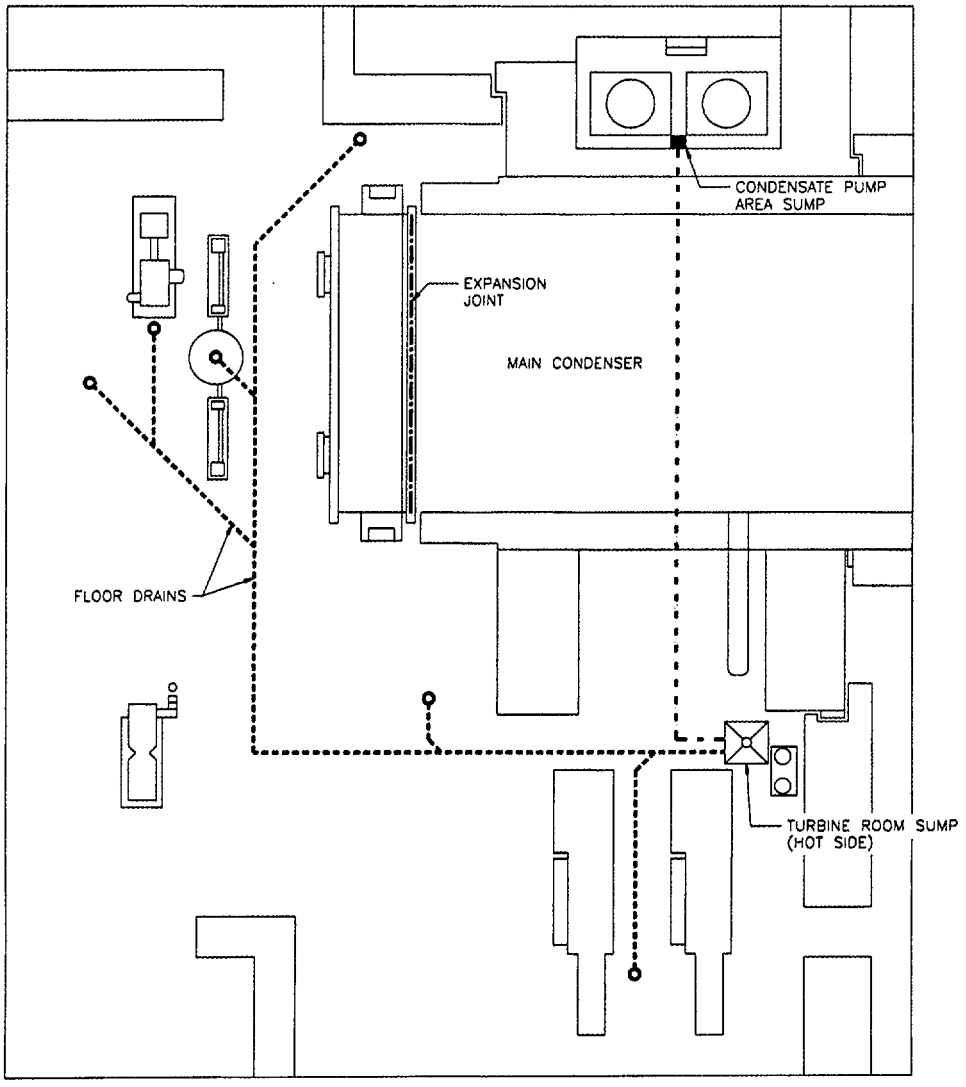
The above areas can be considered as parts of the permanent structures of the Turbine Building. The condenser is considered to be a permanent part of the Turbine Building structure. The condenser weighs approximately 225 tons. The condenser hotwell is a large rectangular shaped box that forms the bottom of the condenser. The expansion joint is a large metallic section located between the water box and condenser shell that extends outward approximately 8 inches along the periphery of these two interfaces. During the construction of the Pathfinder Turbine Building, the Turbine Building basement was poured with concrete and the condenser was set in place. The remaining floors of the Turbine Building, which includes the mezzanine and the turbine operating deck, were built around the condenser. The sumps listed above are integral rectangular sections of the Turbine Building floor, which are recessed from the floor level to collect drains. The floor drain piping is encased within the basement floor. Figure 2-3 shows the location of contaminated Turbine Building surface areas.

The contaminated building surfaces in the Boiler Building include the following.

- The boiler mud drums

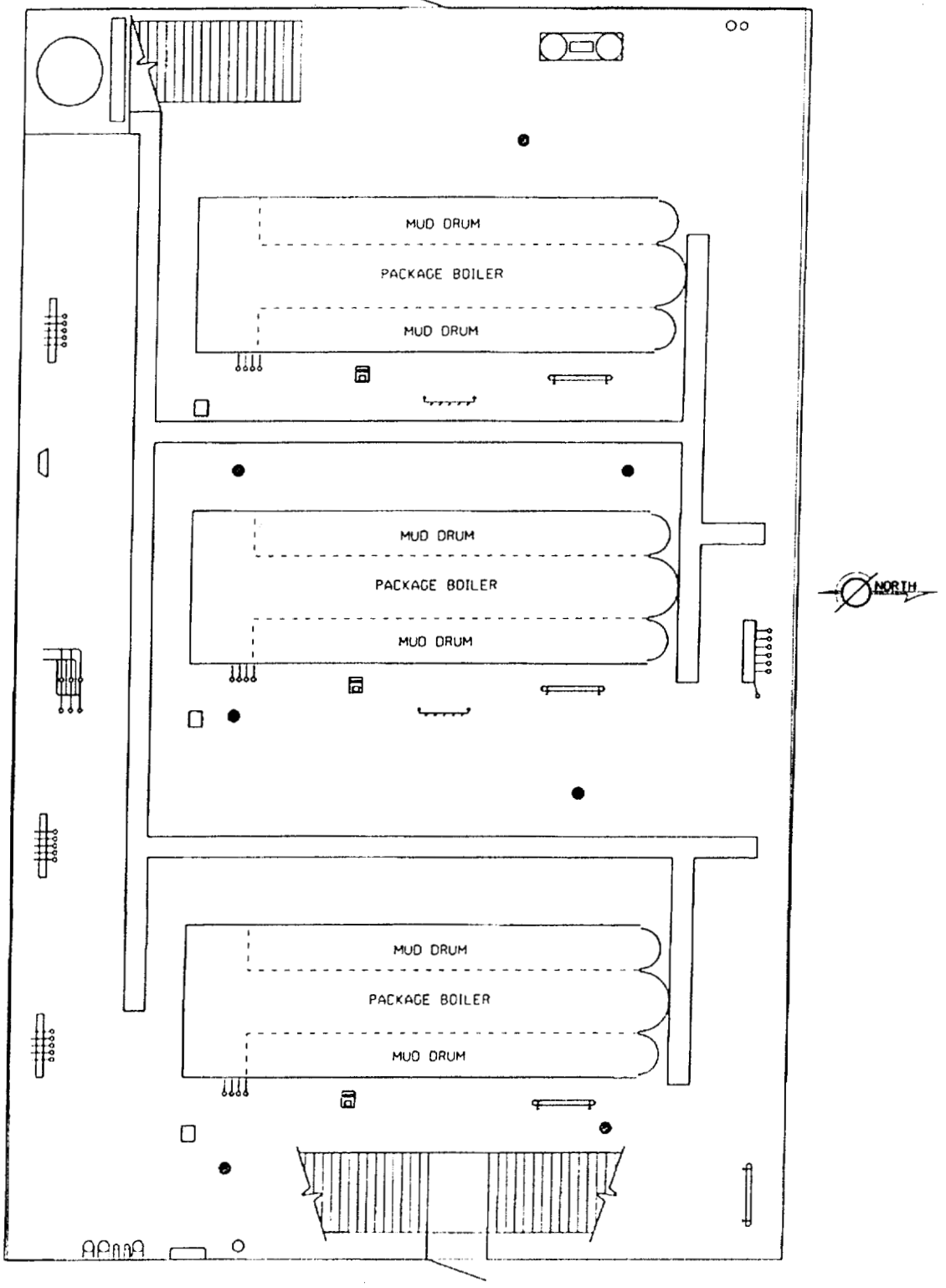
The boiler mud drums can also be considered as permanent structures. These drums are large heavy cylinders that are integral to the boiler and affixed to the boiler room floor. Figure 2-4 shows the location of the mud drums in the Boiler Building.

Figure 2-3
Contaminated Building Surfaces (Turbine Building)



TURBINE BUILDING
HOT SIDE – BASEMENT
(NOT TO SCALE)

Figure 2-4
Contaminated Building Surfaces
(Mud Drums) in Boiler Building



BOILER BUILDING
GROUND FLOOR
(NOT TO SCALE)

2.4 Contaminated Systems and Equipment

Based on recent characterization surveys, there is presently no indication of radioactive contamination of systems and equipment from licensed activities in excess of the DCGL criteria for unrestricted release at the Pathfinder facility. This is consistent with the survey history of the facility. System and equipment include non-permanent portions of the Pathfinder Peaking Plant. No remediation activities of systems and equipment are planned.

2.5 Surface Soil Contamination

Based on recent characterization surveys, there is presently no indication of radioactive contamination of soil from licensed activities at the Pathfinder facility. This is consistent with the survey history of the facility. No remediation activities of soil at the site will occur. The decommissioning activities are restricted to activities located within the boiler and Turbine Buildings. The appropriate controls will be implemented to prevent cross-contamination of site soil from cutting, grinding, or cleaning of contaminated surfaces and equipment or from the storage and transportation of radwaste.

2.6 Surface Water and Groundwater Contamination

Based on recent characterization surveys, there is presently no indication of radioactive contamination of surface or groundwater from licensed activities at the Pathfinder building surfaces. This is consistent with the survey history of the facility. No remediation activities of surface or groundwater will occur. The decommissioning activities are restricted to certain equipment located within the Turbine Building. The appropriate controls will be implemented to prevent cross-contamination of site surface water and groundwater from cutting, grinding, or cleaning of contaminated surfaces and equipment or from the storage and transportation of radwaste.

3. UNRESTRICTED RELEASE CRITERIA

This section of the decommissioning plan provides the criteria that will be used to demonstrate that the Pathfinder Site can be released for unrestricted use.

Subpart E of 10 CFR 20 allows license termination and the release of a site for unrestricted use if the residual radioactivity that is distinguishable from background does not result in a total effective dose equivalent to an average member of the critical group in excess of 25 mrem per year and the residual radioactivity has been reduced to levels that are as low as reasonably achievable, ALARA. Appendix B of NUREG-1757, Volume 1 provides radionuclide specific screening values that may be used to demonstrate compliance with the requirements of Subpart E of 10 CFR 20.

3.1 Building Surfaces

For building surfaces the criteria for release for unrestricted use will generally be those found in Appendix B of NUREG-1757, Volume 1. The criteria for radionuclides not contained within Appendix B will be calculated using the NRC's D&D Code, Version 2.1. The criteria for radionuclides not contained in either Appendix B or available within the NRC's D&D Code will be calculated using RESRAD BUILD, Version 3.21. The assumptions of the models were verified applicable to the Pathfinder site. The only radionuclide identified during the characterization survey not contained in either Appendix B or available within the NRC's D&D Code is Ag-108m. Since Ag-108m was identified in only one area within the plant and that area will be remediated, it is quite possible that Ag-108m will not be a radionuclide of interest during the final status survey.

Table 3-1 lists the criteria that will be used for building surfaces to demonstrate that the Pathfinder Site is acceptable for release for unrestricted use.

The criteria for building surfaces will be applied to building surfaces, which includes permanent structures. Examples of permanent structures within the Pathfinder Peaking Plant include items that are encased within or permanently affixed to building surfaces such as embedded piping, large steam lines, the main condenser, and package boilers.

The criteria specified for building surfaces is in terms of total activity. When applying the criteria it will be verified that the removable activity does not exceed 10% of the criteria for total activity. When more than one radionuclide is present the sum of the fractions rule will apply as will allowances for hard to detect radionuclides.

Table 3-1
Criteria For Demonstrating Building Surfaces Are Acceptable
For Release For Unrestricted Use

Radionuclide	Criteria dpm/100 cm^2
H-3	1.2 E8 [1]
Co-60	7.1 E3 [1]
Zn-65	4.8 E4 [2]
Ag-108m	1.7 E4 [3]
Cs-137	2.8 E4 [1]
Eu-152	1.3 E4 [2]
Eu-154	1.1 E4 [2]
Eu-155	1.6 E5 [2]

Source:
[1] Appendix B to NUREG-1757 Volume 1
[2] Derived from a calculation using NRC's D&D Code Version 2.1. Radionuclide specific computer runs are included in Appendix A.
[3] Criteria calculated using RESRAD BUILD Version 3.21. A radionuclide specific computer run is included in Appendix B.

3.2 Soils - Including Open Land Areas

For soils at the Pathfinder Site, the criteria for release for unrestricted use will generally be those found in Appendix B of NUREG-1757, Volume 1. The criteria for radionuclides not contained within Appendix B will be calculated using the NRC's D&D Code, Version 2.1.

Table 3-2 lists the criteria that will be used for soils to demonstrate that the Pathfinder Site is acceptable for release for unrestricted use.

The criteria for soils will be applied to open land areas surrounding the Pathfinder Plant and to soils that may be encountered within the plant during remedial activities. The criteria may also be applied to limited volumes (i.e. less than 100 ft^3) of volumetrically contaminated concrete. If more than 100 ft^3 of volumetrically contaminated concrete is encountered, and if the contaminated concrete will remain following remediation, a site-specific dose evaluation will be prepared and forwarded to the NRC for approval.

When more than one radionuclide is present the sum of the fractions rule will apply as will allowances for hard to detect radionuclides.

Table 3-2
Criteria For Demonstrating Soils Are Acceptable For
Release For Unrestricted Use

Radionuclide	Criteria (pCi/g)
H-3	1.1 E2[1]
Co-60	3.8 E0[1]
Zn-65	1.1 E1[2]
Cs-137	1.1 E1[1]
Eu-152	8.7 E0[1]
Eu-154	8.0 E0[1]
Eu-155	2.8 E2[2]

Source:
[1] Appendix B of NUREG-1757, Volume 1
[2] Calculated value using D&D Code Version 2.1. Radionuclide specific computer runs are included in Appendix B.

3.3 Systems and Equipment

For systems and equipment, the criteria for release for unrestricted use will be taken from NRC Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors. Table 3-3 lists the criteria that will be used for systems and equipment to demonstrate that the Pathfinder Site is acceptable for release for unrestricted use. Examples of systems and equipment within the Pathfinder

Peaking Plant are non-permanent items such as small pumps and valves, work benches, etc. When more than one radionuclide is present the sum of the fractions rule will apply as will allowances for hard to detect radionuclides.

The criteria specified above for systems and equipment is in terms of total activity. When applying the criteria it will be verified that the removable activity does not exceed 10% of the criteria for total activity.

Table 3-3
Criteria For Demonstrating Systems and Equipment Are Acceptable For Release For Unrestricted Use

Radionuclide	Criteria dpm/100 cm^2
H-3	5,000
Co-60	5,000
Zn-65	5,000
Ag-108m	5,000
Cs-137	5,000
Eu-152	5,000
Eu-154	5,000
Eu-155	5,000

3.4 Planned Remediation Activities

This section of the plan discusses the remediation activities to be undertaken as part of the decommissioning of the Pathfinder Site. Prior to and throughout the decommissioning, surveys will be performed to validate the results of the characterization survey, monitor the progress of the remediation, verify that exposures to both the decommissioning staff and members of the public are within administrative limits, assure releases to the environment are as low as reasonably achievable, and verify any assumptions used to design the final status survey plan. If previously unidentified contamination is identified, the affected and surrounding areas will be evaluated. If appropriate, the scope of the remediation will be expanded to address this newly identified contamination.

The results of the characterization survey were used to plan the remediation activities. Section 2 of this document lists those areas within the plant in which residual activity was identified. Section 3 provides the criteria to be used to demonstrate that the Pathfinder Plant meets the criteria for release for unrestricted use. The planned remedial activities are intended to ensure that the areas with residual activity will meet the criteria for release for unrestricted use. Although use of the screening values in NUREG-1757 obviate the need to demonstrate that doses from residual activity are ALARA, some areas will be remediated even

though they are likely to meet the criteria for unrestricted use in their present condition.

Listed below are the areas within the Pathfinder Plant that will be remediated along with a brief description of planned remedial activities in each area. Based on the results of the surveys to be performed during the remediation, the list of areas to be remediated may be expanded and the remedial actions modified as appropriate. See Section 5 herein for radiological controls.

No remedial activities are planned for the environs surrounding the plant since the characterization survey did not identify any radioactivity attributable to licensed activities.

Floor Drain System Piping

The floor drain lines beneath the basement floor on the hot side of the Turbine Building will be remediated. It is anticipated that the concrete floor above the drain lines will be sectioned and removed. The concrete will either be free released or packaged for disposal as radioactive waste. The cement material surrounding the drain lines will be removed by a jackhammer and stock piled. This material will either be used for fill or packaged for disposal as radioactive waste. Material to be used as fill will be covered to minimize the potential for cross contamination. To allow for sampling or assessment, excavation areas will not be backfilled prior to notifying the NRC. The contaminated portions of the drain lines will be sized to fit into standard B-25 boxes, capped, removed, and packaged for disposal as radioactive waste. The trenches resulting from the remediation of the floor drain lines will be left exposed to allow for confirmatory measurements if required. Steel plates and/or barricades will be erected to minimize safety hazards.

Circulating Water System Piping Near Flange

If the results of the characterization survey can be verified to show contamination above action levels, the affected portion of the condensate system will be remediated. If necessary remedial actions will likely include the use of abrasive pads and appropriate decon solutions. If necessary the affected piping portion will be removed and disposed of as radwaste.

Condensate Pump Sump

The small condensate pump sump located between the two condensate pumps in the basement of the Turbine Building will be remediated. A sample collected for analysis from within the sump revealed the presence of Ag-108m. This was the only area where Ag-108m was identified. If practical, the sump will be remediated to the extent that Ag-108m does not need to be considered during the final status survey. Since the condensate pump sump is constructed of poured

concrete, the remedial actions will likely include the use of needle guns. If needle guns are used, HEPA ventilation and HEPA vacuums will be used to minimize the potential for spreading contamination. If the condensate sump cannot be successfully remediated, its small size (2-3 ft^3) will allow for complete removal and disposal as radioactive waste.

Turbine Building Sump

The sump on the hot side of the Turbine Building will be remediated. Due to the possible presence of liquids, the contents of the sump will be segregated for treatment prior to disposal as radioactive waste. Since the sump is constructed of poured concrete, the remedial actions will likely include the use of needle guns. If needle guns are used, HEPA ventilation and HEPA vacuums will be used to minimize the potential for spreading contamination. At the end of the remedial activities the sump will be completely emptied to facilitate the performance of the final status survey.

Condenser Hotwell

The condenser hotwell can be accessed from the basement of the Turbine Building and will be remediated. The dried sludge in the bottom of the hotwell will be removed and disposed of as radioactive waste. The hotwell will be remediated, as necessary, using abrasive pads and appropriate decon solutions. If required, sections of the hotwell can be removed and disposed of as radioactive waste.

Floor Under Condenser

Certain sections of the floor under the condenser in the basement of the Turbine Building will be remediated. Since the floor is constructed of poured concrete the remedial actions will likely include of the use of needle guns. If needle guns are used, HEPA ventilation and HEPA vacuums will be used to minimize the potential for spreading contamination.

Condenser Expansion Joint

The condenser expansion joint can be accessed from the basement on the hot side of the Turbine Building and will be remediated. The expansion joint is a metal joint with a channel that extends around the periphery of the connection between the water box and the condenser shell. The Pathfinder condenser is equipped with only one expansion joint. This joint will be cut out, packaged, and disposed of as radioactive waste. The remainder of the expansion joint not accessible to cutting will be opened to expose its internal surface. These surfaces will be cleaned to facilitate the performance of the final status survey.

Mud Drums

The boiler mud drums located in the Boiler Building will be remediated as necessary. The mud drums will be vacuumed using a HEPA vacuum to remove all loose debris. All of the mud drums were considered to have fixed contamination for planning purposes.

3.5 Schedule for Decommissioning Activities

The schedule for decommissioning activities is presented in Figure 3-1. Xcel Energy expects to complete all decommissioning activities within the timeliness guidelines contained in Section 2.1 of NUREG 1757, Consolidated NMSS Decommissioning Guidance, Vol. 3, Financial Assurance, Record Keeping and Timeliness. This includes submittal of a request for license termination within 24 months of NRC approval of the decommissioning plan.

4. DECOMMISSIONING ORGANIZATION AND ADMINISTRATION

4.1 General

An organizational diagram of the Pathfinder Decommissioning Project is presented in Figure 4-1.

4.2 Corporate Management

The Xcel Energy Nuclear Asset Management division has primary responsibility for Pathfinder decommissioning activities. The General Manager of Nuclear Asset Management is responsible for overall oversight and management of these activities. Nuclear Asset Management is also responsible for oversight of the Prairie Island and Monticello nuclear power plants. Utility Engineering, a wholly owned Xcel Energy subsidiary, is responsible for project management.

The Pathfinder Peaking Plant is located on the same site as Xcel Energy's Angus Anson simple cycle plant. Access to the site for decommissioning activities is controlled. According to the license, the Pathfinder Plant Manager, who also oversees the Angus Anson plant, has overall responsibility for the retired Pathfinder plant. All decommissioning activities are coordinated through the Pathfinder/Angus Anson Plant Manager.

Activity ID	Orig Dur	R Du.	%	Early Start	Early Finish
A1000	0	0	100	21FEB03A	
A1100	0	0	100	16APR03A	
A1110	33	0	100	16APR03A	30MAY03A
A1120	0	0	100	20MAY03A	
A1130	153	0	100	02JUN03A	
A1140	20	0	100	04AUG03A	29AUG03A
A1150	89	0	100	01SEP03A	01JAN04A
A1160	0	0	100	06OCT03A	
A1170	5	0	100	06OCT03A	10OCT03A
A1180	15	0	100	06OCT03A	24OCT03A
A1190	15	0	100	06OCT03A	24OCT03A
A1200	20	0	100	06OCT03A	31OCT03A
A1210	20	0	100	06OCT03A	31OCT03A
A1230	0	0	100	31OCT03A	
A1250	0	0	100	20NOV03A	
A1260	23	0	100	01DEC03A	31DEC03A
A1269	35	9	74	01DEC03A	20FEB04
A1270	0	0	0	20FEB04*	
A1280	66	66	0	20FEB04	21MAY04
A1290	115	160	0	24MAY04	31DEC04
A1330	20	20	0	01OCT04	28OCT04
A1300	66*	66*	0	01OCT04	31DEC04
A1310	66	66	0	01OCT04	31DEC04
A1320	66	66	0	01OCT04	31DEC04
A1340	20	20	0	29OCT04	25NOV04
A1350	6	6	0	26NOV04	03DEC04
A1360	20	20	0	06DEC04	31DEC04
A1400	85	85	0	03JAN05	29APR05

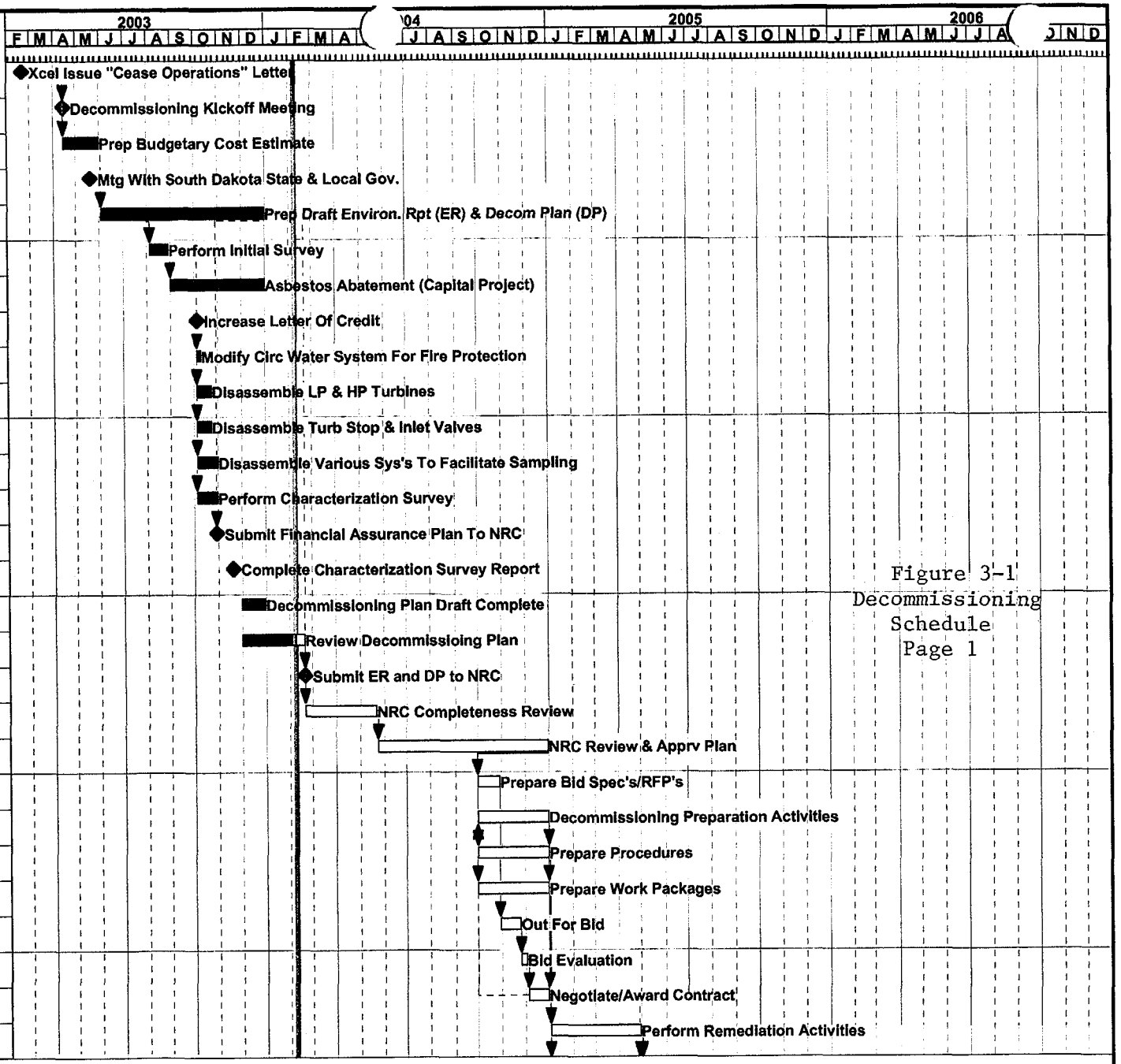


Figure 3-1
Decommissioning
Schedule
Page 1

Start Date	01FEB03
Finish Date	31OCT06
Data Date	10FEB04
Run Date	18FEB04 08:44

Early Bar
Progress Bar
Critical Activity

PAF4

Sheet 1 of 2

Xcel Energy

Pathfinder-Decommissioning Proj 2004

Classic Schedule Layout

Date	Revision	Checked	Approved

Activity ID	Orig Dur	Rem Dur	%	Early Start	Early Finish
A1410	85	85	0	03JAN05	29APR05
A1420	0	0	0		29APR05*
A1500	45	45	0	02MAY05	01JUL05
A1501	45	45	0	04JUL05	02SEP05
A1600	65	65	0	05SEP05	02DEC05
A1650	42	42	0	05DEC05	31JAN06
A1700	43	43	0	01FEB06	31MAR06
A1800	0	0	0		03APR06
A1900	0	0	0		31OCT06*

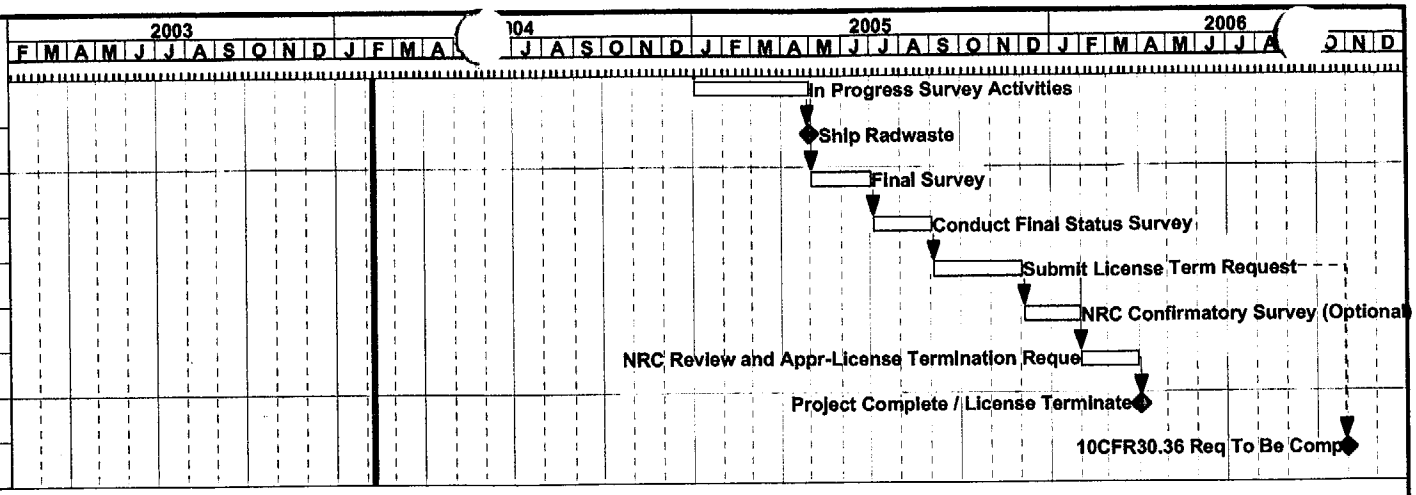


Figure 3-1
Decommissioning
Schedule
Page 2

Start Date	01FEB03
Finish Date	31OCT06
Data Date	10FEB04
Run Date	18FEB04 08:44

Early Bar
Progress Bar
Critical Activity

PAF4 Sheet 2 of 2

Xcel Energy

Pathfinder-Decommissioning Proj 2004

Classic Schedule Layout

Date	Revision	Checked	Approved

Xcel Energy

Pathfinder Project Organization

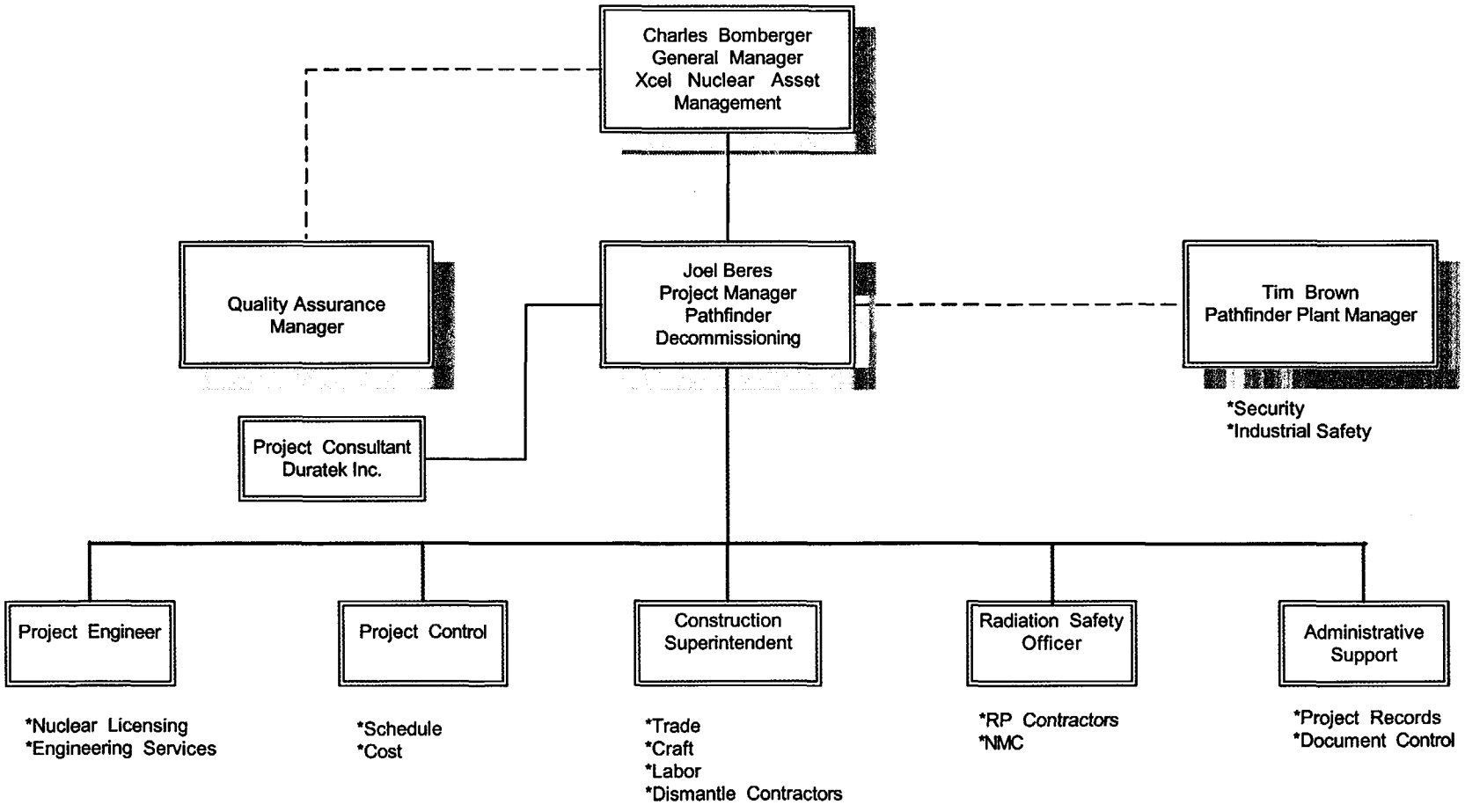


Figure 4-1
Organizational Chart

Xcel Energy's corporate environmental services group provides support on environmental matters to the project. There are persons from this group who have specific Pathfinder experience including direct experience with previous Pathfinder decommissioning activities.

4.3 Project Management

The Pathfinder Decommissioning Project Manager, an Xcel Energy employee, is directly responsible for planning, developing, and implementing the decommissioning project. The Project Manager reports to the General Manager of Nuclear Asset Management. The Project Manager coordinates the services of the Environmental, Construction, Administrative, Licensing, and Radiation Protection/Radwaste groups that are assigned to the Pathfinder project.

The Radiation Safety Officer (RSO) is responsible for the radiation safety program at Pathfinder. The RSO is responsible for radiation work permits, procedures, surveys, and radiation monitoring for decommissioning. The qualifications of the RSO were submitted to the NRC by letter dated June 16, 2003. The RSO qualification requirements are given in Section 5.2.

The construction superintendent is responsible for coordinating with Angus Anson plant staff and managing equipment dismantling activities.

4.4 Contractor Support

Xcel Energy has obtained the services of Duratek Inc. to assist in the planning and execution of the decommissioning activities. Duratek has extensive experience with decommissioning activities. Duratek was also the principal contractor for the characterization survey, which is attached herein. Duratek will work under the direction of the Decommissioning Project Manager and the RSO.

Xcel Energy is also employing the services of Nuclear Management Company (NMC), the operator of Xcel Energy's Monticello and Prairie Island nuclear power plants, to plan and implement the decommissioning project. NMC has demonstrated competencies in quality assurance, radiation safety, and radwaste handling. NMC may also provide independent audit support for the project. Depending on the level of outsourcing for the project, NMC also may provide health physicists to support the dismantling and sampling activities.

5. RADIATION SAFETY AND HEALTH PROGRAM

5.1 Radiation Safety Controls and Monitoring for Workers

Introduction

The radiation safety and health program will be implemented during decommissioning activities to ensure that exposure to radioactive material by members of the decommissioning staff and members of the public, and potential release of radioactivity to the environment are maintained as low as reasonable achievable (ALARA). Given the results of the characterization survey, the primary radiological concern during the decommissioning will be the potential intake of radioactive materials by members of the decommissioning staff. There is also some potential for skin exposure resulting from a contamination incident. Significant whole body external exposures hazards are not expected. No one is expected to receive a total effective dose equivalent, TEDE, in excess of 0.5 rem during the decommissioning effort.

Xcel Energy will employ administrative and engineering controls to control the spread of radioactive materials will minimize potential exposures to members of the decommissioning staff. The decommissioning staff will use personal protective clothing as necessary. In the unlikely event that engineering controls are not deemed sufficient to reduce airborne concentrations to acceptable levels, respiratory protection may be used to minimize potential intakes.

These controls will prevent any radiation release beyond the plant boundary such that the members of the public are not expected to receive any dose from the proposed decommissioning activities.

Implementation

All members of the decommissioning staff are required to comply with the requirements of this plan, related procedures, and applicable regulations contained within 10 CFR 20. Each member of the decommissioning staff will be responsible for maintaining their exposure ALARA and notifying managers of potential radiological hazards, improper practices, or issues of noncompliance. Each member of the decommissioning staff will be encouraged to identify potential changes to current procedures and or practices especially those that may reduce exposures or improve worker safety.

Managers and supervisors supporting the decommissioning will implement the radiation safety and health program set forth in this decommissioning plan and develop related the procedures and controls necessary to maintain compliance with 10 CFR 20. Managers and supervisors will:

- Ensure that all members of the decommissioning staff have received training related to the Radiation Safety and Health Program
- Take appropriate action to correct issues of noncompliance
- Document violations with the requirements of this plan, related procedures, and applicable regulations contained within 10 CFR Part 20

5.2 Radiation Safety and Health Organization

The radiation safety and health organization will consist of a Radiation Safety Officer (RSO), a Health Physicist, Radiological Engineers/Specialists, and Health Physics Technicians. The RSO is an employee of Nuclear Management Company (NMC), the company that operates the nuclear power plants owned by Xcel Energy. The Health Physicist, Radiological Engineers/Specialists, and Health Physics Technicians will be likely be employees of Duratek Inc. and supplied under contract to Xcel Energy. The RSO will report to the Decommissioning Project Manager. Functionally the Health Physicist will report to the Radiation Safety Officer and administratively to the Decommissioning Project Manager. Staffing levels associated with the radiation safety and health organization will be reviewed periodically to ensure adequate staffing levels are maintained to support planned activities.

The RSO is responsible for overseeing the implementation of the radiation safety and health program. The RSO ensures that all activities involving potential exposure to radioactive material are conducted in compliance with specific license requirements, this plan, related procedures, and applicable regulations contained within 10 CFR Part 20.

The minimum qualifications for the RSO are as follows.

- A four year degree in health physics or related field
- Certification by the American Board of Health Physics
- Ten years of supervisory experience
- Twenty years of experience related to radiation safety

The Health Physicist, HP, is responsible for implementing the radiation safety and health program. The HP will supervise and coordinate the activities of the radiation safety and health organization.

The minimum qualifications for the Health Physicist are as follows.

- A four year degree in health physics or related field
- Certification by the American Board of Health Physics
- Five years of supervisory experience
- Ten years of experience performing radiological decommissionings including final status surveys

5.3 Occupational Dose Limits

Subpart C to 10 CFR 20 specifies the following annual limits for individuals occupationally exposed to ionizing radiation.

- A total effective dose equivalent of 5 rem
- The sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue, other than the lens of the eye, of 50 rem
- A shallow dose equivalent to the skin or to any extremity of 50 rem
- An eye dose equivalent of 15 rem

The occupational dose limits will apply to all decommissioning staff members entering radiologically controlled areas. Prior to being allowed to enter a radiologically controlled area, each member of the decommissioning staff shall supply a written estimate/record of their year to date occupational dose. Only those individuals whose year to date occupational doses are less than 50% of the applicable occupational dose limits will be allowed to enter a radiologically controlled area without written authorization from the RSO.

5.4 Administrative Dose Limits

Administrative dose limits are used to control doses to ensure regulatory limits are not exceeded and that occupational doses are maintained ALARA. The following administrative dose limits have been established for each member of the decommissioning staff.

- A total effective dose equivalent of 0.1 rem per month or 0.5 rem decommissioning activities
- The sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue, other than the lens of the eye, of 0.5 rem per month or 2.5 rem during the coarse of the decommissioning

If an administrative dose limit is exceeded, the affected member(s) of the decommissioning staff shall not be allowed to enter a radiologically controlled area without written authorization from the RSO.

5.5 Personnel Monitoring

Subpart F to 10 CFR 20 requires the use of individual monitoring devices if the individual is likely to exceed 10% of the occupational dose limits from sources of radiation external to the body. It also requires that potential intakes and the resulting committed effective dose be evaluated for occupationally exposed individuals if the individuals are likely to exceed in a year 10% of the applicable annual limit on intake(s), ALI(s) listed in Appendix B to 10 CFR 20.

The recent characterization survey did not identify any significant external radiation hazards. No individual is expected to receive 0.5 rem from external sources, therefore, individual monitoring devices will likely not be provided to members of the decommissioning staff. If radiological conditions change such that a member of the decommissioning staff is likely to exceed 10% of the occupational dose limits from sources of radiation external to the body, that particular decommissioning activity would cease until individual monitoring devices were provided. In addition, any doses received prior to issuance of the individual monitoring devices would be evaluated and the results of the evaluation documented.

The potential for intakes of radioactive material by members of the decommissioning staff will be evaluated through the implementation of a comprehensive air sampling program. Air samples will generally be taken as follows.

- During breaches of radioactive systems
- During entries into known or potential airborne radioactivity areas
- During decommissioning activities in areas with loose surface contamination in excess of 10,000 dpm/100 cm^2
- At the exhaust of HEPA ventilation units

General and breathing zone air samples will be collected. Lapel air samplers will be employed if members of the decommissioning staff plan to make extended entries into known or potential airborne radioactivity areas (>0.3 DAC). All entries into known airborne radioactivity areas will require the use of DAC-hr tracking to document potential intakes.

Although not expected, if an intake in excess of 5% of the applicable annual limit on intake(s), ALI(s), listed in Appendix B to 10 CFR 20 is suspected, the affected individual(s) will be requested to provide bioassay samples and may be required to obtain a whole body count in order to more accurately assess the intake.

In addition to potential exposures from radiation sources external to the body and potential exposures from intakes of radioactive materials into the body the potential for exposure due to radioactive materials on the body also exists. Skin and personnel clothing contamination in excess of 10,000 dpm/100 cm^2 will be evaluated.

5.6 Respiratory Protection

If required, respiratory protection will be used to protect personnel from airborne contamination. The use of respiratory protection will support the goal of keeping individual exposures (both internal and external) ALARA. In deciding to use respiratory protection non-radiological impacts such as physiological and psychological stresses will be evaluated. In general, respiratory protection will not

be used unless there is a potential for an individual to receive an intake in excess of 2 DAC-hrs in a day or 10 DAC-hrs in a week.

If respiratory protection is required, Xcel Energy will prepare a written policy statement addressing its use and will approve the procedures necessary to implement a respiratory protection program. The procedures will address the following.

- The means to ensure the proper equipment is selected based on the potential hazards
- Training requirements
- Medical surveillance requirements
- The use of only equipment certified by the Bureau of Mines/National Institute of Occupational Safety and Health, NIOSH
- The means to evaluate the respiratory programs effectiveness
- The means to track potential intakes

Each individual required to use respiratory protection shall have been fit tested within the previous 12 months using the specific model and size of respirator to be used to ensure that the individual can obtain an adequate seal. Fit test shall only be performed on individuals who are clean shaven, have obtained medical approval to use respiratory protection within the previous 12 months, and who have attended respiratory protection training within the previous 12 months.

If required, the use of respiratory protection will be specified on the RHWP used to control access to a specific radiologically controlled area.

5.7 Radiological Surveys

Subpart F of 10 CFR 20 requires surveys to be performed to comply with the regulations and to evaluate radiological conditions. Radiological surveys will be performed throughout the decommissioning in order to identify, quantify and evaluate potential hazards associated with the radiological conditions within a given area. The survey results will be used to determine posting requirements, evaluate the need for and the effectiveness of engineering controls, determine appropriate protective clothing requirements, and to help ensure that exposures to radioactive materials are maintained ALARA.

The radiological surveys to be performed during the decommissioning will include surveys for fixed contamination, removable contamination, exposure rates, and airborne contamination. In addition samples will be collected to assess the contamination levels in various media and to determine the radionuclides of interest and their relative fractions in the various media or within a given area. Based on the results of the characterization survey it is expected that the majority of the surveys for fixed and removable contamination will be for beta activity. If alpha activity is identified the survey protocols will be modified as appropriate.

Both routine and job specific surveys will be performed. The routine surveys will be performed to identify changing conditions and/or adverse trends. The routine surveys will be performed at least weekly. More frequent surveys will be performed in areas having a high potential for significant changes in radiological conditions. Routine surveys will be performed within radiologically controlled areas and in areas immediately abutting such areas. Job specific surveys will be performed to facilitate job planning activities, to assess the effectiveness of controls and to ensure there are no releases of radioactive materials from the effected area. Surveys will generally be performed as follows.

- Prior to initiating remediation activities in a given area
- During the performance of remediation activities in a given area
- During the breach of known or suspected radioactive systems
- At the conclusion of decommissioning activities in a given area
- At the exhaust of HEPA ventilation units
- At ingress/egress points to a given area
- To support the shipment of radioactive materials
- To support the release of materials from radiologically controlled areas
- At radwaste collection areas

Radiation survey results shall be legible and documented in a timely manner. The survey documentation shall include the following.

- The date, time, and location of the survey
- The instruments used and their calibration status
- The name of the surveyor(s)
- The results of all measurements and analyses

All survey documentation shall be reviewed by the HP or a qualified designee. Survey results that indicate adverse trends or the presence of radioactivity outside of a radiologically controlled area shall be reported to the Radiation Safety Officer.

5.8 Instrumentation

All instrumentation shall be calibrated on a semiannual basis using National Institute of Science and Technology, NIST, traceable sources and test equipment. Calibration labels showing the instrument's identification number, calibration date, and calibration due date shall be attached to all instruments. The presence of the instrument's calibration label shall be verified by the user prior to each day's use. In addition, each instrument shall be source checked or its efficiency determined prior to each day's use.

The radionuclides used for the source checks and efficiency determinations depend on the type of radiation the instrument is designed to detect. Table 5-1 lists the radionuclides to be used for source checks and efficiency determinations.

Table 5-1
Radionuclides For Source Checks And Efficiency Determinations

Type Of Radiation To Be Detected	Radionuclide Used
Alpha	Th-230
Beta	Tc-99
Gamma	Cs-137

5.9 Radiation/Hazardous Work Permits

A radiation/hazardous work permit, RHWP, is a document that will be used to inform individuals of the radiological conditions in a given area and identifies any potential safety hazards associated with the area. The RHWP specifies the requirements for entering an area and performing specific activities within the area. Once decommissioning activities are initiated, an RHWP will be required to enter any radiologically controlled area. Each RHWP shall contain the following.

- A unique identification number
- A description of the activities to be performed
- A description of the area in which the activities will be performed
- Actual and/or expected radiological conditions within the area
- A list of non radiological hazards within the area
- Personnel monitoring requirements (if applicable)
- Personnel protective clothing requirements
- Specific engineering and/or administrative controls (if applicable)
- Survey requirements
- The estimated person-rems for the activities to be performed
- Pre-job briefing requirements
- The date and time the RHWP is effective
- The date and time the RHWP will expire
- The name and signature of the individual preparing the RHWP
- The signature of the RSO approving the RHWP

Each individual entering a radiologically controlled area shall log in and out using a RHWP sign in sheet attached to the RHWP. In addition, prior to their initial entry, each individual must attend an RHWP briefing and sign the briefing attendance sheet signifying that they attended the briefing, understood the information presented at the briefing, and agree to comply with the requirements of the RHWP while in the radiologically controlled area.

5.10 Contamination Control Program

The purpose of the contamination control program is to specify the requirements for identifying, evaluating, and controlling radioactive contamination. Radioactive contamination control measures will be established to minimize the spread of contamination, to minimize the need for protective clothing (including respiratory protection) and to maintain exposures ALARA. The control of radioactive contamination will be accomplished by the following methods.

- Promptly identifying sources of contamination by performing surveys for fixed, removable, and airborne contamination
- Minimizing sources and potential sources of contamination
- Planning and performing work activities in ways that will minimize the creation and spread of contamination
- Implementing good house keeping practices
- Requiring the use of appropriate personal protective equipment
- Monitoring personnel, materials, and equipment prior to removing them from a potentially contaminated area

Any area with fixed or removable contamination in excess of the limits in Table 5-2 shall be posted and controlled as a contaminated area.

Table 5-2
Fixed and Removable Contamination Limits

Type of Radiation	Fixed	Removable
Alpha	2,000 dpm/100 cm^2	100 dpm/100 cm^2
Beta	20,000 dpm/100 cm^2	1,000 dpm/100 cm^2

Any area with airborne contamination, or with the potential for airborne contamination, in excess of the limits specified in Table 5-3 shall be posted and controlled as an airborne contaminated area.

Table 5-3
Airborne Contamination Limits

Radionuclide	Activity Concentration (uCi/ml)
Co-60	3E-9
Zn-65	3E-8
Ag-108m	3E-9
Cs-137	2E-8
Eu-152	3E-9
Eu-154	2E-9
Eu-155	1E-8

The airborne contamination limits equate to 30% of the applicable DAC values. When more than one radionuclide is identified the sum of the fractions rule shall apply. If the airborne activity is to be estimated based on a gross beta analysis, it shall be assumed that the radionuclide of interest is Co-60.

The size and number of contaminated areas should be kept to a minimum, as should the amount of materials brought into a contaminated area. Contamination control measures such as bagging, sleeving, and coating should be considered as applicable. All items to be removed from a contaminated area shall be surveyed for free release. Items not able to be free released shall be kept in a radiologically controlled area.

All contaminated areas shall be posted, including potential airborne contaminated areas. Unless the area is surrounded by walls, its boundaries shall be marked using yellow and magenta rope or tape. Access points shall be equipped with step off pads. The step off pads shall be considered non contaminated and all protective clothing shall be removed prior to stepping onto the step off pad. All access points shall also be equipped with contamination monitors and all individuals exiting a contaminated area shall monitor themselves for contamination prior to leaving the area. Receptacles shall be placed by the step off pads for the collection of reusable protective clothing and trash. The receptacles shall be clearly labeled.

Any accidental spread of contamination or release of radioactive material shall require immediate action to minimize its impact. These include the following.

- Attempting to stop the spread of contamination or the release of radioactivity, if it is safe to do so
- Warning others to avoid the effected area
- Isolating potentially effected areas
- Assisting in the removal and decontamination of any individuals that may have been present in the effected area at the time of the event

Surveys of the affected area and surrounding areas should be performed as soon as practical and plans made to remediate the effected area.

If required, only HEPA filtered vacuum cleaners and ventilation systems will be used in radiologically controlled areas. Such vacuum cleaners and ventilation systems must have had a documented DOP test performed within the previous 12 months. These vacuum cleaners and ventilation systems shall be labeled and controlled as appropriate.

5.11 Free Release Of Items From Radiologically Controlled Areas

All items to be free released from radiologically controlled areas shall be surveyed to ensure that the item is not contaminated with detectable activity attributable to licensed activities. Each item to be free released shall be surveyed for both fixed and removable contamination. No items shall be released if the survey results exceed the minimum detectable activity (MDA) associated with the survey protocols. The survey protocols shall be established to ensure that the MDAs do not exceed those specified in Table 5-4.

Table 5-4
Minimum MDAs Required For Free Release Surveys

Type Of Radiation	Fixed	Removable
Alpha	1,000 dpm/100 cm^2	100 dpm/100 cm^2
Beta	5,000 dpm/100 cm^2	500 dpm/100 cm^2

The MDA is defined as the smallest amount, or concentration, of radioactive material that will yield a net positive count with a 5% probability of falsely interpreting background responses as true activity. The MDA is dependent upon count times, geometry, sample size, detector efficiency background, and for the scanning rate and the efficiency of the surveyor.

Fixed and removable alpha measurements will only be taken on items if they are being removed from an area known or suspected to contain alpha contamination in excess of the free release criteria

Beta scans for fixed contamination will be performed by positioning the detector a half inch or less from the item being scanned and scanning at a rate not to exceed 1 detector width per second. Monitoring the audible output of the survey meter will result in an MDA in the range of 4,000 dpm/100 cm^2 to 5,000 dpm/100 cm^2.

Direct Measurements

The equation used for calculating the MDA for direct measurements is:

$$MDA = \frac{\frac{2.71}{t_s} + 3.29\sqrt{\frac{R_b}{t_s} + \frac{R_b}{t_b}}}{E\left(\frac{A}{100}\right)} \qquad \text{Equation 5.11.1}$$

Where:
- MDA = Minimum Detectable Activity (dpm/100 cm^2)
- R_b = Background Count Rate (cpm)
- t_b = Background Count Time (min)
- t_s = Sample Count Time (min)
- A = Detector Area (cm^2)
- E = Detector Efficiency (c/d)

Beta Scans

The equation used for calculating the MDA for beta scans is:

$$MDA = \frac{d' * \sqrt{b_i} * \frac{60}{i}}{E_i * E_s * \sqrt{p} * \frac{A}{100}} \qquad \text{Equation 5.11.2}$$

Where:
- MDA = Minimum Detectable Activity (dpm/100 cm^2)
- d' = Decision error taken from Table 6-5 of MARSSIM
- i = Observation counting interval (scan speed divided by the detector width)
- b_i = Background count per observation interval
- E_i = Detector Efficiency (c/d)
- E_s = Surface Efficiency (typically around 50%)
- p = Surveyor Efficiency (typically 50%)
- A = Detector Area (cm^2)

6. ENVIRONMENTAL MONITORING PROGRAM

6.1 Effluent Monitoring and Control

By Amendment 11 to the Byproduct Material License (Ref. 2), the NRC allowed NSP to modify the Pathfinder radiological surveillance program. The effluent monitoring portion of this program had included 20 years of liquid effluent sampling. Discharges were well below allowed levels and regular periodic sampling was suspended. Sampling for special events was retained. In addition, an extensive radiological monitoring program was in effect during decommissioning of the Reactor Building and Fuel Handling Building. Radiological measurements were taken from samples of ambient air, groundwater, surface water, drinking water, bottom river sludge, raw milk, fish, plants, and soil. No detectable isotopes of attributable to licensed activities were found.

Since the decommissioning of the reactor plant and fuel storage facilities were completed in 1992, there have been no events or conditions that would have allowed for any significant transfer of the fixed contamination within the fossil system to the environment. Notwithstanding this consideration, NSP has taken samples of from site wells, soils, ditches, and settling ponds as part of the characterization survey. No significant contamination was found.

Environmental monitoring outside of the boundaries of the Turbine Building is not necessary for Pathfinder decommissioning activities. Only trace amounts of low airborne radioactive particles, if any, will be generated from decontamination activities. The spread of these particles will be programmatically controlled and locally confined to the remediation areas and will not affect the public. Doses to workers will be maintained ALARA and below the NRC requirements of 10 CFR 20. Releases of contaminated liquids to environmental pathways are not expected.

6.2 Airborne Radioactive Effluents

Cutting and grinding activities have the potential for generating airborne radioactivity. These activities will be monitored locally using portable air samplers or Continuous Air Monitors (CAMs) if necessary. Vacuum cleaners may be used to suppress dust and control airborne releases. These cleaners will be equipped with a High Efficiency Particulate Air-Purifying (HEPA) filter if necessary. See Section 5.10 herein for a description of the airborne controls within the Contamination Control Program.

6.3 Liquid Radioactive Effluents

No significant volumes of liquid radioactive wastes are expected to occur from decommissioning activities. There are currently no contaminated liquids stored on site. The site's groundwater and surface water are not contaminated. Only a few gallons of ordinary cleaning fluids or water will be used, if necessary, for simple decontamination and remediation purposes. Decommissioning activities may include the use of a few gallons of liquid chemical cleaners. These liquids will be collected and isolated from the normal liquid waste stream (the Turbine Building sumps). If these liquids become contaminated they will be appropriately disposed of in separate containers. Spills will be controlled to prevent contamination.

7. RADIOACTIVE WASTE MANAGEMENT

Radiologically controlled areas will be controlled to minimize the potential for spreading and generating radioactive waste. Whenever possible items in radiological controlled areas will be surveyed for free release and removed form the area. Items that cannot be adequately surveyed or items that do not meet the criteria for free release will be disposed of as radioactive waste.

All radioactive waste will be wrapped or placed in approved containers at the point of generation to minimize the spread of contamination. To the extent practical and in keeping with good radiological practices, various waste streams (liquids, used protective clothing, sludge, metals, etc.) will be surveyed and segregated. The waste will then be moved to an approved storage location where it will be packaged in approved shipping containers and staged for shipment. The waste will be packaged to minimize void spaces while ensuring that the design specifications of the shipping container are not exceeded. Waste containers staged for shipment will be surveyed, weighed, and labeled.

Based on the characterization data and the planned remediation activities, Xcel Energy estimates that less than 1,200 ft^3 of dry radioactive waste will be generated from decommissioning activities. A small amount of liquid radioactive waste may be generated from general cleaning activities and from sump cleaning activities. The amount of liquid waste, if any, is estimated to be less than less than 100 ft^3. This limited volume should require only one radioactive waste shipment to an off site treatment and disposal facility using an exclusive use vehicle. None of the waste is expected to exceed the criteria for low specific activity waste given in 49 CFR 173.403.

All radioactive waste generated during the decommissioning will be sent to Duratek's licensed facility in Oak Ridge, Tennessee for treatment and/or disposal. If necessary, some waste may be transshipped for disposal to the Envirocare facility in Clive, Utah using Duratek's pre-approved waste profiles. If appropriate, some waste may be surveyed and disposed of in an industrial landfill in Tennessee in accordance with

Duratek's license requirements. Treatment options include metal melt, incineration, and compaction. All secondary waste generated during treatment will be disposed of at Envirocare or provided to another license for beneficial reuse.

According to NUREG-0586, Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, most of the dose to members of the public arising from the decommissioning of licensed facilities is due to the transportation of radioactive waste to the disposal site. Since the activity of the radioactive waste to be disposed of as a result of decommissioning the Pathfinder site is relatively small, the dose to members of the public due to the transportation of the resulting waste is expected to be negligible. A calculation was performed to estimate the potential dose. The results of this calculation indicate that a person in the vicinity of the waste (approx. 3 ft.) would be exposed to a dose of approximately 30 μR/hr. To further bound the potential dose, the Pathfinder decommissioning was compared to the decommissioning of the reference research reactor discussed in NUREG-0586, which included shipping spent fuel which is considerably more radioactive than the expected Pathfinder radwaste. According to NUREG-0586, the dose to members of the public due to the transportation of radioactive resulting from the decommissioning of the reference research reactor is negligible (< 0.1 man-rem).

8. FACILITY RADIATION SURVEY

8.1 Plan and Form of Final Status Survey

Future Submittal of Final Status Survey Plan

A final status survey will be performed to demonstrate that the Pathfinder Site meets the criteria for release for unrestricted use. Prior to initiating the final status survey, a Final Status Survey Plan will be prepared and submitted to the NRC for review. The plan will incorporate information obtained during remediation activities. The survey plan will be developed in accordance with guidelines delineated in NUREG-1757 Vol. 1, Section 15.4.3 and NUREG-1757 Vol. 2, Section 4.4.

Description of Final Status Survey

The results of final status surveys will be compiled into a report and submitted to the staff as part of a future license amendment request to terminate the Pathfinder Byproduct Materials License. This report will document the results of the final survey. The data from the final status survey will provide a record of the site radiological status. A comparison of the radiological status with the unrestricted release criteria will be provided. The format and content of the report will be in accordance with Section 4.5 of Volume 2 of NUREG-1757. A description of the salient components of the final status survey is provided below.

Criteria For Release For Unrestricted Use

The criteria for release are discussed in Section 3 herein. Criteria are provided for the following.

- Building Surfaces
- Soils
- Non Permanent Structures and Equipment

These criteria are meant to ensure that residual activity that is distinguishable from background does not result in a total effective dose equivalent to an average member of the critical group in excess of 25 mrem per year. Specific guidance will be provided in the final status survey plan on how to statistically evaluate the final status survey results, if necessary, to demonstrate compliance with the criteria for release for unrestricted use.

When gross activity measurements are used to demonstrate compliance with the criteria for release for unrestricted use, as will be done to evaluate building surfaces and non permanent structures, a gross activity guideline value, GV, will be calculated as follows.

$$GV = \frac{F}{\left(\frac{f_1}{C_1} + \frac{f_2}{C_2} + \frac{f_3}{C_3} + \ldots \frac{f_n}{C_n}\right)} \qquad \text{Equation 8.1.1}$$

Where:

GV = The gross activity guideline value that equates to 25 mrem/yr, (dpm/100 cm^2)

F = The fraction of the radionuclide mix which is considered detectable based on the radionuclide beta yields and end-point energies relative to the radionuclide used to calibrate the detector, (unitless)

f_i = The relative fraction of radionuclide *i* in the mix, (unitless)

C_i = The radionuclide specific criteria for release for unrestricted use, (dpm/100 cm^2)

The relative fraction of the radionuclide mix (f_i) will be obtained from representative samples analyzed for all radionuclides of concern. If the relative fractions for different samples vary greatly, either area dependent GVs will be calculated or the most conservative GV used.

When radionuclide specific activity measurements are used to demonstrate compliance with the criteria for release for unrestricted use, as will be done to evaluate soils and other potentially volumetrically contaminated media surrogate relationships may be established if hard to detect radionuclides are present.

Statistical Test

When the final status survey results are compiled one of three possible results are possible

- None of the survey results exceed the criteria for release for unrestricted use
- A percentage of the survey results exceed the criteria for release for unrestricted use but the mean of the results is less than the criteria for release for unrestricted use
- The mean of the survey results exceeds the criteria for release for unrestricted use.

In the first case the survey results indicate that the criteria for release for unrestricted use has been met. In the third case the survey results indicate the criteria for release for unrestricted use has not been met. In the second case a statistical test is required to determine if the criteria for release for unrestricted use has been met or not. In such cases, the statistical test will assess the null hypothesis, H_0.

For this test the H_0 is defined as

> H_0 : residual activity distinguishable from background exceeds the criteria for release for unrestricted use.

Two types of statistical tests may be conducted to determine if the H_0 can be rejected, the Sign Test and/or the Wilcoxon Rank Sum Test.

The Sign Test is generally used when radionuclide specific measurements are made and the radionuclides of concern are not present in background. The Sign Test may also be used if the radionuclides are present in background at levels that are insignificant relative to their criteria for release for unrestricted use. When using the Sign Test a background study within an appropriate reference area is not required.

The Wilcoxon Rank Sum Test is generally used when the radionuclides of concern are present in background and when gross activity measurements are made. When using the Wilcoxon Rank Sum Test a background study within an appropriate reference area is required. If a single background is to be subtracted from each measurement, the Sign Test can also be used to determine if H_o can be rejected.

The H_0 is assumed to be true unless the statistical test indicates that it should be rejected. When performing these statistical tests, two types of decision errors need to be considered. A Type I error, or false positive, is the probability that the H_0 is rejected when it should be accepted and a Type II error, or false negative, is the probability of accepting the H_0 when it should be rejected. For this final status survey the probability of both a Type I and a Type II error will be set at 5%.

Survey Units

All areas to be surveyed as part of the final status survey will be divided into survey units to facilitate survey planning, performance of the survey and the analysis of the survey results. Survey units are defined based on physical characteristics, history, and potential for residual contamination following remedial activities.

All survey units are classified as Class 1, 2, or 3 based on the following.

- A Class 1 survey unit is a survey unit that has or had prior to remediation contamination levels approaching (>75%) or exceeding the criteria for release for unrestricted use.
- A Class 2 survey unit is a survey unit that does not have contamination approaching (>75%) or exceeding the criteria for release for unrestricted use. Typically Class 2 survey units are not remediated. If remediation is required the survey unit will be reclassified as a Class 1.
- A Class 3 survey unit is a survey unit that is not expected be contaminated or is expected to have contamination exceeding a small fraction (<25%) of the criteria for release for unrestricted use.

Survey units are limited in size to ensure adequate survey coverage. Tables 8-1 and 8-2 list size limitations and provide an initial indication, based on the historical site assessment and the characterization survey results, of how the final status survey units will be classified.

It is possible that some survey units may be reclassified prior to their being surveyed. Survey units may also be reclassified and resurveyed based on the results of the final status surveys performed within a given survey unit. Survey units will be reclassified if residual activity is encountered during the final status survey as follows.

- A Class 3 survey unit will be reclassified to a Class 2 survey unit when the survey results exceed 25% of the criteria for release for unrestricted use.
- A Class 2 survey unit will be reclassified to a Class 1 survey unit when the survey results exceed 75% of the criteria for release for unrestricted use.

Survey Packages

Survey packages will be developed for each survey unit. The survey package will include survey instructions, list the appropriate location codes for tracking the data, and identify any abnormal conditions or safety concerns that may be encountered during the survey. As the survey progresses, the survey results and the results of any analyses will be placed in the survey package. Signatures will be required of those individuals completing specific portions of the survey and of those reviewing the specific portions. The signature blocks will be used to track the progress of the survey.

Survey Protocols

The survey of building surfaces, permanent and non-permanent structures, and equipment will consist of beta scans and measurements of total beta activity. Representative samples will be collected and analyzed to determine if the removable activity exceeds 10% of criteria for the total activity and to verify the radionuclides of interest and their relative fractions. Representative samples will also be collected, if appropriate, to verify that the object being surveyed does not contain volumetric contamination and to verify that the surface of interest is not being attenuated by an overlying surface.

The survey of open land areas/soils will consist of gamma scans and surface (0 to 6 inches) soil samples.

Number Of Measurements

The number of measurements to be collected in each survey unit will be based on the on the statistical test (Sign Test or Wilcoxon Rank Sum Test) that may need to be used to test the null hypothesis. If required, the survey results from building surfaces, permanent and non permanent structures, and miscellaneous items will be evaluated using either the Wilcoxon Rank Sum Test or the Sign Test and the survey results from open land areas/soils will be evaluated using the Sign Test.

The number of measurements to be collected will be calculated in accordance with this plan and the guidance contained in NUREG-1575, Multi-Agency Survey and Site Investigation Manual (MARSSIM) August 2000. The resulting calculation will be placed into the appropriate survey package. In some cases the number of measurements required may conservatively exceed the number calculated. It is expected that a minimum of 20 measurements will be required in each survey unit.

The scanning coverage for each survey unit is dependent on its classification

- Class 1 100% coverage
- Class 2 50% coverage
- Class 3 10% coverage

Gridding

Class 1 and Class 2 survey units consisting of building surfaces and open land areas will be gridded. The grid spacing, L, will be determined assuming a square grid pattern as follows

$$L = \sqrt{\frac{A}{N}} \qquad \text{Equation 8.2}$$

Where:

L = Grid spacing, m
A = Survey unit area, m^2
N = Number of required measurements, unitless

Once the grids have been established the actual measurement or sampling location will be established by using a random number generator to determine off sets from 0 to 1 in both the x and y direction from the grid origin assumed to be in the south east corner of each grid. The grid spacing will be multiplied by the off sets to determine actual measurement or sampling location. Measurement and sampling locations will be marked in survey units that are not gridded.

Table 8-1
Classification Of Building Surfaces

Survey Unit Classification	Size Limit, m^2	Scan Frequency	Pathfinder Preliminary Classification
Class 1	< 100	100 %	Hot side of the Turbine Building Basement Any area identified as containing residual activity ≥ 75% of the criteria for unrestricted use
Class 2	<1,000	50%	First floor of the Boiler Building Any radioactive waste storage areas (such as the storage area located on the mezzanine of the Turbine Building) Any area exceeding 25% of the criteria for unrestricted use with the exception of the Fuel Handling Building
Class 3	No limit	10%	Second floor of the Boiler Building Cold side of the Turbine Building basement Turbine Building mezzanine Turbine deck Water treatment plant Outbuildings: warehouse, temporary loading and storage building, security and construction office, fire pump house Maintenance shop and admin bldg Paved surfaces surrounding the Pathfinder Peaking Plant Fuel Handling Building

Table 8-2
Classification Of Open Land Areas

Survey Unit Classification	Size Limit, m^2	Scan Frequency	Pathfinder Preliminary Classification
Class 1	< 2,000 m^2	100%	None at this time
Class 2	<10,000 m^2	50%	Construction Laydown Area
Class 3	No Limit	10%	The open land areas surrounding the Pathfinder Plant extending from the base of the cooling tower basin to the Big Sioux River

9. FINANCIAL ASSURANCE

9.1 Demonstration of Financial Assurance

By letter dated October 15, 2003 (Ref. 6), Xcel Energy provided the staff with an updated decommissioning financial assurance funding plan. This letter informed that the staff that Xcel Energy would increase the Pathfinder decommissioning funding letter of credit from $750K to $3M. This increase became effective on October 21, 2003. The $3M amount was greater than the site-specific cost estimate with considerable margin. The associated cost estimate provided within Reference 6 to support the funding increase was based on conservative assumptions on the nature and extent of the radioactive inventory at the Pathfinder Site and the related scope of remediation activities.

Since this plan was submitted, the detailed characterization survey indicates that the radioactive inventory, and therefore the scope of the proposed remediation activities, has decreased considerably. The cost estimate for the funding plan included an assumption that a significant portion of steam and condensate equipment located with the peaking plant would be removed and that 10% of that amount would be shipped offsite as radwaste. In light of recent characterization data, only a small amount of equipment will be removed, and the amount of radwaste to be shipped (approximately 1300 ft^3) will be considerably less than the previously estimated amount.

The other key assumptions for the cost estimate remain conservative and valid. In addition, costs to date for the decommissioning project have been paid by internal funds and have tracked according to forecast. The remediation portion of the decommissioning project is scheduled for completion by the end of 2005. The forecasted costs for 2004 decommissioning activities have not changed and are likely to be conservative. The estimated costs for the 2005 remediation effort,

which is the largest decommissioning cost activity, are a function of the radioactive inventory. Barring any unforeseen circumstances, remediation costs will be significantly less than forecasted in the site specific cost estimate. Consequently, the financial assurance amount as presented by Xcel Energy by its letter dated October 15, 2003 letter is more than sufficient to cover the cost of the Pathfinder decommissioning activities and will not require adjustment.

Xcel Energy has used the guidance of Part A.18 to Appendix A of NUREG 1757, Consolidated NMSS Decommissioning Guidance, Vol. 3, Financial Assurance, Recordkeeping, and Timeliness, in demonstrating financial assurance for decommissioning. The financial assurance mechanism is a letter of credit (#NZS3361111- Wells Fargo) and standby trust agreement.

Since the Pathfinder decommissioning project is an active project that will remain active from now until decommissioning is complete, the site-specific cost estimate will be subject to ongoing periodic budget reviews. These comprehensive reviews will be conducted at least annually. The decommissioning activities are scheduled for completion no later than December 31, 2005.

10. QUALITY ASSURANCE

Xcel Energy has developed a Quality Assurance Project Plan (QAPP) to assure compliance with regulatory requirements. The QAPP is provided as Appendix E to this decommissioning plan. Decommissioning activities that affect quality are subject to applicable controls of the QAPP. Activities subject to the QAPP will be identified on the implementing documents such as procedures and instructions.

The QAPP includes descriptions of the Quality Assurance organization, document control, and other features of the Quality Assurance program. The program permits the use of contractor's procedures for activities such as survey methodology, chain of custody, and instrumentation selection and calibration. These procedures will be developed under an approved and current Quality Assurance plan that meets the requirements of the Pathfinder QAPP.

11. RESTRICTED USE AND ALTERNATE CRITERIA

Xcel Energy does not request termination of its material license using either restricted use or alternate criteria provisions of 10CFR20 Subpart E.

12. REFERENCES

1. Topical Report, Residual Radionuclide Distribution and Inventory at the Pathfinder Generating Plant, D.E. Robertson et al, Prepared for the USNRC under a Related Services Agreement with the US Department of Energy, Pacific Northwest Laboratory, Richland Division of Low-Level Waste Management and Decommissioning Headquarters Office, USNRC, June 1982 (Appendix C attached)

2. Letter from L. Callan, NRC, to T. Parker, NSP, November 10, 1992

3. B.M. Smith, Oak Ridge Institute for Science and Education, Confirmatory Radiological Survey of Portions of the Pathfinder Generating Station Sioux Falls, South Dakota, Prepared for the Division of Low-Level Waste Management and Decommissioning Headquarters Office, USNRC, November 1992

4. Letter from T. Parker, NSP, to USNRC, Evaluation of Decommissioning Radionuclide Release Data, February 15, 1993

   Letter from T. Parker, NSP, to USNRC, Amendment Request No.11, May 22, 1992

5. Letter from C. Bomberger, Xcel Energy, to USNRC, Financial Assurance for Pathfinder Decommissioning, October 15, 2003

6. Characterization Survey Report for the Pathfinder Plant in Sioux Falls South Dakota, December 2003, Rev. 0 (Appendix D attached)

Pathfinder Decommissioning Plan

Environmental Information Addendum

February 17, 2004

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1. INTRODUCTION AND SUMMARY

1.1 Introduction

Xcel Energy is providing this Environmental Information Addendum to supplement the Pathfinder Decommissioning Plan. The decommissioning plan is being submitted as a license amendment request to Byproduct Materials License No. 22-08799-02. The Pathfinder decommissioning project is categorized as a Group 3 Decommissioning. The decommissioning plan follows the guidance of NUREG 1757, Consolidated NMSS Decommissioning Guidance. The purpose of this addendum is to provide the NRC staff with sufficient information to evaluate the environmental impacts of the proposed decommissioning activities and prepare an environmental assessment.

1.2 Proposed Action

Xcel Energy is proposing to incorporate decommissioning activities into Byproduct Materials License No. 22-08799-02. The license currently allows for possession of material with no provision for decommissioning activities. This request includes a decommissioning plan. The plan contains a description of decommissioning activities, final release criteria, and a description of the final status survey plan.

The three principal decommissioning activities are remediation, a shipment of a small amount of low level radwaste, and final status surveys. These activities will be accomplished following NRC approval of the license amendment request and are currently scheduled to occur during 2005. The planned remediation activities are described in Section 3 of the decommissioning plan. The remediation activities will be largely confined to areas within the basement of the existing turbine building at the Pathfinder Site. No remediation of soil, groundwater, or surface water is planned.

In addition to remediation activities, the decommissioning will include a shipment of a small amount of Low Specific Activity waste (LSA) and radiation surveys. The radwaste shipment will consist of materials removed from building surfaces. The shipment will likely be limited to no more than one truckload of contaminated material. The estimated volume of radwaste for shipment is estimated at not more than 1300 ft^3 of material.

Need for the Proposed Action

The application for license amendment and NRC approval is necessary for Xcel Energy to proceed with the decommissioning activities as required by the

timeliness requirements of 10 CFR 30.36(g). A change to the current license is necessary since no decommissioning activities are presently authorized. Upon satisfactory completion of decommissioning activities and compliance with unrestricted release criteria is demonstrated, Xcel Energy intends to apply for a termination of the Pathfinder Byproduct Material License.

2. SITE AND FACILITY DESCRIPTION

Location

7100 East Rice Street, Sioux Falls, South Dakota, 57110
Minnehaha County
Latitude/Longitude: 43° 36' 11" N / 96° 38' 14" W

Topography

The Pathfinder site lies in the Western Glaciated Plains region. Wisconsin age glaciers have resulted in a land surface that is smooth and gently undulating with poorly developed drainage features. The effects of Kansan age glaciers are reflected in the uplands immediately north and south of the Pathfinder site. This region is characterized by a well-defined network of small streams and carved channels in boulder rich clay.

The Pathfinder site is located on glacial outwash deposits within the Big Sioux River Valley. An upper terrace ranges in width from 200 to 3000 feet. The lower terrace, which the current channel meanders through, is approximately 2000 feet wide. The site is bounded by the river to the north and bluffs to the south (Figure 2-1).

A cross section profile of the river valley can be summarized as follows.

- Bluff Top Elevation - 1450 MSL
- Upper Terrace Elevation - 1360 MSL
- Plant Site Elevation - 1320 MSL
- Lower Terrace Elevation - 1305 MSL
- Big Sioux River Elevation – 1295 MSL

2.1 Facility Description

The Pathfinder site is shown in Figure 2-2. The site was developed and is owned by Northern States Power Company, which is a wholly owned subsidiary of Xcel Energy Inc.

The Pathfinder facility includes: the Pathfinder Peaking Plant, which is located within the existing turbine and boiler buildings, the warehouse, the administration

building, the security building, the cooling tower control house, the cooling tower chlorine house, the fire pump house and the area within the site boundary, not including the oil tanks and the Angus Anson Plant. The reactor building, fuel storage building, and temporary warehouse, have been previously decommissioned.

Figure 2-1
Pathfinder Site Location and Topography

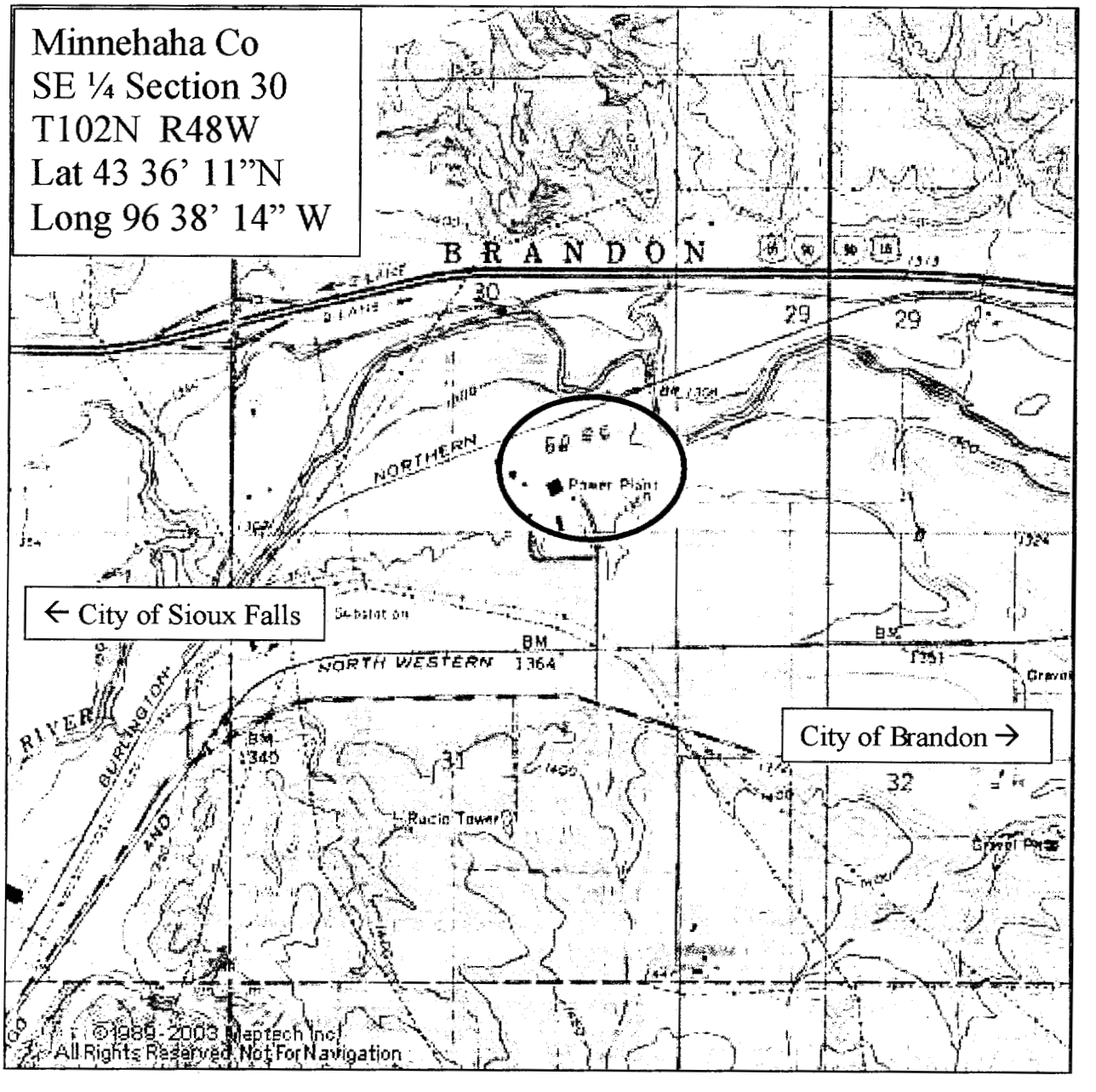


Figure 2-2
Pathfinder Site Plan

History

(See Section 2 of the Pathfinder Decommissioning Plan for additional detail.)

The secondary system of the Pathfinder Peaking plant was once an integrated part of the Pathfinder Atomic Power Plant. The atomic plant was employed as a small electrical generation plant rated at 66 MWe. It had a unique design that employed in-core superheaters. Outside of the reactor vessel, the plant configuration was similar to modern day boiling water reactors. The nuclear plant went critical on March 24, 1964. The plant commenced commercial operations on August 1, 1966 and was permanently shutdown soon after on September 16, 1967. Most of the operation during this period involved phased testing, and sustained full power operation at the design power level of 190 MWth was never achieved. All radioactive releases during this period were within regulatory limits. There were no indications of fuel failures.

The brief operating period introduced a relatively small amount of radioactive contamination into the Balance of Plant (BOP). The BOP was not subject to any additional radioactivity from any sources after this period. The nuclear fuel was shipped offsite in 1970 and the plant was placed in SAFSTOR in 1971.

The Pathfinder BOP was later decontaminated and disconnected from the reactor plant steam source. Phosphoric acid (30%) solution was used to decontaminate the LP and HP turbine casing, all turbine parts, the condenser, an inlet steam line, and two of the feedwater heaters. The decontamination removed 500 mCi from the turbine and condenser (mostly Zn-65), 300 mCi from turbine parts, and 500 mCi from feedwater heaters. A total of 1300 mCi was packaged and shipped offsite. All contaminated material stored in the Turbine Building was removed and stored on the reactor side or shipped offsite. The nuclear plant and associated systems were isolated from the turbine building. Steam, reactor feedwater, and other process lines were cut and capped. The BOP was then integrated into a fossil-fueled peaking plant with gas/oil package boilers supplying steam to operate the turbine. This conversion began in December 1968. Commercial operation of this new configuration, known as the Pathfinder Peaking Plant, commenced in May 1969 and continued until July 2000.

In 1980, Pacific Northwest Laboratory conducted a comprehensive site survey under an NRC contract (Ref. 1). This survey was conducted as part of a data program to provide the NRC with information on types, quantities, and locations of radionuclides at retired power plants. Pathfinder was the first plant to be surveyed under this program.

The reactor plant and fuel storage systems from the shutdown Pathfinder Atomic Power Plant were subsequently decommissioned. This extensive effort started in

March 1990 and was completed in 1992. The reactor vessel was shipped offsite in 1991. The effort resulted in removal of approximately 562 of the estimated 563 Ci of site radioactive materials inventory. By letter dated Nov. 10, 1992 (Ref. 2) the NRC staff authorized unrestricted release of the above buildings and demolition of the reactor building. An Environmental Assessment of the decommissioning of the fuel handling building and reactor building was performed (Ref. 3).

The Angus Anson fossil plant, which consists of two simple cycle combustion turbines, was constructed on the Pathfinder site and commenced commercial operations in September 1994. The Angus Anson project included an Environmental Impact Statement (Ref. 4). These two units continue to operate. The Pathfinder Peaking Plant does not affect operation of the Angus Anson plant. Both plants share administration facilities and have connections to the site water treatment and fire protection systems.

The Pathfinder Peaking Plant continued to operate until July 13, 2000, when the cooling tower collapsed in a storm. Due to economic reasons, the decision was made to cease operations of the peaking plant and commence decommissioning activities.

The Pathfinder Peaking Plant has been shutdown since July 2000. The suspension of maintenance activities such as turbine maintenance will effectively prevent future use of existing equipment for electrical generation without major modifications and expenditures. None of the Pathfinder Peaking Plant power systems such condensate, feed, or steam systems are in current usage. A few non-contaminated systems, such as building heating and air compressors, are still in use.

Some of the Pathfinder administration buildings are used to support operation of the Angus Anson plant. The settling ponds, once used for the Pathfinder facility, are also in use for water treatment system discharges.

3. ENVIRONMENTAL SETTING

3.1 Demography

The nearest population center of 25,000 or more is the city of Sioux Falls, South Dakota which lies about 6 miles southwest of the Pathfinder site. The 2000 population of Sioux Falls is 123,975. The closest incorporated town is Brandon, South Dakota, which is located approximately 2 miles east of the Pathfinder site. See Table 3.1 below for demographic data.

Table 3.1
Demographic Data
Brandon, Sioux Falls and Minnehaha County, South Dakota*

Year	Brandon Population	Per Capita Income
1990	3,543	N/A
2000	5,639	$19,869
2002**	6,212	N/A
Year	Sioux Falls Population	Per Capita Income
1990	100,814	N/A
2000	123,975	$21,374
2002**	130,491	N/A
Year	Minnehaha County Population	Per Capita Income
1990	123,809	N/A
2000	148,281	$20,713
2002**	152,545	N/A

* Source: U.S. Bureau of the Census 2000
** Estimate

3.2 Geography

The Pathfinder site is underlain by a series of alluvial, glacial, and marine sediments. Basement rock for the site consists of Sioux Quartzite. A geologic cross section for the site is presented in Figures 3-1 and 3-2.

Sioux Quartzite

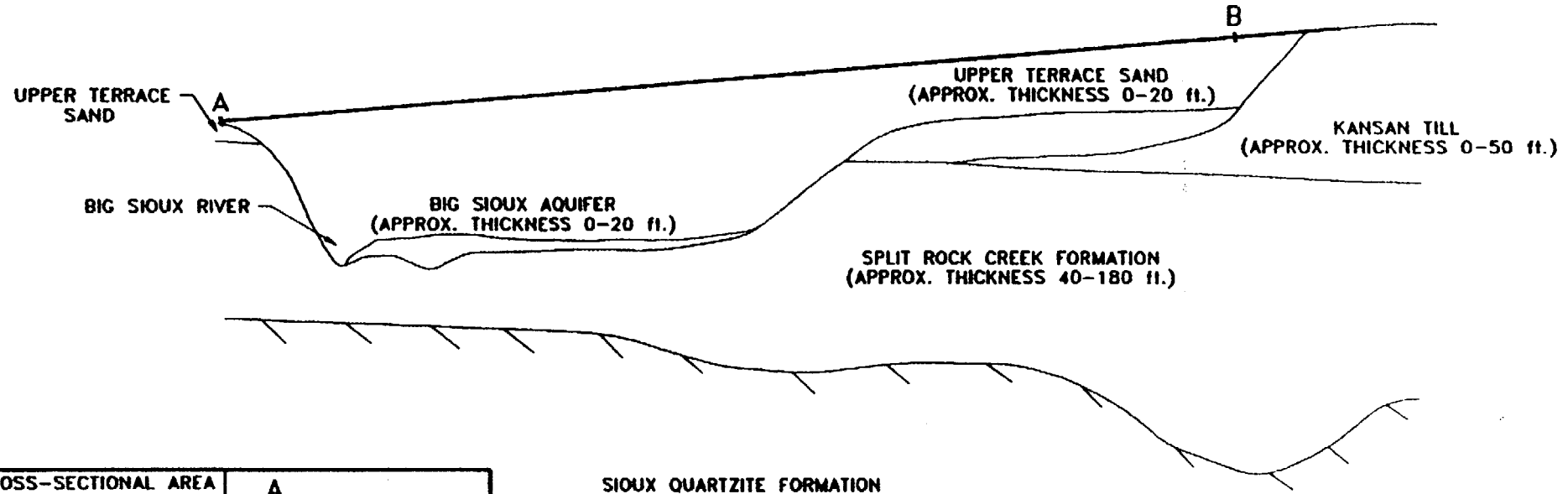
Sioux Quartzite is the basement rock, which underlies most of southeast South Dakota. The material is composed primarily of clean well-sorted beach sands that are well cemented with silica. The formation is estimated to be 3,000 to 5,000 feet thick. It is jointed both horizontally and vertically. Its fractures and weathered surface yields a limited amount of water. The closest outcrop is north of I-90.

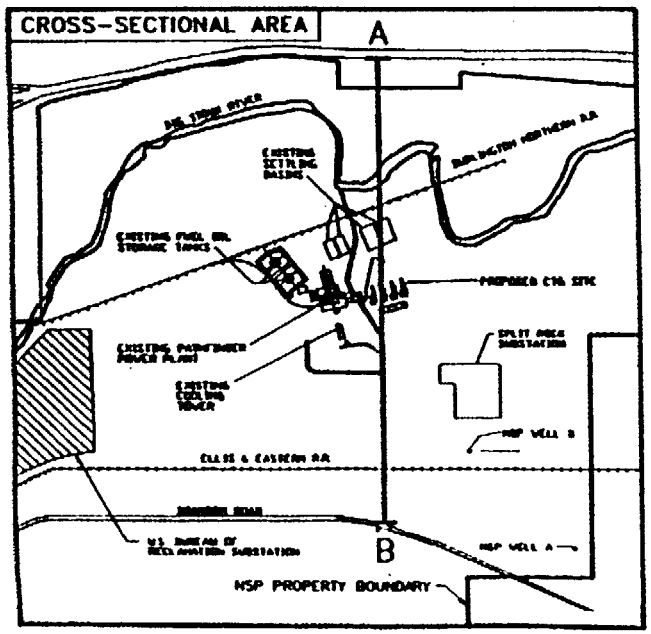
Split Rock Creek

The Split Rock Creek Formation consists of marine deposits; its horizontal extent is approximately 100 square miles. It varies in thickness from 180 feet beneath the upper terraces and 40 ft in the areas eroded by the Big Sioux River. The Split Rock Creek Formation (historically referred to as the Black Rock Formation) consists of five identifiable units: a) Shale (black) b) Siltstone (black and well cemented) c) Sandy Clay d) Sand (pink) with Shale lens e) Shale and Siltstone.

NORTH

Figure 3-1
Geologic Cross Section for Pathfinder
(NSP 1992)





0 400 800 1600

APPROX. HORIZONTAL SCALE IN FEET

EIS FIGURE 2-8.

NORTHERN STATES POWER COMPANY
PATHFINDER SITE, SOUTH DAKOTA

FIGURE 4-2
GENERALIZED GEOLOGICAL
CROSS-SECTION

DWG NO.: N05644052.F101 | DAMES & MOORE

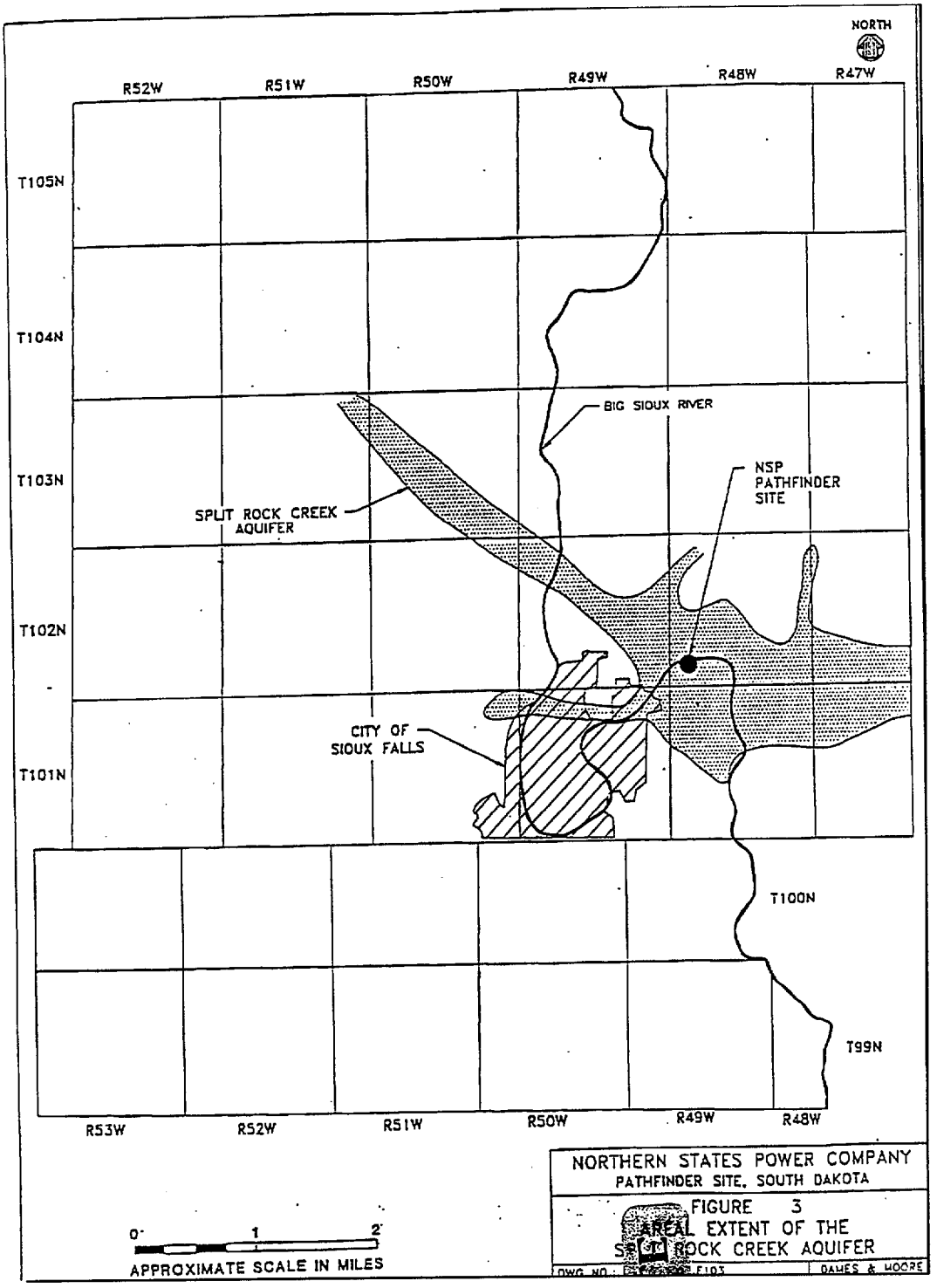


Figure 3-2
Geologic Cross Section for Pathfinder
(NSP 1992)

Unconsolidated Materials

Unconsolidated material consists of topsoil, till, fine alluvium, and coarse alluvium. Topsoil and fine alluvium typically consist of lean clay. The coarse alluvium consists of sandy silt with gravel. The coarse alluvium exists directly over shale bedrock. Alluvial deposits are thin and typically less than 20 feet in thickness. These deposits are primarily restricted to the margins of the Big Sioux River. The material has a relatively high permeability.

Kansan Till

The Pleistocene Kansan till is composed of boulder rich till which may contain outwash deposits. It is approximately 0-50 ft in thickness. The material was deposited on top of cretaceous sediments and forms the upland bluffs.

Upper Terrace Deposits

The upper terrace is approximately 20 ft thick. The unit is a fluvial deposit, which may or may not be of glacial origin. This former flood plain has been abandoned by the Big Sioux River, which has cut a deeper channel and developed a new flood plain at a lower level. The permeable material does not contain a permanent source of water.

Lower Terrace Deposits

The lower terrace is approximately 12 ft thickness. It consists of a fine alluvium over coarse sand & gravel. Based upon grain size analysis, the permeability is estimated to be 1.6 E-2 cm/sec.

3.3 Hydrology

Ground Water

There are two principle aquifers beneath the Pathfinder site, the shallow Big Sioux Aquifer and the deeper Split Rock Creek Aquifer. Water infiltrating at the Pathfinder facility recharges the Big Sioux Aquifer due to its shallow depth and coarse overlying materials. The Split Rock Creek Aquifer is protected from on-site infiltration by the presence of overlying shale deposits; recharge occurs off site where Sioux quartzite outcrops at the ground surface.

The Big Sioux Aquifer consists of the shallow deposits of sand and gravel in the current flood plain. These deposits may be as thick as 20 feet and are reported to be strongly connected to the river. In the vicinity of the Pathfinder site,

groundwater is encountered at a depth of 71/2 feet and flows NE towards the river. The aquifer follows the river axis and pinches out along the flood plain edges where the shale is less eroded and found at a higher elevation.

The water-bearing portion of the Split Rock Creek Aquifer consists primarily of the deeper pink sand unit, which is thought to result from the weathering of Sioux Quartzite. This sand unit ranges in thickness from 0 to 60 feet. Upward flow direction has been documented for this aquifer at the Pathfinder site, which further protects it from contamination due to onsite infiltration.

Figure 3-3 illustrates the ground water flow patterns typically seen within the Big Sioux Aquifer. Continuous ground water elevation monitoring has shown variation in river elevation has little effect on flow direction. The Big Sioux River is predominately a gaining stream. Ground water travel velocities are estimated to range from 400 to 700 ft/yr.

Surface Water

The primary surface water in the vicinity of the Pathfinder site is the Big Sioux River. Uses of the water include casual drinking by cattle in pastures along the river and recreational fishing. The Big Sioux River is not a municipal water supply at any point between the plant and the rivers confluence with the Missouri River.

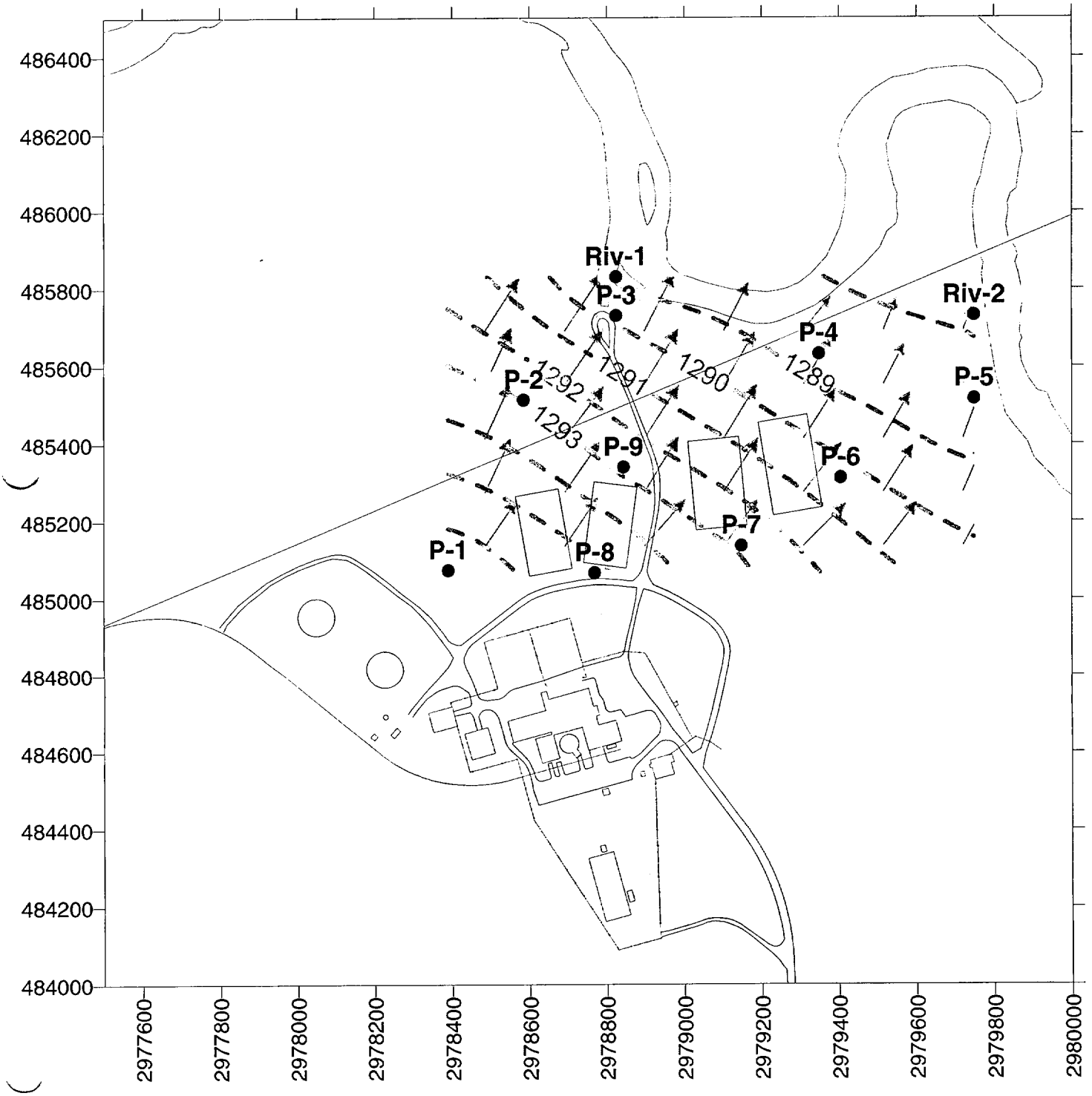
Average flow for the Big Sioux River is 270 cfs. Flooding is extremely flashy and generally endures less than a few days. They usually occur in the spring and often carry ice with them. Local damming and unnaturally high stages are, therefore, possible. These factors supported the adoption of a conservatively high flood stage for the design of the Pathfinder facilities.

3.4 Meteorology

The plant site is located east of Sioux Falls, South Dakota. It experiences a high plains continental climate with a large seasonal variation in temperature and precipitation. Upper level winds bring warm, dry air from the southwest and cold dry air from the Canadian interior. A southerly wind during the summer months brings moisture from the Gulf of Mexico; thus approximately 41 percent of the yearly precipitation falls during June, July, and August.

Figure 3-3

Pathfinder Ground Water Elevations
Arrows denote flow direction (NSP 1999)



Temperature and Humidity

Site temperatures recorded at the Sioux Falls Airport are summarized in Table 3-2. Temperatures have ranged from -36 degrees (Jan 1981) to 110 degrees (June 1988). A typical year reports 167 days with a minimum temperature of 32 degrees or less, and 23 days each year where the maximum temp exceeds 90 degrees. The warmest monthly average is July, and the coldest month is January.

Relative humidity is the absolute humidity divided by the maximum humidity possible for the current temperature. Regardless of month, the typical relative humidity drops during the day, starting off at near 80% and ending at 60%.

Heating and Cooling Degree Days

Units of degree-days can be used as an indicator of heating or cooling requirements. One heating degree-day is accumulated for each degree that the daily mean temperature drops below the base temperature of 65 F. Cooling degree-days are accumulated when the daily mean temperature is above 65 F. Table 3-3 gives mean monthly and annual degree-day totals for Sioux Falls, South Dakota.

Precipitation and Evaporation

Table 3-4 summarizes monthly precipitation for the Sioux Falls Area. Figure 3-4 illustrates the distribution of precipitation through out the year. Total annual precipitation averages 24.5 inches per year with monthly totals ranging from 0.5 to 3.5 inches. Snow accumulation is a significant component to the annual precipitation value. Annual average snowfall totals 41.8 inches.

Figure 3-5 presents the probability of various rain events. There is a 20 to 35% chance, on any given day that a trace of precipitation will occur. The 100 yr 24 hr rain event is approximately 5.75 inches. The 25 yr 24 hr rain event is 4.75 inches.

The annual gross lake evaporation is estimated to be 36 inches based on data from the period 1946 through 1955.

Barometric Pressure

The annual barometric pressure adjusted to the site elevation of 1,320 feet is 28.59 inches Hg.

Table 3-2
Temperature Summary for Sioux Falls SD

Station:(397667) SIOUX FALLS WSFO									
From Year=1948 To Year=2000									
		Daily Extremes				Max. Temp.		Min. Temp.	
	Monthly Mean	High	Date	Low	Date	>= 90 F	<= 32 F	<= 32 F	<= 0 F
	F	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days
January	13.8	66	24/1981	-36	19/1970	0	21.5	30.9	13
February	20.5	70	23/1958	-31	28/1962	0	15.3	27.6	7.5
March	31.5	87	30/1968	-23	Nov-48	0	7.9	26.2	2
April	46.3	94	25/1962	5	Mar-75	0.2	0.5	13.2	0
May	58.5	100	25/1967	17	Apr-67	0.6	0	1.9	0
June	68.3	110	21/1988	33	Jan-56	4.1	0	0	0
July	73.6	108	Sep-89	38	Apr-67	9.2	0	0	0
August	71.5	108	26/1973	34	20/1950	7.1	0	0	0
September	61.2	104	Jun-76	22	30/1974	1.9	0	1.2	0
October	49.1	94	May-63	9	19/1972	0.1	0.1	10.6	0
November	32.5	81	Aug-99	-17	14/1959	0	6.7	25.6	1.2
December	19.4	63	Jan-98	-28	23/1990	0	18.3	30.5	7.5

High Plains Regional Climate Center, oninet@hprcrsun.unl.edu

Table 3-3
Heating and Cooling Degree Days

Month	Normal Degree-Day	
	Heating	Cooling
January	1,631	0
February	1,285	0
March	1,073	0
April	561	0
May	240	29
June	52	154
July	14	293
August	15	226
September	161	41
October	489	6
November	960	0
December	1,404	0
Annual	7,885	749

*Period of record: 1951-1980.

Source: United States Department of Commerce, Local Climatological Data--Annual Summary with Comparative Data--Part I--Central Region, Sioux Falls, South Dakota, National Climatic Data Center, Asheville, North Carolina, 1988.

Table 3-4
Average
Monthly
Precipitation
(1948-2000)

Station: (397667) SIOUX FALLS WSFO

From Year=1948 To Year=2000

	Precipitation								Total Snowfall		
	Mean	High	Low	1 Day Max.	>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Year
	in.	in.	in.	in.	# Days	# Days	# Days	# Days	in.	in.	-
January	0.52	1.71	0.05	1.59	6	1	0	0	6.8	19.6	69
February	0.76	4.05	0.05	1.62	7	2	0	0	8.2	48.4	62
March	1.66	4.08	0.14	2.39	9	4	1	0	9.6	31.5	51
April	2.5	5.83	0.17	2.64	10	5	2	0	2.8	18.4	83
May	3.35	8.26	0.61	3.55	11	7	2	1	0	0.2	54
June	3.74	8.43	0.91	4.26	11	7	3	1	0	0	48
July	2.95	8.41	0.39	3.35	10	6	2	1	0	0	48
August	2.88	9.09	0.53	4.59	9	5	2	1	0	0	48
September	2.73	9.26	0.29	4.02	8	5	2	1	0	0.9	85
October	1.7	6.28	0	4.54	6	3	1	0	0.8	10	91
November	1.1	2.95	0.02	1.55	6	2	1	0	5.8	21.9	85
December	0.63	2.62	0	1.41	6	2	0	0	7.7	41.1	68

High Plains Regional Climate Center, online@hpccsun.unl.edu

Figure 3-4
Average
Total
Monthly
Precipitation
(1948-2001)

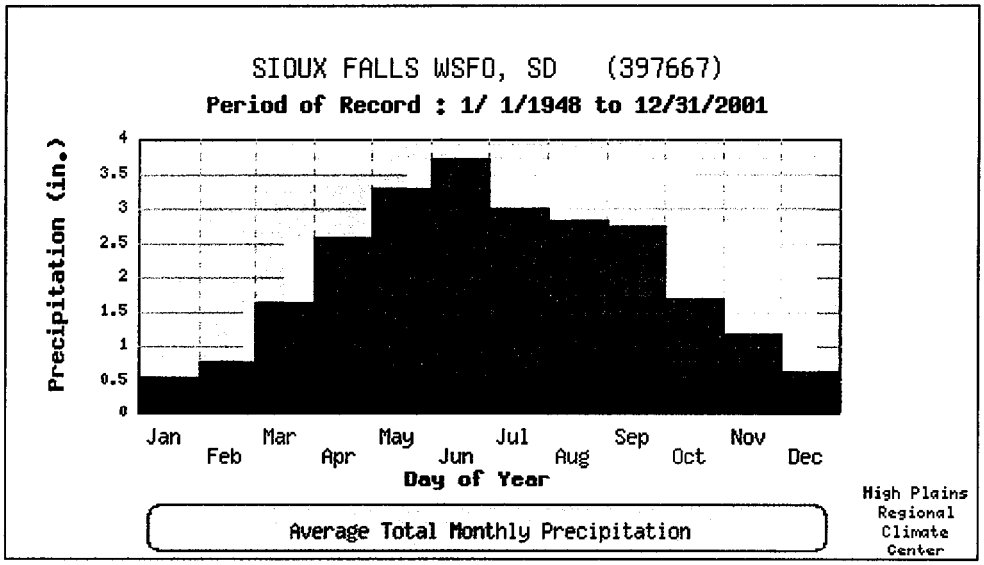
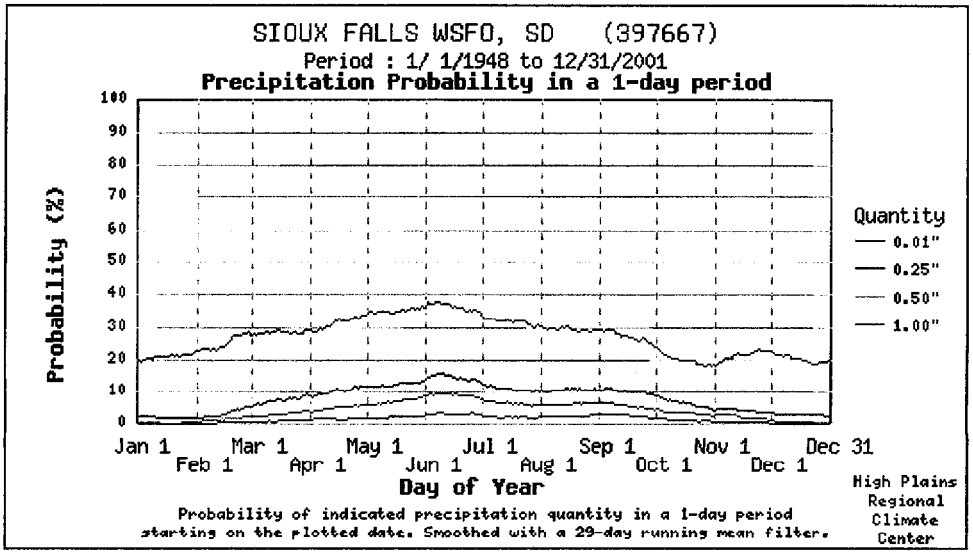


Figure 3-5
Precipitation
Probability in
a 1-Day
Period
(1948-2001)



Wind Speed and Direction

Ten years of wind data from Sioux Falls (1965-1974) were used to generate annual and seasonal wind roses. Wind roses show that two wind directions are predominant. North winds (12 miles per hour) are common during fall, winter, and early spring, reflecting the influence of the polar front and synoptic pattern over the Rockies. The common occurrence of low-pressure systems in the desert southwest and high-pressure systems in the southeast during late spring, summer, and fall set up southerly circulation with wind speeds of about 13 miles per hour.

3.5 Land Use

The Pathfinder facility is located in a rural setting. The site consists of 1020 acres. Of the 1020 acres approximately 60 acres is used for generating facilities and auxiliary equipment, 550 acres is cultivated and 410 acres are unused grassland. Three land uses (Figure 3-6) are present in the project vicinity: agricultural, industrial, and residential.

The generating site, which is comprised of both the Pathfinder and Angus Anson Combustion Turbine Generating Plants, is in an industrially zoned area. The Split Rock & Lawrence substations and associated transmission lines are also located within one mile of the site.

Agricultural production is the primary land use adjacent to the subject property. Corn and soybeans are typical crops, although small grains may be included in the crop rotation. Lands near the project site are not classified as prime agricultural lands. Lands less suited for row crops may be used for forage production, such as alfalfa, hay, or pasture. Some areas within the agricultural land use areas are not conducive to crop or forage production due to soil limitations or topography and are essentially undeveloped.

Transportation corridors bisect adjacent lands. Interstate I-90 is north of the site. East Rice Street and the Burlington Northern Railroad are south of the site.

Additional land use restrictions have been established in the area due to geologic and hydrologic conditions. The upper and lower terrace areas are included in a Natural Resource Protection area and the 100-year flood plain is located along the lower terrace. Land use is restricted in terms of structures, which may be constructed, and materials placed upon the land.

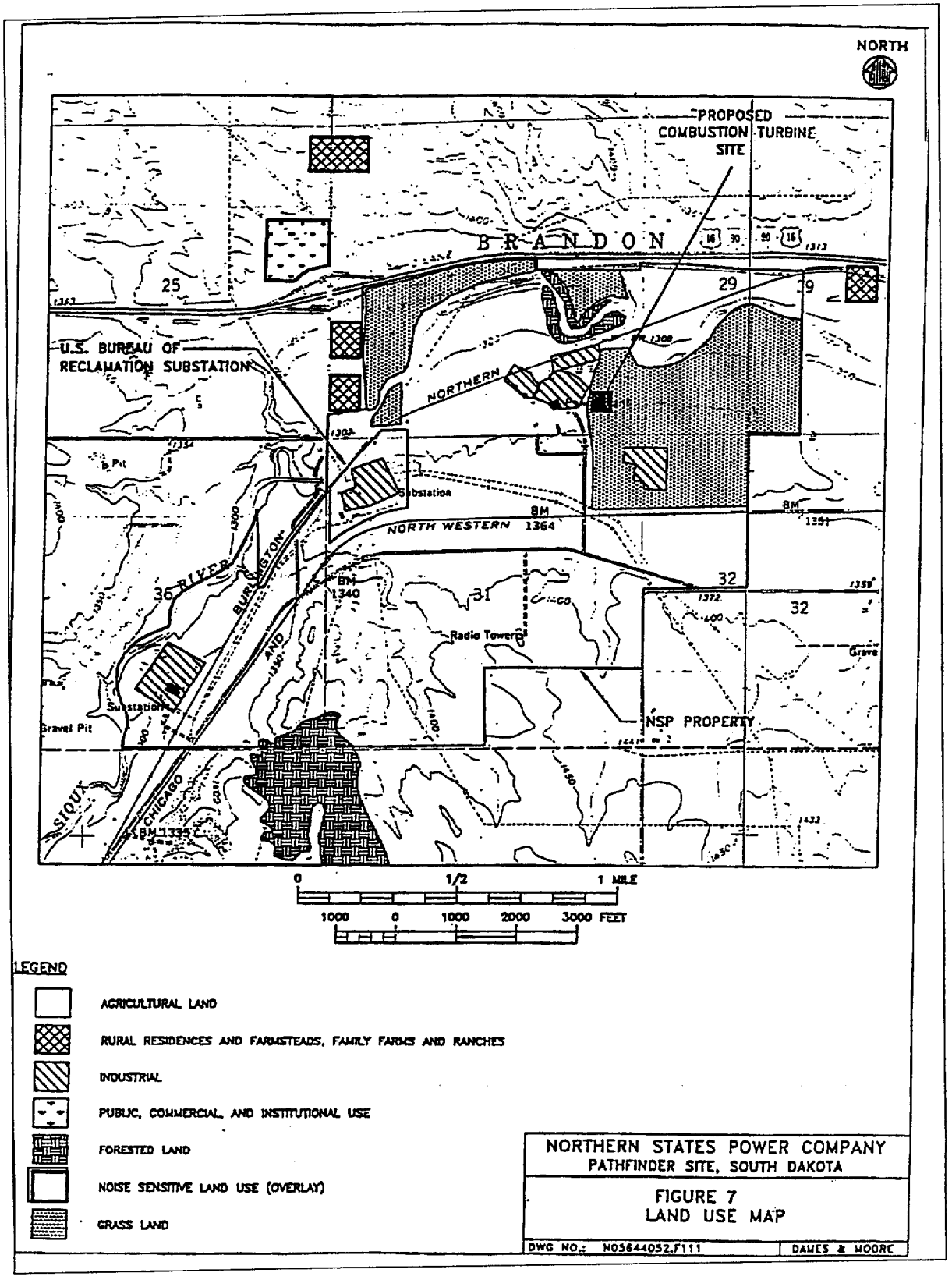


Figure 3-6
Land Use Map

Four residences and one public campground can be found within 1 mile of the project; the closest residence is about 0.6 miles away. A residential subdivision is being developed approximately 2 miles southeast of the site, but no houses had yet been completed as of the date of the amendment request.

4. DECOMMISSIONING ACTIVITIES

4.1 Decommissioning Alternatives

No Action

The no action alternative would leave the site in its existing condition without decommissioning, which would keep the byproduct material onsite. This alternative is contrary to statutory requirements. This alternative would result in no change to current environmental impacts. The environmental impacts of the proposed decommissioning activities are very small and not significant. When the decommissioning is complete, the site will be left in an improved environmental condition because the radiation levels have will been reduced to below the free release values without significantly impacting the environment.

Further Deferral of Decommissioning

Further deferral of decommissioning is not warranted. Radwaste disposal costs are expected to rise significantly over time, which results in an economic disincentive. In addition, Xcel Energy is relying in part on internal resources to provide radiological history, assist in the remediation effort, and manage the project. Many of these resources have direct experience with the Pathfinder site. This experience base will be diluted over time, which will increase costs and reduce efficiency if the project were deferred. Finally, Xcel Energy has the financial resources to execute this project at this time, which cannot be predicted with certainty in the future.

4.2 Decommissioning Schedule

The decommissioning schedule is attached (Figure 4-1). This schedule is conservative with respect to task completion dates. Xcel Energy fully expects to complete decommissioning activities well within the regulatory timeliness requirements.

Activity ID	Orig Dur	R Du.	%	Early Start	Early Finish
A1000	0	0	100	21FEB03A	
A1100	0	0	100	16APR03A	
A1110	33	0	100	16APR03A	30MAY03A
A1120	0	0	100	20MAY03A	
A1130	153	0	100	02JUN03A	
A1140	20	0	100	04AUG03A	29AUG03A
A1150	89	0	100	01SEP03A	01JAN04A
A1160	0	0	100	06OCT03A	
A1170	5	0	100	06OCT03A	10OCT03A
A1180	15	0	100	06OCT03A	24OCT03A
A1190	15	0	100	06OCT03A	24OCT03A
A1200	20	0	100	06OCT03A	31OCT03A
A1210	20	0	100	06OCT03A	31OCT03A
A1230	0	0	100	31OCT03A	
A1250	0	0	100	20NOV03A	
A1260	23	0	100	01DEC03A	31DEC03A
A1269	35	9	74	01DEC03A	20FEB04
A1270	0	0	0	20FEB04*	
A1280	66	66	0	20FEB04	21MAY04
A1290	115	160	0	24MAY04	31DEC04
A1330	20	20	0	01OCT04	28OCT04
A1300	66*	66*	0	01OCT04	31DEC04
A1310	66	66	0	01OCT04	31DEC04
A1320	66	66	0	01OCT04	31DEC04
A1340	20	20	0	29OCT04	25NOV04
A1350	6	6	0	26NOV04	03DEC04
A1360	20	20	0	06DEC04	31DEC04
A1400	85	85	0	03JAN05	29APR05

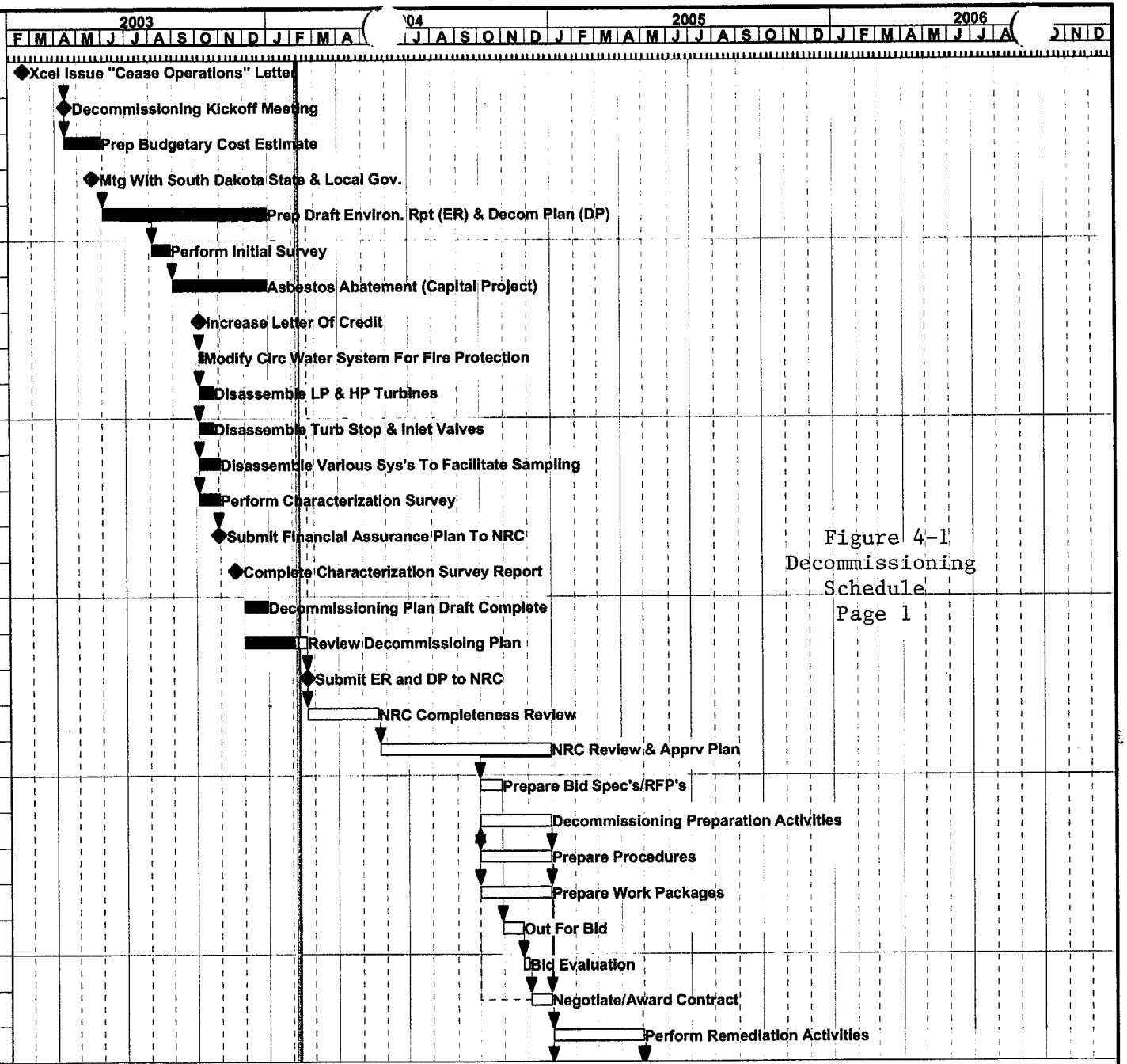


Figure 4-1
Decommissioning
Schedule
Page 1

Start Date	01FEB03
Finish Date	31OCT06
Data Date	10FEB04
Run Date	18FEB04 08:44

Early Bar
Progress Bar
Critical Activity

PAF4 Sheet 1 of 2

Xcel Energy

Pathfinder-Decommissioning Proj 2004

Classic Schedule Layout

Date	Revision	Checked	Approved

Activity ID	Orig Dur	R Du.	%	Early Start	Early Finish
A1410	85	85	0	03JAN05	29APR05
A1420	0	0	0		29APR05*
A1500	45	45	0	02MAY05	01JUL05
A1501	45	45	0	04JUL05	02SEP05
A1600	65	65	0	05SEP05	02DEC05
A1650	42	42	0	05DEC05	31JAN06
A1700	43	43	0	01FEB06	31MAR06
A1800	0	0	0		03APR06
A1900	0	0	0		31OCT06*

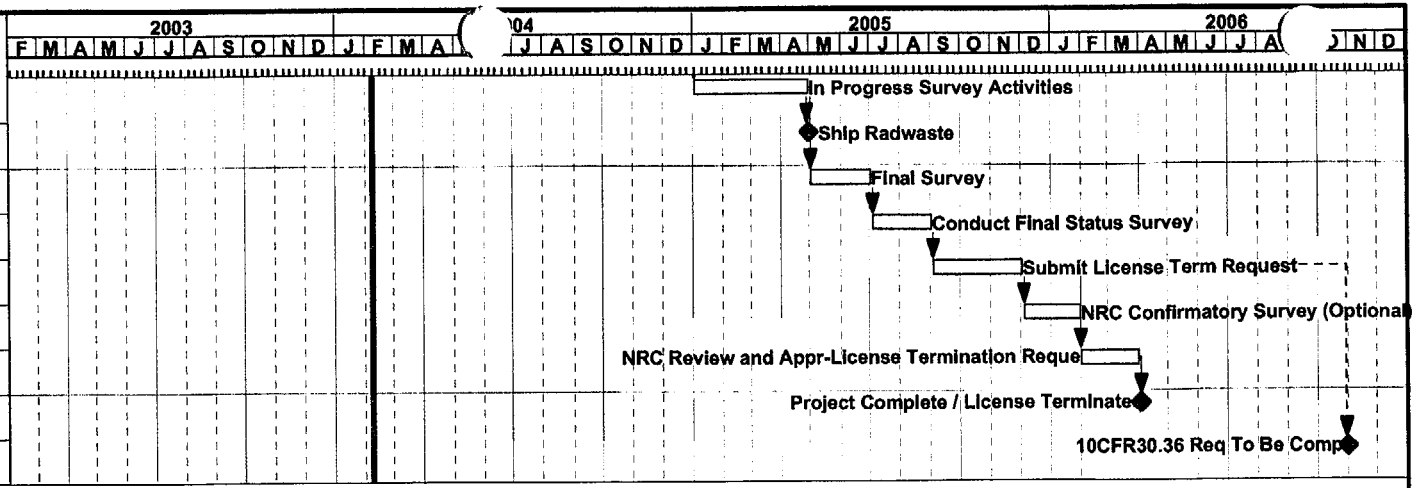


Figure 4-1
Decommissioning
Schedule
Page 2

Start Date	01FEB03
Finish Date	31OCT06
Data Date	10FEB04
Run Date	18FEB04 08:44

Early Bar
Progress Bar
Critical Activity

PAF4

Sheet 2 of 2

Xcel Energy

Pathfinder-Decommissioning Proj 2004

Classic Schedule Layout

Date	Revision	Checked	Approved

5. ENVIRONMENTAL EFFECTS OF DECOMMISSIONING ACTIVITIES

5.1 Effects on Noise, Dust, and Airborne Particles

The Pathfinder decommissioning will have no significant impacts on noise, dust, or airborne particles. A small increase in noise levels may occur due to operation of power tools during remediation activities, but this will be largely confined to the interior of the turbine building and boiler buildings and the will have no effect on the public.

Soil will not be disturbed except for routine sampling of surface soils. Fugitive dust will be insignificant. No excavation or construction will occur outside of existing buildings. Some cutting and grinding activities will occur, but these activities will be confined to the surfaces within the completely enclosed basement area of the turbine buildings. Containments or other means such as vacuuming will be used to prevent a release of dust or airborne particles beyond the immediate area of the building interiors.

5.2 Effects on Terrain, Vegetation, and Wildlife

The decommissioning activities will not adversely affect terrain, vegetation, or wildlife. The only decommissioning activity that remotely affects terrain, vegetation, and wildlife is gaining access (walking) to the site soil and existing wells during sampling activities. No plants on the federal or state lists of threatened or endangered species were detected in the sampling area. Sampling activities will not affect wildlife habitat. Besides sampling, the other decommissioning activities are similar in effect to routine maintenance activities performed within site buildings.

The largest part of the proposed decommissioning activities will be conducted within the existing Pathfinder turbine building. These activities will generate some non-hazardous solid waste for recycle and landfill disposal. A small amount of low-level radioactive waste, which is estimated at less than 1300 cubic feet, will be packaged in approved containers and shipped to an approved disposal facility in Tennessee. These wastes will be shipped offsite by trailer truck (approximately one truckload) on existing roads from existing loading docks. These activities will not adversely impact terrain, vegetation, or wildlife.

5.3 Effects on Groundwater, Surface Waters, and Aquatic Life

The proposed decommissioning activities will not adversely affect groundwater, adjacent, surface waters, or aquatic life. The Little Sioux River is located north of the plant and forms the northern site boundary. The Big Sioux Aquifer and the Split Rock Creek Aquifer are located beneath the Pathfinder site.

Remediation activities are confined to the Pathfinder turbine building and boiler buildings. These activities will be isolated from surface and groundwater pathways at the site. The relatively small amount of radwaste removed from building surfaces is comprised of metals and corrosion products. No significant liquid radwaste from reactor sources are known to currently exist at the site. Controls will be in place such that there are no pathways for migration of liquid or solid radioactive materials from the plant into the groundwater or surface water.

No contaminated liquids from remediation activities will be released to the environment. The remediation activities involve cutting, grinding, and cleaning of metal and concrete surfaces. These remediation activities will not create any significant liquid radwaste. Remediation will involve some cleaning of the turbine building sumps and removal of the turbine building floor drains. Radioactive materials such as corrosion products or concrete materials that arise from remediation activities will be segregated and packaged such that no potentially contaminated materials will be released outside of the plant. Containments and other means such as vacuuming will be used, as necessary, to prevent a release of airborne radioactive particles that may arise due to cutting and grinding activities from remediation areas.

During the course of remediation activities, radioactive materials released from cleaning activities may become suspended as a liquid. In addition, small volumes of contaminated liquid, which are not currently known to exist, may be found in places such as low points, sumps, and pipe bends. These liquids, if any, will be collected and isolated from effluent pathways and collected with appropriate equipment such as containments and wet vacuums and segregated as radwaste for shipment. Processing of these small volumes will occur offsite at a licensed disposal facility.

A small volume of tritium-contaminated water was found in condensate at the bottom of the hydrogen cooler. The entire volume was collected and sent to our testing laboratory (Eberline of Oak Ridge, Tennessee). The laboratory disposed of this water in accordance with regulatory requirements.

Groundwater sampling activities will be via existing wells that are routinely used for sampling purposes. The decommissioning activities do not involve sampling or

disturbing surface waters or aquatic life in the Big Sioux River. Some sampling of settling ponds will occur during the Final Status Survey.

5.4 Effects of Released Chemical and Sanitary Wastes

The proposed decommissioning activities will not involve a release of chemical or sanitary wastes. The decommissioning activities do not affect the operation of the existing chemical and sanitary waste storage at the site. The remediation activities are limited to retired equipment and surfaces that are not known to contain any chemical or sanitary wastes. Generation of non-radiological waste will be negligible. See Section 5.7 below.

5.5 Radioactive Waste

A small amount of radioactive waste (estimated to be less than 1300 cubic feet) will be generated from remediation activities. This waste will be packaged and temporarily stored in approved containers within the Pathfinder Peaking Plant. The waste will principally consist of corrosion products, contaminated scrap metal, and possibly some concrete. A small amount of radwaste from materials such as gloves, cleaning materials, and clothing will also be included. These containers will be shipped to a licensed facility in Oak Ridge, Tennessee for treatment or disposal.

5.6 Dose Impacts of Decommissioning Activities

Worker (Occupational) Dose

The occupational dose during decommissioning activities will be well within established guidelines. See Section 5 of the Pathfinder decommissioning Plan for a description of the Occupational Dose Limits for the decommissioning activities.

Public Dose

Decommissioning Activities

The remediation activities will not release any significant amounts of radioactive material to the environment or create any new pathways for release. Therefore, there is no dose impact to the public from decommissioning activities.

Radwaste Shipment Dose

The radiation dose due to the radwaste shipping from Pathfinder remediation activities will be insignificant. Based on the characterization data and the planned remedial activities, less than 1,300 ft^3 of radioactive waste is expected from decommissioning activities. This limited volume should require only one radioactive waste shipment to an off site treatment and disposal facility using an exclusive use vehicle. None of the waste is expected to exceed the criteria for low specific activity waste given in 49 CFR 173.403. The expected dose from the radwaste shipment is discussed in Section 7 of the Pathfinder Decommissioning Plan.

5.7 Non-Radiological Waste

The proposed Pathfinder decommissioning project will not generate significant amounts of non-radiological hazardous waste.

The project may create a small amount of chemical waste from commercially available household and industrial cleansers during condenser and drain cleaning activities. A large portion of the plant's asbestos has previously been removed in accordance with Federal and State regulations. None of the remaining asbestos, such as that used for wiring insulation, will need to be disturbed for remediation or sampling activities. There are no decommissioning activities that will create any significant non-radiological waste.

5.8 Socioeconomic Effects

The socioeconomic effects of decommissioning are minimal. The project will employ small teams of mostly contract workers for a few months in 2005, which will provide a small increase in income for the surrounding communities of Brandon and Sioux Falls, SD. This increase will be temporary.

The project does not affect tax payments. The Pathfinder Peaking Plant has been fully depreciated. Property values may increase somewhat as the decommissioning is completed and the results are made public. This increase may be tempered by widespread and sustained community acceptance of the nuclear plant, which has been shutdown since 1967.

Traffic impacts will be insignificant and temporary. The onsite project staff, nominally comprised of less than 10 persons for a few months, will not adversely affect local traffic patterns by commuting to the jobsite. The project's shipping needs for equipment and radwaste will be limited to a few truck shipments, and local impacts to traffic patterns will be insignificant.

5.9 Cultural Resources and Aesthetics

The Pathfinder buildings are not listed on the National Register of Historic Places, nor is the facility located in an area identified for cultural preservation. This is consistent with studies conducted for the previous decommissioning. See Environmental Report - Decommissioning of the Pathfinder Atomic Plant prepared by Northern States Power and Black & Veatch (1989).

The South Dakota State Historical Society, Archaeological Research Center, performed a records search of the Pathfinder Site (Ref. 5). The records search identified nine sites within a one-mile radius of the site. Seven of the nine sites are located greater than ½ mile from the plant buildings, which is beyond Xcel Energy's property boundary. A brief discussion of the two sites that are located within ½ mile is provided below. See Figure 5-1.

- Burlington Northern Railroad bridge - Site: 39MH2000. This bridge is located 1800 feet away and is identified as a potential historical site. The proposed decommissioning activities will not impact this structure.

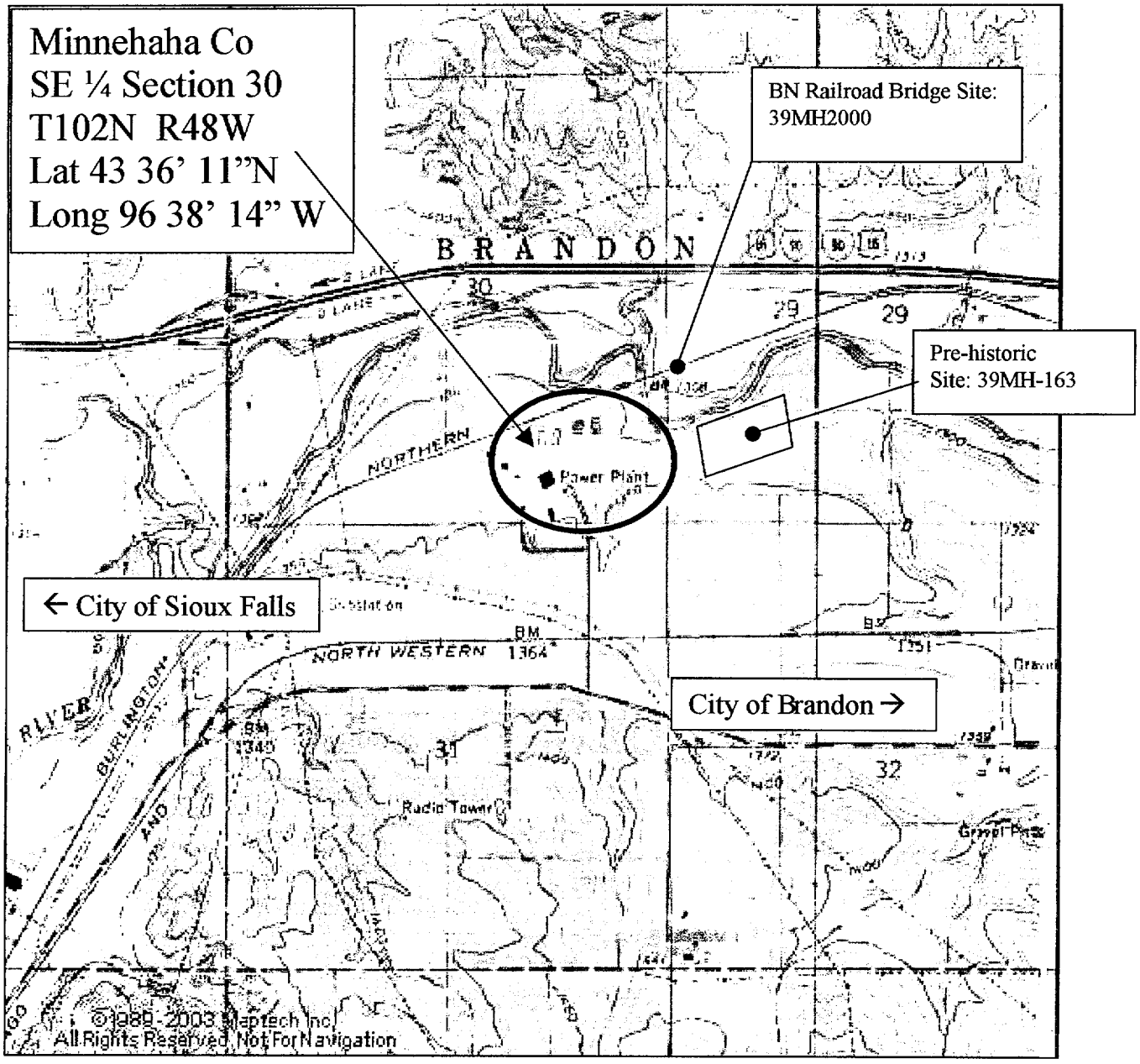
- Pre-historic investigation site – Site: 39MH163. The Archaeological Lab, Augustana College in 1997, performed a scatter type survey. The survey area was cleared for a water works excavation project. The eastern edge of the study area is approximately 1800 feet east of the Pathfinder buildings. The proposed decommissioning activities will not impact this site.

Other than sampling of wells and soil, the decommissioning activities are largely confined to small-scale remediation activities within closed existing buildings at the Pathfinder site. Decommissioning does not involve outside excavation or building modifications/destruction. The decommissioning activities will not adversely affect any cultural resources or any of the historical sites discussed above. In addition, there will be no impacts or changes to the aesthetics or visual appearance of the Pathfinder site due to the proposed decommissioning activities.

5.10 Threatened and Endangered Species

An extensive examination of threatened and endangered species at the Pathfinder Site was done as part of the Environmental Impact Statement (EIS) prepared for the South Dakota Public Utilities Commission when the Angus Anson plant was constructed at the Pathfinder Site (Ref. 4). See section 2.4.9 therein.

Figure 5-1
Archeological Resource Site Map



The proposed decommissioning activities are largely limited to routine sampling and small scale remediation activities within existing site buildings. These activities will have no significant effect on the habitats of threatened and endangered species. These include species on both federal and state lists as described within section 2.4.9.

A walkdown of the site for the federally endangered western prairie fringed orchid (Platanthera praeclara) was conducted during the summer of 2003 in order to minimize any impact during environmental sampling activities. The orchid was not found.

6. ENVIRONMENTAL EFFECTS OF ACCIDENTS DURING DECOMMISSIONING ACTIVITIES

The proposed decommissioning activities will not create the potential for a new accidental release of radioactive materials or increase the probability of a release during an event. All the low level radwaste removed from permanent plant structures will be temporarily stored within secure radwaste containers inside secure areas of existing plant buildings for not more than a few months and then shipped off site. In the unlikely event of a catastrophe such as a fire or earthquake, the waste stored in the containers would not be significantly more likely to be released to the environment than if the contamination had remained on building surfaces. Controls will be implemented to prevent the possibility of a fire during cutting or grinding operations such that the risk of a fire or explosion is no greater than that which would arise from a routine maintenance activity. The probability of a radioactive release affecting the public is not significantly greater than that which could be postulated to occur if the facility had not been decommissioned.

Decommissioning activities do not increase the volume of existing radioactive waste or create any new contamination pathways. The consequences of a release during decommissioning activities, however remote, would not be any more severe. Once the radwaste has been removed from the Pathfinder site, the remaining radiation levels will be below the unrestricted release criteria, and therefore the consequences of an accident will diminish.

Offsite radiological events from decommissioning activities are limited to those associated with radwaste shipments. The level of radioactivity that will be shipped is relatively low. The Pathfinder Quality Assurance Plan will be implemented to assure that radwaste shipments are performed safely and in accordance with the applicable regulatory requirements.

7. FACILITY RADIOLOGICAL STATUS AND ENVIRONMENTAL MONITORING

7.1 History

The history of the Pathfinder Site is described in Section 1 of the Pathfinder Decommissioning Plan.

7.2 Present Radiological Status

The present radiological status of the Pathfinder site is described in Section 2 of the Pathfinder Decommissioning Plan.

7.3 Demolition of Site Buildings

The scope of this proposed decommissioning plan does not include demolition of any buildings. Note that demolition of site buildings is not currently planned for the foreseeable future.

7.4 Dose from Soil and Groundwater Remediation

The scope of the proposed Pathfinder decommissioning does not include remediation of soil or groundwater. The recent characterization survey showed that the amount of contamination in soil and groundwater from isotopes attributable to licensed activities at Pathfinder is insignificant, which is consistent with results from the previous decommissioning activities. The wildlife, workers, or the general public will not be adversely impacted by radiological exposure from soil related activities at Pathfinder.

7.5 Environmental Surveys at the Pathfinder Site

After 20 years of comprehensive liquid effluent sampling, environmental monitoring of liquid releases was discontinued due to extremely low levels of radiation in 1992 by Amendment 11 to the Pathfinder Materials License. A separate and extensive radiological monitoring program was also in effect during the decommissioning activities conducted in 1992. Radiological measurements were taken of samples of ambient air, ground water, surface water, drinking water, bottom river sludge, raw milk, fish, plants, and soil. No detectable isotopes of plant origin were found. Since the liquid sampling program was suspended and the previous decommissioning was completed, there has been no transport of significant amounts of contaminated material to the environment from routine operations or from an unplanned event such as a fire or explosion. There were no

liquid effluent releases during the previous decommissioning activities. There will be no significant releases of contaminated material from the proposed decommissioning activities.

Given this background and the insignificant environmental impact of the proposed decommissioning activities, it is not necessary to initiate another comprehensive environmental sampling program, which includes fish and wildlife. Nevertheless, the recent 2003 characterization survey included sampling of soil, groundwater, settling ponds, ditches and storm drains at the Pathfinder site. The results of this analysis indicated no significant activity. The final status survey will also be designed to demonstrate that the remediation activities had no effect on these areas.

7.6 Final Status Survey

The Final Status Survey is discussed in Section 8 of the Pathfinder Decommissioning Plan.

7.7 Release Criteria

The release criteria are discussed in Section 3 of the Pathfinder Decommissioning Plan.

8. SUMMARY OF ENVIRONMENTAL EFFECTS OF DECOMMISSIONING ACTIVITIES

Xcel Energy believes that the approval of the license amendment request to authorize decommissioning activities will not cause any significant impacts to the environment. This environmental evaluation did not identify any adverse impacts that would require mitigation.

REFERENCES

1. Topical Report, *Residual Radionuclide Distribution and Inventory at the Pathfinder Generating Plant,* D.E. Robertson et al, Prepared for the USNRC under a Related Services Agreement with the US Department of Energy, Pacific Northwest Laboratory, Richland Division of Low-Level Waste Management and Decommissioning Headquarters Office, USNRC, June 1982

2. Letter from L. Callan, NRC, to T. Parker, NSP, November 10, 1992

3. *Environmental Assessment of the Proposed Final Decommissioning of the Fuel Handling Building and the Reactor Building at the Pathfinder Generating Plant,* License Number 22-08799-02, Docket No. 30-05004, Northern States Power Company, June 1990

4. *Final Environmental Impact Statement For a Proposed Combustion Turbine Generator Facility, Northern States Power Company Pathfinder Site, Minnehaha County, South Dakota,* January 14, 1993

5. Letter from J.P. Watts, South Dakota Department of Tourism and State Development, to C. Donkers, Xcel Energy, December 9, 2003