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INDIANA MICHIGAN POWER

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U. S. Nuclear Regulatory Commission
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Donald C. Cook Nuclear Plant Units 1 and 2
1999 ANNUAL ENVIRONMENTAL OPERATING REPORT

Attached is the Annual Environmental Operating Report for Units 1 and 2 of the Donald C. Cook Nuclear Plant for the operating period from January 1, 1999, through December 31, 1999. The report is prepared in accordance with the requirements of Technical Specification (T/S), Appendix B, Part 2, Section 5.4.1, and T/ S 6.9.1.6.

Should you have any questions, please contact me at (616) 466-2698.

Sincerely,

Robert C Godley

Robert C. Godley
Regulatory Affairs Director

/dms

Attachment

c: J. E. Dyer
MDEQ – DW & RPD, w/o attachment
NRC Resident Inspector
R. Whale, w/o attachment

IE25

ATTACHMENT TO C0500-01

ANNUAL ENVIRONMENTAL OPERATING REPORT

Donald C. Cook Nuclear Plant Units 1 & 2

Annual Environmental Operating Report

January 1 through December 31, 1999

Indiana Michigan Power Company
Bridgman, Michigan

Docket Nos. 50-315 & 50-316
License Nos. DPR-58 & DPR-74

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I. INTRODUCTION

Technical Specifications Appendix B, Part 2, Section 5.4.1, requires that an Annual Environmental Operating Report be produced and include summaries and analyses of the results of the environmental protection activities required by Section 4.2 of the Environmental Protection Plan for the report period. The Annual Environmental Operating Report shall include a comparison with preoperational studies, operational controls (as appropriate), previous non-radiological environmental monitoring reports, and an assessment of the observed impacts of the plant operation on the environment. In addition to Technical Specification, Appendix B, Part 2, Section 5.4.1, Technical Specification 6.9.1.6 requires that an annual report, which details the results and findings of ongoing environmental radiological surveillance programs, be submitted to the Nuclear Regulatory Commission.

This report serves to fulfill these requirements and represents the Annual Environmental Operating Report for Units 1 and 2 of the Donald C. Cook Nuclear Plant for the operating period from January 1 through December 31, 1999.

There were no operational parameters to report for the year as both units were taken offline in September 1997 and have not been returned to service.

Parameter	Unit 1	Unit 2
Gross Electrical Generation (MWH)	0	0
Unit Service Factor (%)	0	0
Unit Capacity Factor – MDC* Net (%)	0	0

II. CHANGES TO THE ENVIRONMENTAL TECHNICAL SPECIFICATIONS

There were no changes to Environmental Technical Specifications in 1999.

III. NON-RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

A. Non-Routine Reports

A summary of the 1999 non-routine events is located in Appendix I of this Report. No long-term, adverse environmental effects were noted.

B. Environmental Protection Plan

There were no instances of Environmental Protection Plan noncompliance in 1999.

C. Plant Design and Operation

During 1999, there were no changes in station design, operations, tests, or experiments which involved a potentially significant unreviewed environmental issue. There was one environmental evaluation performed during the reporting period that assessed the impact of replacing the unit one stream generators. The conclusion of the environmental evaluation was that replacement did not result in an unreviewed environmental question.

D. Environmental Monitoring – Herbicide Application

Herbicide applications are the activities monitored in accordance with Technical Specification Appendix B Section 4.2. There were no preoperational herbicide studies to which comparisons could be made. Herbicide applications are managed by plant procedure 12 THP 2160 HER.001.

A summary of the 1999 herbicide applications is contained in Appendix III of this report. Based on observations, there were no negative impacts or evidence of trends toward irreversible change to the environment as a result of the herbicide applications. Based on our review of application records and field observations, the applications conformed to EPA and State requirements for the approved use of herbicide.

E. Mollusc Biofouling Monitoring Program

Macrofouling monitoring and control activities during 1999 are discussed in Appendix IV of this report.

F. Special Reports

There were no special reports during 1999.

IV. RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

The Radiological Environmental Monitoring Program annual report is located in Appendix VI of this report.

The objectives of the operational radiological environmental monitoring program are:

1. Identify and measure radiation and radioactivity in the plant environs for the calculation of potential dose to the population.

2. Verify the effectiveness of in-plant measures used for controlling the release of radioactive material.

3. Provide reasonable assurance that the predicted doses, based on radiological effluent data, have not been substantially underestimated and are consistent with applicable standards.

4. Comply with regulatory requirements and Station Technical Specifications and provide records to document compliance.

A. Changes to the REMP

There were no identified changes to the REMP during 1999.

B. Radiological Impact of Donald C. Cook Nuclear Plant Operations

This report summarizes the collection and analysis of various environmental sample media in 1999 for the Radiological Monitoring Program for the Donald C. Cook Nuclear Plant.

The various analyses of most sample media suggest that there was no discernible impact of the nuclear plant on the environment. The analysis of air particulate filters, charcoal cartridges, direct radiation by thermoluminescent dosimeters, fish, water, sediments from Lake Michigan, drinking water, and food products, either did not detect any radioactivity or measured only naturally occurring radionuclides at normal background levels.

The only radionuclide that appears attributable to the Donald C. Cook Nuclear Plant operation is tritium, which was measured at low levels in onsite wells. However, the associated groundwater does not provide a direct dose pathway to man.

C. Land Use Census

The Land Use Census is performed to ensure that significant changes in the immediate vicinity of the Donald C. Cook Nuclear Plant are identified. Any identified changes are evaluated to determine whether a modification must be made to the REMP or other related programs. A further discussion of the land use can be found in Appendix VI of this report.

D. Solid, Liquid, and Gaseous Radioactive Waste Treatment Systems

There were no changes in the solid, liquid, or gaseous radioactive waste treatment systems during 1999.

V. CONCLUSION

Based upon the results of the radiological environmental monitoring program and the radioactive effluent release reports for the 1999 reporting year, it can be concluded that there were no adverse affects to the environment or to the general public due to the operation of the Donald C. Cook Nuclear Plant.

APPENDIX I

NON-ROUTINE REPORTS

1999

1999 Non-Routine Events

July 7, 1999 - At 1245 hours, unnatural turbidity was observed at Cook Plant Outfall 002 (Condenser Cooling Water and Miscellaneous Low Volume Waste.) the turbidity was observed during a molluscicide treatment being performed at the Cook Nuclear Plant, in accordance with the conditions of our NPDES permit.

On July 7, 1999 from 1042 to 2252 hours, Betz-Dearborn CT-2 was applied for zebra mussel control in plant raw water systems. The observed turbidity was caused by bentonite clay being fed into the discharge vaults for Units 1 and 2, during the molluscicide treatment. Clay is used to satisfy the NPDES Permit detoxification requirements. Clay feed was terminated at 0200 hours on July 8.

The turbidity observed during the molluscicide treatment was expected, since similar observations have been made during previous treatments. Preventive actions are not possible due to the detoxification requirements contained in the NPDES permit.

July 7, 1999 - During the biocide treatment performed at the Donald C. Cook Nuclear Plant, two short interruptions in detoxification agent bentonite clay occurred. These interruptions led to NPDES permit exceedences in Outfall 001.

On July 7, 1999, outfall 001 (Circulating Water Discharge) sample taken at 2100 hours showed a residual Clam-Trol CT-2 value of 0.17 ppm. The discharge exceedence was the result in an interruption of the clay feed to the Unit 1 Discharge Vault. A valve placed at the end of the clay feed line at the Unit 1 Discharge Vault became blocked with clay and restricted the flow of clay slurry to the vault. The valve was cleared and clay feed was re-established. Another sample was pulled at 2207 hours and indicated less than the detectable concentration of 0.05 ppm Clam-Trol CT-2.

Clam-Trol CT-2 feed had been completed at 2252 hours on 7/7/99. Clay feed was continued for purposes of detoxifying the Clam-Trol CT-2 residual that was left in the system until it passed through plant equipment between 0145-0200 hours on July 8, 1999. On July 8, 1999, outfall 001(Circulating Water Discharge) samples taken at 0130 and 0200 hours showed 0.08 ppm and 0.06 ppm Clam-Trol CT-2 respectively. The cause of the 0130 hours exceedence was due to an air operated clay pump freezing just before the sample was taken at 0130 hrs. The cause of the 0200 hours exceedence was due to the clay truck running out of clay slurry between 0145-0200 hours. Outfall 001 was again sampled at 0300 hours and showed less than the detectable concentration of 0.05 ppm Clam-Trol CT-2.

We believe there was no environmental impact of the CT-2 discharge on Lake Michigan fish at Unit 1 discharge because of the following:

1. Bioassay data for the CT-2 product for NOEL (No Observable Effect Limit) is 2.0 ppm as CT-2 for Trout as tested in a 96 hour flow through bioassay test. The maximum exposure to the fish would have been 0.17 ppm for a maximum of 1 hour at 2100 hours on 7/7/99 and 0.08 ppm for a maximum of 2 hours at 0100 hours on July 8, 1999.

2. The Unit 1 discharge stream was 1/10 of the total treatment flow of 150,000 gallons per minute for the combined Unit 1 and 2 discharge. The majority of discharge was directed to Unit 2's outfall 002 where the circulating water pump discharge was directed. This does not take into account the further dilution available at the discharge-mixing zone at the end of the pipe, which would further reduce CT-2 concentration.

To prevent future exceedences, we will implement the following actions for all subsequent CT-2 applications that require detoxification by clay addition.

1. The inventory of clay will be maintained to allow for an added two hours of detoxification after a calculated zero CT-2 level is reached. Actual feed of clay will be done for 1 hour after actual test sample of zero for service water is recorded

2. Visual/instrument verification of the clay feed point discharge will be continuous to ensure clay feed to the Unit discharge vault. Also, clay feed slurry back-up pumps will be installed as spares for immediate availability should the main pump fail.

September 9, 1999 - Unnatural turbidity was observed at Cook Plant Outfall 001 and 002 (Condenser Cooling Water and Miscellaneous Low Volume Waste.) the turbidity was observed during a molluscicide treatment being performed at the Cook Nuclear Plant, in accordance with the conditions of our NPDES permit.

On September 8 and 9 from 1816 hours to 0540 hours, Betz-Dearborn CT-2 was applied for zebra mussel control in plant raw water systems. The observed turbidity was caused by bentonite clay being fed into the discharge vaults for Units 1 and 2, during the molluscicide treatment. Clay is used to satisfy the NPDES Permit detoxification requirements. Clay feed was terminated at 1010 hours on September 9.

The turbidity observed during the molluscicide treatment was expected, since similar observations have been made during previous treatments. Preventive actions are not possible due to the detoxification requirements contained in the NPDES permit.

For the year 1999, there were no reportable spills at the Cook Nuclear Plant.

APPENDIX II

ENVIRONMENTAL SCREENING REPORTS

1999

AMERICAN ELECTRIC POWER

DONALD C. COOK NUCLEAR PLANT

ENVIRONMENTAL EVALUATION

FOR

UNIT 1

STEAM GENERATOR REPLACEMENT PROJECT

October 8, 1999

Prepared by: Eva Huerta Pavia — Oct 8, 1999
Eva Huerta-Pavia, Demark, Inc. — Date

Approved by: _____ — Nov. 23, 1999
John P. Carlson, AEP, Environmental Affairs — Date

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ATTACHMENTS

I. EXECUTIVE SUMMARY

The current Unit 1 Westinghouse Model 51 steam generators will be replaced with new B&W Model 51R steam generators.

This Environmental Evaluation was conducted to determine if the U1 Steam Generator Replacement Project (SGRP) will result in an unreviewed environmental question pursuant to the D. C. Cook Nuclear Plant Environmental Technical Specifications or whether a change to the environmental protection plan (Appendix B Environmental Technical Specifications) would be needed. The Environmental Evaluation provides an analysis of all the activities involved with the U1 SGRP and is included in Design Change Package 300. The listed references were reviewed and 12 EA 6090 ENV.107, Preparation and Distribution of Environmental Evaluations was used to determine if the replacement of the Unit 1 steam generators results in an unreviewed environmental question. The document includes all known activities as of the time of this writing. Subsequent activities will be treated independently.

Based on this Environmental Evaluation it is concluded that the replacement of the Unit 1 steam generators does not result in an unreviewed environmental question. No change to the Environmental Protection Plan is required.

II. PURPOSE OF THE ENVIRONMENTAL EVALUATION

The purpose of this Environmental Evaluation is to determine if the SGRP results in an un-reviewed environmental question as defined in Part II, Section 3.1 of the D. C. Cook Nuclear Plant Environmental Technical Specification.

As stated in Part II, Section 3.1 of the D. C. Cook Nuclear Plant Environmental Technical Specifications, "A proposed change, test or experiment shall be deemed to involve an unreviewed environmental question if it concerns

(1) a matter which may result in a significant increase in any adverse environmental impact previously evaluated in the final environmental statement (FES) as modified by staff's testimony to the Atomic Safety and Licensing Board, supplements to the FES, environmental impact appraisals, or in any decisions of the Atomic Safety and Licensing Board; or
(2) a significant change in effluents or power level [in accordance with 10CFR part 51.5(b)(2)]; or
(3) a matter not previously reviewed and evaluated in the documents specified in (1) of the Subsection which may have a significant adverse environmental impact."

III. DESCRIPTION OF THE PROPOSED ACTIVITY

D.C. Cook Nuclear Plant Unit 1 has exhibited accelerated secondary side degradation of the steam generator tubing for over 13 years. The degradation is caused by intergranular corrosion (IGC) to the tube outside surfaces, and primary side degradation caused by primary water stress corrosion cracking on the tube inside surface.

The original steam generators are particularly susceptible to IGC because of their Inconel 600 tubing, deep tubesheet crevices, and carbon steel support plates. A series of expensive repair methodologies, combined with remedial measures, have been utilized over the past 13 years to combat tube degradation. These measures have slowed but not stopped the tube degradation. Continued operation under these conditions will result in additional tube degradation and an increased probability for conducting mid-cycle inspections to assess tubing condition.

Because of tubing degradation and its adverse effect on the original steam generators, long term, cost-effective, reliable operation cannot be assured through the end of plant life. There are few technical options to prevent further degradation. Replacement of the steam generators remains the most viable option to continue the operation of Unit 1 until 2014, the end of its current license.

The Westinghouse Series 51 steam generators (SGs) in Unit 1 are currently scheduled for replacement in January of 2000. This will be a two piece replacement utilizing Babcock & Wilcox Series 51R SG lower assemblies and upper internals while reusing the original steam domes.

The exterior envelope of the replacement steam generators will remain essentially unchanged with the exception of a minor change to the vessel blowdown piping connection. The new steam generators differ from the original Westinghouse design. The new steam generators feature Inconel 690 tubes, improved upper internals package, and design features that minimize corrosion related degradation.

The enhanced design features include an improved moisture separator unit, improved internal feedwater distribution system, installation of an internal steam flow restrictor, improved feedwater inlet/thermal sleeve arrangement, use of lattice grid support plates and an overall increase in tube bundle size. The replacement steam generator tubes are flush-welded to the primary face of the tube sheet and hydraulically expanded to maximize mechanical strength and to minimize the tube-to-tubesheet crevice. This is a major design enhancement that will limit the loosening of tubes or creation of crevices.

The SGRP will involve permanent modifications to existing plant items, temporary dismantling and/or modifications of existing plant items and installation of temporary facilities to house and accommodate personnel, equipment and fabrication activities. The main engineering/installation work involves:

- Removal and storage of the old steam generators
- Installation of replacement steam generators
- Removal and repair of enclosures for access to steam generators
- Severing primary and secondary system piping from the steam generator nozzles
- Removal and reinstallation of sections of the main steam and feedwater system piping and supports
- Vessel girth cutting and welding
- Steam dome refurbishment
- Removal and installation of thermocouples and accelerometers
- Replacement of existing insulation on the steam generators and segments of interfacing piping systems; reactor coolant, main steam, feedwater, blowdown.

IV. DESCRIPTION OF THE AFFECTED AREA

A. Location

The plant is located in Lake Township, Berrien County, Michigan approximately eleven miles south-southwest of the center of Benton Harbor, Michigan. The plant site consists of approximately 650 acres situated along the eastern shore of Lake Michigan. The closest population center is the twin cities of Benton Harbor-St. Joseph, Michigan.

The main activities involved in the U1 SGRP will be located in the Unit 1 containment and surrounding building and areas. The additional support facilities and/or areas include:

- Old Steam Generator Storage Facility: The existing Unit 1 steam generator lower assemblies will be stored onsite in the Old Steam Generator Storage Facility after their removal. The Unit 2 previously replaced steam generator lower assemblies that were stored in the facility have been shipped to an approved offsite radioactive waste disposal facility. The facility will be modified utilizing Commercial Controls.

- Replacement Steam Generator Preparation and Storage Area (Attachment C): The replacement steam generator lower assemblies will be stored at a temporary facility located adjacent to the 345 kV Switchgear Yard. The facility will be constructed using commercial controls. In addition, the area will provide warehouse space, fab shop, weld test shop, mock-up facility and a fenced laydown area.

- Transport Route of the New and Old Steam Generators: The old steam generators will be transported to the Old Steam Generator Storage Facility via a route that has been load tested. The new steam generators will be transported from the storage/prep area to the reactor building utilizing the same route.

- Containment Access Facility (Attachment D): A temporary trailer complex will be located inside the protected area north of and adjacent to the Unit 1 refueling water, primary water and condensate storage tanks directly underneath the 345 kV dead end tower #4. The temporary trailer complex will be constructed utilizing Commercial Controls. The temporary trailer complex is intended to provide office, craft assembly area, daily planning meeting room and self contained toilet facilities. A plan of the day office will be located on the strip of unpaved ground between the existing plant roads, north of the containment access facility and a minimum of 30 feet from the existing site construction office building. Self-contained toilet facilities will consist of commercially available sanitary package units that are equipped with holding tanks. An approved contractor will maintain the holding tanks and dispose the waste off site. No tie-in to the plant sanitary system is required. Asbestos abatement support activities including a self-contained shower facility will be located in the temporary trailer complex. The shower water containing asbestos fibers will drain from the showers to a filter skid and then pumped through a filter cascade system and filtered to <5 microns. It is then discharged to a 400 gallon holding tank. The tank is pumped via a sump pump to the turbine room sump. The NPDES permit allows miscellaneous floor drains to be routed to the turbine room sump. Both the 400 gallon holding tank and the filter skid are located in the containment berm. A temporary prefabricated enclosure will be installed outside of containment on the containment building electrical tunnel and main steam enclosure to facilitate access to the existing containment penetration. The temporary trailer complex will be removed upon completion of the project. The existing Contractors Access Control area will be used as the ingress/egress point. Permanent modifications to this building will be completed utilizing DCP-312 and include installation of a new double door, installation of a temporary connection to the new temporary walkway for material access and relocation of existing personal monitors.

- Steam Generator Replacement Project Office: This temporary facility has been constructed to provide office space for SGRP project and AEP personnel.

B. Geology and Soils

Soils of the site are comprised of dune sands and glacial till deposits. Underlying the sand and till is bedrock consisting of shale, limestone, sandstone, and dolomite.

C. Groundwater and Surface Water

The groundwater table generally rises gradually eastward away from Lake Michigan. The water table is less than 30 feet above the level of the lake and occurs within the dune sand or beach sand which overlays impermeable glacial lake clays. The overall direction of groundwater flow is toward Lake Michigan. This groundwater pattern has remained unchanged since the 1973 Final Environmental Study. The project will have no effect on ground water flow or direction. Discharges will be authorized via National Pollution Discharge Elimination System (NPDES) surface water or ground water permits if required.

D. Biological Resources

1. Terrestrial Ecology

The Unit 1 reactor building is part of the original plant construction. The site of Unit 1 reactor building and immediate vicinity is void of any vegetation.

The remaining temporary facilities that will support the project are located in previously disturbed areas. The selected fabrication and storage area near the 345 kV SwitchYard is void of vegetation growth with the exception of sparse clumps of annual grasses. The surrounding area consists of trees, grass and scattered bushes. The vegetation offers limited wildlife habitat.

2. Aquatic Ecology

No significant surface water resources are impacted by the SGRP. Storm drains within the protected area discharge to Outfalls 001S and 002S. There are no impacts to the storm drain system because adequate controls are in place to prevent contaminants from reaching the storm drains within the protected area. Changes to effluent releases into Lake Michigan are detailed in the Section V, ENVIRONMENTAL IMPACTS.

E. Cultural Resources

1. Land Use

The steam generator replacement project is located entirely in areas that were previously disturbed during the original construction.

Other areas within the owner controlled property but outside the protected area used for temporary SGRP contractor facilities and staging areas have required the completion of environmental reviews. A summary of the completed environmental reviews associated with the project is included in Section V, ENVIRONMENTAL IMPACTS. The environmental reviews concluded that these activities did not alter the previous land use. No environmental screenings were required of the environmental reviews completed.

2. Archaeology

Previous construction excavations in the area have not unearthed any artifacts or other examples of archeological significance. These previous excavations include the construction of the Unit 1 reactor, auxiliary building, primary water tank, condensate storage tank, and refueling water tank.

V. ENVIRONMENTAL IMPACTS

A. Procedural Process

The SGRP will be completed utilizing a series of Design Change Packages (DCPs). Each DCP undergoes a 50.59 safety evaluation. The 50.59 process includes a general question that identifies whether the activity may have an environmental impact.

Other previously described work will also be completed utilizing Commercial Controls in compliance with PMP 5043 CCD.001 Configuration Change Determination.

The following table is a matrix of the DCP activities that will be completed during the SGRP. The list is current as of the date of this document. The Environmental Evaluation for the project is included DCP-300.

DCP #	Description	EE Required
300	Component Replacement	YES
301	Template Target Installation	NO
302	Modify CPN 83	NO
304	Containment & Aux Bldg. Mods	NO
305	SG Vessel & Large Bore Pipe	NO
306	SG & RCS Supports, RCS Pipe	NO
307	Small Bore Pipe	NO
308	Insulation and Asbestos Abatement	NO
309	SG Enclosure Mod	NO
310	Restore OSGSF	NO
311	Upgrade Plant Telephone	NO
312	Modify Contractors Access Control	NO
313	Rigging Inside Cont/Aux Bldg	NO
314	Rigging Outside Cont/Aux Bldg	NO
315	Modify Aux Crane Controls	NO
316	Install Transformer & Distribution System	NO
318	Temporary Containment Power	NO
319	Modify Aux Bldg Crane Controls	NO

A general description of each DCP and related environmental impacts follows.

DCP 300 Component Replacement: Involves the functional aspects of replacing the Unit 1 Westinghouse steam generator lower assemblies with B&W lower assemblies and refurbished original steam domes. The exterior envelope of the replacement steam generators will remain essentially unchanged. The new steam generators differ internally from the original. Major differences involve enhanced design features. This DCP evaluates the various component changes and identifies, if any, impacts these changes have on plant operation. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 301 Template Target Installation: Involves the installation of laser target assemblies at certain locations below the lower lateral restraints of the steam generators. The amount of aluminum in the target assemblies has been evaluated and approved for installation in containment. The targets serve as benchmarks for key laser beam measurements that establish vital reference points for locations of existing piping and equipment. The installations are per Seismic Class 1 criteria and there is no impact on the plant structures, systems or components. These

activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 302 Modify CPN 83: Involves the modification of spare containment penetration CPN-83 inside Unit 1 containment for use as a "service" penetration during the SGRP. This will facilitate construction activities and future ice condenser maintenance related activities. The converted penetration will allow for service hoses and cables to enter the upper containment as opposed to routing them through the air locks. The activities involve removing the existing end caps, installing a hinge cover and adding a "B" leak test connection. The penetration is designed to maintain containment integrity following a loss of coolant or other design basis accident. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 304 Containment and Aux Building Modifications: Involves the permanent modifications to existing plant utilities, temporary re-locations and/or modifications of existing plant utilities and installation of temporary facilities. Includes:

Modifications
Steam generator platforms
Containment stairway
CRDM ductwork
Containment spray piping
Containment spray piping support structure (catwalks)
Containment upper ventilation units and associated drain piping
NESW piping
Post-Accident Containment Hydrogen Monitoring
System sample lines
Containment air pressure (wide range) sensing lines
Containment purge exhaust system ductwork support
Containment humidity monitoring line
Missile shield
RCP hatch covers
Reactor head lift rig
Auxiliary Building fuel transfer control station platform
Fuel handling crane
Lower containment ventilation system ductwork inside SG enclosures
Containment fuel manipulator crane
Hydrogen skimmer piping support
Steam generator enclosure roof handrail and walkways
Safety injection piping rupture restraint
Electrical systems

Temporary Installations

Allied marine crane installation and use
Reactor cavity decking
Temporary containment ventilation
Containment temporary power
Equipment runway system installation and use
Rigging inside auxiliary and containment buildings

The modifications are located in Unit 1 containment. These modifications involve removal to accommodate work activities associated with cutting, welding, and rigging of the replacement steam generators. The present configuration will be restored upon completion of the steam generator installation. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 305 Steam Generator Vessel and Large Bore Secondary Piping: Involves the removal of the old steam generators, installation of the replacement steam generators, severing secondary system piping from the steam generator nozzles, removal and reinstallation of the main steam and feedwater system piping, including associated pipe whip restraints, modification of the feedwater nozzles, replacement of the feedwater elbows, steam dome refurbishment, and removal and reinstallation of thermocouples and accelerometers. The work is performed in Unit 1 containment. The present configuration will be restored upon completion of the steam generator installation. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 306 Steam Generator Supports, Reactor Coolant System Supports, and RCS Piping: Involves the steam generator supports – dead weight, upper lateral and lower lateral supports, steam generator snubbers, temporary support of the steam generator for rigging; reactor coolant system (RCS) piping templating, cutting, machining, welding and temporary supports; RCS pipe end decontamination; RCS cold and hot gap measurement program, and cut lines for severing RCS piping from the existing steam generator at the nozzle. The function of the permanent steam generator support/restraint design and the reactor coolant system piping will not change due to the installation and removal of the temporary steam generator restraints. The replacement steam generator design maintains the same relative location and piping connections are aligned with existing piping. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 307 Small Bore Secondary Piping: Involves the removal and reinstallation of the replacement steam generator instrumentation piping, tubing, and supports; blowdown system piping and supports; any associated instrument or root valve

changes; and other attached small bore secondary piping/tubing and supports. Performing this task requires the removal of all miscellaneous piping, components, and structures that attach to the steam generators or in the removal and replacement path of the steam generators. The impact of the steam generator replacement on all small bore lines ($\leq$ 2 inch nominal diameter), valves, and supports in the steam generator enclosures have been identified and are all related to direct connection to the generator. The present configuration will be restored upon completion of the steam generator installation. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 308 Insulation and Asbestos Abatement: Involves the removal and replacement insulation required for the steam generators and attached primary and secondary system piping. The affected piping systems include reactor coolant, main steam, feedwater, and blowdown. The existing insulation, consisting of metal reflective insulation on the existing steam generator primary channel head and calcium-silicate insulation on the remainder of the existing steam generator, is to be replaced with a Transco's MRI® system. Existing insulation installed on designated segments of the interfacing piping systems; i.e., RCS, MS, FW, and BD, are to be removed and replaced. The MRI® insulation is designed to meet, as a minimum, the same reactivity, flammability, radiation, seismic, and thermal requirements as the existing insulation system. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

Asbestos Abatement: Involves the requirements for the removal of the asbestos insulation. Asbestos abatement support activities include separate showers to be installed in the Contractors Access Facility. Wastewater will be filtered and pumped to a holding tank where it will be tested and then ultimately discharged. An approved asbestos contractor will cut, remove, and dispose of the old asbestos-bearing calcium-silicate insulation. Inspection must be performed by State qualified inspectors per D.C. Cook Nuclear Plant procedure 12 PMP 6010 RPP.004. The asbestos insulation and debris will be disposed of in compliance with Environmental Protection Agency, OSHA and MIOSHA requirements. All other relevant procedures will be adhered too. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 309 Steam Generator Enclosure Modifications: Involves the removal and restoration of the steam generator enclosure roofs. This activity is limited to the core boring and cutting of the existing concrete into sections for removal and the installation of the replacement concrete roof. Coreboring of the enclosure roofs and upper wall sections will facilitate saw cutting the concrete into manageable sections. Coreboring activities will require a supply of water and will result in

some runoff. The use of proper construction procedures will ensure that waste water is controlled and contained in an acceptable manner. Saw cutting shall be performed during the defueled condition only.

Sawcutting and chipping operations will produce dust and debris. The spread of dust within containment will be controlled locally by enclosures and by water/slurry collection devices. Tents and filters will be used to control the dust and debris. Floor drains will be covered to control the spread of dust. Prior to entering Mode 4, all dust and debris from saw cutting and chipping will be collected and removed.

Concrete waste material will be generated as a result of removing the steam generator enclosure to facilitate the generator replacement. The estimated total weight that will be disposed is 440 tons. The concrete sections will be removed from containment to the auxiliary building. Surface areas will be wiped to remove dust. After a radiological survey, the sections will be wrapped in protective material and moved to a temporary storage area. Further processing will be completed in preparation for interim storage at a designated spoils area and then final disposal at a licensed disposal facility. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 310 Restore Steam Generator Storage Facility: The Unit 1 steam generators will be stored in the old steam generator storage facility that housed the Unit 2 steam generators. The Unit 2 steam generators have been shipped to an approved licensed radioactive waste disposal facility. The storage facility requires changes prior to the storage of the U1 steam generators. Precast concrete panels will be re-positioned. The roof will be refurbished to its original structural configuration. South and West wall utility holes will be filled and additional lighting installed. An environmental evaluation was completed prior to the construction of the facility in 1988. The environmental evaluation concluded that there was no impact to the Environmental Protection Plan. There is no new construction associated with this DCP. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 311 Upgrade the Plant Telephone System: Involves the installation of equipment that expands the phone line capacity of the switch and also expands the capacity of the connection with the Training Center switch. The battery charger system is reconfigured to accommodate the new equipment. The new charger system will consist of six new modular power supplies. The battery will also be replaced and disposed of per approved procedures. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 312 Modify Contractors Access Control (CAC): Describes the required utility connections including engineering design, material, and labor necessary for the installation of a temporary trailer complex to support the SGRP. The temporary trailer complex will be constructed utilizing Commercial Controls procedures and is *not* part of this DCP. The existing Contractors Access Control area will be used as the ingress/egress point. Modifications to this building include installation of a new double door, installation of a temporary connection to the new temporary walkway for material access, removal of interior walls and ceiling of the existing control room/office and relocation of existing personal monitors. Existing above ground structures that interfere with the installation of the temporary trailer complex will be modified and restored. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 313 Rigging Inside Containment/Aux Building: The temporary lifting device (TLD) is a hydraulically operated, mobile, two leg gantry crane equipped with a chain jack assembly which enables it to raise and lower loads. Use of the TLD minimizes the amount of concrete removal required at the steam generator enclosures by allowing the steam generator components to be lifted higher than could be achieved using the existing polar crane trolley. The TLD can be disassembled to allow movement into containment through the equipment hatch and is compatible with the existing polar crane girders. The TLD will be used to lift the old steam generator steam domes and old steam generator lower assemblies out of the steam generator enclosures and downend them onto transfer carts on the runway system. The replacement steam generator lower assemblies and refurbished steam domes will likewise be upended from the transfer carts and rigged into final position within the enclosures using the TLD. Various steam generator components will also be rigged through the auxiliary building utilizing the overhead cranes. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 314 Rigging outside Containment/Aux Building: Movement of the steam generator components on site will follow designated heavy haul routes. The haul routes for the steam domes, old steam generator lower assemblies, and the replacement steam generator lower assemblies follow existing plant roads. Some portions of the route are coincident with the existing railroad alignment located between the auxiliary building and turbine building, auxiliary building and the steam generator storage facility. The majority of the haul route has been used previously for transport of steam generator components for the Unit 2 SGRP. Underground utilities beneath the haul route have been evaluated for the loads. Clearances and existing surface structures along the haul route have been evaluated. Temporary measures to protect underground utilities provide adequate clearance from surface structures, and provide adequate road width during

component transport/load testing will be implemented as required. The entire haul route will be load tested prior to component transport to confirm adequacy of the surface course/subgrade.

Transport of the steam domes will follow those sections of the haul route between the auxiliary building and turbine building. Prior to transport, those sections of the haul route will be evaluated, prepared and load tested. The steam domes will be transported via hydraulic transporter. All transport equipment will be inspected to ensure no leakage. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 315 Modify Aux Crane Controls: Involves the replacement radio controls for the east aux building crane and replacement of the bridge drives on the east and west aux building cranes. Other control components that interact with the radio and bridge controls will also be replaced. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 316 Install Transformer and Distribution System: Involves the installation of a permanent transformer, switchboard and the necessary routing of conductors to feed the transformer and connect the transformer to the switchboard. The transformer and distribution system will provide temporary power to support plant and shop equipment and facilities. The transformer will be certified PCB free. It will have a containment berm constructed of impervious materials. The berm will have a capacity of at least 110% of the entire volume of oil in the transformer. The installation will comply with 40CFR110, 40CFR112, and Michigan Water Resources Rules, Part 5. The AEP Spill Prevention, Control and Countermeasure Plan and the Pollution Incident Prevention Plan will require updating when the installation is complete. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 318 Temporary Containment Power: Involves a power connection to the reactor coolant motor feed and polar crane with installation of a temporary transformer to provide power for contractor activities. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

DCP 319 Modify Aux Building Bridge Crane Controls: Involves the replacement of the drive motor and slow speed motor with a single inverter duty motor and replacements of associated bridge controls including a variable frequency drive and telemotive laser guard system. These activities conform to the Environmental Protection Plan and Appendix B Environmental Technical Specifications.

B. Geological and Soils

Limited soil excavation is expected. If any soil is removed it will be used as backfill or placed in an approved spoils area away from surface water and drainage ditches.

C. Surface and Ground Water

Limited excavation activities are involved in the SGRP. If any excavation occurs, it is not deep enough to cause any impact on the area water table.

D. Biological Resources

1. Terrestrial Ecology

The SGRP and its related support areas are confined to previously disturbed areas. The site is void of existing habitat. No habitat will be removed as a result of the SGRP. Machinery is limited to previously disturbed areas. Removal of existing habitat on the north and east side will be prohibited.

The area is already subjected to the intrusion of man and machinery. Any animals that reside in the areas adjacent to the construction will not be further disturbed by the increased activity.

2. Aquatic Ecology

No significant surface water resources are impacted by the SGRP.

E. Cultural Resources

1. Land Use

The area affected by SGRP has been previously disturbed during original construction. There is no change in land use.

2. Archeology

No archeological resources are known to exist within the D.C. Cook Nuclear Plant based on original construction excavation.

F. Noise

The SGRP related activities are well within the confines of the plant property. Noise levels will not exceed previously established limits. Most of the heavy equipment operations will be performed during daylight hours.

VI. ALTERNATIVES TO PROPOSED ACTIVITY

Alternatives to replacing the steam generators include:

- Retubing in place
- Sleeving
- Operating at 80% reactor power to lower the temperature and reduce the rate of corrosion.

Retubing in place has not been demonstrated in the radioactive environment of an operating nuclear plant and was therefore technically rejected. Sleeving is not feasible due to intergranular corrosion present in the tube support plate intersections. Sleeving is generally restricted to short straight sections of tubes and is not practical or economic for multiple elevations. Operating at a lower power has significant economic implications. There are higher costs associated with purchasing substitute power and increased surveillance and maintenance costs.

An economic evaluation concluded that on a present worth basis, the replacement of the steam generator lower assemblies was the best option.

VII. COST BENEFIT ANALYSIS

It is estimated that the replacement of the four Unit 1 steam generators will require a total capital expenditure of $190 million. This includes labor, equipment, and other charges such as overhead, contingency funds, escalation, and allowance for funds used during construction.

The SGRP outage is expected to last approximately 6 months from start of the work to completion.

VIII. ENVIRONMENTAL CONTROLS

The following environmental controls shall be utilized to minimize the environmental impacts associated with the SGRP. These environmental controls shall be reviewed by the contractor prior to the start of construction in areas discussed in this evaluation.

A. Noise

The majority of the construction activities involving the use of heavy machinery will take place during the day shift. This will reduce the impact of noise on the surrounding community. Noise from internal combustion engines will be controlled by the use of exhaust mufflers.

B. Limitations of Machinery Movement and Equipment Maintenance

Machinery will be allowed to operate only in areas that have been previously disturbed by construction activities. Areas that have not been previously disturbed and are inadvertently impacted by machinery will require restoration to the original state. The contractor operating the machinery is responsible for the restoration.

Machinery and equipment will be inspected and maintained to prevent and/or minimize spills from hydraulic hoses, fuel overfills, etc. All portable equipment will be maintained leak tight to prevent oil and chemical spills.

C. Handling and Storage of Oil and Chemicals

The handling and storage of oil will be conducted in accordance with the D.C. Cook Nuclear Plant policies and procedures to prevent contamination and compliance with the Storm Water Discharge permit.

Chemicals will be controlled and disposed of per plant procedure PMI 2160 Chemical Control and other related procedures.

D. Environmental Monitoring

Environmental reviews have been completed for activities that have already begun and are related to the SGRP. The table in Attachment A outlines the SGRP related environmental reviews that have been completed to date. No further environmental evaluations were required of any of the reviews. Additional reviews associated with the project are expected.

E. Permit Compliance

1. National Pollution Discharge Elimination System (NPDES) Permit # MI0005827

Discharge limitations as defined in the NPDES will not be exceeded as a result of the SGRP.

The steam generator operating and lay-up chemistry will remain unchanged with the exception of boric acid, which has been eliminated from the treatment program.

The discharge volume from outfalls 001 and 002 consisting of non-contact condenser cooling water and miscellaneous low volume wastes to Lake Michigan are expected to remain within the current NPDES permit parameters.

The discharge volume from outfalls 00C – Plant Heating Boiler Blowdown, 00G – Reverse Osmosis System Reject, and 00H – Turbine Room Sump Evergency Overflow are expected to remain within the current NPDES permit parameters.

The thermal and chemical characteristics of surface water and groundwater discharges will remain within the NPDES permit parameters with the use of the new steam generators.

Other discharges include process wastewater and sanitary wastewater. These discharges are expected to remain within the current NPDES permit parameters.

2. Industrial Stormwater Discharge Certificate of Coverage MIS 520011

D. C. Cook Nuclear Plant has a General Stormwater Permit issued by the Michigan Department of Environmental Quality. The SGRP will not impact this permit. No changes are anticipated in the stormwater discharge. The stormwater pollution prevention plan will require updating to address the use of the temporary facilities.

3. Critical Dunes

The steam generator construction project activities do not affect Sand Dune Protection and Management. All construction activities are located within the owner controlled area and not within any area designated under the protection of the Sand Dune Protection Management.

4. Berrien County Soil Erosion

The steam generator project activities do involve areas affected by the Soil Erosion and Sedimentation Control permits. Currently, D. C. Cook Nuclear Plant has two open Berrien County Drain Commisioner issued permits. Permit #2612 involves the Guard House Storm Water Reroute

Project and Permit #2590 involves the Beach Nourishment Project. Neither is affected by the SGRP.

Berrien County Soil Erosion Permit #2732 has been amended to include the activities of two SGRP related Environmental Reviews. Environmental Review #99-027 involves digging a trench from the RPAC to the Unit 1 Radioactive Waste Storage Tank yard as described in DCP-316. Environmental Review #99-033 involves excavation to install a potable water line from an existing header to the SGRP restroom trailer. A new Berrien County Soil Erosion Permit, # 2776 was granted to authorize work that will be performed as described in Environmental Review #99-037.

5. Air Permits # 544-97 and # 460-93

Currently, D. C. Cook Nuclear Plant has two Michigan Department of Environmental Quality Air Use Permits. Permit #544-97 applies to the alternate plant heating boiler. Permit #460-93 applies to the Emergency Diesel Generators and Plant Heating Boiler. The SGRP does not impact either permit.

Nuisance dust generated from heavy truck traffic will be controlled when necessary through the use of water spray in the owner controlled areas.

6. Other Permits

D. C. Cook Nuclear Plant has a Submerged Lands Permit # 98-12-0414 and # 98-BR-224-C issued by the MDEQ Land and Water Management Division and U.S. Army Corps of Engineers Permit # 69-056-004-7. These permits apply to a beach nourishment project. The SGRP does not impact these permit.

D. C. Cook Nuclear Plant has a Wetland Protection Permit # 95-12-0267 issued by MDEQ Land and Water Management Division. This permit applies to the installation of a Boardwalk Nature Trail through a wetland. The SGRP does not impact this permit.

D. C. Cook Nuclear Plant has a Permit # 94-BR-321-C Power Line Right of Way Vegetation Control. The SGRP does not impact this permit.

7. Railroad Enhancements

Railroad enhancements have been completed utilizing the environmental review process. The activities include excavation to remove and replace

ties, clearing of brush and interference's on railroad track route, and enhancements to the rail system. As outlined in the table in Section VIII. ENVIRONMENTAL CONTROLS, D. Environmental Monitoring, the environmental review did not require additional environmental screening and the enhancements were completed.

8. Housing and Building

The construction of additional facilities to support the project will be completed utilizing approved D. C. Cook Nuclear Plant procedures and processes.

9. Plant Policies

The SGRP activities will be conducted in compliance with the following: Spill Prevention Control Countermeasure Plan, Pollution Incident Prevention Plan, PMI 2160 Chemical Control. The replacement is physically within the owner controlled area. All D. C. Cook Nuclear Plant policies are applicable. Work will be conducted in accordance with plant policies and procedures.

IX. CONCLUSION

It is concluded that no significant adverse environmental impact will result from the Unit 1 SGRP. One new permit was granted for completion of work associated with the project. No preferable alternatives to the proposed action are available. It is further concluded that the Unit 1 SGRP does not involve an unreviewed environmental question pursuant to Part II, Section 3.1 of the D. C. Cook Nuclear Plant Environmental Technical Specifications.

X. REFERENCES

1. Donald C. Cook Nuclear Plant Final Environmental Statement (FES), 1973.
2. Donald C. Cook Nuclear Plant Appendix B, Environmental Technical Specifications, Environmental Protection , Amendment Nos. 54 & 40.
3. Donald C. Cook Nuclear Plant National Pollution Discharge Elimination System (NPDES) Permit # MI0005827.
4. Michigan Department of Environmental Quality (MDEQ), Industrial Stormwater Discharge, Permit # MIS520011.
5. MDEQ Air Use, Permit # 544-97.
6. MDEQ Air Use, Permit # 460-93.
7. MDEQ – Land and Water Management Division Part 325 Submerged Lands, Permit # 98-12-0414.
8. MDEQ – Land and Water Management Division Part 353 Sand Dune Protection and Management, Permit # 98-BR-224-C.
9. MDEQ – Land and Water Management Division Part 303 Wetland Protection, Permit # 95-12-0267.
10. MDEQ – Land and Water Management Division Part 353 Sand Dune Protection and Management, Permit # 94-BR-321-C.
11. Berrien County Drain Commissioner, Soil Erosion and Sedimentation Control, Permit # 2612.
12. Berrien County Drain Commissioner, Soil Erosion and Sedimentation Control, Permit # 2590.
13. Berrien County Drain Commissioner, Soil Erosion and Sedimentation Control, Permit # 2732.
14. Berrien County Drain Commissioner, Soil Erosion and Sedimentation Control, Permit # 2776.
15. U.S. Army Corps of Engineers Permit # 69-056-004-7.
16. Spill Prevention, Control and Countermeasure Plan (SPCC).
17. 12 PMP 2230 SPC.002, Pollution Incident Prevention Plan (PIP).
18. 12 PMP 2160 CWM.001, Pollution Prevention Plan.
19. 12 PMP 6010 RPP.004, Asbestos Control Program.
20. 12 EA 6090 ENV.107, Preparation and Distribution of Environmental Evaluations.
21. PMI-2160, Control of Chemical Materials.
22. PMP 1040 SES.001, Safety Screening/Evaluations.
23. 12 PMP 2160 CWM.002, Chemical Waste Management.
24. 12 PMP 2160 CWM.003, Restricted Area Chemical Control.
25. 12 PMP 2160 CWM.004, Drain Management.

ATTACHMENT A
SGRP ENVIRONMENTAL REVIEWS

Review #	Activity
97-034	Install storage shed on west side of SGRP offices including underground power supply.
98-006	Modifications to the plant access road to allow entry of large construction or delivery vehicles to the fabrication site near the 345 KV Switchgear Yard.
98-010	Perform soil borings for engineering analysis.
98-011	Repair and maintain the Site Rail System.
98-017	Install sign and post for SGRP Offices.
98-021	Create a storage yard for trailers and sea vans from the W-Yard area.
98-022	Clear small trees, bushes, brush, limbs 15' from the centerline of railroad tracks, both sides.
98-023	Excavate adjacent to railroad tracks for the removal and replacement of railroad ties.
98-030	Establish a laydown area to store materials relocated from the old steam generator storage building.
98-033	Install power pole, guy wires and conduit trench for power supply to steam generator storage building. Install pole and platform for power supply to the SGRP Fab shop and warehouse.
99-009	Trim bushes/trees 15 feet from railroad track centerline from Red Arrow Highway to switch one.
99-013	Site preparation and construction of steam generator warehouse facility. Work to include foundation preparation, parking lot installation and grading and installation of power and communications. (345 kV yard)
99-014	Site preparation and construction of steam generator fab shop and storage building. Work includes foundation preparation, parking lot installation and grading, and installation of power and communications. (345 kV yard)
99-022	Seal abandoned well #B-5060B5 located north at 345kV switchyard. This well is an old soil boring used to identify underground material for the temporary steam generator storage building complex.
99-027	DCP-316 trenching from RPAC to TWST Yard Unit 1, Berrien Erosion Permit #2732.
99-033	Excavate to install potable waterline from existing header to SGRP restroom trailer, Berrien Erosion Permit #2732.
99-037	Sawcut and remove pavement, excavate for storm tie-downs and surface soil removal for leveling pads and yard drainage, Berrien Erosion Permit #2776.
99-039	Trench across road by blast shack, paint storage shack, run conduit line to craft trailer, trench to protect line.
99-041	Repair road north of the 345 KV Switch yard.
99-042	Construct swale to convey runoff from new intersection at Red Arrow Highway.
99-043	Park SGRP RP Consumables Trailer 45' overland enclosed located near the sewage plant.
99-044	Dig trenches between SGRP Building and north and south trailers.
99-047	Increase road width north of 345 KV yard and slope bank on a 2/1 slope.
99-049	Excavate trench to install permanent electrical feed to the steam generator mausoleum. Trench to be backfilled using spoils material.

ATTACHMENT B

ENVIRONMENTAL REVIEWS

A/R # NA
J.O. # NA
J.O.A.# NA

(Assigned by Environmental Affairs)
Review # 97-034
Revision # 1
Expiration Date 12/31/98

PMP 6090 ADM.001
Attachment 2

Closed and sent to NRM 1/19/99

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

Install storage shed on west side of SGRP offices. (Temporary) Route underground power to shed. Shed to be 12x16'.

Department: SGRP Contact: Joe Jones Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Provide work controls & practices per revision 0 to 97-034

3. Potential permit or plan requirements/changes

☒	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☐	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☐	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

none

Reviewer/Evaluator [signature] Date 11/16/98

General Supervisor - Environmental Review [signature] Date 11/16/98

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 97-034
Revision # 0
Expiration Date ~~3/3/98~~ 9/31/98
BK2 4/1/98

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

(OLD CESA YARD AREA) → MAX 220 TOTAL
U-1 SGRP (1) INSTALL TEMP. BUILDING FOUNDATIONS 2'ϕ x 4' DEEP (2) INSTALL UNDERGROUND POTABLE & SANITARY LINES TO BUILDING (3) INSTALL COMMUNICATION CABLE DUCT TO BUILDING (4) INSTALL POWER TO BUILDING (5) ESTABLISH PARKING AREAS (AND MAINTAIN) AS NEEDED. (22A LIMESTONE)

Department: PM & IS Contact: P.N. STATHAKIS Ext. 1754

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

REF Dwg "GE CAPITAL AO; S1" " MARK LINE S1"

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

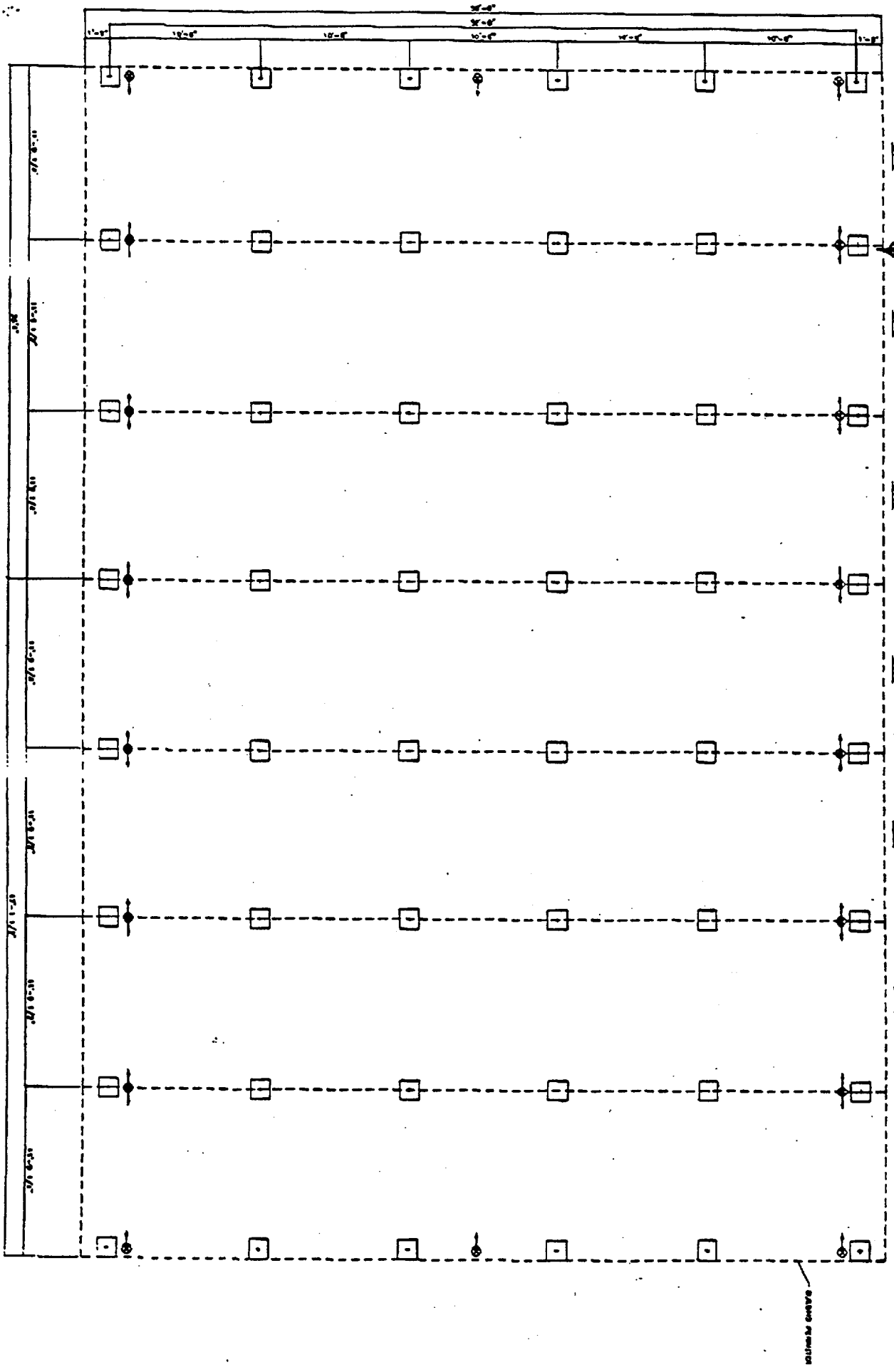
2. Work requirements and restrictions
Grade area toward Storm drains at west end as practical. Work at directing stormwater path towards ~~the~~ infiltration areas along the access road. AVOID directing stormwater towards access roads west to the Lake of Passinole.

3. Potential permit or plan requirements/changes

☒	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☐	Michigan Storm Water Construction Permit	☐	PIP Plan	☒	Storm water
☐	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

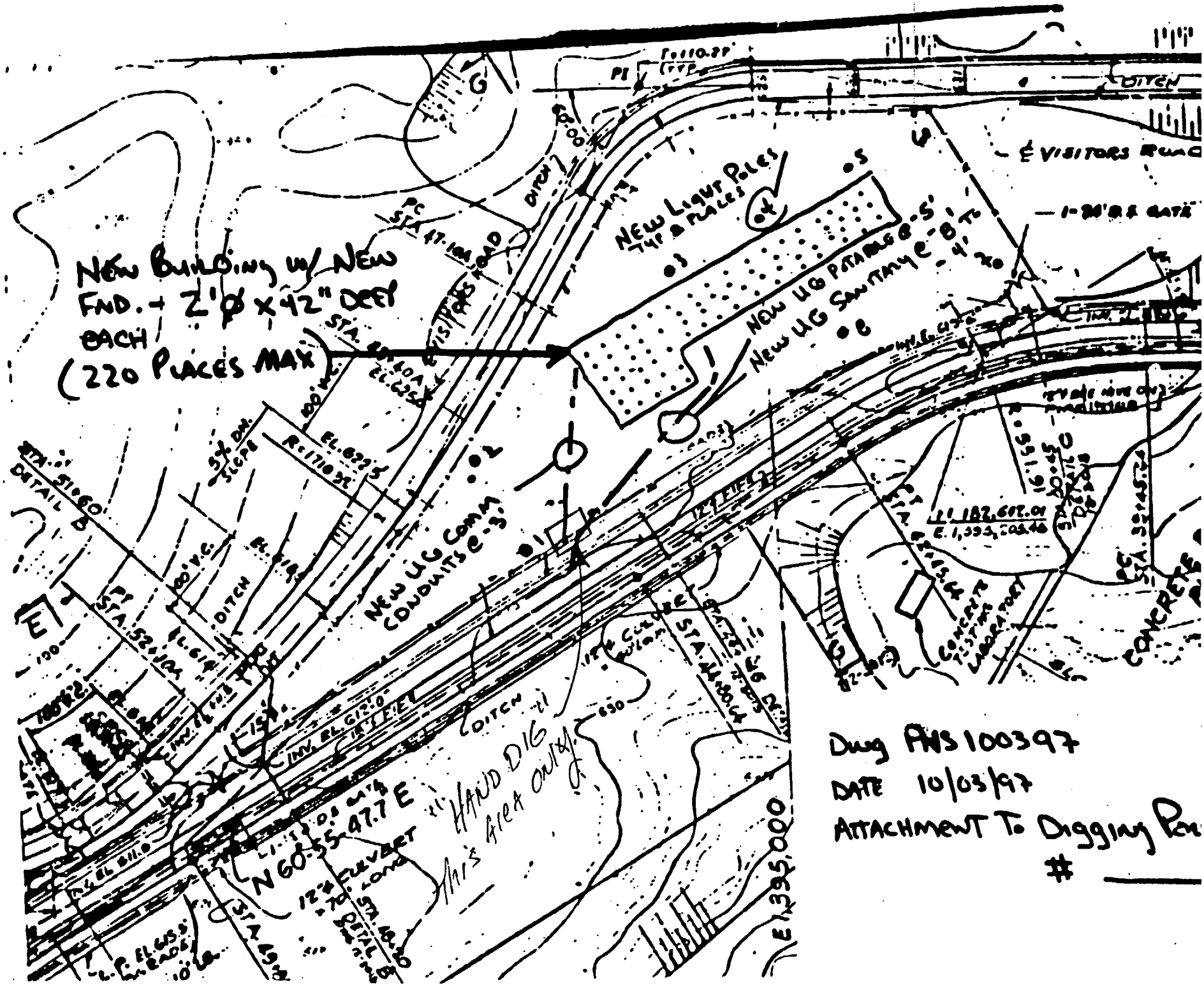
4. Additional comments:
Called MDEQ concerning construction- Area will not encroach on critical Dunes or any slopes. Permission granted for Building. NO B.C Erosion Permit Not required <500' from Surface water <1 acre in size

Reviewer/Evaluator _____ Date 10-6-97
General Supervisor - Environmental Review _____ Date 10-7-97



Typ Fwd 2"Ø x 42" DEEP

10 UNITS (6) = 120
2 UNITS (12) = 24
20 UNITS
132 TOTAL


NEW BUILDING W/ NEW FND. - 2'Ø X 42" DEEP EACH (220 PLACES MAX)
NEW LIGHT POLES TYP
NEW UG PATABLE
NEW UG SANITARY
NEW UG COMM CONDUITS
VISITORS
DITCH
HAND DIG IN THIS AREA ONLY
N60°55'47.7"E
E 1,395,000
CONCRETE
Dwg #NS100397
DATE 10/03/97
ATTACHMENT TO Digging Per
#

DIGGING PERMIT # _____ REV. ____

DESIGN CHANGE OR C/R NO. N/A JOB ORDER N/A CONTRACT WORK

DIGGING PERMIT

Work Group:

Requested By: PETER SPANTAKIS Department PM&IC Phone # 1754

Date Requested: 10/3/97 Date Digging is to start: 10/4/97

Reference Drawing(s) No.: SEE ATTACHED SSK # SSKPNS100397 Work Lines: _____

LOCATION: (If a trench list starting point, termination point(s) and intermediate points where direction changes).
SEE ATTACHED SSK PNS100397 TO INSTALL: (1) COMMUNICATION LINES; (2) POWER LINES; (3) SANITARY; (4) POTABLE; (5) BUILDING FOUNDATIONS (6) SITE GRADING, (7) SITE DRAINAGE.

REASON FOR EXCAVATION: INSTALLATION OF UTILITIES AND FOUNDATIONS FOR 41 SGRP OFFICES

FACILITIES LIKELY TO BE ENCOUNTERED: _____

REMARKS: ~~No Dead Dogs Available, OK to Excavate in Area as Shown on Sketch~~ AREA IS APPROVED FOR MACHINE EXCAVATION! Hand Dig in Area where New Utilities were previously installed. TPC (See Attached Sketch) TPC

Reviews:

PM&IS Electrical _____ Date: 10/3/97

PM&IS Civil _____ Date: 10/3/97

PM&IS Mechanical _____ Date: 10-3-97

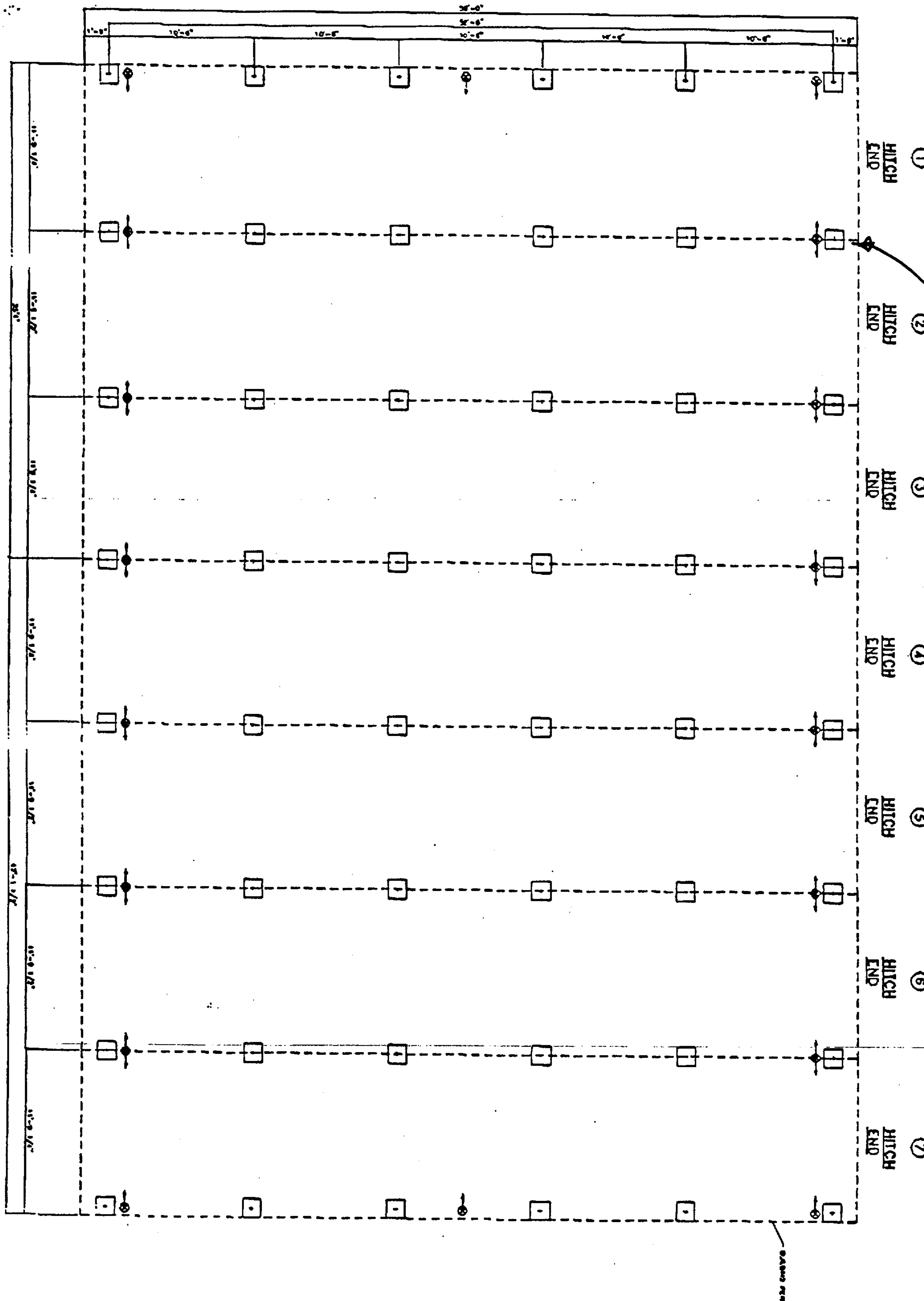
Environmental _____ Date: 10-6-97

Safety Coordinator _____ Date: 10/3/97

PM&IS FINAL REVIEW

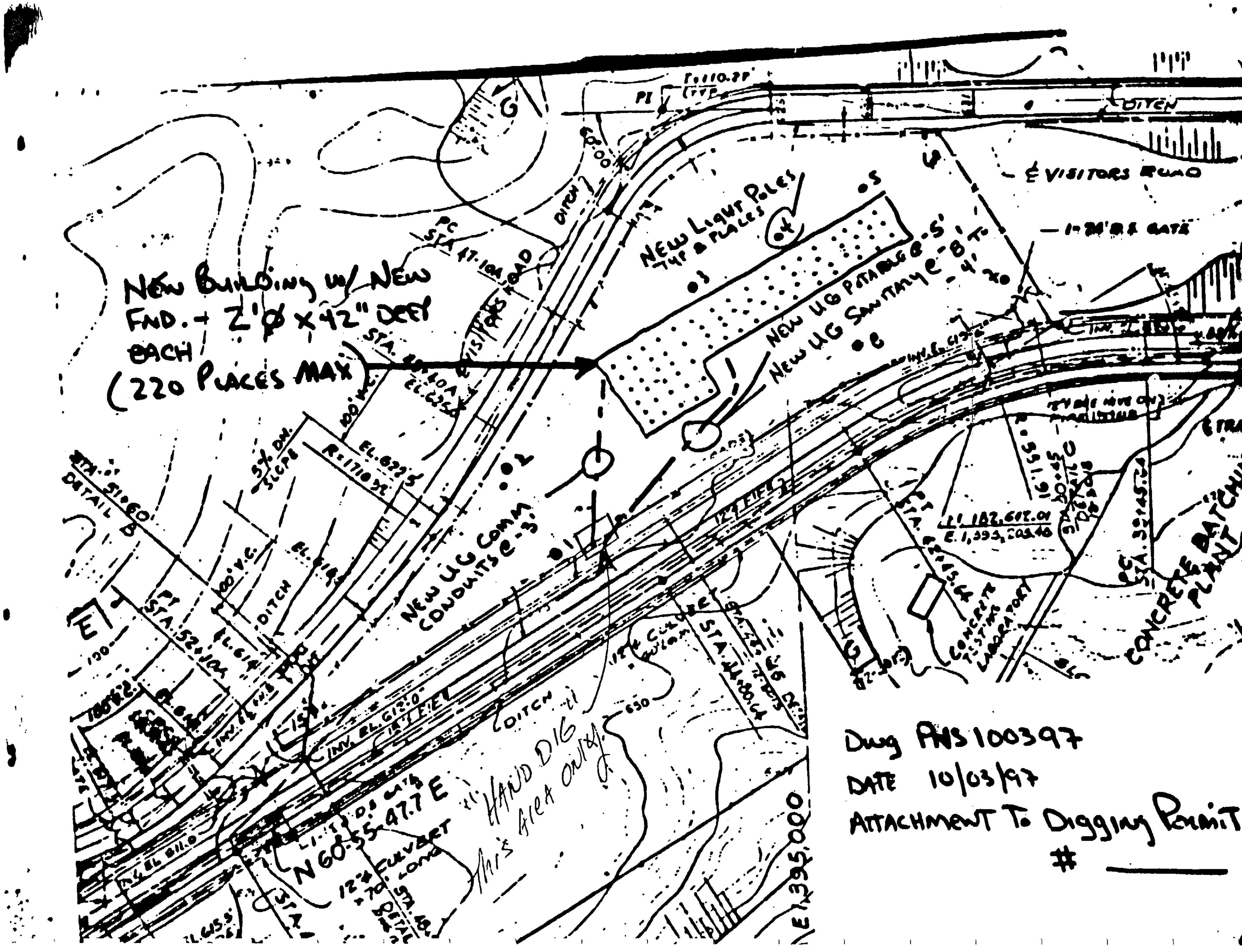
Remarks: All utilities in immediate area were removed during the CESA Bldg. demolition project. TJ 10/3/97

Date: _____



14Ø FWD 2Ø X 42 DEEP

2 units (12) = 24
20 units
132 TOTAL


NEW BUILDING W/ NEW
FND. - 2'Ø X 42" DEEP
EACH
(220 PLACES MAX
NEW LIGHT POLES
NEW UG POTABLE E-5'
NEW UG SANITARY E-8'
NEW UG COMM
CONDUITS E-3'
℄ VISITORS ROAD
VISITORS ROAD
CONCRETE BATCHING
PLANT
CONCRETE
TESTING
LABORATORY
DITCH
HAND DIG
This area only
N 60-55-47.7 E
E 1,395,000
DETAIL B
Dwg PNS 100397
DATE 10/03/97
ATTACHMENT To Digging Permit
#

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-006
Revision # 0
Expiration Date 12/31/98

PMP 6090 ADM.001
Attachment 2

Closed and Sent to NRM 1/19/99 EQV.

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

See Attached For Description of Work.

Department: SGRP Contact: Joe Jones Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☐ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Protect storm drains from eroded soil.
Replant / restore vegetation after the job is complete

3. Potential permit or plan requirements/changes

☐	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☐	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☐	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Perm
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

Crit. Dune - Na. - outside of Critical Dune Line. Area is on blanket C. Dune
Permit for Potential Maint. work. Stormwater - Na < 5 acres.
B.C. erosion - Na > 500 feet from the Lake

Reviewer/Evaluator _____ Date 4-9-98

General Supervisor - Environmental Review _____ Date 4-14-98

Attachment to Project Environmental Review
JAJ 4/7/98

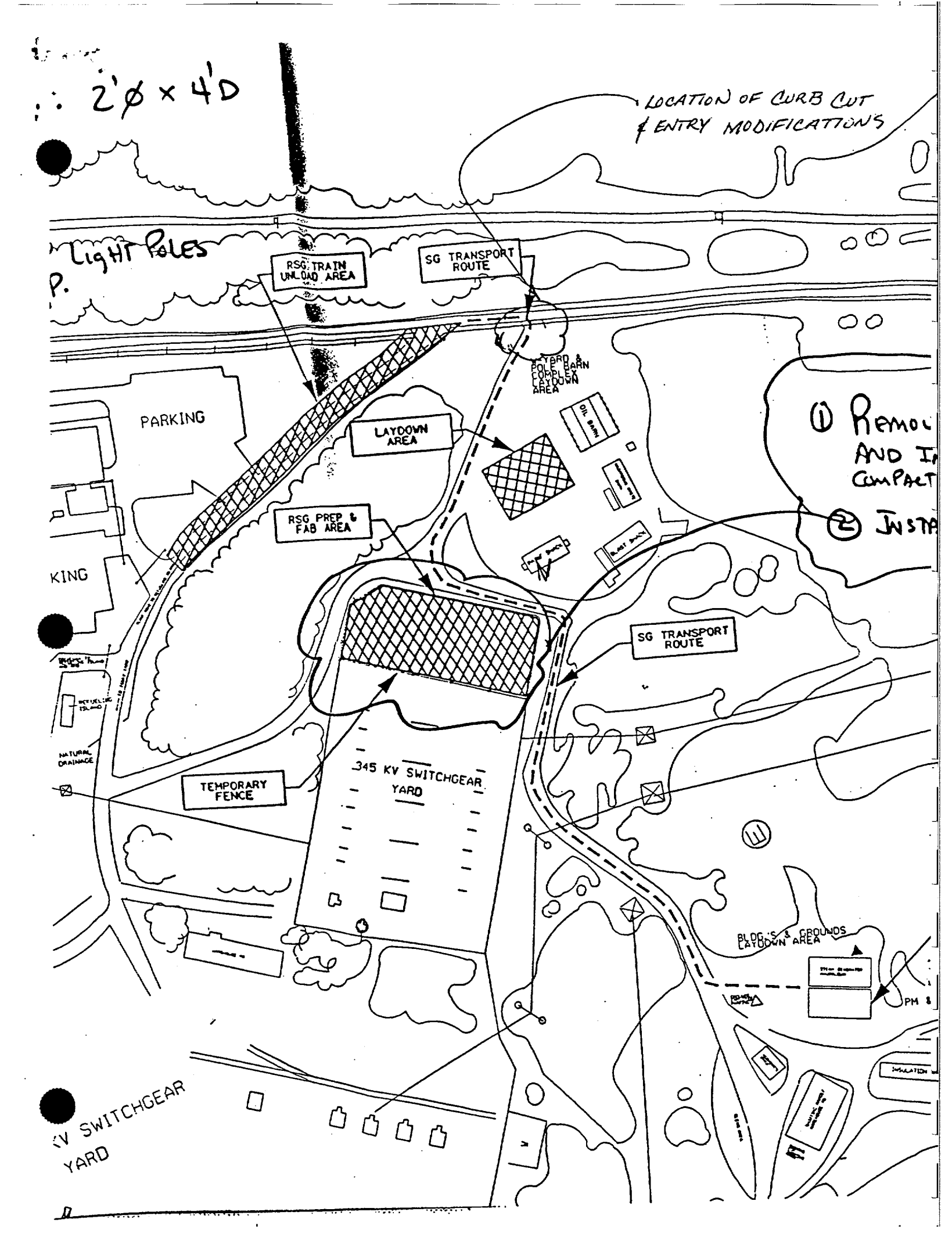
A. Description of Proposed Activity

The steam generator replacement contractor has a designated RSG Preparation and Fabrication area within the 345 KV Switchgear Yard. Access to the RSG preparation and fabrication site from the plant access road will be via the entry to the W-yard and pole barn complex area, (paint shack, blast shack, oil barn, haz. waste barn). In order to permit the entry of large construction or delivery vehicles the entry to the W-yard will need to be modified. The proposed modifications will consist of; the removal of one large growth oak tree, the excavation of a small berm, driveway widening, curb cutting to create a depressed curb in the new driveway location, and landscaping and replanting disturbed areas. These modifications will be incorporated in the SGRP Office parking lot contract to be let spring of 98.

Joseph A. Jones
Ext. 3483

Additional modification to the East curb at the EAST entrance of the Training center Drive was approved on July 10, 1998. The modification involved cutting back 200 Ft of curb to accomodate SG movement back to the 345 kv yard.

7-10-98


∴ 2'ø x 4'D
LOCATION OF CURB CUT & ENTRY MODIFICATIONS
LIGHT POLES
P.
RSG TRAIN UNLOAD AREA
SG TRANSPORT ROUTE
YARD & POLE BARN COMPLEX LAYDOWN AREA
PARKING
LAYDOWN AREA
RSG PREP & FAB AREA
KING
SG TRANSPORT ROUTE
NATURAL DRAINAGE
TEMPORARY FENCE
345 KV SWITCHGEAR YARD
BLDG'S & GROUNDS LAYDOWN AREA
PM
KV SWITCHGEAR YARD

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-011
Revision # 0
Expiration Date 9-30-98

PMP 6090 ADM.001
Attachment 2

closed
1/14/98
CW. and sent to NRM.

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

REPAIR & MAINTAIN THE SITE RAIL SYSTEM. WORK TO INCLUDE: REMOVING OLD RR TIES & INSTALLING NEW TIES, LUBRICATING SWITCHES AND RECOMPACTING BALLAST.

Department: SGRP Contact: Joe Jones Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☑ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

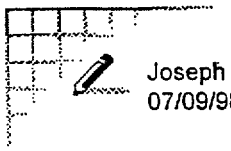
HAVE CONTRACTOR REMOVE OLD TIES from SITE OR CONTACT ENVIRONMENTAL FOR PROPER DISPOSAL

3. Potential permit or plan requirements/changes

☐	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☐	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☐	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

Reviewer/Evaluator _____ Date 7-9-98
General Supervisor - Environmental Review _____ Date 7-9-98



Joseph A Jones
07/09/98 10:59 AM

To: Pete N. Stathakis/American Electric Power@AEPIN, Brett J Taylor/BC1/AEPIN@AEPIN, Thomas A. Szymanski/American Electric Power@AEPIN, Ed A. Young/American Electric Power@AEPIN

cc: Bruce J. Abbgy/American Electric Power@AEPIN, Alvin W Cretsinger/BC2/AEPIN@AEPIN, Kim P Gioannini/BC1/AEPIN@AEPIN, Stephen P. Hodge/AEPSC/American Electric Power@AEPIN, James A. Kobyra/AEPSC/American Electric Power@AEPIN, Brenda G. Kovarik/American Electric Power@AEPIN, Bill R. Linn/American Electric Power@AEPIN, Mayo H Roth/BC1/AEPIN@AEPIN, Ken R. Schultz/INM/American Electric Power@AEPIN, Robert M. Totzke/American Electric Power@AEPIN, Paul T Wasilewski/BC1/AEPIN@AEPIN, Charles D. Springman/American Electric Power@AEPIN

Subject: Rail Repairs

U.S. Trackworks has been contracted to perform rail repairs on the plant system. On July 10, 1998 they will be on site to perform the repairs on items that were identified as significant track defects which limited use of the plant rails. These areas include the switches at the #4 and #5 turnouts, (switches just east of Red Arrow Highway), the sun kink just west of Red Arrow Highway and an area in the 765 kv yard where the train car had derailed. Upon completion of these repairs the plant rail system can be utilized for material transport. U.S. Trackworks will return to site in August to complete the balance of repairs identified in the Rail Inspection Report, this work will include replacing ties, tightening bolts, resetting spikes, adjusting and lubricating switches and compacting ballast.

Joe #3483

U.S. TRACKWORKS

August 2, 1998

Mr. Joe Jones
American Electric Power
DC Cook Nuclear Plant
Unit 1 Steam Generator Replacement Project
One Cook Place
Bridgman, MI 49106

Dear Mr. Jones:

This is to notify you that all the ties that we remove from the railroad trackage at your facility in Bridgman, Michigan will be taken offsite and disposed of in accordance with all local, state and federal requirements.

Sincerely,

Scott R. Tameling
Project Coordinator

NRC
The National Railroad Construction and Maintenance Association Inc

Railroad Construction / Maintenance / Design & Construction
P.O. Box 10, Moline, Michigan 49335-0010 / 616-877-4777 / Fax: 616-877-4096
P.O. Box 39786, Cincinnati, Ohio 45247 / 513-385-3802 / Fax: 513-385-3803

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-010
Revision # 1
Expiration Date 11/31/98

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

Perform Soil Borings for Engineering Analysis.
See Drawing # 23733-C-001 attached to dig permit for locations & details.

Department: SGRP Contact: Joe Jones Ext. # 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Conserve Soil / Prevent from Washing into nearby Storm drains

3. Potential permit or plan requirements/changes

☑	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☑	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☑	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

Critical DA - on critical dune Blanket Permit.
Soil Erosion: DA > 500' from Lake, also in asphalt Parking Lot, No Soil erosion risk.
Storm water: < 5 acres of disturbed land

Reviewer/Evaluator _____ Date 7-8-98
General Supervisor - Environmental Review _____ Date 7-8-98

MISS DIG # 8425357

DIGGING PERMIT # 998 REV. 0

DESIGN CHANGE OR C/R NO. N/A (SGRP JOB ORDER N/A (SGRP)

DIGGING PERMIT

Work Group:

Requested By: J.A. Jones Department SGRP Phone # 3483

Date Requested: 6/29/98 Date Digging is to start: 7/13/98

Reference Drawing(s) No.: Bechtel 23733-C-001 (Attached) Work Lines:

LOCATION: (If a trench list starting point, termination point(s) and intermediate points where direction changes).
Detail #1 345 kV Yard, north of relocated fence.
Detail #2 Plant Access road & 765 kV Yard road intersection.
Detail #3 North of Plant fab shop.

REASON FOR EXCAVATION: Soil Borings for engineering analysis.

FACILITIES LIKELY TO BE ENCOUNTERED: Direct Buried Conduit · Cable, Misc Buried Mechanical Piping ect. See Attached Docs for approx Locations. **

REMARKS: Either locate all Utilities Prior to Boring or Hand excavate to a point agreed upon by all parties discipline safety ect and then use Boring machine. Use Extreme Caution ** May be other Utilities in Area. Contact Mosley for location assistance Contact St Joe Division for D.B. Buried Cables, Plant Communications
Reviews: may be able to assist.

See Notes Attch Docs Date: 7/6/98 ** See Above
PM&IS Electrical Bechtel 23733-C-001

Date: 7/01/98
PM&IS Civil

REF. DWG. 12-5261B Jami Ponton Date: 7/01/98
PM&IS Mechanical

Date: 7-7-98 #
Environmental - see notes above about elect. hazards

Harold Smith - use elect. insulated gloves + boots Date: 7/6/98
Safety Coordinator - call "Miss Dig". - use caution #

PM&IS FINAL REVIEW
Remarks: Dawn Charleston

Date: 7-11-98

Protect Surrounding Stormwater Drains

Closed on 10/2/98 and sent to NR

PMP 6090 ADM.001
Attachment 2

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-017
Revision # 0
Expiration Date 9/30/98

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

INSTALL SIGN & POST FOR SGRP OFFICES. LOCATION IS BEHIND THE CURB ON THE NORTH SIDE OF THE PLANT ACCESS ROAD, APPROXIMATELY 25' EAST OF THE EXISTING SGRP OFFICE ENTRANCE.

Department: SGRP Contact: JOE. JONES Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

control/ Contain Soils after digging for Sign Posts

3. Potential permit or plan requirements/changes

☐ Critical Dune/High Risk Erosion	☐ Asbestos	☐ Ground water
☐ Michigan Storm Water Construction Permit	☐ PIP Plan	☐ Storm water
☐ Erosion (Berrien Co. Drain Comm)	☐ SPCC Plan	☐ Chemical Storage Permit
☐ Waste Storage Permit	☐ Hazwoper	☐ NPDES
☐ Air	☐ Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways	

4. Additional comments:

Reviewer/Evaluator [signature] Date 9/8/98
General Supervisor - Environmental Review [signature] Date 9/10/98

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-021
Revision # 0
Expiration Date 11/1/98

PMP 6090 ADM.001
Attachment 2

Closed 11/4/98 EV. and sent to NRM

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

CREATE A STORAGE YARD FOR TRAILERS AND SEA VANS FROM THE W-YARD AREA. (SEE ATTACHED DRAWING)

Department: SGRP Contact: JOE JONES Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions.

Dispose of scraped dirt in area marked on Map
USE AH site #1, (Less vegetation) Disturbance.

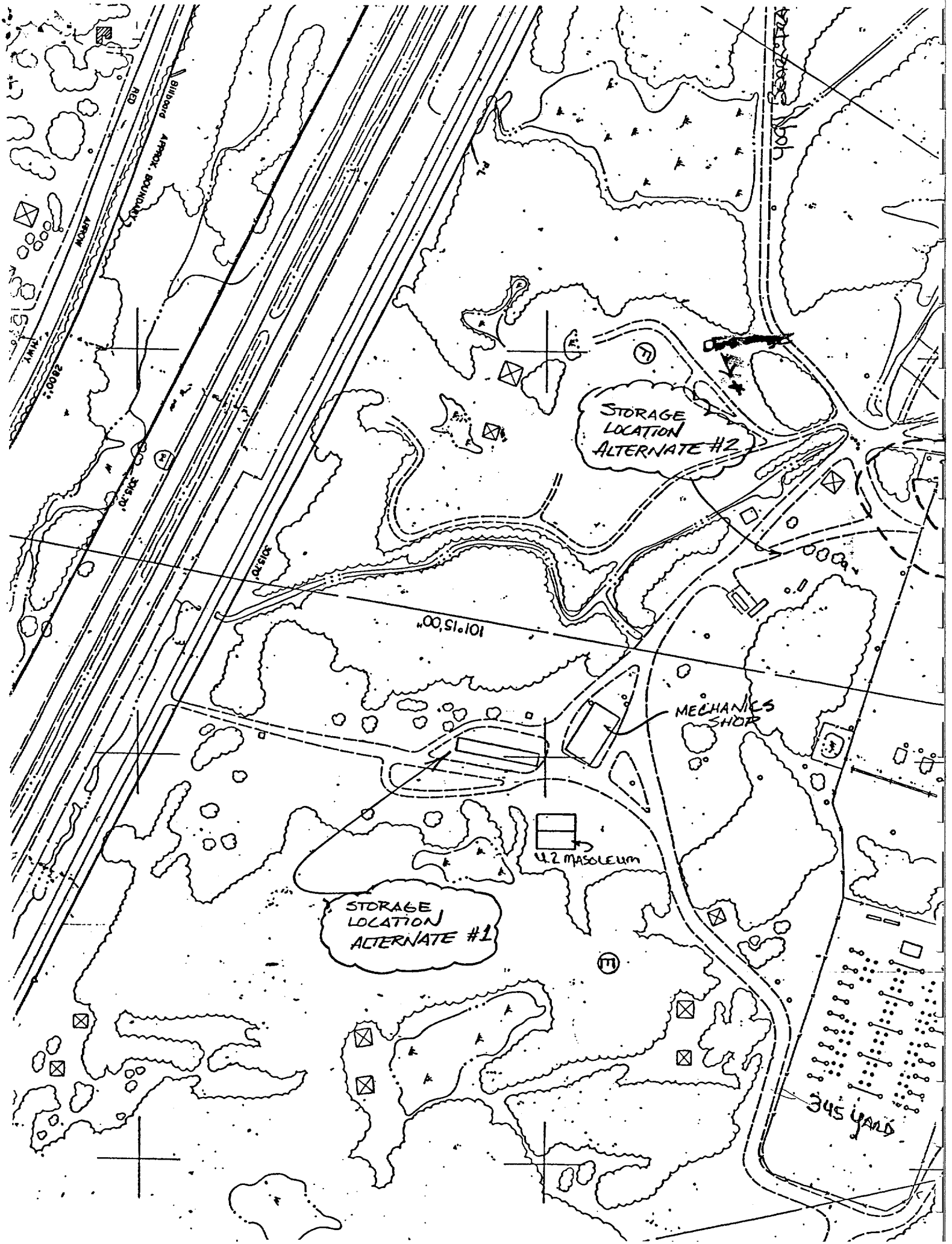
3. Potential permit or plan requirements/changes

☐ NA	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☐ NA	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☐ NA	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

BC Erosion: NA - < 1 acre, > 500 feet from shore

Reviewer/Evaluator B. Ford Date 9/23/98
General Supervisor - Environmental Review Carlson Date 9/24/98


STORAGE LOCATION ALTERNATE #2
MECHANICS SHOP
42 MASOLEUM
STORAGE LOCATION ALTERNATE #1
345 YARDS

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-022
Revision # 0
Expiration Date 12/31/98

PMP 6090 ADM.001
Attachment 2

Closed and Sent to NRM 1/19/99

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

Clear small trees, bushes, brush, limbs etc. 15' from centerline of railroad tracks, both sides.

Department: SGRP Contact: Joseph A. Jones Ext. #3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☑ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

~~Leave brush at the site for~~
Dispose of Brush at Landscape Dumpster

3. Potential permit or plan requirements/changes

☐	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☐	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☐	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

No Permits required East of red arrow highway
ONLY IN YELLOW HIGHLIGHTED AREAS

Reviewer/Evaluator BJ Jones Date 10-1-98
General Supervisor - Environmental Review [signature] Date 10-1-98

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-023
Revision # 0
Expiration Date 12/31/98

PMP 6090 ADM.001
Attachment 2

Closed and sent to NRM 1/19/99

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

EXCAVATE ADJACENT TO RR TRACKS FOR TIE REMOVAL & REPLACEMENT

Department: SGRP Contact: J.A. Jones Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Prevent soils from entering yard drains.

3. Potential permit or plan requirements/changes

- ☑ Critical Dune/High Risk Erosion
- ☑ Michigan Storm Water Construction Permit
- ☑ Erosion (Berrien Co. Drain Comm)
- ☐ Waste Storage Permit
- ☐ Air
- ☐ Asbestos
- ☐ PIP Plan
- ☐ SPCC Plan
- ☐ Hazwoper
- ☐ Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways
- ☐ Ground water
- ☐ Storm water
- ☐ Chemical Storage Permit
- ☐ NPDES

4. Additional comments:

within "Blanket" area of C. Dune Permit / also [illegible] C. Dune area S.W <5 acres of excavation
Erosion <1 acre, [illegible] >500' from S.W

Reviewer/Evaluator [signature] Date 10/8/98
General Supervisor - Environmental Review [signature] Date 10/8/98

DIGGING PERMIT # _____ REV. ____

DESIGN CHANGE OR C/R NO. N/A JOB ORDER N/A

DIGGING PERMIT

Work Group:

Requested By: Joseph A. Jones Department SGRP Phone # 3483

Date Requested: 10/5/98 Date Digging is to start: 10/16/98

Reference Drawing(s) No.: 12-3010-13, 12-3011 (ATTACHMENTS A, B, C, D) Work Lines: _____

LOCATION: (If a trench list starting point, termination point(s) and intermediate points where direction changes).

1) SWITCH AT NORTH ACCESS CONTROL ADJACENT TO TRUCK INSPECTION BAY
2) 765 KV YARD
3) ~~EXCEX~~ SIDING
SEE ATTACHED SKETCH

REASON FOR EXCAVATION: EXCAVATE ADJACENT TO RAILROAD TRACKS, SEE ATTACHMENT "D", TO ALLOW FOR REMOVAL & REPLACEMENT OF RR TIES.

FACILITIES LIKELY TO BE ENCOUNTERED: 765 KV YARD, GROUND WIRES FOR RR TRACKS.

REMARKS: EXCAVATION TO BE PERFORMED MECHANICALLY, MAXIMUM DEPTH IS 18".

Reviews:

D. Owens Date: 10-5-98
PM&IS Electrical

[signature] Date: 10/6/98
PM&IS Civil

[signature] Date: 10/6/98
PM&IS Mechanical

(Electrical) Date: _____
Environmental ON Attachment "A" Print 1-1441 shows "use caution". 4 KV in area. Could be underground elect. in other areas. use caution.

H Snell Date: 10/6/98
Safety Coordinator
PM&IS FINAL REVIEW
Remarks: _____

Date: _____

DIGGING PERMIT PROBLEM REPORT

If during the digging operation, contact is made with any obstruction, digging is to stop immediately. The Operator must contact his Supervisor, who will in turn contact the Shift Supervisor and the I&M person who requested the permit. The Operator/Supervisor will document the item encountered, date, time, and the names of the individuals contacted. It is the responsibility of the AEP person(s) responsible for the digging operation to resolve the difficulty. Upon resolution they should date, time, and initial below to indicate digging can continue.

Digging is not to continue until this requirement is met.

ITEM ENCOUNTERED: _____

OPERATOR/SUPERVISOR: _____ DATE:_____ TIME: _____

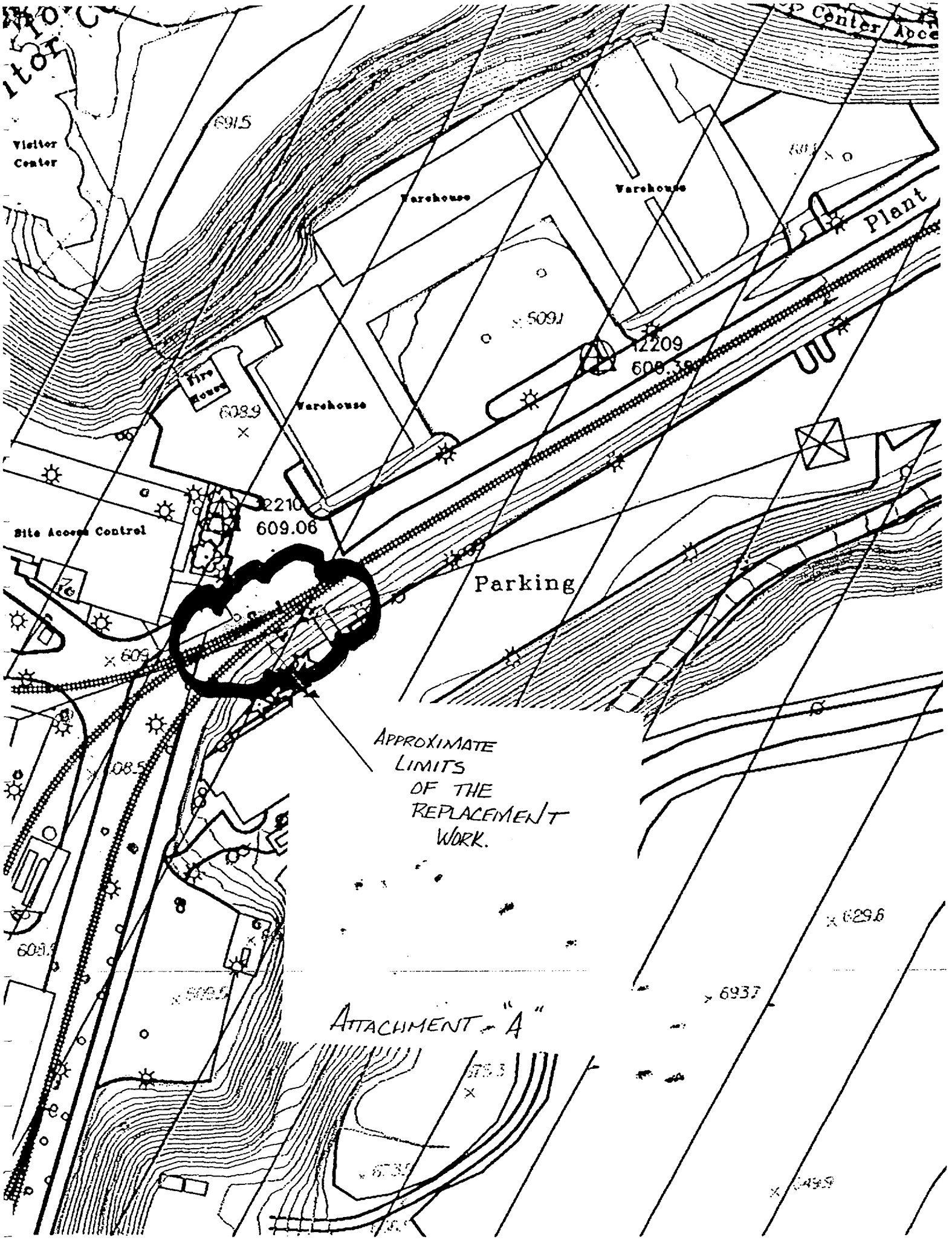
AEP Individual: _____ Time Contacted: _____

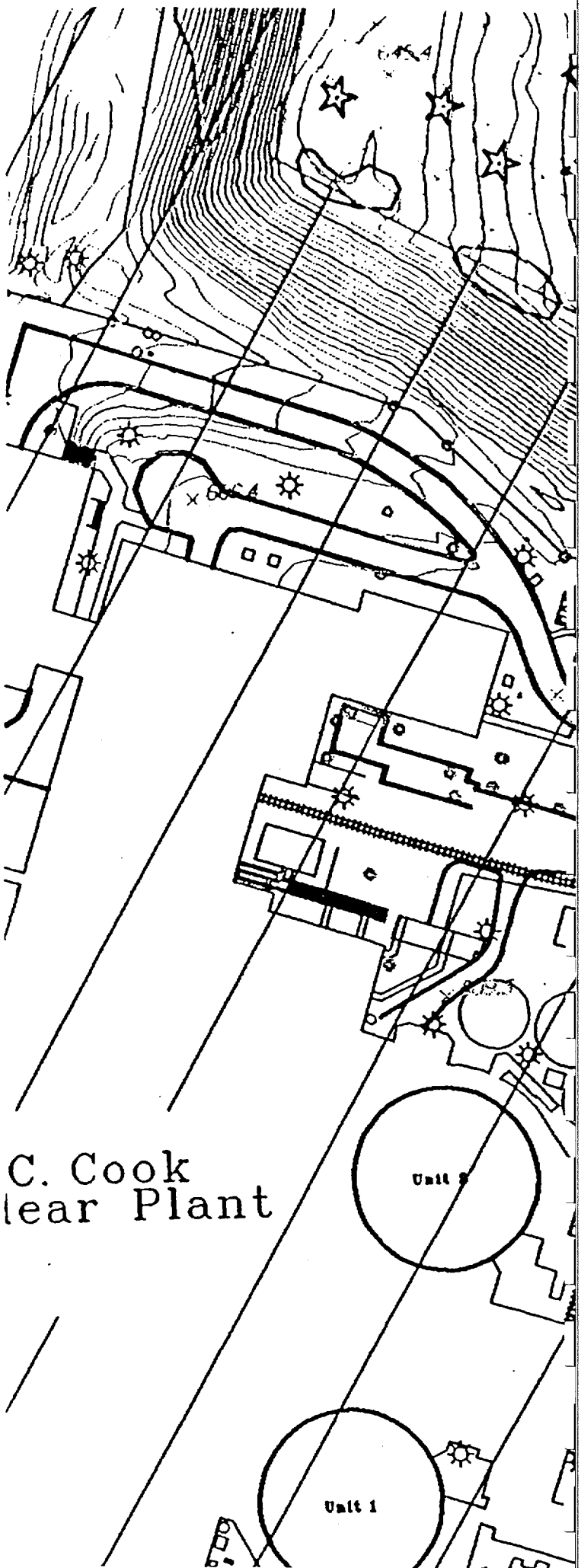
SS/ASS/US: _____ Time Contacted: _____

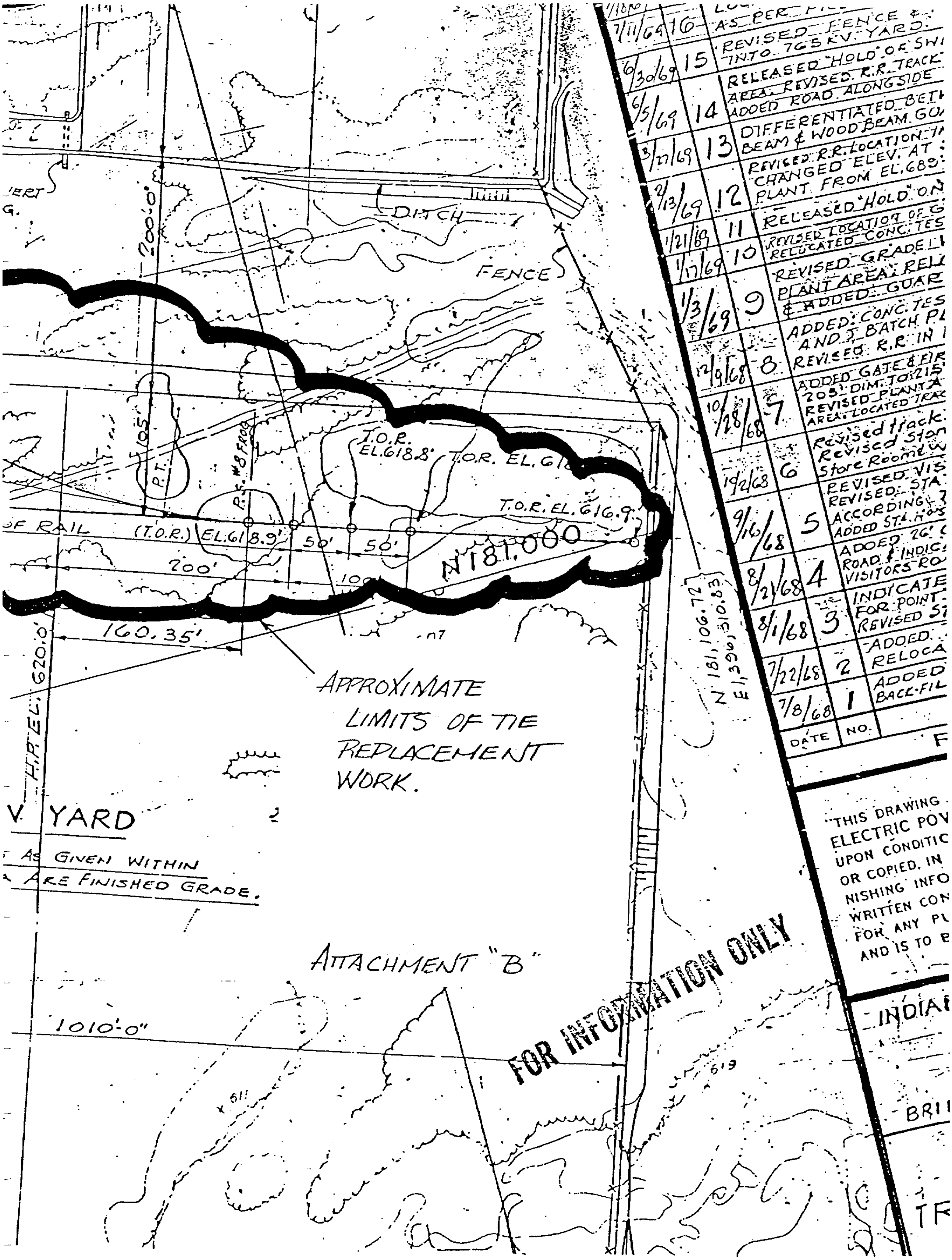
RESOLUTION: _____

Permission to resume digging: [ ] YES [ ] NO

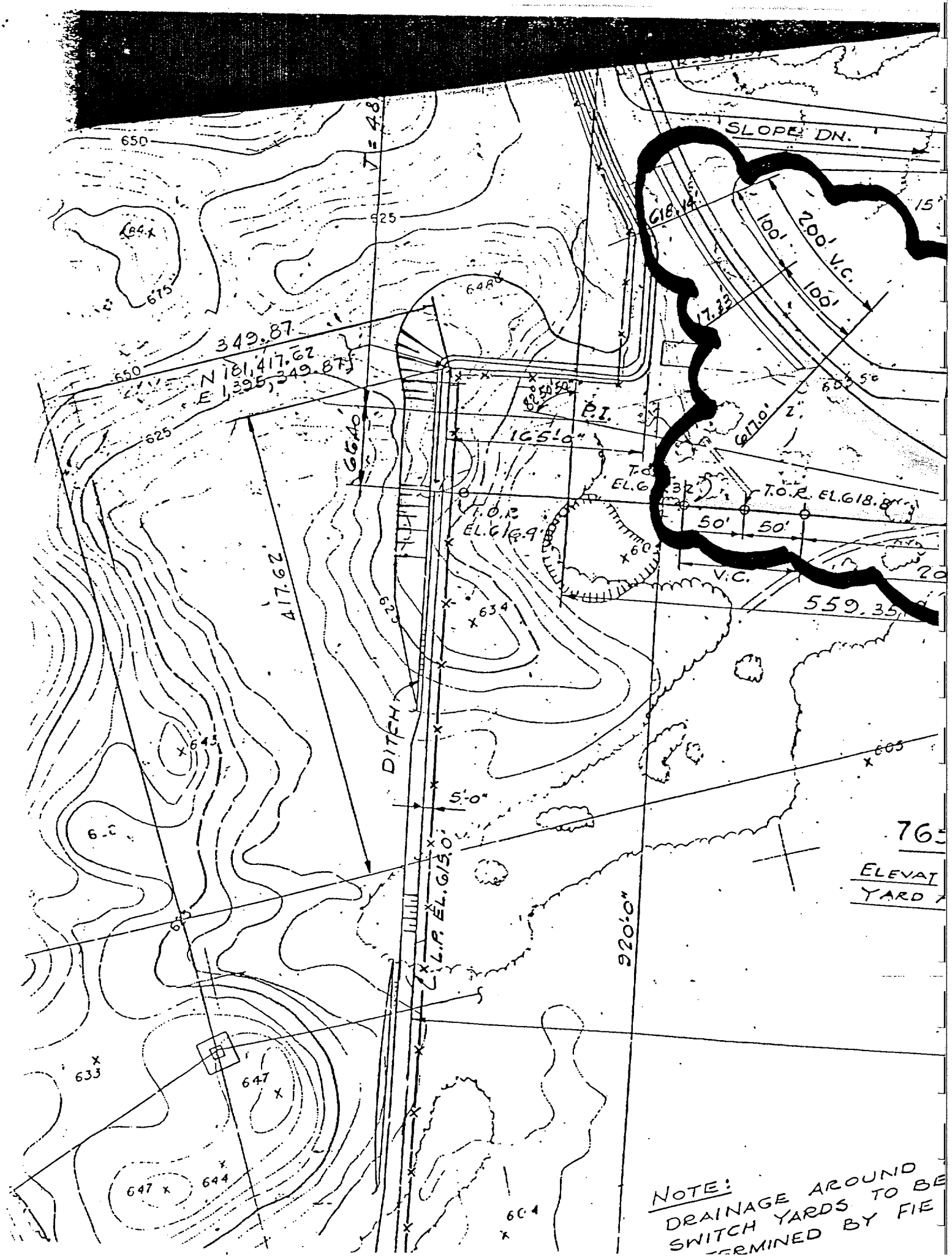
AEP: _____ Date: _____ Time: _____

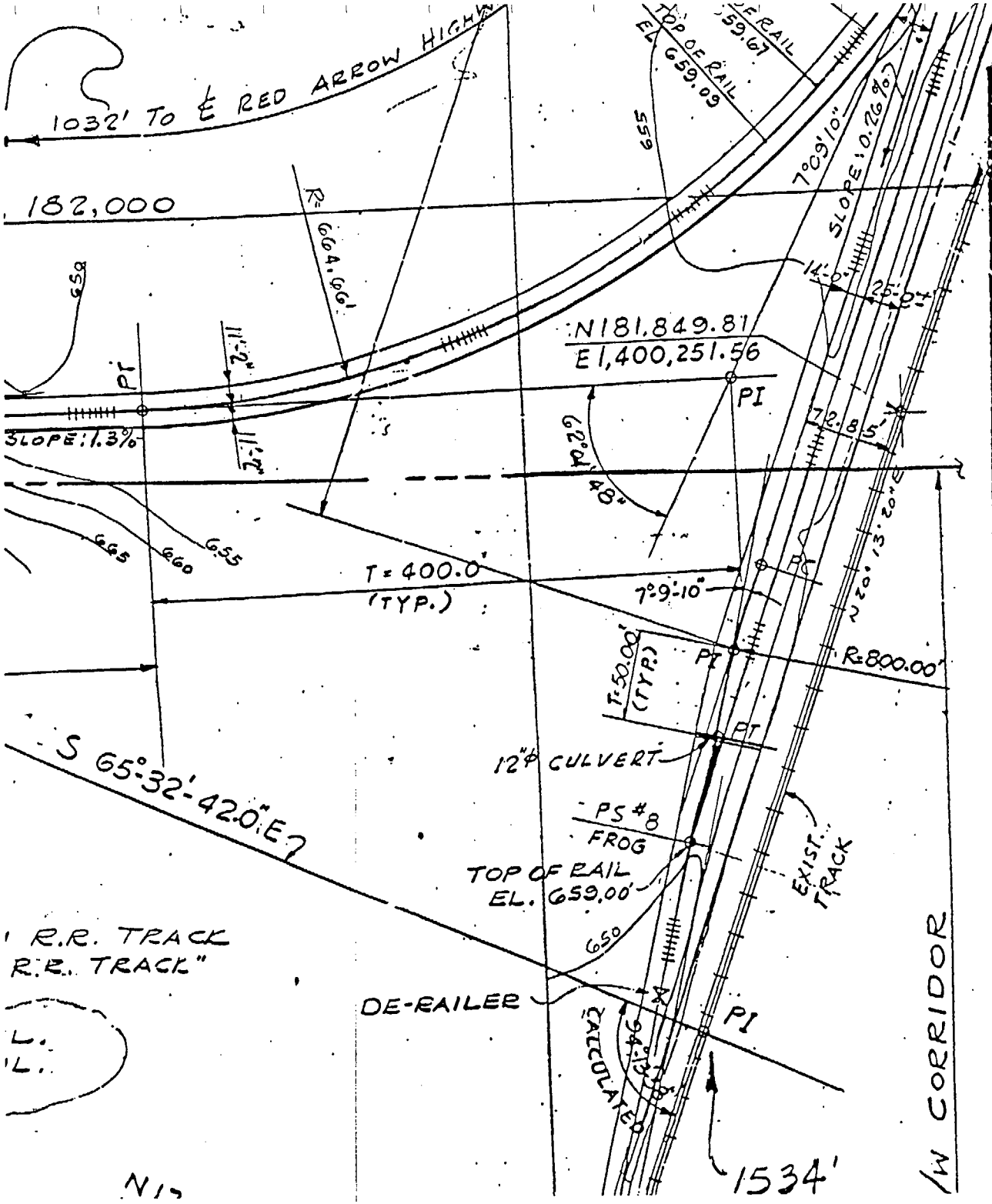

Visitor Center
Warehouse
Warehouse
Plant
Fire House
Warehouse
609.06
Site Access Control
Parking
APPROXIMATE LIMITS OF THE REPLACEMENT WORK.
ATTACHMENT - "A"


C. Cook
lear Plant
Unit 2
Unit 1



DITCH
FENCE
200'0"
105'
P.T.
P.S. #8 FROG
T.O.R. EL.618.8'
T.O.R. EL.61
T.O.R. EL.616.9'
OF RAIL (T.O.R.) EL.618.9'
50'
50'
200'
N181,000
160.35'
APPROXIMATE LIMITS OF TIE REPLACEMENT WORK.
H.P. EL. 620.0'
N 181,106.72
E1,396,510.83
V. YARD
As Given Within
Are Finished Grade.
ATTACHMENT "B"
1010'-0"
FOR INFORMATION ONLY
16 AS PER
7/11/69 REVISED FENCE
15 INTO 765KV YARD.
6/30/69 RELEASED HOLD OF SW
AREA. REVISED R.R. TRACK
14 ADDED ROAD ALONGSIDE
6/5/69 DIFFERENTIATED BET
BEAM & WOOD BEAM GU
3/27/69 13 REVISED R.R. LOCATION
CHANGED ELEV. AT
12 PLANT FROM EL.683
2/13/69 RELEASED HOLD ON
1/21/69 11 REVISED LOCATION OF
RELOCATED CONC. TES
1/17/69 10 REVISED GRADE
PLANT AREA. REL
1/3/69 9 & ADDED GUAR
ADDED CONC. TES
AND 1 BATCH PL
12/9/68 8 REVISED R.R. IN
ADDED GATE & FIR
205 DIM. TO 215
10/28/68 7 REVISED PLANT A
AREA. LOCATED TRAC
Revised track
Revised Stor
10/2/68 6 Store Room W
REVISED VIS
REVISED STA
9/16/68 5 ACCORDING
ADDED STA. HOS
ADDED 26'
8/21/68 4 ROAD & INDIC
VISITORS RO
INDICATE
8/1/68 3 FOR POINT
REVISED S
ADDED
7/22/68 2 RELOCA
ADDED
7/8/68 1 BACK-FIL
DATE NO.
THIS DRAWING
ELECTRIC POV
UPON CONDITIC
OR COPIED, IN
NISHING INFO
WRITTEN CON
FOR ANY PL
AND IS TO E
INDIA
BRI
TR


SLOPE DN.
200' V.C.
100'
100'
618.14'
617.0'
17.33
349.87
N 181,417.62
E 1,395,349.87
P.I.
165'-0"
T.O.R. EL.618.8'
T.O.R. EL.616.9'
50'
50'
V.C.
559.35'
417.62'
DITCH
5'-0"
L.P. EL.613.0'
920'-0"
650
625
675
648
644
647
633
634
629
605
604
NOTE:
DRAINAGE AROUND
SWITCH YARDS TO BE
ELEVAT
YARD



DATE	NO.	DESCRIPTION	APPD.
1/3/69	6	C.A.S. OF RED ARROW HIGHWAY AND GUARDRAIL ALONG ROADS.	W.S.
11/18/68	5	REVISED TRACK @ C&D.R.R. AND REROUTING OF THORNTON ROAD. REVISED BRIDGE SPAN AND DISTANCE OF ℄ ROADWAY TO ℄ TRACK	W.S.
10/28/68	4	REVISED RELOCATED THORNTON RD. ADDED SECTIONS M-M & N-N REVISED TRACK DIM. AT C.F.O. R.R. REVISED HIGHWAY BRIDGE, ROAD & TRACK ELEV. WEST OF BRIDGE	W.S.
10/2/68	3	Revised Plant Access Track from C&O.	W.S.
8/1/68	2	REVISED COORDINATES FOR POINT "P.I" OF MAIN ROAD	W.S.
7/22/68	1	RELOCATED VISITORS ROAD	W.S.

REVISIONS

INDIANA & MICHIGAN ELECTRIC CO.

DONALD C. COOK

NUCLEAR PLANT

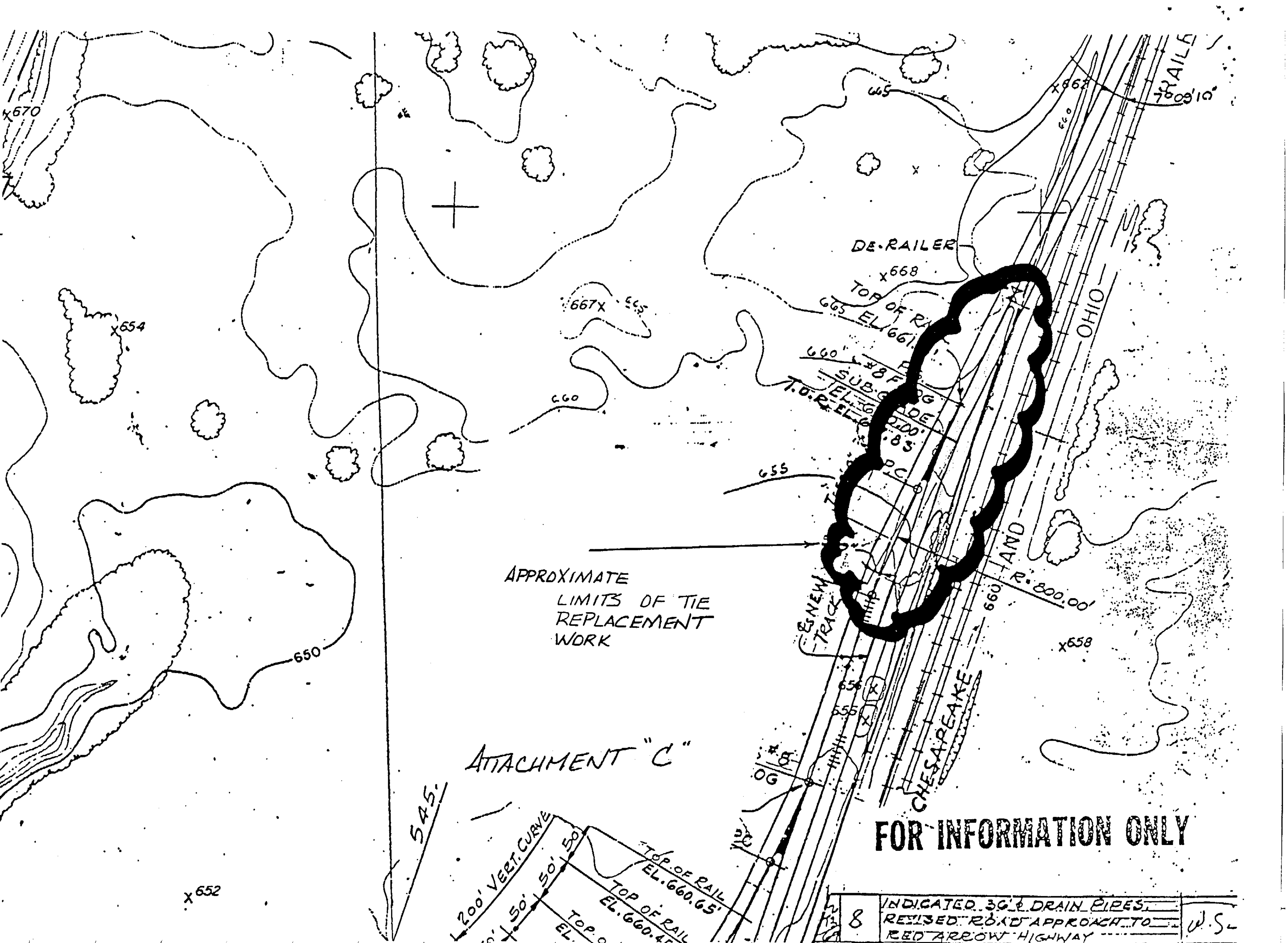
BRIDGMAN MICHIGAN

PLOT PLAN

TRACK AND ROAD LAYOUT

SH. 1

DR. NO. 12-3010-13



DE-RAILER
TOP OF RAIL
EL. 661.
SUBGRADE
T.O.R. EL.
PC
655
660
665
667x
x668
x670
x654
x652
x658
x662
650
545.
APPROXIMATE LIMITS OF TIE REPLACEMENT WORK
ATTACHMENT "C"
℄ NEW TRACK
CHESAPEAKE AND OHIO RAILROAD
R. 800.00'
200' VERT. CURVE
50' 50' 50' 50'
TOP OF RAIL EL. 660.65'
TOP OF RAIL EL. 660.45'
FOR INFORMATION ONLY
8
INDICATED 36" DRAIN PIPES.
REVISED ROAD APPROACH TO RED ARROW HIGHWAY
W.S.

(ATTACHMENT
TYPICAL SECT
EXCAVATION
RAIL TIE REPL

	AREA	METH
1)	765 KV YARD	BALLA
2)	MAIN TRACK	BALLA.
3)	SWITCH #9	TRACTO

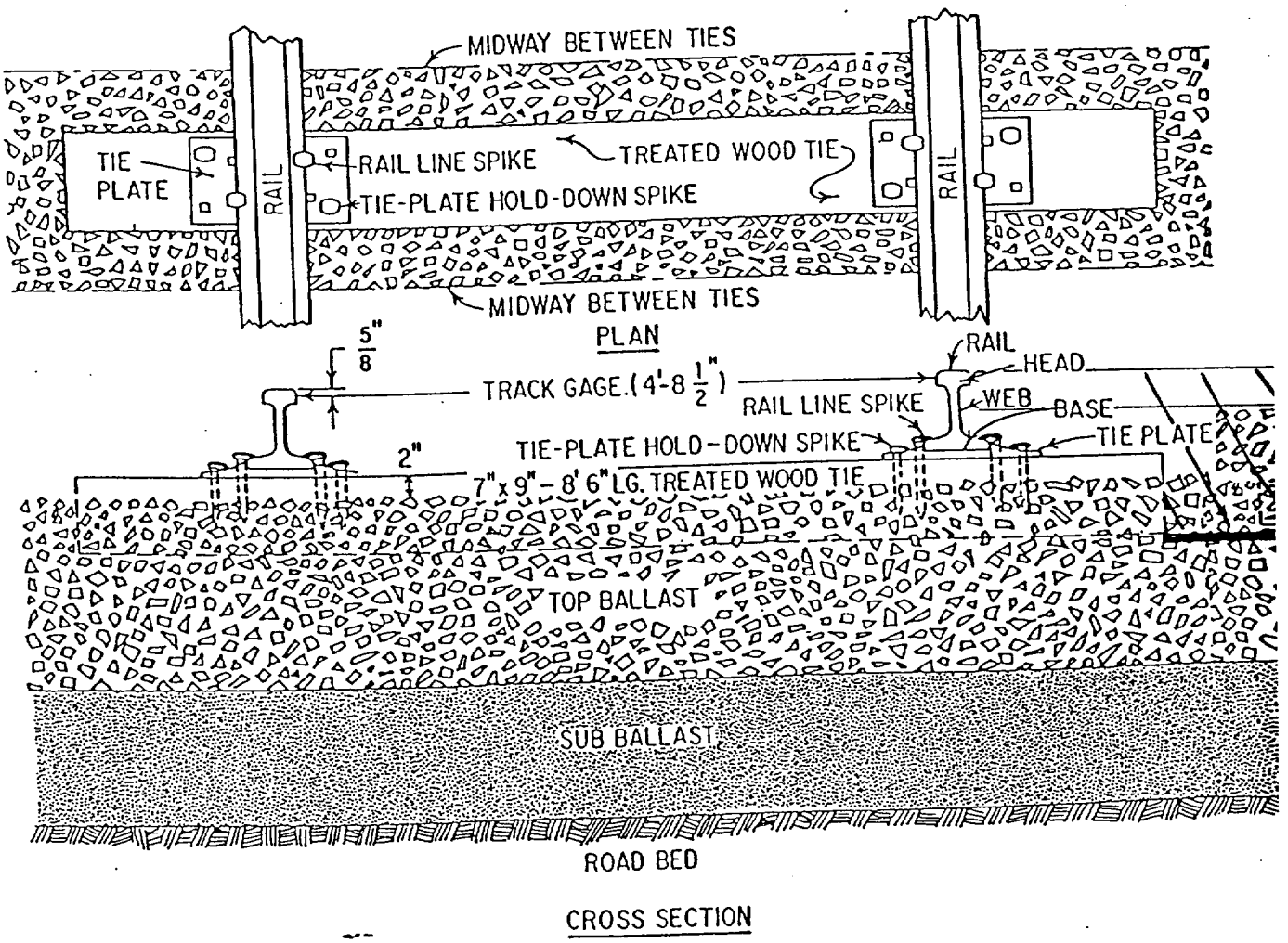


Fig. 19-18. Typical standard-gage, duo-rail track on tangent.

"D")

TION

LIMITS FOR

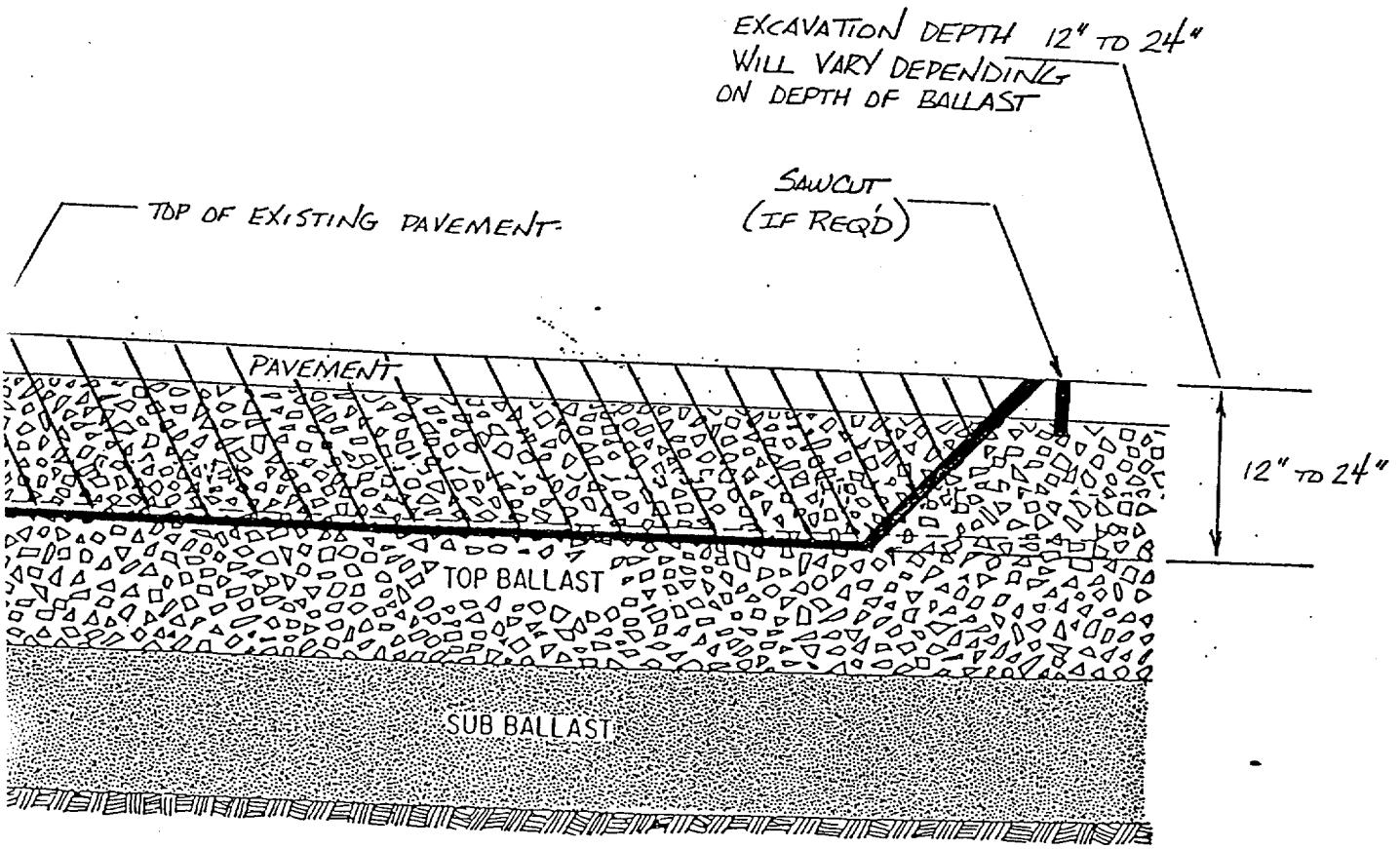
LACEMENTS

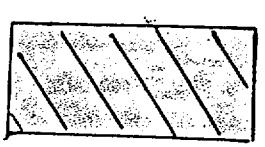
HOD OF EXCAVATION

AST REGULATOR

ST REGULATOR

OR / BACKHOE





DENOTES AREA
TO BE EXCAVATED

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-030
Revision # 0
Expiration Date 10/31/2000

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

ESTABLISH A LAYDOWN AREA TO STORE MATERIALS RELOCATED FROM THE OLD SGR STORAGE BLDG. (MAUSOLEUM) - ONLY

Department: ~~J.A. Jones~~ SGRP 12/1/98 Contact: J.A. Jones Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

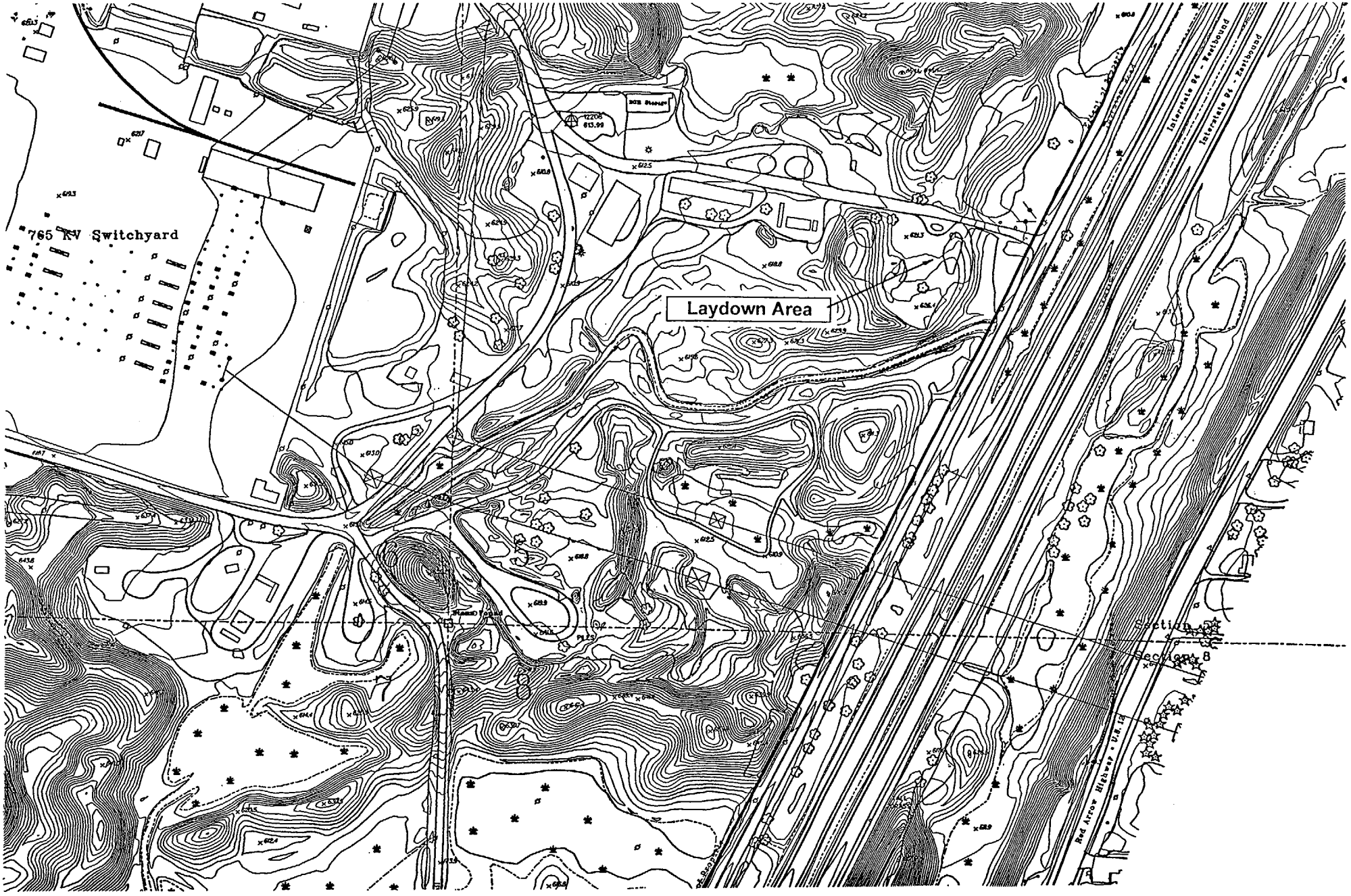
These materials should be moved back once 5/6 work is complete and this site restored.
Contact ENV if any soil disposal is necessary.

3. Potential permit or plan requirements/changes

☐	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☐	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☐	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

Reviewer/Evaluator _____ Date 12/4/98
General Supervisor - Environmental Review _____ Date 12/4/98


765 KV Switchyard
Laydown Area
Section 8
Section 8
Red Arrow Highway - U.S. 12
Interstate 94 - Eastbound
Interstate 94 - Eastbound

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 98-033
Revision # 0
Expiration Date 3/15/99

PMP 6090 ADM.001
Attachment 2

Closed and sent to NRM on 4/12/99 EM.

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

1) INSTALL POLES & GUY WIRES FOR POWER SUPPLY TO STEAM GENERATOR STORAGE BUILDING.
2) INSTALL POLE & PLATFORM FOR POWER SUPPLY TO NEW SGRP FAB SHOP/WAREHOUSE

fab shop

Department: SGRP Contact: Joe Jones Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☑ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Pole install's are NOT covered in Regulations, Letter to state 4-30-91. states The company's position on Pole sets.

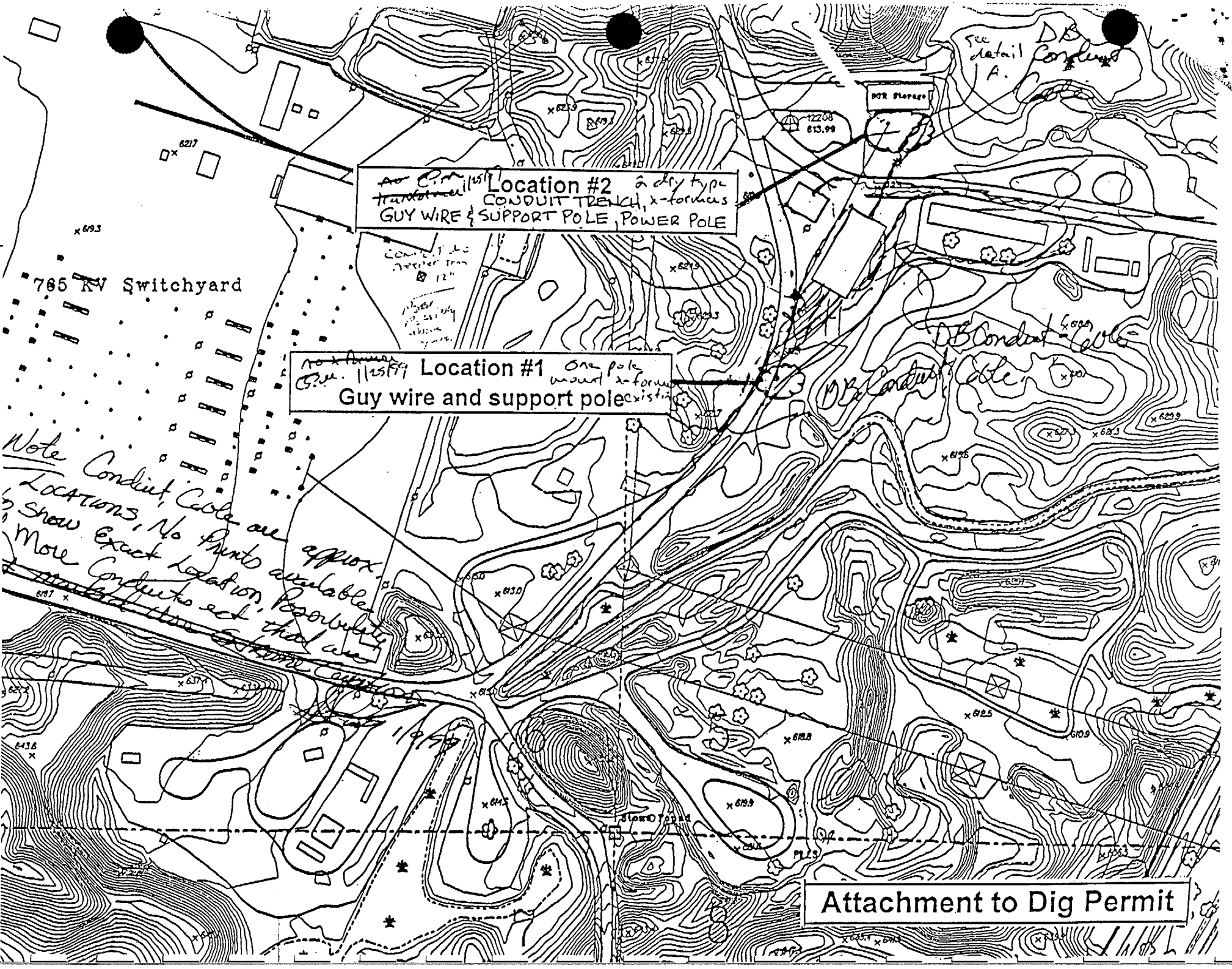
3. Potential permit or plan requirements/changes

☑	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☑	Michigan Storm Water Construction Permit	☐	PIP Plan	☑	Storm water
☑	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

all required Docs Do Not apply. <5 acres of Dist. soil >500' from water outside Crit. Dune line. - NON PCB TRANSFORMERS only.

Reviewer/Evaluator [signature] Date 12/21/98
General Supervisor - Environmental Review [signature] Date 12/23/98


765 KV Switchyard
Location #2
CONDUIT TRENCH, x-formers
GUY WIRE & SUPPORT POLE, POWER POLE
Location #1
Guy wire and support pole
DB Conduit Cable
Note Conduit Cable are approx Locations, No Prints available to show Exact Location, Boarbility More Conduits ect that are
Attachment to Dig Permit

DIGGING PERMIT # 1023 REV. 1

DESIGN CHANGE OR C/R NO. N/A JOB ORDER N/A

DIGGING PERMIT

Work Group:

Requested By: R. S. BROWN Department SGRP Phone # 3565

Date Requested: 1/6/99 Date Digging is to start: 1/18/99

Reference Drawing(s) No.: SEE ATTACHED SKETCH Work Lines:

LOCATION: (If a trench, list starting point, termination point(s) and intermediate points where direction changes).
ADJACENT TO OLD STEAM GENERATOR STORAGE BUILDING AND ADJACENT TO ACCESS ROAD AS SHOWN ON ATTACHED SKETCH.

REASON FOR EXCAVATION: INSTALL POLES & GUY WIRES FOR POWER SUPPLY TO OLD S/G STORAGE BUILDING & CONDUIT TRENCH FOR POWER TO TEMP TRAILER.
FACILITIES LIKELY TO BE ENCOUNTERED: SEE ATTACHED DIG. PERMIT.

REMARKS: SEE ATTACHED DIG PERMIT. PREVIOUS LOCATION 2 DELETED AND LOCATION 4 WILL BE INCORPORATED INTO ANOTHER DIG PERMIT. Hand Excavate to verify location of U.G. Conduit and Cables. Use Extreme Caution. Contact MTIS Rep for assistance. Hand Excavate to a minimum of 5'-0" Below Grade prior to machine excavation if necessary.

Reviews:

See Remarks Date: 1/22/99 — MTIS Electrical

See Attached Sheet for Approx Cable/Conduit Location

Date: 1/22/99 — MTIS Civil

Date: 1-22-99 — MTIS Mechanical

Date: 1/25/99 — Environmental

Date: _____ — Safety Coordinator

NOTES:

1. Don't start digging until all reviews are completed
2. Post this permit at the digging work site before digging begins

A/R # NA
J.O. # NA
J.O.A.# NA

(Assigned by Environmental Affairs)
Review # 98-033
Revision # 1
Expiration Date ~~3/15/99~~ 6/30/99 1/25/99

PMP 6090 ADM.001
Attachment 2

Closed and sent to NRM on 4/12/99 C.W.

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

INSTALL POWER POLE, GUY WIRES & CONDUIT TRENCH PER ATTACHED SKETCH. Install office trailer, electrical panel, 2 dry type step down x-formers + welder per Detail A.

Department: SERP Contact: RAY BROWN Ext. 3565
Pgr 0168

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

General Guide allowed for Pole maint. and installation practices. Minor trenching is OK - Protect from excess erosion contact Env for Spoil disposal

3. Potential permit or plan requirements/changes

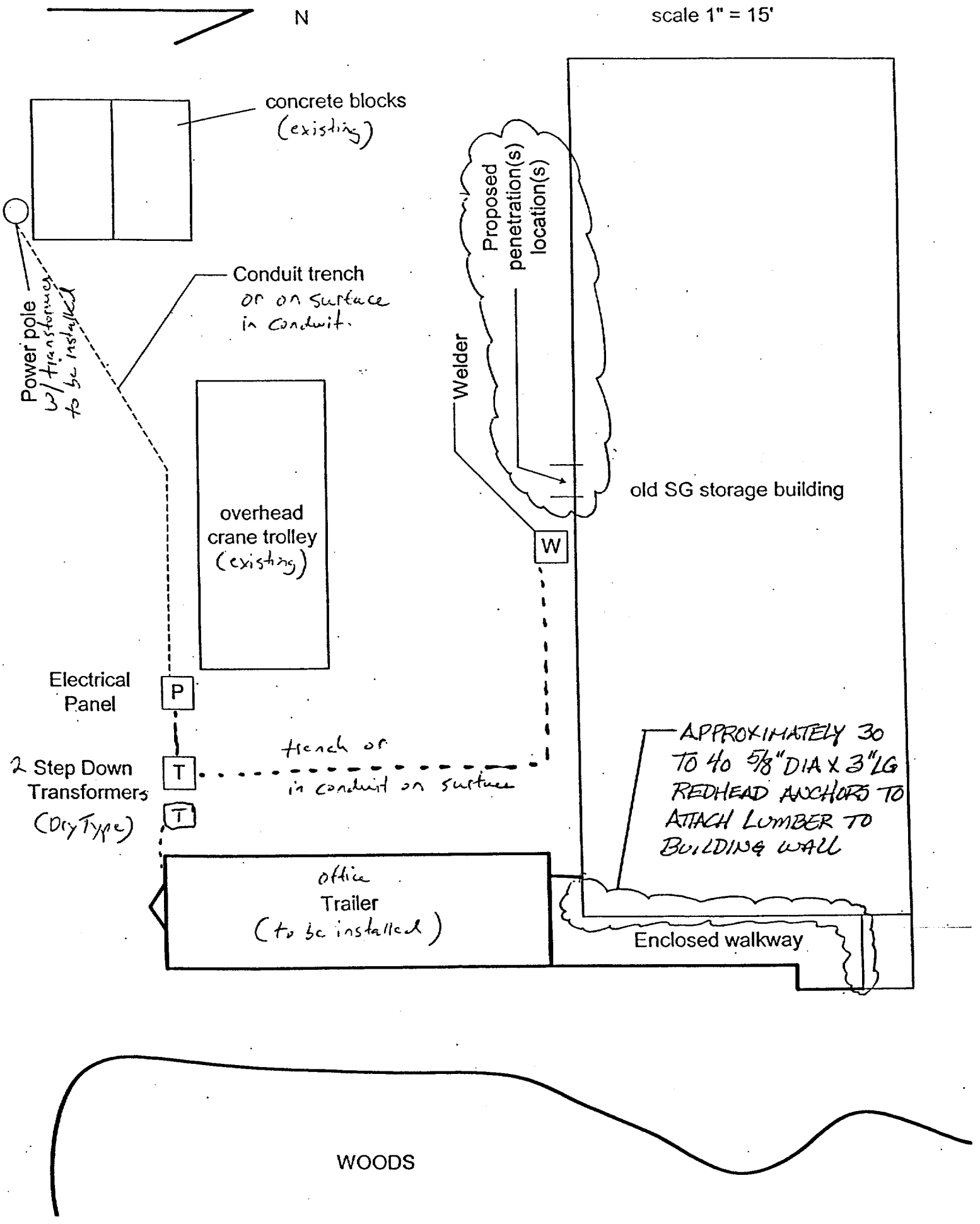
☑	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☑	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☑	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Perm
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit fo Wetlands and Waterways		

4. Additional comments:

Ockser Crit. Dunes line - Will be Permit, >500' from lake shoreline B.C. erosion not required. < 5 acres disturbed soil no storm water permit required.

Reviewer/Evaluator _____ Date 1-25-99
General Supervisor - Environmental Review _____ Date 1/25/99

Detail A


N
scale 1" = 15'
concrete blocks
(existing)
Power pole
w/ transformers
to be installed
Conduit trench
or on surface
in conduit.
overhead
crane trolley
(existing)
Proposed
penetration(s)
location(s)
Welder
W
old SG storage building
Electrical
Panel
P
2 Step Down
Transformers
(Dry Type)
T
T
trench or
in conduit on surface
APPROXIMATELY 30
TO 40 5/8" DIA X 3" LG
REDHEAD ANCHORS TO
ATTACH LUMBER TO
BUILDING WALL
office
Trailer
(to be installed)
Enclosed walkway
WOODS

A/R # NA
J.O. # NA
J.O.A.# NA

(Assigned by Environmental Affairs)
Review # 99-009
Revision # 0
Expiration Date 5/30/99

PMP 6090 ADM.001
Attachment 2

Closed 5/12/99

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable.. Attach additional pages as necessary.

Brush: 15' from Center of Track
TRIM TREES ALONG RAILROAD TRACKS FROM RED ARROW HWY TO SWITCH ONE. This is FOR The Two Generators That will Be Railed out FRIDAY TO prevent BRANCHES FROM Slicing Holes in Shrink WRAP. will Also remove 2 ≈ 15' high Pine trees near The Highway.

Department: ANR Contact: John MOCK Ext. 1162 / Pgr 6810

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

all Brush can be left at the side of the Tracks away from the path of train cars.

3. Potential permit or plan requirements/changes

☒	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☐	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☐	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

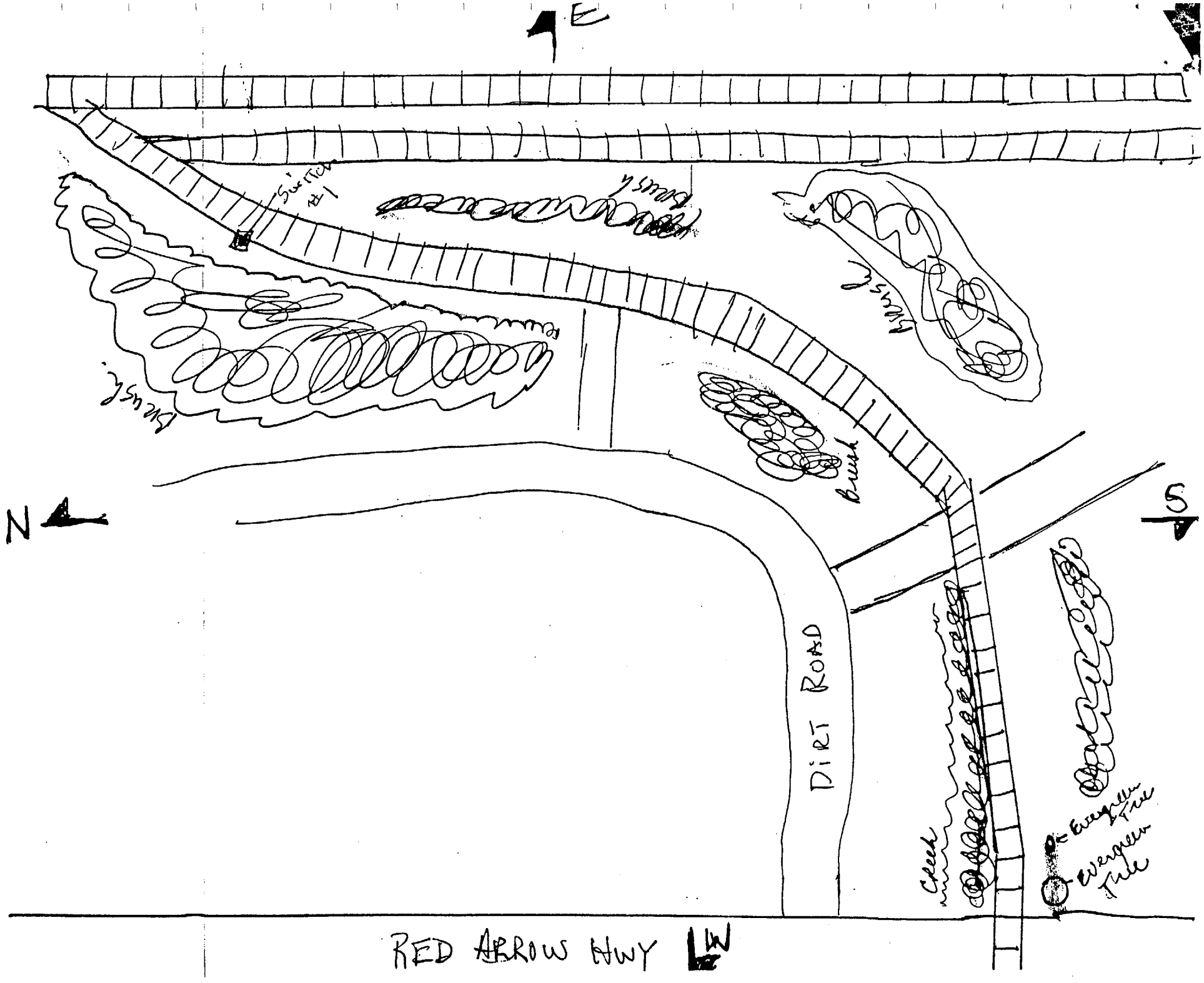
No Permits required for Trimming of Vegetation.

4. Additional comments:

all work is outside the critical Dune Line - No C. Dune Permit required. No other Permits are required for this Job.

Reviewer/Evaluator [signature] Date 4-27-99

General Supervisor - Environmental Review [signature] Date 4/27/99


E
Site Plan #1
Bushes
Bushes
Bushes
Brush
N
S
DIRT ROAD
Creek
Evergreen Tree
Evergreen Tree
RED ARROW HWY
LW

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 99-013
Revision # 0
Expiration Date 6/30/00

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

SITE PREPARATION AND CONSTRUCTION OF STEAM GENERATOR WAREHOUSE FACILITY. WORK INCLUDES FOUNDATION PREPARATION, PARKING LOT INSTALLATION & GRADING, AND INSTALLATION OF POWER & COMMUNICATIONS SEE ATTACHED SKETCH FSK-C-001, SHT 1 of 1 AND BRIEF DESCRIPTION.

Department: SGRP Contact: Joseph A. Jones Ext. #3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☒ YES ☒ N/A
(If yes, attach screening to this review)

C. Cole 5/12/99

This project will be captured in the environmental screening performed by Eva Huerta-Pavia

2. Work requirements and restrictions

Control Soil erosion on-site, Ensure Runoff is addressed by using Erosion Control devices such as filter fence or mulch. Inspect weekly for signs of erosion and filter fence deterioration. Repair damage as necessary. Seal/mulch/protect soils upon paving is complete. Prevent water accumulation in nearby roads. ENV. techs will inspect this Job as required in Amplex ADM. 001.

3. Potential permit or plan requirements/changes

☒	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☒	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☒	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:

Area is outside of Critical Dune Line and is exempt from Critical Dune Permit. Area is exempt from Berrien County Erosion Permit since it is a paving Project. Area is >500 feet from a Surface water and a Storm water permit is not required

Reviewer/Evaluator _____ Date 5-7-99

General Supervisor - Environmental Review _____ Date 5-7-99

Permit 99-013
(Supplemental information)
SPOIL DISPOSAL AREA

Option 1 = Place organic material along South bank, between paint, blast shack and 345 KV yard. Construct an 18" high burm along top of ridge and stabilize disposal area to avoid erosion.

Option 2 = Place spoil in a pile located in the Southeast corner of the concrete disposal yard.

Option 3 = Place spoil at a two on one slope along the East side of the concrete disposal area.

approved Blair Jordan 6-25-99

BLAIR,

I HAVE SAVED THIS ON PAUL SCHULTZ MACHINE UNDER PERMIT 99013.

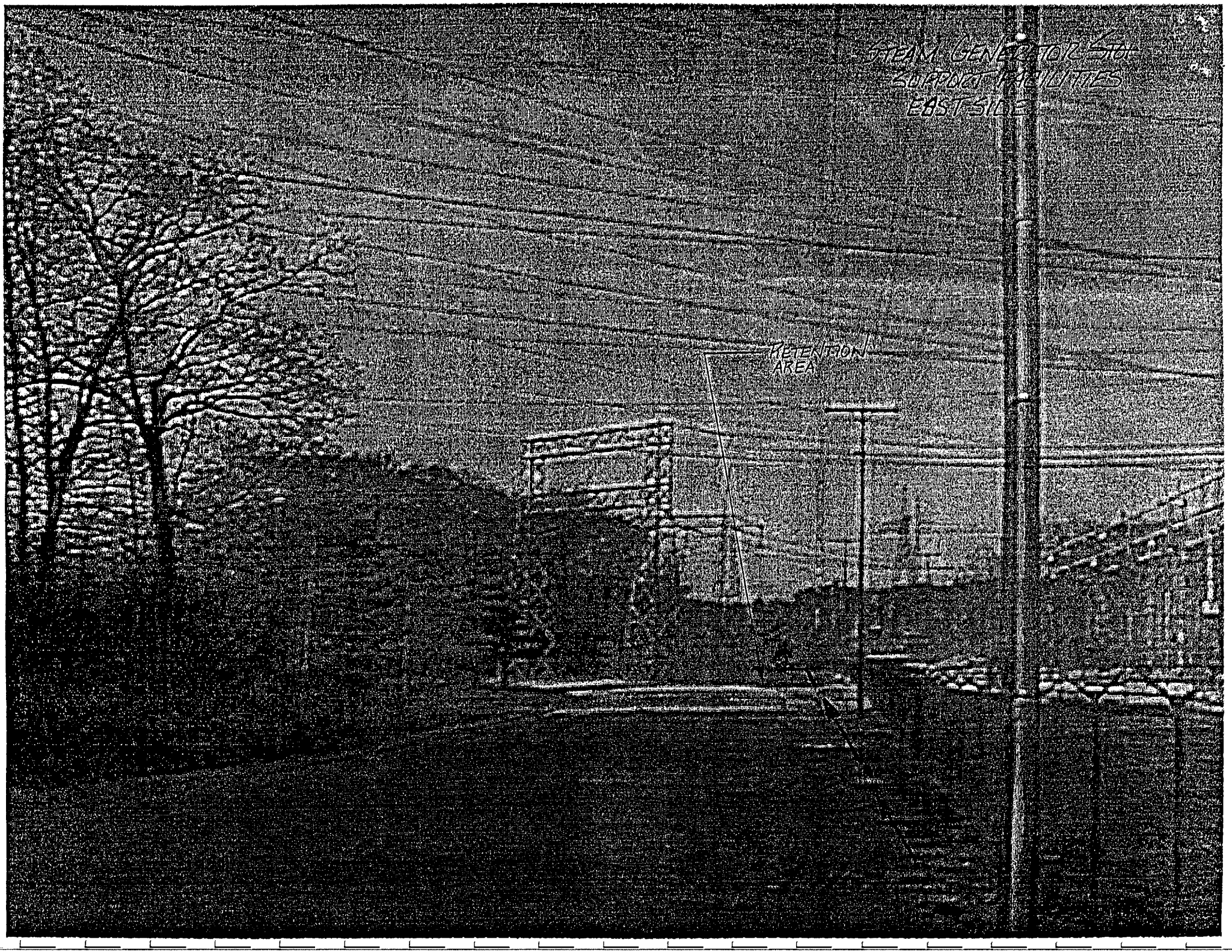
THANKS FOR YOUR TIME.

DEWAYNE SUTTON

X3581

Received by:

Lee Miller - 6/25/99


STEAM GENERATOR SITE
SUPPORT FACILITIES
EAST SIDE
RETENTION
AREA

Attachment to Environmental Review.

Steam Generator Warehouse

Please refer to FSK-C-001.

The Warehouse improvements consist of grading an area covering 110' x 180' or approximately .45 acres. A 60' x 100' x 4" thick concrete slab will then be constructed to support the warehouse. Drainage from the warehouse site will be accomplished via a surface drainage system, which will send run off to the east and then south along the east fence line. At the south end of the fence line is a small retention area, which will hold any water drained from the area.

During construction of the warehouse facility the contractor will be required to install erosion control devices.

Permit 99-013
(Supplemental information)
SPOIL DISPOSAL AREA

Option 1 = Place organic material along South bank, between paint, blast shack and 345 KV yard. Construct an 18" high burm along top of ridge and stabilize disposal area to avoid erosion.

Option 2 = Place spoil in a pile located in the Southeast corner of the concrete disposal yard.

Option 3 = Place spoil at a two on one slope along the East side of the concrete disposal area.

Approved B Jensen 6-25 99

BLAIR,

I HAVE SAVED THIS ON PAUL SCHULTZ MACHINE UNDER PERMIT 99013.

THANKS FOR YOUR TIME.

DEWAYNE SUTHERS

X3581

Reviewed by:

C Waller 6/25/99

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 99-014
Revision # 0
Expiration Date 6/30/00

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

SITE PREPARATION AND CONSTRUCTION OF STEAM GENERATOR FAB SHOP AND STORAGE BUILDINGS. WORK INCLUDES FOUNDATION PREPARATION, PARKING LOT INSTALLATION AND GRADING, AND INSTALLATION OF POWER AND COMMUNICATIONS

Department: SGRP Contact: Joseph A. Jones Ext. #3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☒ YES ☒ N/A
(If yes, attach screening to this review)

CQuc 5/12/99*
*this project will be captured in the environmental screening performed by Eva Huerta-Pavia

2. Work requirements and restrictions

Control soil erosion on site, Ensure Runoff is addressed by using Filter Fence. Inspect weekly to ensure fence is still in good condition. Seal/protect soils when paving is completed. Prevent water accumulation in Roadways. Envi. techs will inspect this Job as required in PMP 6090 ADM.001

3. Potential permit or plan requirements/changes

☒	Critical Dune/High Risk Erosion	☐	Asbestos	☐	Ground water
☒	Michigan Storm Water Construction Permit	☐	PIP Plan	☐	Storm water
☒	Erosion (Berrien Co. Drain Comm)	☐	SPCC Plan	☐	Chemical Storage Permit
☐	Waste Storage Permit	☐	Hazwoper	☐	NPDES
☐	Air	☐	Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways		

4. Additional comments:
Remove/Disregard Item #15 on attached Print.
Minor grading for Parking Lot Preparations do not require a Berrien County Soil Erosion Permit. This area is not within critical Dune area and is also >500' from Lake Michigan. Therefore no Critical Dune permit or Stormwater Permit is applicable.

Reviewer/Evaluator BLorza Date 5-7-99
General Supervisor - Environmental Review [signature] Date 5-7-99

Attachment to Environmental Review.

Steam Generator Fab Shop / Generator Storage Buildings

Please refer to FSK-C-001.

The Fab Shop / Generator Storage Building improvements consist of grading an area covering 240' x 180' or approximately .99 acres and an area of 140' x 25' or approximately .08 acres. A 75' x 205' x 6" thick concrete slab will then be constructed to support the buildings. Drainage from the site will be accomplished via a surface drainage system, which will send run off to the west and then south along the west fence line. At the south end of the fence line is a small retention area, which will temporarily hold water drained from the area.

Note: There is past evidence of runoff in this area crossing the road and running back north.

During construction of the Fab Shop / Generator Storage facility the contractor will be required to install erosion control devices.


STEAM GENERATOR SUPPORT #4
WEST SIDE LOOKING SOUTH
RETENTION AREA


STEAM GEN. SUPPORT FAC.
WEST SIDE

A/R # N/A
J.O. # N/A
J.O.A.# N/A

(Assigned by Environmental Affairs)
Review # 99-022
Revision # 0
Expiration Date 8/30/99

PMP 6090 ADM:001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

"SEE ATTACHED"

Department: SGRP Contact: DEWAYNE JUHNKE Ext. 3581

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

follow attached. Well abandonment Procedure / Disregard steps 1, 2, 3, - This is a boring hole and not a well. there is no water Depth present here. - BE/ais 6/16/99

3. Potential permit or plan requirements/changes

- ☐ N/A Critical Dune/High Risk Erosion
- ☐ N/A Michigan Storm Water Construction Permit
- ☐ N/A Erosion (Berrien Co. Drain Comm)
- ☐ N/A Waste Storage Permit
- ☐ N/A Air
- ☐ N/A Asbestos
- ☐ PIP Plan
- ☐ SPCC Plan
- ☐ Hazwoper
- ☐ Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways
- ☐ N/A Ground water
- ☐ Storm water
- ☐ Chemical Storage Permit
- ☐ NPDES

4. Additional comments:

well is an observation boring 14' deep x 2" wide. Not a true well, but a hole used to evaluate soil composition. Work is done, and needs to be filled in for SGRP work

Reviewer/Evaluator [signature] Date 6/16/99
General Supervisor - Environmental Review [signature] Date 6/16/99

Seal abandon well # B-506 OBS

Well is located north of the 345 KV switchyard. This well is an old soil boring, used to identify underground material for the temporary (New) steam generator storage building complex. (Reference drawing FSK-C-001 SHT 1 of 1)

Well shall be filled with AEP approved bentonite clay (# 0987) per manufactures instructions. Then cut off approximately twelve inches below existing grade.

The upgrade to this area will include the placement of structural backfill (with an approximate depth of 1'- 4") over the abandon well.

DeWayne Juhnke
Bechtel SGRP
Lead Civil Engineer
X 3581

AEP
INDIANA MICHIGAN POWER

Date May 3, 1994

Subject Cook Plant Well Abandonment

From J. L. Hughey JL Hughey

To J. T. Massey-Norton

I spoke with Lee Ann Claucherty (Michigan DNR) about our concerns regarding the groundwater monitoring well abandonment at Cook Plant. Michigan does not have specified procedures for well closure. However, the MDNR sent the attached letter approving of the Indiana DNR guidelines for well closures.

Please follow the referenced procedures, then send me the closure documentation for Environmental Affairs submittal to the DNR. Also, we would like to notify the DNR about the new well's installation date, location, and depth. Please provide me with the pertinent data after the project completion.

JLH/sdb/013

Attachment

c: D. L. Baker - att.
A. A. Blind - att.
~~D. M. Fitzgerald~~/J. P. Carlson - att.

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

ROLAND HARMES, Director

Plainwell District Headquarters
P.O. Box 355, Plainwell, Michigan 49080-0355

April 26, 1994

RECEIVED
APR 2 8 1994
ENVIRONMENTAL AFFAIRS

Mr. Jon Hughey
Indiana-Michigan Power Company
P.O. Box 60
Fort Wayne, Indiana 46801

Dear Mr. Hughey:

SUBJECT: Groundwater Monitoring Well Abadonment,
Indiana-Michigan Power Company, Berrien County

This letter serves to respond to recent telephone conversations between Indian-Michigan Power Company and the Michigan Department of Natural Resources (MDNR) regarding the abandonment of a groundwater monitoring well at your facility. The abandonment of the well is necessary because it is located in an area where a treatment facility expansion is planned. The monitoring well to be abandoned is not part of any groundwater monitoring program regulated by the MDNR.

Guidelines for well abandonment developed by the Indiana Department of Natural Resources were sent to this office. These guidelines are acceptable to use at the facility. The Waste Management Division is requesting that you provide documentation to this office regarding the abandonment of the aforementioned well.

If you have any questions, please contact me at 616-685-0033.

Sincerely,

Lee Anne Claucherty, Geologist
Waste Management Division
Plainwell District

LAC:ls

cc: Jim Janiczek, WMD
Leep/Douglas/file

WELL ABANDONMENT PROCEDURES

Monitoring wells are installed to determine the existing groundwater quality. They will be abandoned when necessitated by construction activities. The following abandonment procedures will be followed:

1. The depth to water shall be measured and recorded. The sampling device shall be removed from the well.

2. A five-foot long dummy probe shall be used to measure the depth of the well and note any obstructions within the well bore.

3. The depth of the well as measured by the dummy probe shall be compared to the recorded depth on the well log.

4. The well shall be grouted with bentonite-cement grout slurry and emplaced by a tremie pipe starting at the bottom of the hole.

5. The entire length of the well bore shall be grouted to grade elevation.

6. The casing protector and casing shall be cut off at grade elevation.

7. The date of well abandonment shall be noted on the well log. The well log shall be retained on file until the disposal site is released from its post-closure monitoring requirements.

Professional Service Industries, Inc.
RECORD OF SUBSURFACE EXPLORATION

Boring: B-506

Project Name: STEAM GENERATOR REPLACEMENT PROJECT Date of Boring: 9-3-98

Site: D.C. COOK NUCLEAR POWER PLANT - BRIDGMAN, MI Project No: 152-85080

DESCRIPTION	DEPTH ft.	SAMPLE	N	CLASS	REMARKS
SURFACE ELEVATION 614.8					
Brown clayey SAND with gravel, dry, dense 611.8		1-SS	31	SC	Approx. Plant Coordinate N: 181,945 E: 1,396,244
Light Brown fine SAND, trace of medium sand and silt, dry, medium dense to dense		2-SS	27	SP	Sample 1-SS: 19% Gravel 62% Sand (37%F, 18%M, 7%C) 19% Fines
		3-SS	13	SP	
	5	4-SS	18	SP	
		5-SS	10	SP	
603.8		6-SS	34	SP	
Light Brown fine SAND, trace of medium sand and silt, very moist, dense to medium dense	10	7-SS	43	SP	Sample 7-SS: 87% Fine Sand 11% Medium Sand 2% Fines
		8-SS	34	SP	
		9-SS	18	SP	Sample 9-SS: 90% Fine Sand 9% Medium Sand 1% Fines
597.8	15	10-SS	19	SP	
END OF BORING AT 15 FEET. Groundwater was observed at a depth of about 9 feet while drilling. A monitoring well was installed at this location. A water level was measured on 9-16-98. At this time, groundwater was measured at a depth of about 9.5 feet.	20				Drilled By: CME-75 3.25" I.D. HSA Driller: Nick Eckerle
	25				

STEP #1 DEPTH OF WATER ELEVATION 603.6'

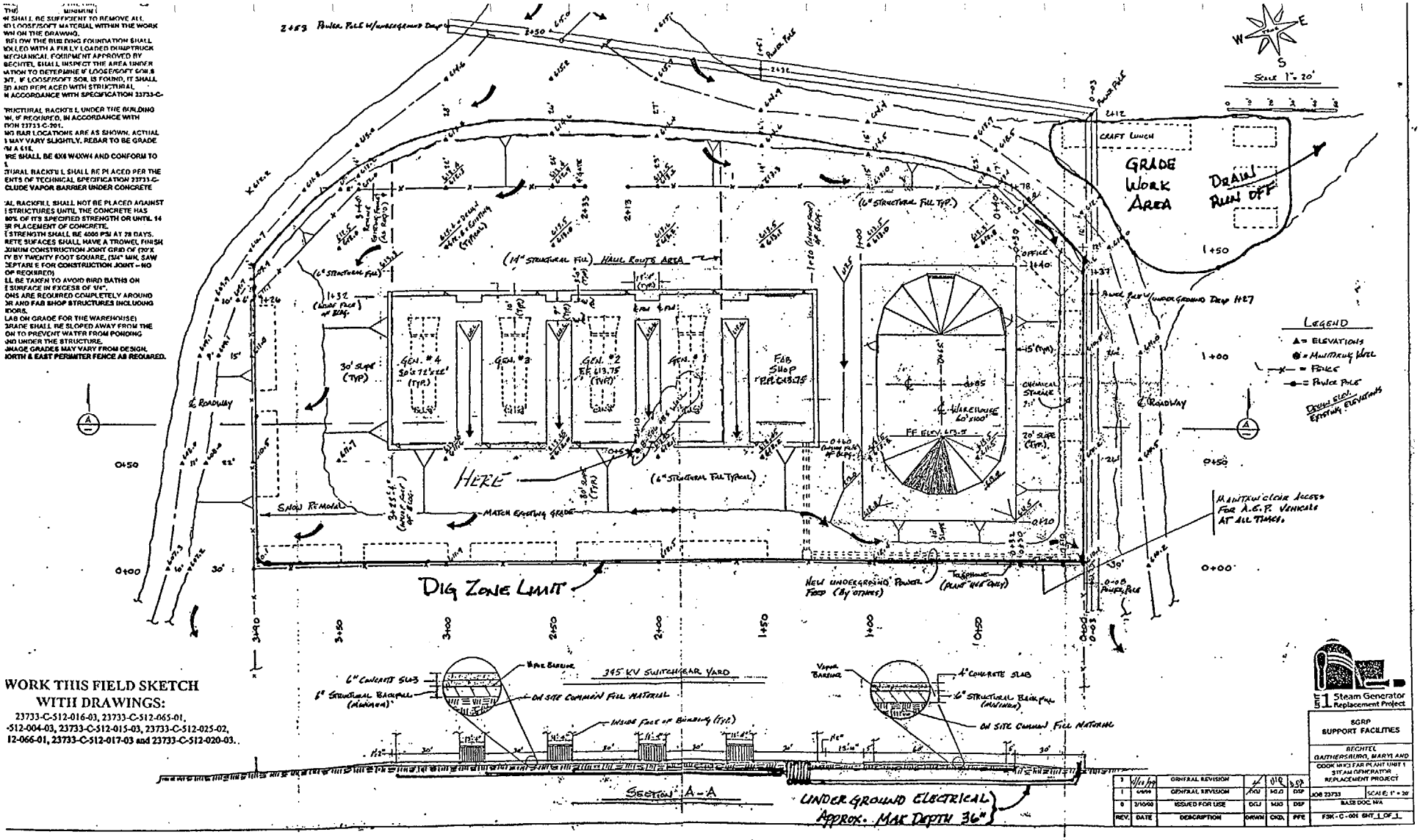
STEP #3 DEPTH OF WELL ELEVATION 599.1'

7/15/99

RBB 7/15/99

BORING ABANDONED 15 JULY 99

STEP #2 = NOTE: NO OBSTRUCTIONS IN WELL BORE.



THE MINIMUM
M SHALL BE SUFFICIENT TO REMOVE ALL
NT LOOSE/SOFT MATERIAL WITHIN THE WORK
WN ON THE DRAWING.
BELOW THE BUILDING FOUNDATION SHALL
OLLED WITH A FULLY LOADED DUMPTRUCK
MECHANICAL EQUIPMENT APPROVED BY
BECHTEL SHALL INSPECT THE AREA UNDER
NATION TO DETERMINE IF LOOSE/SOFT SOILS
ENT. IF LOOSE/SOFT SOIL IS FOUND, IT SHALL
ED AND REPLACED WITH STRUCTURAL
N ACCORDANCE WITH SPECIFICATION 23733-C-

TRUCTURAL BACKFILL UNDER THE BUILDING
W, IF REQUIRED, IN ACCORDANCE WITH
TION 23733-C-201.
NG BAR LOCATIONS ARE AS SHOWN. ACTUAL
S MAY VARY SLIGHTLY. REBAR TO BE GRADE
M A 615.
IRE SHALL BE 6X6 W4XW4 AND CONFORM TO
.
TURAL BACKFILL SHALL BE PLACED PER THE
ENTS OF TECHNICAL SPECIFICATION 23733-C-
CLUDE VAPOR BARRIER UNDER CONCRETE

AL BACKFILL SHALL NOT BE PLACED AGAINST
STRUCTURES UNTIL THE CONCRETE HAS
80% OF ITS SPECIFIED STRENGTH OR UNTIL 14
ER PLACEMENT OF CONCRETE.
STRENGTH SHALL BE 4000 PSI AT 28 DAYS.
RETE SURFACES SHALL HAVE A TROWEL FINISH
IMUM CONSTRUCTION JOINT GRID OF (20'X
Y BY TWENTY FOOT SQUARE, (3/4" MIN. SAW
CEPTABLE FOR CONSTRUCTION JOINT – NO
OF REQUIRED)
LL BE TAKEN TO AVOID BIRD BATHS ON
E SURFACE IN EXCESS OF 1/4".
DMS ARE REQUIRED COMPLETELY AROUND
ER AND FAB SHOP STRUCTURES INCLUDING
RDERS.
LAB ON GRADE FOR THE WAREHOUSE)
RAINS SHALL BE SLOPED AWAY FROM THE
ON TO PREVENT WATER FROM PONDING
AND UNDER THE STRUCTURE.
RMAGE GRADES MAY VARY FROM DESIGN.
NORTH & EAST PERIMETER FENCE AS REQUIRED.

WORK THIS FIELD SKETCH WITH DRAWINGS:

23733-C-512-016-03, 23733-C-512-065-01, -512-004-03, 23733-C-512-015-03, 23733-C-512-025-02, 12-066-01, 23733-C-512-017-03 and 23733-C-512-020-03..

REV.	DATE	DESCRIPTION	DRAWN	CKD.	PE
3	9/15/99	GENERAL REVISION	JMU	MJO	DSP
1	6/8/99	GENERAL REVISION	JMU	MJO	DSP
0	3/10/99	ISSUED FOR USE	DCL	MJO	DSP

UNIT 1 Steam Generator Replacement Project

SGRP SUPPORT FACILITIES

BECHTEL GAITHERSBURG, MARYLAND

COOK NUCLEAR PLANT UNIT 1 STEAM GENERATOR REPLACEMENT PROJECT

JOB 23733 SCALE: 1" = 20'

BASE DOC. N/A

FSK-C-001 SHT_1 OF_1_

A/R # A0182586
J.O. # _____
J.O.A.# _____

(Assigned by Environmental Affairs)
Review # 99-027
Revision # 0
Expiration Date 9-30 99

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

WORK REQUIRED FOR INSTALLATION OF DCP-316 INCLUDES PAVEMENT SAWCUTTING & REMOVAL AND EXCAVATION WORK REQUIRED FOR TRANSFORMER FOUNDATION, CONDUIT ROUTING AND SWITCHBOARD VAULT.

Department: SGRP Contact: J.A. Jones Ext. 3483

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Control spoil areas / Protect storm drains.
Reuse all soil back to trench. Contact P. Schultz or B. Asbury for disposal of asphalt and extra soil.

3. Potential permit or plan requirements/changes

- ☐ Exempt - Inside protected area Critical Dune/High Risk Erosion
- ☐ NA Michigan Storm Water Construction Permit
- ☒ 2732 Erosion (Berrien Co. Drain Comm)
- ☐ NA Waste Storage Permit
- ☐ NA Air
- ☐ NA Asbestos
- ☐ PIP Plan
- ☐ SPCC Plan
- ☐ Hazwoper
- ☐ Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways
- ☐ NA Ground water
- ☐ Storm water
- ☐ Chemical Storage Permit
- ☐ NPDES

4. Additional comments:

Amend B.C. Erosion Permit 2732 over the Phone 7/8/99 (Glenn Kreiger) followed by a letter with additional area

Reviewer/Evaluator _____ Date 7/8/99
General Supervisor - Environmental Review _____ Date 7/8/99

DIGGING PERMIT # _____ REV. _____

DESIGN CHANGE OR C/R NO. DCP-316 JOB ORDER _____

DIGGING PERMIT

Work Group: SGRP

Requested By: J.A. Jones Department SGRP Phone # 3483

Date Requested: 6/16/99 Date Digging is to start: 7/12/99 Expiration Date: _____

Reference Drawing(s) No.: _____ Work Lines: _____

LOCATION: (If a trench, list starting point, termination point(s) and intermediate points where direction changes). * ALL DIMENSIONS ARE APPROXIMATE
SEE ATTACHED SKETCH. THE CONDUIT TRENCH LOCATION MAY CHANGE BASED ON THE RESULTS OF GROUND PENETRATING RADAR SERVICES TO BE PERFORMED.
TRANSFORMER EXCAVATION = (15' x 15' x 5.5' DEPTH), CONDUIT RUN = (3.5' x 200' x 5.5' DEPTH)
SWITCHBOARD VAULT = (12' x 12' x 8' DEPTH)

REASON FOR DIGGING: INSTALL TRANSFORMER FOUNDATION, CONDUIT RUNS AND SWITCHBOARD VAULT FOR DCP-316.

FACILITIES LIKELY TO BE ENCOUNTERED: BURIED CABLE AND CONDUITS, STORM SEWERS, *** F.P. Piping Hyd. #7, Sanitary Piping See Drawing 12-5260-36 For Location)

REQUEST USE OF EXCAVATION EQUIPMENT TO REMOVE PAVEMENT: (BACKHOE), PAVEMENT BREAKER

REMARKS: WORK SCOPE INCLUDES SAWCUTTING AND REMOVAL OF PAVEMENT, EXCAVATION FOR TRANSFORMER FOUNDATION, CONDUIT ROUTE AND SWITCHBOARD VAULT.
** REQUEST USE OF HYDROVAC EXCAVATION METHOD IN LIEU OF HAND EXCAVATION **

Underground Drawings Reviewed:

DEO 6-16-99 2-HOT 2-1141-40	/ Douglas Owens DEO	/ 6-16-99
MTIS Electrical Drawings	Print Name/Initial	Date
12-3041-18 YARD DRAINAGE	/ Phil Richard PR	/ 6/16/99
MTIS Civil Drawings	Print Name/Initial	Date
*** 12-5260-SE	/ Jamie Leto JL	/ 6-16-99
MTIS Mechanical Drawings	Print Name/Initial	Date
Scan Complete See notes on attached sketch	/ W.R. Chesney / WRC	/ 7/8/99
Underground Scan Completed	Print Name/Initial	Date
Blair Jordan	/ Blair Jordan / BRJ	/ 7/8/99
Environmental Department	Print Name/Initial	Date
	/	/
AEP Supervisor	Print Name/Initial	Date
	/	/
Safety Coordinator	Print Name/Initial	Date

NOTES:
1. Don't start digging until all reviews are completed
2. Post this permit at the digging work site before digging begins

DIGGING PERMIT PROBLEM REPORT

If during the digging operation, contact is made with any obstruction, digging is to stop immediately. The Excavator must contact his AEP Supervisor. The Operations Shift Manager and Environmental shall be notified if plant equipment has been damaged. The Excavator/Supervisor will document the item encountered, date, time, and the names of the individuals contacted. It is the responsibility of the AEP person(s) responsible for the digging operation to resolve the difficulty. Upon resolution they should date, time, and initial below to indicate digging can continue.

Digging is not to continue until this requirement is met.

Reference Digging Permit: _____

ITEM ENCOUNTERED AND AT WHAT DEPTH (Including archaeological artifact information): _____

_____

_____

_____

_____

_____

_____

EXCAVATOR/SUPERVISOR: _____ DATE:_____ TIME: _____

AEP Individual: _____ Time Contacted: _____

SM/ASS/US: _____ Time Contacted: _____
(only if damage occurs)

ENVIRONMENTAL: _____ Time Contacted: _____
(only if damage causes a spill)

RESOLUTION: _____

_____

_____

_____

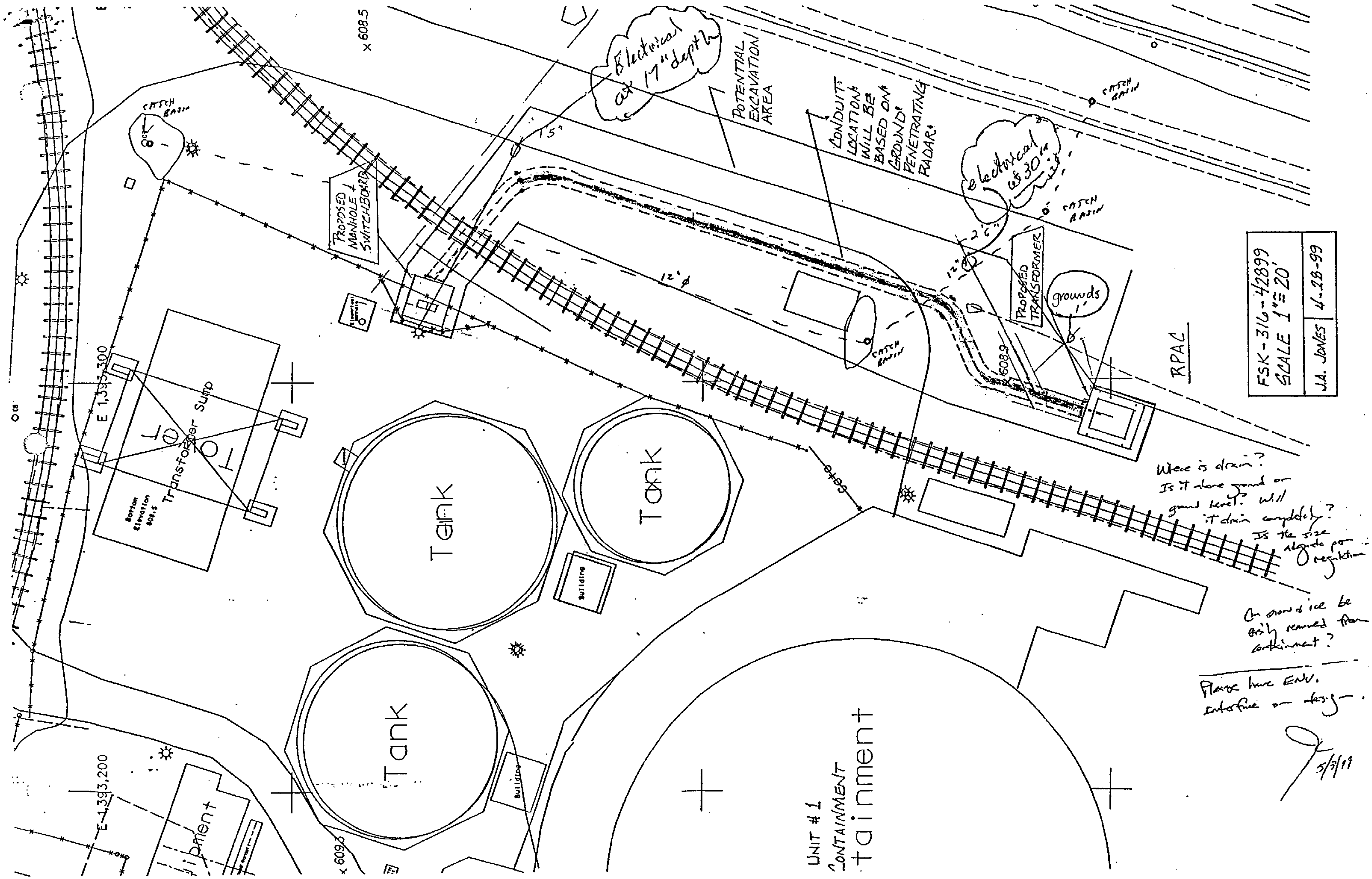
_____

_____

_____

Permission to resume digging: [ ] YES [ ] NO

AEP: _____ Date: _____ Time: _____



Electrical at 17" depth
POTENTIAL EXCAVATION AREA
CONDUIT LOCATION WILL BE BASED ON GROUND PENETRATING RADAR
electrical at 30 in
CATCH BASIN
CATCH BASIN
CATCH BASIN
CATCH BASIN
PROPOSED MANHOLE & SWITCHBOARD
PROPOSED TRANSFORMER
grounds 1"
12" ϕ
RPAC
FSK-316-42899
SCALE 1"=20'
J.A. JONES
4-28-99
E 1,393,300
Transformer Sump
Bottom Elevation 608.5
Tank
Tank
Tank
Building
Building
Unit #1 Containment
tainment
E 1,393,200
608.5
608.9
609.5
Where is drain? Is it above ground or ground level? Will it drain completely? Is the size adequate per regulation?
Can snow & ice be easily removed from containment?
Please have ENV. interface on design.
5/3/99

A/R # A-188095
J.O. # _____
J.O.A.# _____

(Assigned by Environmental Affairs)
Review # 99-033
Revision # 0
Expiration Date 9/30/99

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

EXCAVATE TO EXISTING POTABLE WATER LINE. INSTALL NEW CONNECTION TO SUPPORT SGR PROJECT.

Department: SGRP Contact: D. GARRISON Ext. 3587

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Contain soils / prevent them from entering the storm Drains.

3. Potential permit or plan requirements/changes

- ☐ N/A Critical Dune/High Risk Erosion
- ☐ N/A Michigan Storm Water Construction Permit
- ☒ Erosion (Berrien Co. Drain Comm)
- ☐ N/A Waste Storage Permit
- ☐ N/A Air
- ☐ N/A Asbestos
- ☐ PIP Plan
- ☐ SPCC Plan
- ☐ Hazwoper
- ☐ Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways
- ☐ N/A Ground water
- ☐ Storm water
- ☐ Chemical Storage Permit
- ☐ NPDES

4. Additional comments:

Amended B. C. erosion Permit 2732 to include New trench ok'd by G. Kreiger 8/3/99 of the Drain office.

Reviewer/Evaluator B. Lafond Date 8/3/99
General Supervisor - Environmental Review R. Ell Date 8/3/99

DIGGING PERMIT # __________ REV. _____

DESIGN CHANGE OR C/R NO. N/A JOB ORDER __________

DIGGING PERMIT

Work Group: SGRP

Requested By: DAVE GARRISON Department SGRP Phone # 3587

Date Requested: 7-19-99 Date Digging is to start: 8-2-99 Expiration Date: __________

Reference Drawing(s) No.: 23733-C-007 (BECHTEL) Work Lines: __________

LOCATION: (If a trench, list starting point, termination point(s) and intermediate points where direction changes).
SEE ATTACHED DRAWING
SOUTH OF SECURITY HOUSE AT ACCESS ROAD "Y". TO SOUTH SIDE OF R.R. TRACK SPUR TO UNIT #1 TURBINE BAY. APPROXIMATELY 50' LONG

REASON FOR DIGGING: INSTALL POTABLE WATER LINE FOR SGR PROJECT USE.

FACILITIES LIKELY TO BE ENCOUNTERED: NONE

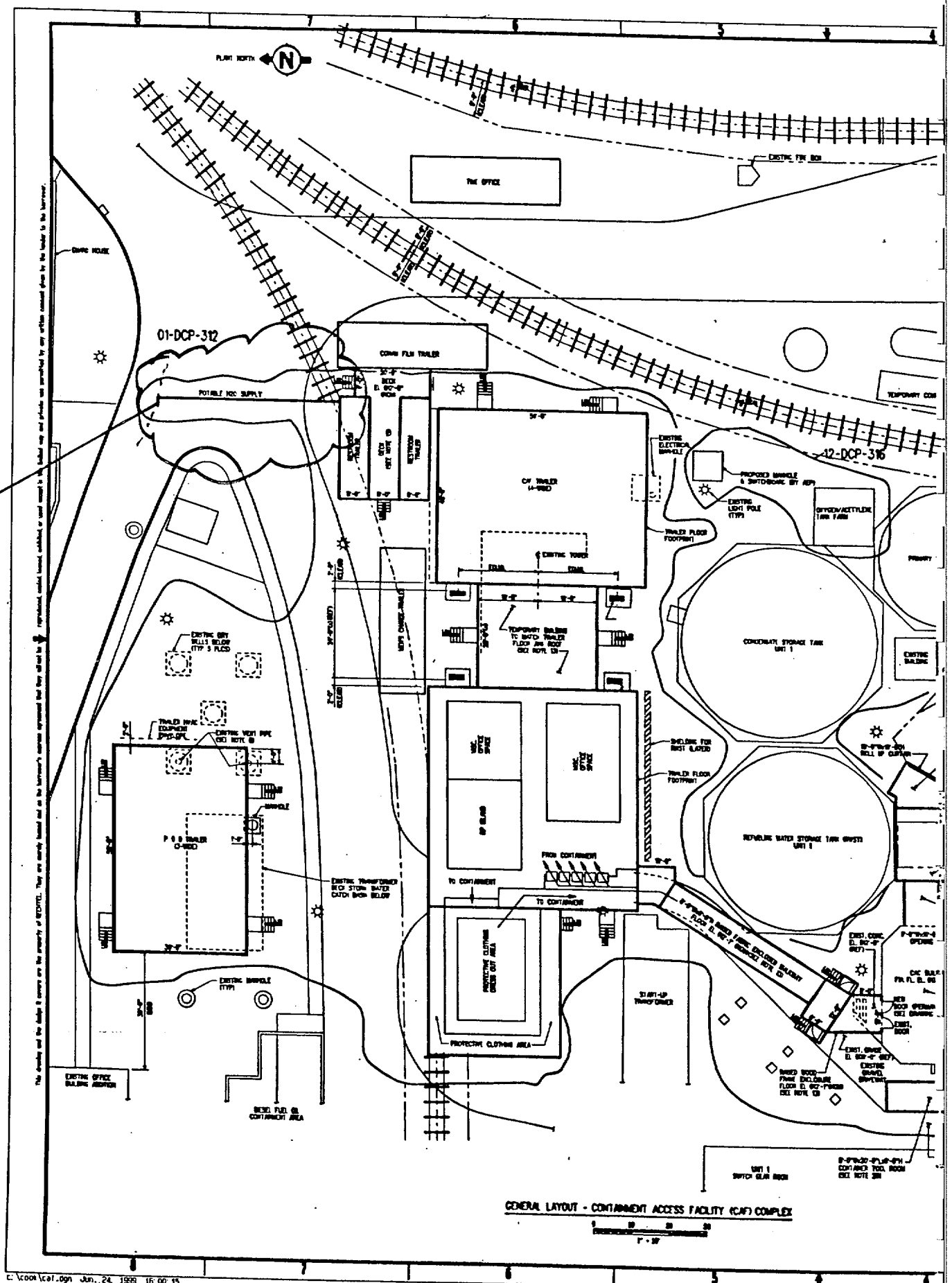
REMARKS: WORK SCOPE INCLUDES SAWCUTTING AND REMOVAL OF PAVEMENT. EXCAVATION TO EXISTING POTABLE WATER ~~REMARKS:~~ LINE (APPROX. 10'). REQUEST USE OF BACKHOE TO REMOVE PAVEMENT AND USE OF HYDROVAC EXCAVATION METHOD.

See Drawing 12-5260-~~3B~~ 3C For Yard Piping Location JL 7-22-99

Underground Drawings Reviewed:

OK 12-1141-40	/ Douglas Ovens DEO	/ 7-27-99
MTIS Electrical Drawings	Print Name/Initial	Date
OK 12-3041-18	/ Phil Richard PR	/ 7/20/99
MTIS Civil Drawings	Print Name/Initial	Date
OK 12-5260-3C	/ Jamie Leto JL	/ 7-27-99
MTIS Mechanical Drawings	Print Name/Initial	Date
SCAN COMPLETE SEE ATTACHED SHEET.	/ Earl Rose ER	/ 7-27-99
Underground Scan Completed	Print Name/Initial	Date
~~SCAN COMPLETE DEO 7-27-99 SEE ATTACHED SHEET.~~ B Zordell	/ Blair Zordell BZ	/ 8/3/99
Environmental Department	Print Name/Initial	Date
	/	/
AEP Supervisor	Print Name/Initial	Date
	/	/
Safety Coordinator	Print Name/Initial	Date

NOTES:
1. Don't start digging until all reviews are completed
2. Post this permit at the digging work site before digging begins

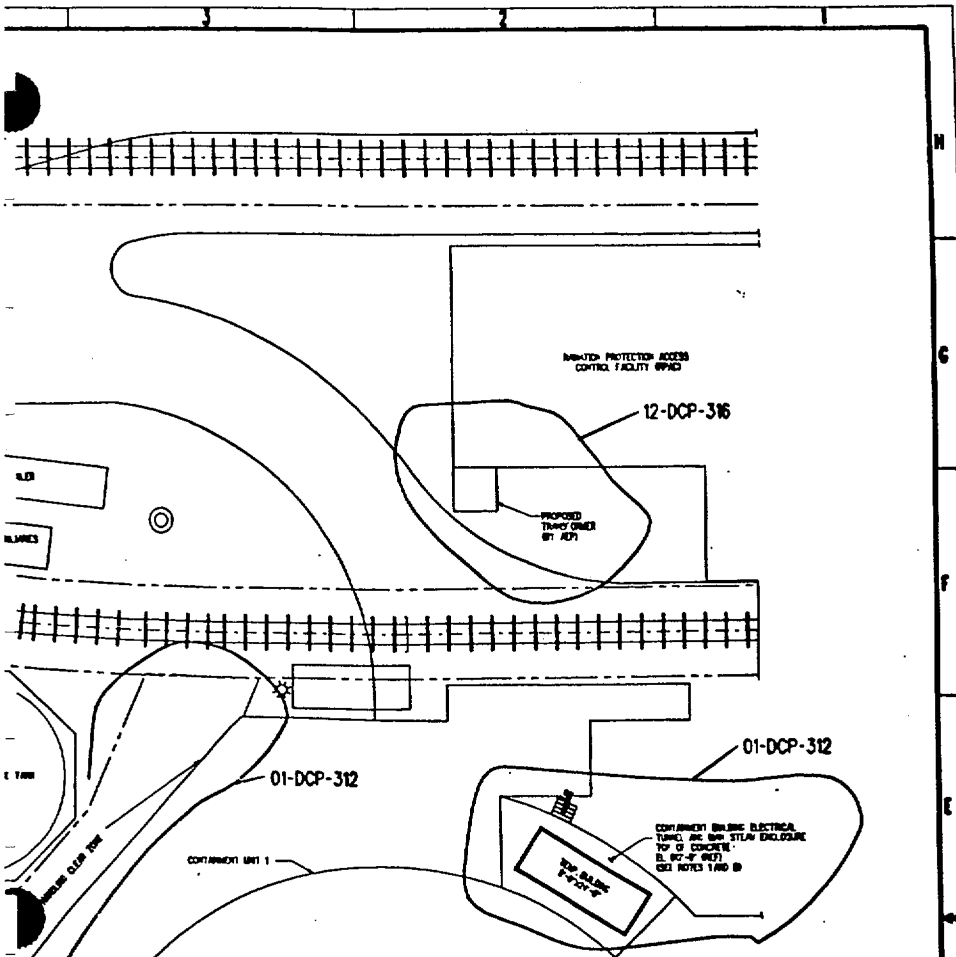


GENERAL LAYOUT - CONTAINMENT ACCESS FACILITY (CAF) COMPLEX

1" = 10'

c:\coor\caf.dgn Jun. 24, 1999 16:00:15

RAISED READING AT 10'



NOTES

1. ALL WORK ON THIS DRAWING IS NON-SAFETY RELATED EXCEPT FOR INSTALLATION OF ... IN THE CONTAINMENT BUILDING ELECTRICAL TUNNEL AND MAIN STEAM ENCLOSURE. INSTALLATION OF ... AT CONTAINMENT BUILDING ELECTRICAL TUNNEL AND MAIN STEAM ENCLOSURE SLAB IS SAFETY RELATED. WORK MAY BE PERFORMED AND ALL FACILITIES MAY BE INSTALLED AND REMOVED WITH UNIT 1 AND UNIT 2 IN ANY OPERATING MODE OR IN THE DEFUELED CONDITION. ALL CAF/CAC STRUCTURES AND MODIFICATIONS ARE TEMPORARY AND SHALL BE REMOVED WHEN NO LONGER REQUIRED FOR SGRP, UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS SHOWN ARE NOMINAL. CONSTRUCTION SHALL ADJUST TO SUIT IN THE FIELD BASED ON STANDARD PRODUCT SIZES AND DETAILED LAYOUTS.
3. PURCHASE EXPANSION ANCHORS PER AEP SPECIFICATION ES-CIVIL-...-QCN. INSTALL EXPANSION ANCHORS TO MEET THE TECHNICAL REQUIREMENTS OF AEP SPECIFICATION ES-CIVIL-0477-QCN.
4. REMOVE RAIN GUTTERS AND DOWN SPOUTS AS REQUIRED TO CLEAR WALKWAY AND REINSTALL AFTER REMOVAL OF WALKWAY. EXISTING DOOR MAY BE BLOCKED BY WALKWAY.
5. ALL FABRIC AND WOOD FRAME CONSTRUCTION SHALL BE FIRE-RETARDANT.
6. REMOVE TOP PORTION OF EXISTING VENT PIPE IF REQUIRED TO CLEAR BOTTOM OF TRAILER. CONNECT FLEX HOSE TO DIVERT GAS OUTSIDE FOOTPRINT OF TRAILER. REINSTALL PIPE BY SPLICING ... AFTER REMOVAL OF FOR TRAILERS.
7. SIZE AND LOCATION OF ACCESS PLATFORMS, STAIRS AND HANDRAILS SHALL BE DETERMINED BY FIELD.
8. FOR INSTALLATION OF ... CUTTING OF EXISTING REBAR IS NOT PERMITTED.
9. CRANES SHALL NOT BE USED TO INSTALL ANY TRAILER, WALKWAY OR TEMPORARY BUILDING ADJACENT TO THE ... OF THE CONTAINMENT EXTERIOR WALL.
10. REMOVE EXISTING LIGHT POLE, IF REQUIRED, BASED ON FINAL POSITIONING OF CAF TRAILERS AND ENTRANCE LOCATION PRIOR TO REMOVAL OF LIGHT POLE. COORDINATE WITH AEP SECURITY FOR MINIMUM LIGHTING REQUIREMENTS. IF REMOVED, REINSTALL LIGHT POLE AFTER REMOVAL OF CAF.
11. COORDINATE WITH AEP FOR POWER AND COMMUNICATION TIE-INS.
12. FOR PLACEMENT OF TRAILERS AND TEMPORARY STORAGE OF MATERIALS, MAINTAIN A MINIMUM CLEARANCE OF 8'-0" TO CENTERLINE OF RAIL AS SHOWN.

NOTES CONTINUED

13. CONSTRUCTION TO PROVIDE/ERECT TEMPORARY BUILDING, WALKWAYS, AND DECKS AS REQUIRED TO SUIT CONDITIONS. FABRICATE ALL TEMPORARY BUILDINGS, WALKWAYS, AND DECKS FROM WOOD, FABRIC AND ALUMINUM OR OTHER LIGHTWEIGHT FIRE RETARDANT MATERIALS.
14. FOR DOMESTIC WATER TIE-IN FOR CAF, SEE DRAWINGS 23733-C-...-30 AND 23733-C-...
15. FOR CAF ELECTRICAL WORK, SEE DRAWINGS 23733-E-...-4, 23733-E-...-R, 23733-E-...-08, 23733-E-...-8, 23733-E-...-7, 23733-E-...-R AND 23733-E-...-4.
16. INSTALLATION AND SUPPORT OF TRAILERS, TEMPORARY BUILDINGS, WALKWAYS AND DECKS SHALL NOT BLOCK OR ALTER EXISTING SITE CATCH BASINS OR DRAINAGE PATHS.
17. DO NOT SUPPORT TRAILERS, TEMPORARY BUILDINGS, WALKWAYS OR DECKS DIRECTLY ON ANY EXISTING AT-GRADE CONCRETE OR STRUCTURES. CAF TRAILERS AND TEMPORARY BUILDINGS MAY BE SUPPORTED DIRECTLY ON EXISTING SPARE TRANSFORMER PAD.
18. SUPPORT TRAILERS AS SHOWN IN DETAIL ...
19. INSTALL TRAILER RESTRAINT SYSTEM AS SHOWN IN DETAIL ...
20. INSTALL CONTAINER TOOL ROOM RESTRAINT SYSTEM AS SHOWN IN DETAIL ...

REFERENCE DRAWINGS

AEP DRAWINGS

12-...-48	34.5KV-&-4KV-POWER-DUCT-RUNS-&-CONTROL CABLE-PIPE RUNS IN PLANT YARD
12-3011-20	PLOT PLAN TRACK AND ROAD LAYOUT SH. 2
12-3040-4	ROADS, PARKING AREA AND YARD DRAINAGE SH. 1 OF 2
12-3041-8	ROADS, PARKING AREAS AND YARD DRAINAGE SH. 2 OF 2
12-5200-36	YARD PIPING UNIT 1 & 2
1-3...-6	TRANSFORMER DECK DRAINS & PIPING, DIESEL FUEL OIL TANK & PIPING UNIT 1
2-3...-7	TRANSFORMER DECK DRAINS & PIPING, DIESEL FUEL OIL TANK & PIPING UNIT 2
12-3...-2	UNITS NO. 1 & 2 STORM WATER CATCH BASIN IN VICINITY OF TRANSFORMER DECK MASONRY REINFORCING
1-3754-2	MAIN AND SPARE TRANSFORMER FOUNDATIONS UNIT 1
12-3...-4	UNIT 1 & 2 CONDENSATE STORAGE, PRIMARY WATER STORAGE, REFUELING WATER STORAGE TANK FOUNDATION MASONRY & REINFORCING PLAN & SECTIONS
12-3...-24	UNIT 1 & 2 CONTAINMENT BUILDING ELEC. TUNNEL AND MAIN STEAM ENCLOSURE SLAB EL 617-0' EAST PORTION MASONRY PLAN
12-3...-42	UNIT 1 & 2 CONTAINMENT BUILDING ELEC. TUNNEL AND MAIN STEAM ENCLOSURE (EAST) MASONRY SECTIONS

A	ISSUED FOR REVIEW FOR BOH DCP										

BECHTEL
GAITHERSBURG, MARYLAND

AMERICAN ELECTRIC POWER

DONALD C. COOK NUCLEAR PLANT UNIT 1
STEAM GENERATOR REPLACEMENT

CONTAINMENT ACCESS FACILITY COMPLEX - PLOT PLAN

JOB NO.	DRAWING NO.	REV.
23733	23733-C-007	A

A/R # ________
J.O. # ________
J.O.A.# ________

(Assigned by Environmental Affairs)
Review # ~~99-032~~ 99-037
Revision # 0 BJ2 8-13-99
Expiration Date 12-13-99

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

(SEE ATTACHED DWG 23733-C-007) SAW CUT AND REMOVE PAVEMENT (AS REQ'D) EXCAVATE FOR (EARTH ANCHOR) STORM TIE-DOWNS AND SURFACE SOIL REMOVAL FOR LEVELING PADS AND YARD DRAINAGE (AS REQ'D)

Department: SGRP Contact: DeWayne Juhnke Ext. 3581

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Contain all soils prevent them from entering Storm Drains. Approved for minor level changes only excavations should be minor in nature to ensure trailers are Level flash fill / flowable fill. Type 1 cement 50 to 100 lbs. fly ash + sand 500 lbs/yd³ 2,550 lbs/yds MDOT mix #2.

3. Potential permit or plan requirements/changes

☐ NA Critical Dune/High Risk Erosion
☐ NA Michigan Storm Water Construction Permit
☒ NA Erosion (Berrien Co. Drain Comm)
☐ NA Waste Storage Permit
☐ NA Air

☐ NA Asbestos
☐ PIP Plan
☐ SPCC Plan
☐ Hazwoper
☐ Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways

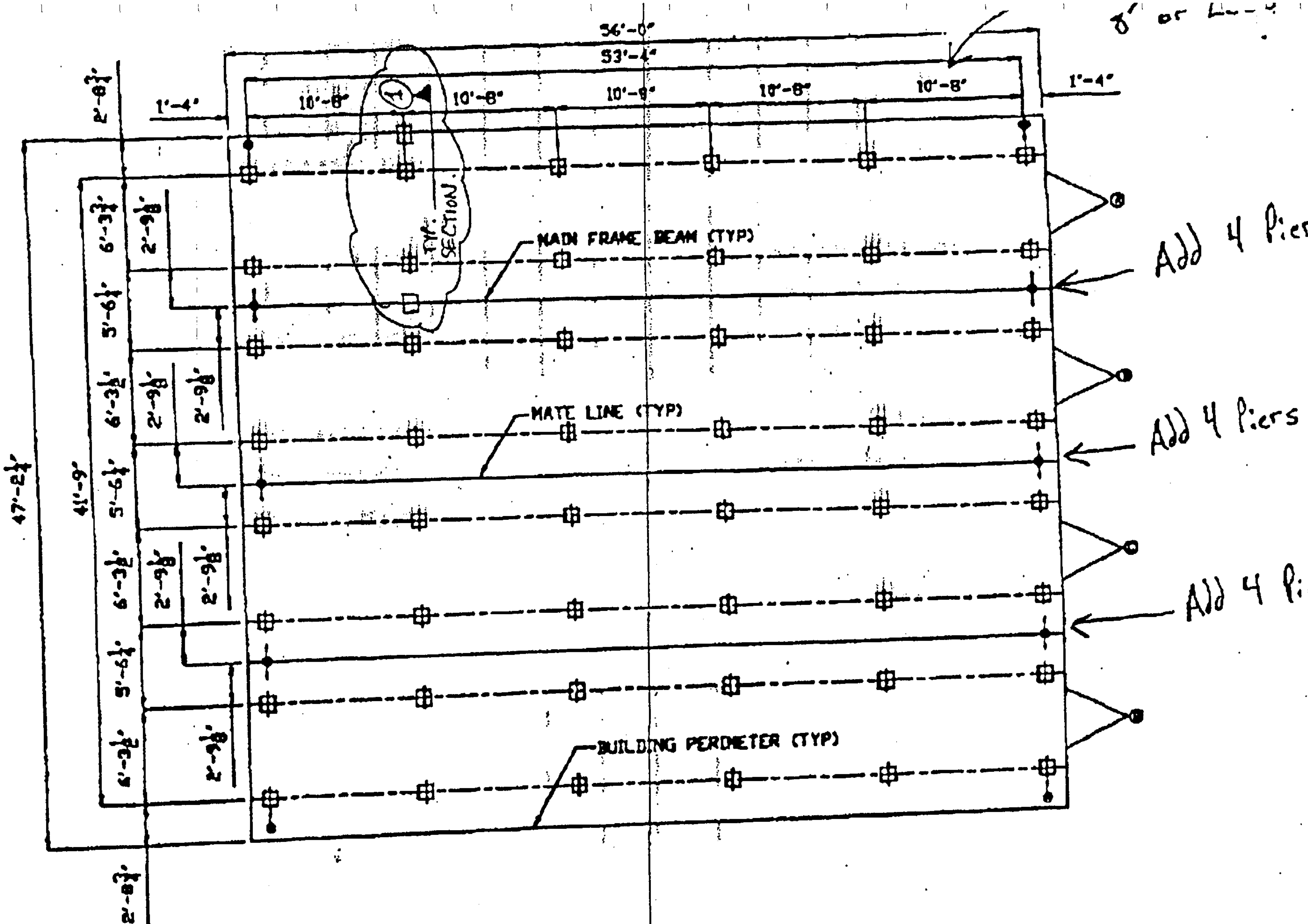
☐ NA Ground water
☐ Storm water
☐ Chemical Storage Permit
☐ NPDES

#2776
8/16/99

4. Additional comments: – Contact RP for any excess soil disposal
RP approval is required for Flash fill use.
Exempted by Michelle Hohn from Critical Dune Permitting due to location.
Stormwater is NA since < 5 acres. NA Minor excavations for B.C. erosion Permit
~~B.C. erosion: will amend Permit 2732 to include this trench.~~
~~Per G. Kroger 8/3/99~~

BK2
8/3/99

Reviewer/Evaluator [signature] Date 8/13/99
General Supervisor - Environmental Review [signature] Date 8-13-99

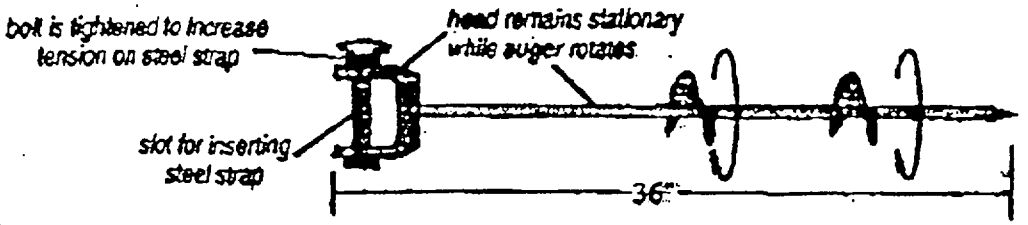


TRAILER LAYOUT-PLAN

STRUCTURES & FOUNDATIONS

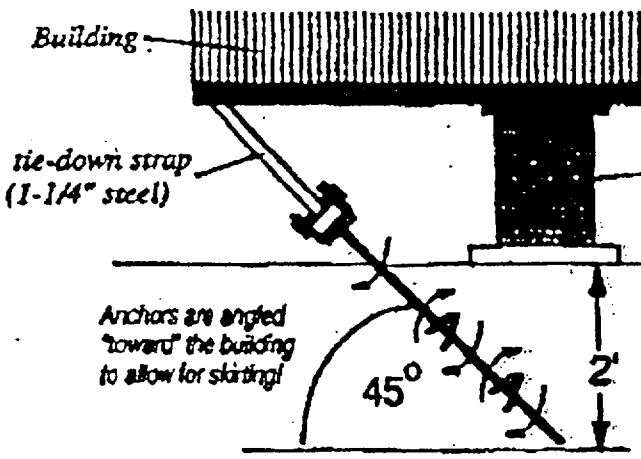
Anchors (or "Tie-Downs")

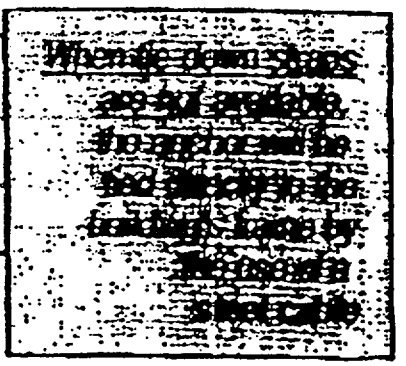
Anchors. By definition, an anchor ties the building to a fixed, immovable object. In the case of mobile and modular buildings, this "fixed, immovable object" is the earth. A typical anchor is shown below.

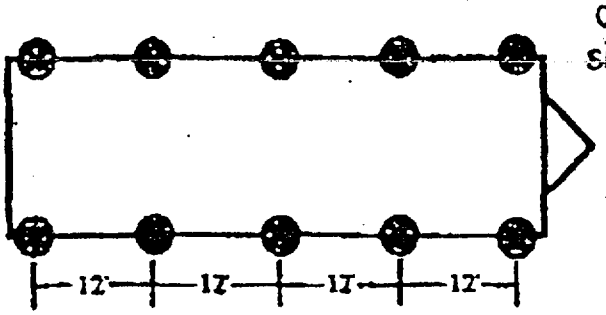


Anchors are best installed at a 45° angle into the ground, towards the building. Because of the auger-like disks, it is "screwed" into the ground to a depth of approximately 2 feet.

The anchor is attached to the building by threading the 1-1/4" tie-down straps (*also called "hurricane straps"*) through a bolt-like piece at the top of the anchor, and twisting to achieve tension. This is why anchors are often referred to as **"Tie-Downs"**.







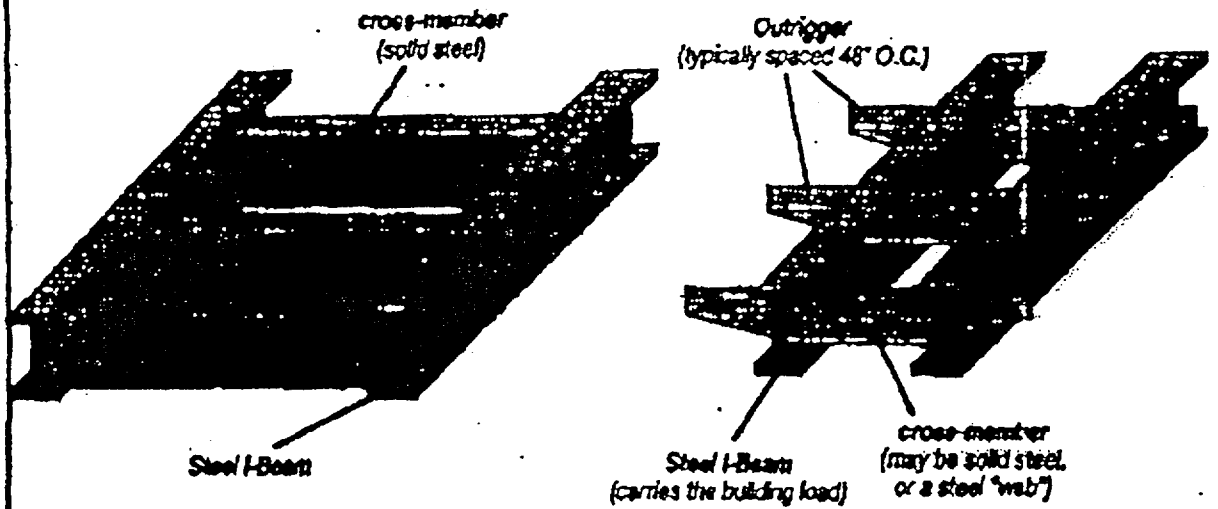
As a general rule, anchors are placed 12' on-center. This will vary, depending upon local building codes site conditions, and whether tie-down straps are still on the building!

Anchors are not typically part of the standard installation of the building. They cost extra – anywhere from $30 to $70 per anchor.

Assume 100 - 3x3x3 Holes

Frames. The frame is made of steel, and is the basic support for the floor system. It also provides the means of support while the building is being transported.

Two types of chassis frames are utilized in GE Capital Modular Space buildings:



Perimeter Frame

Also called a "Box Frame"

Steel I-beams form a "box" around the perimeter of the building

Solid steel cross-members traverse the interior of the frame

Building exterior walls bear directly upon the perimeter I-beams.

Heavy, bulky, and more expensive than Outrigger Frames

Used in buildings with exceptionally heavy floor loads, buildings with concrete floors, or buildings with perimeter stem wall foundations.

Outrigger Frame

Standard for GECMS buildings

2 Steel Jr. I-Beams carry the building load

Steel cross-members may be solid or "web-type"

Steel outriggers bear the exterior walls, and transmit the load to the I-beams

Light, efficient design

A/R # LA
J.O. # 1
J.O.A.# 1

(Assigned by Environmental Affairs)
Review # 99-039
Revision # 0
Expiration Date 8-31-99

PMP 6090 ADM.001
Attachment 2

PROJECT ENVIRONMENTAL REVIEW

A. DESCRIPTION OF PROPOSED ACTIVITY

Provide a brief description of the proposed activity. Include applicable supporting documentation to facilitate the review (e.g., map/drawing, type of chemicals, etc.). Provide Action Request number, Job Order and Job Order Activity, if applicable. Attach additional pages as necessary.

BR 8/18/99

Trench across road by Blast Shack, Paint Storage shack.
Run Conduit Line across 1411 and over to craft trailer.
Trench to Protect Line

Department: Bechtel Contact: Tandy Dillen/Ray Edgette Ext. 3561 3512

B. ENVIRONMENTAL REVIEW/EVALUATION
(Environmental Affairs to Complete)

1. Is an Environmental Screening required? ☐ YES ☒ N/A
(If yes, attach screening to this review)

2. Work requirements and restrictions

Don't Dig on hill, Protect vegetation if encountered.
(Trench will be within Road way

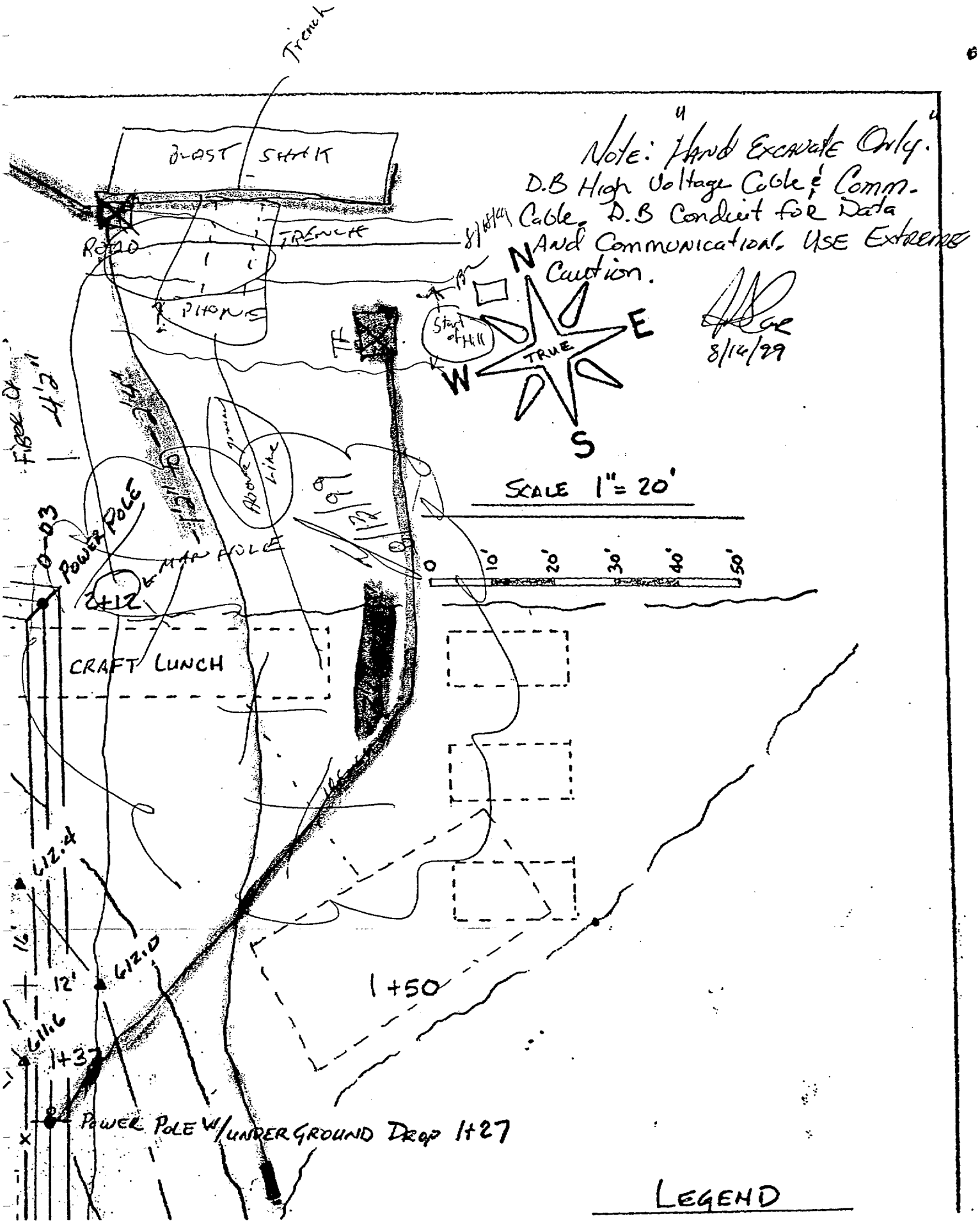
3. Potential permit or plan requirements/changes

- ☐ LA Critical Dune/High Risk Erosion
- ☐ Michigan Storm Water Construction Permit
- ☐ Erosion (Berrien Co. Drain Comm)
- ☐ Waste Storage Permit
- ☐ Air
- ☐ LA Asbestos
- ☐ PIP Plan
- ☐ SPCC Plan
- ☐ Hazwoper
- ☐ Joint Army Corps of Engineer/MDEQ Permit for Wetlands and Waterways
- ☐ LA Ground water
- ☐ Storm water
- ☐ Chemical Storage Permit
- ☐ NPDES

4. Additional comments:

No critical Dunes outside Line
& <1 acre ∴ No B.C erosion, >500' from Lake

Reviewer/Evaluator Date 8-18-99
General Supervisor - Environmental Review Date 8/18/99



Note: Hand Excavate Only. D.B High Voltage Cable & Comm. Cable, D.B Conduit for Data And Communication. USE Extreme Caution.

8/14/99

Attachment C is a drawing and is not included in this report. Contact environmental at (616) 465-5901 ext. 2004 or ext. 1153 to view this attachment.

Attachment D is a drawing and is not included in this report. Contact environmental at (616) 465-5901 ext. 2004 or ext. 1153 to view this attachment.

APPENDIX III

HERBICIDE APPLICATION REPORT

1999

AMERICAN ELECTRIC POWER

Date February 28, 2000

Subject 1999 Herbicide Spray Report - Cook Nuclear Plant

From M. W. Snyder

To J. P. Carlson

The following herbicides were applied on Cook Nuclear Plant property during 1999:

Karmex DF
NuFarm Credit
Riverdale Solution Water Soluble IVM
Round –Up Pro
Preen

On the dates of May 26, 27, 28 and June 15 a mixture of Karmex DF, NuFarm Credit, and Riverdale Solution was used for total plant control in the 69KV, 345KV and 765 KV switch yards, railroad right-of-ways, around buildings, parking lots, and within the plant's protected area. DeAngelo Brothers; a Michigan licensed herbicide applicator on contract to the AEP Western Division performed the application. A total of 267 pounds of Karmex DF, 133.5 quarts of NuFarm Credit, and 801 oz. of Riverdale Solution were used for the application and spread over 44.5 acres. Hi-Light Indicator, a marker dye, was used at a rate of 4 oz./80 gallon mix. The following table details the application rates used compared to the allowable application rates.

Product Name	Quantity Used	Quantity Used/Acre	Quantity Allowed/Acre
Karmex DF	267 lb.	6 lb.	15 lb.
NuFarm Credit	133.5 qt.	3 qt.	6 qt.
Riverdale Solution	801 oz.	15 oz.	45 oz.
Hi-Light Indicator	178 oz.	4 oz./80 gal. mix	9.6 oz./80 gal. mix

Between August 30 and September 6, 1999, the mortality of these herbicide applications was assessed to be greater than 90% by environmental technician Mr. Dean Warlin. There was no evidence of over-spray or spillage in any of the application areas. The results of the inspection were as follows:

- Some weeds noted growing in the northeast corner of the upper parking lot as cars were parked in the area during application
- Weeds near the East Side of Warehouse 5 north of door to shooting range
- Weeds noted on the north end of the fire protection training area/Laydown area between pieces of equipment
- Weeds noted near the W-Yard around sea-vans
- Weeds noted near the 765KV yard by the back-up source and preferred source service centers TR #1 and #2 (nameplate data) which are located near the center of the switchyard.

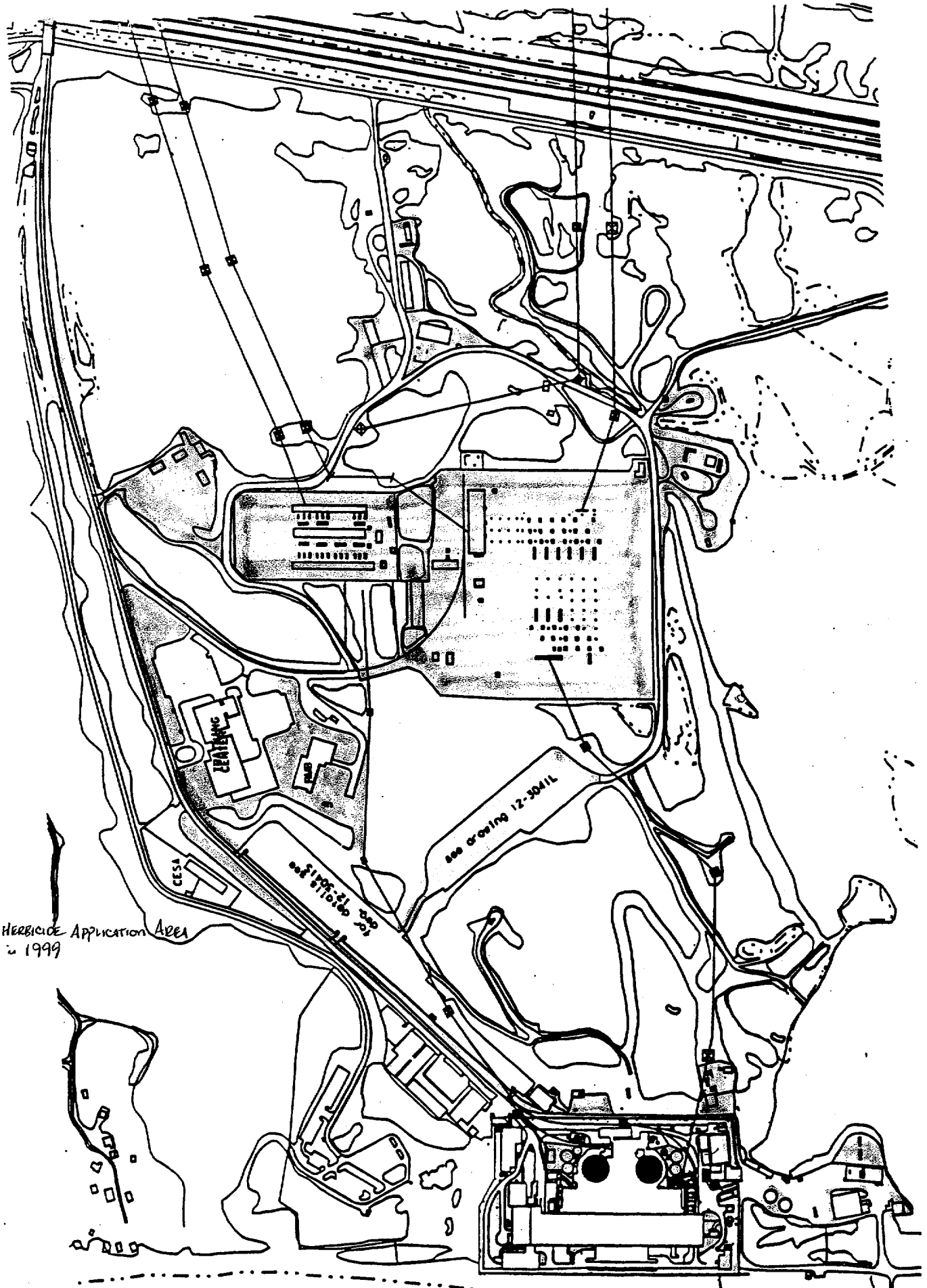
Round-Up Pro mixed with water in a backpack sprayer was used to spot spray weeds in the landscaped stone areas around the plant site, the fire protection water storage tanks, the sewage ponds, the Training Center AC units, and under the racks in the PM&IS steel yard. A total of 90 ounces of Round-Up Pro was used for spot spraying in 1999. The applications were performed by a licensed applicator from the Maintenance ANR Buildings and Grounds crew. As these applications were not broadcast, but weeds were individually spot sprayed, product usage rates per acre are not reported for these applications.

One application of Preen was used for weed control in planting beds around the North Guardhouse entrance, east of the cafeteria, and the Training Building in 1999. Two hundred, fifty ounces of Preen granules were spread over 2,703 square feet during the application on April 19. This amounted to an application rate of 0.92 oz./10 ft2. The allowed label rate was 1 oz./10 ft2. per application. The herbicide was applied by a licensed applicator from the Maintenance ANR Buildings and Grounds crew. The herbicide was 100% effective and controlled weeds in the planting beds thus cutting back on weeding time. The following table details the application rates used for weed control in the grass and garden beds compared to the allowable application rates.

Product Name	**Quantity Used**	**Quantity Used/Area**	**Quantity Allowed/Area**
Preen	250 oz.	0.92 oz. / 10 ft2	1 oz. / 10 ft2
Round-Up Pro	90 oz.	spot sprayed	spot sprayed

In summary, based upon our review of the application records, manufacturer specifications, material safety data sheets (MSDSs) and observations of the treated areas, the herbicides were applied according to the manufacturer's labeled instructions and according to Federal and State requirements. As required by the State of Michigan all personnel performing herbicide applications were licensed. A map has been included with this report indicating areas of herbicide application. Detailed maps and application records are filed in 12 PMP 2160 HER.001, Guidelines for the Application of Approved Herbicides. No signs of over spray or spillage were observed or noted. No adverse environmental effects occurred.

c: W. Tucker
B. Taylor



: HERBICIDE APPLICATION AREA
in 1999

APPENDIX IV

MOLLUSC BIOFOULING MONITORING PROGRAM REPORT

1999

Prepared for:

American Electric Power
Donald C. Cook Nuclear Plant
One Cook Place
Bridgman, Michigan

MOLLUSC BIOFOULING MONITORING DURING 1999

March 2000

Grand Analysis
12684 Oak Park
Sawyer, Michigan 49125

Table of Contents

List of Tables and Figures

Executive Summary

Biofouling Studies have been conducted at the Donald C. Cook Nuclear Plant since 1983. In 1991, monitoring of zebra mussels in the circulating water, essential service water (ESW), and nonessential service water (NESW) systems was added to the program. The objectives of this monitoring are to detect the presence and density of zebra mussel veligers in the circulating water system and postveliger settlement and growth rate in the forebay and service water systems. Another objective of the program is to determine the effectiveness of oxidizing and non-oxidizing biocides in the plant systems by comparing densities and sizes of settled zebra mussels.

Veligers were present in the forebay from 27 May through 16 December 1999. Peak densities occurred on 8 July, 22 July, 26 August, 2 September, and 14 October with the major peak occurring on 19 August (286,750 veligers per cubic meter). This year's densities and peaks were higher than last year's numbers. In 1998, the Plant did not generate any power, as well as this year, meaning the conditions were similar where the same number of circulating water pumps (either one or two of the seven) were running. When the Plant is in full operation, up to seven circulating water pumps can be running.

Cumulative settlement was monitored in the forebay using slides as artificial substrates. Analysis on the slides was done monthly to determine growth rates and cumulative settlement. Density and size data indicate that settlement started slowly in May and in June with translocators being predominant. July had a lower density than in June, due to the CT-2 treatment performed on 7 July. July's sizes indicate that most of the settlement was from translocaters. Beginning in August and continuing through December, the postveliger densities showed a continuous increase. The results of the forebay's cumulative artificial substrate sampling also showed a continuous increase in average size of settled postveligers. The continuous growth and the

continuous increase in density of settled postveligers along with the continuous presence of translocators, all indicate the need for chlorination during the veliger spawning season which was 27 May until 16 December 1999.

Cumulative settlement was also monitored in the forebay using two six-inch PVC pipes. These were set on 7 May and retrieved on 16 December. One sampler was exposed to two CT-2 treatments and the other was placed in untreated water during the CT-2 treatment period. The objective was to compare post-treatment settlement with that of the entire monitoring period. Analysis following retrieval in December showed the density on the treated sampler was approximately 59% of the density on the sampler that was not exposed to CT-2. Size ranges were similar on the two samplers, but the mean sizes of the zebra mussels show that the untreated samplers averaged almost 200*u* larger than the sampler treated with the CT-2. This would be expected because the untreated sampler received settlement throughout the spawning season and zebra mussels continued to increase in size. The treated sampler was exposed to two CT-2 treatments that reduced the numbers of zebra mussels and their individual sizes.

Service Water Systems

Cumulative settlement on the artificial substrates in the service water systems was low during the sampling season when the systems were being chlorinated. The highest densities were found on 16 September in 2 ESW and 2 NESW (23,500 individuals/m^2 and 18,700 individuals/m^2 respectively). This sampling date follows an approximate period of five weeks where the systems were not being chlorinated. These densities indicate a marked increase in the numbers of settled individuals when the systems are not being chlorinated.

Though the densities and size ranges of the 2 NESW compare similarly to the 1 ESW and 2ESW, it is to be noted that the flow in the 2NESW biobox was frequently low during the sampling season. The NESW cooling demand was low due to the dual unit outage, therefore flow was low.

Visual inspections of the ESW and NESW systems during 1999, which were opened during maintenance activities did not identify any living zebra mussels.

Miscellaneous Sealing and Cooling Water System

Settlement on the artificial substrates placed in the MSCW system was observed on all sampling dates from 27 May through 16 December. The MSCW system's biobox was not chlorinated throughout the entire sampling season until 27 October. On 18 September, the flow to MSCW's biobox stopped due to an isolation valve, 2-CW-173 to the Unit 2 circulating pumps, being closed on clearance # 299144 tag # 130. On 27 October, Unit 2 MSCW's biobox was switched to Unit 1 MSCW to the Unit 1 circulating pumps and flow resumed through 16 December, when the biobox was removed from service. On 27 October through 5 November, MSCW's biobox received its only chlorination during the 1999 sampling season. The MSCW system did receive the CT-2 treatments performed on 7-8 July and on 8-9 September. The data should be reviewed and used accordingly.

Chapter 1

Introduction

1.1 Past History

American Electric Power Company (AEP) has been conducting zebra mussel monitoring studies at the Donald C. Cook Nuclear Plant since 1991. The purpose of these studies is to monitor the presence of zebra mussel veliger and postveliger settlement densities in the circulating water, essential service water (ESW), nonessential service water (NESW), and miscellaneous sealing and cooling water (MSCW) systems to help determine the effectiveness of the zebra mussel control program.

In 1999, Grand Analysis conducted the monitoring program, designed to detect the timing of spawning and settling of zebra mussels at the Cook Nuclear Plant. The program also determines densities for: 1) whole water samples for planktonic veligers: and 2) artificial substrates set within the circulating water, ESW, NESW, and MSCW systems for cumulative postveliger settlement. The effects of periodic molluscide treatments on settled zebra mussels was also determined using PVC piping as an artificial substrate.

1.2 Objectives

Specific objectives for the 1999 Biofouling monitoring program were as follows:

- Whole water sampling of the circulating water system was conducted weekly (June-November), bimonthly (May), and monthly (April and December) to determine the presence and density of larval zebra mussels.

- Artificial substrates were deployed in the intake forebay and service water systems to detect settlement of postveligers. Samples were collected monthly from May through December.

- PVC piping, also used as an artificial substrate, was deployed in the intake forebay to determine the effects of CT-2 molluscide treatments on the densities and sizes of settled zebra mussels.

Chapter 2

Methods

2.1 Whole water Sampling

Whole water sampling of the circulating water system was conducted from 29 April to 16 December 1999 (Table 2-1). Samples were collected from mid-depth in the intake forebay by pumping lake water through an in-line flowmeter into a plankton net. The sampling location was consistent with that of previous studies. Two replicates (2,000 liters each) were collected during each sampling date.

A Myers Model 2JF-51-8 pump was connected to an in-line flowmeter assembly (Signet Model #P58640) and pumped water into a plankton net for approximately one hour. To minimize organism abrasion, measured flow was directed into a No. 20 plankton net that was suspended in a partially filled 55-gallon plastic barrel.

Samples were gently washed into the cod-end bucket of the plankton net using filtered circulating water system water and then transferred to a one-liter plastic container. Filtered water was added to the container to ensure that a full liter was analyzed. The two samples were analyzed immediately in an on-site laboratory.

Samples were initially mixed thoroughly for three minutes using a magnetic stir plate. Then, using a calibrated Pasteur pipette, a 1-milliter aliquot of mixed sample was placed into a Sedgewick-Rafter cell for counting. An Olympus SZ-1145 binocular microscope (18-110x) equipped with cross-polarizing filters was used. Ten replicates were counted and the average was

TABLE 2-1

SAMPLING SCHEDULE FOR ZEBRA MUSSEL MONITORING AT THE D.C. COOK NUCLEAR PLANT IN 1999

Date		Whole Water	Artificial Substrates
April	29	X	
May	13	X	
	27	X	X
June	3	X	
	10	X	
	17	X	X
	24	X	
July	1	X	
	8	X	
	15	X	X
	22	X	
	29	X	
August	5	X	
	12	X	X
	19	X	
	26	X	
Sept.	2	X	
	9	X	
	16	X	X
	23	X	
	30	X	
Oct.	7	X	
	14	X	X
	21	X	
	28	X	
Nov.	4	X	
	11	X	X
	18	X	
	23	X	
Dec.	16	X	X(*)

X(*) Remove and analyze PVC

extrapolated to determine the number of individuals per cubic meter. This process was repeated for the second replicate and the mean of the two values was calculated to yield a final density value. The density was calculated as follows:

Density (#/m3)=(average #*DF)/0.001L*1L/2000L*1000L/m3

DF- Dilution Factor

Size measurements were recorded for up to 50 organisms from each sample. Veliger size was measured using an ocular micrometer that was calibrated to a stage micrometer.

2.2 Artificial Substrates

To determine zebra mussel settlement in the circulating water, artificial substrates were placed in the intake forebay, upstream of the trash racks. Sidestream samplers were installed on the return side of both service water systems and on the miscellaneous sealing and cooling water system to determine settlement in these systems. Samplers were equipped with modified test-tube racks designed to hold microscope slides for cumulative sampling.

2.2.1 Intake Forebay

On 7 May, substrate monitors, consisting of 80 microscope slides in test tube racks secured inside the openings of a cinder block, were suspended by rope near the center of the intake forebay. Monthly, 10 slides were retrieved and analyzed for density and shell size accordingly to the sampling schedule.

Also on 7 May, two PVC pipe sections measuring 6 inches long and having an inside diameter of 3.5 inches were cut in half lengthwise. They were rejoined using hose clamps and attached to a rope weighted by a concrete block and suspended at mid-depth in the intake forebay. One PVC sampler was exposed to Clam-Trol CT-2 treatments on 7-8 July and again on 8-9 September while the other sampler was not exposed. On 16 December, both of the PVC samplers were analyzed for densities and sizes of shells by scraping two different square inch sections of each of the PVC samplers. Cumulative monitoring was designed to provide information on accumulated infestation throughout the growing season.

2.2.2 Service Water Systems

Sidestream monitors were placed on the return side of the service water systems (1 ESW, 2 ESW, 2 NESW) and the miscellaneous sealing and cooling (MSCW) water system. Each monitor contained two modified test tube racks containing 80 microscope slides. The racks held the slides above the monitor base that allowed silt and sediment to fall out before they could affect the slide settlement. The monitors were covered with a plant-approved fireproof fabric to limit light exposure. Plant personnel checked the monitors periodically to ensure that adequate flow was available, and flow was adjusted as necessary. Monthly, on each sampling date, ten slides from each location were retrieved and immediately analyzed for densities and shell size.

2.2.3 Artificial Substrate Cumulative Sample Analysis

An Olympus SZ-1145 binocular microscope (18-110x) equipped with cross polarizing filters was used for analyzing samples. After one side of the slide was scraped clean, the slide was placed on the microscope stage so that the attached postveligers could be counted. When slides became heavily infested, a subsampling technique was followed:

- The slides were subsampled using a straight edge that permitted either half or a quarter of the slide to be counted. Counts were then proportionally extrapolated to one square meter.

Settlement rates were computed by taking the average number of mussels from the ten slides and multiplying this value by 533.34 to obtain the density of zebra mussels per square meter. (One postveliger/microscope slide equals 533.34 veligers per square meter.)

Shell diameters were measured for up to 50 random individuals to obtain maximum, minimum and mean sizes. Diameters were measured using an ocular micrometer calibrated to a stage micrometer.

Chapter 3

Results and Discussion

The zebra mussel monitoring system performed up to expectations in 1999. The whole water sampling for free-swimming veligers coupled with monitoring post-veliger settlement on artificial substrates provided sample results that could be compared with previous years' data.

This year, like 1998, the plant did not generate any power during the entire sampling period. This meant that only one or two circulating water pumps were in operation. When the plant is fully operational and generating power, up to seven circulating water pumps may be in service. When the number of pumps increases, the intake flow increases. In 1998, the whole water densities of zebra mussels were almost three times lower than in 1996, when the plant was in full operation, leading one to assume that the decreased volume of water lead to the decrease in density of zebra mussel veligers. In 1999, however, the densities were almost three times higher than in 1998 with the same number of pumps operating (1 or 2). 1999 densities are similar to densities found in 1997 and 1996 with peaks all close to 300,000 individuals per cubic meter. In 1996 and up to September 1997, the plant was operating with 4-7 pumps compared to the 1 or 2 pumps. 1999 results indicate that the volume of water pumped into the plant is independent of the density of zebra mussel veligers found in the whole water. This is understandable since the concentration of veligers in the water should remain the same regardless of the flow through the plant.

The injection of sodium hypochlorite was started 4 June (Appendix Table 1). A 0.3-0.6 ppm total residual chlorine (TRC) is the target range for the control of zebra mussel settlement. Chlorination was stopped on 2 July, for the day, due to circulating water line-up changes to support the 7-8 July CT-2 biocide treatment. This treatment included the service water and the MSCW systems. On 5 July–8 July, chlorination was shut down for the

CT-2 treatment. Chlorination resumed 9 July but was stopped on 26 July to allow Operations to operate with only one circulating water pump. The chlorination system needs two or more circulating water pumps running to ensure sufficient dilution so that NPDES discharge limits are not exceeded. A second circulating water pump was started 31 July allowing chlorination to be re-started. Again, on 10 August, chlorination was stopped until 10 September, due to only one circulating water pump operating. On 8-9 September, a second CT-2 treatment was performed. Chlorination ran from 10 September until 18 September, then ran again 27 September until 12 October, stopping because of only one circulating water pump running. Chlorination then ran from 16 October until 5 November and this was the last of the chlorination that the systems received during the sampling season. It should be noted that circulating water pump operation was under restrictions during 1999 due to breaker cleaning and plant loads management as a result of the transformer tap changes.

Appendix Table 1 shows chlorination values for the ESW systems. NESW system's values could not be obtained because of procedural problems, although the systems were being chlorinated at the same time that the ESW systems were. The chlorination procedure would not allow sampling of the NESW system at points other than the NESW returns. The MSCW system was not chlorinated the entire sampling season until the last week of chlorination (27 October-5 November), though it did receive CT-2 treatments in July and September.

3.1 Whole Water Sampling

Sampling of planktonic veligers in the circulating water system was initiated 29 April and was completed on 16 December. Results are presented in Figure 3-1 and Table 3-1. Veligers first appeared on 27 May and were present in all subsequent samples through 16 December. The major peak density occurred on 19 August (286,750m^3). The following two weeks, 26 August (181,750m^3) and 2 September (91,250m^3), secondary peaks occurred. On 8 July (85,250m^3) and

FIGURE 3-1

1999 D.C. Cook Plant- Whole Water Zebra Mussel Veliger Density and Water Column Temperature in Intake Forebay

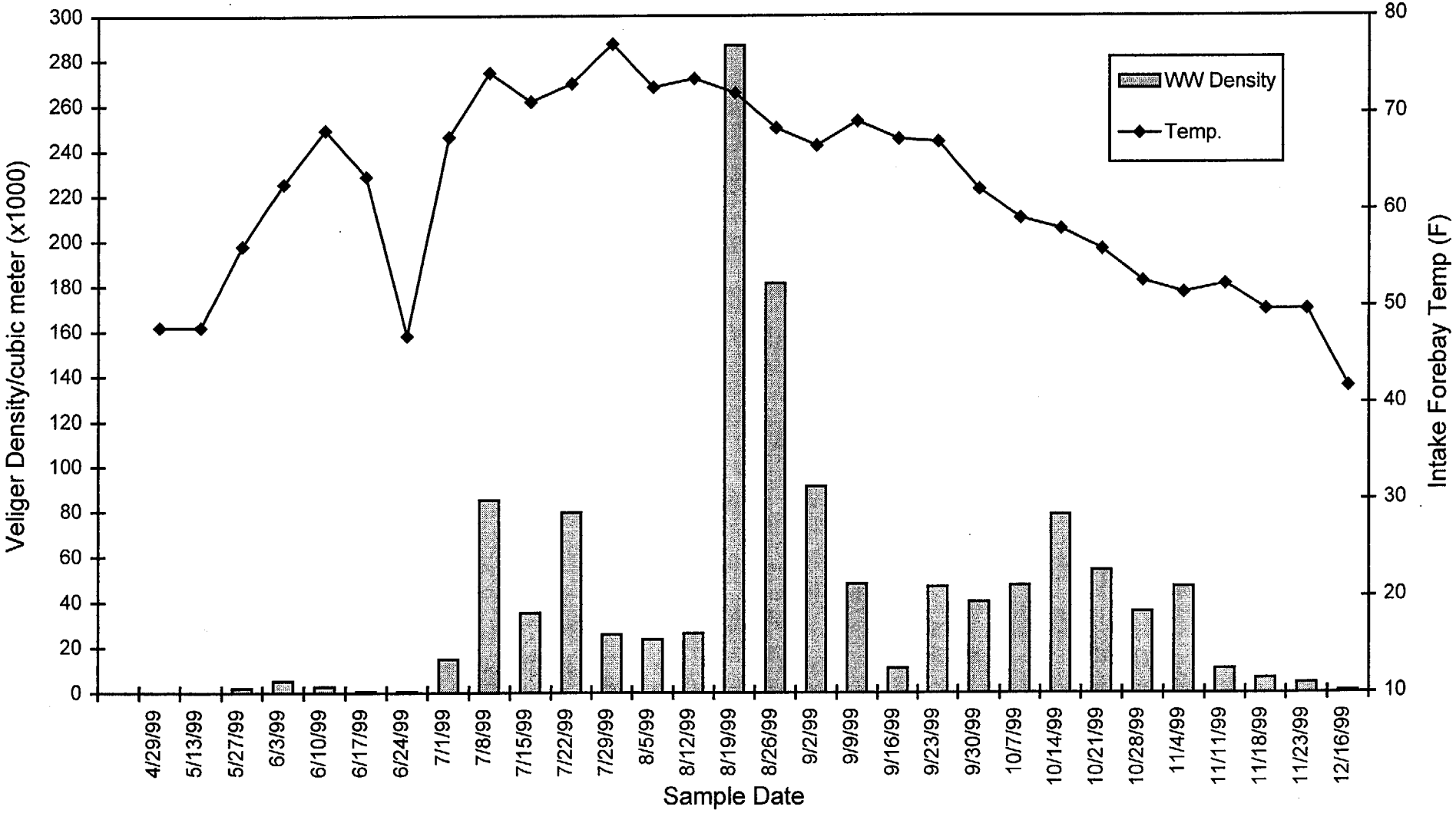


Table 3-1

Whole-Water Sampling Program Number of Zebra Mussel Veligers Per Cubic Meter, Veliger Size Range, and Mean Veliger Size (*u*m) Collected in The D.C. Cook Nuclear Plant Forebay in 1999

Date	Density (No./m^3)	Size Range (*u*m)	Mean Size (*u*m)
4/29/99	0	0	0
5/13/99	0	0	0
5/27/99	2,080	80-130	98
6/3/99	5,125	80-130	100
6/10/99	2,900	90-160	110
6/17/99	650	100-200	125
6/24/99	450	100-140	115
7/1/99	14,750	90-200	105
* 7/8/1999	85,250	100-160	123
7/15/99	35,330	100-230	140
7/22/99	79,750	100-230	178
7/29/99	25,830	100-230	177
8/5/99	23,500	100-230	147
8/12/99	26,280	100-260	139
8/19/99	286,750	100-200	134
8/26/99	181,250	100-260	160
9/2/99	91,250	100-230	183
* 9/9/1999	48,000	100-260	190
9/16/99	10,630	100-300	173
9/23/99	46,900	90-260	138
9/30/99	40,300	90-300	149
10/7/99	47,500	100-260	166
10/14/99	79,000	90-300	152
10/21/99	54,250	100-260	182
10/28/99	36,000	100-260	161
11/4/99	47,170	100-260	174
11/11/99	10,600	100-260	159
11/18/99	6,430	100-230	151
11/23/99	4,350	100-230	157
12/16/99	830	100-230	169

* CT-2 treatments performed on these dates

22 July (79,750m^3), peaks also occurred. This could be from the warm average monthly temperature that occurred in July (73 degrees Fahrenheit). The whole water densities show that there are substantial numbers of veligers in the forebay, indicating the need for effective chlorination in the service water systems, which is critical to the safety and operation of the plant due to the threat of small valves and piping becoming clogged with zebra mussels.

Heaviest spawning activity occurred during early July through the beginning of November. Compared to previous years, this activity started earlier and lasted longer. 1999 mean veliger densities were almost three times higher than in 1998. In 1997, mean densities were twice as high as in 1999. The mean densities in 1993, 1994, 1995 and 1996 were all lower than in 1999. In 1993, 1995 and 1996, peak densities were recorded during mid-September to the end of October. In June of 1994, due to unusually hot weather, an early peak occurred. Similar to 1997's and 1998's peak periods of abundance, 1999 peaks occurred six to eight weeks earlier than the typical mid-September period for this region. Due to the extended shut down of the plant, data comparisons with previous years should be kept in consideration.

Whole water densities recorded during 1993 through 1995 for the November and December sampling periods were less than 1,000/m^3 for sampling conducted after 3 November. In 1998, whole water densities recorded in November were similar to those of 1996 and 1997 and about five times greater that those of the 1993 through 1995 period, showing that spawning occurred into the late fall of 1998. In 1999, similar to 1996, 1997, and 1998 densities show late fall spawning due to warm fall weather. The past four consecutive years show a definite change in the Dreissana spawning populations. Because of the late fall spawning, there is a need for chlorination into the late fall months to prevent zebra mussel settlement and growth in plant systems.

In summary, zebra mussel veligers were present in the water column on all sampling dates from 27 May through 16 December. Spawning commenced mid-May and continued through the end of the sampling program. Peak veliger densities occurred during an 18-week period from the beginning of July extending to the first of November. This is the earliest beginning peak period, due to warm lake temperatures (beginning of July) observed at the Cook Plant since 1993 until now with the exception of one early June peak in 1994.

3.2 Artificial Substrate Sampling

3.2.1 Circulating Water System

Cumulative artificial substrate monitoring was conducted at the center forebay location (which is protected by a deflector wall) from 27 May to 16 December. Cumulative settlement densities for the forebay are shown in Figure 3-2. Table 3-2 provides density and size information for the settled postveligers. The results show an increase in density throughout the sampling season except for the July and September density number. These results were anticipated due to the two CT-2 treatments performed before the July and September sampling dates. The July figures show a decrease in density from 24,000m^2 in June to a 17,600m^2 for July. September's 111,500m^2 density is lower than the August density of 131,200m^2. These decreases indicate the effects of the CT-2 treatments on the artificial substrates. After the 8-9 September CT-2 treatment, one would expect to see a lower density on 16 September forebay artificial substrates. Due to the high density of veligers in the water, they quickly resettle on the artificial substrates. The mean sizes increase monthly from 12 August through 16 December, averaging 143μm of growth per month. Figure 3-2 and Table 3-2 show that the sizes and densities continued to both increase during the sampling season, indicating new postveligers continue to settle on the forebay slides throughout the season, which is expected because of the whole water activity that is seen into

FIGURE 3-2

1999 D.C. Cook Plant- Number of Zebra Mussels settled on Cumulative Substrate Samplers in the Intake Forebay

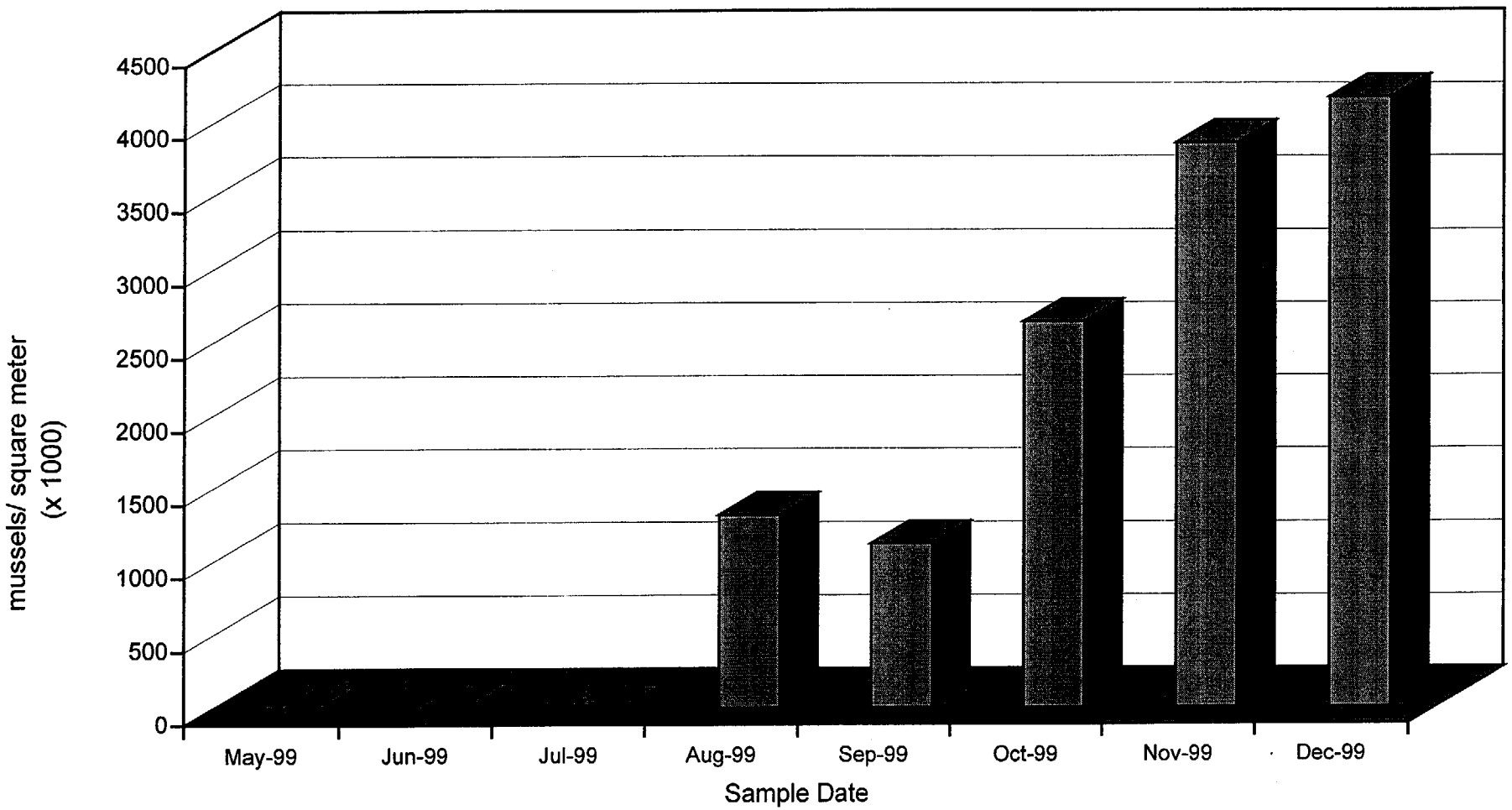


Table 3-2

Density (No./m^2), Average Size (um), and Size Range (um), of Settled Zebra Mussel Postveligers Collected in the Forebay, on Cumulative Artificial Substrates Placed in the Service Water Systems and Miscellaneous Sealing and Cooling Water System in the D.C. Cook Nuclear Plant in 1999.

Cumulative Samples															
	Forebay			NESW			MS&CW			1 ESW			2 ESW		
Date	Density (no/m^2)	Avg. Size (um)	Range (um)	Density (no/m^2)	Avg. Size (um)	Range (um)	Density (no/m^2)	Avg. Size (um)	Range (um)	Density (no/m^2)	Avg. Size (um)	Range (um)	Density (no/m^2)	Avg. Size (um)	Range (um)
5/27/99	267	1,170	660-1780	0	0	0	1,600	173	160-180	1,600	607	230-830	0	0	0
6/17/99	2,400	1052	200-2500	2,130	2,160	1320-2700	2,130	165	100-330	0	0	0	530	130	130
7/15/99	1,760	958	180-2870	1,070	160	160	26,700	153	130-200	0	0	0	1,070	260	260
8/12/99	131,200	252	200-300	8,000	191	130-260	14,400	163	100-200	1,600	260	230-290	12,300	184	100-230
9/16/99	111,500	301	130-530	18,700	206	130-330	1,755,000	189	130-300	2,670	190	130-260	23,500	177	130-300
10/14/99	263,500	520	200-1320	4,690	165	100-300	58,700	176	100-300	2,930	192	100-230	5,330	167	100-260
11/11/99	385,600	613	200-1290	530	260	260	0	0	0	530	430	430	2,130	245	230-260
12/16/99	417,000	823	260-1560	1,600	163	100-260	3,200	252	160-330	530	160	160	0	0	0

On 8 July and 9 September, CT-2 treatments were performed

December. Once again, this indicates the need to chlorinate the service water systems through the end of November.

Cumulative settlement was also monitored in the forebay using two six-inch PVC pipes with a 3.5 inch inside diameter. These were set in the forebay on 7 May. One PVC pipe was pulled from the forebay on 7 July and again on 8 September so that it would not receive the CT-2 treatment while the other piece of pipe remained in the forebay for the treatments. On 16 December, the end of the sampling period, both PVC pipes were retrieved and analyzed. Information from previous years suggests that a substantial portion of the annual settlement occurs within a short time following the CT-2 treatments.

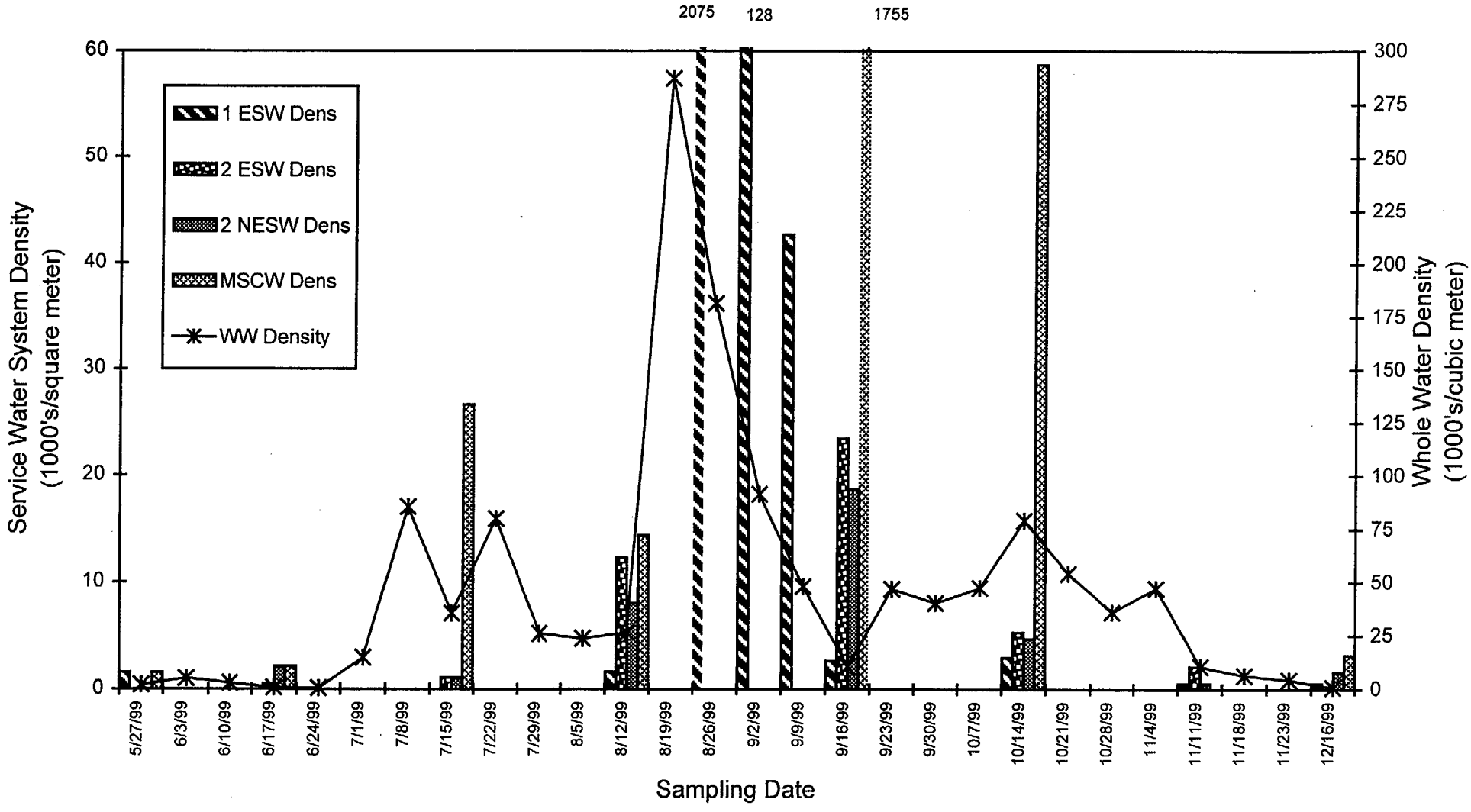
Density on the treated substrate was 269,700 ind./m^2. Individuals ranged from 260*u*-2700*u* and the mean size of fifty randomly selected individuals was 1,018*u*. Zebra mussel data collected from the pipe that was not exposed to the CT-2 treatment was 463,450 ind./m^2. The size range was 600*u*-2600*u* and the average size was 1,212*u*. These densities are three times greater than found in 1998. This is a reasonable finding since the whole water densities were much greater in 1999 than in 1998.

3.2.2 Service Water Systems

The return sides of the ESW and NESW systems were monitored in the 1999 Zebra Mussel Monitoring Project. Chlorine is injected beneath each ESW pump. The ESW systems are cross-tied downstream of the chlorine injection point that serves both ESW systems. A separate chlorine injection point, which is in the suction header, serves the NESW system. The NESW systems can also be cross-tied. Prior to 1999's sampling project, periodic testing was done in the systems, with ten slides being examined and replaced every two weeks. The periodic testing was not performed this season. Cumulative testing was done on a monthly basis in 1999. Artificial

FIGURE 3-3

1999 D.C. Cook Plant- Wholewater Zebra Mussel Veliger Density and Zebra Mussel Postveliger Cumulative Settlement in the Service Water Systems D.C.



16-A

substrate slides were set on 7 May and ten slides per month were examined and not replaced. Results are shown in Figure 3-3 and in Table 3-2. The data indicates that the chlorination system was effective in preventing growth and prolonged settlement of postveligers in the service water systems. Chlorination was not being administered from 10 August through 10 September, when the whole water densities were at their peak. On the 16 September sampling date that followed the period when the systems were not chlorinated, the plant experienced the highest densities of the season in the 2 ESW (23,500 ind./m^2) and NESW (18,700 ind./m^2). This data demonstrates the effectiveness of chlorination and the importance of running it continuously throughout the peak density period of the season. These peak densities occurred one week after the 8-9 September CT-2 treatment. This shows that quick resettlement occurs during peak whole water periods. Unit 1 ESW's highest densities were in September (2,670 ind./m^2) and in October (2,930 ind./m^2). During the period 10 August through 10 September, when the systems were not receiving chlorination, one slide from the 1 ESW system was examined for three weeks to observe settlement that occurred without the chlorinaton. The 26 August slide had a density of 2,075,000 ind./m^2, the 2 September slide had a density of 128,000 ind./m^2 and the 9 September slide (the day after a CT-2 treatment) had a density of 42,700 ind./m^2 (Figure 3-3). These high densities of zebra mussel postveliger settlement in such a short time, warrants the need for chlorination during the peak-settling season.

On 16 December, NESW and 1 ESW showed settlement. This settlement could be expected with the whole water still containing veligers and also without the systems receiving chlorination. Unit 1 ESW densities were found to be the lowest of all of the service water systems throughout the season. Mean sizes in all of the service water systems showed that the settlement of postveligers was not permanent because there was no steady growth in monthly mean sizes.

Early settlement in May and June showed that a few settlers were translocators. The highest settlement in all of the service water systems was seen in August, September and October, which coincided with the highest whole water densities.

Comparison of daily water temperatures recorded on the DMR's for the months of October, November and the first half of December for 1993 through 1999 indicate that October's mean temperatures are all conducive to zebra mussel spawning. (See chart below) Mean intake water temperatures reflect lake conditions, which were less conducive to zebra mussel spawning in October of 1998 and 1999 than they were in the 1995 through 1997 period. However, the November of 1999 average temperature was warmer than all of the previous years, and more conducive to spawning. The 4 November density of 47,170 ind./m^3 confirms this finding. While some spawning occurred in December, temperatures were not conducive to spawning.

Mean Intake Water Temperatures (°F)

Year	October	November	December (1-15)
1993	58.3	49.0	44.6
1994	56.2	48.1	43.4
1995	57.6	45.8	38.8
1996	61.6	48.9	42.2
1997	58.8	46.3	39.1
1998	57.0	49.0	47.9
1999	57.1	50.4	45.1

3.2.3 Miscellaneous Sealing and Cooling Water System

A sidestream monitor was placed on the miscellaneous sealing and cooling system, which draws water from the circulating water system. Artificial substrates used for cumulative analysis were set on 7 May and sets of ten slides were examined monthly beginning on 27 May. The MSCW system did not receive chlorination for the majority of the 1999 sampling season. The flow in the biobox, due to a clearance tag-out of the Unit 2 circulating water system, stopped completely for five weeks at the end of September. The location of the MSCW biobox was moved to the Unit 1 circulating water system and MSCW was cross-connected with the NESW system to receive chlorination. This was the first time during the 1999 sampling season that MSCW was chlorinated (27 October through 4 November). Table 3-2 and Figure 3-3 show the densities and sizes of the settlement occurring on the artificial substrates. The results show an increase in density from May through July, a decrease in August, a huge increase and peak density (1,755,000 ind./m^2) in September. October's density decreased to 58,700 ind./m^2. August and October's decrease in density were caused by the CT-2 treatments that MSCW did receive the on 7-8 July and on 8-9 September. November's density dropped to zero after receiving one week of chlorination. December showed settlement again, due to veligers still present the whole water samples, and due to receiving no chlorination after 4 November.

Prior to the one week of chlorination received by the MSCW, the slides contained much detritus, algae, slime and other living microscopic organisms, indicating that chlorination controls settlement of other living and nonliving material, which is important for the Cook Nuclear plant systems.

In summary, density and size data collected in 1999 in the service water systems and in the miscellaneous sealing and cooling system sampling locations indicate the settlement was very

low in May and June and that a portion of these individuals were translocators. These results are similar to past year's studies, with peak settlements occurring 10 days to two weeks after peak whole water densities. Comparing settlement from the service water systems, which were chlorinated, to the MSCW settlement, which was not chlorinated, show the effectiveness of the chlorination in these systems. Prolonged settlement in the service water systems is not seen when chlorinaton is running.

3.2.4 Fire Protection

In August of 1998, during system flow testing of the fire suppression system, Plant Protection personnel found three deluge nozzles that were plugged with Asiatic clamshells. These were believed to be remnants of when the fire protection system was on lake water from the time of construction up until the time when the system was placed on chlorinated drinking water in the Spring of 1993.

In October of 1998, two fire hydrants, (#11 and #27) were flushed through a plankton net to test for biological contaminants. Microscopic worms, rotifers and daphnia were found in the samples. These occur naturally in the soil and were believed to be introduced through the hydrant drain holes. A dead zebra mussel veliger and a veliger fragment were also found in the samples. These are believed to be relics of when the system was on lake water and do not pose a problem to the fire protection system.

In October of 1999, fire hydrant's #11 and #27 were again flushed through a plankton net to test for biological contaminants. Similar findings, such as microscopic rotifers, daphnia, gastrotrich and nematodes were identified in the samples. Dead zebra mussel veligers were also found. It was concluded that the findings do not pose a problem to the fire protection system.

The Total Residual Chlorine (TRC) was analyzed in both 1998 and 1999 for the two fire hydrant's samples. Lake Township Water Supply injects chlorine into the raw water line from the lake at 1.50-1.80 ppm. In 1999, hydrant # 27 contained <0.05 mg/l TRC and hydrant # 11 contained 0.05 mg/l TRC. In 1998, TRC values for both hydrants ranged from 0.04-0.06 mg/l. The efficacy of the chlorine decreases as it sits in the hydrants, allowing microscopic organisms to live. These microscopic organisms do not present a threat to the systems due to their low numbers and small sizes.

For inspection purposes, per job order C46058, the Unit 2 transformer fire protection spray nozzles were removed, cleaned, and reinstalled on May 18, 1999. No mussels or Asiatic clamshells were found.

3.2.5 CT-2 Clamtrol Treatments

Two chemical treatments, using CT-2 Clamtrol, were performed on 7-8 July and 8-9 September to control zebra mussel infestation in the plant intake tunnels. The treatment's effectiveness was determined by mortality rates in bioboxes seeded with live mussels and diving inspections. Biobox mortality results were as follows:

	July	September
North Intake Tunnel	100%	100%
Center Intake Tunnel	98%	100%
South Intake Tunnel	100%	100%
Intake Forebay	39%	99%
Intake Forebay (Control)	0%	1%
Unit 1 NESW Supply	100%	100%
Unit 2 NESW Return	99%	100%
Unit 1 ESW Return	100%	99%
Unit 2 ESW Return	100%	100%
Unit 2 MSCW	36%	71%

The CT-2 biobox mortality results indicate the effectiveness of the treatments in the plants water systems. The post-treatment settlement densities observed on the artificial substrates in the forebay and in the service water systems (see Figure 3-2 and Table3-2) show how quickly resettlement of post veligers occur. This supports the need for effective chlorination during the peak zebra mussel settling season.

3.2.6 1999 Winter Growth Study

A monthly winter analysis was performed to document the growth of zebra mussels through the winter period. The treated and untreated PVC artificial substrate samplers, from the forebay, used in the 1998 Zebra Mussel Monitoring Project, were used for this study.

Data collected on 14 January, 18 February and 18 March of 1999 indicate that growth during these months average approximately 100 microns per month. It was determined that this rate can be used with appropriate caution, (due to data from only three monthly measurements) to predict potential effects of zebra mussels over the winter months in the service water systems at the Cook Plant. (See Attachment 1)

Chapter 4

Summary and Recommendations

4.1 Summary

The 1999 Zebra Mussel Program was initiated on 29 April and continued to 16 December. The major spawning peak occurred on 19 August. The heaviest spawning period ran from 8 July through 4 November. This 18 weeks is the longest stretch of heavy spawning recorded at the D.C. Cook Plant.

Cumulative settlement in the forebay started slowly in May, June and July. Beginning in August, following a peak in whole water density, cumulative settlement increased from 17,600 ind./m^2 to 131,200 ind./m^2. Cumulative settlement continued to increase, with the exception of a minor dip following the September CT-2 treatment, into December. Mean sizes of settled postveligers increased from August through December. Based on mean sizes, fewer translocators were seen from August through December.

Peak cumulative settlement densities occurred in September in the NESW and 2 ESW systems. These densities correspond with peak periods of spawning as measured in the whole water samples and also with the period in which chlorination was not being administered to the systems. A peak settlement density did not occur in 1 ESW.

The MSCW system did not receive chlorination throughout the entire 1999 sampling season, except for one week at the end of October. MSCW had settlement on every sampling date except in November, when the MSCW had no settlement following a one-week period of receiving chlorination. This clearly shows the effect of chlorination on settlement rates.

4.2 Recommendations

Based on observations made during the course this program, Grand Analysis is making the following recommendations:

- Whole Water sampling should continue to be initiated in April to determine the presence of veligers in the water column, as currently implemented.
- Studies of cumulative postveliger settlement should continue to be conducted from May through December, as currently implemented.
- Chlorination should begin and run continuously from the first part of May, based on the settlement data from May and June, as currently implemented.
- Chlorination should run through November based on the settlement data from November and December.
- Daily chlorination and temperature data should continue to be made available to allow meaningful interpretation of results, as currently implemented.

References

Lawler, Matusky, & Skelly Engineers LLP. 1999. Mollusc biofouling monitoring during 1998, Donald C. Cook Nuclear Plant: Final Report.

Lawler, Matusky, & Skelly Engineers LLP. 1995. Mollusc biofouling monitoring during 1994, Donald C. Cook Nuclear Plant: Final Report.

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Great Lakes Enviromental Center. 1996. A zebra mussel (Dreissena) monitoring survey for the Donald C. Cook Nuclear Plant. Final Report.

Appendix Table 1

Chlorination Values for 1999 Zebra Mussel Monitoring Program

Date	1 ESW ppm	2 ESW ppm
June 4, 1999	.07	.08
June 5, 1999	.34	.34
June 6, 1999	.34	.36
June 7, 1999	.47	.38
June 8, 1999	.27	.43
June 9, 1999	.40	.52
June 10, 1999	.31	.30
June 11, 1999	.27	.26
June 12, 1999	.33	.37
June 13, 1999	.33	.04
June 14, 1999	.32	.38
June 15, 1999	.34	.37
June 16, 1999	.39	.49
June 17, 1999	.16	.15
June 18, 1999	.45	.42
June 19, 1999	.36	.29
June 20, 1999	.27	.30
June 21, 1999	.15	.16
June 22, 1999	.57	.55
June 23, 1999	.60	.58
June 24, 1999	.30	.29
June 25, 1999	.31	.30
June 26, 1999	.13	.13
June 27, 1999	.22	.27
June 28, 1999	.39	.36
June 29, 1999	.16	.16
June 30, 1999	.51	.51
July 1, 1999	.56	.56
July 2, 1999	NC	NC
July 3, 1999	.30	.31
July 4, 1999	.36	.32
July 5, 1999	NC	NC
July 6, 1999	NC	NC
July 7, 1999	NC	NC
July 8, 1999	NC	NC
July 9, 1999	.34	.34
July 10, 1999	.34	.36
July 11, 1999	.66	.71
July 12, 1999	.31	.35
July 13, 1999	.58	.60
July 14, 1999	.31	.28
July 15, 1999	.37	.35
July 16, 1999	.07	.05
July 17, 1999	.51	.45
July 18, 1999	.40	.32
July 19, 1999	.42	.38
July 20, 1999	.38	.37
July 21, 1999	.39	.43

Comments: ND- no data
NC- no NaCl

Date	1ESWppm	2ESWppm
July 22, 1999	.29	.31
July 23, 1999	.39	.40
July 24, 1999	.36	.39
July 25, 1999	.33	.41
July 26, 1999	.46	.52
July 27, 1999	NC	NC
July 28, 1999	NC	NC
July 29, 1999	NC	NC
July 30, 1999	NC	NC
July 31, 1999	.37	.46
August 1, 1999	.41	.70
August 2, 1999	.35	.32
August 3, 1999	.68	.67
August 4, 1999	.41	.47
August 5, 1999	.30	.38
August 6, 1999	.38	.46
August 7, 1999	.34	.43
August 8, 1999	.49	.37
August 10, 1999	.17	.22
August 11, 1999	NC	NC
August 12, 1999	NC	NC
August 13, 1999	NC	NC
August 14, 1999	NC	NC
August 15, 1999	NC	NC
August 16, 1999	NC	NC
August 17, 1999	NC	NC
August 18, 1999	NC	NC
August 19, 1999	NC	NC
August 20, 1999	NC	NC
August 21, 1999	NC	NC
August 22, 1999	NC	NC
August 23, 1999	NC	NC
August 24, 1999	NC	NC
August 25, 1999	NC	NC
August 26, 1999	NC	NC
August 27, 1999	NC	NC
August 28, 1999	NC	NC
August 29, 1999	NC	NC
August 30, 1999	NC	NC
August 31, 1999	NC	NC
September 1, 1999	NC	NC
September 2, 1999	NC	NC
September 3, 1999	NC	NC
September 4, 1999	NC	NC
September 5, 1999	NC	NC
September 6, 1999	NC	NC
September 7, 1999	NC	NC
September 8, 1999	NC	NC
September 9, 1999	NC	NC
September 10, 1999	.50	.58
September 11, 1999	.24	.59
September 12, 1999	ND	ND

Comments: ND- No Data
NC- No NaCl

Date	1ESWppm	2ESWppm
September 13, 1999	.38	.57
September 14, 1999	.70	.67
September 15, 1999	.29	.40
September !6, 1999	.20	.28
September 17, 1999	.23	.37
September 18, 1999	.13	ND
September 19, 1999	NC	NC
September 20, 1999	NC	NC
September 21, 1999	NC	NC
September 22, 1999	NC	NC
September 23, 1999	NC	NC
September 24, 1999	NC	NC
September 25, 1999	NC	NC
September 26, 1999	NC	NC
September 27, 1999	.40	.41
September 28, 1999	.12	.08
September 29, 1999	.15	.09
September 30, 1999	.30	.26
October 1, 1999	.32	.30
October 2, 1999	.41	.41
October 3, 1999	.46	.36
October 4, 1999	.35	.34
October 5, 1999	.36	.39
October 6, 1999	.36	.35
October 7, 1999	.48	.47
October 8, 1999	.41	.41
October 9, 1999	ND	ND
October 10, 1999	ND	ND
October 11, 1999	.60	.67
October 12, 1999	NC	NC
October 13, 1999	NC	NC
October 14, 1999	NC	NC
October 15, 1999	NC	NC
October 16, 1999	.53	.50
October 17, 1999	ND	ND
October 18, 1999	.28	.21
October 19, 1999	.51	.32
October 20, 1999	.79	.05
October 21, 1999	.62	.16
October 22, 1999	.31	1.02
October 23, 1999	.28	.48
October 24, 1999	.42	.51
October 25, 1999	.19	.41
October 26, 1999	.20	.44
October 27, 1999	.36	.51
October 28, 1999	ND	ND
October 29, 1999	.20	.38
October 30, 1999	.31	.37
October 31, 1999	.32	.41
November 1, 1999	.21	.21
November 2, 1999	.32	.32
November 3, 1999	.32	.32
November 4, 1999	.31	.31
November 5, 1999	.02	.02

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March 28, 2000
File No. 673-005

Mr. Eric Mallen
Donald C. Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106

Dear Mr. Mallen:

During the 1998 zebra mussel monitoring program, the Cook Plant environmental staff requested that Lawler, Matusky & Skelly Engineers LLP continue to monitor the cumulative substrates that had been placed in the intake forebay beyond the scheduled end date of 10 December 1998. It was agreed that these substrates, both treated and control, would be retrieved and analyzed at monthly intervals during January, February, and March 1999. The objective of these additional analyses was to document growth of settled zebra mussels through the winter period.

This letter report provides the data collected during the analyses conducted on 14 January, 18 February, and 18 March 1999. Methods of deployment, retrieval, and laboratory analysis used during these sampling events were entirely consistent with those used during the regular program. To the extent practicable, 50 live zebra mussels were to be measured on each sampling date. This criterion was met with the exception of 18 February when only 21 individuals were present in the randomly selected aliquot.

Results of these analyses are presented in the attached table. Inspection of this table reveals that the average sizes of treated substrate were always less than those of control substrates. Mean monthly growth on the control substrate ranged from 84 to 110 microns, while mean monthly growth on treated substrates ranged from - 72 to 180 microns. The - 72 micron difference between the December, 1998 and January 1999 samples was the result of randomly selecting a portion of the substrate in December that had one very large individual which skewed the December mean.

While three monthly measurements do not constitute a data base that reduces variation about a mean, the data indicate that growth during these months is approximately 100 microns per month. This rate can be used, with appropriate caution, to determine or predict potential effects of an overwintering population of zebra mussels in the service water systems at the Cook Plant. It should be noted that it is important to continue chlorination of the service water systems up to the first week of December. This is particularly needed during those years that have unusually warm falls through the first half of December.

If you have any questions about this study, please call.

Sincerely,

Bruce L. Lippincott, Ph.D.
Manager, Midwest Office

SIZE (MICRONS) OF ZEBRA MUSSELS COLLECTED FROM CUMULATIVE ARTIFICIAL SUBSTRATES IN FOREBAY OF DONALD C. COOK NUCLEAR PLANT
DECEMBER, 1998 – MARCH, 1999

DATE:	12/10/98		1/14/99		2/18/99		3/18/99	
	Treated	Control	Treated	Control	Treated	Control	Treated	Control
Mean	838	962	766	1046	900	1132	1080	1242
Max.	8000	11,000	2000	2400	1500	2300	3000	2200
Min.	300	100	300	500	600	600	800	800

APPENDIX V

SPECIAL REPORTS:

1999

There were no special reports in 1999.

APPENDIX VI

ANNUAL REPORT:

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

1999

DONALD C. COOK NUCLEAR PLANT

UNITS 1 & 2

OPERATIONAL

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

1999 ANNUAL REPORT

JANUARY 1 to DECEMBER 31, 1999

Prepared by

Indiana Michigan Power Company

and

Teledyne Brown Engineering

April 15, 2000

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INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK POWER NUCLEAR PLANT

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SUMMARY

This report summarizes the collection and analysis of various environmental sample media in 1999 for the Radiological Environmental Monitoring Program for the Donald C. Cook Nuclear Plant.

The various analyses of most sample media suggest that there was no discernible impact of the Donald C. Cook Nuclear Plant on the environment. The analysis of air particulate filters, charcoal cartridges, direct radiation by thermoluminescent dosimeters, fish, water, milk and sediments from Lake Michigan, drinking water, and food products, either did not detect any radioactivity or measured only naturally occurring radionuclides at normal background levels.

Tritium, measured at low levels in on-site wells, appears to be the only radionuclide attributable to the plant operations. However, the associated groundwater does not provide a direct dose pathway to humans.

I. INTRODUCTION

I. INTRODUCTION

The Donald C. Cook Nuclear Plant's Radiological Environmental Monitoring Program (REMP) is conducted in compliance with NRC Regulatory Guide 1.21 and 4.1, licensing commitments, and Technical Specifications. The REMP was developed in accordance with the NRC Radiological Assessment Branch Technical Position (BTP), Rev. 1, November 1979. A synopsis of the sampling program and maps can be found in Section II, Sampling and Analysis Program. This report represents the Annual Radiological Environmental Operating Report for Units 1 and 2 of the Donald C. Cook Nuclear Plant for the operating period from January 1, 1999 through December 31, 1999.

A. The Donald C. Cook Nuclear Plant of American Electric Power Company is located on the southeastern shore of Lake Michigan approximately one mile northwest of Bridgman, Michigan. The plant consists of two pressurized water reactors, Unit 1, 1030 MWE and Unit 2, 1100 MWE. Unit 1 achieved initial criticality on January 18, 1975 and Unit 2 achieved initial criticality on March 10, 1978.

B. Objectives

The objectives of the operational radiological environmental monitoring program are:

1. Identify and measure radiation and radioactivity in the plant environs for the calculation of potential dose to the population.

2. Verify the effectiveness of in-plant measures used for controlling the release of radioactive materials.

3. Provide reasonable assurance that the predicted doses, based on effluent data, have not been substantially underestimated and are consistent with applicable standards.

4. Comply with regulatory requirements and Station Technical Specifications and provide records to document compliance.

During 1999 changes made to the Offsite Dose Calculation Manual (ODCM) include the following statements to direct actions to be performed if effluent channels are not operable.

"After thirty days, if the channels are not operable, then continue releases with estimation of the flow rate once per four hours and provide a description in the next Annual Radiological Effluent Release Report, as to why the inoperability was not corrected."

"After thirty days, if the channels are not operable, then continue releases with grab samples once per shift and provide a description in the next Annual Radiological Effluent Release Report, as to why the inoperability was not corrected."

"After thirty days, if the channels are not operable, then continue releases with sample collection by auxiliary sampling equipment and provide a description in the next Annual Radiological Effluent Release Report, as to why the inoperability was not corrected."

Reason:

Expanded system restart readiness reviews performed on the RMS system resulted in gaseous effluent channels 1501, 03, 05, 2501, 03 and 05 being declared inoperable. The extent of the condition caused the monitors to remain inoperable for greater than thirty days. The above action statements were required in order to give clear direction in the event gaseous effluent channels are inoperable for greater than 30 days.

II. SAMPLING AND ANALYSIS PROGRAM

II. SAMPLING AND ANALYSIS PROGRAM

Table 1 summarizes the sampling and analysis program for the Donald C. Cook Nuclear Plant for 1999. For each sample medium, the table lists the sample locations, including distance and direction from the center of the two units, and the station identification. The station identifications for the sampling locations are shown on Figures 1 and 2. Also for each sample medium the sample collection frequency, type of analysis, and frequency of analysis are listed.

TABLE 1

DONALD C. COOK NUCLEAR PLANT- 1999

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Environmental (TLD's)						
ONS-1	(T-01)	1945 ft.		18°	Quarterly	Direct Radiation/Quarterly
ONS-2	(T-02)	2338 ft.		48°		
ONS-3	(T-03)	2407 ft.		90°		
ONS-4	(T-04)	1852 ft.		118°		
ONS-5	(T-05)	1895 ft.		189°		
ONS-6	(T-06)	1917 ft.		210°		
	(T-07)	2103 ft.		36°		
	(T-08)	2208 ft.		82°		
	(T-09)	1368 ft.		149°		
	(T-10)	1390 ft.		127°		
	(T-11)	1969 ft.		11°		
	(T-12)	2292 ft.		63°		
New Buffalo	(NBF)	15.6 mi	SSW			
South Bend	(SBN)	26.2 mi	SE			
Dowagiac	(DOW)	24.3 mi	ENE			
Coloma	(COL)	18.9 mi	NNE			
Intersection of Red Arrow Hwy. & Marquette Woods Rd, Pole #B294-44	(OFT-1)	4.5 mi	NE			
Stevensville Substation	(OFT-2)	3.6 mi	NE			
Pole #B296-13	(OFT-3)	5.1 mi	NE			
Pole #B350-72	(OFT-4)	4.1 mi	E			
Intersection of Shawnee & Cleveland, Pole #B387-32	(OFT-5)	4.2 mi	ESE			
Snow Rd., East of Holden Rd., #B426-1	(OFT-6)	4.9 mi	SE			
Bridgman Substation	(OFT-7)	2.5 mi	S			
California Rd., Pole #B424-20	(OFT-8)	4.0 mi	S			
Ruggles Rd., Pole B369-214	(OFT-9)	4.4 mi	ESE			
Intersection of Red Arrow Hwy., & Hildebrant Rd.,Pole #B422-152	(OFT-10)	3.8 mi	S			
Intersection of Snow Rd. & Baldwin Rd., Pole #B423-12	(OFT -11)	3.8 mi	S			

TABLE 1 (Cont.)

DONALD C. COOK NUCLEAR PLANT- 1999

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Air Charcoal/Particulates						
ONS-1	(A-1)	1945 ft.		18°	Weekly	Gross Beta/Weekly
ONS-2	(A-2)	2338 ft.		48°		I-131/Weekly
ONS-3	(A-3)	2407 ft.		90°		Gamma Isotopic/
ONS-4	(A-4)	1852 ft.		118°		Quarterly Composite
ONS-5	(A-5)	1895 ft.		189°		
ONS-6	(A-6)	1917 ft.		210°		
New Buffalo	(NBF)	15.6 mi	SSW			
South Bend	(SBN)	26.2 mi	SE			
Dowagiac	(DOW)	24.3 mi	ENE			
Coloma	(COL)	18.9 mi	NNE			
Groundwater						
Onsite	(W-1)	1969 ft.		11°	Quarterly	Gamma Isotopic/Quarterly
Onsite	(W-2)	2292 ft.		63°		Tritium/Quarterly
Onsite	(W-3)	3279 ft.		107°		
Onsite	(W-4)	418 ft.		301°		
Onsite	(W-5)	404 ft.		290°		
Onsite	(W-6)	424 ft.		273°		
Onsite	(W-7)	1895 ft.		189°		
Onsite	(W-8)	1279 ft.		53°		
Onsite	(W-9)	1447 ft.		22°		
Onsite	(W-10)	4216 ft.		129°		
Onsite	(W-11)	3206 ft.		153°		
Onsite	(W-12)	2631 ft.		162°		
Onsite	(W-13)	2152 ft.		182°		
Onsite	(W-14)	1780 ft.		164°		
Steam Generator Groundwater						
Steam Generator Storage Facility	(SG-1)	0.8 mi		95°	Quarterly	Gross Beta/Quarterly
Steam Generator Storage Facility	(SG-2)	0.7 mi		92°		Gross Alpha/Quarterly
Steam Generator Storage Facility	(SG-4)	0.7 mi		93°		Gamma Isotopic/Quarterly
Steam Generator Storage Facility	(SG-5)	0.7 mi		92°		

TABLE 1 (Cont.)

DONALD C. COOK NUCLEAR PLANT- 1999

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Drinking Water						
St. Joseph Public Intake	(STJ)	9.0 mi	NE		Daily	Gross Beta/14 Day Composite Gamma Isotopic/14 Day Composite I-131/14 Day Composite
Lake Township Public Intake Station	(LTW)	0.4 mi	S			Tritium/Quarterly Composite
Surface Water						
Condenser Circulating Water Intake	SWL-1	Intake			Daily	Gamma Isotopic/Monthly
Lake Michigan Shoreline	SWL-2	500 ft.	S			Composite
Lake Michigan Shoreline	SWL-3	500 ft.	N			Tritium/Quarterly Composite
Sediment						
Lake Michigan Shoreline	SL-2	500 ft.	S			
Lake Michigan Shoreline	SL-3	500 ft.	N		Semi-annually	Gamma Isotopic/Semi-Annually
Milk-Indicator (a)						I-131/Sample
Milk-Background (a)						
Broadleaf Vegetation (a)						
3 Indicator Samples 1 Control Sample	Within 8 miles of plant 15-25 miles distant		Highest D/Q Land Sector Less prevalent wind direction		Monthly when available	Gamma Isotopic/Monthly I-131/Monthly

(a) No milk samples were obtained in 1999 as 2 of 3 indicator farms dropped from program at the end of 1995 and no replacements have been found. Broadleaf vegetation samples were obtained in lieu of milk in 1999.

TABLE 1 (Cont.)

DONALD C. COOK NUCLEAR PLANT- 1999

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Fish						
Lake Michigan	ONS-N	0.3 mi	N		2/year	Gamma Isotopic/ 2 per year
Lake Michigan	ONS-S	0.4 mi	S			
Lake Michigan	OFS-N	3.5mi	N			
Lake Michigan	OFS-S	5.0 mi	S			
Grapes/Broadleaf						
Nearest sample to Plant in highest D/Q land sector containing media.			Sector D		At time of harvest	Gamma Isotopic at time of harvest.
Grapes						
In a land sector containing grapes approximately 20 miles from the Plant in one of the less prevalent D/Q land sectors.			Sector J		At time of harvest	Gamma Isotopic at time of harvest.

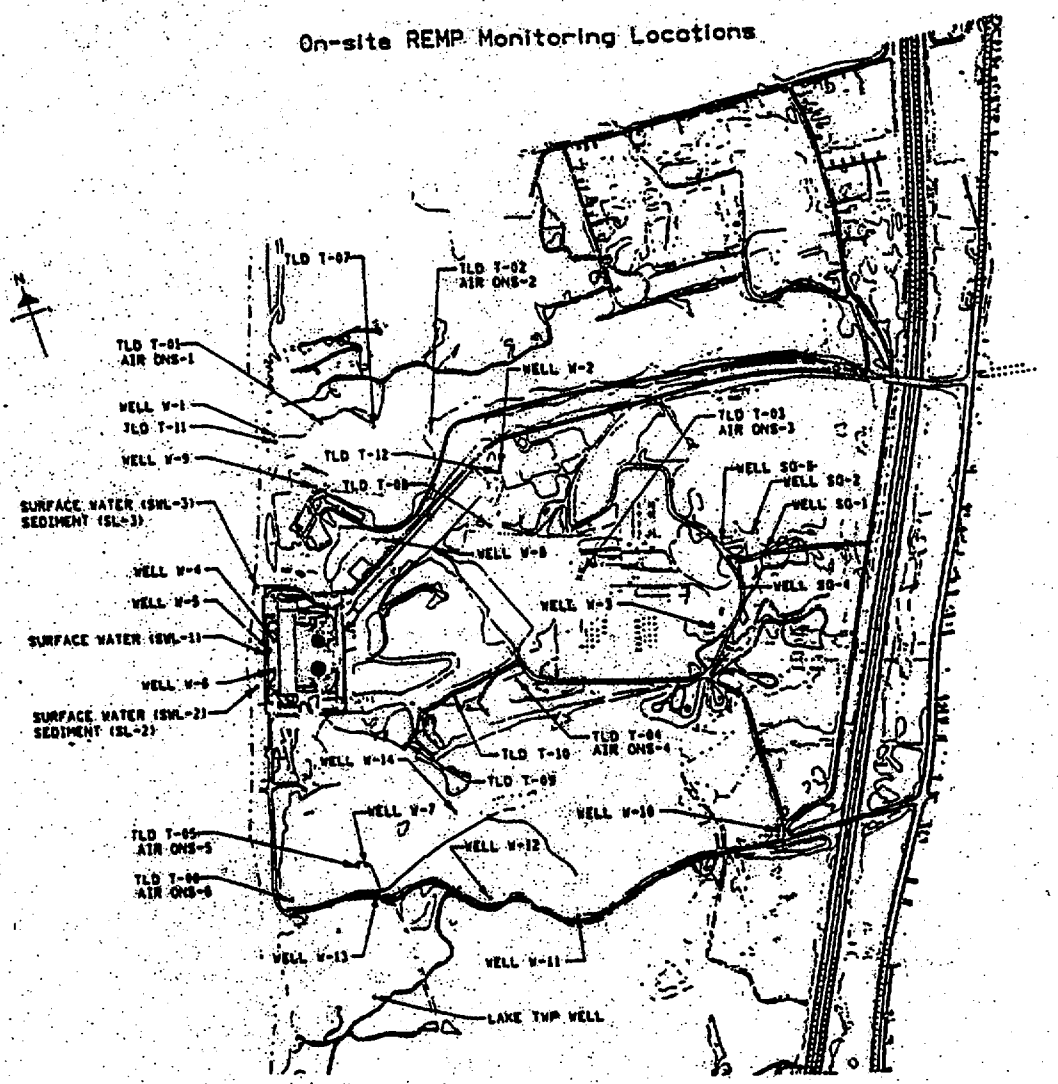
* Composite samples of Drinking and Surface water shall be collected at least daily.

* Particulate sample filters should be analyzed for gross beta activity 24 or more hours following filter removal. This will allow for radon and thoron daughter decay. If gross beta activity in air or water is greater than 10 times the yearly mean of control samples for any medium, gamma isotopic analysis should be performed on the individual samples.

Please note the following definitions:

Weekly - at least once every seven (7) days
Monthly - at least once every (31) days
Quarterly - at least once every ninety-two (92) days
Semi-annually - at least once every one hundred eighty-four (184) days

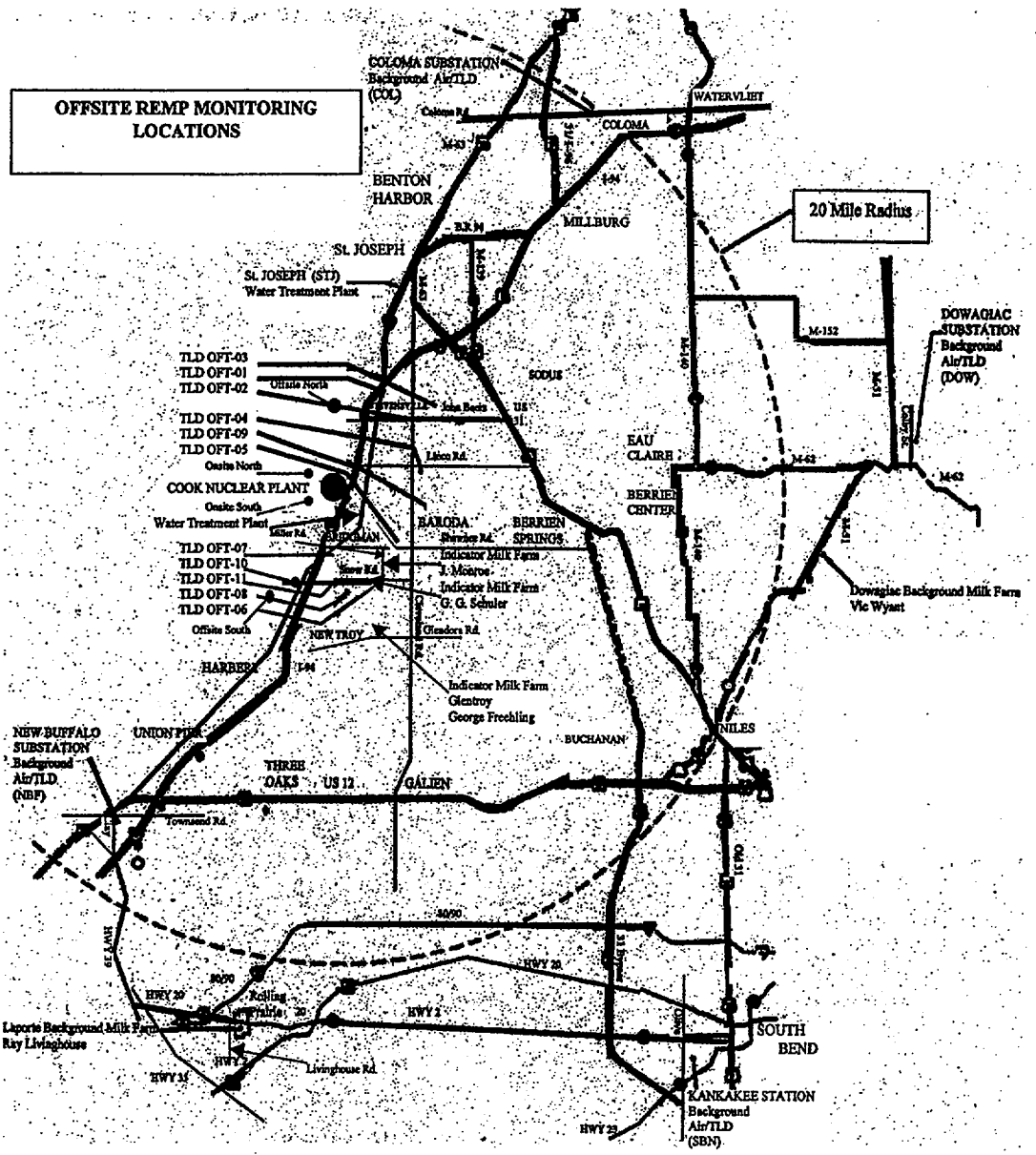
Figure 1



LEGEND

ONS-1 – ONS-6: Air Sampling Stations
T-01 - T-12: TLD Sampling Stations
W-1 - W-14: REMP T/S Groundwater Wells
SG-1, SG-2, SG-4, SG-5: REMP Non T/S Groundwater Wells
SWL-1, 2, 3: Surface Water Sampling Stations
SL-2, SL-3: Sediment Sampling Stations

Figure 2



The current mild indicator farms are indicated here, but they will be determined and controlled by the Annual Land Use Census, those that are willing to participate, and 12-THP-6010.RPP.635, Collection of Milk Samples.

III. SUMMARY AND DISCUSSION OF 1999 ANALYTICAL RESULTS

III. SUMMARY AND DISCUSSION OF 1999 ANALYTICAL RESULTS

A discussion of the data from the radiological analyses of environmental media collected during the report period is provided in this section. Analyses of samples for 1999 were analyzed by Teledyne Brown Engineering, Inc. (TI) in Westwood, New Jersey. The procedures and specifications followed at Teledyne Brown Engineering are in accordance with the Teledyne Brown Engineering Quality Assurance Manual and are explained in the Teledyne Brown Engineering Analytical Procedures. A synopsis of analytical procedures used for the environmental samples is proved in Appendix C. In addition to internal quality control measures performed by Teledyne, the laboratory also participates in Interlaboratory Comparison Programs. Participation in these programs ensures that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples are performed. The results of the Interlaboratory Comparison are provided in Appendix D.

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. Teledyne Brown Engineering analytical methods meet or exceed the Lower Limit of Detection (LLD) requirements given in Table 2 of the USNRC Branch Technical Position of Radiological Monitoring, Revision 1, November 1979, and 12 PMP 6010 OSD.001, "Off-Site Dose Calculation Manual".

The following is a discussion and summary of the results of the environmental measurements performed during the reporting period. Comparison is made where possible with radioactivity concentrations measured in the preoperational period of August 1971 to the initial criticality of Unit 1 on January 12, 1975. A brief summary of the preoperational program is found in Appendix G.

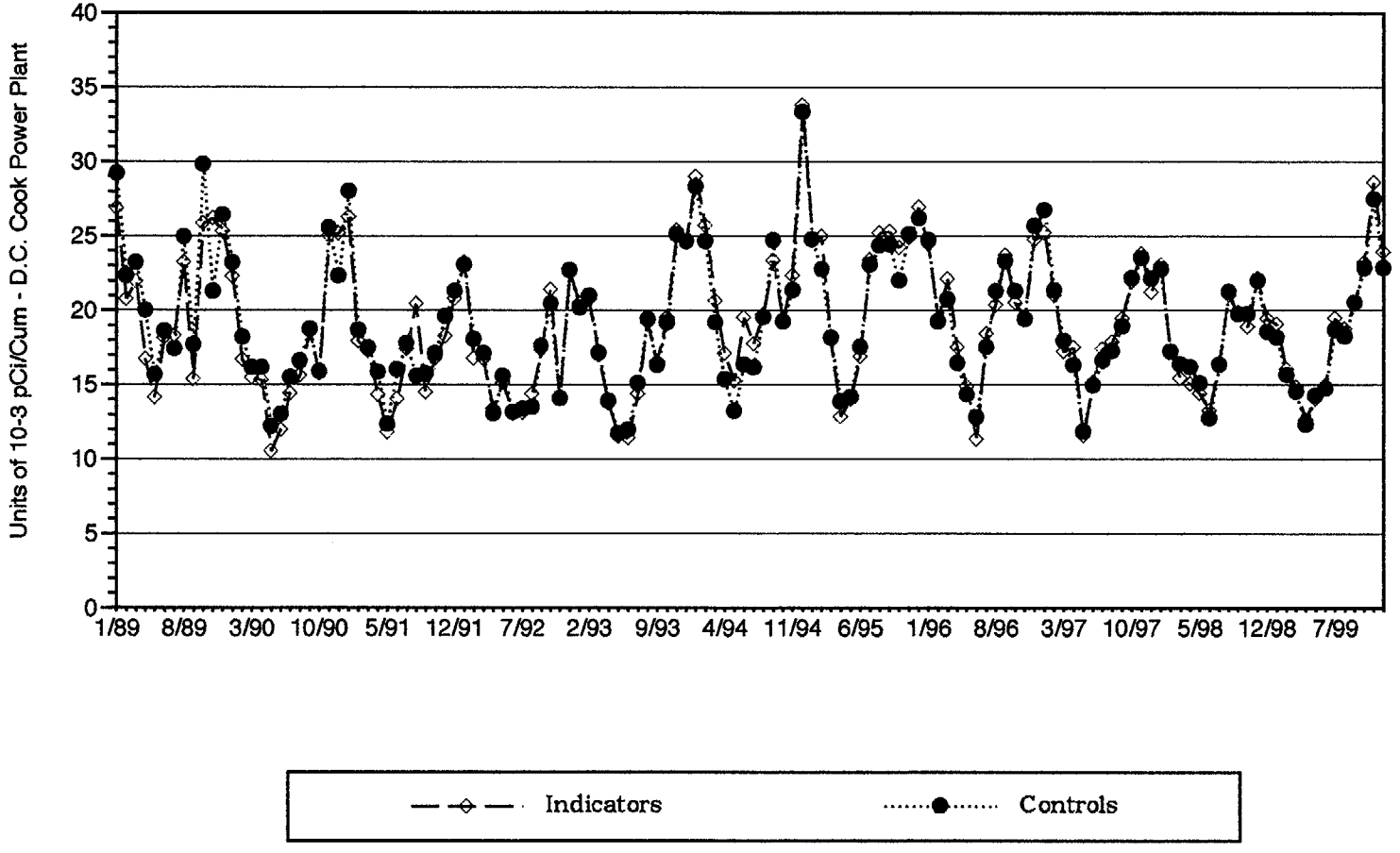
A. Airborne Particulates

Airborne particulate samples are collected with an oil less pump at approximately 56 LPM using a 47 mm particulate filter. Results of gross beta activities are presented in Table B-1. The measurement of the gross beta activity on the weekly air particulate filters is a good indication of the levels of natural and or manmade radioactivity in the environment. The average gross beta concentration of the six indicator locations was 0.019 pCi/m^3 with a range of individual values between 0.009 and 0.054 pCi/m^3. The average gross beta concentration of the four control locations was 0.018 pCi/m^3 with a range between 0.007 and 0.050 pCi/m^3. In Trending Graph 1 the monthly average gross beta concentrations for the indicator locations and for the control locations are plotted. The gross beta concentrations in air particulate filters in 1999 were lower than at the end of the preoperational period when the effects of recent atmospheric nuclear tests were being detected.

Air particulate filters were composited by location on a quarterly basis and were analyzed by gamma ray spectroscopy. Results are presented in Table B-2. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation, was measured in all forty samples. The average concentration for the control locations was 0.129 pCi/m^3 and the values ranged from 0.093 to 0.188 pCi/m^3. The average concentration for the indicator locations was 0.135 pCi/m^3 with a range of 0.094 to 0.185 pCi/m^3. These values are typical of beryllium-7 measured at various locations throughout the United States. Naturally occurring potassium-40 was measured in eight of the twenty-four indicator quarterly composites with an average concentration of 0.004 pCi/m^3 and a range of 0.002 to 0.007 pCi/m^3. Potassium-40 was measured in one of the sixteen control quarterly composites with a concentration of 0.003 pCi/m^3. No other gamma emitting radioactivity was detected.

Trending Graph - 1

AVERAGE MONTHLY GROSS BETA IN AIR PARTICULATES



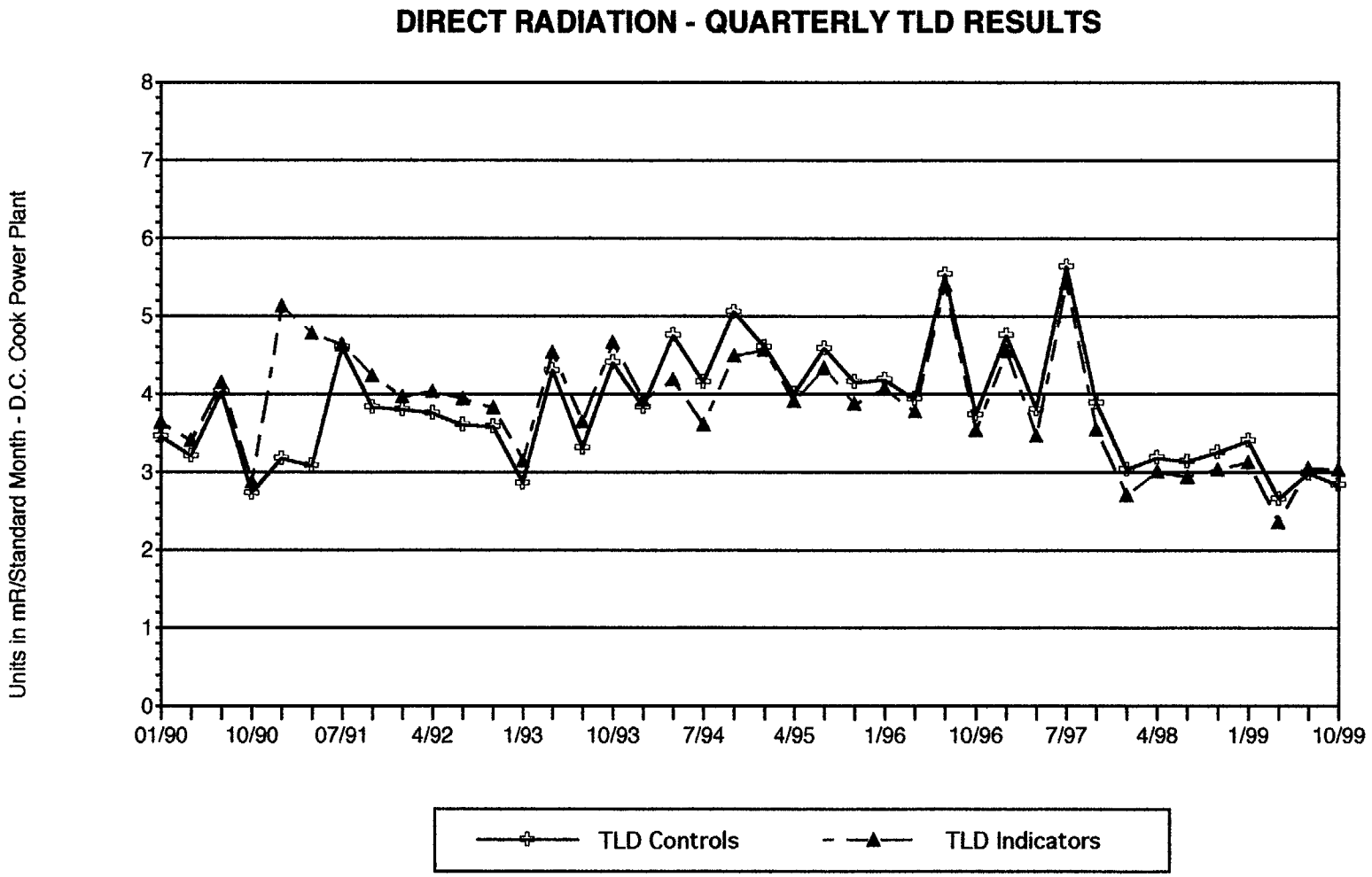
B. Airborne Iodine

Airborne iodine samples are collected with an oil less pump at approximately 56 LPM using a charcoal filter cartridge. Charcoal cartridges are installed downstream of the particulate filters and are used to collect airborne radioiodine. The results of the weekly analysis of the charcoal cartridges are presented in Table B-3. All results were below the lower level of detection of 0.07 pCi/m^3 with no positive activity detected.

C. Direct Radiation - Thermoluminescent Dosimeters

Thermoluminescent dosimeters (TLDs) measure external radiation exposure from several sources including naturally occurring radionuclides in the air and soil, radiation from cosmic origin, fallout from atomic weapons testing, potential radioactive airborne releases from the power station and direct radiation from the power station. The TLDs record exposure from all of these potential sources. The TLDs are deployed quarterly at 27 locations in the environs surrounding the D. C. Cook Nuclear Plant. The average value of the four areas of each dosimeter (calibrated individually after each field exposure period for response to a known exposure and for transit exposure) are presented in Table B-4. Those exposure rates are quite typical of observed rates at many other locations in the country. The average annual measurement for the control samples was 2.96 mR/standard month with a range of 2.2 to 3.9 mR/standard month. The annual accumulation of indicator samples had a measurement of 2.89 mR/standard month with a range of 1.7 to 4.3 mR/standard month. The 1999 annual average in the environs of the Donald C. Cook Nuclear Plant is at the low range of the exposure rates (1.0 to 2.0 mR/week) measured during the preoperational period. The results of the indicator and control TLDs are in good agreement and are plotted in Trending Graph 2.

Trending Graph - 2



D. Surface Water

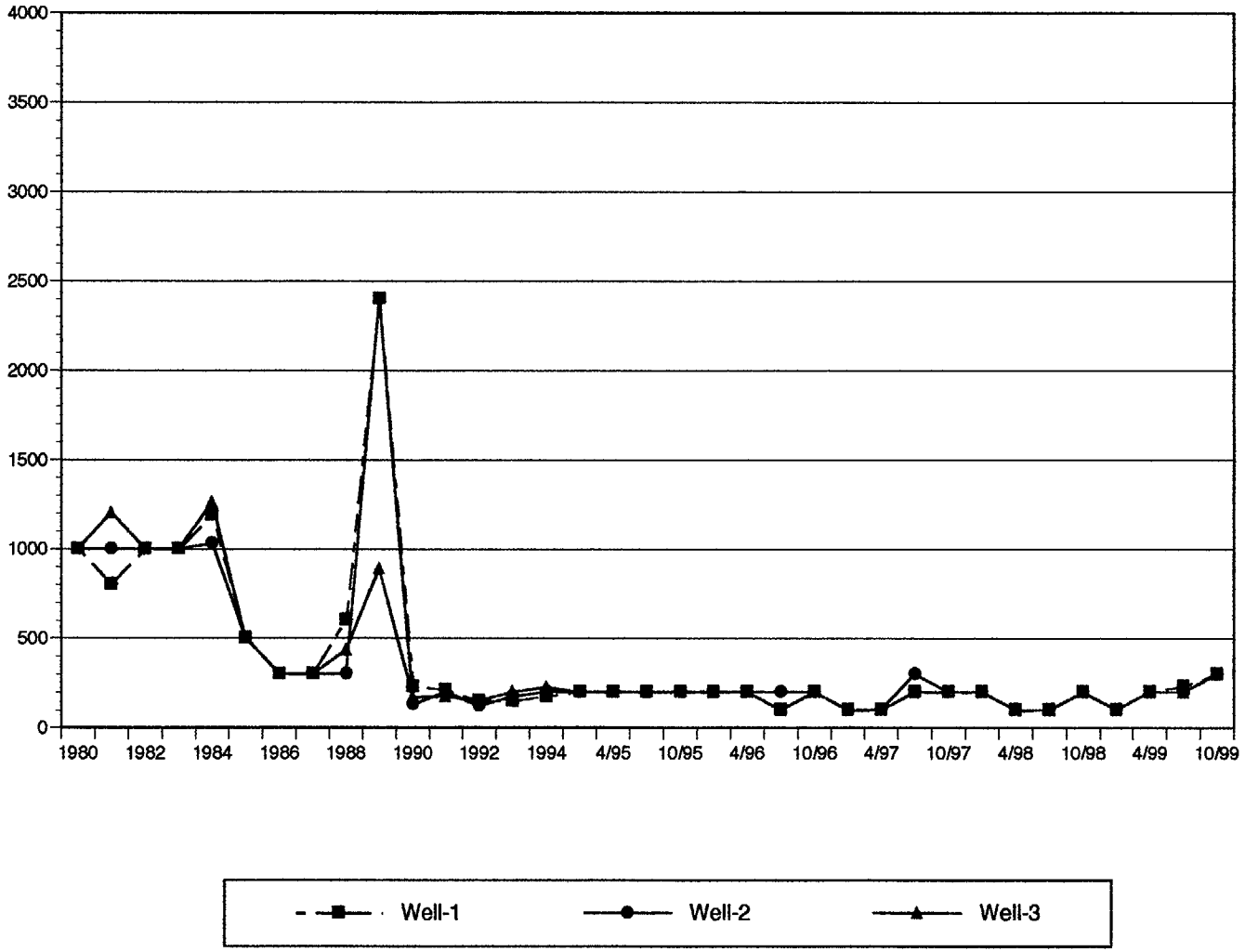
A 125 milliliter surface water sample is collected from the intake forebay and from two shoreline locations, all within 0.3 mile of the two reactors and were composited daily over a monthly period. The thirty-four samples were analyzed for iodine-131 by the radiochemical technique described on page 75. All results were less than the lower limit of detection of 1 pCi/liter. The quarterly composite was analyzed for tritium by liquid scintillation method described on page 74. Results are presented in Table B-5. Tritium was detected in 2 of the 12 samples analyzed with an average concentration of 330 pCi/liter and a range of 310 to 350 pCi/liter. This is consistent with the 6 measurements in 1998 which had an average concentration of 228 pCi/liter. During the preoperational period tritium was measured in surface water samples at concentrations of approximately 400 pCi/liter. Naturally occurring potassium-40 and cesium-137 were not measured during 1999. Naturally occurring gamma emitting isotopes were detected using gamma ray spectroscopy.

E. Groundwater

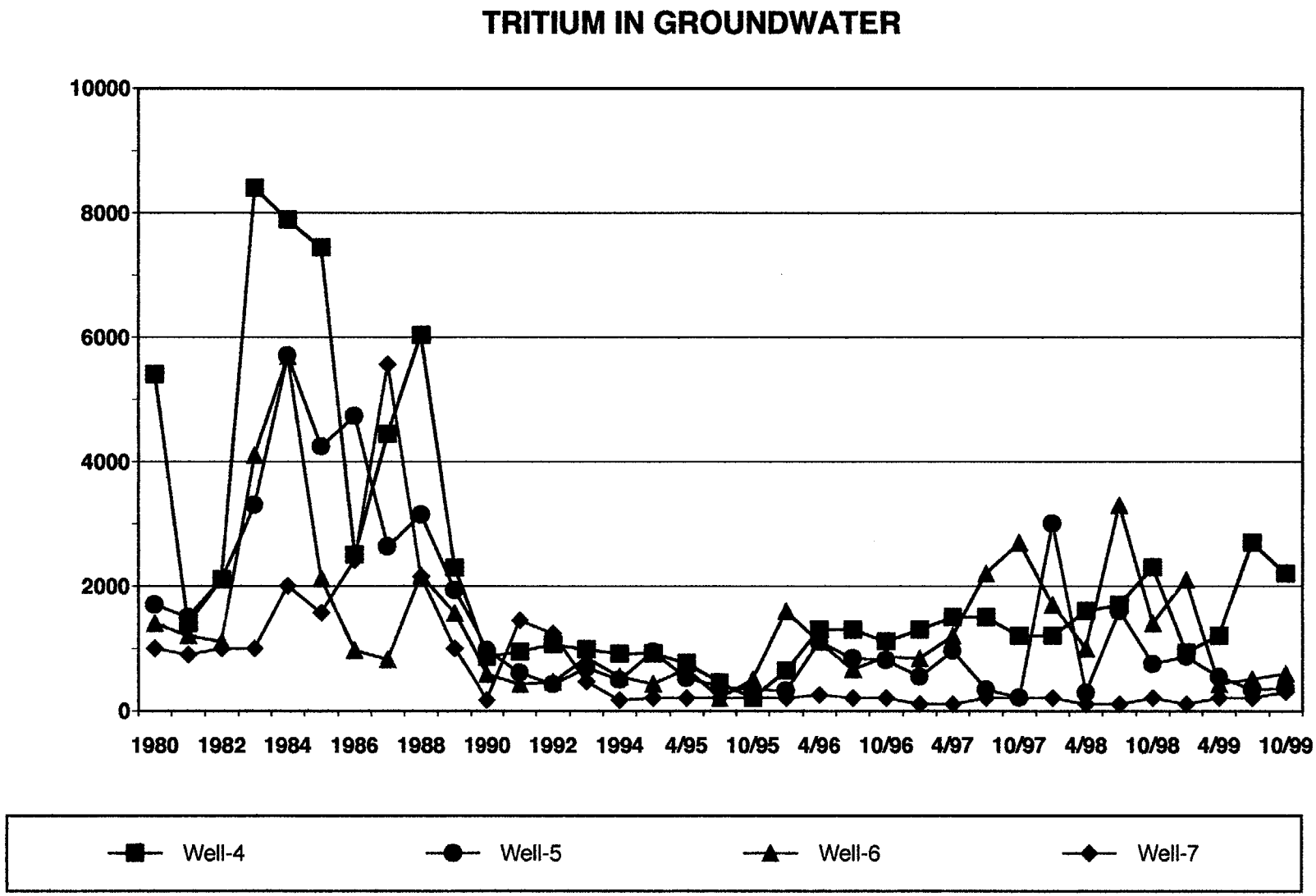
Water samples are collected quarterly from fourteen wells, all within 4300 feet of the reactors. First, a static water elevation is determined and three well bore volumes are purged from the well using a groundwater pump, or equivalent. A four liter sample is then obtained. The samples are analyzed for gamma emitters and tritium. The results are presented in Table B-6. Naturally occurring potassium-40 was measured in one sample with a concentration of 70.6 pCi/liter. There were no other gamma emitting isotopes measured. The groundwater wells W-1, W-4, W-5, W-6, W-8, W-10, and W-14 had measurable tritium activity throughout 1999. Tritium was measured in 18 of the 56 samples at the locations with an average concentration of 863 pCi/liter and a range of 140 to 2700 pCi/liter. This is significantly lower than the tritium measured during 1998 with an average of 1561 pCi/liter and a range of 210 to 3300 pCi/liter. The annual concentrations of tritium in wells W-1 through W-7 are plotted in Trending Graph 3.

Trending Graph - 3

TRITIUM IN GROUNDWATER

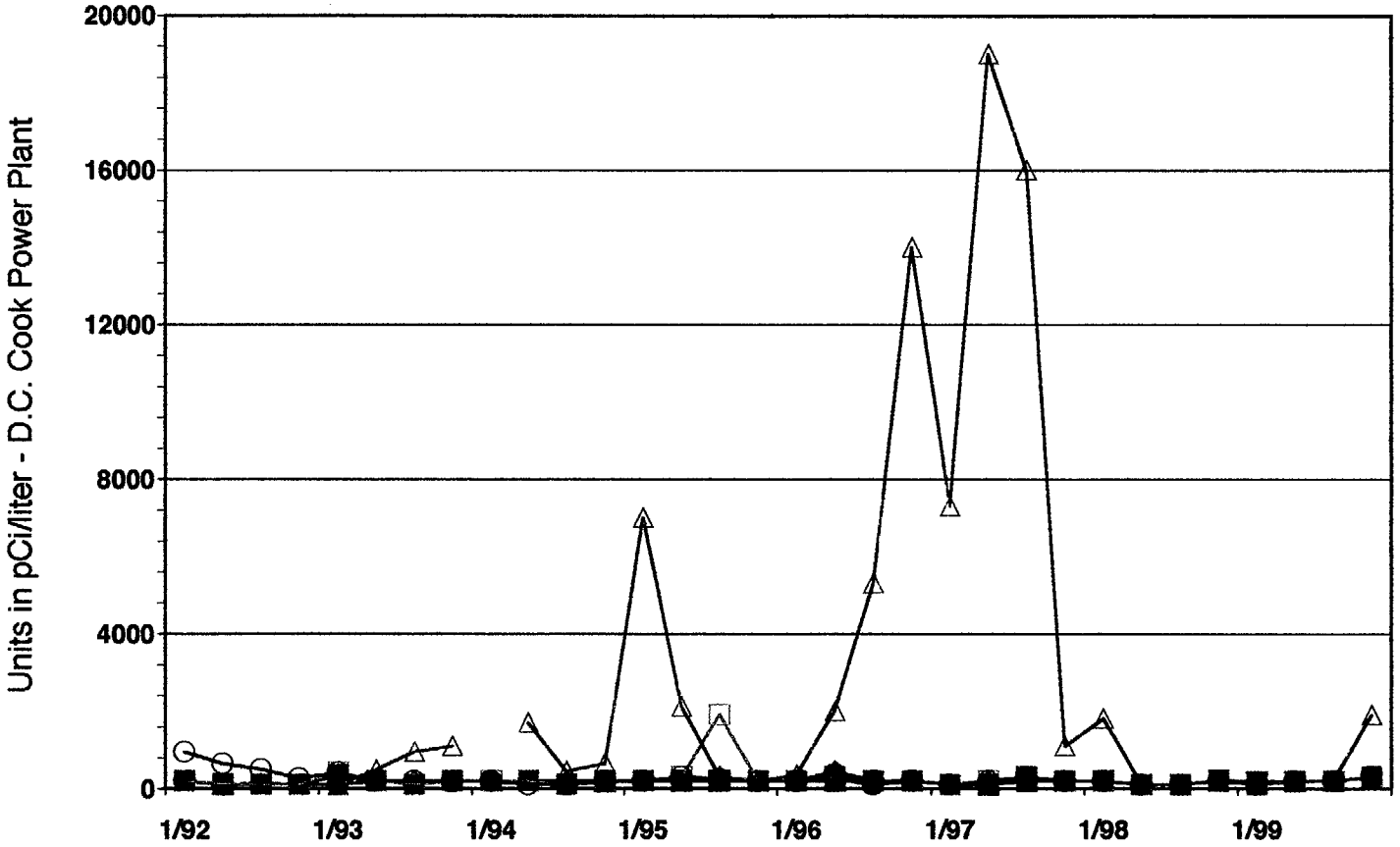


Trending Graph - 3 (Cont.)



Trending Graph - 3 (Cont.)

TRITIUM IN GROUNDWATER

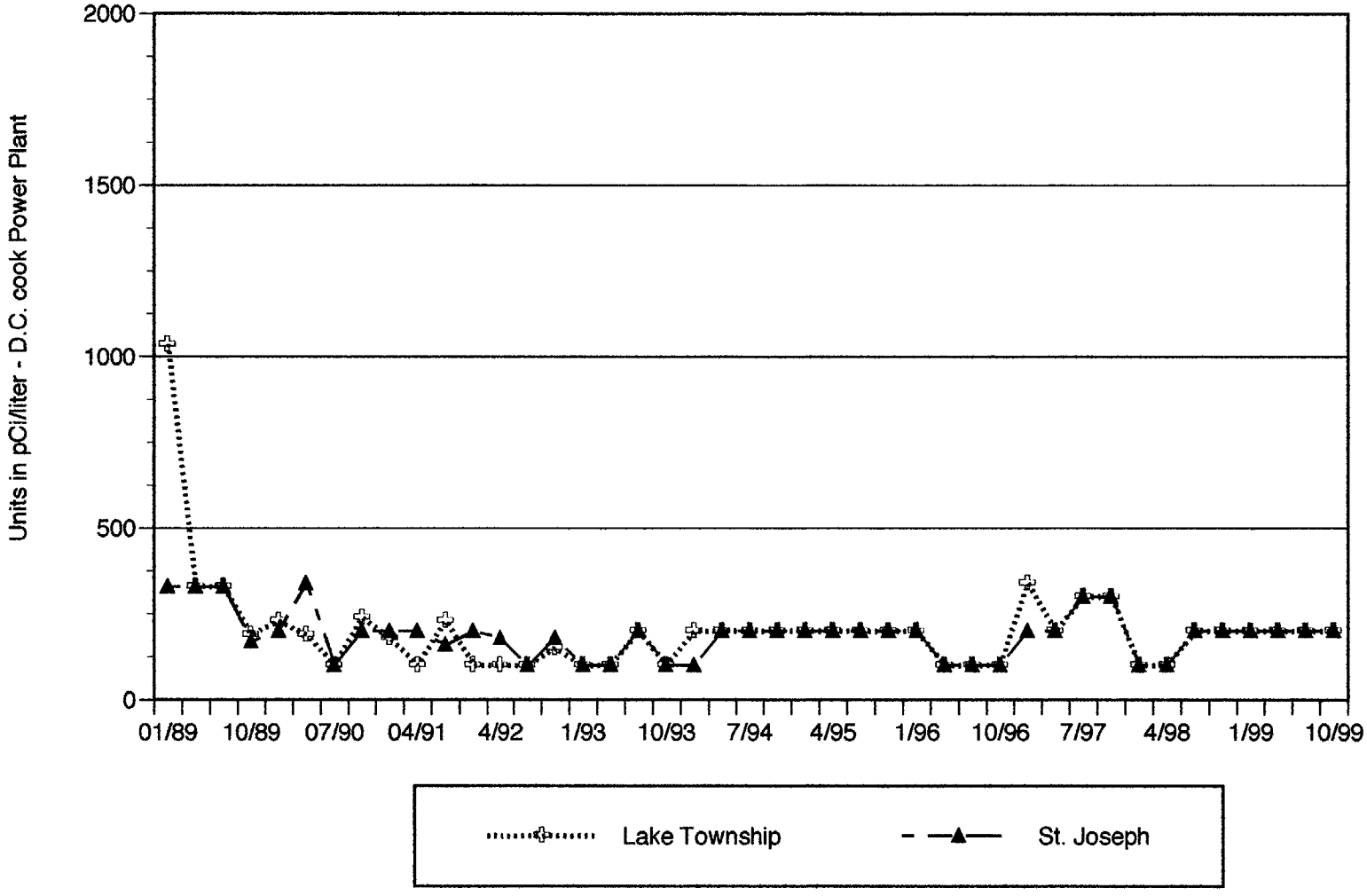


Well 14 added to the program in 1993.
No sample collected January 1994.

Well-8 Well-9 Well-10 Well-11 Well-12 Well-13 Well-14

Trending Graph - 4

TRITIUM IN DRINKING WATER



Tritium concentration in groundwater wells during the preoperational period typically averaged 400 pCi/liter.

F. Drinking Water

Daily samples are collected at the intake of the purification plants for St. Joseph and Lake Township. The 500 ml daily samples at each location are composited and analyzed for gross beta, iodine-131, and gamma emitters. On a quarterly basis the daily samples are composited and analyzed for tritium. The results of analyses of drinking water samples are shown in Table B-7.

Gross beta activity was measured in twenty-five of the twenty-six samples from the Lake Township intake with an average concentration of 3.20 pCi/liter and a range from 1.0 to 4.2 pCi/liter. Gross beta activity was measured in all twenty-six samples from the St. Joseph intake with an average concentration of 3.36 pCi/liter and a range from 1.4 to 6.3 pCi/liter. No gamma emitting isotopes or iodine-131 were detected. Tritium was not measured at the Lake Township location or the St. Joseph intake location. Tritium (or LLD values) in drinking water are plotted in Trending Graph 4.

There were no drinking water analyses performed in the preoperational program.

G. Sediment

Sediment samples are collected semiannually along the shoreline of Lake Michigan at the same two locations as the surface water samples. Two liters of lake sediment are collected using a small dredge in an area covered part time by wave action. The sediment samples are analyzed by gamma ray spectroscopy, the results of which are shown in Table B-8. In April and October one sample was collected from location SL-2 and SL-3. Gamma ray spectroscopy detected naturally occurring potassium-40 in all four samples. The average potassium-40 concentration was 6373 pCi/kg (dry weight) with a range from 5910 to 7260 pCi/kg (dry

weight). Thorium-228, also naturally occurring was measured in all four samples with an average concentration of 104 pCi/kg (dry weight) with a range from 85.0 to 134 pCi/kg (dry weight). Radium-226 and cesium-137 were not measured during 1999. All other gamma emitters were below the lower limits of detection.

H. Milk

The requirements of three indicator samples could not be met during 1999, therefore sampling of food samples was increased to offset the milk.

I. Broadleaf Vegetation

Broadleaf vegetation was collected in lieu of milk during 1999. Twenty-four samples were collected and results are presented in Table B-10. Naturally occurring potassium-40 was measured in the six control samples with an average concentration of 5195 pCi/kg (wet weight) and a range of 4420 to 6120 pCi/kg (wet weight). Potassium-40 was measured in the eighteen indicator samples with an average concentration of 3689 pCi/kg (wet weight) and a range of 1910 to 5280 pCi/kg (wet weight). Cosmogenically produced beryllium-7 was measured in the six control samples with an average concentration of 1543 pCi/kg (wet weight) and a range of 619 to 2730 pCi/kg (wet weight). Beryllium-7 was measured in the eighteen indicator samples with an average of 852 pCi/kg (wet weight) and a range of 134 to 2010 pCi/kg (wet weight). Cesium-137 was detected in two indicator samples with an average concentration of 47.5 pCi/kg (wet weight) and a range of 12.1 to 82.9 pCi. Cesium-137 was not measured at the control location. Thorium-228 was measured in one control sample with a measurement of 53.5 pCi/kg (wet weight). Thorium-228 was also measured in two of the eighteen indicator samples with an average activity of 78.7 pCi/kg (wet weight) and a range of 52.4 to 105 pCi/kg (wet weight). Radium-226 was not measured during 1999.

J. Fish

Using gill nets in approximately twenty feet of water in Lake Michigan, 4.5 pounds of fish are collected 2 times per year from each of four locations. The samples were then analyzed by gamma ray spectroscopy. Results are presented in Table B-11. Naturally occurring potassium-40 was measured in the two control samples with an average concentration of 2920 pCi/kg (wet weight) and a range of 2920 to 2920 pCi/kg (wet weight). Potassium-40 was measured in all six indicator samples with an average concentration of 2621 pCi/kg (wet weight) and a range of 2200 to 3000 pCi/kg (wet weight). Cesium-137 was measured in one control fish samples with a concentration of 31.3 pCi/kg (wet weight). Cesium-137 was measured in the six indicator samples with an average concentration of 54.0 pCi/kg (wet weight) and a range of 32.4 to 75.6 pCi/kg (wet weight).

K. Food Products

Food samples are collected annually at harvest, at two locations, as near the site boundary as possible, and approximately twenty miles from the plant. Each sample consists of 3 pounds of grapes and 3 pounds of broadleaves. There were four food samples collected during 1999 and results are presented in Table B-12. Naturally occurring potassium-40 was measured in both control samples with an average concentration of 2415 pCi/kg (wet weight) and a range of 2170 to 2660 pCi/kg (wet weight). Potassium-40 was measured in the two indicator food samples with an average concentration of 2080 pCi/kg (wet weight) and a range of 1920 to 2240 pCi/kg (wet weight). Cosmogenically produced beryllium-7 was measured in both control samples with an average concentration of 1370 pCi/kg (wet weight) and a range of 50.3 to 2690 pCi/kg (wet weight). Beryllium-7 was measured in one of the two indicator samples with a concentration of 4040 pCi/kg (wet weight). Cesium-137 was not detected in the two food samples for 1999. All other gamma emitters were below the lower limits of detection.

IV. CONCLUSIONS

IV. CONCLUSIONS

The results of the 1999 Radiological Environmental Monitoring Program for the Donald C. Cook Nuclear Plant have been presented. The results were as expected for normal environmental samples. Naturally occurring radioactivity was observed in sample media in the expected activity ranges.

Occasional samples of a few media showed the presence of man-made isotopes. These have been discussed individually in the text. Observed activities were at very low concentrations and had no significant dose consequence. Specific examples of sample media with positive analysis results are discussed below.

Air particulate gross beta concentrations of all the indicator locations for 1999 appear to follow the gross beta concentrations at the control locations. The concentration levels are actually lower than during the preoperational period. Gamma isotopic analysis of the particulate samples identified the gamma emitting isotopes as natural products (beryllium-7 and potassium-40). No man-made activity was found in the particulate media during 1999. No iodine-131 was detected in charcoal filters in 1999.

Thermoluminescent dosimeters (TLDs) measure external gamma radiation from naturally occurring radionuclides in the air and soil, radiation from cosmic origin and fallout from atmospheric nuclear weapons testing, and radioactive airborne releases and direct radiation from the power plant. The average annual TLD results were at normal background exposure levels.

Surface water samples are collected daily from the intake forebay and two locations in Lake Michigan. The samples are analyzed quarterly for tritium, and monthly for gamma emitting isotopes. No gamma emitters were detected during 1999. Tritium was measured in two of the twelve samples collected. The tritium concentration was at a normal background level.

Groundwater samples were collected quarterly at fourteen wells, all within 4300 feet of the reactors. The three wells within 500 feet had measurable tritium, which is attributed to the operation of the plant. The highest concentration measured in 1999 was 2700 pCi/liter which compares favorably with the highest concentration measured during 1998 of 3300

pCi/liter. Potassium-40, a naturally occurring nuclide was detected in one of the fifty-six samples with a concentration of 70.6 pCi/liter. No other gamma emitting isotopes were detected.

Samples are collected daily at the intakes of the drinking purification plants for St. Joseph and Lake Township. Samples composited daily over a two week period are analyzed for iodine-131, gross beta, and measured for gamma emitting isotopes. Samples are also analyzed quarterly for tritium. No iodine-131 or gamma emitting isotopes were detected. Gross beta was measured in all fifty-two samples at normal background concentrations. Tritium was not measured in the eight quarterly composite samples collected during 1999.

Sediment samples can be a sensitive indicator of discharges from nuclear power stations. Sediment samples are collected semiannually along the shoreline of Lake Michigan at two locations in close proximity of the reactors. The samples were analyzed by gamma ray spectroscopy and only naturally occurring gamma emitters were detected. There is no evidence of station discharges affecting Lake Michigan, either in the sediments or in the water, as previously discussed.

Milk samples were not analyzed during 1999 due to lack of participants in the program. Broadleaf sampling was performed in lieu of milk collection in 1999. Cesium-137 was measured in two broadleaf samples during 1999. Naturally occurring potassium-40, beryllium-7, and thorium-228 were observed during 1999. No other gamma emitting isotopes were measured in broadleaf samples in 1999.

Fish samples collected in Lake Michigan in the vicinity of the nuclear plant were analyzed by gamma ray spectroscopy. The only gamma emitting isotope measured was cesium-137 which was found in low concentrations in three samples.

Food products, consisting of grapes, and broadleaf vegetation were collected and analyzed by gamma ray spectroscopy. The only gamma emitting isotopes measured during 1999 were potassium-40 and beryllium-7.

The results of the analyses have been presented. Based on the evidence of the Radiological Environmental Monitoring Program the Donald C. Cook Nuclear Plant is operating within regulatory limits. Tritium in four on-site wells appears to be the only radionuclide which can be directly correlated with the plant. However the associated groundwater does not provide a direct dose pathway to humans because these wells do not supply water to the local population.

V. REFERENCES

V. REFERENCES

1. Data Tables from 1985- 1988 CEP-AEPSC Annual Radiological Environmental Monitoring Program Reports.

2. Eberline Instrument Company. Indiana Michigan Power Company, "D. C. Cook Nuclear Plant Radiological Environmental Monitoring Program - 1974 Annual Report", May 1975.

3. American Electric Power, 12 PMP 6010 0SD.001, Offsite Dose Calculation Manual.

4. United States Nuclear Regulatory Commission, Regulatory Guide 4.8, "Environmental Technical Specifications for Nuclear Power Plants", December 1975.

5. United States Nuclear Regulatory Commission, Regulatory Guide 1.21 "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants, April 1974.

6. United States Nuclear Regulatory Commission, Regulatory Guide 1.4 "Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants", April 1975.

7. USNRC Branch Technical Position, "Acceptable Radiological Environmental Monitoring Program", Rev. 1, November 1979.

APPENDIX A
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT **DOCKET NO. 50-315/50-316**

BERRIEN COUNTY JANUARY 1 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		ALL INDICATOR LOCATIONS MEAN (a/b) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Air Iodine (pCi/m^3)	I-131	519	-(0/311) -			-(0/208) -	0
Airborne Particulates (1E-03 pCi/m^3)	Gross Beta (Weekly)	519	18.8(311/311) (8.8-54)	ONS-2 Onsite 2338 ft.	19.8(52/52) (11-52)	18.3(208/208) (6.7-50)	0
	Gamma	40					
	Be-7	40	135(24/24) (93.6-185)	SBN. 26.2 mi SE	145(4/4) (101-188)	129(16/16) (92.6-188)	0
	K-40	40	4.34(8/24) (2.44-6.57)	ONS-3 Onsite 2407 ft.	6.57(1/4) -	3.29(1/16) -	0
Direct Radiation (mR/Standard Month)	Gamma Dose Quarterly	107	2.89(91/91) (1.7-4.3)	OFT-6 4.9 mi SE	3.85(4/4) (3.8-4.3)	2.96(16/16) (2.2-3.9)	0

(a/b) Ratio of samples with detectable activity to total number of samples analyzed.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT **DOCKET NO. 50-315/50-316**

BERRIEN COUNTY JANUARY 1 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		ALL INDICATOR LOCATIONS MEAN (a/b) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Surface Water (pCi/liter)	Gamma	36	(0/12) -	N/A		(0/24) -	0
	H-3	12	-(0/4) -	SWL-2 Intake	350(1/4)	330(2/8) (310-350)	0
Groundwater (pCi/liter)	Gamma	56					
	K-40	56	70.6(1/56) -	Well 13 -	70.6(1/4) -	-(0/0) -	0
	Th-228	56	-(0/56) -	N/A		-(0/0) -	0
	H-3	56	863(18/56) (140-2700)	Well 4	1758(4/4) (930-2700)	-(0/0) -	0
Drinking Water (pCi/liter)	Gross Beta	52	3.28(52/52) (1.0-6.3)	St. Joseph 9.0 mi NE	3.36(26/26) (1.4-6.3)	-(0/0)	0
	I-131	52	-(0/52) -	N/A	N/A	-(0/0) -	0
	Gamma	52	-(0/52) -	N/A	N/A	-(0/0) -	0
	H-3	8	-(0/8) -	N/A	N/A	-(0/0) -	0

(a/b) Ratio of samples with detectable activity to total number of samples analyzed.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT **DOCKET NO. 50-315/50-316**

BERRIEN COUNTY JANUARY 1 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		ALL INDICATOR LOCATIONS MEAN (a/b) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Fish (pCi/kg wet)	Gamma	8					
	K-40	8	2621(6/6) (2200-3000)	OFS South 5.0 mi S	2920(2/2) (2920-2790)	2920(2/2) (2920-2920)	0
	Cs-137	8	54.0(6/6) (32.4-75.6)	ONS-South 5.0 mi S	43.4(2/2) (16.7-70.0)	31.3(1/2) -	0
Food/Vegetation (pCi/kg wet)	Gamma	4					
	Be-7	4	4040(1/2) -	Sector D	4040(1/2) -	1370(2/2) (50.3-2690)	0
	K-40	4	2080(2/2) (1920-2240)	Sector J	2415(2/2) (2170-2660)	2415(2/2) (2170-2660)	0
	Cs-137	4	-(0/1) -		N/A	-(0/1) -	0

(a/b) Ratio of samples with detectable activity to total number of samples analyzed.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT DOCKET NO. 50-315/50-316

BERRIEN COUNTY JANUARY 1 to DECEMBER 31, 1999

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		ALL INDICATOR LOCATIONS MEAN (a/b) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Sediment (pCi/kg dry)	Gamma	4					
	K-40	4	6373(4/4) (5910-7260)	SL-2 0.2 mi S	6735(2/2) (6210-7260)	-(0/0) -	0
	Cs-137	4	-(0/4) -	N/A	N/A	-(0/0) -	0
	Ra-226	4	-(0/4) -	N/A	N/A -	-(0/0) -	0
	Th-228	4	104(4/4) (85-134)	SL-3 0.2 mi N	122(2/2) (109-134)	-(0/0) -	0
Broadleaf/ Vegetation (pCi/kg wet)	Gamma	24					
	Be-7	24	852(18/18) (134-2010)	Sector J	1543(6/6) (619-2730)	1543(6/6) (619-2730)	0
	K-40	24	3689(18/18) (1910-5280)	Sector J	5195(6/6) (4420-6120)	5195(6/6) (4420-6120)	0
	Cs-137	24	47.5(2/18) (12.1-82.9)	Sector D	47.5(2/18) (12.1-82.9)	-(0/6) -	0
	Th-228	24	78.7(2/18) (52.4-105)	Sector D	78.7(2/18) (52.4-105)	53.5(1/6) -	0

(a/b) Ratio of samples with detectable activity to total number of samples analyzed.

APPENDIX B
DATA TABLES

TABLE B-1

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL	Average ± 2 s.d.
JANUARY 99											
01/06/99	18 ± 2	17 ± 2	18 ± 2	24 ± 2	17 ± 2	17 ± 2	17 ± 2	19 ± 2	19 ± 2	18 ± 2	18 ± 4
01/13/99	27 ± 2	23 ± 2	26 ± 2	31 ± 2	27 ± 2	22 ± 2	27 ± 2	27 ± 2	24 ± 2	24 ± 2	26 ± 5
01/20/99	18 ± 2	16 ± 2	18 ± 2	22 ± 2	15 ± 2	16 ± 2	14 ± 2	17 ± 2	19 ± 2	6.7 ± 1.3	16 ± 8
01/27/99	16 ± 2	16 ± 2	16 ± 2	21 ± 2	15 ± 2	16 ± 2	13 ± 2	14 ± 2	15 ± 2	15 ± 2	16 ± 4
02/03/99	16 ± 2	17 ± 2	18 ± 2	14 ± 2	17 ± 2	18 ± 2	21 ± 2	18 ± 2	19 ± 2	16 ± 2	17 ± 4
FEBRUARY											
02/10/99	18 ± 2	19 ± 2	20 ± 2	19 ± 2	19 ± 2	18 ± 2	20 ± 2	16 ± 2	17 ± 2	19 ± 2	19 ± 3
02/17/99	16 ± 2	15 ± 2	16 ± 2	15 ± 2	15 ± 2	15 ± 2	14 ± 2	16 ± 2	14 ± 2	16 ± 2	15 ± 2
02/24/99	15 ± 2	14 ± 2	15 ± 2	14 ± 2	14 ± 2	12 ± 2	14 ± 2	14 ± 2	15 ± 2	15 ± 2	14 ± 2
03/03/99	17 ± 2	17 ± 2	15 ± 2	16 ± 2	17 ± 2	14 ± 2	16 ± 2	16 ± 2	14 ± 2	14 ± 2	16 ± 3
MARCH											
03/10/99	17 ± 2	15 ± 2	14 ± 2	14 ± 2	15 ± 2	14 ± 2	15 ± 2	15 ± 2	14 ± 2	16 ± 2	15 ± 2
03/17/99	18 ± 2	19 ± 2	17 ± 2	16 ± 2	17 ± 2	18 ± 2	17 ± 2	14 ± 2	17 ± 2	18 ± 2	17 ± 3
03/24/99	13 ± 2	14 ± 2	14 ± 2	14 ± 2	16 ± 2	14 ± 2	15 ± 2	15 ± 2	14 ± 2	14 ± 2	14 ± 2
03/31/99	14 ± 2	11 ± 2	12 ± 2	12 ± 2	14 ± 2	14 ± 2	12 ± 2	14 ± 2	11 ± 2	11 ± 2	13 ± 3
Quarter Avg.	**17 ± 7**	**16 ± 6**	**17 ± 7**	**18 ± 11**	**17 ± 7**	**16 ± 5**	**17 ± 8**	**17 ± 7**	**16 ± 7**	**16 ± 8**	**17 ± 7**

TABLE B-1 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL	Average ± 2 s.d.
APRIL											
04/07/99	12 ± 2	12 ± 2	13 ± 2	10 ± 1	9.9 ± 1.4	12 ± 2	11 ± 1	15 ± 2	14 ± 2	11 ± 1	12 ± 3
04/14/99	16 ± 2	17 ± 2	16 ± 2	14 ± 2	15 ± 2	16 ± 2	15 ± 2	14 ± 2	15 ± 2	12 ± 2	15 ± 3
04/21/99	10 ± 2	11 ± 2	11 ± 2	9.7 ± 1.5	9.5 ± 1.5	10 ± 2	9.4 ± 1.4	9.1 ± 1.4	9.0 ± 1.5	9.8 ± 1.5	9.9 ± 1.4
04/28/99	12 ± 2	15 ± 2	12 ± 2	13 ± 2	14 ± 2	13 ± 2	14 ± 2	14 ± 2	12 ± 2	12 ± 2	13 ± 2
MAY											
05/05/99	14 ± 2	15 ± 2	14 ± 2	13 ± 2	15 ± 2	15 ± 2	15 ± 2	16 ± 2	14 ± 2	13 ± 2	14 ± 2
05/12/99	8.8 ± 1.5	12 ± 2	11 ± 1	9.1 ± 1.5	12 ± 2	11 ± 2	12 ± 2	13 ± 2	10 ± 2	9.2 ± 1.4	11 ± 3
05/19/99	14 ± 2	12 ± 2	15 ± 2	14 ± 2	15 ± 2	13 ± 2	15 ± 2	15 ± 2	15 ± 2	13 ± 2	14 ± 2
05/26/99	11 ± 2	13 ± 2	13 ± 2	15 ± 2	13 ± 2	11 ± 2	13 ± 2	14 ± 2	12 ± 2	11 ± 2	13 ± 3
06/02/99	22 ± 2	19 ± 2	16 ± 2	18 ± 2	21 ± 2	17 ± 2	19 ± 2	20 ± 2	19 ± 2	16 ± 2	19 ± 4
JUNE											
06/09/99	14 ± 2	15 ± 2	13 ± 2	14 ± 2	14 ± 2	14 ± 2	14 ± 2	12 ± 2	12 ± 2	11 ± 2	13 ± 3
06/16/99	11 ± 2	13 ± 2	13 ± 2	15 ± 2	14 ± 2	11 ± 2	13 ± 2	16 ± 2	14 ± 2	13 ± 2	13 ± 3
06/23/99	18 ± 2	20 ± 2	19 ± 2	19 ± 2	20 ± 2	19 ± 2	19 ± 2	22 ± 2	18 ± 2	17 ± 2	19 ± 3
06/30/99	12 ± 2	15 ± 2	13 ± 2	12 ± 2	14 ± 2	16 ± 2	14 ± 2	13 ± 2	14 ± 2	13 ± 2	14 ± 3
Quarter Avg.	**13 ± 7**	**15 ± 6**	**14 ± 4**	**14 ± 6**	**14 ± 7**	**14 ± 6**	**14 ± 5**	**15 ± 7**	**14 ± 6**	**12 ± 4**	**14 ± 4**

TABLE B-1 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL	Average ± 2 s.d.
JULY											
07/07/99	16 ± 2	21 ± 2	16 ± 2	19 ± 2	20 ± 2	16 ± 2	19 ± 2	17 ± 2	17 ± 2	16 ± 2	18 ± 2
07/14/99	16 ± 2	20 ± 2	15 ± 2	16 ± 2	19 ± 2	15 ± 2	17 ± 2	18 ± 2	16 ± 2	14 ± 2	17 ± 4
07/21/99	24 ± 2	26 ± 2	28 ± 2	27 ± 2	24 ± 2	25 ± 2	27 ± 2	29 ± 2	26 ± 2	21 ± 2	26 ± 5
07/28/99	18 ± 2	19 ± 2	16 ± 2	17 ± 2	16 ± 2	18 ± 2	16 ± 2	17 ± 2	14 ± 2	17 ± 2	17 ± 3
08/04/99	19 ± 2	21 ± 2	18 ± 2	20 ± 2	19 ± 2	(a)	18 ± 2	19 ± 2	19 ± 2	16 ± 2	19 ± 3
AUGUST											
08/11/99	14 ± 2	18 ± 2	15 ± 2	16 ± 2	18 ± 2	16 ± 2	18 ± 2	19 ± 2	15 ± 2	12 ± 2	16 ± 4
08/18/99	17 ± 2	14 ± 2	13 ± 2	17 ± 2	15 ± 2	16 ± 2	17 ± 2	17 ± 2	15 ± 2	14 ± 2	16 ± 3
08/25/99	23 ± 2	22 ± 2	21 ± 2	21 ± 2	20 ± 2	19 ± 2	20 ± 2	20 ± 2	21 ± 2	19 ± 2	21 ± 3
09/01/99	22 ± 2	23 ± 2	25 ± 2	22 ± 2	22 ± 2	21 ± 2	25 ± 2	23 ± 2	19 ± 2	17 ± 2	22 ± 5
SEPTEMBER											
09/08/99	29 ± 2	30 ± 2	27 ± 2	28 ± 2	28 ± 2	27 ± 2	33 ± 2	29 ± 2	27 ± 2	27 ± 2	29 ± 4
09/15/99	20 ± 2	19 ± 2	17 ± 2	19 ± 2	17 ± 2	18 ± 2	19 ± 2	22 ± 2	17 ± 2	18 ± 2	19 ± 3
09/22/99	14 ± 2	15 ± 2	12 ± 2	13 ± 2	13 ± 2	12 ± 2	13 ± 2	14 ± 2	13 ± 2	11 ± 2	13 ± 2
09/30/99	21 ± 2	22 ± 2	20 ± 2	24 ± 2	24 ± 2	20 ± 2	20 ± 2	25 ± 2	21 ± 2	19 ± 2	22 ± 4
Quarter Avg.	**19 ± 9**	**21 ± 8**	**19 ± 10**	**20 ± 9**	**20 ± 8**	**19 ± 8**	**20 ± 11**	**21 ± 9**	**18 ± 9**	**17 ± 8**	**19 ± 9**

(a) Sample not obtained.

TABLE B-1 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL	Average ± 2 s.d.
OCTOBER											
10/06/99	15 ± 2	17 ± 2	15 ± 2	14 ± 2	12 ± 2	13 ± 2	8.9 ± 1.8	17 ± 2	15 ± 2	12 ± 2	14 ± 5
10/13/99	25 ± 2	26 ± 2	23 ± 2	24 ± 2	24 ± 2	24 ± 2	24 ± 2	27 ± 2	24 ± 2	22 ± 2	24 ± 3
10/20/99	17 ± 2	17 ± 2	15 ± 2	17 ± 2	16 ± 2	14 ± 2	16 ± 2	18 ± 2	14 ± 2	14 ± 2	16 ± 3
10/27/99	13 ± 2	15 ± 2	15 ± 2	13 ± 2	15 ± 2	15 ± 2	14 ± 2	16 ± 2	14 ± 2	13 ± 2	14 ± 2
11/03/99	39 ± 3	52 ± 3	43 ± 3	46 ± 3	48 ± 3	54 ± 3	50 ± 3	50 ± 3	45 ± 3	42 ± 3	47 ± 10
NOVEMBER											
11/10/99	27 ± 2	32 ± 2	25 ± 2	28 ± 2	27 ± 2	31 ± 2	30 ± 2	27 ± 2	29 ± 2	26 ± 2	28 ± 5
11/17/99	26 ± 2	30 ± 2	25 ± 2	23 ± 2	24 ± 2	27 ± 2	29 ± 2	26 ± 2	25 ± 2	23 ± 2	26 ± 5
11/24/99	34 ± 3	37 ± 3	36 ± 3	33 ± 3	34 ± 3	37 ± 3	35 ± 3	26 ± 2	38 ± 3	33 ± 3	35 ± 7
12/01/99	25 ± 2	28 ± 2	23 ± 2	23 ± 2	23 ± 2	27 ± 2	26 ± 2	22 ± 2	22 ± 2	21 ± 2	25 ± 5
DECEMBER											
12/08/99	23 ± 2	23 ± 2	23 ± 2	22 ± 2	24 ± 2	26 ± 3	22 ± 2	19 ± 2	20 ± 2	20 ± 2	24 ± 4
12/15/99	27 ± 2	32 ± 3	26 ± 2	26 ± 2	29 ± 2	26 ± 2	27 ± 2	28 ± 2	26 ± 2	25 ± 2	28 ± 4
12/22/99	24 ± 2	22 ± 2	21 ± 2	24 ± 2	21 ± 2	23 ± 2	27 ± 2	24 ± 2	24 ± 2	22 ± 2	23 ± 4
12/29/99	25 ± 2	24 ± 2	22 ± 2	20 ± 2	20 ± 2	21 ± 2	21 ± 2	20 ± 2	21 ± 2	19 ± 2	22 ± 4
Quarter Avg.	**25 ± 14**	**27 ± 20**	**24 ± 16**	**24 ± 17**	**24 ± 18**	**26 ± 22**	**25 ± 21**	**25 ± 17**	**24 ± 18**	**22 ± 16**	**25 ± 18**
Annual Avg.	**19 ± 13**	**20 ± 15**	**18 ± 13**	**19 ± 13**	**19 ± 13**	**19 ± 15**	**19 ± 15**	**19 ± 13**	**18 ± 13**	**17 ± 12**	**19 ± 14**

TABLE B-2

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN QUARTERLY COMPOSITES OF AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Stations	Nuclides	First Quarter 12/30/98-03/31/99	Second Quarter 03/31/99-06/30/99	Third Quarter 06/30/99-09/30/99	Fourth Quarter 09/30/99-12/29/99	Average ± 2 s.d.
ONS-1	Be-7	153 ± 15	153 ± 15	136 ± 14	93.6 ± 9.4	134 ± 56
	K-40	4.01 ± 1.96	< 5	< 5	2.44 ± 1.18	3.23 ± 2.2
	Cs-134	< 0.3	< 0.3	< 0.4	< 0.2	-
	Cs-137	< 0.2	< 0.3	< 0.3	< 0.2	-
ONS-2	Be-7	130 ± 13	161 ± 16	157 ± 16	119 ± 12	142 ± 41
	K-40	< 6	< 5	4.34 ± 2.47	< 5	4.34 ± 2.47
	Cs-134	< 0.2	< 0.2	< 0.3	< 0.3	-
	Cs-137	< 0.2	< 0.3	< 0.3	< 0.4	-
ONS-3	Be-7	152 ± 15	144 ± 14	140 ± 14	99.4 ± 9.9	134 ± 47
	K-40	< 5	< 7	6.57 ± 2.45	< 6	6.57 ± 2.45
	Cs-134	< 0.3	< 0.3	< 0.3	< 0.2	-
	Cs-137	< 0.3	< 0.3	< 0.2	< 0.3	-
ONS-4	Be-7	141 ± 14	139 ± 14	139 ± 14	107 ± 11	132 ± 33
	K-40	< 4	< 10	4.47 ± 2.26	< 10	4.47 ± 2.26
	Cs-134	< 0.3	< 0.3	< 0.3	< 0.4	-
	Cs-137	< 0.2	< 0.3	< 0.2	< 0.3	-
ONS-5	Be-7	117 ± 12	185 ± 18	138 ± 14	98.1 ± 9.8	135 ± 75
	K-40	< 4	4.27 ± 1.73	4.16 ± 2.09	4.47 ± 2.27	4.30 ± 0.3
	Cs-134	< 0.2	< 0.2	< 0.3	< 0.3	-
	Cs-137	< 0.2	< 0.2	< 0.3	< 0.3	-

* Typical LLDs are found in Table B-12. All other gamma emitters were <LLD.

TABLE B-2

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN QUARTERLY COMPOSITES OF AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Stations	Nuclides	First Quarter 12/30/98-03/31/99	Second Quarter 03/31/99-06/30/99	Third Quarter 06/30/99-09/30/99	Fourth Quarter 09/30/99-12/29/99	Average ± 2 s.d.
ONS-6	Be-7	127 ± 13	145 ± 15	157 ± 16	111 ± 11	135 ± 40
	K-40	< 7	< 6	< 5	< 6	-
	Cs-134	< 0.2	< 0.2	< 0.2	< 0.2	-
	Cs-137	< 0.2	< 0.2	< 0.2	< 0.3	-
NBF	Be-7	133 ± 13	153 ± 15	146 ± 15	92.6 ± 9.3	131 ± 54
	K-40	< 4	< 5	< 6	< 8	-
	Cs-134	< 0.3	< 0.3	< 0.2	< 0.3	-
	Cs-137	< 0.2	< 0.3	< 0.2	< 0.3	-
SBN	Be-7	133 ± 13	188 ± 19	159 ± 16	101 ± 10	145 ± 74
	K-40	< 5	3.29 ± 1.71	< 4	< 10	3.29 ± 1.71
	Cs-134	< 0.3	< 0.3	< 0.3	< 0.4	-
	Cs-137	< 0.2	< 0.2	< 0.3	< 0.3	-
DOW	Be-7	125 ± 13	144 ± 14	134 ± 13	93.1 ± 9.3	124 ± 44
	K-40	< 4	< 7	< 4	< 4	-
	Cs-134	< 0.2	< 0.3	< 0.2	< 0.2	-
	Cs-137	< 0.3	< 0.3	< 0.2	< 0.2	-
COL	Be-7	121 ± 12	132 ± 13	124 ± 12	92.9 ± 9.3	117 ± 34
	K-40	< 10	< 10	< 5	< 6	-
	Cs-134	< 0.3	< 0.3	< 0.2	< 0.2	-
	Cs-137	< 0.3	< 0.3	< 0.3	< 0.2	-

* Typical LLDs are found in Table B-12. All other gamma emitters were <LLD.

TABLE B-3

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE-131 IN WEEKLY AIR CARTRIDGE SAMPLES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL
JANUARY 99										
01/06/99	< 7	< 7	< 7	< 7	< 5	< 10	< 10	< 10	< 10	< 8
01/13/99	< 7	< 7	< 7	< 7	< 5	< 8	< 8	< 8	< 8	< 6
01/20/99	< 10	< 10	< 10	< 10	< 8	< 10	< 10	< 10	< 10	< 7
01/27/99	< 8	< 8	< 8	< 8	< 6	< 8	< 8	< 9	< 8	< 5
02/03/99	< 8	< 8	< 8	< 8	< 7	< 8	< 8	< 9	< 8	< 6
FEBRUARY										
02/10/99	< 7	< 7	< 7	< 7	< 5	< 6	< 6	< 6	< 6	< 4
02/17/99	< 10	< 10	< 10	< 10	< 8	< 10	< 10	< 10	< 10	< 7
02/24/99	< 8	< 7	< 7	< 7	< 6	< 7	< 7	< 8	< 7	< 5
03/03/99	< 6	< 6	< 6	< 6	< 5	< 10	< 10	< 10	< 10	< 6
MARCH										
03/10/99	< 7	< 7	< 7	< 7	< 6	< 8	< 8	< 8	< 7	< 5
03/17/99	< 8	< 8	< 7	< 8	< 6	< 8	< 8	< 8	< 8	< 5
03/24/99	< 7	< 7	< 7	< 7	< 5	< 10	< 10	< 10	< 10	< 7
03/31/99	< 6	< 6	< 6	< 6	< 5	< 10	< 10	< 10	< 10	< 8

TABLE B-3 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE-131 IN WEEKLY AIR CARTRIDGE SAMPLES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL
APRIL										
04/07/99	< 7	< 7	< 7	< 7	< 5	< 10	< 10	< 10	< 10	< 7
04/14/99	< 10	< 10	< 10	< 10	< 9	< 9	< 9	< 9	< 9	< 7
04/21/99	< 8	< 8	< 8	< 8	< 6	< 10	< 10	< 10	< 10	< 8
04/28/99	< 6	< 6	< 6	< 6	< 5	< 10	< 10	< 10	< 10	< 7
MAY										
05/05/99	< 10	< 10	< 10	< 10	< 8	< 8	< 7	< 8	< 7	< 6
05/12/99	< 10	< 10	< 10	< 10	< 8	< 7	< 7	< 8	< 8	< 6
05/19/99	< 8	< 8	< 8	< 8	< 5	< 10	< 10	< 10	< 10	< 8
05/26/99	< 7	< 7	< 6	< 7	< 5	< 20	< 20	< 20	< 20	< 10
06/02/99	< 10	< 10	< 10	< 10	< 9	< 7	< 7	< 7	< 8	< 5
JUNE										
06/09/99	< 10	< 10	< 10	< 10	< 9	< 7	< 7	< 7	< 7	< 5
06/16/99	< 10	< 10	< 10	< 10	< 9	< 7	< 7	< 7	< 8	< 5
06/23/99	< 7	< 7	< 6	< 7	< 5	< 6	< 6	< 6	< 6	< 4
06/30/99	< 8	< 7	< 7	< 7	< 5	< 10	< 10	< 10	< 10	< 8

TABLE B-3 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE-131 IN WEEKLY AIR CARTRIDGE SAMPLES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL
JULY										
07/07/99	< 9	< 9	< 8	< 9	< 6	< 9	< 9	< 9	< 9	< 6
07/14/99	< 9	< 9	< 9	< 9	< 8	< 8	< 8	< 9	< 9	< 6
07/21/99	< 9	< 9	< 9	< 9	< 7	< 9	< 9	< 9	< 9	< 6
07/28/99	< 8	< 8	< 8	< 8	< 6	< 7	< 7	< 8	< 7	< 5
AUGUST										
08/04/99	< 8	< 8	< 8	< 8	< 6	(a)	< 10	< 10	< 10	< 10
08/11/99	< 10	< 10	< 10	< 10	< 9	< 10	< 10	< 10	< 10	< 8
08/18/99	< 8	< 9	< 8	< 9	< 7	< 8	< 9	< 9	< 8	< 6
08/25/99	< 10	< 10	< 10	< 10	< 9	< 20	< 20	< 20	< 20	< 10
09/01/99	< 9	< 9	< 9	< 9	< 6	< 7	< 8	< 8	< 7	< 5
SEPTEMBER										
09/08/99	< 8	< 9	< 9	< 9	< 6	< 10	< 10	< 10	< 10	< 8
09/15/99	< 10	< 10	< 10	< 10	< 9	< 10	< 10	< 10	< 10	< 8
09/22/99	< 10	< 10	< 10	< 10	< 8	< 10	< 10	< 10	< 10	< 8
09/30/99	< 10	< 10	< 10	< 10	< 7	< 10	< 10	< 10	< 10	< 10

(a) Sample not obtained.

TABLE B-3 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE-131 IN WEEKLY AIR CARTRIDGE SAMPLES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL
OCTOBER										
10/06/99	< 9	< 10	< 9	< 9	< 7	< 10	< 10	< 10	< 10	< 6
10/13/99	< 8	< 8	< 8	< 8	< 6	< 10	< 10	< 10	< 10	< 8
10/20/99	< 10	< 10	< 10	< 10	< 7	< 20	< 20	< 20	< 20	< 9
10/27/99	< 9	< 10	< 9	< 9	< 6	< 10	< 10	< 10	< 10	< 9
11/03/99	< 9	< 10	< 9	< 10	< 6	< 20	< 20	< 20	< 10	< 9
NOVEMBER										
11/10/99	< 9	< 9	< 9	< 9	< 7	< 9	< 9	< 9	< 9	< 6
11/17/99	< 9	< 9	< 9	< 9	< 6	< 10	< 10	< 10	< 10	< 9
11/24/99	< 10	< 10	< 10	< 10	< 9	< 20	< 20	< 20	< 20	< 10
12/01/99	< 10	< 10	< 10	< 10	< 7	< 10	< 20	< 20	< 10	< 10
DECEMBER										
12/08/99	< 10	< 10	< 10	< 10	< 10	< 8	< 9	< 9	< 8	< 6
12/15/99	< 10	< 10	< 10	< 10	< 8	< 9	< 10	< 10	< 9	< 7
12/22/99	< 8	< 8	< 8	< 8	< 5	< 10	< 10	< 10	< 10	< 8
12/29/99	< 10	< 10	< 10	< 10	< 8	< 20	< 10	< 20	< 20	< 10

TABLE B-4

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

DIRECT RADIATION MEASUREMENTS - QUARTERLY TLD RESULTS

Results in Units of mR/standard month

STATION CODES	FIRST QUARTER 12/30/98-03/31/99	SECOND QUARTER 03/31/99-06/30/99	THIRD QUARTER 06/30/99-09/29/99	FOURTH QUARTER 09/29/99-12/29/99	AVERAGE ± 2 s.d.
T-01	2.8 ± 0.6	2.2 ± 0.4	3.1 ± 0.4	3.0 ± 0.4	2.8 ± 0.8
T-02	2.4 ± 0.4	2.3 ± 0.2	2.9 ± 0.4	2.9 ± 0.3	2.6 ± 0.6
T-03	2.4 ± 0.4	1.7 ± 0.2	2.5 ± 0.2	2.5 ± 0.2	2.3 ± 0.8
T-04	2.7 ± 0.1	2.5 ± 0.3	3.0 ± 0.3	3.4 ± 0.2	2.9 ± 0.8
T-05	3.1 ± 0.5	2.2 ± 0.4	2.9 ± 0.2	2.9 ± 0.4	2.8 ± 0.8
T-06	3.2 ± 0.3	2.1 ± 0.2	2.8 ± 0.3	2.8 ± 0.1	2.7 ± 0.9
T-07	2.9 ± 0.6	2.1 ± 0.3	2.7 ± 0.3	2.8 ± 0.2	2.6 ± 0.7
T-08	3.1 ± 0.2	2.2 ± 0.1	2.8 ± 0.4	2.9 ± 0.2	2.8 ± 0.8
T-09	3.1 ± 0.6	2.1 ± 0.4	2.9 ± 0.4	2.9 ± 0.2	2.8 ± 0.9
T-10	2.5 ± 0.5	1.9 ± 0.3	2.7 ± 0.3	3.0 ± 0.4	2.5 ± 0.9
T-11	3.2 ± 0.3	2.3 ± 0.8	2.9 ± 0.3	2.9 ± 0.4	2.8 ± 0.8
T-12	3.2 ± 0.4	2.3 ± 0.2	3.1 ± 0.3	2.8 ± 0.2	2.9 ± 0.8
OFT-1	2.9 ± 0.5	2.2 ± 0.1	2.7 ± 0.3	(a)	2.6 ± 0.7
OFT-2	2.6 ± 0.3	2.3 ± 0.3	2.8 ± 0.2	2.6 ± 0.2	2.6 ± 0.4
OFT-3	3.2 ± 0.5	2.3 ± 0.3	2.9 ± 0.5	2.8 ± 0.5	2.8 ± 0.7
OFT-4	3.2 ± 0.5	2.6 ± 0.6	3.2 ± 0.5	3.2 ± 0.4	3.1 ± 0.6
OFT-5	3.4 ± 0.3	2.6 ± 0.4	3.2 ± 0.4	2.8 ± 0.1	3.0 ± 0.7
OFT-6	4.0 ± 0.6	3.3 ± 0.3	4.3 ± 0.6	3.8 ± 0.6	3.8± 0.8
OFT-7	3.2 ± 0.3	2.2 ± 0.2	3.0 ± 0.3	2.8 ± 0.4	2.8 ± 0.9
OFT-8	3.9 ± 0.5	2.8 ± 0.2	3.8 ± 0.7	3.8 ± 0.6	3.6 ± 1.0
OFT-9	3.9 ± 0.3	2.5 ± 0.2	3.5 ± 0.2	3.4 ± 0.3	3.3 ± 1.2
OFT-10	3.1 ± 0.4	2.2 ± 0.4	2.6 ± 0.7	2.8 ± 0.3	2.7 ± 0.8
OFT-11	3.8 ± 0.6	3.2 ± 0.3	3.7 ± 0.6	3.9 ± 0.6	3.7 ± 0.6
NBF	3.9 ± 0.2	2.3 ± 0.6	3.3 ± 0.3	3.1 ± 0.4	3.2 ± 1.3
SBN	3.9 ± 0.4	3.2 ± 0.4	3.4 ± 0.2	3.5 ± 0.5	3.5 0.6
DOW	3.2 ± 0.3	2.6 ± 0.3	2.6 ± 0.2	2.5 ± 0.3	2.7 ± 0.6
COL	2.6 ± 0.2	2.5 ± 0.2	2.6 ± 0.1	2.2 ± 0.5	2.5 ± 0.4
Average ± 2 s.d.	**3.2 ± 1.0**	**2.4 ± 0.8**	**3.0 ± 0.8**	**3.0 ± 0.8**	**3.0 ± 1.0**

- Standard month = 30.4 days.

(a) Tld missing

TABLE B-5

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE, TRITIUM AND GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
SWL-1 (Condenser Circ.)	01/31/99	< 0.6	< 10	< 200
	02/28/99	< 0.6	< 50	
	03/31/99	< 0.9	< 10	
	04/30/99	< 0.8	< 60	< 200
	05/31/99	< 0.6	< 30	
	06/30/99	< 0.2	< 50	
	07/31/99	< 0.2	< 50	< 300
	08/31/99	< 0.8	< 40	
	09/30/99	< 0.7	< 100	
	10/31/99	< 0.8	< 50	< 200
	11/30/99	< 0.6	< 80	
	12/31/99	< 0.6	< 40	
SWL-2 (South Comp)	01/31/99 (a)			
	02/28/99	< 0.7	< 40	< 200
	03/31/99	< 0.7	< 80	
	04/30/99	< 0.8	< 50	< 200
	05/31/99	< 0.6	< 30	
	06/30/99	< 0.2	< 100	
	07/31/99	< 0.2	< 50	< 300
	08/31/99	< 0.9	< 40	
	09/30/99	< 0.9	< 50	
	10/31/99	< 0.8	< 60	350 ± 160
	11/30/99	< 0.8	< 100	
	12/31/99	< 0.7	< 40	

(a) Sample not collected due to ice on shoreline.

* Typical LLDs are found in Table B-12. All other gamma emitters were below <LLD.

TABLE B-5 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE, TRITIUM AND GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
SWL-3 (North Comp)	01/31/99	(a)		
	02/28/99	< 0.6	< 90	< 200
	03/31/99	< 0.8	< 60	
	04/30/99	< 0.9	< 30	< 200
	05/31/99	< 0.5	< 30	
	06/30/99	< 0.2	< 100	
	07/31/99	< 0.4	< 100	< 300
	08/31/99	< 0.8	< 80	
	09/30/99	< 0.8	< 70	
	10/31/99	< 0.5	< 100	310 ± 160
	11/30/99	< 0.6	< 70	
	12/31/99	< 0.6	< 50	

(a) Sample not collected due to ice on shoreline.

* Typical LLDs are found in Table B-12. All other gamma emitters were below <LLD.

TABLE B-6

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS* IN GROUNDWATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
Well W-1	01/20/99	< 0.3	< 100	< 100
	04/22/99	< 0.2	< 40	< 200
	07/27/99	< 0.3	< 50	230 ± 100
	10/29/99	< 0.3	< 50	< 300
Well W-2	01/21/99	< 0.3	< 50	< 100
	04/22/99	< 0.3	< 90	< 200
	07/27/99	< 0.2	< 50	< 200
	10/28/99	< 0.2	< 40	< 300
Well W-3	01/21/99	< 0.3	< 60	< 100
	04/22/99	< 0.3	< 50	< 200
	07/28/99	< 0.3	< 90	< 200
	10/28/99	< 0.2	< 60	< 300
Well W-4	01/26/99	< 0.2	< 50	930 ± 100
	04/23/99	< 0.2	< 60	1200 ± 200
	08/06/99	< 0.2	< 50	2700 ± 200
	10/29/99	< 0.3	< 50	2200 ± 200
Well W-5	01/26/99	< 0.2	< 50	870 ± 110
	04/22/99	< 0.2	< 50	540 ± 140
	08/06/99	< 0.2	< 50	340 ± 130
	10/29/99	< 0.2	< 60	360 ± 210
Well W-6	01/26/99	< 0.2	< 50	2100 ± 100
	04/22/99	< 0.3	< 50	420 ± 120
	08/06/99	< 0.2	< 90	510 ± 120
	10/29/99	< 0.2	< 100	590 ± 180

* Footnotes located at end of table.

TABLE B-6 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS* IN GROUNDWATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
Well W-7	01/21/99	< 0.4	< 90	< 100
	04/22/99	< 0.2	< 70	< 200
	07/28/99	< 0.2	< 100	< 200
	10/28/99	< 0.2	< 50	< 300
Well W-8	01/21/99	< 0.3	< 100	160 ± 80
	04/22/99	< 0.4	< 40	< 200
	07/27/99	< 0.2	< 40	< 200
	10/29/99	< 0.2	< 70	< 300
Well W-9	01/21/99	< 0.3	< 50	< 100
	04/22/99	< 0.3	< 50	< 200
	07/28/99	< 0.2	< 70	< 200
	10/29/99	< 0.4	< 60	< 300
Well W-10	01/21/99	< 0.3	< 70	< 100
	04/22/99	< 0.3	< 40	180 ± 110
	07/27/99	< 0.2	< 50	< 200
	10/28/99	< 0.3	< 50	< 300
Well W-11	01/21/99	< 0.3	< 50	< 100
	04/22/99	< 0.3	< 90	< 200
	07/27/99	< 0.2	< 40	< 200
	10/28/99	< 0.3	< 50	< 300
Well W-12	01/21/99	< 0.3	< 50	< 100
	04/22/99	< 0.3	< 60	< 200
	07/27/99	< 0.2	< 40	< 200
	10/28/99	< 0.3	< 50	< 300

* Footnotes located at end of table.

TABLE B-6 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS* IN GROUNDWATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
Well W-13	01/21/99	< 0.3	< 90	< 100
	04/22/99	< 0.2	< 50	< 200
	07/27/99	< 0.2	< 80	< 200
	10/28/99	< 0.3	70.6 ± 27.6	< 300
Well W-14	01/21/99	< 0.3	< 80	140 ± 80
	04/22/99	< 0.3	< 50	180 ± 110
	07/28/99	< 0.2	< 50	< 200
	10/28/99	< 0.3	< 100	1900 ± 200
Average ± 2 s.d.			**70.6 + 27.6**	**863 ± 1627**

* Typical LLDs are found in Table B-12. All other gamma emitters were LLD.

TABLE B-7

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA, IODINE, TRITIUM AND GAMMA EMITTERS* IN DRINKING WATER

Results in Units of pCi/liter ± 2 sigma

COLLECTION DATE	Gross Beta	Gamma Spec	Iodine-131	Tritium
LTW				
01/13/99	4.0 ± 1.0	< LLD	< 0.4	< 200
01/27/99	3.6 ± 1.0	< LLD	< 0.4	
02/10/99	3.3 ± 0.9	< LLD	< 0.4	
02/24/99	3.9 ± 1.1	< LLD	< 0.4	
03/10/99	3.5 ± 1.0	< LLD	< 0.4	
03/24/99	3.2 ± 0.9	< LLD	< 0.5	
04/07/99	3.4 ± 1.1	< LLD	< 0.5	< 200
04/21/99	3.2 ± 1.0	< LLD	< 0.4	
05/05/99	< 1	< LLD	< 0.4	
05/19/99	2.7 ± 0.9	< LLD	< 0.3	
06/02/99	1.0 ± 0.2	< LLD	< 0.5	
06/16/99	2.3 ± 0.9	< LLD	< 0.4	
06/30/99	2.6 ± 1.0	< LLD	< 0.5	
07/14/99	3.4 ± 1.0	< LLD	< 0.5	< 200
07/28/99	2.6 ± 1.0	< LLD	< 0.5	
08/11/99	3.4 ± 1.0	< LLD	< 0.4	
08/25/99	3.1 ± 0.9	< LLD	< 0.3	
09/08/99	3.0 ± 1.0	< LLD	< 0.6	
09/22/99	4.0 ± 1.2	< LLD	< 0.4	
10/06/99	3.5 ± 1.0	< LLD	< 0.4	
10/20/99	3.0 ± 0.9	< LLD	< 0.4	< 200
11/03/99	3.2 ± 0.9	< LLD	< 0.3	
11/17/99	4.1 ± 0.9	< LLD	< 0.4	
12/01/99	4.2 ± 1.5	< LLD	< 0.3	
12/15/99	3.3 ± 0.9	< LLD	< 0.4	
12/29/99	2.4 ± 0.9	< LLD	< 0.4	
Average ± 2 s.d.	**3.2 ± 1.4**			

* Typical LLDs are found in table B-12.

TABLE B-7 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA, IODINE, TRITIUM AND GAMMA EMITTERS* IN DRINKING WATER

Results in Units of pCi/liter ± 2 sigma

COLLECTION DATE	Gross Beta	Gamma Spec	Iodine-131	Tritium
STJ				
01/13/99	1.7 ± 0.8	< LLD	< 0.3	< 200
01/27/99	2.3 ± 0.9	< LLD	< 0.4	
02/10/99	2.7 ± 0.9	< LLD	< 0.4	
02/24/99	5.1 ± 1.1	< LLD	< 0.4	
03/10/99	3.3 ± 1.0	< LLD	< 0.3	
03/24/99	3.1 ± 1.0	< LLD	< 0.3	< 200
04/07/99	4.2 ± 1.2	< LLD	< 0.4	
04/21/99	2.4 ± 1.0	< LLD	< 0.4	
05/05/99	3.8 ± 1.0	< LLD	< 0.4	
05/19/99	4.0 ± 1.0	< LLD	< 0.2	
06/02/99	1.4 ± 0.2	< LLD	< 0.5	
06/16/99	2.6 ± 1.0	< LLD	< 0.4	
06/30/99	6.3 ± 1.2	< LLD	< 0.4	
07/14/99	3.8 ± 1.0	< LLD	< 0.4	< 200
07/28/99	3.2 ± 1.0	< LLD	< 0.4	
08/11/99	2.8 ± 1.0	< LLD	< 0.3	
08/25/99	3.3 ± 0.9	< LLD	< 0.5	
09/08/99	3.0 ± 1.0	< LLD	< 0.4	
09/22/99	4.0 ± 1.2	< LLD	< 0.3	
10/06/99	3.4 ± 1.0	< LLD	< 0.4	
10/20/99	3.1 ± 0.9	< LLD	< 0.4	< 200
11/03/99	3.8 ± 1.0	< LLD	< 0.4	
11/17/99	3.5 ± 0.9	< LLD	< 0.3	
12/01/99	4.3 ± 1.5	< LLD	< 0.3	
12/15/99	3.0 ± 0.9	< LLD	< 0.3	
12/29/99	3.2 ± 1.0	< LLD	< 0.4	
Average ± 2 s.d.	**3.4 ± 2.0**			

* Typical LLDs are found in table B-12.

TABLE B-8

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN SEDIMENT

Results in Units of pCi/kg (dry) ± 2 sigma

Station	Collection Date	Be-7	K-40	Cs-137	Ra-226	Th-228
SL-2	04/15/99	< 200	6210 ± 620	< 20	< 400	85.0 ± 20.9
SL-3	04/15/99	< 200	5910 ± 590	< 20	< 400	134 ± 33
SL-2	10/14/99	< 200	7260 ± 730	< 20	< 400	86.6 ± 20.6
SL-3	10/14/99	< 100	6110 ± 610	< 20	< 300	109 ± 17
Average			**6373 ± 1209**			**104 ± 46**

* Typical LLDs are found in table B-12. All other gamma emitters were <LLD.

TABLE B-9

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE AND GAMMA EMITTERS* IN MILK

Results in Units of pCi/liter ± 2 sigma

COLLECTION DATES	ANALYSIS	STATION CODES

There were no milk analyses completed during 1999 due to lack of participants to meet the minimum requirements of the REMP program. In lieu of milk, broadleaf vegetation samples were collected.

TABLE B-10

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN BROADLEAF VEGETATION COLLECTED IN LIEU OF MILK

Results in Units of pCi/kg (wet) ± 2 sigma

COLLECTION DATE	Station	Description	Be-7	K-40	I-131	Cs-137
05/26/99	Sector-J	Broadleaf	1230 ± 120	4420 ± 440	< 30	< 6
05/26/99	Sector-D	Broadleaf	590 ± 65	3040 ± 300	< 20	82.9 ± 8.3
05/26/99	Sector-D	Broadleaf	835 ± 84	3310 ± 330	< 20	< 10
05/26/99	Sector-D	Broadleaf	626 ± 63	3210 ± 320	< 20	< 7
05/26/99	Sector-D	Broadleaf	648 ± 65	4530 ± 450	< 30	< 9
06/23/99	Sector-J	Broadleaf	619 ± 63	5300 ± 530	< 10	< 8
06/23/99	Sector-D	Broadleaf	616 ± 73	4240 ± 420	< 10	< 10
06/23/99	Sector-D	Broadleaf	134 ± 50	3960 ± 400	< 10	< 8
06/23/99	Sector-D	Broadleaf	293 ± 57	3350 ± 340	< 10	< 8
07/22/99 (a)	Sector-J	Broadleaf	1550 ± 160	6120 ± 610	< 10	< 9
07/22/99 (b)	Sector-D	Broadleaf	435 ± 61	4700 ± 470	< 20	< 8
07/22/99 (c)	Sector-D	Broadleaf	394 ± 57	4500 ± 450	< 10	< 7
07/22/99	Sector-D	Broadleaf	382 ± 48	2690 ± 270	< 20	< 7
08/18/99	Sector-J	Broadleaf	1410 ± 140	5850 ± 580	< 20	< 10
08/18/99	Sector-D	Broadleaf	630 ± 63	3490 ± 350	< 20	12.1 ± 5.2
08/18/99	Sector-D	Broadleaf	1260 ± 130	2830 ± 280	< 20	< 10
08/18/99	Sector-D	Broadleaf	716 ± 76	3380 ± 340	< 20	< 10
09/15/99	Sector-J	Broadleaf	1720 ± 170	4450 ± 440	< 5	< 10
09/15/99	Sector-D	Broadleaf	714 ± 71	3720 ± 370	< 7	< 9
09/15/99	Sector-D	Broadleaf	1300 ± 130	4200 ± 420	< 6	< 10
09/15/99	Sector-D	Broadleaf	1860 ± 190	4070 ± 410	< 6	< 10

* Footnotes are located at end of table.

TABLE B-10 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN BROADLEAF VEGETATION COLLECTED IN LIEU OF MILK

Results in Units of pCi/kg (wet) ± 2 sigma

COLLECTION DATE	Station	Description	Be-7	K-40	I-131	Cs-137
10/13/99	Sector-J	Broadleaf	2730 ± 270	5030 ± 500	< 9	< 10
10/13/99	Sector-D	Broadleaf	1890 ± 190	5280 ± 530	< 8	< 10
10/13/99	Sector-D	Broadleaf	2010 ± 200	1910 ± 190	< 9	< 10
Average ± 2 s.d.			**1025 ± 1325**	**4066 ± 2057**		**47.5 ± 100**

(a) Thorium-228 was measured at 53.5 ± 8.2 pCi/kg wet.
(b) Thorium-228 was measured at 105 ± 11 pCi/kg wet.
(c) Thorium-228 was measured at 52.4 ± 8.2 pCi/kg wet.
* Typical LLDs are found in table B-12. All other gamma emitters were <LLD.

TABLE B-11

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN FISH

Results in Units of pCi/kg (wet) ± 2 sigma

Collection Date	Station	Description	Be-7	K-40	Cs-137	Ra-226	Th-228
06/22/99	OFS-N		< 100	2590 ± 260	36.2 ± 12.4	< 200	< 20
06/22/99	ONS-N		< 90	2790 ± 280	22.6 ± 8.7	< 300	< 20
06/22/99	ONS-S		< 100	3000 ± 300	70.0 ± 10.9	< 200	< 20
06/22/99	OFS-S		< 100	2920 ± 290	< 20	< 300	< 20
08/27/99	OFS-N		< 100	2200 ± 220	27.7 ± 11.1	< 200	< 20
08/27/99	ONS-N		< 100	2820 ± 280	43.1 ± 10.8	< 200	< 20
08/27/99	ONS-S		< 100	2330 ± 230	16.7 ± 8.5	< 200	< 20
08/27/99	OFS-S		< 200	2920 ± 290	31.2 ± 11.6	< 200	< 20
Average ± 2 s.d.				**2696 ± 590**	**35.4 ± 35.1**		

* Typical LLDs are found in table B-12. All other gamma emitters were <LLD.

TABLE B-12

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN FOOD/VEGETATION

Results in Units of pCi/kg (wet) ± 2 sigma

COLLECTION DATE	Station	Description	Be-7	K-40	I-131	Cs-137
09/08/99	Sector-J	Grapes/Leaves	50.3 ± 20.0	2170 ± 220	< 5	< 3
09/08/99	Sector-D	Grapes/Leaves	< 40	2240 ± 220	< 7	< 4
09/08/99	Sector-J	Grapes/Leaves	2690 ± 270	2660 ± 270	< 20	< 10
09/08/99	Sector-D	Grapes/Leaves	4040 ± 400	1920 ± 190	< 20	< 9
Average ±			**2260 ± 4059**	**2248 ± 615**		

* Typical LLDs are found in table B-12. All other gamma emitters were <LLD.

TABLE B-13

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

GAMMA SPECTROMETRY LOWER LIMITS OF DETECTION AND REPORTING LEVELS

Isotope	TI LLD	ODCM LLD	Rept Level	TI LLD	ODCM LLD	Rept Level
	Vegetation - pCi/Kg-wet				**Water - pCi/liter**	
Cerium-144	60	N/A	N/A	30	N/A	N/A
Barium/La-140	10	N/A	N/A	50/10	60/15	200
Cesium-134	10	60	1000	7	15	30
Ru,Rh-106	80	N/A	N/A	50	N/A	N/A
Cesium-137	10	60	2000	6	18	50
Zr,Nb-95	10	N/A	N/A	10/15	30/15	400
Manganese-54	10	N/A	N/A	5	15	1000
Iron-59	15	N/A	N/A	15	30	400
Zinc-65	20	N/A	N/A	10	30	300
Cobalt-60	10	N/A	N/A	5	15	300
Cobalt-58	10	N/A	N/A	5	15	1000
Iodine-131	20	60	100	10	1	2
Iodine-131 (a)				1	1	
	Milk - pCi/liter				**Air Filter - pCi/m3**	
Cerium-144	30	N/A	N/A	0.007	N/A	N/A
Barium/La-140	50/10	60/15	300	0.005	N/A	N/A
Cesium-134	7	15	60	0.002	0.06	10
Ru,Rh-106	50	N/A	N/A	0.010	N/A	N/A
Cesium-137	6	18	70	0.002	0.06	20
Zr,Nb-95	20	N/A	N/A	0.002	N/A	N/A
Manganese-54	5	N/A	N/A	0.002	N/A	N/A
Iron-59	15	N/A	N/A	0.002	N/A	N/A
Zinc-65	10	N/A	N/A	0.002	N/A	N/A
Cobalt-60	5	N/A	N/A	0.002	N/A	N/A
Cobalt-58	5	N/A	N/A	0.002	N/A	N/A
Iodine-131	10	1	3	0.040	0.07	0.9
Iodine-131 (a)	1	1				

(a) Analysis by radiochemistry and based on the assumptions in Procedure PRO-032-11.
* Charcoal Trap

TABLE B-13 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

GAMMA SPECTROMETRY LOWER LIMITS OF DETECTION AND REPORTING LEVELS

Isotope	TI LLD	ODCM LLD	Rept Level	TI LLD	ODCM LLD	Rept Level
	FISH - pCi/Kg-wet (b)			**Sediment/Soil - pCi/Kg-dry**		
Cerium-144	200	N/A	N/A	150	N/A	N/A
Barium/La-140	200	N/A	N/A	5	N/A	N/A
Cesium-134	20	130	1000	30	150	N/A
Ru,Rh-106	200	N/A	N/A	200	N/A	N/A
Cesium-137	20	150	2000	30	180	N/A
Zr,Nb-95	40	N/A	N/A	40	N/A	N/A
Manganese-54	20	130	30000	9	N/A	N/A
Iron-59	40	260	10000	50	N/A	N/A
Zinc-65	40	260	20000	60	N/A	N/A
Cobalt-60	20	130	10000	20	N/A	N/A
Cobalt-58	20	130	30000	20	N/A	N/A
Iodine-131	100	N/A	N/A	30	N/A	N/A

Gross Beta/Tritium LLDs and Reporting Levels

	Gross Beta		
Air Particulates	0.01 pCi/m^3	0.01 pCi/m^3	N/A
Drinking Water	2 pCi/l	4.0 pCi/l	N/A
	Tritium - pCi/l		
Surface Water	200	2000	20,000
Ground Water	200	2000	20,000
Drinking Water	200	2000	20,000

(b) Based on the assumptions in procedure PRO-042-5.

APPENDIX C
ANALYTICAL PROCEDURES SYNOPSIS

ANALYTICAL PROCEDURES SYNOPSIS

Appendix C is a synopsis of the analytical procedures performed during 1999 on samples collected for the Donald C. Cook Nuclear Plant's Radiological Environmental Monitoring Program. All analyses have been mutually agreed upon by American Electric Power and Teledyne Brown Engineering and include those recommended by the USNRC Regulatory Guide 4.8,BTP, Rev. 1, November 1979.

GROSS BETA ANALYSIS OF SAMPLES

Air Particulates

After a delay of five or more days, allowing for the radon-222 and radon-220 (thoron) daughter products to decay, the filters are counted in a gas-flow proportional counter. An unused air particulate filter, supplied by the customer, is counted as the blank.

Calculations of the results, the two sigma error and the lower limit of detection (LLD):

RESULT (pCi/m^3) = $((S/T) - (B/t))/(2.22\ V\ E)$

TWO SIGMA ERROR (pCi/m^3) = $2((S/T^2) + (B/t^2))^{1/2}/(2.22\ V\ E)$

LLD (pCi/m^3) = $4.66\ (B^{1/2})/(2.22\ V\ E\ t)$

where:

S = Gross counts of sample including blank
B = Counts of blank
E = Counting efficiency
T = Number of minutes sample was counted
t = Number of minutes blank was counted
V = Sample aliquot size (cubic meters)

DETERMINATION OF GROSS BETA ACTIVITY IN WATER SAMPLES

Introduction

The procedures described in this section are used to measure the overall radioactivity of water samples without identifying the radioactive species present. No chemical separation techniques are involved.

One liter of the sample is evaporated on a hot plate. A smaller volume may be used if the sample has a significant salt content as measured by a conductivity meter. If requested by the customer, the sample is filtered through No. 54 filter paper before evaporation, removing particles greater than 30 microns in size.

After evaporating to a small volume in a beaker, the sample is rinsed into a 2-inch diameter stainless steel planchette which is stamped with a concentric ring pattern to distribute residue evenly. Final evaporation to dryness takes place under heat lamps.

Residue mass is determined by weighing the planchette before and after mounting the sample. The planchette is counted for beta activity on an automatic proportional counter. Results are calculated using empirical self-absorption curves which allow for the change in effective counting efficiency caused by the residue mass.

Detection Capability

Detection capability depends upon the sample volume actually represented on the planchette, the background and the efficiency of the counting instrument, and upon self-absorption of beta particles by the mounted sample. Because the radioactive species are not identified, no decay corrections are made and the reported activity refers to the counting time.

The minimum detectable level (MDL) for water samples is nominally 1.6 picoCuries per liter for gross beta at the 4.66 sigma level (1.0 pCi/l at the 2.83 sigma level), assuming that 1 liter of sample is used and that $\frac{1}{2}$ gram of sample residue is mounted on the planchette. These figures are based upon a counting time of 50 minutes and upon representative values of counting efficiency and background of 0.2 and 1.2 cpm, respectively.

The MDL becomes significantly lower as the mount weight decreases because of reduced self-absorption. At a zero mount weight, the 4.66 sigma MDL for gross beta is 0.9 picoCuries per liter. These values reflect a beta counting efficiency of 0.38.

ANALYSIS OF SAMPLES FOR TRITIUM

(Liquid Scintillation)

Water

Ten milliliters of water are mixed with 10 ml of a liquid scintillation "cocktail" and then the mixture is counted in an automatic liquid scintillator.

Calculation of the results, the two sigma error and the lower limit detection (LLD) in pCi/l:

RESULT = $(N-B)/(2.22\ V\ E)$

TWO SIGMA ERROR = $2((N + B)/\bullet t)^{1/2}/ (2.22\ V\ E)$

LLD = $4.66\ (B/\bullet t)^{1/2}/(2.22\ V\ E)$

where:

N	=	the gross cpm of the sample
B	=	the background of the detector in cpm
2.22	=	conversion factor changing dpm to pCi
V	=	volume of the sample in ml
E	=	efficiency of the detector
•t	=	counting time for the sample

ANALYSIS OF SAMPLES FOR IODINE-131

Milk or Water

Two liters of sample are first equilibrated with stable iodide carrier. A batch treatment with anion exchange resin is used to remove iodine from the sample. The iodine is then stripped from the resin with sodium hypochlorite solution, is reduced with hydroxylamine hydrochloride and is extracted into carbon tetrachloride as free iodine. It is then back-extracted as iodide into sodium bisulfite solution and is precipitated as palladium iodide. The sodium bisulfite solution and is precipitated as palladium iodide. The precipitate is weighed for chemical yield and is mounted on a nylon planchette for low level beta counting. The chemical yield is corrected by measuring the stable iodide content of the milk or the water with a specific ion electrode.

Calculations of results, two sigma error and the lower limit of detection (LLD) in pCi/l:

RESULT	=	$(N/\bullet t-B)/(2.22\ E\ V\ Y\ DF)$
TWO SIGMA ERROR	=	$2((N/\bullet t+B)/\bullet t)^{1/2}/(2.22\ E\ V\ Y\ DF)$
LLD	=	$= 4.66(B/\bullet t)^{1/2}/(2.22\ E\ V\ Y\ DF)$

where:	N	=	total counts from sample (counts)
	•t	=	counting time for sample (min)
	B	=	background rate of counter (cpm)
	2.22	=	dpm/pCi
	V	=	volume or weight of sample analyzed
	Y	=	chemical yield of the mount or sample counted
	DF	=	decay factor from the collection to the counting date
	E	=	efficiency of the counter for I-131, corrected for self absorption effects by the formula
	E	=	$E_s(\exp-0.0061M)/(\exp-0.0061M_s)$
	E_s	=	efficiency of the counter determined from an I-131 standard mount
	Ms	=	mass of PdI_2 on the standard mount, mg
	M	=	mass of PDI_2 on the sample mount, mg

GAMMA SPECTROMETRY OF SAMPLES

Milk and Water

A 1.0 liter Marinelli beaker is filled with a representative aliquot of the sample. The sample is then counted for approximately 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Dried Solids Other Than Soils and Sediments

A large quantity of the sample is dried at a low temperature, less than 100°C. As much as possible (up to the total sample) is loaded into a tared 1-liter Marinelli and weighed. The sample is then counted for approximately 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Fish

As much as possible (up to the total sample) of the edible portion of the sample is loaded into a tared Marinelli and weighed. The sample is then counted for approximately 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Soils and Sediments

Soils and sediments are dried at a low temperature, less than 100°C. The soil or sediment is loaded fully into a tared, standard 300 cc container and weighed. The sample is then counted for approximately six hours with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height and analysis.

Charcoal Cartridges (Air Iodine)

Charcoal cartridges are counted up to five at a time, with one positioned on the face of a Ge(Li) detector and up to four on the side of the Ge(Li) detector. Each Ge(Li) detector is calibrated for both positions. The detection limit for I-131 of each charcoal cartridge can be determined (assuming no positive I-131) uniquely from the volume of air which passed through it. In the event I-131 is observed in the initial counting of a set, each charcoal cartridge is then counted separately, positioned on the face of the detector.

Air Particulate

The thirteen airborne particulate filters for a quarterly composite for each field station are aligned one in front of another and then counted for at least six hours with a shielded Ge(Li)

detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

A mini-computer software program defines peaks by certain changes in the slope of the spectrum. The program also compares the energy of each peak with a library of peaks for isotope identification and then performs the radioactivity calculation using the appropriate fractional gamma ray abundance, half life, detector efficiency, and net counts in the peak region. The calculation of results, two sigma error and the lower limit of detection (LLD) in pCi/volume of pCi/mass:

RESULT		=	(S-B)/(2.22 t E V F DF)
TWO SIGMA ERROR		=	$2(S+B)^{1/2}/(2.22\ t\ E\ V\ F\ DF)$
LLD		=	$4.66(B)^{1/2}/(2.22\ t\ E\ V\ F\ DF)$
where:	S	=	Area, in counts, of sample peak and background (region of spectrum of interest)
	B	=	Background area, in counts, under sample peak, determined by a linear interpolation of the representative backgrounds on
either side of the			peak
	t	=	length of time in minutes the sample was counted
	2.22	=	dpm/pCi
	E	=	detector efficiency for energy of interest and geometry of sample
	V	=	sample aliquot size (liters, cubic meters, kilograms, or grams)
	F	=	fractional gamma abundance (specific for each emitted gamma)
	DF	=	decay factor from the mid-collection date to the counting date

ENVIRONMENTAL DOSIMETRY

Teledyne Brown Engineering uses a $CaSO_4$:Dy thermoluminescent dosimeter (TLD) which the company manufactures. This material has a high light output, negligible thermally induced signal loss (fading), and negligible self dosing. The energy response curve (as well as all other features) satisfies NRC Reg. Guide 4.13. Transit doses are accounted for by use of separate TLDs.

Following the field exposure period the TLDs are placed in a Teledyne Brown Engineering Model 8300. One fourth of the rectangular TLD is heated at a time and the measured light emission (luminescence) is recorded. The TLD is then annealed and exposed to a known Cs-137 dose; each area is then read again. This provides a calibration of each area of each TLD after every field use. The transit controls are read in the same manner.

Calculations of results and the two sigma error in net milliRoentgen (mR):

RESULT = $D = (D_1+D_2+D_3+D_4)/4$

TWO SIGMA ERROR = $2((D_1-D)^2+(D_2-D)^2+(D_3-D)^2+(D_4-D)^2)/3)^{1/2}$

WHERE:

D_1	=	the net mR of area 1 of the TLD, and similarly for D_2, D_3, and D_4
D1	=	I_1 K/R_1 - A
I_1	=	the instrument reading of the field dose in area 1
K	=	the known exposure by the Cs-137 source
R_1	=	the instrument reading due to the Cs-137 dose on area 1
A	=	average dose in mR, calculated in similar manner as above, of the transit control TLDs
D	=	the average net mR of all 4 areas of the TLD.

APPENDIX D
SUMMARY OF INTERLABORATORY COMPARISONS

INTERLABORATORY COMPARISON PROGRAM

The US Environmental Protection Agency (EPA) discontinued their Interlaboratory Comparison Program in December 1998.

Since the EPA is no longer involved in the program, there are no "approved" laboratories for Intercomparison Studies, however, Teledyne Brown Engineering participates in the Analytics, Inc. and Environmental Resource Associates (ERA) programs to the fullest extent possible. That is we participate in the program for all radioactive isotopes prepared and at the maximum frequency of availability.

The National Institute of Standards and Technology (NIST) is the approval authority for laboratory providers participating in Intercomparison Study Programs, however, at this time, there are no approved laboratories for environmental and/or radiochemical isotope analyses.

The EPA Interlaboratory Comparison table for 1998 has been included with this report since there were investigations still in progress when the REMP report for 1998 was submitted to the NRC.

Trending graphs are provided in this section for the EPA Program and for Analytics when there were at least two data points to plot.

EPA INTERLABORATORY COMPARISON PROGRAM 1998
Environmental

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Brown Engineering Result(b)		Normal Dev. Known(c)	
01/16/98	Water	Sr-89	8.0 ±	5.0	5.00 ±	1.73	-1.04	
		Sr-90	32.0 ±	5.0	31.67 ±	0.58	-0.12	
01/30/98	Water	Gr-Alpha	30.5 ±	7.6	33.00 ±	2.65	0.57	
		Gr-Beta	3.9 ±	5.0	5.60 ±	0.90	0.59	
02/06/98	Water	I-131	104.9 ±	10.5	110.00 ±	0.00	0.84	
02/13/98	Water	Ra-226	16.0 ±	2.4	14.67 ±	0.58	-0.96	
		Ra-228	33.3 ±	8.3	32.00 ±	2.00	-0.27	
03/13/98	Water	H-3	2155.0 ±	348.0	1833.33 ±	57.74	-1.60	
04/21/98	Water	Gr-Alpha	54.4 ±	13.6	50.00 ±	1.73	-0.56	
		Ra-226	15.0 ±	2.3	15.00 ±	0.00	0.00	
		Ra-228	9.3 ±	2.3	8.50 ±	0.20	-0.60	
		Gr-Beta	94.7 ±	10.0	102.00 ±	6.56	1.26	
		Sr-89	6.0 ±	5.0	4.67 ±	1.15	-0.46	
		Sr-90	18.0 ±	5.0	21.67 ±	1.15	1.27	
		Co-60	50.0 ±	5.0	52.33 ±	1.53	0.81	
		Cs-134	22.0 ±	5.0	21.00 ±	1.00	-0.35	
		Cs-137	10.0 ±	5.0	11.67 ±	0.58	0.58	
06/05/98	Water	Co-60	12.0 ±	5.0	13.00 ±	1.00	0.35	
		Zn-65	104.0 ±	10.0	111.67 ±	2.52	1.33	
		Cs-134	31.0 ±	5.0	32.33 ±	0.58	0.46	
		Cs-137	35.0 ±	5.0	37.67 ±	2.08	0.92	
		Ba-133	40.0 ±	5.0	35.00 ±	2.65	-1.73	
06/12/98	Water	Ra-226	4.9 ±	0.7	4.47 ±	0.85	-1.07	
		Ra-228	2.1 ±	0.5	1.93 ±	0.21	-0.58	
07/17/98	Water	Sr-89	21.0 ±	5.0	21.00 ±	1.00	0.00	
		Sr-90	7.0 ±	5.0	6.33 ±	0.58	-0.23	
07/24/98	Water	Gr-Alpha	7.2 ±	5.0	5.43 ±	0.64	-0.61	
		Gr-Beta	12.8 ±	5.0	14.67 ±	2.08	0.65	
08/07/98	Water	H-3	17996.0 ±	1800.0	16000.00 ±	0.00	-1.92	
09/11/98	Water	I-131	6.1 ±	2.0	5.93 ±	0.55	-0.14	
09/18/98	Water	Ra-226	1.7 ±	0.3	1.53 ±	0.46	-0.96	
		Ra-228	5.7 ±	1.4	6.70 ±	0.35	1.24	
10/20/98	Water	Gr-Beta	94.0 ±	10.0	74.67 ±	7.64	-3.35	(d)
		Sr-89	19.0 ±	5.0	18.33 ±	1.53	-0.23	
		Sr-90	8.0 ±	5.0	8.33 ±	1.15	0.12	

EPA INTERLABORATORY COMPARISON PROGRAM 1998
Environmental

Collection Date	Media	Nuclide	EPA Result(a)		Teledyne Brown Engineering Result(b)		Normal Dev. Known(c)	
10/20/98	Water	Gr-Beta	94.0 ±	10.0	74.67 ±	7.64	-3.35	(d)
		Sr-89	19.0 ±	5.0	18.33 ±	1.53	-0.23	
		Sr-90	8.0 ±	5.0	8.33 ±	1.15	0.12	
		Co-60	21.0 ±	5.0	22.33 ±	1.15	0.46	
		Cs-134	6.0 ±	5.0	6.67 ±	0.58	0.23	
		Cs-137	50.0 ±	5.0	56.33 ±	3.79	2.19	(e)
		Gr-Alpha	30.1 ±	7.5	21.67 ±	2.31	-1.95	
		Ra-226	4.5 ±	0.7	4.67 ±	0.25	0.41	
		Ra-228	1.5 ±	0.4	1.9 ±	0.20	1.73	
11/11/98	Water	Co-60	38.0 ±	5.0	39.67 ±	2.52	0.58	
		Zn-65	131.0 ±	13.0	140.67 ±	10.97	1.29	
		Cs-134	105.0 ±	5.0	103.00 ±	2.00	-0.69	
		Cs-137	111.0 ±	6.0	115.33 ±	1.53	1.25	
		Ba-133	56.0 ±	6.0	46.33 ±	2.52	-2.79	(e)

Footnotes:

(a) EPA Results-Expected laboratory precision (1 sigma). Units are pCi/liter for water and milk except K is in mg/liter. Units are total pCi for air particulate filters.

(b) Teledyne Results - Average ± one sigma. Units are pCi/liter for water and milk except K is in mg/liter. Units are total pCi for air particulate filters.

(c) Normalized deviation from the known.

(d) The special EPA instructions concerning multiple evaporation with concentrated nitric acid (to purge chlorides derived from HCl preservative) were omitted by oversight. The chlorides cause greater self absorption and lead to lower results. Two additional aliquots using two evaporations with concentrated nitric acid were analyzed. The results, when corrected for decay of Sr-89, were 87 and 83 pCi/liter which compare favorably with the EPA result.

(e) The results of the EPA Interlaboratory Comparison Program, sample collect date 11/06/98, indicate a low bias for the Ba-133 result. Weekly efficiency counts for our detectors were found to be in compliance during that period of time. One possible cause for the low bias may be the Branching Intensity value used in the calculation. The EPA does not supply their values used to calculate activity. If the Brookhaven or RadDecay Data Tables are used to supply the B.I. and Half-Life, the calculated results will fall within the acceptable range:

TBEES (Atomic Data and Nuclear Data Tables Vol 13 Nos 2-3 1974)

	Branching Intensity	Half-Life	Calculated Activity
TBEES	0.670	10.9 years	46.33
Brookhaven Tables	0.6205	10.52 years	50.04
RadDecay Tables	0.605	10.5 years	51.31

ANALYTICS CROSS CHECK COMPARISON PROGRAM 1998

Sample ID	Media	Nuclide	Teledyne Brown Engineering Result (a)	Analytics Result	Ratio (b)
E1346-396 TI #71657 03/12/98	Milk	I-131	87 ± 9	82 ± 4	1.06
		Ce-141	66 ± 7	70 ± 4	0.94
		Cr-51	220 ± 30	201 ± 10	1.09
		Cs-134	85 ± 9	84 ± 4	1.01
		Cs-137	180 ± 20	161 ± 8	1.12
		Mn-54	130 ± 10	133 ± 7	0.98
		Fe-59	110 ± 10	95 ± 5	1.16
		Zn-65	160 ± 20	142 ± 7	1.13
		CO-60	82 ± 8	85 ± 4	0.96
E1460-396 TI #78921 06/11/98	Milk	I-131	68 ± 7	67 ± 3	1.01
		Ce-141	94 ± 9	99 ± 5	0.95
		Cr-51	97 ± 31	132 ± 7	0.73
		Cs-134	101 ± 10	95 ± 5	1.06
		Cs-137	79 ± 8	70 ± 4	1.13
		Mn-54	112 ± 11	106 ± 5	1.06
		Fe-59	58 ± 9	45 ± 2	1.29
		Zn-65	143 ± 14	122 ± 6	1.17
		CO-60	157 ± 16	143 ± 7	1.10
E1630-396 TI #94881 12/14/98	Milk	I-131	65 ± 1	71 ± 4	0.92
		Ce-141	647 ± 65	746 ± 37	0.87
		Cr-51	900 ± 90	979 ± 49	0.92
		Cs-134	200 ± 20	220 ± 11	0.91
		Cs-137	177 ± 18	183 ± 9	0.97
		Mn-54	136 ± 14	142 ± 7	0.96
		Fe-59	156 ± 16	148 ± 7	1.05
		Zn-65	132 ± 14	140 ± 7	0.94
		CO-60	169 ± 17	178 ± 9	0.95
		Sr-89	20 ± 2	69 ± 3	0.29 (c)
		Sr-90	16 ± 1	41 ± 2	0.39 (c)
E1631-396 TI #94882 12/14/98	Filter	Ce-141	566 ± 57	524 ± 26	1.08
		Cr-51	800 ± 80	687 ± 49	1.16
		Cs-134	147 ± 15	154 ± 8	0.95
		Cs-137	158 ± 16	128 ± 6	1.23
		Mn-54	122 ± 12	100 ± 5	1.22
		Fe-59	134 ± 13	104 ± 5	1.29
		Zn-65	129 ± 13	98 ± 5	1.32
		CO-60	134 ± 13	125 ± 6	1.07
E1632-396 TI #94883 12/14/98	Water	H-3	5500 ± 200	5980 ± 299	0.92
E1633-396 TI #94884 12/14/98	Water	Am-241	8.3 ± 1.5	7.9 ± 0.4	1.05
		Pu-239	9.8 ± 1.8	8.9 ± 0.4	1.10

Footnotes:

(a) Teledyne Results - counting error is two standard deviations. Units are pCi/liter for water and milk. For gamma results, if two standard deviations are less than 10%, then a 10% error is reported. Units are total pCi for air particulate filters.

(b) Ratio of Teledyne Brown Engineering to Analytics results. Acceptance criteria are based on USNRC acceptance criteria described in USNRC Procedure 84750 dated March 15, 1994.

(c) The original and repeat analysis data sheets for Sr-89 and Sr-90 have been reconstructed from information in the laboratory notebook and the counter printouts. This sample was originally analyzed in January 1999 (login L4004) and produced unacceptable radiostrontium results. The analysis was repeated in April 1999 using a smaller aliquot of 500 ml because 1000 ml was no longer available. The repeat analysis produced good results:

Result	Analytics value		ratio
Sr-89	74 +- 8	69 +- 3	1.07
Sr-90	37 +- 1	41 +- 2	0.90

A problem such as sample identity is suspected for the first analysis.

ANALYTICS CROSS CHECK COMPARISON PROGRAM 1999

Sample ID	Media	Nuclide	Teledyne Brown Engineering Result (a)	Analytics Result(b)	Ratio (c)
E1823-396 TI #09576 06/24/99	Water	Sr-89	60 ± 5	69 ± 3	0.87
		Sr-90	35 ± 2	46 ± 2	0.76
E1824-396 TI #09577 06/24/99	Water	Gr-A	160 ± 10	98 ± 5	1.63 (d)
		Gr-B	300 ± 10	290 ± 15	1.03
E1825-396 TI #09578 06/24/99	Water	I-131	77 ± 13	68 ± 3	1.13
		Ce-141	139 ± 14	134 ± 7	1.04
		Cr-51	162 ± 42	172 ± 9	0.94
		Cs-134	86 ± 9	92 ± 5	0.93
		Cs-137	167 ± 17	151 ± 8	1.11
		Mn-54	77 ± 8	68 ± 3	1.13
		Fe-59	40 ± 9	38 ± 2	1.05
		Zn-65	113 ± 12	98 ± 5	1.15
		Co-60	179 ± 18	171 ± 9	1.05
E1826-396 TI #09579 06/24/99	Filter	Ce-141	169 ± 17	162 ± 8	1.04
		Cr-51	241 ± 24	208 ± 10	1.16
		Cs-134	105 ± 10	111 ± 6	0.95
		Cs-137	211 ± 21	182 ± 9	1.16
		Mn-54	96 ± 10	82 ± 4	1.17
		Fe-59	55 ± 8	46 ± 2	1.20
		Zn-65	144 ± 14	118 ± 6	1.22
		Co-60	214 ± 21	206 ± 10	1.04
E1827-396 TI #09580 06/24/99	Soil	Ce-141	0.274 ± 0.027	0.269 ± 0.013	1.02
		Cr-51	0.374 ± 0.103	0.345 ± 0.017	1.08
		Cs-134	0.200 ± 0.020	0.184 ± 0.009	1.09
		Cs-137	0.450 ± 0.045	0.429 ± 0.021	1.05
		Mn-54	0.153 ± 0.015	0.136 ± 0.007	1.13
		Fe-59	0.118 ± 0.022	0.077 ± 0.004	1.53 (e)
		Zn-65	0.206 ± 0.021	0.196 ± 0.010	1.05
		Co-60	0.351 ± 0.035	0.343 ± 0.017	1.02

Footnotes:

(a) Teledyne Results - counting error is two standard deviations. Units are pCi/liter for water and milk. For gamma results, if two standard deviations are less than 10%, then a 10% error is reported. Units are total pCi for air particulate filters. Units are pCi/gram for Soil, which has been added to the program for 1999.

(b) Analytics Result - Average ± 1 sigma

(c) Ratio of Teledyne Brown Engineering to Analytics results. Acceptance criteria are based on USNRC acceptance criteria described in USNRC Procedure 84750 dated March 15, 1994.

(d) A high Gross Alpha result was obtained because the calculation was mistakenly performed using Th-230 counting efficiency. If our normal Am-241 calibration were used, we would have reported *110 +- 10 pCi/L*, which is an acceptable value.

(e) Random or coincidental summing caused the problem. Two other energy lines can sum a peak on the same energy band causing more counts to be thrown in. The key line was changed and the resulting value was 0.079, which is in agreement with Analytics.

ERA STATISTICAL SUMMARY
PROFICIENCY TESTING (PT) PROGRAM - 1999

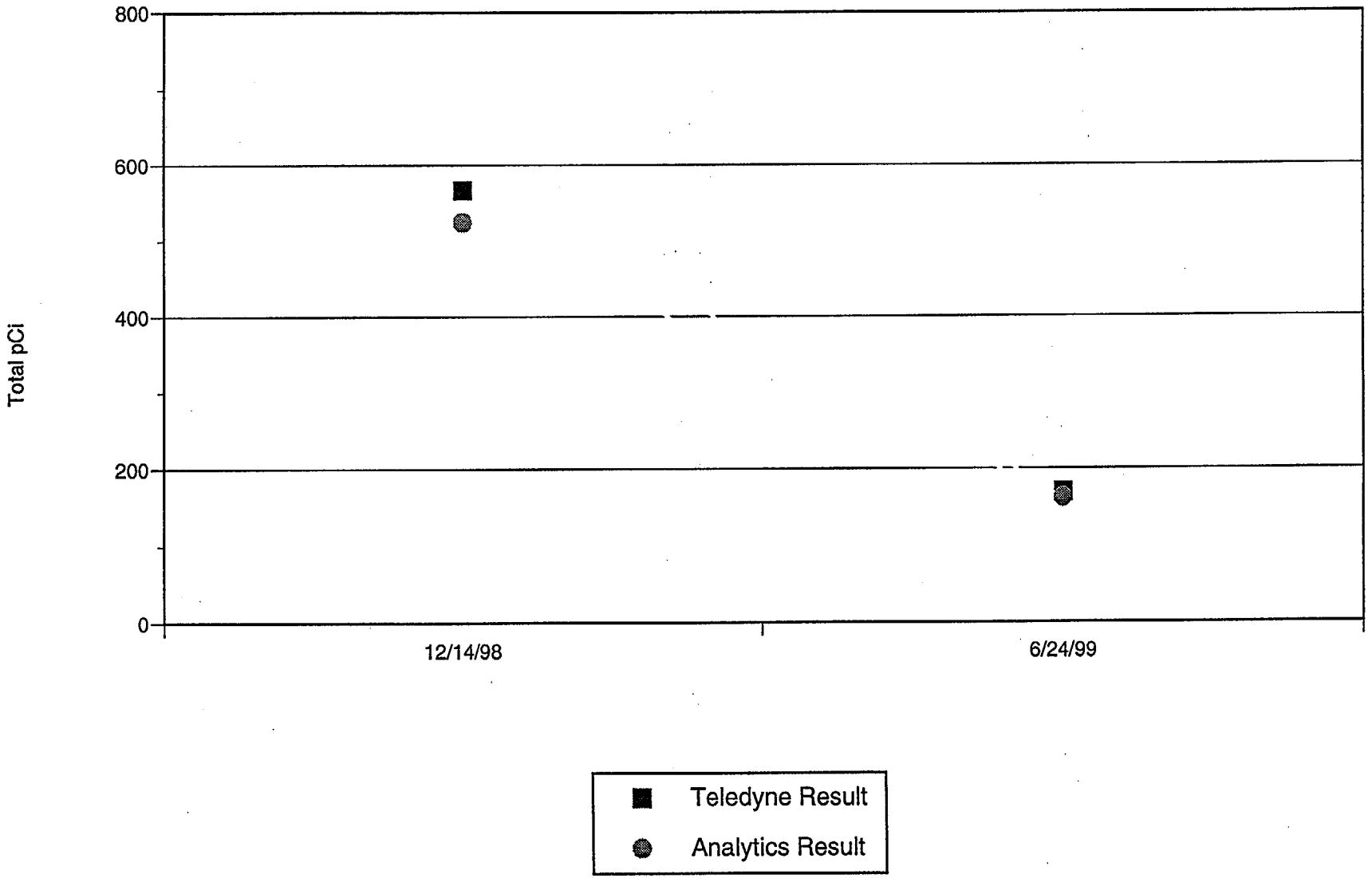
TI #s	DATE	NUCLIDE	ERA Known Value (pCi/l)(a)	TBE Result (b) (pCi/l)	Expected Dev. Known (c) (pCi/l)	Control Limits (d) (pCi/l)	Warning Limits (e) (pCi/l)	Performance Evaluation (f)
11811-11813	8/23/99	U(NAT)	12.4	13.0	3.00	7.20-17.6	8.94-15.9	A
11811-11813	8/20/99	Ra-226	7.21	7.37	1.08	5.34-9.08	5.96-8.46	A
11811-11813	8/23/99	Ra-228	4.51	7.17	1.13	2.57-6.45	3.21-5.81	NA (g)
11808-11810	8/24/99	Sr-89	26.6	25.0	5.00	17.9-35.3	20.8-32.4	A
11808-11810	8/24/99	Sr-90	40.2	39.7	5.00	31.5-48.9	34.4-46.0	A
13058-13060	9/15/99	Gr-A	48.6	30.3	12.2	27.7-69.5	34.6-62.6	CE (h)
13061-13063	9/14/99	Gr-B	20.0	22.0	5.00	11.3-28.7	14.2-25.8	A
14425-14427	9/01/99	H-3	6130	5530	613	5090-7170	5420-6840	A

Footnotes:

(a) The ERA Known Value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.
(b) Average $\pm$ 1 sigma.
(c) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.
(d) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.
(e) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.
(f) A= Acceptable. Reported Result falls within the Warning Limits.
NA = Not Acceptable. Reported Result falls outside of the Control Limits.
CE = Check for Error. Reported Result falls within the Control Limits and outside of the Warning Limits.
(g) A calculation error was made by not correcting for Ra-226 content. If this correction is made, an average result of 5.7 pCi/l is obtained which is in the acceptance region.
(h) The low value is attributed to greater self-absorption characteristics of the sample matrix compared to those of the calibration matrix. This source of bias is often observed in gross alpha measurements, nevertheless, the average result is within the control region (but also in the warning region).

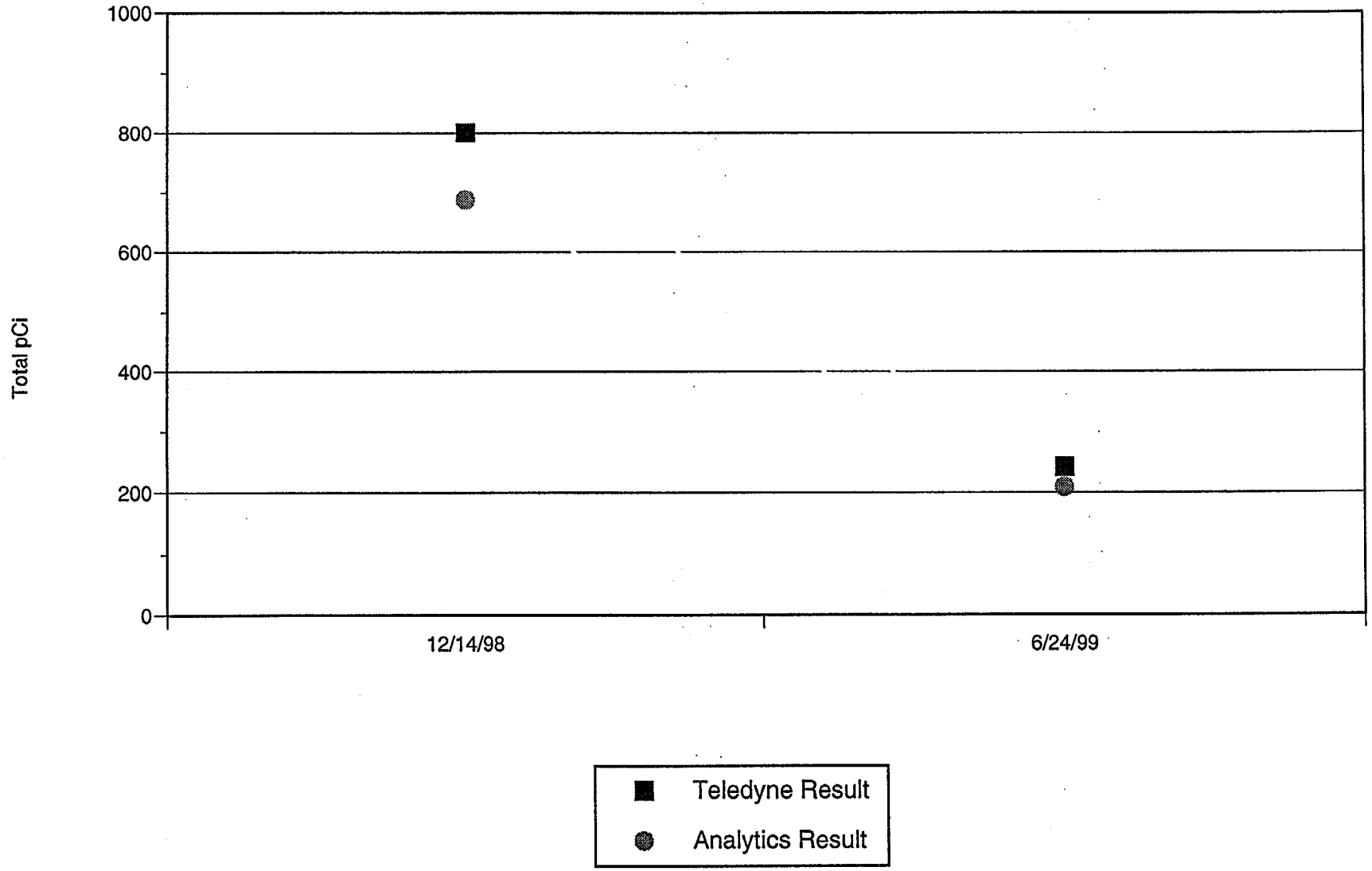
ANALYTICS INTERLABORATORY COMPARISON PROGRAM

CERIUM-141 IN AIR FILTERS



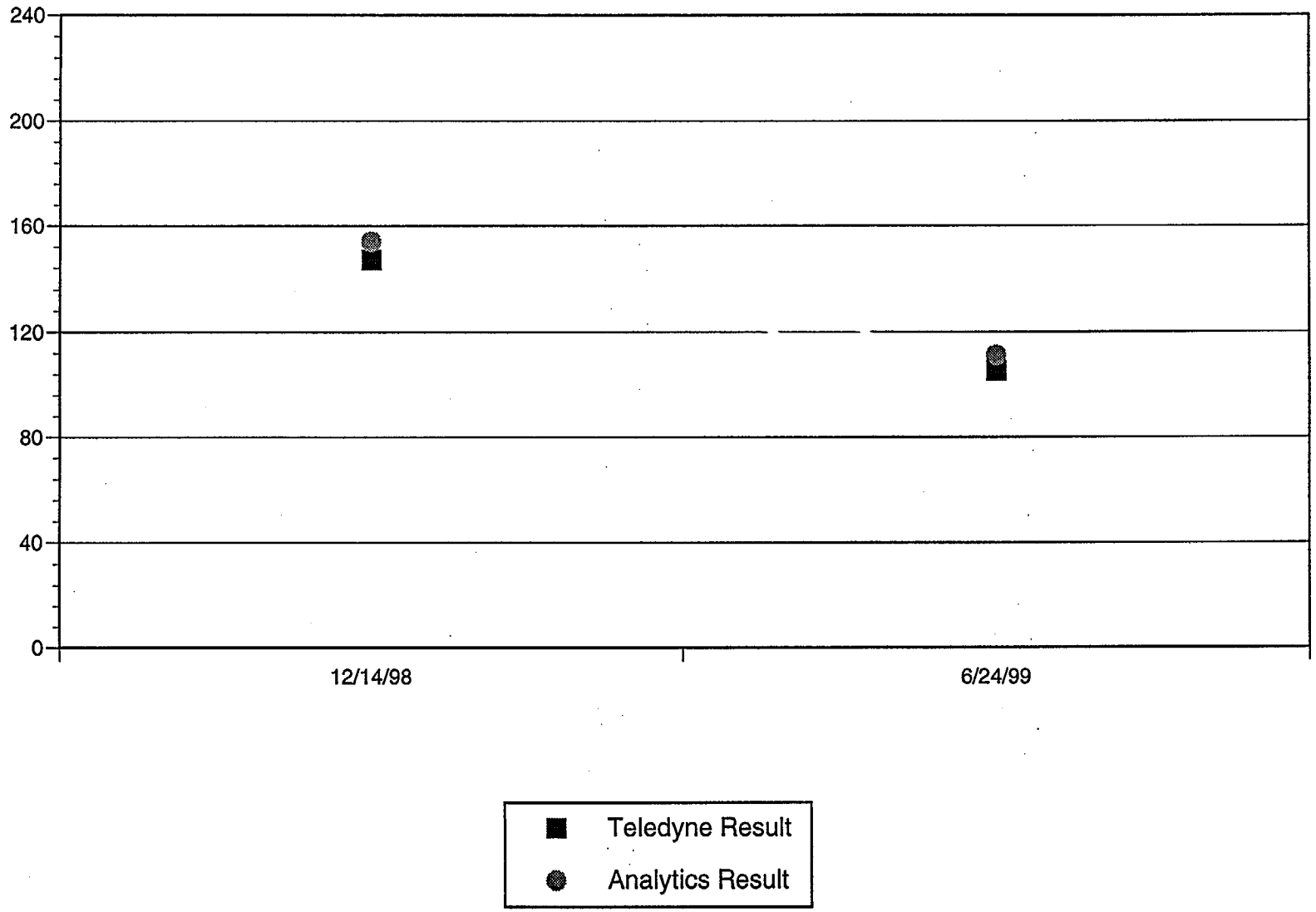
ANALYTICS INTERLABORATORY COMPARISON PROGRAM

CHROMIUM-51 IN AIR FILTERS



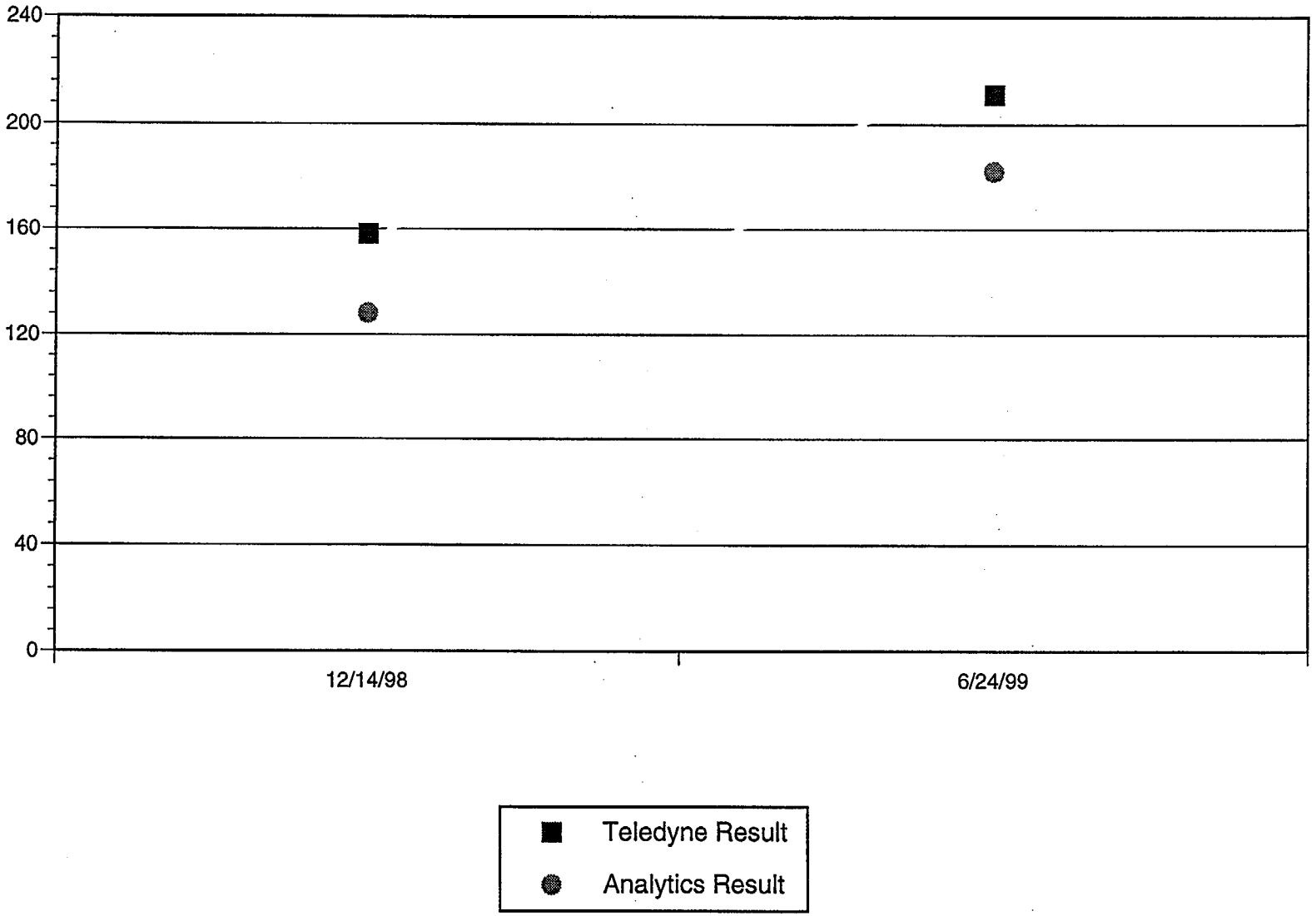
ANALYTICS INTERLABORATORY COMPARISON PROGRAM

CESIUM-134 IN AIR FILTERS



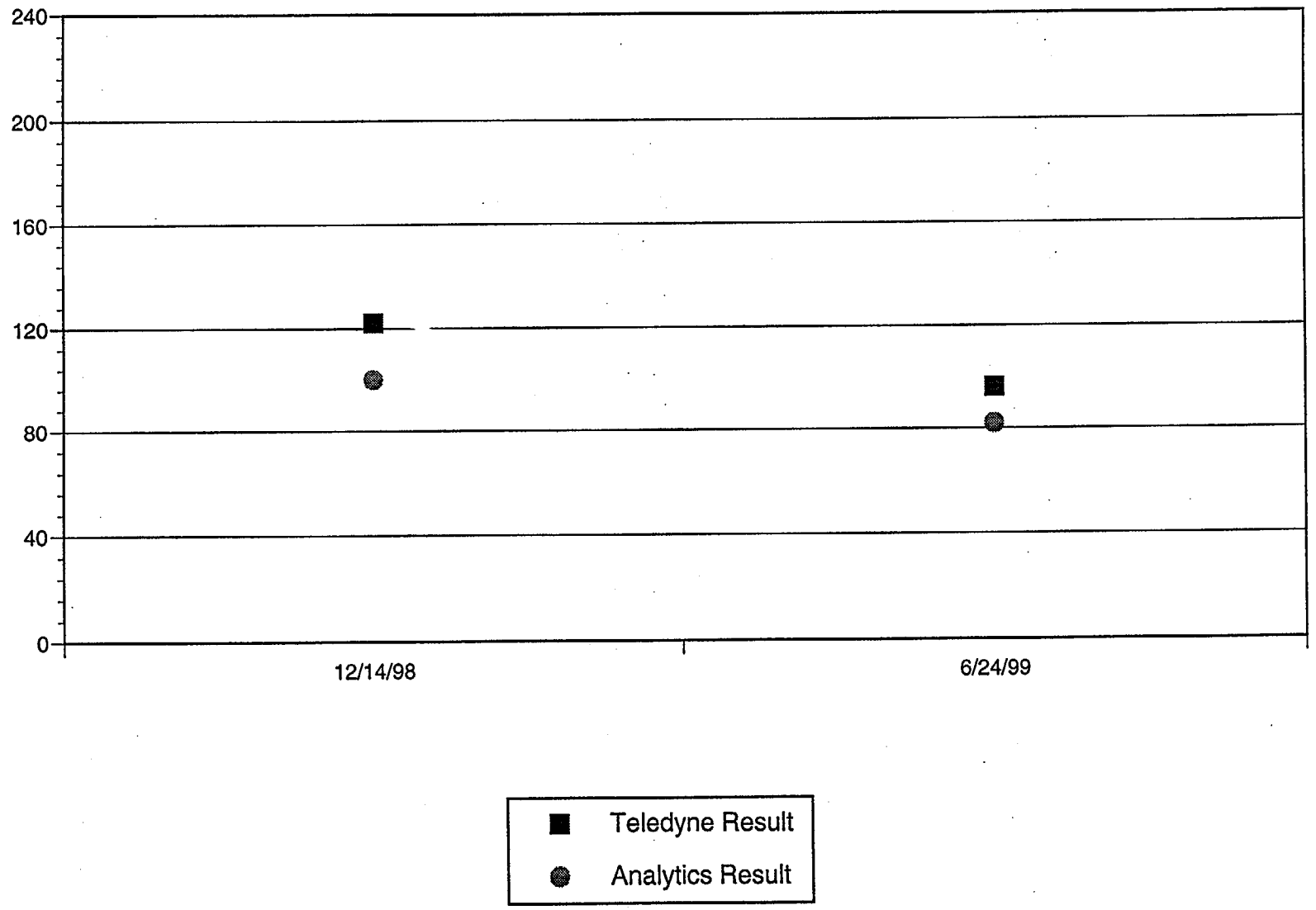
ANALYTICS INTERLABORATORY COMPARISON PROGRAM

CESIUM-137 IN AIR FILTERS



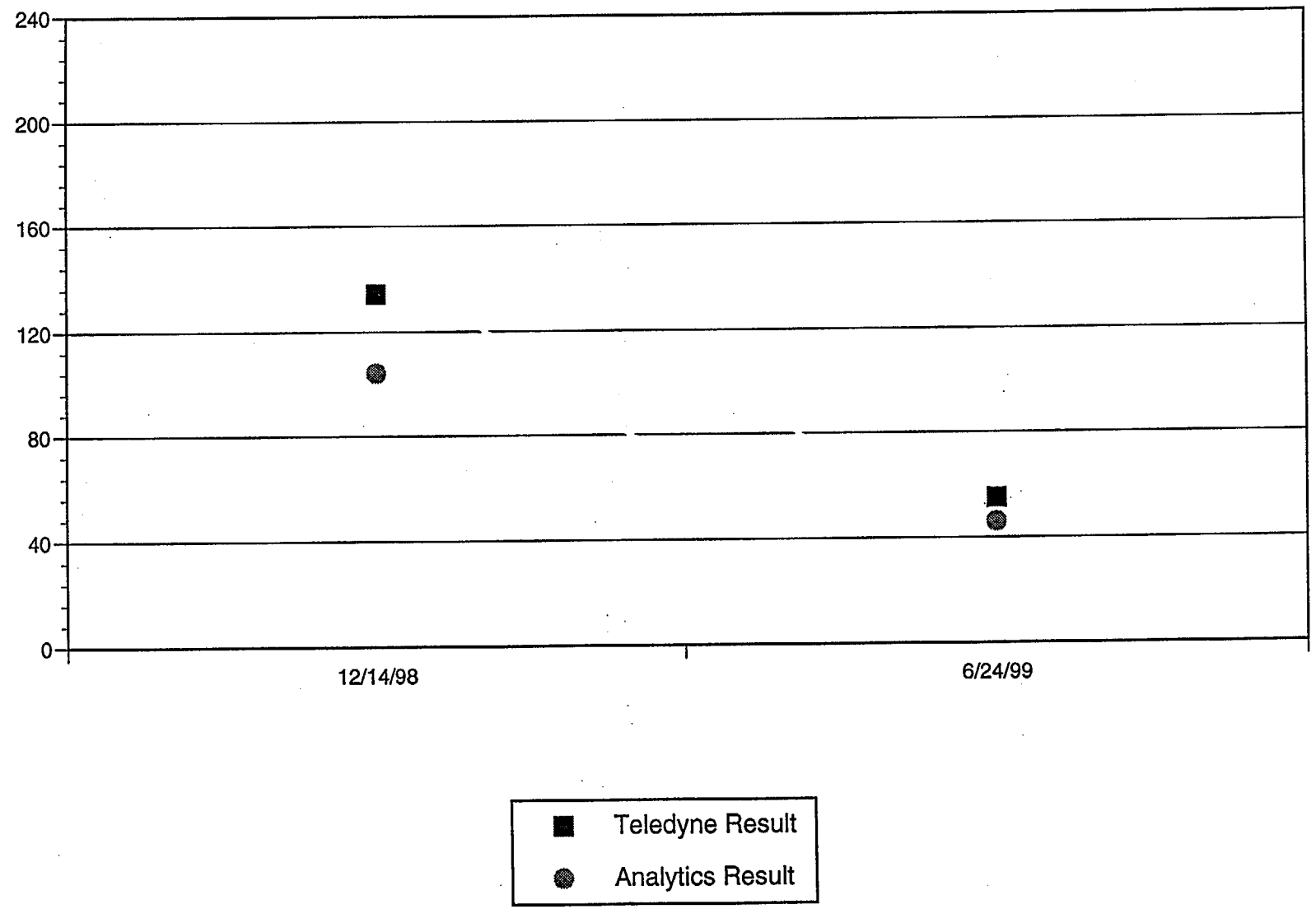
ANALYTICS INTERLABORATORY COMPARISON PROGRAM

MANGANESE-54 IN AIR FILTERS



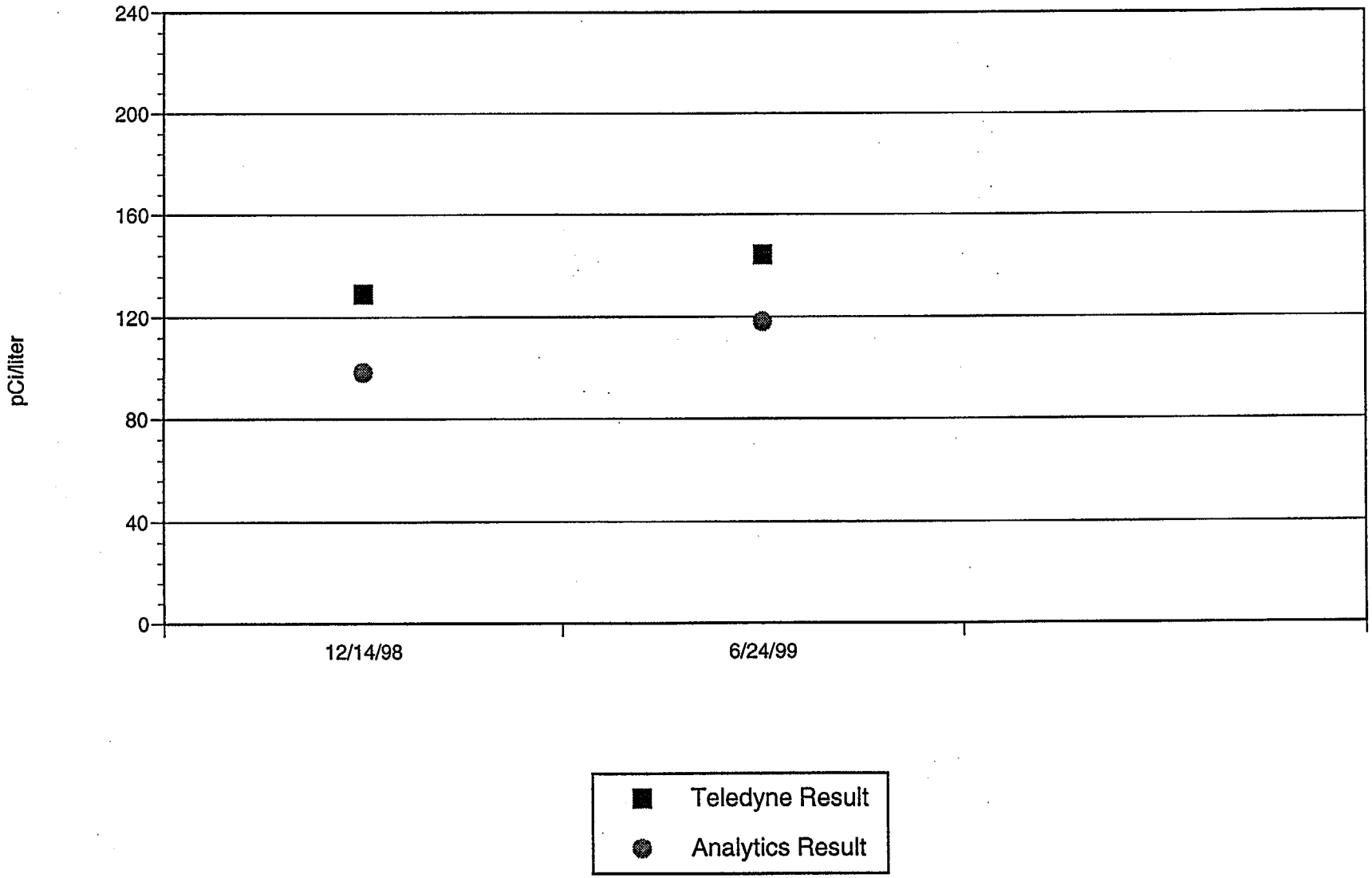
ANALYTICS INTERLABORATORY COMPARISON PROGRAM

IRON-59 IN AIR FILTERS



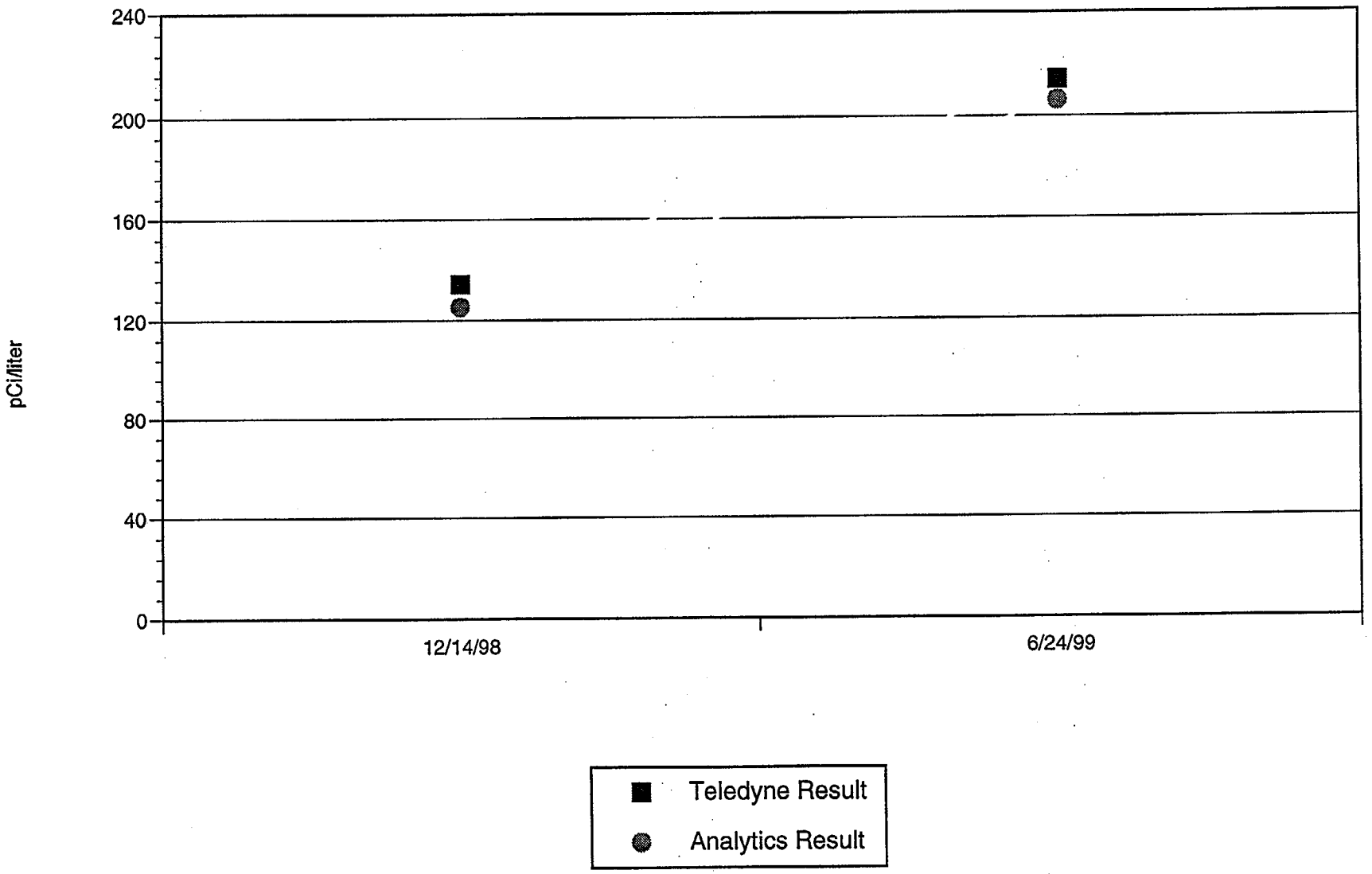
ANALYTICS INTERLABORATORY COMPARISON PROGRAM

ZINC-65 IN AIR FILTERS



ANALYTICS INTERLABORATORY COMPARISON PROGRAM

COBALT-60 IN AIR FILTERS



APPENDIX E
REMP SAMPLING AND ANALYTICAL EXCEPTIONS

REMP SAMPLING AND ANALYTICAL EXCEPTIONS

Air Particulates

Throughout the year the majority of air particulate gross beta results exceeded the ODCM LLD of 0.01 pCi/m3. (Sample results which were at or below the LLD values include: COL for 01/13/99-01/20/99; ONS-4 and ONS-5 for 03/31/99-04/07/99; ONS-1, ONS-4, ONS-5, NBF, SBN, DOW, and COL for 04/14/99-04/21/99; ONS-1, ONS-4, DOW and COL for 05/05/99-05/12/99; and NBF for 09/30/99-10/06/99.

All of the results were less than 0.055 pCi/m3. Air particulate gross beta results for all air sample station locations with run start dates of 10/27/99 and through to 12/15/99 show noticeable increases from the previous months' results. This increase was almost twice as high as the one seen last year.

Prior to 10/27/99 results averaged approximately 0.016 pCi/m3; however, the samples collected on 11/03/99 averaged 0.047 pCi/m3. On 11/03/99 the results averaged 0.047 pCi/m3. On 11/09/99 the results averaged pCi/m3. On 12/15/99 the average was 0.027 pCi/m3. On 12/22/99 the results averaged 0.023 pCi/liter and on 12/29/99 the results averaged 0.021 pCi/m3.

Results greater than the ODCM LLD limit of 0.01 pCi/m3 are consistent with historical data. However, the increased air particulate results from 11/03/99 were greater than the increases normally seen. A review of laboratory processes and sampling techniques were performed to ensure no associated changes were implemented which may have affected sample results. No changes in either program were discovered. It is believed that the high gross beta values were caused by seasonal weather related variations in naturally occurring nuclides.

Air sample media was not collected on 09/29/99 due to shipment of charcoal filters being late. These samples were collected on 09/30/99 (the eighth day of the normal seven-day interval). The collection of the samples was within the 25 percent allowable time period defined in PMP-6010.OSD.001. The Cook Plant storeroom has minimum and maximum values for their stock to prevent this type of situation. This situation had not occurred previously and there has not been a reoccurrence.

On 07/28/99, the air sampler for ONS-6 was not restarted after the collection of the previous sample media. Due to this event the required sample was not available on 08/04/99 when the samples were scheduled for collection. This event was documented on condition report number P-99-20252. The sample collector was interviewed. He stated that he was

distracted by the numerous deer flies in the area of the air sample station. Screened hats and other insect repellant equipment are available for the sample collectors. No similar incidents have occurred.

Surface Water

Surface water samples were not obtained from beach locations SWL-2 and SWL-3 between 01/01/99 and 01/31/99 and also on dates 02/04/99, 02/12/99, 02/28/99, 03/03/99, 03/10/99 and 03/24/99 due to hazardous environmental conditions such as ice, wind and high waves.

Thermoluminscent Dosimeters (TLDs)

On 12/29/99, while collecting the fourth quarter 1999 environmental dosimeters and distributing the first quarter 2000 environmental dosimeters, the TLD at OFT-1 was not located. The snow covered ground immediately surrounding the utility pole was searched; however, the TLD was not located. This condition was documented on condition report number P-99-29902. This TLD is located offsite. The suspected cause of the missing TLD is either high winds or public mischief. The TLDs have been placed at approximately two meters above the ground to try to prevent future occurrences of loss due to vandalism.

Groundwater

The groundwater well sample from location W-6 for 01/26/99 had a tritium result of 2100 pCi/liter, which exceeded the ODCM LLD level of 2000 pCi/liter. The groundwater well sample from location W-4 for 08/06/99 had a tritium result of 2700 pCi/liter, which exceeded the ODCM LLD level of 2000 pCi/liter. The groundwater well sample from location W-4 for 10/29/99 had a tritium result of 2200 pCi/liter, which exceeded the ODCM LLD level of 2000 pCi/liter.

The first quarter groundwater samples for locations W-4, W-5 and W-6 were delayed from their scheduled date of 01/22/99 until 01/26/99 due to hazardous weather. These locations are inside the plant-protected area on the beach side of the plant, which offers no protection from the normal winter northwestern winds. The collection of these samples was well within the 25 percent allowable extension time as per the ODCM.

The third quarter groundwater samples for locations W-1 through W-3, W-7 through W-14, SG-1, SG-2, SG-4 and SG-5 were not collected until 07/27/99 and 07/28/99. This is a 97 day frequency from the previous quarter, versus the optimum 92-day frequency which would have been on 07/23/99 and 07/24/99. However, this is well within the 25 percent allowable extension time as per the ODCM.

The third quarter groundwater samples for locations W-4, W-5 and W-6 were not collected until 08/06/99 due to a sample pump malfunction. (Sample collection was scheduled for 07/27/99). However, 102 days is well within the 25 percent allowable extension times as per the ODCM.

The fourth quarter groundwater samples for locations W-1 through W-14 were scheduled for collection on 10/27/99 and 10/28/99. They were not collected until 10/29/99, which is a 93-day frequency from the previous quarter due to scheduling conflict with NPDES environmental samples. However, 93 days is well within the 25 percent allowable extension time as per the ODCM.

Drinking Water

For the following dates the St. Joseph water treatment facility gross beta composite results measured greater than the ODCM LLD level of 4.0 pCi/liter:

02/11/99-02/24/99 = 5.1 pCi/liter
03/25/99-04/27/99 = 4.2 pCi/liter
05/20/99-06/02/99 = 5.1 pCi/liter
06/17/99-06/30/99 = 6.3 pCi/liter

The Lake Township water treatment facility gross beta composite result measured 4.1 pCi/liter for the composite sample for 11/04/99-11/17/99 and 5.3 pCi/liter for the sample for 05/20/99 to 06/02/99. These composite results exceeded the ODCM LLD level of 4.0 pCi/liter.

Broadleaf Samples in Lieu of Milk Samples

Broadleaf samples were not obtained during January, February, March, April, November or December of 1999 due to seasonal unavailability of adequate sampling media.

APPENDIX F
1999 LAND USE CENSUS

APPENDIX F
SUMMARY OF THE 1999 LAND USE CENSUS

The Land Use Census is performed to ensure that significant changes in the areas in the immediate vicinity of the plant site are identified. Any identified changes are evaluated to determine whether modifications must be made to the REMP or other related programs. The following is a summary of the 1999 results.

Dairy Farm Survey (See Attachments 1, 2, 3, 4 and 5)

The dairy farm survey was performed to update the list of dairy farms located in the plant area (Berrien County), to identify the nearest animal whose milk is used for human consumption. The milk farm survey for the Donald C. Cook Nuclear Plant was conducted on September 15, 22 and 29, 1999.

There were no changes in the dairy farm list from the Michigan Department of Agriculture between July 1, 1998 and July 1, 1999. One farm (Wesner), which was located during the door-to-door survey of 1998, was found in 1999 to no longer have dairy cows used for milk consumption. Wesner does have a Holstein steer. Four new dairy farms were located in the county during this year's door-to-door survey.

During the 1999 Land Use Census, four farms/residences with dairy animals used for milk consumption within eight miles of the plant were visited (Shuler, Monroe, Glen-Troy and Jerry Warmbein). These farm residents were questioned to see if they would participate in our milk sampling program. The Monroe farm and the Glen-Troy farm have stated that they would be interested in participating in the milk program. However, neither the Shuler farm nor the Jerry Warmbein farm wished to participate. Therefore, Cook Plant will continue to obtain monthly broadleaf samples in lieu of milk samples (as per 12 THP 6010 RPP.635) until a third participating milk farm or residence for indicator samples can be acquired.

The closest milk-producing animals (for human consumption) are milk cows at the Shuler & Son Farm located at 2791 Snow Road in Baroda.

Residential Survey

From June 1, 1998 through June 1, 1999, one residential building permit was issued for new construction in Lake Township for Sections 5, 6, 7 and 8. These sections border the Cook Plant property. The one permit was for Lot #6 in the Wildwood development north of Bridgman between I-94 and Lake Michigan. It was issued on 10/09/98 to construct a pool house. The residence for this lot

is the closest residence to the Cook Plant in Sector H. The construction of the pool house will not effect the Plant's radiological evaluation of this residence.

Grape and Broadleaf Survey

In accordance with the Offsite Dose Calculation Manual 12 PMP 6010 OSD.001 and the grape and broadleaf collection procedure 12 PMP 6010 RPP.638, broadleaf vegetation sampling is performed in lieu of a garden census. Broadleaf sampling is performed to monitor for plant impact on the environment. The samples were obtained as close to the site boundary as possible in a land sector, with sample media, with the highest average deposition factor (D/Q). Control samples were also obtained in a less prevalent sector approximately 20 miles from the site boundary. The broadleaf analytical results for 1999 were less than ODCM LLDs (60 Pico-curies/kg for Cs-134, Cs-137 and I-131).

1999 Land Use Census – Operating Dairy Farms In Berrien County

Name and Address	Township	Section	Sector/Distance
Andrews University Dairy Road Berrien Springs, 49103	Oronoko	12	E / 10.5 miles
Brohman Farm 1637 Mt Tabor Rd. Berrien Springs, 49103	Oronoko	29	F / 8.5 miles
Glen Troy Farm Mel Freehling 2221 Glendora Rd. Buchanan, 49107	Weesaw	10	H / 7.0 miles
Koebel Farm 16318 Avery Rd. Three Oaks, 49128	Three Oaks	36	J / 10.6 miles
Dean Lozmack 14843 Cleveland Rd. Galien, 49218	Weesaw	23	H / 9.2 miles
Paul Lozmack 4193 Elm Valley Three Oaks, 49128	Weesaw	30	J / 10.3 miles
William Nimtz 3445 Park Rd. Eau Claire, 49111	Pipestone	07	D / 13.5 miles
Howard Payne RFD 2 Box 148 Three Oaks, 49128	Weesaw	31	J / 10.9 miles
Powers Farm 16402 Wells Rd Buchanan, 49107	Buchanan	31	H / 12.7 miles
Shuler Farm 2791 Snow Rd. Baroda, 49101	Lake	28	G & H / 4.1 miles
Wagner Farms Carl Wagner, Jr. 8523 Chapel Rd.	Berrien	35	F / 16.5 miles
Carl Wagner, Sr. 11215 Pucker St. Niles, 49120	Berrien	26	F / 17.0 miles
John Warmbein RFD 2 Box 180 (Old Mill Rd.) Three Oaks, 49128	Weesaw	19	J / 8.5 miles

The above farms are Michigan Department of Agriculture Grade A approved.

ATT 1

1999 Land Use Census – Operating Dairy Farms In Berrien County -Continued

The farms listed below are not MI Department of Agriculture approved farms.

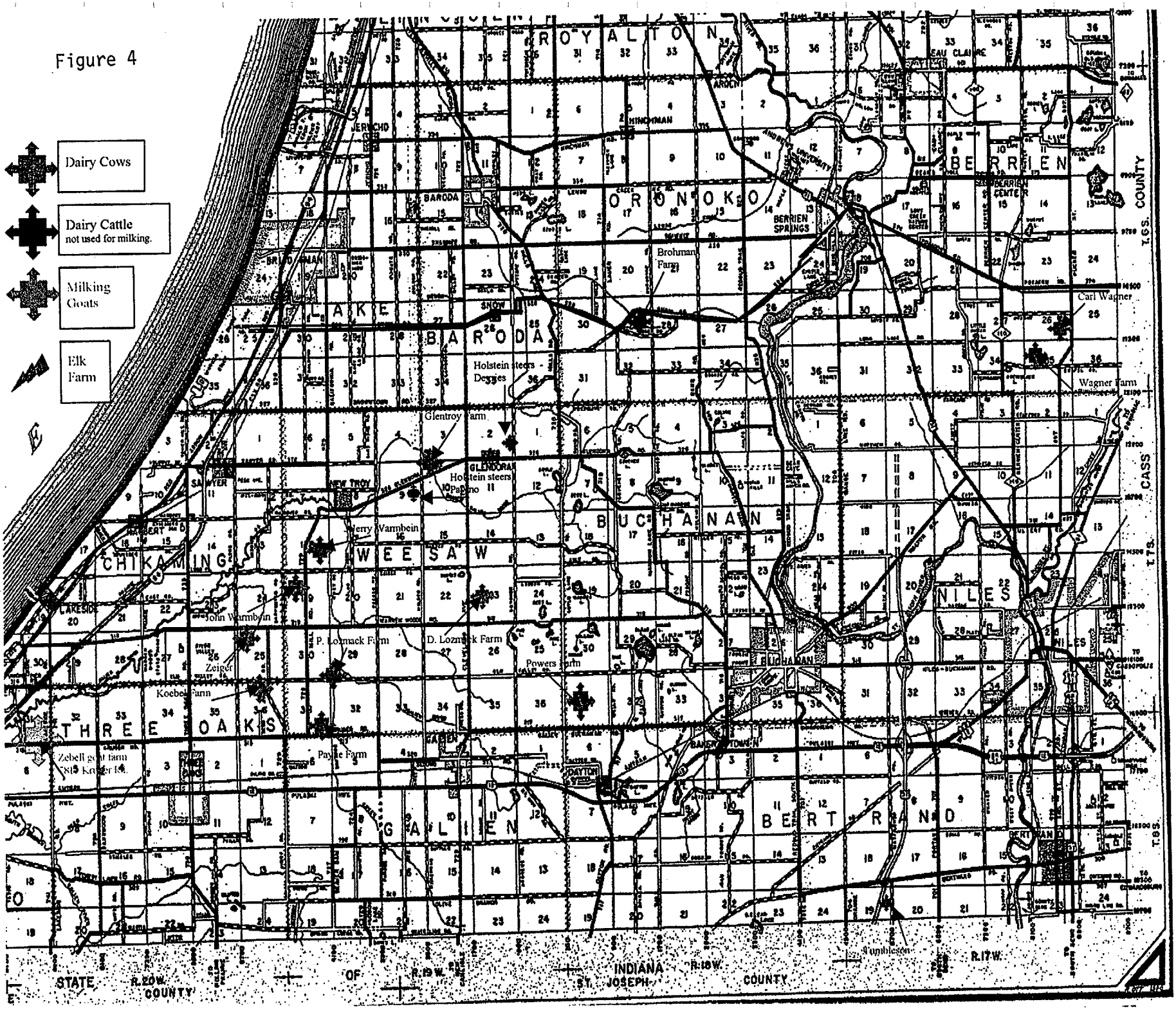
Name and Address	Township	Section	Sector/Distance
Jeff Monroe 10627 Miller Rd. Baroda, 49101	Lake	27	G / 5.0 miles
Jerry Warmbein 14143 Mill Rd. Three Oaks, 49128	Weesaw	18	J / 7.7 miles
Robert Zebell 7819 Kruger Road Three Oaks, 49128	Three Oaks	33 & 34	K / 12.0 miles
Zeiger Farm 5692 Warren Woods Rd. Three Oaks, 49128	Three Oaks	25	J / 9.4 miles

The following farms/residences have steers and/or cows (Holstein or Jersey) which are not used for milking at this time but should be verified annually.

Devries 1847 Gardner Rd. Buchanan, 49107	Weesaw	10	G / 7.8 miles
William Haase 10276 Miller Rd. Baroda, 49101	Lake	27	G / 4.5 miles
Patyno 2629 Glendora Rd. Buchanan, 49107	Weesaw	10	H / 7.2 miles
Arthur Phillips 2414 Park Rd. Eau Claire, 49111	Bainbridge	31	D / 14.0 miles
Nelson Farm Shawnee Rd. Berrien Springs, 49103	Oronoko	14	F / 10.5 miles
Roger Tumbleson 3120 Mayflower Rd. Niles, 49120	Bertrand	19	G / 19.0 miles
Chad White 1558 W. Shawnee Rd Baroda, 49101	Lake	14	F / 4.5 miles

Att 1

Figure 4



ATT 2


M I C H I G A N
COLOMA
HAGAR
WATERVLIET
BENTON
BAINBRIDGE
BENTON HARBOR
BENTON HEIGHTS
ST. JOSEPH
SOUTH ST. JOSEPH
FAIRPLAIN
LAKE MICH. COLLEGE
PEARL GRANGE
SPINKS CORNERS
NORTH SHORE
TWELVE CORNERS
RIVERSIDE
MILLBURG
BAINBRIDGE CENTER
ELK
SCOTTDALE
GLENLORD
SODUS
PIPESTONE
NAOMI
HOLLYWOOD
STEVENSVILLE
LINCOLN
ROYALTON
BUCKHORN
EAU CLAIRE
JERICHO
HINCHMAN
BARODA
ORONOKO
BERRIEN
BERRIEN CENTER
BERRIEN SPRINGS
LAKE
SNOW
VAN BUREN COUNTY
T.3S.
T.4S.
T.5S.
Holstein heifers
NIMTZ FARM
Nimtz summer pasture
Nimtz summer pasture
Andrews Farm
Holstein steers
Brohman Farm
Carl Wagner
Wagner Farms
Hasse - steer
White steers
Shuler Farm
Monroe's

Att 3

FORM RP-640-01

LAND USE CENSUS

I. RESIDENTIAL LAND USE DATA

Sector	House Number	Lot Number	Distance (ft)
A	1 (Iler Rd. Rosemary Beach)	11-11-0006-0004-01-7	2161
B	2 (Iler Rd. Rosemary Beach)	11-11-0006-0004-09-2	2165
C	3 (Lake Rd. Rosemary Beach)	11-11-6800-0028-00-0	3093
D	4 (7500 Thorton Rd)	11-11-0005-0036-01-8	5733
E	5 (7927 Red Arrow Hwy)	11-11-0008-0009-07-0	5631
F	6 (8197 Red Arrow Hwy)	11-11-0008-0015-03-1	5392
G	7 (8345 Red Arrow Hwy)	11-11-0008-0010-03-0	5382
H	8 (Loc #6 Wildwood)	11-11-8600-0006-00-4	4650
J	9 (Livingston Hills)	11-11-0007-0010-02-3	3366
K	10 (Livingston Hills)	11-11-0007-0010-03-1	3090

II. DAIRY FARM SURVEY

Additions

Sector	Name Address	Distance (ft)
G	Jeff Monroe 10627 Miller Rd. Baroda	26400
K	Robert Zebell 7819 Kruger Rd., Three Oaks	63360
J	Zeiger Farm 5692 Warren Woods Rd., Three Oaks	49632

Deletions

Sector	Name Address	Distance (ft)
E	George and Bill Wesner Farm 7655 Sinclair Rd. Eau Claire	79200
N/A	N/A	N/A
N/A	N/A	N/A

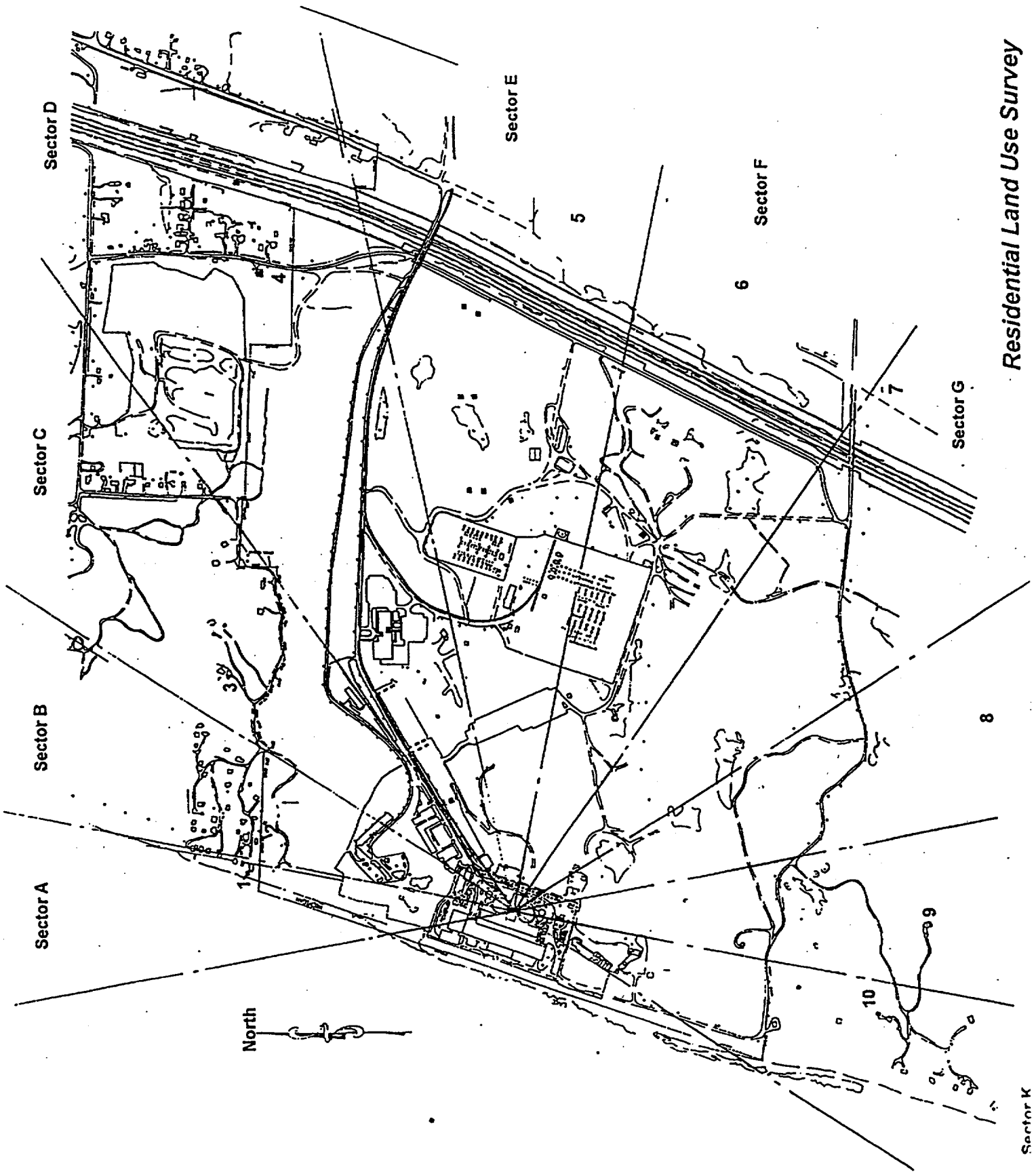
III. CLOSEST MILK PRODUCING ANIMAL

Sector	Name Address	Distance (ft)
G & H	Shuler Farm 2791 Snow Rd., Baroda	21648

Jon H. Hamm JR — Performed By — 09-29-99 Date

Reviewed By — 10/13/99 Date

Figure 6



ATT 5

APPENDIX G
SUMMARY OF THE PRE-OPERATIONAL RADIOLOGICAL MONITORING PROGRAM

SUMMARY OF THE PREOPERATIONAL RADIOLOGICAL MONITORING PROGRAM

A preoperational radiological environmental monitoring program was performed for the Donald C. Cook Nuclear Plant from August 1971 until the initial criticality of Unit 1 on January 18, 1975. The analyses of samples collected in the vicinity of the Donald C. Cook Nuclear Plant were performed by Eberline Instrument Corporation. The summary of the preoperational program presented in this appendix is based on the seven semi-annual reports covering the period. The purpose of this summary is to provide a comparison of the radioactivity measured in the environs of the Donald C. Cook Nuclear Plant during the pre-start up of Unit 1 and the radioactivity measured in 1998.

As stated in the report for the period of July 1 to December 31, 1971, the purposes of a preoperational radiological monitoring program include:

(a) "To yield average values of radiation levels and concentrations of radioactive material in various media of the environment.

(b) To identify sample locations and/or types of samples that deviate from the averages.

(c) To document seasonal variations that could be erroneously interpreted when the power station is operating.

(d) To indicate the range of values that should be considered "background" for various types of samples.

(e) To "proof test" the environmental monitoring equipment and procedures prior to operation of the nuclear power station.

(h) To provide baseline information that will yield estimates of the dose to man, if any, which will result from plant operation."

The discussion that follows is for the various sample media collected and analyzed in both the preoperational period and during 1997. Analyses

performed during the preoperational but not required in 1997, are not discussed.

The gross beta activity in air particulate filters ranged from 0.01 to 0.17 pCi/m^3 from the middle of 1971 to the middle of 1973. In June of 1973 and in June of 1974 the People's Republic of China detonated atmospheric nuclear tests. As a result there were periods during which the gross beta results were elevated to as high as 0.45 pCi/m^3 with no statistically significant differences between indicator and background stations. By the end of the preoperational period the values were approximately 0.06 pCi/m^3.

The gamma ray analyses of composited air particulate filters showed "trace amounts" of fission products, Ce-144, Ru-106, Ru-103, Zr-95, and Nb-95, the results of fallout from previous atmospheric nuclear tests. Cosmogenically produced beryllium-7 was also detected.

The direct radiation background as measured by thermoluminescent dosimeters (TLD) ranged between 1.0 and 2.0 mrem/week during the three and one-half years period.

Milk samples during the preoperational period were analyzed for iodine-131 and by gamma ray spectroscopy (and for strontium-89 and strontium-90). All samples had naturally occurring potassium-40 with values ranging between 520 and 2310 pCi/liter. Cesium-137 was measured in many samples after the two atmospheric nuclear tests mentioned above. The cesium-137 activity ranged from 8 to 33 pCi/liter. Iodine-131 was measured in four milk samples collected July 9, 1974. The values ranged between 0.2 and 0.9 pCi/liter.

Lake water samples were collected and analyzed for tritium and by gamma ray spectroscopy. Tritium activities were below 1000 pCi/liter and typically averaged about 400 pCi/liter. No radionuclides were detected by gamma ray spectroscopy.

Gamma ray spectroscopy analyses of lake sediment detected natural abundances of potassium-40, uranium and thorium daughters, and traces of cesium-137 below 0.1 pCi/g which is attributed to fallout.

Gamma spectroscopy analyses of fish detected natural abundances of potassium-40 and traces of cesium-137, the latter attributed to fallout.

Drinking water analysis was not part of the preoperational program.

APPENDIX H
SUMMARY OF THE SPIKE AND BLANK SAMPLE PROGRAM

TELEDYNE BROWN ENGINEERING QUALITY CONTROL PROGRAM

The goal of the quality control program at Teledyne Brown Engineering is to produce analytical results which are accurate, precise and supported by adequate documentation. The program is based on the requirements of 10CFR50, Appendix B, Nuclear Regulatory Guide 4.15 and the program as described in Quality Assurance Manual IWL-0032-395 and Quality Control Manual IWL-0032-365.

All measuring equipment is calibrated for efficiency at least annually using standard reference material traceable to NIST. For alpha and beta counting, check sources are prepared and counted every day the counter is in use. Control charts are maintained with three sigma limits specified. Control of the alpha-beta counting equipment is described in procedure PRO-032-27, "Calibration and Control of Alpha/Beta Counters". Backgrounds are usually measured at least once per week.

The gamma spectrometers are calibrated annually with a NIST traceable standard reference material selected to cover the energy range of the nuclides to be monitored and to include all of the geometries measured. Backgrounds are determined every other week and check sources are counted weekly. The energy resolution and efficiency were plotted at two energy levels on charts and held within three sigma control limits. From January 1, 1996 December 31, 1996 the energy levels were 59.5 and 1332 KeV. This procedure is described in PRO-042-44, "Calibration and Control of Gamma Ray Spectrometers".

The efficiency of the liquid scintillation counters is determined at least annually by counting NIST traceable standards which have been diluted in a known amount of distilled water and various amounts of quenching agent. The procedure is described in PRO-052-35, "Determination of Tritium by Liquid Scintillation". The background of each counter is measured with each batch of samples. A control chart is maintained for the background and check source measurements as a stability check.

Preparation of carrier solutions and acceptability criteria are contained in procedure PRO-032-49 "Standardization of Radio-chemical Carrier Solutions".

Preparation of efficiency calibration standards and check sources is described in procedure PRO-032-27, "Calibration and Control of Alpha/Beta Counters".

Results are reviewed before being entered into the data system by the Quality Assurance or Laboratory Manager, or supervisors for reasonableness of the parameters (background, efficiency, decay, etc.). Any results which are suspect, being higher or lower than results in the past, are returned to the laboratory for recount. If a longer count, decay check, recount on another system or recalculation does not give acceptable results based on experience, a new aliquot is analyzed. The complete information about the sample is contained on the work sheet(s).

The Donald C. Cook Nuclear Plant's procedures for implementing the quality control program references Regulatory Guide 4.15 which outlines the use of blank, replicate and spike samples within four different parameters: gross beta, iodine, gamma isotopic, and tritium. The blank and replicate samples are prepared at Donald C. Cook Nuclear Plant and spiked samples are prepared by Teledyne Brown Engineering.

No deviations from written procedures occurred during 1999.

Teledyne Brown Engineering In-House Spiked Sample Results - 1999

Water

Analysis	Spike Levels (pCi/L)	Acceptable Range (pCi/l)
Gross Beta	2.2 ± 0.7 E 01	1.5 - 2.9 E 01
Gamma (Cs-137)	2.0 ± 0.3 E 04	1.7 - 2.3 E 04
H-3 (LS)	1.7 ± 0.5 E 03	1.2 - 2.2 E 03

TI #	Analysis Date	Gross Beta Activity (pCi/l)
98364	01/27/99	1.9 ± 0.1 E 01
99148	02/10/99	2.3 ± 0.1 E 01
00764	03/03/99	2.1 ± 0.1 E 01
02375	03/24/99	2.1 ± 0.1 E 01
04371	04/14/99	2.2 ± 0.1 E 01
08500	06/09/99	2.1 ± 0.2 E 01
09498	06/23/99	1.7 ± 0.1 E 01
20834	11/03/99	1.8 ± 0.1 E 01

SPIKES - GAMMA (Cs-137)

TI #	Analysis Date	Activity (pCi/l)
98364	01/27/99	2.1 ± 0.2 E 04
99148	02/10/99	1.9 ± 0.2 E 04
00764	03/03/99	2.2 ± 0.2 E 04
02375	03/24/99	2.0 ± 0.2 E 04
04371	04/14/99	2.1 ± 0.2 E 04
08500	06/09/99	2.1 ± 0.2 E 04
09498	06/23/99	2.1 ± 0.2 E 04
20834	11/03/99	2.2 ± 0.2 E 04

SPIKES - TRITIUM - (H-3) 10ml

TI #	Analysis Date	Activity (pCi/l)
98128	01/27/99	1.7 ± 0.2 E 03
99152	02/10/99	1.5 ± 0.2 E 03
00768	03/03/99	1.6 ± 0.2 E 03
04375	04/14/99	1.5 ± 0.2 e 03
08504	06/09/99	1.7 ± 0.2 E 03
09502	06/23/99	1.5 ± 0.1 E 03
16772	09/08/99	1.7 ± 0.2 e 03
20575	11/03/99	1.6 ± 0.2 E 03
21769	11/17/99	1.6 ± 0.2 E 03

Results of Duplicate Analyses for 1999

Sample Type	Analysis	First Analysis	Second Analysis
Air Particulates Results in Units of 10^{-3} pCi/m^3	Gr-Beta	2.4 ± 0.2 E-02	2.7 ± 0.2 E-02
	"	1.5 ± 0.2 E-02	1.7 ± 0.2 E-02
	"	1.8 ± 0.2 E-02	1.9 ± 0.2 E-02
	"	1.4 ± 0.2 E-02	1.3 ± 0.2 E-02
	"	1.4 ± 0.2 E-02	1.4 ± 0.2 E-02
	"	1.4 ± 0.2 E-02	1.4 ± 0.2 E-02
	"	9.9 ± 1.4 E-03	9.7 ± 1.4 E-03
	"	1.0 ± 0.2 E-02	1.2 ± 0.2 E-02
	"	1.5 ± 0.2 E-02	1.4 ± 0.2 E-02
	"	1.5 ± 0.2 E-02	1.5 ± 0.2 E-02
	"	1.9 ± 0.2 E-02	1.9 ± 0.2 E-02
	"	1.3 ± 0.2 E-02	1.3 ± 0.2 E-02
	"	1.2 ± 0.2 E-02	1.5 ± 0.2 E-02
	"	2.0 ± 0.2 E-02	2.4 ± 0.2 E-02
	"	1.6 ± 0.2 E-02	2.5 ± 0.2 E-02
	"	1.6 ± 0.2 E-02	1.7 ± 0.2 E-02
	"	2.0 ± 0.2 E-02	2.2 ± 0.2 E-02
	"	2.7 ± 0.2 E-02	2.8 ± 0.2 E-02
	"	1.3 ± 0.2 E-02	1.3 ± 0.2 E-02
	"	1.7 ± 0.2 E-02	1.5 ± 0.2 E-02
	"	1.4 ± 0.2 E-02	1.7 ± 0.2 E-02
	"	4.2 ± 0.3 E-02	4.4 ± 0.3 E 02
	"	2.6 ± 0.2 E-02	2.6 ± 0.2 E-02
	"	2.8 ± 0.2 E-02	2.7 ± 0.2 E-02
	"	2.6 ± 0.2 E-02	2.5 ± 0.2 E-02
	"	2.0 ± 0.2 E-02	2.2 ± 0.2 E-02
Air Particulates/ Charcoal Filters Results in Units of 10^{-3} pCi/m^3	Iodine-131	L. T. 8. E-03	L. T. 9. E-03
	"	L. T. 5. E-03	L. T. 4. E-03
	"	L. T. 7. E-03	L. T. 9. E-03
	"	L. T. 7. E-03	L. T. 7. E-03
	"	L. T. 7. E-03	L. T. 7. E-03
	"	L. T. 7. E-03	L. T. 8. E-03
	"	L. T. 5. E-03	L. T. 1. E-02
	"	L. T. 1. E-02	L. T. 2. E-02
	"	L. T. 7. E-03	L. T. 5. E-03
	"	L. T. 1. E-02	L. T. 6. E-03
	"	L. T. 8. E-03	L. T. 2. E-02

(a) All gamma results were less than the detection limit (LLD).

Results of Duplicate Analyses for 1999 (Cont.)

Sample Type	Analysis	First Analysis	Second Analysis
Air Particulates/ Charcoal Filters Results in Units of 10^{-3} pCi/m^3	"	L. T. 5. E-03	L. T. 7. E-03
	"	L. T. 8. E-03	L. T. 1. E-02
	"	L. T. 9. E-03	L. T. 8. E-03
	"	L. T. 8. E-03	L. T. 7. E-03
	"	L. T. 1. E-02	L. T. 5. E-03
	"	L. T. 9. E-03	L. T. 1. E-02
	"	L. T. 1. E-02	L. T. 7. E-03
	"	L. T. 1. E-02	L. T. 1. E-02
	"	L. T. 1. E-02	L. T. 1. E-02
	"	L. T. 2. E-02	L. T. 2. E-02
	"	L. T. 9. E-03	L. T. 2. E-02
	"	L. T. 9. E-03	L. T. 7. E-03
	"	L. T. 1. E-02	L. T. 2. E-02
		L. T. 1. E-02	L. T. 1. E-02
		L. T. 1. E-02	L. T. 1. E-02
Ground Water Results in Units of pCi/liter	Gamma	(a)	(a)
	H-3	L. T. 1. E 02	1.4 ± 0.8 E 02
	Gamma	(a)	(a)
	H-3	L. T. 2. E 02	L. T. 2. E+02
	Gamma	(a)	(a)
	H-3	L. T. 3. E 02	L. T. 3. E 02
Drinking Water Results in Units of pCi/liter	Gr-Beta	5.1 ± 1.1 E 00	4.2 ± 1.2 E 00
	I-131	L. T. 4. E-01	L. T. 4. E-01
	Gamma	(a)	(a)
	Gr-Beta	2.6 ± 1.0 E 00	3.5 ± 1.0 E 00
	I-131	L. T. 5. E-01	L. T. 4. E-01
	Gamma	(a)	(a)
	Gr-Beta	3.0 ± 0.9 E 00	3.5 ± 0.9 E 00
	I-131	L. T. 3. E-01	L. T. 4. E-01
	Gamma	(a)	(a)
Food Results in Units of pCi/kg (wet)	Gamma	(a)	(a)
	I-131	L. T. 2. E 01	L. T. 3. E 01
	Be-7	6.26 ± 0.63 E 02	6.48 ± 0.65 E 02
	K-40	3.21 ± 0.32 E 03	4.53 ± 0.45 E 03
	Cs-137	L. T. 7. E 00	L. T. 9. E 00

(a) All gamma results less than the detection limit (LLD).

APPENDIX I
TLD QUALITY CONTROL PROGRAM

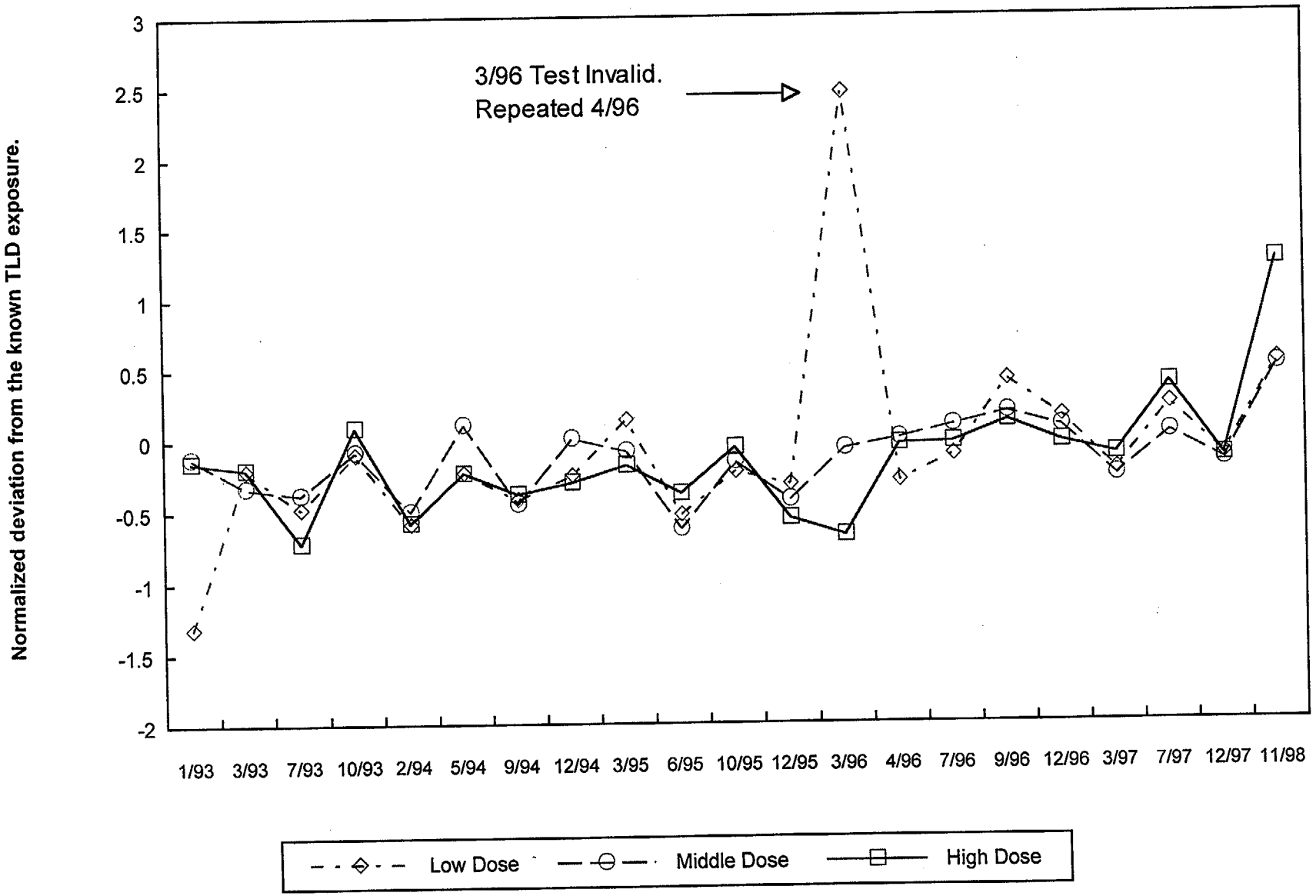
Thirty-three badges with no cases were prepared and color coded into 3 groups of eleven. Each group was assigned to a unique reader. Two dosimeters for each color group were used as controls for the model 8300 manual readers. The remaining dosimeters were exposed to three different test levels: 33 mR, 53.9 mR and 80.8 mR.

The results for the readers compare favorably with the requirements of Regulatory Guide 4.13, Section C. The standard deviation of the three measurements is less than 7.5% and the variation from the known is less than 30%.

Attached are also graphs reflecting the normalized deviation from the known based on an expected laboratory precision for a single determination of 20% and for three determinations for all readers. All the TLD readers responded well within the acceptance limits at each dose level.

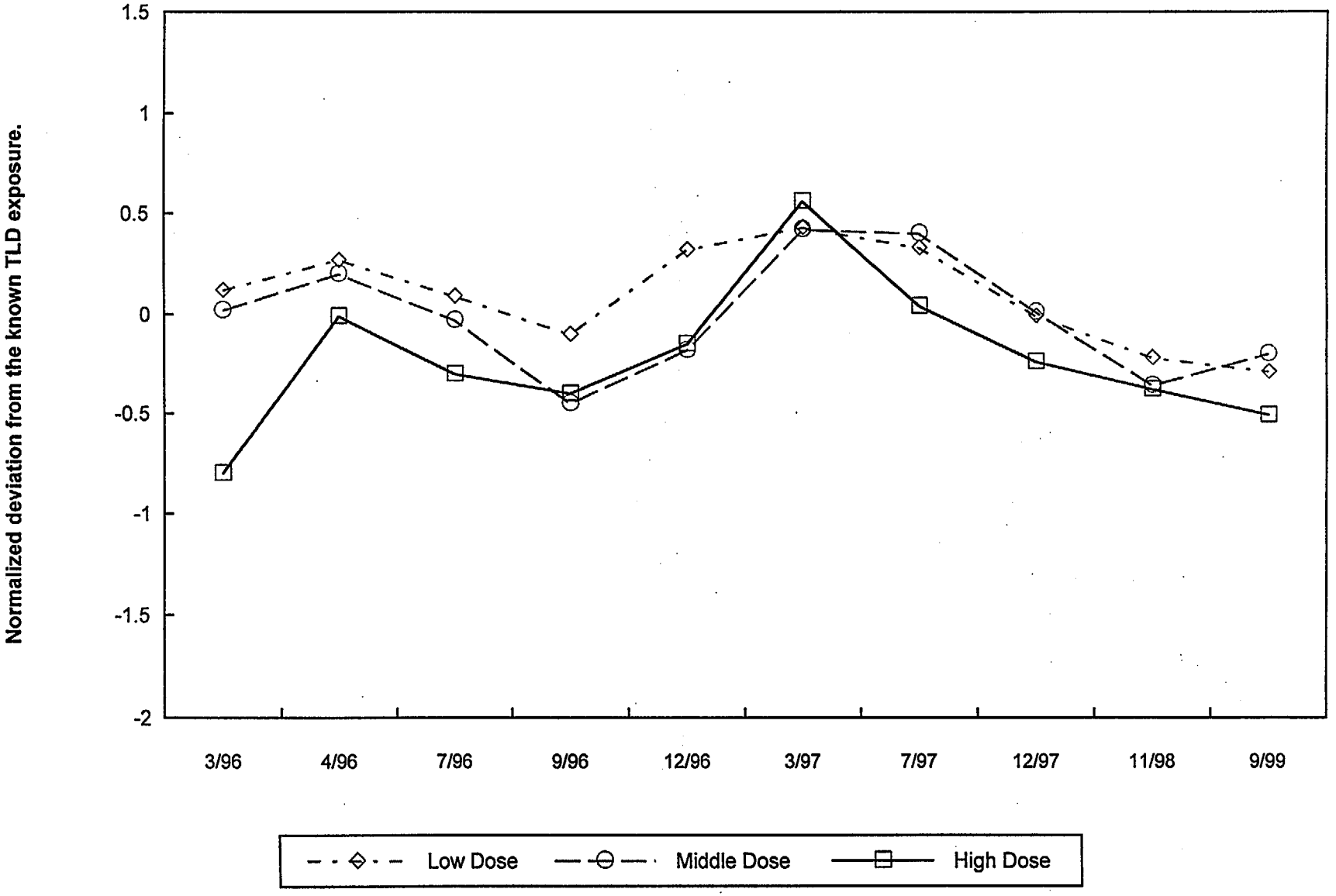
QUALITY CONTROL - TLDs

TLD READER 205

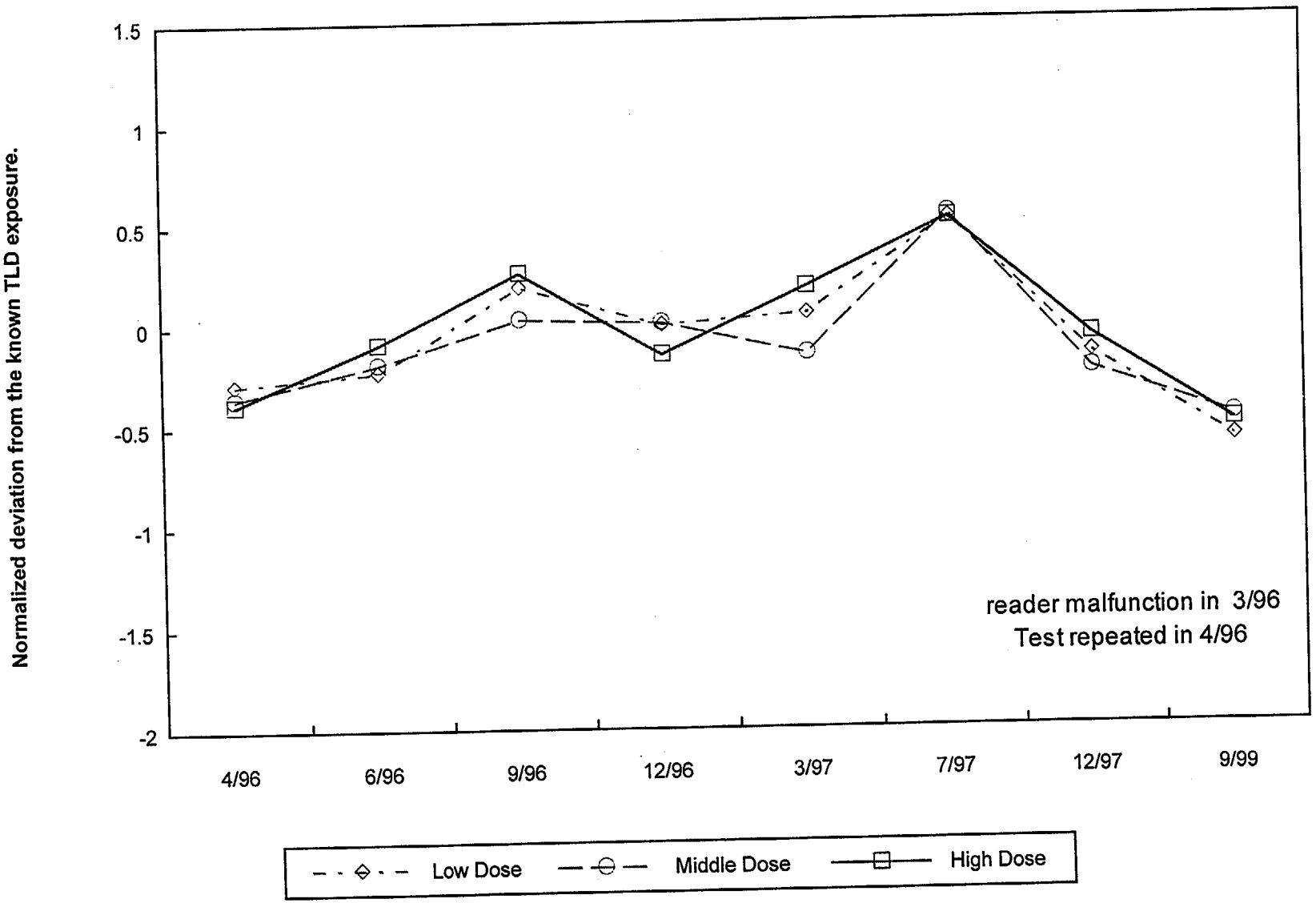


QUALITY CONTROL - TLDs

TLD READER 211

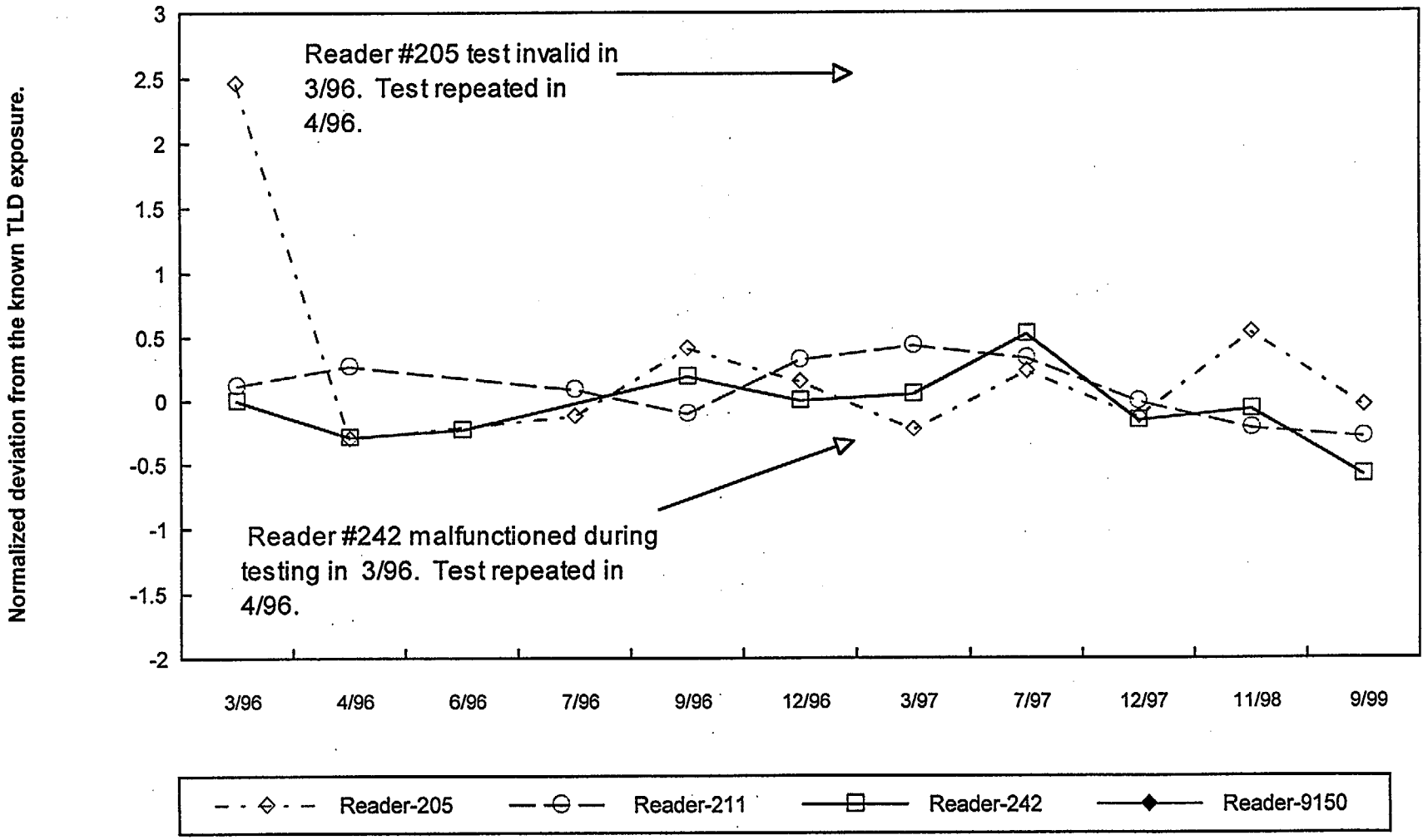


QUALITY CONTROL - TLDs
TLD READER 242



QUALITY CONTROL - TLDs

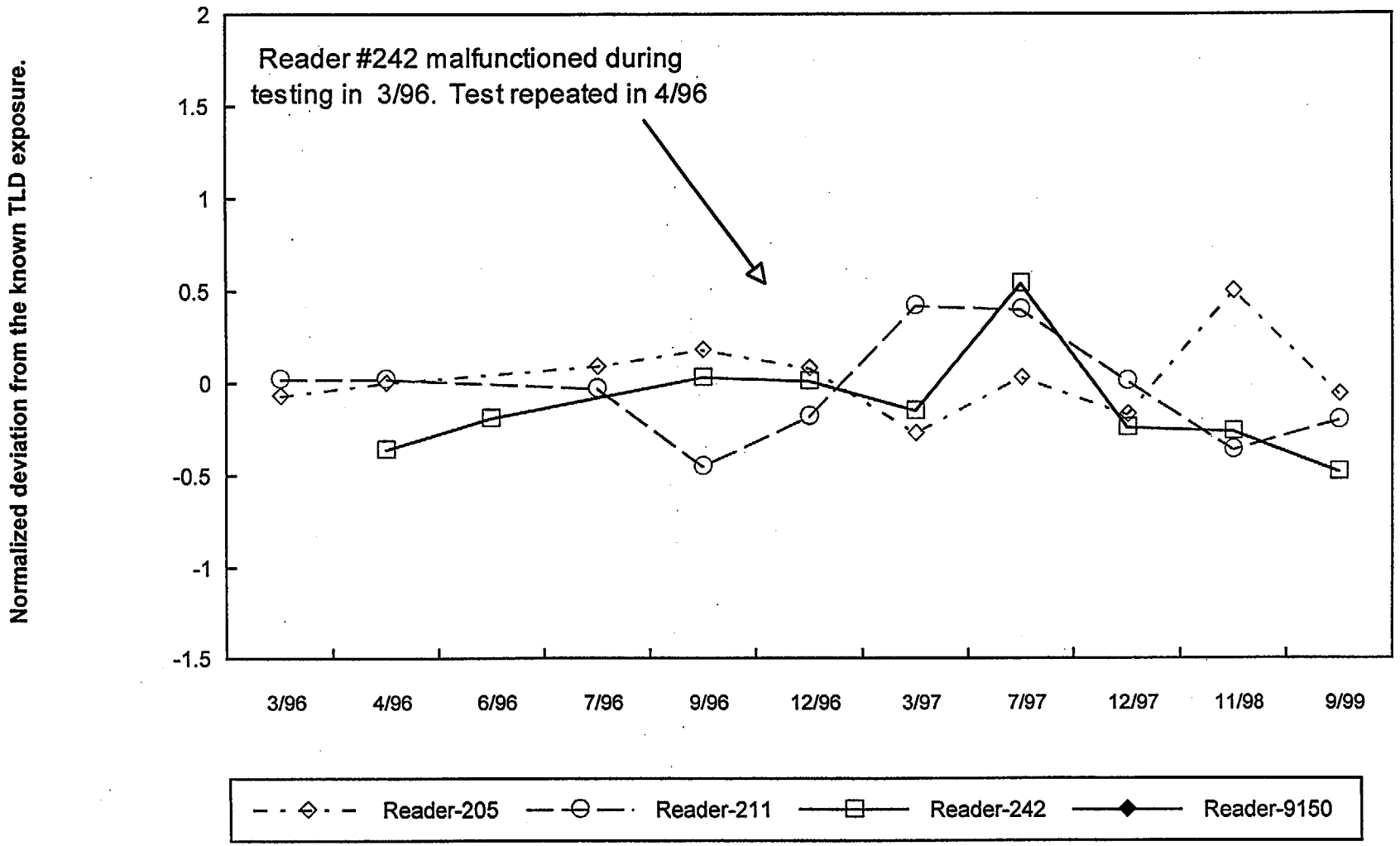
LOW DOSE



Reader-9150 was permanently removed from service during the first quarter 1993.

QUALITY CONTROL - TLDs

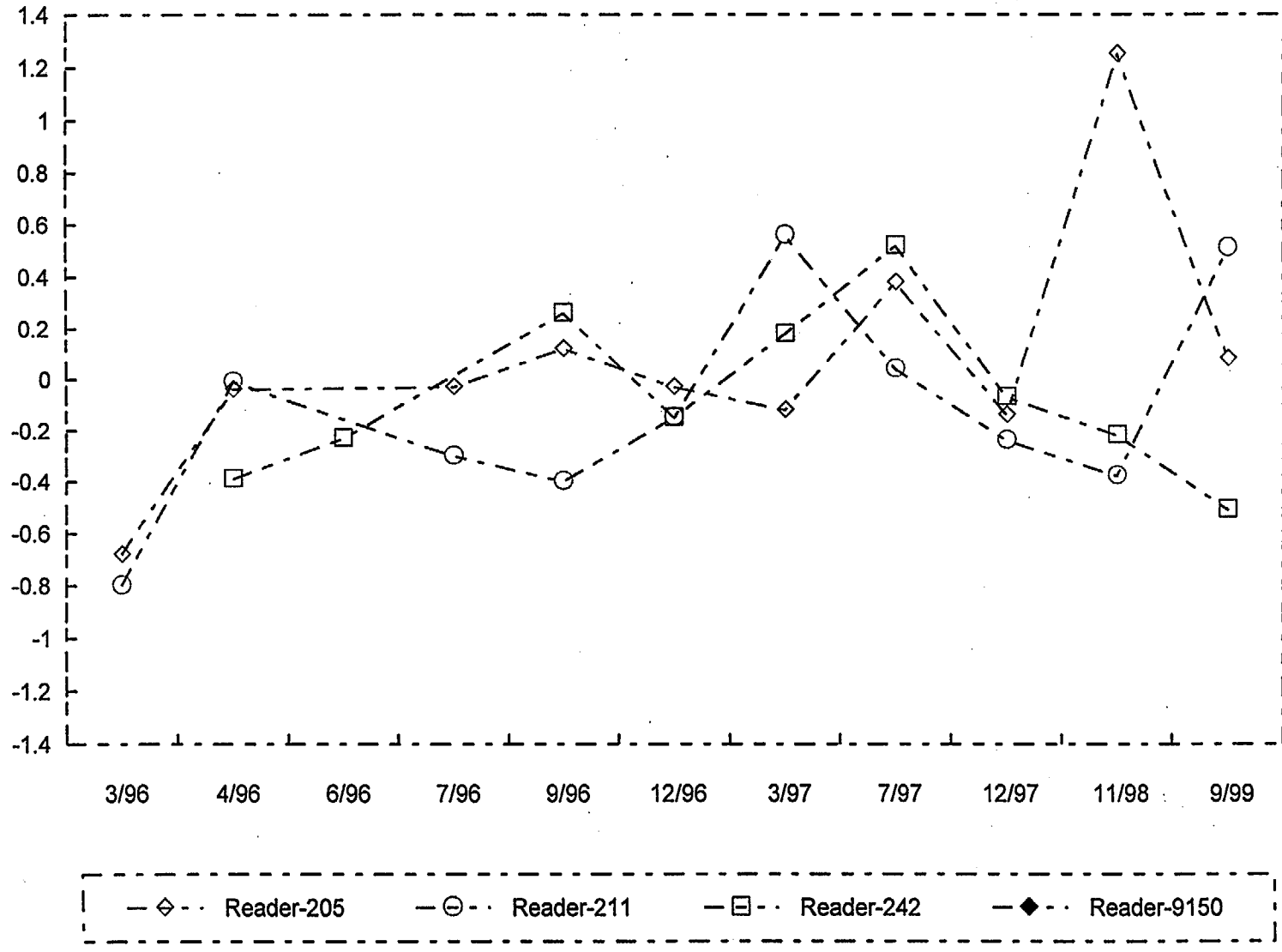
MIDDLE DOSE



Reader-9150 was permanently removed from service during the first quarter 1993.

QUALITY CONTROL - TLDs

HIGH DOSE



Reader-9150 permanently removed from service during the first quarter 1993.